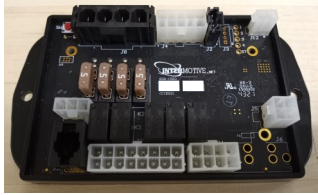


Instructions



eVolution+™ Ford

B-EVP501 2020-2022 Ford Police Interceptor Utility

***Not for use on chassis with Push to Start ignition systems.**

System Overview

Introduction

EVolution+™ (EVP) is a configurable automatic engine stop/start system that provides improved fuel economy, lower vehicle emissions, improved engine life, and extended oil changes by shutting off the engine when appropriate. Automatic engine restarts are triggered by multiple configurable parameters: primary or secondary battery voltage, Service Brake, thermistor temperature and auxiliary restart input. Auto-restarts are preceded by a warning beeper sound. Battery charge protect prevents a dead battery when loads are left on. Two separate battery system inputs allow auto restarts from either a primary or auxiliary battery source. EVP can fast idle the engine based on configurable triggers: primary or secondary battery voltage, Park Brake, AC, heater boost, thermistor, and external input. A hood switch interlock input disables the system when the hood is open.

EVP operates key in and key out. With the key in, the system does not require any driver interaction. This passive operation leads to greater fuel savings. With the key out, the system provides more security. During key out operation the shifter is locked in the Park position.

EVP is designed to operate in conjunction with engine off heating and cooling systems. EVP uses an optional thermistor to trigger engine off heating and cooling at configured setpoints. EVP controls the OEM HVAC blower, temperature, venting and A/C automatically during thermistor triggered events.

The following are the default vehicle safety and functional pre-conditions for Auto Stop and Auto Restart. These and other parameters may be altered to suit specific needs. A new configuration file can be loaded with the InterMotive Download Manager. Configuration changes can be made with the InterMotive eVolution+™ Mobile App.

| Auto Stop Defaults | Auto Restart Defaults |
|--|--|
| Vehicle Hood = Closed | Vehicle Hood = Closed |
| Trans Range = Park or Neutral (Vehicle Speed = 0) | Trans Range = Park or Neutral (Vehicle Speed = 0) |
| Battery Voltages > Restart Threshold | Engine Auto-Stopped by EVP |
| Brake Pedal = Not Pressed | Key in Run or Key Out Mode Active |
| Engine On Request = Not Active | |
| Thermistor Trigger = Not Active | |

When all Auto Stop conditions are met, the EVP will automatically stop the engine when the idle timer expires or an external discrete wire Ignition Off Request is activated. The default idle timer is set to 15 seconds.

Instructions

EVP Ford Versions and Supported Vehicles

Make sure the version of EVolution+™ you are installing is the correct one for you vehicle. There may be new vehicles or model years added. If you don't see your vehicle or model year below, please check with InterMotive.

B-EVP501-A 2020-2022 Ford Police Interceptor Utility

EVP Add-On Options

- T: Thermistor for temperature activated Auto Restart.
- B: Hood Switch (only required if EVP cannot obtain hood switch status from vehicle network)

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.



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

EVP Module

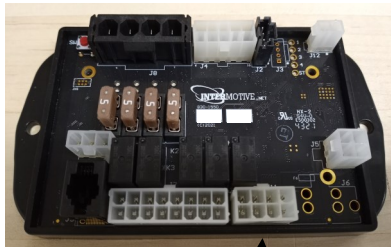
Remove the lower dash panel below the steering column and find a suitable location to mount the module. Locate the module in an area away from excessive heat sources (engine, heater ducts, etc.). Ensure when routing harnesses that the tilt steering column does not contact them in the full down position. 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

Installation Instructions (continued)

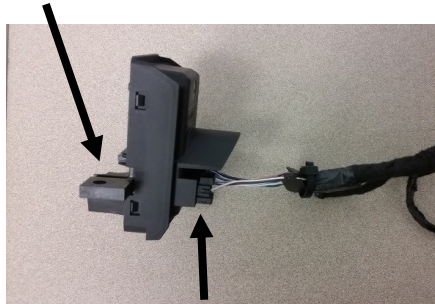
Gateway Plug and Play Harness (6-pin connector)

1. Locate the vehicles Gateway Module (C2431). It will be mounted below the lower left dash panel behind the BCM.
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 EVP5XX Gateway harness so that it does not hang below the lower dash panel.



