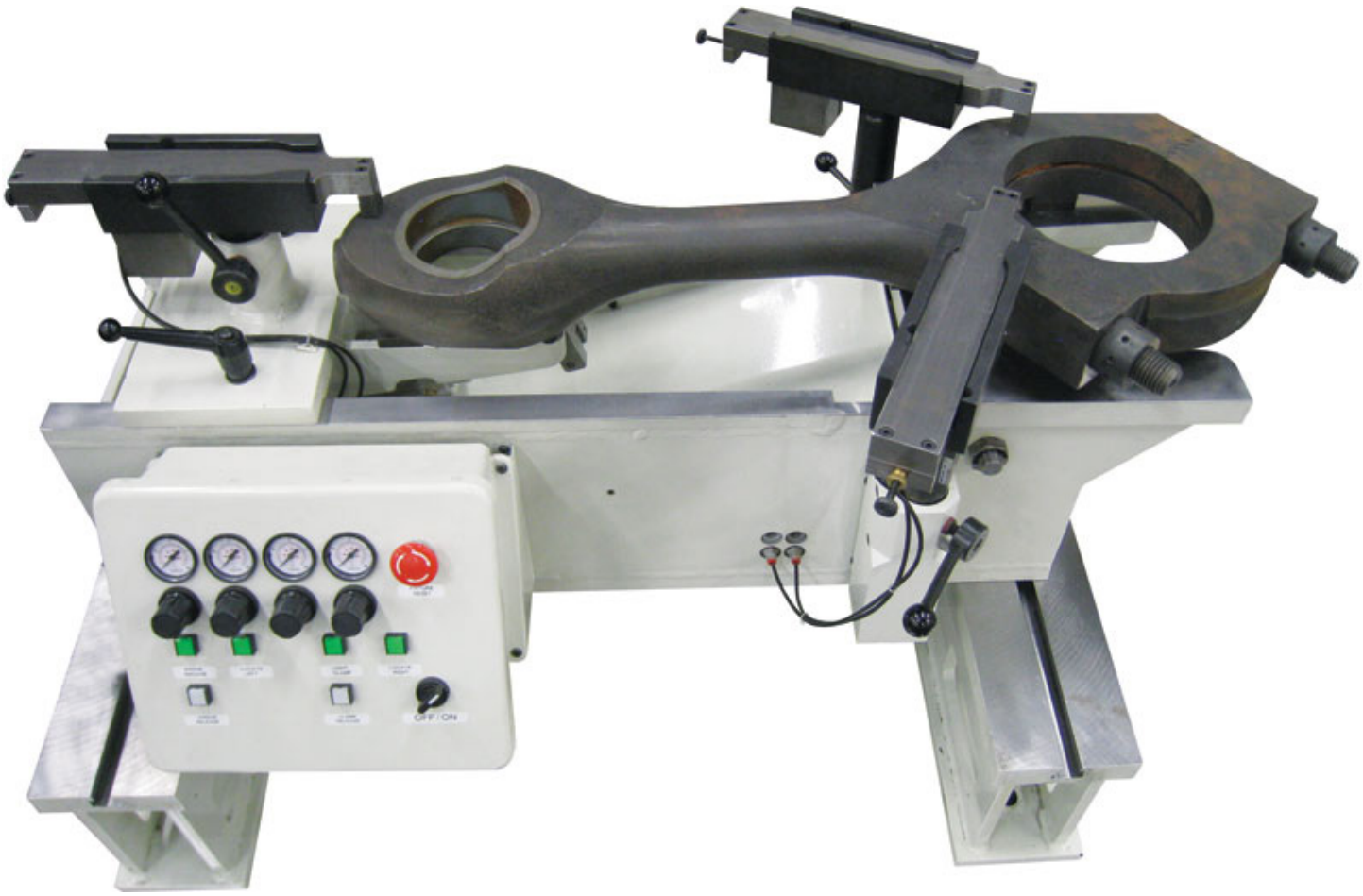
ROTTLER

650-3-64
CON ROD FIXTURE

OPERATION AND MAINTENANCE MANUAL



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10.10.2016

MANUAL SECTIONS

INTRODUCTION

INSTALLATION

SAFETY

CONTROL DEFINITIONS

OPERATING INSTRUCTIONS

PARTS

OPTIONS

ORDERING PROCEDURE

Contact your regional Rottler sales rep for assistance in ordering optional equipment, replacement parts, or tooling.

If you are unable to contact your regional Rottler sales rep, call the factory at 253-872-7050 and ask to speak to the parts sales specialist.

Have the following information handy to expedite the ordering process:

1. Your name, business name, and contact number
2. Customer number
3. If you don't have a customer number, your billing address
4. Shipping address if different from billing address
5. Machine model and serial number
6. Part number and description of what you want to order
7. Preferred method of shipment
8. You may also contact us via e-mail with the above information. Send e-mail requests to: parts@rottlermfg.com or intlpart@rottlermfg.com

In some cases you may be requested to send a photo of the part you are ordering if it is a replacement part, or doesn't appear in the database.

If you are unsure which part you need to order, contact our service department and ask to speak to one of our service consultants. They will assist you in determining which part you require.

THERE IS A MINIMUM ORDER OF $25.00

INTRODUCTION

We suggest that the new user of the Connecting Rod Fixture first read the CONTROL DEFINITIONS to get an idea how the machine operates.

The Control Definitions and Operating Instructions chapters should be read in order to familiarize the user with the actual button pushing sequences required to carry out a job. These chapters in the manual should be considered an introduction. As the operators of the Connecting Rod Fixture gain experience with using the different functions of the machine, complicated setups and programs will make more sense.

If this fixture is being retrofitted to a machine already in service, then chapter 2, Installation should be referred to.

The rest of the manual contains information and part number reference on fixtures, cutting tools, and machine maintenance. The operator should read and become familiar with these areas as well.

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INSTALLATION

Aligning the Connecting Rod Fixture

- Make sure the fixture is bolted down to the table of the machine.
- Start by pressing the left locate button on the control panel.
- Remove the centering block.
- With the probe find and zero the center of the centering lever.
- Zero the Y Axis in the software on the DRO.
- Move to the right side of the fixture and activate the right locate button.
- Remove the locator plate.
- With the Y Axis still on it’s zero bring the probe down and find the difference of offset of the locator holder.
- Loosen the lock nuts on both sides of the fixture.
- Tighten and loosen the locator nuts to bring the offset to less than .0005”.
- Torque the nuts to 15 ft lbs and alternating from one side to the other tightened the set screws one at a time until all six are tight. check that when tightening that the locator holder hasn’t moved.

