
FTI OPERATIONS, MAINTENANCE, AND REPAIR MANUAL

**Medium Brute Hydraulic Offset
Puller Unit**

**Part #2720-011, Log #01310
Revision D**

January 17, 2014



Original Instruction

Fatigue Technology (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 have 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. 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 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, 7,100,264; 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.

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 or program. Should inconsistencies occur between your tooling and this manual, please contact our Sales Department.

ABOUT FATIGUE TECHNOLOGY

Fatigue Technology (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.

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SECTION 1.0: INTRODUCTION

This instruction manual contains information on the operation and maintenance of the Fatigue Technology (FTI) Medium Brute Hydraulic Offset (MBHO) 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 the manual for future reference. If requested, FTI will provide this manual in the language of the end-user.

1.1 ABOUT THE MEDIUM BRUTE HYDRAULIC OFFSET PULLER UNIT

The MBHO puller unit is a powerful, small, tool specifically designed for use with FTI's patented Split Sleeve Cold Expansion™ process. The MBHO puller unit is designed to pull a mandrel, fitted with a pre-lubricated split sleeve, through a hole.

The intended use for the MBHO Puller Unit is for restricted access areas and not intended for long sustained periods of handling. It is recommended that the operator wear gloves to help support the weight of the MBHO Puller Unit.

The MBHO puller has a maximum pull force of 17,000 pounds at 10,000 psi pump pressure. There are two root MBHO model number families. Each family has a series of different variants and is capable of cold expanding holes up to 1/2-inch diameter in aluminum and 3/8-inch diameter in titanium:

- *Root families*
 - MBHO-20 series will pull a mandrel through 2-inch (50.8mm) thick material
 - MBHO-35 series will pull a mandrel through 3-1/2-inch (88.9mm) thick material
- *Variants*
 - MBHO-xx-x.x is a reduced stroke unit
 - MBHO-xx-Hxx signifies a unique hose length other than the standard 10'
 - MBHO-xx-V comes with high visibility hoses

The MBHO has a safety feature in the 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 are compatible with older units IW100MF and IW10MF). The MBHO has proven to be very reliable, and requires minimal maintenance.

1.2 GENERAL DESCRIPTION

NOTE: Specifications are the same for both MBHO-20 and MBHO-35 pullers unless otherwise noted.

Hydraulic Fluid Requirements	U.S. MIL-SPEC #5606; AW ISO 46
Operating Hydraulic Pressure.....	10,000 psi
Pull Force Capacity	17,000 pounds
Air Line Requirements	3/8-inch to 1/2-inch inside diameter
Air Flow Requirements (via PowerPak).....	90 to 120 psi, 50 cfm
Actuation	Pneumatic
Operation.....	Hydraulic
Compatible PowerPaks.....	FT-200 or FT-20
Safety Air Trigger	Air logic safety circuit halts mandrel retraction when trigger is released
Replacement Seal Kit.....	MBHO Seal Kit (MBHO-SK)
Weight, excluding hoses*	
MBHO-20 series.....	25 pounds (11.34 kg)
MBHO-35 series.....	30 pounds (13.61 kg)

*A user supplied suspension system might be required at the end use site. The requirement for a suspension system is based on the end user's workplace lifting and weight standards. A risk analysis for the suspension is necessary to maintain compliance to end user's standards or directives. All risks involved with the suspension of the MBHO are the responsibility of the end user. User instructions and training regarding the suspension system are the responsibility of the end user.

1.3 GENERAL SPECIFICATIONS

The MBHO-20 puller is the preferred model since material stackups rarely exceed the MBHO-20's 2-inch stackup capability in the applicable diameter range. Actual specifications for both the MBHO-20 and MBHO-35 are shown in Table 1.3-1. Figures 1.3-1 and 1.3-2 also show the MBHO specifications.

Nosecap Selection: The MBHO is compatible with the MBHO series of nosecap.

Mandrel Selection: The MBHO is designed to be used with the 5/8-inch (type 20A) threaded Medium Brute Offset Adapter mandrels.

