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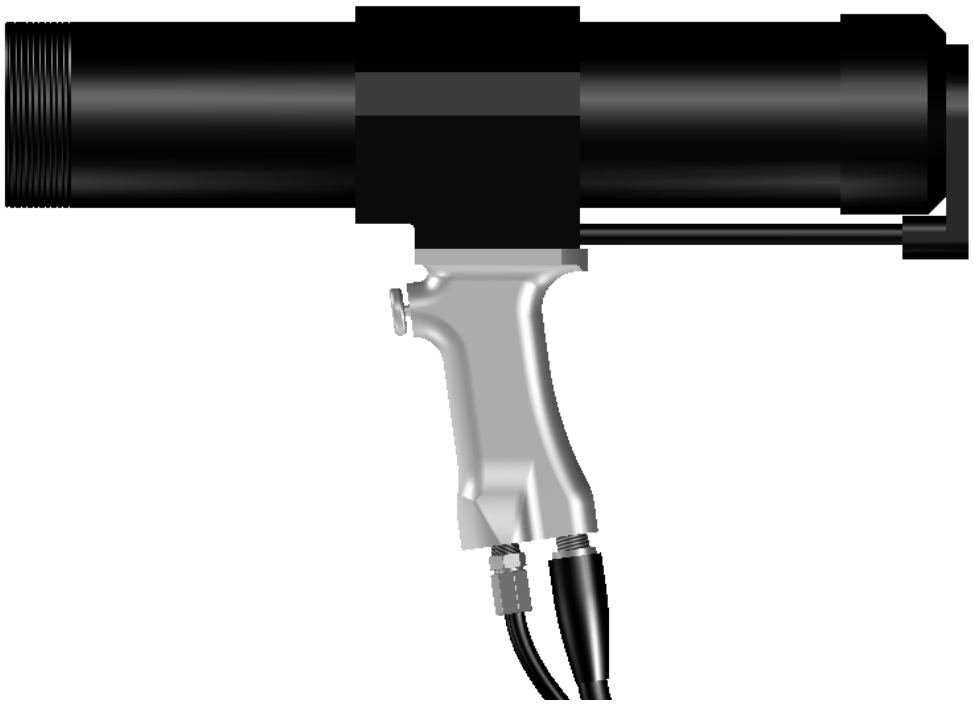
FTI OPERATIONS, MAINTENANCE, AND REPAIR MANUAL

Big Brute Puller Unit

Part #2720-008, Log #1206
Revision C

November 18, 2011



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 Technical 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 program. Should inconsistencies occur between your tooling and this manual, please contact our Technical 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
- Complete inventory allowing FTI to respond quickly to customer' requirements

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

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

SECTION	DESCRIPTION	PAGE

FIGURES

TABLES

SECTION 1.0: INTRODUCTION

This instruction manual contains information on the operation and maintenance of the Big Brute Puller Unit (BBPU). 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 BIG BRUTE PULLER UNIT

The Big Brute hydraulic puller unit is a powerful, heavy-duty tool specifically designed for use with FTI's patented Split Sleeve Cold Expansion process. The BB puller unit is designed to pull a mandrel through a hole with the pre-lubricated stainless steel split sleeves used in this process.

The BB pullers have a maximum pull force of 38,000 pounds at 10,000 psi pump pressure. The BB is available in sizes (models) capable of cold expanding holes up to 1-3/4 inches in diameter and 10 inches deep in aluminum, steel and titanium. For hole sizes larger than 1-3/4 inches, please contact the FTI technical support staff for assistance. The Big Brute is available in various models to accommodate multiple material stackups, including "-V" models with high-visibility hose markings.

The Big 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 are compatible with older units IW100MF and IW10MF). The BB has proven to be very reliable, and requires minimal maintenance.

1.2 GENERAL SPECIFICATIONS

Pull Force Capacity	38,000 pounds
Air Line Requirements	3/8 inch to 1/2 inch ID
Air Flow Requirements (via PowerPak)	45 cfm
Weight:*	
BB-10	26 pounds
BB-30	33 pounds
BB-70	40 pounds
BB-100	45 pounds
Stackup Capacity:	
BB-10	1.3 inches
BB-30	3.0 inches
BB-70	7.0 inches
BB-100	10.0 inches
Hole Diameter Capacity:	
Aluminum	>1-3/4 inches diameter
Steel	>1-3/4 inches diameter
Titanium	>1-3/4 inches diameter
Actuation	Pneumatic
Operation	Hydraulic
Air and Hydraulic Hose Length	10 feet
Compatible PowerPaks	FT-200 or FT-20
Fail-Safe	Air logic safety circuit halts mandrel retraction when trigger is released
Replacement Seal Kit	BB Seal Kit (BB-SK)

*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 Big Brute 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 DESCRIPTION

- Air actuated, hydraulic puller is designed to pull a mandrel through a hole using the pre- lubricated stainless steel split sleeves used in the cold expansion process.
- Maximum pull force is 38,000 pounds at 10,000 psi of hydraulic pressure.
- Includes a 10-foot hose assembly, spanner wrench and nosecap pin wrench.
- Capable of cold expanding holes up to 2.5 inches in aluminum and mild steel and 1.25 inches in titanium and high strength steel.
- Up to 10.0 inches material stackup capacity.
- Hydraulic pressure provided by the FT-200 PowerPak.

