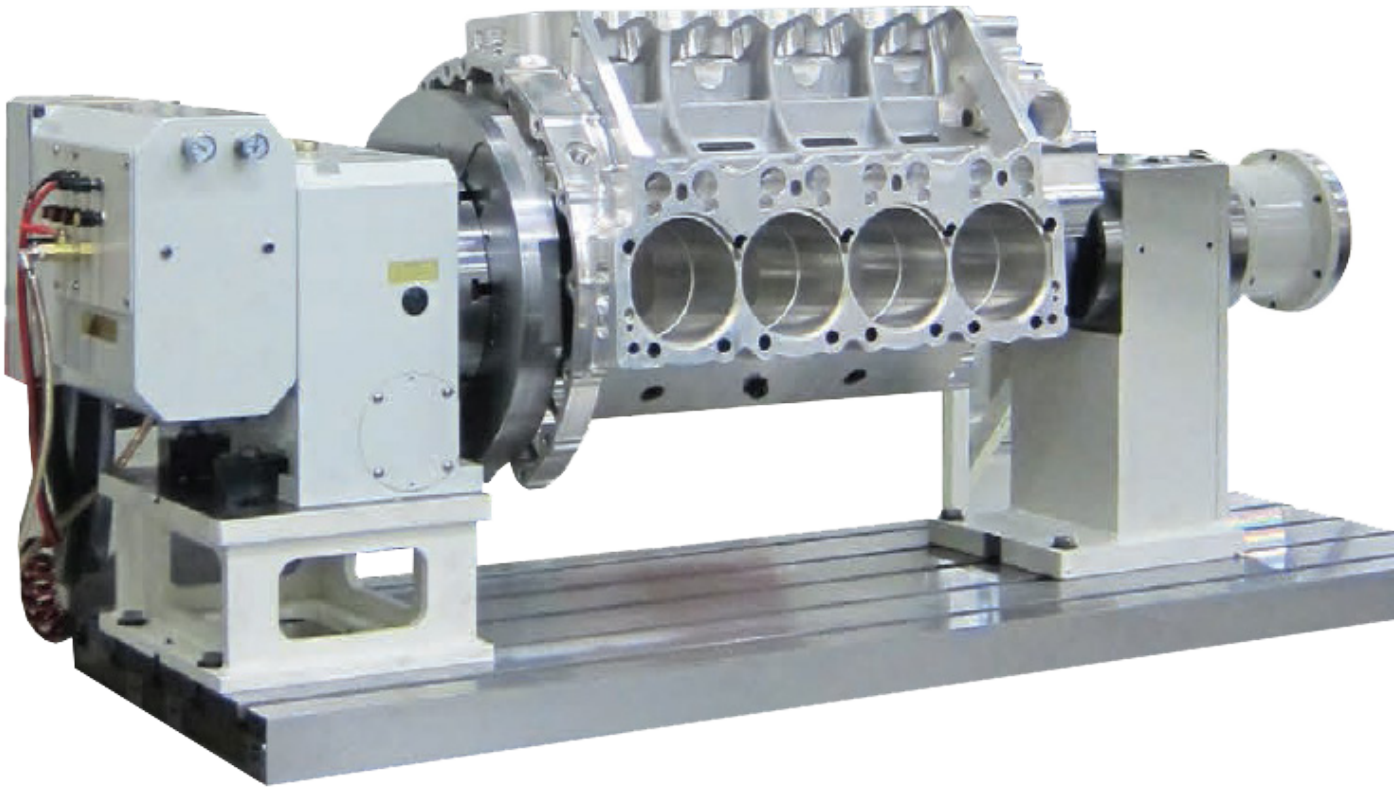
ROTTLER

690-3-63 AUTOMATIC 4th AXIS FIXTURE

OPERATION AND MAINTENANCE MANUAL



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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

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.

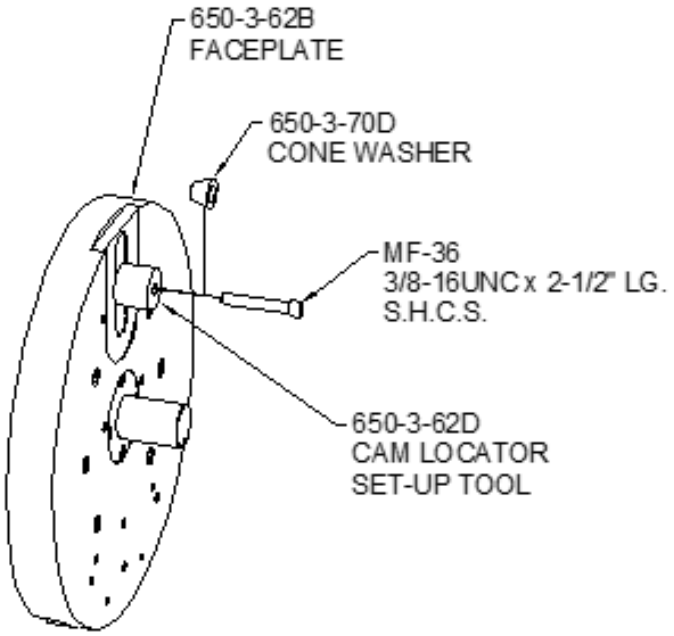
If you are unsure which part you need to order, contact our service department and ask to speak to one of our service consultants. They will assist you in determining which part you require.

THERE IS A MINIMUM ORDER OF $25.00

Contents

Using the 4th Axis Fixture:

The 650-3-62D cam locator set-up tool should be installed on the indexer from the factory. This tool is used to check the angle '0' of the indexer. The diameter of this tool is the same diameter as the shaft on the 650-3-62H faceplate pinion. With the indexer set to 0 degrees these two shafts should be aligned vertically. An indicator can be used to check this. With the two shafts aligned vertically, the flat machined on the top of the 650-3-62B faceplate should indicate 0. The number stamped on the machined flat is the exact distance from the flat to the headstock centerline. The two flats milled at 45 degrees to each side of this central flat are set to the same distance from centerline.

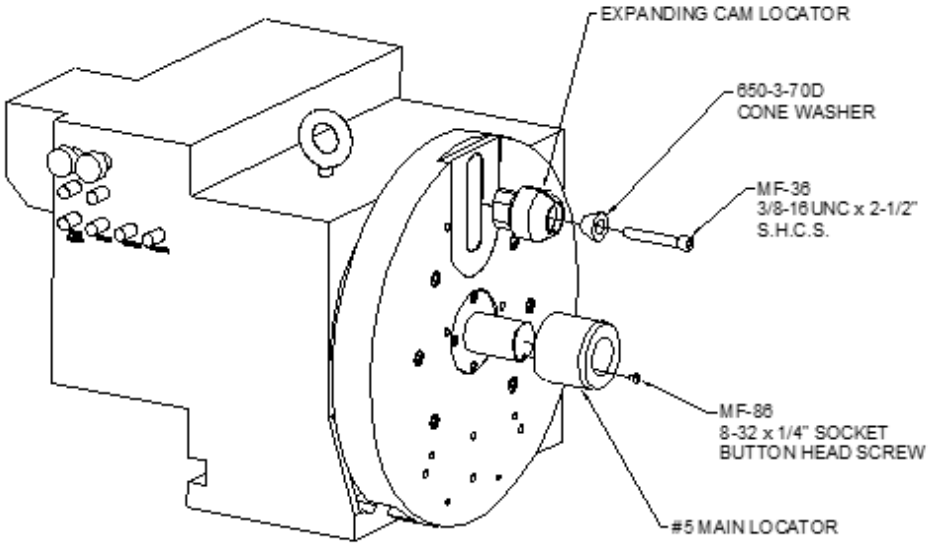


Locators: This fixture requires the use of locator sets, sized to fit individual engine blocks. These sets consist of (1) cam bearing bore locator, (1) #5 main bearing bore locator, and (1) #1 main bearing bore locator.

