



SanRex

SANARG

300AP

**WITH COOLING WATER
PRESSURE SENSOR**

**AC/DC/AC-SOFT
INVERTER**

ARC WELDER

**Operators
Manual**

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SanRex

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 300AP with cooling water pressure sensor AC/DC STICK 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 appropriately left to the vast array of Vocational, Trade and other institutions that provide 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 300AP with cooling water pressure sensor, hereby referred to as 300AP, an AC/DC Stick and TIG 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 300AP. 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 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 functional lock 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, 300AP attributes and model features and remote control receptacle specifications.

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

This section shows the basic STICK and TIG connection set-up for the 300AP from tank to workpiece.

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 300AP is shipped from the factory with the VRD disabled.

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.

Contents

1.0 SAFETY REGULATIONS AND REQUIREMENTS	9
1.01 Notes, Cautions and Warning Annotations.....	9
1.02 Safety Recommendations.....	10
1.03 Welding Symbols.....	11
1.03.01 Safety Symbol Legend.....	11
1.03.02 Graphic Symbol Legend.....	17
1.04 Safety Precautions.....	18
1.05 Safe Operation of the Welder and Personal Protection	19
1.05.01 Important Safety Precautions.....	19
1.05.02 Electric Shock.....	20
1.05.03 Gases and Fumes.....	21
1.05.04 Fire and Explosions.....	22
1.05.05 Arc Welding Rays, Noise and Spatter or Slag.....	23
1.05.06 Gas Cylinders.....	24
1.06 Reference Publications.....	25
2.0 INTRODUCTION AND DESCRIPTION.....	27
2.01 General Information.....	27
2.02 Welding Machine Description.....	27
2.03 300AP Power Source Features.....	27
2.04 Welding Output Voltage and Amperage Curves	30
2.04.01 300AP V/A Output Curves.....	30
2.05 Functional Block Diagram.....	31
3.0 INSTALLATION RECOMMENDATIONS.....	33
3.01 Transportation Methods.....	33
3.02 Environment.....	34
3.03 Machine Grounding & High Frequency Interference.....	34
3.03.01 Grounding.....	34
3.03.02 High Frequency Introduction.....	34
3.03.03 High Frequency Interference.....	35
3.04 Location.....	36
3.05 Electrical Input Connections & Requirements	36
3.05.01 Input Power.....	36
3.05.02 Fusing.....	37
3.05.03 Electrical Input Connections.....	38
3.06 Specifications.....	40
3.06.01 Input/Output.....	40
3.06.02 General Information.....	41
3.07 Duty Cycle.....	42
4.0 OPERATOR CONTROLS, DIMENSIONS & OUTLINE	43
4.01 Dimensions and Outline.....	43
4.02 Operator Controls, Location and Functionality	43
4.03 14-PIN Remote Control Receptacle.....	46
4.04 Parameter Display Panel.....	47
4.05 Function Selection	51
4.06 Parameter Selection	52
4.07 Internal Parameter Selection.....	53
5.0 SET-UP FOR BASIC STICK (SMAW) AND TIG (GTAW) WELDING.....	55
6.0 SEQUENCE OF OPERATION.....	56
6.01 Stick Welding.....	58
6.01.01 Stick Welding Sequence with Voltage Reduction Device Disabled	59

6.01.02 Stick Welding Sequence with Voltage Reduction Device Enabled.....	59
6.02 AC or DC HF TIG Welding.....	60
6.03 LIFT TIG Sequence.....	61
6.03.01 Standard Mode.....	61
6.03.02 Slope Mode.....	61
6.03.03 Repeat Mode.....	61
6.04 HF TIG Sequence.....	62
6.04.01 Standard Mode.....	62
6.04.02 Slope Mode.....	62
6.04.03 Repeat Mode.....	62
6.04.04 Spot Mode.....	63
6.05 Waveform Options.....	63
6.05.01 VR-Current.....	63
6.05.02 AC-SOFT Mode.....	64
6.06 Slope Function.....	65
6.06.01 2T Slope Function.....	65
6.06.02 4TS Mode Setting.....	65
7.0 VOLTAGE REDUCTION DEVICE (VRD).....	66
7.01 VRD Specifications.....	66
7.02 Enabling/Disabling VRD.....	66
8.0 TROUBLE SHOOTING.....	69
8.01 Power Source Problems.....	69
8.02 Power Source Error Codes.....	71
9.0 ROUTINE MAINTENANCE.....	75
9.01 Opening the Enclosure.....	76
10.0 PARTS LIST 300AP.....	79
10.01 Interconnect Diagram 300AP.....	88
10.02 Exploded View 300AP.....	90
APPENDIX A.....	92

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:

1.01 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.

1.02 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 sufficient 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.













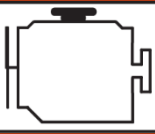

Please call your local distributors, business offices, or service agents if you have any questions.






1.03 Welding Symbols





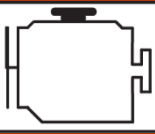

1.03.01 Safety Symbol Legend




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.



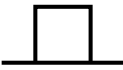





SYMBOL	SOURCE OF HAZARD	HAZARD	HOW TO AVOID
	Optical Radiation and Arc Heat	Thermal	Establish a written policy documenting general safety requirements for the wearing of contact lenses. Conduct an eye hazard evaluation in the workplace
	Cuts, Scrapes, Heat, Flames, Molten Metal, Wet Gloves, Insulation 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
	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.
	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.

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

1.03.02 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 <input type="checkbox"/> (High Frequency GTAW)
	Touch Start <input type="checkbox"/> (Lift Start GTAW)

	STICK <input type="checkbox"/> (Shielded Metal Arc SMAW)
	Pulse Current Function
	Spot Time (GTAW)
	Remote Control (Panel/Remote)
	Remote Function
	Arc Control (SMAW)
	Gas Post-Flow t2
	Gas Pre-Flow t1
VRD	Voltage Reduction Device Circuit
	Negative
	Positive
	Gas Input
	Gas Output
	Protective Ground

1.04 Safety Precautions



NOTE:

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.



PROCEDURES 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.

1.05 Safe Operation of the Welder and Personal Protection

1.05.01 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.



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

1.05.02 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.



Tighten cable connections securely and insulate properly.



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



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



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.



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



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



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



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



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



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



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

1.05.03 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 a respirator, and perform the welding work under supervision.



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 a respirator. Welding coated steel plates 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.

1.05.04 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 a steel frame may cause overheating due to conducting current and may resulting in a fire.



When welding ceilings, floors or walls, 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 welding 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.

1.05.05 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.



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.



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



Prevent gas cylinders from being exposed to welding arc and spatter generated from the welding torch.



Loud noise can cause hearing loss.



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



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



Never touch the gas cylinder with the electrode.



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

1.05.06 Gas Cylinders

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



Turnover, tipping or falling gas cylinder may cause injury to the operator or others. Cylinders should properly secured.



Read and follow all warnings, safety precautions, and instructions in the 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 a special-purpose holder or rack.



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 away from the gas cylinder outlet when opening the gas cylinder valve.



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



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



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



1.06 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

2.01 General Information

This manual is intended to be a guide to the understanding of the 300AP 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.

2.02 Welding Machine Description

The 300AP is as an inverter based DC Power Source Unit that is powered from an external source of 208/230 or 460 VAC, single or three phase power. The 300AP is capable of providing Constant Current (CC) output characteristics. The 300AP is also equipped with a lift arc starter for use with Gas Tungsten Arc Welding (GTAW) as well as user settable Hot Start and Arc Control functions for use with Shielded Metal Arc Welding (SMAW) process. The unit is equipped with a digital Amperage/Voltage meter and Output Contactor and Output Control functions that that are conveniently located on the front control panel. The 300AP incorporates a high-performance microcontroller to achieve complete digital control. The 300AP is designed with a flame and impact resistant non-conductive plastic case enclosure.

The 300AP is equipped with a water pressure sensor switch, that when used properly will reduce torch burn-up cause by inadequate water flow thru water cooled torches.

2.03 300AP 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 still providing optimum cooling.
- Fan speed reduces approximately 30 seconds after machine is turned on.
- Fan speed increases when internal components reach 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. See the separate VRD section in this manual for additional information.

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. See the separate error code section in this manual for additional information.

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.

Water Cooled Torch Protection

The 300AP is equipped with a cooling water pressure switch that will disable the welding output current if inadequate cooling water is flowing to the torch.

To enable the cooling water pressure switch circuitry:

- Press the **WATER COOLING** button.
- Once the LED is illuminated, the water cooling pressure switch circuitry is enabled. No output current will be available if there is insufficient cooling water pressure detected. The cooling water pressure switch circuitry is operational in all welding modes.

To disable the cooling water pressure switch circuitry:

- Press the **WATER COOLING** button.
- Once the LED is extinguished, the water cooling pressure switch circuitry is disabled. Output current will be available regardless of cooling water pressure.

2.04 Welding Output Voltage and Amperage Curves

2.04.01 300AP V/A Output Curves

The waveforms shown in figure 2.1 are the maximum Voltage-Amperage output capabilities of the 300AP. Curves for actual welding setting will fall within the curves shown.

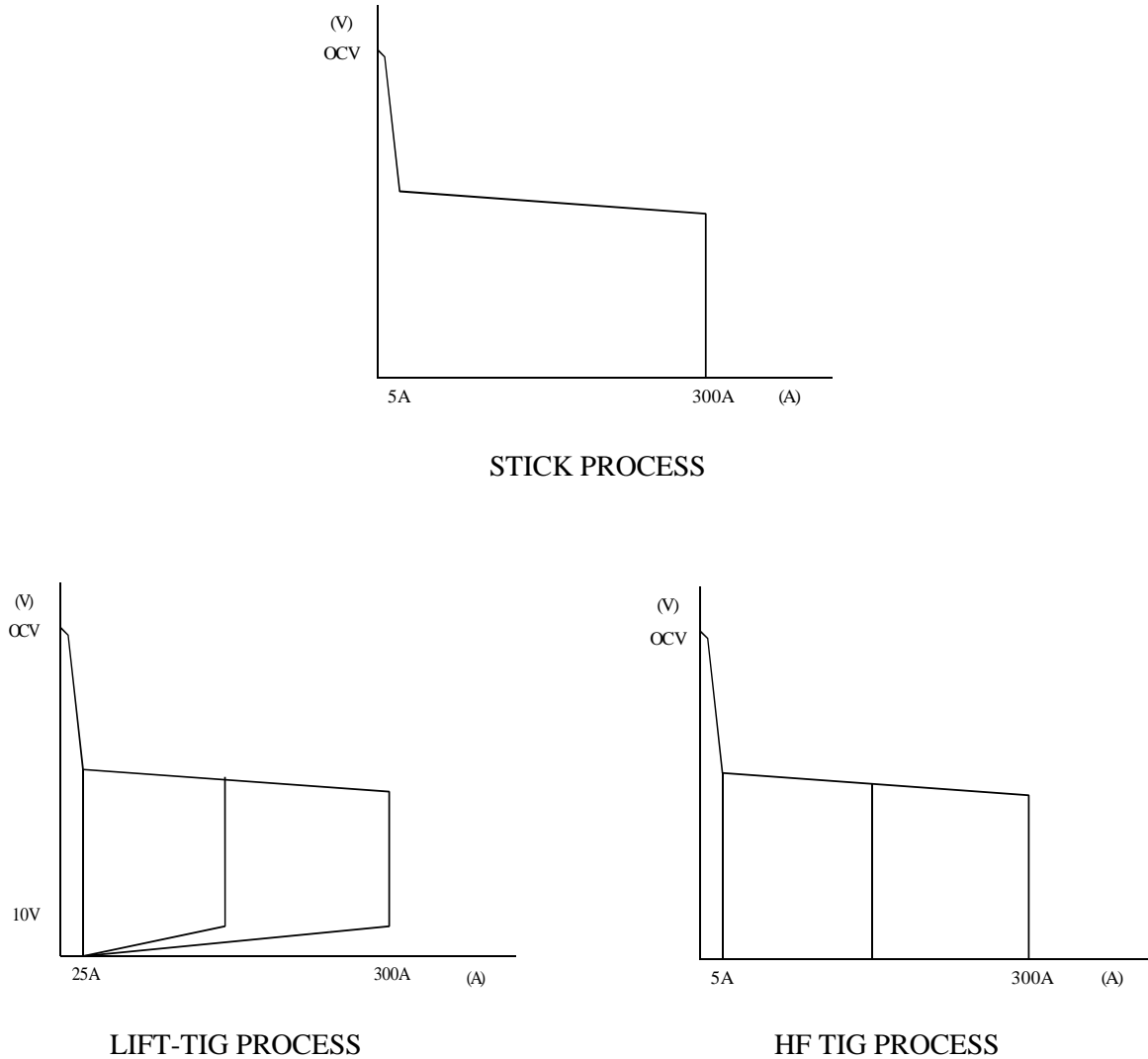


FIGURE 2-1 : 300AP Voltage-Ampere Curves

2.05 Functional Block Diagram

Figure 2.2 shows the functional block diagram of the 300AP.

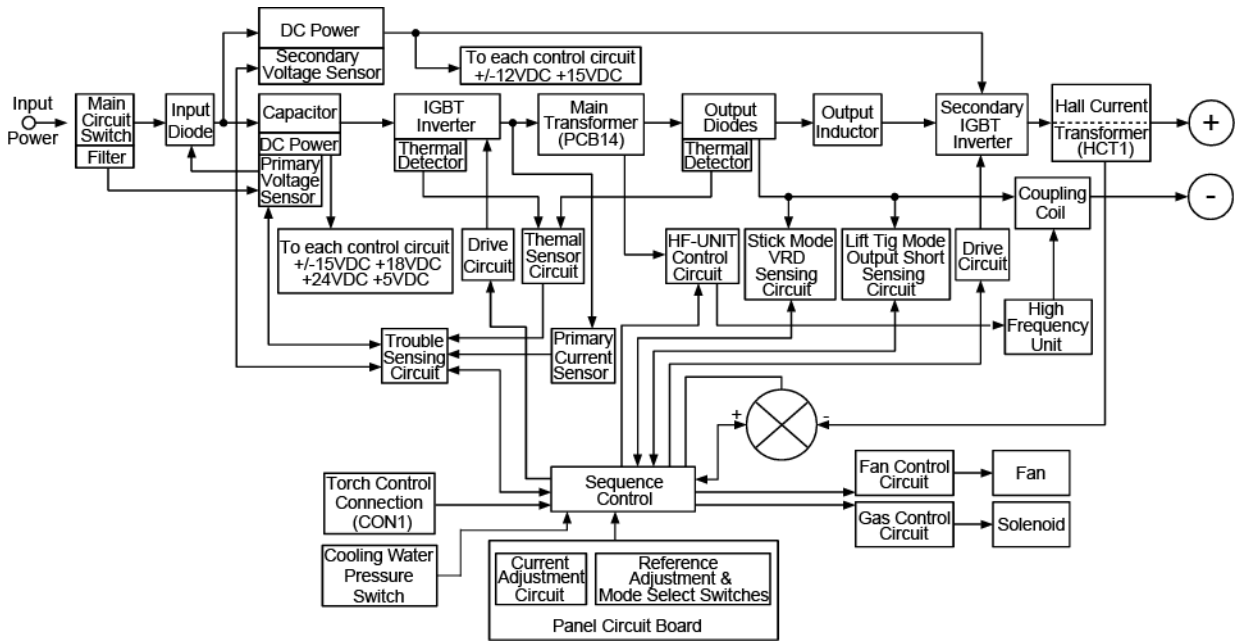


FIGURE 2-2 : 300AP Functional Block Diagram

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SECTION 3 - INSTALLATION RECOMMENDATIONS

3.0 INSTALLATION RECOMMENDATIONS

3.01 Transportation Methods

The case design of the 300AP 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 cannot 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.

