

Operating the Pinnacle™ NCD+ 500b Stud Welding System



Operations Manual (729-110-046)

For Software Version 1.00 and later



CAUTION

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 AWS SP -“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.

Pinnacle™ NCD+ 500b 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 and within one year or 500,000 welds from the date the equipment was delivered, whichever comes first. 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.

Pinnacle™ NCD+ 500b Battery 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 and within 90 days from the date the equipment was delivered. 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.

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WARNING

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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:

- 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 work piece has been completely cleaned so that there are no substances on the work piece 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



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 work 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 work piece to a good electrical ground.
5. Connect the work cable to the work piece. 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 work piece 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.



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.



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.



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.



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.

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1 Connection and Installation

 <p>SAFETY SYMBOLS ATTENTION! BE ALERT!</p> <p><i>WELDING CAN BE HARMFUL TO YOURSELF AND OTHERS.</i></p>		Used to call attention to immediate hazards which, if not avoided, will result in immediate, serious personal injury or loss of life.
		Used to call attention to potential hazards which could result in personal injury or loss of life.
		Used to call attention to hazards which could result in minor personal injury.

1.1 Installation Precautions

Attention must be paid to the fact that the welding unit is installed on a horizontal, vibration-free and non-slip surface. The load-carrying capacity of the floor space should be at least double the weight of the unit. When working in high-lying locations, such as bridges, ladders or platforms, the NCD+ must be secured against the risk of falling.

The NCD+ must be adequately protected against the intrusion of liquids. It may not be installed on liquid-bearing pipelines.

In order to guarantee unimpeded temperature exchange with the environment, a minimum clearance of 39.4 inch (1 m) to existing heat sources must be observed.

Attention must be paid to the fact that the ventilation slits on the unit casing are kept free.

1.1.1 Input Connection

The Nelson® Pinnacle™ Li-ion Battery can be re-charged with an input power voltage of 115 VAC / 60 Hz. See the rating plate on the back panel of the unit.



The input power to charger must be wired with the earth ground connection. It is not acceptable to use an isolation plug to isolate the earth ground connection. It could result in unsafe conditions.

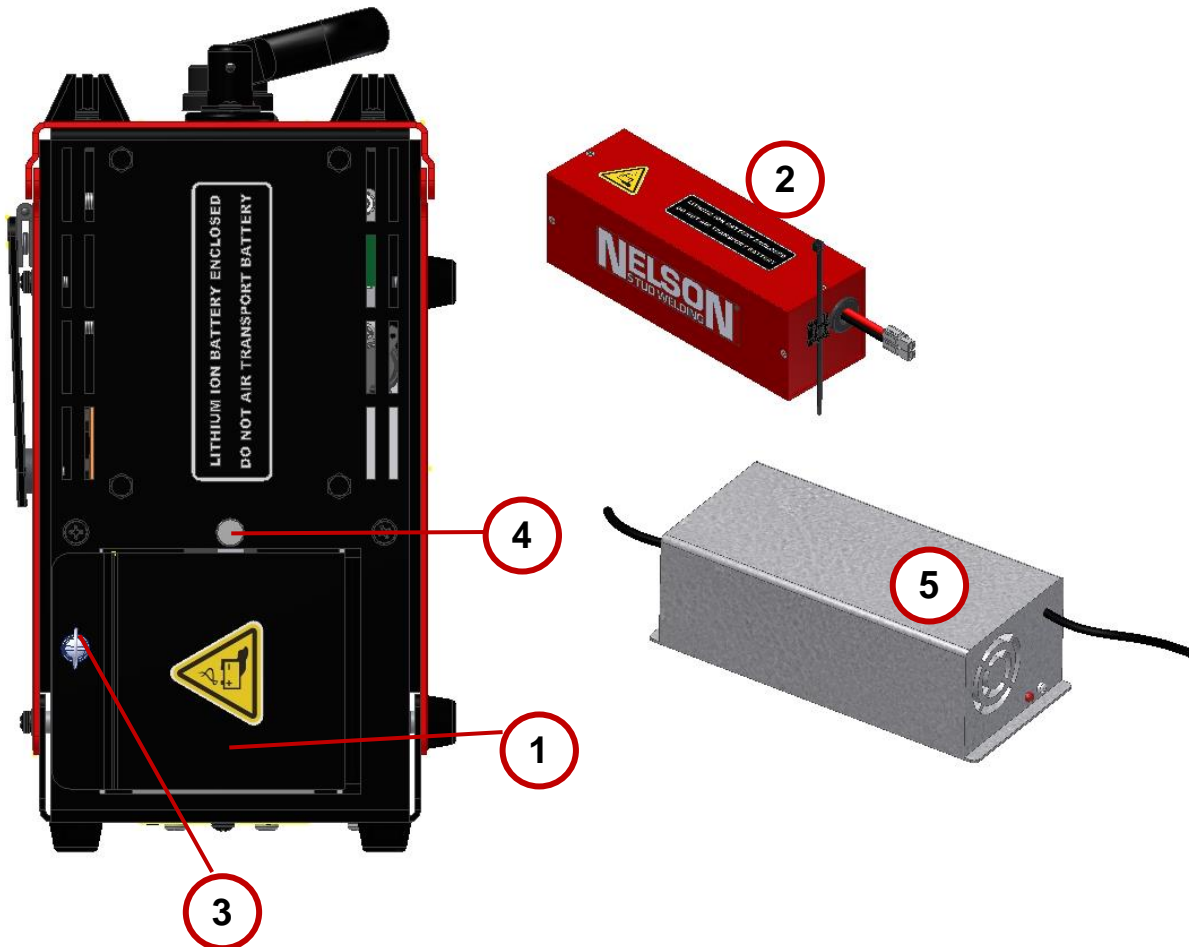
1 Battery Compartment
2 Nelson Pinnacle Li-ion Battery
3 Compartment door lock
4 Battery retainer
5 Battery Charger



Finger pinch hazard

Recommended practice: Brace the battery with one hand to relieve the pressure on the retainer, while turning the battery retainer knob with the other hand.

