

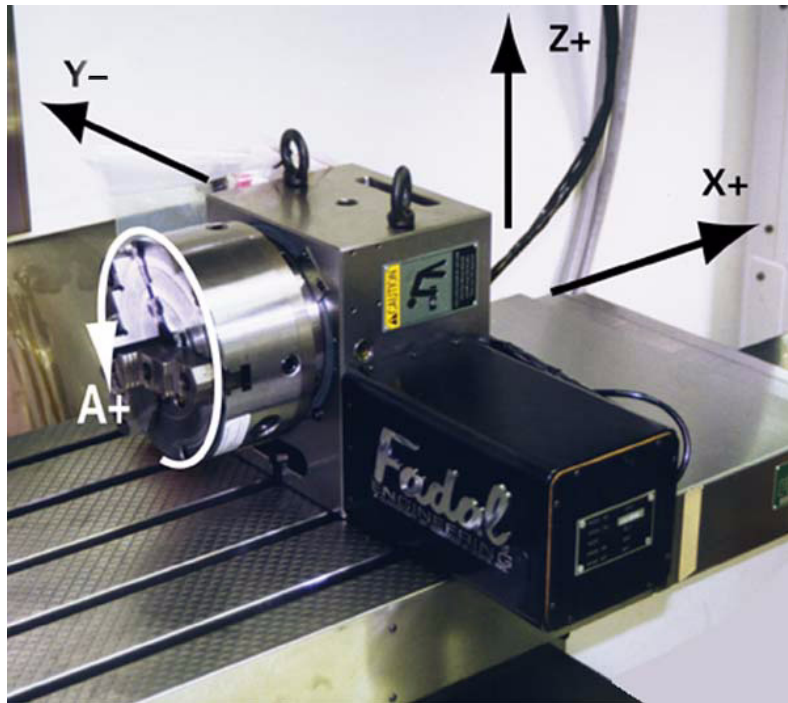
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## Section 10: Rotary Tables

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### Rotary Tables, 4th Axis



*Figure 10-1* Rotary Table

#### **Pre-installation**

Remove the top of the shipping crate:

- 1) With a large screwdriver gently pry the clips from the bottom of the crate.
- 2) Remove the crate top.

Install all items except the Rotary Table itself. These items are included specifically for your VMC configuration, and may include:

- Amplifier Servo Card
- Axis Controller Card
- Brake Solenoid
- Overload Relay
- Air Lines and Fittings
- Prewire Harness

### Remove the Rotary Table from the Shipping Crate:



#### IMPORTANT

Wear Safety goggles, steel toe shoes and gloves to reduce the risk of injury.

The VMC table, or any surface on which the rotary table rests, must be free of chips, or anything else that might damage it.

- 1) Loosen 3/8-16 bolts securing the rotary table and/or tail stock to the crate.
- 2) Using proper lifting procedures to reduce the risk of muscle strain. Remove the rotary table and/or tail stock.
- 3) Save the shipping crate. It will be needed if the rotary table needs to be returned to FADAL for any reason.

### Installation

- 1) Stone both the table and the bottom surface of the rotary table to remove any possible dings. Wipe clean with a light oil.
- 2) Jog the VMC's table to the X+ and Y+ limits to ease installation. The rotary table normally sits on the right side of the VMC table.
- 3) Using proper lifting procedures, position the rotary table above the VMC's center T slot, and attach the supplied table keys with two 1/4-20 x 1/2 socket head cap screws.
- 4) Secure the rotary table to the table using two 1/2-13 x 1 3/4 hex head bolts and hard washers with two 1/2-13 T-nuts. **DO NOT TORQUE BOLTS UNTIL THE ROTARY TABLE IS SQUARE.**

### Squaring the VH-65

- 1) Place a tool holder with indicator in the VMC spindle.
- 2) Square the rotary table at the face plate surface using a soft-face mallet, and tighten the 1/2-13 bolts when square.

### Connecting the VH-65 Motor Cable

With the POWER OFF and LOCKED OUT at the main power box:

- 1) Remove the 4th axis dummy plug located on the top right panel on the inside of the machine. If you have 4th and 5th axis prewire, the 4th axis plug is nearest the back of the machine. To remove the plug, unscrew the top ring of the connector while simultaneously pulling. Store the plug in a

clean container for future use, as the machine must have either the rotary table or the dummy plug installed in order to operate.

- 2) Uncoil the cable by clipping only the wire ties holding the cable in a loop. The other ties are for the 1/4 inch air line.
- 3) Plug the motor cable in the vacant 4th axis receptacle by lining the orientation pin with the slot, then push up while turning the top ring of the connector. Be sure the two connectors mate firmly or a faulty connection may result.
- 4) Insert the 1/4 inch brake line in the brass fitting located next to the 4th axis connector.

### **Horizontal Installation Difference(s)**

The rotary table will rest on its back with the motor cable hanging over the edge of the table. To square the unit, indicate the bottom of the unit. Use toe clamps in the top and bottom clamp slots to secure the unit to the table.

### **Installing the Servo Control**

With the POWER OFF and LOCKED OUT at the main power box, open the main control box located on the right side of the column.

- 1) Place the 4th axis servo amplifier into the left most open slot of the amplifier chassis.
- 2) Bolt in place with the screws provided on the chassis.
- 3) Connect the numbered wires to their corresponding positions on the terminal block.
- 4) Remove the card retainer bracket.
- 5) Remove the 4th axis servo controller from its electrostatic bag.
- 6) Verify jumper settings located at J4 on the card. The rotary table requires jumpers from 5-7 and 7-10. Jumpers may vary with different rotary head types.
- 7) Place the card in open slot #13 of the card cage with the components facing left and firmly press the card into position.
- 8) Replace the card retainer.
- 9) To avoid damage to the unit observe any special notes or tags that may be supplied with the rotary table, such as current limit settings.

### Setting the VMC Parameters

With the power on, in the COMMAND MODE type SETP then press the enter key. There are three parameters associated with the rotary table.

- 1) Set AXES: to X,Y,Z,A
- 2) Set A-AXIS RATIO: to 90:1
- 3) Set M60/A-AXIS BRAKE: to YES
- 4) Press the manual key to exit from the SETP mode.
- 5) Power the machine off and then back on to activate the parameters.

**Note:** Failure to set M60/A-AXIS Brake to YES may cause damage to the VH-65.

### Balancing the Amplifier

Before balancing the amplifier, verify correct timing of the clock card. Using the X axis, establish a constant feed rate for a set distance with the feed pot locked out, and time the move with a stopwatch. The following sample program executes a 20" move at 100 IPM, which should take 12 to 12.5 seconds.

- 1) Enter the X axis, program a 20" move at 100 IPM with feed pots out (M49).

```
N1 L100  
N2 M49  
N3 X20. F100.  
N4 X-20.  
N5 M17  
N6 M30  
N7 L101.1
```

- 2) Move the machine to X-10."
- 3) Type SETX <<ENTER>>.
- 4) Run the program in single block.
- 5) Time the move with a stopwatch, it should take 12 to 12.5 seconds.
- 6) Take several readings and average them.