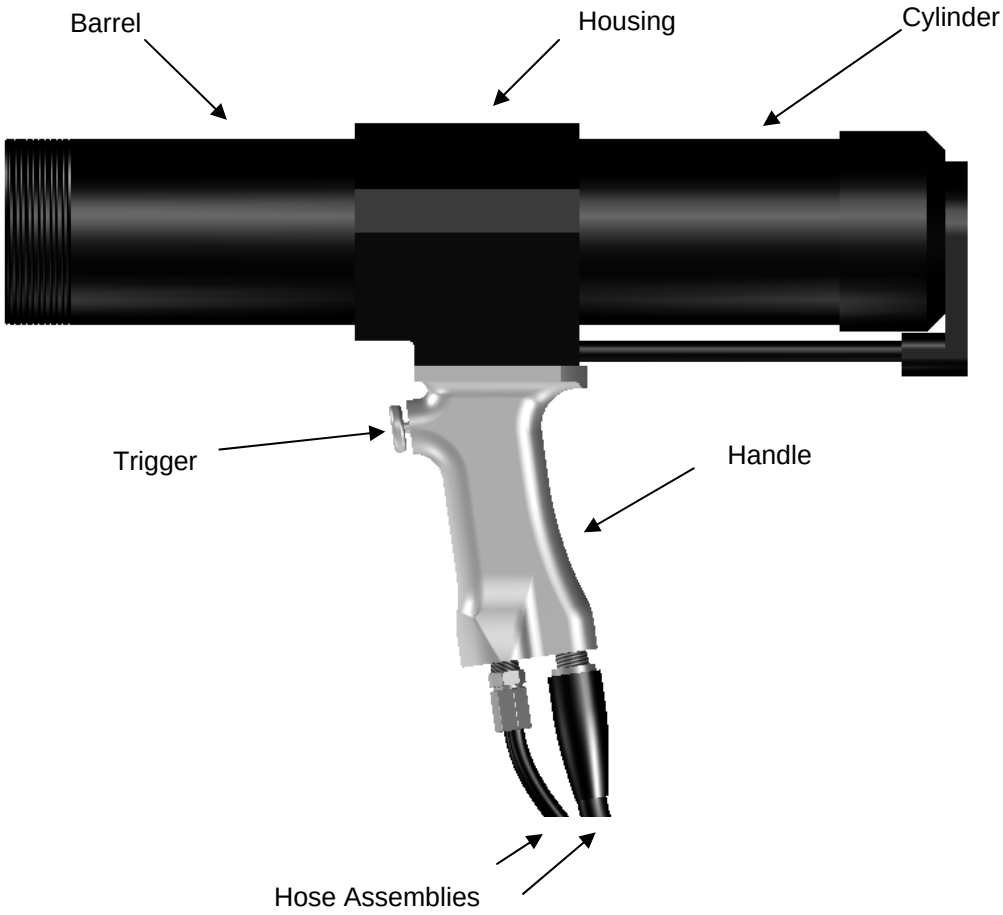


Figure 1.3-1
Big Brute Puller Unit

Table 1.3-1
Big Brute Specifications

Model Number	Maximum Material Stackup (inch)	L (Reference FTI Tooling Catalog) (inch)	F (Reference FTI Tooling Catalog) (inch)	Weight (lbs)	Mandrel Attachment	Stroke (inch)
BB-30	3.0	21.3	10.5	35	.960" tang 7/8-14 thd	6.26
BB-30A	3.0	21.3	10.5	35	7/8-14 thd 1-14 thd	6.26
BB-70	7.0	27.0	13.4	40	.960" tang 7/8-14 thd	9.14
BB-70A	7.0	27.0	13.4	40	7/8-14 thd 1-14 thd	9.14
BB-100	10.0	35.3	17.5	45	7/8-14 thd	13.26

Nosecap Selection: The Big Brute Puller Unit is compatible with the flush nosecaps (Section 2,*) and the extension nosecaps (Section 2,*).

Mandrel Selection: The Big Brute Puller Unit is directly compatible with threaded or tang mandrels (Section 2*).

***** Refers to the FTI Tooling Catalog, current revision.

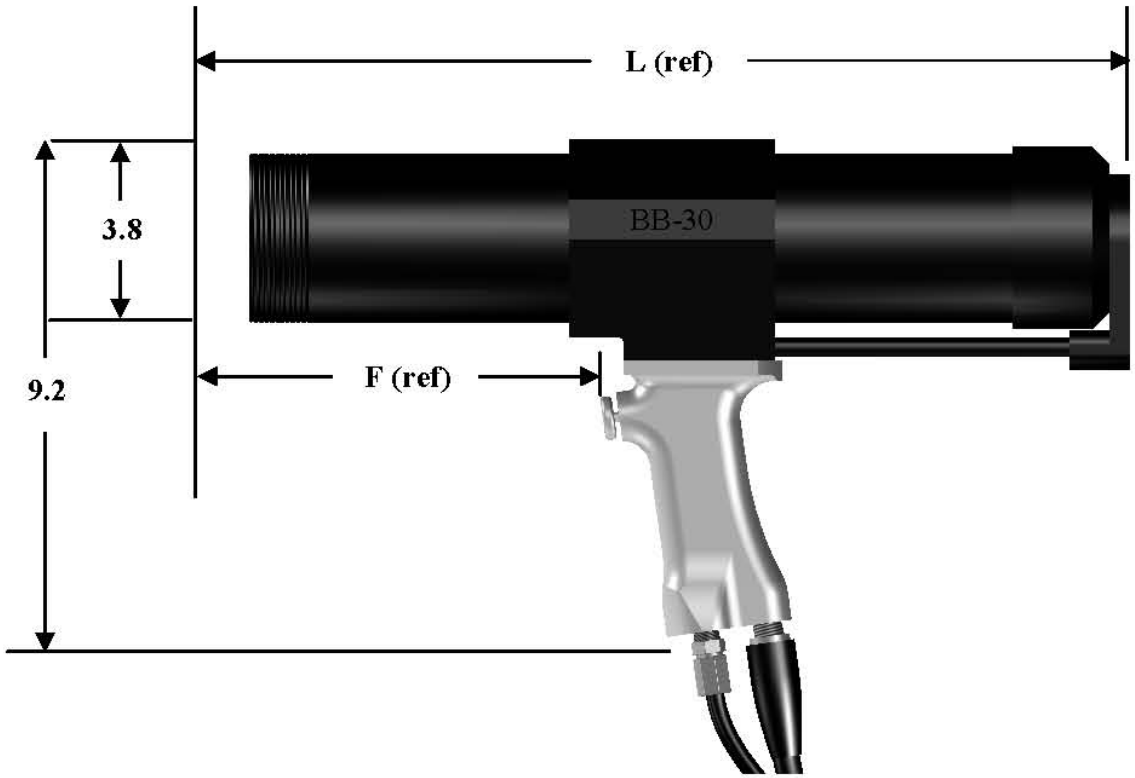


Figure 1.3-2
Big Brute Puller Unit Specifications

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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.

