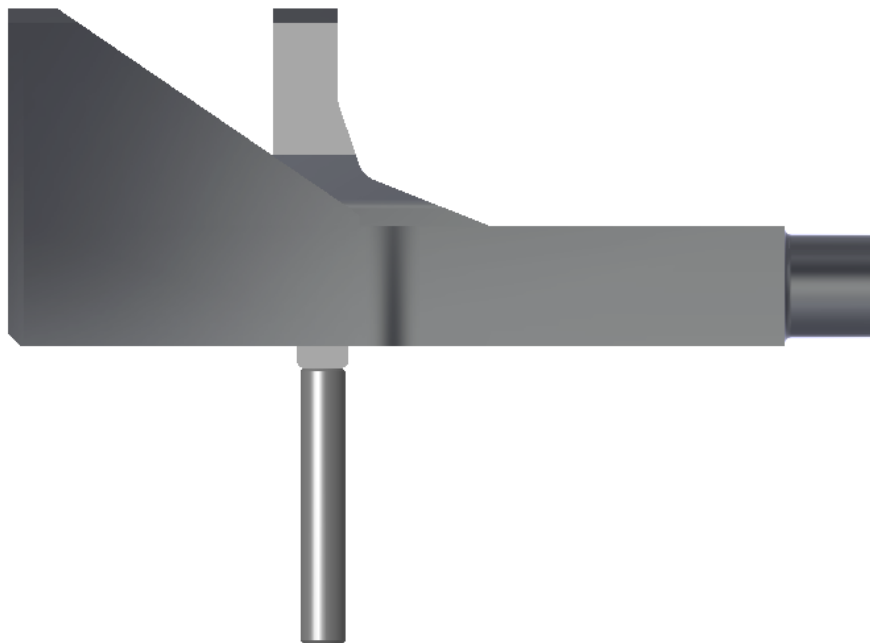

FTI OPERATIONS, MAINTENANCE, AND REPAIR MANUAL

Medium Brute Offset Adapter

**Part #2720-009, Log #2566
Revision A**

March 30, 2009



**This manual should be used in conjunction with the
FTI “Medium Brute Operations, Maintenance, and Repair Manual.”**

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

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SECTION 1.0: INTRODUCTORY INFORMATION—MEDIUM BRUTE OFFSET ADAPTER

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

Read this manual before operating the MBOA, and retain the manual for future reference.

The Medium Brute Offset Adapter (shown in Figure 1):

- Is designed for use with the Medium Brute (MB-30) Puller Unit.
- Is compatible with the MB-70 and Big Brute (BB-30 and BB-70) Puller Units.
- Is used to cold expand holes with lateral clearances of 0.90 inch.
- Has a backup plate included with each offset adapter.
- Weighs 30 pounds. With MB-30 puller attached, unit weighs 47 pounds.
- Has a maximum pull force of 22,000 pounds (from the Medium Brute Puller Unit).
- Identification is provided by engraved model and serial numbers.

