

## Vector Drive - Troubleshooting Guide - NGC

### Introduction



The Haas Vector drive is the source of power for the spindle motor and the servo amplifiers. There are three sizes of Haas Vector drives: 20HP [1], 40HP [2] and 60HP [3].

### Electrical Safety

 **Caution:** When you do maintenance or repair on CNC machines and their components, you must always follow basic safety precautions. This decreases the risk of injury and mechanical damage.

- Set the main circuit breaker to the [OFF] position.

 **Danger:** Before beginning any work inside the control cabinet the High Voltage indicator light on the 320V Power Supply / Vector Drive must have been off for at least 5 minutes.

Some service procedures can be dangerous or life-threatening. DO NOT attempt a procedure that you do not fully understand. If you have any doubts about doing a procedure contact your Haas Factory Outlet (HFO) and schedule a service visit.

## Symptom Table

---

SYMPTOM	POSSIBLE CAUSES	CORRECTIVE ACTION
Alarm 123 SPINDLE DRIVE FAULT and Alarm 993 SHORT CIRCUIT	The vector drive detected a short circuit.	Inspect the Vector Drive and the Wye-Delta contactors for a short circuit. For Delta-Wye Contactor Troubleshooting refer to: <a href="#">Wye-Delta Contactor - Troubleshooting Guide - NGC</a> . See the <b>Vector Drive short-circuit inspection</b> section below.
Alarm 123 SPINDLE DRIVE FAULT  Alarm 160 LOW INCOMING AC LINE VOLTAGE	There is a problem with the DC Bus.	Compare the measured DC voltage to the Diagnostic page. See the <b>DC BUSS</b> section below.
Alarm 123 SPINDLE DRIVE FAULT  Alarm 160 LOW INCOMING AC LINE VOLTAGE  at power on.	The vector drive J3 connector inserted upside down.	The old style Vector Drive J3 connector does not have ribs and can be accidentally inserted upside down. This could damage the pins. Correctly inserted, the latch faces away from the Vector drive.
Alarm 647 REGEN LOAD SHORTED	There is a problem with the REGEN.	Measure the resistance across the REGEN leads. See the <b>Regen Load</b> section below.
Alarm 648 DC BUS SHORTED	There is a problem with the REGEN circuit on the vector drive.	Check the regen circuit on the vector drive. See the <b>Regen Load</b> section below.
Alarms 9911 AXIS AMPLIFIER CABLE DISCONNECTED	The motor drive cable from Maincon to Amplifier is not connected or has a bad connection.	Check the corresponding axis motor drive cable from the Maincon to the Amplifier and make sure it is seated correctly.
Alarm 200 HIGH VOLTAGE POWER SUPPLY OVER-TEMPERATURE	There is a problem with the vector drive cooling fan.	Inspect the cooling fan. See the <b>Cooling Fan</b> section below.
Alarm 444 REGEN REMAINED ON TOO LONG	There is a problem with the incoming AC power.	Measure the incoming voltage to the machine. See the <b>Incoming AC Voltage</b> section below.
The Machine Fails to Maintain Spindle Orientation.	The vector drive output is unbalanced.	Measure voltage outputs across the vector drive terminals. See the <b>Unbalance Output Inspection</b> section below.

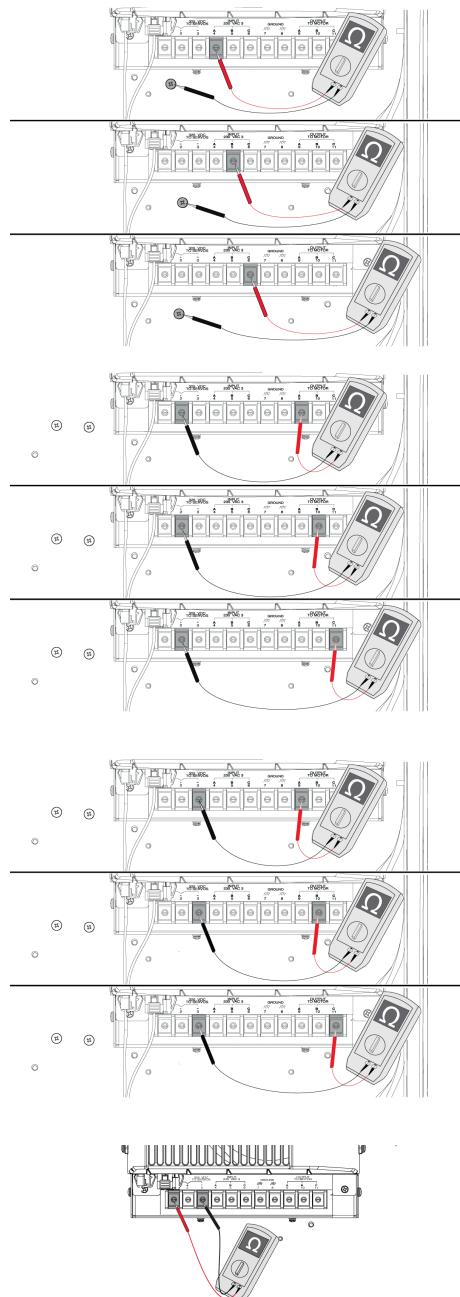
	The wye contactor has a loose connection on the buss bar or jumper cables.	Inspect the wye-delta assembly for loose connections.
<b>Alarm 119 INPUT AC LINE OVERVOLTAGE</b>	The incoming voltage to the machine is too high.	The check incoming voltage and transformer taps.
	The vector drive over voltage cable is not plugged in or defective.	<p>Disconnect the 970 cable from connector J1 on the vector drive. Inspect the J1 connector pins and the pins on the 970 cable for damage. Make sure that the cable is connected to the correct I/O PCB location.</p> <ul style="list-style-type: none"><li>• I/O PCB: P49</li></ul>
<b>Alarm 9931 UNDEFINED HIGH VOLTAGE POWER SUPPLY FAULT</b>	The cable from the vector drive to the I/O PCB is not plugged in correctly.	Make sure the cable from the Vector drive is correctly connected to the I/O PCB at P49.

