



SVE BULLETIN

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Q-108

Date: August 19, 2004

Revised: September 20, 2004

New Stationary Elevated Idle Control for 2005 Model Year Light Trucks

Models Affected 2005 Model Year F-250/350/450/550 and E-250/350/450.

Purpose

To introduce the new stationary elevated engine idle speed control system for power take-off applications, including related customer access signal circuits and pass-thru circuits.

Overview

• **SEIC strategy**

- 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.
- Standard in all PCM's for Super Duty F-Series light truck, and E-Series, over-8500 lb. GVWR, all powertrains.
- Replaces the Auxiliary Powertrain Control Module (APCM) used with 2004 model year and prior diesel engines.

• **Blunt-cut wires to access SEIC, and customer access for VSO, CTO, PARK, PARK-NEUTRAL signals.**

- F-Series: Located in the cabin, tagged and bundled above the parking brake pedal assembly. Pass-thru wires are in the same bundle.
- E-Series: In the engine compartment, tagged and bundled with the large harness running below the windshield/cowl. Remove some of the plastic harness tape where the harness exits its plastic support gutter above the engine air induction tube to reveal the blunt-cut wires.
- The final stage manufacturer or up-fitter is required to supply the customer interface or controller.
- Further detailed in the "Circuit Descriptions" section.

• **Blunt-cut wires to access the four optional Up-fitter Switches.**

- Available as an option on Super Duty F-Series only, Option Code 66S.
- May be used as a PTO activation switch.
- Located in the cabin, above the parking brake pedal assembly. Remove the PDJB for easy access.
- Further detailed in the "Circuit Descriptions" section.

• **Transmission PTO gear and port.**

- Available for Super Duty F-Series only.
- Standard with M6OD 6-speed manual transmission.
- Available for TorqShift 5-speed automatic transmission by ordering "Transmission Power Take-Off Provision", Option Code 62R.

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. This is powertrain control strategy in the PCM. Blunt-cut wires are provided for customer access.

VSO: 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.

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

BCPIL / BCPSW: Battery Charge Protection Illumination (Lamp) / Switch.

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 off the PTO switch and back on again before SEIC will allow elevated idle to return.

TRO_PN, TRO_P: Transmission Range Output, indicating either combination PARK or NEUTRAL, or PARK-ONLY

PDJB: Power Distribution Junction Box. Located at lower driver-side instrument panel.

Product Descriptions

SEIC (Stationary Elevated Idle Control): New for 2005 model year, this feature is included in the powertrain control strategy of all F250/350/450/550 and E250/350/450, over-8500 lb GVWR, all powertrains. For diesel engines it replaces the APCM (Auxiliary Powertrain Control Module) previously included with Ford "Auxiliary Idle Control Kit" Option Codes 96P (F-Series) and 961 (E-Series). For a stationary vehicle it allows the operator to elevate engine idle speed to operate a transmission-mounted PTO, or engine FEAD-mounted clutch-pump, air compressor, or generator; or be used to help keep the vehicle battery charged. SEIC uses CAN messaging internally. It is activated by applying discrete voltage signals to a wire bundle located in the F-Series cabin above the parking brake release handle, and in the E-Series engine compartment. The up-fitter will need to complete the circuits as described herein, and provide the customer interface (i.e. buttons, LCD read-out for engine speed, PTO switch, etc.). Note: The F-Super Duty light truck offers four optional relayed rocker switches on the instrument panel for the up-fitter to use (Option Code 66S). Ramp-up rate is fixed and approximately 200 rpm/sec for diesel engine and 400 rpm/sec for gas engine.

PTO Control (For automatic transmission-mounted PTO only): This is PCM strategy within the SEIC feature that automatically looks for and recognizes whether the vehicle has a TorqShift automatic transmission with a side-mount PTO ("Transmission PTO Provision", Option Code 62R), and makes the internal PTO gear function by commanding the torque converter to lock at 1200 rpm minimum speed. The PTO gear is splined directly to the transmission torque converter turbine shaft. When all of the vehicle safety enablers are met, and the engine speed is commanded by the operator to at least 1200 rpm, then the strategy automatically commands the torque converter to lock at 1200 rpm to deliver engine torque to the PTO gear (actual lock-up begins at approximately 1050 rpm), and elevates the transmission hydraulic line pressure to 150 psi nominal for the aftermarket PTO to use to hold its engagement clutch. NOTE: Applying battery voltage to the Diesel "PTO" or Gas "PTO-Mode" wires is required to initiate these commands. Failing to do so may show up as low or oscillating hydraulic line pressure and low or no aftermarket PTO torque or pump flow output. Any attempt to operate the aftermarket PTO at elevated idle without these commands may result in under-capacity PTO clutch wear, resulting in rapid contamination of transmission fluid and internal transmission damage. This applies to both stationary and mobile automatic transmission PTO operations.

