Ballscrew - Troubleshooting Guide

7.5 BALLSCREW TROUBLESHOOTING

LAST UPDATED: 03/08/2023

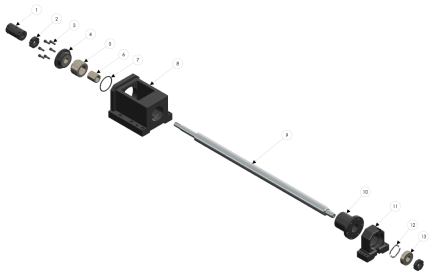
Ballscrew - Troubleshooting Guide

Introduction

⚠ Download and fill out the Ballscrew Inspection Report Checklist below before replacing any parts.

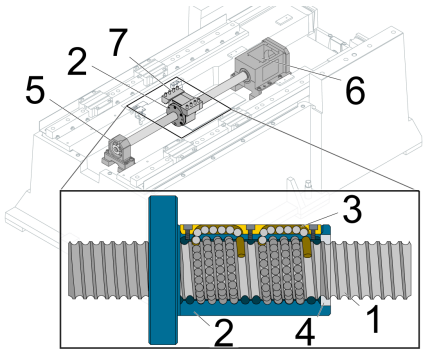
BALLSCREW INSPECTION REPORT CHECKLIST

DUAL BALLSCREW INSPECTION REPORT CHECKLIST



Exploded View:

1. SOLID COUPLING
2. BEARING LOCKNUT
3. SHCS 1/4-20 X 3/4
4. ANGULAR CONTACT BEARING
5. BEARING FILLER
6. SPACER
7. O-RING
8. MOTOR HOUSING
9. BALL SCREW
10. BALL NUT
11. SUPPORT HOUSING
12. WAVE WASHER
13. DEEP GROOVE BEARING



Main Components:

1. Ballscrew
2. Ballnut
3. Balls circulate through the ballnut
4. Wiper
5. Support-bearing housing
6. Motor housing
7. Ballnut housing

Symptom Table

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION

Alarm 103 SERVO ERROR TOO LARGE **Alarm 104** SERVO ERROR TOO LARGE **Alarm 105** SERVO ERROR TOO LARGE The axis motion is very rough when the axis is jogged. There is unusual noise when the axis moves.	There is insufficient lubrication.	Check the ballscrew for correct lubrication.
	The ballscrew or ballnut is damaged.	Check the ballscrew and ballnut for damage.
	The ballscrew support bearings are damaged.	Check the ballscrew support bearings for damage.
	Ballscrew misalignment	Ballscrew misalignment
	Faulty power cable	Check the Servo Motor - Troubleshooting Guide for further instructions on how to troubleshoot a faulty cable
	Misaligned ballscrew coupler	If the machine has been crashed the coupler may have moved out of alignment. Refer to the **Coupler section** of this procedure for more information on how to align a coupler. NOTE: It is important to troubleshoot for a faulty cable before realigning the
Alarm 108 AXIS SERVO OVERLOAD	Ballscrew misalignment	Ballscrew misalignment HSG-A 03/07/2023
	The cutting tool is not sharp or is damaged.	Install a new device or a new tool insert.
The axis position does not repeat within specification. Inconsistent accuracy, positioning, backlash.	There is insufficient lubrication, or the lubrication is contaminated.	Check the ballscrew for correct lubrication.
	The ballscrew or ballnut is damaged.	Check the ballscrew and ballnut for damage.
	The ballscrew coupling is damaged.	Check the ballscrew coupling for damage.
	There is excessive thermal growth.	Correct your application

<table>
<tr>
<td rowspan="2">Dual ballscrew GM-2 is experiencing different and high loads during a movement on the X-axis and slave (F1)-axis.</td>
<td>Machine may have moved during shipping</td>
<td rowspan="2">Before taking any corrective action please verify the machine is experiencing the following behavior:
The loads on the X & F1 axis are compounding at different rates
Note: F1 axis may need to be made visible
When the direction is reversed the loads switch on the two axis
When the E-stop is engaged the position of the two axis are not the same
If your machine is experiencing these issues please provide an inspection report and error report to Haas Service for analysis.

Please also complete the Dual Ballscrew Inspection Checklist located at the begining of this document. Further instructions will be provided after analysis.

