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Service Bulletin

Number: 0011

Title: 115 VAC Line/Neutral Wiring

Date: Sept 22, 2006

Product Identification: PCNC 1100 Milling Machine, serial numbers 1 through 148.

Special Note:

THIS SERVICE BULLETIN REGARDS MACHINE SAFETY

Overview:

Machine numbers 1 through 148 should be checked for proper line/neutral wire connections. Checking can be done with a visual inspection. If needed, the correction of the wiring will take normally less than 3 minutes. This is a safety issue; all machines in the serial number range should be checked and corrected as necessary.

Background:

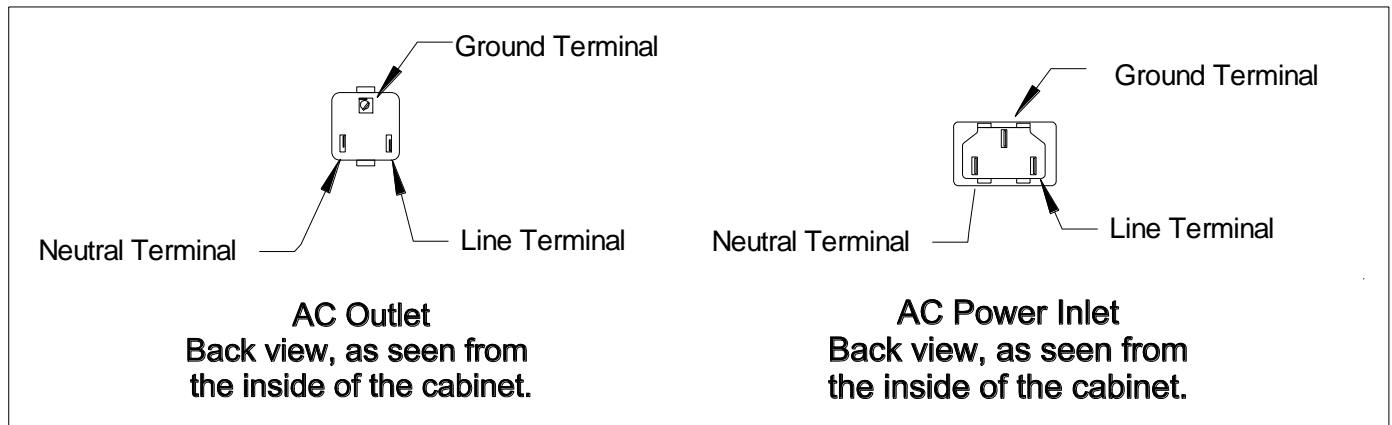
The PCNC 1100 has two input power connections. The main power input (normally 230 VAC) operates the machine, while a 115 VAC input provides auxiliary power via switched outlets for the coolant system and computer power.

We have learned that machines with serial numbers 148 and earlier may have been wired improperly on the 115 VAC auxiliary power. Some machines may be wired to switch the *neutral* conductor, not the *line* conductor, or with the *neutral* and *line* conductors reversed at outlet.

115 VAC wiring involves 3 wires: a *line* (hot) conductor, a *neutral* (return) conductor, and a *ground* line. When power is turned off it is the *line* conductor that should be switched. Switching *neutral* will effectively turn off the device, but it will leave a live voltage to the device.

Checking a Machine:

The problem is limited to how the wires are connected to the 115 VAC input and outputs at the bottom of the electrical cabinet. This can be viewed by opening the cabinet door. In the simplest terms, the *ground* wire should be connected from the *ground* terminal on the input connector to ground of each of the output connectors. The *neutral* line is also connected from *neutral* terminal of the input connector to the *neutral* terminal of each of the power outlets. The wire connected to the *line* terminals will lead off to the other wiring of the cabinet.



