Technical Information and Diagnostic Guide

for Freightliner *ParkSmart* Rev5/Split No Idle System for

optimized idle *- March 2013 also rev 5.6(38n)*

Beginning 3/7/2016 all (NEW) trucks are built with the Optimized Idle compatible unit, including (NEW) trucks that do not have Optimized Idle. See controller compatibility information inside this manual.

This guide will assist you in becoming more familiar with the working components of the ParkSmart® System and the proper steps and procedures to completely diagnose the no idle unit.

!! Attention !!

Before proceeding with any diagnostics please call for authorization. Opening the ParkSmart Unit without authorization could void your warranty!

Technicians are responsible for verifying all truck batteries and AUX System batteries are in good condition and are properly charged. Do not proceed with any diagnostics without checking batteries and connections first!

Communication

The front HVAC control unit, auxiliary control unit, and the ParkSmart internal control unit communicate over the J1939 datalink. The front HVAC control unit uses source address (SA) 25 and the auxiliary control unit uses SA 58. The internal ParkSmart controller uses SA 68. The messaging communicated is used for operation, diagnostics, and data used to monitor the system with Datalink Monitor.

Links:

NITE system	www.nitesystem.com/html/technical_docs.cfm
Battery option: East Penn	www.eastpenn-deka.com
Auxiliary Fuel Fired Coolant Heater: Espar Hydronic 5	www.espar.com

TABLE OF CONTENTS

APPENDIX

A: Fuses located on the control center

ATC-A Fuse 10 Amp
This fuse provides short circuit protection for the unit controls.

ATC-B Fuse 5 Amp
This fuse provides protection for the battery sense wire.

ATC-C Fuse 15 Amp (Mini)
This fuse provides protection for the condenser fan.

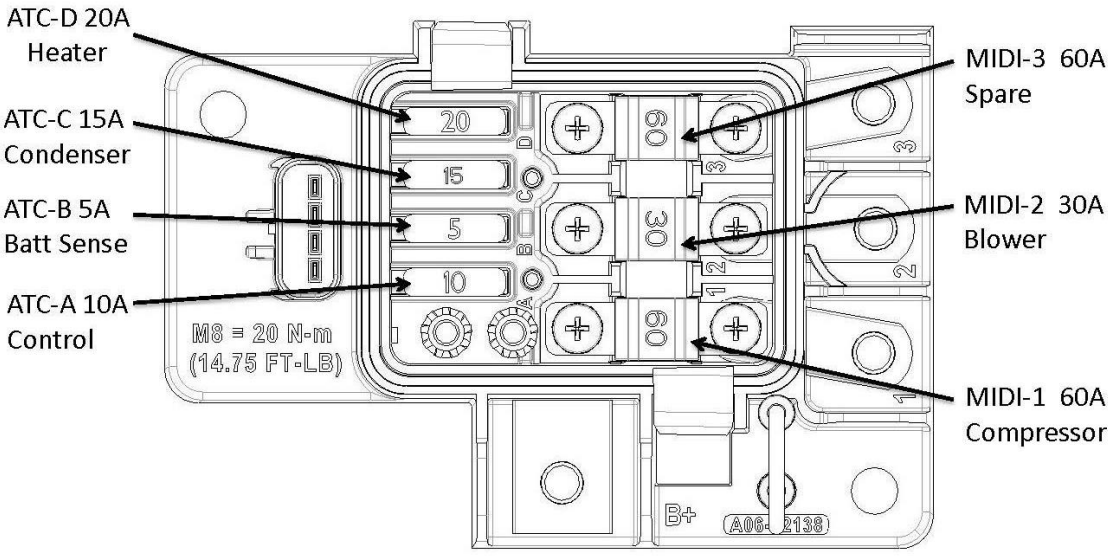
ATC-D Fuse 20 Amp (Mini)-Heater
This fuse provides protection for the fuel operated heater.

MIDI-1 Fuse 60 Amp
This fuse provides short circuit protection for the compressor.

MIDI-2 Fuse 30 Amp
This fuse provides protection for the evaporator blower.

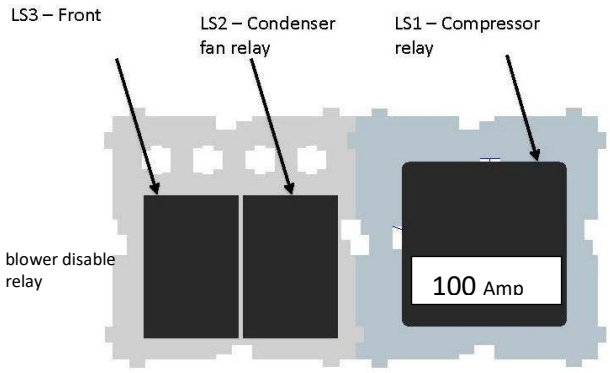
MIDI-3 Fuse 60 Amp
Spare fuse.

Fuse 80 Amp
This fuse provides protection for the main battery power to the ParkSmart unit. This fuse is located in the rear battery box.



B: Relays

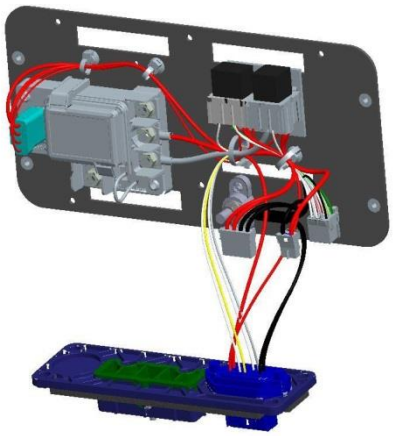
Location: On the control center



LS1 – 100 amp. This relay controls the voltage to the compressor controlling section of the Control PCB Assembly.

LS2. This relay controls the voltage to the condenser fan.

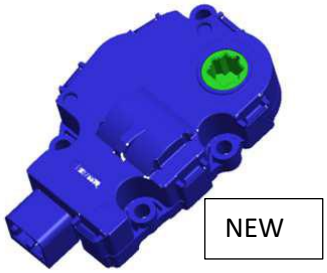
LS3. This relay prevents the front HVAC system from operating when in optimized idle operation.



C: Blend Door Actuator

This actuator operates the blend door, changing the air flow path through the ParkSmart evaporator coil and heater core.

<u>Beginning 2/2017 Parksmart uses a new blend door actuator and door.</u>



D: AUX Control Panel

Backlights light for 8 seconds when touched in Park mode.
Operates like standard Auxiliary HVAC when the engine is running

Pushing "PARKED" button with Engine off / brakes set starts parked mode and illuminates parked button LED.
Unit exits parked when, engine is started, unit is shut off or batteries are depleted.
See owner's manual for Opt-Idle operating instructions.

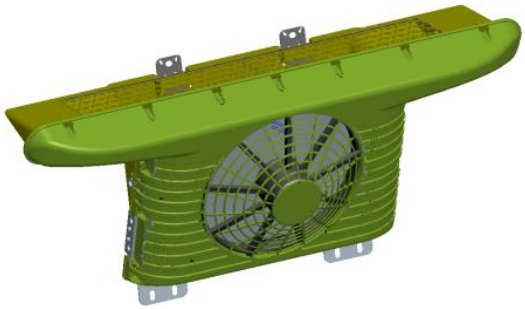
NOTE: If opt-idle is engaged, PARK button does not function.
Unit operates as a standard bunk unit.

E: Condenser Fan

Prior to 10-2015

This fan draws air through the condenser coil to cool the refrigerant flowing through the system. The hot air is exhausted away from the truck.

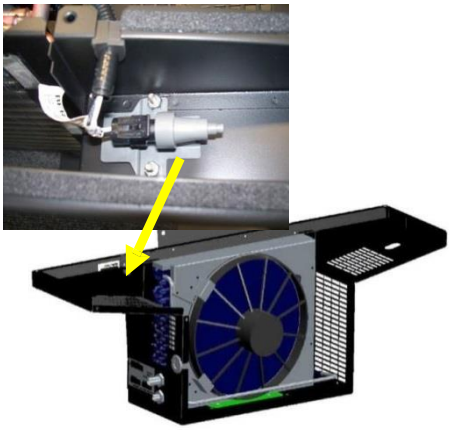
New Plastic Condenser beginning 10-2015 has serviceable receiver drier



⚠ **Cleaning condenser – See page 33**

F: Ambient Outside Air Sensor

This sensor monitors the air at the condenser coil. See appendix N Page 19 for test instructions.



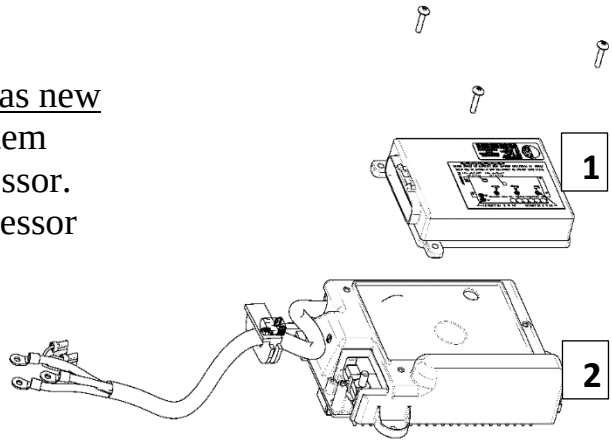
G: Charge Port

Internal components

A: Control PCB Assembly

This device stores the operating program and controls the **ParkSmart** Unit, as well as controls the output voltage to the variable speed compressor. It is located in the upper section next to the evaporator blower.

NOTICE: Beginning early 2017 Parksmart unit has new separate controllers. The top section (1) is the system control. The lower section (2) controls the compressor. See pages 43-46 for servicing the new split compressor controller and phase harness.



WARNING: Please verify your controller matches the Parksmart Opt Idle unit. All trucks built after 3-7-2016 use an Opt Idle system controller - including trucks that do not have Optimized Idle.

NOTE: Unit must be serviced with Optimized Idle service controller, failure to do so will cause the unit to be inoperable in parked mode.

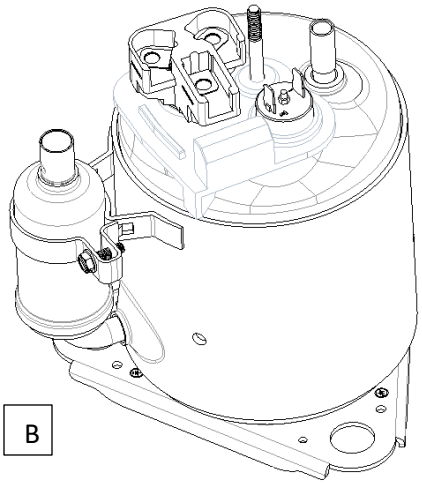
B: Compressor

This unit is part of the hermetically sealed refrigeration system.

Units built March 2013 to 10-2015 use cluster block terminals for controller connection. Photo A.


A

Units built 10-2015 to current use ring terminal compressor connections. Photo B.


B

For servicing cluster block Harness or Controller, follow instructions on pages 34-36.

For servicing RING TERMINAL harness or controller, follow instructions on pages 37-40.

New 10-2015

C: Thermal Limit Switch on Compressor

This is a normally closed switch to protect the compressor from high temperature.

D: Evaporator Blower

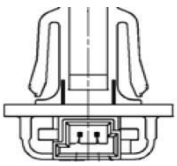
This blower pulls air through the evaporator coil to cool the interior of the sleeper.

⚠ Blower motor change 4-2015. Installing a new style motor in an older unit will require a jumper harness

E: Binary Pressure Switch

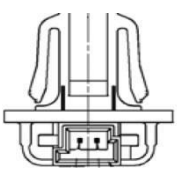
This unit has a serviceable Schrader mounted switch. Opens for low or high-high side pressure.

F: Evaporator Sensor/Freeze Switch



This sensor stops and prevents the operation of the compressor if ice was to form on the evaporator coil. See appendix F for test instructions.

G: Sleeper Sensor

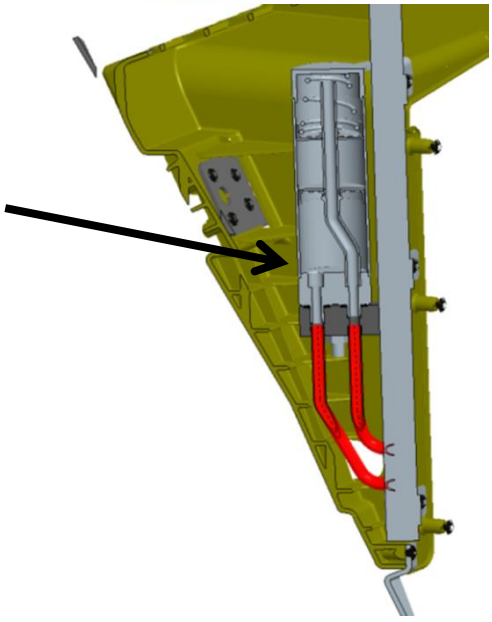


This sensor monitors the sleeper compartment temperature. See appendix M for test instructions.

H: Evaporator inlet filter:

This filter protects the evaporator coil from dust and debris. It is washable and should be serviced every other month by washing dust and debris off with warm water. In environments with pets or dusty environments the filter may need more frequent washing. Failure to do so will affect the performance of the unit and could lead to drain tube clogging.

I: Receiver Drier / serviceable



Beginning in 10 - 2015, Parksmart steel condenser assembly was changed to a plastic model which contains a serviceable receiver. Torque drier to 180 inlb's in gradual steps.

Attention: Steel condenser and plastic condenser have unique line sets. WILL NOT INTERCHANGE without changing ½ set of lines!

ParkSmart System Diagnostic Table

TRUCK MUST BE IN PARKED MODE TO PERFORM DIAGNOSTIC TESTS. DO NOT PERFORM DIAGNOSTICS IN OPT-IDLE MODE

For additional wiring diagrams and J1939 fault codes see Freightliner doc # C02.03

When testing AC portion of unit ESPAR HEATER must be disconnected.

