



Body Builders Layout Book

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SEIC / PTO

SEIC / PTO INDEX

2015
MODEL YEAR

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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.
- **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 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 P/U Option Code 66S.
 - May be used as a PTO activation switch.
 - Located in the cabin, above the parking brake pedal assembly.
 - Further detailed in the "Circuit Descriptions" section.

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.

SEIC: Stationary Elevated Idle Control (PCM Strategy). Blunt-cut wires provided for customer access.

PCM: Powertrain Control Module

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

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

VSO: Vehicle Speed Out. Blunt-cut wire provided for access (see "Circuit Descriptions"). 8000 pulses per mile, 2.2 Hz per mile-per-hour.

TPO: Throttle Position Out. Customer access not available.

ECT: Engine Coolant Temperature

CTO: Clean Tach Out. An engine speed signal. Blunt-cut wire provided for access (see "Circuit Descriptions").

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 or less 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.

VEHICLES USED AS A STATIONARY POWER SOURCE – GENERAL RECOMMENDATIONS AND WARNINGS

Ford trucks are designed principally to provide vehicle motivation and short-term auxiliary power needs. Power activation of hydraulic or mechanically driven devices such as wrecker lift, snowplow blade lift and movement, power tailgate lift or dump body lift, are a few examples.

The variety of factors such as air circulation available, temperature environment, vehicle maintenance level, and other existing conditions, combined with the range of auxiliary horsepower and torque demands that may be placed upon a vehicle in power take-off usage, make it difficult to assess the ultimate performance of a vehicle subjected to extended duration usage as an auxiliary power source. The guidelines in this book are intended to assist the PTO equipment installer with avoiding inadvertent vehicle performance and safety concerns. These guidelines should not be considered all inclusive; it is the responsibility of the PTO equipment installer to choose and install a PTO system that the vehicle operators will be able to use in a safe manner, and with the necessary precautions to ensure safe operation and customer satisfaction.

Additional transmission fluid may be required with the addition of the transmission-mounted PTO.

1. The final stage manufacturer is responsible for alerting the user to proper maintenance. PTO usage may require using the Ford "severe-duty" vehicle maintenance schedules, including transmission fluid changes. Some applications may require an even more frequent maintenance schedule if the PTO system is used in "continuous duty".
2. Route PTO hydraulic lines and hoses away from the vehicle exhaust system.
3. Diesel engines are recommended over gas engines for stationary PTO operation of extended duration.

4. Do not block air flow circulation to the engine coolant radiator, engine, and transmission oil cooler.
5. The following are some maximum temperatures monitored by the PCM. The aftermarket PTO system designer or installer should consider adding a sensor to monitor these for the purpose of aborting the PTO operation to protect against vehicle powertrain damage. Some PTO suppliers may offer temperature monitors for this purpose.
 - a) Maximum Engine Coolant Temperature (ECT): 220° F (Gasoline), 234° F (Diesel)
 - b) Maximum Engine Oil Sump Temperature: 284° F
 - c) Maximum Transmission Oil Temperature (TOT): 250° F
 - d) Maximum Catalyst Temperature: varies (not intended for aftermarket monitoring).

If any of the above temperatures are exceeded then "de-clutch" the auxiliary load of the PTO operation and return the vehicle engine speed to base engine idle. Allow the temperature to stabilize at a lower level before re-engaging PTO operation. Gas engine strategy uses these to abort SEIC (return engine to base idle speed and unlock automatic transmission torque converter).

6. The blunt-cut wires related to SEIC go directly back to pins on the PCM. Care should be taken with any aftermarket circuitry connecting with these or neighboring wires to prevent feeding those modules with any unwanted, threatening signals or voltages. Unwanted vehicle behavior and/or PCM damage may result.
7. Both gas and diesel powertrains are calibrated to accept up-fitter commands through the SEIC wiring only, which are battery-voltage commands only, no CAN messaging. Any alternate method to obtain stationary elevated idle control may result in unpredictable or inconsistent engine speed or stalling.



SEIC / PTO APPLICATION INFORMATION (Cont'd)

PRODUCT DESCRIPTIONS

"Transmission Power Take-Off Provision" (Option Code 62R):

This Option, available for F-Series only, provides the 5-speed (6.8L) and 6-speed (6.7L) auto transmission with an internal PTO drive gear and access port in the transmission case. A unique PCM is not included nor required.

Automatic Transmission Fluid Temperature Gauge:

A Transmission Fluid Temperature Gauge is included with the instrument cluster of Super Duty F-Series, signaled by the Transmission Oil Temperature (TOT) sensor. A complete description can be found in the vehicle's Owner Guide. Listed in brief below are some descriptions of gauge readings to help the operator monitor PTO operation:

- Cold Range: 50° F or less.
- White Area: Normal operating range of 51° F to 248° F.
- Yellow Area: Warning: Stop driving the vehicle or remove auxiliary loads at the earliest convenience. Typically, leave the engine running at base idle speed and allow to cool into the normal range before starting to drive or operate the PTO. The transmission fluid is not over-heated, but operating in the Yellow Range for extended periods of time may cause internal transmission damage.
- Red Area: The transmission fluid is over-heating. Stop the vehicle, do not drive, and allow to cool into the normal operating temperature range. If the gauge continues to show high temperatures then see your Ford dealer.