Main bearing bore locators: The #5 main locator is sized to fit onto the 650-3-62H faceplate pinion with the tapered end facing out. This locator is retained on the pinion by the MF-86 buttonhead screw in the pinion. The #1 main locator is sized to fit onto the 650-3-61H piston cap of the tailstock with the tapered end facing out. This locator is also retained by an MF-86 buttonhead screw.

Expanding cam bore locator: The cam bore locator is sized to fit into the 650-3-62B faceplate. To load the specific locator: remove the MF-36 3/8-16UNC capscrew and the 650-3-62D setup tool from the faceplate. The setup tool should be set aside for checking indexer '0' in the future. Install the cam locator with its socket fitting into the slot in the faceplate. The 650-3-70D cone washer is installed into the mating countersink in the locator, and held in by re-installing the 3/8-16UNC capscrew. This capscrew threads into the 650-3-62V cam locator nut that is trapped in the 650-3-62B faceplate Tighten the capscrew just enough to hold the locator in the desired location in the slot.

CAM AND MAIN LOCATOR INSTALLATION



Loading An Engine Block:

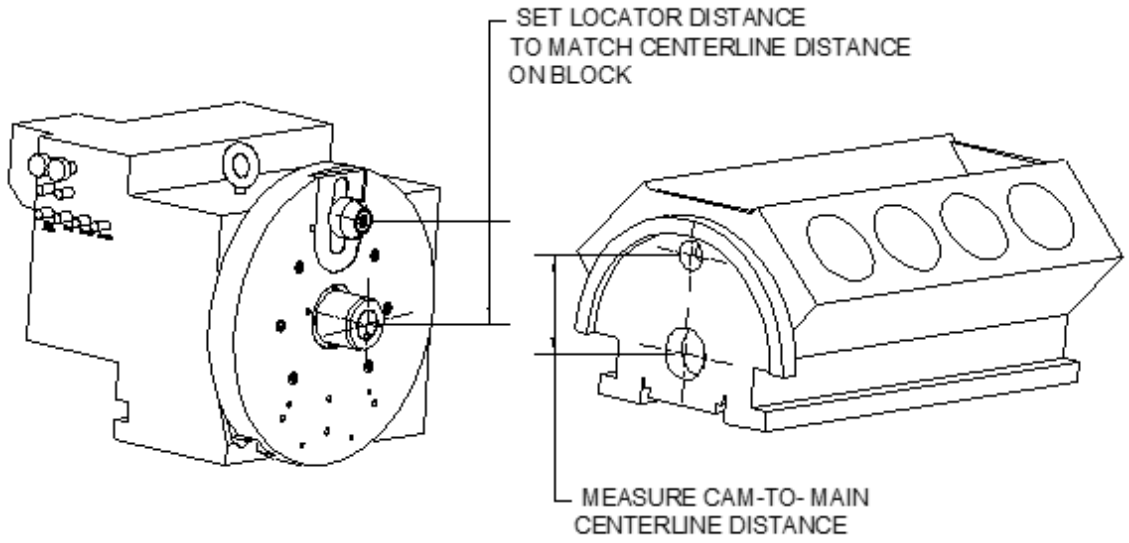
This fixture requires the main bearing bores, the rear cam bearing bore, and the transmission mounting surface of the engine block be clean and free from nicks, dings, and foreign particles. Failing to ensure this will result in poor performance of your fixture.

The tailstock must be positioned to allow space to install the engine block, but still be close enough to clamp the block within the 6” of stroke allowed by the tailstock piston. Approximately 3-1/2” of the stroke will be used to take up the required length of the locators, leaving approximately 2-1/2” of room to position the tailstock.

Generally, measure the overall length of the engine block and add 1”. This will be the space to leave between the pinion noses of the headstock and tailstock with the tailstock piston retracted. Example: a 20” long engine block will require the pinion noses to be 21” apart. This will leave 1/2” of room on each end of the engine block for loading and still be within the stroke length of the tailstock.

After setting the distance between the pinion noses, tighten the tailstock down with its keys pushed back against the center keyway of the table.

Measure the distance between the centerlines of the main and cam bores of the block. Slide the adjustable cam locator to be equal to this distance. Lightly tighten the MF-36 capscrew to keep the cam locator in place.



Using a hoist, load the engine block down between the pinions with the bell housing surface facing the headstock. Slide the blocks main bore over the #5 main locator on the headstock and position the block to slide the cam bore over the cam locator. Tapers on the outside of both locators will aid in positioning. Push the block flush up against the faceplate and activate the 'light extend'. This will extend the tailstock piston with limited pressure to locate the block on the tailstock. CAUTION: keep fingers and all other objects out of the path of the tailstock piston. Even with limited pressure, severe injury could occur if this rule is not followed. If desired, a hex socket and long extension can reach through the cam bores from the front of the block and be used to tighten the capscrew holding the cam locator in place. The 650-3-70D cone washer will expand the cam locator to provide a tighter fit on the cam bore, further centering the block on the indexer '0'. Once the block is located properly, full tailstock pressure can be applied after rotating the indexer to the desired angle.

After machining is complete, unload the block in reverse order. Loosen the capscrew on the cam locator to release pressure on the cam bore of the block. Position the hoist to hold block and retract the tailstock. Slide the block off the faceplate and locators to remove.

Readjusting Tailstock Piston Alignment:

Checking for tailstock alignment may be required after heavy use or after a crash has occurred. The first step is to check all possible variables before making adjustments.

Headstock: make sure the headstock is pushed back with the keys against the back of the center keyway of the machine table. Tighten the (4) bolts to secure the headstock to the table and check faceplate for squareness.

Tailstock: the tailstock also must be pushed back with the keys against the back of the center keyway of the machine table.

With both units tightened down as described above, an indicator can be used to check the alignment between the two pinions both vertically and horizontally. If the alignment is out more than .001 in either direction an adjustment must be made.

The headstock pinion should be checked for runout. With an indicator placed on the 650-3-62H pinion, rotate the indexer. The runout here should be no more than .0005. Runout of this pinion can be adjusted by loosening the (6) MF-33A 3/8-16 capscrews holding the faceplate to the indexer and tapping the faceplate until the pinion runs true. Retighten the (6) capscrews. Check both pinions with an indicator again for alignment. If still not aligned within specs the tailstock will need adjustment.

Begin with the tailstock piston retracted. Remove the 650-3-61K cushion from the tailstock piston cap. Note the timing of the 650-3-61H piston cap relative to the piston tube to reassemble in the same configuration. Remove the (4) MF-5 capscrews from the 650-3-61H piston cap. If the cap does not slide out, the MF-5 capscrews can be threaded into the four tapped holes of the cap and evenly tightened to push the cap out of the 650-3-61G piston tube. Beneath the piston cap is the 650-3-61J nose plate which is attached to the piston of the 650-3-61E stroking cylinder with a MF-172 ½-20 hex nut. Activating the tailstock to light extend should push the nose plate out of the piston tube. Using the flats on the cylinder piston to keep it from turning, removed the ½-20 hex nut. Slide the nose plate off of the cylinder piston.

