INSTRUCTION BULLETIN

No. 9021684
Machine: T7AMR
Published: 12-2022
Rev. 01

NOTE: DO NOT DISCARD the Parts List from the Instruction Bulletin. Place the Parts List in the appropriate place in the machine manual for future reference. Retaining the Parts List will make it easier to reorder individual parts and will save the cost of ordering an entire kit.

NOTE: Numbers in parenthesis ( ) are reference numbers for parts listed in Bill of Materials.

Installation instructions for **kit number 9052000**

Kit installation must be performed by Tennant*True*® service or an authorized service provider.

SYNOPSIS:

This kit contains the parts needed to install the Lithium- Ion battery kit into T7AMR scrubbers. Please follow step-by-step instructions.

SPECIAL TOOLS/CONSIDERATIONS: Torque Wrench, Electrical Pin Extraction Tool (Molex® Extractor Tool - 011030044E)

(Estimated time to complete: 4 hours)

PROTECT THE ENVIRONMENT

Please dispose of packaging materials, used machine components such as batteries and fluids in an environmentally safe way according to local waste disposal regulations.

Always remember to recycle.

1. Ensure none of the new lithium batteries (1) is turned on. All batteries must be OFF prior to installation.

   Quickly press and release the power button (**Do Not** hold button for more than 1 second) and observe the charge indicator bars near the button. None of the lights should be illuminated, indicating the battery is off.

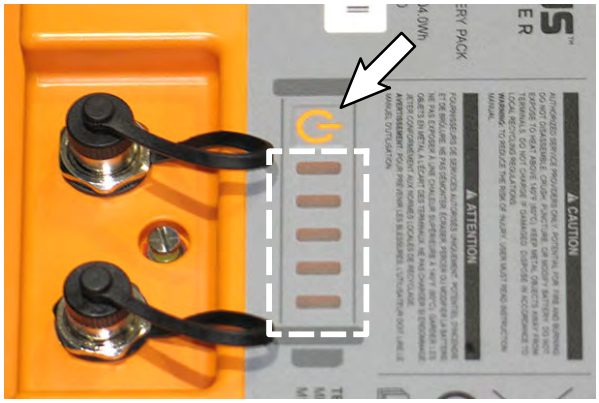

FIG. 1

If a lithium battery (1) is on (the charge indicator bars are illuminated), press and hold the power button for 20 seconds to turn the battery off. Quickly press and release the power button again to ensure the battery is off.

Use voltmeter to measure the battery terminal voltage to ensure the batteries are turned off (there must be no voltage present on the terminals).

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2. Completely empty the recovery tank.

3. Turn the key switch ON, completely lower the scrub head to the floor, turn the key switch OFF, and remove the key.

FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine, and remove key.

4. Disconnect the battery cable from the batteries.

WARNING: Always disconnect battery cables from machine before working on electrical components.

5. Tilt the recovery tank back. Ensure the recovery tank is empty before tilting. (Fig. 2)

FIG. 2

6. Disconnect the main wire harness from the operator seat switch harness. (Fig. 3)

FIG. 3

7. Remove the operator seat/seat plate from the machine. Set seat/seat plate aside. (Fig. 4)

FIG. 4

8. Remove the battery box cover from the machine. Set the battery box cover aside. (Fig. 5)

FIG. 5

9. Remove the controller cover plate from the machine. Set the controller cover and hardware aside. (Fig. 6)

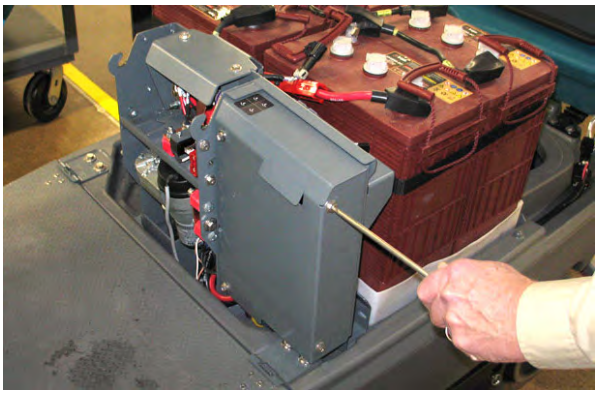


FIG. 6

10. Remove the Kinetek controller from the machine. Set the hardware aside.

11. Photograph/note/mark harness connection locations to the Kinetek controller onto the wire harness. The harness must be connected to the same locations on the new Kinetek controller (23).

12. Disconnect all wire harness connections from the Kinetek controller. Discard the removed Kinetek controller.

13. Remove the existing batteries and the plastic battery tray (if equipped) from the machine.

FOR SAFETY: Before leaving or servicing machine, Use a hoist and adequate assistance when lifting batteries, Keep all metal objects off batteries, Use a non-conductive battery removal device.

14. Remove the contactor cover from the actuator support. Set the contactor cover and hardware aside. (Fig. 7)

FIG. 7

INSTALLATION:

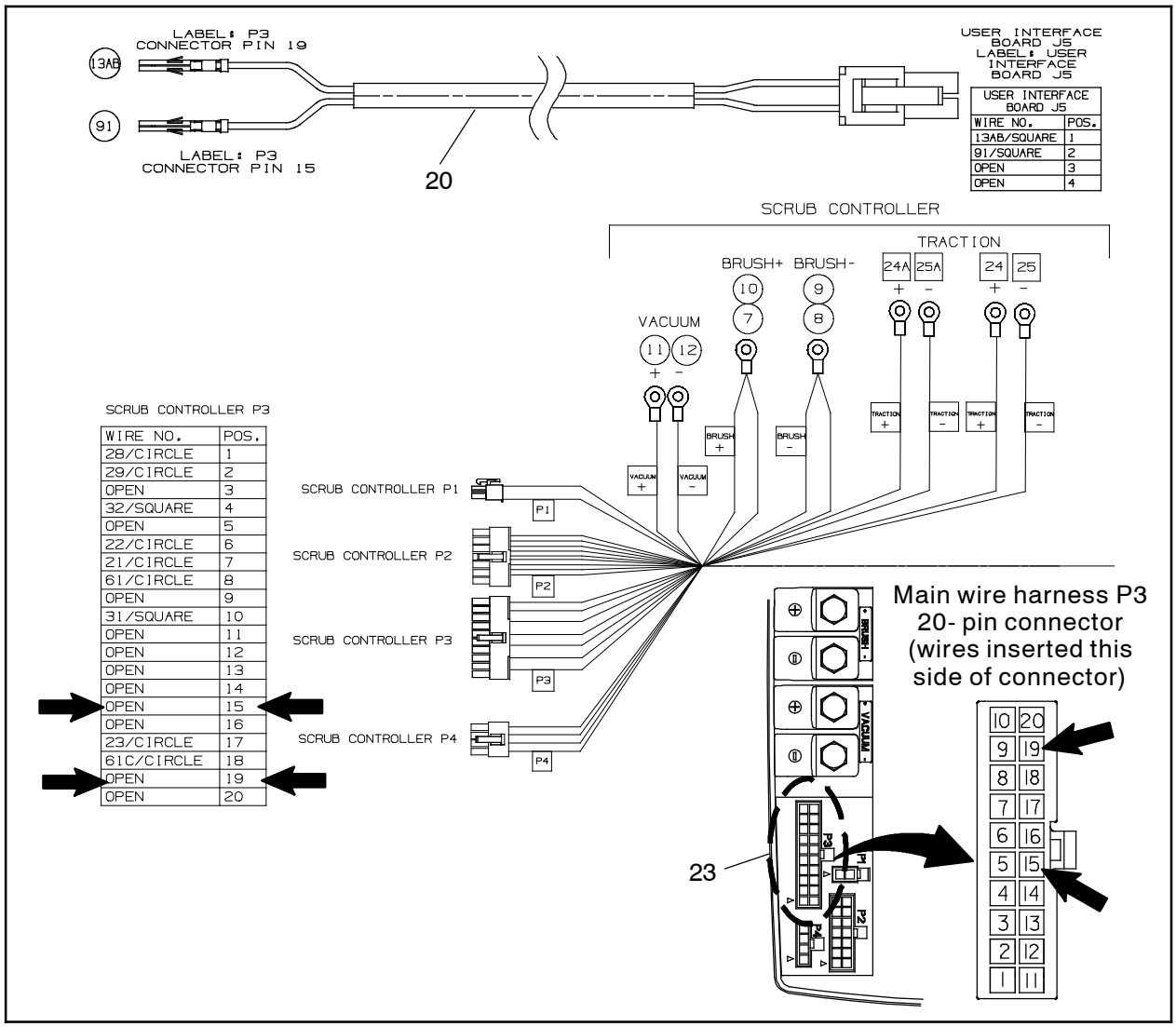


FIG. 8

1. Observe the new Kinetek (23) controller for label “For use on T7AMR with Li BATTERIES ONLY”. The new Kinetek controller must have this label. (Fig. 9)

FIG. 9

2. Connect the leg electric harness (20) to the main wire harness P3 20- pin connector terminals 15 and 19. (Fig. 8/Fig. 10)

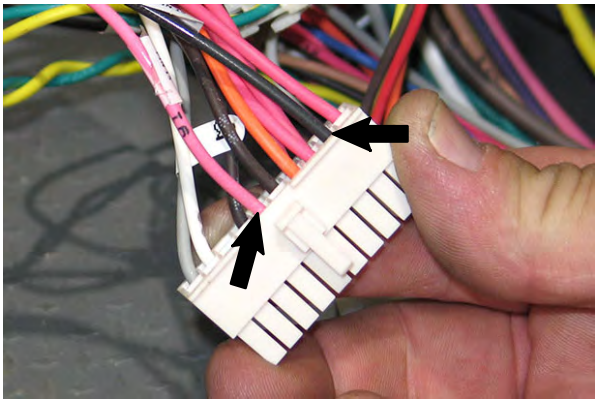


FIG. 10

3. Connect all wire harness connections to the new Kinetek controller (23). Refer to previously photographed/noted harness connection locations from the removed Kinetek controller for the wire harness locations. The harness must be connected to the same locations on the new Kinetek controller (23). (Fig. 11)

FIG. 11

4. Route the leg electric harness (20) into the battery compartment. Situate the leg electric harness so it is not later crimped/damaged when the shroud is later installed onto the machine. (Fig. 12)