3.02 Environment

The 300AP is 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 300AP is 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.

3.03 Machine Grounding & High Frequency Interference

3.03.01 Grounding

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

3.03.02 High Frequency Introduction

The 300AP units are inverter power source that produce 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.

3.03.03 High Frequency Interference

Interference may be transmitted by a high frequency in an 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.

3.04 Location

The location of the 300AP 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.

3.05 Electrical Input Connections & Requirements

The 300AP welding power source operates from a single or three-phase 50/60 Hz, AC power supply. 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.

3.05.01 Input Power

The 300AP incorporates 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 575VAC or higher is applied.

The 300AP 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.

3.05.02 Fusing

The 300AP 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.



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).

3.05.03 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 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.



NOTE:

These units are equipped with a three-conductor with earth power cable that is connected at the welding power source end for single and three phase electrical input power. For Single-Phase operation connect the GREEN, BLACK and WHITE input conductors. Insulate the RED conductor, it is not used for single-phase operation. The welding power source will not operate properly if the BLACK or WHITE wire is exchanged for the RED wire in single-phase operation.

Do not connect an input (WHITE or BLACK or RED) 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 the other lines as follows:
 - a. For three-phase input connections: Connect the ends of line 1 (BLACK) and line 2 (WHITE) and line 3 (RED) input conductors to a de-energized line disconnect switch.

- b. For single-phase input connections: Connect the ends of line 1 (BLACK) and line 2 (WHITE) input conductors to a de-energized line disconnect switch. Insulate the end of line 3 (RED) conductor, as it is not used for single-phase operation.
3. Use Table 3-1 and section 3.5.2 as a guide to select proper line fuses for the disconnect switch.

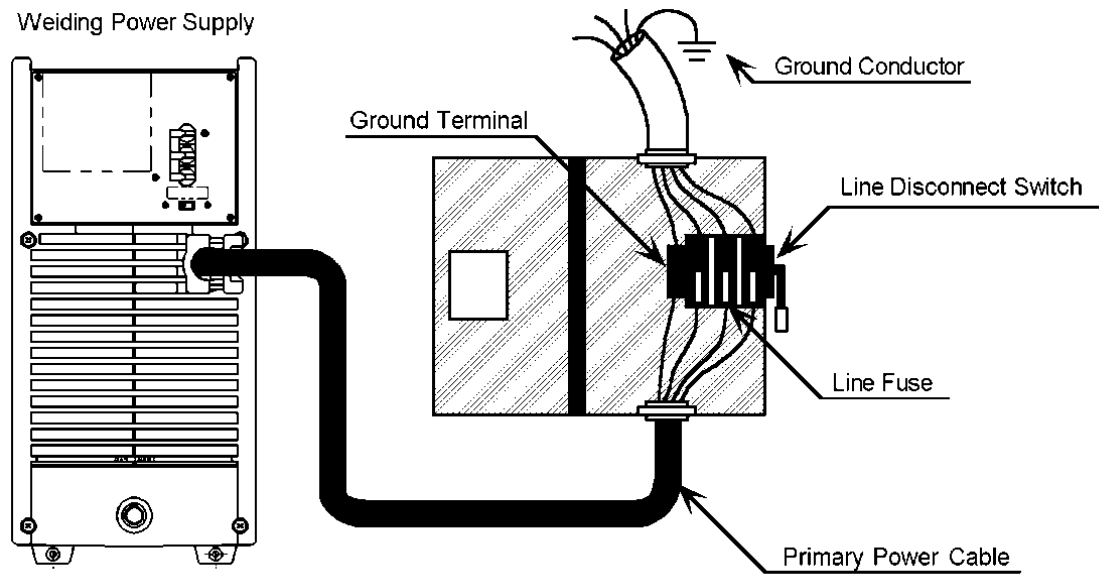


Figure 3-1. Electrical Input Connections

3.06 Specifications

3.06.01 Input/Output

PARAMETERS		SANARG 300AP			
Model		IA-3000TP-U3E			
Description		AC/DC HF TIG, LIFT TIG, STICK			
Rated output		300 A at 32 V, 25% Duty Cycle (STICK)			
Welding Mode		Input Power	25% Duty Cycle	60% Duty Cycle	100% Duty Cycle
Output Current/Voltage	TIG	208-230/460 1/3Ø	300A@22V	190A@18V	150A@16V
	STICK	208-230/460 1/3Ø	300A@32V	190A@28V	150A@26V
Open Circuit Voltage		Approximately 65 V at 230/460 VAC input Approximately 18 V with low OCV circuitry enabled			
Output Current Range	TIG	5-300 A (DC Mode) 10-300 A (AC Mode, 60 Hz, 50% cleaning)			
	STICK	5-300 A (DC Mode) 10-300 A (AC Mode, 60 Hz, 50% cleaning)			
Input/Output at Rated Load	Three-phase		Single-phase		
	Voltage	Current	Voltage	Current	
Rated Input Voltage/Current	208	45	208	97	
	230	41	230	87	
	460	21	N/A	N/A	
Output Amperes	300		300		
Output Volts	32		32		Input at No Load
KVA	16		20		0.5
KW	12		12		0.13
Input					
Input Voltage		208-230/460 VAC 3-Phase, 208-230 VAC 1-Phase			
Line Frequency		50 / 60 Hz			
Line Volts Compensation		+ / - 10%			
Input Cable		AWG 8/4 SOOW, approximately 10 feet long			
Dimensions		W: 8.27 in. (210 mm), H: 16.89 in. (435 mm), L: 17.72 in. (450mm)			
Weight		53 lb. (24 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.

3.06.02 General Information

Model	IA-3000TP-U3E		
General			
Approval/Standard	IEC60974-1, IP23S		
Language	English		
Front Panel			
Front Panel Pot	Welding Current / Parameters Adjustment Push to voltage display / Set / Error Release		
Function Select Button	Process	STICK / HF TIG / LIFT TIG	
	Mode	OUTPUT	STD / SLOPE / REPEAT / SPOT
		AC/DC	DC / AC / AC-SOFT
	Pulse	PULSE ON	
Parameter Select Button	Forward / Back	AC	AC FREQ. / WAVE BALANCE
		Current	PEAK WELD / BASE
			HOT START / INITIAL CUR. / CRATER CUR. / VR CUR.
		Pulse	WIDTH / FREQ.
	Time Sequence	PRE FLOW / POST FLOW / SPOT TIME UP SLOPE / DOWN SLOPE	
Save / Load Button	Save / Load	Ch1 – Ch30	
Water Cooled Torch select Button		WATER COOLING	
Digital Panel Meter Indicator	Amperage / Parameter / Error Code / Internal Parameter		
	* Holds weld value for 8sec after weld current has stopped Value stops displaying if control knob is rotated		
LED Indicator (Voltage Reduction Display)	Selected Function and Parameter		
	GREEN	VRD ON	
	RED	Others	
	* Both VRD light off in HF TIG & LIFT TIG modes		
Contactors Functions Button	Output On/Off (at STICK,LIFT TIG mode)		
Panel / Remote Selections Button	Panel or Remote chosen about a setup of welding current		
Shielding Gas Output	5/8 18inch UNF (F)		
Cooling Water Output	5/8 18inch UNF (F) (LEFT-HAND THREAD)		
Output	DIN style		
Remote Control	14 pin connector for Torch Control with automation controls		
Rear Panel			
ON/OFF Switch	Switch		
230V / 460V Selector	Switch		
Shielding Gas Input	5/8 18inch UNF (F)		
Cooling Water Input	5/8 18inch UNF (F) (LEFT-HAND THREAD)		
Size			
Width	210 mm		
Height	420 mm		
Depth	450 mm		
Weight (Shipping)	24kg		
Material of Outline Case	Plastic		
Attachment	Terminal plug	2 pcs	
	Operation Manual	1 pcs	

3.07 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.



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.

Refer to the Input/Output specification chart in section 3.06.01 to determine the duty cycle based on input voltage and welding mode.

SECTION 4 - OPERATOR CONTROLS, DIMENSIONS & OUTLINE

4.0 OPERATOR CONTROLS, DIMENSIONS & OUTLINE

4.01 Dimensions and Outline

The figure below shows the dimensions, in millimeters, and the outline of the SanRex model 300AP.

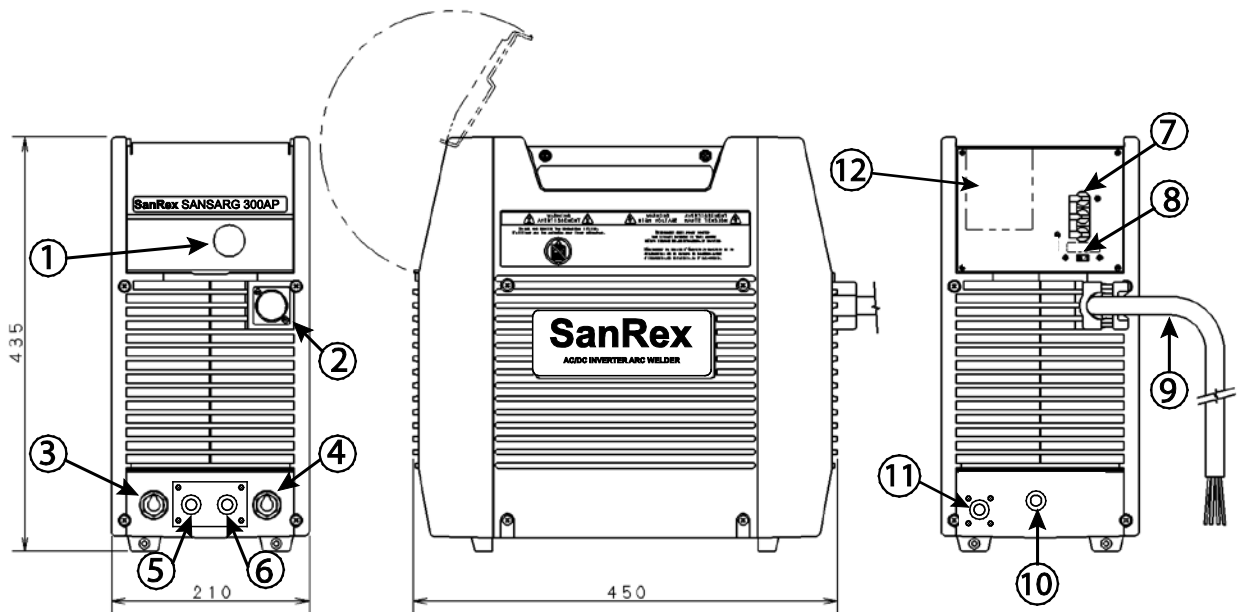


FIGURE 4-1 : 300AP Dimensions and Controls

4.02 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. 14-PIN Remote Control Receptacle

The 14-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 14-PIN Remote Control Receptacle.

3. Positive Output Terminal

Welding current flows from the Power Source via heavy duty Dinse type 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 heavy duty Dinse type 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 OUTLET

The Gas Outlet is a 5/8 18 UNF right-hand threaded female fitting.

6. WATER OUTLET

The Water Outlet is a 5/8 18 UNF left-hand threaded female fitting.

7. 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 700V potential with respect to earth.

8. AC INPUT VOLTAGE SELECT SWITCH

This manual slide, user selectable switch selects the proper AC input voltage range. If this slide switch is not set to the position that matches the input line voltage, the internal microcontroller will inhibit the welding power source from turning on and will display an error code on the front control display panel.



WARNING:

Do not alter the position of the Voltage Input Select Switch when the ON/OFF switch is in the ON position and the unit is powered up.

9. INPUT CABLE

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

10. GAS INLET

The Gas Inlet is a 5/8 18 UNF right-hand threaded female fitting.

11. WATER INLET

The Water Inlet is a 5/8 18 UNF left-hand threaded female fitting.

12. MANUFACTURES IDENTIFICATION DATA PLATE

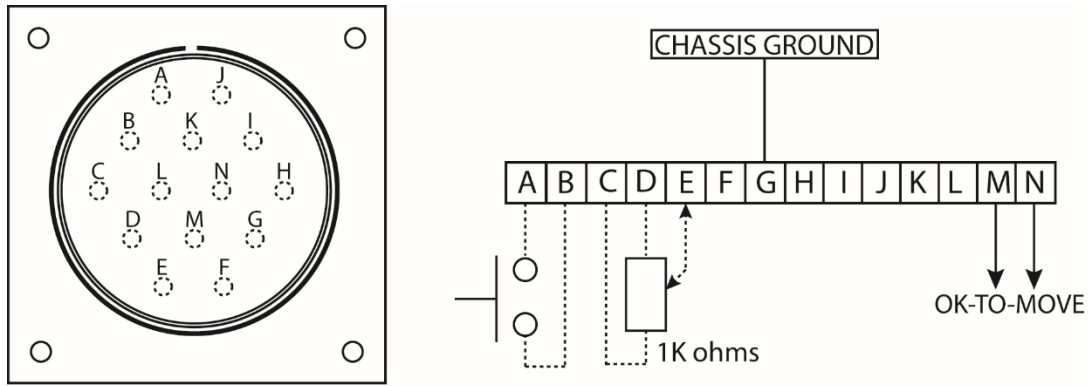
The Manufacturers Identification Data Plate label is located on the rear panel, upper left hand side. The layout of the data plate is based on IEC standard 60974-1 and indicates model type, manufacturer, load voltage, rated output amperage, duty cycle percentage, primary input voltage, input amperage 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.

4.03 14-PIN Remote Control Receptacle



Front view of 14-Pin
Socket Receptacle

FIGURE 4-2 : 14-PIN Remote Control Receptacle Layout.

Socket Pin	I/O	Function
A	Input	Torch Switch Input. To energize weld current, connect pins A & B.
B	Input	Torch Switch Input. To energize weld current, connect pins A & B.
C	Output	+10VDC signal connects to high side of 1k ohm remote control potentiometer.
D	GND	Zero ohm (minimum) connection to low side of 1k ohm remote control potentiometer.
E	Input	Wiper arm connection to 1k ohm remote control potentiometer, (0 to +10VDC signal)
F	N/C	Not used
G	GND	Internally connected to chassis ground.
H	N/C	Not used
I	N/C	Not used
J	N/C	Not used
K	N/C	Not used
L	N/C	Not used
M	Output	OK TO MOVE (current detect signal, dry contact closure to pin N)
N	Output	OK TO MOVE (current detect signal, dry contact closure to pin M)

TABLE 4-1 : 14-PIN Remote Control Receptacle Pin-Out Description.



