



SanRex

SANARG 160P

**DC INVERTER
ARC WELDER**

Operators Manual

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WELCOME TO THE SANREX FAMILY WELDING TEAM!

Dear Welding Professional,

We would like to take this opportunity to thank you, and congratulate you on procuring a SanRex SANARG 160P DC STICK/TIG Welding Machine.

Welding Professional, now that is a term that we do not take lightly. The welding machine that you purchased is a full function, portable unit that was designed with the Welding Professional in mind. The unit is suitable for use as a portable welder on the job site, to a unit utilized in an industrial manufacturing setting. This unit will perform and is truly a welder for the Professional Welder. As you review this manual, you will be provided with information regarding the use and functionality of the unit. What you will not see is information or instruction on “how to weld”, as this is appropriately left to the vast array of Vocational, Trade and other institutions that provide proper instructional education in welding.

This manual also contains sections that are dedicated solely to the safety of you and others in the work area. It is highly recommended that this information be reviewed and that this manual be kept in a secure but accessible location for reference of these important safety and well-being notices. Remember, the number one requirement in performing any job is safety.

Sansha Electric of Osaka Japan and its “SanRex” brand name of products has specialized in the power supply and power semiconductor manufacturing business for over 80 years. With over 55 years producing welding power supplies and over 30 years producing inverter based welding and plasma cutting power supplies, you can be assured that you have purchased one of the best welding machines on the market today.

The superior Arc Characteristics that you will experience is achieved through our dedication and commitment to research and development as well as developing smart solutions for safe, reliable and environmentally friendly welding machines.

We value long term relationships with our customers and strive to provide the most cost effective solutions that support this philosophy.

We thank you for choosing SanRex equipment.

SanRex Family Welding Team

INTRODUCTION

PURPOSE OF THIS MANUAL

This manual has been prepared to present the safety, installation/operation and maintenance instructions for the SanRex SANARG 160P, hereby referred to as 160P, a DC Stick, TIG and MIG welding machine manufactured by the Sansha Corporation of Osaka, Japan. The manual contains the information necessary for the Professional Welder to correctly use and operate the 160P. It is not the intent of this manual, and *does not*, instruct or offer information on how to weld.

This operation manual includes an introduction followed by detailed information sections.

The information in this operating manual is generic to this model line of the welding machine and must be supplemented with the application specific data, environment condition (location), electrical input connections, limitations, and principal safety standards.

SECTION 1 - SAFETY REGULATIONS AND REQUIREMENTS

This section contains the leading particulars and descriptions of the welding symbols, safety, warning instructions; additional symbols for a complete understanding and safe use of the equipment are also included.

SECTION 2 – INTRODUCTION AND DESCRIPTION

This section includes descriptions and features of the product, V-A curves and the block diagram of the product.

SECTION 3 - INSTALLATION RECOMMENDATIONS

Describing the transportation, working environment, electrical hook-up with consideration for grounding and high frequency interference. Also input power, connections and specifications.

SECTION 4 – OPERATOR CONTROLS, DIMENSIONS AND OUTLINE

Included in this section is a sequence of operation, welding process selection, 160P attributes and model features, plus torch switch receptacle specifications.

SECTION 5 – SET-UP FOR BASIC STICK AND TIG OPERATION.

Basic STICK and TIG set –up shown in a simple pictorial manner.

SECTION 6 - SEQUENCE OF OPERATION

This section describes the sequence to set-up the machine to perform STICK, TIG and HF-TIG welding operations.

SECTION 7 – VOLTAGE REDUCTION DEVICE (VRD)

This section includes information in the Voltage Reduction device that is built-in to the unit. This device lowers the Open Circuit Voltage in STICK welding. This function is useful in applications where a high OCV could be dangerous. The 160P is shipped from the factory with the VRD in the disabled state.

SECTION 8 – TROUBLESHOOTING

This section provides information on Power Source problems and Power Source Error Codes.

SECTION 9 – ROUTINE MAINTENANCE

This section describes basic maintenance for the welding power source.

SECTION 10 – PARTS LIST

This section contains the basic schematic, exploded view and a listing of the spare parts and order numbers.

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SECTION 1 – SAFETY REGULATIONS AND REQUIREMENTS

*Please read this operating manual thoroughly before utilizing the equipment.
Wherever welding equipment is used, safety is always our concern.
PROTECT yourself and others.*

1.0 SAFETY REGULATIONS AND REQUIREMENTS

Throughout this manual, notes, cautions, danger, attention and warnings are used to highlight important information. These highlights are categorized as follows:

1.1 NOTES, CAUTIONS AND WARNING ANNOTATIONS

NOTE:



An operation, procedure, or background information which requires additional emphasis or is helpful in efficient operation of the system.

CAUTION:



A procedure which, if not properly followed, may cause damage to the equipment.

WARNING:



A procedure which, if not properly followed, may cause injury to the operator or others in the operating.

DANGER:



Procedures, which if not properly followed, may lead to death or serious injury.

1.2 SAFETY RECOMMENDATIONS



For the purpose of safety, it is recommended that this welding equipment be installed, maintained, inspected, and repaired by appropriate qualified person or persons who are well familiarized with welding equipment.



As for safety training, it is recommended to avail yourselves of various seminars and qualifying examinations for welding engineers and welding technicians sponsored by the Welding Society, the Welding Engineering Society, and the headquarters or branch offices of societies or associations concerned.



For the purpose of safety, it is recommended that this welding equipment should be operated by persons who have enough knowledge and skill to understand all safety precautions and instructions in the Operating Manual and to be able handle the equipment safely.









After reading this Operating Manual, please store it carefully with guarantee where it will be made accessible to all personnel dealing with the equipment

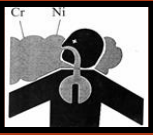
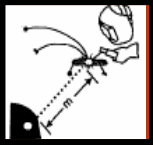










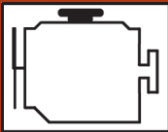

Please call your local distributors, business offices, or service agents if you have any questions




1.3 WELDING SYMBOLS

1.3.1 SAFETY SYMBOL LEGEND









SYMBOL	SOURCE OF HAZARD	HAZARD	HOW TO AVOID
	Welding Electrode	Electric Shock	Don't weld on painted parts. Remove the surface coating before you begin welding. Keep your face away from the welding plume.
	Wiring	Electric Shock	Protect welding cables from sparks, hot metal, open flames, sharp edges, oil, and grease. Do not use cables with frayed, cracked or bare spots in the insulation. Learn all you can about safety. Your employer must provide safety training.
	Welding Arc	Arc Rays	Required protection varies with time of exposure, distance from source, and shielding used. Follow recommended procedures in AWS F2.1.
	Engine Fuel	Fire	Develop adequate procedures, and use proper equipment to do the job safely. When required obtain a Hot-Work Permit (See NFPA 51B). If relocation is not possible, protect combustibles with fire resistant covers.
	Welding Fumes and Gases	Fumes and Gases	Keep your head out of the fumes. Do not breathe the fumes. Use enough ventilation or exhaust at the arc, or both, to keep fumes and gases from your breathing zone and general area.
	Welding Electrode and Wiring	Electric Shock	Read all instructions, labels, and installation manuals before installing, operating, or servicing the equipment. Train all personnel involved in welding operations to observe safe electrical work practices according to OSHA 1910.332. Do not touch live electrical parts.














SYMBOL	SOURCE OF HAZARD	HAZARD	HOW TO AVOID
	Chromium and Nickel Fumes	Welding Fumes	Do not breathe fumes and gases. Keep your head out of the fumes. Use enough ventilation or exhaust at the arc or both to keep fumes and gases from your breathing zone and general area.
	Hazard Distances	Ultraviolet Radiation	Maintain proper distances from the arc ray. Review the "Safety and Health Fact Sheet No. 26" from the AWS for recommendations.
	Falling Objects	Falling Objects	Be certain that material being welded or cut is secured from falling. Do not permit loose objects near the edge of overhead structures.
	Confined Space	Fire, Exposure to Hazardous Air Contaminants	Determine if special training or a permit is required to enter the space. Open all covers and secure them from closing. Test atmosphere for: (1) suitable oxygen content (2) combustibles or reactives (3) toxics
	Sparks, Radiation, Hot Metal, Slag, Heat	Electrical, Thermal	Wear a helmet with filter lens and cover plate that complies with ANSI Z87.1 for protection from radiant energy, flying sparks, and spatter. According to ANSI Z49.1 and OSHA 29 CFR 1910.252, "Helmets and hand shields shall protect the face, forehead, neck, and ears PPE.
	Hot Metal, Slag, Arc Rays, Hot Work Piece	Thermal	Use approved helmets or hand shields that provide protection for the face, neck, and ears, and wear a head covering. Wear approved safety goggles or safety glasses with side shields, even under your helmet. Wear dry, hole-free insulating gloves.

SYMBOL	SOURCE OF HAZARD	HAZARD	HOW TO AVOID
	Optical Radiation and Arc Heat	Thermal	Establish a written policy documenting general safety requirements for the wearing of contact lenses. Conduct an eye hazard evaluation in the Workplace.
	Cuts, Scrapes, Heat, Flames, Molten Metal, Wet Gloves, Insulation Failure	Mechanical, Thermal, Electrical	Gloves should be: Dry and moisture resistant. In good condition, no holes or tears. Flame resistant. Electrically and thermally insulated to suit the process.
	Coating of Steel	Fumes and Gases	Obtain the Material Safety Data Sheets (MSDSs) for all materials used. Read and understand the specification for coating type and coating weights. Find out what hazardous materials are present or might be given off by the coating when it is exposed to the arc of high temperatures.
	Reactive Force from Tools, Tool Jammed or Coming Loose	Mechanical	Wear proper head, eye and hand protection. Use face shields, safety glasses, and goggles as appropriate. Inspect tools before use. Never use a tool that is in poor or faulty condition. Keep all tools in good condition.
	Engine-Driven Generators, power source Equipment	Health Hazard	Reduce the intensity of the source. Shield the source where practical. Use engineering control methods, such as room acoustics, to control noise.
	Place Body Between Welding Electrode and Work Cables	Electric & Magnetic Fields	Do not place your body between the welding electrode and work cables. Route cables on the same side of your body. Route the welding cables close together. Secure them together with tape or cable ties.

SYMBOL	SOURCE OF HAZARD	HAZARD	HOW TO AVOID
	Any Coatings on Base Metal, Weld Process	Fumes and Gases	Keep your head out of the fumes. Do not breathe the fumes. Use enough ventilation or exhaust at the arc, or both, to keep fumes and gases from your breathing zone and general area.
	Welding & Cutting	Toxic Fumes, Electric Shock	Be alert, aware, and focused on the job and the work area; notice any changing conditions. Wear and use only the correct, approved equipment for the specific job; be sure it is properly installed and used.
	Welding or its Allied Processes	Pneumatic, Electrical, Gases, Liquid	Employers must develop a written lockout/tagout program and procedure. Employees must be trained in these procedures, as well as the purpose and methods of lockout/tagout.

1.3.2 GRAPHIC SYMBOL LEGEND

A	Amperage
V	Voltage
Hz	Hertz (cycles per second)
f	Frequency
SEC	Seconds
%	Percentage
	DC (Direct Current)
	AC (Alternating Current)
	Standard Function
	Slope Function
	Slope with Repeat Function
	Spot Function
	Impulse Starting (High Frequency GTAW)
	Touch Start (Lift Start TIG circuit GTAW)

	STICK (Shielded Metal Arc SMAW)
	Pulse Current Function
	Spot Time (GTAW)
	Remote Control (Panel/Remote)
	Remote Function
	Arc Control (SMAW)
	Gas Post-Flow
	Gas Pre-Flow
VRD	Voltage Reduction Device Circuit
	Negative
	Positive
	Gas Input
	Gas Output
	Protective Ground

1.4 SAFETY PRECAUTIONS

ATTENTION



FOR PROPER USE, PLEASE READ THIS OPERATING MANUAL THOROUGHLY PRIOR TO UTILIZING THE WELDING MACHINE.

The safety precautions described in this Operating Manual will give you the information necessary for you to handle the equipment safely and prevent any hazard or damage to you or others.

Although this welding equipment is designed and manufactured taking into account all possible scenarios, be sure to observe the safety precautions in this Operating Manual when operating this welding equipment. Not doing so may cause harm to the operator or others, resulting in death or serious injury.

Improper use of the equipment may cause various levels of damage. In this Operating Manual, such damages are classified into two ranks by combination of attention attracting symbols and signal for the purpose of warning indications. These attention attracting symbols and signal terms have the same meanings as those for warning labels on the equipment.

CAUTION



PROCEDURES, IF NOT PROPERLY FOLLOWED, MAY CAUSE A RISK TO OPERATORS RESULTING IN MEDIUM OR SLIGHT INJURY AND/ OR DAMAGE

Serious or light injury includes loss of sight, (high temperature and/or low temperature) burns, electric shock, bone fracture, and poisoning which may lead to hospitalization or long-term hospital stay for treatment. Further, medium and slight injury includes burns, and electric shock, which do not require hospitalization or long-term visit to hospital stays for treatment. Damage to objects denotes widespread damage to property or equipment.

DANGER



PROCEDURES NOT PROPERLY FOLLOWED, MAY LEAD TO DEATH OR SERIOUS INJURY.

1.5 SAFE OPERATION OF THE WELDER AND PERSONAL PROTECTION

1.5.1 IMPORTANT SAFETY PRECAUTIONS

To prevent serious injury to the operator or others, be sure to observe the following:



Never allow any unqualified person to enter the surrounding area of this welding equipment or the welding area inadvertently.



Those who use heart pacemakers should not enter the surrounding area of this welding equipment in operation or the welding area without permission of the doctor. Welding equipment during energizing produces a magnetic field in the surrounding area which adversely affects the operation of such pacemakers



Perform any work of power source on the input side, select any location, handle and store and pipe high pressure gases, store work pieces welded, and treat wastes in accordance with legislations and/or regulations, and your company's standards.



For the purpose of safety, it is recommended that this welding equipment should be installed, maintained, inspected, and repaired by appropriately qualified personnel or persons who are well familiarized with welding equipment



Although this welding equipment is designed and manufactured taking into account safety adequately be sure to observe safety precautions in this Operating Manual when operating this welding equipment. Not doing so may cause fatal injury to the operator or others, resulting in death or serious injury.



For the purpose of safety, it is recommended that this welding equipment should be operated by persons who have enough knowledge and skill to understand all safety precautions and instructions in the Operating Manual and to handle the equipment safely.



Perform any work of power source on the input side, select any location, handle and store and pipe high pressure gases, store work pieces welded, and treat wastes in accordance with legislations and/or regulations, and your company's standard.



Do not use this welding equipment for applications other than welding.

1.5.2 ELECTRIC SHOCK

To prevent electric shock, be sure to observe the following precaution:



Touching any parts that are electrically “live” or “hot” may cause fatal electric shock or burns.



Have a qualified electrician connect the Welding Power Source. Check the enclosure, base metal and jig that they are electrically connected in ordnance with local regulations. (Electrical Facilities Technical Standards)



Before installing, maintaining, or inspecting this welding equipment, leave the equipment for over 5 minutes after turning off power supply at the distribution panel switch.



Capacitors built-in may be electrically charged even after the power has been switched off.



Before performing works, make sure that no charging voltage should be applied to such parts.



Do not use cables which have insufficient capacity, are damaged, or in which any conductor is exposed.

Tighten cable connections securely and insulate properly.



Tighten cable connections securely and insulate it.



