

BW3000 AutoBoreWelder

OPERATION & MAINTENANCE MANUAL

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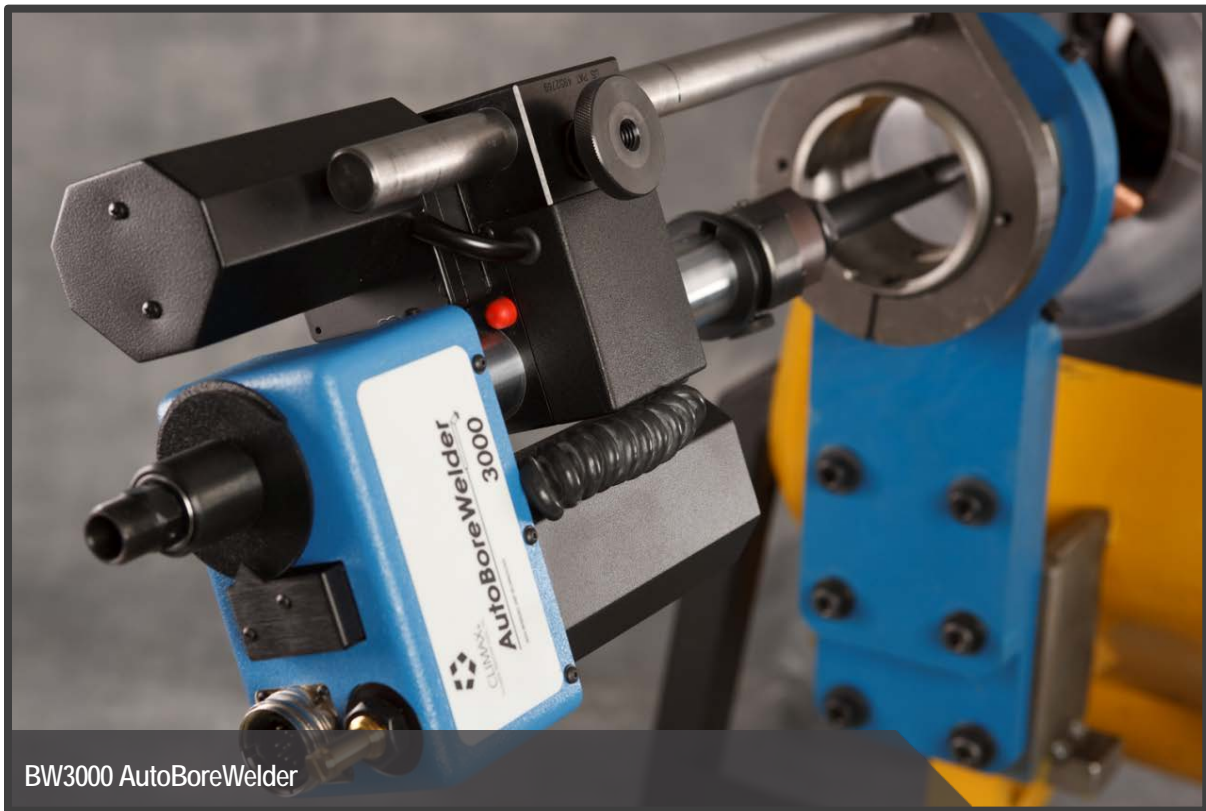



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	WARNING
	<p>For maximum safety and performance, read and understand the entire manual and all related safety instructions before using this equipment. Failure to follow the instructions and guidelines in this manual could cause personal injury, fatalities or property damage.</p>

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Safety Precautions

The primary challenge for most on-site maintenance is that repairs are often done under difficult conditions.

Climax Portable Machining and Welding Systems, Inc. leads the way in promoting the safe use of portable machine tools. Safety is a joint effort. As the operator of this machine, you are expected to do your part by scrutinizing the job site and closely following the operating procedures outlined in this manual, your own company rules, and local regulations.

General Safety Practices

QUALIFIED PERSONNEL!

Before operating this machine, you must receive training specific to this machine from a qualified trainer. If you are not familiar with the proper and safe operation, do not use the machine.

OBEY WARNING LABELS!

Obey all warnings and warning labels. Failure to follow instructions or heed warnings could result in injury, or even be fatal. Proper care is your responsibility. Contact Climax immediately for replacement of damaged or lost manuals or safety decals. 1-800-333-8311

INTENDED USE

Only use the machine according to the instructions in this operating manual. Do not use this machine for any purpose other than the intended use as described in this manual. When using the tools, machine, accessories and/or tool bits, you must determine the proper working conditions and the work to be performed.

STAY CLEAR OF MOVING PARTS!

Keep clear of the machine during operation. Never lean toward or reach into the machine to remove chips or to adjust the machine while it is running. Keep bystanders away while operating this machinery.

ROTATING MACHINERY

Rotating machinery can seriously injure an operator. Lock out all power sources before you interact with the machine.

KEEP YOUR WORK AREA CLEAN AND TIDY!

Keep all cords and hoses away from moving parts during operation. Do not clutter the area around the machine. Keep the work area clean and well lit.

AMBIENT LIGHTING

Do not operate this machine in ambient lighting that is less than normal intensity.

SECURE LOOSE CLOTHING AND LONG HAIR!

Rotating machinery can seriously injure an operator as well as others close by. Don't wear loose fitting clothing or jewelry. Tie back long hair or wear a hat.

HAZARDOUS ENVIRONMENTS

Do not use the machine in a hazardous environment, such as near explosive chemicals, flammable liquids, gasses, toxic fumes, or inappropriate radiation hazards.

HOSES, PENDANT AND ELECTRICAL CABLES

Do not abuse the pendant cable as this can damage the cable and pedant. Never use the cord for carrying, pulling or unplugging. Remove any and all kinks before straightening the cable. Keep cords and hoses away from heat, oil, sharp edges or moving parts. Plugs must match the outlet. Never modify the plugs in any way. Do not use an adapter plug with grounded power tools. Do not expose the machine to rain or wet conditions. Always examine hoses and cables for damage before use. Be cautious and never drop electrical equipment, this will damage the components.

REPETITIVE MOTION

Individuals can be susceptible to disorders of the hands and arms when exposed to tasks that involve highly repetitive motions and/or vibration.

STAY ALERT

Stay alert, watch what you are doing and use common sense when operating machinery. Do not operate machinery while you are tired or under the influence of drugs, alcohol or medication.

Machine Specific Safety Practices

All aspects of the machine have been designed with safety in mind. Rotating parts are not always shielded by machine components or by the work piece. Do not force the machine.

PERSONAL PROTECTIVE EQUIPMENT

Eye and hearing protection must be worn while using the machine. These safety items do not impose constraints to the safe operation of the machine.

OPERATING CONDITIONS

Do not operate the machine if it is not mounted to the work piece as described in this manual.

TOOLING

The machine is provided with all the tools for the setup and operation of the machine. Remove all adjustment tools before starting the machine.

LIFTING

Most of the machine components are heavy and must be moved or lifted with approved rigging and practices. Climax accepts no responsibility for the selection of lifting equipment. Always follow your plant's procedures for lifting heavy objects. Do not lift heavy objects by yourself as serious injury can result.

CUTTING TOOLS AND FLUIDS

There are no cutting or cooling fluids supplied with this machine. Keep cutting tools sharp and clean.

CONTROLS

The machine controls are designed to withstand the rigors of normal use and external factors. The on-off switches are clearly visible and identifiable. If hydraulic power supply failure occurs, be sure to turn off the supply before leaving the machine.

DANGER ZONE

The operator and other persons can be anywhere in the vicinity of the machine. The operator must ensure there are no other persons in danger from the machine.

METAL FRAGMENT HAZARD

The machine produces metallic fragments during normal operation. You should wear eye protection at all times when working with the machine. Only remove fragments with a brush after the machine has stopped completely.

HAZARDOUS ENVIRONMENTS

Do not use the machine in a hazardous environment, such as near explosive chemicals, toxic fumes, or a radiation hazard.

RADIATION HAZARDS

There are no systems or components on this machine that are capable of producing hazardous EMC, UV or other radiation hazards. The machine does not use lasers nor does it create hazardous materials such as gasses or dust.

ADJUSTMENTS AND MAINTENANCE

All adjustments, lubrication and maintenance should be done with the machine stopped, and locked out from all power sources. The shut-off valves should be locked and tagged out before performing any maintenance. Do not operate the machine if moving parts are misaligned, binding or broken. If the machine or parts are damaged, have the machine repaired before use.

WARNING LABELS

Warning labels are already attached to your machine. Contact Climax immediately if replacements are required.

MAINTENANCE

Be sure the machine components are free of debris and properly lubricated prior to use. Have your machine serviced by a qualified repair person using only identical replacement parts

NOISE LEVEL

85 dB(A) or higher – Hearing Protection is required.

STORED ENERGY

Hydraulic fluids could still be under pressure! Make sure the HPU is shut off and locked out properly.

MSDS

Material Data Safety Sheets are included in the maintenance manual.


UNINTENTIONAL STARTING


Prevent unintentional starting. The machine must be properly locked out and/or shut down before maintenance.


Safety Sign and Symbol Guidelines


The purpose of product safety signs and symbols is to increase the level of awareness to possible dangers.

Safety alert symbols indicate **DANGER**, **WARNING** or **CAUTION**. These symbols may be used in conjunction with other symbols or pictographs. Failure to obey safety warnings can result in serious injury or death. Always follow safety precautions to reduce the risk of hazards and serious injury.

	DANGER
	Indicates a hazardous situation that could be fatal or cause serious injury.

	WARNING
	Indicates a potentially hazardous situation that could be fatal or cause serious injury.

	CAUTION
	Indicates a potentially hazardous situation that could result in minor to moderate injury, damage to the machine or interruption of an important process.

	IMPORTANT
	Provides critical information for the completion of a task. There is no associated hazard to people or the machine.

	INFORMATION
	Provides important information regarding the machine.

Warranty Information

Climax warrants that all new machines are free from defects in materials and workmanship. This warranty is available to the original purchaser for a period of one year after delivery. If the original purchaser finds any defect in materials or workmanship within the warranty period, the original purchaser should contact its factory representative and return the entire machine, shipping prepaid, to the factory. Climax will, at its option, either repair or replace the defective machine at no charge and will return the machine with shipping prepaid.

Climax warrants that all parts are free from defects in materials and workmanship, and that all labor has been performed properly. This warranty is available to the customer purchasing parts or labor for a period of 90 days after delivery of the part or repaired machine or 180 days on used machines and components.

If the customer purchasing parts or labor finds any defect in materials or workmanship within the warranty period, the purchaser should contact its factory representative and return the part or repaired machine, shipping prepaid, to the factory. Climax will, at its option, either repair or replace the defective part and/ or correct any defect in the labor performed, both at no charge, and return the part or repaired machine shipping prepaid.

For quick and accurate service, please provide your factory representative with your name, shipping address and telephone number, the machine model, serial number, and date of purchase.

THESE WARRANTIES DO NOT APPLY TO THE FOLLOWING:

- Damage after the date of shipment not caused by defects in materials or workmanship.
- Damage caused by improper or inadequate machine maintenance.
- Damage caused by unauthorized machine modification or repair.
- Damage caused by machine abuse.
- Damage caused by using the machine beyond its rated capacity.

ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED AND EXCLUDED.

Be sure to review the terms and conditions of sale which appear on the reverse side of your invoice. Those provisions control and limit your rights with respect to the goods purchased from Climax.

DISCLAIMER

Climax Portable Machining & Welding Systems, Inc. (hereafter referred to as "Climax") provides the contents of this manual in good faith as a guideline to the operator. Climax cannot guarantee that the information contained in this manual is correct for applications other than the application described in this manual. Product specifications are subject to change without notice.

All trademarks mentioned in this manual or other documentation provided with your Climax product are trademarks or registered trademarks of their respective holders.

Introduction to the BW3000

The BW3000 BoreWelder is an automated bore welding system with the following features:

- Variable step control for extended weld coverage.
- Auto Skip for designating weld-only or skip-only areas.
- Auto Stop and Position Indicator Collar to set stop and restart points.
- Quick disconnect system for quick setup and takedown.
- Dedicated wire feeder.
- Remote control of the power supply.
- High current limit.
- Precise angle control.

This chapter contains important safety information and a description of the product, its features, its basic operation, and specifications. It also describes the parts of the BoreWelder.

Product Description and Basic Operation

The BW3000 BoreWelder is an automated welding device. It passes current, welding wire, and metal inert gas (MIG) to a torch that moves in both rotary and axial directions. As the torch moves, it deposits a continuous layer of metal (contiguous weld beads) around the bore's circumference to build up the surface. You can adjust the BoreWelder to differences in the bore diameter by selecting a different torch and/or adjusting the Offset Head.

In addition, the BoreWelder has an Auto Skip function. With this function, you can set up the BoreWelder to not weld a portion of the bore, such as a keyway, or to weld only a portion of the bore, such as a worn section.

When you are setting up the BoreWelder you must:


- Attach the BoreWelder to the part to be welded.
- Align the BoreWelder to the bore.
- Determine the proper torch/bore clearance.
- Make the initial control settings.

When you are welding, you must:

- Start and stop the machine.
- Make minor adjustments in the rotational speed, voltage, and wire speed to maintain good weld quality.

Safety

As you would with all welding processes, make sure that your skin and eyes are properly protected before using this equipment. Damage to the skin and eyes can result from *both direct and indirect exposure to arc rays*. Protect yourself and others accordingly.

	CAUTION
	<p>You must use protective eye wear, protective clothing, weld curtains, and shields when using the BoreWelder to protect yourself and others from eye and skin damage. Damage can result from both direct and indirect exposure to arc rays.</p>

Operators are responsible for protecting themselves and others when they are welding. Climax strongly recommends:

- The use of weld curtains and shields.
- Shade 3 sunglasses with side shields for operators.
- A handheld weld helmet for operators.

The handheld helmet is held between the process and the operator, allowing the operator to view the control box without raising a conventional helmet. It's also easier to inspect the process with a handheld helmet, as you can hold the helmet near the process without bumping into the BoreWelder or the part you're welding.

General Safety Precautions

- Set-up, maintenance, and operation of the BW3000 BoreWelder should be attempted by qualified individuals only.
- Alterations to this machine must not be made without written approval from Climax.
- Any parts needed for special applications, alterations, repair, or servicing must be approved in writing by Climax to avoid creating hazardous conditions.
- To ensure that nothing gets caught in rotating members, avoid wearing loose fitting clothing and keep hair back or in a cap when operating the machine.
- Turn off the input power before changing torches or working on the machine.
- Read and follow all instructions for the power supply unit you have chosen to use with the BoreWelder.

Welding Safety Precautions

- The operator and any personnel observing the machine when in use must use a protective shield with a filter and cover plates that conform to ANSI Z87.1 standards.
- The operator needs protective clothing, such as heavy shirts and cuffless pants made of a durable flame-resistant material for protection from sparks and flame. Other personnel in the area need to be protected from the arc rays by a screen and/or a warning not to watch or otherwise expose themselves to the rays or to any hot spatter.
- Practice good housekeeping in the area around the BoreWelder.
- Keep combustibles or any other fire hazards well away from the work area. For in-shop use, have a fire extinguisher readily available.

Risk assessment checklist

Use these checklists as part of your on-site risk assessment and include any additional considerations that may pertain to your specific application.

Table 1. Risk assessment checklist before set-up

- I took note of all the warning labels on the machine.
 - I removed or mitigated all identified risks (such as tripping, cutting, crushing, entanglement, shearing, or falling objects).
 - I considered the need for personnel safety guarding and installed any necessary guards.
 - I read the machine assembly instructions and took inventory of all the items required but not supplied.
 - I created a lift plan, including identifying the proper rigging, for each of the setup lifts required during the setup of the support structure and machine.
 - I located the fall paths involved in lifting and rigging operations. I have taken precautions to keep workers away from the identified fall path.
 - I considered how this machine operates and the best placement for the controls, cabling, and the operator.
 - I evaluated and mitigated any other potential risks specific to my work area.
-

Table 2. Risk assessment checklist after set-up

- I checked that the machine is safely installed (according to the Setup section) and the potential fall path is clear. If the machine is elevated, I checked that the machine is safeguarded against falling.
- I identified all possible pinch points, such as those caused by rotating parts, and informed the affected personnel.
- I planned for containment of any chips or swarf produced by the machine.
I followed the Maintenance Intervals with the recommended lubricants.
- I checked that all affected personnel have the recommended personal protective equipment, as well as any equipment required by the site or other regulations.
- I checked that all affected personnel understand the danger zone and are clear of it.
- I evaluated and mitigated any other potential risks specific to my work area.

Product Features

Patented “Step” Process

- Complete weld coverage at the start and finish of the bore.
- Infinite step size (and weld bead) adjustment from 0.025 inch (0.6 mm) to 0.220 inch (5.6 mm).
- Ability to step in either direction.
- Adjustable step location.

Auto Skip

- Ability to designate weld-only or skip-weld areas up to 180 degrees.
- Automatic skipping of keyways and intersecting bores.
- Automatic repair of out of round bores without pre-machining.
- Reduced repair, machining, and pre-machining time.
- Lower consumable and labor costs.
- Elimination of re-welding by skipping good sections of the bore.

Auto Stop and Position Marker

- The Auto Stop function lets you set a stop point so that the BoreWelder stops when the bore is complete.
- The Position Marker recalls the last stop point.

Control Box

- When a Climax wire feeder is used, the control box provides:
- One central location for adjusting all BoreWelder functions.
- Remote control of the welding power supply.

Patented Torch and Extension System

- Quick disconnect system with a captive liner allowing for fast setup and takedown.
- Easy replacement of consumables without moving the BoreWelder.
- Quick readjustment for bores longer than the stroke of the machine.

175 Amp Current Limit

- Extended arc time for high productivity.
- Up to 5 pounds per hour of weld deposition.

Specifications

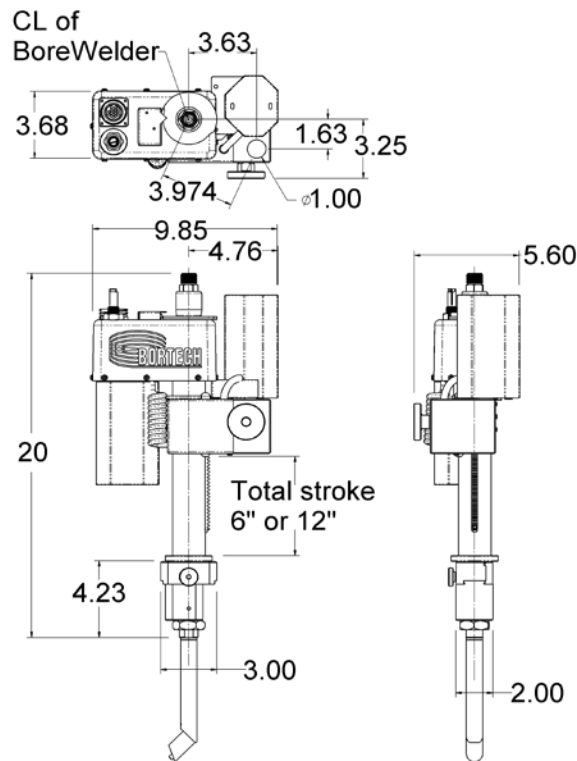


Table 3. BW3000 BoreWelder Specifications (6-inch Stroke Model)

<i>Specification</i>	<i>Description</i>
WELDING PROCESS	Metal inert gas (MIG)
WIRE DIAMETER RANGE	0.023 to 0.045 inch (0.6 to 1 mm)
BUILDUP DIAMETER RANGES (STANDARD MODEL)	Bore: 0.88 to 27 inches (22 to 686 mm) Outside: 0.88 to 14 inches (22 to 356 mm) Face: 0.88 to 20 inches (22 to 508 mm)
UNSUPPORTED TORCH REACH IN VERTICAL AXIS	60 inches (1.5 meter)
LENGTH OF STROKE	6 inches (152 mm) and 12 inches (305 mm)
STEP RANGE	0.025 to 0.200 inch (0.6 to 5 mm)
MAXIMUM CONTINUOUS WELDING CURRENT	175 A
WELDING POWER REQUIRED	Constant voltage (CV) 200 A minimum 100% duty cycle
CONTROL BOX POWER REQUIREMENTS	100 to 120 VAC, 5 A, 60/50 Hz
REMOTE VOLTAGE AND CONTACTOR CONTROL	10 K ohm potentiometer and dry contact
TYPICAL WELD VOLTAGE OPERATING RANGE (SHORT ARC/0.035 WIRE)	16 to 17.5 V
COMPONENT WEIGHTS	BoreWelder: 6 in. (152 mm) stroke, 22 lb. (9.4 kg) Control Box: 18 lb. (8.10 kg) Wirefeeder: 32 lb. (14.40 kg)

Major Assemblies

BoreWelder

The BoreWelder provides the circular and axial motion needed to build up a bore. It also provides for the rotational passage of current, welding wire, and shielding gas to the welding torch. The figure below shows the BW3000 BoreWelder and its major assemblies, including the control box, wirefeeder, and adjustable base.

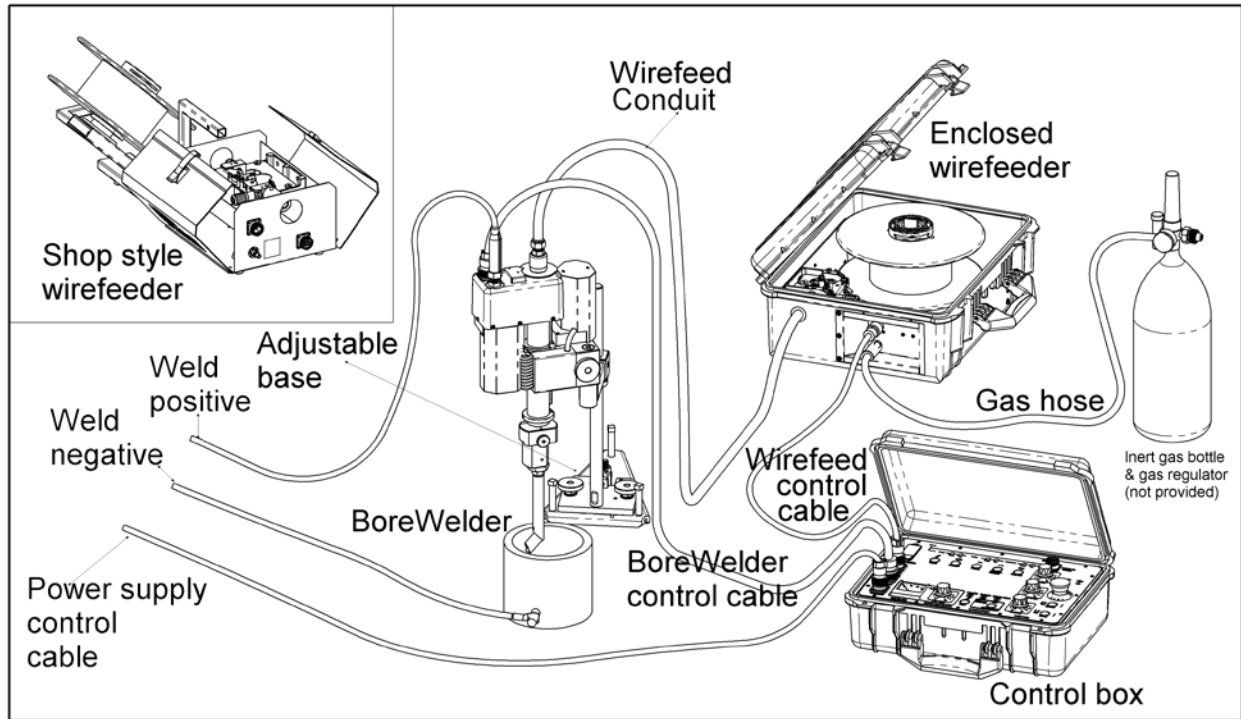


Figure 1. BoreWelder and Major Assemblies

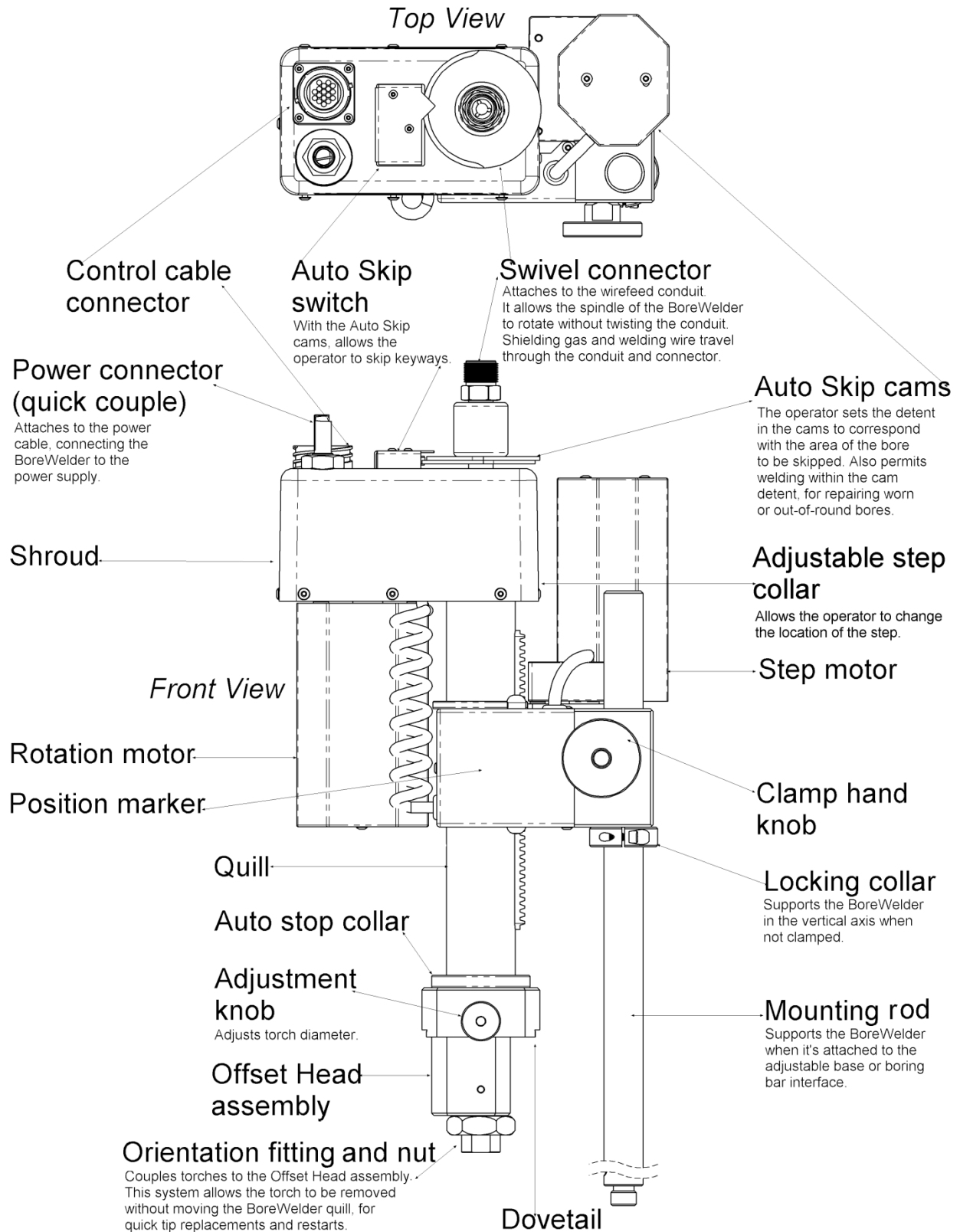


Figure 2. Parts of the BoreWelder

Control Box

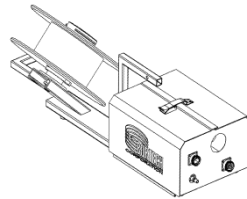
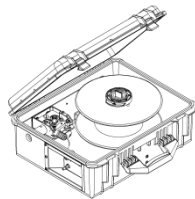
The control box controls all the welding functions. It contains the motor controllers for the wirefeeder step and rotation, plus relays for gas solenoid and power supply contactor control. Four potentiometers allow you to adjust rotation speed, wire speed, step size, and weld voltage.



Control Cables. These cables connect the control box to the BoreWelder, wirefeeder, welding power supply, and the 100 to 120V AC power.

Wirefeeder

The wirefeeder supports a standard 12 inch (305 mm) roll. The four-roll assembly and shielding gas solenoid are operated by the control box. wirefeeders may be enclosed (below left) or shop style (below right).



Wirefeed Conduit. The wirefeed conduit allows passage of wire and shielding gas from the wirefeeder to the BoreWelder. It's available in 2, 3, 4, 5, 10, and 15-foot lengths (0.6, 0.9, 1.2, 1.5, 3, and 4.6 meters).

Gas Hose. The gas hose connects the shielding gas (inert gas) regulator to the wirefeeder.

Adjustable Base

The adjustable base enables quick setup and provides support for the BoreWelder while also allowing you to adjust parallelism and centering. The jack screws help keep the BoreWelder parallel to the bore; the slider permits one axis of fine centering adjustments. The mounting rod supports the BoreWelder.

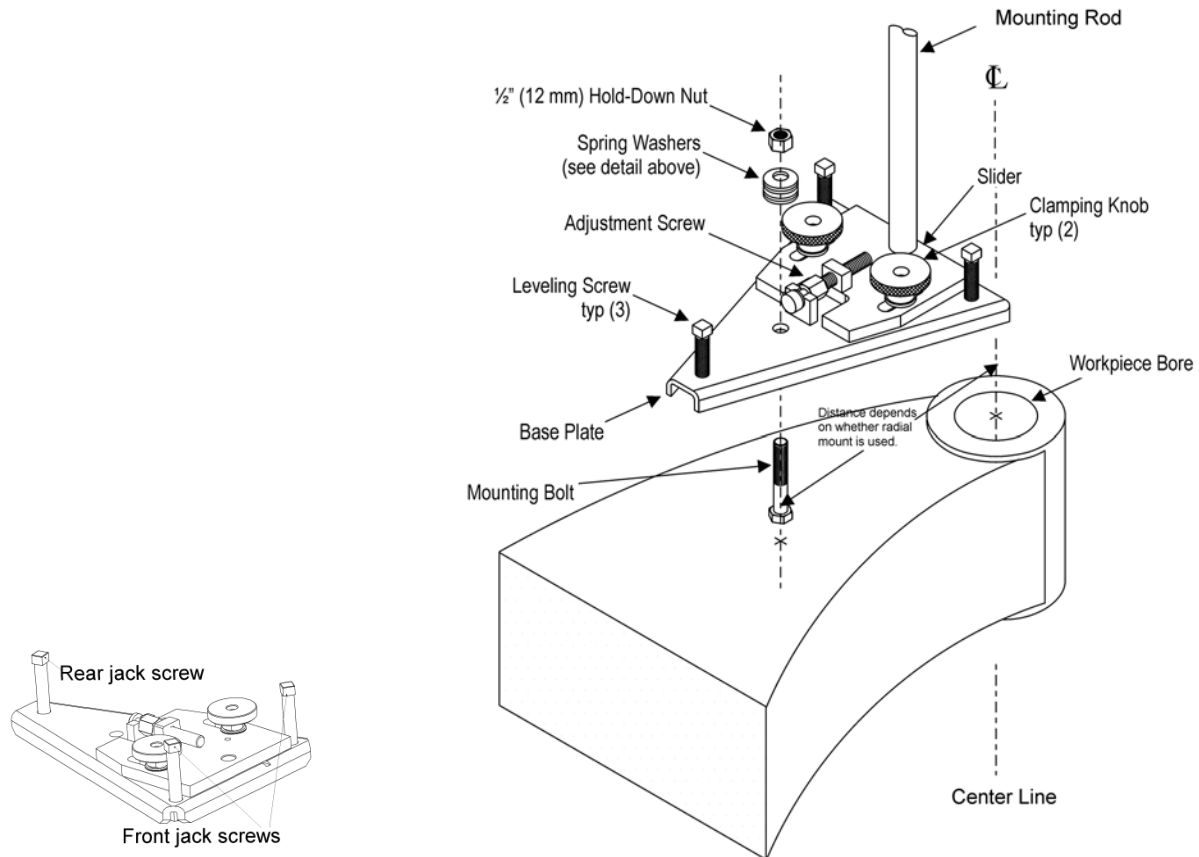
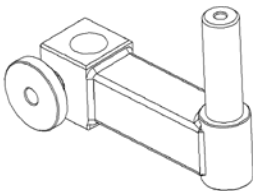


Figure 3. Adjustable Base & Mounting Hardware

Radial Mount. The radial mount is used to extend the distance of the BoreWelder from the mounting rod to the bore being welded. It's also used to help center the BoreWelder.

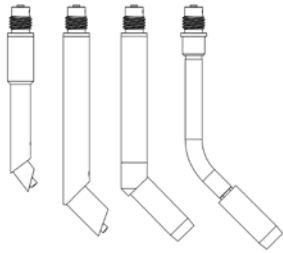


Locking Collar. The locking collar, installed on the mounting rod, prevents the BoreWelder from sliding down the mounting rod when the bore axis is vertical.

Torches

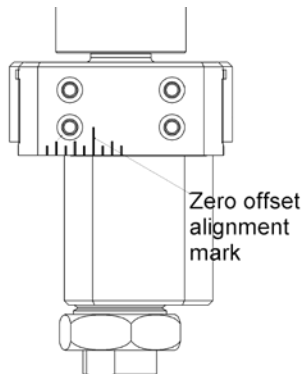
The torches attach to the Offset Head assembly using the Orientation Fitting. Torches are available to let you weld holes from 0.5 to 56 inches (13 to 1422 mm) in diameter.

Torch Extensions. Torch extensions allow the torch to enter into deep or remotely located holes. The extensions come in 3-inch, 6-inch, 12-inch, and 18-inch lengths (76, 152, 305, and 457 mm). The extensions can also be used as an indicator for setting the BoreWelder parallel to the bore.



Offset Head Assembly

The Offset Head lets you change the torch diameter without changing the torch angle. By allowing you to slide the torch and change its orientation, the Offset Head Assembly adjusts the torch's diameter range up to 3 inches (76 mm).



Carrying Case

The BoreWelder comes with an all-weather case that has a customized interior to protect your BoreWelder during storage or transportation.

Power Supply

To use the full potential of the BW3000 BoreWelder, you should use a power supply that generates a continuous welding current of 200 amps. The power supply must be a constant voltage (CV) supply and should be fitted with a remote voltage control receptacle.

The BW3000 comes equipped with a power supply control cable that interfaces the control box and the power supply.

The power cable (#2 welding cable) transmits welding current from the power supply to the BoreWelder.


Getting Started with the BW3000

This chapter presents procedures for setting up your BW3000 BoreWelder including additional tools and equipment needed for setup. It explains:

- The contents of the carrying case.
- The type of mounting system used.
- Attaching the BoreWelder to the part to be welded.
- Attaching the control box.
- Adjusting parallelism using the torch extension as a guide.
- Centering with the torch extension (coarse center).
- Installing a welding torch and setting the clearance.
- Fine centering with the adjustable base.
- Understanding the boring bar interface.
- Adjusting the reach.
- Attaching the wirefeed conduit and loading wire.
- Attaching the weld cables and gas hose.
- Setting the axial and rotational start positions.


Inspection for in-shipment damage


- Upon receiving your machine inspect the containers for shipping damage.
- Open the containers and inspect the machine for shipping damage.
- Check the items you received against the items listed on the invoice.

	IMPORTANT
	Contact Climax immediately at 1-800-333-8311 concerning damaged or missing components.

Unpacking instructions

- When unpacking the machine, take care not to drop or damage the components.
- Use lifting eyes or slings to lift the components out of the shipping crate.
- Save the shipping crate to store the machine when not in use.

	CAUTION
	The containers are designed to be lifted only with the provided lifting points and with the container fully closed. DO NOT LIFT with the container covers removed.

	INFORMATION
<p>Surfaces subject to corrosion were sprayed with a rust preventative prior to shipment (and possibly wrapped in oil impregnated paper). The user should exercise caution while handling the components provided since they may be greasy and/or slippery.</p>	

Additional Required Tools and Equipment

The following list describes the minimum additional tools required to complete a job. These tools are *not* provided with the BoreWelder.

- Hand-held welding helmet, shade #9.
- Safety glasses with side shields, shade #3.
- Diagonal cutters.
- Adjustable wrench.
- Stopwatch or wristwatch with second hand.
- Shielding gas regulator.
- Shielding gas (for mild steel, Climax recommends mixtures of 75% argon/25% carbon dioxide for welding in the horizontal axis and 92% argon/8% carbon dioxide for welding in the vertical axis).
- Welding wire (this chapter assumes the use of ER-70S-6).
- Negative cable and “C” type clamp to connect the power supply to the work piece.
- Stick electrode holder and stick welding rod.
- Weld power supply CC/CV 300 amp.

Contents of the Carrying Case

The all-weather case protects the BoreWelder while giving you quick access to the equipment. From the top tray, remove the control box, cables, gas hose, and isolator pad. From the bottom tray, remove the adjustable base, mounting rod, radial mount, locking collar, 1/2-13x3 inch bolt, nut, and four spring washers.

Mounting System (When Not Using the Boring Bar Interface)

A 1/2-13x3 inch bolt attaches the BoreWelder adjustable base to the part being welded. First, you must weld the bolt to the part. Climax recommends stick welding, which provides quick setup and reliable performance in rough environments. The optional A-1086 stick electrode holder fits quickly into the A-1097 positive weld cable to allow stick welding. After the bolt is welded to the part, you secure the adjustable base to it as described later.

Setting Up the BW3000

Attaching the BW3000 using the Adjustable Base.

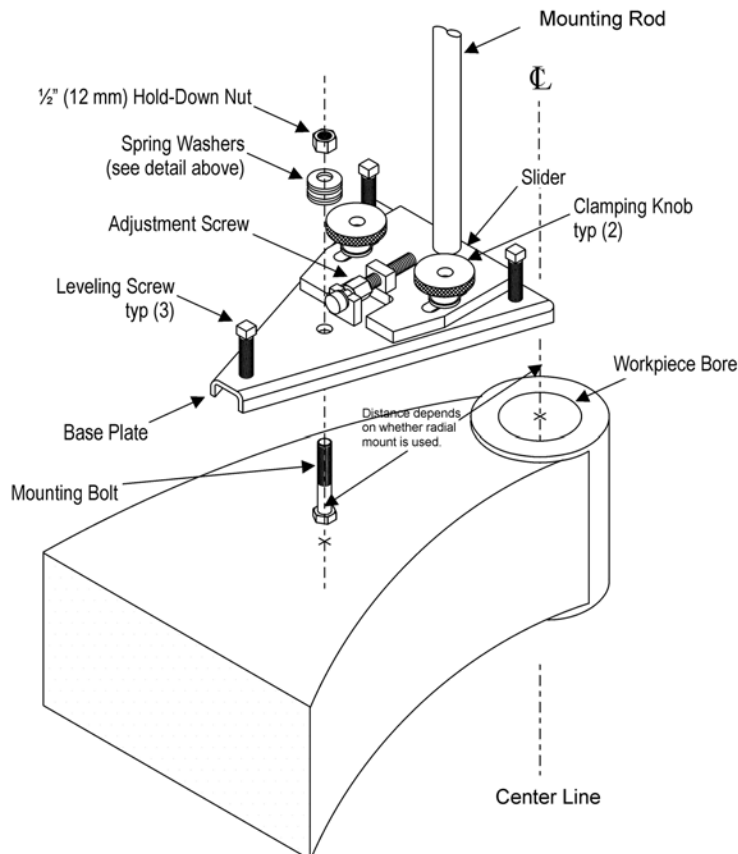
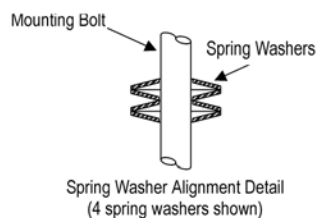


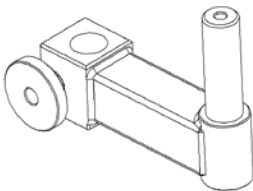
Figure 4. Attaching BoreWelder Using Adjustable Base

1. If you are using a radial mount, weld the 1/2-13x3 inch mounting bolt to a spot approximately 14 inches (36 mm) from the center of the bore to be built up (the workpiece bore).
2. If you aren't using a radial mount, weld the mounting bolt to a spot approximately 11 inches (28 mm) from the center of the bore.
3. Place the adjustable base plate over the mounting bolt as shown in the figure above.
4. Secure the adjustable base to the part by installing the four spring washers and nut (see below). Tighten the nut one-half turn past finger tight with the 3/4 wrench provided.



The spring washers maintain consistent pressure on the leveling screws while you adjust the parallelism.

1. Screw the mounting rod into the slider hole and tighten firmly. Torque to 15 foot pounds (2 kg-m).
2. Install the locking collar (10140) 8 inches from the top of the mounting rod. This sets the height of the BoreWelder and prevents the equipment from inadvertently sliding down the mounting rod.
3. If you are using a radial mount (A-1023) (see below), install it over mounting rod.
4. Slip the BoreWelder over the radial mount.
5. Move the BoreWelder and radial mount to bring the Offset Head directly over the bore to be welded.

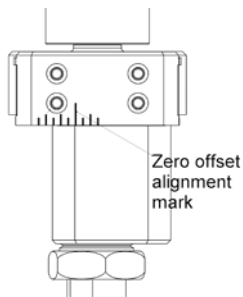


Attaching the Control Box

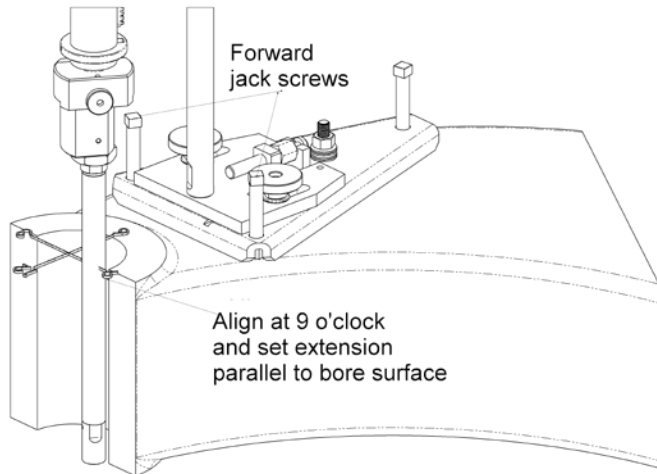
1. Connect the control cables as shown on Figure 1.
 - Wirefeeder control cable.
 - BoreWelder control cable.
 - Power supply control cable.
2. Connect the AC power cable to 115 VAC 60 Hz with ground.
3. Switch the POWER switch on the front panel of the control box to the ON position to ensure operation. In the normal power up cycle, the LEDs on the control box flash three times, and then only the red LED and the arc interrupt blue LED stay lit. If the control cables aren't plugged in, the LEDs continue to flash.

Adjusting Parallelism Using the Torch Extension as a Guide

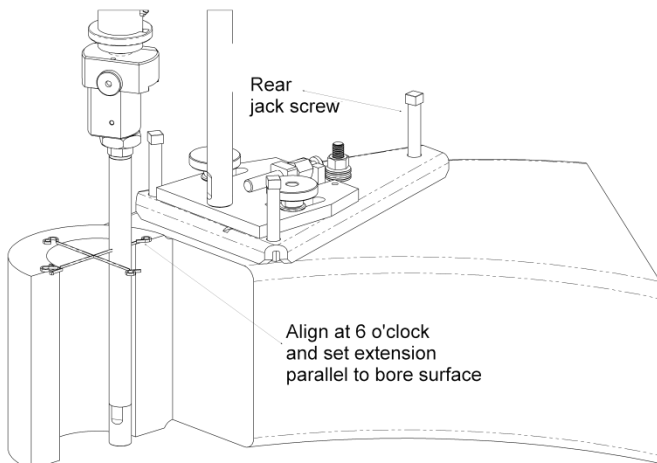
1. Set the Offset Head assembly to zero offset by lining up the large hash mark on the side plate with the edge of the offset side (shown below).



2. To adjust parallelism, install an extension into the Orientation Fitting, long enough to project through the bore to be welded. Move the BoreWelder left or right until the attached extension nears the bore surface at the 3 o'clock or 9 o'clock position. Adjust the forward jack screws on the adjustable base (see below) as necessary to make the extension parallel to the bore.



3. Move the BoreWelder forward or back until the attached extension nears the bore surface at the 6 o'clock or 12 o'clock position. Adjust the rear jack screw as needed to make the extension parallel to the bore.



Centering the BoreWelder with the Torch Extension (Coarse Center)


1. Make slight adjustments to the BoreWelder and radial mount to move the attached extension to the center of bore. Estimate the center by eye or measure with a scale.
2. Lock the BoreWelder to the radial mount by tightening the clamp knob on the BoreWelder (15 ft/lb. maximum torque).
3. Lightly tighten the radial mount clamp knob to the mounting rod.
4. Remove the extension from the Orientation Fitting.

Installing a Welding Torch and Setting the Clearance

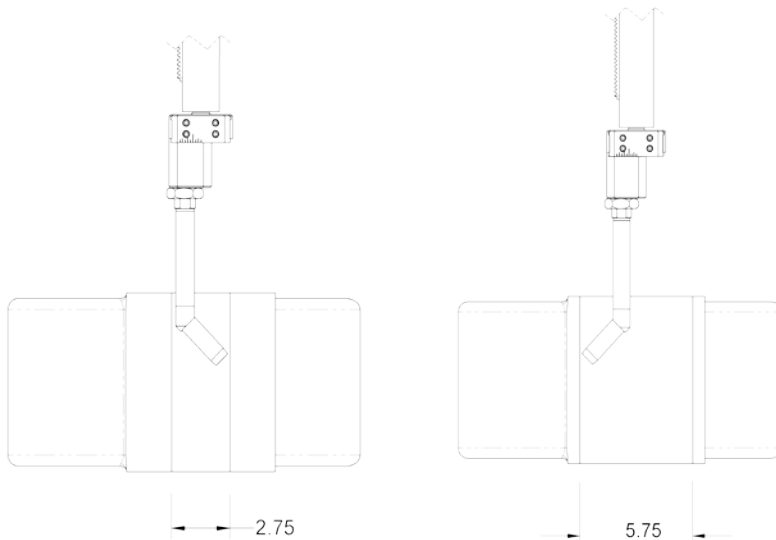
1. Select the appropriate torch for your project according to Table 4.