NOTE:

The 14-PIN Remote Control Contactor has the capability to operate by shorting pin set A-B

4.04 Parameter Display Panel

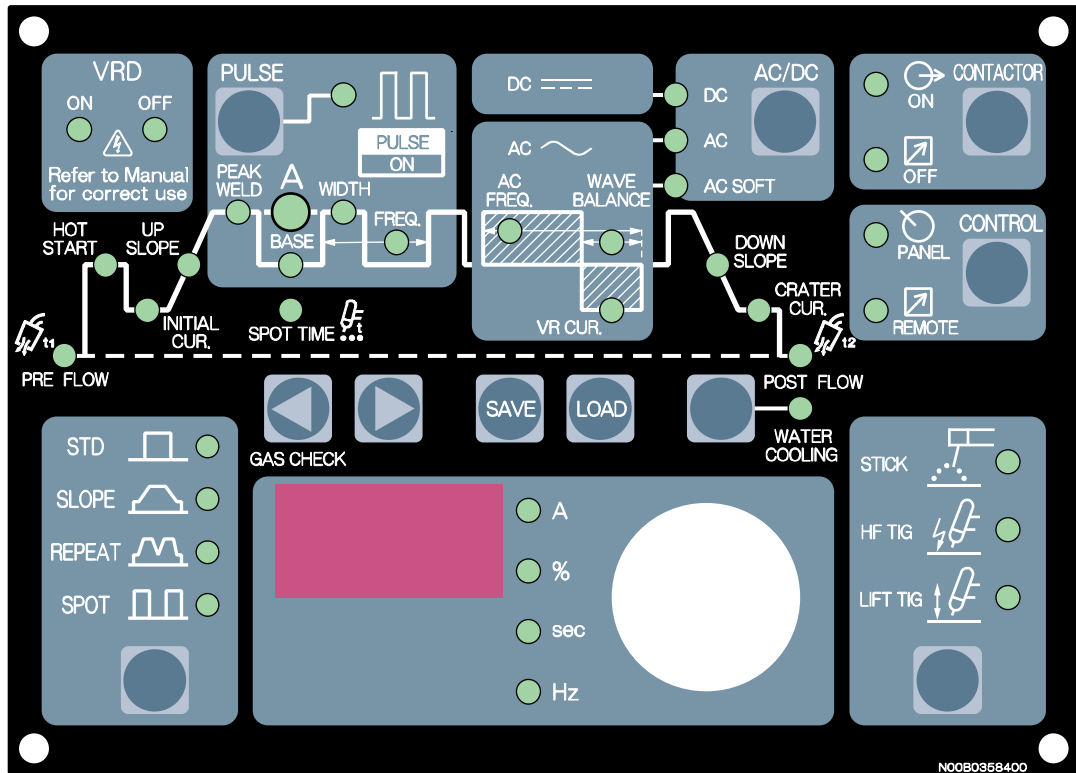


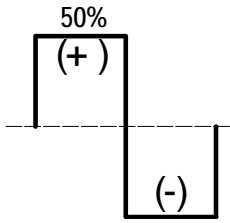
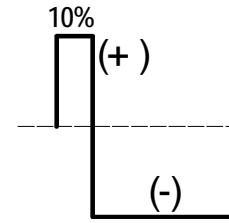
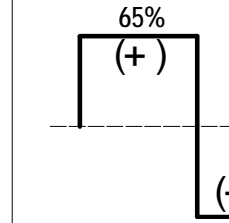



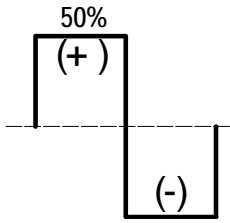
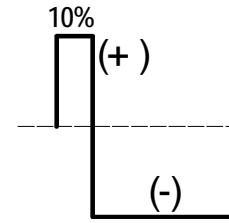
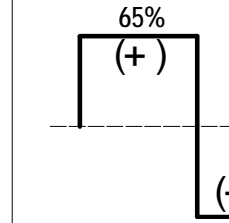



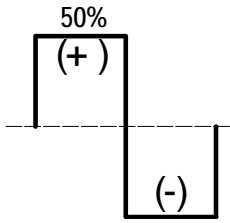
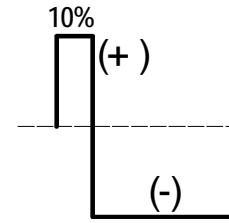
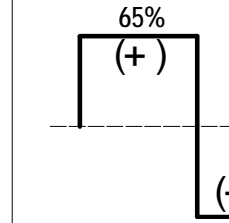





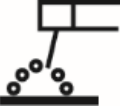





Figure 4-3 – 300AP Front Panel

PARAMETER	DESCRIPTION
 PRE-FLOW	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.
HOT START	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. e.g. <i>HOT START</i> current = 130 amps when <i>PEAK (WELD)</i> = 100 amps & <i>HOT START</i> = 30 amps
INITIAL CUR.	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.
UP SLOPE	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

PARAMETER	DESCRIPTION									
	pressed then released, from INITIAL CUR to PEAK or BASE current									
PEAK CUR. A (WELD)	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 <i>STICK</i> 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									
PULSE WIDTH	This parameter sets the percentage on time of the <i>PULSE FREQUENCY</i> for PEAK weld current when the <i>PULSE</i> is on.									
PULSE FREQ.	This parameter sets the <i>PULSE FREQUENCY</i> when the <i>PULSE</i> is on.									
AC FREQUENCY	This parameter operates in AC mode only and is used to set the frequency for the AC weld current.									
WAVE BALANCE	<p>This parameter is used for aluminium AC TIG mode and is used to set the penetration to cleaning action for the AC weld current. Generally <i>WAVE BALANCE</i> is set to 50% for AC <i>STICK</i> welding. The <i>WAVE BALANCE</i> control changes the ratio of penetration to cleaning action of the AC TIG welding arc. Maximum weld penetration is achieved when the <i>WAVE BALANCE</i> control is set to 10%. Maximum cleaning of heavily oxidised aluminium or magnesium alloys is achieved when the <i>WAVE BALANCE</i> control is set to 65%.</p> <table border="1" data-bbox="357 1228 1299 1711"> <thead> <tr> <th>WAVE BALANCE=50%</th> <th>WAVE BALANCE=10%</th> <th>WAVE BALANCE=65%</th> </tr> </thead> <tbody> <tr> <td>  <p>50% (+) (-) 50%</p> </td> <td>  <p>10% (+) (-) 90%</p> </td> <td>  <p>65% (+) (-) 35%</p> </td> </tr> <tr> <td>Balanced with 50% penetration and 50% cleaning </td> <td>Maximum Penetration and reduced cleaning </td> <td>Maximum Cleaning and reduced penetration </td> </tr> </tbody> </table>	WAVE BALANCE=50%	WAVE BALANCE=10%	WAVE BALANCE=65%	 <p>50% (+) (-) 50%</p>	 <p>10% (+) (-) 90%</p>	 <p>65% (+) (-) 35%</p>	Balanced with 50% penetration and 50% cleaning 	Maximum Penetration and reduced cleaning 	Maximum Cleaning and reduced penetration 
WAVE BALANCE=50%	WAVE BALANCE=10%	WAVE BALANCE=65%								
 <p>50% (+) (-) 50%</p>	 <p>10% (+) (-) 90%</p>	 <p>65% (+) (-) 35%</p>								
Balanced with 50% penetration and 50% cleaning 	Maximum Penetration and reduced cleaning 	Maximum Cleaning and reduced penetration 								
VR CUR	<p>This parameter works only in AC mode and is used to set the negative current value of AC welding current.</p> <p>The VR current cannot be set beyond the output current range.</p> <p>The minimum output current during AC welding is 10 A.</p> <p>The maximum output current is 300A in AC mode and 200A in</p>									

PARAMETER	DESCRIPTION
	AC-SOFT mode.
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 (4T)</i> 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 30 programs into the 300AP 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 30 is displayed on the meter. • After selecting the desired memory location (ie 1 to 30), 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 30 is displayed on the meter. <p>After selecting the desired memory location (ie 1 to 30), press the right scroll button and the machine will give a beep to confirm the weld parameters are loaded onto the control panel.</p> <p>When welding after the welding parameters have been changed, the previous 5 sets of welding parameter settings can be loaded.</p> <p>Press the LOAD button and turn the Control Knob to select the history number (“L. -1” to “L. -5”) you want to call up on the parameter display.</p> <p>Example: Select -2 to recall the previous welding conditions.</p> <p>Press the SET button to load the welding conditions that correspond to the displayed history number.</p>
STICK 	STICK mode of operation.
HF TIG 	HF TIG mode of operation. A remote control device may be used for use during LIFT TIG operation. See section 4 for the 14-Pin Remote Control Receptacle for complete details of the remote device.

PARAMETER	DESCRIPTION
 <p data-bbox="99 205 211 237">LIFT TIG</p>	<p data-bbox="354 155 1289 260">LIFT TIG mode of operation. A remote control device may be used for use during LIFT TIG operation. See section 4 for the 14-Pin Remote Control Receptacle for complete details of the remote device.</p>
 <p data-bbox="136 512 285 575">WATER COOLING</p>	<p data-bbox="354 289 1300 575">Depressing this button and illuminating the corresponding LED will enable the Cooling Water Pressure Sensor circuitry. This circuitry operates in all welding modes, i.e. STICK, LIFT TIG and HF TIG. If insufficient water pressure is detected when enabled, the unit will display error code E33, produce an audible alarm and the welding current will cease. Restoring water pressure, or disabling the WATER COOLING circuitry by depressing the button to extinguish the LED, will reset error code E33 and welding current will resume.</p> <p data-bbox="354 590 1166 653">WARNING: Disabling the water cooling pressure circuitry is not recommended and could cause damage to water cooled torches.</p>

4.05 Function Selection

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


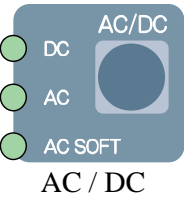
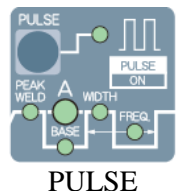



Function	Selection	STICK	LIFT	HF	Description
	STD	YES	YES	YES	2T operation in TIG Modes using remote devices to control contactor & current
	SLOPE	NO	YES	YES	4T operation in TIG Modes with crater fill using a remote contactor device to control sequence.
	REPEAT	NO	YES	YES	4T operation in TIG Modes with repeat operation and crater fill using a remote contactor device.
OUTPUT MODE	SPOT	NO	NO	YES	2T operation spot welding in HF TIG using a remote contactor device.
	AC / DC	YES	YES	YES	Selects AC, DC or AC-SOFT weld current
	AC SOFT	NO	YES	YES	
	ON / OFF	NO	YES	YES	Enables Pulse operation in TIG Modes
	ON/OFF	YES	NO	NO	Contactor operation in Stick Mode
	PANEL / REMOTE	YES	YES	YES	Selects operation in Panel or Remote
	ENABLE/DISABLE	YES	YES	YES	Enables the cooling water pressure sensor.

TABLE 4-2 : Front Panel Function Description.

4.06 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
AC Frequency	15 to 150Hz	60Hz	1Hz	YES	YES	YES
Wave Balance	10 to 65%	20%	1%	YES	YES	YES
VR Current	-99 to 100A *4	0A	1A	YES	YES	YES
Weld Current	5 to 300A *3	120A	1A	YES	YES	YES
Pulse Base Current	5 to 300A *3	80A	1A	NO	YES	YES
Pulse Peak Current	5 to 300A *3	120A	1A	NO	YES	YES
Hot Current	0 to 70A	20A	1A	YES	NO	YES
Initial Current	5 to 300A *3	30A	1A	NO	YES	YES
Crater Current	5 to 300A *3	30A	1A	NO	YES	YES
Pulse Duty	15 to 80 %	50%	1%	NO	YES	YES
Pulse Frequency	0.5 to 500.0 Hz	100.0Hz	*2	NO	YES	YES
Pre-Flow Time	0.0 to 25.0 sec	0.1sec	0.1sec	NO	YES	YES
Post-Flow time	0.0 to 60.0 sec	10.0sec	0.1sec	NO	YES	YES
Spot Time	0.1 to 25.0 sec	2.0sec	0.1sec	NO	NO	YES
Up-Slope Time	0.0 to 25.0 sec	1.0sec	0.1sec	NO	YES	YES
Down-Slope Time	0.0 to 25.0 sec	3.0sec	0.1sec	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 : Pulse frequency units are dependent on frequency setting range as shown below:

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

TABLE 4-4 : Front Panel Parameter Selection Ranges.

*3 : The minimum value in AC mode and AC-SOFT mode is 10A.
The maximum value in AC-SOFT mode is 200A.

*4 : The VR current cannot be set beyond the output current range.
The minimum output current is 10 A.
The maximum output current is 300A in AC mode and 200A in AC-SOFT mode.

4.07 Internal Parameter Selection

Internal parameters can be set by pressing and holding the encoder button.
Turn the encoder to display “End” and press the encoder to return to the standby screen.

Code No.	Items	Setting area	Default	Remarks
P00	Anti-Stick	OFF / ON	OFF	[ON Setting] The welding current is reduced to 25A if the output short-circuit state continues for 1 second or longer in stick mode.
P14	Setting the maximum peak current at REMOTE	OFF / ON	OFF	[OFF Setting] The welding current set on the operation panel is the maximum current. [ON Setting] Maximum current is 300A.
P19	2T Slope Function	OFF / ON	OFF	See Section 6.6.1
P20	4TS mode Setting	OFF / ON	OFF	See Section 6.6.2
P24	AC waveform Selection	OFF / ON	OFF	[OFF Setting] Sinusoidal wave [ON Setting] Triangular wave
P26	OK to Move current detect signal output logic inversion	OFF / ON	OFF	[OFF Setting] CON1_M-N short-circuited at current detection. [ON Setting] CON1_M-N is open when current is detected.
P31	Operation panel lock password setting	OFF / ON	OFF	When the encoder button and mode selection button are pressed at the same time, the panel is locked and parameter changes are prohibited. [OFF Setting] The panel lock is released by pressing the encoder button and mode selection button at the same time. [ON Setting] When P31 is turned on, a password for unlocking the panel can be set. When releasing the panel lock, the panel lock can be released by setting the password set in P31.

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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. Welding 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.