Do not operate with welding equipment with its cover or enclosure loose or removed



Do not wear damaged, torn or wet gloves. Always wear dry insulated gloves



Use a lifeline harness when performing works at any high elevations.



Carry out maintenance and inspection periodically and use it after the repair of any and all damaged parts.



Turn off both the Mains ON/OFF switch on equipment and the distribution panel switch when not in use.

1.5.3 GASES AND FUMES

To protect you and others from fumes and gases produced during the welding processes, use safeguards.



Inhalation of gases and fumes produced during the welding processes can be dangerous and hazardous to your health.

Welding in confined spaces may cause oxygen deficiency, resulting in suffocation.



When welding in confined spaces, ensure that the welding area is adequately ventilated, wear the respirator, and perform the welding work under



Never perform the welding work in the vicinity of degreasing, washing, and spraying operations. Doing so may cause harmful gases



When welding a coated steel plate, ensure that the welding area is adequately ventilated or wear the respirator. Welding the coated steel plate may produce harmful fumes or gases.



To prevent gas poisoning or suffocation, use local ventilating facilities set forth in legislations or Regulations (Industrial Safety and Health Law and Ordinance on Prevention of Hazards Due to Dusts and/or Fumes) or wear a respirator.

1.5.4 FIRE AND EXPLOSIONS

To prevent fire, explosion, or rupture, be sure to observe the following precautions.



Spatter or hot base metals produced during and immediately after the welding processes may cause fire.



Do not weld in the vicinity of flammable gases.



Keep hot base metals immediately after the welding processes away from combustibles.



Poor connections of cables or defective contacts in any current path on the base metal such as steel frame may cause overheating due to conducting current, resulting in fire.



When welding ceiling, floor or wall, remove combustibles hidden adjacent to them.



Tighten cable connections securely and insulate them.



Explosion can be caused by the welding arc produced on containers that may have held combustibles such as gasoline.



Connect work lead so that it is positioned as close to the part welded as possible.



Rupture can be caused by welding enclosed tanks or pipes.



Do not weld a gas pipe that may have held any gas or an enclosed tank or pipe



Keep combustibles away from scattered spatter. Cover combustibles that cannot be removed with incombustible shields.



Have a fire extinguisher handy in the vicinity of the welding area in preparation for emergency.

1.5.5 ARC WELDING RAYS, NOISE AND SPATTER OR SLAG

To protect you and others from arc rays, scattered spatter or slag, and loud noise produced during the welding processes, use safeguards.



Arc rays can cause your eyes irritation and burn your skin.



Scattered spatter or slag will damage your eyes and cause burns.



Loud noise can cause hearing loss.



To perform or monitor welding works, wear an eye protector with filter lenses providing sufficient scale number, or a welding face shield.



To protect your eyes from spatter or slag, wear goggles.



Wear safeguards including gauntlet type of welding safety gloves, long-sleeved clothing, leggings and spats, and leather aprons, etc.



Prevent the gas cylinder from being exposed to welding arc generated from the welding torch.



To protect others' eyes from arc rays, place protective booths, screens, or shields around the work area.



Never touch the gas cylinder with the electrode.



In case when noise levels exceed safe levels, wear protective earplugs and/or earmuffs.

1.5.6 GAS CYLINDERS

To prevent the turnover of gas cylinder or the rupture of gas flow regulator, be sure to observe the following precautions.



Turnover of the gas cylinder may cause injury to the operator or others.



Read and follow all warnings, safety precautions, and instructions in Operating Manual which is supplied with the gas flow regulator prior to use.



If gas cylinder containing a gas at high pressure is handled improperly, high pressure gas may flow out, causing injury to the operator or others.



Fix the gas cylinder on the special-purpose holder.



Gas cylinder shall not be exposed to high temperature.



Handle the gas cylinder according to legislations or regulations and your company's standards.



Keep your face out of the gas cylinder outlet when opening the gas cylinder valve.



Use a gas flow regulator of the proper size and is suited for shielding gas type being used.



Be sure to attach a protective cap to the gas cylinder outlet when not in use.



Prevent the gas cylinder from being exposed to welding arc generated from the welding torch.

1.6 REFERENCE PUBLICATIONS

Refer to the following standards or their latest revisions for more information:

1. OSHA, SAFETY AND HEALTH STANDARDS, 29CFR 1910, obtainable from the Superintendent of Documents, U.S. Government Printing Office, 732 N. Capital St NW, Washington, D.C. 20402
2. ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING, updated 2010, obtainable from the American Welding Society, 8669 NW 36th Street, Miami, FL 33166-6672
3. NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
4. ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION, obtainable from American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036
5. ANSI Standard Z41.1, STANDARD FOR MEN'S SAFETY-TOE FOOTWEAR, obtainable from the American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10018
6. ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES, obtainable from American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10018
7. AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES, obtainable from American Welding Society, 8669 NW 36th Street, Miami, FL 33166-6672
8. NFPA Standard 51, OXYGEN-FUEL GAS SYSTEMS FOR WELDING, CUTTING AND ALLIED PROCESSES, obtainable from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169
9. NFPA Standard 70, NATIONAL ELECTRICAL CODE, obtainable from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169
10. NFPA Standard 51B, CUTTING AND WELDING PROCESSES, obtainable from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169
11. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, obtainable from the Compressed Gas Association, 14501 George Carter Way, Suite 103, Chantilly, VA, 20151
12. CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING, obtainable from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3
13. NWSA booklet, WELDING SAFETY BIBLIOGRAPHY obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103
14. American Welding Society Standard AWSF4.1, RECOMMENDED SAFE PRACTICES FOR THE PREPARATION FOR WELDING AND CUTTING OF CONTAINERS AND PIPING THAT HAVE HELD HAZARDOUS SUBSTANCES, obtainable from the American Welding Society, 8669 NW 36th Street, Miami, FL 33166-6672
15. ANSI Standard Z88.2, PRACTICE FOR RESPIRATORY PROTECTION, obtainable from American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10018

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SECTION 2 – INTRODUCTION AND DESCRIPTION

2.0 INTRODUCTION AND DESCRIPTION

2.1 GENERAL

This manual is intended to be a guide to the understanding of the SANARG 160P welding machine and process requirements. The application outlined is typical and serves only to illustrate and explain the relationship of power source to the process. Selecting the correct power source depends upon process requirements.

This manual will concentrate only on safety and the operational aspects of the welding power source.

2.2 WELDING MACHINE DESCRIPTION

The SanRex SANARG 160P is an inverter based DC Power Source Unit that is capable of providing Constant Current (CC) output characteristics when powered from an external power source capable of supplying 115/230 VAC single-phase power.

The 160P conveniently locates, on its front control panel, a digital Amperage/Voltage meter, Output Control functions and Voltage Reduction Device (VRD) status.

The 160P is also equipped with lift-arc and high-frequency (HF) arc starter for use in Gas Tungsten Arc Welding (GTAW). A Sloper mode for Gas Tungsten Arc Welding-Sloped (GTAW-S) process and a Pulser mode for the Gas Tungsten Arc Welding-Pulsed (GTAW-P) as well as user settable Hot Start for use with GTAW and Shielded Metal Arc Welding (SMAW) processes are standard and fully adjustable.

The 160P incorporates high-performance microcontrollers to achieve complete digital control. The 160P is designed with a flame and impact resistant non-conductive plastic case enclosure.

2.3 160P POWER SOURCE FEATURES

Digital Control

- All welding parameters are fully adjustable.

Touch Panel Switches

- Touch switch eliminates mechanical damage.

Flip-Up Control Cover

- Protects front panel controls from damage.

Digital Ammeter/Volt

- Displays selected weld parameter value.
- Displays average weld current when welding.

- Displays average weld current for 20 seconds after weld has been completed.
- Pressing the Control Knob while welding will display the arc voltage.
- A selected weld parameter value can be adjusted at any time even while welding.

Intelligent Fan Control

- The intelligent cooling system is designed to reduce dust and foreign material build-up, while providing optimum cooling.
- Fan speed reduces approximately 30 seconds after machine is turned on.
- Fan speed increases when internal components reaches operating temperature.

ON/OFF Switch

- Mains ON/OFF switch located on rear panel.

Voltage Reduction Device (VRD)

- VRD fully complies with IEC 60974-1.
- VRD light is ON and operational when in STICK mode.

Control Knob

- For the selected weld parameter, rotating the knob clockwise increases the parameter.
- Rotating the knob counter-clockwise decreases the parameter.
- A selected weld parameter value can be adjusted at any time even while welding.
- Pressing the Control Knob while welding will display the arc voltage.

Self-Diagnostic Error Codes

- An error code is displayed on the *Digital Meter* when a problem occurs with Mains supply voltage or internal component problems.

High Frequency TIG Starting

- Using the HF TIG function provides an easy non-touch Arc-Start.
- Eliminates the possibility of the Tungsten Electrode to contaminate the base metal. This non-touch Arc-Start is suitable for code welding regulation.

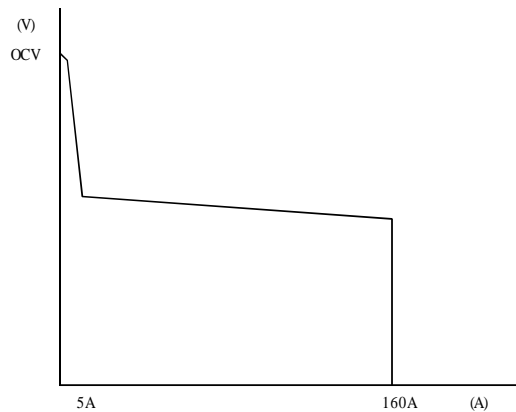
SAVE and LOAD

- User can easily save up to 5 welding programs.

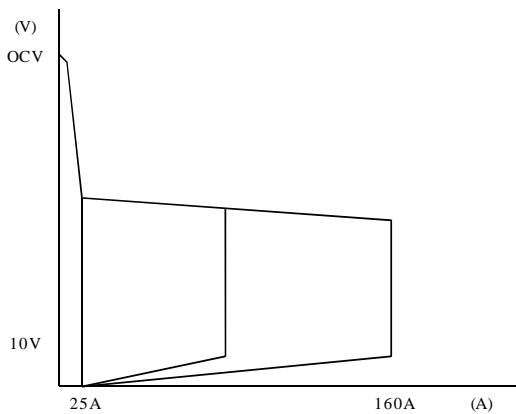
2.4 WELDING OUTPUT VOLTAGE AND AMPERAGE CURVES

2.4.1 160P V/A OUTPUT CURVES

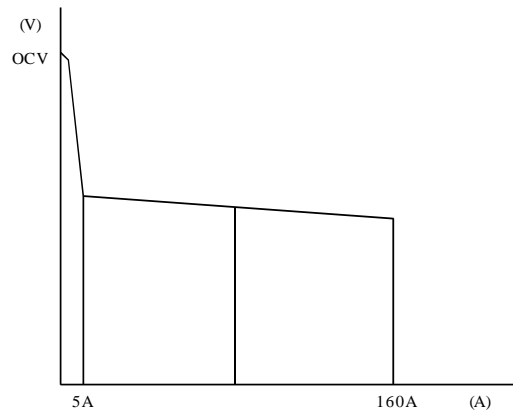
The waveforms shown in figure 2.1 are the maximum Voltage-Ampere output capabilities of the 160P. Curves for actual welding setting will fall within the curves shown.



STICK PROCESS



LIFT-TIG PROCESS



HF TIG PROCESS

FIGURE 2-1 : Model 160P Voltage-Ampere Curves

2.5 FUNCTIONAL BLOCK DIAGRAM

Figure 2.3 shows the functional block diagram of the SanRex Model 160P.

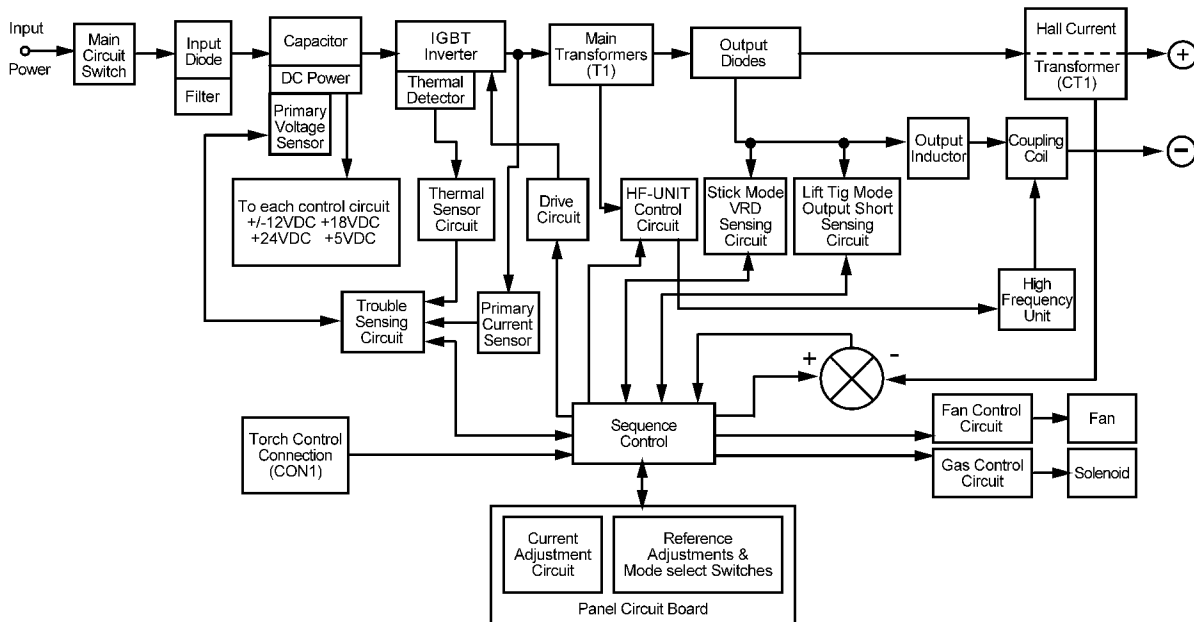


FIGURE 2-3 : Model 160P Functional Block Diagram

SECTION 3 – INSTALLATION RECOMMENDATIONS

3.0 INSTALLATION RECOMMENDATIONS

3.1 TRANSPORTATION METHODS

The case design of the 160P incorporates a built-in handle for carrying purposes. The case design also allows for the units to be stacked where the feet on one unit aligns with the notches on the top of another unit.

WARNING:



ELECTRIC SHOCK can kill. DO NOT TOUCH live electrical parts. Disconnect input power conductors from de-energized supply lines before moving the welding power source.

WARNING:



If stacking units, DO NOT stack units more than two units high. Stacked units must be supported in an appropriate way such that the units can not fall and cause damage.

WARNING:



FALLING EQUIPMENT can cause serious personal injury and equipment damage.

- Always lift the unit utilizing the handle on top of case.
- Use handcart or similar device of adequate capacity when transporting
- If using a fork lift vehicle, place and secure unit on a proper skid before transporting.

3.2 ENVIRONMENT

The SANARG 160P models are designed for use in adverse environments with an IP23S rating.

Examples of environments with increased adverse conditions are -

- With its small, lightweight and portable form factor, the 160P are ideal for use in locations in which freedom of movement is restricted, so that the operator is forced to perform work in cramped (kneeling, sitting or lying) positions.
- The external case is constructed of non-conductive ABS plastic for use in locations which are fully or partially limited by conductive elements, and in which there is a high risk of unavoidable or accidental contact by the operator, or
- In wet or damp hot locations where humidity or perspiration considerably reduces the skin resistance of the human body and the insulation properties of accessories.