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SAFETY

Safety Information

For Your Own Safety Read This Instruction Manual Before Operating This Machine.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in serious injury.

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Safety Instructions for Machine Use

WARNING **This machine is capable of causing severe bodily injury**

ONLY A QUALIFIED, EXPERIENCED OPERATOR SHOULD OPERATE THIS MACHINE. NEVER ALLOW UNSUPERVISED OR UNTRAINED PERSONNEL TO OPERATE THE MACHINE. Make sure any instructions you give in regards to machine operation are approved, correct, safe, and clearly understood. Untrained personal present a hazard to themselves and the machine. Improper operation will void the warranty.

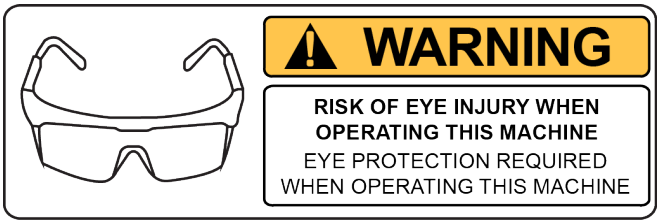
KEEP GUARDS IN PLACE and in proper working order. If equipped with doors, they must be in the closed position when the machine is in operation.

KEEP WORK AREA CLEAN. Cluttered areas and benches invite accidents.

KEEP CHILDREN AND VISITORS AWAY. All children and visitors should be kept a safe distance from work area.

WEAR THE PROPER APPAREL. DO NOT wear loose clothing, gloves, rings, bracelets, or other jewelry which may get caught in moving parts. Non-Slip foot wear is recommended. Wear protective hair covering to contain long hair.

ALWAYS USE SAFETY GLASSES. Also use face or dust mask if cutting operation is dusty. Everyday eye glasses only have impact resistant lenses, they are NOT safety glasses.



DO NOT OVER-REACH. Keep proper footing and balance at all times.

USE THE RECOMMENDED ACCESSORIES. Consult the manual for recommended accessories. The use of improper accessories may cause risk of injury.

CHECK DAMAGED PARTS. Before further use of the machine, a guard or other part that is damaged should be checked to determine that it will operate properly and perform its intended function. Check for alignment of moving parts, breakage of parts, mounting, and other conditions that may affect its operation. A guard or other part that is damaged should be properly repaired or replaced.

NEVER OPERATE A MACHINE WHEN TIRED, OR UNDER THE INFLUENCE OF DRUGS OR ALCOHOL. Full mental alertness is required at all times when running a machine.

IF AT ANY TIME YOU ARE EXPERIENCING DIFFICULTIES performing the intended operation, stop using the machine! Then contact our service department or ask a qualified expert how the operation should be performed.

DO NOT MODIFY OR ALTER THIS EQUIPMENT in any way. If modifications are deemed necessary, all such requests must be approved and/or handled by Rottler Manufacturing. Unauthorized modifications could cause injury and/or damage to machine and will void the warranty.

SAFETY DECALS SHOULD NEVER BE REMOVED. They are there to convey important safety information and warn of potential hazards.

ALL LOCAL SAFETY CODES AND REGULATIONS should be followed when installing this machine.

ONLY QUALIFIED PERSONAL should perform service on the electrical and control systems.

When boring the machine is capable of throwing metal chips over 10- feet from the cutting area. Always use the guards. Eye protection must be worn at all times by the operator and all other personnel in the area of the machine.

CAUTION No list of safety guidelines can be complete. Every piece of shop environment is different. Always consider safety first, as it applies to your individual working conditions. Use this and other machinery with caution and respect. Failure to follow guidelines could result in serious personal injury, damage to equipment or poor work results.

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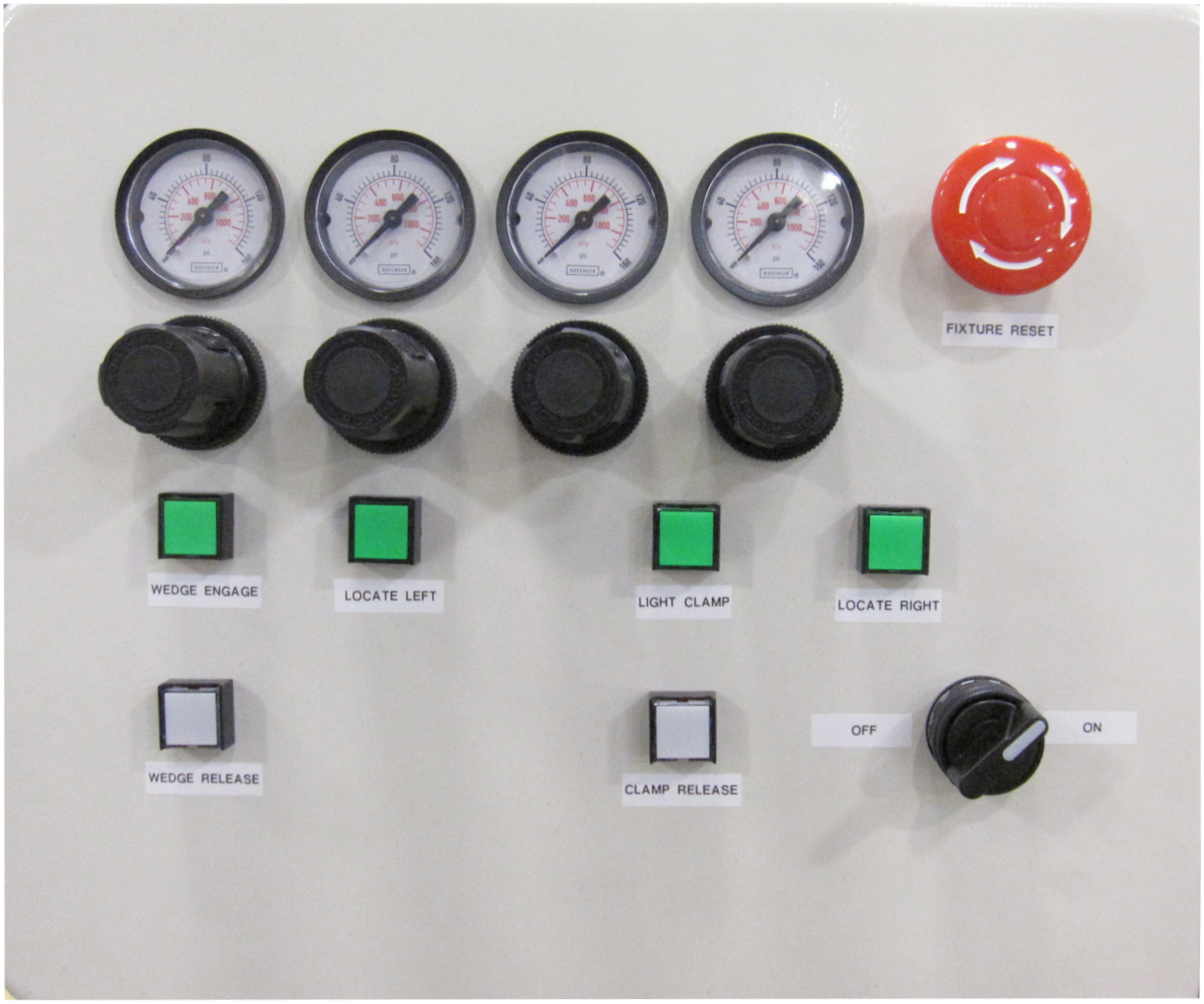
CONTROL DEFINITIONS



