INSTRUCTION TO SERVICE

ITS-61320	
SECTION:	260 – Battery Compartment
SUBJECT:	Rooftop Ferrite Core Enclosure Field Retrofit
ISSUE:	ZF Center Axle A/B Bearing Failures
SUMMARY:	Install ferrite core enclosures inside rooftop inverters to eliminate excessive CMC and subsequent center axle bearing failures.

ITS-61320

Ref. NHTSA Recall No.	Ref. Transport Canada Recall No.
N/A	N/A

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.

PROCEDURE:

Part A – Bus Preparation

DANGER

Maintenance of high voltage equipment must be performed by qualified personnel only. Refer to 1.1. "High Voltage Safety" on page 1 at the beginning of this section for safety requirements. Ensure that the Battery Disconnect switch is set to the OFF position, and Lockout/Tagout has been performed. If vehicle was just running allow six minutes for components to discharge electricity before proceeding.

ALWAYS wear appropriate Personal Protection Equipment (PPE) and remove all jewelry while servicing the vehicle's electrical components. Refer to 1.5. "PPE Requirements" on page 3 in this section for all PPE requirements.

DANGER

DO NOT perform maintenance unless you have been properly trained on high voltage safety and are familiar with the safety requirements and procedures detailed in the BAE Vehicle Propulsion Management System (VPMS) Manual. Adhere to the procedures described in the vendor manual.

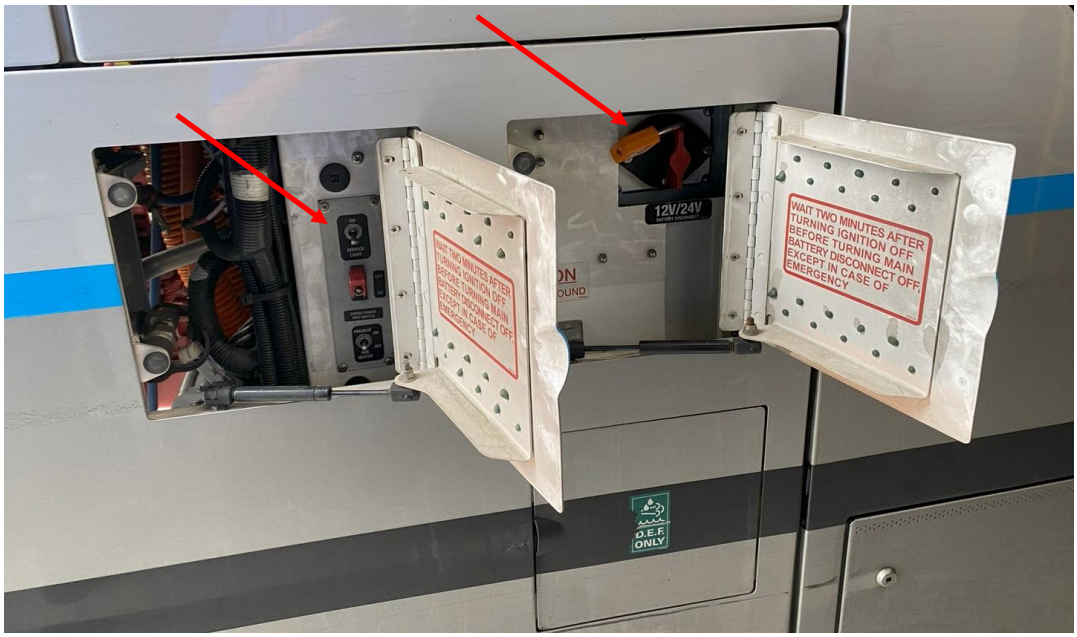
DANGER

Use work platforms or scaffolding whenever working on roof-mounted components. Ensure maintenance personnel use an approved safety harness.

1. Set the park brake and place wheel chocks underneath the front wheels.
2. Set the Master Run Switch to the Stop Engine position.

⚠ **Caution: Wait two minutes after turning the Master Run Switch to Stop Engine, before turning the Battery Disconnect switch OFF.**

3. Turn the 12/24V battery disconnect switch to the "OFF" position. Lock and tag the switch and retain key.
4. Place the Emergency Power Disconnect switch to the "OFF" position.



☞ **NOTE: The Emergency Power Disconnect Switch cannot be locked out but should be switched OFF to disconnect low voltage power to the High Voltage system.**

5. Verify that the Low Voltage and High Voltage Systems are disabled. Refer to applicable section in the New Flyer Service Manual.

6. Remove forward inverter front cover assembly, the top covers of the inverters and the side screen panels. Retain all hardware for reinstall. Refer to Figure 1.

☞ **NOTE: Side screen panels (marked by #1-4 below) may be different depending on customer specifications.**

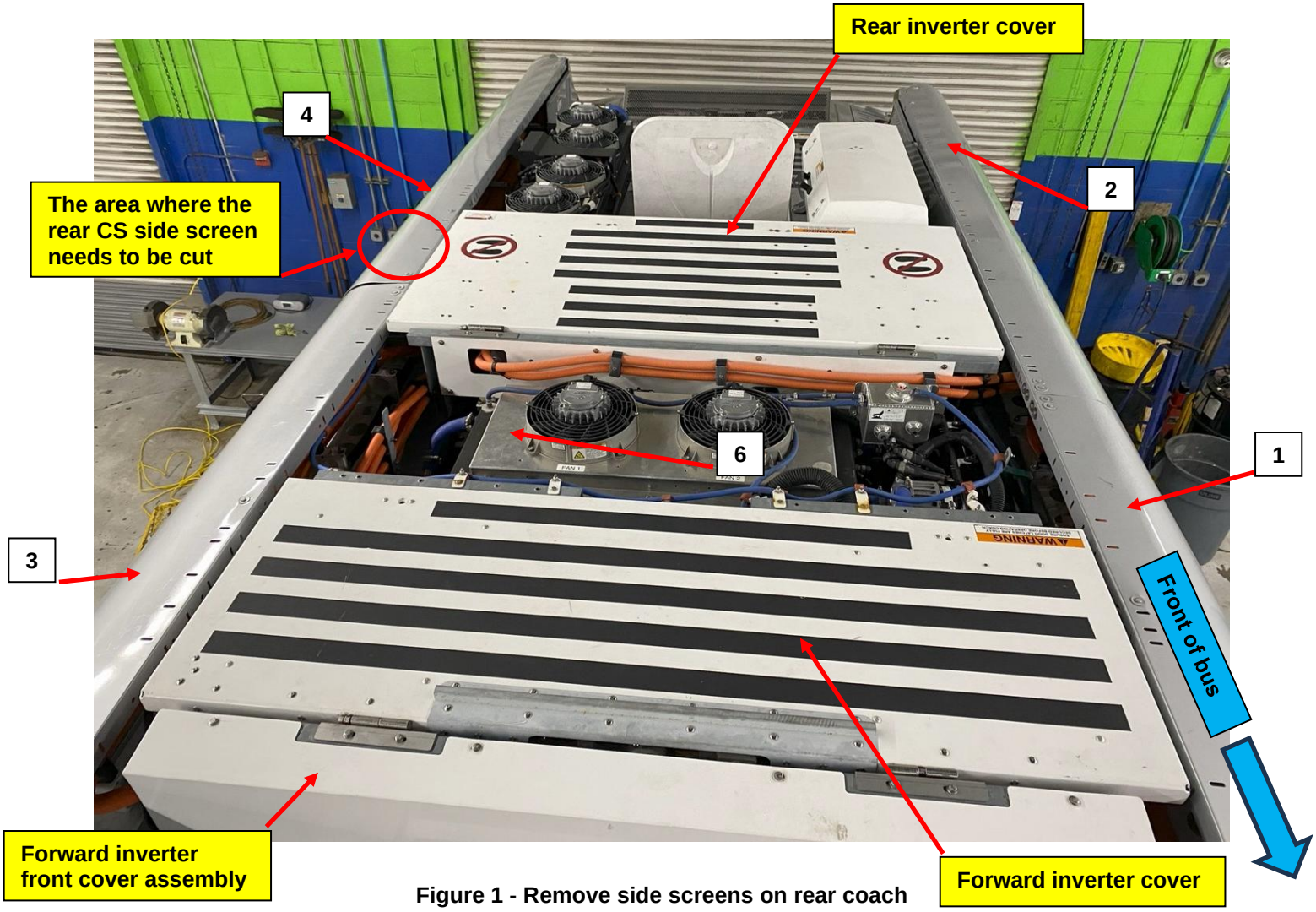


Figure 1 - Remove side screens on rear coach

7. The rear CS side screen needs to be cut to provide clearance for strain relief of the cables at the rear enclosure. Refer to Figure 2.

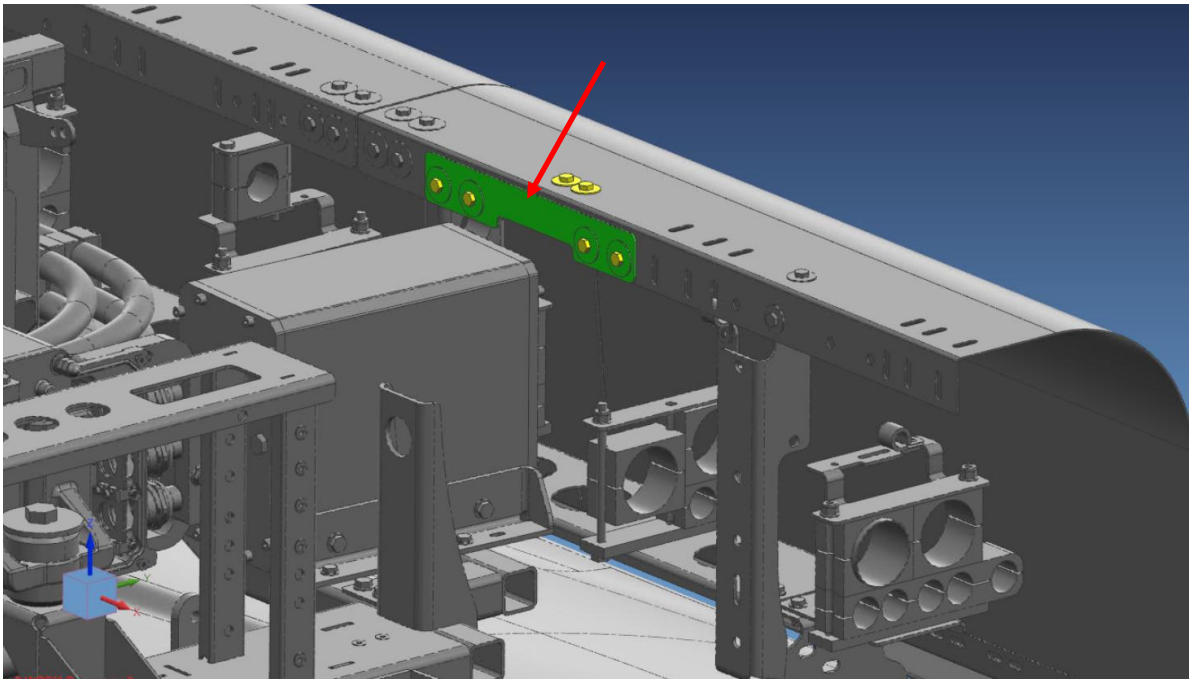


Figure 2 – Location of the required cut out of CS side screen

8. Measure 7.18” from the forward end of the side screen then mark the 4.5” x 0.5” section as shown on the drawing below. Carefully trim out of the edge of the side screen panel. Refer to Figure 3.

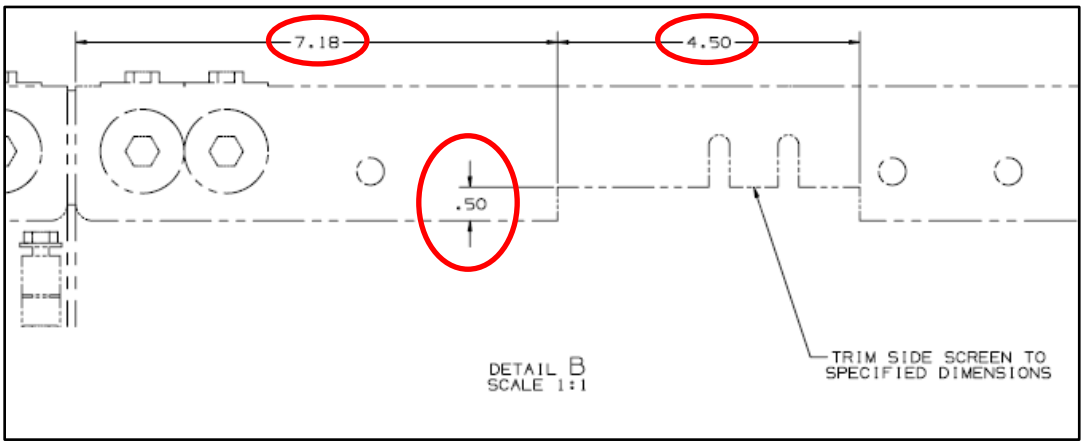


Figure 3 - Carefully trim a 4.5” x 0.5” section out of the edge of the panel

9. Position Side Screen Cutout Plate (P/N **1116484**) and use as a template to drill 0.266” (Drill size H or 17/64”) holes at the required locations. Refer to Figure 4.

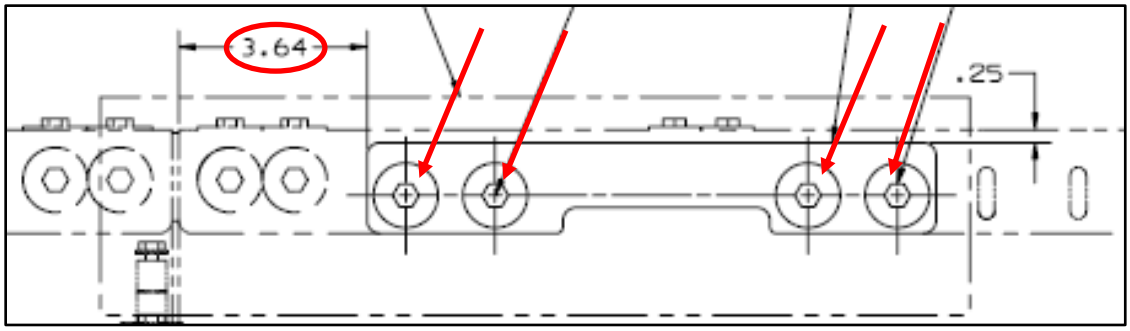


Figure 4 – Use side screen cutout bracket as a template and drill holes

10. On the inside of the side screen panel, wipe bonding surfaces with a clean lint-free cloth moistened with Sika 205 Activator (P/N **055702**) to ensure that surface is dust and residue free. Apply Sika 221 (P/N **242702**) to the outside face of Cutout Support Bracket Assembly (P/N **1116443**) and bond to inside face of side screen. Ensure holes in bracket are aligned with existing holes/slots. Refer to Figure 5.
11. Apply Loctite 243 (P/N **081034**) to first two threads of Hex Bolts (P/N **20B04012**) x6, then install Washers (P/N **277551**) x4, and Washers (P/N **060771**) x2 to secure bracket to the side screen. Refer to Figure 5.

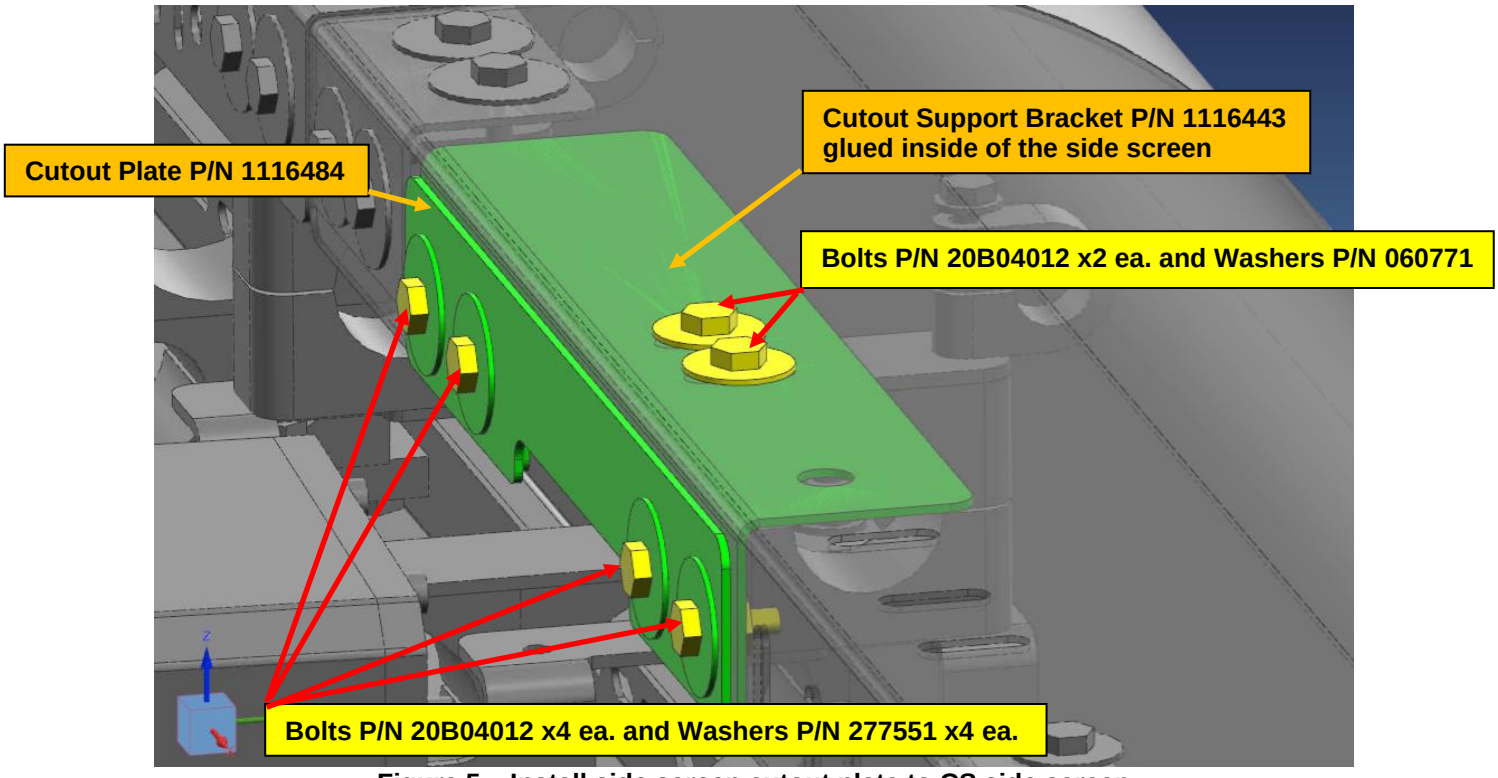
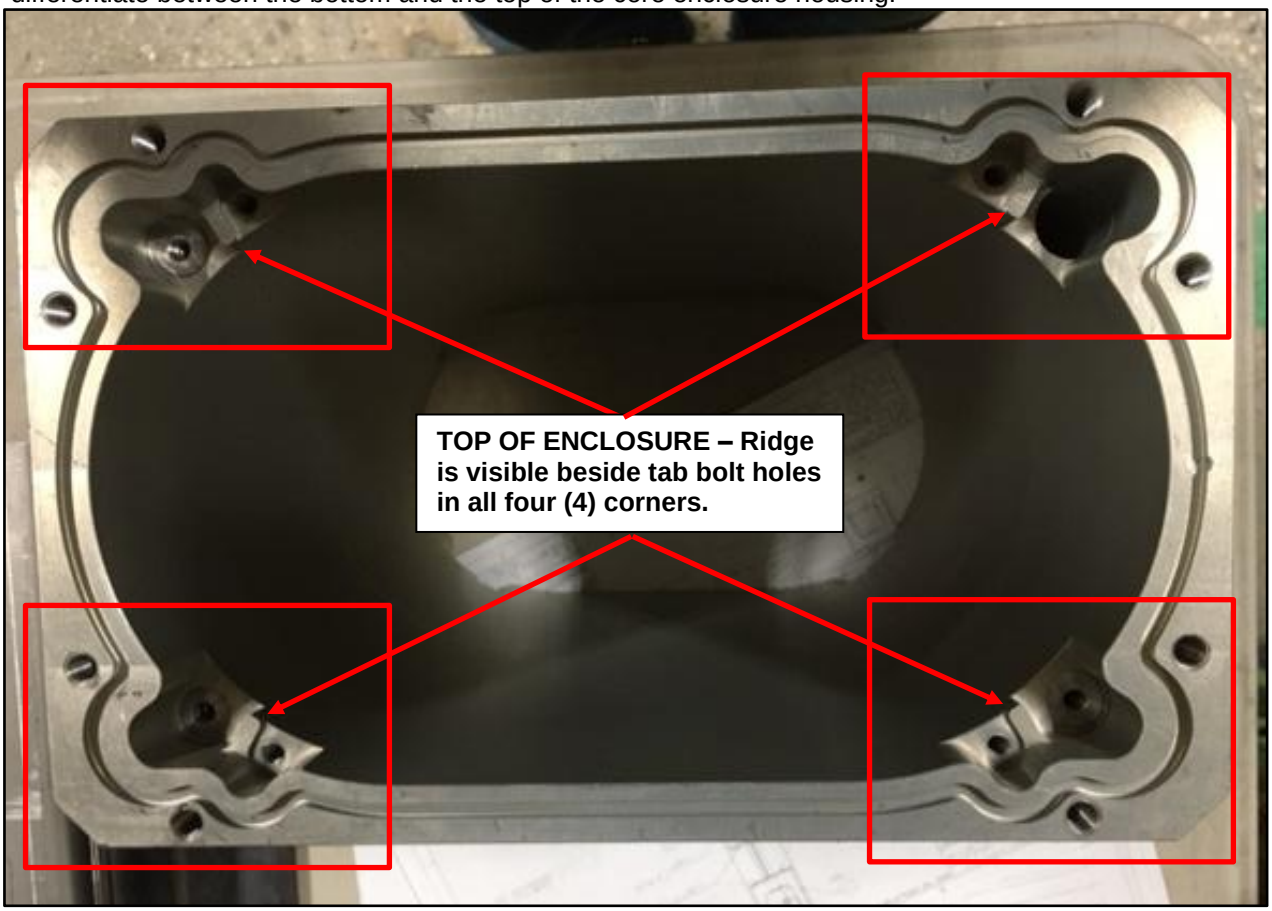


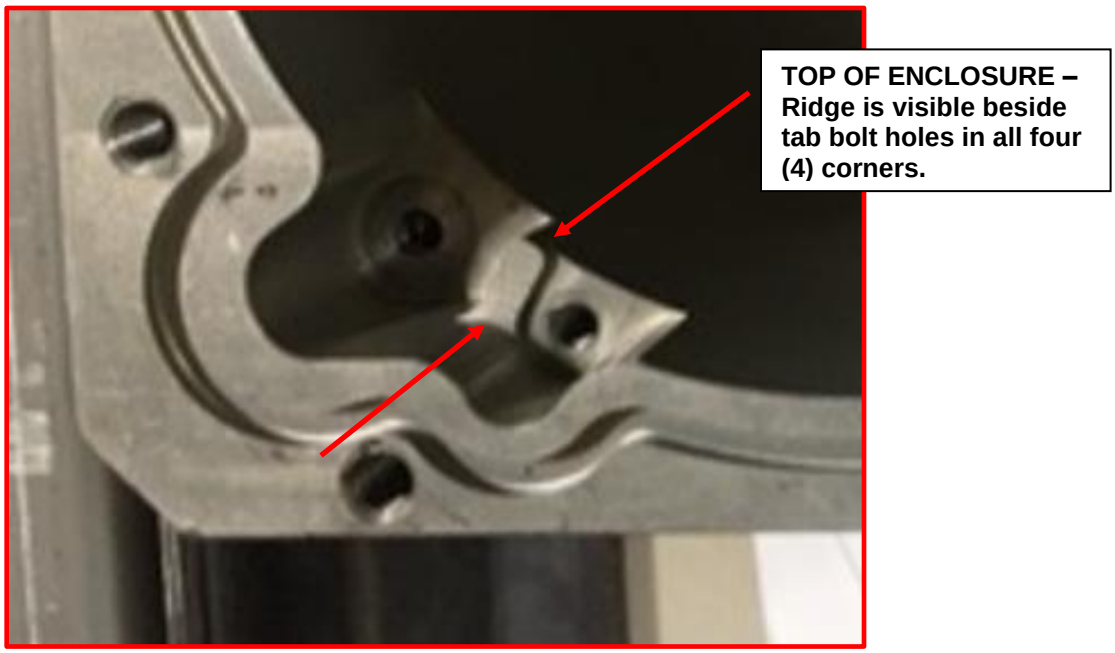
Figure 5 – Install side screen cutout plate to CS side screen

Part B – Ferrite Core Enclosure Assembly

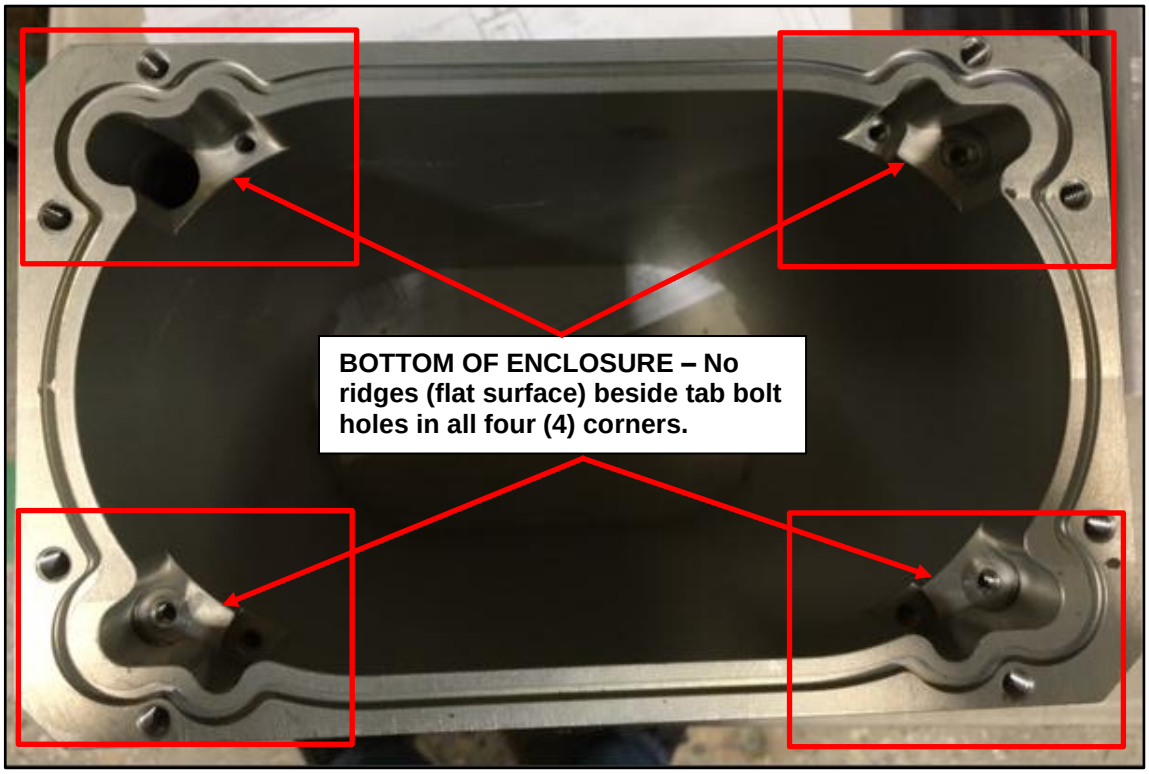
☞ **NOTE: Also refer to the applicable New Flyer drawings for buildup of Front filter core enclosure assembly P/N 1114438 and Rear filter core housing assembly P/N 1114505 throughout this section of the ITS.**

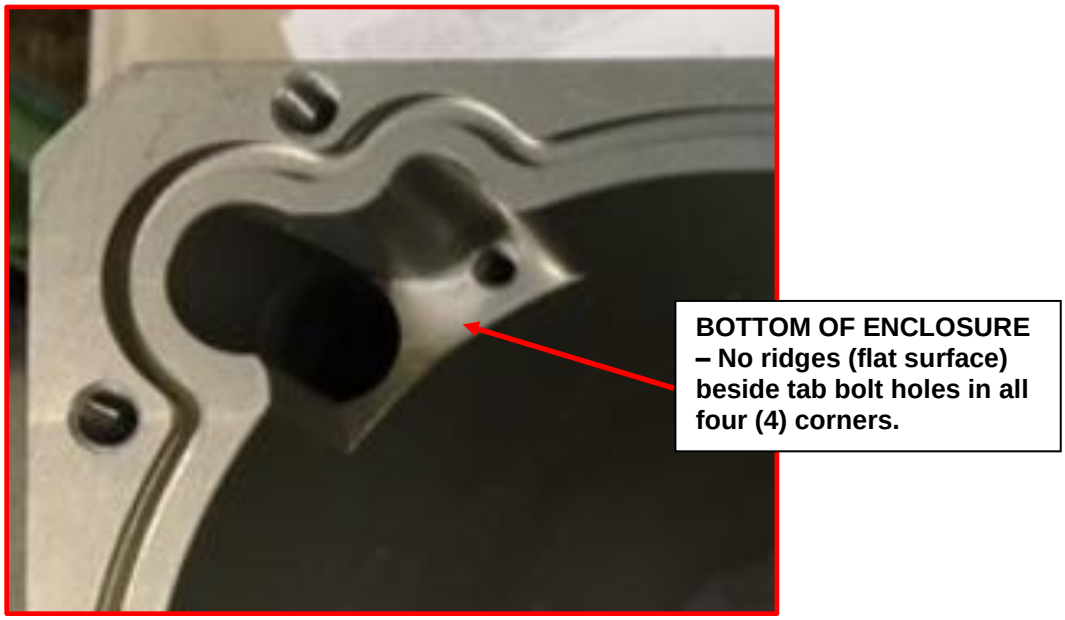
12. Locate the bottom of core enclosure housing P/N 1114441. Refer to the details in the images below to differentiate between the bottom and the top of the core enclosure housing.





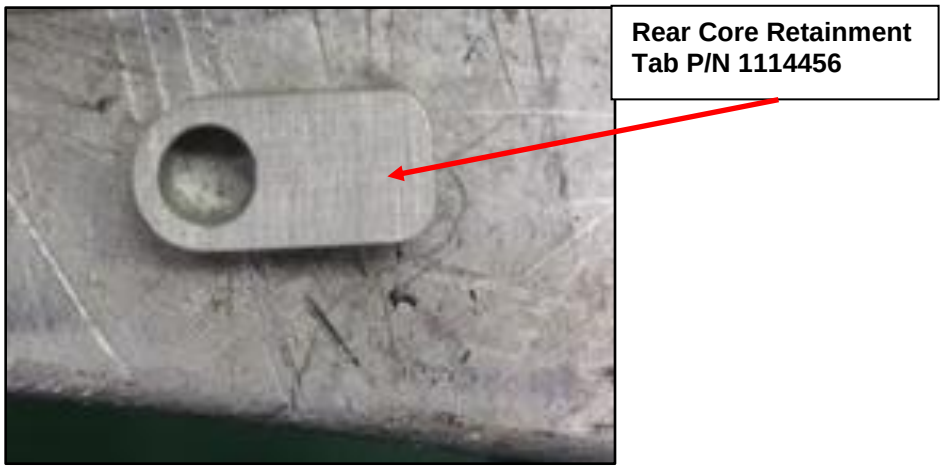
TOP OF ENCLOSURE – Ridges present next to tab bolt holes in each corner





BOTTOM OF ENCLOSURE - Ridges NOT present (flat surface) next to tab bolt holes in each corner

13. On the bottom of the enclosure, secure Rear Core Retainment Tabs P/N 1114456 x4 with Screws P/N 505618 x4 in each corner. Apply Loctite 243 to threads of hardware and torque to 15 IN-LBS.

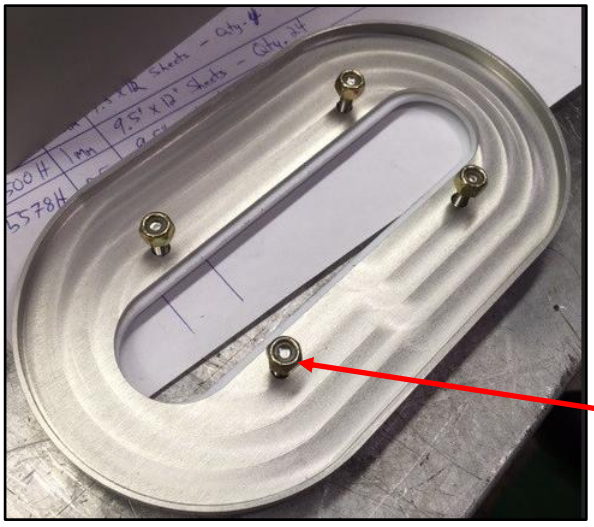


BOTTOM OF ENCLOSURE – Secure Rear Retainment Tabs P/N 1114456 x4 with Screws P/N 505618 x4 in each corner.

Apply Loctite 243 to threads of hardware and torque to 15 IN-LBS.

BOTTOM OF ENCLOSURE – Install rear core retainment tabs

14. Secure White Plastic Spacer P/N 1114442 to End Spacer Plate P/N 1114443 with Screws P/N 505618 x4 and #10 Locknuts P/N 42N00000 x4. Apply Loctite 243 to threads of hardware and torque to 15 IN-LBS. Assembly two (2) end spacer plate assemblies.



