

PTEC II

# Pump Throttle Electronic Control

## Series II

PTEC II

PN 100509

# For Mechanical Diesel Engines

## PTEC II System Overview

The Series II Pressure Governor is a computer controlled throttle and pump interlock monitoring system. The system uses a linear throttle actuator and a set of toggle switches to control engine RPM. It will maintain a selected pump discharge pressure or engine speed in response to the selected mode and desired operating parameter. Pressure sensing is done with a 0-300 PSI transducer and RPM is monitored with a magnetic pick-up.

There are seven (7) major components:

ECU Microsentry Unit	PN 108082
PSI Transducer	PN 100581
Linear Actuator	PN 101702
RPM Sensor	PN 102902
Actuator Control Module	PN 100328
Control Head	PN 100478
Harness	PN100454-D

In PSI Mode, the system monitors the pressure transducer and changes the actuator position to maintain the set pressure. In essence, cruise control for the pump. In RPM Mode, the system maintains a constant engine RPM regardless of varying torque loads or pressure. Both modes are dependent on the capability of the engine to respond to changes.

The system has diagnostic capability through the Control Head Assembly and requires a "diagnostic pigtail" for access. The system stores fault codes for key components and these are also accessed through the Control Head.

Installation requirements are 12 Volt power with circuit protection and a safety interlock system.



# PTEC II Hardware

## Electronic Control Unit (ECU)

Microprocessor control logic to operate the system. The ECU contains internal memory for system setup and diagnostic information. Inputs and outputs at the ECU determine system operation. The ECU should be mounted in an accessible area but protected as much as possible from physical damage especially the wiring.



CONN: P.E.D. # 12034398  
TERM: P.E.D. # 12047680

SOCKET	WIRE
1B	DEC
2B	MAGPU
3B	INC
1C	DIAGNOSTIC
1E	INTLK #1A
2E	GOVMODE
2G	PPSI
3J	PSI GND
3K	ACT IN/ON

CONN: P.E.D. # 12040921  
TERM: P.E.D. # 12047680

SOCKET	WIRE
3A	ACTOUT
2C	GOV LT
3D	GROUND
1F	SYS ACTIVE
2F	5V-OUT
3F	MAGGND

## Control Head

This unit contains the switches and LED's for the user interface to the system. Diagnostics and System Setup can be performed using the Control Head and a diagnostic connector. This part of the system is the operator interface and should be mounted on the pump panel at a height that allows easy operation and viewing.



ECU	Connector Deutsch HD14- 9-16P	Terminal Deutsch 0460- 202-16141
TERMINAL	SOCKET	FUNCTION
-----	A	SYS READY
C 2-1F	B	SYS ACTIVE
C 1-1E	C	INTLK #1A
-----	D	INTLK #1
C 1-2E	E	GOVMODE
C 1-3B	F	INC
C 1-1B	G	DEC
C 2-2C	H	GOV LT
C 2-3D	J	GROUND

## PTEC II Hardware (cont.)

### Linear Actuator

This is a 12 VDC, 2 Amp nominal DC motor incorporating fast braking on direction change, adjustable limits (max. 3 inch) and a high pull force (50 lbs). The resolution of the actuator installation is perhaps the most critical of the system. The least RPM change with the greatest actuator movement possible works best.

The actuator should be mounted in an area that subjects it to least amount of vibration, heat and water. The actuator body should be mounted higher than the linkage point to prevent water intrusion through the cable.. It should NOT be mounted directly to the engine or engine mounts or brackets.



ACTUATOR	CONNECTOR
SOCKET	FUNCTION
A	-----
B	-----
C	GROUND
D	ACT DIR A
E	ACT DIR B

### Vehicle Interface Box

The Actuator Interface Module connects to the harness with a Deutsch connector and is sealed against the environment. It contains the relays for actuator direction and mechanical force to idle. Anytime the Park Brake interlock is lost or the governor switch is turned off, the module disconnects the actuator from the ECU and forces it to Idle.

