



Split Mandrel Puller
Tooling Manual

OM-SM-9302-3



West Coast Industries

Seattle, Washington



Coldwork Tooling Manual

Table of Contents

Section 1—Introduction

1.1	Introduction	1
1.2	Typical Applications	2

Section 2—Coldwork Procedure

2.1	Introduction	3
2.2	Assembling Tooling	3
2.3	Hole Preparation	5
2.4	Coldwork the Hole	6
2.5	Final Steps	6

Section 3—Puller Gun

3.1	Introduction	7
3.2	Theory of Operation	7
3.3	Disassembly	11
3.4	Assembly	12
3.5	Broken or Stuck Mandrel	14

Section 4—Extension Nosecap

4.1	Introduction	16
4.2	Nosecap Removal and Assembly—Standard & Quick Change	16

Section 5—Troubleshooting 18

Section 6—Appendix -

6.1	Retrofitting a Boelube Pump	22
6.2	Schematic	23
6.3	Parts List	24

Section 1—Introduction

1.1 Introduction

The West Coast Industries, Inc. hydraulically powered, pneumatically controlled, puller guns are used to pull a tapered mandrel through the workpiece in the coldworking process. The Model 300 is used to coldwork hole diameters up to $27/64$ " (12-3-N), while the Model 400 will coldwork holes between $3/8$ " (12-0) and $43/64$ " (20-3); both offer a maximum material stackup of $3\frac{1}{2}$ inches in aluminum.

While it is normally recommended our customers return the units to WCI for maintenance and repair, this manual is provided for those customers having tool repair facilities and trained technicians available to perform these types of repairs. It is important to note, due to the high hydraulic pressures developed by the unit, any repair or service must be in strict accordance to the steps outlined in this manual.

1.2 Typical Applications

Refer to Figure 1-01. A standard nose cap may be used for most applications of coldworking. For restricted access situations wherein lateral access problems exist, it may be necessary to utilize a nose extension on a standard puller gun.

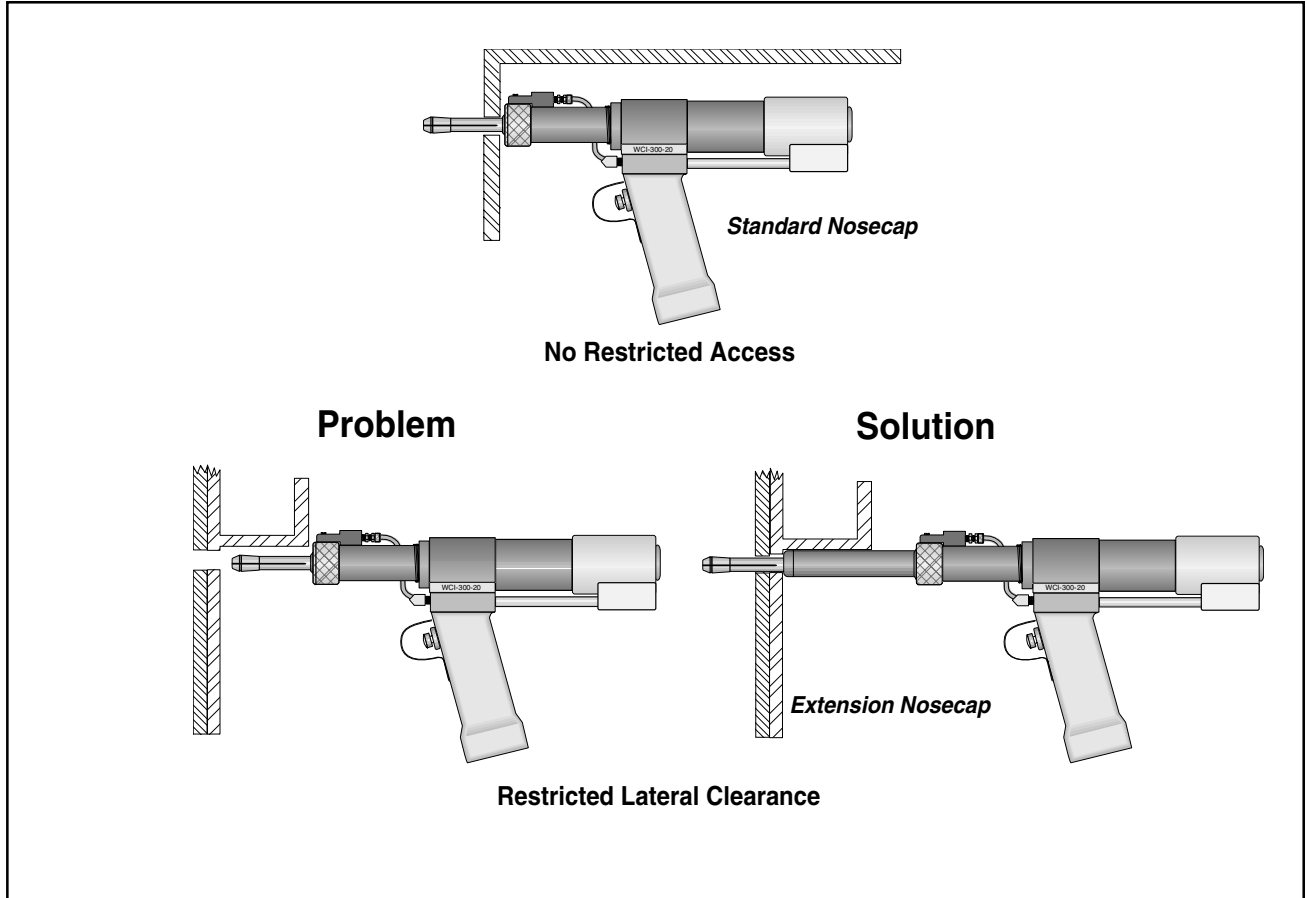


Figure 1-01

Section 2—Coldworking Procedures

2.1 Tooling Selection

- 2.1.1 Select the proper puller unit, mandrel, pilot and nosepiece for the hole size to be processed.
- 2.1.2 Refer to Figure 2-01 for an overview of the coldworking process.
- 2.1.3 Check mandrel wear by inserting the inspection pin in the hollow mandrel (this takes the place of the internal pilot). Check mandrel with no-go mandrel wear gage.
- 2.1.4 Check pilot wear utilizing the pilot wear gage. If the pilot goes through the wear gage slot, the pilot is worn and must be replaced.

2.2 Assemble Tooling

WARNING

Do not remove any part of the puller unit while it is connected to the power pak or supply air source. Failure to comply may cause serious injury.

2.2.1 Removal of Nosecap and Barrel

Refer to Figure 2-02.

- 2.2.1.1 Remove the nosecap by loosening three set screws around its circumference.

