Number: FS-2013-03

Date: July 2, 2013

Model: ***All Buses Subject To FS-2012-03, 04 & 05***

Approved:

Robert L. Birdwell, Executive Director
Quality Control & Field Service

Subject: Exhaust System Flex Pipe Change

Gillig is issuing FS-2013-03 to replace the exhaust flex pipes listed below with a new Truflex NTSD, (stainless steel wound):

1. ***Hutchinson Linkeo exhaust flex pipes, (red silicone cover), not yet changed out per FS-2012-03; FS-2012-04 & FS-2012-05.***

2. ***Truflex BTLI flex pipes, (steel bellow style), that were changed as per FS-2012-03; FS-2012-04 & FS-2012-05.***

3. ***Truflex BTLI flex pipes used in Gillig production prior to 3/7/2013.***

4. ***Truflex BTLI flex pipes provided through Gillig Parts Department.***

The new Truflex NTSD flex pipe, (stainless steel wound), is designed to eliminate the early life failures some properties experienced with the Hutchinson Linkeo and Truflex BTLI flex pipes.

For specific pipe part numbers, tools and procedures, please refer to the attached replacement document.

FS-2013-03 supercedes FS-2012-03, FS-2012-04 & FS-2012-05.

RLB:rlb

Gillig, LLC
25800 Clawiter Road
Hayward, CA 94545
(800) 735-1500
(510) 785-1500
BB@Gillig.com

We will be sending you the following:

A. One Truflex NTSD flex pipe (stainless steel wound), bellow for each bus in your fleet involved with this campaign.

B. Alignment tool, if needed.
In most cases, the alignment tool has already been sent. If one was not sent, please contact Gillig Field Service. The use of this tool is necessary to ensure the exhaust pipes are properly aligned for this change.

The Hutchinson Linkeo pipe, (red silicone) and the Truflex BTLI pipe, (steel bellow style), once removed, should be discarded.

You can file a warranty claim for up to one hour per bus to make this change.

We would like you to fill out the attached form and return it to Vy Vu, in Gillig Field Service, (vvu@gillig.com).

RLB:rlb

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Photo of completed installation

FIELD SERVICE BULLETIN

For the installation of the Tru-Flex all metal, braid reinforced NTSD exhaust bellows on 2007-2013 year engine equipped buses.

The NTSD bellows is an all metal bellows with braid reinforcement over the bellows. The NTSD can directly replace the Linkeo red silicone bellows or the Tru-Flex BTLI, non-braid reinforced bellows.

Note: Read entire bulletin before beginning work

Bellows and Alignment Tool Part Numbers:			Bellows Replaced by NTSD Bellows:	
Installed Length (inches)	Tru-Flex NTSD	Alignment Tool P/N	Tru-Flex BTLI	Linkeo Silicone
12	01-71799-000	01-71059T000	01-70763-000	* See Below
12.25	01-71800-000	01-71059T000	01-70942-000	* See Below
14	01-71759-000	01-71059T001	01-70764-000	N/A
16	01-71801-000	01-71059T002	01-71004-000	01-59312-000

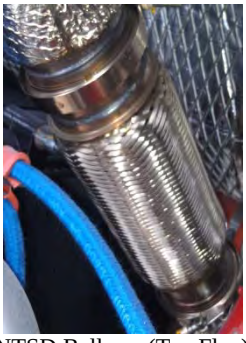
* Contact Gillig Parts Department or Field Service to identify the correct replacement part number if required.

NOTE: ALL NTSD BELLOWS ARE DESIGNED TO BE COMPRESSED SLIGHTLY DURING INSTALLATION. FOR THIS REASON, ALL NTSD BELLOWS WILL MEASURE APPROXIMATLEY 0.38" LONGER AT THEIR FREE STATE THAN THE COMPERABLE BTLI BELLOWS THEY REPLACE. FOR EXAMPLE, P/N 01-71799-000 IS DESIGNED TO BE INSTALLED AT A LENGTH OF 12.00 BUT WILL MEASURE APPROXIMATLEY 12.38" AT ITS FREE STATE.

