



## Sigma 5 - Axis Servo Motor and Cables - Troubleshooting Guide - CHC

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### Electrical Safety

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**⚠ 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.

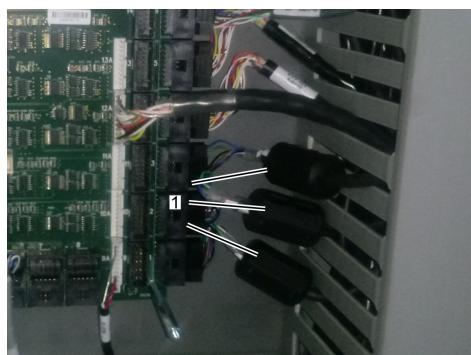
### Symptom Table

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SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION																				
	Encoder signals are affected by noise from high power cables.	Refer to <b>Serial Data Communication Faults / Electrical Noise</b> section below.																				
	Cables are not connected correctly or encoder is faulty.	Inspect the cables and connectors. Refer to the <b>Main Processor/Encoder Cable</b> section below. Check the encoder steps/revolution versus and ball screw pitch and verify the encoder counts are accurate per each rotation.																				
<b>Alarms 828-839 AXIS SERIAL DATA COMMUNICATION FAULT</b>	The FPGA firmware is outdated.	<p>Go to Diagnostics / System tab, to see the FPGA firmware version. It needs to be version 1.09 or higher.</p> <p><b>Note:</b> The firmware must be updated by a Certified Service Technician.</p> <table border="1"> <tbody> <tr> <td>ROTARY</td> <td>VER 21</td> </tr> <tr> <td>FLOPPY</td> <td>FV 6 14.01</td> </tr> <tr> <td>VIDEO</td> <td>VV 41</td> </tr> <tr> <td>MOCON#1</td> <td>17.28</td> </tr> <tr> <td>Monitor</td> <td>2.02</td> </tr> <tr> <td>FPGA</td> <td>1.09</td> </tr> <tr> <td>MOCON#2</td> <td>N/A</td> </tr> <tr> <td>Monitor</td> <td>N/A</td> </tr> <tr> <td>FPGA</td> <td>N/A</td> </tr> <tr> <td>SKBIF</td> <td>VER 47 (SKBIF-2 RJD-C)</td> </tr> </tbody> </table>	ROTARY	VER 21	FLOPPY	FV 6 14.01	VIDEO	VV 41	MOCON#1	17.28	Monitor	2.02	FPGA	1.09	MOCON#2	N/A	Monitor	N/A	FPGA	N/A	SKBIF	VER 47 (SKBIF-2 RJD-C)
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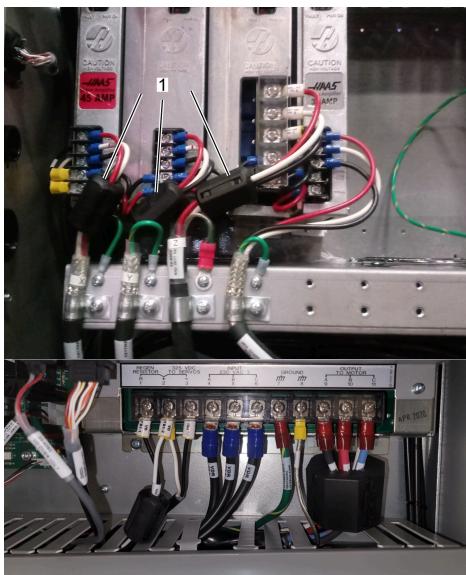
<b>Alarms 161-164, 193, 276 AXIS DRIVE FAULT</b>	Faulty power cable.	Inspect the cables and connectors. Refer to the <b>Power Cable</b> section below.
	Faulty servo amplifier.	Check the corresponding amplifier assembly. Refer to <a href="#">Servo Amplifier - Troubleshooting Guide</a> to troubleshoot the amplifier.
	Faulty servo motor.	Check the corresponding servo motor. Refer to <b>Servo Motor</b> section below.
<b>Alarm 103-105, 270, 709 AXIS SERVO ERROR TOO LARGE</b>	Encoder signals are affected by noise from high power cables. Or Faulty encoder.	Refer to <b>Serial Data Communication Faults / Electrical Noise</b> section below. Check the encoder steps/revolution versus and ball screw pitch and verify the encoder counts are accurate per each rotation.
	The axis motor brake, is not disengaging when servos are enabled.	See the <b>Motor Brake</b> section below:
	The axis ballscrew is damaged.	Check the corresponding axis ballscrew. Refer to <a href="#">Ballscrew - Troubleshooting Guide</a> to troubleshoot the ballscrew.
<b>Alarm 103-105, 270, 709 AXIS SERVO ERROR TOO LARGE, after a software upgrade.</b>	The machine parameters are not correct.	<p>Make sure you have the correct parameters for the type of axis motor.</p> <ol style="list-style-type: none"> <li>1. Determine if machine has Sigma-1 or Sigma-5 motors. <b>Note:</b> The Sigma-5 axis motor have a push-lock connector for the encoder plug.</li> <li>2. Run parameter checker and select either Sigma-1 or Sigma-5 option.</li> </ol>
<b>Alarm 103 - 105 AXIS SERVO ERROR TOO LARGE, during the zero return process. The axis zero returns in the wrong direction.</b>	The home sensor is being made during the zero return process causing the axis to zero return in the opposite direction.	Check the axis home switch to make sure there are no metal chips on top of the sensor.

