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Options:

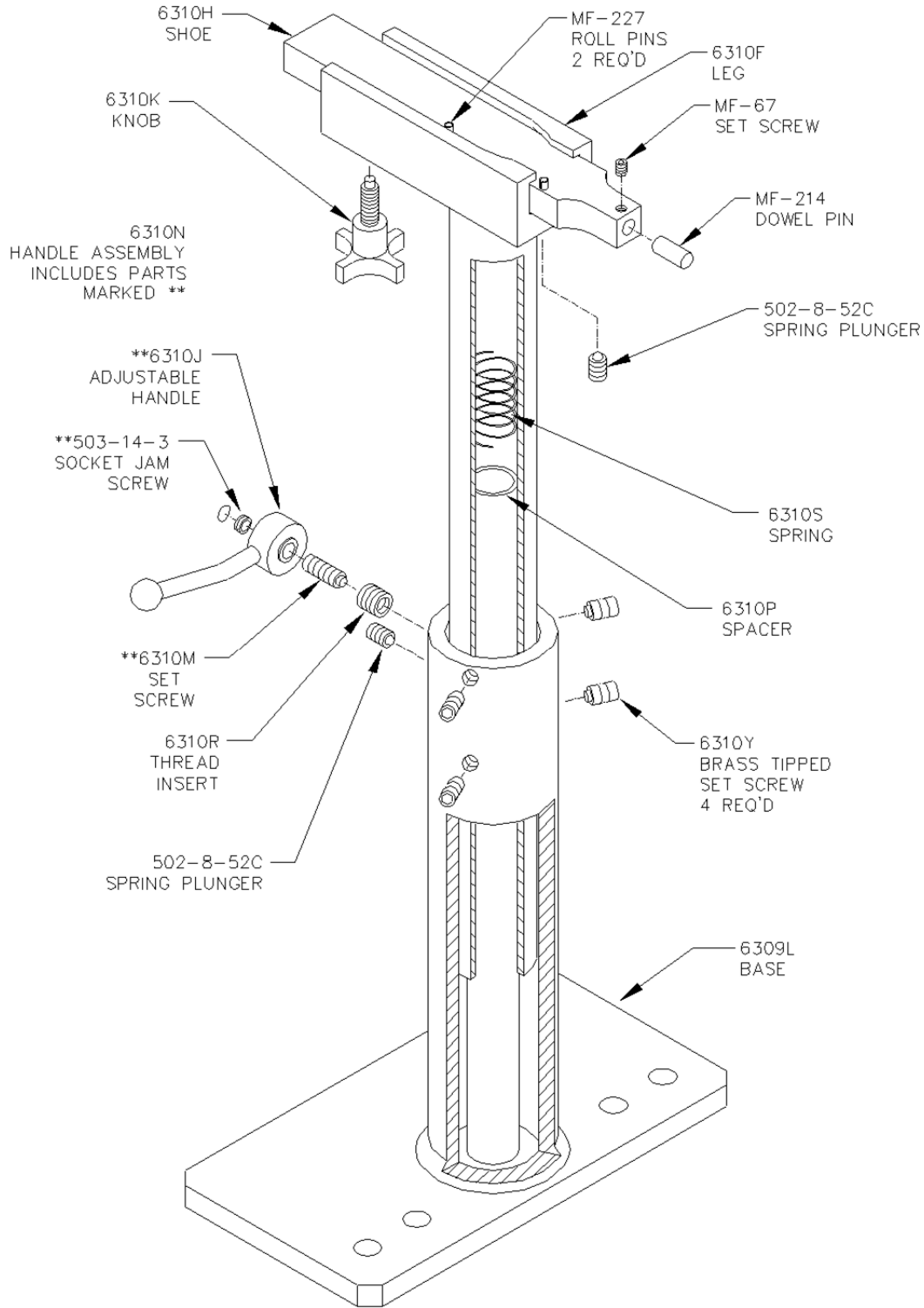
6309N

Tail

Clamp

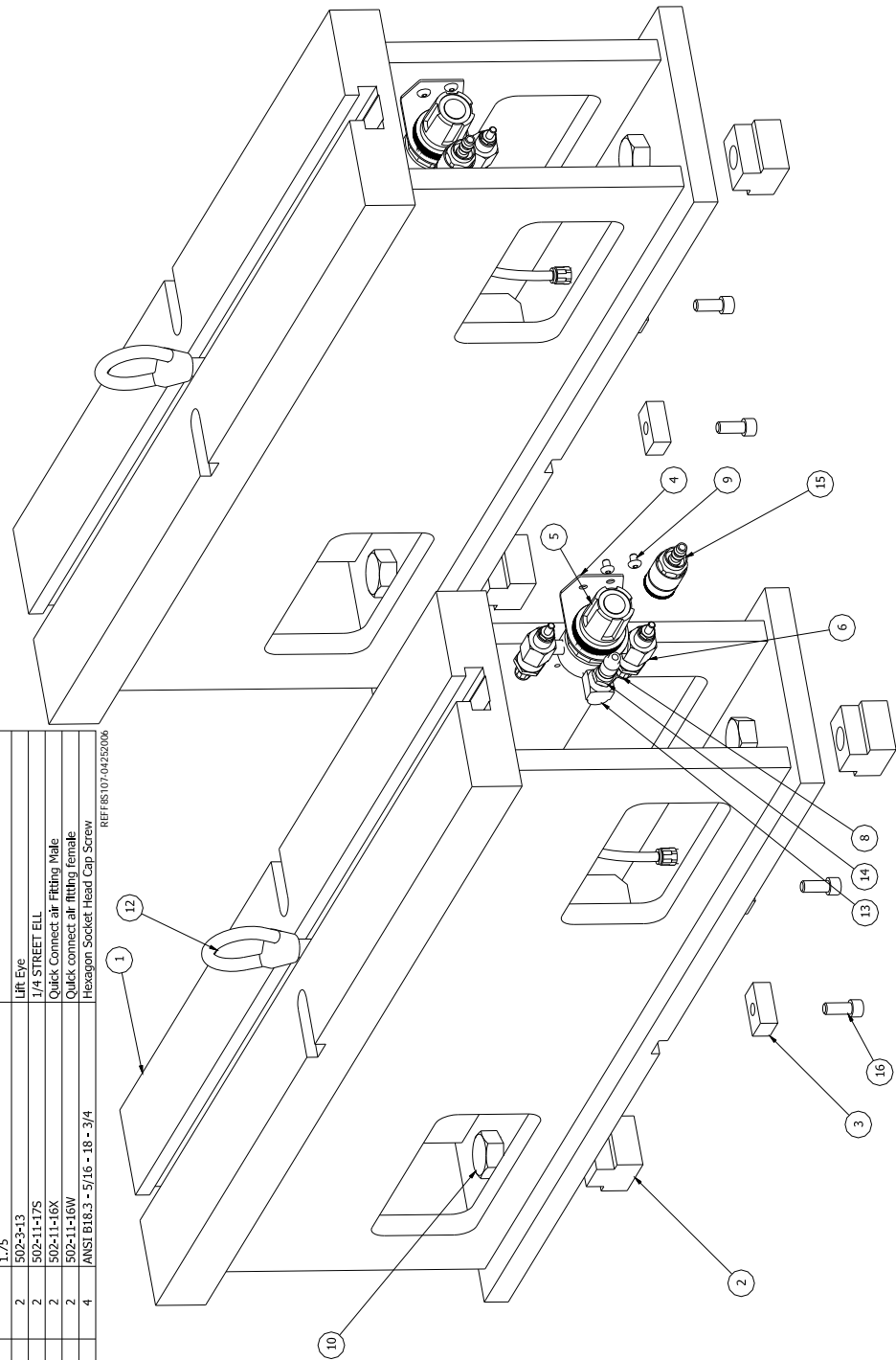
Arm

Assembly:



6370Z 10" Parallel Assembly F90:

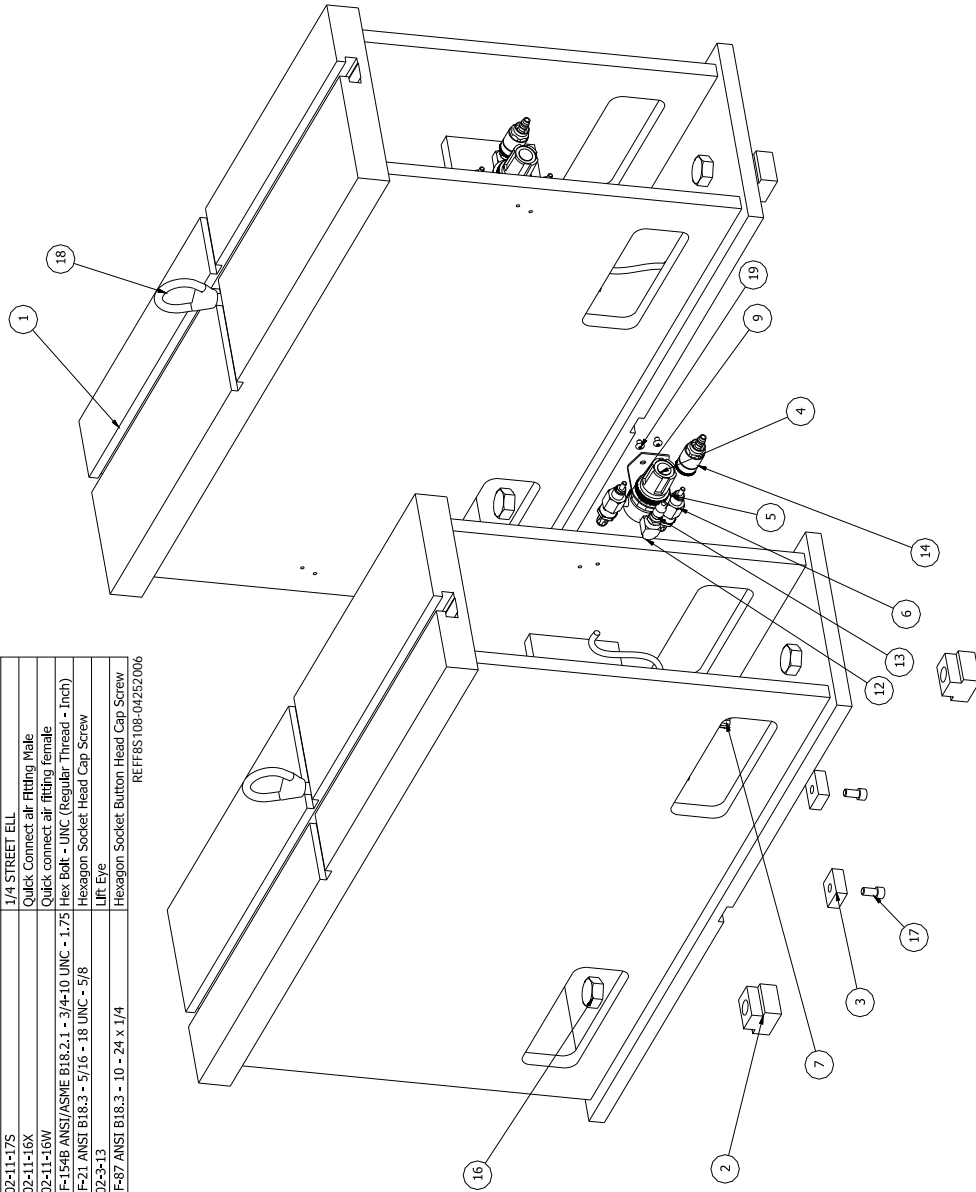
ITEM	QTY	6370Z Parts List - 10" Parallels	DESCRIPTION
1	2	6370Y	10" Parallel Machining
2	4	6160	T-Nut
3	4	65531	Guide Key
4	2	502-27-17A	Regulator Bracket
5	2	502-27-17	Regulator 0 - 60 PSI
6	4	502-11-35A	Flo Control
7	4	502-11-17J	Close Nipple
8	8	514-4-17W	Legris Straight 1/4 x 1/8 npt
9	4	MF-87 ANSI B18.3 - 10 - 24 x 1/4	Hexagon Socket Button Head Cap Screw
10	4	MF-154B ANSI/ASME B18.2.1 - 3/4-10 UNC - 1.75	Hex Bolt - UNC (Regular Thread - Inch)
12	2	502-3-13	Lift Eye
13	2	502-11-17S	1/4 STREET ELL
14	2	502-11-16X	Quick Connect Air Fitting Male
15	2	502-11-16W	Quick connect air fitting female
16	4	ANSI B18.3 - 5/16 - 18 - 3/4	Hexagon Socket Head Cap Screw



6370C 18" Parallel Assembly F90:

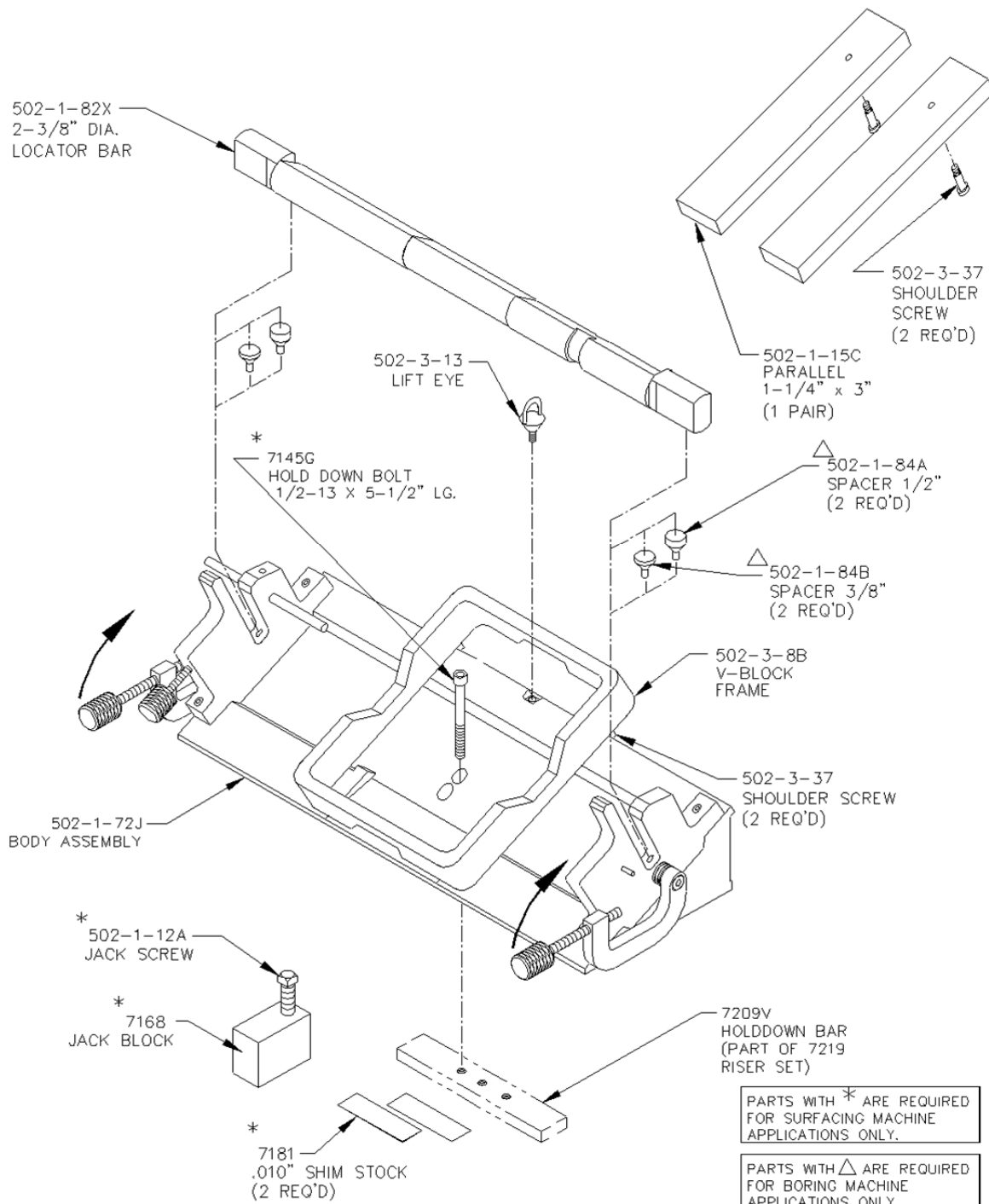
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	6370M	
2	4	6160	T-Nut
3	4	6653K	Guide Key
4	2	502-27-17	Regulator 0 - 60 PSI
5	2	502-27-17A	Regulator Bracket
6	4	502-11-35A	Flc Control
7	8	514-4-17W	Legris Straight 1/4 x 1/8 npt
9	4	502-11-17J	Close Nipple
10	2	502-11-17S	1/4 STREET ELL
11	2	502-11-16X	Quick Connect air Fitting Male
12	2	502-11-16W	Quick connect air fitting female
13	4	MF-154B ANSI/ASME B18.2.1 - 3/4-10 UNC - 1.75	Hex Bolt - UNC (Regular Thread - Inch)
14	4	MF-21 ANSI B18.3 - 5/16 - 18 UNC - 5/8	Hexagon Socket Head Cap Screw
15	2	502-3-13	Lift Eye
16	4	MF-87 ANSI B18.3 - 10 - 24 x 1/4	Hexagon Socket Button Head Cap Screw

REF:85108-04252006

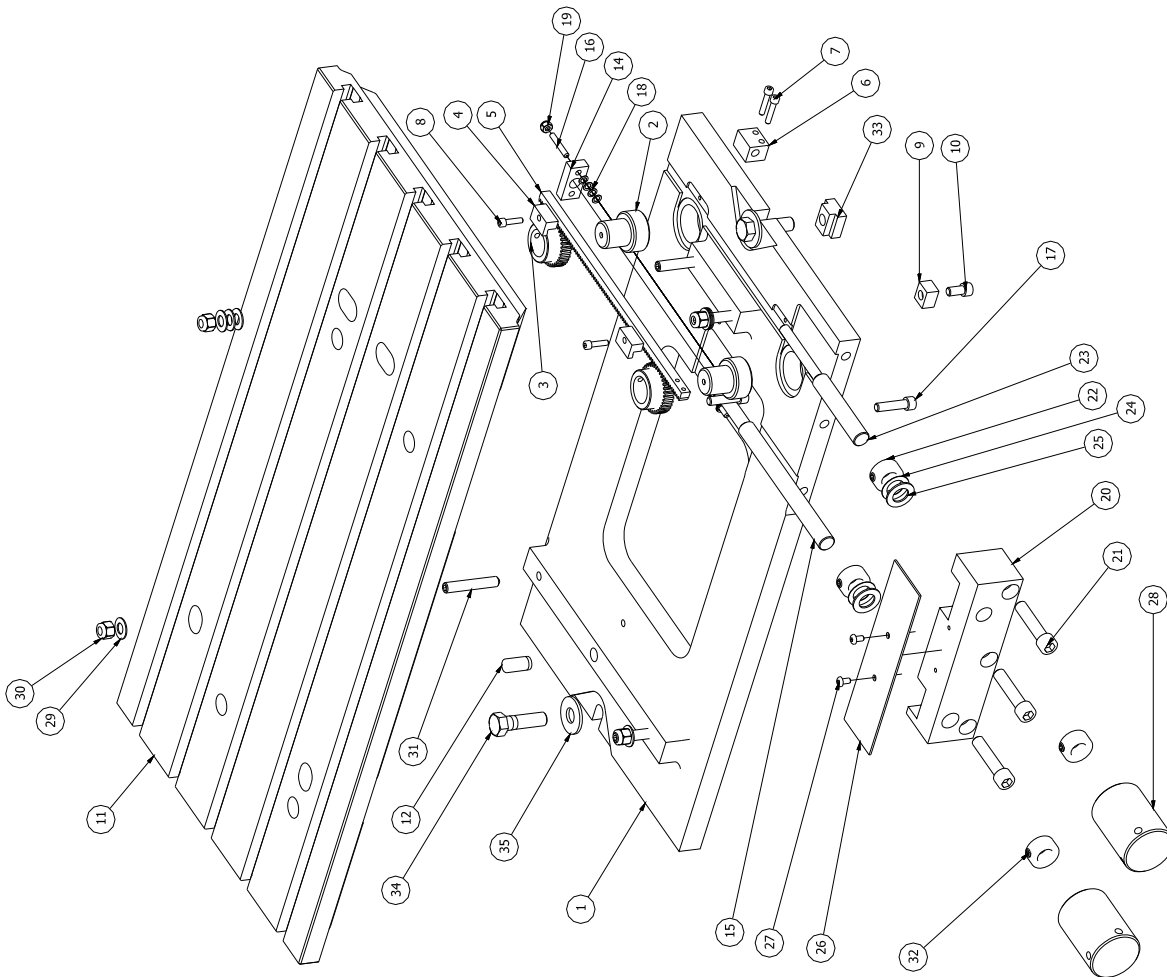


502-37-72H V6 / V8 Manual Fixture Assembly:

REF:FIXTUR75-110397



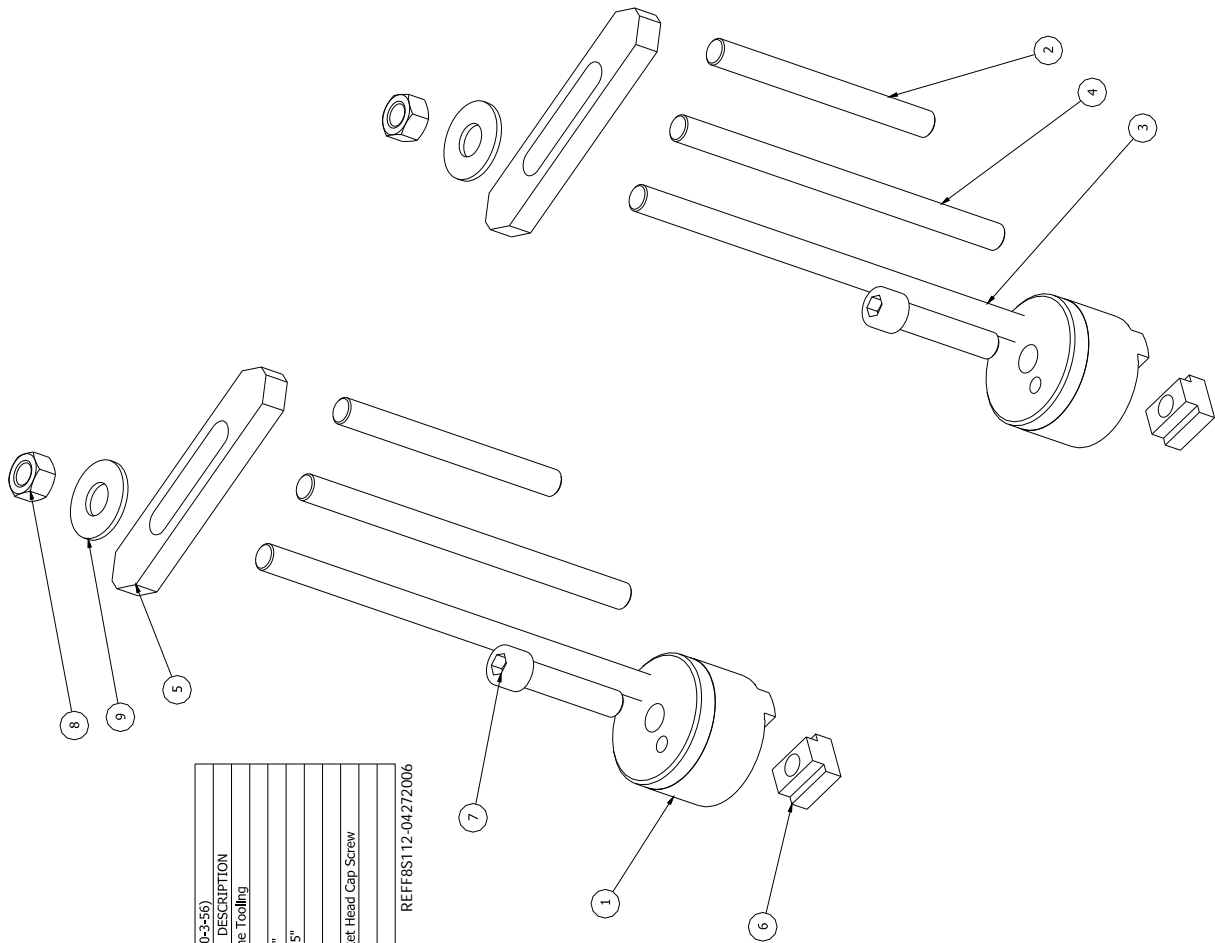
650-3-56 Line Bore Pivot Table



ITEM	QTY	650-3-56 Parts List - Line Bore Pivot Table PART NUMBER	DESCRIPTION
1	1	650-3-56C	Lower Plate, Pivot Table
2	1	650-3-56D	Jack Screw, Pivot Table
3	2	650-3-56F	Gear, Pivot Table
4	2	650-3-56K	Retainer, Rack Pivot Table
5	1	650-3-56V	Rack, Pivot Table
6	1	650-3-56W	Threaded Block, Gear Rack
7	2	MF-6A ANSI B18.3 - No. 10 - 24 - 1	Hexagon Socket Head Cap Screw
8	2	ANSI B18.3 - No. 10 - 24 - 3/4	Hexagon Socket Head Cap Screw
9	2	650-3-59	Key
10	2	MF-21 ANSI B18.3 - 5/16 - 18 - 5/8	Hexagon Socket Head Cap Screw
11	1	650-3-56A	Table Top, Pivot Table
12	1	MF-2138 ANSI B18.8.2 - 1/2 x 1	Pin - Hardened Ground Machine Dowel
13	1	650-3-56N	Threaded Block, Rotate Adjust
14	1	650-3-56R	Lock Plate, Rotate Adjust
15	1	650-2-29D	Shaft, Rotate Adjust
16	2	MF-57A ANSI B18.3 - 10-24 UNC x 1.25	Hexagon Socket Set Screw - Cup Point
17	2	MF-24 ANSI B18.3 - 5/16 - 18 - 1 1/4	Hexagon Socket Head Cap Screw
18	8	650-3-56Q	Spring, Belleville Rotate Adjust
19	2	MF-186B	Nylock Nut, 10-24
20	3	MF-40A ANSI B18.3 - 7/16 - 14 - 2	Control Block, Handwired, Pivot Table
21	3	MF-40A ANSI B18.3 - 7/16 - 14 - 2	Hexagon Socket Head Cap Screw
22	4	7199E	Collar, Support Block
23	1	650-3-56U	Shaft, Lift Adjust
24	2	650-3-56S	Belleville Spring Rqd BDB-65
25	2	514-7-20	Washer, Thrust
26	1	650-3-56T	Chip Shield, Control Block
27	2	MF-88 ANSI B18.3 - 10 - 24 x 3/8	Hexagon Socket Button Head Cap Screw
28	2	650-2-29E	Handle, Pivot Table
29	8	650-2-29E	Washer, Belleville
30	4	MF-187B	Nylock Nut 3/16-18
31	4	MF-75B	Socket Set Screw Flat Point 3/8-16 x 2 1/4
32	4	ANSI B18.3 - 5/16-18 UNC x 0.31	Hexagon Socket Set Screw - Cup Point
33	2	650-3-10	TIN-5 T-Nut
34	2	MF-149BANSI/ASME B18.2.1 - 1/2-13	Hex Bolt - UNC (Regular Thread - Inch)
35	2	MF-180	1/2" FLAT WASHER

REF8S111-04272006

650-3-57 In Line Tooling Package (included w/ 650-3-56)



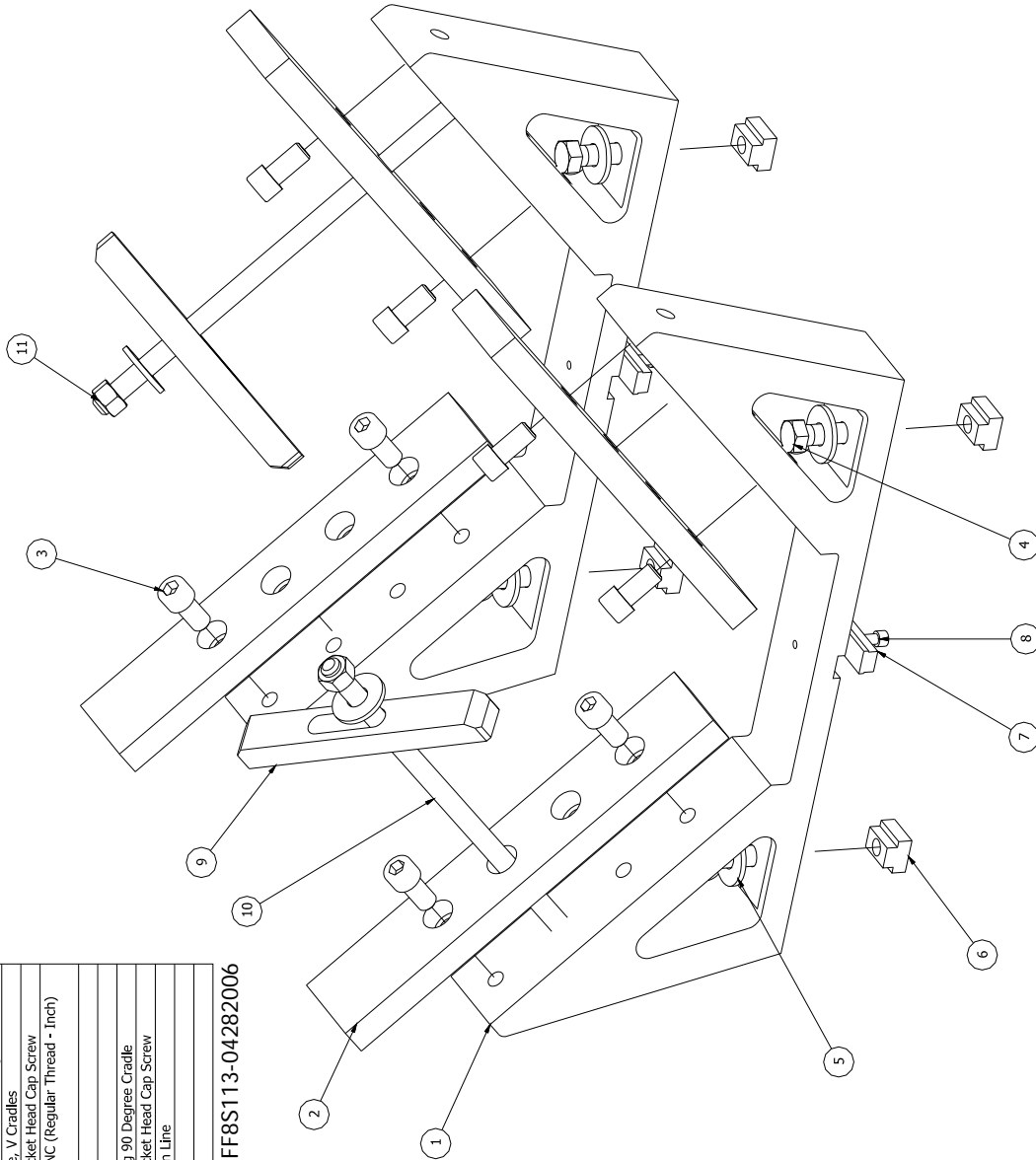
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	650-3-57A	Locator - In Line Tooling
2	2	650-3-57C	Clamp Rod 5"
3	2	650-3-57G	Clamp Rod 10"
4	2	650-3-57H	Clamp Rod 7.5"
5	2	650-3-57B	Clamp Bar
6	2	7137B	T-Nut
7	2	MF-41C ANST B18.3 - 1/2 - 13 - 2 1/4	Hexagon Socket Head Cap Screw
8	2	MF-165 ANST B18.2.2 - 1/2 - 13	Hex Nut
9	2	MF-180 ANST B18.22.1 - 9/16 - wide - Type A	Washer A

REF8S112-04272006

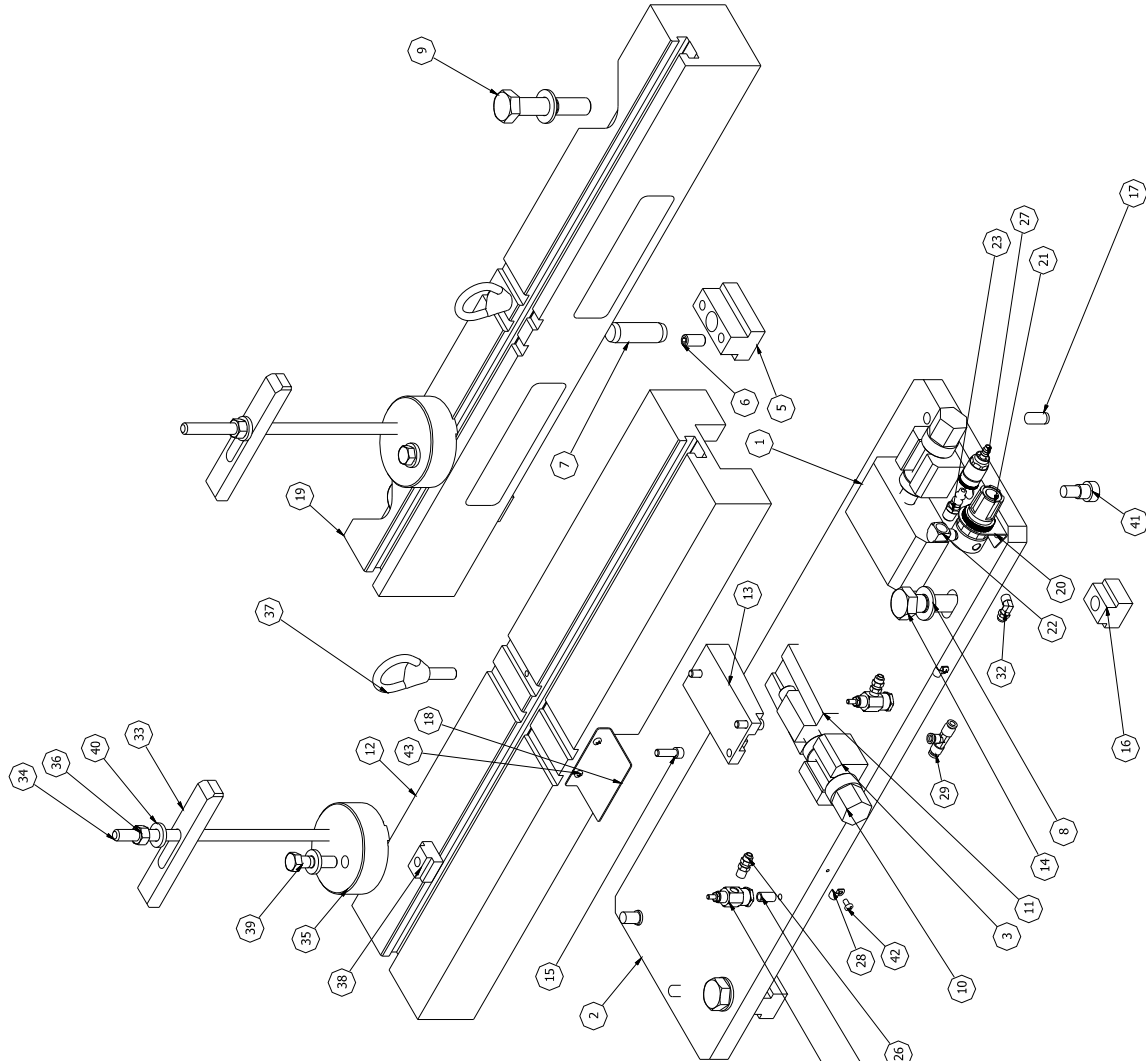
650-3-57J Supports – 90 Degree (included w/ 650-3-56)

ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	6843A	Cradle, Right and Left 90 Degree
2	4	6789D	Adapter Plate, V Cradles
3	8	MF-42 ANSI B18.3 - 1/2 - 13 - 1	Hexagon Socket Head Cap Screw
4	4	MF-150A ANSI/ASME B18.2.1 - 1/2-13 UNC - 1.5	Hex Bolt - UNC (Regular Thread - Inch)
5	6	MF-180	Washer 1/2"
6	4	7137B	T-Nut
7	2	650-3-9F	Key, Locating 90 Degree Cradle
8	2	MF-12 ANSI B18.3 - 1/4 - 20 - 1/2	Hexagon Socket Head Cap Screw
9	2	6833A	Clamp Bar, In Line
10	2	6833B	Clamp Rod
11	2	MF-165 ANSI B18.2.2 - 1/2 - 13	Hex Nut

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6821 Adjustable Universal Line Boring Parallel Assembly



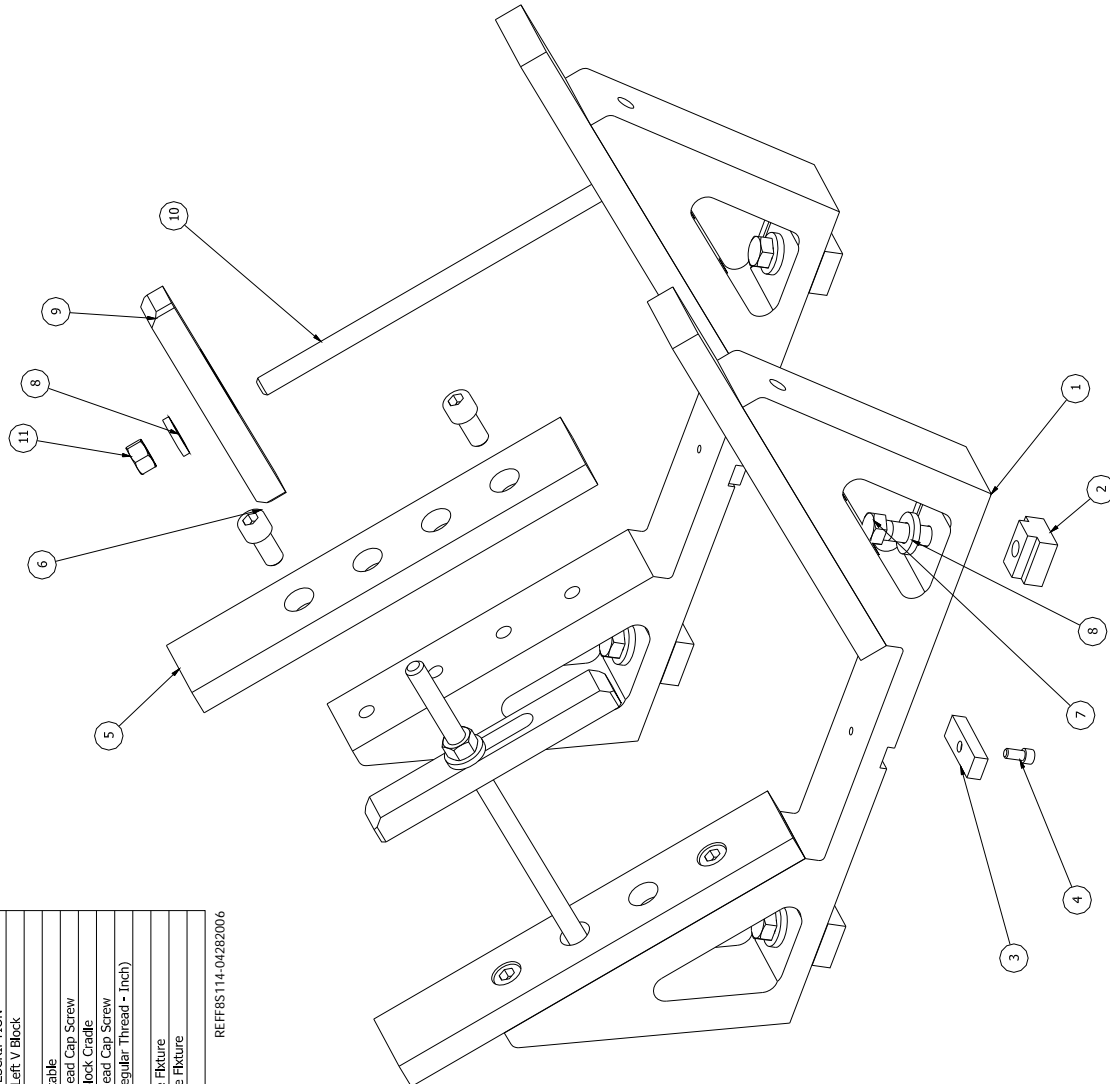
ITEM	QTY	6821 Parts List - Adjustable Parallel Assembly Line Bore Fixture	DESCRIPTION
1	1	6830	Block, Adjusting Adjustable Parallel
2	1	6825A	Plate, Lower Adjustable
3	2	6829A	Bracket, Screw Adjustable
4	8	MF-43 ANSI B18.3 - 1/2 - 13 - 1 1/4	Hexagon Socket Head Cap Screw
5	1	6820	Locating Pin/ont Key, Waukesha 7042/ CAT 399
6	2	MF-72 ANSI B18.3 - 1/2-13 UNC x 1	Hexagon Socket Set Screw - Flat Point
7	1	6819	Locating, Pivot Pin
8	4	6287	Washer - 3/4"
9	2	6822B	Hex Bolt - 3/4-10 x 4 UNC
10	2	6828	Screw Adjustable Parallel
11	1	6827	Wedge, Lower Adjustable Parallel
12	1	6824A	Pad, Upper Adjustable Parallel
13	1	6826	Wedge, Upper Adjustable Parallel
14	2	MF-154C ANSI B18.2.1 - 3/4-10 UNC - 2.5	Hex Bolt
15	3	MF-23 ANSI B18.3 - 5/16 - 18 - 1	Hexagon Socket Head Cap Screw
16	4	6160	Nut, T - Hardened
17	2	MF-413B ANSI B18.8.2 - 1/2 x 1	Pin - Hardened Ground Machine Dowel
18	1	6834	Chip Shield, Upper Pad Adjustable Parallel
19	1	6829A	Parallel, Stationary Adjustable
20	1	502-27-17A	Regulator Bracket
21	1	502-27-17	Regulator 0 - 60 PSI
22	1	502-11-17S	1/4 STREET ELL
23	1	502-11-16X	Quick Connect air Fitting Male
24	2	502-11-17J	Nipple, Close 1/8" NPT
25	2	502-11-35A	Flt. Control
26	2	502-11-16E	Connector, Male 1/4 x 1/8 PT
27	1	502-11-16W	Quick connect air fitting female
28	2	502-12-16	Clfo. Hose
29	1	514-4-17N	Tea. Union 1/4 Tube
30	1	502-11-16I	Elbow, Male 1/4 FPT x 1/8 PT
31	2	6833A	Clamp Bar, In Line
32	2	6833B	Clamp Rod, In Line
33	2	6833	Locator, In-Line Block
34	2	6833	Hex Nut
35	2	MF-165 ANSI B18.2.2 - 1/2 - 13	U/Lt Eye
36	2	502-3-13	T-Nut
37	2	502-1-11B	Hex bolt - UNC (Regular Thread - Inch)
38	2	MF-149C ANSI/ASME B18.2.1 - 1/2-13 UNC - 2	Washer A
39	2	MF-180 ASTM F436 - 1/2	Screw, Shoulder
40	4	MF-111 ANSI B18.6.3 - No. 10 - 24 - 3/8	Cross Recessed Pan Head Machine Screw
41	2	MF-110 ANSI B18.6.3 - No. 10 - 24 - 1/2	Cross Recessed Pan Head Machine Screw

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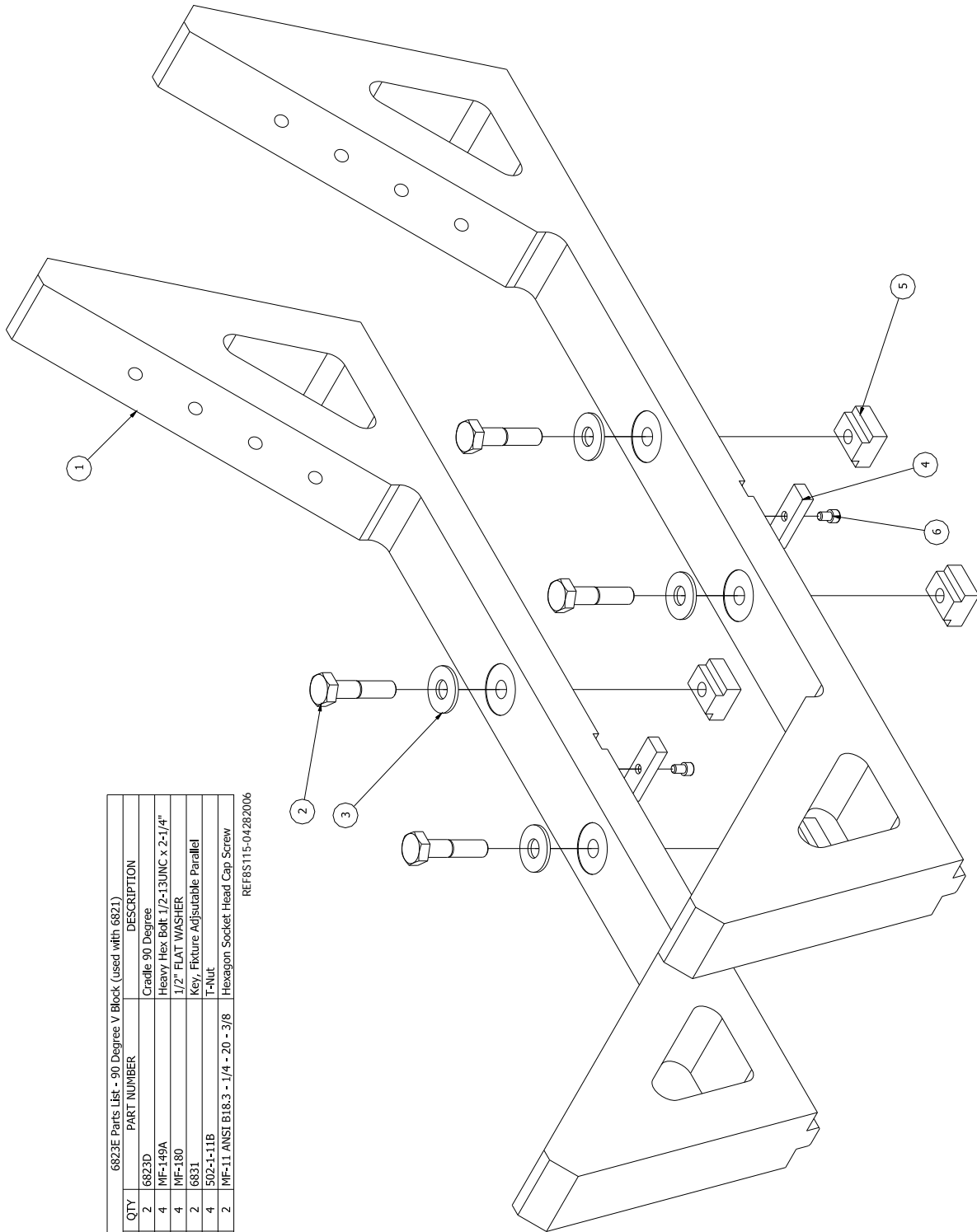
6843 Support V Block 90 Degree – Use with 6821 (F88) and 6843 (F84/85)

ITEM	QTY	6843 Parts List - Supports V Block 90 Degree	DESCRIPTION
1	2	6843A	Cradle, Right and Left V Block
2	4	502-1-11B	T Nut
3	2	6831	Key, fixture Adjustable
4	2	MF-12 ANSI B18.3 - 1/4 - 20 UNC - 1/2	Hexagon Socket Head Cap Screw
5	4	6789D	Adapter Plate V Block Cradle
6	8	MF-42 ANSI B18.3 - 1/2 - 13 UNC - 1	Hexagon Socket Head Cap Screw
7	4	MF-140A ANSI/ASME B18.2.1 - 1/2-13 UNC - 1.5	Hex Bolt - UNC (Regular Thread - Inch)
8	6	MF-180 ASTM F436 - 1/2	Washer 1/2"
9	2	6833A	Clamp Bar, In Line Fixture
10	2	6833B	Clamp Rod, In Line Fixture
11	2	MF-165 ANSI B18.2.2 - 1/2 - 13	Hex Nut

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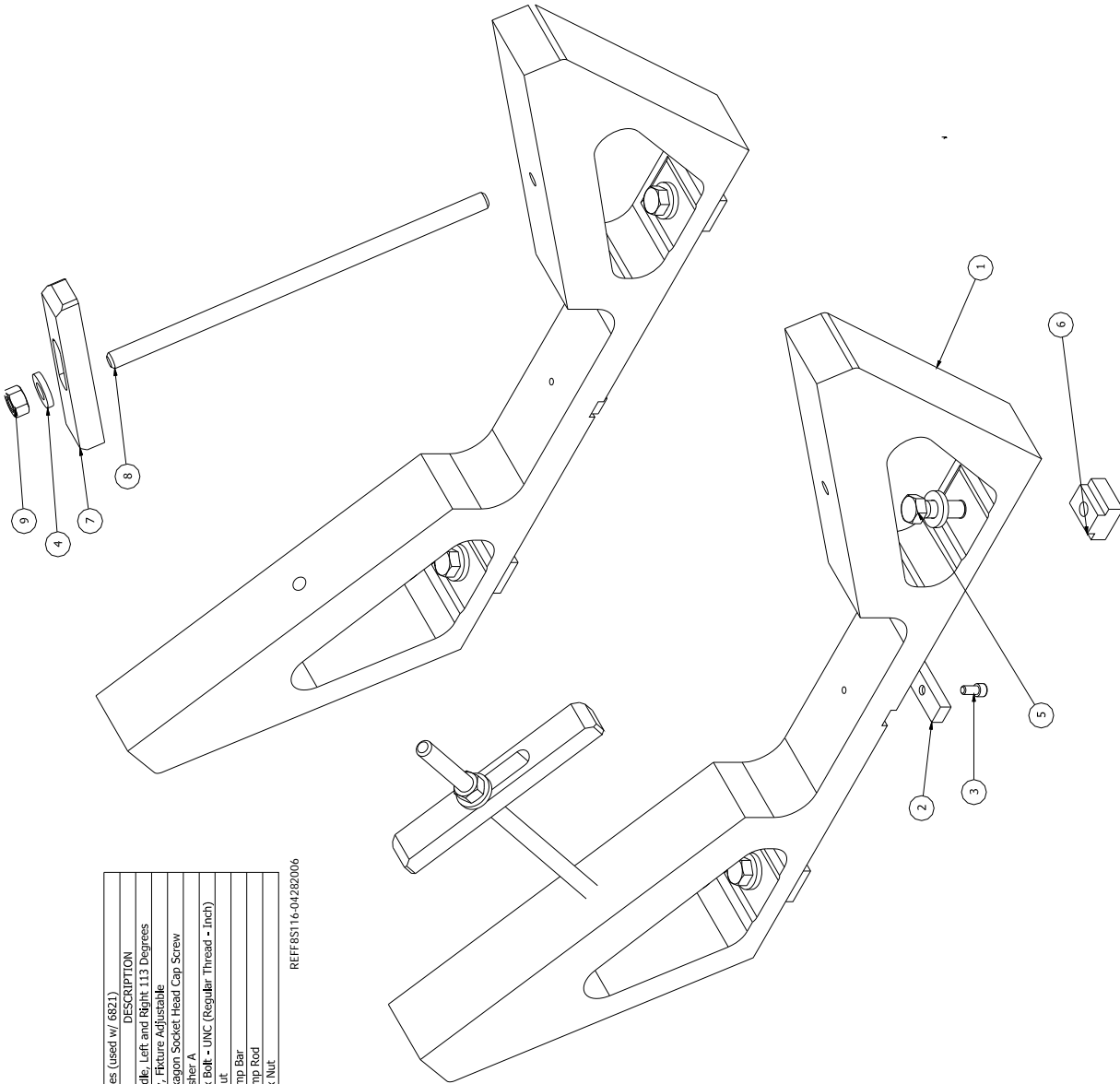
6823E 90 Degree V Block (used w/ 6821)



6823E Parts List - 90 Degree V Block (used with 6821)			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	6823D	Cradle 90 Degree
2	4	MF-149A	Heavy Hex Bolt 1/2-13UNC x 2-1/4"
3	4	MF-180	1/2" FLAT WASHER
4	2	6831	Key, Fixture Adjustable Parallel
5	4	502-1-11B	T-Nut
6	2	MF-11 ANSI B18.3 - 1/4 - 20 - 3/8	Hexagon Socket Head Cap Screw

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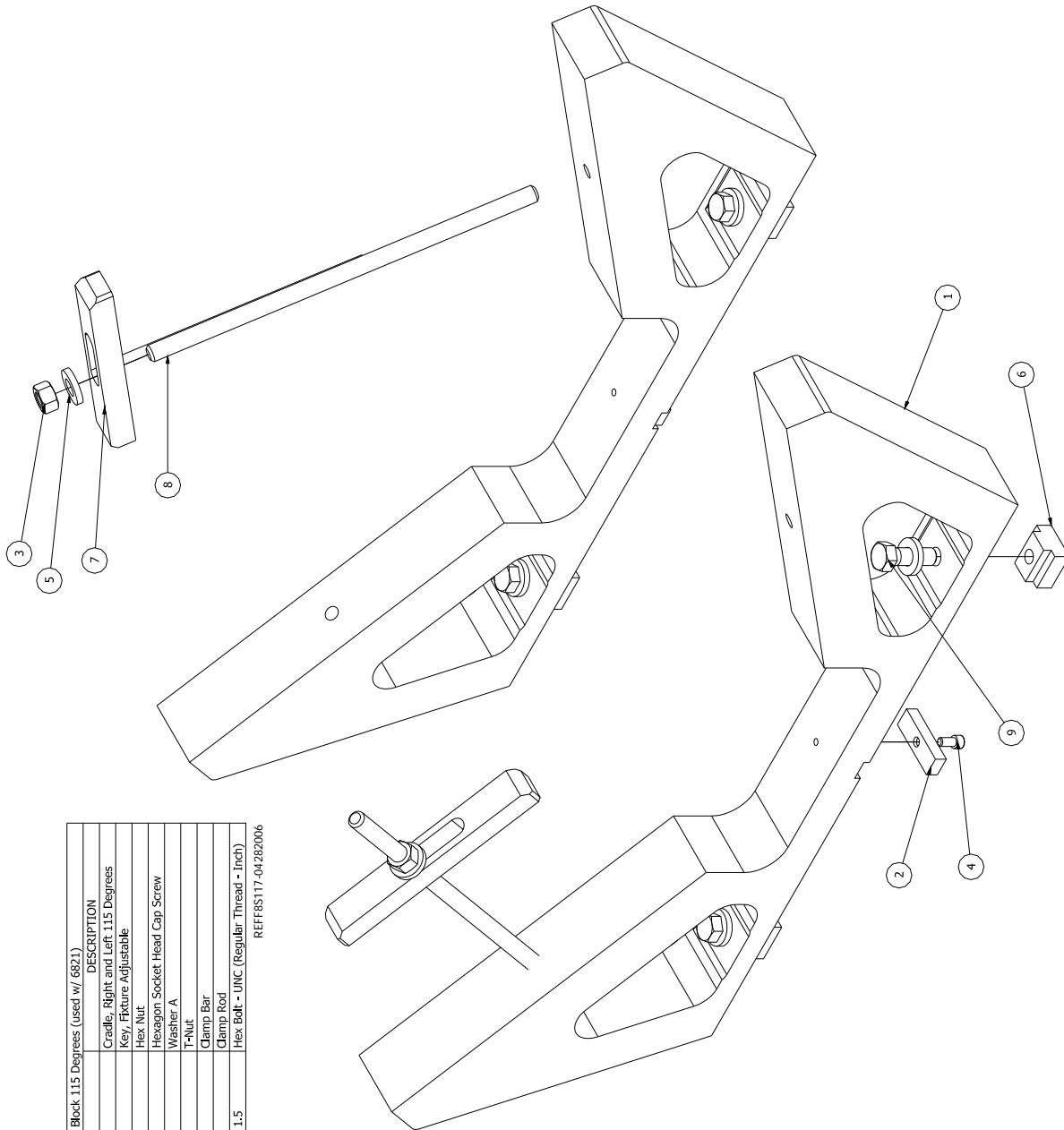
6789L Support, V Block 113 Degrees (used w/ 6821)



