Instructions

EVO953

A-EVO953-A 2019+ Mercedes-Benz Sprinter

Patent Pending
Contact InterMotive for specific engine applications.
For use on chassis with Push-to-Start ignition systems

Introduction

The EVO953 is an engine start/stop system designed for the Mercedes-Benz Sprinter 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 operation for enhanced security. The product has several field programmable parameters which can be modified to user specifications.

EVO953 interfaces with the vehicle through the use of plug and 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 (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

WARNING
Disconnect the battery to prevent setting a check engine light.

Disconnect vehicle battery before proceeding with installation.

EVO953 Module

Remove the lower dash panel below the steering column and find a suitable location to mount the module. Place 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 slack so the module can be removed if necessary. Do not mount module until all wire harnesses are routed and secure.

Instructions

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Installation Instructions (continued)

Installation Overview

EVO953 will be installed in these dash locations. Interior panel removal will be required.

1. Data Link connection at the OBDII port
2. Module mounting location in the driver's knee bolster area
3. Data Link connection to the Peripheral CAN header

Instructions

Installation Instructions (continued)

Sprinter Disassembly Overview

The main harness connects to the vehicle's push-to-start ignition switch and service brake switch. Connections are also made in the center console area and the bulkhead. Disassemble the necessary components.

Tools Needed:

1. Plastic trim removal tool
2. Torx T20 bit and bit driver

1. Remove the right-hand dash panel.
2. Remove the floor entrance trim.
3. Remove the center cupholder.
4. Remove the tool kit cover and lift out the tool kit.
5. Remove the passenger side flooring.
6. Remove the kick panel.

Repeat for identical items on the driver's side.

Installation Instructions (continued)

Sprinter Disassembly Overview

7. Remove the driver's knee bolster trim panel.
8. Remove the driver's side center console trim.
9. Remove the left-hand kick panel.
10. Remove the lower center console trim.

Instructions

Installation Instructions (continued)

Sprinter Disassembly Overview

11. Remove the HVAC control panel by pulling outward.
12. Remove the center console.

Instructions

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Installation Instructions (continued)

Sprinter Disassembly Overview

13. Remove the lower trim that provides access to the push-to-start switch.

Instructions

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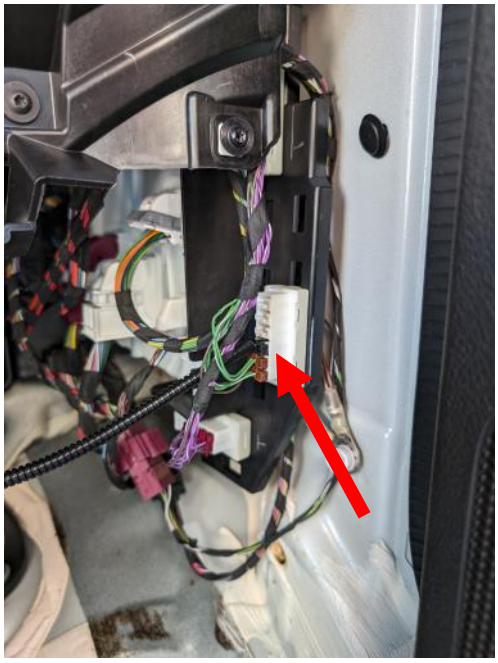
Installation Instructions (continued)

Data Link Connection

1. Install the data link harness in place of the original OBDII connector. Plug the vehicle OBDII connector into the data link harness.

2. Route the 2-way peripheral CAN connector to the front passenger right-hand footwell, and plug it into the peripheral CAN header (pictured in white). Secure all wiring.



Instructions

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Installation Instructions (continued)

Proximity Hood Switch

1. Under the vehicle's hood, mount the proximity hood switch and harness in a suitable location. Mounting on the driver's side of the engine compartment as shown has been tested for fit and functionality.

