



## Eco-Star models ECO805 & ECO809-CW Stop and auto-Restart Idle Reduction System for J1939-based Work Truck Vehicles

**2011 - 2017 Ford F650-750 (6.7L Cummins Diesel Only)**

**2011 - 2017 Freightliner M2/S2**

**2011 - 2017 International DuraStar and TerraStar**

Contact InterMotive for additional vehicle applications and specific model years.

### Introduction

The ECO805 and ECO809-CW are automatic engine stop/start systems that provides lower vehicle emissions and improved fuel economy by forcing an idling engine to shutoff. The system accepts user inputs that allow the operator to control engine stop/start from a remote location (i.e. a work truck boom). An idle shutoff timer is also added as an additional means to minimize engine run time. Restarts are triggered automatically by low battery voltages or the user restart request. For more information on the specific operating conditions, go to [www.intermotive.net](http://www.intermotive.net) and download the Eco-Star Application Note.

### Installation Instructions

**Disconnect vehicle battery before proceeding with the installation.**



#### WARNING

Disconnect the battery to prevent setting a check engine light.

#### IMPORTANT—READ BEFORE INSTALLATION

It is the installer's responsibility to route and secure all wiring harnesses where they cannot be damaged by sharp objects, mechanical moving parts and high heat sources. Failure to do so could result in damage to the system or vehicle and create possible safety concerns for the operator and passengers. Avoid placing the module where it could encounter strong magnetic fields from high current cabling connected to motors, solenoids, etc. Avoid radio frequency energy from antennas or inverters next to the module. Avoid high voltage spikes in vehicle wiring by always using diode clamped relays when installing upfitter circuits.

### Choosing the ECO805/809 Module Location

Remove the lower dash panel below the steering column and find a suitable location to mount the module. Locate the module in an area away from excessive heat sources (engine, heater ducts, etc.). Ensure when routing harnesses that the tilt steering column does not contact them in the full down position. Do not mount the module until all wire harnesses are routed and secure. The last step of the installation is to mount the module. When installing the harnesses, leave several inches of take-out such that the module can be removed if necessary.

## J1939 Plug and Play Data Link Harness (Optional P2 Data Link Harness)

1. Locate the vehicle's J1939 Connector. It is usually located below the lower left dash panel.
2. Remove the J1939 Connector from the mounting bracket.
3. Connect the ECO805/809 Data Link harness J1939 female connector to the vehicle's J1939 connector.
4. Mount the ECO805/809 Data Link harness J1939 male connector to the vehicle's J1939 connector mounting bracket.
5. Plug the free end of the ECO805/809 Data Link harness into the mating 6-pin connector on the module.
6. Secure the ECO805/809 Data Link harness so that it does not hang below the lower dash panel.



## Ignition Switch Connections

The ECO805/809 module shuts down and restarts the engine by tapping into the ignition switch wires and simulating key off/on/start. Many medium duty vehicles use clearly marked ignition switches which have the battery, run, start, accessory circuits clearly marked on the back of the switch.

**If the crank circuit draws more than 500mA, a diode suppressed relay will be necessary.**

The following sections provide separate instructions for the Ford F650-750, Freightliner M2/S2, and International DuraStar/TerraStar. Find the appropriate section for your installation.

The supplied **male** pigtail has Blue and Purple wires, the **female** pigtail has Red and Purple wires. Find a location on the vehicle's steering column / Ignition Harness with ample space to locate these 2-pin connector pigtails inside the OEM steering column housing.

These provided pigtail connectors allow the OEM circuits to be easily restored to stock and allow ECO805/809 to be removed at any time, by unplugging the pigtail connectors from the ECO805/809 harness and mating them with each other.

## Ignition Switch Connections (Continued)

### Ford F650-750 (diesel only) Ignition Switch Connectors

- Remove the lower steering column trim cover. Locate the ignition switch connector and disconnect it from the back of the switch.
- Locate two wires: Pin 1 (Dark Blue/Light Green wire) and Pin 5 (Red/Light Blue wire).
- Cut the ignition switch pin 1 Dark Blue/Light Green wire and attach the ignition switch side to the **female** 2 pin connector Red wire.
- Attach the OEM harness side of the pin 1 Dark Blue/Light Green wire to the **male** 2 pin connector Blue wire.
- Cut the ignition switch pin 5 Red/Light Blue wire and attach the ignition switch side to the **female** 2 pin connector Purple wire.
- Attach the OEM harness side of the pin 5 Red/Light Blue wire to the **male** 2 pin connector Purple wire.

