GROSSEL TOOL COMPANY

WELD GUN MANUAL

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Chapter 1: Introduction

General Information

This manual describes the procedures for disassembly and assembly of C-Type, Pinch-Type, and Scissor-Type weld guns, as used in Fixture, Robot and Manual environments, along with their major components: dual piston cylinders and equalizers.

The manual also contains preventive maintenance procedures, test procedures, and information about calculating tip force.

Figures 1.1 through 1.15 are representative ilustrations of the three types of guns.

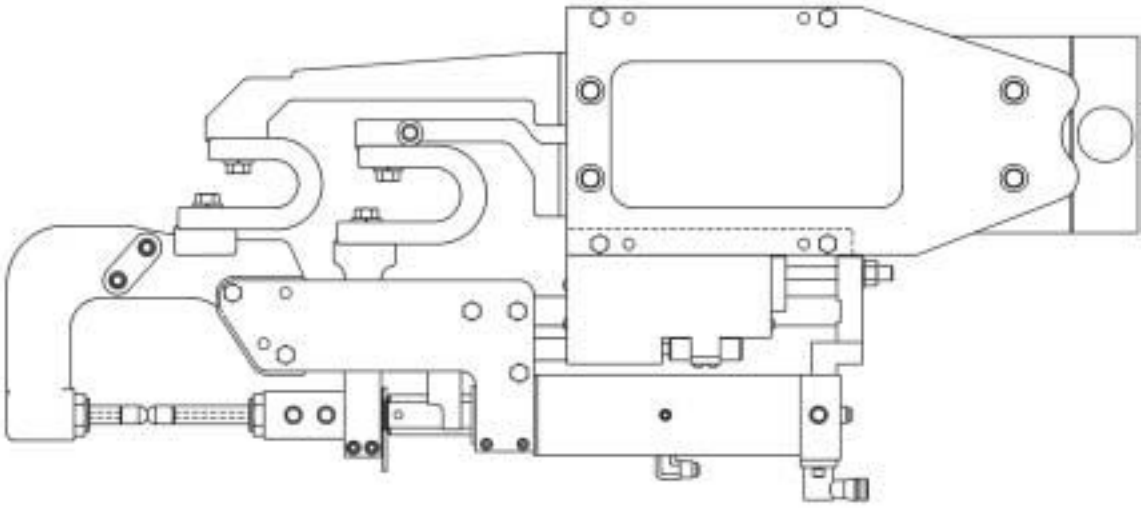


Figure 1.1: Fixture Style, C-Type Gun w/Transformer

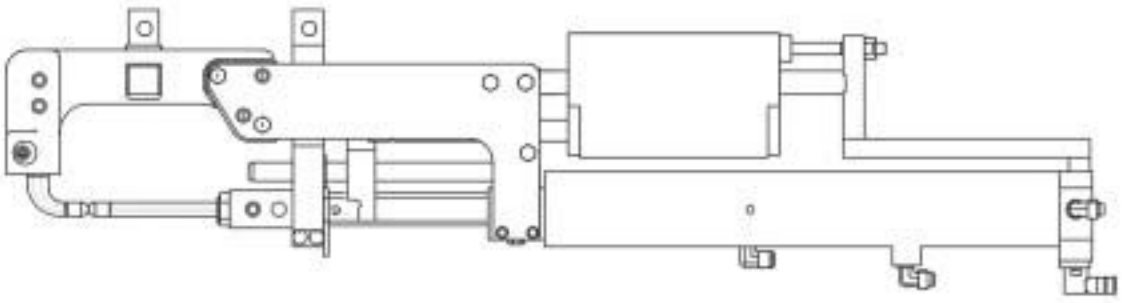


Figure 1.2: Fixture Style, C-Type Gun wo/Transformer

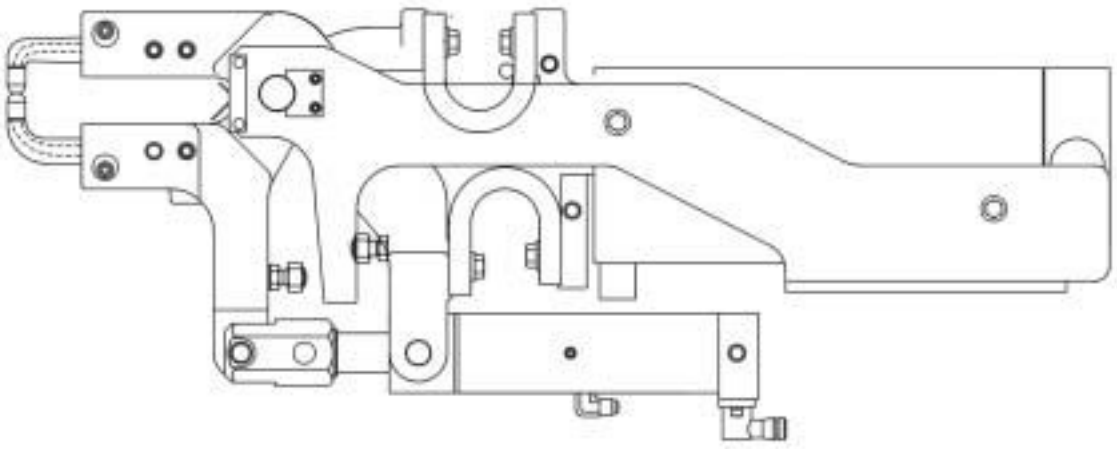


Figure 1.3: Fixture Style, Pinch-Type Gun w/Transformer

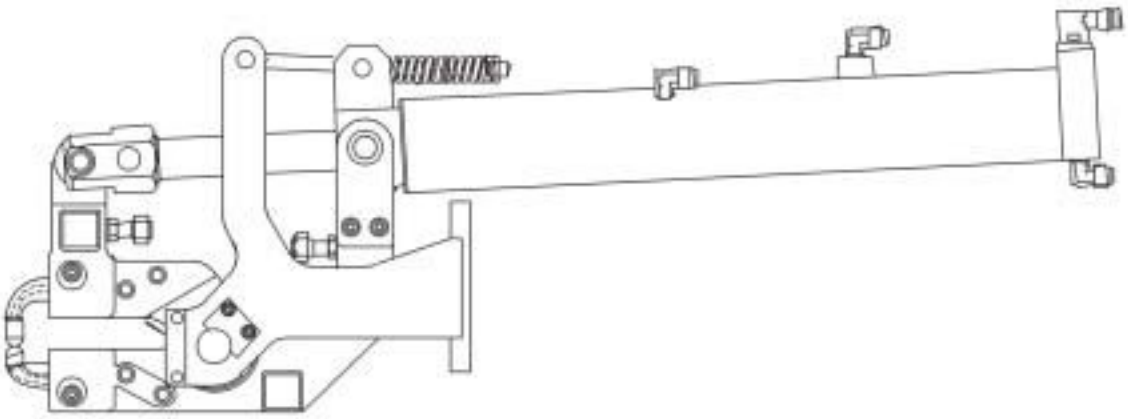


Figure 1.4: Fixture Style, Pinch-Type Gun wo/Transformer

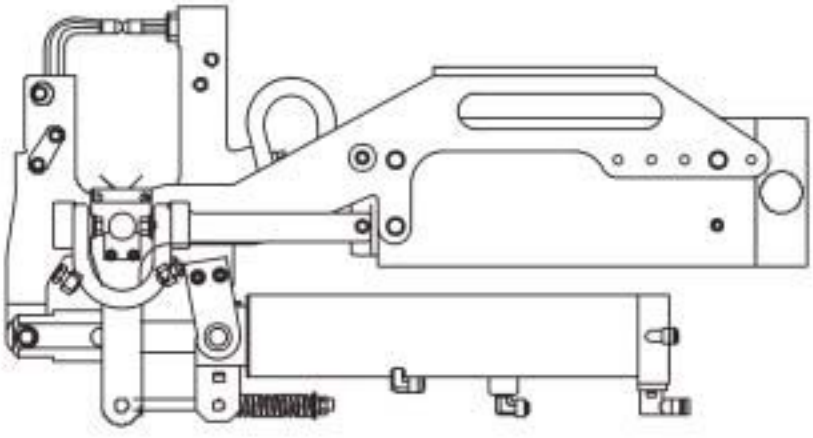


Figure 1.5: Fixture Style, Scissor-Type Gun w/Transformer

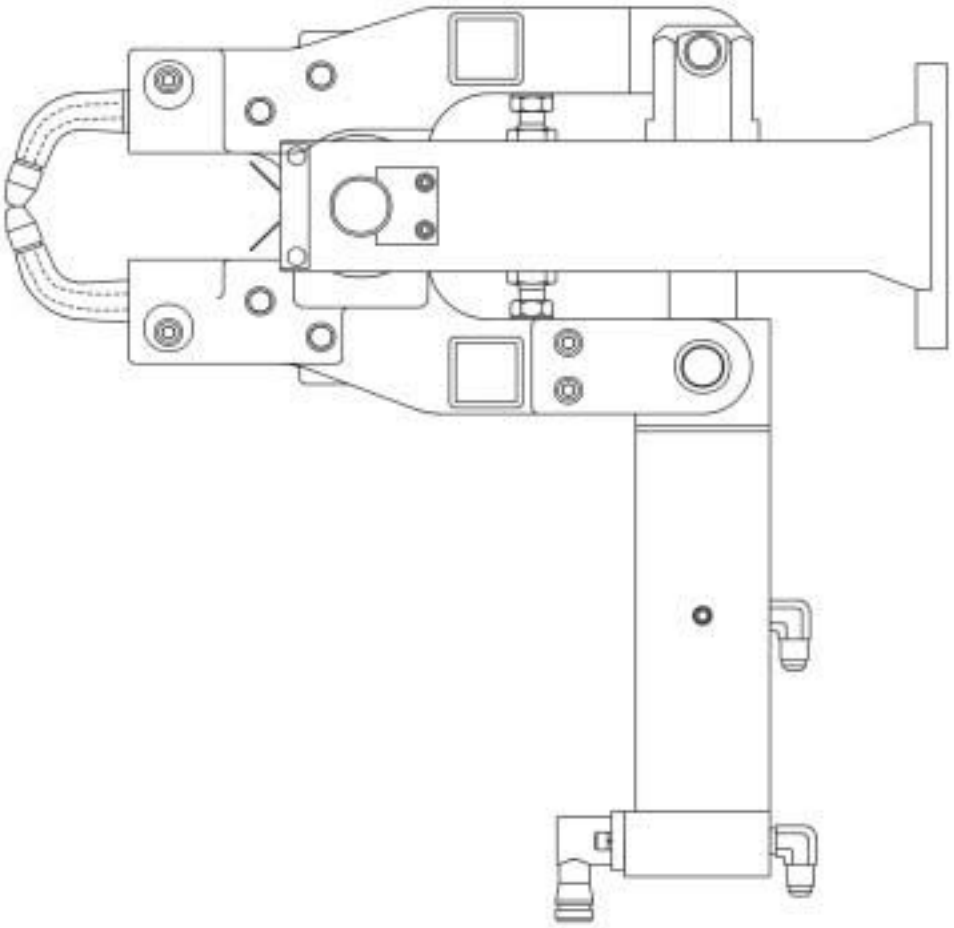


Figure 1.6: Fixture Style, Scissor-Type Gun wo/Transformer

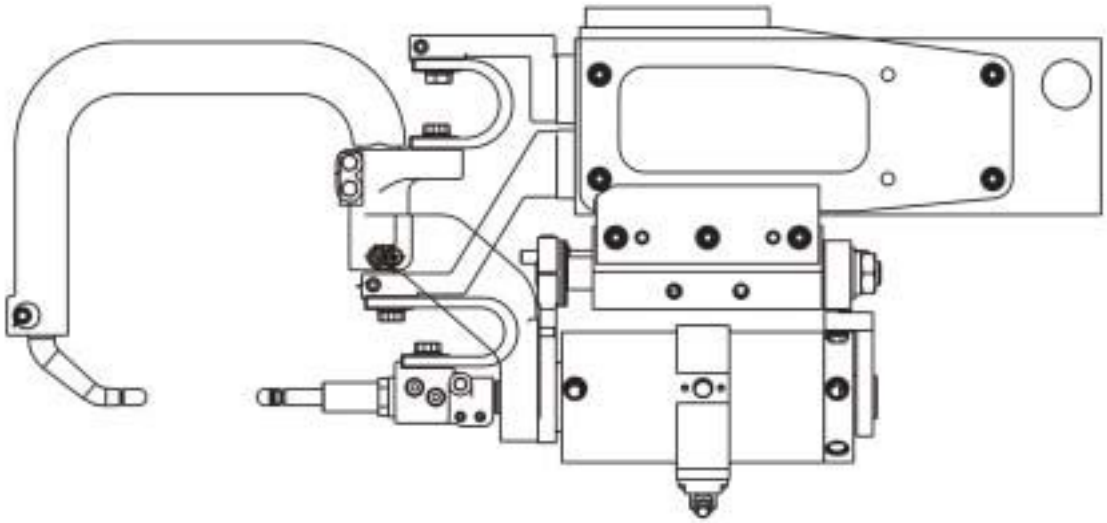


Figure 1.7: Robot Style, C-Type Gun w/Transformer

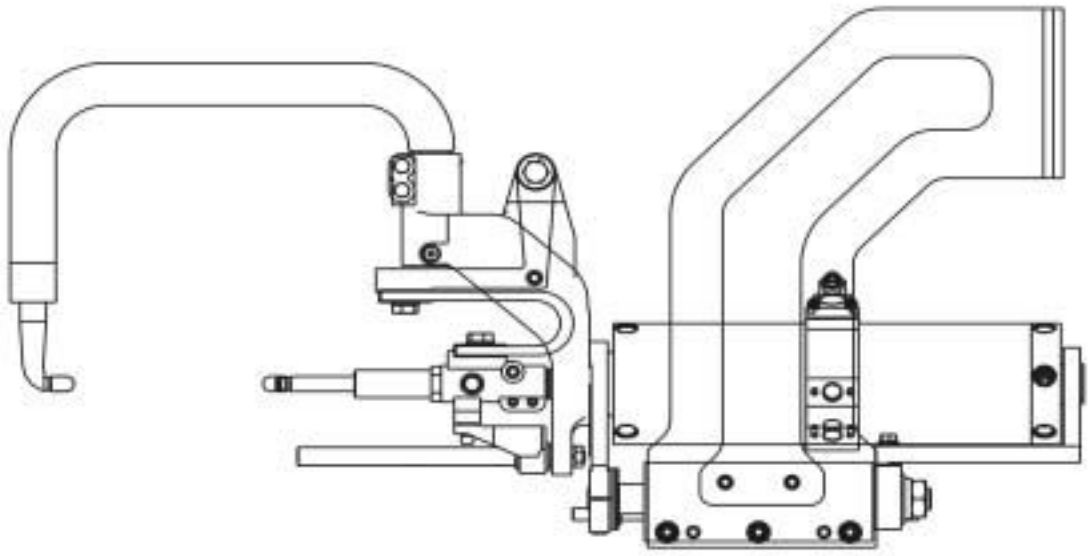


Figure 1.8: Robot Style, C-Type Gun wo/Transformer

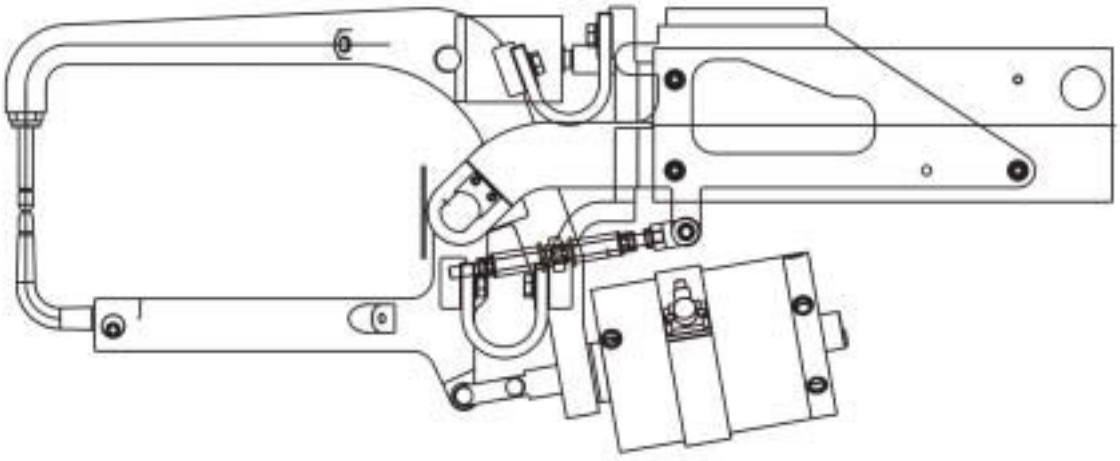


Figure 1.9: Robot Style, Pinch-Type Gun w/Transformer

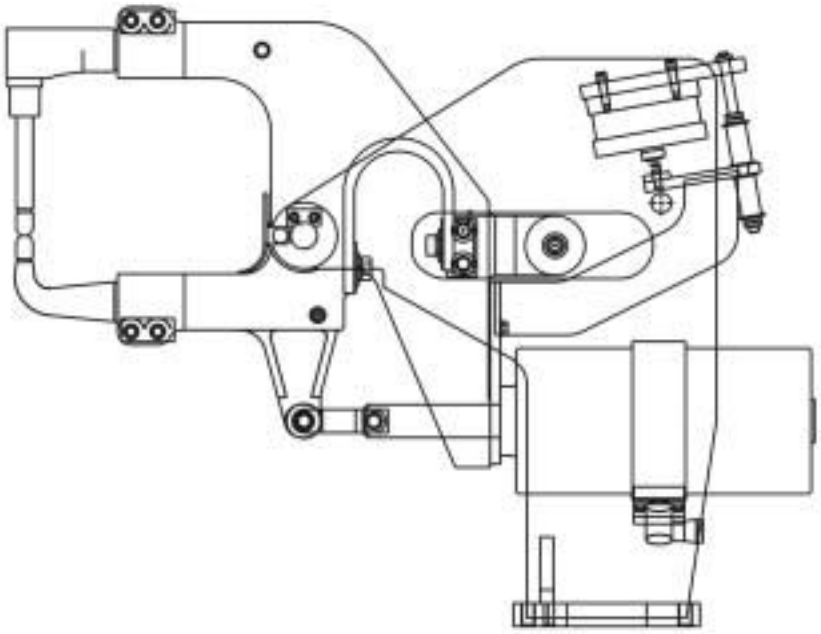


Figure 1.10: Robot Style, Pinch-Type Gun wo/Transformer

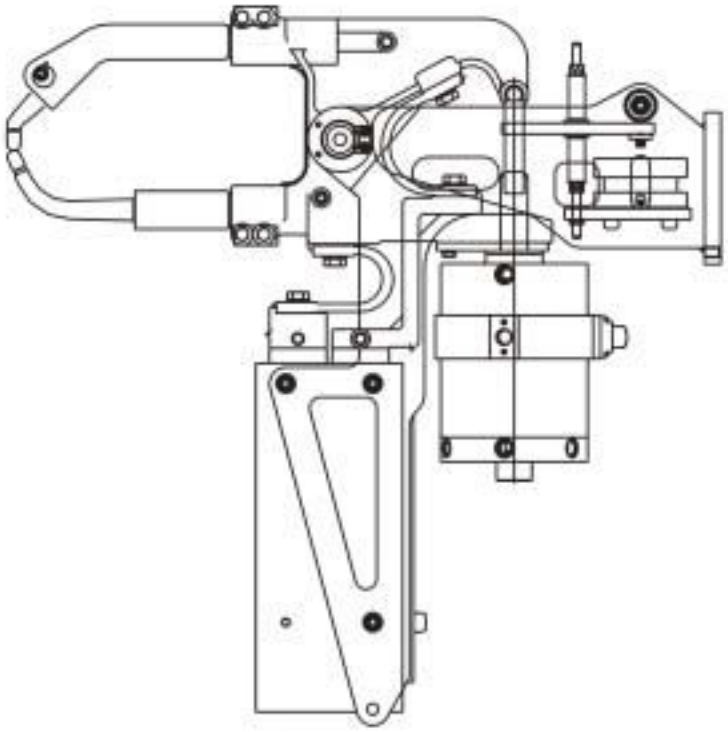


Figure 1.11: Robot Style, Scissor-Type Gun w/Transformer

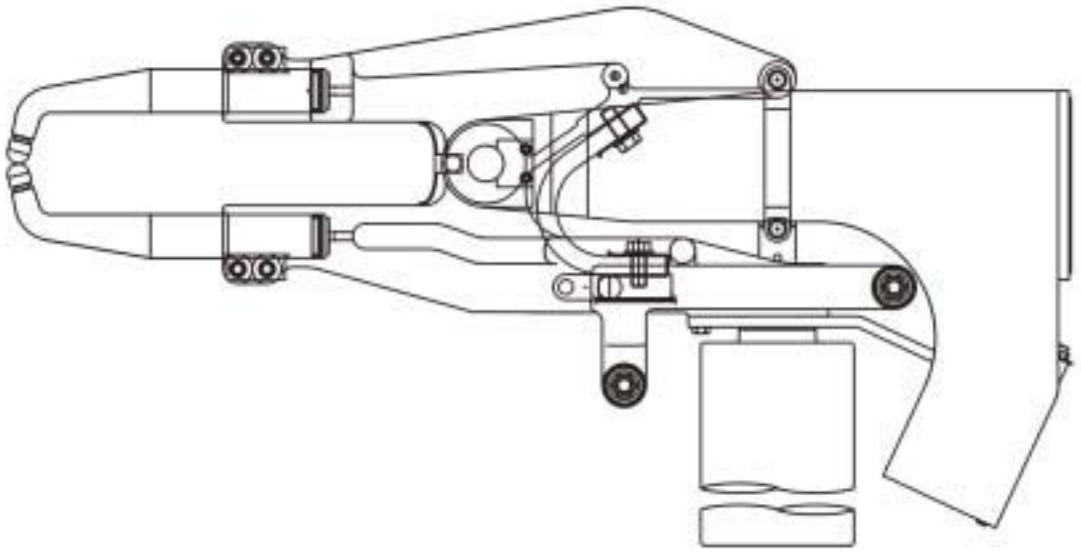


Figure 1.12: Robot Style, Scissor-Type Gun wo/Transformer

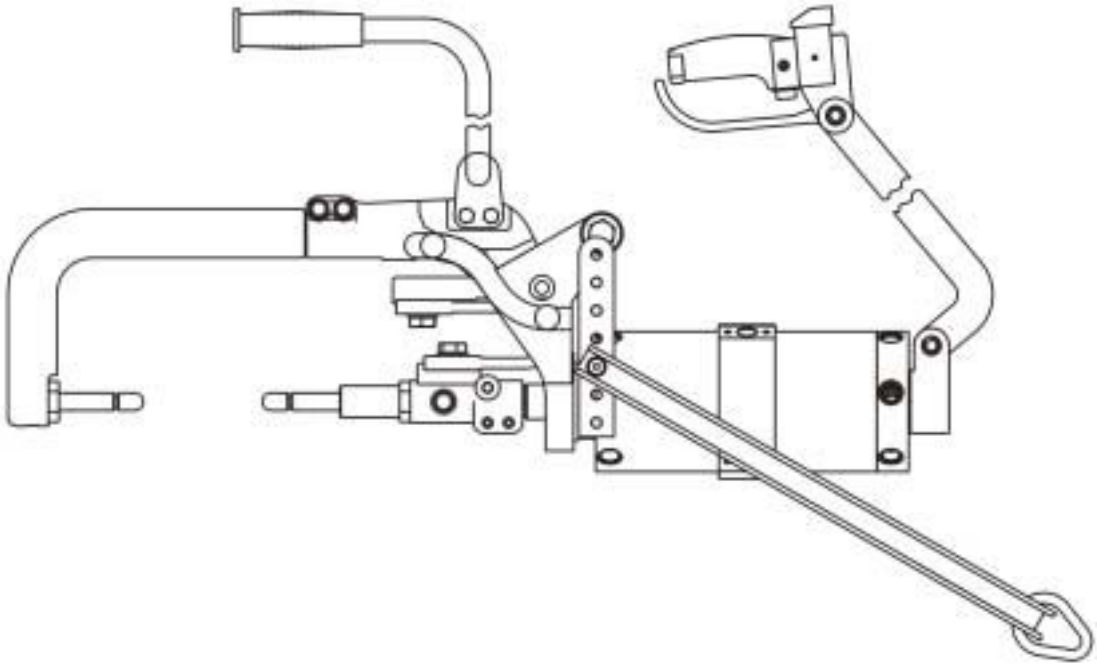


Figure 1.13: Manual Style, C-Type Gun wo/Transformer

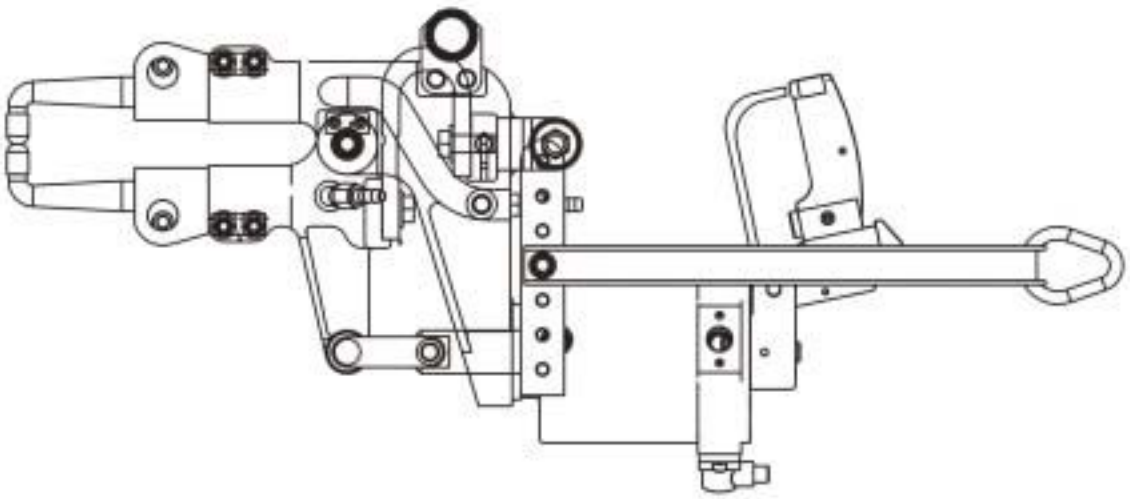


Figure 1.14: Manual Style, Pinch-Type Gun wo/Transformer

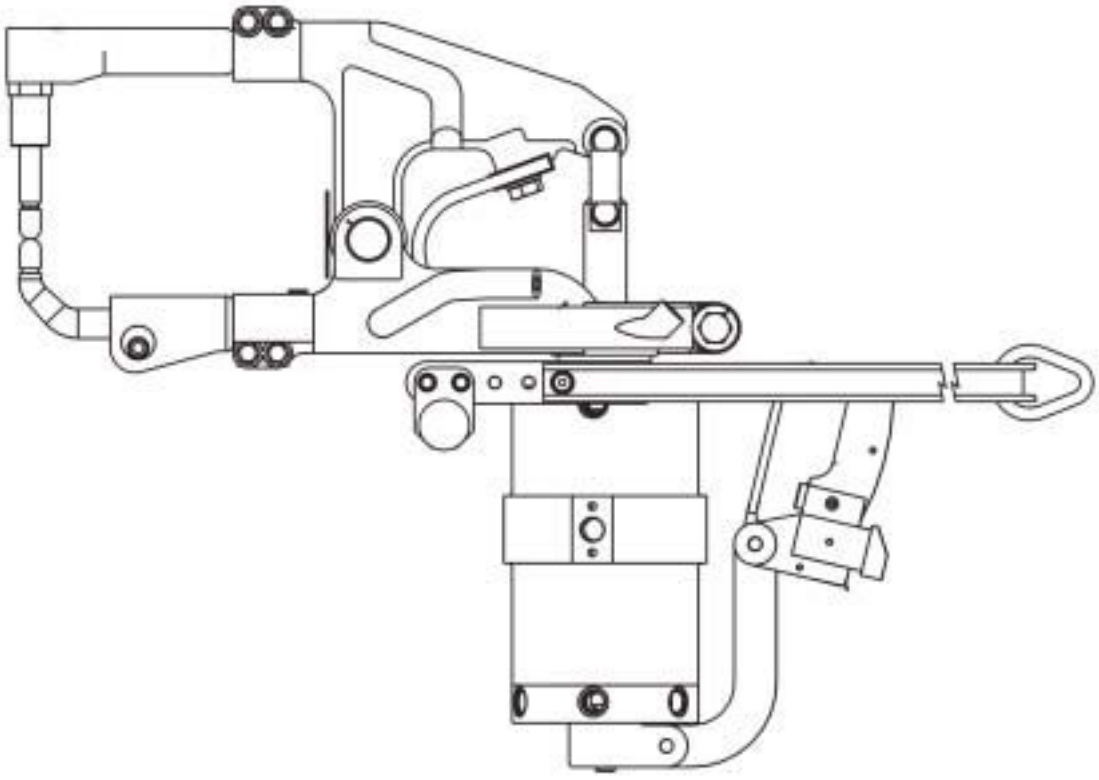


Figure 1.15: Manual Style, Scissor-Type Gun wo/Transformer

Chapter 2: Safety

General Information

This chapter details the general and specific safety guidelines that should be observed when operating, servicing or repairing weld guns.

Safety Notice

This manual provides general directions, disassembly/assembly, service and repair procedures. All procedures outlined in the manual must be followed to assure the safe and reliable operation of the weld guns and the safety of the personnel performing the work.

Variations in procedures, techniques, tools and parts for servicing the equipment as well as the skill level of individuals performing the work make it impossible to anticipate and provide for all eventualities. Accordingly, anyone who departs from the instructions in this manual must first establish that he/she compromises neither their own personal safety nor the integrity of the gun by their actions.

Although the procedures in this manual have proven to be safe in practice at GROSSEL TOOL COMPANY, GROSSEL assumes no responsibility for personal injury or equipment damage resulting from their application.

Much of the information in this manual relates to good shop practice. This manual describes shop practices and safety issues that apply to all operator and maintenance personnel.

Other documents you should obtain and study for safety concerns are:

OSHA Safety and Health Standards, Subpart “O” Machine and Machine Guarding.

Write to: Superintendent of Documents U.S. Government Printing Office Washington, D.C. 20402

National Electric Code. Write to:
National Safety Council
425 North Michigan Avenue
Chicago, IL. 60611

Notes, Cautions and Warnings

As you read through the procedures and processes in this manual, you will see NOTES, CAUTIONS and WARNINGS. Each of these is provided for a specific purpose.

NOTES: Provide additional non-safety related information.

CAUTIONS: Provide information to help personnel avoid causing damage to equipment.

WARNINGS: Provide information to help personnel avoid acts that can cause personal injury.

General Machine Safety Precautions

WARNING: Before performing any maintenance or service on a weld gun, make certain that the gun and its welding components have cooled to a safe temperature for handling. Always wear heat protective gloves when handling the weld gun.

- Follow all plant Energy Control and Power Lockout (ECPL) procedures when performing any maintenance on the guns.
- Know the location of the MASTER STOP button before proceeding with any weld gun operations.
- Wear approved safety glasses at all times.
- Secure loose clothing, neckties and long hair. Remove items such as rings, necklaces, bracelets and wristwatches to avoid engagement with moving parts. Wear medical alert jewelry with caution.
- Do not climb over the machine when servicing the gun.
- Machine guarding is designed to protect against any and all pinch points (areas where a moving machine component could cause a hazardous pinching condition). Report any unguarded pinch point to your safety coordinator so that this unsafe condition can be corrected immediately.
- Never reach around safety guarding. Guards are in place to protect personnel against bodily injury.
- Numerous switches are provided to stop the machine operation in the event of an abnormal condition. Never attempt to service a gun with machine switches disconnected or bypassed.
- Report any unsafe condition or practice to your safety coordinator for correction.
- Ensure that your work areas are kept clean. Do not work on slippery floors and surfaces. Remove all hazardous obstacles.

Pneumatic System Safety

WARNING: Relieve the pressure from the pneumatic system prior to performing any maintenance.

Prior to performing maintenance on the weld gun, ensure that the pneumatic lockout valve is CLOSED (OFF) and the pressure is relieved from the system.

Coolant System Safety

WARNING: Relieve the pressure from the coolant system prior to performing any maintenance.

Prior to performing maintenance on the weld gun, ensure that the coolant has been turned off and the pressure has been relieved from the system.