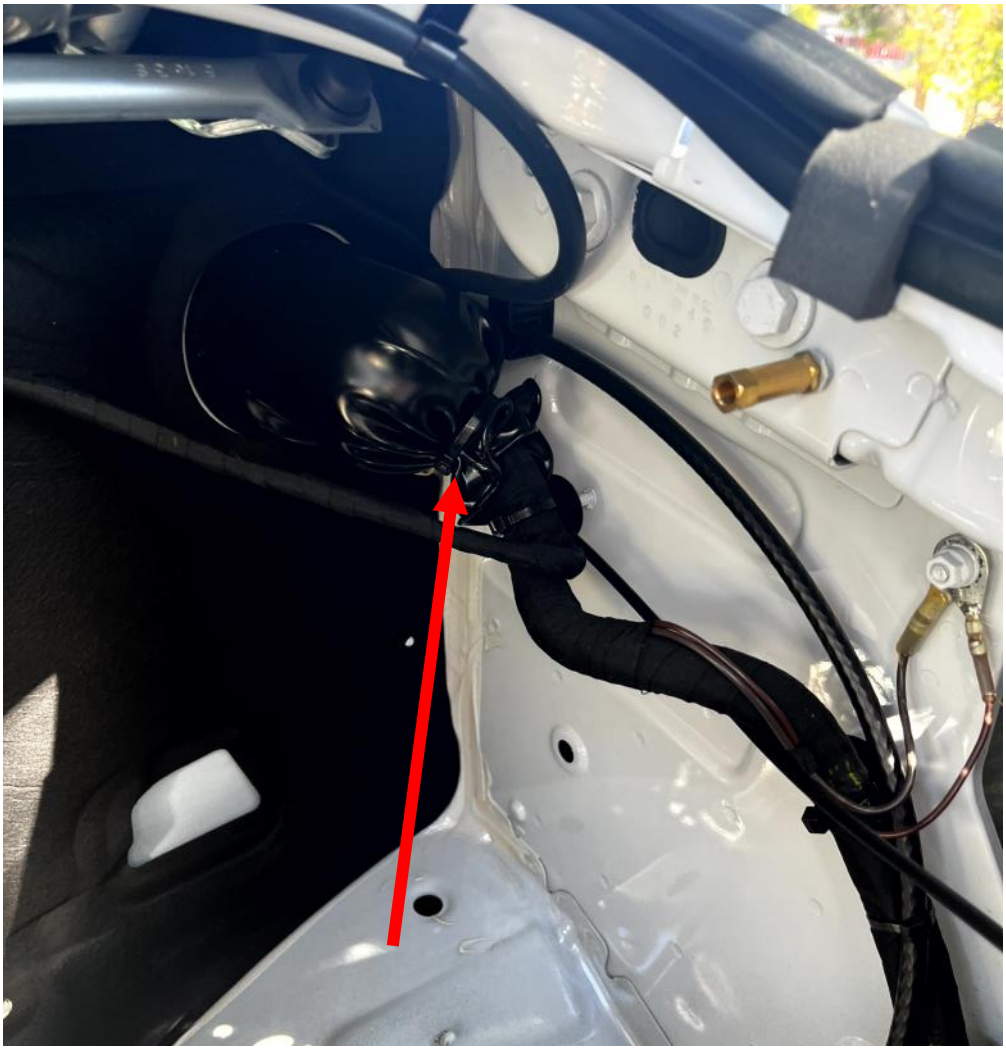
2. Secure both parts of the proximity sensor to the chassis and hood using adhesive and/or fasteners as desired.

Instructions

Installation Instructions (continued)

Proximity Hood Switch (continued)

3. Route the male bullet terminal and ring terminal to the cabin interior by opening the bulkhead wiring boot. Secure the wiring in the engine compartment and close the bulkhead boot with a wire tie.