## Short Circuit Inspection

### Corrective Action:

Inspect the spindle motor cables. Make sure the spindle motor cables are not contaminated or pinched.

Inspect the vector drive. Disconnect all the vector drive terminals and do the following tests:



Set your meter to Ohms test mode.

- Put the black lead on chassis with the red lead measure terminals 4 (A), 5 (B) and 6 (C).

If the meter does not show OPEN (O.L) the vector drive is damaged.

Set your meter to Ohms test mode.

- Put the black lead on terminal 2 (+) with the red lead measure the motor output terminals 9 (A), 10 (B) and 11 (C).

The meter should show high resistance readings typically in the Kilo or Mega ohms. If the meter reads very low resistance the Vector drive is damaged.

Set your meter to Ohms test mode.

- Put the black lead on terminal 3 (-) with the red lead measure the motor output terminals 9 (A), 10 (B) and 11 (C).

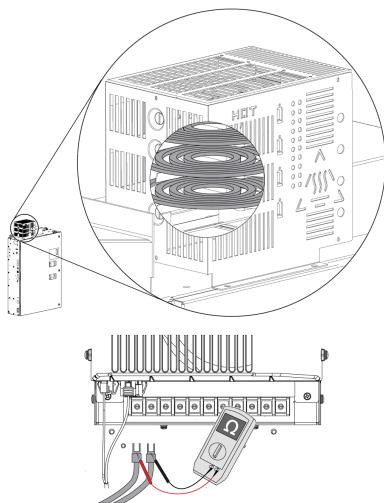
The meter should show high resistance readings typically in the Kilo or Mega ohms. If the meter reads very low resistance the Vector Drive is damaged.

Set your meter to Ohms test mode.

- Put the black lead on terminal 3 (-) with the red lead measure terminal 1 (R).

If your meter reads less than 100k ohms, the vector drive is damaged.

## Regen Load



### Corrective Action:

Press [POWER OFF]. If the vector drive voltage indicator light is on, do not touch the electrical components. The high voltage in the control cabinet can kill you. Wait for the voltage indicator LED on the vector drive to go off completely.

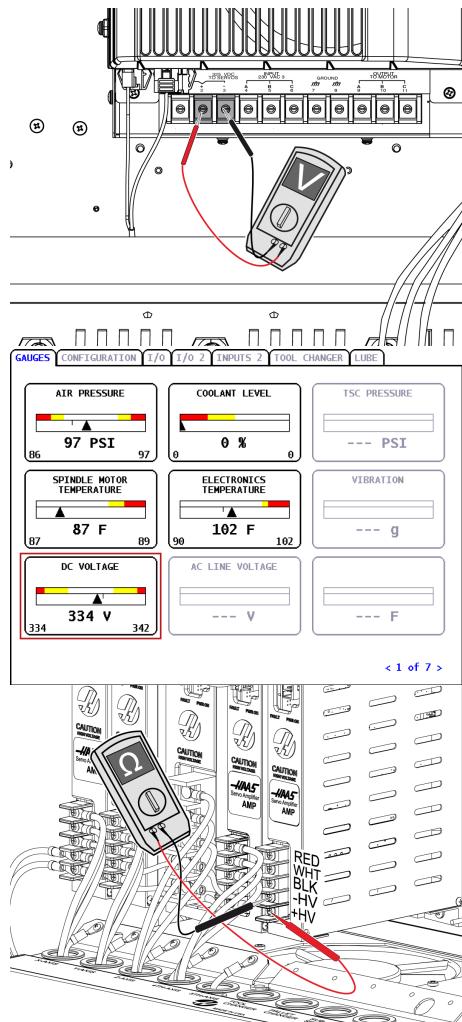
Disconnect the REGEN load leads from the vector drive at terminals 1 and 2. Measure the resistance across the leads. The reading must be as follows:

- 2-resistor box: between 9.5 and 12.5 ohms.
- 3-resistor box: between 6.3 and 8.3 ohms. (As shown in the illustration.)
- 4-resistor box: between 4.6 and 6.6 ohms.