Electrical System Safety

- Observe all plant electrical lockout procedures before working on a gun.
- Never attempt to work on a gun when it is connected to a power source.
- Remove the gun from the line before performing any work on it.

Chapter 3: Fixture Guns

General Information

This chapter describes Service Procedures for fixture mounted C-Type, Pinch-Type and Scissor-Type welding guns and their major components including Transformers, Cylinders, Equalizers and any unique smaller components.

C-Type

This section describes the C-Type weld gun, as used on most fixtures, and the procedures for disassembly, part replacement and assembly. See Figures 3.1 and 3.2.

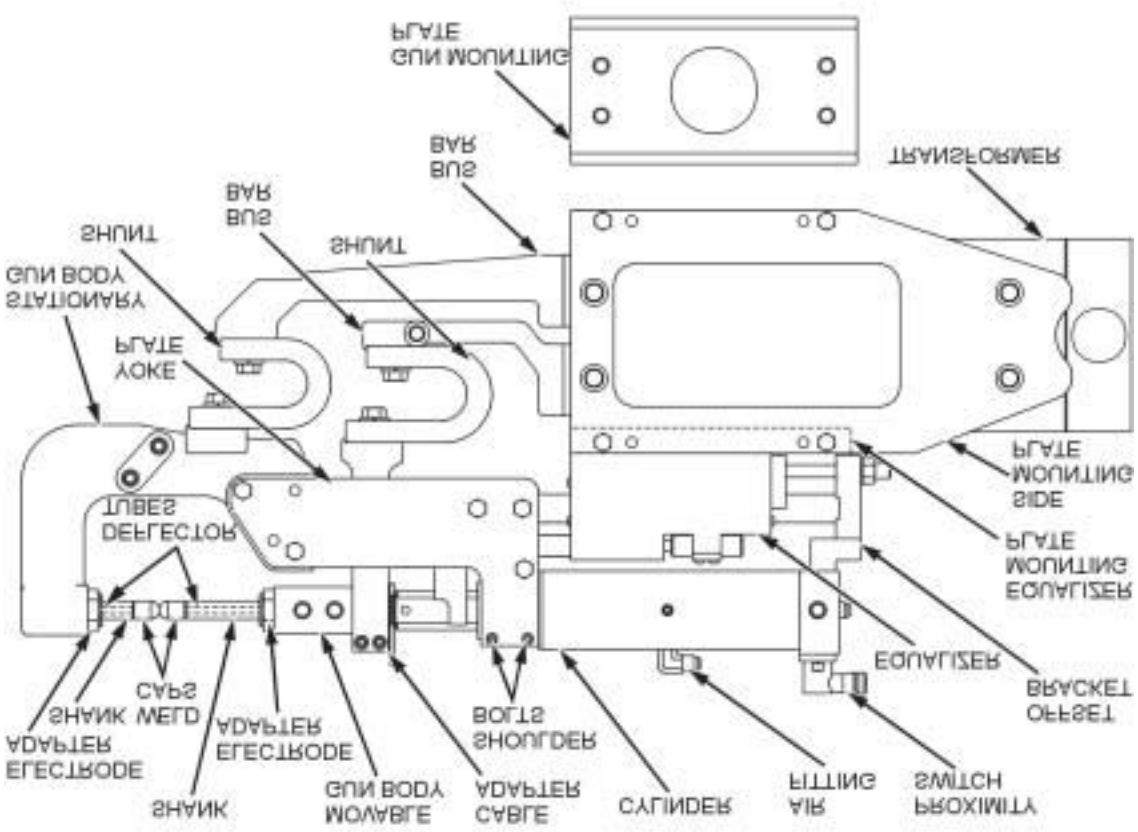


Figure 3.1: C-Type Gun w/Transformer

Removal/Installation

The following sections describe how to:

- Remove and Install the transformer. Refer to Chapter 8: Common Components. (If no transformer, skip these procedures)
- Remove and install the equalizer
- Remove and install the cylinder

CAUTION: During disassembly and assembly operations, support the gun and the part being worked on so that neither is damaged.

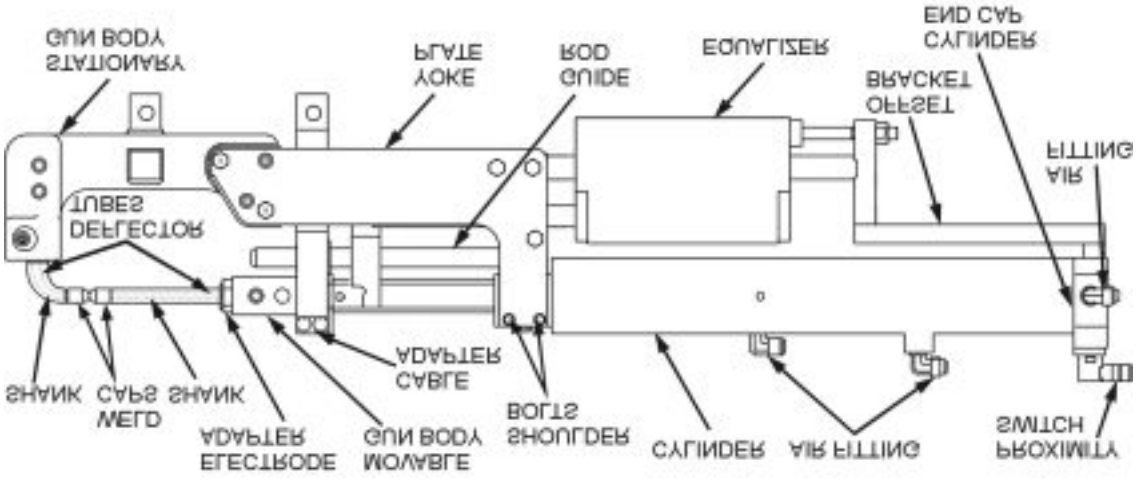


Figure 3.2: C-Type Gun wo/Transformer

Equalizer

Equalizer Removal (Transformer Guns)

1. Remove cylinder.
2. For air assist equalizers, remove all air hoses and air fittings.
3. Remove shunts.
4. Remove four (4) dowel pins aligning the equalizer mounting plate to the side mounting plate.
5. Remove four (4) hex head screws attaching the equalizer mounting plate to the side mounting plate.
6. Lift the weld gun assembly away from the mounting bracket and transformer.
7. Remove three (3) hex head screws retaining the equalizer assembly to the side yoke plates.
8. For air assist equalizer, slide the equalizer guide rod out of the moveable gun body. Lift the equalizer assembly out of the weld gun assembly.

Equalizer Installation (Transformer Guns)

1. For air assist equalizer, slide the equalizer guide rod into the moveable gun body. Lift the equalizer assembly into the weld gun assembly.
2. Attach the equalizer assembly to the side yoke plates, using the three (3) hex head screws.
3. Lift the weld gun assembly toward the mounting bracket and transformer.
4. Install the four (4) dowel pins and align the equalizer mounting plate to the side mounting plate.
5. Attach the equalizer mounting plate to the side mounting plate, using the four (4) hex head screws.
6. Install the shunts.
7. For air assist equalizers, install all air hoses and air fittings.
8. Install cylinder.

Equalizer Removal (Cable Guns)

1. Remove cylinder.
2. For air assist equalizers, remove all air hoses and air fittings
3. Remove three (3) hex head screws retaining the equalizer assembly to the side yoke plates.
4. For air assist equalizer, slide the equalizer guide rod out of the moveable gun body. Lift the equalizer assembly out of the weld gun assembly.

Equalizer Installation (Cable Guns)

1. For air assist equalizer, slide the equalizer guide rod into the moveable gun body. Lift the equalizer assembly into the weld gun assembly.
2. Attach the equalizer assembly to the side yoke plates, using the three (3) hex head screws.
3. For air assist equalizers, install all air hoses and air fittings.
4. Install cylinder.

Cylinder

Cylinder Removal

NOTE: Record prox switch and port location prior to cylinder removal.

1. Remove any gun components that prevent clear access to the cylinder assembly.
2. Remove all air hoses and air fittings.
3. Remove Movable Gun Body from the piston rod.
4. At the rear of the cylinder, remove the two (2) socket head screws under the end cap that hold the cylinder to the offset bracket.
5. Remove the four (4) shoulder bolts that connect the cylinder trunnion to the side yoke plates.
6. Lift the cylinder assembly out of the weld gun assembly.

Cylinder Installation

1. Lift the cylinder assembly into the weld gun assembly.
2. Connect the cylinder trunnion to the side yoke plates, using the four (4) shoulder bolts.
3. Attach cylinder to the offset bracket. At the rear of the cylinder, install the two (2) socket head screws under the end cap.
4. Install Movable Gun Body to the piston rod.
5. Install all air fittings and air hoses.
6. Install any remaining gun components.
7. Set prox switch and port location to the values recorded prior to cylinder removal

Pinch-Type

This section describes the Pinch-Type gun, as used on most fixtures, and the procedures for disassembly, part replacement and assembly. See Figures 3.3 and 3.4.

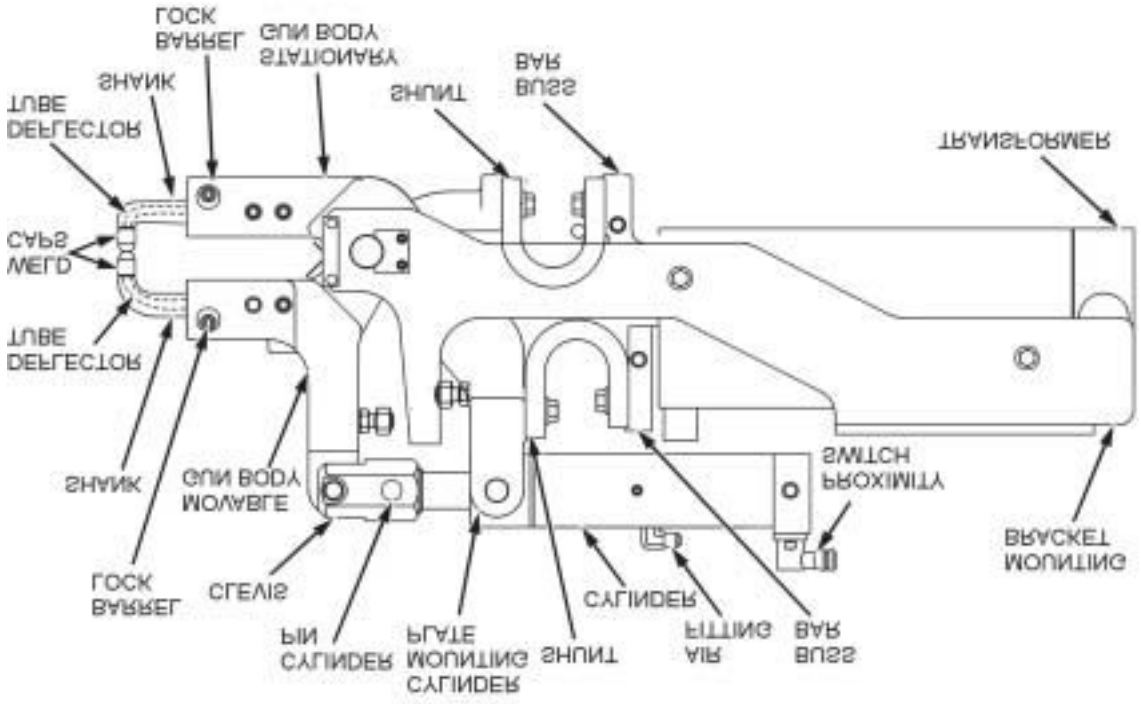


Figure 3.3: Pinch-Type Gun w/ Transformer

Removal/Installation

The following sections describe how to:

- Remove and install the transformer. Refer to Chapter 8: Common Components. (if no transformer, skip these procedures)
- Remove and install the spring pack
- Remove and install the cylinder

CAUTION: During disassembly and assembly operations, support the gun and the part being worked on so that neither is damaged.

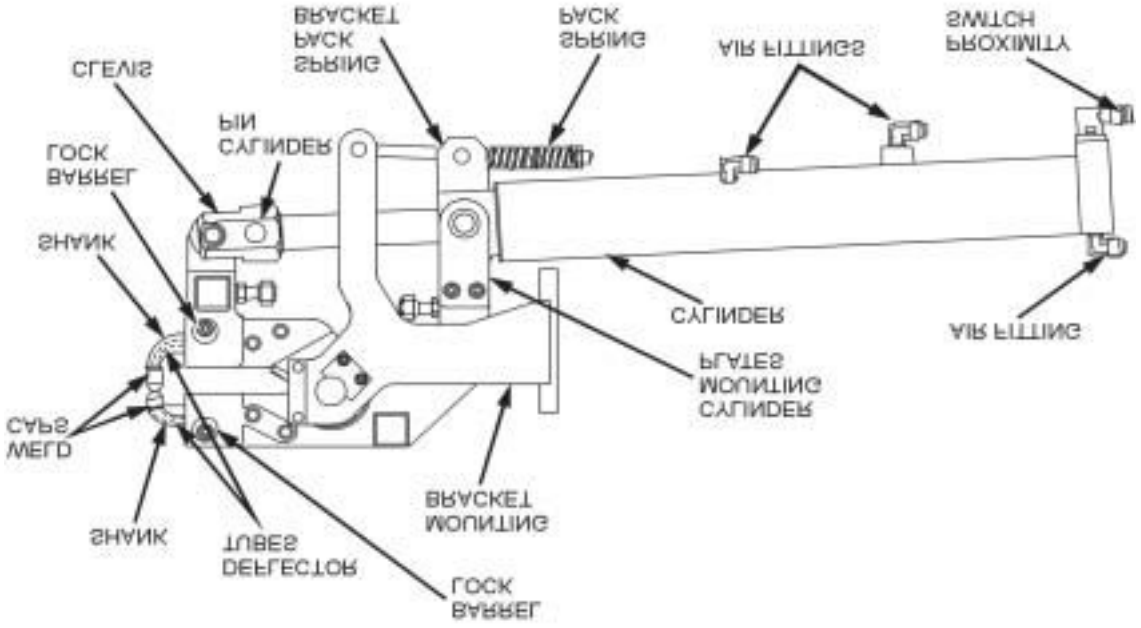


Figure 3.4: Pinch-Type Gun wo/ Transformer

Spring Pack

Spring Pack Assy. Removal

1. Properly support all gun components prior to starting this procedure.
2. Measure and record the spring tension for assembly purposes.
3. Loosen hex jam nuts to relieve all spring tension.
4. Remove pin that secures the spring pack eye bolt to the mounting bracket.
5. Remove the pins retaining the spring block to the spring pack mounting bracket
6. Remove eye bolt and spring block.
7. If required, remove the screws retaining the spring pack mounting bracket to the cylinder trunnion.

Spring Pack Assy. Installation

1. Properly support all gun components during all steps of this procedure
2. If removed, install the screws retaining the spring pack mounting bracket to the cylinder trunnion.
3. Install eye bolt and spring block
4. Install the pins retaining the spring block to the spring pack mounting bracket
5. Install pin that secures the spring pack eye bolt to the mounting bracket
6. Adjust the spring tension to the values previously recorded during removal.
7. Tighten jam nuts to secure the spring tension adjustment.