This is a sealed unit and can be mounted in any convenient location that provides protection from physical damage.

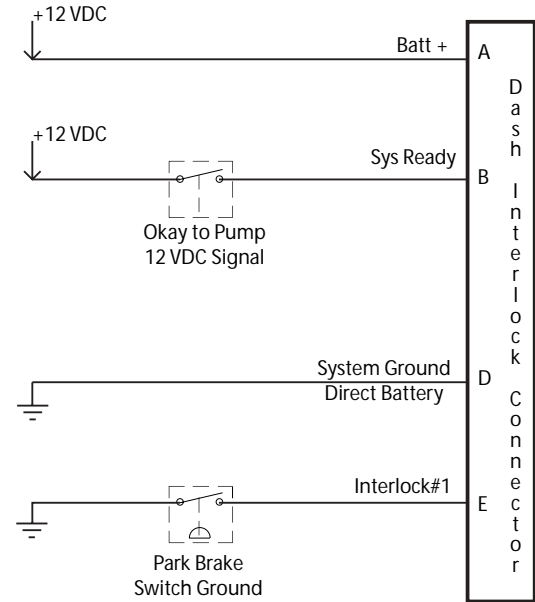


ACTUATOR INTERFACE	CONNECTOR DEUTSCH HD36-18-14SN	TERMINALS DEUTSCH 0462-201-16141
ECU	SOCKET	FUNCTION
C2-3A	A	ACTOUT
C2-3D	E	GROUND
-----	F	BATT +
C1-1E	L	INTLK #1A
C1-3K	M	ACTINON
-----	N	ACT DIR B
-----	P	ACT DIR A

PTEC II  
**Hardware (cont.)**

## Dash Interlock Connections

System Power and Ground are connected to the harness through this connector. They should be clean and as direct to the battery as possible. Two safety interlocks are connected to system at this point. SYS READY, 12 VDC when Okay to Pump is achieved and INTLTK#1 which is a ground typically when the Park Brake is set. INTLTK #1 must be below 700mV to be valid at the ECU.



The system diagnostic cable is placed between the Dash Interlock Connector and the Harness to facilitate set-up and diagnostics.



## PTEC II Hardware (cont.)

### Pressure Transducer

The transducer is a 300 PSI gauge pressure sensor. The PSI sensor is a voltage generator based on pressure with a range of 4 volts DC starting at 700 mV atmospheric pressure. It is connected to the harness with a 3 pin Packard Metri-pack connector and provided with a 5 VDC source and signal ground by the ECU. It should be mounted on the discharge side of the pump. At the rear of the Pressure Test Port or Master Discharge Gauge is a desirable location. The transducer is a critical component of the system that is the only piece that provides pump pressure information to the ECU.



	ECU	Flat Connector	Transducer Connector
PSI Ground	C1-3J	A	A
PSI 5 VDC	C2-2F	C	B
PSI Signal	C1-2G	B	C