Instructions

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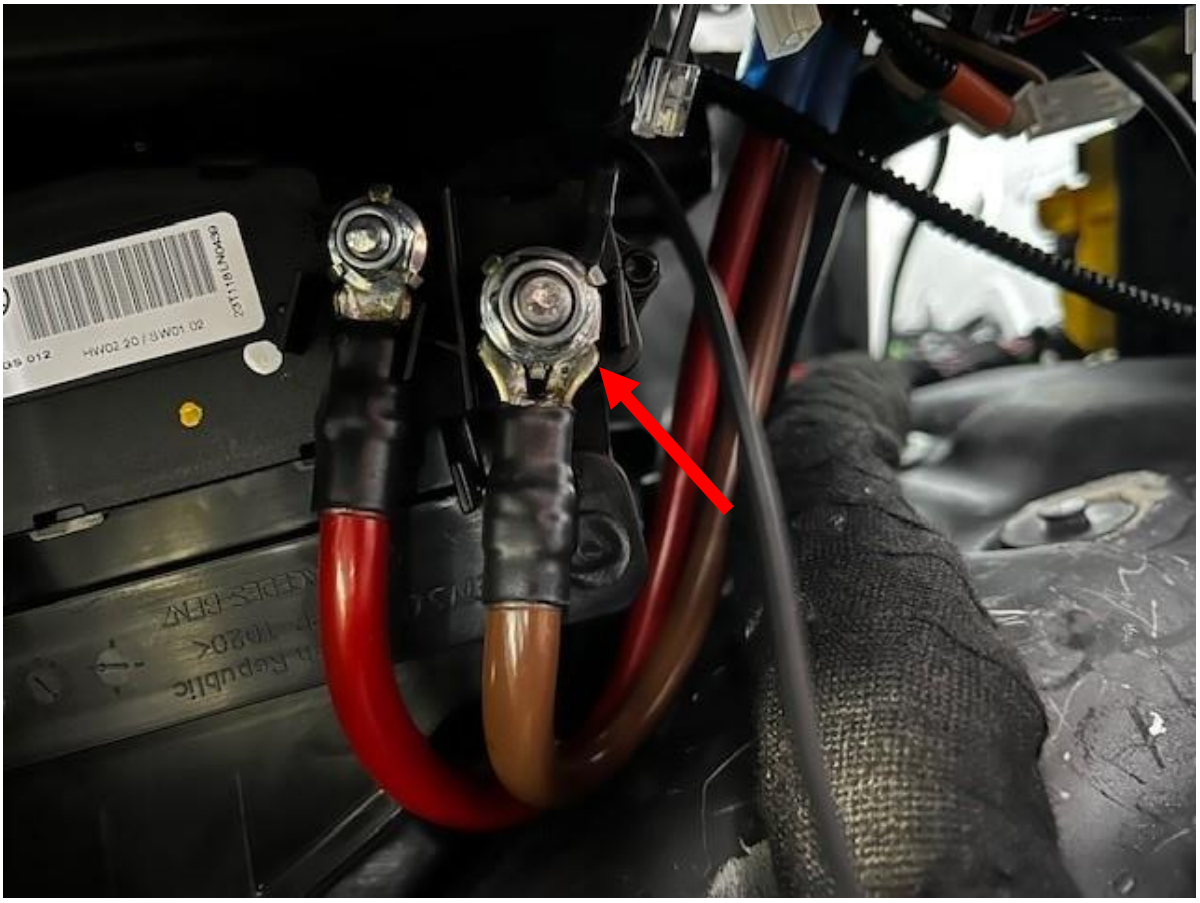
Installation Instructions (continued)

Proximity Hood Switch (continued)

4. Connect the ring terminal to the battery chassis ground located under the vehicle dash near the center console.



5. The bullet terminal of the proximity hood switch sensor connects to the EVO953 main harness.

Instructions

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Installation Instructions (continued)

Battery Board Harness

1. Remove and store the fob cover, mechanical key, and battery from the spare vehicle fob.
2. Install the battery board harness into the spare key fob by aligning the wires on the edge of the board with the circular printed logo.

Instructions

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Installation Instructions (continued)

Battery Board Harness (continued)