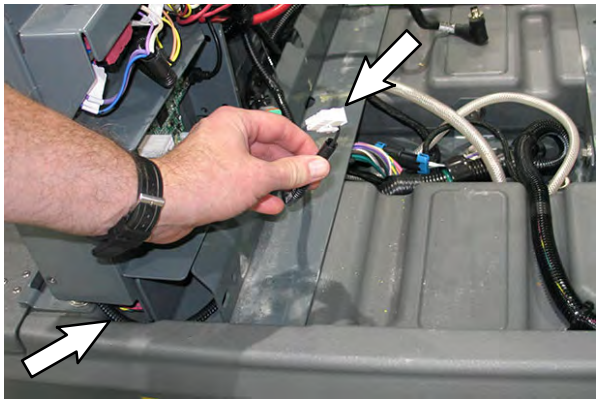


FIG. 12

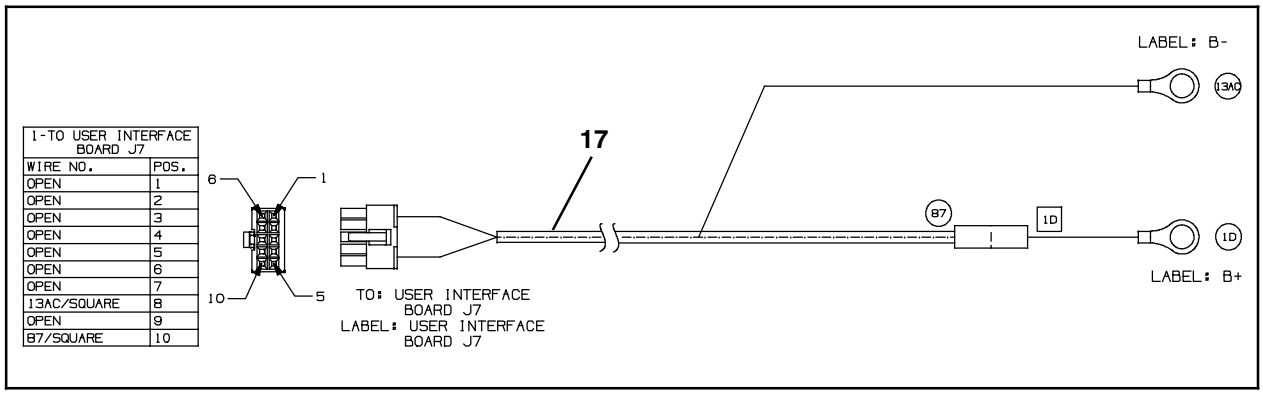


FIG. 13

5. Route the UI power electric harness (17) B- lead through the grommet in the actuator support weldment and to the main contactor B- location. (Fig. 14)

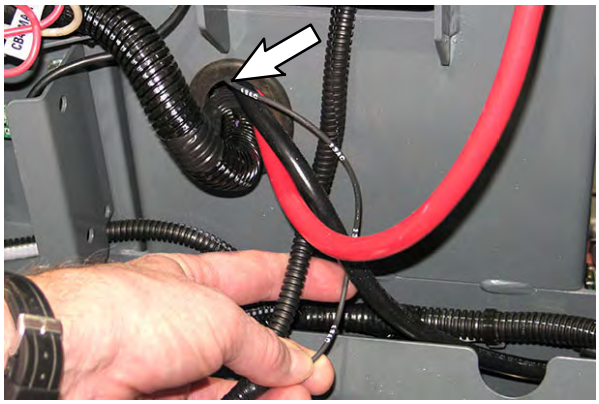


FIG. 14

6. Connect the UI power electric harness (17) lead with the fuse to the main contactor B+ terminal. (Fig. 13/Fig. 15)

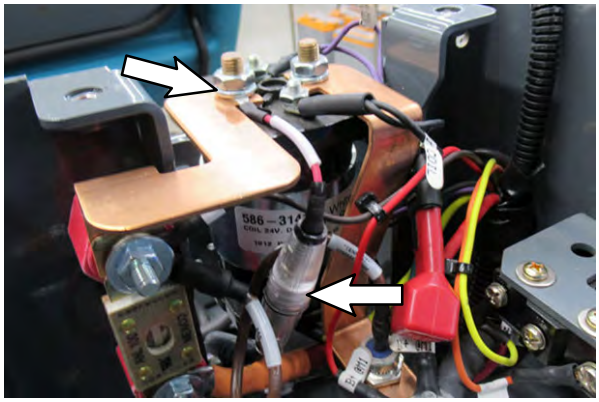


FIG. 15

7. Connect the UI power electric harness (17) B- lead to the main contactor B- standoff. (Fig. 13/Fig. 16)

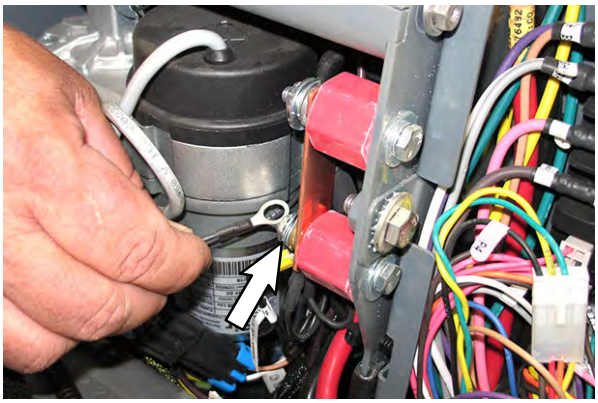


FIG. 16

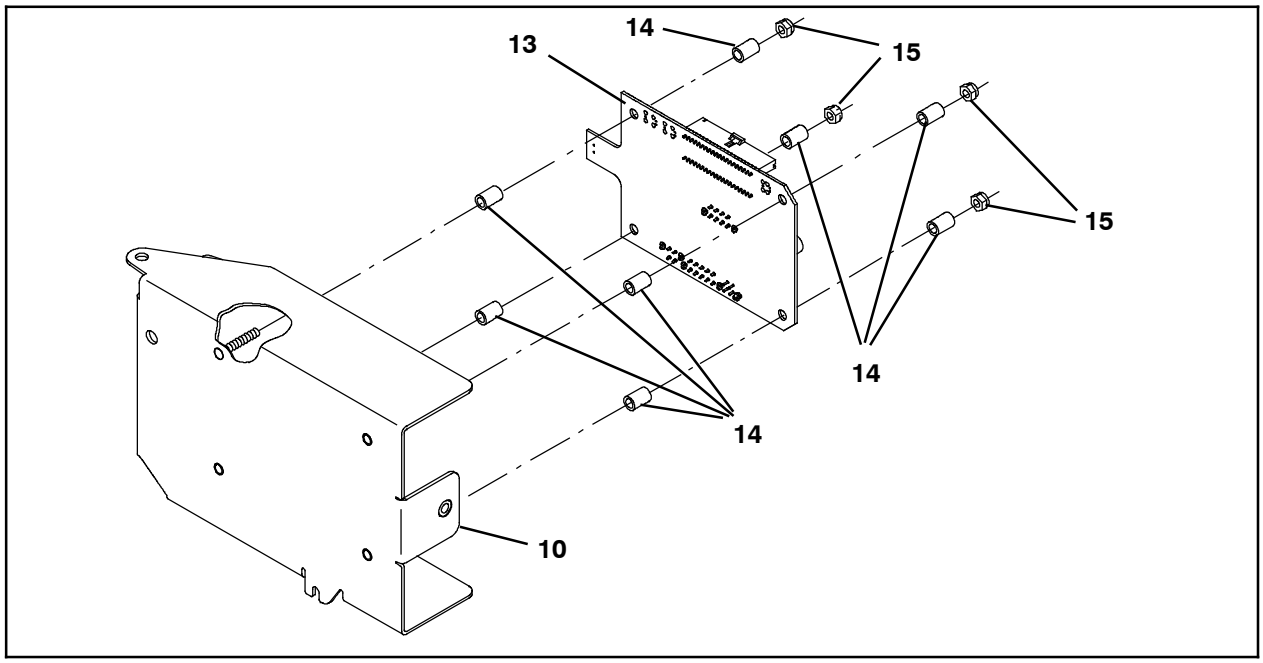


FIG. 17

8. Install four nylon spacers (14) onto the M5 studs on the board mounting plate (10). (Fig. 17/Fig. 18)

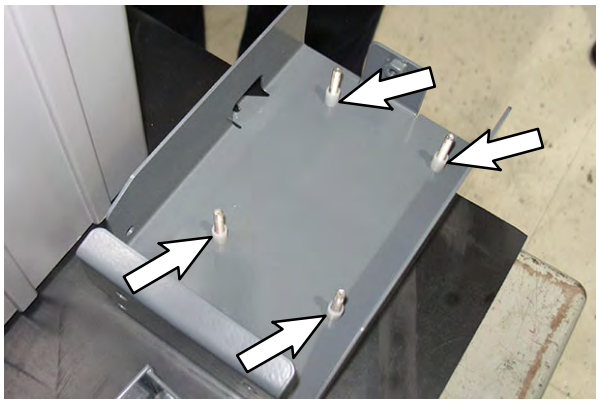


FIG. 18

9. Install the communication board (13) onto the board mounting plate (10). (Fig. 17/Fig. 19)

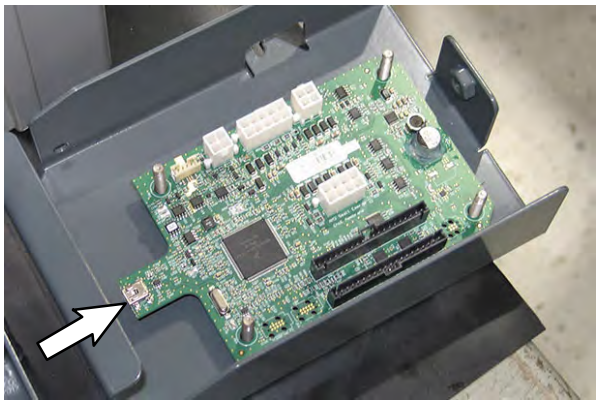


FIG. 19

10. Use four M5 hex nuts (15) and four nylon spacers (14) to secure the communication board (13) onto the board mounting plate (10). Do Not over tighten the M5 hex nuts. Communication board could be damaged if the M5 hex nuts are over tightened. (Fig. 17/ Fig. 20)