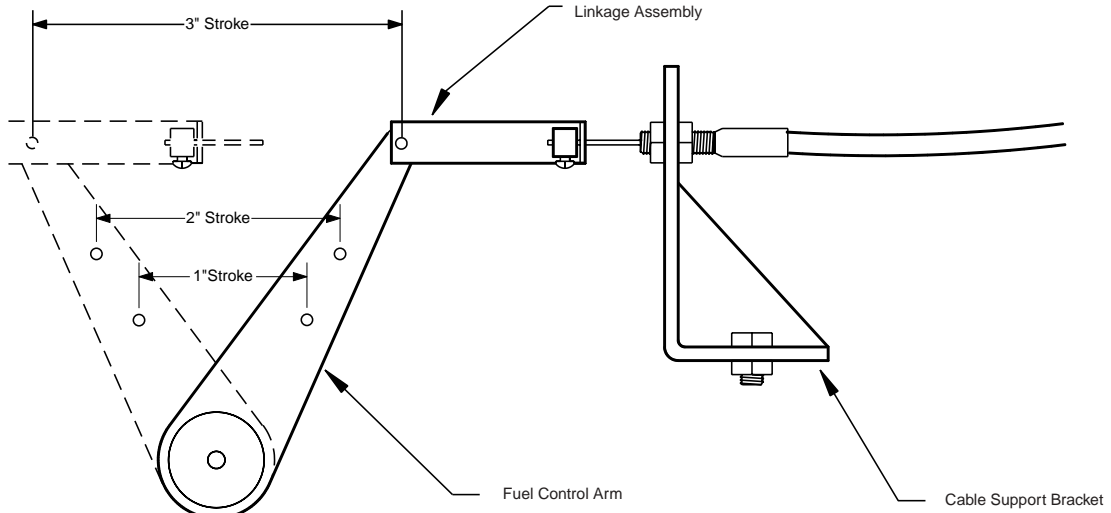
### Speed Sensor

Magnetic Pickup type (13/16 NC thread) operating typically off the flywheel for pulse generation (frequency input to the ECU). It connects to the harness with a 2 pin Packard Weather-pack connector. It must be mounted to the bell housing where it is in close proximity to the engine flywheel teeth.



	Connector Packard 12015792	Terminal Packard 12010182
ECU	Socket	Wire
C1-2B	A	MagPU
C2-3F	B	Mag Gnd

# PTEC II Linear Actuator



## Actuator Resolution

The further out on the control arm that the actuator cable is installed, the better the actuator resolution.

In most cases the fuel control arm needs to be extended to make best use of the 3" actuator stroke.

Ideally, a small amount of actuator movement should result in very minor changes in RPM.

If the actuator installation has poor resolution, the result will be uncontrollable engine oscillations as the governor attempts to find the setpoint and overshoots that setpoint each time. There are adjustments that can be made to the ECU that will adjust for minor inadequacies, but CAN NOT compensate for a bad installation

## Linear Throttle Actuator Setup

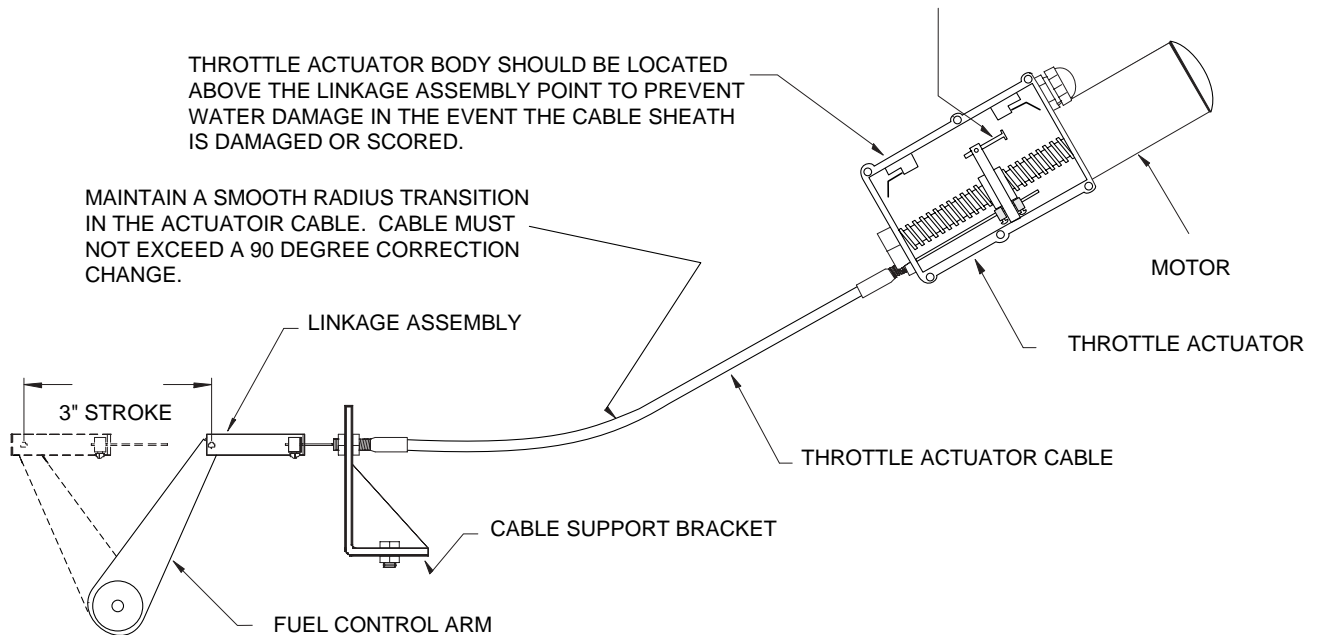
NOTE: the engine should not be running during setup.

