



SVE BULLETIN

SPECIAL VEHICLE ENGINEERING – BODY BUILDERS ADVISORY SERVICE

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Revision	Update	Revision Date

2011 Super Duty Gas Engine Stationary Elevated Idle Control

Models Affected

2011 MY Super Duty 6.8L Chassis Cab F-450/550 and 6.2L Chassis Cab F-250/350 & 6.2L Pick-Up F-250/350.

Purpose

To explain changes and functions of the stationary elevated engine idle speed control system (SEIC) for power take-off (PTO) applications.

Overview – SEIC (6.2/6.8L) and Trans PTO (6.8L only)

- A powertrain control module (PCM) strategy that provides elevated engine speed to drive auxiliary commercial equipment such as hydraulic pumps, generators, air compressors; or maintain vehicle battery charge under extreme electrical demands.
- SEIC is standard in all PCM's for Super Duty F-Series light trucks.

Customer Access Wires for SEIC and VSO/CTO/PARK Signals

- Located in cabin, tagged and bundled above parking brake pedal assembly behind data link connector.
- Pass-thru wires are in the same bundle.
- The final stage manufacturer or up-fitter is required to supply the customer interface equipment.
- Additional information in the "Circuit Descriptions" section.

Transmission PTO Gear and Port

- Available on 6.8L Super Duty F-Series
- Standard with M6 manual transmission (Ford of Mexico only).
- Available for TorqShift™ 5-speed automatic transmission by ordering "Transmission Power Take-Off Provision". The PTO gear is direct-splined to the torque converter output shaft and thus receives any torque the torque converter is delivering, (i.e. no internal PTO clutch).
- NEVER use any sealer, especially silicone-based, on the PTO port gasket.
- The PTO gear delivers up to 250 ft-lbs torque to the aftermarket PTO, and can manage the heat of 40 hp continuously. Higher horsepower can be delivered, but for shorter durations depending on the amount of power required.
- Typically, the aftermarket PTO cannot use all this available torque and horsepower, so contact the individual aftermarket PTO supplier.

Vocabulary / Definitions

PTO Applications: Includes all forms of mechanical power, using the vehicle powertrain as the source, including transmission side-mounted PTO, split-shaft PTO, crankshaft PTO, and FEAD-mounted clutch-pumps, air compressors, and generators.

Clutch-Pump: A type of PTO that is driven by the vehicle engine crankshaft through the FEAD pulley system.

PCM: Powertrain Control Module

FEAD: Front End Accessory Drive (belt and pulley drive system)

SEIC: Stationary Elevated Idle Control

VSO, VS_OUT: Vehicle Speed Out. 8000 pulses per mile signal. Blunt-cut wire provided for customer access.

TPO: Throttle Position Out. Direct customer access not provided.

ECT: Engine Coolant Temperature

CTO: Clean Tach Out. An engine speed signal. A blunt-cut wire is provided for customer access. See Body Builders Layout Book for signal description.

VPWR: Vehicle Power Battery voltage signal only, not intended to carry high current load.

Intermittent Duty Usage: Ten (10) minutes or less of continuous operation.

Continuous Duty Usage: Greater than 10 minutes of continuous operation.

Change-of-State: Part of the Gas engine SEIC strategy only. If any condition is met that disables SEIC, the operator is required to turn the PTO switch OFF and back ON again before SEIC will allow elevated idle to return.

TRO_N, TRO_P: Transmission Range Output, indicating NEUTRAL ONLY, or PARK-ONLY.

BCM: Body Control Module, located at lower passenger-side of instrument panel.

Product Descriptions / Special Situations

SEIC

- Intended to be commanded ONLY by applying battery voltage to certain customer-access blunt-cut wire circuits, and adding a target-speed resistor, and is only available when the vehicle road speed signal is zero.
- Includes a link circuit which changes from open-circuit to ground when enablers are met, that may be used to turn on an indicator lamp, while providing battery power to an aftermarket PTO clutch or solenoid.
- Ramp rates are fixed and cannot be altered by the customer.
- Maximum engine speed is 2400 rpm.
- Minimum engine speed – Gas engine: 910 rpm approximately. Gas engine has a 900 rpm "stand-by" speed that it first goes to when SEIC is initiated to step it away from stall speed that it could dip to as PTO load is applied. This is an unusable speed for any application. However, a resistor can be chosen that sets the useable target speed for carrying an auxiliary load to just above 900 rpm. This is mainly intended for applications using a FEAD-driven PTO device like a clutch-pump, or manual transmission PTO, because the TorqShift™ torque converter cannot fully lock until 1200 rpm engine speed rpm.
- **WARNING:** Using the TorqShift™ PTO below 1200 rpm for the 6.8L risks transmission damage from over-heating, or aftermarket PTO clutch slippage debris.

