

OPERATING & SERVICING THE **NELWELD 6000**



Quick Set-up Guide

Version 1.0



These instructions are for experienced operators. If you are not fully familiar with the principles of operation and safe practices for arc welding equipment, we urge you to read AWSSP - "Safe Practices" available from the American Welding Society. **Do not permit untrained persons to install, operate or maintain this equipment. Do not attempt to install or operate this equipment until you have read and fully understand these instructions.** If you do not fully understand these instructions, contact your supplier for further information. Be sure to read the Safety section before utilizing this equipment.

Nelweld Power Control Unit Limited Warranty

NELSON'S only warranty is that goods being sold will be free from defects in workmanship and material. This warranty is expressly in lieu of other warranties, expressed or implied and whether statutory or otherwise, including any implied warranty of merchantability or fitness for a particular purpose.

NELSON'S liability for breach of warranty shall arise only upon return of the defective goods at Buyer's expense after notice to NELSON of the claimed breach, and shall be limited to furnishing a like quantity of such goods free from such defects or, at NELSON'S option, to refunding the purchase price (less reasonable depreciation based on actual use); provided, however, that NELSON will not accept receipt of equipment returned unless buyer has previously afforded NELSON'S personnel a reasonable opportunity to inspect and repair said equipment at buyer's facility or such other location as is mutually agreeable. Notice to NELSON must be given within 30 days of such defect or failure within two (2) years from the date the equipment was delivered or before the welding of one million Nelson studs. No compensation or reimbursement for transportation costs of any kind will be allowed.

Please note that this warranty does not extend beyond the original registered purchaser, and does not warrant equipment that has been modified by any party other than NELSON, or equipment that has been improperly installed, improperly operated, or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of specifications for the equipment. NELSON shall never be liable for consequential damages.

NELSON reserves the right to make engineering and/or part changes, at any time without notice, as a result of our commitment to continuous improvement.

| | |
|-----------------------------|--|
| MODEL NO. | |
| SERIAL NO. | |
| SHIPPING DATE | |
| VOLTAGE REQUIRED | |



WARNING

WARNING

The following Safety section is for your protection. It summarizes precautionary information from the references

listed in the Additional Safety Information section. Before performing any installation or operating procedures, be sure to read and follow the safety precautions listed below as well as all other manuals, material safety data sheets, labels, etc. Failure to observe these precautions can result in injury or death.

PROTECT YOURSELF AND OTHERS



Some welding, cutting, and gouging processes are noisy and require ear protection. The arc, like the sun, emits ultraviolet (UV) rays and other radiation which can harm the skin and eyes. Hot metal can cause burns. Training in the proper use of the processes and equipment is essential to prevent accidents. Therefore:

1. Always wear safety glasses with side shields in any work area, even if welding helmets, face shields and goggles are also required.
2. Use a face shield fitted with filter shade #3 per ANSI Z87.1. Cover sparks and rays of the arc when operating or observing operations. Warn bystanders not to watch the arc and not to expose themselves to the rays of the electric-arc or hot metal.
3. Wear flameproof gauntlet type gloves, heavy long-sleeve shirt, cuffless trousers, high topped shoes, and a welding helmet or cap for hair protection, to protect against arc rays and hot sparks or hot metal. A flameproof apron may also be desirable as protection against radiated heat and sparks.
4. Hot sparks or metal can lodge in rolled up sleeves, trousers cuffs or pockets. Sleeves and collars should be kept buttoned and open pockets eliminated from the front of clothing.
5. Protect other personnel from arc rays and hot sparks with suitable nonflammable partitions or curtains.
6. Use goggles over safety glasses when chipping slag or grinding. Chipped slag may be hot and can fly far. Bystanders should also wear goggles over safety glasses.



FIRES AND EXPLOSIONS

Heat from flames and arcs can start fires. Hot slag or sparks can also cause fires and explosions. Therefore:

1. Remove all combustible materials well away from the work area or cover the materials with a protective nonflammable covering. Combustible materials include wood, cloth, sawdust, liquid and gas fuels, solvents, paints and coatings, paper, etc. Hot sparks or hot metal can fall through cracks or crevices in floors or wall openings and cause a hidden smoldering fire or fires on the floor below. Make certain that such openings are protected from hot sparks and metal. Do not weld, cut, or perform other hot work until the workpiece has been completely cleaned so that there are no substances on the workpiece which might produce flammable or toxic vapors. Do not do hot work on closed containers. They may explode. Have appropriate fire extinguishing equipment handy for instant use, such as a garden hose, water pail, sand bucket or portable fire extinguisher. Be sure you are trained for proper use. Do not use equipment beyond its ratings. For example, overloaded welding cable can overheat and create a fire hazard. After completing operations, inspect the work area to make certain there are no hot sparks or hot metal which could cause a later fire. Use fire watchers when necessary. For additional information, refer to NFPA Standard 51B, "Fire Prevention in Use of Cutting and Welding Processes," available from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.



ELECTRICAL SHOCK

Contact with live electrical parts and ground can cause severe injury or death. DO NOT use welding current in damp areas, if movement is confined, or if there is danger of falling. Faulty or improperly electrified equipment can cause injury or death. Therefore:

1. Always have qualified personnel perform the installation, troubleshooting, and maintenance unless you are qualified to perform such work.
2. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.
3. Be sure the power source frame (chassis) is connected to the ground system of the input power.
4. Connect the workpiece to a good electrical ground.
5. Connect the work cable to the workpiece. A poor or missing connection can expose you or others to a fatal shock.
6. Use well-maintained equipment. Replace worn or damaged cables.
7. Keep everything dry, including clothing, work area, cables, torch/electrode holder and power source.
8. Make sure that all parts of your body are insulated from work and from the ground.
9. Do not stand directly on metal or the earth while working in tight quarters or a damp area; stand on dry boards or an insulating platform and wear rubber soled shoes.
10. Put on dry, hole-free gloves before turning on the power.
11. Refer to ANSI/ASC Standard Z49.1 for specific grounding recommendations. Do not mistake the work lead for a ground cable.
12. Before performing any work inside a power source, disconnect the power source from the incoming electrical power using the disconnect switch at the fuse box before working on the equipment.



