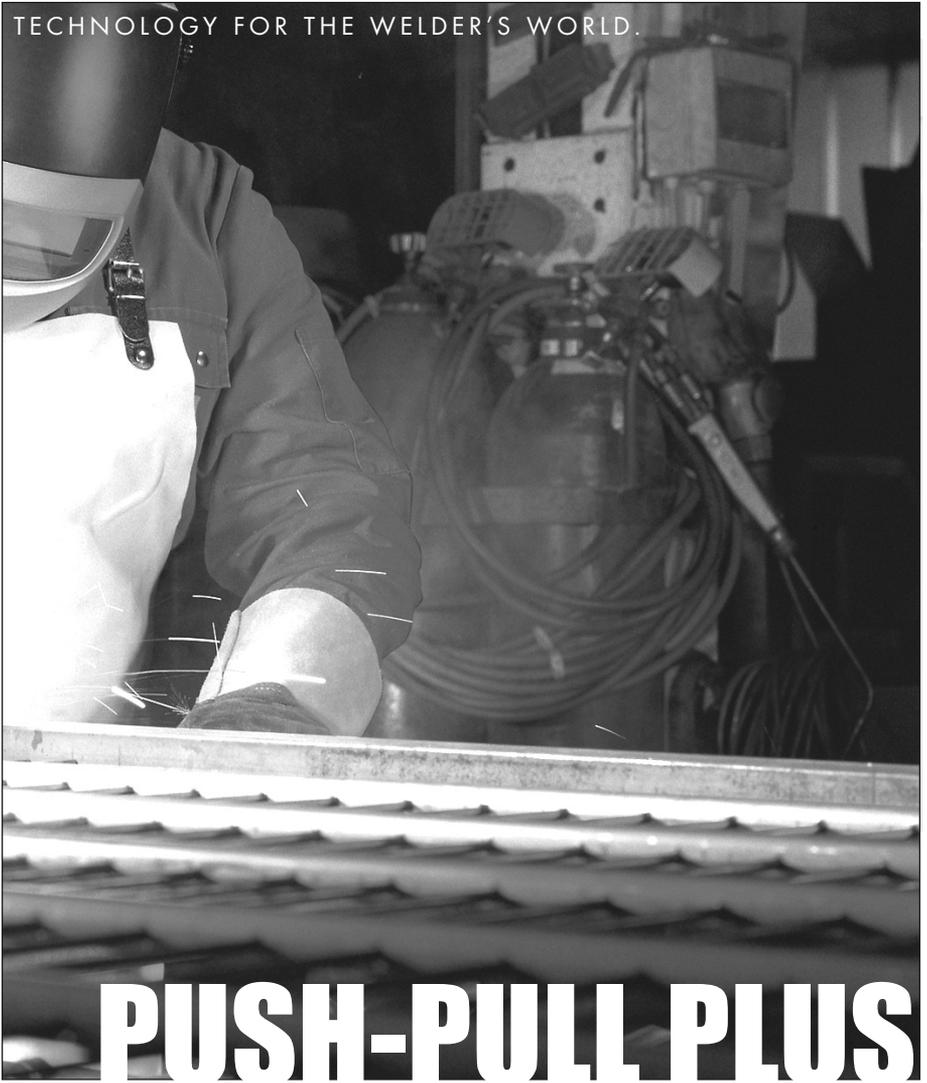


TECHNOLOGY FOR THE WELDER'S WORLD.



# **PUSH-PULL PLUS**

## **Instruction Manual**



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# Table of Contents

<b>Subject</b>	<b>Page</b>
Introduction .....	1
Use of this manual .....	1
User responsibility .....	1
Personal protection .....	2
Fire safety .....	2
Electrical shock .....	3
Ventilation requirements .....	3
Equipment maintenance .....	4
Push Pull Plus product description .....	4
Universal Power Supply description and installation .....	4, 5
Binzel Central Adapter System description .....	5
Central Adapter System installation .....	6-8
Liner installation instructions .....	8-10
Steel Monocoil liners .....	8
Teflon liners .....	9, 10
Drive rolls .....	10
Swanneck wire and neck liner guide .....	10, 11
Drive roll pressure adjustment .....	11
Consumables .....	11, 12
Gas diffuser .....	11
Contact tip holder .....	11
Contact tip .....	12
Nozzle .....	12
Maintenance .....	12-14
General inspection and cleaning .....	12, 13
Adapter kit maintenance .....	13
Push Pull gun maintenance .....	13
Torch body diagram .....	15
Troubleshooting guide .....	17-24



## Introduction

The purpose of this manual is to explain the installation, operation, and maintenance of the Abicor Binzel Corporation semi-automatic Push-Pull welding gun.

This manual is not to be regarded as a training program, but as a guide for experienced personnel. The training of personnel to effectively and safely install, operate, and maintain Abicor Binzel product is the responsibility of the owner and user. Abicor Binzel Corporation originated and exclusively owns the information contained in this manual. The manual is supplied only to provide information to the owner or user of the equipment, it is not a license for reproduction of the equipment or equipment design. The owner or user has no right to give the information contained in the manual to others.

Read carefully and make sure you understand this complete manual before attempting to operate, install, or maintain the equipment. The equipment and this manual are intended for use only by persons familiar with the safety precautions required for the use, installation, and maintenance of arc welding equipment. Do not permit untrained personnel to operate, install or maintain the equipment.

## Use of this manual

This manual is divided into sections for ease when performing particular operations. The entire manual is to be read before any work is performed.

