INSTRUCTION TO SERVICE

ITS: 60576	DATE 12/08/2022
SECTION:	260U – Battery Compartment
WRITTEN BY:	Daniel Tice
SUBJECT:	Inspect and compress ESS and Inverter mounting hardware insert
ISSUE:	ESS and Inverter mounting hardware insert not fully compressed
SUMMARY:	Inspect and fully compress inserts

ITS60576

Ref. NHTSA Recall No.	Ref. Transport Canada Recall No.
Not Applicable	Not Applicable

THIS ITS DOCUMENT SHOULD BE RETAINED AND REFERRED TO FOR FUTURE MAINTENANCE UNTIL THE NEW FLYER PARTS AND/OR SERVICE MANUAL IS UPDATED TO REFLECT WORK DONE AS A RESULT OF THIS DOCUMENT. ENSURE THAT THIS DOCUMENT IS AVAILABLE FOR PARTS AND MAINTENANCE STAFF GOING FORWARD.

PROBLEM DESCRIPTION:

Intention to inspect for the following items:

1. ESS enclosure foot mounting rail inserts for proper crimp.
2. Inverter enclosure foot mounting rail inserts for proper crimp.

SOLUTION:

1. Document & properly crimp or replace the ESS enclosure foot mounting rail inserts.
2. Document & properly crimp or replace the ESS enclosure foot mounting rail inserts.

Table of Content:

PROCEDURE:

Part 1- Prepping, De-Energizing & Lock Out-Tag Out for ESS Inspection

⚠ ***Danger: The work detailed in the following steps involves working closely to HV connections. It is required that the service personnel be trained in NFI HV safety practices such as Appendix A – NFIL Spec 532295 - High Voltage Safety Guidelines & Procedures for New Flyer Battery Bus.***

1. Prior to starting the ITS inspection technicians are required to review all faults & DTC's present on the bus and ESS system.
2. Resolve any faults identified before staring the ITS inspection.
3. Resolve all safety related faults if present on the bus before heading to next steps in this ITS.
4. Turn the MRS to the off position and wait 5 minutes before proceeding to the next step.
5. Turn the main battery disconnect and HV interlock switch to the "OFF" position.
6. Perform the Lock Out Tag Out procedure.
7. Perform the de-energizing procedure in preparation for cable and ESS removal before moving to the next step in this ITS.

☞ ***NOTE: Refer to the Lockout/Tagout Procedure and De-Energizing Procedures in section 9 of the New Flyer Service Manual.***

☞ ***NOTE: Use commercially available lock out equipment and tags being sure to follow any local laws or workplace procedures.***

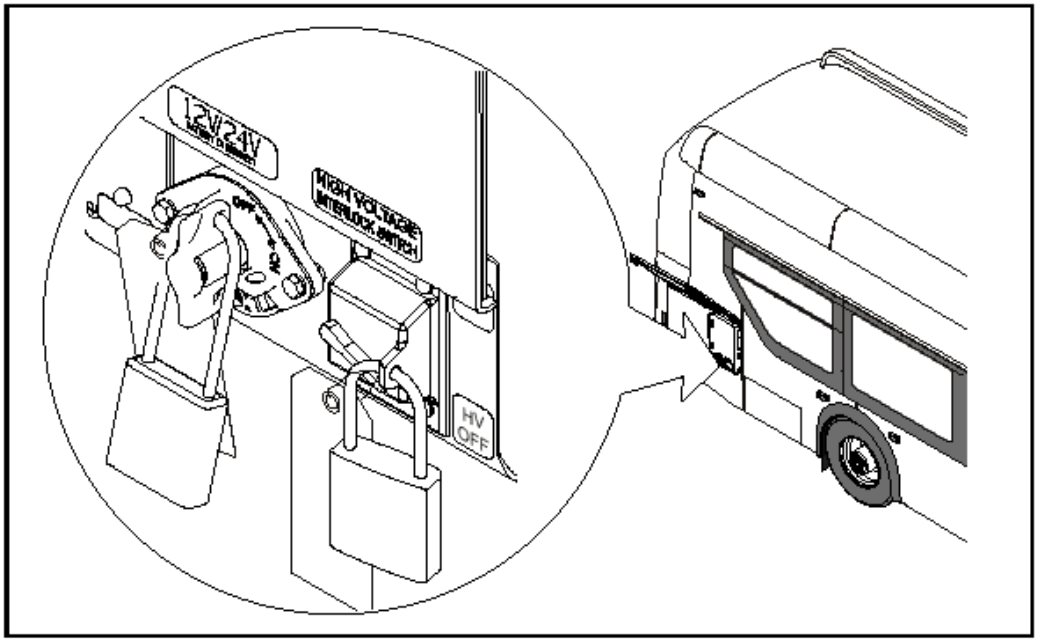


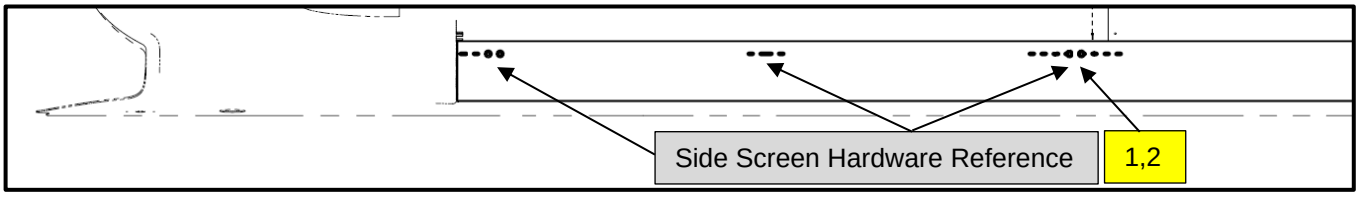
Figure 1: Lockout tagout location reference.

Part 2- Side Screen Access for ESS Inspection

8. Ensure steps 2–7 are completed before moving to the next step.

   ☞ **Note: Ensure proper fall protection, PPE and appropriate safety procedures are followed.**

9. Gain access to the side screens along the side of the bus.
10. Determine the side screens that will require opening to gain access to the ESS and inverter foot mounting hardware. Remove the appropriate screen mounting Bolts item #1 and Washers #2 and set aside for re-installation. See Figure 1.
11. Open the side screens to gain access to ESS and inverter enclosure mounting hardware as required based on your application.



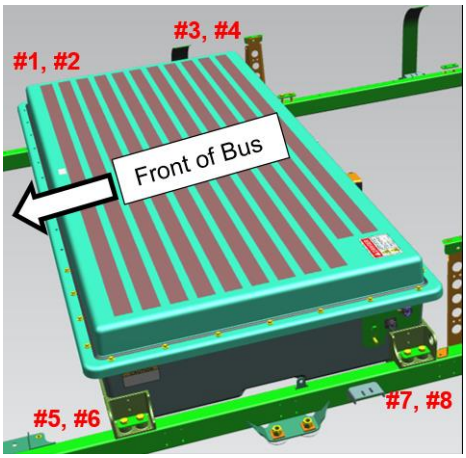
Item	Part Number	Description
1	20B04012	Bolt-Hex ¼ UNC x .75
2	060771	Washer ¼ x 1 x .063

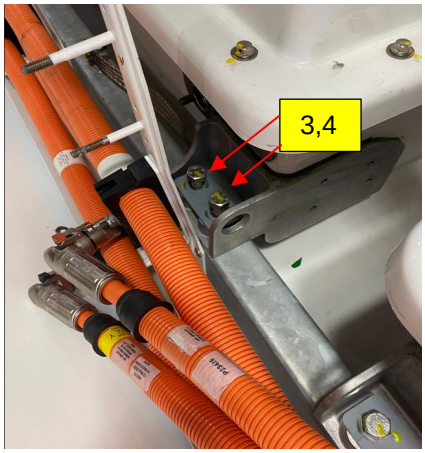
Figure 2: ESS and side screen hardware access location reference.