Environments with adverse conditions do not include places where electrically conductive parts are in the near vicinity of the operator, which can cause increased hazard, have been insulated.

3.3 MACHINE GROUNDING & HIGH FREQUENCY INTERFERENCE

3.3.1 GROUNDING

The welder must be properly grounded. Check the local codes and the National Electric Code (NEC) book for proper grounding regulation.

3.3.2 HIGH FREQUENCY INTRODUCTION

The 160P is an inverter power sources that produces many high frequency signals that may cause other equipment to perform adversely. The importance of correct installation of the unit, and other high frequency welding equipment cannot be over-emphasized. Interference due to high frequency starting or even in a stabilized arc is almost invariably traced to improper installation. The following information is intended as a guide for personnel installing high frequency welding machines.

WARNING:



Explosives:

The high frequency section of this machine has an output similar to a radio transmitter. The machine should NOT be used in the vicinity of blasting operations due to the danger of premature firing.

WARNING:



Computers:

It is also possible that operation close to computer installations may cause computer malfunction.

3.3.3 HIGH FREQUENCY INTERFERENCE

Interference may be transmitted by a high frequency initiated or stabilized arc welding machine in the following ways:

Direct Radiation

Radiation from the machine can occur if the unit is not properly grounded. The shielding of the high frequency unit in the Power Source will prevent direct radiation if the equipment is properly grounded.

Remedy: Keep the input power lines as short as possible. Enclose excessive lengths in rigid metal conduit or equivalent shielding. The metal conduit should have a good common ground to the welder ground.

Transmission via the Supply Lead

Without adequate shielding and filtering, high frequency energy may be fed back into the wiring within the installation (mains) by direct coupling. The energy is then transmitted by both radiation and conduction.

Remedy: Keep the work and torch leads as short as possible and as close together as possible.

Radiation from Welding Leads

Radiated interference from welding leads, although pronounced in the vicinity of the leads, diminishes rapidly with distance.

Remedy: Keeping leads as short as possible will minimize this type of interference. Looping and suspending of leads should be avoided where possible when welding to avoid producing additional interference.

Re-radiation from Unearthed Metallic Objects

A major factor contributing to interference is re-radiation from unearthed metallic objects close to the welding leads.

Remedy: Effective grounding of such objects will prevent re-radiation in most cases.

3.4 LOCATION

The location of the 160P units should be in accordance to the following guidelines:

- In areas, free from moisture and dust.
- In areas, free from oil, steam and corrosive gases.
- In areas, not exposed to direct sunlight or rain.
- Ambient temperature between 0 degrees C to 40 degrees C.
- In areas, not subjected to abnormal vibration or shock.
- Place at a distance of 12" (304.79mm) or more from walls or similar that could restrict natural airflow for cooling.

3.5 ELECTRICAL INPUT CONNECTIONS & REQUIREMENTS

The 160P welding power source operates from a single-phase 50/60 Hz, AC power source. The input voltage must match one of the electrical input voltages shown on the input data label on the unit nameplate. Contact the local electric utility for information about the type of electrical service available, how proper connections should be made, and any inspection required.

3.5.1 INPUT POWER

The 160P units incorporate an INRUSH circuit and input voltage sensing circuit. When the MAIN CIRCUIT SWITCH is turned on, the inrush circuit provides a pre-charging of the input capacitors. SCR's in the Power Control Assembly (PCA) will turn on after the input capacitors have charged to full operating voltage (approximately 5 seconds).

NOTE:



Damage to the PCA could occur if 460VAC or higher is applied.

The 160P unit is designed for use with a generator as an input power source. As a general rule, depending on the type of generator used, the minimum generator capacity should be twice the maximum rating of the welder.

3.5.2 FUSING

The 160P units is equipped with an input switch and does not have an input circuit breaker for protection. It is the responsibility of the user to provide proper fuse protection for the welding power source. **Failure to do so will void the warranty.** The installer should reference the table above to select a suitable fuse for the input voltage of the installation location.

NOTE:



Maximum fuse size should be such that the fuse value not be more than 200 percent of the rated input amperage of the welding power source.
(Based on Article 630, National Electrical Code).

3.5.3 ELECTRICAL INPUT CONNECTIONS

- DO NOT TOUCH live electrical parts.
- SHUT DOWN welding power source, disconnect input power employing lockout/tagging procedures. Lockout/tagging procedures consist of padlocking line disconnect switch in an open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

WARNING:



ELECTRIC SHOCK can kill; a SIGNIFICANT DC VOLTAGE is present after removal of input power until the internal components have time to discharge.

A line disconnect switch provides a safe and convenient means to completely remove all electrical power from the welding power supply whenever necessary to inspect or service the unit.

3.5.3.1 160P Input Power Connections

Do not connect an input (WHITE or BLACK) conductor to the ground terminal.

Do not connect the ground (GREEN) conductor to an input line terminal.

Refer to Figure 3-1 and:

1. Connect end of ground (GREEN) conductor to a suitable ground. Use a grounding method that complies with all applicable electrical codes.
2. Connect ends of line 1 (BLACK) and line 2 (WHITE) input conductors to a de-energized line disconnect switch.
3. Use Table 3-1 and section 3.5.2 as a guide to select proper line fuses for the disconnect switch.

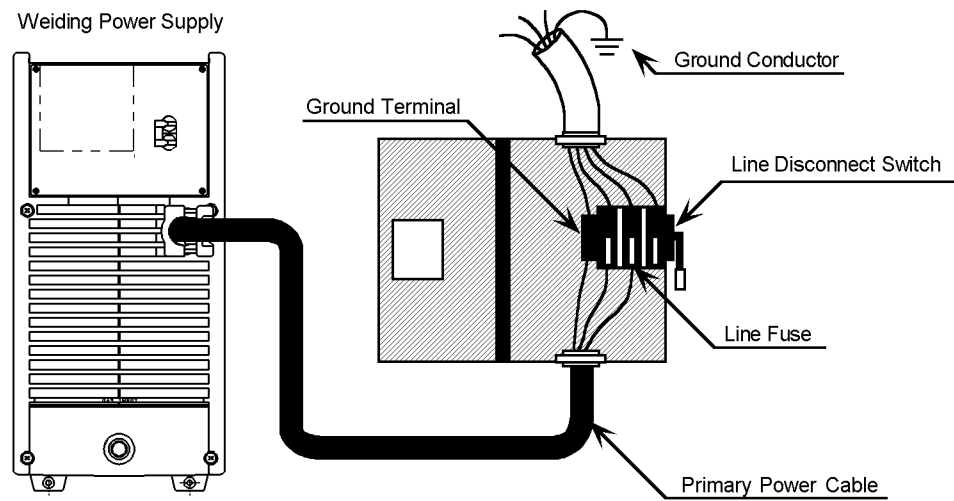


Figure 3-1. Electrical Input Connections 160P

3.6 SPECIFICATIONS

3.6.1 INPUT/OUTPUT

PARAMETERS		SANARG 160P			
Model		ID-1600TP-U1E			
Description		DC HF TIG, LIFT TIG, STICK			
Rated output		160 A @ 27 V, 35% Duty Cycle (TIG)			
Welding Mode		Input Power	35% Duty Cycle	60% Duty Cycle	100% Duty Cycle
Output Current/Voltage	TIG	115 1Ø			85A @ 13V
		230 1Ø	160A @ 17V	130A @ 15V	100A @ 14V
	STICK	115 1Ø			85A @ 23V
		230 1Ø	160A @ 27V	130A @ 25V	100A @ 24V
Open Circuit Voltage		Approximately 65 V at 115/230 VAC input Approximately 18 V with low OCV circuitry enabled			
Output Current Range	TIG	1 - 160 A (230VVAC), 1 - 85 A (115VAC)			
	STICK	1 - 160 A (230VVAC), 1 - 85 A (115VAC)			
Input/Output at Rated Load		Single-phase			
Rated Input	Voltage	115	230		
	Current	39	39		
Output Amperes		85	160		
Output Volts		23	27	Input at No Load	
KVA		4.4	9.0	0.5	
KW		2.4	5.4	0.13	
Input					
Input Voltage		115/230 1-Phase			
Line Frequency		50 / 60 Hz			
Line Volts Compensation		+ / - 10%			
Input Cable		AWG 12/3 SOOW with 5-15P, approximately 10 feet long			
Dimensions		W: 5.12 in. (130 mm), H: 10.24 in. (260 mm), L: 12.60 in. (320mm)			
Weight (Shipping)		17.63 lb. (8 kg)			

SanRex continuously strives to produce the best product possible and therefore reserves the right to change, improve or revise the specifications or design of this or any product without prior notice. Such updates or changes do not entitle the buyer of equipment previously sold or shipped to the corresponding changes, updates, improvements or replacement of such items.

The values specified in the table above are optimal values, your values may differ. Individual equipment may differ from the above specifications due to in part, but not exclusively, to any one or more of the following; variations or changes in manufactured components, installation location and conditions and local power grid supply conditions.

3.6.2 GENERAL

Model	ID-1600TP-U1E		
General			
Approval/Standard	IEC60974-1,IP23S		
Language	English		
Front Panel			
Front Panel Pot	Welding Current / Parameters Adjustment Push to voltage display		
Function Select Button	Process		STICK / HF TIG / LIFT TIG
	Mode See TABLE 1	OUTPUT	STD / SLOPE / REPEAT / SPOT
		Pulse	ON
Parameter Select Button	Forward / Back	Current	Weld / Hot / Initial / Crater Pulse Peak / Pulse Base
		Pulse	Duty / Frequency
	See TABLE 2	Time	Pre Flow/ Post Flow / Spot
		Sequence	Up Slope / Down Slope
	Save / Load Button	Save / Load	Ch1 – Ch5
Digital Panel Meter Indicator	Amperage / Parameter / Error Code (See TABLE 3)		
	* Holds weld value for 8sec after weld current has stopped Value stops displaying if control knob is rotated		
LED Indicator	Selected Function and Parameter		
	RED	HOT START, INITIAL CUR, PEAK(WELD) CUR, BASE, CRATER CUR, A	
		PULSE WIDTH, %, PULSE FREQ, Hz	
		PULSE ON, STD, SLOPE, REPEAT, SPOT, STICK, HF TIG, LIFT TIG	
		PRE-FLOW, UP SLOPE, SPOT TIME, DOWN SLOPE, POST FLOW, sec	
	GREEN	VRD ON	
	* Both VRD light off in HF TIG & LIFT TIG modes		
Shielding Gas Output	5/8 18inch UNF (F)		
Cooling Water Output	None		
Output	DIN style		
Remote Control	8 pin connector for Torch Control		
Rear Panel			
ON/OFF Switch	Switch		
Shielding Gas Input	5/8 18inch UNF (F)		
Cooling Water Input	None		
Size			
Width	130 mm		
Height	260 mm		
Depth	320 mm		
Weight (Shipping)	8kg		
Material of Outline Case	Plastic		
Attachment	Terminal plug	2 pcs	
	Operation Manual	1 pcs	

3.7 DUTY CYCLE

The duty cycle of a welding power source is the percentage of a ten (10) minute period that it can be operated at a given output without causing overheating and damage to the unit. If the welding amperes decrease, the duty cycle increases. If the welding amperes are increased beyond the rated output, the duty cycle will decrease.

WARNING:



Exceeding the duty cycle ratings will cause the thermal overload protection circuit to become energized and shut down the output until the unit has cooled to normal operating temperature.



Continually exceeding the duty cycle ratings can cause damage to the welding power source and will void the manufactures warranty.

SECTION 4 – OPERATOR CONTROLS, DIMENSIONS & OUTLINE

4.0 OPERATOR CONTROLS, DIMENSIONS & OUTLINE

4.1 DIMENSIONS AND OUTLINE

The figure below shows the dimensions, in millimeters, and the outline of the SanRex model 160P.

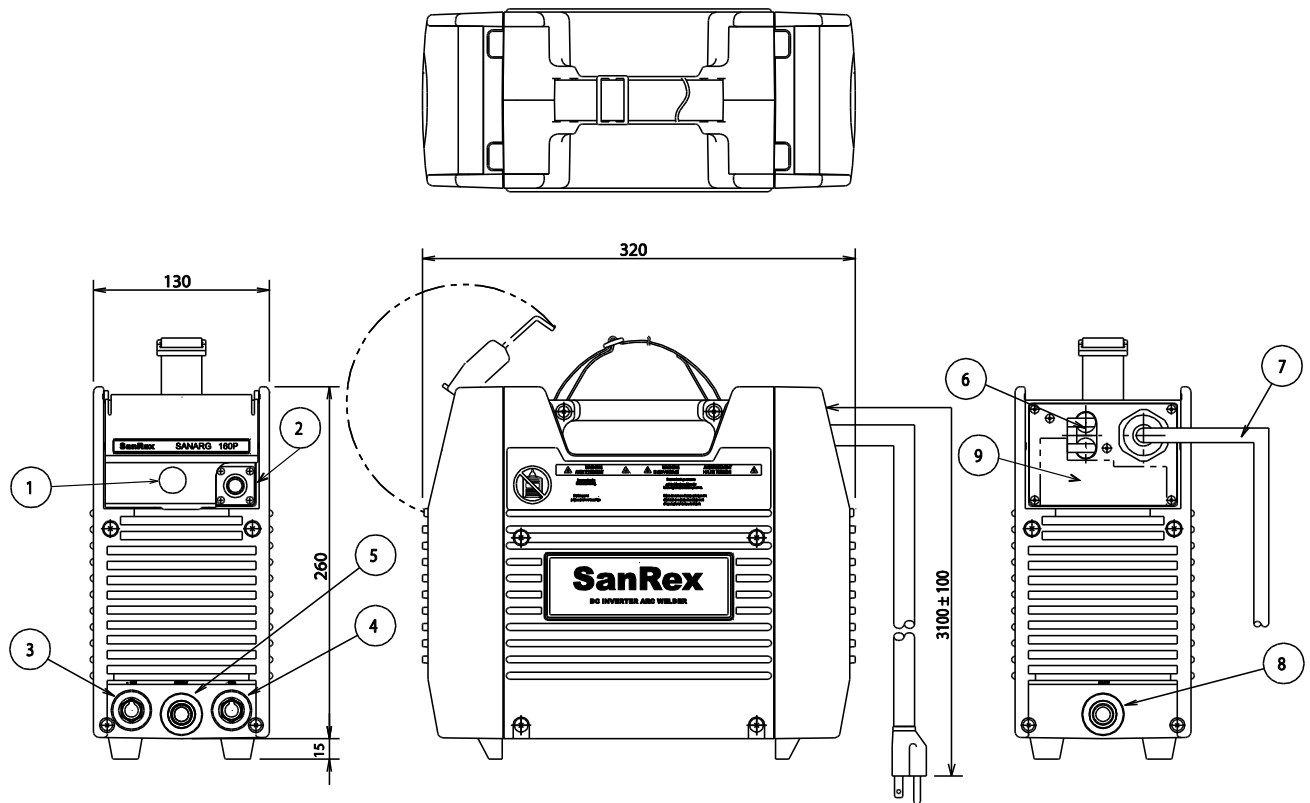


FIGURE 4-1 : Model 160P Dimensions and Controls

4.2 OPERATOR CONTROLS, LOCATION AND FUNCTIONALITY

Refer to the figure above for the corresponding reference numbers.

