Instructions

B-EVO505-A

2020 - 2022 Ford F53*

Patent Pending

Contact InterMotive for specific engine applications.

Not for use on chassis with Push to Start ignition systems

* For vehicles with the OEM gateway connector located below the lower left dash panel (with a Black OBDII connector).

Introduction

The B-EVO505-A is an engine start/stop system designed for the Ford E-Series chassis. It will automatically start and stop the vehicle's engine (when enabled) to charge either the OEM 12V battery and/or an auxiliary battery system. It allows unattended (key out) operation for enhanced security. The product has several field programmable parameters which can be modified to user specifications.

B-EVO505 interfaces with the vehicle through the use of "Plug & Play" connectors that plug directly into the factory OEM connectors. This method of installation reduces the installation time and improves connection reliability.

The module provides internal safeguards as well as functional preconditions to ensure the safe operation of the vehicle. In addition, there are diagnostic functions that allow for rapid troubleshooting.

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 and solenoids when installing upfitter circuits.

CAUTION

All electronic products are susceptible to damage from Electrostatic Discharge or ESD. Ground yourself before handling or working with the module and harnessing by first touching chassis ground, such as the barrel of the cigarette lighter.

Installation Instructions

Disconnect vehicle battery before proceeding with installation.

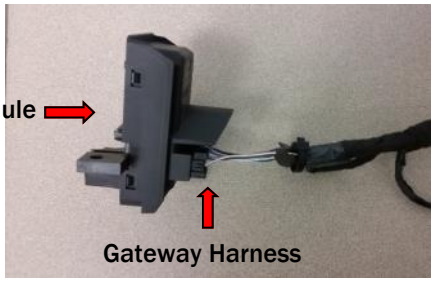
EVO505 Module

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. When installing the harnesses, leave several inches of take-out so the module can be removed if necessary. Do not mount module until all wire harnesses are routed and secure. The last step of the installation is to mount the module.

Instructions

Ford 24-pin Data Link Harness

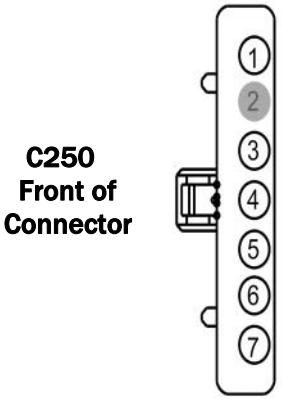
1. Locate the vehicle's Gateway Module. It will be mounted below the lower left dash panel.
2. Remove the harness behind the Gateway module by pressing the locking tab and pulling outward.
3. Plug the Female side of the InterMotive Gateway Harness into the back of the Gateway module. Ensure the connection is fully seated and secured by the locking tab.



4. Plug the Male side of the InterMotive Data Link Harness into the Gateway harness.
5. Secure the EVO505 Gateway harness so that it does not hang below the lower dash panel.

Ignition Switch Connections

1. Remove the lower steering column trim cover. Locate the ignition switch connector (C250) and disconnect it from the ignition switch.
2. Install the EVO505 harness between the Ignition Switch and the OEM connector.



Proximity Hood Switch

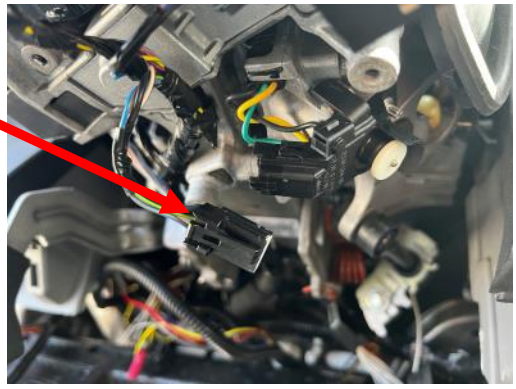
1. Under the vehicle hood, mount the proximity hood switch and harness in a suitable location.
2. Connect the ring terminal to chassis ground.
3. Route the male bullet terminal to the cabin interior and connect it to the EVO505 main harness.

Instructions

Installation Continued

Shift Lock Connection

1. Locate connector C2008 (4-pin connector). Remove the OEM connector and plug it into the mating 4-pin connector T-harness supplied with the EVO505. Plug the remaining male connector into the OEM cavity.



EVO505 Monitor Mode Switch and LED (S-H84KX)

A switch with LED is provided in the kit which illuminates when Monitor Mode is active.