If the readings are incorrect, adjust or replace the clock card as required. If the readings are correct, proceed with evaluating the following error.

**Evaluating the Following Error**

To evaluate the A-axis following error, enter the following program into the VMC. This program can also be loaded from the TA,2 programs, program number 5815. If you use 5815, you MUST modify the F word on line 4 to match the 90:1 ratio for the A axis (that is, change F1" on line 4 of program 5815 to F2000").

```
N1 L100
N2 M49
N3 A360.00 G1 F2000.
N4 A-360.00
N5 M17
N6 M30
N7 L101.1
```

The following error for each axis is displayed next to the axis position readout on the control.

- 1) Run the test program and observe the following error for the A-axis.
- 2) If the error is 670-690, no adjustment is necessary.
- 3) If not, adjust by slowly turning the SIG2 pot, on the amplifier, until the error reads 680.

**Setting the Voltage**

Once the amplifier is balanced, the voltage must be set. With the test program running, and using a meter set to DC voltage:

Place the black lead on COM and the red lead on SIG2. The voltage should read +1.660 VDC. If not, turn the SIG2" pot until +1.660 VDC is read on the meter.

**Setting Backlash at the Control**

Zero any existing backlash correction in the VMC for the A-axis by typing BL,4,0 <<ENTER>>.

Check backlash at the rotary:

- 1) Position an indicator on the end of a horizontal T slot.
- 2) Place the machine in jog with the selector on A-axis and .010 increments.
- 3) Zero the indicator.
- 4) Jog +.03 then -.03.
- 5) Verify that the indicator reads zero. Repeat steps 3 and 4 until a zero reading is obtained.

6) Jog  $-.03$  then  $+.03$ .

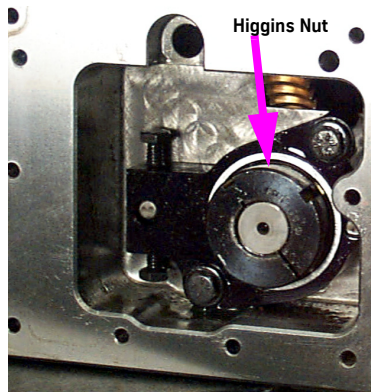
The difference on the indicator is the backlash. The backlash should be between  $.0004$  and  $.0010$ . If it is more, mechanical adjustment is necessary. Backlash is entered in tenths. An error of  $.0007$  would be entered: BL,4,7 <<ENTER>>.

### Setting the VH-65 Worm Gear Backlash

After disassembly or repairs, set the mechanical backlash for the VH-65 as follows:

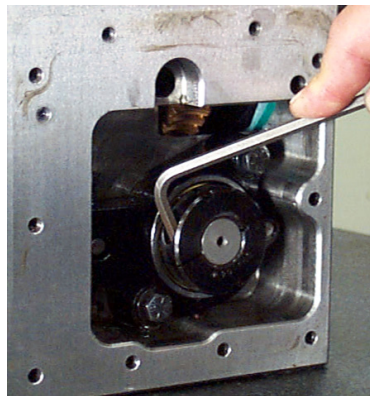
**Note:** Setting the backlash requires a granite plate or other precision surface.

1) The Higgins nut pre-load should be no more than hand tight.



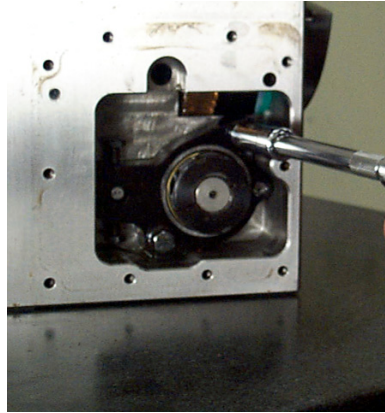
*Figure 10-2* Higgins Nut

2) Secure the Higgins nut to the worm shaft by tightening the set screw.



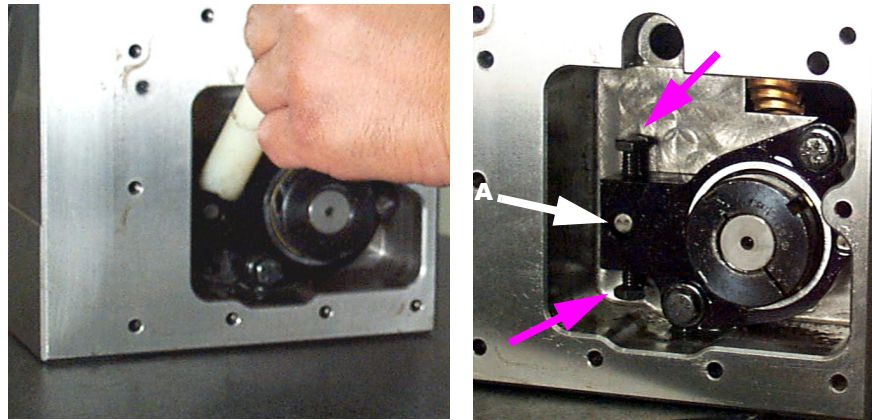
*Figure 10-3* Tighten Set Screw

- 3) The bolts holding the worm pivot plate must be loose to allow setup for the adjustments.



*Figure 10-4* Loosen Bolts Holding Worm Pivot Plate

- 4) The pivot adjustment screws should be set to zero (pivot plate resting on pin A) before starting the adjustment procedure.

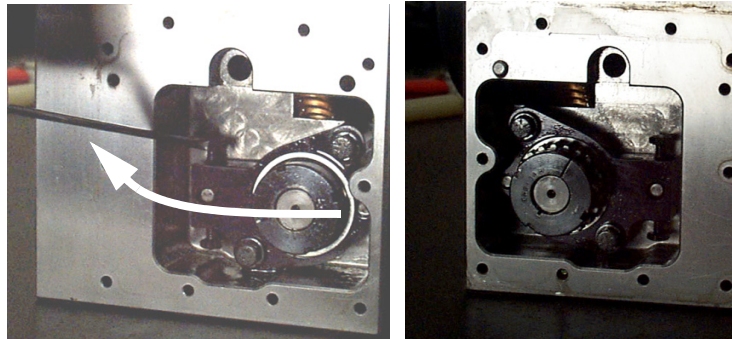


*Figure 10-5* Set Pivot Adjustment Screws to Zero

- 5) Turn the top pivot adjusting screw one turn on the side opposite of the motor. Turn the screw on the motor side two turns. (A turn for this

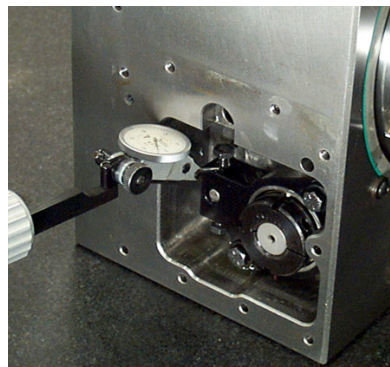


procedure is as far as the wrench will move from one side of the pocket to the opposite side).



