

FTI OPERATIONS, MAINTENANCE, AND REPAIR MANUAL

Little Brute Puller Unit

**FTI Part #2720-006, Log #01151
Revision G**

March 15, 2016



Original Instruction

ABOUT FATIGUE TECHNOLOGY INC.

Fatigue Technology Inc. (FTI) is a world-leading aerospace engineering and manufacturing company. FTI pioneered Cold Expansion (Cx™) 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. 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 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: 4,809,420; 4,885,829; 4,934,170; 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; 1,061,276; 513,898; 692015124; 581,385; 69310828; 468,598; 69105390; 643,231; 69414946; 696,686; 785,366; 1032769; 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.

Fatigue Technology Inc. (FTI) has provided innovative solutions to fatigue problems in metal structures since 1969. Complete systems of tooling are used worldwide to enhance the fatigue life of holes in airframes, turbine engines, and other critical structures.

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.

This manual can be made available in other languages. Please contact the Sales Department to request a copy.

TABLE OF CONTENTS

SECTION	DESCRIPTION	PAGE
1.0	Introduction.....	1
1.1	About the Little Brute Puller Unit.....	1
1.2	General Description.....	1
1.3	General Specifications.....	2
2.0	Safety	4
3.0	Puller Unit Operating Instructions	6
3.1	Puller Unit Setup Procedure and Operation	6
3.2	Activation of Puller Unit	6
4.0	Puller Unit Maintenance	7
4.1	General Cleaning.....	7
4.2	Lubrication	7
4.3	Inspection	7
4.4	Disassembly.....	7
4.5	Re-Assembly	9
5.0	Troubleshooting.....	10
6.0	Illustrated Parts Breakdown.....	14
6.1	Little Brute Rework Kit; Parts List and Diagram	15
6.2	Little Brute Seal Kit; Parts List and Diagram	16
6.3	Previous Little Brute Trigger Assembly; Parts List and Diagram	17
6.4	Little Brute Puller Assembly; Parts List and Diagram.....	18

FIGURES

Figure 1.3-1	Little Brute Puller Unit Parts	2
Figure 1.3-2	Little Brute Specifications	3
Figure 2.0-1	Safety Stickers	4
Figure 2.0-2	Location of Air Disconnect	4
Figure 5.0-1	FT-20 PowerPak	10
Figure 5.0-2	FT-200 PowerPak	10
Figure 5.0-3	Hydraulic Quick Coupler.....	11
Figure 5.0-4	Location of Hydraulic Quick Coupler (FT-200).....	11
Figure 5.0-5	Location of Hydraulic Quick Coupler (FT-20).....	11
Figure 5.0-6	Enerpac CT-604 Pressure Relief Tool.....	11
Figure 5.0-7	Trigger Response Valves	12
Figure 5.0-8	Pressure Gage (FT-200).....	13

TABLE OF CONTENTS (Continued)

SECTION	DESCRIPTION	PAGE
Figures (Continued)		
Figure 6.1-1	Diagram of Little Brute Rework Kit Parts (LB-CT-RK).....	15
Figure 6.2-1	Diagram of Little Brute Assembly (LB-SK)	16
Figure 6.3-1	Diagram of Previous Little Brute Trigger Assembly.....	17
Figure 6.4-1	Little Brute Assembly	18
	E.C. Declaration of Conformity Letter	20
TABLES		
Table 6.0-1	Trigger Assembly Conversion	14
Table 6.1-1	Parts List for Little Brute Rework Kit	15
Table 6.2-1	Little Brute Seal Kit (LB-SK).....	16
Table 6.3-1	Previous Little Brute Trigger Assembly	17
Table 6.4-1	Little Brute Parts List	19

SECTION 1.0: INTRODUCTION

This instruction manual contains information on the operation and maintenance of the Little Brute (LB) Puller Unit. To obtain optimum performance and many years of trouble-free service, operate the puller unit properly and carefully follow maintenance procedures.

Read this manual before operating the puller unit and retain it for future reference.

1.1 ABOUT THE LITTLE BRUTE PULLER UNIT

The Little Brute hydraulic puller unit is a powerful, small, lightweight tool specifically designed for use with Fatigue Technology Inc. (FTI) patented Split Sleeve Cold Expansion™ (SsCx™) process. The Little Brute Puller Unit is designed to pull a mandrel through a hole with the pre-lubricated stainless steel split sleeves used in this process.

The Little Brute puller has a maximum pull force of 8,000 pounds (35,584N) at 10,000 psi (68.95MPa) pump pressure. The Little Brute is available in six sizes (models) for cold expanding holes up to 1/2 inch (12.7 mm) in diameter and 3-1/2 inches (88.9 mm) deep in aluminum, and 3/8 inch (9.53 mm) in diameter and 3-1/2 inches (88.9 mm) deep in steel and titanium.

The Little Brute is available in various models to accommodate multiple material stack-ups, hose options, and mandrel adapters.

- LB-xx where ‘-xx’ relates to material stack (see Figure 1.3-2)
- LB-xx-V where ‘-V’ represents high visibility hoses
- LB-xx-Hxx where ‘-Hxx’ represents a unique hose length other than the standard 10 feet
- LB-xxA comes with a LB-CA-4 mandrel adapter
- LB-xxB comes with a LB-CA-6 mandrel adapter
- LB-xx-SH where ‘-SH’ represents short hose length of 4 inches
- LB-15-20D4 is an LB-15 puller with an LB-20 front barrel
- LB-xx-4K is designed for the reduced pressure PowerPak (FT-20-4K) with 4,000 maximum psi

The Little Brute has a fail-safe air control system that causes the puller retraction cycle to be interrupted whenever the operator releases finger pressure on the trigger or in the event of air or hydraulic hose failure. All puller units operate in conjunction with either of FTI’s PowerPak air-hydraulic power units: the standard FT-200 or portable FT-20 (and compatible with older units IW100MF and IW10MF). The Little Brute has proven to be very reliable and requires minimal maintenance.

1.2 GENERAL DESCRIPTION

NOTE: Specifications are the same for all Little Brute pullers LB-10 through LB-35.

Hydraulic Fluid Requirements.....	U.S. MIL-SPEC #5606
Operating Hydraulic Pressure.....	10,000 psi (68.95MPa)
Pull Force Capacity	8,000 pounds (35,584N)
PowerPak Air Line Requirements	3/8 inch to 1/2 inch (9.53 to 12.70 mm) ID (FT-200)
PowerPak Air Flow Requirements	90 to 120 psi (0.621 to 0.827MPa), 50 cfm (1.42m ³ /min) (FT-200)
Actuation	Pneumatic
Operation	Hydraulic
Compatible PowerPaks.....	FT-200 or FT-20
Fail-Safe.....	Air logic safety circuit halts mandrel retraction when trigger is released
Replacement Seal Kit	LB Seal Kit (LB-SK)

1.3 GENERAL SPECIFICATIONS

The LB-20 Puller Unit is the preferred model by most customers since material stack-ups rarely exceed 2 inches (50.8 mm) in the applicable diameter range.

Nosecap Selection: The Little Brute is compatible with both the standard nose cap and the flush nose cap. See FTI's comprehensive Tooling Catalog for more information.

Mandrel Selection: The Little Brute is directly compatible with standard Type 1, 7/16-20 threaded mandrels. The LB may also be adapted to tang or pintail mandrels using LB-CA and LB-PC chuck assemblies, respectively. See FTI's comprehensive Tooling Catalog for more information.

Figures 1.3-1 and 1.3-2 show the parts and specifications of the Little Brute Puller Unit.