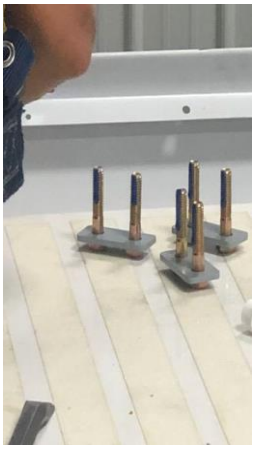
Part 3- ESS Insert Go/No-Go Inspection

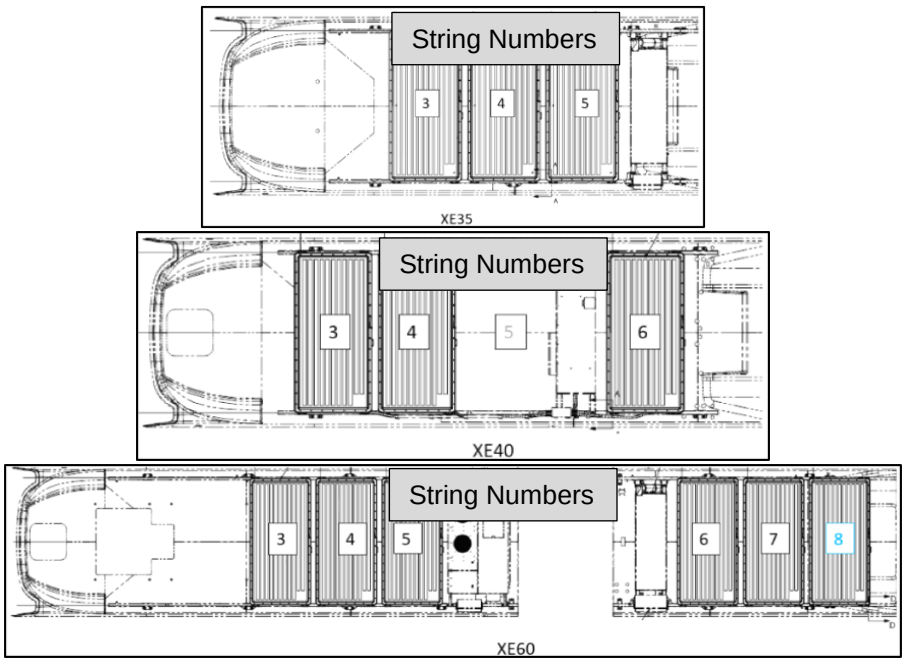
12. The following steps to inspect, compress inserts, re-install and torque all mounting hardware are to be completed on each ESS starting with string three working to the rear of the bus until all upper ESS enclosures are completed.
13. Remove the ESS foot mounting bolts and support plates in mounting positions **#1 - #8** with an impact wrench and set aside for re-installation. See Figure 3.

☞ **Note: As required disconnect the HV cables to the enclosures and secure out of the way.**









Item	Part Number	Description
3	10B08036	Bolt ½ c 2.25
4	842568	Plate-ESS Support

Figure 3: ESS string and mounting hardware location reference.

Part 3- ESS Insert Go/No-Go Inspection Cont'd

☞ **Note: Any buses requiring rework due to inserts failing the Go/No-Go gage or dome inspection are to be noted by bus number on the inspection sheet attached to this ITS.**

14. Using the Go/No-Go gage provided (NF PN XC-MT-3202) check each ESS insert to ensure pass or fail. See Figure 4. A grease pencil can be used to mark each location requiring additional work.

☞ **Note: The Go/No-Go gage has two sides. One side to confirm using the top of the insert and the other to confirm to the top of the mounting foot**.

☞ **Note: Any inserts that do not pass will require further work in the steps to follow.**

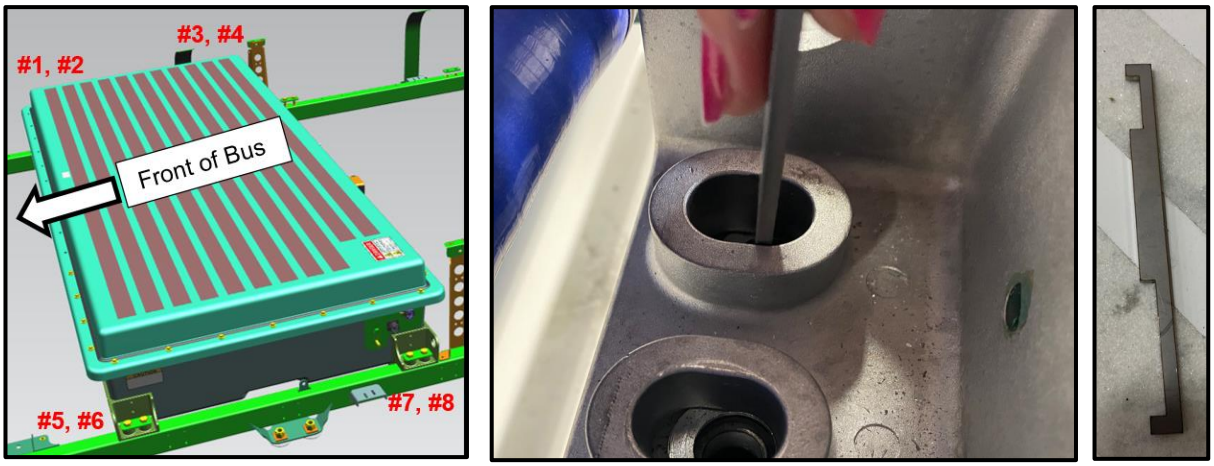


Figure 4: ESS inserts Go/No-Go inspection reference.

Part 4- ESS Insert Doming Inspection

15. Visually inspect each insert for dome shaping. See Figure 5. A grease pencil can be used to mark each location requiring additional work. See Figure 5.

☞ **Note: Any inserts that have signs of doming will require further work in the steps to follow.**

16. If doming has not occurred to the inspected inserts move to part 6 insert seating of this ITS.

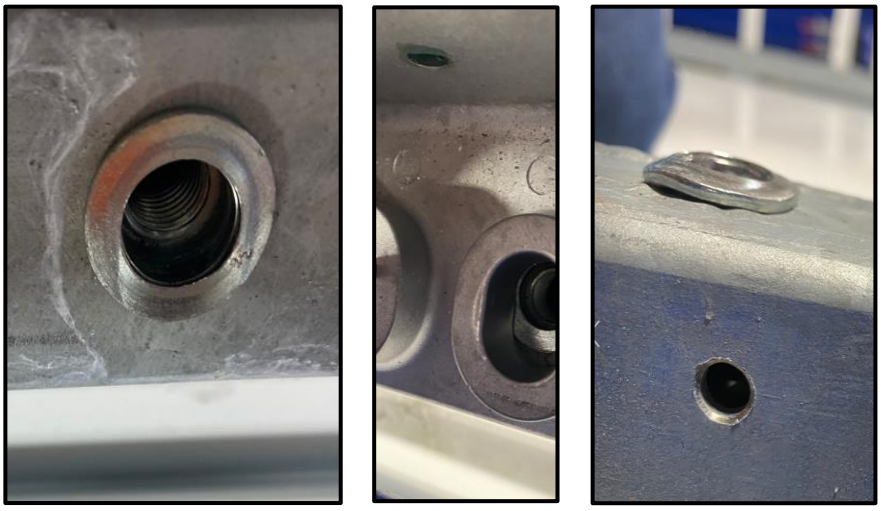


Figure 5: ESS inserts doming repair reference.