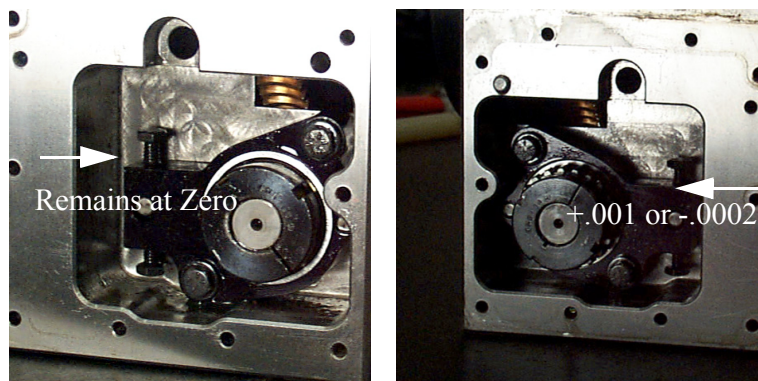
*Figure 10-6* Turn Top Pivot Adjusting Screw and Screw on Motor Side

- 6) Set an indicator on a stand. Zero the indicator on the worm pivot plate of the side opposite the motor.



*Figure 10-7* Zero Indicator on Worm Pivot Plate

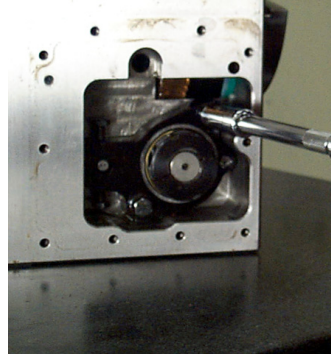
- 7) Move the indicator to the opposite side and take a reading off of the motor side pivot plate. Adjust the motor side pivot plate so that it is  $+0.001$  or  $-0.0002$  ( $+0.0254\text{mm}$  or  $-0.0508\text{mm}$ ).



*Figure 10-8* Move Indicator and Take Reading

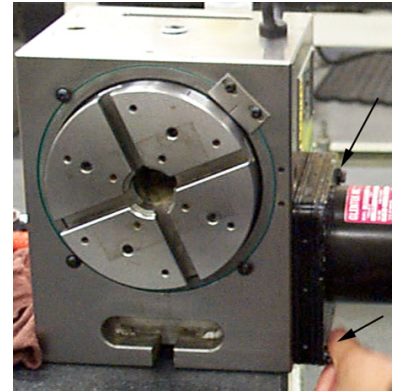
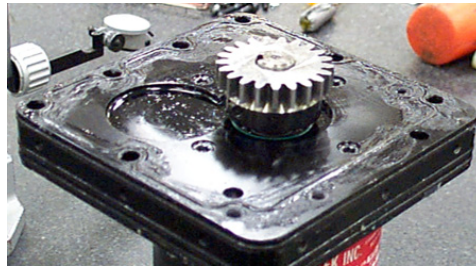


- 8) Keep checking that the pivot plate on the side opposite the motor stays at zero, adjust back to zero if required. Continue adjusting and checking pivot plate heights until the plates are adjusted.
- 9) Tighten pivot plate bolts until snug.



*Figure 10-9* Tighten Pivot Plate Bolts

- 10) Tighten adjustment bolts until they are touching the pin, do not tighten beyond just touching the pin.
- 11) Install motor plate o-ring and set motor on housing with two bolts at opposite corners.



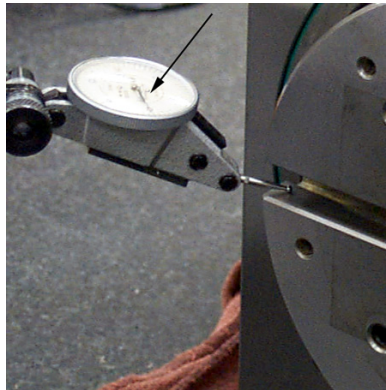
*Figure 10-10* Install Motor Plate O-Ring and Set on Housing

- 12) Connect power leads to the motor.
- 13) Enter the following program to run the motor:

```
N1 L100  
N2 G91  
N3 A360. G0  
N4 A20.  
N5 A-360.
```

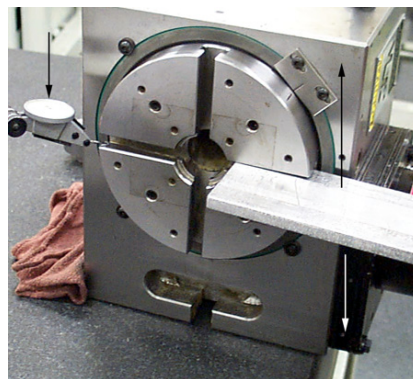
N6 M17  
N7 M30  
N8 L101.1  
N9 A-0.09

- 14) Listen to the operation of worm gear. Any knocking or banging indicates a bad gear adjustment on the worm or motor gear. Exit the program and enter the JOG mode.
- 15) Place an indicator on the face of the chuck, near the outer edge of the chuck as shown.



*Figure 10-11* Place Indicator on Face of Chuck

- 16) Zero the indicator and jog the axis in each direction returning to the initial position. The indicator should not be more than  $\pm .0002$  (0.0508mm) from zero. If the indication exceeds this, continue with the next step to determine the cause of backlash error.
- 17) Zero the indicator. Using a flat plate in the slots of the chuck, place force up and down on the plate. If there is movement indicated, the worm gear adjustment is off. If there is no movement the motor gear backlash is the cause.



*Figure 10-12* Place Force on Plate

- 18) To correct worm gear backlash, adjust the worm gear backlash on the exposed side of the housing with adjusting bolts until indicator moves less than .002 (0.508mm) when the plate is pressed.

### **Verifying Air Brake Engagement**

Verify the brake is energized when the M60 command is executed.

- 1) In MDI mode type M60 <<ENTER>> and then press <<START>>.
- 2) There should be a sound of air from the solenoid.

If there is no sound of air:

- 3) Verify that there is air to the machine.
- 4) Verify that the air valve is functioning.
- 5) Type M61 <<ENTER>> to deactivate the brake.

### **Adjusting the Cold Start**

The Cold Start position is used as a machine zero position. The relation of the A-axis cold start and the VH-65 T slots is set at the discretion of the person doing this procedure. The T slots may be at any angle. If it is desired that the T slots are timed to the cold start position, perform the following procedure:

- 1) Jog the A-axis to the Cold Start position, align the marks.
- 2) Type CS <<ENTER>>.
- 3) Run an indicator along either the horizontal or vertical T slot. If the reading is not zero, a resolver adjustment is necessary. The resolver is located on the end of the motor, inside the motor cover.
- 4) Remove the end plate and gasket from the motor cover.
- 5) Loosen the three retaining screws around the resolver. Do not remove them!
- 6) Slowly turn the resolver until the T slot is zero.
- 7) Tighten the retaining screws.
- 8) Type CS then <<ENTER>>.
- 9) Recheck the T slot.