ELECTRICAL AND MAGNETIC FIELDS

Electric and magnetic fields may be dangerous. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding and cutting current creates EMF around welding cables and welding machines. Therefore:

1. Operators having pacemakers should consult their physician before welding. EMF may interfere with some pacemakers.
2. Exposure to EMF may have other health effects which are unknown.
3. Operators should use the following procedures to minimize exposure to EMF:
4. Route the electrode and work cables together. Secure them with tape when possible.
5. Never coil the torch or work cable around your body.
6. Do not place your body between the torch and work cables. Route cables on the same side of your body.
7. Connect the work cable to the workpiece as close as possible to the area being welded.
8. Keep welding power source and cables as far away from your body as possible.



MOVING PARTS CAN CAUSE INJURY

Electric fan can start at any time without warning and cause severe injury, therefore:

1. Always disconnect electrical power prior to service to prevent the fan from starting unexpectedly.
2. Keep all doors, panels, covers, and guards closed and securely in place.
3. Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.
4. Keep hands, hair, loose clothing, and tools away from moving parts.
5. Reinstall panels or guards and close doors when servicing is finished and before reenergizing welder.



FUMES AND GASES

Fumes and gases can cause discomfort or harm, particularly in confined spaces. Do not breathe fumes and gases. Shielding gases can cause asphyxiation. Therefore:

1. Always provide adequate ventilation in the work area by natural or mechanical means. Do not weld, cut, or gouge on materials such as galvanized steel, stainless steel, copper, zinc, lead, beryllium, or cadmium unless positive mechanical ventilation is provided. Do not breathe fumes from these materials.
2. Do not operate near degreasing and spraying operations. The heat or arc rays can react with chlorinated hydrocarbon vapors to form phosgene, a highly toxic gas, and other irritant gasses.
3. If you develop momentary eye, nose, or throat irritation while operating, this is an indication that ventilation is not adequate. Stop work and take necessary steps to improve ventilation in the work areas. Do not continue to operate if physical discomfort persists.
4. Refer to ANSI/ASC Standard Z49.1 (see listing on next page) for specific ventilation recommendations.



EYE PROTECTION

Flying metal can injure eyes. Welding, chipping, wire brushing and grinding can cause sparks and flying metal. As welds cool, they can throw off slag. Therefore:

1. Wear approved safety glasses with side shields even under your welding helmet.
2. Warn others nearby about flying metal hazard.



HEARING PROTECTION

Prolonged Noise from Capacitor Discharge welding applications can damage hearing if levels exceed limits specified by OSHA. Therefore:

1. Use Approved ear plugs or ear muffs if noise level is high.
2. Warn others nearby about noise hazard.
3. For additional information, refer to OSHA Safety Standards 3074.



CYLINDER HANDLING

Cylinders, if mishandled, can rupture and violently release gas. Sudden rupture of cylinder, valve, or relief device can injure or kill. Therefore:

1. Use the proper gas for the process and use the proper pressure reducing regulator designed to operate from the compressed gas cylinder. Do not use adaptors. Maintain hoses and fittings in good condition.
2. Always secure cylinders in an upright position by chain or strap to suitable hand trucks, undercarriages, benches, walls, post, or racks. Never secure cylinders to work tables or fixtures where they may become part of an electrical circuit.
3. When not in use, keep cylinder valves closed. Have valve protection cap in place if regulator is not connected. Secure and move cylinders by using suitable hand trucks. Avoid rough handling of cylinders.
4. Locate cylinders away from heat, sparks, and flames. Never strike an arc on a cylinder.
5. For additional information, refer to CGA Standard P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders", which is available from Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202.



ADDITIONAL SAFETY INFORMATION

For more information on safe practices for electric arc welding, refer to the following publications.

1. ANSI/ASC Z49.1 Safety in Welding and Cutting
2. AWS C5.1 Recommended Practices for Plasma Arc Welding
3. AWS C5.6 Recommended Practices for Gas Metal Arc Welding
4. AWS SP Safe Practices (Reprint) Welding Handbook
5. ANSI/AWS F4.1 Recommended Safe Practices for Welding and Cutting of Containers That Have Held Hazardous Substances.



EQUIPMENT MAINTENANCE

Faulty or improperly maintained equipment can cause injury or death. Therefore:

1. Always have qualified personnel perform the installation, troubleshooting, and maintenance work. Do not perform any electrical work unless you are qualified to perform such work.
2. Before performing any maintenance work inside a power source, disconnect the power source from the incoming electrical power.
3. Maintain cables, grounding wire, connections, power cord, and power supply in safe working order. Do not operate any equipment in faulty condition.
4. Do not abuse any equipment or accessories. Keep equipment away from: heat sources such as furnaces, wet conditions such as water puddles and inclement weather oil or grease corrosive atmospheres.
5. Keep all safety devices and cabinet covers in position and in good repair.
6. Use equipment only for its intended purpose. Do not modify it in any manner.

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SAFETY SYMBOLS
ATTENTION!
BE ALERT!

WELDING CAN BE HARMFUL
TO YOURSELF AND OTHERS.



DANGER

Used to call attention to immediate hazards which, if not avoided, will result in immediate, serious personal injury or loss of life.



WARNING

Used to call attention to potential hazards which could result in personal injury or loss of life.