ITEM	QTY	6789L Parts List - Support, V Block 113 Degrees (used w/ 6821)	DESCRIPTION
1	2	6789M	Cradle, Left and Right 113 Degrees
2	2	6831	Key, Fixture Adjustable
3	2	MF-12 ANST B18.3 - 1/4 - 20 UNC - 1/2	Hexagon Socket Head Cap Screw
4	6	MF-180 ASTM F436 - 1/2	Washer A
5	4	MF-150A ANST/ASME B18.2.1 - 1/2-13 UNC - 1.5	Hex Bolt - UNC (Regular Thread - Inch)
6	4	S02-I-11B	T-Nut
7	2	6833A	Clamp Bar
8	2	6833B	Clamp Rod
9	2	MF-165 ANST B18.2.2 - 1/2 - 13	Hex Nut

REF68116-04282006

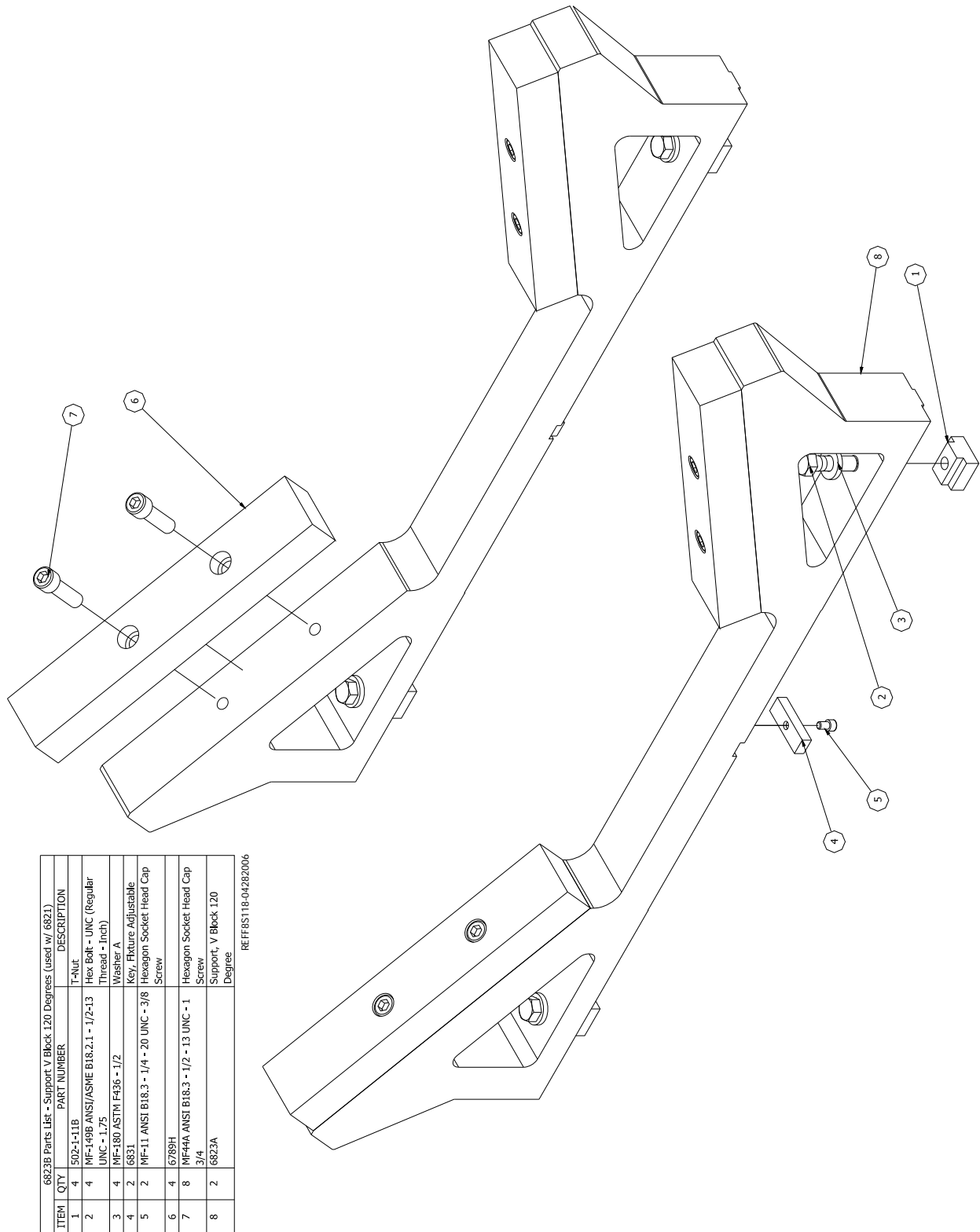
6789E Support V Block 115 Degrees (used w/ 6821)



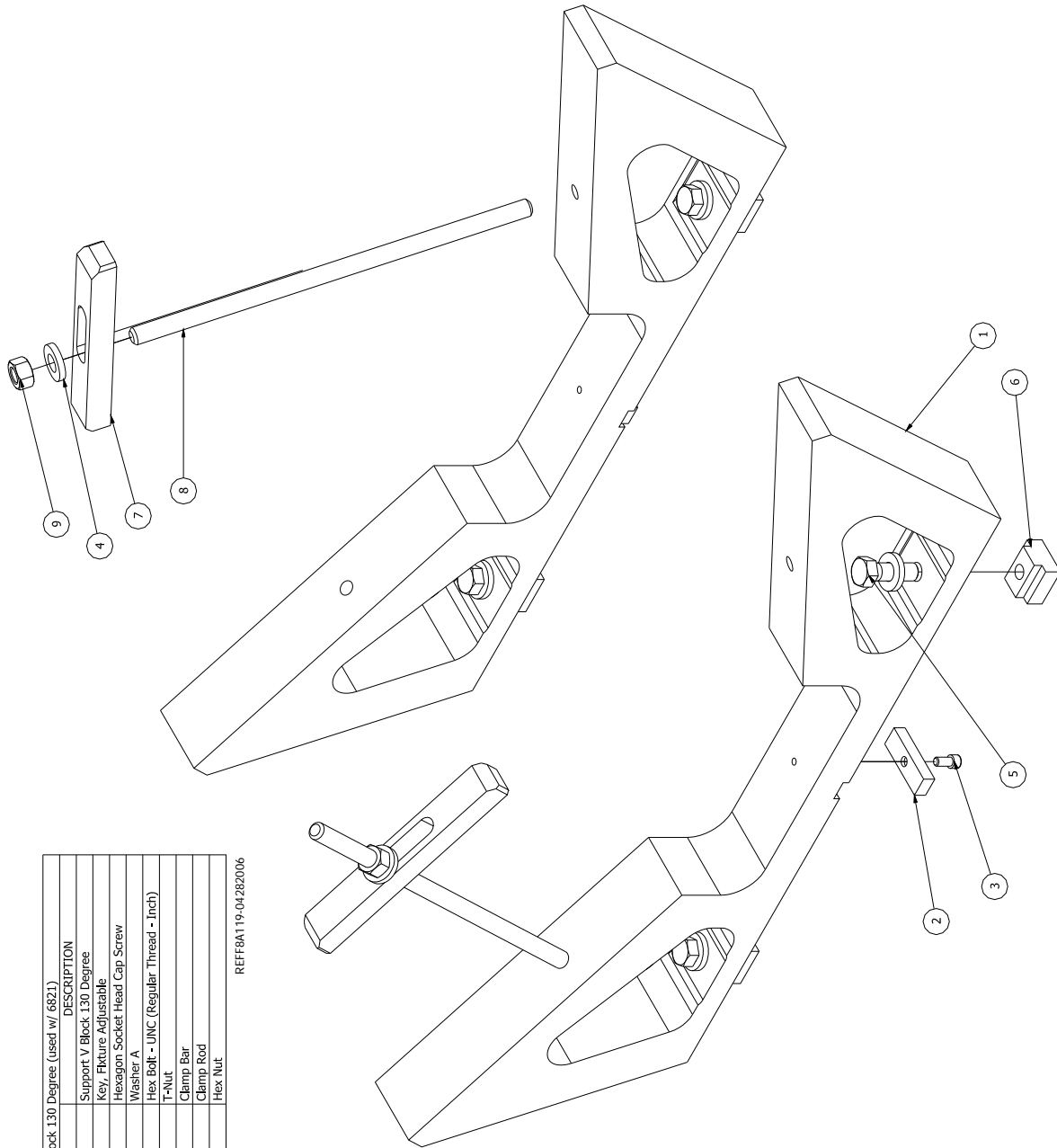
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	6789F	Cradle, Right and Left 115 Degrees
2	2	6831	Key, Fixture Adjustable
3	2	ANSI B18.2.2 - 1/2 - 13	Hex Nut
4	2	ANSI B18.3 - 1/4 - 20 UNC - 1/2	Hexagon Socket Head Cap Screw
5	6	ASTM F436 - 1/2	Washer A
6	4	502-1-11B	T-Nut
7	2	6633A	Clamp Bar
8	2	6633B	Clamp Rod
9	4	ANSI/ASME B18.2.1 - 1/2-13 UNC - 1.5	Hex Bolt - UNC (Regular Thread - Inch)

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6823B Support, V Block 120 Degrees (used w/ 6821)



6789K Support V Block 130 Degrees (used w/ 6821)

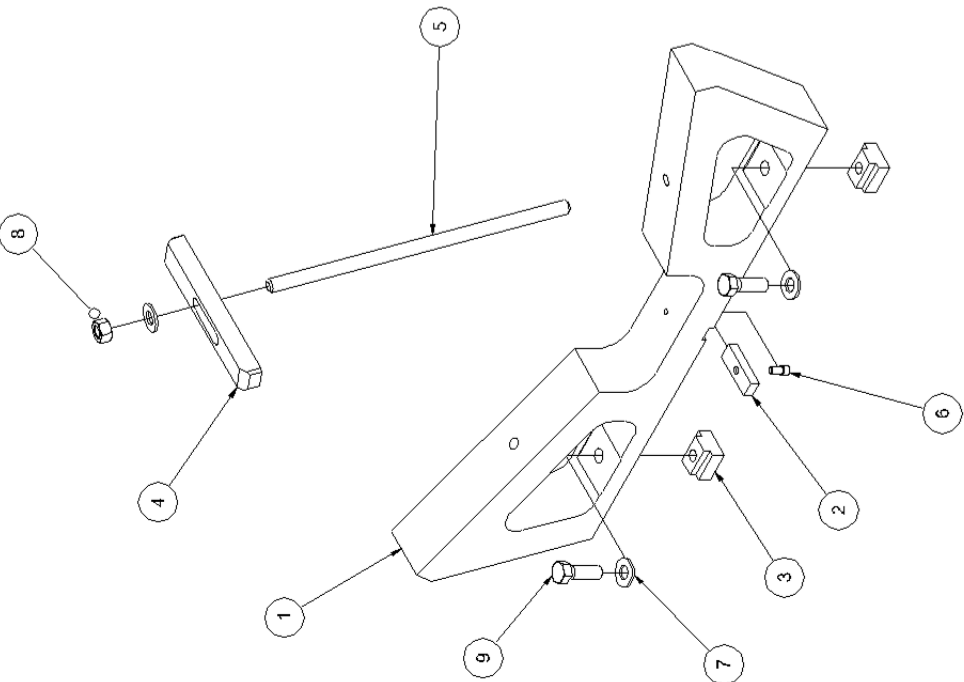


ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	6789J	Support V Block, 130 Degree
2	2	6831	Key, Fixture Adjustable
3	2	ANSI B18.3 - 1/4 - 20 UNC - 1/2	Hexagon Socket Head Cap Screw
4	6	ASTM F436 - 1/2	Washer A
5	4	ANSI/ASME B18.2.1 - 1/2-13 UNC - 1.5	Hex Bolt - UNC (Regular Thread - Inch)
6	4	502-1-11B	T-Nut
7	2	6833A	Clamp Bar
8	2	6833B	Clamp Rod
9	2	ANSI B18.2.2 - 1/2 - 13	Hex Nut

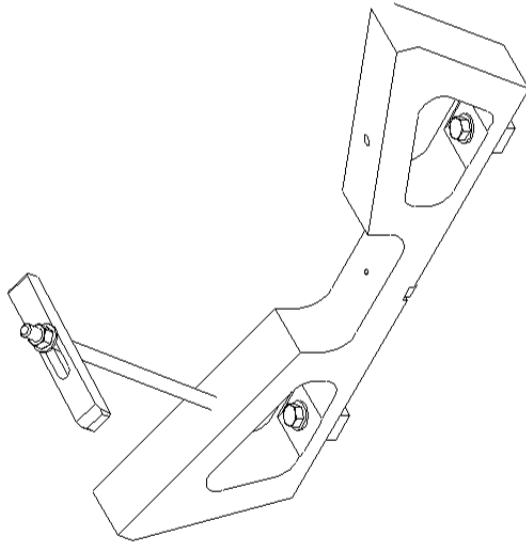
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6789Q Support V Block 140 Degrees (used w/ 6821)

6789Q CRADLE ASSEMBLY		PART DESCRIPTION
ITEM	QTY	RMC PART NO.
1	2	6789S
2	2	6831
3	4	502-1-11B
4	2	6833A
5	2	6833B
6	2	MF-12
7	6	MF-180
8	2	MF-165
9	4	MF-150A



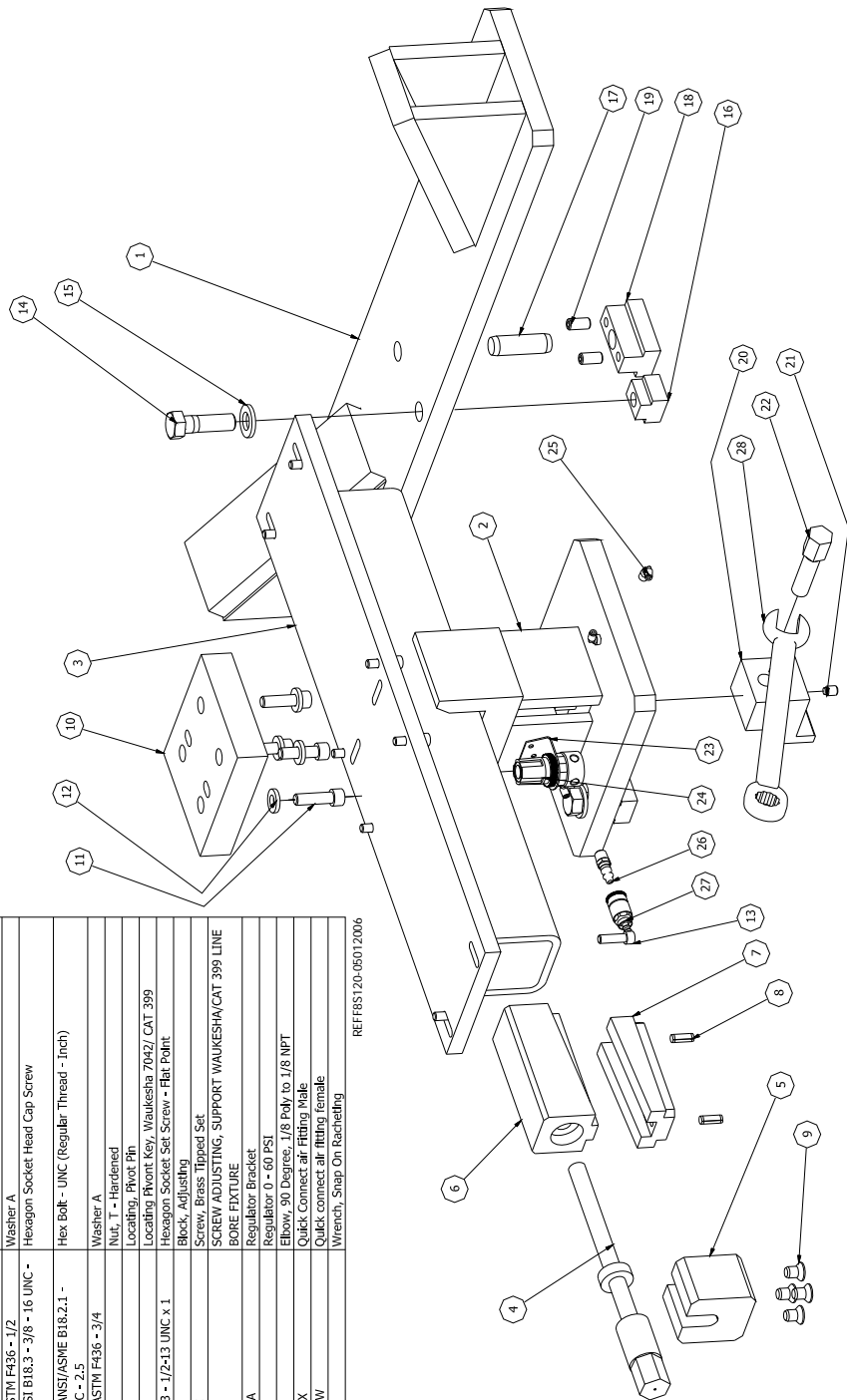
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6810 – Waukeshaw 7042, 9360 and CAT 379, 398, 399 Line Bore Fixture

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6811B	Cradle, Waukeshaw, CAT 399
2	1	6812D	Support, Waukeshaw, CAT 399
3	1	6813	TUBE ASSEMBLY, ADJUSTABLE WAUKESHA/ CAT 399 LINE BORE FIXTURE
4	1	6508	SCREW LEVELING, SUPPORT WAUKESHA/CAT 399 LINE BORE FIXTURE
5	1	6409	BRACKET LEVELING, SUPPORT WAUKESHA/CAT 399 LINE BORE FIXTURE
6	1	6410	PAD, UPPER LEVELING, SUPPORT WAUKESHA/CAT 399 LINE BORE FIXTURE
7	1	6411	PAD, LOWER LEVELING, SUPPORT WAUKESHA/CAT 399 LINE BORE FIXTURE
8	2	MF-29B ANSI B18.8.2 - 3/8 x 1 Standard Duty	Pin - Coiled Spring
9	4	6409A ANSI B18.3 - 1/2-13 UNC x 0.75	Hexagon Socket Flt Countersunk Head Cap Screw
10	1	6813C	Adapter, Waukeshaw 7042, CAT 399 Line Bore Fixture
11	4	MF-44A ANSI B18.3 - 1/2 - 13 UNC - 1 3/4	Hexagon Socket Head Cap Screw
12	4	MF-180 ASTM F436 - 1/2	Washer A
13	8	MF-32 ANSI B18.3 - 3/8 - 16 UNC - 1 1/4	Hexagon Socket Head Cap Screw
14	5	MF-154C ANSI/ASME B18.2.1 - 3/4-10 UNC - 2.5	Hex Bolt - UNC (Regular Thread - Inch)
15	5	MF-181A ASTM F436 - 3/4	Washer A
16	5	6160	Nut, T - Hardened
17	1	6819	Locating Pivot Pin
18	1	6820	Locating Pivot Key, Waukeshaw 7042/ CAT 399
19	2	ANSI B18.3 - 1/2-13 UNC x 1	Hexagon Socket Set Screw - Flt Point
20	1	6814A	Block, Adjusting
21	1	500-96-3C	Screw, Brass Tipped Set
22	1	6812E	SCREW ADJUSTING, SUPPORT WAUKESHA/CAT 399 LINE BORE FIXTURE
23	1	502-27-17A	Regulator Bracket
24	1	502-27-17	Regulator 0 - 60 PSI
25	4	514-4-18	Elbow, 90 Degree, 1/8 Poly to 1/8 NPT
26	1	502-11-16X	Quick Connect air fitting Male
27	1	502-11-16W	Quick connect air fitting female
28	1	6812F	Wrench, Snap On Ratcheting

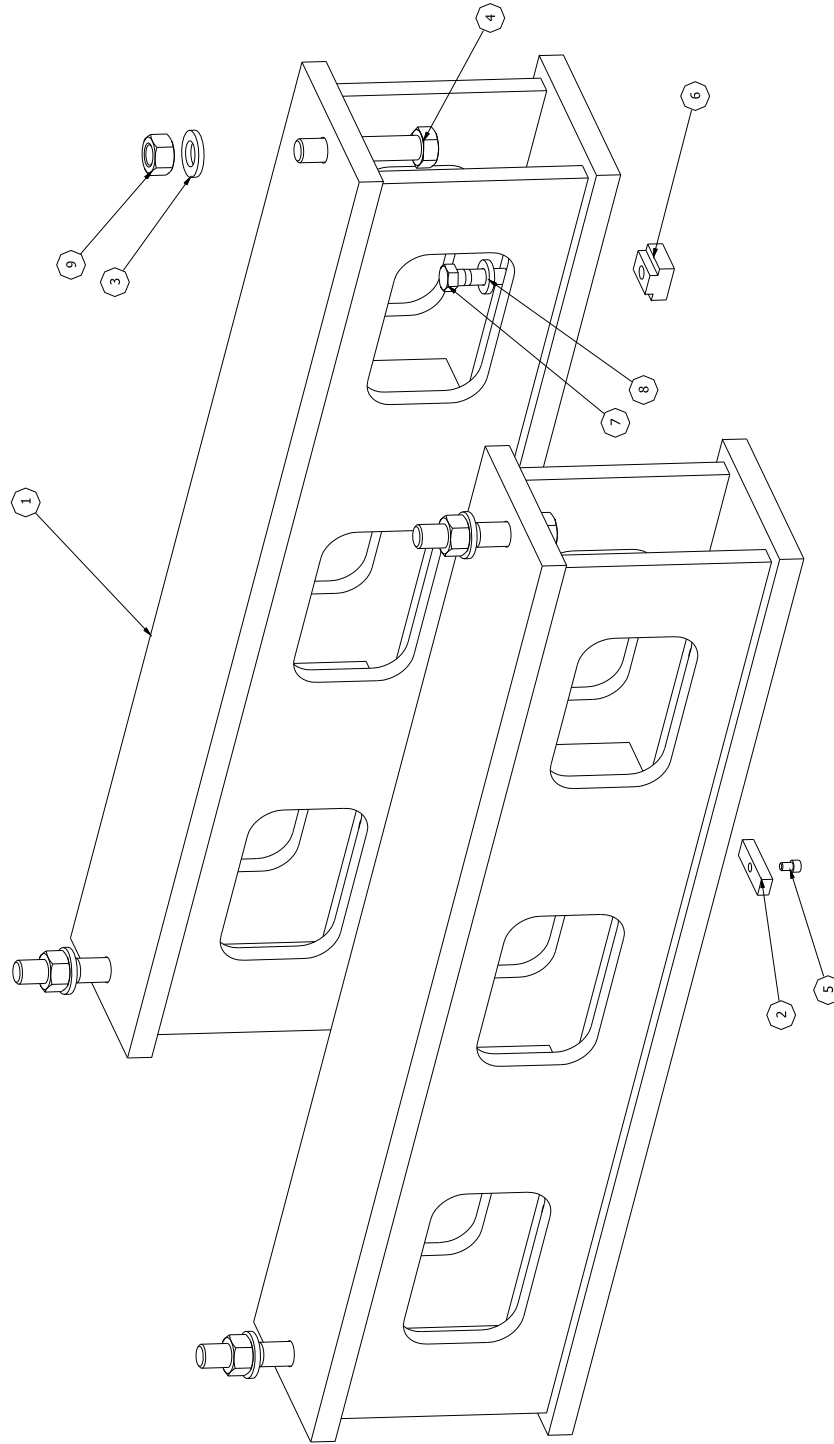
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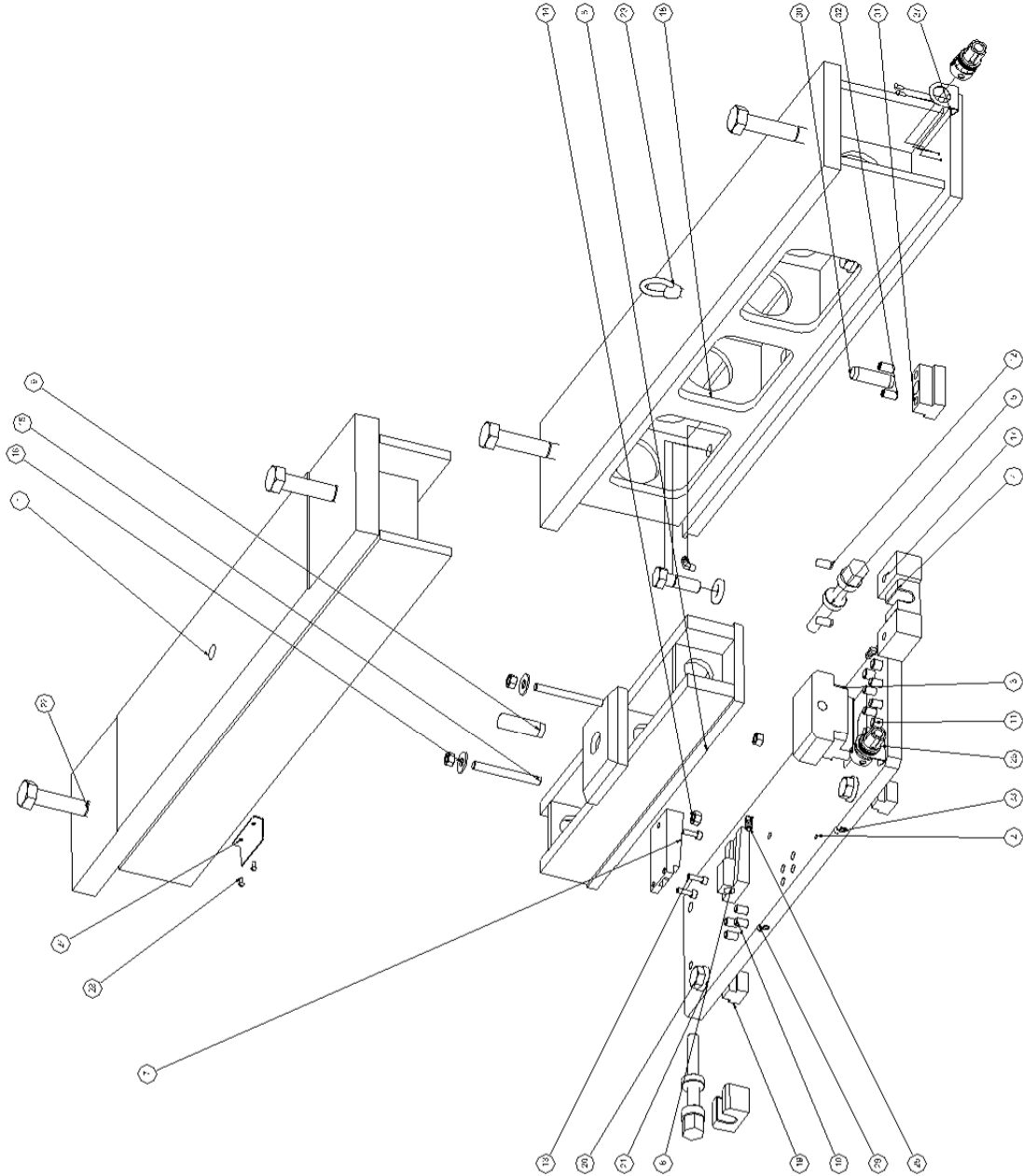
6815 White Superior 8G825 Line Bore Fixturing (used w/ 6821)

ITEM	QTY	6815 Parts List - White Superior 8G825 Line Bore Fixture PART NUMBER	DESCRIPTION
1	2	6816A	Parallel, White Superior 8G825 Line Bore Fixture
2	2	6831	Key, Fixture Adjustable
3	8	MF-181A ASTM F436 - 3/4	Washer A
4	4	6822B ANST/ASME B18.2.1 - 3/4-10 UNC - 4	Hex Bolt - UNC (Regular Thread - Inch)
5	2	MF-11 ANST B18.3 - 1/4 - 20 UNC - 3/8	Hexagon Socket Head Cap Screw
6	4	502-1-11B	T-Nut
7	4	MF-149B ANST/ASME B18.2.1 - 1/2-13 UNC - 1.75	Hex Bolt - UNC (Regular Thread - Inch)
8	4	MF-180 ASTM F436 - 1/2	Washer A
9	4	MF-166A ANST B18.2.2 - 3/4 - 10	Hex Nut

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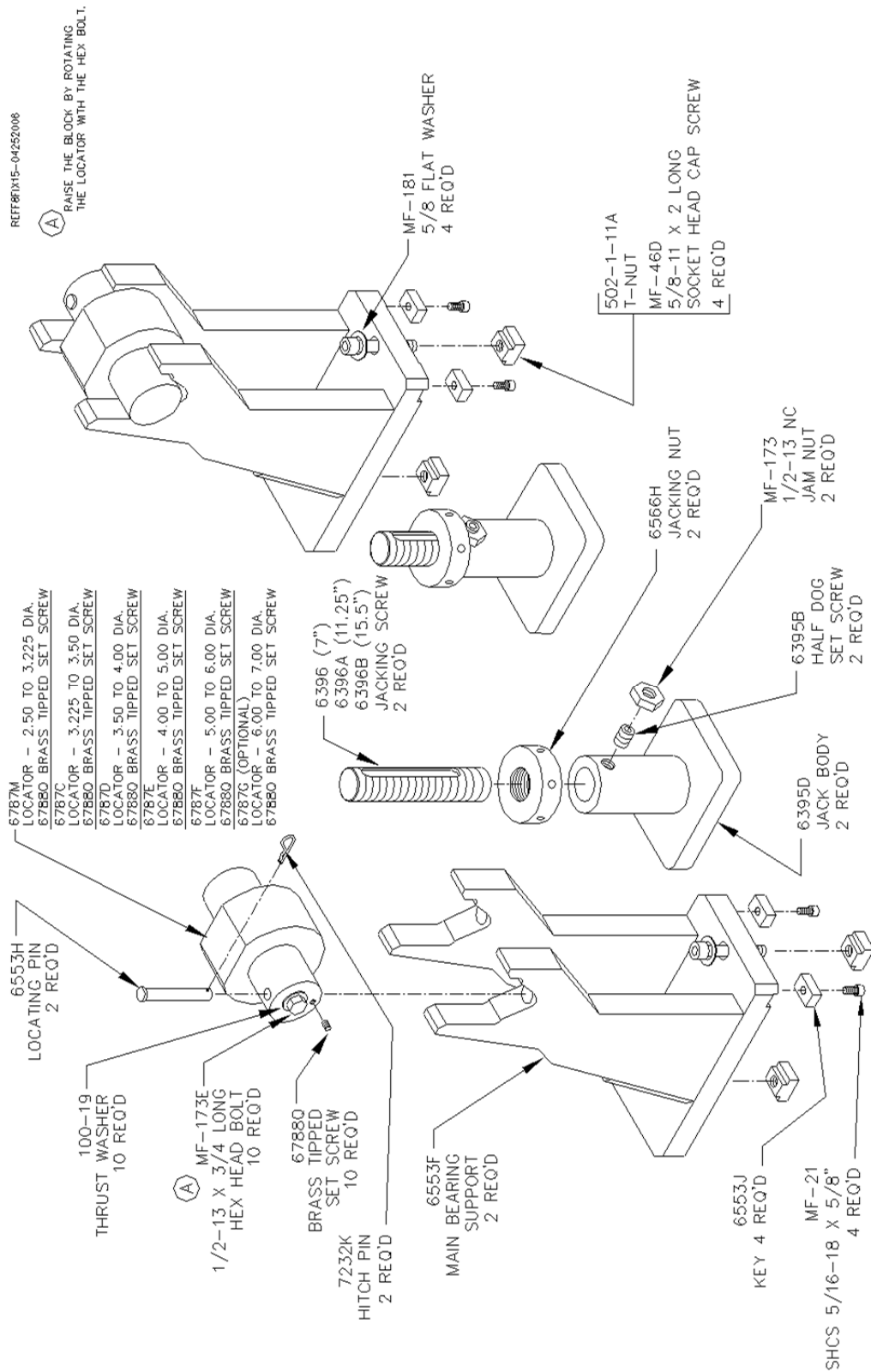
6846 White Superior Line Bore Fixturing:



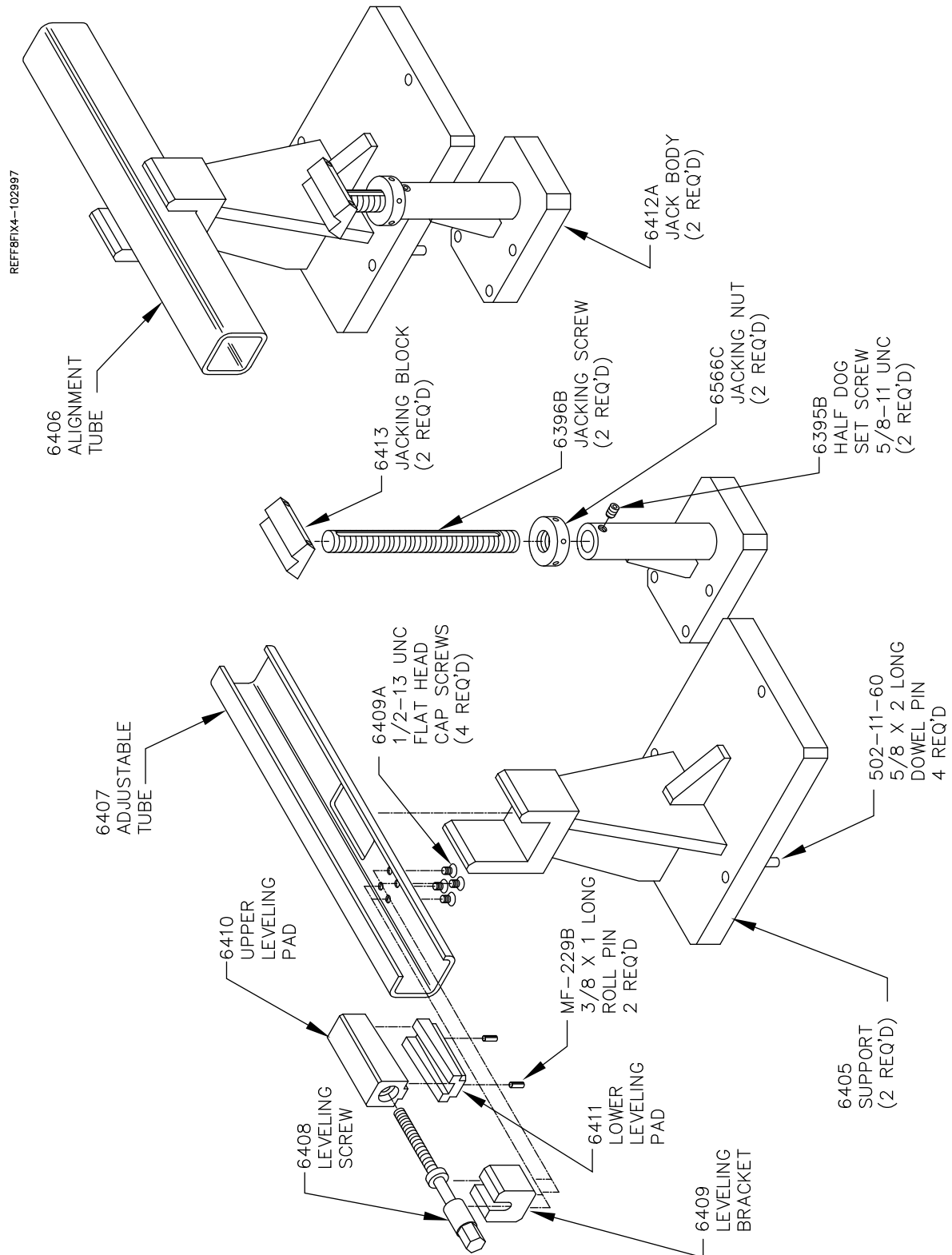
REV	QTY	PART NUMBER	DESCRIPTION
1	1	18422	COMP-PR (MESH)
2	1	18423	1/2" U/F/C
3	1	18424	2 CA. 2-BAWING
4	2	18425	2-3.5" Stable Parts of
5	2	18426	Support Sems
6	1	18427	2-3.5" Stable Parts of
7	1	18428	Support Sems
8	1	18429	2-3.5" Stable Parts of
9	1	18430	Support Sems
10	1	18431	2-3.5" Stable Parts of
11	1	18432	Support Sems
12	1	18433	2-3.5" Stable Parts of
13	1	18434	Support Sems
14	1	18435	2-3.5" Stable Parts of
15	1	18436	Support Sems
16	1	18437	2-3.5" Stable Parts of
17	1	18438	Support Sems
18	1	18439	2-3.5" Stable Parts of
19	1	18440	Support Sems
20	1	18441	2-3.5" Stable Parts of
21	1	18442	Support Sems
22	1	18443	2-3.5" Stable Parts of
23	1	18444	Support Sems
24	1	18445	2-3.5" Stable Parts of
25	1	18446	Support Sems
26	1	18447	2-3.5" Stable Parts of
27	1	18448	Support Sems
28	1	18449	2-3.5" Stable Parts of
29	1	18450	Support Sems
30	1	18451	2-3.5" Stable Parts of
31	1	18452	Support Sems
32	1	18453	2-3.5" Stable Parts of
33	1	18454	Support Sems

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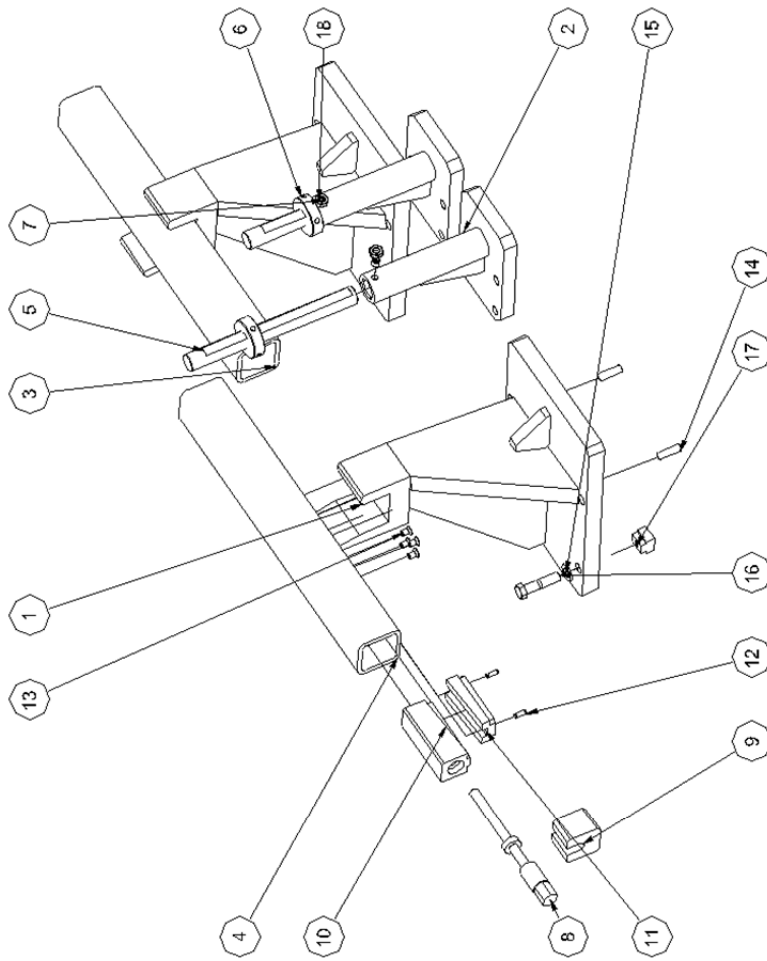
6725 Mid Range in-Line and V Block Fixture:



6405A Large V-Block Fixture:



6405E Large V Block Fixture MTU 4000 V16, V18 & V20

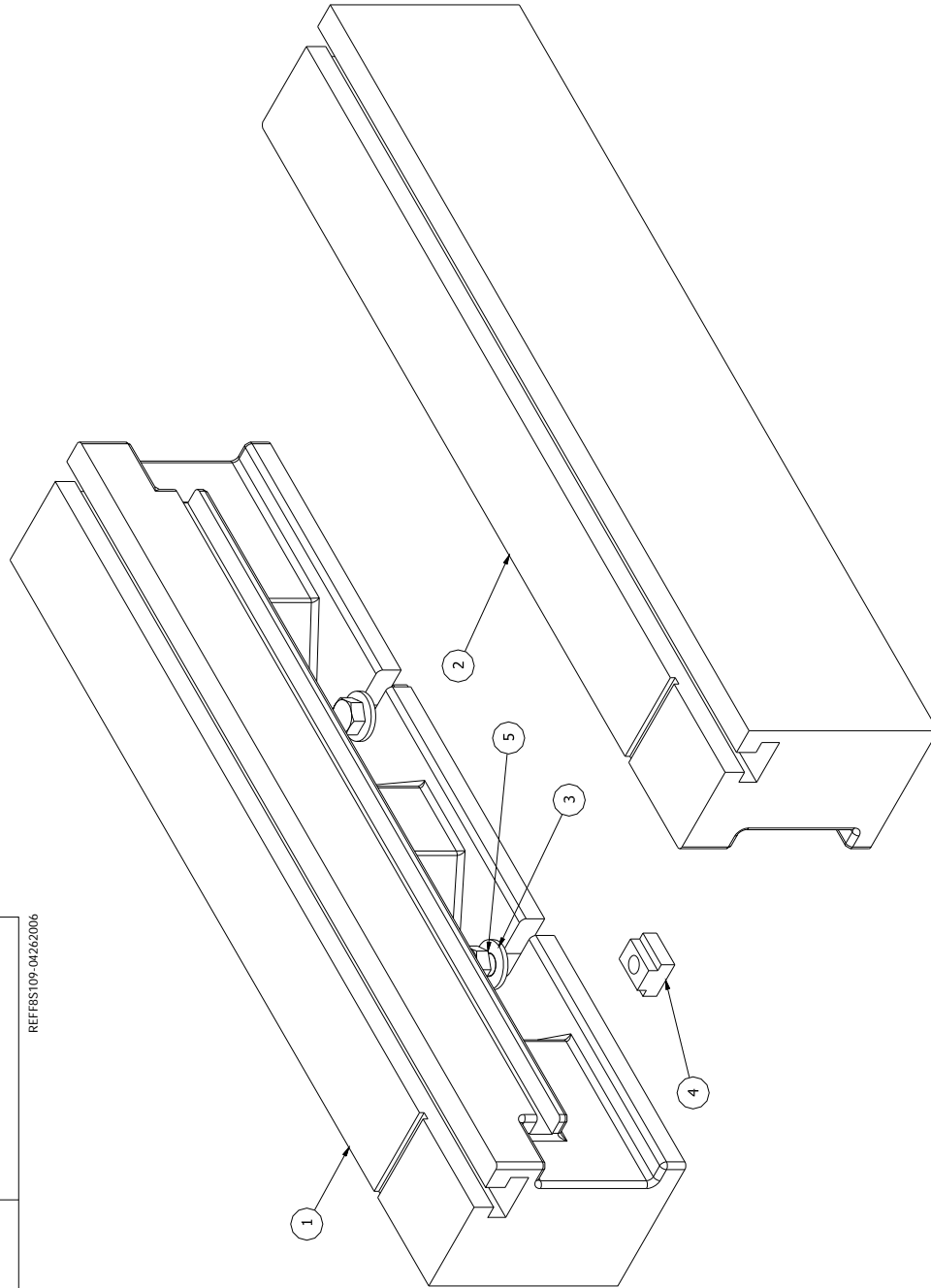


Parts List			DESCRIPTION
ITEM	QTY	PART NUMBER	
1	2	6405D	Main Support
2	2	6412A	Jack Body
3	1	6406	Tube-Alignment 4"
4	1	6407	Tube-Main Bearing Adjustable
5	2	6396B	Jacking Screw
6	2	6566C	Nut, Jacking
7	2	ANSI B18.3 - 5/8-11 UNC x 0.63	Hexagon Socket Set Screw - Flat Point
8	1	6408	Screw, Leveling
9	1	6409	Bracket, Leveling
10	1	6410	Pad, Upper
11	1	6411	Pad Lower
12	2	ANSI B18.8.2 - 3/8 x 1 Standard Duty	Pin - Coiled Spring
13	4	ANSI B18.6.2 - 1/2-13 UNC x 0.75	Slotted Flat Countersunk Head Cap Screw
14	4	502-11-60	5/8 - 2" Dowel Pin
15	1	ANSI B18.22.1 - 3/4 - narrow - Type A	Washer A
16	1	ANSI/ASME B18.2.1 - 3/4-10 UNC - 3.25	Hex Bolt - UNC (Regular Thread - Inch)
17	1	6160	T-Nut
18	2	ANSI B18.2.2 - 5/8 - 11	Hex Jam Nut

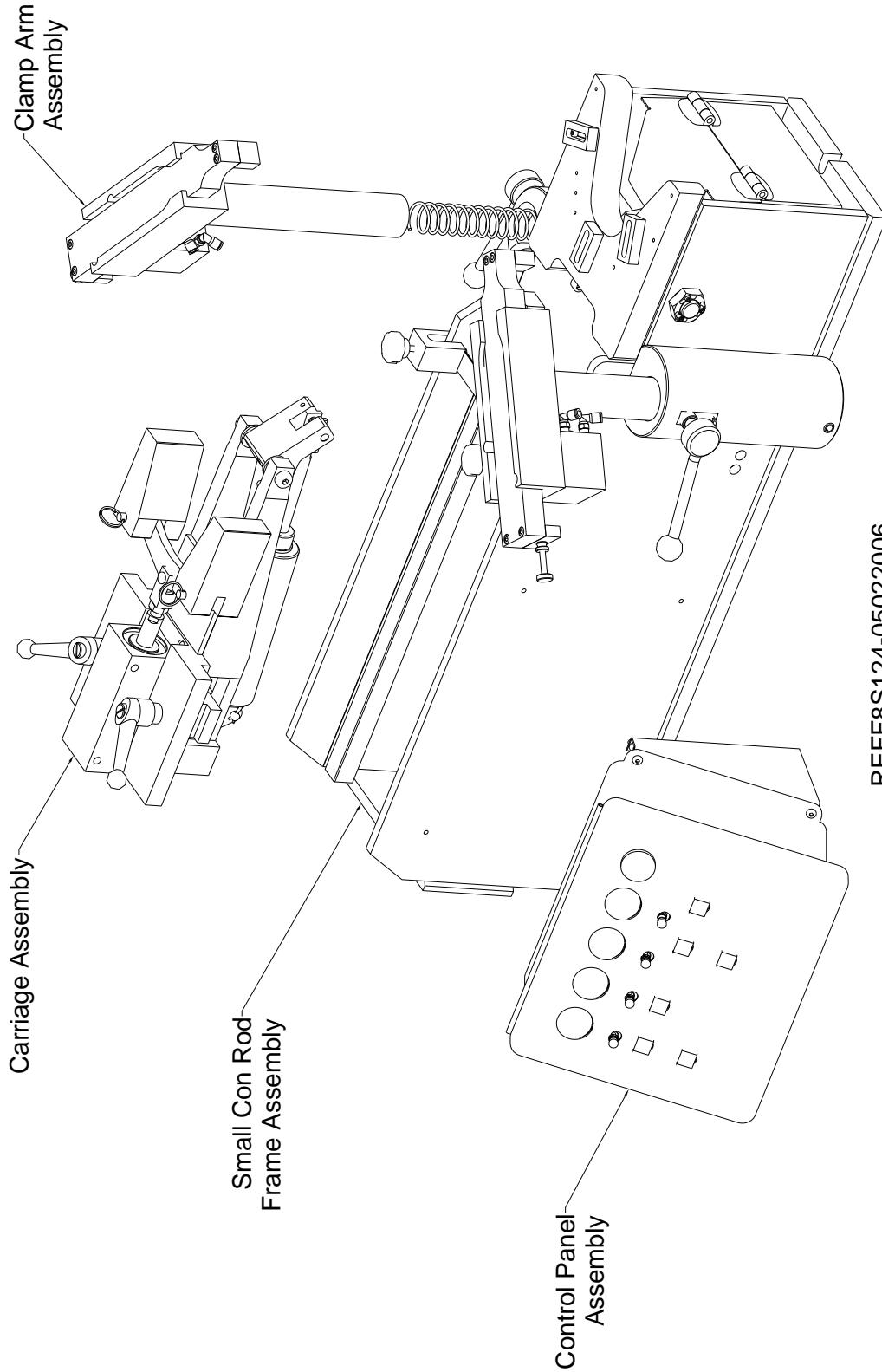
7219W 5.19" Parallel Assembly

7219W Parts List - 5.19" Parallels		
ITEM	QTY	DESCRIPTION
1	1	7219V Riser, 5.19" Left Hand
2	1	7219T Riser, 5.19" Right Hand
3	4	100-19A Hardened washer 17/32 I.D.
4	4	650-3-10 TN-5 T-Nut
5	4	MF-137A ANSI/ASME B18.2.1 - 1/2-13 Hex Bolt - UNC (Regular Thread - Inch)
		UNC - 1.5

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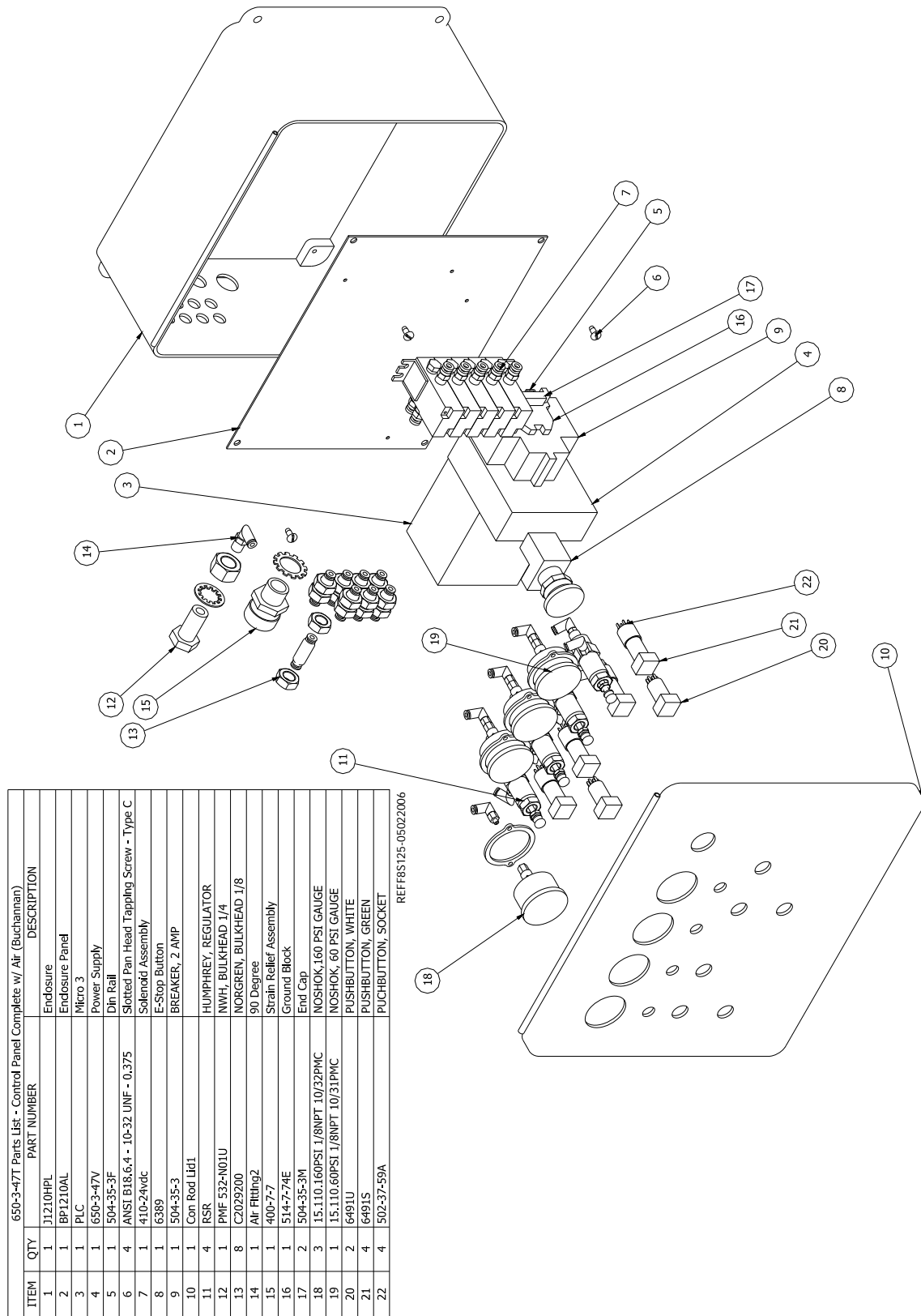