Table 4. Available Torches


TORCH USED	TORCH WITH STANDARD DIFFUSER BORE SIZES IN INCHES (MM)		TORCH WITH 52FN DIFFUSER BORE SIZES IN INCHES (MM)	
	00	0.875–1.75	(22–44)	—
0	1.75–3	(44–76)	—	
1	2.75–5.5	(70–140)	4.25–7.00	(108–178)
2	4.5–7.5	(114–191)	6.00–9.00	(152–229)
3	6–9	(152–229)	7.5–10.5	(191–267)
4	8–11	(203–279)	9.5–12.5	(241–318)
5	10–13	(254–330)	11.5–14.5	(292–368)
6	12–15	(305–381)	13.5–16.5	(343–419)
7	14–17	(356–432)	15.5–18.5	(394–470)
8	16–19	(406–483)	17.5–20.5	(445–521)
9	18–21	(457–533)	19.5–22.5	(495–572)
10	20–23	(508–584)	21.5–24.5	(546–622)
11	22–25	(559–635)	23.5–26.5	(597–673)
12	24–27	(610–686)	25.5–28.5	(648–724)

	WARNING
	<p>Rotating machinery can cause serious injury to the operator and bystanders. Turn off and lock out the machine before making the pre-start checks. When operating the machine, always be aware of the location of all people in the vicinity of the machine.</p>

2. Attach the torch (and extensions, if needed) to the BoreWelder Orientation Fitting and secure the torch in position with the 1.5 inch (38 mm) Orientation Nut, as shown in the figure below.




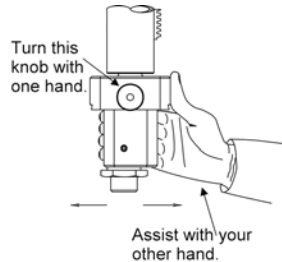
	IMPORTANT
	<p>Climax recommends that you remove the Orientation Fitting from the Offset Head when changing torches. Spinning the Orientation Fitting onto the torch is easier than rotating the torch into the Orientation Fitting when the fitting is fixed to the head.</p>

	CAUTION
	<p>Never use a wrench or pliers to adjust the knob on the Offset Head. A wrench or pliers could damage the equipment.</p>

The range of the torch changes depending on which side of the offset head the torch is oriented toward.

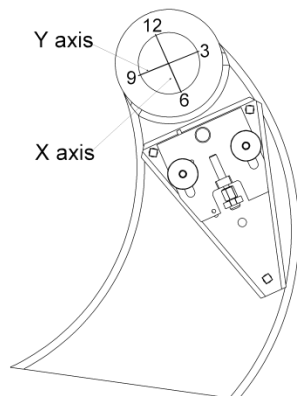
3. Align the torch to the Offset Head dovetail travel. Using the adjustment knob on the Offset Head, shift the offset of the torch to adjust the diameter range. If the torch doesn't fit the bore as shown in the figure, turn the torch and Orientation Fitting clockwise 180 degrees in the slide. Then re-adjust the Offset Head to its opposite extreme to change the range of the torch.
4. Use the adjustment knob on the Offset Head to adjust the torch clearance to 1/4 inch (6 mm) from nozzle to bore surface.

	INFORMATION
<p>Turn the adjustment knob with one hand while helping the slide along with the thumb and finger of your other hand.</p>	



Fine Centering with the Adjustable Base

To center the BoreWelder to the bore, you must work in two axes, one after the other (we'll refer to them as X and Y for this discussion). The adjustable base lets you adjust the X-axis using a slide and lead screw arrangement and adjust the Y-axis by pivoting from the mounting rod. For the purposes of this discussion, assume the adjustable base is pointing in the 6 o'clock position when viewed from the top.



1. Press the ROTATE JOG button or manually rotate the Offset Head to rotate the torch from the 6 o'clock position (Point A) to the 12 o'clock position (Point B). Make a mental note of the distance from the torch nozzle to the bore surface at these positions.
2. Turn the adjustment screw on the adjustable base to center the torch between Points A and B. Move the screw clockwise to move the slider away from the base and counterclockwise to move the slider toward the base. Accuracy within 1/16 inch (1.6 mm) is sufficient for most applications.
3. Press the ROTATE JOG button or manually rotate the Offset Head to rotate the torch from the 3 o'clock position (Point C) to the 9 o'clock position (Point D). Make a mental note of the distance from the torch nozzle to the bore surface at these positions.
4. Loosen the radial mount clamp knob and pivot on the mounting rod to center the torch between Points C and D. Accuracy within 1/16 inch (1.6 mm) is sufficient for most applications.

5. Lock the radial mount clamp knob (15 ft/lb. maximum torque) to prevent movement of the BoreWelder and subsequent loss of centering.

Understanding the Boring Bar Interface

A boring bar interface may be used instead of the Climax adjustable base (for full details, please consult the operating manual from the boring bar manufacturer).

When using a boring bar interface in the horizontal axis, it's helpful to position the interface so the mounting rod is above the hole to be welded. This will ease centering adjustments since the BoreWelder will be hanging from the mounting rod.

Centrality adjustment is normally limited to one axis: the Y or swing axis from the mounting rod. The instructions above explain how to center on the Y axis.

In most cases the boring bar interface eliminates the need for parallelism adjustment, since the interface is trued to the boring bar and, consequently, the bore. In situations where parallelism is inaccurate, please refer to your boring bar manual for adjustment information or contact Climax directly.

Adjusting the Reach

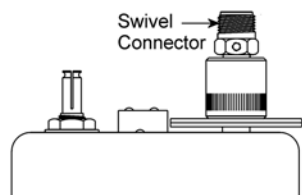
The BoreWelder should be positioned on the mounting rod so that the axial torch travel will reach the beginning and end of the bore (if the bore is shorter than the stroke of the BoreWelder). You have two options for positioning the BoreWelder.

Option 1: Add or remove extensions to change the reach without moving the BoreWelder on the mounting rod.

Option 2: Slide the BoreWelder up or down the mounting rod.

Attaching the Wirefeed Conduit and Loading Wire

1. Attach the BoreWelder end of the wirefeed conduit to the swivel connector located at the top of the BoreWelder by engaging the attachment nut. Tighten by hand only, as the seal is obtained with an O-ring.



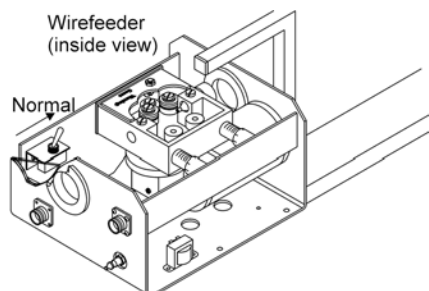
2. Open the wirefeeder case.
3. Loosen the thumb screw of the feeder conduit fitting.

INFORMATION



If the wire does not feed freely: (a) Especially with the #00 and #0 torch, you may need to momentarily increase the feed roll pressure by squeezing the roll down and forcing the feed wire through the bent tip. Apply pressure by hand only. (b) In other cases (not with the #0 and #00 torches), the wire gets caught at the “funnel” entrance of the contact tip. Stop pressing the WIRE JOG switch. Instead, turn the spindle a revolution or two. You’ll hear a snap as the wire works its way into the contact hole. Now press the WIRE JOG switch. The wire will pass freely through the torch.

4. Attach the wirefeeder end of the wirefeed conduit by inserting the end into the feeder conduit fitting to a positive stop.
5. Secure the feeder conduit fitting with the thumb screw.
6. Place the roll of wire on the spool holder so that the wire will feed from the *bottom* of the roll. Straighten about 6 inches (152 mm) of wire at the end of the roll to prepare for feeding.
7. If your wirefeeder is equipped with the push/pull option, place the toggle switch in the normal position before you go through the following steps.




8. Disengage the pressure rolls on the wirefeeder by flipping the lever(s) off the pressure roll arm.
9. Thread the wire into the feed mechanism inlet guide. Push the wire past the feed rolls and into the conduit fitting.
10. Engage the feed roll pressure lever(s).
11. Make sure the control box is ON, and press the WIRE JOG switch. The wire will be pushed through the wirefeed conduit and the BoreWelder and on to the torch.

Attaching the Weld Cables and Gas Hose

Refer to Figure 1 on page 12.


1. Attach one end of the positive weld cable to the BoreWelder quick connect, and the other end to the power supply.

2. Attach the negative weld cable to the part to be welded. The ground clamp should be attached to clean, bare metal, and be located near the bore being welded.
3. Attach one end of the gas hose to a regulated source of shielding gas, and the other end to the quick connect at the wirefeeder.
4. On the control box, press the PURGE button to check the gas flow rate and clear the system of unwanted gases. A flow of 35 cfh (1 m³/hour) is good.

	CAUTION
	<p>Always use #2 weld cable. Do not use a larger size to get a higher current capacity. Higher currents will damage the BoreWelder. Make sure you have a good ground. Poor ground leads to poor arc quality, poor arc stability, and increased risk of electrical shock.</p>

Setting the Axial and Rotational Start Positions

1. To set the axial start position, jog the torch along its long axis until the nozzle is positioned properly to start welding at the end of the hole farthest from the BoreWelder. Typically, the wire is 1/16 to 1/8 inch (1.6 to 3.2 mm) from the end. Welding always progresses toward the BoreWelder.
2. To set the rotation start position, push and hold the ROTATION INITIALIZE button on the control box until the torch stops rotating. This will be the rotation starting position for the weld. Starting here ensures a complete revolution of the torch before the step occurs, thereby providing complete buildup at the very end of the hole.
3. To change the rotation initialize point, reach into the square hole on the side of the red shroud and turn the knurled adjustable step collar to the desired location.

	INFORMATION
	<p>If you are welding horizontally, be sure to retract the starting point to remove backlash from the gear train.</p> <p>After the step point is reached, feed a foot or so of wire out of the torch, removing twisted wire from inside the BoreWelder.</p> <p>Do Not adjust the step collar while the machine is welding.</p>

Operating the BW3000

This chapter presents procedures for welding with your BW3000 BoreWelder:

- Understanding the control box.
- Choosing the control settings (including rotation speed, wire speed, step, arc voltage, and shielding gas flow rate).
- Pre-weld checklist.
- Starting, stopping, and interrupting the weld process.
- Using Auto Skip.
- Using Pie Mode and Carriage Return.
- Welding pointers.
- Welding in the horizontal axis.

Understanding the Control Box

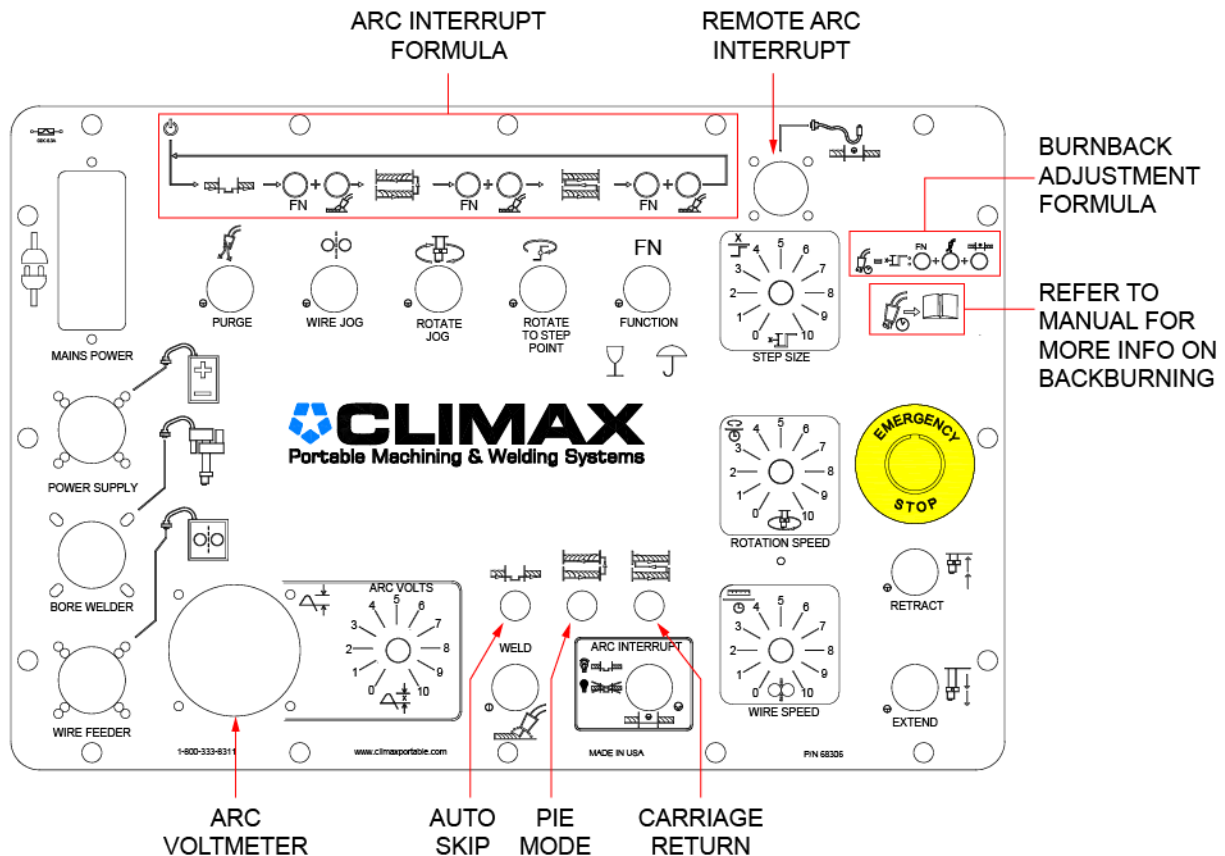


Figure 5. Control Box Panel

Table 5. Control panel definitions

	Button	Purpose	Result with Function key
Buttons	FUNCTION	Access the second function of a button	NA
	PURGE	Purge shielding gas	NA
	WIRE JOG	Jog wire at the speed set by the WIRE SPEED dial	Retract wire
	ROTATE JOG	Rotate the spindle at the speed set by the ROTATION SPEED dial	Reverse the direction of rotation
	ROTATE TO STEP POINT	Rotate the spindle to the step point (start point)	Cycle step
	RETRACT	Jog the quill/spindle/torch away from the bore	Toggle step enable
	EXTEND	Jog the quill/spindle/torch towards the bore	Reverse step
	WELD	Start or stop welding. <i>Follow all safety instructions!</i>	Cycle through AUTO SKIP, PIE MODE, and carriage return Note: When AUTO SKIP is on, the ARC INTERRUPT light is blue.
	ARC INTERRUPT	Briefly stop welding, but maintain the motion of the BoreWelder	Disable AUTO SKIP Note: When AUTO SKIP is off, the ARC INTERRUPT light is off.
	EMERGENCY STOP	Disconnect the mains power	NA
Knobs	STEP SIZE	Sets the step size between 0.025–0.220 in. (0.6–5.6 mm)	
	ROTATION SPEED	Sets the rotation speed between 0.875–28 in. (22–711 mm) diameter bores	
	WIRE SPEED	Sets the wire speed between 0.5–750 IPM	
	ARC VOLTS	Remotely controls the power supply arc voltage	
Lights	AUTO SKIP	Red when AUTO SKIP is on	
	PIE MODE	Blue when PIE MODE is on	
	CARRIAGE RETURN	Green when CARRIAGE RETURN is on	
Meter	Arc Voltmeter	Reads the arc voltage at the BoreWelder head	
Accessory	Remote arc interrupt	An accessory cable may be purchased and connected to this control to remotely stop the welding process at any time. Although the weld operation will stop, the welding head will continue to rotate.	
Formulas	Burnback adjustment formula	Burnback = step size + Function + purge + arc interrupt Note: Adjusting burnback will change the amount of time the power supply continues to feed current into the weld wire after the wire has stopped feeding. <ul style="list-style-type: none"> • 0 on the step dial is zero burnback, which results in the wire stuck to the base material. • 10 is maximum burnback, which results in the wire burning back into the welding tip. • 2.5 on the step dial is usually an optimal burnback setting. 	

Choosing the Control Settings

Setting Rotation Speed Using Travel Speed and SPR

Understanding Rotation Speed. Rotation speed is how fast the spindle of the BoreWelder is turning. Spindle speeds for the BoreWelder are so slow that they are measured in seconds per rotation (SPR), rather than revolutions per minute (RPM).

Understanding Travel Speed. Travel speed describes the speed at which the torch travels along the surface of the part being welded. The unit of measurement is inches per minute (IPM). Typical travel speeds for MIG borewelding are between 18 and 22 IPM.

When the rotation speed is correctly set, the relationship between wire speed and step remains almost unchanged through a wide range of applications. This reduction of variables is important to the success and speed of completion of a weld.

Estimating Rotation Speed (SPR). As a rule of thumb, in a 1 inch diameter bore, at 20 IPM travel speed, the SPR is 10 seconds. For every inch of bore diameter, add 10 seconds to your SPR.

Example: 3.5 inch diameter x 10 = 35 SPR @ 20 IPM

Calculating Rotation Speed (SPR) Exactly. The diameter of the bore and the target travel speed (IPM) provide the information necessary to exactly determine the rotation speed (SPR). Below is simple formula for quickly determining SPR.

Diameter x 10.4 = SPR @ 18 IPM [Vertical axis]

Diameter x 9.4 = SPR @ 20 IPM

Diameter x 8.4 = SPR @ 22 IPM [Horizontal axis]

Setting Rotation Speed on the Control Box. To attain the correct ROTATION SPEED dial setting for the bore that you are welding, Climax provides a chart to show the coarse setting of rotation speed. As a final check, a quick calculation of SPR will provide you with the actual seconds per revolution. By holding down the ROTATE button, you can time the spindle rotation easily and make final adjustments to rotation speed.


	<p style="text-align: center; font-weight: bold; font-size: 1.2em;">INFORMATION</p> <p>Operators familiar with typical manual MIG welding are used to high currents and voltages, combined with torch lead angles and weave movements. The BoreWelder runs with lower currents and voltages, neutral gun angle, and no weave motion. Therefore, travel speed is very important. Also since the operator is not in manual contact with the process, the normal feedback loop has been removed.</p>
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Table 6. Rotation Speed

DIAL SETTING	0	1	2	3	4	5	6	7	8	9	10
SECONDS PER REVOLUTION	290	254	173	110	72	49	32	22	15.5	11	8.5
BORE SIZE @20 IPM	31	30	18.3	11.6	7.6	5.2	3.3	2.3	1.6	1.2	0.9

Setting Wire Speed

Understanding Wire Speed. Wire speed is the rate at which the wire travels through the BoreWelder system. The unit of measure is typically in inches per minute (IPM). The amount of wire being used in the weld process requires a certain amount of amperage to create the arc and melt the wire. Wire speed and amperage are directly proportional to each other. Most weld power supplies have an ammeter, which reads the amount of current (amperes) being generated by the power supply while welding.

Table 7. Wire Speed Settings and Amperage (0.035 Diameter Wire)

DIAL SETTING	0	1	2	3	4	5	6	7	8	9	10
WIRE SPEED (IPM) FOR STANDARD WIREFEEDER	0	30	190 (120A)	340 (160A)	510	670					
WIRE SPEED (IPM) FOR PUSH/PULL WIREFEEDER	0	10	90	160 (100A)	240 (125A)	330 (155A)	400	490	580	630	630

Setting of Wire Speed. To measure the IPM of wire, set the WIRE SPEED dial to “2” (for example), depress the WIRE JOG button for 6 seconds, and multiply that result by 10.

Example: 6 seconds of WIRE JOG feeds 19 inches of wire. Multiply 19 by 10 to get 190 IPM of wire.

If you start welding at this dial setting, your amperage will be approximately 120 amperes, referencing the chart above.

While the BoreWelder can use different size welding wires, Climax recommends using 0.035-inch welding wire in most cases.

Typical Startup Wire Speed Parameters. The startup parameters address the first one or two rotations. After this, you increase wire speed and step to increase deposition.


	INFORMATION
	Regardless of welding wire size, the 175 amp current limit of the BoreWelder sets the limit of deposition rates for wire.

Table 8. Wire Speed at Startup (with 0.035 Diameter Wire)

AXIS	DIAL SETTING	AMPERAGE	WIRES PEED (IPM)
VERTICAL	2.0 to 3.0	120 to 160	190 to 340
HORIZONTAL	1.8 to 2.5	100 to 130	160 to 265

Setting the Step


Understanding Step. Step is the amount of distance the BoreWelder automatically retracts during one revolution.

The range of step on the BW3000 is infinitely adjustable from 0.025 inch (0.6 mm) to 0.220 inch (5.6 mm). You must verify by visual inspection that the step value is correct, after welding has been initiated. The verification method is explained below.

Estimating Step. Step is set to an *estimated value* before welding.

Table 9. Estimated Step Settings at a Travel Speed of 20 IPM

STEP DIAL SETTING	1	2	3	4	5	6	7	8	9	10
STEP VALUE (INCH)	0.045	0.065	0.080	0.100	0.120	0.140	0.160	0.180	0.200	0.220
AMPERAGE				100	120	140	160			

	INFORMATION
	<p>If the travel speed is 20 inches per minute, the amperage and step value in inches are nearly equal.</p>

How to Tell If Step Is Set Right. To visually verify whether step is set correctly, watch the leading edge of the weld process. The intent is to have the weld bead lying directly in between the previous bead and the base metal. If the step is too short, lack of fusion to the base metal can result. If the step is too long, lack of fusion to the previous bead can result.

Setting Arc Voltage

Understanding Arc Voltage. Arc voltage is the length of the arc between the molten puddle and the end of the electrode, in this case, MIG wire.

The MIG process has four operating modes: stubbing, short arc, globular transfer, and spray. In borewelding, it is important to remain in short arc. This is the lowest voltage possible to attain a consistent dynamic weld process. If the voltage is lowered below short arc mode, stubbing will occur (indicated by a very unstable inconsistent weld process). To enter short arc mode, raise the voltage. Any voltage higher than short arc mode can result in shortened tip life, loss of current density, and possible lack of fusion.

Weld Power Supply Remote Control Settings. When interfacing with weld power supplies, the following settings need to be addressed. Due to the wide variation of power supplies it may be necessary to consult the operator’s manual for your power supply or call Climax Technical Support.


- Set the voltage control on the power supply to REMOTE.
- Set the contactor control on the power supply to REMOTE, where applicable.

Setting Arc Voltage. The Climax control box interfaces with most power supplies, allowing remote control of voltage at all times.

If your power supply has digital readouts, set the arc voltage to 18.5 volts as a startup value.

If your power supply has no digital readouts, wait until the arc is struck and then adjust the voltage to between 17 and 19 volts.

You may need to re-adjust the ARC VOLTAGE dial as soon as you begin welding.

	INFORMATION
	The Climax mounting mechanism must be in contact with the negative weld potential to actuate the voltmeter.

Choosing Shielding Gas and Setting the Gas Flow Rate

Shielding Gas Type. Shielding gas mixtures between 75% argon/25% CO2 and 92% argon/8% CO2 are normally used with mild steel buildup.

GAS TYPE	BEST USE	PROS	CONS
75/25	Welding in horizontal axis	Good control for uphill/downhill welding	Generates more spatter
92/8	Welding in the vertical axis	Low spatter for long duration welding	More fluid puddle; harder to control

Checking Flow Rate. The shielding gas flow rates should not exceed 35 cfh. To check the flow rate, press the PURGE button. The gas solenoid will open for 10 seconds, allowing you to check the flow rate and also clear unwanted gases from the system.

Pre-Weld Checklist

Now that all of your parameters are set on the control, take a minute to review the setup and connections.

ITEM	CHECK BOX
Weld positive connected to BoreWelder and weld power supply	<input type="checkbox"/>
Weld negative connected to part and weld power supply	<input type="checkbox"/>
Rotation speed set (ROTATION SPEED)	<input type="checkbox"/>
Wire speed set (WIRE SPEED)	<input type="checkbox"/>
Step set (STEP SIZE)	<input type="checkbox"/>
Voltage set (ARC VOLTAGE)	<input type="checkbox"/>
Shielding gas connected and on (PURGE)	<input type="checkbox"/>
Torch at rotation initialize point (step point)	<input type="checkbox"/>
Twisted wire fed out from BoreWelder (WIRE JOG)	<input type="checkbox"/>
Quill retracted to correct position to start weld (RETRACT)	<input type="checkbox"/>

Starting, Stopping, and Interrupting the Weld Process


Starting

To start welding, press the WELD button on the control box.

If stubbing occurs, raise the voltage until the process stabilizes.

After the first rotation you should be able to view the placement of the weld bead in relation to the previous bead and the base metal. As mentioned earlier (“How to Tell If Step Is Set Right” on page 32), the correct step is attained when the weld is evenly placed between the previous bead and base metal.

Normally, only adjustments to step, wire speed, and voltage are necessary to maintain the required weld deposits and feed necessary for successful borewelding.

	<p style="text-align: center;">WARNING</p> <p>As with any arc welding process, you must use the appropriate light shield when you make any visual inspection. Avoid both direct and indirect exposure to arc rays.</p>
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Stopping

To stop welding, press the WELD button again.

Using Arc Interrupt

Arc interrupt lets you briefly stop the weld process yet maintain all other weld mode functions. For example, you can manually stop the process when welding over a grease hole.

1. When your torch approaches an area you don't want to weld, press the ARC INTERRUPT button on the control box. Welding stops.
2. Release the ARC INTERRUPT button. Welding resumes.

This procedure must be repeated for each revolution until the area where weld is not to be deposited is passed. When you observe arc interrupt, make sure you use an appropriate light shield.

Using Auto Skip

Auto Skip is, first, a way to automatically skip keyways. However, with a quick keystroke, the Auto Skip system lets you fill in an out-of-round or worn section of a bore.

This function greatly increases productivity, as you can fix a worn section of the bore without excessive pre-machining and subsequent borewelding to fill in the over-bored area.

You program the skip area using two cam disks on the top of the BoreWelder.

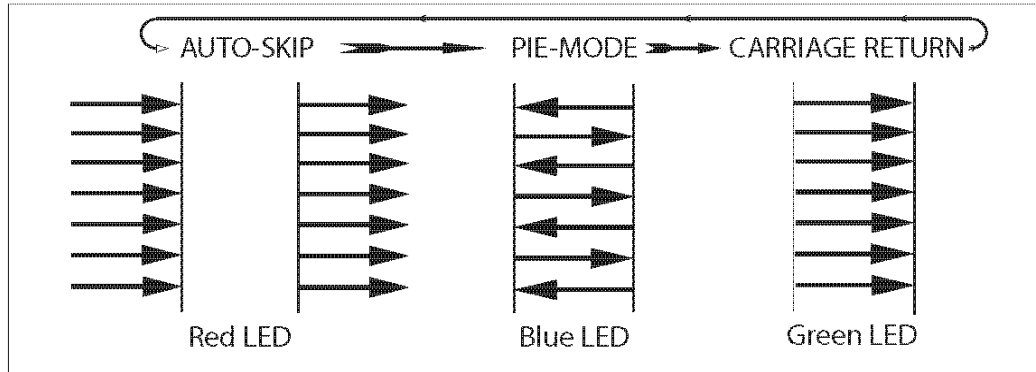
If keyways are to be avoided or worn sections are to be welded:

1. Make sure the BoreWelder is centered and parallel to the bore.
2. Rotate the torch manually or press the ROTATE button. Rotate to the beginning of the “interrupt” or weld area.
3. Squeeze the outside diameter of the cam discs with the thumb and forefinger, and pull away from the spindle, opening a low spot in the cam discs.
4. Rotate the discs until the AUTO SKIP switch just falls into the low area.
5. Rotate the torch as in Step 2 to the end of the interrupt area.
6. Hold the first disc where you set it in Step 3. Then move the other disc until the AUTO SKIP switch actuates (that is, the switch rides up on the “high” leaving the low “interrupt” area).
7. Re-check the disc settings by rotating the spindle through the “interrupt” zone in the welding rotation direction.

Listen to the switch click or visually watch the switch actuate to verify the accuracy of your stops and starts. Make all final adjustments before welding.

Using Pie Mode and Carriage Return

Hold down the FUNCTION key and press the WELD button to cycle through three settings in this order:



For example, if you wanted to go from the Auto Skip (the default power up setting) to Carriage Return, you would hold down the FUNCTION key and press the WELD button twice. To go from Carriage Return to Auto Skip, you would hold down the FUNCTION key and press the WELD button once.

Pie Mode

Pie mode is used to weld up worn areas of bore in the vertical axis.

The following procedure assumes you have just powered up the control and are in the Auto Skip mode. To use Pie Mode:

1. Set up the BoreWelder as described in Chapter 2 and in this chapter.
2. Set the Auto Skip cams as if you were going to *skip* the worn section.
3. While you are *not* welding, hold down the FUNCTION key and press WELD once (to cycle from Auto Skip to Pie Mode).
4. Resume welding as you would for normal borewelding.

The BoreWelder will now weld back and forth inside the worn area, stopping the weld process, stepping, then beginning weld again in the opposite direction at each end point. The weld parameters are controlled exactly the same as for normal borewelding.

If multiple passes are needed to ensure complete correction of the worn bore, Climax recommends starting with a small pie section for the first pass, widening the pie for the second pass, and so on. In this way, the stops and starts are hidden underneath the subsequent beads, simplifying the machining process.

Carriage Return

Carriage Return is used to weld up a worn area of a bore in the horizontal axis, when the worn section occurs on the uphill or downhill side of the bore.

The following procedure assumes you have just powered up the control and are in the Auto Skip mode. To use Carriage Return:

1. Set up the BoreWelder as described in Chapter 2 and in this chapter.
2. Set the Auto Skip cams as if you were going to skip the worn section.
3. While you are not welding, hold down the FUNCTION key and press WELD twice (to cycle from Auto Skip to Carriage Return).
4. Set the rotation direction to the preferred weld direction for your application by holding down the FUNCTION key and pressing the ROTATE button to toggle the rotation direction.
5. Resume welding as you would for normal borewelding.


The BoreWelder welds in the rotation direction inside the worn area, until it reaches the end of the set cam limit. It then stops welding and reverses rotation at full speed to the original starting point while stepping. The weld and rotation begin again. All parameters are set as you would with normal borewelding.

Welding Pointers

Achieving the Smoothest and Least Violent Arc Action

The length of time the BoreWelder can be used continuously depends mostly on spatter buildup in the welding nozzle. Therefore, a main objective when deciding what kind of wire, gas, and power supply to use is to choose the combination that produces the smoothest and least violent arc action. Such a combination typically produces less spatter buildup and longer welding times.

Wires with higher deoxidizer contents usually work best. Wires ER-70S-6 and ER-70S-2 work well. Any common inert gas can be used; but those with high argon contents are preferred. A mixture of 92% argon/8% CO₂ works well, as does 75% argon/25% CO₂. The former generally is preferred. Straight argon or helium should not be used for steel, and straight CO₂ produces excessive spatter.

	INFORMATION
<p>ER-70S-2 is probably the better choice for multilayer buildups because it deposits less silicon dioxide.</p>	

Avoiding Wire Flip by Using a Wire with a Large Cast

The term “wire flip” is used to describe an inherent condition in borewelding. The spindle and torch of the BoreWelder rotate around a nonrotating wire. Torque is applied to the wire by the rotating torch, and is affected by a number of variables including, but not limited to, extension lengths, stroke of machine, conduit length, conduit shape and configuration, orientation of wirefeeder in relation to BoreWelder, and the cast of the wire.

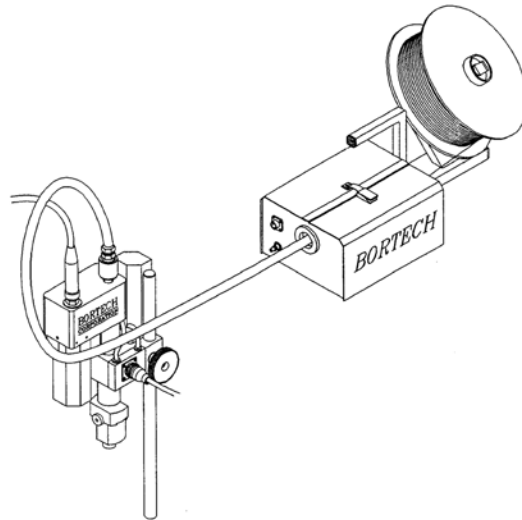
As the BoreWelder turns, the wire is twisted slightly between the torch and the wirefeeder. This twist (in extreme cases), unwinds once per revolution as the torch progresses around the bore, and produces a change in the track of the weld in a small area of the bore. In extreme cases, “flip” can cause a void in the weld. Typically, there are no detrimental effects to the finished product.

To avoid this problem, use a wire with a large arc or “cast.” Cast is the diameter of the circle that a wire makes on the floor in its relaxed state.

To check cast, cut about 4 feet (1.2 meters) from your roll of wire and toss it on the floor. The cast diameter should be as large as possible and at least 40 inches (1 meter). Casts below 30 inches (0.8 meter) are likely to cause difficulties. A cast of 40 inches (1 meter) or more will reduce or eliminate the effect of wire flip. Consult with Climax if you are unable to find large cast wires.

To reduce the chances of wire flip, take these steps:

1. Avoid an “S” shape in the conduit. A “C” shape is preferred.
2. Alternately, position the conduit as shown in the figure below. This method works particularly well with long conduits.
3. If the wire has a tight cast and it still flips in this configuration, try tightening up the curve. Long torch extensions tend to negate any benefit that this conduit shape (see figure below) may have.



Cleaning Glass Inclusions from the Bore

Welding wire usually contains some silicon as a deoxidizer. During the welding process, this changes to silicon dioxide (glass) and solidifies in clumps on the surface of the weld. These clumps normally do not cause a problem; but when many layers of buildup are applied one on top of another, the glass from the lower level is re-melted and added to the new glass, forming larger glass clumps. It is therefore a good practice to clean the glass from the bore after two layers have been applied.

Providing Appropriate Axial Movement Each Revolution


During welding, check that the STEP SIZE setting is providing appropriate axial movement during each revolution. If the step is too great, the bead will appear ropy, and spaces may appear between the beads. If the step is too little, the surface of the weld may appear smooth and flaw-free but it may have fused poorly to the base metal. Make sure the arc is directed slightly above the intersection point between the base metal and the previous bead.

At the beginning of the welding process, the first circular bead has no previously laid bead to rely on for support and, therefore, is a different shape than those that follow. It is best if the first step (at the end of the first revolution) is made slightly smaller than those that follow. An alternative is to use a slightly slower wire speed or slightly higher rotation speed during the first revolution.

Welding in the Horizontal Axis

Welding in the horizontal axis requires that you pay more attention to the machine settings than when welding in the vertical axis. In the horizontal axis, the weld bead must travel through the flat, vertical-up, overhead, and vertical-down positions. Flat and overhead positions of the bore present no problems for the BoreWelder. However, vertical-up and vertical-down positions may be challenging.

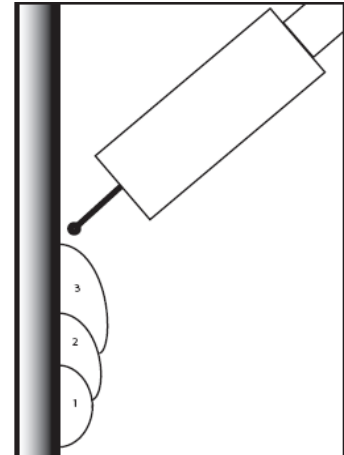
This section begins with a procedure for horizontal welding. This is followed by practical suggestions for vertical-up and vertical-down welding.

	INFORMATION
<p>Make sure you've mastered vertical axis bore buildup before you try welding in the horizontal axis.</p>	

Procedure for Horizontal Axis Welding

Use the short arc MIG weld process. In most cases, it is the only practical mode in which the BoreWelder can be used successfully for horizontal welding.

1. Always retract to the starting location to eliminate backlash in the gear train.
2. The first few beads are the most critical. If the first bead is not against a shoulder (or a previous bead), you must take special care to ensure that this first bead is smooth and even. At the start, a reduced current (wire speed) is advisable (about 95 amps for 0.030- inch wire and 110 amps for 0.035-inch wire). A normal to slightly fast rotational travel speed is appropriate to promote fast freezing.
3. It also is advisable to set the step to a lower value for the first step because the first bead is smaller and flatter than those that follow. For example:
 - Set the step to 2.2.
 - Set the first rotation to a wire speed of 110 amps.
 - When the machine steps (at the beginning of the second rotation), increase the wire speed to 130 amps.
 - Before the next step, increase the step to 2.6.
 - When the machine steps, increase the wire speed to 150 amps.
 - Before the next step, increase the step to 3.1.
 - After the step occurs, visually verify that the value is correct.




Make any fine adjustments needed to the step, then let the machine finish applying the beads.

If the beginning of the weld is treated in this manner, the weld can be deposited into the “V” formed by the bore surface and the previously deposited weld metal. This “V” helps the weld bead to stay in place by:

- Providing increased heat sink area to freeze the weld.
- Forcing the bead into a more controllable shape so its surface tension can hold it in place.

Once the buildup is started in this way, you can increase the weld current. You should be able to weld smoothly at 150 amps using 0.035- inch wire.

A shielding gas of 75% argon/25% CO₂ helps to control the weld puddle by increasing the freeze rate. The CO₂ increases the penetration into the workpiece. To decrease spatter, decrease the CO₂ in the gas mixture as low as 8%. (The bead will be more difficult for the beginner to manage.)

	<h2 style="margin: 0;">INFORMATION</h2> <p style="margin: 0;">When doing multiple passes in the horizontal axis, be sure to alternate rotation direction between passes. This makes the uphill weld of the second pass travel up over the smooth downhill section of the first pass.</p>
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When building up a horizontal axis bore, it's important to eliminate any dirt or rust in the bore. Rust tends to make the puddle more fluid and harder to control. This causes bead-to-bead fusion problems that are accentuated in the horizontal axis.

Make sure the step size is large enough. Insufficient step is one of the causes for lack of fusion to the base material. To be safe, be sure the step size is, if anything, too great rather than too small.

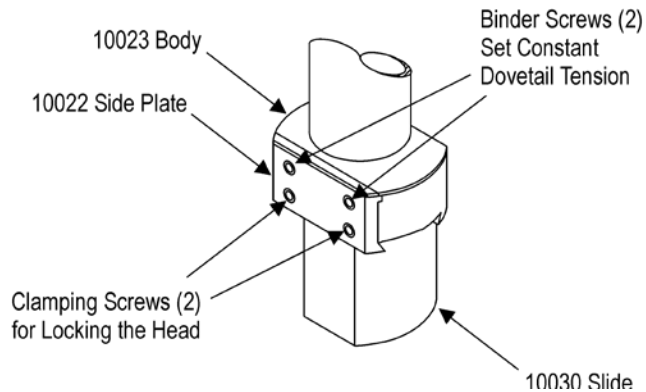
Make sure rotation speed is fast enough to prevent the puddle from flowing ahead of the arc. If the weld puddle flows ahead of the arc on the downhill, the weld bead may not adhere to the base metal. This is a common cause for lack of fusion on the downhill. Travel speeds of 22 IPM are generally sufficient to prevent this from happening. However, impurities in the base metal, choices of shielding gas, excessive voltage, excessive amperage, or a combination of all the above can contribute to lack of fusion on the downhill section of the bore.

Do not allow the arc voltage to climb too high. An arc voltage of 17 volts is normal. A high voltage (above 19) will make the weld bead difficult to control, especially on the downhill side.

The inductance of the power supply plays an important part in horizontal buildup also. If the power supply has an INDUCTANCE control, you can increase the inductance to help flatten out the bead, make it blend better, and, most important, keep it from piling up on the uphill side and forming a tall narrow bead. These tall narrow beads tend to spill and expose new base metal for the arc to gouge and spill again.

Offset Head Settings When Using Extensions in the Horizontal Axis

In horizontal axis welding, when reaching with extensions over 3 feet (0.9 meter), the weight of the torch and extensions can pry the slide from its seat. In this case, the clamping screws should be tightened to no greater than 20 inch pounds to lock the slide and body together.



Consider using the Torch Extension Support Kit when reach extends past 4 feet (1.2 meters).

Optional Equipment

This chapter presents a brief overview of optional equipment for the BoreWelder and its major components. The following table lists the optional equipment and related part numbers.

ITEM	OPTIONAL EQUIPMENT	PART NO.	
TORCHES AND TORCH ACCESSORIES	Face Welding Torch	28186	
	Compact Face Torch	Consult Climax	
	Trammel Torch: standard	27013	
	Trammel Torch: 28 inches Trammel Torch: 56 inches	38506 53004	
	Conical Seat Torch	28020	
	Extended Range Torch 13/24	34473	
	Adapter, Standard Torch to Trammel	36170	
	Counterbalance Kit	30756	
	Torch Extension Support Kit	33256	
	#1A Torch	39723	
	#000 Torch	39724	
	CONSUMABLES	EZ Feed #0 and #00 Tips	35486
		Heavy Duty Tips, Nozzles, and Diffusers	Consult Climax
WIREFEEDER ACCESSORIES	Push/Pull Option	44992	
	Wire Straightener (shop-style wirefeeder only)	35357	
MOUNTING ACCESSORIES	Radial Mount 5 Inch	31411	
	Radial Mount 10 Inch	35006	
	Mounting Rod Extender	30831	
CABLES AND CONDUITS	Stick Electrode Holder	36169	
	Positive Weld Cable, 90 Degree Connector	34345	
	2, 3, 4, 5, 10, and 15-Foot Conduits	Consult Climax	
	Other Feeder Conduits	Consult Climax	
	BoreWelder Cable Remote Step, No Rotate	Consult Climax	

ITEM	OPTIONAL EQUIPMENT	PART NO.
BORE WELDER ACCESSORIES	Auto Skip Option (factory installed)	28000
	Slow Rotation Pulley and Belt	32574
	Fast Rotation Motor	Consult Climax
	Plate, Offset Head Protector (Inverted Operation)	Consult Climax

Torches and Torch Accessories

Face Welding Torch

The Face Welding Torch is used to apply weld buildup on faces up to 20 inches (508 mm) in diameter. It welds in a spiral pattern, starting at the outside and working inward 0.166 inch (4 mm) with each revolution of the torch. It requires the use of two radial mounts and a mounting rod extender.

It comes with:

- An alternate leadscrew for a finer spiral pattern (for horizontal axis applications)
- An over-center extension for reaching through a bore to weld inside faces
- A 2-inch (51-mm) torch extender to vary the range of the Face Torch
- Straight and angled torch heads
- Extra conduit and liner.

Compact Face Torch

The Compact Face Torch is designed with the boring bar user in mind.

The clearances required to operate this torch are reduced to 6 inches (152 mm) axial and 6 inches (152 mm) radial. The basis of operation is the same as for the Face Welding Torch.

Trammel Torch

The Trammel Torch can be used for both bore buildup and OD buildup.

The diameter range of the Trammel Torch when used for bore buildup is 9 to 18 inches (229 to 457 mm). The diameter range of the standard Trammel Torch when used for OD buildup is 0 to 14 inches (0 to 356 mm). Torch limitations when doing OD buildup restrict such buildup to about 10 inches (254 mm) from the end.

This torch can be ordered for 28 and 56-inch (0.7 and 1.4 meter) diameters. Radial mounts equal to the radius of the bore should be fitted between the mounting rod and the BoreWelder.

The Trammel Torch requires a mounting rod extender.

The Trammel Torch is supplied with:

- A standard torch adapter for fitting of BW3000 torches and extensions (The standard torch adapter fits the standard BW3000 torches to the Trammel Torch. This allows for a longer reach.)
- A 2-inch (51 mm) torch extender for changing the Trammel Torch head location.
- Straight and angled torch heads.
- Extra conduit hose and liner.

Conical Seat Torch

The Conical Seat Torch is designed to weld tapered bores from 10degrees taper to negative 10 degrees cone. The stroke of this torch is 4 inches (102 mm). The operation of this torch is similar to the operation of the Face Torch, except for its variable angle of feed.

The diameter capability in its stock form is 3 to 20 inches (76 to 508 mm).

Use of one 10-inch (254 mm) or two 5-inch (127 mm) radial mounts is required for swing clearance

Use of the mounting rod extender is required for axial clearance. Consult Climax for the clearance required to use this torch.

Extended Range Torch #13/#24

This is a combination torch designed to span borewelding range of 28 to 56 inches (0.7 to 1.4 m).

Radial mount lengths equal to the radius of the bore must be used to provide swing clearance.

The slow rotation belt and pulley must be fitted to the BW3000 in order to attain correct output spindle speeds.

Counterbalance Kit

This accessory provides counterbalance for the rotation drive when operating in the horizontal axis. Use the counterbalance with BoreWelder torch #6 and with Face Welding, Trammel, Extended Range, and Conical Seat Torches. This accessory maintains a consistent rotation speed for the torch.

The counterbalance is normally installed on a 3-inch (76 mm) extension that is fitted between the Offset Head and the torch being used. The weight is oriented opposite the torch, and should be moved in or out on its arm until it balances the weight of the torch.

Torch Extension Support Kit

The Torch Extension Support Kit is used to provide extension and torch support when the distance from the BoreWelder to the torch is far enough to make torch stability questionable and alignment difficult.

This accessory is advisable when torch extensions reach over 4 feet (1.2 m) in the horizontal axis.

The kit comes with a remote Offset Head and steady-rest.

#1A torch

This torch has an internal diameter of 3 to 5.5 inches (76 to 140 mm).

It's designed to replace the #1 torch when exotic or highly alloyed wires and/or high preheats are being used. This torch consists of a one- piece bronze body with the diffuser machined directly into the torch body, enhancing heat transfer away from the contact tip.

#000 Torch

The #000 torch is designed to work down to bore sizes of 0.5 inch (13 mm). The maximum working depth of this torch is 5 inches (127 mm). The recommended wire has a 0.023 to 0.025-inch (0.58 to 0.64-mm) diameter. Typical parameters are 60 to 80 amps and 13 to 14 volts. Shielding gas can be fed from the opposite end of bore if applicable, or through the torch body if the bore is blind.

The BW3000 BoreWelder must be fitted with a fast rotation motor to attain correct travel speeds.

