

## Series 5000 eAPU Installation Manual





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**CAUTION PPE Safety: Follow the safety guidelines listed below**

- Always wear safety glasses during all procedures
- Ensure the work area is clear of trips, slips or fall hazards prior to starting work
- Make sure you are wearing non-conductive shoes prior to working with electrical components
- Do not lift heavy objects by yourself; use a lift cart or 2-person procedures

## Pallet Contents

The APU system will arrive on a pallet and will include the following components:

- Condensing unit (921001)
- Condenser mounting plate assembly (921006)
- Evaporator (921002)
- Installation Kit (921015)
- Automatic Start-Stop Kit (12 options available, truck specific)
- Battery Box (optional)
  - Battery box installation kit
  - Battery box mounting kit

Please take time to inventory the contents of the pallet. Place the individual boxes near the area of the truck where they will be installed.

Contents	Truck Location
Condensing unit	Backside of cab
Condenser Mounting plate	Backside of cab
Battery box	Backside of cab
Evaporator	Interior bunk
Automatic Start-Stop kit	In the cab

## System & Installation Overview

The eAPU system consists of these main components:

### 1. Condensing unit



Figure 1: Condensing Unit with Cover

### 2. Evaporator



Figure 2: Evaporator Unit with Cover

### 3. Automatic Start-Stop module



Figure 4: Stop-Start Module with Harnesses In-Cab

### 4. Battery Box (optional)



Figure 3: In-Frame Battery Box with Separator and Cables

## Tools Recommended for the Installation Process

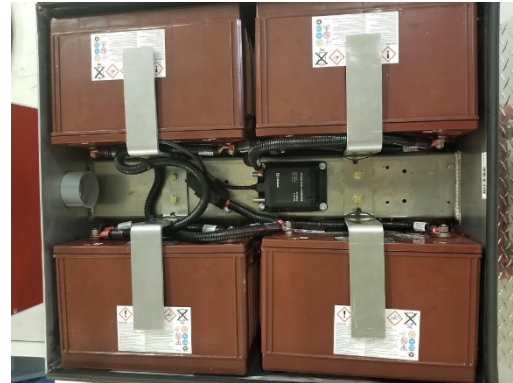
- Pneumatic Rivet Nut tool
  - Pressure regulator
  - 5/16-18 chuck
  - ¼-20 chuck
- A/C Recovery Machine (R134a) with service hoses
  - 1.75lb R134a required
- Ear clamp pliers (Knipex 1099) for refrigeration fittings
- ½" Drill
- Impact Driver
- Torque Wrench
- Cable cutters
- Cable Crimpers
- Heat Gun
- Drill bits:
  - 17/32" – Condenser Rivet Nuts
  - 25/64" – Evap Rivet Nuts
  - 2-1/2" hole saw
  - Step drill
- Sockets (deep well)
- Nut Drivers
- Miscellaneous Tools:
  - Assorted driver bits (Torx, Hex)
  - Razor knife
  - Anti-corrosion spray

## Battery Box Installation

The in-frame battery box requires 28 inches of clearance between the truck's frame cross members (front of the truck toward the back of the truck). The needed space requires square drop in corner clearance to accommodate the square corners of the in-frame battery box.

The in-frame battery box is mounted between the truck's frame rails, behind the cab. The in-frame battery box assembly replaces the truck's step deck and has a removeable lid for battery access. The in-frame battery box contains:

- 4 AGM batteries
- Cables (connected)
- Battery separator
- Fuse



*Figure 5: In-Frame Battery Box with Separator and Cables*

## Installation

1. Confirm that the space is available for the in-frame battery box.
2. Remove the step deck plates or plates to reveal the open space needed for the in-frame battery box.
3. Move or remove any obstacles, between the truck's frame rails, that will prevent installation of the in-frame battery box.
4. Make sure the wiring opening is facing towards the front of the truck. Using an approved lifting mechanism, safely lift the battery box and set it between the frame rails behind the truck sleeper. Ensure the battery box is not rubbing against any electrical or air lines.

5. Center the battery box between the frame rails making sure all areas are equally spaced.



*Figure 6: Positioning the Battery Box using a Lifting Crane*

6. Install all 4 hold down blocks, bolts, nuts, and washers. Snug up the bolts and make sure the blocks are square with the frame and battery box before torquing all mounting bolts to 33 ft. lbs.

## Battery Box Installation – Side Mount

**NOTICE - The battery box is heavy and requires assistance to place it onto a lifting cart or transmission jack.**

1. The side-mount battery box is mounted on the outside of the frame rail, directly behind the fuel tank on the passenger side (normal installation location).



*Figure 7: Side Mount Battery Box Installed on Frame*

## Cable Connections

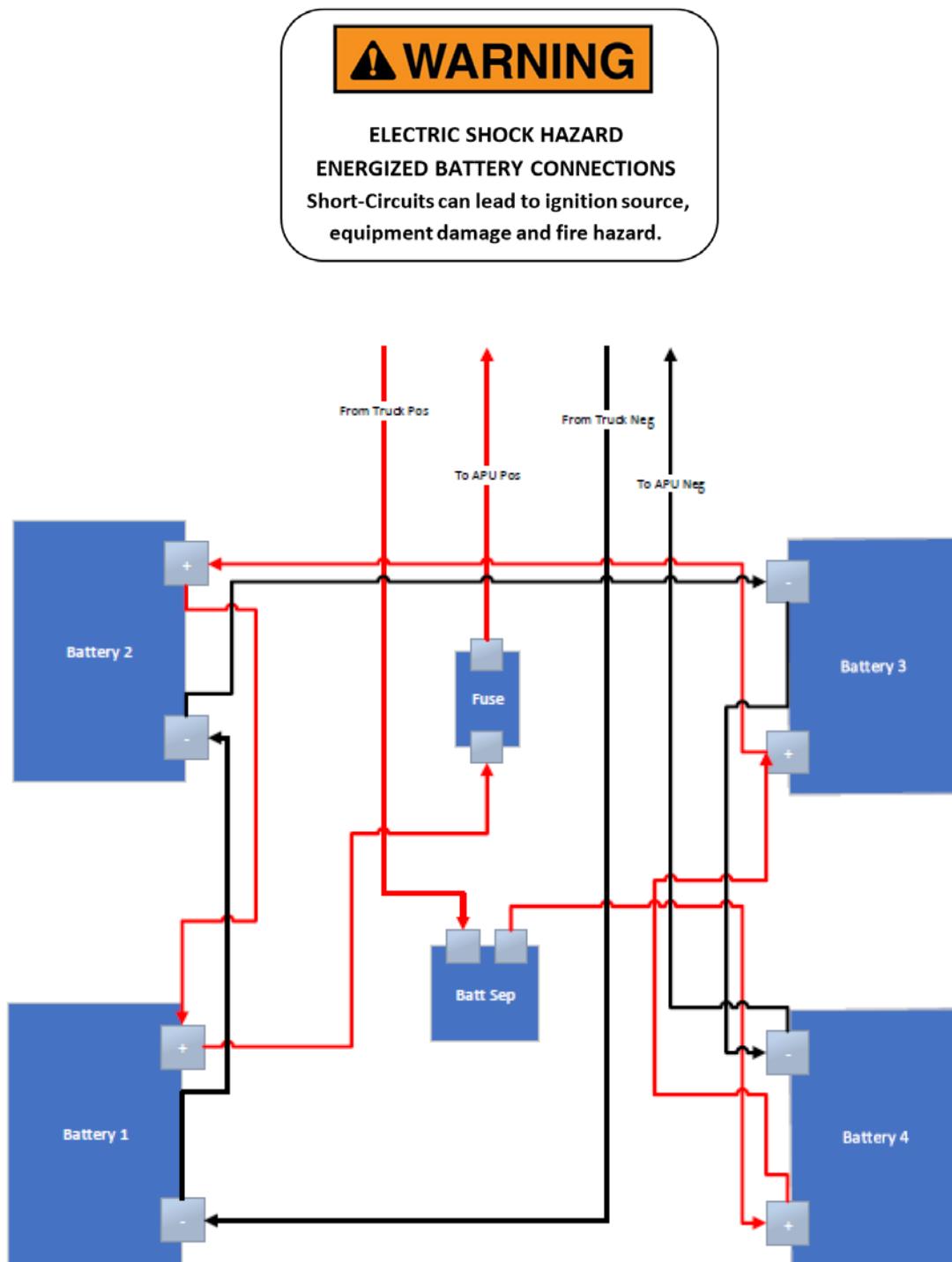


Figure 8: eAPU Battery Connections Diagram



1. Route the positive and negative cables connected to the truck battery bank into the in-frame battery box. Follow company policies for routing. Keep clear of moving components and heat sources. **DO NOT MAKE CONNECTIONS TO TRUCK BATTERIES UNTIL COMPLETION OF APU INSTALLATION.**
2. Cut cable(s) to length so that they go up to the connectors they will be connected to, using the following list:
  - a. Positive (red) cable from truck battery box is connected to the open terminal on the battery separator, using a 3/8" lug that is for 2 Ga cable. Heat Shrink connector. Before attaching to battery separator, slip current sensor on to cable with arrow facing battery separator.



Figure 9: Current Sensor along with Directional Arrows



Figure 10: Current Sensor Installed on Battery Cable

- b. Negative (black) cable from truck battery box is connected to the closest negative post in the battery bank **THAT ONLY HAS ONE NEGATIVE CABLE ON IT ALREADY**. Use a 3/8" lug for 2 Ga Cable. Heat Shrink connector.
3. When all battery cable connections are complete, place **BLUE** Loctite on each positive or negative connection and torque to 10 ft lbs.
4. Zip-tie all cables into position.

## Condensing Unit Installation

Condensing unit to be installed on the backside of the cab. Make sure you have all the tools you will need for this install. **NOTICE – If you are installing on a Mack Anthem truck, reference Mack Anthem addendum at the end of this document.**

**\*Note – There are 2 different size rivet nuts in the bag.**

- One is for MATERIAL THICKNESS RANGE .027" - .150"
  - One is for MATERIAL THICKNESS RANGE .150" - .312" (Kenworth)
1. Find the location on the back of the truck cab where the condensing unit will not interfere with lights. Look for rivet or spot weld lines. **At least four bolts need to go in the rivet/spot weld line.**
  2. Adhere the condenser mounting plate template that is included in the kit to the backside of the cab where you want the condensing unit to be installed. Make sure the template is level. Mark the eight holes to be drilled using the template.
    - a. It is recommended to mount the plate **using the outer most holes as possible.**
    - b. Some truck models may require different hole placements than the pre-marked holes.
    - c. All mounting bolts must be on the same plane and not in the stamped or recessed areas of the cab sheet metal



Figure 12: Operator Placing Condenser Mounting Template on Back Wall

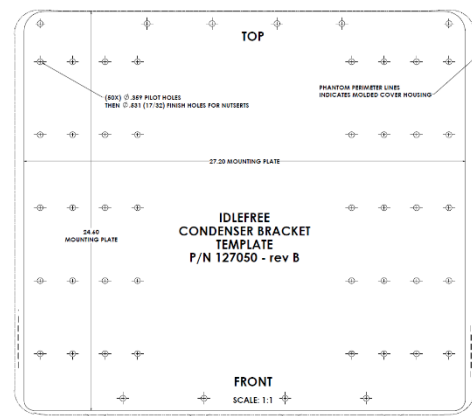


Figure 11: Condenser Bracket Template

3. Remove template and drill marked holes using a 1/8" drill bit. Repeat using a 17/32" drill bit to enlarge the holes for rivet nuts.



Figure 14: Back Wall with Rivet-Nut Holes Drilled



Figure 13: Operator Drilling Holes in Back Wall

4. Set rivet nut securely into each hole. Use pneumatic rivet nut tool and approximately **55psi** of air pressure to insert rivet into cab. Do not over tighten. Adjust pressure as necessary. **Caution: Too high of air pressure could cause damage to the structure.**



Figure 16: Operator Installing Rivet-Nuts using Pneumatic Gun



Figure 16: Back Wall with Rivet-Nuts Installed

5. Insert bolt (5/16") through condenser mounting plate in each of the eight holes being used. Then place a 1" nylon spacer over the bolt. Place retaining washer on the bolt to hold the spacer in place.



Figure 18: Condenser Mounting Plate with Spacers Installed

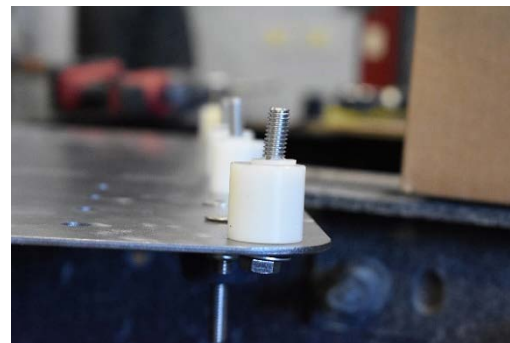


Figure 18: Close-Up Image of Spacer Hardware Stack up

6. Mount the condenser mounting plate to the cab with the nylon spacers between the cab and the mounting plate. Tighten bolts into the rivet nuts.



*Figure 19: Operator Installing Condenser Mounting Plate to Back Wall*

7. Hand tighten each of the bolts and then use a torque wrench to tighten to 11 ft-lbs. Now you are ready to mount the condensing unit.
8. Remove the condensing unit from the box and remove the white plastic Idle Free cover and set aside (bag of hardware taped to the inside of the cover).



*Figure 20: Condensing Unit with Cover Removed (Pre-Install)*

9. Hang condensing unit on the four studs on the condenser mounting plate
10. Hand tighten flange nuts. Torque to 11 ft-lbs. The final condenser installation will be completed after the evaporator is installed.