There is a limit switch at the end of the actuator travel, this should be set so that the actuator can not travel further than the engine throttle linkage full throttle position.

It is important that the ram be adjusted and that the tangs on the limit switches are not bent.

The actuator cable should be attached to the throttle linkage and there should be no interference with normal throttle movement. The cable should not bind or bend at either extreme of travel.

Adjust this pin to limit retraction of the actuator rod.





## PTEC II

### **SYSTEM OPERATION**

The governor will NOT operate unless the RDY light is illuminated on the Control Panel. If the ready light is not on, it indicates a problem with the interlock circuits or wiring.

Once the Ready Light is on, the pressure governor becomes operational when the Govern Switch is toggled to the ON position. The ACTIVE Light on the Control Panel will then be illuminated and the system will be active. The system will control the throttle to maintain either engine speed (RPM Mode) or Pump Pressure (PSI Mode). Whenever the Govern Switch is turned off, the Actuator Interface will return the actuator to its idle position.

#### **RPM MODE**

When the Mode Switch is in the RPM Position, the PTEC II will control the throttle to maintain the engine speed attained with the INC/DEC Switches or the current engine speed if the Mode Switch is toggled from PSI to RPM. The engine speed can be changed by using the INC or DEC switches. The engine speed obtained when the INC/DEC switch is released will become the set speed and the system will provide throttle control to maintain this speed.

#### **PSI MODE**

Whenever the Mode Switch is in the PSI position and the Govern Switch is on, the system will provide pump pressure control using the linear actuator to adjust engine speed. The set pressure can be adjusted using the INC or DEC switches to achieve a new operating pressure. The pressure is monitored with a 300 PSIG transducer located on the discharge side of the pump.

#### **PUMP CAVITATION**

If discharge pressure drops below 30 PSI for 5 seconds, the actuator will be returned to idle. The INC switch must be toggled to increase engine RPM (pump pressure) after this event.

#### **SWITCHING MODES**

The PTEC II can be changed from RPM to PSI or PSI to RPM Mode without going to Idle. The setpoint becomes either the current engine speed or pump pressure at the time of the change as appropriate.

#### **MECHANICAL FORCE to IDLE**

The Actuator Interface Module contains a relay that is activated with the Park Brake. Whenever this input is lost the actuator is forced to its maximum extension.

## PTEC II

### DIAGNOSTIC MODE

The system stores fault information and these fault indications can be retrieved from the Control Switch 'ACTIVE LIGHT' using a diagnostic cable.

**NOTE:** The Diagnostic Wire from Terminal C can be grounded to enter the Diagnostic Mode, the interlocks must be present .



Enter the diagnostic mode by installing the diagnostic harness and turning the GOVERN Switch to ON.

The sequence of information is as follows:

### SWITCH STATUS

The ECU will cycle through the switches and flash the ACTIVE Light twice if the switch is ON and three times if it is OFF.

- 1 Park Brake Switch
- 2 DECREASE Switch
- 3 INCREASE Switch
- 4 RPM/PSI Switch 2=RPM and 3=PSI

A **2-3-3-2** would indicate the Park Brake is ON, the DEC is OFF, INC is OFF and Mode is PSI.