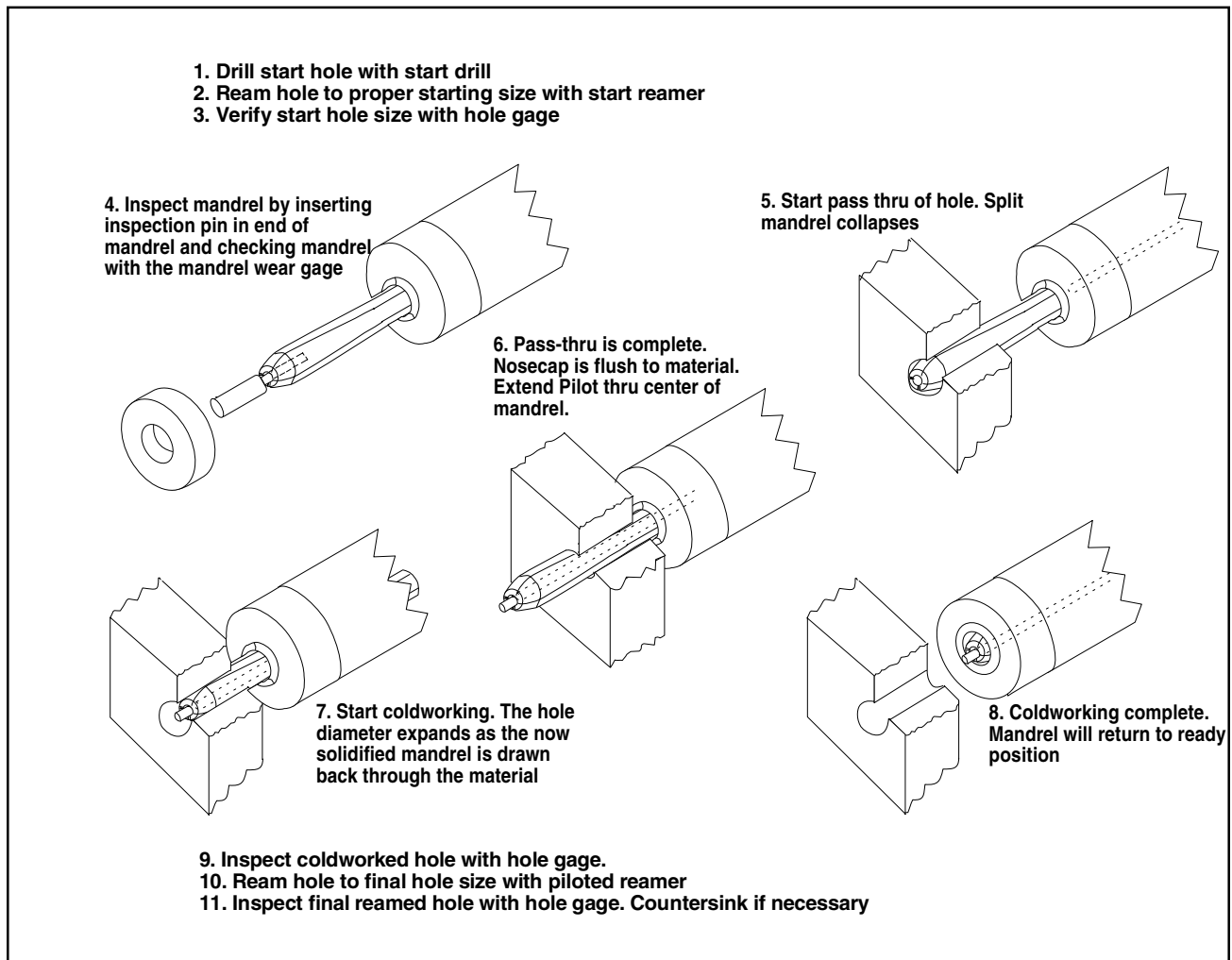


Figure 2-01

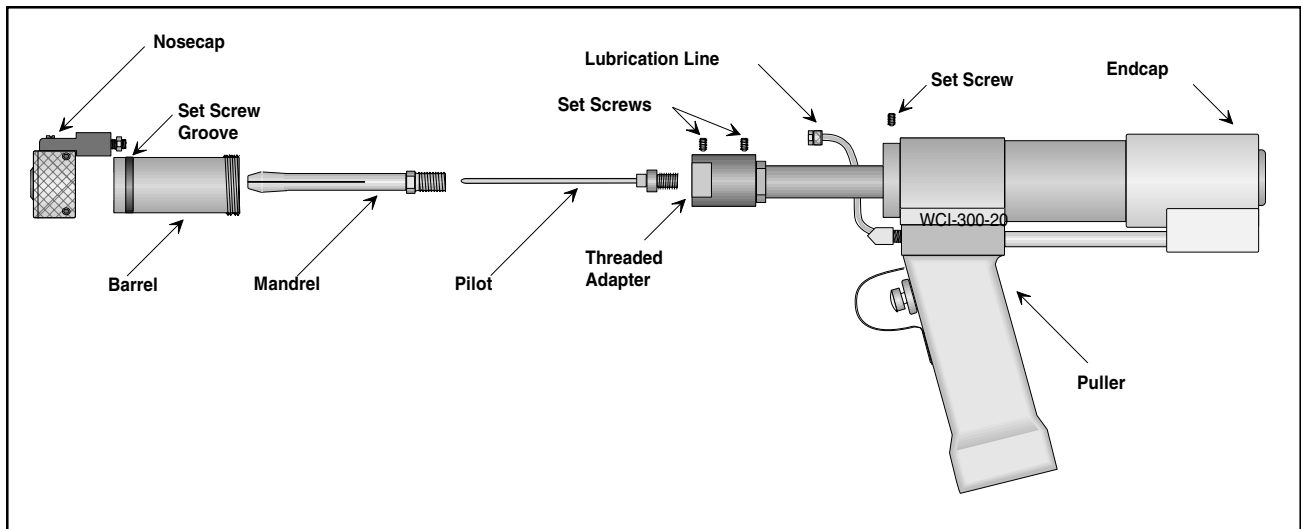


Figure 2-02

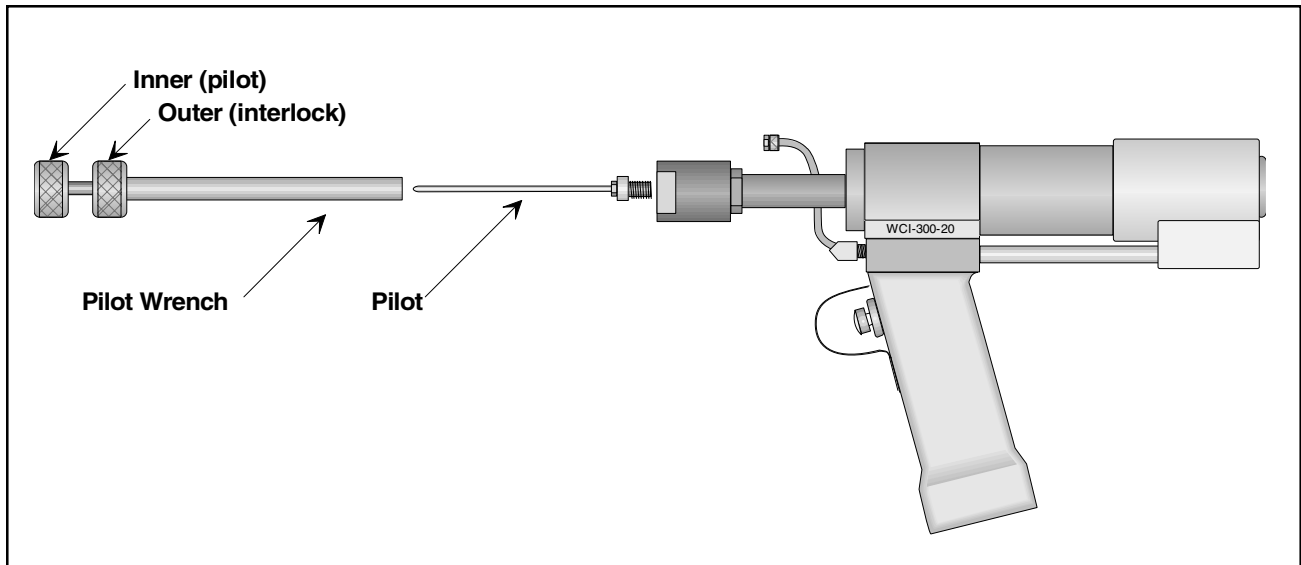


Figure 2-03

- 2.2.1.2 Remove the acorn nut on the lubrication line. Pull lubrication line from fitting on nosecap.
- 2.2.1.3 Slide the nosecap from the mandrel and barrel.
- 2.2.1.4 Remove the barrel from the puller unit by loosening the set screw located on the housing. Remove the barrel exposing the threaded adapter.
- 2.2.1.5 Loosen the set screw in the threaded adapter and remove the mandrel by unthreading it from the threaded adapter.

2.2.2 Pilot Removal

- 2.2.2.1 Use the appropriate pilot wrench set to remove the pilot from the puller unit (*ref fig 2-03*).
- 2.2.2.2 Insert the wrench set into the threaded adapter until the inner wrench is seated on the hex portion of the pilot. Rotate the knurled knob of the inner wrench from side to side while at the same time pressing lightly against the wrench. This insures the wrench is seated on the hex of the pilot.

2.2.2.3 Slide the outer wrench into the threaded adapter until it is seated on the hex portion of the safety interlock. Rotate the knurled knob of the outer wrench from side to side while at the same time pressing lightly against the wrench. This insures the wrench is seated on the hex of the safety interlock.

2.2.2.4 While holding the outer wrench, turn the inner wrench counterclockwise until the pilot is free from the safety interlock.

2.2.2.5 Remove both wrenches with the pilot.

2.2.3 Pilot Installation

2.2.3.1 To install the pilot, insert the long rod end of the pilot into the inner wrench until the hex is seated (the threaded end of the pilot should be sticking out from the wrench).

2.2.3.2 Insert the inner wrench into the outer wrench.

2.2.3.3 Insert this entire assembly into the threaded adapter.

2.2.3.4 Slide the outer wrench into the threaded adapter until it is seated on the hex of the safety interlock. Rotate the knurled knob of the outer wrench from side to side while at the same time pressing lightly against the wrench. This insures the wrench is seated on the hex of the safety interlock.

2.2.3.5 While holding the outer wrench, turn the inner wrench (clockwise) until the pilot is seated into the safety interlock. Do not overtighten. Finger tight is sufficient.

2.2.3.6 Remove the two wrenches from the threaded adapter. Insure the safety interlock is seated against the valve in the end cap by pushing the pilot toward the end cap.

2.2.4 Thread the corresponding mandrel into the threaded adapter until it is seated. Tighten the set screw on the threaded adapter to hold the mandrel in place.

2.2.5 Installation of Barrel and Nosecap

2.2.5.1 Re-install the barrel onto the puller unit. Tighten the set screw on the housing when the barrel is seated.

2.2.5.2 Slide the corresponding nose cap onto the mandrel until it is seated on the barrel. Position the nose cap by turning to the desired position. Tighten the three (3) set screws to hold it in place.

2.2.5.3 Re-install the lubrication line into the fitting on the nose cap. Tighten the acorn nut. Do not overtighten. Finger tight, then $\frac{1}{4}$ turn with a wrench is sufficient.

