INSTRUCTION TO SERVICE

ITS: 61261	02/05/2025
SECTION:	260-Battery Compartment
SUBJECT:	Off-site vendor update of ESS packs
ISSUE:	Internal component upgrade by supplier.
SUMMARY:	Remove battery enclosure, ship to supplier for rework, replace with updated reworked enclosure.

ITS-61261

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.

Warning

•Exposure to high voltages from a large modules or packs can cause shock, burns or even death.
•The high voltage components in a large module or pack can only be serviced by technicians with special high voltage training.
• Follow all necessary precautions before working on them.
• Always assume voltage is present on high voltage cables until you have verified voltage has been removed.

Equipment Calibration

All test equipment must be within their calibration interval and recorded such with the respective serial numbers. These records must be available to the Checker.

Personnel Requirement

Only trained personnel shall supervise and perform High Voltage system rework, and troubleshooting. Two personnel shall perform rework Procedures, together, to ensure safety of themselves, others nearby & for the protection of vehicle & property. Refresher training shall be provided to these personnel on a regular basis and when new systems are to be checked by them. The training of the personnel shall consist of:

HV & low voltage basics, intermediate & advanced electricity
HV & low voltage electrical systems of the vehicle
Shop safety practices & procedures
First aide including CPR & the use of the shop defibrillator
How to release a victim that can't let go HV
Quickest method of shutting down HV
Firefighting and emergency procedures
HV & arc flash safety
Organized & tidy placement of equipment & tools allowing for unrestricted movement
Operation of Hi-pot

To ensure effectiveness of training, exams of the trained material shall be required with a high passing mark of at least 80% and a retraining of the missed 20 % on a one-to-one basis.

(Caution: The employee completing the rework must not have any health conditions that can be exacerbated when startled and must not have any electronic implants.)

Vehicle Inspection

It is necessary that the vehicle to be reworked, first be visually inspected of all systems, workmanship and with special attention to ensuring there is no HV cable or equipment damage or chafing.

High Voltage Rework Preparation

(1) Install Safety barricade with warning lights & signs indicating "Danger High Voltage" around the vehicle perimeter and ensure no personnel are within the fenced perimeter during the rework procedure.
(2) It shall always be the goal to check the systems as much as possible with all HV power OFF and Locked Out/Tagged Out and proven as de-energized by voltage measurement using the DMM. The functionality of the DMM must be proved before and after the verification of no HV present. Then, if possible, the HV systems should be challenged by trying to energize them while checking that no HV appears.
(3) When it is necessary to perform tests of HV systems with the power ON, then the Working Live procedure must be followed.
(4) The test personnel shall always rehearse the actions required in case of any possible accident scenarios.
(5) Before beginning the rework Procedure, the test personnel shall remove all their jewelry (including pierced ones), watches and any electrically conductive objects on them.

PPE Requirements

The PPE voltage class, Arc Flash and Arc Blast rating shall be compatible with the voltage and Arc Flash capability of the systems being tested. Appropriate leather glove protectors shall be worn over the HV rubber gloves.

PPE Care & Testing

Rubber insulated PPE shall be periodically cleaned and tested in accordance with 29 CFR 1910.137 and the appropriate ANSI/ASTM standards. HV gloves, sleeves and mats shall be tested every 6 months. PPE apparel shall be cleaned and maintained in accordance with the manufacturer’s instructions. A record of the PPE testing shall be maintained and available to the users.

PPE Inspection

Inspect PPE equipment, before use, for any degradation or damage and ensure that the HV gloves have been tested every 6 months. Also perform an air pressure test on the HV gloves before and after each use. If during PPE use a potential damaging incident occurred to the PPE, stop further testing and inspect the PPE. If at any time the PPE is defective, reject it, and obtain an accepted one.

PPE Storage

PPE apparel should be stored lying flat, undistorted, right-side out and not folded in protective containers. The HV mats can be rolled with an inside diameter greater than 2 inches.
Rubber HV gloves should be stored in cool, dark, dry, and free from damaging chemicals or vapors. The glove cuffs should face downwards, without folding, in the appropriate glove bag and hung vertically.

Insulated Tools

Insulated tools should be visually inspected for insulation damage before and after each session of use.

Lockout/Tagout Procedure

The Lockout/Tagout procedure should be followed that is specified in the respective rework procedure. When removing the lock and tag:
(1) The locks and tags shall be removed by the installer of them or under her/his supervision.
(2) If the installer of the locks and tags is not available, then her/his supervisor:
(a) Ensures that the installer of the locks and tags in not in the facility
(b) Contacts the installer to inform her/him that the locks and tags will be removed
(c) Reminds the installer of the lock and tag removal when she/he resumes work

Stored Energy

Personnel must always remember the characteristics of stored energy devices such as capacitors and batteries and when energy is available from.

Working Live

To maximize safety, it is always important to perform the maximum amount of HV rework in the de-energized state.
When it is necessary to work with HV equipment while energized or to verify whether HV is present, the utmost care and safety procedures must be utilized including:
(1) Wearing appropriate PPE with protector gloves over top of the HV rubber gloves
(2) Ensure all personnel, except the Checker and Monitor/Recorder, are clear of the vehicle
(3) Kneeling or standing on HV insulated mat

Energizing & De-energizing Procedure

It is critical that before any HV system is energized that a visual check be performed to ensure that all possible HV compartments are closed and there is no debris, tools or test equipment lying on HV terminations.

If there is a certain sequence of energizing and de-energizing the HV system, then all personnel involved must be trained in this sequence. (CAUTION: Never try to connect or disconnect circuit components such as cables, fuses, connectors, etc. while there is current flowing in the circuit.)

Electrical Injuries

Electrical injuries should be immediately reported to the first aide personnel and the supervisor. Other than electrostatic shocks, even non-injurious electrical shocks should be reported to the supervisor. These should be immediately investigated and documented to determine the cause and prevent the occurrence in the future.

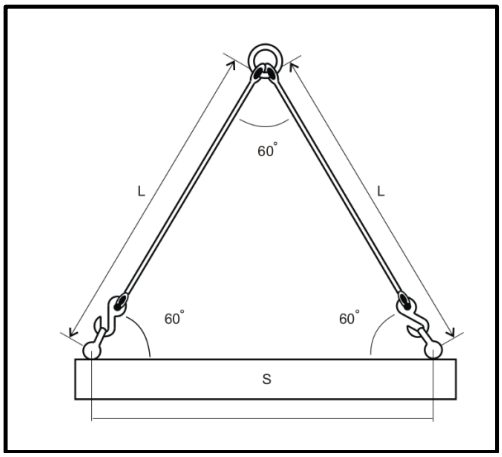
Juice Box ESS Enclosure Removal Beam

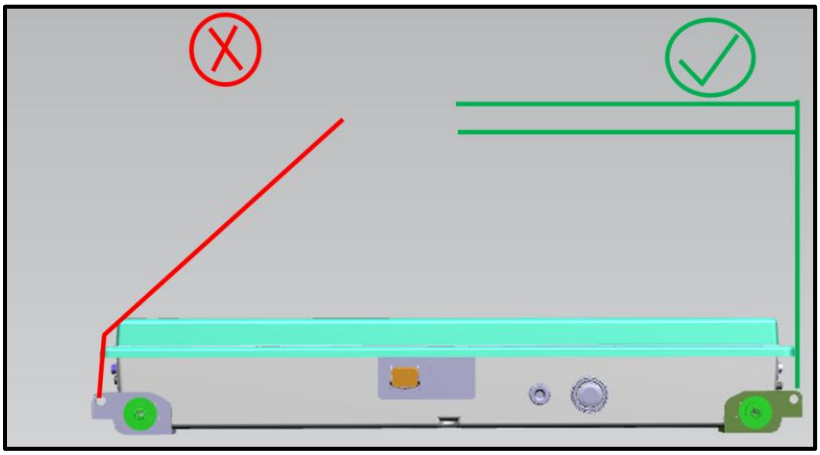
CAUTION: **It is important that technicians involved in hoisting and rigging are trained in both safety and operation procedures. Hoisting equipment should only be operated by trained personnel. Do not use equipment that is suspected to be unsafe or unsuitable, until a competent person has verified its suitability. The rated working load limits apply only to equipment and hardware in good condition. Any equipment damaged in service should be taken out of service and repaired or destroyed.**

CAUTION: **Do not attempt to lift the ESS enclosure without the gasket and lid attached and all fasteners applied and properly torqued.**

☞ **NOTE: It is strongly recommended to use a JB removal beam (NF PN: 6485763) with a forklift adapter boom (NF PN: 6485514) to lift the ESS assembly to ensure safe load distribution and avoid damage to the fiberglass lid. Minimum requirement for safe lifting is to use a spreader beam and is also acceptable. See Illustration below for reference.**

☞ **NOTE: Lifting device securement straps should be connected at no less than 60 degrees as shown below to prevent strap damage to the ESS enclosure or connected to a lifting device wider than the ESS unit being removed in a vertical position as shown below to prevent strap damage to the ESS enclosure.**





JB removal beam and forklift adapter tool reference.

PROCEDURE:

Section 1 – Initial Prep Work

1. Set the park brake and chock the wheels.
2. Turn the main battery disconnect and HV interlock switch to the “OFF” position.

⚠ **WARNING:** ***The work detailed in this ITS involves working near exposed High Voltage (HV) compartments, even after the bus has been locked out and tagged out. It is recommended that the service personnel be trained in NFI HV safety practices, such as those included in NFIL Spec 532295 - High Voltage Safety Guidelines & Procedures for New Flyer Battery Bus.***

3. Perform the Lock Out Tag Out and De-Energizing procedures found in the Electrical System Section of the New Flyer Service Manual. See Figure 1.

⚠ **WARNING:** ***ENSURE MSD DUMMY PLUGS AND ARC FLASH GLOVES ARE AVAILABLE PRIOR TO STARTING ANY HV DISASSEMBLY***

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

4. Drain the coolant from the upper and rear ESS systems.

Note: If instructions are required a copy of the coolant drain and fill procedures may be viewed in the SR service manual.

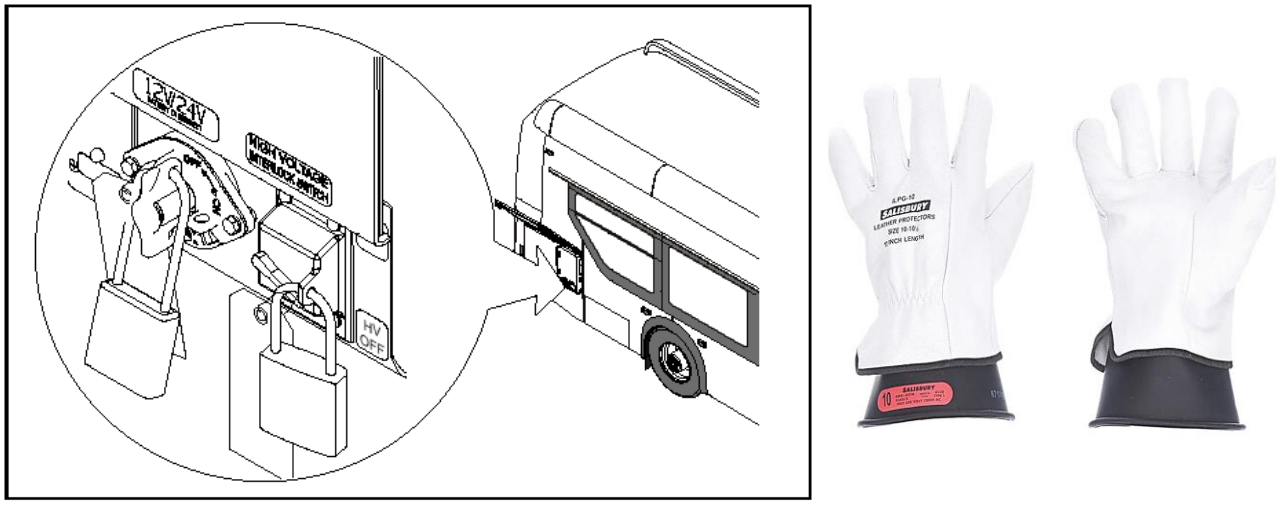


Figure 1: HV and LV Disconnect Switch Location and Arc Flash Glove Reference

Section 2 – Upper ESS Assembly Removal.

5. Gain access to the upper side screens. Remove the hardware in the top of the side screens and tilt outwards to access the ESS enclosures. Set the mounting hardware aside for re-installation. See Figure 2.
6. Locate the MSD's and remove them from each ESS unit and install a dust cover. See Figure 2.
7. Remove the Pos and Neg HV cable quick disconnects from the ESS units. Remove the ESS Ground cable and set washers aside for re-installation. See Figure 2.

☞ **NOTE: When ground cable is secured with a nylock nut or bolts longer than ½" discard locknut and bolts.**

☞ **NOTE: Bolts ½" in length may also be set aside for re-installation.**

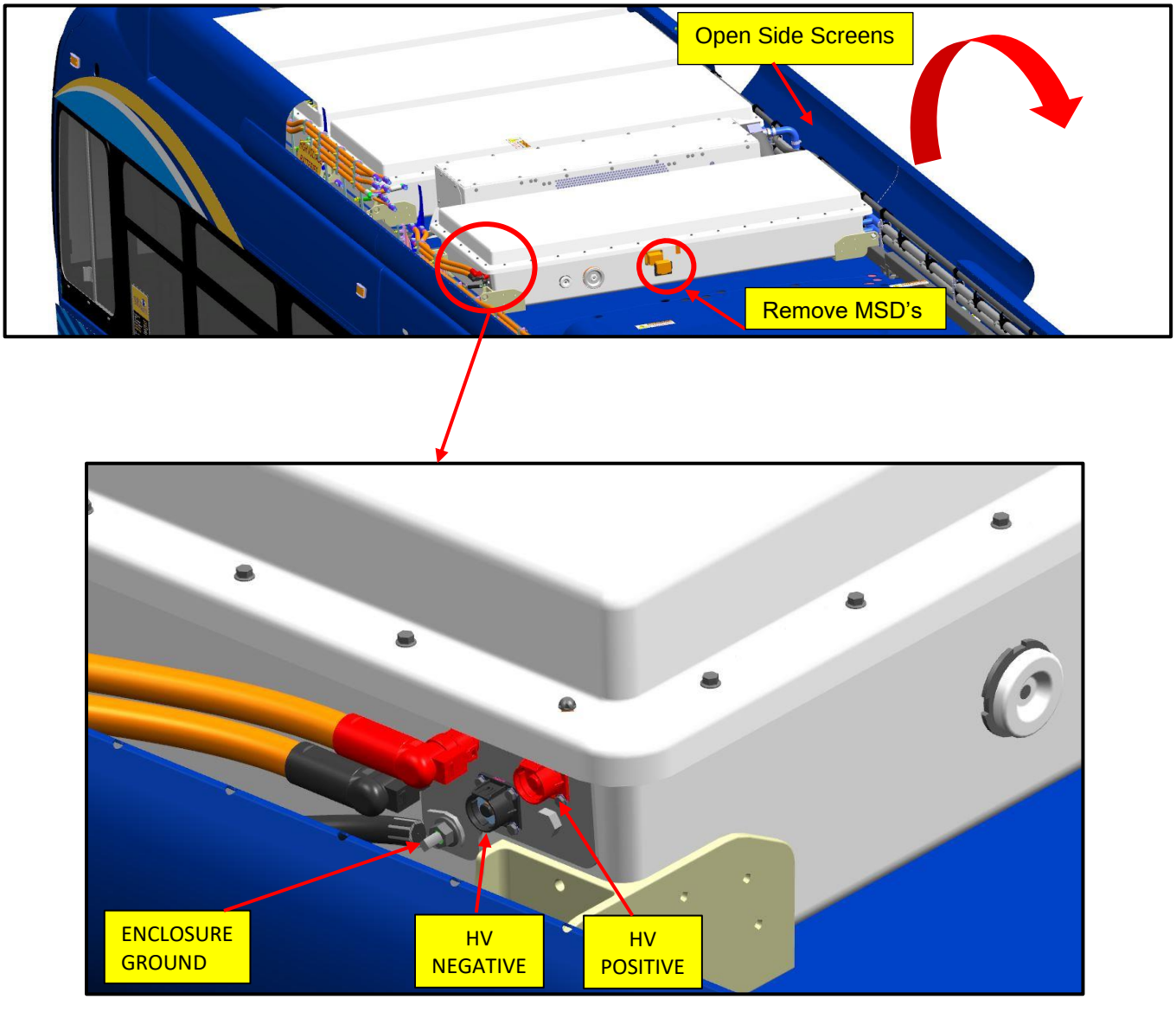


Figure 2: Side Screen and Upper ESS MSD Location Reference.

8. Remove HV charge rail as required. Move to following page if not required. HV cable clamps from street side of charge rail and disconnect HV cable quick disconnects from charge box. Secure HV cables out of the way for charge rail assembly removal. See Figure 3A.
9. Disconnect WLAN antenna from bus harness. Secure WLAN harness for charge rail assembly removal. See Figure 3A.