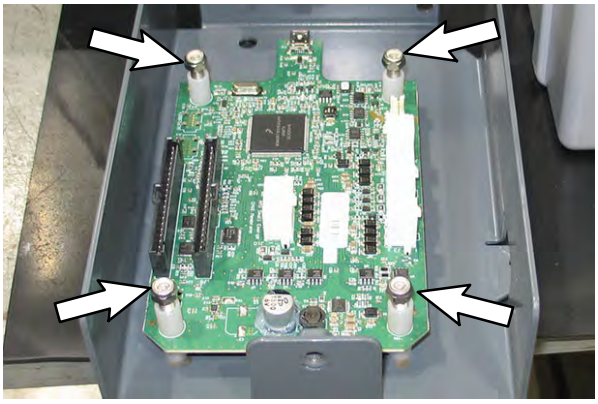


FIG. 20

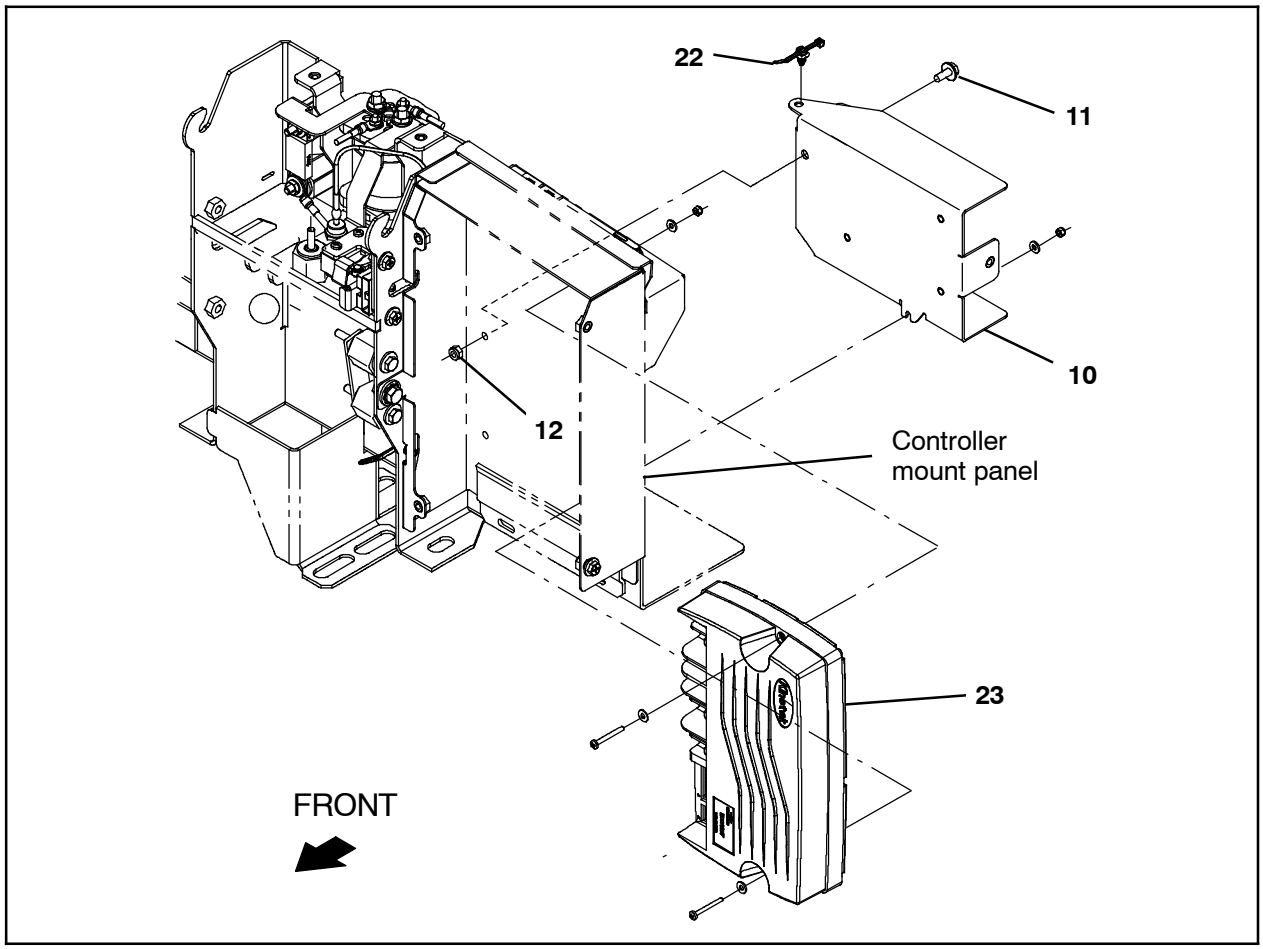


FIG. 21

11. Use one SEMS M6 hex screw (11) and a M6 hex nut (12) to install the communication board (13)/board mounting plate (10) onto the controller mount panel. (Fig. 21)

12. Install the Kinetek controller (23) onto the controller mount panel. (Fig. 21)

13. Connect the leg electric harness (20) 4- pin connector to the communication board (13) J5 terminal. (Fig. 22)

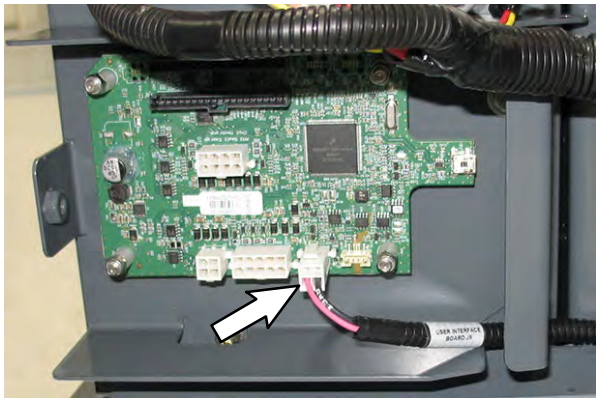


FIG. 22

14. Connect the UI power electric harness (17) 10- pin connector to the communication board (13) J7 terminal. (Fig. 23)

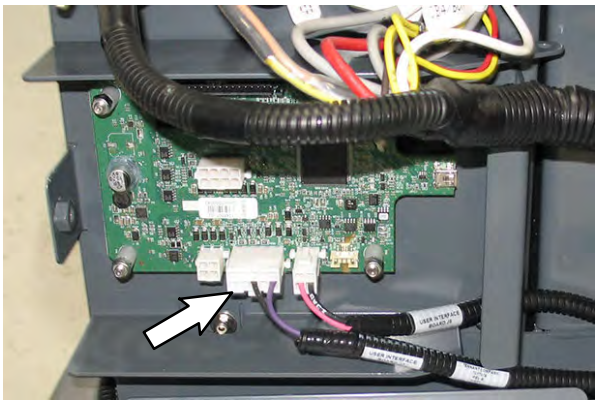


FIG. 23

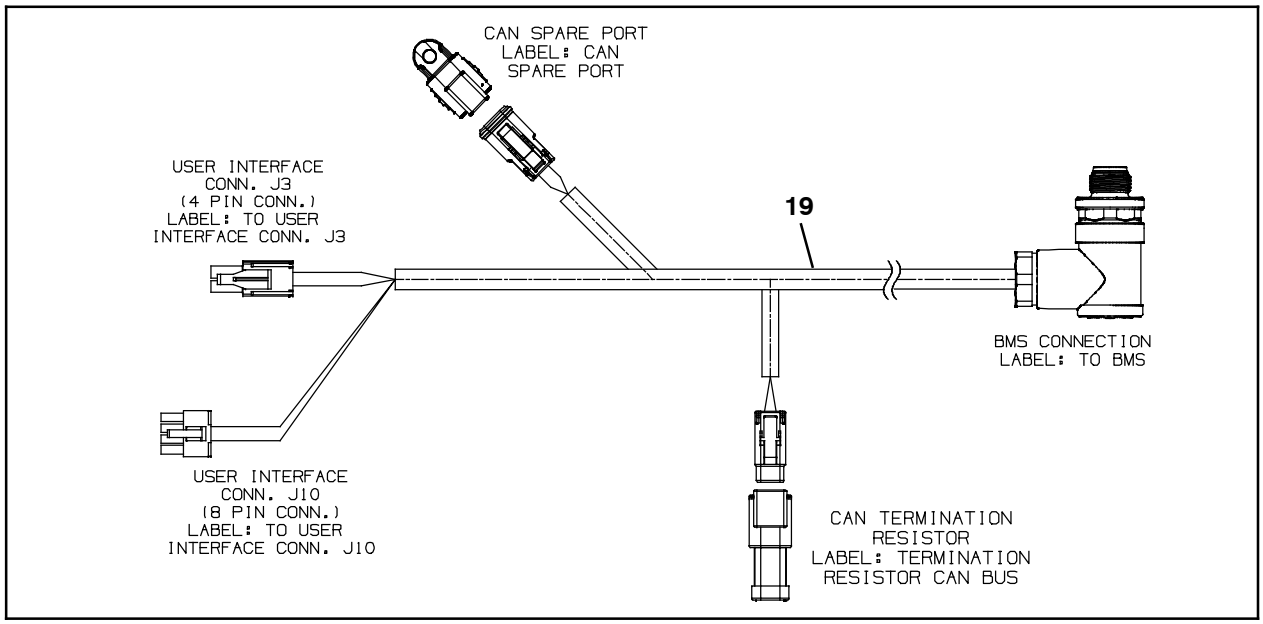


FIG. 24

15. Connect the signals UI to BMS electrical harness (19) to the communication board (13) J3 and J10 terminals. (Fig. 24/Fig. 25)

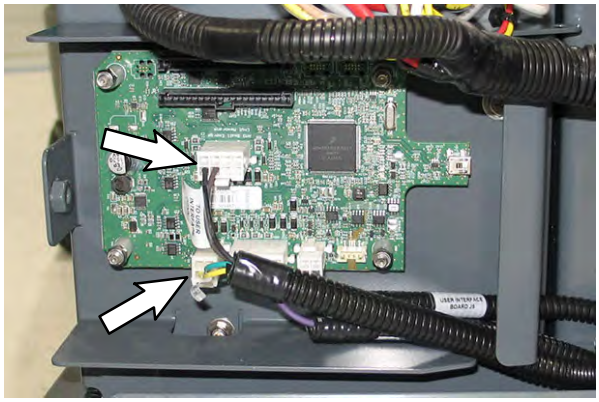


FIG. 25

16. Connect the digital pot 5V enable electrical harness (16) to the communication board (13) J4 terminal. (Fig. 26)

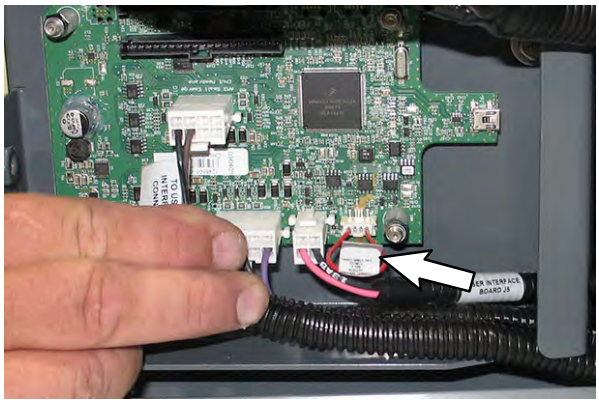


FIG. 26

17. Use a cable tie (22) to secure the UI to BMS electrical harness (19) to the board mounting bracket (10). (Fig. 27/Fig. 21)