*Figure 22: Condensing Unit Hung on Mounting Plate/Back Wall*



*Figure 22: Condensing Unit Completed for Reference*



## Evaporator Installation

1. Determine location of the evaporator. Avoid speakers, wall controls or accessories such as cabinets. The preferred location is on the back wall above the lower bunk, but some trucks may require side wall installation.
2. Remove wall interior to locate interior cab structure. Mounting strips may be required in certain truck models to add structure to support evaporator.
  - a. If required, attach mounting strips with self-tapping screws.

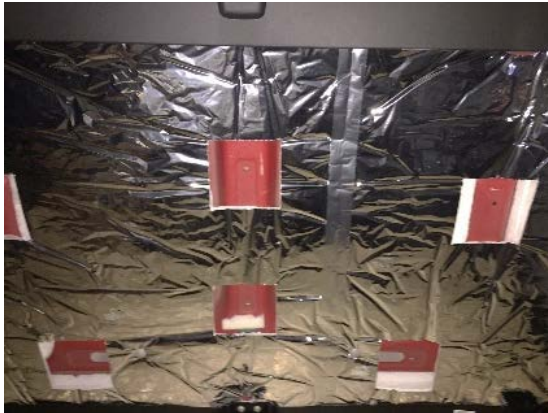


Figure 24: Interior Back Wall with Interior Panel Removed. Cutouts shown are Back-Wall Structure



Figure 23: Interior Back Wall with Mounting Strips Added via Self-Tapping Screws

3. Tape template on structure and drill 25/64" holes (4) for rivet nuts.



Figure 25: Evaporator Template Taped to Interior Back Wall - Use this Template to Drill Rivet-Nut Holes

4. Insert rivet nuts using Pneumatic Rivet Nut tool. Thread in 2 1/2" stud into the rivet nuts until it stops. Test fit the evaporator in place.
5. Put the interior wall panel back in place and apply pressure to mark for threaded studs. Remove interior wall panel from cab. Punch out the four mounting holes through the

interior wall panel. (If running harnesses and refrigeration lines inside wall use template to cut out pass through hole for harnesses and refrigeration lines.)

6. Drill a pilot hole in the floor below where the evaporator will be hung for the harnesses and refrigeration lines. Check to ensure there are no obstructions. Drill a 2 ½" hole for the floor collar.
7. Secure the floor collar into the hole.
8. Run both refrigeration lines from the interior to the exterior. Run the open end of refrigeration lines through the floor collar.
9. Run drain hose from interior cab out through floor collar.
10. Route harnesses (922008 and 922001) from exterior into the interior through the floor collar. See diagram below for further clarification.

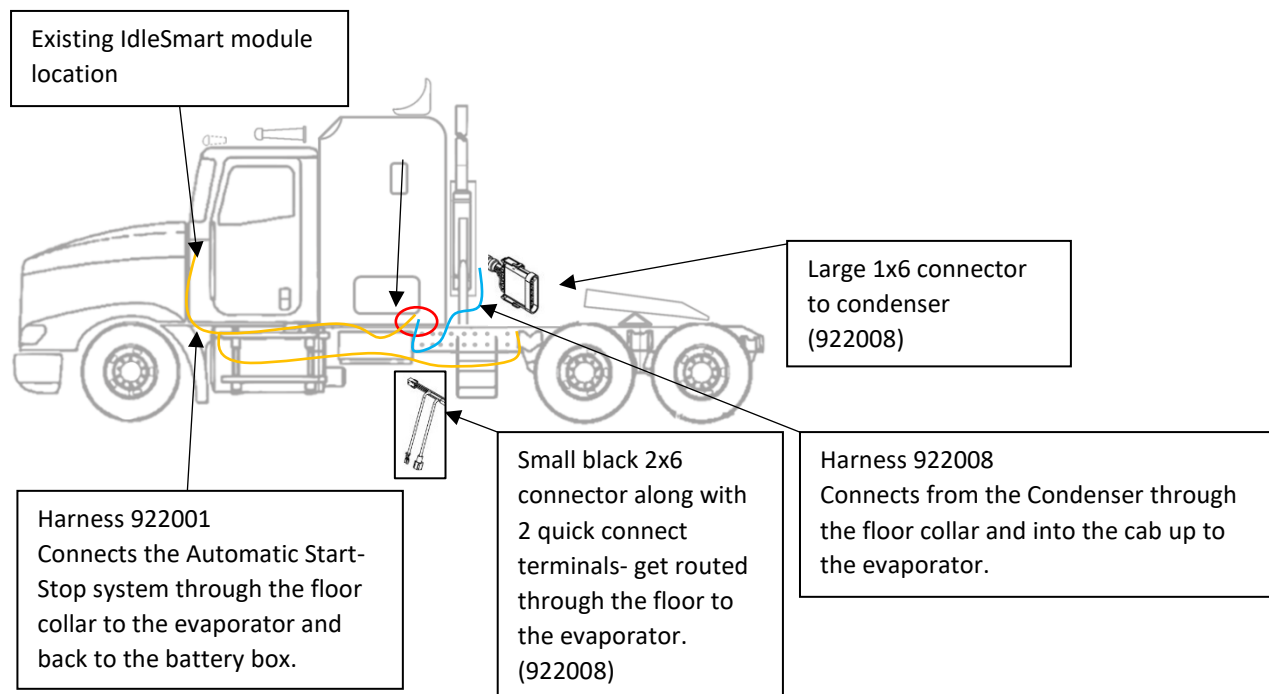


Figure 26: Diagram of the Wire Routing and Connections for the Major Harnesses for the S5000 System

11. Feed harnesses, drain hose, and refrigeration lines up through the back wall. Reattach the interior wall panel and feed the hoses and harnesses through the pass-through hole.



*Figure 27: Back Wall with Harnesses and Drain Line Installed*

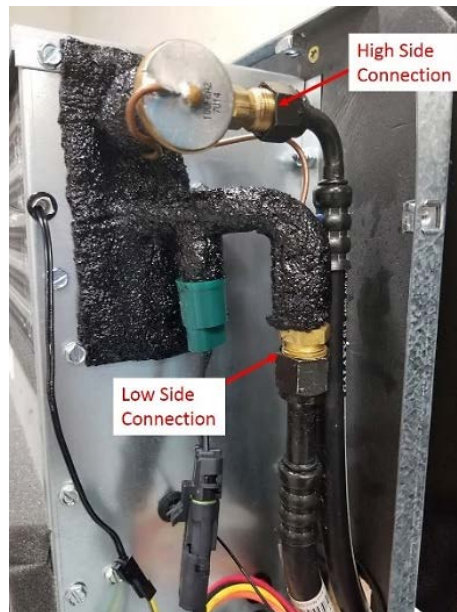
12. Route harnesses drain hose and refrigeration lines through evaporator metal frame.  
Mount the evaporator on the threaded studs and secure with lock nuts and torque to 75 in-lbs.
13. Attach drain hose and clamp on barbed elbow joint. Tighten clamp.



*Figure 28: Drain with Drain Hose and Clamp Installed*

14. Remove shipping caps from coil. There will be a hissing sound as nitrogen escapes.  
Remove slowly. Now you can install refrigerant lines.

15. There are two refrigerant lines (high and low pressure). Starting with the high pressure (smaller diameter) refrigerant line - attach the line to the expansion valve.

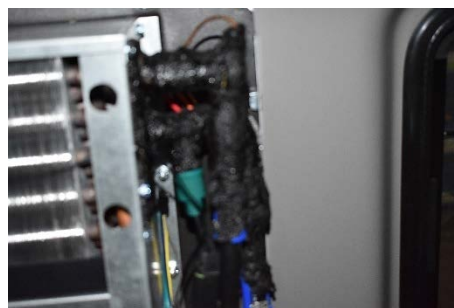


*Figure 29: Install High and Low Side Hoses and Torque to Tighten*

Tighten using one wrench on the fitting and one wrench on the expansion value. Make sure the hose is straight and there are no kinks. Repeat this step for the low pressure (larger diameter) refrigerant line.

**Torque Values: 15ft-lbs for #6 Line (High Side), 25ft-lbs for #8 Line (Low Side)**

16. Use 4-5" strips of asphalt tape and wrap around the metal fittings on the high- and low-pressure refrigerant lines.



*Figure 30: Surround Area in Asphalt Tape to Seal*



17. There are two harnesses that go into the evaporator. The previously mentioned 922008 - HARNESS, COND TO EVAP the second the 922001 HARNESS, START-STOP. See diagram below for wiring connections, also see following steps.
- The orange wire goes to the blower switch plug (B).

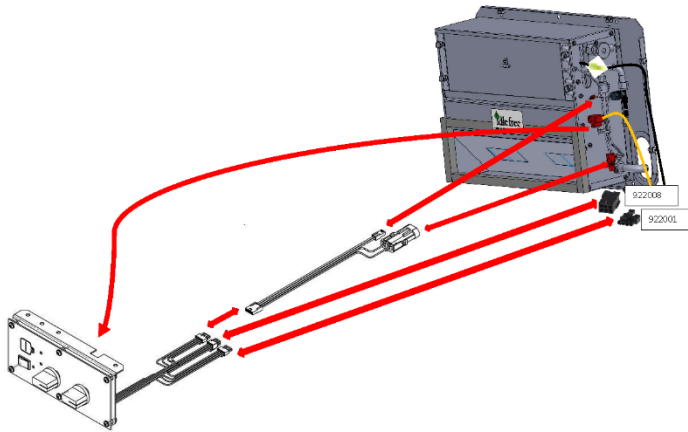


Figure 32: Connections for the Evaporator Controller and Harnesses



Figure 31: Orange Wire into the Blower Fan Plug

18. Connect the black negative wire from harness 922008 to the black evaporator negative wire.

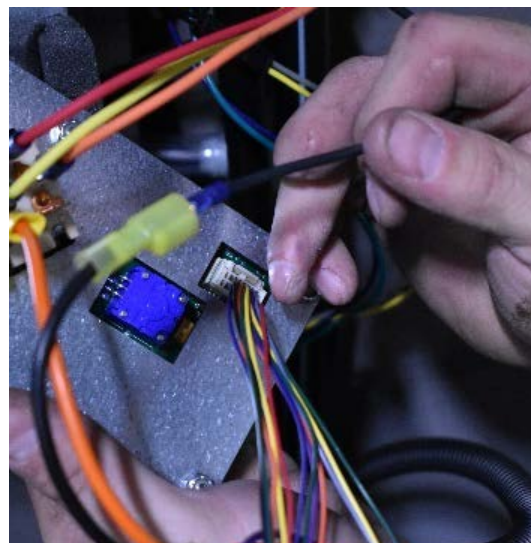


Figure 33: Insert Black Negative Spade Terminal from 922008 to Black Spade Terminal from Evaporator Harness

19. Unbox the controller (921013 included in the Series 5000 install kit). Insert the blower switch plug into the backside of the controller. It will only fit in one orientation.

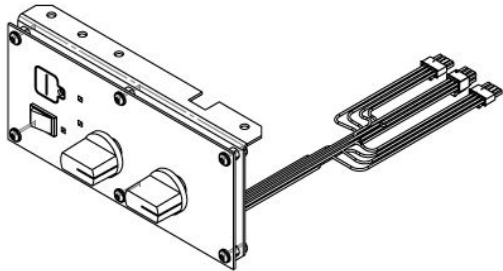


Figure 35: Controller Isometric View

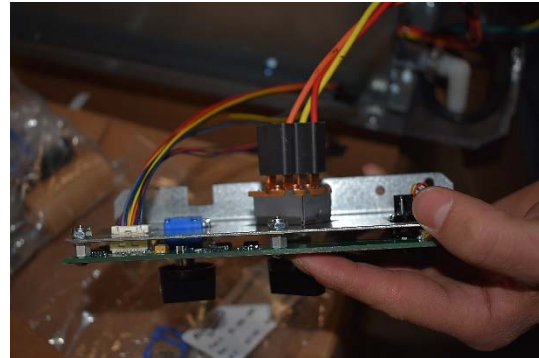


Figure 34: Controller with Blower Switch Plug Installed

20. Connect the four wires from the controller to harness 922001. The four-wire connector (purple, orange, blue, green) from the control panel connects with the same four-color wire connector that is coming from 922001.

