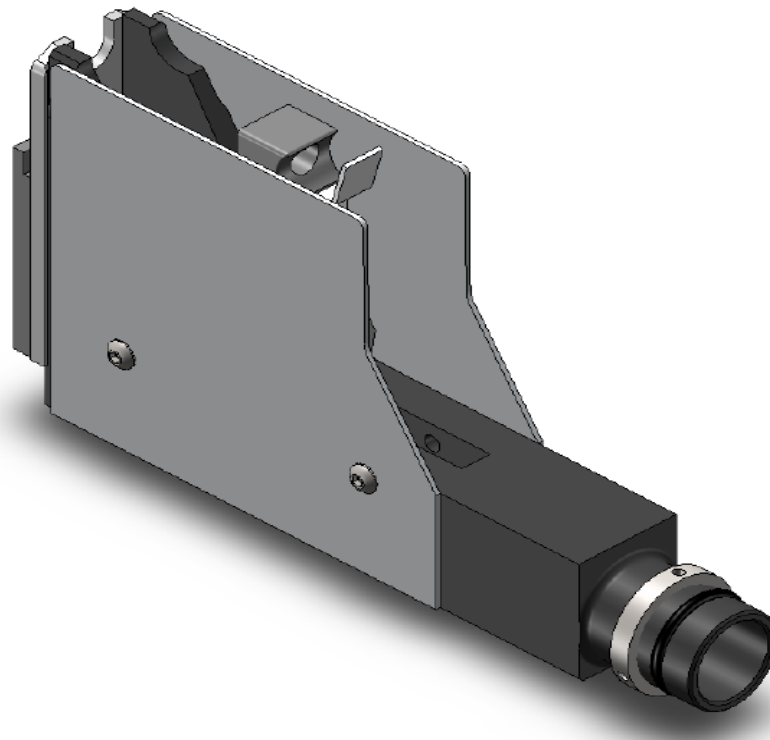

FTI OPERATIONS, MAINTENANCE, AND REPAIR MANUAL

Little Brute Offset Adapter

Part #2720-010, Log #1203
Revision G

March 22, 2022



*Units with a guard
meet the
requirements of*

CE

*(see Section 1.0,
numbers 1 and 3)*

Original Instruction

Little Brute Offset Adapter with Finger Guard

This manual should be used in conjunction with the FTI
“Little Brute Puller Unit Operations, Maintenance, and Repair Manual”

ABOUT FATIGUE TECHNOLOGY INC.

Fatigue Technology Inc. (FTI) is a world-leading aerospace engineering and manufacturing company. FTI pioneered cold expansion technology (which provides solutions to fatigue problems associated with holes in metal structures) back in 1969 and has advanced this science to develop innovative bushing and fastener products. Complete systems of tooling are used worldwide to enhance the fatigue life of holes in airframes, turbine engines, and other critical structures. These proprietary products and associated tooling may be covered by patents or agreements owned by, or exclusively licensed to, Fatigue Technology Inc. Use of tooling procured from other than a licensed source may constitute patent infringement.

The detailed tooling information in this manual was compiled and written by FTI. The tooling was designed specifically for use with FTI's Cold Expansion (Cx™) Systems. FTI cannot be held responsible for damage or injury as a result of operating this equipment if it is used for other than the process intended, with any other tooling not provided by FTI, or not used in accordance with the instructions contained in this manual. To avoid personal injury, please observe all safety precautions and instructions. FTI reserves the right to change specifications or configurations of equipment detailed in this manual as part of our ongoing technical and product improvement programs. If you have any questions about the use or serviceability of this equipment, please contact our Sales Department.

FTI's Cold Expansion systems and processes are the subject matter of one or more of the following patents: 5,083,363; 5,096,349; 5,103,548; 5,127,254; 5,129,253; 5,218,854; 5,245,743; 5,305,627; 5,341,559; 5,380,136; 5,405,228; 5,433,100; 5,468,104; 6,077,010; 6,183,180; 6,487,767; 6,792,657; 6,990,722; 7,024,908; 7,100,264; 7,375,277; 7,406,777; 7,448,652; 7,509,829; 7,617,712; 7,641,430; 7,926,318; 7,946,628; 7,958,766; 8,057,144; 8,061,178; 8,069,699; 8,117,885; 8,128,308; 8,191,395; 1,061,276; 513,898; 692015124; 581,385; 69310828; 468,598; 69105390; 643,231; 69414946; 696,686; 785,366; 1032769; 1893875; 2019739; 1280621; 4819678; and other patents pending. These systems and processes are tooling critical and must be performed in accordance with FTI's specifications or controlling documents. To ensure proper results from FTI's cold expansion systems and to be licensed to use FTI's patented processes, it is essential that FTI's complete integrated system of tooling be purchased and utilized. The use of tooling purchased from other than a licensed supplier could jeopardize fatigue life enhancement and may constitute patent infringement.

FTI reserves the right to change the specifications or configurations of tooling detailed in this manual as part of its ongoing technical and product information program. Should inconsistencies occur between your tooling and this manual, please contact our Sales Department.

The FTI staff of professionals provides a full range of support services including:

- Application engineering
- Detailed project planning, implementation, and management
- On-site assistance, including training and tool room setup

The Sales Department is always available to assist with special fatigue enhancement requirements. Please contact FTI with questions at any time.

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SECTION 1.0: INTRODUCTORY INFORMATION—LITTLE BRUTE OFFSET ADAPTER

This instruction manual contains information on the operation and maintenance of the Little Brute Offset Adapter (LBOA) designed by Fatigue Technology Inc. (FTI) for use with the patented Split Sleeve Cold Expansion™ (SsCx™) process. To obtain optimum performance and many years of trouble-free service, carefully follow maintenance procedures and operate the LBOA properly.

Read this manual before operating the LBOA, and retain the manual for future reference. If requested, FTI will provide this manual in the language of the end-user.

There are three variants of the Little Brute Offset Adapter:

1. *Little Brute Offset Adapter with Finger Guard* (shown in Figure 1-1): These are available by adding “-G” to the end of the LBOA-xx model number. **These units provide safety improvements that comply with the European Council’s Machinery Directive 2006/42/EC.**
2. *Little Brute Offset Adapter without Finger Guard* (shown in Figure 1-2): These are available by the LBOA-xx model number and offer access to more restricted areas (see Figure 3-1).
3. *Little Brute Offset Adapters with added restricted access benefits at the face of the unit*: This variant has 45 degree angles cut into the housing and backup plate/nosecap. These units have model numbers like LBOA-xx-RAX; review the Tables in Section 3.0 to determine which model numbers **comply with the European Council’s Machinery Directive 2006/42/EC.**

The Little Brute Offset Adapter:

- Is capable of cold expanding holes in restricted access areas up to 1/2-inch diameter in aluminum and mild steel and 7/16-inch diameter in titanium and high-strength steel.
- Attaches to the Little Brute (LB) series of puller units. See the Little Brute Puller Unit Operations, Maintenance, and Repair Manual for additional safety information.
- Weighs approximately 6.5 pounds (2.95kg); with the LB puller unit, it weighs approximately 17 pounds (7.71kg).
- Requires only 0.300-inch lateral clearance (see Figure 3-1).
- Has a maximum pull force of 7,000 pounds (generated by the Little Brute Puller Unit).
- Identification is provided by machined model and serial numbers.