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

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

3. Disconnect the air supply when:
   - Maintenance is to be performed.
   - Hydraulic hose is disconnected.
   - PowerPak is not in use.

4. 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 2.0-1). **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.

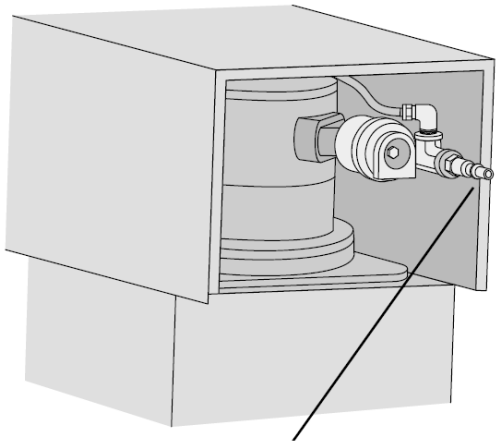

Figure 2.0-1
Location of Air Disconnect

5. Keep hands away from nosecap assembly while holding nosecap against the workpiece.

6. Release puller unit trigger when mandrel clears the workpiece, or becomes stuck.

7. End cap must always be in place while in use. Injury may occur if end cap is removed during operation. All new puller units have been modified to ensure operator safety. However, rework instructions are available from FTI for any Big Brute Puller Units that don't have a role pin and air seal adapter like that shown in Figure 6.3-1.

8. 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.

9. Operators must read this manual in its entirety before using the Big Brute. Eye and ear protection must be worn while operating the Big Brute. Three safety stickers on the Big Brute act as a reminder to these instructions. The symbols are defined in Figure 2.0-2 (on the next page).

10. Do not use in potentially explosive atmospheres.

Hydraulic Hose Safety

11. 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.

12. **DO NOT** attempt to disconnect the hydraulic hose while it is under pressure.

13. **DO NOT** expose hoses to potential hazards such as extreme heat or cold, sharp surfaces, or heavy impact.

Read manual before using ***Always wear eye protection*** ***Always wear ear protection***

Figure 2.0-2
Safety Stickers

14. **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.

15. **DO NOT** use the hose to move attached equipment**.**

16. **DO NOT** remove strain reliever from hoses.

17. Hose strain relievers must be placed around hose fittings during use. Hoses with damaged strain relievers must be replaced immediately.

18. Hose material and coupler seals must be compatible with hydraulic fluid that meets the requirements of U.S. MIL-SPEC #5606.

19. 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.

20. Before operating pump, make sure all hose connections are tightened securely. **DO NOT** overtighten.

21. If hoses require replacement contact FTI Technical Sales Department.

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SECTION 3.0: PULLER UNIT OPERATING INSTRUCTIONS

Become familiar with these instructions before operating the puller.

3.1 PULLER UNIT SETUP AND OPERATION PROCEDURE

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

1. Inspect all threads and fittings of PowerPak 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 (female) onto the hydraulic fitting of the FTI PowerPak (male). Wipe fittings clean prior to connecting. Make sure to 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. See Section 5.0, Problem 5.2, for more information.

4. Connect the male/female AIR quick-disconnects from puller to FTI PowerPak.

5. Remove the thread protectors from the air inlet on back of PowerPak. Connect the female quick disconnect of a 3/8-inch or 1/2-inch (9.5 mm or 12.7 mm) inner diameter shop air line onto the male air inlet of the PowerPak.

6. Test shop air supply to ensure that air is clean, dry, and between 90 and 120 psi (6.2 and 8.3 bar) at 45 cfm (1274.3 liter/minute).

7. Install appropriate mandrel into threaded adapter (hand tight).

8. Install appropriate nosecap assembly over mandrel and thread onto barrel (hand tight).

3.2 ACTUATION OF THE PULLER

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.

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).

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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 oxided surfaces.

4.3 INSPECTION

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

4.4 ASSEMBLY AND DISASSEMBLY

Normal replacement of seals (refer to the Illustrated Parts Breakdown, Figure 6.4-1).

Disassembly

1. Loosen lock ring (14) and remove nosecap (13).
2. Remove Allen-head bolt (19) and pull out barrel (5).
3. Loosen locknut (9) and unthread chuck or threaded adapter.
4. Remove set screws (27), air adapter (11) and air tube.
5. Remove and replace seals (20) at each end of air tube.
6. Loosen lock rings (14), unthread end cap (29) and cylinder (3).

7. Pull cylinder (3) off piston (4), the piston may stick in cylinder. If needed, remove piston from cylinder after cylinder is removed.

8. Remove and replace O-rings (25) on piston (4).

9. Remove handle (16) by removing Allen screws (12).

10. Pull hydraulic adapter (3) out of handle or housing (8) whichever it is stuck in.

11. Remove and replace O-ring (13) and backup ring (11) at each end of hydraulic adapter.

12. Remove sleeve (2).

13. Remove and replace O-ring (24) and backup ring (25).

14. Remove and replace O-ring (22) and backup ring (23).

15. Remove and replace scraper (21).

Reassembly

1. Replace sleeve (2).

2. Install piston (4) in barrel (3).

3. Put sleeve (2) onto piston shaft (3) and slide sleeve down to end of barrel so O-rings (25) are seated down in the end of the cylinder.