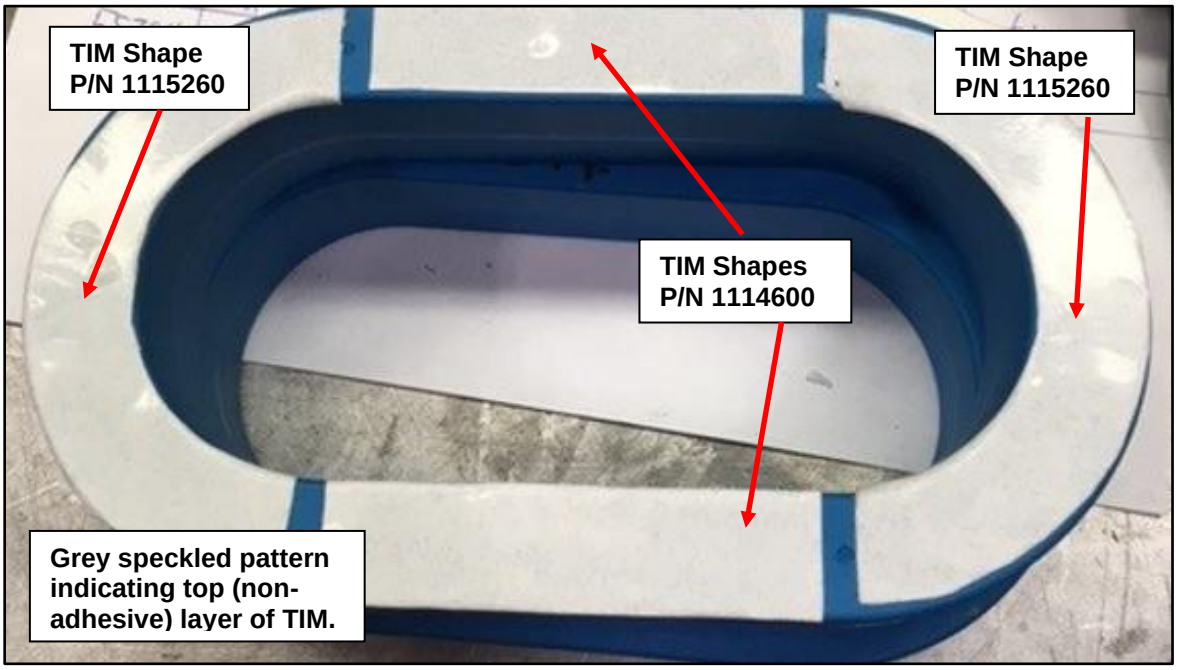
Secure White Spacer with Screws P/N 505618 x4 and #10 Locknuts P/N 42N00000 x4.

Apply Loctite 243 to threads of hardware and torque to 15 IN-LBS.

Secure White Plastic Spacer to End Spacer Plate and repeat

15. Remove the backing (white paper) and install Thermal Interface Material (TIM) side shapes P/N 1115260 x2 and P/N 1114600 to one side of a Ferrite Core Ring P/N 1114606.

☞ **NOTE: Ensure that TIM material is applied with the adhesive side down. The top layer of the TIM has a grey speckled pattern and is not adhesive.**



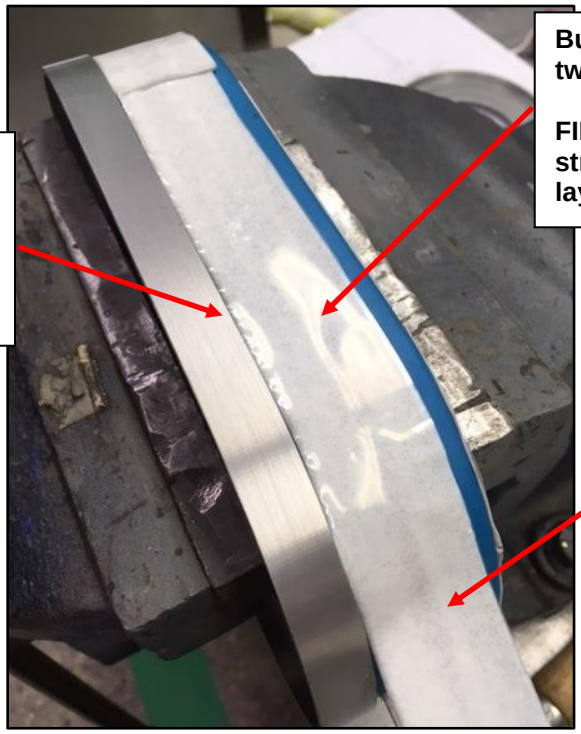
Remove clear film and install TIM on one side of a ferrite core ring

16. Install the ferrite core ring into one (1) end space plate assembly with TIM shapes facing downward.

17. Using edge of end spacer plate as a guide, apply TIM strips P/N 1114603 to the outer circumference of the ferrite core ring. **GENTLY** hold the ferrite core ring/end plate in a vice when applying TIM strips if necessary.

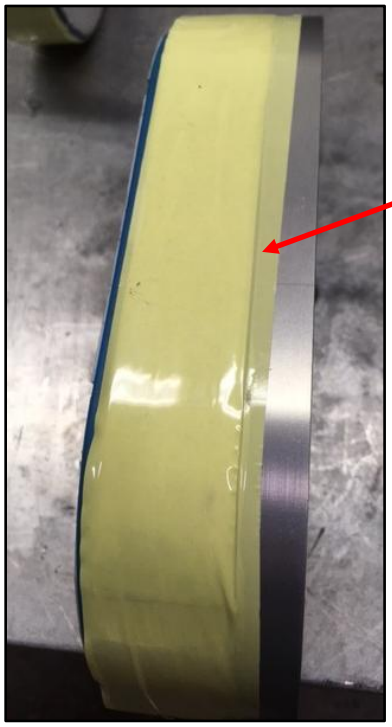
☞ **NOTE: Ensure that TIM material is applied with the adhesive side down. The top layer of the TIM has a grey speckled pattern and is not adhesive.**

☞ **NOTE: Build up 3mm of TIM with two (2) layers. FIRST layer is 2mm strips x 2 and SECOND layer is 1mm strips x2. Ensure that the second layer overlaps any gaps in TIM material around the core ring.**



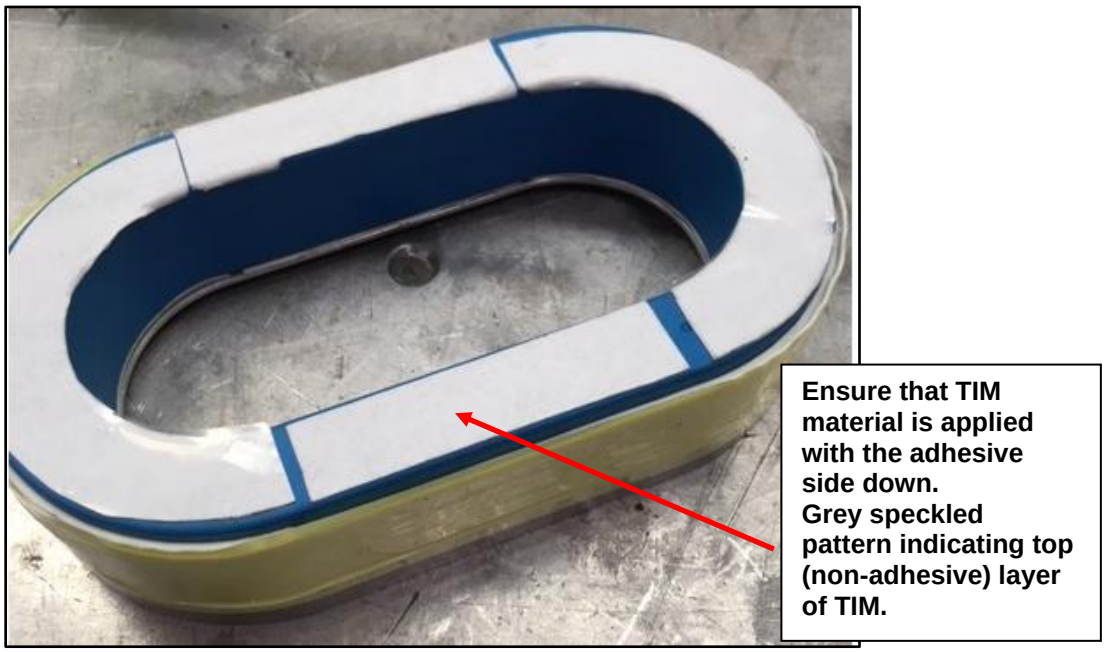
Build-up 3mm of TIM around ferrite core ring

18. Apply Polyester Film Tape P/N 1115226 around the ferrite core ring assembly. Ensure that tape clearly overlaps the metal edge between the TIM strips and the spacer end plate.



Apply polyester film tape around the ferrite core ring assembly.

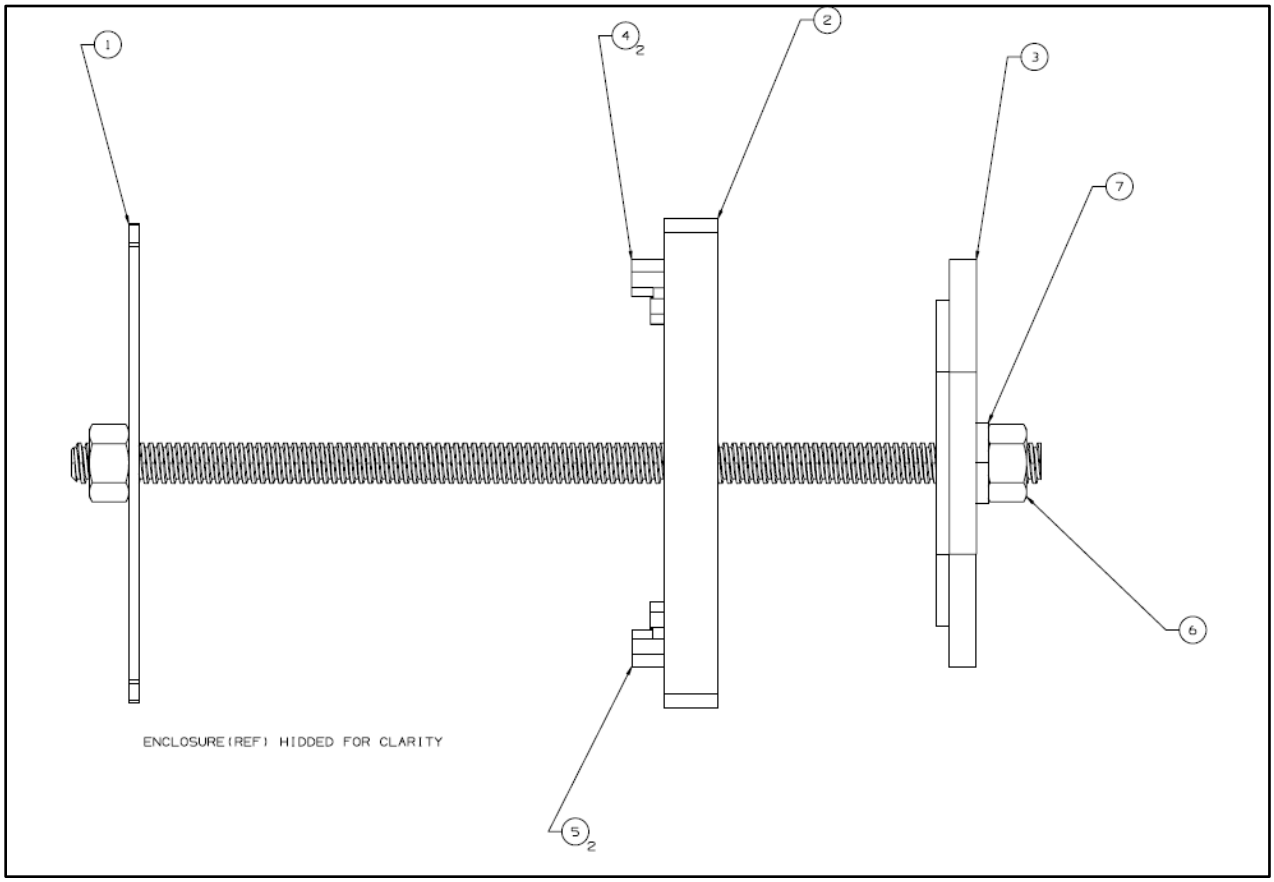
19. Remove clear film from top layer of TIM shapes on ferrite core ring assembly.



CORE INSERTION OPTION 1 – Jack Screw Insertion Tool

20. Assemble Jack Screw Insertion Tool P/N 1117856. Install Plugs P/N 1117849 x2 and P/N 1117848 x2 into Front End Plate P/N 1117846. Install Front End Plate of tool on the enclosure and secure with Socket Screws P/N 203631 x4.

☞ **NOTE: Apply Polyester Film Tape P/N 1115226 over plugs at four (4) locations to ensure smooth core insertion into enclosure.**

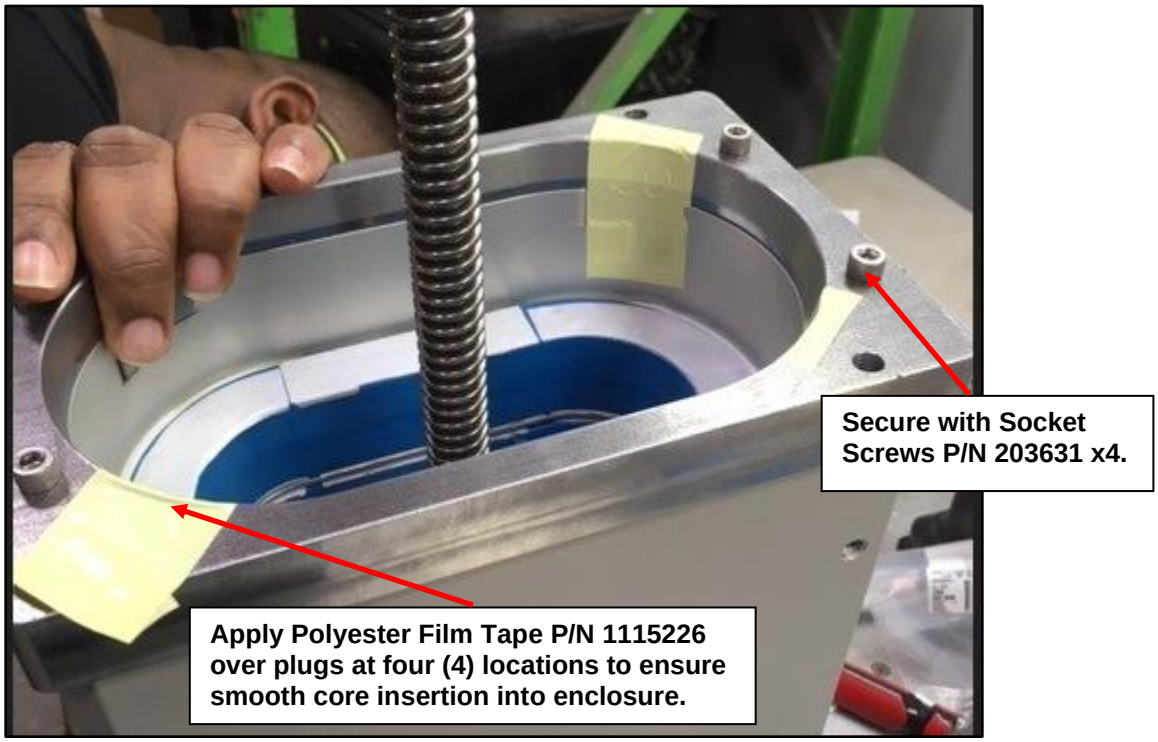


QTY	U/M	ITEM	PART NO.	DESCRIPTION
1	EA	7	1117902	WASHER-OXIDE STEEL
1	EA	6	1118017	ASSY-ACME LEAD SCREW
2	EA	5	1117849	PLUG-ENCLOSURE (TYPE 2)
2	EA	4	1117848	PLUG-ENCLOSURE (TYPE 1)
1	EA	3	1117847	TOOL-PLATE
1	EA	2	1117846	TOOL-FRONT END PLATE
1	EA	1	1117997	ASSY-REAR END PLATE

MATERIAL
6061-T6
ALUMINUM

TITLE

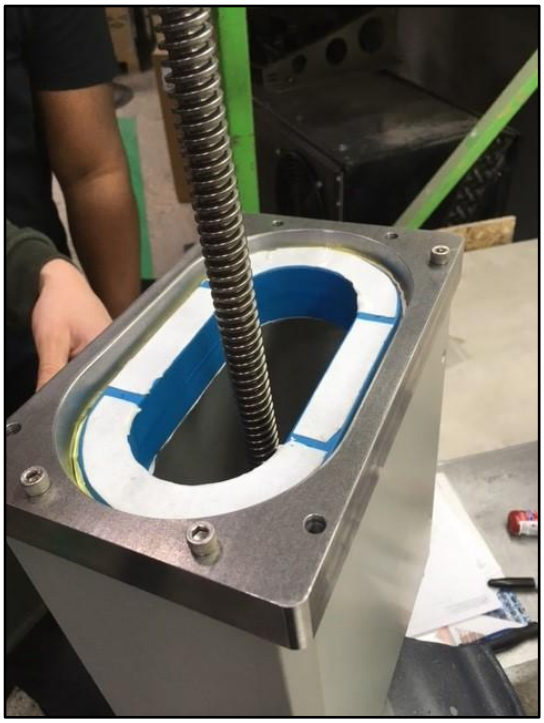
ASSY-TOOL FILTER CORE HOUSING

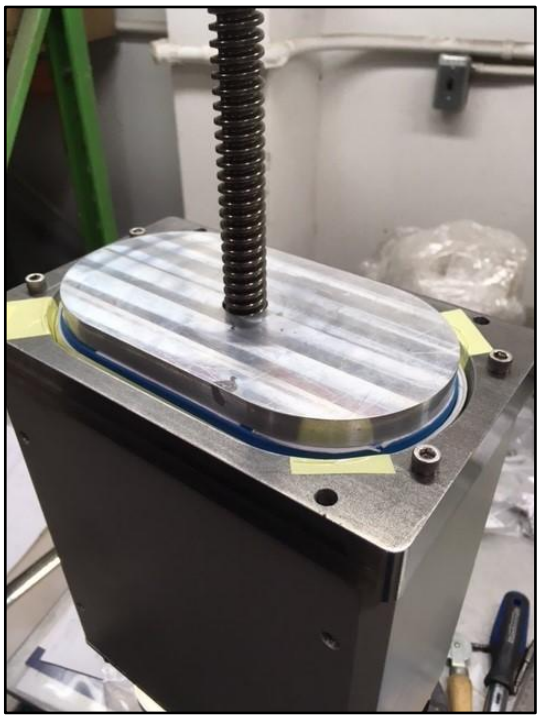


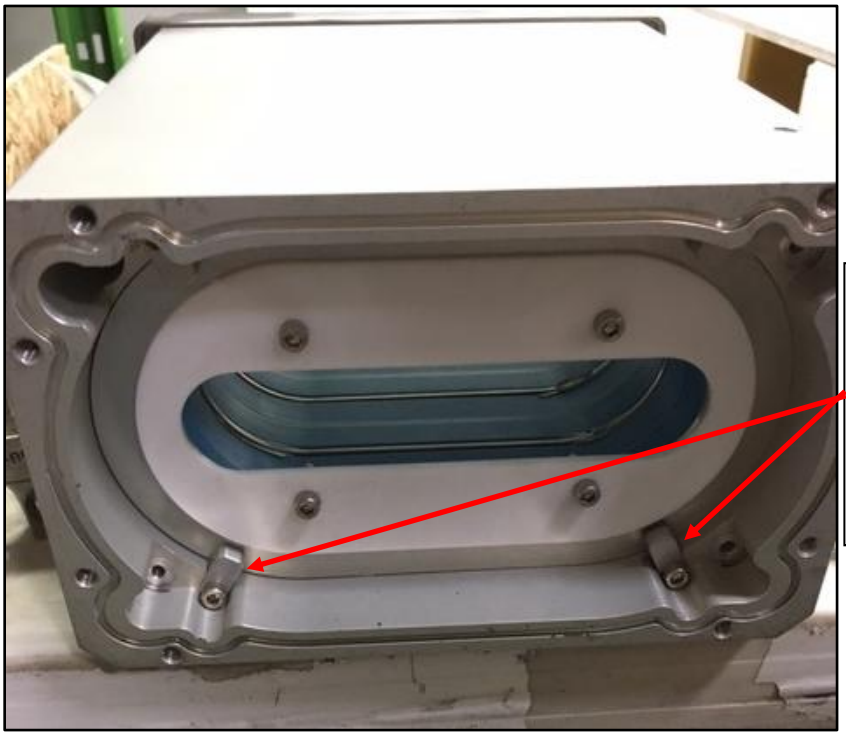
Install Front End Plate of jacking screw tool on the enclosure and secure with Socket Screws

21. Install remained of jacking screw tool on enclosure and use a 1 ¼" wrench/crow's foot socket to turn end nut and gently insert ferrite core ring assembly into enclosure. Do not stop until ring assembly bottoms out against the four (4) rear core retainment tabs at the bottom of the enclosure.

☞ **NOTE: Hold the bottom of the jacking screw tool in a vice during core insertion if necessary.**







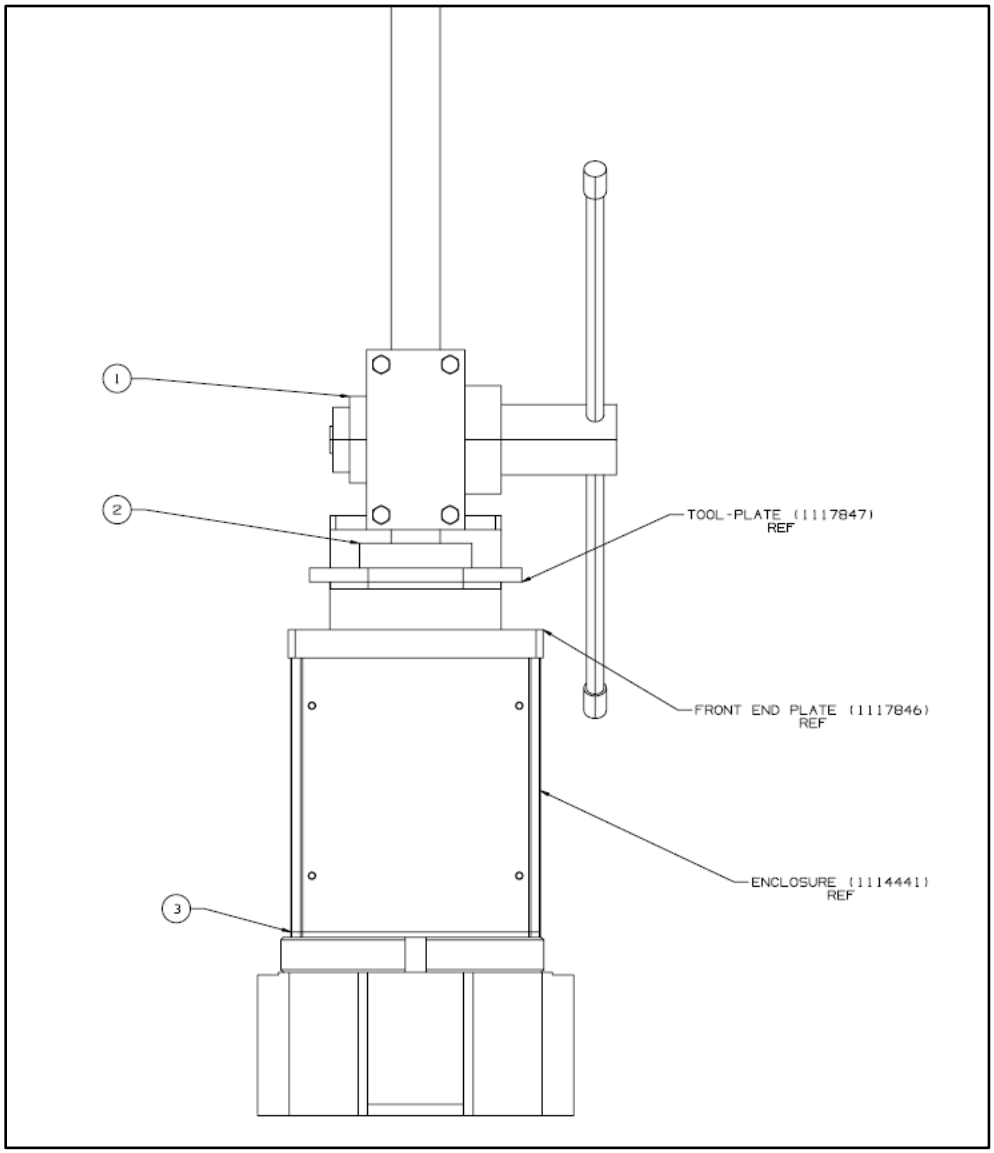
Do not stop core insertion until ring assembly bottoms out against the four (4) rear core retainment tabs at the bottom of the enclosure.

CORE INSERTION OPTION 2 – Arbor Press (Preferred Option)

22. Assemble arbor press. Install Plugs P/N 1117849 x2 and P/N 1117848 x2 into Front End Plate P/N 1117846. Install Front End Plate of tool on the enclosure and secure with Socket Screws P/N 203631 x4.

☞ **NOTE: Apply Polyester Film Tape P/N 1115226 over plugs at four (4) locations to ensure smooth core insertion into enclosure.**

23. Install Lever Press Adapter Tool P/N 1117975 and Core Press Plate P/N 1117847 on arbor press. Gently insert ferrite core ring assembly into enclosure. Do not stop until ring assembly bottoms out against the four (4) rear core retainment tabs at the bottom of the enclosure.



QTY	U/M	ITEM	PART NO.	DESCRIPTION
1	EA	3	1117845	TOOL-REAR END PLATE
1	EA	2	1117975	TOOL-LEVER PRESS
1	EA	1	1117969	LEVER-PRESS BENCH MOUNT

MATERIAL
6061-T6
ALUMINUM

TREATMENT
SEE NOTES

WEIGHT
15.567

SIMILAR TO
N/A

TITLE
ASSY-LEVER PRESS

UNSPEC'D TOLS.	DEC. IN.
.X	±.12
.XX	±.06
.XXX	±.03
HOLE DIA.	±.015
BEND RADII.	±.03
ANGLE TOL.	±1°

NFI GROUP

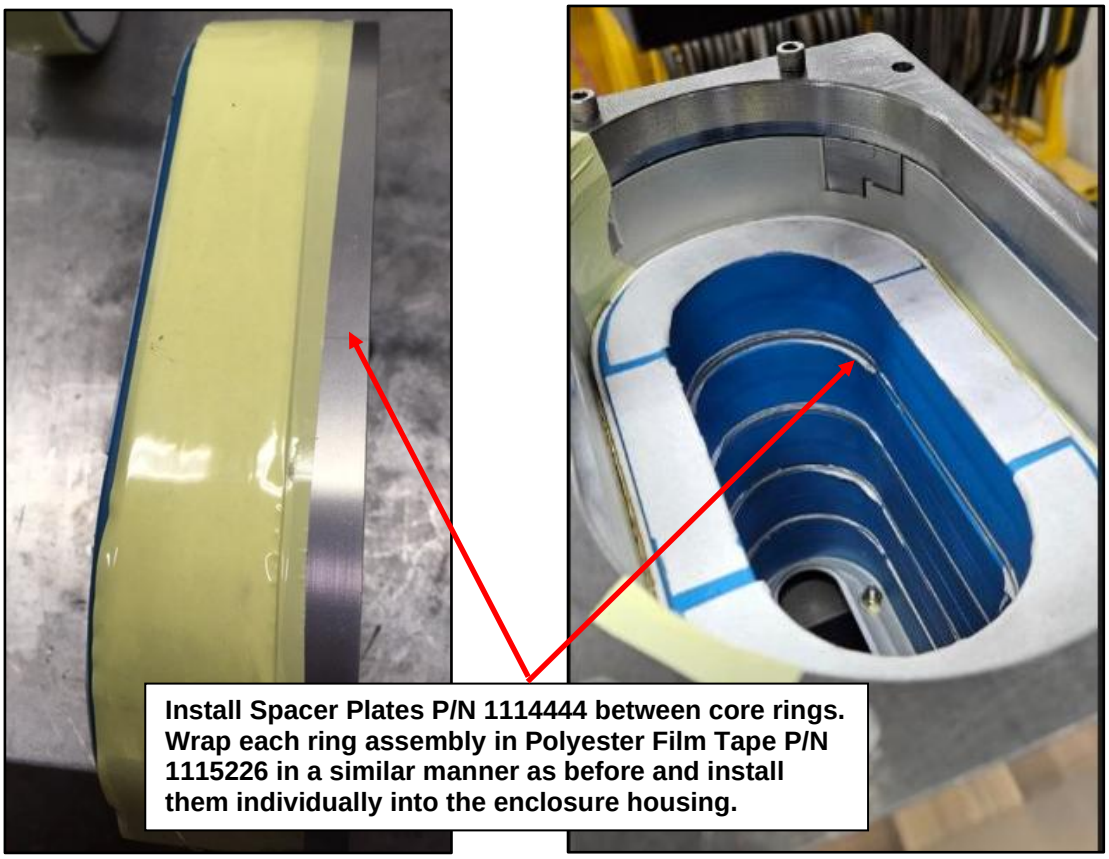
PART Nº
1117983
(NK)

SCALE NTS

E

SHEET 1 OF 1

24. Repeat process for remaining four (4) ferrite core rings. Apply TIM shapes/strips to the remaining core rings and install into enclosure housing. Install spacer Plates P/N 1114444 x4 between core rings.
    Wrap each ring assembly in Polyester Film Tape P/N 1115226 in a similar manner as before and install them individually into the enclosure housing.



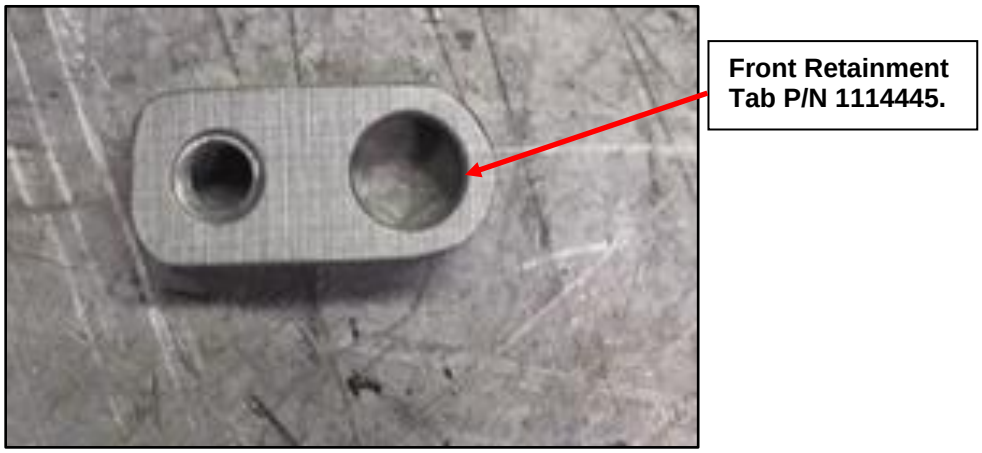
25. Lightly apply pressure to ensure that all five (5) cores are squeezed together and that core stack is sufficiently bottomed out inside enclosure.

☞ **NOTE: DO NOT apply excessive force when squeezing core stack together with jacking screw tool or arbor press.**

26. Position the second end spacer plate assembly (previously assembled) on top of the core stack inside the enclosure housing.

27. Use a very small Allen key to install Ball Nose Spring Plungers P/N 1114447 x4 into threaded holes in Front Retainment Tabs P/N 1114445 x4.

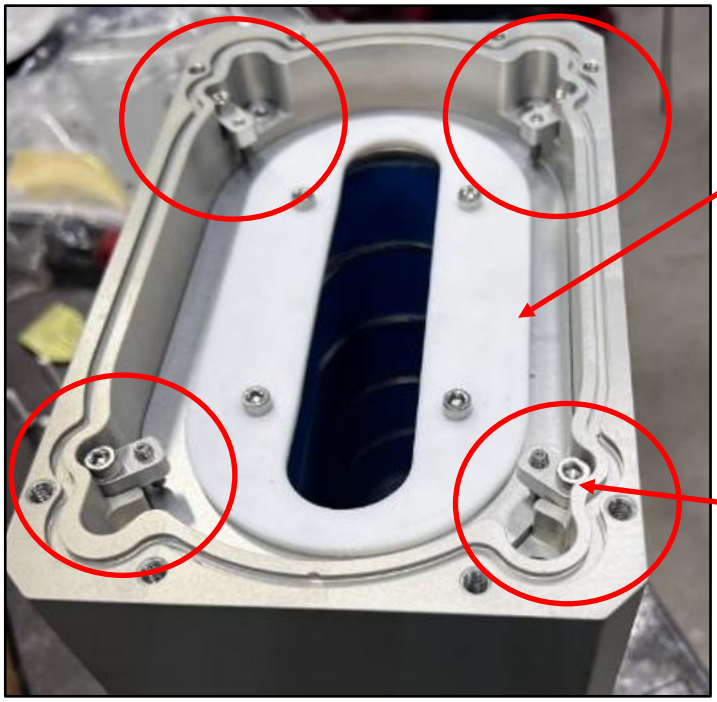
28. Install Front Retainment Tabs P/N 1114445 x4 in each corner of the top of the enclosure housing with Screws P/N 505618 x4 in each corner. Apply Loctite 243 to threads of hardware and torque to 15 IN-LBS.



Install Front Retainment Tabs P/N 1114445 with Screw P/N 505618.

Apply Loctite 243 to threads of hardware and torque to 15 IN-LBS.

Install Ball Nose Spring Plungers P/N 1114447 x4 into threaded holes in Front Retainment Tabs P/N 1114445 x4.



Position the second end spacer plate assembly (previously assembled) on top of the core stack inside the enclosure housing.

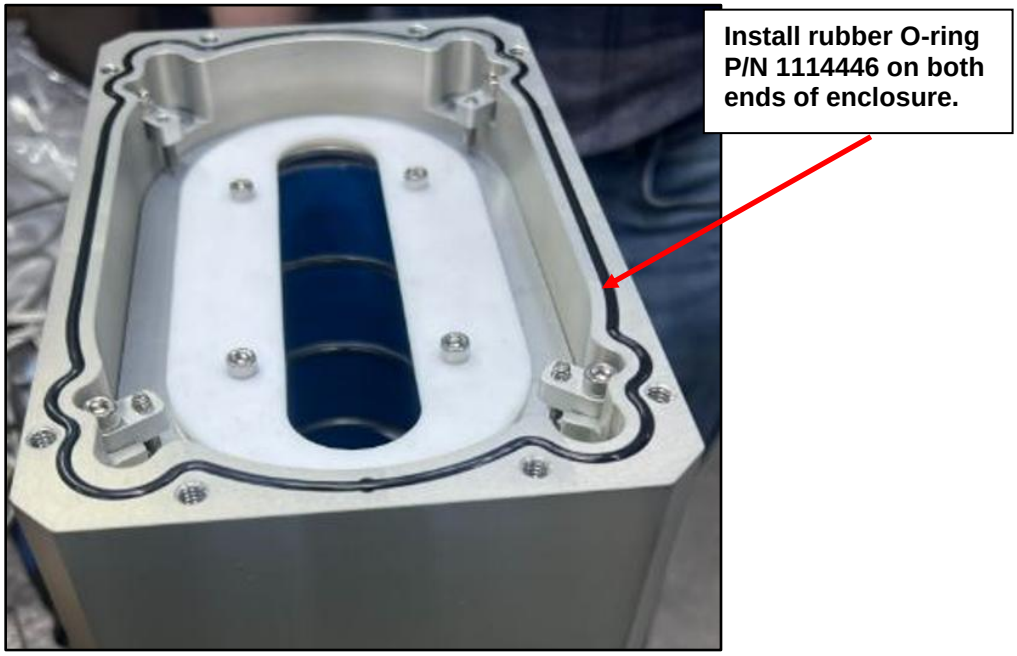
Install Front Retainment Tabs P/N 1114445 x4 in each corner of the top of the enclosure housing with Screws P/N 505618 x4 in each corner.