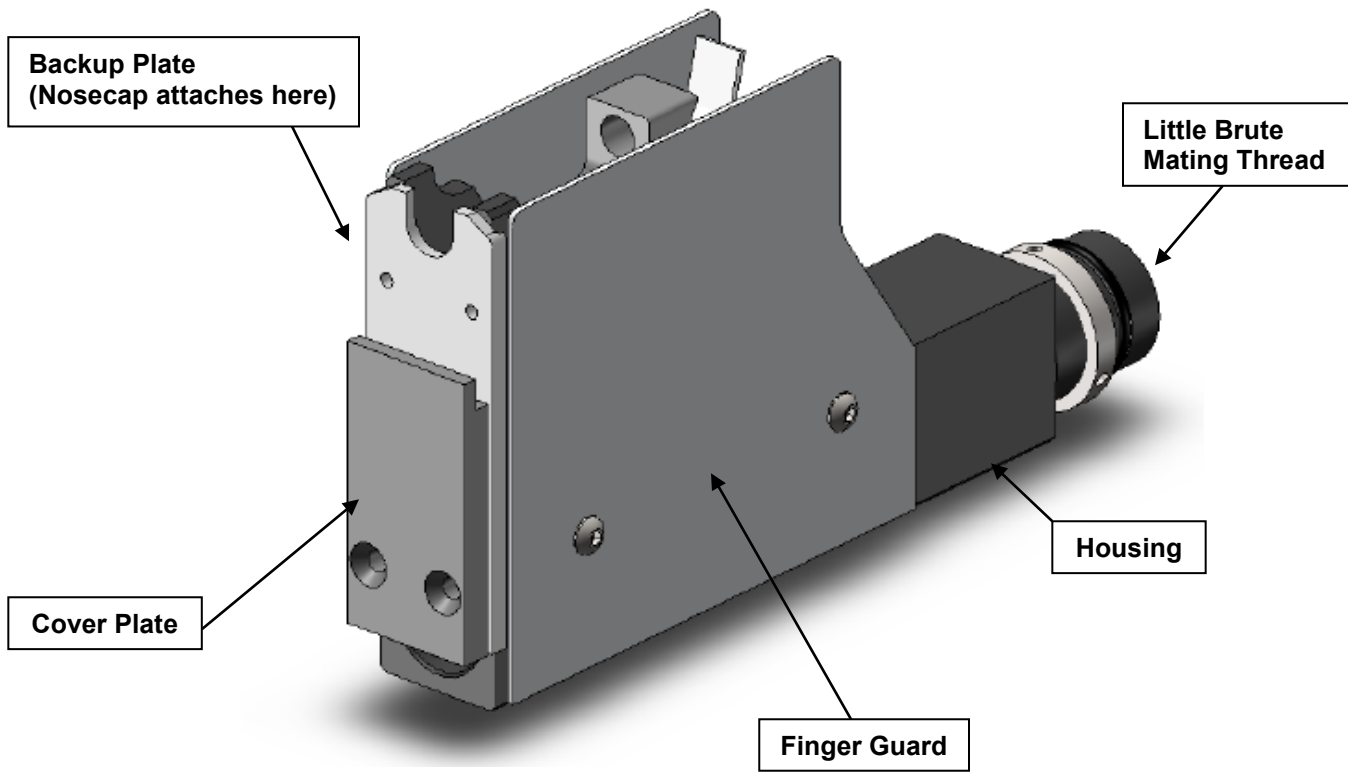


Figure 1-1
Little Brute Offset Adapter Parts with Guard

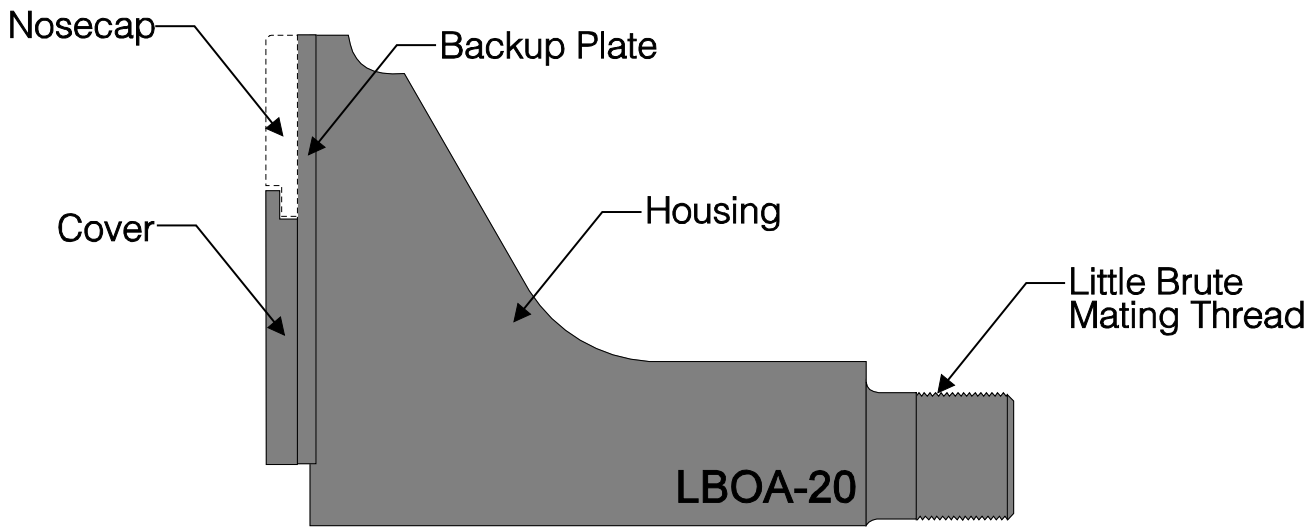


Figure 1-2
Little Brute Offset Adapter Parts without Guard

SECTION 2.0: SAFETY

Safe operation of the LBOA is of paramount concern. Along with standard shop safety practices (eye protection, safe handling of high-pressure equipment, etc.), the following items are peculiar to the LBOA/puller unit assembly:

1. Disconnect the LB Puller Unit from PowerPak before attaching the LBOA.
2. **CAUTION:** Pinch point risk.
3. **CAUTION:** Keep fingers out of the slide channel.
4. Use the self-alignment nut for tooling numbered 14-0-N through 16-0-N to prevent mandrel breakage.
5. When using the self-alignment nut, ensure the nut retainer is in place. Bending the nut retainer may cause damage or failure.
6. Take care not to scratch the puller piston rod of the LB puller unit.
7. Observe all safety precautions associated with the LB Puller Unit and PowerPaks, as listed in their separate manuals.



IMPORTANT: FTI completed a risk assessment on this unit at our factory. Any modifications done by a third party or the final user are excluded from that risk assessment. As a result, modifications done by a third party or the final user nullify the CE marking.

