4th Axis Inhibit Circuit Verification

Rotary Operation

When a 4th axis rotary table is permanently wired to a Fadal vertical CNC, the Inhibit Circuit is often times overlooked. This is the silent safety circuit keeping your $1000 rotary servo motor from burning up when you have applied the air/hydraulic brake for machining operations.

Rotary indexers and full Rotary 4th axes both need to turn at one point or another or you would simply mount your material to a solid fixture. Some indexers turn manually, but most with servo motors these days. Servo motors are designed with a full feedback loop that insures it holds position when told to stop by the machine. So when the machine is on and the servo drives are up and engaged the motor "hunts" for position all the while. When the servo motor "hunts," it is moving back and forth quickly in very small movements. The closed loop servo system is sending power to move the motor, the encoder or resolver sends a message to the controller card where the motor is and that it is moving CW, then the controller card sends a signal to the servo amplifier to change direction, so it does and the cycle starts over again. This is normal and how all closed loop systems move to and hold position.

If you then clamp the motor down with a brake, but allow the servo system to continue to "hunt," you will overheat your motor. The reason is that the motor must move to hunt and verify position. If you don't allow movement, the amplifier continues to send more and more power to the motor to force movement...which is usually does by overcoming the brake, then it reverses and faces the same struggle...thus overheating and eventual early death of the motor.

The loop looks like this:

1) Control tells rotary to turn.
2) Control releases brake holding motor rigid.
3) Rotary servo motor turns to position, then stops.
4) Control applies brake to hold position & provide rigidity again for the machining process.

Figure 1

Inhibit Circuit

Figure 1 to the left shows a Inhibit circuit. They are mounted in the right side cabinet of your machine in the left upper side. All wires are cut to insure they reach their destinations from this point. FadalCNC stocks both the 4th axis (WIR-0578) and 5th axis (WIR-0579) Inhibit Circuits.

The sole purpose of the Inhibit circuit is to keep your servo

motor from burning up when the brake is applied. It sends an "Inhibit" signal to the amplifiers on the terminal you see below to shut down the amp while the brake is applied.

Testing the Inhibit Circuit

Testing the inhibit circuit is quite simple. You can use a multimeter or amp clamp, whichever is more available to you (or visually on an AMP-0014).

Figure 2
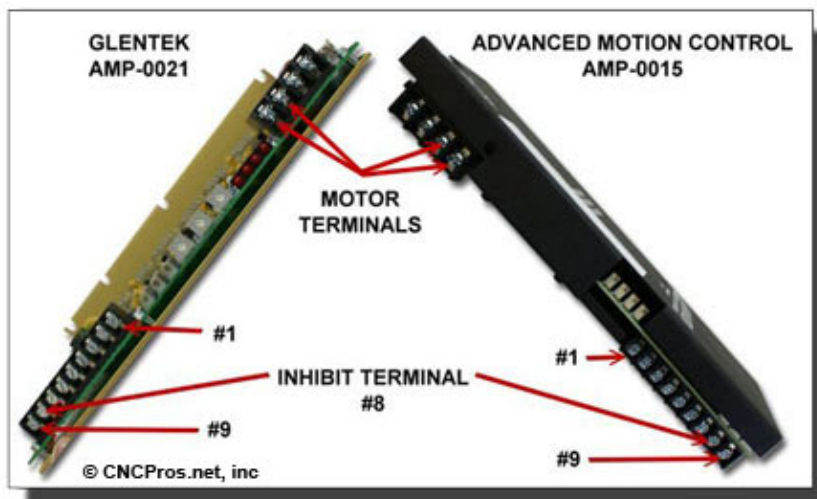
Check your parameters (SETP) and insure the control parameter for the rotary is set to apply the brake automatically when the rotary stops. If you prefer not to use this feature or have a manual brake, don't worry about the parameter.

Command your rotary to index to any point and stop. With a multimeter, check the power at terminals MTR+ & MTR-. See Figure 2. You should read something less than 5 VDC and closer to zero. No system is perfect, so you may see some voltage on the leads, but this will be residual if the Inhibit Circuit is working correctly. If you are using an amp clamp, simply clamp around the above wires connected to these terminals, one at a time, and verify you have zero current flowing to the motor.

If you have an Advanced Motion Control AMP-0014, there is a bright red LED that will illuminate on the face when the Inhibit signal is active.

