



Hi Performance Electric Vehicle Systems

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## **INSTALLATION INSTRUCTION**

# **HPEVS EZGO Controller Conversion Installation Notes**

**REVISION: B**

**Date: 09-28-20**

**IMPORTANT DISCLAIMER:** FOR ANY VEHICLES THAT HAVE A HPEVS LITHIUM BATTERY PACK INSTALLED, IF THE VEHICLE IS GOING TO BE STORED FOR A LONG PERIOD OF TIME **THE VEHICLE NEEDS TO BE PLUGGED IN TO CHARGING POWER AT ALL TIMES AND THE 12 VOLT CONVERTOR SHOULD BE DISCONNECTED.** FAILURE TO FOLLOW THIS PROCEDURE WILL DRAIN THE LITHIUM BATTERIES DOWN TO A POINT WHERE THE BATTERIES WILL BE DAMAGED. **IF THE BATTERIES ARE DAMAGED FOR NOT FOLLOWING THIS PROCEDURE, THIS WILL VOID ANY IMPLIED WARRANTY.**



**CAUTION: DO NOT HANDLE THE ELECTRICAL CONNECTORS WHEN THE SYSTEM IS ENERGIZED. DOUBLE CHECK THE VOLTAGE POTENTIAL WITH A VOLTAGE METER PRIOR TO HANDLING MAKING SURE VOLTAGE IS AT 0V. FAILURE TO DO SO WILL RESULT IN INJURY OR DEATH!**

**SCOPE:** This instruction set is given as a detailed guide to install a Curtis Instruments AC Motor Controller kit provided by HPEVS into a **STOCK EZGO RXV** golf car.

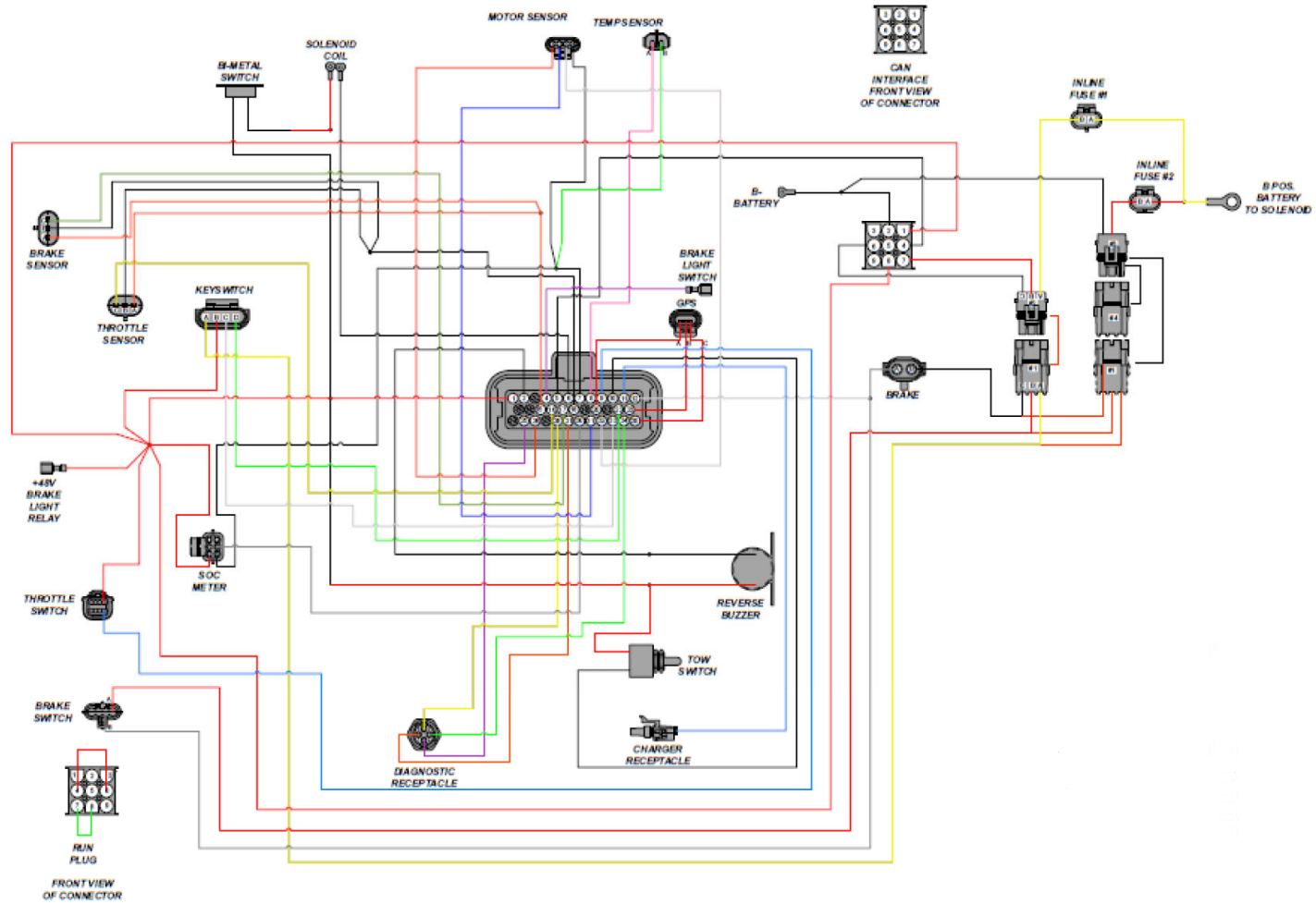
**NOTE: THESE PROCEDURES ARE WRITTEN WITH THE EXPECTATION THAT THE ORIGINAL CURTIS INSTRUMENTS AC MOTOR CONTROLLER IS INSTALLED IN THE VEHICLE.**

**NOTE: FOR A HPEVS LITHIUM PACK INSTALLATION, USE THE DOCUMENT “EZGO RXV Lithium Battery Pack with HPEVS Motor Controller Conversion Installation Notes” IN CONJUNCTION WITH THIS DOCUMENT**

Items included in the kit:

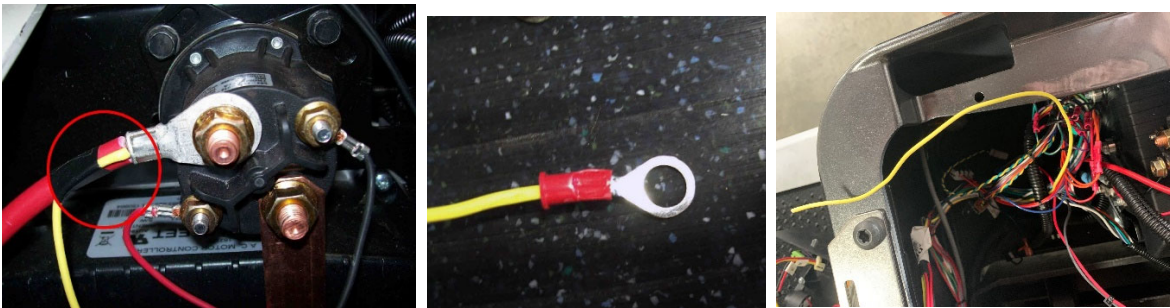
- 1.Curtis Instruments AC Motor Controller
- 2.Controller Mounting Plate
- 3.Resistor Regen Controller
- 4.Wiring Harnesses
- 5.Fuse Holder/Fuse
- 6.” Z” Buss Bar
- 7.Curtis Instruments 3140 LCD Display
- 8.Golf/Street Switch
- 9.Battery, Pack Negative and Pack Positive #4 Cables (Optional for lead acid)
- 10.Menu Button
- 11.Associated Hardware

# STOCK EZGO WIRING HARNESS



## CONTROLLER INSTALLATION WITH LEAD ACID BATTERIES

1. Make sure the ON/OFF key switch to OFF position and remove key from key switch.
2. Remove the controller splash shield and set it aside.
3. Disconnect the wiring from the solenoid.
4. Disconnect the B- cable from the motor controller.
5. If the main red pack + cabling has a yellow wire crimped in the main lug, this wire goes to the key switch. Cut away the yellow wire at the lug. Strip and crimp on a 5/16" ring terminal on the yellow wire. If the yellow wire is not present in the lug as shown, the yellow wire will need to be located.



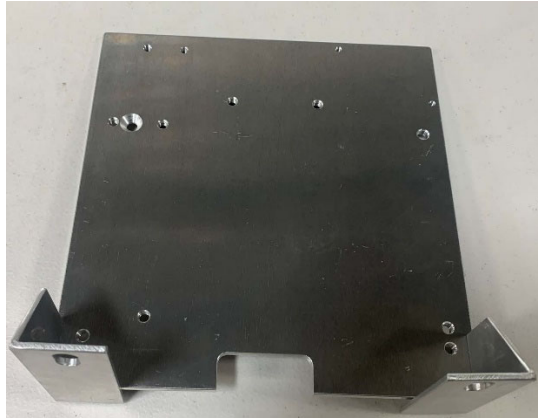
6. Remove the remaining cabling from the controller. Locate the three motor cables (U, V, W) from the controller and place them out of the way.
7. Remove the stock controller plate with the controller, solenoid, and braking resistor.
8. Remove the solenoid and braking resistor from the mounting plate.
9. Zip tie the motor cables to the plastic tub as shown.