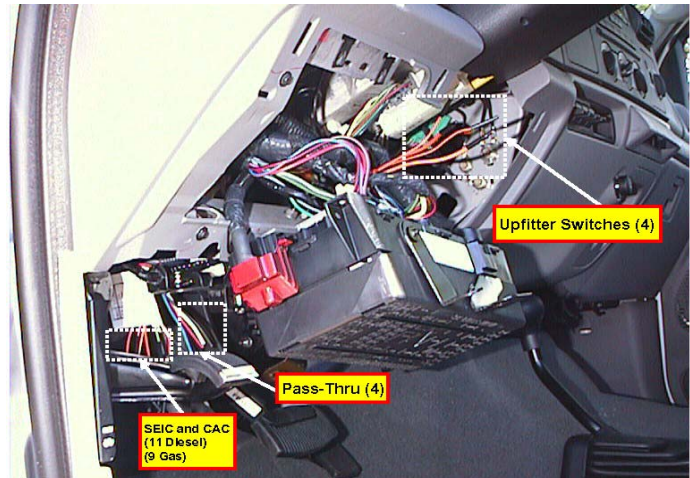
Wire Locations

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

F250/350/450/550

Cabin / Instrument Panel

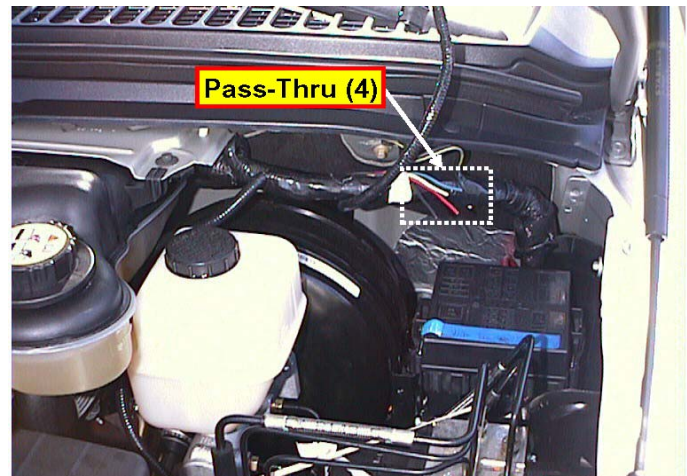
- Blunt-cut access wires for SEIC, "Customer Access" signal circuits for CTO, VSO, PARK, PARK-NEUTRAL, and 4 pass-thru wires, are bundled together at the harness above the parking brake pedal assembly.
- Blunt-cut access wires for the 4 optional "Upfitter Switches" are at the harness behind the Power Distribution Junction Box. Pull the PDJB away from the instrument panel for better access as shown.



F250/350/450/550

Engine Compartment

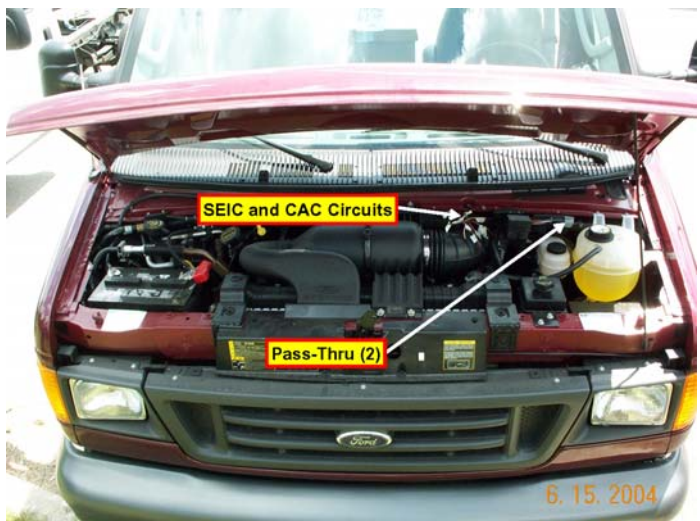
- The 4 blunt-cut pass-thru wires are found in the harness below the cowl, just outboard of the brake master cylinder, as shown.