Remove the (4) MF-34 3/8-16 x 2” long capscrews holding the 650-3-61C tailstock extension on. The tailstock extension with the stroking cylinder should slide out through the back of the housing.

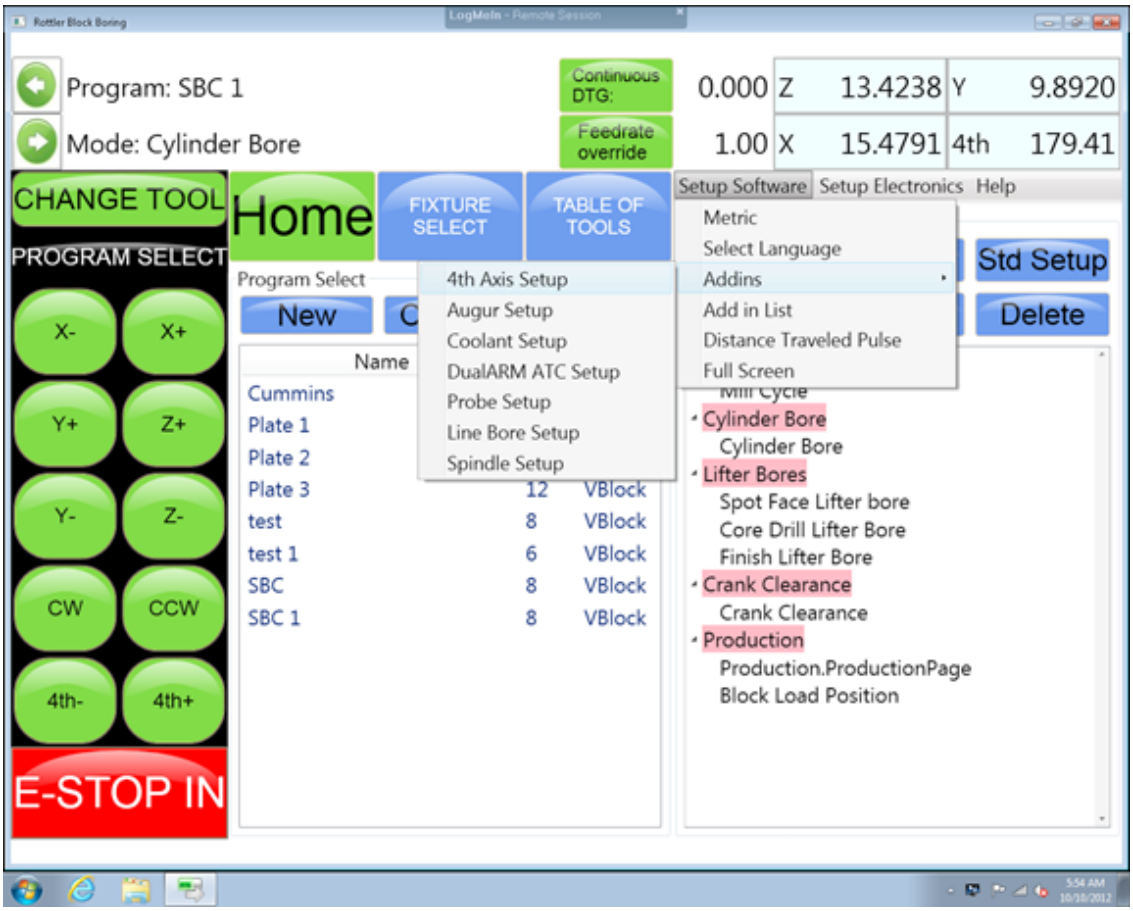
Slide the piston tube to be centered in the tailstock housing. Reinstall the 650-3-61H nose plate in the piston tube. Remove 6247A retainer, 6248 wiper, 6249 felt compressor, and 6251 felt oiler from front of 6225A bearing carrier. Loosen 100-82-2B 8-32 brass tipped set screw in bearing carrier. Tighten 6223 spindle nut until piston tube will not slide by hand. Loosen the (6) MF-32 3/8-16 capscrews holding the 6225A carrier on the housing. Loosen the (6) MF-31 3/8-16 capscrews holding the 650-3-61F rear bushing on the housing.

Install the 650-3-61T alignment tube assembly over the pinion of the headstock. Slide the tailstock up to fit the tailstock pinion into the alignment tube. Tighten (4) setscrews on the alignment tube to lock the two pinions in alignment. Push the tailstock housing to the rear to contact the keys with the middle keyway of the machine table and tighten its two mounting bolts. Check the piston tube with an indicator across the top and the back on both ends for straightness. Tap on either the carrier or the rear bushing to adjust alignment. The piston tube should be straight within .0005 in both directions. Retighten the 3/8-16 capscrews holding both the carrier and the rear bushing. Loosen the tailstock mounting bolts. Loosen the (4) set screws of the alignment tube assembly and slide the tailstock back from the headstock. Push the tailstock back on the middle keyway and tighten the mounting bolts. Recheck alignment of the pinions with an indicator in both directions. Recheck the straightness of the piston tube with an indicator. If alignment is within specs, reassemble the tailstock as follows:

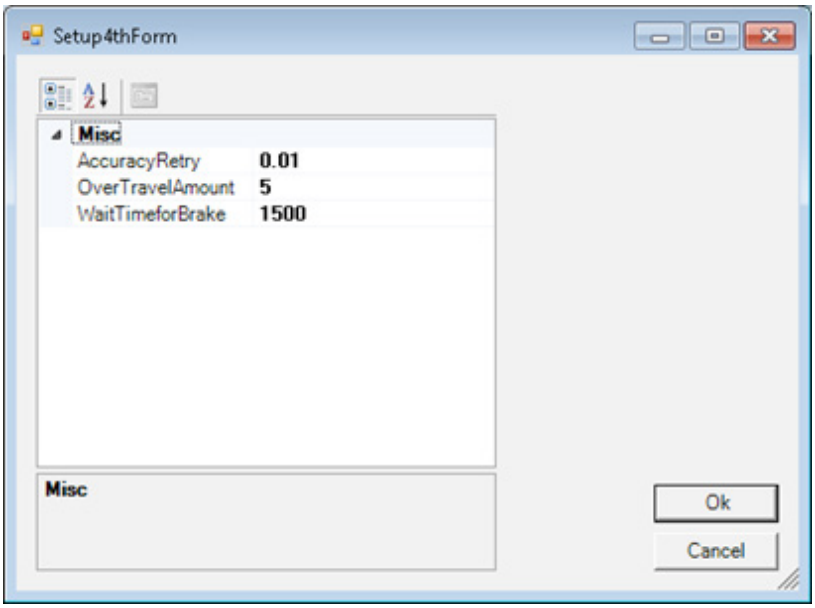
Loosen the 6223 spindle nut until the piston tube can be moved by hand applying about 40-50 lbs. of force. Tighten the 100-82-2B set screw to lock the nut in place. Remove the 650-3-61H piston cap. Reinstall the 650-3-61C tailstock extension with the stroking cylinder attached and lightly tighten its (4) mounting capscrews. The stroking piston cylinder should be sticking out the front of the piston tube. Reinstall the 650-3-61J nose plate and tighten the ½-20 nut to secure. Release the air pressure from the stroking cylinder and slide its piston back by hand into the piston tube until the nose plate contacts the bottom of the counterbore in the piston tube. Tighten the (4) capscrews holding the 650-3-61C tailstock extension on. Reinstall the 650-3-61H piston cap and 650-3-61K cushion.