650-3-44R Small Precision Connecting Rod Fixture

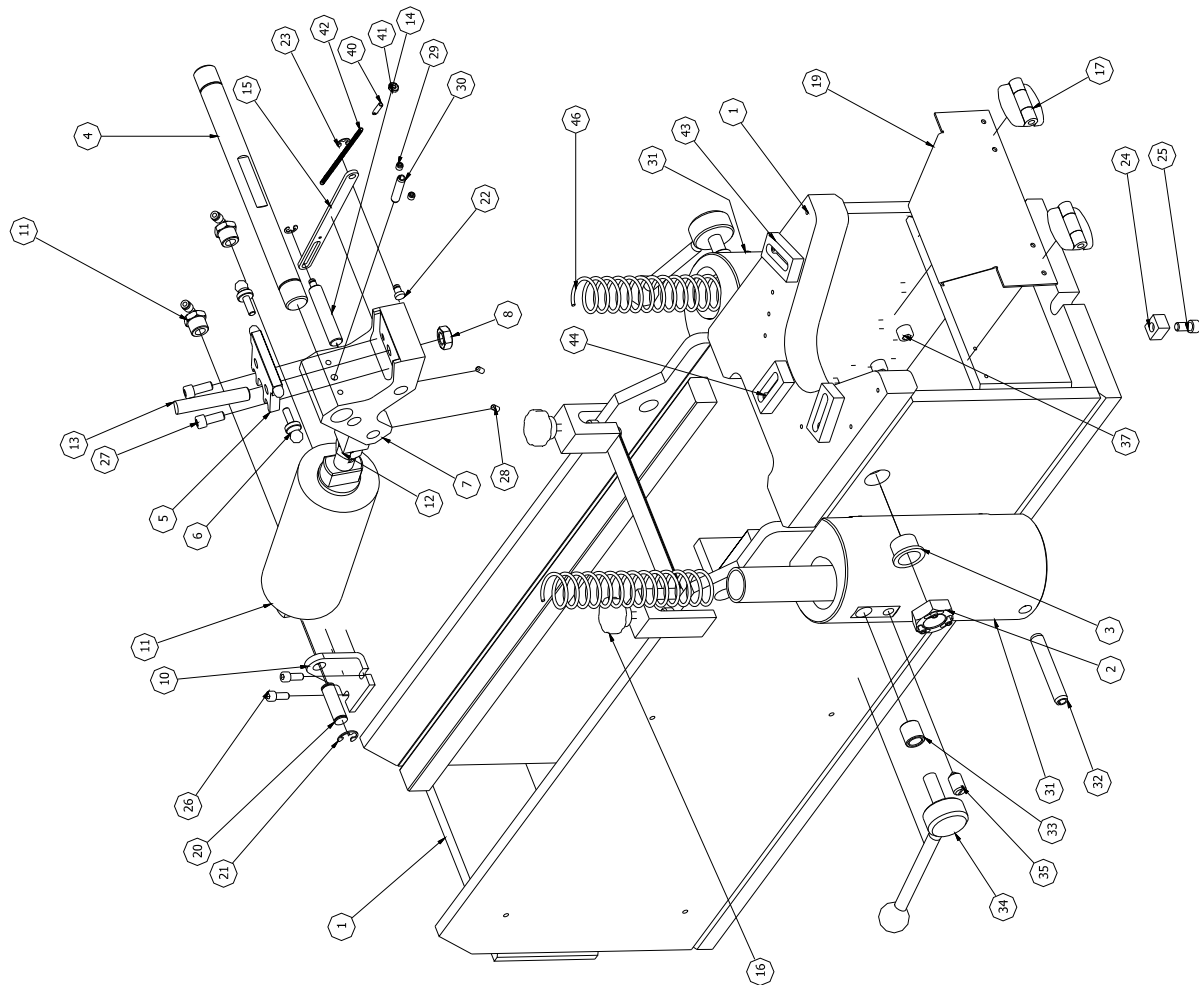


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650-3-44R Small Precision Connecting Rod Fixture – Control Panel



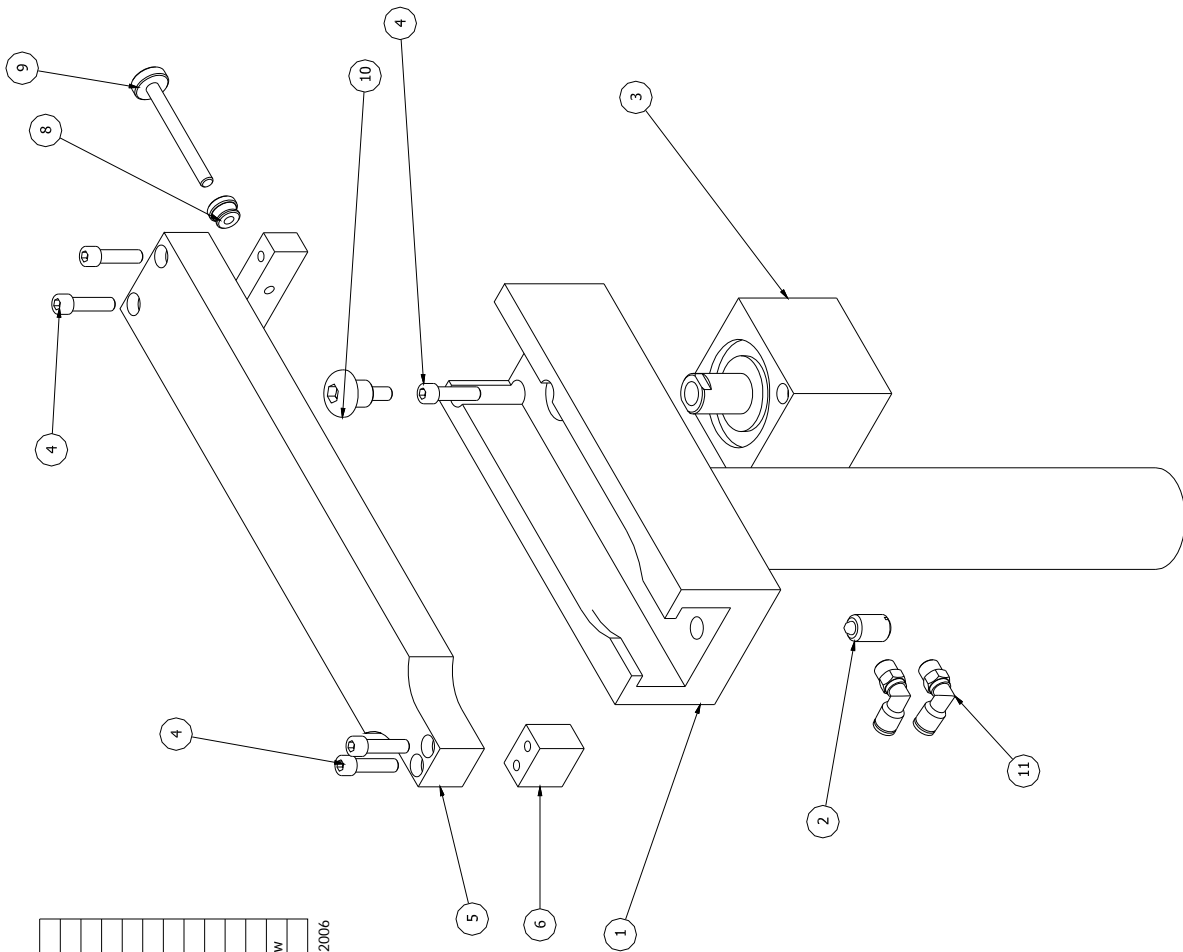
650-3-44R Small Precision Connecting Rod Fixture – Small Frame



ITEM QTY	PART NUMBER	DESCRIPTION
1	650-3-67B	Small Frame
2	650-3-66T	Lock Nut REID BLN-105
3	650-3-46U	Flange Bearing Symmco SF-2832-12
4	650-3-46G	Pivot Shaft
5	650-3-46N	Locator 1.78
6	650-3-46C	Tooting Ball Reel #TCB-26820
7	650-3-46J	Locator Holder
8	ANSI B18.2.2 - 1/2 - 13	Hex Jam Nut
9	650-3-45H	Pivot Bracket Right
10	650-3-45K	Pivot Bracket Left
11	650-3-45G	Locating Cylinder
12	650-3-45I	Rod Clevis
13	650-3-47K	Stop Screw - Set 1/2-13 x 3
14	650-3-46K	Pivot Pin
15	650-3-46L	Linkage Arm
16	650-3-47B	Support Strip
17	650-3-46S	Hinge, Dust Cover
18	650-3-46Q	Locator Cover Con Rod Fixture
20	PIN1	Included In 650-3-47J
21	E CLIP	Included In 650-3-47J
22	650-3-46R	Linkage Pin
23	650-3-49	E-clip - Titearc E-Ring #RE-2JST
24	650-3-49H	Key
25	2	Hexagon Socket Head Cap Screw
26	MF-21 ANSI B18.3 - 5/16 - 18 - 5/8	Hexagon Socket Head Cap Screw
27	MF-13 ANSI B18.3 - 1/4 - 20 - 5/8	Hexagon Socket Head Cap Screw
28	MF-22 ANSI B18.3 - 5/16 - 18 - 3/4	Type B - Hexagon Socket Set Screw - Cup Point - UNC (Regular Thread - Inch)
29	MF-53 ANSI B18.3 - 10-24 UNC - 0.375	Type B - Hexagon Socket Set Screw - Cup Point - UNC (Regular Thread - Inch)
30	MF-60 ANSI B18.3 - 1/4-20 UNC - 0.25	Type B - Hexagon Socket Set Screw - Cup Point - UNC (Regular Thread - Inch)
31	MF-210 ANSI B18.8.2 - 5/16 x 2.1/2	Pin - Slotted Spring
32	650-3-49Q	Clamp Base, ConRod Clamp arms
33	ANSI B18.8.2 - 1/2 x 3	Pin - Slotted Spring
34	6310R	Thread Insert
35	502-96-52C	Handle
37	8	Spring Plunger
40	ANSI B18.3 - 3/8 - 16 - 1	Hexagon Socket Head Cap Screw
41	650-3-48P	Spring anchor Reel CSA-50
42	ANSI B18.6.3 - 8 - 32	Hex Machine Screw Nut UNC
43	514-7-83N	Extension Spring
44	650-3-48L	Support Parallel
45	3	Hexagon Socket Head Cap Screw
46	2	Support Tube
		Spring

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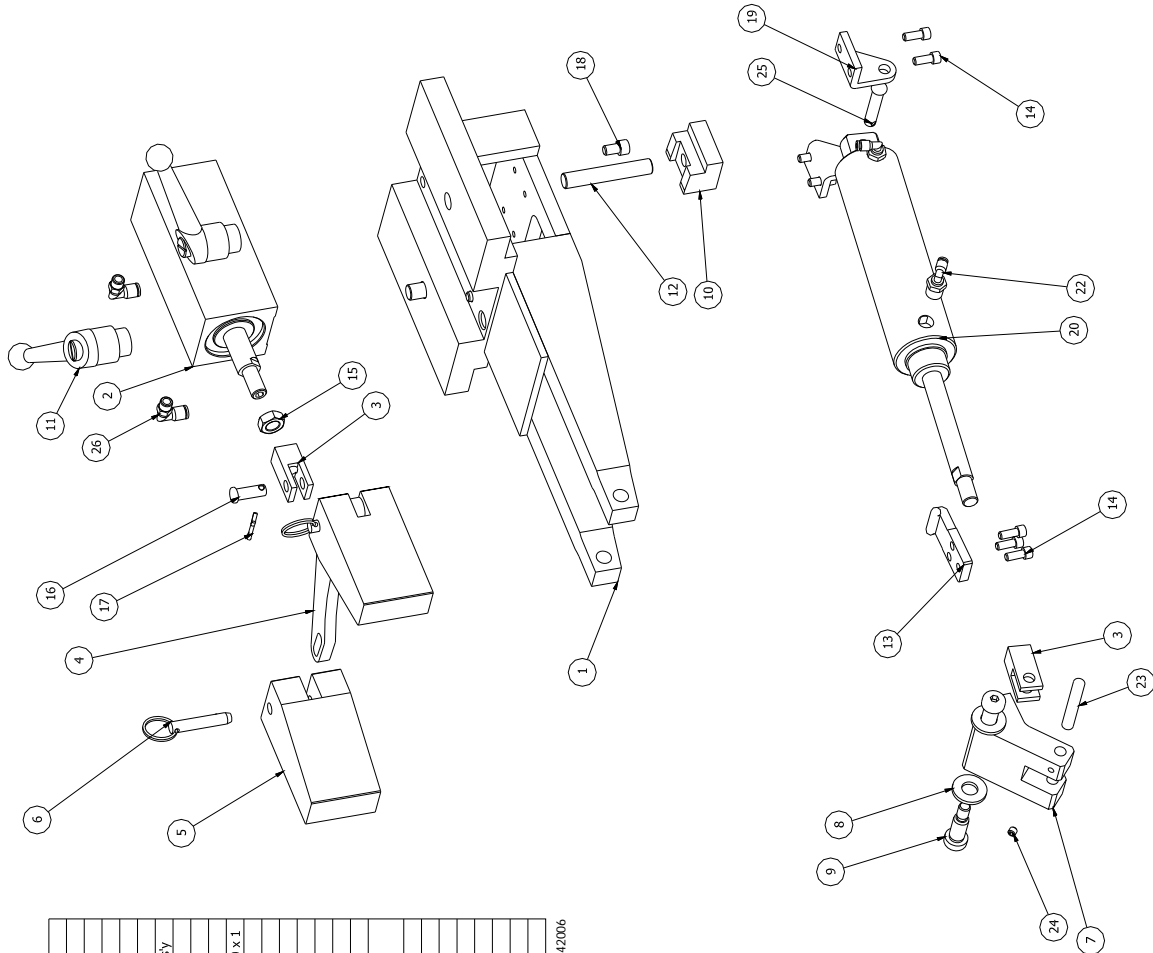
650-3-44R Small Precision Connecting Rod Fixture – Clamp Arm Assembly



ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	650-3-49H	Clamp Leg
2	1	502-8-52C	Spring Plunger
3	1	650-3-45E	Clamp Arm Cylinder
4	6	ANSI B18.3 - 1/4 - 20 UNC - 1	Hexagon Socket Head Cap Screw
5	1	650-3-49K	Clamp Arm
6	1	650-3-49L	Extension
7	1	650-3-49N	Stop Block
8	1	650-3-34J	Thumbknob Reid at-721
9	1	650-3-34S	Clamp Screw
10	1	ANSI B18.3 - 1/2-20 - 5/8	Hexagon Socket Button Head Cap Screw
11	2	514-4-17Y	Legris Angle

REF8S127-05042006

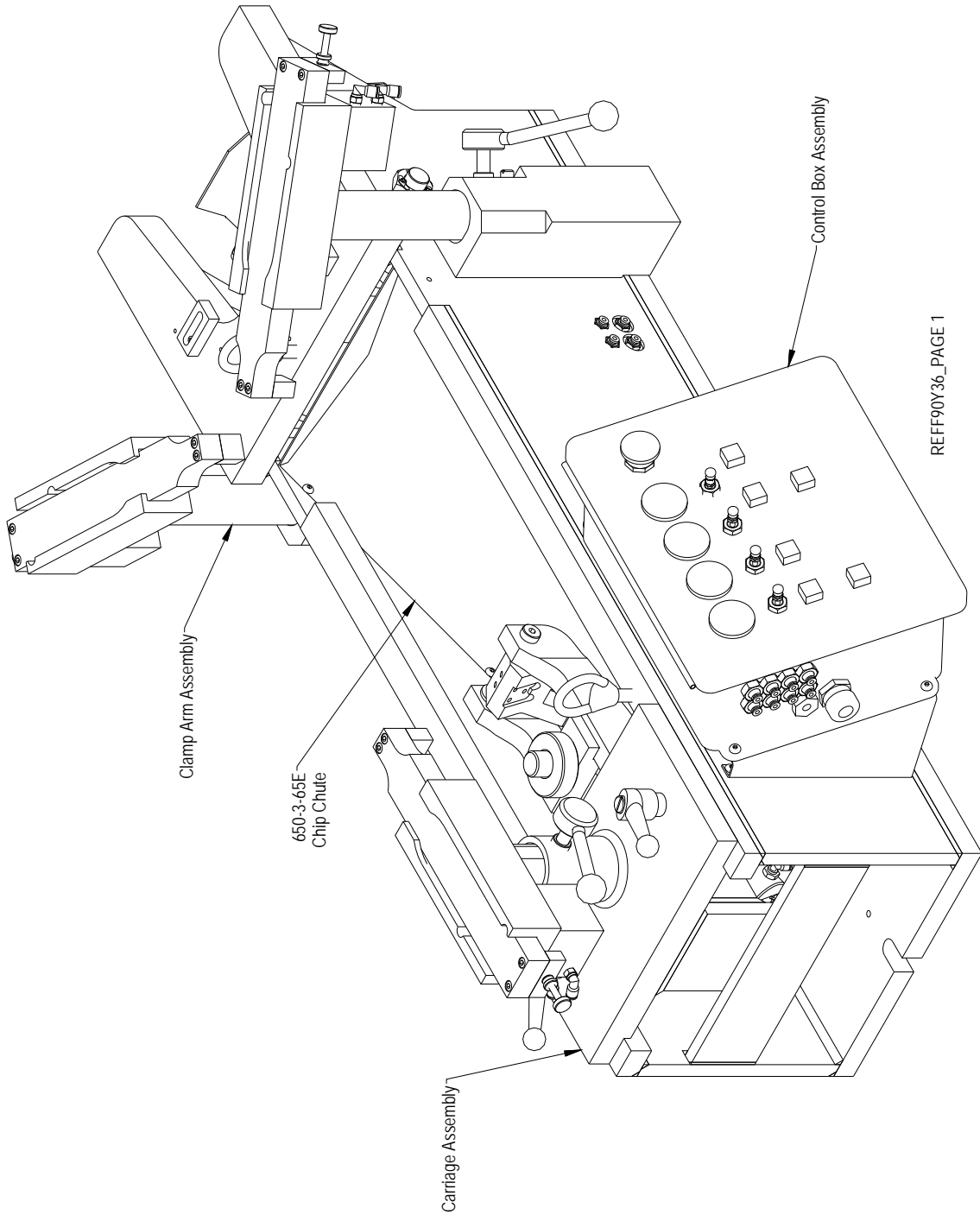
650-3-44R Small Precision Connecting Rod Fixture – Carriage Assembly



Small Precision Connecting Rod Fixture Carriage Assembly Parts List		DESCRIPTION
ITEM	QTY	PART NUMBER
1	1	650-3-67 Carriage, Machining
2	1	650-3-45D Wedge Cylinder
3	2	650-3-45L Clevis
4	1	650-3-48J Linkage, Wedge
5	2	650-3-48G Wedge Clamp - Medium, Con-Rod Fixture ass'y
6	2	650-3-48K Release Pin, Clamp Wedge
7	1	650-3-47D Centering Lever
8	2	100-19A Hardened washer 17/32 I.D.
9	2	650-3-45 Hexagon Socket Head Shoulder Screw .0500 x 1
10	2	650-3-48 Clamp Shoe
11	2	514-2-39 Handle
12	2	514-4-58 Stud
13	1	650-3-47S Centering Block - Medium Long
14	7	MF-13 ANSI B18.3 - 1/4 - 20 - 5/8 Hexagon Socket Head Cap Screw
15	1	ANSI B18.2.2 - 1/2 - 20 Hex Jam Nut
16	1	Rod Clevis Pin RC-5
17	2	ANSI B18.8.1 - 1/8 x 3/4 Extended Prong Pin - Cotter
18	4	ANSI B18.3 - 5/16 - 18 - 1/2 Hexagon Socket Head Cap Screw
19	2	650-3-45K Pivot Bracket
20	2	Norgren RLQ04 Norgren
21	2	Legris angle 25x532
22	1	MF-212A ANSI B18.8.2 - 3/8 x 2 1/4 Pin - Hardened Ground Production Dowel
23	1	MF-60 ANSI B18.3 - 1/4-20 UNC x 0.25 Hexagon Socket Set Screw - Clip Point
24	1	Pinot Pin Norgren CY
25	1	Legris Angle
26	2	

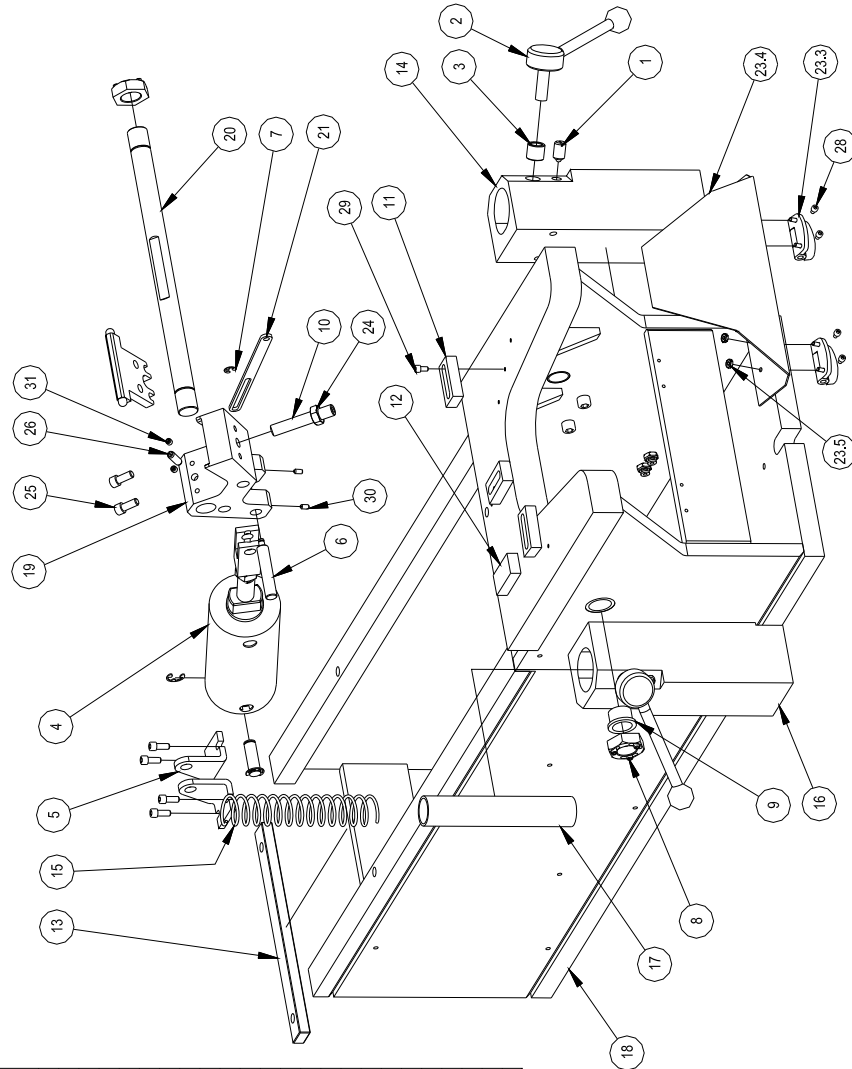
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650-3-64 Heavy Duty Con Rod Fixture



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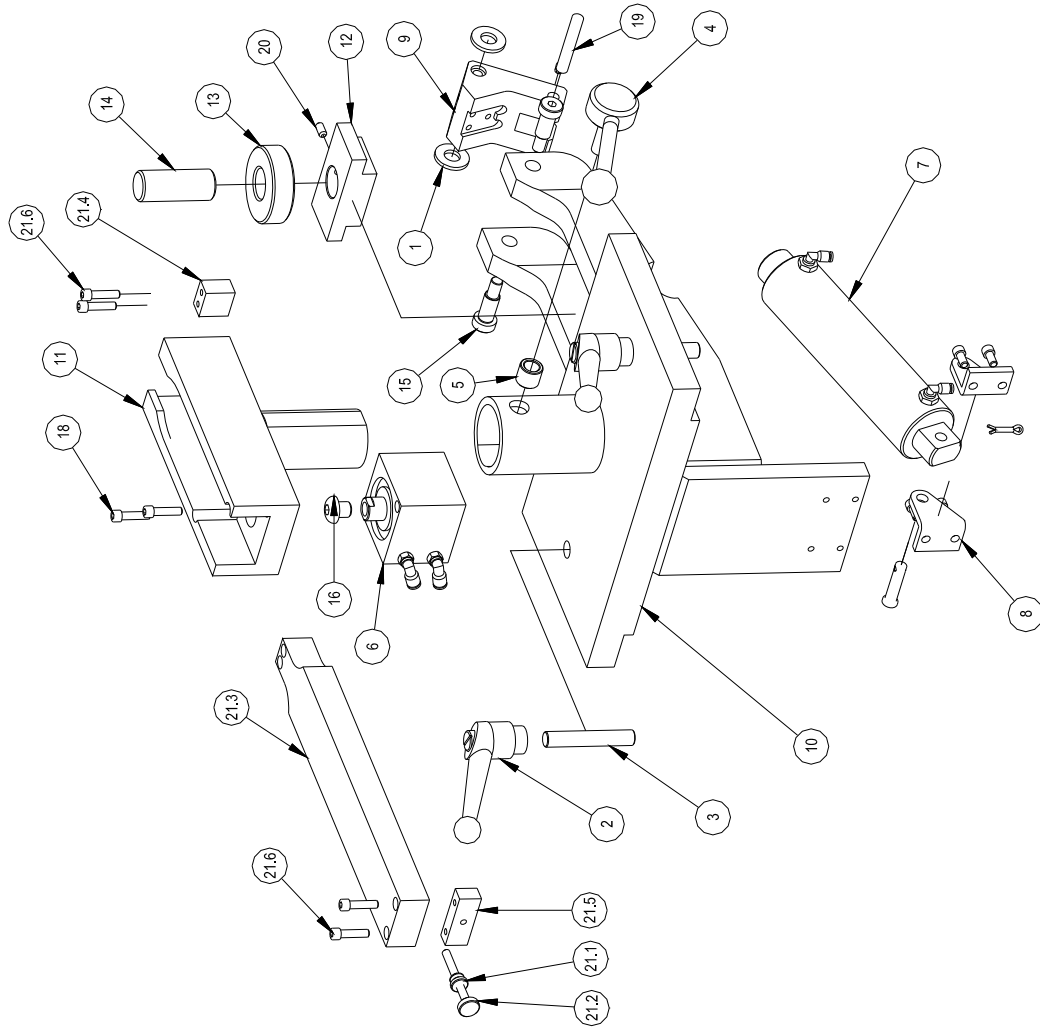
650-3-64 Heavy Duty Con Rod Fixture – Cylinder Assembly



Conrod Centering Cylinder Assembly		
ITEM	QTY	PART NUMBER DESCRIPTION
1	2	502-4-52C Spring Plunger
2	2	6310J Clamp Handle
3	2	6310R Thread Insert
4	2	650-3-45G Locate Cylinder
5	1	650-3-45H Pivot Bracket, Bimba #D-13512-A
6	1	650-3-46K Pivot Pin
7	1	650-3-46R E-clip - Truearc E-Ring #RE-25ST
8	2	650-3-46T Lock Nut REID BLN-105
9	2	650-3-46U Flange Bearing Symmoos SF-2832-12
10	1	650-3-47K Stop Screw
11	3	650-3-48L Support Parallel
12	1	650-3-48M Support Parallel, +.002
13	1	650-3-48R Clamp Bar, Carriage, Large ConRod fixture
14	1	650-3-49F Clamp Base - Left Side
15	2	650-3-49M Spring
16	1	650-3-49e Clamp Base - Right Side
17	2	650-3-49g Clamp Leg Spacer Tube.
18	1	650-3-64A Main Frame (Machining)
19	1	650-3-64G Locator Holder
20	1	650-3-64M Pivot Shaft
21	1	650-3-65G Linkage Arm
22	2	650-3-9 Key
23.1	1	650-3-46H Linkage Pin
23.2	1	650-3-46R E-clip - Truearc E-Ring #RE-25ST
23.3	2	650-3-46S Hinge
23.4	1	650-3-65F Dust Cover
23.5	4	MF-160 Hex Machine Screw Nut 8-32
24	1	MF-3D S.H.C.S. 8 - 32 UNC - 3/8
24	1	MF-165 Hex Jam Nut 1/2-13
25	2	MF-22 S.H.C.S. 5/16 - 18 UNC - 3/4
26	1	MF-22TA 5/16 x 1-1/4 Roll Pin
27	8	MF-31 S.H.C.S. 3/8 - 16 UNC - 1/4
28	4	MF-3B S.H.C.S. 10 - 24 UNC - 3/8
29	3	MF-4 S.H.C.S. 10 - 24 UNC - 3/8
30	2	MF-53 Cup Point Set Screw 10 - 24 x 3/8
31	2	MF-60 Cup Point Set Screw 1/4 - 20 x 1/4
32	2	MF21A S.H.C.S. 5/16 - 18 UNC - 1/2

REF90Y36_Locate Cylinder

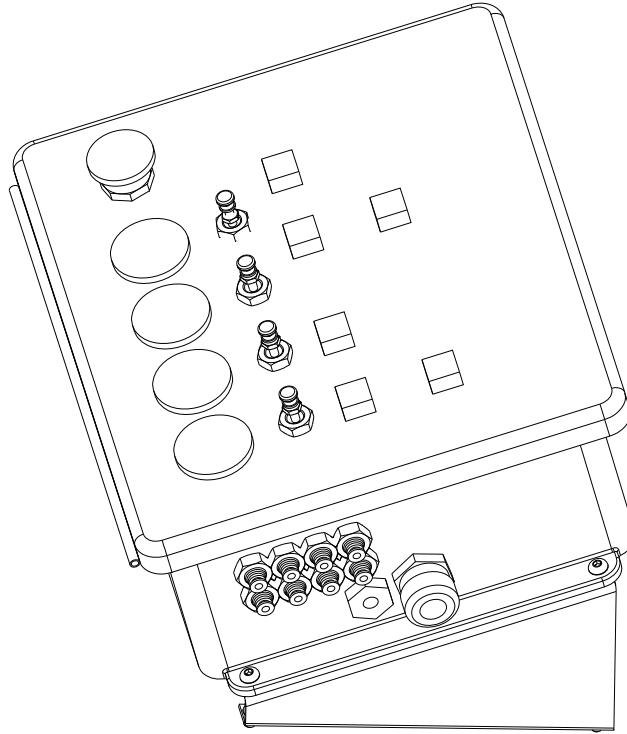
650-3-64 Heavy Duty Con Rod Fixture – Carriage Assembly



Carriage Assembly			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	100-19A	Hardened washer-17/32 I.D.
2	2	514-2-39	Handle
3	2	514-4-5B	Stud
4	1	6310J	Clamp Handle
5	1	6310R	Thread Insert
6	1	650-3-45E	Clamp Arm Cylinder
7	1	650-3-45F	Centering Cylinder
8	1	650-3-45K	Pivot Bracket
9	1	650-3-47D	Centering Lever
10	1	650-3-64C	Carriage
11	1	650-3-64F	Short Clamp Arm
12	1	650-3-65A	Jack Body
13	1	650-3-65B	Jacking Nut
14	1	650-3-65C	Jacking Screw
15	2	650-4-18A	Shoulder screw, 1/2" x 1" long
16	1	650-4-41	Socket Button Head Cap Screw - Cup
17	1	ANSI B16.3 - 1/4-20 UNC x 0.38	Point
18	2	MF-15	S.H.C.S. 1/4 - 20 UNC - 1
19	1	MF-212A	Pin - Hardened Dowel
20	1	MF-61	Hexagon Socket Set Screw - Cup
			Point
21.1	1	650-3-34J	Thumbknob Reft aj:721
21.2	1	650-3-34S	Clamp Screw
21.3	1	650-3-49K	Clamp Arm
21.4	1	650-3-49L	Clamp Arm Extension
21.5	1	650-3-49N	Stop Block
21.6	4	MF-15	S.H.C.S. 1/4 - 20 UNC - 1

REF:FWO3-CARRIAGE ASSEMBLY

650-3-64 Heavy Duty Con Rod Fixture – Control Box Assembly



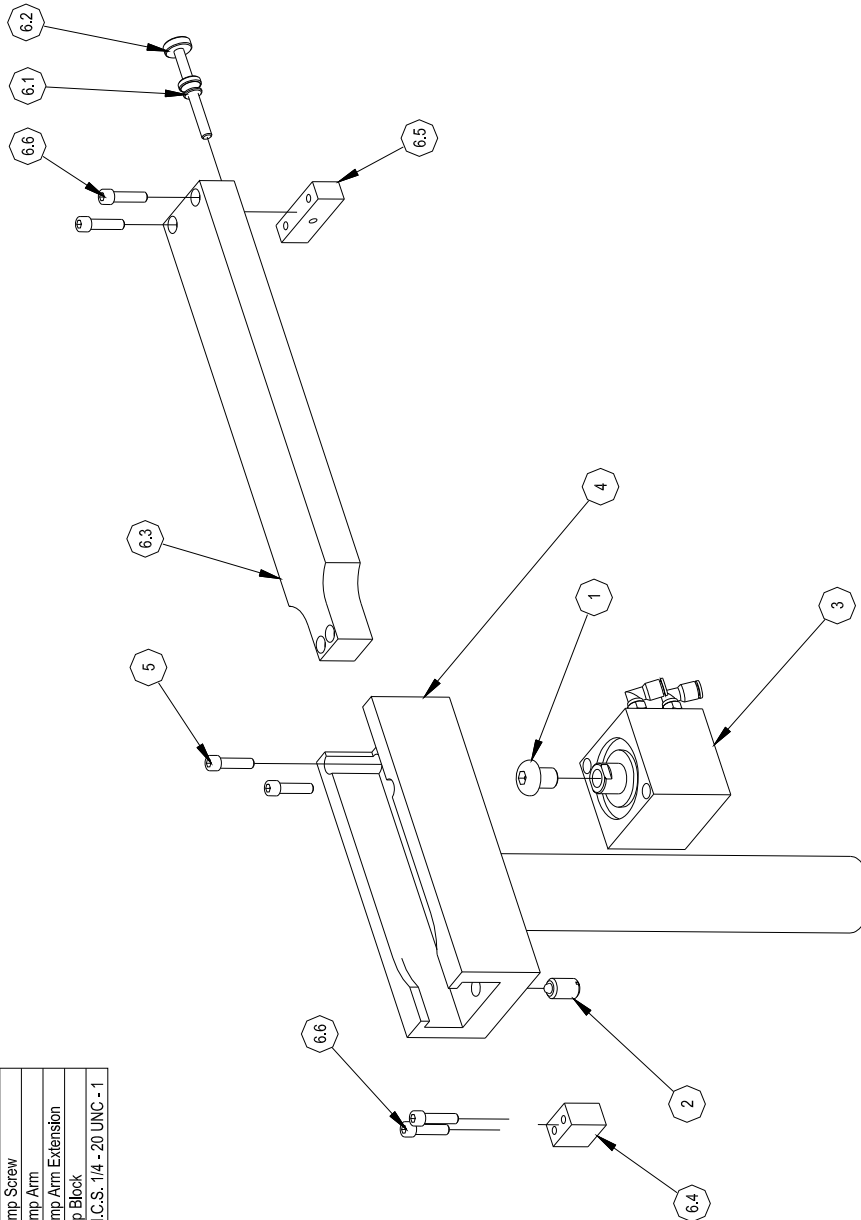
Control Box Assembly				
ITEM	QTY	PART NUMBER	DESCRIPTION	
1	1	650-3-47T	Conrod Control Box Assembly	
2	4	650-3-47W	Rivet nut Reid ALC-47850	
3	2	650-3-65D	Bracket, Control Box ConRod Fixture	
4	4	ANSI B18.3 - 1/4 - 20 x 3/8	Button Head Cap Screw	
5	4	MF-91	Button Head Cap Screw	

REFR00Y26_CONTROL BOX

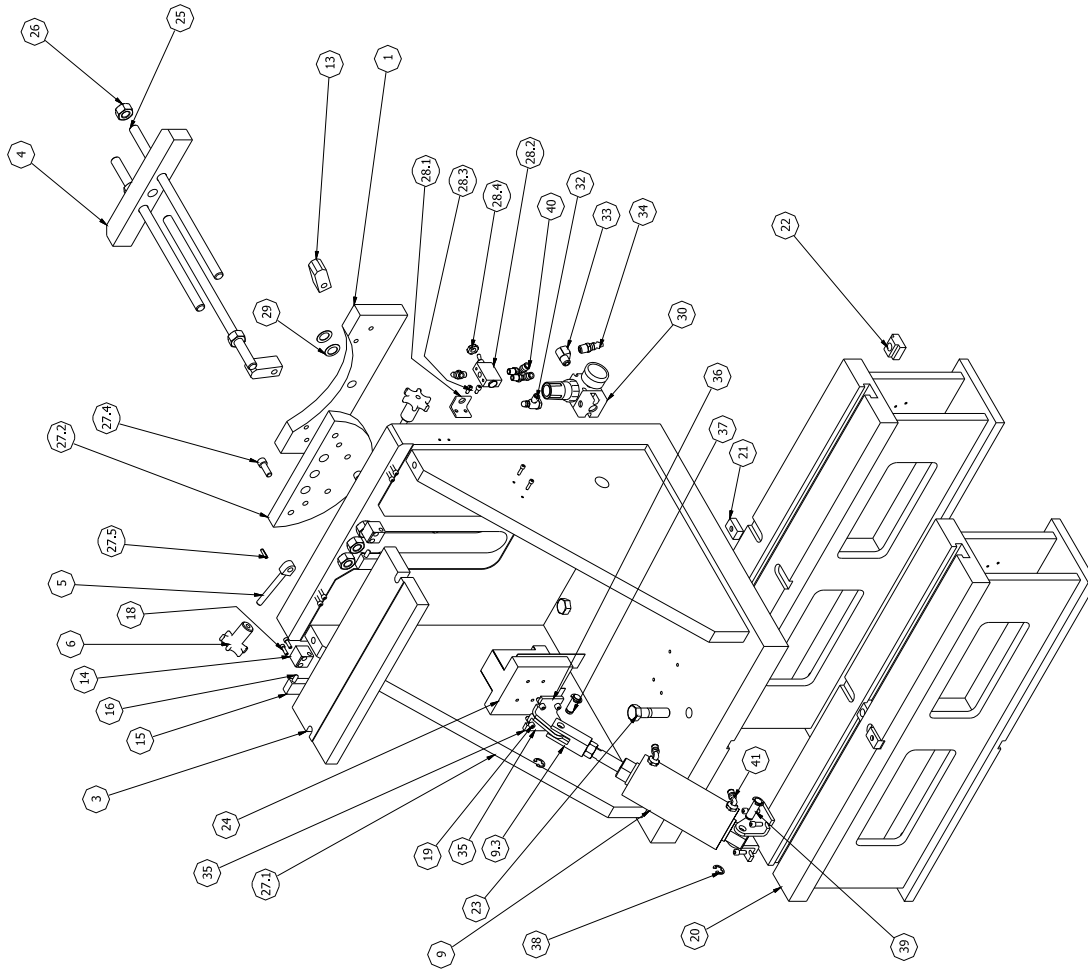
650-3-64 Heavy Duty Con Rod Fixture – Clamp Arm Assembly

Clamp Arm Assembly			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	650-4-41	Socket Button Head
2	1	502-8-52C	Spring Plunger
3	1	650-3-45E	Clamp Arm Cylinder
4	1	650-3-49H	Clamp Leg
5	2	MF-15	S.H.C.S. 1/4 - 20 UNC - 1
6.1	1	650-3-34J	Thumbknob Reid 9t-721
6.2	1	650-3-34S	Clamp Screw
6.3	1	650-3-49K	Clamp Arm
6.4	1	650-3-49L	Clamp Arm Extension
6.5	1	650-3-49N	Stop Block
6.6	4	MF-15	S.H.C.S. 1/4 - 20 UNC - 1

REF90786_CLAMP_ARM_ASSEMBLY



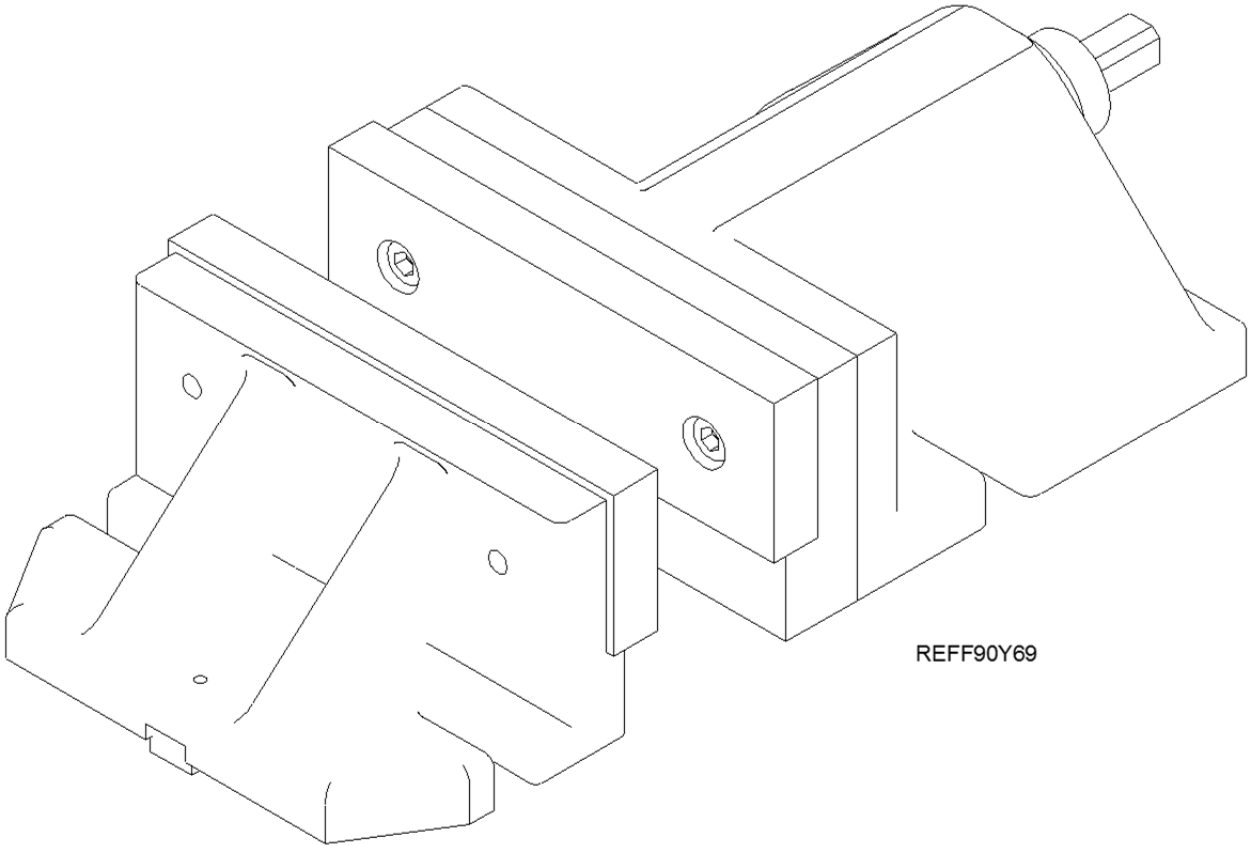
650-3-66 Precision Connecting Rod Cap Milling Fixture



Parts List		
ITEM QTY	PART NUMBER	DESCRIPTION
1	650-3-66C	Carriage, Cap Cutting Fixture
3	650-3-66D	Locate Plate
4	650-3-66B	Clamp Bar
5	650-3-66P	Eye bolt - rald swb-1
6	650-3-66N	Knob - rald tc2a
9	650-3-45G	Phot Shaft
9.3	650-3-45J	Clevis 1" Bimba D-8314-A
13	650-3-66E	Lift Arm
14	650-3-66H	Upper Hinge
15	650-3-66I	Lower Hinge
16	MF-207 ANSI B18.8.2 - 1/4 X 1 1/2	Ph - Hardened Ground Production Dowel
18	4 MF-5 ANSI B18.3 - No. 10 - 24 - 5/8	Hexagon Socket Head Cap Screw
19	8 ANSI B18.3 - 1/4 - 20 - 5/8	Hexagon Socket Head Cap Screw
20	2 6370Y	10" Support Parallel
21	2 65533	Locating Key
22	3 502-1-1A	T-Nut, 3/4 table, 5/8-11 thread
23	MF-152A ANSI/ASME B18.2.1 - 5/8-11 UNC - 2.5	Hex Bolt - UNC (Regular Thread - Inch)
24	1 650-3-66G	Slide Assy (Turcite)
25	3 650-3-66M	Clamp Stud
26	6 MF-166 ANSI B18.2.2 - 5/8 - 11	Hex Thick Nut
27	1 650-3-66K	Main Frame Assembly
27.1	1 650-3-66A	Cap Fixture, Main Base
27.2	1 650-3-66L	Thrust Parallel
27.4	4 MF-31 ANSI B18.3 - 3/8 - 16 - 1	Hexagon Socket Head Cap Screw
27.5	2 MF-30 ANSI B18.8.2 - 3/16 x 3/4	Ph - Slotted Spring
27.6	2 MF-213 ANSI B18.8.2 - 3/8 x 1 1/2	Ph - Hardened Ground Production Dowel
28	1 Air Switch Assembly	
28.1	1 502-1-55A	Air switch mount bracket
28.2	1 502-1-55	Air Switch, Clippard #MTU-4
28.3	2 MF-4 ANSI B18.3 - No. 10 - 24 - 3/8	Hexagon Socket Head Cap Screw
28.4	1 Nut	Mount nut for 502-1-55, air switch.
29	2 650-3-56S	Belleville spring Rald BDB-65
30	1 514-2-70K	Regulator Assy
32	1 502-11-55A	Flow Control
33	1 502-11-175	1/4 STREET ELL
34	1 502-11-16X	Quick Connect, air Fitting Male
39	1 650-3-45H	Phot Bracket
40	3 514-4-17V	1/4 poly x 1/4 npt 90, Legris metal
41	2 514-4-18B	1/4 poly x 1/4 npt 90, Legris metal
42	4 MF-6 ANSI B18.3 - No. 10 - 24 UNC - 3/4	Hexagon Socket Head Cap Screw
43	1 650-3-66Q	Shoulder Screw 5/8 X 1.25
44	2 MF-22 ANSI B18.3 - 3/8 - 16 UNC - 1 1/4	Shoulder Screw 1/2 X 1 1/2
45	2 MF-23 ANSI B18.3 - 3/8 - 16 UNC - 1 1/4	Hexagon Socket Head Cap Screw
46	2 MF-3A ANSI B18.3 - No. 8 - 32 UNC - 7/8	Hexagon Socket Head Cap Screw

REFR5134-06082006

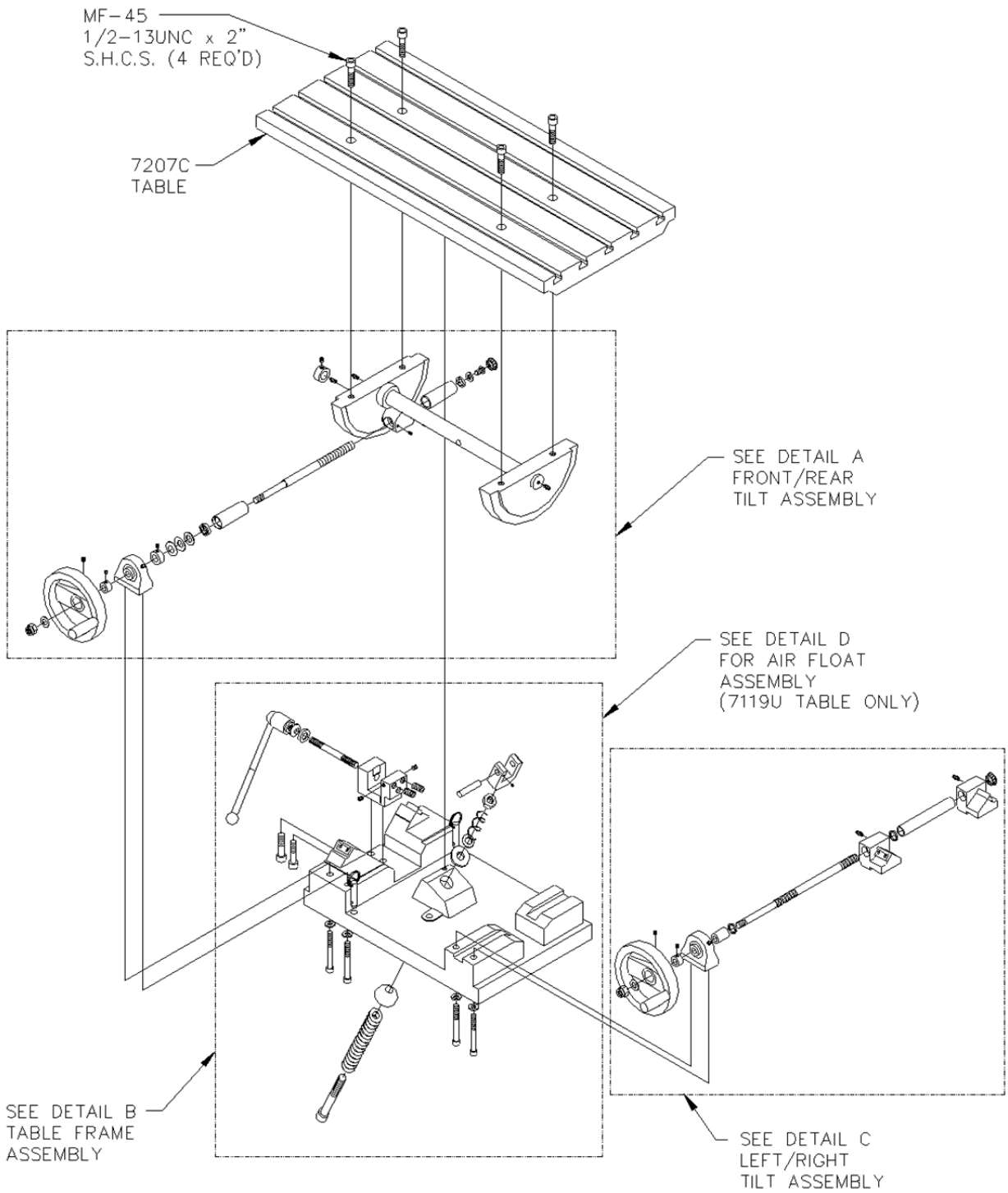
7209N two Piece Vice:



REF90Y69

7209M Dual Axis Table Assembly:

REFHD17-082095



ROTTLER DUAL AXIS FIXTURE TABLE
7119V - FIXTURE TABLE WITHOUT AIR FLOAT OPTION
7119W - FIXTURE TABLE WITH AIR FLOAT OPTION

APPROXIMATE TABLE
WEIGHT: 325 LBS.