Throughout this manual special safety precautions are highlighted in the following manner:

***WARNING! This precaution if not carefully followed can lead to serious personal injury and/or death!***

***CAUTION! This precaution if not carefully followed can lead to minor personal injury and/or damage to the equipment!***

Additionally, special information is highlighted in the following manner:

***NOTE: This information is included to ease assembly and/or separate instructions, which if not followed can lead to decreased efficiency or incorrect operation of the equipment.***

## User responsibility

It is the owner's and/or user's responsibility to make themselves aware of and to comply with the codes and regulations applicable to the installation, use, and maintenance of this equipment in the country, state, or territory of use. Abicor Binzel Corporation will not accept liability for the non-compliance of the owner or user with applicable laws or codes.

## **Personal protection**

***WARNING! Skin burns and eye burns from exposure to ultra-violet rays generated by an electric arc or hot metal are more severe than sunburn.***

Always use a face shield with the correct filter and cover plates to protect your eyes, face, neck, ears, and scalp from arc rays and sparks, both when operating or merely observing. Do not allow bystanders or those working in the area to look at the arc or expose themselves to the rays.

Wear flameproof gauntlet-type gloves, and clothing.

Protect other nearby personnel against arc rays and hot sparks with a nonflammable partition.

Wear safety glasses or goggles when in a work area. Use safety glasses with side shields when chipping slag or grinding.

***WARNING! Chipped slag can be hot and can travel considerable distance! Bystanders should also wear safety glasses!***

Certain welding processes can produce excessively high noise levels and require ear protection.

## **Fire safety**

***WARNING! Hot slag or sparks can cause serious fires when in contact with combustible solids, liquids, or gases.***

Remove all combustible materials from the welding area or completely cover the materials with a non-flammable covering. Examples of combustible materials are wood, clothing, sawdust, gasoline, kerosene, paints, solvents natural gases, acetylene, and propane.

Hot sparks or molten metal can fall into cracks in floors or walls and cause a hidden fire. Cover all openings accordingly.

Have fire-extinguishing equipment on hand for immediate use.

## Electrical shock

**WARNING! Live electrical parts can cause severe burns, or fatal shock to the body. Severity of electrical shock is determined by the path and the amount of current passing through the body.**

Never allow live metal parts to touch bare skin or any wet clothing. Be sure gloves are dry.

When standing on metal or welding in a damp area, make certain that you are well insulated by wearing dry gloves, rubber soled shoes, and by standing on a dry board or platform.

Keep cables away from sharp metal edges and objects, which can cut or puncture cables. Do not stress cables mechanically by pulling equipment, or electrically by overloading. Worn or damaged cables should be replaced.

When not welding, turn off the equipment as accidental grounding can cause overheating or create a fire hazard.

Keep clothing, work area, cables, welding guns, and welding machines dry. Fix water leaks immediately.

## Ventilation requirements

**WARNING! Welding gases and fumes can cause discomfort and physical harm, especially in a confined space.**

Provide adequate ventilation in the work area at all times either by natural or mechanical means. Do not weld galvanized steel, zinc, lead, beryllium, or cadmium without proper ventilation to prevent breathing these fumes and gases.

Do not weld in proximity of chlorinate hydrocarbon vapors coming from degreasing or spraying operations. The heat or arc rays can react with solvent vapors to form phosgene gas (highly toxic!) and other irritant gases. If you develop momentary eye, nose or throat irritation during welding, this is an indication of inadequate ventilation. Stop work and take the necessary steps to improve ventilation in the welding area.

If ventilation is not adequate to remove all fumes and gases, use a fresh air respirator.

## Equipment maintenance

**WARNING! Faulty or improperly maintained equipment can result in physical injury or death through electric shock or fires.**

Have only qualified personnel perform installation, maintenance, and trouble-shooting. Do not perform any electrical work unless qualified.

Always disconnect the welding machine from the power source when performing any maintenance work inside the machine.

Cables, welding gun, grounding wire, connections, power cord, and welding machine must be maintained in safe working order.

Keep all safety devices and cover plates in place.

Always use equipment for its intended purpose. Do not modify!

## Push Pull Plus product description

The Binzel Push-Pull welding guns are designed to enable feeding of normally difficult to feed welding wires over long distances with a smooth and consistent feed rate.

The ideal application for these welding guns is in welding with "soft" aluminum wires. It can also be used for steel as well as stainless steel wires. These welding guns can be used for wire sizes from .024"-.062" when fitted with the correct liners, tip, and drive roll.

**CAUTION! These units, though designed to withstand normal industrial use, are precision tools. Do NOT knock spatter out of the nozzle by banging the gun! Do NOT throw the unit! Avoid dropping the unit! Damage to the motor or welding head may result.**

## Universal Power Supply

The unit uses a direct current slave motor located in the handle to maintain tension on the wire. Power for the motor is obtained from the Binzel "Universal Power Supply". This power supply connects to a standard 120 volt receptacle, and provides torque sensitive power.