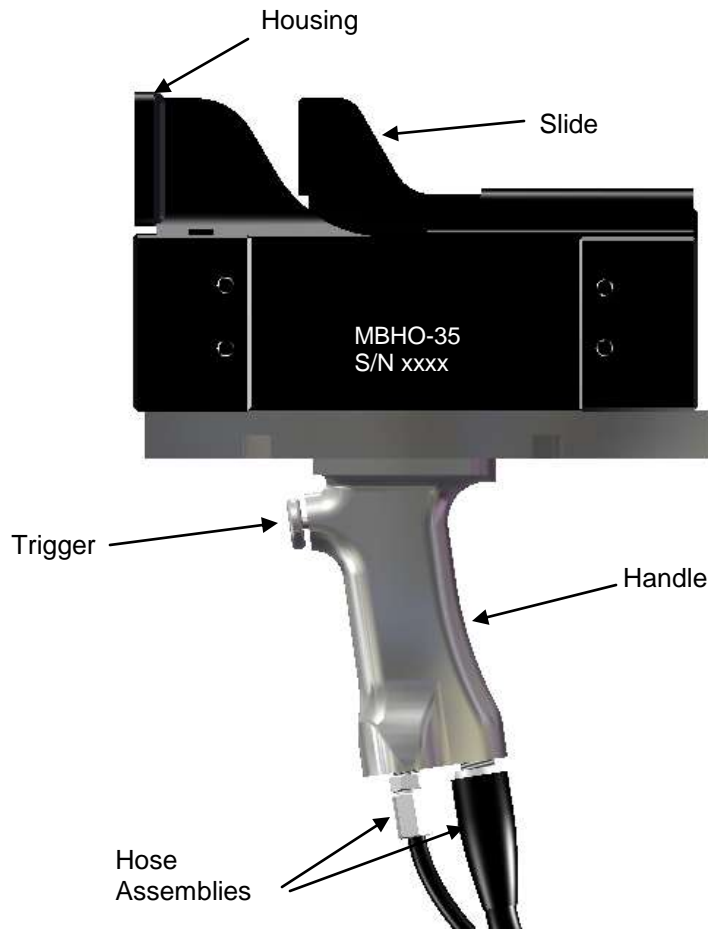
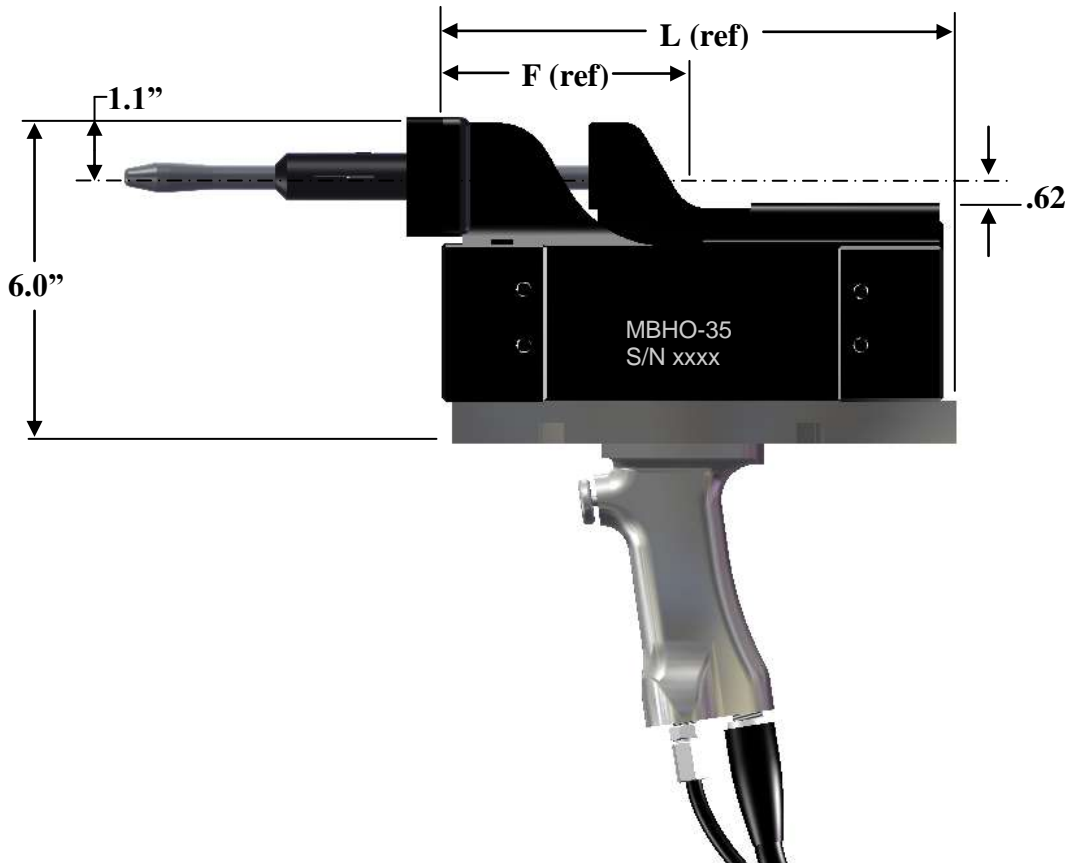


Figure 1.3-1
Medium Brute Hydraulic Offset General Parts

**Table 1.3-1
Medium Brute Hydraulic Offset Specifications**

Model Number	Maximum Material Stackup	Overall Length L	Frontside Clearance F	Stroke
MBHO-20	2.0 inches	9.1 inches	5.6 inches	3.10 inches
MBHO-35	3.5 inches	12.1 inches	7.1 inches	4.60 inches



**Figure 1.3-2
Medium Brute Hydraulic Offset Measurements**

SECTION 2.0: SAFETY

Consult PowerPak manual for safety precautions before connecting the puller unit.

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, the operator is responsible for personal safety; however, the following general safety precautions should be observed.

The MBHO is used where access is an issue and so typically is only used for a few holes at a time. However, if extended use is needed, it is recommended to wear work gloves due to the weight and handling of the Puller Unit.

CAUTION: The weight of this unit may require a suspension system per the end-user's workplace lifting standards.

1. Wear eye and ear protection when operating the puller unit.

Read manual before using

Always wear eye protection

Always wear ear protection



**Figure 2.0-1
Safety Stickers**

2. **CAUTION:** Pinch point risk.
3. **CAUTION:** Keep fingers out of slide channel.
4. Disconnect the air supply when (see Figure 2.0-2):
 - Maintenance is to be performed
 - Hydraulic hose is disconnected
 - PowerPak is not in use



5. 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. If hydraulic oil should penetrate the skin, medical attention must be sought immediately.

6. Keep hands away from nosecap assembly while holding nosecap against the workpiece.
7. Release puller unit trigger when mandrel clears the workpiece, or becomes stuck.
8. End cap must always be in place while in use. Injury may occur if end cap is removed during operation.
9. Before operating the pump, tighten all hose connections using the proper tools. Do not overtighten the connections. Connections need only be tightened securely and leak-free. Overtightening may cause premature thread failure or high-pressure fittings to split at pressures lower than their rated capacities.
10. Operators must read this manual in its entirety before using the Medium Brute. Eye and ear protection must be worn while operating the Medium Brute. Three safety stickers on the Medium Brute act as a reminder to these instructions. The symbols are defined in Figure 2.0-1 (on the previous page).
11. Do not use in potentially explosive environments.