E250/350/450

Engine Compartment

- Blunt-cut access wires for SEIC, and the "Customer Access" signal circuits for CTO, VSO, PARK, PARK-NEUTRAL, are with the large harness running below the windshield/cowl. Remove some of the plastic harness tape where the harness exits its plastic support gutter above the engine air induction tube to reveal the blunt-cut wires.
- The two pass-thru wires are part of the same modified vehicle wiring kit as prior years. Located at the 4-pin connector in the harness below the cowl, outboard of the brake master cylinder, as shown. Mating pigtail connector, 4C24-14A411-A, found in dunnage. Opposite ends located above driver-side kick-panel.



Circuit Descriptions for SEIC and Customer Access Signal Circuits

All circuits lead back to pins on the PCM.

F-250/350/450/550 – Diesel Engine PCM		
Circuit Intent	Wire Tag	Description
INPUT (VPWR)	PTO	PCM Pin C1-12 Circuit No. 2242 Wire Color: Orange <ul style="list-style-type: none"> Applying vehicle battery voltage to this wire begins SEIC process. Signals TorqShift transmission to enter SEIC strategy. Verifies safety enablers. Turns off OBD and other emission-related monitoring. Elevates engine speed to target found at PTO-RPM circuit. Invokes the PTOC circuit when safety enablers are met. Looks for the target engine speed requested at the PTO_RPM circuit using a resistor or POT.
OUTPUT	PTOC	PCM Pin C2-15 Circuit No. 2244 Wire Color: Orange / Lt. Blue <ul style="list-style-type: none"> A low-side driver, changing from "open-circuit" to "ground" indicating all safety enablers satisfied. Intended for powering an indicator lamp, or turn on a relay coil. LED lights require adding a resistor in series (1K ohm, ¼ watt). Do not feed PCM pin with more than 1 amp.
INPUT (resistor)	PTO_RPM	PCM Pin C1-06 Circuit No. 2246 Wire Color: Orange / Yellow <ul style="list-style-type: none"> Add a resistor or potentiometer to obtain fixed or variable engine target speed. Combine in circuit with PTO-VREF and PTO_GND. Speed range available: 1200 rpm to 2400 rpm
Reference Voltage	PTO_VREF	PCM Pin C1-44 Circuit No. 2245 Wire Color: Orange / Red <ul style="list-style-type: none"> A 5-volt reference, buffered against shorts to ground or power, used to complete the resistor circuit for engine speed selection.
PCM Ground	PTO_GND	PCM Pin C1-32 Circuit No. 2247 Wire Color: Orange / Black <ul style="list-style-type: none"> A ground reference, buffered, used to complete the resistor circuit for engine speed selection.
INPUT (VPWR)	BCPSW	PCM Pin C1-09 Circuit No. 2248 Wire Color: Purple / Lt. Green <ul style="list-style-type: none"> Applying vehicle battery voltage to this wire begins BCP. Engine speed is sent to 1200 rpm when all safety enablers are met, regardless of the degree of battery charge. After 1200 rpm, BCP regulates engine speed based upon the degree of battery charge, up to 2400 rpm maximum.
OUTPUT	BCPIL	PCM Pin C2-16 Circuit No. 2249 Wire Color: Lt. Green / Purple <ul style="list-style-type: none"> A low-side driver, changing from "open-circuit" to "ground" indicating that BCP is in effect. Intended for powering an indicator lamp. Do not feed PCM pin with more than 300 ma.
CUSTOMER ACCESS SIGNAL CIRCUITS		
OUTPUT PARK-Only	PARK	PCM Pin C1-07 Circuit No. 1857 Wire Color: Yellow / White <ul style="list-style-type: none"> A low-side driver, changing from "open-circuit" to "ground".
OUTPUT NEUTRAL-Only	(Feature not Available)	
OUTPUT PARK or NEUTRAL	PARK/ NEUTRAL	PCM Pin C3-05 Circuit No. 1146 Wire Color: Lt. Green / Red <ul style="list-style-type: none"> A low-side driver, changing from "open-circuit" to "ground".
OUTPUT Vehicle Speed	VSO	PCM Pin C1-22 Circuit No. 0239 Wire Color: White / Orange
OUTPUT Engine Speed	CTO	PCM Pin C1-01 Circuit No. 0076 Wire Color: Lt. Green / White