3. Place the fob into the key box as shown. Secure the cover with the included screws.

Instructions

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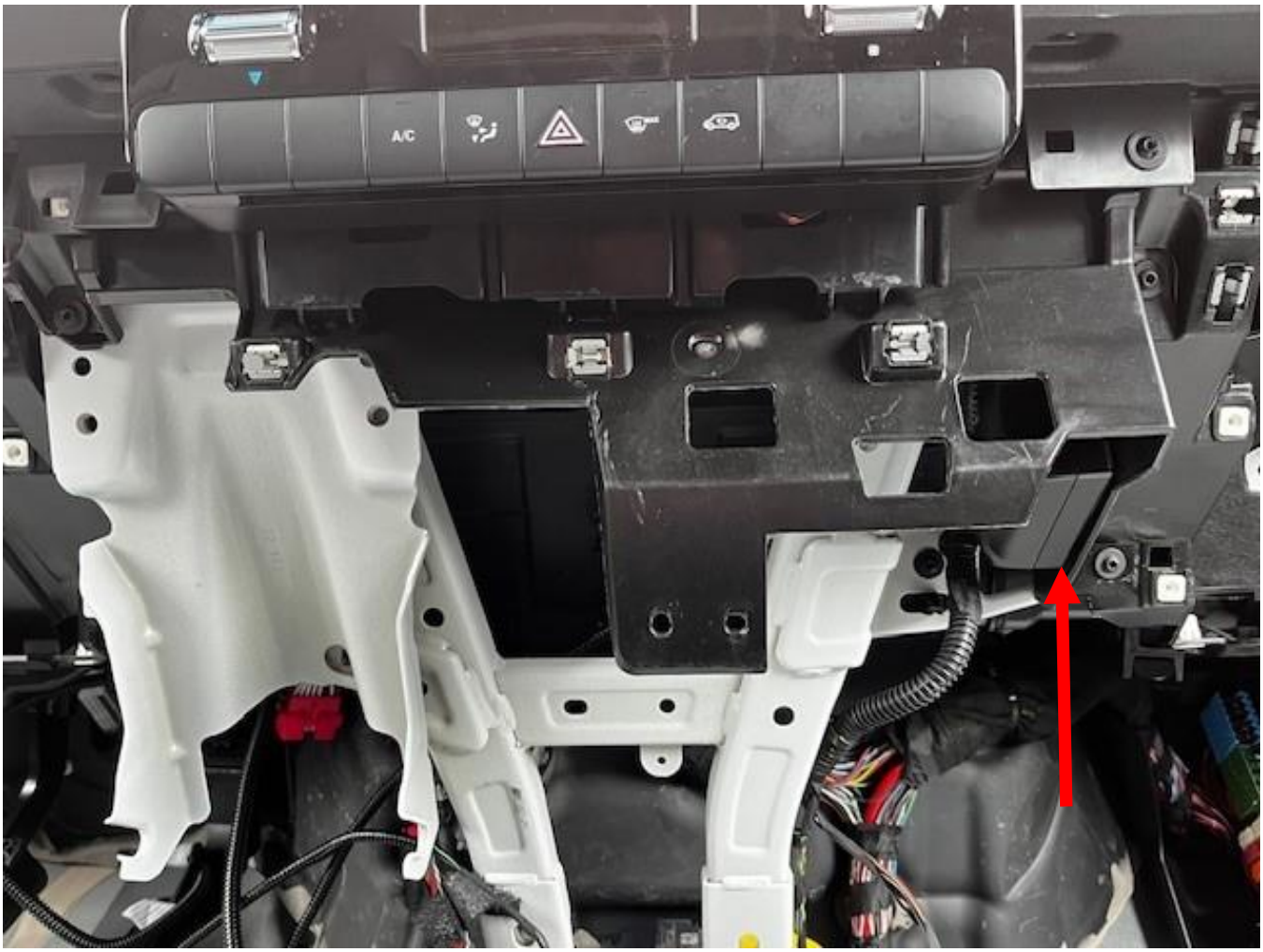
Installation Instructions (continued)

Battery Board Harness (continued)

4. Mount the key fob box in a hidden location. One possible location indicated by the red arrow is shown below.



Instructions

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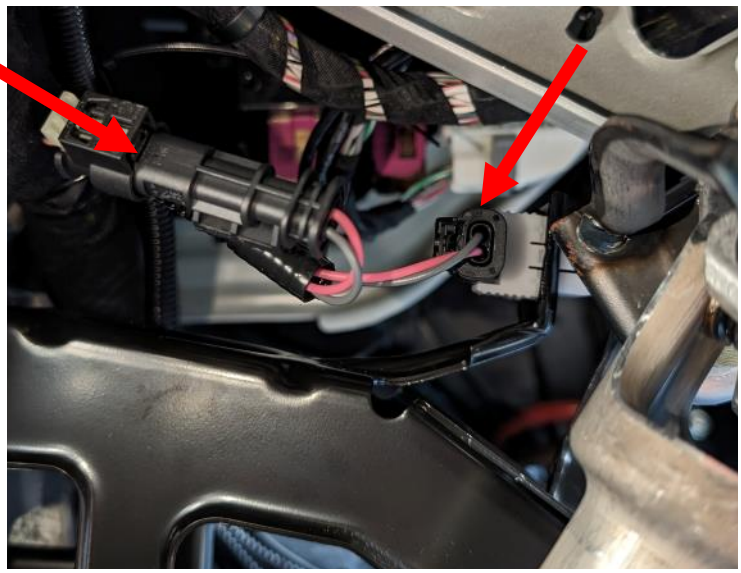
Installation Instructions (continued)

Main Harness Installation

1. Disconnect the service brake switch connector. Plug the 2-way EVO harness into the brake switch. Plug the vehicle connector into the EVO harness and secure the wiring.



2. Disconnect the push-to-start ignition switch connector. Plug the 10-way EVO harness into the switch. Plug the vehicle connector into the EVO harness and secure the wiring.