Program Set Up:

From the Setup Software menu, select Addins and then choose 4th Axis Setup, as seen below.

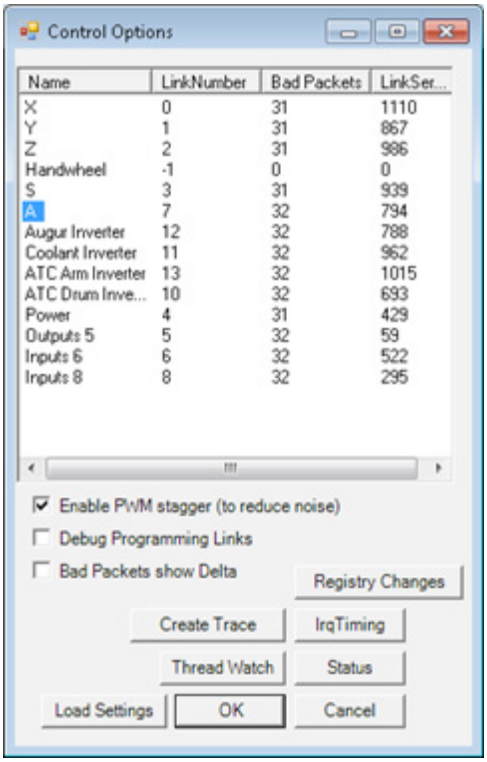


The following screen will appear. Verify the settings are correct.

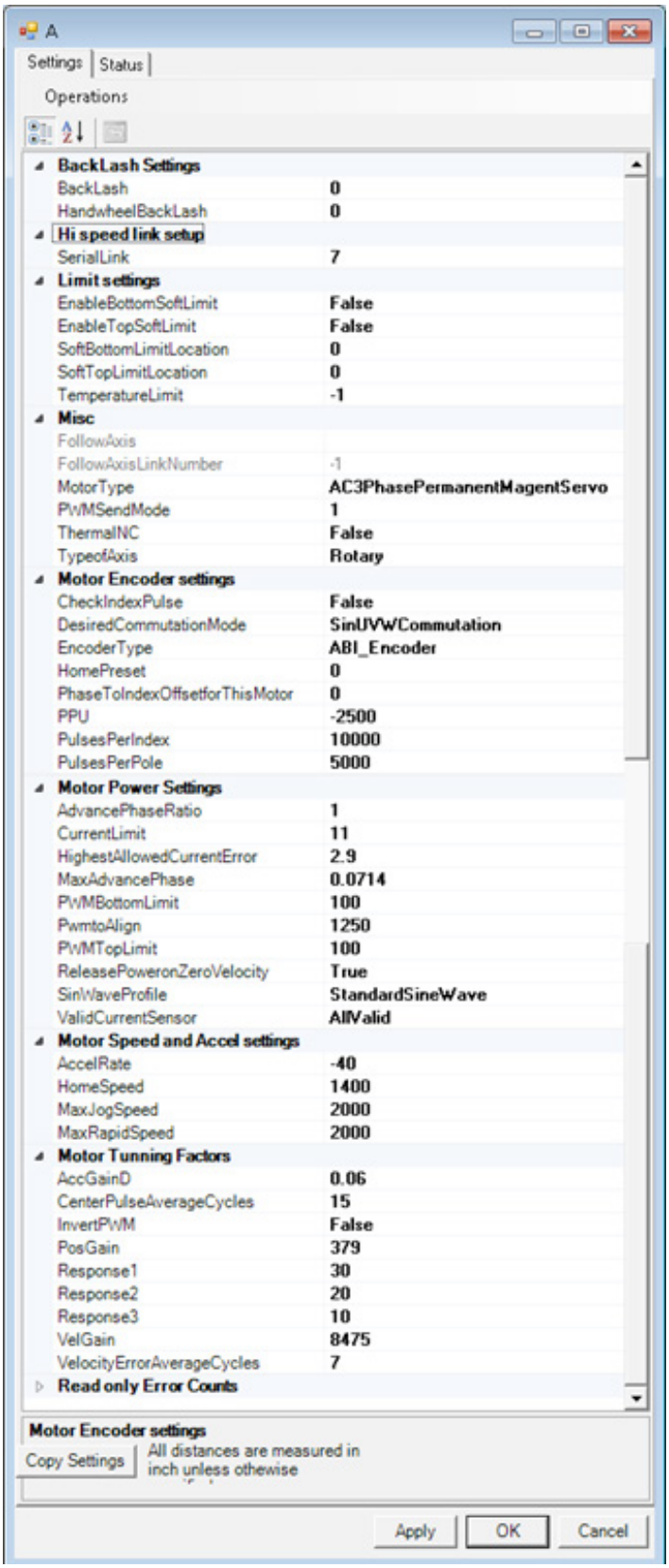


From the Setup Electronics menu, choose Control.

A new window will appear, choose A.



Verify the settings are correct.

