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Coding Information

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Title: Frame Rail Straightness Inspection Procedure

Applies To: All trucks with ladder frames

CHANGE LOG

Please refer to the change log text box below for recent changes to this article:

03/15/20121 - Initial Article Release

DESCRIPTION

This document will guide the user through the inspection process of verifying the straightness of a chassis frame that does not have a body installed on the vehicle.

Also see related documents:

- [S01002 - Service Manual Section for Frames](#)
- iKNOW Article - [IK0300061 - 8,000 LBS Front Suspension Lean Correction](#)
- iKNOW Article - [IK1400023 - Suspension Lean Diagnostics](#)

SYMPTOM(s)

The chassis frame may appear to be leaning, bent, twisted, or bowed when levelling the chassis. It is also important verify the chassis/suspension lean is within tolerance prior to making any adjustments or changes to the frame itself. Follow the published procedures for suspension lean correction.

Diagnostic Trouble Code(s) & Dashboard Indicator Light(s):

- This condition does not trigger any trouble codes or dash trouble lights

SPECIAL TOOL(s) / SOFTWARE

| Tool Description | Tool Number | Comments |
|------------------|-------------|-------------------------|
| String | N/A | Heavy string works best |
| Jack Stands | N/A | Four are needed |
| Straight Edge | N/A | Two are needed |
| Vise-Grips | N/A | Two are needed |

SERVICE PARTS INFORMATION

There are no service parts required for this procedure.

DIAGNOSTIC STEP(s)

CAUTION:

Be sure to wear all required PPE when working on and around vehicles

This overall process includes three steps to verify what may be causing the chassis to lean and if there is a non-conformance in the frame assembly. Follow these three steps in the order listed:

1. Follow the IROS iKNOW Article IK1400023 for chassis lean.
 - This is the first step in checking for lean based on historical lean issues.

If the IROS iKNOW procedure above does not correct the lean condition; proceed with the next two steps:

2. Complete the frame lean inspection using the jack stands procedure listed below.
 - This procedure removes suspension support entirely from the frame to see if a lean persists with only the chassis/frame supported on leveled jack stands.
3. Frame Rail Straightness check/string test
 - Identifies where frame issues are located along length of rail, but not the sole indicator as assembly concerns or a twist induced by suspension could affect measurement.

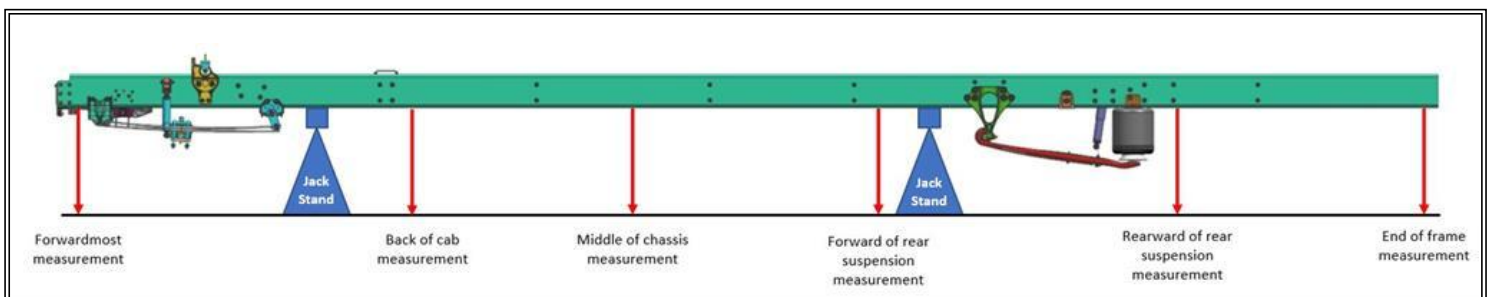
NOTE: The string test can be used as quick indicator of frame concerns if jack stand test can not to be performed.

| Step | Action | Decision |
|------|--|--|
| 1 | DIAGNOSTIC: (All these conditions need to be true) After inspecting and correcting the chassis/suspension for level requirements: <ul style="list-style-type: none"> • The suspension lean diagnostics has been completed and any lean from the suspension has been corrected per the appropriate procedures and the frame still appears to be off. • The chassis/frame still exceeds lean tolerance and the frame visually appear to be either leaning, bent, twisted, or bowed | Yes. Follow the inspection procedure below for measuring the straightness of each frame rail independently. |
| | | No. Chassis/Frame is within spec. No further action is required. |

| Step | Action | Decision |
|------|--|---|
| 2 | DIAGNOSTIC: After following the frame rail inspection procedure below; either one or both of the rails are out of tolerance as described in the procedure. | Yes. The defective rail will have to be corrected by a qualified technician or frame shop. |
| | | No. The rails are straight, flat, not twisted or bowed and do not need to be repaired. The chassis level should be rechecked, and the frame squareness should be verified per the service manual for frames S01002, Section 6. |

PRE-INSPECTION VEHICLE SET UP

Be sure the vehicle is parked on a flat level surface. Using four jack stands to raise the frame up until it is no longer being supported by the suspension. (See Figure 1) Each jack should be equally set so the frame is at the same distance from the ground at each jack stand. This will ensure that your rail measurements are most accurate and not skewed by other external factors.



FRAME LEAN INSPECTION PROCEDURE

Summary: The overall purpose of this procedure is to verify the straightness of the overall frame structure independent of the suspension. Once the frame is set on the jack stands as shown in figure 1, measurements will be taken at six locations along each rail. Six measurements on the left rail and six measurements at the same distance on the right rail. (On each rail - the measurements will be directly opposite left to right) These measurements will need to be as accurate as possible from the ground and recorded for comparison.