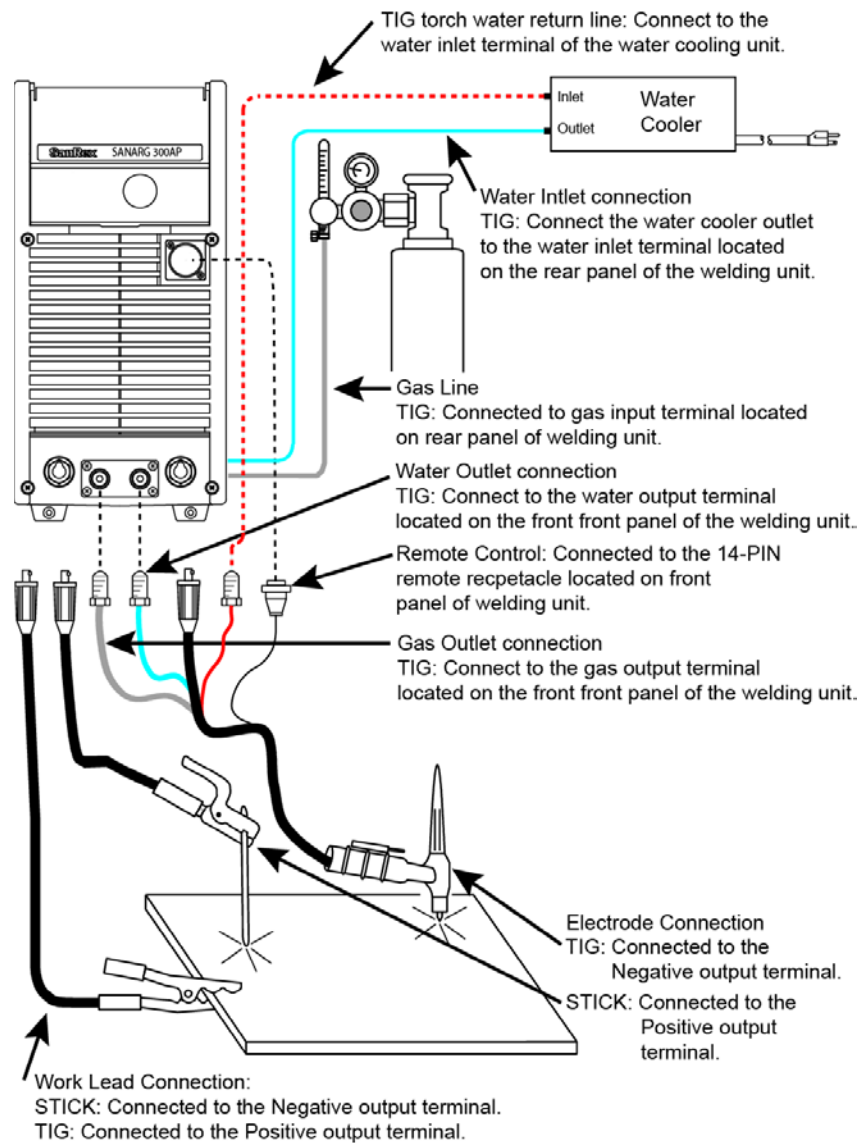




Figure 5-1 300AP Basic Set-Up

SECTION 6 – SEQUENCE OF OPERATION

6.0 SEQUENCE OF OPERATION

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

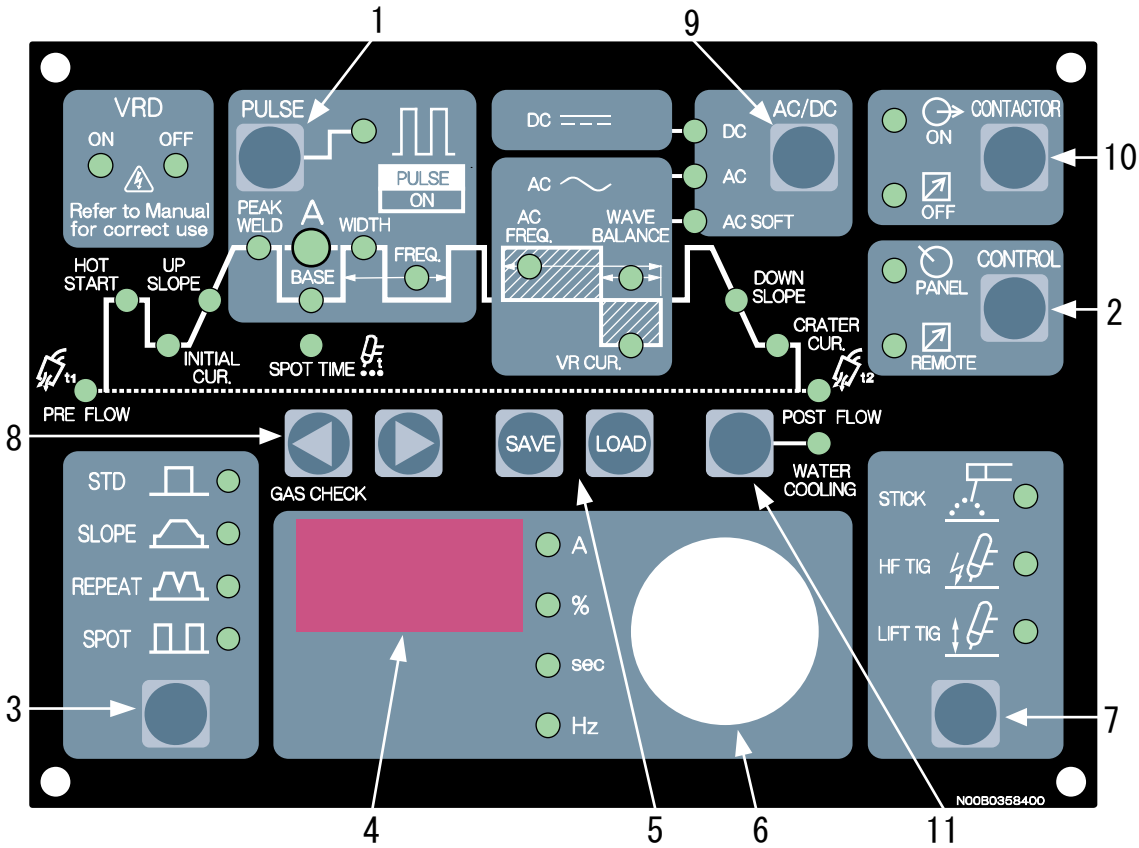


Figure 6-1 – 300AP Front Panel

1. **Pulse Function** – Pressing this button enables the TIG current pulse functions.
2. **Remote Current Function** – Pressing this buttons enables remote current functions.
3. **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.
4. **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.
5. **Save/Load Buttons** – Used to easily Save and Load (retrieve) up to 5 welding parameter sequences.
6. **Control 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.
7. **Process Button** – Pressing this button selects between STICK, Lift TIG or HF TIG welding processes.
8. **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.
GAS CHECK – Press and hold the Back button to enter gas check mode. During gas check, “GAS” is displayed on the LED Display and welding is not possible. To end gas check, press and hold the back button during gas check, or gas scheck will end automatically after 2 minutes.
9. **AC/DC Button** – Selects between DC or AC or AC-SOFT welding output.
10. **Contacto Function** – Pressing this buttons enables Contactor Functions.
11. **Water Cooling** – Pressing this button enables the WATER COOLOING pressure sensor circuitry that is intended for use with water cooled torches. The WATER COOLING pressure sensor can be enabled in ALL welding processes and may inhibit output current during welding processes that normally do not utilize water cooling equipment. The WATER COOLING function should be disabled when no water cooling equipment is utilized.

6.01 Stick Welding

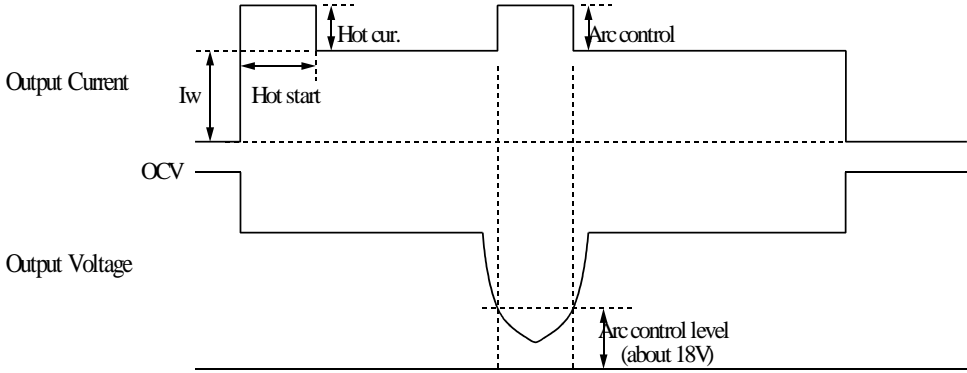
- Connect work lead to negative terminal.
- Connect electrode lead to positive terminal.
- Switch machine on.
- Wait for machine to cycle thru the start-up sequence during which the software version, followed by the machine code is displayed on the front Panels Digital Display.
- Set *AC* or *DC* weld current. If *AC* is selected then set *AC FREQ* to 60Hz & *WAVE BALANCE* to 50%.
- Disable the *WATER COOLING* function of the welding power source in *STICK* mode.
- Set Contactor.
- Connect remote control device if required.

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

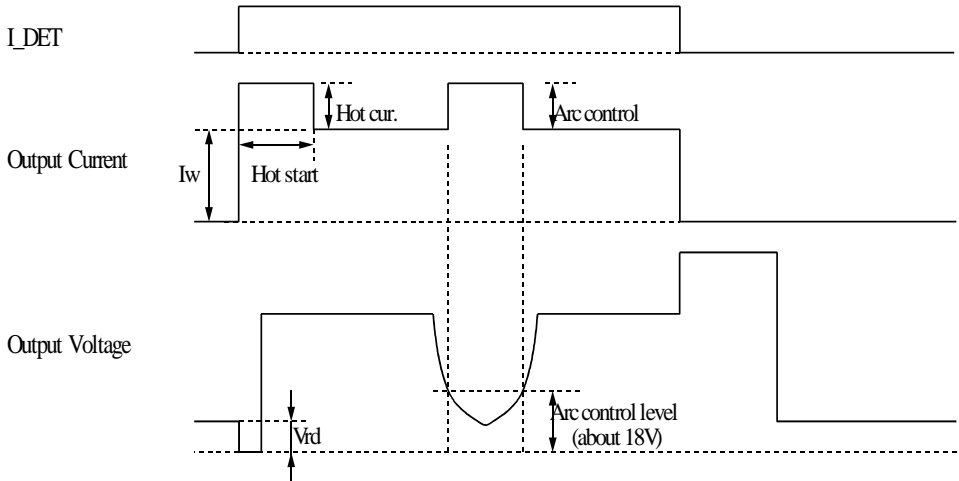
- Set *HOT START*.
- Set *WELD* current.

Commence welding.

6.01.01 Stick Welding Sequence with Voltage Reduction Device Disabled



6.01.02 Stick Welding Sequence with Voltage Reduction Device Enabled



6.02 AC or DC HF TIG Welding

- Connect work lead to positive terminal.
- Connect TIG torch to negative terminal.
- Switch machine on.
- Wait for machine to cycle thru the start-up sequence during which the software version, followed by the machine code is displayed on the front Panels Digital Display.
- Set *DC or AC* or *AC-SOFT* weld current. If *AC* is selected, then set *AC FREQ & WAVE BALANCE & VR CUR*.
- Connect remote control device. A remote control device is required for use during LIFT TIG and HF TIG operation. See section 4.03, “14-PIN Remote Control Receptacle”, for complete details of the remote device.
- Enable the *WATER COOLING* function of the welding power source when utilizing water cooled TIG torches

Use the Scroll Buttons to move to the parameter to be set. An illuminated LED indicates 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) *PEAK CUR* current.
- Set *POST-FLOW* time.

Slope Mode Parameters if required.

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

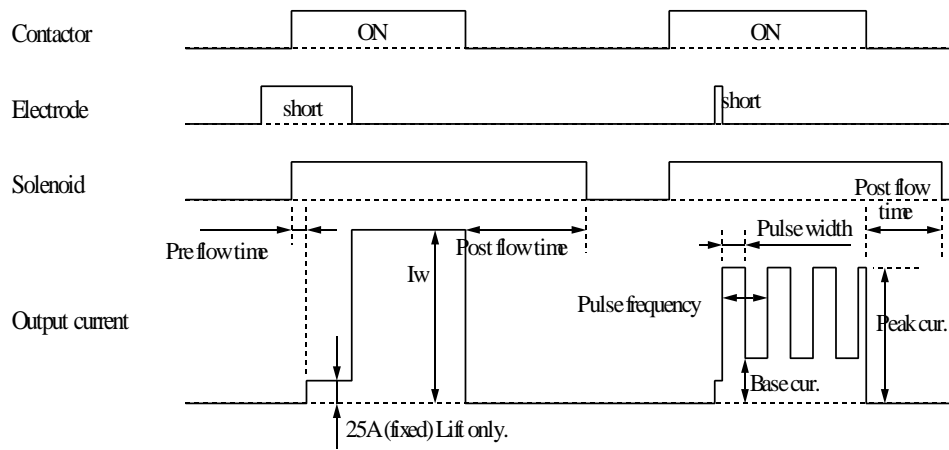
Pulse Mode parameters if required.

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

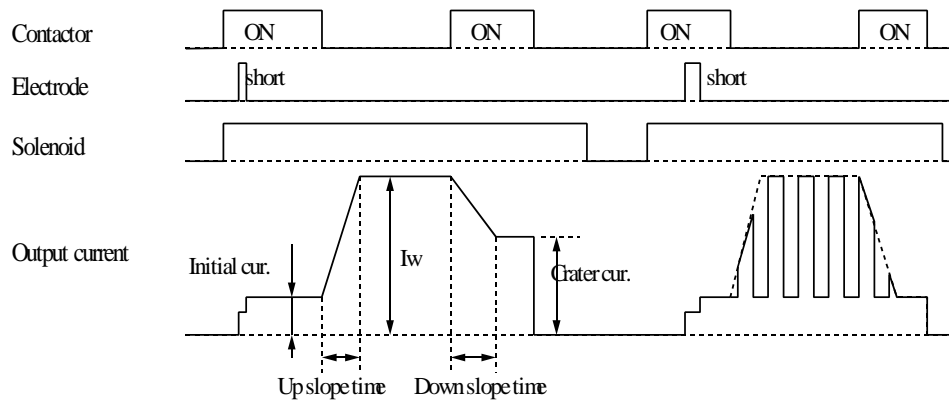
Commence welding.

