



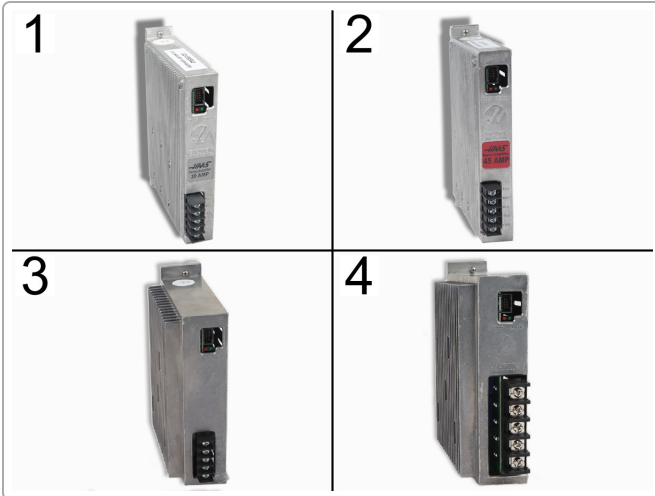
Servo Amplifier - How it Works and Troubleshooting Guide

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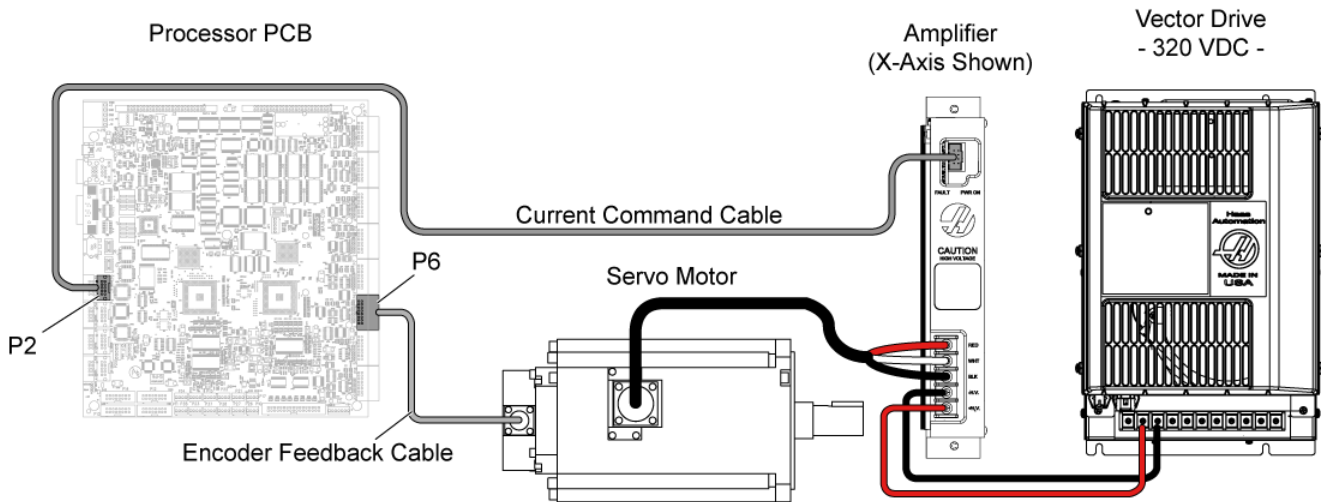
How it Works




The Haas Smart Servo Amplifier assembly is the source of power for the axis servo motors. There are four versions of Haas amplifiers. 30A [1], 45A [2], 60A [3], and 90A [4]. All four operate the same way.

Smart Amplifier assemblies are powered from the 320 VDC Bus from the Vector Drive assembly or Minimill Power Supply. They each have a red LED FAULT light, and a green LED POWER ON light to show the status of the amplifier.

The amplifier operates from analog signals sent by the processor PCB. These signals represent torque, velocity, and direction. The amplifier takes the analog signals and generates velocity and power at the required direction by Pulse Width Modulation.