Apply Loctite 243 to threads of hardware and torque to 15 IN-LBS.

29. Torque Ball Nose Spring Plungers P/N 1114447 x4 until they are snuggly up to end spacer plate to firmly secure core stack inside core enclosure housing.

30. Install rubber O-ring P/N 1114446 in grooves on both ends of core enclosure housing.

☞ **NOTE: Evenly distribute the length of O-rings inside the grooves to prevent excessive bunching/slack in some areas.**

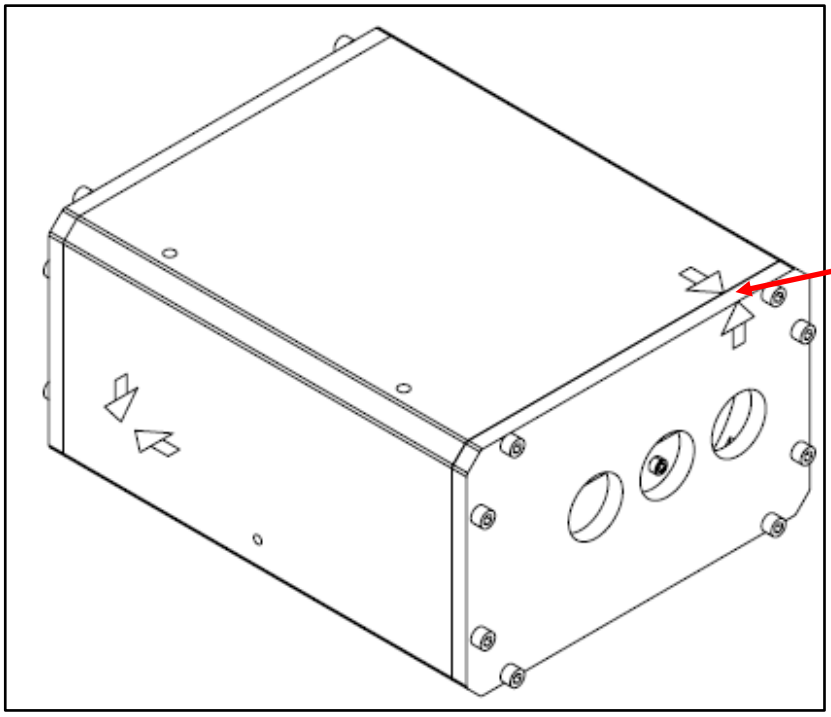


31. Line up arrows and LOOSELY install both Front End Plate P/N 1114439 and Rear End Plate P/N 1114440 on Front filter core enclosure assembly P/N 1114438 with Socket Screws P/N 203631 x16.

    Line up arrows and LOOSELY install both Front End Plate P/N 1114509 and Rear End Plate P/N 1114508 on Rear filter core enclosure assembly P/N 1114505 with Socket Screws P/N 203631 x16.

☞ **NOTE: Front and rear end plates can be differentiated by threaded gore vent hole. Rear end plates will always have a threaded hole for gore vent (see next step).**

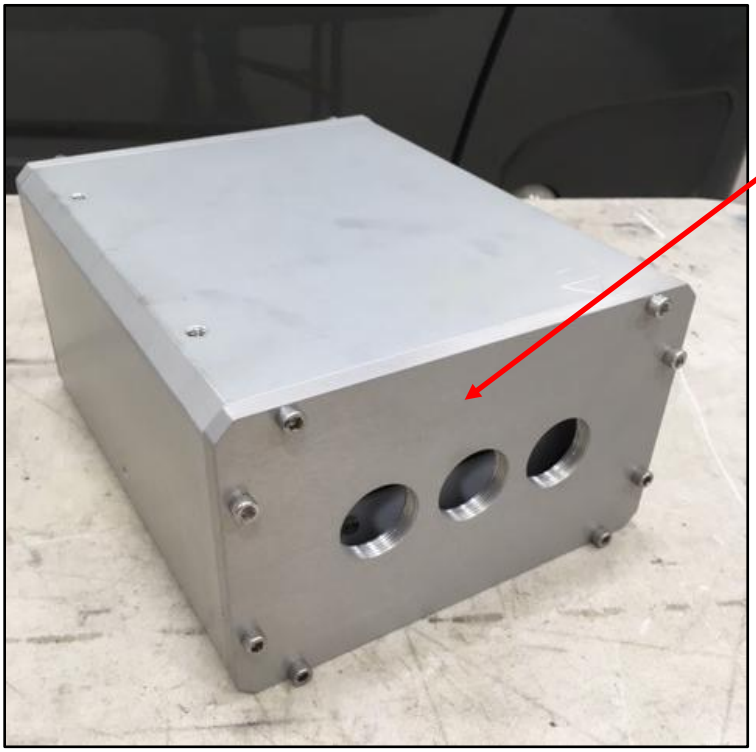
32. Thread Gore Vents P/N 1114463 into existing threaded holes in Rear End Plate P/N 1114440 (Front Enclosure) and Rear End Plate P/N 1114508 (Rear Enclosure). Hand-tighten gore vents into end plates.



Line up arrows when installing font/rear end plates on enclosures.

Secure end plates with Socket Screws P/N 203631 (8 each side).

Apply Loctite 243 to threads and torque hardware to 30 IN-LBS.



Front End Plate: No threaded hole present for gore vent.

Rear End Plate: Hand tighten Gore Vent P/N 1114463 into existing threaded hole in rear end plate.

Part C – Ferrite Core Enclosure Mounting

33. Disconnect inverter horns, HV cables and BAE electric accessory cables from both forward and rear rooftop inverters.
    Also, disconnect all additional electrical cables and clamps from the CS of the bus as required as well as cable support bracket in front inverter rack. Retain all hardware. Refer to Figure 6(a) and 6(b).

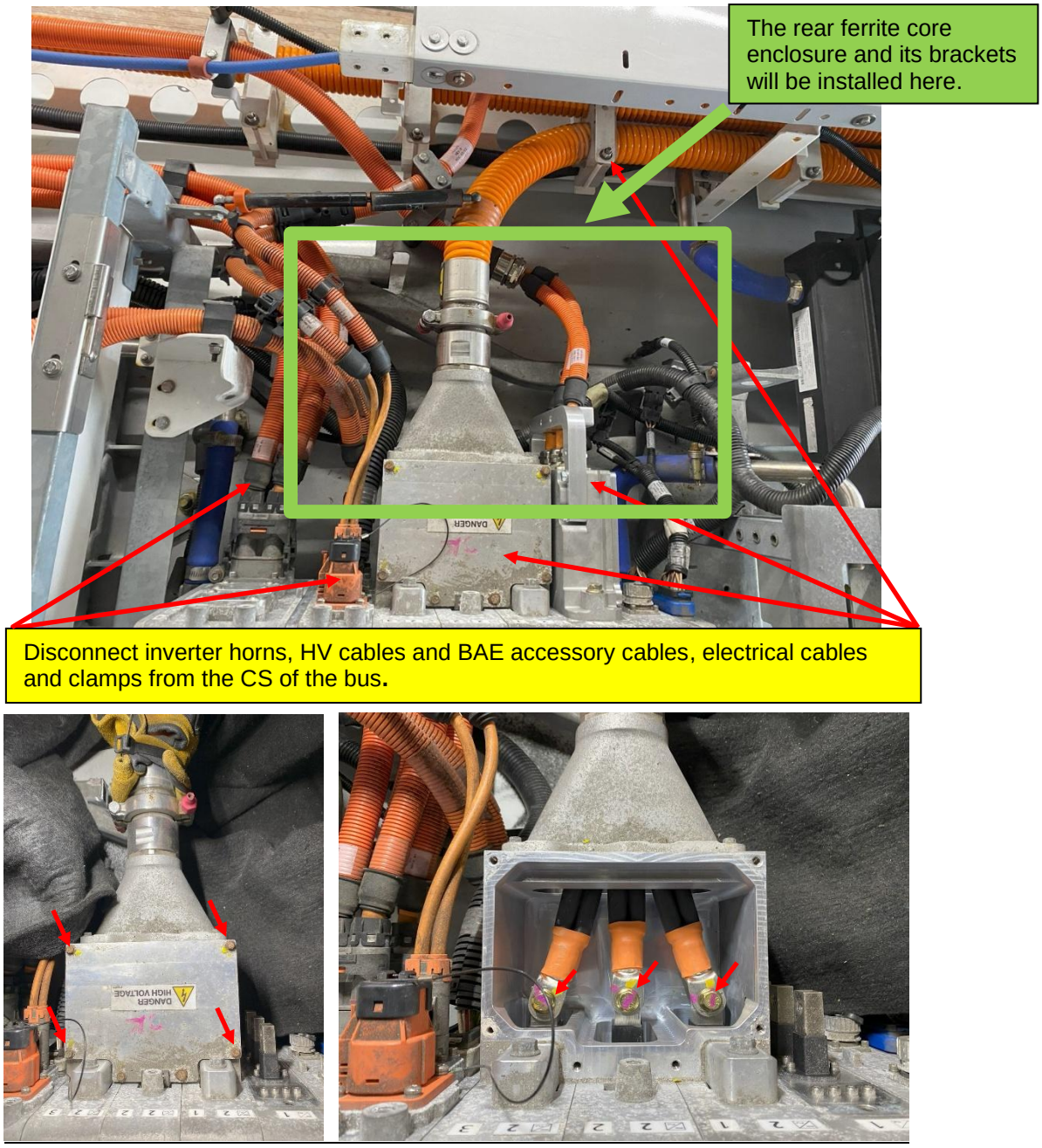


Figure 6(a) – Disconnect MPCS HV cable connectors (inverter horns) and BAE cables on both rooftop inverters (rear inverter location shown).

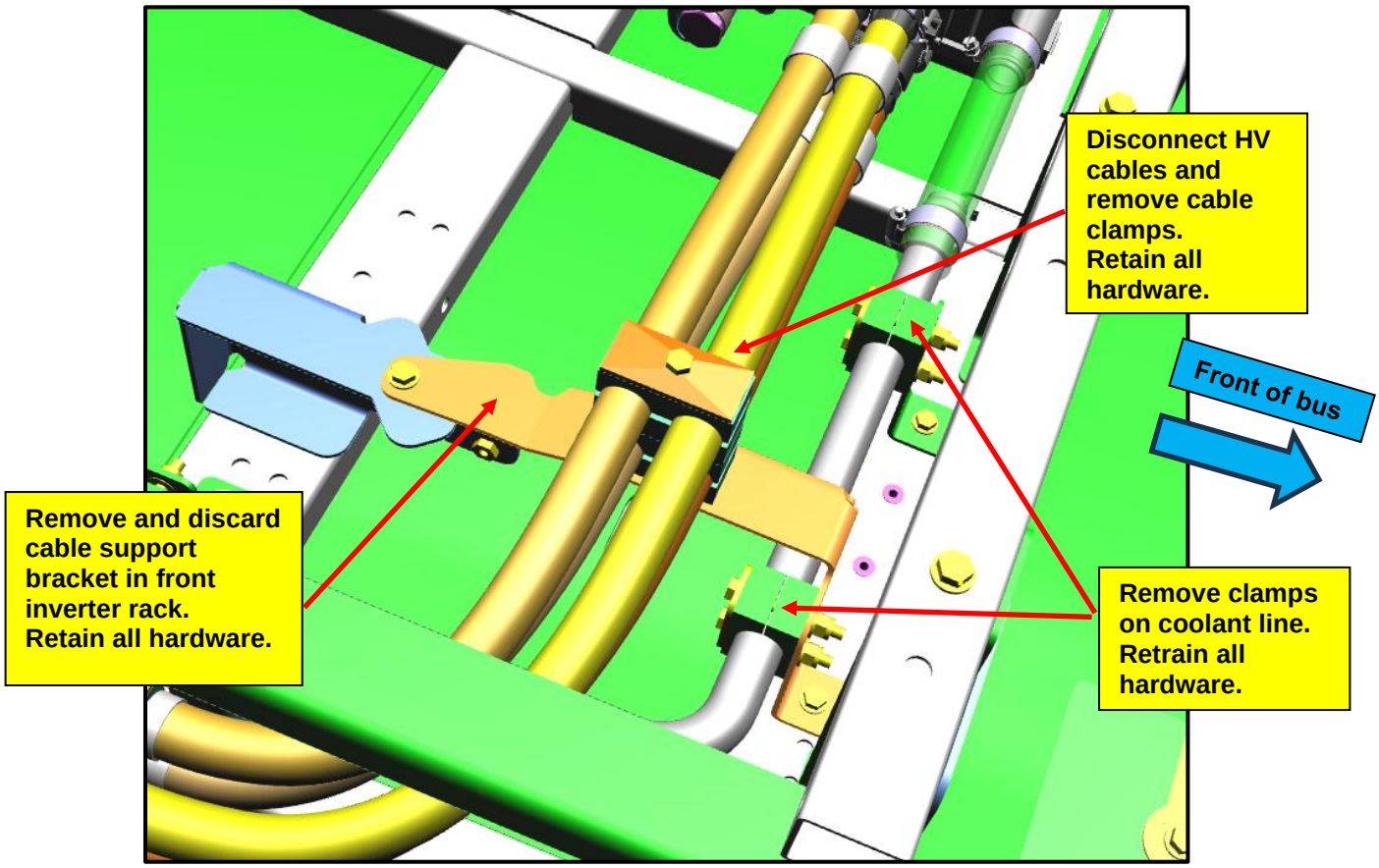


Figure 6(b) – View inside front inverter rack – Remove HV cables, clamps and cable support bracket

Installing the support bracket for the rear ferrite core enclosure

34. Locate existing rear cable support bracket (shown in red on the Figures below) in the rear rooftop inverter rack.
35. Carefully grind off welded flanges and remove from both rack structure tubes. Ensure that edges on structure tubes are smooth/flush after grinding. Refer to Figure 7(a).

☞ **NOTE: Carefully prep/mask the surrounding area BEFORE griding inside the inverter rack. Use all necessary spark covers and take special precautions to protect bus and electrical components from sparks. Clean the area sufficiently after grinding to ensure that no residual metal filings are present.**

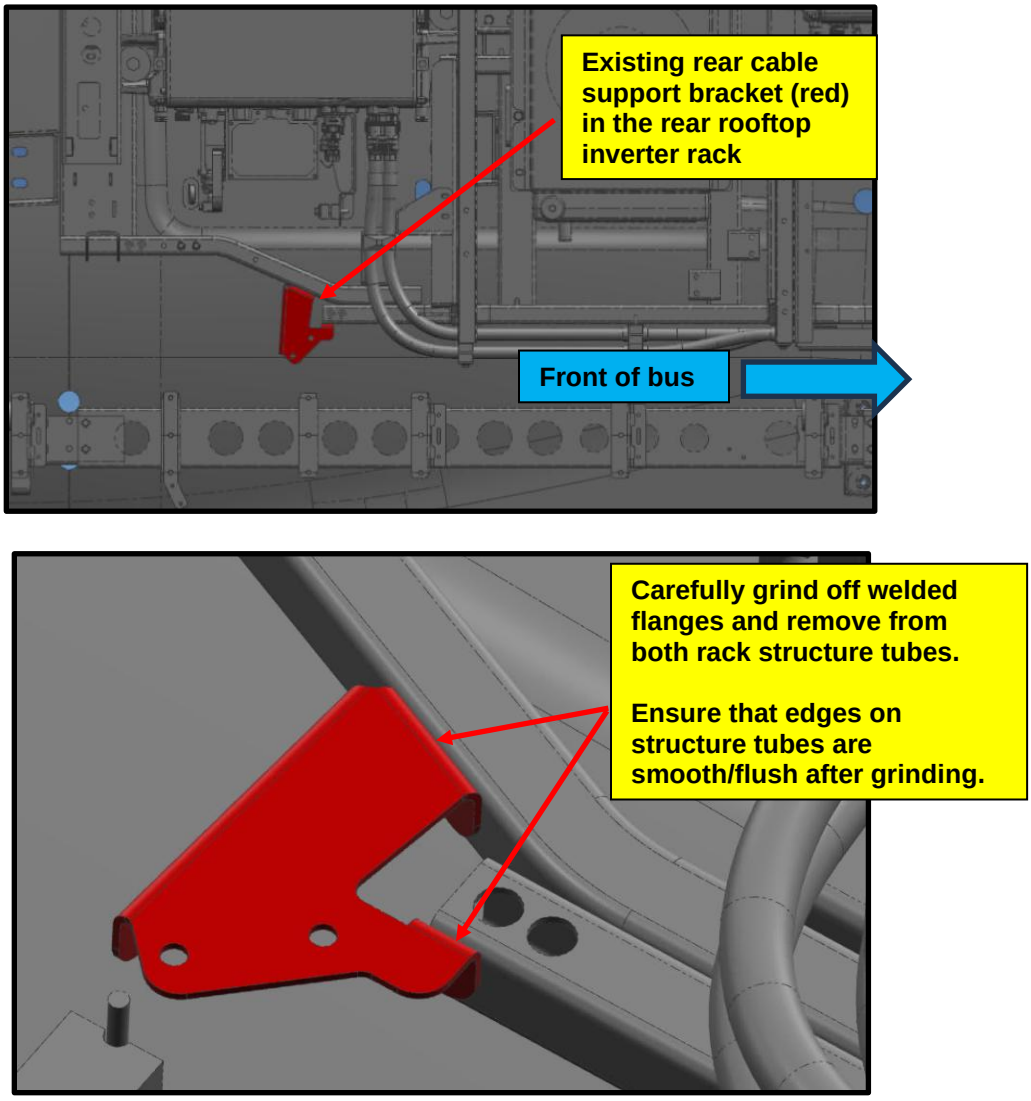
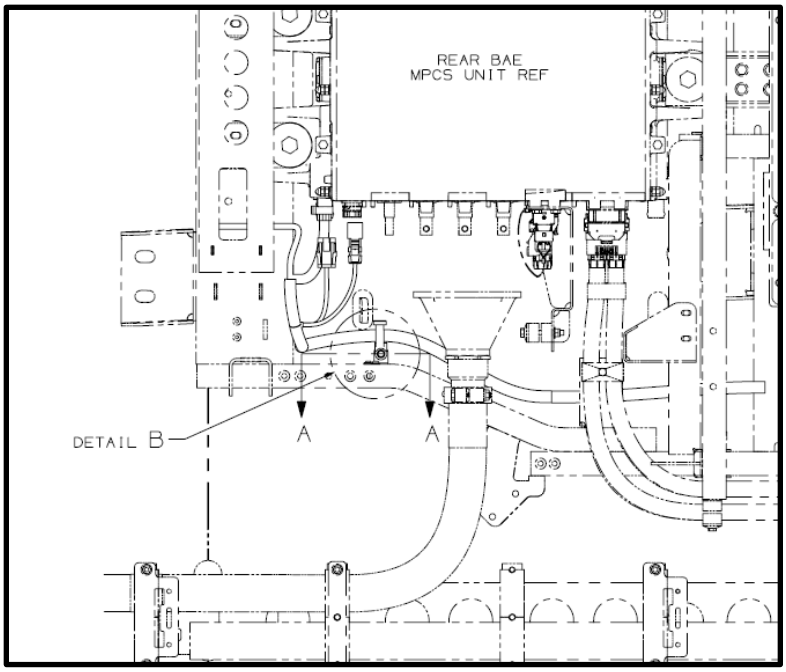
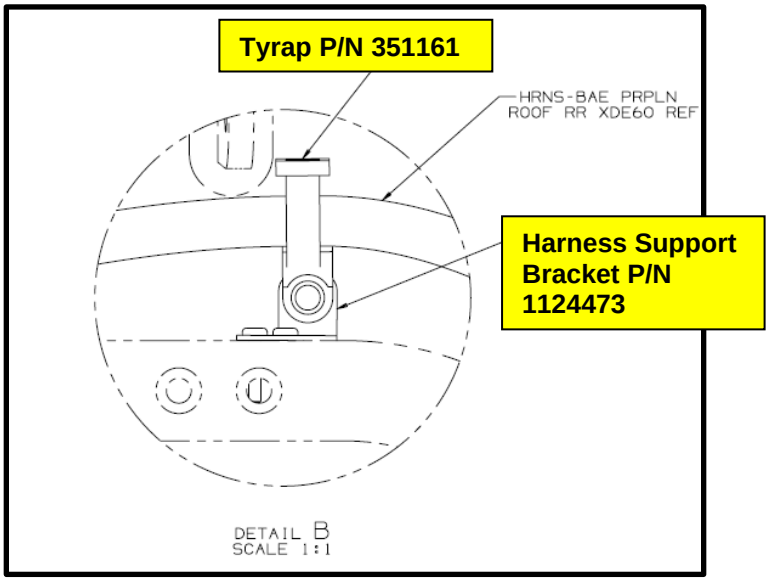


Figure 7(a) – Original cable support bracket needs to be cut off

36. Locate BAE population harness in rear inverter rack and remove existing harness bracket. Install new Harness Support Bracket (P/N **1124473**) on existing holes in structure tube and secure with Screws (P/N **14S00016**) x2 and apply Loctite 243 to threads of hardware. Secure existing tyrap base, tyrap screw, Nylock P/N 42N00000 and washers. Use new tyrap P/N 351161 to secure BAE population harness back on new bracket. Refer to Figure 7(b).





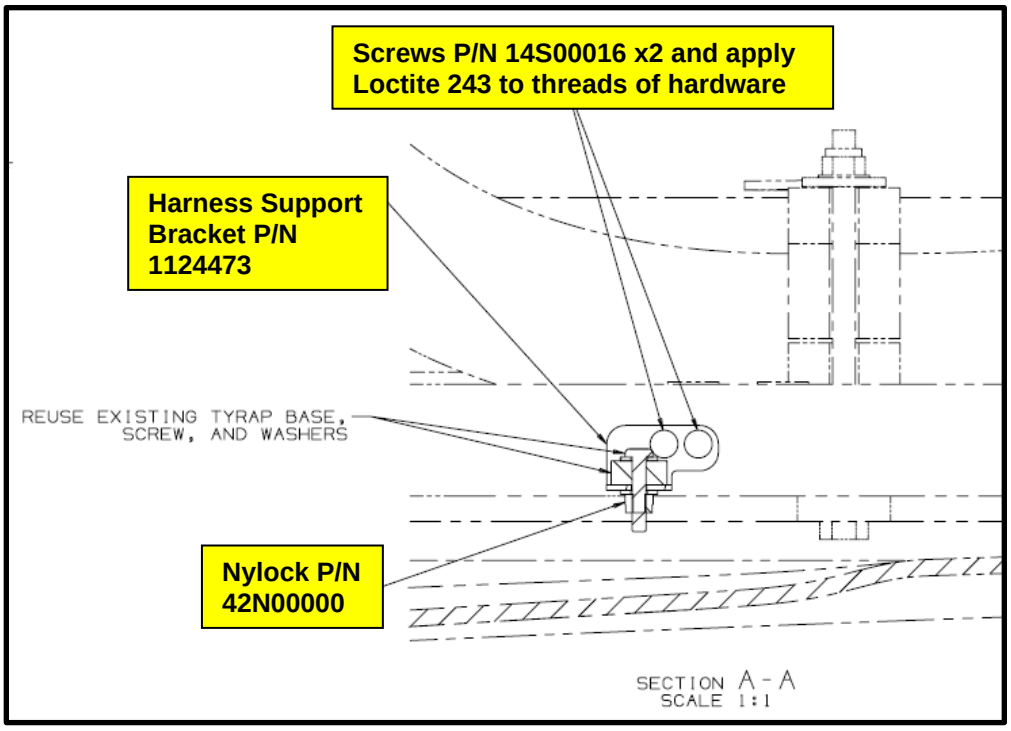


Figure 7(b) – Install new BAE harness support bracket

37. In the bottom of the rear inverter rack, position Core Rack Support Assembly (P/N **1114576**) against existing structure tubes. Drill 0.332” (drill size Q) holes through both sides of rack tube at specified locations. Enlarge hole in TOP of rack tube to 0.688” (22/32”) and install 4 ea. crush sleeves P/N **1114453** into the holes. Install 5/16” hardware (Bolts P/N **10B05040**, Washers P/N **20W05000**, Nylock Nuts P/N **40N05000**) at four (4) locations. Torque hardware to 24 FT-LBS. Refer to Figures 8a, 8b.

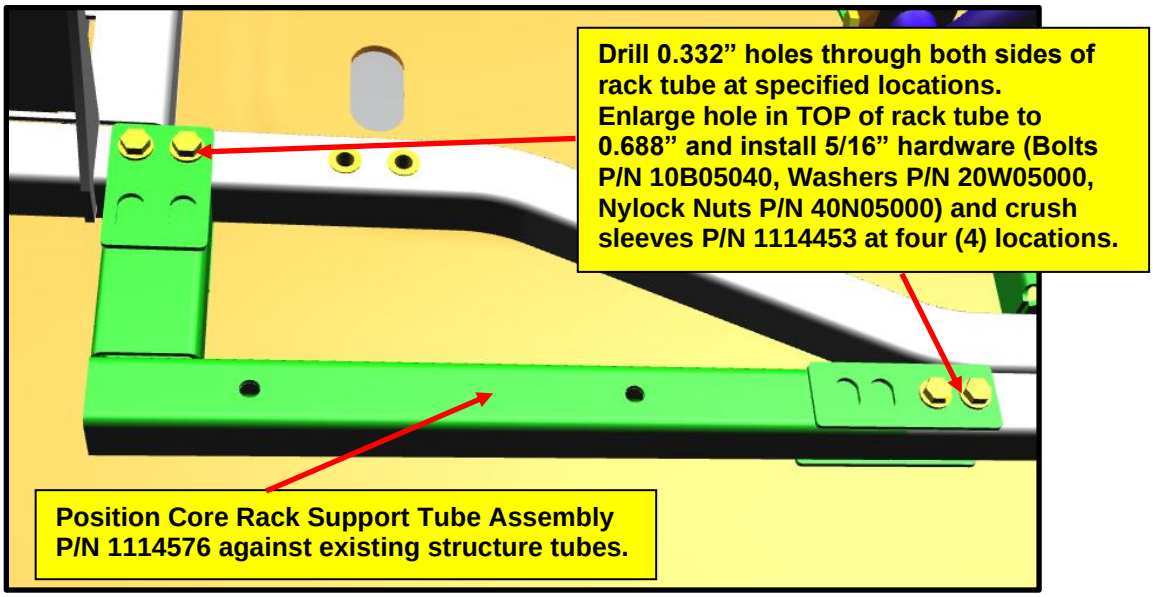


Figure 8a – Install Core Rack Support Tube Assembly

Figure 8b – Drilling mounting holes for the Core Rack Support Tube Assembly

38. Position drilling template **XC-DJ-3386** on existing holes on new core rack support tube and mark holes in inverter rack structure tubes. Drill ¼" holes at specified locations then enlarge these holes to 0.391" size (use a 25/64" size drill bit). Install ¼-20 threaded inserts (P/N **050798**).
39. Degrease surface of the inverter rack where the bracket was cut off. Apply two light coats of zinc primer over the bare metal surfaces. Mix 1 part of zinc primer resin (PN **606945**) with 2 part of zinc powder (PN **638699**).
40. Apply Loctite 243 to the first two threads of ¼" bolts (P/N **10B04012**), Washers (P/N **10W04000**) in Rear Ferrite Core Mounting Brackets P/N **1113783** x2 and torque hardware to 5 FT-LBS. Refer to Figures 9a and 9b.

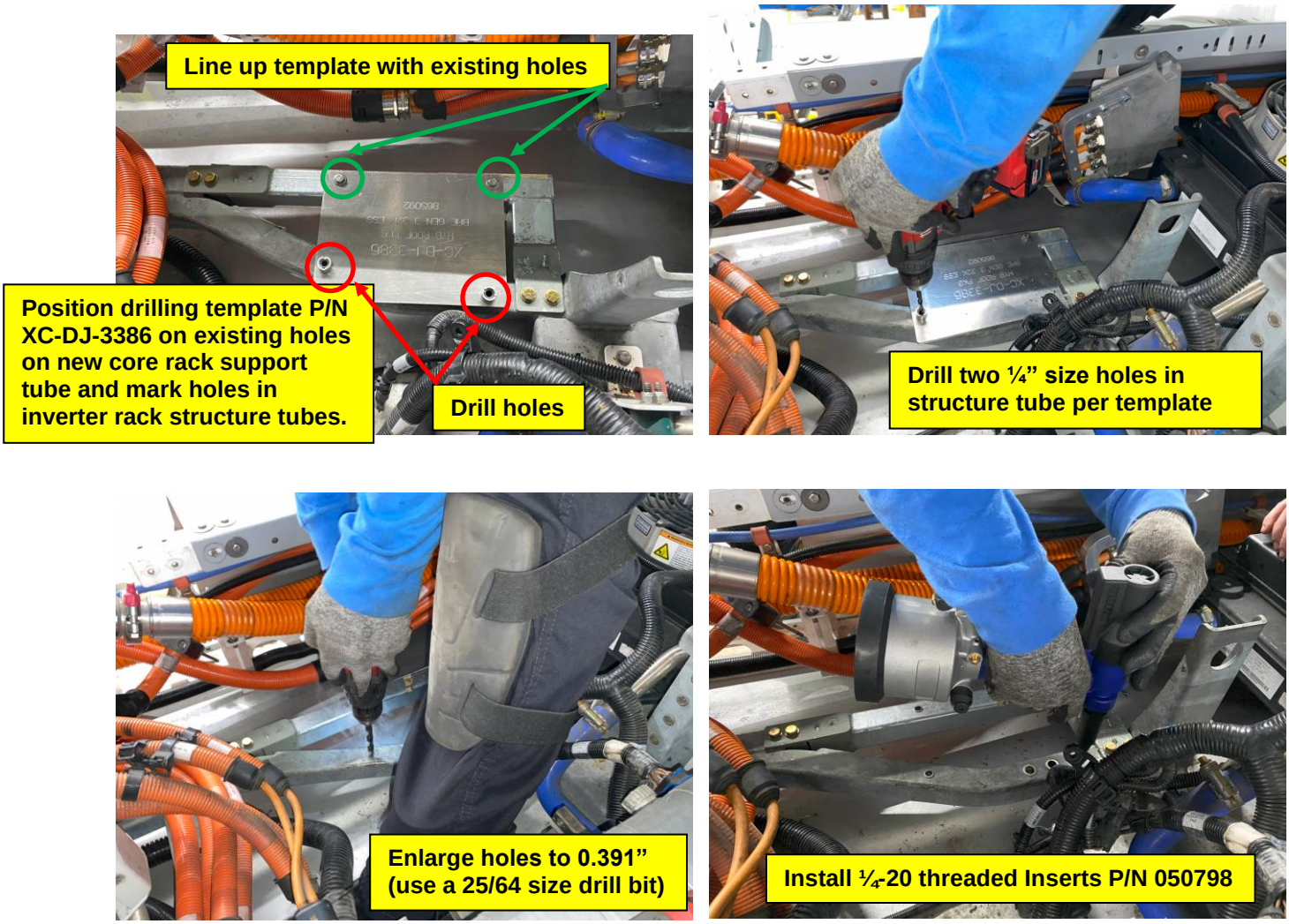


Figure 9 – Drilling holes and installing ¼-20 treaded inserts

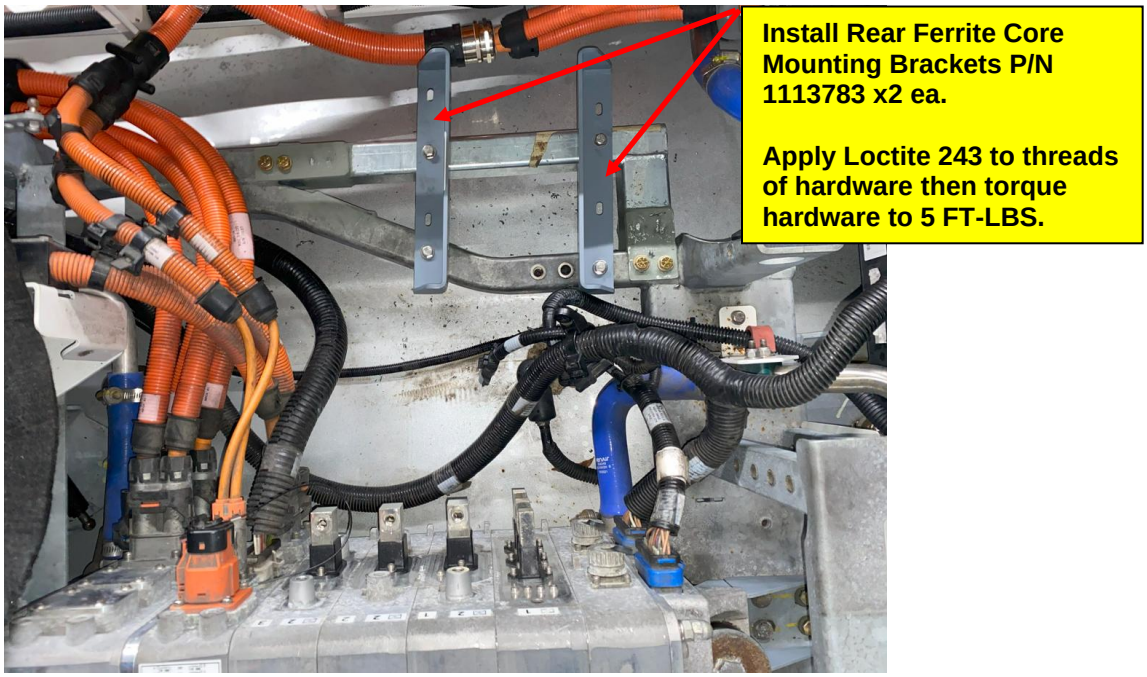


Figure 9b – Install Rear Ferrite Core Mounting Brackets

Installation of the brackets for the forward ferrite core enclosure

41. Move to the forward inverter rack and secure drilling template P/N #### to the forward structure tube using existing insert locations. Refer to Figure 10.