Part 5- ESS Insert Doming Repair

17. Identify the locations of the inserts that require dome repair.
18. Locate the dome removal hammer tool (NF PN XC-MT-3206)
19. Place the dome removal tool in each slot on the ESS foot that requires repair and gently strike the dome removal tool with a hammer.
20. Remove the tool and visually inspect to ensure the insert top is flat and repeat as required until surface is visually flat. Repeat for each location on the ESS as required. See Figure 6.

    Caution: Gently tap the dome tool. The tool requires little force to remove the dome from the insert and excessive force can damage the rail or insert.

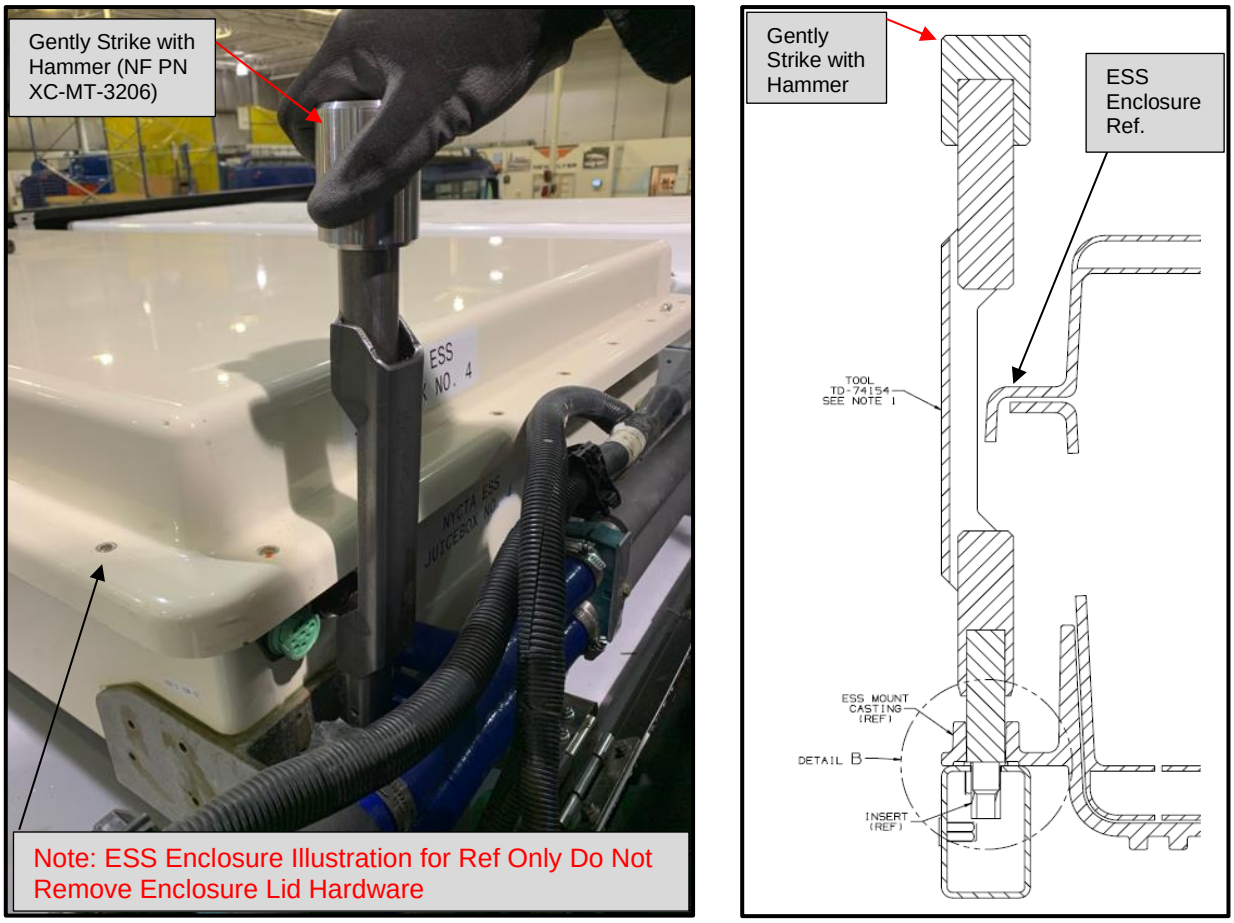


Figure 6: Insert seating location reference.

Part 6- ESS Insert Seating

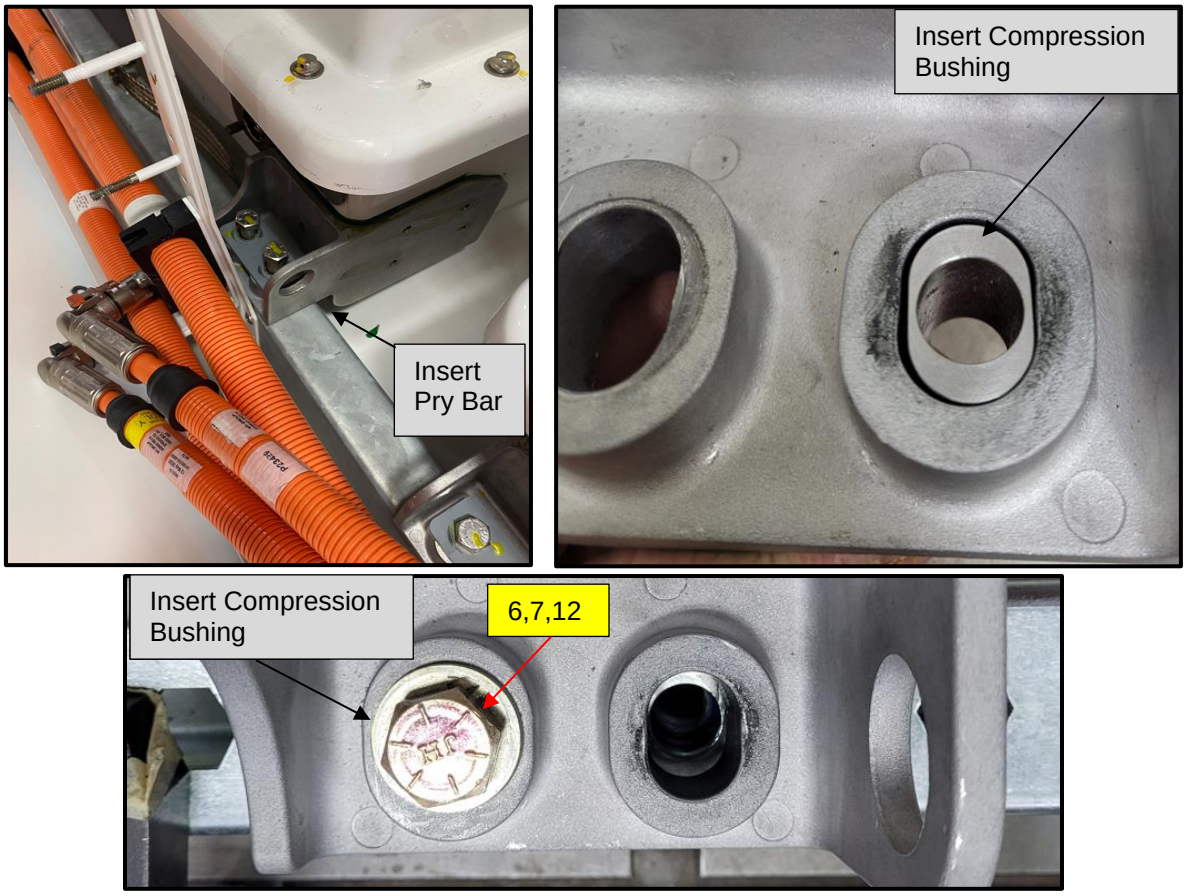
21. Identify the locations of the inserts that require seating.
22. Place the compression insert bushing (NF PN 988406) in the slot on the foot in the areas that require seating.
23. Place a prybar between the foot on the ESS and the ESS enclosure mounting rail and gently apply pressure to align the center of the bushing with the center of the insert. See Figure 7.