**Note: Some chassis use the same color wires for the different ignition switch circuits! Therefore, it is VERY IMPORTANT to only cut and connect one wire at a time. These connections must be made by using solder and the supplied heat shrink tubing. Cut the tubing to 1" lengths for this purpose.**

- Attach the 2-pin ignition connectors to the ECO805/809 harness.
- Attach the 12-pin connector of the ECO805/809 harness to the ECO805/809 module's 12 pin connector.
- Attach the 4-pin connector of the ECO805/809 harness to the ECO805/809 module 4 pin connector.
- Reattach the Ignition Switch Connector to the Ignition Switch.

## Freightliner M2/S2 Ignition Switch Connectors

- Remove the lower steering column trim cover. Locate the ignition switch connector and disconnect it from the switch.
- Locate two ignition wires and the start wire (all Pink wires) by removing the ignitions switch connector from the ignition switch. "IGN" (ignition) and "ST" (start) will be printed on the underside of the connector.
- Cut the ignition wires (both Pink) and attach the ignition switch side of both wires to the **female** 2-pin connector Red wire.
- Attach the OEM harness side of the ignition wires (both Pink) to the **male** 2-pin connector Blue wire.
- Cut the start wire (Pink) and attach the ignition switch side to the **female** 2-pin connector Purple wire.
- Attach the OEM harness side of the start wire (Pink) to the **male** 2-pin connector Purple wire.
- Attach the 2-pin ignition connectors to the ECO805/809 harness.
- Attach the 12-pin connector of the ECO805/809 harness to the ECO805/809 module 12 pin connector.
- Attach the 4-pin connector of the ECO805/809 harness to the ECO805/809 module 4 pin connector.

## International DuraStar and TerraStar Ignition Switch Connectors

- Remove the lower steering column trim cover. Locate the ignition switch connector and disconnect it from the switch.
- Locate Pins B and D (both Pink wires).
- Cut the ignition switch pin D Pink wire and attach the ignition switch side to the **female** 2-pin connector Red wire.
- Attach the OEM harness side of the pin D Pink wire to the **male** 2-pin connector Blue wire.
- Cut the ignition switch pin B Pink wire and attach the ignition switch side to the **female** 2-pin connector Purple wire.
- Attach the OEM harness side of the pin B Pink wire to the **male** 2-pin connector Purple wire.
- Attach the 2-pin ignition connectors to the ECO805/809 harness.
- Attach the 12-pin connector of the ECO805/809 harness to the ECO805/809 module 12 pin connector.
- Attach the 4-pin connector of the ECO805/809 harness to the ECO805/809 module 4 pin connector.
- Reattach the Ignition Switch Connector to the Ignition Switch.

## I/O Features and Descriptions

### Hood Open Disable Switch (-B Add on Option)

Installing a Hood Open Disable Switch is required. This grounding connection **must** be made in order for the module to operate. It is one of the most important safety features and the time must be taken to properly install a switch such that a ground contact is made only with the hood fully closed.

Pin #3 (Brown wire) of the 4 pin connector is the Hood input. A ground signal allows auto restart **only** when the hood is closed. As an important safety feature, this connection must be made to prevent auto restarting when someone is working under the hood area. Extend the Brown Hood Open Disable wire through the bulkhead into the engine compartment (solder and heat shrink all connections.) Attach the Hood Open Disable wire to a normally open hood switch that grounds this signal when the hood is closed. A low current switch with gold contacts is recommended.

### Engine Off Request Input

Pin #2 (White wire) of the 12 Pin Connector is an Engine Off Request input. Grounding this wire with a switch allows remote engine shutoff capability. Keeping this input grounded will keep Run/Start loads off (exceptions: a remote Engine On switch OR a low battery **will** restore ignition power and restart the engine). Holding request engine Off low after shutdown reduces the draw on the battery to a minimum, allowing the greatest amount of time between low battery restarts.