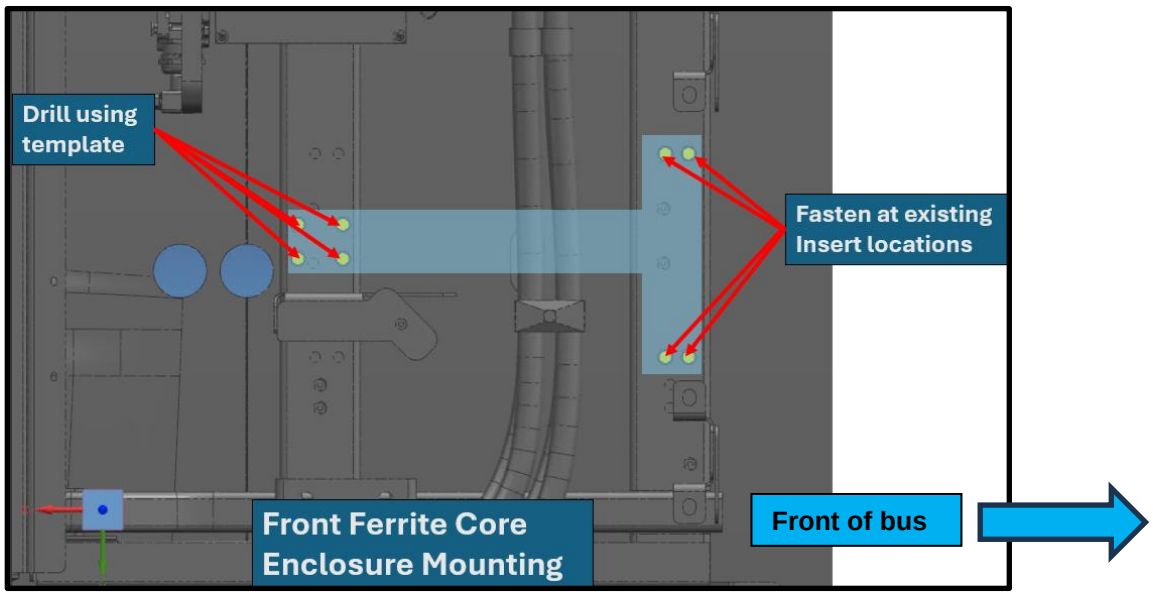


Figure 10 – Use drilling template to drill holes in structure tubes in forward inverter rack

42. Use the template to drill four (4) ¼" size holes then remove template and enlarge holes to 0.391" (use a 25/64 size drill bit). Refer to Figure 11.

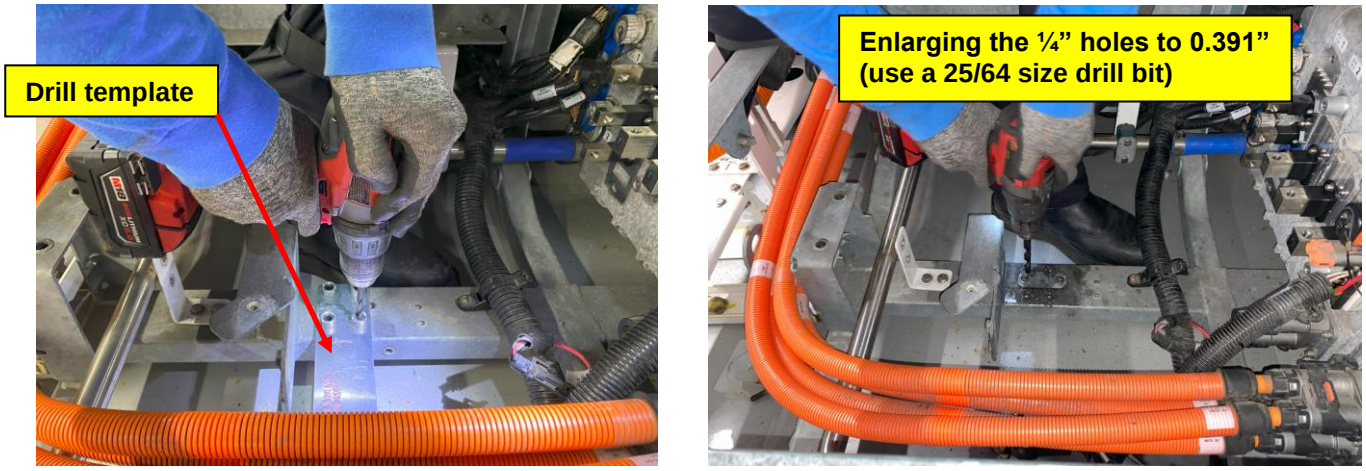


Figure 10 – Use drilling template to drill ¼" size holes then enlarge holes with a 25/64" size drill bit

43. Install ¼-20 threaded Inserts (P/N **522558**) x4.
44. Secure both Ferrite Core Mounting Assembly Bracket (P/N **1114578**) and Ferrite Core Mounting Bracket (P/N **1113711**) to inverter rack structure tubes using Bolts (P/N **20B04012**) x8 and Washers (P/N **50W04000**) x8. Apply Loctite 243 to threads and torque hardware to 5 FT-LBS (front hardware) and 9 FT-LBS (rear hardware) respectively. Refer to Figures 10 and 11.

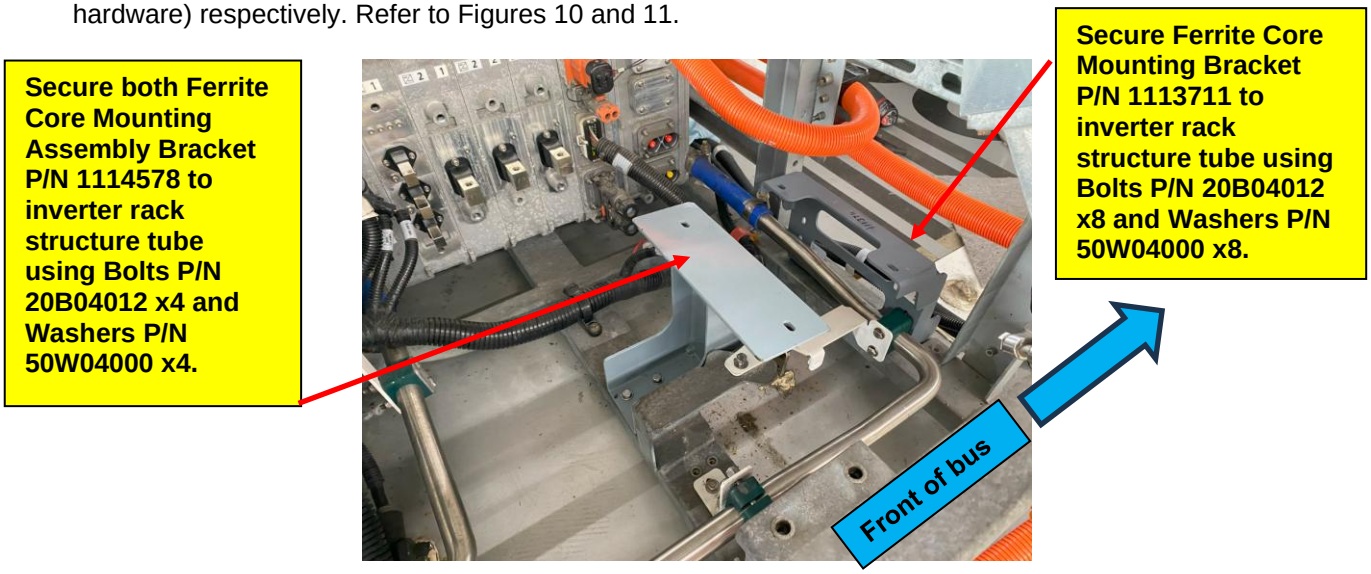


Figure 11 – Install Ferrite Core Mounting Brackets in Forward Inverter Rack

45. In the forward inverter rack, loosen hardware and adjust AC traction motor clamp ~45 degrees to provide clearance between this clamp and the forward ferrite core enclosure that will be installed above it. Refer to Figure 12.

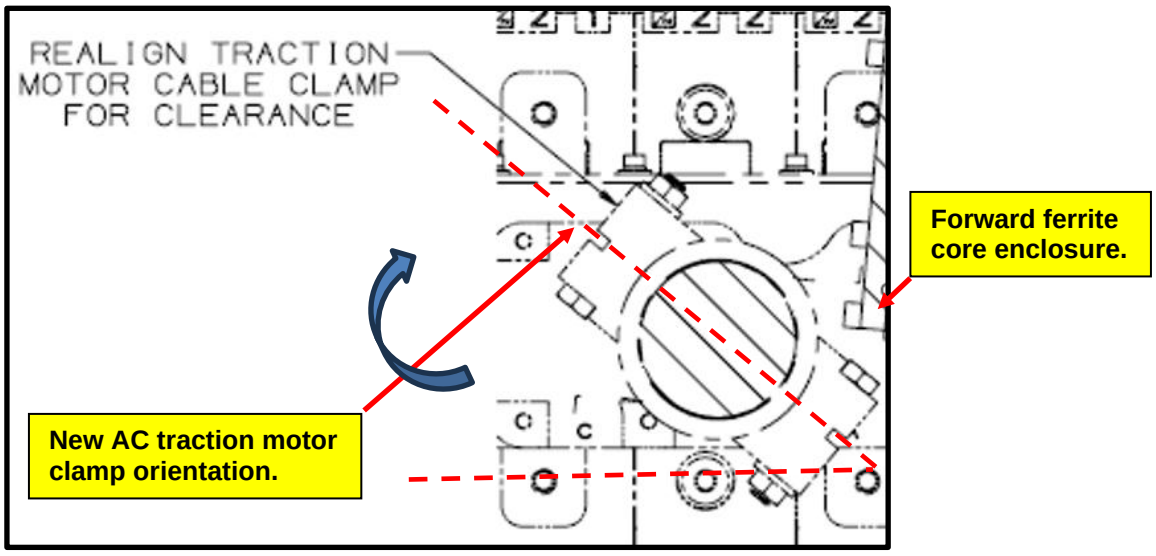


Figure 12 – View inside forward inverter rack - Adjust AC traction motor clamp

Replacing coolant line to provide clearance for the forward ferrite core enclosure

46. Loosen and retain all required clamps/hardware on the existing coolant line in the forward inverter rack.
47. Clamp coolant hoses before and after the line to prevent coolant loss. Use special hose clamps as shown below.

Figure 13a – Clamp coolant hoses to prevent coolant loss

48. Remove existing coolant line and replace with new coolant line (P/N **1113621**). Torque coolant line clamps (ends of coolant line) to 80 IN-LBS dry, tighten at 75 RPM or less. Re-torque clamps that secure hoses to the coolant line to 80 IN-LBS at 75 RPM or less after 30 minutes. Also, reinstall any additional mounting clamps located along the length of the coolant line using existing hardware **but do not tighten the hardware of these mounting clamps until the new cable support bracket is installed, see step 29 on next page**. Refer to Figure 13b.

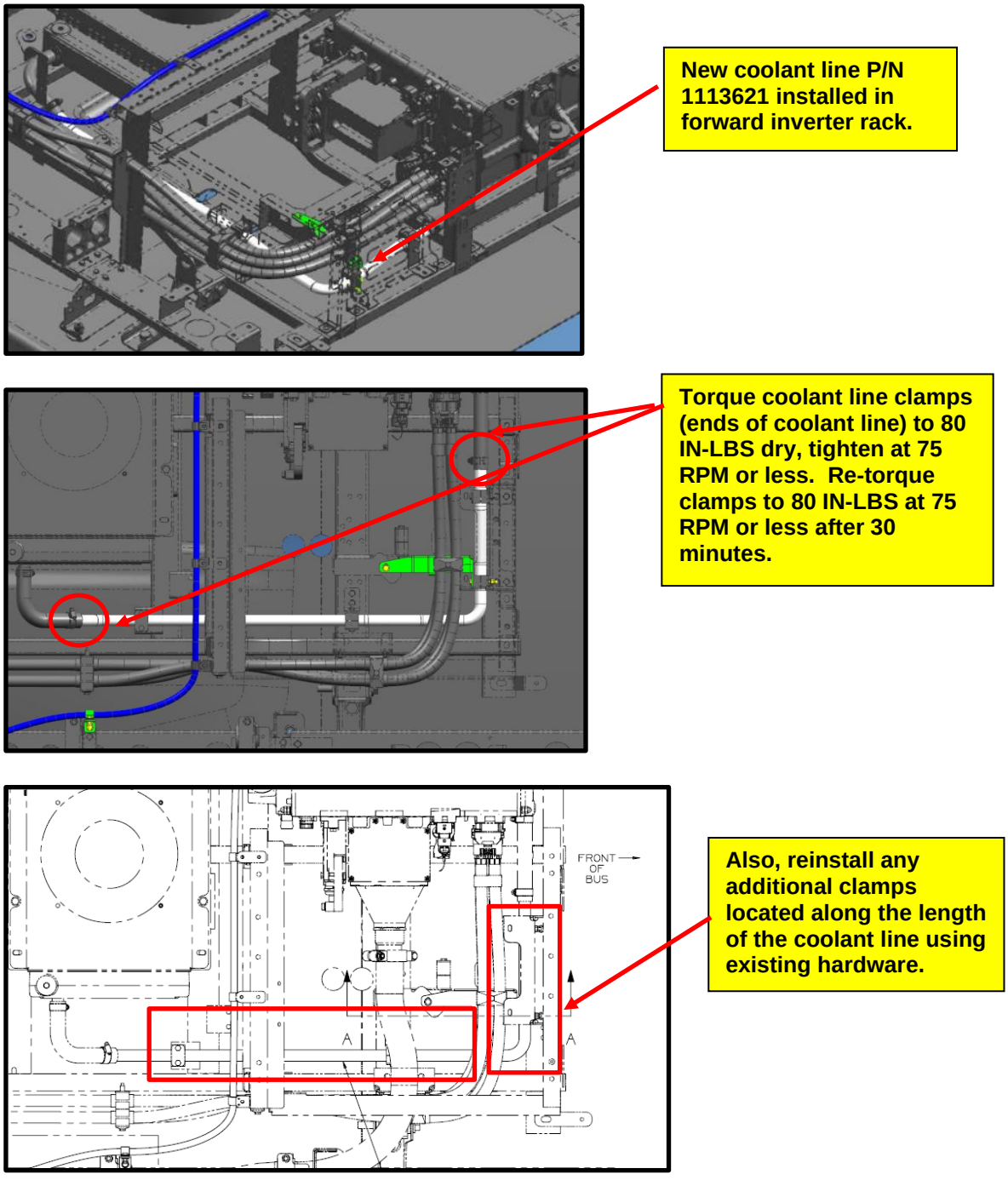


Figure 13b – Install new coolant line in forward inverter rack

49. Install new cable support assembly bracket P/N **1114649** on new coolant line. Secure bracket with ¼" Bolts (2.25" long) P/N **20B04036** x2, ¼" Bolt P/N **20B04012** (0.75" long) and Washers P/N **50W04000** x3. Apply Loctite 243 to threads of hardware. **Tighten hardware of all mounting clamps of the coolant line.** Refer to Figure 14.

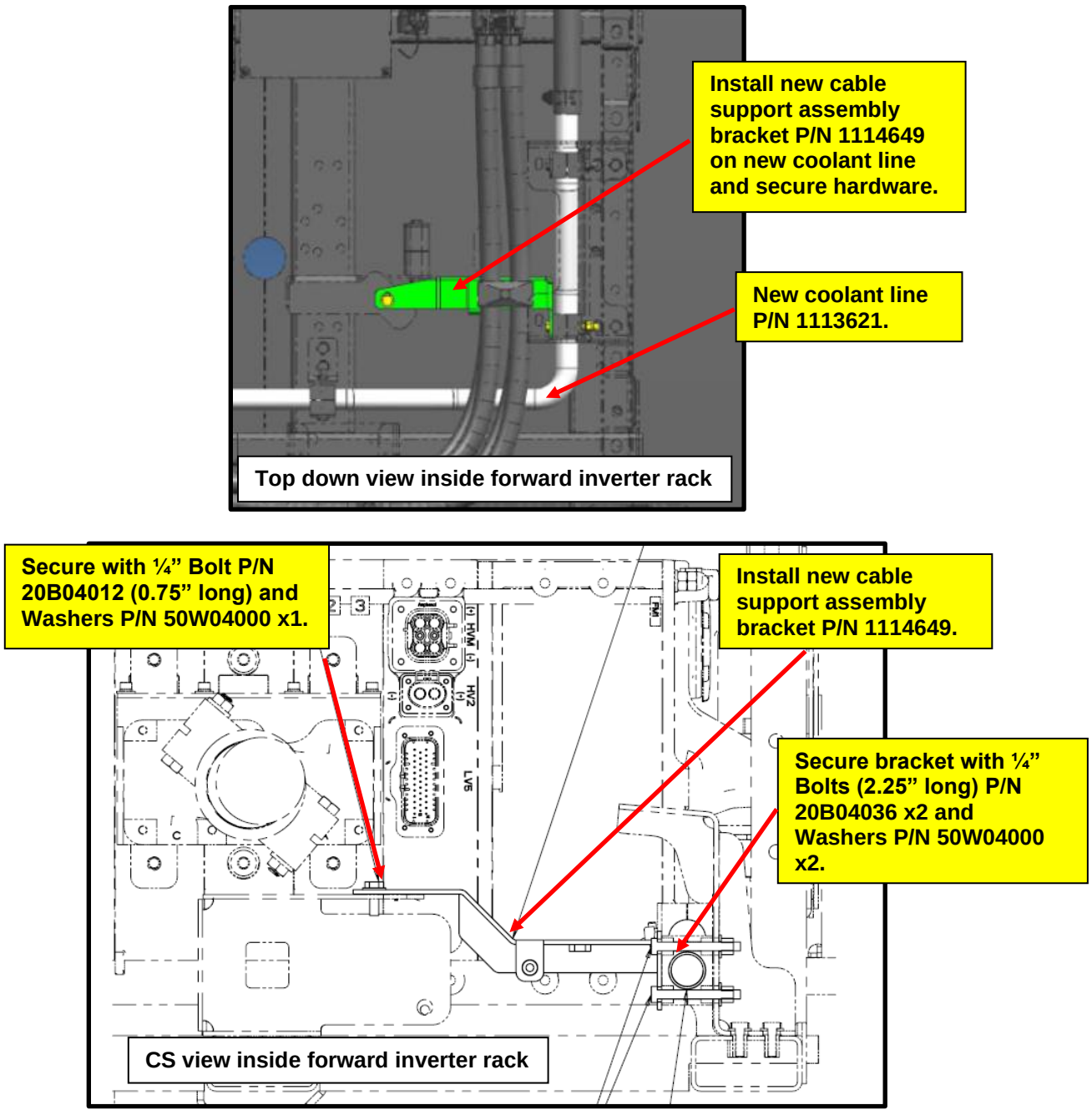


Figure 14 – Install new cable support assembly bracket insider forward inverter rack

Install Front and Rear Ferrite Core Housing Assemblies

50. Reconnect HV cables to the inverter, secure cables with the original clamps and bolt. Refer to Figure 15a.

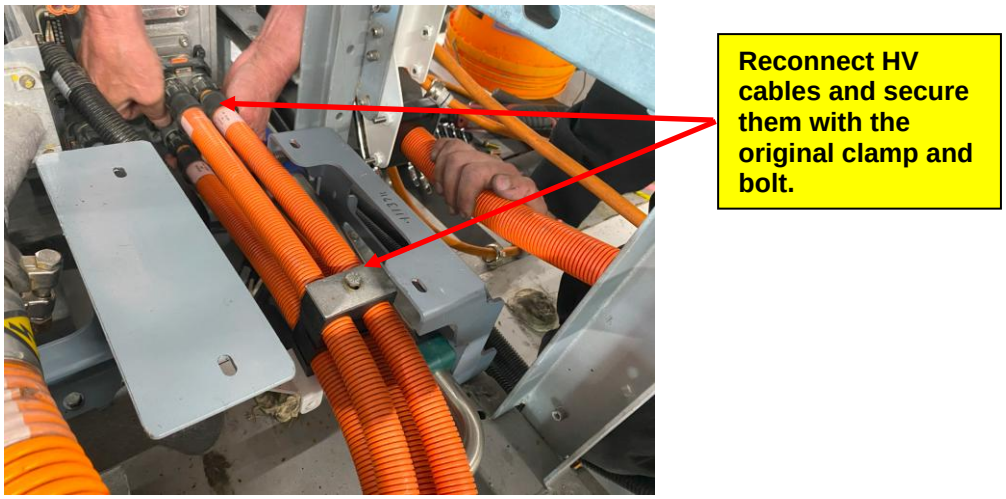


Figure 15a – HV cables underneath the forward ferrite core enclosure

51. In the front inverter rack, install front filter core housing assembly P/N **1114438** on the newly installed brackets. Ensure that the threaded hole for the ground cable is pointing towards the CS of the bus.
52. Secure front filter core housing assembly to mounting brackets using 5/16" Bolts P/N **10B05016** (1" long) x4 and 5/16" Washers P/N **20w05000** x4. Apply Loctite 243 to threads of hardware and torque bolts to 28 FT-LBS. Refer to Figure 15b.

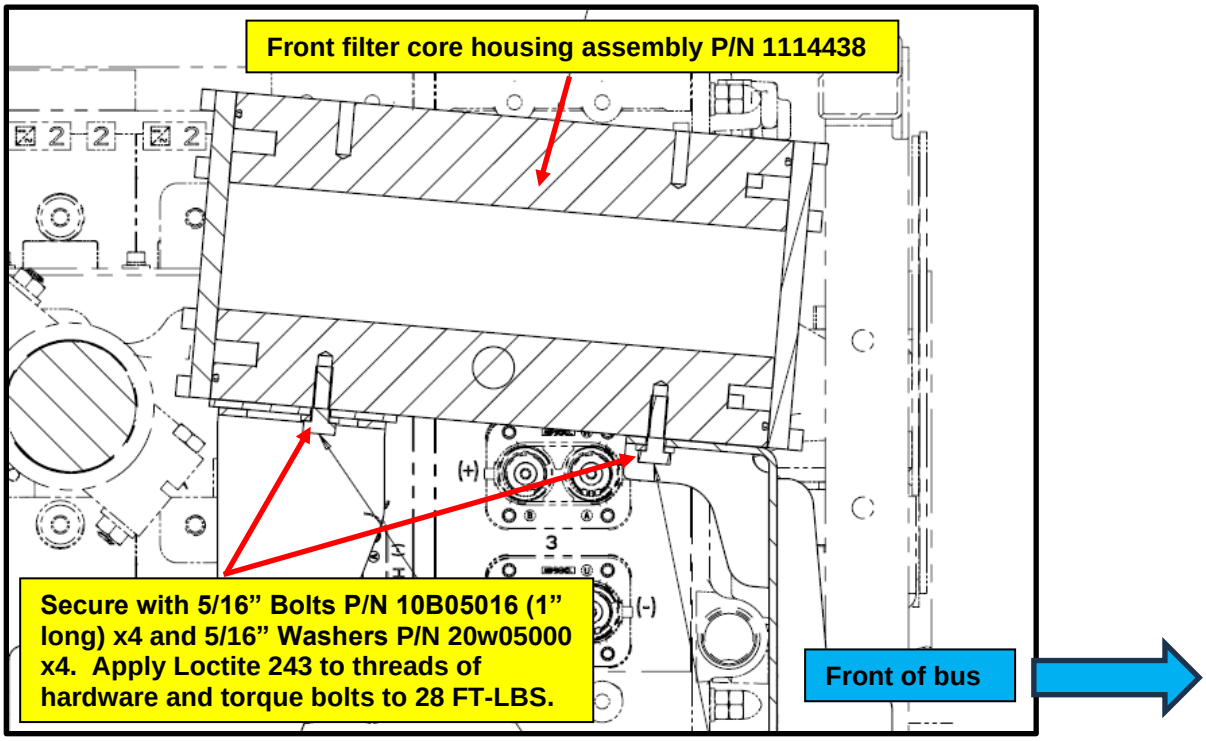


Figure 15b - CS view inside forward inverter rack – Install front ferrite core enclosure assembly

53. In the rear inverter rack, install rear filter core housing assembly P/N **1114505** in Rear Ferrite Core Mounting Brackets P/N **1113783** x2 (refer back to Step 15).
    Secure rear housing assembly to brackets using 5/16" Bolts P/N **10B05016** x4, 5/16" and Washers P/N **20W05000** x4. Apply Loctite 243 to threads of hardware and torque bolts to 28 FT-LBS. Refer to Figure 16.

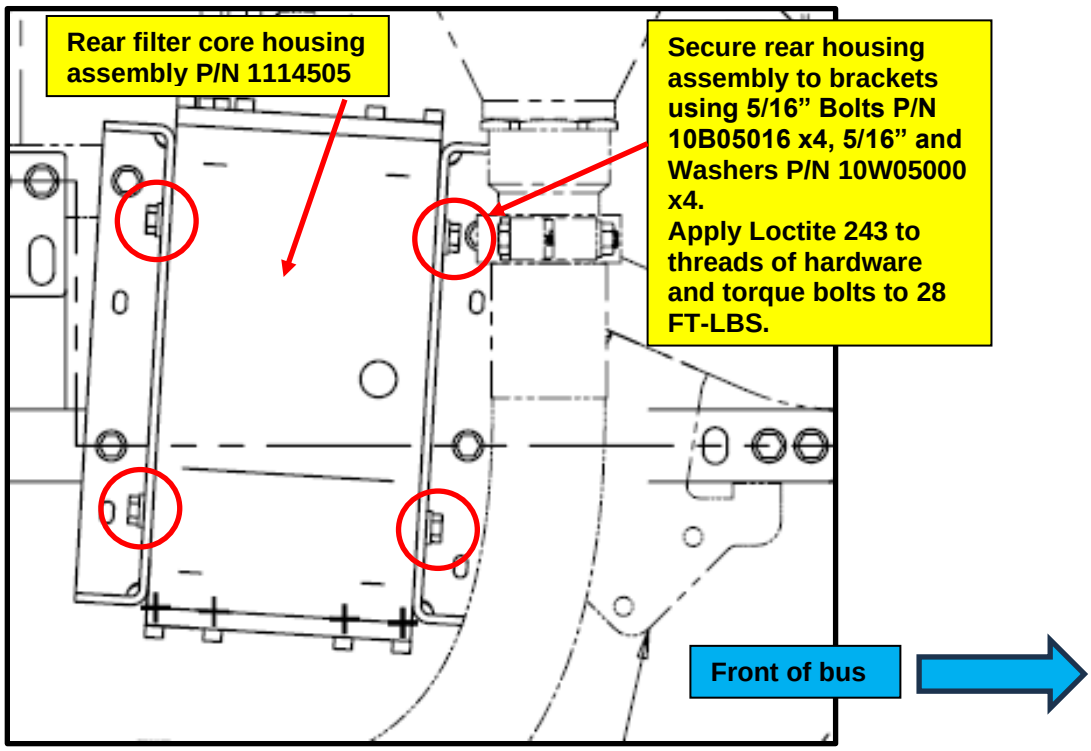


Figure 16 – Top down view in rear inverter rack – Install rear filter core housing assembly

54. Locate both Zone A and Zone B on AC traction motor cables running along the CS rear of the bus. Refer to Figure 17.

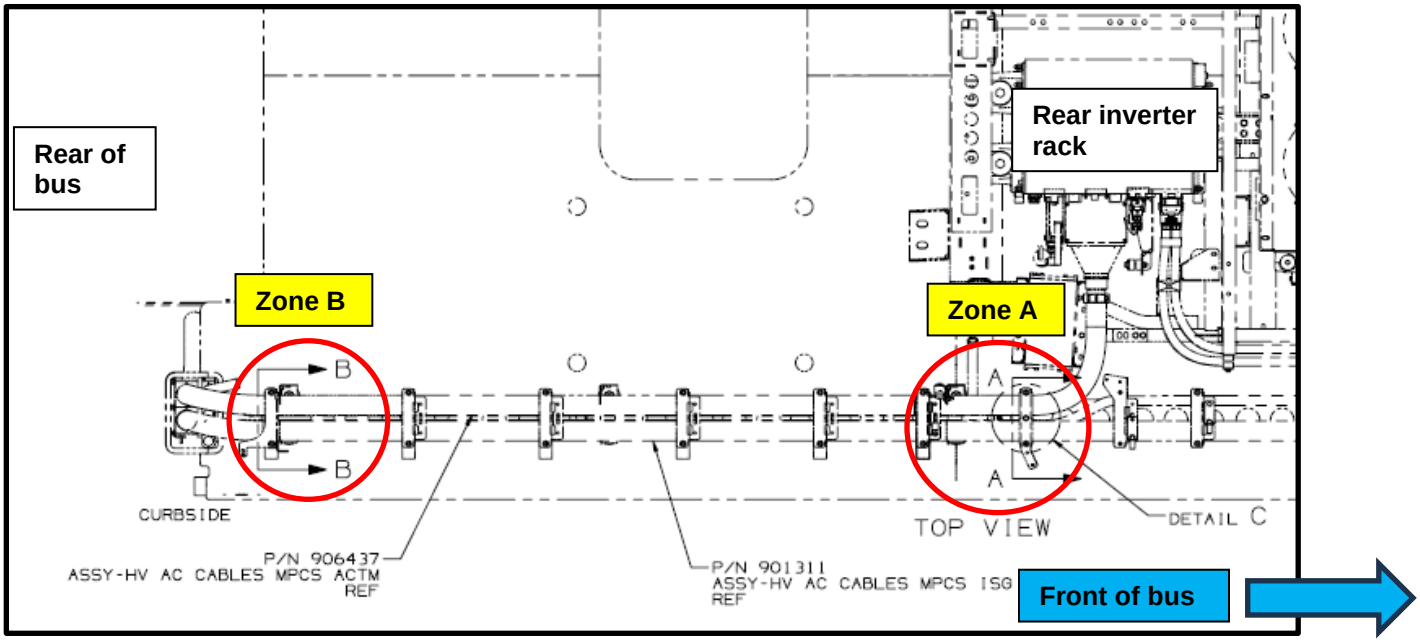
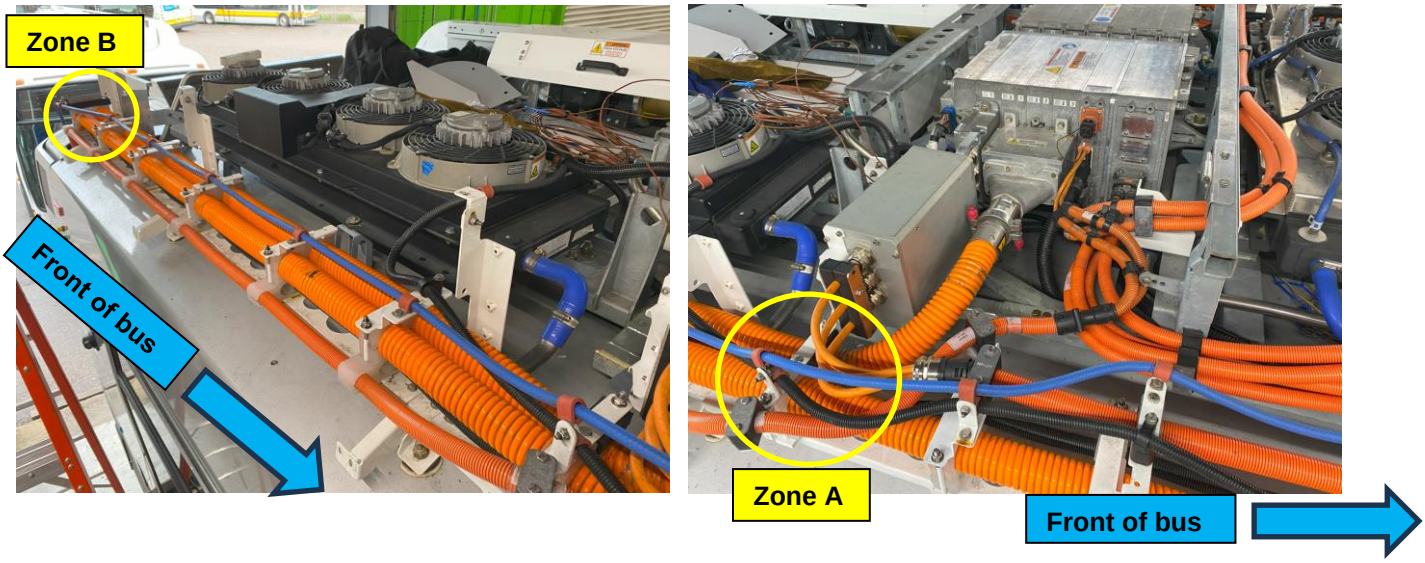


Figure 17 – View of AC traction motor cables on CS rear of bus



55. Dismantle the AC traction motor cable clamps at Zone A. Use middle hole in existing top clamp plate as a template to drill a 0.266” hole (Drill size H or 17/64”) through side screen bracket to allow for installation of clamp hardware in middle position. Reassemble cable clamp bundle with new hardware/spacers in accordance with Figure 18.