### SENSITIVITY SETTINGS

After the Switch Status, a short pause on the ACTIVE Switch and then the SENSITIVITY Settings are flashed on the ACTIVE Light in this sequence:

- |                        |  |
|------------------------|--|
| 1 Pressure Sensitivity | Range is 6 to 15 with 6 being the most sensitive |
| 2 RPM Sensitivity      | Range is 1 to 5 with 1 being the most sensitive  |
| 3 Ramp Speed           | Range is 5 to 25 with 5 being the fastest speed  |

### DIAGNOSTIC CODES

The Diagnostic Codes are flashed in two digit codes with a short pause between the digits and a long pause between the codes.

flash flash flash flash (short pause) flash flash flash (long pause)  
flash flash flash (short pause) flash flash flash (long pause)

This would be a code 43 and then code 33

### CODE CHART

- |    |   |
|----|---|
| 23 | Pressure Sensitivity Error, PSI Sensitivity is reset to twelve (12) |
| 25 | RPM Sensitivity Error, RPM Sensitivity is reset to two (2)          |
| 27 | Ramp Speed Error, Ramp Speed is reset to ten (10)                   |
| 33 | Interlock Error, Interlock drops out when the governor is active    |
| 43 | Pressure Sensor Error, Pressure Transducer reading is out of range  |
| 45 | Pump Cavitation, logged when discharge pressure drops below 30 PSI  |
| 53 | INC/DEC Error, fault is detected in the INC/DEC switch circuit      |

### ERASING CODES

Hold the INC/DEC Switch in the INC position while the codes are being flashed or hold the INC switch ON with the Mode Switch in RPM Mode when Diagnostic Mode is entered.

# PTEC II System Setup

## ECU SETUP

To enter SETUP Mode, place the Diagnostic Connector in-line between the Dash Connector and the Governor Harness.



## PSI and RPM SENSITIVITY

Place the MODE Switch in the PSI position  
HOLD the INC/DEC Switch in the INC Position  
Turn the GOVERN Switch ON  
Release the INC switch after approximately 5 seconds  
Use the INC/DEC Switch to adjust the desired setting (count the flashes on the ACTIVE Light)  
Typical PSI values range from 6 to 15 with 6 being more sensitive, the default value is 12  
Exit by turning off the GOVERN Switch **OR**  
toggle the MODE Switch to the RPM position to set RPM Sensitivity  
Use the INC/DEC Switch to adjust RPM Sensitivity  
Typical RPM values lie between 1 and 5 with 1 being more sensitive, the default is 2

## RAMP SPEED

Place the MODE Switch in the RPM Position  
Hold the INC/DEC Switch in the DEC Position  
Turn the GOVERN Switch ON  
Release DEC after approximately 5 seconds  
Use the INC/DEC Switch to adjust the Ramp Speed, the range is 5 to 25 with 5 being the faster value. Default Ramp Speed is ten (10)  
Exit by turning the Govern Switch OFF