Climax recommends fitting the BW3000 with a push/pull wirefeeder to aid in feeding wire with low column strength.

Consumables

EZ Feed #0 and #00 Tips

EZ feed tips are used when feeding wire through the #0 or #00 torch is difficult.

Installation and use of these tips is the same as for the standard #0 and #00 tips.

Heavy-Duty Tips, Nozzles, and Diffusers

These parts can be fitted to bore torches and specialty torches to increase weld time when you're using wires other than mild steel.

These parts are available for all torches except the #0, #00, #000, and #1A torch.

Diffusers affect the maximum and minimum diameter ranges of the torches that they are fitted to, as detailed in the torch ranges shown in Table 4.

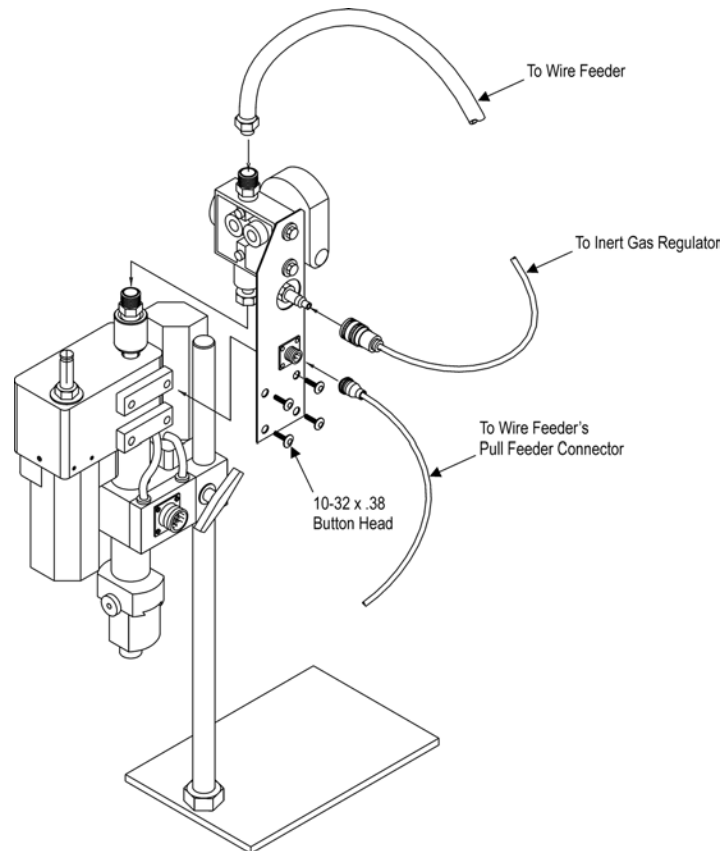
Consumable Kit P/N 66947

PART NO.	DESCRIPTION	QTY	UoM
36530	NOZZLE #00 TORCH END	1	Piece
36531	NOZZLE #0 BW TORCH	1	Piece
67174	BOX PLASTIC TRANSLUCENT W/ ADJUSTABLE COMPARTMENTS 7 X 3-5/8 X 1-5/8	1	Piece
69520	TIP WELDING #0 STANDARD (.035/.9mm) (KB)	5	Piece
69521	TIP WELDING #00 (.035/.9mm) (KB)	5	Piece
69778	DIFFUSER WELDING	5	Piece
69865	TIP WELDING (.035/.9mm)	25	Piece
70763	LABEL CONSUMABLES KIT BW3000	1	Piece

Wirefeeder Accessories

Push/Pull Wirefeeder

The push/pull option is an extra wirefeeder mounted to the top of the BW3000. This wirefeeder is a single drive roll feeder that assists the main wirefeeder in feeding wires with low column strength or wires that are difficult to feed. To use this option, the main wirefeeder must be push/pull capable. The following picture shows a BoreWelder equipped with a push/pull feeder.



Wire Straightener

The wire straightener is intended to reduce the bend (“cast”) in the welding wire to prevent wire flip, which causes the weld to deviate from its intended track.

With the wirefeed conduit disconnected from the wirefeeder, the wire straightener is inserted into the wirefeed motor, oriented, and adjusted to attain a 60 to 70-inch (1.5 to 1.8 m) cast.



INFORMATION

The wire straightener can be used only with the shop style wirefeeder.

Mounting Accessories

Radial Mounts (5 and 10 inch) (127 and 254 mm)

The radial mount accessory is used to distance the center line of the BoreWelder away from the mounting rod. This is helpful when building up large diameter bores or pins. The mount is also used when the accessory attached needs radial clearance to rotate without hitting the mounting rod. Two lengths are available: 5 inches (127 mm) and 10 inches (254 mm).

Mounting Rod Extender

The mounting rod extender is used with the mounting rod to extend its length. This item is commonly used when using the Face, Conical, or Trammel Torch to provide axial clearance between the BoreWelder and the part.

Cables and Conduits

Stick Electrode Holder

This cable plugs directly into the standard positive weld cable supplied with your BW3000. This cable allows very quick changeover from borewelding to stick welding. As most modern power supplies have both CV and CC capability, this attachment is very handy. This cable is essential for attaching the adjustable base bolt, welding down boring bar bearing mounts, or touching up un-welded sections of the bore.

Positive Weld Cable, 90 degree Connector

When attached to the BW3000, the positive weld cable with a 90 degree connector has an overhead clearance of under 1/2 inch (13 mm), compared to 6 inches (152 mm) with the standard positive weld cable. This cable is intended to plug into the standard positive weld cable.

2, 3, 4, 5, 10, and 15 Foot Conduits (0.6 to 68.6 m)

There are multiple conduit lengths available for your borewelding application. Consider the shortest conduit possible to lessen wire flip. Custom conduits are available for special applications.

Non-Climax Feeder Conduits


Many different styles of conduits are available to attach the BoreWelder to wirefeeders other than the Climax feeder. Most common brands of wirefeeders can be integrated with the Climax BoreWelder. These conduits change the stock BW3000 system in the following ways:

- The weld current is transmitted through the conduit itself, to a junction block at the BoreWelder end of the conduit. From the junction block there is a weld cable shunt that transmits weld current to the positive weld connector.
- The wire speed control, voltage control, purge, and wire jog are inoperative when using a non-Climax feeder.
- Conduit lengths range from 8 feet (1.8 m) to 15 feet (4.6 m).
- The Climax push/pull wirefeeder cannot be used with non-Climax feeders.

BoreWelder Accessories


Slow Rotation Pulley and Belt

The slow rotation pulley and belt are fitted to the BoreWelder rotation drive when the diameter to be welded is over 27 inches (686 mm) in diameter. When these parts are installed, the rotation speed (spindle speed) is 50 percent of the original speed. The final output spindle speed allows welding of diameters from 1.75 inches to 54 inches (44 mm to 1372 mm).

	INFORMATION
	<p>Installation requires partial disassembly and should be handled only by qualified personnel with instruction from Climax to prevent damage to your BoreWelder.</p>

Fast Rotation Motor

The fast rotation motor can be fitted to the BoreWelder rotation drive when the diameter to be welded is under 0.875 inches (22 mm). When installed, the spindle speed is triple the original speed. The final output spindle speed allows welding of diameters from 0.5 inches to 9.3 inches (13 mm to 236 mm) at a travel speed of 20 IPM.

	INFORMATION
	<p>Installation requires partial disassembly and should be handled only by qualified personnel with instruction from Climax to prevent damage to your BoreWelder.</p>

Plate, Offset Head Protector (Inverted Operation)

This shield is designed to protect the rack and rack slot from spatter when the BoreWelder is used in the inverted position.

This shield mounts over the Orientation Fitting on the Offset Head slide.

Maintenance & Adjustments



CAUTION

Failure to properly maintain the machine will result in premature wear or damage to the machine. Damaged caused by improper or inadequate machine maintenance is not covered by the machine limited warranty.

This chapter presents routine maintenance and adjustments for the BoreWelder, wirefeeder, torches, conduits, cables, and control box.

BoreWelder Maintenance

The BoreWelder requires little maintenance when properly cared for. Preventative maintenance is the most effective means of attaining a long service life.

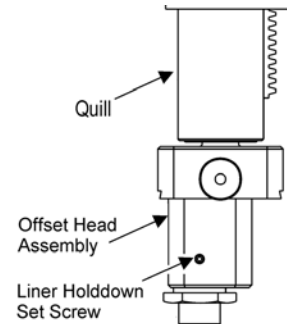
Daily Maintenance

Daily maintenance consists primarily of keeping the BoreWelder clean and protected. The BoreWelder is designed to survive in industrial environments that are usually dusty and gritty; however, it has close fitting parts and will last longer if kept clean.

The quill and Offset Head provide sliding movement. For this reason, you should clean both items daily under normal use.

Quill. A clean shop towel lightly sprayed with a lubricant such as WD-40™, can be used to remove iron oxide (and any other foreign materials) deposited on the quill from the weld process. Be sure to wipe off any excess lubricant with a clean cloth. This will keep the quill sliding freely in the quill positioner. Avoid using an excessive amount of a sticky lubricant that may trap foreign materials. Avoid spraying Anti Spatter on the quill tube.

Offset Head. After use, use a clean shop towel, lightly sprayed with lubricant such as WD-40™, to clean the mating surface of the Offset Head assembly. It's best to move the slide to its full extent of travel in both directions and clean the exposed area of the body dovetail face.



Orientation Fitting and Nut. Make sure that the mating area of the Orientation Fitting and Nut is kept free of spatter and dirt.

Replacing the BoreWelder Liner

1. Set the Offset Head to zero offset.
2. Remove the swivel coupling and loosen the liner set screw in the Offset Head slide.
3. Push the liner out of the top of the spindle.
4. Remove the spindle conduit fitting from the old liner and install it onto a new liner of the correct length.
5. Slide the liner into the spindle and then into the Offset Head. The liner should be flush in the Offset Head slide, Orientation Fitting counterbore. At the top of the spindle, the spindle conduit fitting should rest 1/8 inch (3 mm) below the top of the spindle.

6. Reinstall the swivel coupling, and torque to 20 foot pounds.

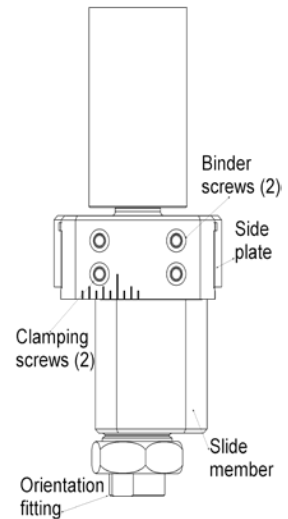
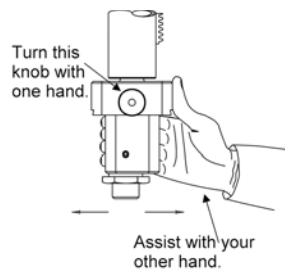
BoreWelder Adjustments

There are only two adjustments that require your attention: the Offset Head and the quick connect for the positive weld attachment.

Offset Head Dovetail Adjustments

The dovetail of the Offset Head must be adjusted so the slide member presses snugly against its seat and yet can still slide from side to side. The Offset Head conducts weld current through this sliding seat, and also prevents shielding gas from escaping. The adjustment is made by tightening the two upper 10-32 socket head cap “binder screws” that secure the side plate.

You should adjust the binder screws so that the head slides with moderate resistance. You should need external hand pressure, in addition to turning the knob to move the slide. The tension of the Offset Head is correct when the slide can be moved only by a combination of turning the knob with one hand while assisting with the other.



If the binder screws are too loose, the Offset Head assembly may overheat from increased resistance across the slide and body interface. Also porosity in the weld can result from contamination of the shielding gas.

Quick Couple Adjustments

The quick couple conducts all the welding current that is used in the welding process. The quick couple is rigged from the factory to have an interference fit with the mating female connector. The tangs of the quick couple should be spread slightly wider than the female connector, to ensure good electrical contact when assembled. The axial force required to assemble this connector should be 5 to 10 pounds. If the female connector slips on easily, it is a sign that the quick couple needs to be spread open slightly. You can spread the quick couple by sliding a flat head screwdriver between the tangs and twisting slightly.

Wirefeeder Maintenance and Adjustments

Wirefeeder Maintenance

The wirefeeders are built to last for years of service. If you keep the machine clean, you'll more easily find and correct wear or maintenance issues.

Inspect the following items for signs of wear:

- Drive rolls
- Pressure rolls
- Geared drive roll adapters
- Axles
- Rubber isolator feet on a shop-style wirefeeder.

For the shop-style wirefeeder, make sure the inside of the case is clean and free of metallic objects. Also check that the wire feed motor is secure in the frame of the wirefeeder. Damage to the system can result if the wire feed motor is allowed to make contact with the frame of the wirefeeder.


Wirefeeder Adjustments

The wire feed drive roll pressure has a wide range of acceptable settings. However, when the force transmitted to the wire exceeds its column strength, the wire collapses in the conduit (seen as a crinkle or wave in the wire), causing the wire to resist movement in its intended direction. Typically, the operator diagnoses this as a problem with wire feeding and quickly turns up the feed roll pressure, making the situation worse. The following procedure should help determine the maximum possible feed roll pressure. In practice, it is advisable to operate the feed roll pressure below the maximum capable pressure, because of variations in the physical characteristics of the wire.

1. Attach the conduit to the wirefeeder only.
2. Jog the welding wire until it exits the free end of the conduit.
3. Clip off any excess wire flush with the end of the conduit fitting.
4. Hold the free end of the wire feed conduit up to a hard surface (like a table edge) and jog the wire feed rolls momentarily (2 to 3 seconds). The rolls should spin on the wire.
5. Remove the conduit end from the hard surface.
6. Jog the full length of wire out of the conduit, watching closely for any distortion in the wire.
7. If the feed roll pressure is just right, the wire that was inside the conduit should not have any "sine wave" effects—it should be "crinkle" free. Tighten the feed rolls slightly. Then, recheck for the sine wave effect. Repeat this until the effect appears.
8. If the feed roll pressure is too tight, the wire column will fail just after the feed rolls. You'll see a noticeable crinkle or sine wave in the wire. Back off the pressure on the rolls until the effect disappears. This setting will be the highest possible feed roll pressure.

In other words, the wirefeeder drive rolls should be set so that, when a stoppage occurs, the wire feed rolls slip and the wire does not crinkle. As mentioned earlier, this is the highest possible tension. In most cases, Climax recommends a wirefeed setting well below this.

For mild steel, 0.035 diameter wire, set the feed roll pressure from 2.5 to 3 on the adjuster barrels.

	<h2 style="margin: 0;">INFORMATION</h2> <p style="margin: 10px 0;">Welding wire varies in consistency, so a feed roll pressure that was right for one wire may be too much for another wire. With each new wire, you may have to re-adjust the feed roll pressure.</p>
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Torches, Conduits, and Cables

Maintaining Torches and Extensions

Torch maintenance includes cleaning or replacing the liners and inspecting diffusers, tips, and nozzles for wear. Inspect the torch and extension threaded ends where they mate for “dings” and burrs. These areas require complete electrical contact and gas seal.

Maintaining Conduits

Conduit maintenance includes an inspection of the O-rings that seal each end of the conduit in its part. The O-rings should be lubricated to allow easy assembly and disassembly. If the O-rings are cracked, worn or otherwise compromised, replace them.

The conduit liner can be blown out to remove foreign matter that might restrict feeding. If the liner needs to be replaced, see below for the procedure.

Replacement of Liners

The replacement schedule for liners in the BoreWelder torches and conduits depends on many factors. These factors include, but are not limited to, workplace environment, welding wire used, welding parameters, feed roll pressure, and maintenance schedule.

When liner replacement is required, you should observe the following procedure. This procedure is important to maintain proper operation of the BoreWelder.

1. When replacing the liner in any component which forms a curve that the liner has to follow, it is important to preload the liner. The liner is pressed into the torch or conduit until the liner is felt to be making contact with the outer wall of the bend in the torch or conduit. This pressure should not exceed 5 pounds.
2. When replacing the liner in a wirefeeder conduit, coil the conduit into a 24-inch (60 mm) circle and push the liner in so it makes contact with the outer wall of the conduit. Then secure it in place with the set screws while it's in this coiled position. Do not over-tighten the set screws when securing the liner.
3. Always clip the liner with a sharp set of diagonal cutters, in such a way that the end of the liner is recessed at the end of the conduit or torch. The distance of recession should not exceed one coil, or approximately 0.050 inch (1 mm). This procedure prevents sharp liner ends from being exposed.

Replacement of Contact Tips for Torches #00 and #0

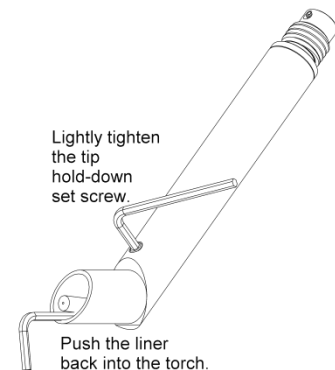
When replacing the contact tips of torches #00 and #0, make sure that the contact tip is positioned correctly in the nozzle. The tip should not be centrally located axially. Instead, the tip should be secured so its exit end is closer to the end of the torch nozzle. To determine the proper location and as a gauge between the tip and the cup, use the same Allen wrench that you used to tighten the set screw holding the tip in place. Do not preload the liner in either of these torches.

If replacement of the contact tip is required, it is not necessary to remove the liner. Instead, loosen the screw that holds the contact tip, remove the tip, and insert a new tip over the liner that is installed in the torch.

An alternative procedure is to remove the tip and the liner, and use a piece of welding wire as a “snake”. The welding wire is inserted into the liner hole in the threaded end of the torch, out through the nozzle. Then the combination of new tip and old liner can be slid onto the “snake” from the nozzle end, and the liner can easily be piloted into the liner attachment area on the threaded end of the torch.

When replacing the liner on the #0 and #00 torches:

1. Remove the old tip and liner.
2. Using a length of liner that is too long, insert the new liner from the threaded attachment end of the torch, out through the nozzle.
3. Install the contact tip on the liner, and move the combination up into the torch until correct placement is reached.
4. Lightly tighten the tip hold-down set screw, making sure your placement is as shown in the figure.
5. Trim the liner to the correct length by pulling the liner out two coils, and cutting in between the two.
6. Push the liner back into the torch with the 3/32 hex wrench used to tighten the liner hold-down set screw.
7. Tighten the liner and tip in place. The tip hold-down torque should not exceed 25 inch pounds.




Control Box Maintenance

The control box is designed to withstand the rigors of the work environment with minimal maintenance. However, care should be taken to avoid direct contact with water, weld spatter, high heat, and excessive impact.

The control box is provided with a cover to completely enclose the case when not in use and to partially protect the case when in use.

To clean the control overlay and buttons, use a shop towel lightly sprayed with WD-40™.

	CAUTION
	The control box enclosure is made from polypropylene copolymer, so be careful not to set it on preheated parts or on parts that have been or are being welded.

Tool Kit P/N 69971

PART NO.	DESCRIPTION	QTY	UoM
10600	WRENCH HEX 5/32 SHORT ARM	1	Piece
11082	WRENCH HEX 3/16 SHORT ARM	1	Piece
11094	WRENCH HEX 5/64 SHORT ARM	1	Piece
40424	SPLINER STAINLESS STEEL .065 ID X .144 OD X 16 FT FOR .023/.045 WIRE	1	Piece
52815	MANUAL INSTRUCTION MODEL BW3000 BOREWELDER	1	Piece
63846	WRENCH SPANNER 2 INCH	1	Piece
63847	WRENCH SPANNER 1.5 INCH	1	Piece
63848	WRENCH SPANNER 1/2 - 7/8 INCH MODEL Z	1	Piece
66947	KIT CONSUMABLE PACKAGE BW3000 .035/.9MM TIPS (KB)	1	Piece
67082	GLOVES WELDING CLIMAX BRANDED SIZE LARGE	1	Piece
67313	WELD SAMPLE 2.750 ID X 3.500 OD X 2.000 (KB)	1	Piece
67337	LUBRICANT 3 OZ WD-40	1	Piece
69866	NOZZLE WELDING (ALL EXCEPT #00 & #0) (1 EA) STANDARD 21-62	5	Piece

Troubleshooting the BW3000

This chapter explains how to troubleshoot the BoreWelder BW3000 for both welding and mechanical problems, including lack of fusion, tip seizure, ropy beads, excessive spatter, a hot torch nozzle, porosity, a deposit that's too hard to machine, cutting tools that break, and weld graping.

Appendix A contains a list of spare parts and support libraries to assist with troubleshooting.

If you are still having problems after trying the remedies in this chapter, please contact Climax's knowledgeable and experienced technical staff.

PHONE	503.538.2185
FAX	503.538.7600
E-MAIL	info@cpmt.com

Common Welding Problems and Their Cures

Lack of Fusion to the Bore Surface

Lack of fusion to the bore surface can be caused by the step being too small. If you are directing the welding arc mostly against the previously deposited bead, the newly deposited weld metal is likely to "cold lap" against the bore surface. It will fuse well with the previously deposited bead but not with the base metal. To cure the problem, set the step to direct the arc precisely at the intersection between the bore surface and the previously laid weld deposit or at an angle that slightly favors the base metal.

Another possible reason for lack of fusion is that the rotation speed is too slow. If rotation is too slow, the welding arc is directed on top of the currently melted weld puddle, preventing the arc from making direct contact with the base metal.

Lack of Fusion to the Previous Weld Bead of the Same Layer

Lack of fusion to the previous weld bead is usually caused by too much step. The welding arc is playing too much on the bore surface and not enough on the previously deposited bead. To prevent this problem, direct the arc at the exact intersection of the previous bead and the bore surface.

Wire Feeding Stops and Wire Burns Back to Tip

This problem is also referred to as tip seizure, and is usually caused by one of two reasons:

1. A mechanical blockage of debris at the "cone" entrance to the contact tip. This debris jams between the wire and contact tip bore. When the wire stops and the welding power supply remains on, the wire burns back to the contact tip and the contact tip melts.
2. Overheated or exhausted contact tip. When the contact tip is overheated or spent, the wire may seize to it. The contact tip is a consumable, so replacement is required at intervals that are determined by, but not limited to, the following factors: dimensions of bore, arc voltage, welding current, welding wire, shielding gas, preheat of part, quality of weld connections, and type of power supply used.


Refer to “Wirefeeder Adjustments” section for information on setting the feed roll pressure.

Weld Beads Are “Ropy”

To make the beads wet out more and become less ropy, you should try the following:

- Increase in the arc voltage up to 18 volts.
- Use less CO₂ in the mixture of shielding gas.
- Verify that the travel speed is within acceptable parameters (18 to 22 IPM).
- Make sure that your welding wire is not contaminated with rust.
- Make sure that the base metal is not contaminated with rust, grease, or scale. A sandblasted pre-machined or ground part is desirable for best results.

If your weld power supply is equipped with inductance control, another strategy is to increase inductance. More inductance flattens the weld puddle.

	<h2 style="margin: 0;">INFORMATION</h2> <p style="margin: 0;">On Lincoln power supplies, turning the knob counterclockwise increases inductance.</p>
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Too Much Spatter

The usual cause for too much spatter is an arc voltage that’s too high. The arc should have an even sound that is not violent. A setting of 15½ to 18 volts is normal.

The shielding gas also has a marked effect on weld spatter. For spatter control, a shielding of argon with less than 15% CO₂ is recommended (for example, 92% argon/8% CO₂). More CO₂ causes excessive spatter.

Certain types of welding wire create more spatter than others. If all other options have been exhausted, try wire from a different manufacturer. Contact Climax for information on alternative wires.

Torch Nozzle Becomes Too Hot

A hot torch nozzle is usually the result of using an arc voltage that’s too high. Keep the voltage between 15½ and 18 volts.

Porosity in the Weld

Porosity is indicated by a sponge-like appearance of the weld bead. Porosity is commonly caused by two factors: Lack or contamination of shielding gas; and a contaminated bore surface.

Spatter buildup in the nozzle can restrict flow, resulting in a lack of shielding gas. A gas flow that’s too high can cause ambient air to contaminate the shielding gas. A flow rate of 20 to 40 CFH is recommended. If wind is a problem in the field, make wind blocking dams out of leather and aluminum foil. Use leather on the BoreWelder side of the bore, as leather does not conduct electricity. A 3-foot square piece of leather with a slit from the center out to one edge provides easy installation over the extension. You can use small magnets to hold the leather in place. Aluminum foil is used on the opposite end of the bore. Fold the aluminum foil around the part to hold it in place to shield the bore, then make a hole to view the process.

Excessive oil, rust, dirt, and grease can contaminate the bore surface and cause porosity. Sandblasting, pre-machining, and preheating may be required. In cases where the base metal is deeply contaminated, you may need to run a flux cored wire to manage the excessive contaminants.

In some cases, laminated sections in heavy equipment bores can have grease deposited in the spaces between the layers. You have a few options to handle this problem. You could pre-grind the lamination line, and pre-weld with stick welding rod to seal the lamination. This is very effective, but is time consuming and difficult on small bores. You could preheat in an attempt to drive out the grease. However, it's likely that grease will continue to leak out while welding continues. It's also possible to weld up to the lamination, stop the weld process, retract the machine over the lamination, and restart the weld process. The unfinished section can then be stick welded after borewelding is complete.


Steel Weld Deposit Is Too Hard to Machine

Assuming the wire is a mild steel wire (such as the 70s-series), the ability to harden must be attained from the base material. If the deposit is hard, it must have obtained carbon and possibly other alloys from the base material which cause it to be susceptible to heat treatment hardening.

Generally, to prevent hardening, slow down the cooling rate. To do so, increase the preheat of the part and/or decrease the rotational travel speed of the torch. Fast travel speeds produce a rapid quench of the weld beads.

If hard weld beads are encountered, you may be able to temper the hardened bead by welding another pass directly over it.

If the buildup is still too hard, post-heat to a temperature of about 1100°F to temper the weld bead and allow machining.

	<p>INFORMATION</p> <p>Be sure to allow the part to cool below 400°F before reheating. Do not allow any part of the weld to rise above the critical temperature (about 1300°F) even for a short time, unless you are prepared to do a full anneal with the associated heat soaking and slow cooling.</p>
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Weld Breaks Cutting Tools When Machined

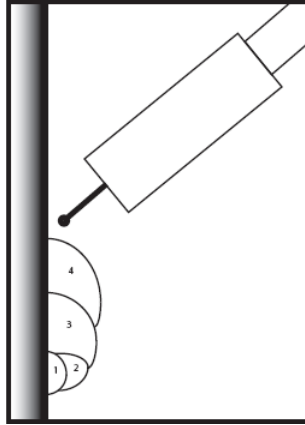
A tungsten carbide tool bit edge can be “honed” to make it less susceptible to breakage. If you create a 45 degree chamfer that's 0.005- inch to 0.007-inch wide (0.127 mm to 0.178 mm), the toughness of the tool bit is increased.

Weld “Graping”

Graping occurs when the molten puddle overcomes the surface tension that holds it in place. The term “graping” refers to the drooping globs of weld metal hanging from the bore surface.

Typically, this occurs on the uphill section when the BoreWelder is in the horizontal axis.

To remedy this problem, use lower currents and voltages for the first revolution and build a shelf that can support subsequent weld beads. Some operators weld two low amperage rotations directly on top of each other to create a large shelf. This shelf supports the third and subsequent rows of much larger beads. Step adjustments are required to provide the desired results.



In any case, step has a marked effect on graping. A step that's too great or too little reduces the required support for the molten puddle.

During most BoreWelder buildup operations in the vertical axis, graping should not be experienced within the current limits of the BW3000. If graping is experienced during the buildup operation, the weld current may be too high or the travel speed too slow. Again, it's possible for graping to occur if the step is too great or too little. In these cases, the bead will be unsupported and its surface tension will no longer hold it in place.

Mechanical/Electrical Troubleshooting

Machine Does Not Step

The default setting on power up is step enabled. Step can be turned on and off by pressing the FUNCTION key, then RETRACT on the control box.

The STEP switch inside the BoreWelder head unit may not be working properly. To check it, hold ROTATION INITIALIZE and wait for the spindle to rotate and stop at the step point. As an alternate means of checking the switch, separate the BoreWelder from the control system. Consult the schematic and test the ohms across the pins relevant for the STEP switch. At the same time, rotate the BoreWelder spindle by hand until the step switch drops into the step detent. The meter should read continuity at this point. If not, remove the red shroud and check the switch directly. The wiring or switch may be at fault.

Check the control cable for continuity.

Check that the RETRACT and EXTEND buttons move the quill. If not, refer to "Machine Cannot be Retracted or Extended" below.

Machine Cannot be Retracted or Extended

1. Check for a motor failure. Can you hear the motor operate when you press either the RETRACT or EXTEND button? If you can, then skip to Step 3.

There should be continuity (through the motor armature). If there is no continuity, a light tap on the side of the motor may restore operation. If the light tap works, contact Climax for a new style of motor brush. Or give the brush springs a slight kink to ensure electrical contact when at rest.

2. Check the cable for continuity.
3. Check whether the worm roll pin is sheared. If the motor operates but the quill does not move, it's likely that the roll pin is sheared or the gear train is otherwise damaged.

Machine Does Not Rotate

First, verify motor continuity by checking BoreWelder receptacle pins (25 to 35 ohms) (check the schematic).

Then check the cable for continuity

If you still have a problem, contact Climax.

Wirefeeder Does Not Feed Wire

First, check the motor for continuity (20 ohms) (check the schematic).

Then check the cable for continuity (check the schematic).

If you still have a problem, contact Climax.

Nothing Happens When the WELD Button Is Pressed

First, check if the machine is completely retracted. Press EXTEND to move the quill off its limit, and try again.

Then check the AC power inlet fuse.

Machine Rotates, Steps, and Feeds Wire Out But Does Not Weld

Check the continuity of the power supply control cable (check the schematic).

Check the positive and negative ground leads for proper connection.

No Voltage Control

Check the continuity of the power supply control cable (check the schematic).

Check the positive and negative ground leads for proper connection

No Arc, No Wire Feed, But Rotates at Full Speed

Check that the AUTO SKIP switch is horizontally aligned to cams (that is, the switch roller contacts both cams).

Check that the AUTO SKIP switch is radially engaging the cams properly (that is, the switch roller is actuated by the high spot on the cams).

No Arc, No Wire Feed, But Rotates at Dial Speed

Make sure the control is not in Pie Mode or Carriage Return.

Troubleshooting Summary

The following table summarizes the troubleshooting information in this chapter. Problems are presented in alphabetical order by keyword. If you are still having problems after trying these remedies, please contact Climax.

PROBLEM	QUICK SOLUTION	SEE PAGE
Arc: No arc	See "Wire feed: No arc, no wire feed, but rotates at full speed" and "Wire feed: No arc, no wire feed, but rotates at dial speed" in this table.	
Broken machining tools	See "Weld breaks cutting tools when machined" in this table.	
Buildup: Separation of the buildup from the underlying base material due to lack of fusion	See "Fusion: Lack of fusion to bore surface" in this table.	
Fusion: Lack of fusion to bore surface	Direct the arc at the precise intersection between the bore surface and the previously laid weld deposit. Increase rotation speed.	64
Fusion: Lack of fusion to the previous weld bead of the same layer	Direct the arc at the precise intersection between the bore surface and the previously laid weld deposit. Increase arc voltage.	64
Graping	See "Weld graping" in this table.	
Hardening of weld deposit	See "Weld: Steel weld deposit is too hard to machine" in this table.	
Machine cannot be retracted or extended	Check for motor failure. Check for continuity of motor circuit (check the schematic). Check cable for continuity. Determine if worm roll pin is sheared or gear train is otherwise damaged.	67
Machine does not rotate	Verify motor continuity by checking BoreWelder receptacle pins (check the schematic). Check cable for continuity.	68
Porosity: Porosity in the weld	Protect shielding gas from contamination from bore surface by lowering gas flow, preventing spatter buildup, cleaning bore surface, and/or using stick welding on laminated surfaces.	65
Ropy beads	See "Weld beads are ropy" in this table.	
Rotation	See "Machine does not rotate" in this table. Also see references under "Weld" and "Wire feed".	
Spatter: Too much spatter	Lower arc voltage.	65
Step: Machine does not step	Make sure step is enabled. Make sure the STEP switch is working properly. Check the control cable for continuity. Make sure the RETRACT and EXTEND buttons move the quill.	67

PROBLEM	QUICK SOLUTION	SEE PAGE
Tip seizure	See "Wire feed: Wire feeding stops and wire burns back to tip" in this table	
Voltage control: No voltage control	Check continuity of the power supply control cable. Check positive and negative ground leads for proper connection.	68
Weld beads are ropy	Increase arc voltage. Use less CO ₂ in the shielding gas. Increase inductance.	65
Weld breaks cutting tools when machined	Hone the cutting edge of the tool. Make sure the nose radius is not too small or too large.	66
Weld graping during horizontal axis borewelding	Lower weld current and voltage for the first revolution. Make sure the step is not too great or too little.	66
Weld graping during vertical axis borewelding	Lower weld current. Increase travel speed. Make sure the step is not too great or too little.	66
Weld: Machine rotates, steps, and feeds wire out but does not weld	Check continuity of the power supply control cable. Check positive and negative ground leads for proper connection.	68
Weld: Nothing happens when the WELD button is pressed	Press EXTEND to move the quill off its limit and try again. Check the inlet fuse.	68
Weld: Steel weld deposit is too hard to machine	Slow down the cooling rate by increasing the preheat of the part and/or decreasing the rotational travel speed of the torch. Deposit another weld layer on top of the hard layer to temper it. Post-heat the buildup after welding and allow to cool.	66
Wire feed: No arc, no wire feed, but rotates at dial speed	Make sure the control box is not in Pie Mode or Carriage Return.	68
Wire feed: No arc, no wire feed, but rotates at full speed	Check that the AUTO SKIP switch is horizontally aligned to the cams and engaging the cams properly.	68
Wire feed: Wirefeeder does not feed wire	Check the motor for continuity (check the schematic). Check cable for continuity. Check whether wire is caught in torch.	28, 68
Wire feed: Wire feeding stops and wire burns back to tip (tip seizure)	Replace the contact tip. Make sure the feed roll pressure is not too tight. Remove blockage of debris at the cone entrance of the contact tip.	64
Wire flip	Use short conduits and extensions. Avoid an "S" shape in the conduit. Tighten the curve of the wire.	42

Preparation for Shipping

The crate the machine arrived in is designed for safe shipment of the machine. Use the crate and packing components that the machine arrived in for repackaging the machine.

Package the machine as shown in the photos.



Storage

This equipment is intended to be stored indoors in a temperature and humidity controlled environment.

Prepare the Machine for Storage

- Ensure the machine is free from dirt, grease, chips and other debris before storage.
- Apply a moisture preventative material to unpainted surfaces (WD-40 for short-term storage, LPS-3 for long-term storage) to prevent corrosion.
- Store the machine in the crates provided.
- Place desiccant bags or vapor wrap around the machine to absorb moisture.

Climax advises changing the desiccant bags in the storage crate every 18 months.

Ideal Long-Term Storage Conditions

Ideal long-term storage conditions are cool and dry indoors (50°F and 20% relative humidity). While such conditions may not be realistic for your setting, do not let temperatures exceed 70°F, and if possible, keep the relative humidity below 40%. Make every effort to keep temperature and relative humidity levels constant.

Glossary

Arc Interrupt	A BoreWelder function that lets you briefly stop the weld process yet maintain all other weld mode functions.
Arc Voltage	The length of the arc between the molten puddle and the end of the electrode, in this case, MIG wire.
Articulate	The hinging motion of the BoreWelder and radial mount to accommodate movement of the BoreWelder spindle towards and away from the mounting rod.
Auto Skip	A BoreWelder function that lets you automatically skip keyways or fill in an out-of-round or worn section of a bore.
Carriage Return	A BoreWelder function that lets you weld up a worn area of a bore in the horizontal axis, when the worn section occurs on the uphill or downhill side of the bore.
Cast	The diameter of the circle that a welding wire makes on the floor in its relaxed state.
Centering	Positioning the BoreWelder so that it's centered over the bore. Complete centering is called "centrality."
DIP Transfer	See <i>short arc</i> .
ESO	Electrical Stickout. See <i>Stickout</i> .
HAZ	Heat Affected Zone.
Leveling	The process of aligning the axis of the BoreWelder to the axis of the bore to be welded.
MIG Welding	Metal inert gas welding, where the consumable metal electrode (wire) is mechanically fed into the arc, shielded by an inert gas.
Parallelism	Positioning the BoreWelder so that it's parallel to the axis of the bore to be welded.
Pie Mode	A BoreWelder function that lets you weld up a worn area of a bore in the vertical axis.
Porosity	The condition that results when the weld bead becomes sponge-like in appearance. Porosity is typically associated with loss of shielding gas coverage, excessive contaminants in or on the base metal, or excessive voltage.
Rotation Speed	How fast the spindle of the BoreWelder is turning, measured in seconds per rotation (SPR). It's calculated from the diameter of the bore and the target travel speed.

Short Arc	One of the operating modes of the MIG welding process that's relevant to this manual (others are stubbing, globular transfer, and spray). In borewelding, it is important to remain in short arc (also known as DIP transfer).
Spring Washer	A Belleville or disc spring washer acts as an axial spring.
Step	Step is the amount of distance the BoreWelder automatically feeds or retracts during one revolution.
Stickout	Electrical Stickout (ESO). The distance between the end of the contact tip and the workpiece.
Stubbing	The undesirable MIG weld mode. Stubbing results in incomplete melting of wire and erratic arc formation, providing inadequate heat to properly bond or form a weld puddle. The weld wire drives into the workpiece, and then the arc disintegrates the wire. Excessive spatter and noise accompany this mode.
Travel Speed	The speed at which the torch travels along the surface of the part being welded, measured in inches per minute (IPM).
Wire Flip	As the BoreWelder turns, the wire is twisted slightly between the torch and the wirefeeder. This twist (in extreme cases), unwinds once per revolution as the torch progresses around the bore, and produces a change in the track of the weld in a small area of the bore.
Wire Speed	The rate at which the wire travels through the BoreWelder system, measured in inches per minute (IPM). Wire speed and amperage are directly proportional to each other.

Schematics

THIS SCHEMATIC APPLIES TO BOREWELDER MODELS
54419, 54421, 54423, 54425

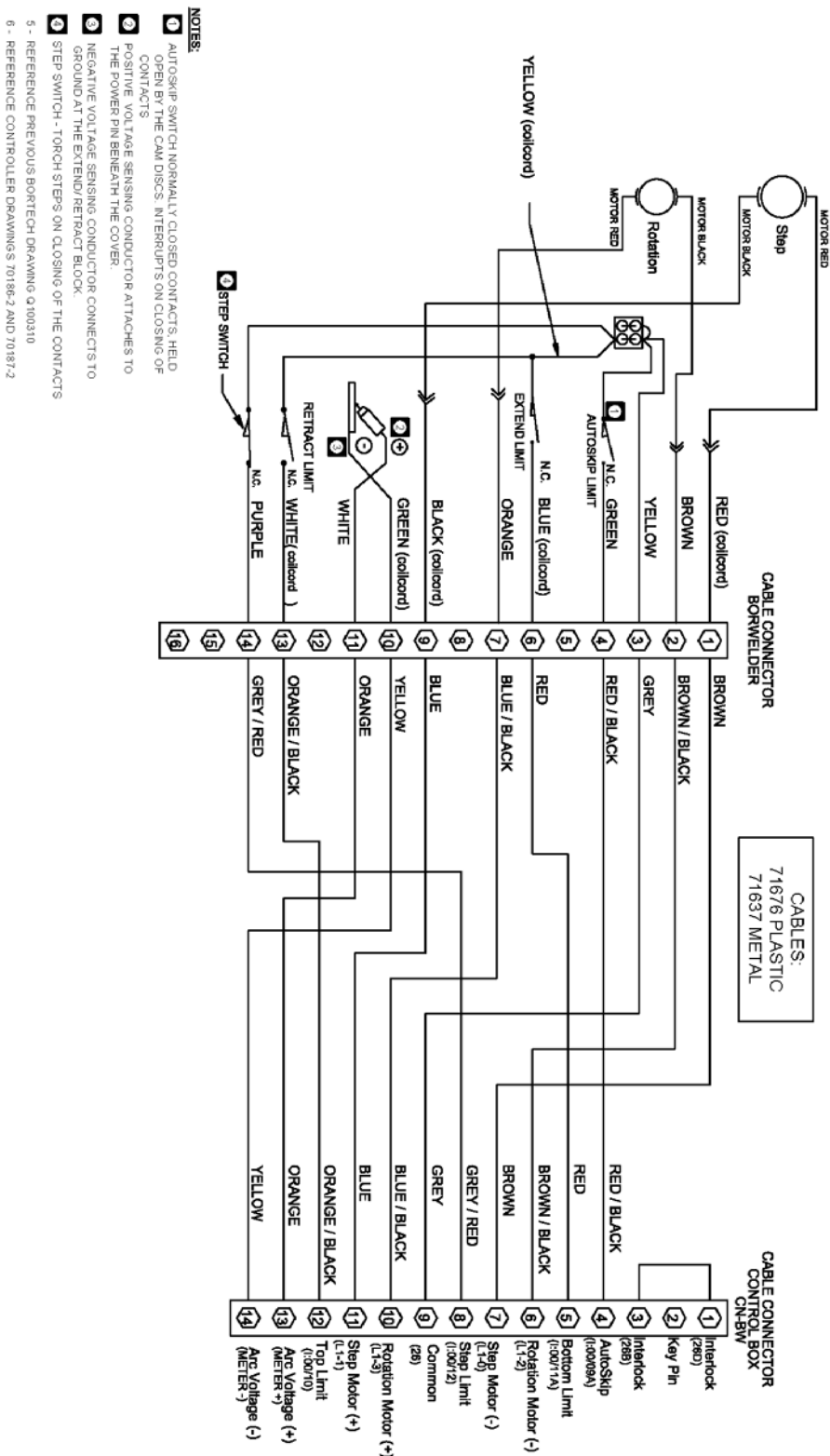


Figure 6. Schematic BW3000 BoreWelder and cables metal or plastic connectors (P/N 87413)

Reference Documents:
 - Boretech Q1000537 rev A
 - Controller Dwg 70186

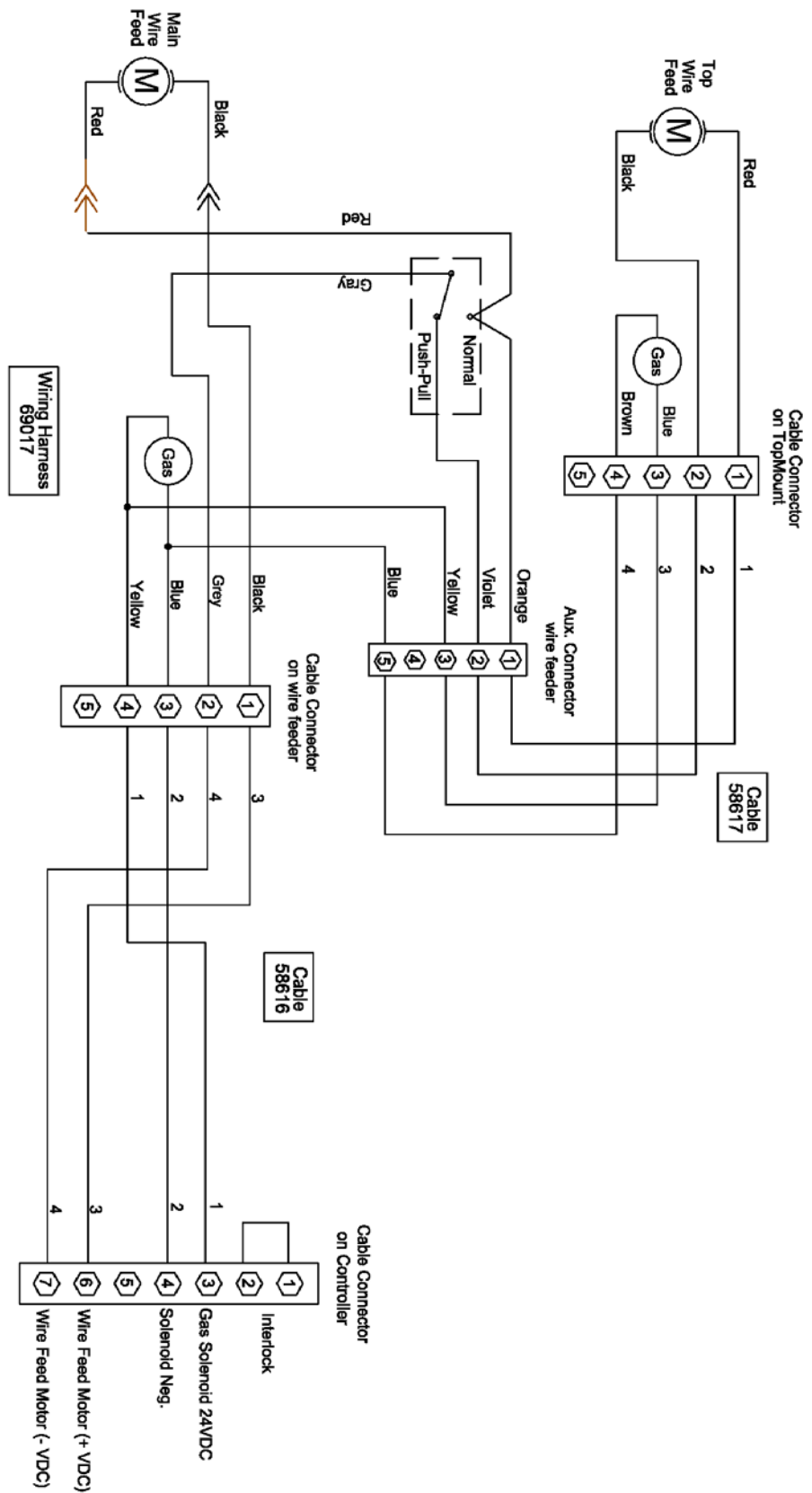
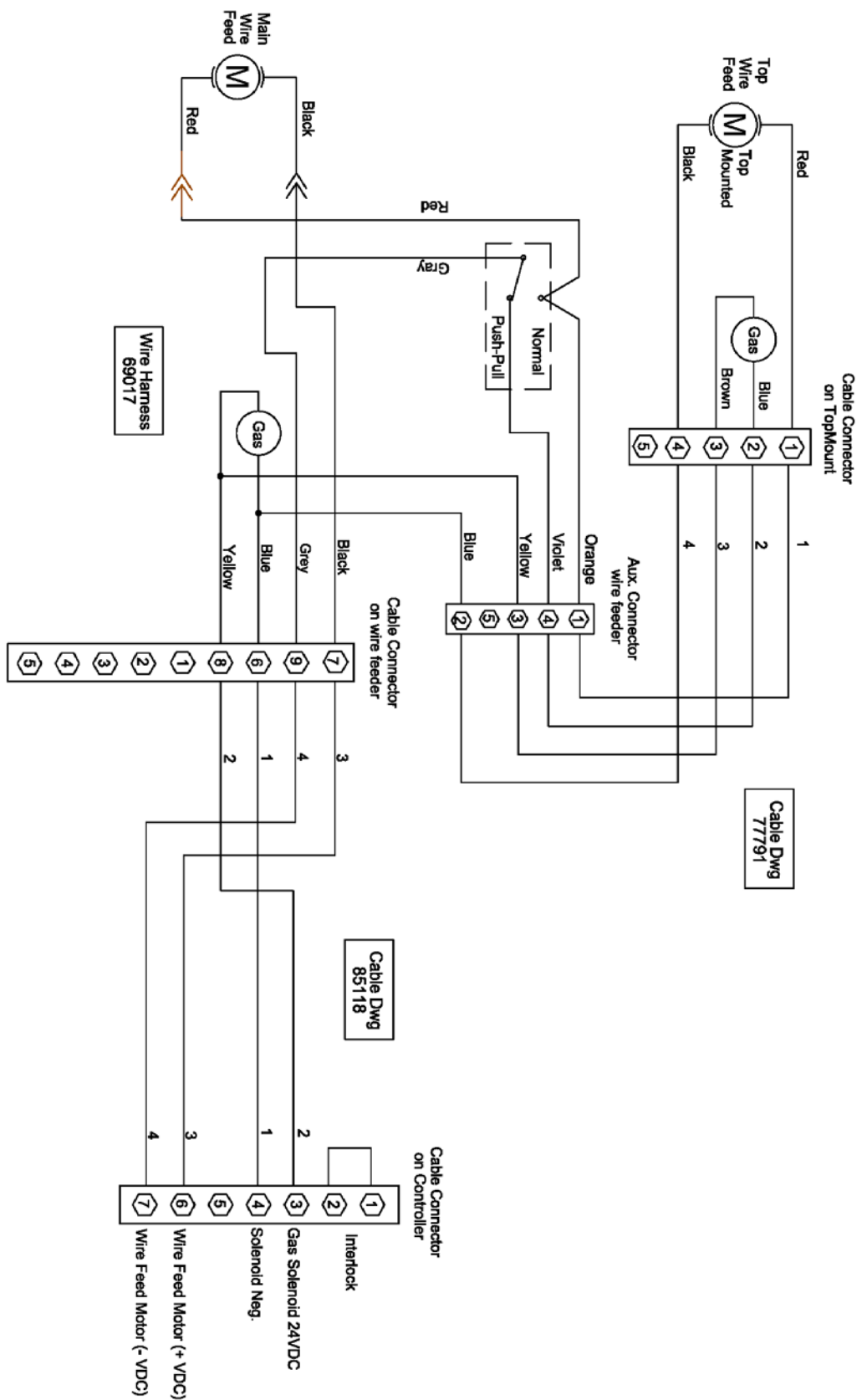