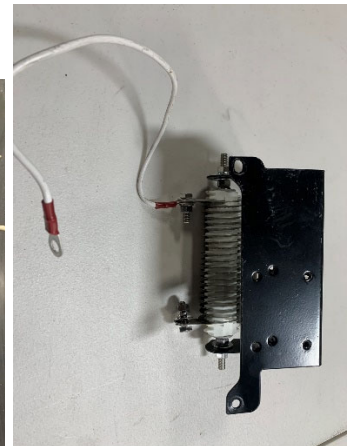
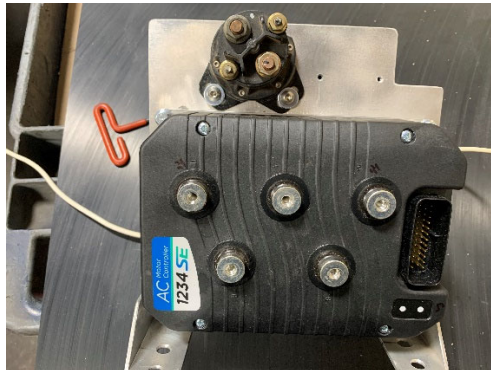
10. Route the dash wiring harness that is included in the kit from the dash location to the motor controller location.

## **PREPARING PROVIDED CONTROLLER PLATE**

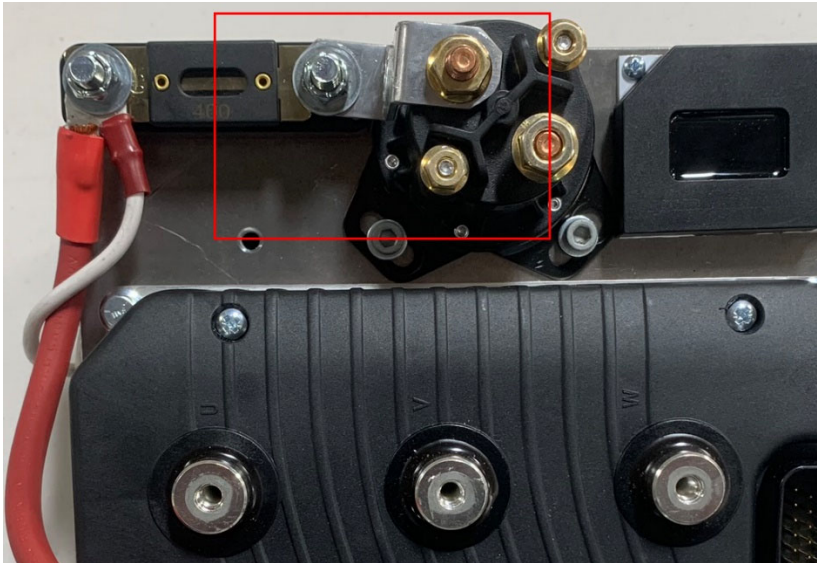
1. Locate the new controller plate supplied with the kit.



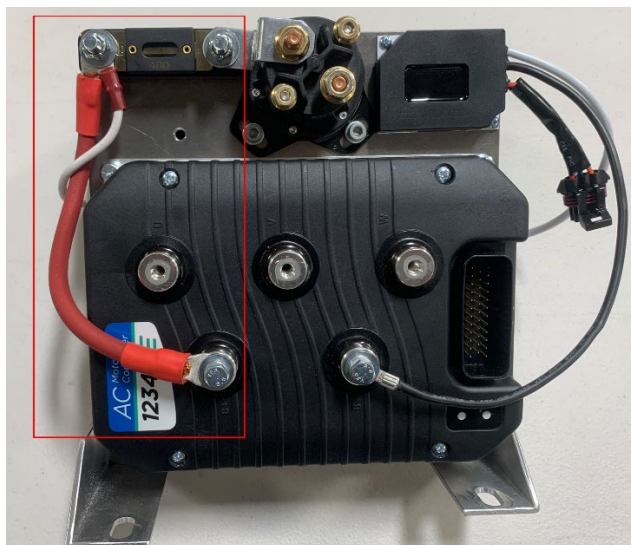
2. Attach onto the new controller plate the stock solenoid, new fuse holder, fuse, and braking resistor controller. **LEAVE THE SCREWS TO THE SOLENOID MOUNTING AND THE FUSE HOLDER LOOSE AT THIS POINT. TIGHTEN ALL OTHER SCREWS.**



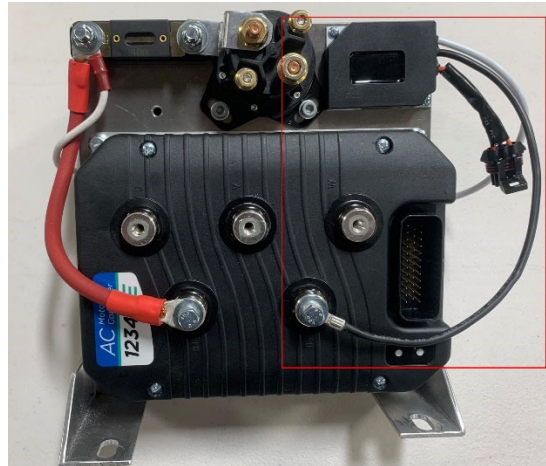
3. Install the “Z” bussbar connection between the solenoid and the fuse holder. With the solenoid and fuse holder screws loose, installing the bussbar should be simple.



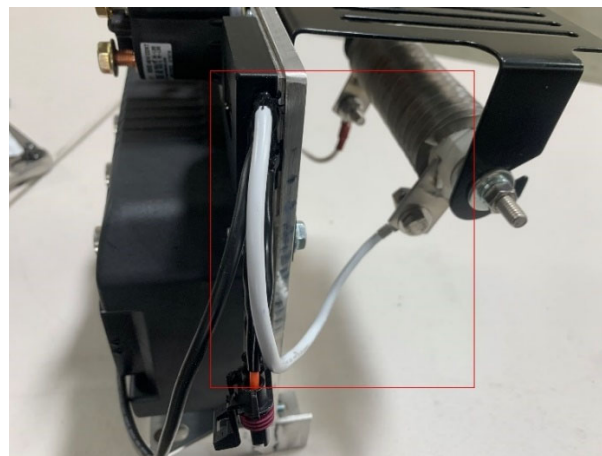
4. Install the two nuts at the fuse holder and the solenoid to hold the bussbar in place, **BUT DO NOT TIGHTEN THESE NUTS AT THIS TIME.**
5. Tighten the screws holding the solenoid in place.
6. Tighten the two screws holding the fuse holder in place.
7. Install the fuse.
8. Tighten the two nuts at the fuse holder and the solenoid holding the bussbar in place.
9. As shown, connect supplied red power cable from the fuse holder to B+ on the controller.
10. Attach the white lead wire from the braking resistor to the same location, making sure that the ring terminal of the white wire rests on top of the red power cable.



11. Temporarily connect the black wire from the braking resistor controller to the B- of the controller.

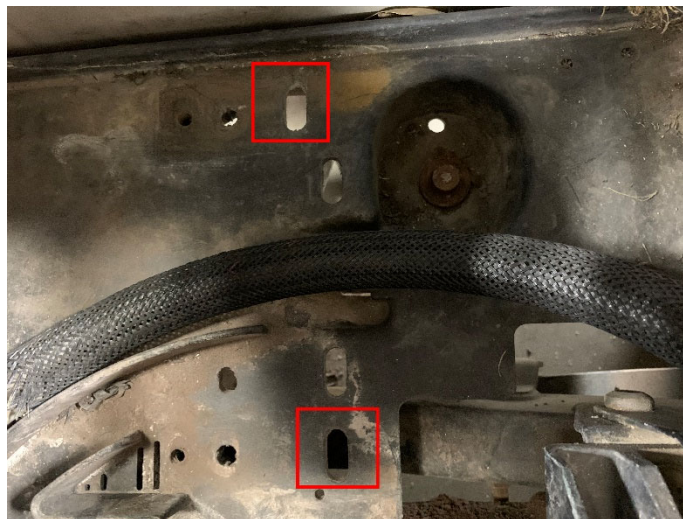


12. Attach the white wire from the braking resistor controller to the braking resistor as shown below.

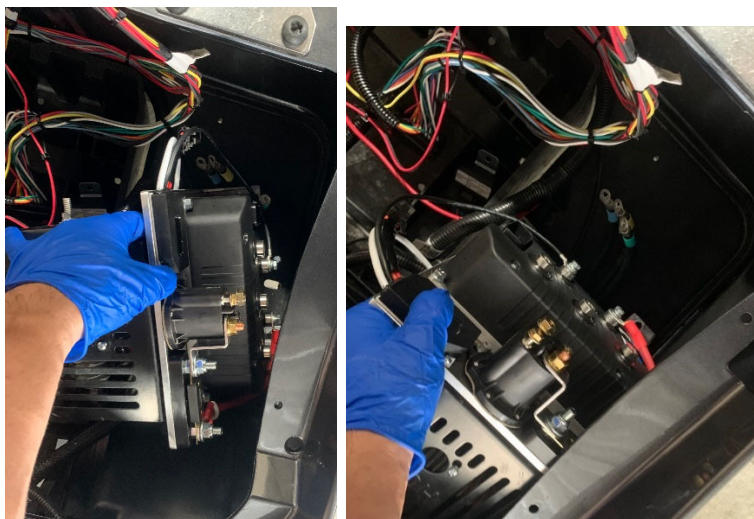




13. In the plastic tub locate the two holes that are depicted below. These holes will be used to secure the controller plate with the supplied hardware.