Figure 1.1 Li-ion Battery and Charger



1.1.2 Input Rating

NELSON STUD WELDING		Nelson Stud Welding, Inc 7900 West Ridge Rd, Elyria, OH 44035 USA	
Type: NCD+ 500b			
Part No. 750-614-800		Serial No.	
U ₂ = 35 V DC...100 V DC			
	U ₀ <30V	I ₂	875A 2500A
		U ₂	35V 100V
FOR USE ONLY WITH 710-100-001 CHARGER			
U ₁ =48V		WEEE-Reg.-Nr. DE 83984120	
Cooling/Kühlart: AF			
Label Part No. 724-576-024			

NELSON STUD WELDING		Nelson Stud Welding Inc 7900 West Ridge Rd Elyria, OH 44035 USA	
Type: Li - ion			
Part No. 750-614-321		Manufacture Date	
Serial No.			
Voltage	48.1V		
Capacity	240.5 Wh		
For Use Only With 710-100-001 Charger			
Label Part No. 724-576-029			

Pinnacle™ Rating

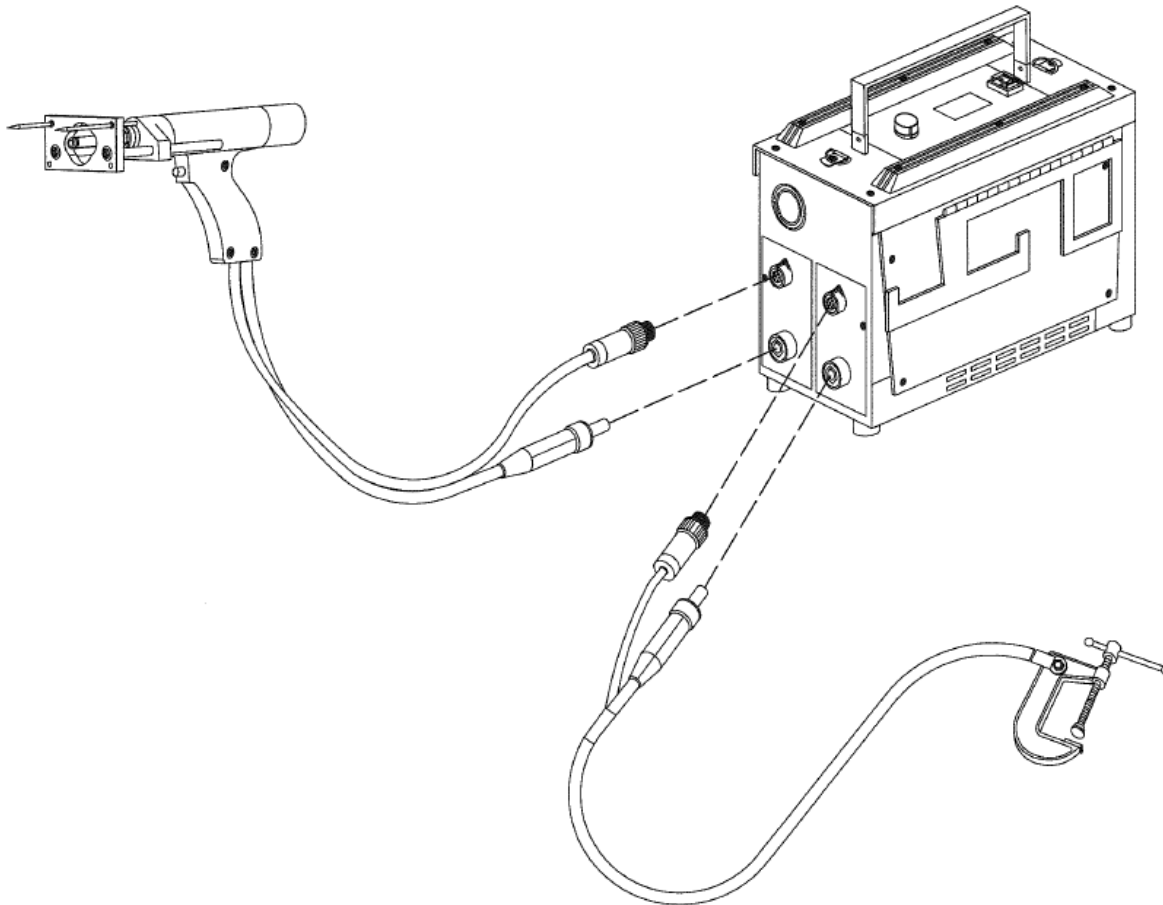
Battery Rating

Figure 1.2 NCD+ Decals

1.1.3 System Design

The Pinnacle NCD+500b can be used in two formats: the standard format and the Pinnacle Max format. Both system designs use the same weld unit. The standard system can weld up to a #10 or M5 stud. When switching over to the Pinnacle Max format which requires larger diameter cables with a shorter length weld tool cable, the unit can weld up to ¼ inch studs.

Pinnacle 750-614-800	500b Standard	Pinnacle Max
Weld Tool	751-650-630 19' #4 weld cable	751-650-640 8' 1/0 weld cable
Ground Cable	720-551-000 12' #4	720-551-001 12' 2/0



1.2 Cable Connection



Prior to any connection work, the NCD+ welding unit must be switched off. The power switch must be in the >>0<< position.



Figure 1.3 NCD+ Connections

1.2.1 Connection of Gun Welding Cable

The Gun Welding Cable connects to the NCD+ via the Gun Welding Cable socket (Item 2 of [Figure 1.3](#)). It must be noted that the procedural safe operation of the system can only be guaranteed when either a Nelson Contact or a Nelson Auto Gap gun is connected.



Figure 1.4 Gun Welding Cable Socket

Gun Welding Cable Connection (X2)

Align the locking pin of the welding cable plug to the locking groove of the welding cable socket. Turn to the welding cable plug 1/3 of a turn to the right clockwise to secure the connection.



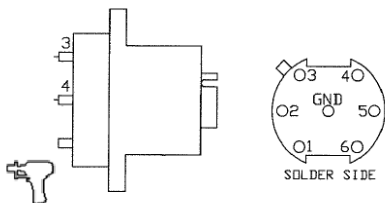
Connect Gun Welding Cable to X2 for straight polarity and to X4 for reverse polarity.

1.2.2 Connection of Gun Control Cable

The Gun Control Cable socket (Item 1 of [Figure 1.3](#)) permits the connection of the control cable to the NCD+ unit. The signals to control the gun are transmitted via the control cable.

The control cable socket of the unit has a 7-pin design.