## Serial Data Communication Faults / Electrical Noise



Sigma-5 servo motors, non-contact encoders output serial data signal to the control. If the serial data signal is missing or becomes unreliable the control will generate a serial data communication error. Electrical noise can cause the serial data signal from the encoder to become unreliable and cause false alarms. Follow the troubleshooting guide below to help eliminate the noise in the system.

1. **Incorrect machine grounding.** Make sure the ground wire size is correct.



Also the ground wire should run all the way back to the electrical panel.

2. **Noise from other equipment.** Make sure the machine does not share its electrical service with another machine.
3. **Loose encoder data connectors at PCB or at the motor encoder,** can cause the serial data to become unreliable. Refer to the **Main Processor / Encoder Cable** section.
4. **Loose ground or high voltage power connectors** will induce noise into the system.
  - **electrical cabinet** check for loose connection at all the ground and high voltage power terminals (vector drive, wye-delta contactors, transformer..etc).
  - **pendant** check for loose terminal connectors.
  - **spindle head** check for loose ground and motor power terminals.
5. The **ferrite filters** suppress high frequency noise produced by the amplifiers and vector drive, when servos are on. Make sure they are installed in:
  - **Encoder data cables.** Make sure there is a ferrite filter P/N 64 1252 installed in all the encoder data cables.
  - **Axis motor power cables.** Make sure there is a ferrite filter P/N 64-1252 installed in X, Y, Z axis motor power cables [1].
  - **Spindle motor cables.** Make sure there is a ferrite filter installed in the motor output of the vector drive.

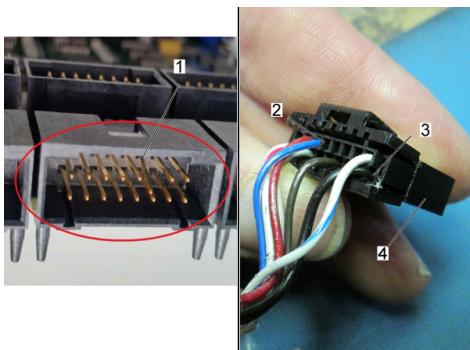
Image show the correct installation of the ferrite filters on the vector drive:

One ferrite filter **P/N 64-1252** on the Black and White cables from the Regen terminals 1 and 2 with one large ferrite filter **P/N 64-1254** on the motor leads at terminals 9, 10 and 11. Making sure ground in out side of the Ferrite filter.