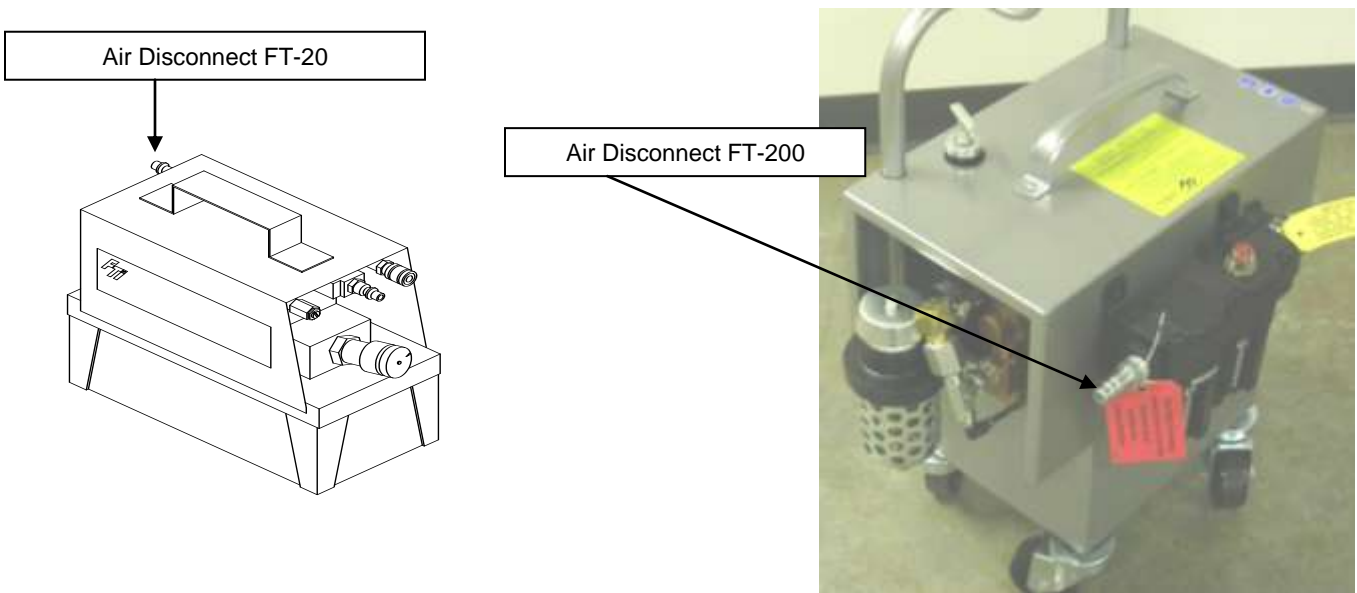


Figure 2.0-2
Location of Air Disconnect

Hydraulic Hose Safety

12. Inspect hydraulic hose for signs of wear (cuts, abrasions, or kinks) to the outer shell materials. 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.
13. **DO NOT** attempt to disconnect the hydraulic hose while it is under pressure.
14. **DO NOT** expose hoses to potential hazards such as extreme heat or cold, sharp surfaces, or heavy impact.
15. **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 and fittings for wear or damage that could cause premature failure of the hose or fittings and possibly result in injury. Damaged hoses must be replaced immediately.
16. **DO NOT** use the hose to move attached equipment.
17. **DO NOT** remove strain reliever from hoses.
18. Hose strain relievers must be placed around hose fittings during use. Hoses with damaged strain relievers must be replaced immediately.
19. Hose material and coupler seals must be compatible with hydraulic fluid that meets the requirements of U.S. MIL-SPEC #5606 or AW ISO 46.
20. 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.
21. Before operating pump, make sure all hose connections are tightened securely. **DO NOT** overtighten.
22. If hoses require replacement contact FTI 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.

The MBHO is used where access is an issue and so typically is only used for a few holes at a time. However, if extended use is needed, it is recommended that the operator work gloves due to the weight and handling of the Puller Unit.

CAUTION: The weight of this unit may require a suspension system per the end-user's workplace lifting standards.

3.1 PULLER UNIT SETUP PROCEDURE AND OPERATION

Refer to Section 6.0 (Illustrated Parts Breakdown) for parts identification.

1. Inspect all threads and fittings for signs of wear or damage and replace them if necessary.
2. Uncoil the hose assembly of the puller unit, and inspect all threads, couplings, and hoses for damage and degradation.
3. Remove the 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.
4. Thread couplers completely together. There should be positive contact between the PowerPak coupler and the hose fitting flange. Failure to completely tighten the coupler will prevent the puller from returning to the forward (start) position. Strain relievers must be placed on hose fittings during operation. If strain relievers are worn or damaged, they must be replaced immediately.
5. Connect the male/female AIR quick-disconnects from the puller to the FTI PowerPak.
6. Test shop air supply to ensure that it is clean, dry, and between 90 and 120 psi (6.2 and 8.3 bar) at 50 cfm.
7. Connect the female quick-disconnect of a 3/8-inch or 1/2-inch (9.5 mm or 12.7 mm) inside diameter shop air line onto the male air inlet of the PowerPak.
8. Install appropriate mandrel into threaded adapter (hand tight).
9. Install appropriate nosecap assembly over mandrel and thread onto barrel (hand tight).

3.2 ACTUATION OF THE PULLER UNIT

1. The puller can be activated only when connected to an FTI PowerPak.
2. Activate the puller 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, which is connected to the cold expansion mandrel.
3. Releasing the trigger changes pressure at the pilot valve and stops the pull cycle, and returns puller to original position.
4. If the puller fails to operate as detailed above, refer to Section 5.0 (Troubleshooting).

SECTION 4.0: 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.

WARNING
Disconnect the PowerPak from the air supply before performing maintenance or repair procedures.

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 reinstalled.
3. Keep all hose connections free of dirt and grime.

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

Periodically inspect the threaded fittings for cracks, leaks, or other damage. Repair and replace as necessary.