6.03 LIFT TIG Sequence

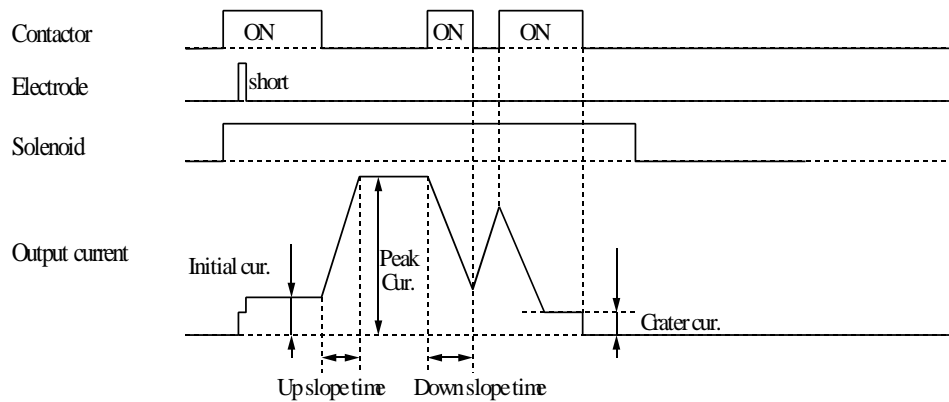
6.03.01 Standard Mode



6.03.02 Slope Mode

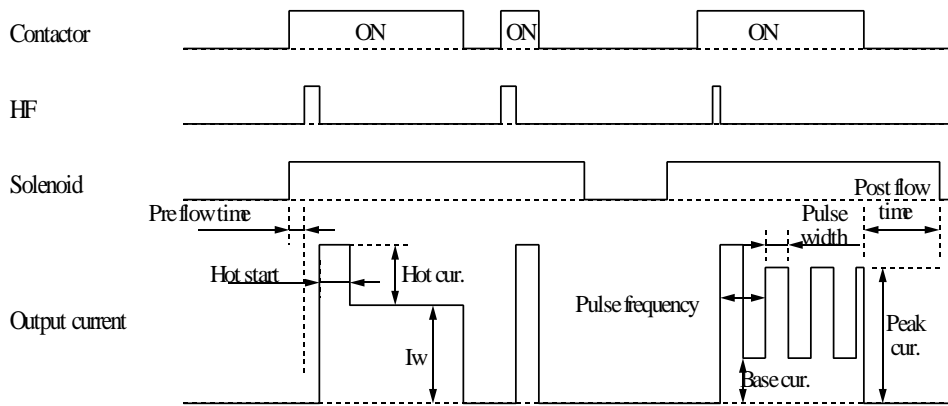


6.03.03 Repeat Mode

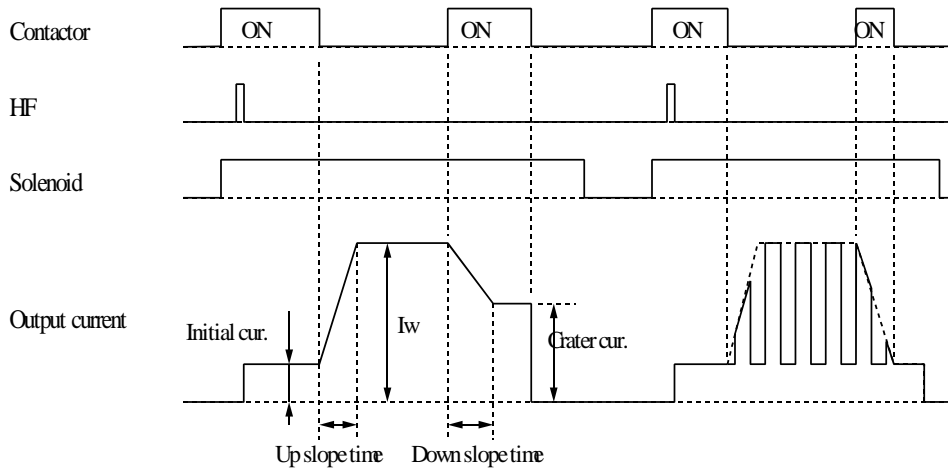


6.04 HF TIG Sequence

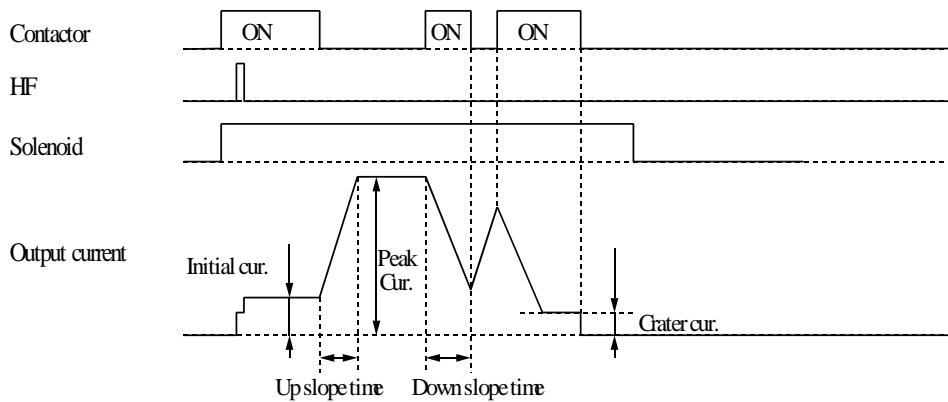
6.04.01 Standard Mode



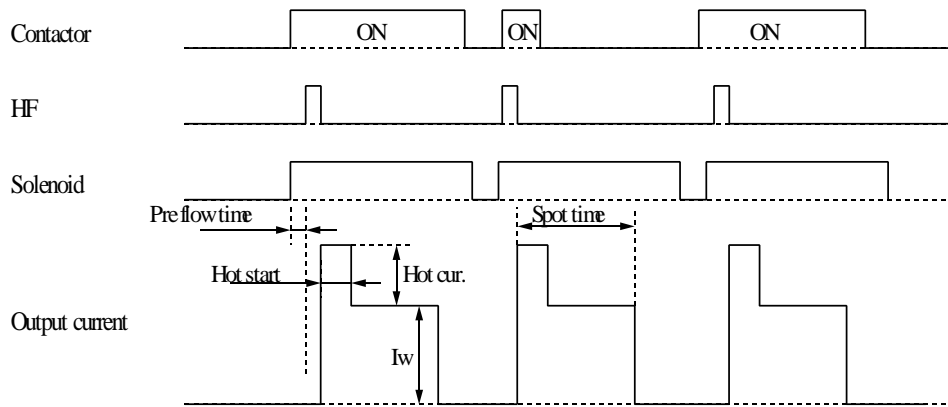
6.04.02 Slope Mode



6.04.03 Repeat Mode



6.04.04 Spot Mode



6.05 Waveform Options

The following references are used within this section.

SP = Straight Polarity

RP = Reverse Polarity

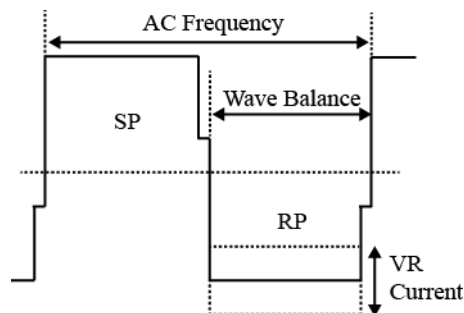
VR-Current = Variable Reverse Polarity Current

6.05.01 VR-Current

Variable of Reverse Polarity Current.

VR-Current is the independent adjustment of the RP Current half cycle of the AC wave to precisely control the heat input to the work and the electrode.

The SP amperage controls the amount of heat directed to the work, while the RP amperage effects the arc cleaning action.



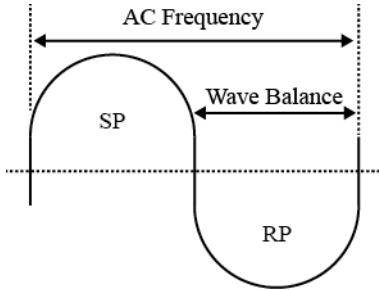
VR-Current along with AC Wave Balance dramatically effects the RP cleaning action. By reducing VR-Current will reduce the heat input to the TIG Torch and reduce electrode geometry degradation and increases heat input to the work piece for increased travel speeds. By increasing VR-Current will enhance cleaning when welding on a dirty work piece. Note: Increased VR-Current and increased Wave Balance will result in an increase to Electrode degradation.

VR-Current is available is all AC modes of operation, the standard AC-Square wave as well as the AC-SOFT modes (AC-sinusoidal and AC-triangle wave).

6.05.02 AC-SOFT Mode

When AC-SOFT mode is selected, there are two waveform options, a sinusoidal waveform or a triangular waveform. When the internal parameter P24 is set to the "OFF" condition, the AC-SOFT mode will output a sinusoidal waveform.

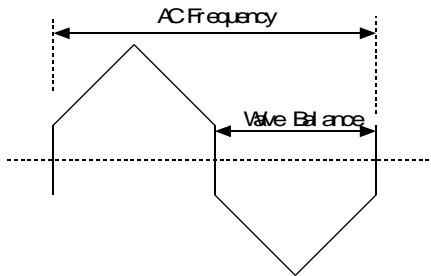
<Sinusoidal Wave (Set Internal parameters P24 to OFF) >



AC-sinusoidal wave includes all the benefits of AC- square wave with the addition of maximum puddle control and good wetting action of the weld puddle which helps to overcome surface tension.

When AC-SOFT mode is selected, there are two waveform options, a sinusoidal waveform or a triangular waveform. When the internal parameter P24 is set to the "ON" condition, the AC-SOFT mode will output a triangular waveform.

<Triangular Wave (Set Internal parameters P24 to ON)>



AC-triangle wave provides the punch of the peak amperage, while reducing overall heat input. Quick puddle formation reduces weld time — limiting heat input and reducing weld distortion, especially on thin materials.

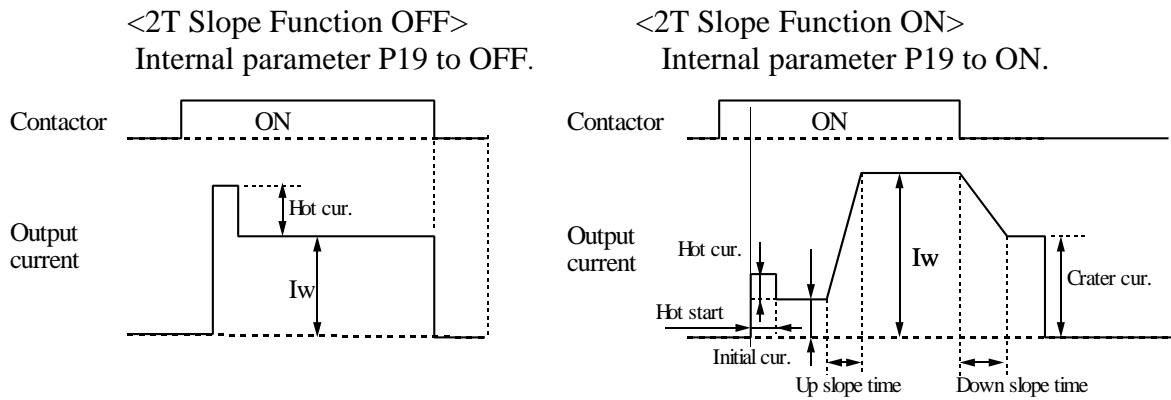
See Section 4.7 in the Owner's Manual for instructions on how to switch from AC-Soft sinusoidal to AC-SOFT triangular waveform. Set Internal Parameter 24 to "ON" for Triangle Wave. Turn Internal Parameter 24 to "OFF" for Soft AC.

6.06 Slope Function

6.06.01 2T Slope Function

(Set with internal parameter P19, Factory setting is P19 OFF)

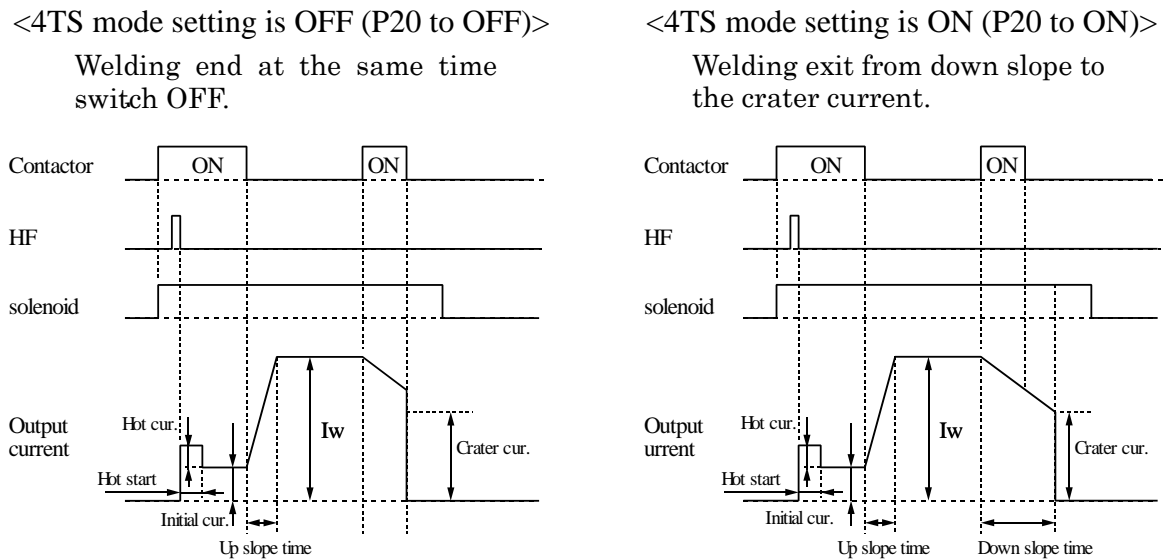
This is the function to control the slope operation under 2T mode. It is necessary to set the upslope time, down slope time, initial current and crater current. The current wave becomes as shown below when this function is valid and invalid (OFF).



6.06.02 4TS Mode Setting

(Set with internal parameter P20, Factory setting is P20 OFF)

In the 4TS mode setting, when a torch switch is turned off during downslope, choose whether or not to weld exiting from down slope to the crater current.



SECTION 7 – VOLTAGE REDUCTION DEVICE

7.0 VOLTAGE REDUCTION DEVICE (VRD)

The 300AP 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 300AP is shipped from the factory with the VRD in the disabled mode. To utilize the VRD, the user must enable the VRD function.

7.01 VRD Specifications

Description	SANARG 300AP	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.

7.02 Enabling/Disabling VRD

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 screwdriver 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.

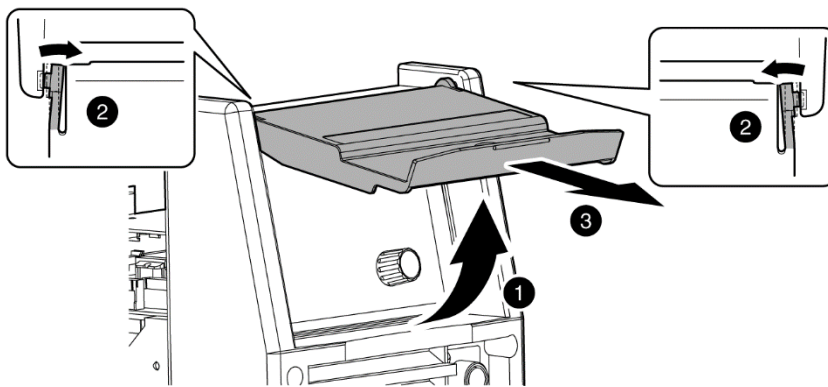


Figure 7-1 VRD ENABLE/DISABLE Step A

- 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 enable/disable potentiometer (see Figure 7-2).



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

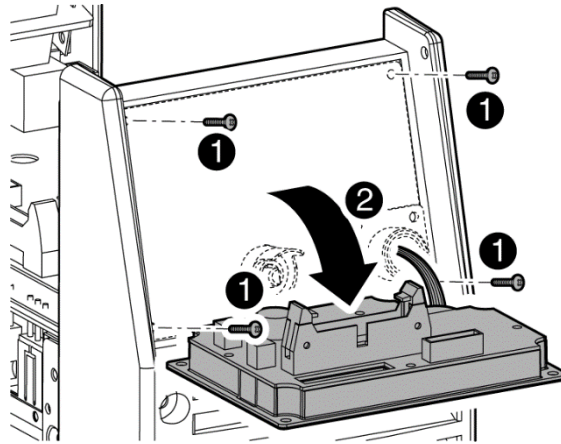


Figure 7-2 VRD Enable/Disable Step B



*The VRD Enable/Disable potentiometer **MUST ONLY** be positioned fully clockwise OR fully counterclockwise 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 specification.
- To **DISABLE** the VRD function: rotate the trim potentiometer (VR1) on the display PCB fully counterclockwise.

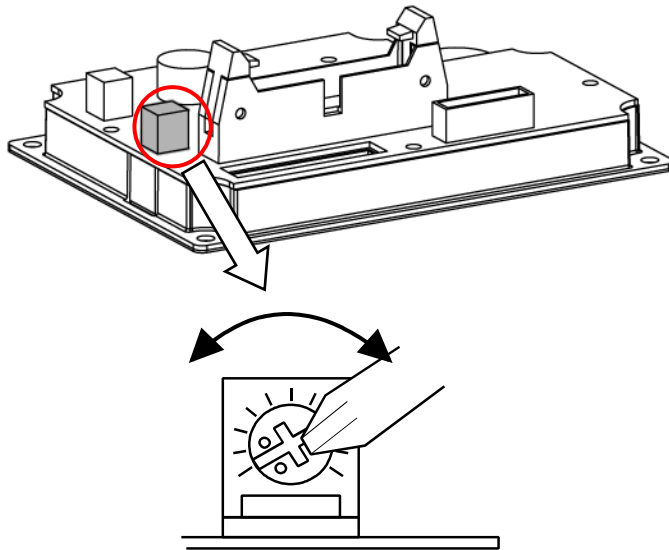


Figure 7-3 VRD ENABLE/DISABLE Step C

SECTION 8 – TROUBLE SHOOTING

8.0 TROUBLE SHOOTING

8.01 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 WATER COOLING pressure switch circuitry enabled without sufficient pressure detected. D Loose connections internally.	A Switch ON the Primary supply voltage. B Switch ON the Welding Power Source. C Disable WATER COOLING function or re-establish water pressure. D 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 when 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, SLOPE, 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, 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.

8.02 Power Source Error Codes

Description		Possible Cause		Remedy		Remarks
1.	<u>E01 error code displayed</u> Temperature sensor TH1 (protects IGBT) is too hot.	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. When the detection temperature of TH1 falls and the Control Knob is pressed, E01 is reset.
		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 too hot.	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. When the detection temperature of TH2 falls and the Control Knob is pressed, E02 is reset.
		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. Error code E04 resets when the voltage reduces and the Control Knob is pressed.