1. Control Knob

This knob is used to change the value of the selected weld parameter, rotate it clockwise to increase the selected weld parameter and counter clockwise to decrease the value. The value is indicated on the digital meter. Pushing the knob in previews the actual welding voltage while welding.

2. 8-PIN Remote Control Receptacle

The 8-PIN Remote Control Receptacle is used to connect a remote current control devices to the welding Power Source. To make the connection, align the keyway, insert plug, and rotate threaded collar fully clockwise. See Section 4.3 for details description of the 8-PIN Remote Control Receptacle.

3. Positive Output Terminal

Welding current flows from the Power Source via a Mini-Dinse type female terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection. A loose or worn connection will cause excessive heat and may cause damage to the front frame or internal components of the welding unit.

4. Negative Output Terminal

Welding current flows from the Power Source via a Mini-Dinse type female terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection. A loose or worn connection will cause excessive heat and may cause damage to the front frame or internal components of the welding unit.



Loose welding terminal connections can cause overheating and result in the male plug being fused in the bayonet terminal and /or melting of the housing (case) and /or internal components of the welding unit.

5. Gas Inlet

The Gas Inlet is a 5/8 18 UNF female gas fitting.

6. ON/OFF Switch

This switch connects the Primary supply voltage to the inverter when in the ON position. This enables the Power Supply.

WARNING:



When the welder is connected to the Primary supply voltage, internal electrical components maybe at 500V potential with respect to earth.

7. Input Cable

The input cable connects the Primary supply voltage to the welding unit.

8. GAS OUTLET

The Gas Outlet is a 5/8 18 UNF female gas fitting.

9. Manufactures Identification Data Plate

The Manufacturers Identification Data Plate label is located on the rear panel, upper left hand side. The layout of the data plate is based on IEC standard 60974-1 and indicates model type, manufacturer, load voltage, rated output amperage, duty cycle percentage, primary input voltage, input amperage and open circuit voltage. The Data Plate is also where you will find the serial number of the unit. This number is required when requesting spare parts and for all warranty work claims.

NOTE:



Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

4.3 8-PIN REMOTE CONTROL RECEPTACLE

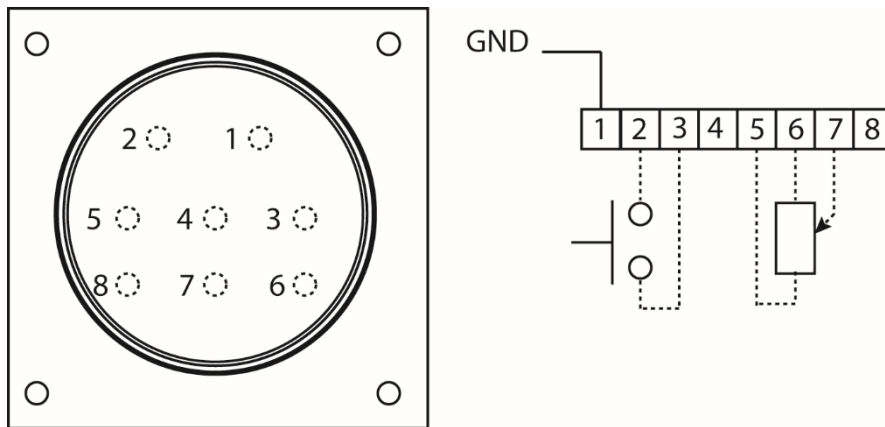


FIGURE 4-2 : 8-PIN Remote Control Receptacle Layout.

Socket Pin	Function
1	Earth (Ground)
2	Torch Switch Input (24V) to (connect pins 2 & 3 to turn on welding current)
3	Torch Switch Input (0V) to energize weld current.(connect pins 2 & 3 to turn on welding current)
4	Connect pin 4 to pin 8 to instruct machine that a remote current control device is connected (12VDC supply)
5	5k ohm (maximum) connection to 5k ohm remote control potentiometer
6	Zero ohm (minimum) connection to 5k ohm remote control potentiometer
7	Wiper arm connection to 5k ohm remote control potentiometer
8	Connect pin 4 to pin 8 to instruct machine that a remote current control device is connected (0V)

TABLE 4-1 : 8-PIN Remote Control Receptacle Pin-Out Description.

4.4 PARAMETER DISPLAY PANEL

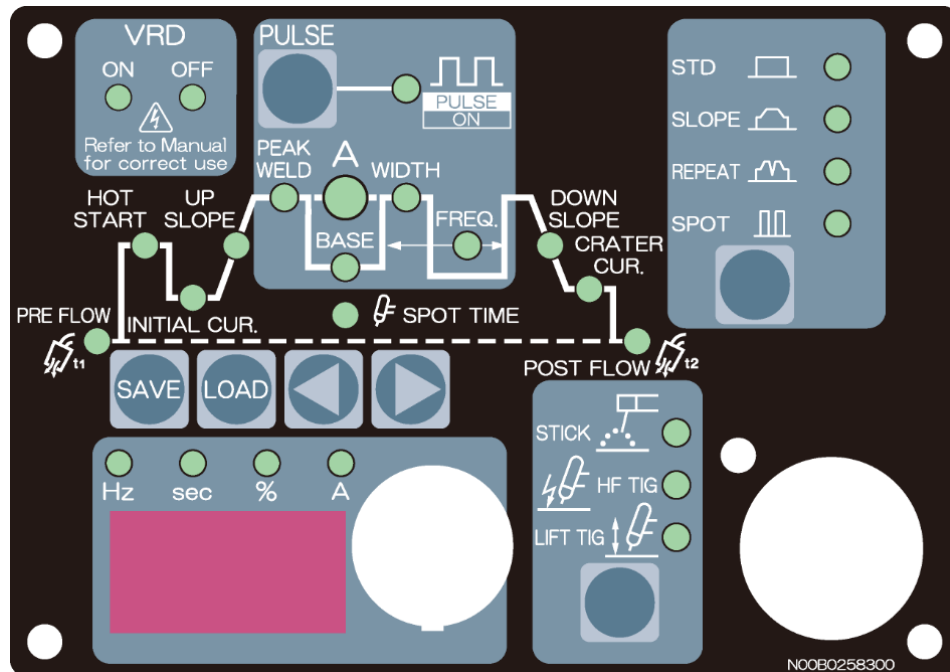





Figure 6-1 – 160P Front Panel

Parameter	Description
 PRE-FLOW	<p>This parameter operates in TIG modes only and is used to get gas to the weld zone prior to striking the arc, once the torch trigger switch has been pressed. This control is used to dramatically reduce weld porosity at the start of a weld.</p>
HOT START	<p>This parameter operates in all weld modes except Lift TIG mode and is used to heat up the weld zone in TIG modes or improve the start characteristics for stick electrodes. e.g. low hydrogen electrodes. It sets the peak start current on top of the <i>PEAK (WELD)</i> current.</p> <p>e.g. <i>HOT START</i> current = 130 amps when <i>PEAK (WELD)</i> = 100 amps & <i>HOT START</i> = 30 amps</p>
INITIAL CUR.	<p>This parameter operates in <i>SLOPE</i> or <i>REPEAT</i> (4T) TIG modes only and is used to set the start current for TIG. The Start Current remains on until the torch trigger switch is released after it has been depressed.</p>
UP SLOPE	<p>This parameter operates in TIG modes only and is used to set the time for the weld current to ramp up, after the torch trigger switch has been pressed then released, from INITIAL CUR to PEAK or BASE current</p>

Parameter	Description
PEAK WELD (Current)	This parameter sets the PEAK weld current when in <i>PULSE</i> mode
	This parameter sets the TIG WELD current in <i>STD</i> , <i>SLOPE</i> , <i>REPEAT</i> and <i>SPOT</i> modes when <i>PULSE</i> is off. This parameter also sets the STICK weld current.
BASE (Background Current)	This parameter sets the Background current when in Pulse TIG mode.
SPOT TIME	This parameter sets the duration of the <i>SPOT TIME</i> in <i>HF TIG</i> mode only
WIDTH (Pulse)	This parameter sets the percentage on time of the <i>PULSE FREQUENCY</i> for PEAK weld current when the <i>PULSE</i> is on.
FREQ. (Pulse)	This parameter sets the <i>PULSE FREQUENCY</i> when the <i>PULSE</i> is on.
DOWN SLOPE	This parameter operates in TIG modes only and is used to set the time for the weld current to ramp down, after the torch trigger switch has been pressed, to <i>CRATER CUR</i> . This control is used to eliminate the crater that can form at the completion of a weld.
CRATER CUR.	This parameter operates in <i>SLOPE</i> or <i>REPEAT</i> (4T) TIG modes only and is used to set the finish current for TIG. The CRATER Current remains on until the torch trigger switch is released after it has been depressed.
 POST-FLOW	This parameter operates in TIG modes only and is used to adjust the post gas flow time once the arc has extinguished. This control is used to dramatically reduce oxidation of the tungsten electrode.
 SAVE/LOAD	<p>The SAVE/LOAD buttons are used to save and retrieve a total number of 5 programs into the 160P memory.</p> <p>SAVE the Current Weld Parameters into Memory</p> <ul style="list-style-type: none"> • Press the <i>SAVE</i> button • Select a memory location by rotating the control knob, 1 to 5 is displayed on the meter. • After selecting the desired memory location (ie 1 to 5), press the right scroll button and the machine will give a beep to confirm the weld parameters from the control panel are saved. <p>LOAD (retrieve) a Program to Control Panel</p> <ul style="list-style-type: none"> • Press the <i>LOAD</i> button. • Select a memory location by rotating the control knob, 1 to 5 is displayed on the meter. <p>After selecting the desired memory location (ie 1 to 5), press the right scroll button and the machine will give a beep to confirm the weld parameters are loaded onto the control panel.</p>

4.5 FUNCTION SELECTION

The Table below provides information of the functions that are available using the front panel display.


Function	Selection	STICK	LIFT	HF	Description
	STD	YES	YES	YES	2T operation in TIG Modes using remote devices to control contactor & output current.
	SLOPE	NO	YES	YES	4T operation in TIG Modes with crater fill using a remote contactor device to control the sequence.
	REPEAT	NO	YES	YES	4T operation in TIG Modes with repeat operation and crater fill using a remote contactor device to control the sequence.
	SPOT	NO	NO	YES	2T operation spot welding in HF TIG using a remote contactor device.
PULSE	ON / OFF	NO	YES	YES	Pulse operation in TIG Modes.

TABLE 4-2 : Front Panel Function Description.

4.6 PARAMETER SELECTION

The Table below provides information of the parameters that are available for modification using the front panel display. The table also provides information on the ranges available for each parameter as well as to which weld process the parameter is available.

PARAMETER	RANGE	Default *1	Units	Process		
				STK	LFT	HF
Peak (Weld) Current	1 to 160 A *2	80 A	1 A	YES	YES	YES
Base Current	1 to 160 A *2	120 A	1 A	NO	YES	YES
Pulse Peak Current	1 to 160 A *2	120 A	1 A	NO	YES	YES
Hot Start Current	0 to 70 A	20 A	1 A	YES	NO	YES
Initial Current	1 to 160 A *2	30 A	1 A	NO	YES	YES
Crater Current	1 to 160 A *2	30 A	1 A	NO	YES	YES
Pulse Duty	15 to 80 %	50%	1%	NO	YES	YES
Pulse Frequency	0.5 to 500.0 Hz	100.0 Hz	*3	NO	YES	YES
Pre-Flow time	0.0 to 1.0 sec	0.1 sec	0.1 sec	NO	YES	YES
Post-Flow time	0.0 to 60 sec	10 sec	0.1 sec	NO	YES	YES
Spot Time	0.5 to 5.0 sec	2 sec	0.1 sec	NO	NO	YES
Up-Slope Time	0 to 15 sec	1 sec	0.1 sec	NO	YES	YES
Down-Slope Time	0 to 25 sec	3 sec	0.1 sec	NO	YES	YES

TABLE 4-3 : Front Panel Parameter Selection Ranges.

*1 : The values listed in the “Default” column are the “Factory Default Settings”. Once these are changed, the last setting(s) before the unit is turned off will remain in memory for the next turn on. These NEW settings will become the new default setting. The user must manually adjust the setting to the values in the above chart to return to the “Factory Default Settings”.

*2 : Current Range : 1 to 85 A at 115VAC input

*3 : Pulse frequency units are dependent on frequency setting range as shown below:

Setting range	Units
0.5 to 20 Hz	0.1 Hz
20 to 100 Hz	1 Hz
100 to 500 Hz	5 Hz

TABLE 4-4 : Pulse Frequency Range and Increments Units

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SECTION 5 – SET-UP FOR BASIC STICK (SMAW) AND TIG (GTAW) WELDING

5.0 SET-UP FOR BASIC STICK (SMAW) AND TIG (GTAW) WELDING

Conventional operating procedures apply when using the Welding Power Source, i.e. connect work lead directly to work piece and electrode lead is used to hold electrode. Wide safety margins provided by the coil design ensure that the Welding Power Source will withstand short-term overload without adverse effects. The welding current range values should be used as a guide only. Current delivered to the arc is dependent on the welding arc voltage, and as welding arc voltage varies between different classes of electrodes, welding current at any one setting would vary according to the type of electrode in use. The operator should use the welding current range values as a guide, then finally adjust the current setting to suit the application.

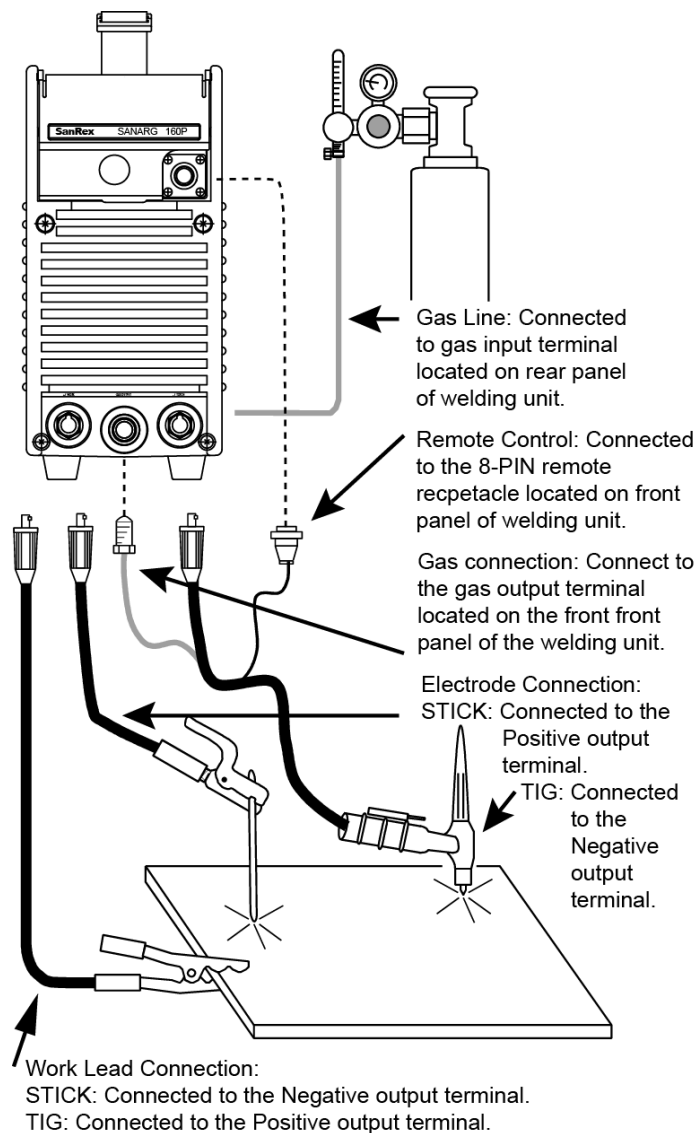


Figure 5-1 160P Basic Set-Up

SECTION 6 – SEQUENCE OF OPERATION

6.0 SEQUENCE OF OPERATION



NOTE: Scroll Buttons are used to select the parameters to be set. The LED's show which function is being adjusted on the weld sequence graph. Refer to Symbols Table located in the front of the manual for Symbol descriptions.