Figure 7. Schematic Enclosed wire feeder 66949 w/ top mount feeder and metal connectors (P/N 87414)



Reference Documents:
 - Boretech Q1000537 rev A
 - Controller Dwg 70187

Figure 8. Schematic enclosed wire feeder 44983 w/ top mount feeder and plastic connectors (P/N 87415)

-  = Hobart Arc Master 351 - 19 pin
-  = Lincoln Invertec Amphenol Socket
-  = Miller XMT Amphenol Socket
-  = Lincoln DC400-DC600
-  = PowCon 300 MST Amphenol

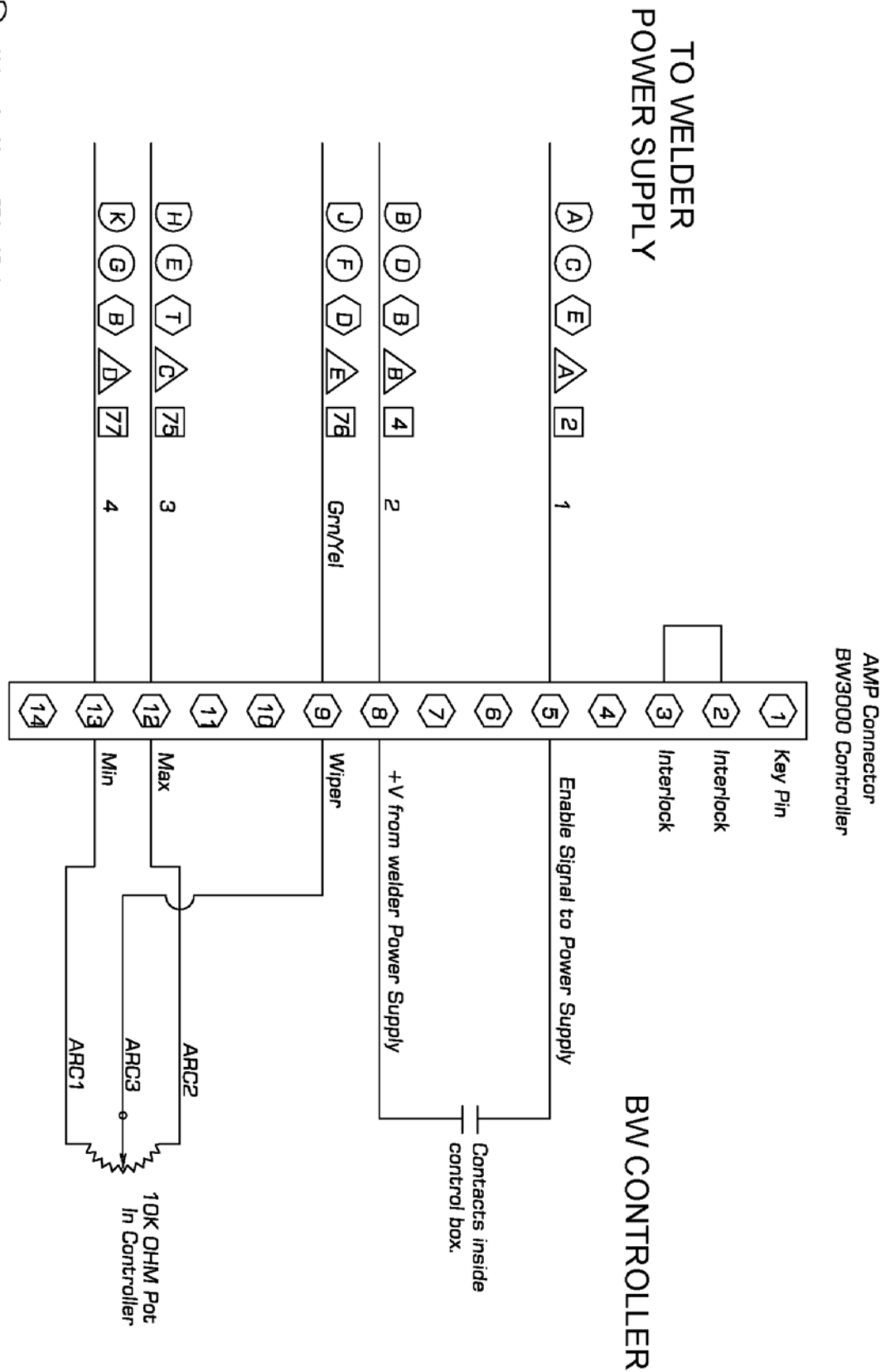


Figure 9. Schematic power supply interface cable 36874 plastic AMP connector (P/N 87419)

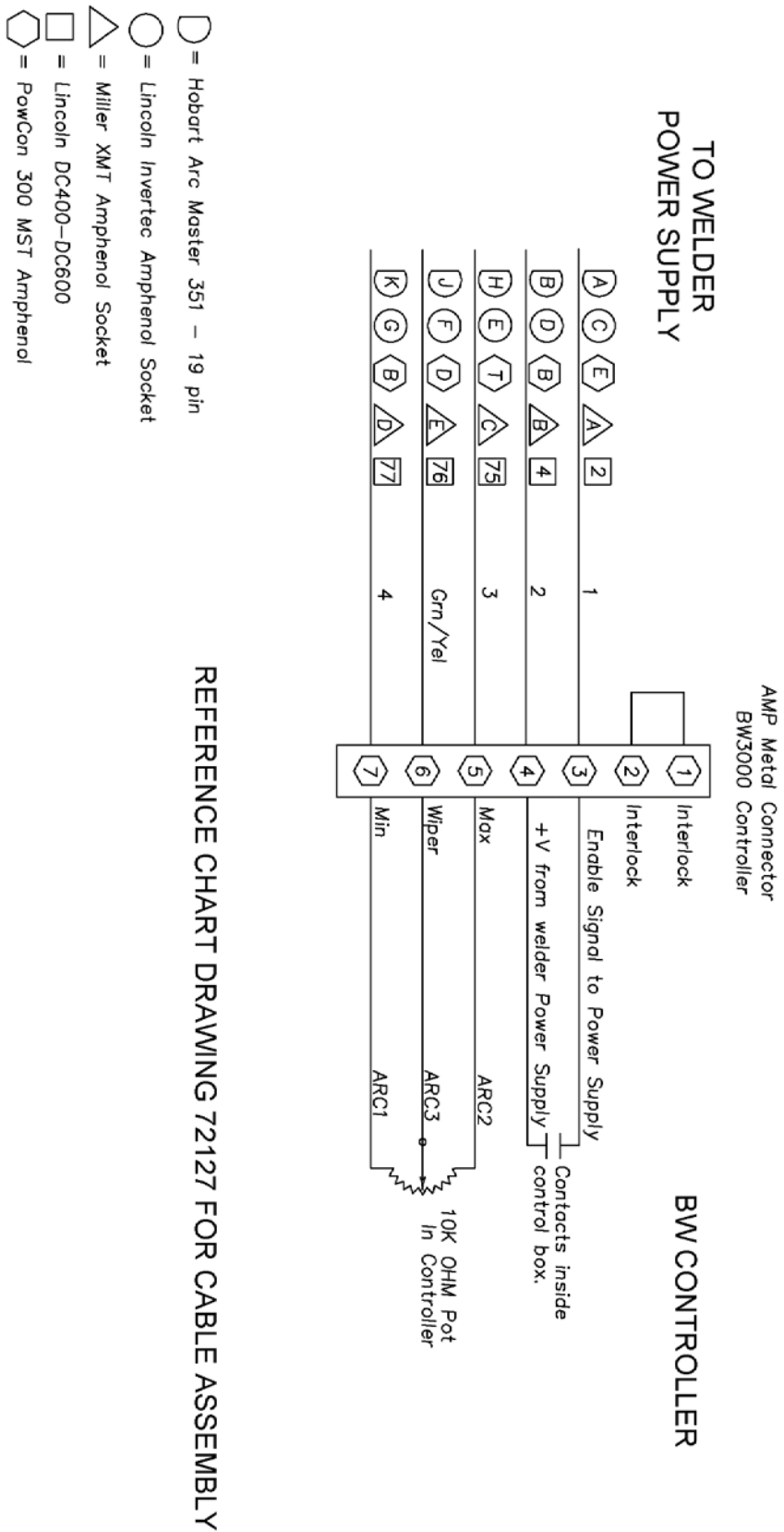
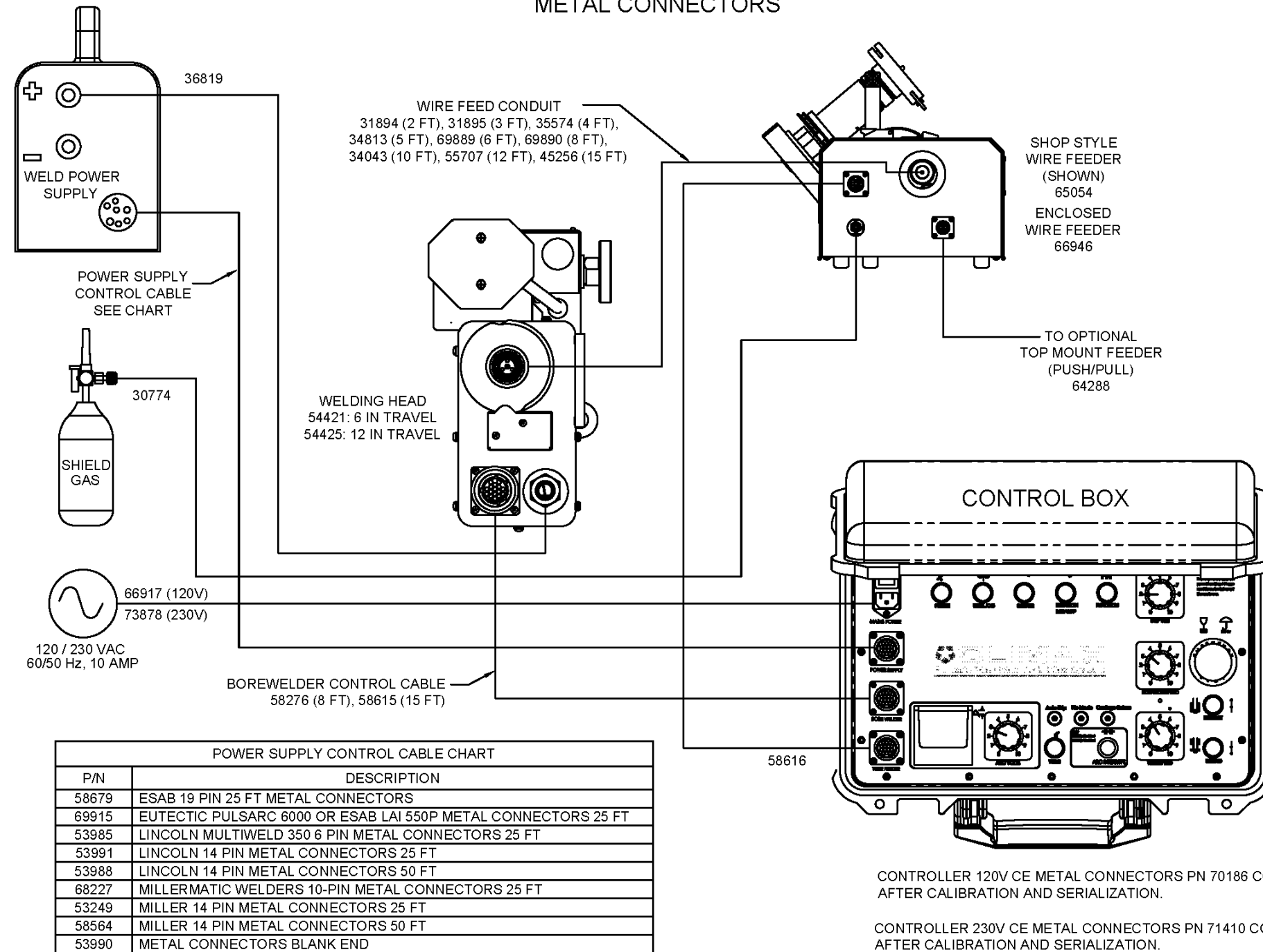



Figure 10. Schematic power supply interface cable 53991 metal connector (P/N 87421)

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BW3000 SYSTEM LAYOUT
METAL CONNECTORS

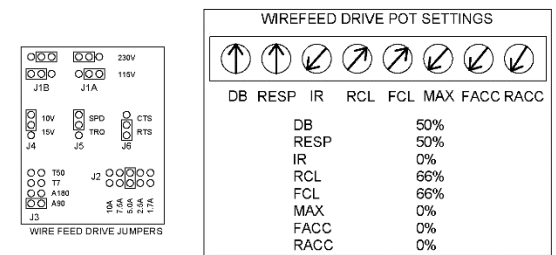
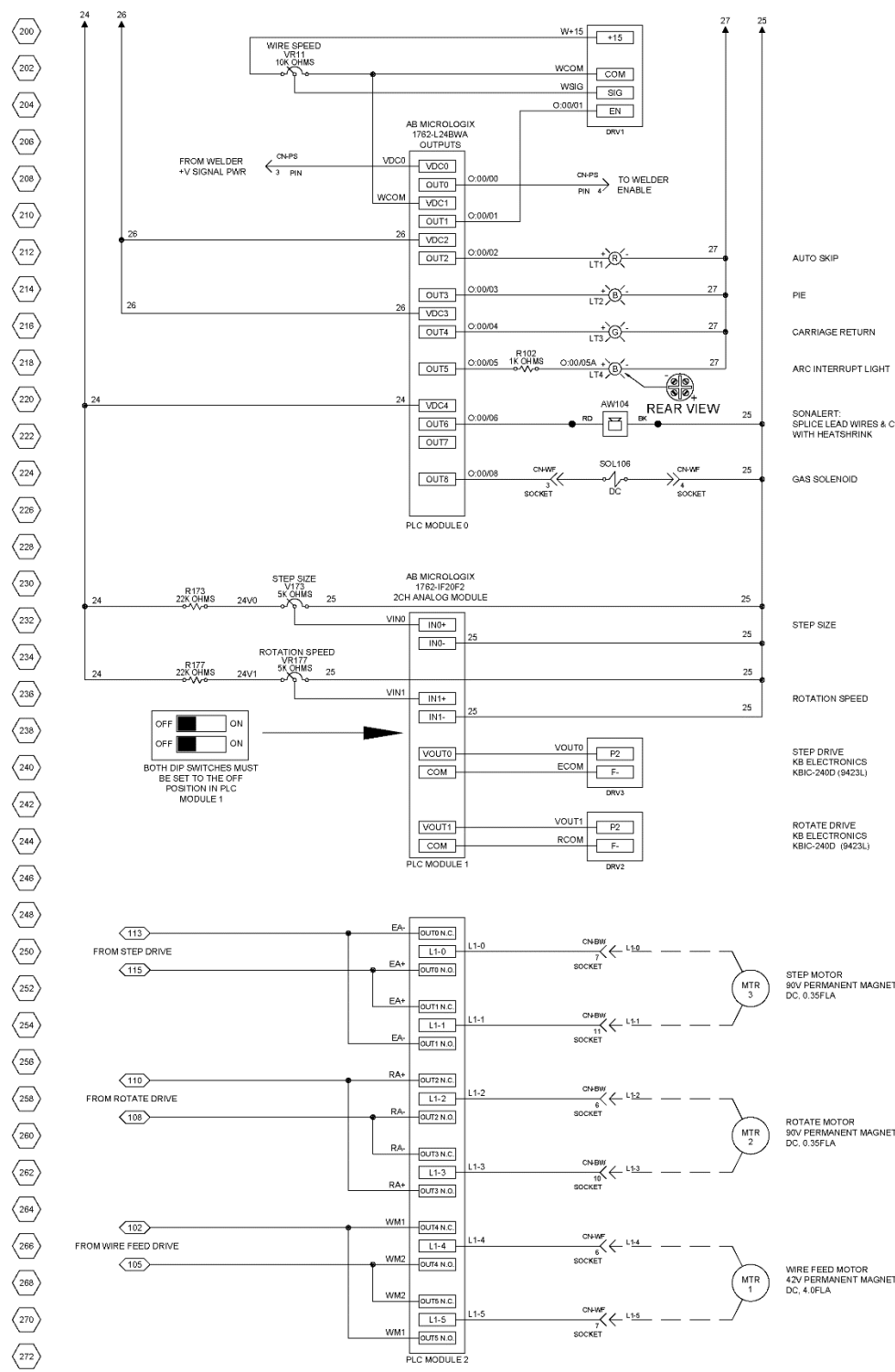
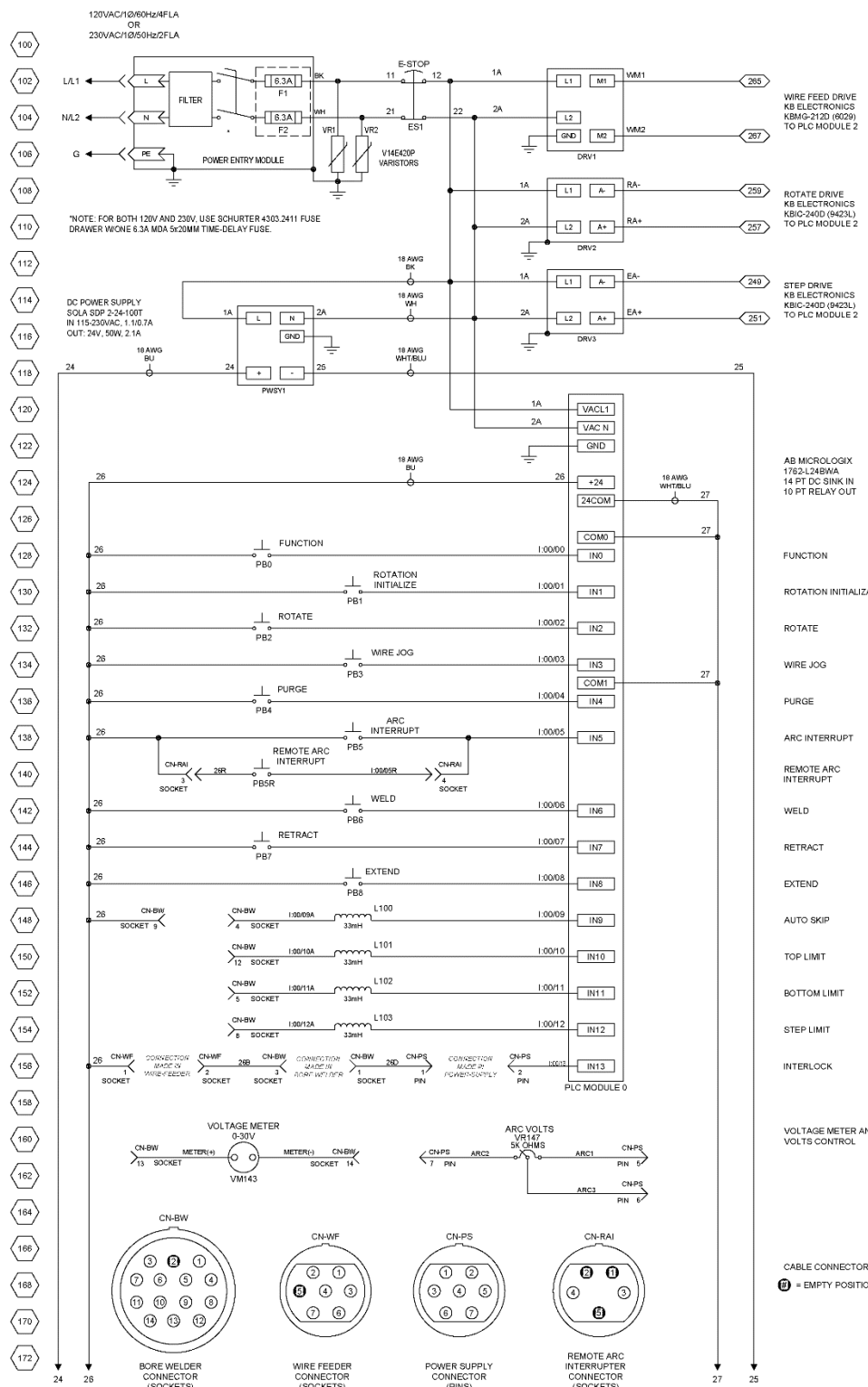


 CLIMAX Portable Machine Tools, Inc.
Newberg, Or. USA 97132

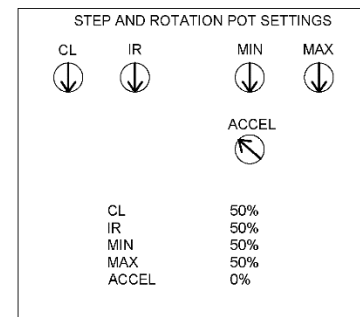
BW3000 SYSTEM LAYOUT
METAL CONNECTORS

DWG NO. **70186-1**

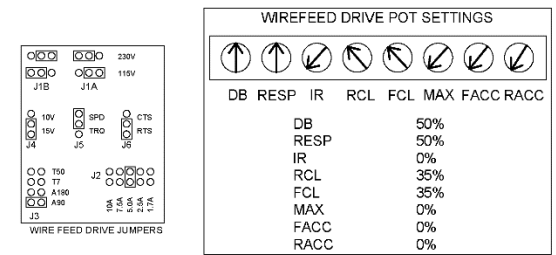
Figure 11. Metal connectors system layout (P/N 70186)



WIRE FEED DRIVE SETTINGS
MODEL: KB ELECTRONICS KBMG-212D
PART NO: 8831J



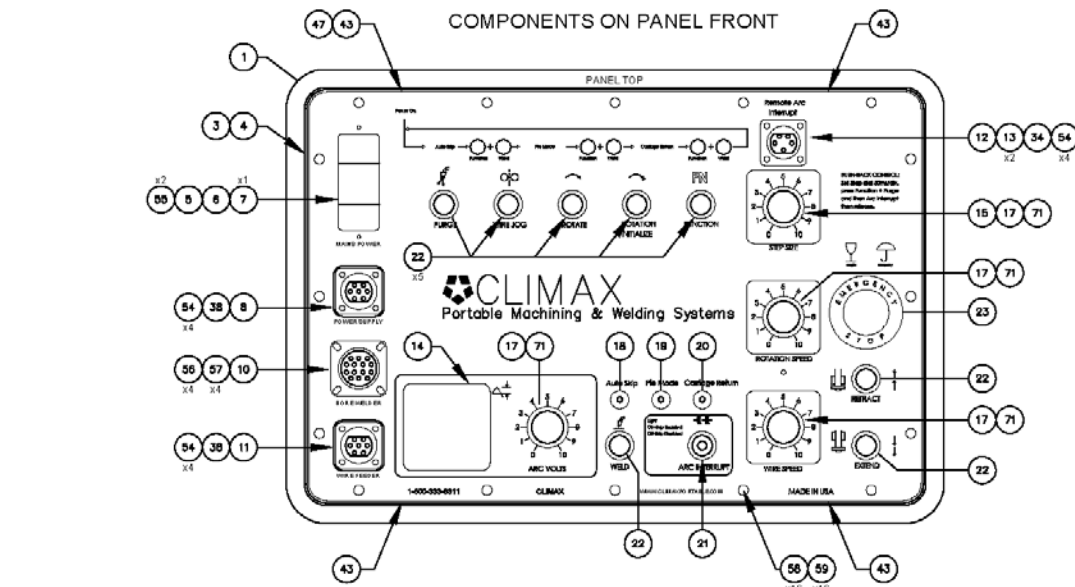
(ALL MODELS)



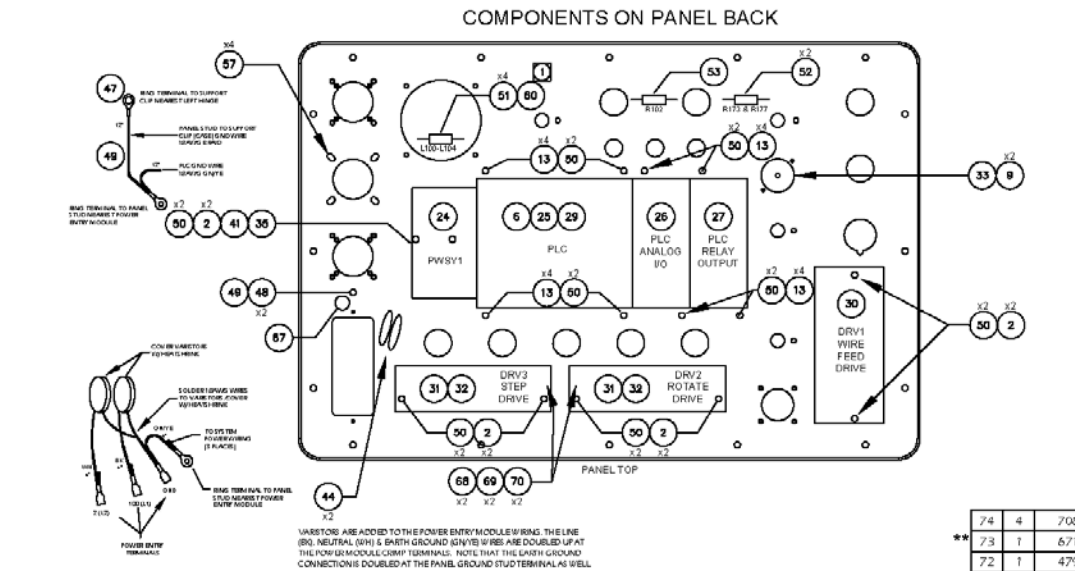
WIRE FEED DRIVE SETTINGS
MODEL: KB ELECTRONICS KBMG-212D
PART NO: 6029

CLIMAX
Portable Machining & Welding System
CONTROLLER BW3000 120/230V CE
METAL CONNECTORS LADDER SCHEMATIC
DWG NO: 70186-2

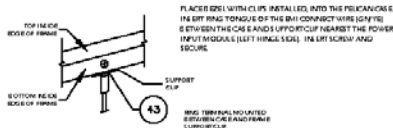
Figure 12. Metal connectors ladder schematic



NOTES:
 1. CASE MOUNTED P/N 70573 CONSISTS OF:
 1- 67248 CASE PELICAN 1000
 1- 70640 PANEL FRAME KIT
 1- 73659 LABEL CLIMAX LOGO
 1- 70603 CLIP PANEL FRAME
 1- 67228 PANEL & PUSH PLC
 CONTACT CLIMAX FOR A DETAIL DRAWING OF THIS SUB-ASSEMBLY
 2. ALL CONTROLLERS ARE TO BE SHIPPED WITH T2172 DRAWER FUSE INSTALLED. FOR T1410 230V CONTROLLER CLIMAX WILL ALSO PROVIDE T1020 DRAWER FUSE W/2 6A-40 FUSE (TO BE USED IN 230V SYSTEMS WITH TWO HOT LINES).
 3. FERRULE NEEDED DURING TOP LEVEL WIRING AS EMBLY TO ATTACH THE POWER HARNESS TO THE POWER SUPPLY.
 4. 70186 NFS CONTROLLER GOES TO MAKE T1402
 T1410 NFS CONTROLLER GOES TO MAKE T1403



VARIABLES ARE ADDED TO THE POWER ENTRY MODULE WIRING THE LINE (B), NEUTRAL (N) & EARTH GROUND (E) WIRE WIRING ARE DOUBLED UP AT THE POWER MODULE CONN. TERMINALS. NOTE THAT THE LINE & GROUND CONNECTIONS DOUBLED UP AT THE PANEL GROUND STUD TERMINAL WILL.



NOTES:
 1. USE 5' OF 28415 FOR EACH T109
 2. MANUFACTURE IN ACCORDANCE WITH CLIMAX DOCUMENT 36380, 'WORKMANSHIP STANDARDS FOR ELECTRICAL DEVICES'
 3. FUNCTION TEST PER CLIMAX 73809

ITEM	QTY	CLIMAX P/N	DESCRIPTION	MFG & P/N
74	4	70828	SCREW 4-24 X 1/2 THD FORMING TYPE B PH	MCMASTER CARR 5026A110
73	1	67167	LABEL 230 VOLT	ULTE12055-230 VMC
72	1	47981	PLATE SERIAL YEAR MODEL ELECTRICAL PANELS CE 2.75 X 3.13	-
71	4	32926	SEAL POTENTIOMETER HEXNUT .25 SHAFT 3/8-32	ALLEN 761540111
70	2	37572	LABEL PE GROUND TERMINAL	CLIMAX 1200114
69	2	20758	WASHER #6 (TSTRW)	ORION ON BOUL 120182
68	2	20760	SCREW 6-32 X 1/4 PHSM6 CROSSPOINT ZINC PLATED	ORION ON BOUL 1202019AC
67	1	77568	LABEL PROTECTIVE EARTH 1/2" DIA	ACCIFORM 1501119
66	1	79288	HARNESS WIRING CONTROL BW 3000 CONTROLLER (NOT SHOWN)	CLIMAX 73809
65	8	73878	CORD POWER CE 7/7 230V 90 DEG C 13 RIGHT 8FT	MESA ELECT 1501019
64	A	66917	CORD POWER S-15 120V 90 DEG C 13 6 FT	VOLTE 17550-10181
63	*	*	*	-
62	*	*	*	-
61	2	73025	DRAWER FUSE POWER ENTRY MODULE 2 POLE 5 X 20MM FUSE	SCHURTER 43022401
60	*	*	*	-

PART NO.	DESCRIPTION	A	B
70186	NFIS CONTROLLER BW3000 120V CE UNFINISHED METAL CONNECTORS	1	0
71410	NFIS CONTROLLER BW3000 230V CE UNFINISHED METAL CONNECTORS	0	1

ITEM	QTY	CLIMAX P/N	DESCRIPTION	MFG & P/N
59	16	79316	WASHER #6 NYLON 15 ID X .32 OD X .03 BLACK	MCMASTER 100161311
58	16	62944	SCREW 6-32 X 5/8 BHS CS	ORION ON BOUL 1201814
57	4	73758	NUT 1/4 4-40 NYLON INSERT LOCKNUT HEX ZINC PLATED	MCMASTER 100131005
56	4	23009	SCREW 4-40 X 1/2 BHS CS	ORION ON BOUL BB 2410857
55	2	35857	SCREW 4-40 X 1/4 FHS CS	FASTenal 24144
54	12	58482	SCREW 4-40 X 3/8 BHS CS	ORION ON BOUL 1201814
53	*	*	*	-
52	*	*	*	-
51	*	*	*	-
50	16	73763	NUT 8-32 NYLON INSERT LOCKNUT HEX ZINC PLATED	MCMASTER 100131005
49	12	73775	BRAID GROUND 18 AWG TINNED COPPER (PART OF B1885 HARNESS POWER AND GROUND)	ALPHA WIRE 21031005
48	2	28617	NUT 8-32 LOCKING STAR WASHER	ORION ON BOUL 1201814
47	*	*	*	-
46	*	*	*	-
45	*	*	*	-
44	*	*	*	-
43	*	*	*	-
42	*	*	*	-
41	2	73776	WIRE TIE 20.5" LONG	HELIUM WIRE TIE 1950267
40	*	*	*	-
39	*	*	*	-
38	2	67194	BEZEL CONTROL PANEL PLC (2M)	CLIMAX 67194
37	*	*	*	-
36	*	*	*	-
35	1	82109	DIN RAIL 35MM X 2 INCHES	CLIMAX 82109
34	1	67173	CAP PUSH ON 1.00 OD X 19/32 HT PLASTIC BLACK	MCMASTER 100131005
33	1	69330	SONALERT	MALLORY 100131005
32	2	67143	RESISTOR 35 OHM HORSEPOWER PLC CONTROL DRIVES CE	KB ELECTRONICS 100131005
31	2	65525	DRIVE MOTOR CONTROL 115/230VAC	KB ELECTRONICS 100131005
30	1	67234	DRIVE REGENERATIVE WIREFEED	KB ELECTRONICS 100131005
29	1	70893	MEMORY MODULE PLC EEPROM	ALLEN BRADLEY 1740-BA1
28	*	*	*	-
27	1	67244	RELAY OUTPUT MODULE	ALLEN BRADLEY A-B1740-BA1
26	1	67242	OUTPUT MODULE ANALOG	ALLEN BRADLEY A-B1740-BA1
25	1	67246	PLC MICROLOGIX 1200	ALLEN BRADLEY A-B1740-BA1
24	1	67247	POWER SUPPLY SOLA 24V 50W	DELTA 15001241500
23	1	67239	BUTTON EMERGENCY STOP RED	ALLEN BRADLEY 100131005
22	8	67205	BUTTON PUSH MOMENTARY LOW PROFILE STAINLESS	ALLEN BRADLEY 100131005
21	1	67207	SWITCH PUSHBUTTON MOMENTARY SP PUSH BLUE	ALLEN BRADLEY 100131005
20	1	67216	INDICATOR LED GREEN 24 VDC SOLDER TAG PANEL MOUNT	ALLEN BRADLEY 100131005
19	1	67215	INDICATOR LED BLUE 24 VDC SOLDER TAG PANEL MOUNT	ALLEN BRADLEY 100131005
18	1	67213	INDICATOR LED RED 24 VDC SOLDER TAG PANEL MOUNT	ALLEN BRADLEY 100131005
17	4	67053	KNOB STEP CONTROL BOX	MCMASTER 100131005
16	1	86568	SET LABELS CONTROLLER ELECTRICAL COMPONENTS BW3000 METAL AND PLASTIC	CLN
15	2	87151	FERRULE WIRE INSULATED 18 AWG RED .24 PIN LENGTH .059 DIAMETER	THOMAS & BETTS 2201
14	1	40610	VOLTMETER 1V - 30V CLIMAX	SIEMENS 100131005
13	16	35923	WASHER #8 FTM NYLON	ORION ON BOUL 1201814
12	1	58486	CONNECTOR SOCKET RECEPTACLE 14-5 METAL	TE 2001211
11	1	67204	CONNECTOR PLUG 7 PIN REVERSE MALE/FEMALE SIZE 14	TE 2001211
10	1	58484	CONNECTOR RECEPTACLE 22-14 NICKEL PLATED	TE 2001211
9	2	66952	SCREW 2-56 X 7/8 PHMS	MCMASTER 100131005
8	1	58485	CONNECTOR RECEPTACLE 14-7 ZINC PLATED	TE 2001211
7	2	64549	FUSE 6.3A TIME DELAY 5 X 20MM	BUSMAN 100131005
6	1	64549	FUSE 6.3A TIME DELAY 5 X 20MM	BUSMAN 100131005
5	1	73773	DRAWER FUSE FOR AC POWER ENTRY MODULE 2 POLE W/ SHORTING BAR 5 X 20MM FUSE	SCHURTER 43022411
4	1	75059	MODULE POWER ENTRY 2 POLE WITH LINE FILTER 10A	SCHURTER 100131005
3	1	63306	OVERLAY CONTROL BOX BW3000 CLIMAX	CLIMAX 63306
2	1	67249	PANEL CONTROL BOX BW3000	CLIMAX 67249
1	1	11872	WASHER #8 FTM SAE ZINC PLATED	FASTenal 23021
0	1	70573	CASE MODIFIED CONTROL BOX CE PELICAN 1500	CLIMAX 70573

* USED ON 120V ONLY (70186)
 ** USED ON 230V ONLY (71410)

CLIMAX
 Portable Machining & Welding Systems
 CHART CONTROLLER BW3000
 CE METAL CONNECTORS

CLIMAX NO. **70186-3** REVISION **L**

SHEET 1 OF 1

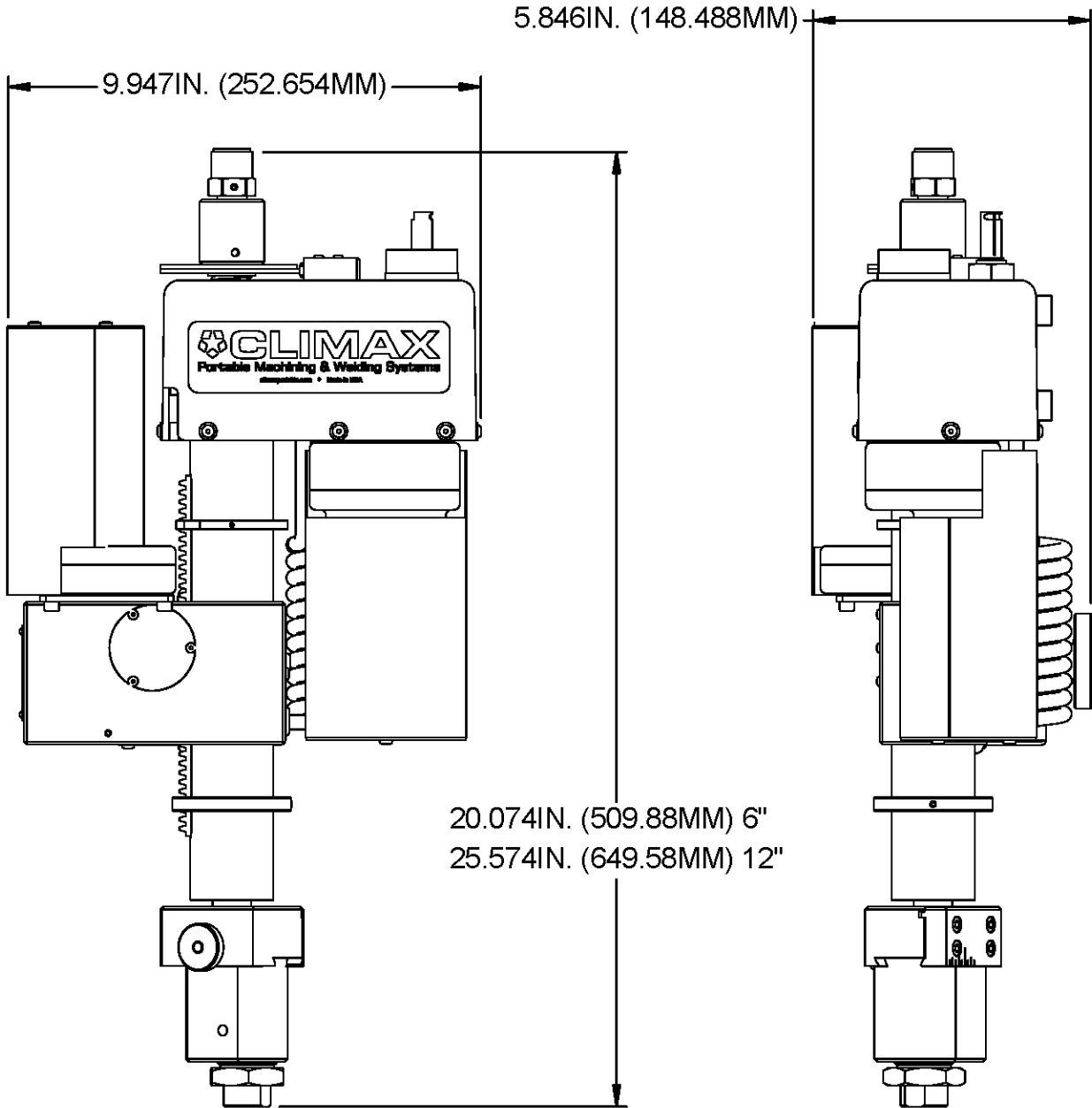
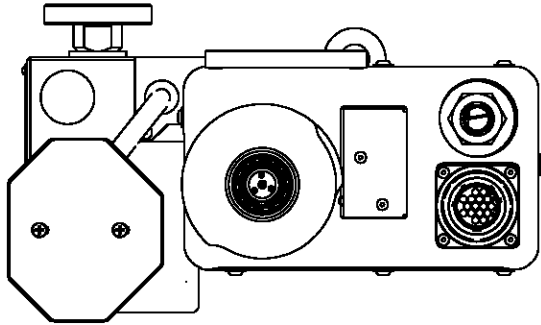
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Exploded Views and Parts Lists

The following diagrams and parts lists are for your reference purposes only. The machine Limited Warranty is void if the machine has been tampered with by anyone who has not been authorized in writing by Climax to perform service on the machine.