FIG. 27

18. Connect the USB harness (18) to the communication board (13) USB terminal. (Fig. 28)

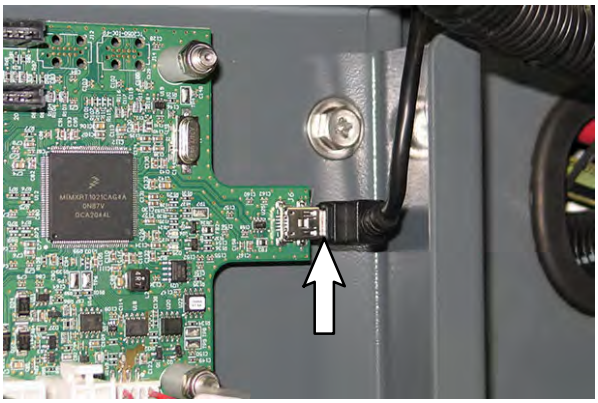


FIG. 28

19. Use one SEMS M6 hex screw (11) to install the board cover (21) onto the board mounting plate (10). (Fig. 29)

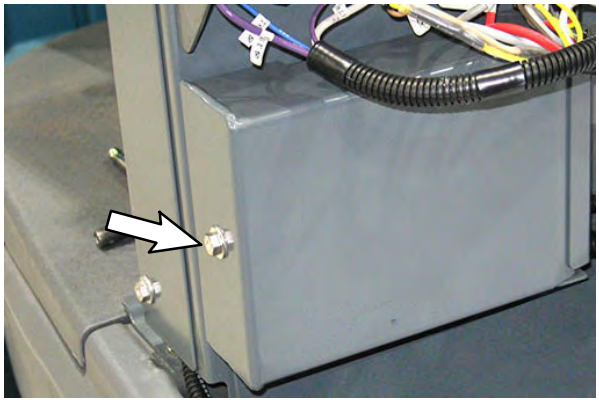


FIG. 29

20. Use a cable tie to secure the USB harness (18) to the actuator support weldment. To help prevent moisture from getting into the connector, be sure the USB cable connector is pointed down. (Fig. 30)

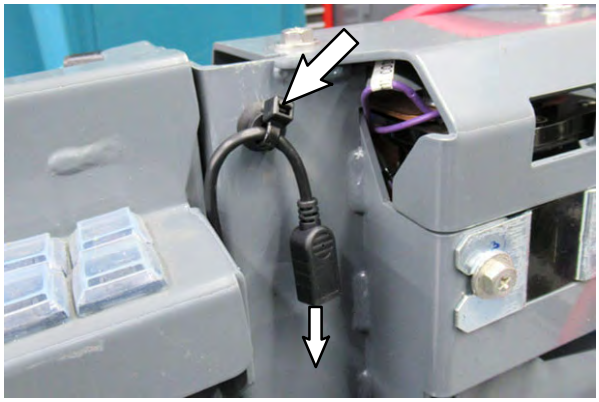


FIG. 30

21. Replace the existing diode on the main wire harness diode plug with electrical diode (25). (Fig. 31)

FIG. 31

22. Ensure none of the lithium batteries (1) is on. Refer to Step 1 at beginning of procedure for instructions how to check/turn off lithium batteries.

23. Install two lithium batteries (1) and one foam spacer (2) into the battery compartment. (Fig. 32/Fig. 33)

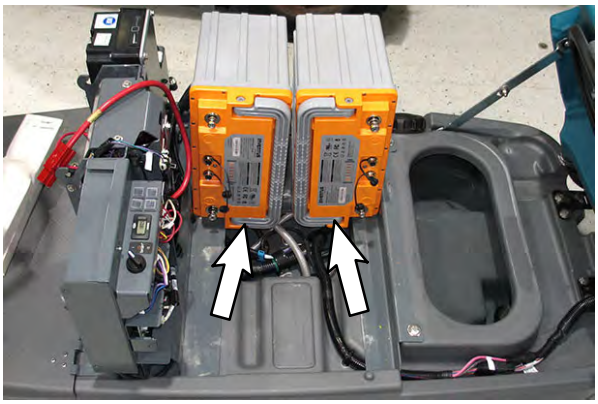


FIG. 32

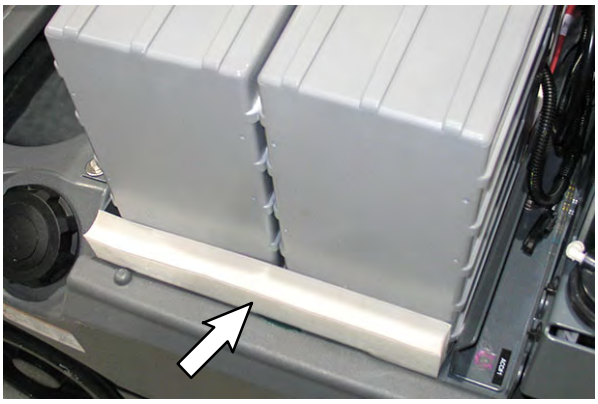


FIG. 33

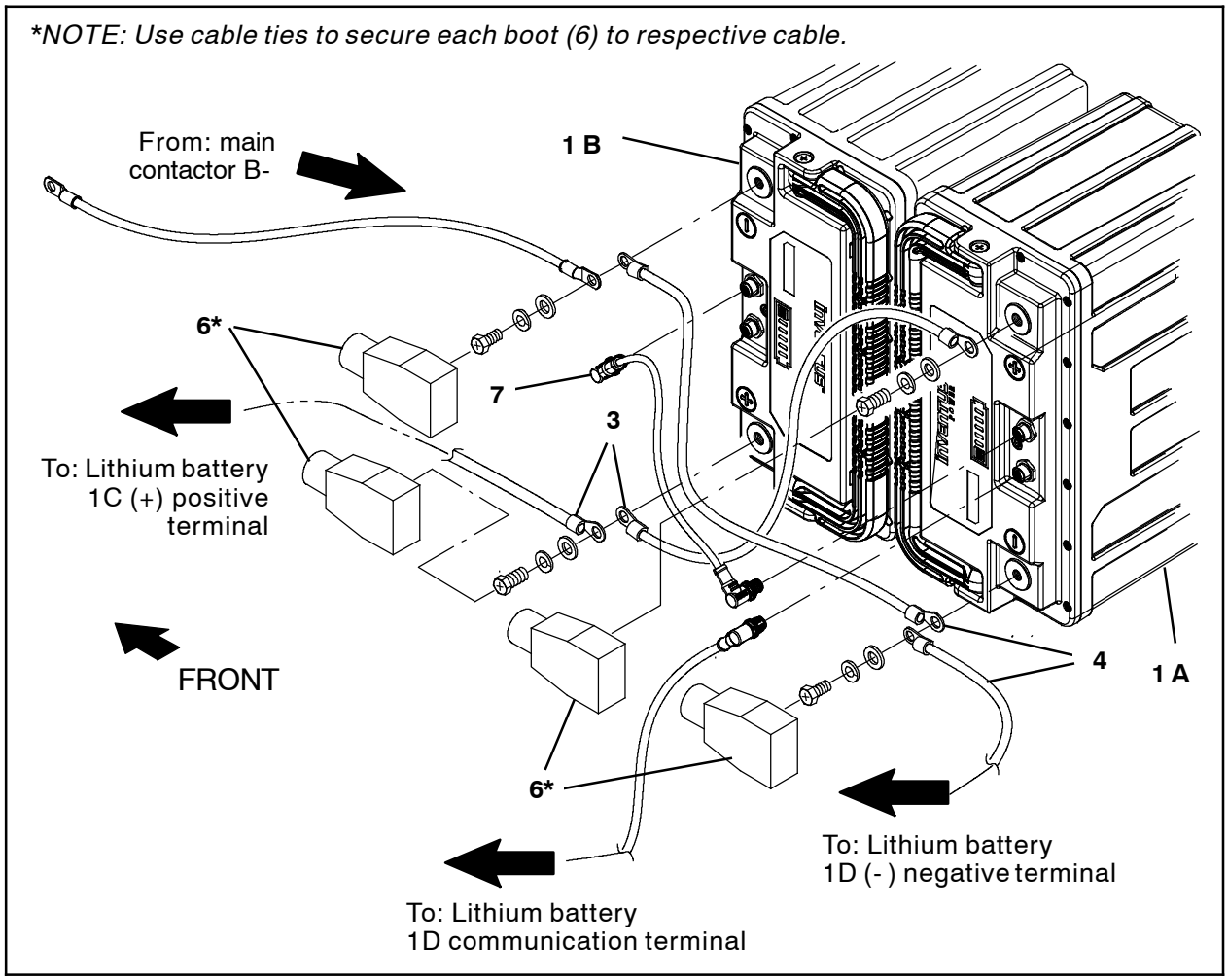


FIG. 34

NOTE: *To achieve correct torques it may be necessary to slightly bend (approximately 20° (degrees)) the cable ends of cables to be connected to the lithium batteries (1). (Fig. 35)*

FIG. 35

24. Slide a boot (6) onto one 18 in. red cable (3) and connect the red cable to lithium battery 1A positive (+) terminal. Torque hex screw to 22 Nm (16 ft. lbs.). (Fig. 34)

25. Slide a boot (6) onto another 18 in. red cable (3) and connect the red cable and the 18 in. red cable (3) installed in the previous step to lithium battery 1B positive (+) terminal. Torque hex screw to 22 Nm (16 ft. lbs.). (Fig. 34)

26. Slide a boot (6) onto one 18 in. black cable (4) and connect the black cable and another 18 in. black cable (4) to lithium battery 1A negative (-) terminal. Torque hex screw to 17 Nm (12.5 ft. lbs.). (Fig. 34)

27. Slide a boot (6) onto the black main contactor B- cable and connect the black cable from main contactor B- and the 18 in. black cable (4) installed in the previous step to lithium battery 1B negative (-) terminal. Torque hex screw to 17 Nm (12.5 ft. lbs.). (Fig. 34)

28. Use cable ties to secure each boot (6) to the respective cable. (Fig. 34)

29. Use an additional cable tie to further secure each boot (6) onto the other cable attached to the lithium battery 1B positive (+) terminal and negative (-) terminal. (Fig. 36/Fig. 37)