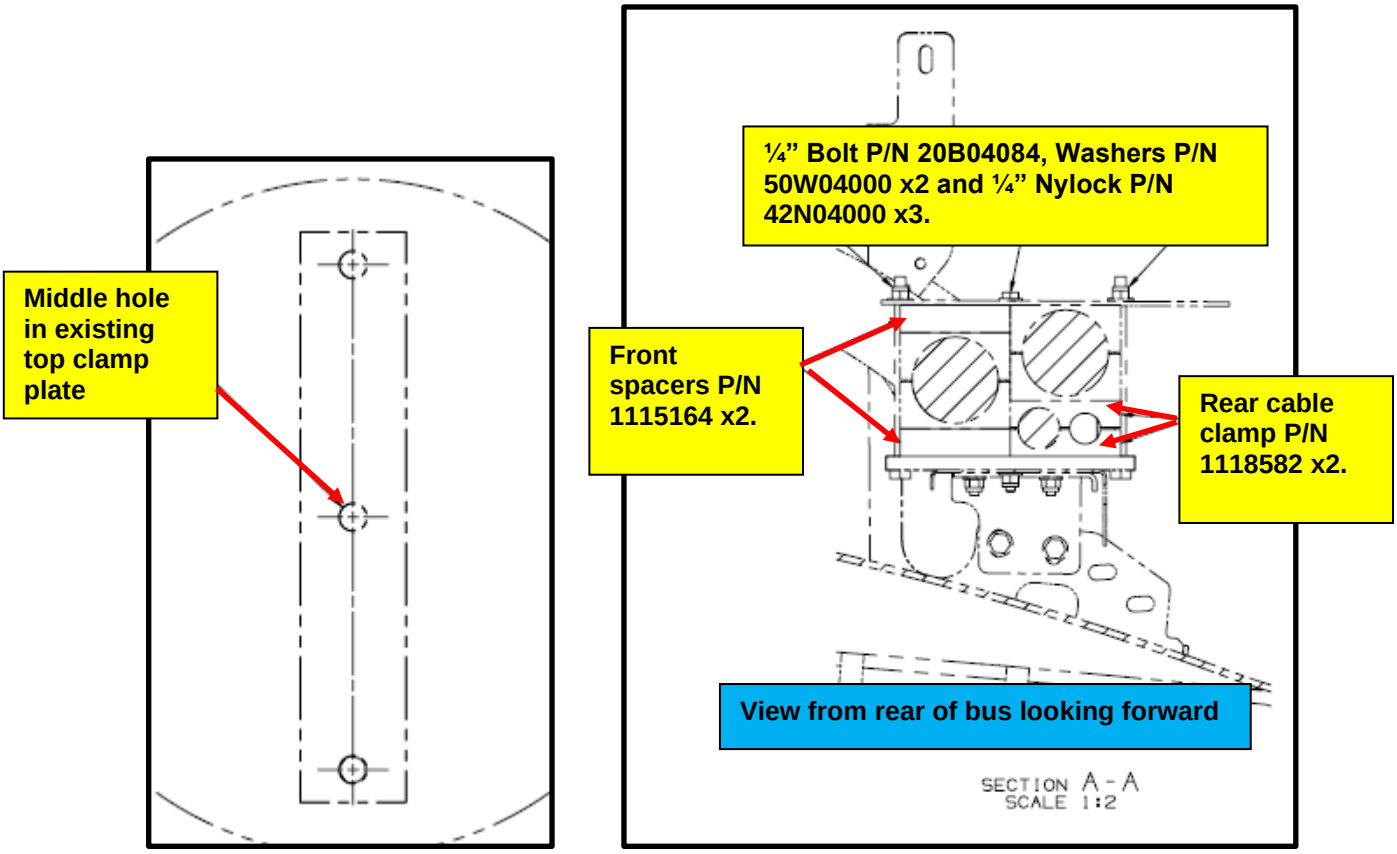


Figure 18 – Zone A view from rear looking forward – Drill hole in plate and reassemble clamp bundle

56. Dismantle the AC traction motor cable clamps at Zone B. Reassemble cable clamp bundle with new hardware/spacers in accordance with Figure 19.

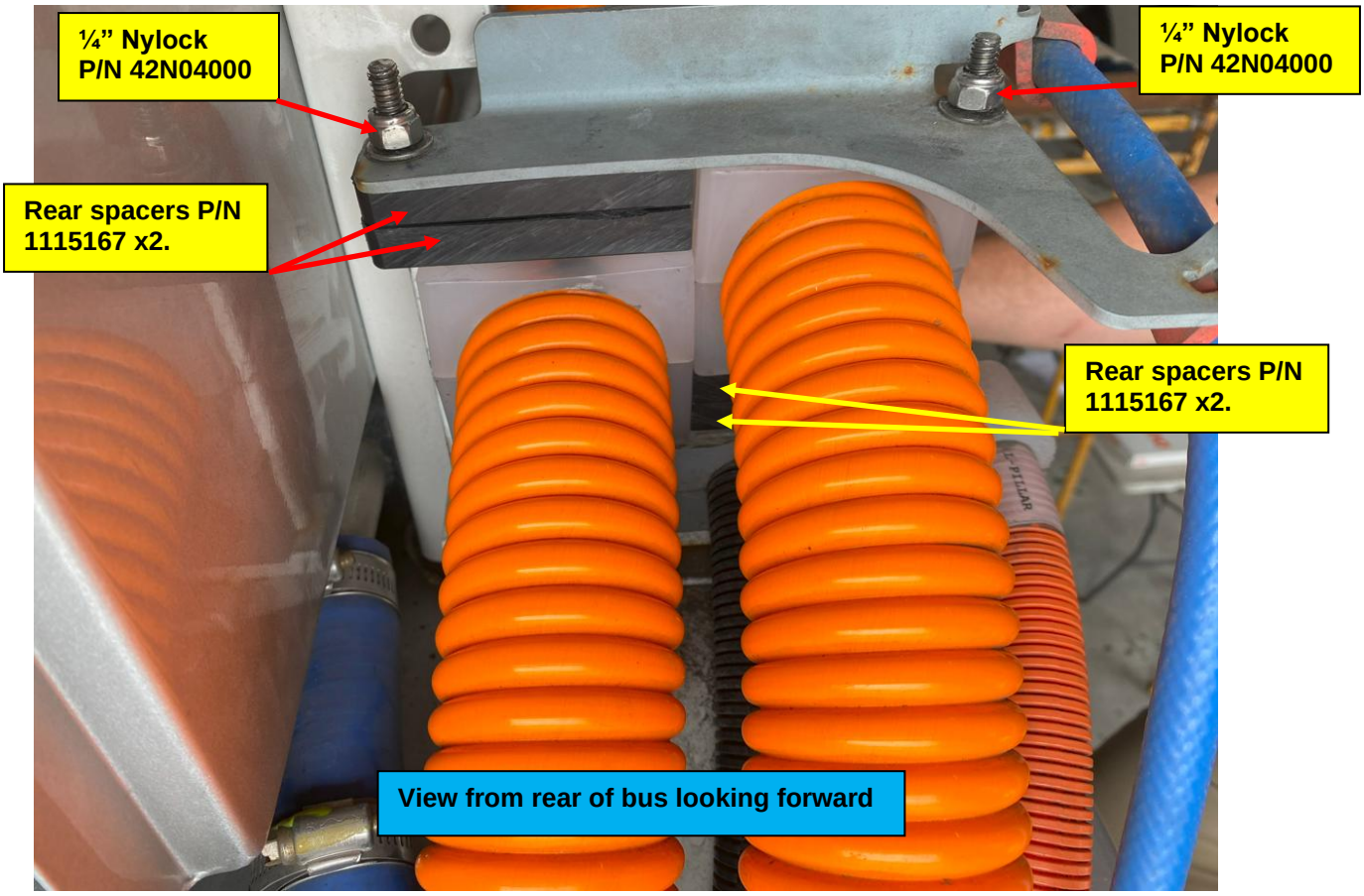


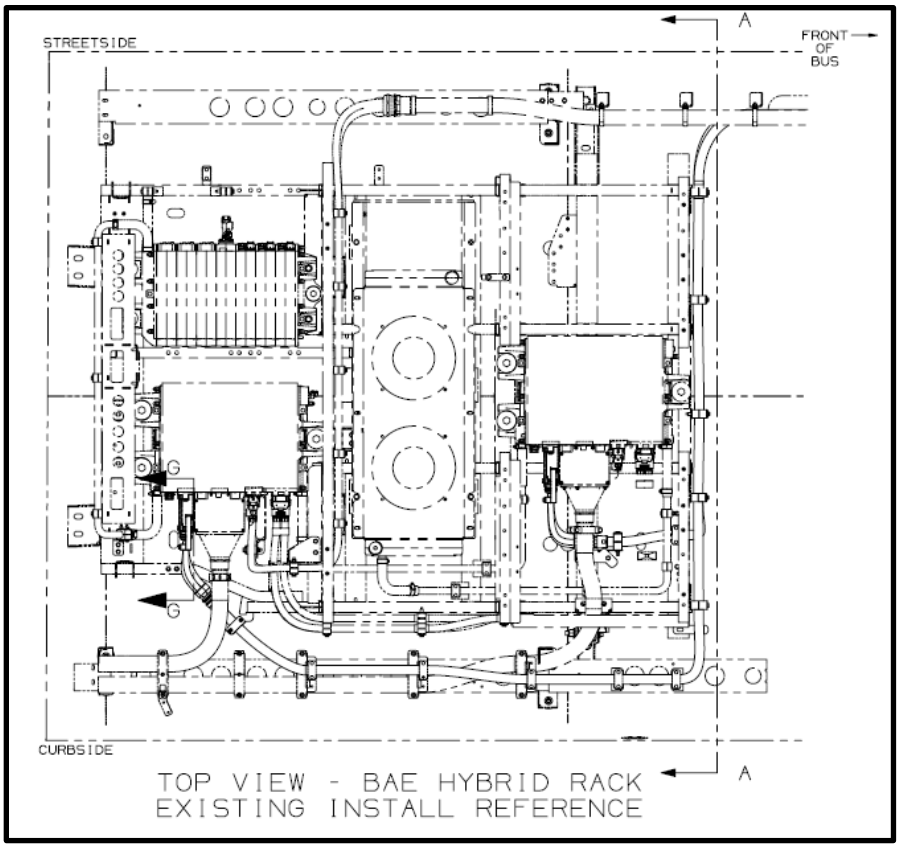
Figure 19 – Zone B view from rear looking forward – Reassemble clamp bundle with spacers

Part D – MPCS Cable Modifications

☞ **NOTE: Also refer to New Flyer EAD-028389 throughout this section of the ITS.**

Initial Disassembly

57. Move to the front of the forward inverter rack. Remove and retain all indicated clamps and hardware indicated on Figure 20.



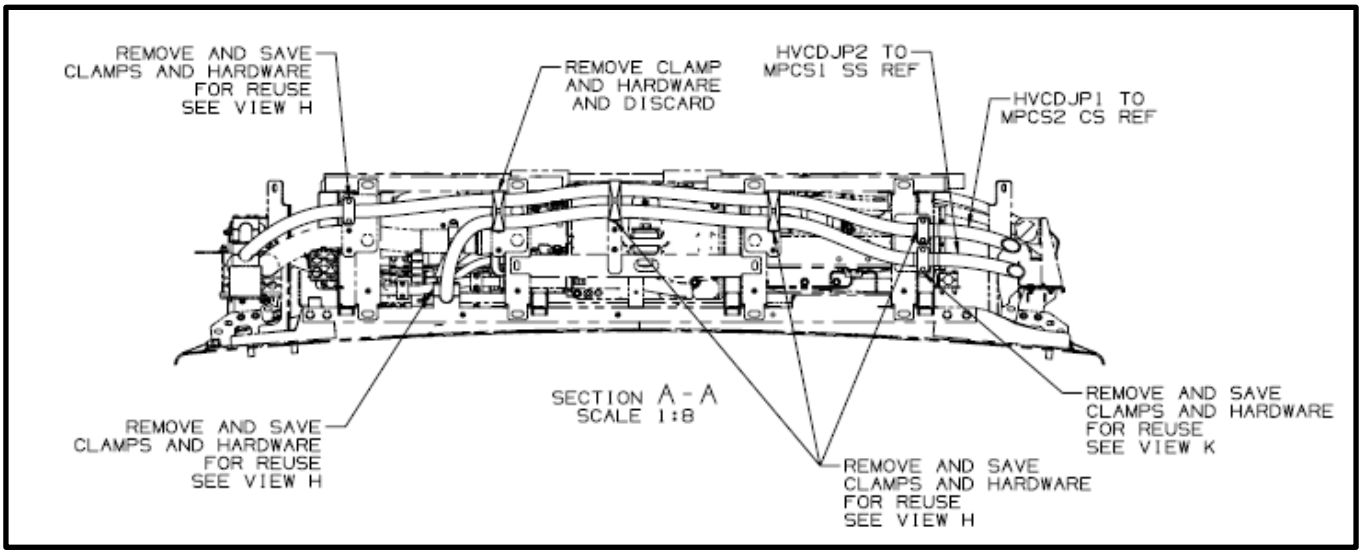


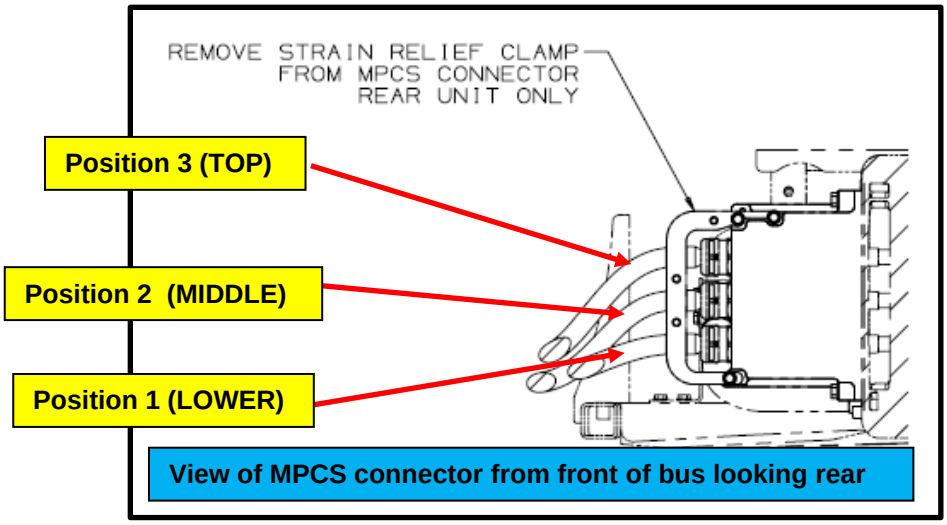
Figure 20 – View looking at rear of bus - Remove and retain all required hardware on MPCS cables

58. Remove MPCS connector (inverter horn) cover, retain the cover and fasteners.

59. Check inverter phase connections for voltage to verify no voltage present.

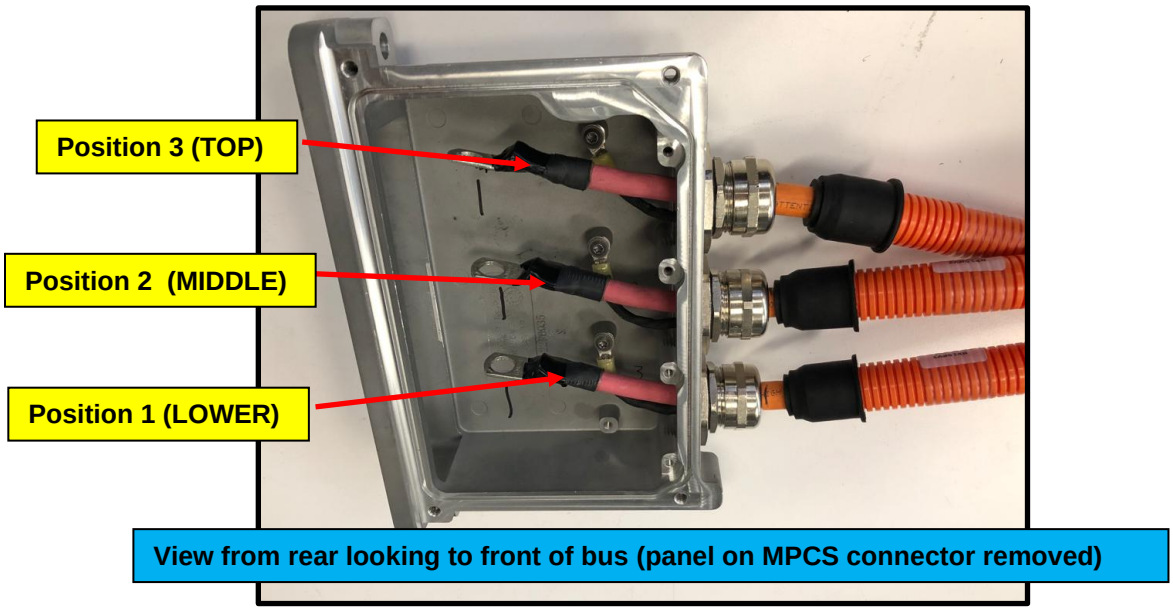
60. Disconnect the three conductors from the inverter and unbolt the MPCS connector (inverter horn) from the MPCS housing.

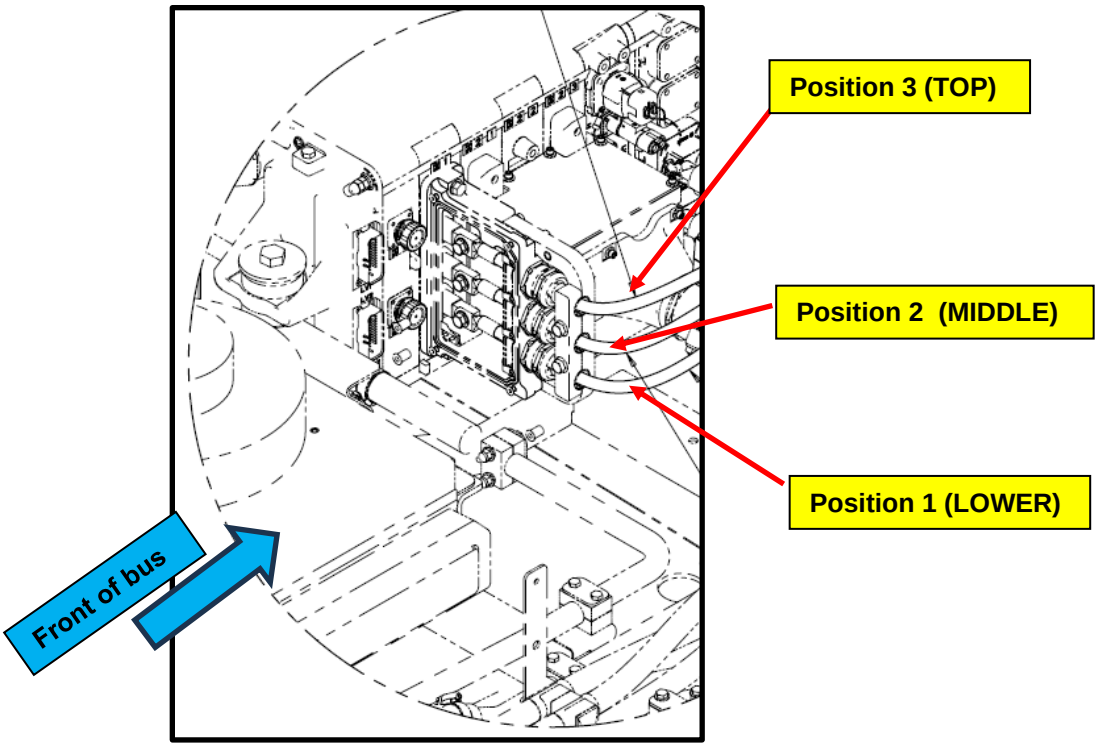
61. Remove strain relief clamp from rear MCPS connector (REAR LOCATION ONLY).



62. Apply identifying marks to the MPCS connector and three (3) conductor cables for reference during reassembly.

⚠ **Caution: Carefully note and label the position of the three (3) conductor cables BEFORE disassembling the MPCS connector.**

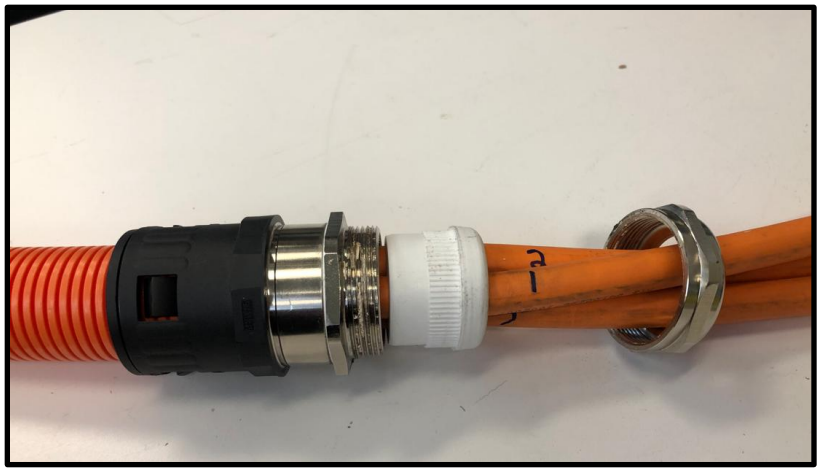




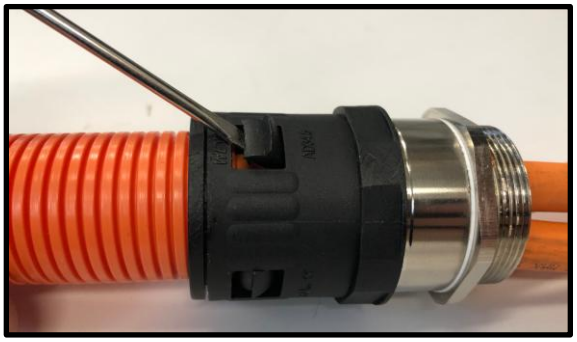
63. Remove the MPCS connector from the three (3) conductor cables. Retain the connector and hardware.

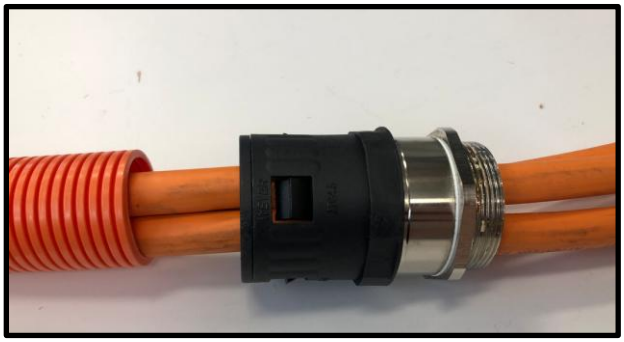
64. Remove the 3 sections of 21.2mm conduit and endcaps, set aside.

65. Remove the 3 hole cable gland, set aside.

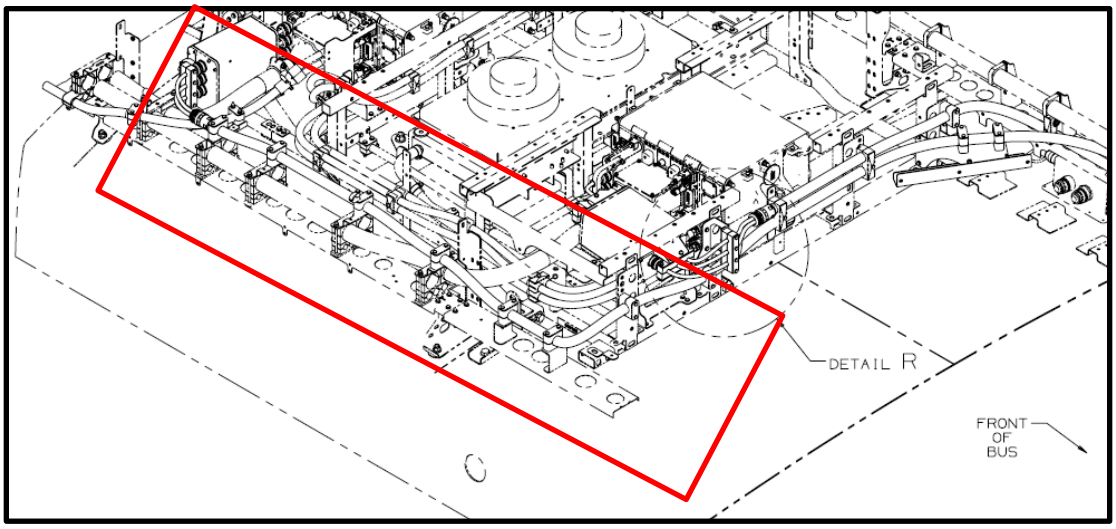


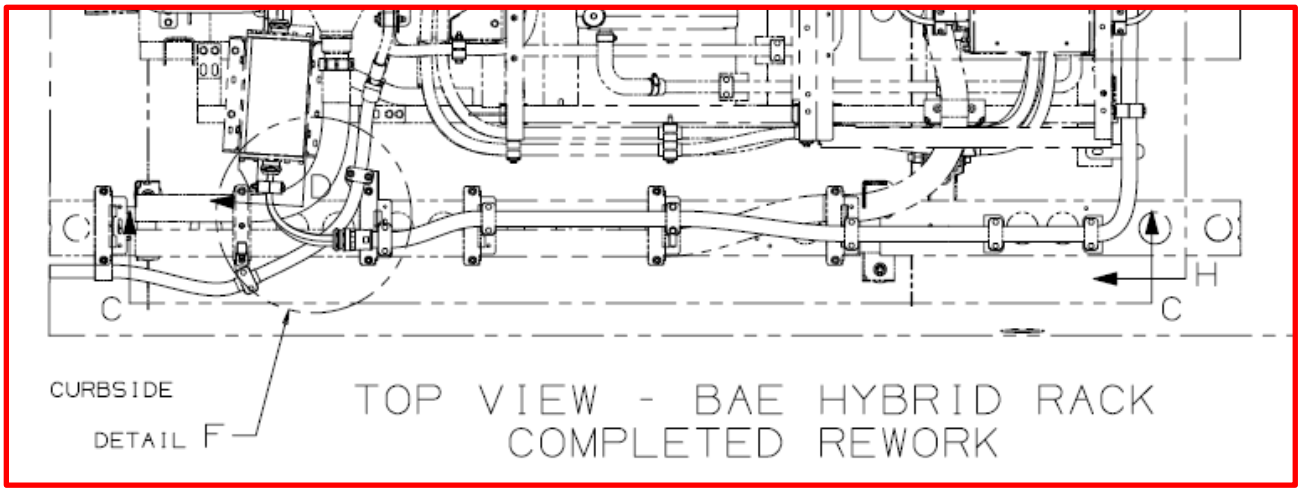
66. Remove the 34.5mm conduit connector, set aside.



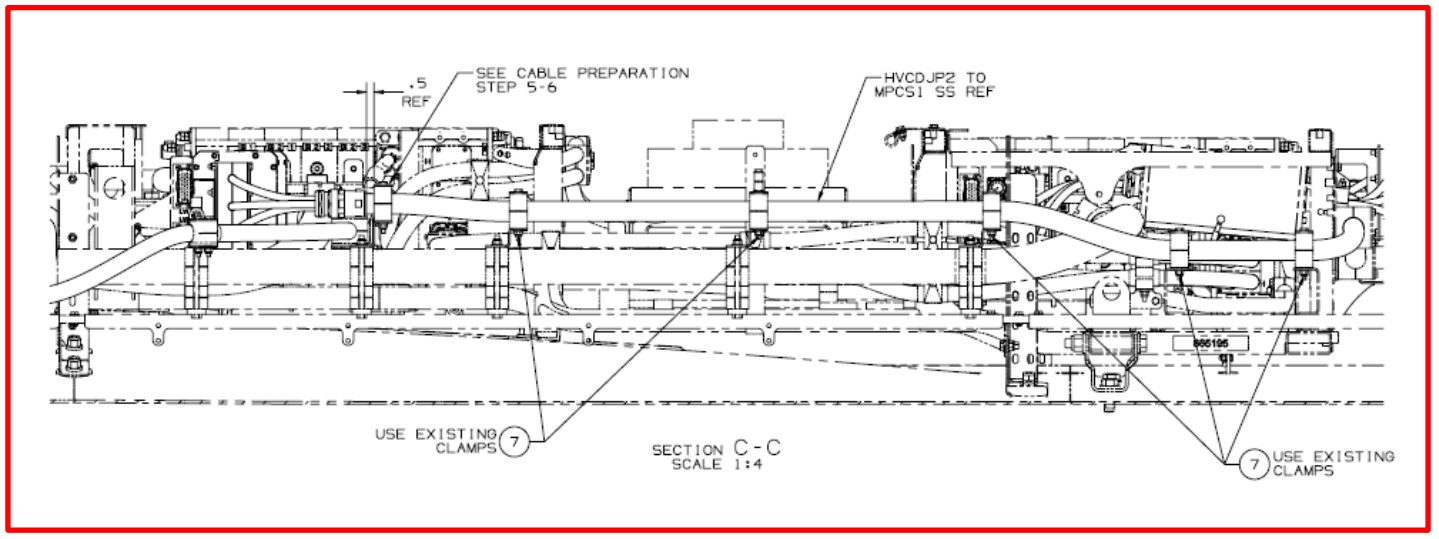


67. Reinstall cable with all required clamps starting from front of bus, up to and including clamp specified in section view H-H and view C-C. Tighten all clamp hardware up to specified clamps.
Also, install new Triple Cable Mount Front Assembly P/N 1114979 on front of forward inverter rack (see Item #25 in Detail E image).



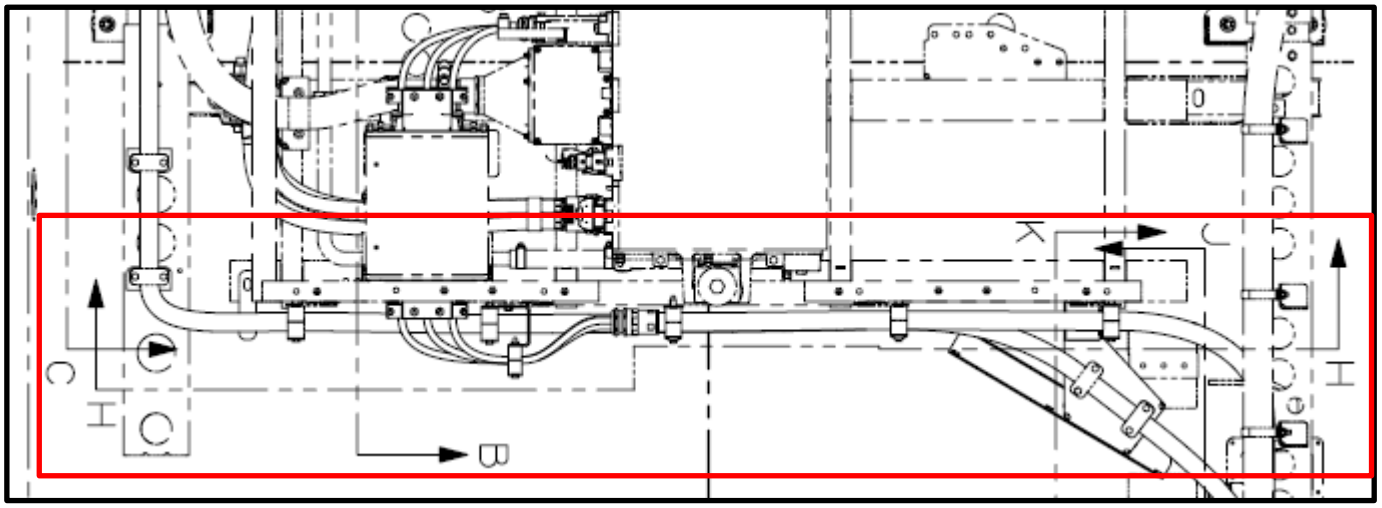


CS view of bus looking down

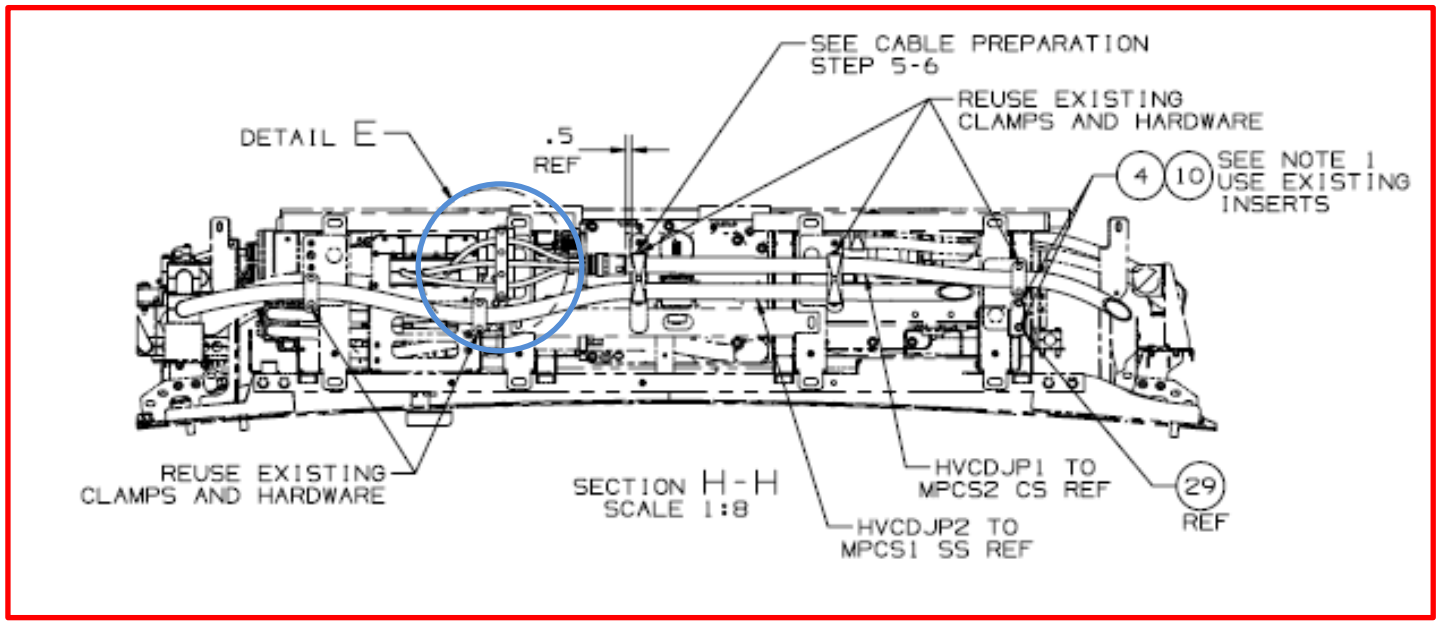


CS view of bus

7	42N04000	NUT-NYLON LOCK 1/4-20 UNC SST



View of forward inverter rack looking down

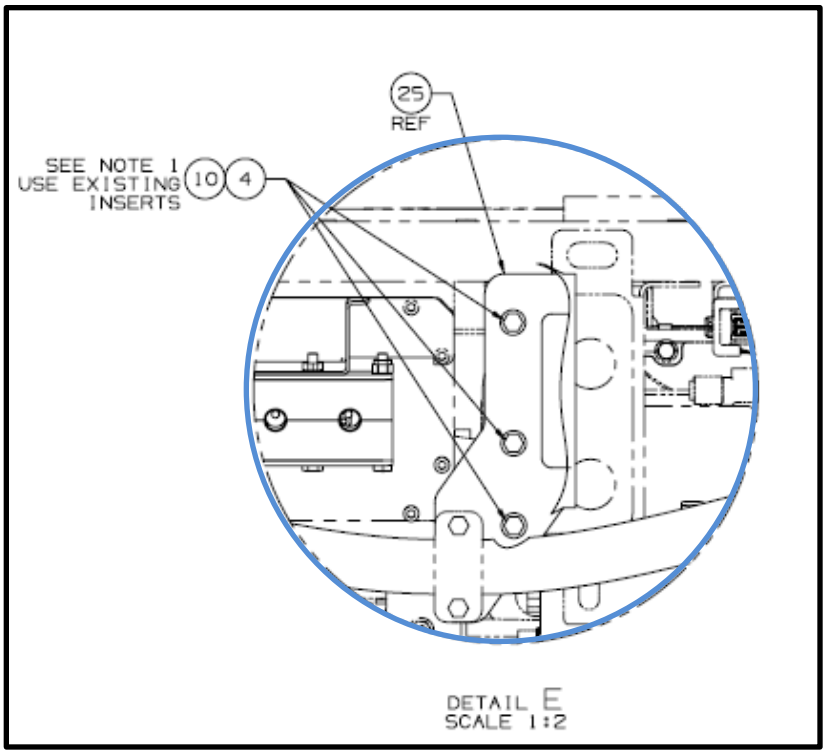


View of forward inverter rack looking rear

NOTES:

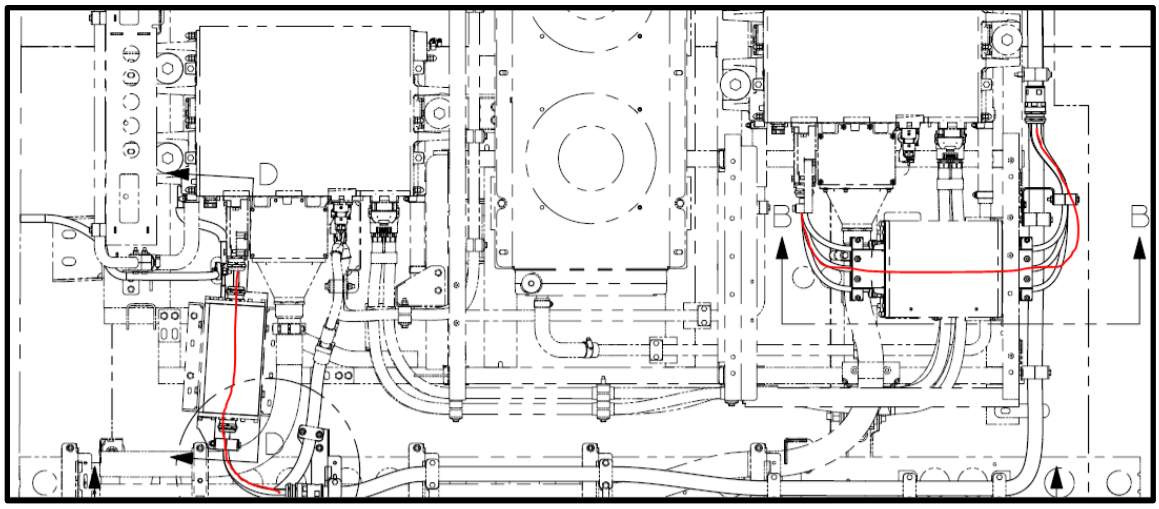
1. APPLY 1 TO 2 DROPS OF LOCTITE TO THREADS OF FASTENERS DURING INSTALLATION.