4.4 DISASSEMBLY

Refer to Section 6.4 for parts list, Figure 6.4-1 (MBHO Assembly).

1. Remove safety cover (33).
2. Remove block plate (12).
3. Remove handle assembly (14). Do not remove hoses from handle.
4. Remove manifold (4).
5. Remove front cover (9) by pushing hydraulic piston (5) and slide toward back position. Then slide cover (9) toward bottom to remove.
6. Remove slide (3) along with wear guides (10) and spring (37).
7. Remove back cover (11) from housing halves (26 and 2).

8. Remove pneumatic piston (6) from back.

CAUTION: Safety glasses must be worn when removing hydraulic piston. Proceed with care, excessive pressure can cause piston to exit slide with high velocity.

9. Remove hydraulic piston (5) from slide (3) by forcing compressed air into hydraulic port.

4.5 **REASSEMBLY**

Refer to Section 6.4 for parts list. Install screws where required.

<p>Important: (1) Thoroughly clean all parts prior to reassembly. (2) Check to see if O’rings are installed toward hydraulic flow with Teflon backup rings “behind.”</p>

1. Install pneumatic piston (6) into back cover (11).
2. Assemble right housing (26), left housing (2) and back cover (11).
3. Install hydraulic adapter (13) into hydraulic piston (5).
4. Install hydraulic piston (5) into slide (3).
5. Install slide (3) with wear guides (10) and spring (37) into housing.
6. Install front cover (9) by pushing slide (3) and hydraulic piston (5) toward back position. When released, hydraulic piston (5) should fit into pocket on front cover (9).
7. Install manifold (4).
8. Install handle (14).
9. Install back plate (12).
10. Install safety cover (33).

SECTION 5.0: TROUBLESHOOTING

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

Note: Should difficulties originate in the PowerPak, consult the specific PowerPak Operations, Maintenance, and Repair Manual.

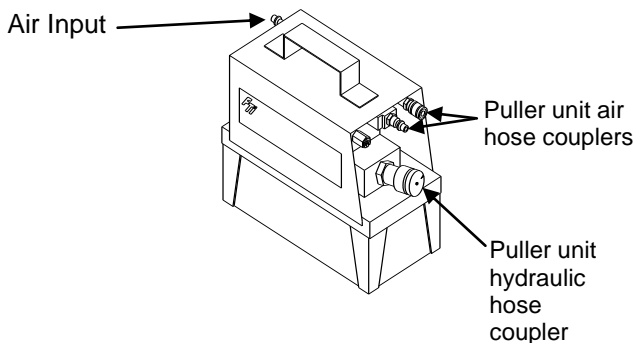
<u>PROBLEM</u>	<u>CAUSE</u>	<u>SOLUTION</u>
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5.1 POWERPAK WILL NOT BUILD FULL HYDRAULIC PRESSURE

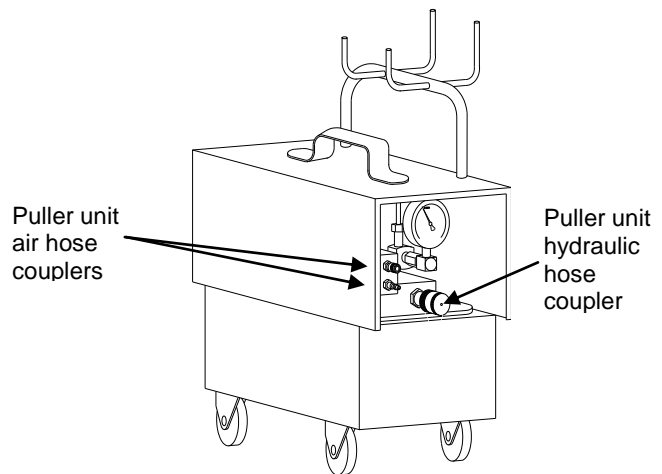
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| (a) One or more of the key air or hydraulic lines has not been securely connected. | (a) Check the following hose connections: <ol style="list-style-type: none">1. Main air line quick-disconnect fitting from shop air system to PowerPak.2. Hydraulic quick couplings connecting the hoses to the PowerPak manifold, and the puller to the hydraulic hoses.3. Two male/female air line quick-disconnect fittings connecting the puller to the PowerPak manifold.4. Check that the main air supply has not been interrupted.5. Figures 5.1-1 and 5.1-2 show the PowerPaks. |
|--|---|

CAUTION

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



**Figure 5.1-1
FT-20 PowerPak***



**Figure 5.1-2
FT-200 PowerPak***

* PowerPak drawings are not to scale.