☞ **Note: Place a shop rag against the rails to prevent scratching of the rail finish as required.**

24. Once the bushing is centered over the insert place washer item #6 on bolt item #12 and apply several drops of item #7 Loctite to the bolt threads. See Figure 7.
25. Torque the bolt to 140 FT-LBS and check with Go/No-Go gage (NF PN XC-MT-3202).
26. Increase torque by 10 FT-LBS until Go/No-Go gage fits properly. Do not exceed 160 FT-LBS.

☞ **Note: If an insert attempts to spin when torquing use an impact on the initial torque.**

27. Repeat for each location on the ESS as required.

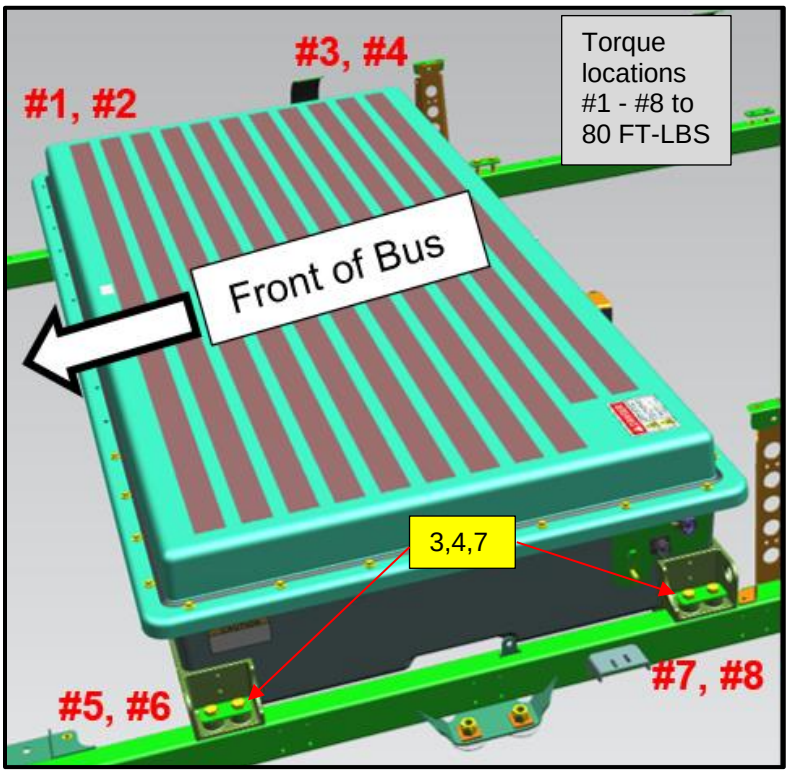


Item	Part Number	Description
6	20W08000	Washer Flat Hardened ½”
7	081034	Loctite – 243 Medium
12	1002618	Bolt Hex ½ UNC X 2.5 Grade 9

Figure 7: Compression insert location reference.

Part 7- ESS Foot Mounting Hardware Torque

28. Ensure all inserts have been visually confirmed the insert is not domed and confirmed to be fully seated using the Go/No-Go gage.
29. Re-install the existing support plate item #4 and bolt item #3 and applying several drops of item #7 Loctite to the bolt threads. Torque each bolt to 80 FT-LBS and apply torque marks. See Figure 7. Repeat for each location on the ESS as required.



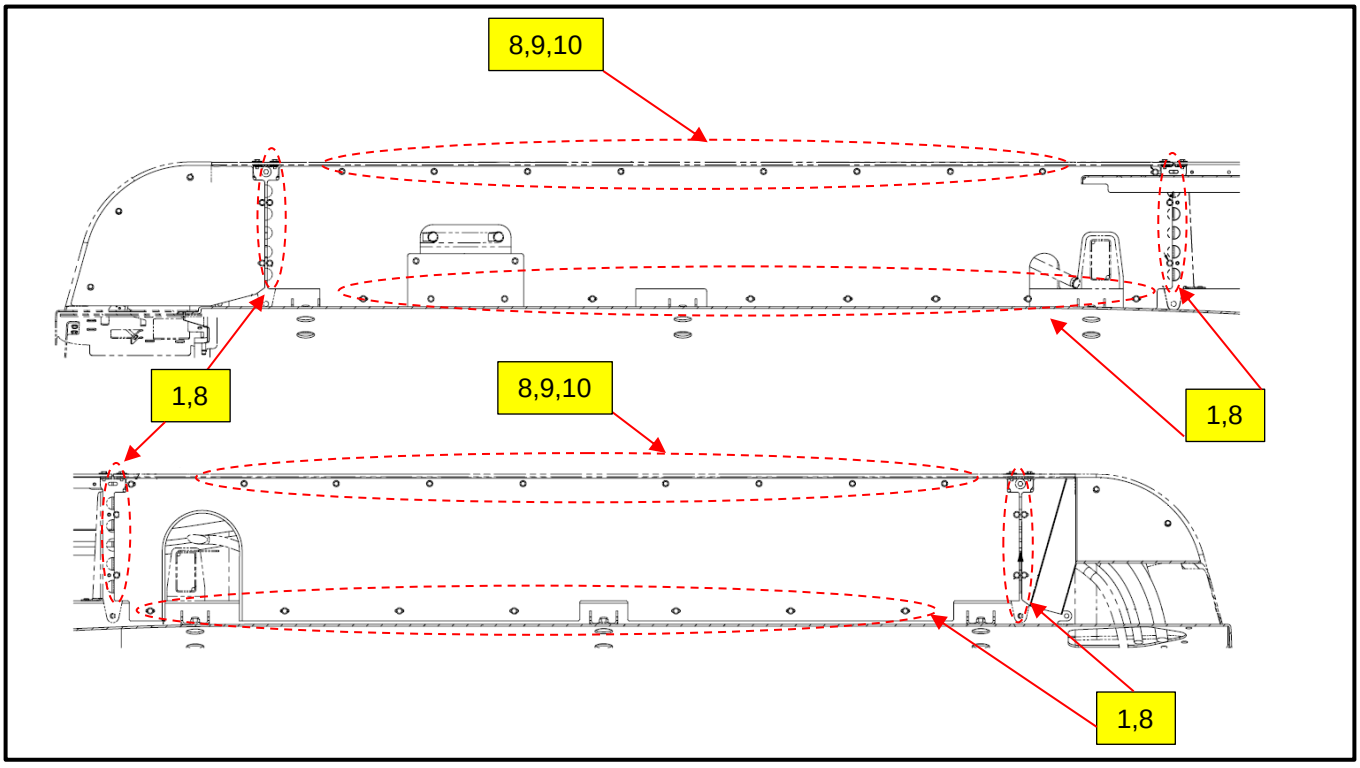
Item	Part Number	Description
3	10B08036	Bolt ½ x 2.25
4	842568	Plate-ESS Support
7	081034	Loctite – 243 Medium

Figure 8: ESS foot mounting hardware torque location reference.