Repeat the above steps until the adjustment remains at zero.

- 10) Double check the retaining screws.
- 11) Replace the cover and gasket.

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**Maintenance****Gear Oil**

The gear oil is the primary concern in rotary table maintenance. The oil should be changed every six to twelve months, depending on usage.

- 1) Remove the 1/8-27 NPT plug from the cover plate opposite the motor.
- 2) To allow the oil to flow more freely, wipe off any chips and dirt from the top of the rotary table and remove the 1/2-14 NPT plug. (No lubrication maintenance is required for the VH-5C.)

As a replacement oil use:

MOBILGEAR 626  
LUBRICATION OIL  
ISO VG 68

- 3) Replace the 1/8-27 NPT plug using teflon tape.
- 4) Using a funnel, fill the rotary table with the recommended oil or an approved equivalent gear oil through the top of the unit. Fill to the line on the sight glass, approximately 48 fl. oz.
- 5) Replace the top plug using teflon tape.

**Coolant**

Some types of coolant have a tendency to swell the motor cover gasket and attack the sealing compound. If this occurs, we recommend switching coolants. Wynns 941 has shown to be a satisfactory coolant.

**Face plate**

The rotary table face plate and any tooling must be free from chips and dings. Stone both surfaces and wipe clean.

**Serialized Matched Sets**

Rotary tables heads and tailstocks are serialized. FADAL maintains a record of the center line height of all serialized heads and tailstocks. If a customer desires at a later date to purchase a matching component, this may be easily accomplished.

**Removal and Storage**

- 1) Wipe any coolant, chips or dirt from the rotary table, motor cable, connector and any fixtures.
- 2) Jog the table for best access to the rotary table.
- 3) Turn off the power and lock out the main power box.

- 4) Unscrew the motor cable connector from the 4th axis receptacle, place a plastic bag around the connector for protection, and replace the dummy plug in the receptacle.
- 5) Coil up the cable and wire tie it in a loop.
- 6) Make sure there are no chips between mating connections.
- 7) Remove any fixtures that are attached to the face plate. The fixtures will add extra weight and make the rotary table awkward to lift.
- 8) Loosen the 1/2-13 hex bolts that mount the unit to the table.
- 9) Carefully slide the unit to the edge of the table.
- 10) Screw in the 1/2-13 eyebolts.
- 11) Ease the rotary table off of the table using the proper lifting procedure.
- 12) Wipe off the bottom of the unit and place it on a clean flat surface.
- 13) Lightly coat with a protective oil to keep it from rusting. The unit may be stored in the original container for protection.
- 14) Power on the machine.
- 15) Type SETP <<ENTER>> to bring up the parameters.
- 16) Change the axes selection from X,Y,Z,A TO X,Y,Z (from 4 to 3).
- 17) Exit the parameter screen.
- 18) Power the machine off and then back on. This will reset the parameters.

## Rotary Set-Up

If the controller card is a PCB-0217 (1010-6) then use the following chart for placing the jumper on the rotary table.  
Install J4 (REV-DIR) as required.

**Table 1: Jumper Placement on Rotary Table**

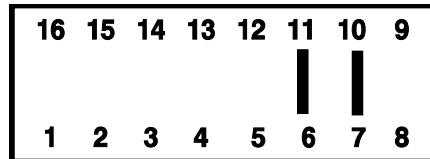
Mode	J16	J17	J18	J19	J4	JP8	JP10
X-AXIS	ON	NONE	NONE	ON	X-AXIS	NONE	NONE
Y-AXIS	ON	NONE	NONE	ON	Y-AXIS	NONE	NONE
Z-AXIS	ON	NONE	NONE	ON	Z-AXIS	NONE	NONE
A-AXIS	ON	NONE	NONE	ON	A-AXIS	NONE	NONE
B-AXIS	ON	NONE	NONE	ON	B-AXIS	NONE	NONE
SPINDLE	NONE	ON	ON	NONE	SPINDLE	NONE	NONE

For all other controller cards use the following:

**FADAL VH-65 &  
VH-5C**

- 1) Set the jumpers on the 1010-5 card as follows:

**201010-4  
JUMPER BLOCK  
AT J4**



**(U7) EPROM  
(U10) EPROM  
B-AXIS**

*Figure 10-13* VH65 & VH-5C Jumper Block

**Note:** The 5C does not use the 6-11 jumper line.

- 2) Set the axes configuration in the SETP to 4 which will select X,Y,Z,A. Once the number of axes has been set, the A axis' ratio and brake parameters will be displayed.
- 3) Set the A axis ratio to 90:1.
- 4) Set the M60/A axis brake to YES.
- 5) Exit the SETP by pressing <MANUAL> and do the CS command.
- 6) Using service program PR,5815, set the position loop gain for the rotary table. Change the fourth line in the subroutine to a feedrate of F2000. and make sure the 360 degree move is for an A axis, i.e. A360.
- 7) Adjust the SIG2 potentiometer on the amplifier until the voltage is 1.660VDC at SIG2 and COM terminals of the amplifier. (Refer to section 6 for a full description of amplifier adjustment procedures.)
- 8) Check and make sure the rotary table rotation is in the correct direction.
- 9) Verify axis brake operation using the procedure in Section 6.
- 10) Set backlash using the procedure in section 6.
- 11) Square up the rotary table so that it is perpendicular with the X axis.



## FADAL V-300 (V-400) Rotary Table

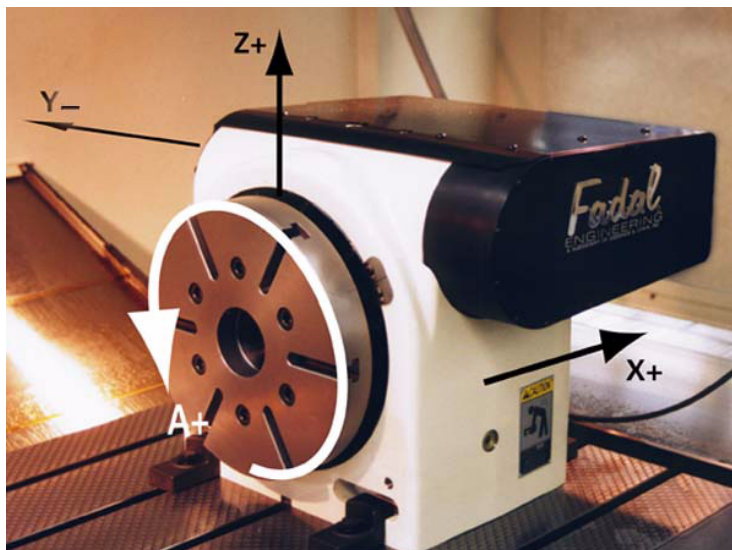


Figure 10-14 FADALFADAL V-300 (V-400) Rotary Table

- 1) Set the jumpers on the 1010-5 card as follows:

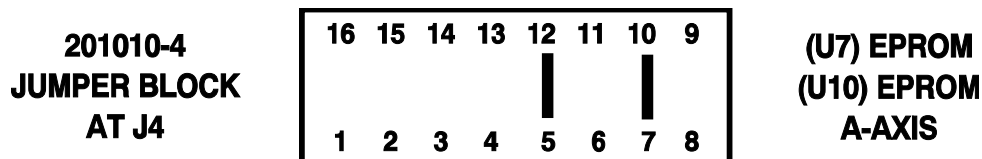
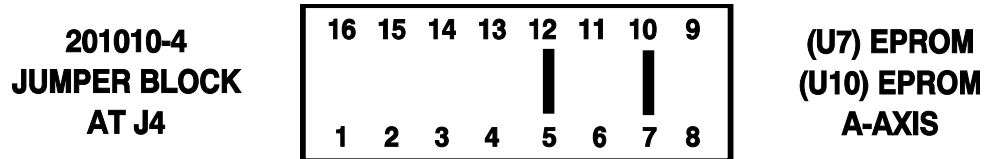


Figure 10-15 V-300 (V-400) Jumper Block

- 2) Set the axes configuration in the SETP to 4, which will select X,Y,Z,A.
- 3) Once the number of axes has been set, the A axis' ratio and brake parameters will be displayed.
- 4) Set the A axis ratio to 180:1.
- 5) Set the M60/A axis brake to YES or NO depending on whether or not the machine is equipped with a brake (the rotary table *must* have *both* a brake *and* the proper solenoids).
- 6) Exit the SETP by pressing <MANUAL> and enter the CS command.
- 7) Using service program PR,5815, set the position loop gain for the rotary table. Change the fourth line in the subroutine to a feed rate of F1000. and make sure the 360 degree move is for an A axis, i.e. A360.
- 8) Check and make sure the rotary table rotation is in the correct direction.
- 9) Verify axis brake operation by entering MDI mode and typing M60/M61.

- 10) Set backlash using the procedure in section 6.
- 11) Square up the rotary table so it is perpendicular with the X axis. Use the procedure in section 6.

**Troyke NC-10** 1) Set the jumpers on the 1010-5 card as follows:



*Figure 10-16* Troyke NC-10 Jumper Block

- 2) Set the axes configuration in the SETP to 4, which will select X,Y,Z,A. Once the number of axes has been set, the A axis' ratio and brake parameters will be displayed.
- 3) Set the A axis ratio to 180:1.
- 4) Set the M60/A axis brake to YES or NO depending on whether or not the machine is equipped with a brake (the rotary table *must* have *both* a brake *and* the proper solenoids).
- 5) Exit the SETP by pressing <MANUAL> and enter the CS command.
- 6) Using service program PR,5815,set the position loop gain for the rotary table. Change the fourth line in the subroutine to a feedrate of F1000. and make sure the 360 degree move is for an A axis, i.e. A360.
- 7) Adjust the SIG2 potentiometer on the amplifier until you get a voltage of 1.660VDC at SIG2 and COM terminals of the amplifier (refer to section 6 for a full description of amplifier adjustment procedures).
- 8) Check and make sure the rotary table rotation is in the correct direction.
- 9) Verify axis brake operation using the procedure in Section 6.
- 10) Set the backlash using the procedure in section 6.
- 11) Square up the rotary table so that it is perpendicular with the X axis.

Technara MD-200R 1) Set the jumpers on the 1010-5 card as follows:

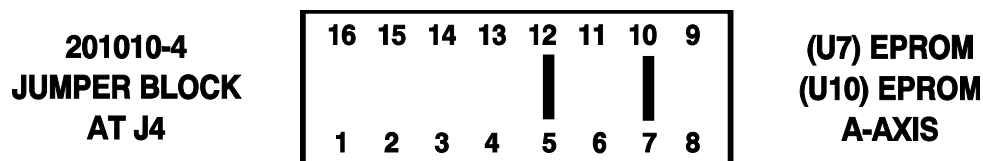


Figure 10-17 Technara MD-200R Jumper Block

- 2) Set the axes configuration in the SETP to 4, which will select X,Y,Z,A.
- 3) Once the number of axes has been set, the A axis' ratio and brake parameters will be displayed. Set the A axis ratio to 360:1.
- 4) Set the M60/A axis brake to YES or NO depending on whether or not the machine is equipped with a brake (the rotary table *must* have *both* a brake *and* the proper solenoids). The Programmable Air Lock hydraulic brake pump unit for the 4th axis is optional.
- 5) Exit the SETP by pressing <MANUAL> and enter the CS command.
- 6) Using service program PR,5815, set the position loop gain for the rotary table. Change the fourth line in the subroutine to a feedrate of F500. and make sure the 360 degree move is for an A axis, i.e. A360.
- 7) Adjust the SIG2 potentiometer on the amplifier until you get a voltage of 1.660VDC at SIG2 and COM terminals of the amplifier (refer to section 6 for a full description of amplifier adjustment procedures).
- 8) Check and make sure the rotary table rotation is in the correct direction.
- 9) Verify the axis brake operation using the procedure in Section 6.
- 10) Set the backlash using the procedure in section 6.
- 11) Square up the rotary table so that it is perpendicular with the X axis.

## Technara MD-300R

- 1) Set the jumpers on the 1010-5 card as follows:

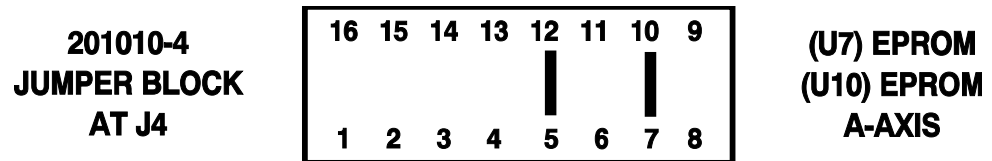
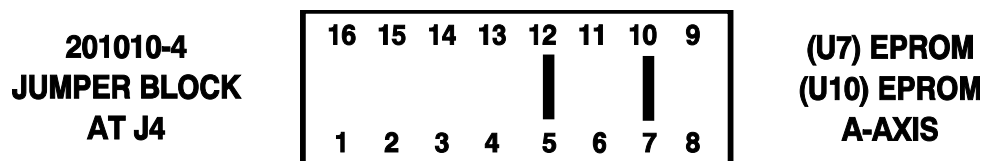


Figure 10-18 Technara MD-300R

- 2) Set the axes configuration in the SETP to 4 which, will select X,Y,Z,A. Once the number of axes has been set the A axis' ratio and brake parameters will be displayed.
- 3) Set the A axis ratio to 360:1.
- 4) Set the M60/A axis brake to YES or NO depending on whether or not the machine is equipped with a brake (the rotary table *must* have *both* a brake *and* the proper solenoids). The Programmable Air Lock hydraulic brake pump unit for the 4th axis is optional.
- 5) Exit the SETP by pressing <MANUAL> and enter the CS command.
- 6) Using service program PR,5815, set the position loop gain for the rotary table. Change the fourth line in the subroutine to a feedrate of F500. and make sure the 360 degree move is for an A axis, i.e. A360.
- 7) Adjust the SIG2 potentiometer on the amplifier until you get a voltage of 1.660VDC at SIG2 and COM terminals of the amplifier (refer to section 6 for a full description of amplifier adjustment procedures).
- 8) Check and make sure the rotary table rotation is in the correct direction.
- 9) Verify the axis brake operation using the procedure in Section 6.
- 10) Set the backlash.
- 11) Square up the rotary table so that it is perpendicular with the X axis.