Symptom	Possible Cause	Corrective Action	Section
Alarms 161-164 AXIS DRIVE FAULT and Alarm 993 AMPLIFIER SHORT CIRCUIT or Alarm 2040 VECTOR DRIVE OR SPINDLE AMPLIFIER-SHORT CIRCUIT	Amplifier detected a short.	Check cables for contamination or damage.	1
Alarms 161-164 AXIS DRIVE FAULT and Alarm 986 CALIBRATION FAULT	Amplifier internal calibration.	Check cables and voltage.	3
Alarms 161-164 AXIS DRIVE FAULT and Alarm 992 AMPLIFIER OVER CURRENT	Amplifier detected a short.	Check cables for contamination or damage.	1
	Axis mechanical blockage.	Remove Blockage.	4
Alarms 161-164 AXIS DRIVE FAULT and Alarm 994 AMPLIFIER OVER LOAD	Incorrect application.	Change speed and check for tool damage.	2
	Axis mechanical blockage.	Remove Blockage.	4
Alarms 161-164 AXIS DRIVE FAULT and Alarm 991 AMPLIFIER OVER TEMPERATURE	Problem with the cooling fan.	Check cooling fan.	5

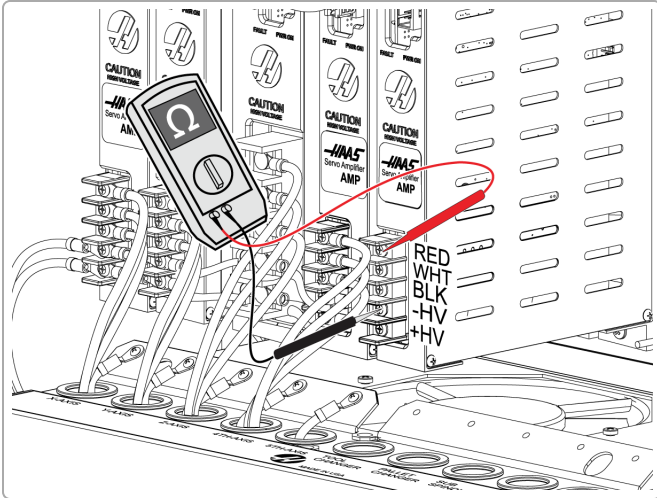
 **Note:** Once you've checked the motor and cables for electrical shorts, and if you have similar-sized amplifiers, you can swap a known good amplifier for the one you are troubleshooting.

Section 1

Symptom: Alarms **161-164** AXIS DRIVE FAULT and Alarm **993** AMPLIFIER SHORT CIRCUIT, Alarm **2040** VECTOR DRIVE OR SPINDLE AMPLIFIER-SHORT CIRCUIT, or Alarms **161-164** AXIS DRIVE FAULT and Alarm **992** Amplifier Over Current

Possible Cause: Amplifier detected a short or Check cables for contamination or damage.

Corrective Action:

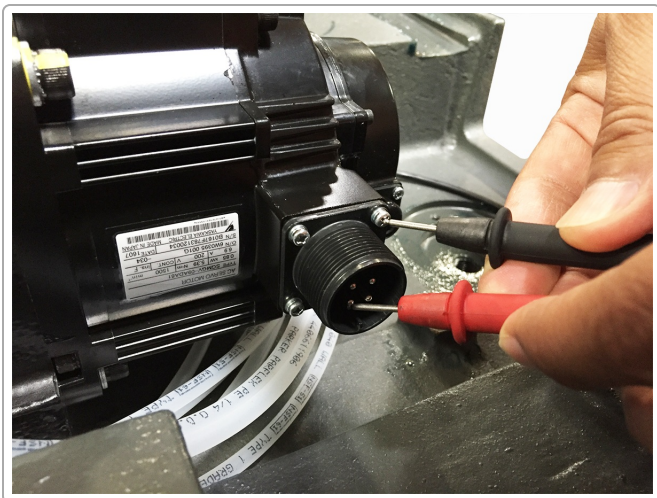


Check the cables for a short: Make sure the axis servo motor cables are not contaminated or pinched. Contaminated or pinched cables can cause a short. Replace the cables if necessary.

Check the amplifier for a short. Power off the machine. Disconnect the cables for the axis servo motor at the amplifier that generates the alarm. Take the following resistance readings:

- Terminal -HV to RED, WHT, and BLK terminals
- Terminal +HV to RED, WHT, and BLK terminals

A short circuit in any of these measurements is an indication of a defective amplifier.



Inspect the servo motor. Disconnect and inspect the power cable connector at the motor. Make sure that there is no coolant contamination. Coolant contamination can cause this alarm and damage the amplifier. Measure the resistance from the pins labeled A, B and C at the motor connector to chassis ground.

- The reading should be OPEN.
- If there is not open resistance, the servo motor is at fault.