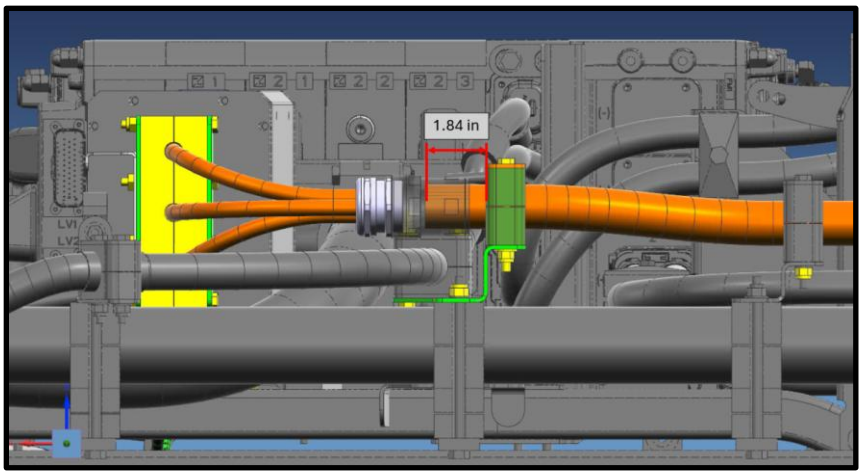
4	20B04020	BOLT-SS 1/4-UNC X 1.25
10	50W04000	WASHER-FLAT 1/4 NOM
29	1116137	ASSY-MPCS CABLE MOUNT BRACKET



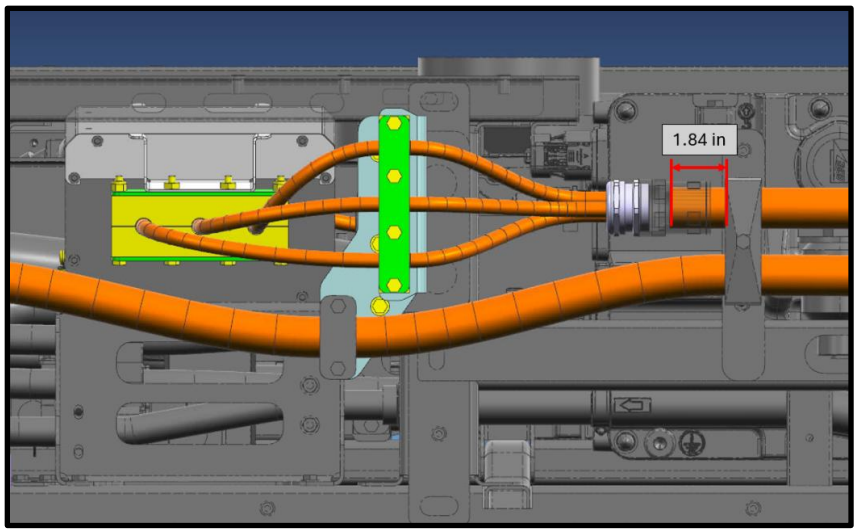
4	20B04020	BOLT-SS 1/4-UNC X 1.25
10	50W04000	WASHER-FLAT 1/4 NOM
25	1114979	ASSY-TRIPLE CABLE MOUNT FRONT

68. Cut outer orange cable conduit to length as shown in section views section view H-H and view C-C.



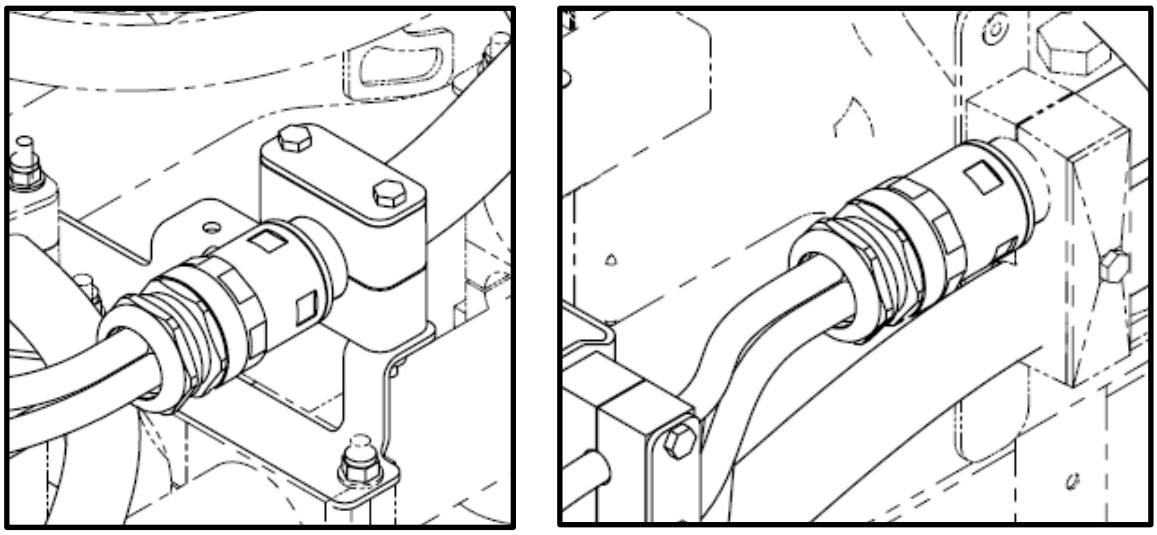


Rear position cable conduit length relative to first cable clamp



Front position cable conduit length relative to first cable clamp

69. Reinstall 3 hole cable gland on both MPCS cables at both forward and rear locations.



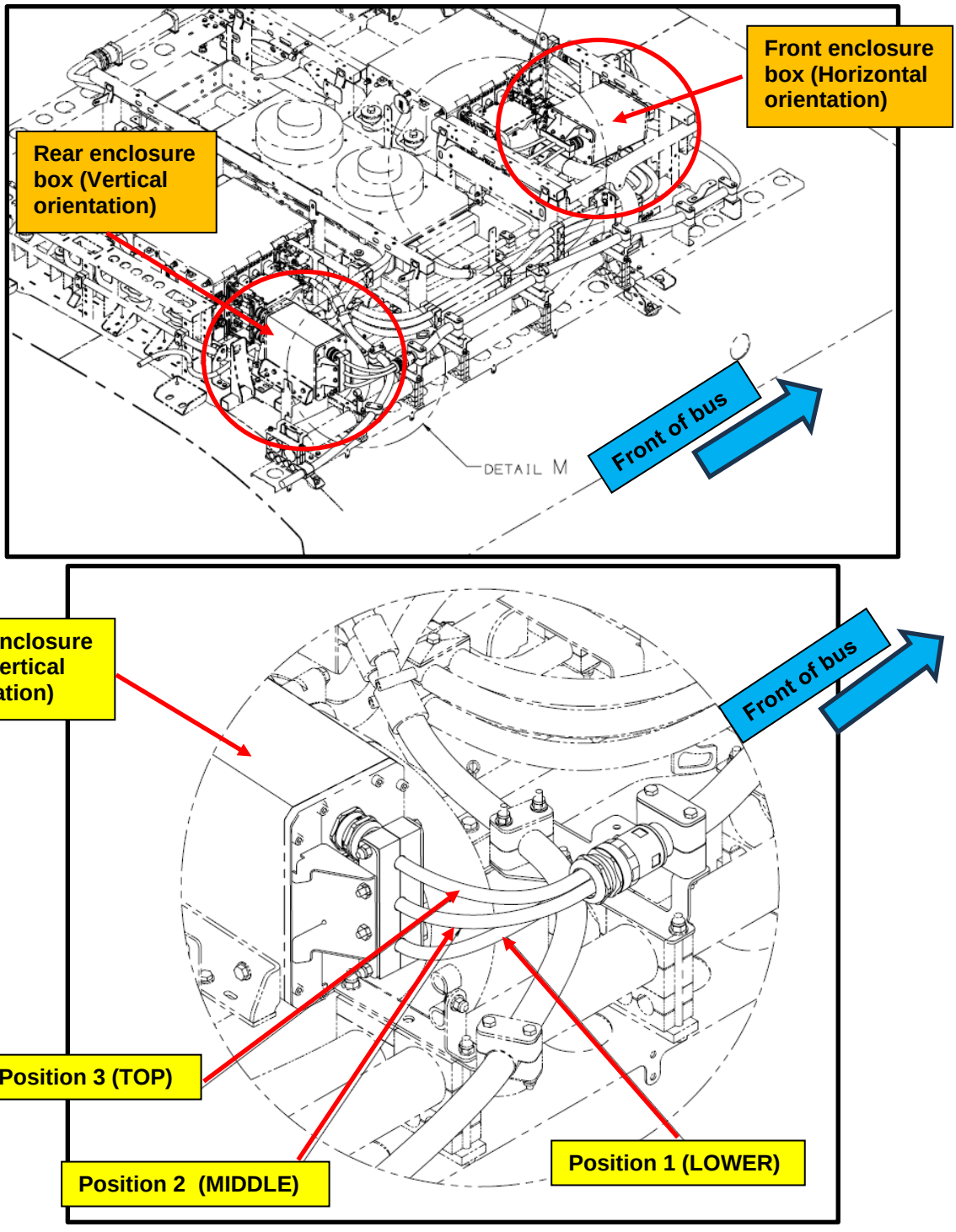
Reinstall 3 hole cable gland on MPCS cables at rear (left) and front (right) locations

Cable Shield Marking

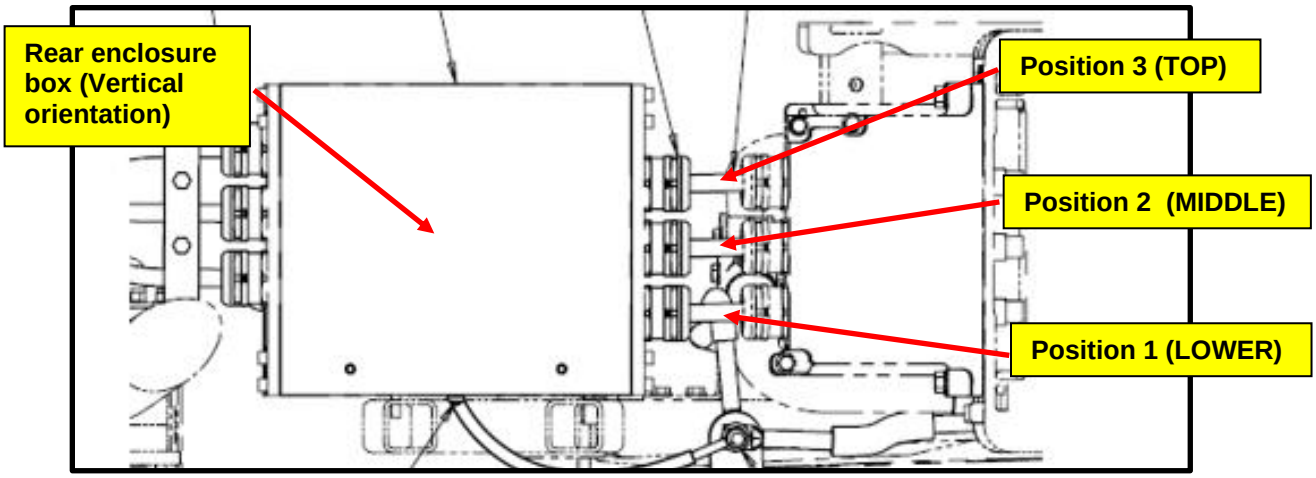
70. Install cable glands into the core enclosure housing endplates.

71. String wires through cable glands, enclosure endplates, enclosure housings and resecure ground ring terminals to MPCS connector. Perform this for both front and rear enclosures.

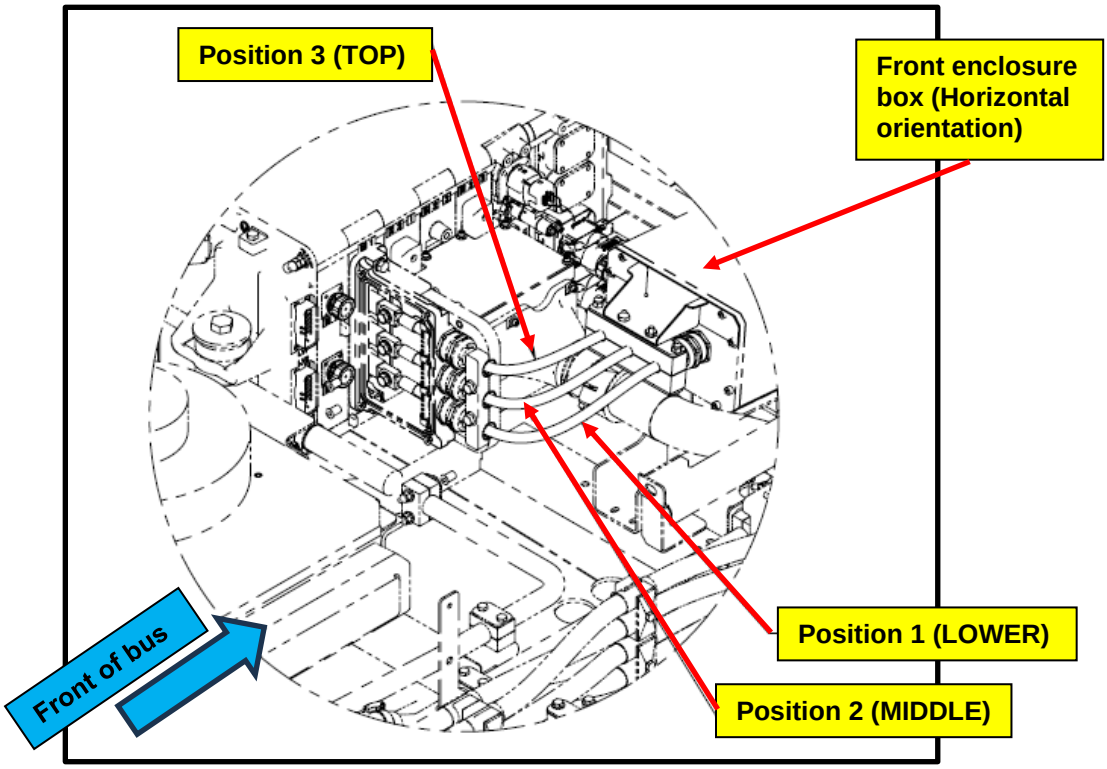
> ⚠ **Caution: Carefully note the position of the conductor cables running through both the front and rear enclosure housings. Refer to the images below.**



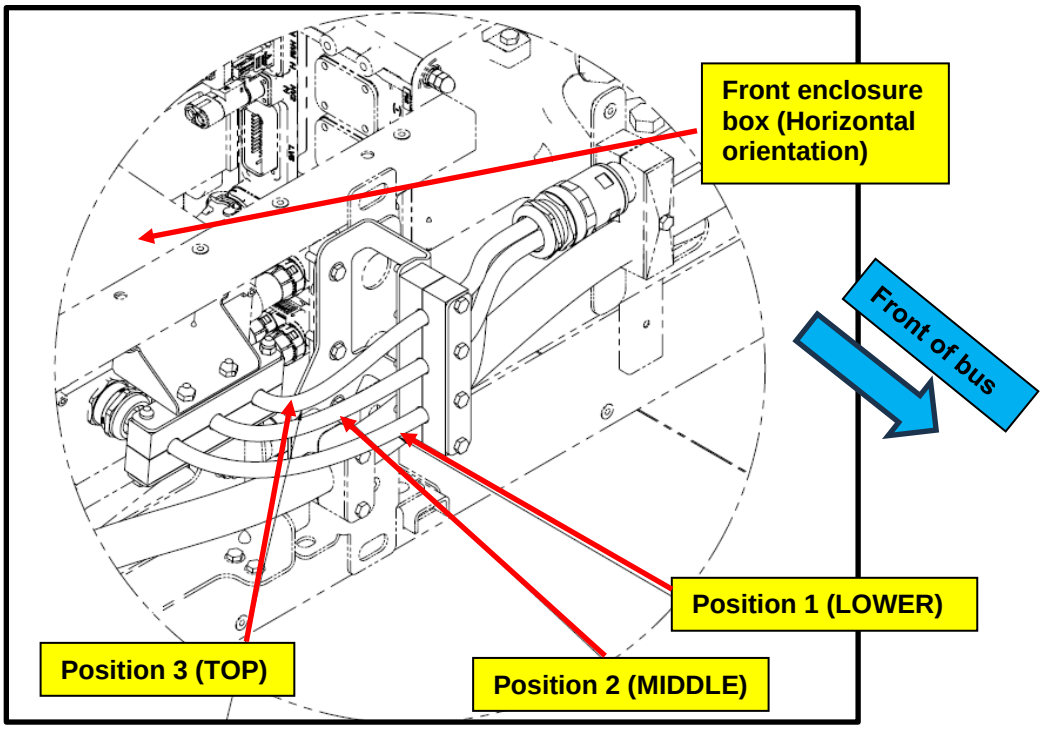
REAR ENCLSOURE HOUSING in rear inverter rack – Conductor cable positions



REAR ENCLOSURE HOUSING in rear inverter rack – Conductor cable positions



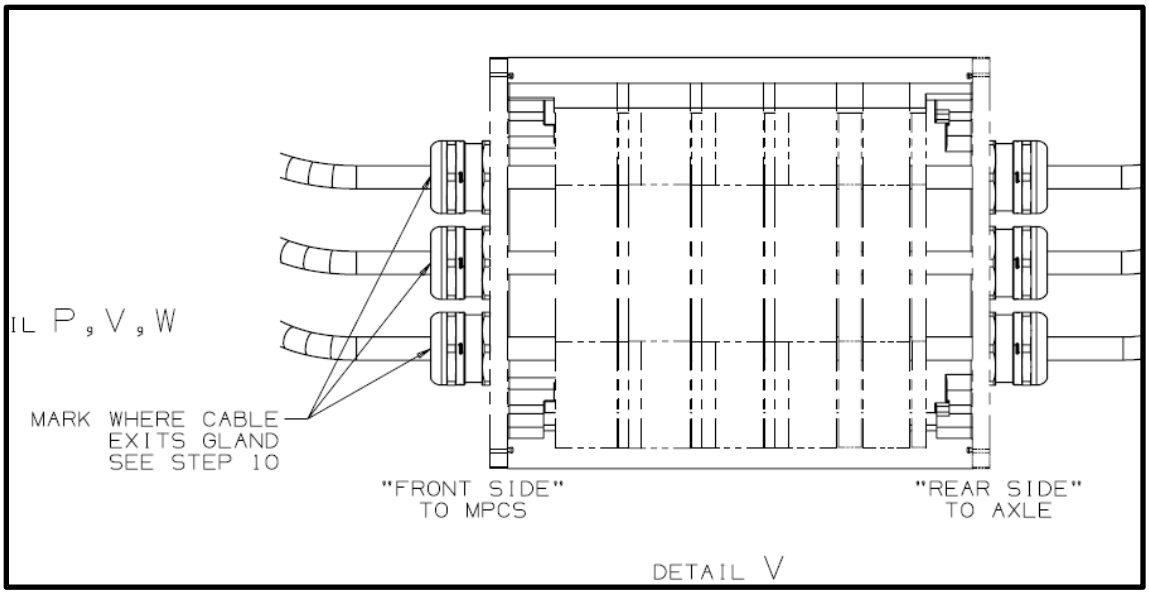
FRONT ENCLSOURE HOUSING in front inverter rack – Conductor cable positions



FRONT ENCLSOURE HOUSING in front inverter rack – Conductor cable positions

72. Reconnect MPCS connector to MPCS.

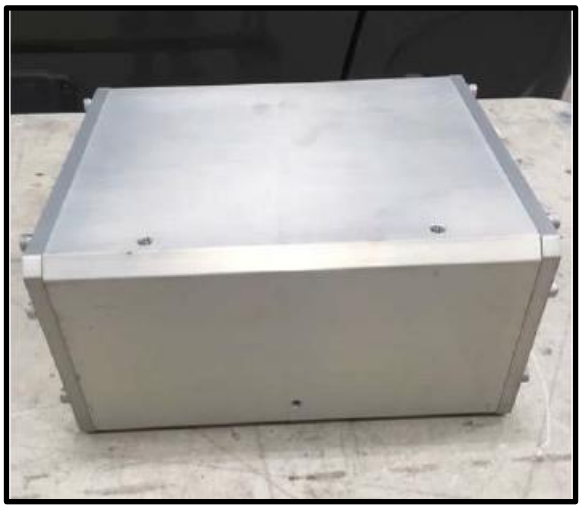
73. Clearly mark on the outer jacket of each cable where it exits the core enclose cable glands on the “Front Side”. Refer to Detail V.



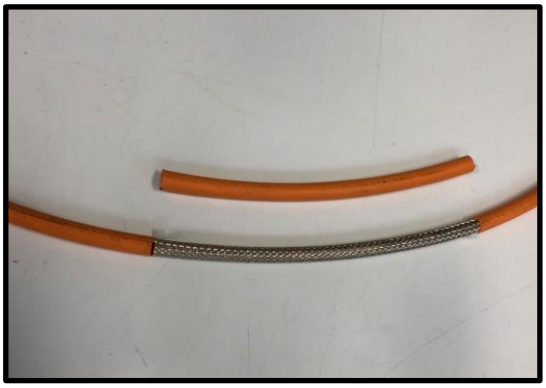
Cable Shield Preparation

74. Remove MPCS Connector and detach ring terminals from MPCS connector.

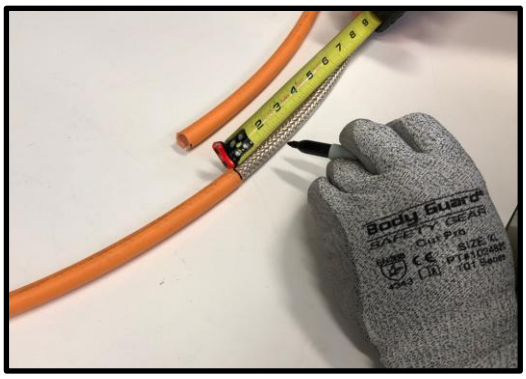
75. Remove end plates from core enclosure housing.

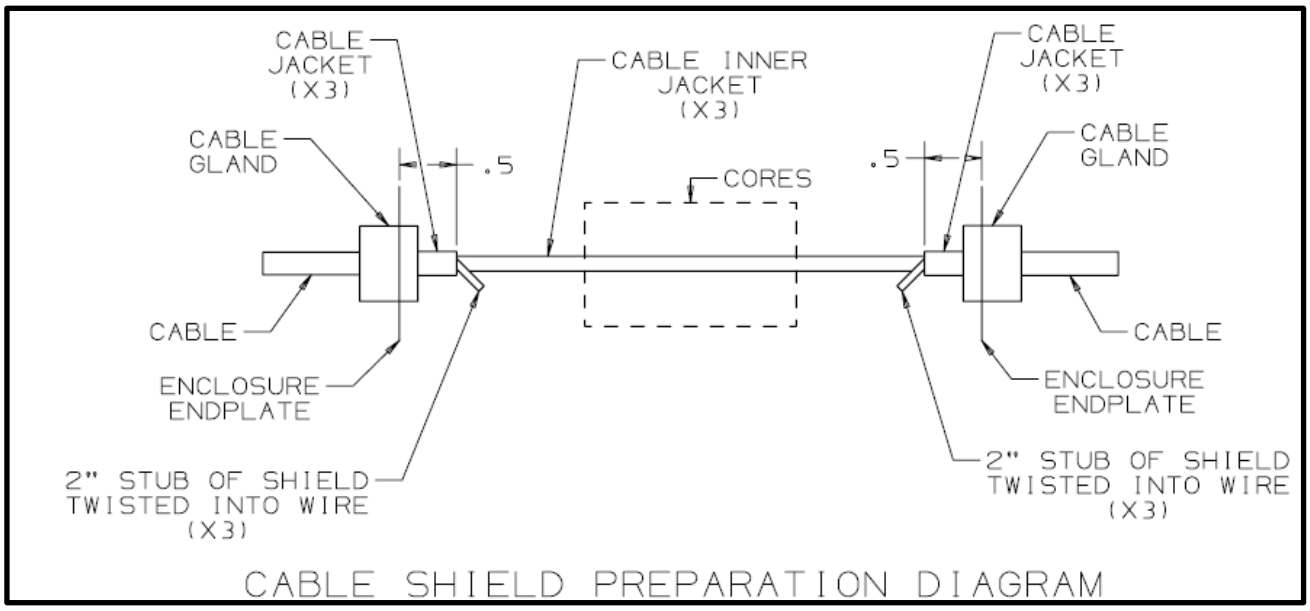


76. Measure 2 inches inward from marked positions on each conductor wire and cut off 9 inches of outer jacket on each conductor wire, exposing the inner wire shielding.



77. Trim out center portion of exposed shield, leaving a 2 inch stub at both ends of each wire. Refer to cable shield preparation diagram.





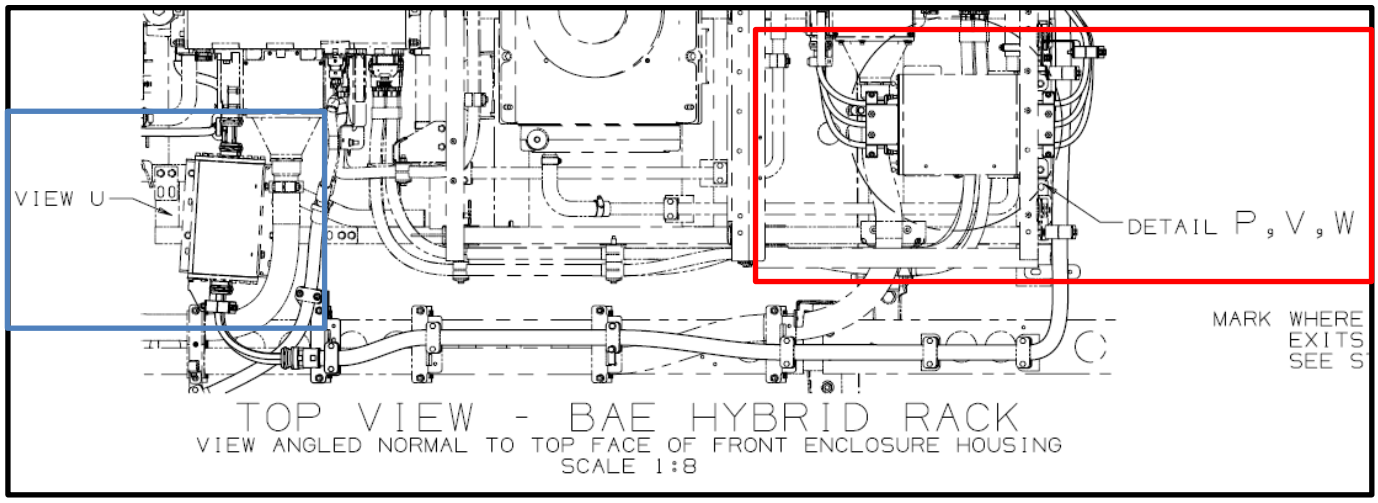
78. Unbraid shield and twist into a wire. Repeat for all six (6) locations. Refer to cable shield preparation diagram.

79. String conductor cables through both front and rear end plates and core enclosures again.

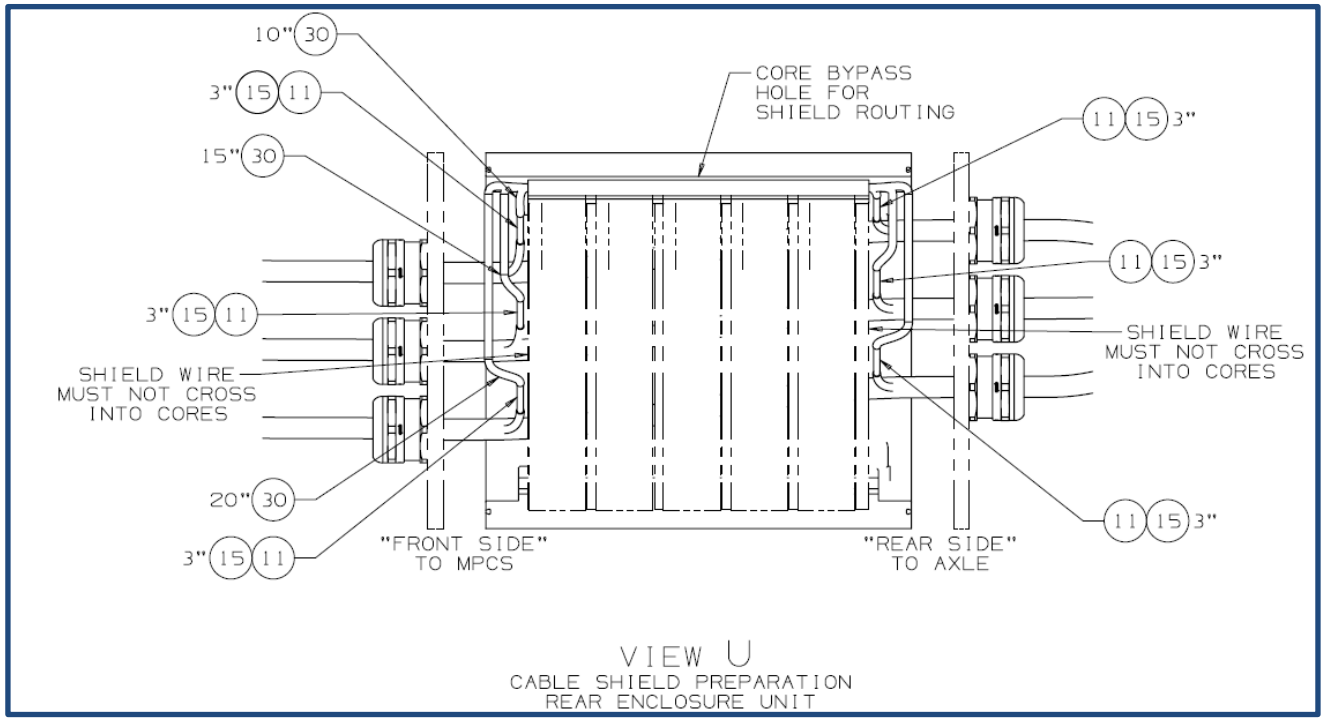
80. Reattach ring terminal to MPCS connector and reconnect MPCS connector to the MPCS unit.