PROBLEM

CAUSE

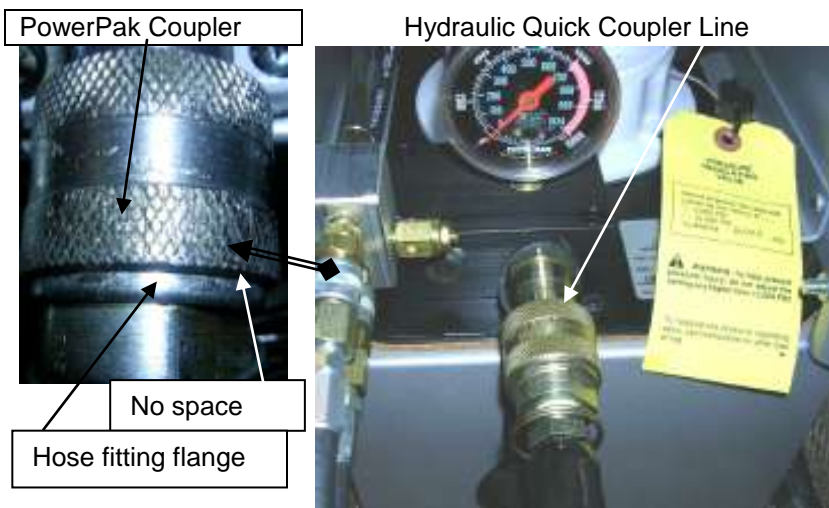
SOLUTION

5.2 PULLER RETRACTS ON FIRST TRIGGER ACTUATION, BUT WILL NOT RETURN TO START POSITION

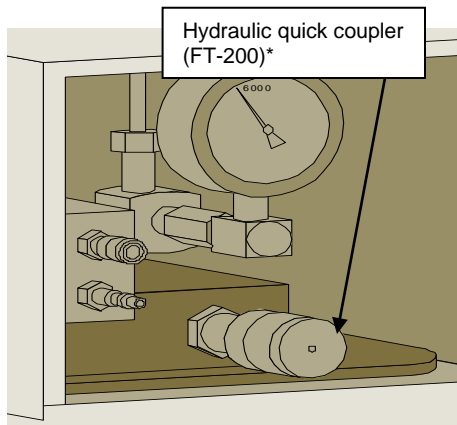
- | | | |
|---|---|--|
| <p>(b) As above, AND the hydraulic hose is difficult to bend or coil (indicating unrelieved pressure built up in the hose).</p> | <p>(a) The new puller unit requires lubrication through the piston and cylinder.
 (b) The hydraulic quick coupler line has not been completely tightened at the PowerPak manifold (there should be no space between the PowerPak coupler and the hose fitting flange). See Figures 5.2-1, 5.2-2, and 5.2-3.</p> | <p>(a) Cycle trigger several times to introduce hydraulic fluid into the cylinder.
 (b) Once hydraulic pressure has been introduced to the hydraulic hose, the pressure must be relieved before the coupler can be sufficiently tightened.</p> |
|---|---|--|

Procedure for relieving hydraulic pressure:

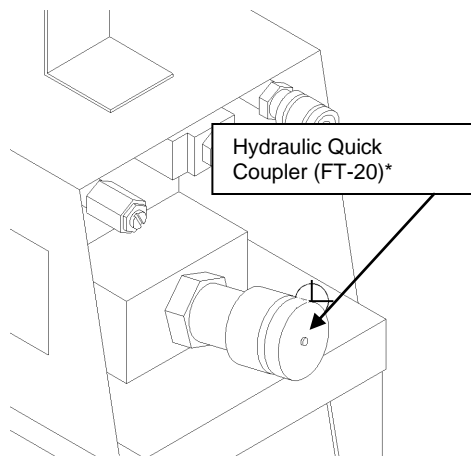
1. Disconnect main air supply.
2. Disconnect coupler from PowerPak.
3. Connect Enerpac CT-604 to the coupler and bleed off hydraulic oil to relieve the built-up pressure. Figure 5.2-4 shows the Enerpac CT-604 Pressure Relief Tool.
4. Once pressure is relieved, coupler may be tightened and reinstalled onto PowerPak.
5. Re-attach air lines to get puller to return.
6. Check oil level in PowerPak reservoir.



**Figure 5.2-1
Hydraulic Quick Coupler**



**Figure 5.2-2
Location of Hydraulic Quick Coupler (FT-200)**



**Figure 5.2-3
Location of Hydraulic Quick Coupler (FT-20)**



**Figure 5.2-4
Enerpac CT-604 Pressure Relief Tool**

*Drawings not to scale

PROBLEM

CAUSE

SOLUTION

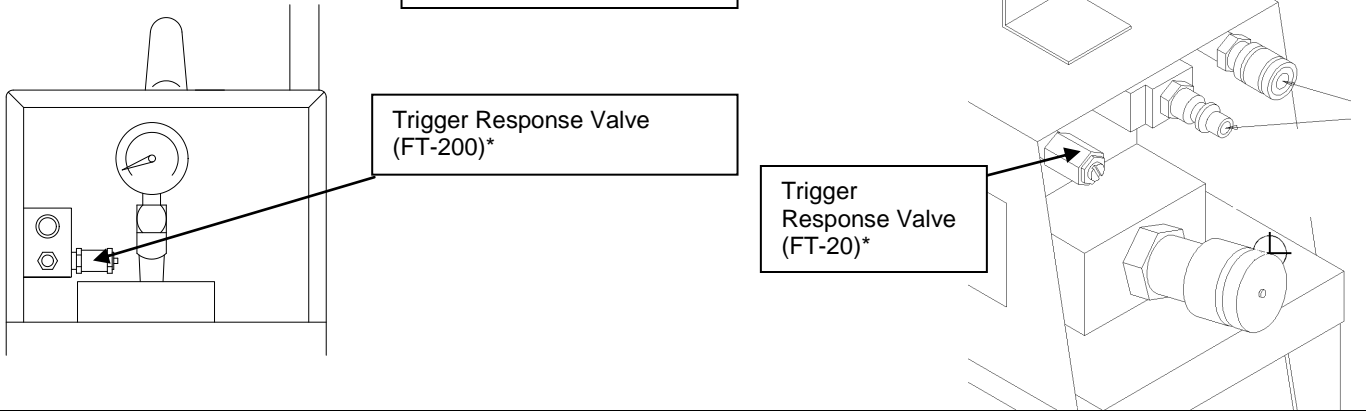
5.3 POWERPAK WILL NOT GENERATE CONSTANT PRESSURE (HICCUPS)

(a) Trigger response valve requires adjustment (see Figure 5.3-1.).

(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.

For puller units with the new trigger assembly (see Section 6.1), the trigger response valve should be closed.



**Figure 5.3-1
Location of Trigger Response Valve (FT-200 and FT-20)**

3. Turn screw clockwise until:
 - PowerPak generates constant pressure when puller triggers 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.

*PowerPak drawings are not to scale.