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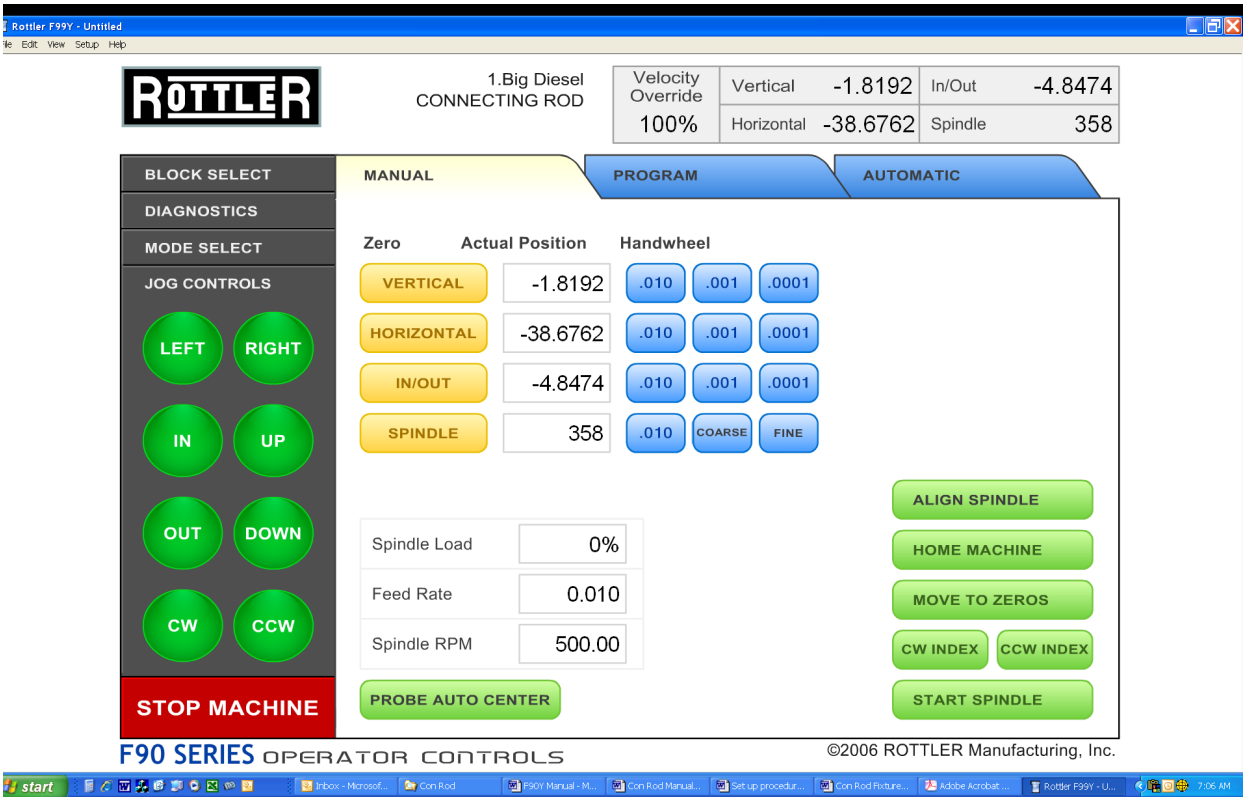
OPERATING INSTRUCTIONS

Contents

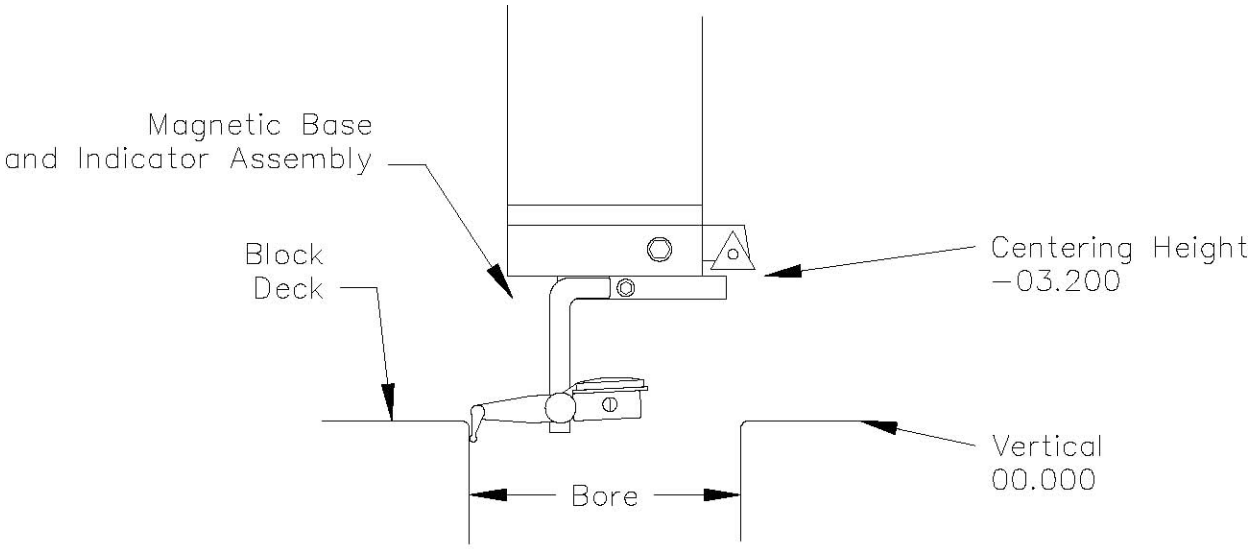
Manual Screen



This screen is used to set the center of the conrod to be bored and a vertical height reference for the cutterhead and boring tool to be used.