For readings in the Red and Yellow areas, make sure that snow or debris is not blocking airflow to the radiator and transmission fluid cooler, that cooler lines are not kinked nor restricted, and that vehicle load capacities or PTO duty cycles are not excessive.

SEIC (Stationary Elevated Idle Control):

This feature is included in the powertrain control strategy of all F250/350/450/550 and E350/450 vehicles over 8500 lb GVWR, with all powertrains. 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 the up-fitter by applying discrete voltage signals to a wire bundle located in the F-Series cabin above the parking brake release handle, and similarly 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 relayed rocker switches on the instrument panel for the up-fitter to use.

Ramp-up rate is fixed at 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 Gasoline "PTO-Mode" wires is what the transmission looks for 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.

SEIC / PTO APPLICATION INFORMATION (Cont'd)

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:
 - Both GASOLINE and DIESEL 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.
- Battery Charge Protection (BCP): A diesel-only function. When switched to ON, the engine speed goes immediately to 600 rpm. In this state, the Powertrain Control Module (PCM) monitors battery voltage, ambient air temperature and engine oil temperature information; the PCM will adjust engine speed to maintain battery voltage. Maximum engine speed in BCP mode is 1200 rpm. Loss of an enabling condition after BCP is engaged will cancel BCP and require recycling of the BCP switch to re-engage the BCP function.
- If the Transmission Oil Temperature (TOT) sensor reaches 240°F, then the 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 (fixed, not programmable):
 - Gasoline 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.

- 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's voltage varies 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 gasoline engine systems than diesel since gasoline uses chassis battery voltage as a reference.
- GASOLINE 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.
 - Gasoline engines require a "change-of-state" at both 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.

SEIC ENABLE-DISABLE CONDITIONS			
Vehicle Conditions to Enable SEIC (all are required)	Vehicle Conditions that Disable SEIC (any one required-See note 1)	Gasoline Engine	Diesel Engine
Parking brake applied.	Parking brake disengaged.	Yes	Yes
Foot off of service brake	Depressing service brake	Yes	Yes
Vehicle in PARK (automatic trans.)	Vehicle taken out of PARK	Yes	Yes
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 ²	Yes ²
Trans Oil Temp above 20°F	Transmission Oil Temperature (TOT) Limit exceeds 240°F.	Yes	Yes
Eng Coolant Temp above 20°F	Engine Coolant Temperature (ECT) above 234°F	No	Yes
Eng Coolant Temp above 40°F ³	Engine Coolant Temperature (ECT) above 220°F	Yes	No
	Catalyst Temperature Limit	Yes	Yes

- (1) A "Change-of-State" at the "PTO-Request" (and "PTO Engage" - Gasoline engines) circuit is required to re-invoke SEIC. When a disabler is seen by the PCM, the "PTO-Indicator" circuit changes from "Ground-Source" to an "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 then turn it back on again.
- (2) If a SEIC disabling condition occurs, the engine must be allowed to reach a stable base idle before the system can be re-initiated.
- (3) 5.4L and 6.2L engines- above 140°F.



SEIC / PTO APPLICATION INFORMATION (Cont'd)

GUIDELINES FOR SPECIFIC APPLICATIONS

FEAD-Mounted Auxiliary Equipment:

1. An auxiliary crankshaft bearing support is required on all modular gas engine applications where the clutch-pump is drawing greater than 5-hp from the engine crankshaft pulley. This further applies to all tangentially-mounted auxiliary aftermarket equipment in general.
A "spider" bracket kit can be obtained for this purpose. It allows up to 70 lb-ft of torque at the clutch-pump. Part Number: (6.8L) XC2E-7275-BB.
2. Always maintain the clearance relationship between the Ford OEM fan, radiator, and shroud to help maintain optimum engine cooling performance.
3. Always consider engine roll and body/frame torsion when packaging clearances.
4. Temperature monitoring of powertrain fluids as discussed earlier in this section is recommended.
5. Avoid the use of aftermarket "power chips" in the engine powertrain control system. These boost engine power by dumping fuel, which heats the engine, thereby turning on the cooling fan 100%, resulting in accelerated FEAD belt and tensioner wear.
6. Belt spans greater than 250 mm [9.8 in] require a pulley or tensioner support within the span.

Split-Shaft PTO (Diesel Only)

Split-Shaft PTO gearboxes provide a cost effective means for driving a pump, generator, air compressor, winch or other auxiliary equipment from the truck engine. An aftermarket gearbox installed in a mid-ship position of the truck between two sections of a split drive shaft. Split-Shaft mode is activated by applying supply voltage to both the PTORS1 & PTORS2 PCM circuits simultaneously.

The enablers are as follows:

- Assure engine is running and warmed-up.
- Apply park brake.
- With transmission in NEUTRAL, disengage drive wheels by shifting the PTO gearbox to AUXILIARY POWER.
- Engage the load and apply RPM REQUEST voltage.
- With foot off brake and accelerator, switch Split-Shaft PTO to ON.