\* (ECO809 Only) The Engine Off Request input is a one wire stop start control for the ECO809. The function of the input is the same as ECO805 except for when the ground is removed from this input the engine will restart.

### Engine On switch Input

Pin #5 (Green wire) of the 12 Pin Connector is the Engine On switch input which may be wired to a remote engine on switch. Note that this input also acts as a Shutdown Inhibit. When active (grounded), the Anti-Idle shutdown timer and the Engine Off Request inputs will **not** turn the engine off.

### Thermistor Input (-T Add on Option)

Pin #5 Green wire on the 12 pin Connector can be connected to an optional thermistor, which can be used to auto restart the engine. The thermistor can be used to auto restart due to high cabin temperature, allowing the A/C to bring the temperature down. It may also be used to restart due to cold temperatures to prevent freezing conditions. See Eco-Star Application note at [www.intermotive.net](http://www.intermotive.net).

**Diesel Regen:** If the diesel particulate filter (DPF) is undergoing active regeneration, the ECO805/809 will not shut the engine down. If the status of active regeneration is unavailable on the network (this will be apparent if Eco-Star shuts the engine down during regeneration) then it is recommended that a "force regen switch" is attached to Pin 5 (Green wire) so Eco-Star will not shut down the engine if forced regen is requested.

## Security Input

Pin #1 of the 4 Pin Connector is an optional security input. When this input is grounded by a switch, the engine will automatically shut off if the Transmission is shifted out of Park. A hidden keyed switch could be used for added security. Connect one of the provided Molex pins to an installer supplied wire and insert into cavity 1 of the 4 pin Molex header. Connect free end of wire to installer provided switch.

## Aux Battery Input

**(Up to 48 Volts if build number is labeled as 30-518 on White box on circuit board. Up to 36 Volts if labeled anything other than 30-518 in White box)**



Pin #4 of the 12 Pin Connector is an auxiliary battery voltage monitor input. It measures the analog battery input and can trigger a low battery restart when this input falls below a user defined level. By default this trigger is disabled, but it may be enabled via a laptop connection. Contact InterMotive for details. A spare Molex pin is provided in the kit to allow the use of this input.

## Restart Beeper

Pin #3 Orange wire of the 12 Pin Connector drives a warning beeper that will sound for 2 seconds prior to a low battery restart.

1. Find a suitable location for mounting the warning beeper so that it is audible to the driver.
2. Connect lead to Red post of beeper, and Black lead to the negative post. The Black lead eyelet must be grounded in order for the beeper to function. The bezel on the beeper can be rotated to control volume.

## I/O Features and Descriptions (continued)

### Un-Interrupted Load Control

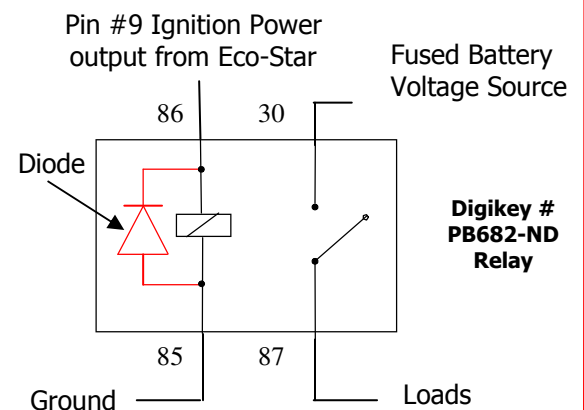
ECO805/809-CW shuts down the vehicle's engine by simulating a key in accessory condition. All electrical loads that normally shut off when the key is in accessory will lose power as long as the Engine Off Request is active. This may not be desirable for all loads and can be avoided by wiring an external relay to Eco-Star's Ignition Power Signal Pin #9 Yellow wire (1 Amp max, see below). The Ignition Power Signal will normally activate only when the key is in the Run/Start position. However, when Eco-Star is commanding Ignition Off, the Ignition Power Signal becomes Key In Ignition. These loads will drain the battery faster. Use of LED lights and higher capacity batteries is recommended.

### Equipment Enable Output

The equipment enable output (pin #1 Pink wire on the 12 pin connector) will force the user to depend on Eco-Star stop/start capability in order to use their equipment. This load is only active when the Request Engine Off input is active. While this input is active, Eco-Star will cycle the engine based on primary/secondary battery Voltages and the Request Engine On input (which now includes the optional thermostat function).