Background: This bulletin defines how to properly install a Tru-Flex all metal bellows. The procedure requires the use of an alignment tool to ensure the correct alignment of the mating exhaust pipes to the bellows and a measurement to ensure correct installed length.

Silicone Bellows (Linkeo)
(Replaced by NTSD)

BTLI Bellows (Tru-Flex)
(Replaced by NTSD)



NTSD Bellows (Tru-Flex)

V-Band Clamp Installation Procedure:
Bellows replacement and alignment will require removal/installation of V-Band clamps. Use the following procedure for proper V-Band clamp installation.

Before installing a new clamp or re-using an existing clamp, check for the following. If any of these problems are found, replace the clamp.

- T-Bolt bent or damaged
- T-Bolt thread damaged or stripped
- T-Bolt nut loose. The T-Bolt nut is a prevailing torque nut and should not turn freely
- Any signs of damage or distortion to the clamp

Installation Notes

- Do not apply anti seize to the T-Bolt, nut or clamping surfaces.
- DO NOT use an air impact wrench to install clamp.
- Recommended installation speed of the T-Bolt nut is 100-200 rpm. Do not exceed 500 rpm.
- Before installing a clamp, make sure the flanges are properly aligned. The clamp should not be required to force or pull the connection into alignment. A forced connection can result in a leaking joint or premature failure.
- Cover open pipes to prevent debris entering the turbo or exhaust piping.

V-Band Clamp installation: For use with new clamps and reinstalling used clamps.

1. Make sure the flange and clamping surfaces are clean, dry and free of any contaminants
2. If the flanges are not already assembled, place the clamp over one of the flanges, and then assemble the flanges.

3. If the flanges are already assembled, open the clamp by removing the nut and remove the bolt from one end of the clamp. Widen the clamp by hand just enough to allow the clamp to slip over the joint. Be sure to not over-extend the clamp. Then reassemble the bolt into the clamp and install the nut back onto the T-Bolt.
4. Tighten the clamp to approximately 5-6 ft-lb. While tightening, gently tap around the perimeter of the clamp to ensure proper seating of the clamp on the flange.
5. Torque the clamp using a torque wrench to 13+/- 0.5 ft-lb.
6. Inspect clamp after assembly to ensure proper alignment of the flanges. Verify the two clamp band loops are not touching.
7. Once installed and torqued to 13 ft-lb DO NOT re-torque to 13 ft-lb. The clamp design accounts for a drop in torque of up to 50% after initial engine run. If checked, a torqued clamp on an engine that has been run should fall between 6 and 13 ft-lb. If torque is below 6 ft-lb, re-torque to 6-7 ft-lb.

Note: Torque Check and Re-torqueing of installed clamps.

- **Do not re-torque an installed clamp to 13ft-lb.** 13 ft-lb torque is only used when installing a new clamp or re-installing a used clamp that was removed for servicing. 13ft-lb is used to allow for the initial seating of the clamp at installation.
- Torque of previously installed clamps to be a minimum of 6 ft-lb. Check torque by setting torque wrench to 6 ft-lb. If 6 ft-lb is reached without nut movement, torque is correct. If nut moves before reaching 6 ft-lb, torque nut to 6-7 ft-lb. (Note: An installed clamp is a clamp that was torqued to 13 ft-lb at installation and has not been removed or loosened.)

Bellows Replacement and Alignment Procedure:

Note: Settee hatch removal is not required to remove existing bellows and is not required to use the alignment tool to check the alignment and is not required to measure the length per step 9. If the alignment of the exhaust piping or the length requires adjustment, settee hatch removal is required to provide access.

Before servicing the bus, change the "SELECT IGNITION" switch from "FRONT" to "ENGINE KILL/OFF" in the rear run box. Make sure that the exhaust bellows is cool enough to work on.