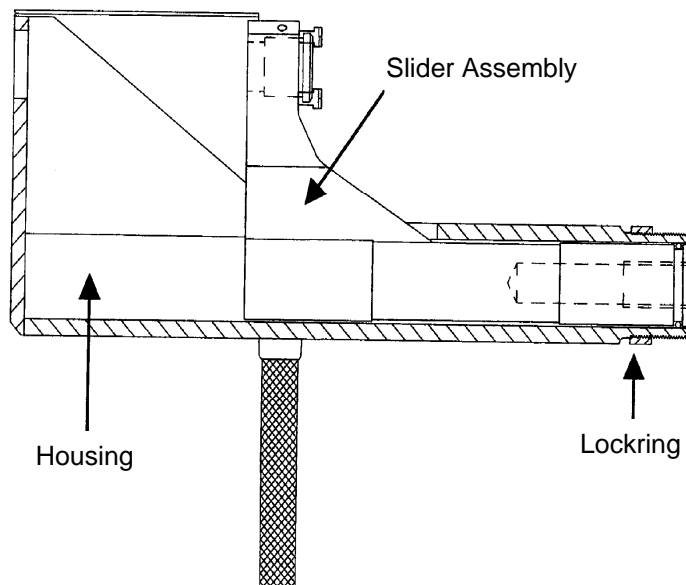


Figure 1
Medium Brute Offset Adapter Parts

SECTION 2.0: MEDIUM BRUTE OFFSET ADAPTER SPECIFICATIONS

Table 1
Medium Brute Offset Adapter Specifications

Model Number	Maximum Material Stackup (inch)	Combined Puller and Adapter Length (OAL) (Ref. Figure 2) (inch)	Adapter Length L (Ref. Figure 2) (inch)	Frontside Clearance F (Ref. Figure 2) (inch)
MBOA-30A	3.0	24.8	14.8	6.8

Nosecap Selection: The MBOA uses special MBOA extension nose caps (refer to FTI Tooling Catalog, Section 2, pages I-8 and I-9) and special MBOA flush nose caps (refer to FTI Tooling Catalog, Section 2, pages I-24 through I-26).

Mandrel Selection: The MBOA uses special MBOA mandrels (refer to FTI Tooling Catalog, Section 2, page H-8).

See Figure 2.

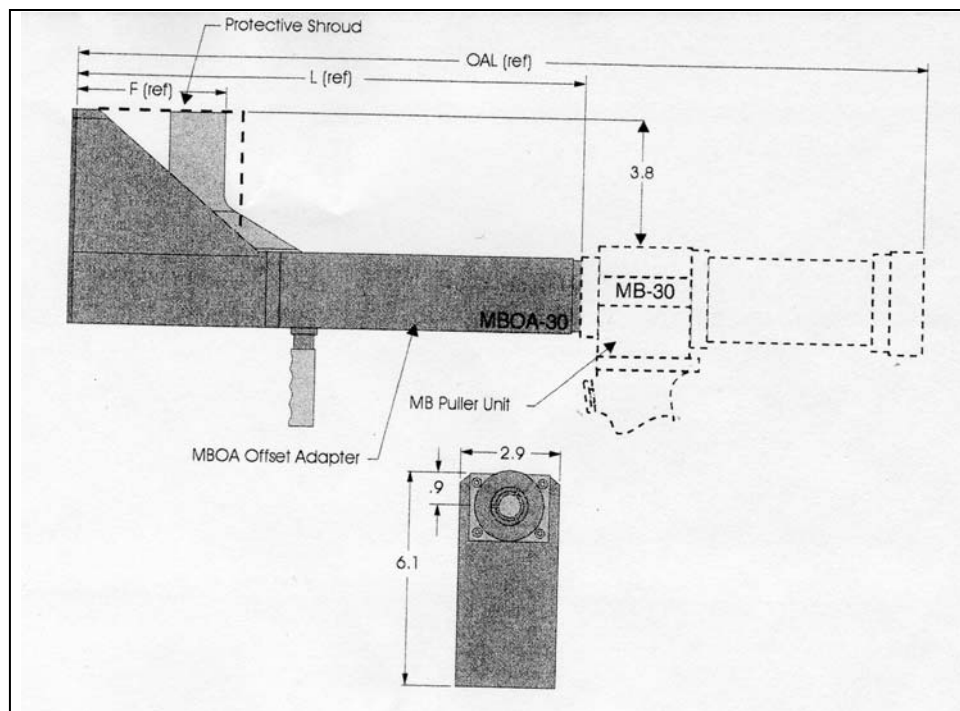


Figure 2
Medium Brute Offset Adapter

SECTION 3.0: SAFETY

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

1. Observe all safety precautions associated with FTI puller units and PowerPaks, as listed in their separate manuals.
2. Keep fingers clear of nose cap and slide channel during use. Do not remove slide channel safety cover.
3. Disconnect the puller unit air supply from the PowerPak when maintenance is performed on the MBOA or the puller unit, whenever it is not in use, or when the hydraulic hose is disconnected from the pump.
4. Take care not to scratch the piston rod on the puller unit.
5. Always ensure that the puller end cap is fully threaded on and secured with the lockring.
6. If any sign of hydraulic fluid leaks exist, do not operate the system until repairs are made.