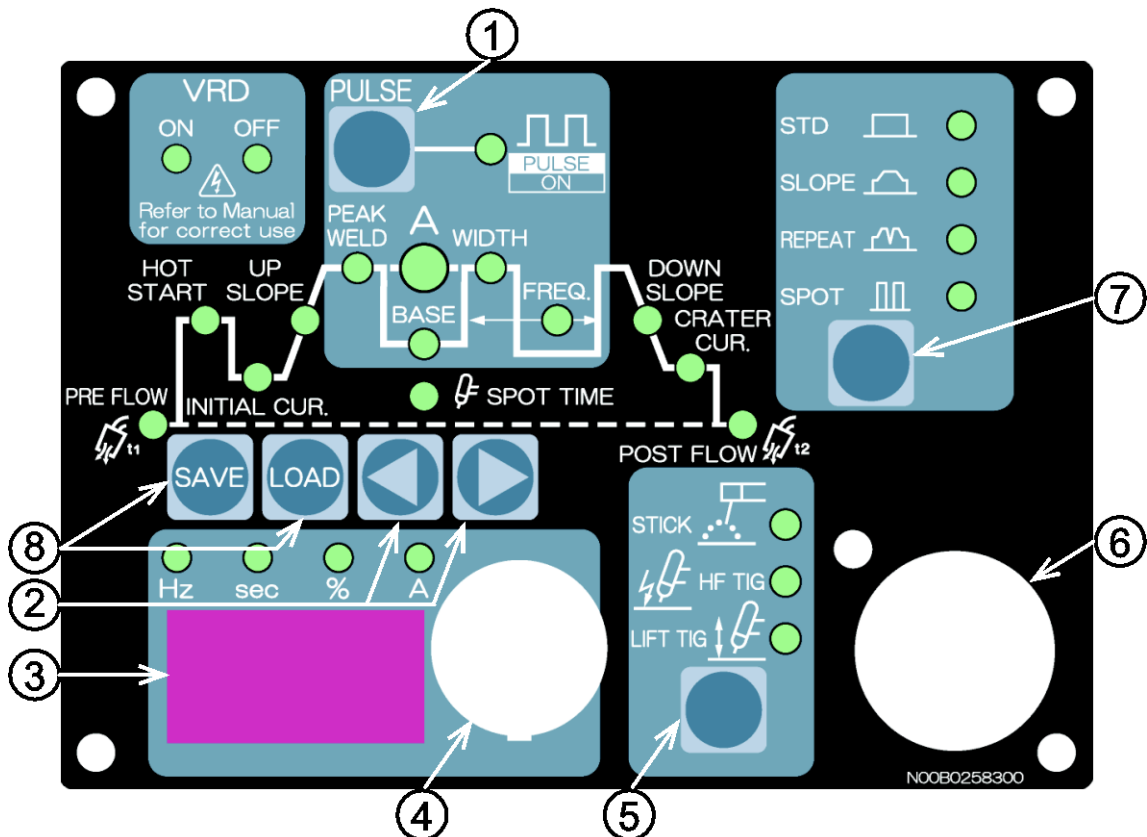


Figure 6-1 – 160P Front Panel

1. **Pulse Function** – Pressing this button enables the TIG current pulse functions.
2. **Scroll Buttons** – Used to scroll through the available welding functions to be set as shown on the on the welding sequence graph. The LEDs in the graphical representation will illuminate indicating which function has been selected and available for adjustment. Once the desired function has been selected, use the Encoder Knob to adjust the function's value.
3. **Digital LED Display** – Welding amperage and parameter values are displayed in this window. Internal error codes such as over temperature, low or high input voltage applied and others are signaled to the operator by means of a warning sound and indicated on the Digital LED display.
4. **Encoder Knob** – Rotating this knob will adjust the value of the function selected. This knob allows the operator to adjust the output amperage within the entire range of the power source as well as adjusting the value of each function. Pushing the knob inward displays actual welding voltage.

5. **Process Button** – Pressing this button selects between STICK, Lift TIG or HF TIG welding processes.
6. **Remote Control Receptacle** – Used to connect an 8-pin remote device.
7. **TIG Mode Functions** – Pressing this button scrolls through the output TIG function modes. The user can select between Standard, Slope, Slope w/repeat or Spot modes.
8. **Save/Load Button** – Used to easily Save and Load (retrieve) up to 5 welding parameter sequences.

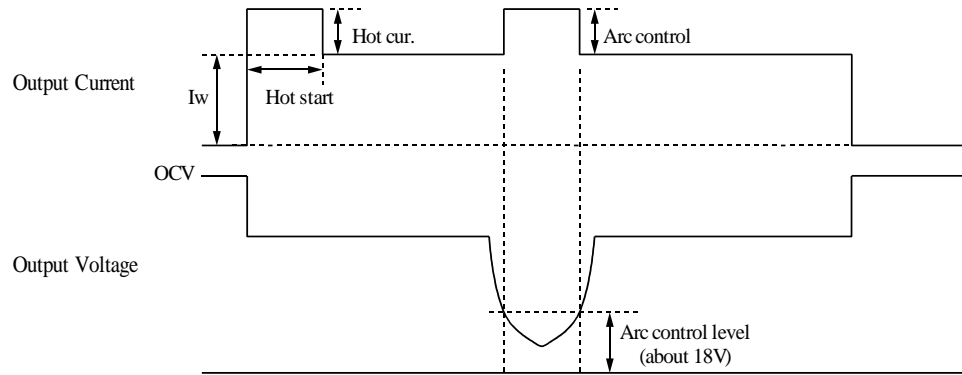
6.1 STICK WELDING

- Connect work lead to negative terminal
- Connect electrode lead to positive terminal
- Switch machine on
- Set weld current
- Connect remote control device if required

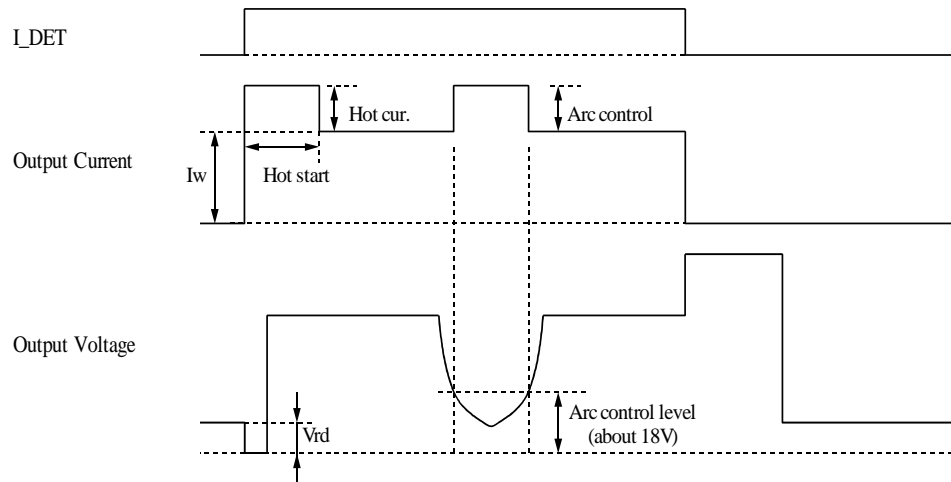
Use the Scroll Buttons to move to the parameter to be set. The LED will show which function is being adjusted on the weld sequence graph. Use the control knob to adjust each parameter.

- Set *HOT START*
- Set *WELD* current
- Commence welding

6.1.1 STICK SEQUENCE WITH VOLTAGE REDUCTION DEVICE DISABLED



6.1.2 STICK SEQUENCE WITH VOLTAGE REDUCTION DEVICE ENABLED



6.2 DC HF TIG & LIFT TIG WELDING

- Connect work lead to positive terminal
- Connect TIG torch to negative terminal
- Switch machine on
- Set *WELD* current.
- Connect remote control device. A remote control device is required for use during LIFT TIG and HF TIG operation. See section 4.3, “8-PIN REMOTE CONTROL RECEPTACLE”, for complete details of the remote device.

Use the Scroll Buttons to move to the parameter to be set. The LED will show which function is being adjusted on the weld sequence graph. Use the control knob to adjust each parameter.

- Set *PRE-FLOW* time
- Set *HOT START* current
- Set *POST-FLOW* time
- Set *WELD* current
- Set *POST-FLOW* time

Slope Mode Parameters if required

- Set *INITIAL CUR* current
- Set *UP SLOPE* time
- Set (WELD) *PEAK CUR* current
- Set *BASE* current
- Set *DOWN SLOPE* time
- Set *CRATER CUR* current