Description		Possible Cause		Remedy		Remarks	
5.	<u>E05 error code displayed</u> No output current detection.		Output current detection signal of main circuit inverter has abnormality.		Have an Accredited SanRex Service Agent or a qualified electrician check for Current detector.		Weld current ceases. Buzzer sounds constantly. Switch machine off, wait 3 seconds, and then switch on to reset E05 error.
6.	<u>E08 error code displayed</u> The power is turned ON with the start signal turned ON.		Torch switch (start signal) is ON when the main power is ON.		Turn OFF the start signal and reset the error.		Weld current ceases. Buzzer sounds constantly. Error code E08 is reset when the start signal is turned OFF and the Control Knob is pressed.
7.	<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 resets when the voltage reduces and the Control Knob is pressed.
8.	<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 is reset when the voltage increases and the Control Knob is pressed.
9.	<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 is reset when the voltage increases and the Control Knob is pressed.
10.	<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 is reset when adequate water pressure is established or circuitry is disabled and the Control Knob is pressed.

Description		Possible Cause		Remedy		Remarks
11	<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.
12.	<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.
13.	<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.
14.	<u>E86 error code displayed</u> There is an abnormality in the voltage balance of the input capacitor when the input voltage is set to AC460V.		When starting up with an input voltage of AC460V, there is a voltage difference between the primary capacitors of the two main circuits.		Have an Accredited SanRex Service Agent or a qualified electrician check the Mains voltage.	Weld current available. Buzzer sounds intermittently. Error code E86 is reset when the input capacitor voltage balance difference is reduced and the control knob is pressed.
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.	A. Main on/off switch on machine has been turned off B. Mains supply (input) voltage has been turned off.	A. B.	A. Turn on/off switch on. B. 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. However, E99 is also displayed when the machine is turned off.

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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 should 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 9.01, 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.

9.01 Opening the Enclosure

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

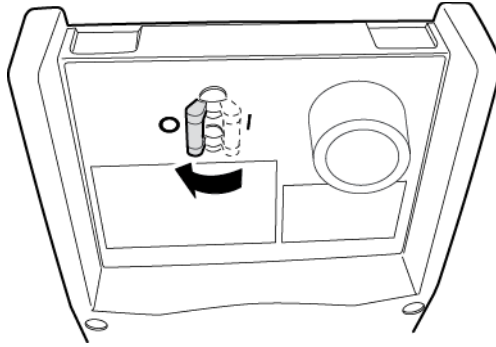


Figure 9-1 Switch OFF



WARNING:

*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.*

- a) Remove all screws and nuts on the side covers.

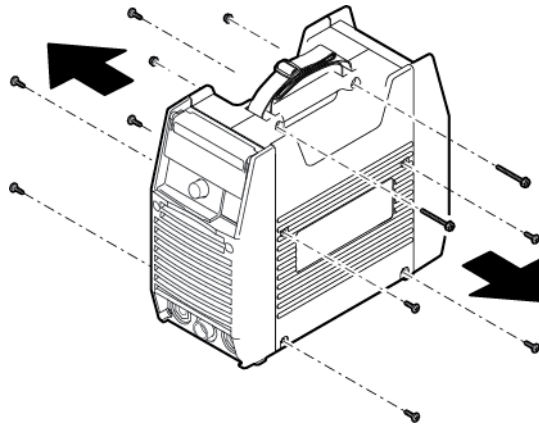


Figure 9-2 Remove screws

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

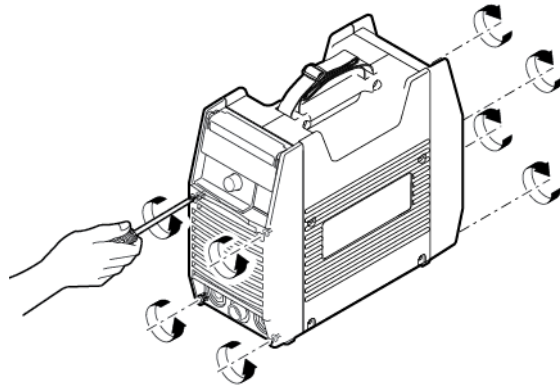


Figure 9-3 Loosen screws



NOTE:

DO NOT remove the screws from the front and rear panels completely.

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

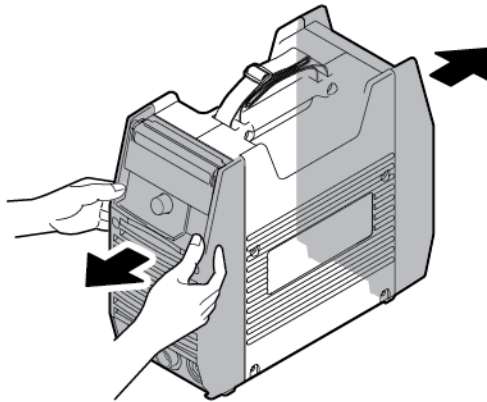
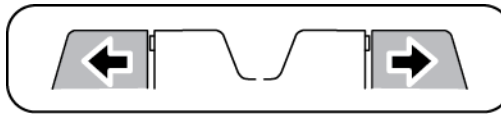


Figure 9-4 Loosen front and rear panels

d) Remove the side covers.

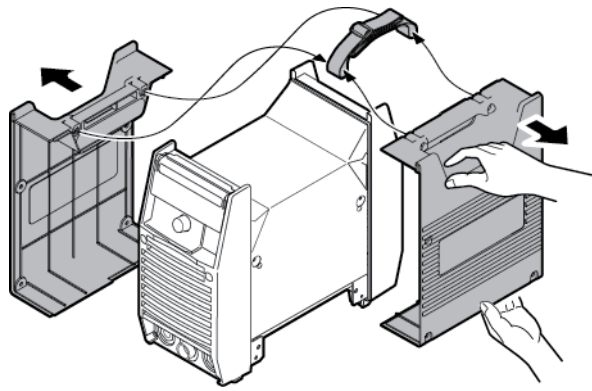


Figure 9-5 Remove Side covers

e) Remove protection cover sheet by removing the four plastic clips.

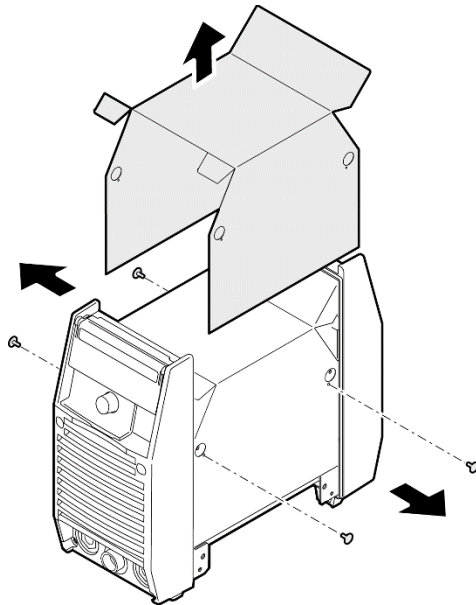


Figure 9-6 Remove PCB cover



NOTE:

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

SECTION 10 - PARTS LIST

10.0 PARTS LIST 300AP

DESCRIPTION	TYPE & RATING	QTY	INTERCONNECT DIAGRAM REFERENCE	EXPLODED VIEW REFERENCE # - SHEET	ORDER NUMBER
Coupling Coil	F3A073802 300A AC CC	1	CC1	1-2	F3A073802
Remote Socket	N/MS3102A20-27S(NIC) 14PIN (with Wiring Assembly)	1	CON1	2-1	U0A877300
Current Trans	F2A503001 CT 1:40	2	CT2-3	3-2	F2A503001
Diode - Input	DFA100BA160R	1	D1	4-2	450A30160
Diode - Output	DBA200UA60R	6	D2-7	5-2	4583A0060
Fan	109E5724H507 DC 24V 16.8W (with wiring assembly)	1	FAN1	6-1	U0A912300
Inductor	F3A040702 300A AC FCH	1	FCH1	7-2	F3A040702
Current Sensor	HC-TN200V4B15M 200A/4V	1	HCT1	8-2	11251009300
HF. Unit	HF.UNIT with gap (NO RESISTORS)	1	HF.UNIT1	9-2	U0A962602
HF. Gap	U0A601101	1		10-2	U0A601101
Reactor	GP-7	1	L1	11-2	479531341
Reactor	ZCAT-3035-1330	1	L105	12-1	63200009600

DESCRIPTION	TYPE & RATING	QTY	INTERCONNECT DIAGRAM REFERENCE	EXPLODED VIEW REFERENCE # - SHEET	ORDER NUMBER
Printed Circuit Board	WK-5493 U05 MAIN PCB (or WK-5493)	1	PCB1	13-2	PZZA0549305 (P0A549300)
Printed Circuit Board	WK-5597 U09 LINK PCB (or WK-5597)	1	PCB2	14-2	PZZA0559709 (P0A559700)
Printed Circuit Board	WK-5548 U13 DDC PCB (or WK-5548)	1	PCB3	15-2	PZZA0554813 (P0A554800)
Printed Circuit Board	WK-4819 U12 DETECT PCB (or WK-4819 U01)	1	PCB4	16-2	P0A481912 (P0A481901)
Printed Circuit Board	WK-5551 U03 CONNECT PCB (or WK-5551)	1	PCB5	17-2	PZZA0555103 (P0A555100)
Printed Circuit Board	WK-7615 U01 AC CTRL PCB (or WK-7615)	1	PCB6	18-2	P00A0761501 (P00A0761500)
Printed Circuit Board	WK-7618 U01 FILTER PCB (or WK-7618)	1	PCB7	19-2	P00A0761801 (P00A0761800)
Printed Circuit Board	WK-5479 U07 (U01) GATE PCB Kit (with IGBT, IGBT Spring Clip, Silicon Rubber Sheet)	2	PCB8-11	20-2	U0A835900

DESCRIPTION	TYPE & RATING	QTY	INTERCONNECT DIAGRAM REFERENCE	EXPLODED VIEW REFERENCE # - SHEET	ORDER NUMBER
Printed Circuit Board	WK-5527 U46 ACDC PANEL PCB (or WK-5527 U45)	1	PCB12	21-1	PZZA0552746 (PZZA0552745)
Printed Circuit Board	WK-5528 U03 ENCODER PCB (or WK-5528)	1	PCB13	22-1	PZZA0552803 (P0A552800)
Printed Circuit Board	WK-5594 U09 TRANSFORMER PCB (or WK-5594 U08)	1	PCB14	23-2	PZZA0559409 (PZZA0559408)
Printed Circuit Board	WK-5606 U03 DIODE SNUBBER PCB (or WK-5606)	1	PCB15	24-2	PZZA0560603 (P0A560600)
Printed Circuit Board	WK-5569 U03 GATE/IMPOSE PCB (or WK-5569)	1	PCB16	25-2	PZZA0556903 (P0A556900)
Printed Circuit Board	WK-5570 U03 IGBT SNUBBER PCB (or WK-5570)	1	PCB17	26-2	PZZA0557003 (P0A557000)
Printed Circuit Board	WK-5499 U06 FILTER PCB (or WK-5499)	1	PCB20	27-2	PZZA0549906 (P0A549900)
Printed Circuit Board	WK-4917 U15 AC INPUT FILTER PCB (or WK-4917 U12)	1	PCB21	28-1	PZZA0491715 (P0A491712)
Pressure Sensor	ST-S6-PB-R/4	1	PRS1	29-2	34613001400

DESCRIPTION	TYPE & RATING	QTY	INTERCONNECT DIAGRAM REFERENCE	EXPLODED VIEW REFERENCE # - SHEET	ORDER NUMBER
Transistor	GCA200EA60 (with WK-3367 U05)	2	Q25-26	30-2	U0A705400
Resistor (on HF UNIT1)	ERG3SJ220H 3W 22Ω	2	R2	31-2	40305002300
Resistor (Superimpose)	JGM23GZ101JT TYPE 1 68W 100Ω	2	R3	32-2	40511005100
Resistor (HF Current Limit)	MHS20A101KI 20W 100Ω	1	R6	33-2	40322117200
Resistor	MHS20A151JI 20W 150Ω	2	R7-8	34-2	40322117900
Switch (AC Input)	DCP-103SR100C-480V 3P-480V	1	S1	35-1	25850003700
Switch (AC Input Select)	SDKGA4-A-1-A SLIDE SWITCH	1	S2	36-1	24704531700
Solenoid Valve	5505NBR1.5 DC24V 11VA/10W (with Gas Inlet and PC4-02)	1	SOL1	37-1	U0A705700
Thermistor	PTP-46F-S1 (Wiring Assembly)	1	TH1	38-2	U1A145900
Thermistor	PTP-46F-S1 (Wiring Assembly)	1	TH2	39-2	U1A146000
Front Panel (300AP-2)	E0D004801 (with water)	1		40-1	A00A0254000
Rear Panel (300AP-2)	E0D004901 (with water)	1		41-1	A00A1210300
Side Panel	E0D005209	2		42-1	E0D005209
Front Control Cover (Mask)	E0C346000	1		43-1	E0C346000
Front Control Cover Adapter Plate (Metal Ring)	JEA496003	1		44-1	JEA496003
Rear Control Cover	JDA173302	1		45-1	JDA173302
Flip-up Protection Cover Assy.	E0C299200 (Assembly with E2B058500) (No name label)	1		46-1	U0A921900

DESCRIPTION	TYPE & RATING	QTY	INTERCONNECT DIAGRAM REFERENCE	EXPLODED VIEW REFERENCE # - SHEET	ORDER NUMBER
Encoder Cover	EBA514400	1		47-1	EBA514400
PCB Cover	E00B0195001 (with Dustcover Sheet)	1		48-1	U0A839800
Name Label (300AP)	N4A084800	2		49-1	N4A084800
Side Label (AC/DC)	N4A009300	2		50-1	N4A009300
Warning Label 1	N1B029700 Safety Instructions	1		51-1	N1B029700
Warning Label 2	N1B029800 Two Warnings	1		52-1	N1B029800
Output Terminal Label	N4A095200	1		53-1	N4A095200
GAS Input Label	N4A095100	1		54-1	N4A095100
Switch Label (Input Voltage Sel.)	N4A146500	1		55-1	N4A146500
GAS Outlet	EBA619700 (with PC4-02)	1		56-1	A00A1210400
WATER Outlet	EBA580600 (with PC4-02)	1		57-1	U0A731200
C-Ring		3		58-1	53003000600
Output Terminal (female)	TRAK-BE35-70S	2		59-1	26999025900
Input Cable	SOOW AWG8X4C L=3.4m	1		60-1	U0A722400
Input Cable Clamp	EBA156800	1		61-1	EBA156800
Heatsink	E1B895000 (IGBT)	2		62-2	E1B895000
Heatsink	E1B870100 (Output Diode)	1		63-2	E1B870100