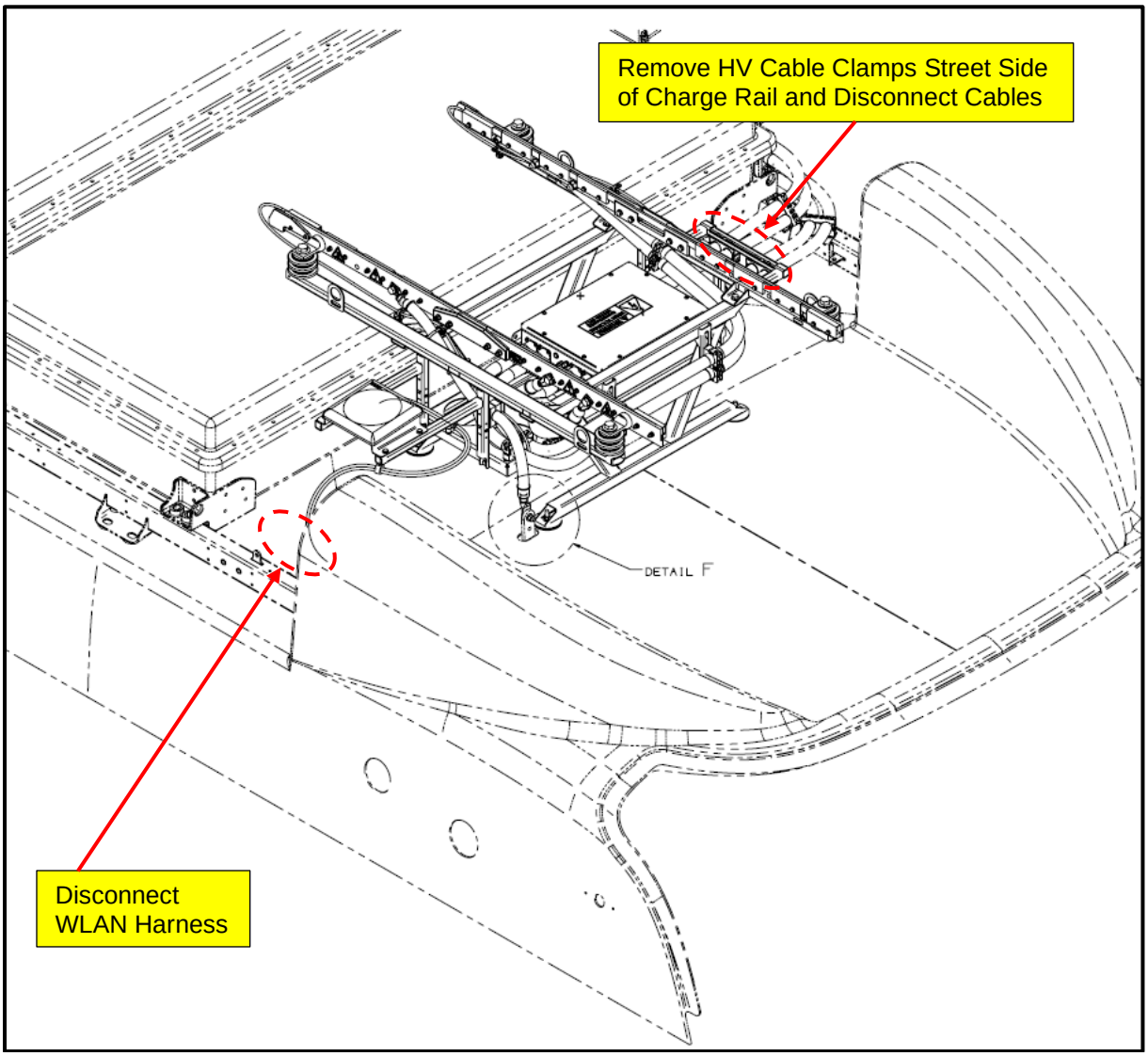


Figure 3A: Charge Rail Removal Location Reference.

10. Remove curb side and street side charge rail heater clamps and wiring securement and set clamps and hardware aside for re-installation.
11. Disconnect the curb side and street side heater wiring from charge rails and set hardware aside for re-installation. See Figure 3B.
12. Remove the low voltage harness connections and clamps to the DC charge box and set camps and hardware aside for re-installation. See Figure 3B.
13. Disconnect the temp sensor from under the DC charge rail box on the street side. See Figure 3B.
14. Secure the harnesses disconnected out of the way for charge rail assembly removal.

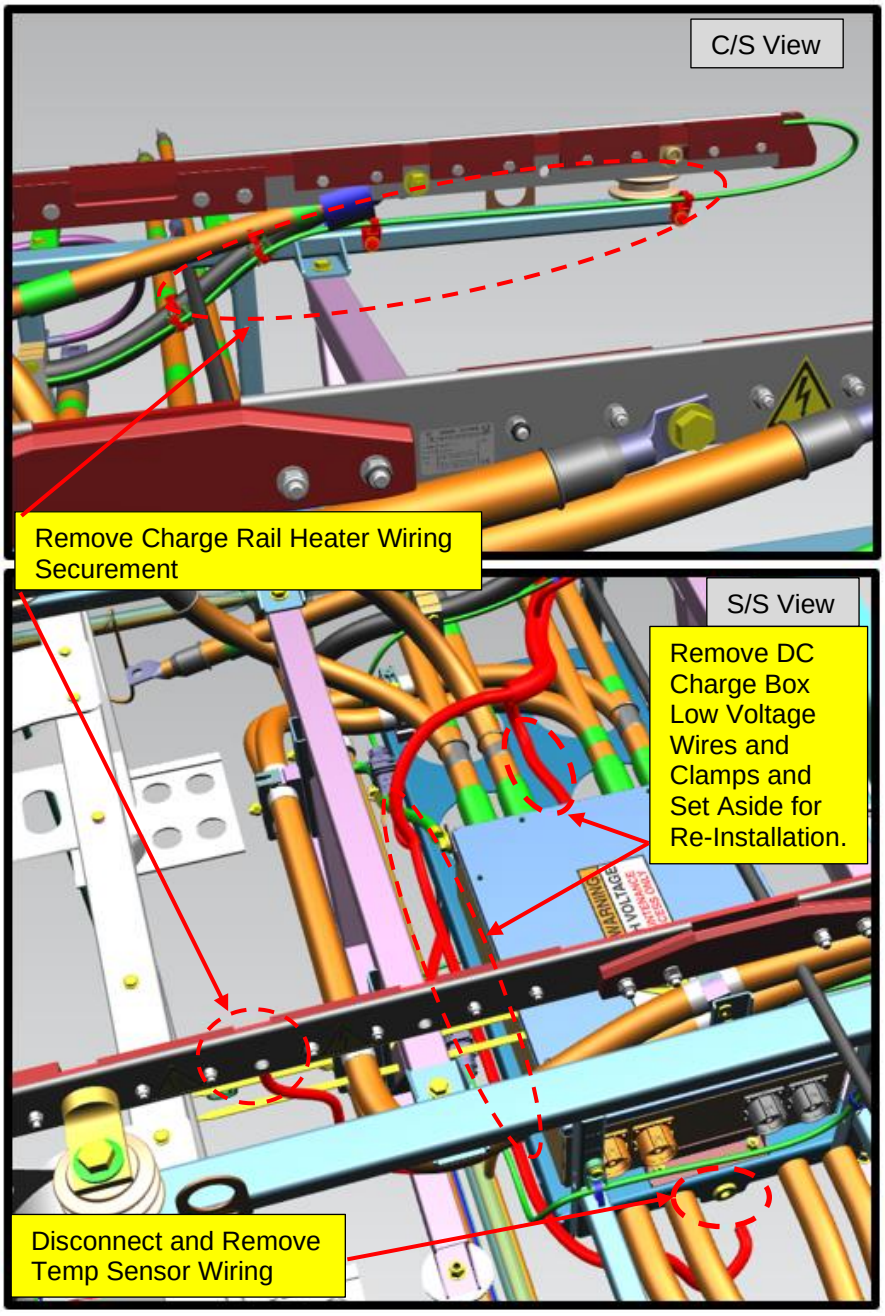


Figure 3B: Charge Rail Removal Location Reference.

15. Disconnect the charge rail ground cable to the body ground stud and set mounting hardware aside for re-installation. See Figure 3C.
16. Disconnect the charge rail box ground to the body ground stud and set mounting hardware aside for re-installation. See Figure 3C.
17. Remove the charge rail assembly mounting hardware to the roof structure and set hardware aside for re-installation. See Figure 3C.
18. Connect an appropriate lifting device to the charge rail assembly and remove the assembly. See Figure 3C.

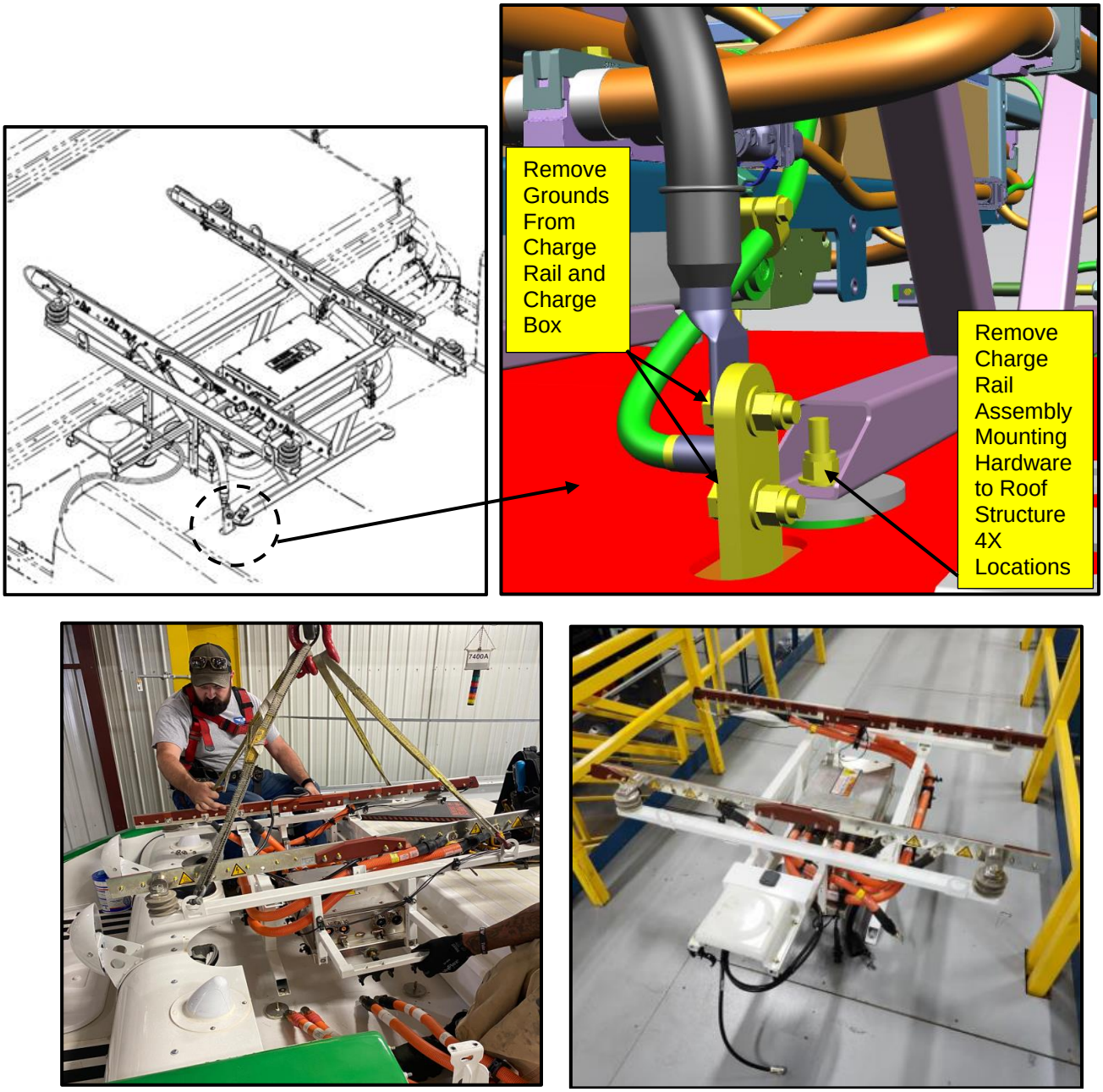


Figure 3C: Charge Rail Removal Location Reference.

19. Locate the coolant line supply and return hose connections at each ESS. Loosen the coolant hose clamps and disconnect the hoses from each ESS unit. Set clamps aside for re-installation. Install coolant line caps on the ends of each fitting. See Figure 4A.
20. Each ESS has a specific size restrictor/orifice based on ESS location that needs to be removed and re-installed in the replacement unit. Remove the orifice at each ESS unit located in the inlet line shown below and set aside at each unit location. Re-install the restrictor/orifice in the replacement unit for the same ESS location. See Figure 4A. (Orifices only in upper ESS Units)
21. Disconnect the LV wiring connectors from each ESS unit and secure out of the way for ESS removal. See Figure 4A.

☞ **NOTE: Ensure to use absorber material to capture any coolant lost during removal.**

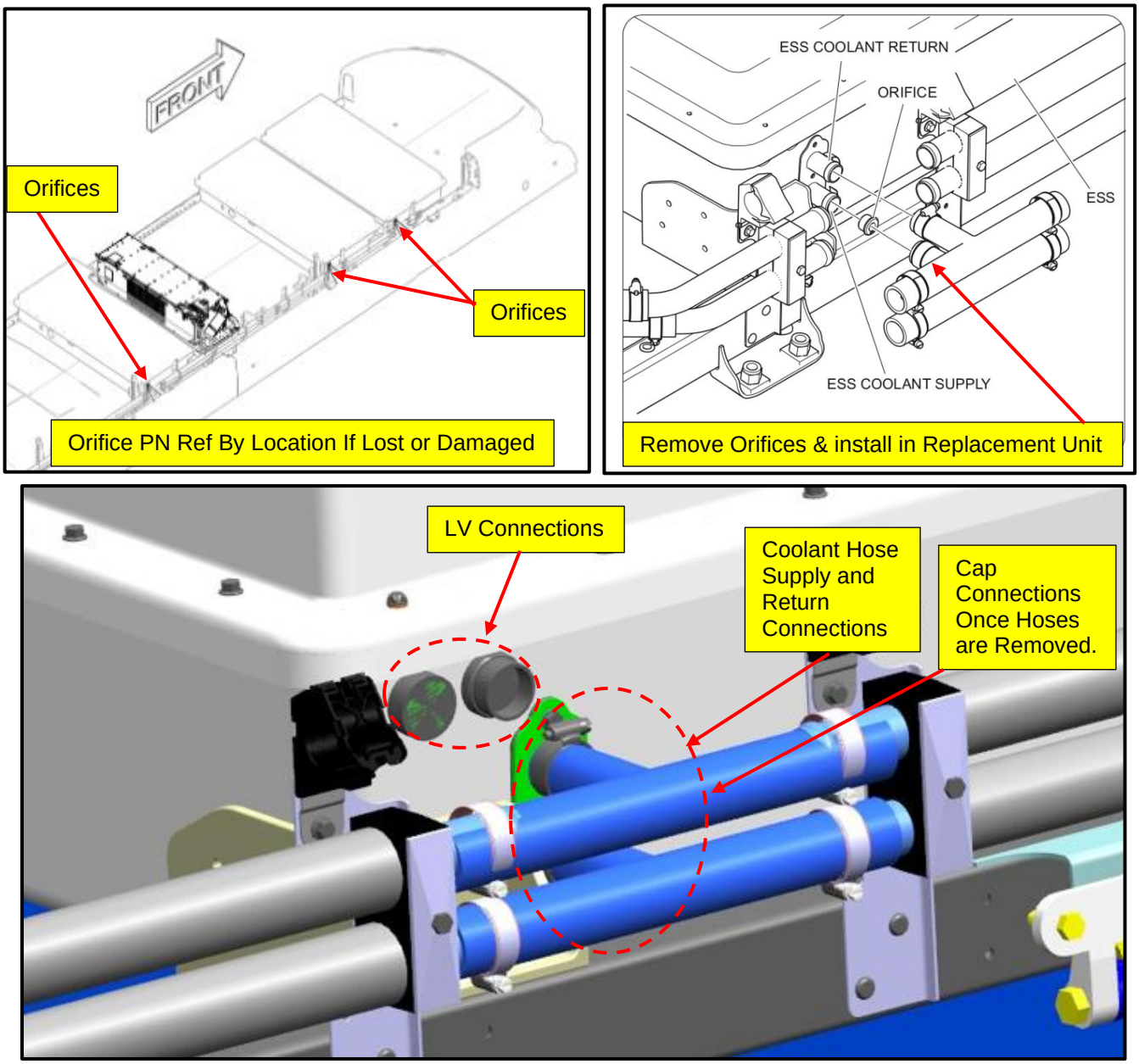


Figure 4A: Upper ESS Coolant Line Removal and Upper ESS Assembly Lifting Device Location Reference.

22. Connect an appropriate lifting device to the ESS unit being removed. See Figure 4B.

☞ **NOTE: Lifting device securement straps should be connected at no less than 60 degrees as shown below to prevent strap damage to the ESS enclosure or connected to a lifting device wider than the ESS unit being removed in a vertical position as shown below to prevent strap damage to the ESS enclosure.**

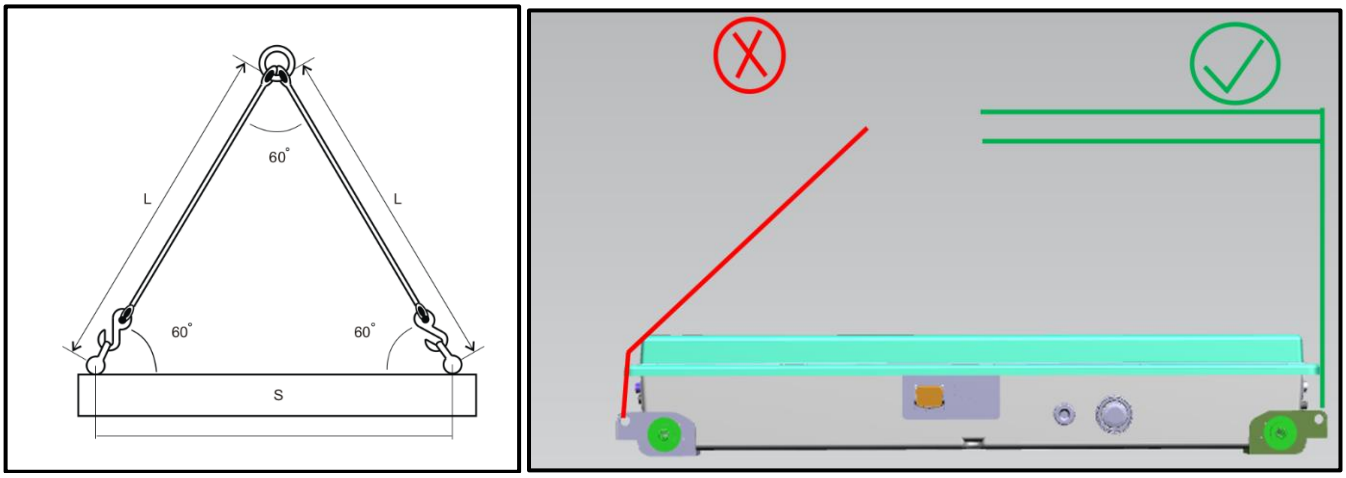


Figure 4B: Upper ESS Coolant Line Removal and Upper ESS Assembly Lifting Device Location Reference.

23. Locate ESS unit mounting hardware. Remove mounting bolts 8X each unit and set aside for re-installation. See Figure 5.
24. Carefully remove the ESS units and place them on an appropriate shipping stand.