Cylinder

Cylinder Removal

1. Remove any gun components that prevent clear access to the cylinder assembly.
2. Remove all air hoses and air fittings.
3. Remove the snap ring retaining the clevis pin on the piston rod side of the clevis assembly.
4. Remove the clevis pin from the clevis assembly. (Be sure to properly support the cylinder assembly, & moveable gun body prior to removing the pin)
5. Fully retract the cylinder piston rod.
6. Remove the four (4) socket head screws retaining the two (2) cylinder mounting bracket to the stationary gun body.
7. Slide the cylinder mounting brackets out of the stationary gun body and cylinder trunnion. (Be sure that the insulating bushing remains with the cylinder mounting bracket)
8. Lift the cylinder assembly out of the weld gun assembly.

Cylinder Installation

1. Lift the cylinder assembly into the weld gun assembly.
2. Slide the cylinder mounting brackets into the stationary gun body and cylinder trunnion. (Be sure that the insulating bushing remains with the cylinder mounting bracket)
3. Connect the cylinder trunnion to the side yoke plates, using the four (4) shoulder bolts.
4. Fully retract the cylinder piston rod.
5. Install the clevis, clevis pin and retaining snap ring. The snap ring should be on the piston rod side of the clevis assembly.
6. Install all air fittings and air hoses.
7. Install any remaining gun components.

Scissor-Type

This section describes the Scissor-Type gun, as used on most fixtures, and the procedures for disassembly, part replacement and assembly. See Figure 3.5.

Removal/Installation

The following sections describe how to:

- Remove and install the transformer. Refer to Chapter 8: Common Components. (if no transformer, skip these procedures)
- Remove and install the spring pack
- Remove and install the cylinder

CAUTION: During disassembly and assembly operations, support the gun and the part being worked on so that neither is damaged.

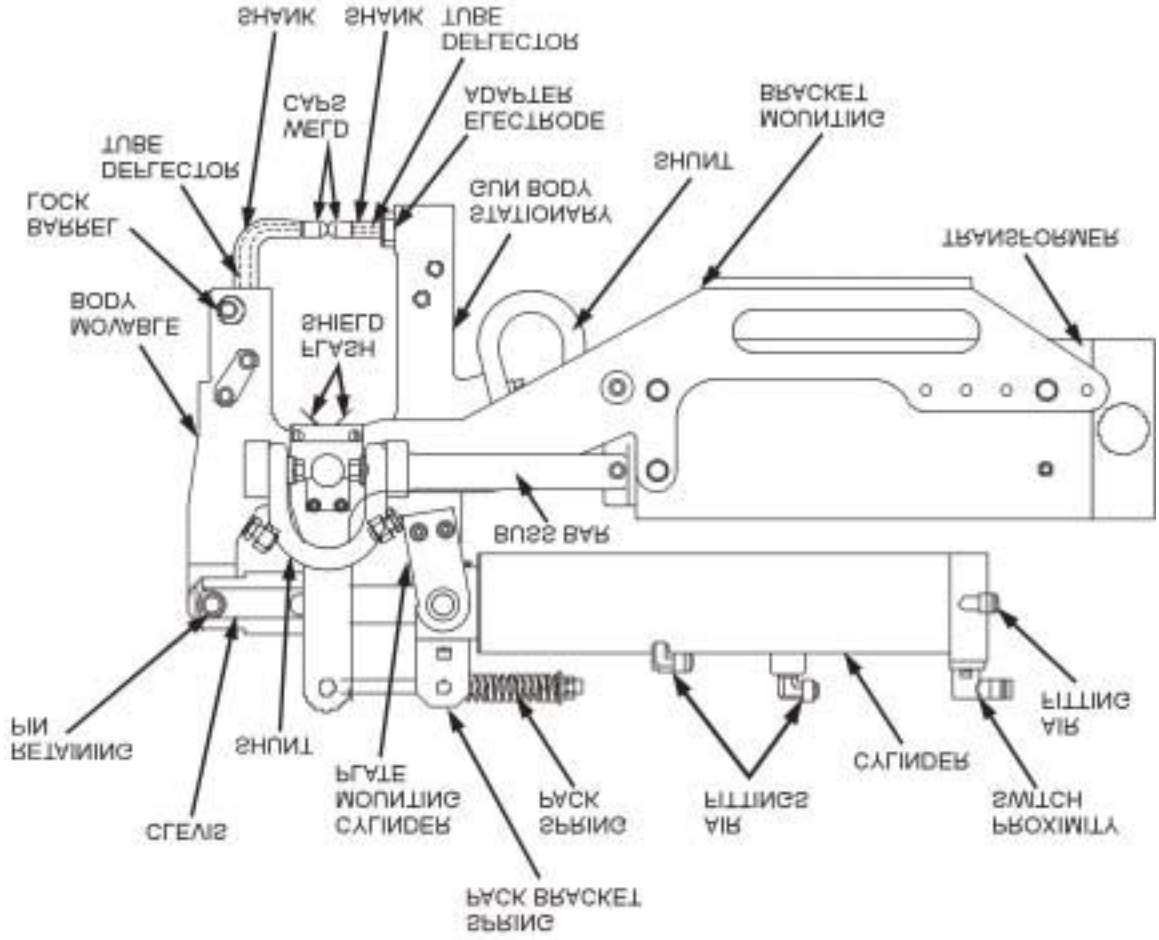


Figure 3.5: Scissor-Type Gun w/ Transformer

Spring Pack

Spring Pack Assy. Removal

1. Properly support all gun components prior to starting this procedure.
2. Measure and record the spring tension for assembly purposes.
3. Loosen hex jam nuts to relieve all spring tension.
4. Remove pin that secures the spring pack eye bolt to the mounting bracket.
5. Remove the pins retaining the spring block to the spring pack mounting bracket
6. Remove eye bolt and spring block.

7. If required, remove the screws retaining the spring pack mounting bracket to the cylinder trunnion.

Spring Pack Assy. Installation

1. Properly support all gun components during all steps of this procedure
2. If removed, install the screws retaining the spring pack mounting bracket to the cylinder trunnion.
3. Install eye bolt and spring block
4. Install the pins retaining the spring block to the spring pack mounting bracket
5. Install pin that secures the spring pack eye bolt to the mounting bracket
6. Adjust the spring tension to the values previously recorded during removal.
7. Tighten jam nuts to secure the spring tension adjustment.

Cylinder

Cylinder Removal

1. Remove any gun components that prevent clear access to the cylinder assembly.
2. Remove all air hoses and air fittings.
3. Remove the snap ring retaining the clevis pin on the piston rod side of the clevis assembly.
4. Remove the clevis pin from the clevis assembly. (Be sure to properly support the cylinder assembly, & moveable gun body prior to removing the pin)
5. Fully retract the cylinder piston rod.
6. Remove the four (4) socket head screws retaining the two (2) cylinder mounting bracket to the stationary gun body.
7. Slide the cylinder mounting brackets out of the stationary gun body and cylinder trunnion. (Be sure that the insulating bushing remains with the cylinder mounting bracket)
8. Lift the cylinder assembly out of the weld gun assembly.

Cylinder Installation

1. Lift the cylinder assembly into the weld gun assembly.
2. Slide the cylinder mounting brackets into the stationary gun body and cylinder trunnion. (Be sure that the insulating bushing remains with the cylinder mounting bracket)
3. Connect the cylinder trunnion to the side yoke plates, using the four (4) shoulder bolts.
4. Fully retract the cylinder piston rod.
5. Install the clevis, clevis pin and retaining snap ring. The snap ring should be on the piston rod side of the clevis assembly.
6. Install all air fittings and air hoses.
7. Install any remaining gun components.

Tip Force

Tip force is a function of piston rod force and the mechanical ratio of piston movement to tip movement. Refer to the Appendix for the explanation of tip force calculation.

Chapter 4: Robot Guns

General Information

This chapter describes Service Procedures for robotically controlled C-Type, Pinch-Type and Scissor-Type welding guns and their major components including Transformers, Cylinders, Equalizers and any unique smaller components.

C-Type

This section describes the C-Type weld gun, as used in most robotically controlled environments, and the procedures for disassembly, part replacement and assembly. See Figures 4.1 and 4.2.

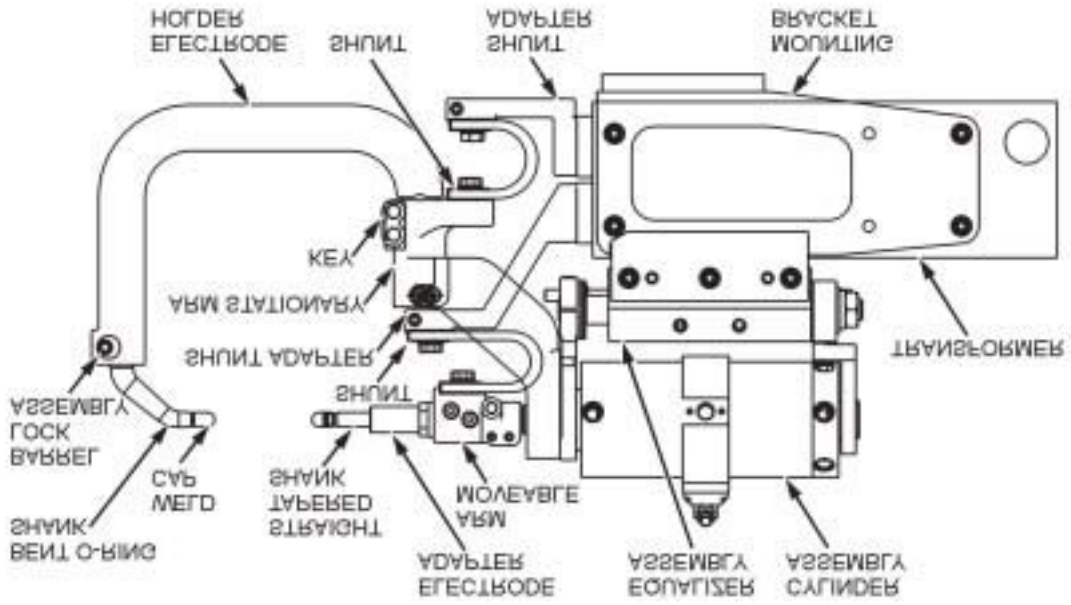


Figure 4.1: C-Type Gun w/Transformer

Removal/Installation

The following sections describe how to:

- Remove and install the transformer. Refer to Chapter 8: Common Components. (if no transformer, skip these procedures)
- Remove and install the cylinder
- Remove and install the equalizer

CAUTION: During disassembly and assembly operations, support the gun and the part being worked on so that neither is damaged.

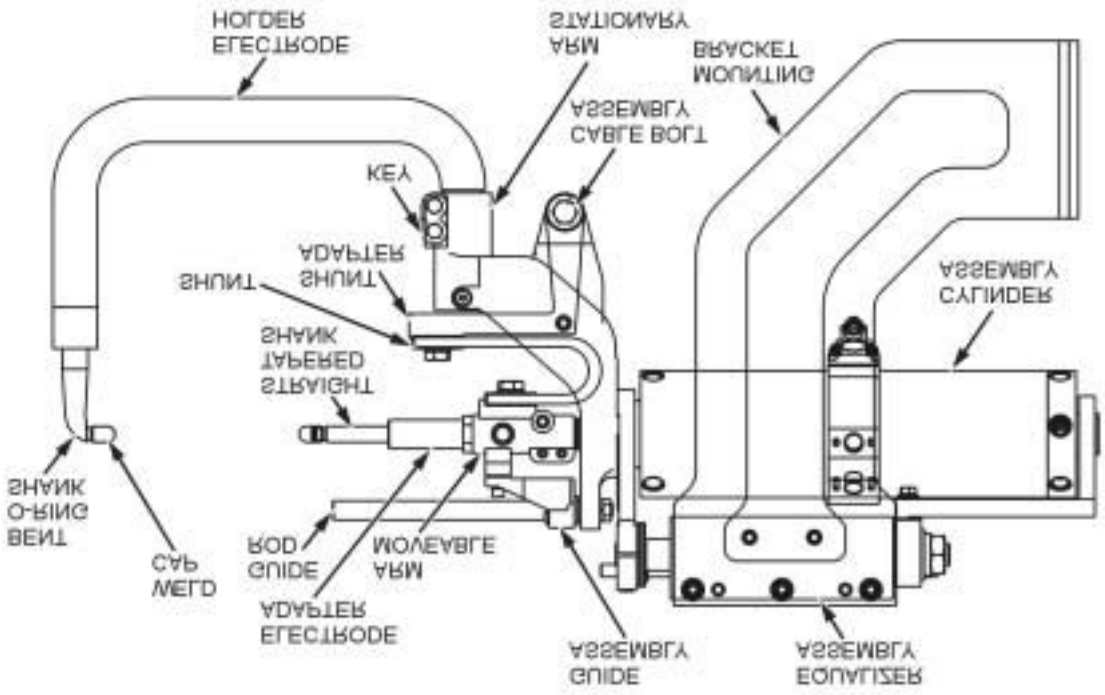


Figure 4.2: C-Type Gun wo/Transformer

Equalizer

Equalizer Removal

1. Remove all air lines and air fittings.
2. Remove both shunts from the gun assembly.
3. Remove the dowel pins and the hex head screw holding the equalizer to the gun mounting bracket.
4. Lift the gun assembly out of the mounting bracket. And place on a workbench.
5. Remove the screws retaining the guide rods into the front equalizer plate or gun bulkhead.
6. Loosen the back equalizer plate clamp screw from the stationary arm if the gun clamps in this area.
7. Remove the equalizer by sliding the equalizer assembly off of the weld gun assembly.

Equalizer Installation

1. Slide the equalizer assembly onto the weld gun assembly
2. Tighten the back equalizer plate clamp screw to the stationary arm if the gun clamps in this area.
3. Install the screws that attach the guide rods to the front equalizer plate or gun bulkhead.

4. Lift the gun assembly into the mounting bracket. Place the assembly on a workbench.
5. Install the dowel pins and the hex head screw which attaches the equalizer to the gun mounting bracket.
6. Install both shunts to the gun assembly.
7. Install all air lines and air fittings.

Cylinder

Cylinder Removal

1. Remove any air lines, fittings and other tooling, which cause interference.
2. Remove the link assembly, clevis assembly, or the moveable gun body, depending on the type of gun the cylinder is on.
3. Remove the four (4) screws holding on the rod bellows, if there is one on the gun.
4. Remove the cylinder mounting screws while supporting the cylinder assembly.
5. Slide the cylinder back to clear the piston rod through the stationary gun body.

Cylinder Installation

1. Slide the cylinder forward through the stationary gun body to the piston rod.
2. Install the cylinder mounting screws while supporting the cylinder assembly.
3. If there is a rod bellows on the gun, install the four (4) screws that attach it.
4. Install the link assembly and clevis assembly, or the moveable gun body, depending upon the type of gun being repaired.
5. Install all air lines, fittings and other tooling previously removed.

Pinch-Type

This section describes the Pinch-Type gun, as used in most robotically controlled environments, and the procedures for disassembly, part replacement and assembly. See Figures 4.3 and 4.4.

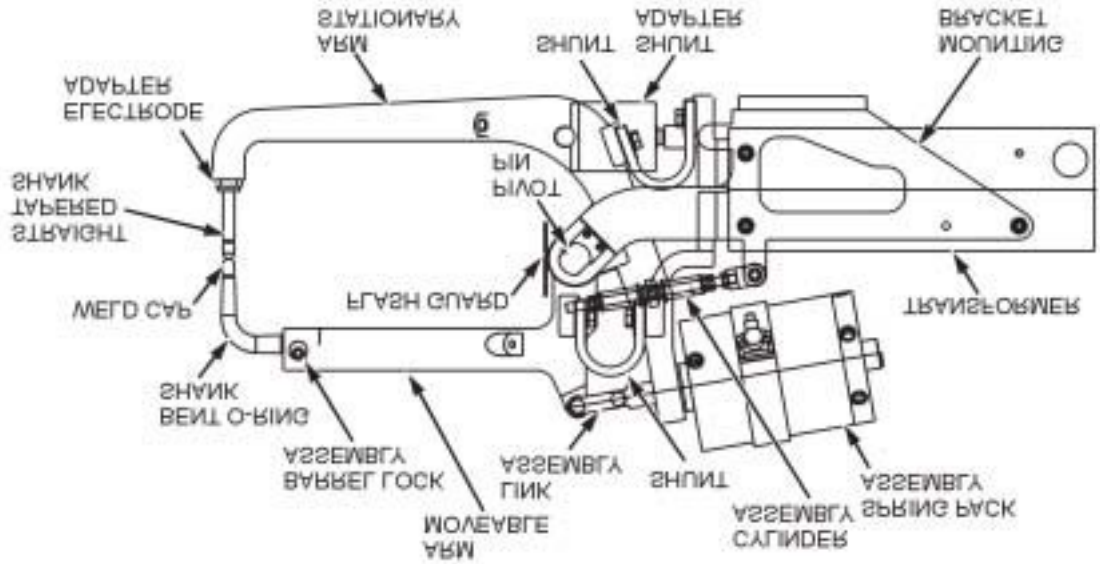


Figure 4.3: Pinch-Type Gun w/ Transformer

Removal/Installation

The following sections describe how to:

- Remove and install the transformer. Refer to Chapter 8: Common Components. (if no transformer, skip these procedures)
- Remove and install the spring pack
- Remove and install the cylinder

CAUTION: During disassembly and assembly operations, support the gun and the part being worked on so that neither is damaged.

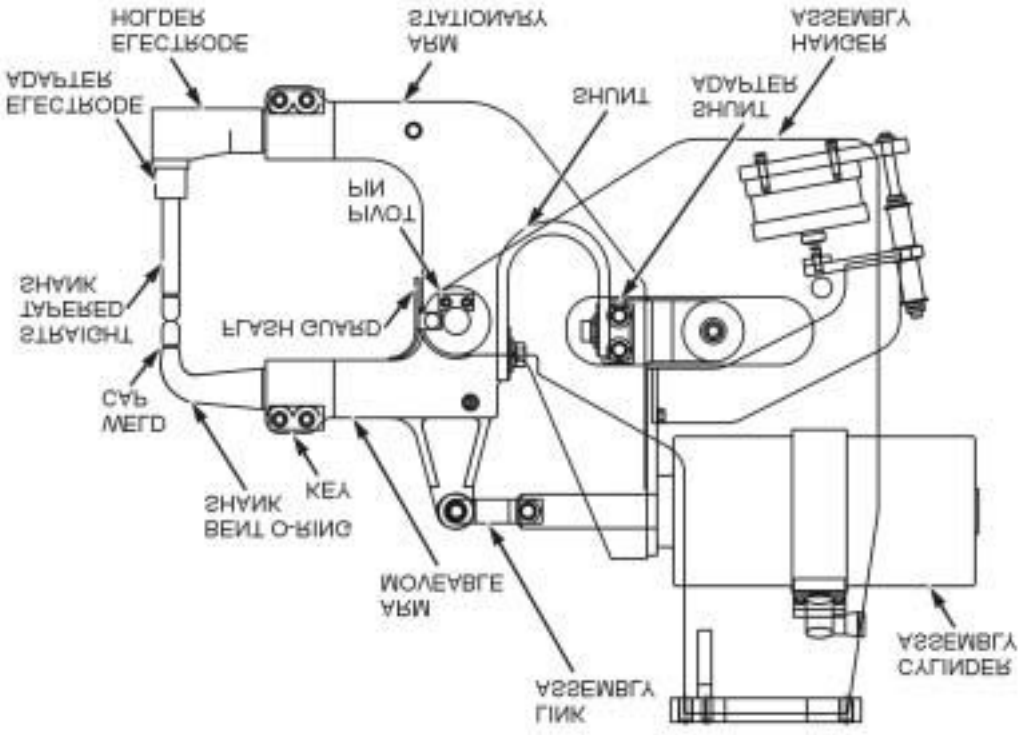


Figure 4.4: Pinch-Type Gun wo/ Transformer

Spring Pack

Spring Pack Assy. Removal

1. Properly support all gun components prior to starting this procedure.
2. Measure and record the spring tension for assembly purposes.
3. Loosen hex jam nuts to relieve all spring tension.
4. Remove pin that secures the spring pack eye bolt to the mounting bracket.
5. Remove the pins retaining the spring block to the spring pack mounting bracket
6. Remove eye bolt and spring block.
7. If required, remove the screws retaining the spring pack mounting bracket to the cylinder trunnion.

8. Spring Pack Assy. Installation.

Spring Pack Assy. Installation

1. Properly support all gun components during all steps of this procedure
2. If removed, install the screws retaining the spring pack mounting bracket to the cylinder trunnion.
3. Install eye bolt and spring block
4. Install the pins retaining the spring block to the spring pack mounting bracket
5. Install pin that secures the spring pack eye bolt to the mounting bracket
6. Adjust the spring tension to the values previously recorded during removal.
7. Tighten jam nuts to secure the spring tension adjustment.

Cylinder

Cylinder Removal

1. Remove any air lines, fittings and other tooling, which cause interference.
2. Remove the link assembly, clevis assembly, or the moveable gun body, depending on the type of gun the cylinder is on.
3. Remove the four (4) screws holding on the rod bellows, if there is one on the gun.
4. Remove the cylinder mounting screws while supporting the cylinder assembly.
5. Slide the cylinder back to clear the piston rod through the stationary gun body.

Cylinder Installation

1. Slide the cylinder forward through the stationary gun body to the piston rod.
2. Install the cylinder mounting screws while supporting the cylinder assembly.
3. If there is a rod bellows on the gun, install the four (4) screws that attach it.
4. Install the link assembly and clevis assembly, or the moveable gun body, depending upon the type of gun being repaired.
5. Install all air lines, fittings and other tooling previously removed.

Scissor-Type

This section describes the Scissor-Type gun, as used in most robotically controlled environments, and the procedures for disassembly, part replacement and assembly. See Figures 4.5 and 4.6.

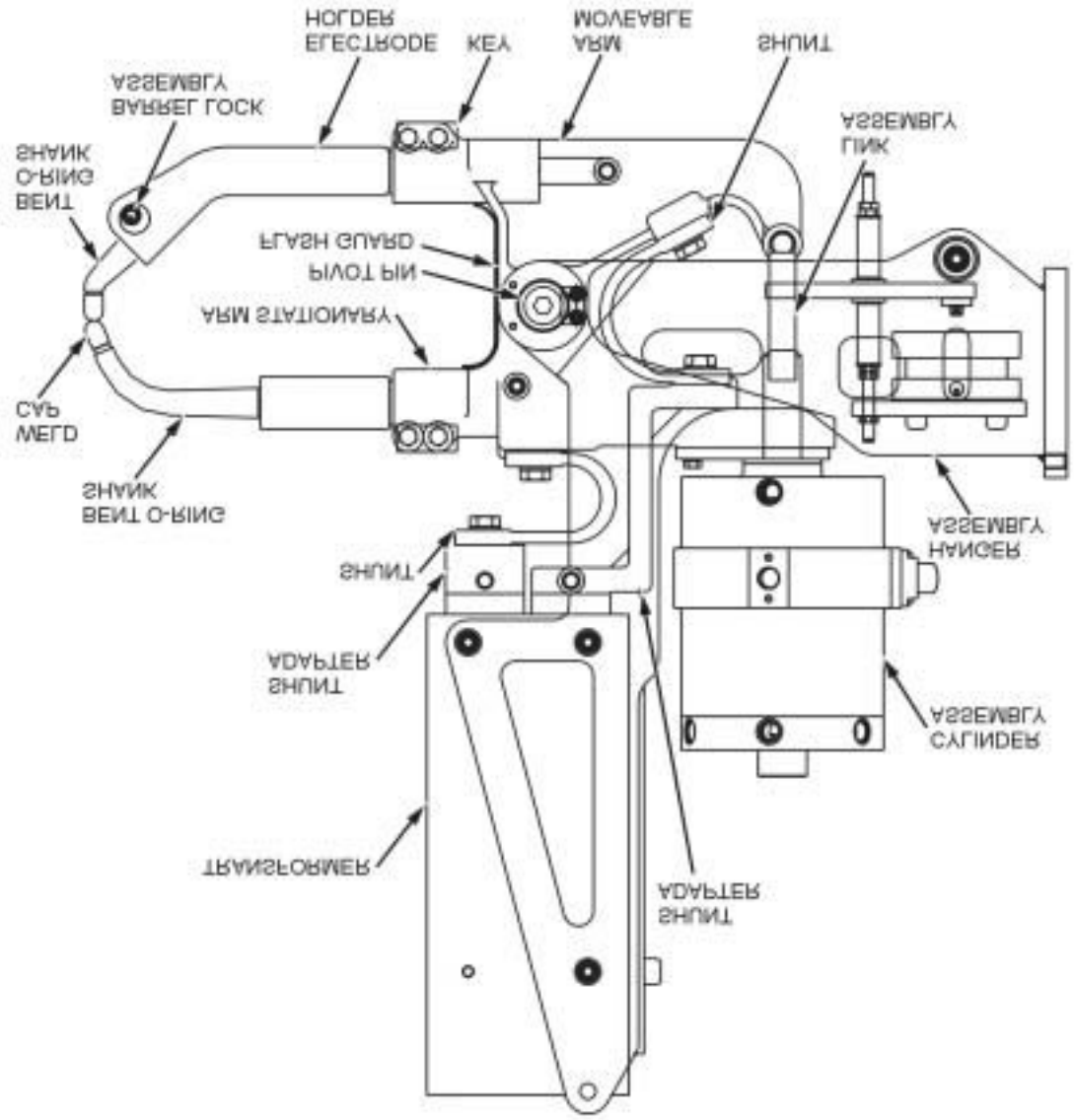
Removal/Installation

The following sections describe how to:

- Remove and install the transformer. Refer to Chapter 8: Common Components. (if no transformer, skip these procedures)
- Remove and install the spring pack
- Remove and install the cylinder

CAUTION: During disassembly and assembly operations, support the gun and the part being worked on so that neither is damaged.