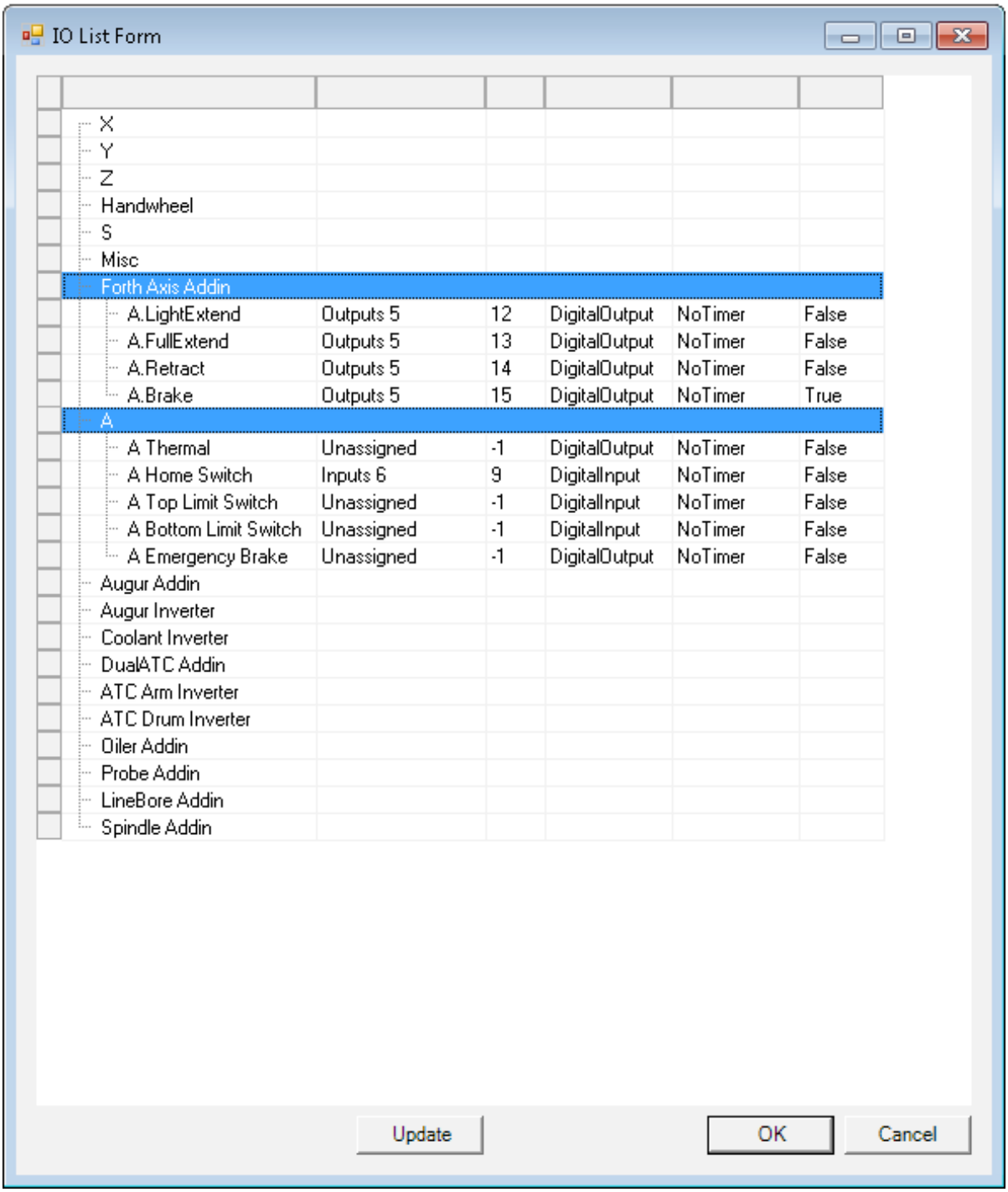


From the Setup Electronics menu, choose IO.

The following list will appear.

Verify the settings are correct for Forth Axis Addin.

Verify the settings are correct for A.



Air Settings:

Set the air pressure for the 4th axis as shown on the air diagram.

Light extend = 50 PSI this may vary a little up or down to get smooth operation that is not too slow.

Brake = 30 PSI

Set the Flow controls

Brake = Full CW and one CCW

Extend = Full CW and two turns CCW

Retract = Full CW and two turns CCW

Exhaust = Full CW and 5 turns CCW

Set the relief valve to PSI. Any pressure over 50 PSI on the Light Clamp air gauge should cause the relief valve to bleed off pressure.

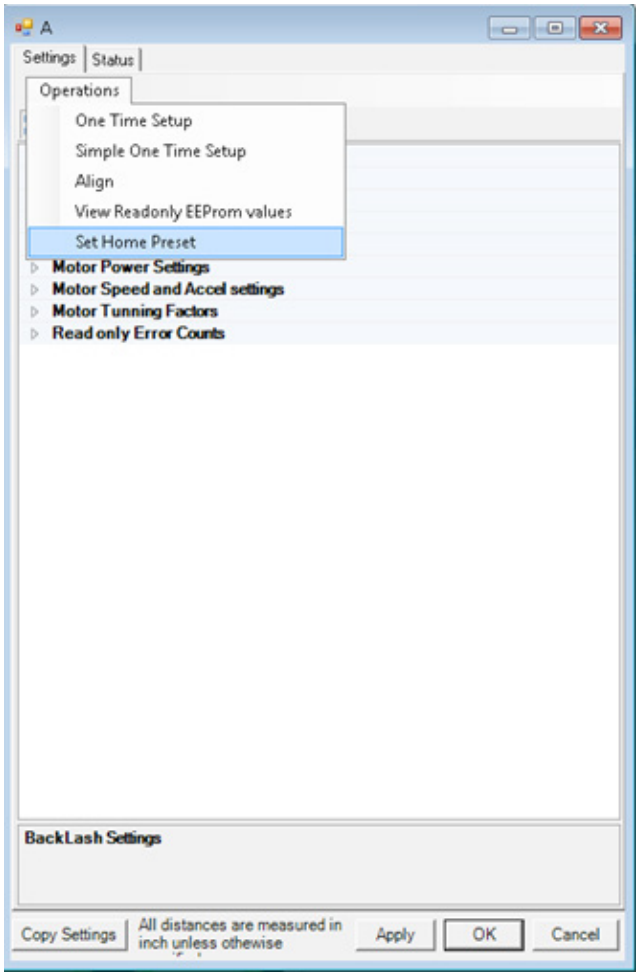
4th Axis Faceplate Indexer Accuracy Setup and Qualification

Go to Setup Electronics>Control>A, set the Auto and Hand-wheel backlash to 00.000

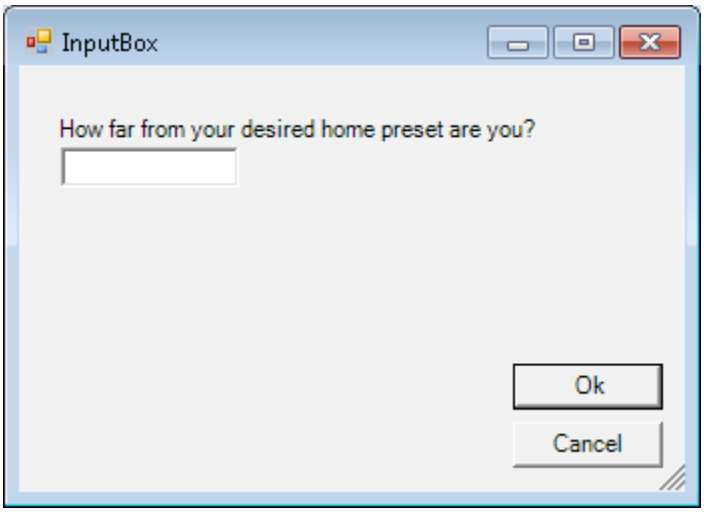
Install a .0001” indicator onto the spindle nose.

Indicate the vertical slot on the face plate to within .0002”. The last move when indicating in MUST be in the Negative direction.

Set the 4th axis zero using the Home Preset in Setup Electronics>Control>A>Operations.