4. Thread barrel and sleeve into housing (8).

5. Align sleeve, replace hydraulic adapter (3) in handle (16), replace gasket (14), and install handle.

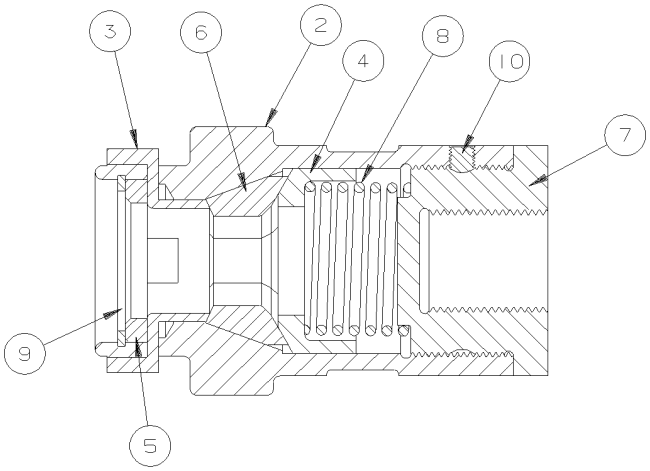
6. Thread end cap (29) onto end of the barrel and tighten lock rings (14).

7. Install locknut (9) and chuck on threaded adapter and tighten locknut.

8. Replace barrel and Allen bolt (19).

9. Install nosecap (13) and lock ring.

4.5 CHUCK ASSEMBLY CLEANING AND JAW REPLACEMENT



Detail Number	Name of Detail	BB-CA-11 Part Number	BB-CA-16 Part Number	BB-CA-20 Part Number
10	Set Screw	1045-109		
9	Retaining Ring	1045-115		
8	Spring	1005-005		
7	Chuck Adapter	2314-001		
6	Jaws	2309-003	2309-001	2309-002
5	Retainer Ring	2308-001		
4	Jaw Follower	2307-001		
3	Jaw Release	2306-001		
2	Casing	2315-001		

Figure 4.5-1
Chuck Assembly

1. Unscrew chuck adapter (7) from casing (2) with a counterclockwise motion. Care should be taken not to lose the spring (8), jaws (6), or follower (4) out of the end of the unit.

2. Remove spring (8), follower (4), and jaws (6).

3. Clean casing (2), jaws (6), release (3), and retainer (9) as a unit in any solvent that leaves little residue.

4. Replace any damaged jaws.

5. Place the chuck assembly in a vertical position with the nose down. In this position align the jaws around the release (3).

> **Note: Do not use grease or oil in reassembling the unit. Debris has a tendency to accumulate, preventing proper operation.**

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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.**

PROBLEM	CAUSE	SOLUTION
5.1 POWERPAK WILL NOT BUILD FULL HYDRAULIC PRESSURE		
	(a) One or more of the key air or hydraulic lines has not been securely connected.	(a) Check the following hose connections: 1. Male 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 the main air supply has not been interrupted.

> **CAUTION**
> **Hydraulic oil under extreme pressure ay cause serious injuries if not handled carefully. For technical assistance, please contact the FTI Technical Sales Department.**

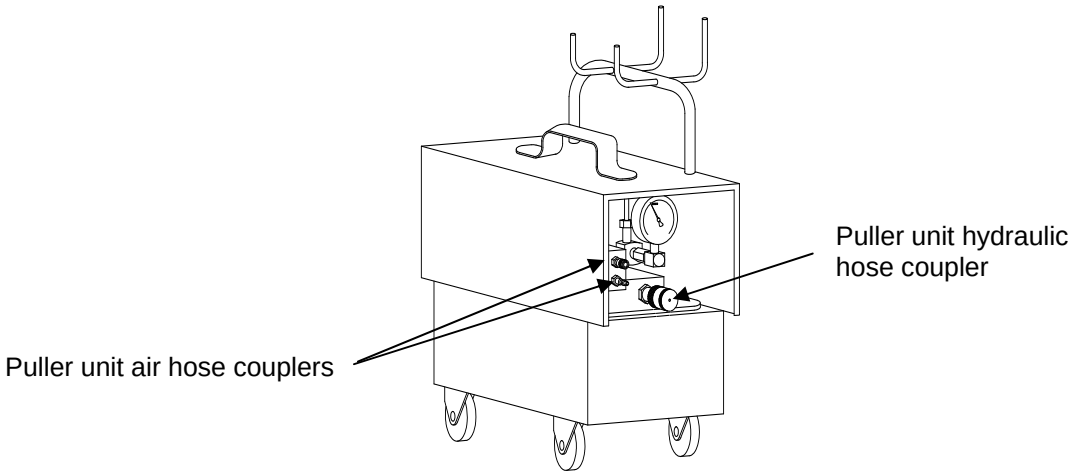


Figure 5.1-1
FT-200 PowerPak*

*Drawings not to scale.

PROBLEM	CAUSE	SOLUTION
5.2 PULLER RETRACTS ON FIRST TRIGGER ACTUATION, BUT WILL NOT RETURN TO START POSITION		
	(a) The new puller unit requires lubrication through the piston and cylinder.	(a) Cycle trigger several times to introduce hydraulic fluid into the cylinder.
(b) As above, AND the hydraulic hose is difficult to bend or coil (indicating unrelieved pressure built up in the hose).	(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 Figure 5.2-1.	(b) Once hydraulic pressure has been introduced to the hydraulic hose, the pressure must be relieved before the coupler can be sufficiently tightened.

Procedure for relieving hydraulic pressure:

1. Disconnect main air supply.
2. Disconnect coupler from PowerPak.
3. Wrap the fitting with a rag to absorb the squirting oil and slowly turn the coupler off the hydraulic hose to allow hydraulic oil to bleed out.
4. Once pressure is relieved, coupler may be tightened and reinstalled onto PowerPak.
5. Re-attach air lines to get puller to return.