**5.4 POWERPAK WILL NOT OPERATE OR MAINTAIN SUFFICIENT PRESSURE
(6,000 PSI, 413.7 BAR)**

PROBLEM

CAUSE

(a) Hydraulic pressure requires adjusting (applicable to FT-200 PowerPak only). See Figure 5.4-1.

(b) Inadequate air supply.

SOLUTION

(a) Adjust PowerPak pressure valve:

1. Squeeze trigger on puller unit to activate PowerPak.
2. If pressure does not reach 6,000 psi (413.7 bar), loosen wingnut and turn hydraulic pressure control clockwise until pressure reaches 6,000 psi (413.7 bar).
3. Tighten locknut to secure available shop air.

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

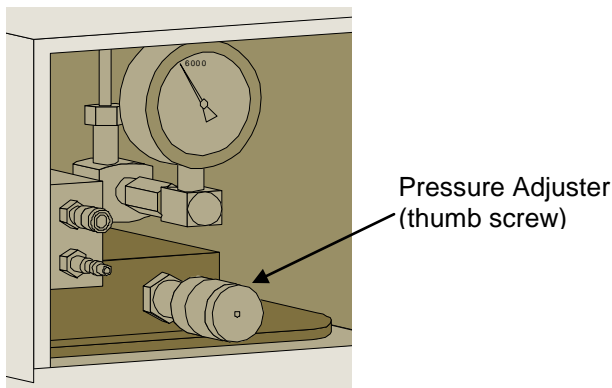
If the PowerPak will not generate or maintain sufficient pressure, the main air line pressure is too low or the PowerPak hydraulic pressure requires adjustment.

Air pressure requirements:

- 1/2-inch (12.7 mm) inside diameter air line with 90 to 120 psi (6.2 to 8.3 bar) for the FT-200
- 3/8-inch (9.5 mm) inside diameter air line with 90 to 120 psi (6.2 to 8.3 bar) for the FT-20

Flow requirements:

- 40 to 50 cfm (1274.3 to 1415.9 liter/minute) for the FT-200
- 20 cfm (566.3 liter/minute) for the FT-20



**Figure 5.4-1
Pressure Gauge (FT-200)**

*

PROBLEM

CAUSE

SOLUTION

5.5 MANDREL STICKS IN THE HOLE WHEN PULLER ACTIVATED

(a) Not enough pressure used to generate pull forces. If Medium Brute is being used with an FT-20 PowerPak, proceed to solution 4.

(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).
2. Pressure gage should read 6,000 psi (413.7 bar). (Note: FT-20 PowerPak is factory set at 10,000 psi or 689.5 bar). If an increase in pressure is required, refer to the solution for Problem 5.4 in this section for instructions.
3. Actuate puller again. If mandrel remains stuck, increase pressure to 10,000 psi (689.5 bar).
4. If mandrel remains stuck at 10,000 psi (689.5 bar), immediately disengage the mandrel from the puller. Push the mandrel out using an impact hammer. Contact the FTI Sales Department for additional assistance.

SECTION 6.0: ILLUSTRATED PARTS BREAKDOWN

FTI has redesigned the puller unit trigger assembly. Puller units with serial numbers equal to or greater than the serial numbers in Table 6.0-1 have the new cartridge trigger assembly design. 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 Medium Brute Hydraulic Offset Rework Kit (MBHO-20-CT-RK or MBHO-35-CT-RK) – (see kit differences in Section 6.1).
- Puller Trigger Rework Tool Kit (FTI-CT-RKT).

One FTI-CT-RK or MBHO-xx-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**

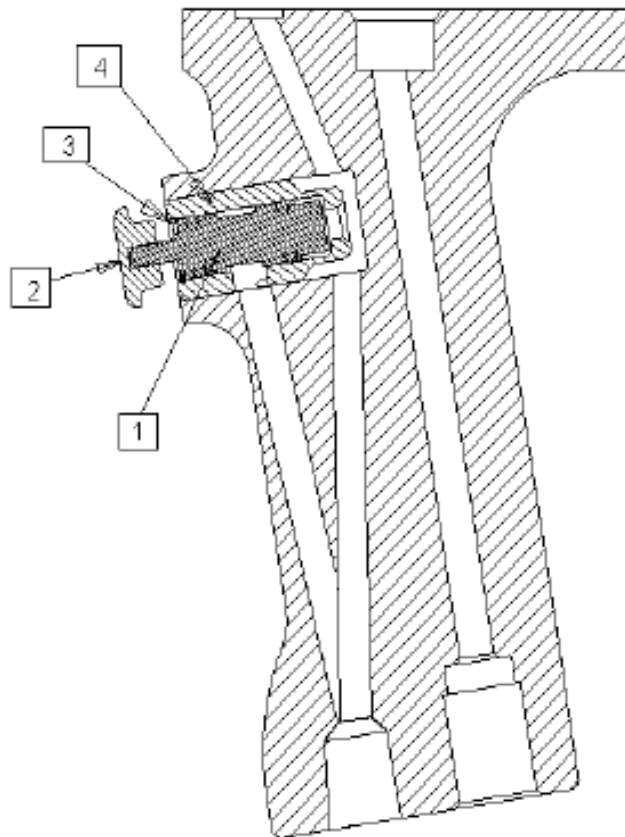
FTI Part Number	FTI Serial Number
2354-001, 2354-007, 2354-005, 5209-001	0167
2354-002, 2354-006, 5209-002	0165

6.1 MEDIUM BRUTE HYDRAULIC OFFSET REWORK KIT (MBHO-XX-CT-RK)

This kit is used to repair or refurbish older pullers. Table 6.1-1 is a parts list for the Medium Brute Hydraulic Offset Rework Kit. Figure 6.1-1 shows a diagram of the cartridge trigger assembly.