SECTION 3.0: LITTLE BRUTE OFFSET ADAPTER SPECIFICATIONS

Table 3-1
Little Brute Offset Adapter Specifications with Metal Guard

Model Number	Maximum Material Stackup (inch)	Adapter Width W (inch)	Combined Puller and Adapter Length (OAL) (inch)	Adapter Length L (inch)	Frontside Clearance F (inch)
LBOA-10-G	1.0	1.65	11.8	6.7	4.75
LBOA-15-G	1.5	1.65	13.3	7.7	5.25
LBOA-20-G	2.0	1.65	14.8	8.7	5.75
LBOA-25-G	2.5	1.65	16.3	9.7	6.25
LBOA-30-G	3.0	1.65	17.8	10.7	6.75
LBOA-35-G	3.5	1.65	19.3	11.7	7.25

Table 3-2
Little Brute Offset Adapter Specifications without Guard

Model Number	Maximum Material Stackup (inch)	Adapter Width W (inch)	Combined Puller and Adapter Length (OAL) (inch)	Adapter Length L (inch)	Frontside Clearance F (inch)
LBOA-10	1.0	1.5	11.8	6.7	4.05
LBOA-15	1.5	1.5	13.3	7.7	4.55
LBOA-20	2.0	1.5	14.8	8.7	5.05
LBOA-25	2.5	1.5	16.3	9.7	5.55
LBOA-30	3.0	1.5	17.8	10.7	6.05
LBOA-35	3.5	1.5	19.3	11.7	6.55
LBOA-25-RA3	2.5	1.4	16.3	9.7	5.55

Table 3-3
LBOA-10-RA1 Adapter Specifications with Neoprene Guard*

Model Number	Maximum Material Stackup (inch)	Adapter Width W (inch)	Combined Puller and Adapter Length (OAL) (inch)	Adapter Length L (inch)	Frontside Clearance F (inch)
LBOA-10-RA1	1.0	1.5	11.8	6.7	4.05

* Specifications on other LBOA units not available at time of printing.

Note: The LBOA-20 or LBOA-20-G is standard.
Nosecap Selection: The LBOA uses special LBOA nose caps (refer to FTI Tooling Catalog, Section 2).
Mandrel Selection: The LBOA uses special LBOA mandrels (refer to FTI Tooling Catalog, Section 2). See Figure 3-1.

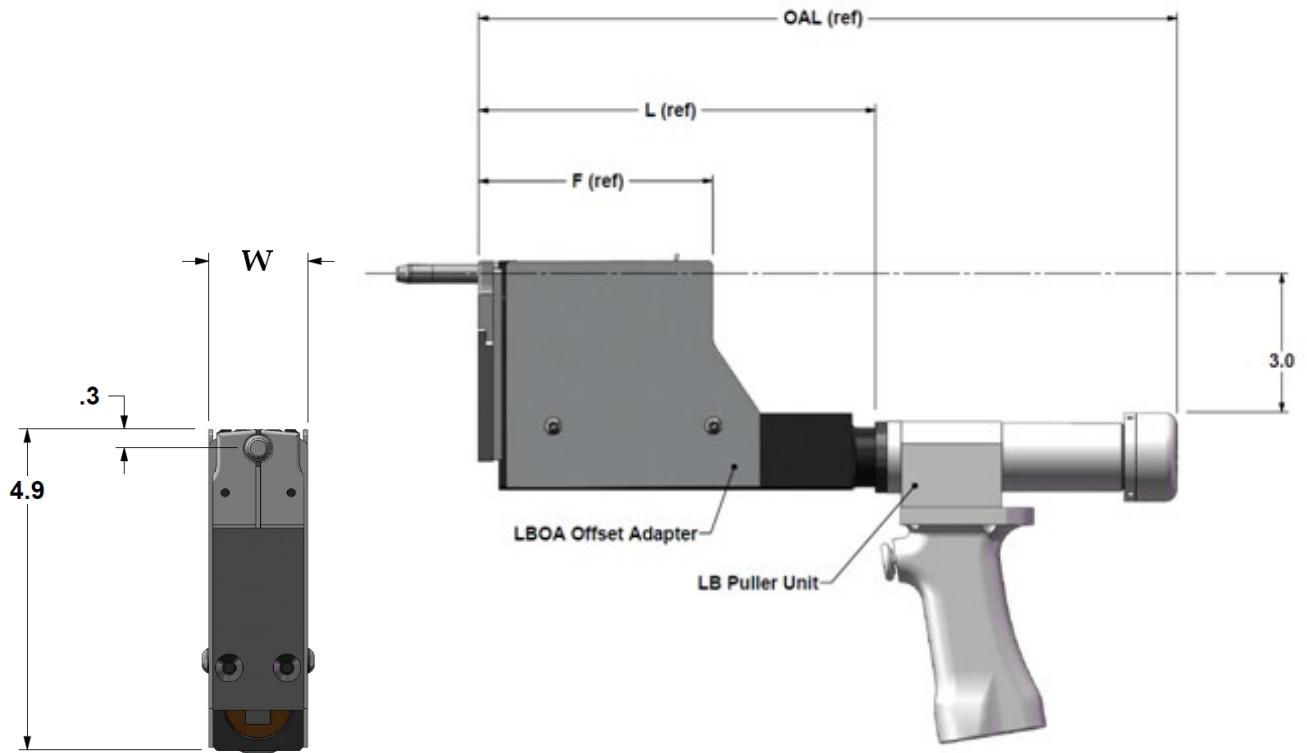


Figure 3-1
Little Brute Offset Adapter with Metal Guard

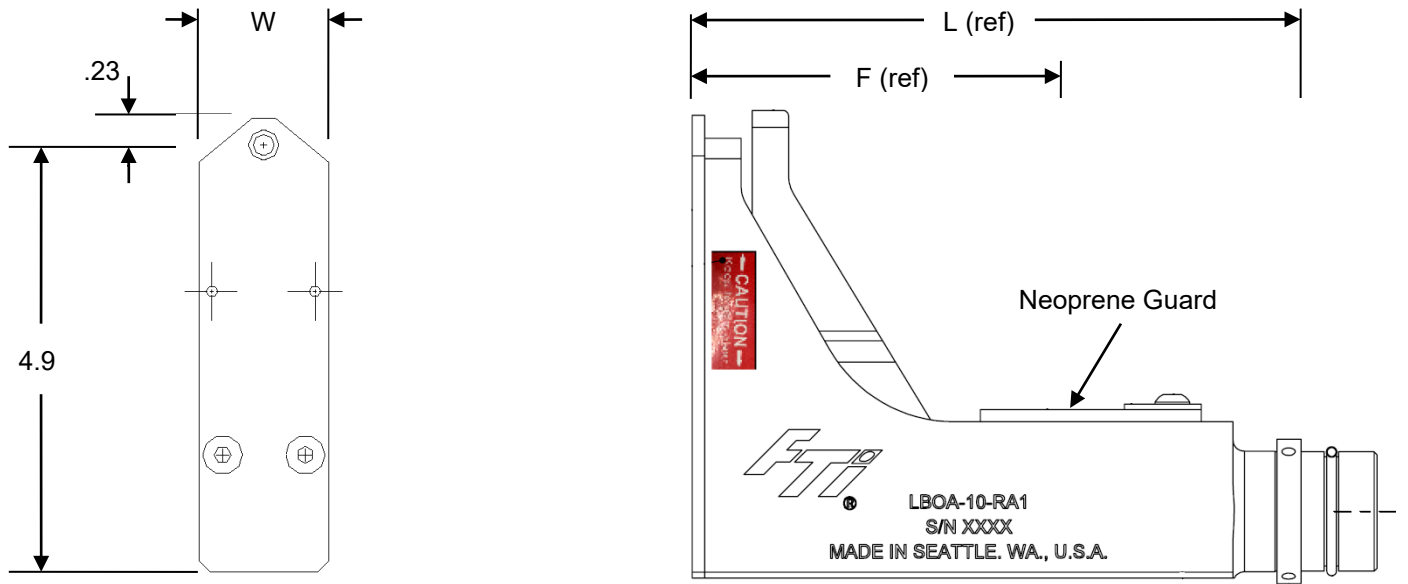


Figure 3-2
Little Brute Offset Adapter with Neoprene Guard

SECTION 4.0: ASSEMBLY AND USAGE OF THE LITTLE BRUTE OFFSET ADAPTER

Follow these steps to assemble and use the LBOA:

SAFETY: Disconnect the LB Puller Unit (see Figure 3-1) from the PowerPak before attaching the LBOA.