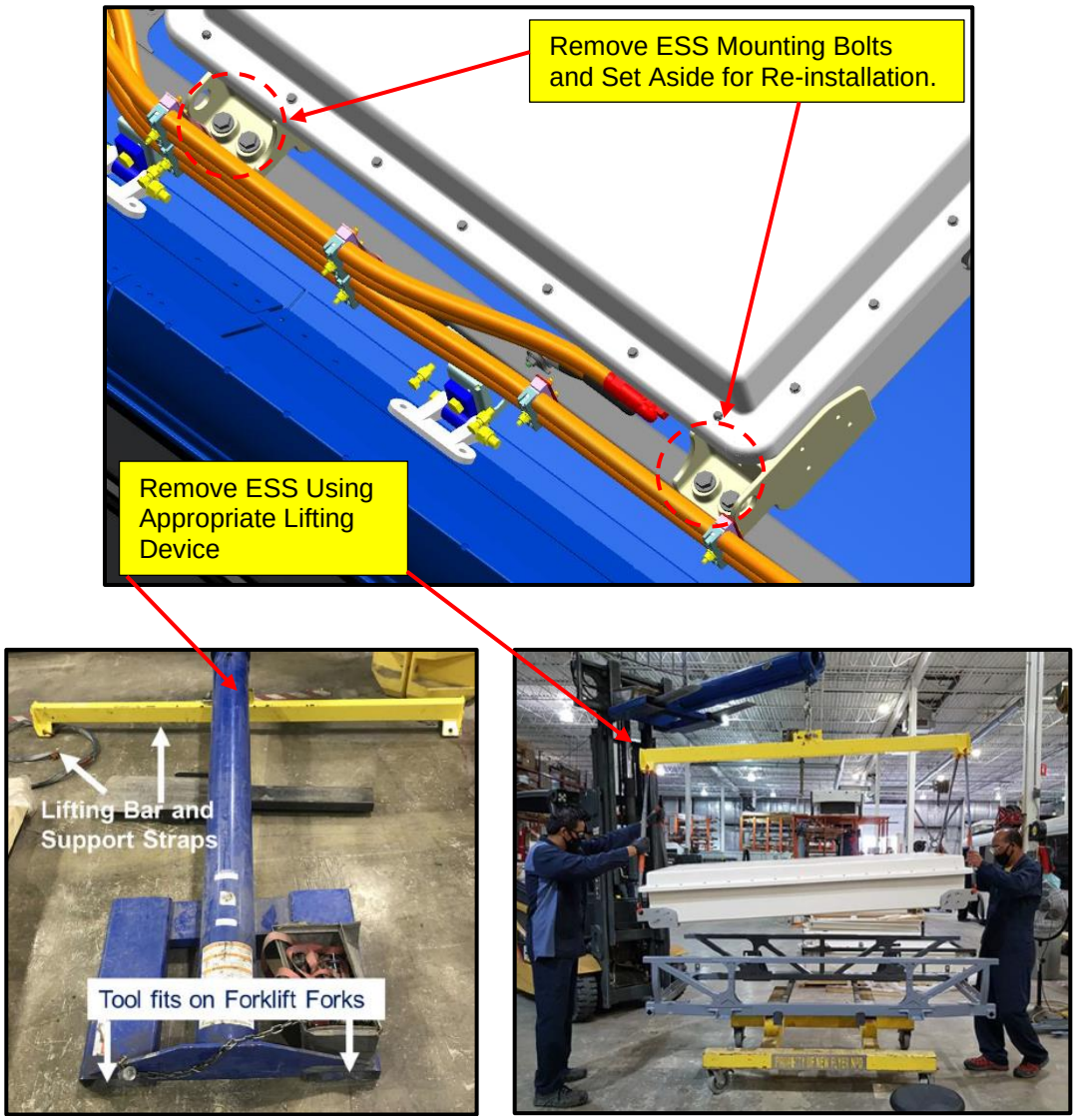


Figure 5: Upper ESS Assembly Removal Location Reference.

25. Locate the serial number documentation form in Appendix A of this ITS or use the electronic version if provided by your RPSM.
26. Then locate the serial number plates on the side of each unit being removed and installed and fill out the form and return to the RPSM for warranty and S/N tracking removed and installed units. See Figure 6.

☞ **NOTE: Illustration for 40 and 60 FT units.**

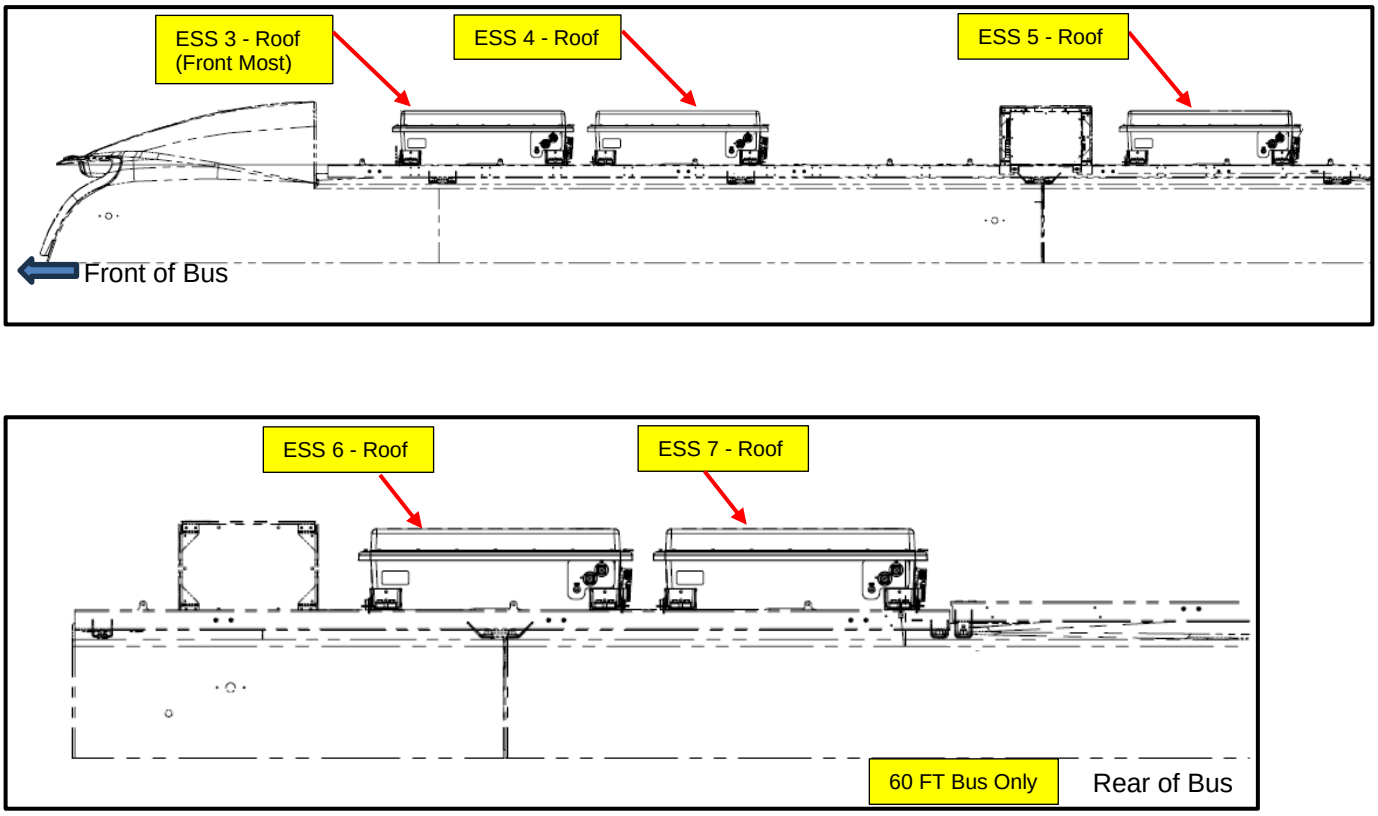


Figure 6: Upper ESS Assembly Serial Number Documentation Location Reference.

27. Inspect the ESS units removed and to be installed for the correct ground cable securement.
    A. If a ground stud as shown below is installed no further action is required. See Figure 7.
    B. If a bolt is installed as shown below check the length of the bolt. If the bolt is ½ IN long no further action is required. See Figure 7.
    C. If a bolt is installed and the length is greater than ½" notify the RPSM and New Flyer Service Engineering immediately. See Figure 7.

☞ **NOTE: Do not install a unit that has had a bolt longer than ½" installed without contacting Service Engineering for guidance.**

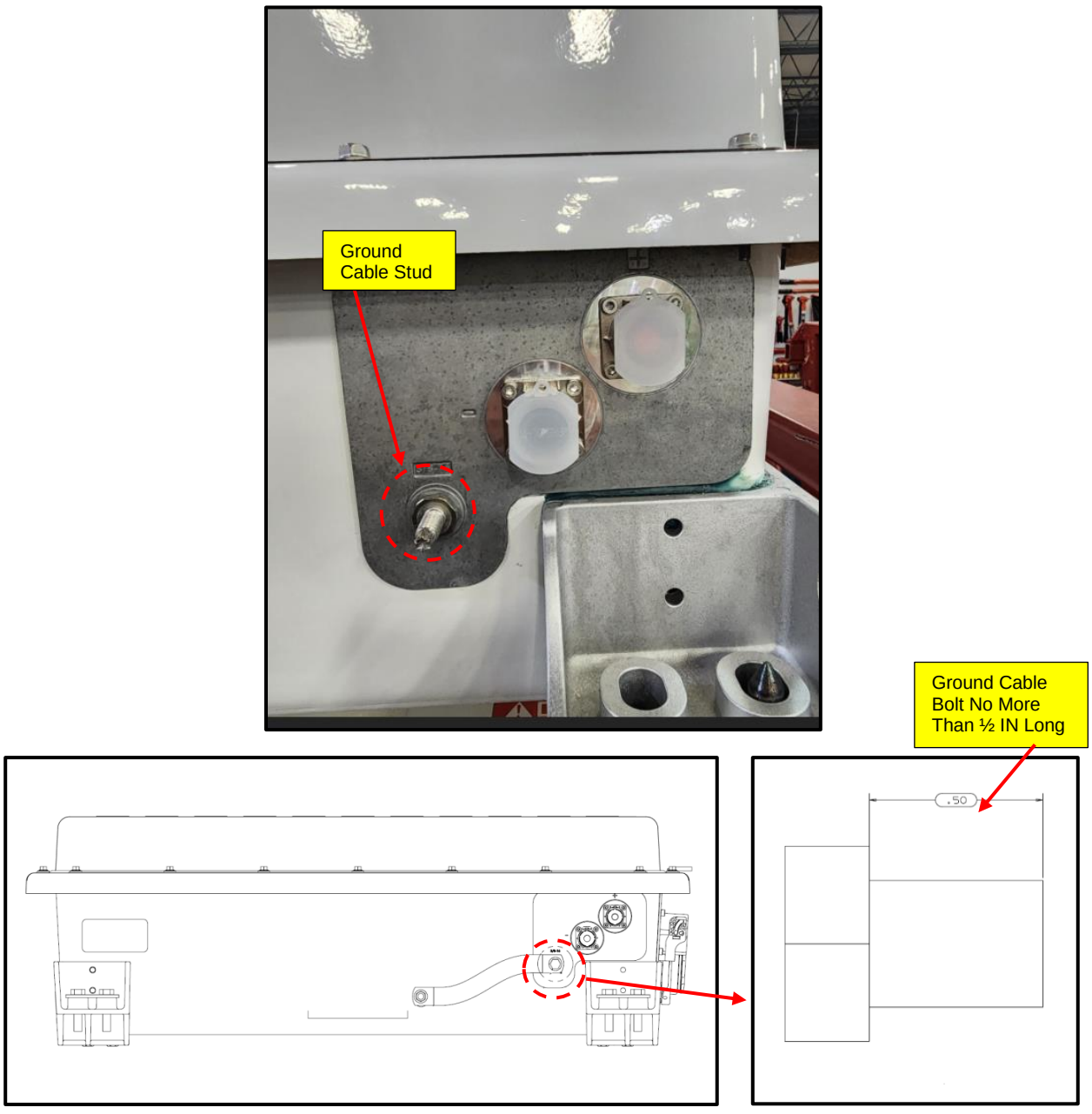
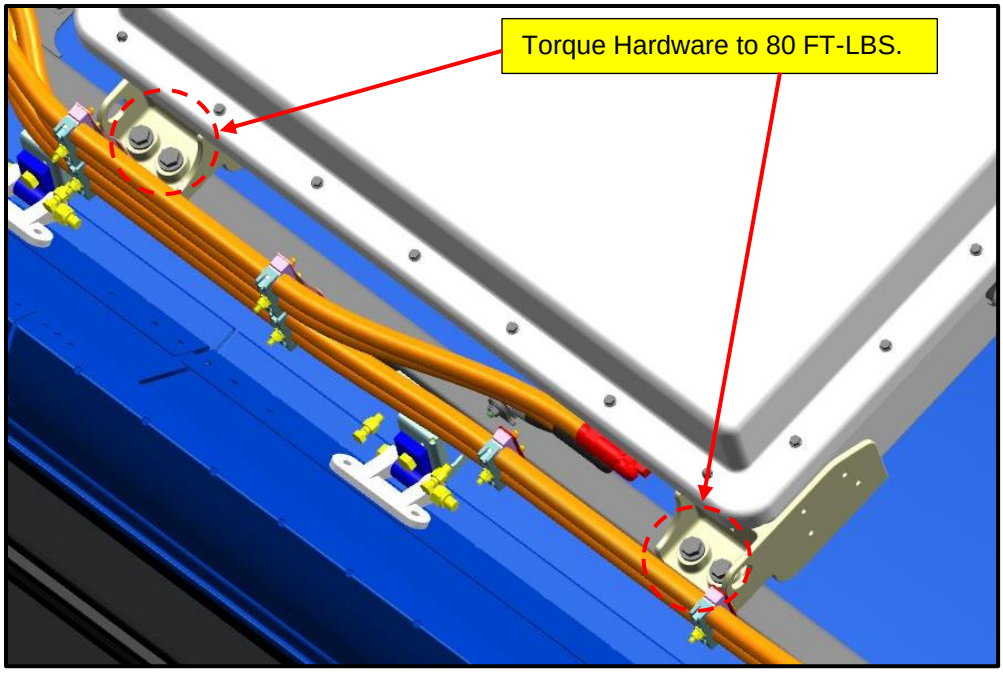


Figure 7: Upper ESS Assembly Ground Stud Inspection Location Reference.

28. Locate the Replacement ESS to be installed and only after the serial number for each ESS has been documented for the installation location to be installed and the ground stud inspection has been completed should the following installation steps be taken.
29. Place the Replacement ESS in place on the roof and install the previously removed hardware plates and secure with the existing bolts applying one or two drops of item #1 Loctite to their threads and torque to 80 FT-LBS. Apply torque marks after torquing. See Figure 8.



Item	Part Number	Description
1	081034	Loctite -243 Medium

Figure 8: Upper ESS Assembly Installation Location Reference.

30. Locate the coolant line supply and return hose connections at each ESS and re-install the restrictor/orifice in the inlet hose. Reconnect the coolant hoses and install the existing clamps from each ESS unit. Torque to 80 IN-LBS. Allow clamps to rest for 30 min and re- torque to 80 IN-LBS. Apply torque marks after torquing. See Figure 9.
31. Re-connect the LV wiring connectors from each ESS unit. See Figure 9.

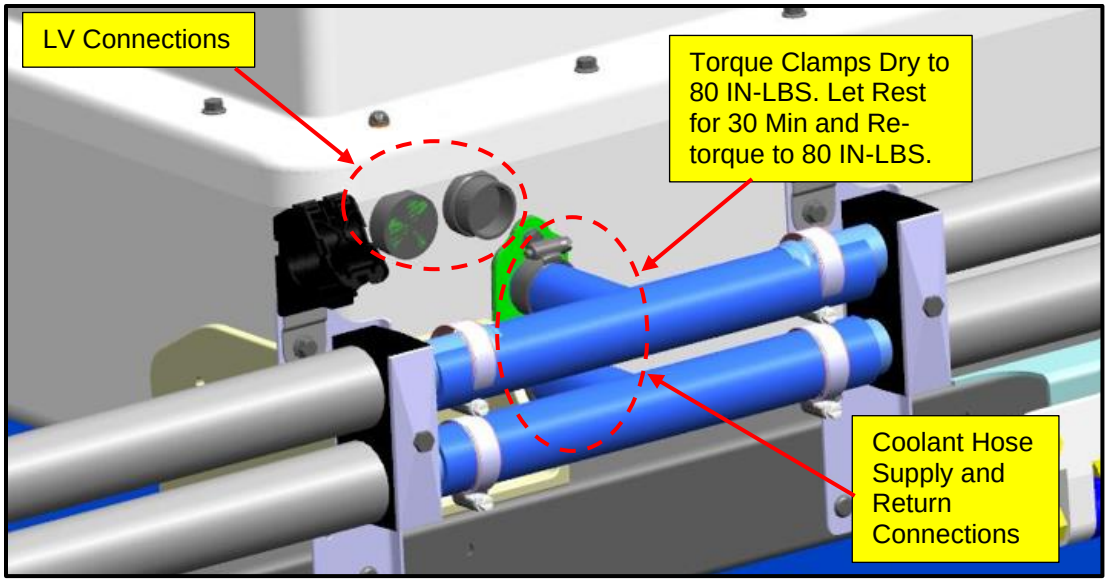


Figure 9: Upper ESS Coolant Line and LV Re-connection Location Reference.

32. Connect the ground cable to the ESS unit using the correct hardware.
    A. For units with a ground stud application place cable on the ground stud with the existing flat washer and Nylon nut Ref item #3 and torque nut to 17 FT-LBS. Apply torque marks after torquing. See Figure 10.
    B. For units with the ground cable bolt mounting secure the ground cable to the unit with the existing washer and ½ IN bolt ref item #4 and Torque to 22 FT-LBS. Apply torque marks after torquing. See Figure 10.