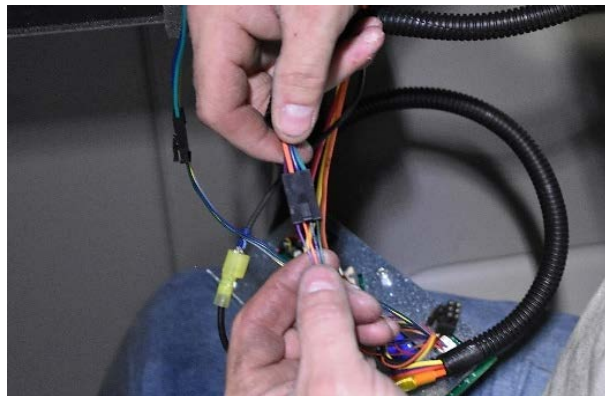


Figure 36: Connect 4-Pin Connector (Purple/Orange/Blue/Green)

21. Connect the four-wire connector from the controller to the same colored four wire connector from the evaporator (grey, yellow, purple, green)

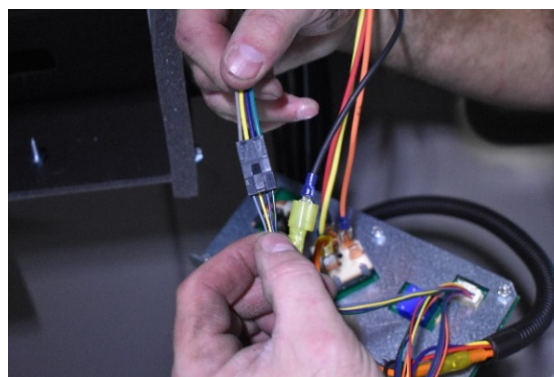
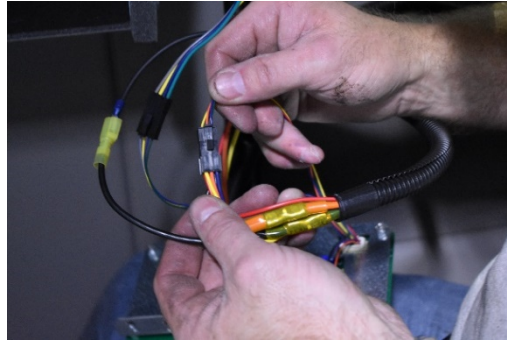


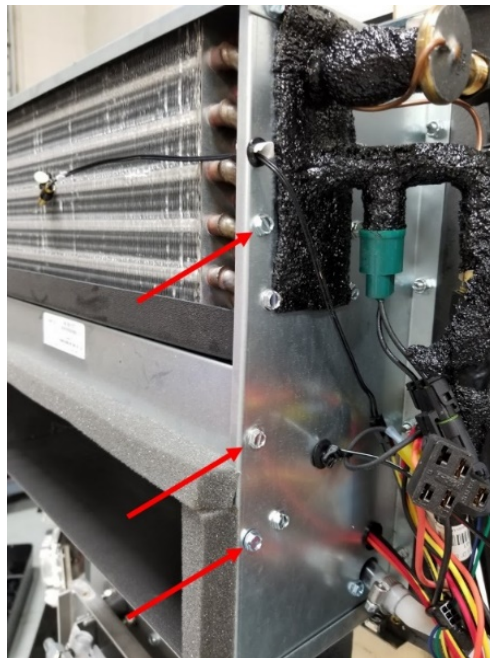
Figure 37: Connect 4-Pin Connector (Grey/Yellow/Purple/Green)

22. Connect the 6-pin plug from the 922008 harness (going to the condenser) to the 6-pin plug coming out of the evaporator controller.



*Figure 38: Connecting 6-Pin from Evaporator Controller to Condenser Harness*

23. To attach the controller to the evaporator, remove three screws on the evaporator where the controller will mount. Hold the controller in place and reinsert the three screws and tighten. Zip tie the harnesses together.



*Figure 39: Location of Three Evaporator Controller Mounting Screws*

24. Optional: If running harnesses and refrigeration lines outside wall, you will notch the bottom of the evaporator cover to feed the hoses through. You may want to cover the refrigerant lines and harnesses with a conduit.



*Figure 40: Evaporator Installed OUTSIDE of the Back Wall Interior Panel for Reference*

25. Put the black Idle Free cover on the evaporator using screws provided. Replace cabinets or shelves that may have been taken out for installation.



*Figure 41: Mack Anthem Evaporator Install - Integrated with Shelf*



*Figure 42: Finished Evaporator Installation, with Cover and Hardware*



## Final Assembly Instructions

1. Go under the truck and feed the harnesses and refrigeration lines from the evaporator to the condensing unit. Secure with zip ties and P-clamps along the route. Follow company policies for routing. Keep clear of moving components and heat sources.
2. Cut the drain hose 6" below floor collar. Attach the duck bill (kazoo valve) with a clamp to the clear condensate drain line.



*Figure 43: Condensate Drain Line with Duck Bill/Kazoo Valve and Clamp Installed*

3. Refrigeration lines:
  - a. Take the low pressure (larger diameter) refrigeration line and cut to length to fit into the Condenser up to the Compressor, but allow some play using a hose or cable cutter. Do not use a utility knife.
  - b. Preassemble the crimp fitting (PD00217034) **Caution:** Make sure the green O-ring is in place or leaking will occur. Tighten both crimps using ear clamp pliers. Attach to the fitting on top of the compressor.



*Figure 44: Crimp Fitting for Condenser Installation to Compressor*

4. Take the high pressure (smaller diameter) refrigeration line and cut to length to fit up to the Condenser Filter, allowing for some play. Assemble the crimp fitting (05000480).  
**Caution:** Make sure the green O-ring is in place or leaking will occur. Tighten both crimps using ear clamp pliers. Attach the line to the filter drier. Angle the service port away from the edges of the condensing frame to allow access.

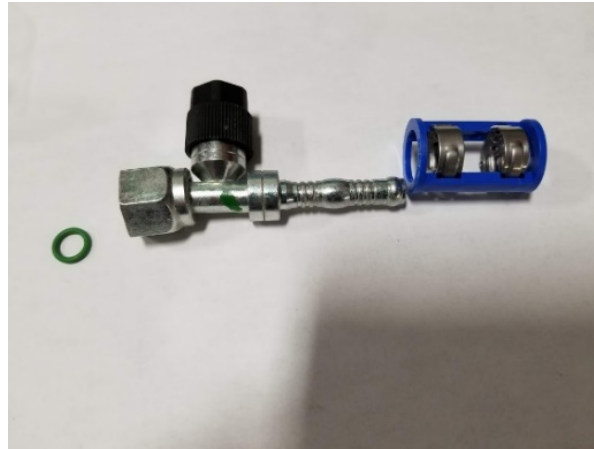


Figure 45: Crimp Fitting for Condenser Installation to Filter Drier

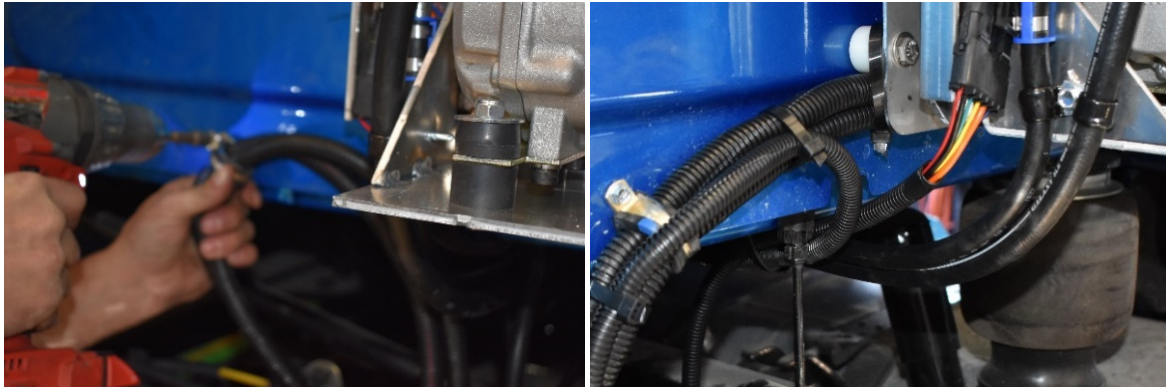
5. Take two P-clamps and wrap around the refrigerant lines. Line up the clamps and install a sheet metal screw through existing hole to secure the lines.



Figure 46: P-Clamps Securing Refrigeration Lines to the Condenser Frame

6. Attach wire harness 922008 (6-pin) to the weather pack connector from the condensing unit.

7. Attach a P-clamp to the harness and refrigeration lines and secure to the exterior sleeper wall, leaving adequate slack for cab movement.



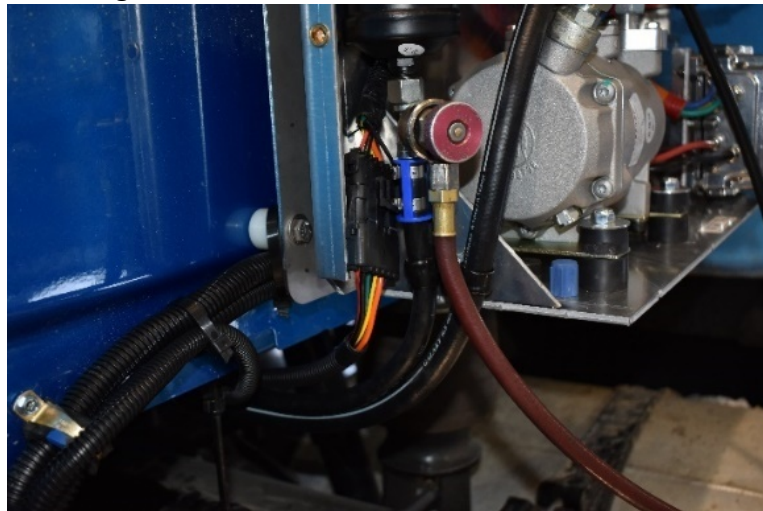
*Figure 47: Operator Installing P-Clamp on Back Wall of Cab to Secure Refrigeration and Electrical Lines*

## Charge System

**ATTENTION:** this step needs to be performed by a trained and EPA certified technician

**WARNING:** Electric compressor POE oil only. Do not add oil during system charge

1. Take each hose from the A/C recovery machine (R134A) and attach it to the service ports on the condensing unit.



*Figure 48: High Side Charge Fitting Installed onto Condenser Fitting*

2. Set the A/C recovery machine to vacuum for 20 minutes.

3. Zip tie compressor oil warning label to compressor



*Figure 49: Compressor Warning Label Zip-Tied to the Refrigerant Line*

4. Once vacuum is complete, charge the system with 1.75lbs of R134A **DO NOT INJECT OIL.**
5. When complete, remove the refrigerant recovery hoses. Reinstall service port covers.
6. Secure white Idle Free cover on condenser. For each bolt, place a star washer on the bolt and then a flat washer. Hand tighten.



## Electrical Harnesses

**CAUTION:** Ensure battery system is disconnected prior to installing electrical harnesses to prevent electric shock.



**ELECTRIC SHOCK HAZARD**  
**ENERGIZED BATTERY CONNECTIONS**  
 Short-Circuits can lead to ignition source,  
 equipment damage and fire hazard.

1. Take harness 922001 and feed the end with 2 ring terminals and 3 pin connectors through the collar at the end of the battery box. Leave slack to allow for cab movement. Plug the 3-pin connector into the current sensor. Attach the black wire to negative stud of the furthest battery from the collar. Attach the red wire to the positive stud of a different battery.



*Figure 50: Close-Up of Battery Box*

2. Take the negative battery cable from the install kit (32044) with 3/8" lug.
  - a. Feed it into the collar of the battery box and attach it to the same negative post that harness 922001 from the previous step is attached to.
  - b. Run the negative battery cable up to the condensing unit. Cut the negative battery cable to length and feed the black boot over the cable and put heat shrink over the cable.

- c. Crimp on 3/8" lug. Heat shrink connector.



Figure 51: Heat Shrink on Battery Cable prior to Heating/Shrink Operation

3. Attach negative battery cable to the black stud at the bottom of the condensing unit.
4. Remove 250amp fuse inside battery box. Feed the positive battery cable with 5/16" lug (32041) through the collar and take one end and attach to fuse holder. (Make sure fuse is removed)
  - a. Run the positive battery cable up to the condensing unit. Cut the positive battery cable to length and feed the red boot over the cable and put heat shrink over the cable.
  - b. Crimp on 3/8" lug. Heat shrink connector.
5. Attach the positive battery cable to the red stud at the bottom of the condensing unit.



Figure 53: Operator Applying Heat to add Heat Shrink to Terminal



Figure 52: Battery Cables installed on bottom of Condensing Unit (boots not yet installed)

6. Coat terminals with anti-corrosion spray.
  - a. **RECOMMENDED: Corrosion X Heavy Duty**



*Figure 54: Battery Cables connected to Condenser with Boots Installed*

- 7. Secure rubber boots over the bottom studs and fill each of the terminal boots with Trucklite NY77 or a similar spec dielectric grease.**
8. Re-install the 250 Amp fuse in battery box.
9. Make final connections to truck batteries.
10. Series 5000 air conditioning system is now operational. Move forward with automatic start-stop installation.

## Automatic Start-Stop Installation (Please see following Indexes for Individual Truck Manufacturer Specific Instructions)

*\*Note – if this is a Volvo or a Mack truck, see attached Volvo/Mack appendix file for additional installation instructions*

*\*Note – if this is an International truck, see attached International appendix file for additional installation instructions*

### 1. Place vehicle in safe condition.

Park vehicle on flat, safe area and chock the wheels. Remove key from ignition switch and set the Parking Brake. If this is a manual transmission truck, put the truck in neutral.

### 2. Place Automatic Start-Stop Base Unit.

The Automatic Start-Stop Base unit is the black square enclosure located in the Start-Stop Kit. Remove the dash to find an appropriate location to place the Start-Stop Base Unit. This should be near the parking brake line behind the dash. The Base Unit should be close to a flat surface or area for mounting or securing behind the dash. Do not mount or secure the Base Unit until later.

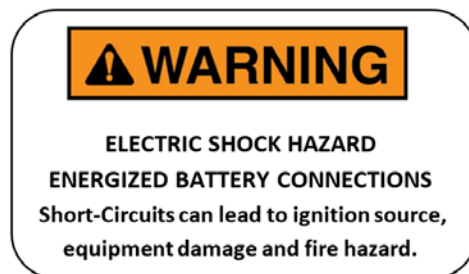


Figure 55: Stop-Start Unit will be placed behind the Dash

### 3. Connect Power to Automatic Start-Stop.

In the Start-Stop Kit, locate the red and black wires labeled “Ignition Power” with the black 4-pin Molex connector. Plug the black Molex connector into the black 4-pin receptacle on the Start-Stop Base Unit.