The figure above identifies the *line*, *neutral*, and *ground* connectors. Note that this is shown with the *ground* connection on the top. If the connector is mounted 180 degrees in orientation, the *line* will be on the left and the *neutral* mounted on the right. Looking at Image 1, below, we can see that the wire which leads out of the *line* terminal (white wire) of the power input goes to the *neutral* terminal of the upper power output, on the lower two power outputs it is connected to the *line* terminal. A white arrow points to each incorrect connection, there are 6 of them in this case.

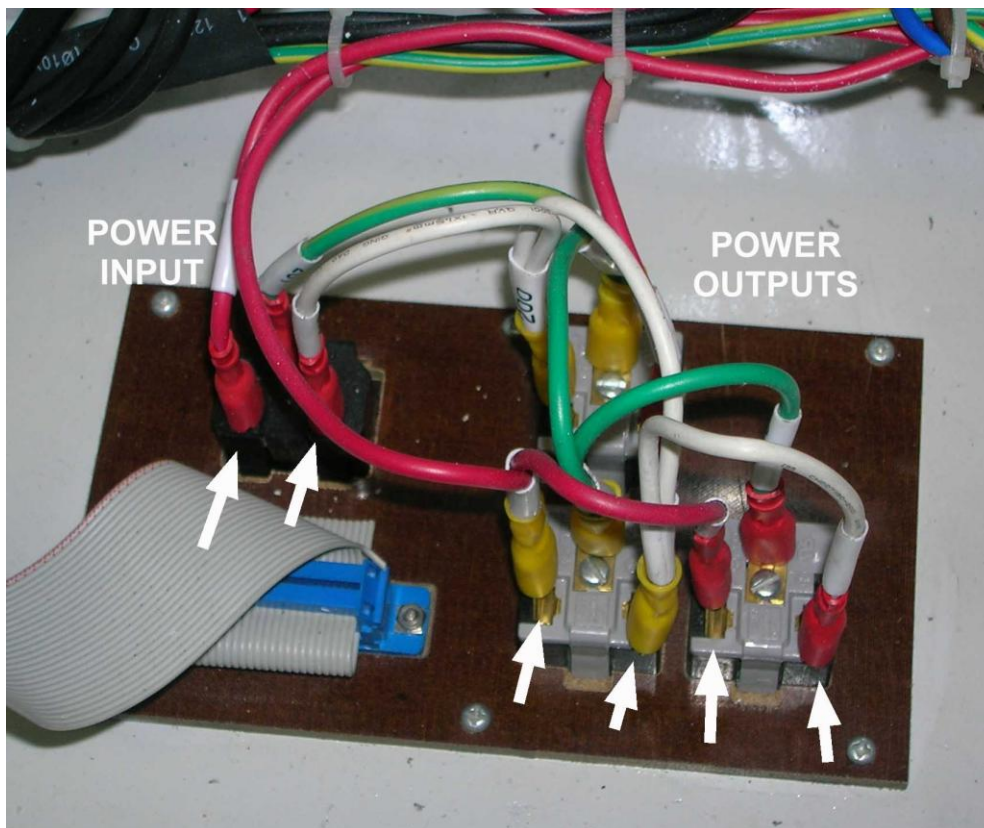


Image 1 - Improper Connections

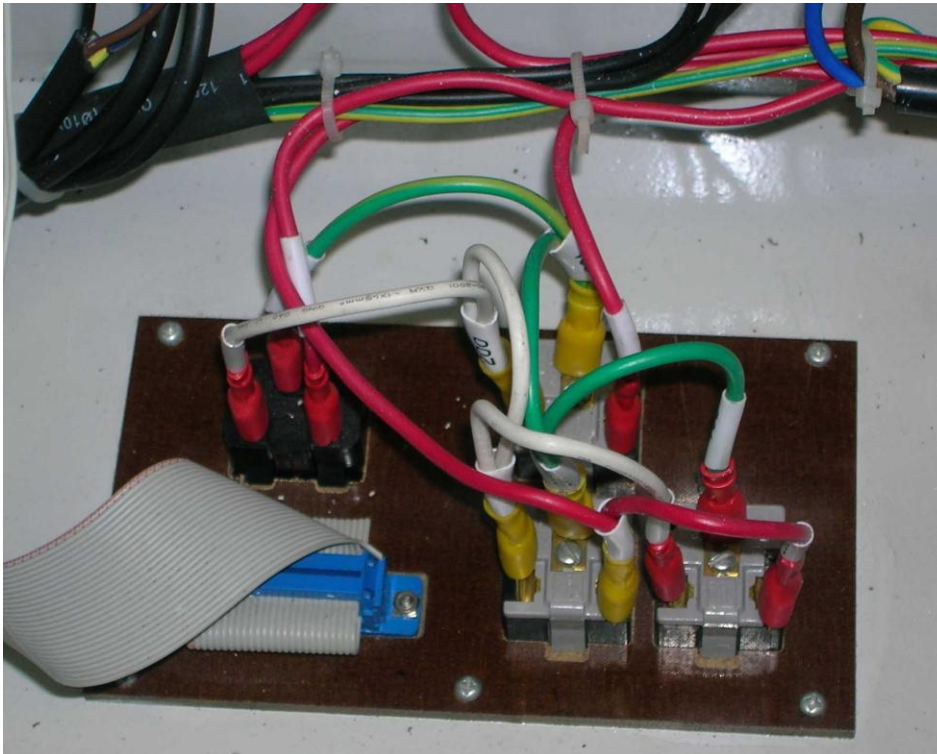


Image 2 - Proper Connections

In Image 2 (above), the white wire goes to the *neutral* terminal of every device. The green/yellow ground goes to the ground terminal of every device. The red wires are attached to the *line* terminals and they lead off toward the other sections of the electrical cabinet. Note that the ground wire does **NOT** connect to the central ground bar of the electrical cabinet. The 115 VAC is grounded through the 115 VAC power line to the wall, it must not be connected directly to the machine.¹

Note that if any outlet or even the entire sub-plate itself is mounted to 180 degrees to orientation show, the left and right sides will be reversed. Refer to the line drawing at the top of page 2 in order to correctly identify *line* and *neutral* terminals.

¹ Do not attempt to modify the ground connection by linking the 115 VAC ground to the machine ground. Doing so will introduce ground loops and electrical noise to the computer. This will defeat the function of the insulating plate that the 115 VAC devices are mounted to and create problems in the reliability of the computer control.



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Correcting the Wiring:

There are two power connections for the machine. Unplug both power connections, disconnecting from all power sources. If there are LED's on inside the control cabinet, wait a minute or two for the LED lights to go out, indicating that all power is dissipated from the capacitors.

Once the cabinet is completely without power, pull the connections off the back of the power input and power output devices and replace them in the correct positions. Most machines use spade type push-on type connectors. Early machines may have soldered connections.²

Related Safety Issue:

We would like to emphasize the importance of making proper connections to the facility power supply. The following is taken from the safety section 1.1 of the PCNC 1100 user manual:

“Grounding: Both primary and secondary power inputs must be grounded. During installation it is not enough to assume that the ground line of a wall outlet is properly grounded. Check continuity of the machine frame and true earth ground (water pipe or similar) to ensure a good ground connection.

A GFI (Ground Fault Interrupt – RCCB i.e. Residual Current Circuit Breaker in Europe) outlet must be used to supply the power to the 115 VAC power input. Your computer, monitor, and coolant system are not bolted to the machine frame so proper grounding cannot be assumed. The combination of electrical power and water based coolant systems makes the GFI protection very important.”

The precautions noted above remain important. Correct grounding and the use of a GFI will mitigate the implications of incorrect *line/neutral* connections, but they will not eliminate the risk. The *line/neutral* connections described in this service bulletin must be checked and amended as necessary. Contact info@tormach.com or call 608-849-8381 if you have any questions regarding this service bulletin

² If you need to move wires with soldered connections, make certain you use resin core flux type solder intended for electrical connections. Solder intended for plumbing will have acid core flux or require applied soldering flux. Applied flux or acid core flux will lead to future electrical failures due to corrosion from residual flux.