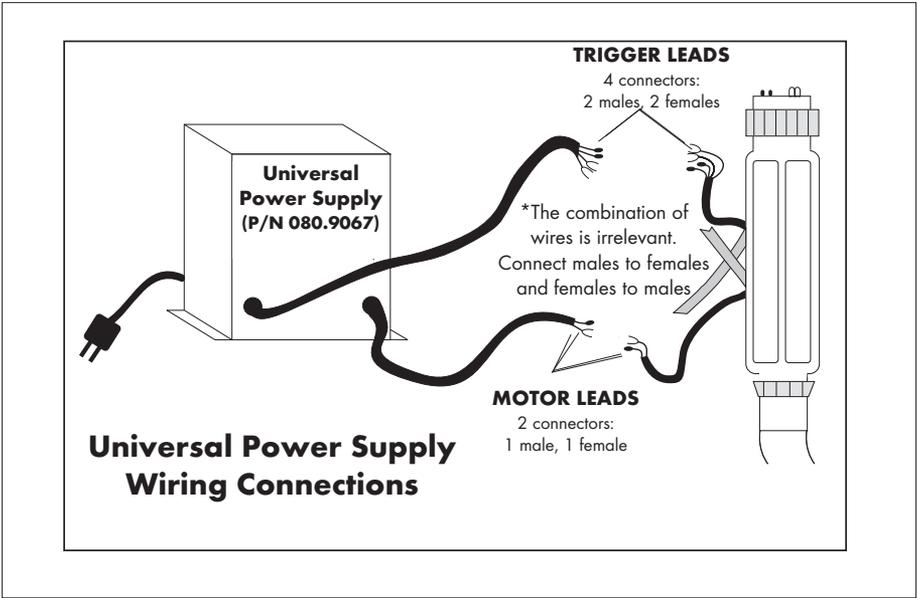
### **How it works.**

When the gun motor is switched on it attempts to run at maximum speed (approximately 780"/min.) The speed of the pull motor is inhibited by the wire speed feed, which is controlled by the main wire drive unit. This results in a tensioning of the wire in the liner, providing smooth and stable feeding.

*continued on page 5*

The slowing of the pull motor due to the drag effect of the wire results in an increase in current, which is dissipated through a resistor in the form of heat. This will provide tension on the wire relative to the speed of the push motor without over load of the pull motor.

**CAUTION! The Universal Power Supply or alternative Binzel power supply must be used! Obtaining current from any other source that does not contain similar electrical circuitry could result in improper wire feeding, wire shavings, and damage to the pull motor.**



## Installation

Connect the 2-conductor motor leads from the gun (one male, one female connector) to the 2-conductor motor leads from the power supply box.

Connect the 4-conductor trigger leads from the gun (two male, two female connectors) to the 4-conductor trigger leads from the power supply box.

**NOTE: The combination of wires is irrelevant, so long as the males are connected to females, and the females are connected to males.**

Plug the U.P.S. box's power cord into a 120 volt supply.

**NOTE: For additional assistance with above see drawing on page 15 of this manual.**

## Binzel Central Adapter System

The Binzel Central Adapter System is a recognized world standard, which allows rapid and easy changing of MIG guns attached to the wire feeder. Once installed on the wire feeder, the system connects power, gas, and trigger circuit with a few turns of the locking nut. This system allows the Binzel Push Pull gun to be mounted to any conventional "Push" type wire feeder.

The system consists of the following parts: The central adapter block, with trigger leads and gas fitting. The adapter plug, which threads into the block and is specifically designed for each machine. The power connection clamp, insulating flange, and a set of wire guide tubes are provided as necessary.

### ADAPTER KIT INSTALLATION INSTRUCTIONS

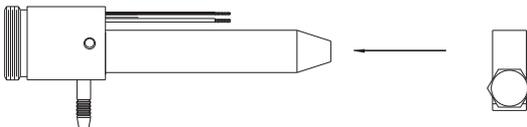
**WARNING! Disconnect the welding machine from the power source to prevent shorts and/or electrical shock.**

**NOTE: These are generalized installation guidelines. Installation may vary slightly due to various feeder designs.**

1. To assemble the adapter kit, first screw in the adapter plug. Then tighten the setscrew located in the adapter block in order to secure the plug. *(Skip this step if using a one-piece internal gas plug).*

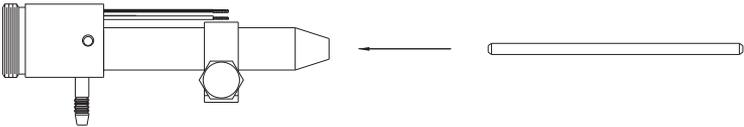


2. If required for your particular feeder, slip the power lug over the adapter plug. Do not tighten, as you will need to locate the correct position once installed on the feeder.

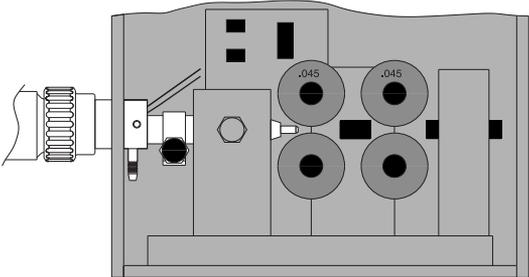


3. If using an external gas block, slide the supplied gas hose over the copper gas nipple, and crimp the clamp securely to seal out atmosphere.

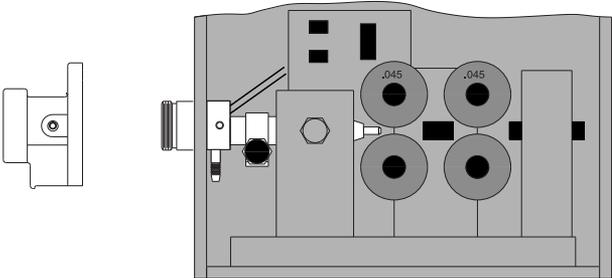
4. Make sure the correct liner is installed in the gun (see “liner installation instructions”) and thread the gun on to the adapter assembly. Insert the appropriate size guide tube into the adapter plug. (Note: Teflon liners 4.3mm or smaller in diameter require the supplied brass guide tube to be fitted over the liner for support. Teflon liners 4.4mm or larger in outside diameter do not require any guide tubes as they can support themselves. Teflon liners must be trimmed so that they butt up against the drive roll).



5. Use the gun to help insert the adapter assembly through the opening located on the feeders outer switchboard panel-face (if the wire drive unit is so equipped). When the adapter plug (with guide tube) is installed with just enough space to prevent the drive rolls from rubbing on the guide tube tighten down the feeder blocks setscrew.



6. Disconnect the welding gun from the adapter plug and slide the supplied plastic insulating flange over the adapter and up to the outer panel-face of the feeder. Position the flange so that the opening for the gas hose is located in line with the gas nipple of the adapter block (normally down position).