Circuit Descriptions, continued

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_Mode	PCM Pin C2-26 Circuit No. 2242 Wire Color: Orange <ul style="list-style-type: none"> • Applying vehicle battery voltage to this wire begins SEIC process. • Signals TorqShift transmission to enter SEIC strategy. • Verifies safety enablers. • Turns off OBD and other emission-related monitoring. • Elevates engine speed to 900 rpm "standby" speed if it finds an "open-circuit" at PTO-RPM_Select. • Invokes the PTOIndicator 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_Indicator	PCM Pin C2-42 Circuit No. 2244 Wire Color: Orange / Lt. Blue <ul style="list-style-type: none"> • A low-side driver, changing from "open-circuit" to "ground" indicating all safety enablers satisfied. • Intended for powering an indicator lamp, or turn on a relay coil. • LED lights require adding a resistor in series (1K ohm, ¼ watt). • Do not feed PCM pin with more than 1 amp.
INPUT (resistor)	PTO_RPM_Select	PCM Pin C2-07 Circuit No. 2246 Wire Color: Orange / Yellow <ul style="list-style-type: none"> • Add a resistor or potentiometer to obtain fixed or variable engine target speed. • Combine in circuit with PTO-ENGAGE. • Speed range available: 910 rpm to 2400 rpm
INPUT (VPWR)	PTO_Engage	PCM Pin C2-09 Circuit No. 2243 Wire Color: Orange / White <ul style="list-style-type: none"> • Applying vehicle battery voltage to this wire signals PCM that the PTO load is being applied. • Must be applied after PTO_Mode, and after PTO_Indicator changes to "ground". • Also used to complete the resistor circuit for engine speed selection.
CUSTOMER ACCESS SIGNAL CIRCUITS		
OUTPUT PARK-Only	PARK	PCM Pin C2-46 Circuit No. 1146 Wire Color: Lt. Green/Red <ul style="list-style-type: none"> • A low-side driver, changing from "open-circuit" to "ground".
OUTPUT NEUTRAL-Only	NEUTRAL	PCM Pin C3-22 Circuit No. 0463 Wire Color: Red / White <ul style="list-style-type: none"> • A low-side driver, changing from "open-circuit" to "ground".
OUTPUT PARK or NEUTRAL	(Feature not Available)	
OUTPUT Vehicle Speed	VSOUT	PCM Pin C2-01 Circuit No. 0239 Wire Color: White / Orange
OUTPUT Engine Speed	CTO	PCM Pin C2-25 Circuit No. 0076 Wire Color: Lt. Green / White

Circuit Descriptions, continued

All circuits lead back to pins on the PCM.

E-250/350/450 – Diesel Engine PCM		
Circuit Intent	Wire Tag	Description
INPUT (VPWR)	PTO	PCM Pin C1-12 Circuit No. 0828 Wire Color: Purple / Lt. Blue <ul style="list-style-type: none"> Applying vehicle battery voltage to this wire begins SEIC process. Signals TorqShift transmission to enter SEIC strategy. Verifies safety enablers. Turns off OBD and other emission-related monitoring. Elevates engine speed to target value found at PTO-RPM circuit. Invokes the PTOC circuit when safety enablers are met. Looks for the target engine speed requested at the PTO_RPM circuit using a resistor or potentiometer.
OUTPUT	PTOC	PCM Pin C2-15 Circuit No. 0239 Wire Color: White / Orange <ul style="list-style-type: none"> A low-side driver, changing from "open-circuit" to "ground" indicating all safety enablers satisfied. Intended for powering an indicator lamp, or turn on a relay coil. LED lights require adding a resistor in series (1K ohm, ¼ watt). Do not feed PCM with more than 1 amp.
INPUT (resistor)	PTO_RPM	PCM Pin C1-06 Circuit No. 2246 Wire Color: Orange / Yellow <ul style="list-style-type: none"> Add a resistor or potentiometer to obtain fixed or variable engine target speed. Combine in circuit with PTO-VREF and PTO_GND. Speed range available: 1200 rpm to 2400 rpm
Reference Voltage	PTO_VREF	PCM Pin C1-44 Circuit No. 2245 Wire Color: Orange / Red <ul style="list-style-type: none"> A 5-volt reference, buffered against shorts to ground or power, used to complete the resistor circuit for engine speed selection.
PCM Ground	PTO_GND	PCM Pin C1-32 Circuit No. 2247 Wire Color: Orange / Black <ul style="list-style-type: none"> A ground reference, buffered, used to complete the resistor circuit for engine speed selection.
INPUT (VPWR)	BCPSW	PCM Pin C1-09 Circuit No. 2248 Wire Color: Purple / Lt. Green <ul style="list-style-type: none"> Applying vehicle battery voltage to this wire begins BCP. Engine speed is sent to 1200 rpm when all safety enablers are met, regardless of the degree of battery charge. After 1200 rpm, BCP regulates engine speed based upon the degree of battery charge, up to 2400 rpm maximum.
OUTPUT	BCPIL	PCM Pin C2-16 Circuit No. 0076 Wire Color: Lt. Green / White <ul style="list-style-type: none"> A low-side driver, changing from "open-circuit" to "ground" indicating that BCP is in effect. Intended for powering an indicator lamp. Do not feed PCM pin with more than 300 ma.
CUSTOMER ACCESS SIGNAL CIRCUITS		
OUTPUT PARK-Only	TRO_P	PCM Pin C1-07 Circuit No. 1857 Wire Color: Yellow / White <ul style="list-style-type: none"> A low-side driver, changing from "open-circuit" to "ground".
OUTPUT NEUTRAL-Only	TRO-N2	PCM Pin C1-03 Circuit No. 0463 Wire Color: Red / White <ul style="list-style-type: none"> A low-side driver, changing from "open-circuit" to "ground".
OUTPUT PARK or NEUTRAL	(Feature not Available)	
OUTPUT Vehicle Speed	VSO	PCM Pin C1-22 Circuit No. 0679 Wire Color: Gray / Black
OUTPUT Engine Speed	CTO	PCM Pin C1-01 Circuit No. 0648 Wire Color: White / Pink