Tsudakoma RNCV-401

- 1) Set the jumpers on the 1010-5 card as follows:



*Figure 10-19* Tsudakoma RNCV-401 Jumper Block

- 2) Set the axes configuration in the SETP to 4, which will select X,Y,Z,A.
- 3) Once the number of axes has been set the A axis' ratio and brake parameters will be displayed. Set the A axis ratio to 180:1.
- 4) Set the M60/A axis brake to YES or No depending on whether or not the machine is equipped with a brake (the rotary table *must* have *both* a brake *and* the proper solenoids). The Programmable Air Lock hydraulic brake pump unit for the 4th axis is optional.
- 5) Exit the SETP by pressing <MANUAL> and enter the CS command.
- 6) Using service program PR,5815, set the position loop gain for the rotary table. Change the fourth line in the subroutine to a feedrate of F1000. and make sure the 360 degree move is for an A axis, i.e. A360.
- 7) Adjust the SIG2 potentiometer on the amplifier until you get a voltage of 1.660VDC at SIG2 and COM terminals of the amplifier (refer to section 6 for a full description of amplifier adjustment procedures).
- 8) Check and make sure the rotary table rotation is in the correct direction.
- 9) Verify axis brake operation using the procedure in Section 6.
- 10) Set the backlash.
- 11) Square up the rotary table so that it is perpendicular with the X axis.

FADAL RT-175 1) Set the jumpers on the 1010-4 card as follows:

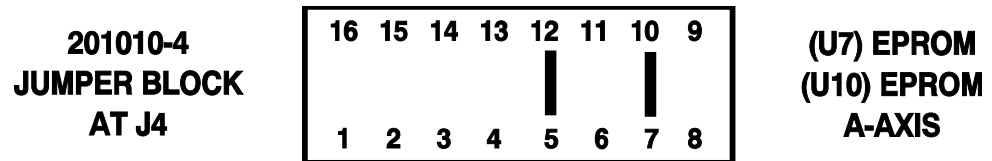
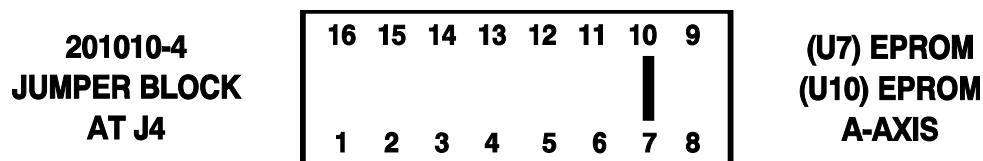


Figure 10-20 RT-175 Jumper Block

- 2) Set the axes configuration in the SETP to 4, which will select X,Y,Z,A. Once the number of axes has been set the A axis' ratio and brake parameters will be displayed.
- 3) Set the A axis ratio to 180:1.
- 4) Set the M60/A axis brake to YES or NO depending on whether or not the machine is equipped with a brake (the rotary table MUST have BOTH a brake AND the proper solenoids). Programmable air lock hydraulic brake pump unit for the 4th axis is optional.
- 5) Exit the SETP by pressing <MANUAL> and do the CS command.
- 6) Using service program PR,5815 set the position loop gain for the rotary table. Change the fourth line in the subroutine to a feedrate of F1000. and make sure the 360 degree move is for an A axis, i.e. A360.
- 7) Adjust the SIG2 potentiometer on the amplifier until you get a voltage of 1.660VDC at SIG2 and COM terminals of the amplifier (refer to amplifier AC drive manual for a full description of amplifier adjustment procedures).
- 8) Check and make sure the rotary table rotation is the correct direction. See illustration in the FADAL Maintenance Manual for the VH-65.
- 9) Verify axis brake operation using the procedure in Section 6.
- 10) Set backlash.
- 11) Square up rotary table so it is perpendicular with the X axis.



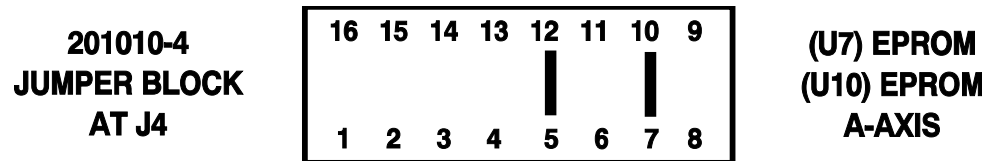
- FADAL RT-225 1) Set the jumpers on the 1010-4 card as follows:



*Figure 10-21* RT-225 Jumper Block

- 2) Set the axes configuration in the SETP to 4, which will select X,Y,Z,A. Once the number of axes has been set the A axis' ratio and brake parameters will be displayed.
- 3) Set the A axis ratio to 180:1.
- 4) Set the M60/A axis brake to YES or NO depending on whether or not the machine is equipped with a brake (the rotary table MUST have BOTH a brake AND the proper solenoids). Programmable air lock hydraulic brake pump unit for the 4th axis is optional.
- 5) Exit the SETP by pressing <MANUAL> and do the CS command.
- 6) Using service program PR,5815 set the position loop gain for the rotary table. Change the fourth line in the subroutine to a feedrate of F1000. and make sure the 360 degree move is for an A axis, i.e. A360.
- 7) Adjust the SIG2 potentiometer on the amplifier until you get a voltage of 1.660VDC at SIG2 and COM terminals of the amplifier.
- 8) Check and make sure the rotary table rotation is the correct direction. See the illustration in the FADAL Maintenance Manual for the VH-65.
- 9) Verify axis brake operation using the procedure in Section 6.
- 10) Set backlash.
- 11) Square up rotary table so it is perpendicular with the X axis.

- FADAL RT-275 1) Set the jumpers on the 1010-4 card as follows:



*Figure 10-22* RT-275 Jumper Block

- 2) Set the axes configuration in the SETP to 4, which will select X,Y,Z,A. Once the number of axes has been set the A axis' ratio and brake parameters will be displayed.
- 3) Set the A axis ratio to 180:1.
- 4) Set the M60/A axis brake to YES or NO depending on whether or not the machine is equipped with a brake (the rotary table MUST have BOTH a brake AND the proper solenoids). Programmable air lock hydraulic brake pump unit for the 4th axis is optional.
- 5) Exit the SETP by pressing <MANUAL> and do the CS command.
- 6) Using service program PR,5815 set the position loop gain for the rotary table. Change the fourth line in the subroutine to a feedrate of F1000. and make sure the 360 degree move is for an A axis, i.e. A360.
- 7) Adjust the SIG2 potentiometer on the amplifier until you get a voltage of 1.660VDC at SIG2 and COM terminals of the amplifier.
- 8) Check and make sure the rotary table rotation is the correct direction. See the illustration in the FADAL Maintenance manual for the VH-65.
- 9) Verify axis brake operation using the procedure in Section 6.
- 10) Set backlash.
- 11) Square up rotary table so it is perpendicular with the X axis.