Data Link Harness
plugs in here

Gateway Module



Gateway Harness



InterMotive Plug and Play Gateway Harness

Instructions

Ignition Switch Harness

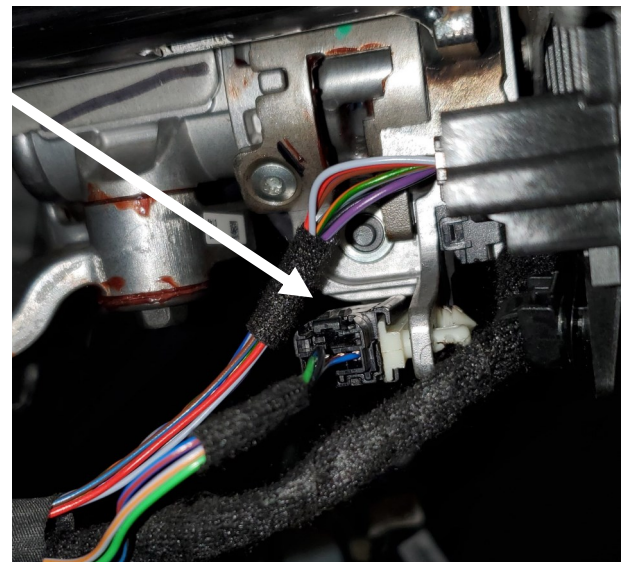
The ignition switch must be accessed in order to connect the ignition harness. Several dash trim panels must be removed.

1. Remove the upper instrument trim panel and remove the 2 screws.
2. Using a non-marring pry tool, remove the lower finish panel from the center stack on the dash.
3. Using a non-marring pry tool, remove the upper finish panel from the center stack on the dash.
4. Locate the connector plugged into the ignition switch and disconnect it.
5. Plug the OEM switch harness connector into the female connector of the EVP ignition switch harness.
6. Connect the male EVP ignition switch harness connector to the OEM ignition switch.



Shift Lock Harness Installation

1. Locate the OEM shift lock solenoid at the side of the steering column (photo below).
2. Remove the OEM 4-pin Black connector from the shift lock solenoid assembly.
3. EVP provides a shift lock T-harness. Plug one leg of the T-harness into the OEM shift lock solenoid, and the other leg into the OEM harness.

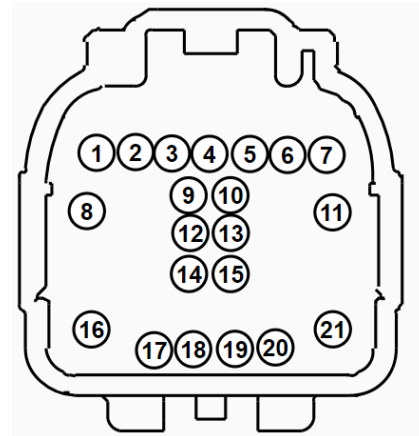


Instructions

Rear Window Connection

This is an optional connection. Make this connection if rear window control is desired when a high cabin temperature fault occurs.

1. Locate the bundle of wires entering the cabin from the drivers door near drivers side kick panel. These wires come from connector C3206.
2. Find the Brown wire in this bundle, this is pin 17 of C3206. Verify this wire is +12V when pressing the right rear window down switch on the driver door.
3. Find the Yellow wire in this bundle, this is pin 13 of C3206. Verify this wire is +12V when pressing the left rear window down switch on the driver door.
4. Attach an LCO configured as Window output to the desired window control wires. If connecting one output to both rear window signals use isolating diodes.

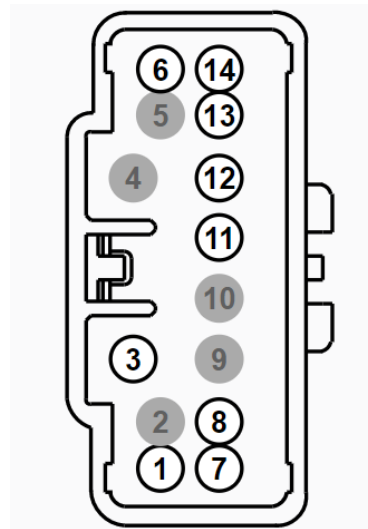


C3206 Connector Face

Horn Connection

This is an optional connection. Make this connection if horn control is desired when a cabin temperature or theft alarm occurs.