14. Install the complete controller plate into the vehicle.



15. Using the supplied 3/8-16 x 1" bolts and 3/8 x 16 serrated flanged nuts, bolt the controller plate to the PLASTIC tub.



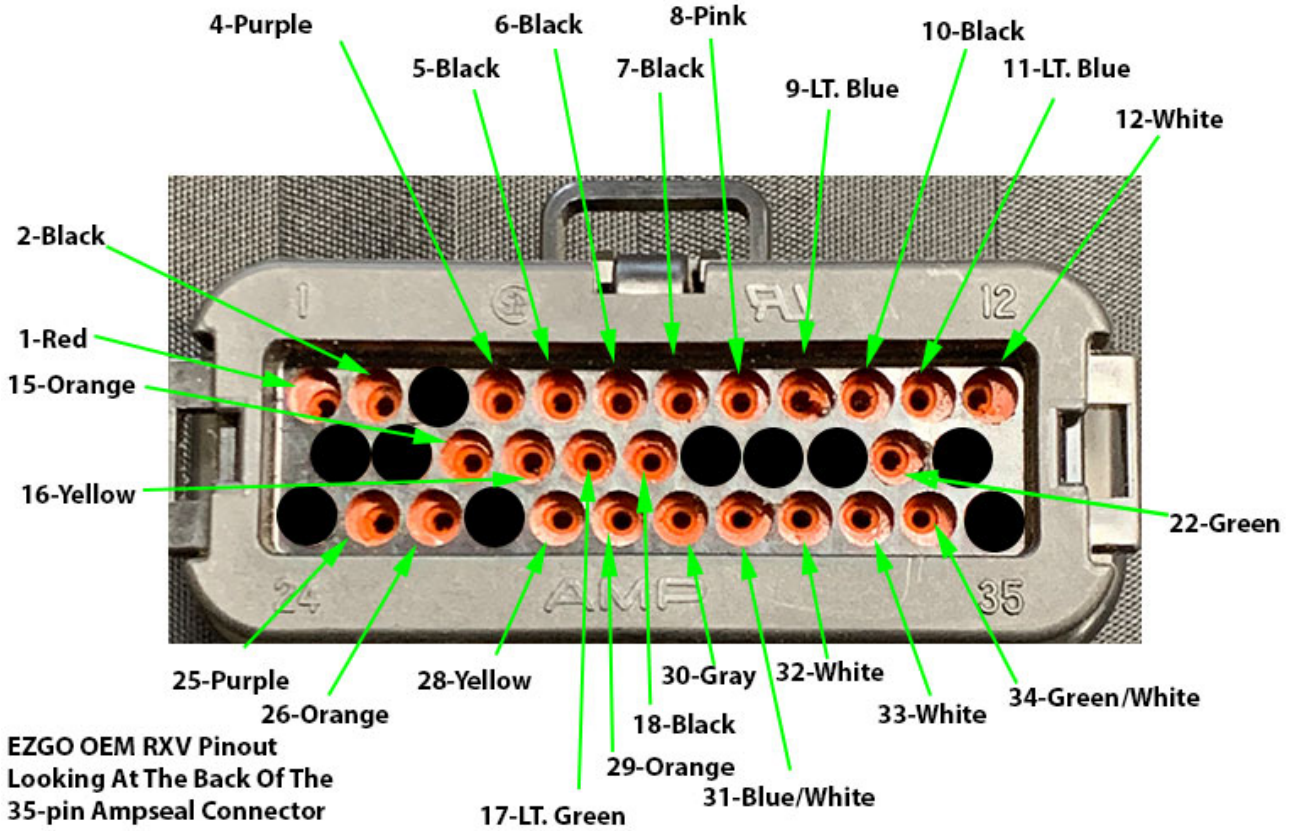
## OEM ELECTRICAL CONNECTIONS

The following describes the OEM connections:

1. For reference, below is information for the stock system.

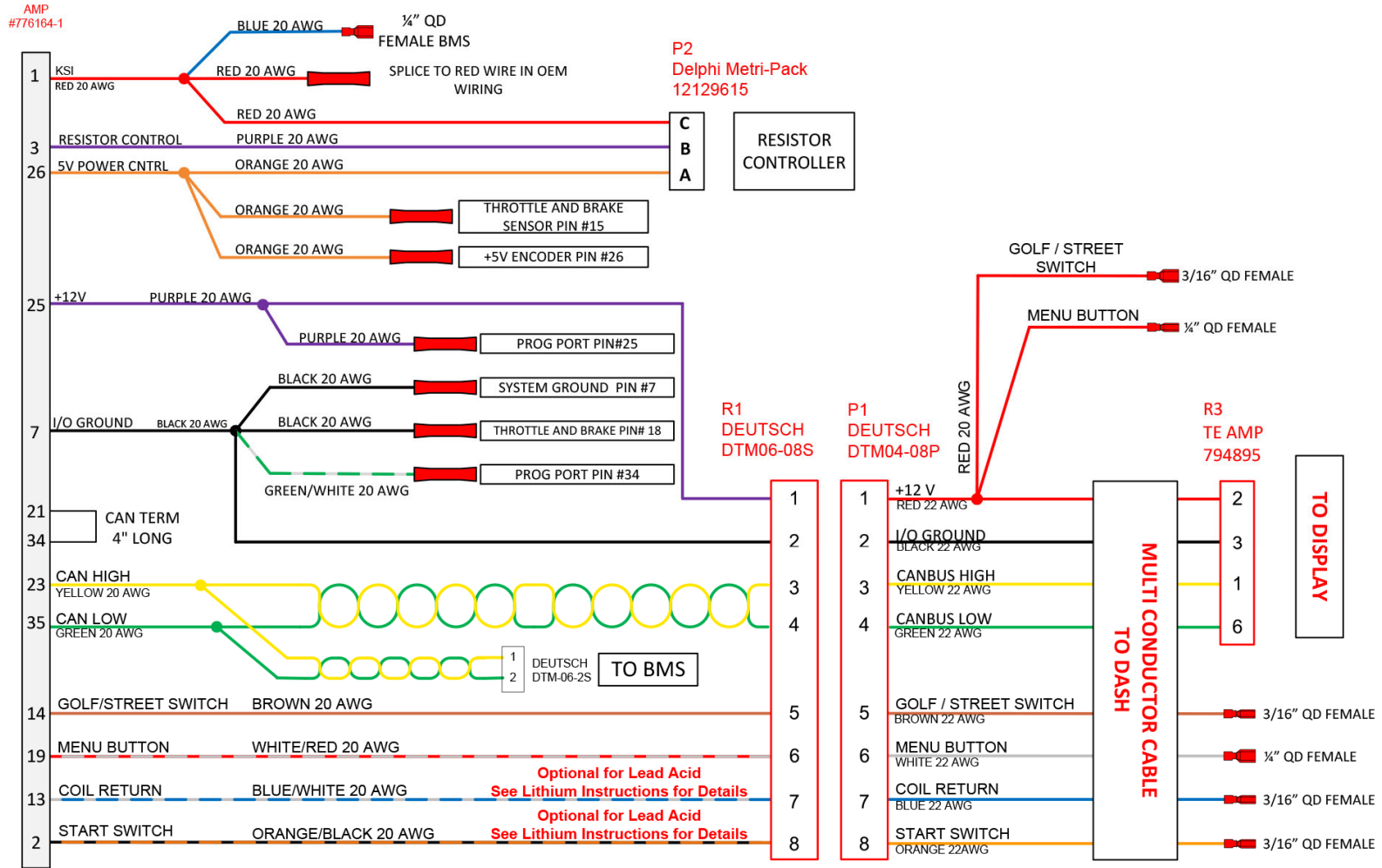
<b>35 PIN OEM CONNECTOR PINOUTS (CURTIS AC-RXV CONTROLLER)</b>				
Pin #	Signal Name	Wire color	Voltage	Description
1	KSI	Red	+48V	Key switch input
2	BUZZER	Black	- 48 V	low side driver for buzzer
3	N/C			
4	BLR	Purple	12 - 15 V	Brake light relay
5	EMB	Black	+48V	Low side driver for electric park brake
6	MAIN	Black	- 48 V	Low side driver for main solenoid
7	GROUND	Black	- 48 V	System ground
8	TEMP SENSOR	Pink	5V	Motor temp sensor
9	PEDAL	Light Blue	+48V	Switch input-pedal
10	TOW	Black	+48V	Switch Input-tow
11	CHARGER	Light Blue		Charger interlock input
12	BRAKE SWITCH	White	+48V	Brake limit switch
13	N/C			
14	N/C			
15	5V +	Orange	5V	5V output to throttle and brake sensors
16	THROTTLE	Yellow	0-5V	Analog throttle input
17	BRAKE SWITCH	Light Green	0-5V	Analog brake input
18	THROTTLE GND	Black	-5V	Ground connection for throttle and brake
19	N/C			
20	N/C			
21	N/C			
22	FWD	Green	+48V	FNR switch input
23	N/C			
24	N/C			
25	12V +	Purple	12V	1311 communication
26	5V +	Orange	5V	5V encoder
27	N/C			
28	TX	Yellow		1311 communication
29	RX	Orange		1311 communication
30	SOC	Gray	0-5V	Analog output 0-5V
31	ENC A	Blue/White	0-5V	Encoder signal A
32	ENC B	White	0-5V	Encoder signal B
33	REV	White	+48V	FNR switch input
34	GND	Green/White		1311 communication
35	N/C			