Gun Control Cable Connection (X1)



Pin 3: Trigger (+)

Pin 4: Trigger (-)

Figure 1.5 Gun Control Cable Socket

The connection must be secured by aligning the index of the control cable plug with the index of the control cable socket. Once the indices are aligned, turn the collar ring to the right until it's tight. Now, the connection is secure.

1.2.3 Connection of Work piece Ground Cable

The welding current return takes place via the Work piece Ground Cable, which must be connected as follows to the Work piece Ground Cable sockets (Items 3 and 4 of [Figure 1.3](#)) on the front panel of the NCD+.

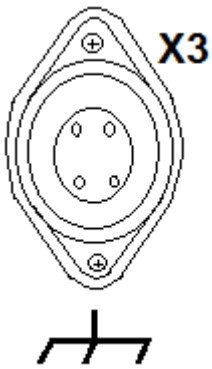


Figure 1.6 Work piece Ground Cable



Work piece Ground Cable Connections (X3 & X4)

Connect the Work piece Ground Cable plug into the NCD+ Dinse socket. Turn the Work piece Ground Cable plug 1/3 to the right clockwise to secure the connection.

Next connect the Chassis Ground Cable connection into the NCD+ Chassis ground connector.



WARNING

Prior to any connection task, the NCD+ welding unit must be switched off and the input power switch must be in the >>0<< position.

1.2.4 Connection of the Work piece

When connecting the work piece ground terminals, attention must be paid to the following:

The work piece ground terminals must be connected directly to the work piece or to the work piece fixture (welding bench, welding grid). Steel constructions, tracks, pipelines, etc. may not be used as current conductors, unless they themselves are the work pieces to be welded. The welding current circuit may not be earth grounded. The exception is the work piece itself or the work piece fixture are earth grounded compulsorily (pipelines, shipbuilding, etc.). Place the work piece ground terminals, if possible, at the same distance from the point of welding when two ground clamps are used.

1.3 Specifications

Item		Value	
Weld Voltage Range, Continuously Adjustable (VDC)		35 - 100	
Max Stored Weld Energy (Ws)		500	
Weld Capacitance (mF)		100	
Weld Rate (studs/min)	Weld Voltage	Standard System	Pinnacle Max
	70	14	
	80	12	
	90	10	
	100	8	
Max Weld Stud Diameter - Steel, Stainless		10 gage	1/4 "
Max Weld Stud Diameter - Aluminum		12 gage	#10
Weight: welder only (lb)		18	
Weight: welder, gun & cables (lb)		27	35
Dimensions L x W x H (in)		13.3 x 6.0 x 11.2	
Gun Cable Length (ft)		19	8
Work Cable Length (ft)		12	12
Gun Connector Type		7 pin	
Weld Connector Type		Dinse	
Operating Temperature Range (Deg C)		0 - 40	
Storage Temperature Range (Deg C)		-20 - 60	
Charger Input Voltage (V) / Current (A) / Frequency (Hz)		115 / 6 / 60	
Max Battery Charge Time (Hours)		3	
Nominal Battery Voltage (VDC)		48.1	
Battery Capacity (Amp Hours)		5.2	
Welds per Battery Charge	Weld Voltage		
	70	2100	
	80	1600	
	90	1200	
	100	1000	