CAUTION

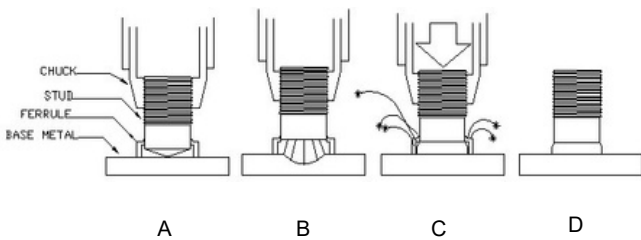
Used to call attention to hazards which could result in minor personal injury.

1 Introduction to Stud Welding

1.1 Principles of the Drawn Arc Welding Process

Drawn Arc stud welding involves the same electrical, mechanical, and metallurgical principles as any other arc welding process. In stud welding, the power source and stud welding control system are set to control the amperage flow (current) and the duration (time) of arcing. The weld gun has a trigger circuit to initiate the weld and a lifting mechanism to draw the stud away from the base material and initiate the welding arc. The gun accessories include a chuck to hold the stud and a ferrule grip to hold the ceramic ferrule, which is also called an arc shield.

Figure 1 Stud Welding Sequence of Operations



The sequence of operations to a stud weld is as follows:

- A stud and ferrule are loaded into the chuck and grip. The gun is positioned against the base material taking up the *plunge*, or stud length available for burn off against the gun spring pressure. (Step A)
- The trigger is then depressed to start the fully controlled automatic sequence. This sequence consists of initiating the weld current, lifting the stud to create an arc by energizing the gun solenoid (Step B), timing out the weld time, plunging the stud by de-energizing the gun solenoid (Step C), and turning off the weld current at the end of the weld cycle. (Step D)

2 Stud Welding Practice

2.1 General Guidelines

In stud welding as in other welding and fabricating methods, there are some general guidelines to consider when determining the basics of good practice. Among these are:

Weld Plate Thickness: A plate thickness that is at least 1/3 of the stud shank diameter will develop the full steel tensile and shear capacity of the stud. The weld base plate will, however, undergo distortion and bending in many cases, leading to a change in the stud diameter/plate thickness ratio, when high loads are applied which are not satisfactory in many cases.

Weld Plate Cleanliness: The most applicable rule is that the area where the stud is to be welded (weld spot) should be as clean as possible to eliminate welding problems. The spot where the ground clamp(s) are to be fastened should also be cleaned on both sides of the plate so a good current path is established. Normally, a light rust or light mill scale is not detrimental. Heavy mill scale or heavy, flaky rust should be removed as should any deleterious coating such as heavy oil, paint, galvanizing, grease, moisture etc. While zinc galvanizing is electrically conductive, studs should not be welded to a galvanized plate. Zinc is a weld contaminant and will cause brittle welds. Weld and ground spots can be cleaned very quickly by spot grinding with an abrasive wheel, wire brush or wheel, drill bur, end mill, or other similar device. It should be noted that solid grinding wheels or abrasive discs do not remove zinc plating very well, but usually just result in the grinding disc or wheel filling with zinc and then merely spreading the zinc plating around making the weld spot look shiny and clean but allowing enough zinc to remain in the weld area to still cause welding problems. Use of open pore abrasive disc or a grinding wheel is preferable when removing galvanizing.

Galvanizing: Galvanizing should be done after the base plate has been stud welded. If galvanizing is done prior to welding, the effects of hydrogen embrittlement should be considered when hot dip galvanizing is used. Hydrogen embrittlement can have several points of origin that can cause serious brittleness in the weld or in the stud shank when studs are bent with a very tight bend diameter.

Grounding/Arc Blow: Edge distance (above) and ground placement can influence weld quality due to arc blow. That is, the welding arc is electromagnetically deflected away from the grounding point or toward the larger mass of the base plate configuration being welded.

2.2 Visual Weld Inspection

A proper relationship between the Lift, Plunge, Time, and Amperage is needed to obtain good weld results. The length reduction or burn-off and the weld fillet appearance are determined by the weld settings. Visual weld inspection consists of interpreting the appearance of the weld flash, and is normally very accurate if certain guidelines are followed.

- A Satisfactory weld with good flash formation
- B Stud in which plunge is too short
- C Hang-up during plunge – possible ferrule/stud binding
- D Poor vertical alignment
- E Stud weld made with insufficient heat
- F Stud weld made with excessive heat

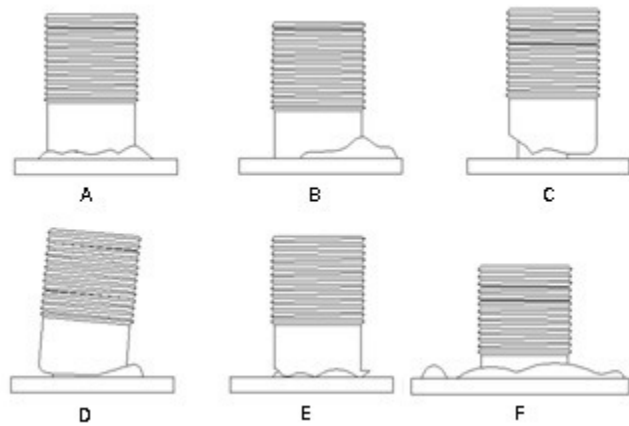


Figure 2 Visual Weld Quality

A good weld is characterized by:

- Even flash formation.
- A shiny, bluish hue to the flash surface.
- A slight flow or bend of flash metal into the base material.
- Good flash height.
- Consistent after-weld length.
- Full “wetting” – flash around the stud periphery

A cold weld, which requires more time and/or amperage, is indicated by:

- Low flash height.
- Incomplete flash formation.
- A dull gray cast to the flash surface.
- Stringers of flash metal forming "spider legs."