The Equipment Enable Load Output is similar to the Un-Interrupted Load Output. The difference is that this load ensures that Eco-Star is cycling the engine. In the case of the Un-Interrupted Load Output, there are ways to disable the stop/start capabilities of Eco-Star (disable idle timer or set to 30 minute idle time) while retaining the output.

The Pin #9 (Yellow wire) and Pin #1 (Pink wire) are capable of driving up to 1 Amp max. When connecting to a relay, always use a diode clamped relay, such as Digikey part number PB682-ND, or add a diode across the relay coil as shown, observing the required polarity. The use of a relay without diode clamped suppression causes high voltage spikes when the relay coil is deactivated. These voltage spikes may cause damage or intermittent behavior to on-board vehicle control modules. Resistors and other methods of clamping are not as effective and are not recommended.



### ECO805/809 Module Mounting

Ensure all harnesses are properly connected and routed, and are not hanging below the dash area. Mount the module as described on page one and secure with supplied screws or double sided tape

## Reconnect the vehicle battery

## Post Installation Operational Test

### Setting module into Installation Test Mode

The installation test mode can be entered by applying a ground to the silver/gold pad on the module labeled "TEST". When test mode activates, the status LED will start blinking. The ECO805/809-CW now functions without monitoring the following pre-conditions: Engine Temp, RPM, Battery Voltage, or Ambient Air Temp. This allows for easier testing for the installer. (Note: the default configuration for ECO805/809-CW effectively ignores temperatures).

Several conditions will prevent ECO805/809-CW from auto-shutdown:

Trans Range Not in Park, Park Brake not set, Service Brake Pedal Applied, Hood Open (Open = Not Grounded), Vehicle Speed not 0, or Engine On Switch active (Grounded).

**Test 1.** With engine running, transmission in Park, Park Brake set, hood closed, activate the Engine Off Request switch input. Engine should shut off, ignition Run/Start loads will go off and stay off (acts like key in accessory).

**Test 2.** Release the Engine Off Request. Ignition power will be restored, loads that are powered with key in Run will be restored.

- ECO805 - Engine will not start (low battery could cause a restart).
- ECO809 - Engine will start (confirm the module shuts off the engine after the configured time delay. Note: Applying the Service Brake will prevent the timer from counting down and shutting off the engine).

**Test 3.** Activate the Engine On switch. The Engine should restart.

**Test 4.** Release the Engine On switch and confirm the module shuts off the engine after the configured time delay. Note: Applying the Service Brake will prevent the timer from counting down and shutting off the engine.

**Test 5.** Repeat test 3 with hood open. As a safety feature, the ECO805/809-CW **MUST NOT** start or stop the engine when the hood is open. If the Engine On switch starts engine with hood open, check hood switch wiring. Do **NOT** allow vehicle to be placed in service.

**NOTE:** ECO805/809-CW will not shut off the engine for 5 seconds after the engine is started.

**Do not put vehicle in service unless hood open disables ECO805/809 from auto restarting engine.**

**If the system fails any of the above tests, check the related wiring. If necessary, call InterMotive Technical Support at 530-823-1048. Do NOT release vehicle for service unless it has passed ALL of the above tests.**



## Changing ECO805/809's default factory settings

ECO805/809 allows customization of numerous parameters, such as engine restart battery voltages, temperature restarts, idle timer shutdown time, etc. To make changes to the default Eco-Star configuration, see Intermotive Application Note for Eco-Star on our website ([www.intermotive.net](http://www.intermotive.net)). This document goes into much greater detail on the parameters and safety conditions of Eco-Star. If the configuration is altered, make note of the modifications for future serviceability and include them with the vehicle.