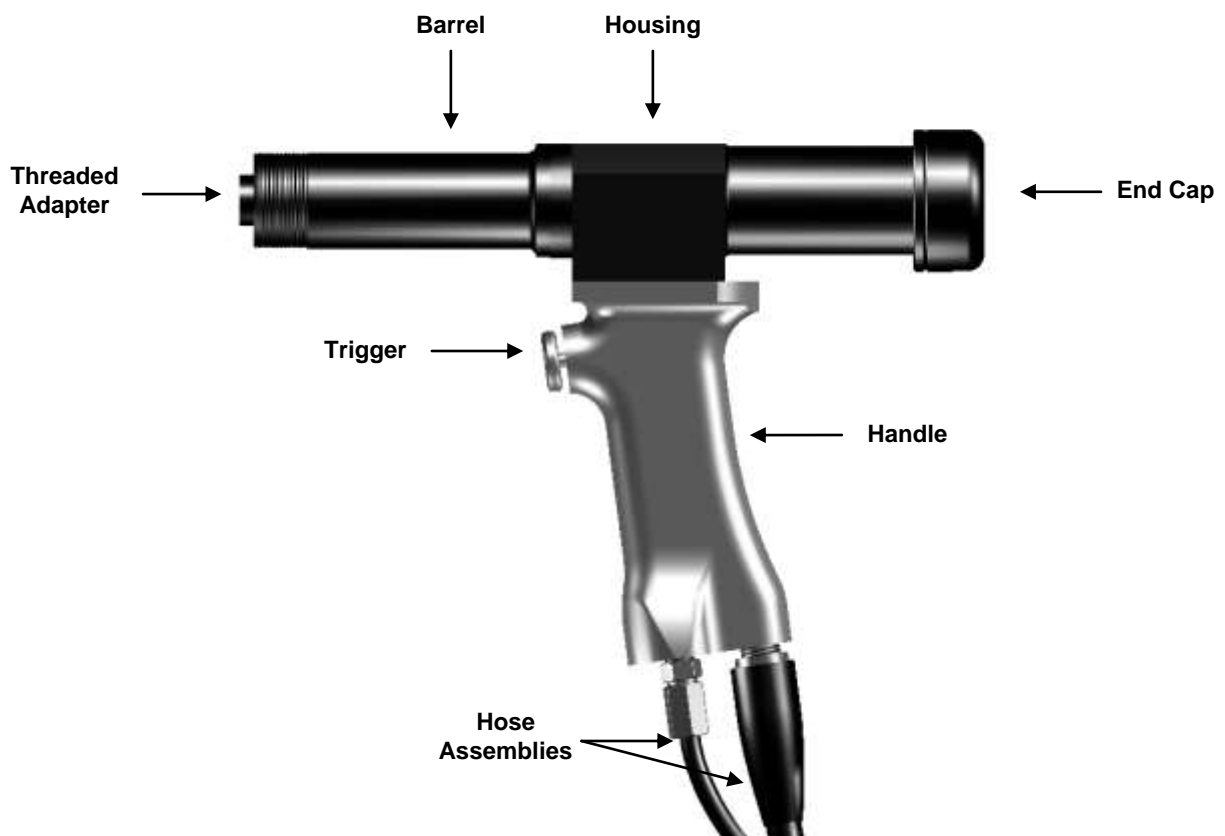
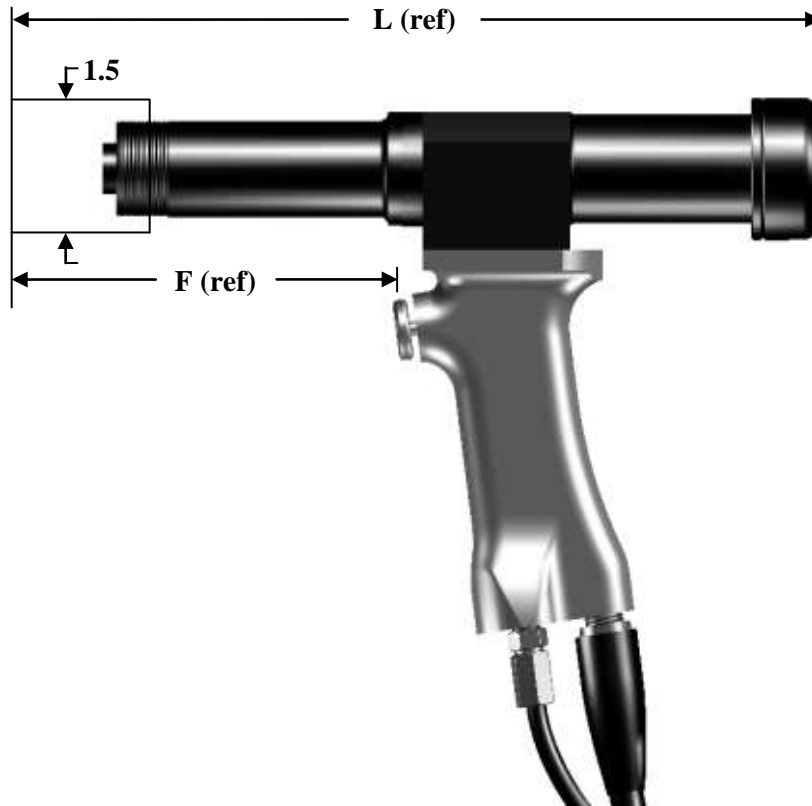


Figure 1.3-1
Little Brute Puller Unit Parts



Model Number	Maximum Material Stackup (inch)	L (inch)	F (inch)	Weight (lb.)	Stroke (inch)
LB-10	1.0 (25.4 mm)	9.2 (233.7 mm)	4.0 (101.6 mm)	10.75 (47.8N)	2.0 (50.8 mm)
LB-15	1.5 (38.1 mm)	10.2 (259.1 mm)	4.5 (114.3 mm)	11.00 (48.9N)	2.6 (66.0 mm)
LB-20	2.0 (50.8 mm)	11.2 (284.5 mm)	5.0 (127.0 mm)	11.25 (50.0N)	3.1 (78.7 mm)
LB-20-FVC	2.0 (50.8 mm)	11.2 (284.5 mm)	5.0 (127.0 mm)	11.25 (50.0N)	3.1 (78.7 mm)
LB-20-FVS	2.0 (50.8 mm)	11.2 (284.5 mm)	5.0 (127.0 mm)	11.25 (50.0N)	3.1 (78.7 mm)
LB-25	2.5 (63.5 mm)	12.2 (309.9 mm)	5.5 (139.7 mm)	11.50 (51.2N)	3.6 (91.4 mm)
LB-30	3.0 (76.2 mm)	13.2 (335.3 mm)	6.0 (152.4 mm)	11.75 (52.3N)	4.1 (104.1 mm)
LB-35	3.5 (88.9 mm)	14.2 (360.7 mm)	6.5 (165.1 mm)	12.00 (53.4N)	4.6 (116.8 mm)

**Figure 1.3-2
Little Brute Specifications**

SECTION 2.0: SAFETY

When used in accordance with these instructions, the puller unit is safe and easy to use. All general safety precautions associated with hydraulic and pneumatically operated power tools should be observed. Many of these are noted in this section.

Ultimately, operators are responsible for their own safety; however, the following general safety precautions should be observed.