CAUTION

This tooling requires high hydraulic and air pressure. For operator safety, also follow these precautions:

- Wear safety glasses at all times during the cold expansion process.
- In the event of a ruptured or leaking hydraulic hose, **IMMEDIATELY RELEASE THE TRIGGER AND DISCONNECT THE AIR SUPPLY LINE** from the PowerPak. **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.
- Periodically inspect the hose for wear or damage that could cause failure of the hose and possibly result in injury.

WARNING

Improper use of cold expansion tooling can damage a structure, injure the operator, and/or provide insufficient fatigue life improvement. In order to ensure the effectiveness of the process, follow these precautions:

- **DO NOT** attempt to disconnect the hydraulic hose while the PowerPak is running.
- **DO NOT** expose hoses to potential hazards such as extreme heat or cold, sharp surfaces, heavy impact, vehicular traffic, toxic materials or paints.
- **DO NOT** allow hoses to kink, twist, curl or bend so tightly that the oil flow within the hose is blocked or reduced.
- **DO NOT** mix this tooling with tooling from other manufacturers. Always use the complete set of compatible FTI tooling including mandrel check fixtures and verification pins.
- **DO NOT** exceed 10,000 psi hydraulic pressure generated by the PowerPak. Pressure beyond the rated capacities may result in personal injury.
- **DO NOT** use mandrels that have been worn beyond their minimum allowable diameter.
- **DO NOT** use tools that have become worn. Replace them with new parts having the same FTI model number.

SECTION 4.0: ASSEMBLY AND USAGE OF THE MEDIUM BRUTE OFFSET ADAPTER WITH THE MB-30 AND MB-70 PULLER UNITS

The MBOA is compatible with both the MB-30 and MB-70 Puller Units. The total stroke of the MBOA is the same for both configurations. For assembly and usage of the MBOA with the MB-30 and MB-70, follow these instructions:

1. Remove the nosecap assembly from the Medium Brute Puller Unit (Figure 3).



Figure 3
MB-30, Nosecap Removed

2. Unscrew and remove barrel from Medium Brute Puller Unit (Figure 4).



Figure 4
MB-30 Barrel Removed

3. Remove mandrel adapter from piston rod (Figure 5).



Figure 5
MB-30, Mandrel Adapter Removed

4. Screw MBOA onto Medium Brute Puller Unit (Figure 6). Connect piston first then connect housing. Tighten locking. Note: To connect the MBOA to the MB-70, the puller unit piston must be partially retracted.