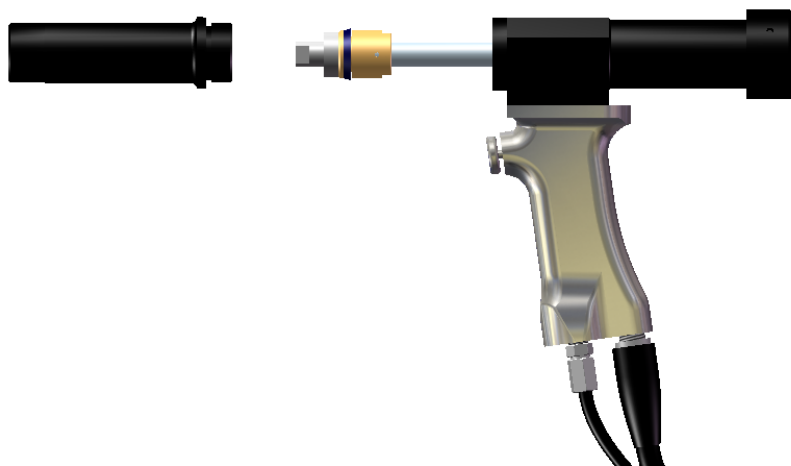
WARNING: Do not use without guard installed.

1. Remove the noscap assembly from the LB Puller Unit (Figure 4-1).



**Figure 4-1
Little Brute Puller Unit, Nosecap Removed**

2. Unscrew and remove the barrel from the LB Puller Unit (Figure 4-2).



**Figure 4-2
Little Brute Puller Unit, Barrel Removed**

- Remove the mandrel adapter from the piston rod (Figure 4-3).



Figure 4-3
Little Brute Puller Unit, Mandrel Adapter Removed

- Select the proper LBOA slide assembly (for tang mandrel, threaded mandrel, or broach). If the proper slide assembly is already installed, disregard Steps 5 and 6.
- Remove the backup plate from the LBOA and insert the slide assembly into the housing (Figure 4-4).
- Install the proper backup plate, special jaw plate, or special noscap spacer (Figure 4-4).
- If a standard backup plate is used, install the proper jaw on the LBOA (Figure 4-4).

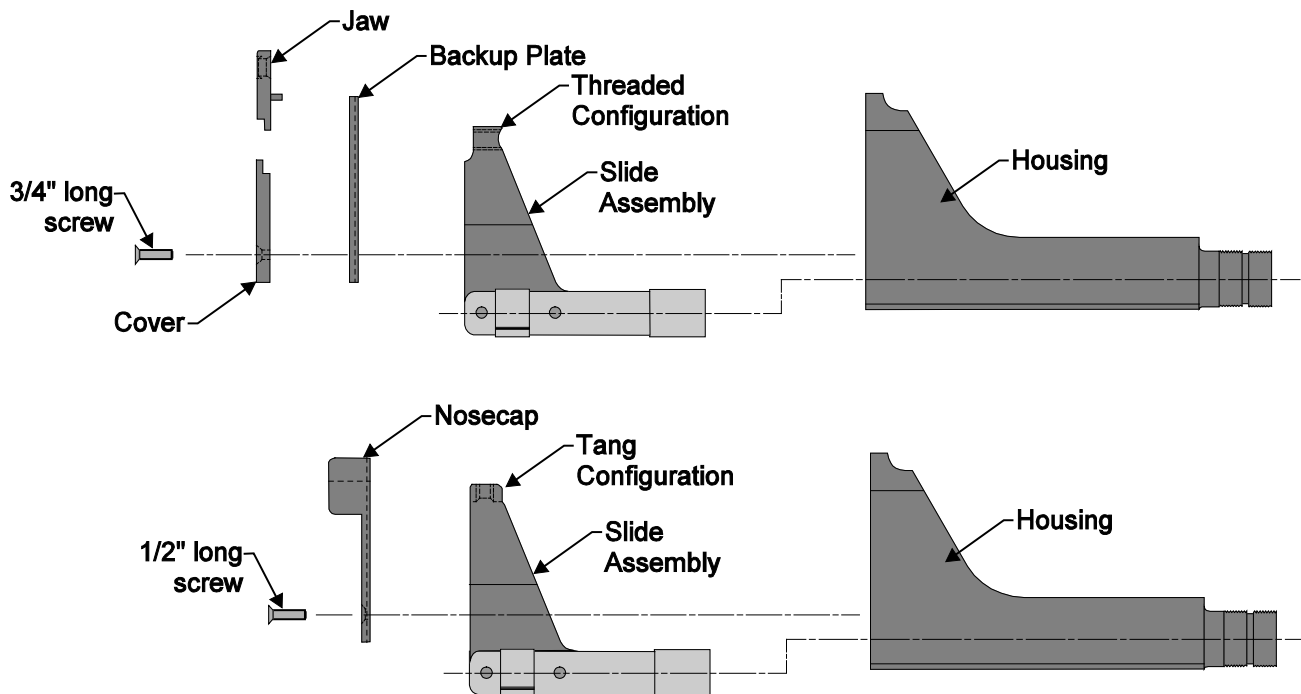


Figure 4-4
Little Brute Offset Adapter, Jaw Installation
(Guard not shown for clarity)

8. Screw the LBOA onto the Little Brute Puller Unit (Figure 4-5). Connect the piston first, then connect the housing. Tighten the lockring.