1. Locate connector C2600 under center console.
 2. Find the Green/White wires in pins 12 and 13.
 3. Verify that applying ground to these pins sounds the horn.
 4. Wire a relay such that a +12V signal applied to the relay coil applies ground to one of the horn switch wires.
- Note:** Use a diode clamped relay. See page 9 for more details.
5. Attach an LCO configured as Alarm output to the relay coil.



C2600 Connector Face

Instructions

I/O Features and Descriptions: (Solder and heat shrink all connections)

Key Out Enable Input

Pin #2 (Gray wire) of the 10 pin J4 Connector is the Key Out Enable input. This input connects to momentary switch supplied in the EVP kit. This enable input is high true (12V). When the momentary button is pressed and released, an LED integral to the button will flash rapidly. Then the user can remove the key within a pre-configured amount of time to activate key out mode. The default period of time is 3 seconds. If key out mode is successfully activated, the integral LED will continue to flash every two seconds. If the key is not removed within the time period the LED will flash rapidly and stop flashing.

Ignition/Engine Off Request Input

Pin #4 (White wire) of the 10 Pin J4 Connector is an Engine Off Request input. Grounding this wire with a switch allows remote engine shutoff capability. Keeping this input grounded will keep the ignition switch power off (exceptions: a remote Engine On Request, low battery OR thermistor restart trigger *will* restore ignition power and restart the engine). Leaving the ignition off after an Engine Off request reduces the draw on the battery to a minimum, allowing the greatest amount of time between low battery restarts.

Engine On Request Input

Pin #7 (Green wire) of the 10 Pin J4 Connector is the Engine On Request input which may be wired to vehicle equipment which requires the engine to continue running. **This switch input must provide a ground when restart is desired.** Solder and heat shrink all connections. This input also acts as a Shutdown Inhibit. As long as it is active (grounded), the Anti-Idle shutdown timer and the Request Engine/Ignition Off inputs will not turn the vehicle off.

Thermistor

An optional thermistor may be attached to the Engine On Request input. The thermistor option enables engine off heating and cooling and auto engine restart based on thermistor temperature readings. For example, it may be used to prevent the engine from getting too cold in severe environments. It may also be used in police K9 vehicles to prevent cabin temperature extremes. Mount the thermistor in a location where it cannot be damaged by sharp objects and mechanical moving parts such as the Park Brake or tilt steering wheel mechanisms.

- **Low Temperature Threshold - Engine On Heating**

EVP restarts engine and sets OEM HVAC for maximum heating and high blower speed.

- **Low Temperature Threshold - Engine Off Heating**

EVP sets OEM HVAC for maximum heating and medium blower speed.

- **Heating Temperature Set Point**

EVP clears low temperature trigger. If engine is running, it will stop when the idle timer expires and no other restart triggers are present.

- **Cooling Temperature Set Point**

EVP clears high temperature trigger. If engine is running, it will stop when the idle timer expires and no other restart triggers are present.

- **High Temperature Threshold - Engine Off Cooling**

EVP enables engine off cooling system and sets OEM HVAC for maximum cooling and medium blower speed.

Instructions

I/O Features and Descriptions (continued)

Thermistor (continued)

- **High Temperature Threshold - Engine On Cooling**

EVP restarts engine and sets OEM HVAC for maximum cooling and high blower speed.

- **High Temperature Threshold - Fault Condition**

If thermistor temperature is above the high temperature threshold 6 minutes after engine on cooling trigger this is a fault condition. EVP can be configured to roll down windows and/or honk horn in response to this fault.

Hood Open Disable Switch

The Hood Open Disable Switch is **not** an optional input. 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 #8 (Brown wire) of the 10 pin J4 connector is the Hood Open Disable input. 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.

Aux Battery Input (Up to 60 Volt)

Pin #9 (Gray wire) of the 10 Pin J4 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 the EVP mobile app. Contact InterMotive for details.

This connection is not necessary if EVP is connected to a Discover Battery via Aux Battery CAN.

Aux Battery CAN

EVP can obtain State-of-Charge (SoC) from installed Discover lithium batteries via the Aux Battery CAN. The obtained SoC can be used as a automatic engine restart trigger. A 2 pin connector breakout is provided on EVP's Data Link Harness 840-00221. Pin #1 (Orange wire) in this connector is CAN-H and pin #2 (Purple wire) is CAN-L.

Restart Beeper

Pin #2 (Orange wire) of the 4 Pin J5 Connector drives a warning beeper that will sound for 2 seconds prior to all restarts except Service Brake restarts.