### Parameters unique to ECO805/809

Three additional parameters are unique to the ECO805/809 module:

- **Set Engine Start RPM**

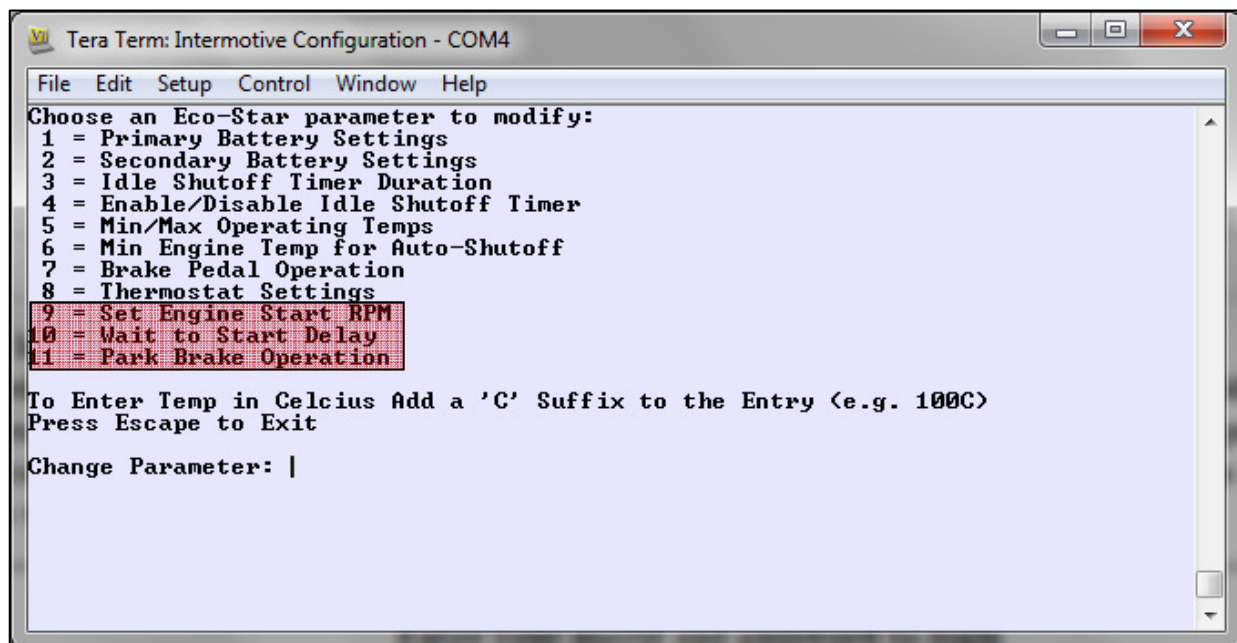
Because the vehicles that ECO805/809 operate on do not have "one touch crank circuits", The ECO805/809 watches engine RPM and stops cranking once the engines starts. Parameter 9 allows the Engine Start RPM to be configured to the customers specifications.

- **Wait to Start Delay**

Most of the vehicles that ECO805/809 operate on are diesel engines and have glow plugs to aid in starting. Once ECO805/809 simulates "key in run" it watches the "Wait to Start" lamp and waits for the light to go out before cranking. There is also a "Wait to Start" delay (Parameter 10) that is a configurable parameter in case the "Wait to Start" lamp is unreadable. If the lamp is readable and a "Wait to Start" delay is configured, ECO805/809 will wait until the delay has expired **and** the lamp has turned Off before cranking.

- **Park Brake Operation**

By default, ECO805 requires the Park Brake to be set for operation because not all medium duty vehicles have a Park pawl. This configurable option will allow the Park Brake pre-condition to be disabled.



Leave in vehicle

## **Eco-Star model ECO805 & ECO809-CW Stop and auto-Restart Idle Reduction System Operating Instructions**

2011 - 2017 Ford F650-750 (6.7 Cummins Diesel Only) , 2011 - 2017 Freightliner M2/S2,  
2011 - 2017 International DuraStar & TerraStar