Typical SEIC Sequence

Initiating SEIC by applying battery voltage to the SEIC-PTO wire immediately commands the PCM to first look for enabling conditions, such as vehicle gearshift selector in PARK, engine at base idle speed, etc.

A complete list of enablers is provided in the "SEIC Enable/Disable Conditions" section of this bulletin. Once enablers are satisfied then the following takes place:

1. Command is sent to boost hydraulic line pressure in the transmission about 20-30 psi (6.8L only), which is used by the aftermarket PTO supplier to hold their PTO clutch.
2. Command is sent to use a unique torque converter lock-up schedule for stationary PTO (6.8L only).
3. Command is sent to increase engine speed to 1200 rpm default (900 with 6.2L engine), or a target speed using a resistor.
4. The low-side driver circuit changes from open-circuit to ground. If the up-fitter uses the circuit wiring offered in this bulletin then this will provide battery voltage to the aftermarket PTO solenoid to engage the PTO.
5. Engine speed increases to the target. For the 6.8L, the torque converter locks at 1200 rpm and hydraulic line pressure increases with engine speed to a maximum of 150 psi at 1200 rpm.

Special Situations

Mobile PTO Operation (6.8L only) Mobile PTO is an unintended function and may require additional safety enabler logic by utilizing the CTO or VSO signals to prevent transmission damage. It is required to apply battery voltage to the SEIC/PTO Request wire to keep SEIC active during Mobile PTO mode. The increased line pressure and torque converter commands must remain active to protect the automatic transmission. Engine speed is no longer commanded by SEIC; instead it is controlled by foot throttle. Convert PTO solenoid power to a switch controlled direct-battery feed instead of through the SEIC circuit suggested in this bulletin. A slightly harsher automatic transmission shift can be expected but is harmless.

WARNING: Using the TorqShift™ PTO below 1200 rpm risks transmission damage from over-heating, or aftermarket PTO clutch slippage debris.

Alternative Calibration

All new Ford light trucks have an "Alternative Calibration" or ALT-CAL installed in the PCM that conditions the powertrain during its early lifetime. It may increase the PARK-idle or drive-idle speed of the engine, by as small as 50 rpm or by several hundred. It affects SEIC initiation by not letting it activate, because one of the SEIC enablers is having a steady, base, idle speed, generally near 650 rpm. If ALT-CAL sets the idle at 700 rpm then SEIC activation will be prevented. ALT-CAL is normally removed after 50 key-on starts, or by driving over 5 continuous miles; it is also sometimes erased by disconnecting the battery for a minute or so.

Split-Shaft PTO (Not Recommended)

The Ford powertrain control strategy will not allow for this operation, whether using SEIC, or an aftermarket controller commanding engine speed directly at the foot pedal throttle or through the Ford data-link connector. The PCM will typically react by restricting power and engine speed, and possibly varying speed while searching for a solution. It may not do this immediately, but after days or a week of customer operation. It also will not guarantee a 1:1 transmission ratio command, typically required by split-shaft PTO applications.

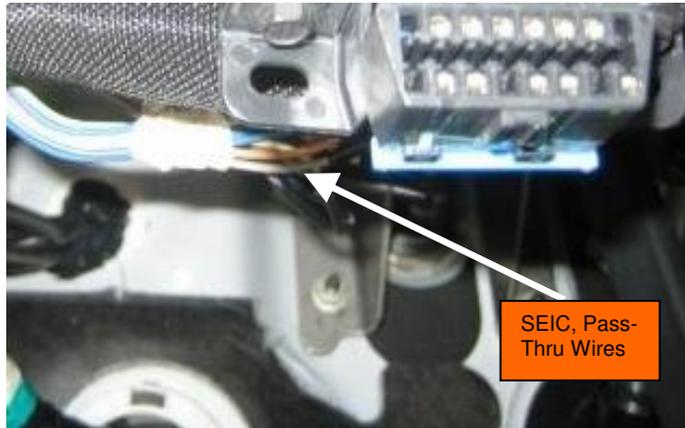
Wire Locations

SEIC circuits, Customer Access Signal Circuits, Pass-Thru Wires.