A hot weld made with too much time and/or amperage is distinguished by:

- Excessive splatter.
- A washed-out flash.
- Undercutting of the stud.
- Burn through the base material.

i The most convenient method of checking burn-off is to stand an unwelded stud upside down (load end up) next to a welded stud to compare the length difference. After weld height can also be checked with a sliding carpenter’s level/square tool. The *Stud Burnoff Length* table shows typical burn-off length reductions when welding to bare plate of sufficient thickness.

| Stud Burn-Off Lengths (not including flux load) | |
|--|------------------|
| Stud Diameter | Length Reduction |
| 3/16" through 1/2" (5mm through 12mm) | 1/8" (3mm) |
| 5/8" through 7/8" (16mm through 22mm) | 3/16" (5mm) |
| 1" and over (25mm and over) | 1/4" (6mm) |

2.3 Physical Weld Inspection

~~Two studs should be welded according to qualified settings during pre-production testing. Following satisfactory visual inspection, they are bent 30° or torque tested in the case of threaded studs. This procedure should also be followed if there is any change of operator or any change in equipment, position, settings, etc. Studs that are bent may be straightened to the original axis. *Studs should not be heated during bending or straightening without approval by the Engineer of Record.* Torque testing is done to a proof load level slightly lower than the nominal yield of the stud so there is no permanent distortion of the threads. Torque test proof load requirements are found in AWS D1.1, D1.5, or D1.6. The test studs may be used in production.~~

The stud welding operator is responsible for pre-production set up and testing. The operator shall weld two studs to a production weld plate or to a piece of material similar to the weld plate in material composition and within 25% of the production weld plate thickness.

Inspections during production are also the responsibility of the operator. Pre-production and production inspection test results should be recorded and approved by the welding supervisor. Any unsatisfactory pre-production and/or production inspections and tests should be brought to the welding supervisor’s attention and corrections made, accompanied by additional tests with fully satisfactory inspection and test results before proceeding with further welding.

At regular intervals during production welding, the studs welded after the last testing interval should have the ceramic ferrules removed and should be visually inspected. If the visual inspection shows a full periphery weld flash, without undercut, and satisfactory after weld length, welding may continue. If the visual inspection shows a lack of flash or insufficient weld burn off, the questionable studs should be marked and appropriate supervisory personnel notified.

| Minimum Weld Flash Size | |
|---|-----------------|
| Stud Diameter | Weld Flash Size |
| 3/16" through 7/16" (5mm through 11mm) | 3/16" (5mm) |
| 1/2" (12mm) | 1/4" (6mm) |
| 5/8" through 7/8" (16mm through 22mm) | 5/16" (8mm) |
| 1" and over (25mm and over) | 3/8" (10mm) |

3 Installation

3.1 Technical Specifications

RECOMMENDED INPUT WIRE AND FUSE SIZES

| Machine | Input Voltage/ Frequency | Input Current/ Duty Cycle | Portable Power Cable ¹ | Fuse or Breaker Size Specifications ² | | Fuse Rating (Amps) | Recommended Fuse (Super Lag) |
|-----------------|-----------------------------|------------------------------|---|--|------|-----------------------|--------------------------------------|
| | | | | Current | Time | | |
| Nelweld 4000 | 208/60 | 488/6.7% | 3/0 | 601 | 1.0 | 150 | LPN-RK(250V)RK1 |
| | 230/60 | 442/6.7% | 3/0 | 544 | 1.0 | 150 | LPN-RK(250V)RK1 |
| | 460/60 | 224/6.7% | AWG 6 | 275 | 1.0 | 100 | LPS-RK(600V)RK1 |
| | 575/60 | 181/6.7% | AWG 6 | 222 | 1.0 | 100 | LPS-RK(600V)RK1 |
| | 220/50 | 461/6.7% | 95mm ² | 568 | 1.0 | 150 | LPN-RK(250V)RK1 |
| | 380/50 | 270/6.7% | 70mm ² | 332 | 1.0 | 100 | LPS-RK(600V)RK1 |
| | 400/50 | 257/6.7% | 70mm ² | 316 | 1.0 | 125 | LPS-RK(600V)RK1 |
| | 415/50 | 248/6.7% | 70mm ² | 305 | 1.0 | 100 | LPS-RK(600V)RK1 |
| | 440/50 | 234/6.7% | 70mm ² | 288 | 1.0 | 100 | LPS-RK(600V)RK1 |
| Nelweld 6000 | 208/60 | 547/23.3% | 250 MCM | 717 | 1.4 | 150 | LPN-RK(250V)RK1 or FRN-R(250V)RK5 |
| | 230/60 | 496/23.3% | 3/0 | 649 | 1.4 | 150 | LPN-RK(250V)RK1 or FRN-R(250V)RK5 |
| | 460/60 | 253/23.3% | 1/0 | 330 | 1.4 | 100 | LPS-RK(600V)RK1 |
| | 575/60 | 204/23.3% | AWG 6 | 266 | 1.4 | 100 | LPS-RK(600V)RK1 |
| | 220/50 | 518/23.3% | 95mm ² | 678 | 1.4 | 150 | LPN-RK(250V)RK1 or FRN-R(250V)RK5 |
| | 380/50 | 304/23.3% | 70mm ² | 397 | 1.4 | 100 | LPS-RK(600V)RK1 |
| | 400/50 | 289/12% # | 70mm ² | 378 | 1.4 | 125 | LPS-RK(600V)RK1 |
| | 415/50 | 279/23.3% | 70mm ² | 364 | 1.4 | 100 | LPS-RK(600V)RK1 |
| | 440/50 | 264/23.3% | 70mm ² | 344 | 1.4 | 100 | LPS-RK(600V)RK1 |

¹ Four (4) conductors, 600V - 90°C

- 2 Fuse should break for currents greater than those listed and/or times longer than those listed. Additionally, ensure that the fuse or breaker is compatible with the listed voltage and maximum instantaneous current.