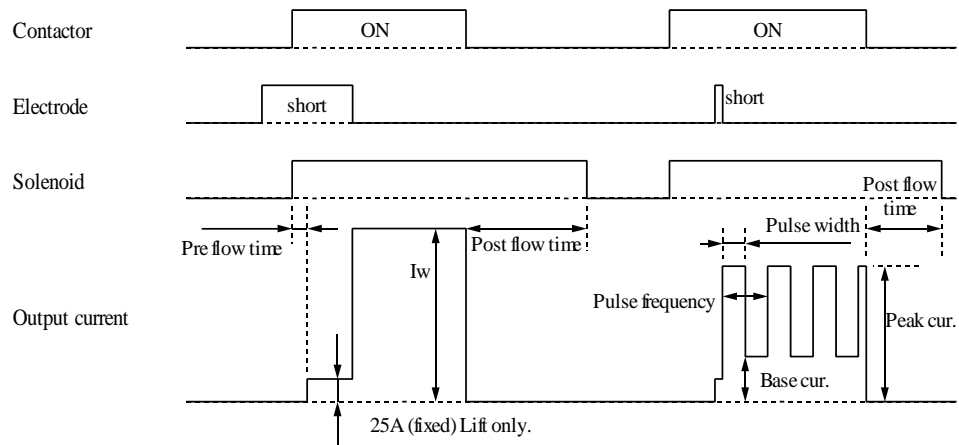
Pulse Mode parameters if required

- Set *PULSE WIDTH* % for *PEAK CURRENT*
- Set *PEAK CURRENT*
- Set *PULSE FREQ*

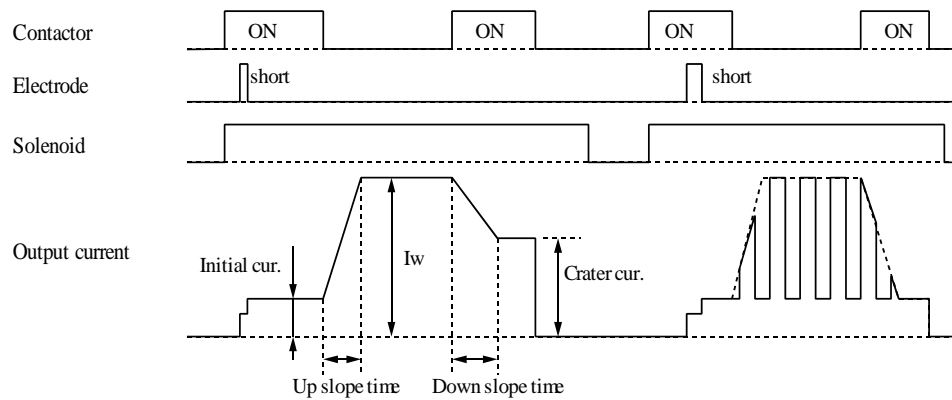
Commence welding

6.3 LIFT TIG SEQUENCE

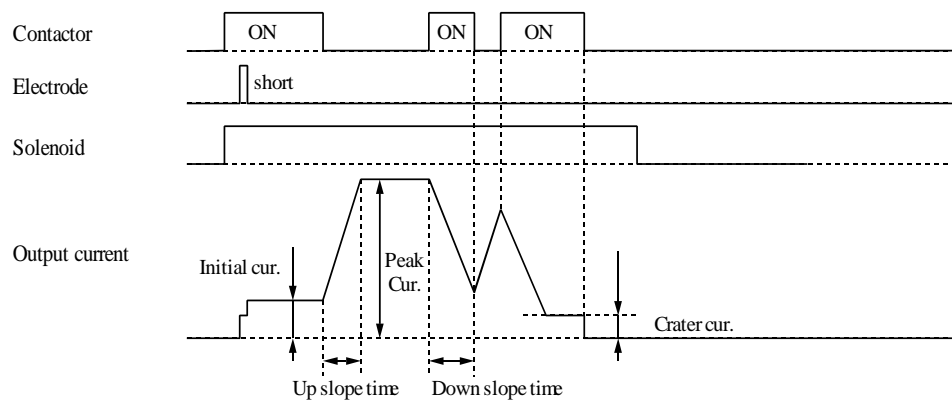
6.3.1 STANDARD MODE



6.3.2 SLOPE MODE

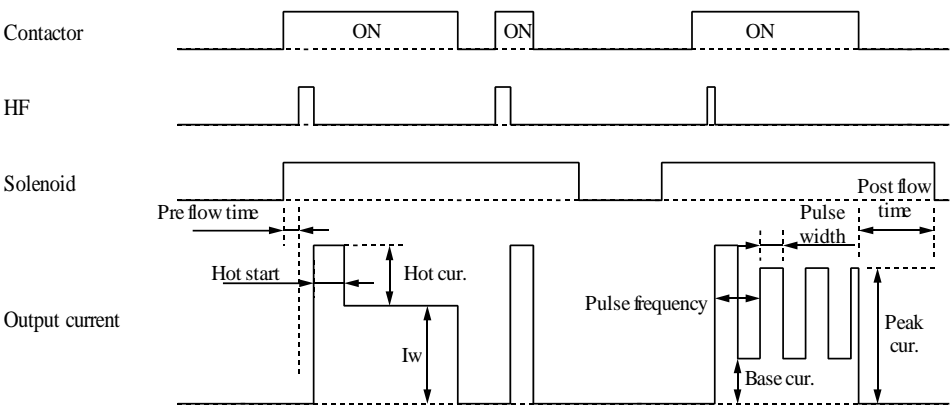


6.3.3 REPEAT MODE

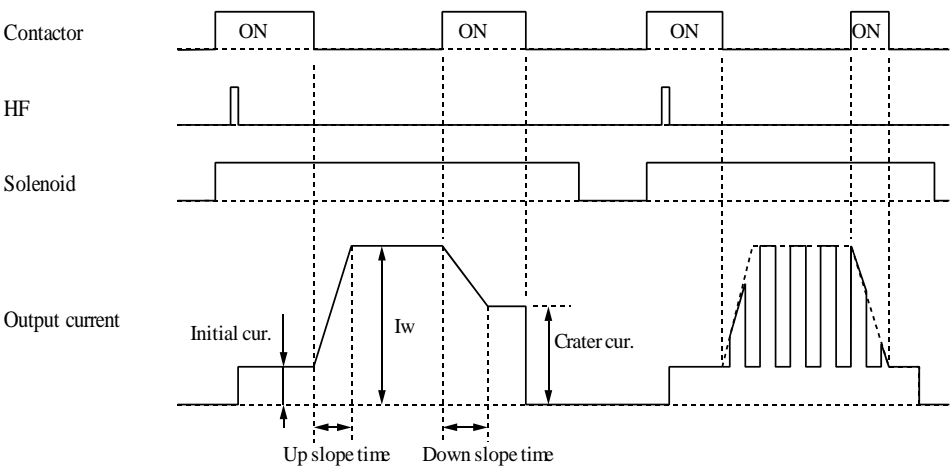


6.4 HF TIG SEQUENCE

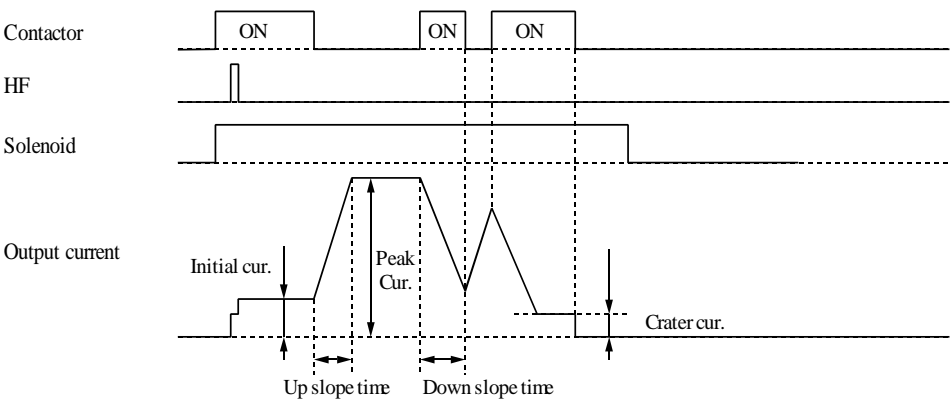
6.4.1 STANDARD MODE



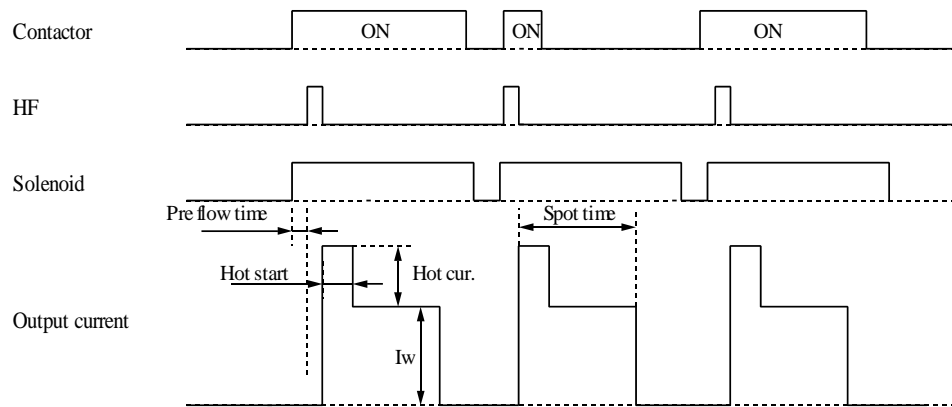
6.4.2 SLOPE MODE



6.4.3 REPEAT MODE



6.4.4 SPOT MODE



SECTION 7 – VOLTAGE REDUCTION DEVICE

7.0 VOLTAGE REDUCTION DEVICE (VRD)

The 160P unit is equipped with a Voltage Reduction Device circuit that when enabled lowers the Open Circuit Voltage (OCV) in STICK mode. This function is used in applications where a high OCV in STICK mode is dangerous or applications where a lower OCV would be advantageous. The 185AP and 200AP units are shipped from the factory with the VRD in the disabled mode. To utilize the VRD, the user must enable the VRD function.

7.1 VRD SPECIFICATIONS

Description	SanRex 160P	Notes
VRD Open Circuit Voltage	15.3 to 19.8V	Open circuit voltage between welding terminals.
VRD Resistance	148 to 193 ohms	The required resistance between welding terminals to turn ON the welding power.
VRD Turn OFF Time	0.2 to 0.3 seconds	The time taken to turn OFF the welding power once the welding current has stopped.

7.2 SWITCHING VRD ON/OFF

Switch the machine OFF.

A) Remove the clear plastic protection cover from the front panel (see Figure 7-1).

- Lift up the cover so it rests on the top of the unit.
- Place a small flat bladed screw driver between the cover hinges on the front panel.
- Gently lift the cover hinge out of the front cover mounting hole.
- Remove the control's clear plastic cover.

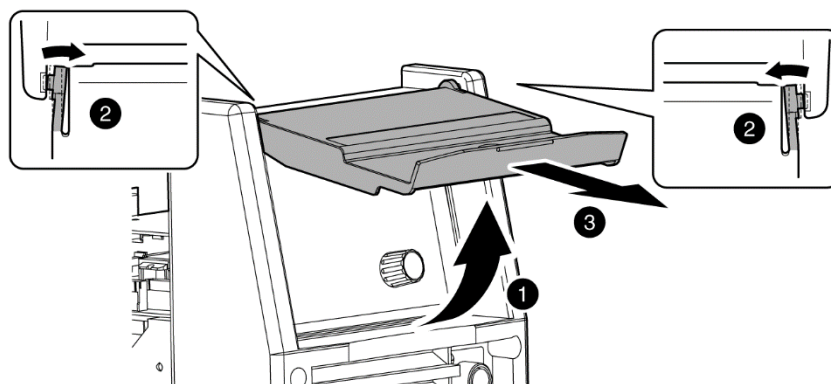


Figure 7-1 VRD ON/OFF Step A

B) Remove the front control cover assembly from the front panel (see Figure 7-2).

- Remove the four mounting screws from the front control panel.
- Access the VRD control by gently prying back the front panel controls to reveal the VRD on/off potentiometer (see Figure 7-2).



Do not pull back the front panel with excessive force as this may unplug the control PCB. Plugging the control PCB back into the front panel controls can only be achieved by removing the side covers.

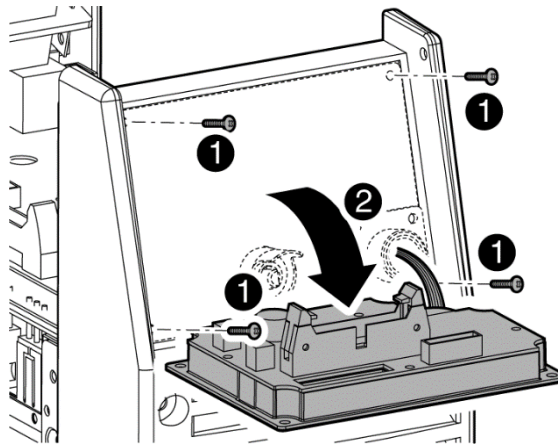


Figure 7-2 VRD ON/OFF Step B

WARNING:



The VRD ON/OFF trim potentiometer MUST ONLY be positioned fully clockwise OR fully counter clockwise as the VRD function will be unknown for every other position.

C) ENABLE/DISABLE the VRD function (see Figure 7-3).

- To ENABLE the VRD function: rotate the trim potentiometer (VR1) on the display PCB fully clockwise. When VRD is ENABLED, verify that it operates as per the VRD specifications.
- To DISABLE the VRD function: rotate the trim potentiometer (VR1) on the display PCB fully counter-clockwise.

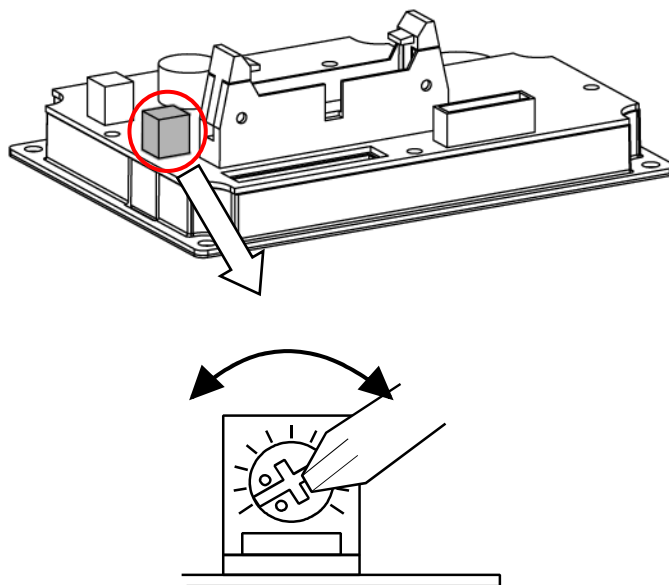


Figure 7-3 VRD ENABLE/DISABLE Step C

SECTION 8 – TROUBLE SHOOTING

8.0 TROUBLE SHOOTING

8.1 POWER SOURCE PROBLEMS

Description	Possible Cause	Remedy
1 The welding arc cannot be established.	A The Primary supply voltage has not been switched ON. B The Welding Power Source switch is switched OFF. C Loose connections internally.	A Switch ON the Primary supply voltage. B Switch ON the Welding Power Source. C Have an Accredited Service Agent repair the connection
2 Maximum output welding current cannot be achieved with nominal Mains supply voltage.	Defective control circuit.	Have an Accredited Service Agent repair the connection
3 Welding current reduces while welding.	A Loose welding cable connections. B Incorrect welding cable size. C Improper input connections. D Poor electrode condition. E Wrong welding polarity.	A Tighten all welding cable connections. B Use proper size and type of cable. C Refer to Section 3.5 Electrical Input Connections & Requirements. D Replace electrode. E Verify output torch connections.
4 No gas flow when the torch trigger switch is depressed.	A Gas hose is cut. B Gas passage contains impurities. C Gas regulator turned off. D Torch trigger switch lead is disconnected or switch/cable is faulty.	A Replace gas hose. B Disconnect gas hose from the rear of Power Source then raise gas pressure and blow out impurities. C Turn gas regulator on. D Reconnect lead or repair faulty switch/cable.

Description	Possible Cause	Remedy
5 Gas flow won't shut off.	<p>A Weld Mode (<i>STD</i>, <i>SLOPE</i>, <i>REPEAT</i> or <i>SPOT</i>) was changed before <i>POST-FLOW</i> gas time had finished.</p> <p>B Gas valve is faulty.</p> <p>C Gas valve jammed open.</p> <p>D <i>POST-FLOW</i> control is set to 60 sec.</p>	<p>A Strike an arc to complete the weld cycle. OR Switch machine off then on to reset solenoid valve sequence.</p> <p>B Have an Accredited Service Agent repair or replace the gas valve</p> <p>C Have an Accredited Service Agent repair or replace the gas valve</p> <p>D Reduce <i>POST-FLOW</i> time.</p>
6 The TIG electrode has been contaminated due to the gas flow shutting off before the programmed <i>POST-FLOW</i> time has elapsed.	The Weld Process Mode (<i>STICK</i> , <i>HF TIG</i> or <i>LIFT TIG</i>) was changed before <i>POST-FLOW</i> gas time had finished.	Do not change Weld Process Mode before the <i>POST-FLOW</i> gas time had finished.

8.2 POWER SOURCE ERROR CODES

Description		Possible Cause		Remedy		Remarks
1.	<u>E01 error code displayed</u> Temperature sensor TH1 (protects IGBTs) is greater than 80°C for about 1 second.	A.	The Welding Power Source's duty cycle has been exceeded.	A.	Let Power Source cool down then keep within its duty cycle.	Weld current ceases. Buzzer sounds constantly. Fan operates at max speed. E01 resets when TH1 decreases to 70°C for about 30 seconds.
		B.	Fan ceases to operate.	B.	Have an Accredited SanRex Service Agent investigate.	
		C.	Air flow is restricted by vents being blocked.	C.	Unblock vents then let Power Source cool down.	
2.	<u>E02 error code displayed</u> Temperature sensor TH2 (protects secondary diodes) is greater than 80°C for about 1 second.	A.	The Welding Power Source's duty cycle has been exceeded.	A.	Let Power Source cool down then keep within its duty cycle.	Weld current ceases. Buzzer sounds constantly. Fan operates at max speed. E02 resets when TH1 decreases to 70°C for about 30 seconds.
		B.	Fan ceases to operate.	B.	Have an Accredited SanRex Service Agent investigate.	
		C.	Air flow is restricted by vents being blocked.	C.	Unblock vents then let Power Source cool down.	
3.	<u>E03 error code displayed</u> Primary (input) current too high.	A.	Primary current is too high because welding arc is too long	A.	Reduce length of welding arc.	Weld current ceases. Buzzer sounds constantly. Switch machine off, wait 3 seconds, and then switch on to reset E03 error.
		B.	Mains supply voltage is more than 10% below nominal voltage.	B.	Have an Accredited SanRex Service Agent or a qualified electrician check for low Mains voltage.	
4.	<u>E04 error code displayed</u> Output voltage exceeds the secondary voltage specification.		TIG torch cable and/or work lead are too long or leads are coiled.		Reduce the length of the TIG torch cable and/or work lead or un-coiled leads.	Weld current ceases. Buzzer sounds constantly. Switch machine off, wait 3 seconds, and then switch on to reset E04 error.

Description		Possible Cause		Remedy	Remarks
5.	<u>E11 error code displayed</u> Over Primary supply (input) voltage at primary capacitors is exceeded for one second.		Primary supply voltage is greater than the nominal voltage plus 10%.	Have an Accredited SanRex Service Agent or a qualified electrician check the Primary voltage.	Weld current ceases. Buzzer sounds constantly. Error code E11 automatically will reset when the voltage reduces.
6.	<u>E12 error code displayed</u> Under mains supply (input) voltage primary capacitors is reduced for one second.		Mains supply voltage is down to a dangerously low level.	Have an Accredited SanRex Service Agent or a qualified electrician check the Mains voltage.	Weld current available. Buzzer sounds intermittently. Error code E12 will automatically reset when the voltage increases.
7.	<u>E14 error code displayed</u> Under mains supply (input) voltage warning primary capacitors is reduced for one second.		Mains supply voltage is less than the nominal operating voltage less 10%.	Have an Accredited SanRex Service Agent or a qualified electrician check the Mains voltage.	Weld current ceases. Buzzer sounds constantly. Error code E14 will automatically reset when the voltage increases.
8.	<u>E33 error code displayed</u> Water cooled torch abnormality detected.		Insufficient water pressure is detected when water pressure sensor circuit is enabled.	Check that water circulator is turned on and water is flowing.	Weld current ceases. Buzzer sounds constantly. Error code E33 will automatically reset when adequate water pressure is established or circuitry is disabled.
9.	<u>E81 error code displayed</u> Wrong Primary supply (input) voltage connected		When 3 phase machine is first turned on with the wrong Primary supply (input) voltage connected.	Have an Accredited SanRex Service Agent or a qualified electrician check the Mains voltage.	No weld current is available. Buzzer sounds constantly. Switch machine off.
10.	<u>E82 error code displayed</u> Link switch plug not connected		Link switch plug not connected.	Have an Accredited SanRex Service Agent check connector plug on input PCB.	No weld current is available. Buzzer sounds constantly. Switch machine off.