- While pressing the service brake, shift transmission into DRIVE.
- The system will shift the transmission into 4th gear, lock the converter and then ramp up to the desired speed in a controlled manner. Release the service brake.
- If vehicle unexpectedly lurches or moves, immediately depress brake pedal and shift transmission into PARK or NEUTRAL to secure vehicle. Contact upfitter immediately for further guidance.

An auxiliary engine cooling system may be required to run at full loads above 2400 rpm. This will be determined by the upfitter based upon the application installed.

LiveDrive Mobile Mode (Diesel Only)

LiveDrive Mobile Mode operates in all gears and all vehicle speeds. The engine idle speed is slightly elevated, but peak engine speed is not limited beyond normal operating ranges. An additional rev limiter may be required to prevent over speed damage to attached pumps and equipment. The maximum load allowable for mobile mode is 150 ft-lbs at the transmission PTO gear. If the PTO feature is used for extended periods of time without vehicle movement it is recommended to switch to Stationary Mode.

Split Shaft Mode/ Live Drive Mobile Mode Enable-Disable Conditions (Diesel only)			
Vehicle Conditions to Enable Split Shaft / Mobile (Live Drive)	Vehicle Conditions that Disable Split Shaft/ Live Drive (any one required - See Note-1)	Split Shaft Mode	Live Drive
Parking brake applied.	Parking brake disengaged.	Yes	No
Foot off of service brake	Depressing service brake	See note-2	No
Vehicle in PARK	Vehicle taken out of PARK	See note-2	No
Foot off of accelerator pedal	Accelerator pedal depressed	Yes	No
Vehicle speed is 0 mph (stationary)	Vehicle speed is not 0 mph (stationary)	Yes	No
Engine at a stable base idle speed		Yes	No
Transmission oil Temp above 20° F	Transmission Oil Temperature (TOT) exceeds 240° F.	Yes	Yes
Engine Coolant Temperature (ECT) 20° F minimum	Engine Coolant Temperature (ECT) exceeds 234° F	Yes	Yes
	Catalyst Temperature Limit	Yes	Yes

(1) A "change-of-state" at the "PTO-Request" circuit is required to re-invoke Split Shaft / Live Drive. When a disabler is seen by the PCM the "PTO-Indicator" circuit changes from "ground-source" to "open-circuit", the PTO mode drops out, and the engine speed returns to base idle. To re-initiate Split shaft / Live Drive the operator must turn off the aftermarket PTO switch (removing command voltage to the "PTO-Mode" circuit) and turn it back on again.

(2) Please see Split Shaft PTO in Special Situations.



Body Builders Layout Book

SEIC / PTO ENGINE PCM PINS E-350/450

E-350/450 – Gasoline Engine PCM		
Circuit Intent	Wire Tag	Description
INPUT (VPWR)	PTO	PCM Pin (5.4L / 6.8L) C175B-3 / C1551B-26 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 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 (5.4L / 6.8L) C175B-11 / C1551B-42 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)	PTOIC-2	PCM Pin (5.4L / 6.8L) C175B-8 / C1551B-7 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 PTORS2. Speed range available: 910 rpm to 2400 rpm
INPUT (VPWR)	PTO-ENGAGE	PCM Pin (5.4L / 6.8L) C175B-6 / C1551B-9 Circuit No. CE924 Wire Color: Blue / Green <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	TRO-P	PCM Pin C175T-14 / C1551B-43 Circuit No. CET22 Wire Color: Gray / Brown
OUTPUT Neutral-Only	TRO-N	PCM Pin C175T-39 / C1551B-39 Circuit No. CET21 Wire Color: Green / White
OUTPUT Vehicle Speed	VSOUT	PCM Pin C175B-5 / C1551B-5 Circuit No. VMC05 Wire Color: Violet / Orange
OUTPUT Engine Speed	PTOIC-1	PCM Pin C175B-10 / C1551B-10 Circuit No. CE913 Wire Color: Blue

NOTE — FOR PASS THRU CIRCUITS - REFER TO THE ELECTRICAL SECTION OF THIS BOOK.



SEIC / PTO ENGINE PCM PINS F-250/350/450/550

CIRCUIT DESCRIPTIONS (All circuits lead back to pins on the PCM)

F-250/350/450/550 – Diesel Engine PCM		
Circuit Intent	Wire Tag	Description
INPUT (VPWR)	PTORS1	PCM Pin C1232B-6 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 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.
INPUT (VPWR)	PTORS2	PCM Pin C1232B-4 Circuit No. CE933 Wire Color: Blue / Orange <ul style="list-style-type: none"> Applying vehicle battery voltage to this wire begins Mobile PTO mode. Signals TorqShift™ transmission to enter SEIC strategy. Verifies safety enablers. Turns off OBD and other emission-related monitoring. Invokes the PTOC circuit when safety enablers are met.
OUTPUT	PTO RELAY (PTO-IND)	PCM Pin C1232B-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 C1232B-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-VREF and PTO-RTN. Speed range available: 1200 rpm to 2400 rpm
REFERENCE VOLTAGE	PTOREF	PCM Pin C1232B-55 Circuit No. LE434 Wire Color: White / Brown <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	PTORTN	PCM Pin C1232B-22 Circuit No. RE327 Wire Color: Gray / Violet <ul style="list-style-type: none"> A ground reference, buffered, used to complete the resistor circuit for engine speed selection.
INPUT (VPWR)	BCP SW	PCM Pin C1232B-21 Circuit No. CE926 Wire Color: Violet / Brown <ul style="list-style-type: none"> Applying vehicle battery voltage to this wire begins BCP. Engine speed is sent to 900 rpm when all safety enablers are met, regardless of the degree of battery charge. After 900 rpm, BCP regulates engine speed based upon the degree of battery charge, up to 2400 rpm maximum.
OUTPUT	BCP LAMP	PCM Pin C1232B-20 Circuit No. CE140 Wire Color: Brown <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.