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION / SEE APPENDIX
Unit Will Not Run or Turn On	1. Loose connection 2. No power is available at the unit. 3. Blown fuse or fuses 4. Defective AUX Control panel. 5. Lost signal to Aux Control Panel - WAKE UP 6. Control PCB Assembly defective. 7. Park Switch defective or wrong logics. 8. No 12 volts to pin C3 battery sense. 9. Broken wire or defective wire harness 10. Parked button illuminates for a couple of seconds but unit does not run.	1. Confirm all connections are tight, including ground lugs, and terminals crimped on wires and battery cables. 2. Check batteries for voltage. Low voltage cut out 11.9 if ambient temperature is above 50 degrees. 12.0 if below 50 degrees. 3. Check ATC-A fuse for continuity and/or voltage and 12 volt input at pin C1 on Control PCB Assembly. See appendix F. 4. Check for 12 volts and ground at AUX control panel. See appendix B 5. Check Wake up signal pin D6 on Control PCB Assembly. See appendix B and /or H. 6. Test Control PCB Assembly. See appendix H 7. Truck parked 0 volts to pin C4. Brakes released 12 volt to pin C4. Check for input. See Pin out chart page 29. 8. Check fuse ATC-B 12V power signal from batteries to pin C3 on PCB assembly. See Pin Out Chart page 29. 9. Inspect all wiring and harness connections. 10. Check for loss of communication on Can Bus J1939. Check for loss of wake up signal (switched to ground) from control to pin D6 on Control PCB Assembly. See appendix B
Unit runs in parked mode but not engine running mode.	1. Truck communication	1. Inspect all wiring and harness connections, including J1939 Can Bus
Unit runs in ***Engine On*** mode, but not ***Engine Off***	1. Low Batteries 2. Park Brake Signal 3. Wake Up Signal 4. Wiring Harness 5. Incorrect System Controller	1. Check batteries. See Appendix A 2. Park brake switch defective, wiring harness issue or wrong switch logics 3. Loss of wake up signal. Check Aux control panel and control PCB Assy. See Appendix B & H. 4. Check wiring harness connectors and physical condition. 5. Installing Non Opt Idle controller in Opt Idle unit – unit works engine on but not Engine Off. Verify controller part number matches Opt Idle unit.
Front HVAC system runs in optimized idle	1. Relay LS3 2. Wire Harness	1. Check for 12V and ground at pins 85 and 86 on relay 2. Check wires back to pin D12 on PCB assembly. See wiring on page 23-28 and chassis wiring. Check relay for operation/relay did not open.

TRUCK MUST BE IN PARKED MODE TO PERFORM DIAGNOSTICTESTS!

Items listed are possible causes and are not intended to be followed as exact steps. Many items should be confirmed using Service Link!

Unit Runs - But Does Not Blow Cold Air CHECK SERVICE LINK Also see C02.03 section-7 Cooling Performance	Δ Check Service Link for faults (Examples) • Ambient outside air temperature • Evaporator temperature / freeze sw. • Sleeper Temperature • Refrigerant pressure binary switch 1. Evaporator airflow blockage. 2. Check Sensors 3. Thermal Expansion Valve 4. Overcharged refrigerant system 5. Condenser fan or coil blocked 6. Compressor Fuse or Relay. 7. Blend door position. 8. Evaporator blower. 9. Compressor controller & phase harness connections. 10. Compressor thermal switch. 11. High side pressure switch 12. Loss of charge. (refrigerant system is serviceable) 13. Defective compressor	See fault code list for complete listing 1. Clear any blockage from recirculation filter, grill and louvers. 2. Check evaporator / sleeper / ambient air sensors. See appendix F, M, and N 3. Thermal expansion valve – refrigerant flow - see appendix F 4. Overcharged system – see appendix D 5. Check condenser fan, inlet and outlet for restriction (outside behind sleeper). See appendix I and pages 32-35. 6. Check F1 fuse and PARKED MODE LS3 relay. See appendix E and D. Confirm all wire harness plugs are connected. 7. Check blend door operation. See appendix L 8. Check Evaporator blower. See appendix J. 9. Check Control PCB Assembly and power to compressor. See appendix H and pages 36-46 10. Check thermal switch. See appendix G 11. Check pressure switch (Normally Closed). Switch open low at 29-35 psi and opens high at 420-430 psi. See appendix D 12. If all tests check OK a loss of charge may have occurred. Check for pressure switch fault. Follow Freightliner service instructions. 13. If all above items are ok and power is detected at the compressor but it does not operate, the system refrigeration loop must be replaced. See Freightliner service instructions.
Unit Cycles On And Off	1. Poor electrical connection. 2. Condenser fan inoperative. 3. Air flow blockage causing high pressure or freeze condition. 4. Condenser coil blocked or fan not operating	1. Check all electrical connections. 2. Check condenser fan. See appendix I 3. Check for restricted airflow under truck at condenser inlet and outlet and at louvers and recirculation grill. Check pressure switch and/or freeze switch. See appendix D and F 4. Check fan and/or clean coil. See appendix J & pages 32-35.
Unit Blows Cold Air, But Low Airflow	1. Check all duct work connections. 2. Evaporator coil or filter blocked 3. Evaporator blower motor	1. Make sure all ducts are connected, sealed and secure. 2. Check for airflow at louvers, replace or clean return air filter. 3. Check evaporator blower motor. See appendix J
Unit Runs Correctly, But Less Than Expected Run Time	1. Ground terminal(s). 2. **AUX** batteries weak or not charged correctly. 3. Trucks main batteries poor condition 4. High amperage draw 5. Defective Outside air temperature sensor. 6. NON AGM BATTERIES	1. Inspect and tighten ALL connections. 2. Check battery condition / state of charge. See appendix A 3. Check Main truck batteries for condition and state of charge. See appendix A 4. Use DC ammeter to check amps when running. Excessive amperage could signal compressor or internal component issue. Amperage ranges 40A to 75A depending on conditions 5. Energy management stops/ amp usage will increase. See appendix O. 6. Non AGM batteries in any location will greatly reduce run time.
Unit is Noisy or Vibrates	1. Evaporator Blower motor. 2. Condenser fan motor. 3. Compressor mounting.	1. Check evaporator blower. See appendix J 2. Check condenser fan. See appendix J & pages 32-35 3. Check rubber compressor mounts. See appendix K
Unit runs but does not blow hot air	1. Heater power and ground 2. Heater fuse 3. Wiring harness 4. Heater enable signal 5. Blend Door 6. Park switch	1. Check for power at the heater pins 1 & 2 2. Check heater fuse ATC D. See page 5 3. Check wiring harness connectors and physical condition 4. Check heater enable 12V at heater pin 7 from PCB pin C15 5. See appendix L 6. Incorrect park brake switch will prevent heater from operating.

Note: Heater diagnostics can be performed using Espar's EDITH diagnostics laptop based program. You must have the ISO cable adapter for the ParkSmart Hydronic heater. Rev 3-4B use the proprietary 4 wire adapter/Rev 5 uses the 8 pin adapter.

Appendix

A. Battery Condition and Performance:

Battery Voltage is critical for system operation. Special attention should be given to both sets of batteries.

Attention: Poor quality truck batteries or a weak alternator will have a Negative impact on **ParkSmart** unit run time. Always maintain the best possible batteries and charging system.

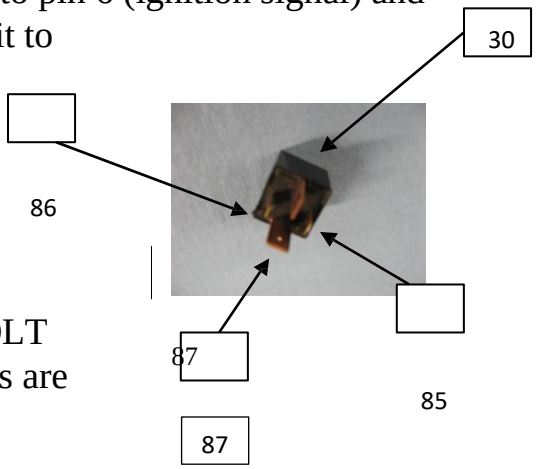
ParkSmart Opt-Idle alternator 270 Amp.

Load test and maintain batteries as required by the manufacturer.

B. AUX Control Panel Testing: <u>Attention! Conduct this test with ENGINE OFF/ KEY OFF AND BRAKES SET!!!</u>

First, check for proper voltage and signal at the 6 pin connector. You should have 12 volts across pins 4 (pos) and 5 (neg). You should also have 12 volts at pin 24 (wake up signal). Pushing the parked button switches the 12 volts at pin 24 to ground, signaling the Park Smart unit to operate.

During this test, you should not have 12 volts to pin 6 (ignition signal) and you must have Can Bus connection for the unit to operate.



C. Relay Testing

With relay unplugged, confirm there is 12 VOLT on the sockets where 85 and 30 relay terminals are connected.

If you do not have 12 VOLT here check fuses, wiring and battery connections.

<u>Now, with relay unplugged</u>, check across terminals 85 and 86 of the relay, using a continuity tester or an OHM meter. You should have continuity or an ohms value through the relay coil. If you do not, replace relay.

In Parked mode, as soon as you turn the **AUX Control Panel** blower switch on and set the temperature control to cold and push the parked button, terminals 86 on LS1 and LS2 relays become connected to ground internally on the Control PCB Assembly pins D10 and D11. When this happens the relays will pull in the contacts and allow voltage through the relays. You should now have 12 VOLT passing through the relay on spade terminal 87 to the condenser fan and the compressor controlling section of the Control PCB Assembly.

NOTES:	**If opt-idle is engaged, PARK button does not function. Unit operates as a standard bunk unit. Front HVAC unit is disabled through Relay LS3 when opt-idle is engaged.**

With relay plugged in: TURN THE UNIT ON IN PARKED MODE. If you do not have 12 VOLT on terminal 87, check across terminals 85 (+) an 86 (-). You should have 12 VOLT. If you have 12 VOLT here and do not have 12 VOLT on terminal 87 your relay is defective. The internal coil of the relay is energized but the contacts are not closing. Replace the relay.

If you have 12 VOLT on terminal 87 and the compressor does not run you could have a defective Control PCB Assembly or compressor. See testing Control PCB Assembly Appendix I.

D. Binary Switch Testing: You must remove the top section of the ParkSmart unit to access the switch. Check J1939 for any fault codes. **The Schrader mounted switch is serviceable (see photo E page 10)**. It opens on low or high – high side pressure. If pressure switch is open or service link shows a fault, you must connect to the loop and check system pressure. Switch opens between 27-35 psig low or 426-483 high.

NOTE: High system pressure and poor performance can occur if the system is overcharged! If the system has been serviced / recharged and does not operate correctly, please verify refrigerant charge level is correct. See page 31.

When the unit is off for a few minutes, unplug the 32 pin connector on the PCB assembly and check across terminals D2 and D5, you should always have continuity. If you do not, you may have a broken wire, bad connection, pressure situation or defective switch. If the pressure, harness and connections are ok, the PCB assembly may have to be replaced. Call Freightliner Dealer

E. Check continuity across fuse body (fuse does not look blown)
Remove fuse from fuse holder. Using a meter, check for continuity across the fuse. You can check for voltage across the fuse using a dc volt meter.

F. Evaporator Sensor/Freeze Switch Testing: Location: Top of unit, behind the evap coil, just inside the cabinet base. **IF THE SENSOR OR CIRCUIT HAS A SHORT OR OPEN, the fault code will be seen on J1939.**

The freeze switch is a temperature sensor. To verify the condition you will need a Volt/OHM meter. If a freeze condition occurs, temperature at or below 39°, the unit will stop the compressor. If the freeze condition leaves, the compressor will restart and the **ParkSmart** unit will continue to run. See chart page 20 for sensor test data.

Thermal Expansion valve blocked or partially blocked can cause improper refrigerant flow and a freeze up condition at the evaporator coil. Check for ice on tubes next to return air filter. A broken capillary tube will also cause the same condition. TXV / cap tube are not serviceable.

G. Compressor Thermal Limit Switch: You must remove the compressor cover of the ParkSmart unit to access the switch.

This device is a normally closed switch. If the compressor gets too hot, the thermal limit switch will open and the compressor will stop. Checking with a meter you should always have continuity between the two terminals when it is cool. Also check harness and connection at circuit board.

H. Control PCB Assembly:

Do not attempt to test the controller or compressor until you have completely eliminated all other possibilities. PCB assemblies have removable harness and cluster block.

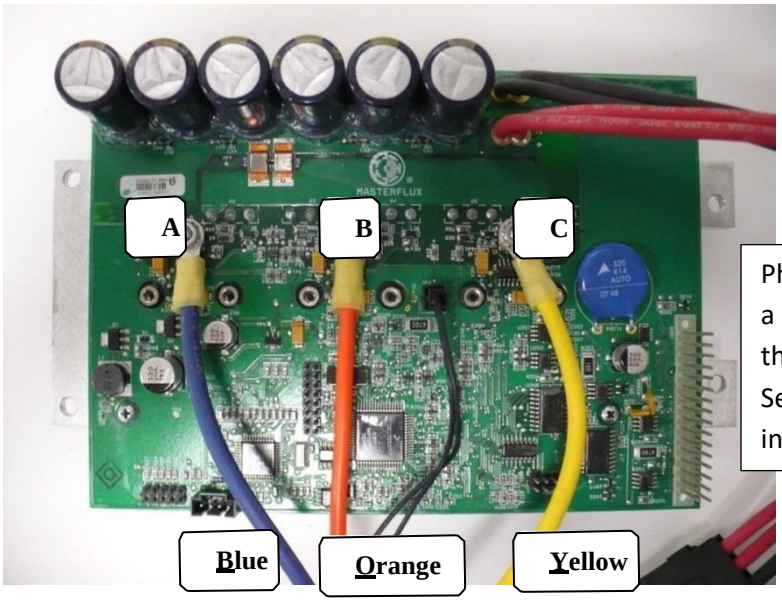


Photo is generic. If replacing a harness, be sure to follow the original OE routing path. See pages 36-46 for routing instructions.

Wires must always be connected in this order and torqued to 12-14 inch LBS (+or- .89 inlb)

In parked mode, when you turn the **ParkSmart** unit on, if the outside temperature is above 40°F and the sleeper temperature is above 60°F, the compressor relay LS1 and fan relay LS2 will close. LS1 will send 12 VOLT main power from terminal 87 to the compressor controller section of the control PCB assembly. LS2 will send main power through its terminal 87 to the condenser fan. If all other conditions are ok, such as the high pressure switch, freeze switch and the compressor thermal limit switch, the compressor controller will then send voltage out to the compressor.

Check for 12 VOLT from the ATC-A fuse going to the PCB controller pin C1. Also check fuse ATC-B, 12 volts, to pin C3 (Battery Sense). The ParkSmart unit will not operate if battery sense is below the LVD. At ambient temperature >50F - LVD is 11.9V, < 50F - LVD is 12.05V. Before condemning an internal component or unit, try operating the unit with engine running.

!!! Cluster Block units – see instructions page 36-37 !!!