Take the un-terminated end of the wires and crimp the included Fuse Tap to the red wire, insert the 2A fuse and plug in fuse tap to a direct 12V power source in the truck fuse panel.

### 4. Install Hood Safety Switch.

In the Start-Stop Kit, locate the cable labeled “Hood Switch” with the white 2-pin Molex

connector. Plug the white Molex connector into the white 2-pin receptacle on the Start-Stop Base Unit. Run this wire through the firewall.

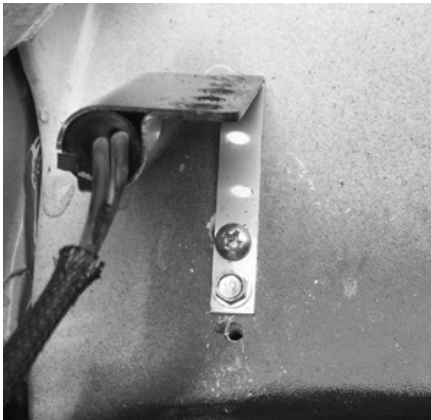


Figure 56: Hood Safety Switch Installed on Truck



To install the Hood Safety Switch, find a mounting location such that when the hood is closed, the Hood Safety Switch is angled downward, and wires should be coming out of the bottom on the Start-Stop safety switch. When the hood is fully open, this switch should be angled upward. This switch is usually mounted on a flat surface next to the rear of the driver's side headlight on the hood. Screw the switch to the truck's hood.

After the safety switch is mounted, connect to the Hood Safety Switch cable making sure that the connector is plugged in and you hear 2 clicks. If this isn't plugged in securely, it could come loose and could cause problems later. When finished, secure wiring to the truck frame.

## 5. Install neutral safety switch

**Automatic Transmission:** In the Start-Stop Kit, locate the jumper connector with the black 2-pin Molex connector. Plug the black Molex connector into the black 2-pin receptacle on the Start-Stop Base Unit.

**Manual Transmission:** In the Start-Stop Kit, locate the cable labeled “Neutral Switch” with the black 2-pin Molex connector. Plug the black Molex connector into the black 2-pin receptacle on the Start-Stop Base Unit.

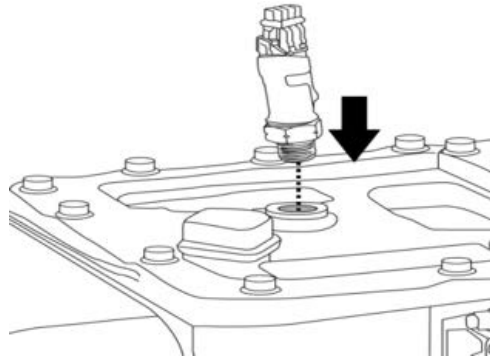


Figure 57: Neutral Switch Installed in Transmission Plug Location

Run this cable through the back and bottom of the dash and through the gearshift boot cover. Locate the Neutral Safety Switch plug on top of the transmission housing. This plug position varies with transmission manufacturer, but the transmission will say “Neutral Switch” at the correct plug location. Remove the transmission plug and replace it with the provided Start-Stop Neutral Safety Switch. In most cases, both metric and standard threaded switches are provided by Start-Stop to accommodate the installation on various transmissions. Connect the cable to the safety switch.

**6. Install the Start-Stop Ignition Plug (Freightliner/Kenworth/Peterbilt shown in Figure 59)**

In the Start-Stop Kit, locate the cable labeled “Ignition Switch” with the white 6-pin Molex connector. Plug the white Molex connector into the white 6-pin receptacle on the Start-Stop Base Unit. Run the wire behind the dash towards the ignition switch.

*Note: Ignition connections vary by truck make.*



Take the ignition plug out of the Start-Stop Kit and put the plug between the truck's ignition switch and the OEM black receptacle. Push in hard to get a firm connection on both ends. Plug the 4-pin Molex connector on the Start-Stop ignition plug into the Start-Stop ignition switch cable.



Figure 59: Freightliner/Kenworth/Peterbilt Specific Ignition Connector



Figure 58:  
Freightliner/Kenworth/Peterbilt Specific  
Inline Y Cable

## 7. Truck ECM Connections

### a) Connect to the truck's diagnostic port

Process to connect to the truck's diagnostic port:

*\*Note – Volvo and Mack Anthem vehicles have a different Y-Cable as listed in Volvo/Mack appendix file.*

### b) Run the Inline Y-Cable

In the Start-Stop Kit, locate the cable labeled "Inline Y-Cable" with the white 4-pin Molex connector and 3-pin connectors. Plug the white Molex connector into the white 4-pin receptacle on the Start-Stop Base Unit. Run the wire behind the dash towards the diagnostic connector (J1939).

### c) Remove Diagnostic Connector (J1939)

Remove the truck's diagnostic connector from the dash of the truck. Place it in a location that will allow easy access to the wires that are pinned at the diagnostic connector.

### d) Connect CanHi (Yellow Wire)

Use the blue extraction tool (provided in kit) to remove the OEM Yellow Wire from Pin C on the truck's diagnostic connector. This is the CanHi wire (J1939).

Plug the OEM Yellow Wire into Pin A on the 3 plug Amphenol connector included in the Start-Stop Y-cable kit.

Plug the Start-Stop Yellow Wire from the harness into Pin C on the truck's diagnostic connector. This is the CanHi wire connection (J1939).



*Figure 60: Yellow CanHi Connector*

**e) Connect CanLo (Pin D)**

Use the blue extraction tool (provided in kit) to remove the OEM Green Wire from Pin D on the truck's diagnostic connector. This is the CanLo wire (J1939).

Plug the OEM Green Wire into Pin B on the 3 plug Amphenol connector included in the Start-Stop Y-cable kit.

Plug the Start-Stop Green Wire from the harness into Pin D on the truck's diagnostic connector. This is the CanLo wire connection (J1939).

**f) Connect Ground (Pin A)**

Use the blue extraction tool (provided in kit) to remove the OEM Black Wire from Pin A on the truck's diagnostic connector. This is the Ground wire.

Plug the OEM Black Wire into Pin C on the 3 plug Amphenol connector included in the Start-Stop Y-cable kit.

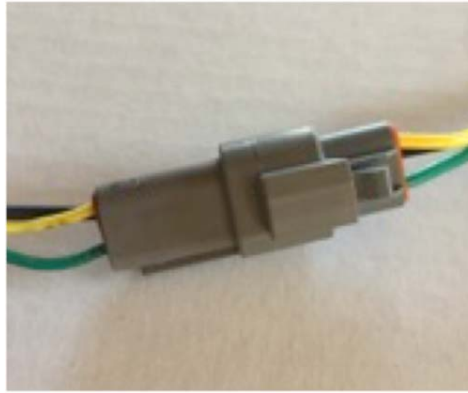
Plug the Start-Stop Black Wire from the harness into Pin A on the truck's diagnostic connector. This is the Ground wire connection.

**g) Connect Connectors and Complete Y-Cable Installation**

Plug the green plastic triangle into the Amphenol connector to provide a locked connection. Connect the 3 plug Amphenol connector with the OEM wires to the Start-Stop Inline Y-Cable harness 3 plug connector. Make sure the connectors "click". Have a slight tug on all the wires and connectors to be sure they are firmly connected.



Installation is now complete. Plug the truck's diagnostic connector back into the dash of the truck.



*Figure 61: Complete Y Cable Installation*

**h) Connect the Idle Free Harness to Automatic Start-Stop**

Connect the white Molex connector from the Idle Free harness (922001) with the white 8-pin receptacle on the Start-Stop Base Unit.

**i) Connect Relay for Idle Free Ignition Sense**

Connect Orange and Purple wires from 922001 harness (that do not plug into the Start-Stop Base unit) into the relay base provided in the install kit (921005) per diagram (diagram attached below). Run the Black wire to the same ground source the Start-Stop Ignition Power harness was run to in Step 3. Run the Blue wire to the back of the ignition switch on the IGN terminal (12V power when key is in ON position).

\*Note if this is a Volvo/Mack or International truck, splice Blue wire into Start-Stop ignition switch cable green wire (Ignition power).

Attach terminal lock and relay to the relay base, zip tie through locking tab to hold everything together and place behind dash next to Start-Stop Base Unit.

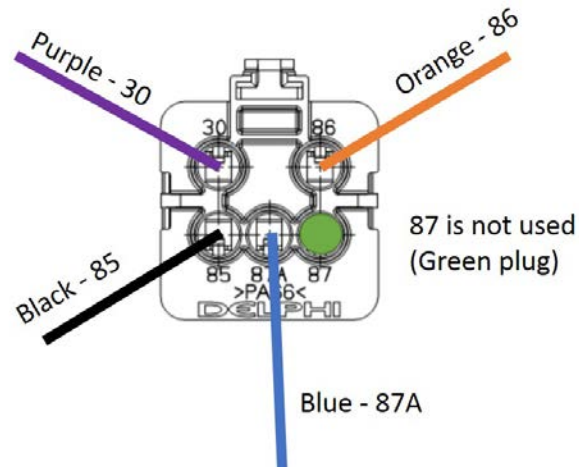


Figure 62: Relay Pinout for Ignition Sense

#### 8. Secure Base Unit Inside Dash

Secure Base Unit within dash preferably to a flat surface with zip ties. Ensure the unit will not excessively vibrate during truck operation or be interfered with by other components or cabling within the compartment. Reassemble dash cover.

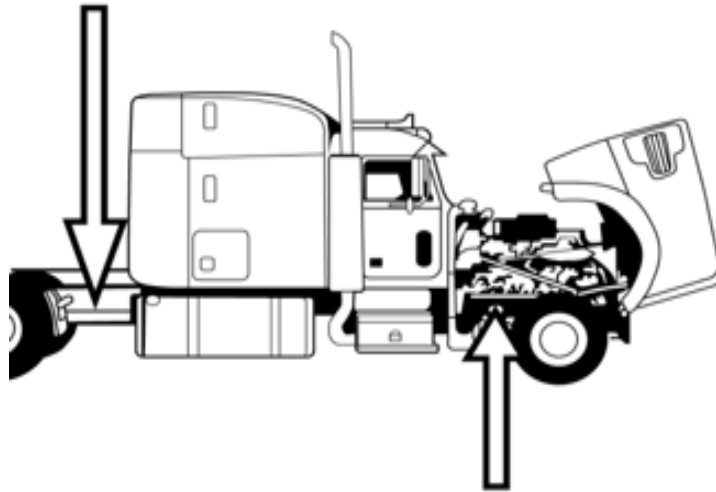
*In the picture below, the installation location for Mack Anthem is behind the instrument panel support bar. Shown with zip ties installed.*



Figure 63: Mack Anthem Placement for Stop-Start Base Unit

### 9. Place Stickers

Place the four warning stickers provided on each frame rail within the engine compartment and between fuel tanks and tandems. The installation is now complete



*Figure 64: Locations for Warning Stickers for S5000*

## Freightliner/Kenworth/Peterbilt Idle Bypass

*Note: Only applicable if truck has provided a PTO connection. Otherwise, this section is not applicable.*

### 1. Run the 12V Low-Amperage Signal Wire

On the start-stop module secured behind the dash, locate the 8-pin Molex Receptacle labeled “APU” (see Image 1). Find the orange wire that has a butt-splice with two wires coming out of it (Image 2) and follow the orange wire to the relay socket. Cut this wire and splice in the Idle Bypass PTO Harness (922037) using the pre-installed butt-splice. Image 3 shows the orange ignition wire, with a butt-splice and additional wire installed. The butt splice may be easier to utilize with both orange wires into the same end of the butt splice – this is up to the discretion of the installer.



IMAGE 1



IMAGE 2



IMAGE 3

### 2. Locate the PTO1 Circuit

In some instances, the PTO1 circuit will need to have a switch added and left secured behind the dash. In other truck builds, the PTO1 will already have a switch on the dash you can utilize.

### 3. Connect to PTO1 Circuit

Cut the Idle Bypass harness to length and install the free end utilizing a butt splice to the PTO1 Circuit.

### 4. Program the ECM

Now that the hardware change has been completed, optimize the Start-Stop system functionality by programming any of the following functionality into the ECM using the table in the ECM/PTO Programming Appendix

## Volvo Appendix

### VOLVO SPECIFIC: Connect to Ignition

#### 1. Connect Ignition Plug

Remove the plastic steering column and pull the black plastic Volvo ignition receptacle from the Volvo ignition switch. Slide Start-Stop's ignition plug through the terminals on the Volvo ignition switch. Be sure that the Start-Stop ignition plug is pressed firmly and evenly on the Ignition switch with the 4 wires and connector on the left side of the ignition switch.