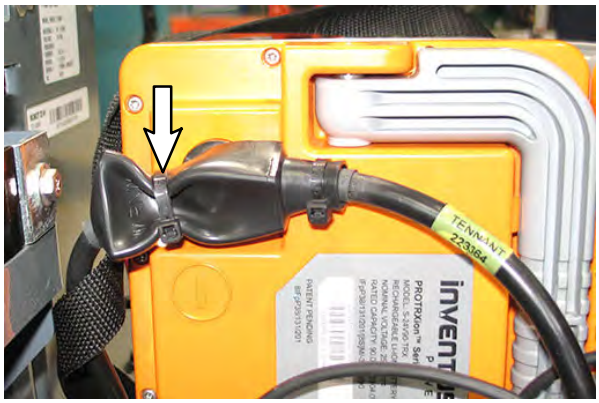


FIG. 36

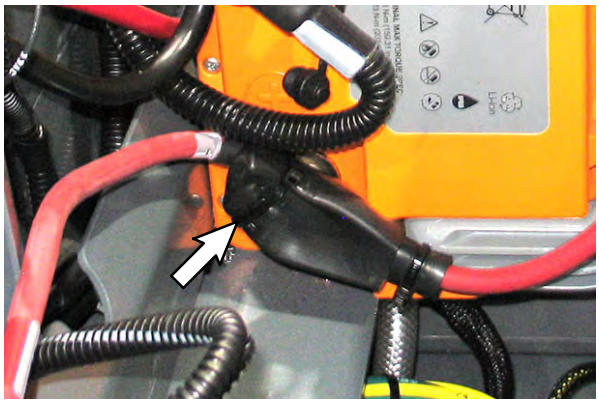


FIG. 37

30. Connect the UI to BMS electrical harness (19) to lithium battery 1B communication terminal. (Fig. 38)

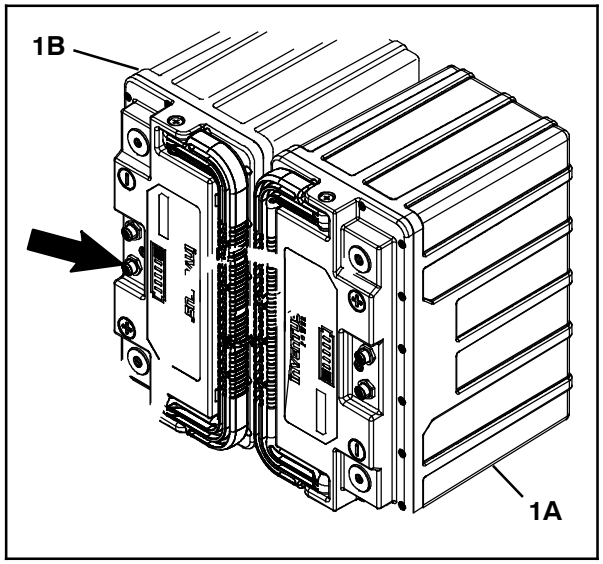


FIG. 38

31. Connect a battery communication cable (7) to the lithium battery 1A and 1B communication ports. (Fig. 34)

32. Connect another communication cable (7) to the remaining open communication port on lithium battery 1A. (Fig. 34)

33. Install the two additional foam spacers (2) into the battery compartment. (Fig. 39)

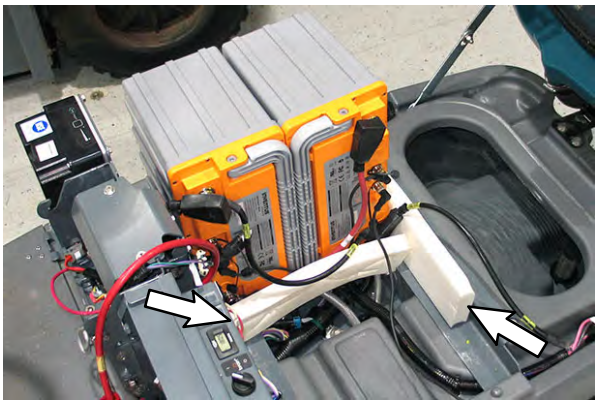


FIG. 39

34. Install the two remaining lithium batteries (1) into the battery compartment. (Fig. 40)

FIG. 40

35. Slide a boot (6) onto one 18 in. red cable (3) and connect the red cable and the 18 in. red cable (3) installed on lithium battery 1B positive (+) terminal to lithium battery 1C positive (+) terminal. Torque hex screw to 22 Nm (16 ft. lbs.). (Fig. 41)

36. Slide a boot (6) onto the other end of the 18 in. red cable (3) connected to lithium battery 1C positive (+) terminal and connect the 18 in. red cable and the 10 in. red cable (5) to lithium battery 1D positive (+) terminal. Torque hex screw to 22 Nm (16 ft. lbs.). (Fig. 41)

37. Slide a boot (6) onto one end of the 18 in. black cable (3) and connect the 18 in. black cable (3) to lithium battery 1C negative (-) terminal. Torque hex screw to 17 Nm (12.5 ft. lbs.). (Fig. 41)

38. Slide another boot (6) onto the other end of the 18 in. black cable (3) connected to lithium battery 1C positive (-) terminal and connect the 18 in. black cable and the 18 in. black cable connected to lithium battery 1A (-) negative terminal to the lithium battery 1D negative (-) terminal. Torque hex screw to 17 Nm (12.5 ft. lbs.). (Fig. 41)

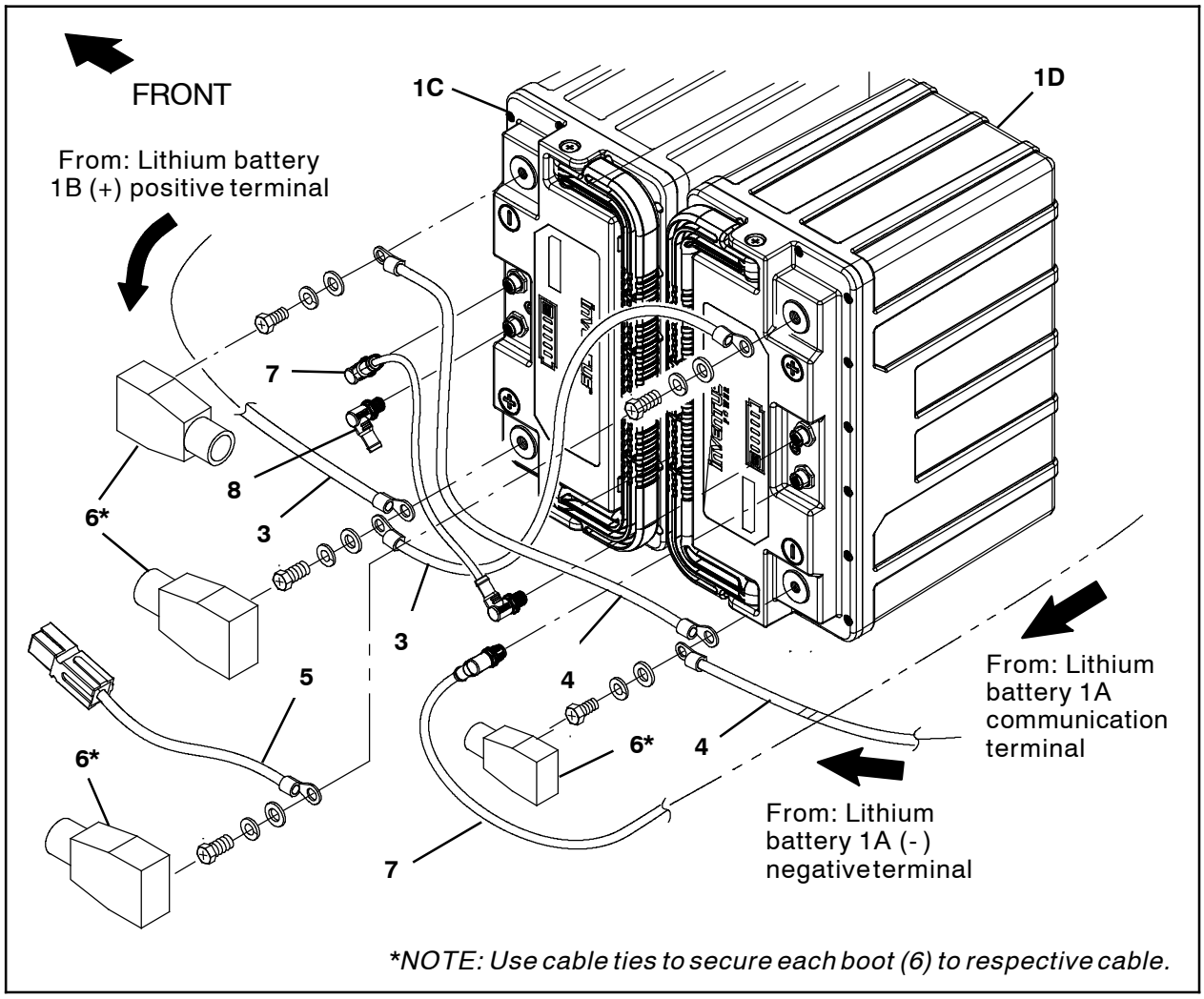


FIG. 41

39. Use cable ties to secure each boot (6) to the respective cable. (Fig. 41)

40. Use an additional cable tie to further secure each boot (6) onto the other cable attached to the lithium battery 1C positive (+) terminal and the lithium battery 1D positive (+) terminal and negative (-) terminal. (Fig. 42/Fig. 43/Fig. 44)

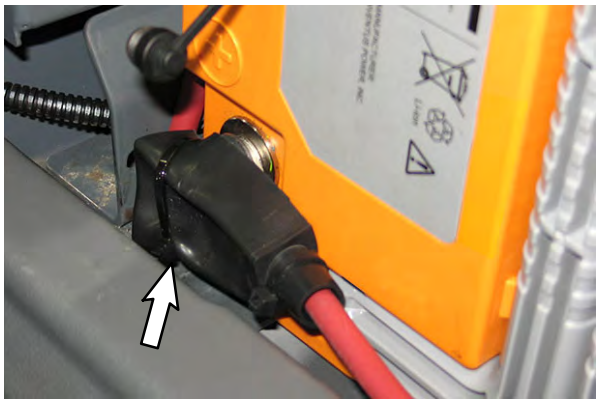


FIG. 42

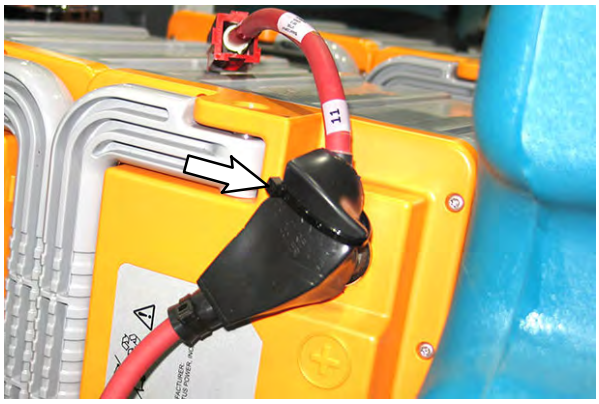


FIG. 43

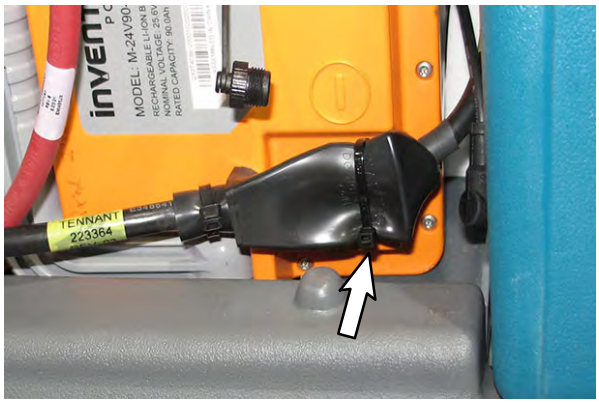


FIG. 44

41. Connect one battery communication cable (7) to communication ports on both lithium battery 1C and 1D. (Fig. 41)

42. Connect the battery communication cable (7) connected to the communication port on lithium battery 1A to the open communication port on lithium battery 1D. (Fig. 41)