2.2.6 Final Setup

2.2.6.1 Connect the puller unit to the power unit via the quick connect fittings on the hose assembly.

2.2.6.2 Connect an air supply line to the power unit.

2.2.6.3 Cycle the puller unit by depressing the trigger.

2.2.6.4 The pilot will extend, the power unit will activate causing the mandrel to retract.

2.2.6.5 Releasing the trigger will stop the power unit when the mandrel has completely retracted.

2.2.6.6 The lubrication line may have lost an amount of lubricant. To replenish this supply, the puller hose assembly must be connected to the power unit. Press the prime button, located on the lubrication system on the power unit. Lubricant can be visibly seen as it advances toward the nose cap. When all of the air is removed from the lubrication line, release the prime button on the lubrication system.

2.2.6.7 The puller unit is ready for coldworking.

2.3 Hole Preparation

2.3.1 Drill and/or ream the hole to proper starting hole dimensions. Clean the hole after all machining operations have been completed. The pre-cold-worked hole shall be free of all foreign materials, including paint, sealant, metal particles and any other foreign materials.

2.3.2 Verify the start hole diameter using the correct start hole gage, or combination gage.

2.4 Coldwork the Hole

- 2.4.1 Cycle the puller unit one time to apply lubricant on the outside of the mandrel. Thereafter, lubricant will automatically be applied when the mandrel extends upon completion of a coldwork cycle.
- 2.4.2 Insert the assembled tooling completely into the hole. Ensure the nosecap is flush against the material to be coldworked. Do not side load the mandrel in the material.
- 2.4.3 Coldwork the hole by pulling the trigger on the puller gun. This will cause the pilot to extend, solidifying the mandrel as it is drawn through the material, cold expanding the hole. Release the trigger and remove the puller gun from the workpiece. The mandrel extends back to the ready position.

2.5 Final Steps

- 2.5.4.1 Verify the coldworking operation, utilizing the combination gage.
- 2.5.4.2 For holes requiring postsizing, ream the hole to the final hole size utilizing the appropriate final reamer.
- 2.5.4.3 Countersink the hole, if required.

Section 3—Puller Gun

3.1 Introduction

While it is normally recommended our customers return the units to WCI for maintenance and repair, this manual is provided for those customers having tool repair facilities and trained technicians available to perform these types of repairs. It is important to note, due to the high hydraulic pressures developed by the power pak, any repair or service must be in strict accordance to the steps outlined in this manual.

3.2 Theory of Operation

The operation of the split mandrel puller gun is a simple cylinder type function. Hydraulic fluid enters one side of the piston during the coldwork cycle and pressurized air enters the opposite side of the piston to extend the mandrel after completion of the coldwork cycle. The trigger valve, located in the handle, controls the valve in the end cap which in turn controls the cycling of the puller gun, lubrication unit and the hydraulic power supply. Refer to figure 3-01 and 3-02.

An air source is connected to the power pak, providing air to: the trigger valve in the puller gun assembly, end cap assembly, and the back side of the piston assembly. This will extend the piston and mandrel to the starting position and hold the safety interlock in the retracted position. With the safety interlock in the rearward position, the valve in the end cap is held closed. The power supply pak is not activated.

When the trigger is depressed, an air signal is sent to the trigger port of the end cap assembly. This signal unseats the safety interlock assembly. The safety interlock and pilot will advance toward the mandrel tip. The mandrel has an internal passage for the pilot. When the pilot is retracted toward the end cap of the puller gun, the segments of the mandrel will collapse, allowing the mandrel to be inserted into the hole to be coldworked. When the pilot is in its forward most position, the mandrel diameter is held in a solid configuration.

When the safety interlock travels to the forward most position, a piston is pulled forward allowing the valve in the end cap to open. An air signal is sent to the control port on the power supply, the pilot port on the "Dump" valve and the control port on the lubrication unit. This signal will close the normally open dump valve and start the pump.

The air signal to the lubrication unit will activate the pump on this unit to cycle one time, delivering a maximum of one drop of lubricant to the felt in the nose cap.

Hydraulic fluid travels through the handle of the puller gun, into the housing and forces the piston assembly, mandrel, pilot and interlock assembly to travel rearward. When the taper of the mandrel enters the hole of the material being cold worked, the nose cap reacts in the opposite direction. This is known as the "Sandwich Effect".

The piston continues to travel rearward until the interlock is seated in the end cap. This position is also when the mandrel/pilot assembly exits the material being cold worked. Upon the interlock seating in the end cap, a piston pushes the stem on the end cap valve venting the control signal to the pump, dump valve and lubrication unit. The loss of this signal deactivates the pump and opens the dump valve port. The constant air supply on the backside of the piston assembly to forces the piston to move forward, forcing the hydraulic fluid out of the puller gun and into the reservoir of the power pak. The piston/mandrel continues moving forward until it stops against the bearing in the forward end of the puller gun housing. As the mandrel extends from the nose cap it is externally lubricated for the next hole to be cold worked.

When the piston started to move forward, the interlock remained in the end cap. This is the position it must be in for the start of the cycle. The position of the interlock also maintains the valve in the end cap in the closed position waiting a signal from the trigger port.

This completes one cycle of the split mandrel puller gun.

3.3 Disassembly

Refer to Figure 3-03.

3.3.1 Hose

- 3.3.1.1 The removal of the hose assembly is normally not recommended unless a leak has developed in one of the lines. Skip to 3.3.2 if removal of the hose is not necessary.
- 3.3.1.2 Remove the hose assembly from the fittings at the bottom of the handle, by first removing the polyurethane hoses (C, L & S) from the compression fittings, then removing the hydraulic hose (H).

3.3.2 Manifold/Tube/Handle

- 3.3.2.1 Remove manifold (15) from endcap (4), by removing screws (16). Pull the manifold slightly down and back, to remove the manifold from the tubes (14). (Note 'o' rings (31) may drop from their position in manifold).
- 3.3.2.2 Remove tubes (14) from handle.
- 3.3.2.3 Remove handle from housing (2) by loosening cap screws (41). Note the position of 'o' ring (37) in the recess in handle to housing mating surfaces. Tube (36) is pressed into the housing.

3.3.3 Trigger Valve

- 3.3.3.1 Removal of two screws (52) will allow the removal of trigger guard (51).
- 3.3.3.2 Remove the trigger button (45) by loosening the set screw in the side of the trigger button.
- 3.3.3.3 Using a scribe, carefully, remove the retainer (47) which holds the valve (46) in place.

Warning

Extreme caution should be exercised when using the scribe, since carelessness may result in operator injury.

- 3.3.3.4 Grab stem on the valve (46) and remove from handle.

3.3.4 Barrel/Threaded Adapter

- 3.3.4.1 Disconnect lubrication line
- 3.3.4.2 Remove nosecap assembly

- 3.3.4.3 Removing the set screw (35) will allow removal of barrel (5) from housing (2).

- 3.3.5.1 Loosening set screws (35) will allow the removal of threaded adapter (9) from piston assembly (3).

3.3.5 Housing

- 3.3.5.1 Removal of the locknut (10) may be accomplished by removal of a roll pin, then unthreading the locknut from the piston assembly (3). Note that the locknut has one side that has a polished finish which faces the bearing end of the piston assembly.

- 3.3.5.2 Removal of the end cap (4) is rather simple once the manifold (15) has been removed (*ref para. 3.3.2*). Unthread the end cap from the housing (2). Pulling the endcap from the housing will expose the safety interlock assembly (8). The safety interlock will come out of the housing when removing the end cap assembly

- 3.3.5.3 Removal of the piston assembly can then be accomplished by pushing on the threaded end of the piston rod (3).

- 3.3.5.4 Removal of the bearing (12) can be accomplished by using a long scribe with a hook on the end. Once the scribe has been inserted from the backside of the housing (2), hook onto the wiper (33) and bearing. Gently pull out the bearing using care to prevent the scribe from damaging the bearing surface or scratching the bore of the housing.

- 3.3.5.5 After disassembly of the puller unit, remove and discard all 'o' rings, backup rings, and wiper, in order to allow cleaning and complete inspection of all parts. Check for wear or damage.

3.3.6 End Cap

- 3.3.6.1 Remove the safety interlock assembly (8) by pulling it out of the end cap (*ref fig. 3-04*). Seal friction is all that holds the interlock assembly in place.

- 3.3.6.2 Remove the screws (18) from the end cap cover (17).

- 3.3.6.3 The gasket (19) may come off with the end cap cover. If not, remove the gasket from the end cap.