1. Wear eye protection when operating the puller unit. Safety stickers are shown in Figure 2.0-1.

Read manual before using



Always wear eye protection



Always wear ear protection



**Figure 2.0-1
Safety Stickers**

2. Disconnect the air supply when:
 - Maintenance is to be performed
 - Hydraulic hose is disconnected
 - PowerPak is not in use
3. In the event of a ruptured or leaking hydraulic hose, **IMMEDIATELY RELEASE THE TRIGGER AND DISCONNECT THE AIR LINE** at the air coupler from the PowerPak (see Figure 2.0-2). **Never use your hands to grasp a leaking hose under pressure.** The force of escaping hydraulic fluid could cause serious injury.
4. Keep hands away from the nosecap assembly when actuating the puller unit.
5. Release the puller unit trigger when the mandrel clears the workpiece or becomes stuck.
6. The end cap must always be in place while in use. Injury may occur if the end cap is removed during operation. All new Little Brute Puller Units have been modified to ensure operator safety. However, rework instructions are available from FTI for any Little Brute Puller Units that do not have a roll pin and air seal adapter (shown in Figure 6.4-1).



**Figure 2.0-2
Location of Air Disconnect**

7. Before operating the pump, tighten all hose connections using the proper tools. Do not over tighten the connections. Connections need only be tightened securely and leak-free. Over tightening may cause premature thread failure or high-pressure fittings to split at pressures lower than their rated capacities.
8. Operators must read this manual in its entirety before using the Little Brute. Eye and ear protection must be worn while operating the Little Brute. Three safety stickers on the Little Brute act as a reminder to these instructions. The symbols are defined in Figure 2.0-1.
9. Do not use in potentially explosive atmospheres.

Hydraulic Hose Safety

10. Inspect hydraulic hose for signs of wear (cuts, abrasions, or kinks) to the outer shell material. Pump clean oil through the entire length. Pressurize the hose and check for leaks at the crimped connectors, between the hose material and the fitting, and between the fitting and the coupler.
11. DO NOT attempt to disconnect the hydraulic hose while it is under pressure.
12. DO NOT expose hoses to potential hazards such as extreme heat or cold, sharp surfaces, or heavy impact.
13. DO NOT allow hoses to kink, twist, curl, or bend so tightly that the oil flow within the hose is blocked or reduced. Periodically inspect the hose for wear or damage that could cause premature failure of the hose and possibly result in injury. Damaged hoses must be replaced immediately.
14. DO NOT use the hose to move attached equipment.
15. DO NOT remove strain reliever from hoses.
16. Hose strain relievers must be placed around hose fittings during use. Hoses with damaged strain relievers must be replaced immediately.
17. Hose material and coupler seals must be compatible with hydraulic fluid that meets the requirements of US MIL-SPEC #5606.
18. Hoses must not come in contact with toxic materials such as creosote-impregnated objects and some paints. Keep couplers and hoses clean and free of paint. Hose deterioration due to chemical degradation may cause the hose to fail under pressure. Damaged hoses must be replaced immediately.
19. Before operating pump, make sure all hose connections are tightened securely. DO NOT over tighten.
20. If hoses require replacement, contact FTI's Sales Department.

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: PULLER UNIT OPERATING INSTRUCTIONS

Become familiar with these instructions before operating the puller.

3.1 PULLER UNIT SETUP PROCEDURE AND OPERATION

Refer to Section 6 (Illustrated Parts Breakdown) for parts identification.

1. Inspect all threads and fittings for signs of wear or damage and replace them if necessary.
2. Install the appropriate mandrel in the threaded adapter. Install the proper chuck assembly in place of the threaded adapter if a tang or pintail mandrel is to be used.
3. Install the appropriate nose cap assembly over the mandrel and thread it into place.
4. Uncoil the hose assembly of the puller unit and inspect all threads, couplings, and hoses for damage and degradation. Any damaged component must be replaced immediately.
5. Remove thread protectors from the hydraulic fittings and thread the hydraulic hose fitting from the puller unit (male) onto the hydraulic fitting of the FTI PowerPak (female). Wipe fittings clean prior to connecting.
6. Thread couplers completely together. There should be positive contact (no space) between the PowerPak coupler and the hose fitting flange. See Section 5, Problem 2 for more information. Failure to completely tighten the coupler will cause the puller piston to become stuck in the retracted position. Strain relievers must be placed on hose fittings during operation. If strain relievers are worn or damaged, they must be replaced immediately.
7. Connect the male/female air quick disconnects from the puller unit to the FTI PowerPak.
8. Test shop air to ensure that the air is clean, dry, and between 90 and 120 psi (0.621 and 0.827MPa) at 50 cfm (1.42m³/min).
9. Connect the female quick disconnect of a 1/2-inch (12.7 mm) ID shop air line onto the male air inlet of the PowerPak.

3.2 ACTIVATION OF PULLER UNIT

1. The puller unit can be activated only when connected to an FTI PowerPak.
2. Activate the puller unit by depressing the trigger on the handle. Hydraulic pressure is transmitted through the hose to the cylinder of the puller, which then retracts the hydraulic piston that performs the cold expansion procedure.
3. Releasing the trigger changes pressure at the pilot valve and stops the pull cycle. Air pressure returns the puller to original position.
4. If the puller fails to operate as detailed above, refer to Section 5 (Troubleshooting).

SECTION 4.0: PULLER UNIT MAINTENANCE

The puller requires routine checking and periodic preventative maintenance to ensure safe, trouble-free operation. No special maintenance is required. The following maintenance actions are suggested.

CAUTION: Before attempting any maintenance operations on the puller unit, disconnect the PowerPak from the air supply or disconnect the puller from the PowerPak or hand pump.

4.1 GENERAL CLEANING

1. Periodically clean the outer surfaces of the puller unit and PowerPak.
2. When not in use, ensure thread protectors are re-installed.
3. Keep all hose connections free of dirt and grime. Doing so will dramatically extend the life of pumps and puller seals.

4.2 LUBRICATION

1. There is no internal lubrication requirement for the puller unit.
2. Whenever the puller is to be stored for any length of time, maintain a thin coat of 10-weight oil on the outside of black oxide surfaces.

4.3 INSPECTION

1. Periodically inspect threaded fittings, hoses, and strain relievers for cracks, leaks or other damage. Repair and replace immediately.

4.4 DISASSEMBLY

Refer to Section 6.4 for parts lists unless otherwise noted. For Little Brute Puller Units below Serial #406, Step 7 will not be possible since the air seal adapter is adhered to the piston rod. These two parts and the required seals are referred to as the piston rod assembly.

1. Unthread and remove the nose cap assembly.
2. Unthread and remove the mandrel from the threaded adapter (8).
3. Loosen the lockring (10) to remove tension from the end cap (9).
4. Unthread and remove the end cap (9).
5. Unscrew and remove the barrel (4) from the housing (2).
6. Unthread and remove the threaded adapter (8) or chuck assembly if so equipped; use the flats on the back of the threaded adapter (8) and mating air seal adapter (7).

7. Remove the spring pin (26) (if present, see Figure 6.4-1). Unthread and remove the air seal adapter (7).

NOTE: Since it is necessary to hold the piston rod stationary to remove the threaded adapter (10), use a screwdriver in the slot (some models may have a hex wrench hole) in the back end of the piston to keep the piston rod from turning. **DO NOT** scratch the piston shaft during disassembly.

8. Remove the piston rod assembly (3, Figure 6.4-1) by pushing on the threaded end (nosecap end) of the piston rod until threads engage the sleeve (5, Figure 6.4-1). Thread the piston rod threads through the sleeve (5, Figure 6.4-1) and remove the piston rod assembly from the unit.
9. Using the pin wrench supplied, remove the sleeve retainer (6, Figure 6.4-1).
10. Remove the brass sleeve (5, Figure 6.4-1).
11. Remove the handle assembly (11, Figure 6.4-1) by removing the four hex-head bolts.

Normal replacement of seals requires the use of Little Brute Seal Kit (LB-SK). Refer to Section 6.2.