1.4 Mechanical Drawing

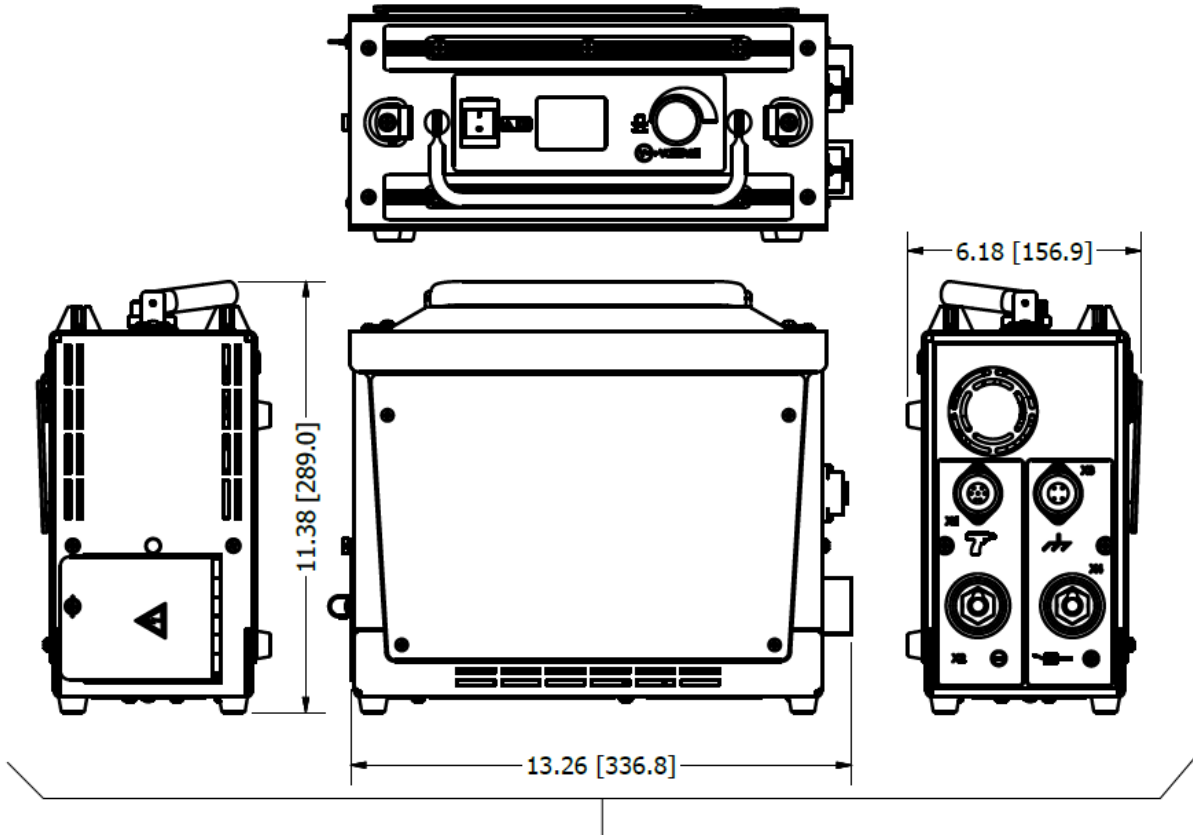


Figure 1.7 NCD+ 500b Dimensions

2 Control and Display Elements

2.1 Front Panel Controls and Displays Weld Parameter

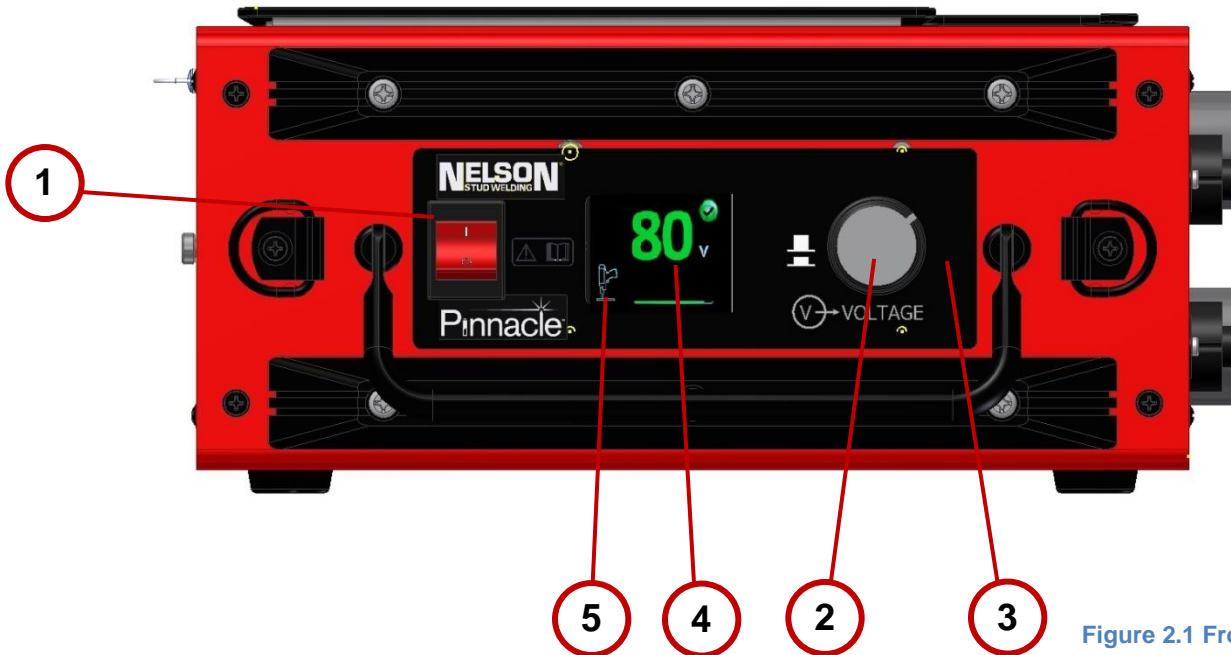


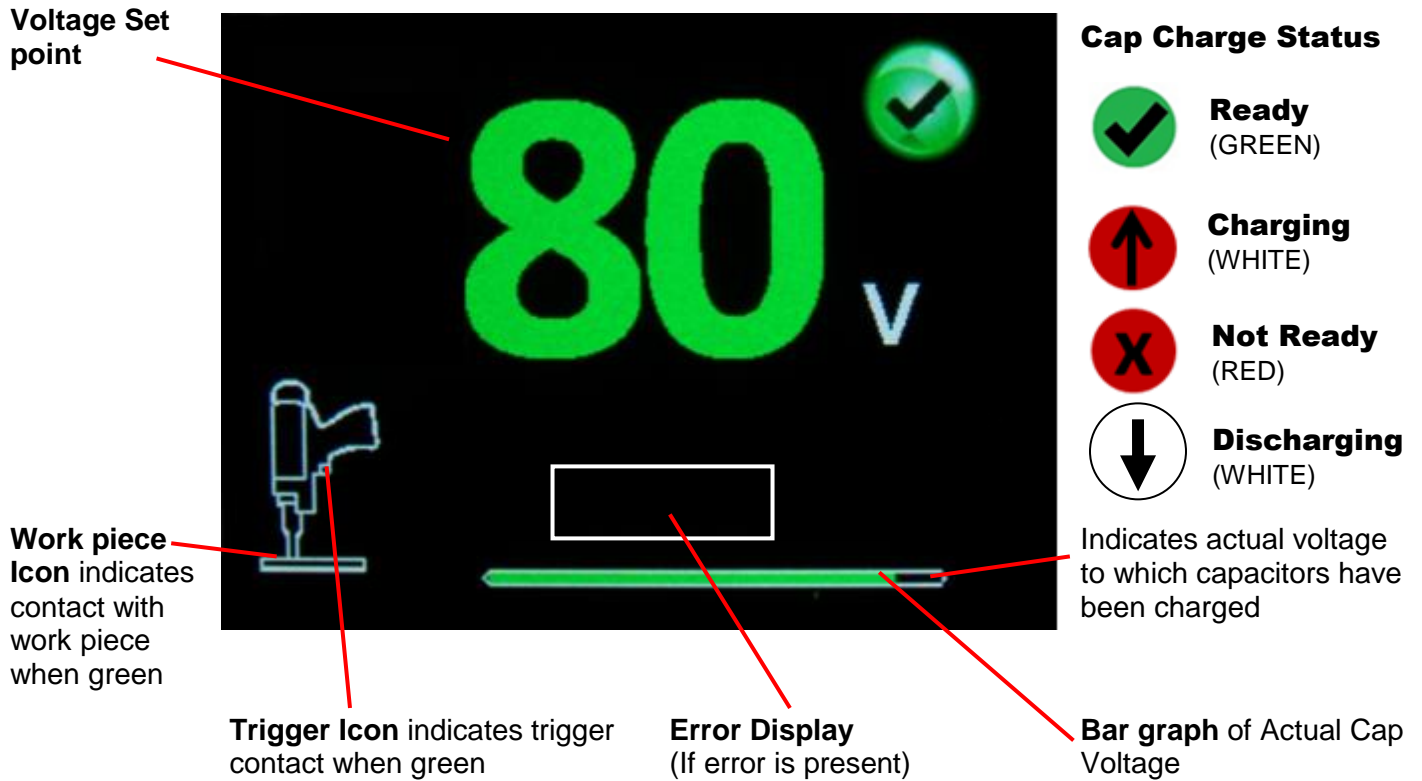
Figure 2.1 Front Panel Controls

1	On/Off Power Switch	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 safe operation of the power source.
2	Function Mode	Press the knob to alternate between modes.
3	Adjustment of Voltage and Other Parameters	Enables voltage selection. The voltage is increased turning the knob in the clockwise direction (or decreased by turning it in the counterclockwise direction). The power supply will take a moment to achieve and display the new voltage setting. Note: Small changes make it easier to reach a new voltage level.
4	Voltage Display	LCD display of voltage setting
5	Weld Tool Icon	The graphical display of gun function and welding process.