- The ECO805/809-CW provides enhanced fuel economy and lower vehicle emissions by limiting engine idle time. Vehicle fuel economy is improved by automatically shutting off the vehicle's engine to prevent unnecessary idling. Restarts may be automatically triggered by low battery voltage, temperatures, or remote equipment operator requests.
- The Engine Off Request is a remote switch that when activated turns the engine off by switching off ignition power. The ignition remains off until: 1) Engine Off Request is removed, 2) Low battery causes a restart, 3) temperature excursions (optional feature), or 4) a remote Engine On switch is activated. The module keeps ignition off to reduce the demand on the batteries, thereby delaying a low battery restart as long as possible. \* (ECO809 Only) The Engine Off Request input is a one wire stop start control for the ECO809. The function of the input is the same as ECO805 except for when the ground is removed from this input the engine will restart.
- The Engine will also be auto-stopped when the idle time exceeds the time out period. The default timeout period is 15 seconds of idling in Park (or neutral if the vehicle doesn't have a Park pawl) with Park Brake set (configurable). After that period elapses, the engine will be automatically turned off. Note that the Service Brake and the Engine On switch will prevent idle timer shutoff.
- The Engine On switch, if installed, is a remote trigger that when activated will start the engine after an auto-stop has occurred. Activating the Engine On switch while the vehicle is running will prevent all auto-stops from occurring.
- Once the engine has been auto-stopped, ECO805/809-CW monitors the main battery voltage (an auxiliary battery may also be monitored). If either fall below the restart voltage, the module will sound an alarm for 2 seconds and auto-restart the vehicle to recharge the batteries. Once the main battery is charged, it will shut the engine off again.
- If a security switch has been installed and is "on", the engine will be turned off if the transmission is shifted out of Park (or neutral if the vehicle doesn't have a Park pawl). This can prevent theft and/or unauthorized driving.
- If the hood is open, auto-engine shut off and restart are disabled.

### **Default requirements for auto engine shut off:**

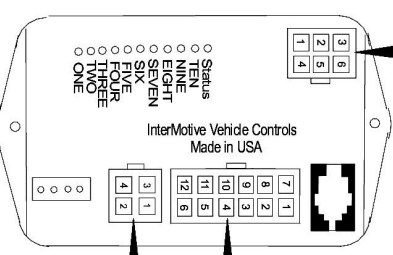
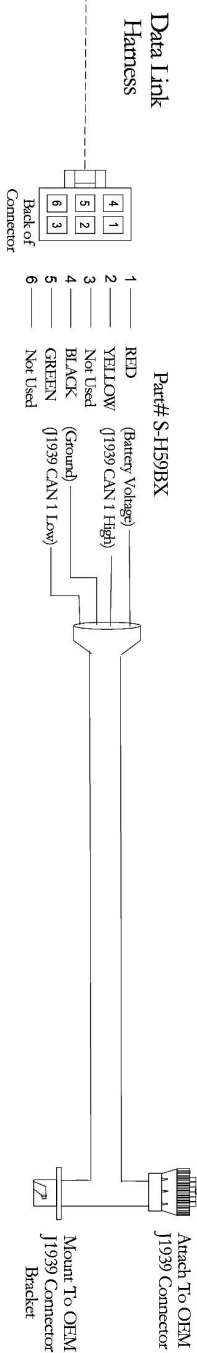
Transmission in Park (or neutral if the vehicle doesn't have a Park pawl) if vehicle is not moving, Park Brake set, hood closed, Service Brake not applied, Battery Voltage not low, and Engine On switch must not be "on" (this switch input overrides the Engine Off Request and Idle Timer).

Note: The module will not respond to an Engine Off Requests for 5 seconds after the engine is started. Additionally, engine RPM must be less than 1100 for the Idle Timer feature to shutoff the engine.