Ring Terminal Units – Follow steps below also see pages 38 - 46

If you have the correct voltage in you should have voltage out on the three phase wires connected to the compressor. Remove controller cover. Disconnect the three phase wires from the controller.
NOTE: See warning on page 36 for testing controller with phase wires disconnected!
Using a volt meter check each post, positive on (A, B or C) negative to battery ground. If you do not have a 6 volt pulse voltage out on each post, replace the controller. Pulse voltage means the controller will cycle to each colored wire. You may see the voltage appear and disappear continuously depending on your meter. It cycles fast and some meters may not pick up the cycles.
If you do have a 6 volt pulse voltage out on each post and at the compressor and the compressor does not run you have a defective compressor.

When reconnecting the three wires you must always use new screws and connect blue to A, orange to B, and yellow to C.

Additional wiring diagrams and controller pin-out table located after Appendix

I. Condenser Fan Motor Testing: First do a visual inspection of all fan parts. Also see appendix V and pages 32-35. Condenser is located outside the truck on rear sleeper wall.

Reconnect any wires or plugs you might have disconnected when removing the cover. Turn the **Parked Unit on,** if you do not have 12 volt at the fan, check fuse ATC-C And relay LS2. If you have 12 VOLT main power, check for the signal voltage from pin C 7 (white wire). You should have zero voltage with unit off and 1.6 to 3.9 volts unit on. If all voltages are correct, reconnect the plug. If the fan does not run see additional tests on pages 30 – 33.

Using a DC ammeter you can check the amperage draw of the blower. Normal amps approx. **9.5** max.

Caution: If attempting to connect blower to an outside power source, internal electronic components are sensitive to arcing or reverse polarity! Damage will occur!!

NOTE: Anytime the unit has been operating and shuts down or is turned off, the condenser fan will continue to run for 90 seconds to cool the system.

J. Evaporator Blower Motor Testing: First do a visual inspection of all blower parts. Check J1939 for any fault codes. For evaporator fan location see Freightliner instructions.

Reconnect any wires or plugs you might have disconnected when removing the cover. Turn the **Parked Unit on** and check for 12 VOLT at the unit side of the wiring harness. If you do not have 12 volt, check fuse MIDI-2. If you have 12 VOLT main power, check for the signal voltage from pin C 13 (tan wire). You should have 10 volts on low speed and approx. 6 volts at high speed. If all voltages are correct, reconnect the plug. If fan does not run, it is defective, and needs to be replaced.

Using a DC ammeter you can check the amperage draw of the blower. Normal amps approx. **10** on high

Caution: If attempting to connect blower to an outside power source, internal electronic components are sensitive to arcing or reverse polarity! Damage will occur!

Blower motor change 4-2015. Installing a new style motor in an older unit will require a jumper harness.

K. Compressor Rubber Mounts:
Visual inspection of the compressor rubber mounts may be necessary if excessive vibration is present. Check for loose mounting nuts. If mounting nuts and captive studs are ok, vibration could be from the internal part of the compressor. If so call your Freightliner dealer.

L. Blend Door Actuator: For blend door location see Freightliner ParkSmart documents. Check J1939 for any fault codes.

Physical inspection can be seen through the top of the unit by removing the main controller or evaporator blower.

This actuator motor drives the blend door. Each time the unit is powered up the door sets to full cold. Removing the ATC-A fuse will reset the unit and the blend door.

When in the heat mode the blend door will direct recycled air through the heater core as directed by the Aux. Control Panel in order to maintain a preset temperature. The Espar Hydronic coolant heater will provide a constant flow of heated coolant through the heated core for internal bunk heat as well as engine heat.

You cannot bench test this actuator.

Check for 12V at pin 2 on the actuator, this is power for pin C8 on the Control PCB Assembly. Use a common ground to check this voltage. With unit operating, phases A, B, C and D are switched to ground in a sequence. With the door in a stationary position check for 12V, you should have 12V on each phase. When the door is being positioned, these phases will be switched to ground. The voltage will be near zero on a switching phase.

M. Sleeper Temperature Sensor: Location see Freightliners instructions

This sensor monitors the sleeper internal temperature. See chart located after appendix for testing data.

IF THE SENSOR OR CIRCUIT HAS A SHORT OR OPEN, the fault code will be seen on J1939

If this sensor fails, the unit will default to 72 degrees.

N. Ambient Outside Air Temperature Sensor:

This sensor monitors the ambient air temperature. See chart located after appendix for testing data.

If this sensor fails open or shorted the power management system stops and although the unit will still operate, the total run time of the battery pack will be reduced.

If this sensor has a partial failure and reads an incorrect temperature, it may prevent compressor operation.

It is located in the condenser unit outside the truck on rear sleeper wall.

Evaporator Sensor / Freeze Switch Resistance Chart

	A	B	C	D
1	Evaporator Sensor			
2				
3	Temp(ºF)	Temp (ºC)	Resistance (nominal)	Voltage (nominal)
4	-40.0	-40.0	92757.0	4.554
5	-31.0	-35.0	66870.0	4.402
6	-22.0	-30.0	48790.0	4.215
7	-13.0	-25.0	35937.0	3.991
8	-4.0	-20.0	26757.0	3.732
9	5.0	-15.0	20103.0	3.443
10	14.0	-10.0	15252.0	3.133
11	23.0	-5.0	11664.0	2.81
12	32.0	0.0	9000.0	2.488
13	41.0	5.0	6998.0	2.175
14	50.0	10.0	5485.0	1.882
15	59.0	15.0	4330.0	1.613
16	68.0	20.0	3443.0	1.374
17	77.0	25.0	2757.0	1.164
18	86.0	30.0	2221.0	0.982
19	95.0	35.0	1800.0	0.826
20	104.0	40.0	1468.0	0.695
21	113.0	45.0	1204.0	0.585
22	122.0	50.0	993.2	0.493
23	131.0	55.0	823.2	0.415
24	140.0	60.0	685.8	0.351
25	149.0	65.0	574.2	0.297
26	158.0	70.0	482.9	0.252
27	167.0	75.0	408.3	0.215
28	176.0	80.0	346.8	0.184
29	185.0	85.0	295.6	0.157

Sleeper Air Sensor Resistance Chart

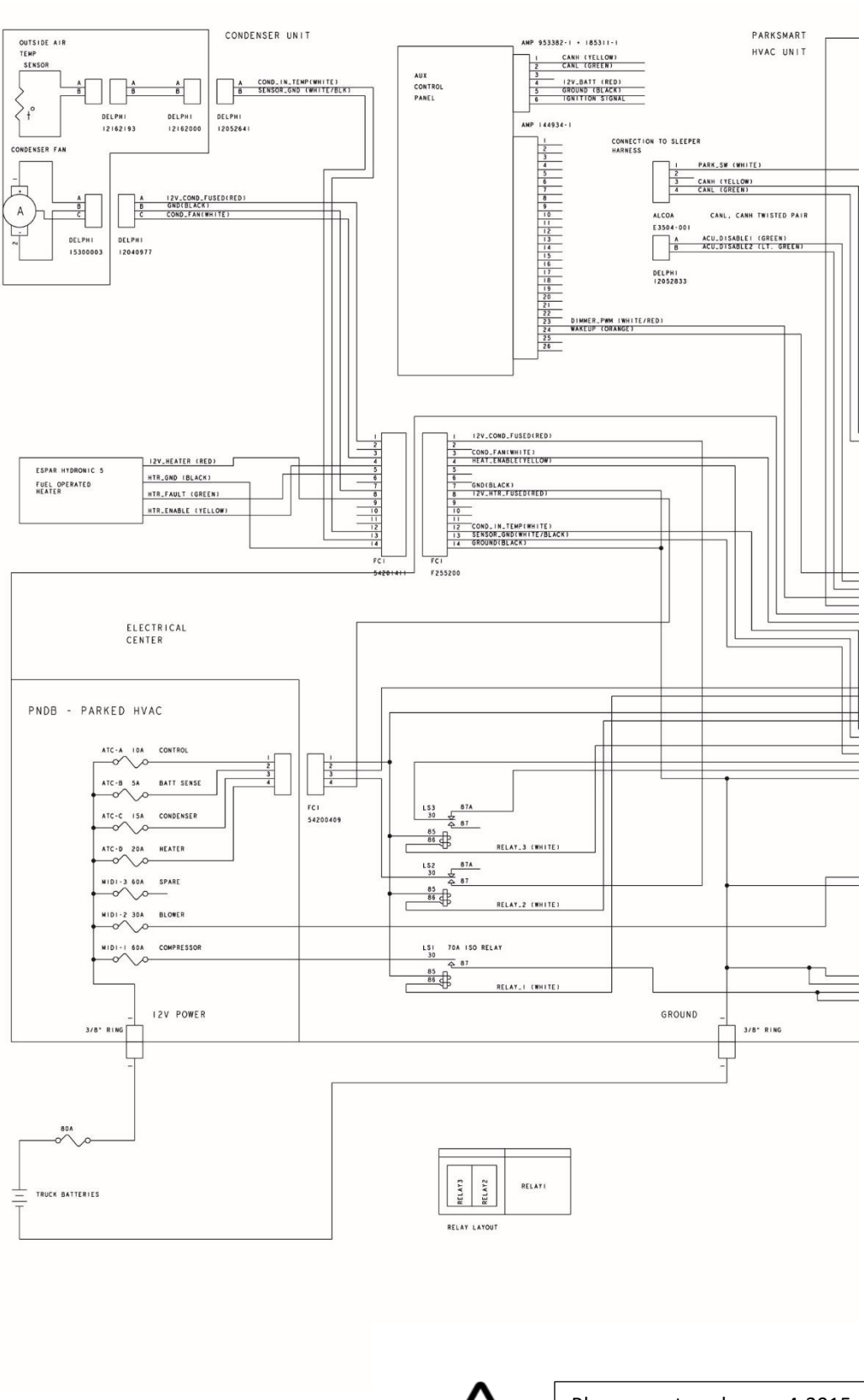
	A	B	C	D
1	Sleeper, Air Temperature Sensor			
2				
				Voltage
4	-40.0	-40.0	336500.0	4.86
5	-31.0	-35.0	242589.0	4.80
6	-22.0	-30.0	177000.0	4.73
7	-13.0	-25.0	130370.0	4.64
8	-4.0	-20.0	97070.0	4.53
9	5.0	-15.0	72929.0	4.40
10	14.0	-10.0	55330.0	4.24
11	23.0	-5.0	42315.0	4.04
12	32.0	0.0	32650.0	3.83
13	41.0	5.0	25388.0	3.59
14	50.0	10.0	19900.0	3.33
15	59.0	15.0	15708.0	3.06
16	68.0	20.0	12490.0	2.78
17	77.0	25.0	10000.0	2.50
18	86.0	30.0	8057.0	2.23
19	95.0	35.0	6531.0	1.98
20	104.0	40.0	5327.0	1.74
21	113.0	45.0	4369.0	1.52
22	122.0	50.0	3603.0	1.32
23	131.0	55.0	2986.0	1.15
24	140.0	60.0	2488.0	1.00
25	149.0	65.0	2083.0	0.86
26	158.0	70.0	1752.0	0.75
27	167.0	75.0	1481.0	0.65
28	176.0	80.0	1258.0	0.56

Ambient Outside Air Sensor Resistance Chart

	A	B	C	D	E
1	Ambient, Air Temperature Sensor				
2			**Resistance (KOHM)**		
3	Temp(ºF)	Temp (ºC)	Minimum	Normal	Maximum
4	-76	-60	1353.41	1596	1838.59
5	-58	-50	619.8	723.22	826.64
6	-40	-40	291.49	335.6	381.71
7	-22	-30	155.2	177.4	199.6
8	-4	-20	85.85	97.12	108.39
9	14	-10	49.25	55.34	61.43
10	32	0	29.33	32.66	35.99
11	50	10	17.99	19.9	21.81
12	68	20	11.37	12.49	13.61
13	77	25	9.12	10	10.88
14	86	30	7.37	8.06	8.75
15	104	40	4.9	5.325	5.75
16	122	50	3.33	3.605	3.88
17	140	60	2.31	3.605	2.57
18	158	70	1.63	2.49	1.87
19	176	80	1.17	1.75	1.34