F250/350/450/550

Cabin / Instrument Panel

- Blunt-cut access wires for SEIC, "Customer Access" signal circuits for CTO, VS_OUT, PARK, TRO_N, and 4 pass-thru wires, are bundled together at the harness above the parking brake pedal assembly behind the data link connector.



F250/350/450/550

Cabin / Instrument Panel

- Blunt-cut access wires for the 4 optional "Upfitter Switches" are taped on a harness near the relay pack that can be found beneath the instrument panel and to the left of the steering column.



F250/350/450/550

Engine Compartment

- The 4 blunt-cut pass-thru wires are found in the harness below the cowl, just outboard of the brake master cylinder, as shown.



Circuit Descriptions for SEIC and Customer Access Signal Circuits

All circuits lead back to pins on the PCM.

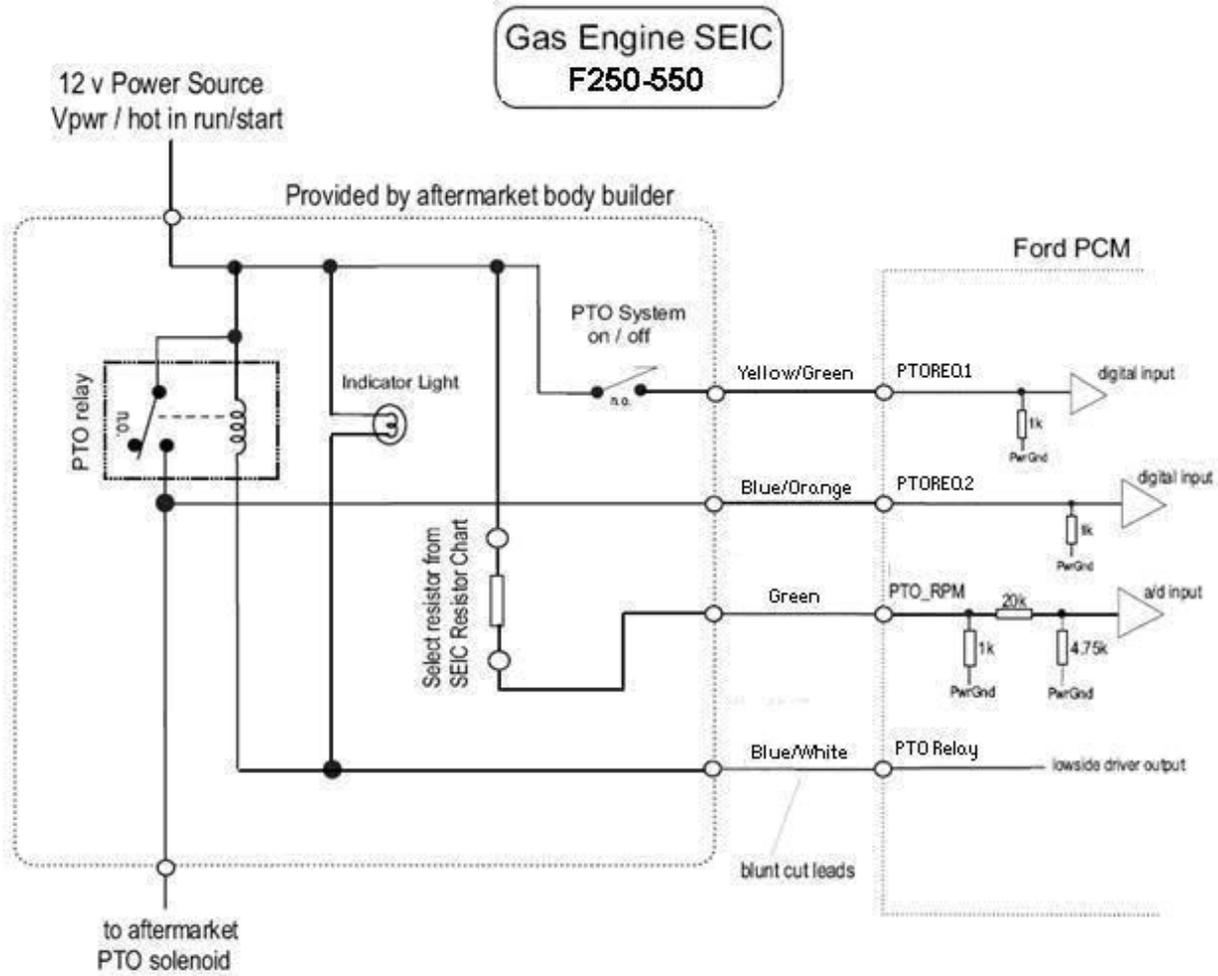
F-250/350/450/550 – Gas Engine PCM		
Circuit Intent	Wire Tag	Description
INPUT (VPWR)	PTO REQUEST1	PCM Pin C175B-22 Circuit No. CE912 Wire Color: Yellow / Green <ul style="list-style-type: none"> • Applying vehicle battery voltage to this wire begins SEIC process. • Signals TorqShift™ transmission (6.8L only) to enter SEIC strategy. • Verifies safety enablers. • Turns off OBD and other emission-related monitoring. • Elevates engine speed to 900 rpm (6.2L) 1200rpm (6.8L) "standby" speed if it finds an "open-circuit" at PTO- RPM Select. • Invokes the PTO Indicator circuit when safety enablers are met. • Looks for the target engine speed requested at the PTO_RPM Select circuit using a resistor or potentiometer.
OUTPUT	PTO RELAY	PCM Pin C175B-11 Circuit No. CE326 Wire Color: Blue / White <ul style="list-style-type: none"> • A low-side driver, changing from "open-circuit" to "ground" indicating that the engine is ready for the PTO operation to begin and that a PTO load may be applied. • Intended for powering a PTO indicator lamp, or turn on a relay coil (not to exceed 1 amp). LED lights require adding a resistor in series.
INPUT (resistor)	PTO RPM	PCM Pin C175B-8 Circuit No. CE914 Wire Color: Green <ul style="list-style-type: none"> • Add a resistor or potentiometer to obtain fixed or variable engine target speed. • Combine in circuit with PTO (+12v). • Speed range available: 910 rpm (1200 rpm for 6.8L) to 2400 rpm
INPUT (VPWR)	PTO REQUEST2	PCM Pin C175B-6 Circuit No. CE933 Wire Color: Blue / Orange <ul style="list-style-type: none"> • Applying vehicle battery voltage to this wire signals the PCM that the PTO load is being applied. • Also used to complete the resistor circuit for engine speed selection.
CUSTOMER ACCESS SIGNAL CIRCUITS		
OUTPUT PARK-Only	TROP	PCM Pin C175B-43 Circuit No. CLS05 Wire Color: Blue / Gray
OUTPUT NEUTRAL-Only	TRON	PCM Pin C175B-39 Circuit No. CET21 Wire Color: Green / White
OUTPUT Vehicle Speed	VSOUT	PCM Pin C175B-5 Circuit No. VMC05 Wire Color: Violet / Orange
OUTPUT Engine Speed	CTO	PCM Pin C175B-10 Circuit No. CE913 Wire Color: Blue