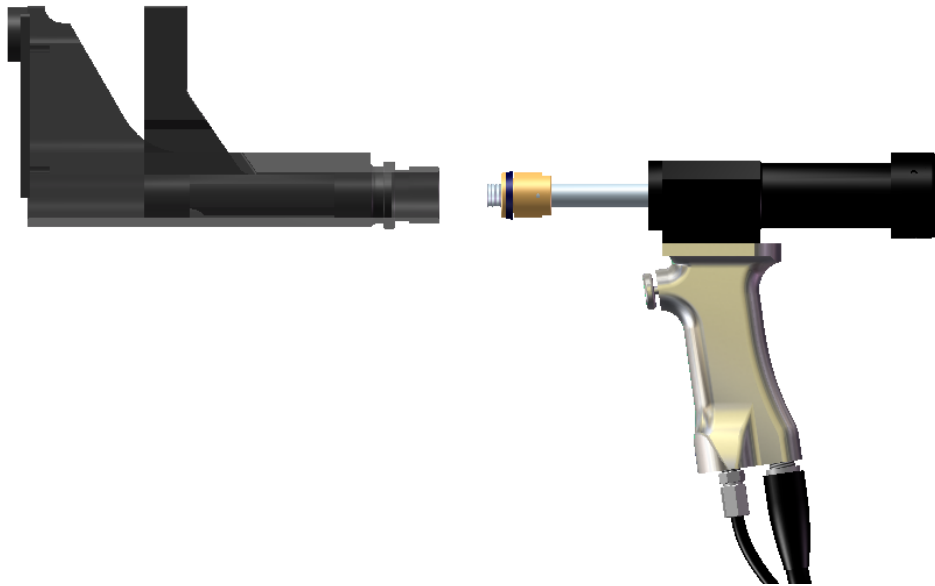


Figure 4-5
Little Brute Offset Adapter Connection to Little Brute Puller Unit
(Guard not shown for clarity)

9. Ream the starting hole to the proper diameter.
10. Verify the starting hole diameter (SHD) using the stepped go/no-go end of a combination gage (Figure 4-6).

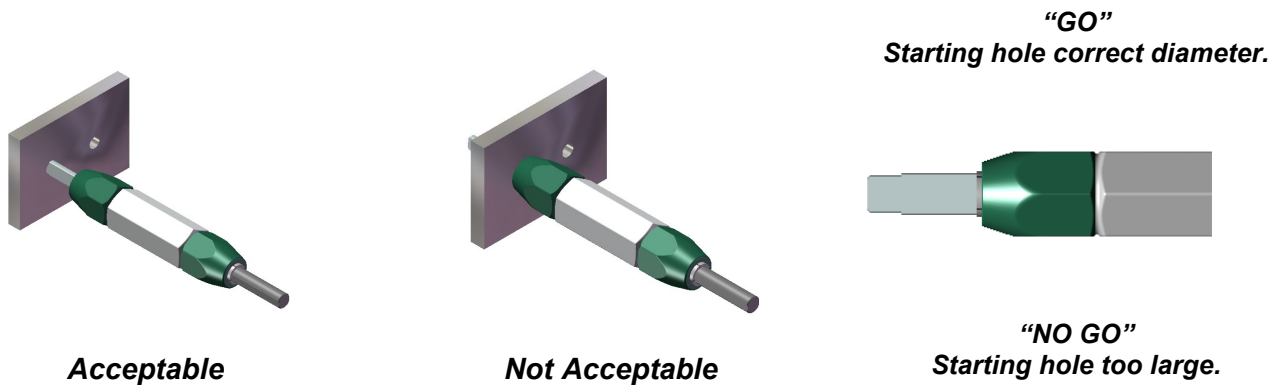


Figure 4-6
Starting Hole Gage

Note: For a threaded slide assembly, refer to Section 5.0; for a tang assembly, refer to Section 6.0.

11. Select the proper mandrel and check the major diameter for wear by inserting the mandrel into a mandrel gage. If the mandrel can pass through the gage, it is excessively worn and must be discarded (Figure 4-7).

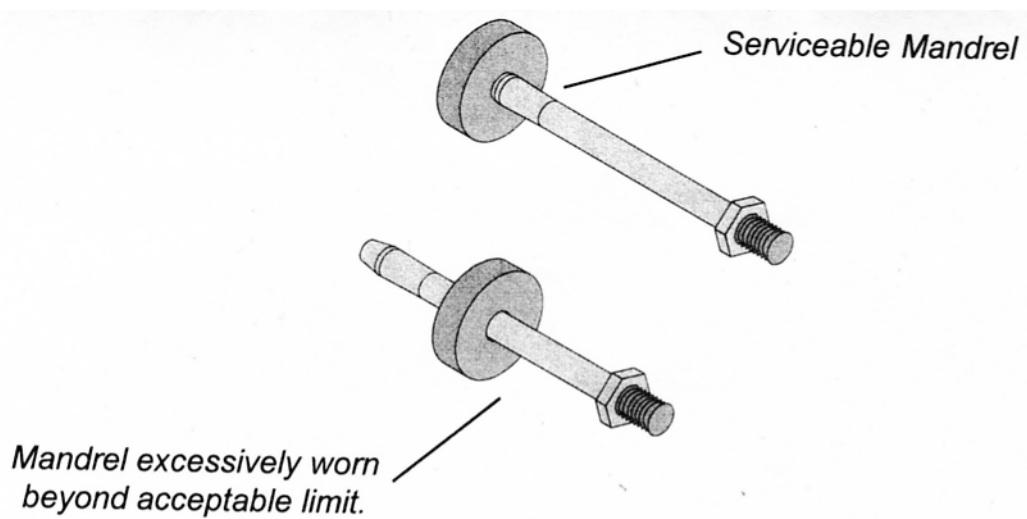


Figure 4-7
Mandrel Check Gage

SECTION 5.0: PROCEDURE FOR THREADED MANDREL SLIDE ASSEMBLY

The LBOA will allow for the use of threaded (7/16-inch -20) mandrels or tang-style mandrels (Section 6.0). The following instructions identify how to install threaded mandrels:

1. Pull the LBOA slide assembly back, thread in the mandrel, and return the slide assembly to its forward position.
2. Thread the LB piston rod into the LBOA slide assembly, then thread the LBOA housing into the LB housing (Figure 5-1). Ensure the O-ring on the LBOA housing is seated at the LB housing.

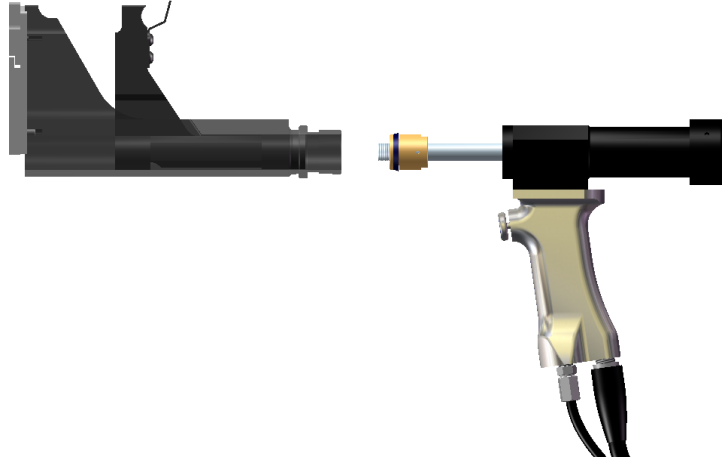


Figure 5-1
Little Brute Piston Rod and Slide Assembly, Threaded Mandrel
(Guard not shown for clarity)

3. Select and install the sleeve on the mandrel with the flare towards the nose cap. Insert the mandrel and sleeve into the hole, as shown in Figure 5-2.