#For CE-marked, 400V, 50/60Hz units, duty cycle is reduced by 50% due to temperature/rating limits imposed by EN60974-12.

*Please consult local standards.



Verify that all fuses or circuit breakers are suitable for the electrical load applied. Failure to comply with the recommended input fuse sizes and warnings can result in damage to the Nelweld unit. Fuses are always preferred over circuit breakers due to the high inrush current (on the order of 1300A for 1-2 cycles).

3.2 Moving the Power Source

This equipment has been designed for portability. Nelweld models are supplied from the factory with legs in the four corners of the base. This allows a forklift to lift these machines from their front or the side for easy relocation. There are also Caster Kits available, which take the place of the stationary legs, for those requiring continuous mobility. Once positioned, the swivel casters should be locked to prevent accidental movement.

The main cable is not a structural member, and must not be used as a handle during transport.

All Nelweld power sources have side handles that can be used to help move a power unit with a Caster Kit installed. These are also designed to allow hoisting by using a fabric slings, each at least 39" long and having a load-carrying capacity of 1100 lbs (500 kg), strung diagonally through opposite corner handles, as shown in Figure 3. The sling may be strung through either two or four handles. If the handles need to be removed, the screws holding the handles in place must be retorqued to 25 ft-lbs, otherwise handle failure may result when lifting the unit.

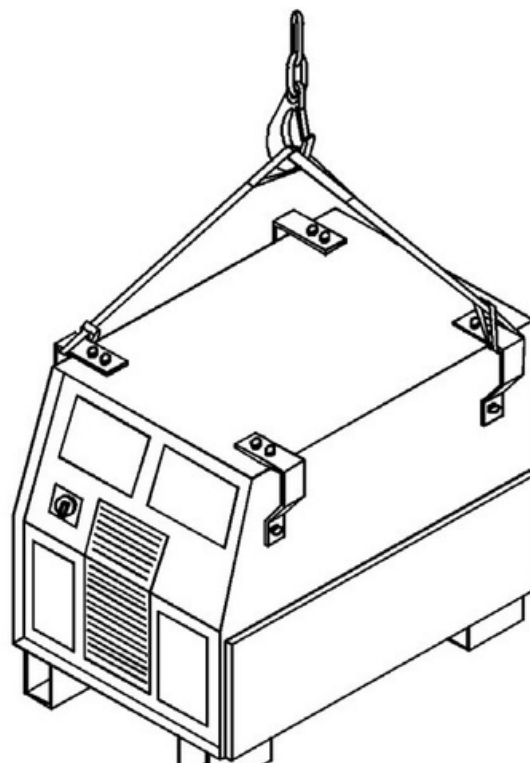


Figure 3 Proper Hoisting Technique of a Nelweld Power Supply Using Two Handles

3.3 Input Connections

~~Only a qualified electrician should connect the input leads to the power source. Connections should be made in accordance with all local and national electrical codes, following the connection diagram located on the inside of the reconnect/input access panel of the machine.~~

Failure to do so may result in bodily injury or death.

INPUT VOLTAGE CONNECTION

The power switch on the front panel should be turned to the off position before making any power connections. Connections should be made in accordance with all local and national electrical codes, following the connection diagram in Figure 4.

Use a three-phase supply line. Remove the left side case side panel, with respect to the front of the machine. A 2½ inch (63.5 mm) diameter hole for the input supply is located on the lower left of the rear cabinet panel.