1. Remove the existing exhaust bellows from the bus by loosening the two V-Band clamps.

FIGURE 1. ISB DIESEL HYBRID ENGINE

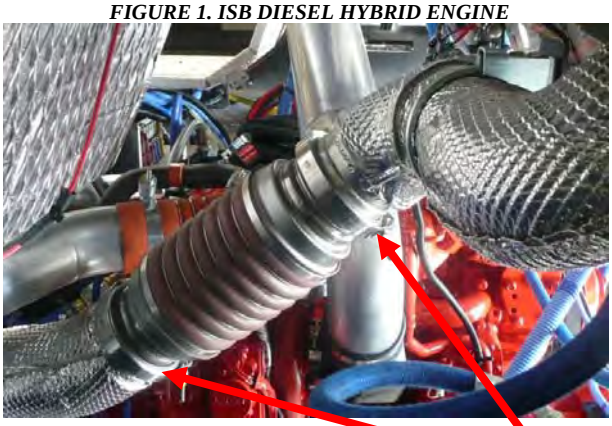


FIGURE 2. ISL DIESEL ENGINE

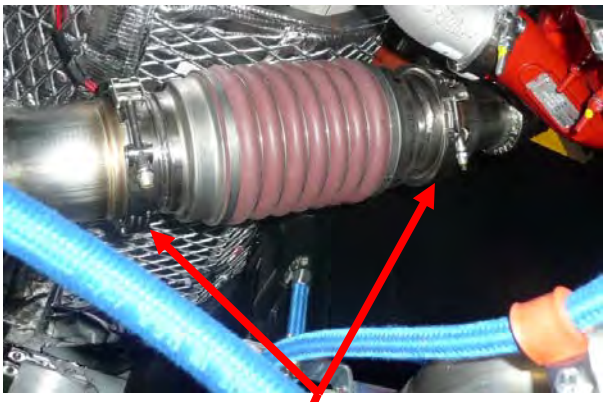


FIGURE 3. ISL-G CNG ENGINE

LOOSEN V-BAND CLAMPS SHOWN TO REMOVE THE EXISTING BELLOWS (CLAMP LOCATION “C”)

NOTE: LINKEO BELLOWS SHOWN, BTLI AND NTSD REMOVAL IS SIMILAR.

2. Insert the alignment tool between the turbo outlet pipe & muffler inlet pipe (as shown below), tighten the bottom V-Band clamp to approximately 6 ft-lb and align the other end of the tool with muffler inlet pipe.
NOTE: DO NOT FORCE THE ALIGNMENT TOOL TO FIT.

FIGURE 4.


FIGURE 5.

3. Then tighten the upper V-Band clamp to approximately 6 ft-lb.

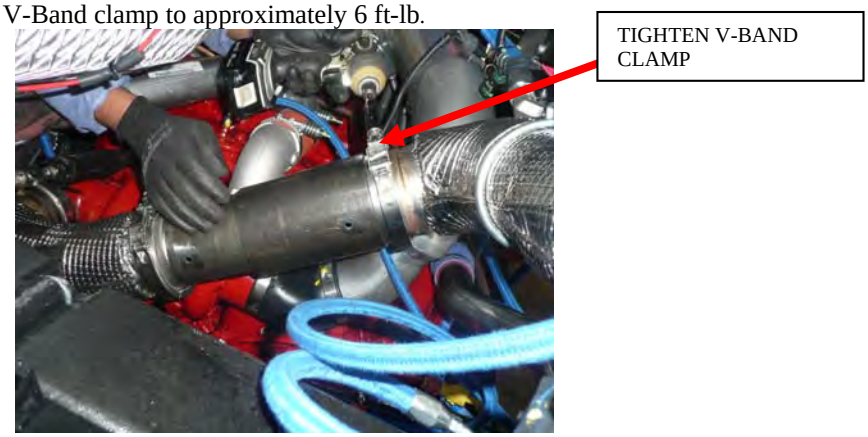


FIGURE 6.