1. Drill a 16mm (0.630”) hole in the desired mounting location.
2. Route the harness through the hole to mount the switch in the hole:
   A. Remove lock nut from switch
   B. Do not dis-assemble the switch to install
   C. Pull the harness through the hole
3. Slide the lock nut onto the harness and snug it down onto the back of the switch.
4. Plug in the 4 pin (Black) connector of the S-H84KX harness into the mating connector on the EVO505 main harness.

Instructions

INTERMOTIVE VEHICLE CONTROLS
An ISO 9001:2015 Registered Company

Installation continued

Verify that the following connections and installations have been made:

1. The Data Link Connector has been installed.
2. The Ignition Switch connectors have been plugged into the ignition switch and the EVO505 main harness.
3. The Shift Lock harness has been plugged into the Shift Lock connector (connector C2008).
4. The Proximity Hood Switch is mounted and the harness has been plugged in to the EVO505 main harness.
5. The LED Monitor Mode button has been mounted and has been plugged into the EVO505 main harness.

Make the following connections from the B-EVO505 main harness to the B-EVO505 module:

Plug the 4-Pin connector into J8 of the B-EVO505 module.

Plug the 4-Pin Molex connector into J5 of the B-EVO505 module.

Plug the 8-Pin Molex connector into J4 of the B-EVO505 module.

Plug the 16-Pin Molex connector into J7 of the B-EVO505 module.

Make the following connections to the B-EVO505 harness:

Connect the 2-pin Molex connector from the auxiliary battery system to the connector on the B-EVO505 main harness.

Reconnect vehicle battery

With the key in the RUN position, plug the free end of the B-EVO505 Data Link harness into J11 of the B-EVO505 module.

Once all connections have been made, installation is complete. Prior to re-installing panels on the vehicle, be sure to conduct all post installation checks and verify correct operation of the module.

Instructions

INTERMOTIVE VEHICLE CONTROLS
An ISO 9001:2015 Registered Company

MODULE OPERATION

When activated, the B-EVO505 module will auto-start a vehicle under certain conditions, allowing the alternator to keep both the OEM and auxiliary batteries charged properly.

The module initiates the auto-start functions based on three possible events:

1. The OEM battery voltage is monitored directly by the module, and if it falls below a pre-programmed set point, the module will start the engine. While engine is running, the module continues to monitor the battery voltage, and when it increases to a pre-programmed level, a timer (configurable) is started. The engine continues to run until the time interval has elapsed at which point the module will auto-stop the engine.
2. If configured to do so, the auxiliary battery potential is monitored directly on the module, and if it falls below a pre-programmed set point, the module will start the engine. While engine is running, the module continues to monitor the battery potential, and when it increases to a pre-programmed level, the module will auto-stop the engine.
3. If configured to do so, EVO505 can communicate with a Battery Management System and receive a 12V start. When the 12V is received, the engine will start. When this 12V source is removed, the engine will auto-stop.

NOTE: The module is configured to monitor EITHER event 2 or event 3, but NOT BOTH. Both OEM and AUX battery sources are required to be fully charged in order to auto-stop the engine. “Fully charged” for event 2 means that the module has measured AUX voltage to be at or above pre-programmed level. “Fully charged” for event 3 means that the 12V trigger has been removed.

Fast Idle:

After an auto-start, the engine is commanded to run at a higher speed to facilitate an optimal charging time. The engine speed is typically set to 1500 RPMs (default) but can be modified within limits. As long as the engine coolant temperature (ECT) is within its safe operating range (0°C to 110°C or 32°F to 230° F), the vehicle can run at a fast idle speed.

Fast Idle is an independent feature controlled by certain preconditions some of which are common to the auto-start/stop feature. The following are required for the Fast Idle to be enabled:

- Vehicle in Park
- Vehicle engine speed between 400 RPM and 2800 RPM
- ECT as stated above

Instructions

INTERMOTIVE VEHICLE CONTROLS
An ISO 9001:2015 Registered Company

VIN Scroll:

Upon a hard boot, the B-EVO505 module requests VIN information from the vehicle in order to verify that the module is connected to the vehicle that it is designed for. If power is provided to the module (data-link harness is plugged in) without the key in "RUN," the module will VIN scroll (LED's blink in ascending, then descending order) for a few seconds before going to sleep. Turning the key to the "RUN" position will allow the module to verify VIN information and operate as intended.

Monitor Mode:

For the B-EVO505 to control engine start/stop, it must first be in Monitor Mode. If preconditions below are met, this module can be entered by pushing and holding the Monitor Mode button for a pre-programmed amount of time. Preconditions for entering Monitor Mode are:

- Vehicle in Park
- Service Brake released
- Parking Brake applied
- Hood Closed
- Fuel Level above configured value
- Key in the RUN position
- Engine coolant temp (ECT) is below the "shutdown ECT" configured value.