1. Find a suitable location for mounting the warning beeper so that it is audible to the driver.
2. Connect the Orange lead to Red post of beeper and the Black lead to the negative post.

Rotate the bezel on the beeper to control volume.

Fast Idle Input

Pin #3 (Yellow Blue wire) (+12V) of the 10 pin J4 connector can be configured as a fast idle trigger input. The configuration can be adjusted with the EVP mobile app.

Instructions

Configurable Low Current Outputs

Pin #1 (Tan wire) (0.5 Amp Max) and pin #2 (Light Green wire) (0.5 Amp Max) of 2 pin J12 are configurable outputs. These outputs can be configured with one of the following 11 logic modes.

1. Lock Mode

When configured for lock mode, an output can control installer supplied normally closed relays to secure equipment when key out is active (e.g. trunk and weapon rack release buttons in police applications). When EVP activates this output, the relays will open the circuits from the buttons and disable them. This minimizes possible theft when EVP is active and the vehicle is unattended.

When EVP is enabled, this output becomes active after a configurable delay. (default 10 seconds) This output remains active until the key is back in the run position.

If an attempted theft is detected and EVP disables, this output will still remain active until the key is back in the run position.

2. Key Out Active

An output using this logic mode can control installer supplied normally closed relays or auxiliary indicator LEDs. This output can enable/disable equipment while EVP is cycling the engine in key out mode. When key out operation is enabled, this output becomes active. This output remains active until the key is back in the run position.

If an attempted theft is detected and EVP disables, **this output will turn off.**

3. Equipment Enable

An equipment enable output will force the operator to depend on EVP stop/start capability in order to use their equipment. This output is only active when the Request Engine Off input is active. While this input is active, EVP will cycle the engine based on primary/secondary battery Voltages and the Request Engine On input (which 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 EVP is cycling the engine. In the case of the Un-Interrupted Load Output, there are ways to disable the stop/start capabilities of EVP (disable idle timer or set to 30 minute idle time) while retaining the output.

4. Un-Interrupted Load Control

EVP shuts down the vehicle's engine by simulating key OFF or ACCESSORY condition. All electrical loads that normally shut off when the key is in the simulated position will lose power. This may not be desirable for all loads and can be avoided by wiring an external relay to an EVP output configured with this mode (continue reading for proper relay wiring).

The Ignition Power Signal will normally activate only when the key is in the Run/Start position. However, when EVP 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.

Instructions

5. Engine Run

An output with this logic mode will turn on when the engine is running. This logic mode can be used to disable equipment when the engine is not running.

6. Theft Alarm

The output will pulse during theft alarm sequence. Connect to auxiliary visual or audible alarm equipment.

7. AFIS Trigger

The output will activate when the AFIS conditions are met to trigger fast idle.

8. Door Lock

The output will activate for 250 ms when the OEM doors are locked. This output can be connected to non-OEM locks for doors or storage containers.

9. Door Unlock

The output will activate for 250 ms when the OEM doors are unlocked. This output can be connected to non-OEM locks for doors or storage containers.

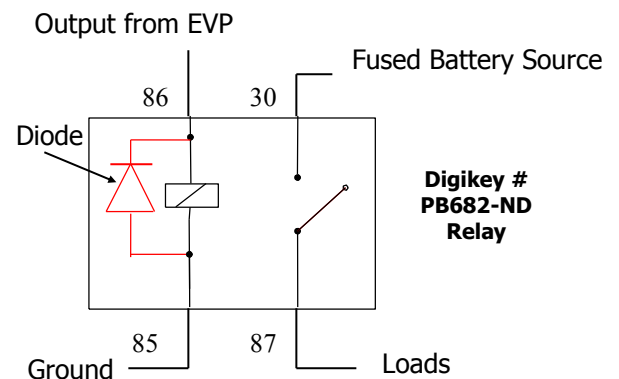
10. Auto-Start Warn

The output will activate 1 second prior to and during an EVP engine auto-start event.

11. Window Control

The output will activate for 5 seconds when a high cabin temperature fault occurs. This output can be connected to the OEM rear window control switch wires.

Pin #3 of J5 (Yellow wire), Pin #1 of J12 (Tan wire), and Pin #2 of J12 (Light Green wire) are capable of driving up to 0.5 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.



EVP 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 two screws or double sided tape.

Reconnect vehicle battery

Instructions

Post Installation Operational Test

Test 1. With engine running, transmission in Park or Neutral, hood closed, activate the Engine Off Request switch input. Engine will shut off, ignition will be held off.