Circuit Descriptions, continued

All circuits lead back to pins on the PCM.

E-250/350/450 – Gas Engine PCM		
Circuit Intent	Wire Tag	Description
INPUT (VPWR)	PTO_Mode	PCM Pin C3-26 Circuit No. 2242 Wire Color: Orange <ul style="list-style-type: none"> • Applying vehicle battery voltage to this wire begins SEIC process. • Signals TorqShift transmission to enter SEIC strategy. • Verifies safety enablers. • Turns off OBD and other emission-related monitoring. • Elevates engine speed to 900 rpm "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-IND	PCM Pin C3-42 Circuit No. 2244 Wire Color: Orange / Lt. Blue <ul style="list-style-type: none"> • A low-side driver, changing from "open-circuit" to "ground" indicating all safety enablers satisfied. • Intended for powering an indicator lamp, or turn on a relay coil. • LED lights require adding a resistor in series (1K ohm, ¼ watt). • Do not feed PCM pin with more than 1 amp.
INPUT (resistor)	PTO_RPM	PCM Pin C3-07 Circuit No. 2246 Wire Color: Orange / Yellow <ul style="list-style-type: none"> • Add a resistor or potentiometer to obtain fixed or variable engine target speed. • Combine in circuit with PTO-ENGAGE. • Speed range available: 910 rpm to 2400 rpm
INPUT (VPWR)	PTO_Engage	PCM Pin C3-09 Circuit No. 2243 Wire Color: Orange / White <ul style="list-style-type: none"> • Applying vehicle battery voltage to this wire signals PCM that the PTO load is being applied. • Must be applied after PTO_Mode, and after PTO_IND changes to ground. • Also used to complete the resistor circuit for engine speed selection.
CUSTOMER ACCESS SIGNAL CIRCUITS		
OUTPUT PARK-Only	PARK_OUT	PCM Pin C3-46 Circuit No. 1857 Wire Color: White / Orange <ul style="list-style-type: none"> • A low-side driver, changing from "open-circuit" to "ground".
OUTPUT NEUTRAL-Only	(Feature not Available)	
OUTPUT PARK or NEUTRAL	PRK_NEU	PCM Pin C3-22 Circuit No. 0463 Wire Color: Red / White <ul style="list-style-type: none"> • A low-side driver, changing from "open-circuit" to "ground".
OUTPUT Vehicle Speed	VSO	PCM Pin C3-01 Circuit No. 0679 Wire Color: Gray / Black
OUTPUT Engine Speed	CTO	PCM Pin C3-25 Circuit No. 0648 Wire Color: White / Pink

Battery Voltage Sources (VPWR)