2.1.1 Voltage Display Modes

Figure 2.2 Voltage Display (Enlarged View of Items 4 & 5 of Figure 2.1)

RED when charging is in progress. GREEN when actual voltage matches with set point.



3 Normal Operation

NOTE: Refer to [Figure 2.1](#) (Page 14) for item references throughout the following instructions.

3.1 Powering Up

Before power up, ensure that battery is charged and connected. Connect all cables are properly. Press the On/Off Power switch (**Item 1**) to the left of the display to start the unit.

Wait for a few seconds while the power supply initiates and completes both a self test and self diagnostics test (**Note: Self tests occur between every weld.**). Once the tests have completed, the power supply will charge the unit to the voltage set point (adjust voltage if necessary). When fully charged, the Cap Charge Status icon ([Figure 2.2](#), Page 15) will become a green checkmark to show that the unit is fully charged and ready to weld.

3.2 Welding Operations


1. Set the welding voltage. Wait until the Voltage Display screen (**Item 4**) lights up green.
2. Rotate the knob (**Item 2**) to the desired level of voltage.
3. Set the spring pressure.
4. Adjust foot/leg assembly to set the plunge.
5. Load the stud into the chuck. Press the stud against the work piece (Ensure that the stud is perpendicular to the work piece). The Work piece icon (**Item 5**) will light up green.
6. Pull the trigger to weld the stud. The Trigger icon will turn green when the trigger switch is depressed ([Figure 2.2](#), Page 15).

Note: If the stud does not make contact with the work piece, it will not weld.

7. Remove the chuck from the welded stud.
8. The unit automatically recharges - wait for the Cap Charge Status icon ([Figure 2.2](#), Page 15) to turn green again before proceeding with the next weld. The unit will not recharge even if the trigger is pulled again before the chuck is removed from the welded stud. This is known as the **Chuck Saver™**.

3.3 Error Codes

Only qualified personnel should perform maintenance. Some functional errors are highlighted by appearance of an error code with the display EXX.

Error Number	Malfunction	Solution
E01	Abnormal presence of voltage on studs when there should be no voltage.	 <p>Stop using the Power Source until issue is resolved.</p> <p>Measure across the weld terminals voltage (VDC) to confirm.</p> <ul style="list-style-type: none"> • If $\geq 30\text{VDC}$, check SCR Gate Leads and replace SCR. • If $< 30\text{VDC}$, replace Control board and Power board.
E02	Capacitors won't charge (after 3 seconds, capacitors still less than 20V)	Replace power board. If the problem is not solved, replace SCR. If neither resolves the issue, replace the wiring harness.
TEMP SW	Trip with thermal switch mounted on heat-sink	Let it cool down. Check for loose cable connections.
CASE	Case is not connected to weld connection. Unit will not charge unless the case is connected to the weld circuit. If weld connection is connected to X3, check internal connection from X3 to case, from case to control board, replace control board.	
BATT	Battery is too low. Charge battery. It will only remain in this state until the battery is too low to power the controls.	
No display	Battery is too low to power the controls. Charge battery.	

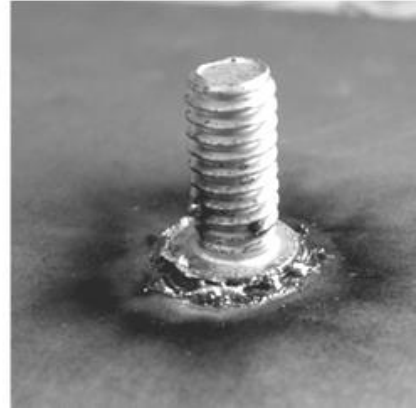
3.4 Weld Quality Visual Inspection



Issue: Too cold
Weld Flash: Not Visible
Weld: Very weak, Will break
Adjustments: Increase voltage, reduce spring pressure, or increase capacitance



Issue: Acceptable Weld
Weld Flash: Normal, No significant weld splatter
Weld: Good, strong
Adjustments: None required



Issue: Too Hot
Weld Flash: Excessive flash and weld splatter
Weld: Weak, May break
Adjustments: Reduce voltage, increase spring pressure, or reduce capacitance

4 Welding Parameters

Stud Size	Material	Plunge Depth		Pressure	NCD+ 500b Voltage
		In	mm	%	
12 ga. CHP/P2P (Point only)	Carbon Steel	0.16	4	0	80-85
10 ga. CHP/P2P (Point only)	Carbon Steel	0.2	5	0	95-100
#6 (M3)	Carbon Steel	0.12	3	100	70
	Stainless Steel	0.12	3	100	60
#8 (M4)	Carbon Steel	0.12	3	0	80
	Stainless Steel	0.12	3	100	70
#10 (M5)	Carbon Steel	0.12	3	50	90
	Stainless Steel	0.12	3	25	80
1/4 " (See Notes)	Carbon Steel	0.12	3	100	100
	Stainless Steel	0.12	3	100	95-100

* Typically the welding of P2P and CHP pin studs is not done using a capacitor discharge welder. It is possible using the Pinnacle, however results may vary and acceptability of the stud weld is the sole responsibility of the user.

** 1/4" Studs

- When welding 1/4 "studs the Pinnacle Max configuration must be used.
- When welding 1/4 "studs the stud flange diameter must be 0.300" or less, although the type of stud and base material type may cause some variation in settings.