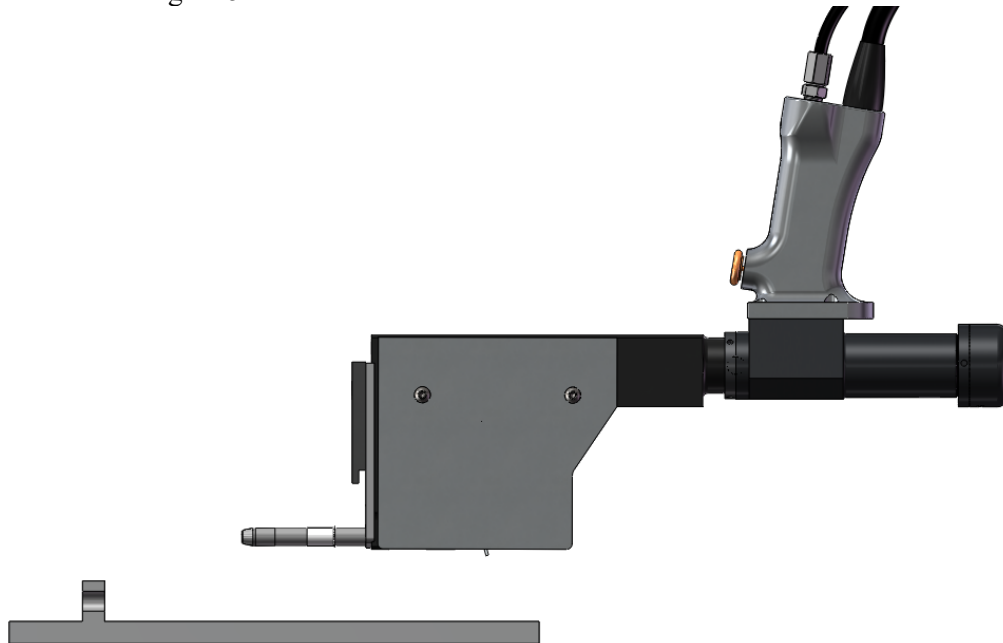


Figure 5-2
Sleeve Installation with Guard

4. Move the LB/LBOA assembly into position, holding the nose cap or nose cap spacer flush against the workpiece. Press the LB trigger to retract the mandrel and cold expand the hole.
5. Verify that the hole has been properly cold expanded. See Figure 5-3.

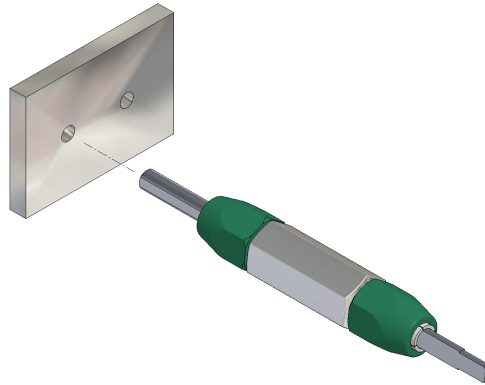


Figure 5-3
Verification Gage

SECTION 6.0: PROCEDURE FOR TANG MANDREL SLIDE ASSEMBLY

The LBOA will allow for the use of tang-style mandrels or threaded (7/16-inch -20) mandrels (Section 5.0). The following instructions identify how to install tang-style mandrels.

1. Thread the LB piston rod into the LBOA slide assembly, then thread the LBOA housing into the LB housing (Figure 6-1).

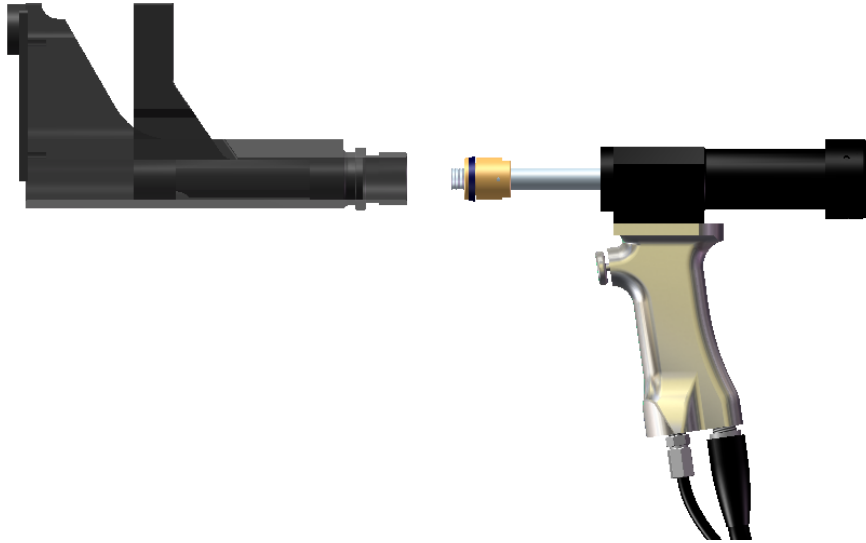


Figure 6-1
Little Brute Piston Rod and Slide Assembly, Tang Mandrel
(Guard not shown for clarity)

2. Select and install the sleeve on the mandrel with the flare away from the nose cap. Insert the mandrel and sleeve into the hole, as shown in Figure 6-2.