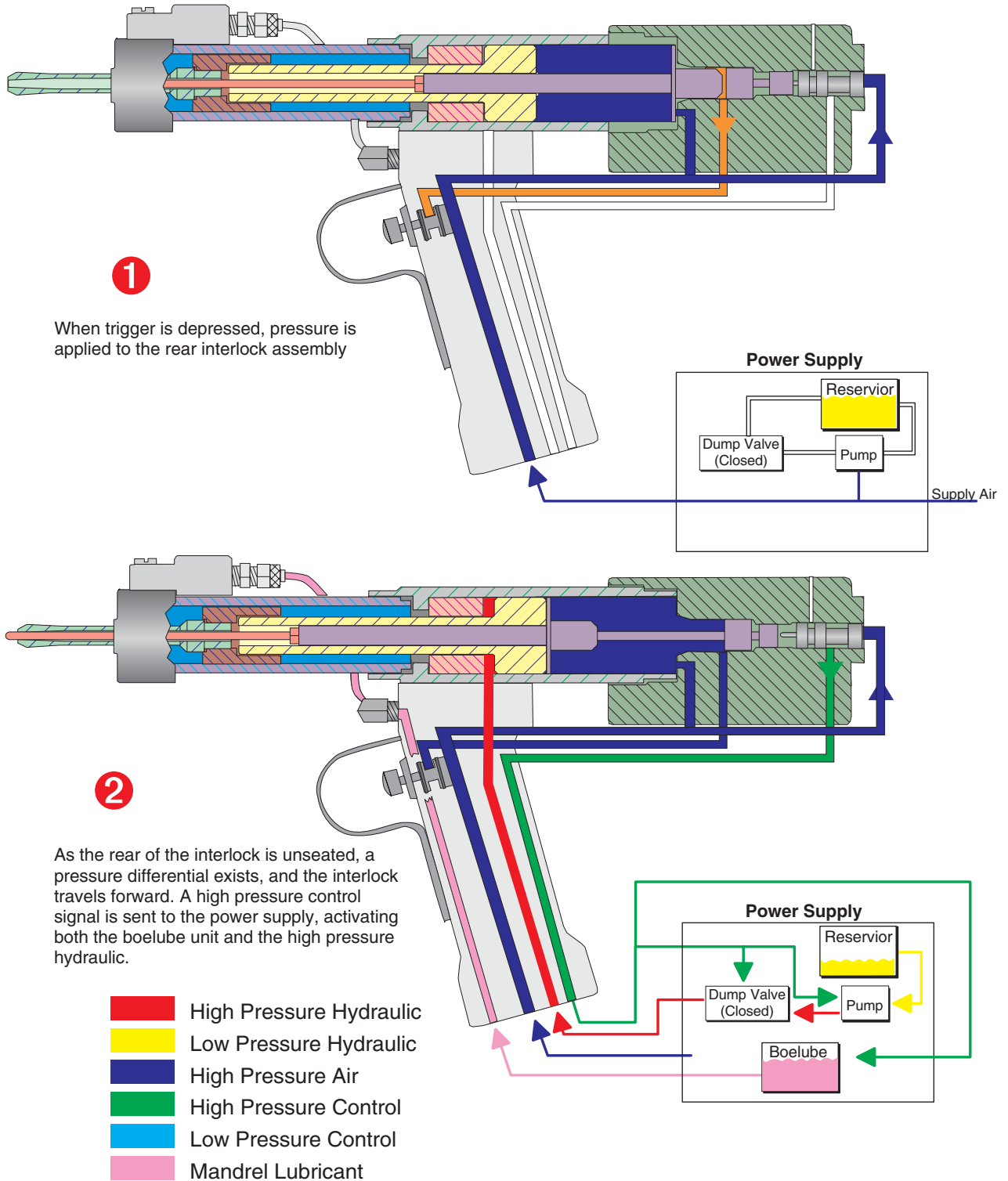


Figure 3-02

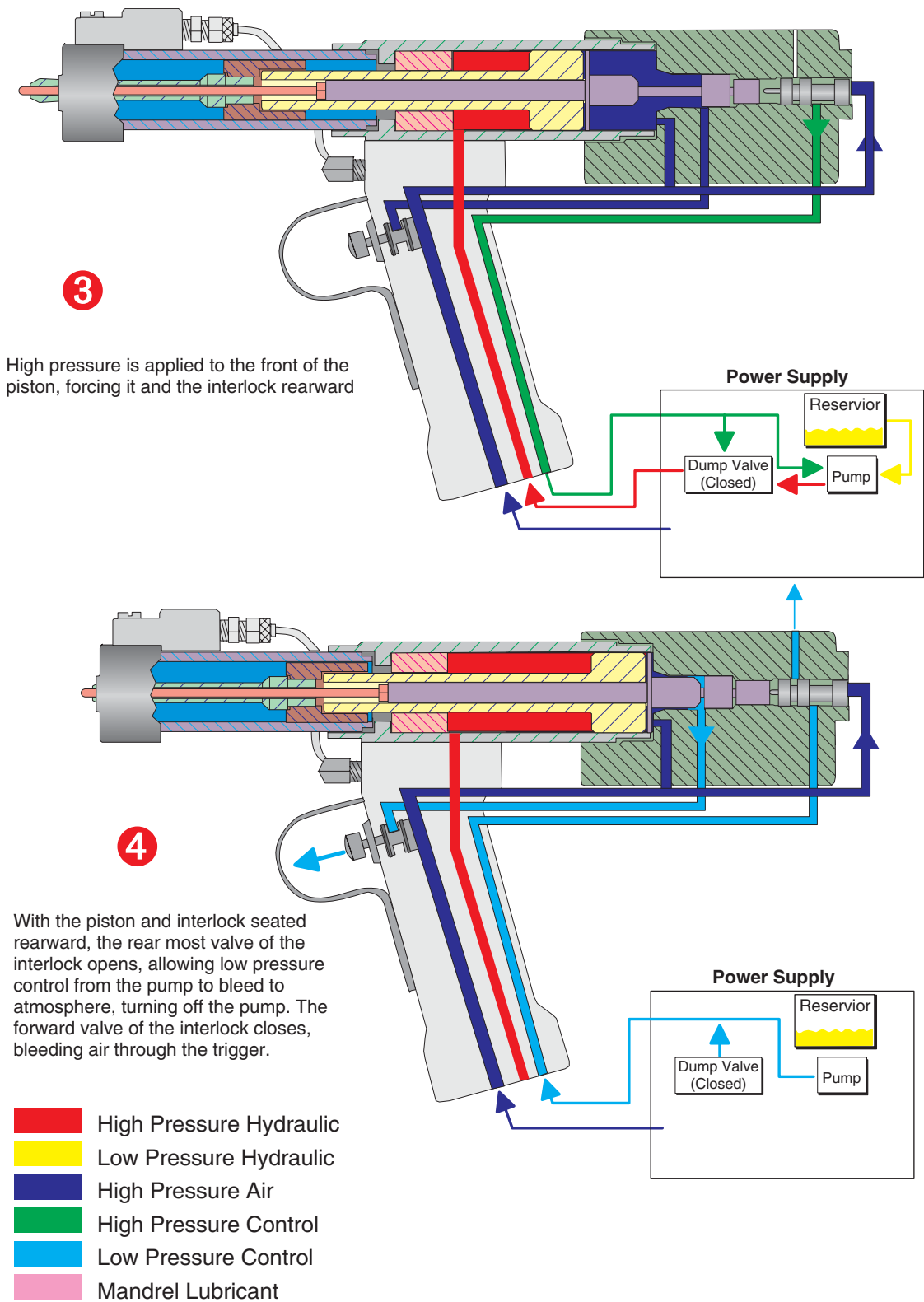


Figure 3-02 (cont.)

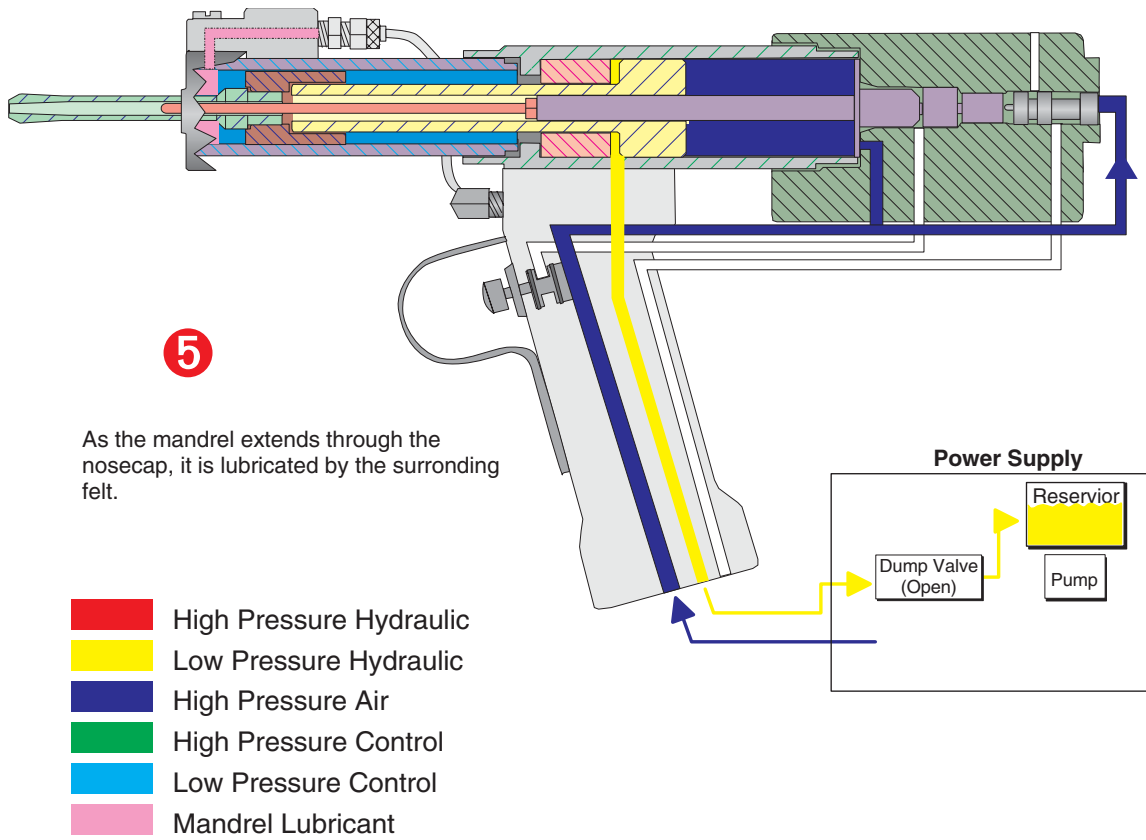


Figure 3-02 (cont.)