Front / Rear Tilt Assembly:

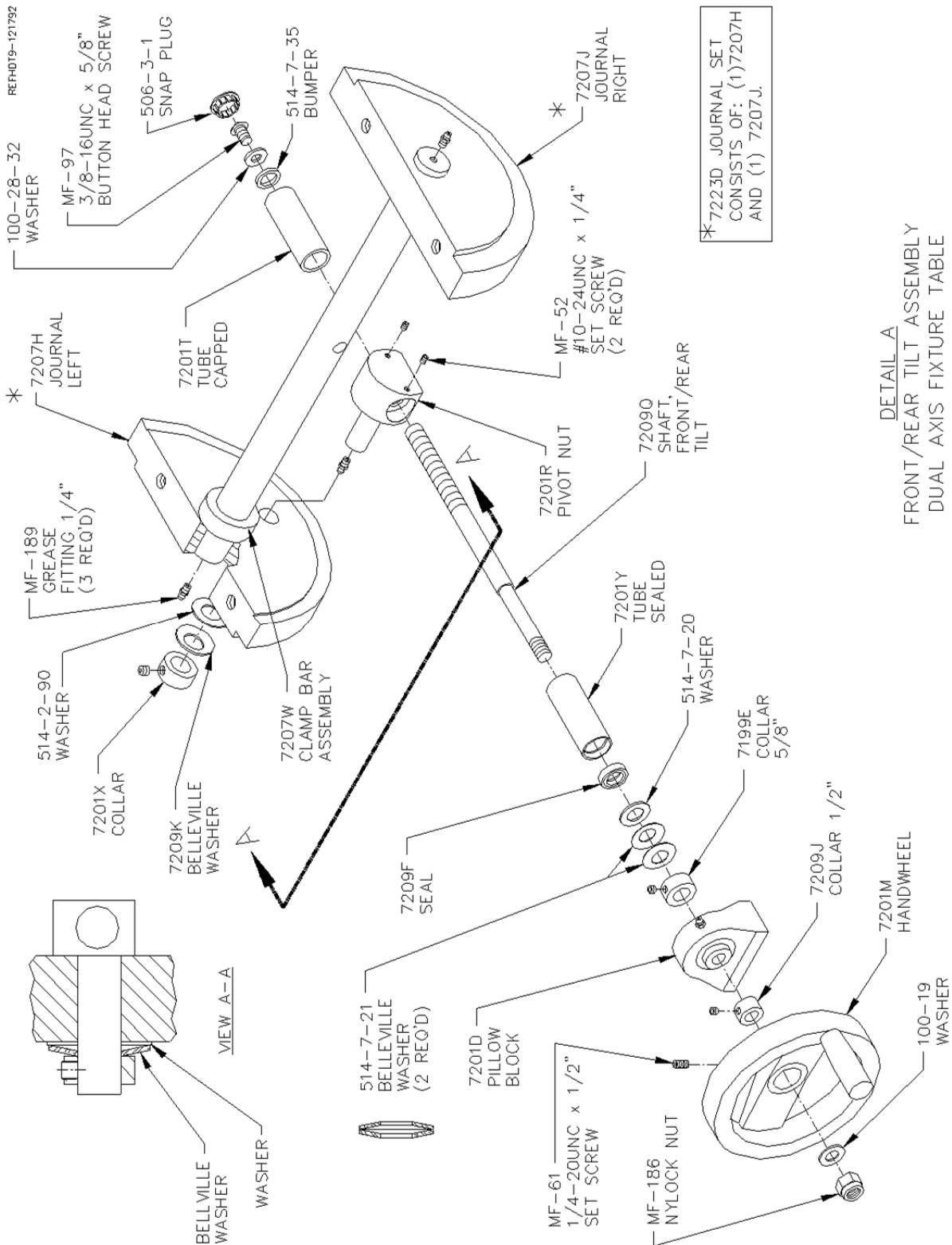
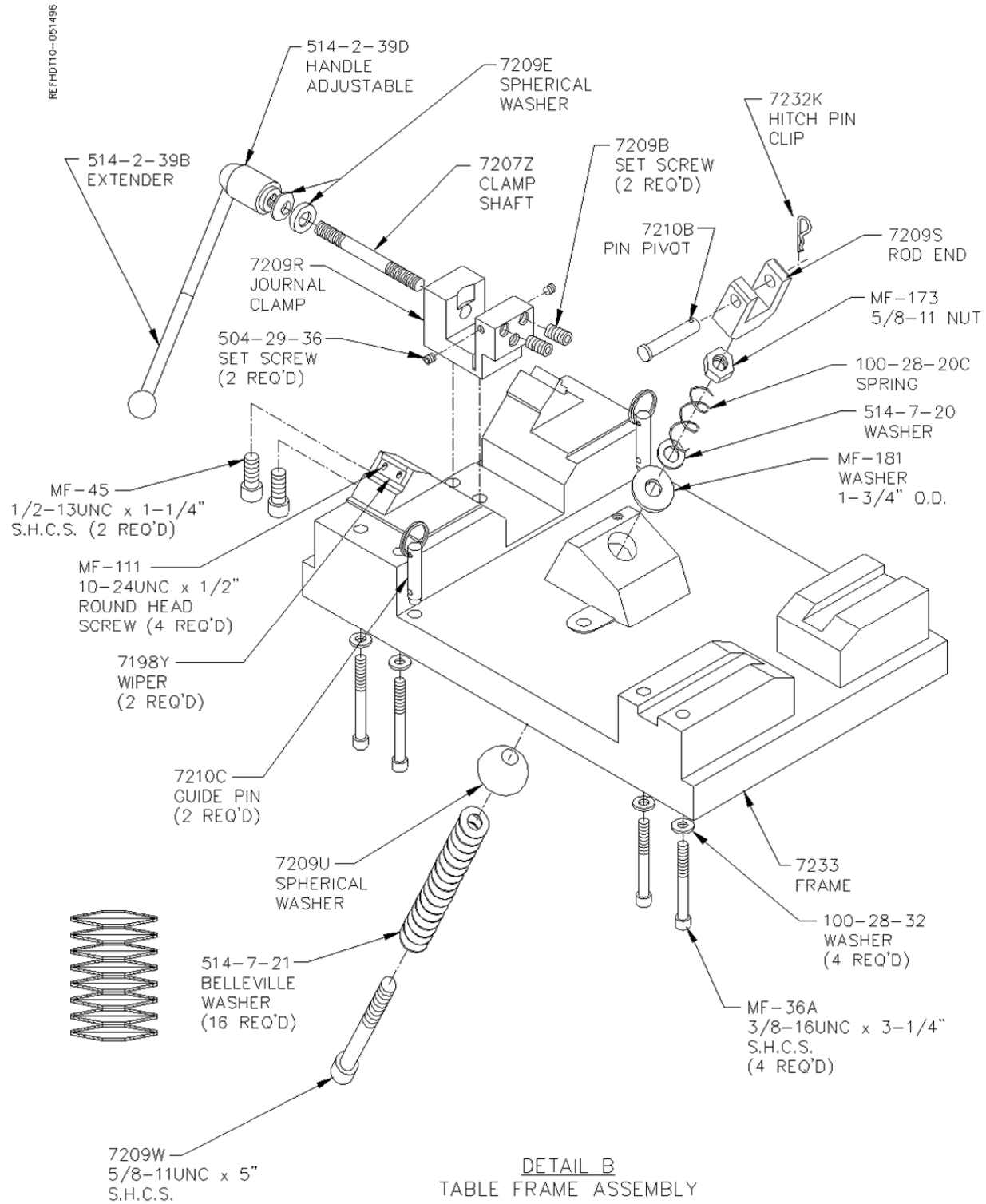
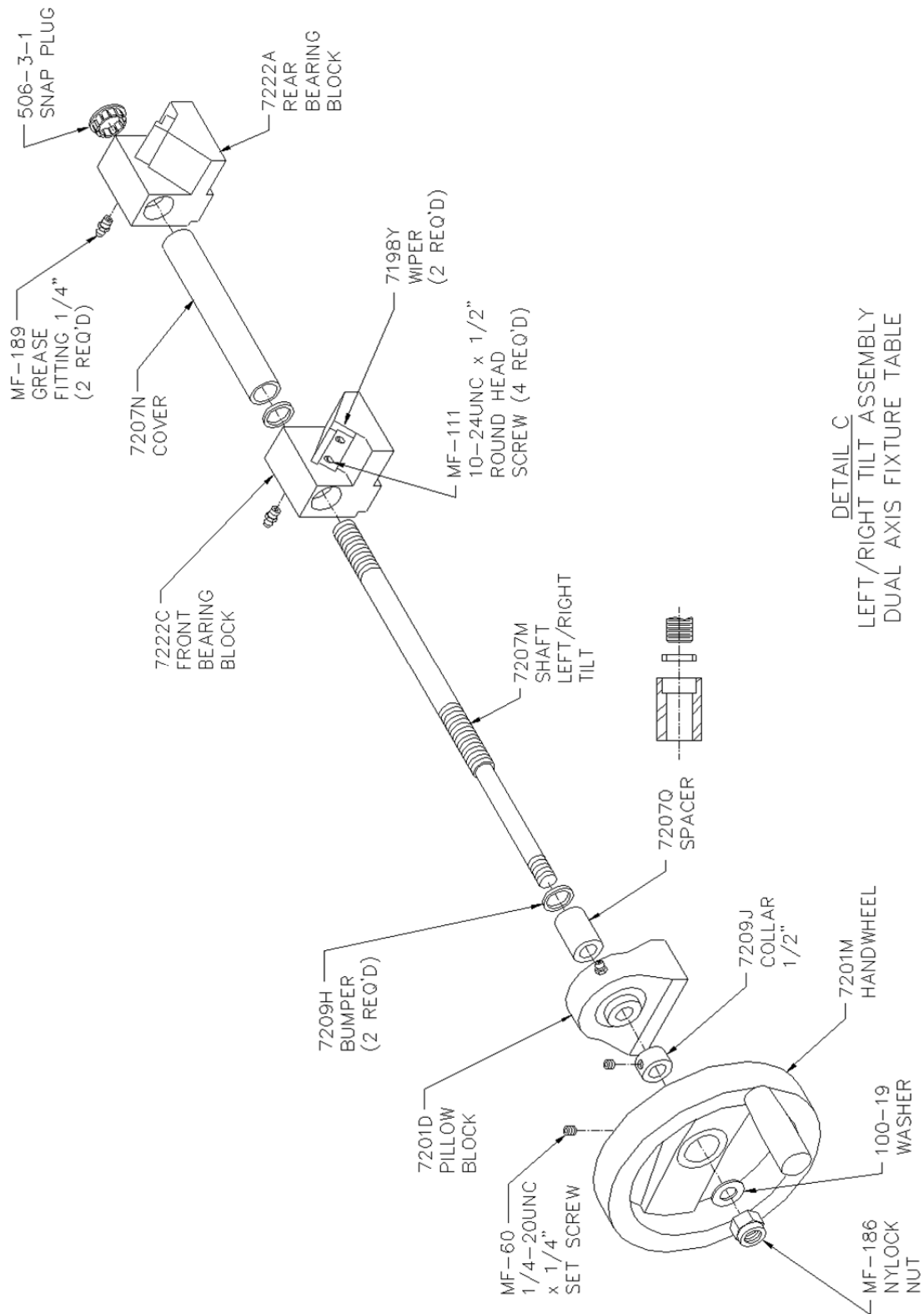


Table Frame Assembly:



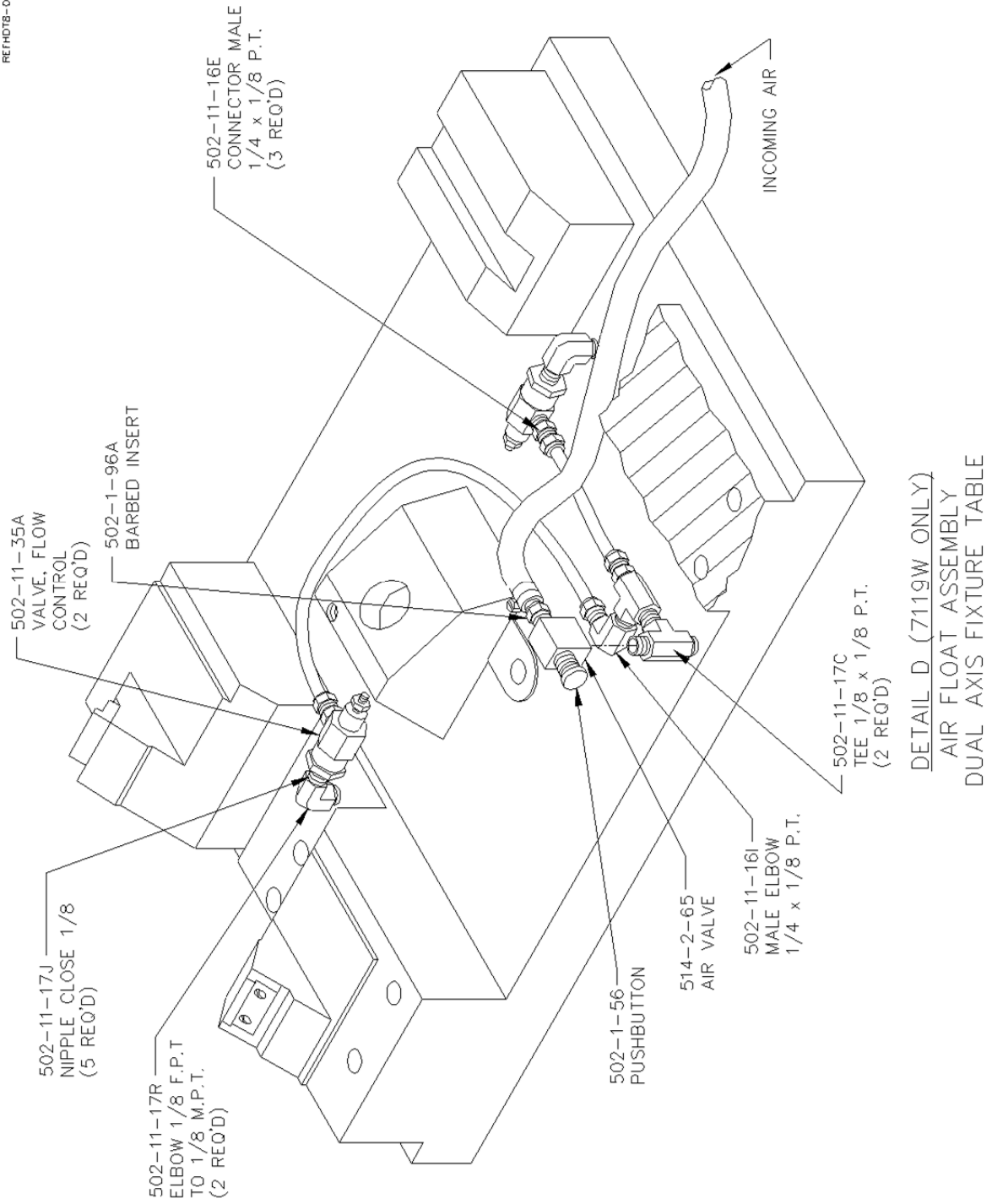
Left / Right Tilt Assembly:

REFHD11-090492



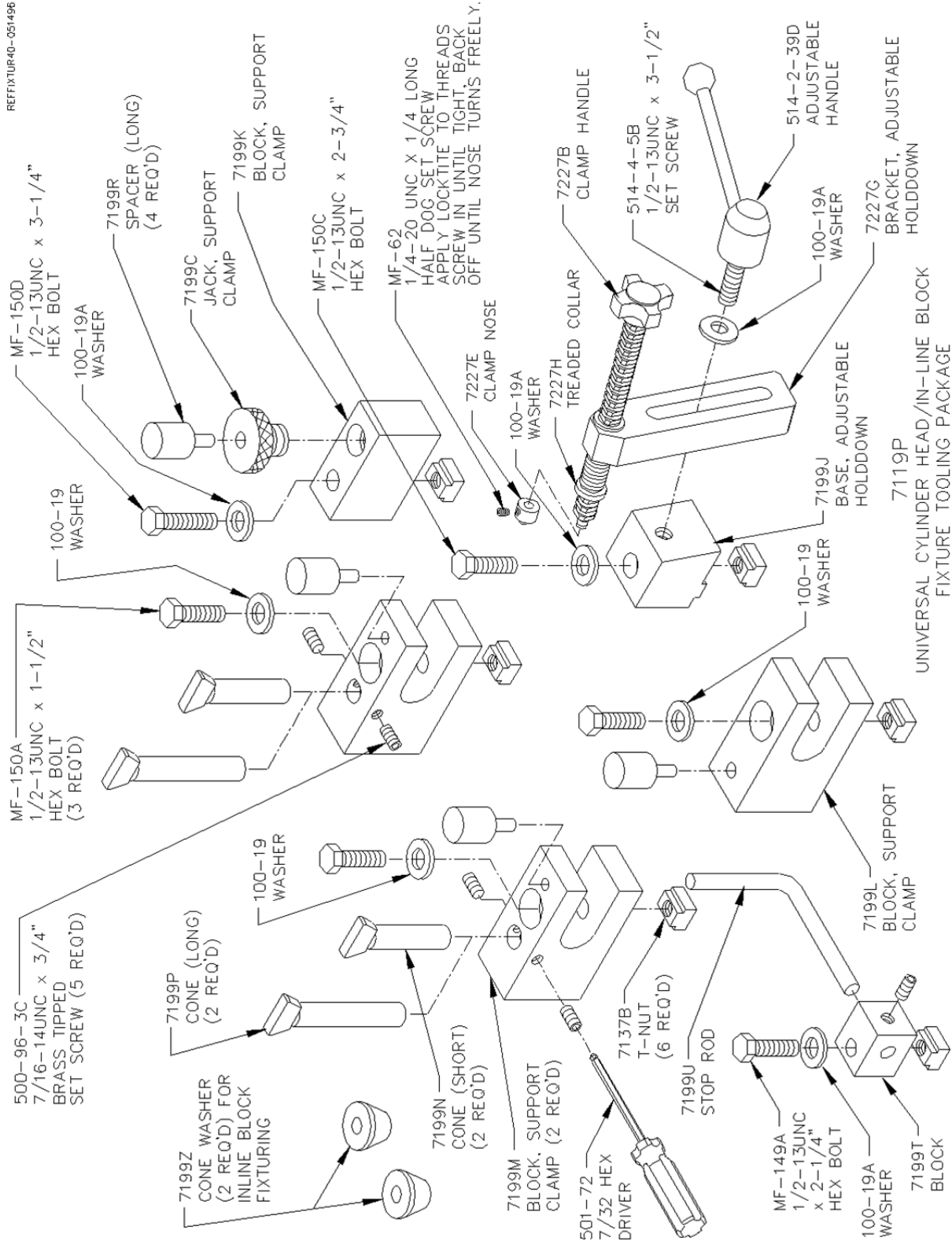
Air Float Assembly:

RETHD18-031593



7119P Universal Tooling Package:

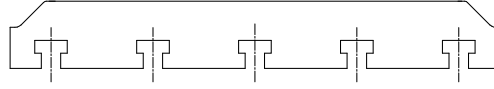
REF:FIXTUR40-051496



Blank Set-Up Sheet:

REFHDBLANK-022894

HEAD TYPE:
O.A. LENGTH:
O.A. WIDTH:
O.A. HEIGHT:

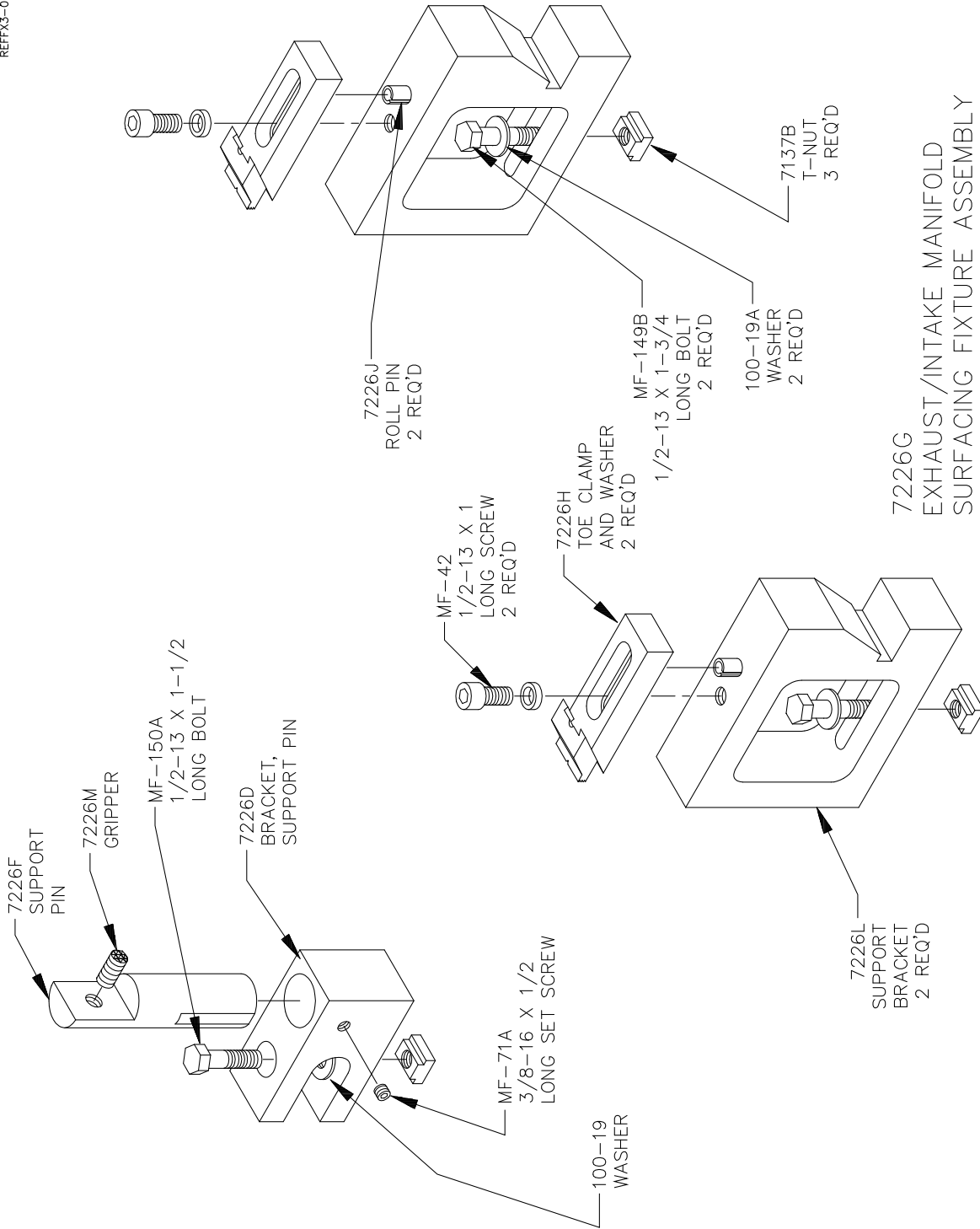


5		4		3		2		1
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FRONT OF
MACHINE ▼

7226G Exhaust / Intake Manifold Surfacing Fixture Assembly:

REFFX3-051496



7226G
EXHAUST/INTAKE MANIFOLD
SURFACING FIXTURE ASSEMBLY

Exhaust / Intake Manifold Fixture: Exhaust instructions:

Note: This fixturing is designed to hold most exhaust manifolds and most intake manifolds from 90 degree V/8 Engines.

Most exhaust manifolds will be surfaced with the supports positioned approximately as shown on next page. Occasionally, however it may be necessary to rearrange the support blocks to fit unusual manifolds.

Place a manifold on the two front brackets. Adjust the rear pin to provide the best support. The best place for the front brackets is under the machined area, for the manifold mounting bolts, at the outside corners of the manifold. The rear pin should be approximately midway between the front brackets on the rear of the part. The pin should support under the main body of the manifold.

Adjust the rear pin up and down to bring the manifold close to level.

Tighten the tow clamps evenly against the cast surface of the manifold (be sure the toe clamps are not pushing on a machined surface). Tighten firmly, test for clamp tightness with a soft faced mallet.

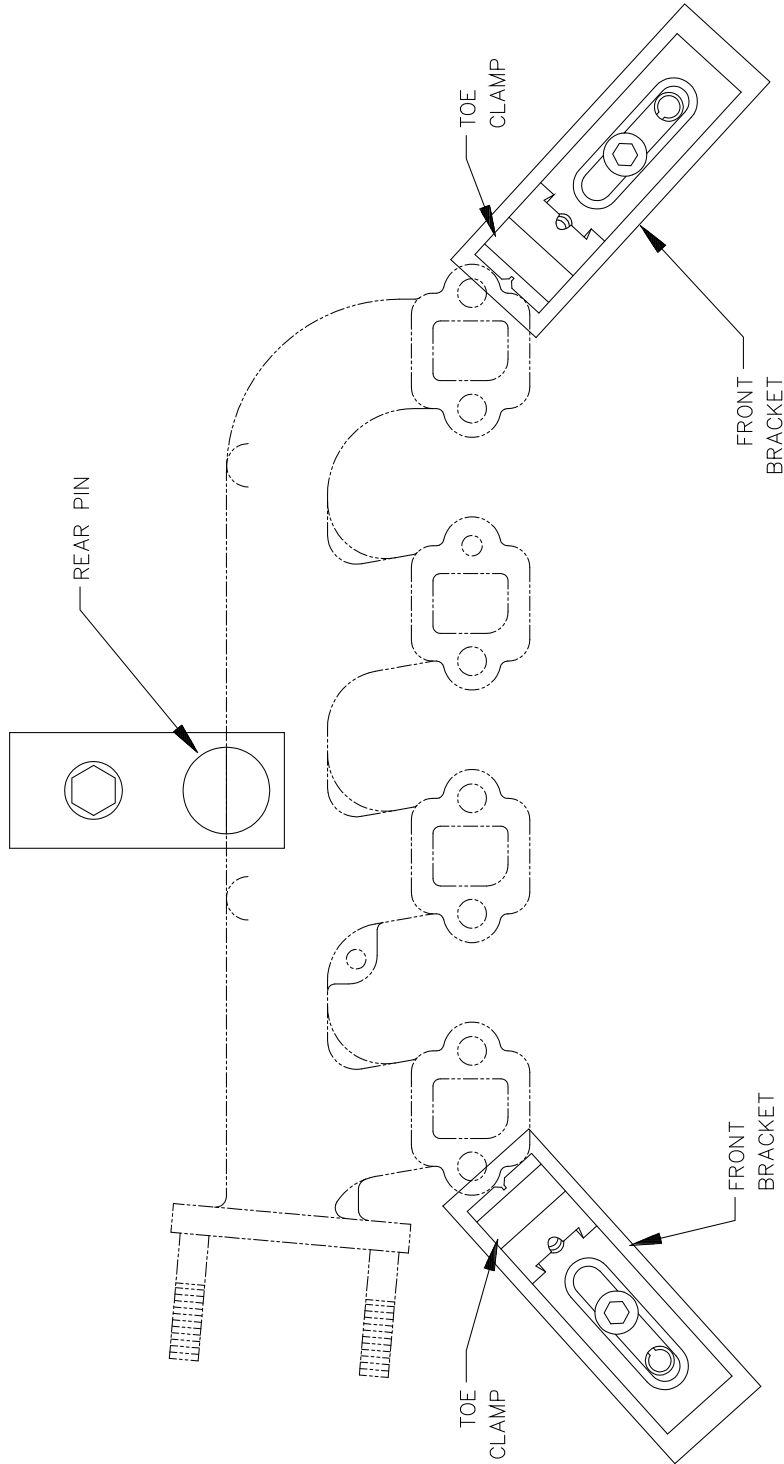
Level the manifold surface using the hand –wheels and the dual axis level system of the table.

Make sure there are no obstructions in the way of the cutterhead you are using. Also be aware of the 14” fly cutter guard, it might interfere with some obstructions. Some manifolds require the use of our 4” diameter shell mill and adapter.

The manifold is ready to surface.

Typical Exhaust Manifold Set-Up:

REFFX4-020993



Intake Instructions:



At all stages of this process be sure there are no obstructions that might interfere with the cutterhead or it's guard.

This fixture will require parts from the Rottler universal head tooling package.

This fixture is designed primarily for intake manifolds from 90 degree V-8 engines.

Start with the support blocks arranged as shown on the next page. Leave, the hold down bolts, finger tight, so that the blocks will slide easily.

Place the manifold in the two rear support brackets as shown. Adjust the brackets so they fit flush and parallel on one intake surface. Tighten the hold down bolts securely.

Adjust the remaining two support blocks to give to the manifold at the front. Slide the clamp assembly over and position the clamp foot so it will push on a solid area of the manifold, approximately centered

Tighten the clamp handle securely. Check to make sure the manifold did not move.

Using a small precision level, level the exposed intake surface, in both directions, by tilting the dual axis table as necessary.

Using the left hand-wheel only, rotate the table to level the lower surface of the manifold. This is done to make sure the dual axis table has enough travel. Rotate the table back up to the intake surface. Level this surface again.

This surface is ready to cut.

After surfacing rotate the table, using the left hand-wheel only, down to the center or lower surface, level this surface.

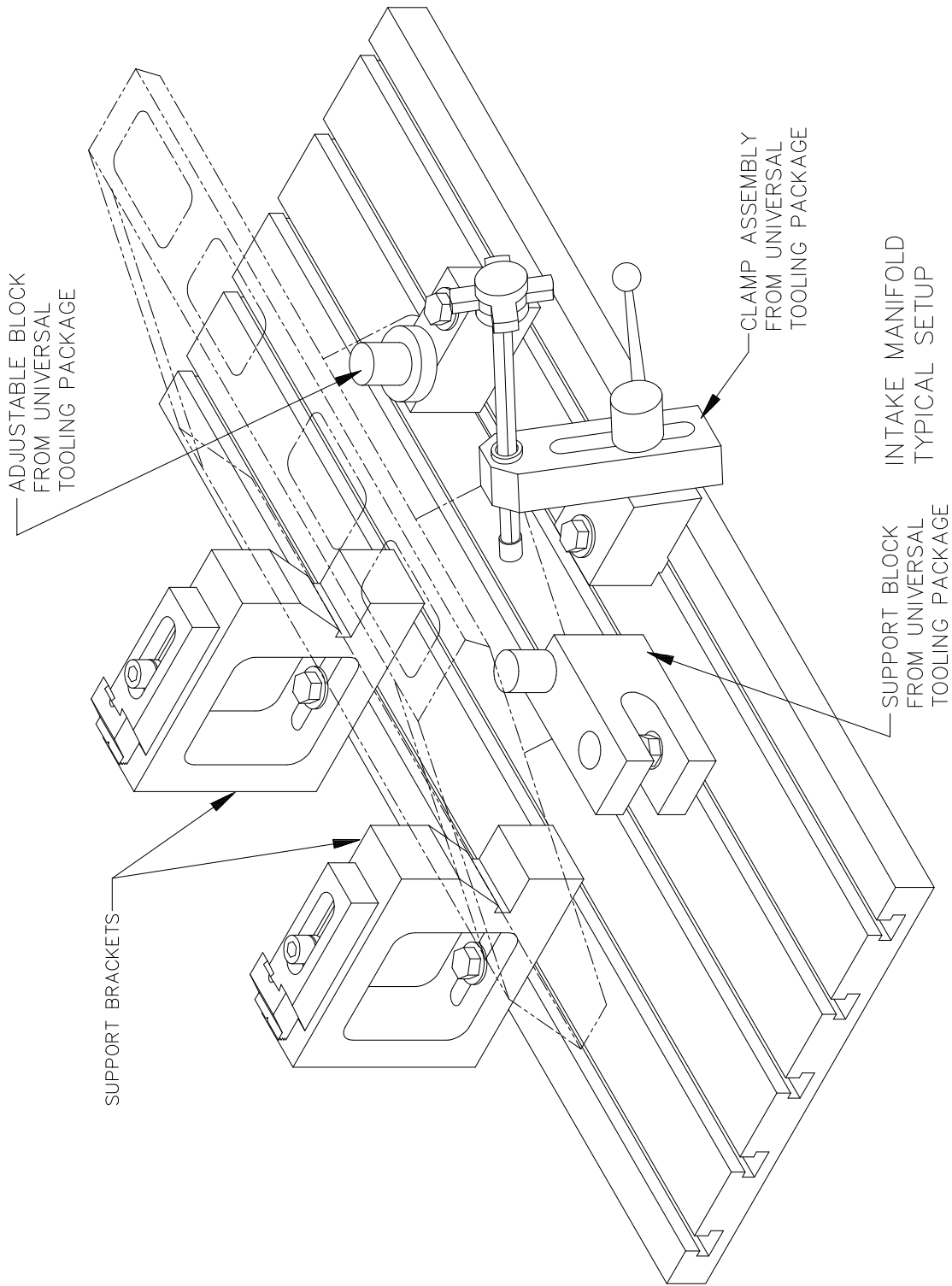
This surface is ready to cut.

Loosen the clamp screw and remove the manifold. Turn it around and reload with the fresh cur surface in the rear support blocks. Level the intake manifold surface and cut.

Using the left hand-wheel level the second lower surface and cut it.

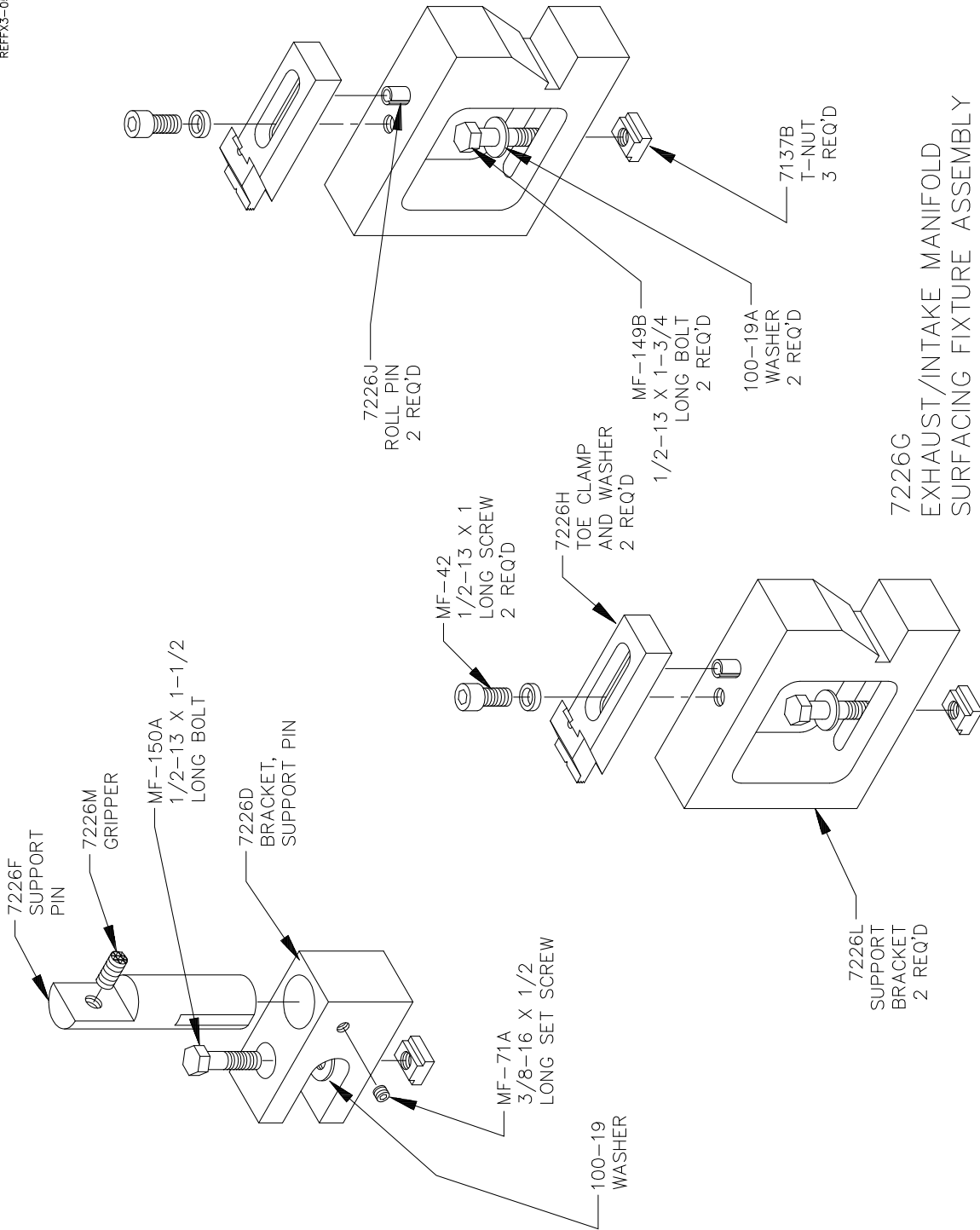
Typical Intake Manifold Set-Up:

REFFX5-070893



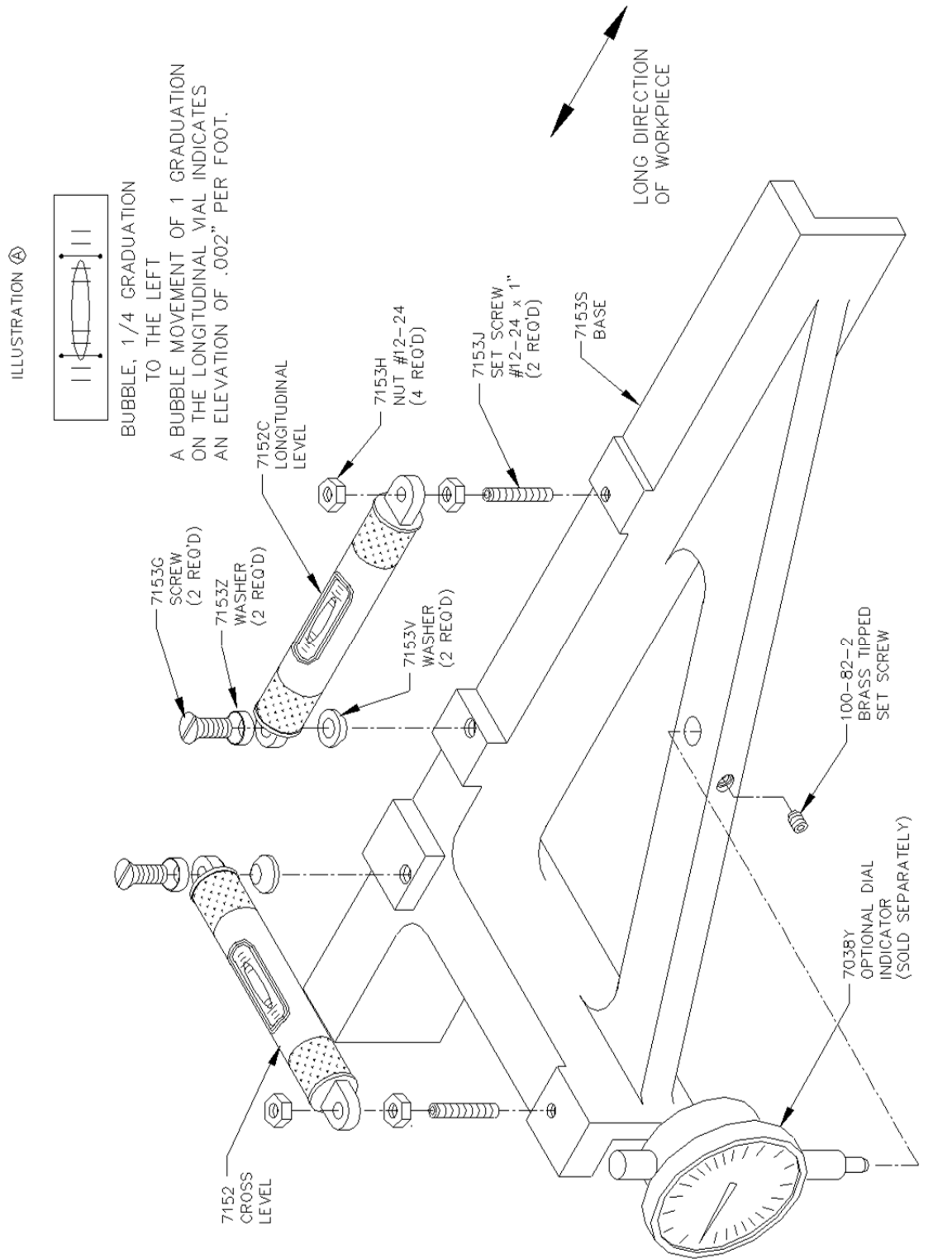
7226G Exhaust / Intake Manifold Assembly:

REFFX3-051496



7226G
EXHAUST/INTAKE MANIFOLD
SURFACING FIXTURE ASSEMBLY

7152A Dual Axis Level Assembly:



REFFIXTUR32-060695

NOTE: 7152A ASSEMBLY DOES NOT INCLUDE 7038Y DIAL INDICATOR

Cutterheads:

Changing Cutterheads:



Press the Emergency Stop button when ever you are changing cutterheads.

Remove the centering fingers before changing the cutterhead. Not doing so could result in the finger not extending or retracting all the way on an automatic cycle.

Turn the cutterhead release knob, the draw bar will drop down about ½". Turn the cutterhead 90 degrees, lower the cutterhead out of the inner spindle slowly so not to damage the taper on either part.

Thoroughly clean the end, including inside the hole, of the cutterhead that is going to be put in. Be sure the cutterhead release switch is on. Line up the slot in the cutterhead, with the draw bar nose. Lift the cutterhead up as high as it will go.

Turn the centering knob handle to engage the centering rod spline inside the cutterhead. Line up the key, on the cutterhead, with the keyway in the inner spindle. Turn the cutterhead release knob to secure the cutterhead. Be sure the key lines up properly so the cutterhead pulls up into the inner spindle.

A dampener weight is in most Rottler boring cutterheads, to improve the performance of the boring machine. The dampener weight requires little or no maintenance. Occasionally, the dampener weight will get contaminated with dirt or liquids. If this happens, the operator will experience chatter problems. The cutterhead will have to be removed, disassembled, and cleaned. Disassembly is done by removing the screws located in the bottom of the cutterhead. (see illustrations following).

Cutting Inserts:

Below is a description of the cutting inserts available from Rottler. The inserts have gone through extensive performance testing. To take full advantage of the capabilities of your Rottler machine, we highly recommend Rottler cutting tools be used. Rottler machine performance can be significantly reduced if qualified tooling is not used. Using an incorrect insert can result in bore geometry inconsistency, short tool life, and poor surface finish.

Below are general guidelines. When using these inserts it is best to refer to the operator manual of the particular machine you are using. Rottler Manufacturing's latest operator manuals have more detailed information on feeds and speeds for the particular machine and cutterhead that you are using.

General Information

Rottler CBN and PCD Inserts are laser marked with our part number on one side. On single sided inserts, the part number is on the back side of the insert.

Rottler surfacing insert toolholders are designed so they can hold square and round inserts that are of the same basic size. For example, a 3/8" IC round and 3/8" IC square insert will fit into the standard 3/8" IC Rottler toolholders. IC stands for inscribed circle.

Rottler SF, F60, F80 and F90 Series surfacing cutterheads are supplied standard with Rottler 3/8" IC toolholders fitted to our surfacing heads. Optional 1/2" toolholders are interchangeable with 3/8" toolholders.

Insert breaking or chipping can be caused by several things. It can be caused by not operating the insert at the correct RPM. It is very typical for an insert to break or chip when cutting too slow. Interrupted cuts can cause an insert to break as well. When making a heavy sleeve cut in a cylinder that has been cracked it is often required to slow the RPM down to 1/2 the normal operating speed to prevent chipping of the insert.

Cutting Speed Calculation

Inserts are designed to cut within a speed range (S.F.P.M.). In order to convert from cutting speed to RPM, use the following formula:

$$\text{RPM} = \frac{\text{S.F.P.M.} \times 3.82}{\text{DIAMETER}}$$

S.F.P.M. = Surface Feet per Minute

RPM = Revolutions per Minute

DIAMETER in Inches

The feed rate on most Rottler machines is designated in inches (mm) / revolution. The F65M and the SFM have feed rates designated in inches (mm) / minute. It is important to adjust the inches (mm) / minute rate to obtain the correct load (inches / revolution). Following are the formulas to use. You do not have to perform this calculation with an "A" model machine

If you know the RPM and the Feed Rate per Revolution you want, use the following formula to obtain the correct Feed Rate per minute.

$$\text{FRM} = \text{RPM} \times \text{FRR}$$

FRM = Feed Rate Inches per Minute

FRR = Feed Rate Inches per Revolution

RPM = Spindle Revolutions per Minute

Cylinder Boring Inserts

Rottler has just completed the development of group of new triangular inserts for cylinder boring. Extensive trials were made to come up with new inserts that would outperform the older inserts. The result is a group of inserts that are the same unit cost but have 5 – 50% increased tool life. The increased tool life decreases overall operation cost to the end user.

RT321 (General purpose and sleeving)

A 3/8" IC triangular insert with a black ceramic coating and 1/64" cutting radius. This insert is the best to use for counterboring when the small corner radius is required for clearance or when the machine is at its extended travel limits. The 1/64" radius should be used when machining to a step where the mating part requires a smaller radius to eliminate an interference problem in the radius. If you are machining a long bore where the spindle must be extended towards the limits of its travel or if a long stub bar is being used, the 1/64" radius will minimize the possibility of chatter. A feed rate of .002 - .005 per revolution should be used to obtain a typical surface finish. When machining large counter bores typically found in Cummins or Cat Blocks, a feed rate of .002 - .004/rev. should be used. When cutting gray cast iron use a speed in the 800 – 1200 S.F.P.M. area for best productivity and tool life.

When cutting nodular, ductile, or compacted graphite cast iron the speed should be in the 200 – 400 S.F.P.M. area – 300 RPM on a 4" diameter bore. Nodular, ductile, or compacted graphite cast irons, is found most often in high performance engine blocks or sleeves. When cutting these tuff cast irons it is best to use a feed rate of between .006 and .010 per revolution.

RT322 (General purpose and sleeving)

This is the same insert as RT321, except it has a 1/32" radius. This insert is the best to use for heavy sleeve cutting and can also be used for general machining and counterboring. This larger radius insert will give a smoother finish for a given feed rate when sleeve cutting to allow easier sleeve fitting and closer metal to metal contact for heat transfer. It is possible to use a feed rate that is 30% faster with the RT322 compared with the RT321 and still obtain the same finish. The 1/32" radius is stronger than the 1/64 radius of the RT321. The RT322 should always be used for heavy sleeve cuts unless the finish part requires the smaller radius for clearance or you are cutting a long bore. The larger radius creates more tool pressure than the small radius. The increased tool pressure may cause chatter in the finish if machining very long bores. A feed rate of .006 - .012 per revolution should be used to obtain a typical surface finish. When machining large counter bores typically found in Cummins or Cat Blocks, a feed rate of .002 - .004/rev. should be used. When cutting gray cast iron use a speed in the 800 – 1200 S.F.P.M. area for best productivity and tool life.

When cutting nodular, ductile, or compacted graphite cast iron the speed should be in the 200 – 400 S.F.P.M. area – 300 RPM on a 4" diameter bore. Nodular, ductile, or compacted graphite cast irons, is found most often in high performance engine blocks or sleeves. When cutting these tuff cast irons it is best to use a feed rate of between .006 and .010 per revolution.

RT211 (General purpose and sleeving)

A 1/4" IC triangular insert with a black ceramic coating and 1/64" cutting radius. The 1/64" radius should be used when machining to a step where the mating part requires a smaller radius to eliminate an interference problem. If you are machining a long bore where the spindle must be extended towards the limits of its travel or if a long stub bar is being used, the 1/64" radius will minimize the possibility of chatter. A feed rate of .002 - .005 should be used to obtain a typical surface finish. When machining large counter bores typically found in Cummins or Cat Blocks, a feed rate of .002 - .004/rev. should be used. When cutting gray cast iron use a speed in the 800 – 1200 S.F.P.M. area for best productivity and tool life.

When cutting nodular, ductile, or compacted graphite cast iron the speed should be in the 200 – 400 S.F.P.M. area – 300 RPM on a 4" diameter bore. Nodular, ductile, or compacted graphite cast irons, is found most often in high performance engine blocks or sleeves. When cutting these tuff cast irons it is best to use a feed rate of between .006 and .010 per revolution.

RT212 (General purpose and sleeving)

This is the same insert as RT212, except it has a 1/32" radius. This larger radius insert will give a smoother finish when sleeve cutting to allow easier sleeve fitting and closer metal to metal contact for heat transfer. The 1/32" radius is stronger than the 1/64 radius of the RT321. The RT322 should always be used for sleeve cuts unless the finish part requires the smaller radius for clearance or you are cutting a long bore. The larger radius creates more tool pressure than the small tool radius. The increased tool pressure will create chatter in the finish. A feed rate of .006 - .012 should be used to obtain a typical surface finish. When machining large counter bores typically found in Cummins or Cat Blocks, a feed rate of .002 - .004/rev. should be used. When cutting gray cast iron use a speed in the 800 – 1200 S.F.P.M. area for best productivity and tool life.

When cutting nodular, ductile, or compacted graphite cast iron the speed should be in the 200 – 400 S.F.P.M. area – 300 RPM on a 4" diameter bore. Nodular, ductile, or compacted graphite cast iron, is found most often in high performance engine blocks or sleeves. When cutting these tuff cast irons it is best to use a feed rate of between .006 and .010 per revolution.

RT321F (Precision Counterboring and Finishing)

A 3/8" IC triangular insert with a gold coating and 1/64" cutting radius. The coating gives the best finish results when machining precision counter bores often machined in diesel engine blocks. The 1/64" radius should be used when machining to a step where the mating part requires a smaller radius to eliminate an interference problem. If you are machining a long bore where the spindle must be extended towards the limits of its travel or if a long stub bar is being used, the 1/64" radius will minimize the possibility of chatter. A feed rate of .002 - .005 should be used to obtain a typical surface finish. When machining large counter bores typically found in Cummins or Cat Blocks, a feed rate of .002 - .004/rev. should be used.

When cutting nodular, ductile, or compacted graphite cast iron the speed should be in the 200 – 400 S.F.P.M. area – 300 RPM on a 4" diameter bore. Nodular, ductile, or compacted graphite cast iron, is found most often in high performance engine blocks or sleeves. When cutting these tuff cast irons it is best to use a feed rate of between .006 and .010 per revolution.

RT322F (Precision Counterboring and Finishing)

A 3/8" IC triangular insert with a gold coating and 1/32" cutting radius. The coating gives the best finish results when machining precision counter bores often machined in diesel engine blocks. A feed rate of .004 - .008 should be used to obtain a typical surface finish. When machining large counter bores typically found in Cummins or Cat Blocks, a feed rate of .002 - .004/rev. should be used. When cutting gray cast iron use a speed in the 300 - 800 S.F.P.M. area for best productivity and tool life. Tool life of this insert is significantly less than the RT322.

RT211F (Precision Counterboring and Finishing)

A 1/4" IC triangular insert with a gold coating and 1/64" cutting radius. The coating gives the best finish results when machining precision counter bores often machined in diesel engine blocks. The 1/64" radius should be used when machining to a step where the mating part requires a smaller radius to eliminate an interference problem. If you are machining a long bore where the spindle must be extended towards the limits of its travel or if a long stub bar is being used, the 1/64" radius will minimize the possibility of chatter. A feed rate of .002 - .005 should be used to obtain a typical surface finish. When machining large counter bores typically found in Cummins or Cat Blocks, a feed rate of .002 - .004/rev. should be used. When cutting gray cast iron use a speed in the 300 - 800 S.F.P.M. area for best productivity and tool life. Tool life of this insert is significantly less than the RT211

RT212F (Precision Counterboring and Finishing)

A 1/4" IC triangular insert with a gold coating and 1/32" cutting radius. The coating gives the best finish results when machining precision counter bores often machined in diesel engine blocks. A feed rate of .002 - .005 should be used to obtain a typical surface finish. When machining large counter bores typically found in Cummins or Cat Blocks, a feed rate of .002 - .004/rev. should be used. When cutting

gray cast iron use a speed in the 300 - 800 S.F.P.M. area for best productivity and tool life. Tool life of this insert is significantly less than the RT211.

RS322 (for high speed oversize through boring)

A 3/8" IC, square insert with a black ceramic coating. It is used on Rottler boring machines for through boring when removing .010" (.25mm) - .060" (1.5mm) inches on the diameter. A very economical insert as it has 8 cutting edges. On a 4" (100mm) bore use 1000 - 1200 RPM and a feed rate of .008" (.2mm) - .012" (.3mm) per rev feed rate to obtain the typical surface finish. The insert can also be used for sleeve cuts when a square step is not required. For example, when used on an F80 or F5 machine it can be run at 1000 - 1200 RPM and .005/rev (.12mm) feed rate to remove up to .200" (5mm) on the diameter from a 4.200" (106mm) inch bore.

When cutting nodular, ductile, or compacted graphite cast iron the speed should be in the 200 - 400 S.F.P.M. area - 300 RPM on a 4" diameter bore. Nodular, ductile, or compacted graphite cast iron, is found most often in high performance engine blocks or sleeves. When cutting these tuff cast irons it is best to use a feed rate of between .006 and .010 per revolution.

501-29-6B R4 (for oversize through boring)

A 3/8" IC square insert with a gold titanium coating. It is used for through boring when removing .010" (.25mm)-.060" (1.5mm) inches on the diameter. A very economical insert as it has 8 cutting edges. For best tool life use 500 - 800 S.F.P.M. Use a feed rate of .004 - .010 to obtain the typical surface finish. This insert is most commonly used on older boring machines which are not capable of turning faster than 700 RPM.

6301E (for high speed oversize through boring)

This is a square 3/8" IC, 1/32" Radius, double sided, CBN Insert. These inserts are intended for use on high speed boring on Rottler F80 and F90M series machines. On common cast iron blocks the RPM should be set to achieve 1000 - 2200 S.F.P.M. On harder cast irons the RPM should be reduced to obtain acceptable tool life. A feed rate of .010" - .014" per revolution. They have exceptional long life when removing up to .040" on the diameter. They do not give good tool life on some cast irons with high sulfur content.

501-29-6K (for high speed aluminum boring)

This is a 3/8" IC, triangle insert with a black diamond tip. It has a 1/32" radius. This insert is used to bore aluminum cylinders. It can not be used to bore any other material. It is the best insert for finishing aluminum. For best tool life and finish the insert can be run from 400 - 4000 SFM. Feed rates between .004 and .010 should be used.

Surfacing Inserts

Below are the inserts commonly used on Rottler machines in surfacing/milling applications. Please read carefully.

6303B

A round 3/8" IC, double sided, CBN Insert. An excellent, long life insert for surfacing cast iron heads and blocks -round shape gives many cutting edges on each side of insert. When using a 14" cutterhead (SF, F65, F80) speeds range from 900-1200 RPM. When using an 18" cutterhead speeds range from 600-800 RPM.

6303M

A round 3/8" IC, single sided, PCD Insert. For use on aluminum only - heads and blocks without liners. This insert has a thin layer of PCD applied to a carbide disk. The diamond appears to be a shiny black wafer. The hardness of the diamond resists the abrasive nature of the silica in aluminum heads and blocks. RPM speeds with a 14" cutter range from 900-2000 RPM.

6303U

A round 3/8" IC, single sided, CBN Insert. This insert does an excellent job when cutting hard cast iron blocks and heads of a single material or bi-metal. This insert is the best to use when machining compacted graphite cast iron heads and blocks often found in the performance industry. RPM speeds with a 14" cutter range from 650-750 RPM.

6303K

A round, 3/8" IC, single sided, coated carbide insert. This is a very economical, general purpose insert for surfacing aluminum. It is advisable to use this insert for rough cutting to remove welding or contaminants before. A PCD insert should be used for the final cut to give the super fine finish required for MLS (multi layer steel) head gaskets. RPM speeds with a 14" cutterhead range from 600-1000 RPM.

RS322

A square 3/8" IC carbide insert with a purple ceramic coating. This carbide insert is normally used for high speed boring. It works well as an economical insert for rough surfacing or heavy stock removal of cast iron. A CBN insert should be used for the final finish cut.

6301J

A square 3/8" IC, 1/16" Radius, double sided, CBN Insert. The 1/16" radius of this insert will produce a more accurate (flatter) finish than a round insert typically used for surfacing on F80/F90 Series machines when surfacing large diesel blocks and heads which are high in nickel. The square surfacing insert is intended for F80/F90 applications where it may encounter heavier cuts and greater interrupted cuts. When using an 18" cutter speeds range from 600-800 RPM, and with a 14" cutter speeds range from 900-1200 RPM.

1/2" (12.70mm) Surfacing Inserts**6303P**

A round 1/2" IC, single sided, PCD Insert. For use on aluminum only - heads and blocks without liners. This insert has a thin layer of PCD applied to the top of a carbide disk. The diamond appears to be a shiny black wafer. The hardness of the diamond resists the abrasive nature of the silica in aluminum heads and blocks. RPM speeds with a 14" cutter range from 1000-2000 RPM. Requires the purchase of 1/2" negative rake tool holders. The standard Rottler 3/8" IC tool holders will not hold this insert.

6303Q

A round 1/2" IC double sided, CBN Insert. An excellent insert for machining cast iron heads and blocks. Round shape gives many cutting edges on each side of insert. Requires the purchase of 1/2" negative rake tool holders. The standard Rottler 3/8" IC tool holders will not hold this insert.

Bi-metal Surfacing**Cylinder Heads with Pre-combustion Chambers and Aluminum Blocks with Hard Sleeves**

Cylinder heads with pre-combustion chambers or aluminum engine blocks with cast iron or steel cylinder sleeves are a challenge to cut and most often require a special cutting insert and special cutting technique. There are many different material combinations so there is not one insert that works the best on all applications. Below is information to use as a guide to the best insert to use and some of the required cutting parameters.