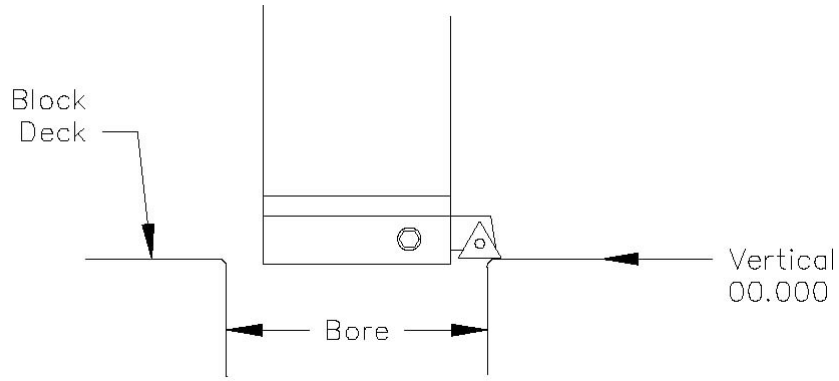
Setting In/Out and Horizontal Zero

Using a suitable Magnetic Base and Indicator assembly as shown below, indicate in the center of the conrod and touch the Yellow Horiz Zero and In/Out Zero Buttons to set the machine to the center of the conrod. Normally only the conrod half of the big end is used for centering. When setting the In/Out Zero, the last movement of travel when indicating the bore of the conrod, must be in the inwards direction. When setting the Horizontal Zero, the last movement of travel when indicating the bore of the conrod, must be in the leftwards direction. This will eliminate any backlash that may be in the machine.

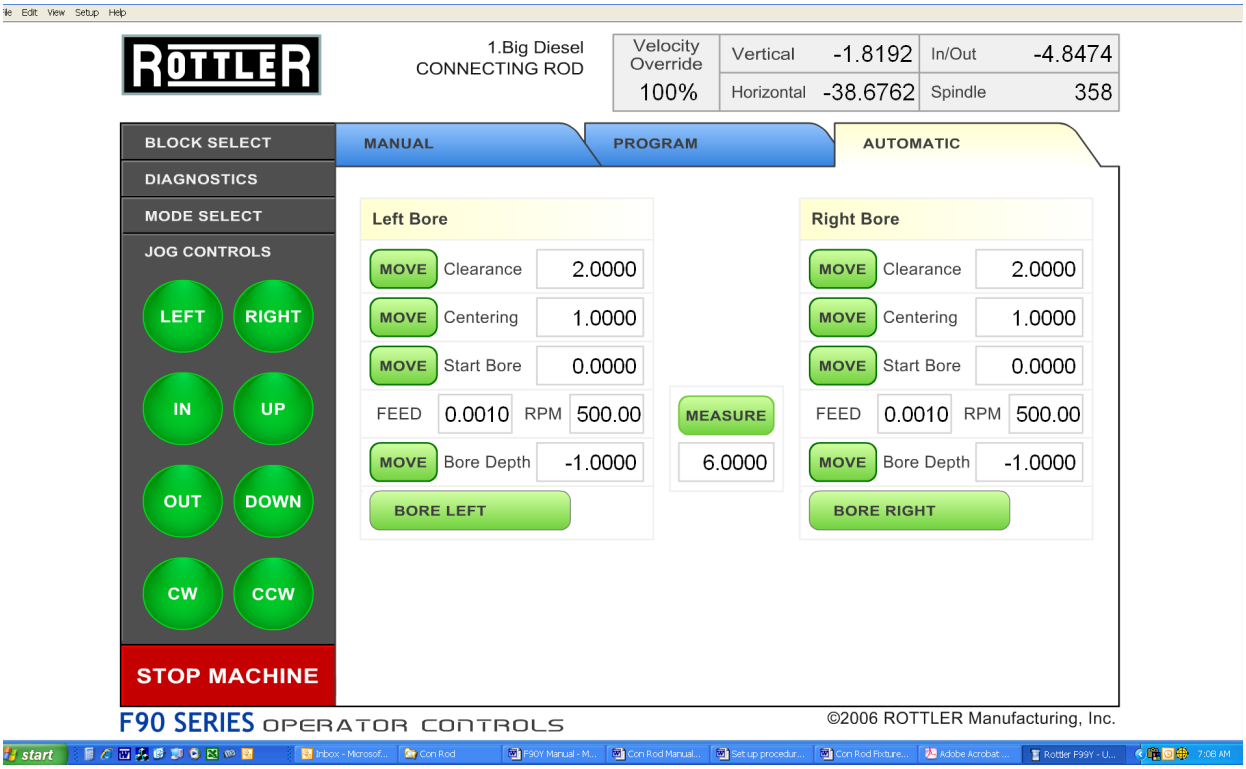


Setting Vertical Zero

Fit the cutterhead and boring tool that is going to be used to bore the big end. Once the Horiz and In/Out center has be established, slowly lower the cutterhead until the boring tool just makes contact with the thrust face of the big end of the conrod. At this point, press the yellow Vert Zero button.