43. Connect the resister plug (8) into the remaining open communication port on lithium battery 1C. (Fig. 45/Fig. 41)

FIG. 45

44. Insert a foam spacer (2) in front of the lithium batteries (1). (Fig. 46)

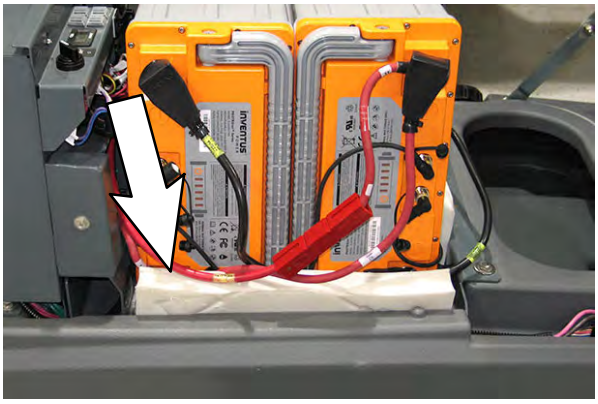


FIG. 46

45. Press and hold the battery power button for 5 seconds to turn each of the lithium batteries (1) on. The battery charge indicator bars are illuminated when battery is on. (Fig. 47)

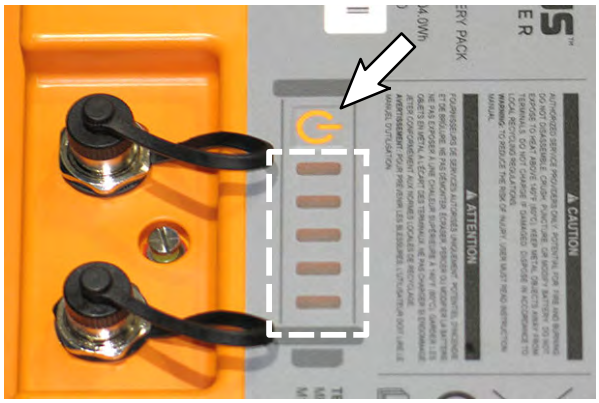


FIG. 47

46. Loop the strap (9) around the four lithium batteries (1). Ensure the strap is not covering any communication cable/battery cable connections. Cables/connections could be damaged if strap is tightened on top of them. (Fig. 48)

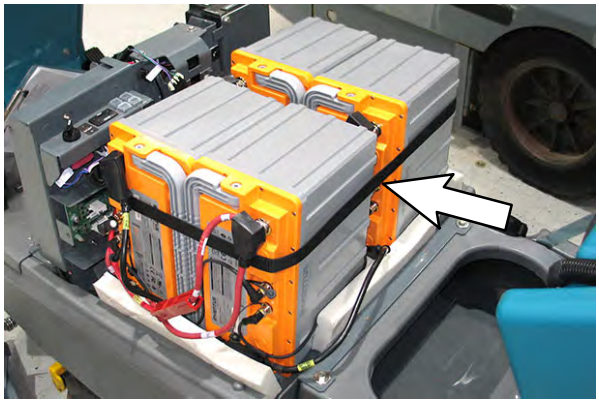


FIG. 48

47. Tighten the strap (9) around the lithium batteries (1). (Fig. 48)

48. Neatly bundle excess strap (9) length and use two cable ties to secure the bundled portion of the strap. (Fig. 49)

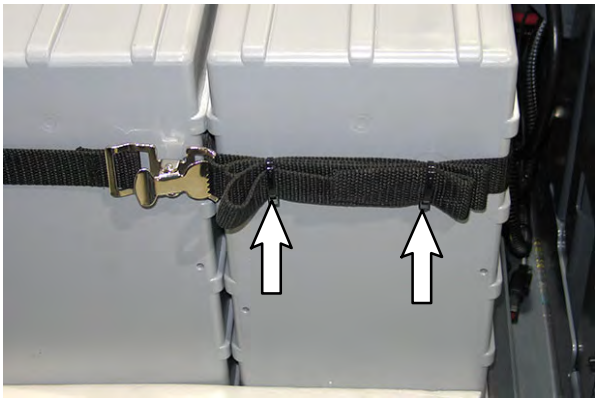


FIG. 49

49. Reinstall the contactor cover and all other items removed from the machine to install the Lithium- Ion battery kit. (Fig. 50)

FIG. 50

50. Connect a USB cable to the service device and the USB harness (18). (Fig. 51)

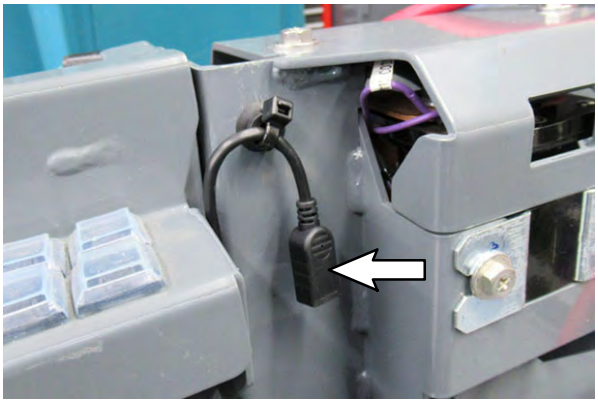


FIG. 51

51. Turn the key switch ON.

52. Double click the Service Diagnostics desktop shortcut, or find the software in All Programs, to launch the software.

53. Allow the Service Diagnostics tool to connect to the control module network. (Fig. 52)

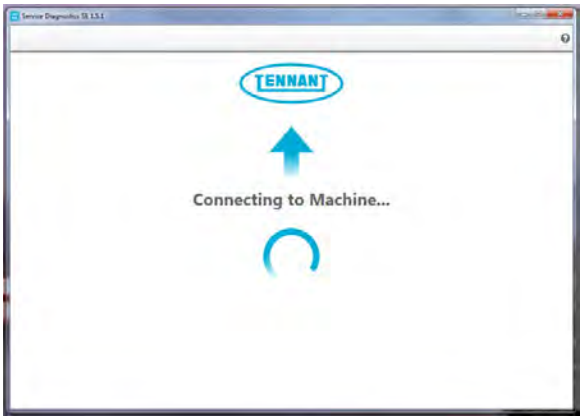


FIG. 52

54. The Service Diagnostics tool automatically detects a new board was installed. A Service Diagnostic window with text “A new board has been installed in this machine and must be properly configured. This wizard will guide you through the process.” appears on the screen. (Fig. 53)

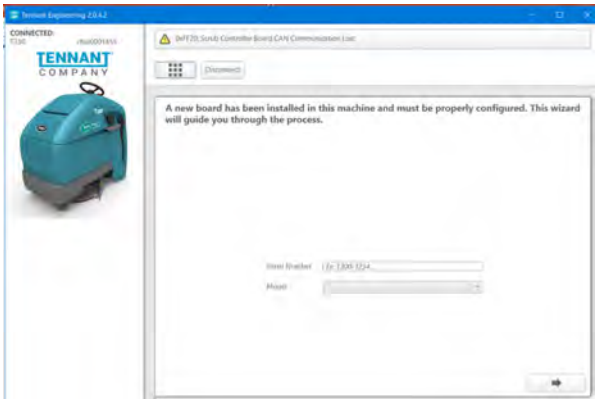


FIG. 53

Enter the serial number, select the model from the pull down menu, and click the arrow button to proceed with reconfiguring the machine for the lithium batteries. (Fig. 54)

FIG. 54

55. The firmware update screen appears and will begin programming the machine for the lithium batteries. The process status indicator and firmware update status box appear on the left side of the screen. (Fig. 55)

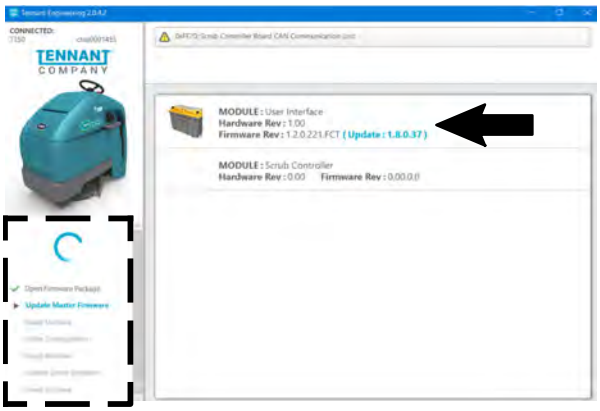


FIG. 55

Allow the lithium battery firmware update to proceed. A process status indicator with a percent status of the update also appears next to the selected lithium battery firmware update. Firmware update process typically takes 2 or 3 minutes. (Fig. 56)

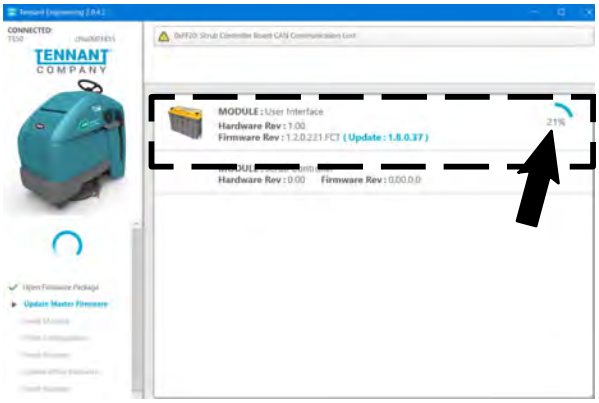


FIG. 56

56. A check appears where the process status indicator with the percent status was previously located when the lithium battery firmware update is complete. (Fig. 57)

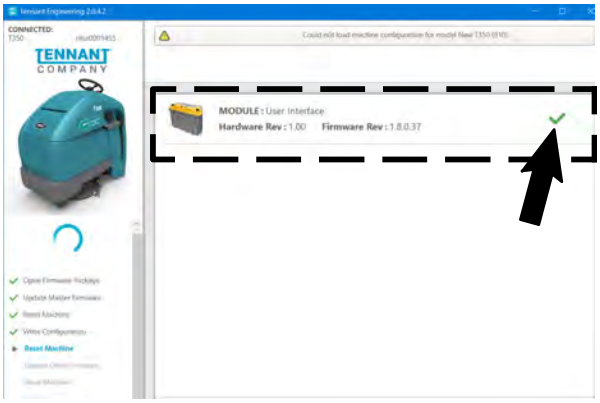


FIG. 57

57. A text box with “Press OK, then Key cycle machine.” appears. Select the OK button and then key cycle the machine to complete the lithium battery firmware update. (Fig. 58)