Generally the tool life when using any of these inserts in the cutting of bi-metal surfaces will be short when compared to cutting a single material. The cost of the insert per surfacing job will be higher compared with cutting single materials. The customer must incorporate the higher insert cost into the price charged for the surfacing job.

Another excellent alternative to cutting cylinder heads with pre-combustion chambers is to remove the combustion chamber from the head, surface the cylinder head, then use the Rottler Pre-combustion Chamber Re-seating Tool to machine the combustion chamber counterbore back to OEM specification depth. It is fast and economical to use. See Bulletin C49.

Cylinder Heads with Protruding Valve Seats

Some cylinder heads have valve seats that protrude into the head gasket surface. Valve seats are made out of a wide variety of material. Some are very hard or difficult to cut when compared with the aluminum or cast iron head surface. In many cases it is best to cut the valve seat down below the head surface in a seat and guide machine. This takes a few more minutes when cutting the valve seats but it can save a lot of time and minimize tooling cost when surfacing the head.

The following inserts use Rottler 3/8" (9.52mm) Toolholders supplied with Rottler Surfacing Cutterheads;**6303S**

A round 3/8" IC, single sided, CBN Insert. For use on aluminum blocks with iron liners and aluminum heads with steel pre-combustion chambers. When cutting aluminum heads with pre-combustion chambers it is best to use Rottler's spray mist coolant system or Goodson's HPS-10 High Performance Resurfacing Spray. RPM speeds with a 14" cutter range from 650-750 RPM.

6303U

A round 3/8" IC, single sided, CBN Insert. This insert does an excellent job when cutting hard cast iron blocks and heads of a single material or bi-metal. This insert is the best to use when machining compacted graphite cast iron heads and blocks often found in the performance industry. RPM speeds with a 14" cutter range from 650-750 RPM.

6303R

A round 3/8" IC, single sided, CBN Insert. For use on cast iron heads with steel pre-combustion chambers. RPM speed with a 14" cutter range from 600-700 RPM and with an 18" cutter range from 500-600 RPM.

6301I

A square 3/8" IC, double sided, ceramic insert. For use on cast iron heads with pre-combustion chambers. You can make one finish cut and two rough cuts with each new cutting edge. Always use a new edge when making a finish cut. Use 350-500 RPM on a 14" diameter cutterhead. See Bulletin C49

6301V

A round 3/8" IC, double sided, ceramic insert. For use on cast iron heads with pre-combustion chambers. You can make one finish cut and two rough cuts with each new cutting edge. Always use a new edge when making a finish cut. Use 350-500 RPM on a 14" diameter cutterhead. See Bulletin C49

Special Toolholder and Insert;

7202X

Holder Assembly, Fly Cutter Tool 3/8" (9.525mm) IC (for use with special insert for aluminum cylinder heads with pre-combustion chamber and cast iron heads with soft precups like Land Rover) for use with 7202Z insert only

7202Z

Round Insert, 3/8" gold coated for aluminum cylinder heads with pre-combustion chamber and cast iron heads with soft pre-combustion chambers like Land Rover). Use in 7202X tool holder only. RPM speeds with 14" cutter range from 450-550 RPM and with a 16" cutter, 400-500 RPM.

Main Line Boring Inserts

Use the same RT series inserts as defined under cylinder boring. Depending on type of toolholder, either 1/4" IC or 3/8" IC inserts will be required. Commonly 1/64" radius inserts are used for rough or heavy cutting, and 1/32" radius inserts are used for finish boring for a smooth surface finish. In extreme conditions where the material is hard or the tool is extended and prone to chatter, use the 1/64" inserts.

Connecting Rod Inserts

The following inserts are commonly used for boring connecting rods.

RTCR321

A triangular, 3/8 IC, 1/64" radius, silver colored insert. This insert is designed to cut 4140 and other steels that connecting rods are often made of. Cutting speed is critical when using this insert. If the insert is operated at a speed that is too slow the surface finish will not be adequate, the tool life will be shortened, and bore geometry will be compromised. The cutting speed should be 800 – 1300 SFM. Feed rate should be between .001" and .004" per revolution depending on the finish requirements.

When connecting rods made of cast iron, the RT series of inserts should be used.

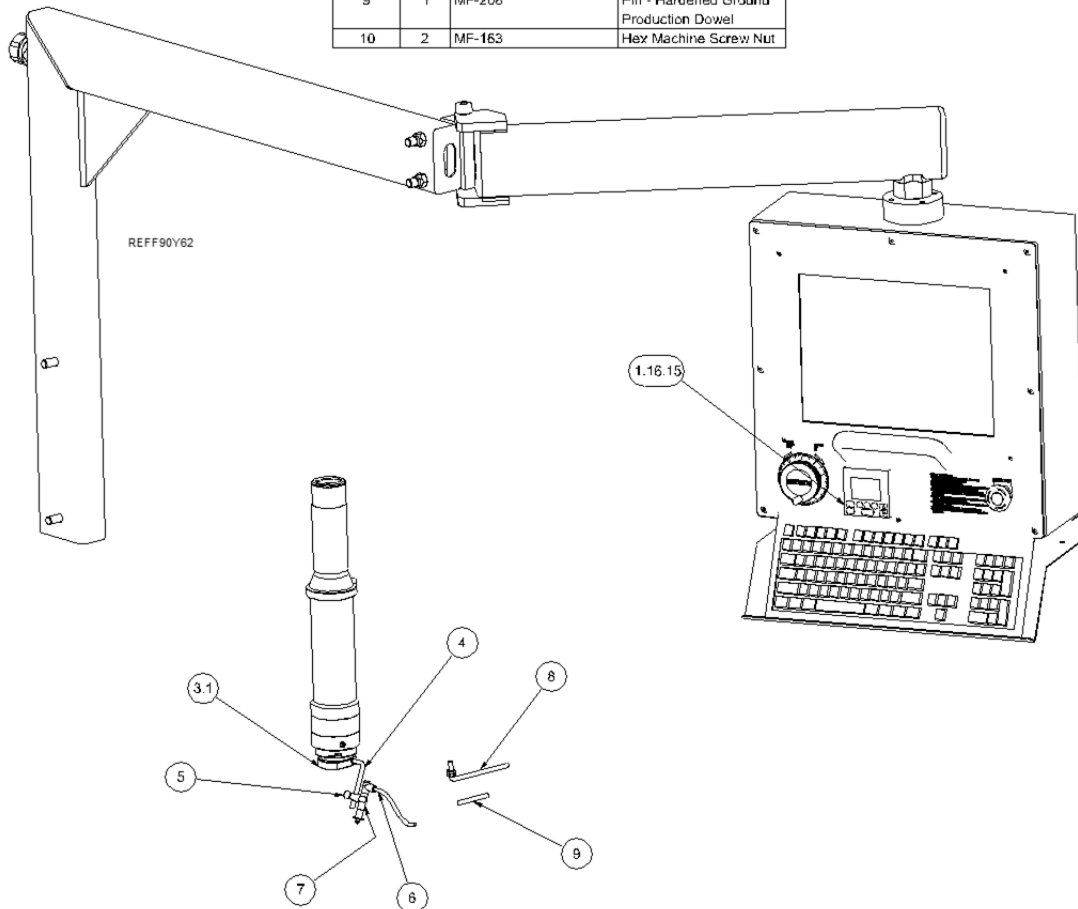
When boring small end bearings made of bronze, the RTF series of inserts should be used.

Measuring and Indicating Devices:

502-12-7B Remote Digital Runout Indicating System:

An optional remote digital indication probe and gauge system is available, to check bore and face runout. The stationary indicator allows easier reading and can be used in the lower bore area where the mechanical indicator cannot be seen. The Digital probe can be used in a considerably smaller bore size relative to the spindle diameter.

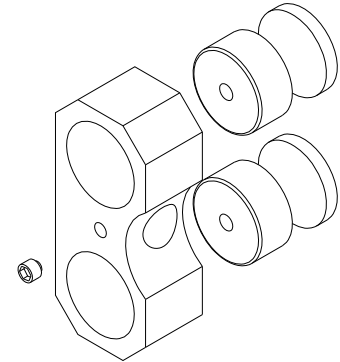
Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1.16.15	1	502-12-7D	Sony LT30 Digital Gage
3	1	502-12-4C	Magnet Holder Assembly w/ Magnets Installed
3.1	1	502-11-39A	Holder, Magnet
3.2	4	502-11-39	Magnet
3.3	4	Magnet Washer	
4	1	502-11-39B	Rod, Adapter Right Angle
5	1	502-11-40	
6	1	502-12-7C	Gage
7	1	502-12-7E	Gage Adapter
8	1	502-11-39Q	Rod, Adapter Right Angle Long
9	1	MF-208	Pin - Hardened Ground Production Dowel
10	2	MF-163	Hex Machine Screw Nut



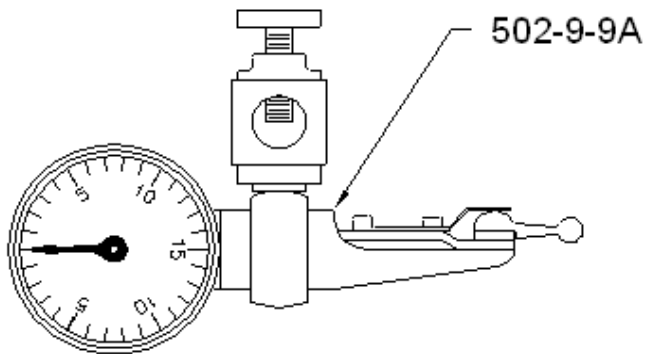
502-12-4A Magnetic Indicator Holder Assembly (requires 502-9-9A Indicator):

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	502-12-4B	Magnet Holder, Indicator Assembly
2	1	502-12-4D	SOCKET SET SCREW, BRASS TIPPED 8-32 X 1/8
3	2	502-11-39	Magnet
4	2	Magnet Washer	

REF8S135-05082006



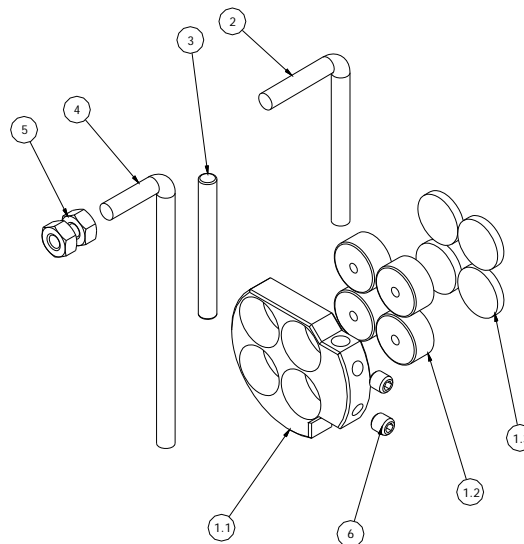
502-9-9A Mechanical Runout Indicator, General Purpose (.001" resolution):



502-12-4 Magnetic Holder Assembly:

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	502-12-4C	Magnet Holder Assembly w/ Magnets Installed
1.1	1	502-11-39A	Holder, Magnet
1.2	4	502-11-39	Magnet
1.3	4	Magnet Washer	
2	1	502-11-39B	Rod, Adapter Right Angle
3	1	ANSI B18.8.2 - 1/4 x 2 1/4	Pin - Hardened Ground Production Dowel
4	1	502-11-39Q	Rod, Adapter Right Angle Long
5	2	ANSI B18.2.2 - 1/4 - 20	Hex Nut
6	2	ANSI B18.3 - 1/4-20 UNC x 0.25	Hexagon Socket Set Screw - Flat Point

REF8S137-05092006

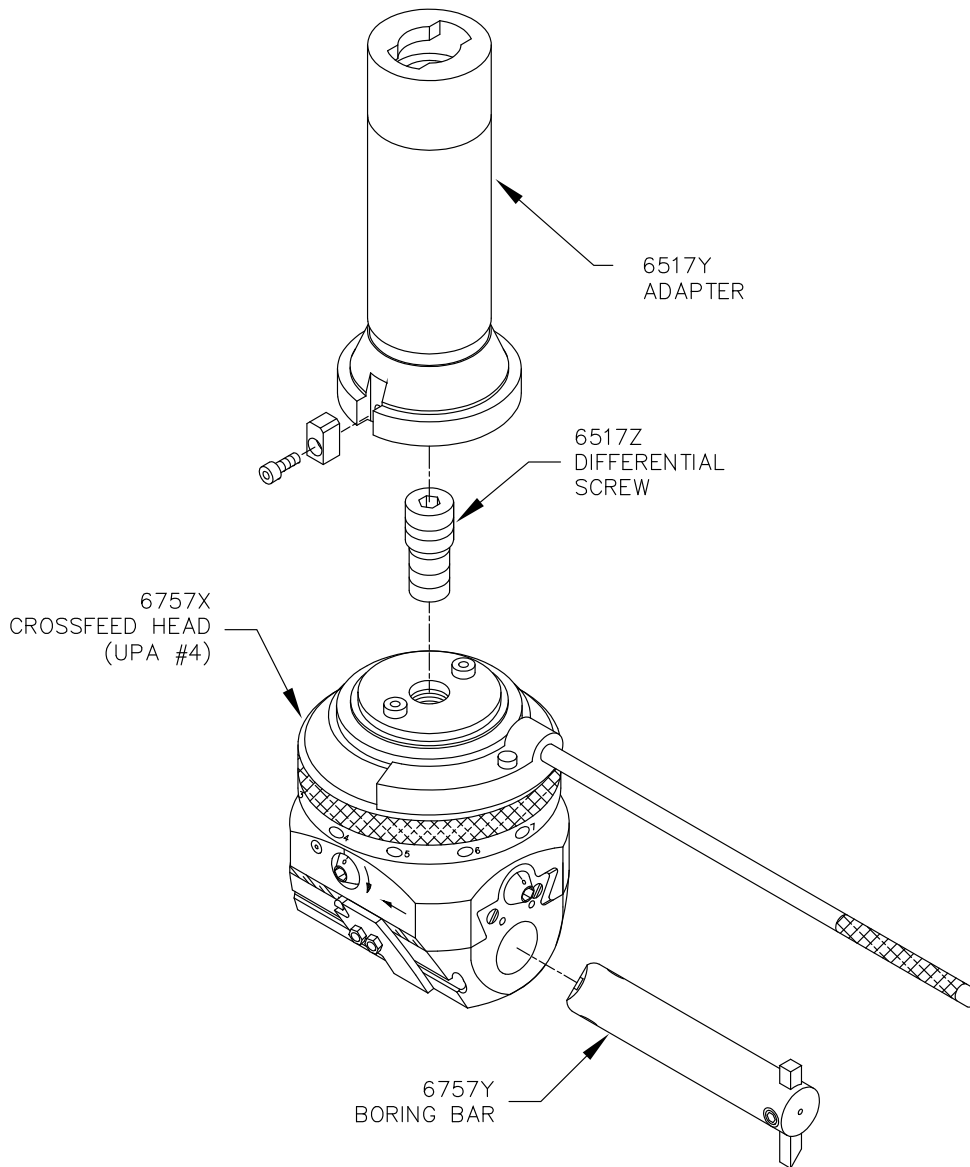


6757Z Cross Feed Head Assembly

The Cross Feed Head is used to machine faces and tapers (chamfers) that are either too wide or inaccessible to our standard counter boring and chamfering tooling packages.

This Cross Feed system is extremely versatile. However, Rottler's standard boring tools are far superior for quick set up and maximum machining performance on standard boring and counter boring operations.

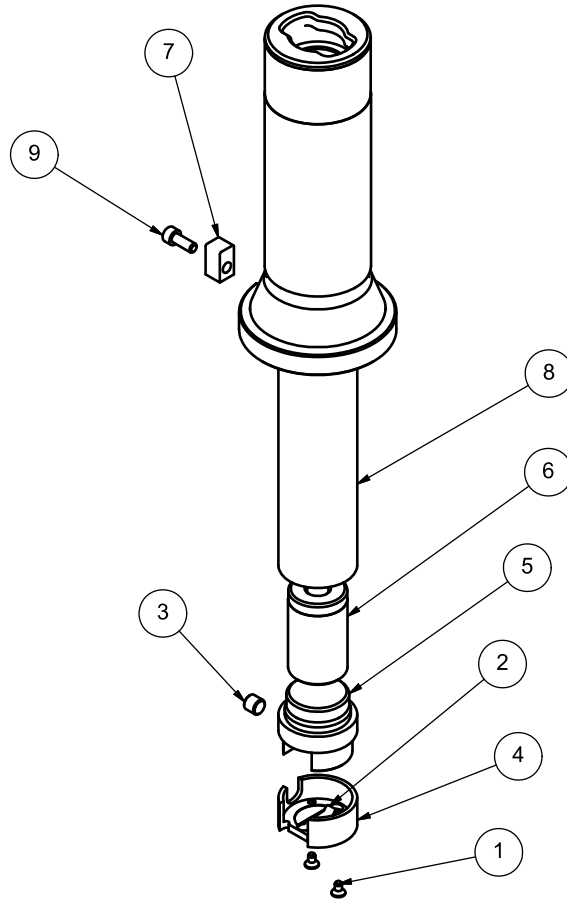
REFFBAC90-121397



1.5" Blind Hole Stub Cutterhead:

6516H With Tooling
6516G Without Tooling

The 1.5" diameter (38mm) stub boring head has a capacity of 1.5" to 4.2" (38mm to 107mm) diameter by 6.5" (165mm) depth.



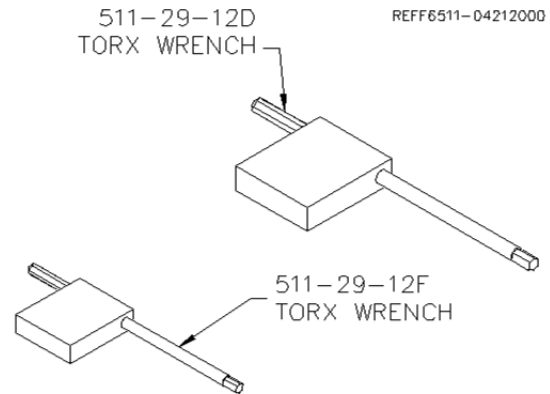
6516G 1-1/2 Stub Bar			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	MF-120A	Socket Flat Head 6-32 UNC x 0.25
2	1	100-1B	Tool Lock Spring
3	1	502-25-1	Tool Holder Lock Screw
4	1	600-5	Cutter Head Cap
5	1	600-7-2D	Lower Body 1-1/2" Stub Bar
6	1	600-8-2	Counter Weight
7	1	6181	DRIVE KEY
8	1	6516F	Adapter - 1-1/2" Stub Bar F-9
9	1	MF-5A	S.H.C.S. 10 - 24 UNC - 1/2

1.5" Standard Tooling:

6801 Series Tool Holders			
Assembly Part #	Tool Holder Part #	Length	Bore Range
6801A*	6800A	1.23"	1.50" – 2.02"
6801B*	6800B	1.44"	1.96" – 2.56"
6801C	6800C	1.65"	2.38" – 2.98"
6801D	6800D	1.85"	2.78" – 3.38"
6801E	6800E	2.05"	3.18" – 3.78"
6801F	6800F	2.25"	3.58" – 4.18"

* = ¼" inserts Triangle insert positive rake

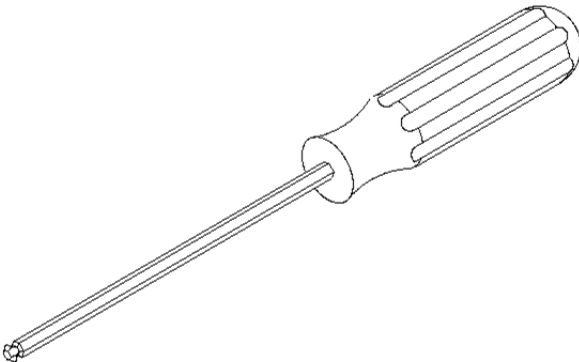
511-29-12D Torx Wrench 511-29-12F Torx Wrench



For use with Torx style screws in Triangle cartridges.

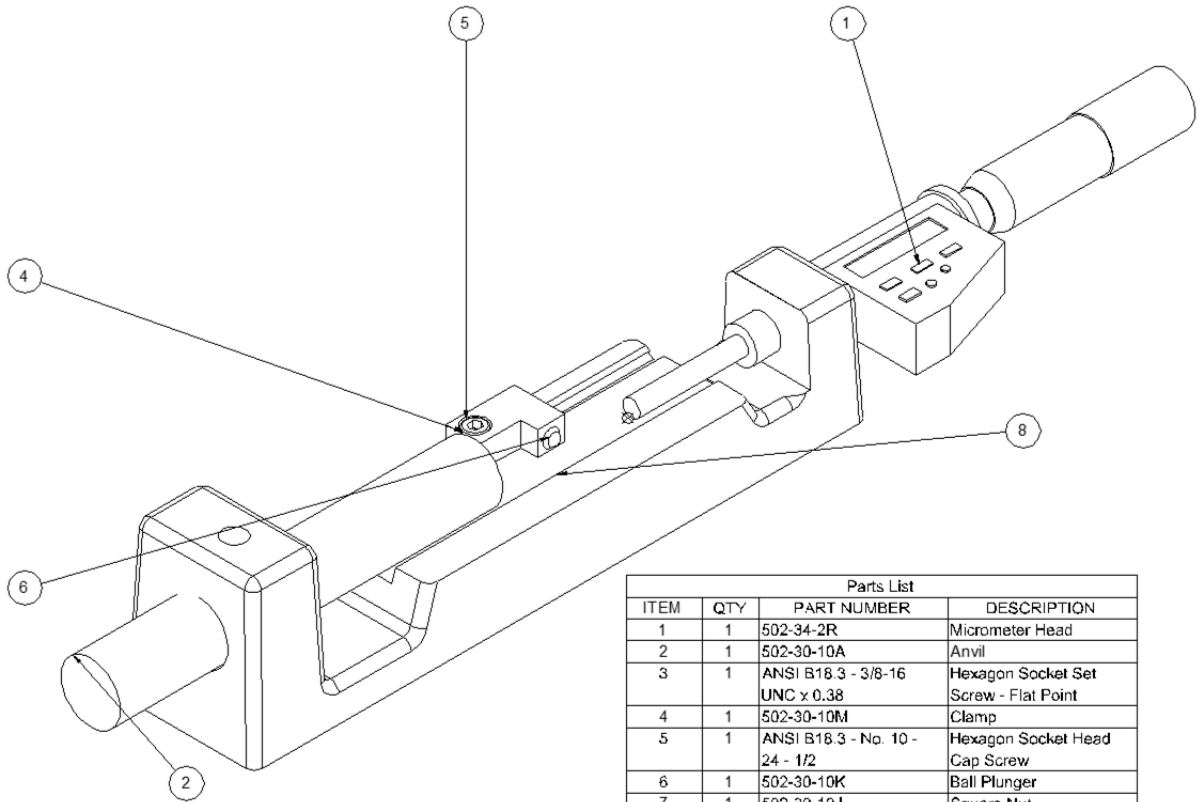
501-72A Hex Driver

REF6512-0422X000



900-2-19 Micrometer Assembly:

1.5: - 4.1"



Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	502-34-2R	Micrometer Head
2	1	502-30-10A	Anvil
3	1	ANSI B18.3 - 3/8-16 UNC x 0.38	Hexagon Socket Set Screw - Flat Point
4	1	502-30-10M	Clamp
5	1	ANSI B18.3 - No. 10 - 24 - 1/2	Hexagon Socket Head Cap Screw
6	1	502-30-10K	Ball Plunger
7	1	502-30-10J	Square Nut
8	1	502-30-10B	Micrometer Frame

2 7/8" Blind Hole Stub Cutterhead:

6519Z With Tooling

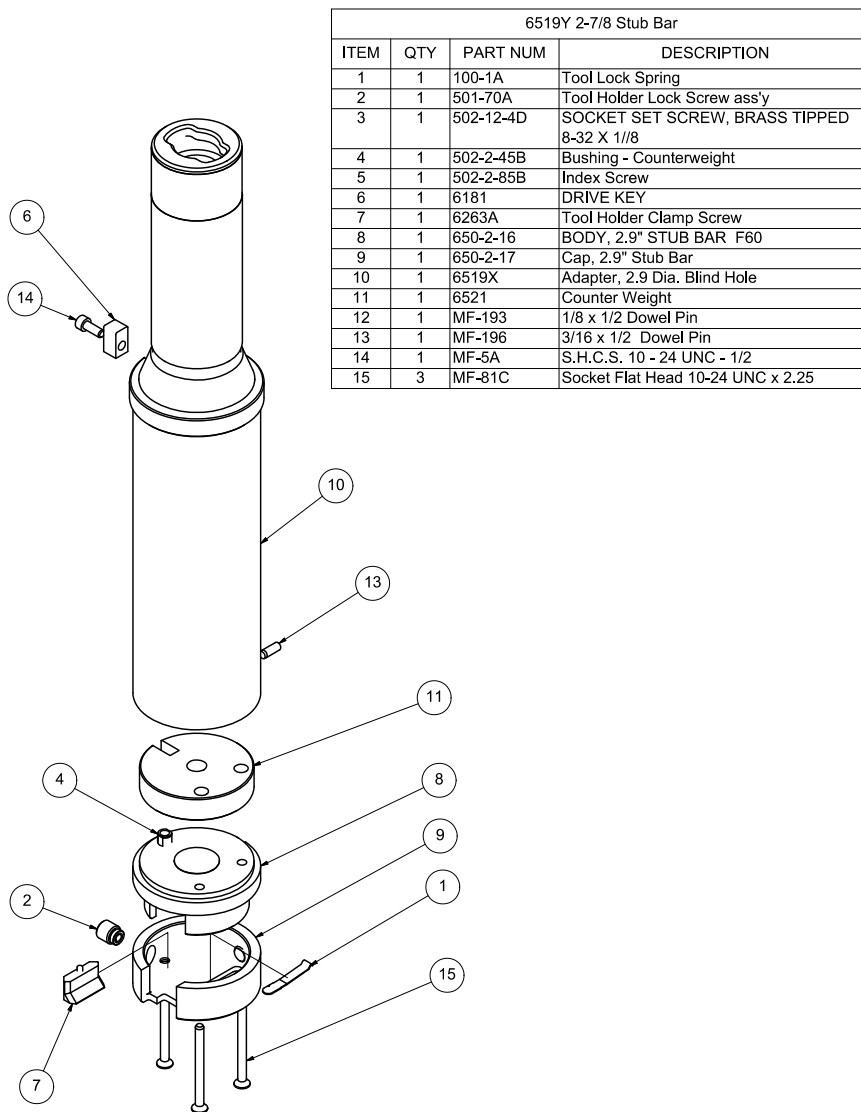
6519Y Without Tooling

The Production Stub Boring Head has a capacity of 2.90" to 5.00" (74mm to 127mm) to 9.7" (246mm) deep. This cutterhead eliminates the need to remove the tool every time you center the spindle in a new bore.



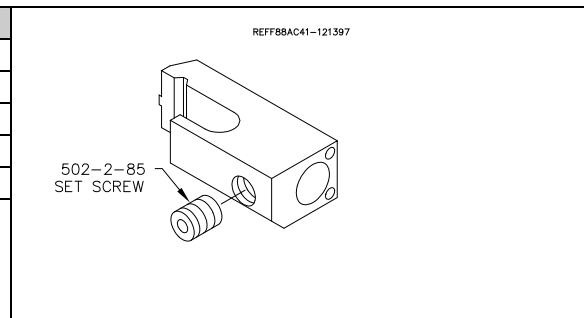
Be sure that this head does not interfere with lower extremities of the block, such as bosses and hubs.

The cutterhead is designed to clear most all obstructions in U.S. passenger car and truck engines.

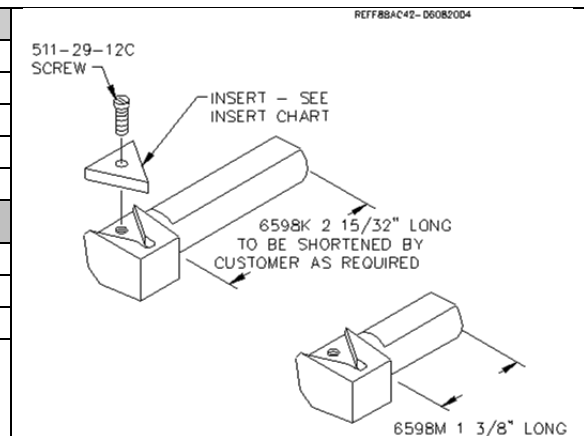


2 7/8" Cutterhead Standard Tooling:

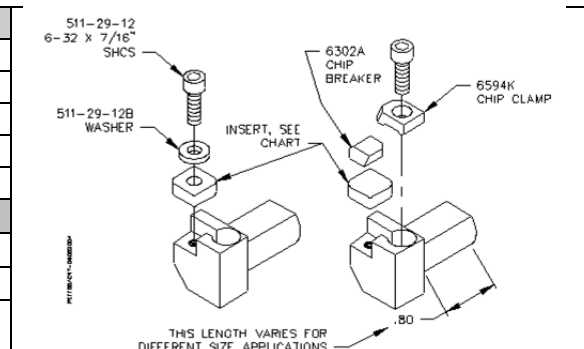
6520 Series Tool Holders	
Tool Holder	Length
6520H	2.25"
6520A	2.37"
6520B	2.62"
6520C	2.87"



6598 Series Tool Bit when used with 6520 Holders		
Tool Bit	Tool Holder	Bore Range
6598M	6520H	3.38" – 3.63"
6598M	6520A	3.63" – 4.00"
6598K	6520B	4.00" – 4.50"
6598K	6520C	4.50" – 5.00"
Standard Inserts		
RT322	3/8 IC TRIANGLE 1/32 RADIUS	
RT321	3/8 IC TRIANGLE 1/64 RADIUS	

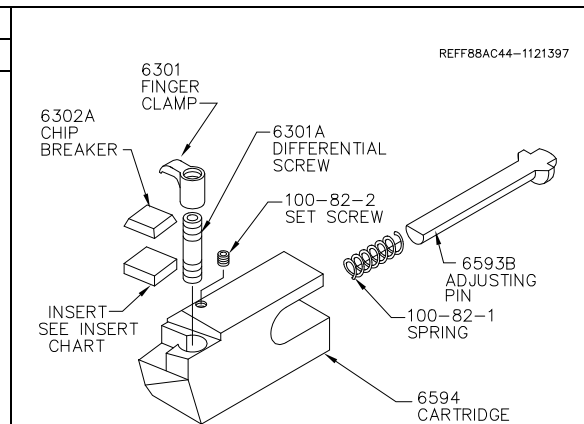


6260 Series Tool Bit when used with 6520 Holders		
Tool Bit	Tool Holder	Bore Range
6260M	6520H	3.38" – 3.63"
6260M	6520A	3.63" – 4.00"
6260L	6520B	4.00" – 4.50"
6260L	6520C	4.50" – 5.00"
Standard Inserts		
RS322	Sq. insert neg rake 1/32 Radius	



6594 Cartridge Tool Holder:

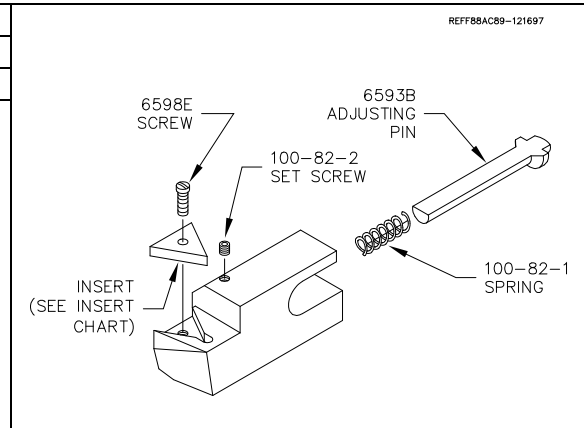
Bore Range
2.90" – 3.40"
Square insert negative rake



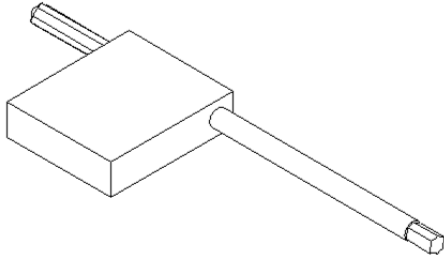
Cartridge Tool Holders:

Tool Holder	Length	Bore Range
6593C	2.03"	2.90" – 3.40"
6593D	2.25"	3.40" – 3.90"

Triangle insert positive rake

**511-29-12D Torx Wrench**

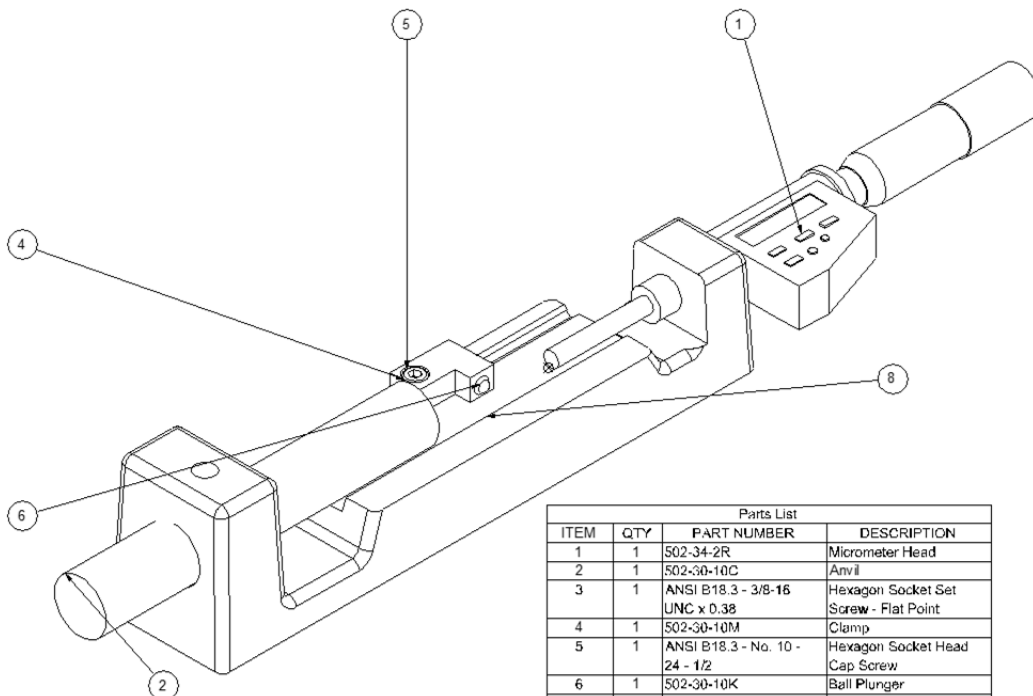
For use with Torx style screw in Triangle cartridges.



REF8S95-06082004

900-2-20 Micrometer Assembly:

2.6" to 5.0" Diameter



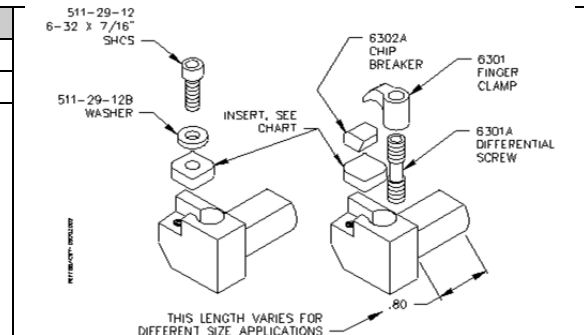
Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	502-34-2R	Micrometer Head
2	1	502-30-10C	Anvil
3	1	ANSI B18.3 - 3/8-16 UNC x 0.38	Hexagon Socket Set Screw - Flat Point
4	1	502-30-10M	Clamp
5	1	ANSI B18.3 - No. 10 - 24 - 1/2	Hexagon Socket Head Cap Screw
6	1	502-30-10K	Ball Plunger
7	1	502-30-10J	Square Nut
8	1	502-30-10B	Micrometer Frame

6519Z Optional Tooling:

Offset Tool Holders:

6260 Series Tool Bit when used with 6520 Holders	
Tool Bit	Bore Range
6260W	3.78" – 5.24"

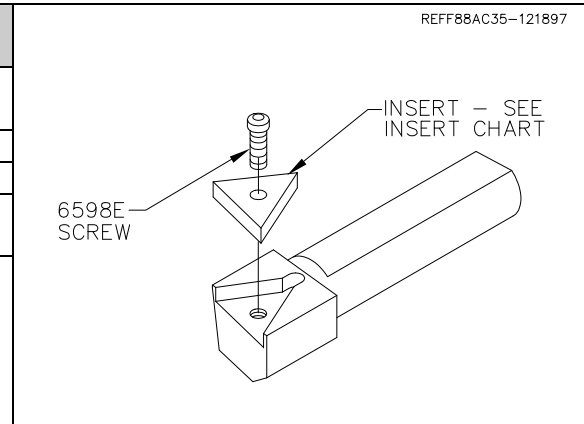
Square insert negative rake



Chamfering Tool Holders:

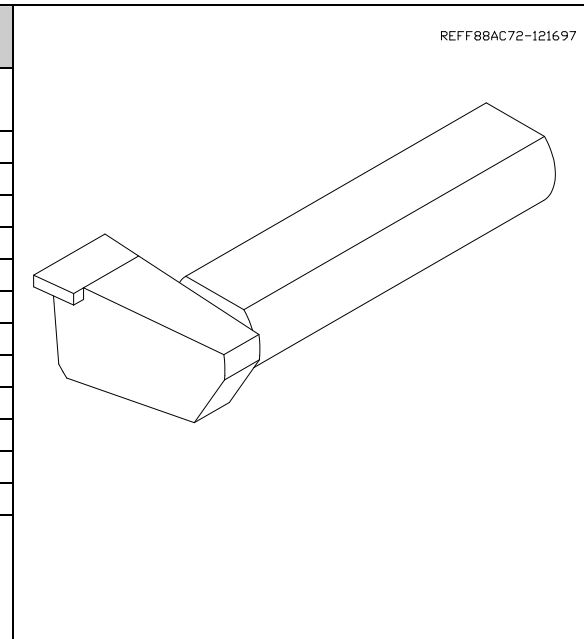
6747 Series Chamfering Tool Bits when used with 6520 Holders		
Tool Bit	Chamfer Angle	Bore Range
6747F	20	3.10" – 5.00"
6747G	15	3.30" – 5.00"
6747M	20	3.45" – 5.00"
6747H	30	

Triangle insert positive rake



Grooving Tool Bits:

6513 Series Grooving Tool Bits when used with 6520 Holders			
Tool Bit	Groove DIA.	Tool Holder	Bore Range
6513J	.037"	6520H	3.55" – 3.95"
6513J	.037"	6520A	3.95" – 4.45"
6513J	.037"	6520B	4.45" – 4.85"
6513L	.039"	6520H	3.55" – 3.95"
6513L	.039"	6520A	3.95" – 4.45"
6513L	.039"	6520B	4.45" – 4.85"
6513N	.060"	6520H	3.55" – 3.95"
6513N	.060"	6520A	3.95" – 4.45"
6513N	.060"	6520B	4.45" – 4.85"
6513P	.085"	6520H	3.55" – 3.95"
6513P	.085"	6520A	3.95" – 4.45"
6513P	.085"	6520B	4.45" – 4.85"



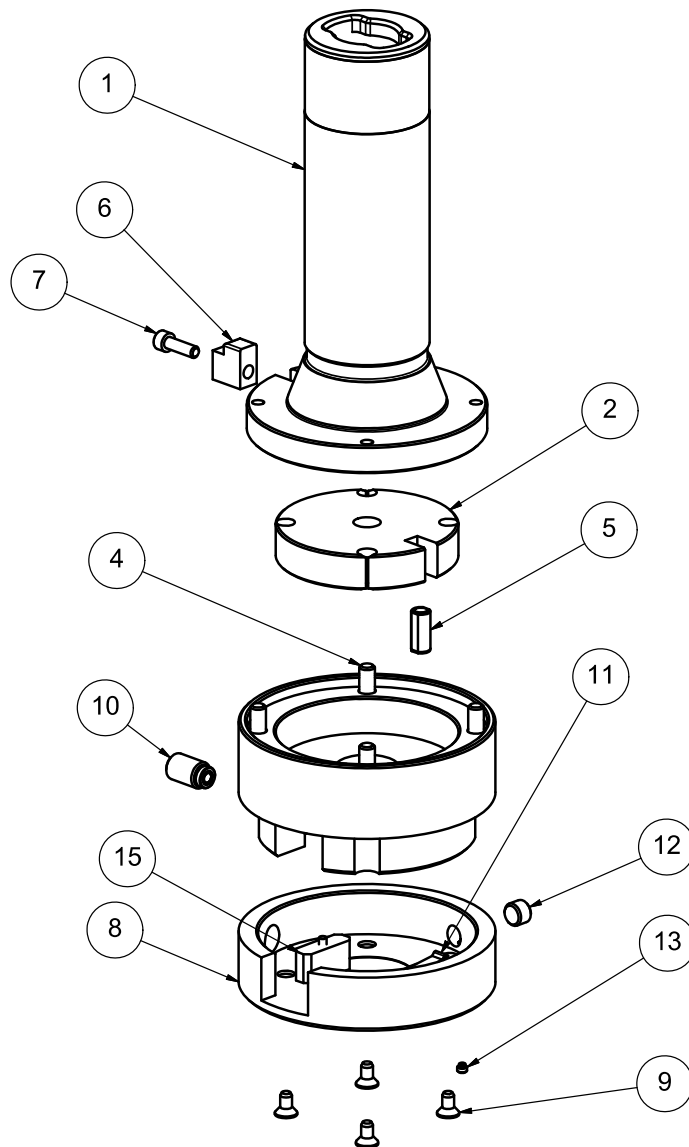
4-1/2" Blind Hole Cutterhead

6256Q With Tooling
6256P Without Tooling

This Cutterhead has a standard bore capacity of 4.50" to 9.0" (114mm – 228mm).



Be sure that this head does not interfere with lower extremities of the block, such as bosses and hubs.



6256P 4-1/2" DIA. CUTTERHEAD			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6256M	Adapter - 7-3/4" Blind Hole Stub bar
2	1	600-20-11	Counter Weight
3	1	6256L	BODY, CUTTERHEAD 4.50" (NO CENTERING)
4	4	MF-15	S.H.C.S. 1/4 - 20 UNC - 1
5	1	502-2-45B	Bushing - Counterweight
6	1	6181A	Drive Key
7	1	MF-5	S.H.C.S. 10 - 24 UNC - 5/8
8	1	6256N	Cap, Cutterhead 4.50" (No Centering)
9	4	MF-78	Socket Flat Head 10-24 UNC x 0.375
10	1	501-70	Tool Holder lock Screw ass'y
11	1	100-1E	Tool Lock Spring
12	1	502-2-85B	Index Screw
13	1	502-12-4D	SOCKET SET SCREW, BRASS TIPPED 8-32 X 1/8
14	1	MF-193	1/8 x 1/2 Dowel Pin
15	1	6263B	Clamp Shoe (Tool Holder)

4 1/2" Blind Hole Cutterhead Standard Tooling:

6259 Series Tool Holders	
Tool Holder	Length
6259P	3.13"
6259C	3.37"
6259D	3.62"
6259I	3.87"
6259E	4.13"
6259F	4.62"
6259G	5.13"

Diagram showing a 6259 Series Tool Holder with a 502-2-85 SET SCREW. Reference: REFF88AC41-121397.

6598 Series Tool Bit when used with 6259 Holders		
Tool Bit	Tool Holder	Bore Range
6598M	6259P	4.50" – 5.00"
6598M	6259C	5.00" – 5.50"
6598K	6259D	5.50" – 6.00"
6598K	6259I	6.00" – 6.50"
6598K	6259E	6.50" – 7.00"
6598K	6259F	7.00" – 8.00"
6598K	6259G	8.00" – 9.00"

Diagram showing the assembly of a 6598 Series Tool Bit with a 511-29-12C SCREW and an INSERT. Reference: REFF88AC42-06082004. Dimensions: 6598K 2 15/32" LONG TO BE SHORTENED BY CUSTOMER AS REQUIRED; 6598M 1 3/8" LONG.

Standard Inserts	
RT322	3/8 IC TRIANGLE 1/32 RADIUS
RT321	3/8 IC TRIANGLE 1/64 RADIUS

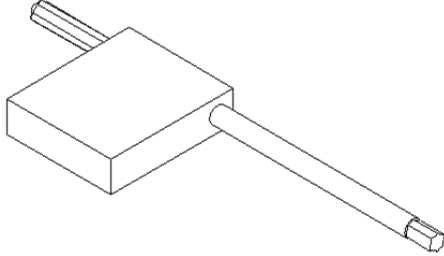
6260 Series Tool Bit when used with 6259 Holders		
Tool Bit	Tool Holder	Bore Range
6260M	6259P	4.50" – 5.00"
6260M	6259C	5.00" – 5.50"
6260L	6259D	5.50" – 6.00"
6260L	6259I	6.00" – 6.50"
6260L	6259E	6.50" – 7.00"
6260L	6259F	7.00" – 8.00"
6260L	6259G	8.00" – 9.00"

Diagram showing the assembly of a 6260 Series Tool Bit with a 511-29-12 6-32 x 7/16" SHCS, 511-29-12B WASHER, 6302A CHIP BREAKER, and 6594K CHIP CLAMP. Reference: REFF88AC42-06082004. Dimension: .80. Note: THIS LENGTH VARIES FOR DIFFERENT SIZE APPLICATIONS.

Standard Inserts	
RS322	Sq. insert neg rake 1/32 Radius

511-29-12D Torx Wrench

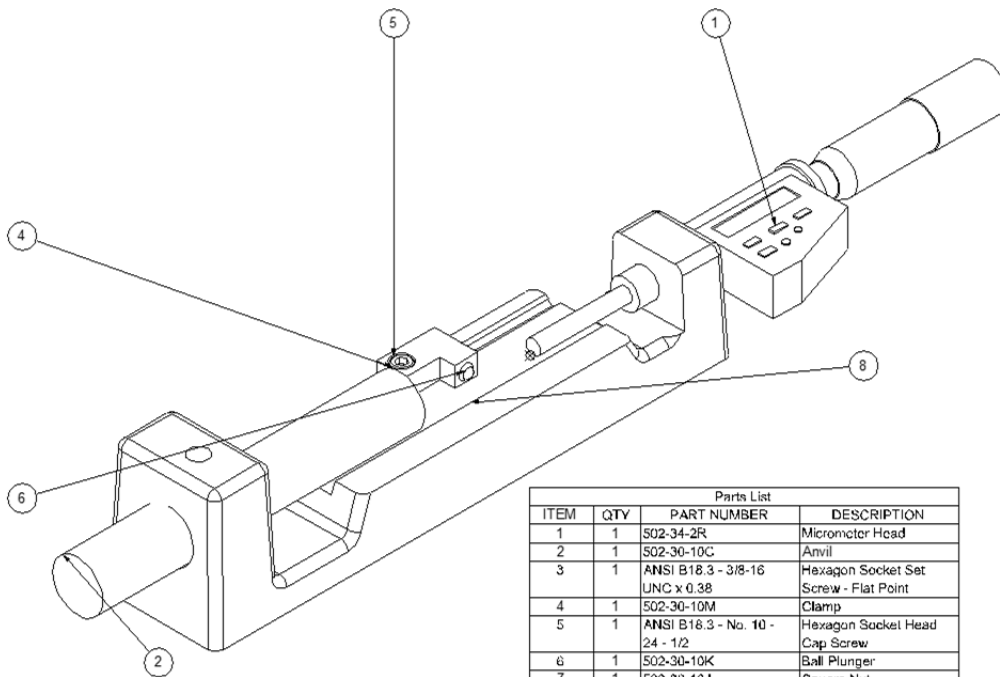
For use with Torx style screw in Triangle cartridges.



REF8S95-06082004

900-2-20 Micrometer Assembly:

2.9" – 6.0" and 6.0" – 9.0" Diameter

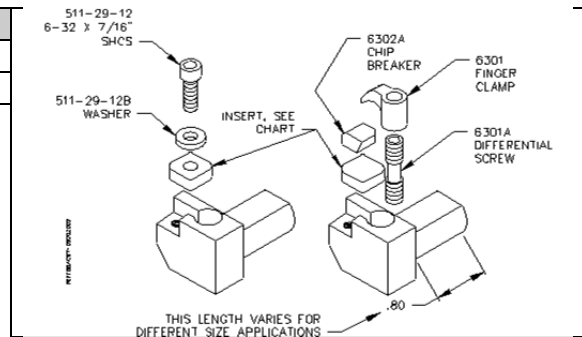


Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	502-34-2R	Micrometer Head
2	1	502-30-10C	Anvil
3	1	ANSI B18.3 - 3/8-16 UNC x 0.38	Hexagon Socket Set Screw - Flat Point
4	1	502-30-10M	Clamp
5	1	ANSI B18.3 - No. 10 - 24 - 1/2	Hexagon Socket Head Cap Screw
6	1	502-30-10K	Ball Plunger
7	1	502-30-10J	Square Nut
8	1	502-30-10B	Micrometer Frame

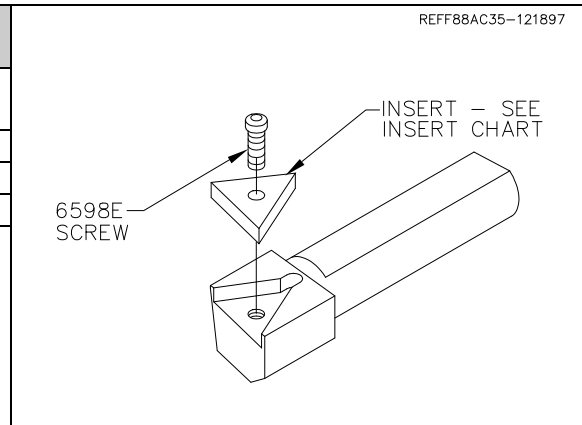
6256Q Optional Tooling:

Offset Tool Holders:

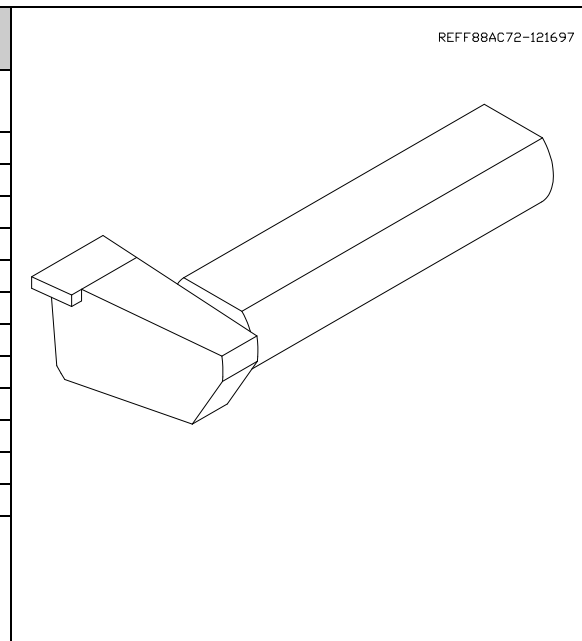
6260 Series Tool Bit when used with 6520 Holders	
Tool Bit	Bore Range
6260W	3.78" – 5.24"
Square insert negative rake	

**Chamfering Tool Holders:**

6747 Series Chamfering Tool Bits when used with 6520 Holders		
Tool Bit	Chamfer Angle	Bore Range
6747F	30	3.10" – 5.00"
6747G	20	3.30" – 5.00"
6747M	15	3.45" – 5.00"
Triangle insert positive rake		

**Grooving Tool Bits:**

6513 Series Grooving Tool Bits when used with 6520 Holders			
Tool Bit	Groove DIA.	Tool Holder	Bore Range
6513J	.037"	6520H	3.55" – 3.95"
6513J	.037"	6520A	3.95" – 4.45"
6513J	.037"	6520B	4.45" – 4.85"
6513L	.039"	6520H	3.55" – 3.95"
6513L	.039"	6520A	3.95" – 4.45"
6513L	.039"	6520B	4.45" – 4.85"
6513N	.060"	6520H	3.55" – 3.95"
6513N	.060"	6520A	3.95" – 4.45"
6513N	.060"	6520B	4.45" – 4.85"
6513P	.085"	6520H	3.55" – 3.95"
6513P	.085"	6520A	3.95" – 4.45"
6513P	.085"	6520B	4.45" – 4.85"



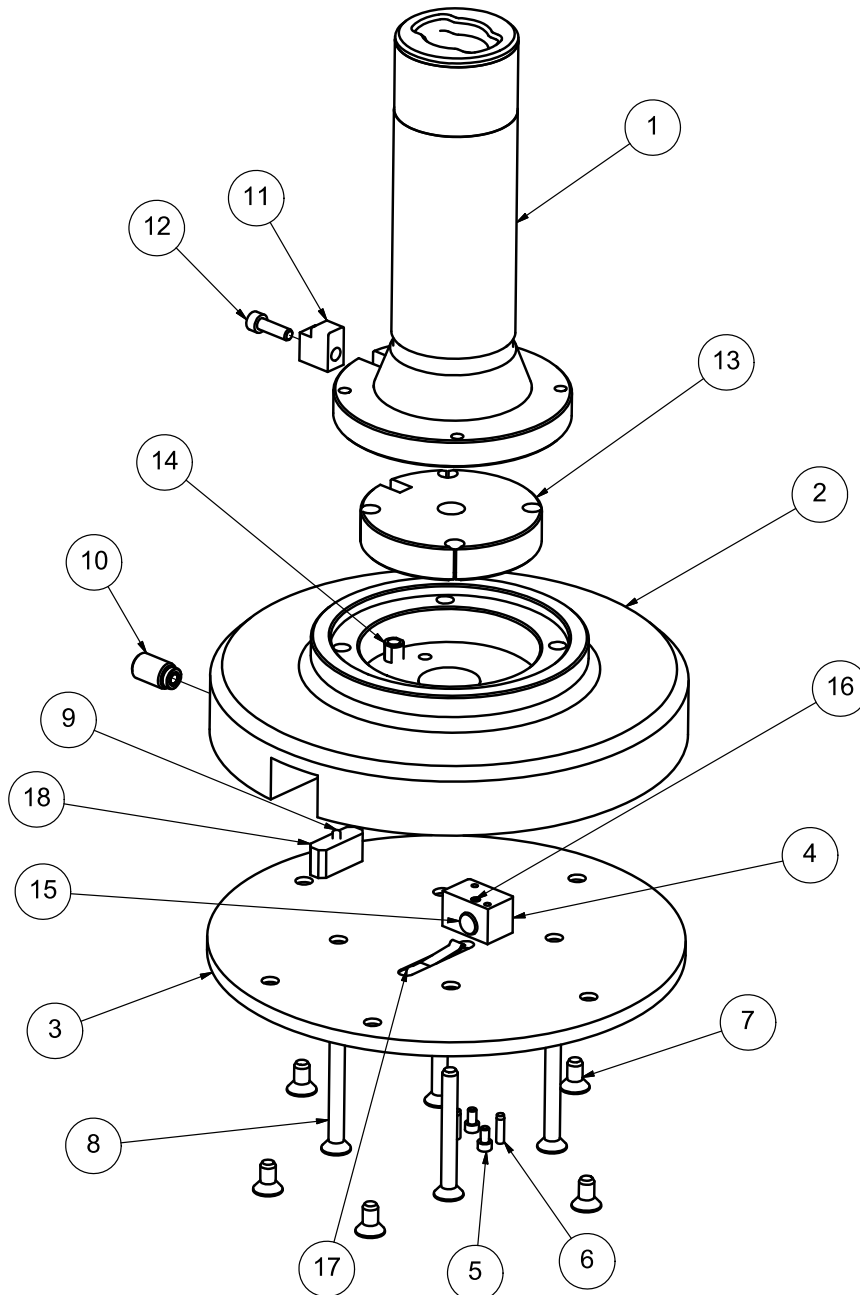
8.0" Blind Hole Cutterhead

6464J With Tooling
6464H Without Tooling

The Blind Hole Cutterhead has a standard bore capacity of 8.0" to 14.0" (203mm – 360mm).