Description		Possible Cause		Remedy		Remarks
11.	<u>E83 error code displayed</u> CPU checks mains supply (input) voltage when the on/off switch on rear panel of machine is turned ON.		The Primary supply (input) voltage fluctuates and is not stable.		Have an Accredited SanRex Service Agent check connector plug on input PCB and the Mains voltage.	No weld current is available. Buzzer sounds constantly. Switch machine off, wait 3 seconds, and then switch on to reset E83 error.
12.	<u>E85 error code displayed</u> Pre-charge abnormality.		Due to a malfunction inside the Welding Power Source, the primary capacitors are not charging.		Have an Accredited SanRex Service Agent service the machine.	No weld current is available. Buzzer sounds constantly. Switch machine off, wait 3 seconds, and then switch on to reset E85 error.
13.	<u>E93 error code displayed</u> Memory chip (EEPROM) on control PCB cannot read/write weld parameters		Memory chip (EEPROM) error.		Have an Accredited SanRex Service Agent check the control PCB.	Weld current ceases. Buzzer sounds constantly. Switch machine off.
14.	<u>E94 error code displayed</u> Temperature sensor TH1 for IGBTs or sensor TH2 for secondary diodes are open circuit.		The Welding Power Source's temperature sensors have malfunctioned.		Have an Accredited SanRex Service Agent check or replace the temperature sensors.	Weld current ceases. Buzzer sounds constantly. Switch machine off.
15.	<u>E99 error code displayed</u> Mains supply (input) voltage has been turned off but control circuit has power from the primary capacitors.	A. B.	Main on/off switch on machine has been turned off Mains supply (input) voltage has been turned off.	A. B.	Turn on/off switch on. Have an Accredited SanRex Service Agent or a qualified electrician check the Mains voltage and fuses.	Weld current ceases. Buzzer sounds constantly. Switch machine off, wait 3 seconds, and then switch on to reset E99 error.

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SECTION 9 – ROUTINE MAINTENANCE

9.0 ROUTINE MAINTENANCE

Routine inspection and testing (power source)

An inspection of the power source, an insulation resistance test and an earth resistance test should be carried out

- a) For transportable equipment, at least once every 3 months; and
- b) For fixed equipment, at least once every 12 months.

The owners of the equipment shall keep a suitable record of the periodic tests.

The only routine maintenance required for the power supply is a thorough cleaning and inspection, with the frequency depending on the usage and the operating environment.

WARNING:



Disconnect Primary power at the source before opening the enclosure. Wait at least two minutes before opening the enclosure to allow the primary capacitors to discharge.

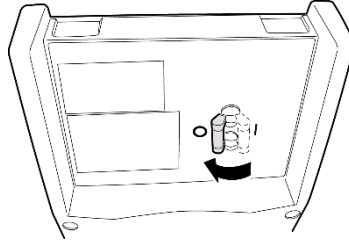
To clean the unit, open the enclosure (see Section 9.1, Opening the Enclosure) and use a vacuum cleaner to remove any accumulated dirt and dust. The unit should also be wiped clean, if necessary; with solvents that are recommended for cleaning electrical apparatus.



Do not blow air into the power supply during cleaning. Blowing air into the unit can cause metal particles to interfere with sensitive electrical components and cause damage to the unit.

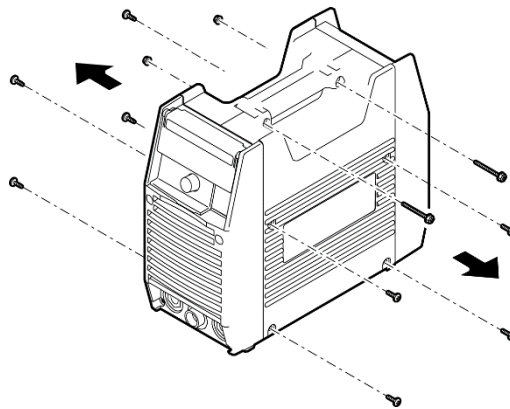
9.1 OPENING THE ENCLOSURE

- 1) Confirm that the switch of power supply and the switch on switchboard (distribution panel) are all OFF.

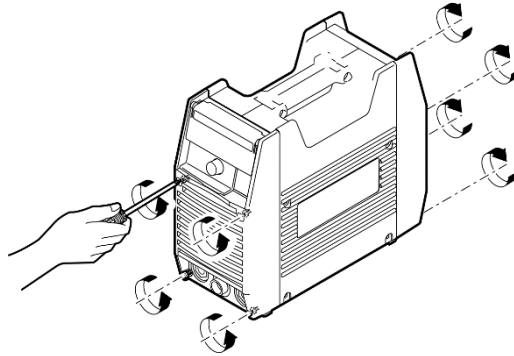


The capacitors inside the power supply will slowly discharged after you turn off the switch of the power supply or the switch at the breaker box (distribution panel). Wait at least 5 minutes for the discharge to complete.

- 2) Remove all screws and nuts from the side covers.



- 3) Loosen the screws on the front panel and the rear panel by turning them approximately two turns CCW.

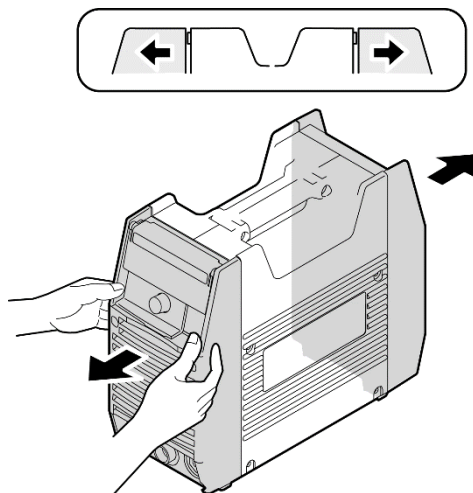


NOTE:

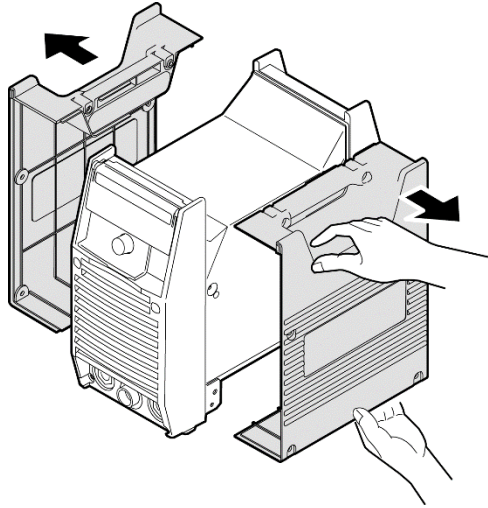


DO NOT remove the screws completely.

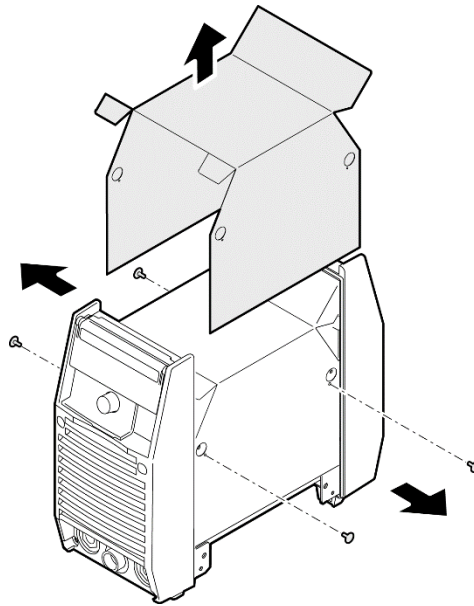
- 4) Pull the front panel slightly forward and pull the rear panel slightly backward.
The interlocking hooks of the side case covers can now be disengaged from the front and rear panels



5) Remove the side covers.



6) Remove protection cover sheet by removing the plastic clips.



NOTE:



When you re-assemble the parts, conduct the above process in the reverse order.

SECTION 10 – PARTS LIST

10.0 PARTS LIST 160P

DESCRIPTION	TYPE & RATING	QTY	INTERCONNECT DIAGRAM REFERENCE	EXPLODED VIEW REFERENCE # - SHEET	ORDER NUMBER
Capacitor	SS351206PP1 DC350V 20uF	1	C1	1 - 2	42601003100
Coupling Coil	F3A287301 200A CC (with FCH1)	1	C.C.	2 - 2	U0A959000
Remote Receptacle	206433-1 8P (with Wiring Assembly)	1	CON1	3 - 1	U0A924800
Current Sensor	HC-TN200V4B15M 200A 4V	1	CT1	4 - 2	11251009300
Diode	S50VB80 IF 50A VRRM 800V	1	D1	5 - 2	44404000600
Diode	DBA200UA60R	2	D2-3	6, 7 - 2	4583A0060
Fan	D12T24PS103 DC 24V	1	FAN1	8 - 1	U0A912200
Inductor	F3A285001 160/200A FCH	1	FCH1	9 - 2	U0A960000
HF.Unit	HF.UNIT (WK-4840 U05)	1	HF.UNIT1	10 - 2	U0A962602
HF.Gap	U0A601101	1		11 - 2	U0A601101

DESCRIPTION	TYPE & RATING	QTY	INTERCONNECT DIAGRAM REFERENCE	EXPLODED VIEW REFERENCE # - SHEET	ORDER NUMBER
Printed Circuit Board	WK-7373 U01 CONTROL SOURCE PCB	1	PCB1	13 - 2	P00A0737301
Printed Circuit Board	WK-7381 U01 MAIN PCB	1	PCB2	14 - 2	P00A0738101
Printed Circuit Board	WK-5609 U05(04) SECONDARY DIODE PCB	1	PCB3	15 - 2	PZZA0560905
Printed Circuit Board	WK-5449 U01 CONTROL PCB or WK-5449 U06 RoHS CONTROL PCB	1	PCB4	16 - 1	P0A544901 P0A544906
Printed Circuit Board	WK-5448 U04 PANEL PCB or WK-5448 U25 RoHS PANEL	1	PCB5	17 - 1	P0A544804 P0A544825
Printed Circuit Board	WK-5460 U02 PRIMARY GATE PCB	1	PCB6	18 - 2	P0A546002
Printed Circuit Board	WK-5460 U02 PRIMARY GATE PCB	1	PCB7	19 - 2	P0A546002

DESCRIPTION	TYPE & RATING	QTY	INTERCONNECT DIAGRAM REFERENCE	EXPLODED VIEW REFERENCE # - SHEET	ORDER NUMBER
Transistor	IRGP20B60PDPBF 600V 22A	3	Q1A-Q1C	18 - 2	43490003400
Transistor	IRGP20B60PDPBF 600V 22A	3	Q2A-Q2C	18 - 2	43490003400
Transistor	IRGP20B60PDPBF 600V 22A	3	Q3A-Q3C	19 - 2	43490003400
Transistor	IRGP20B60PDPBF 600V 22A	3	Q4A-Q4C	19 - 2	43490003400
Resistor	ERG5SJ103 5W 10K Ω	1	R1	24 - 2	40305423000
Resistor (On UNIT1)	ERG3SJ220H 3W 22 Ω	2	R3-4	25 - 2	40305002300
Switch (AC Input)	DCP-52SR50C-480V 2P-480V	1	S1	26 - 1	25850003500
Solenoid Valve	5505NBR1.5 DC24V 11VA/10W (with Gas Inlet and PC4-02)	1	SOL1	27 - 1	U0A705700
Transformer	F3A013701 200A MAIN TR	1	T1	28 - 2	F3A013701
Thermistor	PTP-46F-S1 (with Assembly)	1	TH1	29 - 2	U1A145900
Thermistor	PTP-46F-S1 (with Wiring Assembly)	1	TH2	78 - 2	U1A146000

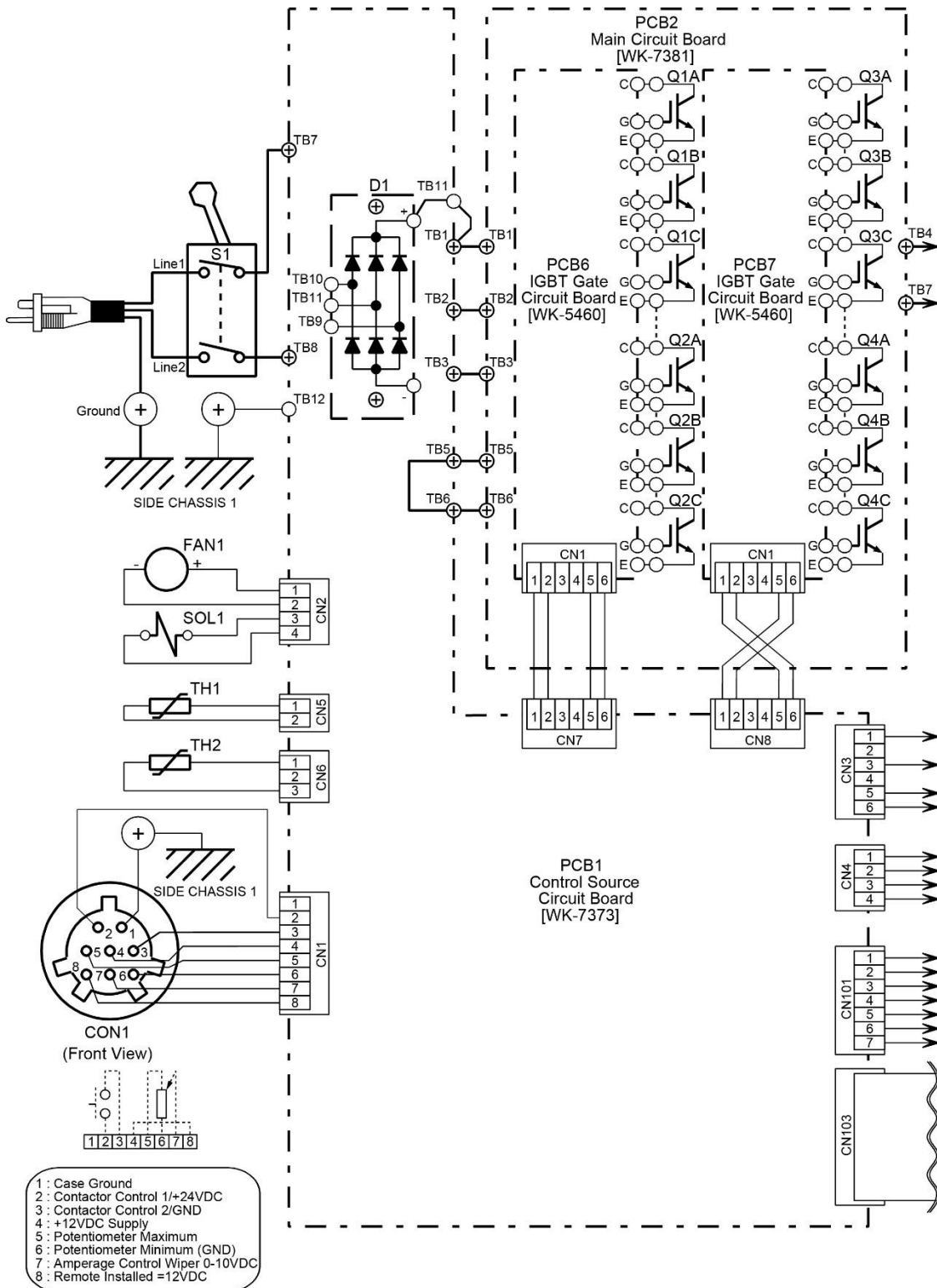
DESCRIPTION	TYPE & RATING	QTY	INTERCONNECT DIAGRAM REFERENCE	EXPLODED VIEW REFERENCE # - SHEET	ORDER NUMBER
Front Panel	E0D004501	1		30 - 1	E0D004501
Rear Panel	E0D004601	1		31 - 1	E0D004601
Side Panel	E0D004709	2		32 - 1	E0D004709
Front Control Cover Mask	E0C341900	1		33 - 1	E0C341900
Rear Control Cover	JFA359601	1		75 - 1	JFA359601
Protection Cover	E1B500700	1		34 - 1	U0A937200
Encoder Cover	EBA514400	1		35 - 1	EBA514400
PCB Cover	E1B550900 (with Caution Label)	1		36 - 1	U0A706700
Name Label	N4A145400 (160P)	2		37 - 1	N4A145400
Side Label	N4A056500	2		38 - 1	N4A056500
Warning Label 1	N1B029600 Safety Instructions	1		39 - 1	N1B029600
Warning Label 2	N1B029500 Two Warnings	1		40 - 1	N1B029500
Output Terminal Label	N4A040000	1		41 - 1	N4A040000
GAS Input Label	N4A040700	1		42 - 1	N4A040700
Input Power-Up Label	N4A598200	1		44 - 1	N4A598200