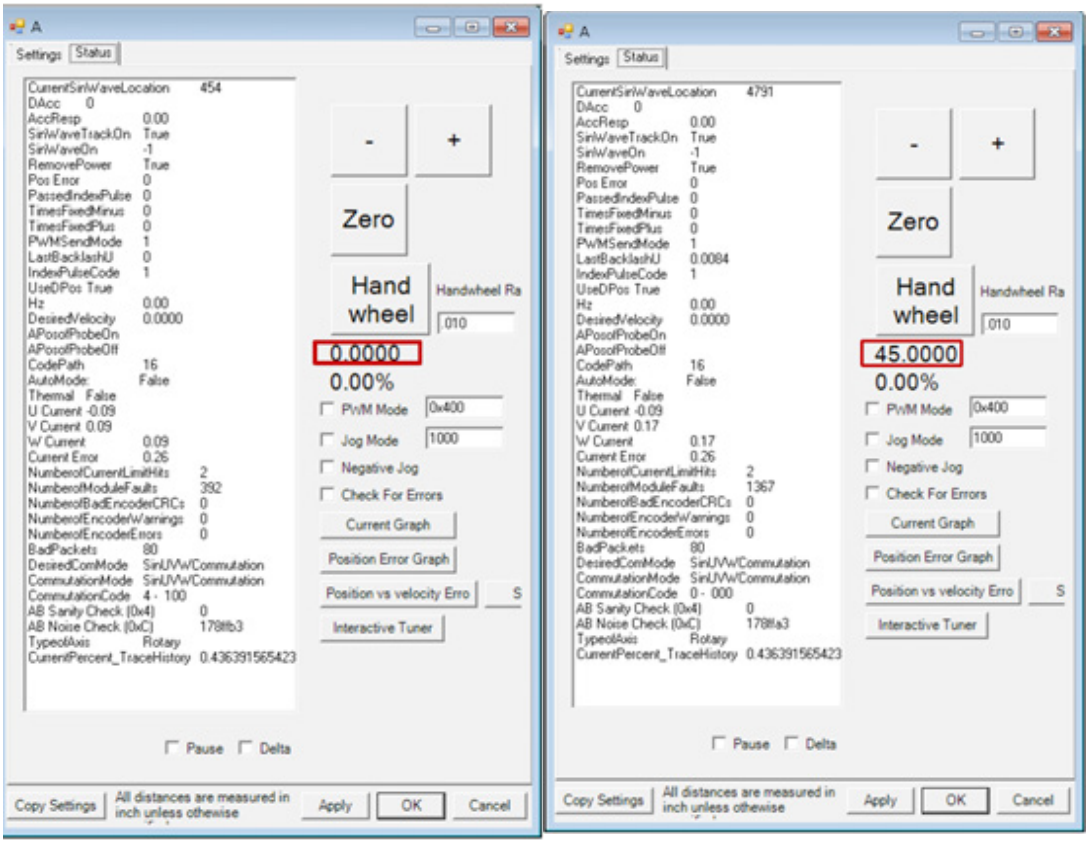


Enter 0 in the box below when the 4th axis zero location it verified.



Setting 4th Axis Backlash

With the vertical slot at zero, open the status page for the A axis.



Rotate the block to the +45 degrees position. Place a 1” travel .001” indicator from the spindle nose to the rear of the +45 degree flat.

Put at least .010” of pressure on the indicator.

Select .001” and rotate the 4th with the hand-wheel in the negative direction one click at a time until you see movement on the indicator. Record the difference in the position readout, of the 4th axis, on the status page DRO and the 45_____. This is the amount of backlash in degrees. Enter this number in Setup Electronics>Control>A>Hand-wheel Backlash.

Place this number in the Auto Backlash also.

Use the “Move To” button; move the 4th axis to 00.000 degrees. It should indicate in flat.

Use the “Move To” button; move the 4th Axis to the -45 position. This should indicate in flat.

Use the “Move To” button; move the 4th Axis to the 45 position. Indicate across the flat and record amount of error_____.

Depending on the direction of the error, increase or decrease the amount of Auto Backlash until it is within .0005”

Record the actual Auto Backlash setting_____.

Milling Faceplate

DO NOT move the 4th axis, indicate the middle or 0 degree flat, and record any error_____. DO NOT dial the flat in.

Use the “Move To” button; move the 4th to -360 degrees. Indicate the flat, record any error_____. What, if any is the difference in the reading between step 4 and 5? _____. DO NOT dial in the flat.

Use the “Move To” button; move the 4th to -45 degrees. Indicate the flat, record any error_____. DO NOT dial in the flat.

Use the “Move To” button; move the 4th to -315 degrees. Indicate the flat, record any error_____. DO NOT dial in the flat.

Use the “Move to” button; move the 4th to -360 degrees. Zero the 4th axis.

Remove the Indicator from spindle and install the 2 Flute .900” Carbide End Mill. This should be marked 4th Axis Squaring in the F60 area.

Align the one of the cutting teeth of the end mill up with the back of the flat to the vertical plane. Zero the Horizontal position.

Use the Vertical hand-wheel in .001”, bring the end mill down until it just touches the flat with a piece of paper between the end mill and the flat. Zero the vertical position.

Wipe some tapping fluid across all flats.

Mill the middle or 00.000 flat at 750 RPM with a .002” Feed Rate.

Use the “Move To” button, move the 4th axis to -45 and Mill the Flat.

Use the “Move To” button, move the 4th axis to -315 and Mill the Flat.

Remove the End Mill from machine and re-install the indicator.

Use the “Move To” button, move the 4th to -360 degrees and zero the 4th axis position.

Verify the Mill cuts be running the indicator along the 0 degree flat, record any error_____.

Use the “Move To” button; move the 4th to -45 degrees. Indicate the flat, record any error_____. DO NOT dial in the flat.

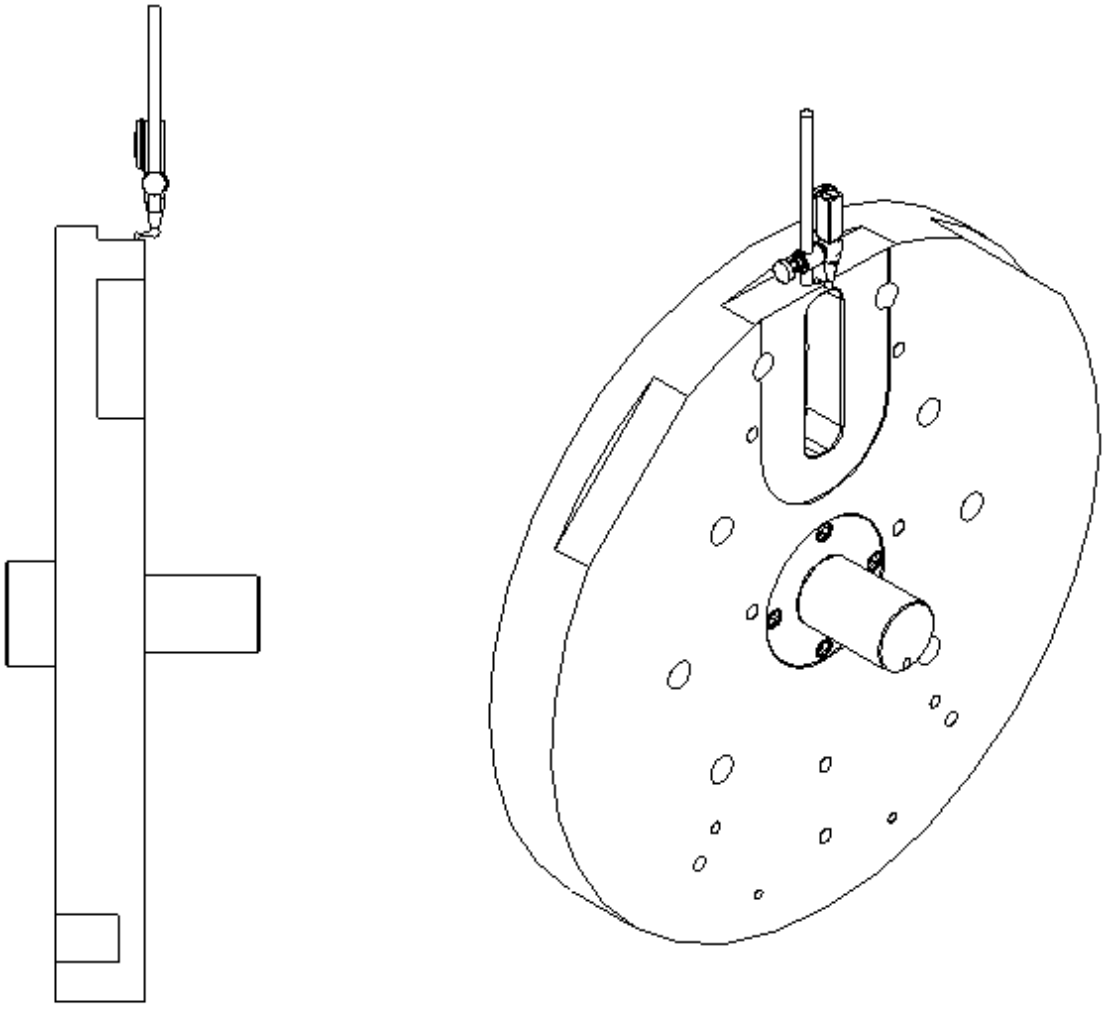
Use the “Move To” button; move the 4th to -315 degrees. Indicate the flat, record any error_____. DO NOT dial in the flat.