Section 2

Symptom: Alarms **161-164** AXIS DRIVE FAULT and Alarm **994** AMPLIFIER OVER LOAD

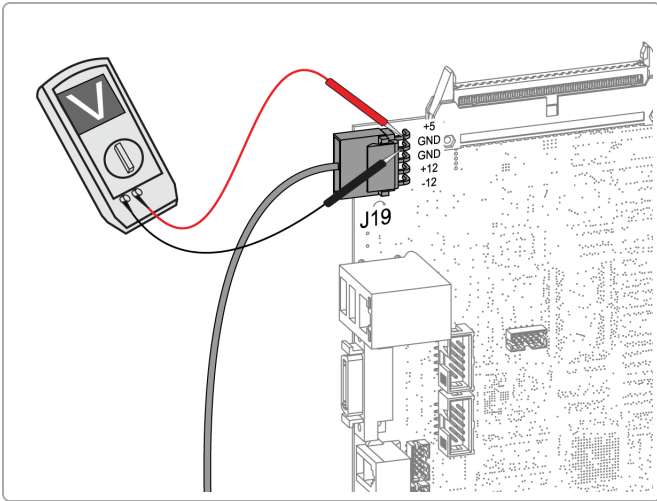
Possible Cause: Incorrect application.

Corrective Action:

The machine load is too high. Decrease the feeds to decrease the machine load. Examine the cutting tool for damage.

Test the axis that generates the alarm. Write a program in MDI to move the axis. If any movement at any feed rate causes the alarm, then the servo amplifier is at fault.

Section 3



processor PCB may be at fault.

Symptom: Alarms **161-164** AXIS DRIVE FAULT and Alarm **986** CALIBRATION FAULT

Possible Cause: Amplifier internal calibration.

Corrective Action:

Measure the low voltage power supply voltage levels at the processor PCB. Make sure you do not short or cross your multimeter pins.

Cycle power to the machine. If the fault stays, then the amplifier is faulty.

If every axis amplifier in the machine generates the alarm at the same time, and the low voltage power supply is correct, then the

Pins	Correct Voltage
+5 and GND	+4.90 to +5.20 V dc
+12 and GND	+11.85 to +12.50 V dc
-12 and GND	-11.85 to -12.50 V dc

Section 4

Symptom: Alarms **161-164** AXIS DRIVE FAULT and Alarm **992** AMPLIFIER OVER CURRENT, or Alarms **161-164** AXIS DRIVE FAULT and Alarm **994** AMPLIFIER OVER LOAD

Possible Cause: Axis mechanical blockage.

Corrective Action:

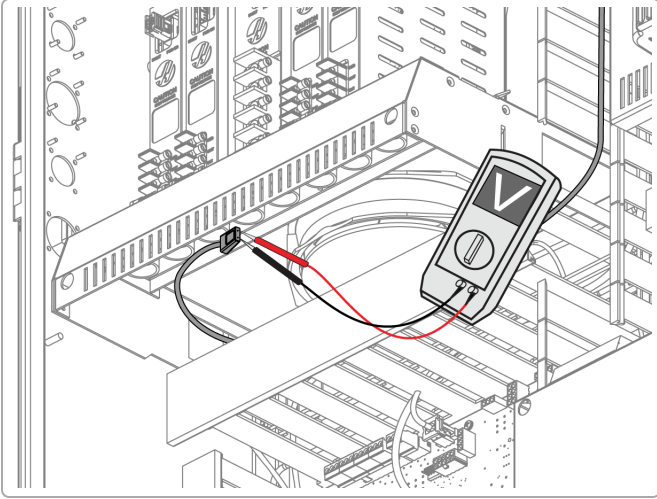
Make sure the axis has a clear path of travel. Tools, part fixtures, or workpieces that are too large can crash into the machine enclosure.

Look at the machine's alarm history. Overload alarms followed by over current alarms are a sign of a crash.

Look at the machine enclosure, spindle and tooling for damage. Damage to the tooling, fixtures and enclosure are signs of a crash.

If there are no signs of a crash, inspect the ballscrew and linear guides. They must move or turn freely by hand.

Section 5



Symptom: Alarms **161-164** AXIS DRIVE FAULT and Alarm **991** AMPLIFIER OVER TEMPERATURE

Possible Cause: Problem with the cooling fan.

Corrective Action:

Note: The maximum temperature for safe operation of Haas CNC machines is 122 °F (50 °C). The amplifier over temperature sensor will trigger at 195 °F (90 °C).

Make sure the cooling fan for the servo amplifiers operates correctly.

If the fan does not operate correctly, measure the voltage it receives. Disconnect the cable from the cooling fan. Measure the voltage between the leads of the cable. The correct voltage 120 VAC.

- If the cable has the correct voltage, the cooling fan is defective.
- If the cable does not have the correct voltage, go to diy.haascnc.com to troubleshoot the Power Supply PCB.