If preconditions are met and Monitor Mode is entered, the Monitor Mode button LED turns ON as a visual indication. As long as Monitor Mode is active, the LED remains ON continuously. The key can be removed from the ignition after entering Monitor Mode.

Upon entering Monitor Mode the instrument cluster will turn on, a 30 second timer will start, and the module will monitor the OEM and auxiliary battery voltages. If both batteries are above their respective "trip-points" and the 30 second timer expires, the system will turn the dash lights off and continue to monitor the batteries with the dash lights off. Once the batteries drop below their "trip-points," or the module receives a 12V start trigger, the system will turn on the dash lights and auto-start/Fast Idle the engine as normal.

Instructions

Monitor Mode (Continued)

There is a configurable engine-run timeout that will start each time the system auto-starts. The engine will run until both the OEM and auxiliary batteries are fully charged, or until the engine timeout timer expires, whichever comes first.

A continuous LED on the Monitor Mode button indicates normal operation. If the LED is blinking, either an error has occurred or an unwanted state has been entered. Four states are defined:

- The engine failed to start after 3 tries
- The engine failed to stop after 3 tries
- The engine prematurely stopped
- The service brake is applied while in Monitor Mode

The fourth state is an anti-theft precaution. In this case, auto-start/stop is again disabled for a period of time (configurable) before automatically returning to normal Monitor Mode operation. In addition to the Monitor Mode LED blinking, each of these states will also cause a module LED to light up as a way to visually identify the state. Module LEDs 1-4 are assigned to the above states respectively. Error states can be exited by inserting the key and turning it to CRANK. For each of these cases, the auto-start/stop function is disabled until Monitor Mode is reset, by exiting and then re-entering Monitor Mode.

Exiting Monitor Mode is accomplished either by pushing and holding the Monitor Mode button. If the engine is running, the B-EVO507 will first shut it OFF and then exit Monitor Mode (Monitor Mode button LED turns OFF).

Battery Force Charge:

There is an additional feature, while in Monitor Mode, that allows the user to activate engine on/Fast Idle in order to force charge the auxiliary battery. If the module is in Monitor Mode, the user can press the Monitor Mode button three times within a 3 second window, at which time the engine will start and go to Fast Idle. The engine will continue to run until the auxiliary battery system and OEM battery is fully charged or until the configurable engine timeout expires (whichever happens first) at which time the engine auto-shut off as normal.

Instructions

Configuration:

The operational aspects of the B-EVO505 are defined/controlled with the use of several parameters. Each has a preset value stored in non-volatile memory. Any of these values can be modified in the field with the use of an InterMotive download cable and a laptop running a terminal emulator application. This laptop/download cable combination is also used to update firmware in the field. Contact InterMotive to order a download cable if required.

The following parameters are available for modification:

- **OEM battery low voltage trip point** - Engine auto starts when OEM battery falls to this level. Default value 11.9V.
- **OEM charge restore point** - When the voltage level is reached, module will start an extended timer. Default value is 13.5V.
- **Extended charge time** - How long engine continues to run after OEM restore point is reached. Default value is 1200 sec. Range is 10 to 3600 sec.
- **Fast Idle engine speed** - Default value is 1500 RPM. Range is 950 RPM—2000 RPM.
- **Monitor Mode lockdown time** - When in Monitor Mode a temporary lockout occurs if service brake is applied, disabling auto-start/stop; this time determines how long before the module reverts back to normal Monitor Mode with auto-start/stop functions restored. Default value is 300 sec. Range is 10 - 600 sec.
- **Push Button Latency** - Button must be held at least this long before it takes effect. Default value is 2 sec. Range is 2 sec to 10 sec.
- **Shutdown ECT** - Maximum coolant temperature beyond which the engine will shut down (if already running) and the module will exit monitor mode. Default value is 110° C (230° F).
- **Maximum ECT** - Maximum coolant temperature beyond which Fast Idle ceases to operate. Default value is 106° C (219° F). Range is 65° C to 110° C (149° F — 230° F).
- **Minimum ECT** - Coolant temperature must be at least this value before Fast Idle will operate. Default value is –10° C (14° F). Range is –10° C to 15° C (14° F — 59° F).
- **Auxiliary Battery low voltage trip point** - Engine auto starts when auxiliary battery falls to this level. Default value is 49.9V. Range is 40V to 60V.
- **Auxiliary Battery charge restore point** - When voltage level is reached, module will auto-stop the engine. Default value is 57V. Range is low limit to 60V.
- **Low Fuel Level threshold value** - If fuel level on vehicle is below this value, system will not enter monitor mode. Default value is 25% of full tank. Range is 0-100%
- **Engine-Run Timeout Value** - Maximum allowable time engine will run on a single auto-start event. Default time is 60 minutes. Range is 50—120 minutes.