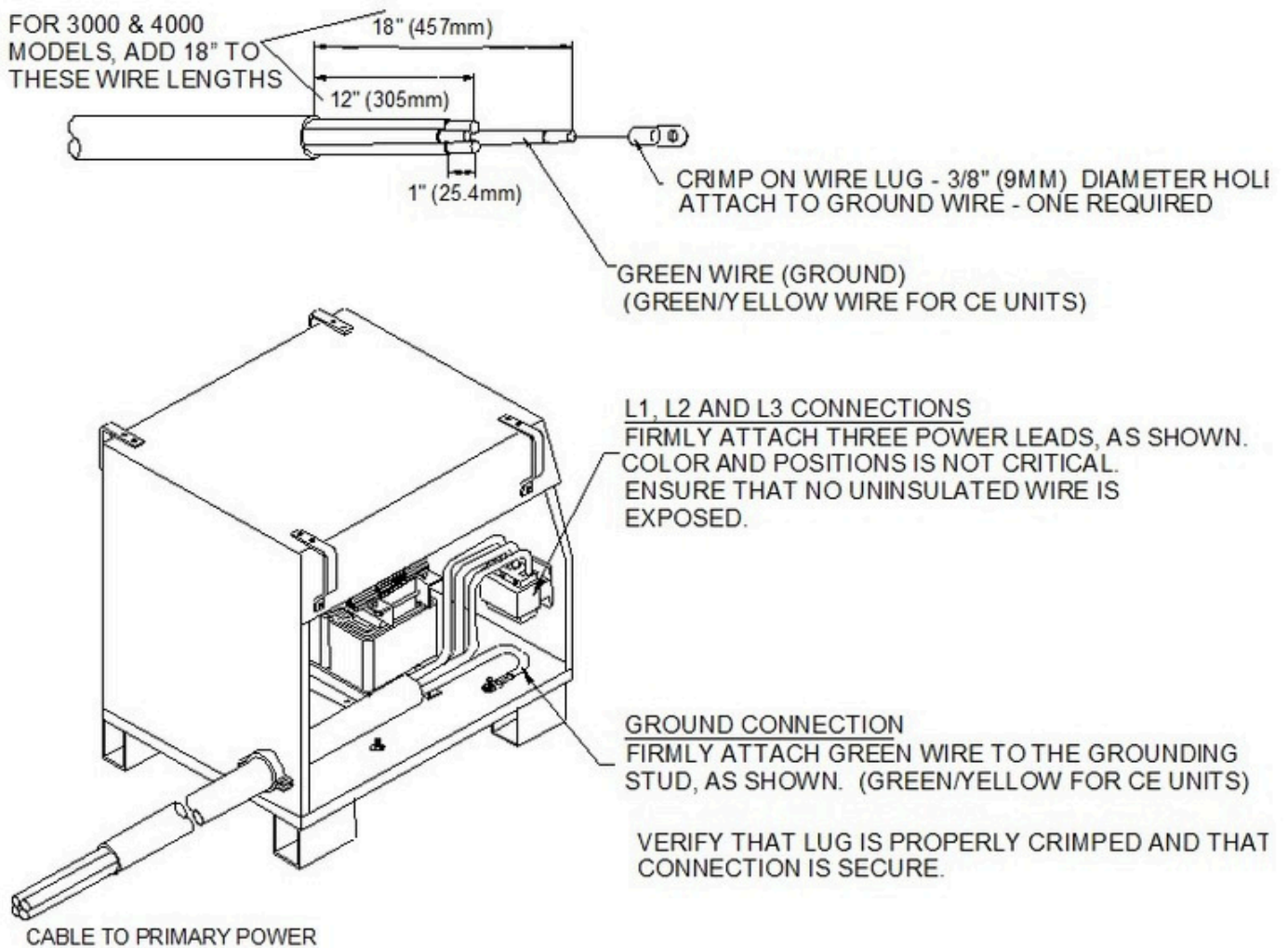


Figure 4 Connecting the Input Power Cables

Connect L1, L2 and L3 to the top of the front mounted disconnect switch. Connect the ground lead to the stud provided on the cabinet floor.

Ensure that the transformer jumper links are appropriately connected for the input line voltage being supplied. Removing the upper case panel and handles are not required in order to change jumper settings, and is not recommended.



WARNING

When changing jumper links, DO NOT OVERTIGHTEN NUTS, otherwise, damage may occur to the Nelweld unit.

Additionally, do not lubricate the posts, nuts, or jumpers.

4 Operation

4.1 Basic Operation Procedure

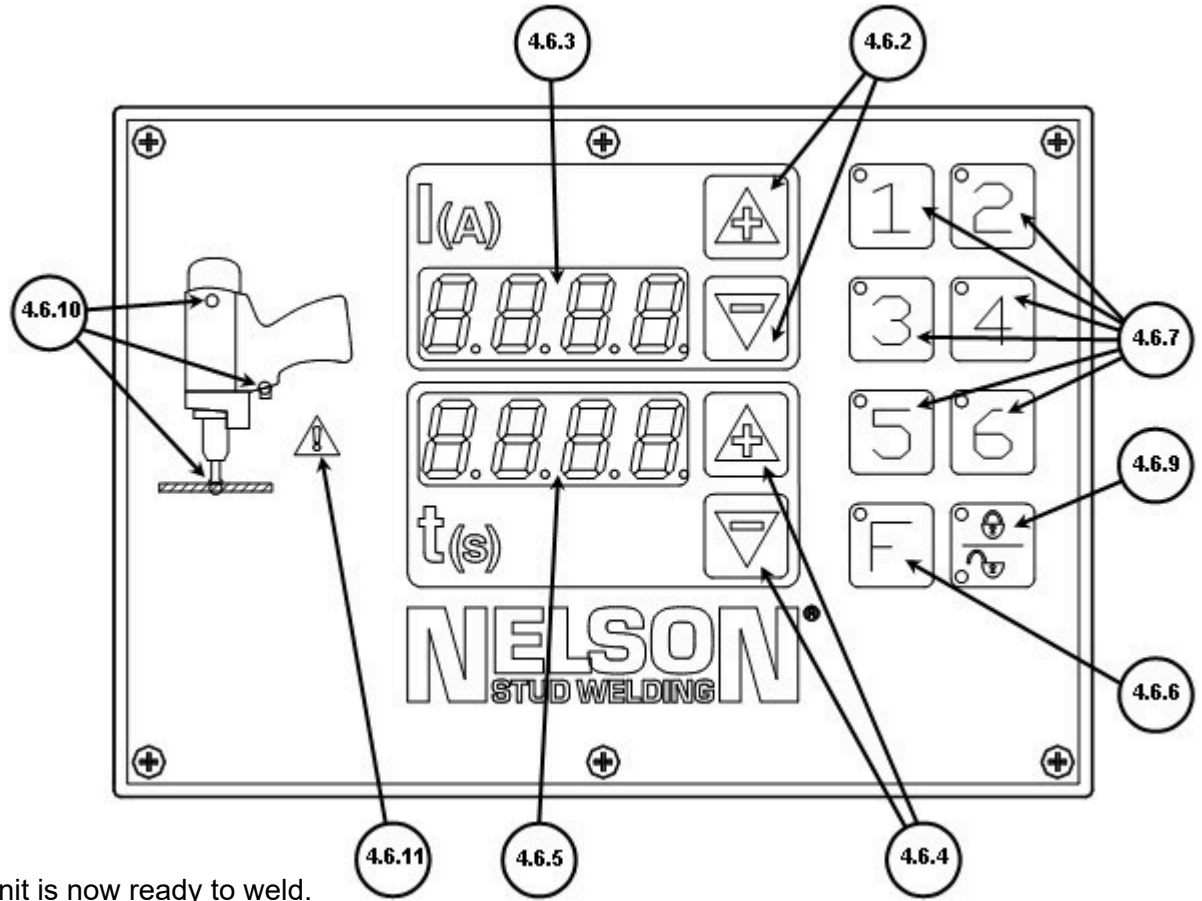
The process to begin welding using a Nelweld unit is very easy. Once the proper electrical connections and gun connections are established:

- Turn the main power switch on the front of the unit to the “on” position. Wait for the unit to complete its startup sequence.
- Set the desired current and time settings.
- Save any setpoints, if desired.
- Adjust other settings by accessing the proper function.
- Perform a lift check to verify proper gun lift.
- Lock the unit, if desired.
- Perform test welds to verify the correct welding settings.