- 3.3.6.4 Take a rod, $\frac{5}{16}$ inch diameter or smaller, insert it in the opposite end of the end cap (large diameter). Take care not to damage the internal bores in the end cap, these are sealing surfaces. Use the rod to remove the valve (32) from the end cap.
- 3.3.6.5 Use a scribe or similar tool to remove the O-ring (29) from the recess inside the bore where the valve had been.
- 3.3.6.6 Inspect all components and seals for wear or damage. Replace all defective or questionable parts.
- 3.3.6.7 Check the mechanical movement of the valve. Press on the stem of the valve and release it. The stem should not stick or drag in the valve.

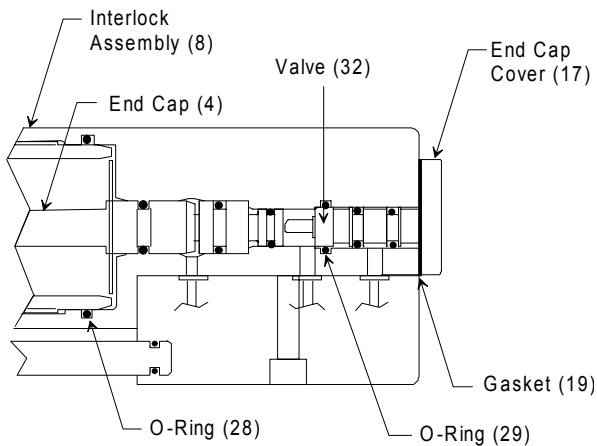


Figure 3-04

3.3.7 Piston (Shock Absorber)

- 3.3.7.1 Position the piston assembly (3) vertically with the shock absorber to the top (ref. fig. 3-06).
- 3.3.7.2 Take a scribe or small screwdriver and remove the spring clip (38) from the bore. A recess in the piston provides access to remove the clip.
- 3.3.7.3 Remove the shock absorber (11) from the piston.
- 3.3.7.4 Remove the O-ring (48).
- 3.3.7.5 Inspect all parts and replace worn or defective components.

3.4 Assembly

Note

All 'o' rings, backup rings and the wiper, should be replaced when re-assembling the puller unit. These are available from WCI as a set, WCI-300-ORK or WCI-400-ORK

- 3.4.1 All parts should be pre-lubricated where noted:
- 3.4.1.1 Use general purpose grease or o-ring lubrication grease for 'o' rings and backup rings.
- 3.4.1.2 For assemblies having moving parts, use general purpose grease.
- 3.4.2 Inspect all hydraulic and air passages, and thoroughly clean all passages and bores to ensure no metal debris or other contaminants are present.

3.4.3 Bearing

- 3.4.3.1 After pre-lubrication, install backup ring (22) onto the bearing (12), in the slot provided. 'O' ring (21) must be installed on the pressure side of the backup ring (ref fig 3-05). The backup ring has a radius which must face the adjoining 'O' ring.

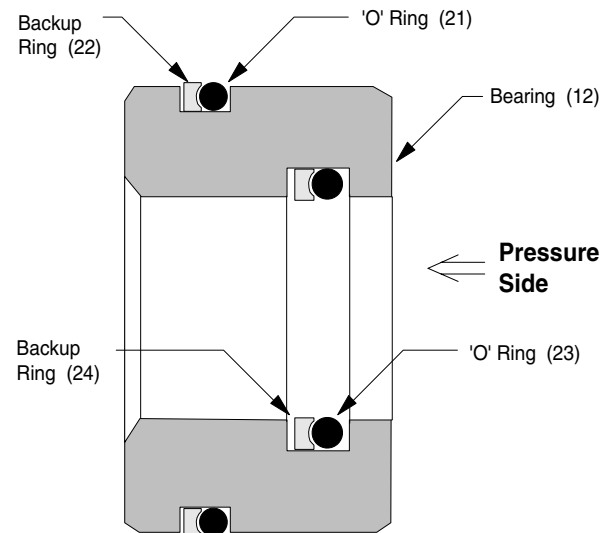


Figure 3-05

- 3.4.3.2 After pre-lubrication, install backup ring (24) and 'o' ring (23) as outlined previously in step 3.4.3.1.

- 3.4.3.3 Install wiper (33) into the housing (2) (*ref fig. 3-07*).
- 3.4.3.4 Pre-lubricate the bore of the housing (2) using general purpose grease prior to bearing (12) installation.
- 3.4.3.5 Install the bearing (12) into the housing, backup ring side first, using a plastic mallet and piston rod assembly (3). As the bearing reaches the end of the housing, align the wiper (33) into position.

3.4.4 Piston/Barrel Assembly

Ref Figure 3-06

- 3.4.4.1 Position the piston assembly (3) vertically with the brass sleeve to the top.
- 3.4.4.2 Install the O-ring (48) into the large diameter bore.
- 3.4.4.3 Install the shock absorber into the bore (shallow side first).
- 3.4.4.4 Install the spring clip (38) into groove within the bore. Be sure it is secure.
- 3.4.4.5 Deburr the threaded end of piston assembly (3) and install grease on the threads in order to prevent damage to 'o' rings in the bearing (12) during the insertion of the piston assembly into the housing. Install backup ring (26) and 'o' ring (25) using procedures previously outlined in step 3.4.3.1. Please note the backup ring will be installed to the short end of the piston rod assembly.

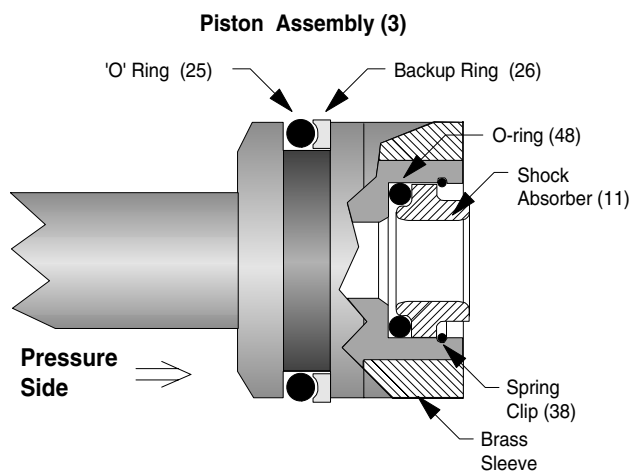


Figure 3-06

- 3.4.4.6 Insert piston assembly into housing and inspect rod threads for rubber 'o' ring material torn during installation. If 'o' ring material is present on the threads, remove piston assembly and bearing and replace the 'o' ring and re-install.
- 3.4.4.7 Install lock nut (10) onto piston rod (shiny side toward housing). Align locknut to hole in piston, and install roll pin (20) to secure locknut to piston.

Note

The shiny side of the locknut must face toward housing, as it and the piston are match drilled.

- 3.4.4.8 Install threaded adapter (9) onto piston assembly until seated against locknut. Tighten set screw (35) to lock in place.
- 3.4.4.9 Install barrel (5) into housing and tighten set screw (35).

3.4.5 Assembling Handle

- 3.4.5.1 Insert valve (46) into handle and secure with retainer (47).
- 3.4.5.2 Install trigger button (45). Tighten screw.
- 3.4.5.3 Install trigger guard (51) with screws (52).
- 3.4.5.4 If the hose assembly was previously removed, coat the hydraulic hose threads with removeable Lok-Tite and connect to handle. Teflon tape is not acceptable due to vibration! Reconnect the black banded polyurethane supply hose to 'S' on the handle, while the non banded hose control line is connected to 'C'. Connect the line with the lubrication in it to the 'L' fitting.
- 3.4.5.5 Insert 'o' ring (37) into passage recess in handle (*ref fig. 3-07*). Polish tube end (36), approximately $\frac{1}{8}$ ", to facilitate insertion into housing. Insert tube, seating firmly in place.

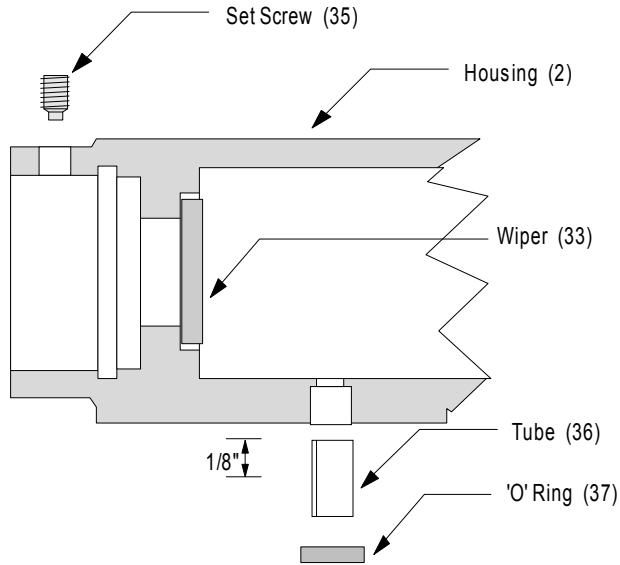


Figure 3-07

- 3.4.5.6 Install handle to housing using capscrew (41) and 'o' ring (37).