12. Remove and replace the O-ring on the top face of the handle (4, Figure 6.2-1).
13. Remove the hydraulic adapter (6, Figure 6.1-1); replace the O-rings (3, Figure 6.2-1) and backup rings (2, Figure 6.2-1).
14. Replace the hydraulic adapter (6, Figure 6.1-1) in the handle (11, Figure 6.4-1).
15. Remove and replace the O-ring (6, Figure 6.2-1) and backup ring (7, Figure 6.2-1) on the outside diameter of the sleeve (5, Figure 6.4-1).
16. Remove and replace the O-ring (8, Figure 6.2-1) and backup ring (9, Figure 6.2-1) on the inside diameter of the sleeve.
17. Replace the omni seal (10, Figure 6.2-1) on the air seal adapter (1, Figure 6.1-1).
18. Remove and replace the O-ring (6, Figure 6.2-1) and backup ring (7, Figure 6.2-1) on the piston rod assembly.
19. Remove and replace the O-ring (5, Figure 6.2-1) on the barrel.

4.5 RE-ASSEMBLY

Refer to Section 6.0 for parts lists. All numbers below refer to location numbers in Figure 6.4-1.

IMPORTANT: 1. Thoroughly clean all parts prior to reassembly.
2. Check to see if O-rings are installed toward the hydraulic flow with Teflon backup rings behind.

1. Place the sleeve (5) into front of housing (2) as shown (note the orientation).
2. Replace the puller unit sleeve retainer (6) and tighten until snug.
3. Install the piston assembly (3) into the housing (2) by gently threading the piston through the sleeve (5). Then push the piston (3) to the full forward position. Lubricating the piston rod and threads with hydraulic oil will help prevent damage to the sleeve seals.
4. Install the handle assembly (11) with hydraulic adapter onto the housing (2) using four hex-head bolts. The Teflon backup rings (2, Figure 6.2-1) may be partially sheared off during the installation process. Remove the bolts and handle assembly to remove any Teflon material sheared off during the installation process. Re-install the handle assembly (11) onto the housing (2) using four hex-head bolts.
5. Install the air seal adapter (7) on the piston rod assembly (3). Install the spring pin (26) if present.
6. Install the threaded adapter (8) or chuck assembly.
7. Reassemble the barrel (4) to the housing (2).
8. Install the end cap (9) and tighten the lockring (10).
9. Select the appropriate mandrel/nosecap combination and install.

SECTION 5.0: TROUBLESHOOTING

This section provides solutions to some basic trouble spots. If you cannot solve your operational problems with the information provided in this section, please contact your nearest FTI representative.

NOTE: Should difficulties originate in the PowerPak, consult the specific PowerPak Operations, Maintenance and Repair Manual. Remember, always disconnect the PowerPak main air supply before performing any repair or maintenance.

PROBLEM	CAUSE	SOLUTION
1. PowerPak will not build full hydraulic pressure.	<ul style="list-style-type: none"> (a) The hydraulic pressure valve has not been properly adjusted. (b) One or more of the key air or hydraulic lines has not been securely connected. (c) Inadequate external pressure. (d) Inadequate air pressure. 	<ul style="list-style-type: none"> (a) Refer to Problem 4 for resolution. (b) Check the following hose connections: <ul style="list-style-type: none"> (1) Main air line quick disconnect fitting from shop air system to PowerPak. (2) Hydraulic quick couplings connecting the hoses to the PowerPak manifold and the puller to the hydraulic hoses. See Figures 5.0-1 and 5.0-2. (3) Two male/female air line quick disconnect fittings connecting the puller to the PowerPak manifold. (c) On FT-200, adjust external pressure regulator. (d) Check the main air supply has not been interrupted and meets minimum flow requirements (90 psi (.621MPa), 50 cfm (1.42m³/min)).

CAUTION: Hydraulic oil under extreme pressure may cause serious injuries if not handled carefully. For technical assistance, please contact FTI's Sales Department.

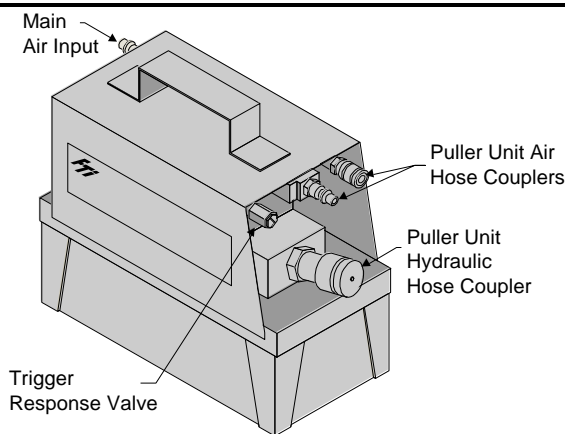


Figure 5.0-1
FT-20 PowerPak

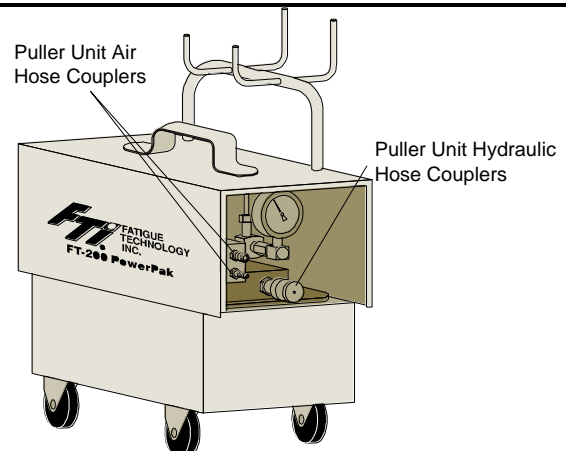


Figure 5.0-2
FT-200 PowerPak

PROBLEM

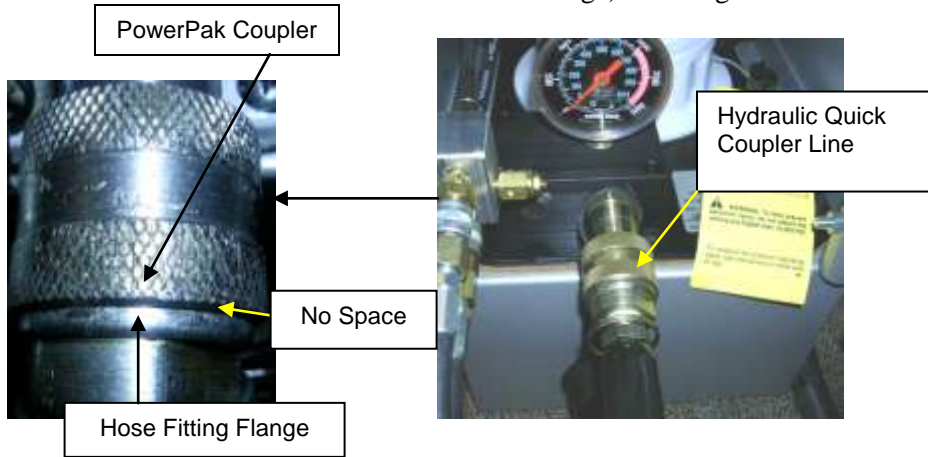
CAUSE

SOLUTION

2. Puller retracts on first trigger actuation but will not return to start position. The hydraulic hose is difficult to bend or coil (indicating unrelieved pressure built up in the hose).

(a) The hydraulic quick coupler line has not been completely tightened at the PowerPak manifold (there should be no space between the PowerPak coupler and the hose fitting flange). See Figure 5.0-3.