After establishing proper setup, production welding may begin.

4.2 Operational Features & Controls

The main switch controls the input power to the machine. Upon powering up, the internal control software performs a series of diagnostic tests to ensure correct connection and operation of the power source. The unit also displays the current software version and model designation during the power up routine. Once the startup routine is complete, the time and current settings are reported on the corresponding front panel displays. The unit is now ready to weld.



| Nelweld Maximum Settings | | | | |
|--------------------------|----------------|------|----------------|-------|
| Power Source | Current (amps) | | Time (seconds) | |
| | Min | Max | Max | |
| Nelweld 4000 | 300 | 2100 | 0.020 | 1.400 |
| Nelweld 6000 | 300 | 2500 | 0.020 | 1.500 |

4.3 Setting the Current

The current setting is displayed on the front panel upper display. It can be changed using the + and - keys to the right of the current display in one (1) amp increments. As each of these keys remains pressed, the current setting will increase or decrease at a faster rate.

4.4 Current Display

The current setting is the current setting during a weld, and can be viewed in the front panel's upper display. It can be changed using the + and – keys to the right of the current display in one (1) amp increments. In normal operating modes, the desired setting and the actual current will be the same. In this situation the display does not change during or after a weld. However, in conditions where it is not possible for the power source to deliver the desired current, a warning light will light on the front panel display. This typically occurs when using high currents with small or excessively long weld cables.

4.5 Setting the Time

The time setting is displayed on the front panel lower display. It can be changed using the + and – keys to the right of the time display in one (1) millisecond (0.001 second) increments. As each of these keys remains pressed, the time setting will increase or decrease at a faster rate.

4.6 Time Display

The time display is used to display both the desired time setting and the actual weld time. In normal operating modes, the desired setting and the actual weld time will be the same. When this is the case, the display does not change during or after a weld. However, if an error condition occurs, the proper error code will be displayed on the front panel display. This will typically happen if a weld is aborted early.

i Please note that when the current and time are specified, the actual current and time delivered during the weld cycle are accurate to 3% of the specified value. Only when the specified value is beyond this tolerance will the current and/or time displays show a different value.

4.7 Status LED Operation

The control panel has three green LED's on the gun diagram and function as follows:

- Gun Coil LED – this LED is on whenever the gun coil is energized. This LED will blink if there is no gun connection detected. It will blink and the Fault Icon will illuminate if the gun coil is shorted.
- Trigger LED – this LED is on whenever the gun trigger is pulled or whenever the unit is welding.
- Contact LED – this LED is on whenever the stud chucked in the gun is in contact with the work.

4.8 Weld Through Deck Mode

The Nelweld power sources can be optimized to perform the weld-through-deck process by using special function F2. When enabled, the plunge time is extended to 180 milliseconds (0.180 seconds) and the maximum weld time is increased to 2.5 seconds. The Nelweld 6000 is shipped with the weld through deck mode disabled.

i

5 Troubleshooting

5.1 Diagnostic Codes – Troubleshooting Guide

The diagnostic codes can be accessed via the F1 Special Function Mode. The E codes can be scrolled with the up/down keys next to the LED Display. The error codes are erased when the unit is shut off.

| Diagnostic Code | Description | Recommended Action |
|-----------------|---------------------------------------|---|
| E001 | Line Frequency Error | Invalid frequency detected. Ensure the proper line frequency is being used. |
| E002 | Missing Phase | Phase B or C (with respect to Phase A) was not detected. Ensure that all input power phases are present. |
| E005 | EEPROM Failure | Main Control PCB failure. |
| E006 | Dual Output Communications Error | Check harness connections between control PCB's. |
| E007 | Gun Coil or Gun Cable Shorted to Work | Check gun coil wiring, or gun control cable for broken insulation or water immersion of a gun control connector. |
| E008 | Gun Coil Open | Check gun coil wiring and related circuit wiring |
| E009 | Gun Lift Error | A short was detected after the pilot arc time expired – Check gun. |
| E010 | Shunt Signal Open | No pilot arc current detected and/or the arc current went out. Check shunt wiring. |
| E012 | Time Control Fault | Main weld arc went out. Clean surface or change weld parameters. |
| E015 | High Temperature Fault | Welding is disabled until the unit's welding power supply cools to an acceptable level. This code will display automatically with or without F1 diagnostic mode enabled. This error will occur if the pilot arc board is unable to supply 15VDC. The 15VDC supply exists if two green LEDs on the pilot arc board are lit. If they are not lit, replace the pilot arc board(s). |
| E016 | SCR Shorted | Check shunt wiring. Replace defective SCR. |
| E017 | Weld Quality Error | Weld was outside of specified tolerance. <i>Only valid for Process Monitor users. See the Nelware users manual for details.</i> |
| E018 | Security Error | An incorrect security code was passed to the Nelweld through the RS-232 port. |