☞ **NOTE: At this point, prepped shield sections on conductor cables should be centered in enclosure housings. Leave end plates loose to allow access to shield stubs on cables on both sides of the enclosure housing.**

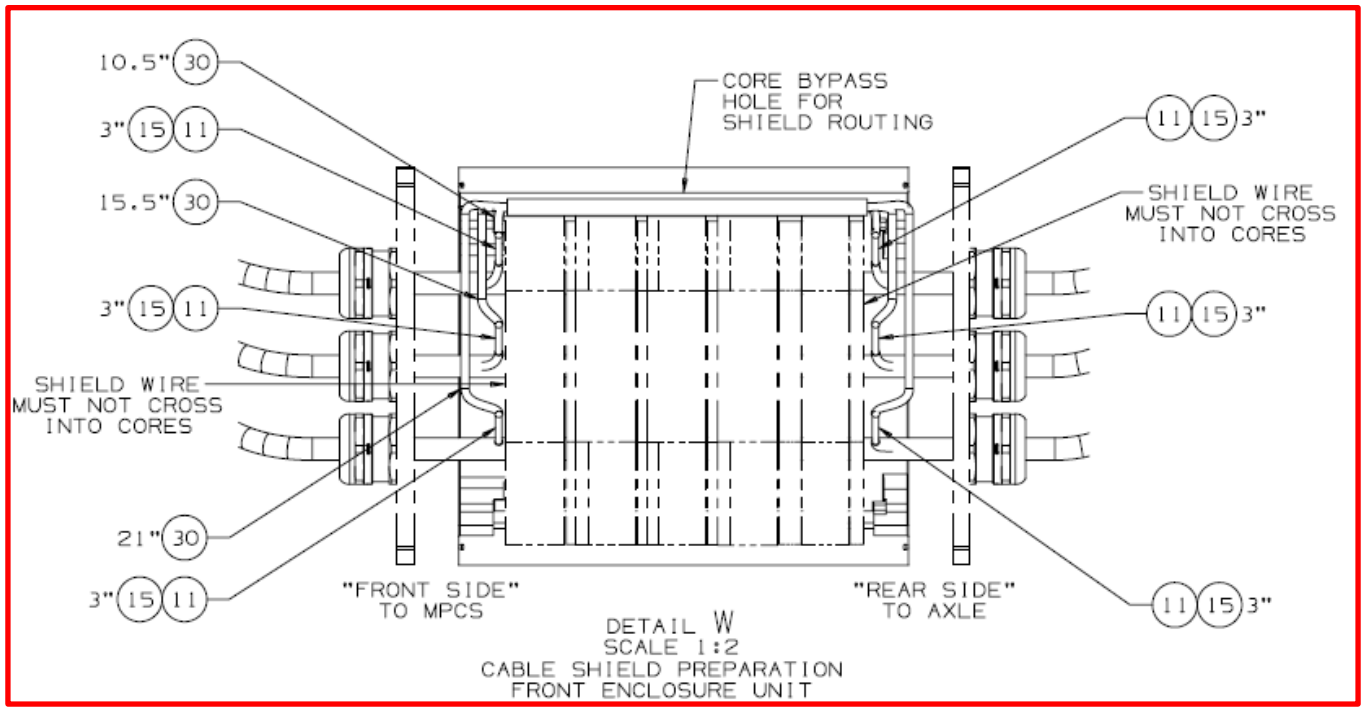
81. Apply heat shrink and splice a section of braided wire onto shield stubs on “Front” side of core housing. Refer to Detail View W (Front enclosure) and Detail View U (Rear enclosure) for required wire segment lengths and heat shrink detail.



Detail View W (Front enclosure) and Detail View U (Rear enclosure) locations



11	018189	BUTT SPLICE SEALED
15	137939	TUBE-HEAT SHRK 0.25 SS
30	1120816	CABLE-BRAIDED, 0.5IN DIA



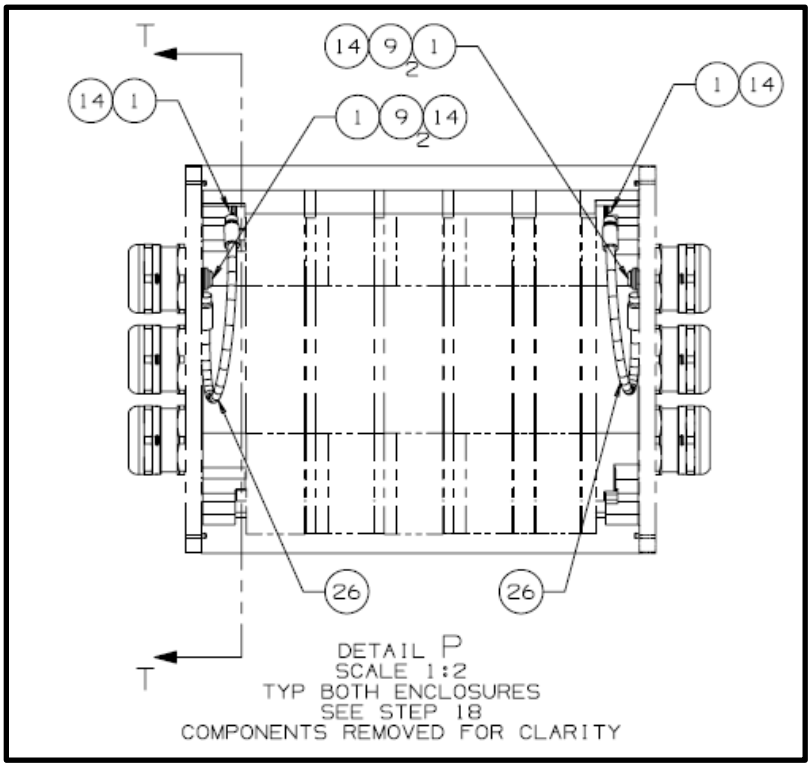
11	018189	BUTT SPLICE SEALED
15	137939	TUBE-HEAT SHRK 0.25 SS
30	1120816	CABLE-BRAIDED, 0.5IN DIA

82. Trim braided wire length as required before splicing to ensure excess braided wire length is not sufficient to cross inside of cores. Refer to Detail View (Rear enclosure) and Detail View W (Front enclosure).

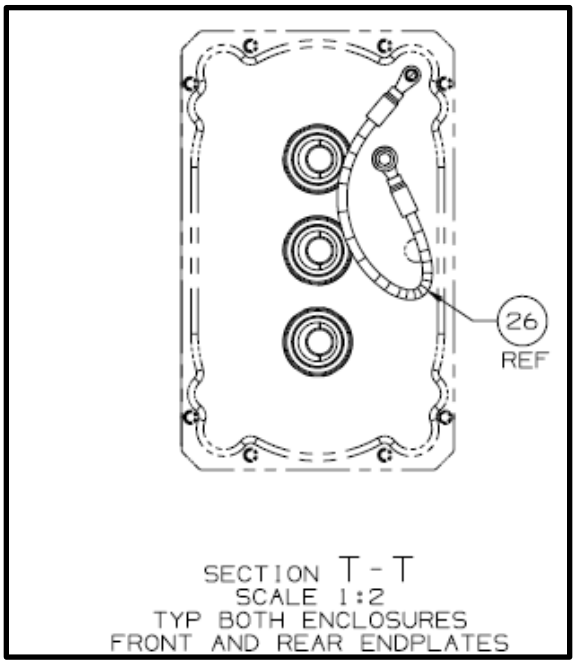
83. Route attached braided wire segments through bypass hole in lower corner along the length of enclosure boxes. Refer to Detail View U and Detail View W.

Cable Enclosure Reassembly

84. Install ground cables to connect both front and rear endplates to enclosure housing. Torque #10 screws P/N 14S00006 to 20 in-lbs. and apply Loctite 243 to threads. Refer to Detail P and Section T-T.

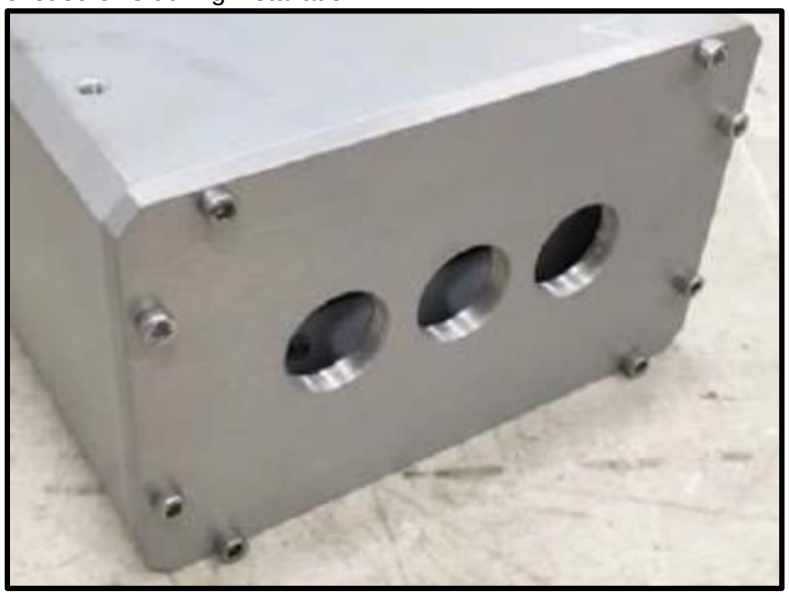


1	14S00006	SCREW MACHINE NO 10 PN HD
9	50W00000	WASHER FLAT SS 10
14	081034	LOCTITE-243 MEDIUM 10ML
26	1115506	ASSY-CABLE,GROUNDING ENDPLATE TO ENCLOSURE



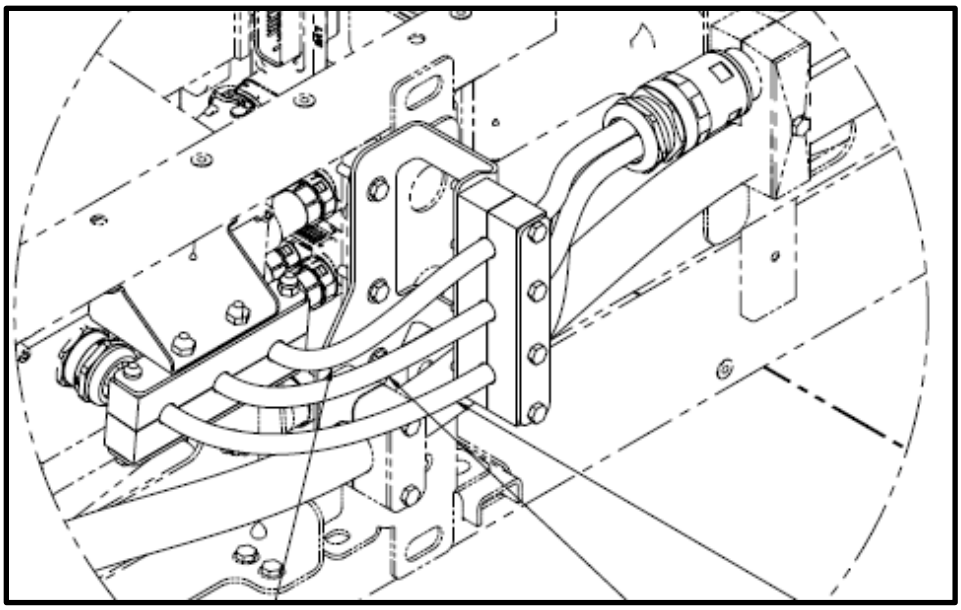
26	1115506	ASSY-CABLE,GROUNDING ENDPLATE TO ENCLOSURE

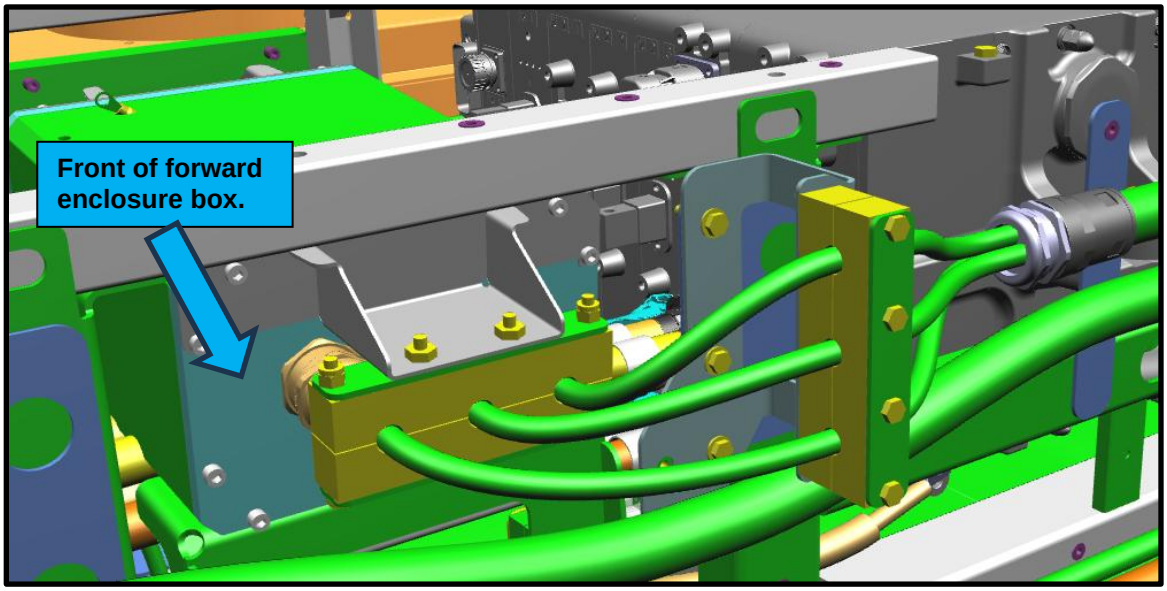
85. Secure end plates to both sides of enclosures using socket screws x8 and torque to 30 in-lbs. Reapply Loctite 243 to threads of socket screws during installation.



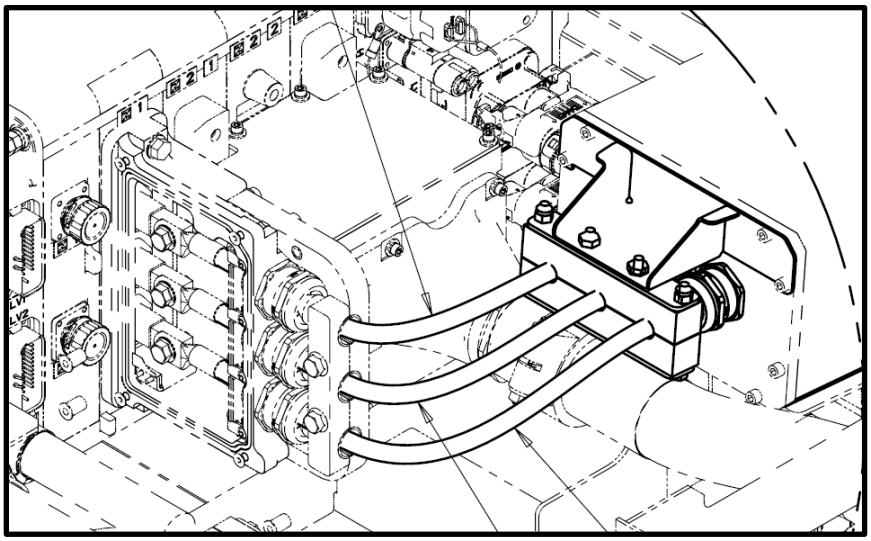
86. Torque cables glands on to enclosure endplates to 7-8 FT-LBS. Tighten strain relief dome of gland to hand tight plus ¼ to ½ a turn.

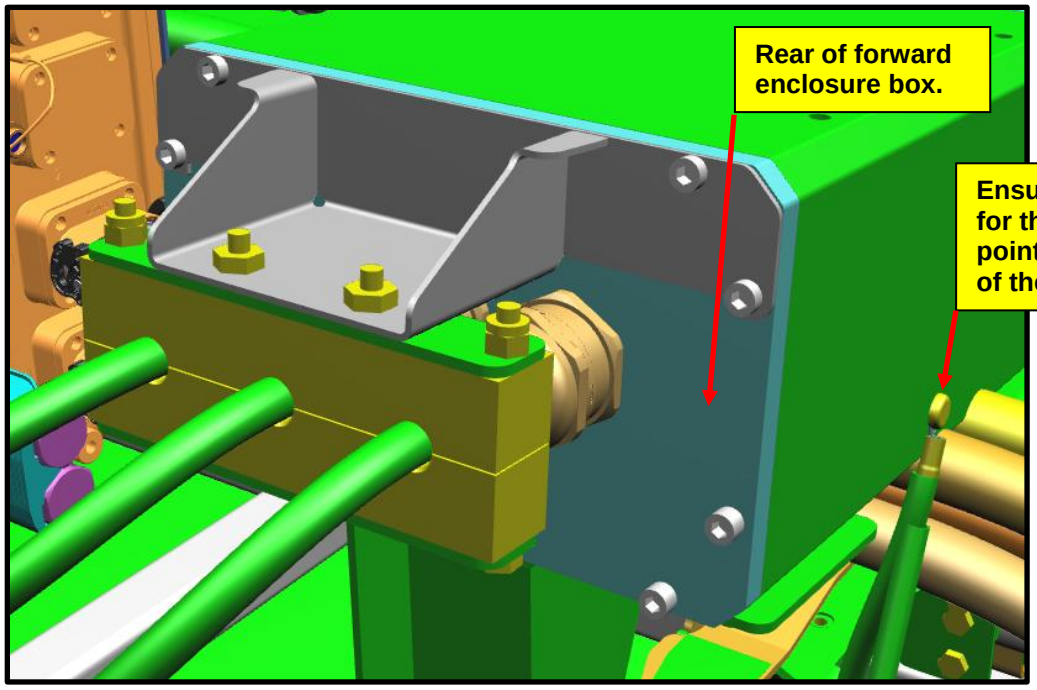
87. Install cable support brackets and clamps to endplates on both front and rear enclosures as shown in images below. Also install forward (P/N 1115616) and rear (P/N 1115611) ground cables on both forward and rear enclosures, respectively.



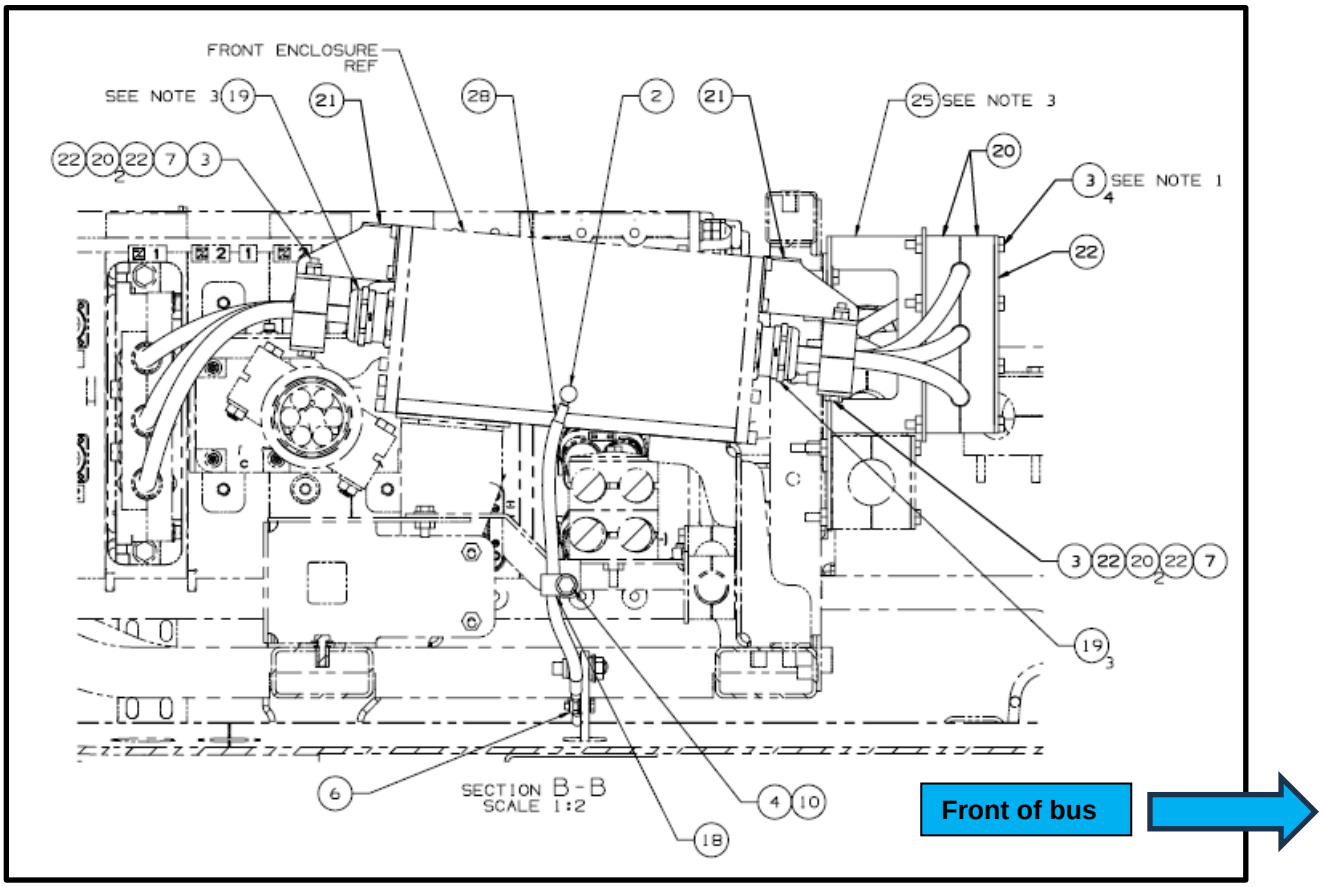


FRONT ENCLOSURE HOUSING – Install cable support brackets and clamps to front of forward enclosure





FRONT ENCLOSURE HOUSING – Install cable support brackets and clamps to rear of forward enclosure



CS view of front enclosure - Install cable support brackets and clamps to endplates

4	20B04020	BOLT-SS 1/4-UNC X 1.25
3	20B04044	BOLT-HEX SST1/4-20X2.75
2	14S04008	SCREW-MACHINE 1/4UNC X .5

7	42N04000	NUT-NYLON LOCK 1/4-20 UNC SST
6	42N00000	NUT-NYLON LOCK #10 SST

10	50W04000	WASHER-FLAT 1/4 NOM

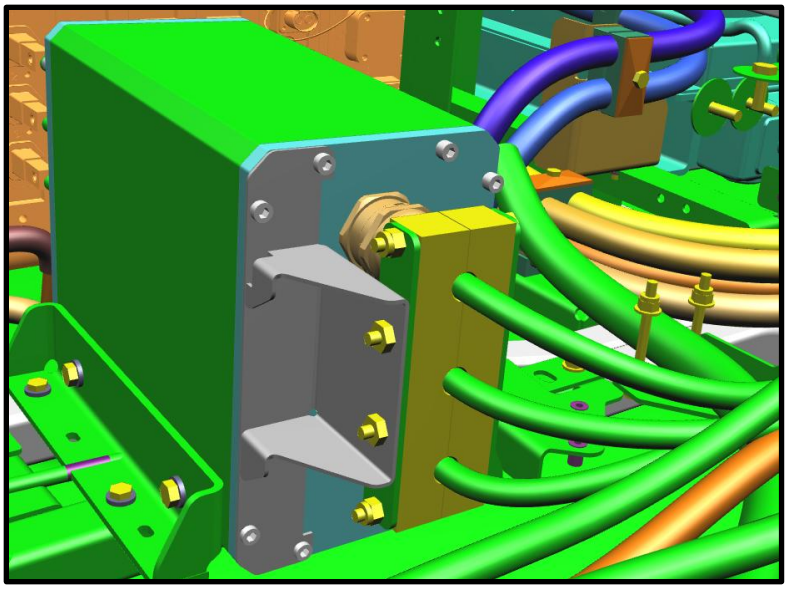
22	1114220	PLATE-TRIPLE 21.2 CLAMP
21	1113634	ASSY-MOUNTING, CABLE SUPPORT FRONT
20	1113626	CLAMP-TRIPLE 3X 21.2
19	901384	GLAND-CABLE PG29
18	536915	CLAMP-SINGLE 3/8 DIA LB-SERIES

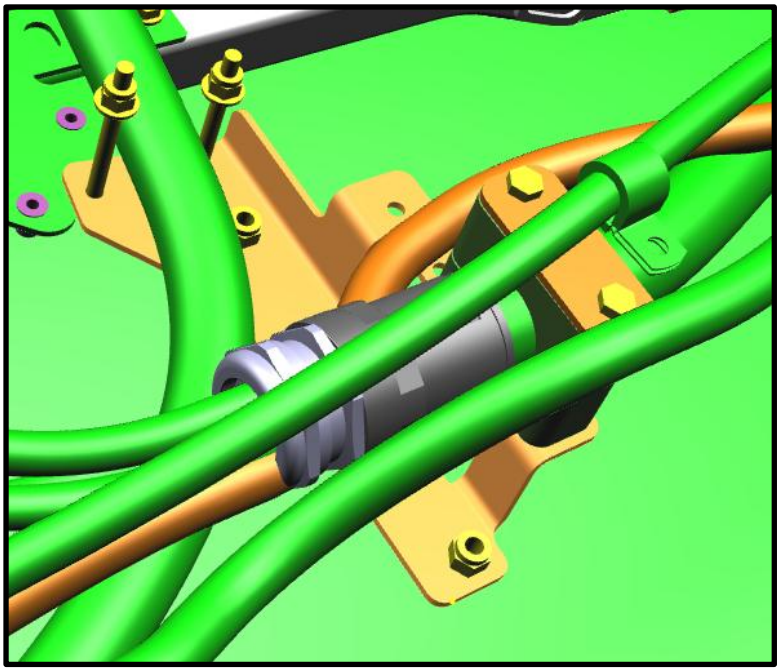
25	1114979	ASSY-TRIPLE CABLE MOUNT FRONT

28	1115616	ASSY-CABLE,GROUNDING, FRONT ENCLOSURE TO CHASSIS

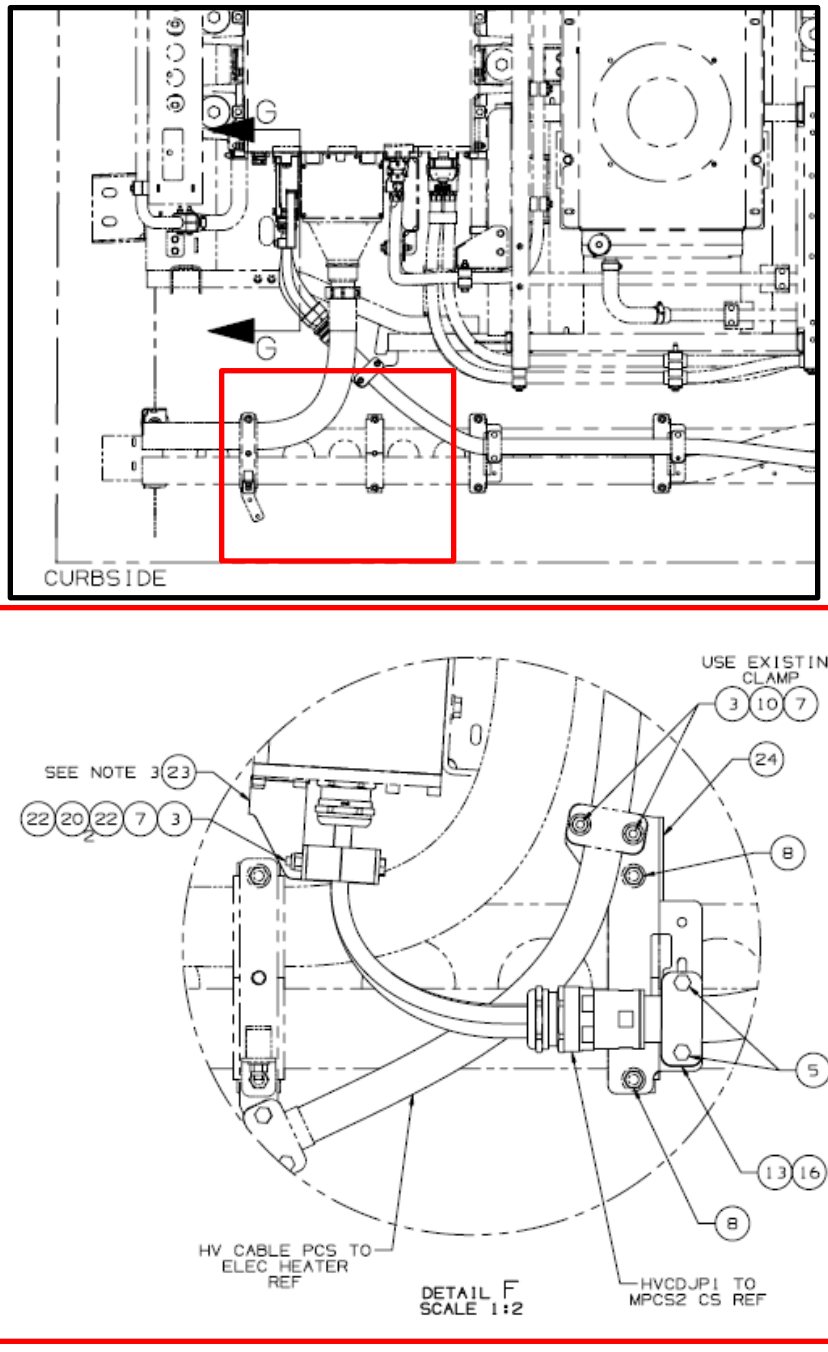
NOTES:

1. APPLY 1 TO 2 DROPS OF LOCTITE TO THREADS OF FASTENERS DURING INSTALLATION.
2. DRILL 0.391 Ø HOLES AT SPECIFIED DIMENSIONS AND INSTALL INSERT (ITEM 17).
3. USE EXISTING ENCLOSURE SCREWS TO SECURE BRACKETS TO ENCLOSURE ENDPLATES. REAPPLY LOCTITE TO ENCLOSURE SCREWS WHEN INSTALLING BRACKETS.





REAR ENCLOSURE HOUSING – Install cable support brackets and clamps (CS end of enclosure)

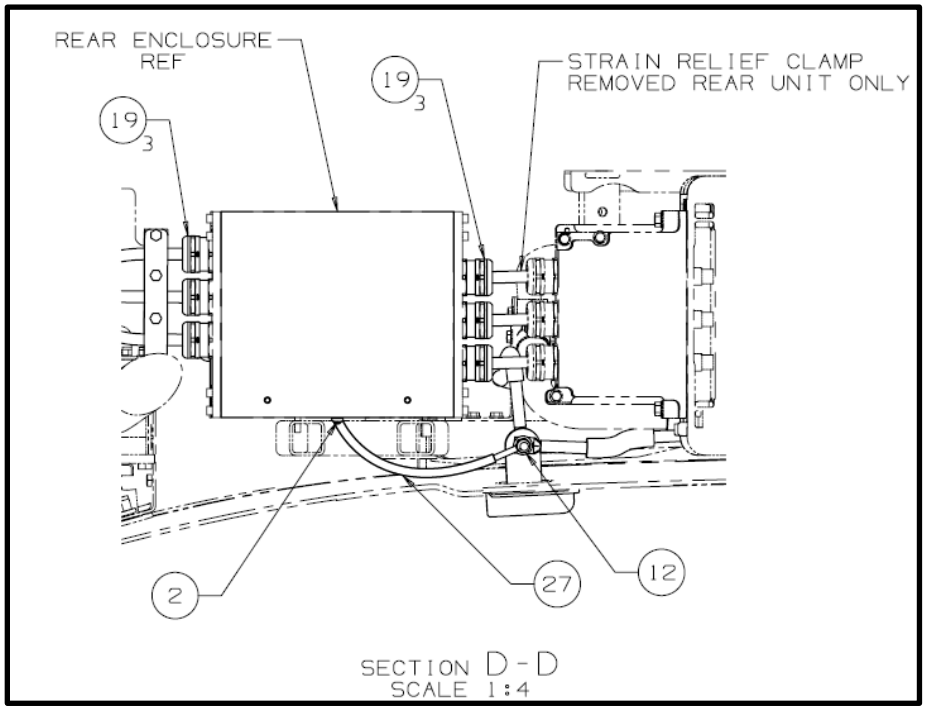


Top down view of rear enclosure - Install cable support brackets and clamps to endplates

3	20B04044	BOLT-HEX SST1/4-20X2.75
5	20B04052	BOLT-HEX 1/4 UNC X 3.25
8	42N05000	NUT-LOCK NYLON 5/16" SST
7	42N04000	NUT-NYLON LOCK 1/4-20 UNC SST

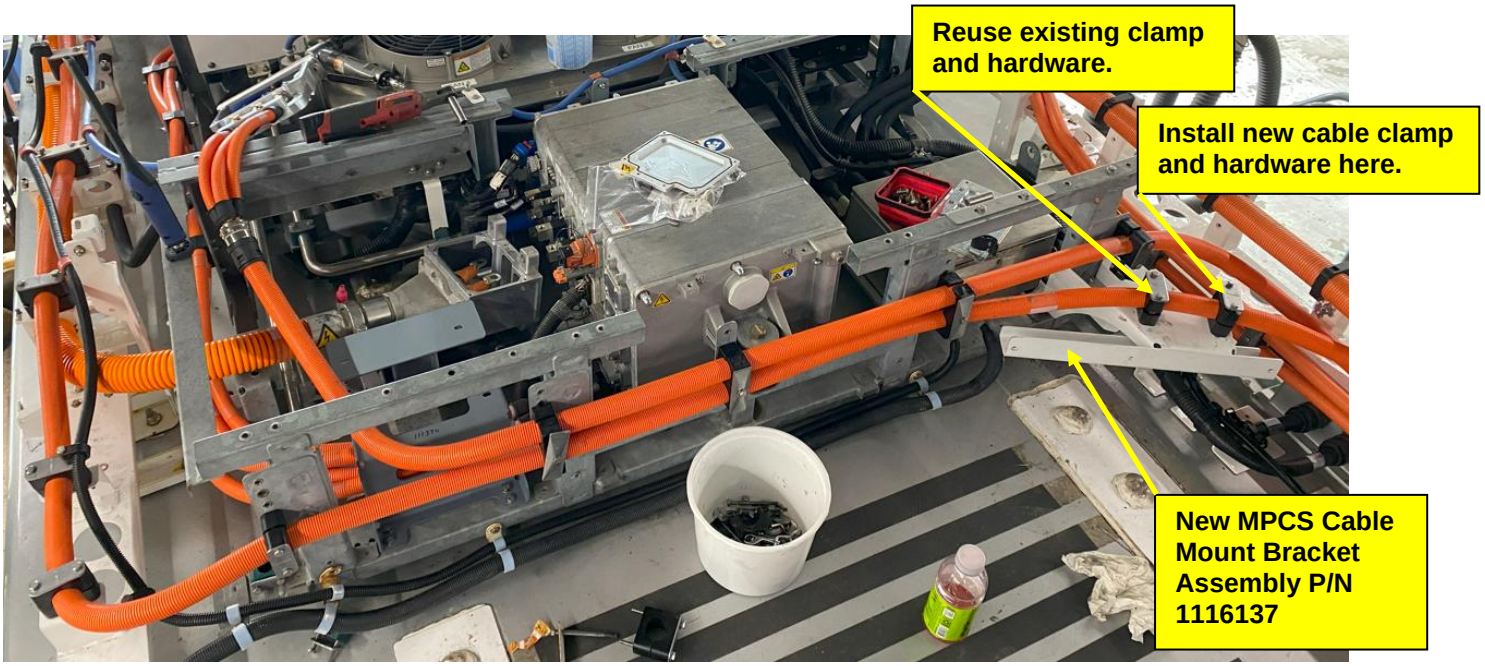
10	50W04000	WASHER-FLAT 1/4 NOM
13	058879	COVER PLATE
16	506293	CLAMP-1.38 O.D. TUBE PA
20	1113626	CLAMP-TRIPLE 3X 21.2
22	1114220	PLATE-TRIPLE 21.2 CLAMP
24	1114577	BRKT-MPCS CABLE SUPPORT SIDESCREEN