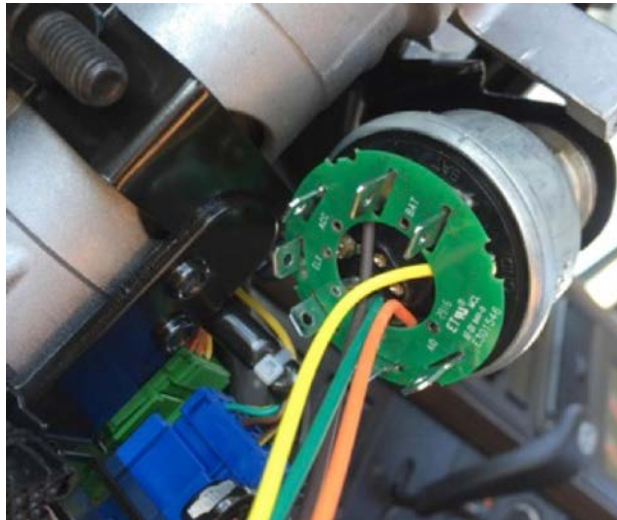


Figure 65: Volvo Ignition Plug with Start-Stop Ignition Plug Installed

#### 2. Drill Hole in Receptacle with Step Drill

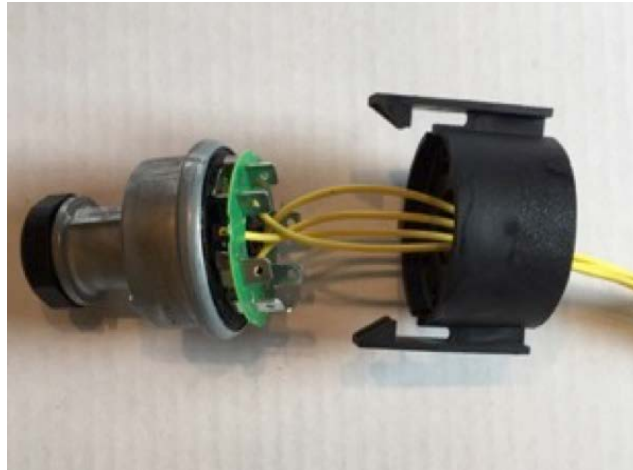
On the black ignition Volvo receptacle, drill a hole in the center circular area between all the harness wires. This hole should be large enough to fit the 4-pin Molex connector through from the Start-Stop ignition plug. **Note: drilling a hole in this plastic plug has been approved by Volvo and does not void any warranties.**



Figure 66: Diagram for where to Drill Hole in Ignition Receptacle

### 3. Volvo Trucks: Run Ignition Plug Wires

Place the Start-Stop white 4-pin Molex connector through the hole in the middle of the



*Figure 67: Wiring of the Volvo Ignition Connector*

Volvo ignition plug receptacle. Plug the Start-Stop ignition plug connector into the Start-Stop ignition harness that is connected to the Start-Stop base unit. Secure the Start-Stop harness to the existing Volvo harness to ensure tilting or rotating of the steering wheel does not damage the Start-Stop wires.

MACK ANTHEM SPECIFIC: Connect to Ignition

VOLVO: ECM and PTO Connections

#### 1. Volvo/Mack Connect to Diagnostic Port

In the Start-Stop Kit, locate the cable with diagnostic connectors and the white 4-pin Molex connector. Begin close to the truck's fuse panel and run the cable behind the dash to connect the white Molex connector with the white 4-pin receptacle on the Start-Stop Base Unit.

Locate the gray plug labeled “terminating resistor” on the yellow and green twisted pair near the fuse panel (J1939 CAN bus). Remove the terminating resistor and plug in the Start-Stop connector harness, plug the terminating resistor into the available gray connector of the start-stop harness.

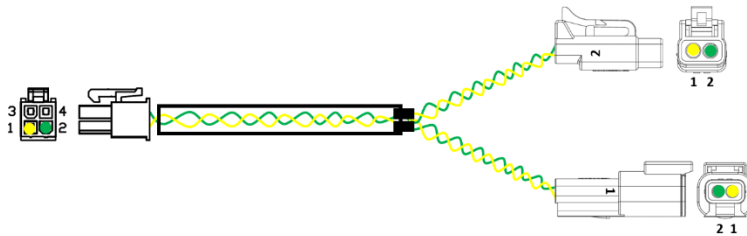


Figure 68: Volvo/Mack Anthem Specific Y Harness

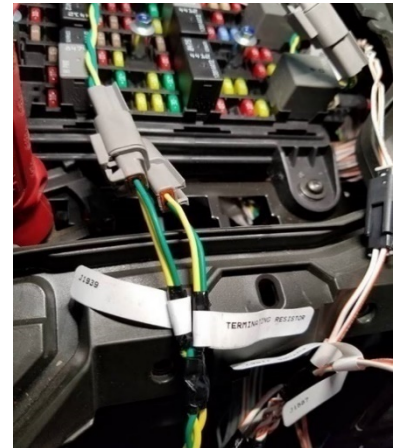


Figure 69: Y-Harness Installed

## 2. Run the 12V Low-Amperage Signal Wire

On the start-stop module secured behind the dash, locate the 8-pin Molex Receptacle labeled “APU” (see Image 1). Find the orange wire that has a butt-splice with two wires coming out of it (Image 2) and follow the orange wire to the relay socket. Cut this wire and splice in the Idle Bypass PTO Harness (922037) using the pre-installed butt-splice. Image 3 shows the orange ignition wire, with a butt-splice and additional wire installed. The butt splice may be easier to utilize with both orange wires into the same end of the butt splice – this is up to the discretion of the installer.



IMAGE 1

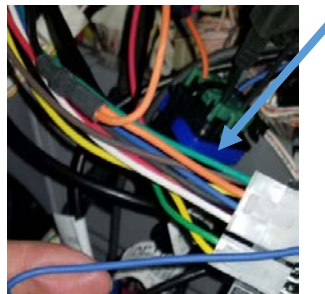


IMAGE 2



IMAGE 3

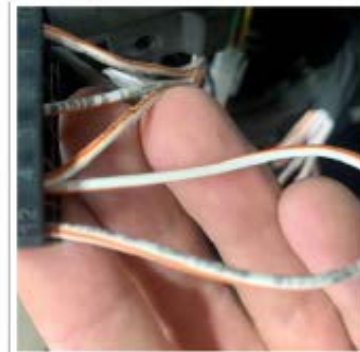
## 3. Locate the Volvo PTO1 Circuit

On the left side of the steering column, locate the black 12-pin connector S28A. The connector will have a tag on the grey wire labeled TR G16-656 (Image 4). The Volvo PTO1 Circuit can be accessed from a jumper wire between pins 4 and 12 (Image 5). You are likely to find the connector behind the middle of the dash on Volvo trucks.





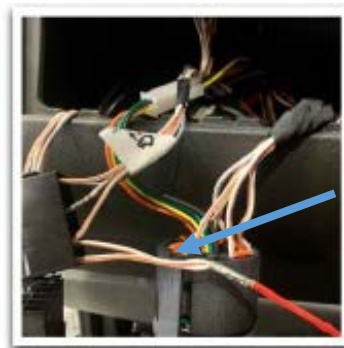
**IMAGE 4**



**IMAGE 5**

**4. Connect Stop-Start Low-Amperage Jumper to Volvo PTO1 Circuit**

Cut the PTO1 wire between Pin 4 and Pin 12 (Image 5), cut the Idle Bypass harness to length and install the free end utilizing a butt splice (Image 6) to the Pin 4 side.



**IMAGE 6**

**5. Program the ECM**

Now that the hardware change has been completed, optimize the Start-Stop system functionality by programming any of the following functionality into the Volvo ECM using the ECM/PTO Programming Appendix.

**6. Complete Installation**

Plug the plastic ignition receptacle back into the ignition plug (Volvo). The ignition plug should fit exactly as it was before Start-Stop was installed. Put the steering column back and continue to the next steps on the installation guide.



Mack Anthem

## Automatic Start-Stop Installation

Place vehicle in safe condition.

Park vehicle on flat safe area and chock the wheels. Remove key from ignition switch and set the Parking Brake.

It is also recommended to disconnect the power from both battery banks prior to installation.

Remove dash trim panels and trim support bracket



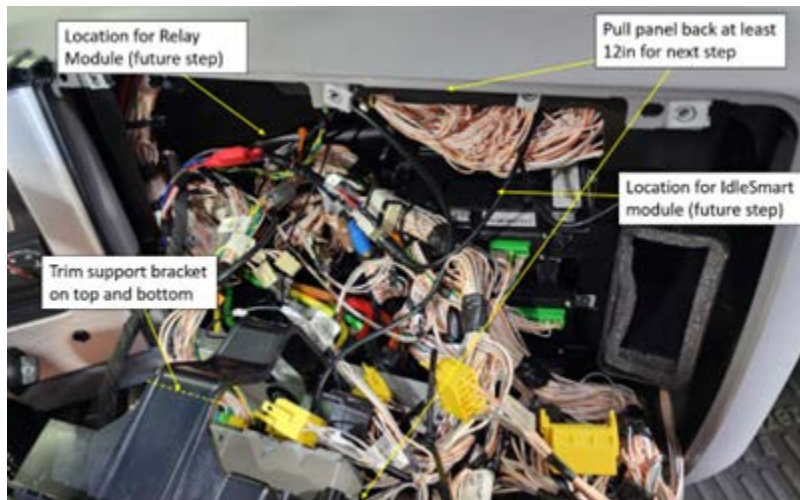
Figure 2: Dash trim panel screw locations



Figure 1: Remove lever caps and HVAC panel screws

The first step of disassembly of the interior panels is to remove the three lever caps (shown in Figure 1) and remove the trim panel screws

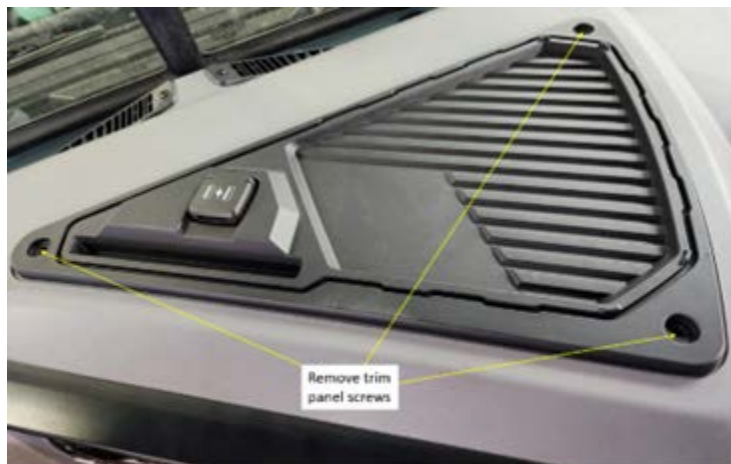
from the HVAC control panel (T25 Torx head). Once the HVAC control panel cover is removed, pull off the bezel face plate (shown in Figure 2).



*Figure 3: Dash opening with panel removed, support bracket trim*

Remove all trim panel screws from the dash trim panel (T25 Torx head) and then pull the dash trim panel out of the dash opening. Trim the support bracket as shown in Figure 3.

#### Remove vehicle fuse center cover



*Figure 4: Vehicle fuse center cover removal*

Remove trim panel screws holding the vehicle fuse center cover in place (shown in Figure 4) (T25 Torx head). Remove cover and set aside.

#### Remove steering column trim panel and driver kick panel

Adjust steering wheel to highest and furthest extended position for clearance. Remove the three steering column trim panel screws (T27 Torx head) and remove the trim panel. Set aside.

Remove the kick panel screws (T25 Torx head). Remove the kick panel and set aside.

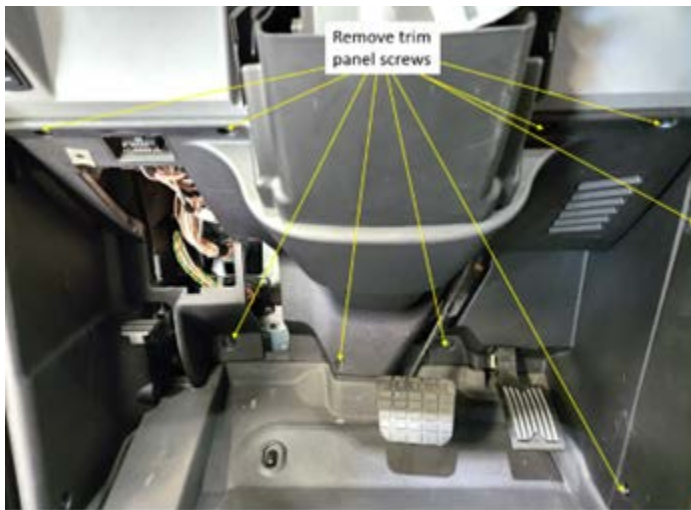


Figure 5: Kick panel screw locations

## Locate harnesses and firewall grommet

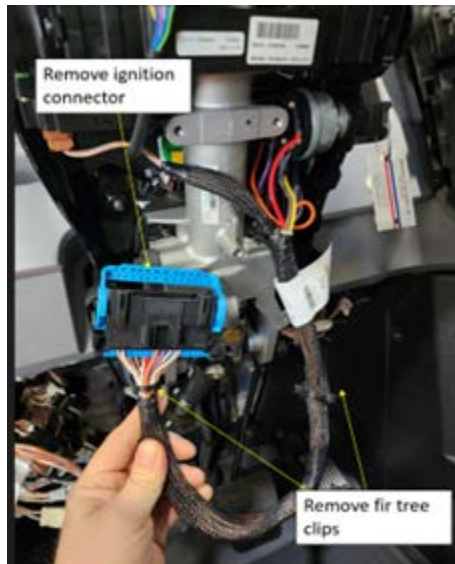


Figure 7: Ignition harness (removed from connector)

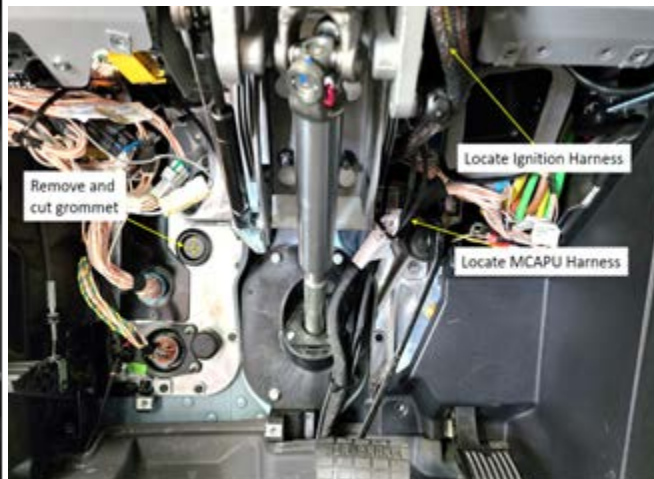


Figure 6: Kick panel removed, locate harnesses, and remove firewall grommet

With the kick panel removed, locate the MCAU Harness (Figure 6) that is routed directly to the right of the steering column. Pull the harness down and view the connectors.