DESCRIPTION	TYPE & RATING	QTY	INTERCONNECT DIAGRAM REFERENCE	EXPLODED VIEW REFERENCE # - SHEET	ORDER NUMBER
GAS Outlet	E5A925600 (with PC4-02)	1		45 - 1	U0A705800
C-Ring		2		46 - 1	53003000600
Output Terminal (female)	TRAK-BE10-25	2		47 - 1	26999025700
Input Cable	132" 12/3 SOWBLKW/5-15P	1		48 - 1	52031130100
Input Cable Clamp	SCLB18A	1		49 - 1	53613021800
Heatsink (IGBT)	E1B834200	2		50 - 2	E1B834200
Heatsink (Output Diode)	E1B836800	1		51 - 2	E1B836800
Heatsink Insulated Board	E1B834100	2		52 - 2	E1B834100
Knob	2615603	1		53 - 1	50990001500
Knob Cap	3015104	1		54 - 1	50990003500
Control Cover Sheet (Mylar)	N00B0258300	1		55 - 1	N00B0258300
Silicone Rubber Sheet	ECA775700	4		56 - 2	ECA775700
Strap	E5A937000	1		57 - 1	E5A937000

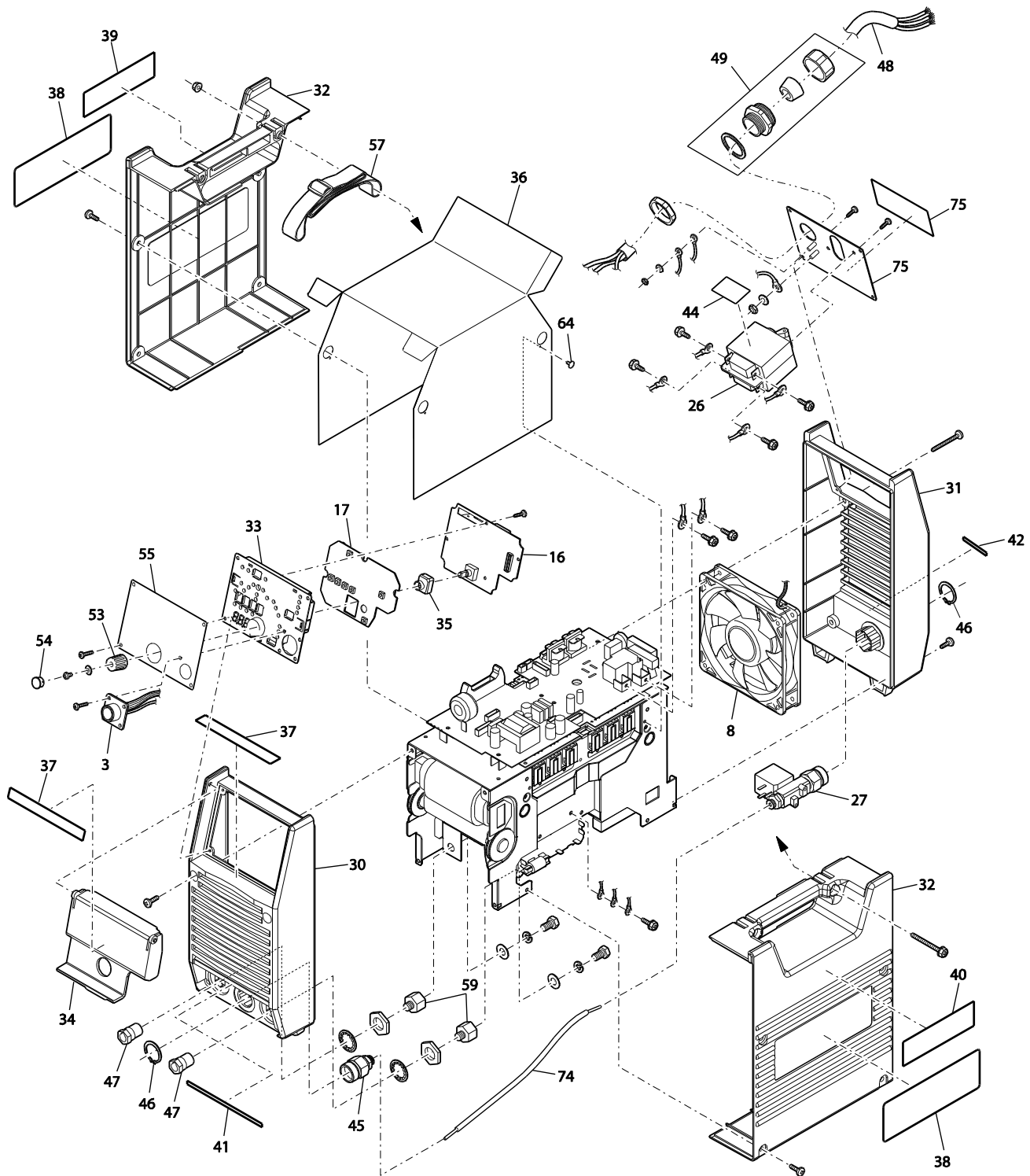
DESCRIPTION	TYPE & RATING	QTY	INTERCONNECT DIAGRAM REFERENCE	EXPLODED VIEW REFERENCE # - SHEET	ORDER NUMBER
Post1	ECA793500 (M4-M4)	1		58 - 2	ECA793500
Output Post	ECA790900	2		59 - 1	ECA790900
T-D Bus Bar1	ECA848700	1		60 - 2	ECA848700
T-D Bus Bar2	ECA848800	1		61 - 2	ECA848800
CT1 Bus Bar	ECA775600	1		62 - 2	ECA775600
Output Bus Bar	ECA788600	1		63 - 2	ECA788600
Clip	#74 NATURAL	4		64 - 1	60602422000

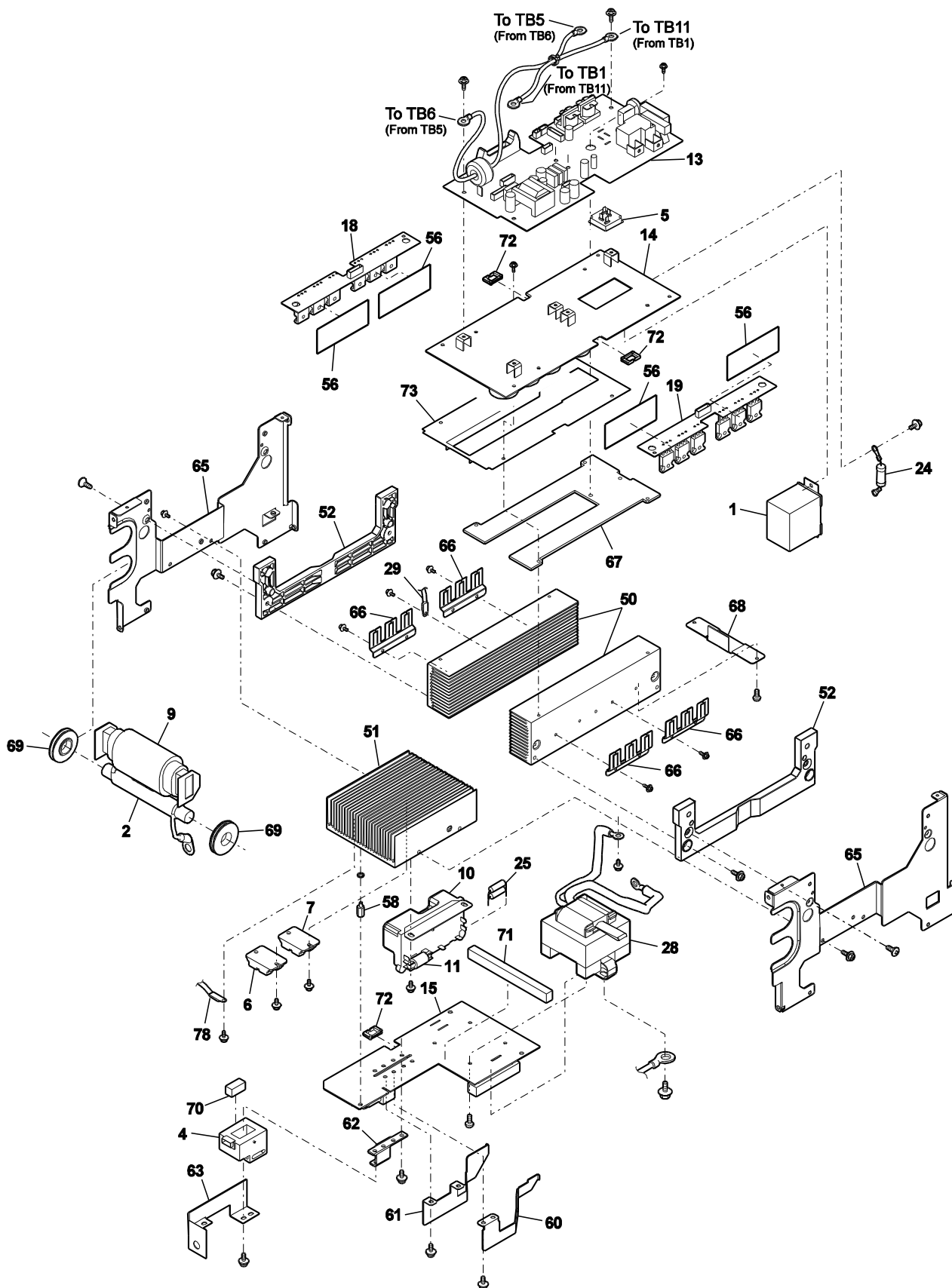
DESCRIPTION	TYPE & RATING	QTY	INTERCONNECT DIAGRAM REFERENCE	EXPLODED VIEW REFERENCE # - SHEET	ORDER NUMBER
Chassis	J4B983800	1set		65 - 2	J4B983800
IGBT(Q1A-Q4C) Spring clip	E1B832400	4		66 - 2	E1B832400
D1 Chassis	J00A2559101	1		67 - 2	J00A2559101
C1 Chassis	JEA280600	1		68 - 2	JEA280600
C.C.-FCH1 Support Ring	ECA774900	2		69 - 2	ECA774900
CT1 Cushion	ECA793900	1		70 - 2	ECA793900
Dust Cushion	ECA793800	1		71 - 2	ECA793800
Edge Protect	EH11U	3		72 - 2	53692118800
PCB Insulated Sheet	ECA775000	1		73 - 2	ECA775000
Gas Tube	T0425B Nylon Hose L=0.5m	1		74 - 2	U0A706000
Rating Label	N00A1096600	1		75 - 1	N00A1096600
Output Plug (male)	TRAK-SK25	2			26999025600

10.1 INTERCONNECT DIAGRAM 160P



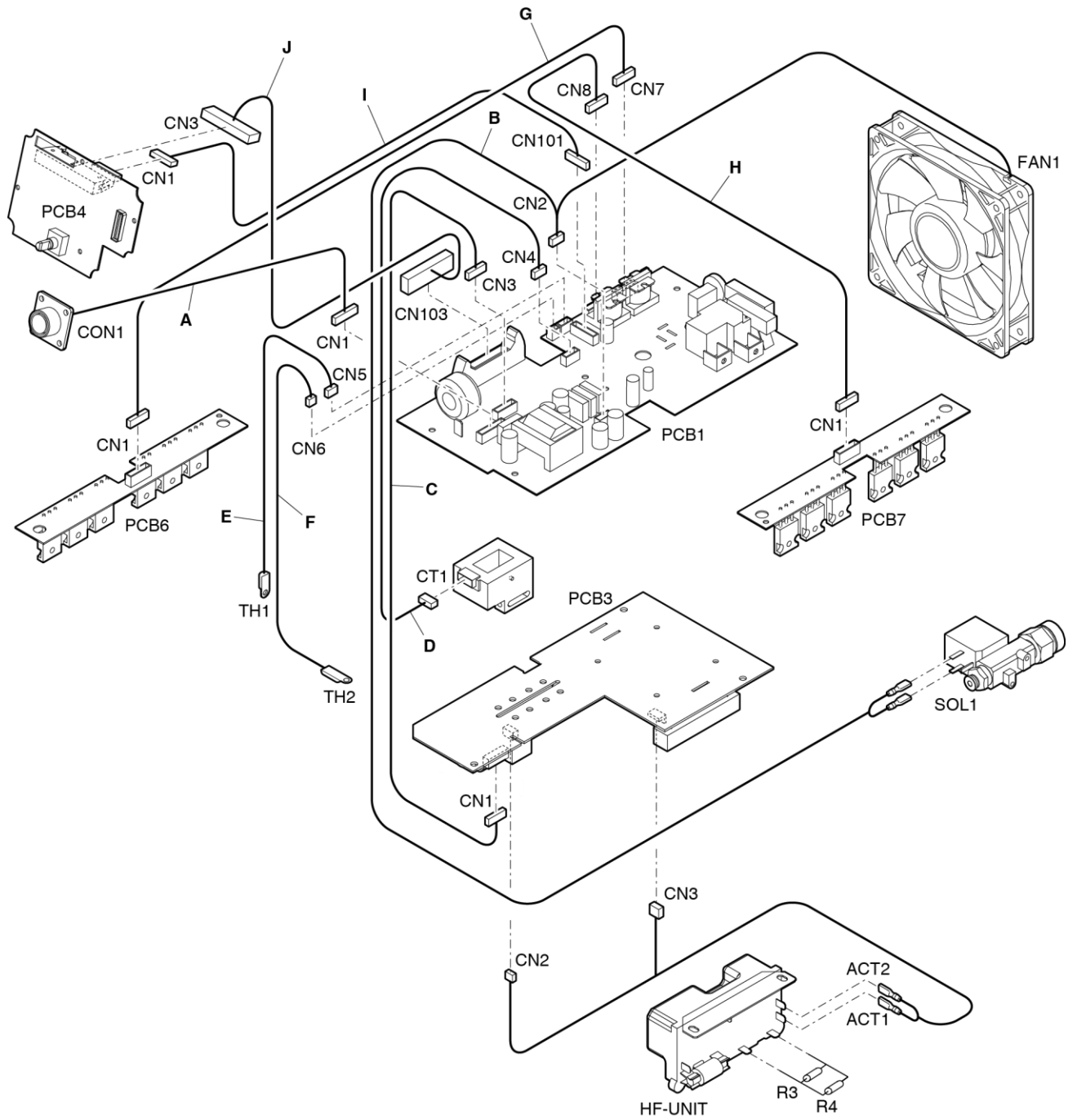
10.2 EXPLODED VIEW – COMPONENT LAYOUT 160P





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10.3 EXPLODED VIEW – WIRING LAYOUT 160P



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