☞ **NOTE: Do not use mounting bolts longer than ½ IN.**

☞ **NOTE: Ensure to validate the torque based on stud or bolt application.**

☞ **NOTE: Apply item #6 Anti-corrosion compound to ground connections.**

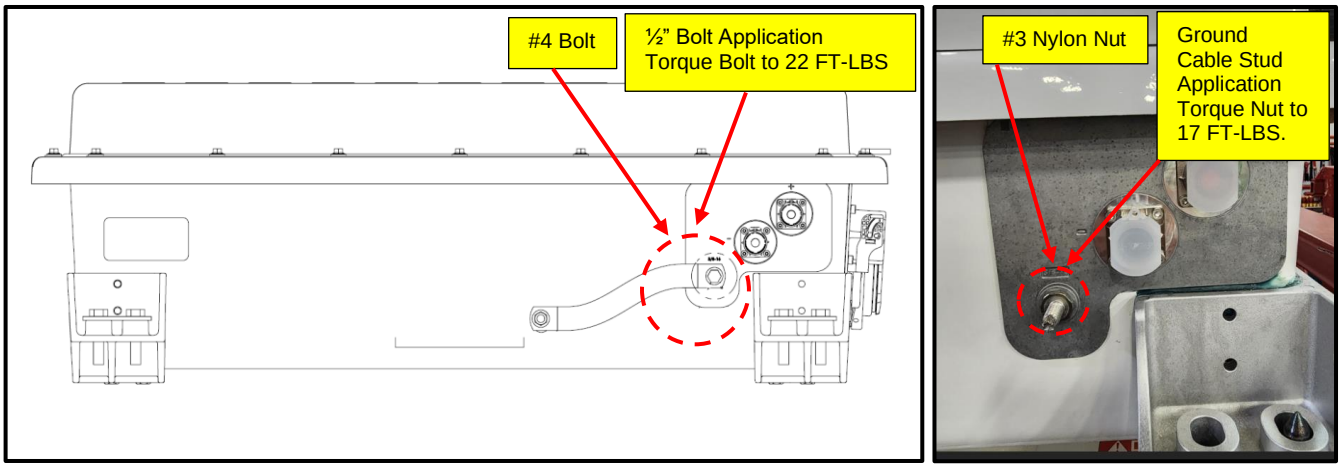
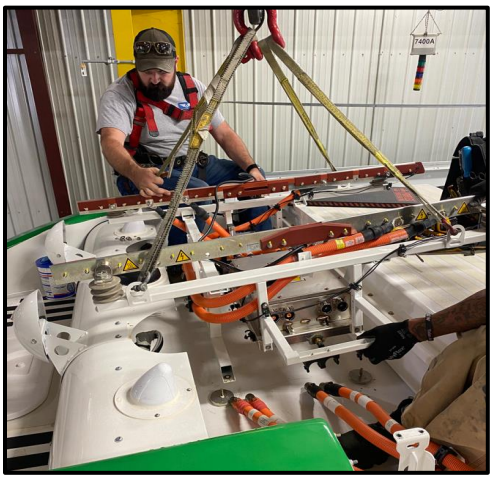
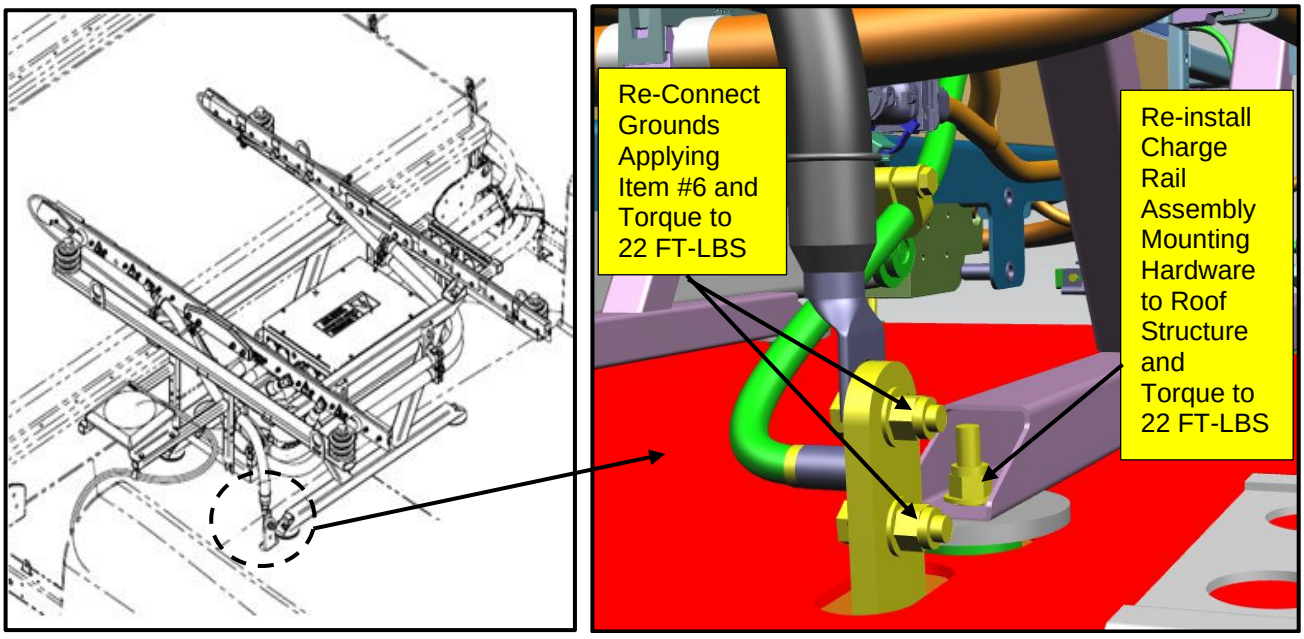


Figure 10: Upper ESS Assembly Ground Stud and HV Cable Re-installation Location Reference.

33. Place the charge rail assembly on the roof and re-install the existing flat washer and item #3 nylock nuts mounting to the roof structure and torque to 22 FT-LBS. Apply torque marks after torquing. See Figure 11.
34. Re-connect the charge rail ground cable to the body ground using existing washers and item #3 nylock nuts and torque to torque to 22 FT-LBS. Apply torque marks after torquing. Applying item #6 Anti-corrosion compound. See Figure 11A.
35. Re-connect the charge rail box ground to the body ground using existing washers and item #3 nylock nuts and torque to torque to 22 FT-LBS. Apply torque marks after torquing. Applying item #6 Anti-corrosion compound. See Figure 11A.

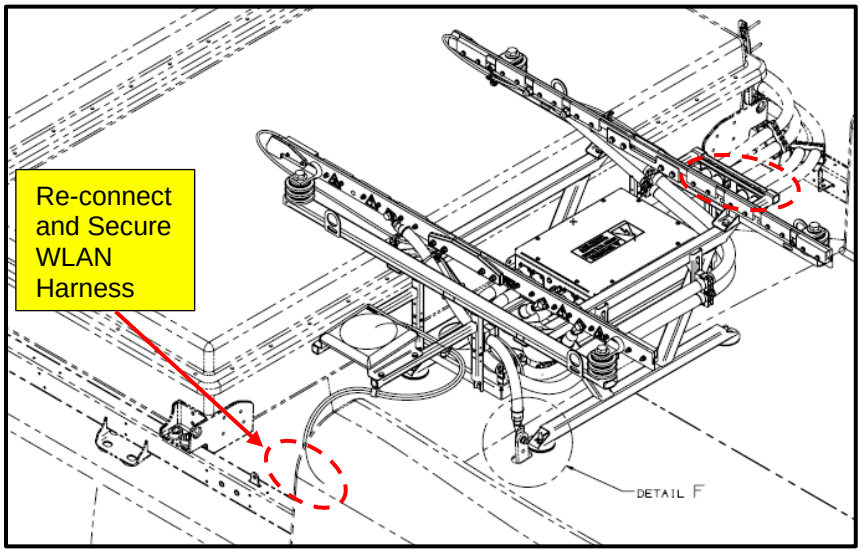


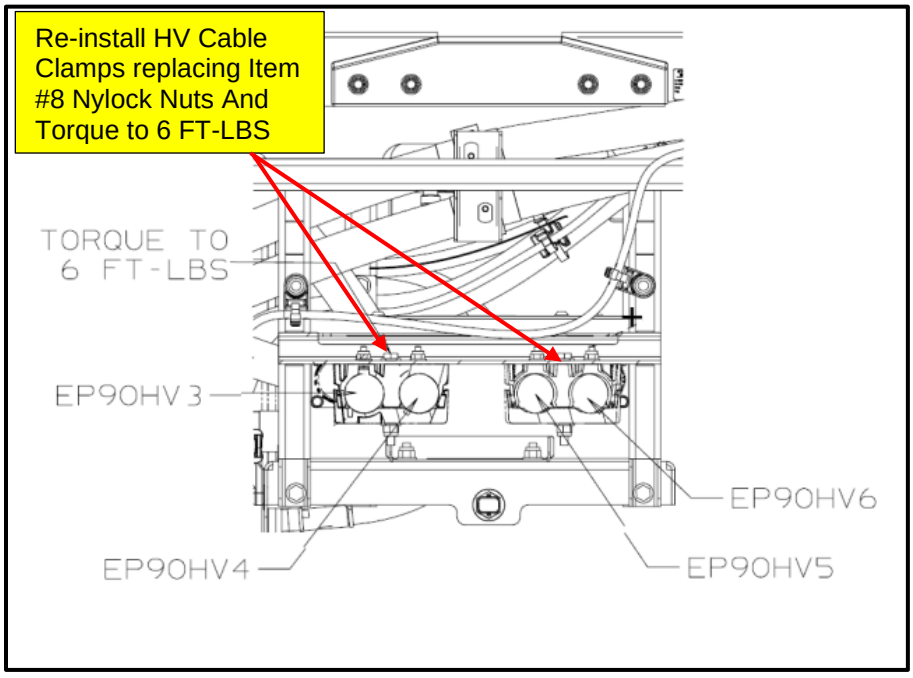


Item	Part Number	Description
3	42N06000	Nut 3/8-16 UNC Nylon Lock SST
6	8111767	Anti – Corrosion Compound NYK-77

Figure 11A: Charge Rail Installation Location Reference.

36. Re-connect HV cable quick disconnects on the street side to appropriate charge box receptacles. See Figure 11B.
37. Re-connect and secure the WLAN antenna to the bus harness. See Figure 11B.
38. Re-install the HV cable clamps on the street side of charge rail with the existing hardware and the nylon lock nuts item #8 and torque hardware to 6 FT-LBS. Apply torque marks after torquing. See Figure 11B.

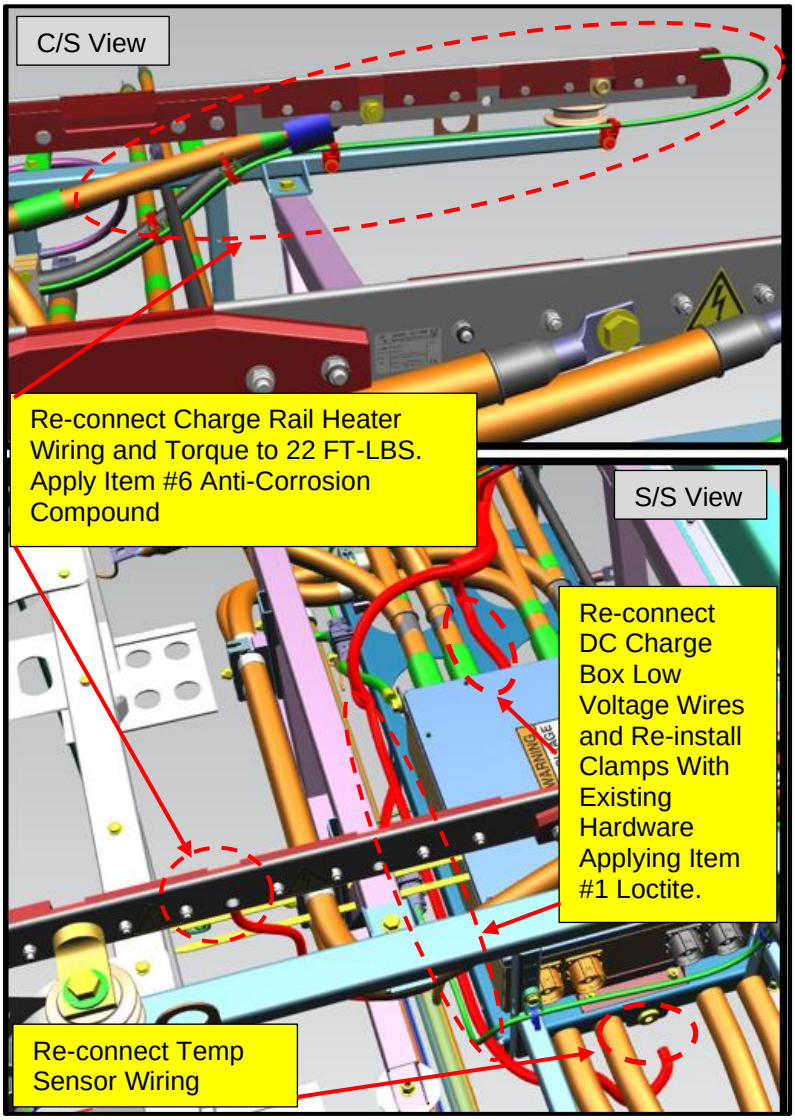




Item	Part Number	Description
8	42N04000	Nut Nylon Lock ¼-20

Figure 11B: Charge Rail Installation Location Reference.

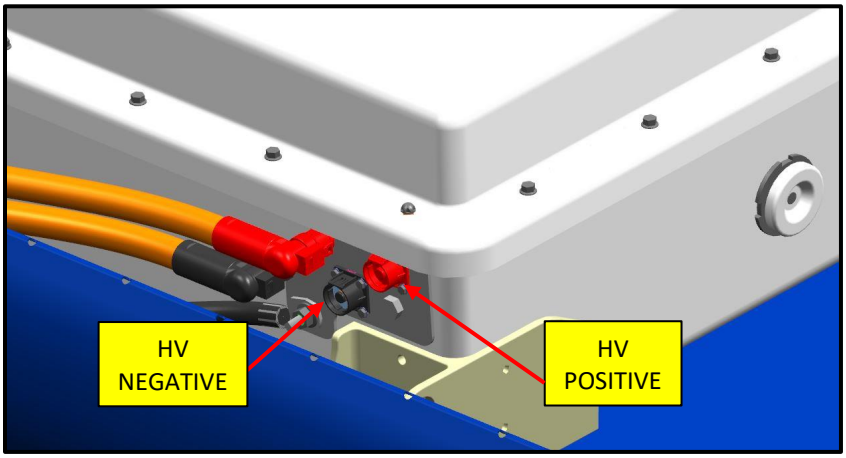
39. Re-connect the curb side and street side heater wiring to the charge rails using the existing hardware applying item #6 Anti-corrosion compound and torque to torque to 22 FT-LBS. Apply torque marks after torquing. See Figure 11C.
40. Re-connect the temp sensor from under the DC charge rail box on the street side and all low voltage wiring. See Figure 11C.
41. Re-install clamps on low voltage harnesses with existing hardware applying one or two drops of item #1 Loctite to the fastener threads.
42. Re-secure harness with item #7 TyRaps as required.

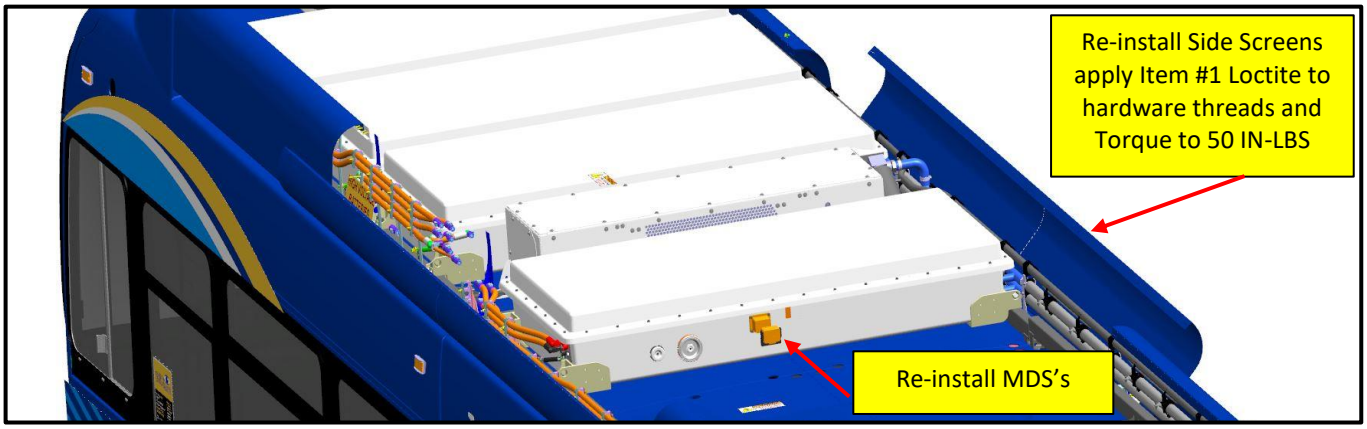


Item	Part Number	Description
1	081034	Loctite -243 Medium
6	8111767	Anti – Corrosion Compound NYK-77
7	5955945	TyRap – 14 IN Black

Figure 11C: Charge Rail Installation Location Reference.

43. Re-connect the HV cable quick disconnects to the ESS unit. See Figure 12.
44. Close the side screen panels and re-install the existing hardware applying one or two drops of item #1 Loctite to their threads and torque to 50 IN-LBS. Apply torque marks after torquing.
45. Re-install MSDs.





Item	Part Number	Description
1	081034	Loctite -243 Medium

Figure 12: Upper ESS HV Cable Connection and Side Screen Location Reference.

Section 3 – Rear ESS Assembly Removal.

46. Open the rear ESS access door and locate and remove the MSDs from each ESS unit and install a dust cover. See Figure 13.
47. Open streetside and curbside upper side corner panels. Remove the gas springs supporting the ESS access door on the bus side and raise the access door in the up position. Tyrap the door to the bracket inside the streetside and curbside side upper corner panels.
48. Support the rear bumper with a forklift, remove the four retaining bolts, and remove the rear bumper and set mounting hardware aside for re-installation. See Figure 13.
49. Remove the lower corner pillars (including turn signals and brake lights) and brackets and set mounting hardware aside for re-installation. See Figure 13.