Setting Home Position:

Press the “HOME MACHINE” button from the SET ZEROES screen. All axes will home including the 4th axis.

When the screen displays the message: ”Homing Complete” … Set the 4th Axis zero.

Place the magnetic base of the indicator assembly on the spindle nose. Place the Probe of the indicator on the middle or) degree flat on the indexer plate.



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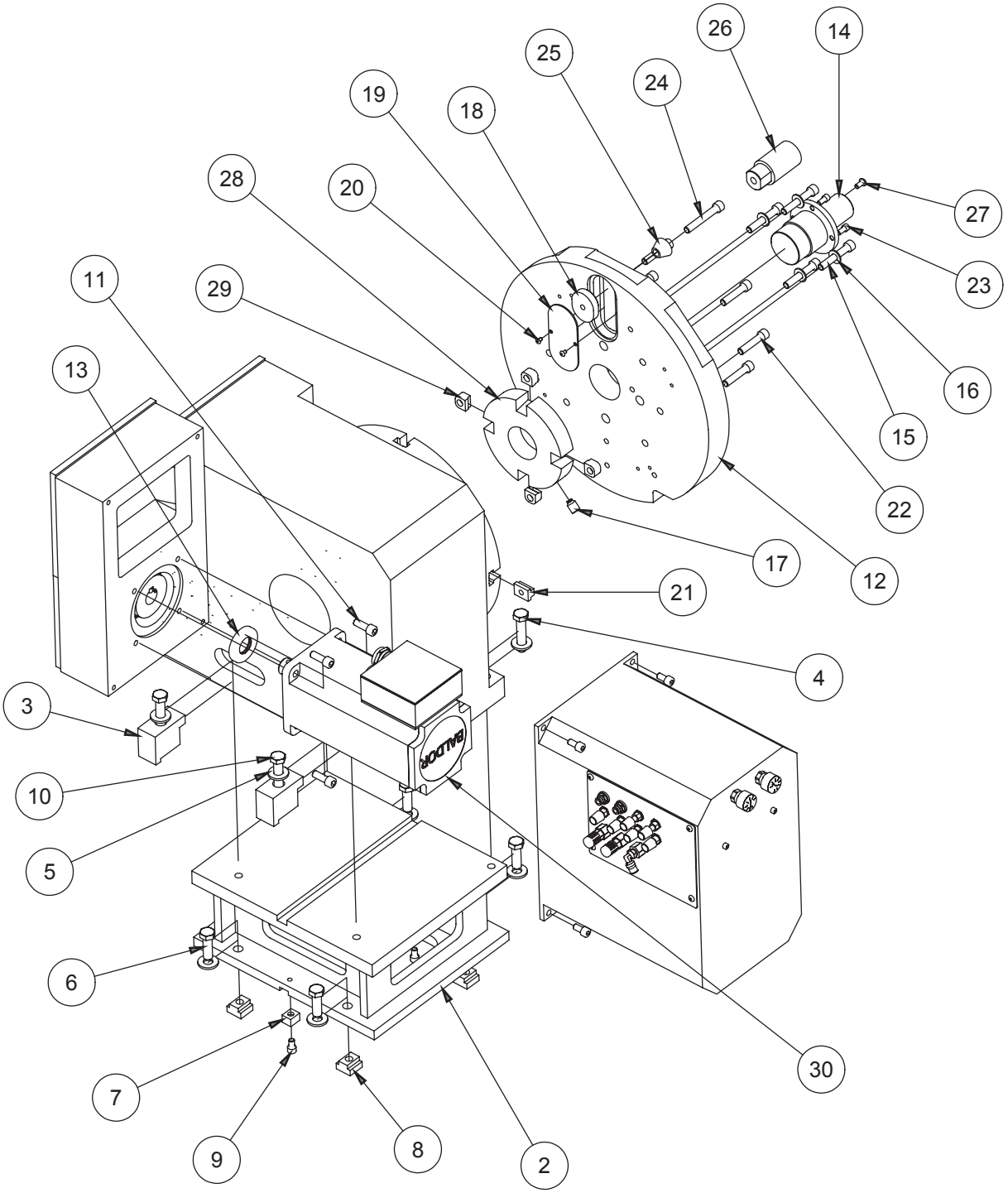
Run the indicator back and forth across the flat… Use the hand-wheel to indicate the surface within .0003”.

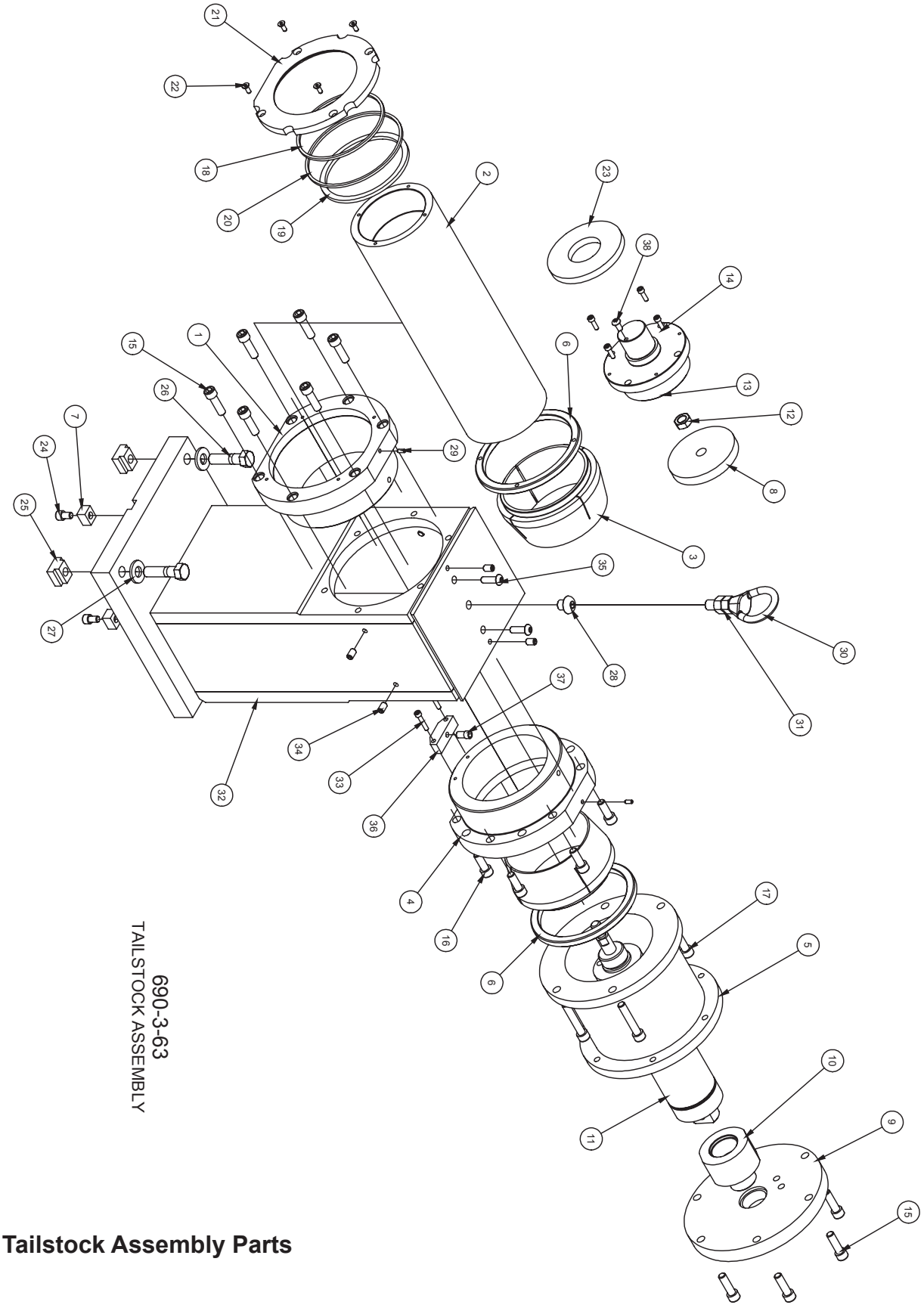
Note the numeric value in the position read out for the 4th Axis. Record the value here_____. This is the Distance from home (in degrees) to the 4th Axis zero position.