7. Mark the location of the three mounting holes, and then remove the flange so that mounting holes can be drilled in the feeders panel-face. Drill 1/16" holes at the marked locations, and bolt the flange to the panel. Tighten the setscrew in the adapter flange in order to secure the complete assembly.

**CAUTION! When drilling holes, be aware of parts behind the panel, which could be damaged! Do not allow metal shavings to fall in the machine.**

8. Inside the wire drive unit, attach the adapter kit trigger wires to the proper trigger connections in the feeder. (Note: Some kits are pre-wired with the proper wire connector.)

9. If installing an adapter with external gas line, connect the gas hose to the wire feed units gas solenoid valve. (Note: Some kits already have gas fittings connected to the hose for ease of installation).

10. If the power lug was required in step 2, it is now time to connect the power lead from the feeder to the Binzel power lug. Once connected and in position, tighten the lug onto the adapter plug.

11. Check to ensure that the proper liner, contact tip, and or drive rolls are installed for the wire size you are using. Now attach the welding gun to the adapter kit. If using a water-cooled gun be sure to hook up the water lines to a suitable cooling device.

You are now ready to inch wire through the gun.

## LINER INSTALLATION INSTRUCTIONS

Below are instructions for the installation of liners in the Binzel Push Pull guns.

### Steel monocoil liners

A. Lay the gun in a straight line. Then remove the liner positioner nut (the hex nut on the rear of the gun). Remove the old liner by pulling outward on the brass collet.

B. Insert the bare end of the new liner into the liner "stud" on the rear of the gun. Inch the liner through the cable assembly until you feel it stop against the torch body. You will notice that some of the liner is still exposed at the back end of the gun. Accurately measure the amount of liner sticking out (*from the end of the threaded stud to the bottom edge of the collet head*). Now remove the liner and cut off this measured section minus 1/8" from the bare end of the liner. Reinstall the liner and hex nut. Tighten the hex nut to secure the liner.

C. Be sure that the correct wire guide tube is inserted into the adapter kit. Thread the gun onto the adapter.

## **Teflon liner installation**

A. Lay the gun in a straight line. Then remove the liner positioner nut (the hex nut on the rear of the gun). Remove the old liner by pulling outward on the brass collet.

B. Unpack the Teflon liner you have selected. You will notice that the brass collet is close to one end of the liner but not in a fixed position, and is backed by a small o-ring. Find the end of the liner without the collet, and using a pencil sharpener or knife, shave this end of the liner to a smooth taper.

**NOTE: This taper is to ensure that the liner seats properly into the torch body. Failure to follow this procedure could result in erratic wire feeding, and bird nesting.**

C. Insert the tapered end of the liner into the liner "stud" on the rear of the gun. Feed the liner through the cable assembly until you feel it stop against the torch body. Check the viewing hole inside the front drive assembly to verify that the liner has been fully inserted.

**NOTE: Use care not to kink the liner while feeding it into the gun. A kinked liner will result in improper or poor wire feeding, and must be replaced.**

D. While holding forward pressure on the liner, slide the collet and o-ring up to the liner "stud". The collet will not go the entire way in the stud due to the collets taper. Install the hex nut over the liner and tighten slightly. (Do not over-tighten).

\*See diagram on page 10 of this manual.

**NOTE: If installed correctly the liner will have a slight compression on it inside the cable. This compression will eliminate any slack, which might have a negative effect on feeding. Over tightening of the liner positioner nut will result in wire feed problems, due to pinching of the wire.**

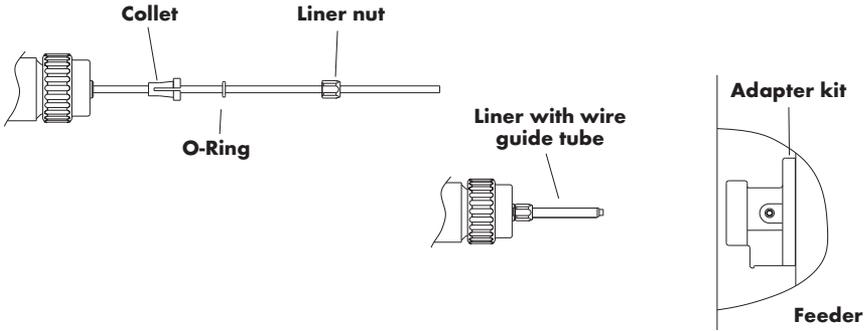
E. If using a liner with an outside diameter of 4.4mm or larger a guide tube support is not necessary. If using a liner 4.3mm or smaller in diameter, slide the guide tube support over the liner. *\*In general if the guide tube fits over the liner, use it.*

F. Insert the excess liner and guide tube through the adapter kit, and up to the drive rolls. Align the gas fitting and trigger pins on the rear of the torch with the corresponding holes on the adapter kit, and tighten the large plastic nut.

G. Mark and trim the excess liner at the drive-rolls to leave a 1/32" gap between the rolls and the liner.

H. The brass guide tube support should be about 1/8" from the drive rolls. If the guide tube is too long, and interferes with the drive rolls, it will need to be trimmed.

**NOTE:** When inching wire through the gun, it may be necessary to open the drive roll cap and set the wire speed feed very slow. Watch the inlet guide at the guns drive roll and when the wire appears, carefully guide it into the outlet guide. If the wire speed is too fast the wire will hit on the front of the torch body and bird nest at the feeder.



### **Drive rolls**

The drive rolls are designed for the specific wire size you are using. Be sure to install the correct size. When looking at the drive rolls you will notice that there is a groove on each end. These grooves are for the same wire size and allow the drive roll to be flipped over for double the life.

To replace the drive rolls you will need a straight screwdriver and 10mm open end wrench. (See diagram on page 15 of this manual)

### **Swanneck liner**

Two different length swanneck neck liners are available. One neckliner is for 180° degree necks, and one is for the 45° degree necks.