3. Ensure the **Proximity Hood Switch** is connected to the EVO main harness.

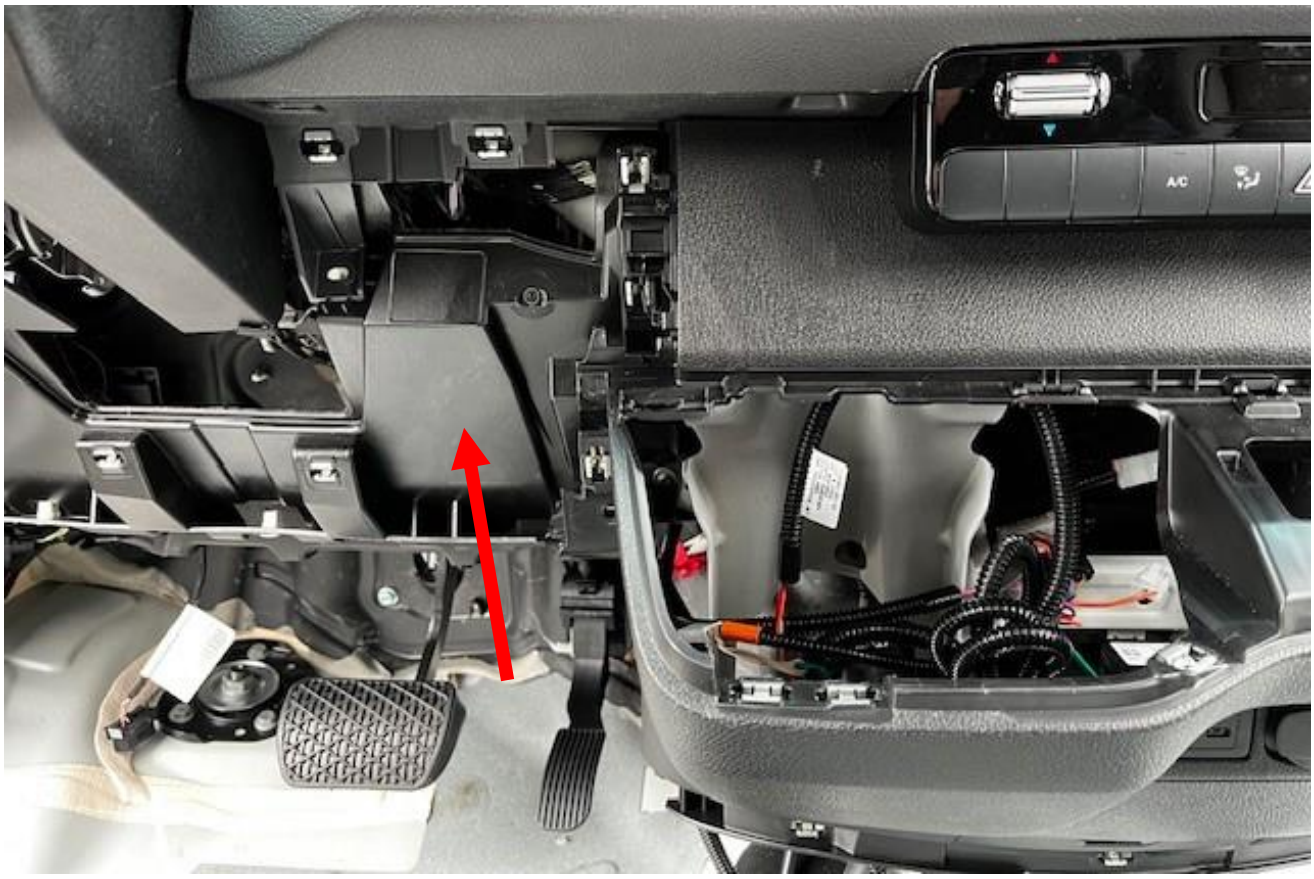
4. Mount the **Monitor Mode Control Button** in a desirable location and route the harness to the 3-pin connector located on the EVO main harness.

Installation Instructions (continued)

Module Installation

Ample harness lengths are provided for installation flexibility. The following mounting location is provided as one of many possible mounting locations.

- Mount the module and ensure the EVO Data Link Harness and main harness will easily connect.
- The module will reach all harnesses if mounted on the backside of the driver's knee bolster support.