SEIC Resistor Charts

6.2/6.8L Engine		
Engine Target Speed (RPM)	Resistor (Ohms) (5%, 1 watt)	Voltage (volts)
650 (Base)		
900	Open Circuit	0
912	3.9K	
1024	2.7K	3.61
1056	2.2K	4.18
1184	1.8K	4.8
1264	1.5K	5.39
1440	1.0K	6.76
1536	820	7.43
1648	680	8.06
1712	560	8.7
1792	470	9.25
1904	380	9.89
1936	330	10.27
2000	270	10.75
2064	220	11.2
2128	180	11.6
2160	150	11.9
2208	120	12.23
2256	100	12.46
2320	0	13.77
	(closed circuit)	

Wiring Diagrams

The following diagrams suggest a method to complete the SEIC circuits for gas engines



SEIC Enable/Disable Conditions

Vehicle Conditions to Enable SEIC (all are required)	Vehicle Conditions that Disable SEIC (any one required)	Gas Engine
Parking brake applied.	Parking brake disengaged.	Yes
Foot off of service brake	Depressing service brake	Yes (See Note-1)
Vehicle in PARK (automatic trans.)	Vehicle taken out of PARK	Yes
Foot off of clutch (manual trans.)	Clutch depressed	Yes
Foot off of accelerator pedal	Accelerator pedal depressed	Yes
Vehicle speed is 0 mph (stationary)	Vehicle not stationary	Yes
Brake lights functional	Brake light circuit disconnected	Yes
Engine at a stable base idle speed		Yes
	Transmission Oil Temperature (TOT) Limit exceeds 240 degrees F.	Yes (See Note-1)
Engine Coolant Temperature (ECT) 140 degree F minimum.	Engine Coolant Temperature Limit (ECT)	Yes (See Note-1)
	Catalyst Temperature Limit	Yes (See Note-1)

Note-1: A "change-of-state" at the "PTORequest1" circuit is required to re-invoke SEIC.