If alignment tool fits between the pipes with V-Band clamps installed to approximately 6 ft-lb, remove the alignment tool, measure/verify length and install new all metal bellows (jump to step 9).
If alignment tool does not fit then continue to step 4.

4. To access the turbo outlet pipe V-Band clamps, remove the settee hatch from inside the bus.
5. Loosen both Cummins cast turbo outlet elbow V-Band clamp and exhaust turbo outlet pipe V-Band clamp through the settee hatch access.

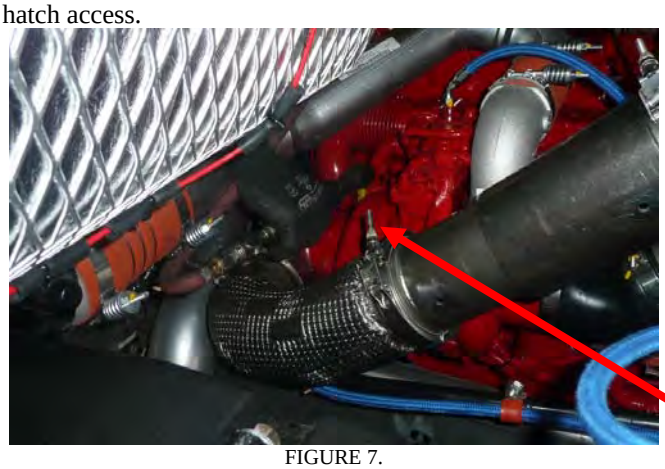
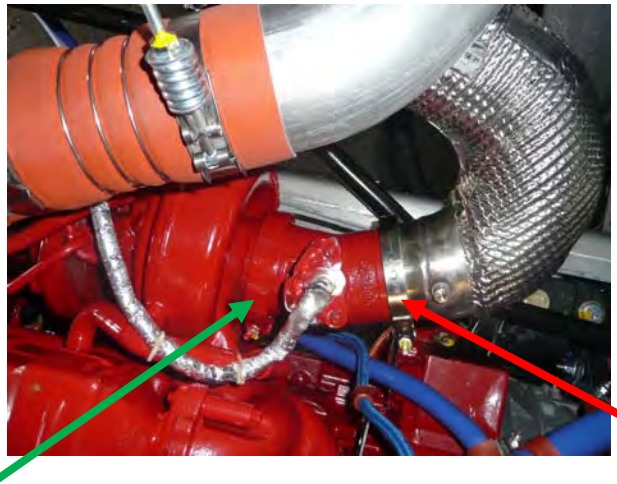


FIGURE 7.

VIEW FROM
SETTEE HATCH



FIGURES 8 & 9. ISB DIESEL HYBRID ENGINE SHOWN

CAST ELBOW AT TURBO
OUTLET V-BAND CLAMP
(CLAMP LOCATION “A”)