If the REGEN loads are within specification, there can be a problem with the vector drive. Measure the resistance across terminals 1 and 3 on the vector drive.

 **Note:** A good drive will read a high resistance across 1 and 3 (somewhere in the Kilo ohm range). A short circuit indicates a faulty vector drive.

## DC BUSS



### Corrective Action:

Press [POWER ON]. Measure the DC voltage between terminals 2 and 3 on the vector drive. Compare the measured voltage with the DC VOLTAGE on the diagnostics page on the control. The readings must match +/-2%.

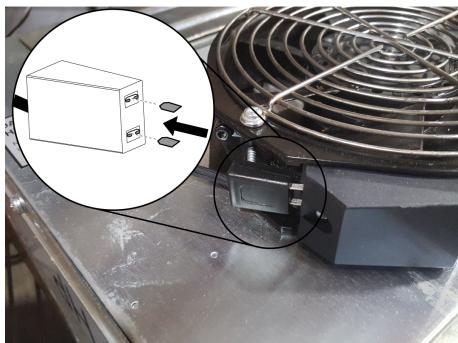
If the readings do not match, the problem can be:

- A bad connection on the 640C cable. Make sure there is a tight connection on the J3 connector on the Vector Drive and the P17 connector on the Maincon/Mocon.
- A faulty Vector Drive if you have incorrect voltage at P17.
- A faulty Maincon/Mocon if you have the correct voltage on the 640C cable at the P17 connector of the Maincon/Mocon. There is 0.01 VDC for every 1 VDC Bus. For example, 320 VDC must show 3.2VDC.

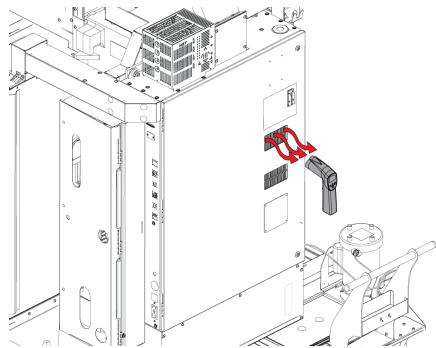
Disconnect the DC Bus cables from terminals 2 and 3 on the vector drive. Power on the machine. Monitor the DC VOLTAGE on the diagnostics page of the control.

- If the DC Bus goes back to the nominal value, there is a short in one of the servo amplifiers. A low resistance or a short is a sign of a faulty servo amplifier.
- If the readings match and the alarm continues, the problem is a faulty vector drive.

## Cooling Fan



Inspect the spindle fan cable connection. Make sure both spade connectors are properly going into the female connector.

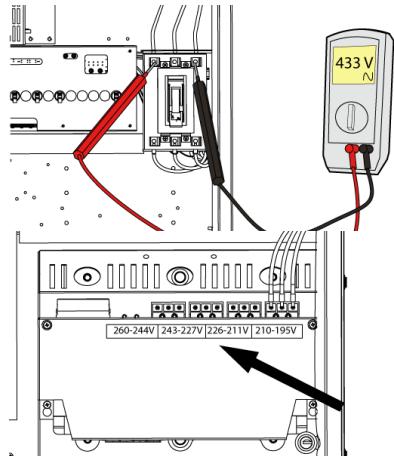


### Corrective Action:

An over-temperature alarm is generated when the vector drive's heat-sink reaches 90°C. The cooling fan must turn ON when the heat-sink temperature reaches 50°C. The cooling fan must turn OFF as the heat-sink cools down.

Measure the temperature of the vector drive's heat-sink through the exhaust vents when this alarm occurs. If the temperature is above 60°C and the fan is not ON, the vector drive has a faulty cooling fan. Replace the cooling fan.

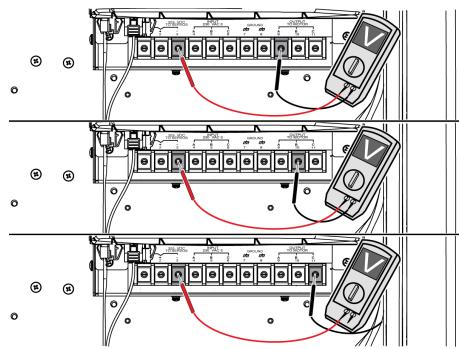
## Incoming AC Voltage



### Corrective Action:

Measure the incoming voltage to the machine. Make sure that the incoming voltage is within the range of the transformer's tap. Move the lines to the correct tap if needed.

## Unbalance Output Inspection



**Corrective Action:** Disconnect the motor cables at the vector drive. Push [POWER ON]. Push [RESET] to clear any alarms. Use a multimeter to measure the DC voltage across the following terminals on the vector drive (see the illustration):

3 and 9

3 and 10

3 and 11

The voltage must be 160-175VDC in all three readings. If any of the voltage readings is 0V or 330V, then this is a sign of an unbalanced output from the vector drive.

## Electrical Diagram