- A. Remove the swanneck from the torch body by un-screwing the swanneck retaining nut.
- B. Unthread the swannecks plastic inlet guide
- C. Unthread the neck liner from the guide.

*continued on page 11*

- D. Thread a new neck liner into the swanneck inlet guide.
- E. Re-install the wire guide assembly into the swanneck, and tighten.
- F. Thread the neck onto the torch body, and hand tighten.

### **Drive roll pressure adjustment**

The drive roll tension knob provides adjustment for various wire types and sizes. The best results can be obtained by starting with the pressure knob turned outward (counter clock-wise), and slowly turning inward (clock-wise) until just enough pressure is applied to feed the wire.

**NOTE: Too much pressure can deform soft wires.**

## **CONSUMABLES**

### **Gas diffuser**

A. The gas diffuser is a ceramic type insulator, which installs between the swanneck and the contact tip holder. This device keeps spatter from building up in the gas ports, and between the nozzle and tip holder. If the gas diffuser is not installed, spatter will accumulate causing gas flow problems, and short circuits.

### **Contact tip holder**

A. The contact tip holder is threaded onto the swanneck with a normal right-hand thread. To install and/or remove the contact tip holder, you should use the tip wrench provided. This part should be installed tighter than the contact tip.

**NOTE: Use care and do not over-tighten the contact tip holder as damage to the swanneck threads will result.**

**NOTE: Thread the contact tip holder on slowly. This will allow the Teflon liner to seat properly. A small piece of welding wire may be inserted through the tip holder to aid in positioning the liner as the contact tip holder is installed.**

## **Contact tip**

A. The contact tip is threaded into the tip holder with normal right-hand thread. The contact tip is designed to transfer current to the welding wire, and should only be used with the wire size it is designed for. To install and/or remove the contact tip, you should use the wrench provided.

**NOTE: The contact tip should not be installed as tight as the contact tip holder. This will aid in removal of the contact tip at the next contact tip change.**

## **Nozzle**

A. The nozzle is a simple slip on type. It is held in place on the tapered nozzle seat by pressure from the spring clip on the nozzle. Installation and removal will be easier if a clockwise turning motion is used while pushing on or pulling off.

# **MAINTENANCE**

## **General inspection and cleaning**

A regular inspection and upkeep schedule will substantially increase the life of the equipment. Periodically clean dirt and accumulated particles from around the drive rolls and wire guides, by blowing out with compressed air. Check all gas, electrical connections, and hardware for damage or looseness. Inspect cables, wires, and hoses for cracked, frayed, or otherwise damaged outer jackets. Remember that one damaged component can cause harm to others. If necessary send your gun in for expert repairs.

**WARNING! When performing inspection or maintenance on the welding gun, be aware of possible shock hazards. Disconnect the welding gun from the machine. Only qualified personnel should perform installation and maintenance.**

**CAUTION! Do not use any equipment that is not operating properly! Correct the problem before using the equipment. Use only genuine Binzel parts.**

**NOTE: The time periods for procedures are based on an eight-hour workday. If your use exceeds these criteria, decrease the time between maintenance and checks.**

## **Adapter kit maintenance**

In the Binzel Central Adapter System one part requires periodic replacement. The steel or brass guide tubes should be inspected any time they are removed for changing wire size or spools.

## **Push Pull Plus gun maintenance**

Other than general inspection and consumable replacement certain tasks should be performed on a periodic basis.

### **Perform daily**

- A. Check the rear adapter nut at the machine connection and the swanneck retaining nut. Tighten by hand if loose.
- B. Open the drive roll cover, and with compressed air, clean the area around the drive roll of metallic particles.

### **CAUTION! Use proper eye protection when using compressed air!**

**NOTE: Use of solvents for cleaning is not recommended, and could damage the motor and cable hoses.**

- C. Check the drive roll for wear and tightness.
- D. Inspect the nozzle for wear and spatter build up. A worn out nozzle will be loose on the nozzle seat.

### **CAUTION! Do not knock spatter out of the nozzle by banging the gun! Use a pair of nozzle cleaning pliers or the equivalent to prevent damage to the gun. Remember this is a precision hand tool!**

- E. Check the contact tip, contact tip holder, and gas diffuser for wear and tightness. Replace and/or tighten as necessary.

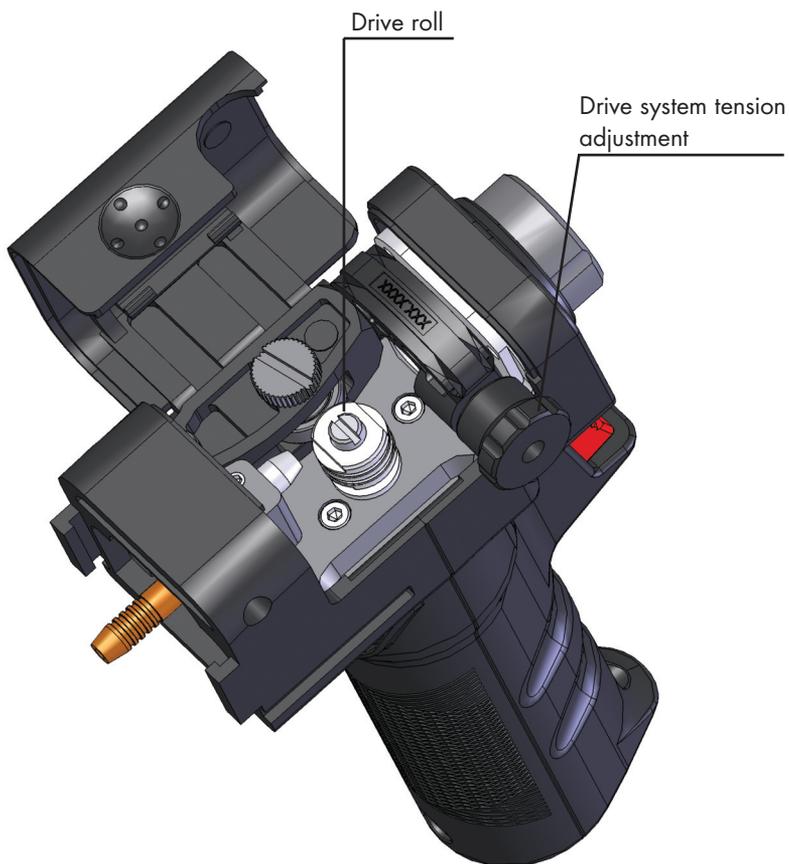
### **Perform when changing wire sizes or spools**