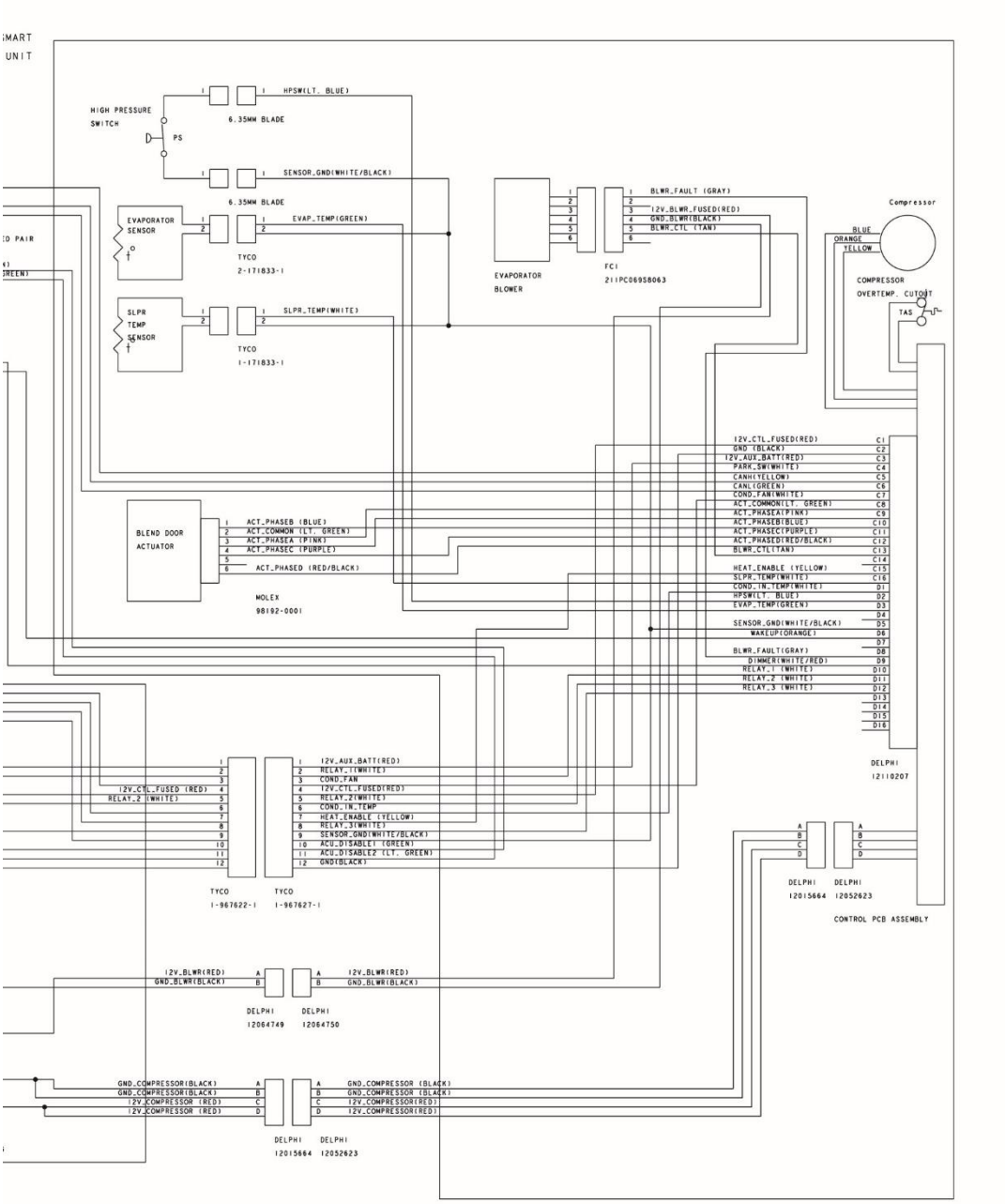
ParkSmart HVAC Wiring Diagram

For Rev 5 - OPT IDLE - Sealed Units built before 3-25-2015



ParkSmart HVAC Wiring Diagram

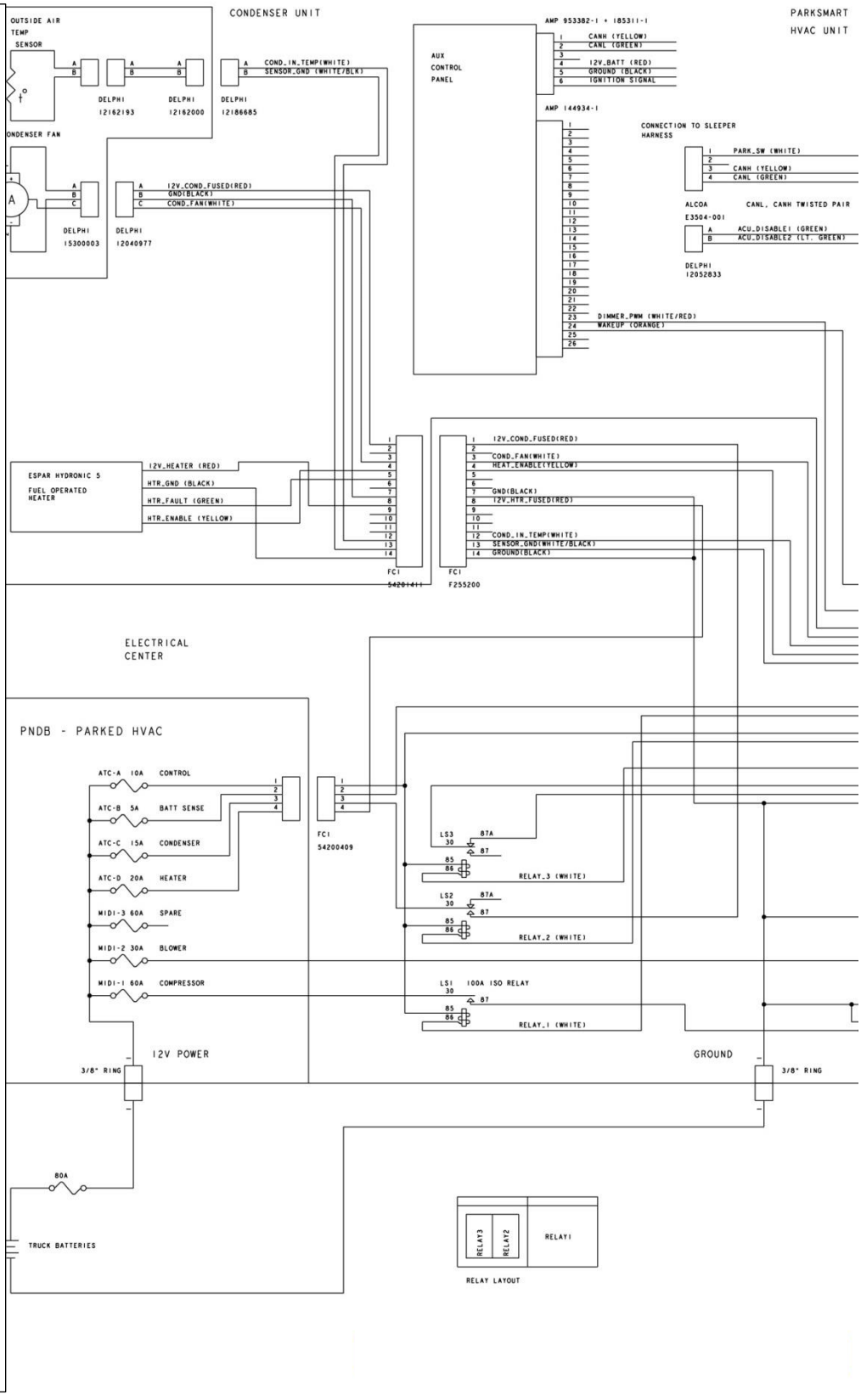
Blower motor change 4-2015. Installing a new style motor in an older unit will require a jumper harness



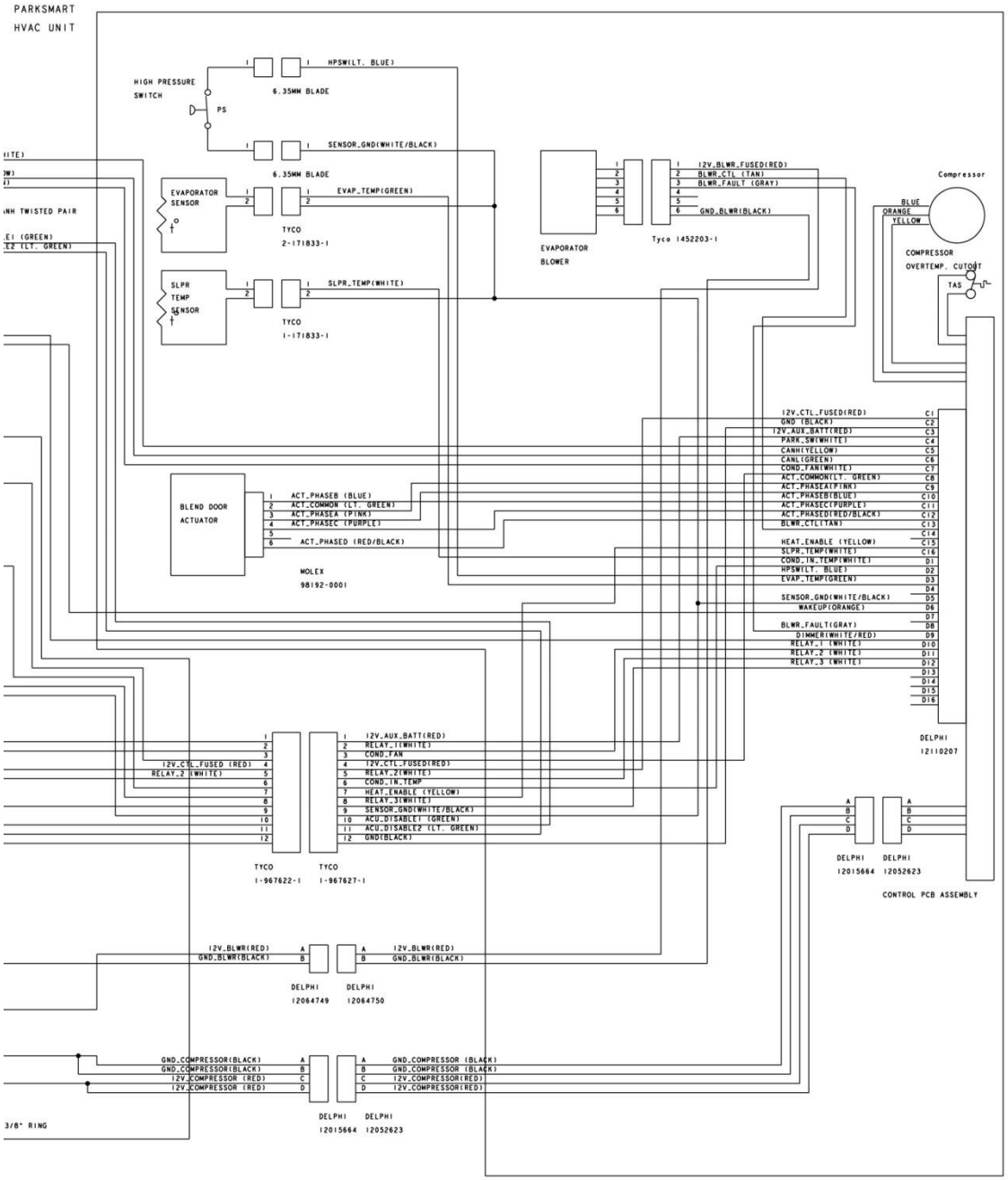
For Rev 5 - OPT IDLE - Sealed Units built before 3-25-2015

ParkSmart HVAC Wiring Diagram

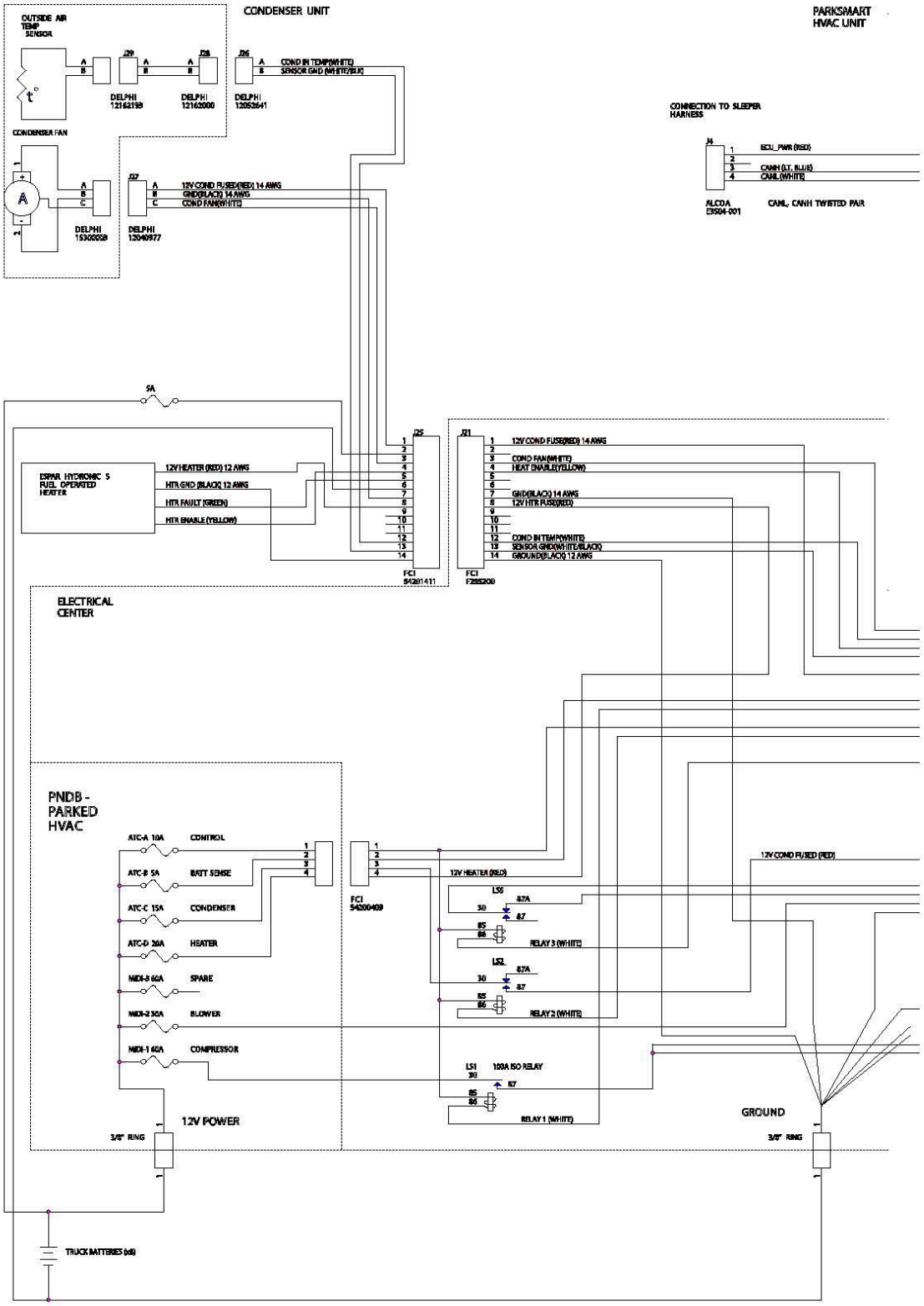
For Rev 5 - OPT IDLE - Sealed Units built after 3-25-2015