Instructions

Diagnostics

The B-EVO505 module is equipped with diagnostic features which can facilitate troubleshooting.

Diagnostic functions use module LED's as well as the red test button to assist the user.

There are four sets of LEDs (F1 - F4) any one of which (when lit) indicate the adjacent fuse is blown.

Five other LEDs labeled 1 - 4 and "ST" are used to display status information depending on the diagnostic page that is selected. The "ST" LED will "blink out" the current diagnostic page - if on Page 1, it will blink once, then delay and blink once again; if Page 2, it will blink twice then delay, then twice again, etc. There are 7 pages currently defined. If the "ST" LED is OFF, the other 4 LEDs will identify a Monitor Mode error if one should occur.

Pages are sequentially selected by pushing the red Test button; the next page's data is displayed after each push. One can proceed either forward (1->7) (with Park Brake applied) or reverse (7->1) (with Park Brake released).

Pages 1-6 will display status information as follows:

	PAGE1 module inputs 1-4	PAGE2 module inputs 5-7	PAGE3 LCO outputs
LED1	Monitor Mode Button	Start/Stop Trig Type	LCO1, Ignition Crank
LED2	12V Trigger Start Req	Aux Battery Low Request	LCO2, unused
LED3	Hood Closed	-	LCO3, +12V, engine running
LED4	Key Position, RUN	Monitor Mode LED	LCO4, optional +12V SEIC Output

	PAGE4 Relay 1-4	PAGE5 Internal Use Only	PAGE6 AFIS State, Internal Use Only
LED1	Relay 1, Shift Lock	Parking Brake Applied	—
LED2	Relay 2, Key ACC	Fuel Level Below Threshold	—
LED3	Relay 3, Key RUN	ECT above shutdown threshold	—
LED4	Relay 4, Ignition Power	Electronic Parking Brake Option	—

Page 7 is a special mode that, when selected, modifies some operational parameters to help make testing the module go quicker. These changes are only temporary, and the parameter values return to normal the next time the module is powered up:

1) Extended charge time is set to 15 seconds.
2) If applicable, Engine OverRev value set to 1700 RPM.
3) Monitor Mode lockdown time is set to 10 sec (after pressing Service Brake while in Monitor Mode).

Post Installation Checks

With all connections properly made to the module, ignition switch, hood latch, and auxiliary battery system, verify that engine will start using the OEM key and that the vehicle drives properly.

Monitor Mode:

Begin with vehicle stopped, in PARK, key in the RUN position (engine OFF), hood closed, parking brake applied, and service brake released.

1. Push and hold the Monitor Mode button - after at least 2 seconds (depending on the button latency setting), the button LED will light up indicating the vehicle is now in the Monitor Mode. The module is now monitoring the OEM battery, the auxiliary battery voltage, or 12V start input.
2. Push and hold the Monitor Mode button again and verify LED turns OFF, taking the module out of Monitor Mode.
3. Apply the Parking Brake and put the vehicle in some gear other than PARK. Push and hold the Monitor Mode button again and verify module **does not** go into Monitor Mode. Release the button.

Instructions

Post Installation Checks (continued)

4. Put the vehicle back into PARK, apply and hold the Service Brake, push and hold the Monitor Mode button again to verify the module **does not** go into Monitor Mode. Release the button and service brake.
5. Open the hood, and push and hold the Monitor Mode button again verify the module **does not** go into Monitor Mode. Release the button.
6. Close the hood and repeat STEP 1 with the key in the RUN position. Module should go into Monitor Mode.
7. Turn key to OFF position and remove.
8. Turn ON some vehicle loads that can run with the ignition off, such as headlights to draw down the OEM battery. When the OEM battery eventually falls to the preset low threshold, verify that the engine automatically starts.
9. With the engine running, verify Fast Idle is enabled after a few seconds. The engine RPM's should increase to some point and stabilize until the module stops the engine.
10. Verify engine runs for the appropriate amount of time and then stops automatically. **NOTE**: for testing purposes this run time can be reduced with a diagnostic feature as explained on Page 8.
11. Repeat steps 8 and 9 to get the engine running again. Once engine is running at Fast Idle, apply the Service Brake and verify the following:

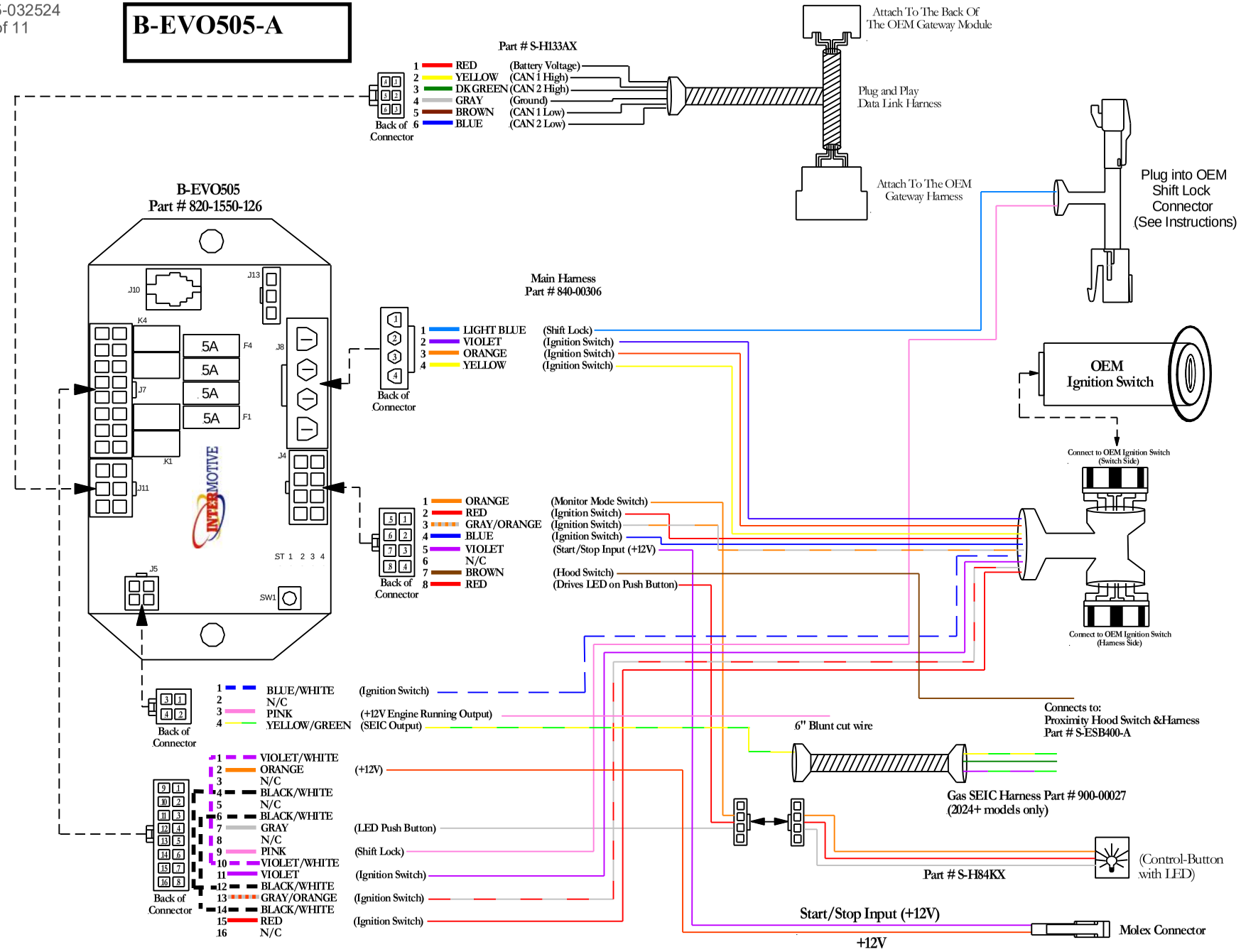
- Fast idle is disabled
- The engine stops
- The Monitor Mode button LED starts blinking

12. Verify button LED continues to blink for a time, (programmable) then returns to continuous ON status. NOTE: during the "blinking time" the auto start/stop feature is disabled.
13. With the engine OFF, draw down the auxiliary battery or cause external battery management system (BMS) to send the 12V engine start request signal.
14. Push and hold the Monitor Mode button again and verify LED turns OFF. In this state, auto start/stop is deactivated - you can verify this by drawing down the OEM battery and observing the engine will not auto start.

If the module fails any step in the checklist, review the installation instructions and check all connections. If necessary, call InterMotive Technical Support at (530) 823-1048.

Submit product registration at www.intermotive.net

B-EVO505-A



Submit product registration at www.intermotive.net

If the B-EVO505 fails any step in the Post Installation Check List, review the installation instructions and check all connections. If necessary, call InterMotive Technical Support at (530) 823-1048.