Locate the ignition harness (Figure 6) which is routed directly to the right of the steering column. Pull out the fir tree retainers holding the harness in place and disconnect the 30-way connector for the next operation step (Figure 7).

Locate the firewall grommet (Figure 6) which is directly to the left of the steering column. Remove the grommet and cut two incisions with a razor blade or utility knife as shown in Figure 6. Reinstall prior to the next operation step.

### Install ignition harness



Figure 10: Ignition Harness extension

Remove the pin lock from the 30-way ignition harness connector (See Figure 8) using a small pick or hook. Set aside for reinstallation at a later step.

Remove pins 7, 8, and 9 from Side A of the 30-way ignition connector (red, purple, and yellow wires) and remove pins 7 and 8 from Side B. On the face of the 30-way connector there are small pin locks on each of the pins, use a small screwdriver to pry those open to assist with removal of the individual pins.



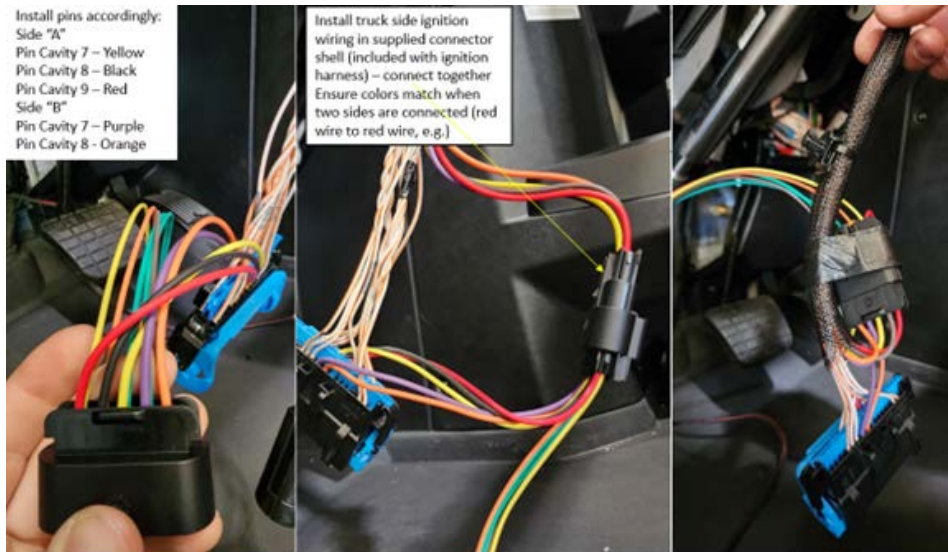


Figure 9: Ignition Harness Installed

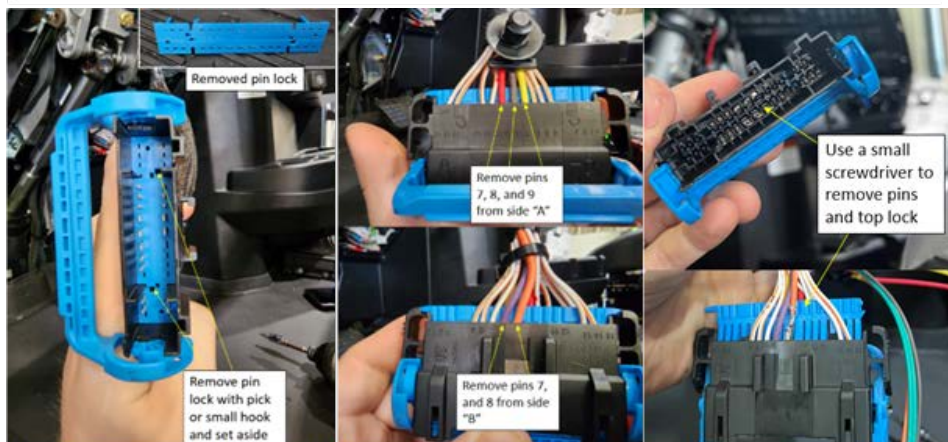


Figure 8: Ignition Connector Wiring Installation

Once all five pins have been removed, install the pins from the provided ignition harness (Figure 9) into the positions that match the colors removed. The red pin from the provided ignition breakout is to be installed to the pin 7 on side A, orange pin from the ignition breakout harness is to be installed to the pin 8 on side B, and so on. Reinstall the pin lock and top lock to the OEM Ignition Harness and secure the provided ignition harness to the OEM Ignition harness with zip ties or electrical tape.

Connect the Ignition Harness Extension (provided with the kit) to the provided ignition harness (4-way white connector) and reinstall the OEM Ignition Harness back into the vehicle to proceed to the next step (see Figure 10).

## Install APU Battery Sense harness

Route the ring terminal ends of the APU Battery Sense Harness out of the steering column grommet cut in step 5, following the frame rails or battery cables connected to the frame back to the APU Battery Box (see Figure 11).

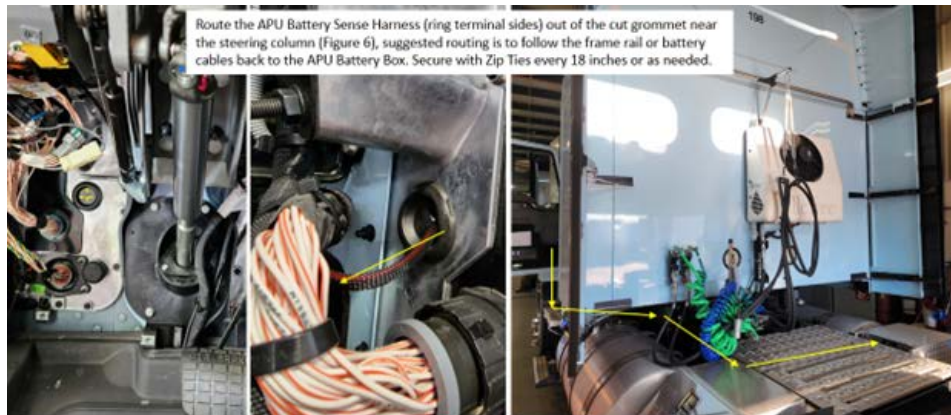


Figure 11: Routing of APU Battery Sense Harness

Remove the cover from the APU Battery Box (located on the passenger side of the frame rails in front of the rear wheels) and set aside.

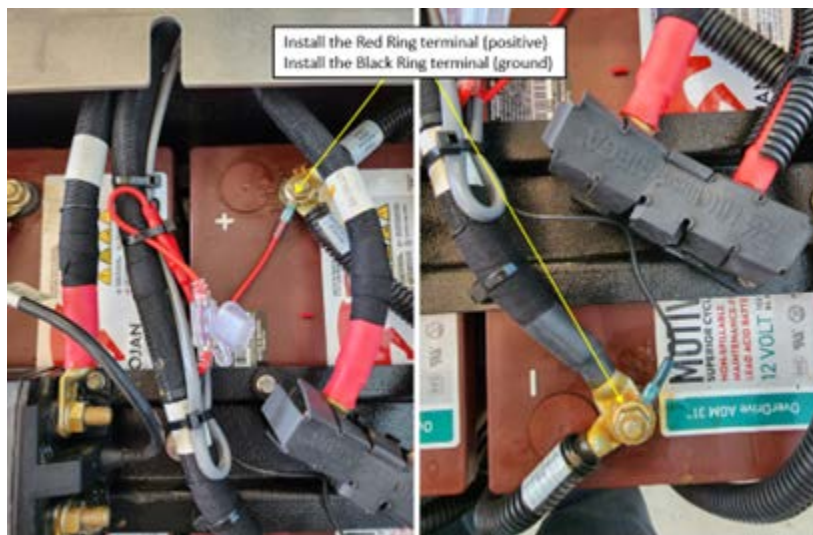


Figure 12: APU Battery Sense ring terminal installation

Install the red ring terminal to the positive stud of the top right battery in the battery box and install the black ring terminal to the negative stud to the top right battery in the battery box. Torque to specifications and reapply corrosion spray as needed (see Figure 12).



## Install hood switch and harness

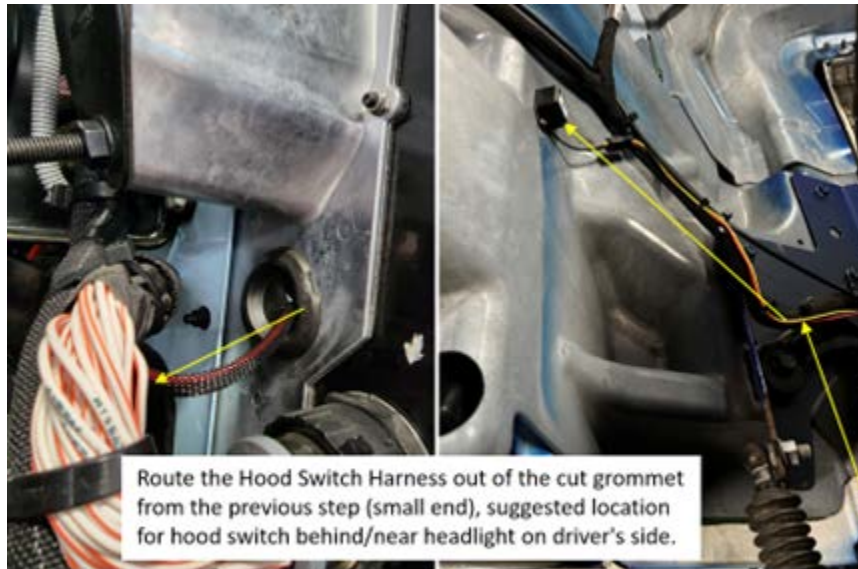


Figure 13: Hood Switch Harness Routing

Route small end of hood switch harness out of the cut grommet near the steering column from the previous installation step. Suggested mounting location for the hood switch is directly behind the driver side headlight, on the plastic fascia on the hood. Ensure during installation of the hood switch that the arrow is pointed “UP” when the hood is closed, or the start-stop system will not function properly. See Figure 13 for details.

## Install Volvo CAN Bus Y-Harness



Figure 15: Vehicle Fuse Center Wiring Locations



Figure 14: Installation of Volvo CAN Bus Y-Harness

In the vehicle fuse center area (cover removed in Step 3), install the Volvo CAN Bus Y-Harness to the Main Cab J1939 and Uncapped Terminating Resistor connectors (see Figure 14). Location of the J1939 and Terminating Resistor wires is shown in Figure 15. Route the 4-pin connector end into the dash/switch panel area to be connected later.

## Install Stop-Start Dash Switch and PTO Bypass Wire

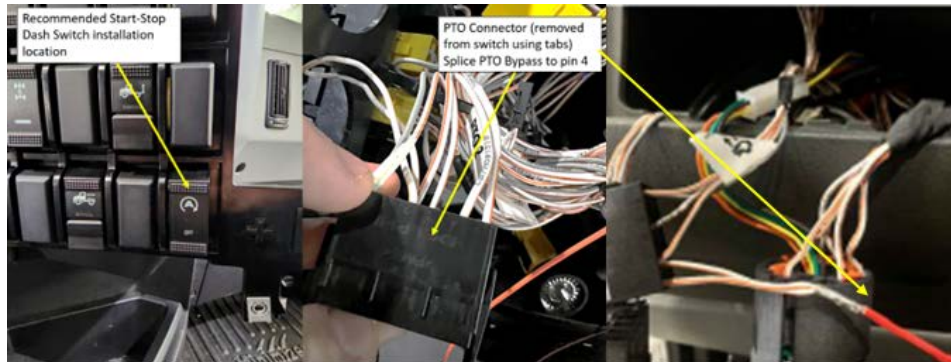


Figure 16: Dash Switch and PTO Bypass Installation on Dash Panel

On the dash trim panel, there should be several blank switch knockouts that can be used to install the Stop-Start Dash Switch. Remove one of the blank switch knockouts using a pliers or screwdriver (locks located on the backside) and discard.

Install the Stop Start Dash Switch into the open switch blank location in the correct orientation (see Figure 16) by pressing into the switch panel from the front.

Locate the empty PTO 1 or PTO 2 switch connector located on the back side of the switch panel (will be marked using harness tags). Use whichever harness does not have an active PTO switch (normally PTO 2) for the next step.

Splice the provided PTO idle bypass wire (includes butt splices) into the wire coming from pin 4 on the PTO connector. Leave 12-18" free on the other end for a future step.

## Install Start-Stop Module power harness, Relay module and harness

In the steering column area, locate the "MCAPU" or harness just to the right of the steering column wiring bundle.