Drawing List

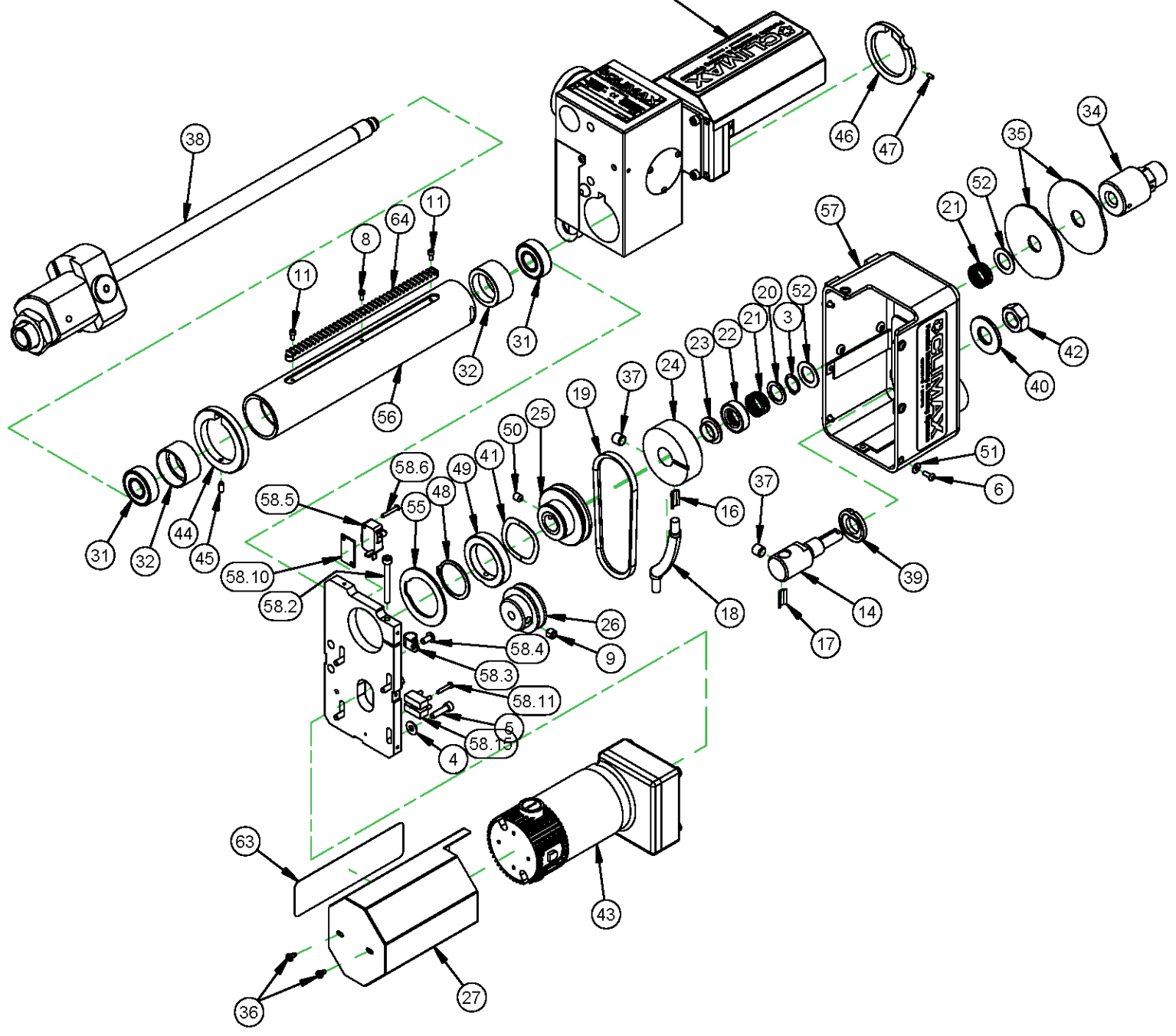
1. 54421 – Welding Head Assembly, 6 inch & 12 inch
2. 54273 – Spindle Head Assembly, 6 inch & 12 inch
3. 68374 – Shroud Assembly, Metal Connector
4. 68379 – Shroud Assembly, Plastic Connector
5. 28208 – Radial Mount Assembly, 5 inch
6. 29037 – Adjustable Base Assembly
7. 65054 – Wirefeeder Assembly, Shop Style
8. 35357 – Wire Straightner Assembly, Shop Style Wirefeeder
9. 69018 – Wirefeeder Assembly, Enclosed
10. 44992 – Feed System Assembly, Top Mount, P/P, 24VDC
11. 66946 – Wirefeeder Assembly, Enclosed, P/P, 24VDC
12. 48013 – Facing Torch Assembly, Compact, 6 in Swing
13. 28186 – Facing Torch Assembly, 8 in Swing
14. 34473 – Torch Assembly, #13 / 24
15. 70132 – Torch Assembly, Bearing Mount Clearance, #6 - #12
16. 38506 – Trammel Torch Assembly
17. 40554 – Hub Assembly, Trammel Torch
18. 64058 – Torch Hub Assembly, Bearing Clearance, #6 - #12
19. 82155 – Torch Extensions, 3–6 in
20. 85213 – Torch Extensions, 12–18 in
21. 30756 – Torch Counterbalance Assembly
22. 28020 – Conical Torch Assembly
23. 39723 – Torch Assembly, #1A
24. 29032 – Torch Assembly, Standard, #2 – #12
25. 31894 – Conduit Assembly, Wire Feed, 2 ft – 15 ft
26. 30774 – Hose Assembly, Shielding Gas
27. 36169 – Electrode Stick Holder Assembly
28. 72101 – Cable Assembly Power Supply Lincoln 14 Pin Plastic Connectors 25 ft
29. 72138 – Cable Assembly Power Supply Lincoln Multi Weld 6 Pin Plastic Connectors
30. 69021 – Cable for Miller Feederless (for 69007)
31. 87304 – NFIS Controller Chart
32. 85396 – Blank End Contactor
33. 85540 – Lincoln Contactor

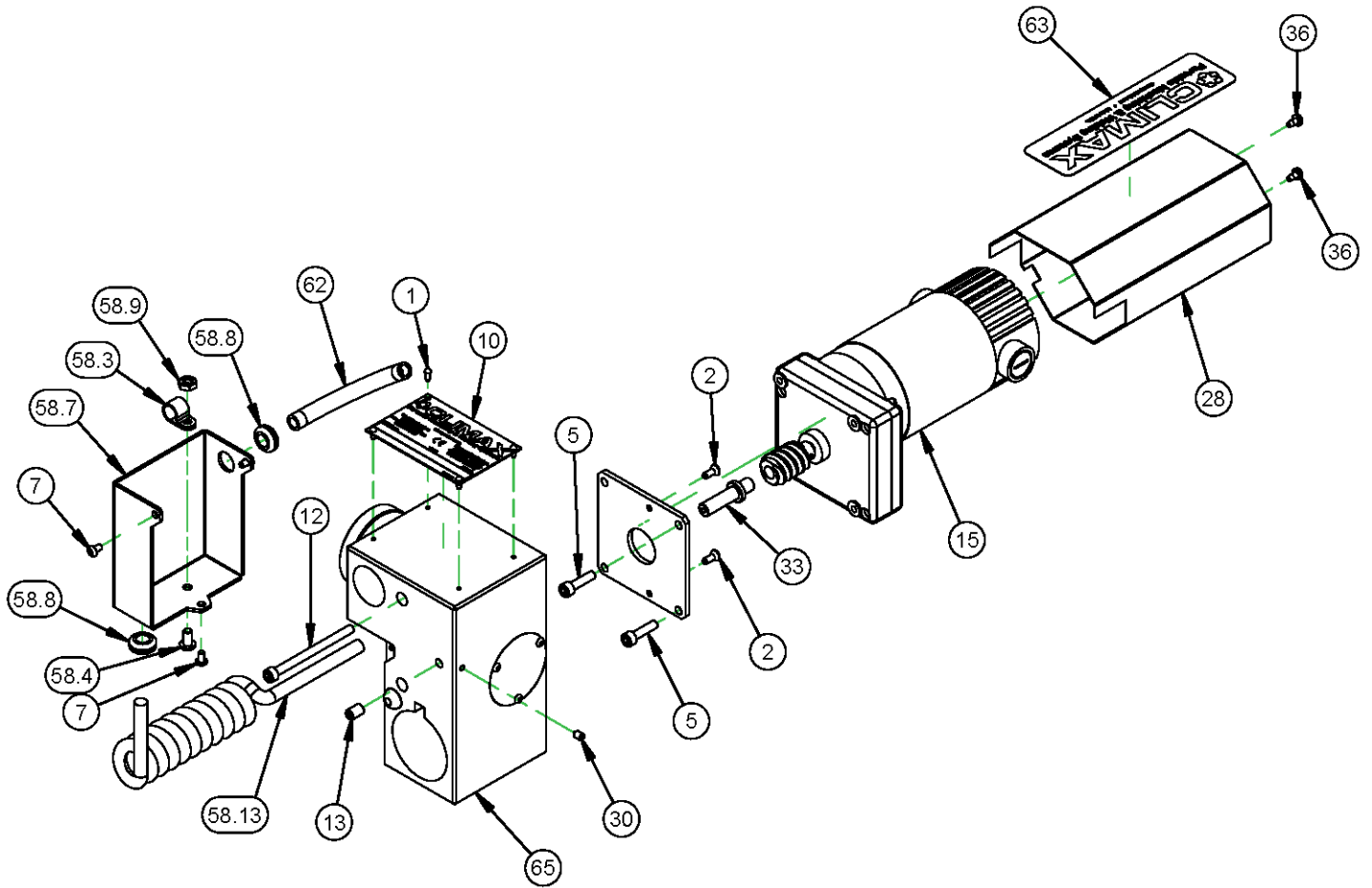


85576 - CHART HEAD WELDING BW3000 AUTO SKIP P/P READY - REV D

FOR REFERENCE ONLY

SEE DETAIL A





DETAIL A

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
2	2	10844	SCREW 6-32 X 3/8 FHSCS
3	1	11019	RING SNAP 5/8 OD X .035 THICK
4	4	11315	WASHER #10 FLTW BLACK OXIDE
5	6	11676	SCREW 10-32 X 3/4 SHCS
6	8	11677	SCREW 6-32 X 3/8 BHSCS
7	3	12599	SCREW 6-32 X 1/4 BHSCS
8	1	12620	SHCS 4-40 X 1/4
9	1	27895	SCREW 5/16-18 X 5/16 SSSFP
10	1	29154	PLATE SERIAL YEAR MODEL CE 2.0 X 3.0
11	2	30828	SCREW 5-40 X 1/4 SHCS
12	2	30889	SCREW 10-32 X 2-1/2 SHCS
13	1	30901	SCREW 1/4-28 X 3/8 SSSFP
14	1	32947	CONNECTOR POWER QUICK COUPLE
15	1	36627	MOTOR MODIFIED STEP GEAR
16	1	36811	INSERT WELDING CABLE SHORT
17	1	36812	INSERT WELDING CABLE CLAMP
18	1	36813	CABLE #2 AWG FLEX-A-PRENE BLACK
19	1	40179	BELT V SPINDLE DRIVE GOODYEAR
20	1	40476	WASHER SHIM .625 ID .875 OD .062 THK STEEL
21	2	40477	SPRING COMP .845 OD X .067 WIRE X .875
22	1	40478	BRG THRUST
23	1	40479	BUSHING INSULATOR POWER COUPLING
24	1	40480	COUPLING POWER UPPER
25	1	40482	PULLEY POWER COUPLING
26	1	40558	PULLEY ROTATION MOTOR STD
27	1	40565	SHROUD MOTOR ROTATION
28	1	40566	SHROUD STEP MOTOR
29	1	40571	PLATE MOTOR ADAPTER
30	1	40572	SCREW 8-32 X 3/16 SSSDP BRONZE TIP
31	2	40575	BEARING QUILL
32	2	40576	BUSHING INSULATOR QUILL
33	1	40592	GUIDE WORM AND THRUST PIN
34	1	42015	SWIVEL ASSEMBLY CONDUIT CONNECTOR
35	2	43874	CAM INTERRUPT
36	4	48582	SCREW 6-32 X 1/4 PPHSTS SELF TAPPING BLACK OXIDE
37	2	48846	SCREW 3/8-16 X 3/8 SSSCP
38	1	54273	SPINDLE OFFSET HEAD ASSEMBLY 6 INCH STROKE
		62468	SPINDLE OFFSET HEAD ASSEMBLY 12 INCH STROKE
39	1	57844	BUSHING INSULATOR LOWER POWER CONNECTOR SUBFRAME
40	1	57845	BUSHING INSULATOR POWER COUPLER

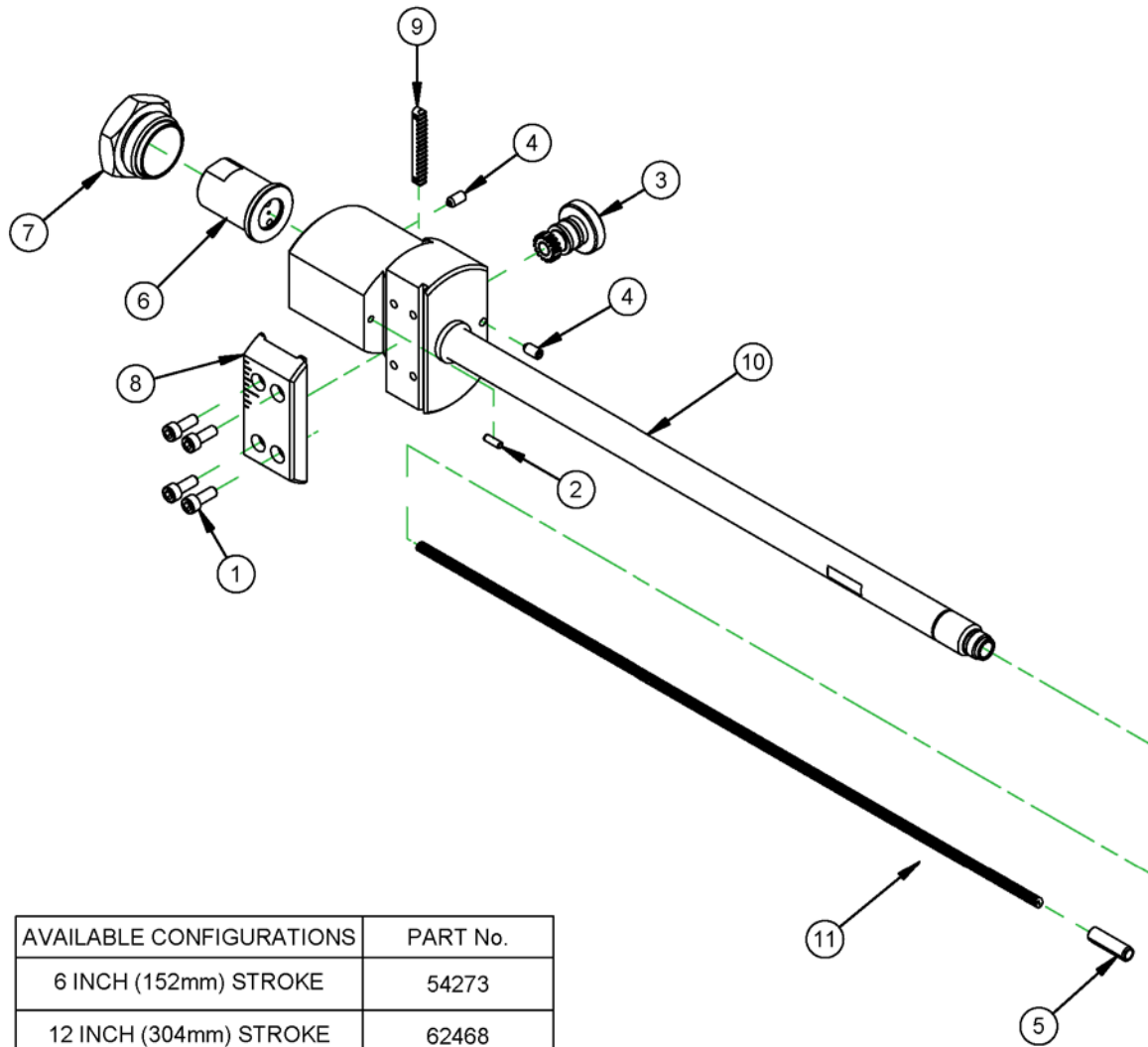
85576 - CHART HEAD WELDING BW3000 AUTO SKIP P/P READY - REV D

FOR REFERENCE ONLY

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
41	1	57846	WASHER SPRING WAVE 1.404 ID X 1.819 OD
42	1	57847	NUT JAMN 5/8-18 X 3/8 THICK
43	1	61210	GEARMOTOR PAINTED BW3000 90 VDC 7 RPM TENV
44	1	62463	COLLAR QUILL LOWER AUTO SHUTOFF MODEL Z
45	1	62464	SCREW 8-32 X 3/8 SSSDP NYLON TIP
46	1	62490	COLLAR UPPER AUTO OFF MODEL Z
47	1	62491	SCREW 4-40 X 1/4 SSSDP NYLON TIP
48	1	62498	RING SNAP 1-3/8 ID X .05 TH BLACK FINISH
49	1	62499	COLLAR STEP ADJUSTABLE POWER COUPLING
50	1	62500	SCREW 1/4-28 X 5/16 SSSCP
51	8	62502	WASHER #6 BLACK OXIDE
52	2	62504	WASHER SHIM .625 ID 1.000 OD .048 THICK STEEL
53	2	67048	(NOT SHOWN) TERMINAL QUICK DISCONNECT DBL CRIMP MALE 22-18 AWG .250 X .032 RED
54	2	67050	(NOT SHOWN) CONNECTOR SOCKET DBL CRIMP 22-18 AWG .250 X .032 RED
55	1	67168	WASHER ISOLATING POWER COUPLING
56	1	67221 67224	QUILL 6 IN STROKE QUILL 12 IN STROKE
57	1	68374 68379	SHROUD ASSY AUTO-SKIP PUSH-PULL METAL CONNECTOR SHROUD ASSY AUTO-SKIP PUSH-PULL PLASTIC CONNECTOR
58	1	68385	TOP PLATE ASSY BW3000
58.1	1	62492	PLATE MOTOR MOUNT STEP MODEL P MODEL Z
58.2	1	13863	SCREW 10-32 X 1-3/4 SHCS
58.3	2	62485	CLAMP 1/4 CABLE PLASTIC LOOP
58.4	2	11678	SCREW 10-32 X 3/8 BHSCS
58.5	1	37407	SWITCH STEP LIMIT
58.6	2	62487	SCREW 4-40 X 3/4 BHSCS
58.7	1	62484	COVER ELECTRICAL QUILL POSITIONER
58.8	2	40588	GROMMET 5/8 OD 5/16 ID
58.9	1	10837	NUT 10-32 STDN ZINC PLATED
58.10	1	68988	SHIM STEP LIMIT
58.11	1	40559	SCREW 4-40 X 5/8 SPHMS
58.12	1	13243	(NOT SHOWN) WIRE TIE MEDIUM .14 X 8
58.13	1	70182	COIL CORD HARNESS
58.14	1	70183	(NOT SHOWN) KIT WIRE DISCRETE BW3000
58.15	1	40180	(NOT SHOWN) TERMINAL BLOCK EURO 2-POS 22-14AWG
62	1	69968	TUBING 1/4 ID 3/8 OD PVC BLACK
63	2	70226	LABEL CLIMAX LOGO 1.5 X 5.5
64	1	72529 72530	RACK QUILL 6 IN STROKE RACK QUILL 12 IN STROKE
65	1	84532	POSITIONER QUILL ASSY BW3000

85576 - CHART HEAD WELDING BW3000 AUTO SKIP P/P READY - REV D

FOR REFERENCE ONLY

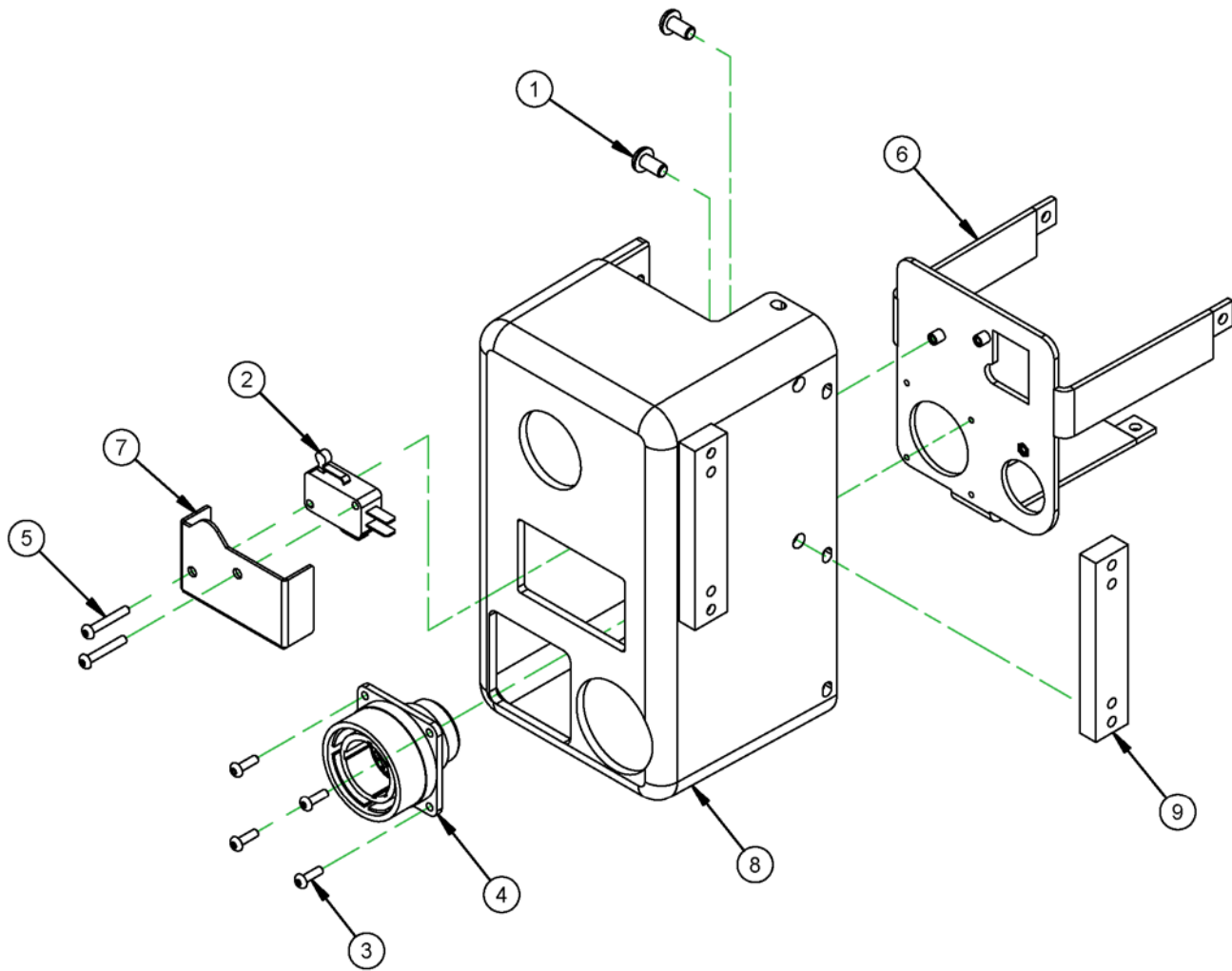


AVAILABLE CONFIGURATIONS	PART No.
6 INCH (152mm) STROKE	54273
12 INCH (304mm) STROKE	62468

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	10877	SCREW 10-32 X .5 SHCS
2	1	14248	PIN DOWEL HARDENED .125 X 3/8
3	1	31675	KNOB ASSEMBLY OFFSET HEAD
4	2	32012	SCREW 10-32 X 3/8 SSSCP
5	1	33955	FITTING CONDUIT SPINDLE
6	1	40283	FITTING TORCH ORIENTATION
7	1	40284	NUT TORCH ORIENTATION FITTING
8	1	40578	PLATE OFFSET HEAD SIDE
9	1	40579	RACK OFFSET HEAD
10	1	62466	SPINDLE ASSEMBLY 6 INCH STROKE
		62467	SPINDLE ASSEMBLY 12 INCH STROKE
11	17.0 in 22.5 in	67162	6 IN TRAVEL - LINER SPINDLE .065 ID X .188 OD 12 IN TRAVEL - LINER SPINDLE .065 ID X .188 OD

SPINDLE OFFSET HEAD ASSEMBLY

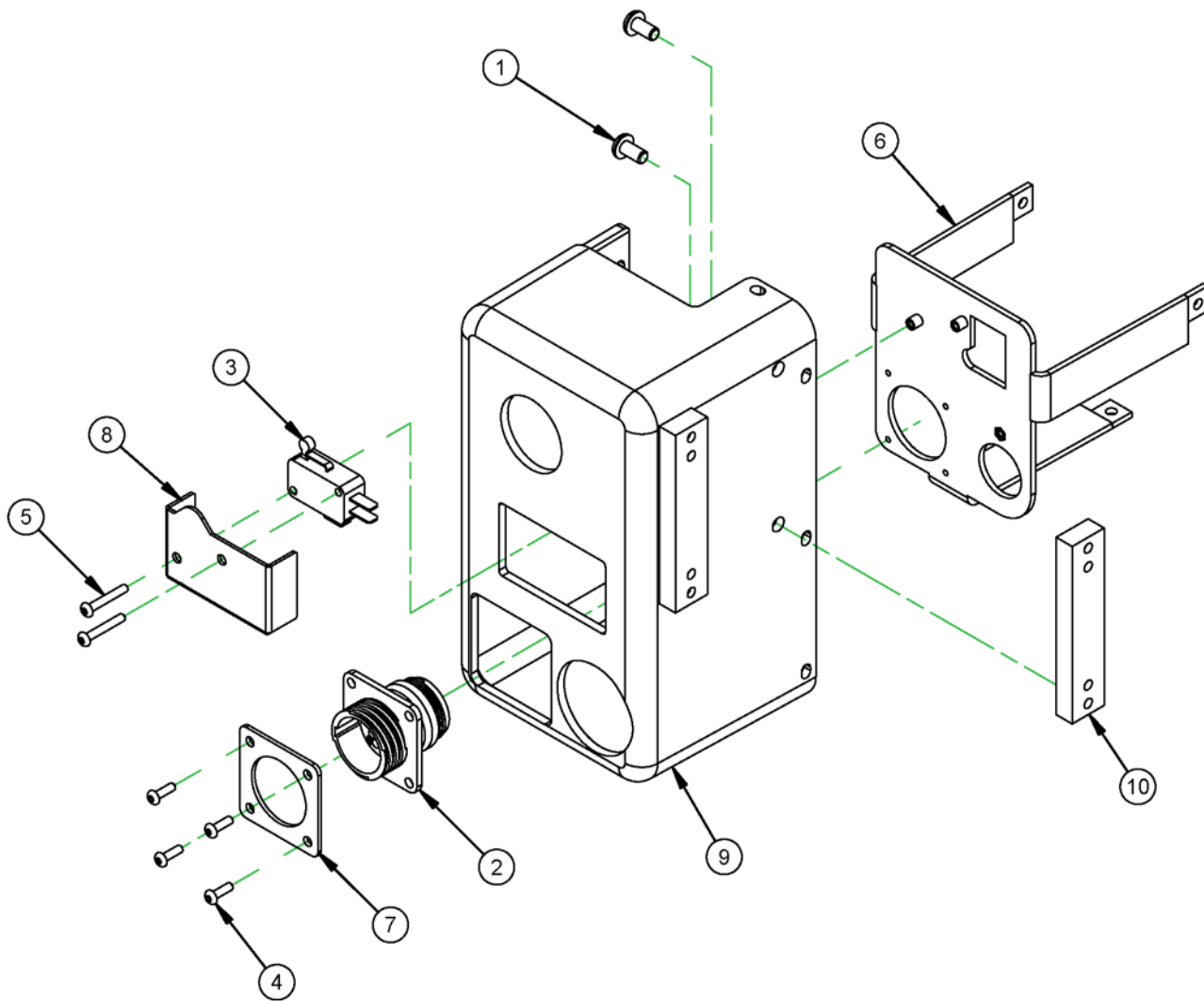
54273



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	11678	SCREW 10-32 X 3/8 BHSCS
2	1	37407	SWITCH STEP LIMIT
3	4	58482	SCREW 4-40 X 3/8 BHSCS
4	1	58483	CONNECTOR RECEPTACLE 22-16 NICKEL PLATED
5	2	62487	SCREW 4-40 X 3/4 BHSCS
6	1	62506	BRACKET COVER SUB FRAME METAL CONNECTORS
7	1	62509	COVER SWITCH AUTO SKIP MODEL Z
8	1	67077	SHROUD AUTO SKIP PUSH PULL MODEL Z CLIMAX
9	2	67201	SPACER MOUNT PULL FEEDER

SHROUD ASSY AUTO-SKIP PUSH-PULL METAL CONNECTOR

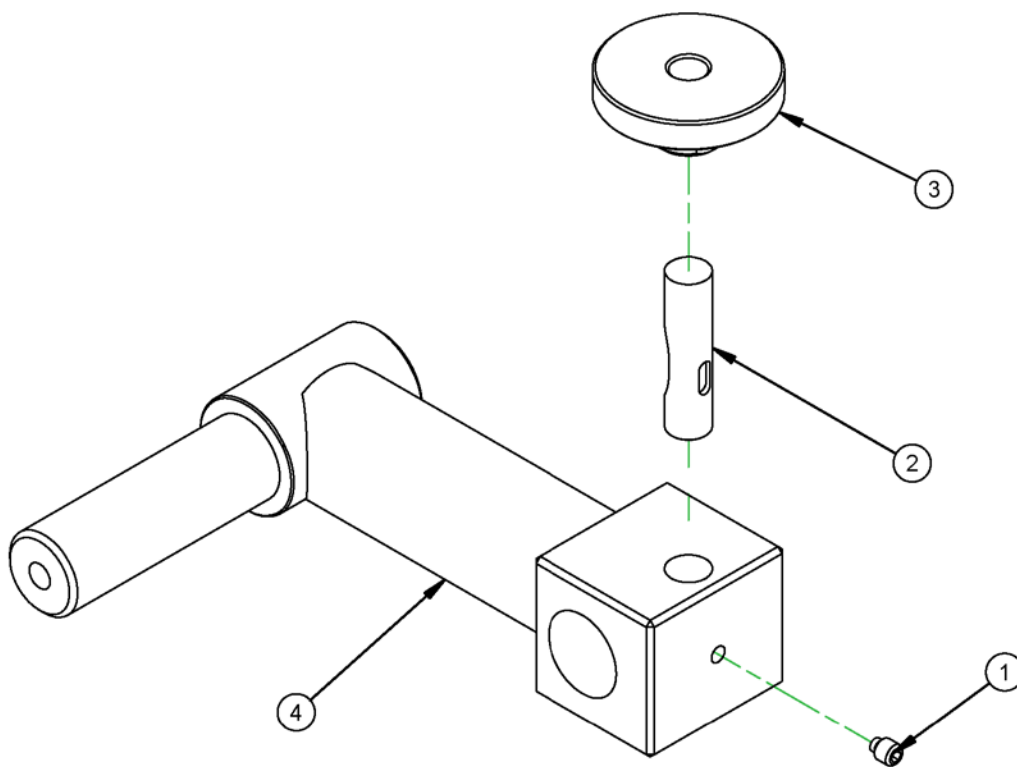
68374



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	11678	SCREW 10-32 X 3/8 BHSCS
2	1	33988	RECEPTACLE 14 PIN PLASTIC FLANGE
3	1	37407	SWITCH STEP LIMIT
4	4	58482	SCREW 4-40 X 3/8 BHSCS
5	2	62487	SCREW 4-40 X 3/4 BHSCS
6	1	62507	BRACKET COVER SUB FRAME PLASTIC CONNECTORS
7	1	62508	BEZEL BW3000
8	1	62509	COVER SWITCH AUTO SKIP MODEL Z
9	1	67077	SHROUD AUTO SKIP PUSH PULL MODEL Z CLIMAX
10	2	67201	SPACER MOUNT PULL FEEDER

SHROUD ASSY AUTO-SKIP PUSH-PULL PLASTIC CONNECTOR

68379

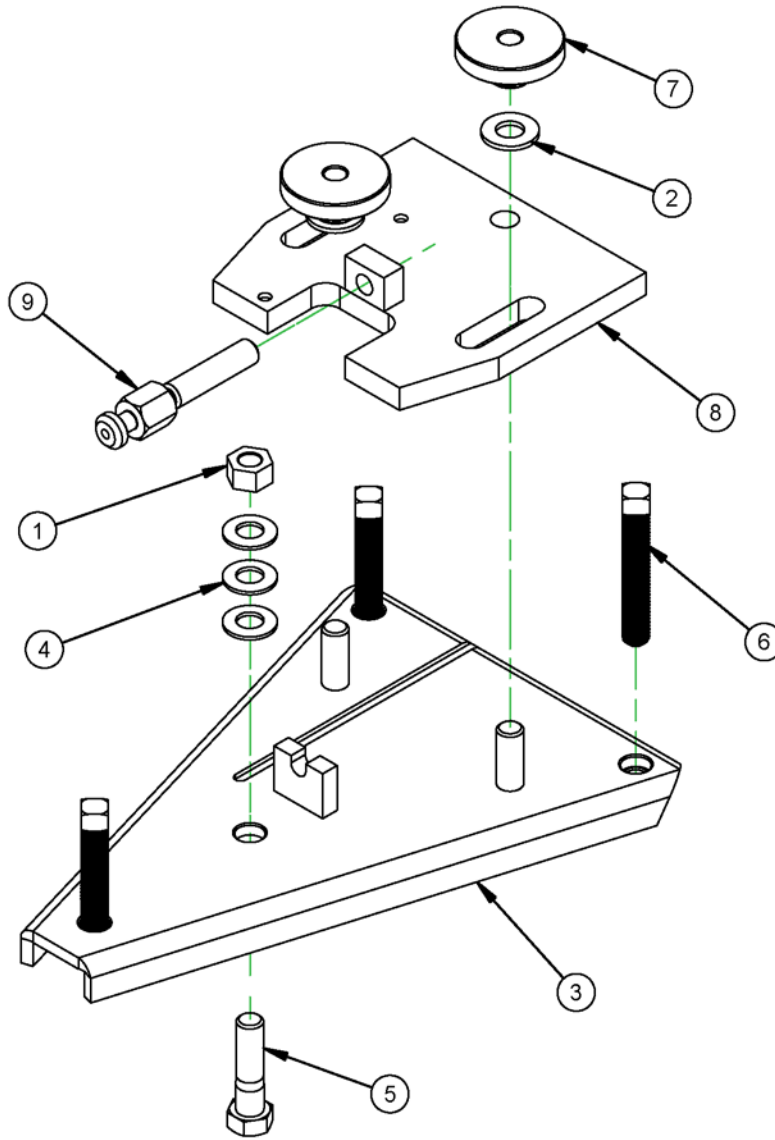


AVAILABLE ASSEMBLIES	PART No.
RADIAL MOUNT 5 in RADIUS (127mm)	28208
RADIAL MOUNT 10 in RADIUS (254mm)	35006

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	15595	SCREW 1/4-20 X 1/4 SSSHDP
2	1	40586	CLAMP RADIAL MOUNT
3	1	40591	KNOB CLAMPING
4	1	67227	BODY RADIAL MOUNT 5 in (127mm)
		67287	BODY RADIAL MOUNT 10 in (254mm)

RADIAL MOUNTS

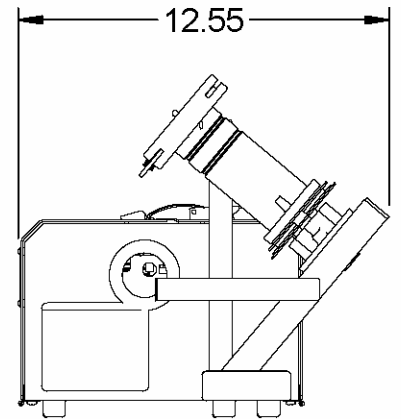
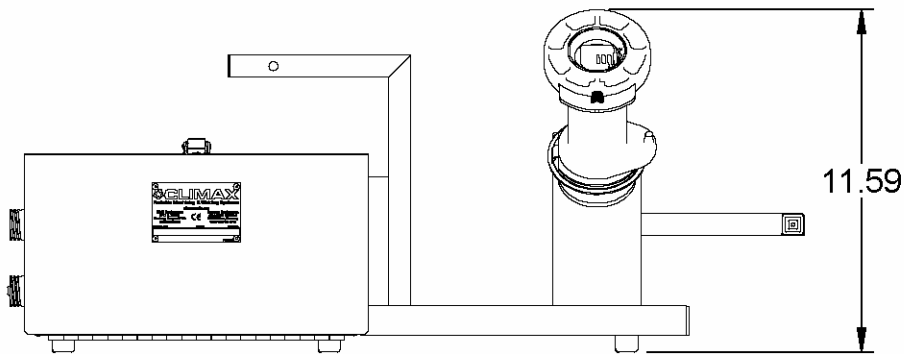
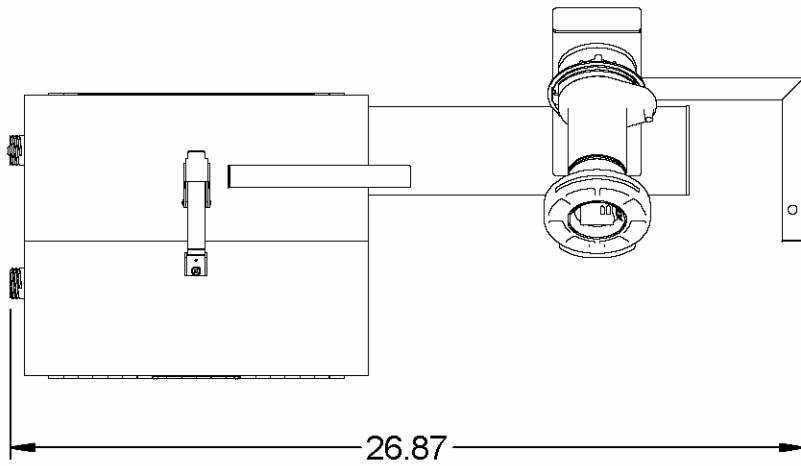
28208



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	10849	NUT 1/2-13 STDN
2	2	11779	WASHER 1/2 FLTW SAE
3	1	35933	BASE ADJUSTABLE
4	3	37975	WASHER SPRING BELLEVILLE 1/2 ID X 1 OD X .073
5	1	39179	SCREW 1/2-13 X 2 HHHCS GRADE 8
6	3	39461	SCREW 1/2-13 X 3 SQHSSCP
7	2	40591	KNOB CLAMPING
8	1	66972	SLIDER BASE ADJUST
9	1	66973	SCREW ADJUSTMENT

ADJUSTABLE BASE

29037

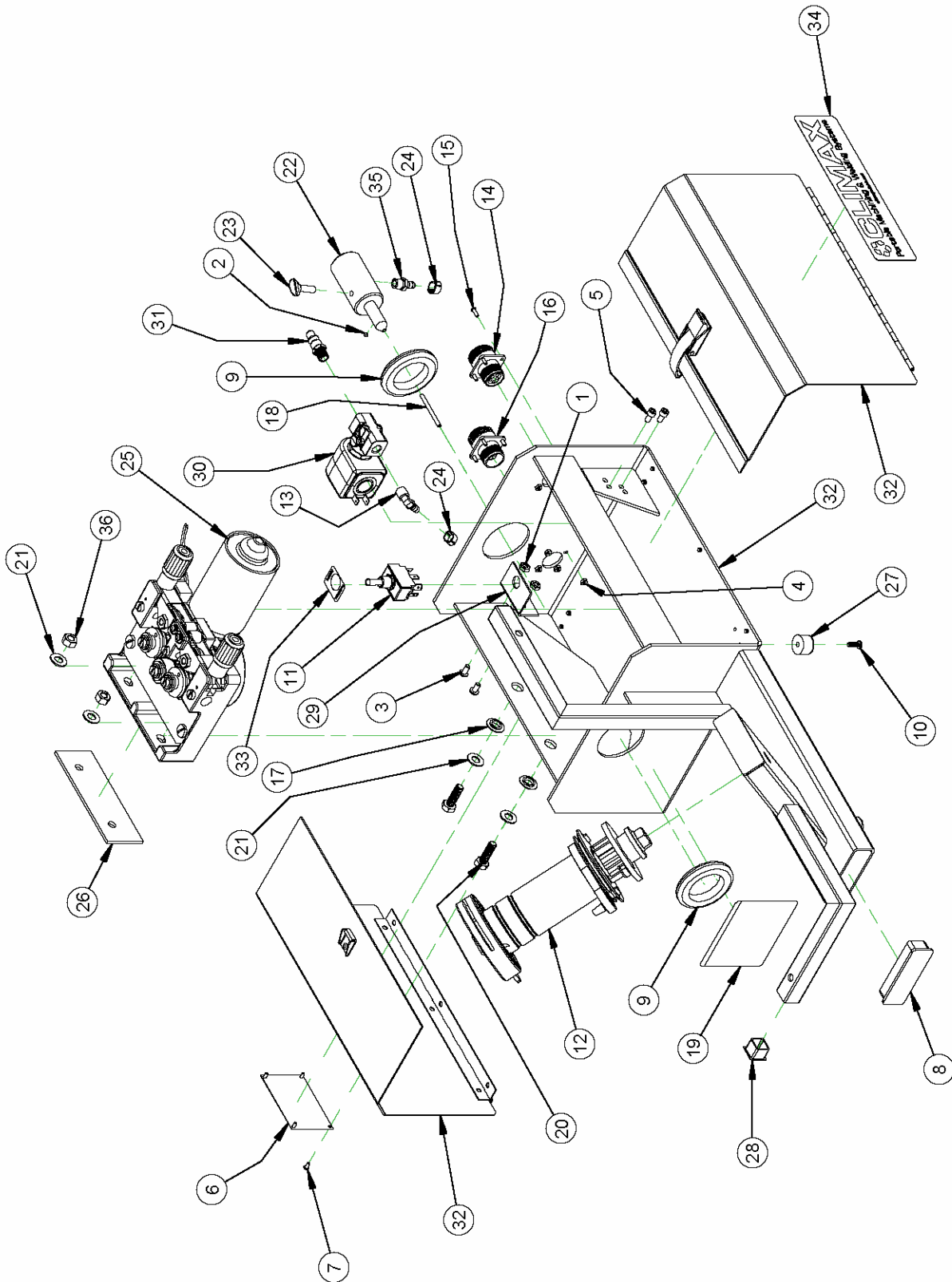


SHOP STYLE WIREFEEDERS PUSH/PULL READY

65054

 **CLIMAX**
Portable Machining & Welding Systems

WWW.CLIMAXPORTABLE.COM inside U.S. 1-800-333-8311



AVAILABLE ASSEMBLIES	PART No.
WIRE FEEDER SHOP STYLE METAL CONNECTORS PUSH PULL READY 24 VDC	65054
WIRE FEEDER SHOP STYLE PLASTIC CONNECTORS PUSH/PULL READY 24 VDC	69812

SHOP STYLE WIREFEEDERS PUSH/PULL READY

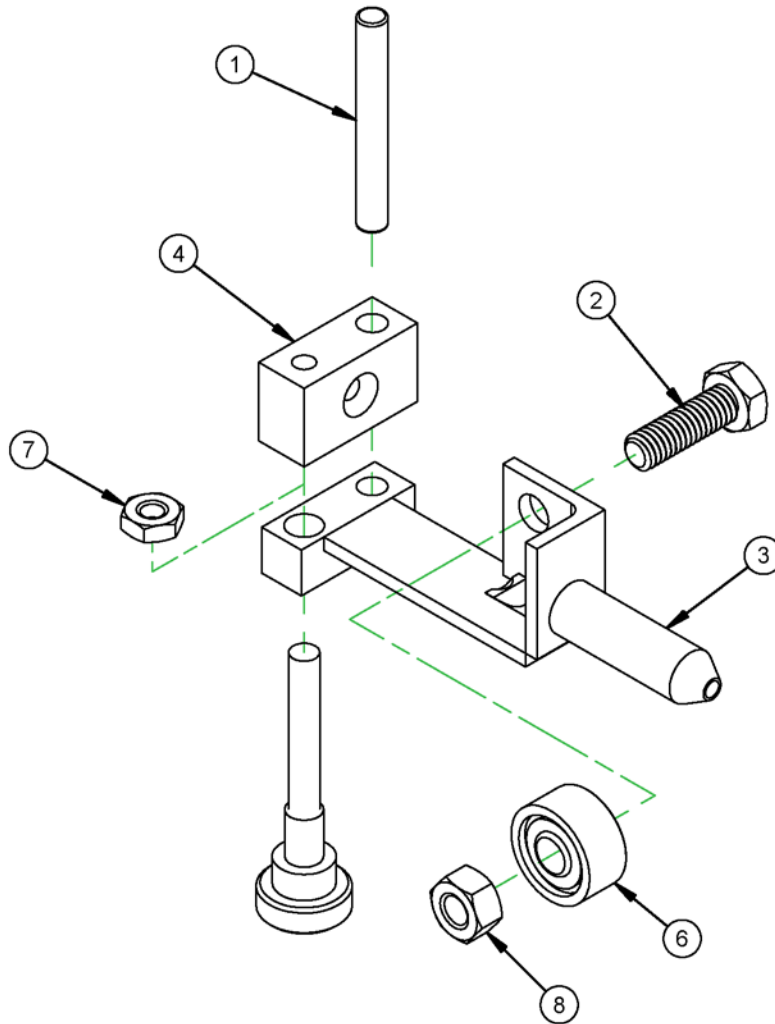


PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	10837	NUT 10-32 STDN ZINC PLATED
2	1	11058	SCREW 8-32 X 1/8 SSSCP
3	2	11678	SCREW 10-32 X 3/8 BHSCS
4	8	12442	NUT 4-40 STDN ZINC PLATED
5	2	19232	SCREW 10-24 X 3/8 SHCS
6	1	29154	PLATE SERIAL YEAR MODEL CE 2.0 X 3.0
7	4	37397	SCREW 4-40 X 1/4 BHSCS
8	2	40490	PLUG TUBING 1 X 3
9	2	40494	GROMMET 2-3/8 OD X 1-1/2 ID
10	6	40501	SCREW 8-32 X 1/2 PPHMS
11	1	40520	SWITCH SPDP 15/32" HOLE DIA
12	1	46555	SUPPORT WIRE REEL
13	1	48791	SP FTG BARB 1/8NPTM X 1/4 HOSE 90 DEG BRASS
14	1	58481	METAL CONNECTOR RECEPTACLE 14-5
		17919	PLASTIC CONNECTOR RECEPTACLE SIZE 13
15	8	58482	SCREW 4-40 X 3/8 BHSCS
16	1	58486	METAL CONNECTOR SOCKET RECEPTACLE 14-5
		67163	PLASTIC CONNECTOR SOCKET RECEPTACLE SIZE 11
17	2	61268	WASHER SHLDR SPACER 3/8 BLACK NYLON
18	1.7 in	62505	LINER BOREWELDER .065 ID X .144 OD
19	1	63504	LABEL WARNING
20	2	67034	SCREW 5/16-18 X 1 HHCS BLK OX
21	4	67037	WASHER 5/16 FLTW SAE BLK OX
22	1	67039	FITTING CONDUIT FEEDER BW3000
23	1	67059	THUMBSCREW 1/4-20 X 3/4 NO SHOULDER
24	2	67064	CLAMP HOSE 3/8 DIA DBL PINCH STEEL
25	1	67074	FEED MECHANISM WIRE FEEDER WITH FEED ROLLS
26	1	67075	ISOLATOR FEED MECHANISM
27	6	67076	BUMPER .78 OD X .56 TALL RUBBER WWASHER
28	2	67081	PLUG END SQUARE 3/4 TUBE
29	1	67203	BRACKET SWITCH PULL FEEDER
30	1	67331	SOLENOID COIL & VALVE 24V
31	1	69332	FTG QUICK COUPLER 1/4B 1/8 NPT MALE AIR
32	1	69856	ASSY FRAME & COVER WIRE FEEDER SHOP STYLE
33	1	69977	LABEL WIRE FEEDER SWITCH PUSH/PULL
34	1	70227	LABEL CLIMAX LOGO 2 X 8
35	1	71257	FTG BARB 1/8 NPTM X 1/4 HOSE BRASS
36	2	71570	NUT 5/16-18 STDN BLK OX
NS	1	58616	CABLE WIRE FEED CONTROL 24V 12 FT METAL CONNECTORS
		41852	CABLE WIRE FEED CONTROL 24V 12 FT PLASTIC CONNECTORS
NS	8.5 in	67031	TUBING 1/4 ID 3/8 OD PVC CLEAR
NS	2	67048	CONNECTOR PIN DBL CRIMP 22-18 AWG .250 X .032 RED
NS	1	69012	HARNESS WIRE FEEDER 24V PUSH/PULL SHOP STYLE