Instructions

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Final Connections

Verify that the following connections and installations have been made:

- The Data Link Harness has been installed.
- The key fob battery board has been inserted into the key fob, the key fob has been inserted into the key box, and the key box has been mounted. The 3-pin Molex connector has been plugged into the J13 connector on the EVO953 module.
- The ignition switch connectors have been plugged into the ignition switch and the EVO953 main harness.
- The monitor mode button has been mounted and has been plugged into the EVO953 main harness.
- The proximity hood switch has been mounted, the ring terminal has been attached to chassis ground, and the bullet terminal has been plugged into the EVO main harness.
- The auxiliary battery system has been connected to the 2-pin Molex connector on the main harness.

NOTE: For the main harness 840-00339, the dark green wire senses the raw auxiliary battery voltage. For the harness 840-00342, the orange wire is an output to indicate when the engine is running.

Make the following connections from the EVO953 main harness to the EVO953 module:

- Plug the 4-Pin connector into J8 of the EVO953 module.
- Plug the 4-Pin Molex connector into J5 of the EVO953 module.
- Plug the 8-Pin Molex connector into J4 of the EVO953 module.
- Plug the 16-Pin Molex connector into J7 of the EVO953 module.

Make the following connections from the key fob harness to the EVO953 module:

- Plug the 3-Pin connector into J13 of the EVO953 module.

Reconnect vehicle battery

With the ignition on and engine off, plug the free end of the EVO953 Data Link harness into J11 of the EVO953 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.

Reverse the installation procedure to reassemble.

Module Operation

When activated, the EVO953 module will auto-start a vehicle under certain conditions, allowing the alternator(s) to keep both the OEM and auxiliary batteries properly charged.

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 preset point, the module will start the engine. While the engine is running, the module continues to monitor the battery voltage, and when it increases to a preset voltage level, a configurable timer is started. When the timer has expired, the module will auto-stop the engine.
2. If configured to do so, the auxiliary battery voltage is monitored directly on the module, and if it falls below a preset point, the module will start the engine. While the engine is running, the module continues to monitor the battery voltage, and when it increases to a preset voltage level, a configurable timer is started. When the timer has expired, the module will auto-stop the engine.
3. If configured to do so, EVO953 can work with a Battery Management System and receive a 12V start trigger. When the 12V start trigger is received, the module will start the engine. When this 12V trigger is removed, the module will stop the engine.

NOTE: The module is configured to monitor **EITHER** event 2 or event 3, but **NOT BOTH**. Both OEM and auxiliary 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 auxiliary voltage to be at or above pre-programmed level. “Fully charged” for event 3 means that the 12V trigger has been removed.

Module Operation (continued)

VIN Scroll

Upon a hard boot, the EVO953 module receives 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 ignition on, the module will VIN scroll (LEDs blink in ascending, then descending order) for a few seconds before going to sleep. Setting ignition to on with the engine off will allow the module to verify VIN information and operate as intended.

Monitor Mode

For the EVO953 to control engine start/stop, it must first be in "Monitor Mode." If the preconditions below are met, this mode can be entered by pushing and holding the Monitor Mode button for a preset amount of time. Monitor Mode can also be activated by pressing the "Lock," "Unlock," and "Lock" fob buttons in that order. Preconditions for entering Monitor Mode are the following:

- Vehicle in Park
- Service Brake released
- Parking Brake applied
- Hood Closed
- Fuel Level above a configured value
- Ignition on (if using the push button to enter Monitor Mode)
- 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. If Monitor Mode is entered using the key fob, the system will start the engine for a short period of time as confirmation that Monitor Mode was successfully activated. As long as Monitor Mode is active, the LED remains ON continuously.

Upon entering Monitor Mode, a 10-second timer will start, and the module will monitor the OEM and auxiliary batteries. If both batteries are above their respective restart voltage thresholds, and the 10-second timer expires, the system will turn the ignition off and continue to monitor the batteries. Once the batteries drop below their restart voltage thresholds, or the module receives a 12V start trigger, the system will auto-start the engine as normal.

Instructions

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Module Operation (continued)

Monitor Mode (Continued)

There is a configurable engine-run timer 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-run 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:

1. The engine failed to start after three tries
2. The engine failed to stop after three tries
3. The engine prematurely stopped
4. The service brake is applied while in Monitor Mode

The fourth state is an anti-theft precaution. In this case, auto-start/stop is disabled for a configurable period of time before automatically returning to normal Monitor Mode operation. In addition to the Monitor Mode LED blinking, a module LED will 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 pressing the push-to-start button. 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 or by pressing the fob “unlock” button five times. If the engine is running, the EVO953 will first shut it OFF and then exit Monitor Mode (Monitor Mode button LED turns OFF). If locked outside the vehicle after disabling Monitor Mode, first press lock and then unlock on the fob to reenter the vehicle.