# OEM ELECTRICAL CONNECTIONS

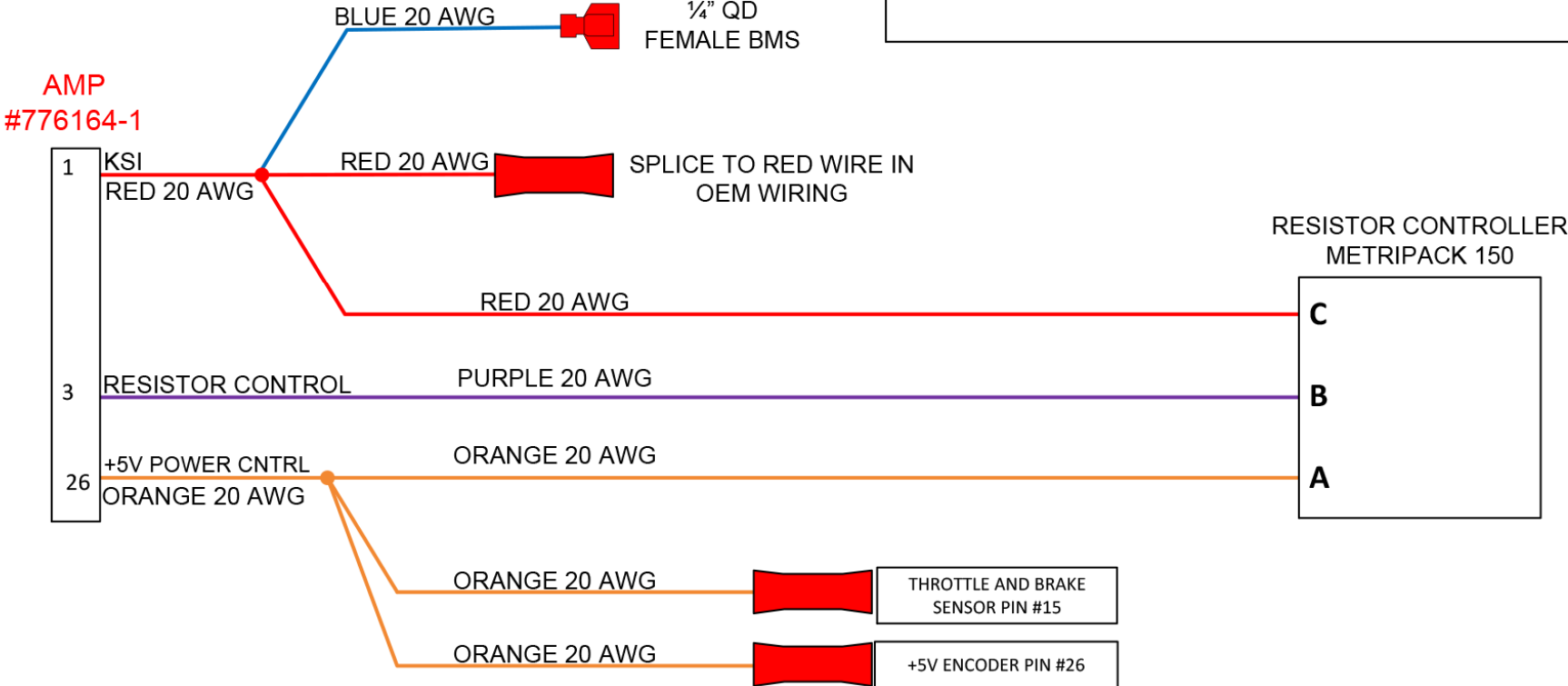


# NEW HPEVS WIRING HARNESS SCHEMATICS

## HPEVS EZGO RXV CONVERSION WIRING HARNESS

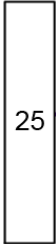


# RESISTOR CONTROL



+12 VOLT

AMP  
#776164-1



+12V  
PURPLE 20 AWG



PURPLE 20 AWG

PURPLE 20 AWG



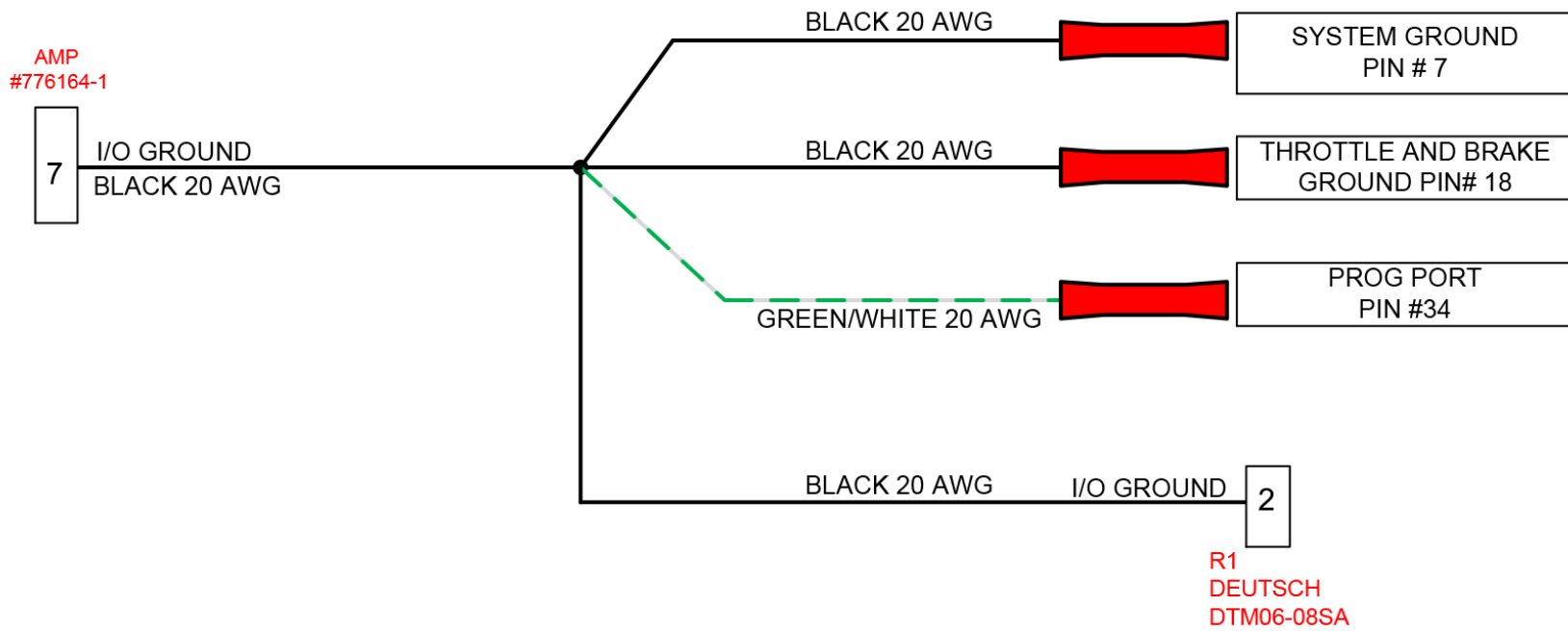
PROG PORT PIN #25

+12V



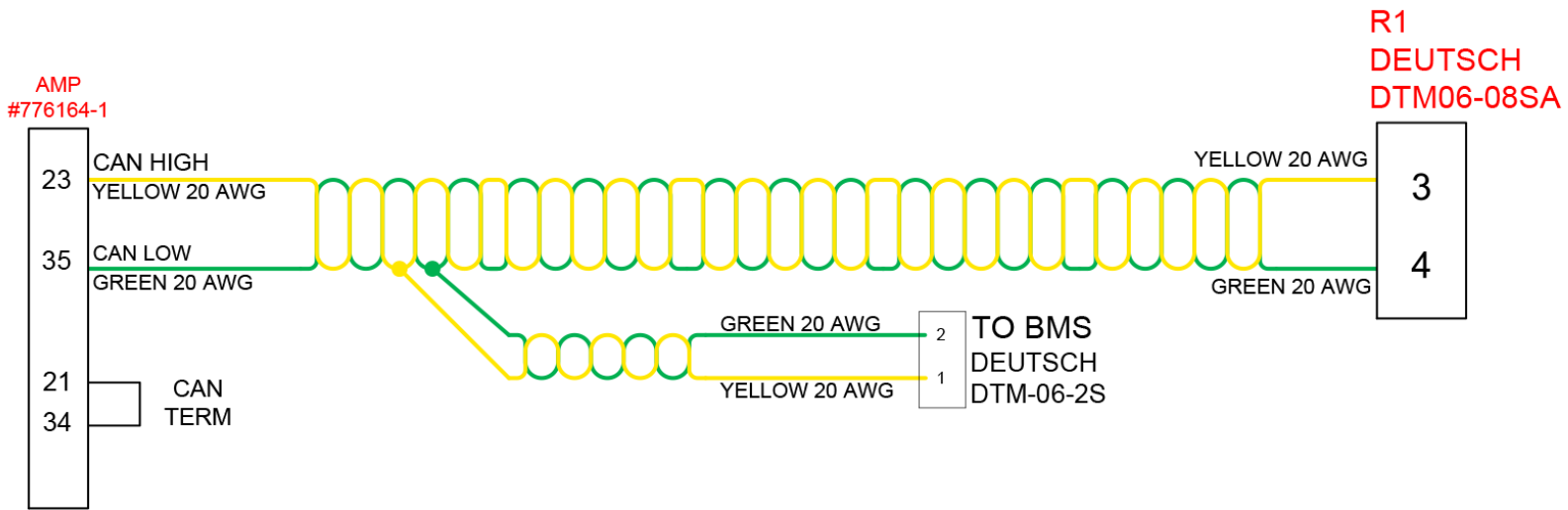
R1  
DEUTSCH  
DTM06-08S

# I/O GROUND





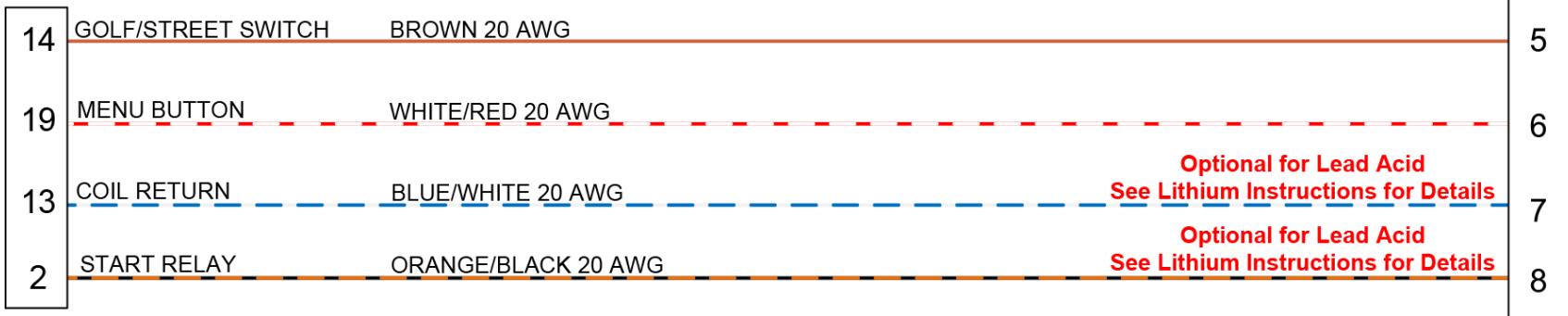
# CANBUS



I/O

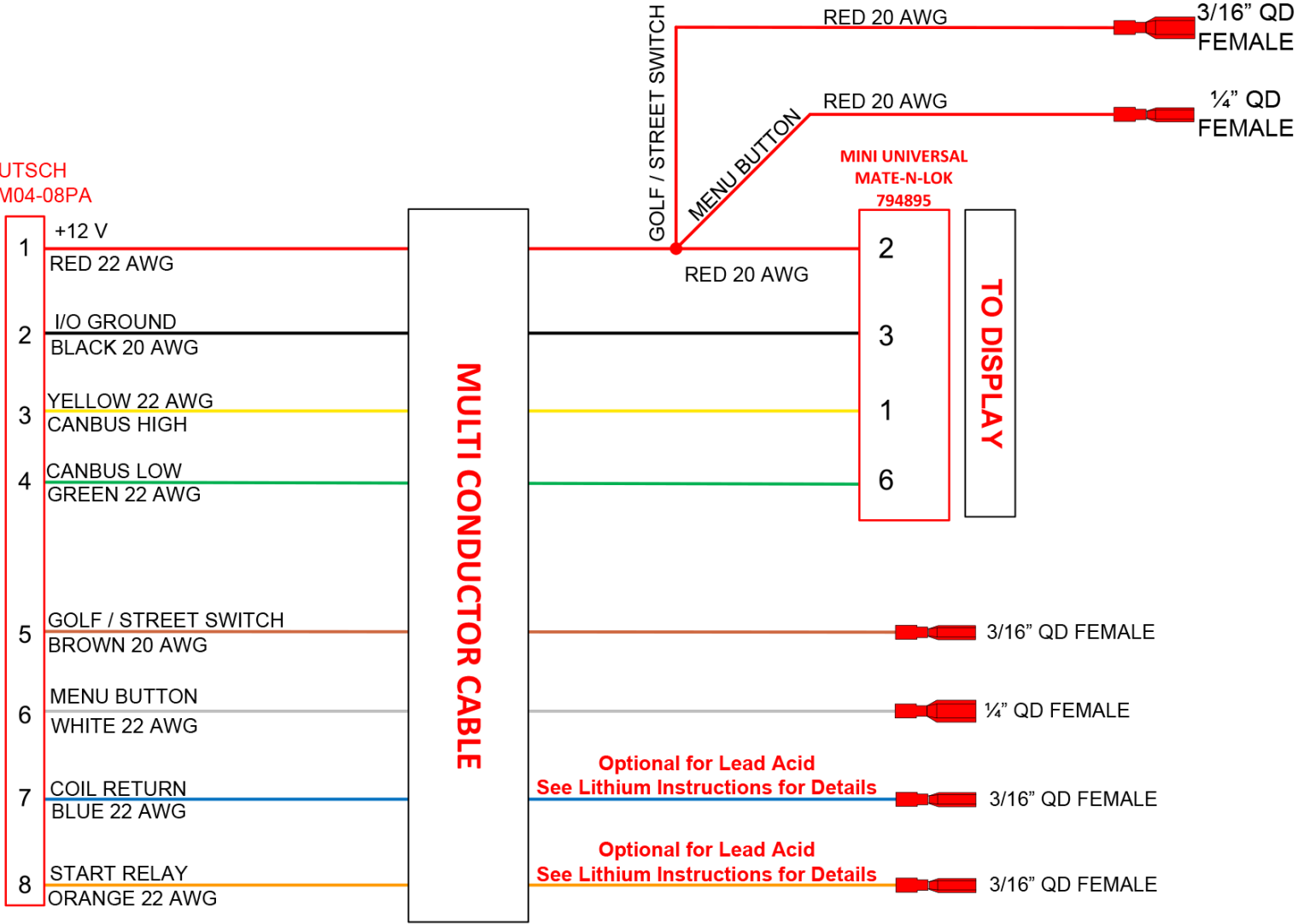
AMP  
#776164-1

R1  
DEUTSCH  
DTM06-08SA



# HARNES TO DASH

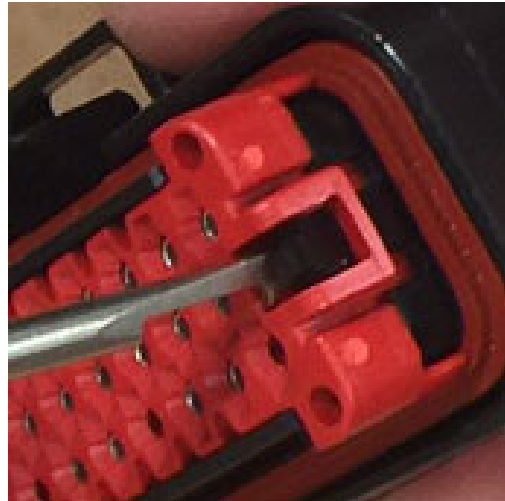
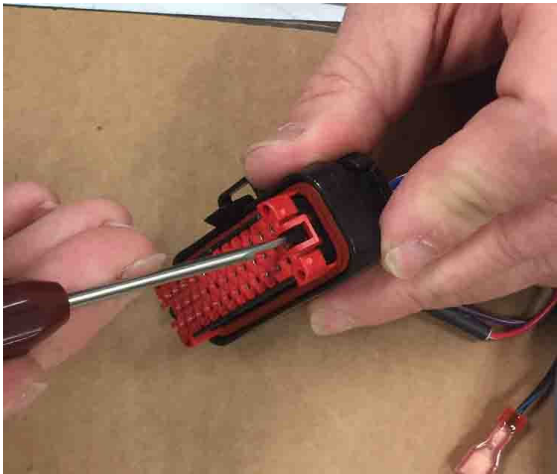
P1  
DEUTSCH  
DTM04-08PA



## WIRING HARNESS CHANGES

The stock harness will need to be modified with the included wiring. Stock connector pins will need to be removed and the wires with this kit will need to be added to the 35 pin Ampseal connector.

1. Using a small blade screwdriver, or a similar tool, place the blade of the tool between the black body latch of the plug and the red colored body of the plug as shown in the pictures.

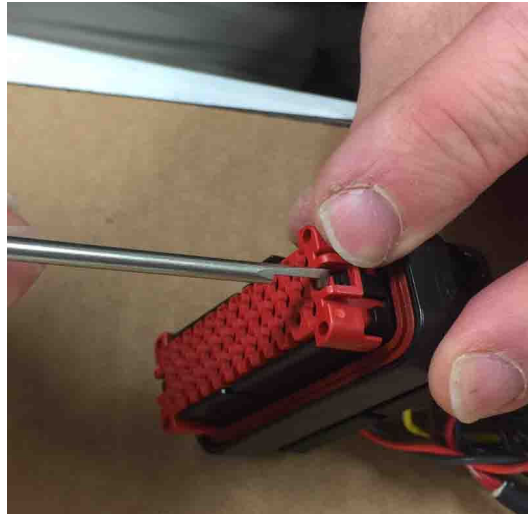


2. With the blade of the screwdriver in place at this point, slightly twist the screwdriver to pry the black colored tab on the body of the plug away from the red colored pin retainer body of the plug.



3. While prying the black plastic tab away from red plastic pin retainer portion of the plug, press the red piece up and away from the body of the plug. There will be a single click when the red plastic plug piece is lifted. This is an indication that the pin retainer piece is in the correct orientation. Do this procedure for both sides of the plug. **DO NOT COMPLETELY REMOVE RED TERMINAL RETAINER**