F-250/350/450/550

Circuit Intent	Wire Tag	Description
Ignition Hot-in-RUN		Circuit no. 294 Wire Color: White / Lt. Blue <ul style="list-style-type: none"> • A fused 10 amp circuit. • Found: Blunt-cut & taped, on the harness behind the Diagnostic Link Connector.
Ford upfitter switches: Ign-Hot-ACC	Aux-1 Aux-2 Aux-3 Aux-4	[30-amp] Circuit No. 1936 Wire Color: Orange / Lt. Green [30-amp] Circuit No. 1933 Wire Color: Orange [10-amp] Circuit No. 1934 Wire Color: Orange / Yellow [10-amp] Circuit No. 1935 Wire Color: Orange / Lt. Blue <ul style="list-style-type: none"> • Found: above parking brake release handle, behind PDJB.
Hot-at-all-times	Fuse #3 Fuse #109 Fuse #5 Fuse #108	[30-amp] Circuit No. 1445 Wire Color: Red / Lt. Green [30-amp] Circuit No. 1448 Wire Color: Orange / Red [10-amp] Circuit No. 1446 Wire Color: Red / Lt. Blue [10-amp] Circuit No. 1447 Wire Color: Red <ul style="list-style-type: none"> • Found: at Power Distribution Junction Box. • DO NOT use in combination with upfitter switches.

E-250/350/450

Circuit Intent	Wire Tag	Description
Hot-at-all-times	(no tag)	Circuit no. 1507 Wire Color: White / Red <ul style="list-style-type: none"> • A fused 30 amp circuit. • Found: at 4-pin connector above the brake master cylinder, part of Modified Vehicle Wiring.
Ignition Hot-in-RUN	(no tag)	Circuit no. 0049 Wire Color: Orange <ul style="list-style-type: none"> • A fused 30 amp circuit. • Found: at 4-pin connector above the brake master cylinder, part of the Modified Vehicle Wiring.

SEIC Resistor Charts

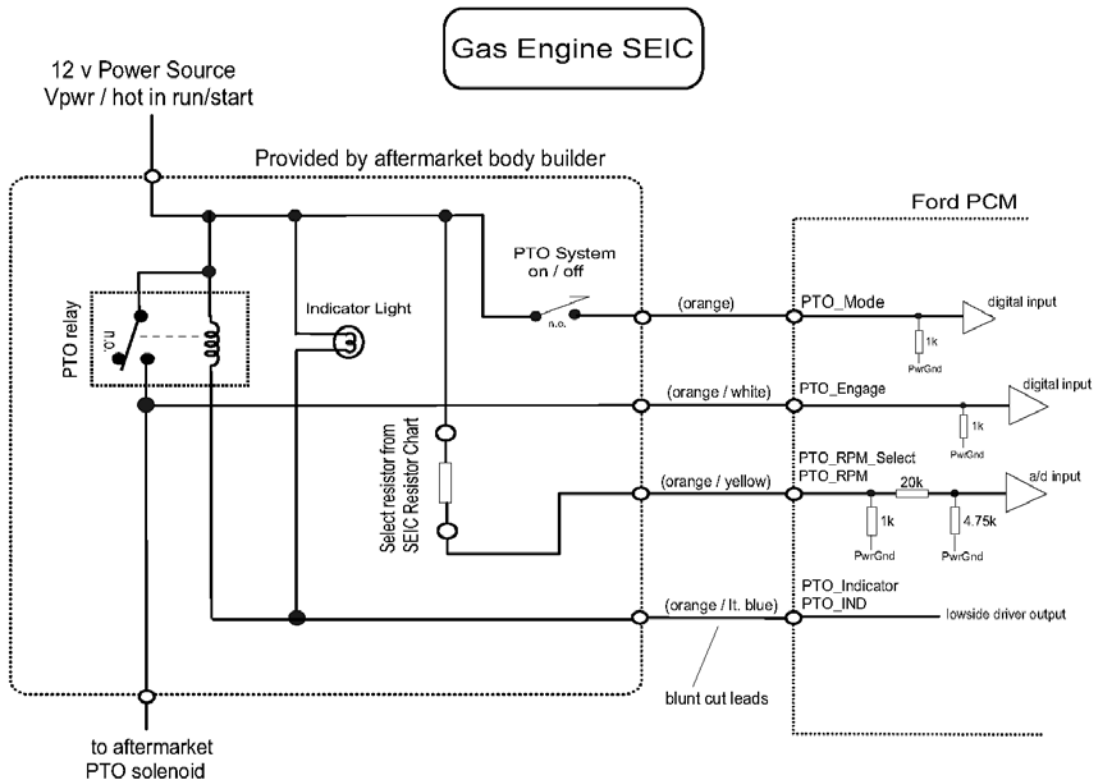
Diesel Engine		
Engine Target Speed (RPM)	Resistor (Ohms) (5%, ¼ Watt)	Voltage (volts) (± 0.0875 v)
680 (Base)		
1200	Open Circuit*	
1200	43K	
1260	27K	0.6875
1320	22K	0.8875
1380	16K	1.0875
1440	13K	1.2875
1500	11K	1.4875
1560	9K	1.6875
1620	7.5K	1.8875
1680	6.2K	2.0875
1740	5.6K	2.2875
1800	4.7K	2.4875
1860	3.9K	2.6875
1920	3.3K	2.8875
1980	2.7K	3.0875
2040	2.4K	3.2875
2100	2.0K	3.4875
2160	1.6K	3.6875
2220	1.3K	3.8875
2280	1.0K	4.0875
2400	510	4.4875