**Tilting Rotary Tables,  
4th & 5th Axis**

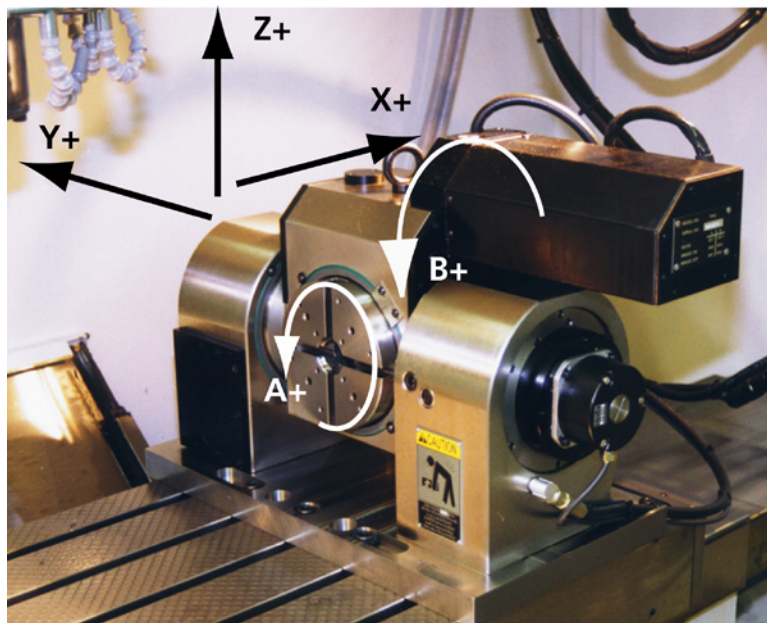
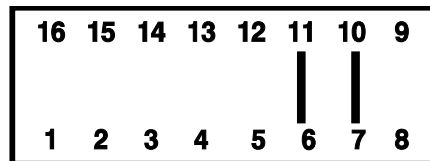


Figure 10-23 Tilting Rotary Table

**FADAL TR-65**

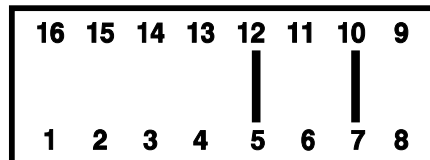
1) Set the jumpers on the 1010-5 card as follows:

**A-AXIS 1010-4  
JUMPER BLOCK  
AT J4**



(U7) AB NOLIM  
(U10) AB NOLIM

**B-AXIS 1010-4  
JUMPER BLOCK  
AT J4**



(U7) AB5P95N  
(U10) AB5P95N

Figure 10-24 TR-65 Jumper Blocks

- 2) The AB NOLIM EPROM is for the A axis. It has no limits. The 15P105N EPROM for the B axis has software limits of 15 degrees positive and 105 degrees negative.
- 3) Set the axes configuration in the SETP to 5 which will select X,Y,Z,A,B. Once the number of axes has been set the A and B axes' ratio and brake parameters will be displayed.
- 4) Set the A axis ratio to 90:1.

- 5) Set the B axis ratio to 180:1.
- 6) Set the M60/A axis brake to YES.
- 7) Set the M62/B axis brake to YES.
- 8) Exit the SETP by pressing <MANUAL> and enter the CS command.
- 9) Using service program PR,5815, set the position loop gain for the rotary table.
- 10) Change the fourth line in the subroutine to a feedrate of F2000. and make sure the 360 degree move is for an A axis, i.e. A360.
- 11) Adjust the SIG2 potentiometer on the amplifier until you get a voltage of 1.660VDC at SIG2 and COM terminals of the amplifier (refer to section 6 for a full description of amplifier adjustment procedures).
- 12) Change the fourth line of the subroutine to a feedrate of F1000. and on the same line change the A360 degree move to a B-90. (Make sure the move is negative). On the next line change the A-360 degree move to a B90. (Make sure the move is positive).
- 13) With the program running, adjust the SIG2 potentiometer on the amplifier until you get a voltage of 1.660VDC at SIG2 and COM terminals of the amplifier (refer to Section 6 for a full description of amplifier adjustment procedures).
- 14) Check and make sure the rotary table rotation is in the correct direction.
- 15) Verify each axis brake operation using the procedure in Section 6.
- 16) Set the backlash.
- 17) Square up the tilting rotary table so that it is perpendicular with the X axis.

## A & B Axis Position Loop Gain (1010-5)

**Note:** Verify the gain setting through the SV command before continuing!

The A and B axis require a different program to be entered. Enter the appropriate program for the rotary table that you have (refer to the chart below).

**Table 2: Loop Gain Adjustment Program**

A AXIS PROGRAM FOR POSITION LOOP GAIN	B AXIS PROGRAM FOR POSITION LOOP GAIN
N1 L100	N1 L100
N2 M49	N2 M49
N3 A1000. ****. G1	N3 B-90. ****. G1
N4 A-1000.	N4 B90.
N5 M17	N5 M17
N6 M30	N6 M30
N7 L199	N7 L199
N8 M2	N8 M2

Replace the asterisks in the above programs with the correct feedrate for your corresponding rotary table from the table below.

**Table 3: Ratio and Feed Rates**

TABLE	AXIS	RATIO	FEEDRATE
NIKKEN	A	90:1	F2000.
TROYKE	A	180:1	F1000.
TECHNARA	A	360:1	F500.
SHIPMAN	A	180:1	F1000.
SHIPMAN	B	180:1	F1000.
TROYKE	B	360:1	F500.
FADAL VH-65	A	90:1	F2000.
FADAL RT-175	A	180:1	F1000.
FADAL RT-225	A	180:1	F1000.
FADAL RT-275	A	180:1	F1000.
FADAL TR-65	A	90:1	F2000.
FADAL TR-65	B	180:1	F1000.
FADAL TR-65 W/O SCALE	B	90:1	F2000.