**Table 6.1-1
Medium Brute Hydraulic Offset Rework Kit (MBHO-XX-CT-RK)**

Piece Number	Quantity FTI-CT-RK	Quantity MBHO-20	Quantity MBHO-35	Description	FTI Part Number
	--	4	4	Screw, Socket End Cap	1035-005
	--	--	1	Spring, Compression	1005-019
	--	1	--	Spring, Compression	1005-018
	--	2	2	Screw, Button	1026-031
	--	1	1	Plate, Safety Cover	5006-001
	--	1	1	Guard, Neoprene	2881-001
	--	1	1	Hydraulic Adapter	2039-005
	--	4	--	Guide, Wear	2348-001
	--	--	4	Guide, Wear	2348-002
See Section 6.2	--	1	1	Seal Kit	8000-952
1	1	1	1	Valve, Cartridge Trigger	1187-622
2	1	1	1	Push Button, Brass	1187-623
3	1	1	1	Retaining Ring, Internal	1187-624
4	1	1	1	Sleeve, Puller Handle Trigger	3196-001



**Figure 6.1-1
Diagram of Cartridge Trigger Assembly**

6.2 MEDIUM BRUTE HYDRAULIC OFFSET SEAL KIT

This kit is used to replace seals. It is included as part of the Medium Brute Hydraulic Offset Rework Kit (see Section 6.1). Table 6.2-1 is a parts list for the Medium Brute Hydraulic Offset Seal Kit.

Table 6.2-1
Medium Brute Seal Kit (MBHO-SK)

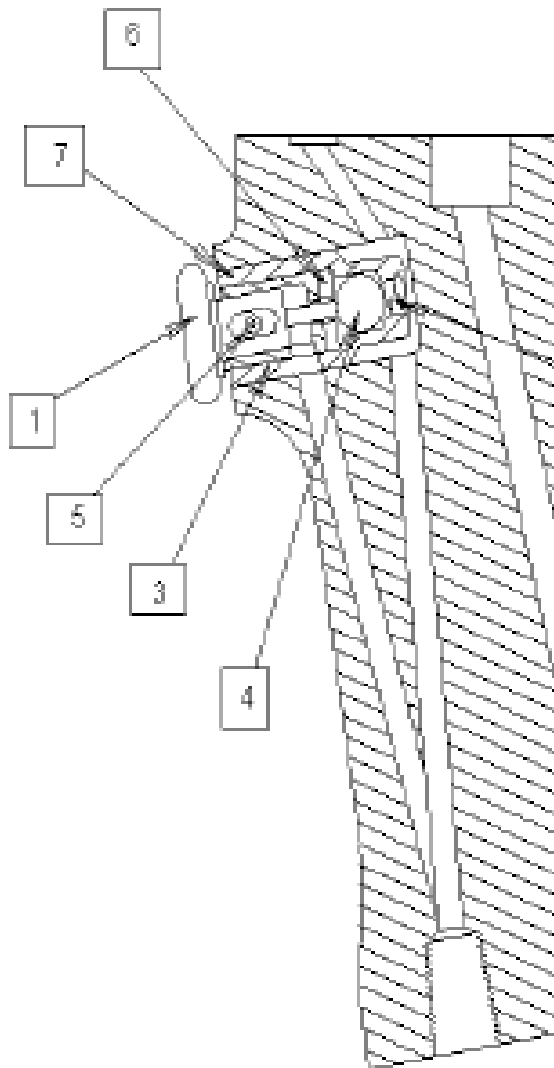
Quantity	Description	FTI Part Number
1	Valve, Cartridge Trigger (See Figure 6.1-1, Piece Number 1)	1187-622
1	Seal, LB Handle (See Table 6.3-1, Piece Item 6)	2040-001
1	O'Ring	1046-059
1	O'Ring	1046-006
1	O'Ring	1046-041
1	O'Ring	1046-012
1	Seal, K	1046-011
1	O'Ring	1046-040
1	T-Seal	1046-111
1	O'Ring	1046-058

6.3 PREVIOUS TRIGGER ASSEMBLY

The previous trigger design (serial numbers smaller than those listed in Table 6.0-1) detailed here can be easily replaced with the improved trigger assembly detailed in Section 6.1. Table 6.3-1 is a parts list for the old-style trigger assembly, also referred to in Figure 6.3-1.