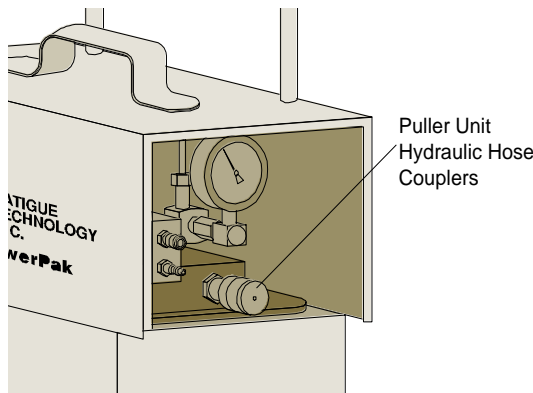
(a) Once hydraulic pressure has been introduced to the hydraulic hose, the pressure must be relieved before the coupler can be sufficiently tightened.



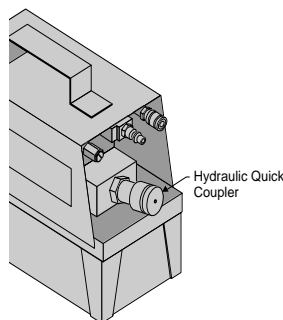
**Figure 5.0-3
Hydraulic Quick Coupler**

Procedure for relieving hydraulic pressure:

- (1) Disconnect the main air supply.
- (2) Disconnect coupler from PowerPak. See Figures 5.0-4 and 5.0-5 for the locations of the hose couplers.
- (3) Connect Enerpac CT-604 to the coupler and bleed off hydraulic oil to relieve the built-up pressure. Figure 5.0-6 shows the Enerpac CT-604 Pressure Relief Tool.
- (4) Once pressure is relieved, coupler may be tightened and reinstalled onto PowerPak.
- (5) Reattach air lines to get puller to return.
- (6) Check oil level in PowerPak Reservoir.



**Figure 5.0-4
Location of Hydraulic Quick Coupler (FT-200)**



**Figure 5.0-5
Location of Hydraulic Quick Coupler (FT-20)**



**Figure 5.0-6
Enerpac CT-604
Pressure Relief Tool**

PROBLEM**CAUSE****SOLUTION**

3. PowerPak will not generate constant pressure (or hiccups).

- (a) Trigger response valve requires adjustment. Figure 5.0-7 shows the trigger response valves.

*** (For pullers with a cartridge trigger assembly (see Section 6.2), the trigger response valve should be closed.)***

- (a) Adjustment procedure:
- (1) Loosen locknut on trigger response valve.
 - (2) Using a screwdriver, open screw counterclockwise until PowerPak will not start when puller trigger is depressed.

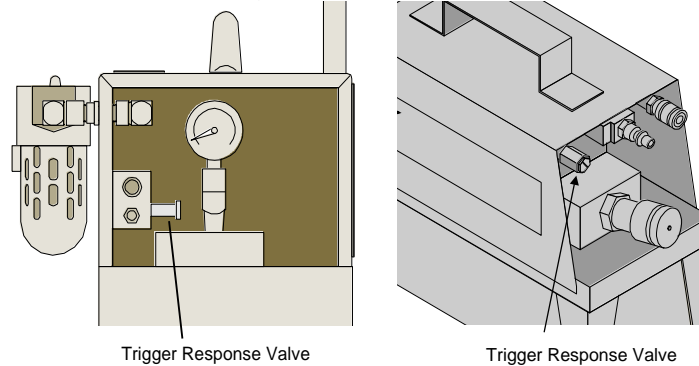


Figure 5.0-7
Trigger Response Valves

- (3) Turn screw clockwise until:
 - PowerPak generates constant pressure when puller trigger is depressed, and
 - PowerPak starts instantly when puller trigger is depressed and stops instantly when released. When the puller trigger is depressed, the PowerPak should be run at the pre-set pressure until the trigger is released.
- (4) Hold set screw in position and tighten locknut until snug.

4. PowerPak will not operate or maintain sufficient pressure (6,000 psi (41.37MPa).)

- (a) Hydraulic pressure requires adjusting (applicable to FTI-200 PowerPak only).

- (a) Adjust PowerPak pressure valve:
- (1) Squeeze trigger on puller unit to activate PowerPak.
 - (2) If pressure does not reach 6,000 psi (41.37MPa), loosen locking and turn hydraulic pressure control clockwise until pressure reaches 6,000 psi (41.37MPa).
 - (3) Tighten locking to secure available shop air.

PROBLEM**CAUSE****SOLUTION**

5. Threaded adapter/chuck assembly will not unthread from piston assembly.

(a) Torque required to unthread threaded adapter/chuck assembly is high enough to spin the piston assembly.

(b) Inadequate air supply.

(a) See disassembly procedures in Section 4.4-6 (use flats on back of threaded adapter and mating air seal adapter).

(b) Increase pressure or flow of available shop air.

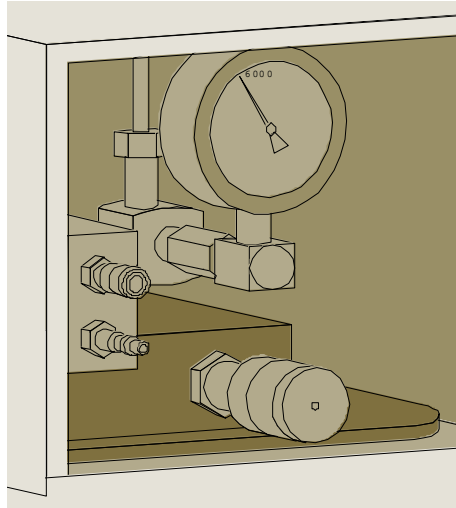
- If PowerPak will not generate or maintain sufficient pressure, the main air line pressure is too low or the PowerPak hydraulic pressure requires adjustment.

- Air pressure requirements:
1/2-inch (12.7mm) ID air line with 90 to 120 psi (.621 to .827MPa) for the FT-200.

3/8-inch (9.525mm) ID air line with 90 to 120 psi (.621 to .827MPa) for the FT-20.

- Flow requirements:
40-50 cfm (1.13-1.42m³/min) for the FT-200.

20 cfm (.57m³/min) for the FT-20.



**Figure 5.0-8
Pressure Gage (FT-200)**

6. The mandrel sticks in the hole when the puller is activated.

(a) Not enough pressure used to generate pull forces.

(a) Use the following procedure to analyze the problem:

(1) Actuate the puller and observe pressure reading on PowerPak pressure gage (FT-200 PowerPak only, Figure 5.0-8).

(2) Pressure gage should read 6,000 psi (41.37MPa). (Note: FT-20 PowerPak is factory set at 10,000 psi (68.95MPa).) If any increase in pressure is required, refer to the solution for Problem 4 in this section for instructions.

(3) Actuate puller again. If mandrel remains stuck, increase pressure to 10,000 psi (68.95 MPa).

(4) If mandrel remains stuck at 10,000 psi (68.95MPa), disengage the mandrel from the puller. Push the mandrel out. Contact FTI's Sales Department for additional assistance.

SECTION 6.0: ILLUSTRATED PARTS BREAKDOWN

Fatigue Technology has redesigned the trigger assembly for Little Brute Series Puller Units. All Little Brute Puller Units with serial numbers equal to or greater than the serial numbers in Table 6.0-1 have the new cartridge trigger assembly. The new design will reduce the occurrence of trigger air leaks, perform more reliably (better pump actuation), and be easier to maintain.

The previous trigger design detailed in Section 6.3 can be easily replaced with this improved trigger assembly detailed in Section 6.1. Two part numbers are needed for replacement:

- Either the Cartridge Trigger Assembly Kit (FTI-CT-RK) or the Little Brute Rework Kit (LB-CT-RK) (see kit differences in Section 6.1), and
- Puller Trigger Rework Tool Kit (FTI-CT-RKT).