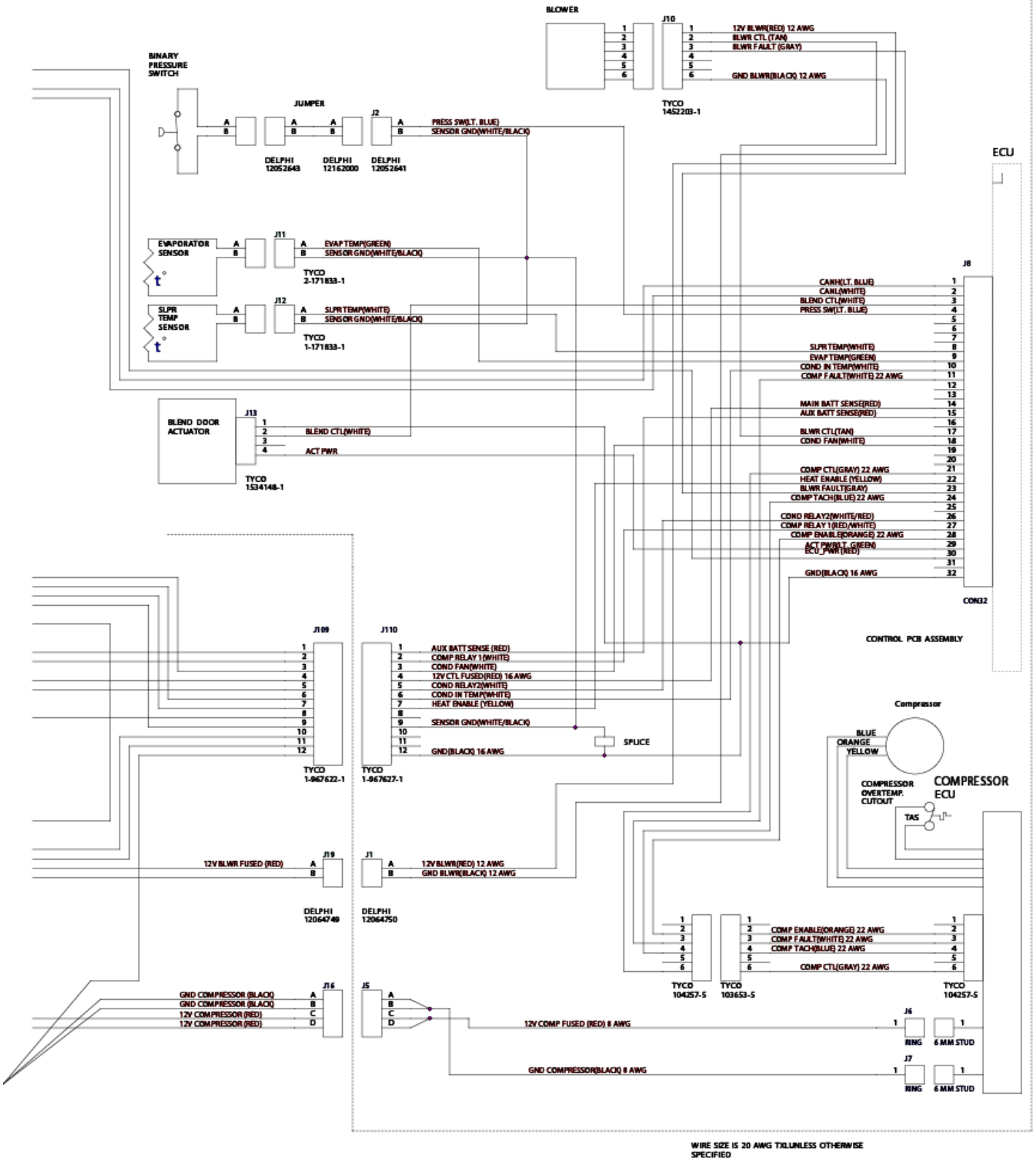
ParkSmart HVAC Wiring Diagram



For Rev 5 - OPT IDLE - Sealed Units built after 3-25-2015



Parksmart Rev 5 New design uses a 2 piece split control assembly early 2017



Parksmart Rev 5 New design uses a 2 piece split control setup. System controller PCB and compressor controller are serviced separately beginning early 2017

Pinout Chart/38N 2 piece controller setup

Connector Pin	Circuit ID	Wire Color	Function	Typical Voltage	Other End of Circuit
1	CANH	Lt. Blue	CAN bus	2.5V+	Cabin CAN
2	CANL	White	CAN bus	2.5V-	Cabin CAN
3	BLEND_CTL	White	LIN Control for actuator	0-12V serial signal	Actuator
4	PRESS_SW	Lt. Blue	Pressure Switch	>10V (unit on, switch open) <1V (unit on, switch closed)	Pressure Switch
5	N/C				
6	N/C				
7	N/C				
8	SLPR_TEMP	White	Sleeper Temperature	1.5-4V	Sleeper Temp Sensor (in sleeper control panel)
9	FREEZE	Green	Evaporator Freeze protection	1.5V-4V	Freeze sensor
10	COND_IN_TEMP	White	Outside Air Temperature	1.5V-4V	Condenser Temp Sensor
11	COMP_FAULT		Compressor controller fault output	<1V (no fault) 5V (fault present)	Compressor controller
12	N/C				
13	N/C				
14	MAIN_BATT_SENSE	Red	Battery voltage sense	Battery voltage	Electrical Center
15	BATT_SENSE	Red	Supply voltage sense	Supply voltage to NITE ECU and control panel	Truck PDM
16	N/C				
17	BLWR_CTL	Tan	Blower PWM control signal	Same as P3	Blower motor
18	COND_SIG	White	Condenser PWM control signal	<0.5V (off)	Condenser
19	N/C				
20	N/C				
21	COMP_SPD	Grey	Compressor speed control signal	<0.6V (compressor off) 1-4V (compressor on)	Compressor Controller
22	HTR_ENABLE	Yellow	Enables Espar Heater Operation	<1V (heater off) >11V (heater on)	Underfloor connector to Espar Heater
23	BLWR_TACH	Yellow	Tach signal from blower	0-5V (pulses)	Blower motor
24	COMP_TACH	Blue	Tach signal from compressor controller	0-5V (pulses)	Compressor Controller
25	N/C				
26	COND_RELAY2	White/Red	Condenser relay control signal	12V (relay off) <1V (relay on)	Condenser Relay
27	COMP_RLY_SIG	Red/White	Compressor relay control signal	12V (relay off) <1V (relay on)	Compressor Relay
28	COMP_ENABLE	White	Compressor controller logic circuit power	<1V (compressor off) >11V (compressor on)	Compressor Controller
29	ACT_PWR	Green	Power for blend door actuator	<1V (unit off) >11V (unit on)	Blend Door Actuator
30	CTL_FUSED	Red	Power for ECU	Battery voltage	Control fuse
31	N/C				
32	Ground	Black	Ground for ECU	Ground	Harness ground splice

ParkSmart System Fault Codes (J1939)

Name	Description	SPN	FMI	Transmitting Module	Limitations
Evaporator Sensor	Shorted to ground	1547	4	FCU/ACU	—
Evaporator Sensor	Shorted to battery or open circuit	1547	5	FCU/ACU	—
Sleeper Sensor	Shorted to ground	1548	4	FCU/ACU/ACU	—
Sleeper Sensor	Shorted to battery or open circuit	1548	5	FCU/ACU/ACU	—
Ambient Air Sensor	Shorted to ground	171	4	FCU/ACU/ACU	—
Ambient Air Sensor	Shorted to battery or open circuit	171	5	FCU/ACU/ACU	—
Blend Door Actuator	Voltage above normal or shorted to high source	523330	3	FCU/ACU/ACU	—
Blend Door Actuator	Voltage below normal, shorted to low source or open circuit	523330	4	FCU/ACU/ACU	—
Blower Motor	Protection Mode: Voltage out of range	523318	2	FCU/ACU/ACU	Diagnostic feedback PWM signal is 10Hzzx50zxx duty cycle
Blower Motor	Protection Mode: Overcurrent or thermal protection	523318	6	FCU/ACU/ACU	Diagnostic feedback PWM signal is 10Hzzx25zxx duty cycle
Blower Motor	Protection Mode: Speed mismatch or blocked rotor	523318	7	FCU/ACU/ACU	Diagnostic feedback PWM signal is 10Hzzx75zxx duty cycle. Use of this FMI assumes a mechanical problem
Over Pressure	Refrigerant pressure open circuit	605	5	FCU/ACU/ACU	Outside temperature must be above 40ºF, sleeper temperature must be over 60ºF, and cooling must be requested. (Check at full cold temp settings)

701 — Approved Leak Detection Methods

The ParkSmart system uses a non-conductive compressor oil. Use only polyvinylether (PVE) refrigerant oil in this system. The system should never be recovered to check AC charge. The ParkSmart system does not need any oil added unless refrigerant loop components have been replaced, or the system has been recovered in excess of 4 times. Addition of improper oil types, or too much oil, will cause damage to the compressor.

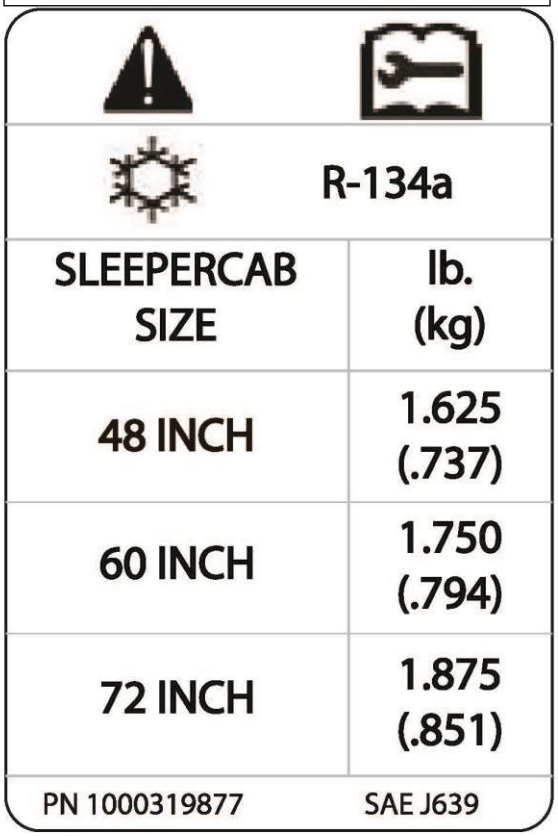
In units built from start of production through June of 2011, the ParkSmart refrigerant loop is not serviceable. When a performance complaint is coupled with evidence of a refrigerant leak, standard leak detecting methods may be employed to confirm the unit is losing refrigerant. The refrigerant type is R-134a. Follow the manufactures' operating instructions and use the leak detectors from the approved tool list to confirm suspected leaks. If a leak is confirmed on an underperforming unit, the refrigerant loop will need to be replaced with a new one.
Beginning in July of 2011 an R-134 A/C service port has been added to the high pressure side of the ParkSmart system for charging and recovery of refrigerant. Charging and recovery of this system should not be done until after the other troubleshooting methods have pointed to low or no refrigerant in the system.

CHARGE LEVELS

Refrigerant levels changed with the new Plastic condenser

Prior to 10-2015

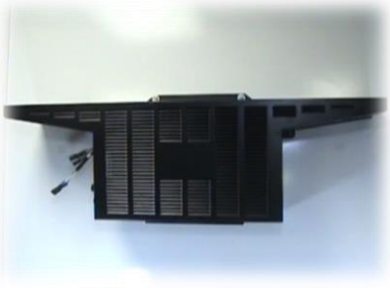
Steel Condenser



After 10-2015

Plastic Condenser

Refrigerant level is the same for all models



Subject: Diagnosis of Intermittent System Operation Resulting in Low
or No Cooling Performance

Background

Various conditions can cause a system to operate intermittently and have little or no cooling ability. When servicing a specified unit for operation or performance, it is necessary to make sure the condenser fan is operating correctly.

See exploded view on page 32.

The condenser fan motor may exhibit “dead spots” prohibiting start-up when the HVAC unit is turned on. This motor is made-up of 24 cog positions roughly 1½ inches apart on the condenser blade.

Driver Observation

- ParkSmart no-idle system is not operating continuously or no cooling.

Diagnostic Procedure for Technicians (Estimated time – 10 minutes)

1. Follow manufacture safety guidelines when servicing this vehicle. Verify the following: Engine off, key off, and parking brakes set.
2. Start the ParkSmart no-idle system in parked mode and adjust settings to full cold and high blower speed to which the parked button must be pushed. Visually inspect condenser fan to verify proper operation. If the condenser fan is not operating, verify for 12 volts across the red and black wires at the condenser fan plug. Also, verify signal voltage is present at the connector. **If the condenser fan has 12 volts and signal voltage but is not working properly please carry out the service replacement procedure. (See page 31).**

   Note: For complete fan diagnostics it is necessary to perform additional phase tests. This preliminary test in *step 2* only confirms the condenser fan operates on one phase of the motor.

   If the condenser fan appears to be working properly continue diagnostic and verify the following:

3. Disconnect power to the condenser fan before advancing through the diagnostic procedure. Failure to follow this step may cause bodily injuries to yourself and/or others as well as damages to the specified unit. This warning is for your protection and information.
4. Remove all 17 mounting screws from the condenser fan cover.
5. Mark “fan blade” with silver permanent marker as shown. This will be the home location.

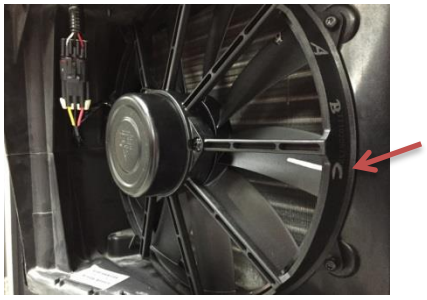
Location 1

Mark “A” as the first test location

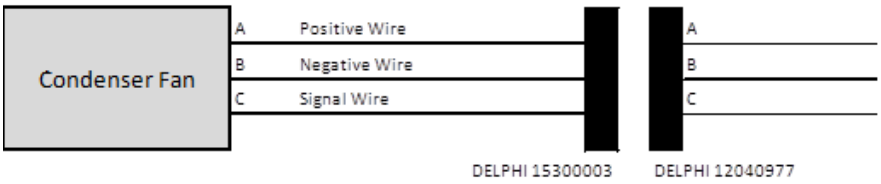
Diagnostic Procedure for Technicians (Estimated time – 10 minutes) - Continued

6. Rotate clockwise 1 cogging torque position and mark the second test location “B”.

7. Rotate clockwise 1 cogging torque position and mark the third test location “C”.



8. Return fan blade to the home location (“A”) and reconnect power to the condenser fan.
9. Start the ParkSmart no-idle system and adjust settings to full cold and high blower speed. Visually inspect condenser fan to verify proper operation. If the condenser fan is not operating, verify for 12 volts across the red and black wires at the condenser fan plug. Also, verify signal voltage is present at the connector. **If the condenser fan has 12 volts and signal voltage**