Gas Engine		
Engine Target Speed (RPM)	Resistor (Ohms) (5%, ¼ watt)	Voltage (volts)
650 (Base)		
900	Open Circuit	0.00
912	3.9K	
1024	2.7K	3.61
1056	2.2K	4.18
1184	1.8K	4.80
1264	1.5K	5.39
1440	1.0K	6.76
1536	820	7.43
1648	680	8.06
1712	560	8.70
1792	470	9.25
1904	380	9.89
1936	330	10.27
2000	270	10.75
2064	220	11.20
2128	180	11.60
2160	150	11.90
2208	120	12.23
2256	100	12.46
2320	0 (closed circuit)	13.77

* TorqShift automatic transmission only; manual transmission requires a resistor.

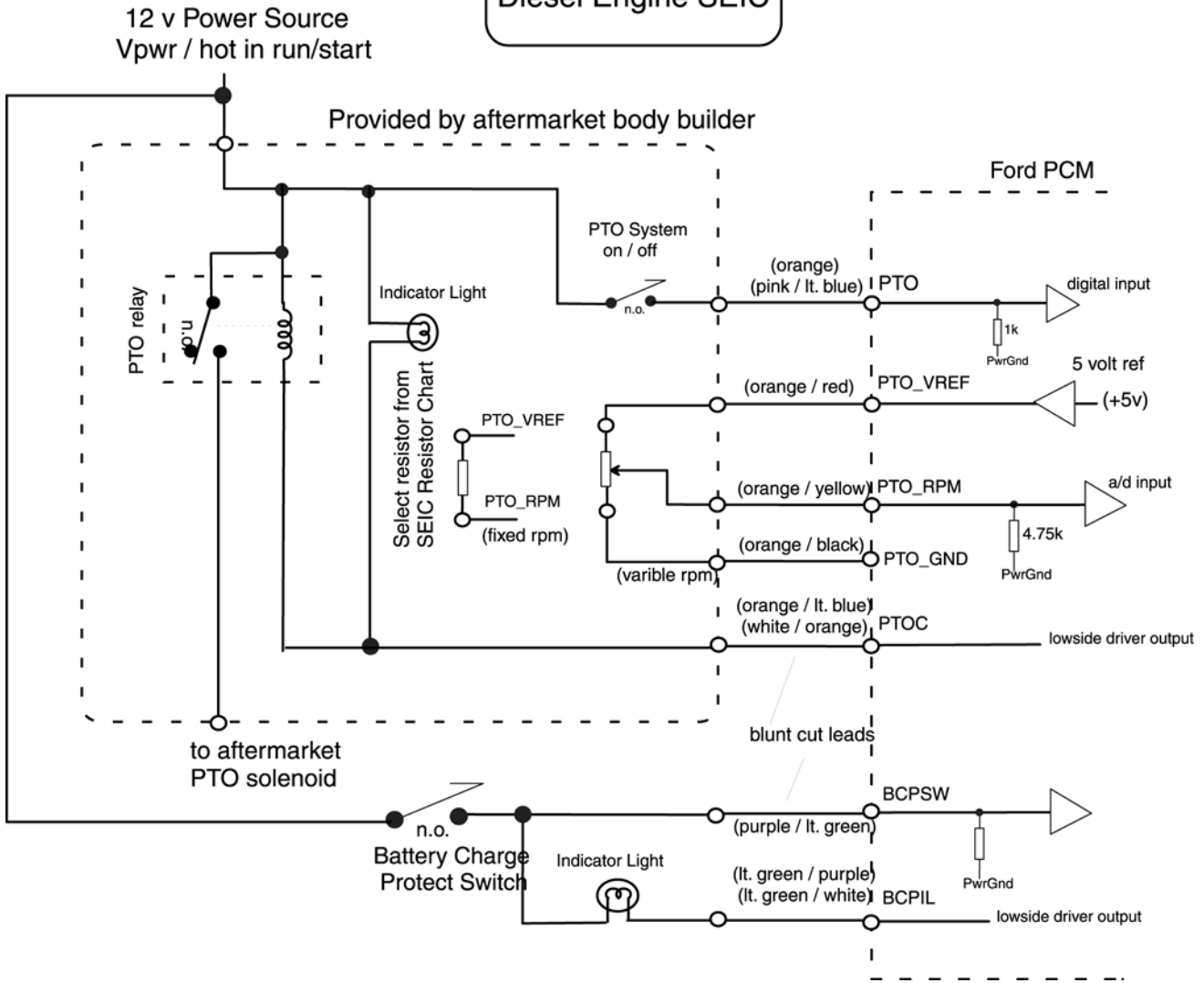
Wiring Diagrams

The following diagrams suggest a method to complete the SEIC circuits for gas and diesel engines. Where the wire color or PCM pin call-outs show two different colors or names, the top one refers to Super Duty F-Series vehicles and the bottom one refers to E-Series vehicles.



Wiring Diagrams (continued)

Diesel Engine SEIC



SEIC Enable/Disable Conditions

Vehicle Conditions to Enable SEIC (all are required)	Vehicle Conditions that Disable SEIC (any one required)	Gas Engine	Diesel Engine
Parking brake applied.	Parking brake disengaged.	Yes	Yes
Foot off of service brake	Depressing service brake	Yes (See Note-1)	Yes (See Note-2)
Vehicle in PARK (automatic trans.)	Vehicle taken out of PARK	Yes	Yes
Foot off of clutch (manual trans.)	Clutch depressed	Yes	Yes (See Note-2)
Foot off of accelerator pedal		Yes	Yes
Vehicle speed is 0 mph (stationary)		Yes	Yes
Brake lights functional	Brake light circuit disconnected	Yes	Yes
Engine at a stable base idle speed		Yes	Yes
	Transmission Oil Temperature (TOT) Limit exceeds 240 degrees F.	Yes (See Note-1)	No
	Engine Coolant Temperature Limit (ECT)	Yes (See Note-1)	No
	Catalyst Temperature Limit	Yes (See Note-1)	No

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

When a disabler is seen by the PCM the "PTO-Indicator" 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 proceeds below 1200 rpm. To re-initiate SEIC the operator must turn off the aftermarket PTO switch (removing command voltage to the "PTO-Mode" circuit) and turn it back on again.

Note-2: SEIC is automatically re-activated after approximately 3 seconds after the disabling condition is removed.