Figure 4.5: Scissor-Type Gun w/ Transformer



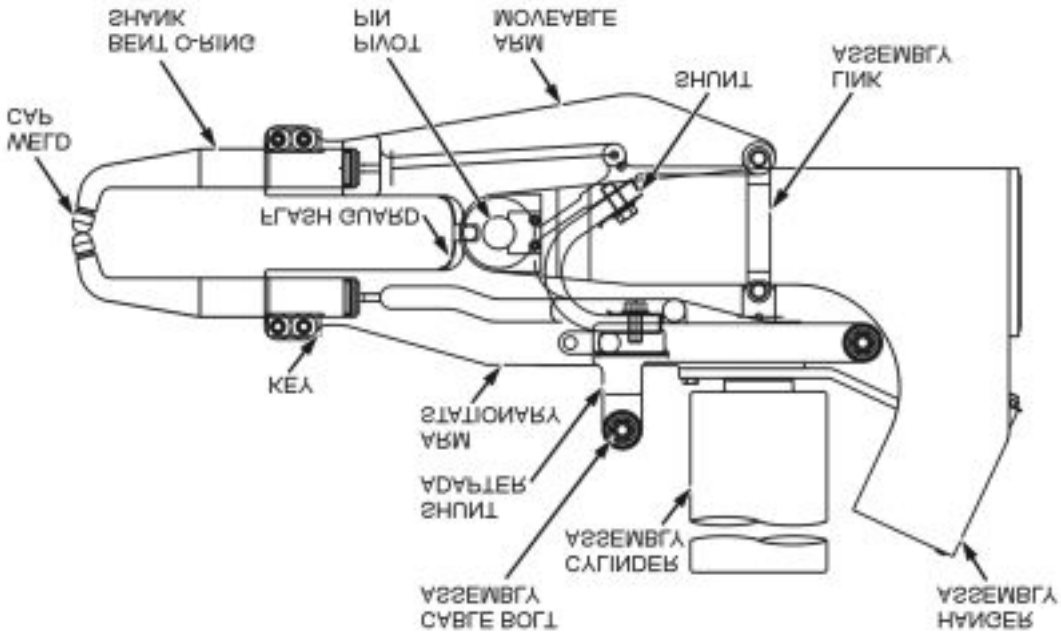


Figure 4.6: Scissor-Type Gun w/o Transformer

Spring Pack

Spring Pack Assy. Removal

1. Properly support all gun components prior to starting this procedure.
2. Measure and record the spring tension for assembly purposes.
3. Loosen hex jam nuts to relieve all spring tension.
4. Remove pin that secures the spring pack eye bolt to the mounting bracket.
5. Remove the pins retaining the spring block to the spring pack mounting bracket
6. Remove eye bolt and spring block.
7. If required, remove the screws retaining the spring pack mounting bracket to the cylinder trunnion.

Spring Pack Assy. Installation

1. Properly support all gun components during all steps of this procedure
2. If removed, install the screws retaining the spring pack mounting bracket to the cylinder trunnion.
3. Install eye bolt and spring block
4. Install the pins retaining the spring block to the spring pack mounting bracket
5. Install pin that secures the spring pack eye bolt to the mounting bracket
6. Adjust the spring tension to the values previously recorded during removal.
7. Tighten jam nuts to secure the spring tension adjustment.

Cylinder

Cylinder Removal

1. Remove any air lines, fittings and other tooling, which cause interference.
2. Remove the link assembly, clevis assembly, or the moveable gun body, depending on the type of gun the cylinder is on.
3. Remove the four (4) screws holding on the rod bellows, if there is one on the gun.
4. Remove the cylinder mounting screws while supporting the cylinder assembly.
5. Slide the cylinder back to clear the piston rod through the stationary gun body.

Cylinder Installation

1. Slide the cylinder forward through the stationary gun body to the piston rod.
2. Install the cylinder mounting screws while supporting the cylinder assembly.
3. If there is a rod bellows on the gun, install the four (4) screws that attach it.
4. Install the link assembly and clevis assembly, or the moveable gun body, depending upon the type of gun being repaired.
5. Install all air lines, fittings and other tooling previously removed.

Tip Force

Tip force is a function of piston rod force and the mechanical ratio of piston movement to tip movement. Refer to the Appendix for the explanation of tip force calculation.

Chapter 5: Manual Guns

General Information

This chapter describes Service Procedures for manually operated C-Type, Pinch-Type and Scissor-Type welding guns and their Cylinders

C-Type

This section describes the C-Type weld gun, as used on most manual applications, and the procedures for disassembly, part replacement and assembly. See Figure 5.1.

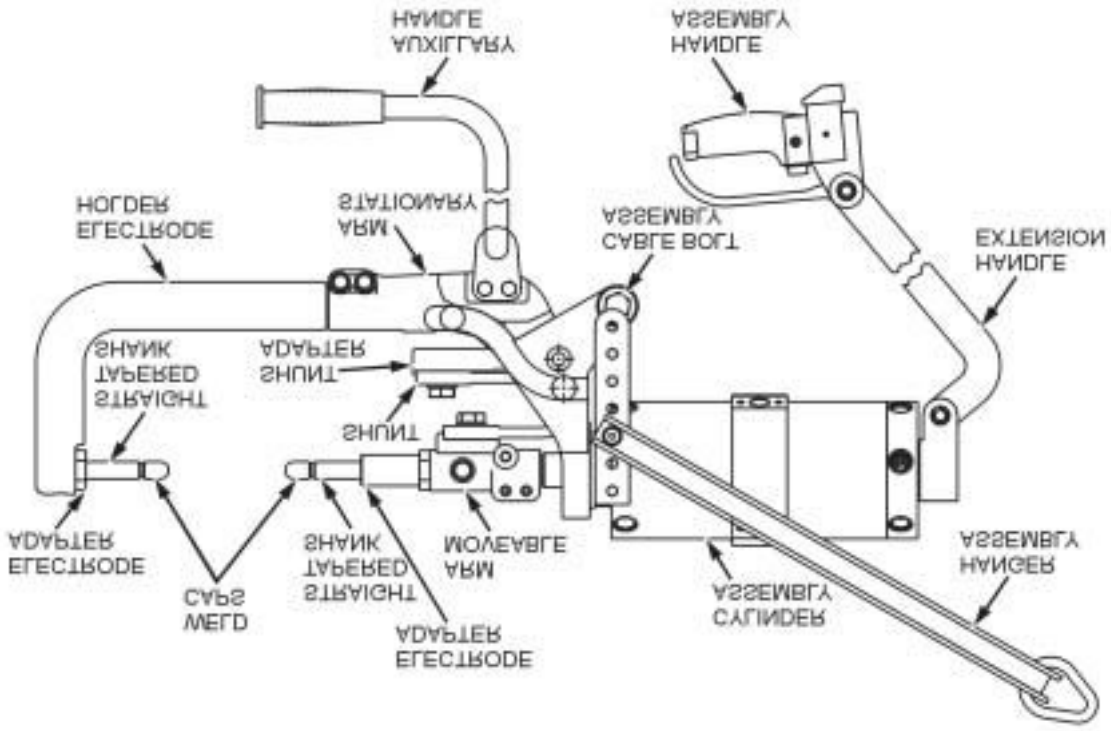


Figure 5.1: C-Type Gun wo/Transformer

Removal/Installation

The following sections describe how to:

- Remove and install the cylinder

CAUTION: During disassembly and assembly operations, support the gun and the part being worked on so that neither is damaged.

Cylinder

Cylinder Removal

1. Remove any air lines, fittings and other tooling, which cause interference.
2. Remove the link assembly, clevis assembly, or the moveable gun body, depending on the type of gun the cylinder is on.
3. Remove the four (4) screws holding on the rod bellows, if there is one on the gun.
4. Remove the cylinder mounting screws while supporting the cylinder assembly.
5. Slide the cylinder back to clear the piston rod through the stationary gun body.

Cylinder Installation

1. Slide the cylinder forward through the stationary gun body to the piston rod.
2. Install the cylinder mounting screws while supporting the cylinder assembly.
3. If there is a rod bellows on the gun, install the four (4) screws that attach it.
4. Install the link assembly and clevis assembly, or the moveable gun body, depending upon the type of gun being repaired.
5. Install all air lines, fittings and other tooling previously removed.

Pinch-Type

This section describes the Pinch-Type gun, as used on most manual applications, and the procedures for disassembly, part replacement and assembly. See Figures 5.2.

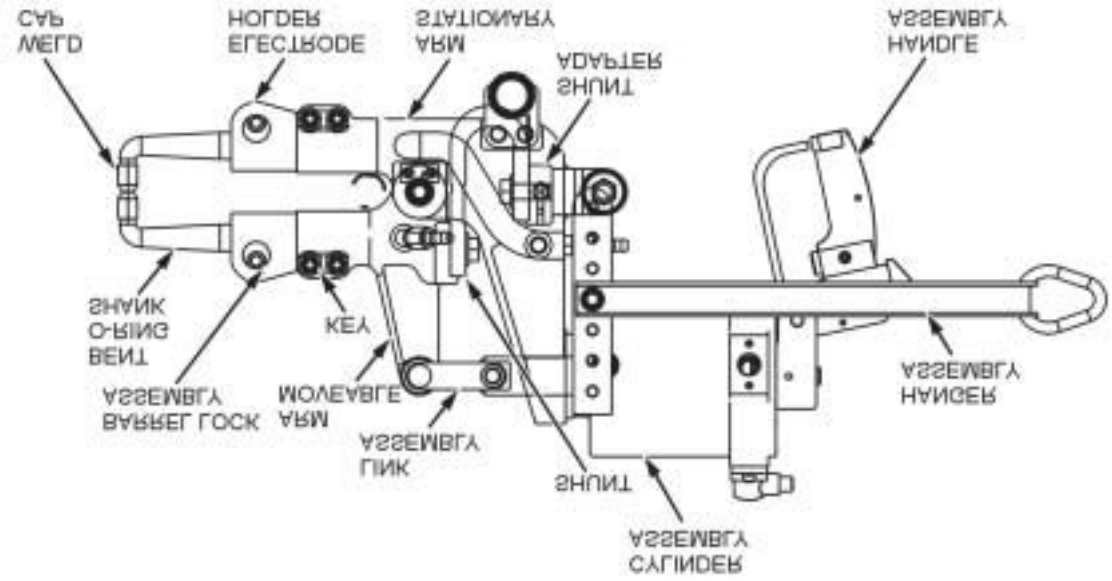


Figure 5.2: Pinch-Type Gun wo/ Transformer

Removal/Installation

The following sections describe how to:

- Remove and install the cylinder

CAUTION: During disassembly and assembly operations, support the gun and the part being worked on so that neither is damaged.

Cylinder

Cylinder Removal

1. Remove any air lines, fittings and other tooling, which cause interference.
2. Remove the link assembly, clevis assembly, or the moveable gun body, depending on the type of gun the cylinder is on.
3. Remove the four (4) screws holding on the rod bellows, if there is one on the gun.
4. Remove the cylinder mounting screws while supporting the cylinder assembly.
5. Slide the cylinder back to clear the piston rod through the stationary gun body.

Cylinder Installation

1. Slide the cylinder forward through the stationary gun body to the piston rod.
2. Install the cylinder mounting screws while supporting the cylinder assembly.
3. If there is a rod bellows on the gun, install the four (4) screws that attach it.
4. Install the link assembly and clevis assembly, or the moveable gun body, depending upon the type of gun being repaired.
5. Install all air lines, fittings and other tooling previously removed.

Scissor-Type

This section describes the Scissor-Type gun, as used on most manual applications, and the procedures for disassembly, part replacement and assembly. See Figure 5.3.

Removal/Installation

The following sections describe how to:

- Remove and install the cylinder

CAUTION: During disassembly and assembly operations, support the gun and the part being worked on so that neither is damaged.

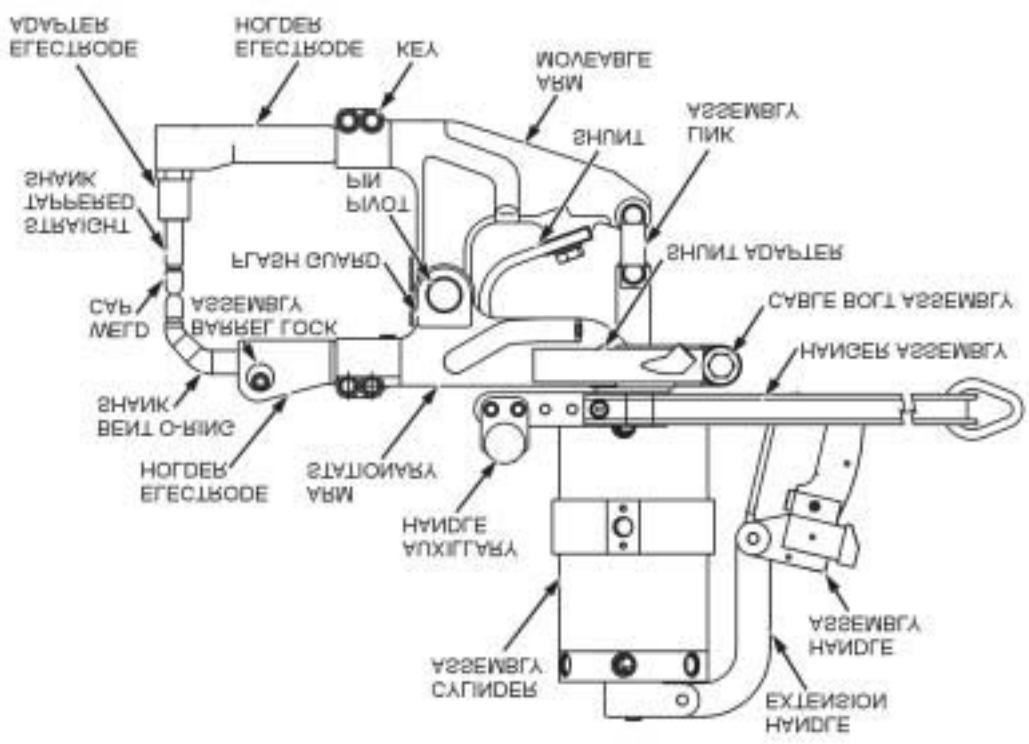


Figure 5.3: Scissor-Type Gun wo/ Transformer

Cylinder

Cylinder Removal

1. Remove any air lines, fittings and other tooling, which cause interference.
2. Remove the link assembly, clevis assembly, or the moveable gun body, depending on the type of gun the cylinder is on.
3. Remove the four (4) screws holding on the rod bellows, if there is one on the gun.
4. Remove the cylinder mounting screws while supporting the cylinder assembly.
5. Slide the cylinder back to clear the piston rod through the stationary gun body.

Cylinder Installation

1. Slide the cylinder forward through the stationary gun body to the piston rod.
2. Install the cylinder mounting screws while supporting the cylinder assembly.
3. If there is a rod bellows on the gun, install the four (4) screws that attach it.
4. Install the link assembly and clevis assembly, or the moveable gun body, depending upon the type of gun being repaired.
5. Install all air lines, fittings and other tooling previously removed.

Tip Force

Tip force is a function of piston rod force and the mechanical ratio of piston movement to tip movement. Refer to the Appendix for the explanation of tip force calculation.

Chapter 6: Cylinders

General Information

This chapter contains the procedures for disassembly and assembly of Dual Piston, Tie-Rod and "GTC" styles of retractable cylinders and Dual Piston, Tie-Rod and "91000" styles of non-retractable cylinders, as used in Fixture and Robot/Manual environments.