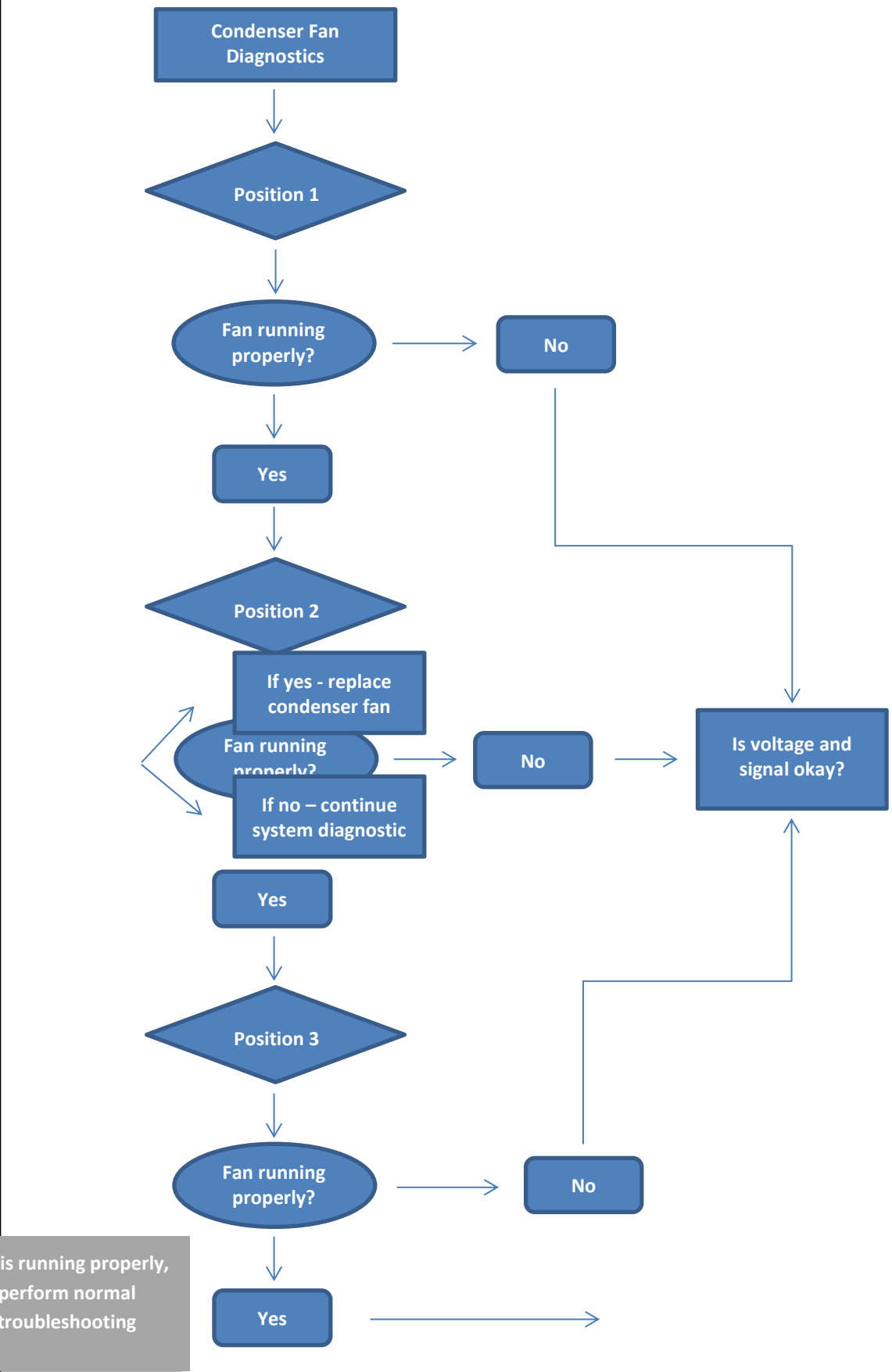


but is not working properly please carry out the service replacement procedure.

10. Once fan has been confirmed functional, shut down the ParkSmart no-idle system and disconnect power to the condenser fan.
11. Wait until the fan completely stops running.
12. Repeat steps 9-11 for test locations B and C.
13. If the condenser fan is working properly in positions A, B, and C the diagnostic procedure is complete. No further testing is required. Reconnect the condenser fan and reinstall the cover.

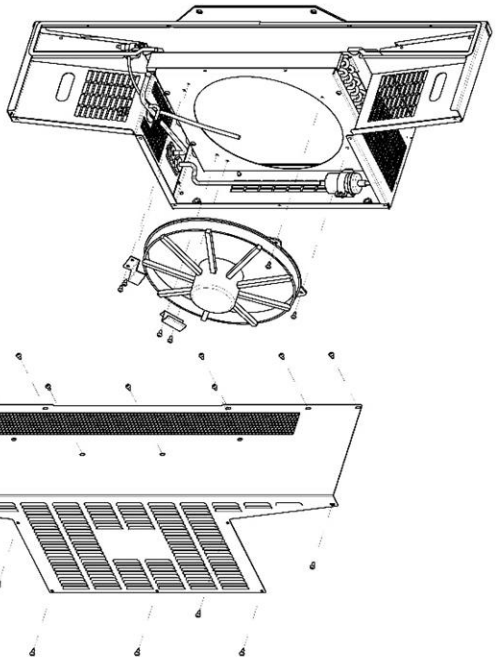
Service Replacement Procedure (Only required for confirmed failures)

1. Verify the ParkSmart no-idle system is turned off and the condenser fan power harness has been disconnected.
2. Remove all the condenser fan mounting hardware and remove the fan from the assembly.
3. Mount the new condenser fan assembly and install the fasteners at 20 in/lbs torque. Do not overtighten.
4. Reconnect the condenser fan and reinstall the cover.
5. Retest ParkSmart unit – follow step 9 above.


Condenser Fan Diagnostics
Position 1
Fan running properly?
No
Yes
Position 2
If yes - replace condenser fan
Fan running properly?
No
If no – continue system diagnostic
Is voltage and signal okay?
Yes
Position 3
Fan running properly?
No
Yes
is running properly, perform normal troubleshooting

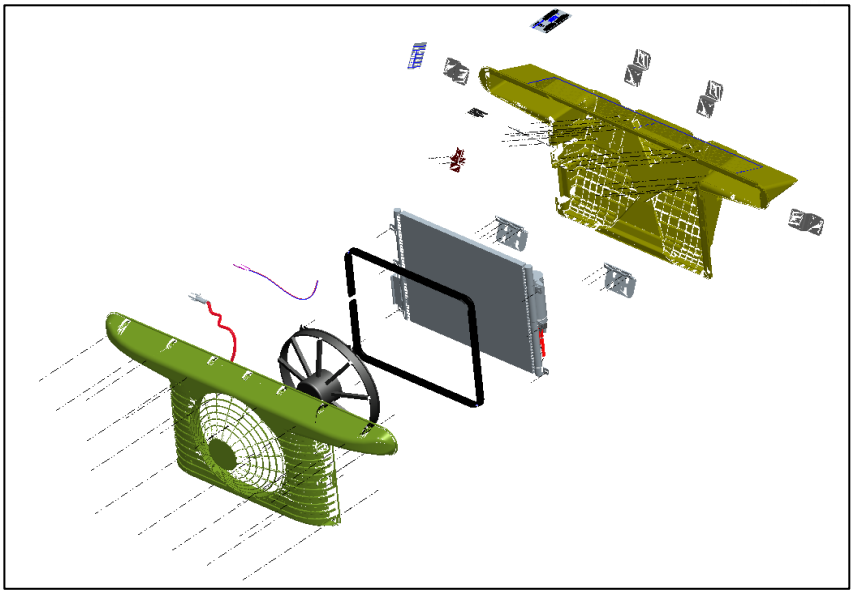
DTNA ParkSmart Rev. 5 Exploded View

Prior to 10 - 2015



This unit has a debris pan.
Occasional cleaning is required.

After 10 - 2015



Cleaning Condenser: "It is recommended to clean the condenser coil every 25k miles in the summer months with an A/C core cleaner that is approved for copper and aluminum cores. Additionally, low pressure water can also be used to clean it. It is also recommended to use a core cleaner that is non caustic, detergent-based alkaline coil cleaner, biodegradable, and releases no VOCs."

All system controllers!

Attention: Removing the phase harness for testing

Operating the system for troubleshooting purposes with the phase harness disconnected can result in a locked out system.

With no active fault codes, the controller should always attempt to start the compressor up to 10 times in a period of approx. 2 minutes; even when the phase harness is disconnected. If the controller does not see the compressor start after 10 attempts, it will time out and stop sending voltage to the compressor. The controller will remain in locked out mode until power is cycled. Please make sure the time does not expire during the test procedure. If necessary, cycling the power switch off and back on will reset the controller. NOTE: “The compressor could take up to 2 minutes to start up after the power switch has been cycled.

Service Instructions for Phase Harness / **Cluster Block** Compressor Only

WARNING: To avoid potential property damage or personal injury, Read Important Safety Warnings and ALL instructions before attempting to install or service product.

CAUTION: Care must always be taken to install the control cover without bending the connector pins identified in **FIGURE 1**.

After the controller with phase harness has been removed from the ParkSmart unit, follow the below instructions to replace the phase harness.

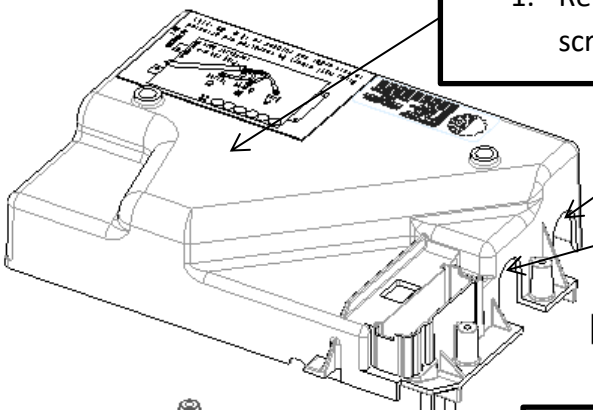


FIGURE 1

Service Instructions for Phase Harness / **Cluster Block** Compressor Only

WARNING: To avoid potential property damage or personal injury, Read Important Safety Warnings and ALL instructions before attempting to install or service product.

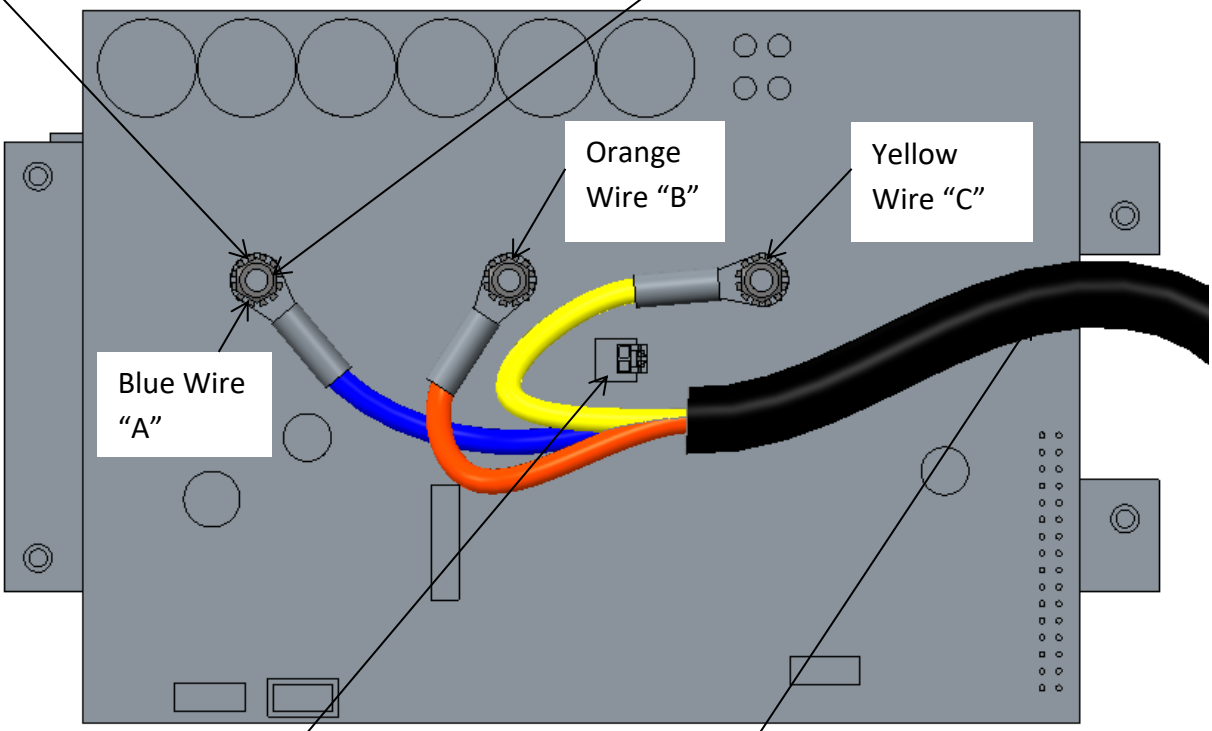
CAUTION: Care must always be taken to install the control cover without bending the connector pins identified in **FIGURE 1** - page 35.

4. Slide (3) ring terminals of new harness over threaded posts of PCB and route wires as shown

   Align each colored wire to specific threaded post identified only.

5. Secure wire terminals with (3) nuts. Torque to 12 to 14 in-lbs

   Use the torque value specified.