F-250/350/450/550 – Gasoline Engine PCM		
Circuit Intent	Wire Tag	Description
INPUT (VPWR)	PTO	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 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_OK	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-ENGAGE. Speed range available: 910 rpm to 2400 rpm
INPUT (VPWR)	PTO_Engage	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.

NOTE — FOR PASS THRU CIRCUITS - REFER TO THE ELECTRICAL SECTION OF THIS BOOK.



SEIC / PTO BATTERY VOLTAGE SOURCES & CUSTOMER ACCESS SIGNALS E-350/450

E-350/450 Battery Voltage Sources (VPWR)

Circuit Intent	Wire Tag	Description
Hot-at-all-times	(no tag)	Circuit no. SBB68 Wire Color: Green / Red <ul style="list-style-type: none"> A fused 50 amp circuit. Found: at 4-pin connector above the brake master cylinder or above and to the right of parking brake release handle by the relay pack (part of the Modified Vehicle Wiring)
Ignition Hot-in-RUN	(no tag)	Circuit no. CAC14 Wire Color: Yellow / Orange <ul style="list-style-type: none"> A fused 40 amp circuit. Found: at 4-pin connector above the brake master cylinder or above and to the right of parking brake release handle by the relay pack (part of the Modified Vehicle Wiring)
Ford upfitter switches: Ign-Hot-ACC	Aux-1 Aux-2 Aux-3 Aux-4	[30-amp] Circuit No. CAC05 Wire Color: Yellow [30-amp] Circuit No. CAC06 Wire Color: Green / Brown [10-amp] Circuit No. CAC07 Wire Color: Violet / Green [15-amp] Circuit No. CAC08 Wire Color: Brown <ul style="list-style-type: none"> Found: under windshield cowl on drivers side engine zone. Requires Upfitter Switch Option 52-S

E-350/450 – Gasoline Engine Customer Access Signal Circuits

Circuit Intent	Wire Tag	Description
OUTPUT PARK-Only	TRO_P	PCM Pin C175B-14 Circuit No. CET22 Wire Color: Gray / Brown C1551B-43 (6.8L)
OUTPUT NEUTRAL-Only	TRO_N	PCM Pin C175B-39 Circuit No. CET21 Wire Color: Green / White C1551B-39 (6.8L)
OUTPUT Vehicle Speed	VSOUT	PCM Pin C175B-5 Circuit No. VMC05 Wire Color: Violet / Orange C1551B-5 (6.8L)
OUTPUT Engine Speed	PTOIC-1	PCM Pin C175B-10 Circuit No. CE913 Wire Color: Blue C1551B-10 (6.8L)

NOTE — FOR PASS THRU CIRCUITS - REFER TO THE ELECTRICAL SECTION OF THIS BOOK.

SEIC / PTO BATTERY VOLTAGE SOURCES & CUSTOMER ACCESS SIGNALS F-250/350/450/550

F-250/350/450/550 Battery Voltage Sources (VPWR)

Circuit Intent	Wire Tag	Description
Ignition Hot-in-RUN		Circuit No. CDC64 Wire Color: White/Blue <ul style="list-style-type: none"> • A fused 5 amp circuit. • Found: in cab under driver's side instrument panel near engine bulkhead
Ford Upfitter Switches: Ignition Hot-ACC	Aux-1 Aux-2 Aux-3 Aux-4	[25-amp] Circuit No. CAC05 Wire Color: Yellow [25-amp] Circuit No. CAC06 Wire Color: Green / Brown [10-amp] Circuit No. CAC07 Wire Color: Violet Green [15-amp] Circuit No. CAC08 Wire Color: Brown *Found: above and to the right of parking brake release handle by the relay pack.