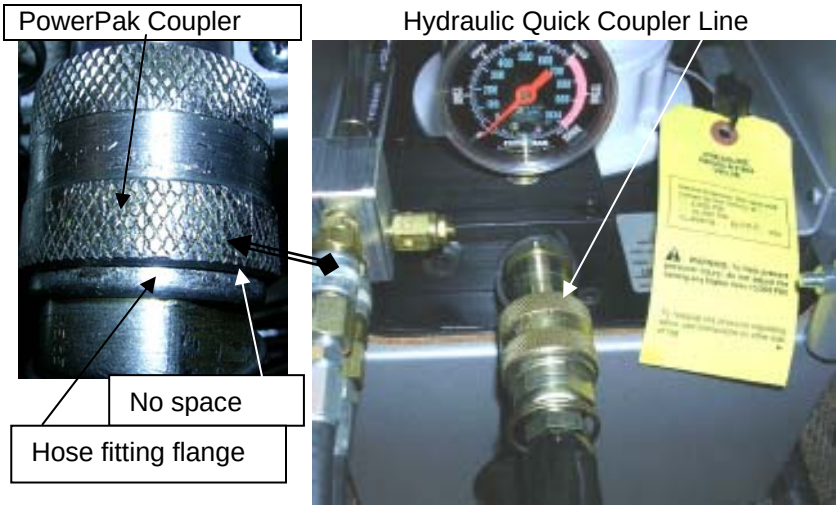


Figure 5.2-1
Hydraulic Quick Coupler

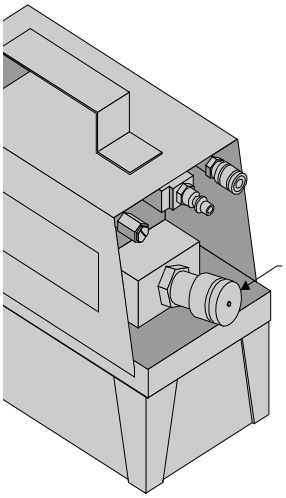


Figure 5.2-2
Location of Hydraulic Quick Coupler (FT-200)

*Drawings not to scale

PROBLEM	CAUSE	SOLUTION

5.3 POWERPAK WILL NOT GENERATE CONSTANT PRESSURE (OR HICCUPS)

(a) Trigger response valve requires adjustment.

(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.
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.

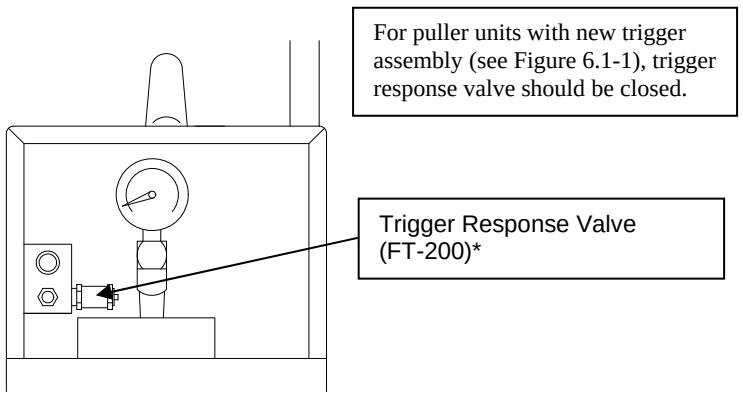


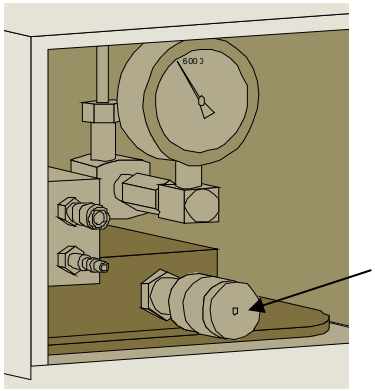
Figure 5.3-1
Location of Trigger Response Valve (FT-200)

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

(a) Hydraulic pressure requires adjusting (applicable to FT-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, loosen wingnut and turn hydraulic pressure control clockwise until pressure reaches 6,000 psi.
3. Tighten locknut to secure available shop air.



(b) Inadequate air supply.

(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.

Figure 5.4-1
Pressure Gauge (FT-200)

*Drawings not to scale.

Air pressure requirements:
-1/2-inch inside diameter air line with 90 to 120 psi for the FT-200

Flow requirements:
-40 to 50 cfm for the FT-200

PROBLEM	CAUSE	SOLUTION
5.5 MANDREL STICKS IN HOLE WHEN PULLER 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). 2. Pressure gage should read 6,000 psi. 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. 4. If mandrel remains stuck at 10,000 psi, immediately disengage the mandrel from the puller. Push the mandrel out using an impact hammer. Contact the FTI Technical Sales Department for additional assistance.

SECTION 6.0: ILLUSTRATED PARTS BREAKDOWN

FTI has redesigned the puller unit trigger assembly. Puller units with serial number 0555 or higher 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 as detailed in Section 6.3 can be easily replaced with the Cartridge Trigger Assembly Kit (FTI-CT-RK) or the Big Brute Rework Kit (BB-CT-RK) and the Puller Trigger Rework Took Kit (FTI-CT-RKT). One FTI-CT-RK or BB-CT-RK 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 also includes detailed instructions on how to perform the modification.

The trigger assembly conversion consists of FTI part numbers 2318-001 through -012. Models with serial numbers less than 0555 have the old trigger assembly. This includes the following models: BB-RR, BB-30, BB-70, BB-100, BB-30A, BB-70A, BB-30B, BB-70B, BB-30C, BB-RT, BB-30-H25, BB-30A-H25, and BB-30-737.