One FTI-CT-RK or LB-CT-RK kit is required for each puller converted. Only one FTI-CT-RKT is required regardless of the number of pullers converted. The FTI-CT-RKT kit includes the tools (punch, tap, etc.) required and detailed instructions on how to perform the modification.

**Table 6.0-1
Trigger Assembly Conversion**

FTI Model Number	FTI Part Numbers	FTI Serial Number
LB-10	2327-001, 2885-001, 2305-001, 2305-013, 2885-013, 2305-007, 2307-020, 2885-007	0707
LB-15	2305-002, 2305-008, 2885-014, 2885-002, 2885-019, 2305-019, 2305-014, 2885-008	FTI-424
LB-20	2885-015, 2885-003, 2885-009, 2305-009, 2305-003, 2305-021, 2305-015	3109
LB-25	2885-010, 2885-016, 2305-004, 2305-010, 2305-016, 2885-004	0424
LB-30	2305-022, 2305-017, 2885-017, 2305-011, 2305-005, 2885-011, 2885-005	0713
LB-35	2885-006, 2305-018, 2885-018, 2305-012, 2305-006, 2305-023, 2885-012	2057
LB-20-AT	2785-003	1091
LB-30-AT	2785-005	0508
LB-35-AT	2785-006	0427

6.1 LITTLE BRUTE REWORK KIT; PARTS LIST AND DIAGRAM

All Little Brute Puller Units with serial numbers equal to or higher than the serial numbers in Table 6.0-1 have a cartridge trigger assembly, as shown in Figure 6.1-1. This trigger configuration can be readily identified by the brass pushbutton (the previous trigger assembly is identified by an aluminum pushbutton - see Section 6.3).

A diagram of the Little Brute Puller Unit is shown in Figure 6.1-1, with parts for the Rework Kit corresponding to Table 6.1-1.

Table 6.1-1
Parts List for Little Brute Rework Kit

Piece Number	Quantity	Description	Part Number	Included in Kit
1	1	Adapter, LB Air Seal (seal and fitting)	2339-001	LB-CT-RK
2	4	Screw, SHC (8-32UNCX 3/8)	1026-002	LB-CT-RK
3	1	Pushbutton, Brass	1187-623	LB-CT-RK and FTI-CT-RK
4	1	Retaining Ring, Internal	1187-624	LB-CT-RK and FTI-CT-RK
5	1	Sleeve, Puller Handle Trigger	3196-001	LB-CT-RK and FTI-CT-RK
6	1	Adapter, LB Hydraulic	2039-001	LB-CT-RK
7	1	Valve, Cartridge Trigger	1187-622	LB-CT-RK and FTI-CT-RK
8	1	O-Ring	1046-012	LB-CT-RK
See Section 6.2	1	Kit, LB Seal (LB-SK)	8000-484	LB-CT-RK