HSG-A 03/07/2023</td>
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<tr>
<td>Machine was built with grade 7 ballscrews and lead compensations are not set correctly</td>
</tr>
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Ballscrew Alignment

Checking Ball Screw Alignment

- Observe Axis Servo load while Jogging axis is question through full travel.
- A properly aligned Ball Screw will exhibit consistent servo loads throughout its travel.

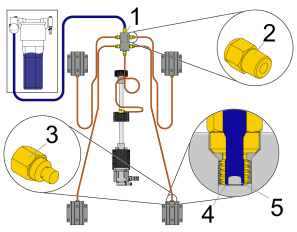
If the servo load is not consistent, the following procedure should be used to align the Ball Screw:

- Break loose then lightly snug the following Bolts:

1. Nut Housing to axis in question Bolts (Saddle, Table, Spindle Head, Etc.)
2. Ballscrew to Nut Housing Bolts
3. Bearing support Bolts

- Jog the Axis back and forth several times, then stop the axis at the bearing support and torque all bolts that were loosened
- Jog the Axis through its entire travel observing for consistent servo load

Lubrication



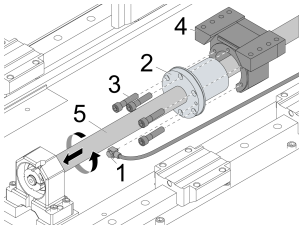
Corrective Action:

Make sure there is a light coat of oil or grease on the surface of the ballscrew. If there is not, inspect the entire lubrication system for leaks and clogs, including all tubes, hoses, and fittings. Check for leaks on each axis: A leak at one axis will cause a lack of lubrication at a different axis. Check for oil or grease puddles to help locate the source of the leak.

Note: The Haas Liquid Grease lubrication system uses adapter fittings [2] in the axis manifolds [1]. The linear guide trucks and ballnuts use restrictor fittings [3]. The restrictor fitting has a gap [5] between the threads and the set screw [4]. This forces the manifold-fed grease to pass through the gap [4] to lubricate the axes.

Make sure the correct lubrication is used. Refer to LUBRICANT, GREASE, AND SEALANT TABLES FOR HAAS MACHINE COMPONENTS.

Ballscrew/Ballnut or Support Bearing



Corrective Action:

Disconnect the lubrication fitting [1] from the ballnut [2]. Remove the screws [3] that attach the ballnut [2] to the ballnut housing [4].

Ballscrew/Ballnut

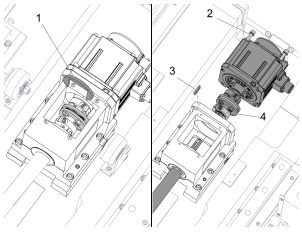
Separate the ballnut [2] from the ballnut housing [4]. Rotate the ballnut [2] by hand and hold the ballscrew [5] so it does not rotate, and the ballnut [2] will move away from the ballnut housing [4].

The ballnut [2] should rotate smoothly. If there is resistance or if it binds, the ballscrew [5] and ballnut [2] are faulty.

Support Bearing

Rotate the ballscrew [5] by hand. If there is resistance or if it binds, the bearings are faulty. Remove the ballscrew [5] and check the support bearings and bearing pack to determine which components need to be replaced.

Coupler



Corrective Action:

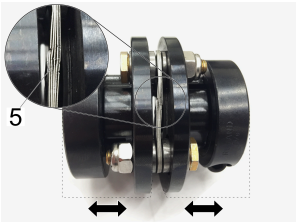
Refer to the BALLSCREW BACKLASH TEST PROCEDURE that is appropriate for your machine.

Power off and lock out the machine. Remove the necessary covers to access the axis with the problem. Remove the axis motor cover.

Install the coupler-installation tool [1] on the motor coupling. Turn the ballscrew so you can see the screw [4] for the motor-coupling clamp.

Remove the motor screws [2]. Loosen the screw [4] on the motor-coupling clamp. Remove the motor with the motor-coupling assembly. Remove the ballscrew key [3]. Inspect for damage or wear on the key or keyway.

Note: If the axis motor is disconnected from the ballscrew, the grid offset and the work offset (such as G54) must be reset. Go to AXIS SERVO MOTOR - SET GRID OFFSET PARAMETER.



Make sure the flex pack [5] in the coupler is not damaged. It should be straight, and tightly compressed together.