**MAKE SURE THAT THE RED PLASTIC PIN RETAINER ONLY CLICKS ONCE AND NO MORE!**



4. Once completed the plug should look like the following. **Note the red plastic pin retainer piece is not attached to the black plastic tab**



## **REMOVING WIRES FROM AMPSEAL CONNECTOR**

1. To remove the wires from the 35-pin Ampseal connector, firmly hold the connector then twist the wire as the wire is being pulled from the connector.
2. Locate the black wire in location Pin 2. Remove this wire from its location and relocate it to Pin 20.
3. Remove the following connector pins from the 35-pin Ampseal. This includes pins:
  - a. Red wire from Pin #1
  - b. Black wire from Pin #7
  - c. Black wire from Pin #18
  - d. Green/White wire from Pin #34
  - e. Purple wire from Pin #25
  - f. Orange wire from Pin #15
  - g. Orange wire from Pin #26
4. Taking the red wire that was removed from pin #1 in the 35-pin connector, cut off the existing pin, strip the insulation and crimp the wire to the red wire butt splice in the new wiring harness. Heat shrink the butt splice to water seal.
5. Insert the red wire within the new wiring harness into pin #1 of the 35-pin connector.
6. Taking the two black wires that were removed from pins #7 and #18, cut off the existing pin, strip the insulation and crimp the wires to the two butt splices in the new wiring harness with the black wires. Heat shrink the butt splices to water seal.
7. Taking the green/white wire from pin #34 removed from the 35-pin connector, cut off the existing pin, strip the insulation and crimp the wire to the butt splice with the green/white wire in the new wiring harness. Heat shrink the butt splices to water seal.
8. Insert the black wire in the new wiring harness into pin #7 of the 35-pin connector.
9. Taking the purple wire that was removed from pin #25 in the 35-pin connector, cut off the existing pin, strip the insulation and crimp the wire to the butt splice with the purple wire in the new wiring harness. Heat shrink the butt splices to water seal.