Part 8- Inverter Inside Side Screen Panel Removal for Inspection

30. Gain access to the inside side screen panels along the inverter at the rear of the bus.
31. Determine if the inside side screen panels will require removal to gain access to the inverter foot mounting hardware. Remove the appropriate screen panel mounting Bolts item #1 and Washers #8 and set aside for re-installation. See Figure 9.
32. Remove the appropriate upper inside side screen mounting Bolts item #9 and Washers #8 and set aside for re-installation. See Figure 9.

☞ **Note: Item #10 upper inside side screen clip/nut shown for ref. if damaged or lost. See Figure 9.**



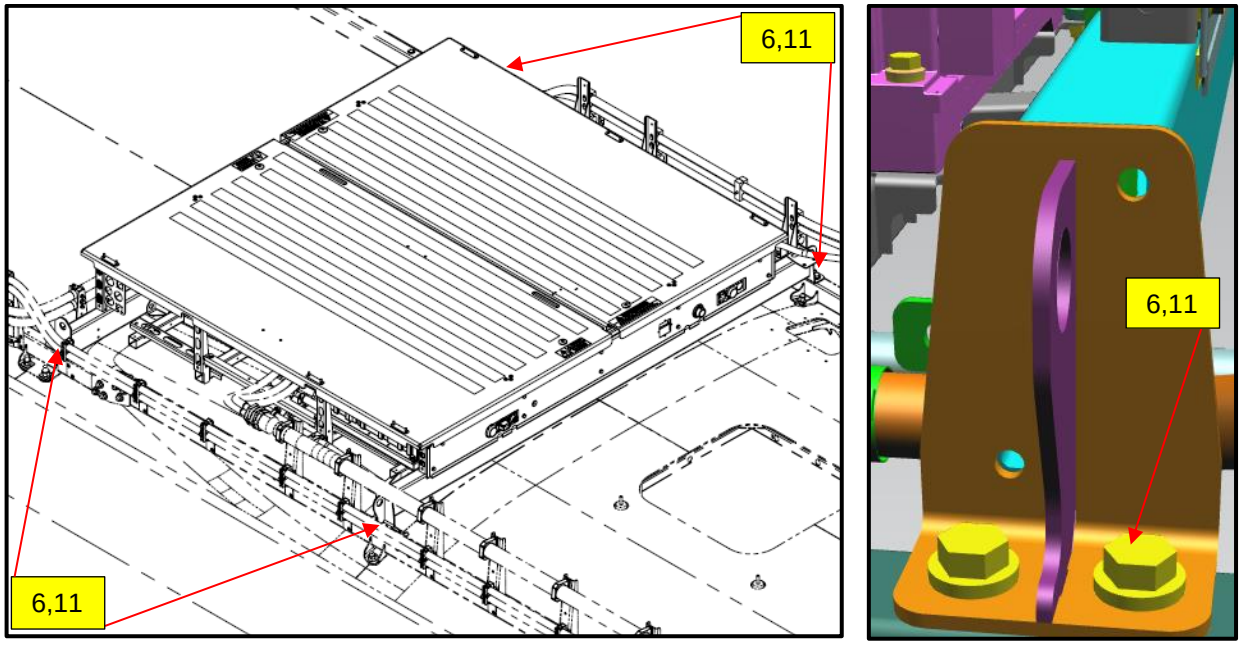
Item	Part Number	Description
1	20B04012	Bolt-Hex ¼ UNC x .75
8	50W04000	Washer Flat ¼ Nom
9	394676	Bolt – 6M x 1.0 x 20 MM LG SST
10	527507	Nut-M6 x 1.00 U type SST

Figure 9: Inverter inside side screen panel foot mounting hardware torque location reference.

Part 9- Inverter Insert Go/No-Go Inspection

33. The following steps to inspect, compress inserts, re-install and torque all mounting hardware are to be completed on the inverter rack mounting hardware.
34. Remove the inverter foot mounting bolts item #11 and washers item #6 with an impact wrench and set aside for re-installation. See Figure 10.

☞ **Note: As required disconnect the HV and LV cables to the enclosures and secure out of the way.**



Item	Part Number	Description
6	20W08000	Washer Flat Hardened ½”
11	10B08028	Bolt-Hex ½ UNC x 1.75

Figure 10: Inverter mounting hardware location reference.

Part 9- Inverter Insert Go/No-Go Inspection Cont'd

☞ **Note: Any buses requiring rework due to inserts failing the Go/No-Go gage or dome inspection are to be noted by bus number on the inspection sheet attached to this ITS.**

35. Using the Go/No-Go gage provided (NF PN XC-MT-3202) check each insert to ensure pass or fail using the smaller side of the gage. See Figure 11. A grease pencil can be used to mark each location requiring additional work.
    ☞ **Note: The inverter may require miner movement right or left to check both sides of the insert.**
    ☞ **Note: Any inserts that do not pass will require further work in the steps to follow.**

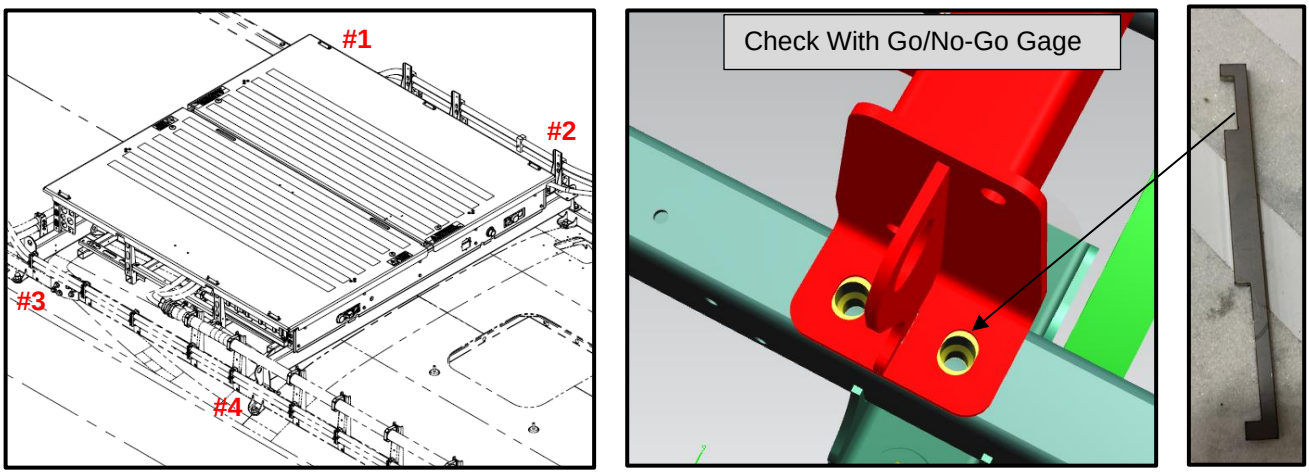


Figure 11: Inverter inserts Go/No-Go inspection reference.

Part 10 - Inverter Insert Doming Inspection

36. Visually inspect each insert for dome shaping. See Figure 12. A grease pencil can be used to mark each location requiring additional work. See Figure 5.
    ☞ **Note: Any inserts that have signs of doming will require further work in the steps to follow.**
37. If doming has not occurred and the inserts pass the Go/No-Go inspection move to part 12 of this ITS.