6.1 BIG BRUTE REWORK KIT (BB-CT-RK)

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

Table 6.1-1
Big Brute Rework Kit (BB-CT-RK)

Quantity	Piece Number	Description	FTI Part Number
4		Screw, SHC (10-32 UNFX 3/4)	1035-005
1		BB-H-D16 Hydraulic Adapter	2039-003
1		BBD35 Adapter, Air	2324-001
1		Big Brute Seal Kit (BB-SK) (See Section 6.2)	8000-486
1	1	Valve, Cartridge	1187-622
1	2	Push Button, Brass	1187-623
1	3	Retaining Ring, Internal	1187-624
1	4	Sleeve, Puller Handle Trigger	3196-001

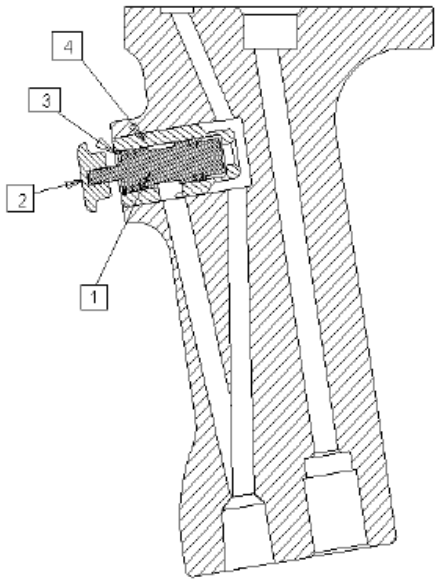


Figure 6.1-1
Diagram of Cartridge Trigger Assembly

6.2 BIG BRUTE SEAL KIT (BB-SK)

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

Table 6.2-1
Big Brute Seal Kit (BB-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
2	Ring, Backup MS28782-9	1046-028
1	A-111-90-BUNA	1046-038
2	AN6227-9	1046-027
1	MS-28782-32	1046-024
1	CP-329	1046-009
1	Scraper (R 2072)	1046-037
1	MS28775-214 O-Ring	1046-059
1	MS28775-224 O-Ring	1046-058
1	AN62278-19	1046-025
1	MS-28782-19	1046-026
1	AN6227B-32	1046-023
1	MS228775-147	1046-035
2	AN6227-5	1046-036

6.3 PREVIOUS TRIGGER ASSEMBLY

The previous trigger design (serial number less than 0555) can be easily replaced with the improved trigger assembly detailed at the beginning of Section 6.0. Table 6.3-1 is a parts list for the old style trigger assembly.