Step 1: Level the chassis on four jack stands as shown in figure 1.

- Set the forward jacks as far forward as possible depending on items attached to the rails. Use of wooden blocks is acceptable and recommended.

- Support frame just behind front suspension and just forward of rear suspension so that suspension is no longer supporting chassis.

Step 2: Measure out and mark each of the six locations shown in figure 1 that will be measured from the floor to the bottom flange of the rails.

- The left and right locations need to be directly opposite so choose locations that can be accessed on both rails.

Step 3: Measure and record the frame to ground dimension at each location along length on both rails to identify if frame lean exists and where.

Measurement Comparison: Measurements at each location should be within 3/8" (9.5mm) from left to right and not necessarily compared to other measurements along the rail.

NOTE: You may notice some tail sag of the rails behind the rear jack stands. This is normal and caused by the weight of the frame extending behind the rear jack stands.

- Depending on the length of the rails behind the jack stands the sag can be as much as 1/2" (13mm) and needs to be taken into consideration of the assessment.

RAIL STRAIGHTNESS INSPECTION PROCEDURE

Summary: The overall purpose of this procedure is to attach and pull a string taut along the top inside edge of each frame rail and compare the taut string to the rail looking for any deviation in distance between the string and the rail. (See Figure 2)

Step 1: Using Vise-Grips, clamp one of the straight edges (flat piece of metal) as far forward on the rail just behind the back of cab.

Step 2: Using Vise-Grips, clamp the other straight edges (flat piece of metal) to the very tail end of the same rail.

Step 3: Tie the string to the front straight edge so the string is right next to inner edge of the frame rail.

Step 4: Extend the string to the rear of the frame rail, pull tight and tie off to the straight edge that is clamped to the rear. Be sure the string is at the top inner edge. Same as front.

Step 5: Measure any deviation between the string and the rail. Take photos and post to the case file as needed.

Deviation allowance between the rail and the string: **Up to 7/16" over 12' (11mm over 3.6M)**

See Figures 3, 4 and 5 for examples of both good and bad rails from using this procedure.

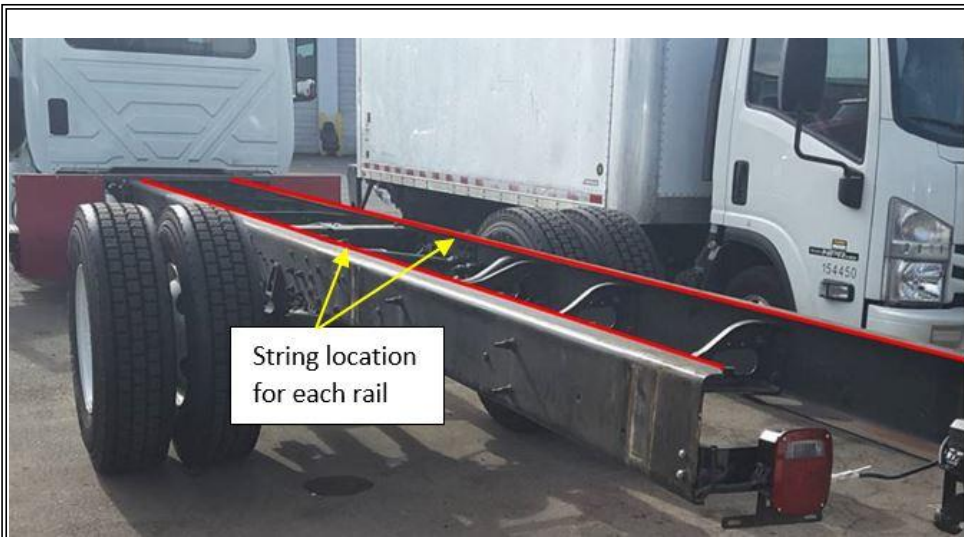


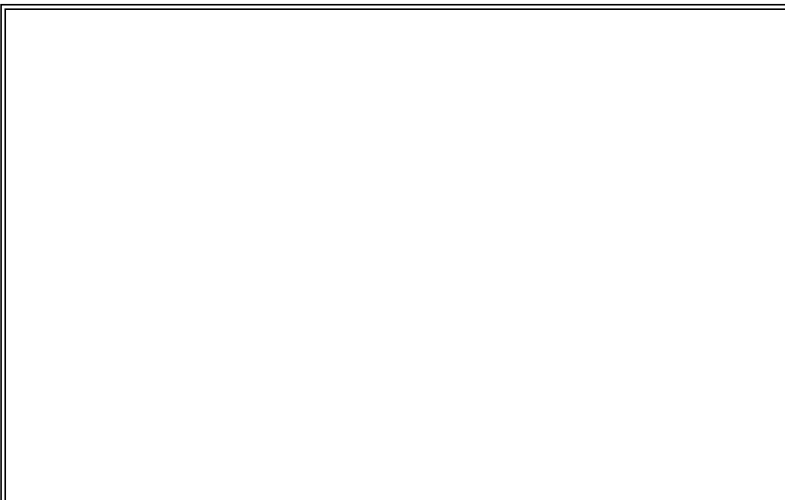
Figure 2: String Location for Rail Inspections



Figure 3: Example of String Test on a Good Rail



Figure 4: Example of String Test on a Rail with a Center Bulge





WARRANTY INFORMATION

Warranty Claim Coding:

Refer to the [Warranty Coding Manual](#) for Group and Noun Codes.

Standard Repair Time(s):

Refer to the [SRT Manual](#) for Repair Times

OTHER RESOURCES

[Master Service Information Site](#)

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