3.4.6 End Cap Assembly and Installation

- 3.4.6.1 Install O-ring (29) into recess in the small diameter bore of the end cap (*ref 3-04*).
- 3.4.6.2 Install the valve (32) into the end cap, stem first. Push it in until flush with the back of the end cap.
- 3.4.6.3 Align gasket (19) and end cap cover (17) on the end cap.
- 3.4.6.4 Secure with screws (18)
- 3.4.6.5 Install large O-ring (28) in end cap.
- 3.4.6.6 Apply grease to O-ring.
- 3.4.6.7 Thread end cap assembly onto housing until it stops.
- 3.4.6.8 Back off the end cap assembly (counter-clockwise) until alignment is made between the bottom of the end cap and the manifold to be installed in step 3.4.7.

3.4.7 Manifold and Tube Installation

- 3.4.7.1 Install O-rings (30) on each end of each tube (14).
- 3.4.7.2 Insert all three tubes in recesses in the back side of the handle assembly (66).
- 3.4.7.3 Install O-rings (31) in the recesses around the holes on top of the manifold (15).
- 3.4.7.4 Turn end cap assembly until lined up with the manifold (15).
- 3.4.7.5 Install the manifold onto the tube ends until alignment is made with the end cap.
- 3.4.7.6 Install screws (16) and tighten.

3.5 Troubleshooting

In the event a mandrel becomes stuck or broken in the workpiece, follow the suggestions below:

WARNING

Disconnect the puller unit from the power pak before performing any repair.

Do not hit the end of the puller unit attempting to free the mandrel. This will damage the puller unit and will not remove the mandrel.

3.5.1 Stuck Mandrel

- 3.5.1.1 If a mandrel becomes stuck in the workpiece, release the trigger on the puller pak.
- 3.5.1.2 Disconnect the supply air line to the power pak.
- 3.5.1.3 Pull puller unit back as far as possible.
- 3.5.1.6 Use an abrasive cutoff wheel to remove the threaded end of the mandrel by cutting through the small diameter of the mandrel and pilot.
- 3.5.1.7 The cutoff wheel should leave the end of the mandrel, which is stuck in the workpiece, square as possible.
- 3.5.1.8 Using either a rivet gun or a bolt remover, place the anvil of the tool on the square surface of the mandrel and drive it out of the workpiece.

3.5.1.9 Inspect the hole in the workpiece after removing the mandrel.

3.5.1.10 Either re-coldwork the hole if it is not damaged, or oversize the hole to the next larger size and coldwork.

3.5.2 Broken Mandrel

3.5.2.1 Depending upon how much of the broken mandrel is remaining, square the broken end of the mandrel with a cutoff wheel or grinder.

3.5.2.2 Make a cylindrical tool that will fit the broken end of the mandrel but is smaller than the hole in which the mandrel is stuck.

3.5.2.3 Repeat steps 3.5.1.9 and 3.5.1.10 under "Stuck Mandrel"

Section 4—Extension Nosecap

4.1 Introduction

The extension nosecap for the puller gun is used for restricted access situations where the regular, flush nosecap is not suitable.

4.2 Nosecap Removal & Assembly—Standard and Quick Change Versions

WARNING:

Do not perform any part removal without disconnecting the puller gun from the power pak. Serious injury will result.

(Refer to Figure 4-01, as well as Section 2 for instructions on removing barrel, nosecap and threaded adapter, as well as instructions on the pilot, safety interlock and connection to power pak.)

- 4.2.1 Remove existing flush nosecap, barrel and threaded adapter.
- 4.2.2 Install threaded adapter, which is different than that supplied with a standard nosecap, on piston assembly. Thread the adapter on until it contacts the lock nut.
- 4.2.3 Tighten the set screw in the threaded adapter.
- 4.3.4 Pilot Extension
 - 4.2.4.1 Take any pilot, insert it through the threaded adapter until it contacts the safety

interlock. Thread the pilot into the safety interlock by hand until it stops.

- 4.2.4.2 Grasp the pilot, pull it out of the piston assembly until it stops. Remove the pilot from the safety interlock.
- 4.2.4.3 Insert the male end of the pilot extension into the threaded adapter. Thread the pilot extension into the safety interlock assembly by hand.
- 4.2.4.4 Take the pilot extension wrench (*ref. fig. 4-02*), slide the notched out portion of the wrench onto the shank of the pilot extension. Slide the wrench into the threaded adapter until it contacts the safety interlock assembly.
- 4.2.4.5 Rotate and lightly push the wrench until it is seated on the hex portion of the safety interlock assembly.
- 4.2.4.6 While holding the pilot extension wrench, use a small crescent wrench or equivalent to tighten the pilot extension.
- 4.2.4.7 Remove the pilot extension wrench from the pilot extension and push the pilot

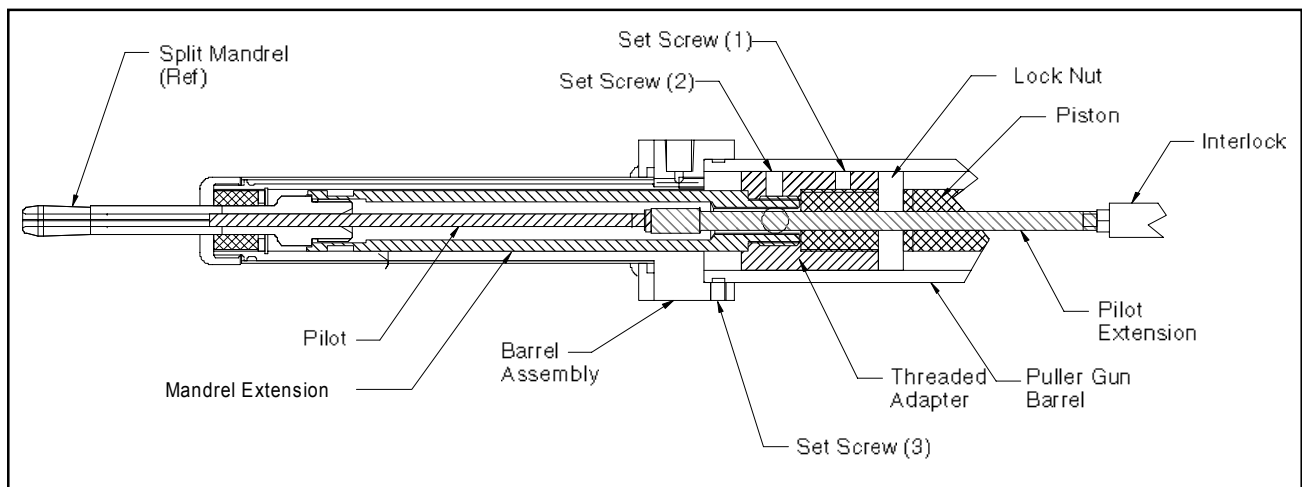


Figure 4-01

extension in toward the piston assembly.
The safety interlock is now seated.

4.2.5 Mandrel Extension

- 4.2.5.1 Thread the mandrel extension into the threaded adapter. Tighten the set screw on the threaded adapter to hold in place.
- 4.2.5.2 Using the pilot wrench set, install the pilot.
- 4.2.5.3 Install the mandrel.

Pilot Extension Wrench

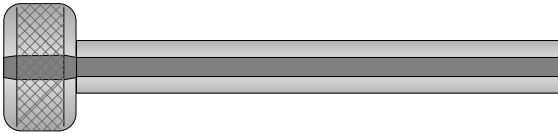


Figure 4-02

4.2.6 Quick-Change Barrel Assembly

(Refer to fig 4-03)

- 4.2.6.1 Slide the quick change barrel assembly (9) onto the mandrel extension and threaded adapter.
- 4.2.6.2 Screw the barrel assembly into the puller gun housing. Tighten the set screw to secure in place.

4.2.7 Quick-Change Nosepiece

- 4.2.7.1 Slide the quick change nosepiece onto the mandrel extension. Turn the knurled ring on the quick change barrel assembly until it stops. Push the quick change nosepiece into the barrel. Release the knurled ring on the barrel.
- 4.2.7.2 Rotate the nosepiece back and forth until the steel balls in the barrel assembly are seated in the detents on the nosepiece assembly.

4.2.8 Final Assembly

- 4.2.8.1 Connect the lubrication line from the puller gun to the fitting on the nosepiece.
- 4.2.8.2 Connect the puller gun to the power unit and test.