SHOP STYLE WIREFEEDERS PUSH/PULL READY



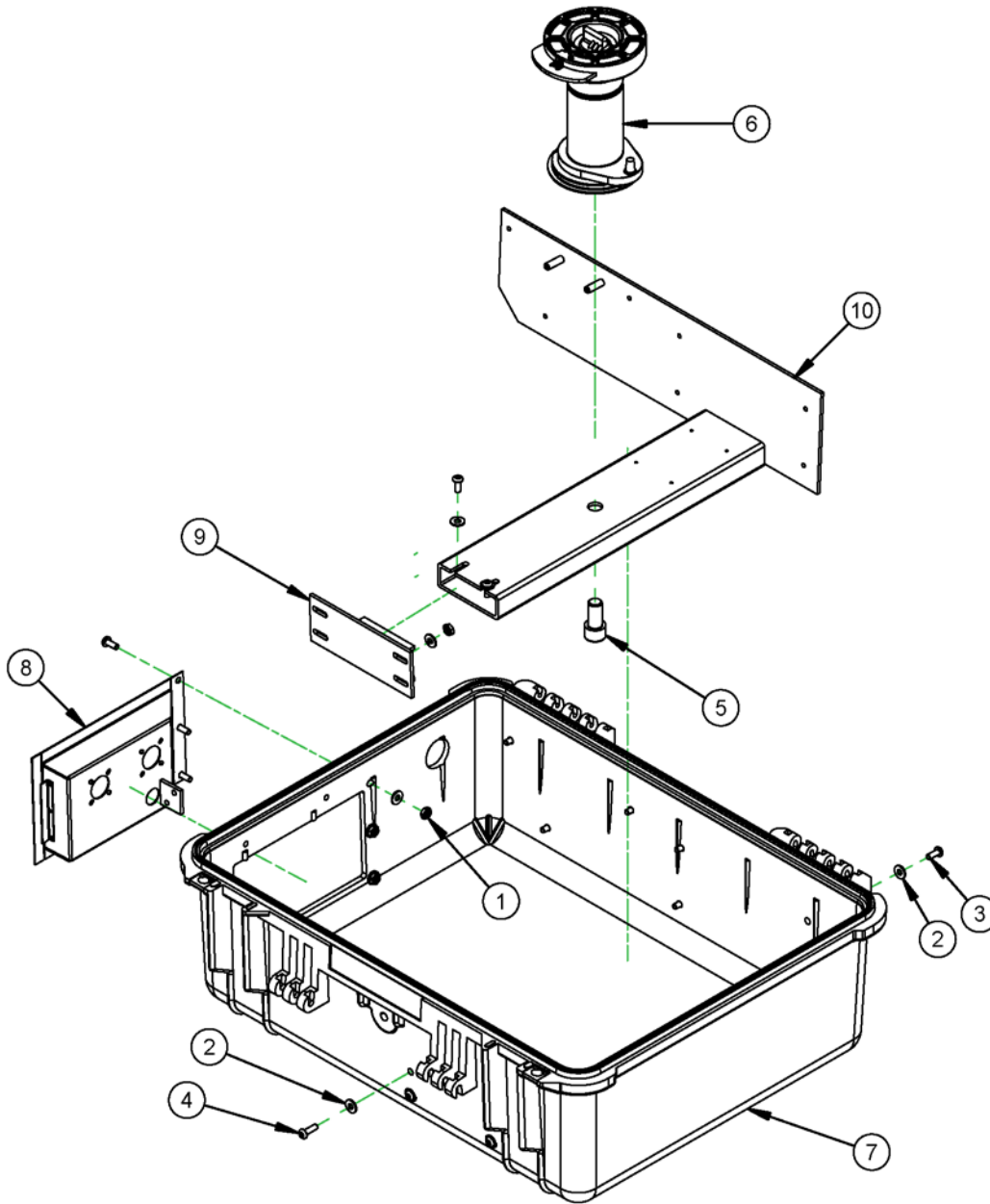
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PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	11877	PIN DOWEL 1/4 DIA X 2
2	1	67034	SCREW 5/16-18 X 1 HHCS BLK OX
3	1	67275	BODY WIRE STRAIGHTENER WELDED
4	1	67276	GUIDE WIRE STRAIGHTENER
5	1	67278	KNOB THREADED ROD ASSY
6	1	67279	BRG BALL 8MM ID X 22MM OD X .497 W/SEALS DEEP GROOVE
7	1	71568	NUT 1/4-20 JAMN BLK OX
8	1	71570	NUT 5/16-18 STDN BLK OX

WIRE STRAIGHTENER (SHOP STYLE WIRE FEEDER ONLY)

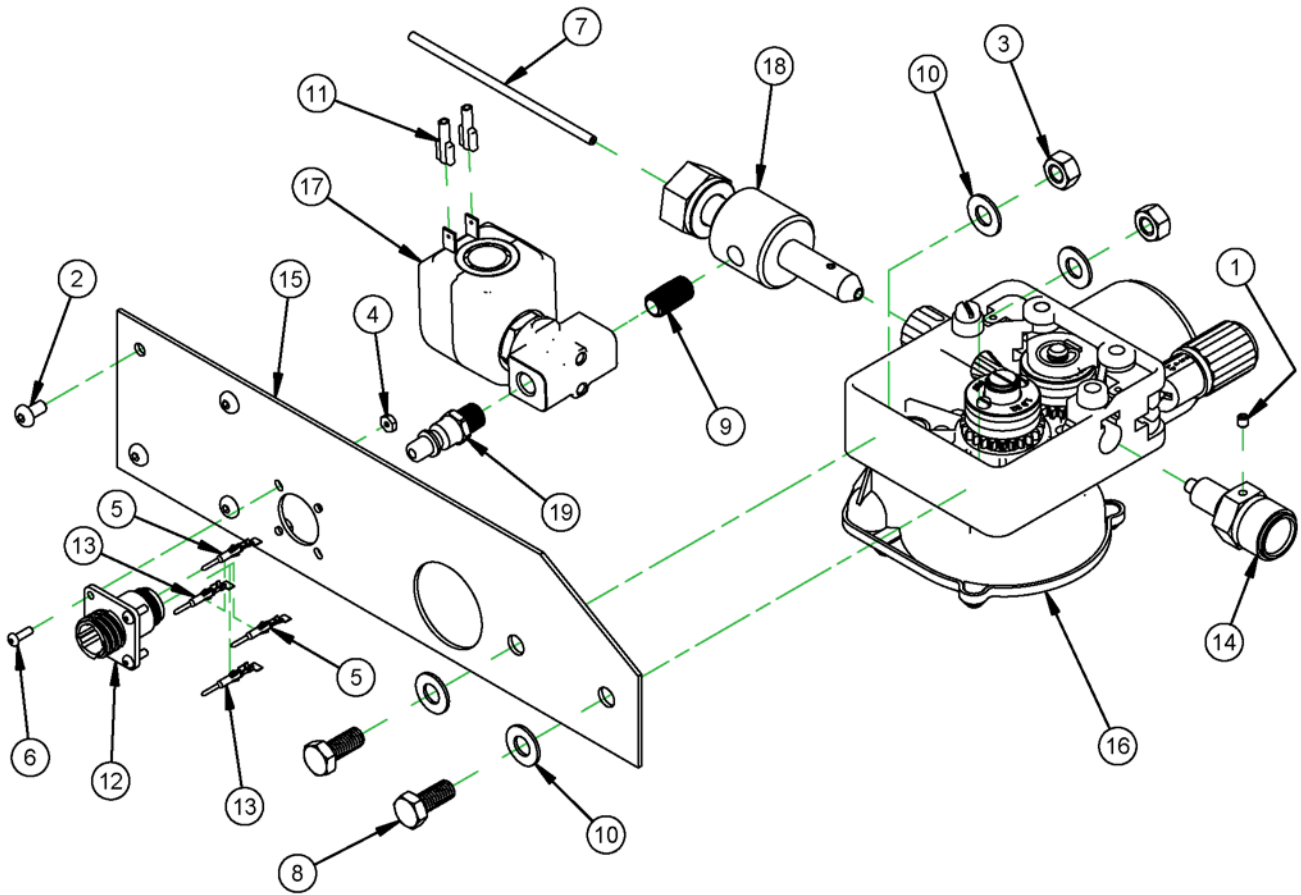
35357



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	7	10837	NUT 10-32 STDN ZINC PLATED
2	20	11315	WASHER #10 FLTW
3	12	11673	SCREW 10-32 X 1/2 BHSCS
4	4	11674	SCREW #10-32 x 5/8 BHSCS
5	1	15307	SCREW 1/2-13 X 1 SHCS
6	1	46555	SUPPORT WIRE REEL
7	1	67302	CASE PELICAN ENCLOSED W/FEED BOX NO LOGO NO CUSTOM FOAM
8	1	67315	WIRE FEED ENCLOSED PANEL BOX
9	1	67316	WIRE FEED ENCLOSED TOP SUPPORT
10	1	67317	WIRE FEED ENCLOSED SPOOL FRAME

ENCLOSED WIRE FEEDER ASSEMBLY

69018



AVAILABLE ASSEMBLIES	PART No.
FEED SYSTEM TOP MOUNT METAL CONNECTORS PUSH PULL 24 VDC	64288
FEED SYSTEM TOP MOUNT PLASTIC CONNECTORS PUSH/PULL 24VDC	44992

TOP MOUNT FEED SYSTEMS PUSH/PULL 24VDC

44992

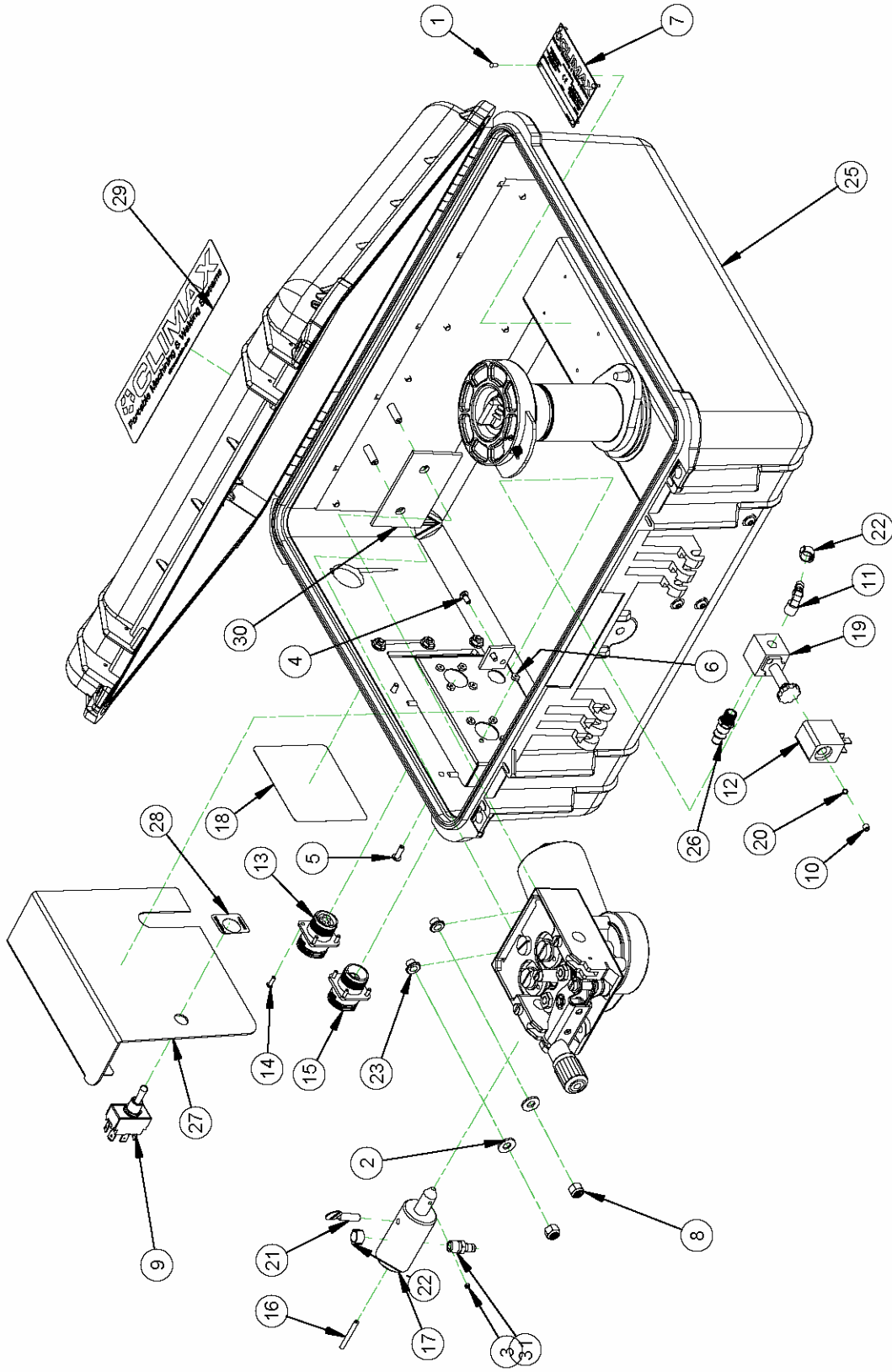
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	10841	SCREW 8-32 X 3/16 SSSCP
3	2	71570	NUT 5/16-18 STDN BLK OX
4	4	12442	NUT 4-40 STDN ZINC PLATED
5	2	53102	CONNECTOR CRIMP CONTACT MALE 24-20 AWG MULTIMATE
6	4	58482	SCREW 4-40 X 3/8 BHSCS
7	4.0 in	62505	LINER BOREWELDER .065 ID X .144 OD
8	2	67000	SCREW 5/16-18 X 3/4 HHCS
9	1	67006	FTG NIPPLE 1/8 NPTM X 1/8 NPTM X 3/4 BRASS
10	4	67037	WASHER 5/16 FLTW SAE BLK OX
11	2	67050	CONNECTOR SOCKET DBL CRIMP 22-18 AWG .250 X .032 RED
12	1	67063	CONNECTOR PLUG 11-4 PLASTIC
		58481	CONNECTOR RECEPTACLE 14-5 NICKEL PLATED
13	2	67155	TERMINAL PIN 18-16 AWG
14	1	67199	ADAPTER INLET PULL FEEDER
15	1	67200	PLATE MOUNTING PULL FEEDER
16	1	67210	WIRE FEEDER TOP MOUNT 1 ROLL
17	1	67331	SOLENOID COIL & VALVE 24V
18	1	69003	FITTING PULL FEEDER SPINDLE
19	1	69332	FTG QUICK COUPLER 1/4B 1/8 NPT MALE AIR
2	4	11678	SCREW 10-32 X 3/8 BHSCS
NS	1	58617	CABLE ASSY P/P WF CONTROL 10 FT METAL CONNECTORS
		70195	CABLE ASSY P/P WF CONTROL 10 FT PLASTIC CONNECTORS
NS	5.5 in	67123	WIRE 20 AWG RED CU STRAND TYPE MTW
NS	5.5 in	67136	WIRE 20 AWG BLUE CU STRAND TYPE MTW

TOP MOUNT FEED SYSTEMS PUSH/PULL 24VDC

44992



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AVAILABLE ASSEMBLIES	PART No.
WIRE FEEDER ENCLOSED METAL CONNECTORS PUSH/PULL READY 24 VDC	66946
WIRE FEEDER ENCLOSED PLASTIC CONNECTORS PUSH/PULL READY 24 VDC	44993

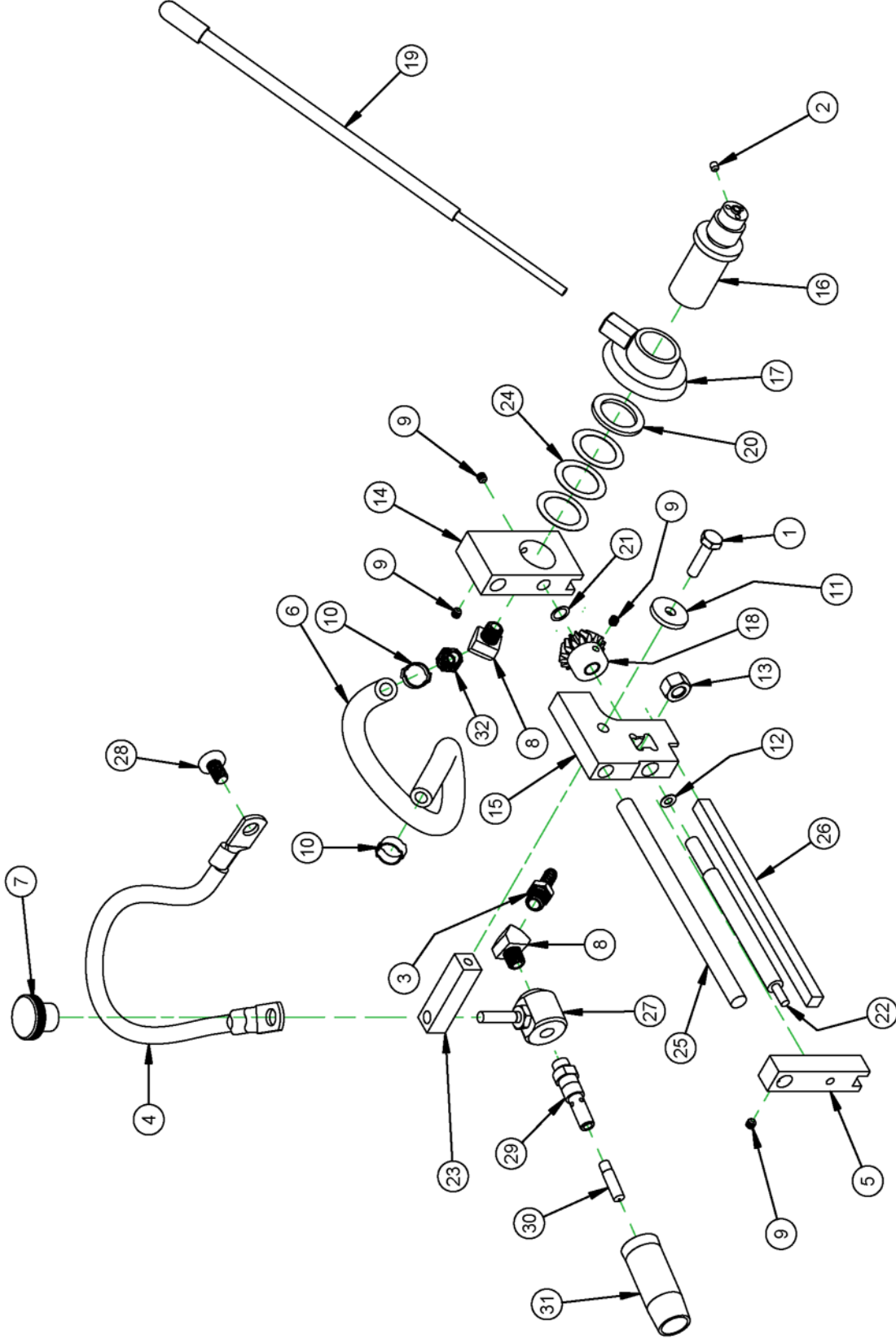
ENCLOSED WIRE FEEDERS PUSH/PULL READY 24 VDC

66946

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	4	10588	SCREW DRIVE #2 x 1/4 HOLE SIZE .089
2	2	10702	WASHER 1/4 FLTW SAE
3	1	11058	SCREW 8-32 X 1/8 SSSCP
4	2	11359	SCREW 8-32 X 3/8 BHSCS
5	2	11852	SCREW 8-32 X 1/2 BHSCS
6	8	12442	NUT 4-40 STDN ZINC PLATED
7	1	29154	PLATE SERIAL YEAR MODEL CE 2.0 X 3.0
8	2	40512	SP NUT 1/4-20 LOCKING
9	1	40520	SWTCH SPDP 15/32" HOLE DIA
10	1	44800	SCREW 10-32 X 3/8 SSSFP
11	1	48791	SP FTG BARB 1/8NPTM X 1/4 HOSE 90 DEG BRASS
12	1	51617	SOLENOID COIL 24 VOLT
13	1	58481	METAL CONNECTOR RECEPTACLE 14-5
		17919	PLASTIC CONNECTOR RECEPTACLE SIZE 13
14	8	58482	SCREW 4-40 X 3/8 BHSCS
15	1	58486	METAL CONNECTOR SOCKET RECEPTACLE 14-5
		67163	PLASTIC CONNECTOR SOCKET RECEPTACLE SIZE 13
16	1.25 in	62505	LINER BOREWELDER .065 ID X .144 OD
17	1	63213	FITTING CONDUIT FEEDER SHORT
18	1	63504	LABEL WARNING
19	1	65473	SOLENOID BODY 24V
20	1	65474	BALL 5/32 302 SS GRADE 100
21	1	67059	THUMBSCREW 1/4-20 X 3/4 NO SHOULDER
22	2	67064	CLAMP HOSE 3/8 DIA DBL PINCH STEEL
23	2	67179	SPACER SHOULDER FLANGED .260 ID X .312 OD
24	1	67300	FEED MECHANISM COMPACT 4 ROLL W/MOTOR & FEED ROLLS
25	1	69018	ENCLOSED WIRE FEEDER ASSEMBLY
26	1	69332	FTG QUICK COUPLER 1/4B 1/8 NPT MALE AIR
27	1	69924	COVER SWITCH WIRE FEEDER ENCLOSED PUSH/PULL
28	1	69977	LABEL WIRE FEEDER SWITCH PUSH/PULL
29	1	70227	LABEL CLIMAX LOGO 2 X 8
30	1	70423	PAD ISOLATOR W/F ENCLOSED
31	1	71257	FTG BARB 1/8 NPTM X 1/4 HOSE BRASS
NS	1	41852	CABLE WIRE FEED CONTROL 24V 12 FT PLASTIC CONNECTORS
		58616	CABLE WIRE FEED CONTROL 24V 12 FT METAL CONNECTORS
NS	8.5 in	67031	TUBING 1/4 ID 3/8 OD PVC CLEAR
NS	1	67048	CONNECTOR PIN DBL CRIMP 22-18 AWG .250 X .032 RED
NS	1	69017	HARNESS ENCLOSED WIRE FEEDER PUSH/PULL

ENCLOSED WIRE FEEDERS PUSH/PULL READY 24 VDC

66946



COMPACT FACE TORCH 6 in (152mm) SWING

48013



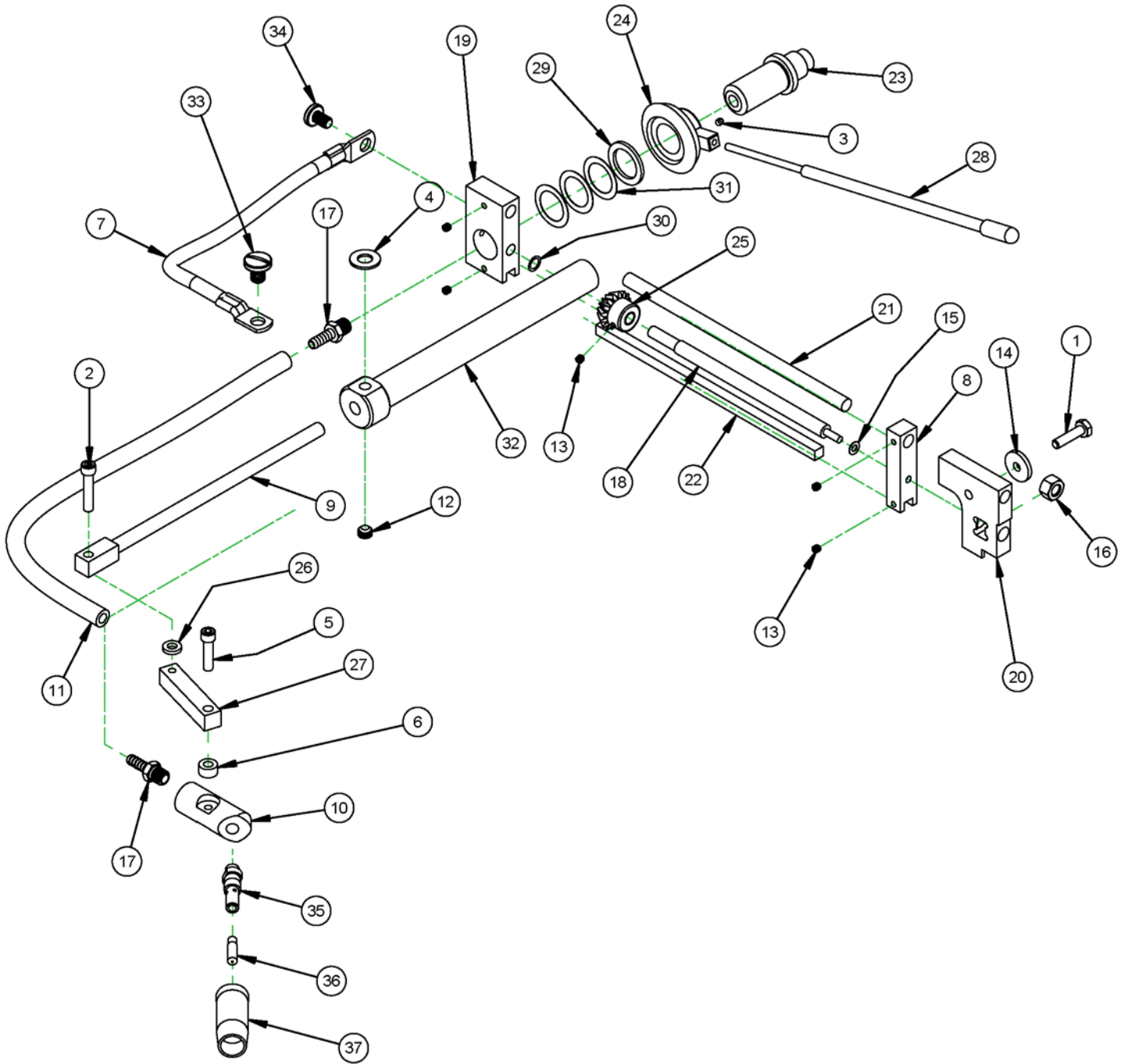
WWW.CLIMAXPORTABLE.COM inside U.S. 1-800-333-8311

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	10220	SCREW 1/4-20 X 1 HHSC
2	1	10841	SCREW 8-32 X 3/16 SSSCP
3	1	16145	FTG BARB 1/8 NPTM X 1/4 HOSE
4	1	40546	CABLE ASSEMBLY
5	1	48870	BLOCK END FACE TORCH
6	1	64063	HOSE 1/4 ID X 1/2 OD
7	2	66965	KNOB KNURLED 1 IN. OD X 3/4 W/ 1/4-28 HOLE
8	2	66968	FTG ELBOW 1/8 NPTM X 1/8 NPTF STREET 45 BRASS
9	6	66971	SCREW 10-32 NFX X 3/16 FHSCS
10	2	67007	CLAMP HOSE 1/2 DIA DBL PINCH STEEL
11	2	67026	WASHER FENDER 1/4 ID X 7/8 OD 11 GA
12	1	67027	WASHER 3/16 ID X 3/8 OD X .015 HARD FIBER GREY
13	1	67036	NUT FACE TORCH 3/8-12 LH ACME
14	1	67139	BLOCK HUB
15	1	67140	BLOCK TRAVELING
16	1	67145	HUB FACE TORCH
17	1	67148	GEAR BEVEL MODIFIED
18	1	67149	GEAR BEVEL PINION
19	1	67153	ASSY ROD TORQUE RESTRAINT
20	1	67154	CHART SPACER GEAR FACE TORCH
21	1	67175	WASHER SHIM .313 ID .438 OD .010 THK
22	1	67182	LEADSCREW SHORT 3/8-12 ACME LH
23	1	67272	BAR MOUNTING 6 IN RADIAL FACE TORCH
24	3	67289	CHART SPACER GEAR FACE TORCH
25	1	67296	GUIDE ROUND FACE TORCH SHORT
26	1	67297	GUIDE SQUARE FACE TORCH SHORT
27	1	69019	HOLDER TRAMMEL TORCH NOZZLE W/ 1/4-20 STUD
28	1	69318	SCREW 5/16-18 X 1/2 SPHMS 18-8 STAINLESS
29	1	69778	DIFFUSER WELDING
30	1	69865	TIP WELDING (.035/.9mm)
31	1	69866	NOZZLE WELDING (ALL EXCEPT #00 & #0) (1 EA) STANDARD 21-62
32	1	71527	FTG BARB 1/8 NPTM X 1/4 HOSE BRASS
NS	21 in	62505	LINER BOREWELDER .065 ID X .144 OD
NS	1	36625	SPACER STEP DRIVE
NS	1	17131	SCREW 1/4-20 X 7/8 SHCS
NS	1	67029	NUT 3/8-16 STDN LEFT HAND
NS	1	67304	EXTENSION OVER-CENTER FACE TORCH
NS	1	67321	LEADSCREW SHORT 3/8-16 LH

COMPACT FACE TORCH 6 in (152mm) SWING

48013





FACE TORCH 8" (203mm) SWING

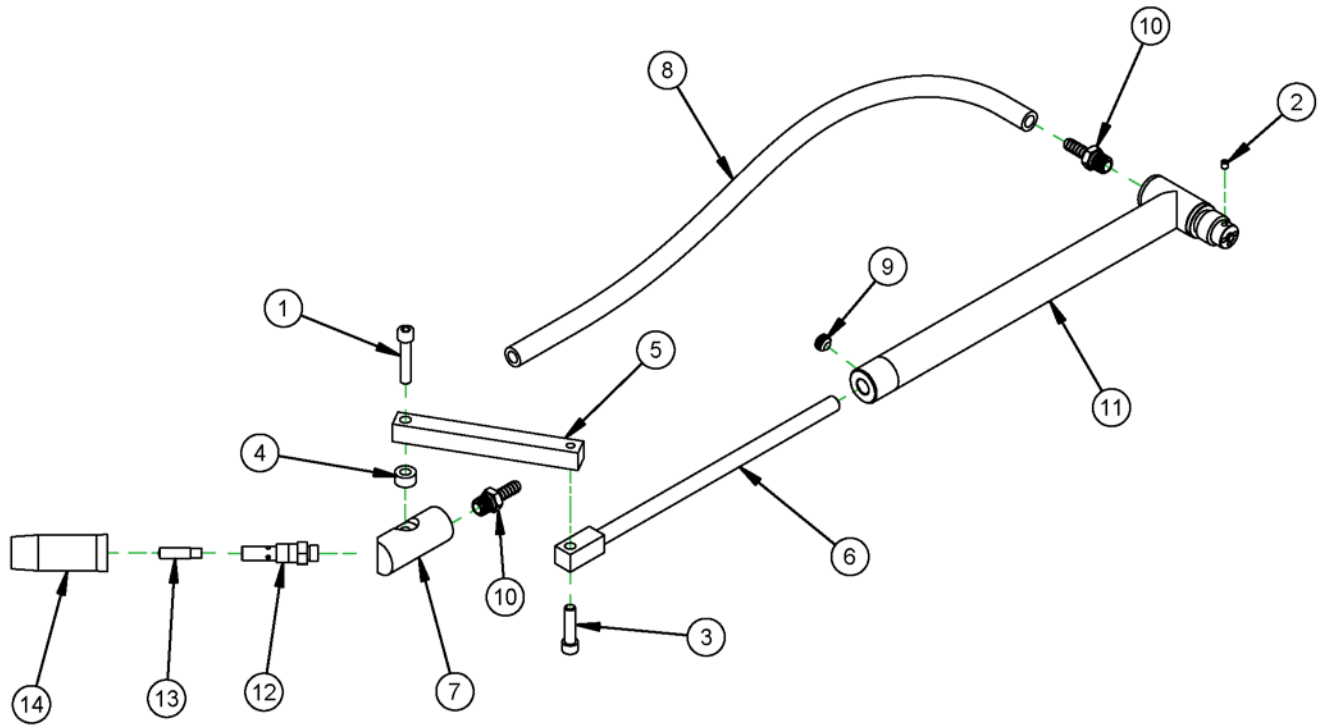
28186

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	10220	SCREW 1/4-20 X 1 HHSC
2	1	10671	SCREW 1/4-20 X 1-1/4 SHCS
3	1	10841	SCREW 8-32 X 3/16 SSSCP
4	1	11080	WASHER 3/8 FLTW SAE
5	1	11118	SCREW 1/4-20 X 1 SHCS
6	1	36625	SPACER STEP DRIVE
7	1	40546	CABLE ASSEMBLY
8	1	48870	BLOCK END FACE TORCH
9	1	64059	ROD TORCH HEAD
10	1	64060	TORCH TRAMMEL NOZZLE STYLE 2
11	1	64063	HOSE 1/4 ID X 1/2 OD
12	1	64064	SCREW 3/8-16 X 1/4 SSSFP
13	6	66971	SCREW 10-32 NFX X 3/16 FHSCS
14	1	67026	WASHER FENDER 1/4 ID X 7/8 OD 11 GA
15	1	67027	WASHER 3/16 ID X 3/8 OD X .015 HARD FIBER GREY
16	1	67036	NUT FACE TORCH 3/8-12 LH ACME
17	2	67058	FTG HOSE END 1/4 HOSE TO 1/8 NPTF
18	1	67073	LEADSCREW FACE TORCH 3/8-12 LH ACME
19	1	67139	BLOCK HUB
20	1	67140	BLOCK TRAVELING
21	1	67141	ROD ROUND GUIDE STANDARD
22	1	67142	ROD SQUARE GUIDE STANDARD
23	1	67145	HUB FACE TORCH
24	1	67148	GEAR BEVEL MODIFIED
25	1	67149	GEAR BEVEL PINION
26	1	67150	SPACER TORCH ROD END
27	1	67151	BAR 2 IN EXTENDER TORCH HEAD
28	1	67153	ASSY ROD TORQUE RESTRAINT
29	1	67154	CHART SPACER GEAR FACE TORCH
30	1	67175	WASHER SHIM .313 ID .438 OD .010 THK
31	3	67289	CHART SPACER GEAR FACE TORCH
32	1	68991	RADIUS ASSEMBLY FACE
33	1	69316	SCREW 3/8-16 X 1/2 SPHMS 18-8 STAINLESS
34	1	69318	SCREW 5/16-18 X 1/2 SPHMS 18-8 STAINLESS
35	2	69778	DIFFUSER WELDING
36	2	69865	TIP WELDING (.035/.9mm)
37	2	69866	NOZZLE WELDING
N/S	1	61389	BAR 6 IN EXTENDER TORCH HEAD
N/S	1	67144	LEADSCREW TPI 16 STANDARD
N/S	1	67029	NUT 3/8-16 STDN LEFT HAND
N/S	1	67004	HOLDER TRAMMEL TORCH NOZZLE
N/S	48 in	62505	LINER BOREWELDER .065 ID X .144 OD
N/S	1	69004	EXTENSION OVER CENTER

FACE TORCH 8" (203mm) SWING

28186

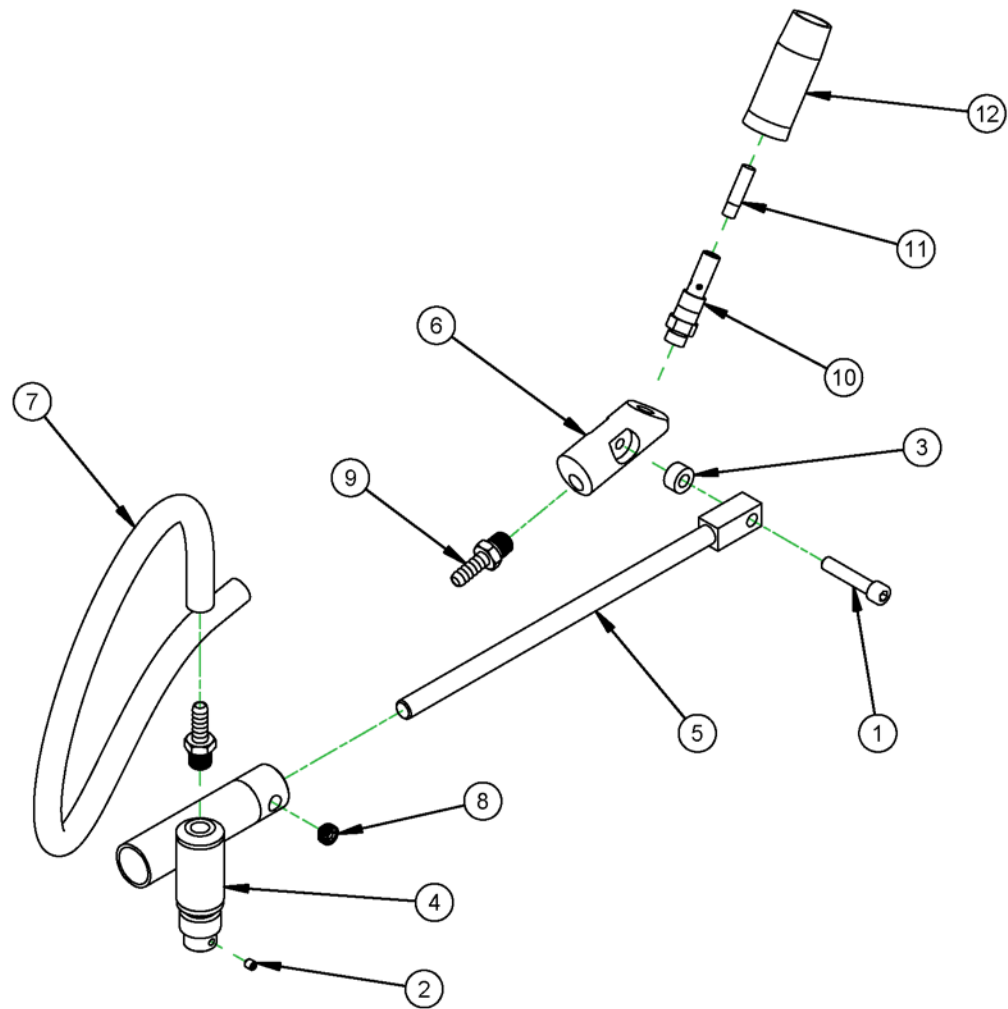




PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	10671	SCREW 1/4-20 X 1-1/4 SHCS
2	1	10841	SCREW 8-32 X 3/16 SSSCP
3	1	11118	SCREW 1/4-20 X 1 SHCS
4	1	36625	SPACER STEP DRIVE
5	1	61387	BAR 4 IN EXTENDER TORCH HEAD
6	1	64059	ROD TORCH HEAD
7	1	64060	TORCH TRAMMEL NOZZLE STYLE 2
8	1	64063	HOSE 1/4 ID X 1/2 OD
9	1	64064	SCREW 3/8-16 X 1/4 SSSFP
10	2	67058	FTG HOSE END 1/4 HOSE TO 1/8 NPTF
11	1	68998	HUB TELESCOPE 13/24 TORCH
12	1	69778	DIFFUSER WELDING
13	1	69865	TIP WELDING (.035/.9mm)
14	1	69866	NOZZLE WELDING (ALL EXCEPT #00 & #0) (1 EA) STANDARD 21-62
NS	1	61389	BAR 6 IN EXTENDER TORCH HEAD (KB)
NS	120 in	62505	LINER BOREWELDER .065 ID X .144 OD

TORCH #13/24 (26-54 in OR 660-1371mm)

34473

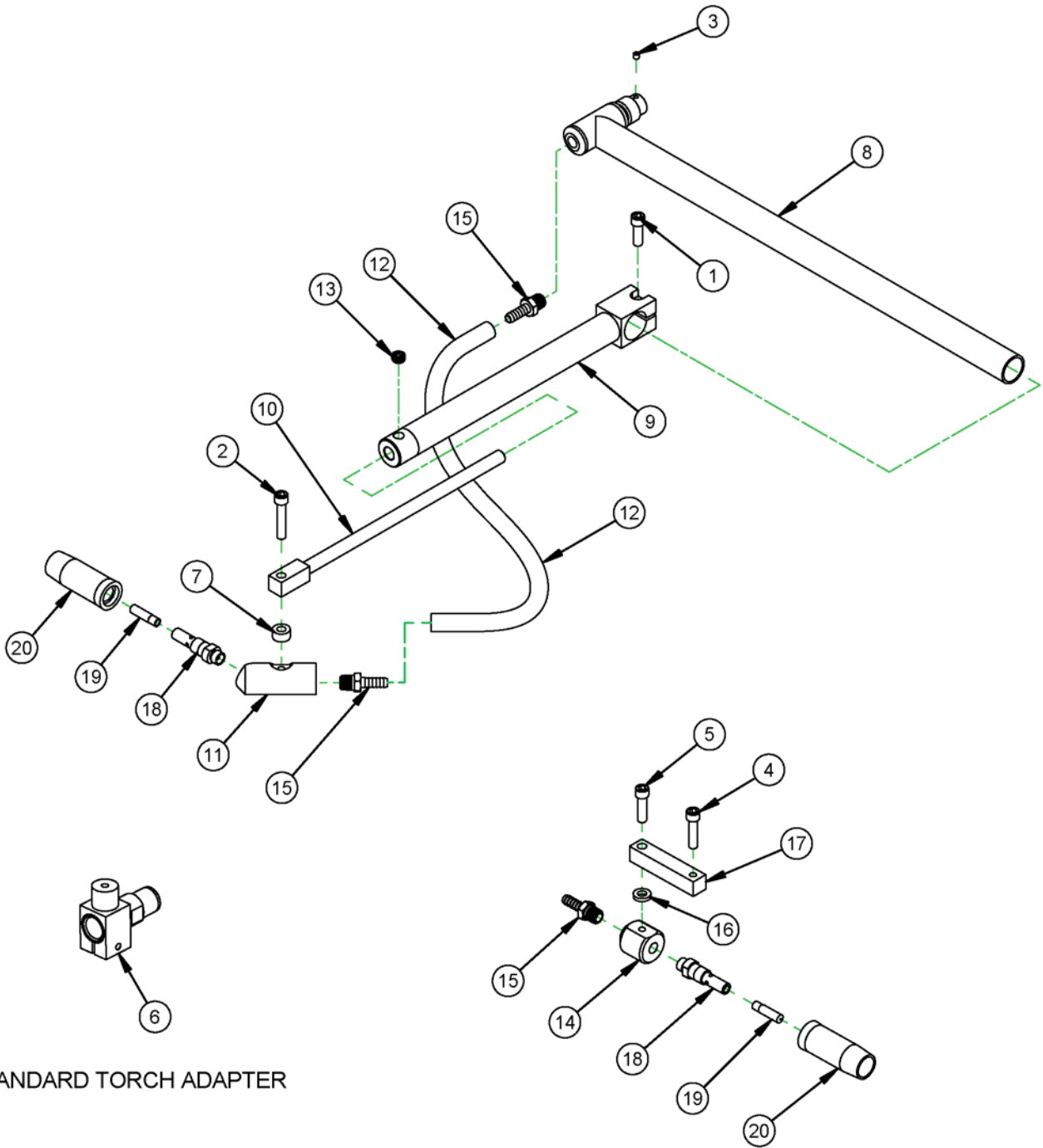


PARTS LIST

ITEM	QTY	PART No.	DESCRIPTION
1	1	10671	SCREW 1/4-20 X 1-1/4 SHCS
2	1	10841	SCREW 8-32 X 3/16 SSSCP
3	1	36625	SPACER STEP DRIVE
4	1	64058	HUB BEARING CLEARANCE TORCH #6 TO #12 RANGE
5	1	64059	ROD TORCH HEAD
6	1	64060	TORCH TRAMMEL NOZZLE STYLE 2
7	18.5	64063	HOSE 1/4 ID X 1/2 OD
8	1	64064	SCREW 3/8-16 X 1/4 SSSFP
9	2	67058	FTG HOSE END 1/4 HOSE TO 1/8 NPTF
10	1	69778	DIFFUSER WELDING
11	1	69865	TIP WELDING (.035/.9mm)
12	1	69866	NOZZLE WELDING (ALL EXCEPT #00 & #0) (1 EA) STANDARD 21-62
N/S	25.5 in	62505	LINER STAINLESS STEEL .065 ID X .144 OD X 1 INCH FOR .023/.045 WIRE
N/S	2	64062	HOSE CLAMP

TORCH BEARING MOUNT CLEARANCE #6 TO #12 RANGE

70132



STANDARD TORCH ADAPTER

ALTERNATE WELD HEAD ASSEMBLY

AVAILABLE ASSEMBLIES	PART No.
TORCH TRAMMEL O.D.	27013
TORCH TRAMMEL EXTENDED DIA TO 28	38506
TORCH TRAMMEL EXTENDED DIA TO 56	53004