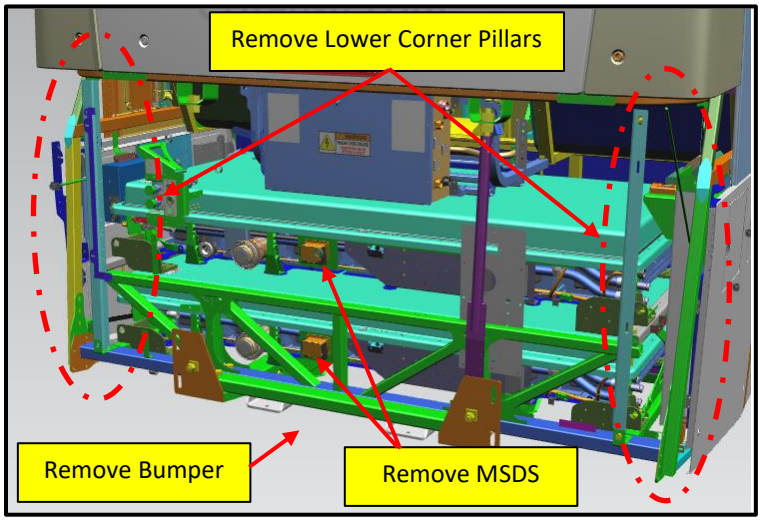


Figure 13: Lower Corner Pillars and Rear Door Removal Location Reference.

50. Disconnect HV cables from both ESS packs. Note: Positive and negative connections are color coed by color when reconnecting. See Figure 14.
51. Secure HV cables out of the way for ESS removal.

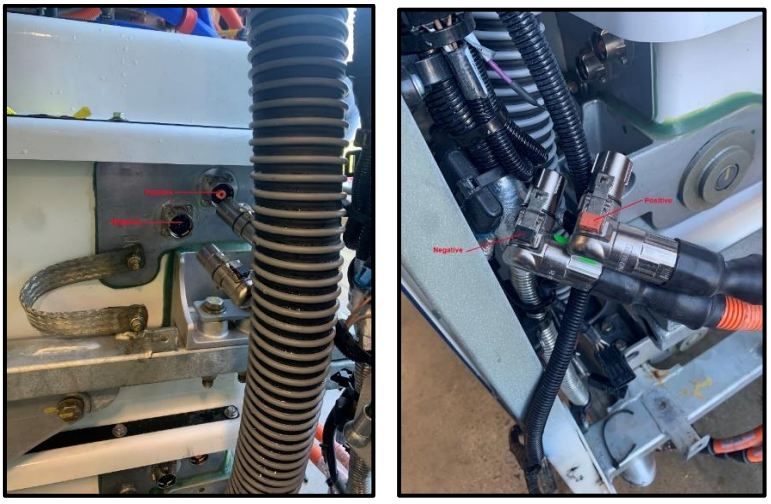


Figure 14: HV Cable Connection Location References.

52. From streetside rear corner, disconnect ESS grounding strap to bus frame. See Figure 15.

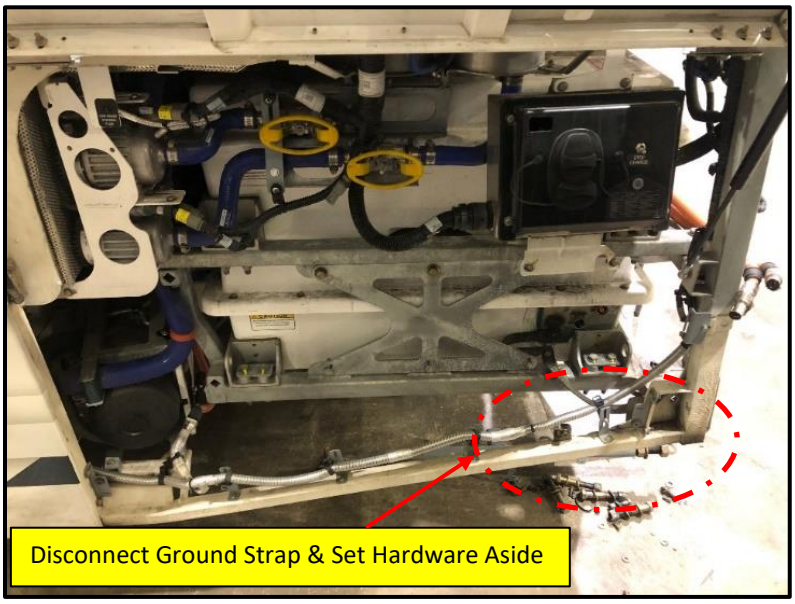


Figure 15: ESS Ground Strap to Bus Frame Location Reference.

53. From the curbside rear of the bus, place suitable coolant catch container under the ¼ turn drain vent valve on the BTMS. Open the vent valve to drain the coolant out of the rear ESS packs. Open the vent valve on the roof at the BTMS module. When the transfer pump starts pulling air through the system open the vent valves at the front of the vehicle. Once completed draining close valves.
54. Remove the clear BTMS vent line from the ESS frame.
55. Disconnect and secure the low voltage harness connected to both ESS packs. Disconnect the supply and return coolant lines from both ESS packs. See Figure 16A. Install coolant line caps on the ends of each fitting.

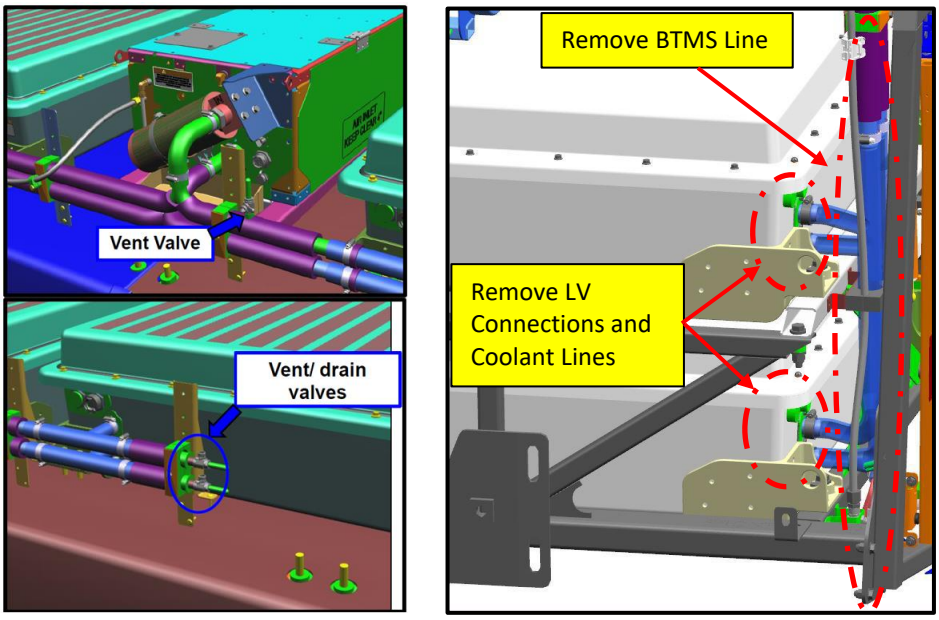


Figure 16A: Low Voltage and Coolant Line Connections Location References.

56. Remove the quick fill port drain hardlines and capture any lost coolant in a suitable container. Place quick fill port mounting hardware aside for re-installation. See Figure 16B.
57. When lines are empty remove both hoses from the hard lines. Set clamps and hardware aside for re-installation. See Figure 16B.

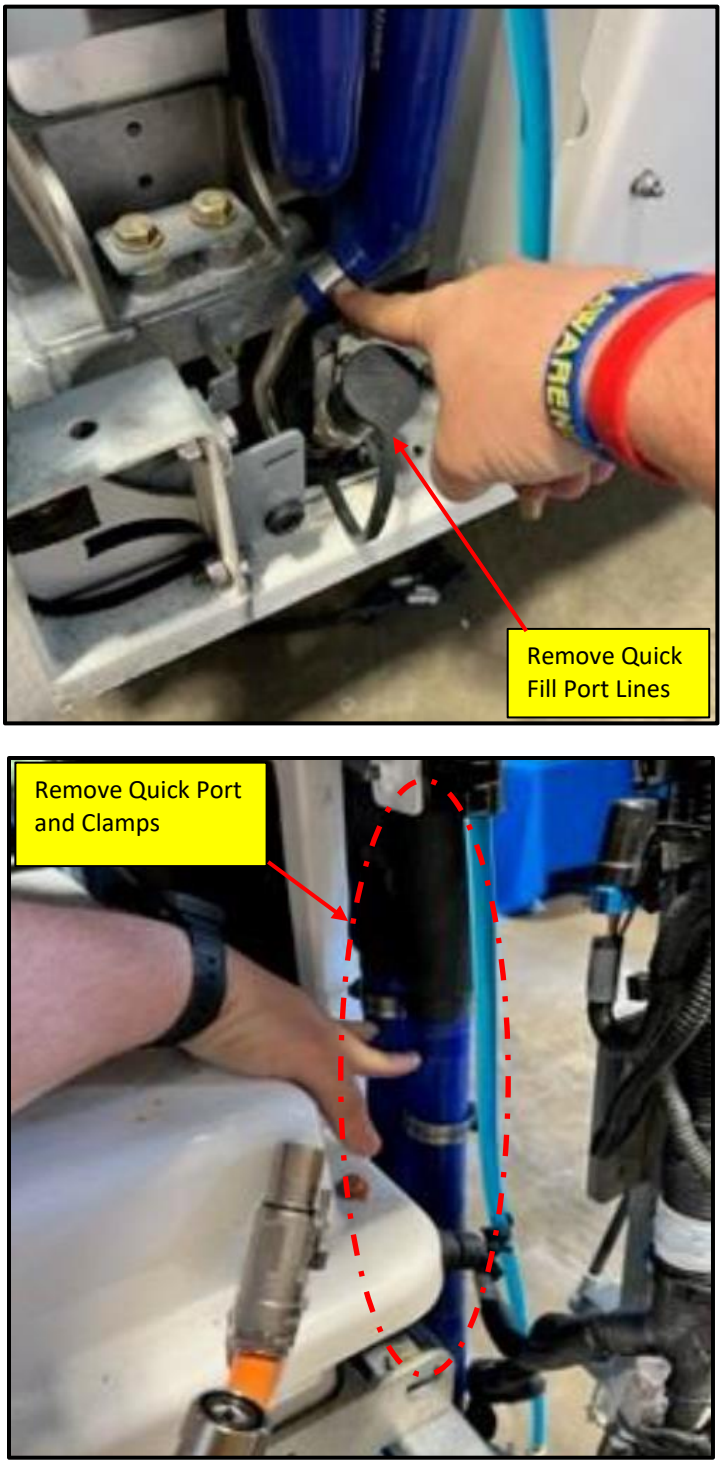


Figure 16B: Low Voltage and Coolant Line Connections Location References.

58. Remove the corner pillar bracket mounting hardware and set aside for re-installation. See Figure 17.
59. Remove the street side and curbside struts as follows: See Figure 17.
    A. Loosen the jam nut and remove the 1” upper nut on the strut.
    B. Remove the ¾” lock nut, bolt, and washers that attach the lower end of the strut to the main frame rail bracket.
    C. Remove the strut itself.
60. Remove the pressure fill assembly mounting hardware and set aside for re-installation. See Figure 17.

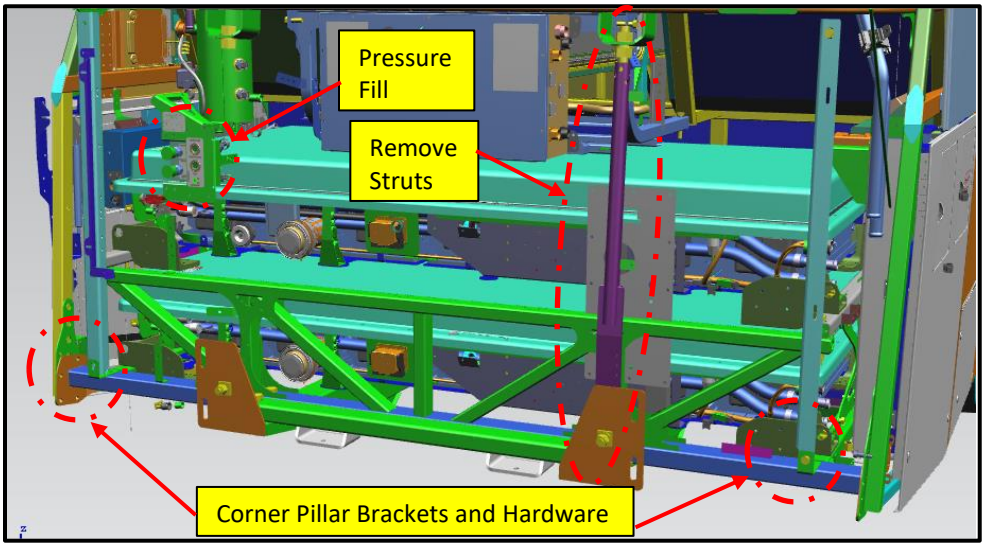


Figure 17: Rear Struts and Side Structure Hardware Removal Location Reference.

61. Using big tyraps, secure both struts along with, HV cables, and AC drain hoses above the ESS packs. See Figure 18.

Figure 18: Struts, HV cables and AC Drain Hose Securement Location References.

62. Support the rear frame members with jack stands. See Figure 19.

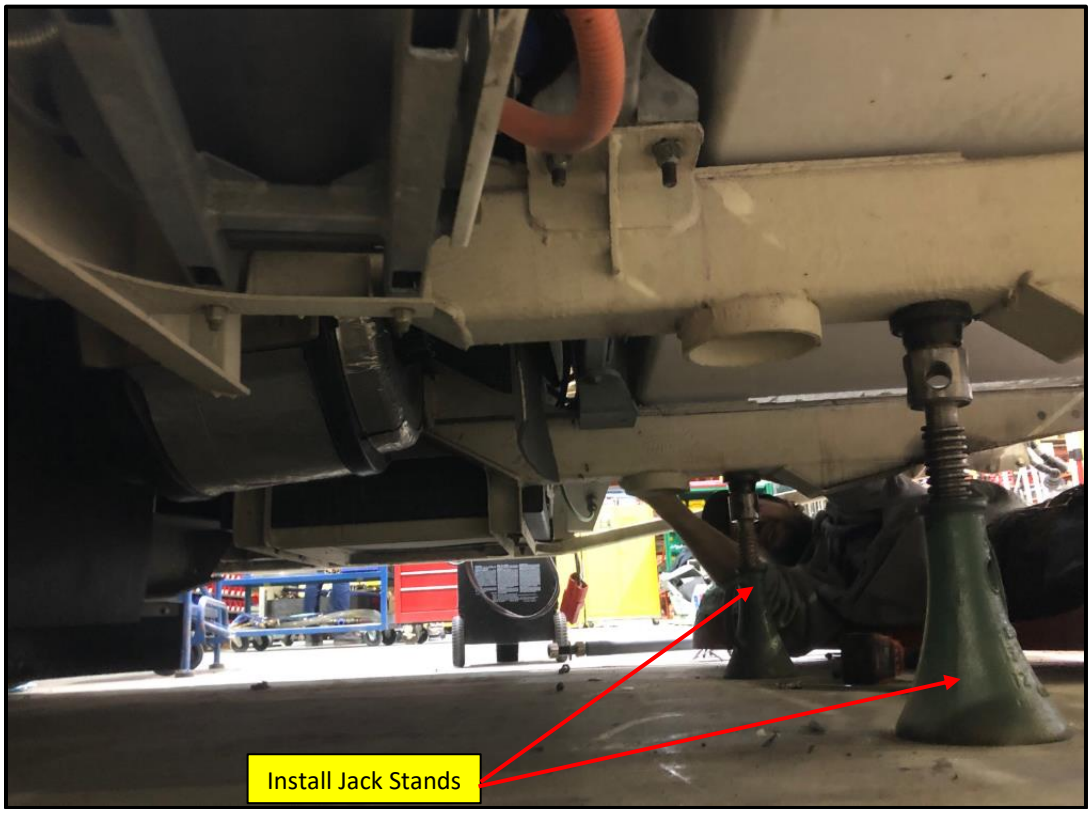


Figure 19: ESS Frame Member Jack Stand Location Reference.

63. Remove the hardware securing the ESS rack on the front and rear chassis. (2 sets each side) Set hardware aside for re-installation. See Figure 20.

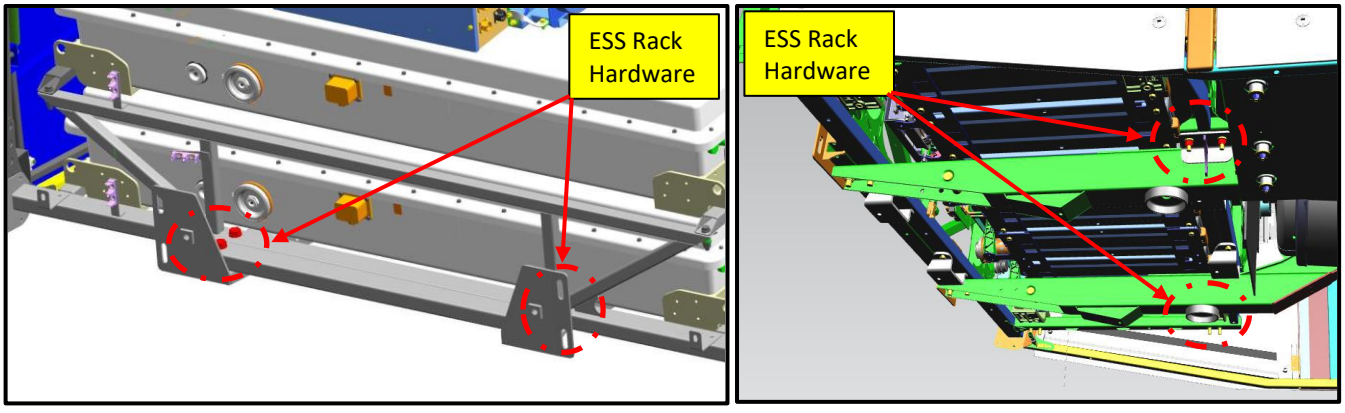


Figure 20: ESS Pack Assembly Mounting Hardware Location Reference.