1. **Cable routing.** Make sure that the encoder cable is separated from high power spindle/axis/pump cables.

## Main Processor/Encoder Cable or Faulty Encoder

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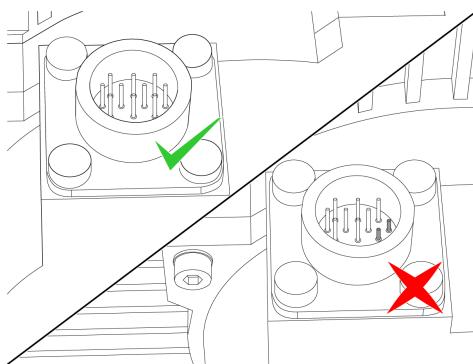
### Main Processor/Encoder Cable Corrective Action:

Examine the connector [1] on the Maincon or MOCON PCB. Make sure it is not damaged.

Examine the cable. Look for signs of damage or stiffness. The connector [4] has two housings [2,3] for the cable pins.

### Faulty Encoder Corrective Action:

Check the encoder steps/revolution in the configuration file. Jog the axis and based on the distance the ball screw travels per revolution (ball screw pitch), verify the encoder counts are accurate per each rotation. View the diagnostic>axis page as you jog the axis. The raw encoder count will show you how many encoder steps have been counted. The z axis channel will also show how many steps have been counted, but will reset each time the z-pulse is passed. The z-pulse is the encoder zero point, so it will reset every time the encoder does one revolution. Based on this information, you will know if the encoder works if the correct amount of steps per revolution are counted each time you jog the axis the distance of the ball screw pitch length. If the numbers do not match up, you have a problem.



If the pins have been pushed into the motor, you must replace the motor and cable together.

Make sure the cable is firmly connected at both ends. Reseat both connections. Make sure the cable is installed in the correct connector at the Maincon or MOCON PCB.

## Power Cable

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### Corrective Action:

Make sure the cables are connected correctly to the corresponding amplifier. Inspect the connector at the motor. Look for loose connections or contamination.

Look for signs of damage or stiffness on the cable. Disconnect the power cable from the amplifier and motor. Measure the resistance from leg to leg, and from leg to ground. Make sure the measurements result in an open connection. Check each leg from one end of the cable to the corresponding leg on the other end of the cable for continuity. If there is an open connection, there is a problem with the cable.

## Servo Motor

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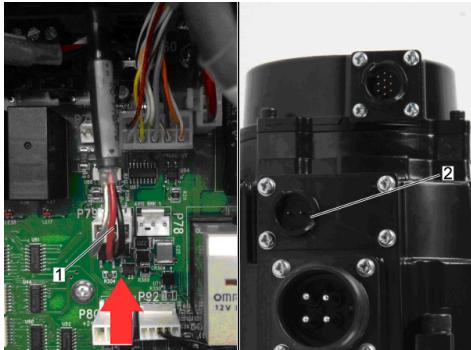
### Corrective Action:

Make sure the motor's connectors are not contaminated. Disconnect and inspect the power cable connector at the motor. Make sure that there is no coolant contamination. Coolant contamination can generate drive fault alarms and damage the amplifier. Measure the resistance from the pins labeled A, B and C at the motor connector to chassis ground.

- The reading must show an open circuit.
- If the reading does not show an open circuit, the servo motor is at fault.

## Motor Brake

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### Corrective Action:

Reseat the connection for P79 or P78 [1] on the I/O PCB.

Measure the voltage across the red and black cables.

Press [**EMERGENCY STOP**]. There should be no voltage.

Press [**RESET**] to clear the alarms. The voltage should be between 20-30 VDC.

Examine the connection at the motor's brake [2] and power connectors [3] for contamination. Reseat the connections.

If no voltage is present, refer to:

- [CLASSIC HAAS CONTROL - I/O PCB - TROUBLESHOOTING GUIDE](#)

## Electrical Diagram

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