Headstock Assembly Parts



690-3-63
HEADSTOCK ASSEMBLY

690-3-63 4TH AXIS FIXTURE HEADSTOCK ASSEMBLY			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	690-3-96 body	INDEXER, 4TH AXIS FIXTURE
2	1	650-3-85C	RISER, MACHINING, - 4TH AXIS INDEXER
3	2	650-3-85D	CLAMP, INDEXER - 4TH AXIS FIXTURE
4	2	MF-49A	1/2-13UNC x 2-1/4" LG. HEX BOLT
5	8	100-19A	Hardened washer 17/32 I.D.
6	4	MF-137A	1/2-13UNC x 1-1/2" LG. HEX BOLT
7	2	650-3-9	Key
8	4	650-3-10	TN-5 T-Nut
9	2	MF-21A	5/16-18UNC x 1/2" LG. S.H.C.S.
10	2	MF-150C	1/2-13UNC x 2-3/4" HEX BOLT
11	4	MF-143	3/8-16UNC x 1" LG. S.H.C.S.
12	1	650-3-62B	FACEPLATE - AUTO PERFORMANCE FIXTURE
13	1	6481H	Seal
14	1	650-3-62H	PINION, FACEPLATE - AUTO PERFORMANCE FIXTURE
15	4	MF-35	3/8-16UNC x 2-1/4" LG. S.H.C.S.
16	4	MF-178	3/8" FLAT WASHER
17	1	6310L	1/2-13UNC x 5/8" LONG SET SCREW, BRASS TIPPED
18	1	650-3-62V	NUT, EXPANDING CAM LOCATOR - AUTO PERFORMANCE FIXTURE
19	1	650-3-62G	COVER, CAM LOCATOR NUT - AUTO PERFORMANCE FIXTURE
20	2	MF-86	8-32UNC x 1/4" LG. SOCKET BUTTON HEAD CAPSCREW
21	6	650-3-61P	T-NUT, FACEPLATE - AUTO PERF. FIXTURE
22	6	MF-33A	3/8-16UNC x 1-3/4" LG. S.H.C.S.
23	4	MF-12	1/4-20UNC x 1/2" LG. S.H.C.S.
24	1	MF-36	3/8-16UNC x 2-1/2" LG. S.H.C.S.
25	1	650-3-70D	CONE WASHER, EXPANDING CAM LOCATOR - AUTO PERFORMANCE FIXTURE
26	1	650-3-62D	CAM LOCATION SET-UP TOOL - AUTO PERFORMANCE FIXTURE
27	1	MF-90	1/4-20UNC x 1/2" LG. SOCKET BUTTON HEAD CAPSCREW
28	1	650-3-96A	CENTERING RING, FACEPLATE, 4TH AXIS FIXTURE
29	4	650-3-96B	CENTERING WEDGE, FACEPLATE, 4TH AXIS FIXTURE
30	1	9020H	BSM90C-3250AB2 MOTOR



Tailstock Assembly Parts

690-3-63 4th AXIS FIXTURE TAILSTOCK ASSEMBLY			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6225A	Lower Bearing Carrier
2	1	650-3-61G	PISTON TUBE, TAILSTOCK ASSEMBLY - 4TH AXIS FIXTURE
3	2	6222B	BUSHING, TAILSTOCK SPINDLE, 4TH AXIS FIXTURE
4	1	650-3-74	REAR BEARING CARRIER, TAILSTOCK - 4TH AXIS FIXTURE
5	1	650-3-61C	EXTENSION, TAIL STOCK - AUTO PERFORMANCE FIXTURE
6	2	6223	Outer Spindle Nut
7	2	650-3-9	Key
8	1	650-3-61J	NOSE PLATE, TAILSTOCK - AUTO PERFORMANCE FIXTURE
9	1	650-3-61L	ENDCAP, TAILSTOCK - AUTO PERFORMANCE FIXTURE
10	1	650-3-61M	SPACER, AIR CYLINDER, TAILSTOCK - AUTO PERFORMANCE FIXTURE
11	1	650-3-61E	STROKING CYLINDER, TAILSTOCK - AUTO PERFORMANCE FIXTURE
12	1	MF-172	1/2-20UNF HEX JAM NUT
13	1	650-3-61H	PISTON CAP, TAILSTOCK - AUTO PERFORMANCE FIXTURE
14	4	Mf-5	Socket Head Cap screw No. 10 - 24 UNC - 5/8
15	12	Mf-32	Socket Head Cap screw 3/8 - 16 UNC - 1 1/4
16	6	Mf-31	Socket Head Cap screw 3/8 - 16 UNC - 1
17	4	Mf-34	Socket Head Cap screw 3/8 - 16 UNC - 2
18	1	6248	Square Ring
19	1	6249	Felt Oiler
20	1	6251	Square Ring
21	1	6247A	Retainer Machining
22	4	Mf-79	Hexagon Socket Flat Countersunk Head Cap Screw
23	1	650-3-61K	CUSHION, TAILSTOCK - AUTO PERFORMANCE FIXTURE
24	2	Mf-21A	Socket Head Cap screw 5/16 - 18 UNC - 1/2
25	3	650-3-10	TN-5 T-Nut
26	3	MF-149C	1/2-13UNC x 2" LG. HEX BOLT
27	3	100-19A	Hardened washer 17/32 I.D.
28	1	650-3-61S	1/2-13UNC x 5/8" LG. SOCKET BUTTON HEAD SCREW
29	2	100-82-2B	Brassed Tipped Set Screw
30	1	502-3-13	Lift Eye
31	2	MF-171	1/2-13UNC HEX JAM NUT
32	1	650-3-61X	TAILSTOCK HOUSING (MACHINING) 4TH AXIS FIXTURE
33	2	MF-6A	S.H.C.S. 10 - 24 UNC - 1
34	6	MF-68D	5/16-18UNC x 1/2" LG. FLAT POINT SET SCREW
35	2	MF-95	5/16-18UNC x 1" SOCKET BUTTON HEAD SCREW
36	1	650-3-74A	KEY BLOCK
37	1	650-3-74B	KEY BOLT
38	1	MF-90	1/4-20UNC x 1/2" LG. Hexagon Socket Button Head Cap Screw

Pneumatic Diagram