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

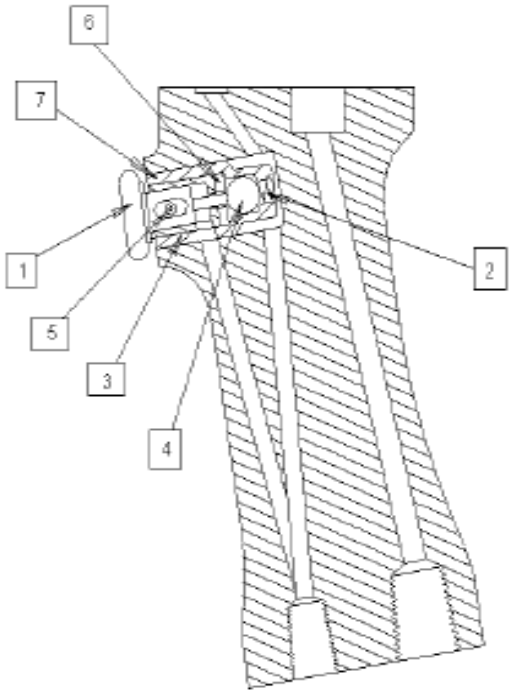


Figure 6.3-1
Diagram of Previous Trigger Assembly

6.4 BIG BRUTE PARTS LIST

Table 6.4-1
Big Brute Parts List

Quantity													Part No./	Piece				
-013	-012	-011	-010	-009	-008	-007	-006	-005	-004	-003	-002	-001	Dash No.	No.	Description	Reference Information		
--	--	--	--	--	--	--	--	--	--	--	--	*	2318-001	-	Assembly, BB-RR Puller with BB-CA-20	BB-RR		
--	--	--	--	--	--	--	--	--	--	--	*	--	2318-002	-	Assembly, BB-30 Puller with BB-CA-20	BB-30		
--	--	--	--	--	--	--	--	--	--	*	--	--	2318-003	-	Assembly, BB-70 Puller with BB-CA-20	BB-70		
--	--	--	--	--	--	--	--	--	*	--	--	--	2318-004	-	Assembly, BB-30 Puller with Threaded Adapters	BB-30A		
--	--	--	--	--	--	--	--	*	--	--	--	--	2318-005	-	Assembly, BB-70 Puller with Threaded Adapters	BB-70A		
--	--	--	--	--	--	--	*	--	--	--	--	--	2318-006	-	Assembly, BB-30 Puller with BB-CA-16	BB-30B		
--	--	--	--	--	--	*	--	--	--	--	--	--	2318-007	-	Assembly, BB-70 Puller with BB-CA-16	BB-70B		
--	--	--	--	--	*	--	--	--	--	--	--	--	2318-008	-	Assembly, BB-30 Puller with 7/8 - 14 Piston Thread	BB-30C		
--	--	--	--	*	--	--	--	--	--	--	--	--	2318-009	-	Assembly, BB-RT Puller	BB-RT		
--	--	--	*	--	--	--	--	--	--	--	--	--	2318-010	-	Assembly, BB-30 with BB-CA-20/25' Hose	BB-30-H25		
--	--	*	--	--	--	--	--	--	--	--	--	--	2318-011	-	Assembly, BB-30 with Threaded Adapters/25' Hose	BB-30A-H25		
--	*	--	--	--	--	--	--	--	--	--	--	--	2318-012	-	Assembly, BB-30-737 Puller with BB-CA-20	BB-30-737		
*	--	--	--	--	--	--	--	--	--	--	--	--	2318-013	-	Assembly, BB-100 Puller with Threaded Adapters	BB-100		
1	1	1	1	1	1	1	1	1	1	1	1	1	2192-001	2	Sleeve	BB-D2		
--	--	--	--	1	--	--	--	--	--	--	--	1	2184-001	3	Cylinder	BB-RR-D3		
1	1	1	1	--	1	--	1	--	1	--	1	--	2184-003	3	Cylinder	BB-30-D3		
--	--	--	--	--	--	1	--	1	--	1	--	--	2184-004	3	Cylinder	BB-70-D3		
1	--	--	--	--	--	--	--	--	--	--	--	--	2184-005	3	Cylinder	BB-100-D3		
--	--	--	--	--	1	--	--	--	--	--	--	1	2105-001	4	Assembly, Piston	BB-RR-D4		
1	1	1	1	--	--	--	1	--	1	--	1	--	2105-002	4	Assembly, Piston	BB-30-D4		
--	--	--	--	--	--	1	--	1	--	1	--	--	2105-003	4	Assembly, Piston	BB-70-D4		
--	--	--	--	--	1	--	--	--	--	--	--	--	2105-005	4	Assembly, Piston	----------		
1	--	--	--	--	--	--	--	--	--	--	--	--	2105-006	4	Assembly, Piston	BB-100-D4		
--	--	--	--	--	--	--	--	--	--	--	--	1	2187-002	5	Barrel	BB-RR-D5		
1	1	1	1	--	1	--	1	--	1	--	1	--	2187-003	5	Barrel	BB-30-D5		
--	--	--	--	--	--	1	--	1	--	1	--	--	2187-004	5	Barrel	BB-70-D5		
1	--	--	--	--	--	--	--	--	--	--	--	--	2187-005	5	Barrel	BB-100-D5		
--	--	--	--	1	--	--	--	--	--	--	--	--	2952-001	5	Barrel	RTB-11		
2	2	2	2	2	2	2	2	2	2	2	2	2	1035-002	6	Screw, Socket Head Cap	1/4-20UNC-2A X 3/8 LONG		
1	1	1	1	1	1	1	1	1	1	1	1	1	2007-007	7	Washer	BB-D7		
1	1	1	1	1	1	1	1	1	1	1	1	1	2127-001	8	Housing	BB-D8		
1	1	1	1	1	--	1	1	1	1	1	1	1	2201-001	9	Locknut	BB-D16		
--	--	--	--	--	1	--	--	--	--	--	--	--	2201-002	9	Locknut	----------		
1	1	1	1	1	1	1	1	1	1	1	1	1	2323-001	10	Sleeve, End Cap	----------		
1	1	1	1	1	1	1	1	1	1	1	1	1	2324-001	11	Adapter, Air	----------		
--	--	--	--	1	--	--	--	--	--	--	--	1	2328-001	12	Tube, Air	BB-RR-D19		
1	1	1	1	--	1	--	1	--	1	--	1	--	2328-002	12	Tube, Air	BB-30-D19		
--	--	--	--	--	--	1	--	1	--	1	--	--	2328-003	12	Tube, Air	BB-70-D19		
1	--	--	--	--	--	--	--	--	--	--	--	--	2328-004	12	Tube, Air	BB-100-D19		
--	--	--	--	--	--	--	--	--	--	--	--	--	2074-001	13	Nosecap	----------		
--	1	--	--	--	--	--	--	--	--	--	--	--	3003-003	13	Nosecap	----------		
3	3	3	3	3	3	3	3	3	3	3	3	3	2120-005	14	Lockring	BB-D27		
1	1	--	--	1	--	1	1	1	1	1	1	1	2107-001	15	Assembly, Hydraulic Hose	IWHH-10		
--	--	--	--	--	1	--	--	--	--	--	--	--	2107-002	15	Assembly, Hydraulic Hose	IWHH-20		
--	--	1	1	--	--	--	--	--	--	--	--	--	2107-008	15	Assembly, Hydraulic Hose	IWHH-25		
1	1	1	1	1	1	1	1	1	1	1	1	1	5211-003	16	Handle, Sub-Assembly	BB-H-1-SA		
--	1	--	1	--	1	--	--	--	--	1	1	1	2313-002	17	Assembly, BB Chuck	BB-CA-20		
--	--	--	--	--	--	1	1	--	--	--	--	--	2313-001	17	Assembly, BB Chuck	BB-CA-16		
1	--	1	--	--	--	--	--	1	1	--	--	--	2526-001	17	Adapter, 7/8-14UNF-2A Threaded	BB-A-D35		
1	1	1	1	1	1	1	1	1	1	1	1	1	1046-035	18	O'Ring	MS28775-147 (16650)		
1	1	1	1	1	1	1	1	1	1	1	1	1	1035-013	19	Screw, Socket Head Cap	1/4-20UNC-2A X 2-1/2 LONG		
2	2	2	2	2	2	2	2	2	2	2	2	2	1046-036	20	O'Ring	AN6227B-5 (16650)		
1	1	1	1	1	1	1	1	1	1	1	1	1	1046-037	21	Scraper	R2072 (16650)		
1	1	1	1	1	1	1	1	1	1	1	1	1	1046-025	22	O'Ring	AN62278-19 (16650)		
1	1	1	1	1	1	1	1	1	1	1	1	1	1046-026	23	Ring, Backup	MS28782-19 (16650)		
1	1	1	1	1	1	1	1	1	1	1	1	1	1046-023	24	O'Ring	AN6227B-32 (16650)		
1	1	1	1	1	1	1	1	1	1	1	1	1	1046-024	25	Ring, Backup	MS278782-32 (16650)		
1	1	1	1	1	1	1	1	1	1	1	1	1	1046-038	26	O'Ring	A-111-90 BUNA (16650)		
2	2	2	2	2	2	2	2	2	2	2	2	2	1045-027	27	Screw, Set	10-32UNF 2A X 1/4 LONG		
1	1	1	1	1	1	1	1	1	1	1	1	--	2197-001	29	Cap, End	BB-D46		
--	--	--	--	--	--	--	--	--	--	--	--	1	5442-001	29	Cap, End	----------		
1	1	1	1	1	1	1	1	1	1	1	1	1	1045-015	30	Wrench, Spanner	0-474 (03100)		
1	1	1	1	1	1	1	1	1	1	1	1	1	1009-185	31	Label	"WARNING" LABEL		
1	1	1	1	1	1	1	1	1	1	1	1	1	1009-094	32	Label	"FTI" LABEL		
1	1	1	1	1	1	1	1	1	1	1	1	1	1009-184	33	Label	"DO NOT STRIKE" LABEL		
2	2	2	2	2	2	2	2	2	2	2	2	2	1009-188	34	Label	"BIG BRUTE" LABEL		
1	1	--	--	1	--	1	1	1	1	1	1	1	2106-001	35	Assembly, Air Hose (Male)	IWAH-10		
--	--	--	--	--	1	--	--	--	--	--	--	--	2106-003	35	Assembly, Air Hose (Male)	IWAH-20		
--	--	1	1	--	--	--	--	--	--	--	--	--	2106-015	35	Assembly, Air Hose (Male)	IWAH-25		
1	1	--	--	1	--	1	1	1	1	1	1	1	2106-002	36	Assembly, Air Hose (Female)	IWAH-10		
--	--	--	--	--	1	--	--	--	--	--	--	--	2106-004	36	Assembly, Air Hose (Female)	IWAH-20		
--	--	1	1	--	--	--	--	--	--	--	--	--	2106-016	36	Assembly, Air Hose (Female)	IWAH-25		
4	4	4	4	4	4	4	4	4	4	4	4	4	2638-001	37	Tube, Heat Shrink	3" LONG	∇	
1	--	1	--	--	--	--	--	1	1	--	--	--	2526-002	-	Adapter, 1-14UNS-2A, Threaded	BB-8-D35	∇	
1	1	1	1	1	1	1	1	1	1	1	1	1	1045-116	-	Wrench, Open End	(ARMSTRONG 28-056)	∇	
1	--	1	--	--	--	--	--	1	1	--	--	--	2526-003	-	Adapter, 1-14UNS-2A, Threaded	BB-C-D35	∇	
--	--	--	--	1	--	--	--	--	--	--	--	--	1045-188	-	Wrench, Open End	2-1/2" 28-080		
1	1	1	1	1	1	1	1	1	1	1	1	1	1166-001	38	Label "CE"	----------		∇ Items flagged thus are
1	1	1	1	1	1	1	1	1	1	1	1	1	1187-105	39	Label "Hearing Protection"	----------		included as part of assembly,
1	1	1	1	1	1	1	1	1	1	1	1	1	1187-106	40	Label "Eye Protection"	----------		but are not installed
1	1	1	1	1	1	1	1	1	1	1	1	1	1187-107	41	Label "Read Manual"	----------		into puller.