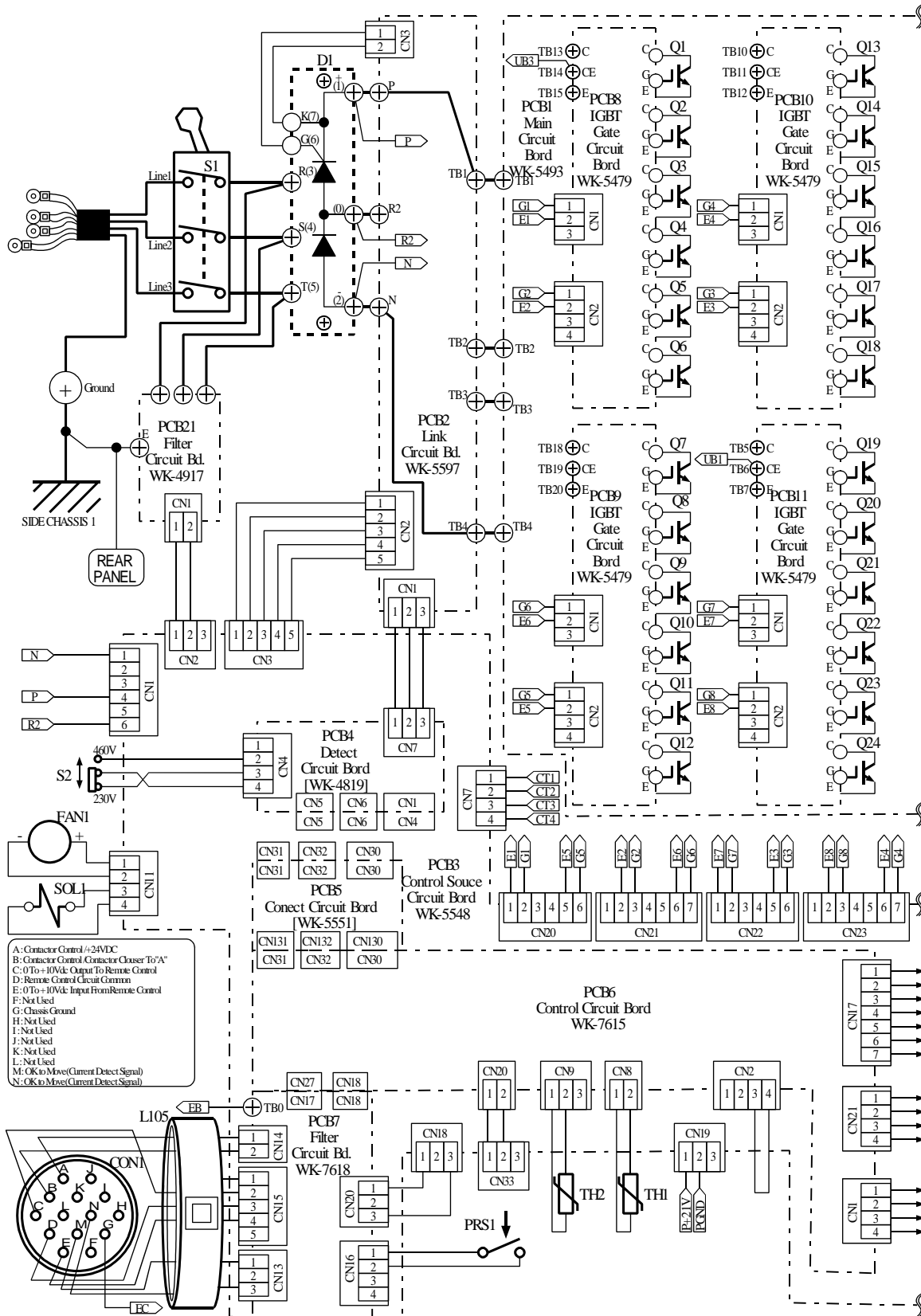
DESCRIPTION	TYPE & RATING	QTY	INTERCONNECT DIAGRAM REFERENCE	EXPLODED VIEW REFERENCE # - SHEET	ORDER NUMBER
IGBT(Q1-Q24) Spring Clips	E1B850100	8		64-2	E1B850100
PCB1 Chassis	J5B017502	1		65-2	J5B017502
Chassis (main support)	J3C356600 (Two piece set)	1 set		66-2	J3C356600
GAS & WATER Outlet Chassis 1	JDA210600	1		67-1	JDA210600
GAS & WATER Outlet Chassis 2	JDA250300	1		68-1	JDA250300
Water INLET Chassis	JDA210700	1		69-1	JDA210700
Knob	2621603	1		70-1	50990001600
Knob Cap	3021104	1		71-1	50990000300
Control Cover Sheet (Mylar)	N00B0358400	1		72-1	N00B0358400
Silicone Rubber Sheet	EDA227700	4		73-2	EDA227700

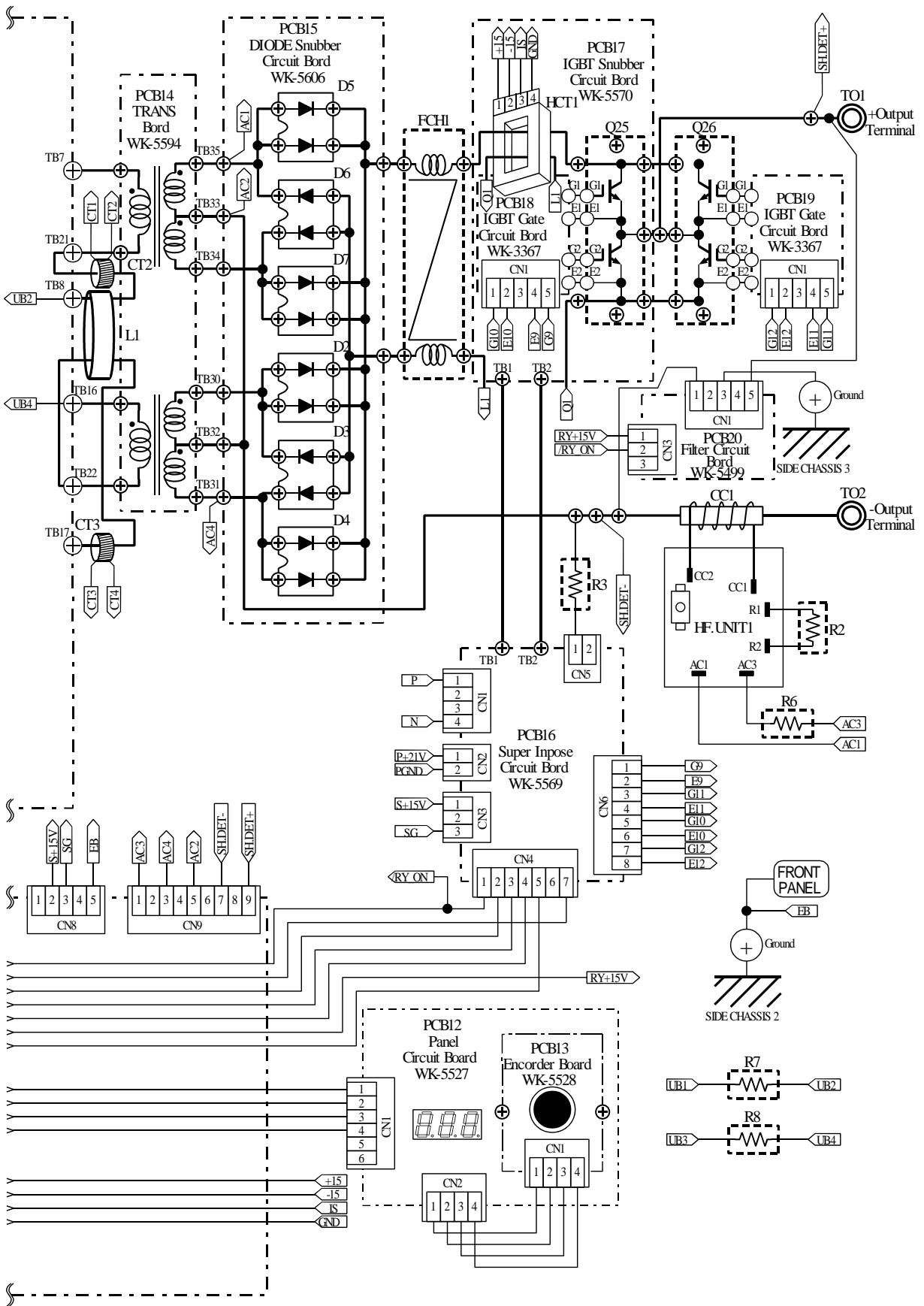
DESCRIPTION	TYPE & RATING	QTY	INTERCONNECT DIAGRAM REFERENCE	EXPLODED VIEW REFERENCE # - SHEET	ORDER NUMBER
Post1 (M5)	EAA502500 (M5-M5)	3		74-2	EAA502500
Post11 (M5) (For S1)	EBA643600 (M5-M5)	3		75-2	EBA643600
D-L Bus Bar 1	EDA046700	1		76-2	EDA046700
D-L Bus Bar 2	EDA046800	1		77-2	EDA046800
T-D Bus Bar	EDA003800	4		78-2	EDA003800
D Bus Bar 1	EDA046902	1		79-2	EDA046902
D Bus Bar 2	EDA047002	1		80-2	EDA047002
D Bus Bar 3	EDA047102	1		81-2	EDA047102
D Bus Bar 4	EDA047202	1		82-2	EDA047202
S1 Bus Bar	ECA321000	3		83-1	ECA321001
Q-Output Bus Bar	EDA046600	1		84-2	EDA046600
L-Q Bus Bar 1	EEA158802	1		85-2	EEA158802
L-Q Bus Bar 2	EEA158902	1		86-2	EEA158902
T-CC Bus Bar	EDA047302	1		87-2	EDA047302
Output Post	ECA867900	2		89-1	ECA867900

DESCRIPTION	TYPE & RATING	QTY	INTERCONNECT DIAGRAM REFERENCE	EXPLODED VIEW REFERENCE # - SHEET	ORDER NUMBER
Heatsink Insulated Board	E1B872000	2		90-2	E1B872000
PCB1 Insulated Sheet	E1B859700	1		91-2	E1B859700
PCB2 Insulated Sheet	EDA079801	1		92-2	EDA079801
Dust Cover Sheet (Front)	E1B933000	1		93-2	E1B933000
Dust Cover Sheet (Rear)	E1B933100	1		94-2	E1B933100
Clip	#74 NATURAL	4		95-1	606024220
Rubber Grommet for PCB1	C30SG20A	2		96-2	53631214500
CON1 Dust Cover (14-Pin)	0250468000 (with String & Clip)	1		97-1	U0A728200
Edge Protect	EH18U	2		98-2	53692118900
Nylon Hose (GAS)	T0425B Nylon Hose L= 0.5m	1		99-1	U0A706000
Nylon Hose (WATER)	PN4-6X4 Nylon Hose L = 0.5m			100-1	U0A731300
RATING Label	N00A0712000	1		101-1	N00A0712000
IGBT Insulated Sheet	EEA405300	2		102-1	EEA405300
WATER Inlet	EBA580700 (with PC4-02)	1		103-1	U0A850400
Output Plug (Male)	TRAK-SK50	2		Not Shown	26999025800

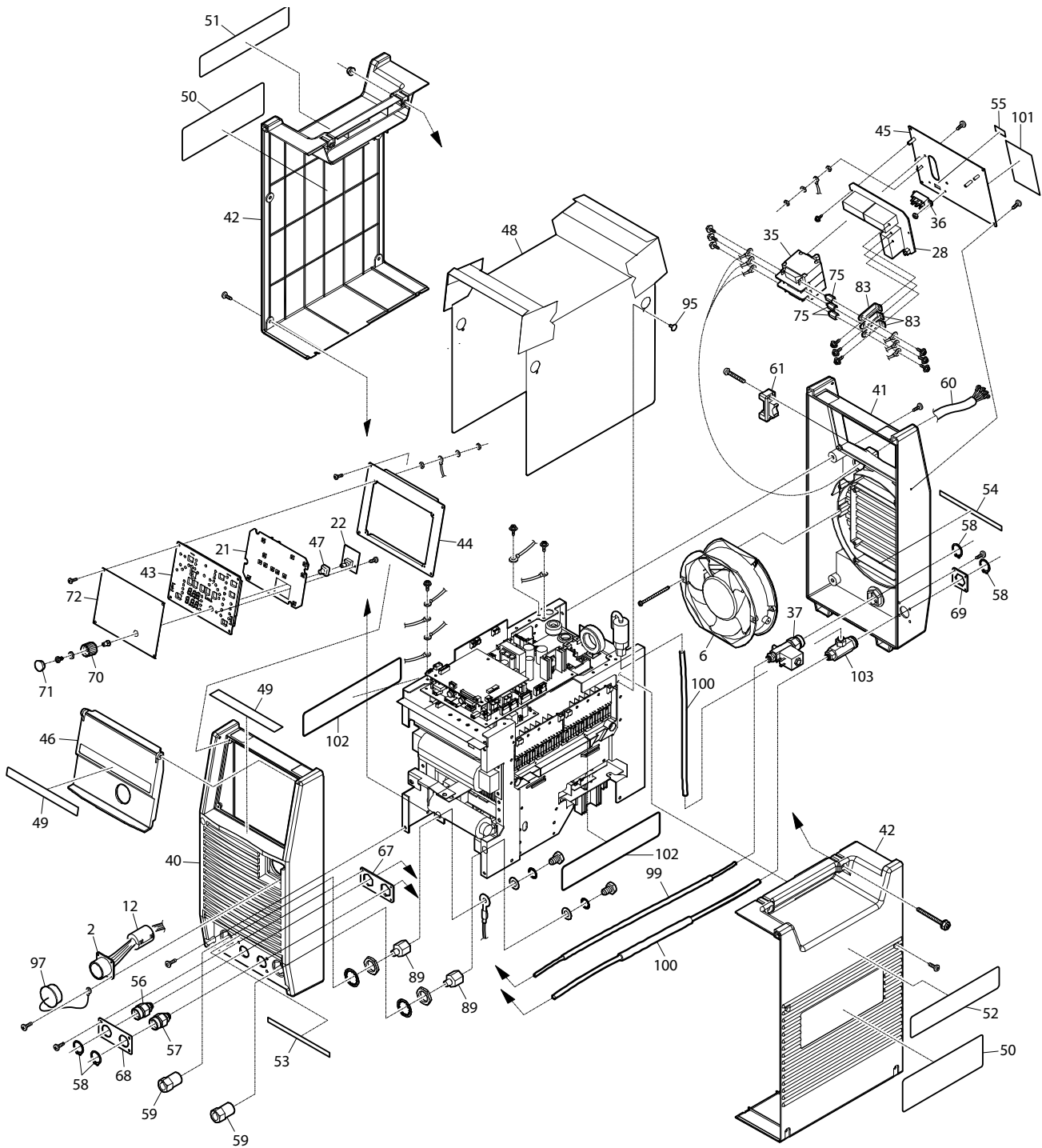
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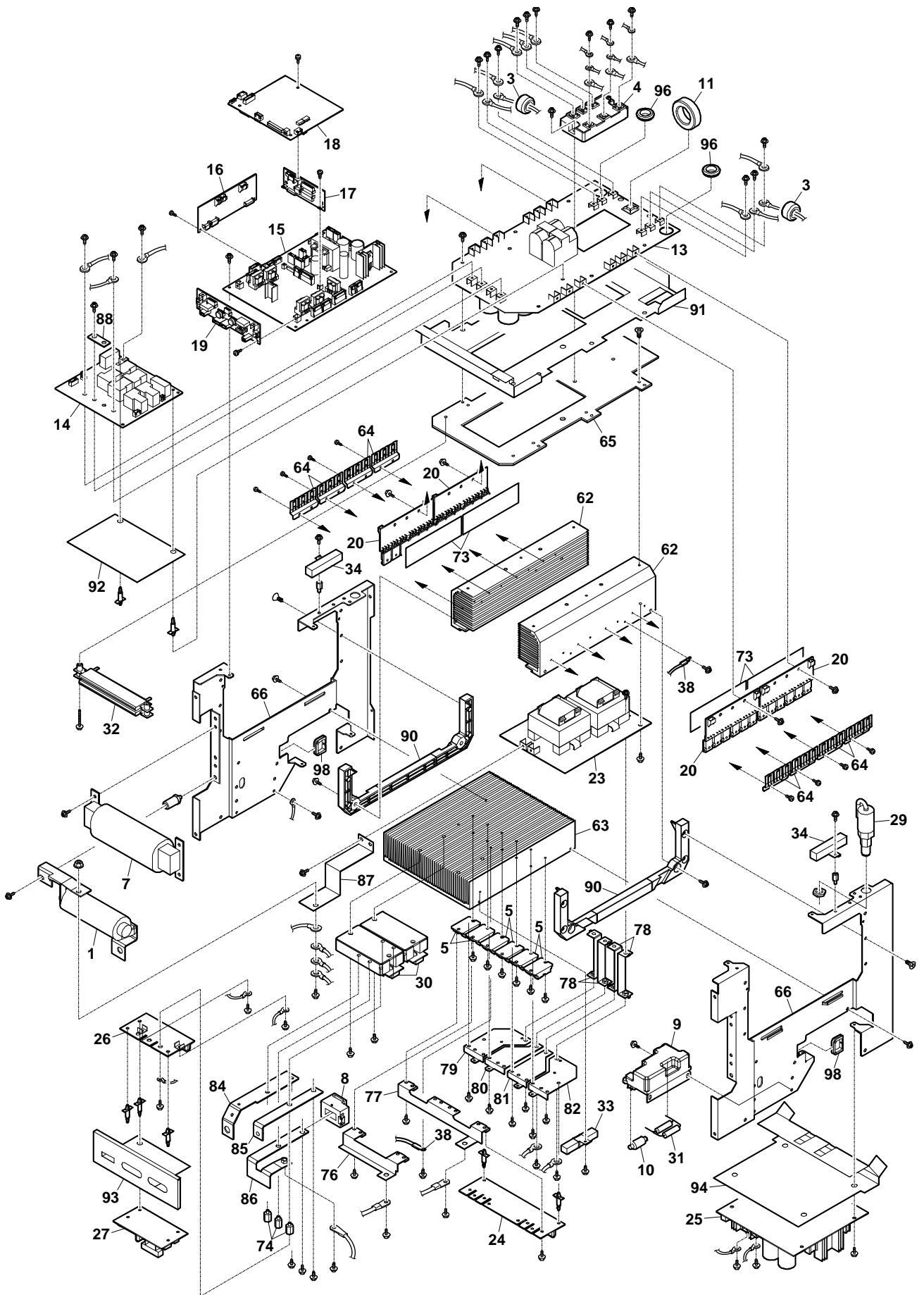
10.01 Interconnect Diagram 300AP