6 Miscellaneous Information

6.1 Function Code Definitions

| | Description | Default Value | Minimum Value | Maximum Value | Units | Zero state | One state | Comments |
|-----|------------------------------|---------------|---------------|---------------|-------|--------------|-------------|--|
| F1 | Error Display | E--- | E001 | E018 | | | | Scrolls through error codes of active errors |
| F2 | Weld Through Deck | 0 | 0 | 1 | | disabled | enabled | Only Nelweld 6000 can enable this option |
| F3 | Plunge Time | 0.050 | 0.050 | 0.250 | sec | | | Default changes to 0.180 if weld through deck enabled. |
| F4 | Pilot Arc Time | 0.050 | 0.010 | 0.100 | sec | | | |
| F5 | Prevent Welding if Error | 0 | 0 | 1 | | disabled | enabled | Disables output capability when weld-related error occurs. |
| F6 | Input Power Detection Scheme | 0 | 0 | 1 | | autodetect | generator | Generator or power grid detection |
| F11 | Lift Check Enable | 1 | 0 | 1 | | disabled | enabled | |
| F12 | Lift Check Delay Time | 2000 | 500 | 9999 | sec | | | |
| F13 | Lift Check Hold Time | 2000 | 500 | 9999 | sec | | | |
| F14 | Gas Valve Enable | 0 | 0 | 1 | | disabled | enabled | |
| F15 | Gas Valve Preflow Time | 0.500 | 0 | 5.000 | sec | | | |
| F16 | Gas Valve Postflow Time | 0.500 | 0 | 5.000 | sec | | | |
| F21 | Feed Signal Enable | 0 | 0 | 1 | | disabled | enabled | |
| F22 | Feed Signal Level | 0 | 0 | 1 | | active low | active high | |
| F23 | Feed Signal Style | 0 | 0 | 1 | | contact loss | after weld | |
| F24 | Feed Signal Pulse Width | 0.010 | 0.010 | 0.500 | sec | | | |

| | Description | Default | Minimum | Maximum Value | Units | Zero state | One state | Comments |
|-----|--------------------------------|---------|---------|---------------|-------|------------|-----------|--|
| | | Value | Value | | | | | |
| F25 | Feed Signal Air Trigger Enable | 1 | 0 | 1 | | disabled | enabled | Stud feed on air trigger. Overridden if F21 is disabled. |
| F26 | Quick Retry Enable | 0 | 0 | 1 | | disabled | enabled | Truncates gun lift time on misfire. |
| F31 | User Weld Counter (millions) | 0 | 0 | 999 | | | | Resettable user weld counter - millions |
| F32 | User Weld Counter (thousands) | 0 | 0 | 999 | | | | Resettable user weld counter - thousands |
| F33 | User Weld Counter (hundreds) | 0 | 0 | 999 | | | | Resettable user weld counter - hundreds |
| F34 | Total Weld Counter (millions) | 0 | 0 | 999 | | | | Non-resettable total weld counter - millions |
| F35 | Total Weld Counter (thousands) | 0 | 0 | 999 | | | | Non-resettable total weld counter - thousands |
| F36 | Total Weld Counter (hundreds) | 0 | 0 | 999 | | | | Non-resettable total weld counter - hundreds |
| F41 | Chuck Stripper Enable | 0 | 0 | 1 | | disabled | enabled | |
| F42 | Chuck Stripper Delay Time | 0.200 | 0.010 | 2.000 | sec | | | |
| F43 | Chuck Stripper Hold Time | 0.050 | 0.010 | 0.500 | sec | | | |
| F44 | Reset to Factory Defaults | FAC | | | | | | Reset all non-preset parameters |
| F45 | Front Panel Lock Enable | 0 | 0 | 1 | | disabled | enabled | |
| F46 | Supervisor's Lock Combination | 1234 | 1111 | 6666 | | | | Password must be 4 digits. |
| F51 | Model Number | 4000 | 2000 | 6000 | | | | Read only - Nelweld model number (2000-6000) |
| F52 | Line Frequency | 60.0 | 40.0 | 70.0 | | | | Read only - Updates every 5 sec. |

| | Description | Default | Minimum Value | Maximum Value | Units | Zero state | One state | Comments |
|------|---------------------------------|---------|---------------|---------------|-------|------------|-----------|--|
| | | Value | | | | | | |
| F53 | Software Version | X.XX | | | | | | Readonly |
| F54 | Software Installation Month/Day | mmdd | | | | | | Month and day the software was installed as <i>mmdd</i> |
| F55 | Software Installation Year | yyyy | | | | | | Year software was installed as <i>yyyy</i> |
| F56 | Chuck Saver Enable | 1 | 0 | 1 | | disabled | enabled | Allows multiple weld attempts without breaking contact |
| F61 | Factory Use | 750 | 0 | 1000 | | | | |
| F62 | Factory Use | ABC | ABC | ACB | | | | |
| F63 | Factory Use | 1 | 1 | 2 | | | | |
| F64 | Factory Use | 0 | 0 | 4000 | | | | |
| F65 | Factory Use | 20 | 20 | 20 | x | | | |
| F66 | Diagnostic Mode Enable | 0 | 0 | 1 | | disabled | enabled | Enable for troubleshooting weld problems |
| F111 | Preset-Enabled Lock Mode | 0 | 0 | 1 | | disabled | enabled | Enable to allow preset selections while locked. |
| F112 | Loadbank Mode Enable | 0 | 0 | 1 | | disabled | enabled | Enable to allow for supply of weld current through a fixed resistive load. |
| F113 | Stud Feed Weld Success Enable | 0 | 0 | 1 | | disabled | enabled | Enable to suppress stud feed signal under all conditions other than a successful weld. |
| F114 | Calibration Factor | 0 | -200 | +200 | | | | Offset adjustment factor for calibrating the Nelweld |
| F115 | KFL Mode Enable | 0 | 0 | 1 | | disabled | enabled | Enable only when using a KFL gun. |
| F116 | Quick Pilot Arc Mode | 1 | 0 | 1 | | disabled | enabled | Enable to fire main arc as soon as pilot arc is established. |

7 Contact Information

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