Note: If the axis motor is disconnected from the ballscrew, the grid offset and the work offset (such as G54) must be reset. Go to AXIS SERVO MOTOR - SET GRID OFFSET PARAMETER.

COUPLER ALIGNMENT:

To realign the coupler to the motor shaft install the mounting bolts loosely and float the motor in until the coupling slides from between both the motor shaft and ballscrew shaft easily.

Torque the bolts down and verify the coupler still slides easily between the two shafts.

Torque the coupler pinch bolt to the specifications found on _____.

Thermal Growth

Corrective Action:

You must warm up the machine axes to bring the ballscrews to a normal temperature for operation. You can warm up the machine automatically by changing certain settings: Use either **Settings 158-160** or **Settings 109-112**. Do not use both.

- **Settings 158-160:** These settings can be set from -30 to +30 and will adjust the screw thermal compensation by -30% to +30%.
- **Settings 109-112:** This *(Setting 109)* is the number of minutes (up to 300 minutes from power-up) during which the compensations specified in **Settings 110-112** are applied.

IMPORTANT: If your application involves moving a single axis repeatedly back and forth over a small area of the ballscrew, the ballnut will heat up the ballscrew and cause thermal expansion. It will also not lubricate correctly because of the short stroke. Every few minutes, it is necessary to move 80% to 90% of the axis travel in order to cycle the grease throughout the ballnut. This is common on smaller machines with a smaller work envelope.

For lathes: Go to the DIAGNOSTICS screen. Check the X Axis Temp. If the measurement fluctuates or has no value, you must inspect the thermal sensor on the ballnut.

Linear Scale Compensation (LSC)

This section applies to Machines with Dual Ballscrews.

1

Version	IsMetric	Interval	AxisC	Index	Position	Correction	MD5
5	TRUE	INTERVAL_1	TT	125	250	1.7977E+308	628b1ce99a55c
5	TRUE	INTERVAL_1	TT	126	252	1.7977E+308	628b1ce99a55c
5	TRUE	INTERVAL_1	TT	127	254	1.7977E+308	628b1ce99a55c
5	TRUE	INTERVAL_1	TT	128	256	1.7977E+308	628b1ce99a55c
5	TRUE	INTERVAL_1	TT	129	258	1.7977E+308	628b1ce99a55c
5	TRUE	INTERVAL_1	TT	130	260	1.7977E+308	628b1ce99a55c
5	TRUE	INTERVAL_1	TT	131	262	1.7977E+308	628b1ce99a55c
5	TRUE	INTERVAL_1	TT	132	264	1.7977E+308	628b1ce99a55c
5	TRUE	INTERVAL_1	TT	133	266	1.7977E+308	628b1ce99a55c
5	TRUE	INTERVAL_1	TT	134	268	1.7977E+308	628b1ce99a55c
5	TRUE	INTERVAL_1	TT	135	270	1.7977E+308	628b1ce99a55c

2

Version	IsMetric	Interval	AxisC	Index	Position	Correction	MD5
5	TRUE	INTERVAL_1	F1	2	20	0.03111	628b1ce99a55c
5	TRUE	INTERVAL_1	F1	3	30	0.02835	628b1ce99a55c
5	TRUE	INTERVAL_1	F1	4	40	0.02774	628b1ce99a55c
5	TRUE	INTERVAL_1	F1	5	50	0.02835	628b1ce99a55c
5	TRUE	INTERVAL_1	F1	6	60	0.02559	628b1ce99a55c
5	TRUE	INTERVAL_1	F1	7	70	0.02207	628b1ce99a55c
5	TRUE	INTERVAL_1	F1	8	80	0.021	628b1ce99a55c
5	TRUE	INTERVAL_1	F1	9	90	0.02038	628b1ce99a55c
5	TRUE	INTERVAL_1	F1	10	100	0.01839	628b1ce99a55c
5	TRUE	INTERVAL_1	F1	11	110	0.01854	628b1ce99a55c

Open the LSC.LSCX file found in the Error report in a spreadsheet program. Determine if axis compensation has been applied by looking at the correction column.

- A value of 1.7977E+308 [1] or zero in the correction column means that there is no compensation.
- Any other value [2] in the correction column means there is compensation.

Note: Compensation values will vary between machines.