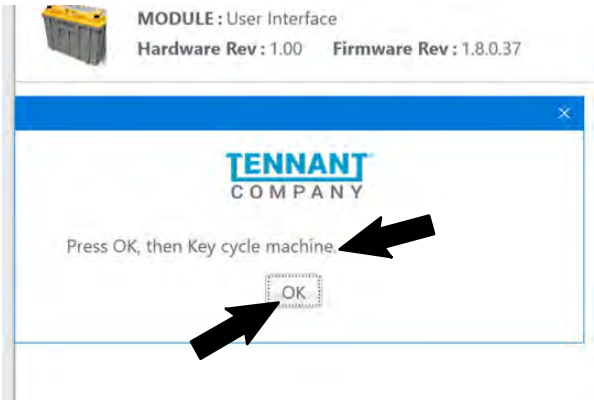


FIG. 58

NOTE: Firmware update status box on left side of the screen will be at “Reset Machine” when text box to key cycle machine appears. All previous listed items are checked/completed. (Fig. 58/ Fig. 59)

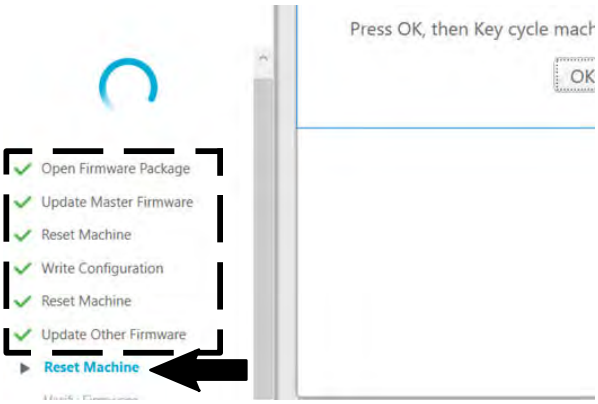


FIG. 59

58. A screen with “Machine Setup Complete” appears when the lithium battery firmware update is complete. (Fig. 60)

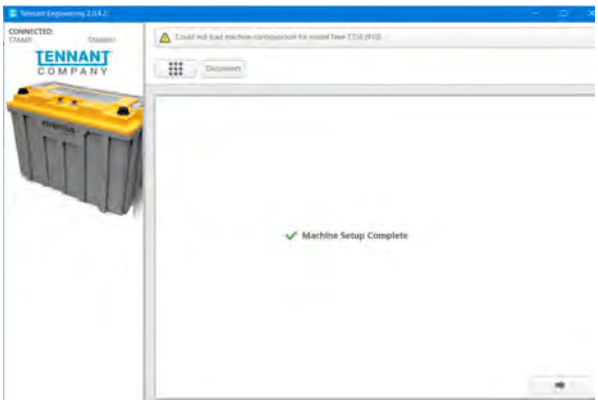


FIG. 60

59. Use the Service Diagnostics tool to access the lithium battery screen. (Fig. 61)

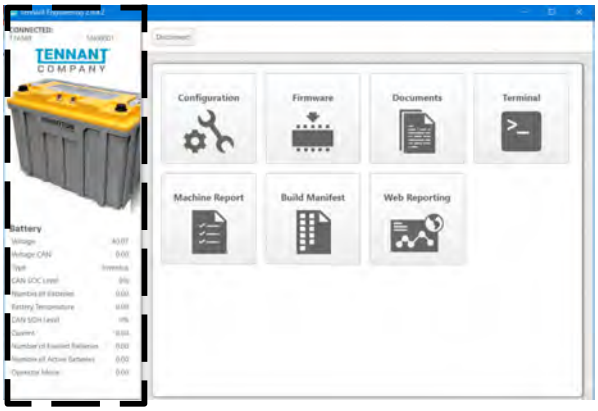


FIG. 61

60. Observe the lithium battery information pane on the left side of the screen. Both the “Number of Batteries” and “Number of Active Batteries” should be four (4), and the “Number of Faulted Batteries” should zero (0.00) . (Fig. 62/Fig. 61)

FIG. 62

61. Disconnect the USB cable from the service device and the USB harness (18).

VIEW CURRENT CHARGER PROFILE/ CHANGE CHARGER PROFILE:

Follow these steps to identify the current charger profile.

NOTE: ***Do Not*** *connect the battery charger to the batteries before completing this checking/ changing the battery charger profile procedure.*

62. Plug the new battery charger (26) into the proper power outlet to power up the charger.

NOTE: Charger power cable included in kit may not be suitable for use in some locations. If necessary, retain charger cable from previous charger or locally obtain suitable power cable.

63. Press and release the Charger Profile Selection Button. (Fig. 63)

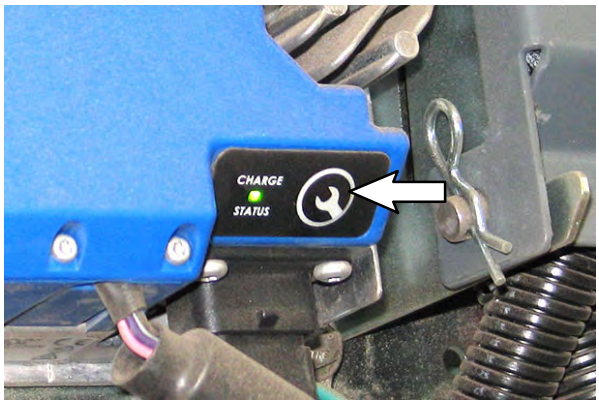


FIG. 63

64. View the flashing battery charging status indicator light sequence to identify the profile in use. (Fig. 64)

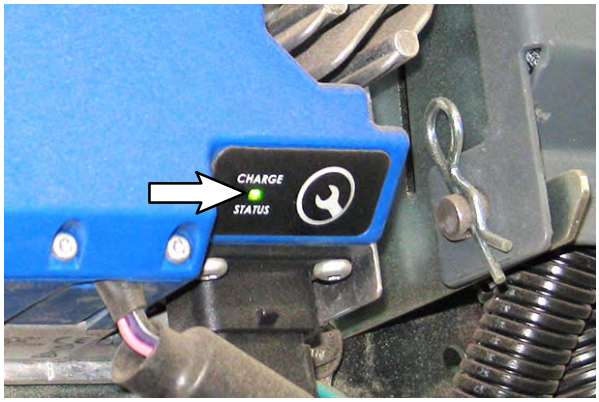


FIG. 64

The charger profile is displayed as a series of quick red and slower green flashing lights. This sequence is repeated twice. The number of flashing green lights is the profile number active on the charger.

Charger Profile 7:

☼☼ ☼☼☼☼☼☼☼☼	Repeated Twice
R R G G G G G G G	Repeated Twice

A profile with a number ten or greater is displayed similar, but with a pause between the green flashes for the first digit and then the second.

Charger Profile 33:

☼☼ ☼☼☼☼II☼☼☼☼	Repeated Twice
R R G G G II G G G	Repeated Twice

Follow these steps to change the charger profile to the lithium- ion profile.

65. Plug the charger into the proper power outlet to power up the charger if charger is not already plugged into a power outlet.

66. Press and hold the Charger Profile Selection Button (Fig. 65) for five seconds to enter the profile selection mode. A sequence of fast red and slower amber lights (Fig. 66) will flash identifying the charger is in the profile selection mode.

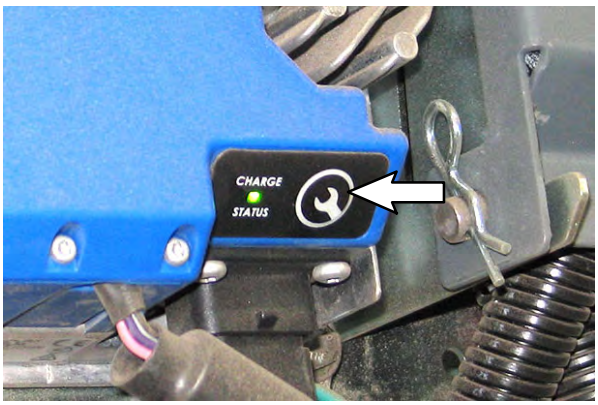


FIG. 65

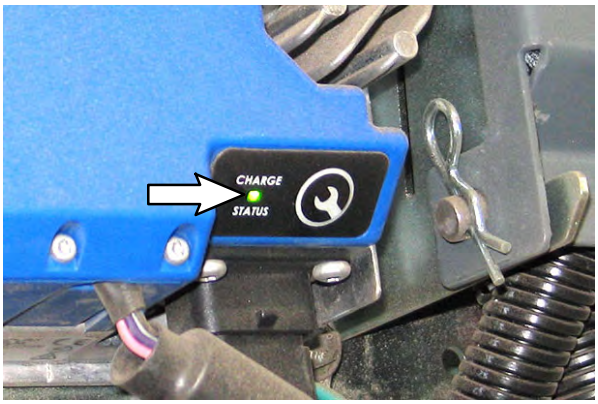


FIG. 66

67. Release the Charger Profile Selection Button after battery charger has entered the profile selection mode. (Fig. 67)

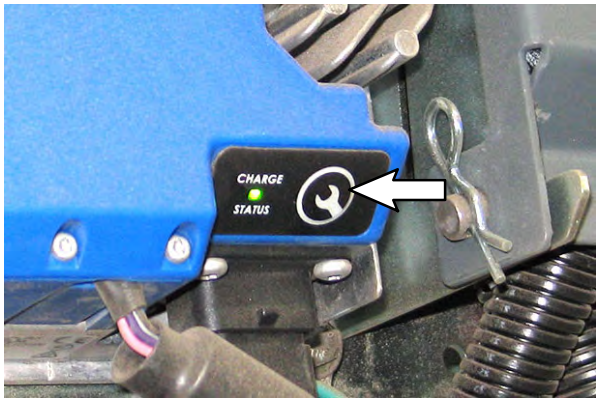


FIG. 67

68. The flashing red and amber sequence identifies the profile currently in use in the same flashing pattern as the current profile. This sequence is repeated four times in the profile selection mode rather than twice as in the current profile setting. (Fig. 68)

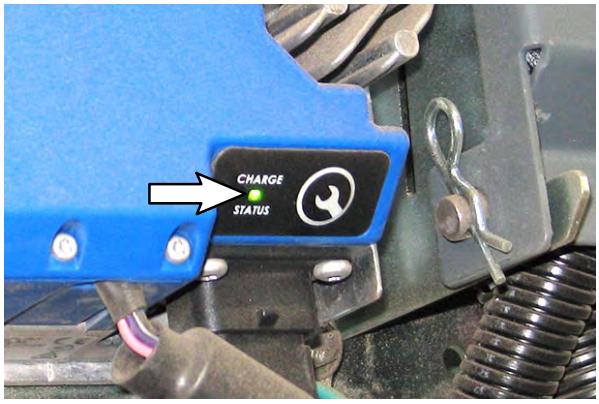


FIG. 68

69. Press the Charger Profile Selection Button (Fig. 67) while in the profile selection mode (4 flashing sequence), to display the next available profile. The flashing pattern for the next available profile will begin a new sequence flashed four times (Fig. 68).