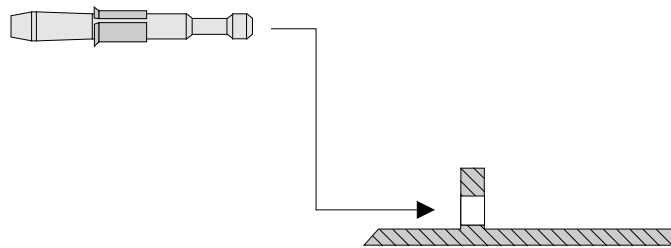


Figure 6-2
Sleeve Installation, Tang Mandrel

3. Position the LB/LBOA assembly and hook the LBOA slide assembly onto the mandrel tang (Figure 6-3).

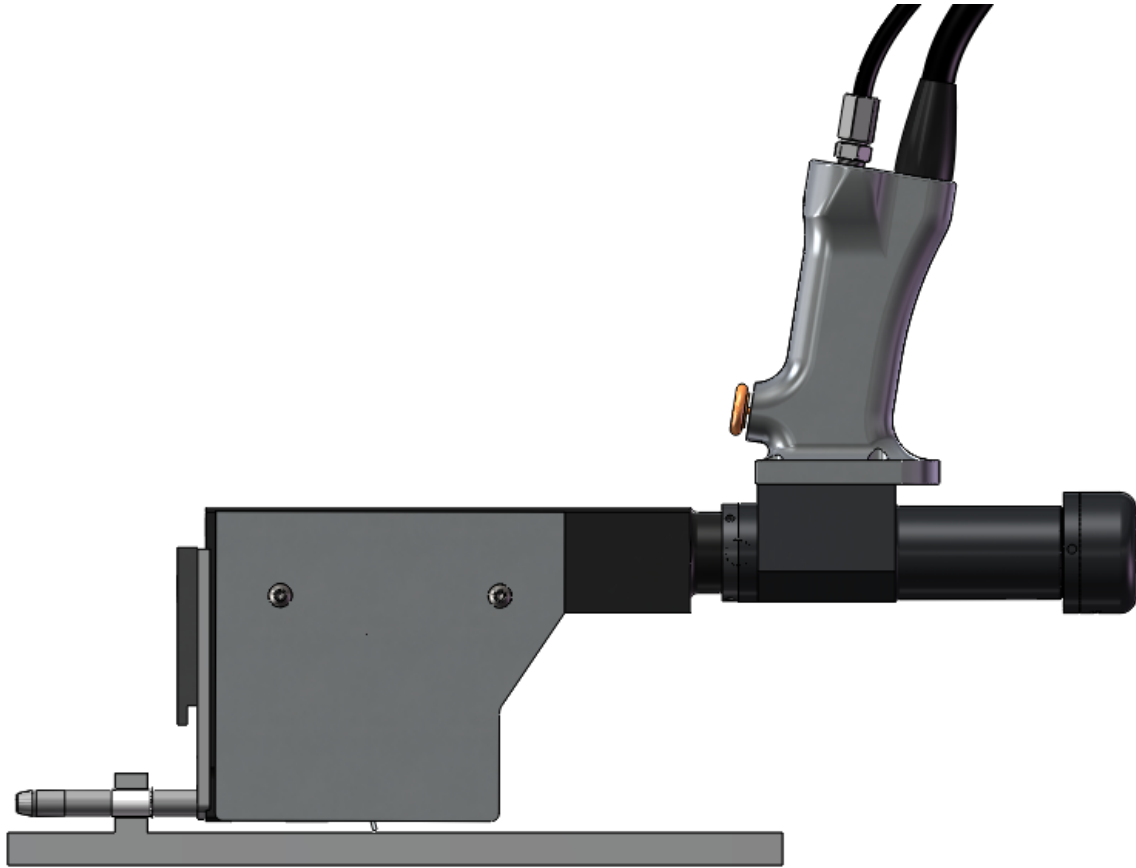


Figure 6-3
Slide Assembly with Guard

4. Keep the noscap spacer flush against the workpiece and press the LB trigger to retract the mandrel and cold expand the hole.
5. Verify that the hole has been properly cold expanded (Figure 6-4).

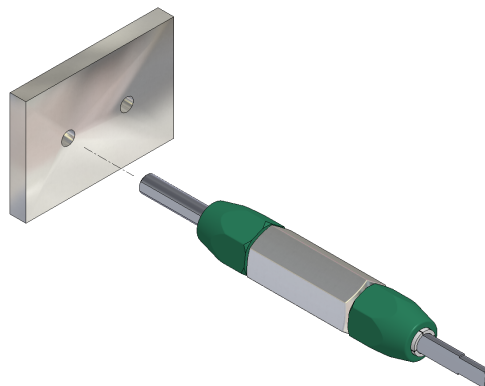
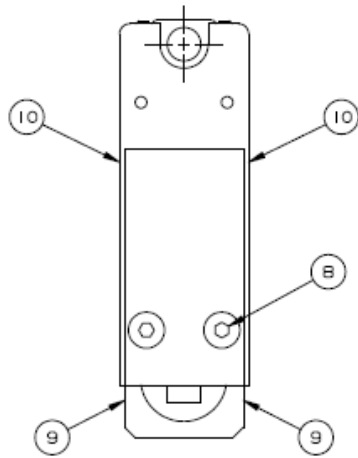
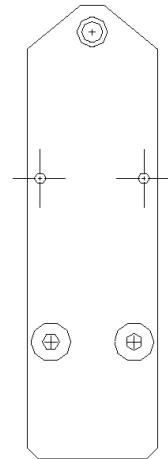


Figure 6-4
Verification Gage

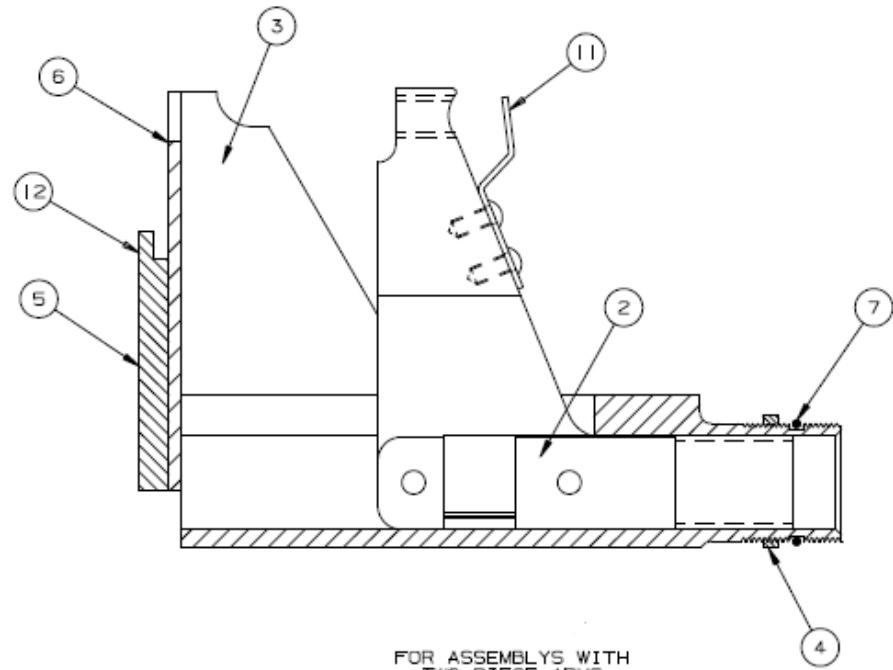
SECTION 7.0: ILLUSTRATED PARTS BREAKDOWN



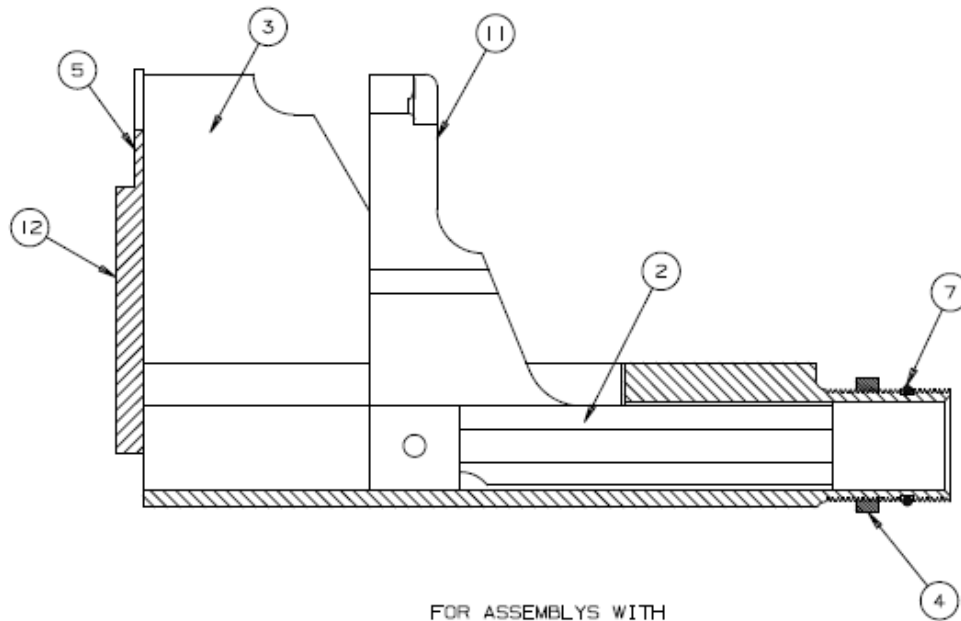
LBOA-xx-x



LBOA-10-RA1



FOR ASSEMBLYS WITH TWO PIECE ARMS.