4.1 Weld Setting Recommendations

Weld Setting Change	Effect on Welds
Voltage Increase	Hotter
Spring Pressure Increase	Colder
Contact Mode-Plunge Increase	Colder
Stud Tip Length Increase	Hotter

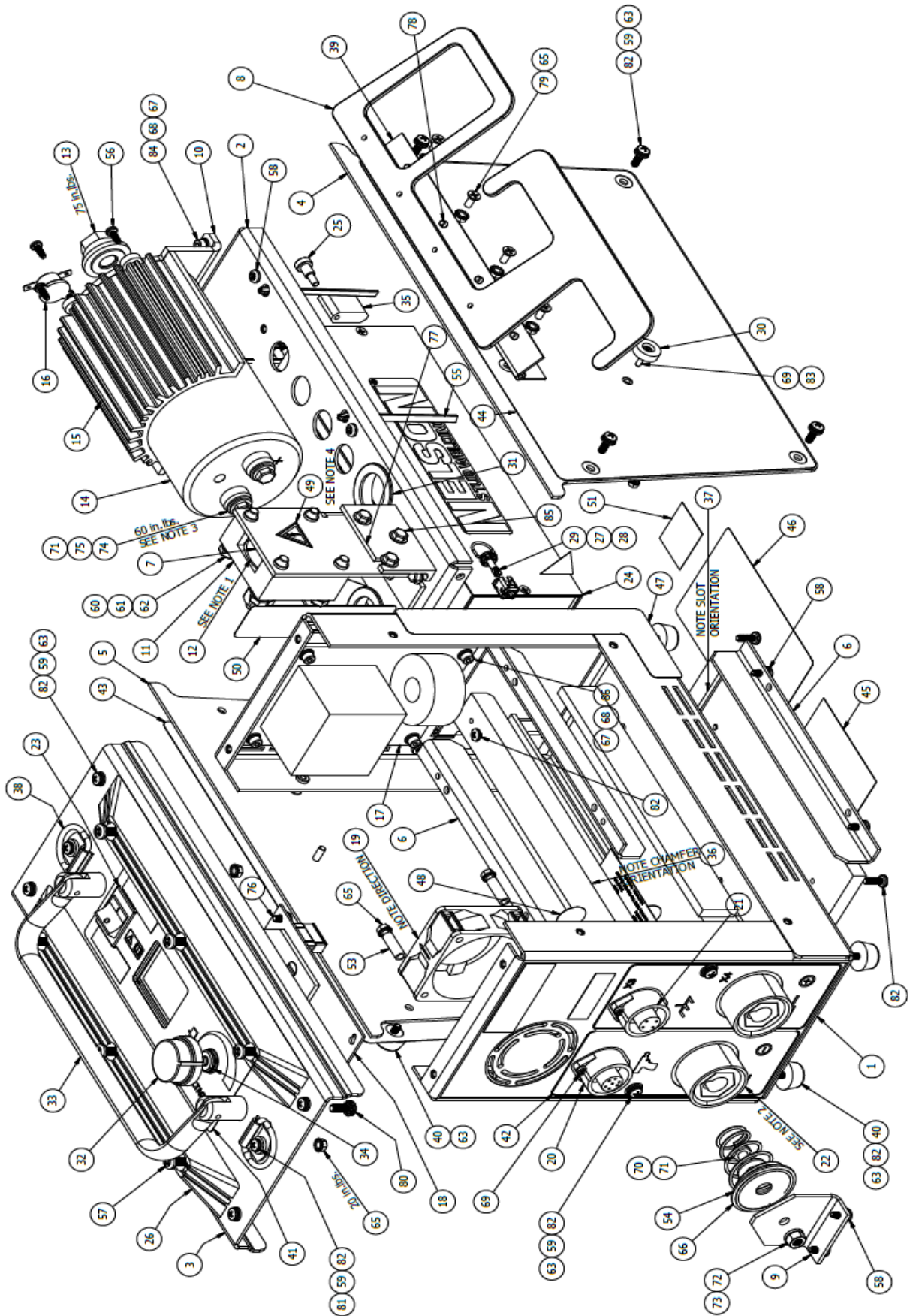
5 Parts List & Exploded View

ITEM	QTY	PART NUMBER	DESCRIPTION	Spare Part Designation
1	1	750-614-300	CHASSIS ASSEMBLY, NCD+ 500b	
2	1	750-614-307	SHELF, NCD+ 500b	
3	1	750-614-304	COVER, TOP, NCD+ 500b	
4	1	750-614-305	COVER, LH SIDE, NCD+ 500b	
5	1	750-614-306	COVER, RH SIDE, NCD+ 500b	
6	4	750-614-310	GUIDE, BATTERY, NCD+ 500b	
7	1	750-614-308	BRACKET, SCR MOUNT, NCD+ 500b	
8	1	750-614-311	HOLDER, GUN/CORD, NCD+ 500b	1
9	1	750-614-309	STOP, BATTERY, NCD+ 500b	
10	1	750-614-322	BRACKET, CAPACITOR END, NCD+ 500b	
11	1	86-02-51	MOUNT, INSULATOR, SCR	
12	1	86-02-50	SCR	1
13	1	524-005-361	NUT, M12 NYLON, CUSTOM CAP STUD MT	
14	1	702-119-002	CAPACITOR, ELECTROLYTIC STUD MT.	1
15	1	717-039-001	HEAT SINK, CAPACITOR	
16	1	709-276-006	THERMOSTAT, 1/2" BI-METAL DISC	
17	1	750-614-070	PCB, POWER, NCD+ 500b	1
18	1	750-614-080	PCB, CONTROL, NCD+ 500b	1
19	1	717-512-042	FAN ASM	
20	1	723-249-002	HARNESS, CTRL BRD TO SCR & GUN CONN	
21	1	723-249-008	CABLE, GROUND, CHASSIS GRD CONN	
22	2	85-10-02	POWER CONNECTOR, DINSE	1
23	1	709-274-010	SWITCH, POWER	
24	1	750-614-321	BATTERY ASSEMBLY, NCD+ 500b	1
25	1	750-614-323	KNOB, BATTERY FINGER	
26	2	729-022-011	PLATE, PLASTIC SKID	
27	1	729-009-003	RECEPTACLE, QUARTER TURN	
28	2	729-009-004	RETAINER, QUARTER TURN	
29	1	729-009-002	STUD, QUARTER TURN	
30	1	729-022-015	MAGNET, MOUNTING, 8.8 LB.	
31	2	714-028-004	BUSHING, WIRE PROTECTOR	
32	1	717-999-010	KNOB, ADJUSTMENT	
33	1	729-041-009	HANDLE, OVAL PIVOT	
34	1	714-033-000	GROMMET, RUBBER	
35	1	750-614-313	LATCH, BATTERY FINGER, NCD+ 500b	
36	1	750-614-314	SPACER, BATTERY TOP, NCD+ 500b	
37	1	750-614-315	SPACER, BATTERY BOTTOM, NCD+ 500b	
38	2	729-022-012	D-RING, 1" BLACK ANODIZED	
39	1	729-022-014	HINGE, 1-1/2" PIANO	
40	8	729-022-010	BUMPER, SCREW MOUNT	