10. Insert the purple wire within the new wiring harness into pin #25 of the 35-pin connector.
11. Taking the orange wires that was removed from pin #15 and pin #26 in the 35-pin connector, cut off the existing pins, strip the insulation and crimp the wire to the butt splice with the orange wire in the new wiring harness. Heat shrink the butt splices to water seal.
12. Insert the orange wire in the new wiring harness into pin #26 of the 35-pin connector.

## **WIRES TO BE ADDED TO AMPSEAL CONNECTOR**

In Addition to the wire changes in the previous step, the following wires need to be added to the existing 35-pin controller connector.

1. Insert the brown wire from the new wiring harness into pin #14 of the 35-pin connector.
2. Insert the purple wire from the new wiring harness into pin #3 of the 35-pin connector.
3. Insert the white/red wire from the new wiring harness into pin #19 of the 35-pin connector.
4. Insert the blue/white wire from the new wiring harness into pin #13 of the 35-pin connector.
5. Insert the orange/black wire from the new wiring harness into pin #2 of the 35-pin connector.
6. Insert the yellow wire from the new wiring harness into pin #23 of the 35-pin connector.
7. Insert the green wire from the new wiring harness into pin #35 of the 35-pin connector.
8. Insert the black jumper wire that comes with the kit into pins #21 and #34 of the 35-pin connector.
9. After verifying that the wires are seated properly, secure the wires by reseating the red plastic pin retainer located on the connector. There will be a click when the retainer is secured properly. Re-verify that the inserted connections are seated properly by tugging on the inserted wires.

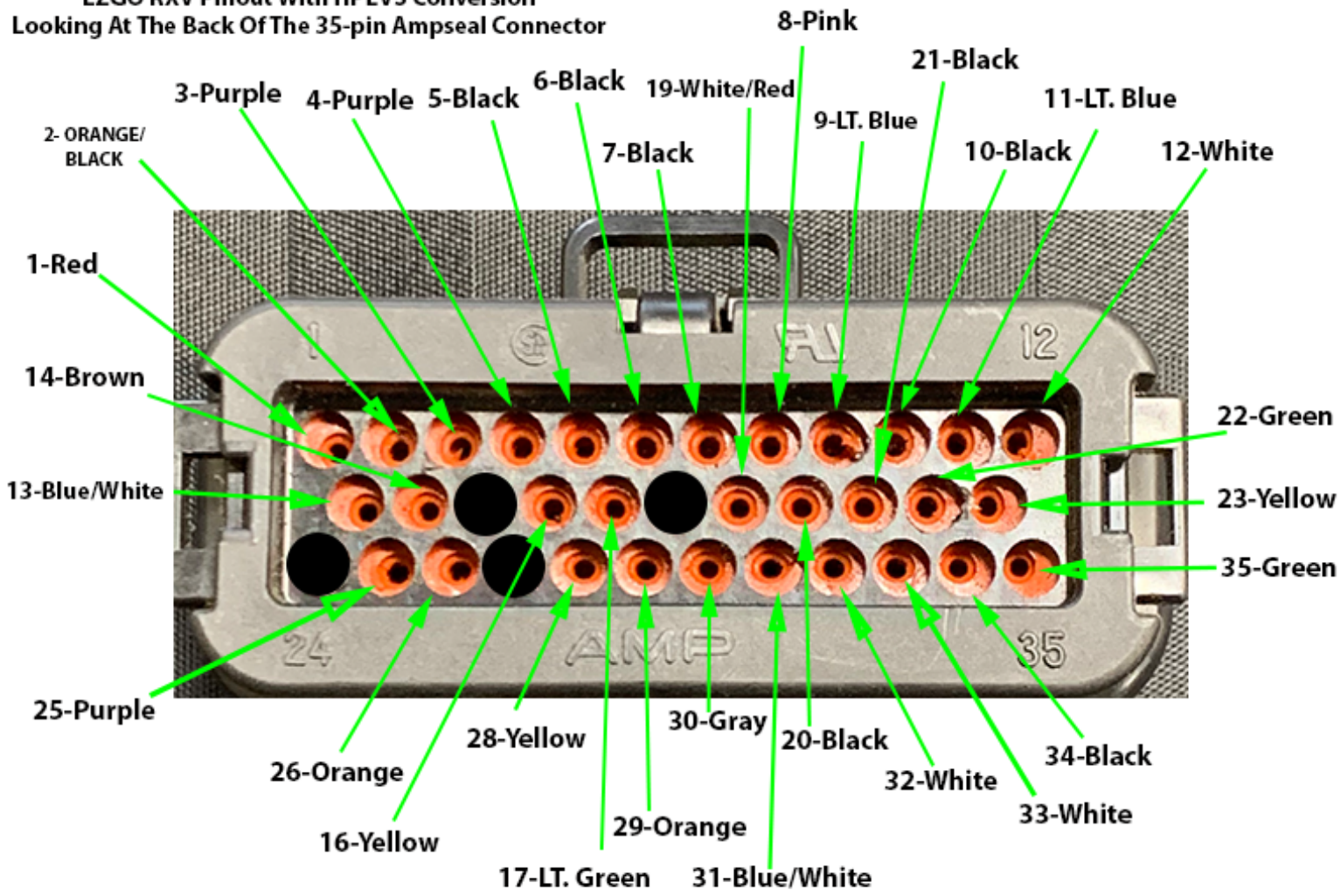
## 35-PIN AMPSEAL CONNECTOR AFTER CONVERSION