F-250/350/450/550 - Diesel Engine Customer Access Signal Circuits

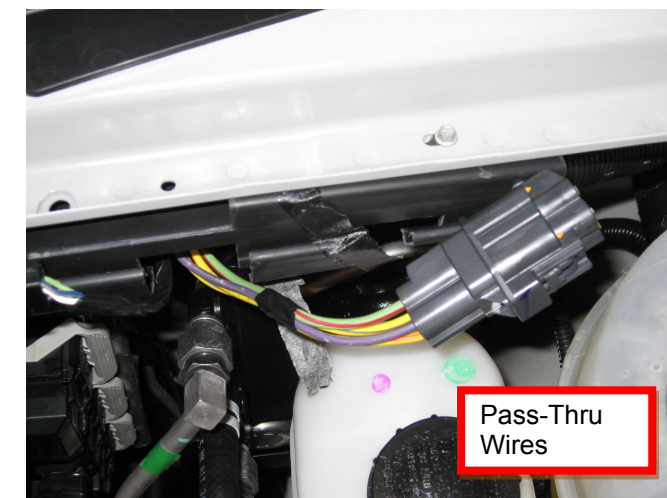
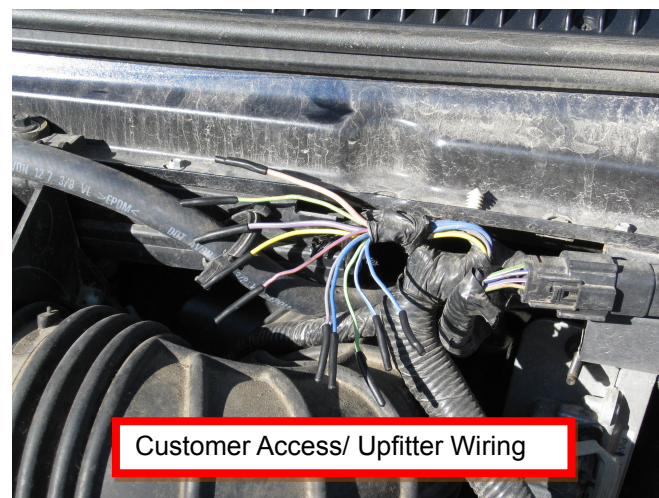
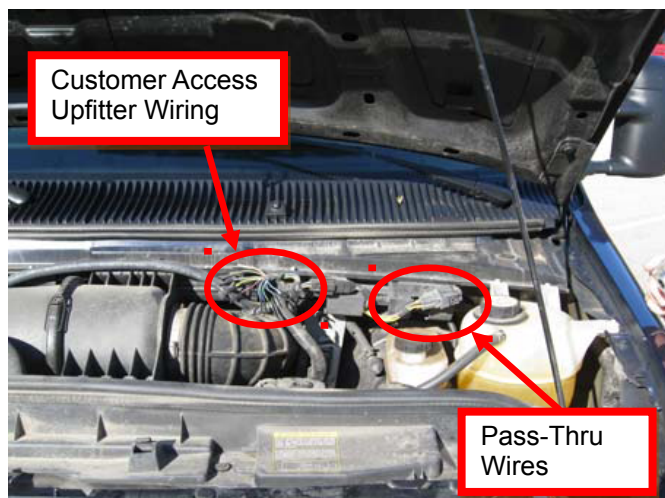
Circuit Intent	Wire Tag	Description
OUTPUT PARK-Only	TROP	TCM Pin C1750-27 Circuit No. CLS05 Wire Color: Blue / Gray
OUTPUT NEUTRAL-Only	TRON	TCM Pin C1750-30 Circuit No. CET21 Wire Color: Green / White
OUTPUT Vehicle Speed	VSOUT	PCM Pin C1232B-5 Circuit No. VMC05 Wire Color: Violet / Orange
OUTPUT Engine Speed	CTO	PCM Pin C1232B-10 Circuit No. CE913 Wire Color: Blue

F-250/350/450/550 - Gasoline Engine Customer Access Signal Circuits

Customer Access Signal Circuits		
Circuit Intent	Wire Tag	Description
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

NOTE — FOR PASS THRU CIRCUITS - REFER TO THE ELECTRICAL SECTION OF THIS BOOK.

SEIC / PTO ACCESS & PASS-THRU WIRING LOCATIONS E-350/450



E350/450 Engine Compartment

- Blunt-cut access for SEIC, "Customer Access" signal circuits for CTO, VSO PARK, optional Upfitter Switch output, and Pass-Thru wires are located below the driver's side windshield/cowl.

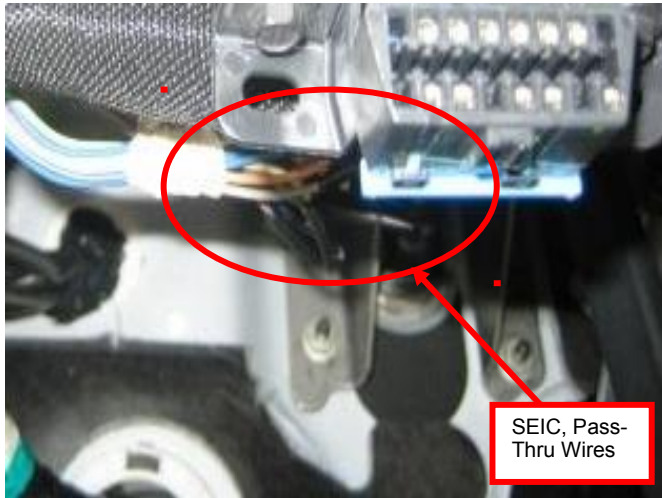
E350/450 Engine Compartment

- To find Blunt-cut Customer access wires, remove some of the plastic harness tape where the large harness (below the engine cowl) exits its plastic support gutter above the engine air induction tube to reveal the blunt-cut wires.