Verify that it is the correct harness connections using the following protocol:

- Remove key from ignition
- Start APU
- Cycle key in ignition (APU should turn off)
- Remove key from ignition again
- Disconnect MCAPU connector
- Start APU
- Cycle key in ignition (APU should stay running if the correct connector is removed)

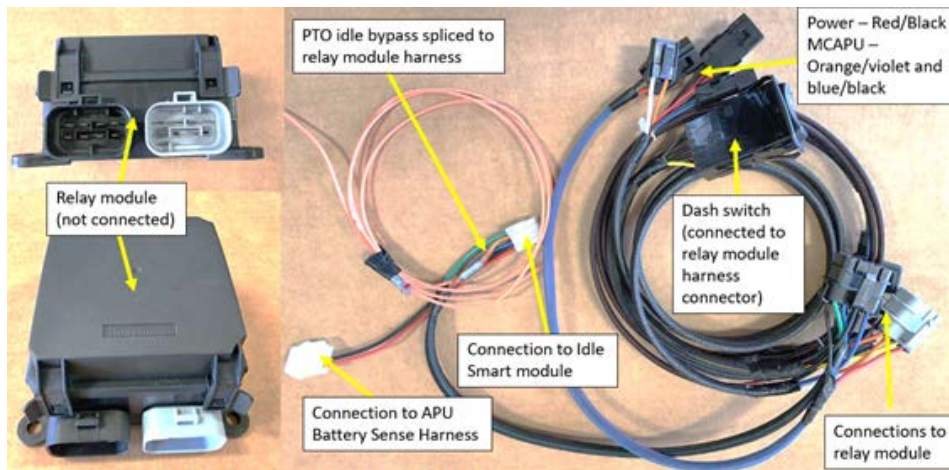


Figure 17: Relay module and harness, detailed list of connections

Connect the relay module harness to the relay module and place inside of the dash panel opening (behind the switch panel) – see Figure 17 for relay module and harness connection callouts.

Route the purple and orange wire connector and the blue and black wire connector down the left side of the center console to the steering column area and connect to the two halves of the MCAPU harness connection (see Figure 18).

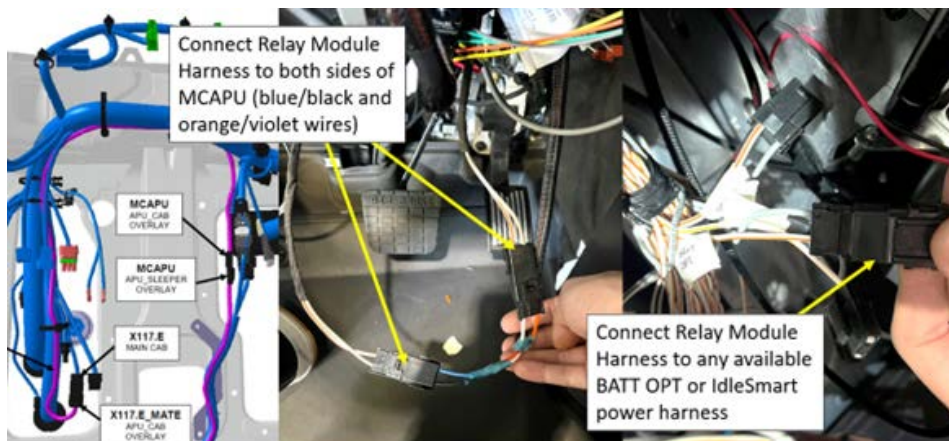


Figure 18: MCAPU Harness Connections to Relay Module

Connect the APU Battery Sense harness to the Relay Module harness (see figure 17).

Route the Start-Stop Module power harness (two 2-pin connector ends) and the red and black wire connector from the Relay Module harness alongside the previous connectors to the X117.E location on the left side of the steering column (see figure 18).



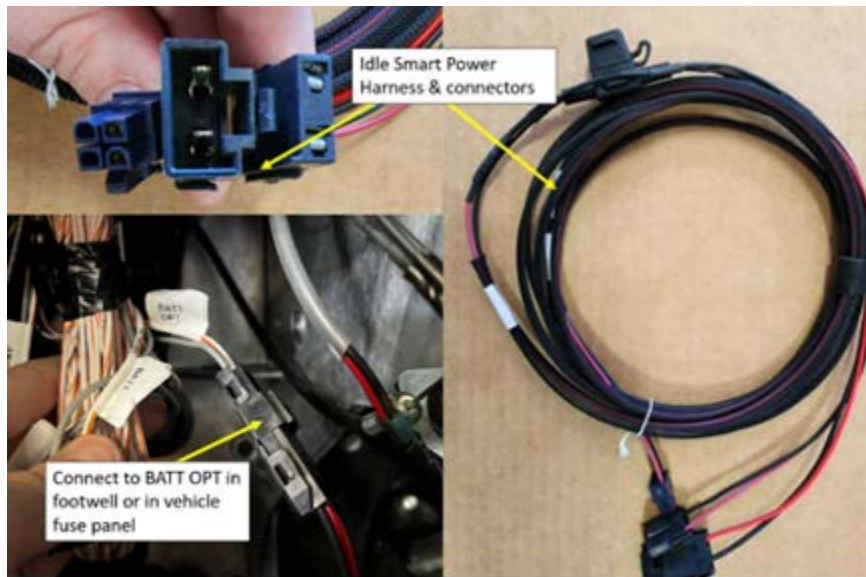


Figure 19: Idle Smart power harness and connectors

Connect the Start-Stop Module power harness to any available open BATT OPT connector in the steering column area and connect the Relay Module harness red and black connector to the Start-Stop Module power harness (or to any additional BATT OPT connector that is open to the installer's preference). See Figure 19 for example.

Install the Dash Switch connector to the installed Dash Switch. It is a poka-yoke connection and should only click into place in one orientation.

### Relay Module installation test

Once all the relay module connections are complete, verify the installation was successful by completing the following test.

- With the key removed, press the “on” button on the dash switch
  - o LED should be illuminated green
- Cycle the key to the “on” position
  - o LED should turn off
- Remove the key from the ignition and turn on the dash switch and the APU
  - o LED should be illuminated green
- Cycle the key to the “on” position
  - o LED **and the APU** should both turn off

If any of the previous test does not function as expected, please see the “troubleshooting” section of this document.

### Install Start-Stop Module, and connect all harnesses

Locate an appropriate position for the Start-Stop Module behind the dash switch panel (recommended location is shown in Figure 3). Connect Transmission jumper to the Start-Stop Module and connect all other harnesses to the Start-Stop Module as shown in Figure 20.

Connect the 4-pin Molex connect side of the Start-Stop Module power harness to the Start-Stop Module.

At this point in the installation, the LED on the Start-Stop Module should start flashing. If it does not flash on and off, check the previous installation steps to ensure that the Start-Stop Module power harness is fully seated on both ends and connected to a live BATT OPT connector.

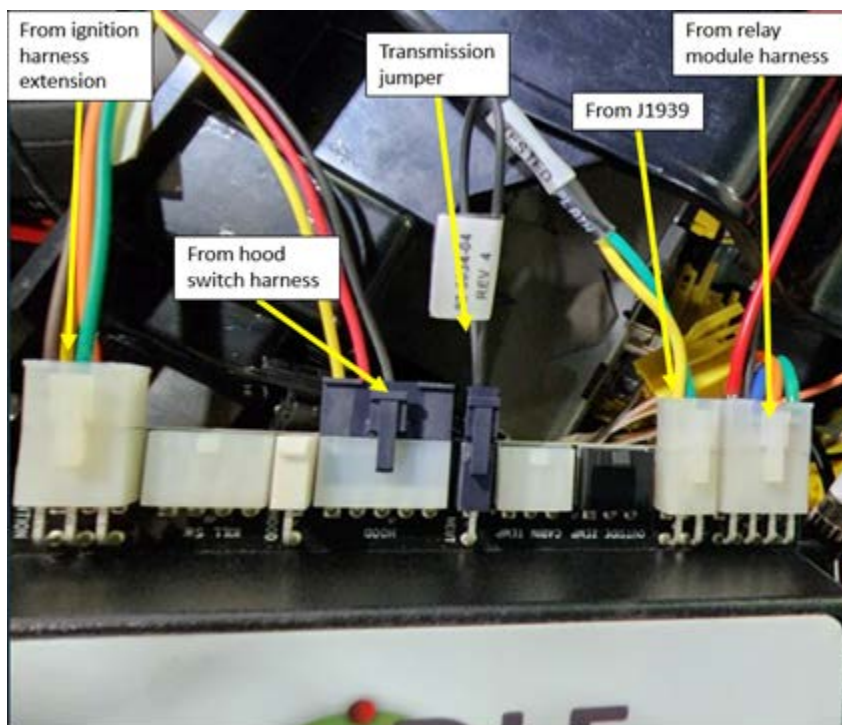


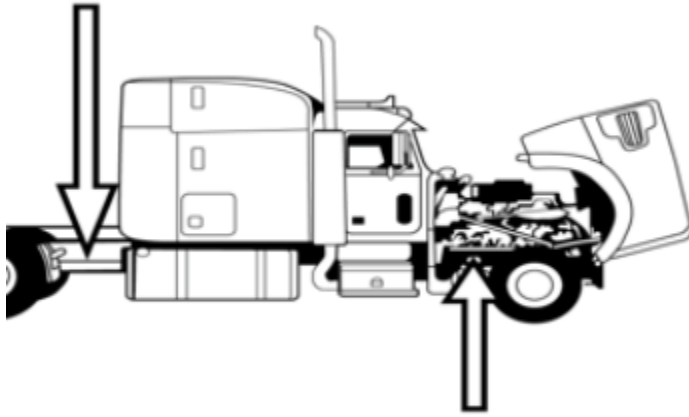
Figure 20: Start-Stop module connections

### Secure Base Unit and Relay Module Inside Dash

Secure Base Unit within dash preferably with zip ties. Ensure the unit will not excessively vibrate during truck operation or be interfered with by other components or cabling within the compartment. Reassemble dash switch panel and the steering column panels (reference Figures 1/2/3 for screw locations).



## Place Stickers



*Figure 21: Label placements for warning stickers*

Place the four warning stickers provided on each frame rail within the engine compartment and between fuel tanks and tandems. The installation is now complete and Automatic Start-Stop is ready for use.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.
- 14.
- 15.
- 16.

## Program the Volvo ECM

Group	Purpose	TechTool Parameter	Value	Description
IDLE TIMER	Enable Idle Shutdown Timer	P1TPI	(1=ON)	Specifies whether the Idle Shutdown feature is to be enabled. When set to specify the following parameters YES, also.
	Set Maximum Idle Time	P1BVS	(Seconds)	Specifies the maximum idle time before automatic idle shutdown
	Idle Shutdown Warning Timer Value	P1BVR	(Seconds)	Specifies the time that an alarm will sound before idle shutdown
PTO OVERRIDE	Allow Override with PTO Active	P1SLC	(1=YES)	While the respective PTO input is active, idle shutdown will be suspended.
	Allow Start with PTO Active	P1HUM	(1=YES)	While the respective PTO input is active, vehicle startup is allowed
PARKING BRAKE	Ignore Parking Brake for Shutdown	P1BXZ	(1=YES)	Specifies whether the parking brake must be set or not for the idle shutdown to occur. Yes, means that the status of the parking brake will be ignored. No means that the parking brake must be set before idle shutdown can occur.

*Table 1: Idle Shutdown Parameters*

Now that the hardware change has been completed, optimize the Start-Stop system functionality by programming any of the following functionality into the Volvo ECM using the below table (Table 1).

## Post Installation Testing



Prior to testing the system, confirm all DC connection in battery box and condenser are tight, as well as all connections to the Stop-Start module in the vehicle's dash and the connections to the Relay Module. Loose connections will impact operation of the eAPU. Be careful as all positive connections are now live.

### Installation Run Test

Attach the Automatic Start-Stop Test Harness inline between the Relay Module harness and Start-Stop base unit. The harness will simulate low battery voltage. Turn on the Dash Switch. After 10-30 seconds the Start-Stop should attempt to start the truck and the Idle Free unit should temporarily shut off.

**Note:** For truck to start the hood needs to be closed, key in off position, truck in neutral, and parking brake engaged. After the truck shuts down there will be a 20-30 second delay and the Idle Free unit will turn back on automatically. If everything worked as expected testing is complete and you can remove the inline test harness and plug the Relay Module harness directly back into the base unit.

**Note:** If the truck shuts down after 5 minutes, the Truck Idle Timer needs to be adjusted to 151 minutes to allow the truck to Idle properly and charge the batteries.

To test safeties during Automatic Start-Stop Idle, you can open the hood, truck will shut down and 20-30 seconds later the Idle Free unit will automatically start up. Upon closing the hood, the truck will start within 20 seconds.

When testing is done be sure to REMOVE THE TEST HARNESS!