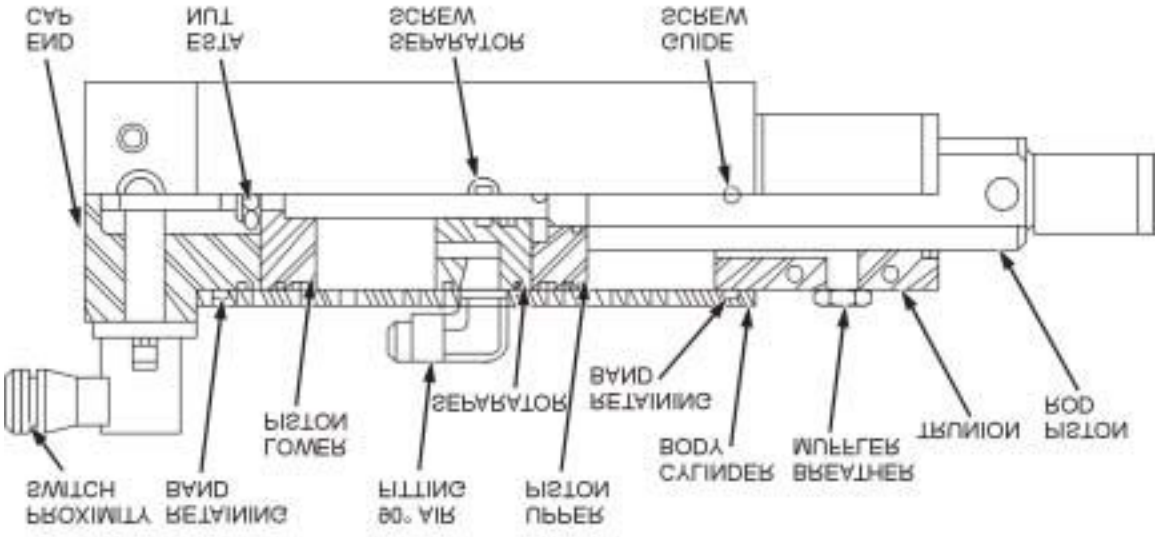


Figure 6.1: Dual Piston Style Non-Retractable Cylinder

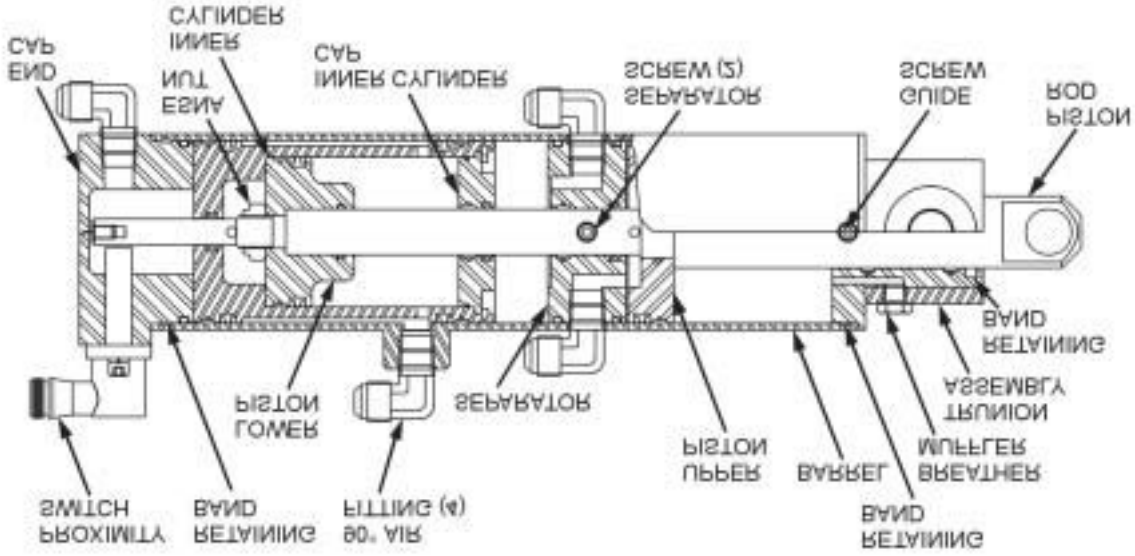


Figure 6.2: Dual Piston Style Retractable Cylinder

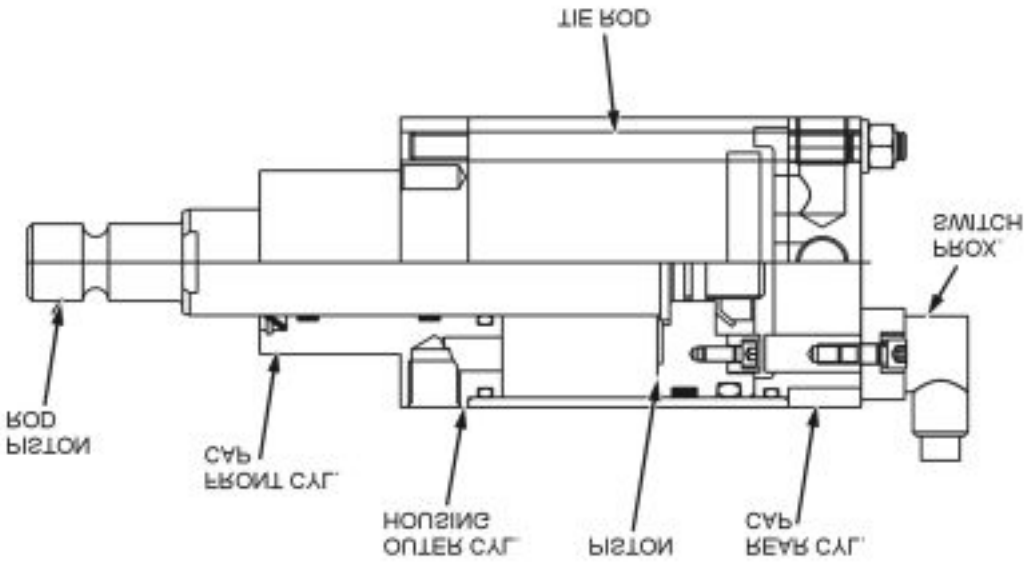


Figure 6.3: Tie-Rod Style Non-Retractable Cylinder

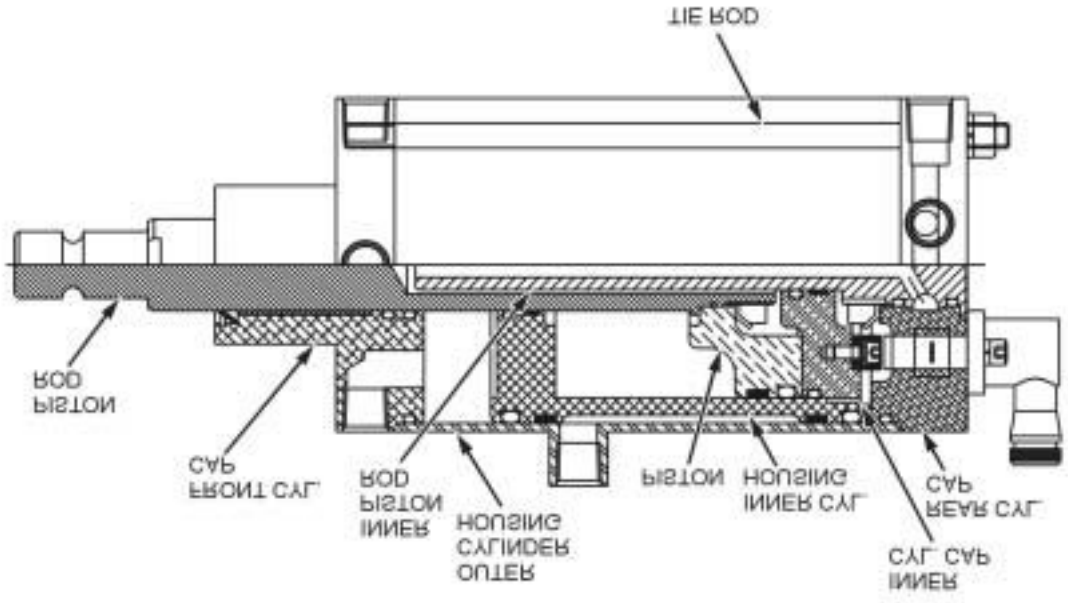


Figure 6.4: Tie-Rod Style Retractable Cylinder

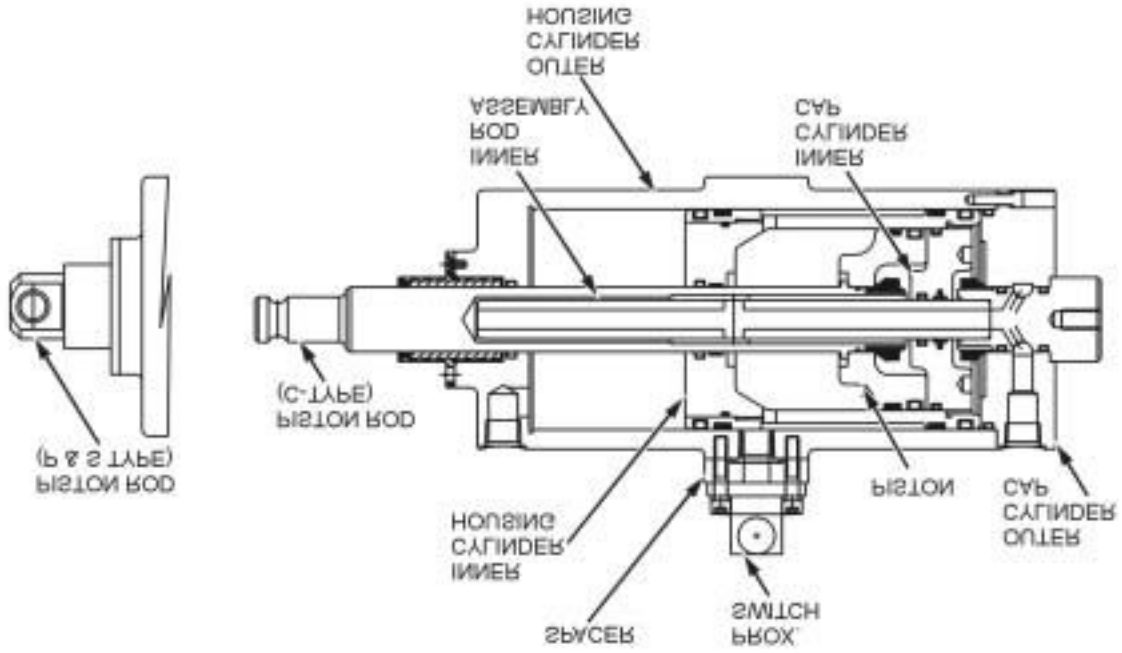


Figure 6.5: "GTC" Style Retractable Cylinder

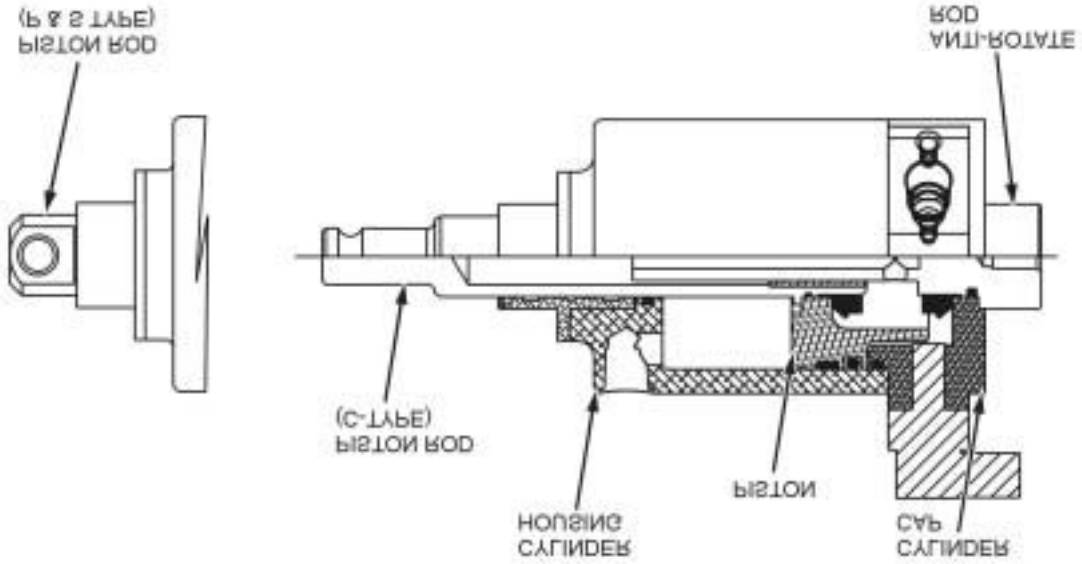


Figure 6.6: "91000" Style Non-Retractable Cylinder

Dual Piston

Dual Piston Disassembly

1. Remove cylinder from the weld gun assembly.
2. Remove all air fittings from the cylinder assembly.
3. Clamp the cylinder in a bench vice by the rear cylinder cap.
4. Remove the front guide screw from the side of the cylinder barrel.
5. Slowly turn the cylinder trunnion until the end of the brass retaining band is visible.
6. Pry the end of the retaining band through the guide screw hole, then by turning the trunnion remove the retaining band.
7. The trunnion can now be removed by sliding it off of the piston rod.
8. Remove the retaining band at the cylinder end cap using the same procedure.
9. Remove the barrel and cylinder internal components from the end cap.
10. Clamp the piston rod end in a bench vice with soft jaws. (The end of the cylinder should be pointing into the air.)
11. Remove the two (2) separator screws located on each side of the cylinder barrel.
12. Slide the cylinder barrel off of the piston rod assembly.
13. Remove the esta nut from the end of the piston rod.
14. The lower piston and separator can now slide off of the piston rod.
15. The upper piston will have to be pressed off of the piston rod using an arbor press or similar type tool.

Dual Piston Assembly

NOTE: Fully lubricate all O-rings and wear bands with ACCROLUBE® - High efficiency grease, fortified with Teflon®

1. Clean all parts if the cylinder is being rebuilt, inspect all parts for wear or damage, replace if necessary.
2. Lightly grease all seals with an approved grease and place on the appropriate details.
3. Press top piston onto piston rod using an arbor press or similar tool. (Note: Make sure the piston is square and perpendicular to the piston rod.)
4. Clamp the piston rod in a bench vice with the threaded rod pointing up.
5. Slide the separator onto the rod. (Note: The crossholes drilled into the separator should be facing up.) Be sure and replace the inner diameter wear band on the separator and lightly grease.
6. Slide the lower piston onto the rod.
7. Lock the piston on the rod using the correct esta nut provided in the rebuild kit.
8. Wrap the Teflon wear bands around both pistons and lightly grease the outer diameter of the bands and seals.
9. Slide the cylinder barrel over the piston rod assembly. Care should be taken when guiding the seals past the grooves and holes in the barrel, to avoid cuts or excessive damage.
10. Align the tapped holes in the separator with the holes in the cylinder barrel and replace the separator screws. (Note: Apply Loctite to the screws prior to installation.)
11. Clamp the cylinder end cap in a bench vice and replace the o-ring seal on the cap.
12. Slide the barrel and piston rod assembly over the end cap. Then align the hole in the cylinder barrel with the blind hole in the end cap.

13. Place the retaining band into the end cap hole through the barrel. Then turn the barrel while feeding the retaining band into the end cap groove.
14. Replace the socket head cap screw into the cap thru the cylinder barrel and tighten to the proper torque. (Note: Apply Loctite to the screws prior to installation.)
15. Slide the trunnion over the piston rod and into the cylinder barrel.
16. Install the retaining band in the same way as described in steps #13 & #14.
17. Connect air to one cylinder port at a time and check for air leaks. Sometimes the cylinder must be stroked in and out to seat the seal properly.

    NOTE: Air should not leak from the return ports when the forward ports are pressurized. Likewise air should not from the forward ports when the return ports are pressurized. The cylinder should stroke freely at approximately 10 P.S.I.

Retractable

Retractable Disassembly

1. Remove cylinder from the weld gun assembly.
2. Remove all air fittings from the cylinder assembly.
3. Clamp the cylinder in a bench vice by the rear cylinder cap.
4. Remove the front guide screw from the side of the cylinder barrel.
5. Slowly turn the cylinder trunnion until the end of the brass retaining band is visible.
6. Pry the end of the retaining band through the guide screw hole. Then, by turning the trunnion, remove the retaining band.
7. The trunnion can now be removed by sliding it off the piston rod.
8. Remove the retaining band at the cylinder end cap using the same procedure.
9. Remove the barrel and the cylinder internal components from the end caps.
10. Clamp the piston rod end in a bench vice with soft jaws. (the end of the cylinder should be pointing into the air.)
11. Remove the two (2) separator screws located in each side of the cylinder barrel.
12. Slide the cylinder barrel off of the piston rod assembly.
13. Remove the retaining band from the front of the inner cylinder.
14. Remove the inner cylinder from the piston rod assembly.
15. Remove the esta nut from the end of the piston rod.
16. The lower piston, inner cylinder cap, and separator can now slide off of the piston rod.
17. The upper piston will have to be pressed off of the piston rod using an arbor press or similar type tool.

Retractable Assembly

1. Clean all parts if the cylinder is being rebuilt, inspect all parts for wear or damage, replace if necessary.
2. Lightly grease all seals with an approved grease and place on the appropriate details.
3. Press the top piston on to the piston rod using an arbor press or similar tool. (Note: Make sure piston is square and perpendicular to the piston rod.)
4. Clamp the piston rod in a bench vice with the threaded end pointed up.
5. Slide the separator on to the piston rod Be sure to replace the inner diameter wear band on the separator and lightly grease.

6. Slide the inner cylinder cap onto the piston rod.
7. Slide the lower piston onto the rod.
8. Lock the piston on the rod using the correct esta nut provided in the rebuild kit.
9. Wrap the rear piston wear band around the piston and lightly grease.
10. Slide the inner cylinder housing over the rear piston. Be sure to replace all of the wear bands and seals in the inner cylinder.
11. Replace the snap ring on the inner cylinder to retain the cap on to the inner cylinder housing.

    NOTE: The inner can should move freely over the rear piston.

12. Wrap the Teflon wear bands around both pistons and lightly grease the outside diameter of the bands and seals.
13. Slide the cylinder barrel over the piston rod assembly. Care should be taken when guiding the seals past the grooves and holes in the barrel, to avoid cuts and excessive damage.
14. Align the tapped holes in the separator with the holes in the cylinder barrel and replace the separator screws. (Note: Apply Loctite to the screws prior to installation.)
15. Clamp the cylinder end cap in a bench vice and replace the o-ring seal on the cap.
16. Slide the barrel and piston rod assembly over the end cap. Then align the hole in the cylinder barrel with the blind hole in the end cap.
17. Place the retaining band into the end cap hole through the barrel. Then turn the barrel while feeding the retaining band into the end cap groove.
18. Replace the socket head cap screw into the cap thru the cylinder barrel and tighten to the proper torque. (Note: Apply Loctite to the screws prior to installation.)
19. Slide the trunnion over the piston rod and into the cylinder barrel.
20. Install the retaining band in the same way as described in steps #13 & #14.
21. Connect air to one cylinder port at a time and check for air leaks. Sometimes the cylinder must be stroked in and out to seat the seal properly.

    NOTE: Air should not leak from the return ports when the forward ports are pressurized. Likewise air should not leak from the forward ports when the return ports are pressurized. The cylinder should stroke freely at approximately 10 P.S.I.

Robot/Manual

Non-Retractable

Tie-Rod Style Non-Retractable Cylinder Disassembly

1. Remove air hose and air fittings.
2. Remove the four (4) nuts on the tie rods, located on the back cap.
3. Remove the back cap of the cylinder.
4. Remove the cylinder barrel.
5. Push the piston rod and inner piston out of the front cap.
6. Remove the bearhug nut from the piston rod and remove the inner piston.

Tie-Rod Style Non-Retractable Cylinder Assembly

1. Clean and inspect all components for excessive wear and replace if necessary.

2. Replace all seals, wiper scrapers, and wear bands on all components and lightly grease prior to assembly.
3. Attach piston to piston rod and fasten using bearing nut along with a bearing washer. Lock in place by bending up the tab on the lock washer.
4. Slide the piston rod assembly through the front cylinder cap.
5. Slide the barrel housing over the piston on to the front cap.
6. Slide the rear cylinder cap on to the cylinder barrel.
7. Replace the lock washers and nuts on the rear cap and tighten to the proper torque.
8. Test by placing compressed air in one port at a time. The cylinder should stroke freely @ 10 P.S.I. and air should not leak from anywhere on the cylinder.

"91000" Style Non-Retractable Cylinder Disassembly

1. Remove the air hose and air fittings.
2. Remove the socket head screws on the back cap of the cylinder and lift the cap out of the cylinder assembly.

   NOTE: On C-type cylinders the anti-rotate piston rod will be removed with the back cylinder cap.

3. Gently tap the piston rod from the front of the cylinder assembly. This will force the inner rod assembly out of the cylinder assembly.
4. Remove the bearhug nut from the rear of the piston rod, this will allow for the removal of the rear piston.
5. Similarly the bearhug nut will need to be removed to take the anti-rotate rod out of the rear cylinder cap.
6. The cylinder guide can be removed from the cylinder housing by removing the flat head screw retaining it in place and sliding it forward.

"91000" Style Non-Retractable Cylinder Assembly

1. Clean and inspect all components for excessive wear and replace if necessary.
2. Replace all seals, wiper scrapers, and wear bands on all components and lightly grease prior to assembly.
3. Attach piston to the piston rod and fasten using bearing nut along with a bearing washer. Lock in place by bending up the tab in the lock washer.
4. Attach the anti-rotate rod into the back cylinder cap using the same process.
5. Slide the piston rod assembly through the cylinder housing. Caution should be taken guiding the various seals past the grooves and steps in the cylinder housing.
6. Slide the rear cylinder cap on to the cylinder barrel.
7. Fasten the rear cap to the cylinder housing using the socket head cap screw and tighten to the proper torque.
8. Test by placing compressed air in one port at a time. The cylinder should stroke freely @ 10-15 P.S.I. and air should not leak from anywhere on the cylinder.

Retractable

"GTC" Style Retractable Cylinder Disassembly

1. Remove the air hose and air fittings.
2. Remove the socket head cap screws on the back cap of the cylinder and lift the cap out of the cylinder assembly.

   NOTE: On C-type cylinders the anti-rotate piston rod will be removed with the back cylinder cap.

3. Gently tap the piston rod from the front of the cylinder assembly. This will force the inner rod assembly out of the cylinder assembly.
4. While holding the inner cylinder housing with a strap wrench or similar tool, unscrew the inner cylinder back cap using a spanner wrench.
5. The piston rod assembly can now be removed from the inner cylinder by pushing the rod from the opposite side.
6. Remove the bearhug nut from the rear of the piston rod, this will allow for the removal of the rear piston.
7. Similarly the bearhug nut will need to be removed to take the anti-rotate rod out of the rear cylinder cap.
8. The cylinder guide can be removed from the cylinder housing by removing the flat head screw retaining it in place and sliding it forward.

"GTC" Style Retractable Cylinder Assembly

1. Clean and inspect all components for excessive wear and replace if necessary.
2. Replace all seals, wiper scrapers, and wear bands on all components and lightly grease prior to assembly.
3. Attach piston to piston rod and fasten using a bearing nut along with a bearing washer. Lock in place by bending up the tab on the lock washer.
4. Attach the anti-rotate rod into the back cylinder cap using the same process.
5. Place the piston rod through the inner cylinder housing. Care should be taken when guiding the piston seals past the threads in the inner cylinder housing.
6. Replace the inner cylinder cap and tighten using a spanner wrench.
7. Slide the piston rod assembly through the cylinder housing. Caution should be taken guiding the various seals past grooves in the cylinder housing.
8. Slide the rear cylinder cap over the back of the cylinder. The piston rod will need to be rotated to align the flats with the anti-rotate bushing inside the piston rod.
9. Fasten the rear cap to the cylinder housing using the socket head cap screw and tighten to the proper torque.
10. Test by placing compressed air in one port at a time. The cylinder should stroke freely @ 10-15 P.S.I. and air should not leak from anywhere on the cylinder.

Tie-Rod Style Retractable Cylinder Disassembly

1. Remove air hose and air fittings.
2. Remove the four (4) nuts on the tie rods, located on the back cap.
3. Remove the back cap of the cylinder.
4. Remove the cylinder barrel.
5. Remove the inner cylinder and piston rod assembly.

6. Use a spanner wrench and remove the inner cylinder back cap from the inner cylinder.
7. Push the piston rod and inner piston out of the inner cylinder.
8. Remove the bearhug nut from the piston rod and remove the inner piston.
9. The bearhug nut on the back cap will have to be removed to slide the inner piston rod from the back cap.

Tie-Rod Style Retractable Cylinder Assembly

1. Clean and inspect all components for excessive wear and replace if necessary.
2. Replace all seals, wiper scrapers, and wear bands on all components and lightly grease prior to assembly.
3. Attach the piston to the piston rod and fasten using a bearing nut along with a bearing washer. Lock in place by bending up the tab on the lock washer.
4. Attach the anti-rotate rod into the back cylinder cap using the same process.
5. Place the piston rod through the inner cylinder housing. Care should be taken when guiding the piston seals past the threads in the inner cylinder housing.
6. Replace the inner cylinder cap and tighten using a spanner wrench.
7. Slide the piston rod assembly through the front cylinder cap.
8. Slide the barrel housing over the inner cylinder housing, onto the front cap.
9. Slide the rear cylinder cap over the back of the cylinder. The piston rod will need to rotate to align the flats with the anti-rotate bushing inside the piston rod.
10. Replace the lock washers and nuts on the rear cap and tighten to the proper torque specifications.
11. Test by placing compressed air in one port at a time. The cylinder should stroke freely @ 10 – 15 P.S.I. and air should not leak from anywhere on the cylinder.

Chapter 7: Equalizers

General Information

This chapter contains the procedures for disassembly and assembly of the air equalizer and the straight equalizer as used in Fixture and Robot environments. See Figures 7.1 and 7.2.

Fixture

Air Equalizer

Air Equalizer Disassembly

1. Remove the socket screws retaining the actuator.
2. Remove the equalizer actuator.
3. Release the tension on the equalizing spring and remove the spring rod.
4. Remove the stabilizing block.
5. Remove the end cap and cover plate from the rear of the equalizer assembly.
6. Remove the ESTA nut from the piston rod.
7. Slide the piston and guide rods from the equalizer assembly.
8. Remove the front end cap and cover plate.
9. Remove the two Welker bushings and discard them.
10. Remove and discard the O-rings, wear bands and scraper.

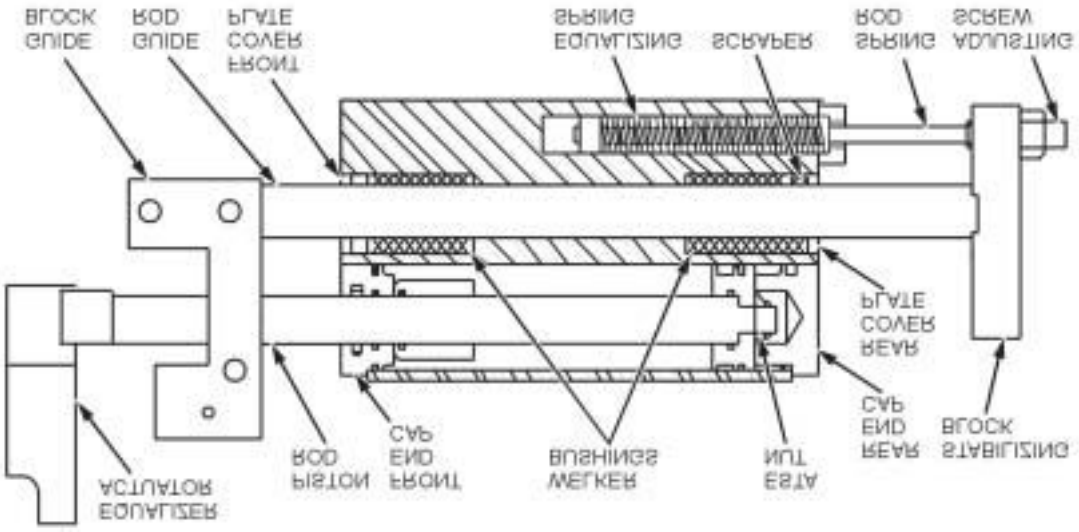


Figure 7.1: Air Equalizer (Assembly Cross Section)

Air Equalizer Assembly

NOTE: Fully lubricate all O-rings, bushings, wear bands, and the scraper with Accrolube grease before assembling the unit.

1. Thoroughly clean all parts and inspect them for excessive wear.
2. Replace all O-rings, wear bands, bushings, and the scraper.
3. Install the front end cap and cover plate.
4. Slide the piston and guide rods into the equalizer assembly.
5. Attach the ESTA nut to the piston rod.
6. Install the rear end cap and cover plate.
7. Install the stabilizing block.
8. Install the spring rod and apply tension to the equalizing spring.
9. Install the equalizer actuator.
10. Install the socket screws to retain the actuator.

Straight Equalizer

Straight Equalizer Disassembly

1. Back out the spring adjusting screw until the tension on the equalizing spring is relieved.
2. Remove the socket head screw and washer holding the stabilizing block to the equalizing shaft.
3. Remove the spring retainer plate from the mounting base. (Front Spring Units Only)
4. Remove the equalizing spring and spring adjuster from the mounting base.
5. Remove the stabilizing block from the spring adjuster.
6. Remove the screws that hold the bushings in place, and remove the bushings.