70. Press the Charger Profile Selection Button (Fig. 67) to locate the 029 LITHIUM, INVENTUS POWER profile and start the four flashing sequence of that profile. (Fig. 68)

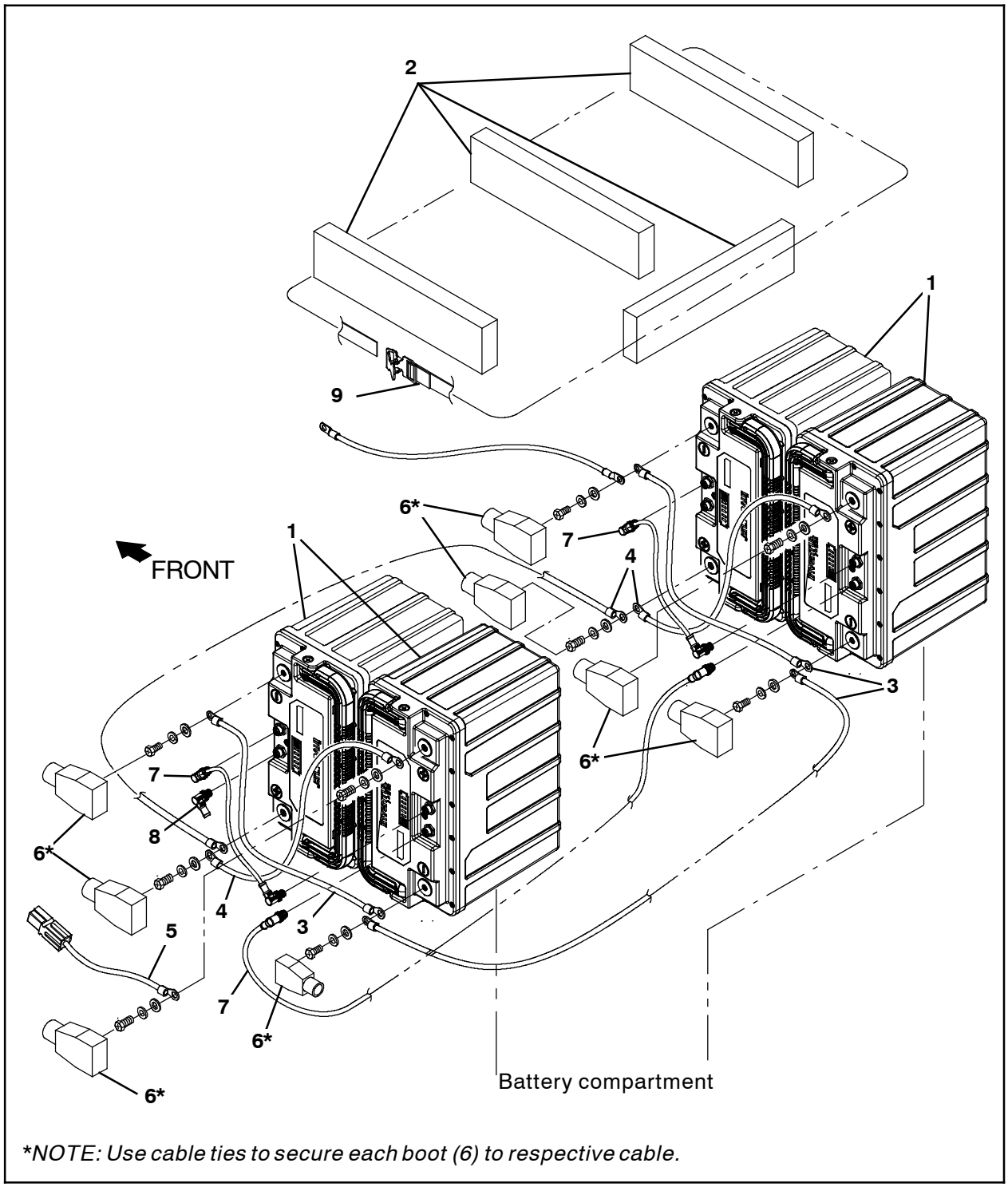
☼☼ ☼☼II☼☼☼☼☼☼☼☼☼☼	Repeated 4 Times
R R A A II A A A A A A A A A	Repeated 4 Times

71. Press and hold the Charger Profile Selection Button (Fig. 67) for seven seconds to select the desired profile. The LED changes red and after the seven seconds the new profile sequence is displayed in green (repeated twice) (Fig. 68).

NOTE: *If the Charger Profile Selection Button is released before the 7 seconds, the Charge Status LED reverts to the last profile displayed in red.*

72. Press the Charger Profile Selection Button to confirm the desired profile has been selected. (Fig. 68)

73. Connect the battery charger (26) to the lithium- ion battery charging cable to begin charging the batteries. Refer to Operators Manual for battery charging instructions.



**NOTE: Use cable ties to secure each boot (6) to respective cable.*

FIG. 69

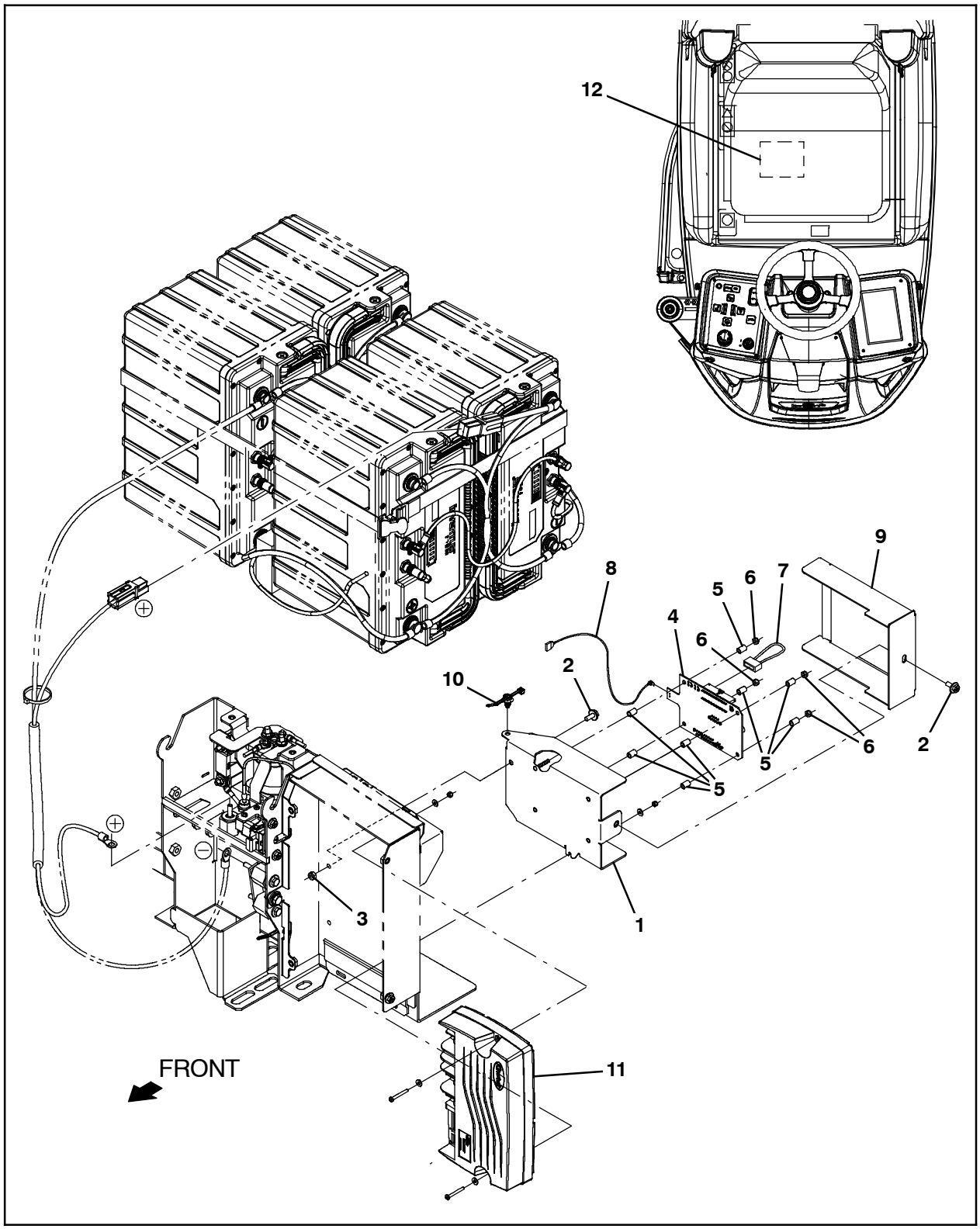


FIG. 70

Bill Of Materials For Conv Kit, Battery, Li-Ion, Cl [T7AMR] - 9052000

Ref.	Tennant Part No.	Description	Qty.
1	1253354	Battery, Lithium, 24VDC, 90AH	4
2	630375	Spacer, Battery, Foam, 1.25 X 3.3 X 13.7	4
3	1077083	Cable, 04GA 18.0L Red .41Ring /.41Ring	3
4	223364	Cable, 04GA 18.0L Blk .34Ring /.34Ring	3
5	1077082	Cable, 04GA 10.0L Red .41Ring /[PP120]	1
6	68872	Boot, Terminal, Battery, 02-01GA, Blk	8
7	1077084	Cable Assy, 8 Pos, Male To Male, 19.7L	3
8	1077081	Resistor, Ele, Plug [120, 1/2W, 5%]	1
9	222682	Strap, Poly, Webbing 1.0 X 100.0	1
10	1256633	Plate Wldt, Mtg, Board, CHUI	1
11	1034731	Screw, Hex, M6 X 1.00 X 16, SEMS, SS	2
12	08708	Nut, Hex, Lock, M6 X 1.00, NL	1
13	1248505	Circuit Board [UI, RTOS]	1
14	1252810	Spacer, Plstc, 0.20B 0.32D 0.47L, Nyl	8
15	06549	Nut, Hex, M5 X 0.80 X 16, 8.8	4
16	1077078	Harness, Ele [Digital Pot 5V Enable]	1
17	1077079	Harness, Ele [UI Power]	1
18	1228665	Cable [USB, Mini-B, Male 90D, Female]	1
19	1077080	Harness, Ele [Signals, UI To BMS]	1
20	1077142	Harness, Ele, Leg	1
21	1256604	Bracket, Mtg, Board	1
22	1210807	Wire, Tie [W/.25” Fir Tree Clip]	1
23	1257153	Controller, Kinetek [T7AMR, Li-Ion]	1
24	1257380	Label, Hzrd, Battery, Connections [LI]	1
25	1077196	Diode, Ele, Plug [Schottky]	1
26	1257205	Charger, 24VDC 1000W 100-240VAC [Off Brd]	1

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