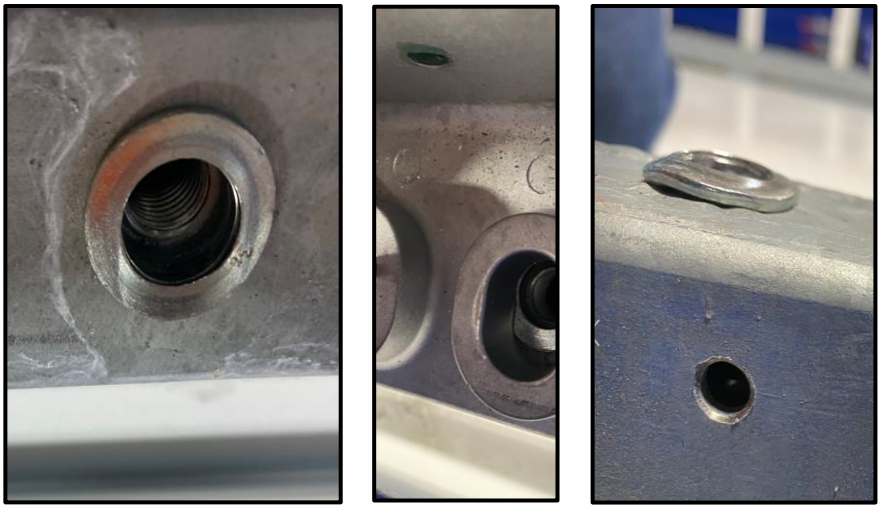


Figure 12: Inverter inserts doming repair reference.

Part 11- Inverter Insert Doming and Seating Repair

38. Identify the locations of the inserts that require dome or insert seating repair.
39. Using a lifting bag place the bag(s) under the inverter rack structure and the roof structure between 17 and 26 inches from the roof rails as shown below. See Figure 13. (17 to 26 inches applicable at all four corners)
40. Carefully raise the inverter one corner at a time enough to slide the insert inverter shim dome and seating tool (NF PN XC-MT-3208) under the inverter foot. See Figure 13. Do not lift more than two sides at a time.

☞ **Note: Repeat lifting at each corner as required.**

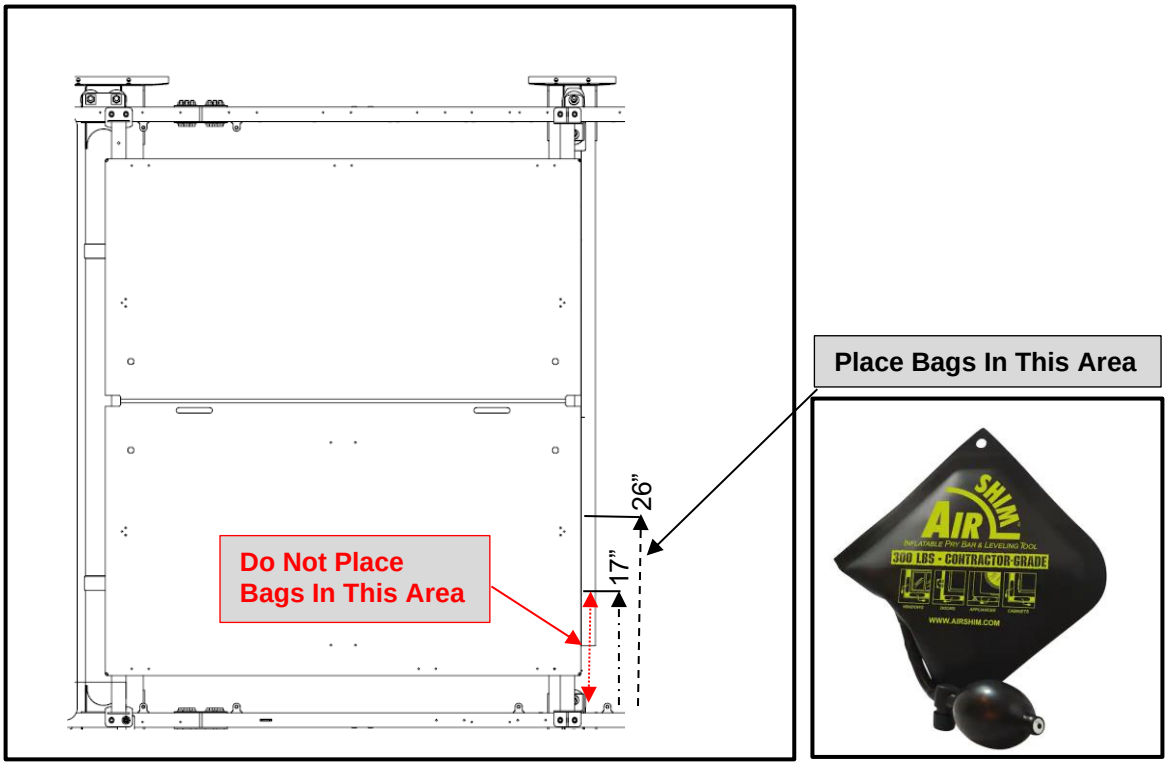


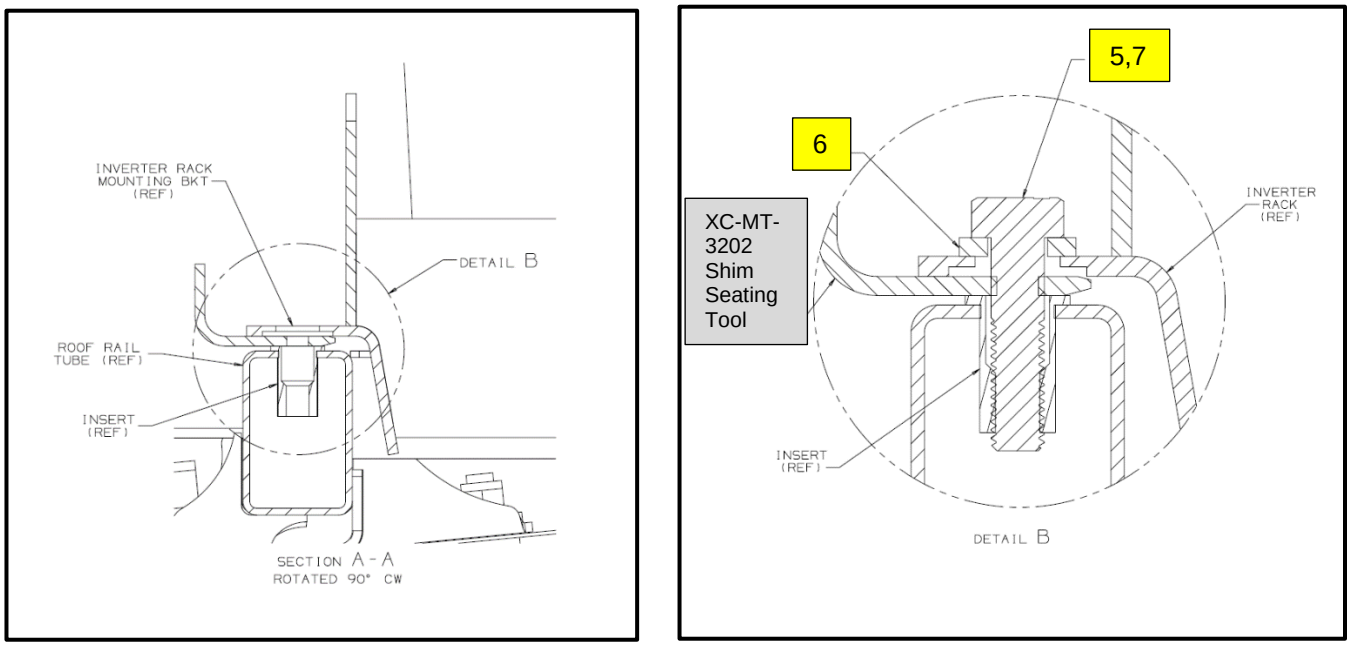
Figure 13: Inverter insert seating location reference.