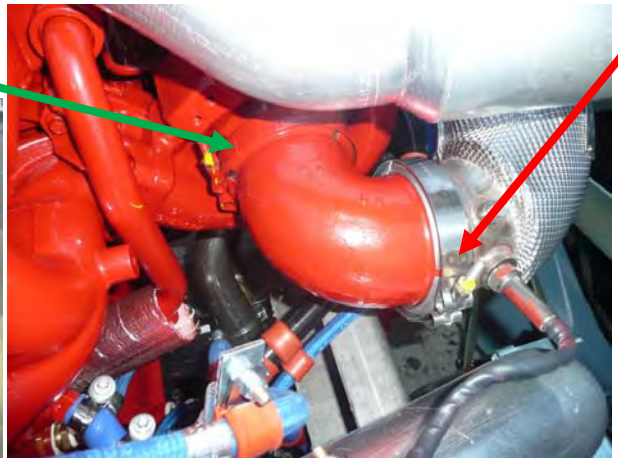
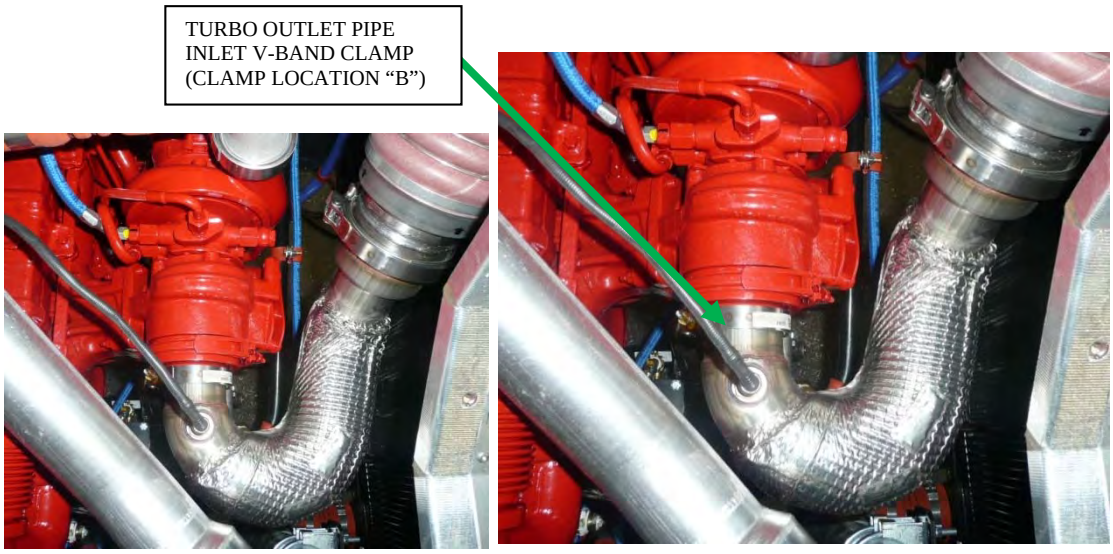


FIGURE 10 & 11. ISL ENGINE SHOWN



FIGURES 12 & 13. ISL-G CNG ENGINE SHOWN

6. Loosen the V-Band & U clamps on exhaust muffler inlet pipe. Loosening the clamps will allow the pipes to move into alignment.