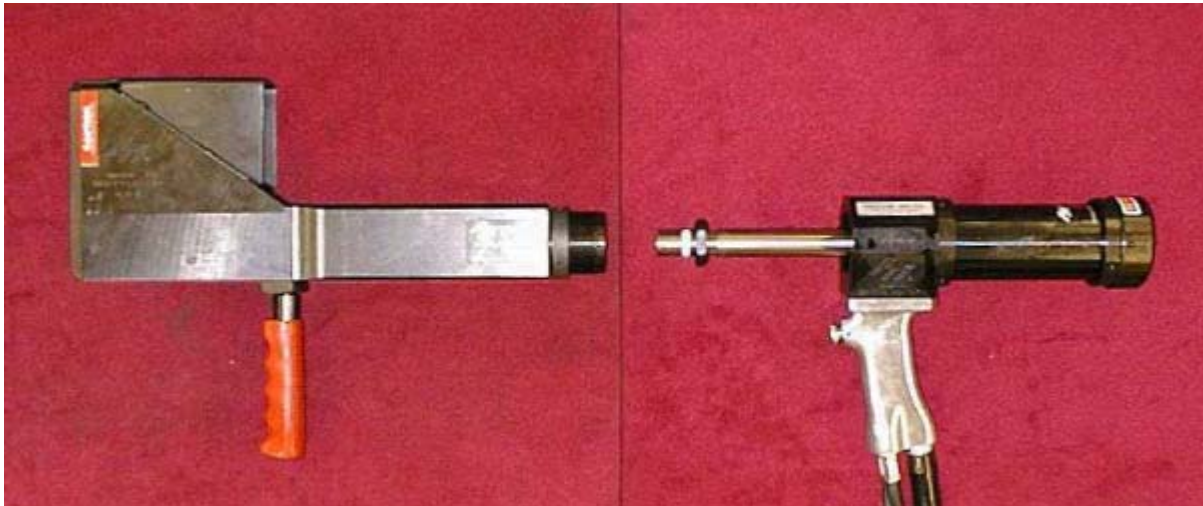


Figure 6
Medium Brute Offset Adapter and MB-30

- Install either the 5/8-inch or 7/8-inch mandrel adapter in the MBOA slider assembly (Figure 7). The 7/8-inch mandrel adapter should be used for holes larger than 5/8-inch diameter. Ensure that safety screws are installed once the mandrel adapter is in place.
- Install the proper MBOA noscap called out in the tool list (Figure 7).

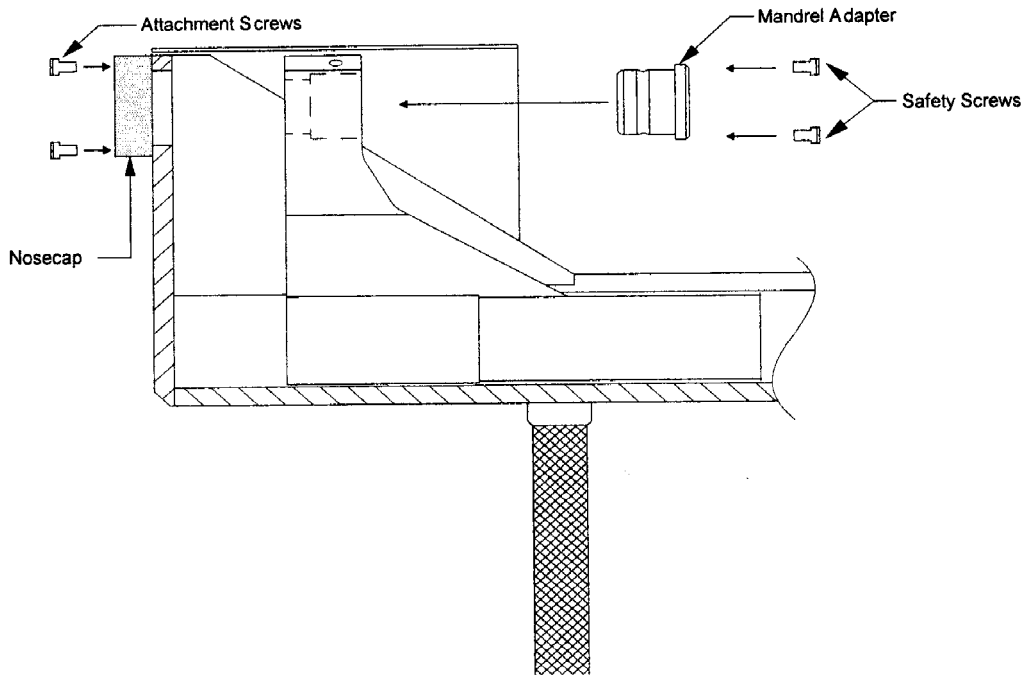


Figure 7
Nosecap and Mandrel Adapter Detail

- Verify starting hole diameter (SHD) using the stepped go/no-go end of combination gage (Figure 8).



Figure 8
Starting Hole Gage

8. Select the proper mandrel and check major diameter for wear by inserting mandrel into mandrel gage. If the mandrel can be passed through the gage, it is excessively worn and must be discarded (Figure 9).