Automatic Screen

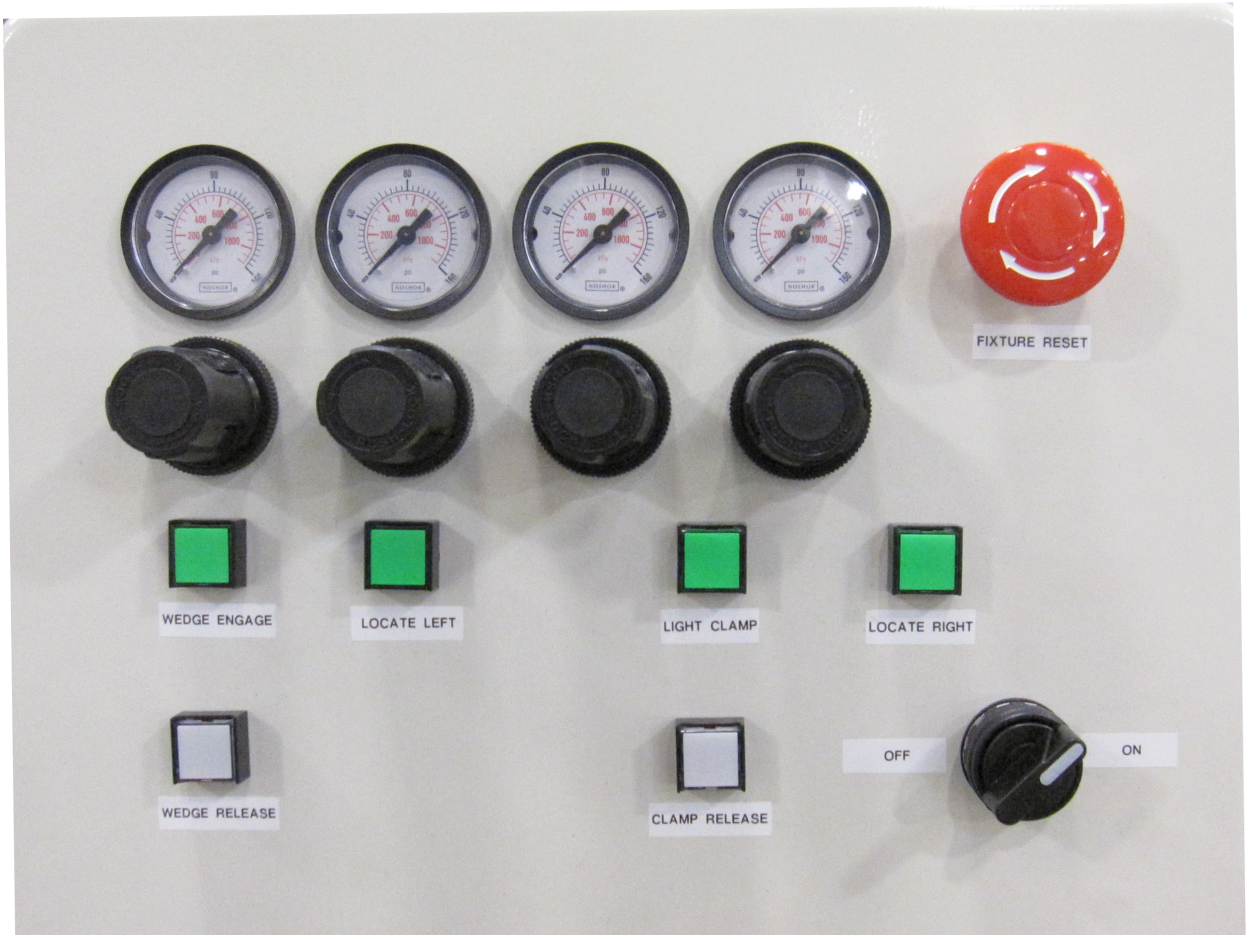


This screen is used to run programs such as bore right big end of the conrod. When the green buttons are touched, the machine will move to the position or start an automatic cycle.

Bore Both: If special cutterheads with big and small end tooling in one are being used, the block can be checked so that the machine will bore both big and small end in one cycle. Normally the big and small ends are bored with different cutterheads and this block will be unchecked.

Note: Do not stop an automatic cycle in mid cycle and then try to start it again. The CNC code running behind the Rottler screens use offsets in the controller. If the machine is stopped during an automatic cycle the machine must be shut down and restarted to clear the offsets. Otherwise the displayed position and actual position of the machine will not be correct.

Fixture Control Panel



Set Up Procedure For Conrod Fixture

- Select the widest big and small end ball locators that will fit inside the conrod big and small end bores.
- Press Locate Right and the right hand ball locator will move up and stop against it's end stop, then remove the air pressure supply to the conrod fixture so that the ball locator pivot arms may be moved manually.
- Fit the selected ball locators to the right and left hand mounting positions. Be sure there are no chips and that the locators fix exactly in their mounting positions.
- Connect the air pressure to the fixture.
- Press Locate Right Button, the right hand ball locator will move up and stop against it's end stop.
- Select the correct conrod support and place across the conrod fixture.
- Place the conrod to be bored into the fixture so that the big end bore touches both the balls of the right hand ball locators.
- Adjust the conrod rest so that the rod lies approximately horizontal.
- Adjust the 3 big end support pads so that each support pad locates on the side of the big end and does not protrude into the big end bore. This will require removing and refitting the conrod to be sure the 3 support pads are correctly located and their hold down cap screws are tight.
- Readjust the conrod support to allow the conrod to lie horizontal with no rock or tilt of the conrod on the 3 big end support pads.
- Remove the conrod from the fixture.
- Press locate left and the left hand small end ball locating device will lift up.

- When the left hand ball locating device is at it's end of travel, place the conrod back in the fixture and adjust the left hand slide assembly so that both the left hand locating balls contact the bore inside the conrod small end.
- Remove the conrod from the fixture.
- Slide the left hand locating assembly approx ½" (12.7mm) to the right and lock both hold down handles securely, this will ensure that the small end ball locators contact the small end with some preload.
- Place the conrod in the fixture.
- Position the clamp arms so that their feet are approx 1/8" (3mm) above the side of the big end, be sure that hey do nor protrude into the big end bore to be machined and adjust their travel limit stops and lock the lock nuts.
- Press the Light Clamp button, this will places light clamping pressure on the clamp arms and lightly hold the conrod down against the 3 support pads under the big end of the conrod.
- Press the Locate Left button, the small end ball locator will move up and contact the bore of the small end of the conrod and firmly press it against the big end and straighten the conrod along the center of the fixture.
- Select a set of wedges that will allow the outside of the small end of the conrod to be supported during boring so that there is no chatter or vibration during boring.
- Press Wedge Engage button, the wedges will be pressed against the outside of the small end.
- The conrod is now ready to be bored.