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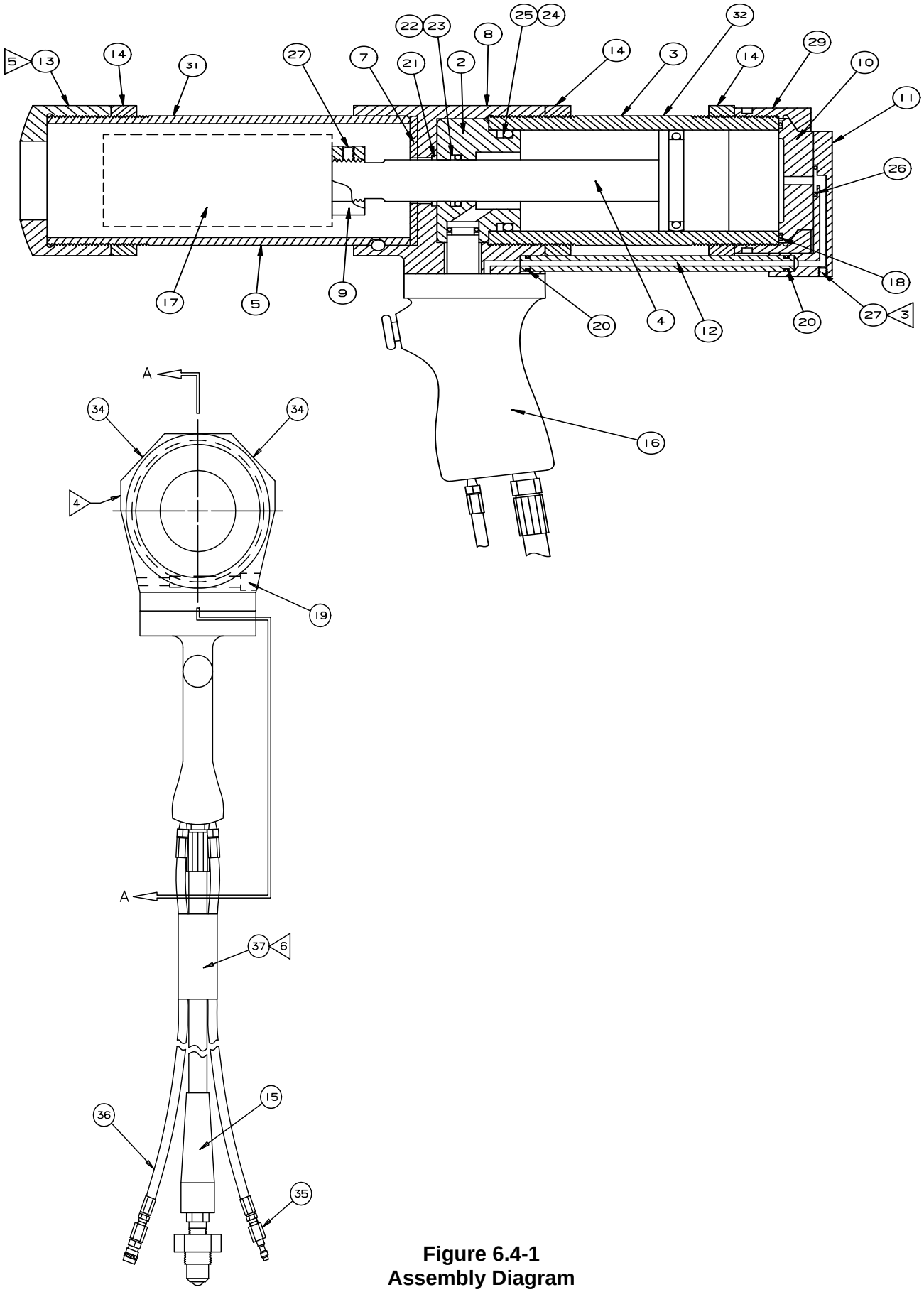

Figure 6.4-1
Assembly Diagram