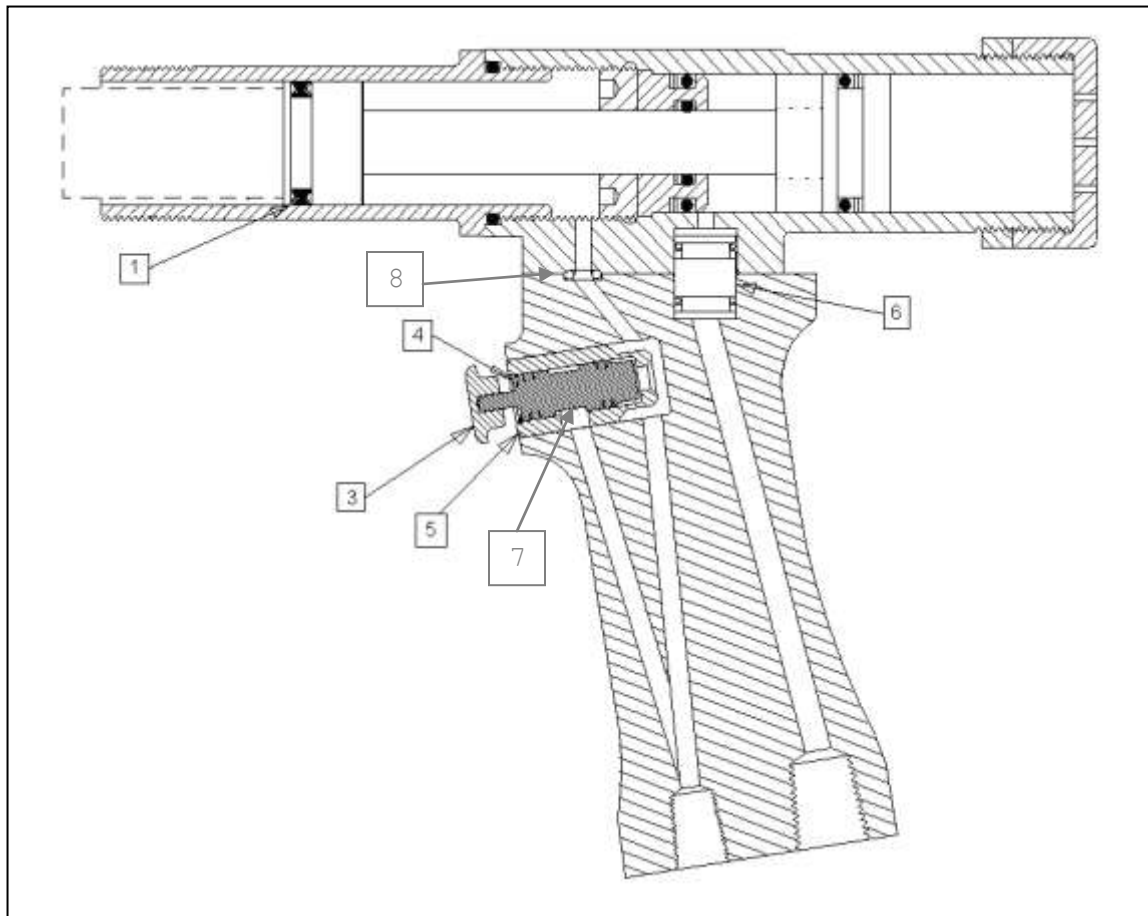


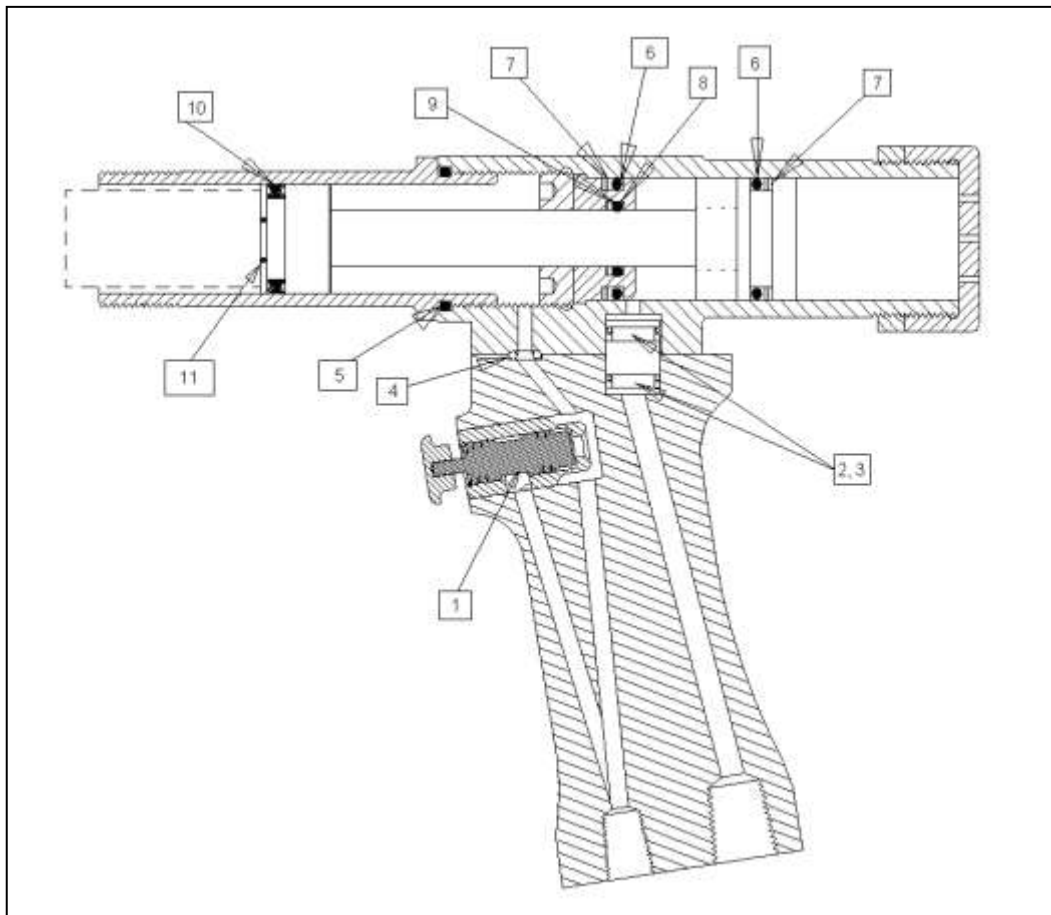
Figure 6.1-1
Diagram of Little Brute Rework Kit Parts (LB-CT-RK)

6.2 LITTLE BRUTE SEAL KIT; PARTS LIST AND DIAGRAM

All Little Brute Puller Units with serial numbers less than the serial numbers on Table 6.0-1 will use Piece Number 2 to replace the seal in the trigger assembly (see Section 6.3). A diagram of the Little Brute Puller Unit is shown in Figure 6.2-1, with parts for the seal kit corresponding to Table 6.2-1.

**Table 6.2-1
Little Brute Seal Kit (LB-SK)**

Piece Number	Description	Part Number	Quantity
1	Valve, Cartridge Trigger	1187-622	1
See Section 6.3, pc. 2	Seal, LB Handle	2040-001	1
2	Ring, Backup	1046-044	2
3	O-Ring	1046-045	2
4	O-Ring	1046-012	1
5	O-Ring	1046-016	1
6	O-Ring	1046-002	2
7	Ring, Backup	1046-003	2
8	O-Ring	1046-014	1
9	Ring, Backup	1046-015	1
10	Seal, Omni	1046-017	1
11	O-Ring	1046-112	1



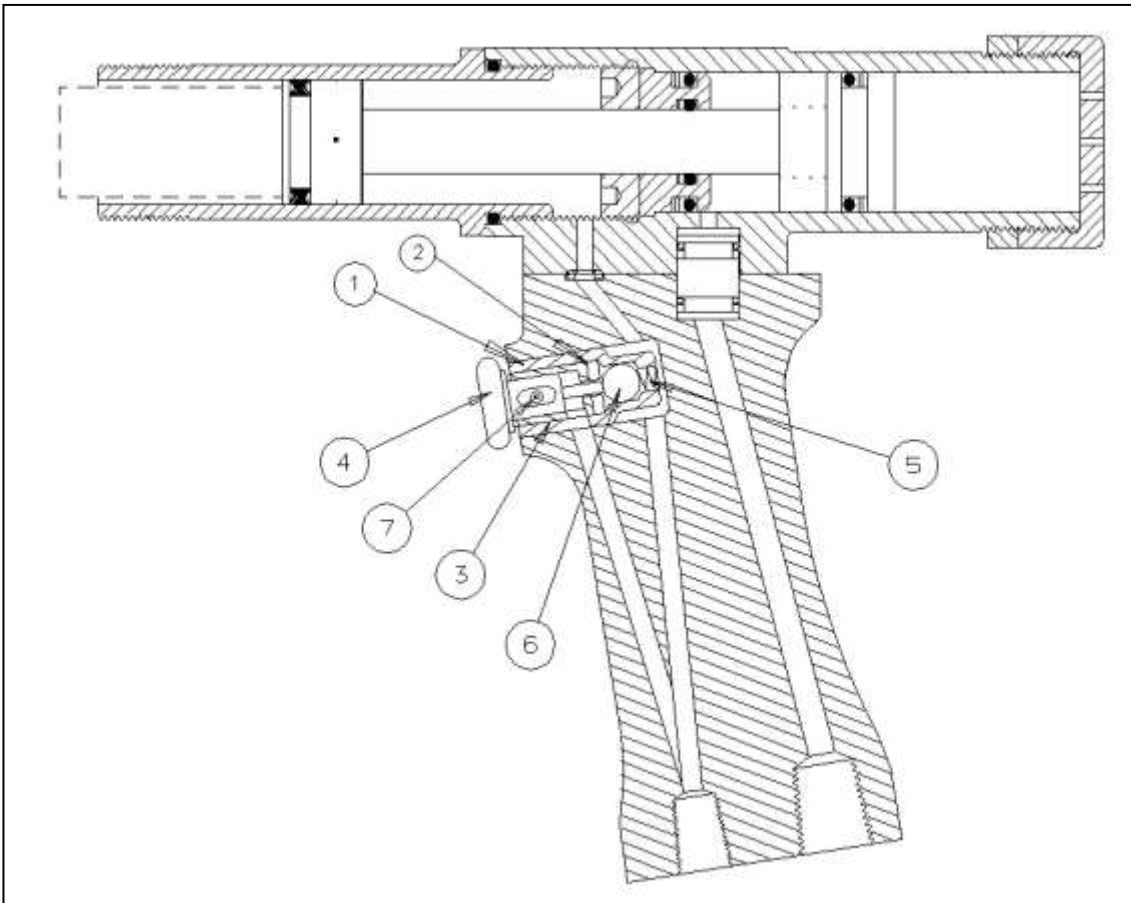
**Figure 6.2-1
Diagram of Little Brute Assembly (LB-SK)**

6.3 PREVIOUS LITTLE BRUTE TRIGGER ASSEMBLY; PARTS LIST AND DIAGRAM

All pullers with serial numbers previous to those listed in Table 6.0-1 have the trigger assembly detailed below. These trigger assemblies can be readily identified by the aluminum pushbutton. (The new trigger assemblies have a brass pushbutton). These trigger assemblies can be reworked by ordering the Cartridge Trigger Assembly Kit (FTI-CT-RK) or the Little Brute Rework Kit (LB-CT-RK), and the Puller Trigger Rework Tool Kit (FTI-CT-RKT) in Section 6.1. A diagram of the Little Brute Puller Unit is shown in Figure 6.3-1, with parts for the previous trigger assembly corresponding to Table 6.3-1:

**Table 6.3-1
Previous Little Brute Trigger Assembly**

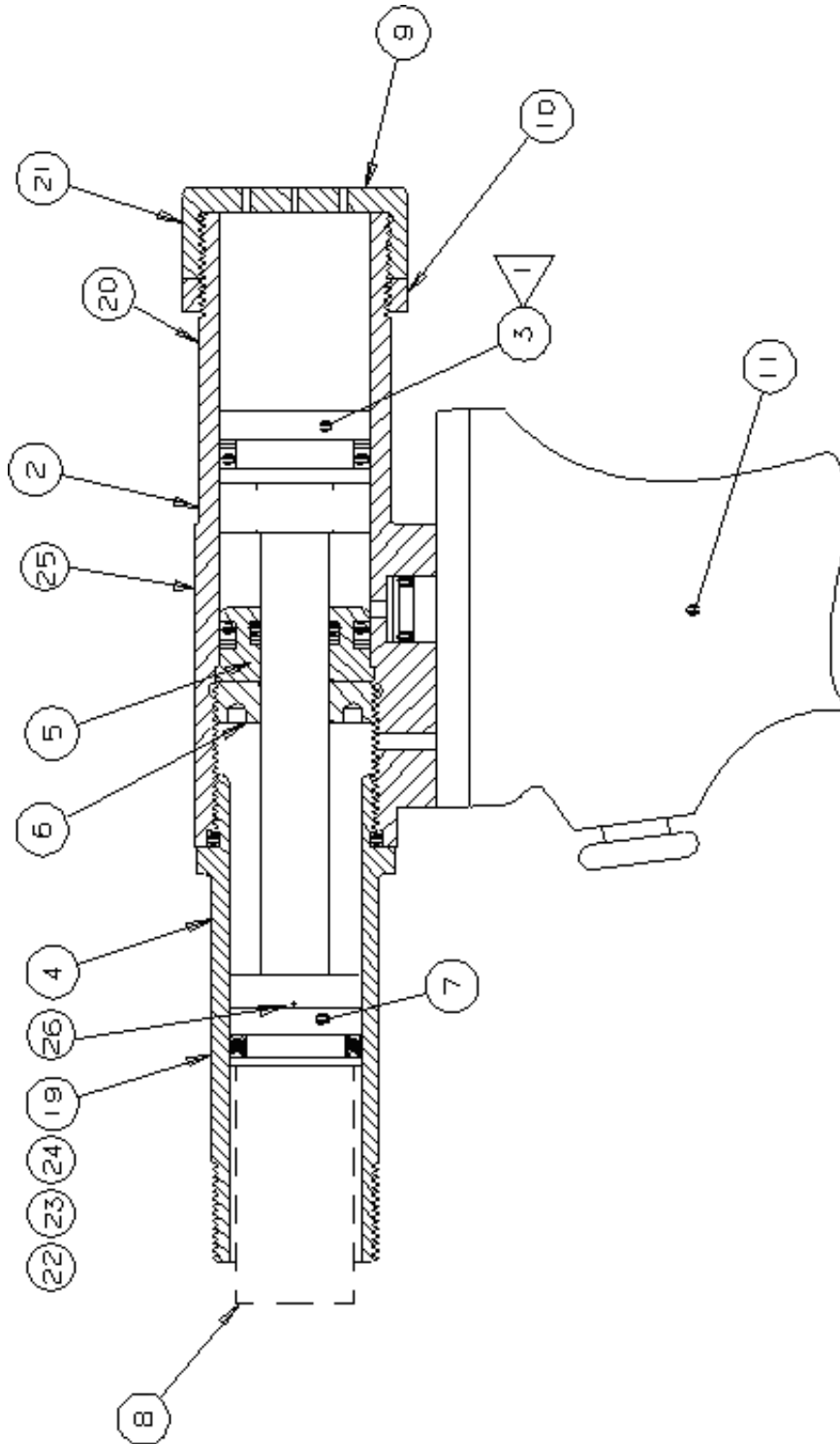
Piece Number	Quantity	Description	Part Number
1	1	Sleeve, LB Handle	2044-001
2	1	Seal, LB Handle	2040-001
3	1	Retainer, LB Handle	2043-001
4	1	Trigger, LB Handle	2042-001
5	1	Spring, LB Handle	1005-003
6	1	Ball, .250 Dia. Stl.	1045-025
7	1	Pin, 1/8 x 3/4 Std. Spring	1045-026



**Figure 6.3-1
Diagram of Previous Little Brute Trigger Assembly**

6.4 LITTLE BRUTE PULLER ASSEMBLY; PARTS LIST AND DIAGRAM

A diagram of the Little Brute Puller Unit is shown in Figure 6.4-1, which corresponds to the parts list in Table 6.4-1 on the following page.



**Figure 6.4-1
Little Brute Assembly**

The following parts list, Table 6.4-1, corresponds to the drawing in Figure 6.4-1 on the previous page.

**Table 6.4-1
Little Brute Parts List**

Reference #	Description	Puller Unit	Part Number
2	LB Housing*	LB-10	LB-10-D2
		LB-15	LB-15-D2
		LB-20	LB-20-D2
		LB-25	LB-25-D2
		LB-30	LB-30-D2
		LB-35	LB-35-D2
3	LB Piston Assembly*	LB-10	LB-10-D3
		LB-15	LB-15-D3
		LB-20	LB-20-D3
		LB-25	LB-25-D3
		LB-30	LB-30-D3
		LB-35	LB-35-D3
4	LB Barrel*	LB-10	LB-10-D4
		LB-15	LB-15-D4
		LB-20	LB-20-D4
		LB-25	LB-25-D4
		LB-30	LB-30-D4
		LB-35	LB-35-D4
5	LB Sleeve	All	LB-D7
6	LB Sleeve Retainer	All	LB-D8
7	LB Air Seal Adapter	All	LB-D9
8	LB Threaded Adapter ⁽¹⁾	All	LB-D10
9	End Cap	All	LB-D5
10	Lockring	All	LB-D6
11	Handle Assembly	All	LB-H-1 ⁽³⁾
19	“Warning” Label	All	1009-185
20	“FTT” Label	All	1009-094
21	“Do Not Strike” Label	All	1009-184
22	Read Manual Label	All	1187-107
23	Eye Protection Label	All	1187-106
24	Ear Protection Label	All	1187-105
25	CE Label	All	1166-001
26	Roll Pin ⁽²⁾	All	1187-093
--	Pressure Relief Tool ⁽⁴⁾	All	1187-770

* Part numbers dependent on applicable puller unit (-10, -20, -25, etc.).

(1) Chuck assemblies may be substituted for tang-style or pintail mandrels. Contact FTI for assistance.

(2) Contained as part of the Air Seal Adapter, part number LB-D9.

(3) All new Little Brute handles are equipped with new cartridge trigger assembly (see Section 6.1).

(4) Not included.

Table 6.4-1 (Continued)
Hose Assembly – Not Shown in Figure 6.4-1

Quantity	Part Number	Description
1	2107-001	Hydraulic Hose Assembly – 10 foot
1	2106-001	Air Hose Assembly, Male – 10 foot
1	2106-002	Air Hose Assembly, Female – 10 foot
1	IWZY-10	Complete Hose Assembly – 1 each 2106-001, 2106-002, and 2107-001



FATIGUE TECHNOLOGY
401 Andover Park East
Seattle, Washington 98188-7605
USA

E.C. DECLARATION OF CONFORMITY

Manufacturer: Fatigue Technology
401 Andover Park East
Seattle, WA 98188-7605

Telephone: (206) 246-2010
Fax: (206) 244-9886

Responsible Person in E.C.: Jean-Michel Derisson
4 rue d'Austerlitz
31490 L g uevin
FRANCE

Telephone: 33 5-34-559-916
Fax: 33 5-34-569-047

The undersigned declares that the machinery described:

Type:

Serial Number:

Conforms to the following directives:

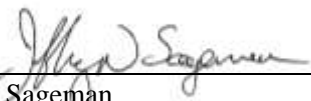
Council Directive 2006/42/EC (the Machinery Directive)

EN 792-1 Hand-Held Non-Electric Power Tools – Part 1

EN 982 Safety Requirements for Fluid Power Systems and Their Components –
Hydraulics

EN 983 Safety Requirements for Fluid Power Systems and Their Components –
Pneumatics

and complies with the relevant health and safety requirements.



Jeff Sageman
Logistics Manager

February 23, 2016

Date