Test 2. Release the Engine Off Request. Ignition power will be restored and loads that are powered with key in Run will be restored. Engine will not start (low battery could cause a restart).

Test 3. Activate the Engine On Request input. The Engine will automatically restart.

Test 4. Release the Engine On Request and confirm the module shuts off the engine after *15 seconds.
Note: Applying the Service Brake may prevent the timer from counting down and shutting off the engine.

Test 5. Start the engine and enable key out operation by pressing the enable button and removing the key within *3 seconds. If successful, the LED that is integral with the button will continue to flash.

Test 6. Confirm the module shuts off the engine after *2 seconds.

Test 7. Repeat test 3 with hood open. As a safety feature, the EVP MUST NOT start or stop the engine when the hood is open. If the Engine Start Request starts engine with hood open, check hood switch wiring.

NOTE: EVP will not shut off the engine for 5 seconds after the engine is started.

*These values are configurable and may change from the stated default values.

Do not put vehicle in service unless hood open disables eVolution+™ from auto restarting engine.

If the system fails any of the above tests, check the related wiring. If necessary, call InterMotive Technical Support. Do NOT release vehicle for service unless it has passed all of the above tests.

Want to change default settings?

To make changes to the default eVolution+™ configuration, use the InterMotive eVolution+™ Mobile App. The app allows you to view or modify any of the EVP configurable parameters. If the configuration is altered, make note of the modifications for future serviceability and include them with the vehicle.

Instructions

Leave in vehicle

Operating Instructions eVolution+™ Ford B-EVP501-A 2020-2022 Ford Police Interceptor Utility

- EVolution+™ (EVP) provides enhanced fuel economy and lower vehicle emissions for customers by limiting engine idle time. Vehicle fuel economy is improved by automatically shutting off the vehicle's engine to prevent unnecessary idling. Restarts can be automatically triggered by low battery voltage, Service Brake, remote equipment operator requests, or thermostat restart trigger (if enabled).
- The system can operate key in (no driver interaction required) or key out by pressing the key out enable button and removing the key within 3 seconds (configurable). During key out operation the shifter is locked and idle timer is 2 seconds. The LED integral with the enable button will flash while key out is active.
- 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) a remote Engine Start Request switch is activated or 4) Thermostat triggered restart. The module keeps ignition off to reduce the demand on the batteries, thereby delaying a low battery restart as long as possible.
- 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. 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 Request switch, if installed, is a remote trigger that, when activated, will start the engine after an auto-stop has occurred. Activating the Engine On Request while the vehicle is running will prevent all auto-stops from occurring. If the vehicle is equipped with the optional thermistor, the vehicle may auto-restart and shut off based on temperature
- Once the engine has been auto-stopped, EVP monitors the main battery voltage (an auxiliary battery may also be monitored). If either fall below a minimum restart voltage, the module will sound an alarm for 2 seconds and auto-restart the vehicle to recharge the batteries. The default restart value is 12.0 Volts for the main battery (aux battery input is disabled). Once the main battery charges above 13.5 volts, a recharge timer of 900 seconds begins that will turn off the engine again.
- EVP controls the OEM HVAC during engine off and engine on thermostat triggered events. During key in operation the HVAC state will be set once but the user can override that state with the OEM HVAC controls. During key out operation the HVAC state will be maintained, the user will not be able to override the HVAC state set by EVP.
- EVP will fast idle the engine based on configurable triggers: primary or secondary battery voltage, Park Brake, AC, heater boost, thermostat and an external input.
- An EVP mobile app is available to view idle reduction stats, view or modify the configuration, and perform system diagnostics.

Default requirements for engine auto-stop

Transmission in Park or Neutral (vehicle not moving), Hood Closed, Service Brake not applied, Battery Voltage greater than 12.0 Volts (may differ from default setting), no thermostat trigger, and Engine Restart switch must not be "on" (this switch input overrides the Engine Off Request and Idle Timer).

Default requirements for engine auto-restart

Hood Closed, Engine must have been auto-stopped, Transmission in Park or Neutral, and the key in the Run position.

Once above conditions are met, the engine will restart when the Engine On Request is activated, a low battery is detected or Thermostat restart trigger is activated.

The EVP may be removed from the vehicle by unplugging the EVP 8 pin harness (behind lower drivers dash panel) and restoring the OEM ignition switch wiring (under steering column trim cover).