<b>35 PIN OEM CONNECTOR PINOUTS (CURTIS AC-RXV CONTROLLER) AFTER MODIFICATION</b>				
Pin #	Signal Name	Wire color	Voltage	Description
1	KSI	Red	+48V	Key switch input, braking resistor controller, Pack voltage to Lithium pack BMS
2	START SWITCH RELAY	Orange/Black		Start relay for cars with HPEVS lithium battery pack; optional for cars with lead acid batteries
3	BRAKING RESISTOR CONTROL	Purple		Braking resistor controller
4	BLR	Purple	12 - 15 V	Brake light relay
5	EMB	Black	+48V	Low side driver for electric park brake
6	MAIN	Black	- 48 V	Low side driver for main solenoid
7	GROUND	Black	- 48 V	System ground, Throttle and Brake ground, Prog port ground
8	TEMP SENSOR	Pink	5V	Motor temp sensor
9	PEDAL	Light Blue	+48V	Switch input-pedal
10	TOW	Black	+48V	Switch input-tow
11	CHARGER	Light Blue		Charger interlock input
12	BRAKE SWITCH	White	+48V	Brake limit switch
13	COIL RETURN	Blue/White		Return for all relays
14	GOLF/STREET SWITCH	Brown		Switch Input to Golf/Street switch
15	N/C			
16	THROTTLE	Yellow	0-5V	Analog throttle input
17	BRAKE SWITCH	Light Green	0-5V	Analog brake input
18	N/C			
19	MENU BUTTON	White/Red		Switch input for menu button
20	BUZZER	Black	- 48 V	low side driver for buzzer
21	CAN TERM H	BLACK		CAN termination CANBUS
22	FWD	Green	+48V	FNR switch input
23	CANH	Yellow		CANBUS high
24	N/C			
25	12V +	Purple	12V	1311 communication BUTT SPLICE, +12V to 1341 display
26	5V +	Orange	5V	5V encoder, 5V to braking resistor controller, 5V output to throttle and brake sensors
27	N/C			
28	TX	Yellow		1311 communication
29	RX	Orange		1311 communication
30	SOC	Gray	0-5V	Analog output 0-5V
31	ENC A	Blue/White	0-5V	Encoder signal A
32	ENC B	White	0-5V	Encoder signal B
33	REV	White	+48V	FNR switch input
34	CAN TERM L	Black		CAN termination CANBUS
35	CANL	Green		CANBUS low



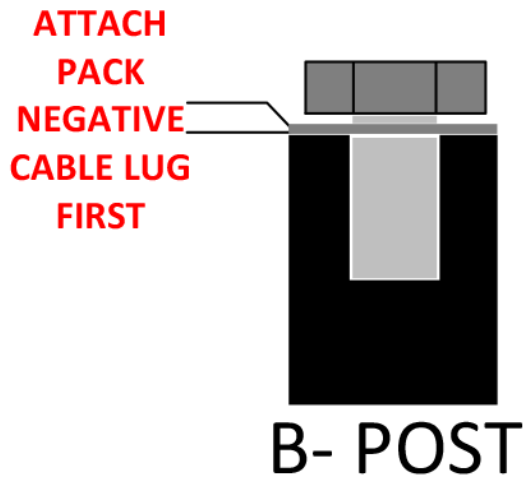
# HPEVS CONVERSION ELECTRICAL CONNECTIONS

**EZGO RXV Pinout With HPEVS Conversion  
Looking At The Back Of The 35-pin Ampseal Connector**

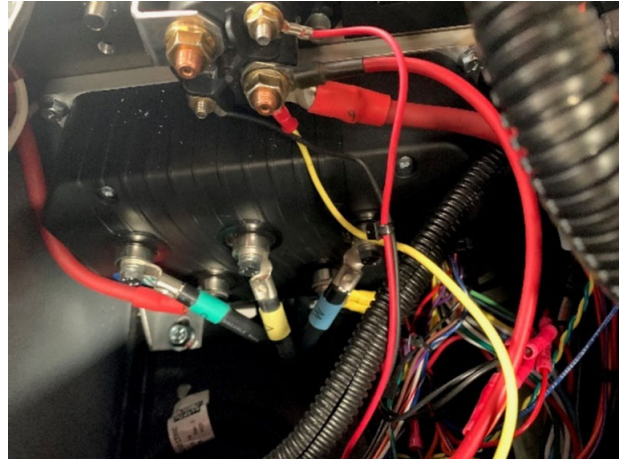
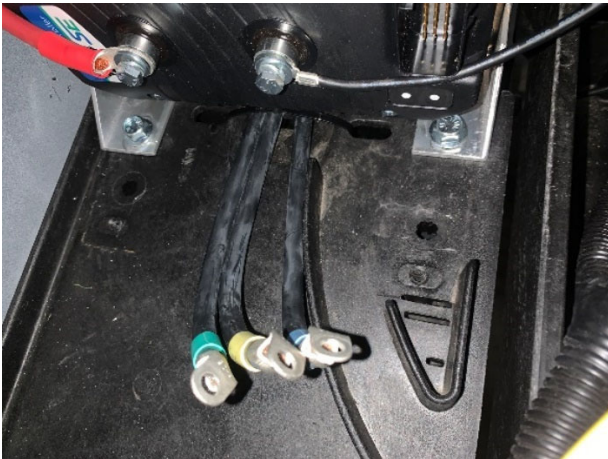


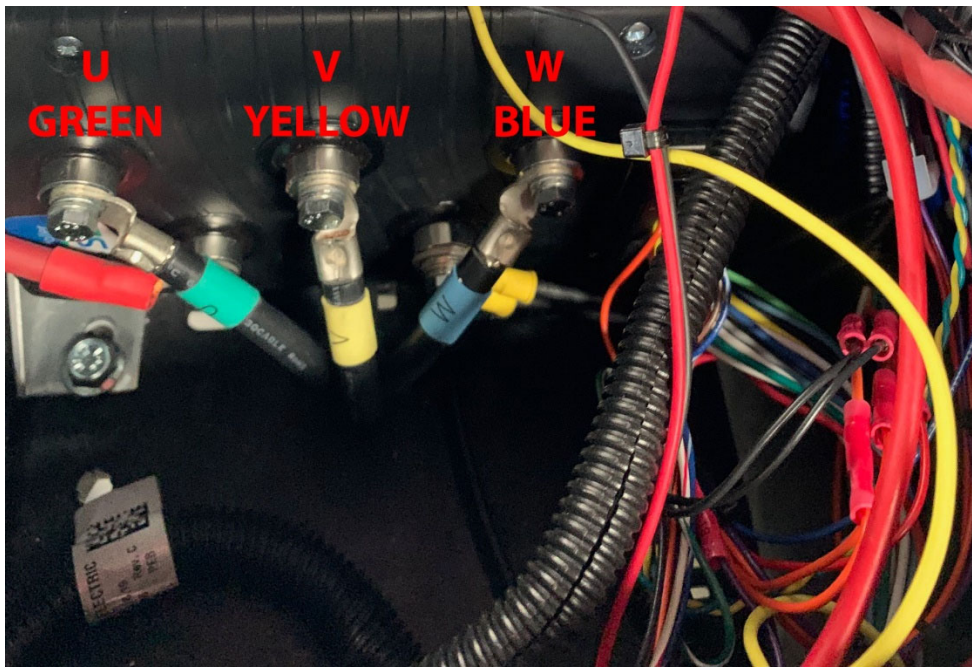
## FINALIZING CONNECTIONS

1. Re-attach the Battery negative cable and the black cable from the Regen Resistor controller onto the B- post of the motor controller. **(IT IS IMPORTANT THAT THE BATTERY PACK NEGATIVE CABLE RESTS AGAINST THE B- POST ON THE CONTROLLER FIRST. ALL OTHER CONNECTORS CAN BE LOCATED ON TOP OF THE B NEGATIVE CABLE IN THE STACK)**



2. Connect the motor lead cables (U, V, W) from the motor to the motor controller (Green band to U terminal, yellow band to V terminal, and Blue band to W terminal).