- A. Disconnect the gun from the machine.
- B. Open the drive roll cap.
- C. Using compressed air (maximum 30 psi), blow into the liner from the rear to remove wire particles.

**CAUTION! Use proper eye protection when using compressed air.**

- D. Close the drive roll cover and re-connect the gun to the machine.

## Push-Pull Plus drive roll diagram



## Trouble shooting guide: Porosity

Porosity is caused by four main possibilities:

- Base metal contamination
- Filler metal contamination
- Atmosphere in the weldment including gas turbulence
- Welding parameters

Binzel has found that most porosity problems are directly related to a gas problem, followed by problems with base metal contamination.

Porosity problem	Probable cause	Solution
Porosity	Drafts, wind, fans, exhaust ducts, etc.	<ul style="list-style-type: none"> <li>a. Protect the work area from drafts with curtains or screens. Drafts can easily draw away the shielding gas from the weld pool leaving it without sufficient protection.</li> <li>b. Use tapered or bottleform nozzles when drafts are unavoidable.</li> </ul>
	Impurities on base metal	<ul style="list-style-type: none"> <li>a. Remove all contaminants from the surfaces to be welded. Paint, mill scall, rust, grease, and other contaminants can cause porosity in welds.</li> <li>b. Use specific wire/gas mixtures for the types of impurities you are working with.</li> </ul>
Porosity	Too high oxygen content moisture in gas	<ul style="list-style-type: none"> <li>a. Fix or replace gas mixing apparatus.</li> <li>b. Replace system filter, and or dryers.</li> </ul>
	Leaks in gas distribution system. Unsuitable joint fit-up Spatter in nozzle and on contact tip	<ul style="list-style-type: none"> <li>a. Fix leaks.</li> <li>a. Minimize gaps or provide backing.</li> <li>a. Clean the nozzle and the contact tip regularly. Spatter on these parts causes turbulence in the gas flow, causing air to become mixed into the shielding gas resulting in porosity. Do not hit nozzle to remove spatter, use a suitable scraper.</li> </ul>
Porosity	Too high or too low gas flow rate	<ul style="list-style-type: none"> <li>a. Consult your welding engineer for proper flow rate. Check accuracy of regulator using Binzel gas checker, (P/N 191.0013) which is available from your authorized Binzel distributor.</li> <li>b. Too low a gas flow rate gives insufficient protection to the weld pool. Too high a gas flow rate causes turbulence in the gas shield, which in turn can suck in air resulting in porosity.</li> </ul>
Porosity	Nozzle damaged	<ul style="list-style-type: none"> <li>a. Replace nozzle. A nozzle with uneven edges gives rise to turbulence in the gas flow. Do not hit nozzle to remove spatter, use a suitable scraper.</li> </ul>
Porosity	Too long a stick-out	<ul style="list-style-type: none"> <li>a. Generally, set the stick-out at about 15 times the diameter of the wire being used. If a longer or shorter stick-out than normal is required, consult your authorized Binzel distributor about the availability of special nozzles. Many types are available.</li> </ul>
Porosity	Misdirected welding gun	<ul style="list-style-type: none"> <li>a. Direct the gun at the weld puddle when critical areas like external corners, edges and joints with wide gaps are encountered. A too sharply inclined welding gun can cause porosity due to miss-direction of the shielding gas from the nozzle or air entrapment.</li> </ul>

## Trouble shooting guide: Porosity

Porosity problem	Probable cause	Solution
Porosity (cont.)	Excessively wide weld pool	a. The width of the weld pool should not exceed the diameter of the nozzle. The shielding gas will insufficiently protect a wider weld pool when air gets mixed into the outer layer of the gas stream. If necessary, a shielding gas post-flow should be applied. Consult your authorized Binzel distributor about the availability of special nozzles that may help you weld wide joints.
	Damaged, kinked or leaking gas hose	a. Inspect and repair or replace as necessary. Consult your authorized Binzel distributor for genuine Binzel replacement parts.
	Damage or missing nozzle insulator or gas diffuser	a. Inspect and replace as necessary. Consult your authorized Binzel distributor for genuine Binzel replacement parts.