O.D. TRAMMEL TORCH ASSEMBLIES

38506

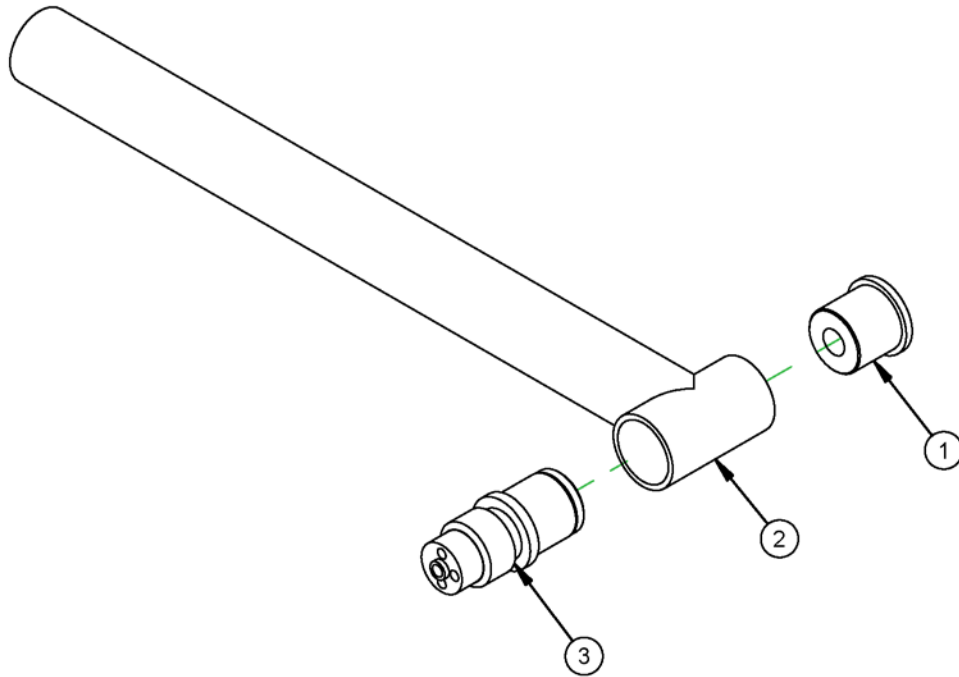
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	10160	SCREW 1/4-20 X 3/4 SHCS
2	1	10671	SCREW 1/4-20 X 1-1/4 SHCS
3	1	10841	SCREW 8-32 X 3/16 SSSCP
4	1	11118	SCREW 1/4-20 X 1 SHCS
5	1	17131	SCREW 1/4-20 X 7/8 SHCS
6	1	36170	ADAPTER STANDARD TORCH TO FACE OR TRAMMEL
7	1	36625	SPACER STEP DRIVE
8	1	40554 69005 70128	HUB ASSEMBLY TRAMMEL TORCH STANDARD HUB ASSY TRAMMEL TORCH 28 INCH DIA RANGE HUB ASSY TRAMMEL TORCH 56 INCH DIA RANGE
9	1	40555	RADIUS ASSEMBLY
10	1	64059	ROD TORCH HEAD
11	1	64060	TORCH TRAMMEL NOZZLE STYLE 2
12	36 in 60 in 72 in	64063	HOSE 1/4 ID X 1/2 OD
13	1	64064	SCREW 3/8-16 X 1/4 SSSFP
14	1	67004	HOLDER TRAMMEL TORCH NOZZLE
15	3	67058	FTG HOSE END 1/4 HOSE TO 1/8 NPTF
16	1	67150	SPACER TORCH ROD END
17	1	67151	BAR 2 IN EXTENDER TORCH HEAD
18	2	69778	DIFFUSER WELDING
19	2	69865	TIP WELDING (.035/.9mm)
20	2	69866	NOZZLE WELDING (ALL EXCEPT #00 & #0) (1 EA) STANDARD 21-62
NS	46 in 84 in 72 in	62505	LINER BOREWELDER .065 ID X .144 OD

O.D. TRAMMEL TORCH ASSEMBLIES

38506



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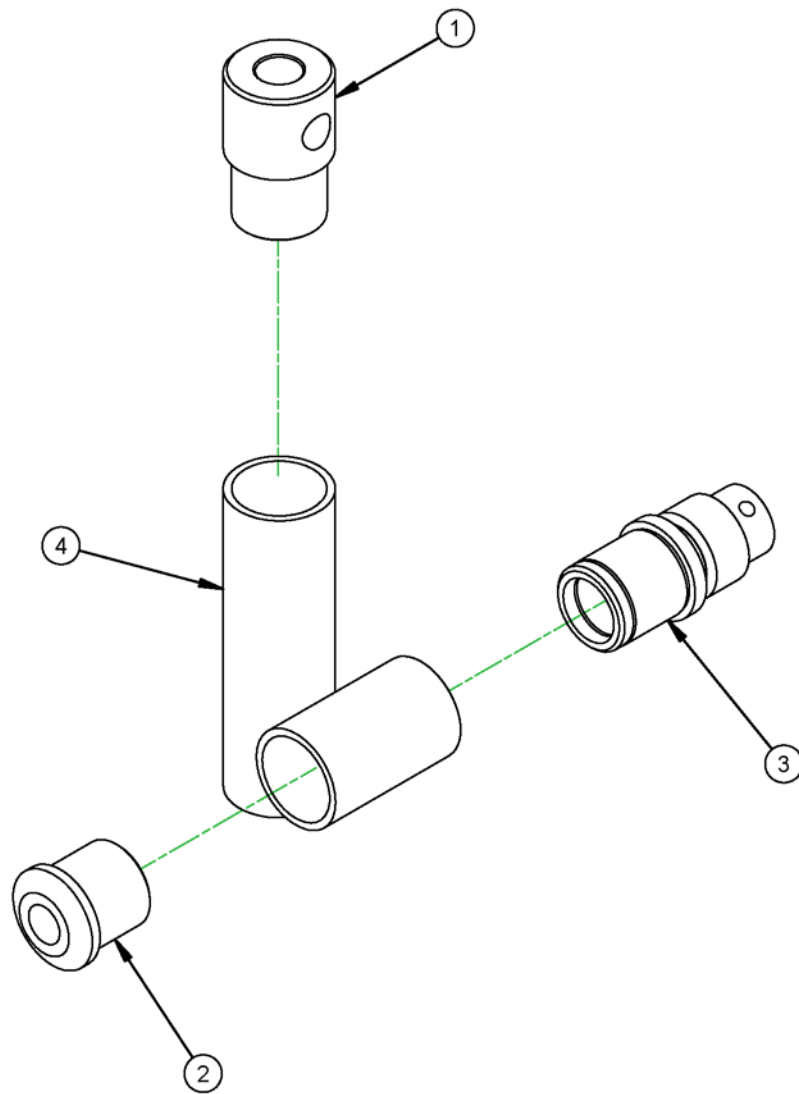


AVAILABLE CONFIGURATIONS	PART No.
HUB ASSEMBLY STANDARD TRAMMEL TORCH	40554
HUB ASSEMBLY 28 in DIA RANGE TRAMMEL TORCH	69005

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	67003	FTG TORCH TRAMMEL HUB
2	1	67101	HUB WELDMENT STANDARD TRAMMEL TORCH
		67308	HUB WELDMENT 28 in DIA RANGE TRAMMEL TORCH
3	1	69829	FTG TORCH EXT MALE W/PILOT

TRAMMEL TORCH HUB ASSEMBLY

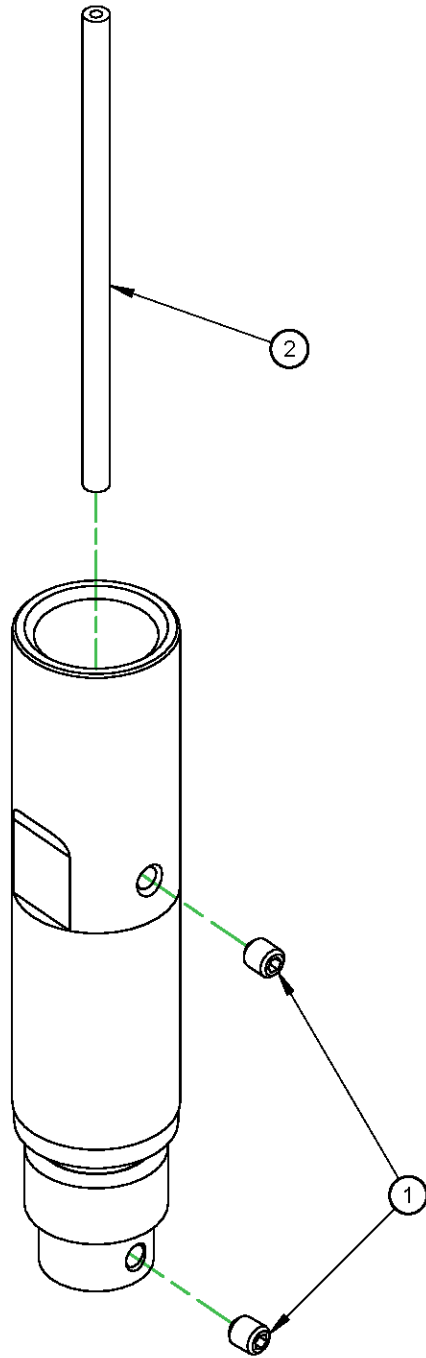
40554



PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	1	67001	BUSHING TORCH TRAMMEL END
2	1	67003	FTG TORCH TRAMMEL HUB
3	1	69829	FTG TORCH EXT MALE W/PILOT
4	1	70134	WELDMENT TORCH BEARING CLEARANCE

HUB BEARING CLEARANCE TORCH #6 TO #12 RANGE

64058

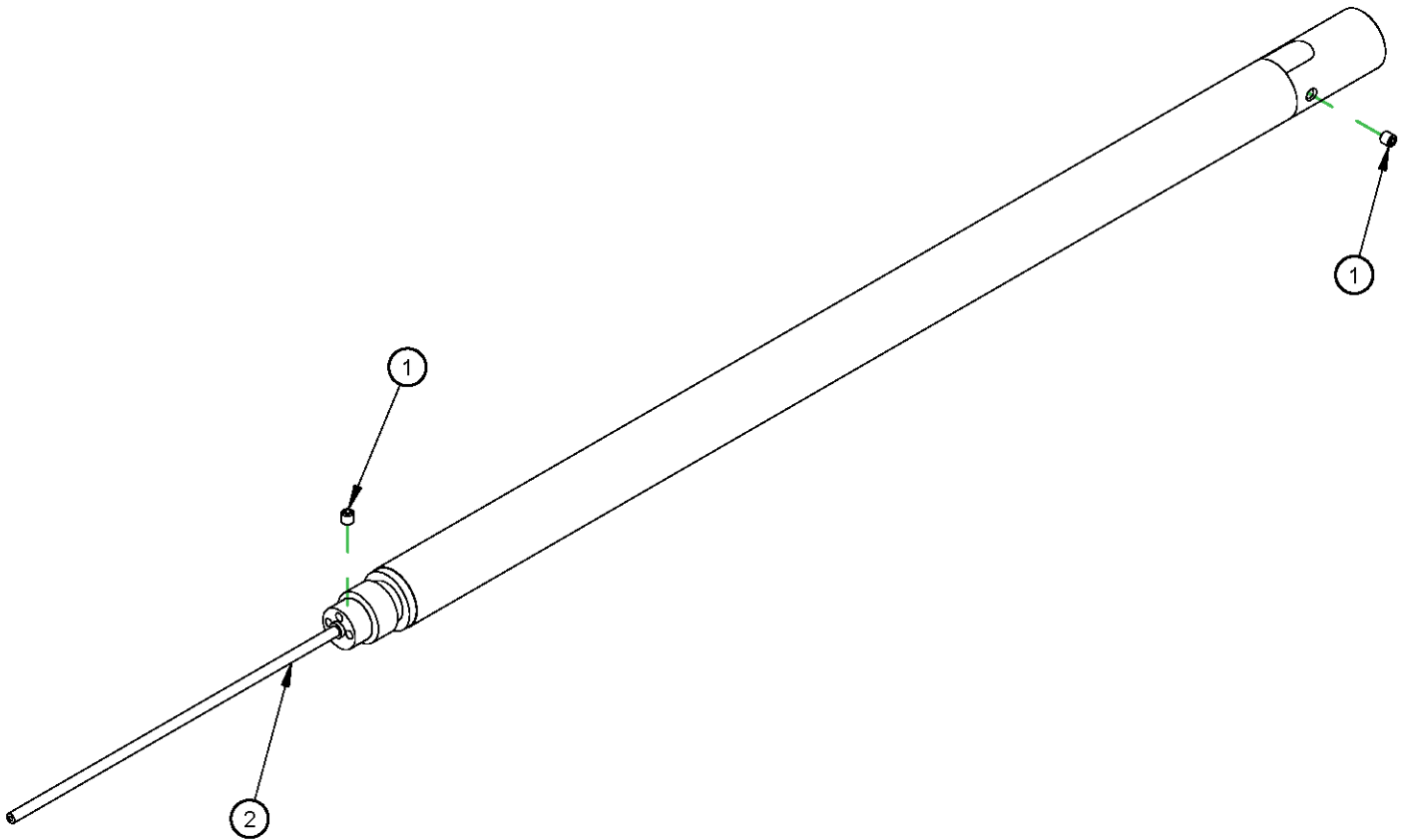


AVAILABLE CONFIGURATIONS	
PART NO	DESCRIPTION
29038	EXTENSION TORCH 3IN
29039	EXTENSION TORCH 6IN

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	10841	SCREW 8-32 X 3/16 SSSCP
2	3IN 6IN	62505	LINER STAINLESS STEEL .065 ID X .144 OD FOR .023/.045 WIRE

82155 - CHART EXTENSION TORCH 3" AND 6" - REV C

FOR REFERENCE ONLY

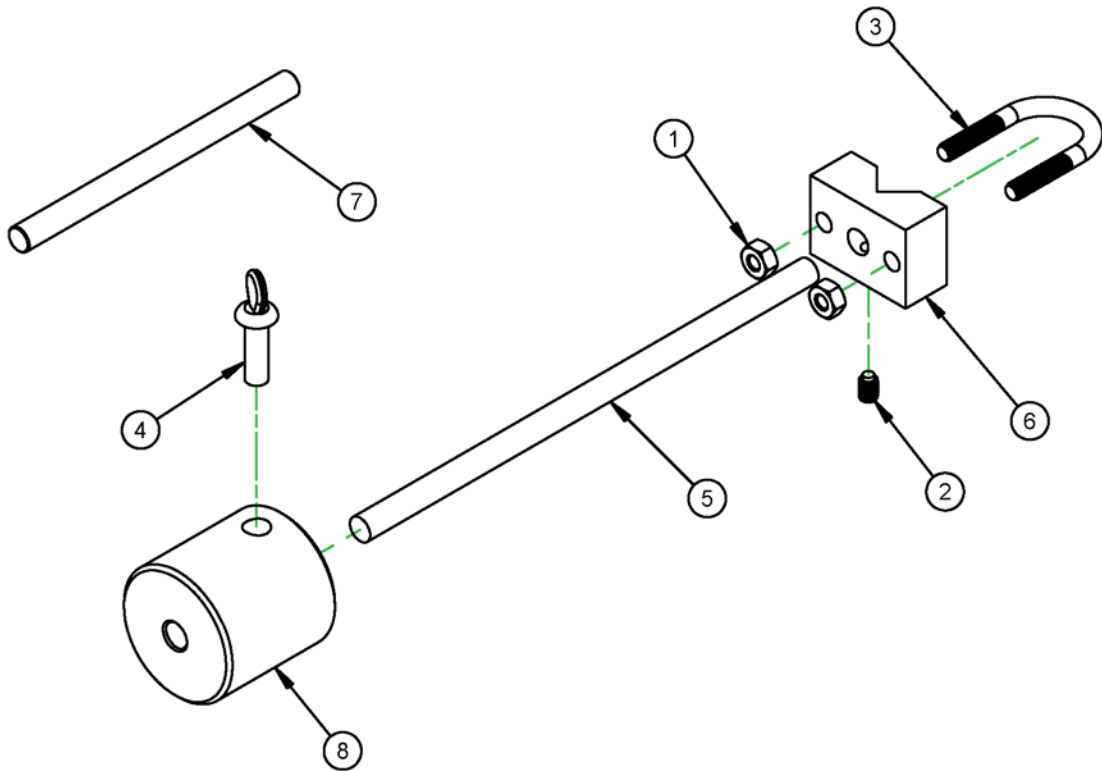


AVAILABLE CONFIGURATIONS	
PART NO	DESCRIPTION
29040	EXTENSION TORCH 12IN (305MM)
29065	EXTENSION TORCH 18IN (457MM)

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	10841	SCREW 8-32 X 3/16 SSSCP
2	12IN 18IN	62505	LINER STAINLESS STEEL .065 ID X .144 OD FOR .023/.045 WIRE

85213 - CHART EXTENSION TORCH 12" AND 18" - REV -

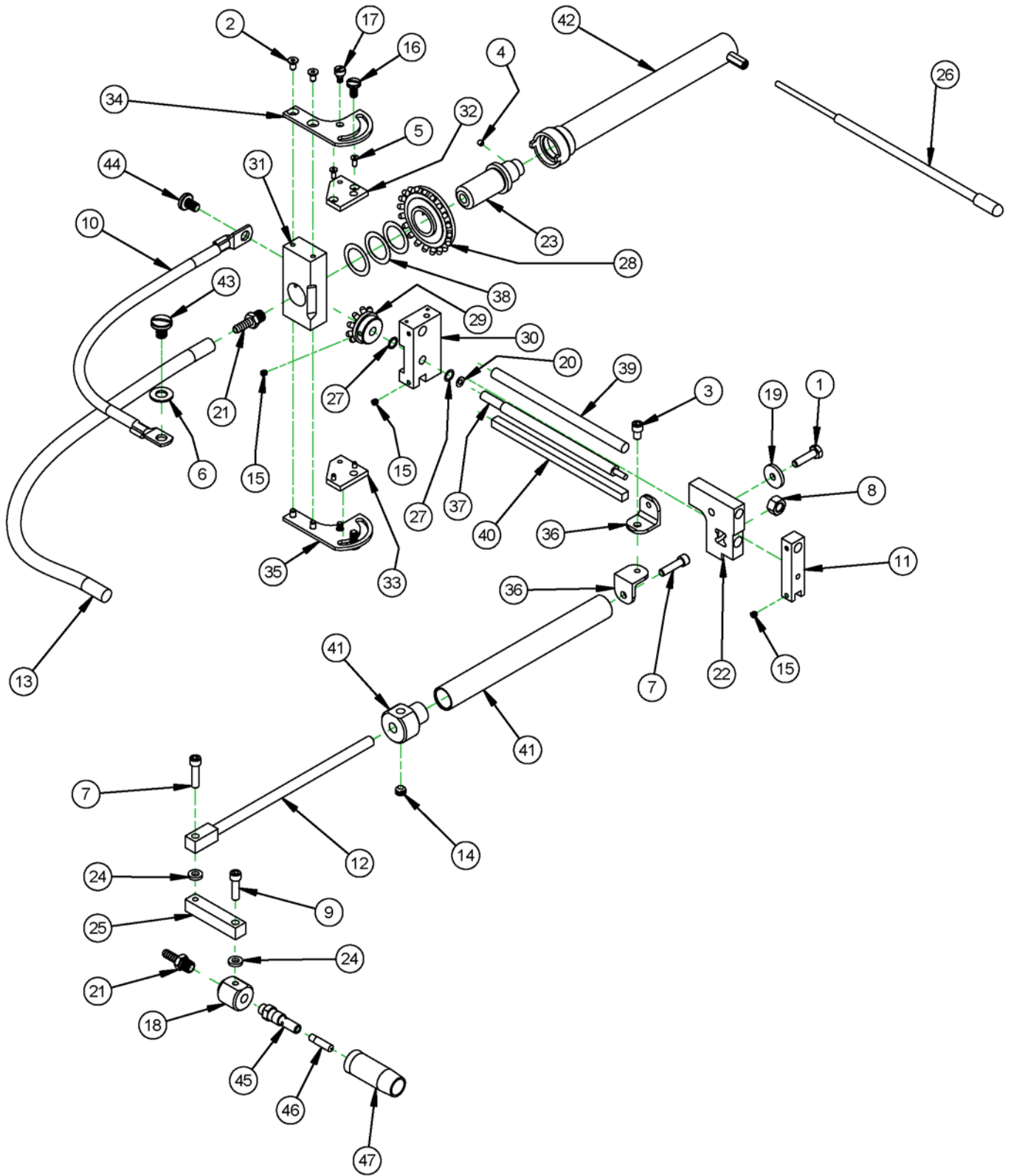
FOR REFERENCE ONLY



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	10716	NUT HEX 1/4 STDN
2	1	13374	SCREW 1/4-20 X 3/8 SSSHDP
3	1	66989	U-BOLT 1/4-20 X 1 X 1-3/4
4	1	67010	THUMBSCREW 5/16-18 X 1 SPADE HD SHOULDER
5	1	67141	ROD ROUND GUIDE STANDARD
6	1	67231	BRACKET COUNTER BALANCE
7	1	67233	ARM COUNTER BALANCE
8	1	67238	WEIGHT COUNTER BALANCE

TORCH COUNTER BALANCE

30756



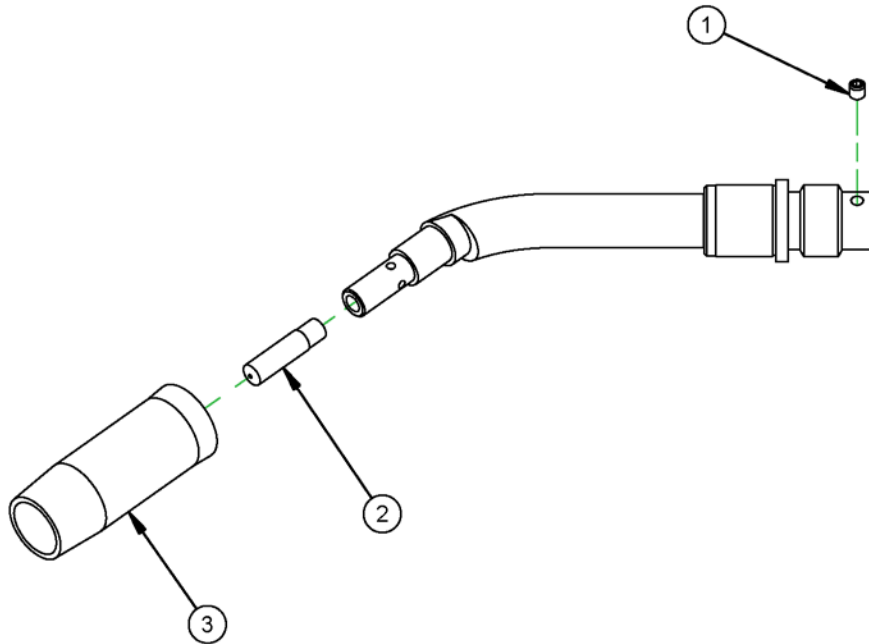
CONICAL SEAT TORCH

28020

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	10220	SCREW 1/4-20 X 1 HHSC
2	4	10560	SCREW 10-32 X 3/8 FHSCS
3	1	10670	SCREW 1/4-20 X 3/8 SHCS
4	1	10841	SCREW 8-32 X 3/16 SSSCP
5	4	10844	SCREW 6-32 X 3/8 FHSCS
6	1	11080	WASHER 3/8 FLTW SAE
7	2	11118	SCREW 1/4-20 X 1 SHCS
8	1	13987	NUT 3/8-16 STDN ZINC PLATED
9	1	17131	SCREW 1/4-20 X 7/8 SHCS
10	1	40546	CABLE ASSEMBLY
11	1	48870	BLOCK END FACE TORCH
12	1	64059	ROD TORCH HEAD
13	1	64063	HOSE 1/4 ID X 1/2 OD
14	1	64064	SCREW 3/8-16 X 1/4 SSSFP
15	6	66971	SCREW 10-32 NFX X 3/16 FHSCS
16	2	66981	SCREW 1/4-20 X 1/2 PHSMS
17	2	66984	SCREW 1/4 DIA X 1/8 X 10-32 SHLDCS
18	1	67004	HOLDER TRAMMEL TORCH NOZZLE
19	1	67026	WASHER FENDER 1/4 ID X 7/8 OD 11 GA
20	1	67027	WASHER 3/16 ID X 3/8 OD X .015 HARD FIBER GREY
21	3	67058	FTG HOSE END 1/4 HOSE TO 1/8 NPTF
22	1	67140	BLOCK TRAVELING
23	1	67145	HUB FACE TORCH
24	2	67150	SPACER TORCH ROD END
25	1	67151	BAR 2 IN EXTENDER TORCH HEAD
26	1	67153	ASSY ROD TORQUE RESTRAINT
27	2	67175	WASHER SHIM .313 ID .438 OD .010 THK
28	1	67243	GEAR SWING 20T
29	1	67245	GEAR SWING 10T
30	1	67252	FTG UNION SPINDLE (KB)
31	1	67253	BLOCK SEAT TORCH HUB
32	1	67254	PLATE PINION BLOCK RIGHT SIDE
33	1	67257	PLATE PINION BLOCK LEFT SIDE
34	1	67259	PLATE RIGHT HUB SIDE
35	1	67261	PLATE LEFT HUB SLIDE
36	2	67266	BRACKET SEAT TORCH TUBE
37	1	67269	SCREW 3/8-16 RH LEAD
38	3	67289	CHART SPACER GEAR FACE TORCH
39	1	68154	ROD SEAT TORCH GUIDE
40	1	68157	GUIDE SEAT TORCH SQUARE
41	1	68991	RADIUS ASSEMBLY FACE
42	1	68997	TUBE TOMMY 8 INCH CONICAL SEAT TORCH
43	1	69316	SCREW 3/8-16 X 1/2 SPHMS 18-8 STAINLESS
44	1	69318	SCREW 5/16-18 X 1/2 SPHMS 18-8 STAINLESS
45	2	69778	DIFFUSER WELDING
46	2	69865	TIP WELDING (.035/.9mm)
47	2	69866	NOZZLE WELDING (ALL EXCEPT #00 & #0) (1 EA) STANDARD 21-62
N/S	24 in	62505	LINER BOREWELDER .065 ID X .144 OD
N/S	1	36625	SPACER STEP DRIVE
N/S	1	10671	SCREW 1/4-20 X 1-1/4 SHCS
N/S	1	64060	TORCH TRAMMEL NOZZLE STYLE 2

CONICAL SEAT TORCH

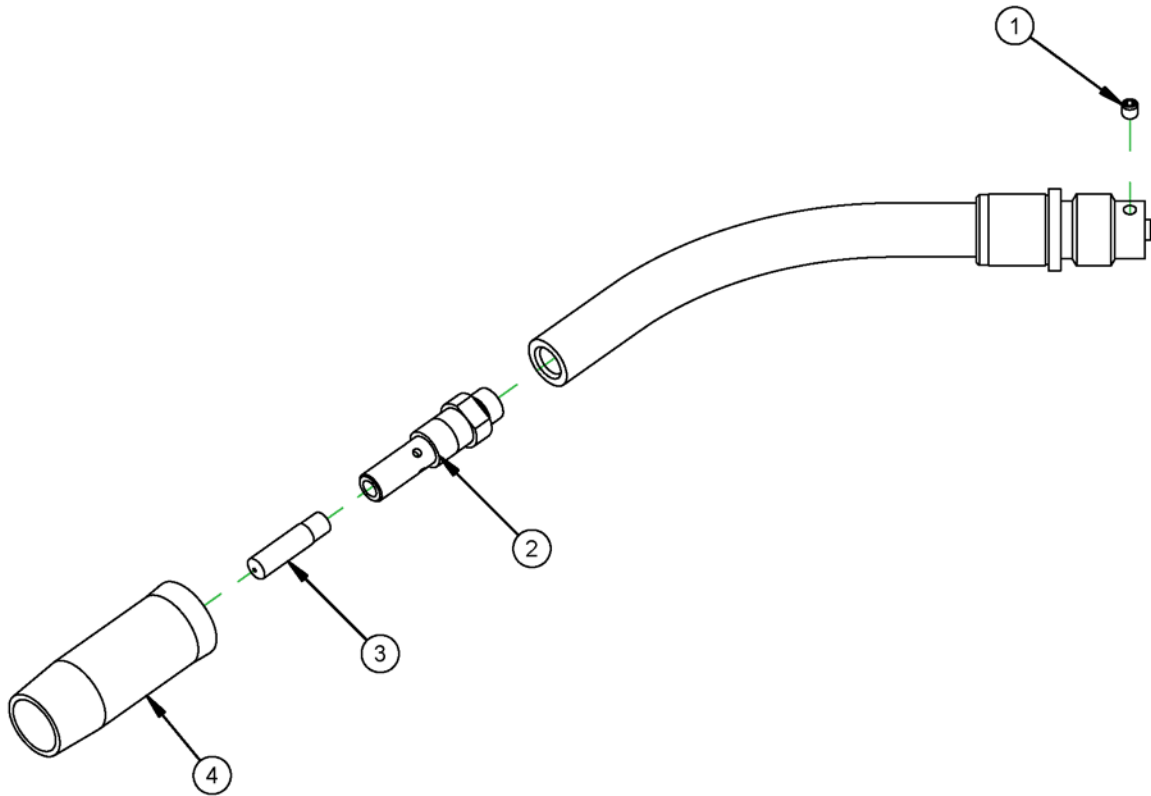
28020



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	10841	SCREW 8-32 X 3/16 SSSCP
2	1	69865	TIP WELDING (.035/.9mm)
3	1	69866	NOZZLE WELDING
N/S	6 in	62505	LINER .065 in ID X .144 in OD

TORCH #1A (76-140mm OR 3.0-5.5 in)

39723

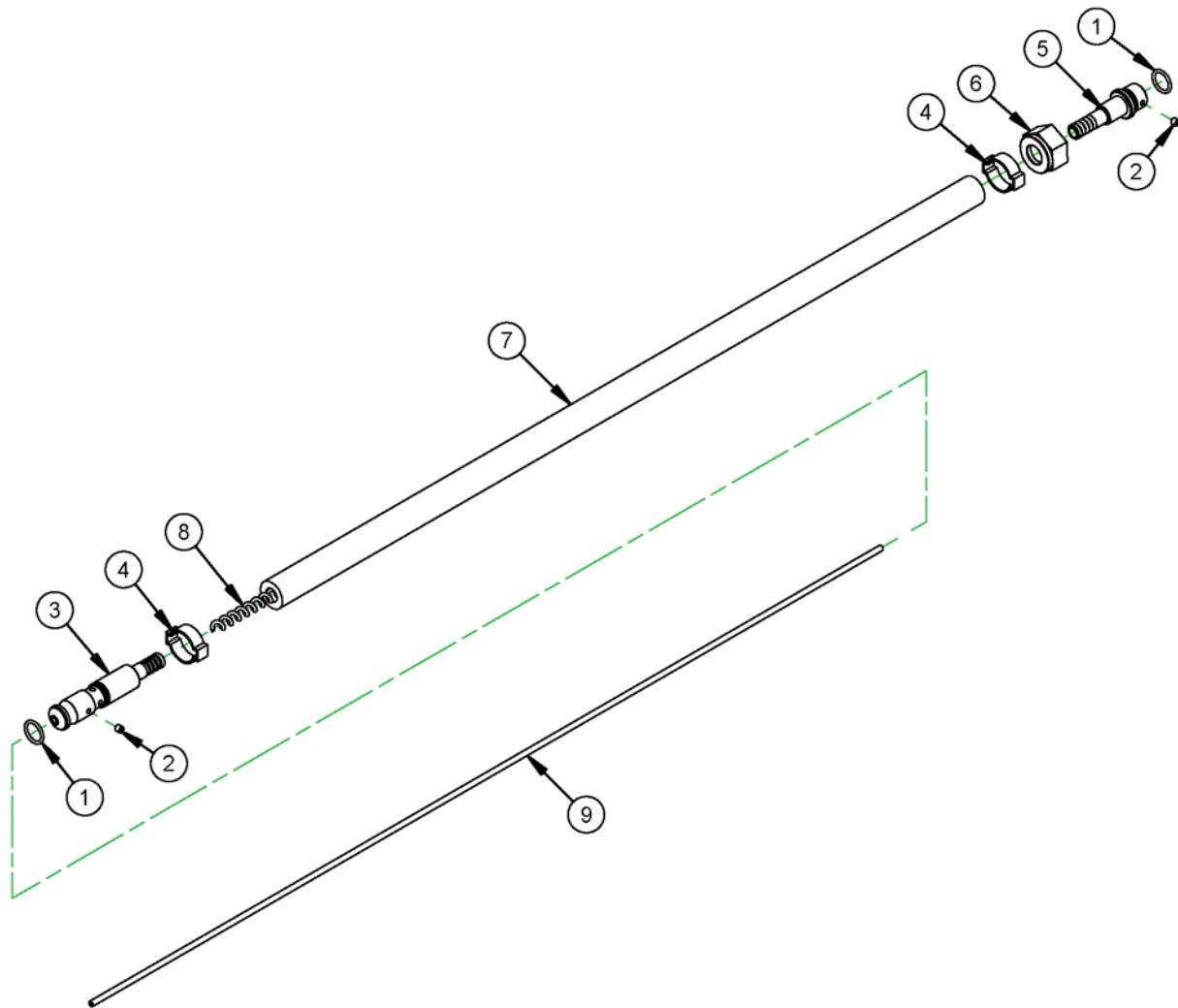


AVAILABLE ASSEMBLIES	PART No.
TORCH #2 (114-190mm OR 4.5-7.5 in)	29032
TORCH #3 (152-228mm OR 6-9 in)	29033
TORCH #4 (203-279mm OR 8-11 in)	29034
TORCH #5 (254-330mm OR 10-13 in)	29035
TORCH #6 (305-381mm OR 12-15 in)	30345
TORCH #7 (356-432mm OR 14-17 in)	31792
TORCH #8 (406-482mm OR 16-19 in)	30346
TORCH #9 (457-533mm OR 18-21 in)	30710
TORCH #10 (508-584mm OR 20-23 in)	30711
TORCH #11 (558-635mm OR 22-25 in)	30712
TORCH #12 (609-685mm OR 24-27 in)	30713

PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	1	10841	SCREW 8-32 X 3/16 SSSCP
2	1	69778	DIFFUSER WELDING
3	1	69865	TIP WELDING (0.9mm/.035 in)
4	1	69866	NOZZLE WELDING
NS	6.0 in	62505	LINER TORCH #2 (.065 in ID X .144 in OD)
	6.0 in	62505	LINER TORCH #3 (.065 in ID X .144 in OD)
	9.6 in	62505	LINER TORCH #4 (.065 in ID X .144 in OD)
	10.8 in	62505	LINER TORCH #5 (.065 in ID X .144 in OD)
	12.0 in	62505	LINER TORCH #6 (.065 in ID X .144 in OD)
	14.4 in	62505	LINER TORCH #7 (.065 in ID X .144 in OD)
	16.8 in	62505	LINER TORCH #8 (.065 in ID X .144 in OD)
	18.0 in	62505	LINER TORCH #9 (.065 in ID X .144 in OD)
	19.2 in	62505	LINER TORCH #10 (.065 in ID X .144 in OD)
	20.4 in	62505	LINER TORCH #11 (.065 in ID X .144 in OD)
	22.8 in	62505	LINER TORCH #12 (.065 in ID X .144 in OD)

STANDARD TORCHES #2-12

29032



AVAILABLE LENGTHS	PART No.
CONDUIT WIRE FEED 2FT (0.6M) LONG	31894
CONDUIT WIRE FEED 3FT (0.9M) LONG	31895
CONDUIT WIRE FEED 4FT (1.2M) LONG	35574
CONDUIT WIRE FEED 5FT (1.5M) LONG	34813
CONDUIT WIRE FEED 6FT (1.8M) LONG	69889
CONDUIT WIRE FEED 8FT (2.4M) LONG	69890
CONDUIT WIRE FEED 12FT (3.6M) LONG	55707
CONDUIT WIRE FEED 15FT (4.5M) LONG	45256

CONDUIT WIRE FEED

31894

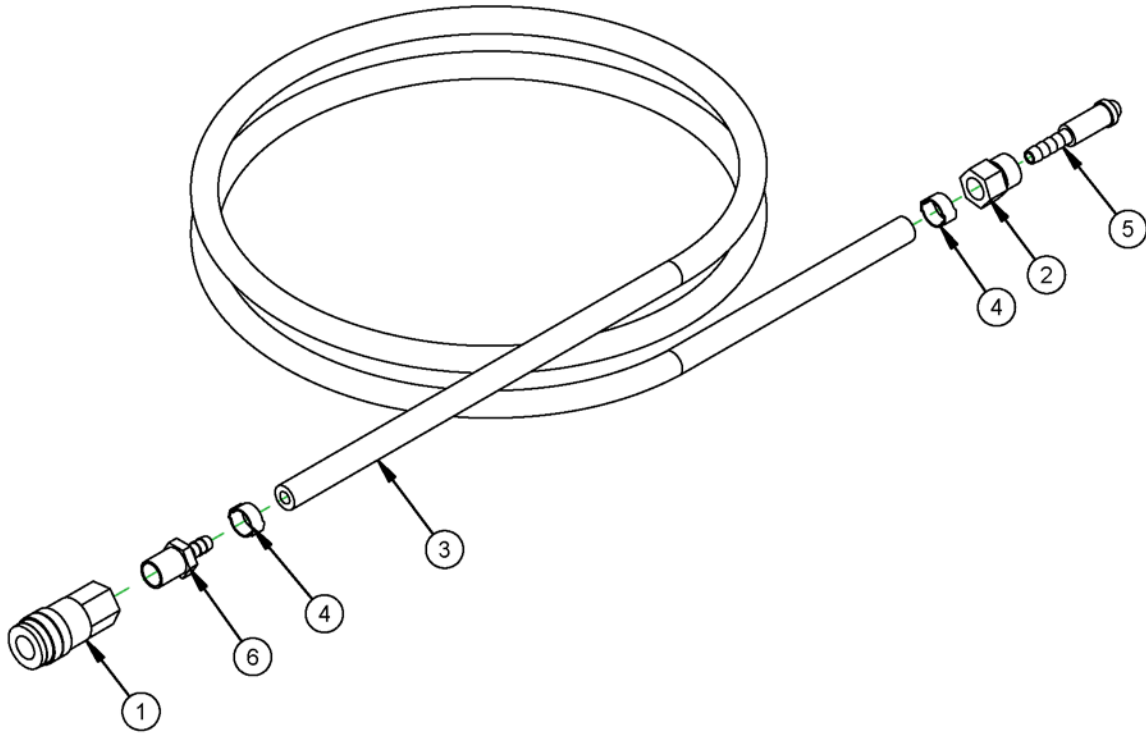
PARTS LIST			
ITEM	QTY	PART No.	DESCRIPTION
1	2	10840	RING O 1/16 X 1/2 ID X 5/8 OD (VMI)
2	2	10841	SCREW 8-32 X 3/16 SSSCP
3	1	40548	NIPPLE CONDUIT FEEDER END
4	2	40549	CLAMP HOSE 3/4 DIA DBL PINCH
5	1	40551	FTG CONDUIT SPINDLE UNION
6	1	66987	NUT CONDUIT SPINDLE UNION
7	24 in 36 in 48 in 60 in 72 in 96 in 144 in 180 in	40550	HOSE HYDRAULIC 3/8 HIGH PRESSURE CONDUIT WIRE FEED 2FT (0.6M) CONDUIT WIRE FEED 3FT (0.9M) CONDUIT WIRE FEED 4FT (1.2M) CONDUIT WIRE FEED 5FT (1.5M) CONDUIT WIRE FEED 6FT (1.8M) CONDUIT WIRE FEED 8FT (2.4M) CONDUIT WIRE FEED 12FT (3.6M) CONDUIT WIRE FEED 15FT (4.5M)
8	22 in 34 in 46 in 58 in 70 in 94 in 142 in 178 in	35011	STABILIZER - LINER CONDUIT WIRE FEED 2FT (0.6M) CONDUIT WIRE FEED 3FT (0.9M) CONDUIT WIRE FEED 4FT (1.2M) CONDUIT WIRE FEED 5FT (1.5M) CONDUIT WIRE FEED 6FT (1.8M) CONDUIT WIRE FEED 8FT (2.4M) CONDUIT WIRE FEED 12FT (3.6M) CONDUIT WIRE FEED 15FT (4.5M)
9	27 in 39 in 51 in 63 in 75 in 99 in 147 in 183 in	62505	LINER .065 in ID X .144 in OD CONDUIT WIRE FEED 2FT (0.6M) CONDUIT WIRE FEED 3FT (0.9M) CONDUIT WIRE FEED 4FT (1.2M) CONDUIT WIRE FEED 5FT (1.5M) CONDUIT WIRE FEED 6FT (1.8M) CONDUIT WIRE FEED 8FT (2.4M) CONDUIT WIRE FEED 12FT (3.6M) CONDUIT WIRE FEED 15FT (4.5M)

CONDUIT WIRE FEED

31894



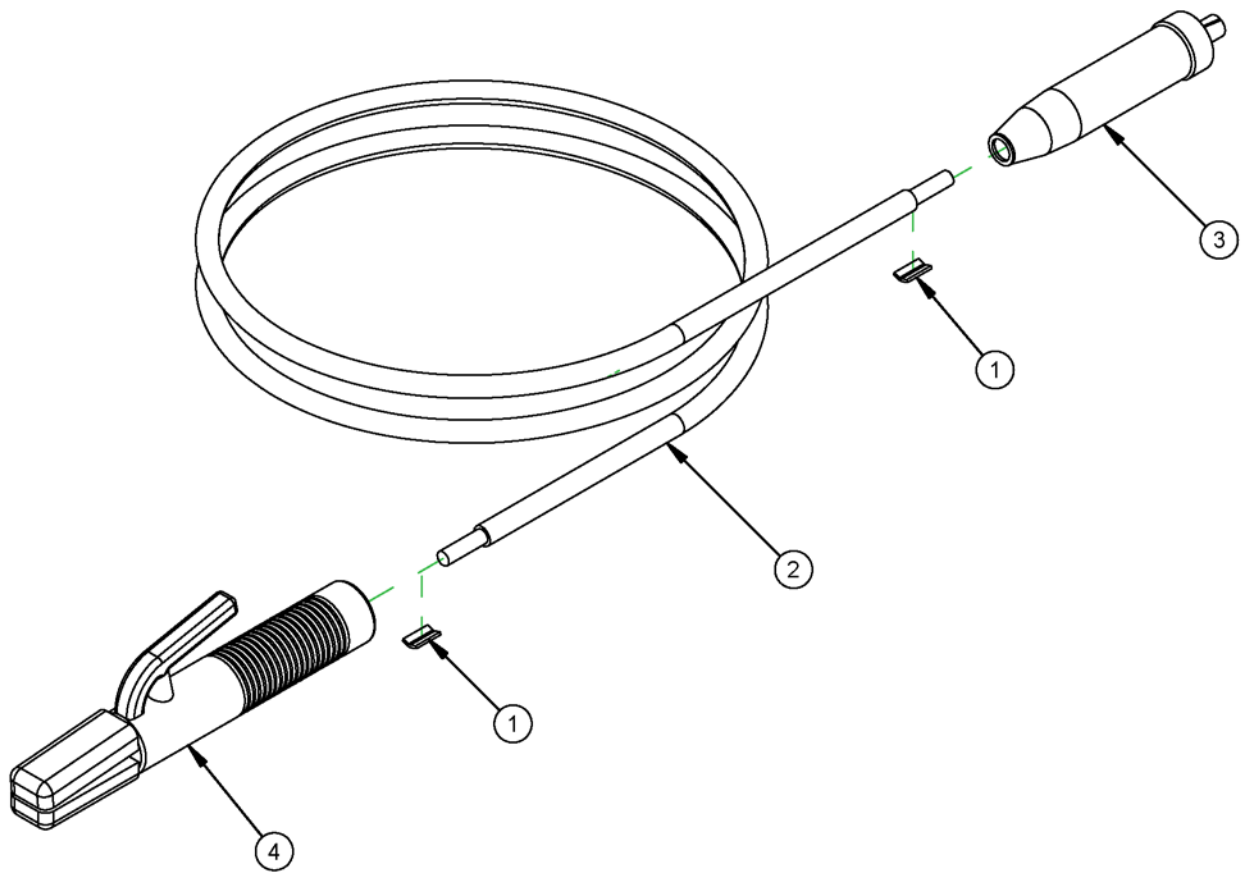
WWW.CLIMAXPORTABLE.COM inside U.S. 1-800-333-8311



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	28494	FTG QUICK COUPLER 1/4B 1/4 NPTF FEMALE AIR
2	1	48939	NUT SIZE B INERT GAS
3	240 in	64063	HOSE 1/4 ID X 1/2 OD
4	2	67007	CLAMP HOSE 1/2 DIA DBL PINCH STEEL
5	1	67033	FTG NIPPLE INERT GAS B SIZE 1/4 HOSE
6	1	67065	FTG HOSE END 1/4 HOSE TO 1/4 NPTF

SHIELDING GAS HOSE ASSEMBLY

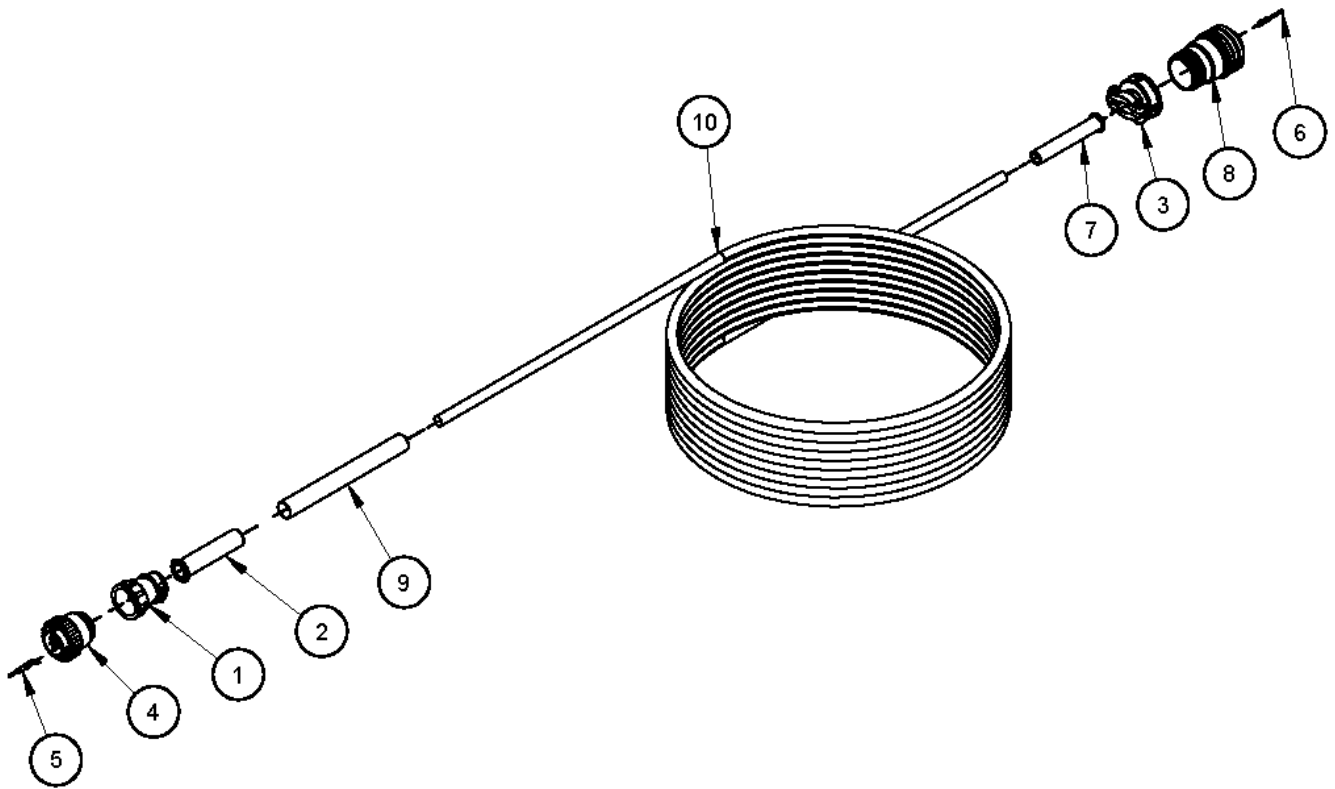
30774



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	36812	INSERT WELDING CABLE CLAMP
2	72 in	36813	CABLE POWER COUPLING
3	1	67159	CONNECTOR POWER MALE
4	1	67235	HOLDER ELECTRODE