When a disabler is seen by the PCM, the "PTO Relay" circuit changes from "ground-source" to "open-circuit". After approximately 3 seconds SEIC drops out, returning the engine speed to base idle. For vehicle-stationary operation, the automatic transmission torque converter unlocks as engine speed drops below 1200 rpm (6.8L only). To re-initiate SEIC the operator must turn off the aftermarket PTO switch (removing command voltage to the "PTORequest1" circuit) and turn it back on again.

SEIC / PTO – General System Behavior

- To guarantee full advertised torque capability at the 6.8L automatic transmission PTO gear and through the aftermarket PTO clutch, the transmission torque converter must be locked, and the hydraulic line pressure serving the aftermarket PTO clutch must be elevated. Applying battery voltage to the PTO circuit is the signal to the transmission to enter SEIC strategy and command these two important functions. This applies to both stationary and mobile PTO operations.
- If an SEIC disabler occurs:
 - GAS engines will require a "change-of-state", meaning the operator is required to turn off voltage to the "PTO-Request" circuit, and back on again to re-invoke SEIC and PTO operation.
- If the Transmission Oil Temperature (TOT) sensor reaches 240 °F, then the TorqShift™ torque converter may disengage, preventing torque from being delivered to the transmission PTO gear.
- SEIC/PTO strategy function in the PCM is not affected by the loss of vehicle battery electrical power.
- SEIC Ramp Rate Max (Not programmable and approximate):
 - 400 rpm/second up and 200 rpm/second down.

SEIC / PTO – General System Behavior (cont)

- Correlation between engine speed and resistor values:
 - The external voltage source that the aftermarket PTO system designer uses to command SEIC through the "PTO" or "PTO-Request" circuits must be the same as that used by the PCM internally for predictable SEIC function. Reasoning is that a fully-charged vehicle battery fluctuates with ambient temperature.
 - If there is a high electrical demand on the chassis battery, such as from aftermarket inverters or generators, etc., the actual elevated idle engine speed may vary with that demand for any given resistance in the SEIC circuit. More so for gas engine systems than diesel since gas engine uses chassis battery voltage as a reference.
 - Normal base engine calibration allows approximately +/-50 rpm fluctuation. If any factory vehicle accessories are used during SEIC, e.g. a/c, defroster, etc., then that fluctuation may increase to approximately +/-100 rpm or more.
 - The sudden loss of aftermarket PTO hydraulic pressure during SEIC/PTO operation, like a ruptured hose, may send SEIC engine speed to near 3000 rpm. It is recommended that a hydraulic pressure switch linked to SEIC/PTO be added to disable SEIC/PTO when a hose ruptures.
 - Because of a service brake circuit characteristic at engine-start, invoking SEIC may cause the diagnostic error code FFG_BOO to get flagged (recorded in the PCM). To avoid this, simply tap the service brake pedal sometime after engine-start and prior to invoking SEIC. Once the code is set, SEIC may not be available until it is erased.
 - Gas engines require a "change-of-state" at the PTO-Mode and PTO-Engage circuits whenever a disabler turns off SEIC (remove battery voltage signal and re-apply).
 - For aftermarket remote engine start-stop: a change-of-state is required to get SEIC to function again.

Early build vehicles; 2 wires with same color

SOME EARLY BUILD 2011 F-SUPER DUTY VEHICLES HAVE TWO IDENTICALLY COLORED WIRES FOR PTO IN A BLUNT CUT HARNESS UNDER THE DASH. THEY ARE BOTH BLUE W/GRAY STRIPES.

ONE WIRE IS AN INPUT TO THE ECM TO INVOKE PTO MODE IN MOBILE MODE (PTORS2 CIRCUIT #CE933). THE OTHER WIRE IS AN OUTPUT FROM THE TCM TO INDICATE WHEN THE VEHICLE IS IN PARK (TRO-P CIRCUIT #CLS05).

USE AN OHM METER TO IDENTIFY WHICH BLUE-GRAY WIRE YOU NEED.

To verify which circuit is which, measure resistance from one of the blunt cut wires to the PCM connector C175B, pin 6. If the resistance is zero, you have identified circuit CE933. If the resistance is open, check the resistance to pin 43. It should read zero. This will identify that you have positively identified circuit CLS05.

THE PTORS2 WIRE WILL BE CHANGING TO BLUE WITH ORANGE STRIPE IN PRODUCTION