## Trouble shooting guide: General

Problem	Probable cause	Solution
Erratic wire feed	Slipping feed rolls	<p>a. Check that the feed roll size is correct for the wire size being used. Increase the drive roll pressure until the wire feed is even. Do not apply excessive pressure as this can damage the wire surface and may cause copper coating to loosen from steel wires or metal shavings to be formed from soft wires like aluminum which will be drawn into the wire feed conduit and will rapidly clog the liner. When welding with flux cored wires, excessive drive roll pressure may open the wire seam and allow flux or metal powers to escape.</p>
	Clogged or worn liner	<p>a. Dust, particles of copper, drawing lubricants, metal or flux and other forms of contamination rapidly clog the liner so that the feed is impeded. A liner which has been in use for an extended period of time becomes worn and saturated with dirt and must be replaced.</p> <p>b. When changing wire, remove the contact tip from the front end of the gun and blow out the liner with clean, dry compressed air from the back of the gun.</p> <p><b>Note: Wear safety goggles when using compressed air to clean liner. Insure proper safety procedures are followed to avoid possible serious eye injury.</b></p>
	Liner too long or too short	<p>a. Check the length of the liner and either trim if too long, or replace the liner if too short. Proper feed of the welding wire is dependent upon the correct length of the liner. Consult the operating instructions for the gun or contact your local authorized Binzel distributor for further information.</p>
	Spatter on wire	<p>a. An unprotected coil of wire quickly collects dust and other airborne contamination. If grinding is being performed in the vicinity, particles can become attached to the wire, severely interfering with the wire feed. Replace with clean wire and keep it protected with a cover.</p>
	Coil brake incorrectly adjusted	<p>a. Set the brake so that the coil immediately stops rotating as soon as welding is interrupted. If the brake is too hard it will cause the feed rolls to slip, resulting in uneven wire feed. If it is too loose, overrun of the wire will occur causing tangles of the wire, irregular tension on the feed mechanism and irregular arc characteristics.</p>
Unstable arc	Incorrect setting of voltage and/or current	<p>a. Set the wire feed in relation to the arc voltage in such a way that the arc burns evenly and stable. In spray arc welding, set the wire feed so that short-circuiting ceases and so that the filler metal is transferred in a spray across the arc.</p>
	Defects in wire feed	<p>a. Find the cause of the interference and correct the condition. (See section "Erratic wire feed".)</p>
	Worn contact tip	<p>a. When the opening of the contact tip has become too badly worn the wire will no longer be in continuous electrical contact, which will result in an unstable arc and an increase in spatter.</p>
	Impurities on the base metal	<p>a. Paint, mill scale, rust, silicon scale or flux deposits from previous weld runs from an insulating layer causing an unstable arc. Clean the surface to be welded.</p>
	Poor contact between ground	<p>a. Securely attach the ground cable as close to the cable and work-piece, point of welding as possible on the work piece. Clean the surfaces to ensure good contact.</p> <p>b. Connect ground to both working pieces to be joined. Clean base metal with dedicated stainless steel wire brush when welding aluminum.</p>

## Trouble shooting guide: General

Problem	Probable cause	Solution
Unstable arc (cont.)	Loose power connection	a. Check to insure welding power connection on the power source is tight, the connection on the wire feeder is tight, the connection to the adapter block is tight, and the connection of the gun to the adapter block is tight.
	Stick-out too long	a. Adjust the contact tip to work distance to a minimum of 3/8" for short arc welding with small diameter wires.
Spatter	Too fast or too slow wire feed in relation to the arc voltage	a. Set the wire feed rate and voltage in accordance with good welding practices as recommended by a qualified welding engineer.
	Too long arc	a. Adjust the wire feed and voltage so that the arc is in accordance with good welding practice for the joint to be welded. The distance from the welding gun to the work piece should be about 1/2" to 1". If the arc is too long there will be spatter, usually in the direction of the weld.
	Damaged contact tip	a. If the contact tip becomes worn the filler will not be in constant contact and the arc will become unstable. A contact tip contaminated with spatter will cause uneven wire feed resulting in further spatter.
	Inclination of welding gun too great	a. The angle of the gas nozzle relative to the work piece should be between 45 and 90 degrees. If the angle is too small, the wire runs parallel to the weld pool, resulting in spatter in the direction of welding.
	Faulty power source	a. Have the power source checked for faulty conditions such as broken wires and faulty contact.
	Incorrect start	a. A lot of spatter occurs if the stick out is too great and if the welding gun is held too far from the work piece when striking the arc. Try to start with as short a stick-out as possible and with the welding gun as close to the starting point as possible. If a large ball end is formed on the end of the welding wire remove it by cutting the wire with sharp wire cutters. It is helpful if the wire is cut to a point. Always remove the ball end before striking an aluminum arc. Check welding ground connection.
	Incorrect pulse parameters	a. Consult the user manual for your power supply or a qualified welding engineer.
	Uneven wire feed.	a. Uneven wire feed give rise to heavy spatter. Find the cause of the disturbance and correct the condition before proceeding.
	Impurities on the base metal	a. Paint, mill scale, rust and other contamination on the base metal form an insulating layer causing an unstable arc, which results in heavy spatter. Clean the surfaces to be welded.
	Poor ground contact	a. Inspect ground cable for loose connections, fraying and cuts. Correct any problem areas found and attach the ground cable directly to the work piece after having cleaned the contact surface first. <b>NOTE: Poor ground contact is the most common cause of unstable MIG welding conditions.</b>
	Too long stick-out (short-arc welding)	a. The stick-out should be 1.5 times the diameter of the electrode being used. With increasing stick-out the current is reduced and the arc voltage rises, giving a longer unstable arc and increased spatter.
	Incorrect polarity	a. Check for correct polarity. Follow the electrode manufacturers recommendation.

## Trouble shooting guide: General Air cooled guns

Problem	Probable cause	Solution
Gun too hot	Poor ground	a. Inspect ground cable for loose connections, fraying and cuts. Correct any problem areas found. Clean clamping area to insure good contact. Securely attach ground cable to work piece as close as possible to the point of welding. Insure good connection to welding power source.
	Loose power connection	a. Check to insure power connection on the power source is tight, the connection on the wire feeder is tight, the connection to the adapter block is tight, and the connection of the gun to the adapter block is tight.
	Loose Bikox connection	a. Remove handle assembly and adapter support. Check to insure the Bikox connection to the swanneck is tight and the Bikox connection to the adapter block is tight.
	Damaged Bikox assembly	a. Visually inspect the Bikox assembly for cuts and tears. Replace Bikox assembly if necessary.
	Consumable items loose or worn	a. Remove nozzle from gun and inspect contact tip and contact tip holder/gas diffuser for wear and tightness, replace or tighten as necessary.
	Capacity of gun being exceeded	a. Note complete weld parameter including welding current (amps), welding voltage, wire feed speed, type and size of wire, type of gas and flow rate of gas and consult your local authorized Alexander Binzel distributor.