Battery Force Charge

An additional feature in Monitor Mode allows the user to start the engine to top-off the charge on the OEM and auxiliary batteries. If the module is in Monitor Mode, the user can press the Monitor Mode button three times within a 3-second window. The engine will start, and once the batteries are fully charged, the EVO953 will shut off the engine.

Note that the engine will stop if the engine run timer expires, or the fuel level drops below the configured low-fuel threshold.

Configuration

The operational aspects of the EVO953 are defined/controlled with the use of several parameters. Each has a preset value stored in 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 restart threshold** - 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 the extended charge timer. Default value is 13.5V.
- **Auxiliary Battery low-voltage restart threshold** - 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-voltage restart threshold (as set above) to 60V.
- **Extended charge time** - Length of time engine continues to run after OEM charge restore point is reached. Default value is 1200 sec. Range is between 10 and 3600 sec.
- **Monitor Mode lockdown time** - When in Monitor Mode, a temporary lockdown occurs if the service brake is applied, disabling auto-start/stop. This lockdown time determines how long before the module reverts to normal Monitor Mode with auto-start/stop functions restored. Default value is 300 sec. The range is 10 - 600 sec.
- **Push Button Latency** - The button must be held at least this long before the desired action can occur. 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).
- **Low Fuel Level threshold value** - If the fuel level on the 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.
- **Engine OverRev RPM** - If a maximum engine RPM is reached, an output will provide a ground signal. Default value is 3700 RPM. Range is 1700—4500 RPM.

Diagnostics

The EVO953 module is equipped with diagnostic features which can facilitate troubleshooting. Diagnostic functions use module LEDs as well as the red test button to assist the user.

There are four sets of red LEDs tied to fuses F1—F4. When lit, they 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. For example, it will blink once if on page one, then delay and blink once again. If on page two, it will blink twice then delay, then twice again, etc. There are seven pages currently defined. If the "ST" LED is OFF, the other four 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:

	Page 1: Module Inputs 1-4	**Page 2: Module Inputs 5-7**	**Page 3: Low-current Outputs**
LED1	Monitor Mode Button Pressed	Start/stop Trigger Type	Unused
LED2	12V Trigger Start Request Active	Auxiliary Battery Low Request	OverRev Output (ground)
LED3	Hood Closed	Unused	Engine Running (+12V)
LED4	Ignition on, engine off	Monitor Mode Enabled	Unused

	Page 4: Relays 1-4	**Page 5: Other**	**Page 6: Internal Use**
LED1	Service Brake Relay	Park Brake Applied	
LED2	PTS Switch Relay 1	Fuel Level Below Threshold	
LED3	PTS Switch Relay 2	ECT Above Shutdown Threshold	
LED4	PTS Switch Relay 3	Electronic Park Brake Option	

Page 7 is a special mode that modifies some operational parameters to aid in efficient testing. These changes are only temporary, and the parameter values return to normal the next time the module is powered up:

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

Post Installation Checks

With all connections properly made to the module, ignition switch, hood latch, and auxiliary battery system, verify that engine will start and that the vehicle drives properly. Begin with vehicle stopped, in PARK, ignition on and engine off, hood closed, parking brake applied, and service brake released.

1. Push and hold the Monitor Mode button for at least 2 seconds (depending on the button latency setting). The button LED will light up indicating the vehicle is now in 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 module out of Monitor Mode.