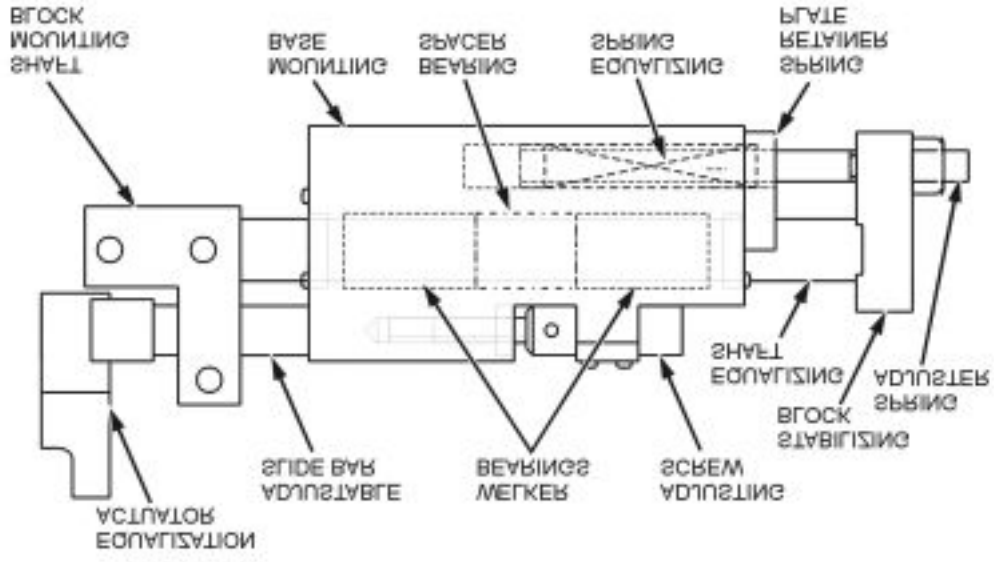


Figure 7.2: Straight Equalizer

7. Remove the cover plate from the mounting base.
8. Remove the adjusting screw from the adjustable slide bar.
9. Slide the equalizing actuator and adjustable slide bar out of the mounting base.
10. Slide the shaft mounting block and equalizing shaft out of the mounting base.
11. Remove the bearing spacer from the equalizing shaft.
12. Remove the equalizing actuator from the adjustable slide bar.
13. Remove the shaft mounting block from the equalizing shaft.

Straight Equalizer Assembly

NOTE: Fully lubricate all O-rings and bushings with ACCROLUBE® - High efficiency grease, fortified with Teflon®

1. Install the bearing spacer in the mounting base.
2. Install the bushings in the mounting base.
3. Install the shaft mounting block on the equalizing shaft.
4. Assemble the equalizing actuator/slide bar and shaft mounting block/equalizing shaft.
5. Install the assembly into the mounting base.
6. Install the adjusting screw in the mounting base so that the screw engages the adjustable slide bar.
7. Install the cover plate.
8. Secure the bushings in place with the button head screws.
9. Install the stabilizing block on the spring adjuster.
10. Secure the stabilizing block to the equalizing shaft.
11. Retension the equalizing screw.

Robot

Air Equalizer

Air Equalizer Disassembly

1. Remove the two (2) nuts holding the rear tie plates to the equalizer assembly and remove the rear tie plate.
2. Remove the retaining rings at both ends of the equalizer holding in the bearing assembly.
3. Lightly tap the equalizer rods out of the housing , forcing out the bearings on one side of the equalizer.
4. Follow the same procedure and drive out the remaining bearings and rods at the same time.
5. Slide the bearings off of the equalizer rods and remove the snap rings holding the piston on to the equalizer rods.
6. The equalizer piston can now be removed from the equalizer rods.

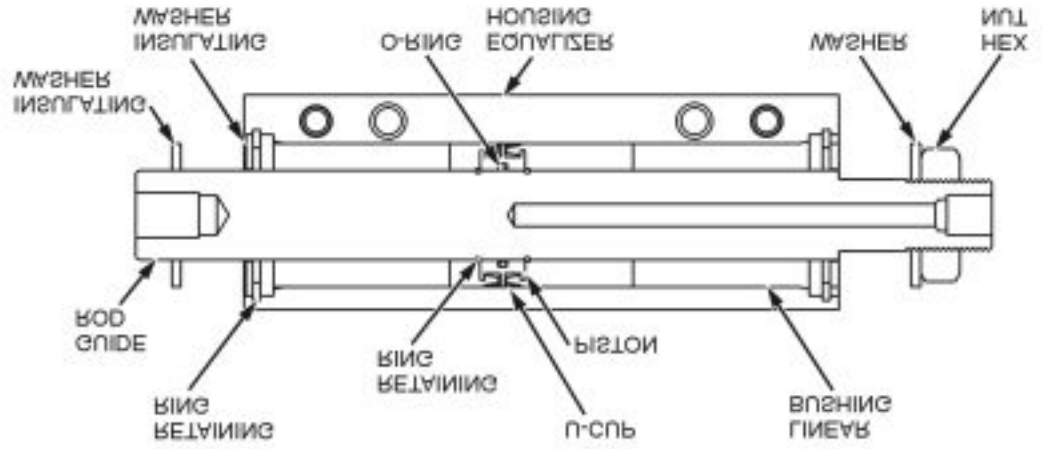


Figure 7.3: Air Equalizer (Assembly Cross Section)

Air Equalizer Assembly

NOTE: Fully lubricate all O-rings, bushings, wear bands, and the scraper with ACCROLUBE® - High efficiency grease, fortified with Teflon®

1. Clean all equalizer components and inspect for damage. Repair or replace if necessary.
2. Replace and lightly grease all seals.
3. Slide the piston on to the equalizer rod and replace the two (2) snap rings holding it in place.
4. Slide one bearing assembly over the equalizer rod then slide the rod and bearing into the equalizer housing.
5. Repeat step “4” for the second equalizer rod.
6. Secure the bearings in place using the snap rings.
7. Slide the remaining bearings into the housing from the opposite side and secure in place using the snap ring.
8. Replace the rear tie plate over the equalizing rods and secure with the lock washers and locknuts.
9. Test the slide by stroking first by hand and then using compressed air. The slide should operate freely with 10-15 P.S.I. air pressure.

Spring Equalizer

Spring Equalizer Disassembly

1. Back out the spring adjusting screw until the tension on the equalizing spring is relieved.
2. Remove the socket head screw and washer holding the stabilizing block to the equalizing shaft.
3. Remove the spring retainer plate from the mounting base. (Front Spring Units Only)
4. Remove the equalizing spring and spring adjuster from the mounting base.
5. Remove the stabilizing block from the spring adjuster.
6. Remove the screws that hold the bushings in place, and remove the bushings.

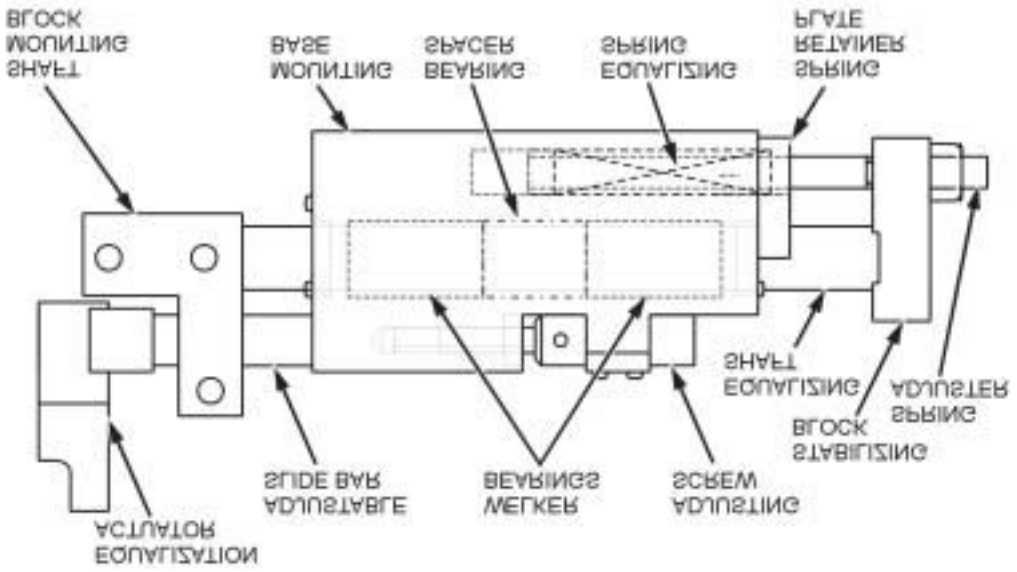


Figure 7.4: Spring Equalizer

7. Remove the cover plate from the mounting base.
8. Remove the adjusting screw from the adjustable slide bar.
9. Slide the equalizing actuator and adjustable slide bar out of the mounting base.
10. Slide the shaft mounting block and equalizing shaft out of the mounting base.
11. Remove the bearing spacer from the equalizing shaft.
12. Remove the equalizing actuator from the adjustable slide bar.
13. Remove the shaft mounting block from the equalizing shaft.

Spring Equalizer Assembly

NOTE: Fully lubricate all O-rings and bushings with ACCROLUBE® - High efficiency grease, fortified with Teflon®

1. Install the bearing spacer in the mounting base.
2. Install the bushings in the mounting base.
3. Install the shaft mounting block on the equalizing shaft.
4. Assemble the equalizing actuator/slide bar and shaft mounting block/equalizing shaft.
5. Install the assembly into the mounting base.
6. Install the adjusting screw in the mounting base so that the screw engages the adjustable slide bar.
7. Install the cover plate.
8. Secure the bushings in place with the button head screws.
9. Install the stabilizing block on the spring adjuster.
10. Secure the stabilizing block to the equalizing shaft.
11. Retension the equalizing screw.

Chapter 8: Common Components

General Information

This chapter describes Removal and Installation procedures for the several common components that are not unique to any particular gun style or usage.

Removal/Installation

The following sections describe how to Remove and Install:

- Transformer
- Shunt Adapters/Buss Bars
- Shunts
- Barrel Locks
- Shanks
- Pivot Pins
- Deflector Tubes
- Links
- Clevis Pins

Transformer

Transformer Removal

WARNING: Properly support the weld gun and transformer prior to starting this procedure, to prevent injury.

NOTE: Inspect and record the order in which the transformer fasteners and insulation are assembled, this is necessary for transformer installation. Replace all damaged insulation and/or fasteners.

1. Remove shunts
2. Remove buss bars/shunt adapters
3. Remove hex head screws supporting the transformer in the gun bracket. (See Note)
4. Use proper lift device (transformer weighs approximately 100 lbs.) to remove transformer from the mounting bracket / gun assembly

Transformer Installation

1. Use proper lift device (transformer weighs approximately 100 lbs.) to position transformer to the mounting bracket / gun assembly
2. Install hex head screws to attach the transformer to the gun bracket. (See Note)
3. Install buss bars/shunt adapters
4. Install shunts

Shunt Adapter/Buss Bar

Shunt Adapter / Buss Bar Removal (Transformer Style)

1. Remove the shunt.
2. Disconnect / remove all water lines and water fittings
3. Remove socket head screws attaching shunt adapter/buss bar to the transformer.
4. Remove the shunt adapter/buss bars, along with the face seal o-ring between the shunt adapter/buss bar and the transformer.

Shunt Adapter / Buss Bar Installation (Transformer Style)

1. Clean or lightly sand any corrosion from shunt adapter / buss bar and transformer contact surfaces.
2. Silver plate the shunt adapter / buss bar & transformer contact surface using Portable Electro plating solution to industry standards.
3. Insert proper o-ring into water jacket c'bore on shunt adapter / buss bar using Copper Lube 188 Compound.
4. Attach shunt adapter / buss bar to the transformer, using socket head screws, to recommended torque.

Shunt Adapter / Buss Bar Removal (Non-Transformer Style)

1. Remove shunt.
2. Disconnect water lines and water fittings.
3. Remove cable bolt assembly.
4. Remove shunt adapter / buss bar from the weld gun assembly.

Shunt Adapter / Buss Bar Installation (Non-Transformer Style)

1. Clean or lightly sand any corrosion from the shunt adapter / buss bar and gun body contact surface.
2. Silver plate the shunt adapter / buss bar and gun body contact surface, using portable electro plating solution to industry standard.
3. Insert shunt adapter / buss bar into the gun body.
4. Attach cable bolt assembly.
5. Connect all water lines and water fittings.

Shunt

Shunt Removal

1. Support shunt adapter / buss bar securely before starting this procedure. Failure to properly support the shunt adapter / buss bar may result in permanent damage to the shunt adapter / buss bar and transformer.
2. Loosen or remove if necessary the hex head screw securing the shunt to the buss bar and gun body.
3. Slide the shunt free of the bolt and washer, and remove from the gun assembly.

Shunt Installation

1. Clean or lightly sand any corrosion from the shunt adapter / buss bar and gun body contact surface.
2. Silver plate the shunt adapter / buss bar and gun body contact surface using portable electro plating solution to industry standards.
3. Install the new shunt, being cautious not to bend or damage the shunt leafs.

CAUTION: Do not torque the hex head screw on the buss bar without properly securing the shunt adapter / buss bar in place. Failure to do this may result in permanent damage to the shunt adapter / buss bar and or transformer.

4. Torque the hex head screw to 65 ft/lbs. Be sure the shunt is tight against the anti-rotate lip on the shunt adapter / buss bar or gun body.

Barrel Lock

Barrel Lock Assembly Removal

1. Loosen the socket head screw approximately 2-3 turns.
2. Gently tap the screw until the threaded portion of the barrel lock assembly breaks free.
3. Remove socket head screw from barrel lock assembly.
4. Using a thin knock out punch, tap the counterbored side of the barrel lock assembly free of the casting.

Barrel Lock Assembly Installation

NOTE: Serrated barrel locks are designed to hold the shank in place and align tips by biting into the shank diameter. When replacing the barrel lock assembly, remove the shank and clean all burrs and indentations caused by the serrated edges of the barrel lock. This process assures proper tip alignment.

1. Install both halves of the barrel lock assembly into the casting, being sure contact is made with the shank.
2. Apply Copper Lube 188 Compound to the socket head screw.
3. Align counterbored and threaded holes and thread socket head screw into place. Tighten to proper torque.

Shank

Shank Removal (Tapered End)

1. Install electrode clamp “WG-10797-51” to electrode shank. See Figure 8.1.
2. Insert electrode fork “WG-10818-51” See Figure 8.1.

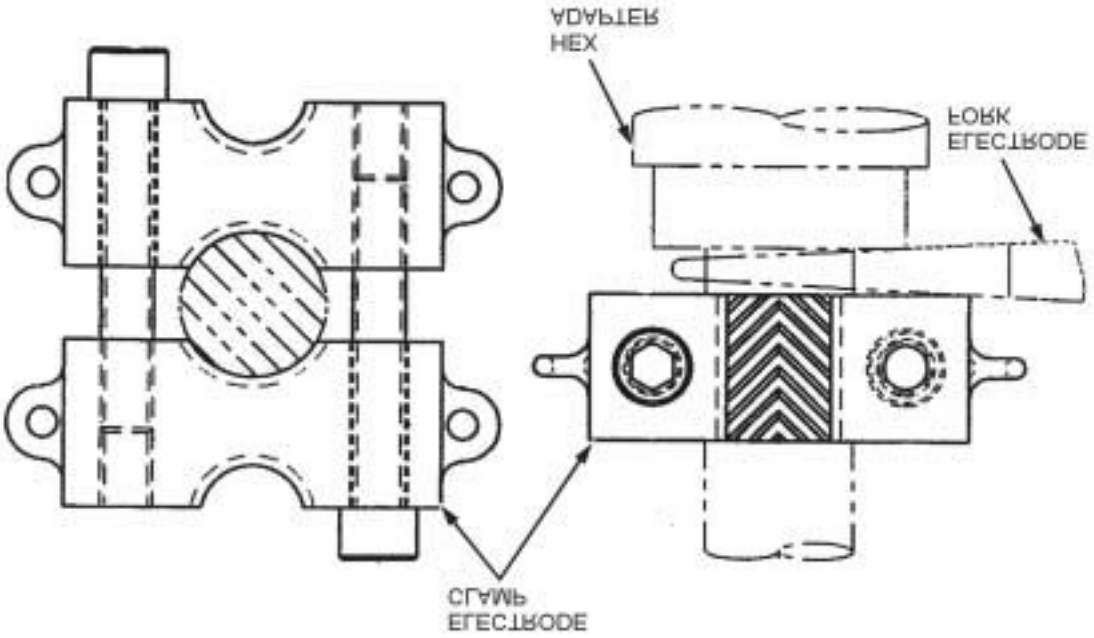


Figure 8.1: Shank Removal Tools

3. Pry shank from the hex adapter.

Shank Installation (Tapered End)

1. Install weld cap on shank.
2. Align shank with hex adapter.
3. Place electrode fork “WG-10818-51” over weld cap. See Figure 8.2.
4. Strike with rubber mallet until shank is secure. See Figure 8.2.

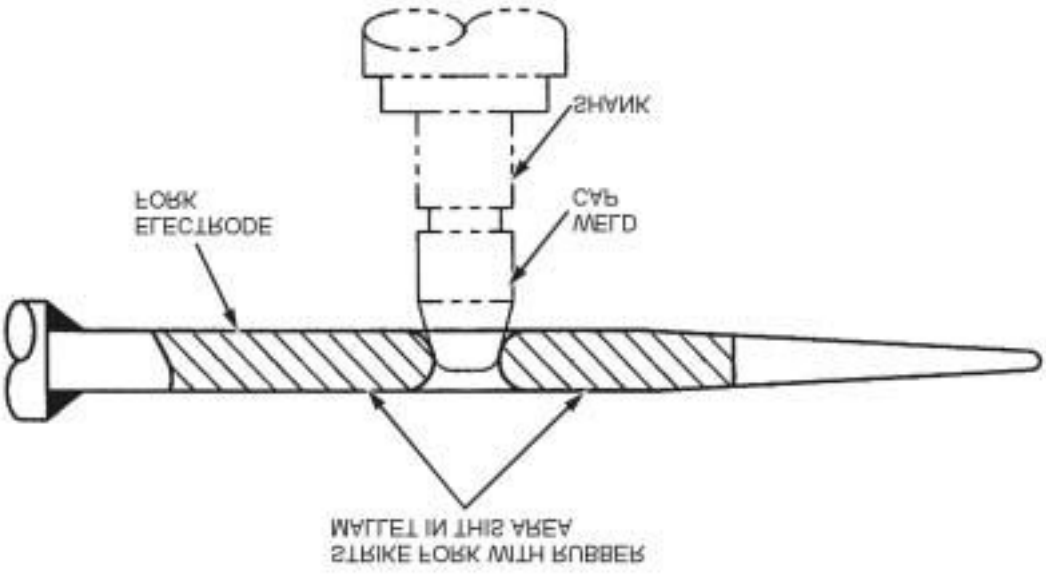


Figure 8.2: Shank Installation

Shank Removal (Barrel Lock Retension)

1. Remove barrel lock assembly.
2. Remove shank from gun body / electrode holder.

   NOTE: Slight rotation may be necessary as shank is pulled from gun body / electrode holder to break it free.

Shank Installation (Barrel Lock Retension)

1. Inspect the gun body / electrode holder for a clean and smooth contact surface. Lightly sand or hone if necessary.
2. Install the proper o-ring per shank diameter. Apply Copper Lube 188 Compound.
3. Insert shank into gun body / electrode holder, guide deflector tube thru the center of the shank.
4. Install the barrel lock assembly and align shank tip properly as related to the opposing tip/tooling.

Shank Removal (Key Retension)

1. Remove the hex head screw and related hardware from the gun body, to free the key.
2. Remove the key.
3. Remove the shank from the gun body.

   NOTE: Slight rotation may be necessary as shank is pulled from the gun body to break it free.

Shank Installation (Key Retension)

1. Inspect casting point hole for a clean and smooth contact surface, lightly sand or hone if necessary.
2. Install proper o-ring per shank diameter. Apply Copper Lube 188 Compound.

CAUTION: Care must be taken when guiding the o-ring past the sawcut in the gun body to prevent damage to the o-ring.

3. Insert shank into casting, guide deflector tube thru the center of the shank.
4. Insert key in to the key slot in the shank, thru the saw cut. Aligning the tips.
5. Insert hex head screw and related hardware, torque to proper specifications, to secure key and shank in place.

Pivot Pin

Pivot Pin Removal (Keeper Style)

1. Remove socket head screw from the keeper.
2. Slide keeper out of the pivot pin groove.

WARNING: Once the pivot pin is removed from the gun assembly, the gun bodies are free to move. Be sure to properly support the gun bodies and necessary components to prevent injury.

3. Using a rubber mallet and undersize alignment pin, drive the pivot pin out of the gun assembly.

Pivot Pin Installation (Keeper Style)

1. Inspect the pivot bushings and washers for excessive wear.
2. Replace all bushings and washers that do not meet original specifications.
3. Lightly coat all mating surfaces with an approved grease.
4. Support the gun bodies into the mounting bracket and insert an undersized alignment pin.
5. Insert the pivot pin and slowly extract the alignment pin, until the pivot pin is completely thru the mounting bracket and or the gun bodies.
6. Insert the keeper into the pivot pin groove. Rotate pin until keeper screw holes align with mounting bracket tapped holes.
7. Install keeper screws and tighten to proper torque specifications, safety wire when required.

Pivot Pin Removal (Shoulder Bolt Style)

1. Remove socket head screw from the keeper.
2. Slide the keeper out of the pivot pin groove.
3. Remove hex locknut from the pivot pin

WARNING: Once the pivot pin is removed from the gun assembly the gun bodies are free to move. Be sure to properly support the gun bodies and necessary components to prevent injury.

4. Using a rubber mallet and undersize alignment pin, drive the pivot pin out of the gun assembly.

Pivot Pin Installation (Shoulder Bolt Style)

1. Inspect the pivot bushings and washers for excessive wear.
2. Replace all bushings and washers that do not meet original specifications.
3. Lightly coat all mating surfaces with an approved grease.
4. Support the gun bodies into the mounting bracket and insert an undersized alignment pin.
5. Insert the pivot pin and slowly extract the alignment pin, until the pivot pin is completely thru the mounting bracket and or the gun bodies.
6. Insert the keeper into the pivot pin groove. Rotate the pin until the keeper screw holes align with the mounting bracket tapped holes.
7. Install the keeper screws and tighten to proper torque specifications, safety wire when required.
8. Install hex locknut to proper torque specifications.

Deflector Tube

Deflector Tube Removal

1. Remove the shank.
2. Unscrew the deflector tube from the gun body.

Deflector Tube Installation

Water is circulated through a flexible deflector tube assembly, which is inserted through a hole in the electrode holder and into the drilled hole in the electrode shank. The water enters through the inside diameter of the tube and returns over the outside diameter. The flexible tube should stop within 1/4" of the end of an electrode shank. If the tube is inserted too deep, it will restrict the flow of water, which can cause the electrode tip to deform, resulting in poor quality welds. See Figures 8.3, 8.4 and 8.5.