10.02 Exploded View 300AP



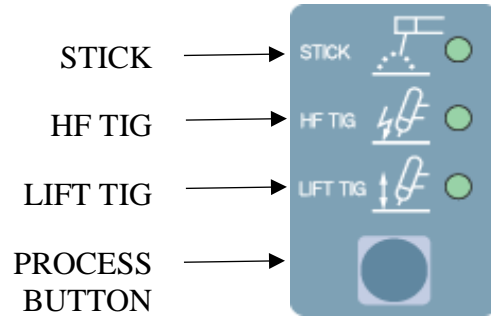


APPENDIX A

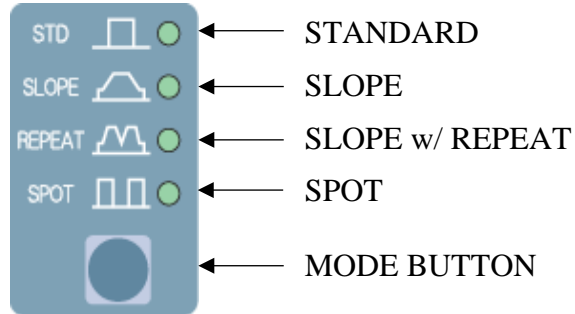
300AP QUICK SET-UP GUIDE

SANARG 300AP Front Panel Description

Process Functions – Push the Process button to scroll through the three processes (STICK, LIFT TIG, HF TIG). The green LED will light as the process is selected. When in STICK mode, the output contactor is activated. A remote device will need to be connected when in the TIG modes to activate the output Contactor.



TIG Mode Functions – Push the Mode button to scroll through the four TIG modes (STANDARD, SLOPE, SLOPE w/REPEAT, SPOT). The green LED will light as the TIG mode is selected.



STANDARD – TIG operation using remote devices to control contactor & current.

SLOPE – TIG operation using a remote contactor device to step through weld the sequence. Sequences include; Initial Current, Up Slope, Weld Current, Down Slope, Final Current.

SLOPE w/REPEAT – Additional Slope function for current control while in the Weld Current sequence activated through the remote ON/OFF device.

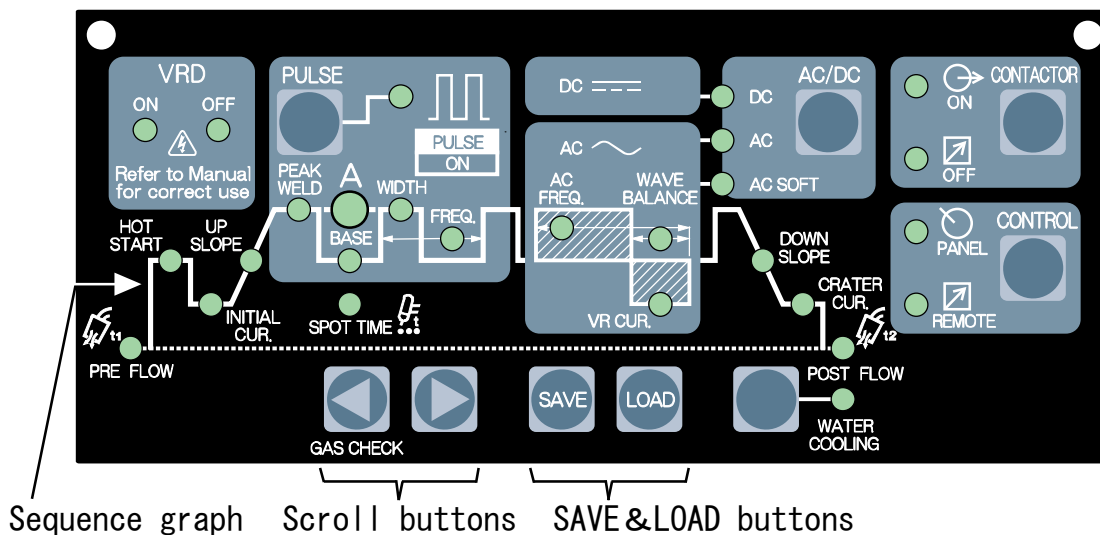
For a detailed description of the Slope, Slope w/Repeat functions see your owner’s manual under the Slope Mode Sequence section.

NOTE: All Slope functions operate with a Remote ON/OFF switch device only.

SPOT – A timed HF TIG operation using a remote ON/OFF device.

Parameter Functions – Are set using the Scroll Buttons and Control Knob.

VRD – Voltage Reduction Device is only active when in the STICK process. The green “ON” LED will light indicating that VRD is activated. The green “OFF” LED will light indicating that VRD is deactivated.



Scroll Buttons – Used these buttons to step through the Sequence Graph. A green LED will light to indicate the parameter selected.

SAVE & LOAD Buttons – Used to save and retrieve a total of five user programs into memory.

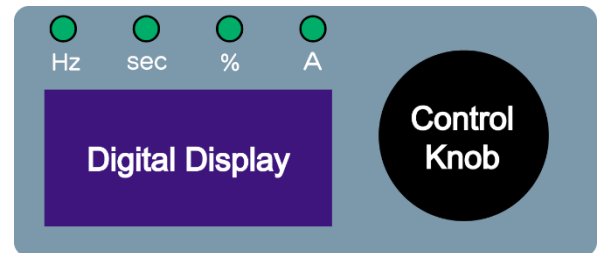
AC/DC – Push the AC/DC button to select DC (Direct Current) output or AC (Alternating Current) output. The green LED will light indicating the output selected. When AC output is selected the Wave Balance and AC output Frequency Parameters are active and can be set through the control knob when selected with the Scroll Buttons.

CONTACTOR – Push this button to turn the output contactor on in STICK Mode.

CONTROL – Push this button to switch between Panel control and Remote control.

PULSE – Pushing the Pulse button turns ON or OFF the Current Pulser. The green LED will light when the Current Pulser is active. With the Pulser active the PEAK Current, Base Current, Pulse Width and Pulse Frequency can be set through the Control Knob when selected with the scroll buttons. Selection is indicated when the green LED lights.

Digital LED Display – Welding current and parameter values are displayed in this window. The display will show settings in Hertz (Hz), Seconds (sec.), Percent (%), and Amperage (A) indicated by the lighted LED above the screen. Internal warnings such as over temperature, low or high input voltage applied are signaled to the operator by a warning sound and error message on the screen. The warning sound will activate when the power source is turned off.



Control Knob – Allows the operator to adjust the output current within the entire range of the power supply, also used to set each parameter value in the Sequence Graph. Pushing the knob inward displays the actual welding voltage. The welding voltage is for reference purposes only and is not a machine adjustable value.

Detailed description of each parameter can be found in the Owner's Manual.

SANARG 300AP SETTINGS

The settings shown below should be used as guidelines for a first set-up. The welder should adjust these settings to achieve optimal weld performance for the specific application.

Equipment: 300AP power supply with TIG torch, argon shielding gas, 3/32" 2% thoriated tungsten (red) or lanthanate (gray) ground to a 30 degree prep.

Aluminum: AC current

1/16" (.062) - pre-flow .1 sec., hot start 20, amperage 70, Hz 100, balance 20%, post-flow 6.0 sec.

For pulse settings - set pulse width 60%, peak current 100, background current 30, Hz 1.0

1/8" (.125) - pre-flow .1 sec., hot start 20, amperage 150, Hz 80, balance 20%, post-flow 6.0 sec.

For pulse settings – set pulse width 60%, peak current 150, background current 50, Hz 1.0

3/16"-1/4" - pre-flow .1 sec., hot start 20, amperage 185, Hz 60, balance 20%, post-flow 8.0 sec.

For pulse settings – set pulse width 60%, peak current 185, background current 125, Hz 1.0

Mild Steel or Stainless Steel: DC current

1/16" (.062) - pre-flow .1 sec., hot start 20, amperage 70, post-flow 6.0 sec.

For pulse settings - set pulse width 60%, peak current 80, background current 30, Hz 1.0

1/8" (.125) - pre-flow .1 sec., hot start 20, amperage 125, post-flow 6.0 sec.

For pulse settings – set pulse width 60%, peak current 125, background current 50, Hz 1.0

3/16"-1/4" - pre-flow .1 sec., hot start 20, amperage 185, post-flow 8.0 sec.

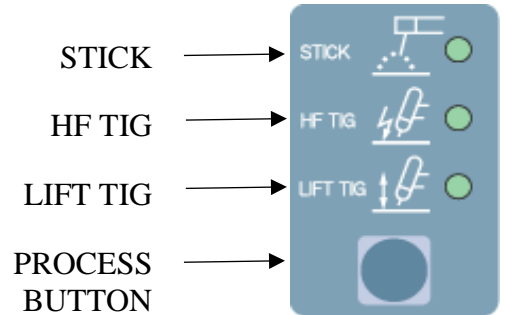
For pulse settings – set pulse width 60%, peak current 185, background current 75, Hz 1.0

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300AP QUICK SET-UP GUIDE

SANARG 300AP Front Panel Description

Process Functions – Push the Process button to scroll through the three processes (STICK, LIFT TIG, HF TIG). The green LED will light as the process is selected. When in STICK mode, the output contactor is activated. A remote device will need to be connected when in the TIG modes to activate the output Contactor.



TIG Mode Functions – Push the Mode button to scroll through the four TIG modes (STANDARD, SLOPE, SLOPE w/REPEAT, SPOT). The green LED will light as the TIG mode is selected.

STANDARD – TIG operation using remote devices to control contactor & current.

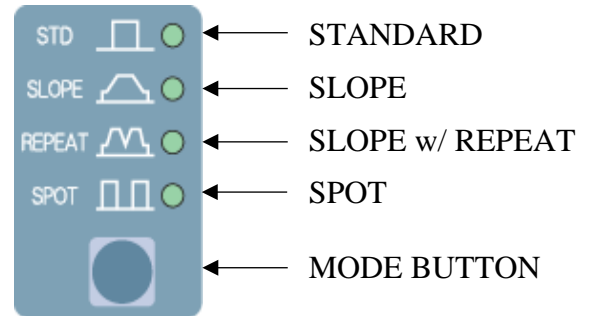
SLOPE – TIG operation using a remote contactor device to step through weld the sequence. Sequences include; Initial Current, Up Slope, Weld Current, Down Slope, Final Current.

SLOPE w/REPEAT – Additional Slope function for current control while in the Weld Current sequence activated through the remote ON/OFF device.

For a detailed description of the Slope, Slope w/Repeat functions see your owner’s manual under the Slope Mode Sequence section.

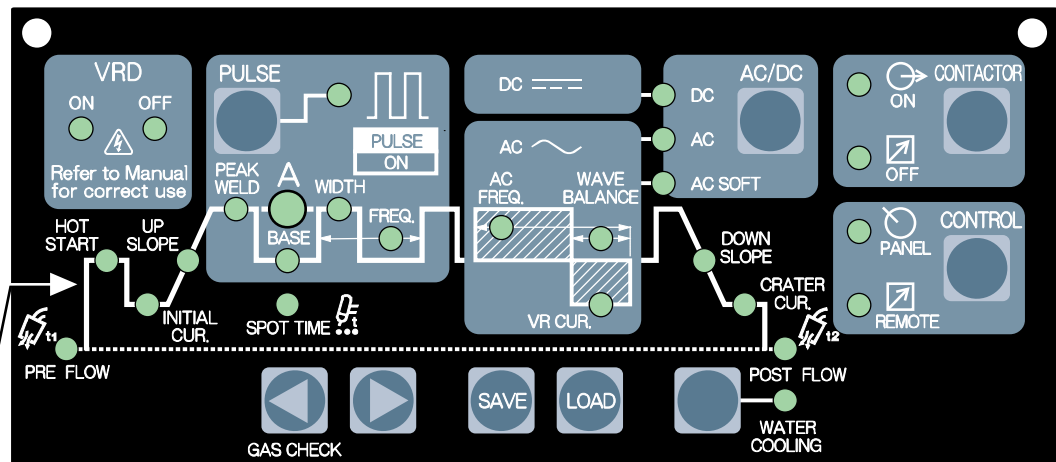
NOTE: All Slope functions operate with a Remote ON/OFF switch device only.

SPOT – A timed HF TIG operation using a remote ON/OFF device.



Parameter Functions – Are set using the Scroll Buttons and Control Knob.

VRD – Voltage Reduction Device is only active when in the STICK process. The green “ON” LED will light indicating that VRD is activated. The green “OFF” LED will light indicating that VRD is deactivated.



Sequence graph Scroll buttons SAVE & LOAD buttons

Scroll Buttons – Used these buttons to step through the Sequence Graph. A green LED will light to indicate the parameter selected.

SAVE & LOAD Buttons – Used to save and retrieve a total of five user programs into memory.

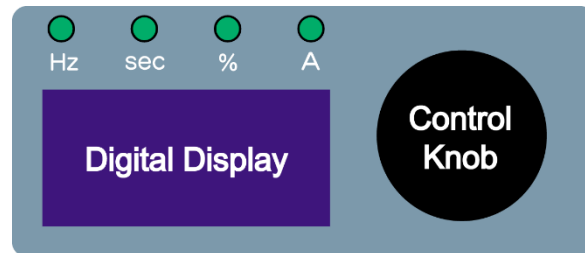
AC/DC – Push the AC/DC button to select DC (Direct Current) output or AC (Alternating Current) output. The green LED will light indicating the output selected. When AC output is selected the Wave Balance and AC output Frequency Parameters are active and can be set through the control knob when selected with the Scroll Buttons.

CONTACTOR – Push this button to turn the output contactor on in STICK Mode.

CONTROL – Push this button to switch between Panel control and Remote control.

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