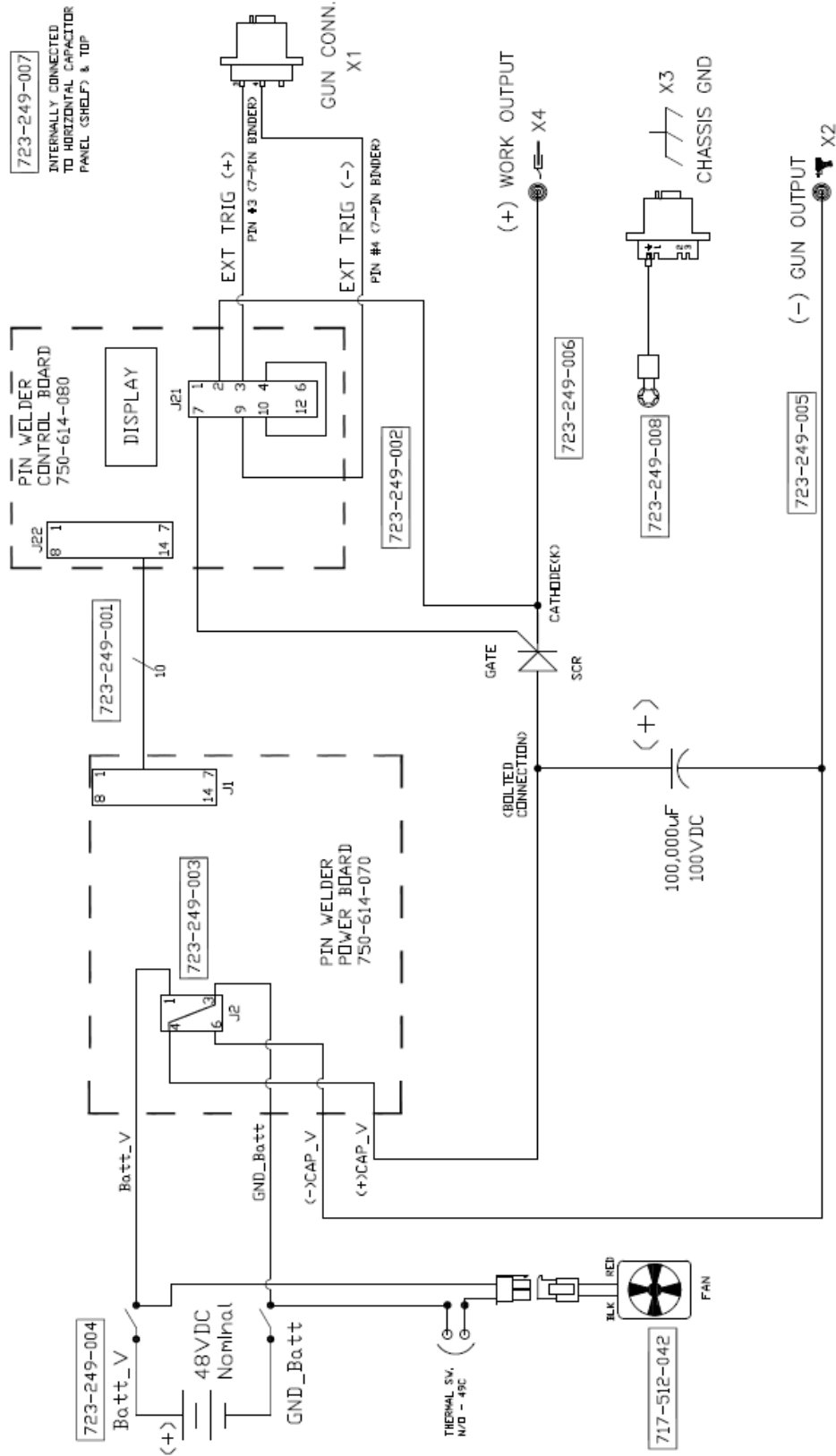
41	1	724-576-022	DECAL, CONTROL, NCD+ 500b	
42	1	724-576-023	DECAL, CONNECTOR, NCD+ 500b	
43	1	724-576-026	DECAL, RH COVER, NCD+ 500b	
44	1	724-576-025	DECAL, LH COVER, NCD+ 500b	
45	1	724-576-024	DECAL, RATING PLATE, NCD+ 500b	
46	1	724-576-028	DECAL, GENERAL WARNING	
47	1	724-576-027	DECAL, LH CHASSIS, NCD+ 500b	
48	3	724-485-010	LABEL, ELECTRICAL GROUND	
49	4	724-485-015	LABEL, HIGH VOLTAGE	
50	1	724-576-031	DECAL, DO NOT AIR SHIP	
51	1	724-576-015	LABEL, MADE IN USA	
52	1	724-576-032	LABEL, BATTERY CAUTION, PACKAGING	
53	2	729-114-024	SPACER, 1/4 X .166 X .75 ALUMINUM	
54	1	526-001-271	SPRING, CONICAL	
55	2	717-615-105	CABLE TIE, PUSH IN	
56	4	524-002-623	SCREW, #6-32 X 3/8 PHMS, THD. CUTT.	
57	6	524-002-624	SCREW, #10-32 X 3/4 PHMS THD. CUTT.	
58	10	524-002-625	SCREW, #8-32 X 3/8 PHMS THD. CUTT.	
59	22	524-005-363	WASHER, LOCK, #8 BLACK SS	
60	4	524-005-291	WASHER, FLAT, M5 SS	
61	4	524-005-304	WASHER, LOCK, M5 SS	
62	4	524-005-312	M6 X 35 HHCS	
63	20	524-005-364	WASHER, M4 FLAT, SS BLACK	
64	1	524-005-078	HEX NUT, M10 SS	
65	11	524-005-210	KEPS NUT, M4 SS	
66	1	524-002-622	WASHER, 3/8 FLAT, OVERSIZE	
67	8	524-005-120	WASHER, FLAT, M4 SS	
68	7	524-005-121	WASHER, LOCK, M4 SS	
69	5	524-005-271	SCREW, PHMS, M3 X 12, SS	
70	1	524-005-300	WASHER, M6 FLAT, SS	
71	3	524-005-314	SCREW, HHCS, M6 x 16 SS	
72	1	524-005-296	LOCKWASHER, M6 SS	
73	1	524-005-339	NUT, M6 SS	
74	2	524-001-309	WASHER, FLAT, 1/4"	
75	2	524-005-311	WASHER, BELLVILLE, M6 SS	
76	1	524-005-343	SCREW, M4 X 8 PHMS, SS	
77	1	750-614-316	BRACKET, EXT. MOUNTING, SCR	
78	4	524-005-365	SCREW, M4 X 6 FHSCS, BLACK SS	
79	4	524-005-366	SCREW, M4 X 10 FHSCS, BLACK SS	
80	2	524-002-626	SCREW, #10-32 X 3/8 W/LOCK, SS	
81	2	524-002-627	WASHER, #8 FLAT OS, BLACK SS	
82	26	524-005-362	SCREW, M4 X 12 PHMS BLACK, SS	
83	1	524-005-272	KEPS NUT, M3, SS	
84	2	524-005-008	SCREW, M4 X 10 SHCS	