FIGURE 14. ISB/ISL DIESEL ENGINE SHOWN

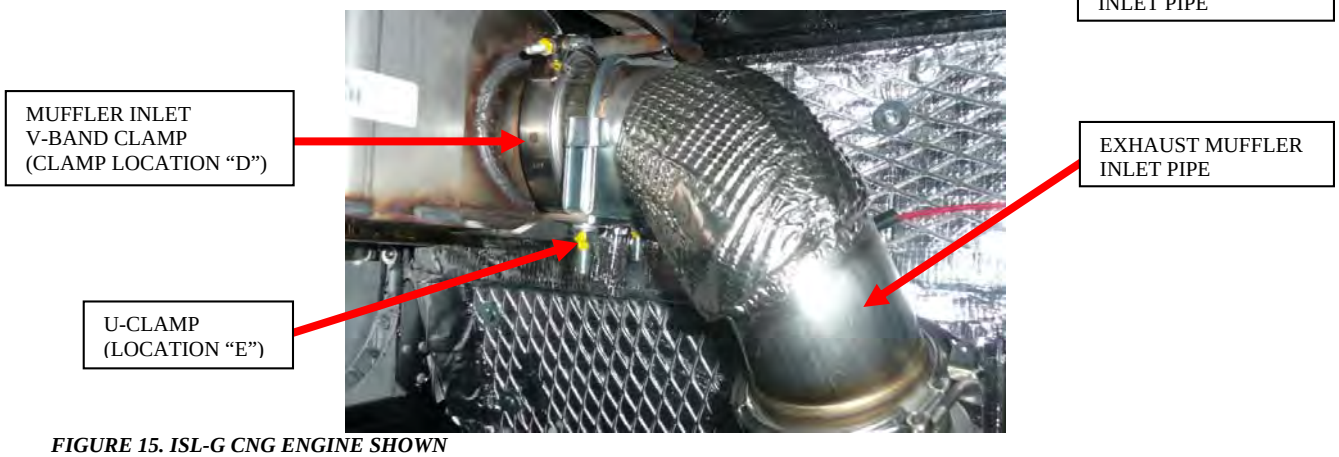


FIGURE 15. ISL-G CNG ENGINE SHOWN

7. Align the pipes with alignment tool & torque all clamps to 13+/- 0.5 ft-lb in the following order:
   - CAST TURBO OUTLET ELBOW V-BAND CLAMP — *LOCATION "A", SEE FIGURES: 8 & 9 FOR ISB on page 4; 10 & 11 FOR ISL on page 4; 12 & 13 FOR ISL-G on page 5*
   - EXHAUST TURBO OUTLET PIPE V-BAND CLAMP — *LOCATION "B", SEE FIGURES: 8 & 9 FOR ISB on page 4; 10 & 11 FOR ISL on page 4; N/A for ISL-G*
   - ALIGNMENT TOOL UPPER & LOWER V-BAND CLAMPS — *LOCATION "C", SEE FIGURE 16 BELOW*
   - MUFFLER INLET PIPE V-BAND CLAMP — *LOCATION "D", SEE FIGURES: 14 FOR ISB on page 5; 14 FOR ISL on page 5; 15 FOR ISL-G on page 5*
   - MUFFLER INLET PIPE U-CLAMP — *LOCATION "E", SEE FIGURES: 14 FOR ISB on page 5; 14 FOR ISL on page 5; 15 FOR ISL-G on page 5*

Clamp Part Numbers:

Engine Model	Clamp Location				
	A – Cast Elbow at Turbo Outlet	**B – Turbo Outlet Pipe Inlet**	**C – Bellows Inlet/Outlet**	**D - Muffler Inlet**	**E - U-Clamp**
ISL Diesel	Cummins P/N 102408	53-28193-003	01-58451-000	53-28193-003	54-00029-002
ISB Diesel Hybrid	Cummins P/N 102408	53-28193-005	01-58451-000	53-28193-003	54-00029-002
ISL-G CNG	N/A	53-28193-006	01-58451-000	53-28193-003	54-00029-002
ISM	N/A	53-28193-005	01-58451-000	53-28193-004	54-00029-001

FIGURE 16.

8. After torqueing all the clamps to 13+/- 0.5 ft-lb, remove the alignment tool by loosening upper & lower V-Band clamps.
9. Measure the length of the gap between the two exhaust pipe flanges and verify the length is within the allowable range for the specific bellows to be installed. Refer to the table below and Figure 17 for the appropriate dimension.

Tru-Flex NTSD P/N	Flange to Flange Distance (inches)
01-71799-000	12.00 +/- 0.25
01-71800-000	12.25 +/- 0.25
01-71759-000	14.00 +/- 0.25
01-71801-000	16.00 +/- 0.25

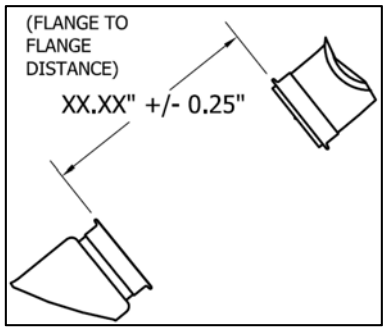


FIGURE 17. Bellows Length Measurement Location.

10. If the flange to flange distance is not correct, repeat steps 2-9. If the correct flange to flange distance cannot be obtained, contact Gillig Field Service.
11. Insert new all metal NTSD exhaust bellows between the turbo outlet pipe & muffler inlet pipe noting the flow direction labeled on the bellows, and then torque bellows V-Band clamps to 13+/- 0.5 ft-lb.
12. After completing the installation:
    - Confirm the exhaust bellows is not damaged or interfering with surrounding components.
    - Start the engine and check for exhaust leaks.
    - Reinstall the settee hatch (if removed).