CAUTION

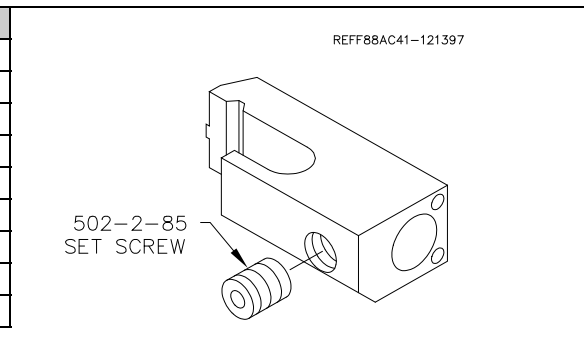
Be sure that this head does not interfere with lower extremities of the block, such as bosses and hubs.



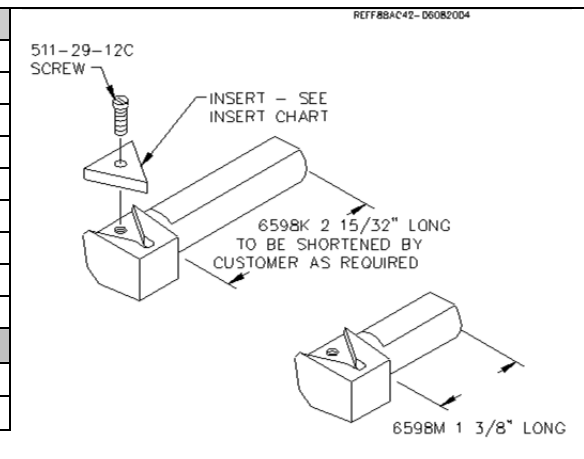
6464H 7-3/4" DIA. CUTTERHEAD			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6256M	Adapter - 7-3/4" Blind Hole Stub bar
2	1	6466A	Cutter Head, 7.75 Dia (No Centering)
3	1	6469A	Cap, 7.75 Dia Cutter Head (No Centering)
4	1	6468	Plug, Cutterhead
5	2	MF-1A	S.H.C.S. No. 6 - 32 UNC - 1/4
6	2	MF-193	1/8 x 1/2 Dowel Pin
7	5	MF-82	Socket Flat Head 1/4-20 UNC x 0.5
8	4	MF-83A	Socket Flat Head 1/4-20 UNC x 2.25
9	1	MF-193	1/8 x 1/2 Dowel Pin
10	1	501-70	Tool Holder lock Screw ass'y
11	1	6181A	Drive Key
12	1	MF-5	S.H.C.S. 10 - 24 UNC - 5/8
13	1	600-20-11	Counter Weight
14	1	502-2-45B	Bushing - Counterweight
15	1	6468A	Adjusting Screw
16	1	100-82-2	Set Screw, brass tipped
17	1	100-1E	Tool Lock Spring
18	1	6263B	Clamp Shoe (Tool Holder)

8.0" Blind Hole Cutterhead Standard Tooling:

6259 Series Tool Holders	
Tool Holder	Length
6259C	3.37"
6259D	3.62"
6259I	3.87"
6259E	4.13"
6259F	4.62"
6259G	5.13"
6259H	5.62"
6259J	6.13"

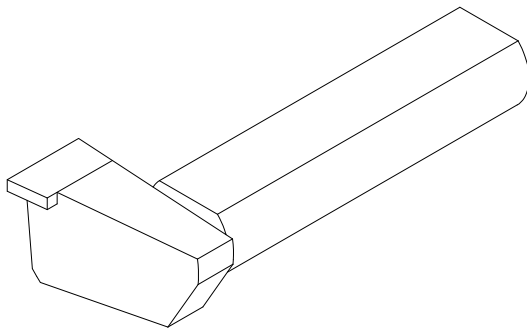


6598 Series Tool Bit when used with 6259 Holders		
Tool Bit	Tool Holder	Bore Range
6598K	6259C	8.00" – 8.25"
6598K	6259D	8.25" – 8.75"
6598K	6259I	8.75" – 9.25"
6598K	6259E	9.25" – 10.25"
6598K	6259F	10.25" – 11.25"
6598K	6259G	11.25" – 12.25"
6598K	6259H	12.25" – 13.25"
6598K	6259J	13.25" – 14.25"
Standard Inserts		
RT322	3/8 IC TRIANGLE 1/32 RADIUS	
RT321	3/8 IC TRIANGLE 1/64 RADIUS	



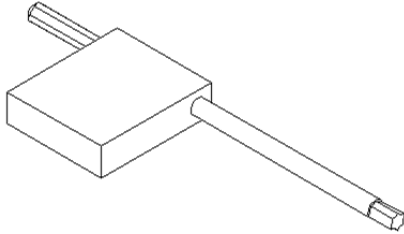
6513D Offset Tool Bit:

REFFB8AC72-121697



511-29-12D Torx Wrench

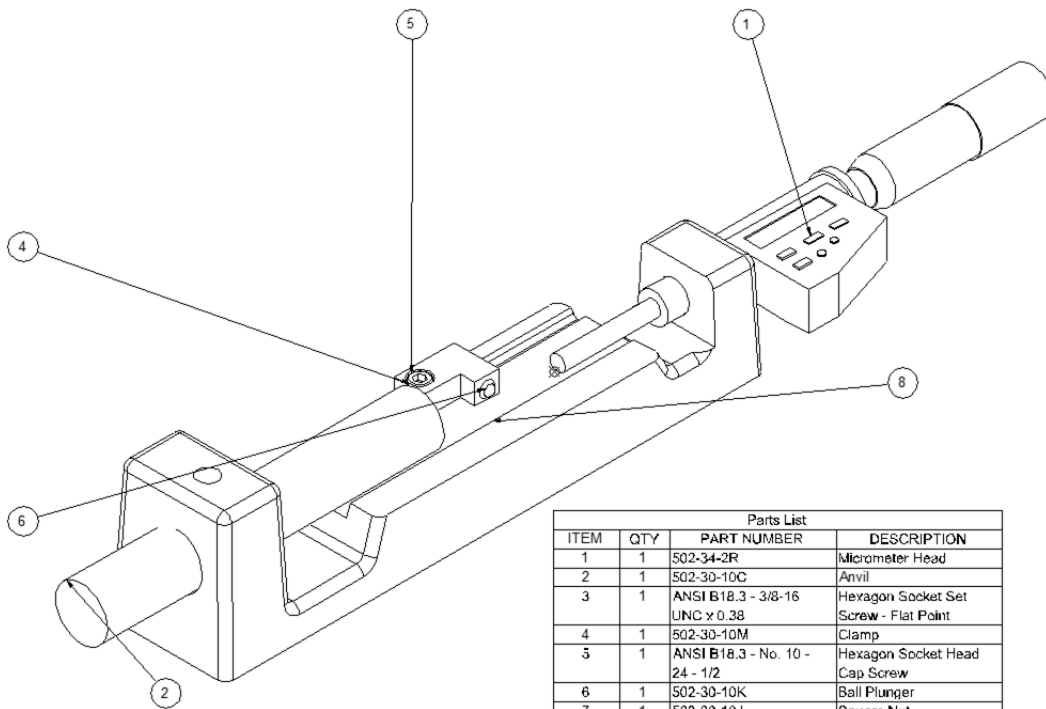
For use with Torx style screw in Triangle cartridges.



REF8595-06082004

900-2-20 Micrometer Assembly:

8.0" – 11.0" and 11.0" – 14.0" Diameter

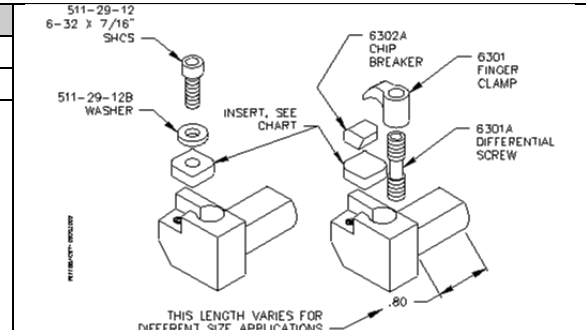


Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	502-34-2R	Micrometer Head
2	1	502-30-10C	Anvil
3	1	ANSI B18.3 - 3/8-16 UNC x 0.38	Hexagon Socket Set Screw - Flat Point
4	1	502-30-10M	Clamp
5	1	ANSI B18.3 - No. 10 - 24 - 1/2	Hexagon Socket Head Cap Screw
6	1	502-30-10K	Ball Plunger
7	1	502-30-10J	Square Nut
8	1	502-30-10B	Micrometer Frame

8.0" Blind Hole Cutterhead **Optional Tooling:**

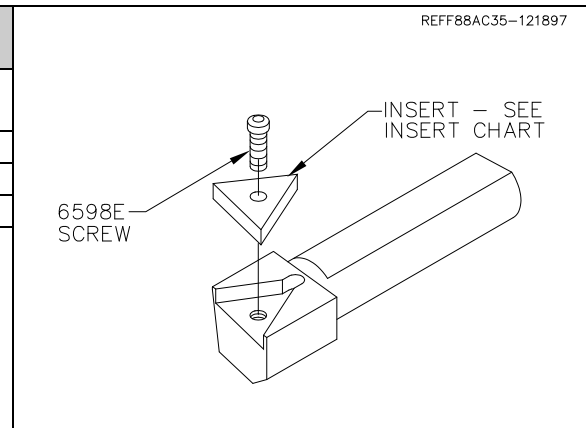
Offset Tool Holders:

6260 Series Tool Bit when used with 6520 Holders	
Tool Bit	Bore Range
6260W	3.78" – 5.24"
Square insert negative rake	



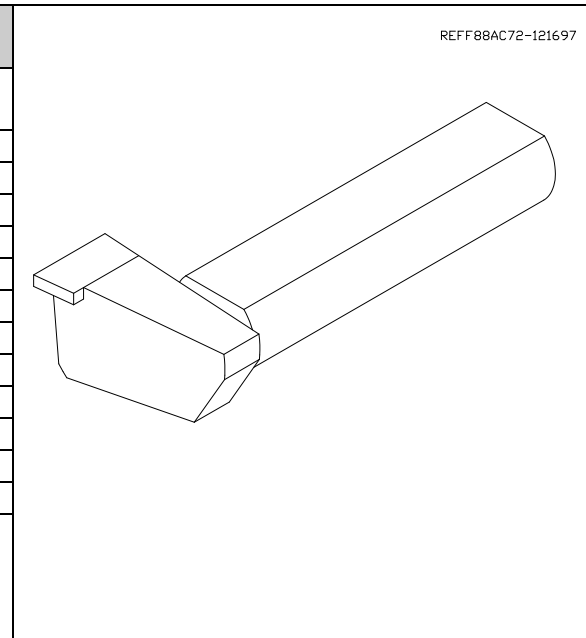
Chamfering Tool Holders:

6747 Series Chamfering Tool Bits when used with 6520 Holders		
Tool Bit	Chamfer Angle	Bore Range
6747F	30	3.10" – 5.00"
6747G	20	3.30" – 5.00"
6747M	15	3.45" – 5.00"
Triangle insert positive rake		



Grooving Tool Bits:

6513 Series Grooving Tool Bits when used with 6520 Holders			
Tool Bit	Groove DIA.	Tool Holder	Bore Range
6513J	.037"	6520H	3.55" – 3.95"
6513J	.037"	6520A	3.95" – 4.45"
6513J	.037"	6520B	4.45" – 4.85"
6513L	.039"	6520H	3.55" – 3.95"
6513L	.039"	6520A	3.95" – 4.45"
6513L	.039"	6520B	4.45" – 4.85"
6513N	.060"	6520H	3.55" – 3.95"
6513N	.060"	6520A	3.95" – 4.45"
6513N	.060"	6520B	4.45" – 4.85"
6513P	.085"	6520H	3.55" – 3.95"
6513P	.085"	6520A	3.95" – 4.45"
6513P	.085"	6520B	4.45" – 4.85"



14" Diameter Cutterhead

6587 With Tooling

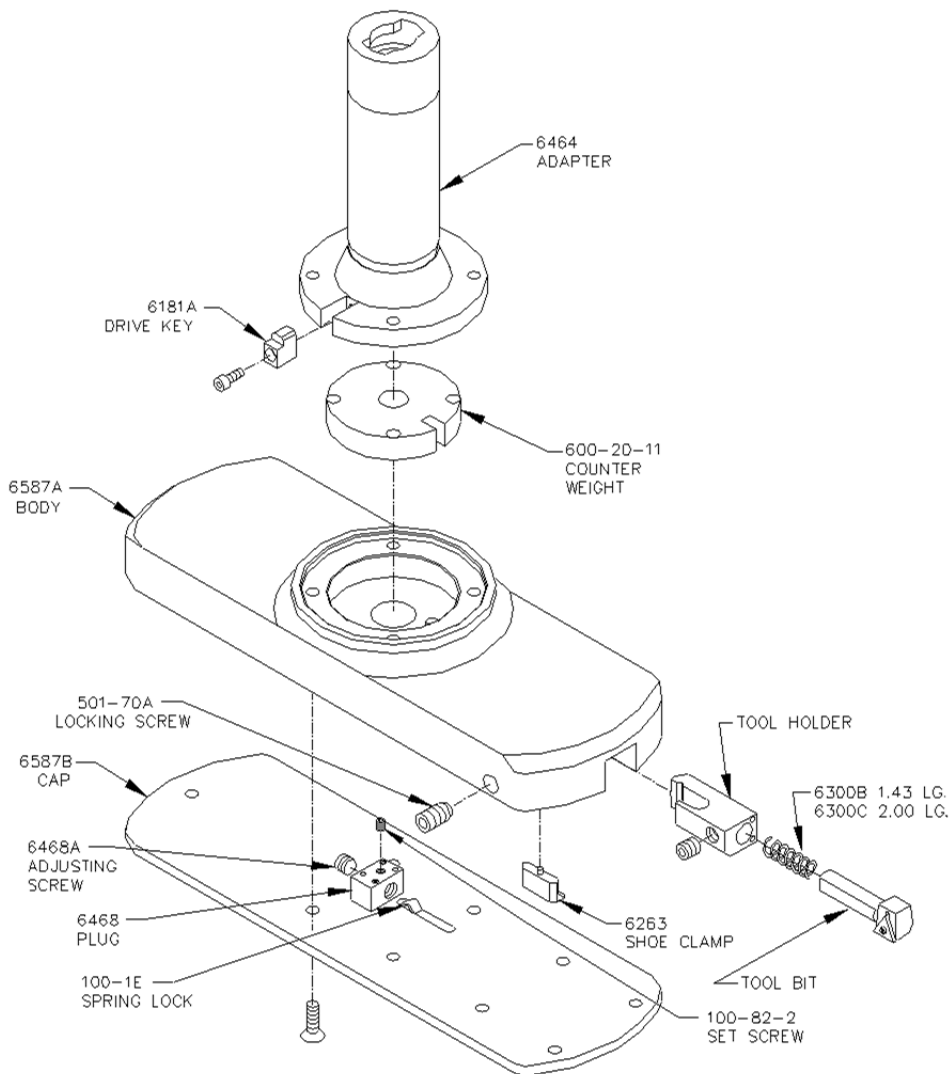
6587D Without Tooling

The 14" cutterhead has a bore capacity of 14.0" to 20.0" diameter.

The large cutterhead is attached in basically the same manner as the smaller cutterheads except that it has no centering fingers.

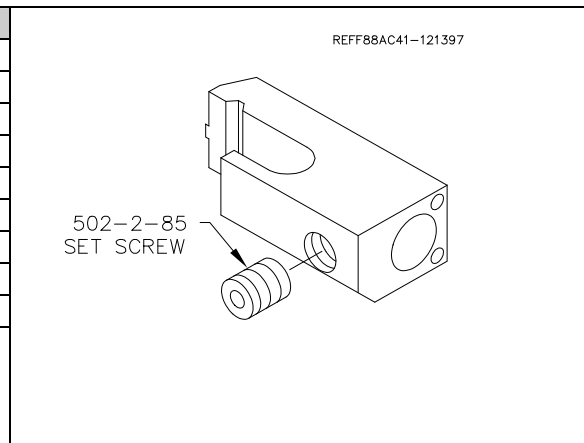
The optional F90 air gauge or a magnetic based dial indicator must be used to center the cutterhead. The toolholder must be removed to center each bore.

REFFB8ACB5-121697



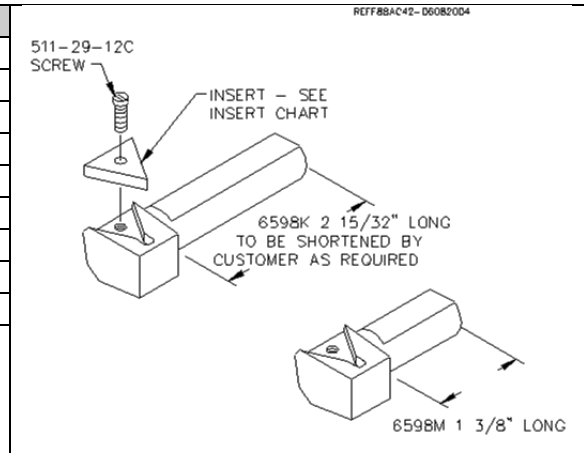
14" Blind Hole Cutterhead Standard Tooling:

6259 Series Tool Holders	
Tool Holder	Length
6259C	3.37"
6259D	3.62"
6259I	3.87"
6259E	4.13"
6259F	4.62"
6259G	5.13"
6259H	5.62"
6259J	6.13"



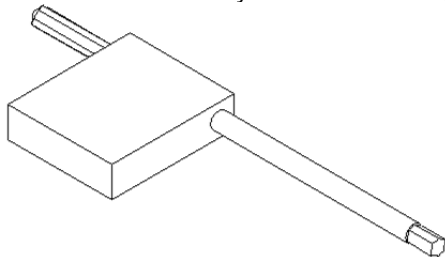
6598 Series Tool Bit when used with 6259 Holders		
Tool Bit	Tool Holder	Bore Range
6598M	6259C	14.00" – 14.50"
6598M	6259D	14.50" – 15.00"
6598K	6259I	15.00" – 15.50"
6598K	6259E	15.50" – 16.50"
6598K	6259F	16.50" – 17.50"
6598K	6259G	17.50" – 18.50"
6598K	6259H	18.50" – 19.50"
6598K	6259J	19.50" – 20.50"

Triangle insert, positive rake



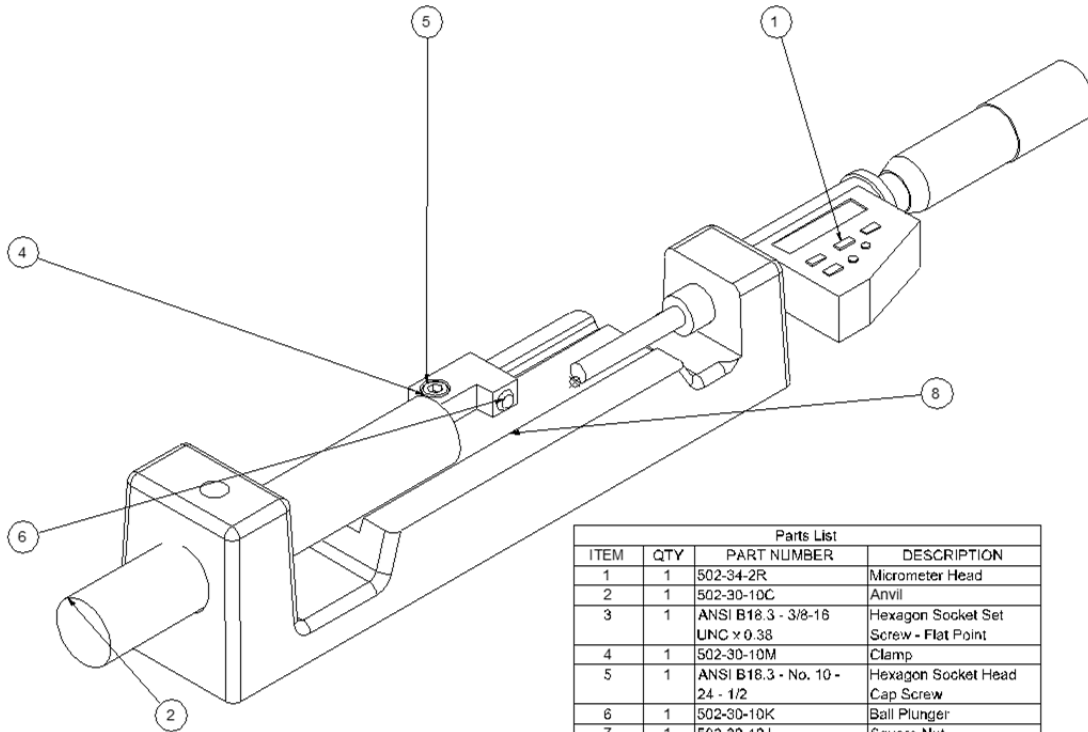
511-29-12D Torx Wrench

For use with Torx style screw in Triangle cartridges.



REF8S95-06082004

**900-2-20 Micrometer Assembly:
13.9" – 17.0" and 17.0" – 20.0" Diameter**

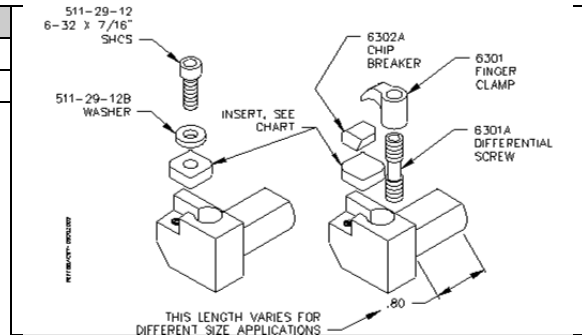


Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	502-34-2R	Micrometer Head
2	1	502-30-10C	Anvil
3	1	ANSI B18.3 - 3/8-16 UNC x 0.38	Hexagon Socket Set Screw - Flat Point
4	1	502-30-10M	Clamp
5	1	ANSI B18.3 - No. 10 - 24 - 1/2	Hexagon Socket Head Cap Screw
6	1	502-30-10K	Ball Plunger
7	1	502-30-10J	Square Nut
8	1	502-30-10B	Micrometer Frame

14" Cutterhead Optional Tooling:

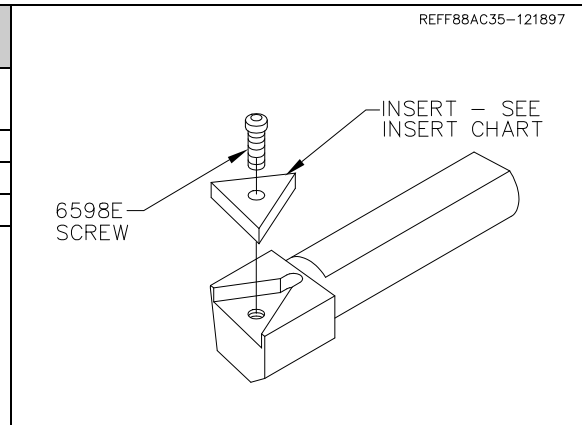
Offset Tool Holders:

6260 Series Tool Bit when used with 6520 Holders	
Tool Bit	Bore Range
6260W	3.78" – 5.24"
Square insert negative rake	



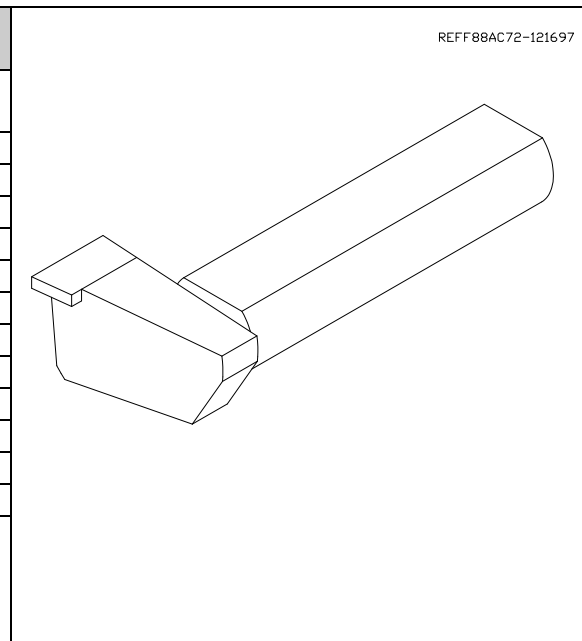
Chamfering Tool Holders:

6747 Series Chamfering Tool Bits when used with 6520 Holders		
Tool Bit	Chamfer Angle	Bore Range
6747F	30	3.10" – 5.00"
6747G	20	3.30" – 5.00"
6747M	15	3.45" – 5.00"
Triangle insert positive rake		

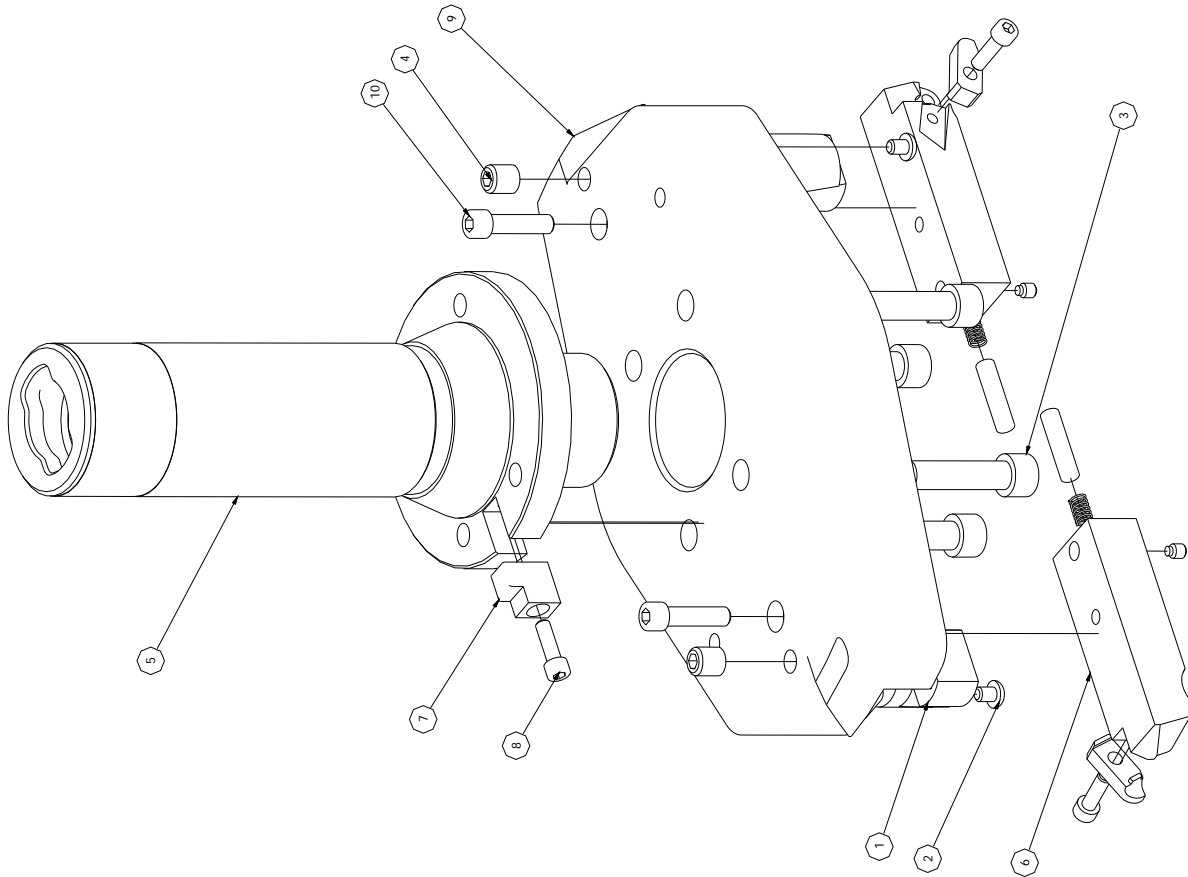


Grooving Tool Bits:

6513 Series Grooving Tool Bits when used with 6520 Holders			
Tool Bit	Groove DIA.	Tool Holder	Bore Range
6513J	.037"	6520H	3.55" – 3.95"
6513J	.037"	6520A	3.95" – 4.45"
6513J	.037"	6520B	4.45" – 4.85"
6513L	.039"	6520H	3.55" – 3.95"
6513L	.039"	6520A	3.95" – 4.45"
6513L	.039"	6520B	4.45" – 4.85"
6513N	.060"	6520H	3.55" – 3.95"
6513N	.060"	6520A	3.95" – 4.45"
6513N	.060"	6520B	4.45" – 4.85"
6513P	.085"	6520H	3.55" – 3.95"
6513P	.085"	6520A	3.95" – 4.45"
6513P	.085"	6520B	4.45" – 4.85"



6294V 10" (250 mm) Surfacing Cutterhead



ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	7206K	L-LOCK
2	2	MF-87 ANSI B18.3 - 10 - 24 X 1/4	Hexagon Socket Button Head Cap. Screw
3	4	7202C ANSI B18.3 - 3/8 - 16 UNC - 1 1/2	Hexagon Socket Head Cap Screw
4	2	MF-33 ANSI B18.3 - 3/8-16 UNC x 0.44	Hexagon Socket Set Screw - Oval Point
5	1	6170B	ADAPTER, SURFACING HEAD
6	2	7202W	TOOL HOLDER ASSEMBLY, FLY CUTTER
7	1	6181A	Drive Key
8	1	MF-5 ANSI B18.3 - No. 10 - 24 UNC - 5/8	Hexagon Socket Head Cap Screw
9	1	7206L	
10	2	MF-15 ANSI B18.3 - 1/4 - 20 UNC - 1	Hexagon Socket Head Cap Screw

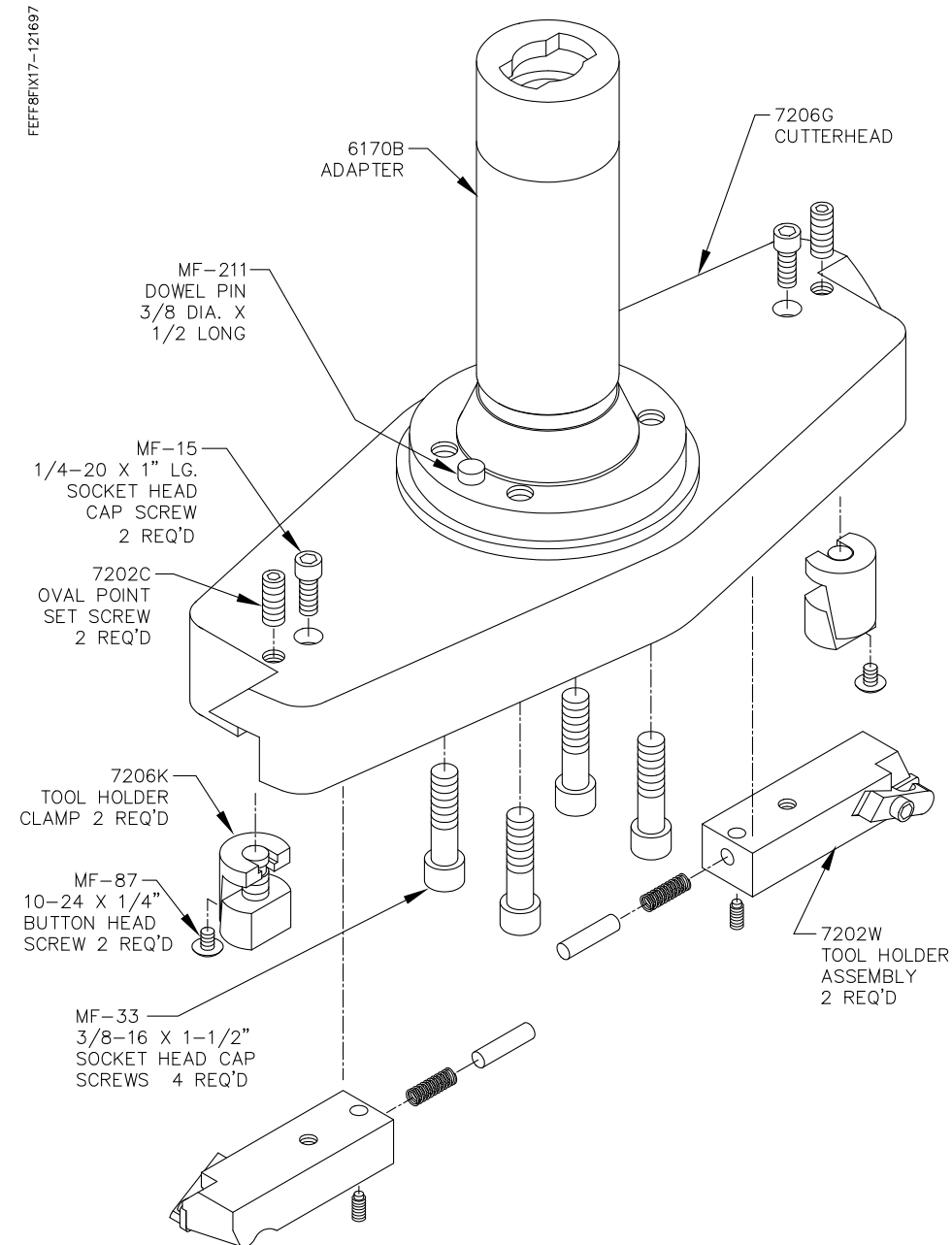
REF 85122-05012006

14" Surfacing Cutterhead

6294U With Tooling

The 14" Surfacing Cutterhead is used to machine off the mating surfaces of most cylinder blocks and cylinder heads.

The surfacing cutterheads install the same way as the boring cutterheads do.

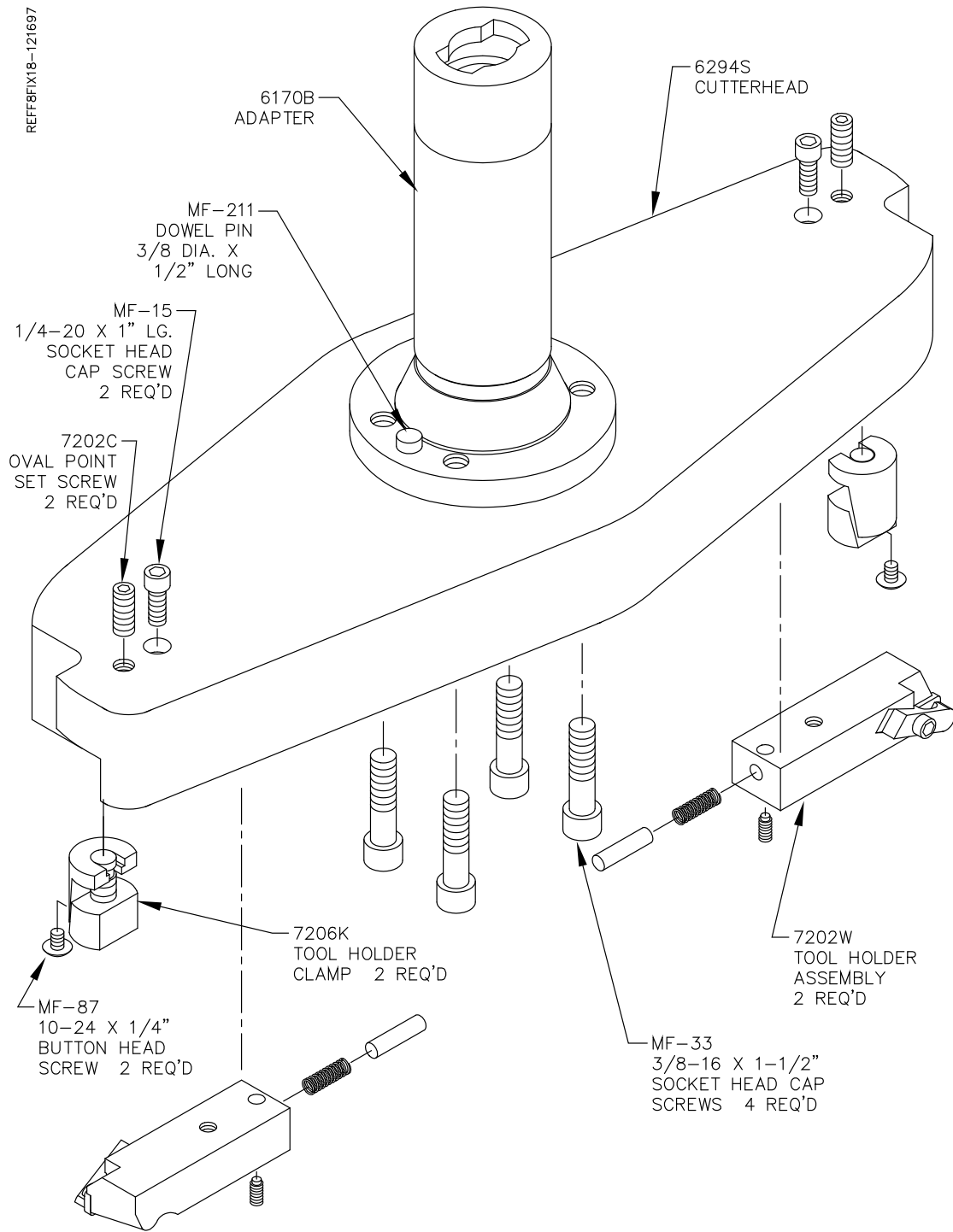


18" Surfacing Cutterhead

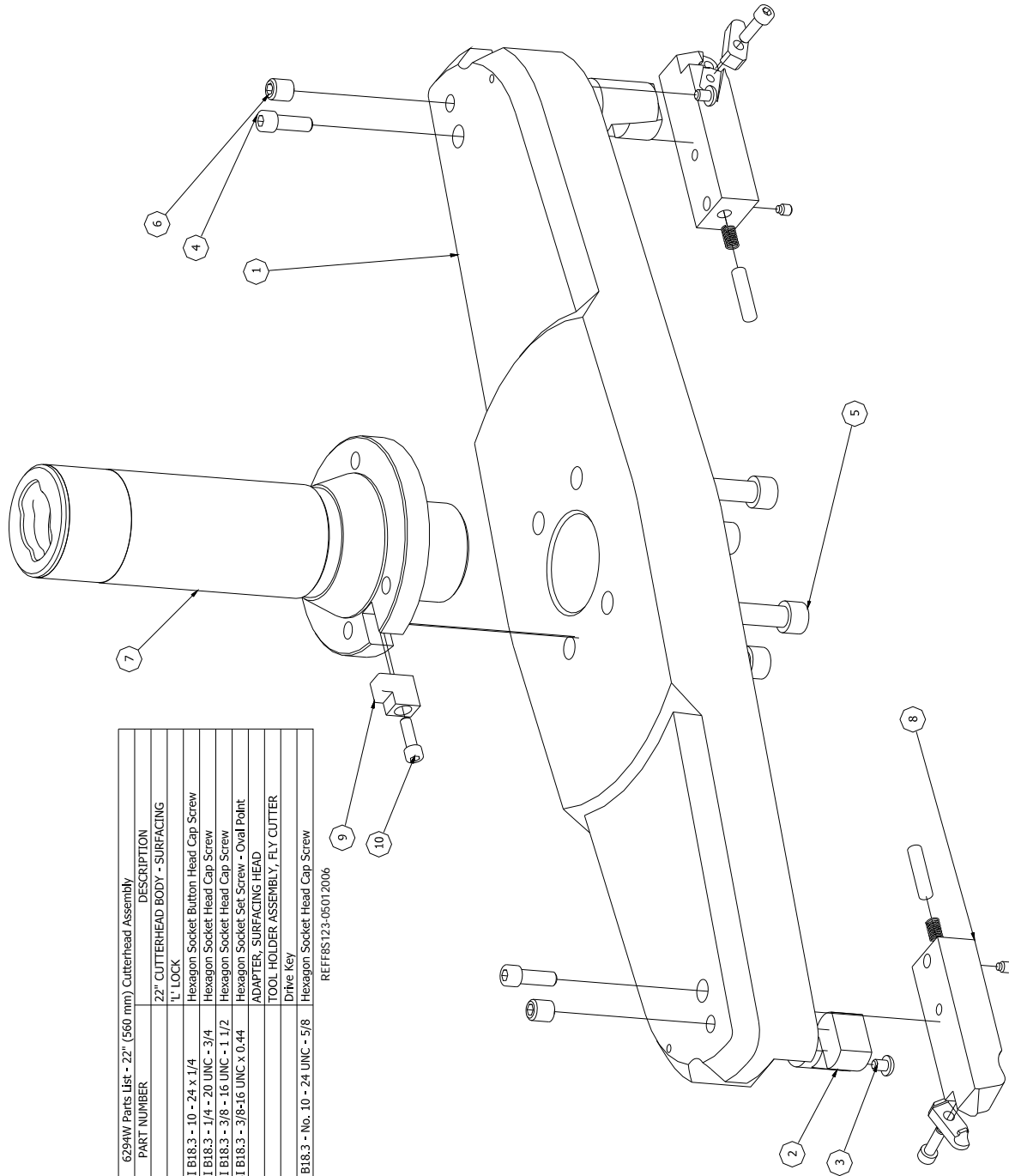
6294T With Tooling

The 18" Surfacing Cutterhead is used to machine the mating surfaces off most cylinder blocks and cylinder heads.

The surfacing cutterheads install the same way as the boring cutterheads do.



6294W 22" (560 mm) Surfacing Cutterhead



ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6294X	22" CUTTERHEAD BODY - SURFACING
2	2	7206K	1" LOCK
3	2	MF-87 ANSI B18.3 - 10 - 24 x 1/4	Hexagon Socket Button Head Cap Screw
4	2	MF-14 ANSI B18.3 - 1/4 - 20 UNC - 3/4	Hexagon Socket Head Cap Screw
5	4	MF-33 ANSI B18.3 - 3/8 - 16 UNC - 1 1/2	Hexagon Socket Head Cap Screw
6	2	7202C ANSI B18.3 - 3/8-16 UNC x 0.44	Hexagon Socket Set Screw - Oval Point
7	1	6170B	ADAPTER, SURFACING HEAD
8	2	7202W	TOOL HOLDER ASSEMBLY, FLY CUTTER
9	1	6181A	Drive Key
10	1	MF-5 ANSI B18.3 - No. 10 - 24 UNC - 5/8	Hexagon Socket Head Cap Screw

REF85123-0501.2006

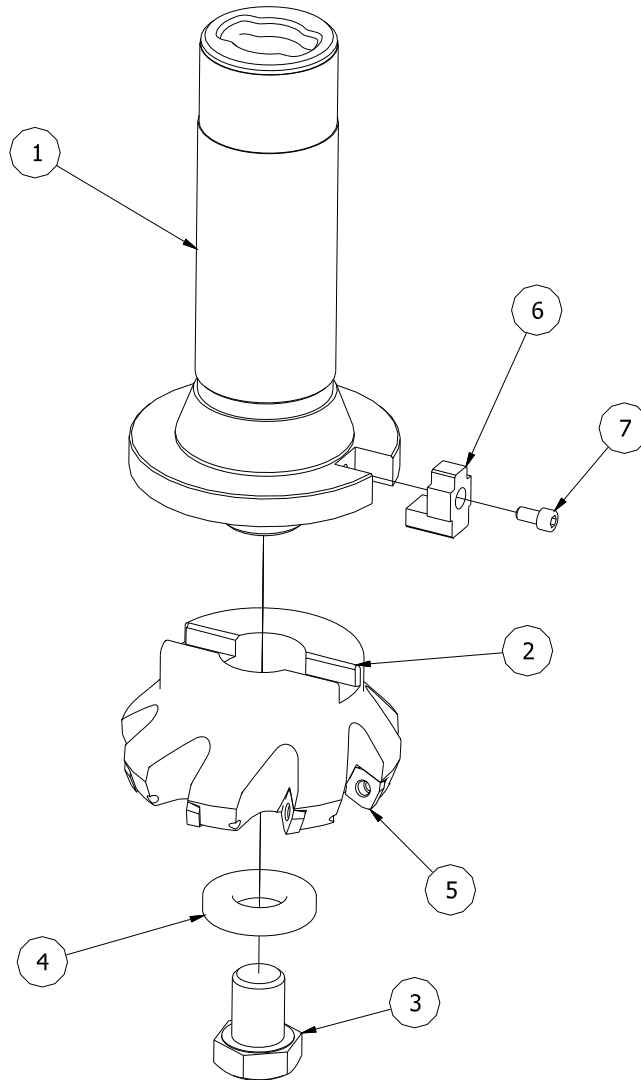
Optional Surfacing Tooling:

Tool Holder	Description
7202W	Square or Round, 3/8", Negative Rake
7202V	Square or Round, 1/2", Negative Rake
7202U	Square or Round, 1/2", Positive Rake

5" Diameter Shell Mill:

6514L With Tooling

The 5" Diameter Shell Mill was designed for cutting blocks and heads that have been repaired by welding. Using the shell mill instead of the surfacing cutterheads reduces chatter. There are many other jobs that this versatile cutterhead could be used for. Use this cutterhead for any cut that is too narrow for the regular surfacing cutterheads.



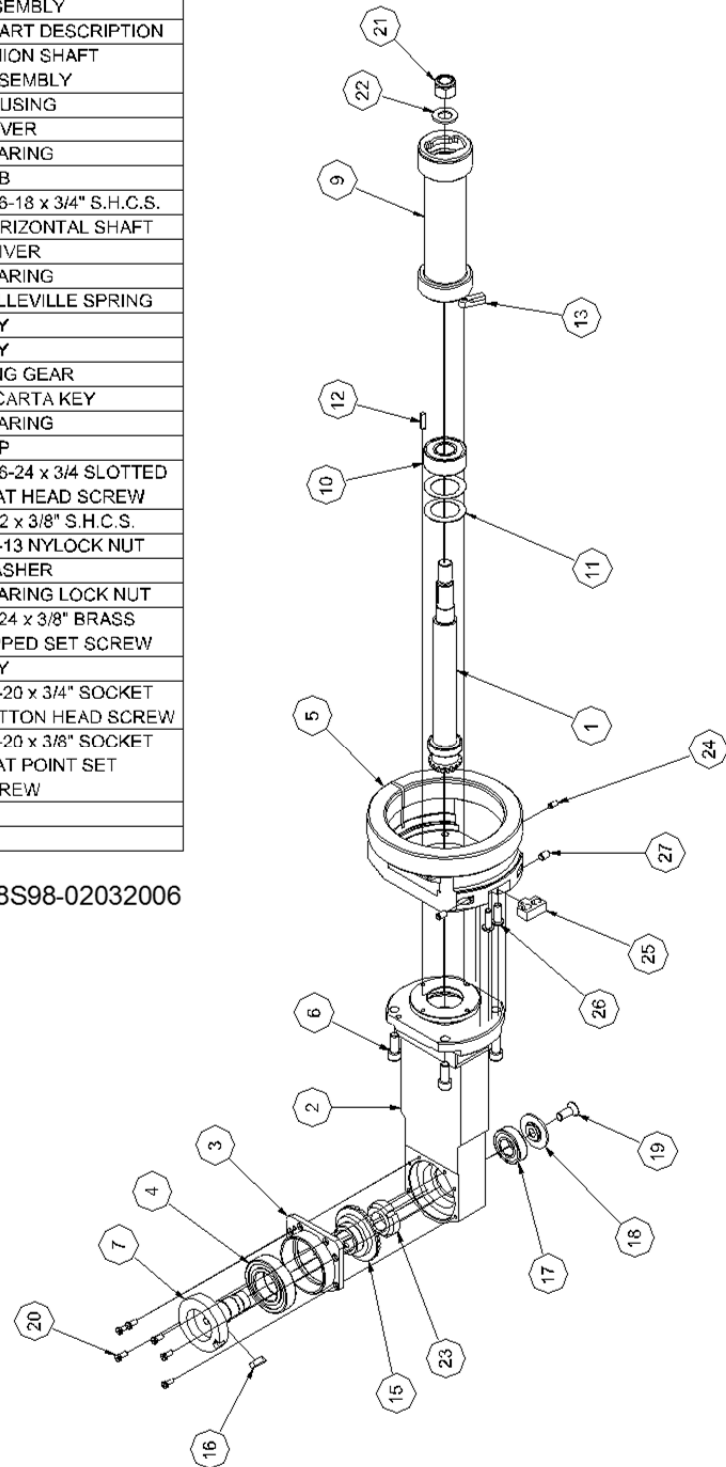
REF90Y43-02142007

6514L 4" SHELL MILL ASSEMBLY Parts List				
ITEM	QTY	ROTLER P/N	DESCRIPTION	MATERIAL
1	1	6514E	4" SHELL MILL ADAPTER	REWORK 6514A ADAPTER
2	1	6514N	4" SHELL MILL	KENAMETAL KSSISR394SD4315F5
3	1	6514H	3/4-16 HEX BOLT	3/4" -16 x 1" HEX BOLT
4	1	6287	3/4" FLAT WASHER	3/4" FLAT WASHER
5	8	6514P	INSERT	KENAMETAL
6	1	6514M	DRIVE KEY	1018 CRS 5/8" x 3/4" x 1.13" LG.
7	1	MF-5A	Hexagon Socket Head Cap Screw	10-24UNC x 1/2" S.H.C.S.

6753J Right Angle Drive:

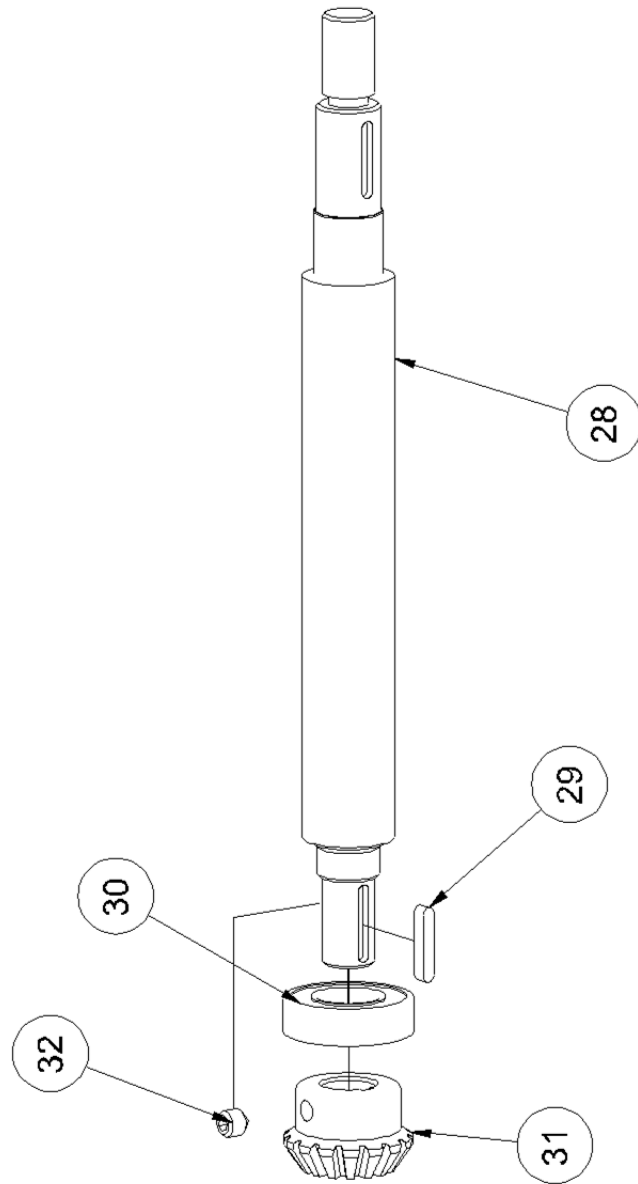
6753J RIGHT ANGLE DRIVE ASSEMBLY			
ITEM	QTY	PART NUMBER	PART DESCRIPTION
1	1	6775C	PINION SHAFT ASSEMBLY
2	1	6773D	HOUSING
3	1	6774	COVER
4	1	502-9-72B	BEARING
5	1	6770B	HUB
6	4	MF-22	5/16-18 x 3/4" S.H.C.S.
7	1	650-2-42A	HORIZONTAL SHAFT
9	1	6771A	DRIVER
10	1	502-9-32	BEARING
11	2	6007A	BELLEVILLE SPRING
12	1	6752Q	KEY
13	1	6776	KEY
15	1	6766W	RING GEAR
16	1	6752P	MICARTA KEY
17	1	6753E	BEARING
18	1	6766F	CAP
19	1	6774K	5/16-24 x 3/4 SLOTTED FLAT HEAD SCREW
20	6	6774E	8-32 x 3/8" S.H.C.S.
21	1	MF-186	1/2-13 NYLOCK NUT
22	1	100-19	WASHER
23	1	6705B	BEARING LOCK NUT
24	1	100-82-2A	10-24 x 3/8" BRASS TIPPED SET SCREW
25	1	6750K	KEY
26	2	MF-92	1/4-20 x 3/4" SOCKET BUTTON HEAD SCREW
27	2	MF-59	1/4-20 x 3/8" SOCKET FLAT POINT SET SCREW
28	1		
29	1		

REF8S98-02032006



6753J Right Angle Drive Cont.