## Wiring Schematic

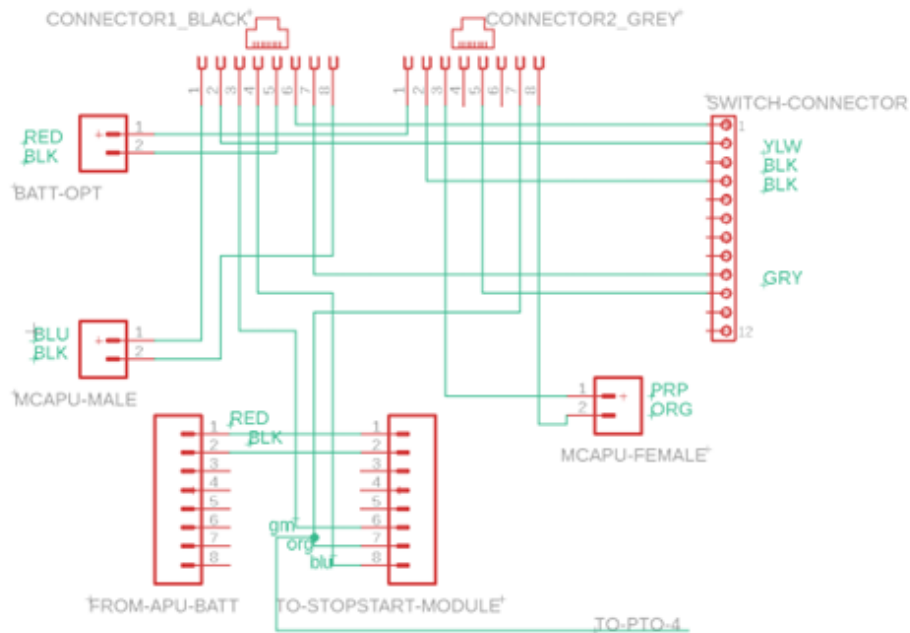


Figure 23: Circuit Diagram of Relay Module Harness

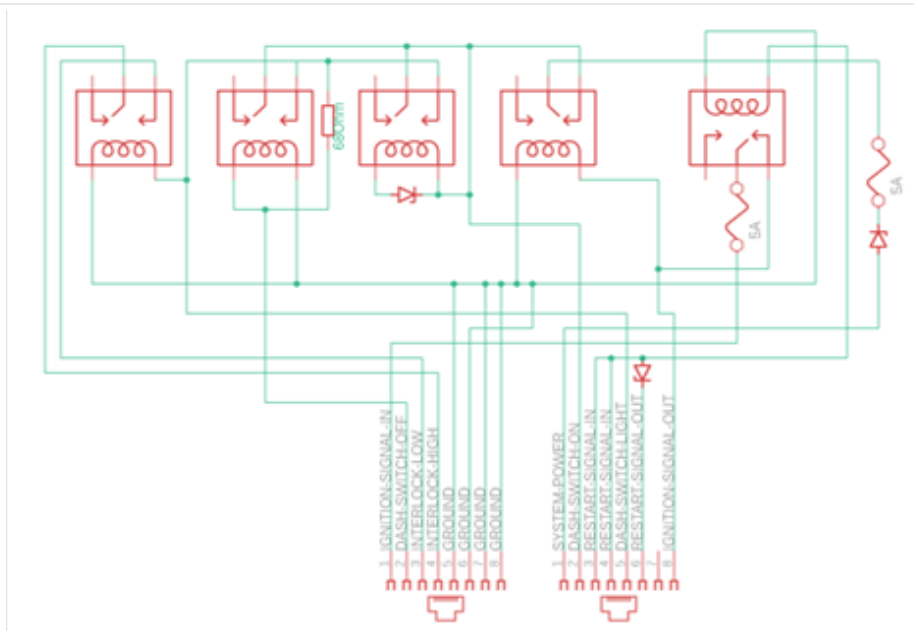


Figure 22: Circuit Diagram of Relay Module

Relay Module Wiring

Diagram

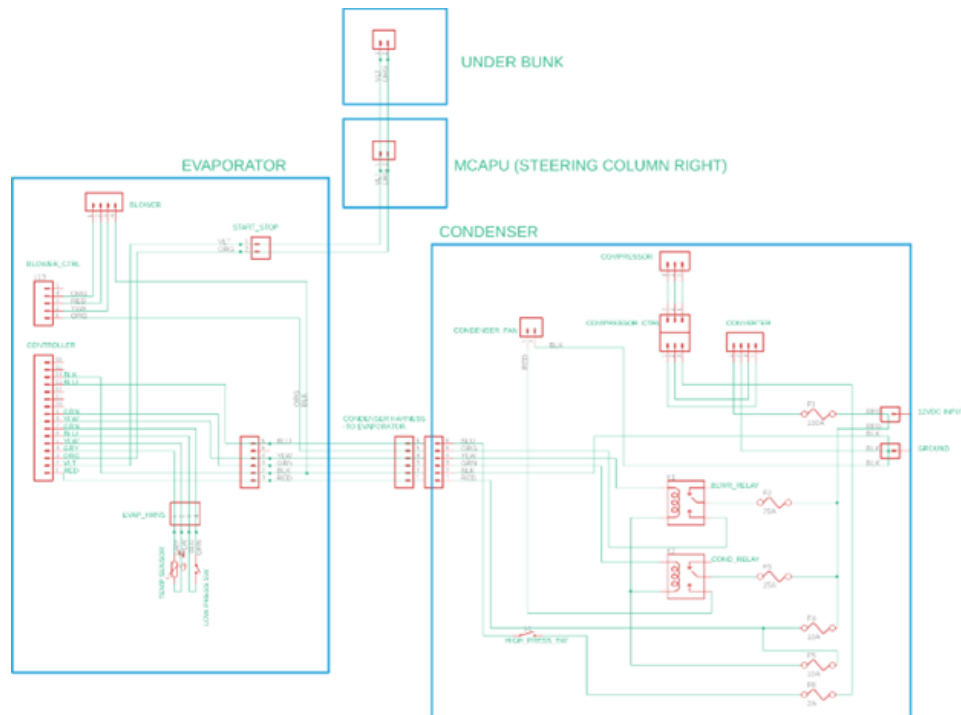


Figure 24: Mack Installed S5000 APU Wiring Schematic





## International Appendix

### 1. Run the Ignition Wire

In the Start-Stop Kit, locate the cable labeled “Ignition Switch” with the white 6-pin Molex connector. Plug the white Molex connector into the white 6-pin receptacle on the Start-Stop Base Unit. Run the wire behind the dash towards the ignition switch.

### 2. Connections to the OEM Ignition System

Connect the following Start-Stop wires using the Posi-Tap® connectors provided in the Start-Stop kit to the correct OEM ignition wires:

- Start-Stop yellow wire to battery 12V+ side wire on ignition switch (BAT)
- Start-Stop brown wire to ignition accessories side of switch (ACC)
- Start-Stop orange wire to start signal (crank signal) wire (STA)
- Start-Stop green wire to ignition power side of switch (IGN)

### 3. Posi-Tap® Instructions

- After finding the correct OEM wire, unscrew the end of the Posi-Tap® connector that contains the needle. Put the OEM wire through the plastic cap and screw the cap back on the end with the needle. Screw in tightly.

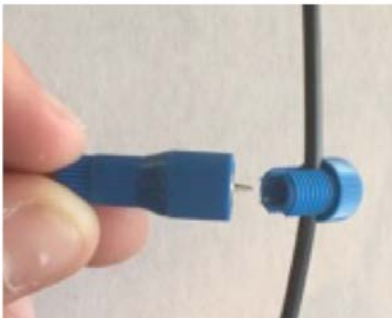


Figure 72: Posi-Tap Install

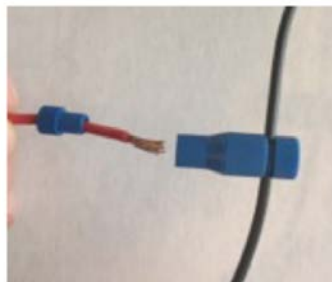


Figure 70: Posi-Tap Installation Step 2

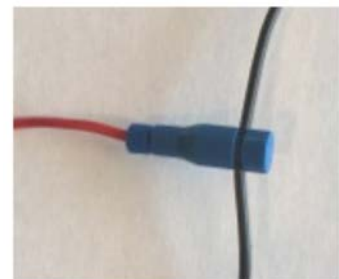


Figure 71: Finished Posi-Tap Installation

- Find the correct Start-Stop ignition wire and strip off 3/8" to insert into the connector. Do not twist the wire. Unscrew the smaller end of the Posi-Tap® connector and put the Start-Stop wire through the cap. Allow the stripped wires to surround the Posi-Tap® post. Screw the cap back into the connector. Screw in tightly.
- After completing the connection, tug on the Posi-Tap® connector to make sure it is snug and secure before moving onto the next wires.

### 4. Run the 12V Low-Amperage Signal Wire

On the start-stop module secured behind the dash, locate the 8-pin Molex Receptacle labeled “APU” (see Image 1). Find the orange wire that has a butt-splice with two wires coming out of it (Image 2) and follow the orange wire to the relay socket. Cut this wire and splice in the Idle Bypass PTO Harness (922037) using the pre-installed butt-splice. Image 3 shows the orange ignition wire, with a butt-splice and additional wire installed. The butt splice may be easier to utilize with both orange wires into the same end of the butt splice – this is up to the discretion of the installer.



**IMAGE 1**



**IMAGE 2**



**IMAGE 3**

**5. Locate the PTO1 Circuit**

In some instances, the PTO1 circuit will need to have a switch added and left secured behind the dash. In other truck builds, the PTO1 will already have a switch on the dash you can utilize.

**6. Connect to PTO1 Circuit**

Cut the Idle Bypass harness to length and install the free end utilizing a butt splice to the PTO1 Circuit.

**7. Program the ECM**

Now that the hardware change has been completed, optimize the Start-Stop system functionality by programming any of the following functionality into the ECM using the table in the ECM/PTO Programming Appendix

## ECM/PTO Programming Appendix

Figure 78: Programming Guide

		Volvo	Navistar	Paccar	Cummins		
		Volvo, Mack	International	Peterbilt, Kenworth	Freightliner, West. Star		
Group	Purpose	Physical Connection				Value	Description
PTO Switch	Connect to Idle Smart "APU" Pin 7	Connect to specific pin/wire on PTO circuit				n/a	Connect the Idle Smart "signal wire" to the vehicle's PTO circuit.

Tech Tool used -->		Tech Tool	NavKal	Paccar	Insite		
Group	Purpose	ECU Parameter				Value	Description
IDLE TIMER	Enable Idle Shutdown Timer	P1TPI	7400[2]	2091305 (sales code)	{enable}	(1=on)	Specifies whether the Idle Shutdown feature is to be enabled. When set to YES, also specify the following parameters:
	Set Maximum Idle Time	P1BVS	7401[2] & 7404[2]	N187 & N188	{set}	(seconds)	Specifies the maximum idle time before automatic idle shutdown.
	Set Alarm Duration	P1BVR	factory set=30	N194	{set}	(seconds)	Specifies the time that an alarm will sound before idle shutdown.
PTO OVERRIDE	Allow Override with PTO Active	P1SLC	YES if 7400[2]=1	N200	{enable}	(1=yes)	While the respective PTO input is active, idle shutdown will be suspended.
	Allow Start with PTO Active	P1HUM	n/a	n/a	n/a	(1=yes)	While the respective PTO input is active, vehicle startup is allowed.
PARKING BRAKE	Ignore Parking Brake for Shutdown	P1BXZ	{enable}	N192	{enable}	(1=yes)	Specifies whether the parking brake must be set or not in order for the Idle Shutdown to occur. YES means that the status of the parking brake will be ignored; NO means that the parking brake must be set before idle shutdown can occur.

## Post Installation Testing

*NOTE: THIS STEP IS REQUIRED FOR ALL INSTALLATIONS TO VERIFY OPERATION PRIOR TO RELEASING THE VEHICLE TO ANY DRIVERS.*

Prior to testing the system, confirm all DC connection in battery box and condenser are tight, as well as all connections to the Stop-Start module in the vehicle's dash. Loose connections will impact operation of the eAPU. Be careful as all positive connections are now live.

### Installation Run Test

1. Make sure hood is down, ignition switch is turned off, and parking brake is engaged while in a neutral gear.
2. On the control panel at the evaporator, turn the air conditioner on. Wait a couple of minutes and make sure the system is producing cold air. (turn the rheostat from cold to colder and back slowly and listen for the compressor to speed up and slow down)
3. With the air conditioner running, turn the ignition switch to the "on" position and confirm the APU shuts down.
4. Attach the Automatic Start-Stop Test Harness (922029) inline between the Idle Free harness (922001) and Start-Stop base unit. The test harness simulates low battery voltage. Make sure the Start-Stop switch is turned on and then turn on the Idle Free system. (Green LED should be lit).
5. After 10 seconds the Start-Stop should attempt to start the truck and the Idle Free unit should shut off.
6. With the truck engine running, open the hood of the truck and confirm the truck engine shuts off. Shut the hood, wait 20-30 seconds for engine to restart. Disengage the parking brake and confirm truck engine shuts off. Reengage brake and wait 20-30 seconds for engine to start, lastly turn ignition switch to "on" and make sure it also turns the truck engine off.
7. **For vehicles with idle bypass:** start the truck and let it idle to verify that the idle shutdown happens at 5 minutes and shuts the engine off. Turn the Key off, install the inline test harness for the Start-Stop, turn on the APU, enable the Start-Stop system via the switch on the Evaporator control unit. Verify that the truck starts via auto start-stop and runs for at least 6 minutes. Shut off the start-stop and remove the inline test harness.
8. When testing is done be sure to REMOVE THE TEST HARNESS INSTALLED IN STEP 4 FOR TESTING!
9. Secure Base Unit within dash preferably to a flat surface with zip ties. Ensure the unit will not excessively vibrate during truck operation or be interfered with by other components or cabling within the compartment. Reassemble dash cover.

### Notes:

1. On Freightliner/Kenworth/Peterbilt without a PTO connection the Idle-Timer Bypass is not feasible. The trucks Idle Timer must be set to 151 minutes to allow the truck to Idle properly and charge the batteries.



2. On all other truck makes, the idle timer is bypassed through the PTO circuit during installation. Set the idle timer to customer specification, many set it to 5 minutes. This will not affect engine runtime during APU operations
3. If batteries are new/charged the Truck should run for 12-15 minutes and then shut off due to detecting full battery charge. If the batteries are not charged the truck will idle until they are charged, or a maximum time of 2.5 hours. When the truck shuts down, the eAPU will automatically start after a 20-30 second delay. If everything worked as expected, testing is complete, and you can remove the inline test harness and plug the Idle Free harness (922001) directly into the base unit.
4. The truck's start battery bank is also monitored by the start/stop system. If they batteries get below a pre-determined value, the truck engine will start and run for 30 minutes.

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