## Trouble shooting guide: General Liquid cooled guns

Problem	Probable cause	Solution
Gun too hot	Poor water flow	a. Insure water flow is unrestricted and provides a minimum of 1.5 qts. per minute of flow at pressure not to exceed 65 psi.
	Direction of flow reversed	a. Insure that water flow direction is into the gun through the blue water line and out of the gun through the red water line.
	Interrupted water flow	a. Insure that water cooler runs for a minimum of 5 minutes after weld is completed. This insures proper post-weld cooling can take place through the entire gun and cable assembly.
	Dirty coolant	a. Clean coolant unit after first disconnecting it from line volt age and draining old coolant fluid. Consult the manufacturer of the unit for proper procedure. Refill unit with fresh clean coolant fluid.
	Poor ground	a. See "Poor Ground" in section marked "Gas/air cooled guns".
	Loose power connection	a. Check to insure power connection on the power source is tight, the connection on the wire feeder is tight, the connection to the adapter block is tight and the connection of the gun to the adapter block is tight.
Water leaks	Capacity of gun being exceeded	a. See "Capacity of gun being exceeded" in section "Gas/air cooled guns".
	Water cooling source not turned on during welding	a. The use of a water-cooled MIG gun without water, even for very short periods of time, will destroy the power cable located inside the cable assembly. Longer periods of use without water will destroy the swanneck of the gun in addition to multiple components within the cable assembly.
	Swanneck damaged	a. See above.
	Cable assembly damaged Excessive coolant pressure	a. See above. a. Insure water flow is unrestricted and provides a minimum of 1.5 qts per minute of flow at pressure not to exceed 65 psi. Make corrections as needed. Replace crimp style clamps on all water connections and tighten water connections prior to starting the welding process again.

## Trouble shooting guide: General Push Pull guns

Problem	Probable cause	Solution
Erratic wire feed or burn back	Incorrect tension on wire feeder drive rolls	a. Check that the feed roll size and groove type is correct for the wire size and type being used. Binzel recommends the use of U-groove drive rolls for soft wires such as aluminum. Set the pressure of the drive rolls so that just enough pressure is present to feed the wire but loose enough so that the movement of the wire can be stopped without causing a bird nest of the wire. Do not apply excessive pressure as this can damage the wire.
	Liner improperly installed	a. Inspect or replace as necessary.
	Liner kinked or clogged	a. Inspect or replace as necessary.
	Liner positioner nut too tight	a. Check and adjust as necessary. If the nut has been tightened excessively on liner material other than steel, the collet can compress the liner material causing pinching of the wire.
	Improper liner type being used	a. Generally, Binzel recommends the use of either Teflon or Polyamide liner for soft wires such as aluminum. If in doubt as to which liner should be used in your case, contact your local authorized Binzel distributor.
	Incorrect or worn pull motor drive roll	a. Check or replace as necessary.
	Improper contact tip size	a. Check and replace as necessary.
	Poor ground	a. See "Poor ground" in section "Gas/air cooled guns".
	Loose power connection	a. Check to insure power connection on the power source is tight, the connection on the wire feeder is tight, the connection to the adapter block is tight and the connection of the gun to the adapter block is tight.
	Impurities on the base metal	a. Paint, mill scale, oxidation and other impurities on the base metal form an insulating layer causing an unstable arc. Clean the surface to be welded.
	Drive roll cap not fully seated	a. Check to insure that the drive roll cap assembly is complete and fully seated on the torch body.
	Incorrect polarity	a. Check for correct polarity. Follow the wire manufacturers recommended specifications.
	Coil brake applied too hard or too soft	a. Set the brake so that the coil immediately stops rotating as soon as welding is interrupted. If the brake is applied too hard it will cause the feed rolls to slip, resulting in uneven wire feed. If the brake is applied too soft, the coil will tend to "coast" and result in uneven wire feed. This is most noticeable by a changing arc length when welding.
Damaged contact tip	a. If the contact tip becomes worn the filler metal will not be in constant contact and the arc will become unstable. A contact tip contaminated with spatter will cause uneven wire feed resulting in further spatter.	
Burn back control not adjusted properly	a. If the power source is equipped with a burn back control feature check to insure proper adjustment. Consult operating instructions provided with power source and wire feeder and follow the manufacturers recommendation.	
Crater-fill mode in use	a. Purchase Binzel robotic power supply that matches the gas solenoid valve of the feeder. Consult Binzel product department.	

## Trouble shooting guide: General Push Pull guns

Problem	Probable cause	Solution
Pull motor does not run	Push Pull control box not plugged in or turned on Connections loose, frayed or broken. Pull motor damaged	a. Check to insure that Push Pull control box is plugged in to standard single phase 110 VAC. a. Inspect all connections and make corrections as necessary.
Pull motor runs but in wrong direction	Pull motor control wires connected improperly Pull motor runs slow	a. Reverse connection of pull motor control wires.  a. Debris in and around pull motor drive roll area. Dust and particles of wire, which have come off the wire and other or sluggish forms of contamination build up in the area around the pull motor drive roll area. Remove the pull motor drive roll and clean debris from this area of the gun. Dry compressed air is recommended for this operation.  <b>NOTE: The use of solvents or other liquids for this operation are not recommended.</b>

**Note: Wear safety goggles when using compressed air for cleaning operations. Insure proper safety procedures are followed when using compressed air to prevent serious eye injury.**

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