Part 11- Inverter Insert Doming and Seating Repair Cont'd

41. Ensure the insert hole is centered with the dome and seating shim tool and place washer item #6 on bolt item #5 and apply several drops of item #7 Loctite to the bolt threads. See Figure 14.
42. Once hardware is in place release the air from the lifting bag(s).
43. Torque the bolt to 140 FT-LBS and Lift unit with the lifting bags again and remove the seating tool. Check the insert with the Go/No-Go gage (NF PN XC-MT-3202).
44. Repeat and increase torque by 10 FT-LBS until Go/No-Go gage fits properly. Do not exceed 160 FT-LBS.
45. Once Go/No-go gage fits properly lift the unit and remove the seating tool and item #6 washer and bolt item #5 and set aside for future use.

☞ **Note: If an insert attempts to spin when torquing use an impact on the initial torque.**

46. Repeat for each location on the inverter as required.

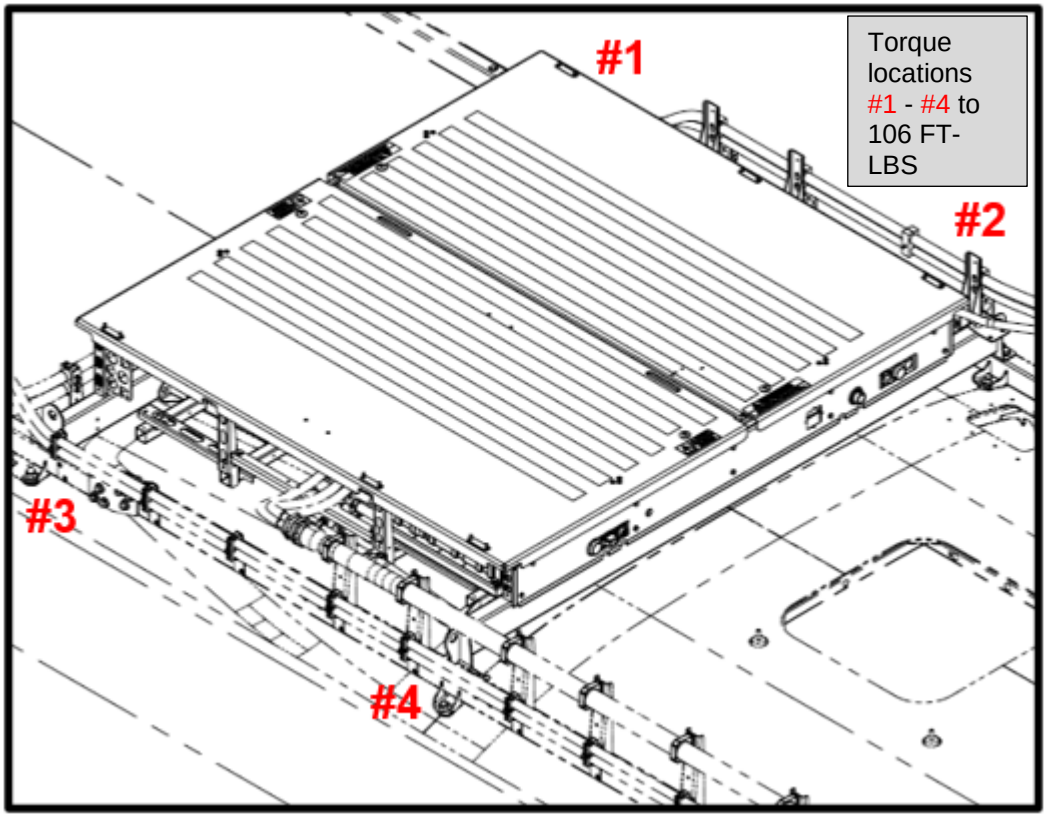


Item	Part Number	Description
5	987427	Bolt Hex ½ UNC X 2.0 Grade 9
6	20W08000	Washer Flat Hardened ½"
7	081034	Loctite – 243 Medium

Figure 14: Inverter hardware compression shim tool location reference.

Part 12- Inverter Foot Mounting Hardware Torque

47. Ensure all inserts have been visually confirmed the insert is not domed and confirmed to be fully seated using the Go/No-Go gage.
48. Re-install the existing bolt item #11, washer item #6 applying several drops of item #7 Loctite to the bolt threads. Torque each bolt to 106 FT-LBS and apply torque marks. See Figure15.

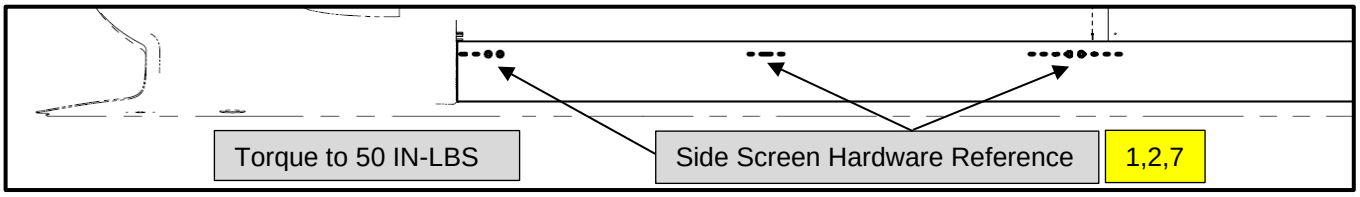


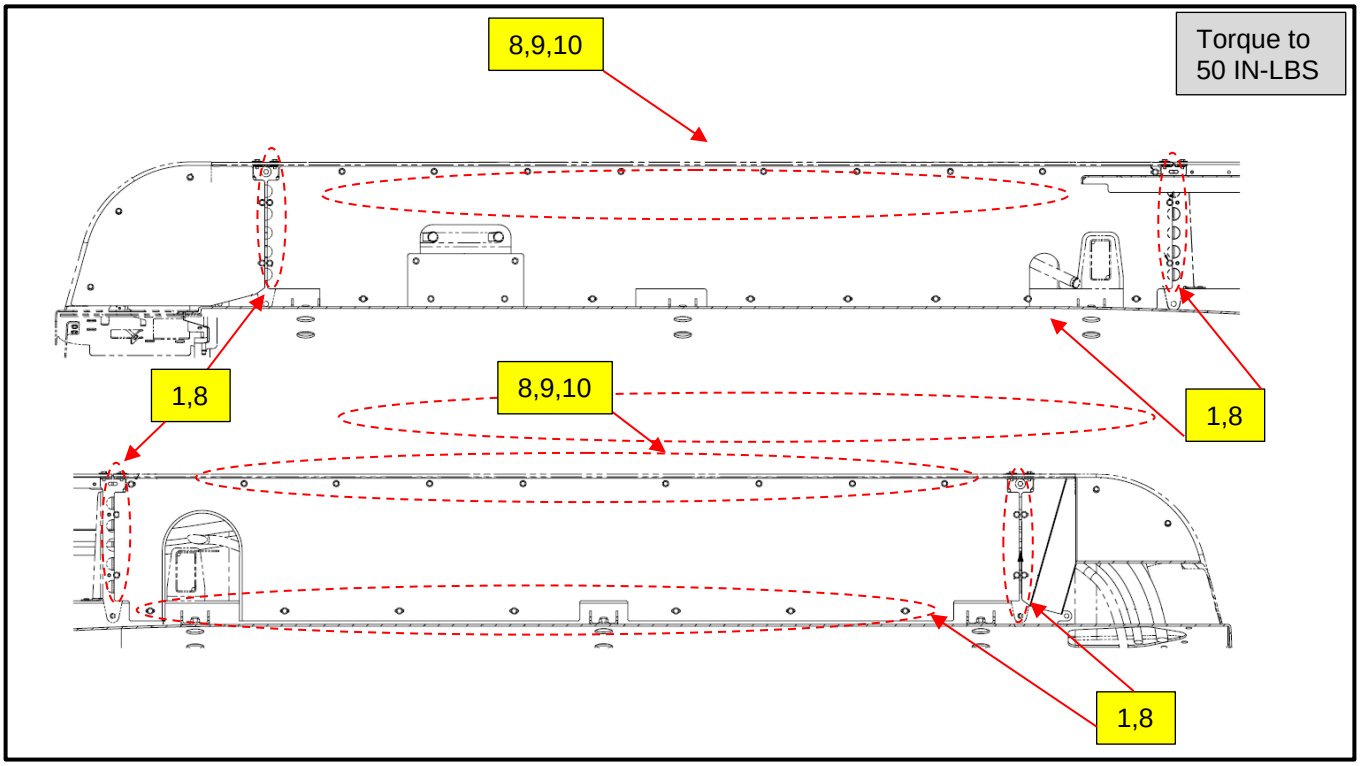
Item	Part Number	Description
6	20W08000	Washer Flat Hardened ½”
7	081034	Loctite – 243 Medium
11	10B08028	Bolt-Hex ½ UNC x 1.75