64. Support the ESS packs with forklift and remove ESS pack assemblies. See Figure 21.

☞ **NOTE: Before removal of the ESS, ensure no harnesses, cables, ground straps, or coolant hoses are connected. Use a spotter to ensure the forks are captured within the pockets on the ESS frame and not resting on the composite ESS enclosure. A c-clamp may be used to ensure the ESS frame does not slide on the forks.**

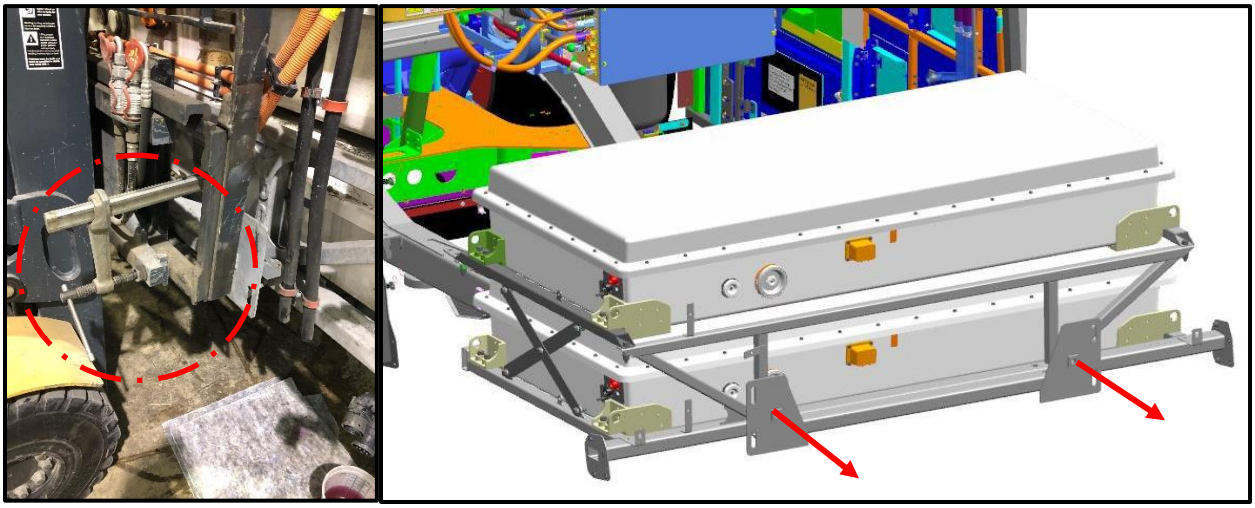


Figure 21: Rear ESS Pack Assembly Removal Location Reference.

65. Move the ESS battery packs to a clear and open workspace. Place block of wood under the ESS battery pack assembly on each side and two in the middle for support. See Figure 22.

Figure 22: ESS Battery Packs Wooden Block Under the Assembly Location Reference.

Section 4: Rear ESS Enclosure Separation.

66. Remove fasteners securing the upper ESS packs to the frame (four fasteners on each side). Set hardware aside for re-installation. See Figure 23.
67. Remove ground strap from ESS pack at ESS frame 2X locations and set hardware aside for re-installation. See Figure 23

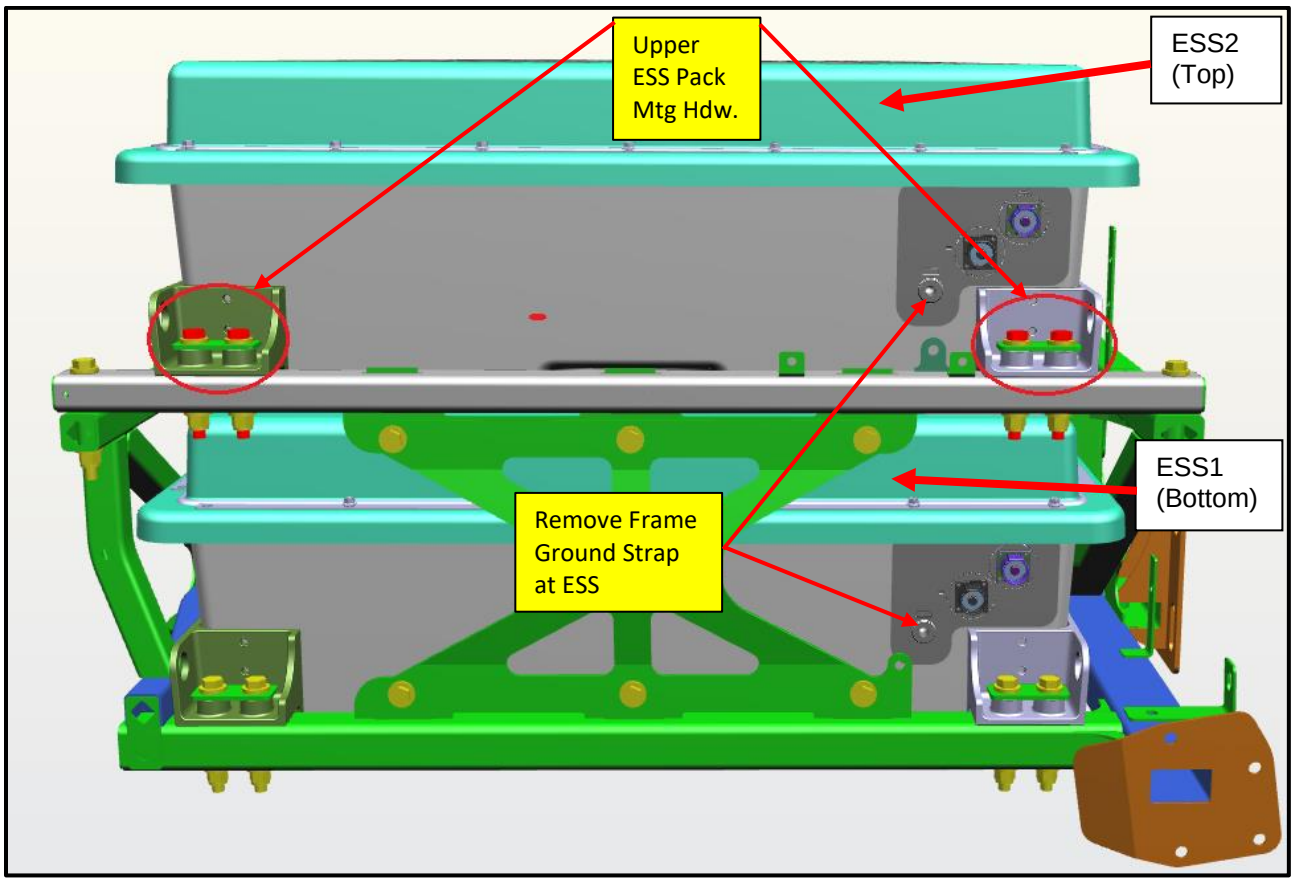
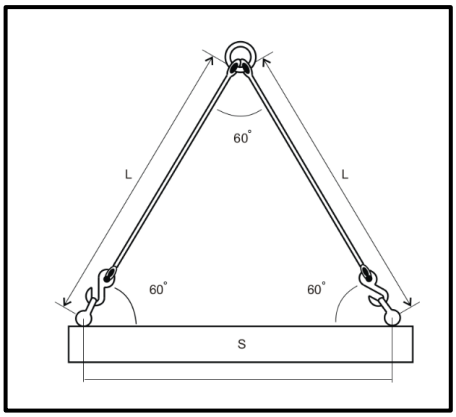


Figure 23: Upper ESS Frame Mounting Hardware Location Reference.

68. Use a forklift with an appropriate hoist boom and straps (one in each corner for proper rigging), lift the upper ESS pack (ESS2) from the frame assembly. See Figure 24.
69. Once ESS2 is removed from over top of ESS1 place on a suitable stand.
70. Connect an appropriate lifting device to the ESS unit being removed. See Figure 24.

☞ **NOTE: Lifting device securement straps should be connected at no less than 60 degrees as shown below to prevent strap damage to the ESS enclosure or connected to a lifting device wider than the ESS unit being removed in a vertical position as shown below to prevent strap damage to the ESS enclosure.**



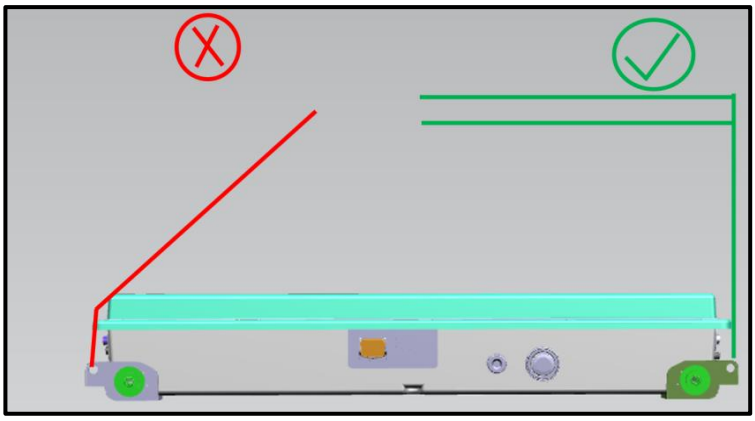


Figure 24: Rigging for Lifting Upper ESS Battery Pack Location Reference.

71. Locate the serial number documentation form in Appendix A of this ITS or use the electronic version if provided by your RPSM.
72. Locate the serial number plates on the side of each unit being removed and installed and fill out the form and return to the RPSM for warranty and S/N tracking removed and installed units. See Figure 25.

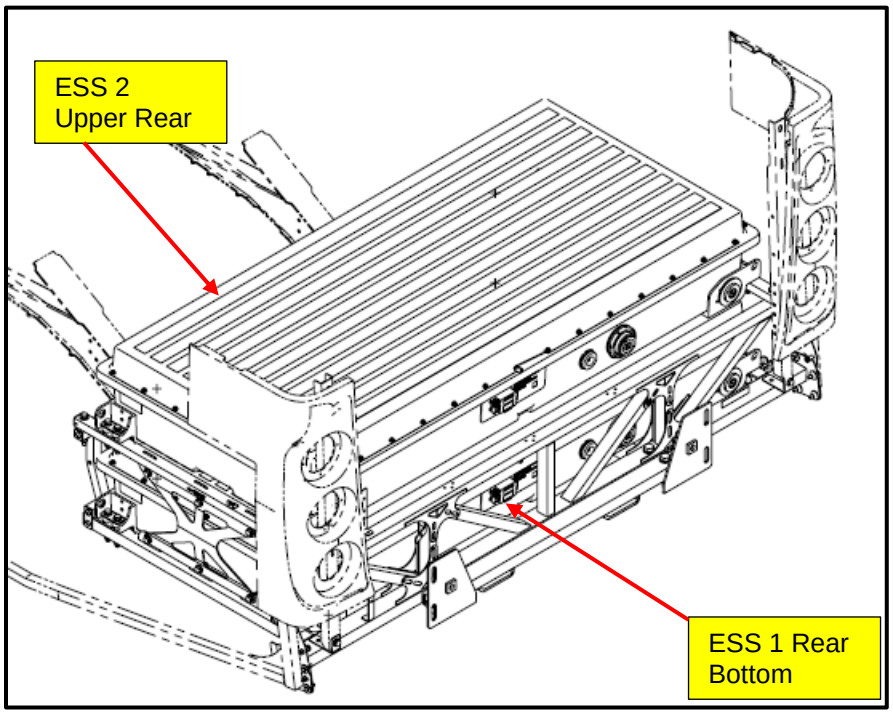


Figure 25: Rear ESS Assembly Serial Number Documentation Location Reference.

73. Inspect each ESS unit removed and to be installed for the correct ground cable securement. Ref ESS1 and ESS2. See Figure 26.
    A. If a ground stud as shown below is installed no further action is required. See Figure 26.
    B. If a bolt is installed as shown below check the length of the bolt. If the bolt is ½ IN long no further action is required. See Figure 26.
    C. If a bolt is installed and the length is greater than ½" notify the RPSM and New Flyer Service Engineering immediately. See Figure 26.

☞ **NOTE: Do not install a unit that has had a bolt longer than ½" installed without contacting Service Engineering for guidance.**

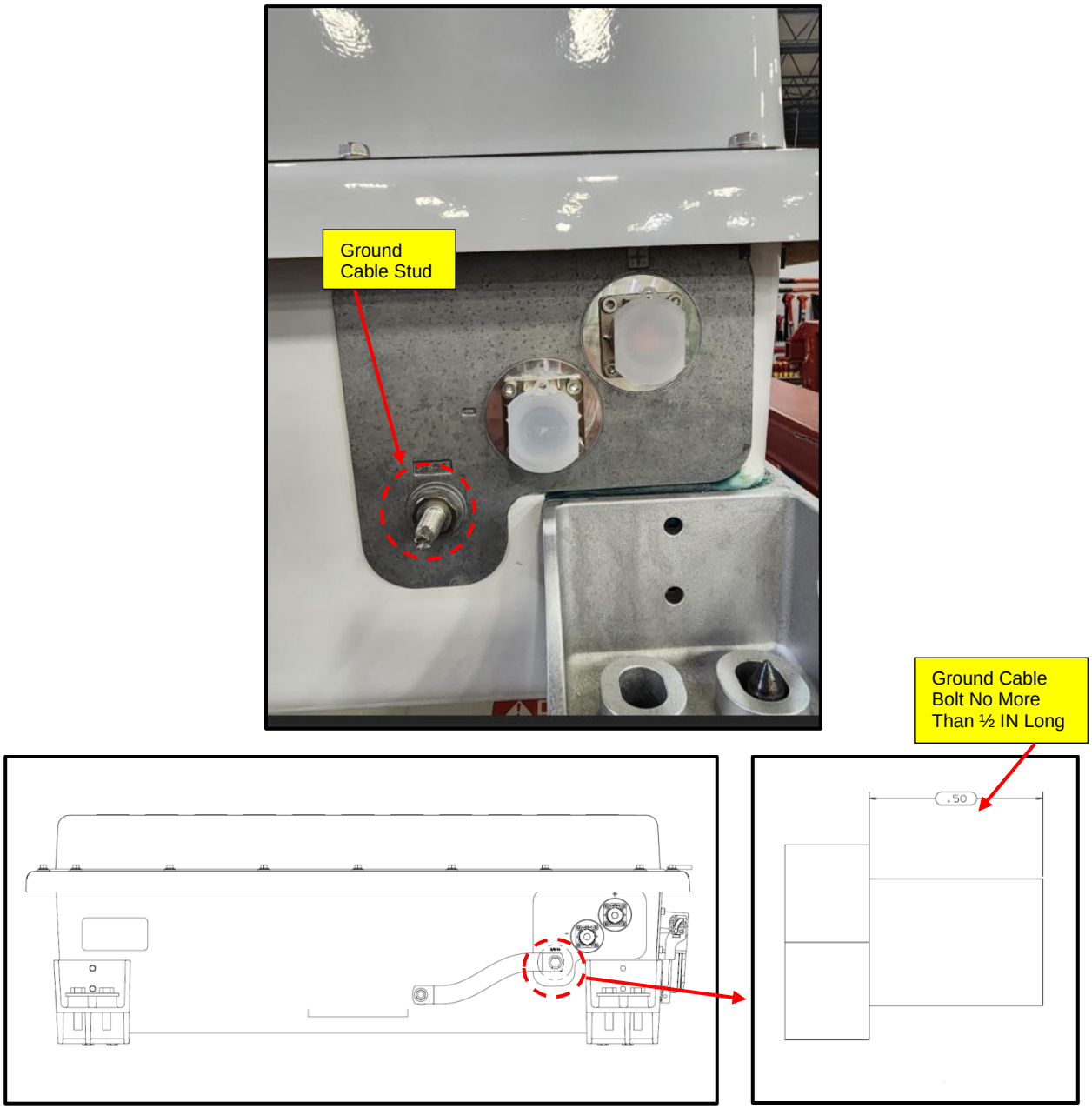


Figure 26: Rear ESS Assembly Ground Stud Inspection Location Reference.

74. Remove the hardware 3 each from the lower side support assembly bracket from both sides and set hardware aside for re-installation. See Figure 27A.
75. Remove the hardware 2 each from the upper horizontal supports from both sides and set horizontal supports and hardware aside for re-installation. See Figure 27A.
76. Remove fasteners securing ESS1 to the frame assembly (four fasteners on each side) and hardware aside for re-installation. See Figure 27A.
77. Use a forklift with appropriate hoist boom and straps (one in each corner), lift the lower ESS pack (ESS1) from the frame assembly. See Figure 24 for proper rigging, typical for all packs.
78. Inspect each ESS unit removed and to be installed for the correct ground cable securement. Ref ESS1 and ESS2. See Figure 26.

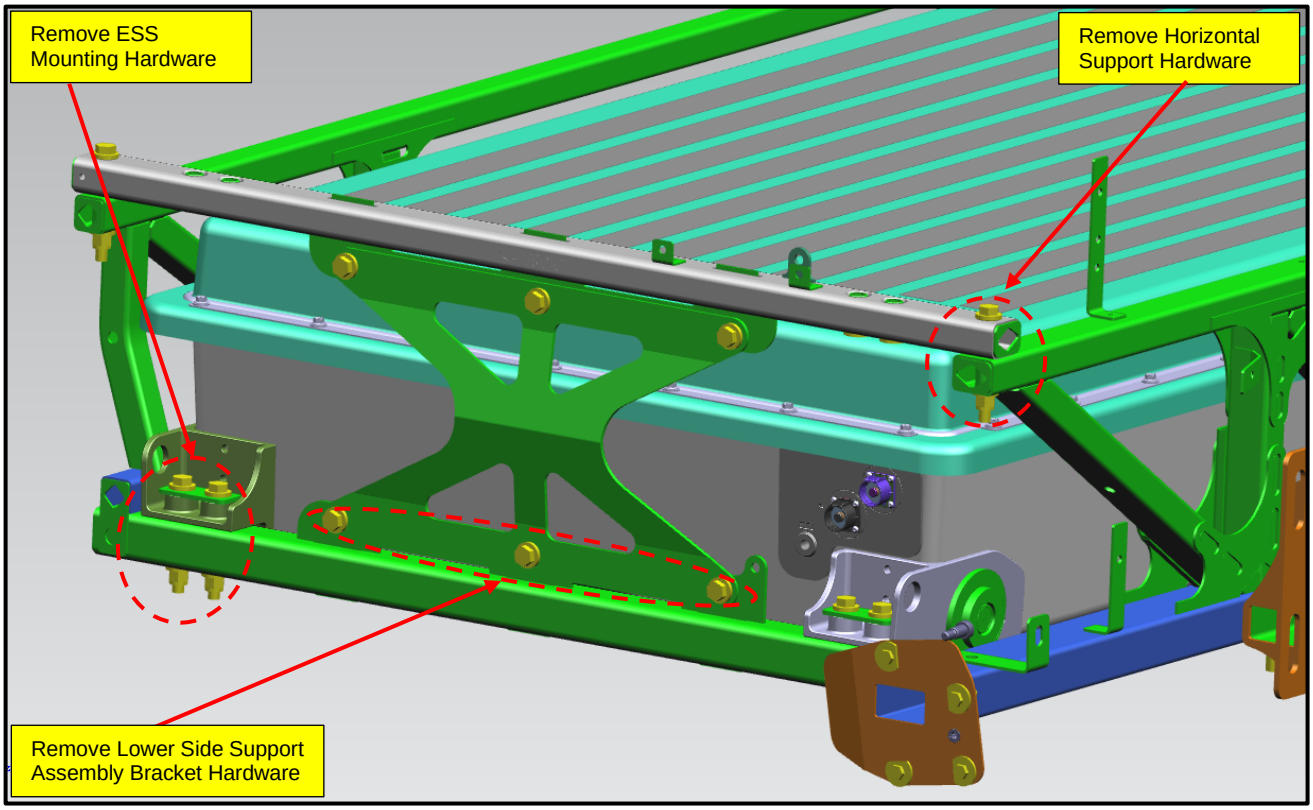


Figure 27A: Rear ESS Pack Assembly Removal and Installation Location Reference.