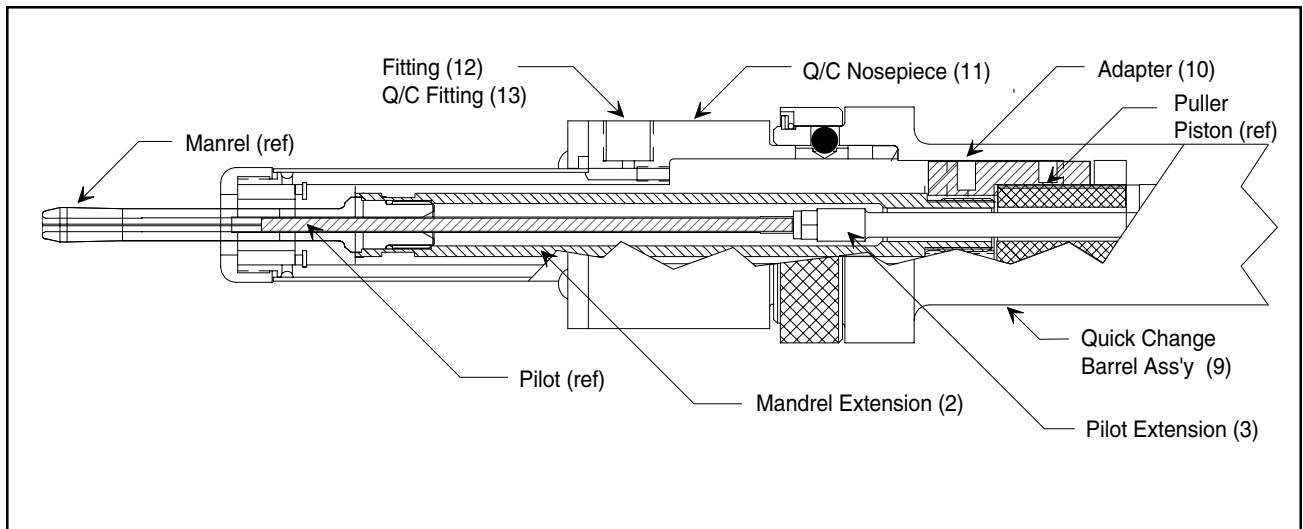


Figure 4-03

Section 5—Troubleshooting

The following pages contain troubleshooting information on the 300 puller gun. When reading the tables, please refer to figures 5-01 and 5-02 below (interlock assembly and endcap, respectively) and figure 3-03, puller gun drawing.

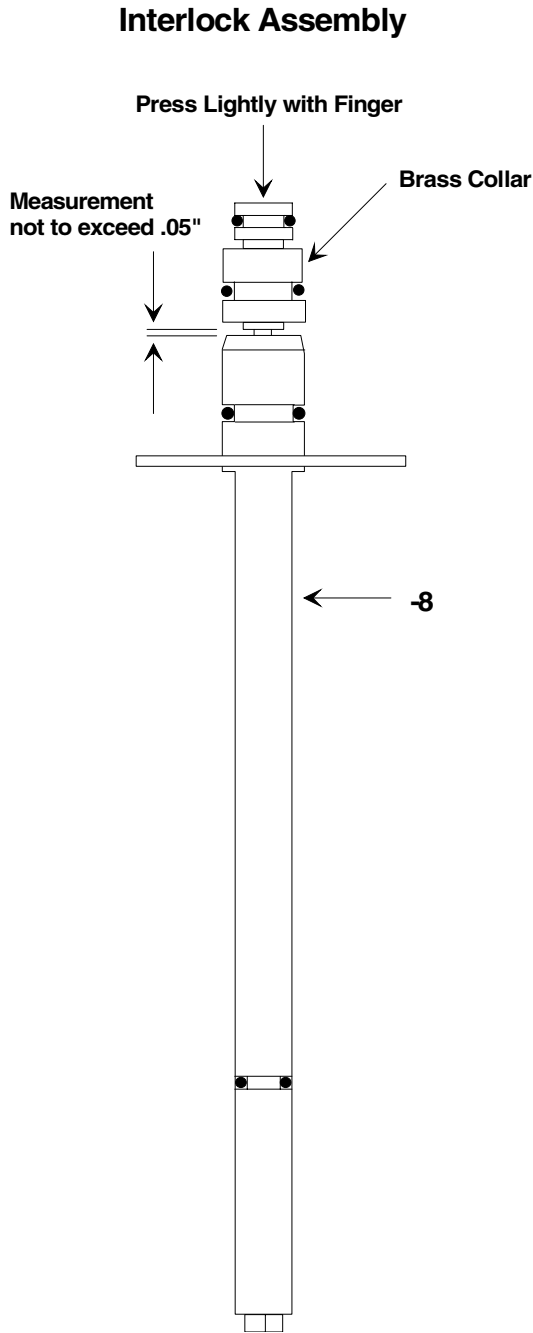


Figure 5-01

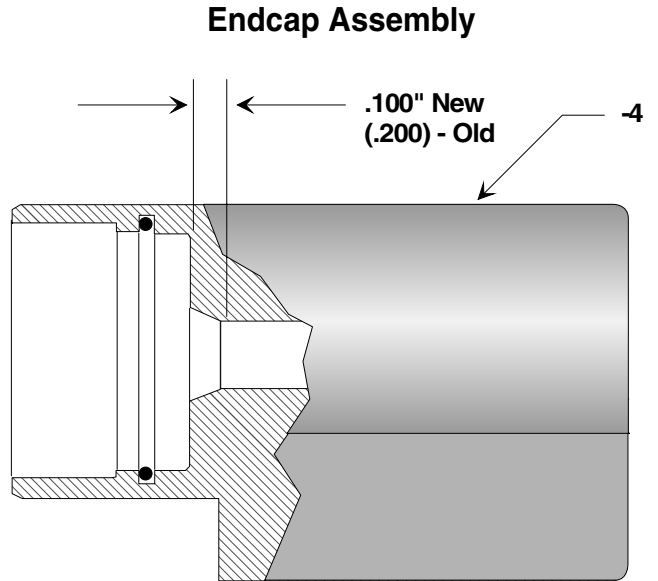


Figure 5-02

Puller Gun Troubleshooting Guide

Problem	Possible Cause	Solution
Puller Gun is connected to the Power Unit but will not operate.	1. Supply air not connected to the Puller Gun.	Disconnect the Supply air line from the handle of the Puller Gun (the poly line with the black band around it). If the Power Unit is connected to supply air and the Puller Gun hoses are connected to the Power Unit, air will discharge from the disconnected Supply air line. Also, check the condition of the poly lines for cuts or punctures.
	2. Control air not activating the Power Unit.	1. Disconnect the Control air line from the handle of the Puller Gun. 2. Squeeze the trigger on the Puller Gun. Air should discharge from the fitting. If it does, re-connect the line to the Puller Gun and disconnect the quick disconnect fitting at the Power Unit. 3. Again, squeeze the trigger on the Puller Gun, air should discharge from the hose end quick disconnect fitting. If it does the problem is in the Power Unit.
	3. Power Unit	See Power Unit manual
Connecting the puller unit to the power unit, the cycle initiates one time and fails to operate	The control and supply lines have been reversed, causing a malfunction in the cycle, and smashing the safety interlock into the end cap, thus damaging both assemblies	1. Remove the end cap from the puller unit, following the steps described in "PULLER UNIT REPEATS A CYCLE" to disassemble and assemble the puller unit. 2. Inspect the end cap assembly and the safety interlock assembly for damage. 3. Inspect the internal components in the housing (i.e., piston assembly, seals, housing bore, etc.) for damage. 4. Replace the end cap assembly. 5. Replace the safety interlock assembly. 6. Replace any damaged parts inside of the housing. 7. Assemble the puller unit. 8. Insure the two air lines on the hose assembly are matched with the stamped letters on both the handle assembly of the puller unit and the letters on the manifold block on the power unit. Also, trace the hoses between the puller unit and the power unit to insure the hoses have not been reversed in the fittings.

Puller Gun Troubleshooting Guide (cont)

Problem	Possible Cause	Solution
The Puller Gun leaks air out of the trigger port of the end cap and initiates another cycle without squeezing the trigger	The gap in the interlock is incorrect. The interlock piston will shut off the valve, stopping the power unit cycle	<ol style="list-style-type: none"> 1. Remove two screws (16) from manifold (15) which is attached to endcap (4) 2. Slide the manifold to the right, detachng the three tubes 3. Grasp the end cap, turn it counterclockwise to remove it from the housing (2) 4. Pull the end cap to the rear and the safety interlock assembly (8) will detach from housing along with the endcap 5. Grasp the safety interlock assembly and remove it from the end cap 6. Hold the safety interlock assembly in the vertical position shown in figure 2-01 7. Lightly press down on the small piston with finger and measure the gap shown in figure 2-01. The distance should be approximately .05". If the measured dimension exceeds this value, the interlock will prematurely actuate the valve (32), causing the puller gun to cycle again
	The lenth of the taper in the end cap housing is incorrect.	<p>The O-ring (29) on the interlock assembly is not positioned far enough into the taper of the end cap. Air will leak past the left side of the O-ring to the right side and initiate another cycle</p> <p>Measure the distance shown in figure 2-02. If the dimension is .200 inches, this is an old end cap, while if .100 inches, it is the new design</p>
	Worn O-rings on the interlock assembly	Replace
	Trigger held on too long	Once the coldwork cycle is complete, release the trigger to discountinue cycle
Hydraulic fluid leaking or discharging from the trigger button on the Puller Gun handle.	Seals on the hydraulic piston are damaged or worn	Disassemble the Puller Gun and replace the seals.
Hydraulic fluid leaking or discharging from the front of the Puller Gun.	Seals on the hydraulic bearing are damaged or worn.	Disassemble the Puller Gun and replace the seals.
An audible discharging of air from the trigger of the Puller Gun handle.	Leaking or damaged trigger valve.	Remove and replace trigger valve.