6775C SHAFT ASSEMBLY				
ITEM	QTY	PART NUMBER	PART DESCRIPTION	PART DESCRIPTION
28	1	6775B	PINION SHAFT	PINION SHAFT ⁽¹⁾
29	1	6752Q	KEY	KEY
30	1	700-11	BEARING	BEARING
31	1	6752M	PINION	PINION
32	1	MF-59B	CONE POINT SET SCREW	CONE POINT SET SCREW

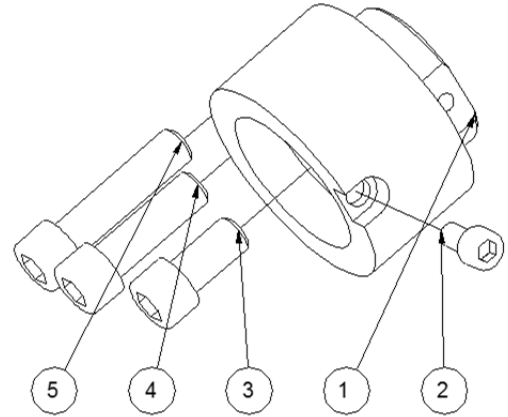


REF F8S99-02032006

6753J Right Angle Drive Standard Tooling:

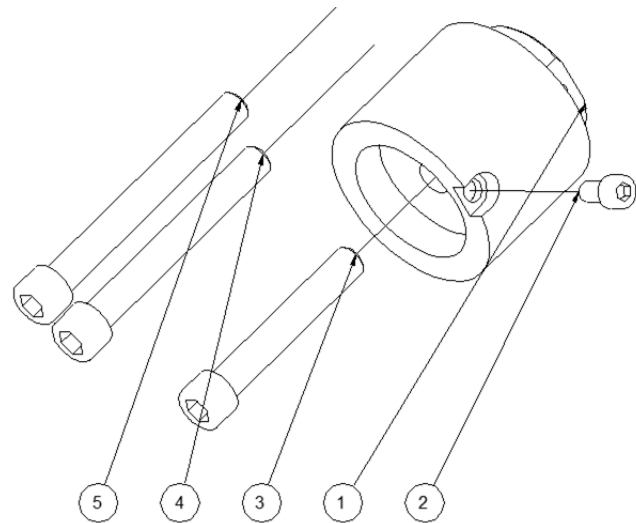
Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	650-2-43	1.05 SPACER
2	1	ANSI B18.3 - No. 10 - 24 - 3/8	Hexagon Socket Head Cap Screw
3	1	ANSI B18.3 - 5/16 - 18 - 5/8	Hexagon Socket Head Cap Screw
4	1	ANSI B18.3 - 5/16 - 18 - 1	Hexagon Socket Head Cap Screw
5	1	ANSI B18.3 - 5/16 - 18 - 1 1/4	Hexagon Socket Head Cap Screw

REF8S100-02152006



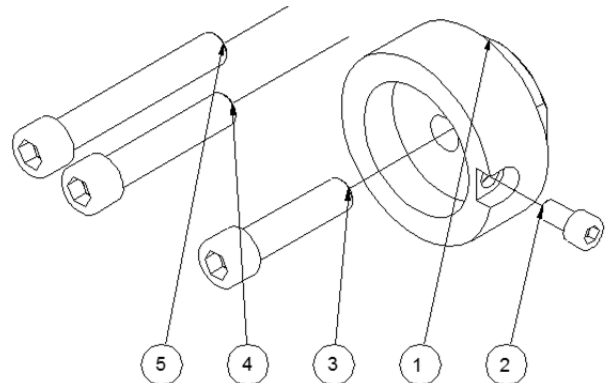
Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	650-2-43A	SPACER - 1.50" LONG
2	1	ANSI B18.3 - No. 10 - 24 - 3/8	Hexagon Socket Head Cap Screw
3	1	ANSI B18.3 - 5/16 - 18 - 2	Hexagon Socket Head Cap Screw
4	1	ANSI B18.3 - 5/16 - 18 - 2 1/2	Hexagon Socket Head Cap Screw
5	1	ANSI B18.3 - 5/16 - 18 - 2 3/4	Hexagon Socket Head Cap Screw

REF8S101-02152006



Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	650-2-43B	SPACER - .70" LONG
2	1	ANSI B18.3 - No. 10 - 24 - 3/8	Hexagon Socket Head Cap Screw
3	1	ANSI B18.3 - 5/16 - 18 - 1 1/4	Hexagon Socket Head Cap Screw
4	1	ANSI B18.3 - 5/16 - 18 - 1 1/2	Hexagon Socket Head Cap Screw
5	1	ANSI B18.3 - 5/16 - 18 - 2	Hexagon Socket Head Cap Screw

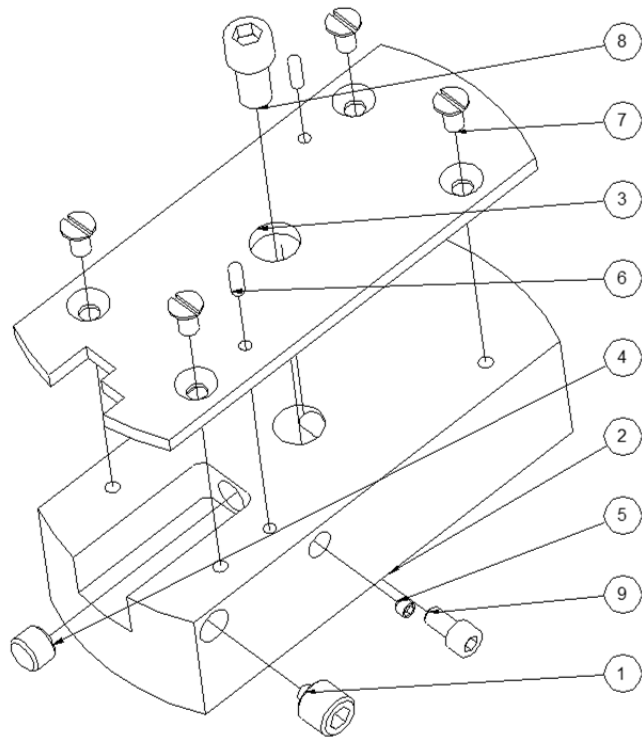
REF8S102-02152006



6753J Right Angle Drive Standard Tooling Cont:

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	501-70A	Tool Holder Lock Screw ass'y
2	1	650-2-16C	BODY, 5.4" PRECISION LINE BORE CUTTERHEAD
3	1	650-2-17B	CAP, 5.4" PRECISION LINE BORE CUTTERHEAD
4	1	502-2-85B	Index Screw
5	1	502-12-4D	SOCKET SET SCREW, BRASS TIPPED 8-32 X 1/8
6	2	ANSI B18.8.2 - 1/8 x 3/8	Pin - Hardened Ground Production Dowel
7	4	ANSI B18.6.2 - 10-24 UNC x 0.375	Slotted Flat Countersunk Head Cap Screw
8	1	ANSI B18.3 - 5/16 - 18 - 5/8	Hexagon Socket Head Cap Screw
9	1	ANSI B18.3 - No. 10 - 24 - 3/8	Hexagon Socket Head Cap Screw

REF8S103-02152006

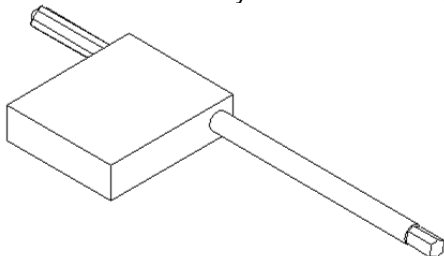


650-2-39A Large Line Bore Head 5.4" – 8.1" (137mm – 206mm)

Toolholder	Toolholder Length	Bore Diameter Range
6801B	1.54" (39mm)	5.4" – 5.7" (137mm – 145mm)
6801C	1.75" (44mm)	5.7" – 6.1" (145mm – 155mm)
6801D	1.95" (50mm)	6.1" – 6.5" (155mm – 165mm)
6801E	2.15" (55mm)	6.5" – 6.9" (165mm – 175mm)
6801F	2.35" (60mm)	6.9" – 7.3" (175mm – 185mm)
6801G	2.55" (65mm)	7.3" – 7.7" (185mm – 195mm)
6801H	2.75" (70mm)	7.7" – 8.1" (196mm – 206mm)

511-29-12D and 511-29-12F Torx Wrenches

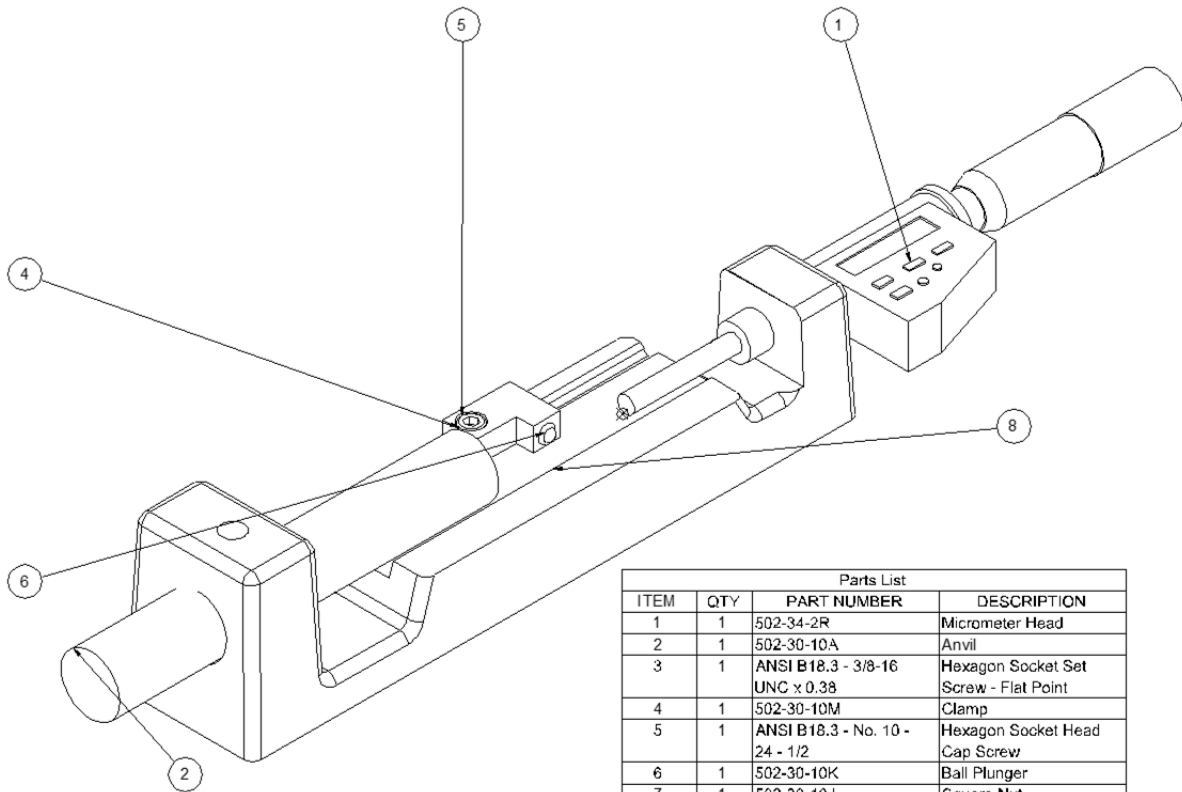
For use with Torx style screw in Triangle cartridges.



REF8S95-06082004

900-2-19 Micrometer Assembly:

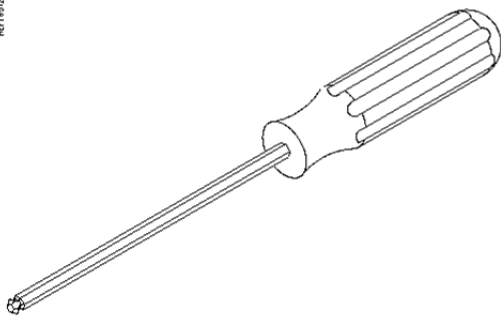
5.4" – 8.1" (137mm – 206mm)



Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	502-34-2R	Micrometer Head
2	1	502-30-10A	Anvil
3	1	ANSI B18.3 - 3/8-16 UNC x 0.38	Hexagon Socket Set Screw - Flat Point
4	1	502-30-10M	Clamp
5	1	ANSI B18.3 - No. 10 - 24 - 1/2	Hexagon Socket Head Cap Screw
6	1	502-30-10K	Ball Plunger
7	1	502-30-10J	Square Nut
8	1	502-30-10B	Micrometer Frame

501-72 and 501-72J Hex Drivers

REF 18902 - 04/2000

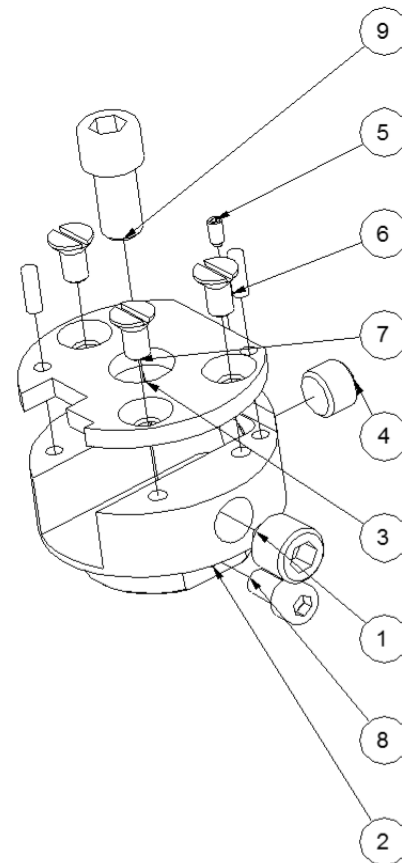


Standard Inserts	
RT322	3/8 IC TRIANGLE 1/32 RADIUS
RT321	3/8 IC TRIANGLE 1/64 RADIUS
RT212	1/4 IC TRIANGLE 1/32 RADIUS
RT211	1/4 IC TRIANGLE 1/64 RADIUS

6753J Right Angle Drive Standard Tooling Cont:

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	501-70A	Tool Holder Lock Screw ass'y
2	1	small cutterhead body	
3	1	small cutterhead cover	
4	1	502-2-85B	Index Screw
5	1	650-2-6A	4-40 brass tipped set screw
6	2	ANSI B18.8.2 - 1/8 x 3/8	Pin - Hardened Ground Production Dowel
7	3	ANSI B18.6.2 - 10-24 UNC x 0.375	Slotted Flat Countersunk Head Cap Screw
8	1	ANSI B18.3 - No. 10 - 24 - 3/8	Hexagon Socket Head Cap Screw
9	1	ANSI B18.3 - 5/16 - 18 - 5/8	Hexagon Socket Head Cap Screw

REFF8S104-02162006

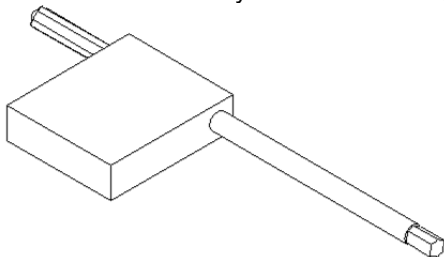


650-2-39B Small Line Bore Head 2.0" – 4.0" (50mm – 100mm)

Toolholder	Toolholder Length	Bore Diameter Range
6801B	1.54" (39mm)	2.0" – 2.4" (51mm – 61mm)
6801C	1.75" (44mm)	2.4" – 2.8" (61mm – 71mm)
6801D	1.95" (50mm)	2.8" – 3.2" (71mm – 81mm)
6801E	2.15" (55mm)	3.2" – 3.6" (81mm – 91mm)
6801F	2.35" (60mm)	3.6" – 4.0" (91mm – 101mm)

511-29-12D and 511-29-12F Torx Wrenches

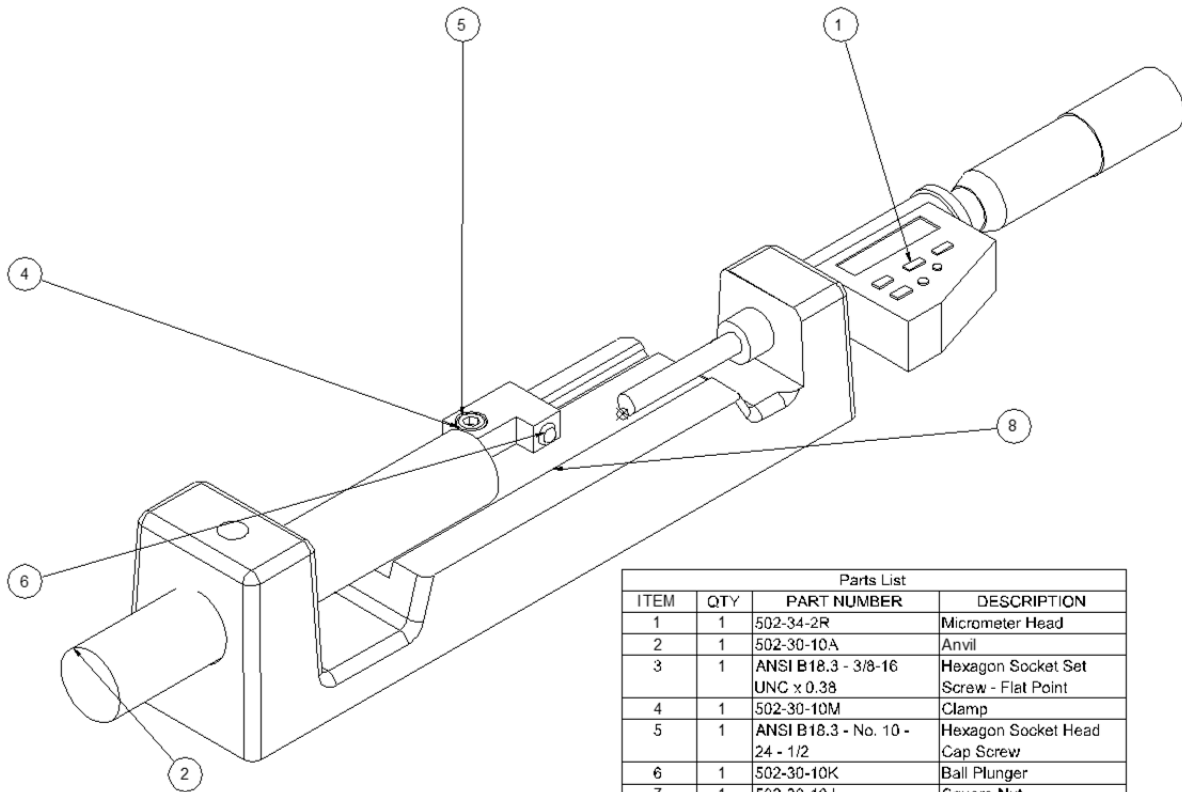
For use with Torx screw in Triangle cartridges.



REFF8S95-06082004

900-2-19 Micrometer Assembly:

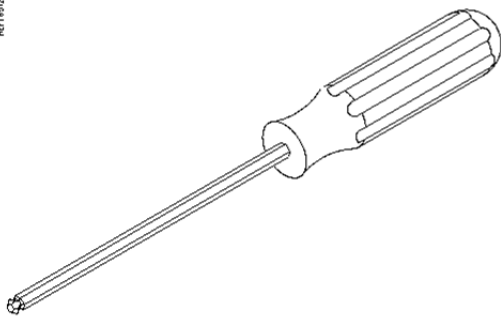
2.0" – 4.0" (50mm – 100mm)



Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	502-34-2R	Micrometer Head
2	1	502-30-10A	Anvil
3	1	ANSI B18.3 - 3/8-16 UNC x 0.38	Hexagon Socket Set Screw - Flat Point
4	1	502-30-10M	Clamp
5	1	ANSI B18.3 - No. 10 - 24 - 1/2	Hexagon Socket Head Cap Screw
6	1	502-30-10K	Ball Plunger
7	1	502-30-10J	Square Nut
8	1	502-30-10B	Micrometer Frame

501-72 Hex Drivers

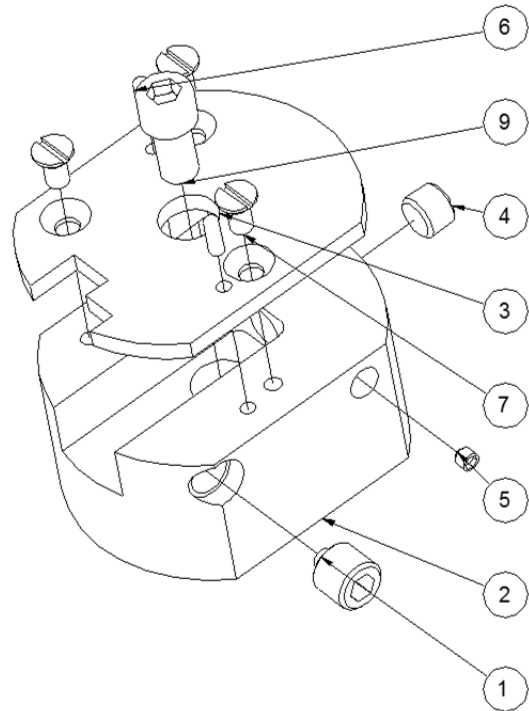
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Standard Inserts	
RT322	3/8 IC TRIANGLE 1/32 RADIUS
RT321	3/8 IC TRIANGLE 1/64 RADIUS
RT212	1/4 IC TRIANGLE 1/32 RADIUS
RT211	1/4 IC TRIANGLE 1/64 RADIUS

6753J Right Angle Drive Standard Tooling Cont:

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	501-70A	Tool Holder Lock Screw ass'y
2	1	650-2-16B	BODY, 2.9" PRECISION LINE BORE CUTTERHEAD
3	1	650-2-17A	CAP 2.9" PRECISION LINE BORE CUTTREHEAD
4	1	502-2-85B	Index Screw
5	1	502-12-4D	SOCKET SET SCREW, BRASS TIPPED 8-32 X 1/8
6	2	ANSI B18.8.2 - 1/8 x 3/8	Pin - Hardened Ground Production Dowel
7	3	ANSI B18.6.2 - 10-24 UNC x 0.375	Slotted Flat Countersunk Head Cap Screw
8	1	ANSI B18.3 - No. 10 - 24 - 3/8	Hexagon Socket Head Cap Screw
9	1	ANSI B18.3 - 5/16 - 18 - 5/8	Hexagon Socket Head Cap Screw

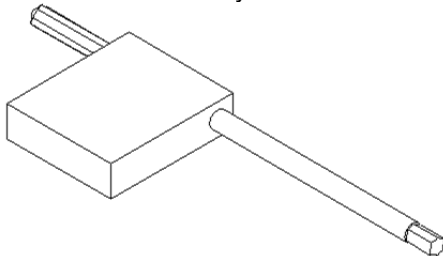


650-2-39C Medium Line Bore Head 2.9" – 5.0" (72mm – 127mm)

Toolholder	Toolholder Length	Bore Diameter Range
6801C	1.75" (44mm)	2.9" – 3.2" (74mm – 81mm)
6801D	1.95" (50mm)	2.4" – 2.8" (81mm – 91mm)
6801E	2.15" (55mm)	2.8" – 3.2" (91mm – 101mm)
6801F	2.35" (60mm)	3.2" – 3.6" (101mm – 112mm)
6801G	2.55" (65mm)	3.6" – 4.0" (112mm – 122mm)
6801H	2.75" (70mm)	3.6" – 4.0" (122mm – 132mm)
6801J	2.95" (75mm)	3.6" – 4.0" (132mm – 142mm)

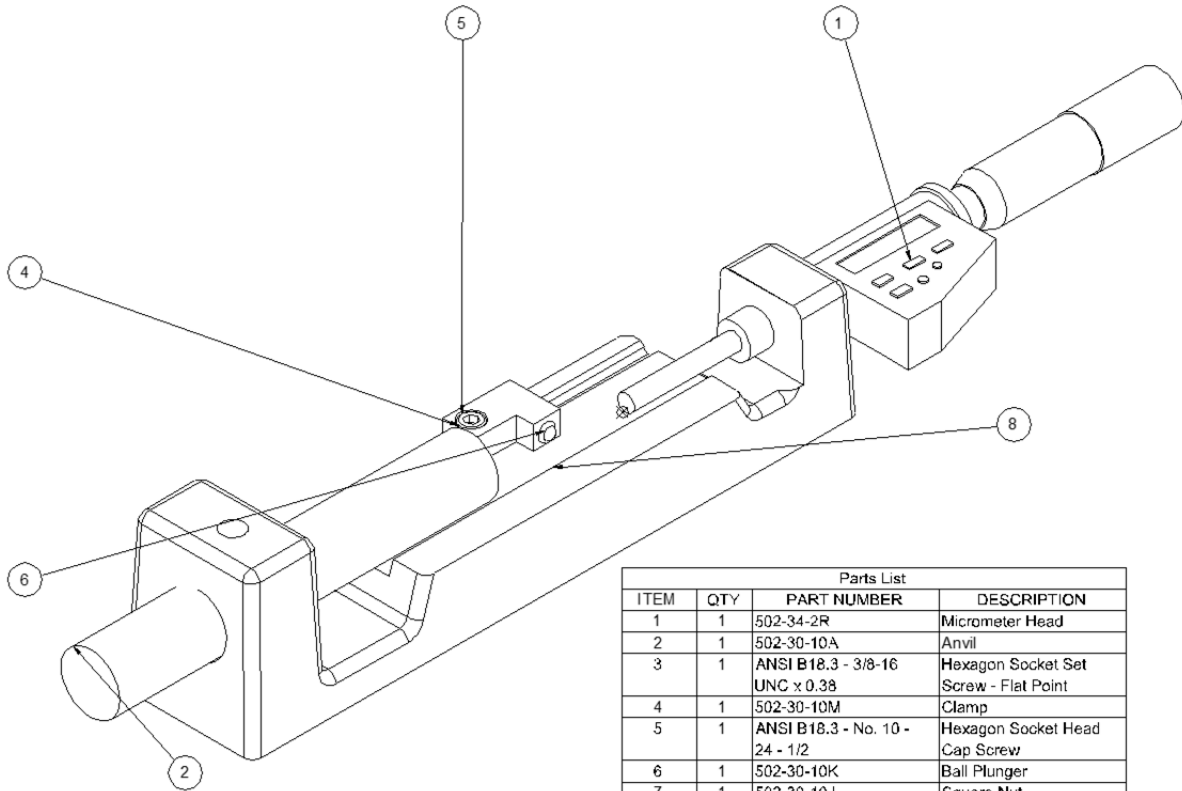
511-29-12D and 511-29-12F Torx Wrenches

For use with Torx style screw in Triangle cartridges.



REF8S95-06082004

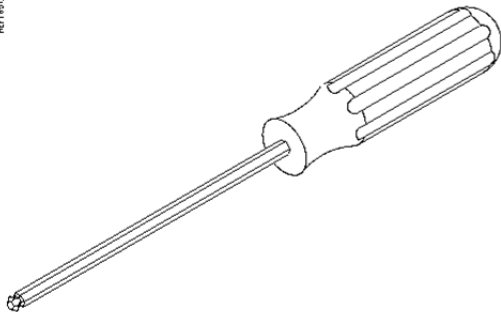
6753J Right Angle Drive Standard Tooling Cont:
900-2-19 Micrometer Assembly:
 2.9" – 5.0" (72mm – 127mm)



Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	502-34-2R	Micrometer Head
2	1	502-30-10A	Anvil
3	1	ANSI B18.3 - 3/8-16 UNC x 0.38	Hexagon Socket Set Screw - Flat Point
4	1	502-30-10M	Clamp
5	1	ANSI B18.3 - No. 10 - 24 - 1/2	Hexagon Socket Head Cap Screw
6	1	502-30-10K	Ball Plunger
7	1	502-30-10J	Square Nut
8	1	502-30-10B	Micrometer Frame

501-72 Hex Drivers

REF11897-04137000



Standard Inserts	
RT322	3/8 IC TRIANGLE 1/32 RADIUS
RT321	3/8 IC TRIANGLE 1/64 RADIUS

Minimum Distance Between Bearing Housings:

	Cutterheads		
		650-2-39B 1.9" (48.26mm) Dia.	650-2-39C 2.9" (73.66mm) Dia.
Right Angle Drive			

F65:

6753K	3.29" (83.57mm)	4.07" (103.38mm)	4.09" (103.63mm)
6753K w/ .70" (17.78mm) Spacer	3.99" (101.35mm)	4.77" (121.16mm)	4.78" (121.41mm)
6753K w/ 1.05" (26.67mm) Spacer	4.34" (110.24mm)	5.12" (130.05mm)	5.13" (130.30mm)
6753K w/ 1.50" (38.10mm) Spacer	4.79" (121.67mm)	5.57" (141.48mm)	5.58" (141.73mm)
Calculating Maximum Bore Depth:			
Bores 1.9" – 2.14" (48.26mm – 54.36mm) Dia. = Subtract 2.085 (52.959mm) from total Width.			
Bores 2.14" – 3.12" (54.36mm – 79.25mm) Dia. = Subtract 1.655 (42.037mm) from total Width.			
Bores 3.12" (79.25mm) Dia. and Larger = Subtract 1.457 (37.008mm) from total Width.			

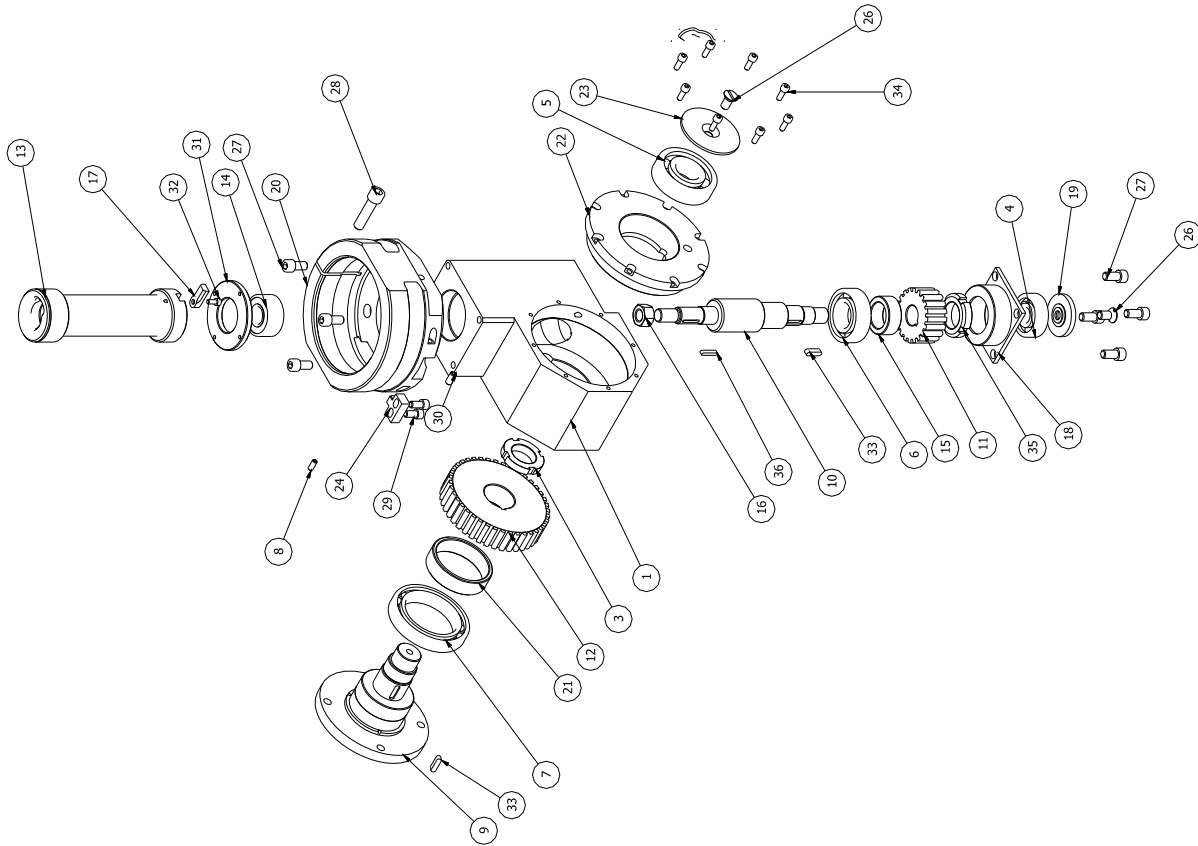
F90:

6753J	3.40" (86.36mm)	4.18" (106.17mm)	4.19" (106.43mm)
6753J w/ .70" (17.78mm) Spacer	4.10" (104.14mm)	4.88" (123.95mm)	4.99" (126.75mm)
6753J w/ 1.05" (26.67mm) Spacer	4.45" (113.03mm)	5.23" (132.84mm)	5.24" (133.10mm)
6753J w/ 1.50" (38.10mm) Spacer	4.90" (124.46mm)	5.68" (144.27mm)	5.69" (144.53mm)
Calculating Maximum Bore Depth:			
Bores 1.9" – 2.34" (48.26mm – 59.69mm) Dia. = Subtract 2.572 (65.329mm) from total Width.			
Bores 2.35" – 3.69" (59.69mm – 93.73mm) Dia. = Subtract 2.165 (54.991mm) from total Width.			
Bores 3.69" (93.73mm) Dia. and Larger = Subtract 1.457 (37.008mm) from total Width.			

Belt Drive:

6753L & 650-2-37	2.69" (68.33mm)	NOT RECOMMENDED	NOT RECOMMENDED
6753L & 650-2-37 w/ .70" (17.78mm) Spacer	3.40" (86.36mm)	NOT RECOMMENDED	NOT RECOMMENDED
6753L & 650-2-37 w/ 1.05" (26.67mm) Spacer	3.74" (95.00mm)	NOT RECOMMENDED	NOT RECOMMENDED
6753L & 650-2-37 w/ 1.50" (38.10mm) Spacer	4.19" (106.43mm)	NOT RECOMMENDED	NOT RECOMMENDED
Calculating Maximum Bore Depth:			
For Bores less than 2.40" (60.96mm) Dia. = Subtract 1.381" (35.077mm) from total Width.			
For bores 2.40" (60.96mm) Dia. and Larger = Subtract .975" (24.765mm) from total Width.			

6773F Heavy Duty Offset 90 Degree Drive



ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6773G	HOUSING, GEAR HEAVY DUTY LINE BORE HEAD
3	1	6777B	Nut, Lock Horizontal Shaft-BH-06
4	1	6778C	Bearing, Lower Vertical Shaft - SKF 6302 2RS
5	1	6778F	Bearing, End Horizontal Shaft
6	1	6778D	Bearing, Middle Vertical Shaft
7	1	6778E	Bearing, Lead Horizontal Shaft
8	1	100-82-2A	Hexagon Socket Set Screw - Flat Point
9	1	6766X	Shaft, Horizontal
10	1	6777	SHAFT, VERTICAL HEAVY DUTY LINE BORE HEAD
11	1	6778	DRIVE GEAR, HEAVY DUTY LINE BORE HEAD
12	1	6778B	DRIVE GEAR, H ENAY DUTY LINE BORE HEAD
13	1	6771A	DRIVER, F90, F90 LINE BORE HEAD
14	1	502-95-32	Bearing, BH
15	1	6775F	SPACER, BEARING VERTICAL
16	1	MF-165 ANSI B18.2.2 - 1/2 - 13	Hex Nut
17	1	6776	KEY, DRIVER ADAPTER, F90, F90 SERIES LINE BORE HEAD
18	1	6774F	BEARING RETAINER, VERTICAL HEAVY DUTY LINE BORE HEAD
19	1	6777A	CAP, END VERTICAL SHAFT
20	1	6770C	HUB, MOUNTING 90 HEAD
21	1	6775D	SPACER, BEARING, HORIZONTAL
22	1	6775E	BEARING RETAINER, VERTICAL
23	1	6775F	CAP, END HORIZONTAL SHAFT
24	1	6759K	Key, Location 90 Degree Head
26	2	ANSI B18.6.2 - 5/16-18 UNC x 0.625	Slotted Flat Countersunk Head Cap Screw
27	8	MF-21 ANSI B18.3 - 5/16 - 18 - 9/8	Hexagon Socket Head Cap Screw
28	1	MF-33 ANSI B18.3 - 3/8 - 16 - 1 1/2	Hexagon Socket Head Cap Screw
29	2	MF-12 ANSI B18.3 - 1/4 - 20 - 1/2	Hexagon Socket Head Cap Screw
30	2	MF-58A ANSI B18.3 - 1/4-20 UNC x 0.51	Hexagon Socket Set Screw - Flat Point
31	1	6772A	NUT, BEARING LINE BORE HEAD
32	1	MF-1B ANSI B18.3 - No. 8 - 32 - 3/8	Hexagon Socket Head Cap Screw
33	6	6752P	KEY, MICARTA, 90 DEGREE HEAD
34	1	6777C	Nut, Lock Bearing
35	1	6777C	Nut, Lock Bearing
36	1	6752Q	Key, Steel

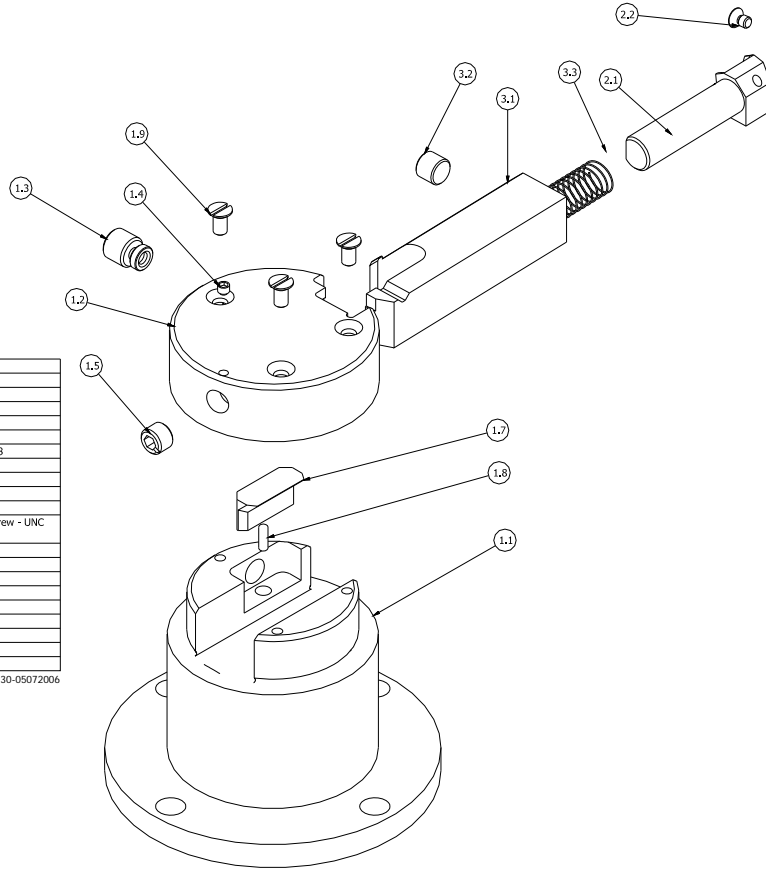
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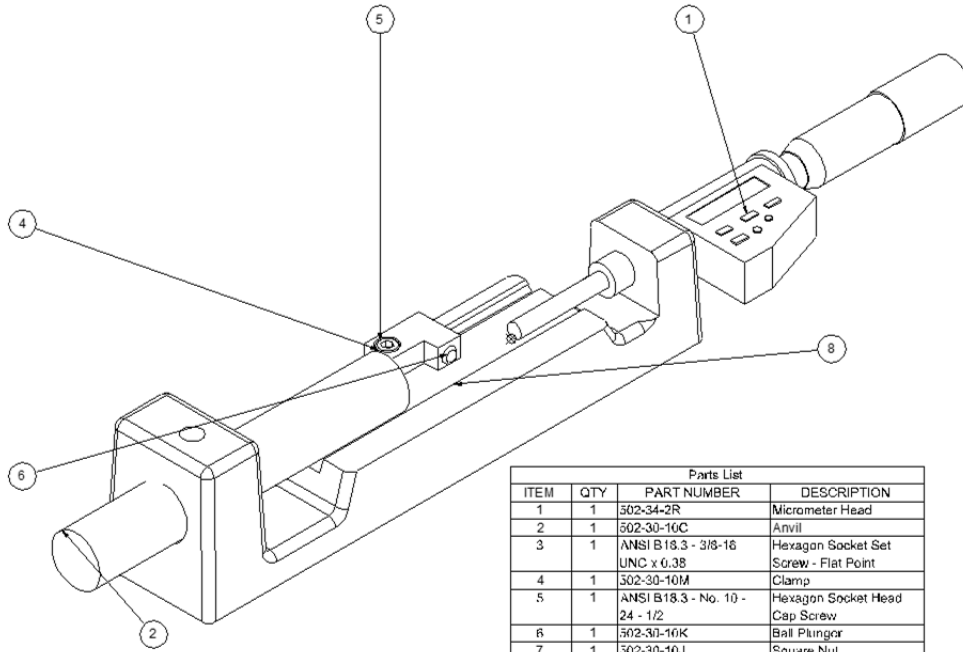
6519V Heavy Duty Offset 90 Degree Drive w/ 3.00" (76mm) Tooling

Minimum distance between bearing housings 7.94" (102 mm). 900-2-20 Digital Micrometer included.

6519V Cutterhead Body Assembly - Heavy Duty Offset 90 Degree Head Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6519U	Cutterhead Body Assembly
1.1	1	6519T	Cutterhead Body
1.2	1	650-2-17	Cap, 2.9" Stub Bar
1.3	1	501-70A	Tool Holder Lock Screw ass'y
1.4	1	502-12-4D	SOCKET SET SCREW, BRASS TIPPED 8-32 X 1/8
1.5	1	502-2-85B	Index Screw
1.6	1	100-1A	Tool Lock Spring
1.7	1	6263A	Tool Holder Clamp Screw
1.8	1	ANSI B18.8.2 - 1/8 x 3/8	Pin - Hardened Ground Production Dowel
1.9	3	ANSI B18.6.3 - 10-24 UNC x 0.375	Slotted 100° Flat Countersunk Head Machine Screw - UNC
2	1	6598K	Cartridge, Indexable Insert Assembly
2.1	1	6598J	Cartridge, Indexable Insert
2.2	1	11-29-12C	Torx Screw M4 x .7 x .315
3	1	6520E	Tool Holder Assembly, 3 3/8" Long
3.1	1	6520E	Tool Holder 3 3/8" Long
	1	6520F	Tool Holder 3 5/8" Long
	1	6520G	Tool Holder 4 1/8" Long
3.2	1	502-2-85	Index Screw 3.8-24 nf x .31 lg.
3.3	1	6520E Spring	

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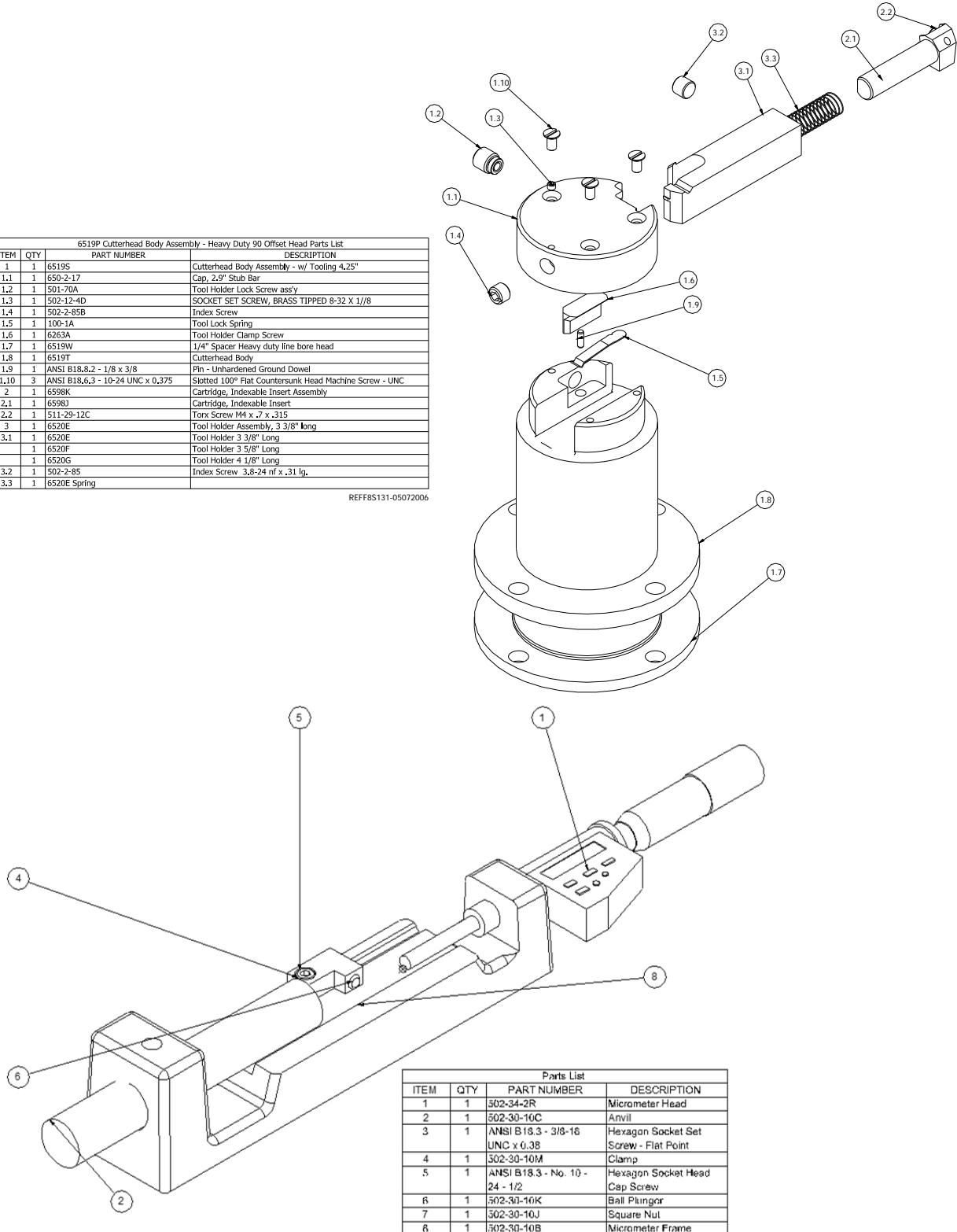
Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	502-34-2R	Micrometer Head
2	1	502-30-10C	Anvil
3	1	ANSI B18.3 - 3/8-16 UNC x 0.38	Hexagon Socket Set Screw - Flat Point
4	1	502-30-10M	Clamp
5	1	ANSI B18.3 - No. 10 - 24 - 1/2	Hexagon Socket Head Cap Screw
6	1	502-30-10K	Ball Plunger
7	1	502-30-10J	Square Nut
8	1	502-30-10B	Micrometer Frame

6519P Heavy Duty Offset 90 Degree Drive w/ 4.25" (108 mm) Tooling

Minimum distance between bearing housings 8.94" (227 mm). 900-2-20 Digital Micrometer included.

6519P Cutterhead Body Assembly - Heavy Duty 90 Offset Head Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6519S	Cutterhead Body Assembly - w/ Tooling 4.25"
1.1	1	650-2-17	Cap, 2.9" Stub Bar
1.2	1	501-70A	Tool Holder Lock Screw ass'y
1.3	1	502-12-4D	SOCKET SET SCREW, BRASS TIPPED 8-32 X 1/8
1.4	1	502-2-85B	Index Screw
1.5	1	100-1A	Tool Lock Spring
1.6	1	6263A	Tool Holder Clamp Screw
1.7	1	6519W	1/4" Spacer Heavy duty line bore head
1.8	1	6519T	Cutterhead Body
1.9	1	ANSI B18.8.2 - 1/8 x 3/8	Pin - Unhardened Ground Dowel
1.10	3	ANSI B18.6.3 - 10-24 UNC x 0.375	Slotted 100° Flat Countersunk Head Machine Screw - UNC
2	1	6598K	Cartridge, Indexable Insert Assembly
2.1	1	6598J	Cartridge, Indexable Insert
2.2	1	511-29-12C	Tonx Screw M4 x .7 x .315
3	1	6520E	Tool Holder Assembly, 3 3/8" long
3.1	1	6520E	Tool Holder 3 3/8" Long
	1	6520F	Tool Holder 3 5/8" Long
	1	6520G	Tool Holder 4 1/8" Long
3.2	1	502-2-85	Index Screw 3.8-24 nf x .31 lg.
3.3	1	6520E Spring	

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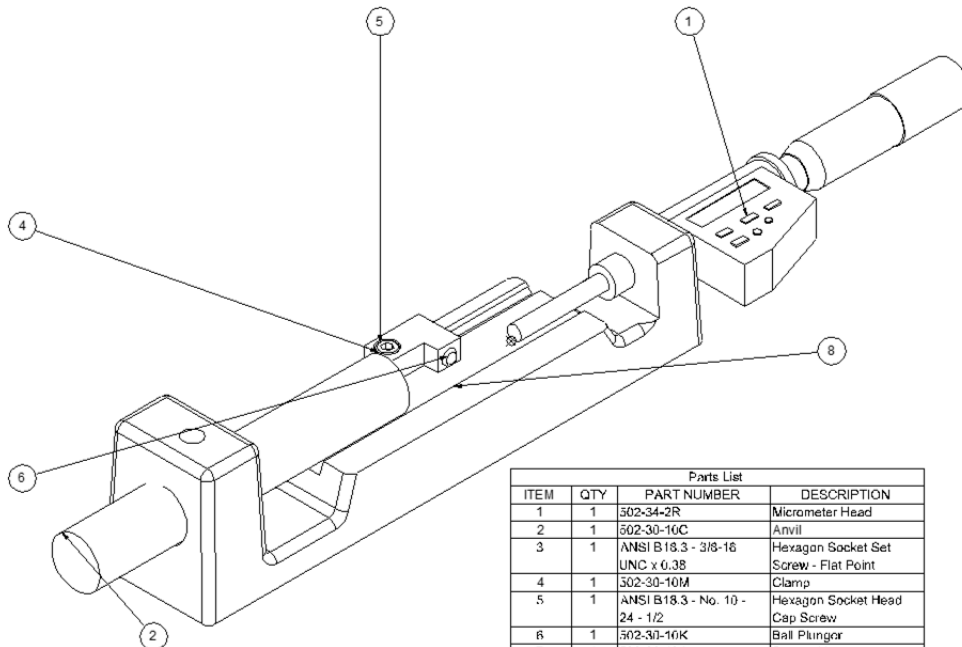
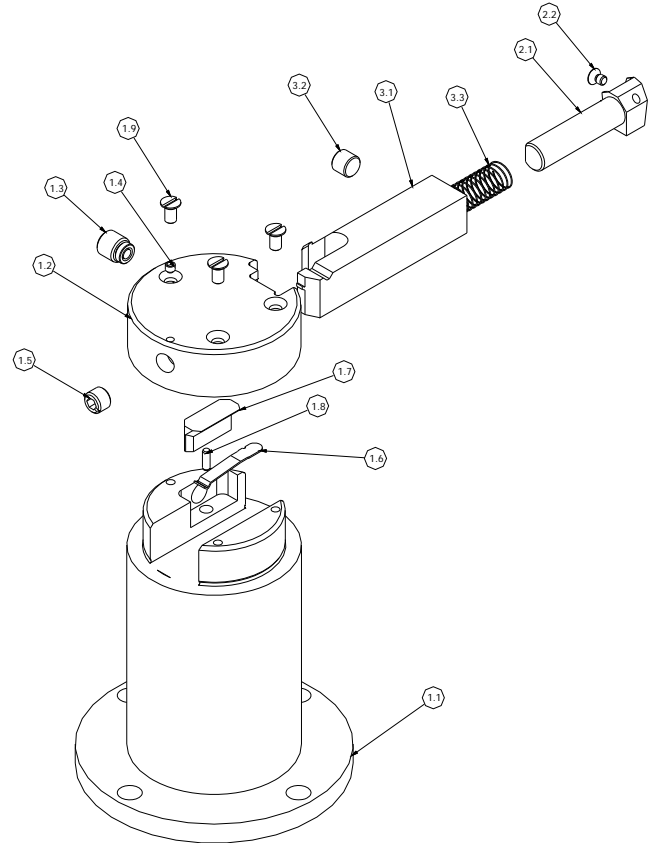


Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	502-34-2R	Micrometer Head
2	1	502-30-10C	Anvil
3	1	ANSI B18.3 - 3/8-16 UNC x 0.38	Hexagon Socket Set Screw - Flat Point
4	1	502-30-10M	Clamp
5	1	ANSI B18.3 - No. 10 - 24 - 1/2	Hexagon Socket Head Cap Screw
6	1	502-30-10K	Ball Plunger
7	1	502-30-10J	Square Nut
8	1	502-30-10B	Micrometer Frame

6519M Heavy Duty Offset 90 Degree Drive w/ 5.10" (130 mm) Tooling

Minimum distance between bearing housings 10.04" (255 mm). 900-2-20 Digital Micrometer included.