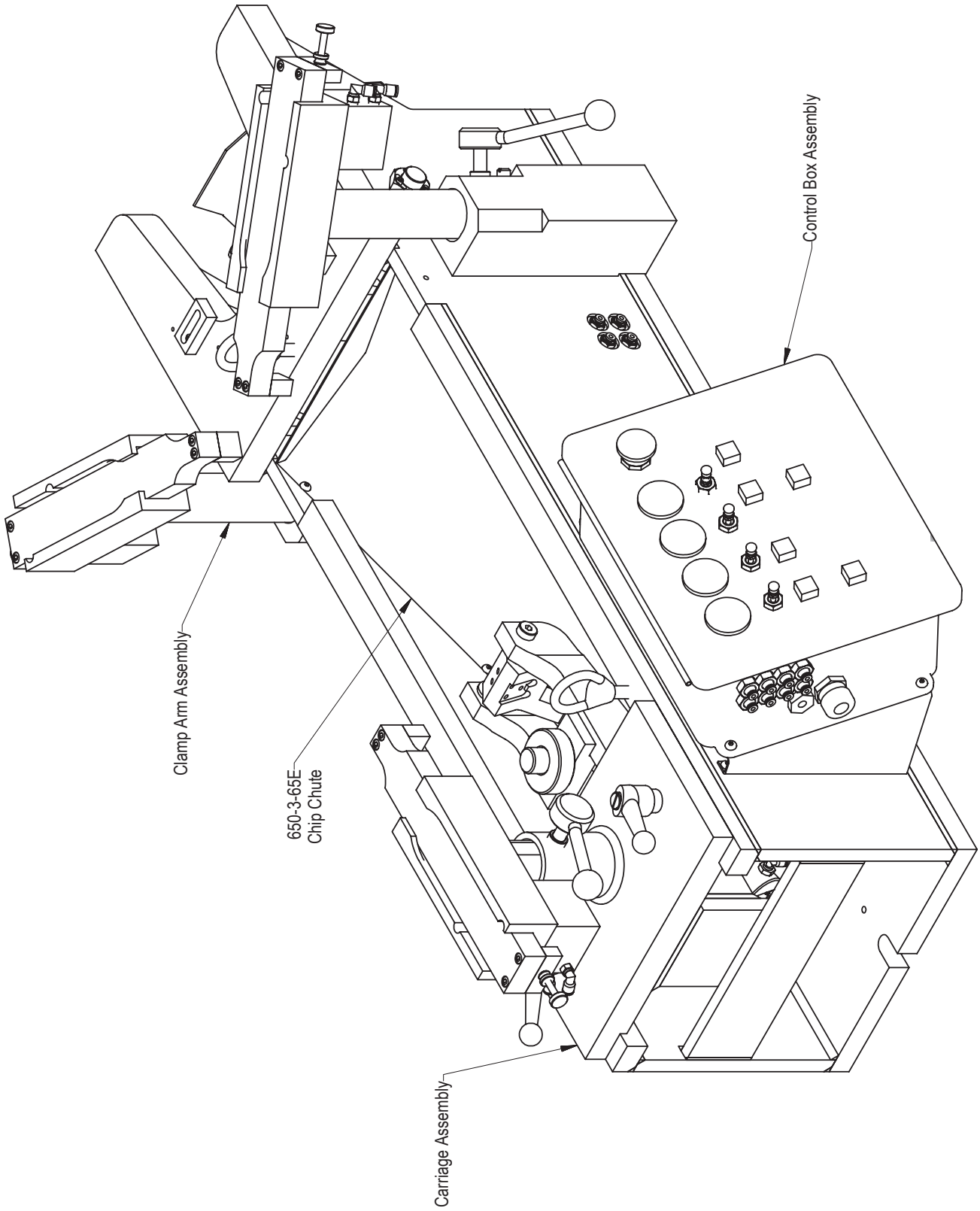
Air Pressure Settings

Right Hand Side Air Gage:	Locate Right	100psi	(6.5Bar)
Second from Right Hand Side:	Light Clamp	15psi	(1.0Bar)
Second from Left Hand Side:	Locate Left	30psi	(2.0Bar)
Left Hand Side Air Gage:	Wedge Engage	30psi	(2.0Bar)