**Table 6.3-1
Parts List for Previous Trigger Assembly**

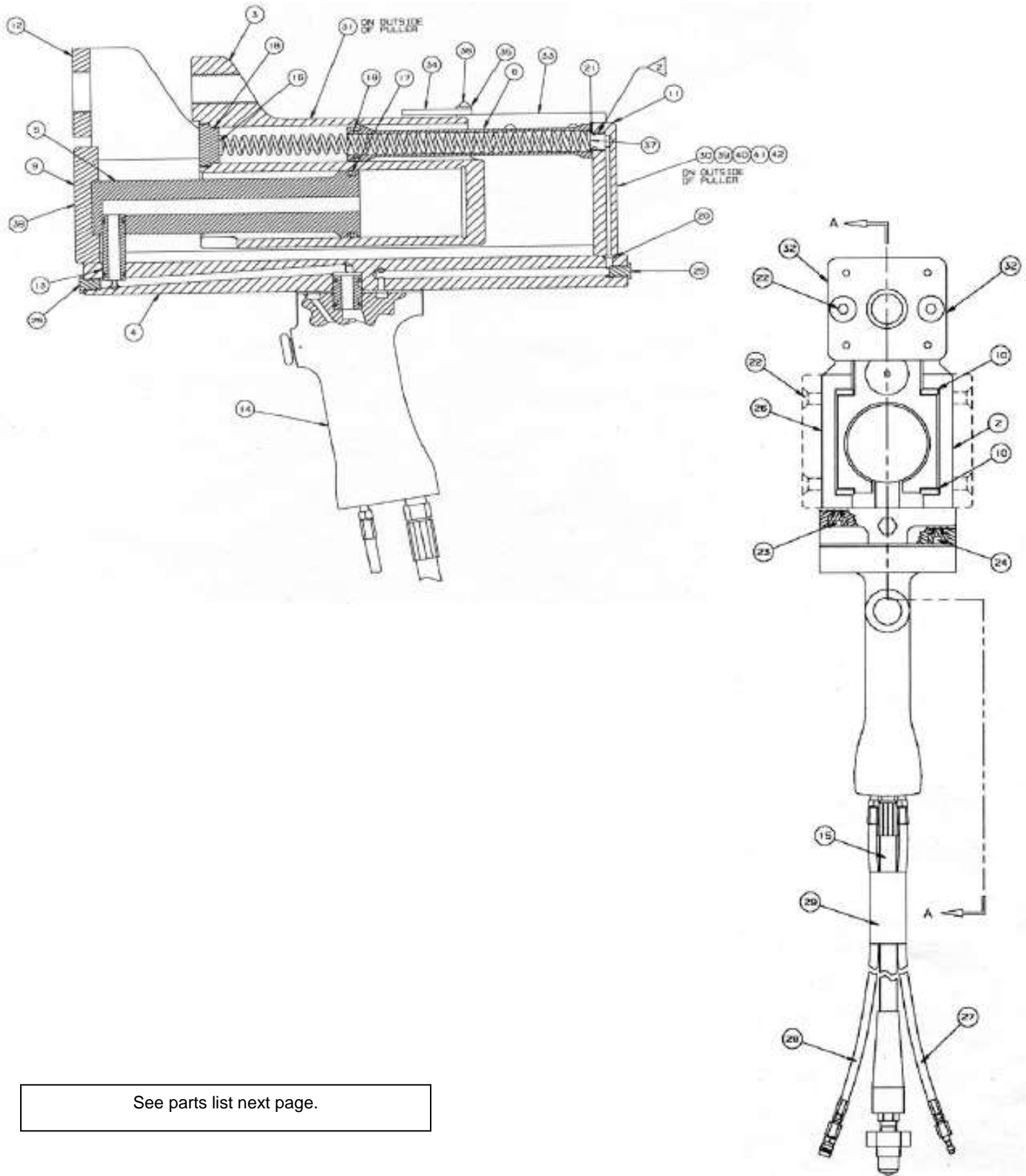
Quantity	Piece Item	Description	FTI Part Number
1	1	Trigger, LB Handle	2042-001
1	2	Spring, LB Handle	1005-003
1	3	Retainer, LB Handle	2043-001
1	4	Ball, .250 Diameter, stl.	1045-025
1	5	Pin, 1/8 x 3/4 stdl. Spring	1045-026
1	6	Seal, LB Handle	2040-001
1	7	Sleeve, LB Handle	2044-001



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

6.4 MEDIUM BRUTE HYDRAULIC OFFSET PULLER ASSEMBLY; PARTS LIST AND DIAGRAM

Table 6.4-1 on the next page is a parts list that coincides with Figure 6.4-1 here.



**Figure 6.4-1
Medium Brute Hydraulic Offset Assembly Diagram**

**Table 6.4-1
Medium Brute Hydraulic Offset Puller Assembly Parts List**

Quantity		Dash No./Part No.	Piece No.	Description
MBHO-35	MBHO-20			
1	1	1009-242	38	Label
1	--	1005-019	37	Spring, Compression
--	1	1005-018	37	Spring, Compression
8	8	1026-031	36	Screw, Button (Black)
1	1	5006-001	35	Plate, Safety Cover
1	1	2881-001	34	Guard, Neoprene
1	--	2869-002	33	Cover, Safety
--	1	2869-001	33	Cover, Safety
2	2	1009-247	32	Label
1	1	1009-184	31	Label
2	2	1009-094	30	Label
4	4	2638-001	29	Tube, Heat Shrink
1	1	2106-002	28	Assembly, Air Hose (Female)
1	1	2106-001	27	Assembly, Air Hose (Male)
1	--	2351-002	26	Housing, Right
--	1	2351-001	26	Housing, Right
2	2	1047-014	25	Plug, Hollow Hex
4	4	1029-005	24	Screw, Cap (Black)
8	6	1029-003	23	Screw, Cap (Black)
10	10	1029-019	22	Screw, Flat Head
1	1	1046-041	21	O'Ring
1	1	1046-012	20	O'Ring
1	1	1046-011	19	Seal, K
1	1	1046-040	18	O'Ring
1	1	1046-111	17	T-Seal
1	1	2355-001	16	Plug, Slide
1	1	2107-001	15	Assembly, Hydraulic Hose
1	1	2049-004	14	Assembly, Handle
1	1	2039-005	13	Adapter, Hydraulic
1	1	2363-001	12	Plate, Block
1	1	2346-001	11	Cover, Back
4	--	2348-002	10	Guide, Wear
--	4	2348-001	10	Guide, Wear
1	1	2347-001	9	Cover, Front
1	--	2341-002	6	Piston, Pneumatic
--	1	2341-001	6	Piston, Pneumatic
1	--	2342-002	5	Piston, Pneumatic
--	1	2342-001	5	Piston, Hydraulic
1	--	2345-002	4	Manifold
--	1	2345-001	4	Manifold
1	--	2344-002	3	Slide
--	1	2344-001	3	Slide
1	--	2343-002	2	Housing, Left
--	1	2343-001	2	Housing, Left
*	--	2354-002	--	Assembly, MBHO-35
--	*	2354-001	--	Assembly, MBHO-20

*Complete assembly



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Telephone: 44 1244 538730
Fax: 44 1244 534423

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.

A handwritten signature in black ink, appearing to read 'Jeff Sageman'.

Jeff Sageman
Logistics Manager

January 17, 2014

Date