E350/450 Engine compartment

- 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, Found in dunnage. Opposite ends located above driver-side kick-panel.

SEIC / PTO ACCESS & PASS-THRU WIRING LOCATIONS F-250/350/450/550



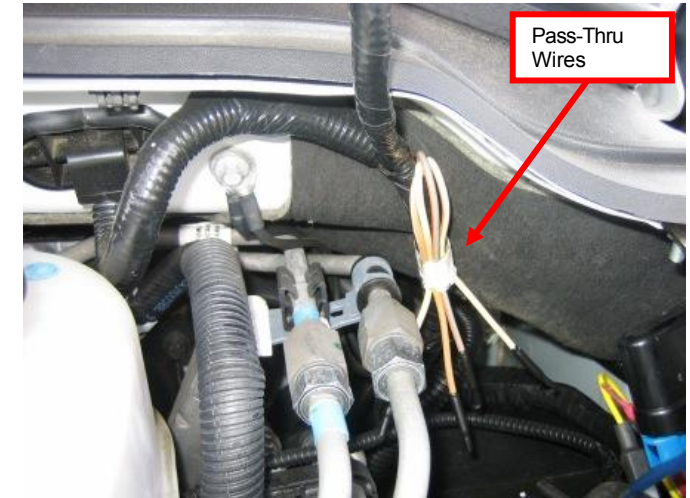
F250/350/450/550
Cabin / Instrument Panel

- Blunt-cut access wires for SEI, "Customer Access" signal circuits for CTO, VS_out, PARK, TRO-N, and 4 pass-thru wire, 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.