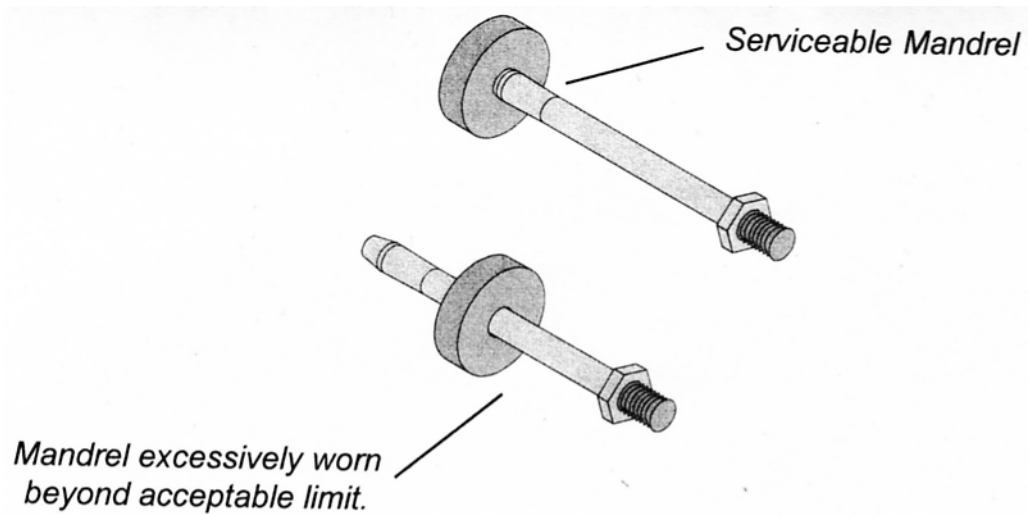


Figure 9
Mandrel Check Gage

9. Connect puller unit to the PowerPak.
10. Cycle puller to ensure that mandrel retracts inside jaw/nose. If mandrel major diameter does not retract inside jaw/nosecap, check tool setup and verify that tools are per the tool list. If needed, contact FTI for assistance.
11. Cold work the hole.
12. Verify that the hole has been properly expanded, using cold expansion hole check gage.

SECTION 5.0: ASSEMBLY AND USAGE OF THE MEDIUM BRUTE OFFSET ADAPTER WITH THE BB-30 AND BB-70 PULLER UNITS

The MBOA is compatible with both the BB-30 and BB-70 Puller Units. The total stroke of the MBOA is the same for both configurations. Additional parts are needed to attach the MBOA to the BB Puller Units (see Steps 4 and 5 that follow). Follow the directions below to set up and use the MBOA/BB assembly.

1. Remove the nosecap assembly from the Big Brute (BB) Puller Unit.
2. Remove the barrel from the BB Puller Unit. This is done by first removing the socket head screw that is through the housing, where the barrel meets the housing, and then pulling the barrel out of the housing.
3. Remove the mandrel adapter from the piston rod. **DO NOT REMOVE PISTON STOP** (Figure 10).



Figure 10
Big Brute Piston Stop

4. Attach the MBOA-to-BB Piston Adapter (FTI part number 2709-001) to the slide assembly of the MBOA.
5. Attach the MBOA-to-BB Threaded Adapter (FTI part number 5539-001) to the housing of the MBOA.
6. Thread the MBOA-to-BB Piston Adapter onto the BB piston.
7. Insert the MBOA-to-BB Threaded Adapter into the housing of the BB Puller Unit. Note: When connecting the MBOA to the BB-70, the puller unit piston must be partially retracted.
8. Replace the socket head screw into the BB Puller Unit housing to secure the MBOA-to-BB Threaded Adapter.
9. Skip to Step 5 of Section 4 and repeat Steps 5 to 12.

SECTION 6.0: MAINTENANCE

The following section covers maintenance of the MBOA.

1. Periodically lubricate internal slide assembly and housing with the 90-weight gear lube.
2. Periodically clean the MBOA to eliminate any chips, fittings, or other debris commonly associated with a metal fabrication environment. Debris of any sort will have a tendency to lodge and jam the slide assembly, impeding motion. Use any mild solvent.
3. Maintain a light coat of lubricant on all metal parts to prevent formation of rust. Use any 10-weight or lighter oil.

NOTES