☞ **NOTE: Rear core housing enclosure DOES NOT have bracket and clamps on side closest to MPCS unit. Refer to Section view D-D.**

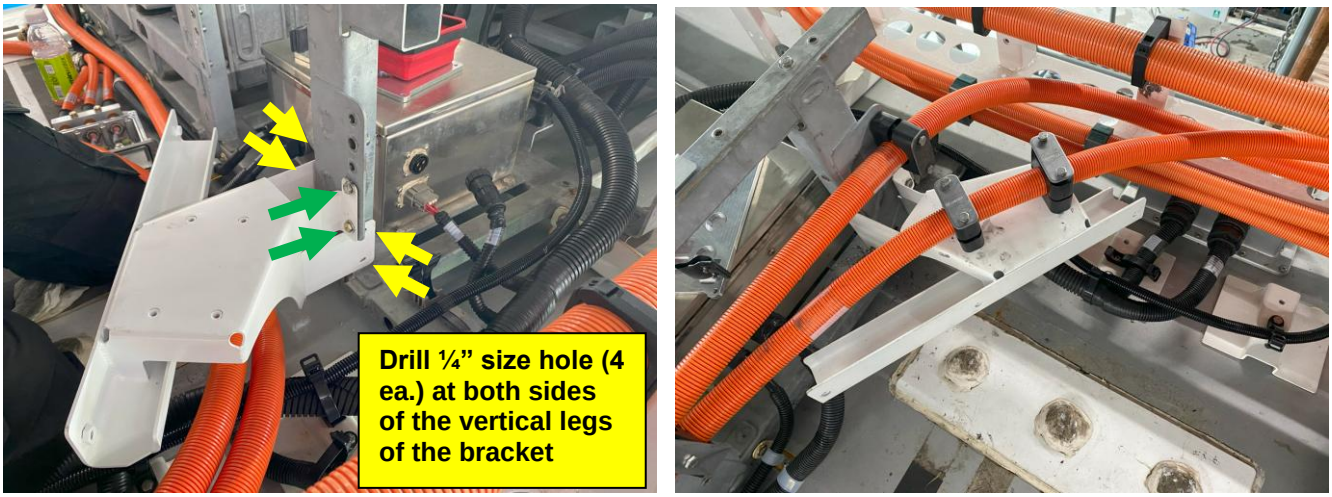


2	14S04008	SCREW-MACHINE 1/4UNC X .5
12	027570	NUT-HEX LOCK 3/8-16 SS
19	901384	GLAND-CABLE PG29
27	1115611	ASSY-CABLE,GROUNDING, REAR ENCLOSURE TO CHASSIS

88. Move to the SS of the bus, in front of the forward inverter rack. Install new MPCS Cable Mount Bracket Assembly P/N **1116137** on the SS structure tube of the forward inverter rack:
    a. Mount bracket with two ¼-20 bolts at the forward side of the bracket (see green arrows below).
    b. Drill the rack through at the side holes of the bracket (4 ea. holes) by using a ¼" drill bit (see yellow arrows below).
    c. Enlarge holes to 0.391" (use a 25/64" size drill bit).
    d. Install ¼-20 threaded insert (4 ea.).
    e. Install ¼-20x1.25 SST bolts (PN **20B04020**) 4 ea.
89. Reuse one (1) existing cable clamp and hardware and install one (1) new cable clamp and hardware on top of mounting bracket assembly. **Do not tighten these clamps because the HV cable needs to be adjusted later.**



Install new MPCS Cable Mount Bracket Assembly on forward inverter rack structure tube on SS of bus

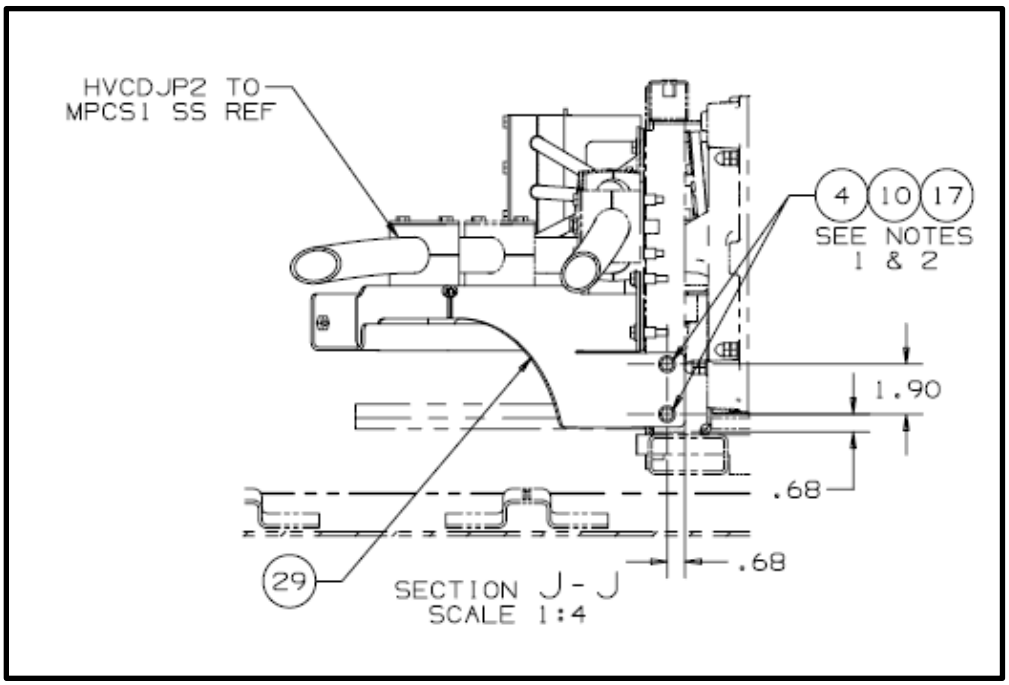


View looking toward SS of bus – Install new MPCS Cable Mount Bracket Assembly

5	20B04052	BOLT-HEX 1/4 UNC X 3.25
4	20B04020	BOLT-SS 1/4-UNC X 1.25
10	50W04000	WASHER-FLAT 1/4 NOM
13	058879	COVER PLATE
18	536915	CLAMP-SINGLE 3/8 DIA LB-SERIES
17	522558	INSERT-1/4-20 UNC SST
29	1116137	ASSY-MPCS CABLE MOUNT BRACKET

NOTES:

1. APPLY 1 TO 2 DROPS OF LOCTITE TO THREADS OF FASTENERS DURING INSTALLATION.
2. DRILL 0.391 Ø HOLES AT SPECIFIED DIMENSIONS AND INSTALL INSERT (ITEM 17).



View looking toward CS of bus – Install new MPCS Cable Mount Bracket Assembly

4	20B04020	BOLT-SS 1/4-UNC X 1.25

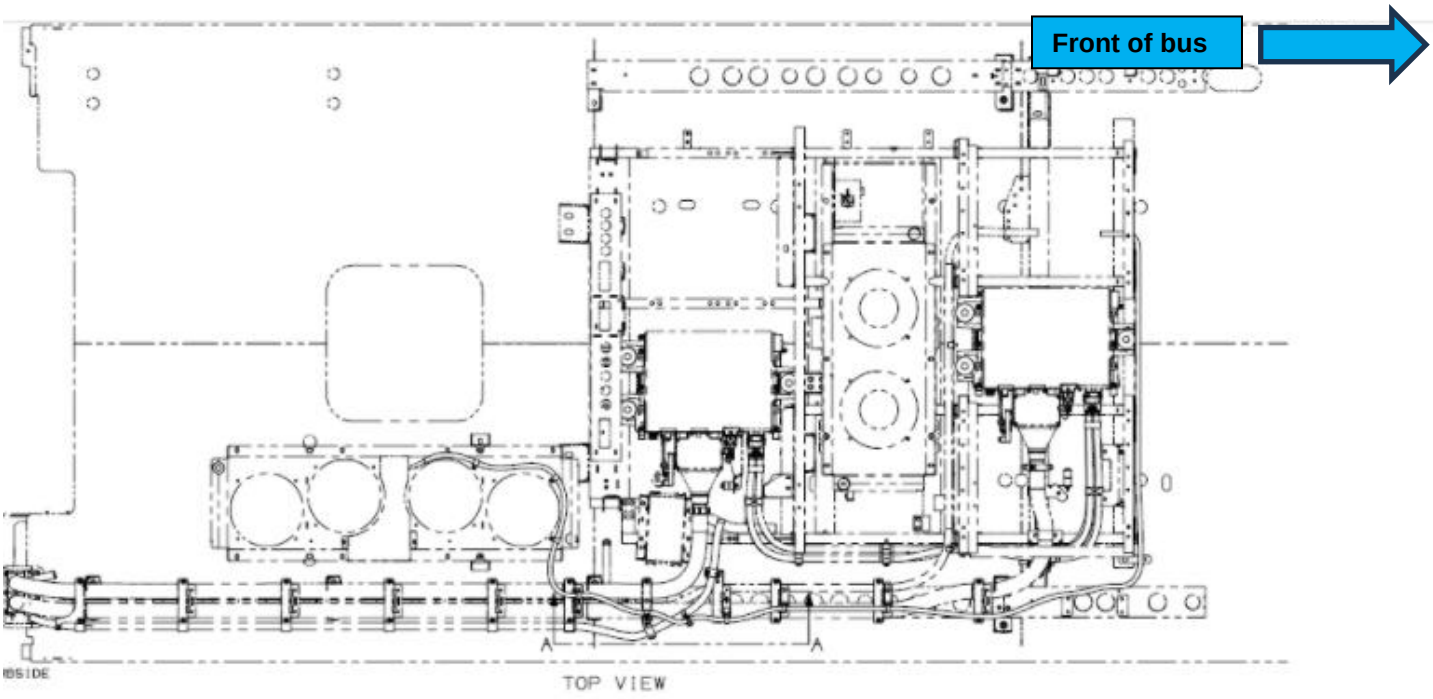
10	50W04000	WASHER-FLAT 1/4 NOM
17	522558	INSERT-1/4-20 UNC SST
29	1116137	ASSY-MPCS CABLE MOUNT BRACKET

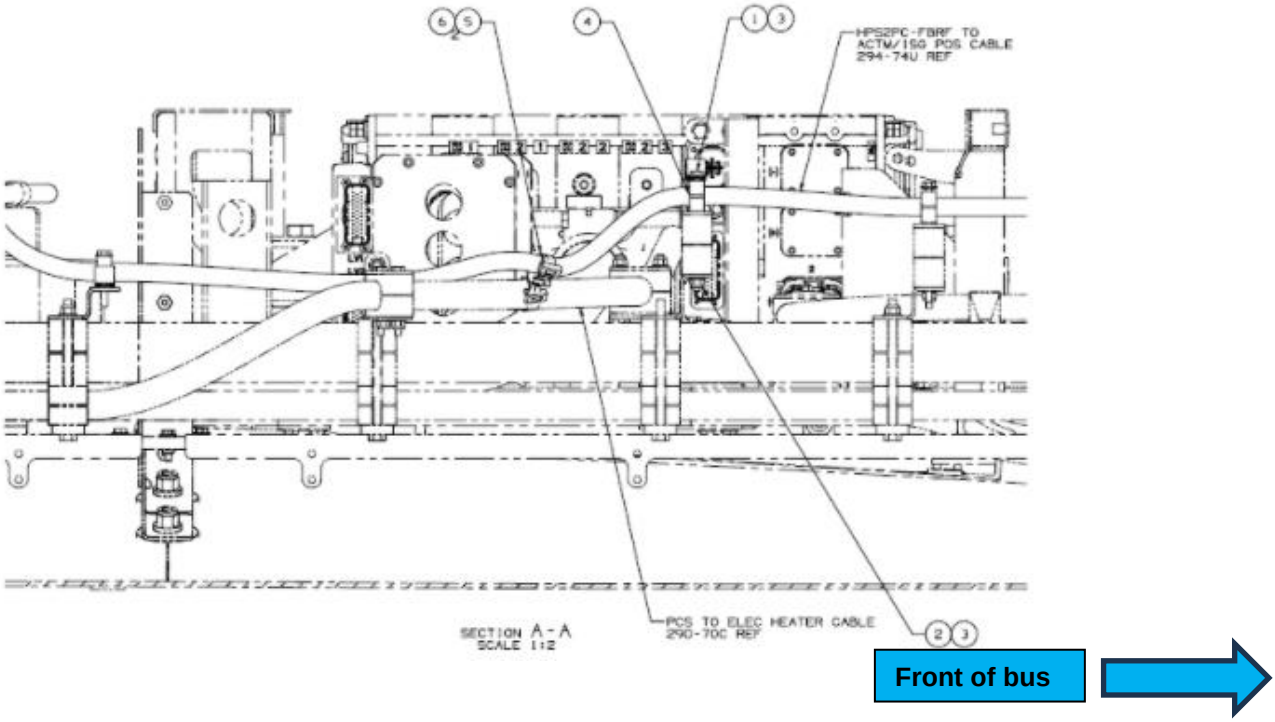
90. Adjust cables as necessary to optimize routing on either end of the enclosure housings. Remove any interferences and distribute slack along the length of cables.

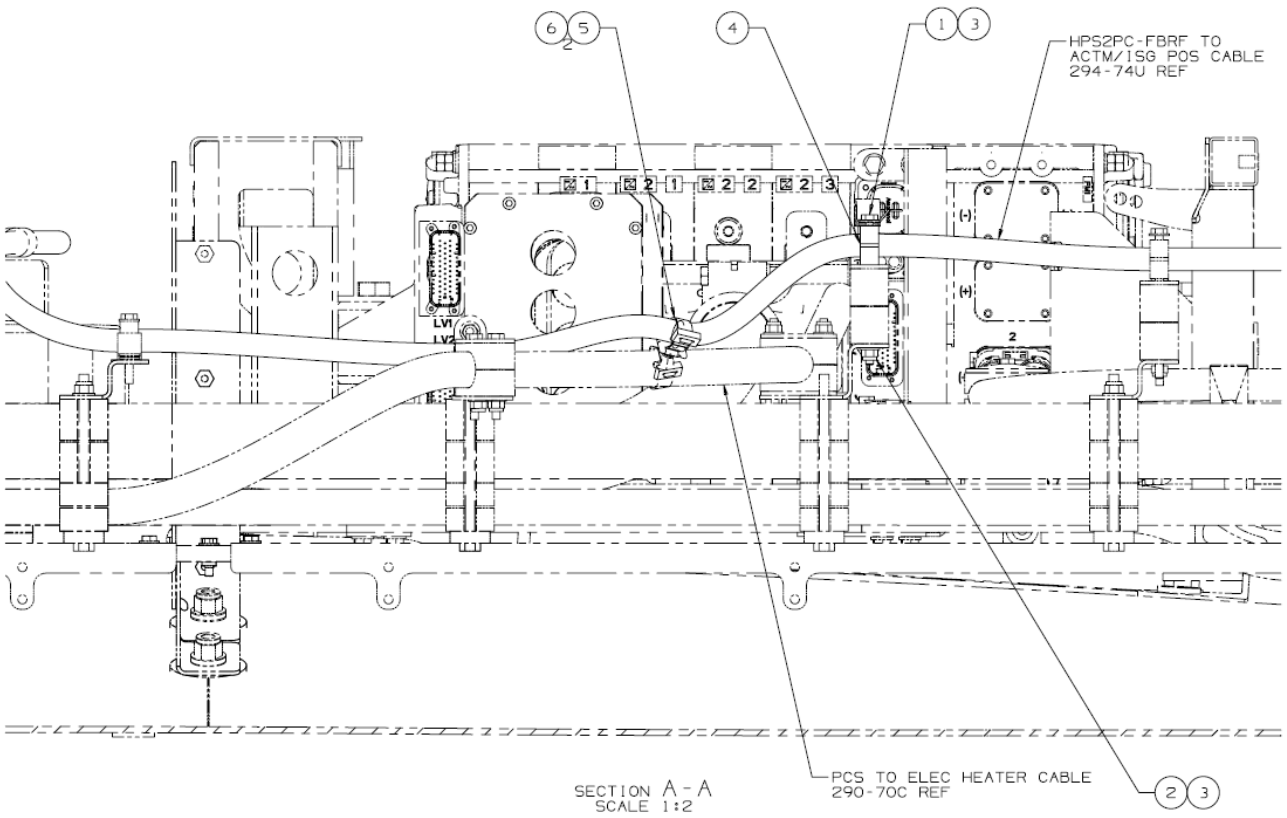
91. Go back and tighten any clamps along the cables that were left loose and reinstall with existing hardware.

Part E – Reroute Rooftop Cooler Power Cable (EAD-028371)

92. Resecure PWR CABLE TO ACTM/ISG COOLER with Item numbers 1-6 on drawings below.

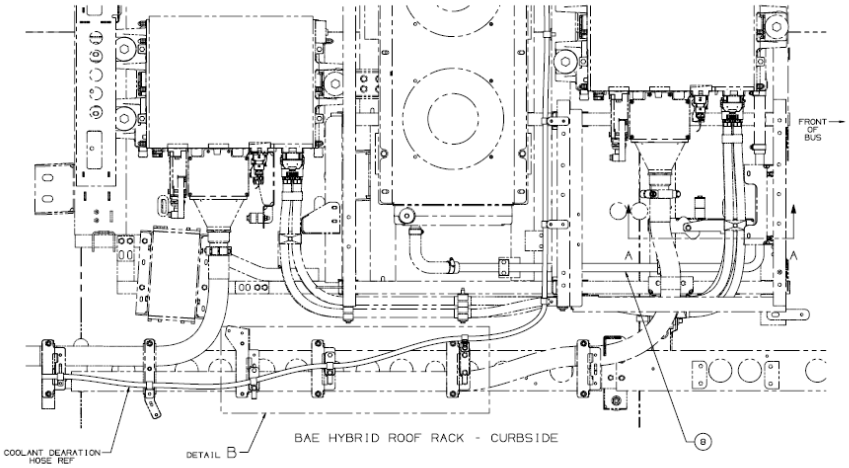


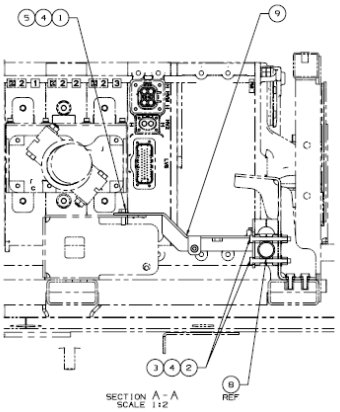


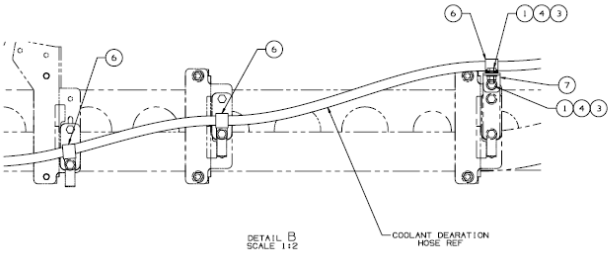


QTY	U/M	ITEM	PART NO.	DESCRIPTION
1	EA	6	351500	SPACER-DUAL SWIVEL SADDLE
2	EA	5	351161	CABLETIE-WIDE HEAVY DUTY
1	EA	4	287602	CLAMP-18MM DIA LN
2	EA	3	50W04000	WASHER-FLAT 1/4 NOM
1	EA	2	42N04000	NUT-NYLON LOCK 1/4-20 UNC SST
1	EA	1	20B04072	BOLT-HEX SS 1/4-20 UNC X 4.50

Part F – Reroute Coolant Aeration Line (EAD-028345)

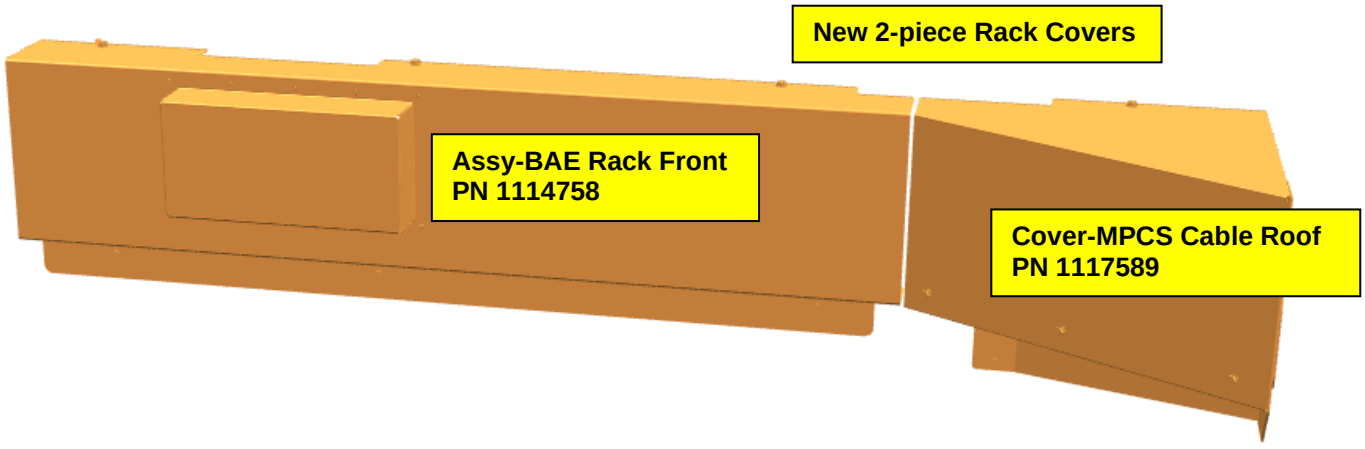


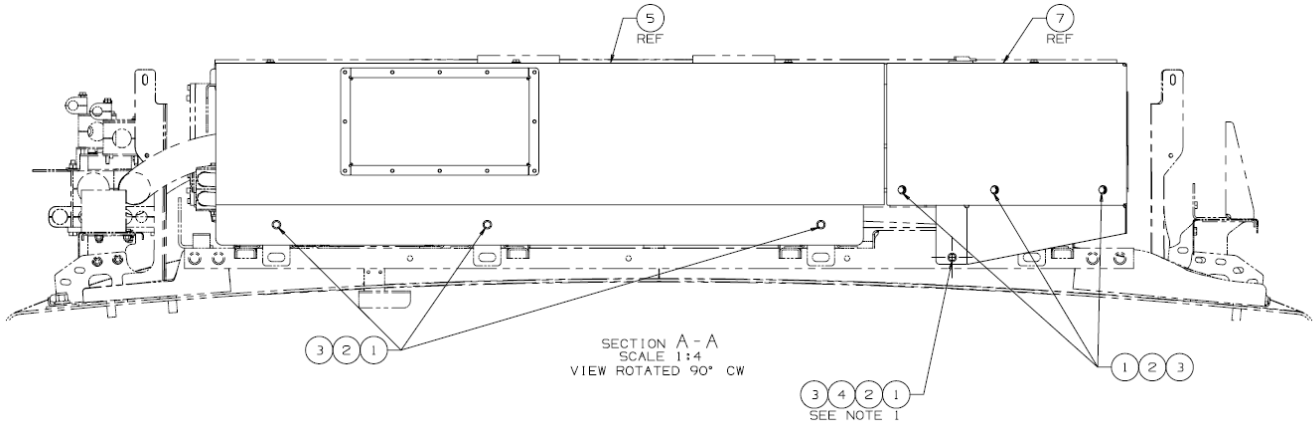




QTY	U/M	ITEM	PART NO.	DESCRIPTION
1	EA	9	1114649	ASSY-CABLE SUPPORT
1	EA	8	1113621	TUBE-1.00 DIA SST
1	EA	7	904661	BRKT-BAE VENT LINE SPRT
3	EA	6	247222	CLAMP-P 0.563
0.010	EA	5	081034	LOCTITE-243 MEDIUM 10ML
6	EA	4	50W04000	WASHER-FLAT 1/4 NOM
4	EA	3	42N04000	NUT-NYLON LOCK 1/4-20 UNC SST
2	EA	2	20B04036	BOLT-HEX 1/4-20 X 2.25 SS
3	EA	1	20B04012	BOLT-HEX 1/4 UNC X 0.75

Part G – Install Hybrid Rack Covers





NOTES:

1. USE COVER (ITEM 7) AS TEMPLATE TO MARK AND DRILL 0.391 Ø HOLE AT SPECIFIED LOCATION. INSTALL INSERT (ITEM 4) AND SECURE COVER TO HYBRID RACK USING 1/4 IN HARDWARE.

2. TORQUE ALL 1/4 IN HARDWARE TO 5 FT-LBS. APPLY 1-2 DROPS OF LOCTITE TO ALL FASTENER THREADS DURING INSTALLATION.

QTY	U/M	ITEM	PART NO.	DESCRIPTION
1	EA	7	1117589	COVER-MPCS CABLE ROOF
0.667	FT	6	003502	CHANNEL-U RBR 1/2LX1/4W
1	EA	5	1114758	ASSY-BAE RACK FRONT
1	EA	4	522558	INSERT-1/4-20 UNC SST
0.010	EA	3	081034	LOCTITE-243 MEDIUM 10ML
12	EA	2	50W04000	WASHER-FLAT 1/4 NOM
12	EA	1	20B04012	BOLT-HEX 1/4 UNC X 0.75

93. Check the coolant level of the rooftop inverter system and add coolant if required in accordance with the procedures outlined in the applicable NF service manual.

94. Close all applicable rooftop inverter enclosures and access panels.

95. Remove all tools and debris from work area and return the bus to service condition.

96. Turn the 12/24V battery switch to the “ON” position.

97. Re-energize the high voltage system on the bus. Refer to the applicable section of the NF service manual for detailed instructions.

LABOUR ESTIMATE				
	Operation	Number of Technician(s)	Hours	Labor Time T X HR
1	Install ferrite core enclosures inside rooftop inverters to eliminate excessive CMC and subsequent center axle bearing failures.	2	12.0	24.0

PARTS REQUIRED					
Item	Part Number	Description	Qty. per Coach	Units	Notes
0	6505573	KIT-ENCLOSURE ROOF ITS-61320	1	each	Includes parts listed rows 3-84 below
1	606945	Primer Zinc	0.2	GA	
2	638699	Primer Zinc Powder	0.4	GA	
Part E: EAD-028371 - REWORK-PC PWR TO ACTM/ISG COOLER PARTS:					
3	20B04072	BOLT-HEX SS 1/4-20 UNC X 4.50	1	each	**Part E**: EAD-028371
4	42N04000	NUT-NYLON LOCK 1/4-20 UNC SST	1	each	Part E: EAD-028371
5	50w04000	WASHER-FLAT 1/4 NOM	2	each	Part E: EAD-028371
6	287602	CLAMP-18MM DIA LN	1	each	Part E: EAD-028371
7	351161	CABLETIE-WIDE HEAVY DUTY	2	each	Part E: EAD-028371
8	351500	SPACER-DUAL SWIVEL SADDLE	1	each	Part E: EAD-028371
Part F: EAD-028345 - REWORK-COOLING LINES ROOF PARTS:					
9	20b04012	BOLT-HEX 1/4 UNC x 0.75	3	each	**Part F**: EAD-028345
10	20b04036	BOLT-HEX 1/4-20 X 2.25 SS	2	each	Part F: EAD-028345
11	42N04000	NUT-NYLON LOCK 1/4-20 UNC SST	4	each	Part F: EAD-028345
12	50w04000	WASHER-FLAT 1/4 NOM	6	each	Part F: EAD-028345
13	081034	LOCTITE-243 MEDIUM 10ML	0.010000	EA	Part F: EAD-028345
14	247222	CLAMP-P 0.563	3	each	Part F: EAD-028345
15	904661	BRKT-BAE VENT LINE SPRT	1	each	Part F: EAD-028345
16	1113621	TUBE-1.00 DIA SST	1	each	Part F: EAD-028345
17	1114649	ASSY-CABLE SUPPORT	1	each	Part F: EAD-028345
Part G: EAD-028350 - REWORK-HYBRID COVERS BAE PARTS:					
18	20b04012	BOLT-HEX 1/4 UNC x 0.75	12	each	**Part G**: EAD-028350
19	50w04000	WASHER-FLAT 1/4 NOM	12	each	**Part G**: EAD-028350
20	081034	LOCTITE-243 MEDIUM 10ML	0.010000	EA	**Part G**: EAD-028350
21	522558	INSERT-1/4-20 UNC SST	1	each	**Part G**: EAD-028350
22	1114758	ASSY-BAE RACK FRONT	1	each	**Part G**: EAD-028350

23	003502	CHANNEL-U RBR 1/2LX1/4W	0.667000	FT	**Part G**: EAD-028350
24	1117589	COVER-MPCS CABLE ROOF	1	each	**Part G**: EAD-028350
EAD-028389 - REWORK-HV CENTER DRIVE CABLE PARTS:					
25	14s00006	SCREW MACHINE NO 10 PN HD	8	each	EAD-028389
26	14s04008	SCREW-MACHINE 1/4UNC x .5	2	each	EAD-028389
27	20B04044	BOLT-HEX SST1/4-20X2.75	18	each	EAD-028389
28	20b04020	BOLT-SS 1/4-UNC X 1.25	10	each	EAD-028389
29	20b04052	BOLT-HEX 1/4 UNC x 3.25	4	each	EAD-028389
30	42N00000	NUT-NYLON LOCK #10 SST	1	each	EAD-028389
31	42N04000	NUT-NYLON LOCK 1/4-20 UNC SST	20	each	EAD-028389
32	42n05000	NUT-LOCK NYLON 5/16" SST	2	each	EAD-028389
33	50w00000	WASHER FLAT SS 10	8	each	EAD-028389
34	50w04000	WASHER-FLAT 1/4 NOM	14	each	EAD-028389
35	018189	BUTT SPLICE SEALED	12	each	EAD-028389
36	027570	NUT-HEX LOCK 3/8-16 SS	1	each	EAD-028389
37	058879	COVER PLATE	2	each	EAD-028389
38	081034	LOCTITE-243 MEDIUM 10ML	0.010000	EA	EAD-028389
39	137939	TUBE-HEAT SHRK 0.25 SS	3.000000	FT	EAD-028389
40	506293	CLAMP-1.38 O.D. TUBE PA	2	each	EAD-028389
41	522558	INSERT-1/4-20 UNC SST	4	each	EAD-028389
42	536915	CLAMP-SINGLE 3/8 DIA LB-SERIES	1	each	EAD-028389
43	901384	GLAND-CABLE PG29	12	each	EAD-028389
44	1113626	CLAMP-TRIPLE 3x 21.2	8	each	EAD-028389
45	1113634	ASSY-MOUNTING, CABLE SUPPORT FRONT	2	each	EAD-028389
46	1114220	PLATE-TRIPLE 21.2 CLAMP	7	each	EAD-028389
47	1114450	ASSY-MOUNTING, CABLE SUPPORT REAR	1	each	EAD-028389
48	1114577	BRKT-MPCS CABLE SUPPORT SIDESCREEN	1	each	EAD-028389
49	1114979	ASSY-TRIPLE CABLE MOUNT FRONT	1	each	EAD-028389
50	1115506	ASSY-CABLE,GROUNDING ENDPLATE TO ENCLOSURE	4	each	EAD-028389
51	1115611	ASSY-CABLE,GROUNDING, REAR ENCLOSURE TO CHASSIS	1	each	EAD-028389
52	1115616	ASSY-CABLE,GROUNDING, FRONT ENCLOSURE TO CHASSIS	1	each	EAD-028389
53	1116137	ASSY-MPCS CABLE MOUNT BRACKET	1	each	EAD-028389
54	1120816	CABLE-BRAIDED, 0.5IN DIA	7.667000	FT	EAD-028389

EAD-028369 - REWORK-HYB POWER CABLES BAE PARTS:					
55	20b04084	BOLT-HEX SS 1/4-20 UNC X 5.25	1	each	EAD-028369
56	42N04000	NUT-NYLON LOCK 1/4-20 UNC SST	5	each	EAD-028369
57	50w04000	WASHER-FLAT 1/4 NOM	2	each	EAD-028369
58	1115164	SPACER-TRACTION MOTOR CABLE FRONT	2	each	EAD-028369
59	1115167	SPACER-TRACTION MOTOR CABLE REAR	4	each	EAD-028369
60	1118582	CLAMP-CABLE,28.5MM, 21.2MM	2	each	EAD-028369
EAD-028273 - MPCS FERRITE CORE ENCLOSURE PARTS:					
61	10b04012	BOLT-HEX 1/4 UNC x 0.75	12	each	EAD-028273
62	10b05016	BOLT-HEX 5/16 UNC x 1.00	8	each	EAD-028273
63	10b05040	BOLT-HEX 5/16 UNC x 2.50	4	each	EAD-028273
64	20w05000	WASHER-HARDENED 5/16	8	each	EAD-028273
65	40n05000	NUT LOCK NYLON 5/16"	4	each	EAD-028273
66	050798	INSERT-1/4-20UNC STL	12	each	EAD-028273
67	081034	LOCTITE-243 MEDIUM 10ML	0.010000	EA	EAD-028273
68	1113711	BRKT-FERRITE FILTER CORE MTG	1	each	EAD-028273
69	1113783	BRKT-REAR FERRITE FILTER CORE MTG	2	each	EAD-028273
70	1114438	ASSY-FILTER CORE HOUSING FRONT	1	each	EAD-028273
71	1114453	TUBE-SUPPORT FERRITE FILTER MOUNT SLEEVE	4	each	EAD-028273
72	1114505	ASSY-FILTER CORE HOUSING REAR	1	each	EAD-028273
73	1114576	ASSY-REAR FERRITE FILTER CORE RACK SPRT	1	each	EAD-028273
74	1114578	ASSY-FERRITE FILTER CORE MTG	1	each	EAD-028273
75	1119829	WASHER-5/16 HARDENED 0.688 OD	8	each	EAD-028273
76	1120880	WASHER-1/4 HARDENED 0.625 OD	12	each	EAD-028273
EAD-028356 – SIDE SCREEN REWORK PARTS:					
77	20b04012	BOLT-HEX 1/4 UNC x 0.75	6	each	EAD-028356
78	055702	AKTIVATOR-SIKA 205	0.010000	EA	EAD-028356
79	060771	WASHER-1/4 X 1 X .063 SST	2	each	EAD-028356
80	081034	LOCTITE-243 MEDIUM 10ML	0.010000	EA	EAD-028356
81	242702	ADHESIVE-SIKA 221 WHITE	0.010000	ML	EAD-028356
82	277551	WASHER-1/4 SST LARGE OD	4	each	EAD-028356
83	1116443	ASSY-SIDE SCREEN CUTOUT SUPPORT	1	each	EAD-028356
84	1116484	PLATE-SIDE SCREEN CUTOUT TRIM	1	each	EAD-028356