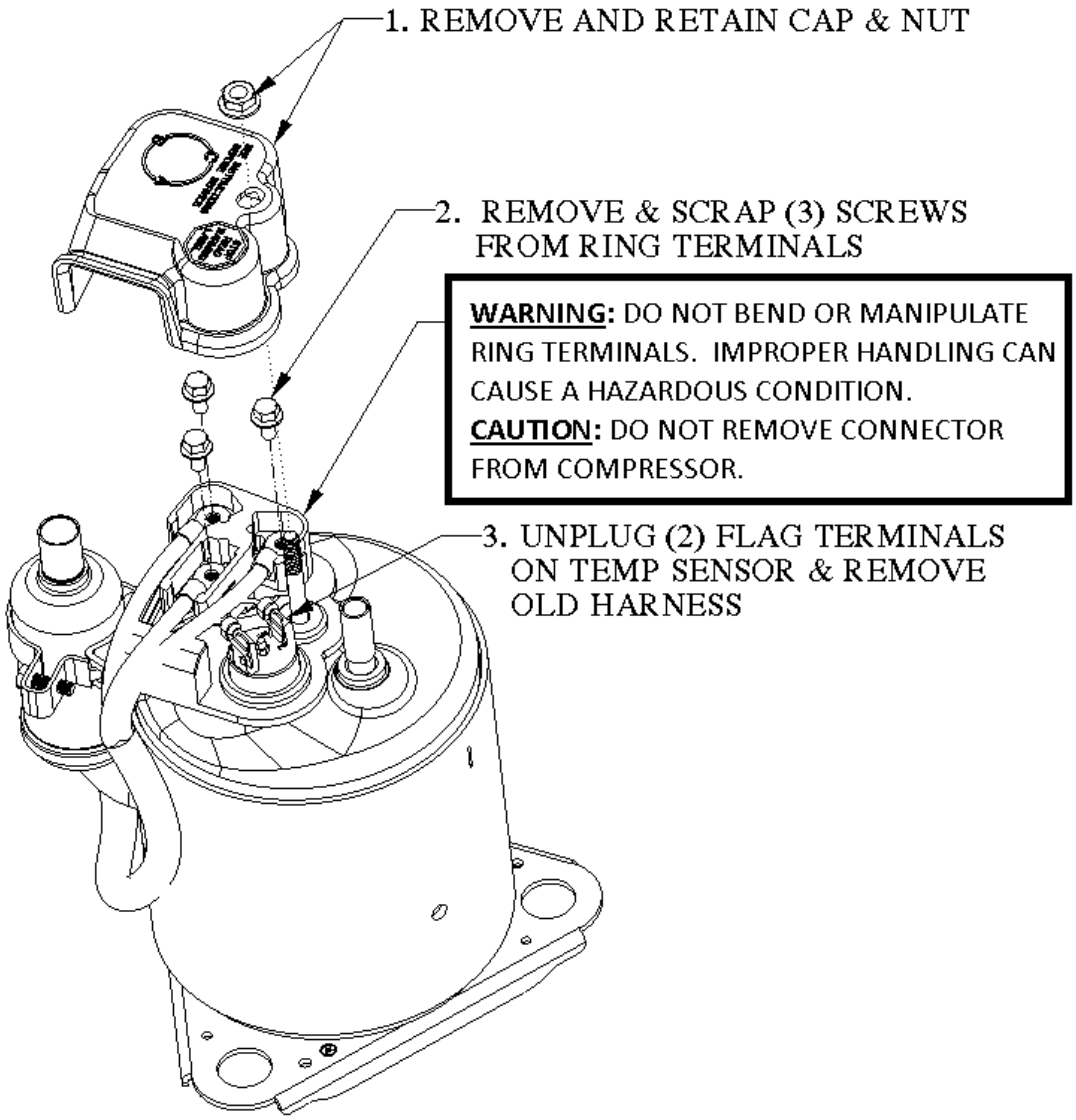
6. Plug 2-Pin connector of new harness into PCB

7. Orient ring terminals and route wiring harness out of cover as shown

8. Replace (2) wiring grommets, cover, and (4) cover screws

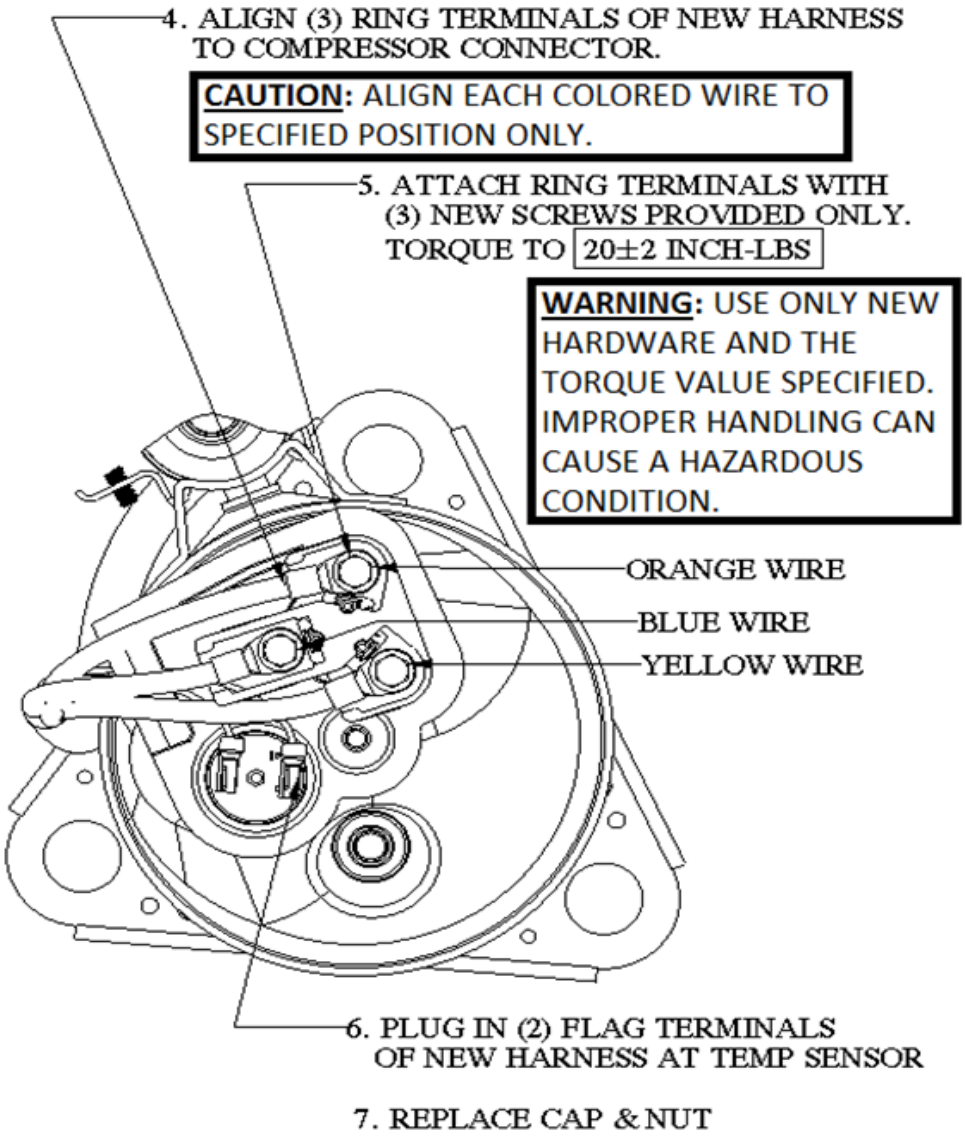
Service Instructions for Phase Harness / **Ring Terminal** Compressor Only

WARNING: To avoid potential property damage or personal injury, Read Important Safety Warnings and ALL instructions before attempting to install or service product.



Service Instructions for Phase Harness / **Ring Terminal** Compressor Only

WARNING: To avoid potential property damage or personal injury, Read Important Safety Warnings and ALL instructions before attempting to install or service product.



⚠ WARNING: To avoid potential property damage or personal injury, Read Important Safety Warnings and ALL instructions before attempting to install or service product.

CAUTION: Care must always be taken to install the control cover without bending the connector pins identified in **FIGURE 1**.

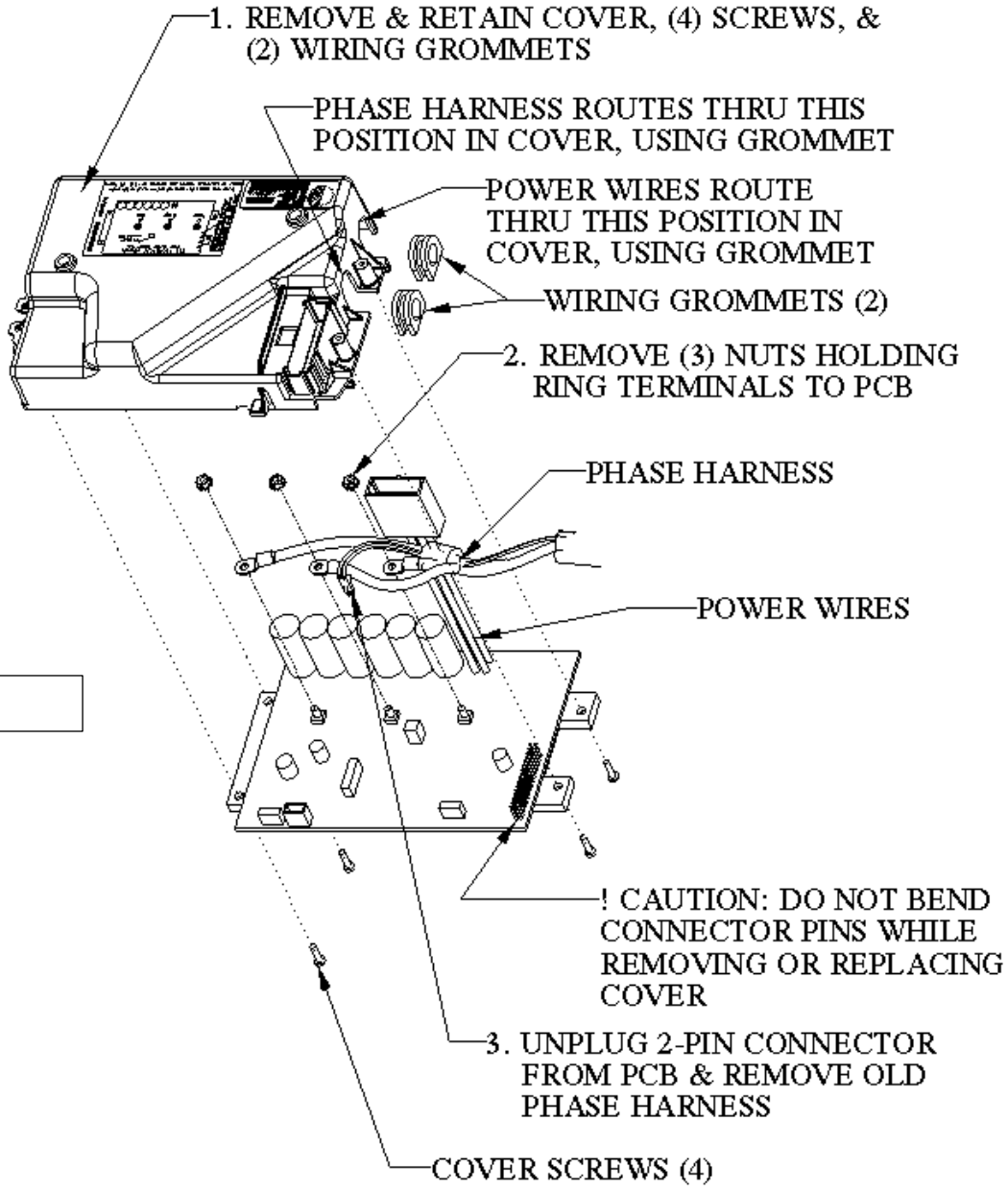


FIGURE 1

⚠ WARNING: To avoid potential property damage or personal injury, Read Important Safety Warnings and ALL instructions before attempting to install or service product.

CAUTION: Care must always be taken to install the control cover without bending the connector pins identified in **FIGURE 1**.

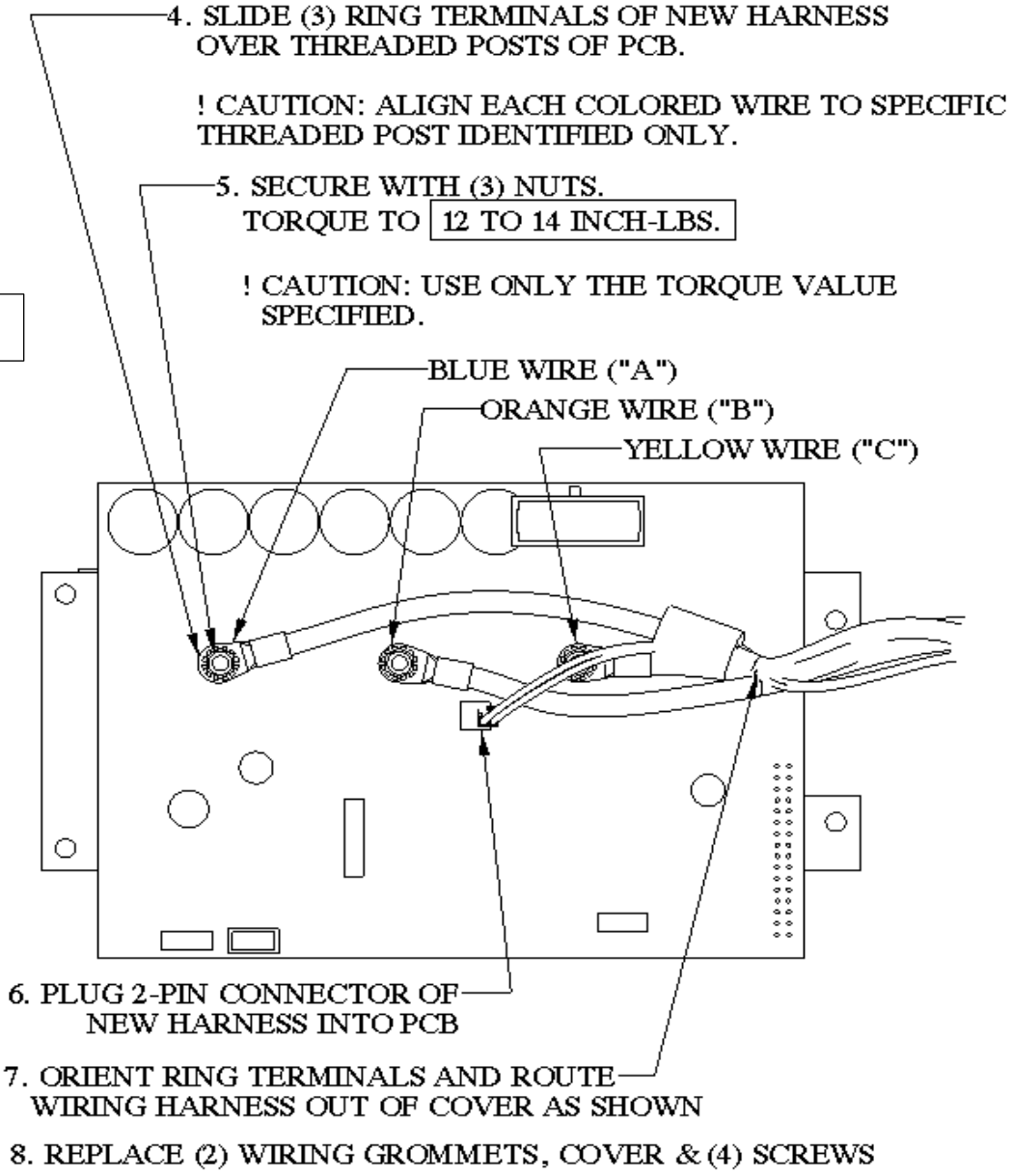
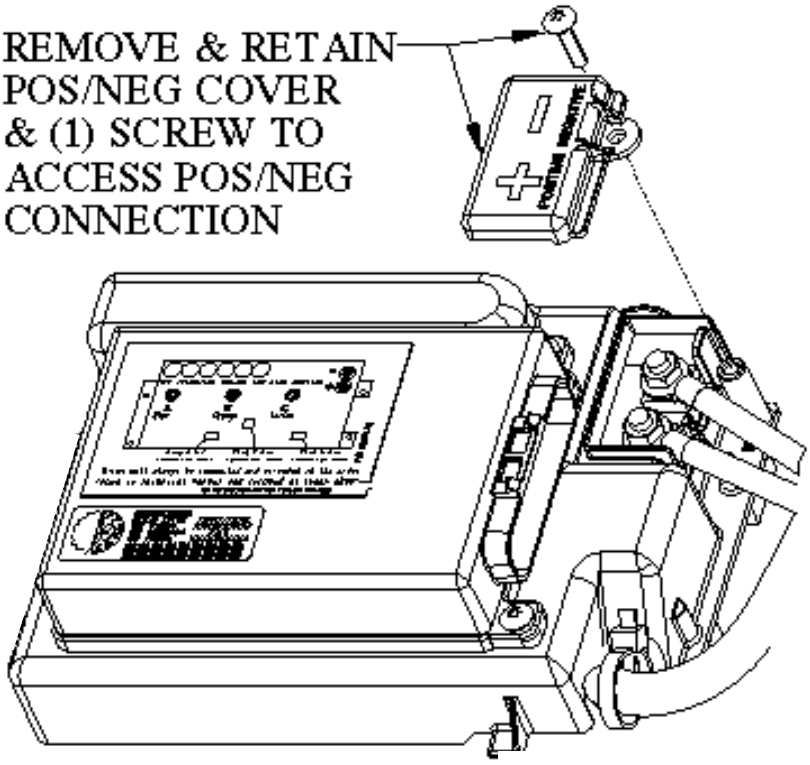