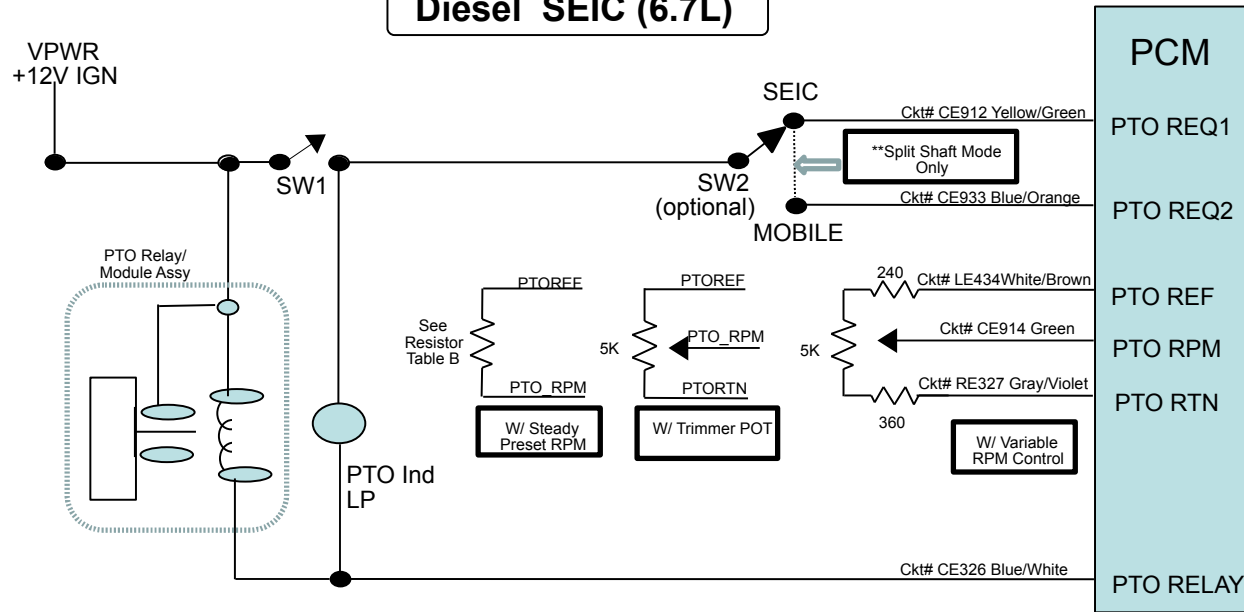


F250/350/450/550
Engine Compartment

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

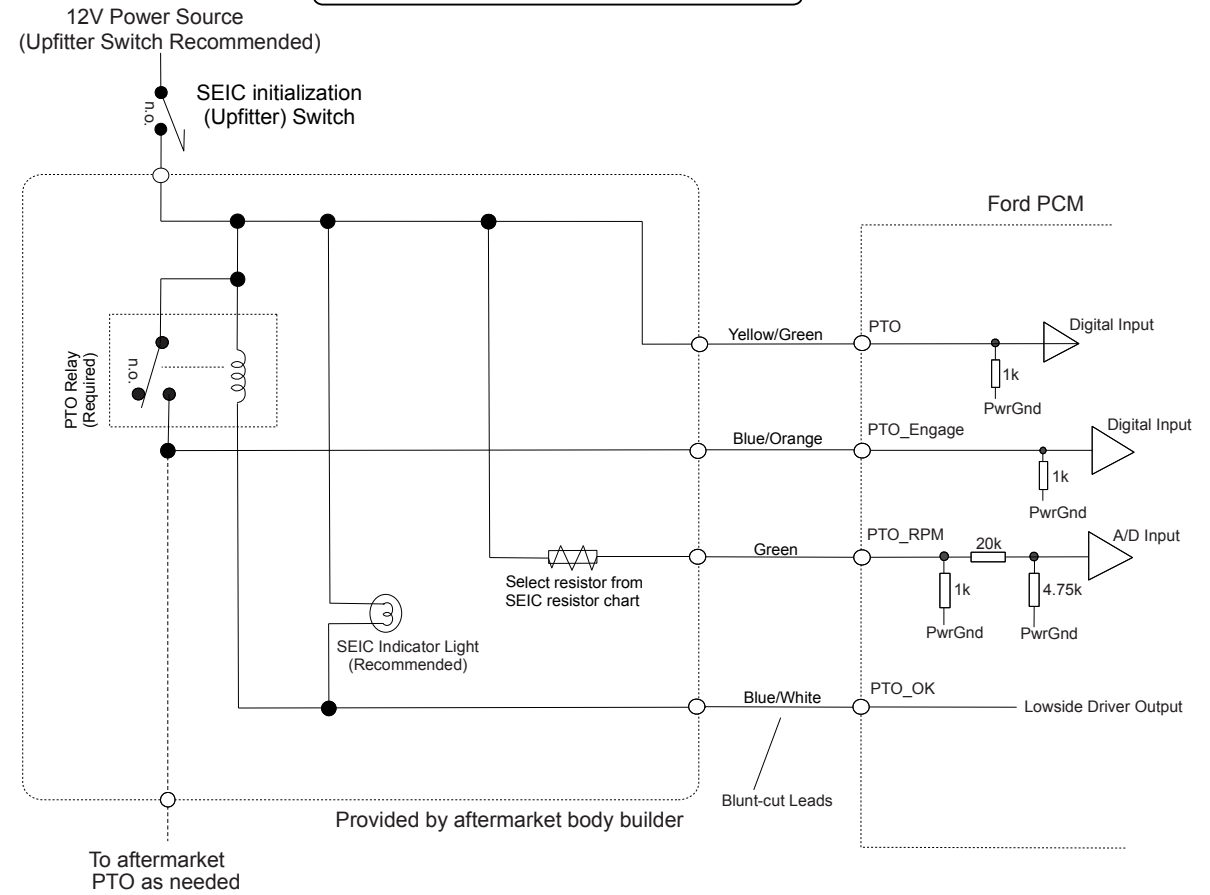
SEIC / PTO WIRING SCHEMATIC F-250/350/450/550 E-350/450 (Gasoline)

Diesel SEIC (6.7L)

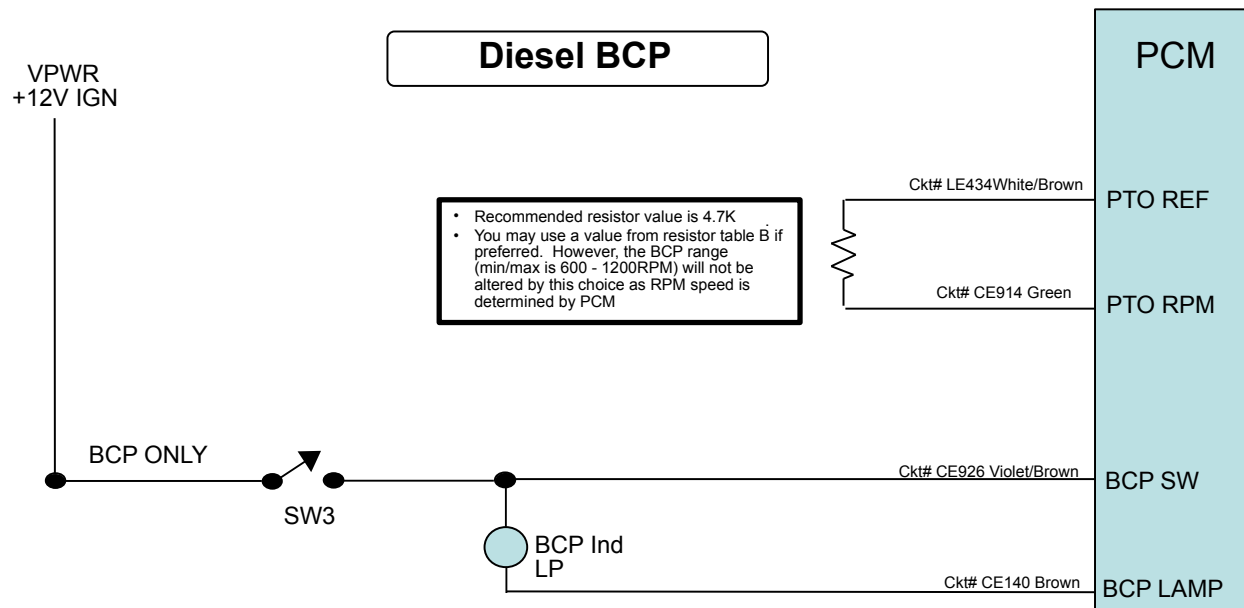


** For Split Shaft operation, both PTORS1 & PTORS2 must have line voltage applied.

Gasoline SEIC (All)