3. Reconnect the battery pack positive cable and yellow wire with installed hoop terminal to the solenoid. Reconnect and all remaining wires that were removed from the solenoid to their original place.



4. Make sure that all electrical connections are secure and tight prior to turning the system on and testing.

## DASH MODIFICATIONS

1. Modify as needed and install the Curtis Instruments 3140 display, menu button and the golf/street mode switch in the dash.
2. Connect the electrical wiring to these devices.



## **REGEN RESISTOR TEST**

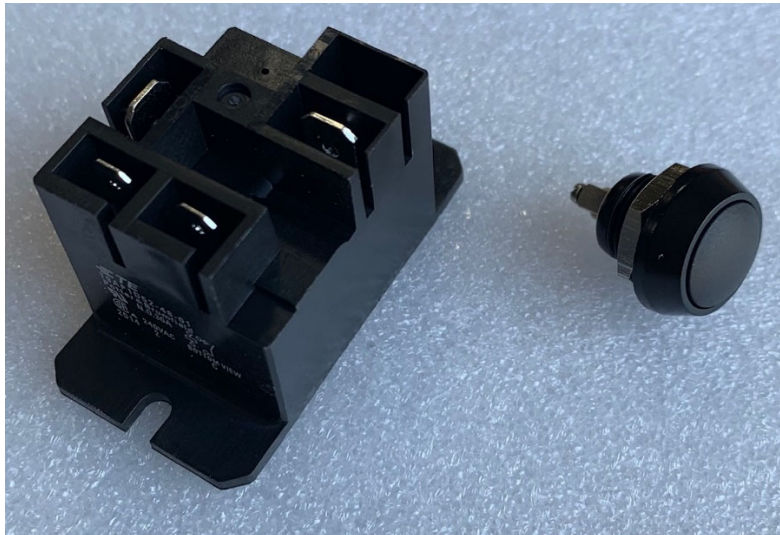
1. Turn on the golf car.
2. Connect to the controller using the 1313 handheld Programmer.
3. Select the Parameters dialog box.
4. Select and open the "User Settings" tab.
5. Scroll down, select, and open "Braking Resistor".
6. Within this tab scroll down and select the "Resistor PWM" parameter.
7. Adjust this parameter to **20%**.
8. Back out of this parameter.
9. Select the "Test Resistor" parameter.
10. Turn this parameter on.
11. While this parameter is on place your hand next to the braking resistor. If a rise in heat is felt, the resistor is working.
12. Turn the "Test Resistor" off. **DO NOT ALLOW THE RESISTOR TO OVERHEAT**

## **OPTIONAL Motor Start Relay**

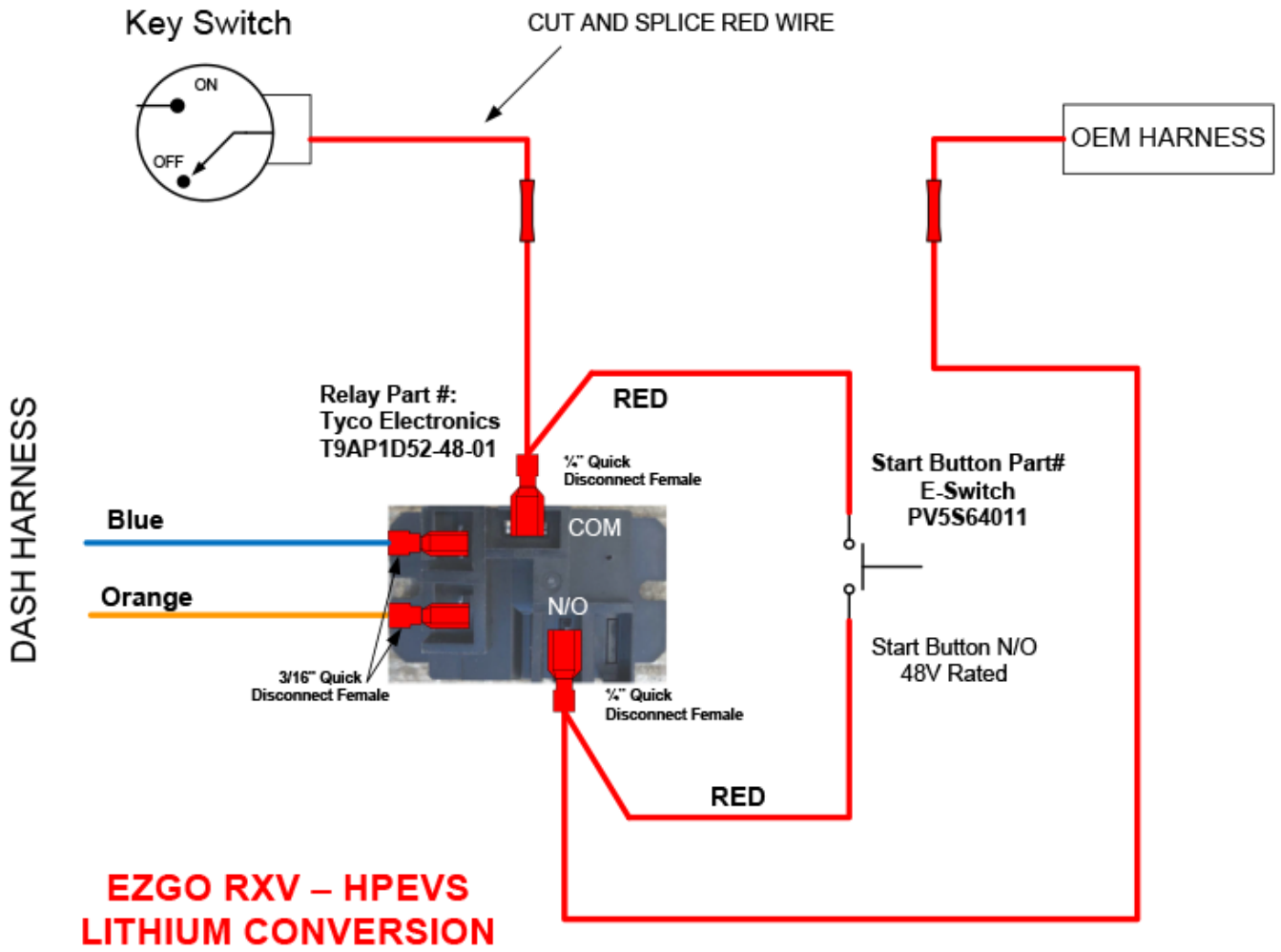
Optional with lead acid batteries is the use of the motor start relay. Utilizing the provided start button to start the golf car, this system is designed to protect the batteries. Once the car is started and running, the vehicle will remain on. If the vehicle has not been driven for 30 minutes, the controller is programmed to shut down the vehicle and all power so that battery power is not being used. To restart the vehicle, simply depress the start button once again to restart the drive system.

**(DISCLAIMER: ALTHOUGH THIS PROCESS IS DESIGNED TO SHUT DOWN THE DRIVE SYSTEM TO PROTECT THE BATTERIES FROM BEING FULLY DEPLETED, THE IGNITION KEY SHOULD ALWAYS BE USED TO SHUTDOWN THE DRIVE SYSTEM).**

1. If used, in the kit, locate the motor start relay and button start.



2. Install these items in the golf car; with the relay behind the dash and the start button in the dash.
3. Connect the electrical wiring for the motor start relay based on the schematic below.



**REVISIONS:**

<b>Rev Number</b>	<b>Description</b>	<b>Date</b>	<b>Approved</b>
<b>A</b>	<b>INITIAL RELEASE</b>	<b>8/26/20</b>	<b>SCF</b>
<b>B</b>	<b>CORRECTED ISSUE OF NO MENTION OF INSERTING PURPLE WIRE FROM 3-PIN DELPHI CONNECTOR INTO PIN #3 OF 35 PIN AMPSEAL MOTOR CONTROLLER CONNECTOR</b>	<b>9/28/20</b>	<b>SCF</b>