6519M Cutterhead Body Assembly - Heavy Duty 90 Degree Offset Head Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6519Q	
1.1	1	6519T	Cutterhead Body
1.2	1	650-2-17	Cap, 2.9" Stub Bar
1.3	1	501-70A	Tool Holder Lock Screw ass'y
1.4	1	502-12-4D	SOCKET SET SCREW, BRASS TIPPED 8-32 X 1/8
1.5	1	502-2-85B	Index Screw
1.6	1	100-1A	Tool Lock Spring
1.7	1	6263A	Tool Holder Clamp Screw
1.8	1	ANSI B18.8.2 - 1/8 x 3/8	Pin - Unhardened Ground Dowel
1.9	3	ANSI B18.6.3 - 10-24 UNC x 0.375	Slotted 100° Flat Countersunk Head Machine Screw - UNC
2	1	6598K	Cartridge, Indexable Insert Assembly
2.1	1	6598J	Cartridge, Indexable Insert
2.2	1	511-29-12C	Torx Screw M4 x .7 x .315
3	1	6520E	Tool Holder Assembly, 3 3/8" long
3.1	1	6520E	Tool Holder 3 3/8" Long
	1	6520F	Tool Holder 3 5/8" Long
	1	6520G	Tool Holder 4 1/8" Long
3.2	1	502-2-85	Index Screw 3.8-24 rf x .31 lg. REFBS132-05072006
3.3	1	6520E Spring	



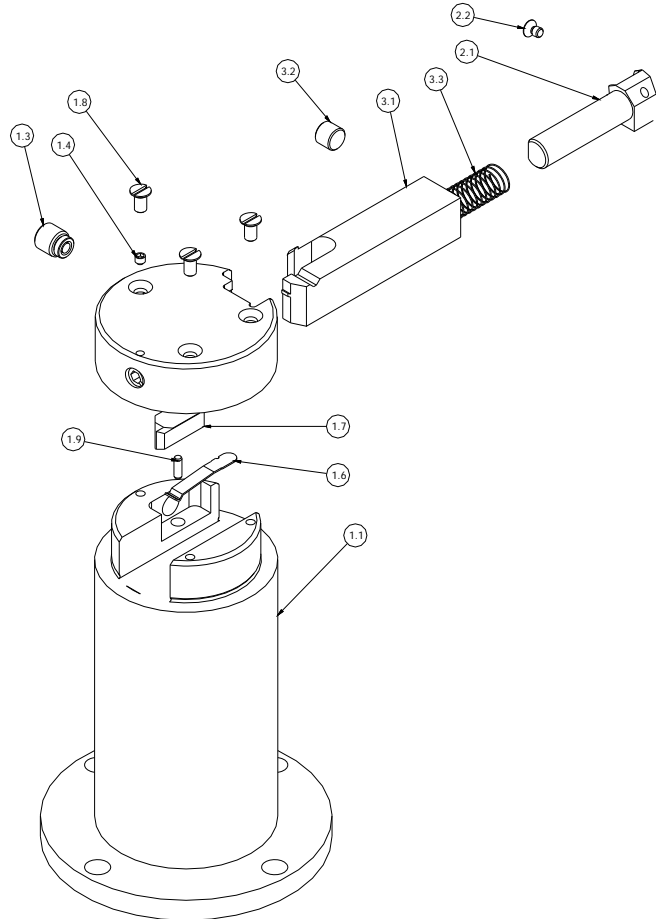
Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	502-34-2R	Micrometer Head
2	1	502-30-16C	Anvil
3	1	ANSI B18.3 - 3/8-16 UNC x 0.38	Hexagon Socket Set Screw - Flat Point
4	1	502-30-10M	Clamp
5	1	ANSI B18.3 - No. 10 - 24 - 1/2	Hexagon Socket Head Cap Screw
6	1	502-30-10K	Ball Plunger
7	1	502-30-10J	Square Nut
8	1	502-30-10B	Micrometer Frame

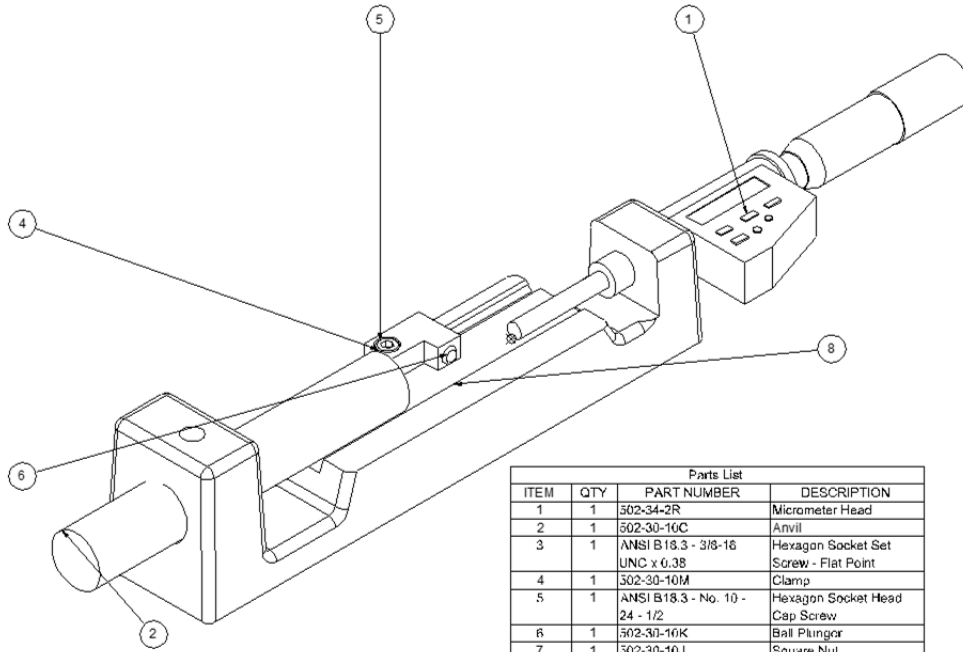
6519N Heavy Duty Offset 90 Degree Drive w/ 6.00" (152 mm) Tooling

Minimum distance between bearing housings 10.94" (278 mm). 900-2-20 Digital Micrometer included.

6519N Cutterhead Body Assembly - Heavy Duty 90 Degree Offset Head Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6519K	Cutterhead Body Assembly
1.1	1	6519K	Cutterhead Body
1.2	1	650-2-17	Cap, 2.9" Stub Bar
1.3	1	501-70A	Tool Holder Lock Screw ass'y
1.4	1	502-12-4D	SOCKET SET SCREW, BRASS TIPPED 8-32 X 1/8
1.5	1	502-2-85B	Index Screw
1.6	1	100-1A	Tool Lock Spring
1.7	1	6263A	Tool Holder Clamp Screw
1.8	3	ANSI B18.6.3 - 10-24 UNC x 0.375	Slotted 100° Flat Countersunk Head Machine Screw - UNC
1.9	1	ANSI B18.8.2 - 1/8 x 3/8	Pin - Unhardened Ground Dowel
2	1	6598K	Cartridge, Indexable Assembly
2.1	1	6598J	Cartridge, Indexable Insert
2.2	1	511-29-12C	Torx Screw M4 x .7 x .315
3	1	6520E	Tool Holder Assembly, 3 3/8" long
3.1	1	6520E	Tool Holder 3 3/8" Long
	1	6520F	Tool Holder 3 5/8" Long
	1	6520G	Tool Holder 4 1/8" Long
3.2	1	502-2-85	Index Screw 3.8-24 nf x .31 lg.
3.3	1	6520E Spring	

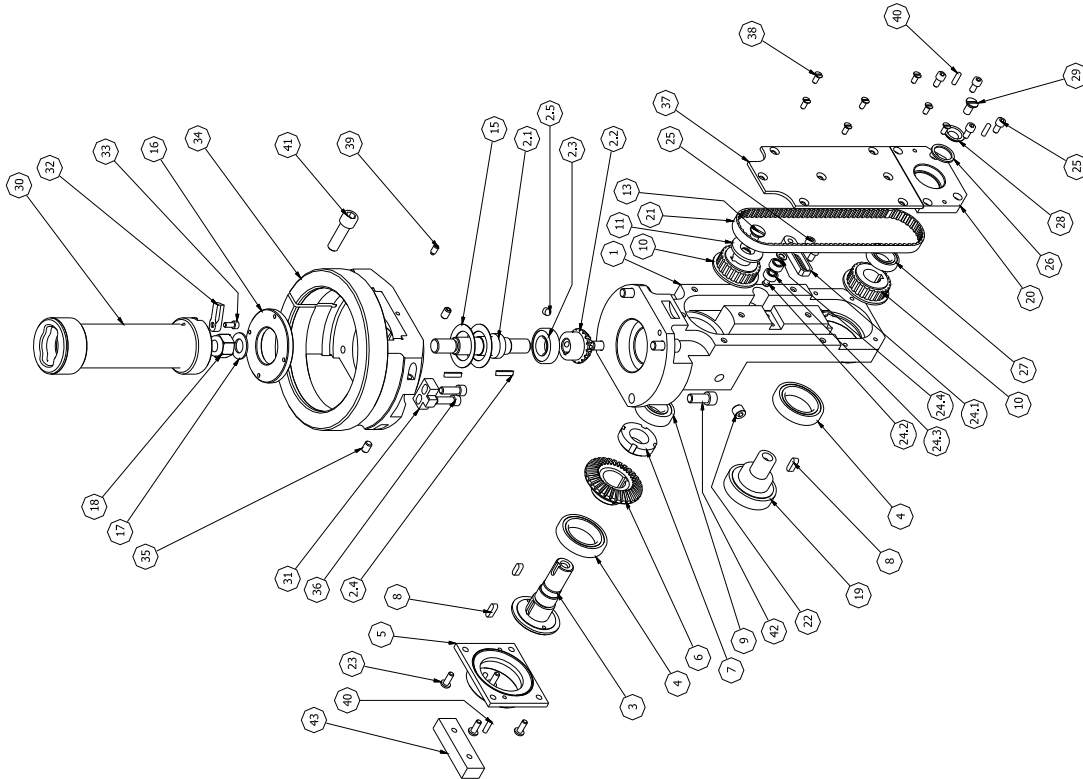
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Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	502-34-2R	Micrometer Head
2	1	502-30-10C	Anvil
3	1	ANSI B18.3 - 3/8-16 UNC x 0.38	Hexagon Socket Set Screw - Flat Point
4	1	502-30-10M	Clamp
5	1	ANSI B18.3 - No. 10 - 24 - 1/2	Hexagon Socket Head Cap Screw
6	1	502-30-10K	Ball Plunger
7	1	502-30-10J	Square Nut
8	1	502-30-10B	Micrometer Frame

6753L Right Angle Belt Drive:



ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	650-2-38B	Housing, Belt Drive 90 Degree Head
2	1	650-2-37X	Pulley Shaft Assembly, Belt Drive
2.1	1	650-2-37Y	Shaft, Belt Drive
2.2	1	6752M	Pulley, 90 Degree Head
2.3	1	700-11	Bearing, Ball
2.4	1	6752Q	Key, Pulley 90 Degree Head
2.5	1	ANSI B18.3 - 1/4-20 UNC x 0.31	Hexagon Socket Set Screw - Cone Point
3	1	650-2-37D	Shaft, Horizontal
4	2	502-9-72C	Bearing, Ball, Outer
5	1	650-2-37C	Bearing Cover
6	1	6766W	Gear, Ring 90 Degree Head
7	1	6705B	Nut, Lock Bearing
8	2	650-2-18M	Key, Micarta
9	1	6753E	Bearing, 90 Degree Head
10	2	650-2-37G	Pulley, Belt Drive
11	1	650-2-37E	End Cap, Upper Pulley Retainer
12	1	650-2-37U	Key, Micarta
13	1	ANSI B18.6.2 - 5/16-24 UNF - 0.75	Slotted Flat Countersunk Head Cap Screw
14	1	6752Q	Key, Pulley 90 Degree Head
15	2	6007A	Washer, Belleville
16	1	6772A	NUT, BEARING LINE BORE HEAD
17	1	100-19	HARDENED WASHER
18	1	MF-186	NV-Lock Nut
19	1	650-2-42B	Shaft, Horizontal Lower
20	1	650-2-37L	Lower Bearing Retainer
21	1	650-2-38D	Bolt, 90 Degree Head
22	4	ANSI B18.3 - 10 - 24 x 1/2	Parker Countersunk Hex-Head Plug 219P 219P-2
23	1	ANSI B18.3 - 10 - 24 x 1/2	Countersunk Hex-Head Plug
24	1	650-2-37P	Bar, Belt Drive
24.1	1	650-2-37Q	Pin, Belt Drive
24.2	1	650-2-37R	Bearing Line Bore Belt Drive
24.3	2	650-2-37S	Washer, Belleville
24.4	1	650-2-37W	Hexagon Socket Head Cap Screw
25	6	ME-4 ANSI B18.3 - No. 10 - 24 UNC - 3/8	Spacer, Lower
26	1	650-2-37V	Bearing, Lower
27	1	650-2-37I	End Cap, Lower Belt Drive
28	1	ANSI B18.6.3 - 1/4-20 x 1/2	Slotted Flat Countersunk Head Machine Screw
29	1	6771A	DRIVER, F90 LINE BORE HEAD
30	1	6751K	Key, Location 90 Degree Head
31	1	6776	KEY DRIVER ADAPTER, F90, F90 SERIES LINE BORE HEAD
32	1	ME-30 ANSI B18.3 - 8-36 UNF - 0.375	Hexagon Socket Head Cap Screw
33	1	6770B	Hub, Horizontal 90 Degree Head
34	2	ME-50 ANSI B18.3 - 1/4-20 UNC x 0.38	Hexagon Socket Head Cap Screw - Flat Point
35	2	ME-92 ANSI B18.3 - 1/4 - 20 UNC - 3/4	Hexagon Socket Set Screw - Flat Point
36	1	650-2-38C	Hexagon Socket Head Cap Screw
37	1	ME-76 ANSI B18.6.3 - 8-32 UNC x 0.375	Slotted 10P Flat Countersunk Head Machine Screw - UNC
38	1	100-95-2	Hexagon Socket Set Screw - Brass Tipless
39	4	ME-105 ANSI B18.8.2 - 5/32 x 1/2	Pin - Hardened Ground Production Dowel
40	1	ANSI B18.3 - 3/8-24 UNF - 1.21	Hexagon Socket Head Cap Screw
41	4	ME-ANSI B18.3 - 3/16-24 UNF - 0.75	Hexagon Socket Head Cap Screw
42	4	ME-ANSI B18.3 - 3/16-24 UNF - 0.75	Hexagon Socket Head Cap Screw
43	1	650-2-38A	Retaining Tool

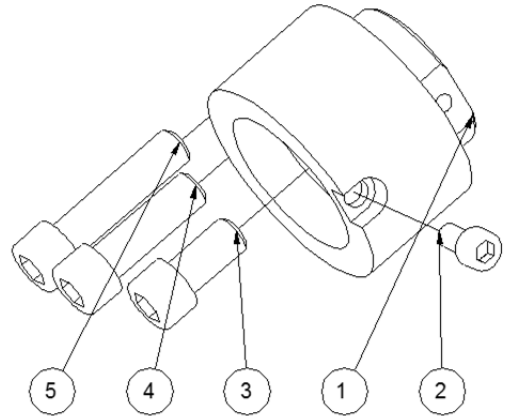
REF F85138-05092/006

6753L Right Angle Drive Standard Tooling:

Note: *The Belt Driven Right Angle Drive is designed for a limited clearance between bearing caps and it's performance will deteriorate as larger diameters are bored and extension spacers used.*

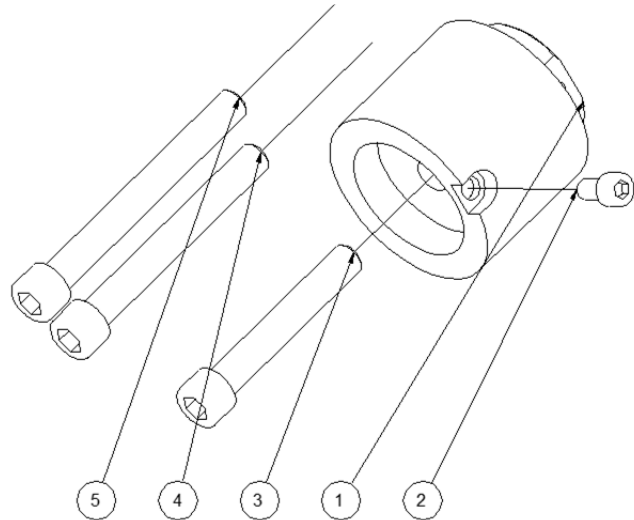
Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	650-2-43	1.05 SPACER
2	1	ANSI B18.3 - No. 10 - 24 - 3/8	Hexagon Socket Head Cap Screw
3	1	ANSI B18.3 - 5/16 - 18 - 5/8	Hexagon Socket Head Cap Screw
4	1	ANSI B18.3 - 5/16 - 18 - 1	Hexagon Socket Head Cap Screw
5	1	ANSI B18.3 - 5/16 - 18 - 1 1/4	Hexagon Socket Head Cap Screw

REF8S100-02152006



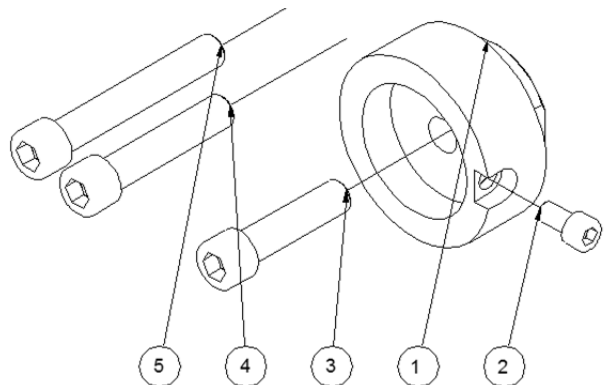
Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	650-2-43A	SPACER - 1.50" LONG
2	1	ANSI B18.3 - No. 10 - 24 - 3/8	Hexagon Socket Head Cap Screw
3	1	ANSI B18.3 - 5/16 - 18 - 2	Hexagon Socket Head Cap Screw
4	1	ANSI B18.3 - 5/16 - 18 - 2 1/2	Hexagon Socket Head Cap Screw
5	1	ANSI B18.3 - 5/16 - 18 - 2 3/4	Hexagon Socket Head Cap Screw

REF8S101-02152006



Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	650-2-43B	SPACER - .70" LONG
2	1	ANSI B18.3 - No. 10 - 24 - 3/8	Hexagon Socket Head Cap Screw
3	1	ANSI B18.3 - 5/16 - 18 - 1 1/4	Hexagon Socket Head Cap Screw
4	1	ANSI B18.3 - 5/16 - 18 - 1 1/2	Hexagon Socket Head Cap Screw
5	1	ANSI B18.3 - 5/16 - 18 - 2	Hexagon Socket Head Cap Screw

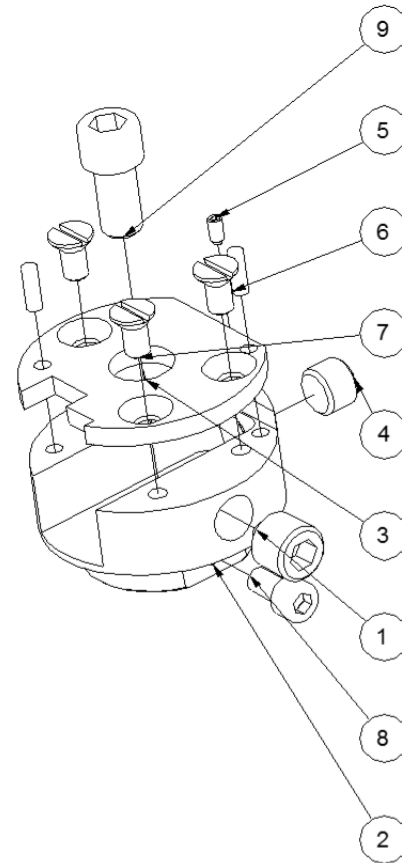
REF8S102-02152006



6753L Right Angle Drive Standard Tooling Cont:

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	501-70A	Tool Holder Lock Screw ass'y
2	1	small cutterhead body	
3	1	small cutterhead cover	
4	1	502-2-85B	Index Screw
5	1	650-2-6A	4-40 brass tipped set screw
6	2	ANSI B18.8.2 - 1/8 x 3/8	Pin - Hardened Ground Production Dowel
7	3	ANSI B18.6.2 - 10-24 UNC x 0.375	Slotted Flat Countersunk Head Cap Screw
8	1	ANSI B18.3 - No. 10 - 24 - 3/8	Hexagon Socket Head Cap Screw
9	1	ANSI B18.3 - 5/16 - 18 - 5/8	Hexagon Socket Head Cap Screw

REF8S104-02162006



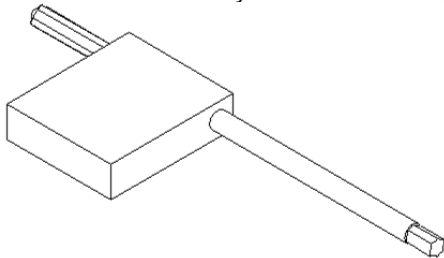
650-2-39B Small Line Bore Head 2.0" – 4.0" (50mm – 100mm)

Toolholder	Toolholder Length	Bore Diameter Range
6801B	1.54" (39mm)	2.0" – 2.4" (51mm – 61mm)
6801C	1.75" (44mm)	2.4" – 2.8" (61mm – 71mm)
6801D	1.95" (50mm)	2.8" – 3.2" (71mm – 81mm)
6801E	2.15" (55mm)	3.2" – 3.6" (81mm – 91mm)
6801F	2.35" (60mm)	3.6" – 4.0" (91mm – 101mm)

When used with 6753L Right angle Drive, minimum distance between bearing housings 2.69" (68.3 mm)

511-29-12D and 511-29-12F Torx Wrenches

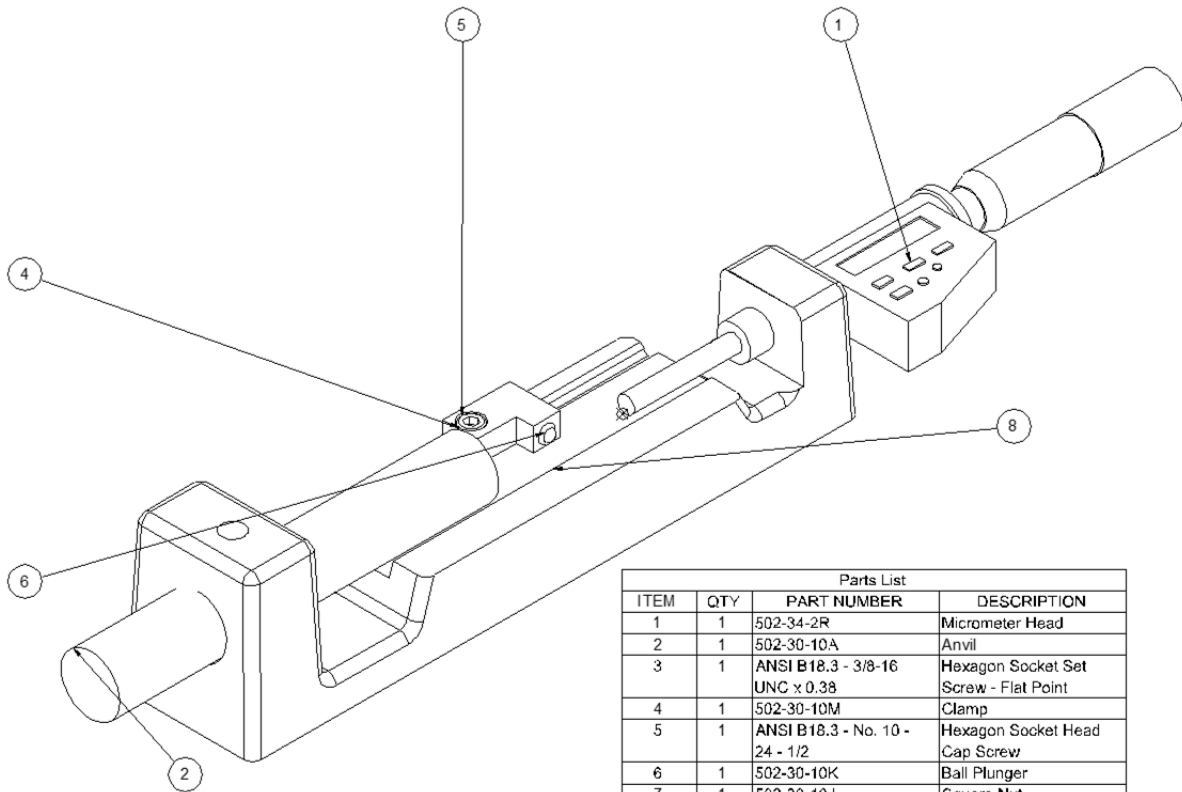
For use with Torx style screw in Triangle cartridges.



REF8S95-06082004

900-2-19 Micrometer Assembly:

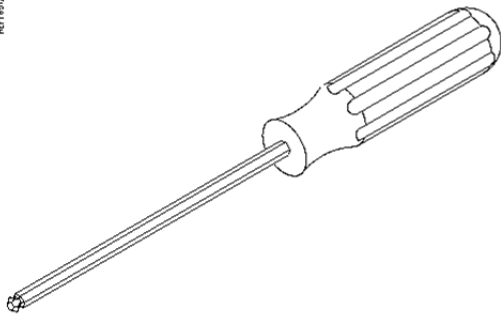
2.0" – 4.0" (50mm – 100mm)



Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	502-34-2R	Micrometer Head
2	1	502-30-10A	Anvil
3	1	ANSI B18.3 - 3/8-16 UNC x 0.38	Hexagon Socket Set Screw - Flat Point
4	1	502-30-10M	Clamp
5	1	ANSI B18.3 - No. 10 - 24 - 1/2	Hexagon Socket Head Cap Screw
6	1	502-30-10K	Ball Plunger
7	1	502-30-10J	Square Nut
8	1	502-30-10B	Micrometer Frame

501-72 Hex Drivers

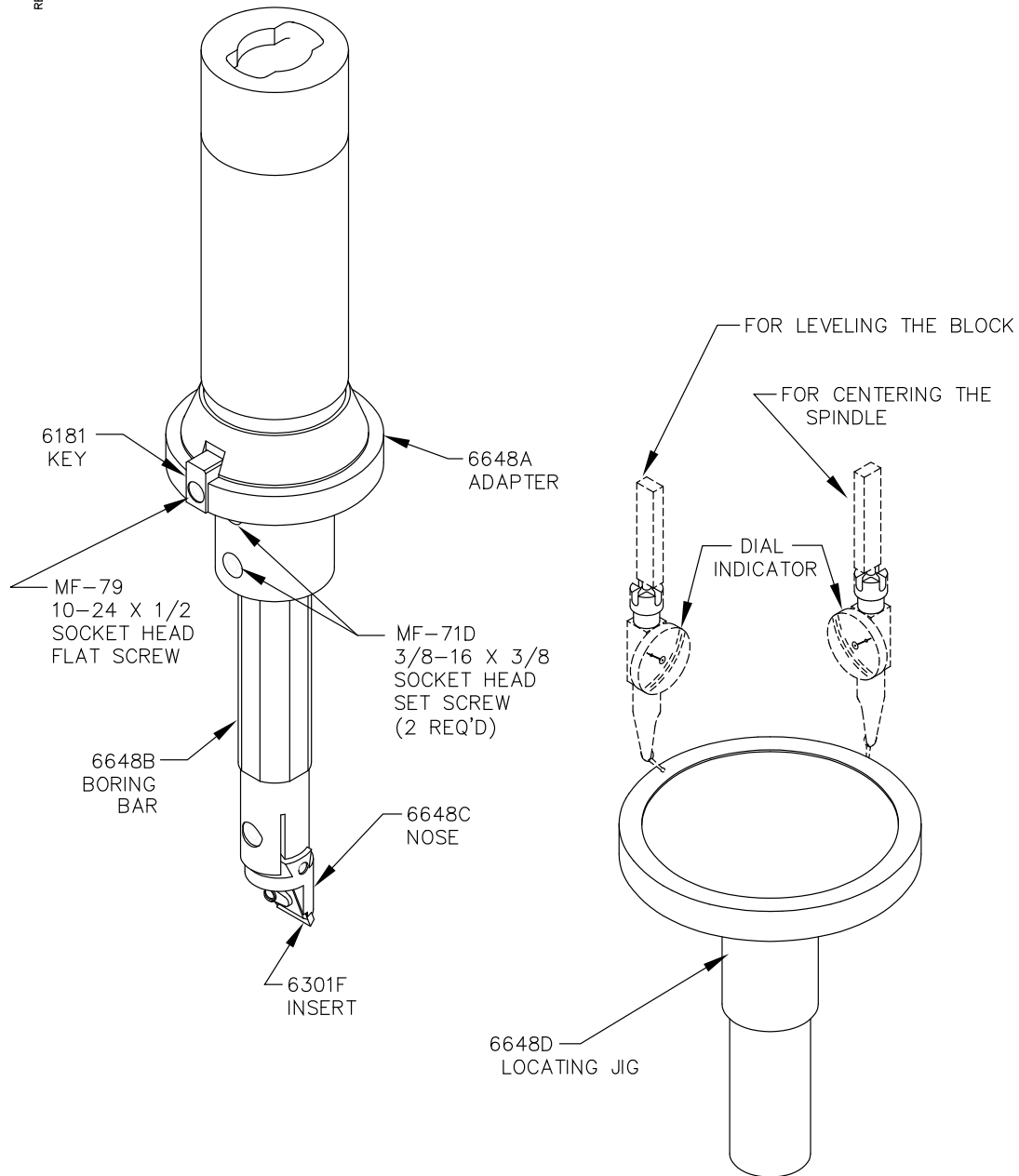
REF 18902 - 04120000



Standard Inserts	
RT322	3/8 IC TRIANGLE 1/32 RADIUS
RT321	3/8 IC TRIANGLE 1/64 RADIUS
RT212	1/4 IC TRIANGLE 1/32 RADIUS
RT211	1/4 IC TRIANGLE 1/64 RADIUS

6648 Caterpillar 3400 Series Tappet Bore Repair Kit:

REFBUL-91-121797



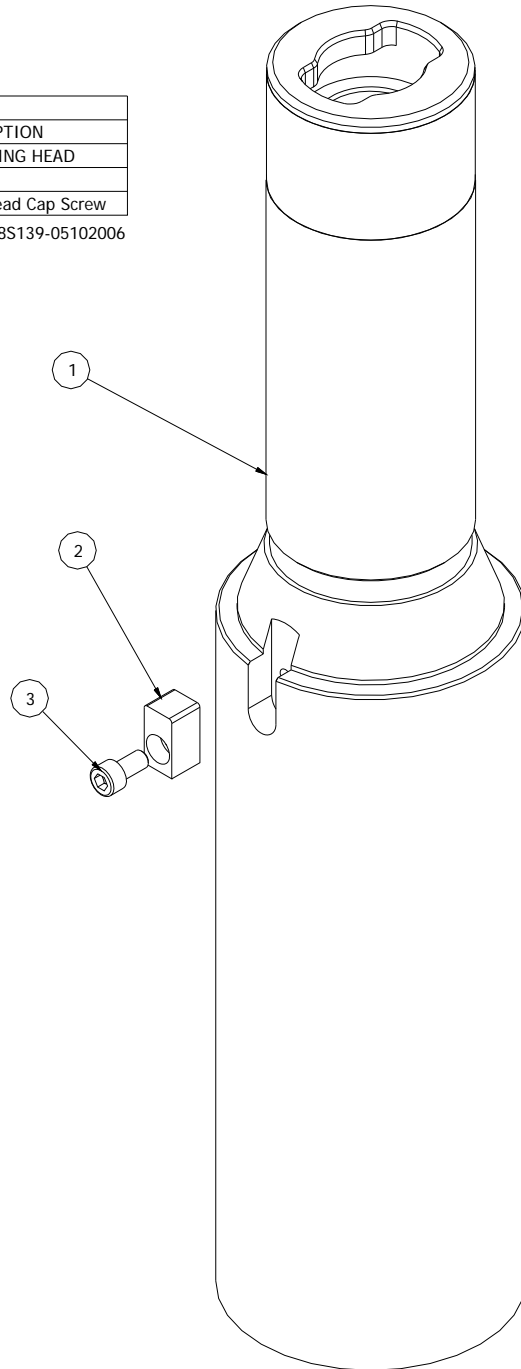
Spindle Adapters for Mounting Universal Tooling

6170C Blank Adapter

This adapter can be machined by the customer to suit special tooling needs.

6170C Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6170L	ADAPTER, SURFACING HEAD
2	1	6181	Drive Key
3	1	ANSI B18.3 - 10-32 UNF - 0.375	Hexagon Socket Head Cap Screw

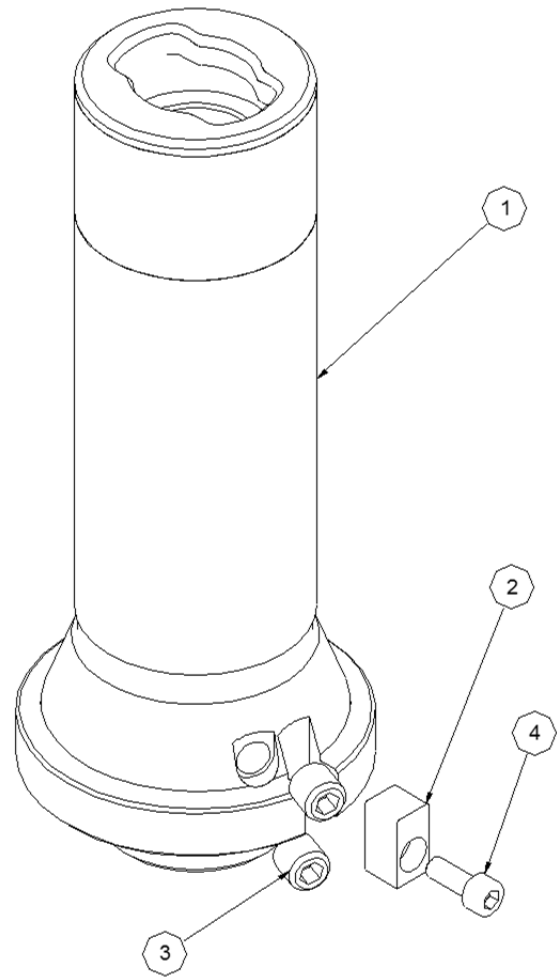
REF8S139-05102006



6648M 1" (25.4 mm) Spindle adapter for driving 1" shank tooling:

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6648A	
2	1	6181	Drive Key
3	2	ANSI B18.3 - 3/8-16 UNC x 0.38	Hexagon Socket Set Screw - Flat Point
4	1	MF-21	Hexagon Socket Head Cap Screw

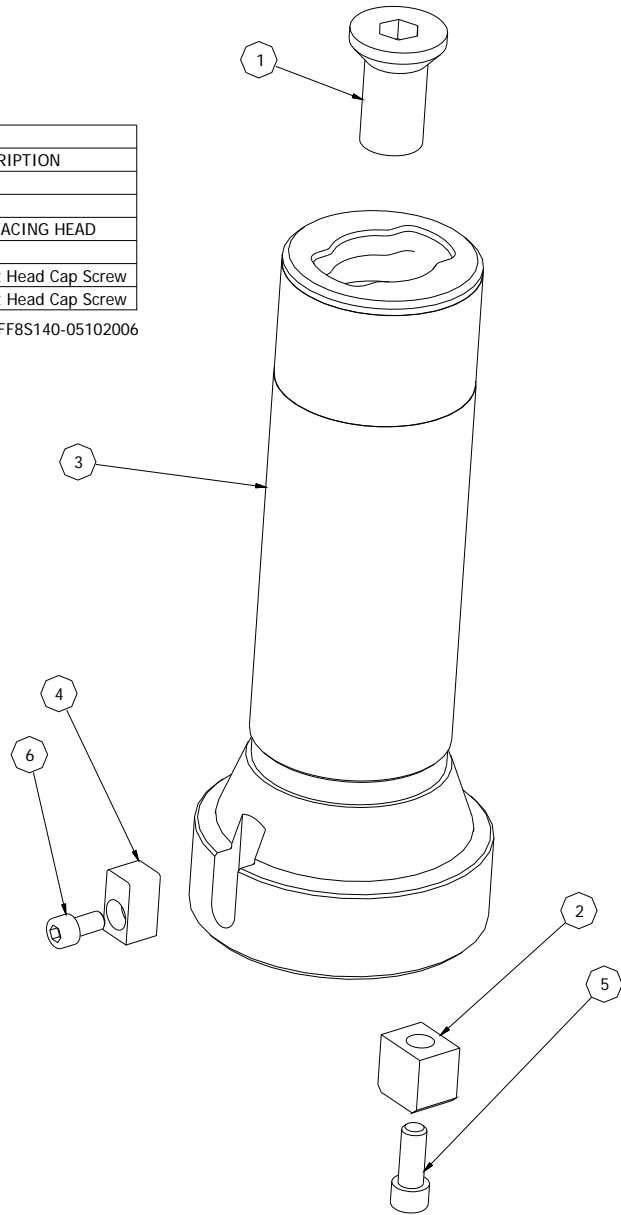
REF90Y64



6170J #40 Taper Adapter Assembly

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6170F	Locking Screw
2	1	6170H	Key, Drive
3	1	6170E	ADAPTER, SURFACING HEAD
4	1	6181	Drive Key
5	1	ANSI B18.3 - 1/4 - 20 UNC - 5/8	Hexagon Socket Head Cap Screw
6	1	ANSI B18.3 - No. 10 - 24 UNC - 3/8	Hexagon Socket Head Cap Screw

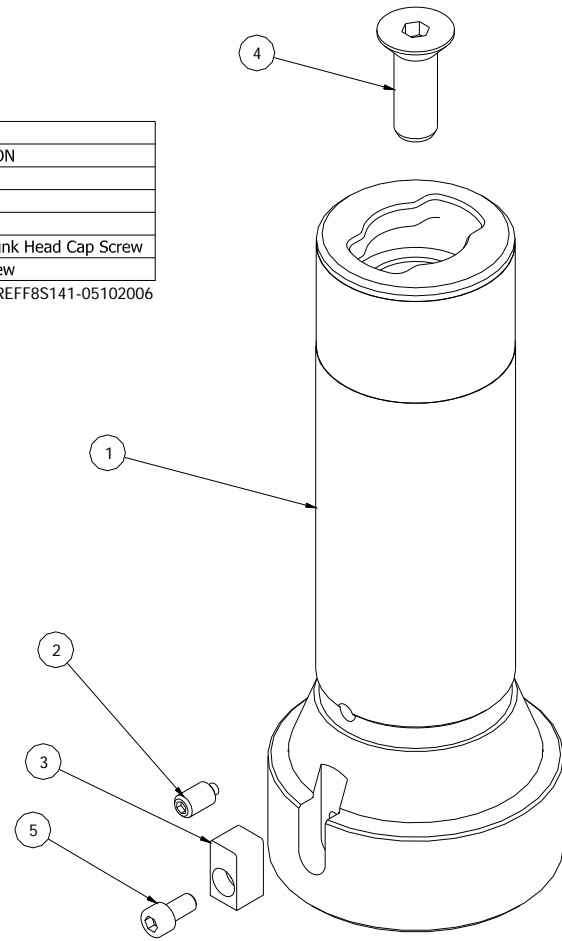
REF8S140-05102006



6170K R8 Adapter Assembly

6170K Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6170D	ADAPTER, FOR R8 TOOLING
2	1	514-3-12K	Screw, key Lower Limit
3	1	6181	Drive Key
4	1	ANSI B18.3 - 7/16-20 UNF x 1.25	Hexagon Socket Flat Countersunk Head Cap Screw
5	1	ANSI B18.3 - 10-32 UNF - 0.375	Hexagon Socket Head Cap Screw

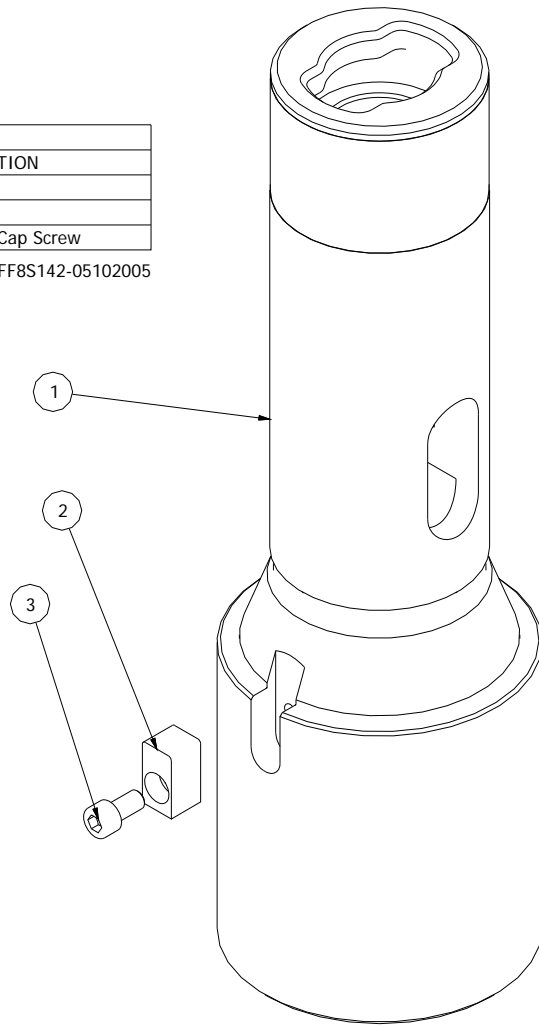
REF8S141-05102006



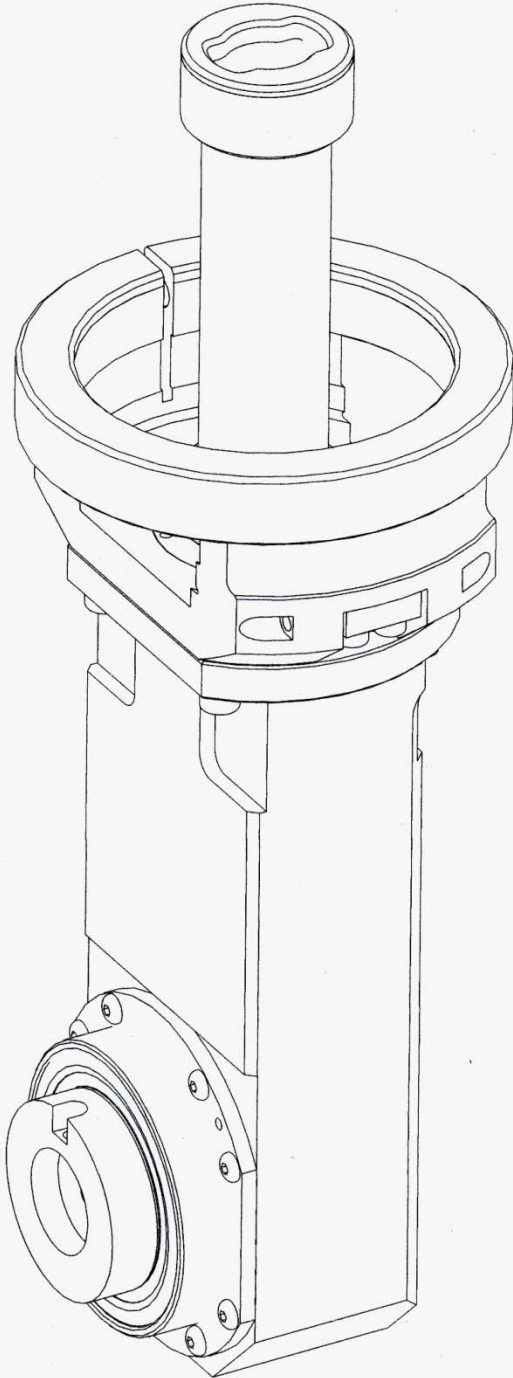
6514Q Adapter, MT #5

6514QParts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6514Q	Adapter, MT #5
2	1	6181	Drive Key
3	1	ANSI B18.3 - 10-32 UNF - 0.375	Hexagon Socket Head Cap Screw

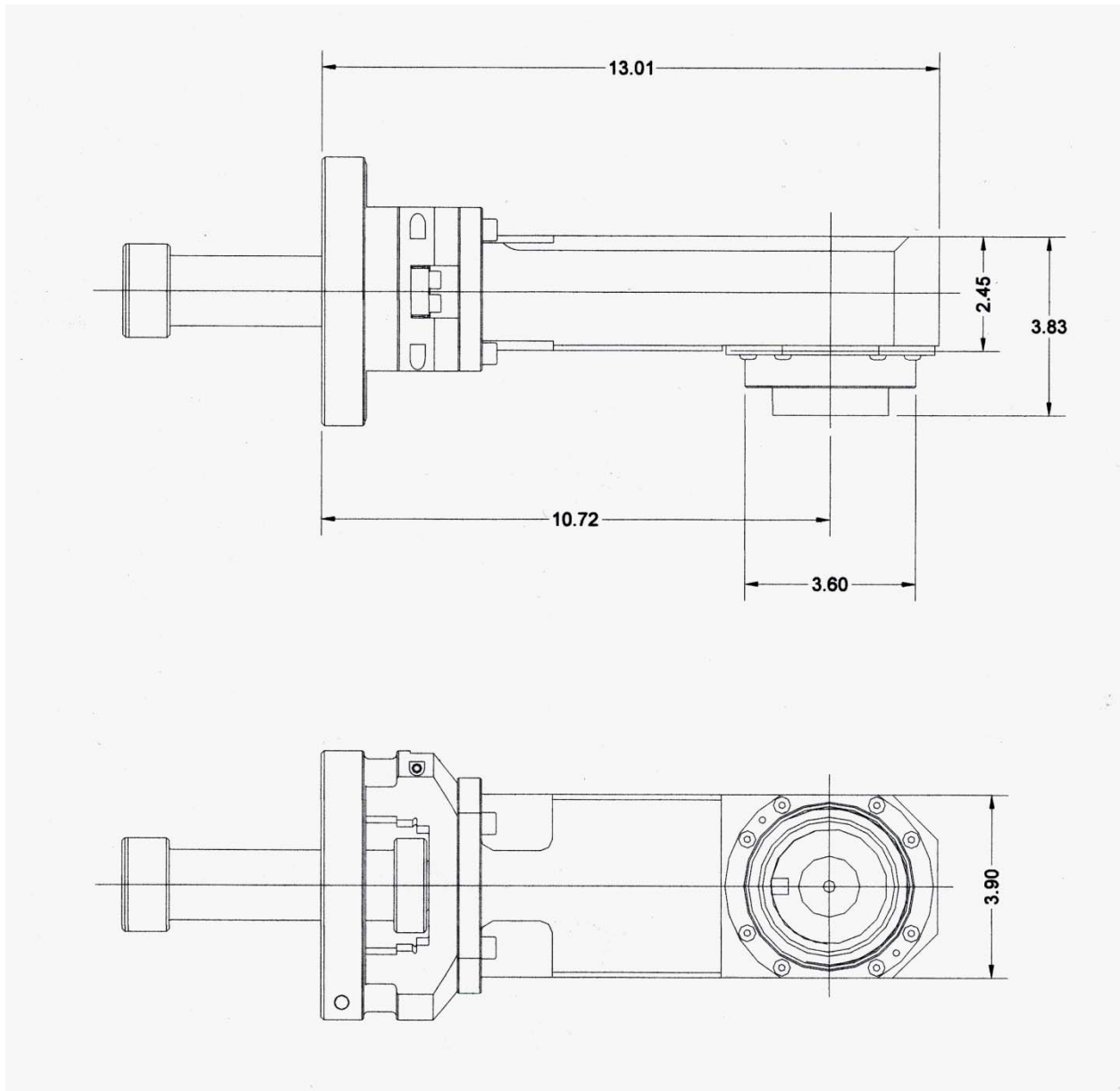
REF8S142-05102005



6856 Heavy Duty Straight Right Angle Drive



6856
MID SIZE RIGHT ANGLE DRIVE



Right Angle Drive Clearances

LINE BORE DRIVE COMBINATION				MINIMUM CLEARANCE BETWEEN MAIN BEARING CAPS						
MACHINE APPLICATION	DRIVE ASSEMBLY P/N	DRIVE STYLE	HEAD SIZE	NO SPACER	WITH .41 SPACER	WITH .70 SPACER	WITH 1.05 SPACER	WITH 1.215 SPACER	WITH 1.50 SPACER	
F65/67	6753K	STANDARD (SHORT)	1.9 HEAD (SHORT)	3.40	3.81	4.10	4.45	4.62	4.90	
			1.9 HEAD (LONG)	3.70	4.11	4.40	4.75	4.92	5.20	
			2.9 HEAD	4.07	4.48	4.77	5.12	5.29	5.57	
			5.4 HEAD	4.08	4.49	4.78	5.13	5.30	5.58	
F68	6753M	STANDARD (SHORT)	1.9 HEAD (SHORT)	3.40	3.81	4.10	4.45	4.62	4.90	
			1.9 HEAD (LONG)	3.70	4.11	4.40	4.75	4.92	5.20	
			2.9 HEAD	4.07	4.48	4.77	5.12	5.29	5.57	
			5.4 HEAD	4.08	4.49	4.78	5.13	5.30	5.58	

CALCULATING MAX. BORE DEPTH:
 BORES 1.9 TO 2.14 (48.26 to 54.36mm) DIA. - SUBTRACT 2.085 (52.99mm) FROM TOTAL WIDTH.
 BORES 2.14 to 3.12 (54.36 to 79.25mm) DIA. - SUBTRACT 1.655 (42.037mm) FROM TOTAL WIDTH.
 BORES 3.12 (79.25mm) AND LARGER DIA. - SUBTRACT 1.457 (37.008mm) FROM TOTAL WIDTH.

MACHINE APPLICATION	DRIVE ASSEMBLY P/N	DRIVE STYLE	HEAD SIZE	NO SPACER	WITH .41 SPACER	WITH .70 SPACER	WITH 1.05 SPACER	WITH 1.215 SPACER	WITH 1.50 SPACER
F65/67	650-2-37	BELT DRIVE	1.9 HEAD (SHORT)	2.69	3.10	3.39	3.74	3.91	4.19
			1.9 HEAD (LONG)	4.41	4.82	5.11	5.46	5.63	5.91
			2.9 HEAD	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
			5.4 HEAD	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
F68	650-2-37A	BELT DRIVE	1.9 HEAD (SHORT)	2.69	3.10	3.39	3.74	3.91	4.19
			1.9 HEAD (LONG)	4.41	4.82	5.11	5.46	5.63	5.91
			2.9 HEAD	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
			5.4 HEAD	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
F80/90	6753L	BELT DRIVE	1.9 HEAD (SHORT)	2.69	3.10	3.39	3.74	3.91	4.19
			1.9 HEAD (LONG)	4.41	4.82	5.11	5.46	5.63	5.91
			2.9 HEAD	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
			5.4 HEAD	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED

CALCULATING MAX. BORE DEPTH:
 BORES LESS THAN 2.40 (60.96mm) DIA. - SUBTRACT 1.381 (35.077mm) FROM TOTAL WIDTH,
 BORES 2.40 (60.96mm) AND LARGER DIA. - SUBTRACT .975 (24.765mm) FROM TOTAL WIDTH.

MACHINE APPLICATION	DRIVE ASSEMBLY P/N	DRIVE STYLE	HEAD SIZE	NO SPACER	WITH .41 SPACER	WITH .70 SPACER	WITH 1.05 SPACER	WITH 1.215 SPACER	WITH 1.50 SPACER
F80/90	6753J	STANDARD (LONG)	1.9 HEAD (SHORT)	3.40	3.81	4.10	4.45	4.62	4.90
			1.9 HEAD (LONG)	3.70	4.11	4.40	4.75	4.92	5.20
			2.9 HEAD	4.07	4.48	4.77	5.12	5.29	5.57
			5.4 HEAD	4.08	4.49	4.78	5.13	5.30	5.58
CALCULATING MAX. BORE DEPTH: BORES 1.9 TO 2.35 (48.26 to 59.69mm) DIA. - SUBTRACT 2.572 (65.329mm) FROM TOTAL WIDTH. BORES 2.35 to 3.69 (59.69 to 93.73mm) DIA. - SUBTRACT 2.165 (54.991mm) FROM TOTAL WIDTH. BORES 3.69 (93.73mm) AND LARGER DIA. - SUBTRACT 1.457 (37.008mm) FROM TOTAL WIDTH.									
F80/90	6856	MID-SIZE	1.9 HEAD (SHORT)	4.57	4.98	5.27	5.62	5.79	6.07
			1.9 HEAD (LONG)	4.86	5.27	5.56	5.91	6.08	6.36
			2.9 HEAD	4.63	5.04	5.33	5.68	5.85	6.13
			5.4 HEAD	5.34	5.75	6.04	6.39	6.56	6.84
CALCULATING MAX. BORE DEPTH: BORES 1.9 TO 2.45 (48.26 to 62.23mm) DIA. - SUBTRACT 3.823 (97.10mm) FROM TOTAL WIDTH. BORES 2.45 to 3.65 (62.23 to 92.71mm) DIA. - SUBTRACT 2.636 (66.95mm) FROM TOTAL WIDTH. BORES 3.65 (92.71mm) AND LARGER DIA. - SUBTRACT 2.45 (62.23mm) FROM TOTAL WIDTH.									

MACHINE APPLICATION	DRIVE ASSEMBLY P/N	DRIVE STYLE		WITH 1.9"-2.4" HEAD AND 6801N TOOL HOLDER	MAXIMUM DEPTH OF CUT	WITH 1.9"-2.4" HEAD AND 6801E TOOL HOLDER	MAXIMUM DEPTH OF CUT
F65/67	650-2-19U	SPECIAL NARROW DRIVE		3.74	2.13	3.20	1.60
F68	6753P	SPECIAL NARROW DRIVE		3.74	2.13	3.20	1.60
F80/90	6773Z	SPECIAL NARROW DRIVE		3.74	2.13	3.20	1.60
CALCULATING MAX. BORE DEPTH: SUBTRACT 1.56 (39.63mm) FROM TOTAL WIDTH.							
MACHINE APPLICATION	DRIVE ASSEMBLY P/N	DRIVE STYLE		WITH 3.00 LONG HEAD	WITH 4.25 LONG HEAD	WITH 5.10 LONG HEAD	WITH 6.00 LONG HEAD
F80/90	6773F	H.D. OFFSET		7.94	9.35	10.04	10.94

7202W Insert Holder

Item	Part Number	Description	Item QTY
1	7202Q		1
2	100-82-2	Set Screw, brass tipped	1
3	1/4 x 1	Pin - Hardened Ground Production Dowel	1
4	MF-9 10-32 UNF - 0.625	Hexagon Socket Head Cap Screw	1
5	100-82-4		1
6	7202P	Tool Holder	1