85	6	524-005-315	SCREW, M5 X 10 FHHCS	
86	4	524-005-325	SCREW, M4 X 8 SHCS, SS	

*SPARE PARTS ARE INDICATED BY THE QUANTITIES LISTED IN THE **SPARE** COLUMN OF THE TABLE.

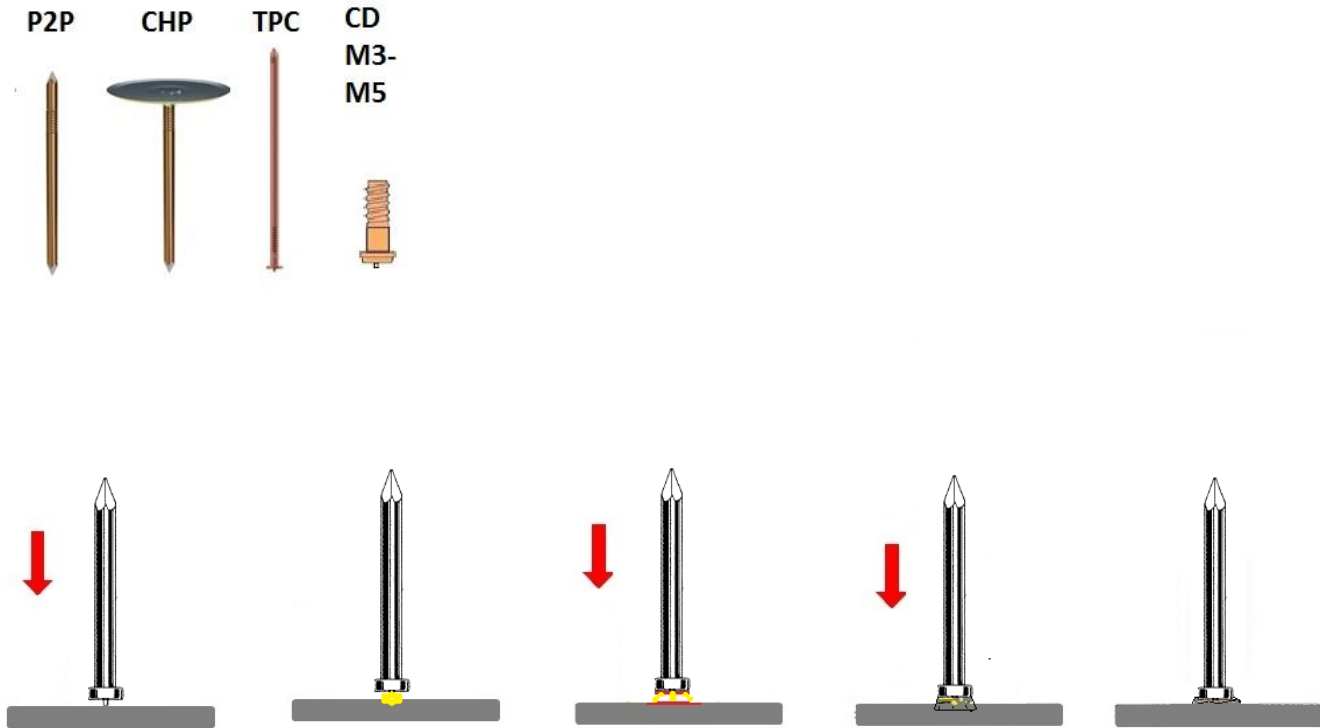


6 Wiring Diagram



7 Nelson NCD+ 500b Welding Modes

7.1 Contact Mode Capacitor Discharge Welding



1. Gun is loaded and properly positioned with the stud in contact with the work. Operator takes up the spring pressure.
 2. The trigger is closed the projection tip or point is flashed off leaving an arc space.
 3. The remaining stored energy is discharged across the arc space (Pin and base material are heated).
 4. The spring pressure plunges the pin into the work piece.
 5. The weld solidifies and connection is complete.
-

8 Contact Information

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<p>*Dallas 2211 Century Center Blvd. Suite 105 Irving, TX 75062 Phone: 972.721.9055 800.635.9353 Fax: 972.438.7883</p>	<p>*San Francisco 23765 Foley Street Hayward, CA 94545 510.293.0660 Phone: 800.635.9353 Fax: 510.293.0677</p>	<p>*Toronto 6199A Danville Rd. Mississauga, Ontario Canada L5T 2H7 Phone: 905.795.8277 800.635.9353 905.795.8275</p>	<p>*Los Angeles 20621B East Valley Blvd. Walnut, CA 91789-2731 Phone: 909.468.2105 800.635.9353 Fax: 909.468.2112</p>
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<p>Germany <i>Nelson Germany</i> Mailing Address Postfach 40-20 58272 Gevelsberg Germany Shipping Address Flurstrasse 7-19 58285 Gevelsberg Germany Phone: 49.2332.661.0 Fax: 49.2332.661.165</p>		<p>For Distributors in specific areas call: 440.329.0400</p> <p>General Offices 7900 West Ridge Rd. P.O. Box 4019 Elyria, OH 44036-2019 USA Phone: 440.329.0400 Fax: 440.329.0597 World Wide Web: NelsonStudWelding.com E-mail: Nelson.Sales@NelsonStud.com</p>	
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