SEIC / PTO – General System Behavior

- To guarantee full advertised torque capability at the 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.
 - DIESEL engines do not require a "change-of-state" at the "PTO" circuit. Once the disabling condition is removed, the strategy re-invokes SEIC after approximately 3 seconds, automatically returning the engine speed back to what was commanded by the operator prior to the disabling condition.
- Battery Charge Protection (BCP): A diesel-only function. When it is switched on the engine speed goes immediately to 1200 rpm, and stays there even if the battery is fully charged. From this state it uses system voltage as well as ambient air temp., engine oil temperature information to raise engine speed higher to maintain a certain battery charge. Maximum engine speed in BCP mode is 2400 rpm. The BCPSW circuit may be wired to circuit to Ignition-Hot-in-Run to make it "automatic" for ambulance. Park-Brake-Set is one of the enablers of BCP.

SEIC / PTO – General System Behavior, continued

- If the Transmission Oil Temperature (TOT) sensor reaches 240°F, then TorqShift torque converter may disengage, preventing torque to be 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 (fixed, not programmable):
 - GAS engines: 400 rpm/second.
 - DIESEL engines: When first applying battery voltage to the PTO circuit the PCM directs the engine to go to the initial target that it sees at the RPM circuit at 200 rpm/second (1200 rpm if there is no resistor in the RPM circuit – open circuit). If resistance is subsequently changed at the RPM circuit then the ramp rate to this second speed target is virtually instantaneous (as fast as the diesel engine can get there).
- 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.
 - The correlation will be better for diesel engines since the diesel engine SEIC system offers buffered PCM voltage and ground circuits to complete the resistor circuits for engine speed, while the gas engine system forces the SEIC circuit installer to use chassis voltage and ground.
 - 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.
- GAS Engine Only:
 - 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.