FOR ASSEMBLYS WITH ONE PIECE ARMS.

Figure 7-1
Diagrams of LBOA Assemblies
(See following tables for part numbers)

**Table 7-1
Itemized Parts List**

Piece Number	Description	Applicable LBOA Assembly Model Numbers	Part Number	Quantity
2	Slide Arm Assembly	LBOA-10	2580-002	1
		LBOA-10-G		
		LBOA-15	2580-003	
		LBOA-15-G		
		LBOA-20	2580-004	
		LBOA-20-G		
		LBOA-20-ATP-RO		
		LBOA-20-1.12-1		
		LBOA-25	2580-005	
		LBOA-25-G		
		LBOA-30	2580-006	
		LBOA-30-G		
		LBOA-35	2580-007	
		LBOA-35-G		
		LBOA-25-RA3	2111-007	
		LBOA-20-SPL-727-1B	2111-008	
		LBOA-20-1.12-T6	2111-012	
LBOA-10-RA1	2111-009			
3	Housing	LBOA-10	2114-001	1
		LBOA-10-G		
		LBOA-15	2114-002	
		LBOA-15-G		
		LBOA-20	2114-003	
		LBOA-20-G		
		LBOA-25	2114-004	
		LBOA-25-G		
		LBOA-25-RA3		
		LBOA-20-SPL-727-1B		
		LBOA-30	2114-005	
		LBOA-30-G		
		LBOA-35	2114-006	
		LBOA-35-G		
		LBOA-20-ATP-RO	2114-007	
		LBOA-20-APL-727-1B	2114-008	
		LBOA-20-1.12-1	2114-009	
LBOA-20-1.12-T6				
LBOA-10-RA1	2436-001			
4	Lockring	All	2120-001	1

**Table 7-1 (Continued)
Itemized Parts List**

Piece Number	Description	Applicable LBOA Assembly Model Numbers	Part Number	Quantity	
5	Cover	LBOA-10	2101-001	1	
		LBOA-10-G			
		LBOA-15			
		LBOA-15-G			
		LBOA-20			
		LBOA-20-G			
		LBOA-25			
		LBOA-25-G			
		LBOA-30			
		LBOA-30-G			
		LBOA-35			
		LBOA-35-G			
		LBOA-25-RA3			
		LBOA-20-SPL-727-1B			
		LBOA-20-1.12-1			
		LBOA-20-1.12-T6			
		LBOA-20-ATP-RO	2101-002		
		LBOA-10-RA1	Not Applicable		
6	Backup Plate	LBOA-10	2122-001	1	
		LBOA-10-G			
		LBOA-15			
		LBOA-15-G			
		LBOA-20			
		LBOA-20-G			
		LBOA-25			
		LBOA-25-G			
		LBOA-30			
		LBOA-30-G			
		LBOA-35			
		LBOA-35-G			
		LBOA-25-RA3			
		LBOA-20-SPL-727-1B			
		LBOA-20-ATP-RO			2122-002
		LBOA-20-1.12-1	5251-001		
LBOA-10-RA1	2439-004				
7	O-Ring	All	1046-016	1	
8	Flat Head Screw	All, except LBOA-10-RA1	1029-020	2	
		LBOA-10-RA1	1029-017		
9	“FTI” Label	All	1009-094	2	
10	“Caution...” Label	All	1009-247	2	
11 (one-piece arm assembly)	“Do Not Strike” Label	All	1009-248	1	
11 (two-piece arm assembly)	Barrel Nut Retainer	All	2984-002	1	
	Barrel Nut Retainer Screws	All	1029-032	2	
12	“Caution...” Label	All	1009-242	1	

APPENDIX A: CONVERTING THE LITTLE BRUTE OFFSET ADAPTER INTO A BROACH PULLER

1. Disconnect the air lines from the PowerPak.
2. Disconnect the LBOA from the Little Brute Puller Unit.
3. Remove the finger guards on the side of the LBOA.
4. Remove the cover plate of the LBOA with an Allen wrench.
5. Remove the LBOA jaw.
6. Remove the backup plate.
7. Remove the slide assembly. This assembly should slide straight out of the housing.
8. Install the tang slide assembly into the housing.
9. Place the noscap against the slide assembly and fasten with 1/2 inch long Allen head screw.
10. Reinstall the LBOA onto the LB Puller per Section 4.0.
11. Refer to Table A-1 and Figure A-1 as needed.

Table A-1
Parts Needed for Conversion to Broach Puller

Quantity	Part Number	Description
1	LBOA-XX	Offset Adapter
1	LBOA-XX-T6	Tang Slide Assembly, Offset Adapter Kit

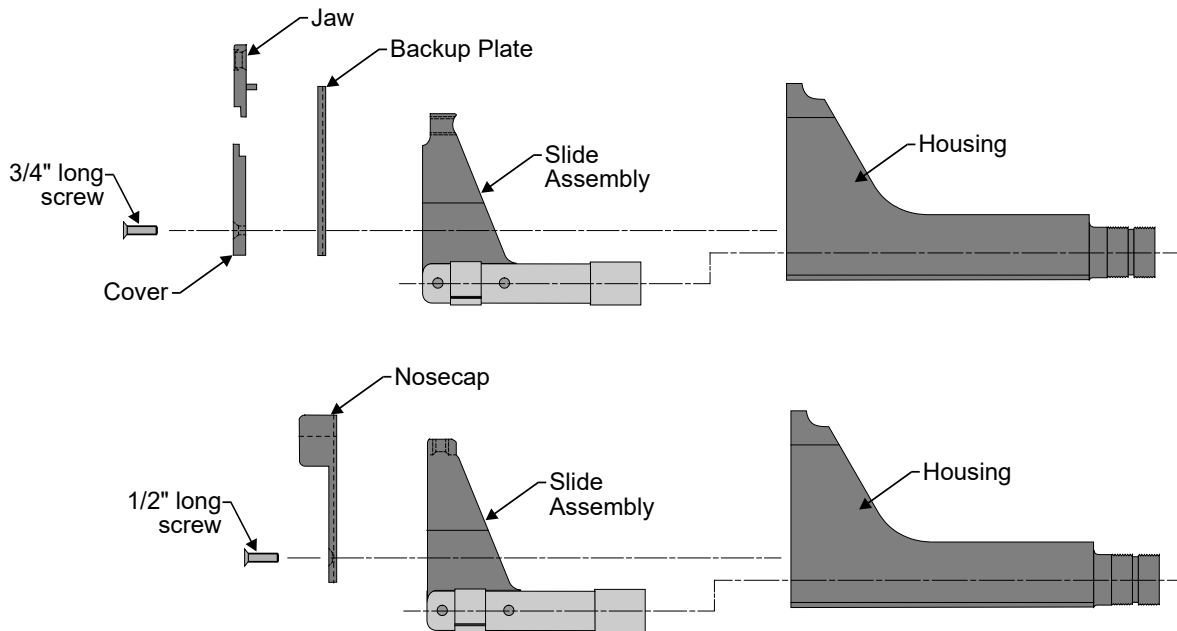


Figure A-1
Parts Needed for Conversion to Broach Puller
(Guard not shown for clarity)

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