Diesel BCP



- Recommended resistor value is 4.7K
- You may use a value from resistor table B if preferred. However, the BCP range (min/max is 600 - 1200RPM) will not be altered by this choice as RPM speed is determined by PCM



SEIC / PTO RPM / RESISTANCE / VOLTAGE CHARTS GASOLINE & DIESEL ENGINES

Gasoline Engine SEIC		
Engine Target Speed (RPM)	Resistor (Ohms) (5%, 1/4 Watt)	Voltage (volts)
650 (Base)		
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

Diesel Engine SEIC		
Engine Target Speed (RPM)	Resistor (Ohms) (5%, 1/4 Watt)	Voltage (volts) (± 0.0875 v)
680 (Base)		
900	51K	0.400
1000	36K	0.590
1200	20K	0.971
1400	12K	1.352
1600	9100	1.733
1800	6200	2.114
2000	4700	2.495
2200	3300	2.876
2400	2400	3.257
2600	1800	3.638
2800	1100	4.019
3000	680	4.400

Diesel Engine Split Shaft		
Engine Target Speed (RPM)	Resistor (Ohms) (5%, 1/4 Watt)	Voltage (volts) (± 0.0875 v)
680 (Base)		
700	51K	0.400
800	36K	0.574
1000	20K	0.922
1200	13K	1.270
1400	10k	1.617
1600	7500	1.965
1800	5600	2.313
2000	4300	2.661
2200	3000	3.009
2400	2200	3.357
2600	1600	3.704
2800	1100	4.052
3000	680	4.400

Diesel Engine Live Drive Mobile Mode		
Engine Target Speed (RPM)	Resistor (Ohms) (5%, 1/4 Watt)	Voltage (volts) (± 0.0875 v)
Throttle Commanded	360	4.644



SEIC / PTO TRANSMISSION SPECIFICATIONS

SUBJECT	ITEM	TORQSHIFT 5-SPEED AUTOMATIC	TORQSHIFT 6 6-SPEED AUTOMATIC
Transmission Fluid Type ⁽¹⁾		Mercon LV ATF	Mercon LV ATF
Hydraulic Fluid Line Pressure ⁽¹⁾	At base engine speed:	50-60 psi	70 psi @ 600 rpm
	At 1200 rpm engine speed:	150 psi nominal ⁽²⁾	150 psi
Transmission Gear Ratios	1 st	3.114	3.974
	2 nd	2.218	2.318
	3 rd	1.545	1.516
	4 th	1.000	1.149
	5 th	0.712	0.858
	6 th	-----	0.674
	Reverse	2.88	3.128
	Torque Converter	1.86	1.9
PTO Drive Gear Function	All FORWARD Drive Gears ⁽³⁾	Yes	Mobile Mode
	REVERSE ⁽³⁾	Yes	Mobile Mode
	OVERDRIVE ⁽³⁾	Yes	Mobile Mode
	PARK (Stationary)	Yes	Mobile / Stationary Mode
	NEUTRAL (Stationary)	No	Mobile Mode
PTO Drive Gear Data	PTO Port	<ul style="list-style-type: none"> • LH (Driver Side) only • SAE 6-bolt pattern • Requires Option Code 62R 	<ul style="list-style-type: none"> • LH (Driver Side) only • SAE 6-bolt pattern • Available Standard
	Gear Torque Rating	250 lb-ft	250 lb-ft Stationary; 150 lb-ft Mobile
	Gear Ratio	1	1
	Number of gear teeth	121	52
	Pitch Diameter	215.985 mm	108.472 mm
	Normal Pressure Angle	17.989°	19.339°
	Angle and Hand of Helix	Spur	RH-Spur Gear
	Gear RPM at 1000 Engine RPM	1000	1000
	Pitch Line Diameter Velocity @ 1000 Engine RPM	2226 ft/min	1118 ft/min
Aftermarket PTO Model Series ⁽⁴⁾	Chelsea Technical Service: (662) 895-1052, chelseatech@parker.com	246	
	Muncie Customer Service: 1-800-FOR-PTOS, info@munciepower.com	4x2: FR62 or FR64 4x4: FR64 only	
Torque Converter – Minimum lock-up speed (vehicle stationary – in PARK or NEUTRAL)		1200 rpm ⁽⁵⁾	N/A
Internal Transmission Fluid Temperature Monitor		Yes	Yes

NOTES:

- (1) Affects the "holding power" of the aftermarket PTO clutch.
- (2) Requires battery voltage applied to "PTO" (diesel engine) or "PTO-Mode" (gas engine) circuit, engine at 1200 rpm, and torque converter locked.
- (3) Vehicle road speed must be greater than zero.
- (4) Consult the PTO manufacturer for more complete detail.
- (5) Although actual lock-up occurs above 1050 rpm, and unlocks below 950 rpm, drawing full torque from the PTO gear is not intended below 1200 rpm engine speed.