Enter the commands

PR <ENTER>

Press #3 (START NEW PROGRAM) <ENTER>

- 1) Enter NEW PROGRAM NUMBER <ENTER>
- 2) Press #6 (EXIT)
- 3) From the prompt ENTER NEXT COMMAND type in IN <ENTER>

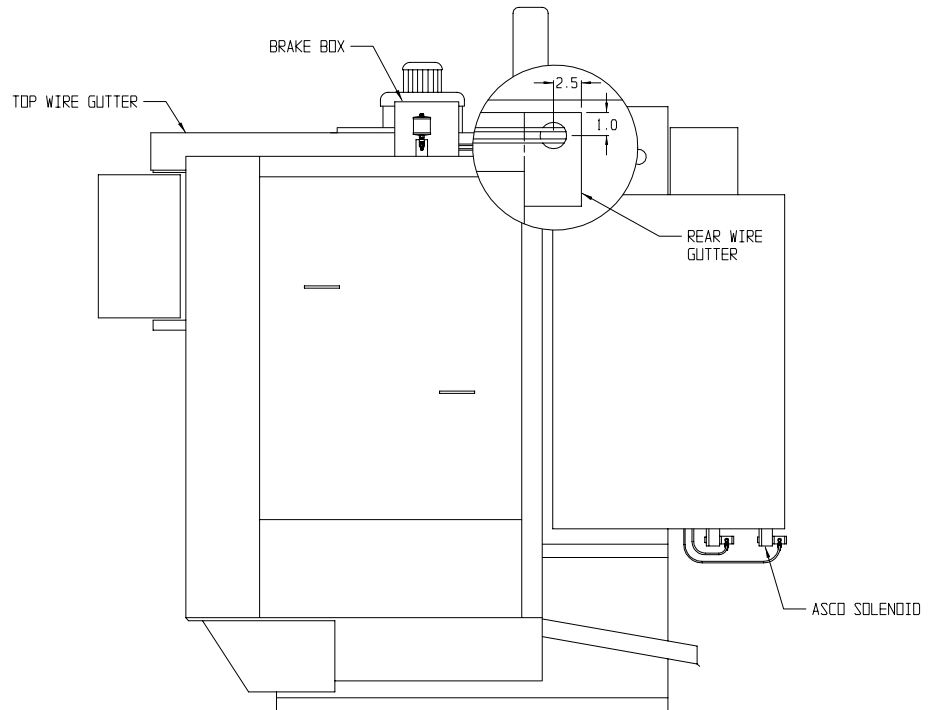
Enter the following program (PR,5815):

- 4) The position loop gain is adjusted by the potentiometer labeled "SIG" on the servo amplifier card (FIG -).
- 5) With the CNC CONTROL CABINET open, start the previous entered program executing (Push the AUTO key).
- 6) Set the digital voltmeter (FLUKE MODEL 27) to the DC scale. Place the black lead of the meter on the "COM" terminal of the amplifier, and place the red on the "SIG" terminal of the amplifier to be adjusted. For the amplifier with the orange connector use the 5th terminal from the front (common) and the 4th terminal from the front (SIG).
- 7) Adjust the "SIG" potentiometer on the amplifier until the meter reads 1.660 +/- .001 volts DC in both directions. When the voltage is set the following error display should read 680.

A 0.0	680 POSITION LOOP GAIN DISPLAY
B 0.0	680



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**Hydraulic Brakes****4th Axis Brake  
Installation**

*Figure 10-25* 4th Axis Brake Installation

- 1) Mount the hydraulic brake unit on top of the right panel as shown.
- 2) Drill a hole in rear wire gutter as shown.
- 3) Install a plastic wire guard around the hole so the wires and air lines do not get chaffed.
- 4) Run air lines from the hydraulic brake box, along the outside of the top wire gutter, into the hole in the rear wire gutter channel, down the inside of the CNC, out the bottom and into the ASCO solenoid.
- 5) Fill reservoir with extra light spindle oil.
- 6) Set air regulator to 20 PSI.
- 7) Neatly wire tie the air lines inside and outside the CNC box so they do not flop around.

### 4th Axis Brake Check-Out

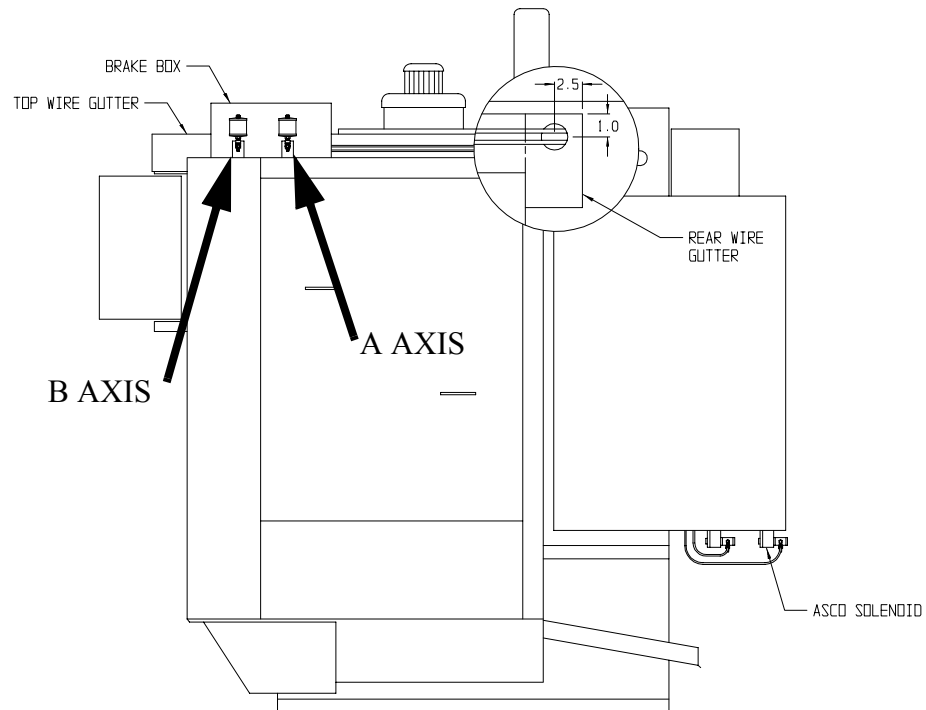
1) Manually check the brake operation by typing the following:

MD <ENTER>

M60 <ENTER> <START> — (A AXIS BRAKE SHOULD LOCK)

M61 <ENTER> — (A AXIS BRAKE SHOULD RELEASE)

### 4th, 5th Axis Brake Installation



*Figure 10-26* 4th and 5th Axis Brake Installation

- 1) Mount the hydraulic brake unit on top of the right panel as shown.
- 2) Drill a hole in rear wire gutter as shown.
- 3) Install a plastic wire guard around the hole so the wires and air lines do not get chaffed.
- 4) Run air lines from the hydraulic brake box, along the outside of the top wire gutter, into the hole in the rear wire gutter channel, down the inside of the CNC, out the bottom and into the ASCO solenoid.
- 5) Fill both reservoirs with extra light spindle oil.
- 6) Set air regulator to 20 PSI.
- 7) Neatly wire tie the airlines inside and outside the CNC box so they do not flop around.

**4th, 5th Axis Brake  
Check-Out**

1) Manually check the brake operation by typing the following:

MD <ENTER>

M60 <ENTER> <START> — (A AXIS BRAKE SHOULD LOCK)

M61 <ENTER> — (A AXIS BRAKE SHOULD RELEASE)

M62 <ENTER> — (B AXIS BRAKE SHOULD LOCK)

M63 <ENTER> — (B AXIS BRAKE SHOULD RELEASE)

**Note:** If the M function does not lock the brake on the correct axis, check the hydraulic and air lines to make sure they are plugged into the correct port.

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