ELECTRODE STICK HOLDER

36169



AVAILABLE CONFIGURATION

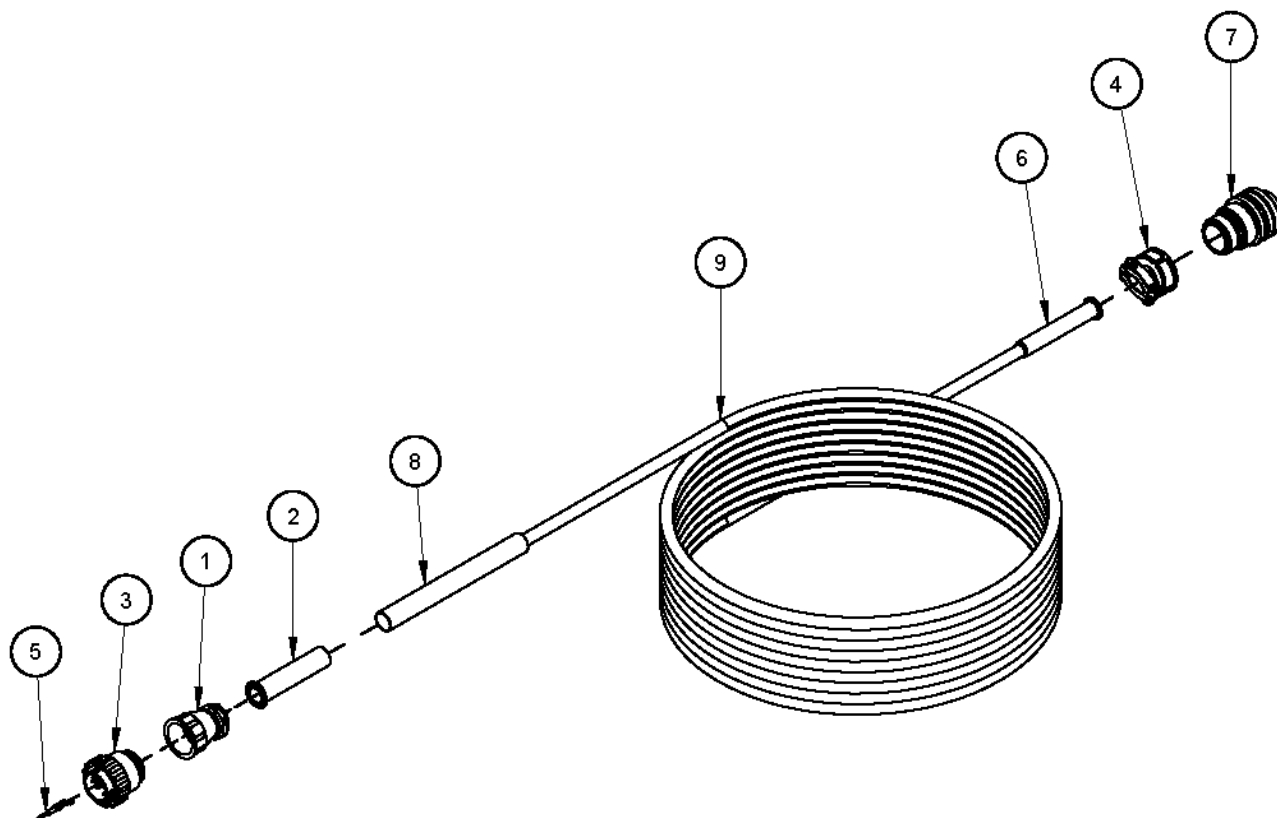
PART NO.	DESCRIPTION	P/N 83988 QTY
32042	CABLE ASSY POWER SUPPLY LINCOLN 14 PIN PLASTIC CONNECTORS 25 FT	301"
44232	CABLE ASSY POWER SUPPLY LINCOLN 14 PIN PLASTIC CONNECTORS 50 FT	601"
47767	CABLE ASSY POWER SUPPLY LINCOLN 14 PIN PLASTIC CONNECTORS 75 FT	901"
47766	CABLE ASSY POWER SUPPLY LINCOLN 14 PIN PLASTIC CONNECTORS 100 FT	1201"

PARTS LIST

ITEM	QTY	P/N:	DESCRIPTION
1	1	34760	CONNECTOR CABLE CLAMP 17-3 PLASTIC
2	1	47013	BOOT #8 RUBBER
3	1	58480	CONNECTOR CABLE CLAMP STEP DOWN 20 TO 14 NICKEL PLATED
4	1	58576	CONNECTOR PLUG 17-14 PLASTIC
6	5	67169	CONNECTOR CRIMP PIN MALE 16-22 AWG
7	1	67214	RUBBER BUSHING FOR MS3057A CABLE CLAMP .312 ID
10	CHART	83988	CORD TYPE SOOW 18 AWG 5 COND 600V .325 OD UNSHIELDED GRAY JACKET
8	1	67298	CONNECTOR V300 14 PIN KEY
9	1	70655	TUBING HEAT SHRINK .5 ID 2:1 SHRINK RATIO CLEAR
5	7	67155	TERMINAL PIN 18-16 AWG
10	1	67295	CABLE 20-5 RUBBER INSUL RUBBER JACKET 26/34 STRAND .300 OD

72101 - CABLE ASSY POWER SUPPLY LINCOLN 14 PIN PLASTIC CONNECTORS 25 FT - REV B

FOR REFERENCE ONLY

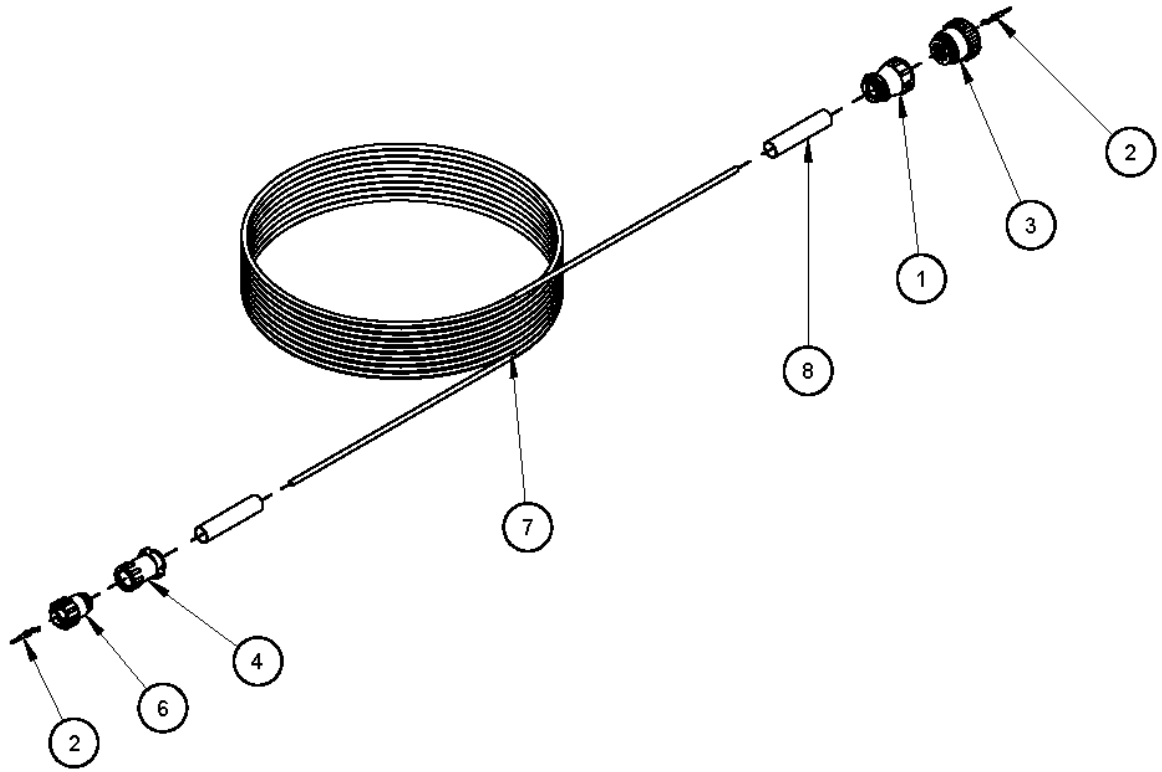


AVAILABLE CONFIGURATION

PART No	DESCRIPTION	P/N 83988 QTY
55327	CABLE ASSY POWER SUPPLY LINCOLN MULTI WELD 6 PIN PLASTIC CONNECTORS 25 FT	301"

PARTS LIST

ITEM	QTY	P/N:	DESCRIPTION
1	1	34760	CONNECTOR CABLE CLAMP 17-3 PLASTIC
2	1	47013	BOOT #8 RUBBER
3	1	58576	CONNECTOR PLUG 17-14 PLASTIC
4	1	67138	CONNECTOR CABLE CLAMP MS3057A SIZE 18
5	7	67155	TERMINAL PIN 18-16 AWG
6	1	67214	RUBBER BUSHING FOR MS3057A CABLE CLAMP .312 ID
7	1	70259	CONN PLUG 6 PIN
8	1	70655	TUBING HEAT SHRINK .5 ID 2:1 SHRINK RATIO CLEAR
9	CHART	83988	CORD TYPE SOOW 18 AWG 5 COND 600V .325 OD UNSHIELDED GRAY JACKET

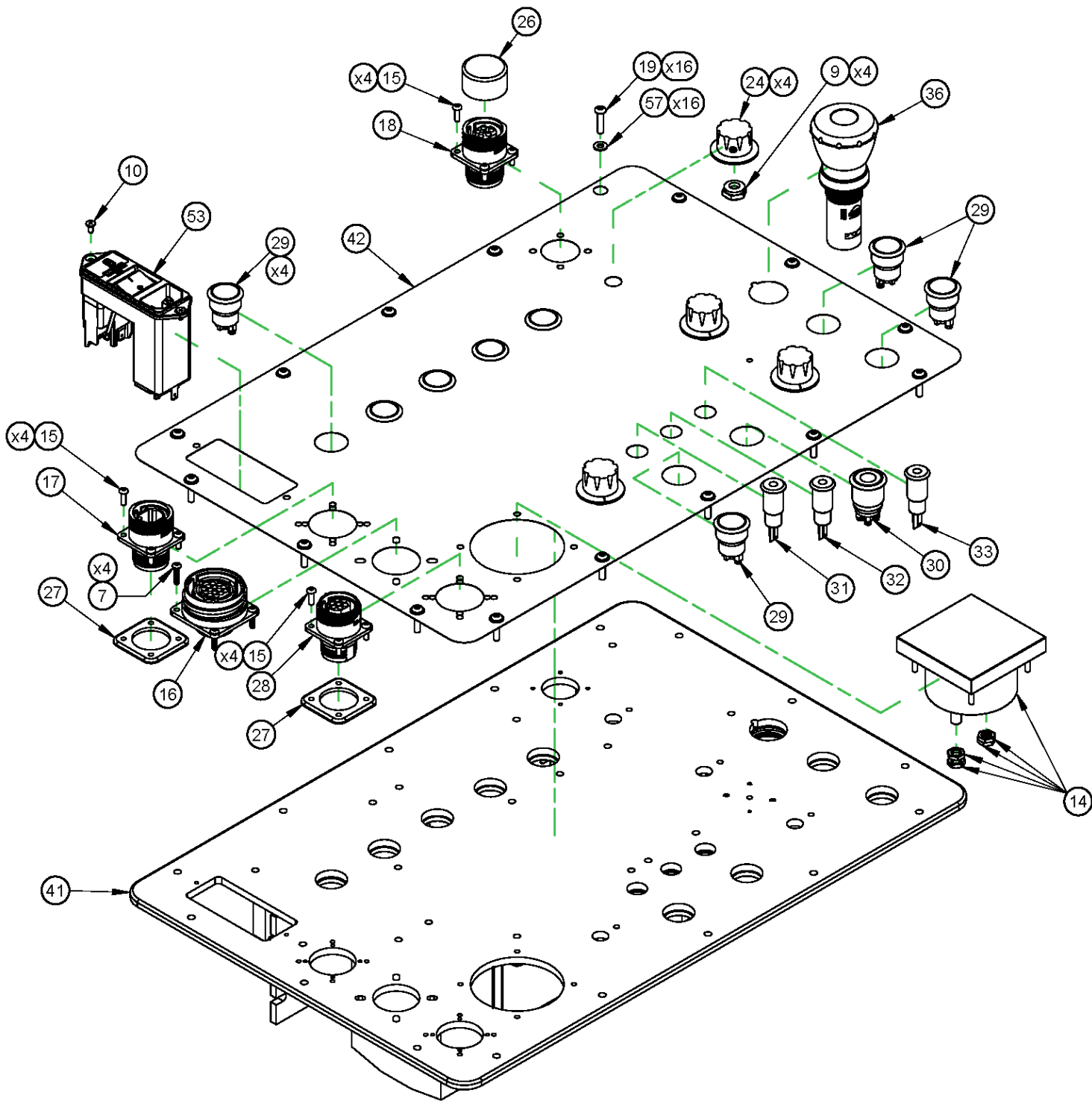


PARTS LIST

ITEM	QTY	P/N:	DESCRIPTION
1	1	34760	CONNECTOR CABLE CLAMP 17-3 PLASTIC
2	6	53102	CONNECTOR CRIMP CONTACT MALE 24-20 AWG MULTIMATE
3	1	58576	CONNECTOR PLUG 17-14 PLASTIC
4	1	67060	CABLE CLAMP LARGE SIZE 11
5	2	67123	(NOT SHOWN) WIRE 20 AWG RED CU STRAND TYPE MTW
6	1	67160	CONNECTOR PLUG 4 PIN REVERSE MALE/FEMALE SIZE 11
7	300	67280	CABLE POWER 2 CONDUCTOR 18 AWG 300 VAC RUBBER JACKET BLACK
8	5	70655	TUBING HEAT SHRINK .5 ID 2:1 SHRINK RATIO CLEAR

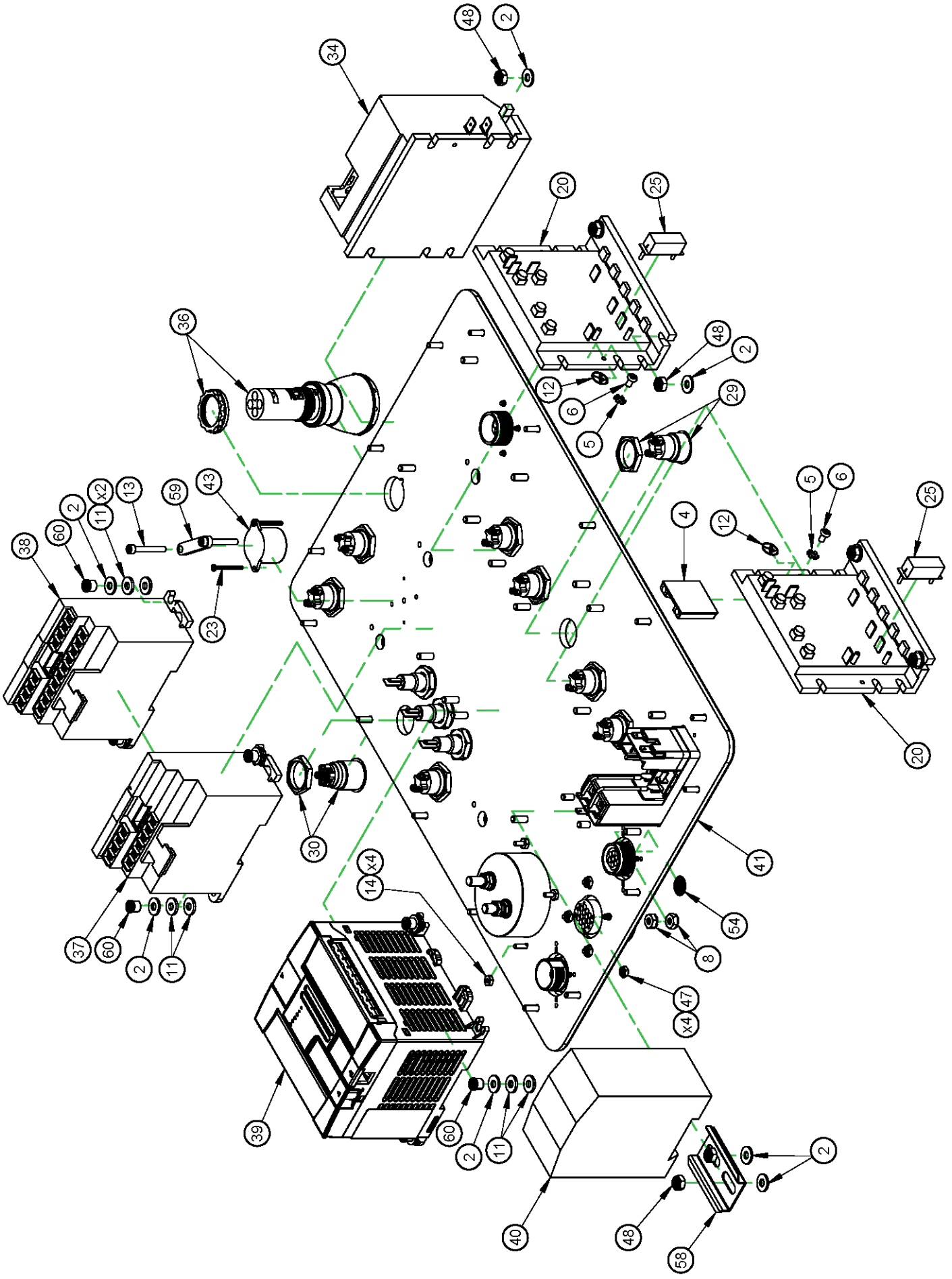
69021 - CABLE FOR MILLER FEEDERLESS (FOR 69007) - REV A

FOR REFERENCE ONLY



**87304 - CHART NFIS CONTROLLER BW3000 120/230V CE UNFINISHED PLASTIC/METAL
CONNECTORS - REV B**

FOR REFERENCE ONLY



70186 - NFIS CONTROLLER BW3000 120V CE UNFINISHED METAL CONNECTORS - REV B

REFERENCE ONLY

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	30	10673	WIRE TIE SMALL .09 X 3.5 (NOT SHOWN)
2	16	11872	WASHER #8 FLTW SAE ZINC PLATED
3	3	12941	(NOT SHOWN) PLUG KEYING CIRCULAR CONNECTOR (PLASTIC ONLY)
4	1	13296	MOUNTING BASE WIRE TIE ADHESIVE BACKED LARGE
5	2	20758	WASHER #6 ITSTRW
6	2	20760	SCREW 6-32 X 1/4 PHSMS CROSSPOINT ZINC PLATED
7	4	23009	SCREW 4-40 X 1/2 BHCS
8	2	28617	NUT 8-32 LOCKING STAR WASHER
9	4	32926	SEAL POTENTIOMETER HEXNUT .25 SHAFT 3/8-32 TH
10	2	35857	SCREW 4-40 X 1/4 FHSCS
11	16	35923	WASHER #8 FLTW NYLON
12	2	37572	LABEL PE GROUND TERMINAL
13	2	40585	SCREW 6 - 32 X 1 SHCS
14	1	40610	METER VOLT 0-30VDC PANEL MOUNT SQUARE
15	12	58482	SCREW 4-40 X 3/8 BHSCS
16	1	58484 58580	CONNECTOR RECEPTACLE 22-14 NICKEL PLATED RECEPTACLE FLANGED 14 PIN AMP THERMOPLASTIC HOUSING
17	1	58485 58580	CONNECTOR RECEPTACLE 14-7 ZINC PLATED RECEPTACLE FLANGED 14 PIN AMP THERMOPLASTIC HOUSING
18	1	58486	CONNECTOR RECEPTACLE 14-5 METAL
19	16	62944	SCREW 6-32 X 5/8 BHSCS
20	2	63525	DRIVE MOTOR CONTROL 115/230VAC
21	1	64549	(NOT SHOWN) FUSE 6.3A TIME DELAY 5 X 20MM
22	1	66917	(NOT SHOWN) CORD POWER 5-15 120V 90 DEG C13 RIGHT 6 FT
23	2	66952	SCREW 2-56 X 7/8 PPHMS
24	4	67053	KNOB POTENTIOMETER 1/4 BLACK PLASTIC
25	2	67143	RESISTOR HORSEPOWER PLC CONTROL DRIVES CE BW3000
26	1	67173	CAP PUS ON 1.00 OD X 19/32 HT PLASTIC BLACK
27	2	67194	BEZEL CONNECTOR BW3000 CONTROLLER
28	1	67204 58580	CONNECTOR PLUG 7 PIN REVERSE MALE/FEMALE SIZE 14 RECEPTACLE FLANGED 15 PIN AMP THERMOPLASTIC HOUSING
29	8	67205	BUTTON PUSH MOMENTARY LOW PROFILE STAINLESS
30	1	67207	SWITCH PUSHBUTTON MOMENTARY ILLUMINATED BLUE
31	1	67213	INDICATOR LED RED 24 VDC SOLDER TAG PANEL MOUNT

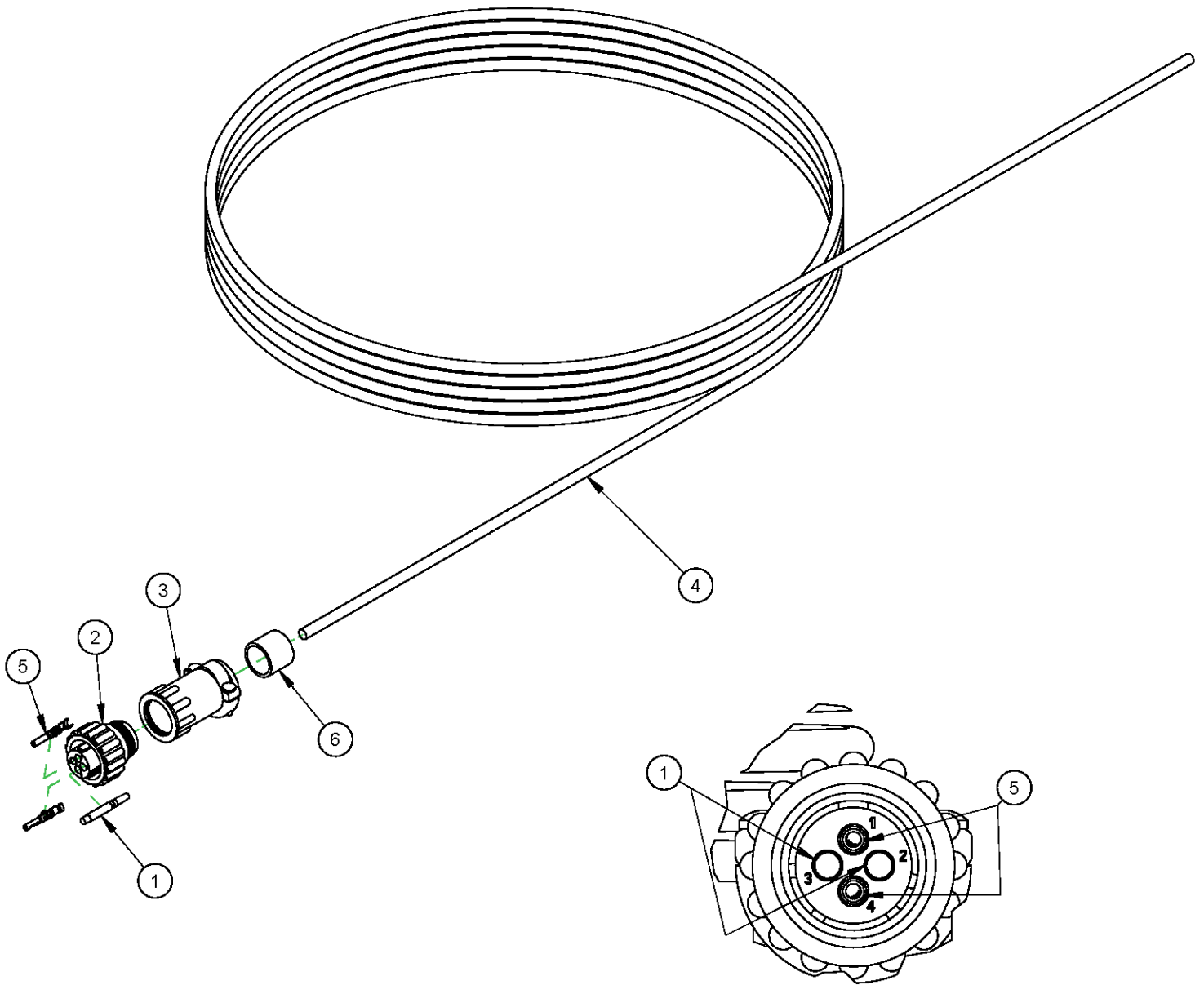
**87304 - CHART NFIS CONTROLLER BW3000 120/230V CE UNFINISHED PLASTIC/METAL
CONNECTORS - REV B**

FOR REFERENCE ONLY

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
32	1	67215	INDICATOR LED BLUE 24 VDC SOLDER TAG PANEL MOUNT
33	1	67216	INDICATOR LED GREEN 24 VDC SOLDER TAG PANEL MOUNT
34	1	67234	DC DRIVE 120/230 10A SCR REVERSING CHASSIS HIGH SPEED CURRENT CLAMPING
35	1	67237	(NOW SHOWN) RELAY 24V DPDT DIN RAIL MOUNT (PLASTIC ONLY)
36	1	67239	BUTTON EMERGENCY STOP RED
37	1	67242	OUTPUT MODULE ANALOG
38	1	67244	RELAY OUTPUT MODULE
39	1	67246	PLC MICROLOGIX 1200
40	1	67247	POWER SUPPLY SOLA 24V 50W
41	1	67249	PANEL CONTROL BOX BW3000
42	1	68306	OVERLAY CONTROL BOX BW3000
43	1	69330	BUZZER 12V 3800HZ
44	1	70573	CASE MODIFIED CONTROL BOX
45	1	70893	(NOT SHOWN) MEMORY MODULE PLC EEPROM
46	1	73025	(NOT SHOWN) DRAWER FUSE POWER ENTRY MODULE 2 POLE 5 X 20MM FUSE (230V ONLY)
47	4	73758	NUT 4-40 NYLON INSERT LOCKNUT ZINC PLATED
48	8	73763	NUT 8-32 NYLON INSERT LOCKNUT HEX ZINC PLATED
49	1	73773	(NOT SHOWN) DRAWER FUSE 2 POLE W/ SHORTING BAR 5 X 20MM FUSE
50	2	73776	(NOT SHOWN) WIRE TIE 20.5" LONG
51	2 IN	73786	(NOT SHOWN) FOAM STRIP .75W X .5 SQFT URETHANE ADHESIVE BACKED (PLASTIC ONLY)
52	1	73878	(NOT SHOWN) CORD POWER CEE 7/7 230V 90 DEG C13 RIGHT 8 FT (230V ONLY)
53	1	75059	MODULE POWER ENTRY 2 POLE WITH LINE FILTER 10A
54	1	77568	LABEL PROTECTIVE EARTH 1/2" DIA
55	1	78487	(NOT SHOWN) PROGRAM PLC MODEL BW3000
56	1	79288	(NOT SHOWN) KIT WIRING BW3000 CONTROLLER 120/230V METAL CONNECTORS
		79289	(NOT SHOWN) KIT WIRING BW3000 CONTROLLER 120/230V PLASTIC CONNECTORS
57	16	79316	WASHER #6 NYLON .15 ID X .32 OD X .03 BLACK
58	1	82109	DIN RAIL 35MM X 2 INCHES LONG
59	1	83309	CLAMP BUZZER HOLDER
60	8	85976	NUT SOCKET CAP 8-32 X .31 OD X .27 LG
61	1	86568	(NOT SHOWN) SET LABELS CONTROLLER ELECTRICAL COMPONENTS BW3000 METAL AND PLASTIC

**87304 - CHART NFIS CONTROLLER BW3000 120/230V CE UNFINISHED PLASTIC/METAL
CONNECTORS - REV B**

FOR REFERENCE ONLY

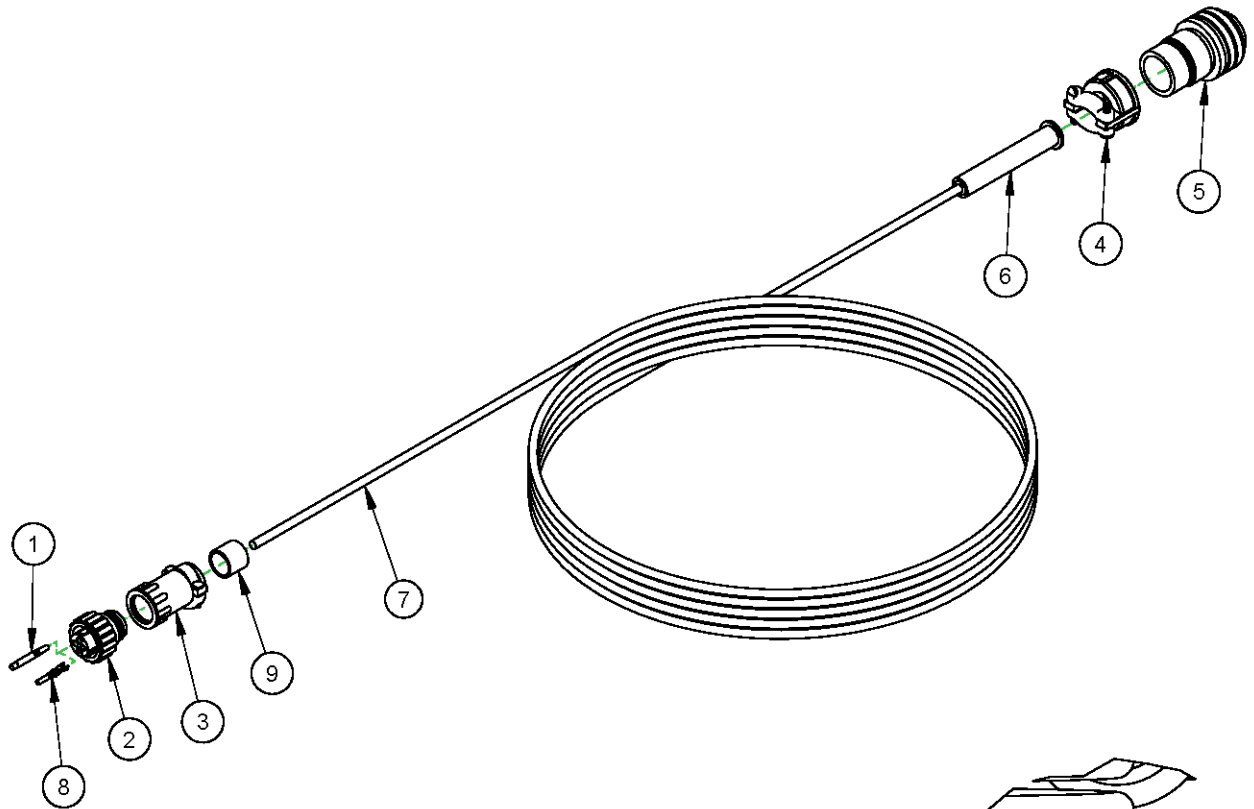


SOCKET LOCATION
 67482 POSITIONS 1 & 4
 PLUG LOCATION
 12941 POSITIONS 2 & 3

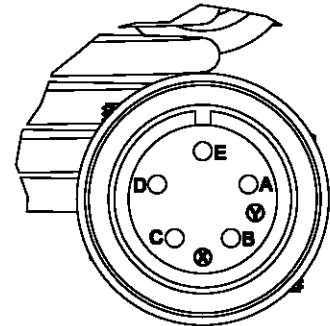
PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
2	1	67057	CONNECTOR PLUG 11-4 METAL SHELL
3	1	67060	CABLE CLAMP LARGE SIZE 11
4	180 IN	67280	CABLE POWER 2 CONDUCTOR 18 AWG 300 VAC RUBBER JACKET BLACK
5	2	67482	CONTACT SOCKET AWG 18-16 CRIMP
6	1	67734	HEAT SHRINK TUBE 1/2 DIA BLACK
1	2	12941	PLUG KEYING CIRCULAR CONNECTOR

85396 - CONTACTOR BW2600 BLANK END W / 4 PIN ASSY - REV A

FOR REFERENCE ONLY



SOCKET LOCATION
 67482 POSITIONS 1 & 4
PLUG LOCATION
 12941 POSITIONS 2 & 3



SOLDER WIRES
 TO PINS **A** AND **C**;
ORIENTATION NOT
CRITICAL

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	12941	PLUG KEYING CIRCULAR CONNECTOR
2	1	67057	CONNECTOR PLUG 11-4 METAL SHELL
3	1	67060	CABLE CLAMP LARGE SIZE 11
4	1	67138	CONNECTOR CABLE CLAMP MS3057A SIZE 18
5	1	67147	CONNECTOR STRAIGHT PLUG SIZE 18 5-PIN
6	1	67214	RUBBER BUSHING FOR MS3057A CABLE CLAMP .312 ID
7	180 IN	67280	CABLE POWER 2 CONDUCTOR 18 AWG 300 VAC RUBBER JACKET BLACK
8	2	67482	CONTACT SOCKET AWG 18-16 CRIMP
9	1	67734	HEAT SHRINK TUBE 1/2 DIA BLACK

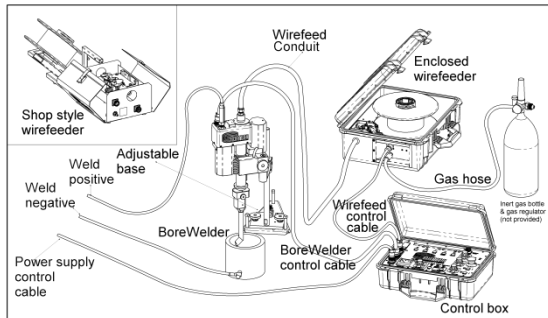
85540 - CONTACTOR ASSY LINCOLN BW2600 - REV A

FOR REFERENCE ONLY

Quick Reference

I. SET UP THE BW3000 BOREWELDER

You must use the appropriate safety equipment, including a hand-held welding helmet and safety glasses, when setting up the BoreWelder.



Attach BoreWelder to Part to Be Welded

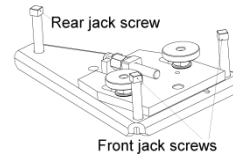
1. If using a radial mount, weld the 1/2-13x3 mounting bolt to a spot approximately 14 in. (36 mm) from the center of the bore. Otherwise (no radial mount), weld the mounting bolt to a spot approximately 11 in. (28 mm) from the center.
2. Place the adjustable base plate over the mounting bolt. Secure it to the part by installing the 4 spring washers & nut. Tighten the nut.
3. Screw the mounting rod into the slider hole & tighten firmly.
4. Install the locking collar 8 in. from the top of the mounting rod.
5. If you're using a radial mount (A-1005), install it over mounting rod.
6. Slip BoreWelder over the radial mount.
7. Move BoreWelder & radial mount to bring the Offset Head directly over the bore.

Attach the Control Box

8. Connect the control cables.
9. Switch POWER switch to ON. LEDs on the control box flash three times; then only red and blue LEDs stay lit. If the control cables aren't plugged in, LEDs continue to flash.

Adjust Parallelism

10. Set Offset Head assembly to zero offset.
11. Install extension to help adjust parallelism.
12. On the adjustable base, adjust the forward jack screws first, using the extension to reference the 3 or 9 o'clock location of bore.
13. Adjust the rear jackscrew, using the extension to reference the 6 or 12 o'clock location of bore.



Center the BoreWelder (Coarse)

14. Adjust BoreWelder & radial mount to move the attached extension to the center of the bore.
15. Lock BoreWelder to radial mount.
16. Lightly tighten radial mount clamp knob to the mounting rod.
17. Remove the extension from the Orientation Fitting.

Install a Welding Torch

18. Attach torch (& extensions) to BoreWelder Orientation Fitting & secure torch with the 1.5 in. (38 mm) Orientation Nut.

19. Align torch to the Offset Head dovetail travel. Shift the offset of the torch to adjust the diameter range.
20. Adjust torch clearance to 1/4 in. (6 mm) from nozzle to bore surface.

Fine Center

21. Press ROTATE JOG or manually rotate the Offset Head to rotate torch from 6 o'clock (Point A) to 12 o'clock (Point B).
22. Turn the adjustment screw on the adjustable base to center torch between Points A & B.
23. Rotate torch as in Step 21 but go from 3 o'clock (Point C) to 9 o'clock (Point D).
24. Loosen the radial mount clamp knob & pivot on the mounting rod to center torch between Points C & D.
25. Lock the radial mount and the BoreWelder clamp knob.

NOTE: A boring bar interface may be used instead of the Climax adjustable base.

Adjust the Reach

26. Add or remove extensions to change the reach without moving BoreWelder. Or slide BoreWelder up or down the mounting rod.

Attach Wirefeed Conduit & Load Wire

27. Attach BoreWelder end of the wirefeed conduit to swivel connector at the top of BoreWelder by engaging attachment nut. Tighten by hand only.
28. Open the wirefeeder case. Loosen the thumb screw of the feeder conduit fitting.
29. Insert the wirefeeder end into the feeder conduit fitting to a positive stop. Secure the feeder conduit fitting with the thumb screw.

30. Place the roll of wire on the spool holder so that the wire feeds from the *bottom* of the roll. Straighten about 6 in. (152 mm) of wire at the end of the roll to prepare for feeding.
31. If your wirefeeder has the push/pull option, place the toggle switch in the normal position.
32. Disengage the pressure rolls on the wirefeeder by flipping the lever(s) off the pressure roll arm.
33. Thread the wire into the feed mechanism inlet guide. Push the wire past the feed rolls and into the conduit fitting.
34. Engage the feed roll pressure lever(s).
35. Make sure the control box is ON, & press the WIRE JOG switch. The wire will be pushed through the conduit, BoreWelder, & torch.

Attach the Weld Cables & Gas Hose

36. Attach the positive weld cable to the BoreWelder quick couple & power supply.
37. Attach the negative weld cable to the part to be welded. Attach the ground clamp to clean, bare metal near the bore being welded.
38. Attach gas hose to a regulated source of shielding gas and a quick connect at wirefeeder.
39. On the control box, press the PURGE button. A flow of 35 cfh (1 cubic m/h) is good.

Set the Axial & Rotational Start Positions

40. Jog the torch along its long axis until the nozzle is positioned properly to start welding at the end of hole farthest from BoreWelder. Typically, the wire is 1/16 to 1/8 in. (1.6 to 3.2 mm) from the end.
41. Welding always progresses toward BoreWelder.
42. Push & hold ROTATION INITIALIZE button until the torch stops rotating.

II. OPERATE THE BW3000 BOREWELDER

You must use the appropriate safety equipment, including a hand-held welding helmet and safety glasses, when operating the BoreWelder.

Pre-Weld Checklist

- | | |
|---|--------------------------|
| Weld positive connected to BoreWelder and weld power supply. | <input type="checkbox"/> |
| Weld negative connected to part and weld power supply. | <input type="checkbox"/> |
| Rotation speed set (ROTATION SPEED)
EXAMPLE: 3.5 in. diameter x 10 = 35 SPR @ 20 IPM. | <input type="checkbox"/> |
| Wire speed set (WIRE SPEED)
EXAMPLE: 6 sec. of wire jog = 19 in. of wire in 10 min., for 190 IPM. | <input type="checkbox"/> |
| Step set (STEP SIZE)
NOTE: If travel speed is 20 in./min., amperage & step value in inches are nearly equal. | <input type="checkbox"/> |
| Voltage set (ARC VOLTAGE)
NOTE: Startup value = 18.5 (approximate). | <input type="checkbox"/> |
| Shielding gas connected and on (PURGE)
NOTE: Shielding gas flow rates should not exceed 35 cfh. | <input type="checkbox"/> |
| Torch at rotation initialize point (step point). | <input type="checkbox"/> |
| Twisted wire fed out from BoreWelder. (WIRE JOG) | <input type="checkbox"/> |
| Quill retracted to correct position to start weld. (RETRACT) | <input type="checkbox"/> |

Startup/Shutdown

Press the WELD button on the control box to start; press it again to stop.
If stubbing occurs on startup, raise the voltage until the process stabilizes.

Arc Interrupt

When your torch approaches an area you don't want to weld, press the ARC INTERRUPT button on the control box. Welding stops. Release the button to resume welding.

Auto Skip

1. BoreWelder must be centered & parallel to bore.
2. Rotate torch manually or press ROTATE button. Rotate to the beginning of "interrupt" or weld area.
3. Squeeze outside diameter of the cam discs with your thumb and forefinger, & pull away from the spindle, opening a low spot in the cam discs.
4. Rotate discs until AUTO SKIP switch just falls into the low area.
5. Rotate the torch to end of the interrupt area.
6. Hold first disc where you set it in Step 3. Move other disc until AUTO SKIP switch actuates.
7. Re-check disc settings by rotating spindle through "interrupt" zone in welding rotation direction.

Pie Mode/Carriage Return

Hold down FUNCTION key & press WELD button to cycle through Auto Skip, Pie Mode & Carriage Return.



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BB Bar Speed:

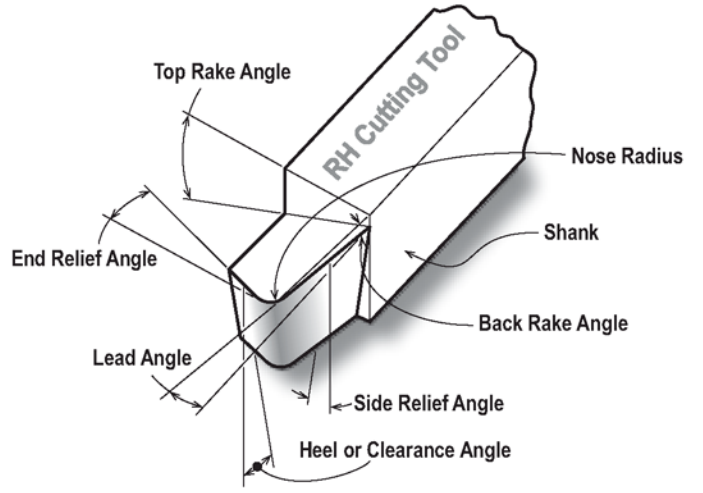
HSS - RPM = 300/Ø
Carbide - RPM = 1000/Ø

Bore Welding Parameters:

Voltage 17.5
Rotation Speed..... Ø x 10 = # seconds/Rev
Wire Speed (sets amps) 22" in 6 seconds
Step 3mm (1/8")
Gas 75% Argon, 25% Co2 @ 35ft³/hr
Wire035 Solid Core - ER70-S6

Torch Ranges

BW1000		BW3000	
00	.88-1.8	00	.88-1.8
0	1.8-3.0	0	1.8-3.0
1	2.7-8.2	1	2.75-5.5
2	8.0-12.0	2	4.5-7.5
3	n/a	3	6-9
4	n/a	4	8-11
5	n/a	5	10-13



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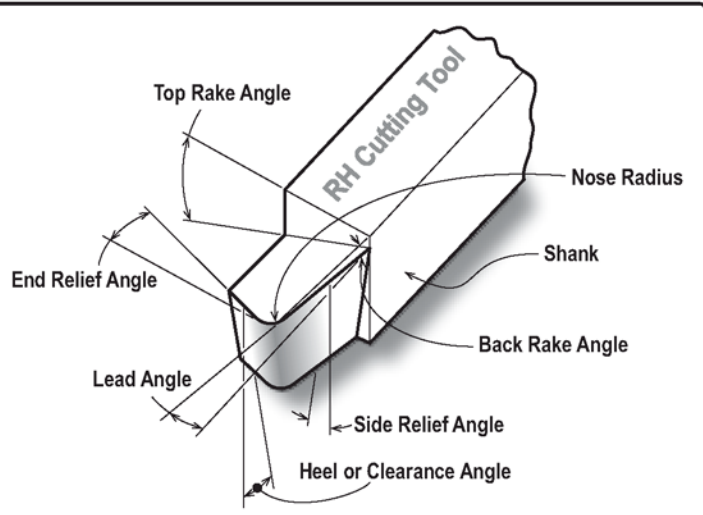
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4	n/a	4	8-11
5	n/a	5	10-13



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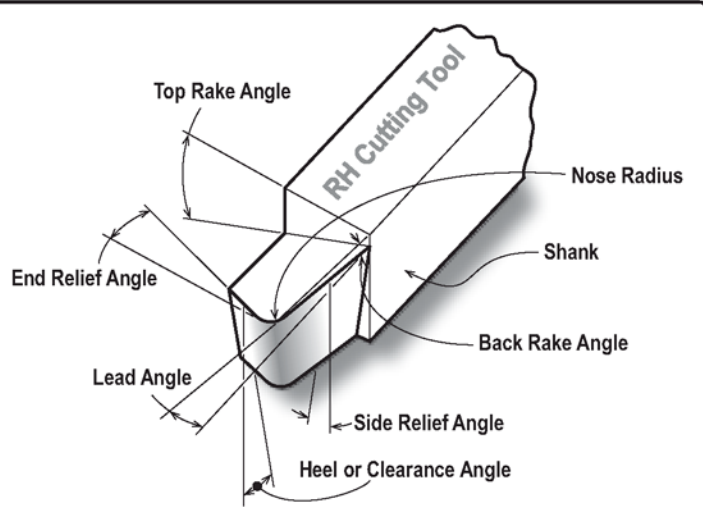
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