Puller Gun Troubleshooting Guide (cont)

Problem	Possible Cause	Solution
<p>Pilot fails to extend when the trigger is depressed</p>	<p>The cover plate on the end cap may show indications of abuse (i.e., marks left by being struck with an object). This action of striking the cover plate happens when a mandrel becomes stuck in the workpiece and the operator tries to free the mandrel. In doing this, the repeated striking on the end cap cover impacts the piston assembly loosening the sleeve which is pressed on the outside of the piston. Shifting the sleeve rearward will contact the large washer on the safety interlock, when the piston assembly is moving rearward in the coldwork cycle, breaking or bending it.</p>	<ol style="list-style-type: none"> 1. Remove the end cap from the puller unit, following the steps described in "PULLER UNIT REPEATS A CYCLE" to disassemble and assemble the puller unit. 2. Inspect the end cap assembly and the safety interlock assembly for damage. 3. Inspect the internal components in the housing (i.e., piston assembly, seals, housing bore, etc.) for damage. 4. Replace the end cap assembly. 5. Replace the safety interlock assembly. 6. Replace any damaged parts inside of the housing. 7. Assemble the puller unit.

Appendix

A.1 Retrofitting a Boelube Lubricator onto an existing Hydraulic Power Supply

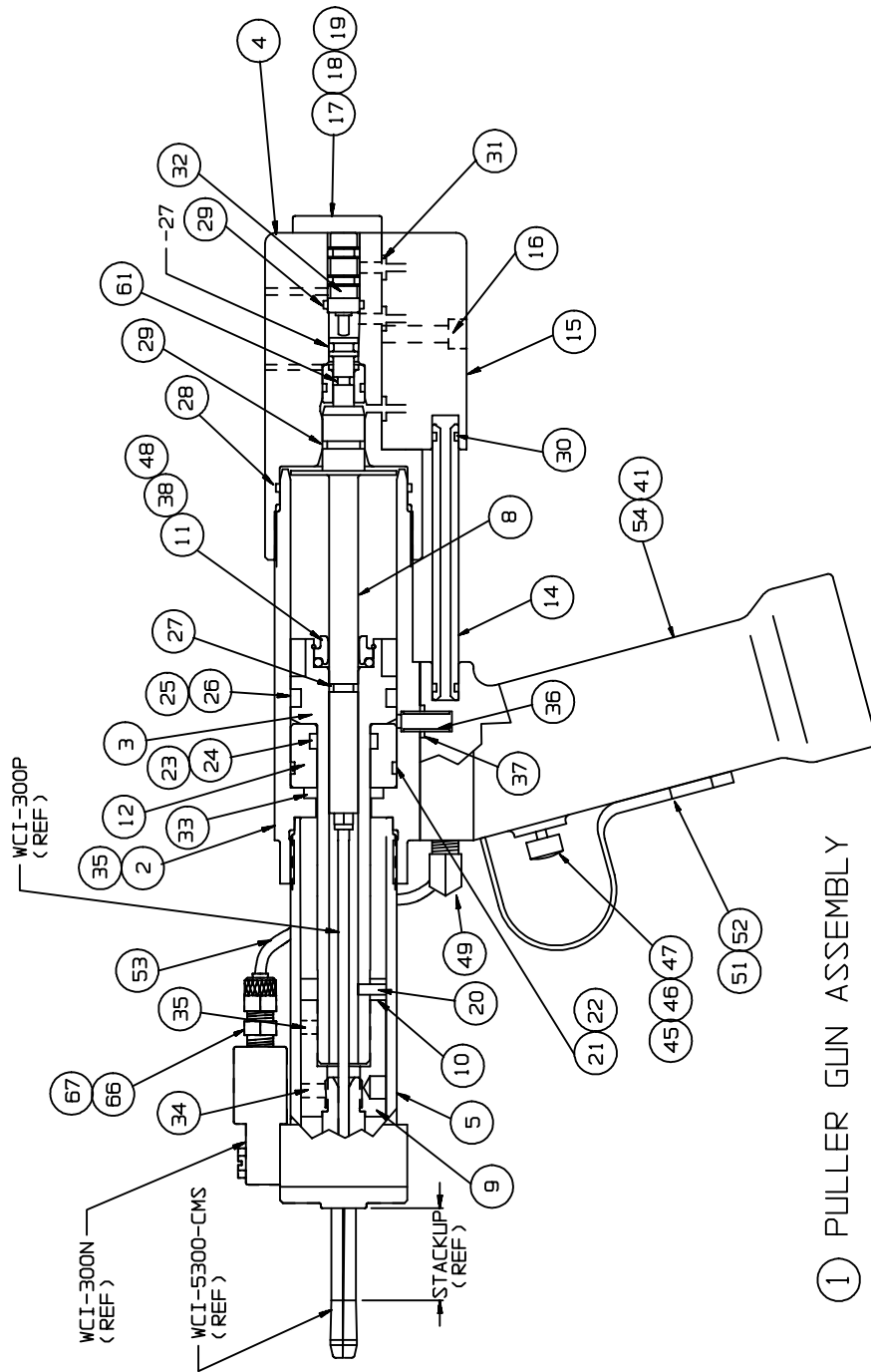
- A.1.1 Reference figure A-1 of the Boelube pump assembly.
- A.1.2 On the top of the unit are three ports marked "S", "L", and "C". These letters identify the purpose of the ports, i.e., S = Supply air inlet, L = Lubrication outlet, C = Control signal from the Puller Gun.
- A.1.3 A 90 degree fitting is threaded into each port of Boelube pump assembly. The S and C ports are connected, using the "T" fittings provided, in the appropriate supply and control lines of the Power Supply unit. The L port on the Boelube pump assembly connects directly to the "L" port on the manifold (See Schematic). The fittings provided do not require any wrenches for tubing installation. These are compression type fittings, just push the end of the hose or plastic tubing into the end of the fitting until it is seated.
- A.1.4 Mount the manifold in a location to allow convenient connection of the puller gun hose fittings.

A.2 Boelube Unit Operation

- A.2.1 Remove the threaded plug in the top of the reservoir.
- A.2.2 Fill to the upper line with Boelube lubricant.
- A.2.3 Install the threaded plug in the top of the reservoir.
- A.2.4 Connect the puller gun hose assembly to the manifold.
- A.2.5 Adjust the Reservoir Pressure Adjustment knob clockwise until the needle indicates 20 psi.
- A.2.6 Press the System Prime button.
- A.2.7 When lubricant can be seen in the clear plastic tubing release the System Prime button. The Boelube pump is now ready for operation.

NOTE: The Lube Flow Adjustment is set at the factory to deliver a maximum of one drop of lubricant for each cycle of the puller gun. If adjustment is necessary to reduce the amount of lubricant, do the following:

- A.2.8 Loosen the set screw in the knurled knob.
- A.2.9 Turn the knurled knob clockwise to decrease the amount of lubricant per cycle.
- A.2.10 Disconnect the lubrication line at the nose cap of the puller gun.
- A.2.11 Cycle the puller gun and observe the amount of lubricant flowing from the end of the tubing.
- A.2.12 When the correct amount of lubricant has been determined, tighten the set screw in the knurled knob.



① PULLER GUN ASSEMBLY

WCI-300 Puller Gun Part Number = WCI-300-XX- (Detail Number) xx=stackup length		
DETAIL NO.	QUANTITY	DESCRIPTION
1	1	ASSEMBLY
2	1	HOUSING
3	1	PISTON ASSEMBLY
4	1	ENDCAP
5	1	BARREL
6		
8	1	SAFETY INTERLOCK ASSY
9	1	ADAPTER
10	1	LOCK NUT
11	1	SHOCK ABSORBER
12	1	BEARING
13		
14	3	TUBE
15	1	MANIFOLD
16	1	SCREW
17	1	END CAP COVER
18	1	SCREW
19	1	GASKET
20	1	ROLL P I N
21	1	O-RING
22	1	BACKUP RING
23	1	O-RING
24	1	BACKUP RING
25	1	O-RING
26	1	BACKUP RING
27	2	O-RING
28	1	O-RING
29	1	O-RING
30	6	O-RING
31	4	O-RING
32	1	MODIFIED VALVE
33	1	WIPER
34	1	SET SCREW
35	1	SET SCREW
36	1	TUBE
37	1	O-RING
38	1	SPRING CLIP
41	1	HANDLE BOLT
45	1	TRIGGER BUTTON
46	1	TRIGGER VALVE
47	1	SPRING RETAINER
48	1	O-RING
49	1	ELBOW FITTING
51	1	TRIGGER GUARD
52	2	SCREW
53	1	BOELUBE TUBE
54	1	HANDLE ASSEMBLY
66	1	FITITNG
67	1	SLEEVE