79. Install one of the supplied replacement ESS units in the ESS1 (lower) position. Ensure enclosure orientation matches that of how it was removed. See Figure 27B.
    - **A.** Use hardware removed from OEM install applying item #10 never seize to bolt threads prior to reinstallation.
    - **B.** Replace Nylock nuts item #9 if damaged and torque to 69 ft-lbs. Apply torque marks after torquing.
    - **C.** Ensure to record the ESS serial number on the tracking sheet in the replacement ESS1 location.
80. Re-install the upper horizontal support assembly and lower side support assembly bracket in the locations they were removed from each side of the ESS lower frame assembly. See Figure 27B.
    - **A.** Use hardware removed from OEM install applying item #10 never seize to bolt threads prior to reinstallation.
    - **B.** Replace the Nylock nuts item #9 if damaged and torque to 69 ft-lbs. Apply torque marks after torquing.
81. Install one of the supplied replacement units in the ESS2 (Upper) position. Ensure enclosure orientation matches the lower ESS. See Figure 27B.
    - **A.** Use hardware removed from OEM install applying item #10 never seize to bolt threads prior to reinstallation.
    - **B.** Replace the Nylock nuts item #9 if damaged and torque to 69 ft-lbs. Apply torque marks after torquing.
    - **C.** Ensure to record the ESS serial number on the tracking sheet in the replacement ESS2 location.

Item	Part Number	Description
9	40N08000	Nut Nylon Lock ½ - 13
10	5928660	Never Seize

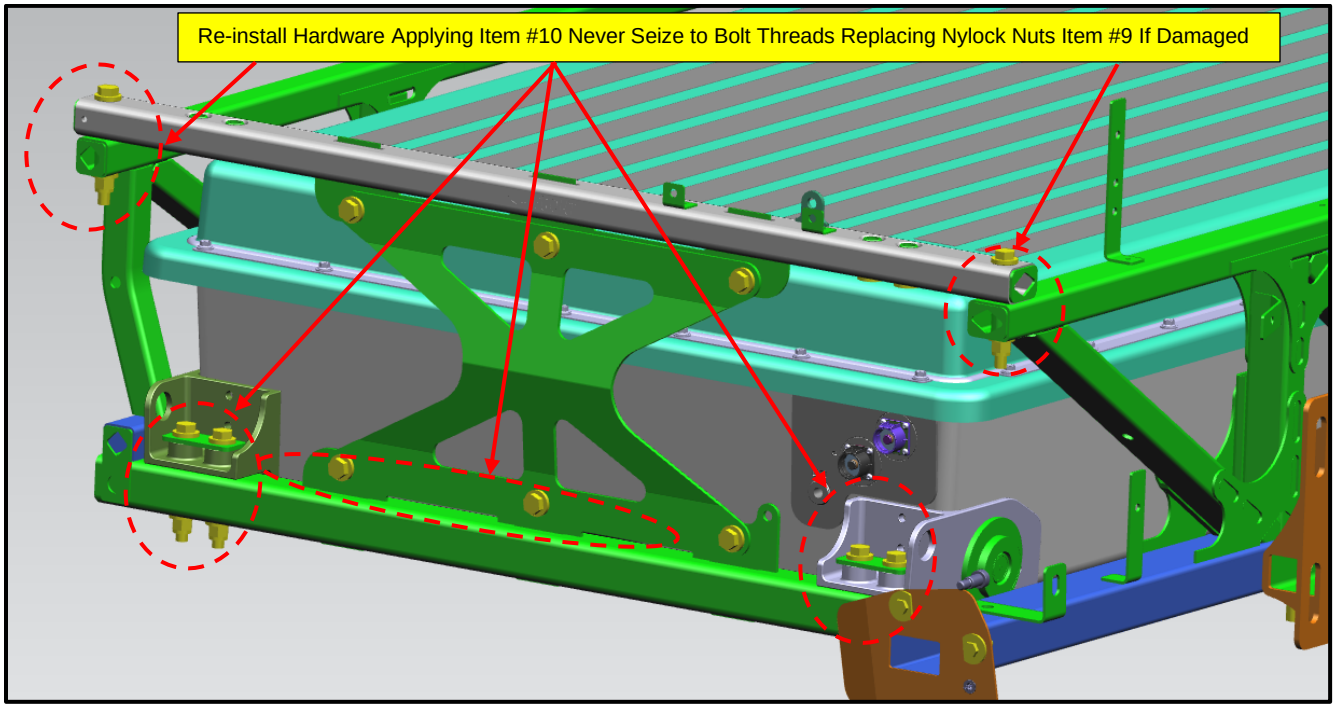
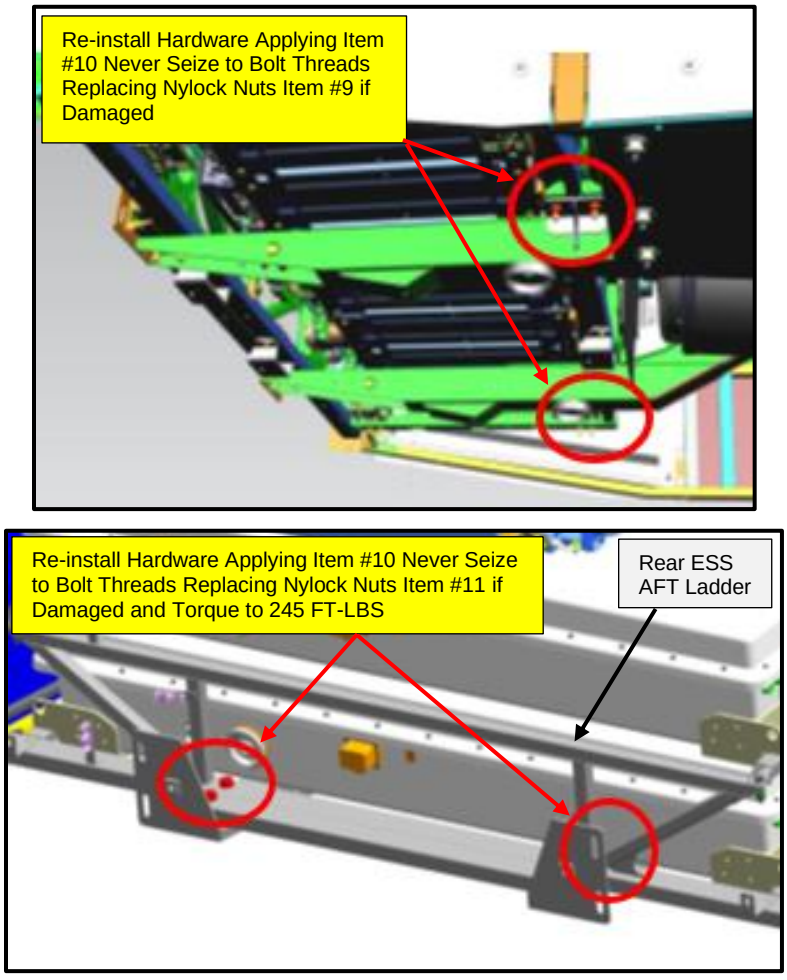


Figure 27B: Rear ESS Pack Assembly Removal and Installation Location Reference.

Section 5: Rear ESS assembly Installation.

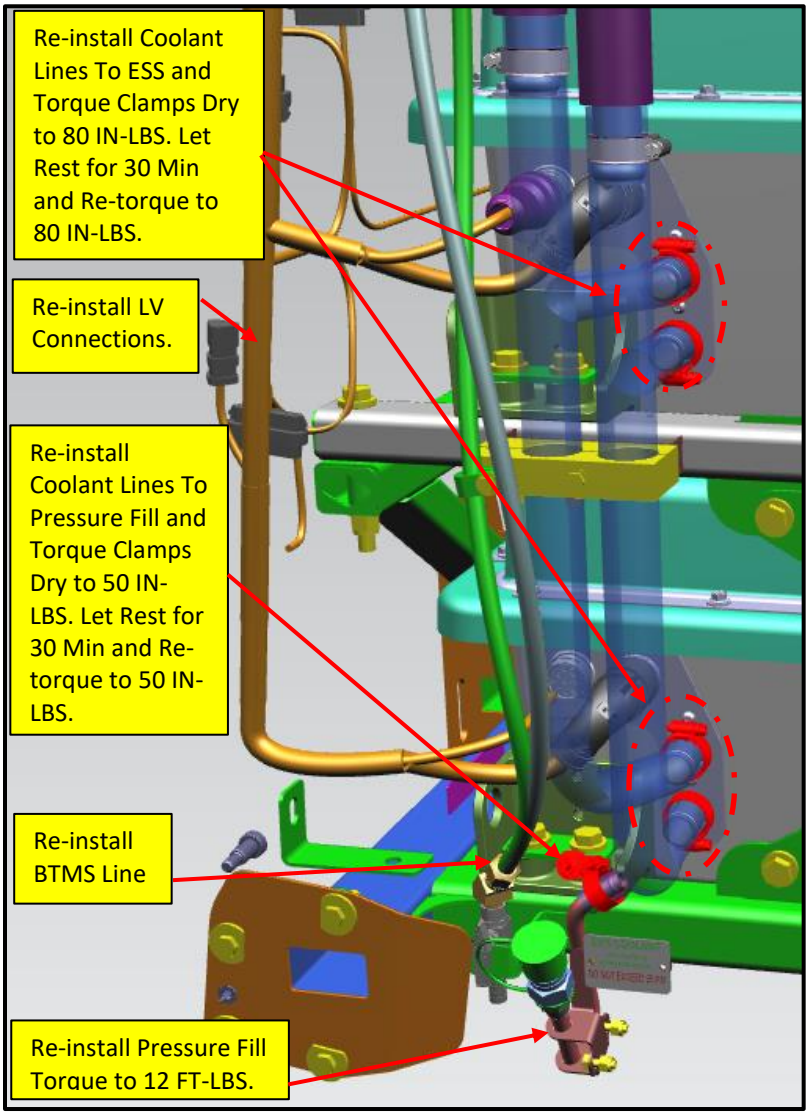
82. Using a forklift, install the ESS battery rack assembly back inside the vehicle and align the mounting holes to the vehicle structure. See Figure 28.
    - **A.** Secure the rear of the ESS battery rack assembly using existing ½" hardware applying item #10 never seize to bolt threads prior to reinstallation. See Figure 28.
    - **B.** Replace the Nylock nuts item #9 if damaged and torque to 69 ft-lbs. Apply torque marks after torquing. See Figure 28.
83. Align the mounting holes to the rear ESS AFT Ladder. See Figure 28.
    - **A.** Secure the rear of the ESS battery rack assembly using existing ¾" hardware applying item #10 never seize to bolt threads prior to reinstallation. See Figure 28.
    - **B.** Replace the Nylock nuts item #11 if damaged and torque to 245 ft-lbs. Apply yellow paint torque marks after torquing. See Figure 28.



Item	Part Number	Description
9	40N08000	Nut Nylon Lock ½ - 13
10	5928660	Never Seize
11	42012000	Nut Nylon Lock 3/4

Figure 28: ESS Battery pack assembly securement hardware reference.

84. Re-install the clear BTMS vent line to the ESS frame using existing hardware applying one or two drops of item #1 Loctite. See Figure 29.
85. Reconnect the low voltage harnesses to the rear ESS packs. Use item #2 Zip ties to secure harnesses.
86. Reconnect the coolant supply and return hoses and install the existing clamps from each ESS unit. Torque to See Figure 29.
87. Re-install the ESS pressure fill Replace the Nylock nuts item #8 if damaged and torque to 12 ft-lbs. Apply torque marks after torquing. See Figure 29.
88. Reconnect the coolant hose to the pressure fill and install the existing clamp. Torque to 50 IN-LBS. Allow clamps to rest for 30 min and re- torque to 50 IN-LBS. Apply torque marks after torquing. See Figure 29.



Item	Part Number	Description
1	081034	LOCTITE 243
2	5962614	Zip Ties
8	42N04000	Nut Nylon Lock ¼-20

Figure 29: Low Voltage and Coolant Line Connections Location References.

89. Connect the ground cable to the ESS unit using the correct hardware.
    A. For units with a ground stud application place cable on the ground stud with the existing flat washer and Nylon nut item #3 and torque nut to 17 FT-LBS. Apply torque marks after torquing. See Figure 30.
    B. For units with the ground cable bolt mounting secure the ground cable to the unit with the existing washer and ½ IN bolt item #4 and Torque to 22 FT-LBS. Apply torque marks after torquing. See Figure 30.

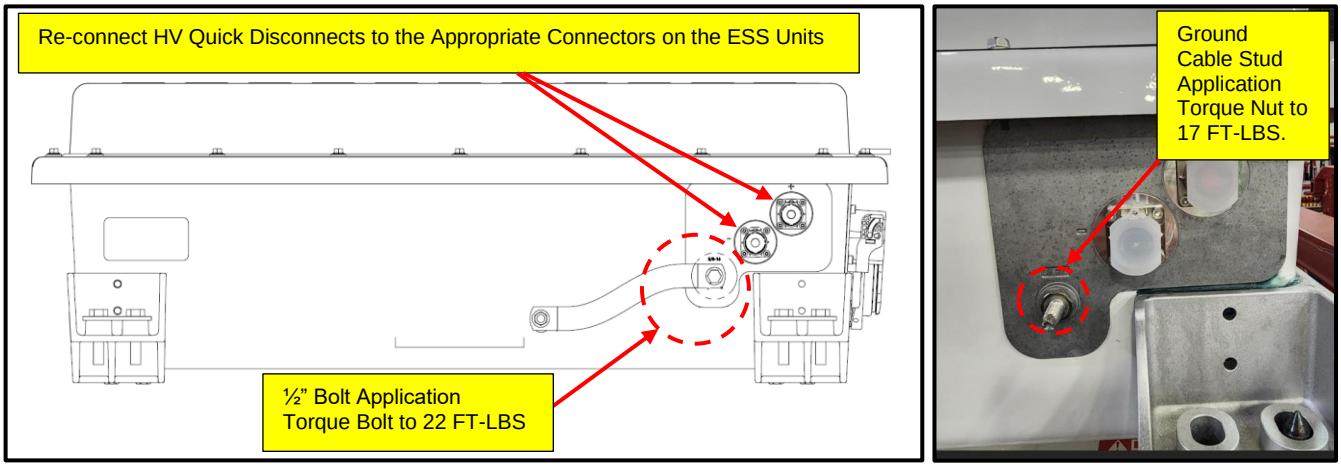
☞ **NOTE: Do not use mounting bolts longer than ½ IN.**

☞ **NOTE: Ensure to validate the torque based on stud or bolt application.**

☞ **NOTE: Apply item #6 Anti-corrosion compound to ground connections.**

Ensure to validate the torque based on stud or bolt application.

90. Re-connect the Pos and Neg HV quick disconnects to each rear ESS unit. See Figure 30.

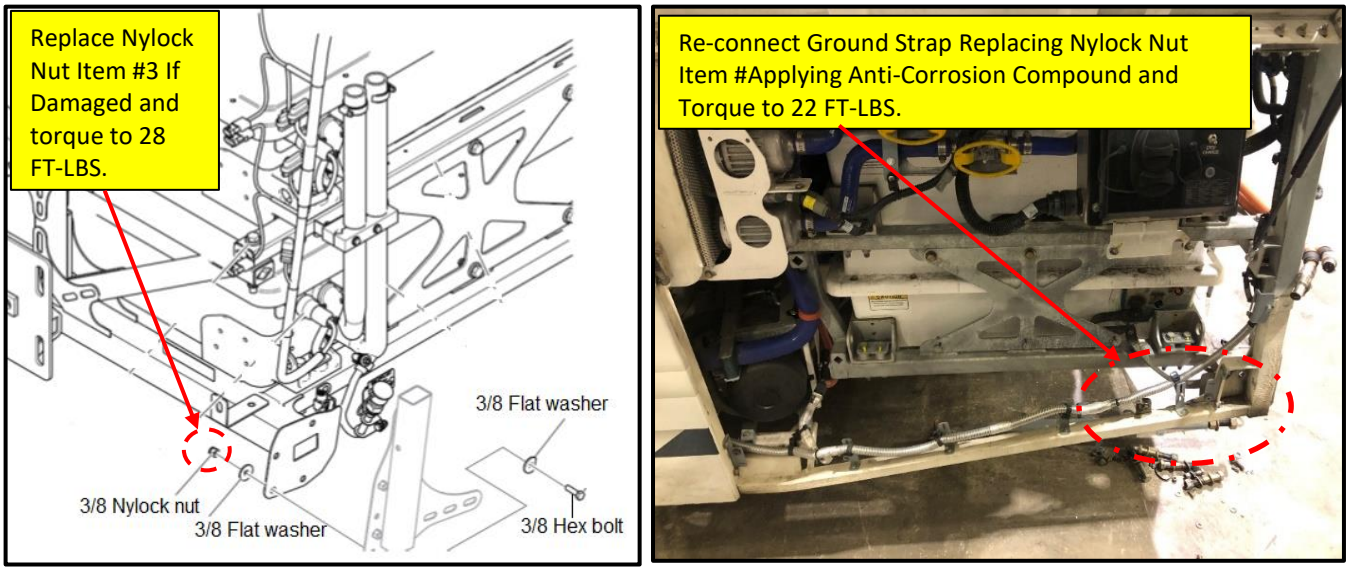


Item	Part Number	Description
3	42N06000	Nut 3/8-16 UNC Nylon Lock SST
4	20B06008	Bolt Hex SS 3/8-16 UNC x ½" Long
5	50W06000	Washer Flat SS 3/8
6	8111767	Anti – Corrosion Compound NYK-77

Figure 30: Rear Upper and Lower ESS Assembly Ground Stud and HV Cable Re-installation Location Reference.