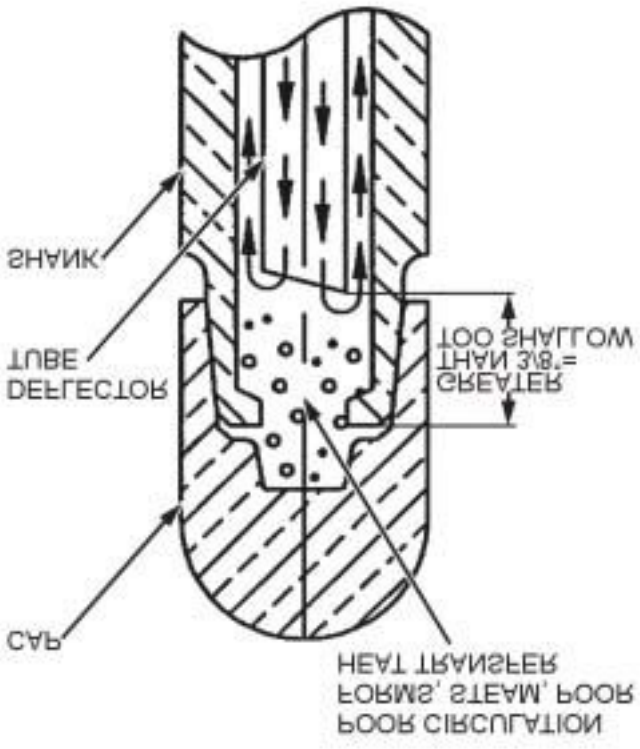


Figure 8.3: Deflector Tube Too Shallow

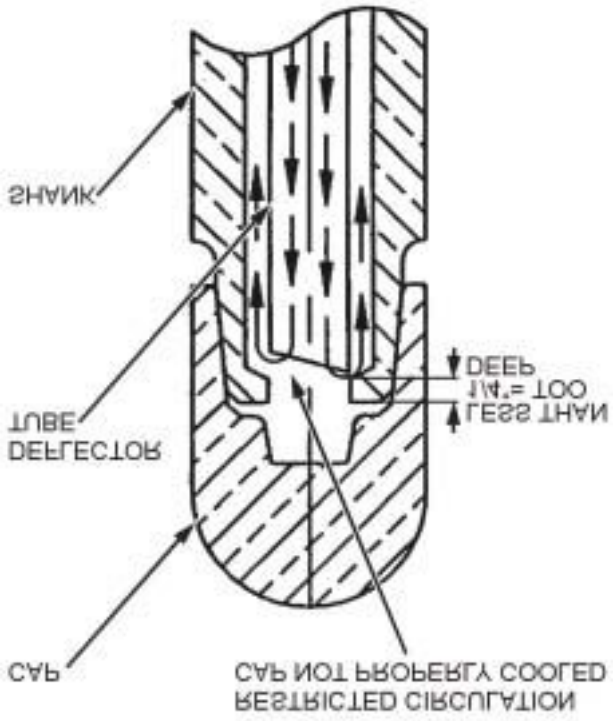


Figure 8.4: Deflector Tube Too Deep

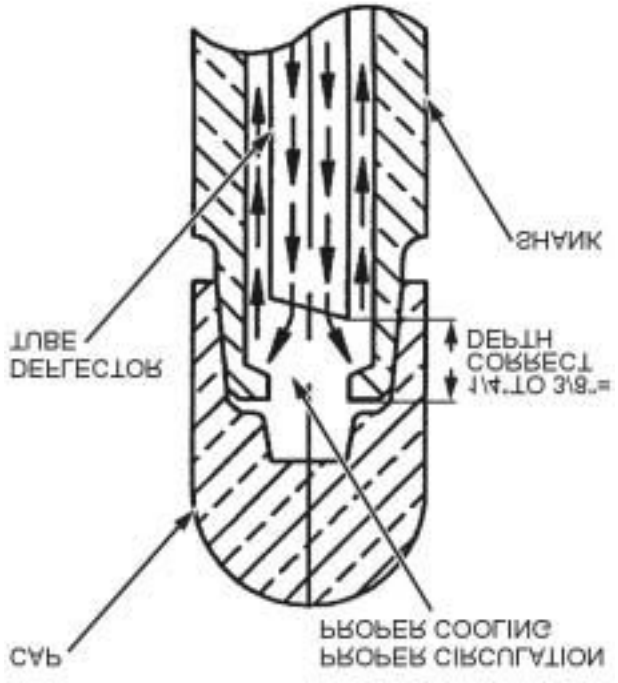


Figure 8.5: Deflector Tube Correct Depth

Flexible water deflector tube components are available in two diameters: large, (7mm Dia. HE-705-53); and, small, (.210" Dia. HE-705-58).

If required, the flexible deflector tube assy., (HE-778), can be made by combining small and large tubes as shown below. This type tube assy. is to be used on all electrode shanks, bent or straight. See Figure 8.6.

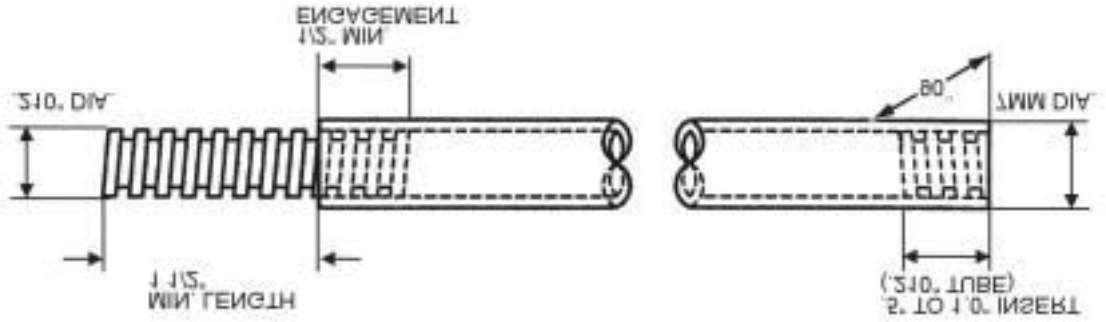


Figure 8.6: Flexible Deflector Tube Assy. Fabrication

CAUTION: Insert a .5" to 1.00" piece of HE-705-58 tubing, as shown, to prevent the FEP tubing from collapsing and being threaded too deep into water fitting, which will restrict water flow. Deflector tube end must be cut square to prevent excessive engagement. See Figure 8.7.

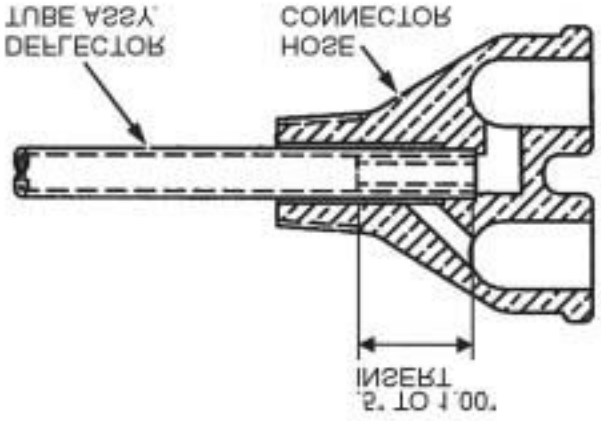


Figure 8.7: Deflector Tube Insert

1. Screw the deflector tube into the gun body.
2. Install the shank
3. Install water connection. See Figures 8.8, 8.9 and 8.10.

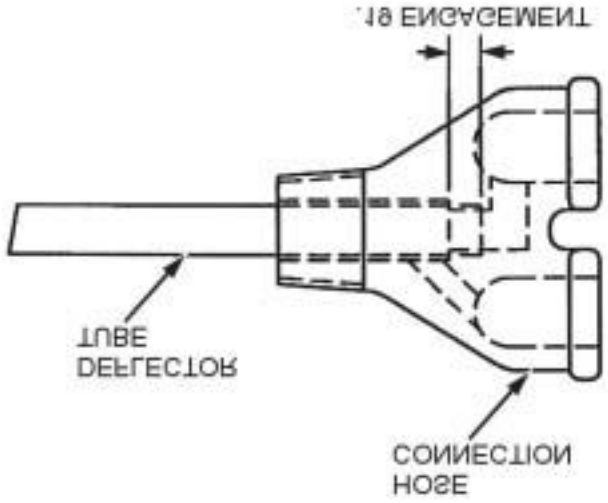


Figure 8.8: Hose Connection (Prior to 01AP97)

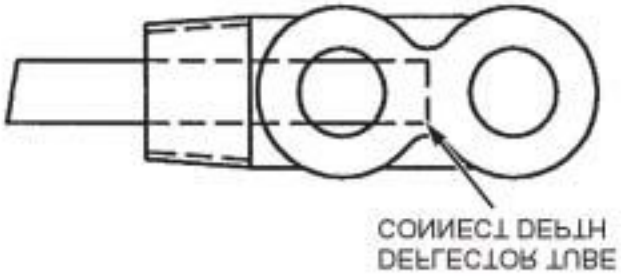


Figure 8.9: Deflector Tube Correctly Installed in Connector

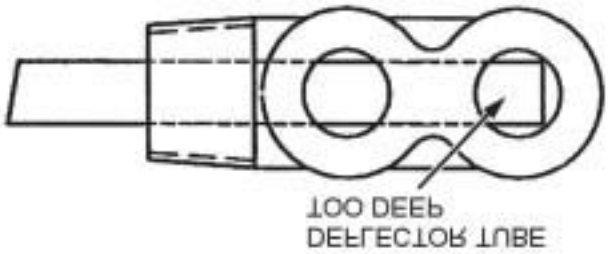


Figure 8.10: Deflector Tube Improperly Installed in Connector

CAUTION: The "stickout" of the HE-705-53 water deflector tube should be .50 -1.00 to ease the installation of the HE-705-58 water deflector tube. However, avoid having the HE-705-53 water deflector tube enter too tight a bend radius of an electrode shank. Too tight a bend radius can contribute to water flow restriction. See Figure 8.11.

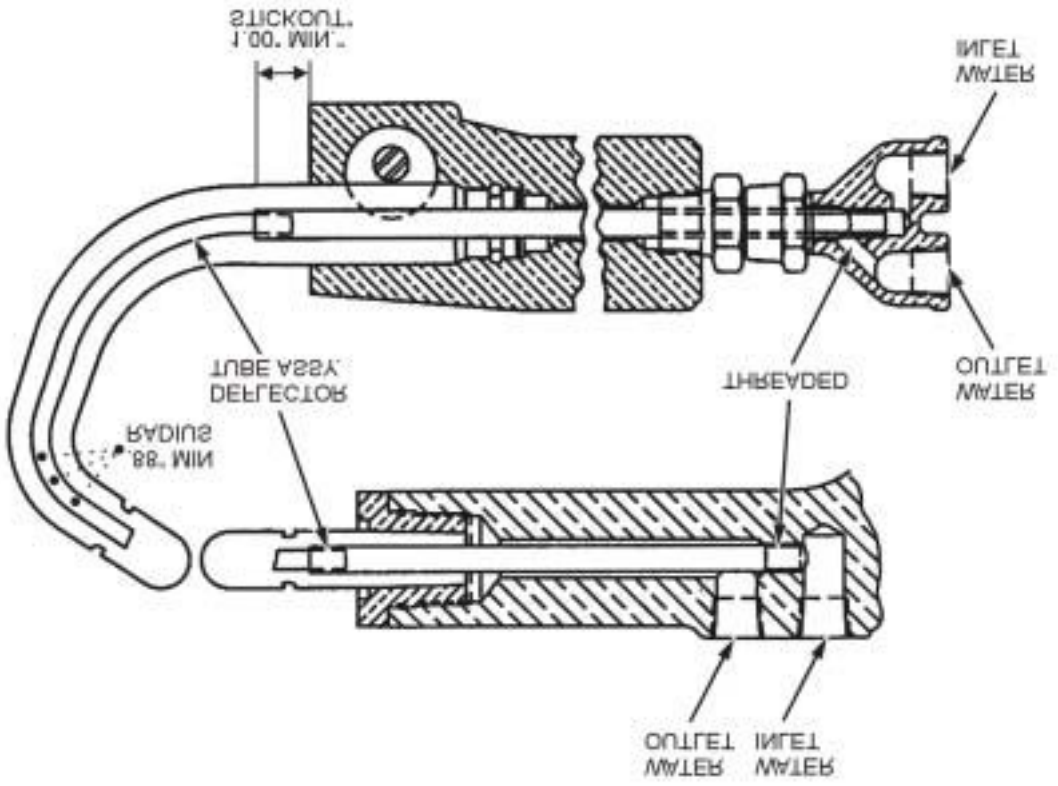


Figure 8.11: Deflector Tube In Place

Link Assembly

Link Assembly Removal

1. Close weld gun assembly tips.
2. Remove snap rings or cotter pins from the link pins.
3. Using a drive pin, tap the piston rod end link pin out.
4. Retract the cylinder piston rod to provide clearance.
5. Using a drive pin, tap the moveable gun body link pin out.
6. Remove the link assembly from the weld gun assembly.

Link Assembly Installation

1. Replace the bushings in the moveable gun body and the piston rod end.
2. Lightly grease all wear surfaces with an approved grease.
3. Slide the link over the moveable gun jaw.
4. Align the hole in the link with the moveable gun body hole and slide the link pin through.
5. Extend the cylinder piston rod forward and slip the link over the piston rod.
6. Align the hole in the link and the hole in the piston rod and slide the link pin through.
7. Place the snap rings and or cotter pins through the link pins.

Clevis Assembly

Clevis Assembly Removal

1. Close the weld gun assembly by extending the cylinder until the weld tips touch. Then remove all air pressure from the cylinder assembly.
2. Remove the snap rings from the clevis pins.
3. Using a drive pin, tap the piston rod end clevis pin out.
4. Retract the cylinder rod, therefore pulling the cylinder rod out of the clevis assembly.
5. Using a drive pin, tap the moveable gun body clevis pin out.
6. The clevis can now be removed from the gun assembly.

Clevis Assembly Installation

1. Replace the bushing in the moveable gun body and the piston rod end.
2. Slide the clevis over the moveable gun body. Lightly grease all wear surfaces with an approved grease.
3. Align the clevis and moveable gun body holes and slip the clevis pin through.
4. Extend the cylinder piston rod forward into the clevis assembly.
5. Align the clevis and piston rod holes and slip the clevis pin through.
6. Place the snap rings on both pins.

Chapter 9: Preventive Maintenance

General Information

Maintenance means “To keep in proper condition”. Only through regular, complete, and timely maintenance can the productivity of the equipment be kept at a high level.

Lubrication Requirements

Table 9.1 lists the lubrication requirements for the weld gun components.

Table 9.1: Lubrication Requirements

Component	Lubrication
Gun Body	No lube points.
Gun, hex adapter	Copper lube. If adapter is removed and then replaced.
Cylinder (in use)	No lubrication required unless mist air is supplied to cylinder.
	CAUTION: Mist air lubrication destroys cylinders permanent lubrication. If mist air is used, it must continue to be used.
	ACCROLUBE® - High efficiency grease, fortified with Teflon ®
Cylinder (rebuild)	

General Maintenance Practices

When performing maintenance, some general practices should be followed at all times.

- Keep detailed records of all maintenance items performed. Records of maintenance work are very useful in determining potential problem areas and preventing them from causing machine breakdowns. Any defects found during inspections should be corrected immediately.
- While maintaining and servicing the equipment, always follow the company lockout procedure.
- Keep the equipment clean at all times.
- For frequency of cleaning, inspection, adjustments and replacement of items, refer to the Periodic Maintenance Schedule documented in Table 9.2.
- Equipment maintenance should be scheduled and performed as recommended.

NOTE: Report problems and damage to supervision immediately.

Preventive Maintenance Schedule

Table 9.2 is the Preventive Maintenance Schedule for the Weld Guns and their components.

Table 9.2: Preventive Maintenance Schedule

Component	Maintenance Frequency/Action		
	5000 Cycles	**50,000 Cycles**	**100,000 Cycles***
Weld Tips	Replace Tips	Check Tip Pressure	
Deflector Tubes	Inspect for excessive wear. Replace if necessary.		
Flash Shield	Inspect for excessive wear. Replace if necessary.		
Shanks	Inspect for excessive wear. Replace in necessary.		
Gun Casting	Check entire gun area for excessive heat.		Inspect for cracking and stress. Replace as necessary.
Spring Equalizer		Inspect for excessive wear and correct tension. Replace if necessary.	
Shunts/Cable Bolts/Buss Bars		Check for correct torque Adjust as necessary.	
Piston Rod Wiper Scraper		Inspect for excessive wear. Replace as necessary.	
Cylinders			* Cylinders Only: 1,000,000 cycles: Disassemble and inspect al components for excessive wear. Rebuild or replace cylinder as necessary.
Pilot Pin Bushings			Inspect for excessive play. Replace as necessary.
Gun Weldments			Inspect structural integrity of the gun. Replace gun if necessary.

Chapter 10: Trouble Shooting

General Information

This chapter contains troubleshooting guidelines for the weld guns. See Table 10.1.

Tables

Table 10.1: Troubleshooting Guidelines

Problem	Cause	Remedy
Low Tip Force	Air Supply Incorrect	Check air supply at cylinder.
	Weld Gun Binding	Replace pivot pin bushing.
	Cracked Casting	Replace casting.
	External Oil Leak	Rebuild cylinder.
	Internal Oil Leak	Rebuild cylinder.
Weld Tips/Gun Over Heating	Insufficient Water Supply	Ensure that the water supply to the weld gun meets specification.
	Water Passage Blocked in Casting	Pressure check water flow through individual components.
	Incorrect Length Deflector Tube Installed or Tube Broken	Replace with correct length tube.
	Casting Leaking	Replace casting.
Tips Misaligned	Loose Barrel Locks	Tighten socket head cap screws.
	Missing Keyway	Replace keyway.
	Cracked Shank	Replace shank.
	Improper Installation	Reinstall tips.
	Cracked Casting	Replace casting.
Poor Welds	Incorrect Weld Schedule	Reload proper schedule.
	Poor Water Cooling	See Weld Tips/Gun Overheating.
	Worn Weld Caps	Replace caps.
	Incorrect Tip Pressure	See Low Tips Force.
	Contaminants On Parts To Be Welded	Clean parts.

Table 10.1: Troubleshooting Guidelines (con't)

Problem	Cause	Remedy
Poor Welds	Poor Part Fit up	Check clamps and tooling.
	Loose Electrical Connections	See Low Weld Tip Amperage.
Low Weld Tip Amperage	Loose Electrical Connection or Corrosion	Clean and tighten connection as required.
	Worn Shunts/Cables	Replace worn parts as necessary.
	Faulty Transformer	Replace transformer.
	Improper Weld Schedule	Reload proper schedule.
	Cranked Shanks	Replace shanks.
	Worn Weld Caps	Replace weld caps.

Chapter 11: Test Procedures

General Information

This chapter documents the Weld Gun Check Out and Test Procedures used to test the Grossel Tool Company weld guns. These procedures provide separate tests for the weld gun assemblies and the cylinder assemblies.

Equipment

Use the following equipment during testing.

- Turck Proximity Switch Test Instrument
- Liquid Filled Air Pressure Gages, 10 - 160 PSI
- Water Flow Meters, 0 - 8 gpm
- Commercial Short Tester
- Roman Master Impedance Tester, Model IM-91
- Weld Probe Force Gage, Sensor Development Inc., Model MM315A
- MEDAR Weld Controller, Model MEDWELD 200

Cylinder Assembly Testing

Following assembly, test the cylinders at:

- 10 psi and 100 psi air pressure for free and smooth operation.
- 100 psi air pressure for any indications of external air leaks.
- 100 psi air pressure for any indications of internal leaks (bypass) by applying air to the ports one at a time and checking the remaining ports for leakage.

Test cylinder proximity switches for proper operation by connecting the Turck tester to the proximity switch and activating the cylinder.

Weld Gun Inspection

During assembly, inspect the weld guns to ensure that:

- The cylinder is the one specified in the bill of material.
- All electrical contact surfaces are clean and silver plated.
- All required screws, pins, washers and nuts N.M.S.S. are installed.
- All flash shields and covers are installed.
- Weld stroke and retract stroke openings are correct and documented.
- Weld tips are properly aligned (±.020).
- Deflection at the tips is within specification.
- Fabrication meets good workmanship requirements.
- All movable components are lightly greased.
- All insulators are properly installed.
- Pivots are free and smooth throughout total gun movement.
- All burrs and sharp edges are removed.
- All locknuts are properly tightened.
- Water tubes meet the design intent and are trimmed to the correct length, ¼ in. below the cap adapter tip.
- All air water ports are correctly marked.
- All detail parts are marked with the correct part number and match the assembly drawing bill of material.

Weld Gun Testing

After assembly perform the following:

- Test the gun for water leaks and proper water flow.
- Cycle the gun 200 full strokes at the air pressure specified on the assembly drawing.
- Inspect the gun for shorts throughout its entire travel.
- Perform an impedance test and record the results.
- Verify the weld tip pressure as specified on the weld gun assembly drawing and record the results.
- Cycle the gun at the rated weld force. The gun must pass a minimum of 10,000 Amps RMS (cap to cap) for ten cycles of weld without any indication of overheating. Record the secondary amperage for integral transformer style guns.
- Test all proximity switches for proper operation.
- Test all cylinders for external and internal leaks at all ports.

Chapter 12: Specifications

General Information

This chapter contains:

- Water cooling requirements for the guns
- Pneumatic specifications for the regulators for the dual piston cylinders
- A list of key Grossel contacts

Water Cooling Requirements

- The water cooling system incorporates a pressure differential of 12-15 psi minimum and 20-40 psi maximum.
- The water flow is one gallon of water per minute minimum with 0.5 gallons per minute minimum from each gun arm holder.

The cooling water diagrams are shown in Figures 12.1 and 12.2.

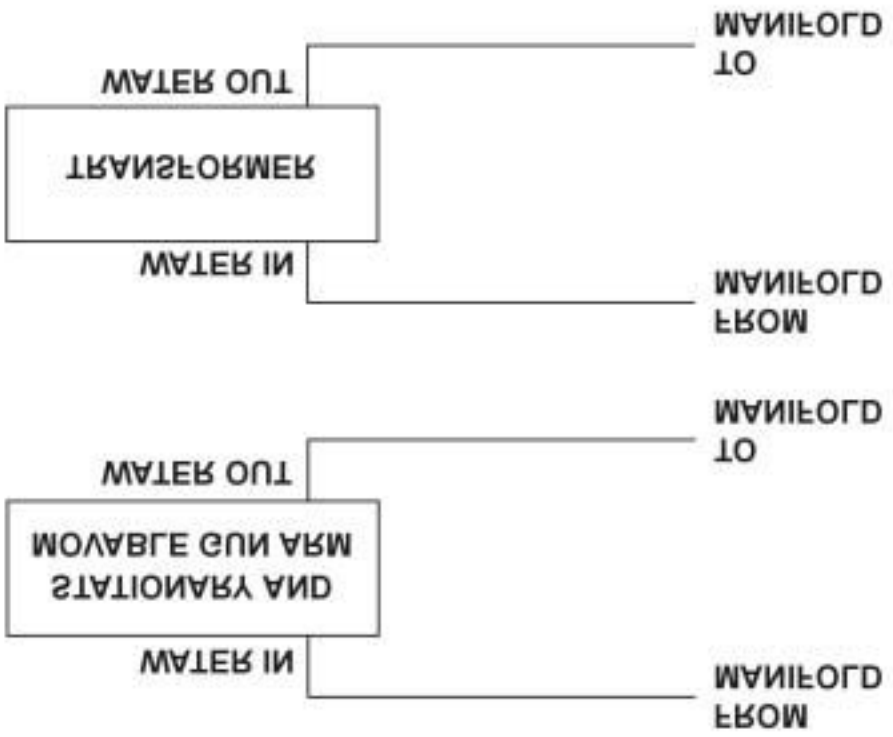


Figure 12.1: Cooling Water Diagram for Stationary and Movable Guns with Transformers

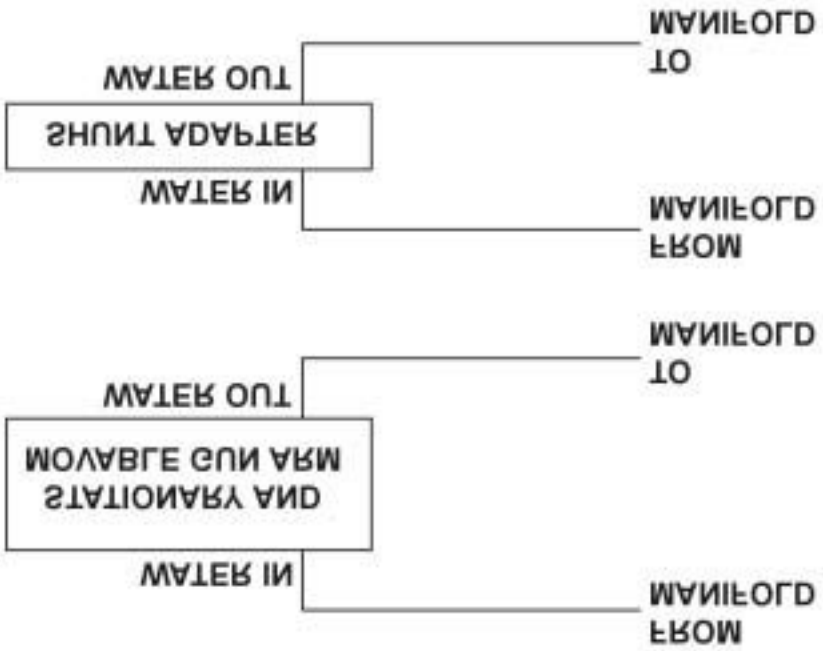


Figure 12.2: Cooling Water Diagram for Stationary and Movable Guns without Transformers

Pneumatic Specifications

The following specifications are general and are provided for general setup. Weld Stroke Forward specifications are directly related to tip force. Refer to the Appendix.