If your Inhibit circuit is not working, then you will either need to replace the unit of defective or trace down the defective relay in the 1100-1 board or broken wire contact. Contact FadalCNC.com for technical support as needed. We can provide all replacement parts and wiring diagrams to nail down any problems with this circuit.

The 10 minutes you just took to read this just saved you about $1500 in a ruined motor and service labor to get it all back working.

Typical 4th Axis Wiring Installation

4th Axis Inhibit Installation Diagram

4th axis card

Install Inhibit Circuit Here

DC Power Supply Connect

1100-1 board

Air Solenoid Control Wires Here

1060-0.
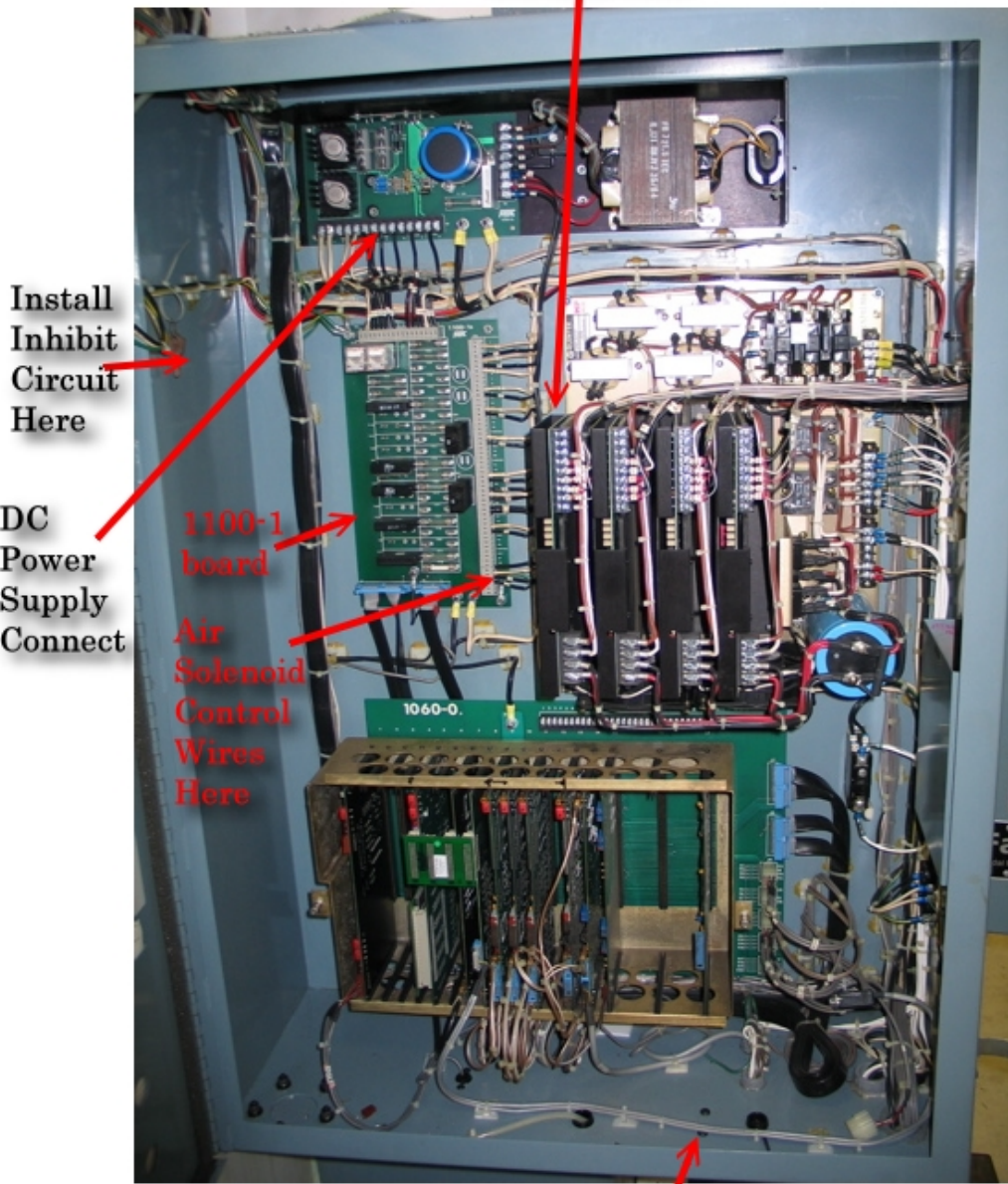
Mount Solenoid Under Cabinet Here