### **Default requirements for auto engine restart:**

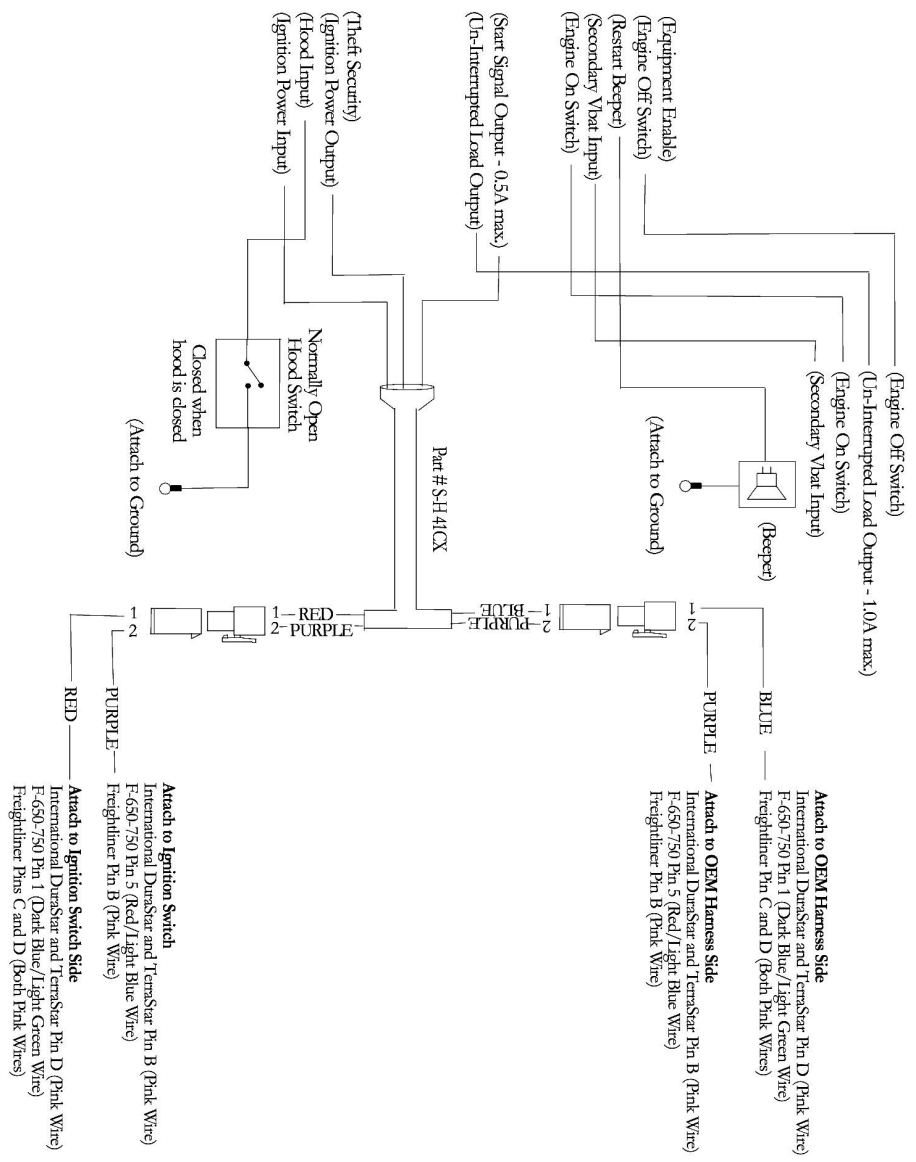
Hood Closed, Engine must have been auto-stopped, Transmission in Park (or neutral if transmission does not have Park), Park Brake set, and the key in the Run position. Once above conditions are met, the engine will restart when the Engine On switch is activated OR a low battery is detected.

The ECO805/809-CW may be removed from the vehicle by unplugging the ECO805/809-CW 6 pin harness (behind lower drivers dash panel) and restoring the OEM ignition switch wiring (under steering column trim cover).



ECO805-CW  
S-M1200-25  
ECO809-CW  
S-M1200-27

- |    |          |
|----|----------|
| 1  | PINK     |
| 2  | WHITE    |
| 3  | ORANGE   |
| 4  | GRAY     |
| 5  | GREEN    |
| 6  | Not Used |
| 7  | Not Used |
| 8  | PURPLE   |
| 9  | YELLOW   |
| 10 | Not Used |
| 11 | Not Used |
| 12 | Not Used |



**Attach to OEM Harness Side**  
International Durastar and TerraStar Pin D (Pink Wire)  
F-650-750 Pin 1 (Dark Blue/Light Green Wire)  
Freightliner Pin C and D (Both Pink Wires)

**Attach to OEM Harness Side**  
International Durastar and TerraStar Pin B (Pink Wire)  
F-650-750 Pin 5 (Red/Light Blue Wire)  
Freightliner Pin B (Pink Wire)

**Attach to Ignition Switch**  
International Durastar and TerraStar Pin D (Pink Wire)  
F-650-750 Pin 1 (Dark Blue/Light Green Wire)  
Freightliner Pins C and D (Both Pink Wires)

## Submit product registration at [www.intermotive.net](http://www.intermotive.net)

If the ECO805/809-CW fails any step in the Post Installation Test, review the installation instructions and check all connections. If necessary, call

**InterMotive Technical Support at (530) 823-1048.**

ECO805/809-CW-092217-CAD