General Specifications

- Pneumatic Supply Line Length: ≤ 10 ft (recommended for best response time).

- Regulator settings for the air supply:
  Retraction Forward (if equipped):
  minimum = 80 psi
  maximum = line pressure
  Retraction Return (if equipped):
  minimum = 80 psi
  maximum = line pressure
  Weld Stroke Forward:
  Set by customer using tip gauge.
  This specification is directly related to tip force.
  Refer to the Appendix.
  Weld Stroke Return: 80 psi or weld stroke forward

Pneumatic diagrams for the most common hook ups are provided below. Refer to Figures 12.3 through 12.10 as needed

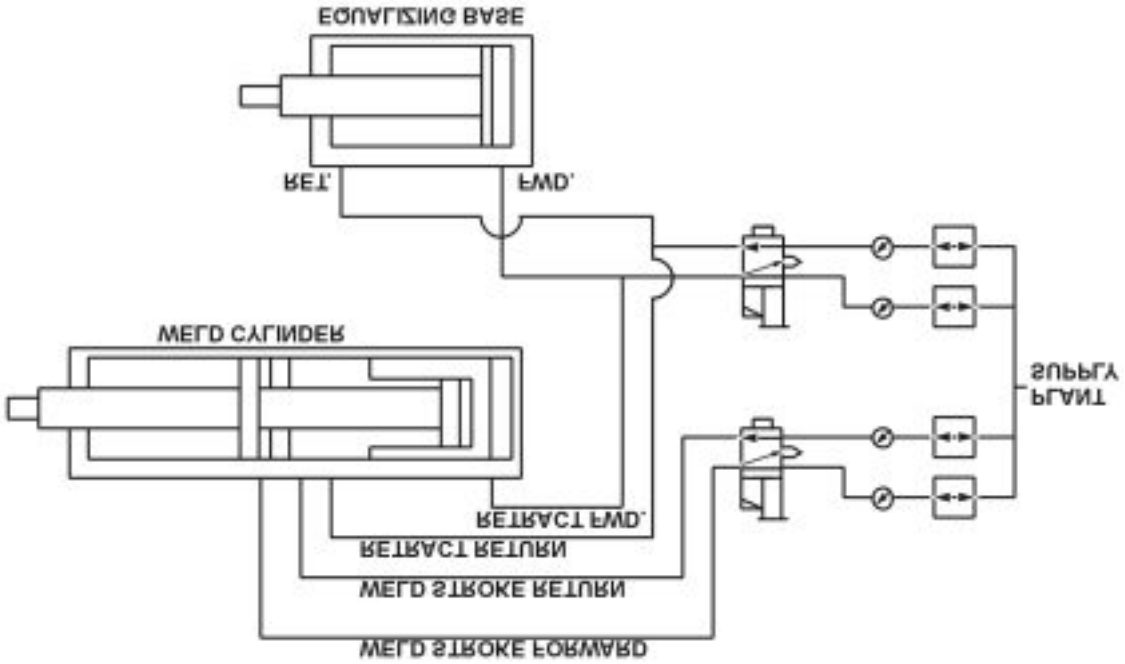


Figure 12.3: Pneumatic Diagram for Retractable Cylinder Equalizing Base

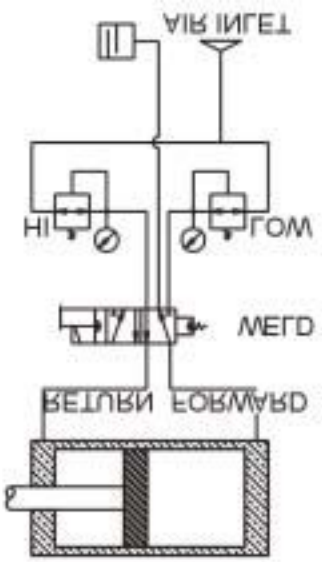


Figure 12.4: Pneumatic Diagram for Standard Cylinder

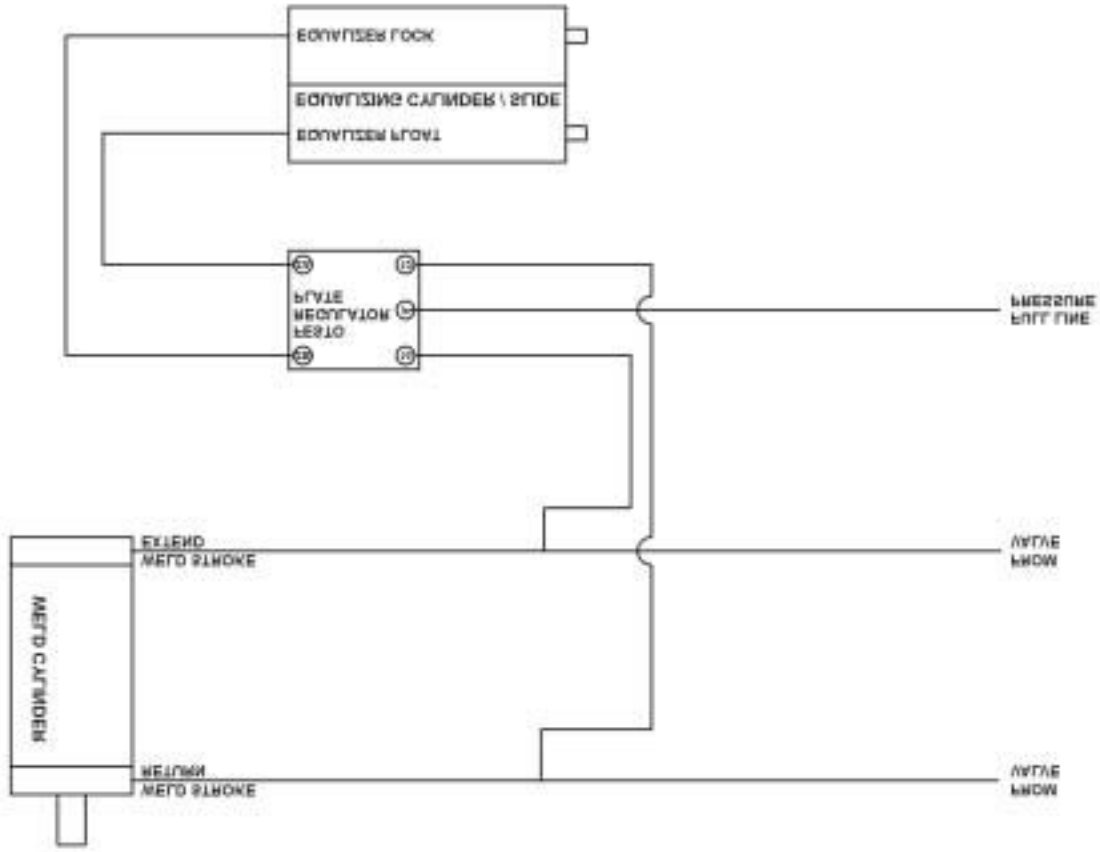


Figure 12.5: Robot C-Type 2 Port Standard Air Cylinder Utilizing A Single Air Slide Or Air Spring Cylinder And Requiring Festo Regulator Plate

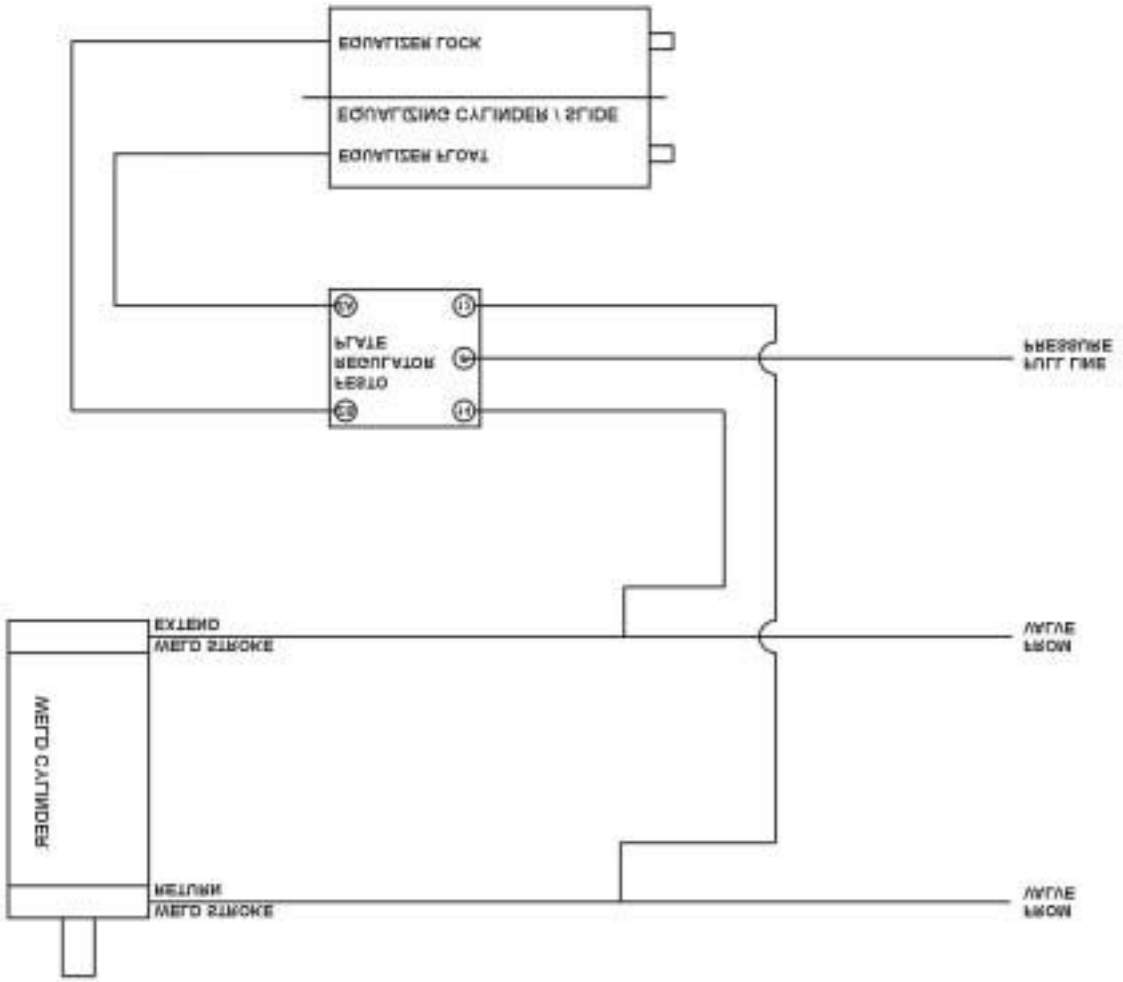


Figure 12.6: Robot C-Type 2-Port Standard Air Cylinder Utilizing A Single Air Slide Or Air Spring Cylinder And Not Requiring Festo Regulator Plate On Pedestal Guns Not Being Fully Piped.

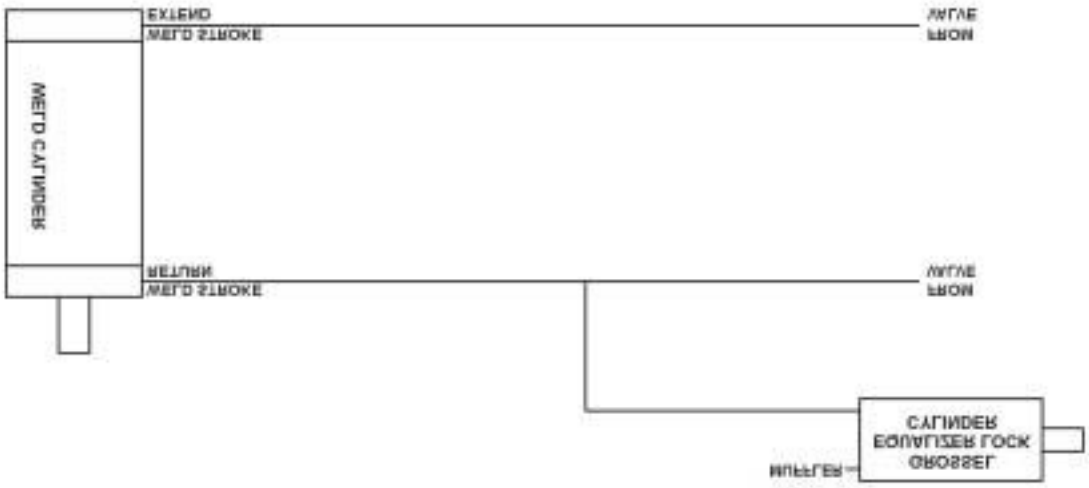


Figure 12.7: Robot Pinch & Scissor 2 Port Standard Air Cylinder Utilizing A Grossel Cylinder As An Equalizer Lock

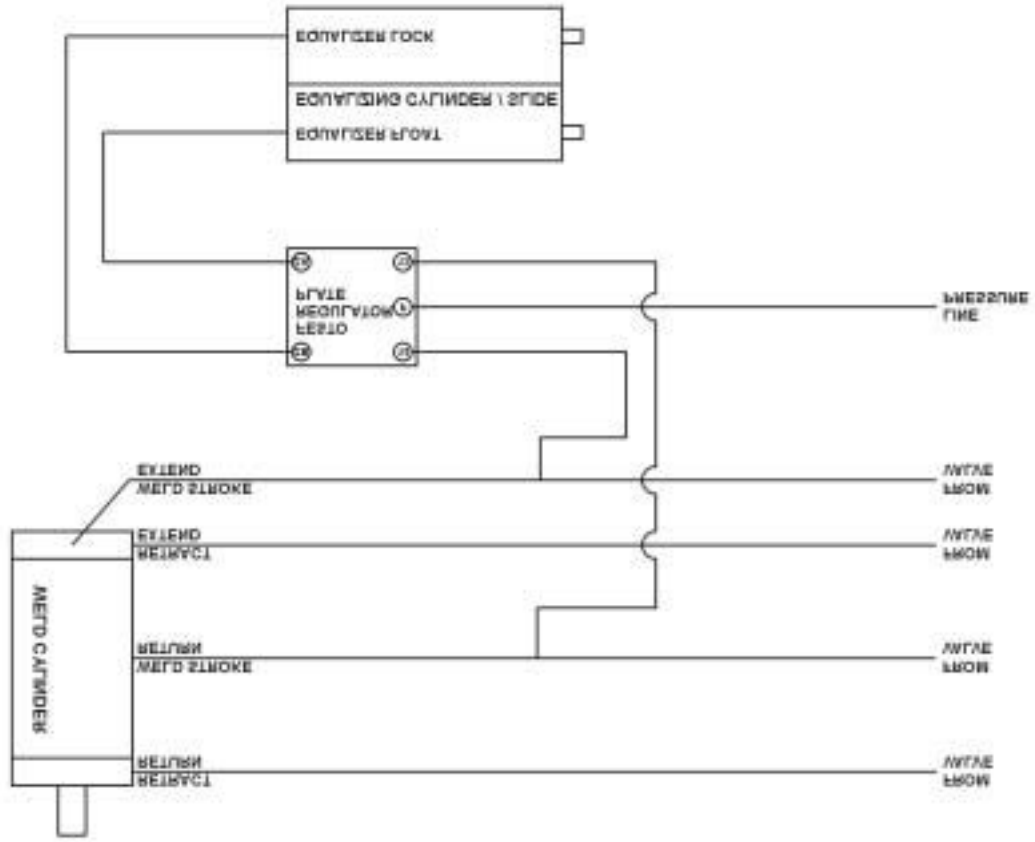


Figure 12.8: Robot C-Type 4 Port Retractable Air Cylinder Utilizing A Single Air Slide Or Air Spring Cylinder And Requiring Festo Regulator Plate

Figure 12.9: Robot Pinch And Scissors Std Lock Cylinder 4 Port Retractable Air Cylinder Utilizing A Grossel Cylinder As An Equalizer Lock

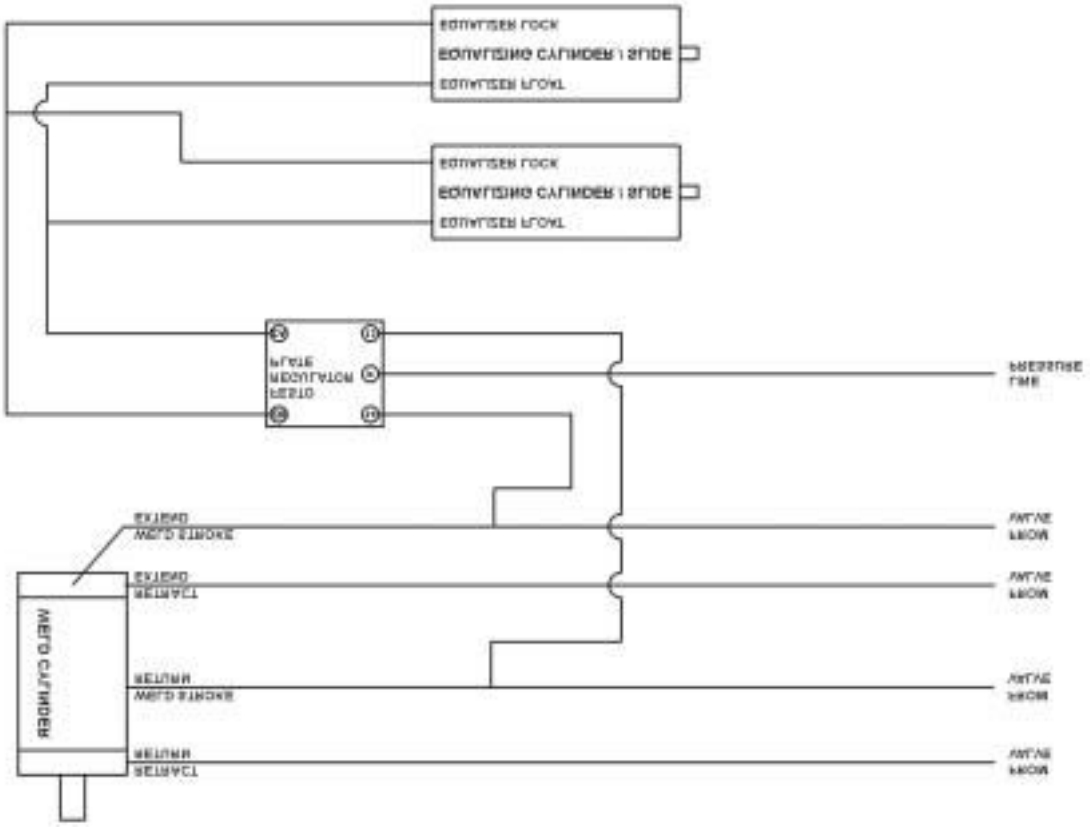


Figure 12.10: Robot Pinch And Scissors With Air Spring 4 Port Retractable Air Cylinder Utilizing Dual Festo Air Cylinders And Requiring Festo Regulator Plate

Grossel Contacts

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Chapter 13: Appendix

General Information

Tip Force Measurement

To determine the ratio of a gun, use the following procedure:

1. Close the tips of the gun.
2. Measure from the centerline of the pivot point to the center line of the cylinder. This value is m.
3. Measure from the centerline of the pivot point to the center of the weld tips. This value is n.
4. Set the ratio for the gun to m:n.

See Figure 13.1.

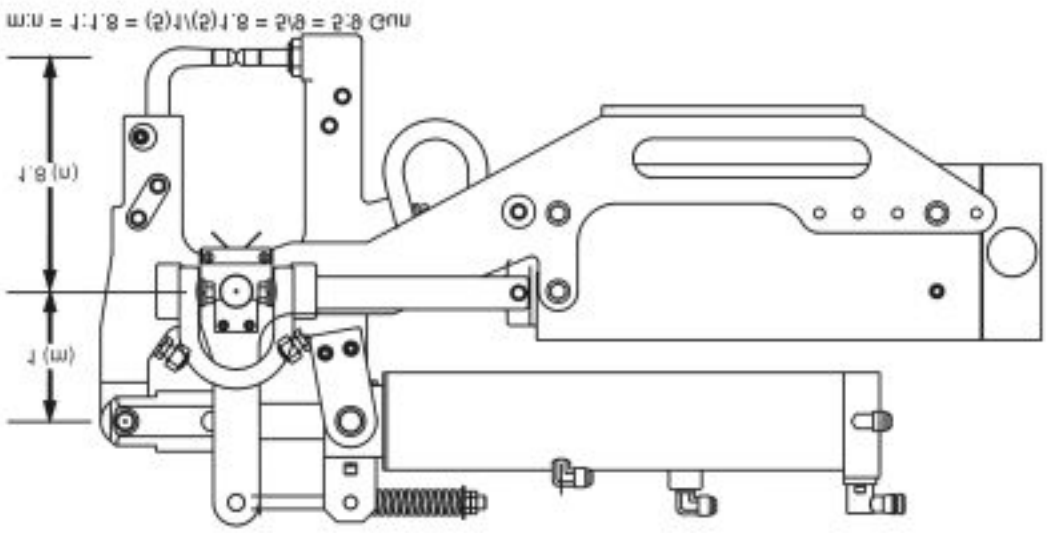

Figure 13.1: Tip Force Measurement

Tip Force Calculation

Tip force is a function of piston surface area, air line pressure and the mechanical ratio of piston movement to tip movement. Thus, the general formula:

Tip Force = PRF * MR
where: PRF = Piston Rod Force
(Piston Surface Area * Air Line Pressure)

MR = Mechanical Ratio of Piston Movement to Tip Movement

For C-Type Guns, and typical Pinch-Type and Scissor-Type Guns, the mechanical ratio is 1:1. Thus the Tip Force is equal to the Piston Rod Force.

Tip Force = PRF X m/n
m = piston movement =1 (m = n)
n = tip movement =1 (n = m)

Table 13.1 shows the tip force for 1:1 guns. For guns where the mechanical ratio is not 1:1, tip force will be less than piston rod force. The tip force formula is then:

Tip Force = PRF X m/n
where: PRF = Piston Rod Force
m = piston movement = m<n
(m less than n)
n = tip movement = n>m
(n greater than m)

To calculate the tip force produced by a given cylinder for guns that have a mechanical ratio other than 1:1, use Table 13.1 as follows:

- Locate the area of the cylinder used on the gun.
- Locate the current air line pressure value.
- The cell in the table where these two intersect is the 1:1 ratio tip force/piston rod pressure.
- Multiply this value by the mechanical ratio for the gun in question.

The result is the tip force for the gun at the current air line pressure.

For example, if the gun is a 5:9 gun and the 1:1 ratio tip force/piston rod force is 1080 lbs., the gun tip force would be 600 lbs
(1080 x 5/9 = 600).

Table 13.1: Tip Force/Piston Rod Force – 1:1 Ratio Guns

Line	Cylinder Area														
PSI	5.98	7.65	8.00	9.51	10.00	11.57	13.00	13.60	15.00	15.75	18.00	18.40	21.00	21.25	24.30
85	508	650	680	808	850	984	1105	1176	1275	1344	1530	1569	1785	1811	2070
80	478	612	640	761	800	926	1040	1106	1200	1264	1440	1477	1680	1704	1948
75	448	573	600	713	750	868	975	1037	1125	1185	1350	1384	1575	1598	1826
70	418	535	560	666	700	810	910	968	1050	1106	1260	1292	1470	1491	1704
65	388	497	520	618	650	752	845	899	975	1027	1170	1200	1365	1385	1583
60	359	459	480	571	600	694	780	830	900	948	1080	1107	1260	1278	1461
55	329	420	440	523	550	636	715	761	825	869	990	1015	1155	1172	1339
50	299	382	400	476	500	579	650	692	750	790	900	923	1050	1065	1217
Tip Force/Piston Rod Force															