Figure 15: Inverter foot mounting hardware torque location reference.

Part 13- ESS and Inverter Side Screen and Inverter Inside Screen Panel Installation

49. Ensure to connect and secure any lines, hardware, harnesses and HV cables that may have been removed during work on the ESS and inverter. Remove any trash and debris from the area.
50. Re-install the side screen and inside side screen panels using the existing hardware items #1,#2, #8, #9, and #10 applying one or two drops of item #7 Loctite to their threads. Torque to 50 IN-LBS. See Figure16.





Item	Part Number	Description
1	20B04012	Bolt-Hex ¼ UNC x .75
2	060771	Washer ¼ x 1 x .063
7	081034	Loctite – 243 Medium
8	50W04000	Washer Flat ¼ Nom
9	394676	Bolt – 6M x 1.0 x 20 MM LG SST
10	527507	Nut-M6 x 1.00 U type SST

Figure 16: Inverter inside side screen panel mounting location reference.

51. **Fill out the inspection form attached to this ITS and return to the RPSM. A copy to be maintained in the RI attachments.**

52. Perform the applicable Energizing Procedure and return the bus to service. See Figure 17.

    ☞ ***NOTE: Refer to the Energizing Procedure in section 9 of the New Flyer Service Manual.***

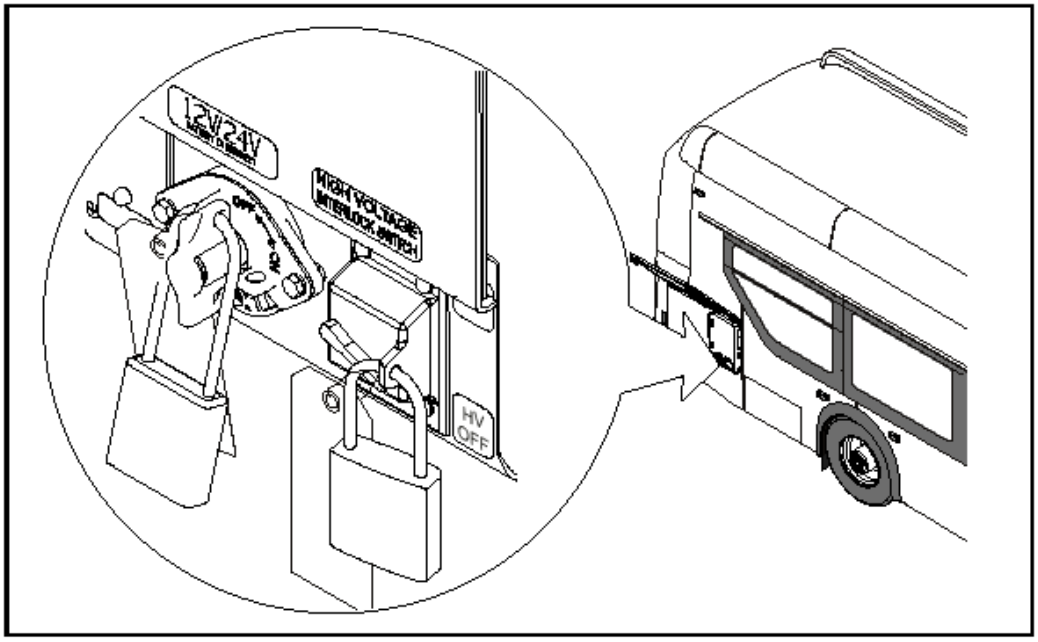


Figure 17: Lockout tagout location reference.

LABOUR ESTIMATE				
	Operation	Number of Technician(s)	Hours	Labor Time Total HR
	Lockout/Tagout	2	.5	1
	Open/Close Fairings	2	.5	1
	Inspect Inserts on 1 ESS or Inverter	2	.25	.5
	Rework Inserts on 1 ESS or Inverter	2	.25	.5
	Inspection and Repairs			
	3 ESS No Inverter			4.5
	3 ESS 1 Inverter			5.5
	4 ESS No Inverter			5.5
	4 ESS 1 Inverter			6.5

PARTS REQUIRED					
Item	Part Number	Description	Qty. per Coach	Units	Notes
1	20B04012	Bolt-Hex ¼ UNC x .75	AR	EA	
2	060771	Washer ¼ x 1 x .063	AR	EA	
3	10B08036	Bolt ½ c 2.25	AR	EA	
4	842568	Plate-ESS Support	AR	EA	
5	987427	Bolt Hex ½ UNC X 2.0 Grade 9	1	EA	
6	20W08000	Washer Flat Hardened ½"	2	EA	
7	081034	Loctite – 243 Medium	0.010	EA	
8	50W04000	Washer Flat ¼ Nom	AR	EA	
9	394676	Bolt – 6M x 1.0 x 20 MM LG SST	AR	EA	
10	527507	Nut-M6 x 1.00 U type SST	AR	EA	
11	10B08028	Bolt-Hex ½ UNC x 1.75	AR	EA	
12	1002618	Bolt Hex ½ UNC X 2.5 Grade 9	1	EA	

SPECIAL TOOLS REQUIRED					
Item	Part Number	Description	Qty.	Units	Notes
	XC-MT-3202	Go-No/Go Gage	1		
	988406	ESS Compression Insert Tool	4		
	XC-MT-3206	ESS Insert Hammer Tool	1		
	XC-MT-3208	Inverter Shim Tool 1/2	2		
	SKU # 1001846565	Air Shim Inflatable Pry Bar Leveling Tool	2		Source Locally Home Depot

ESS & Inverter Insert Inspection Check List

Name of Property: _____ Date: ___ / ___ / _____
SR : _____
Inspectors Name: _____
Bus Configuration: XE35_____ XE40_____ XE60_____

All Inserts Pass Go/No-Go gage Inspections on ESS Units			
Bus Number	***Pass***	***Fail***	***Fail Comments***

All Inserts Pass Go/No-Go gage Inspections on Inverter Rack			
Bus Number	***Pass***	***Fail***	***Fail Comments***