FIGURE 2

<u>WARNING:</u> TO AVOID ELECTRIC SHOCK AND PREVENT ARCING AND DAMAGE TO HARNESS AND CONTROLLER, <u>DISCONNECT POWER FROM SYSTEM PRIOR TO SERVICING!</u>

1. REMOVE & RETAIN POS/NEG COVER & (1) SCREW TO ACCESS POS/NEG CONNECTION

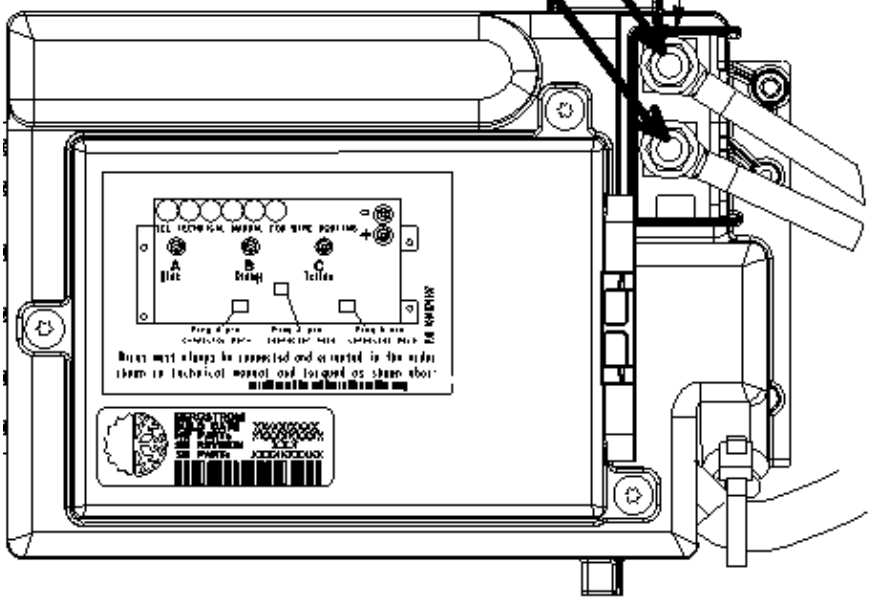


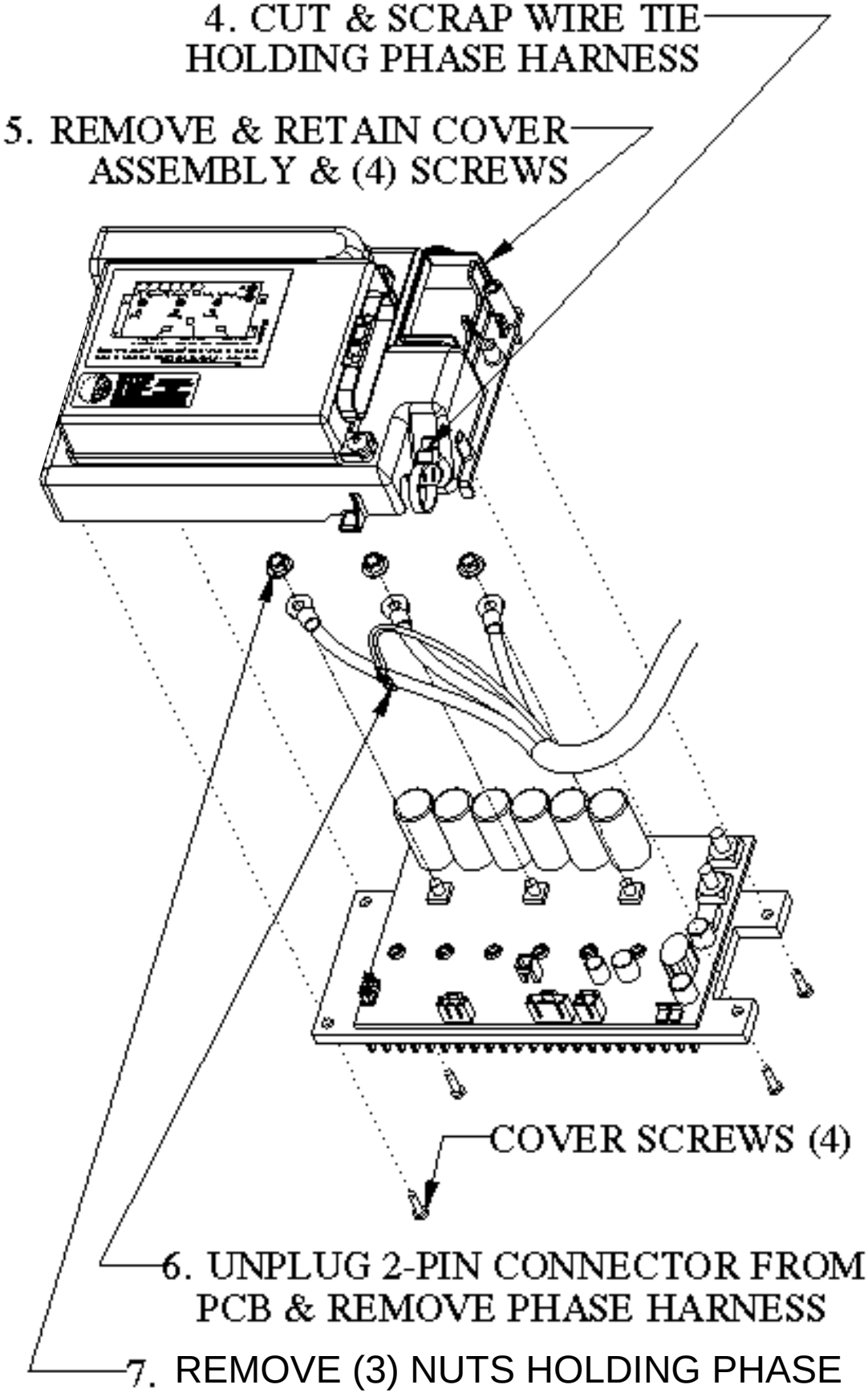
2. REMOVE & SCRAP (2) NUTS

3. REMOVE RED (POS) & BLACK (NEG) RING TERMINALS FROM POSTS ON PCB

BLACK WIRE, NEGATIVE

RED WIRE, POSITIVE




4. CUT & SCRAP WIRE TIE HOLDING PHASE HARNESS
5. REMOVE & RETAIN COVER ASSEMBLY & (4) SCREWS
COVER SCREWS (4)
6. UNPLUG 2-PIN CONNECTOR FROM PCB & REMOVE PHASE HARNESS
7. REMOVE (3) NUTS HOLDING PHASE HARNESS RING TERMINALS TO PCB.

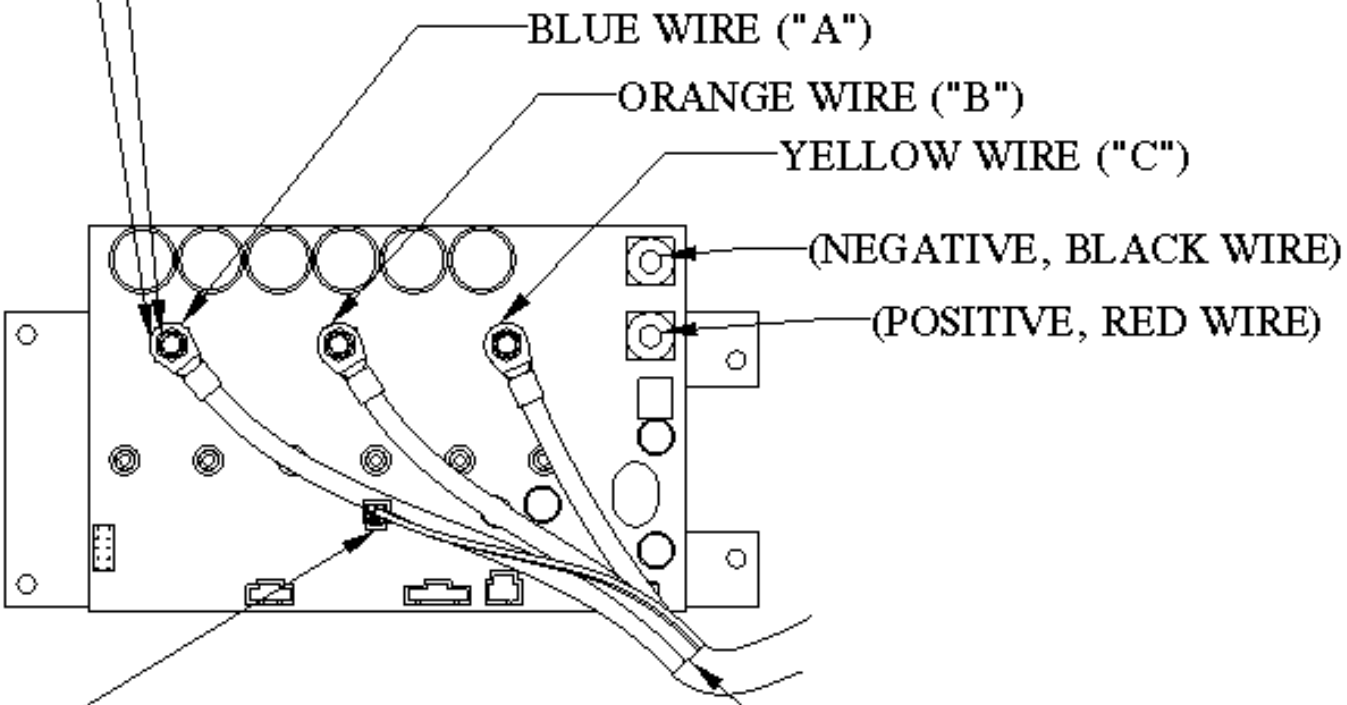
8. SLIDE (3) RING TERMINALS OF PHASE HARNESS OVER THREADED POSTS OF PCB.

CAUTION: ALIGN EACH COLORED WIRE TO SPECIFIC THREADED POST IDENTIFIED ONLY.

9. SECURE WITH 3 NUTS REMOVED IN STEP 7.

TORQUE TO **20 ± 2 INCH-LBS**

CAUTION: USE ONLY THE TORQUE VALUE LISTED WHEN INSTALLING PHASE HARNESS TO PCB!



10. PLUG 2-PIN CONNECTOR OF NEW HARNESS INTO PCB

ORIENT RING TERMINALS AND ROUTE HARNESS OUT OF COVER AS SHOWN

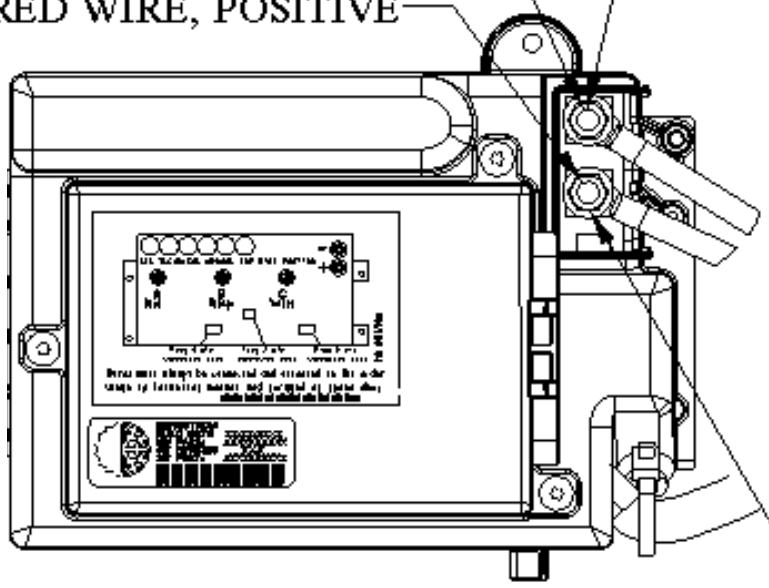
11. REPLACE COVER ASSEMBLY & (4) SCREWS. SECURE NEW WIRE-TIE (PROVIDED) AROUND PHASE HARNESS

12. SLIDE BLACK AND RED RING TERMINALS OF UNIT HARNESS OVER THREADED POSTS OF PCB.

WARNING: ALIGN BLACK AND RED WIRES TO SPECIFIC THREADED POST IDENTIFIED ONLY. REVERSING THE POLARITY CAN CAUSE A HAZARDOUS CONDITION.

BLACK WIRE, NEGATIVE

RED WIRE, POSITIVE



13. SECURE WITH (2) NEW, LARGE NUTS PROVIDED ONLY.
TORQUE TO 34±2 INCH-LBS

CAUTION: USE ONLY NEW HARDWARE AND THE TORQUE VALUE SPECIFIED.

14. REPLACE SMALL (POS/NEG) COVER & (1) SCREW

CAUTION: DO NOT ALLOW THE RING TERMINALS OF THE BLACK AND RED WIRES TO BE IN CONTACT AFTER ROUTING WIRES AND REPLACING COVERS.