91. Secure corner pillar brackets to pillars using existing 3/8” hardware on each side of the bus replacing the nylock nuts item #3 if damaged and torque hardware to 28 ft-lbs. Apply torque marks after torquing. See Figure 31.

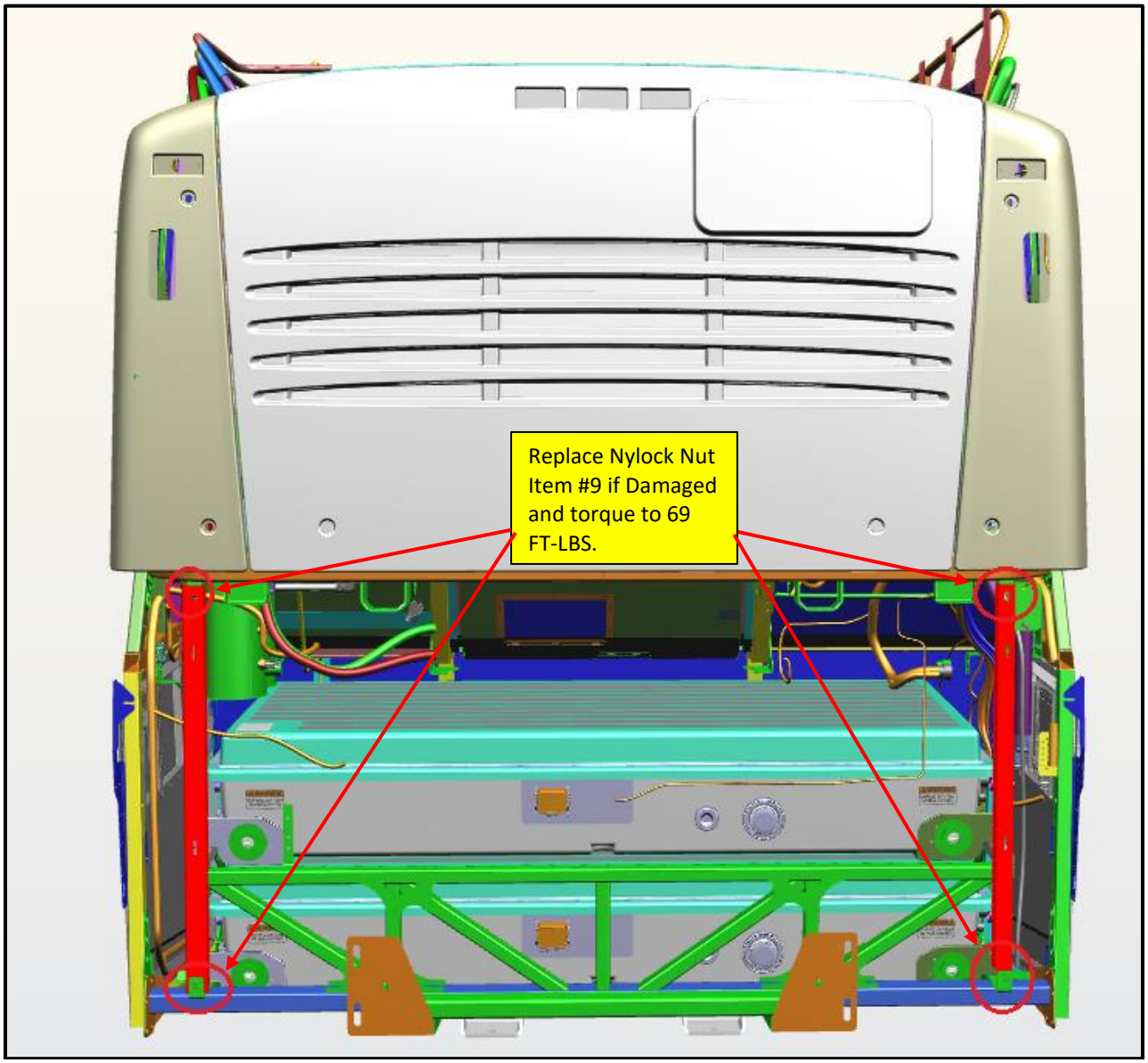
92. From streetside rear corner, reconnect the ESS grounding strap to bus frame applying item #6 Anti-corrosion compound and torque to torque to 22 FT-LBS. Apply torque marks after torquing. See Figure 31.



Item	Part Number	Description
3	42N06000	Nut 3/8-16 UNC Nylon Lock SST
6	8111767	Anti – Corrosion Compound NYK-77

Figure 31: ESS Ground Strap to Bus Frame and Corner Pillar Brackets to Pillar Location References.

93. Re-install the curbside and streetside lower pillar mounting brackets. Secure using existing ½ inch bolts, flat washers replacing Nylock nuts item #9 if damaged. Torque hardware to 69 ft-lbs. Apply Torque Marks. See Figure 32.



Item	Part Number	Description
9	40N08000	Nut Nylon Lock ½ - 13

Figure 32: Curbside and Streetside Lower Pillar Mounting Bracket Location Reference.

94. Reinstall curbside and streetside taillight corner pillar and secure using existing hardware replacing nylon lock nuts item #8 if damaged.
95. Support strut Installation – See Figure 33.
    A. Thread a 1” nut on the upper end of the strut until it’s nearly bottomed out.
    B. Install the threaded end of strut into upper mounting bracket applying item #10 Never Seize to its threads and loosely install the upper nut.
    C. Align hole in lower end of strut with hole in main frame rail mounting bracket and secure strut to frame rail bracket with 3/4" bolt, washers applying item #10 Never Seize to the bolt threads. Replace item #11 ¾” Nylock nut if damaged and torque lock nut to 250 ft-lb. Apply torque marks after torquing.
    D. Ensure lower 1" nut is backed off, then tighten upper 1" nut until contact is made with upper mounting bracket.
    E. Measure the distance between the lower frame rail and upper vehicle structure.
    F. Continue to tighten upper nut until the 44.84" (+/- 0.50) dimension is achieved, and then tighten an additional two turns.
    G. Apply Never-Seize to threaded area of strut and tighten lower 1" jam nut to 426 ft-lb. (578 Nm).

Item	Part Number	Description
8	42N04000	Nut Nylon Lock ¼-20
10	5928660	Never Seize
11	40N12000	Nut Nylon Lock 3/4

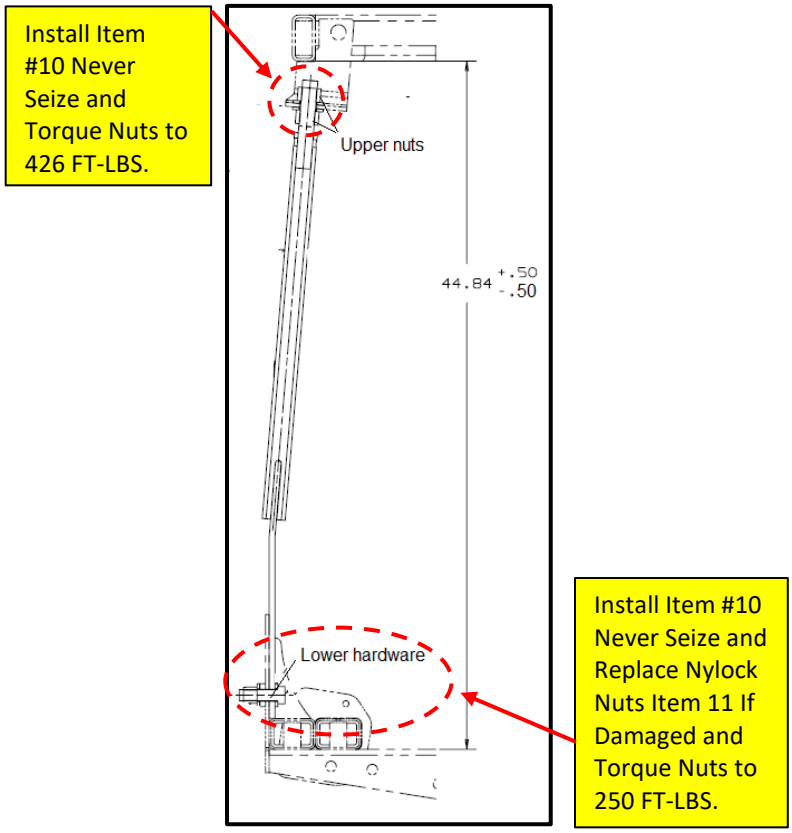


Figure 33: Strut Tensioning Location Reference.

96. Reinstall rear bumper – retorque rear bumper hardware to 106 FT-LBS. Apply 1-2 drops Loctite item #1 to the hardware threads. Apply torque marks after torquing. Additional instruction available within the Service Manual if panel gaps require adjustment.
97. Refill and de-aerate ESS coolant system according to NF Service Manual.
98. Check coolant connections, at the packs removed, for leaks and resolve as required.
99. Reinstall streetside and curbside, side screens securing using the existing hardware. Apply 1-2 drops of Loctite item #1 to the threads of the hardware. Torque hardware to 50 in. lbs. Apply torque marks after torquing.
100. Completed the starting checks in Appendix B.
101. Completed the charging checks in Appendix C.
102. After first full day in service check coolant levels and fill ESS coolant system according to NF Service Manual as required.
103. Ship OEM battery enclosures to supplier using pallets the replacement units came with.

☞ **NOTE:** Email a completed copy of the serial number documentation form to **devin_draward@newflyer.com**

LABOUR				
	Operation	Number of Technician(s)	Hours	Labor Time T X HR
1	R&R rear mount and roof mount ESS assemblies 40 FT	2	16	32
1	R&R rear mount and roof mount ESS assemblies 60FT	2	21	42

PARTS					
Item	Part Number	Description	Qty. per Coach	Units	Notes
1	081034	LOCTITE 243	0.010	EA	
2	5962614	Zip ties	10	EA	
3	42N06000	Nut 3/8-16 UNC Nylon Lock SST	17	EA	Replace as required
4	20B06008	Bolt Hex SS 3/8-16 UNC x ½" Long	1	EA	Replace as required
5	50W06000	Washer Flat SS 3/8	2	EA	Replace as required
6	8111767	Anti – Corrosion Compound NYK-77	0.010	EA	
7	5955945	TyRap – 14 IN Black	15	EA	
8	42N04000	Nut Nylon Lock ¼-20	10	EA	Replace as required
9	40N08000	Nut Nylon Lock ½ - 13	34	EA	Replace as required
10	5928660	Never Seize	0.010	EA	
11	40N12000	Nut Nylon Lock 3/4	6	EA	Replace as required

SPECIAL TOOLS					
Item	Part Number	Description	Qty.	Units	Notes
1	N/A	COOLANT RECOVERY AND FILL TOOL	1	EA	Source Local
2	N/A	3200LBS VERTICAL RATED STRAPS	2	EA	Source Local
3	N/A	FORKLIFT	1	EA	Source Local
4	N/A	HV-INSOLATED TOOLS	1	EA	Source Local
5	N/A	TORQUE WRENCH /Max 200 ft lbs. 3/8 drive	1	EA	Source Local
6	6485763	JB Removal Beam	1	EA	
7	6485514	Forklift Adaptor Boom	1	EA	
8	N/A	Digital Multimeter (DC & AC voltage)	1	EA	Source Local
9	N/A	Laptop with Vansco program w/Nexiq.	1	EA	Source Local
10	N/A	Wood Blocks 1” thick X 3.5”W X 10”L	4	EA	4 per ESS unit
11	N/A	1 ½ Crows Foot	1	EA	Source Local
12	N/A	1 ½ Ratchet Wrench	1	EA	Source Local
13	N/A	1 1/8 Wrench	1	EA	Source Local
14	N/A	1 1/8 Deep wall socket. ½ and 3/8 drive	1	EA	Source Local
15	N/A	15/16 Wrench ratchet	2	EA	Source Local
16	N/A	¾ Wrench	1	EA	Source Local
17	N/A	¾ Deep wall socket 3/8 drive	1	EA	Source Local
18	N/A	3/8 drive deep wall sockets 9/16, ½, 7/16, 5/16, 10mm	1	EA	Source Local
19	N/A	9/16, ½, 7/16, 5/16, 10mm Wrenches	1	EA	Source Local
20	N/A	Torque wrench / Max 500 ft-lbs. / ¾ drive	1	EA	Source Local
21	N/A	Coolant crimp clamps	3	EA	Source Local
22	N/A	3/8 drive extension 6 inch and 12 inches	1	EA	Source Local
23	660817	ASSY-TESTER COOLING SYS PRESS	1	EA	
24	590112	CAP-RADIATOR 18 PSIG LEV-R-VENT	1	EA	

Appendix A – NF Serial Number Documentation Form

See Following Page

ESS Serial Numbers

SR Number	Vehicle Id Number (VIN)	Customer Fleet Number	ESS	ESS 1 Rear Bottom	ESS 2 Rear Top	Roof mounted ESS numbers increase from front to back of bus				
						ESS 3 - Roof (Front-most)	ESS 4 - Roof	ESS 5 - Roof	ESS 6 - Roof	ESS 7 - Roof
			Original ESS							
			Replacment ESS							
			Original ESS							
			Replacment ESS							
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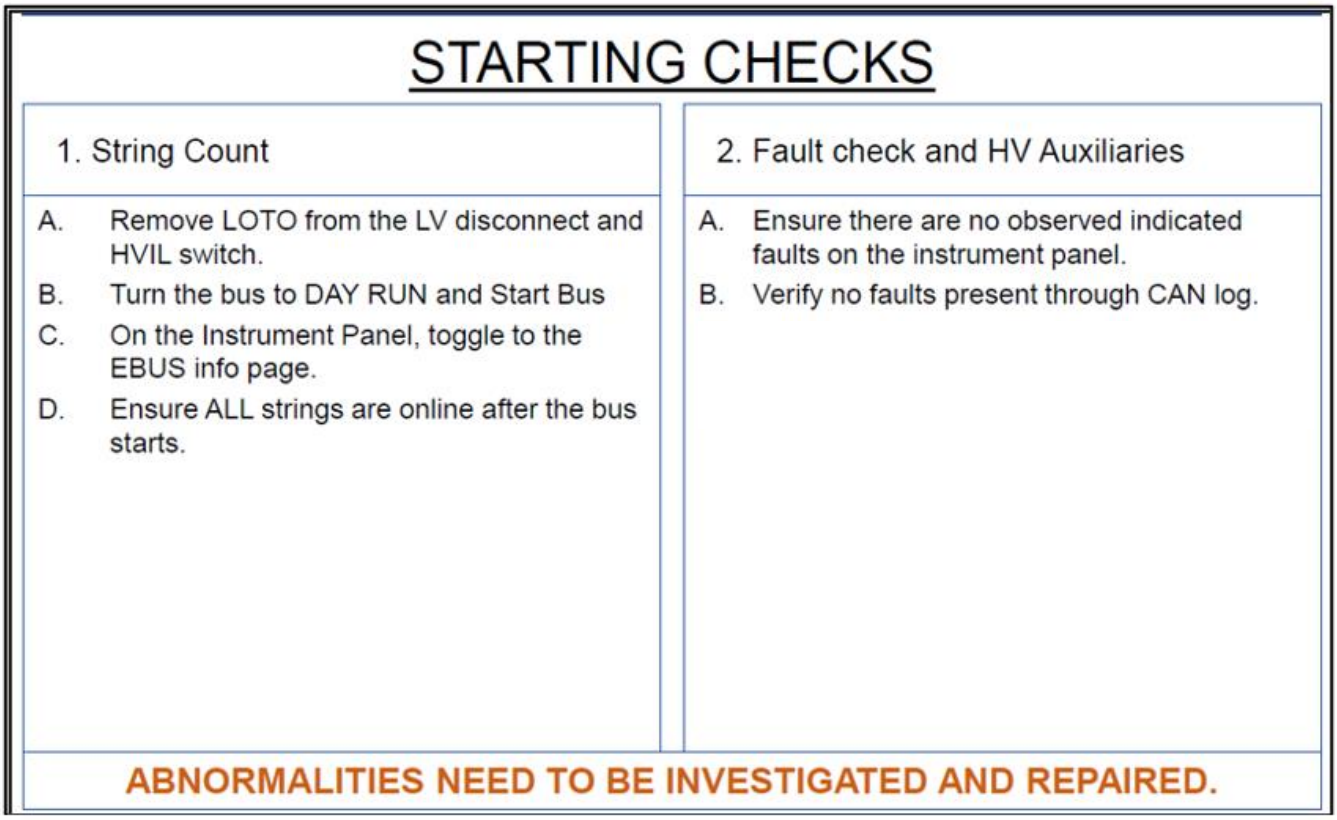
			Replacment ESS							

Appendix B – Starting Checks



STARTING CHECKS

1. String Count

A. Remove LOTO from the LV disconnect and HVIL switch.
B. Turn the bus to DAY RUN and Start Bus
C. On the Instrument Panel, toggle to the EBUS info page.
D. Ensure ALL strings are online after the bus starts.

2. Fault check and HV Auxiliaries

A. Ensure there are no observed indicated faults on the instrument panel.
B. Verify no faults present through CAN log.

ABNORMALITIES NEED TO BE INVESTIGATED AND REPAIRED.

Appendix C – Charging Checks

CHARGING CHECKS

Depot Charging

A. Bus must be under 75% SOC.
B. Use a 150kW or higher capacity depot charger.

- ❑ Charge on the curb side for 10 minutes
- ❑ Stop charge
- ❑ Charge on curb side again for 10 minutes
- ❑ Stop charge
- ❑ Charge on street side (if applicable) for 10 minutes
- ❑ Stop charge
- ❑ Charge on street side (if applicable) again for 10 minutes

EACH CHARGE SESSION SHOULD PROVIDE A **MINIMUM INCREASE OF 1% SOC**.

Overhead Charging (if applicable)

A. Bus must be under 75% SOC.
B. Use a 180kW or higher capacity overhead charger.

- ❑ Charge for 10 minutes
- ❑ Stop charge
- ❑ Drive loop away from charger and back to charger to re-establish wi-fi connection.
- ❑ Charge for another 10 minutes
- ❑ Stop charge

EACH CHARGE SESSION SHOULD PROVIDE A **MINIMUM INCREASE OF 4% SOC**.

**TOP OFF CHARGE PRIOR TO SHIPMENT TO CUSTOMER

CHARGE FAILURES NEEDS TO BE INVESTIGATED AND REPAIRED.