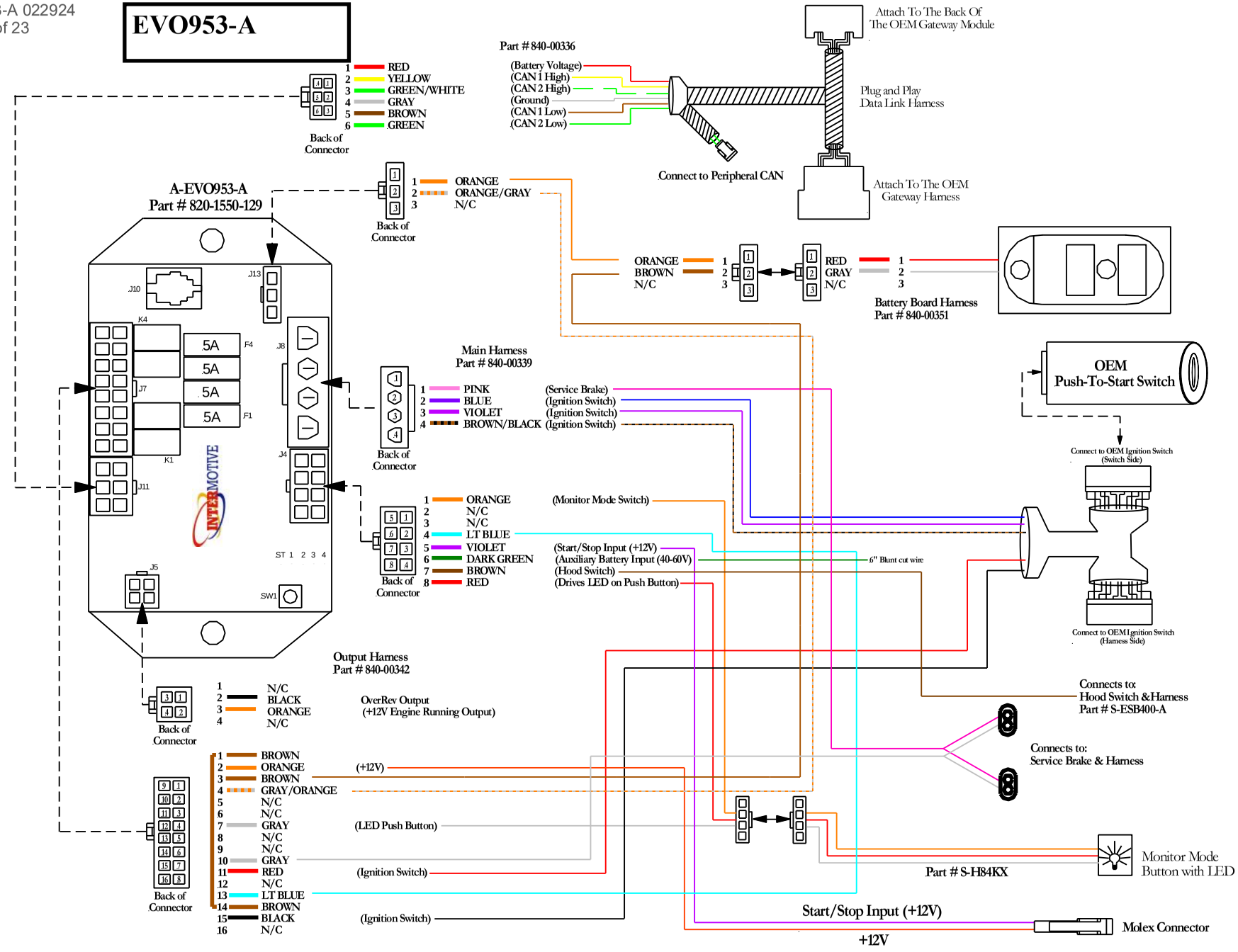
Post Installation Checks (continued)

3. Apply the Parking Brake and put the vehicle in a gear other than PARK. Push and hold the Monitor Mode button again and verify module **does not** go into Monitor Mode. Release the button.
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 the service brake.
5. Open the hood, push and hold the Monitor Mode button again to verify the module **does not** go into Monitor Mode. Release button.
6. Close the hood and repeat step 1 with the ignition on, engine off. The module should go into Monitor Mode.
7. Turn off the ignition and remove main fob from inside the vehicle.
8. Turn ON some vehicle loads that can run with the ignition off, such as the headlights, to draw down the OEM battery. When the OEM battery eventually falls below the low voltage restart threshold, verify that the engine automatically starts.
9. Verify that 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 21.
10. Repeat steps 8 and 9 to get the engine running again. Once engine is running, apply the Service Brake and verify the following:
    - The engine stops
    - The Monitor Mode button LED starts blinking
11. Verify that the Monitor Mode button LED continues to blink, then returns to a continuous ON status after the configured timer expires. **NOTE:** While blinking, the auto start/stop feature is disabled.
12. With the engine OFF, draw down the auxiliary battery or cause the external battery management system (BMS) to send the 12V engine start request signal.
    - If the module is configured to monitor auxiliary battery voltage directly, verify the engine starts and runs until the auxiliary battery voltage reaches the preset level.
    - If the module is configured to receive a 12V request signal from a BMS, verify the engine starts and runs while the signal is active (+12V) and then shuts OFF when the signal goes inactive (0V).
13. Push and hold the Monitor Mode button again and verify the LED turns OFF. In this state, auto start/stop is deactivated - this can be verified by drawing down the OEM battery (see step 8) 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

EVO953-A



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If the A-EVO953 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.