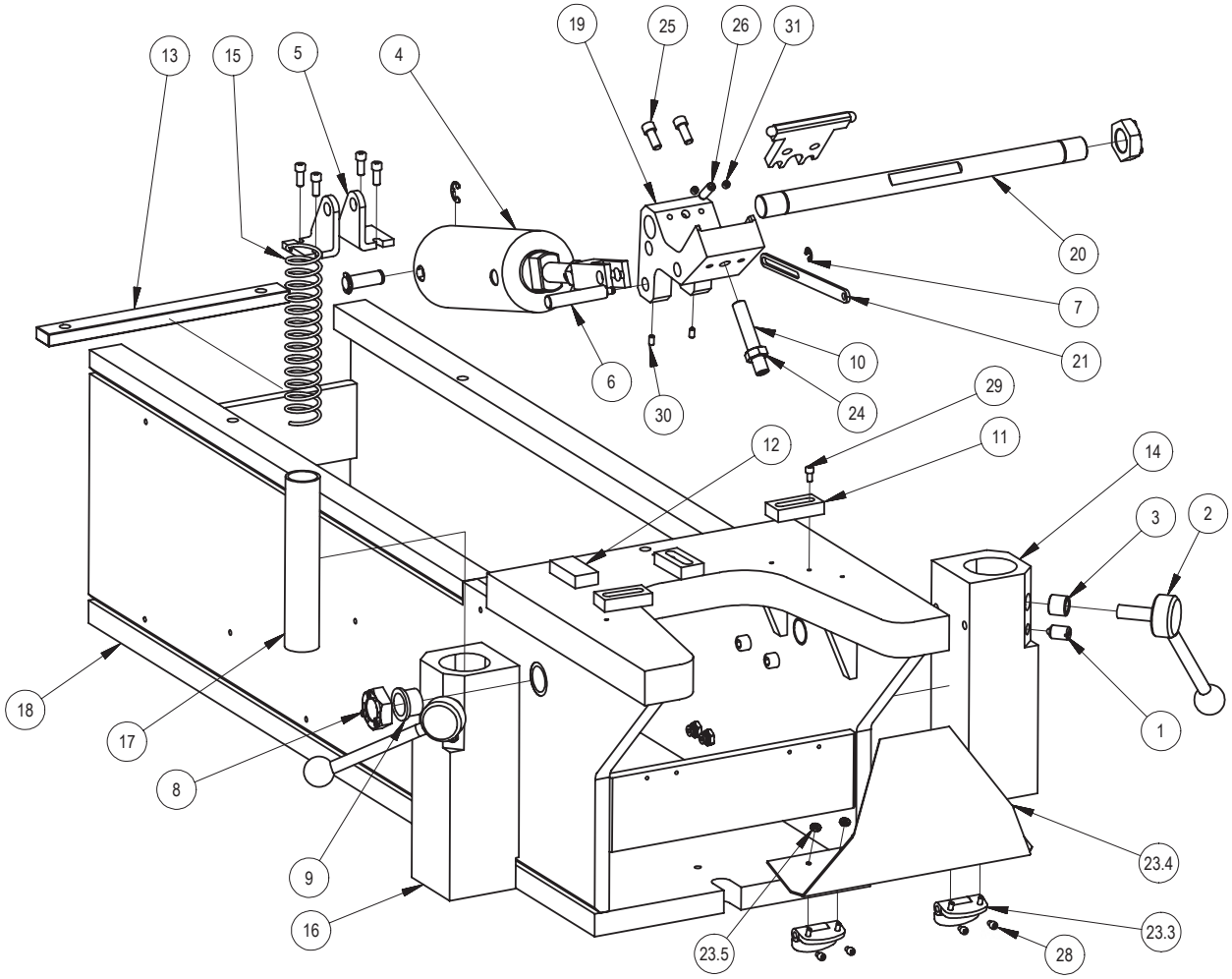
PARTS

Contents

Carriage Components

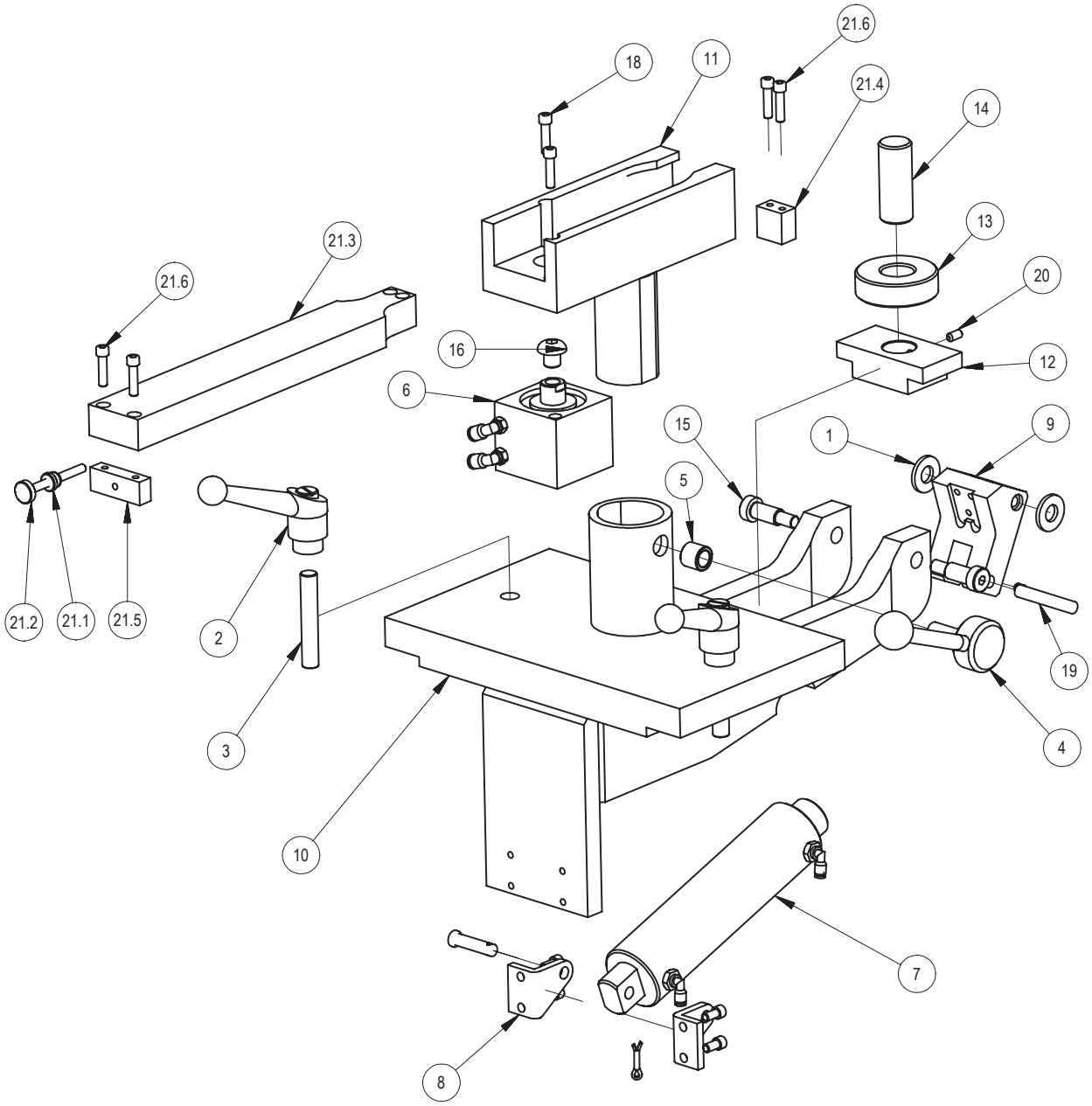


Centering Cylinder Assembly



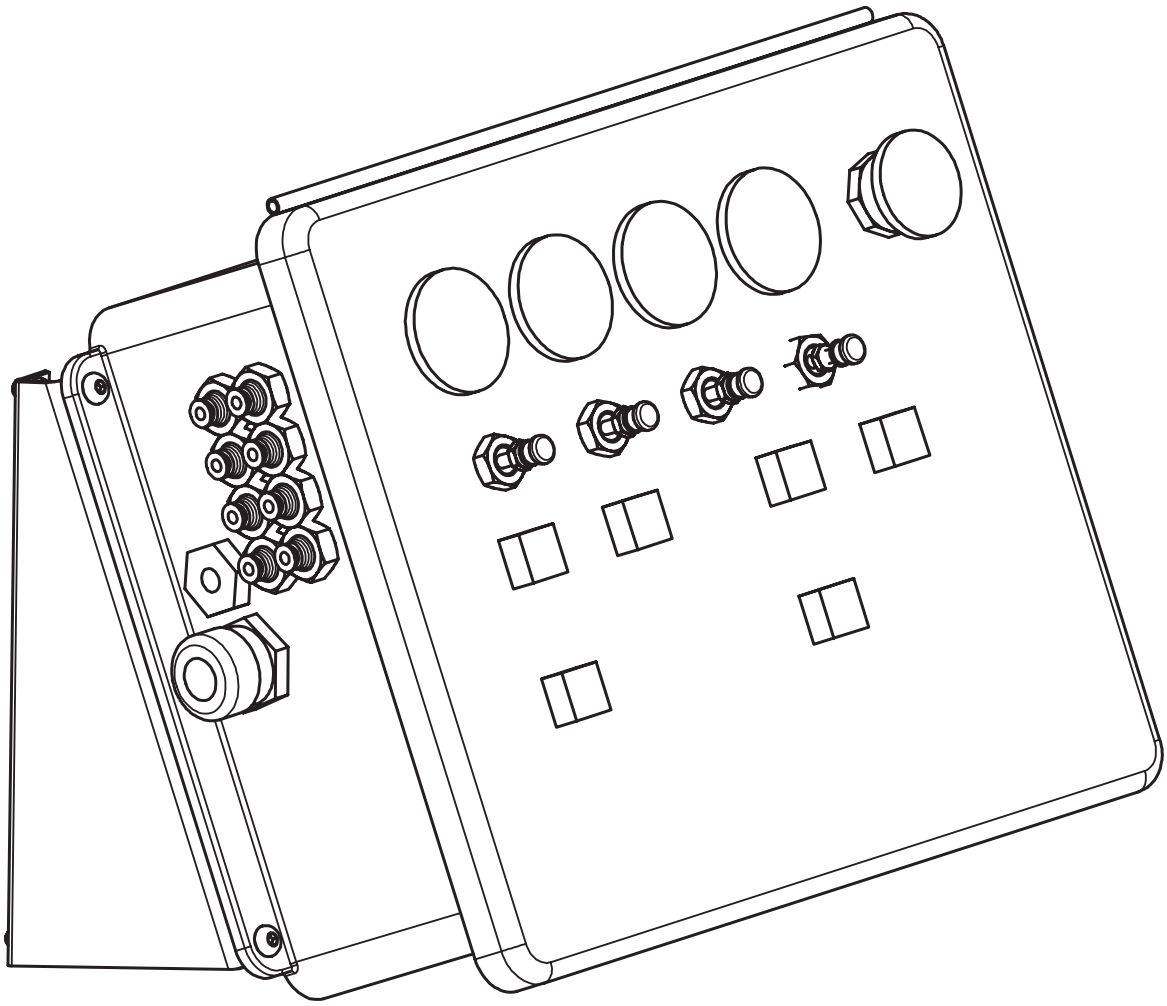
Conrod Centering Cylinder Assembly			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	502-8-52C	Spring Plunger
2	2	6310J	Clamp Handle
3	2	6310R	Thread Insert
4	2	650-3-45G	Locate Cylinder
5	1	650-3-45H	Pivot Bracket, Bimba #D-13512-A
6	1	650-3-46K	Pivot Pin
7	1	650-3-46R	E-clip - Truearc E-Ring #RE-25ST
8	2	650-3-46T	Lock Nut REID BLN-105
9	2	650-3-46U	Flange Bearing Symmco 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
23.6	4	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-227A	5/16 x 1-1/4 Roll Pin
27	8	MF-31	S.H.C.S. 3/8 - 16 UNC - 1
28	4	MF-3B	S.H.C.S. 8 - 32 UNC - 1/4
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

Carriage Assembly



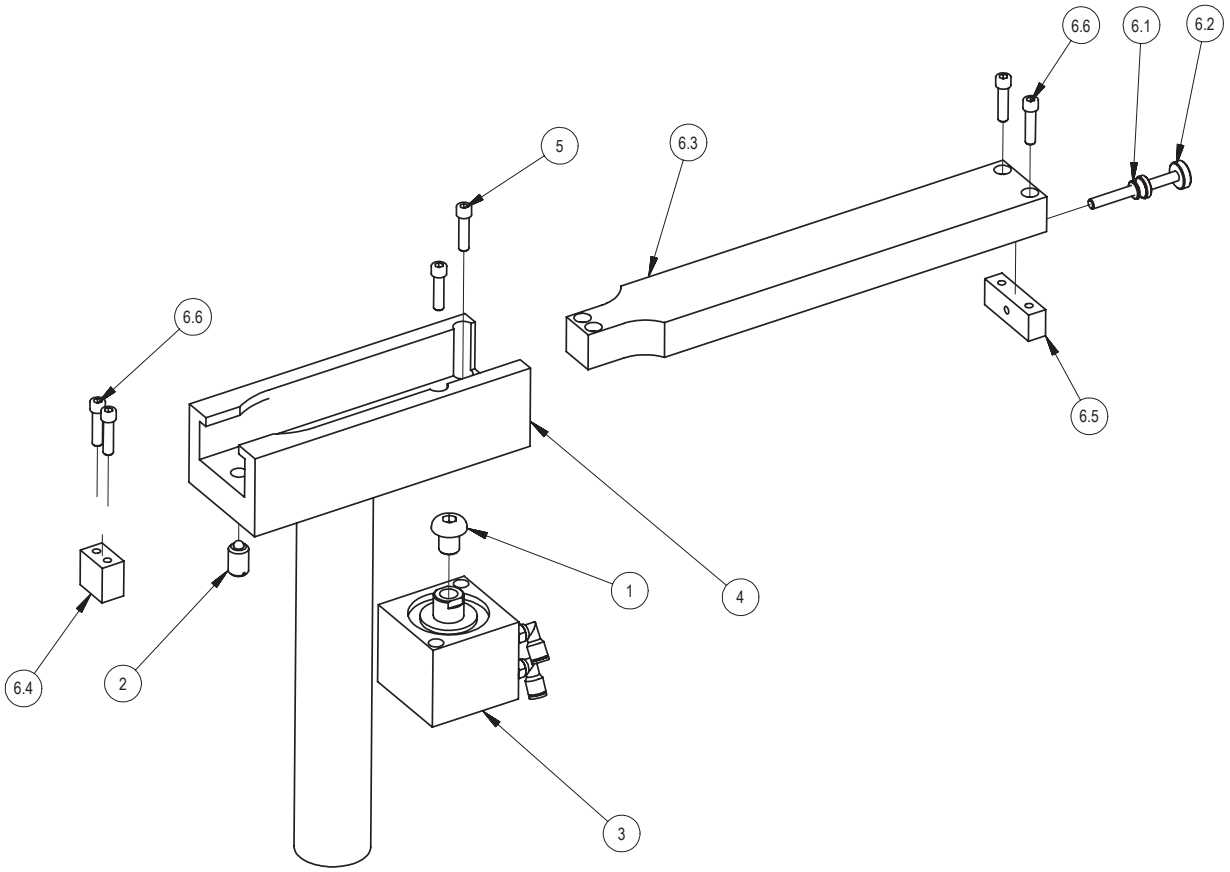
Carriage Assembly			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	100-19A	Hardened washer 17/32 I.D.
2	2	514-2-39	Handle
3	2	514-4-5B	Stud
4	1	6310J	Clamp Handle
5	1	6310R	Thread Insert
6	1	650-3-45E	Clamp Arm Cylinder
7	1	650-3-45F	Centering Cylinder
8	1	650-3-45K	Pivot Bracket
9	1	650-3-47D	Centering Lever
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
17	1	ANSI B18.3 - 1/4-20 UNC x 0.38	Hexagon Socket Set Screw - Cup 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 Reid 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

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

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 aj-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

OPTIONS

Contents

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 ½ 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:

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

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.

FRM = RPM X 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 F90Y 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 were 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.