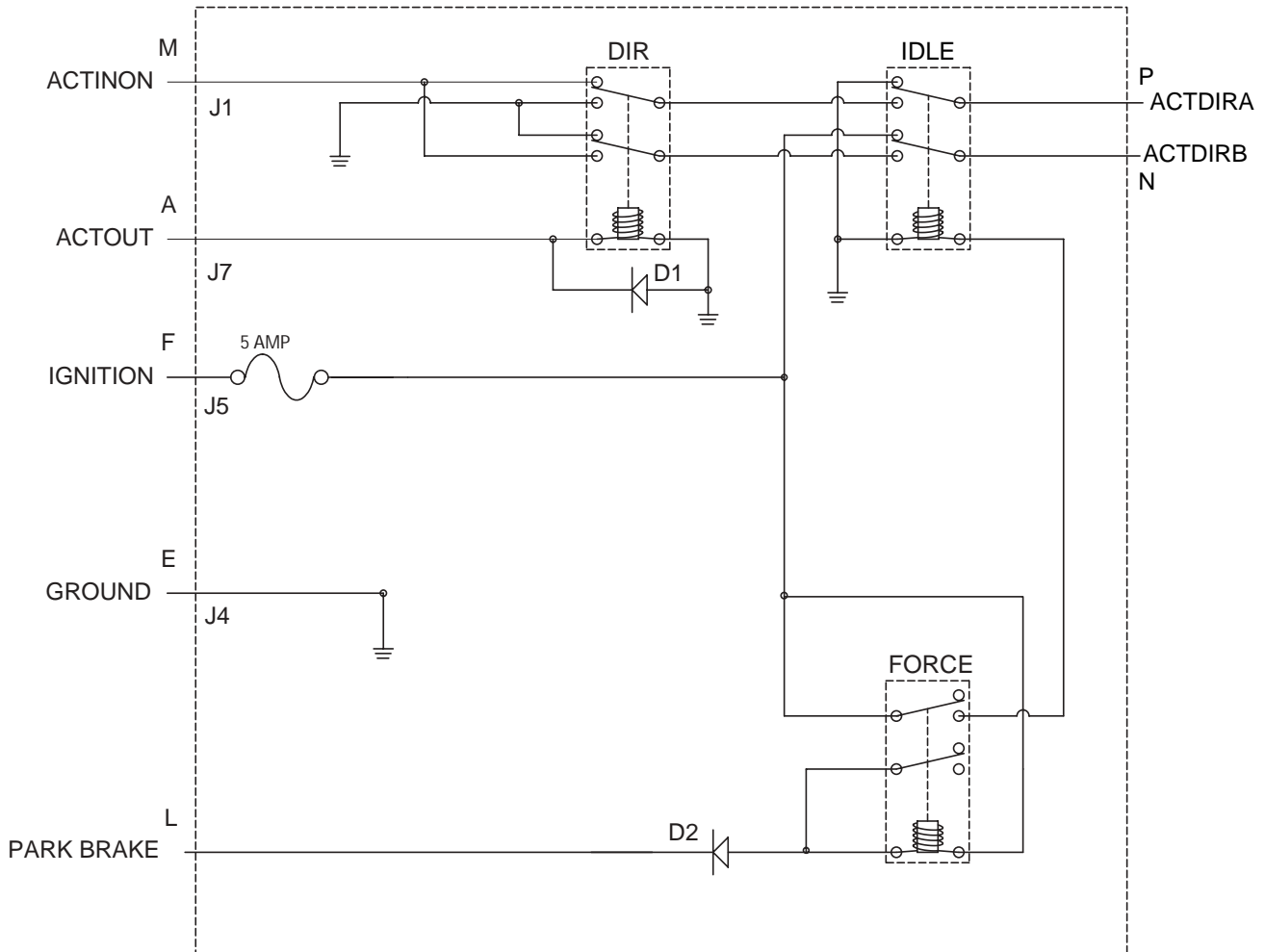
## FLYWHEEL TEETH

Place the MODE Switch in the PSI Position  
HOLD the INC/DEC Switch in the DEC Position  
Turn the GOVERN Switch ON  
Release the INC switch after approximately 5 seconds  
Use the INC/DEC Switch to adjust the flywheel teeth  
The ACTIVE Light will flash the setting in increments of ten (10), you must count the number of toggles until the next 10's increment is reached, the count should = half the number of flywheel teeth Flywheel teeth = 134, count should be 67 or 6 flashes and 7 toggles  
Exit by turning the Govern Switch OFF



# PTEC II Actuator Interface

NOTE: ACTINON is 12VDC from ECU and is active only when the ECU is controlling the actuator!



The Actuator Interface Module contains several relays that control the Linear Actuator. One important function is the Mechanical Force to Idle on Park Brake Loss.

The ACTINON signal is a pulsed 12 VDC from the ECU. It is only present when the ECU is actively positioning the actuator.

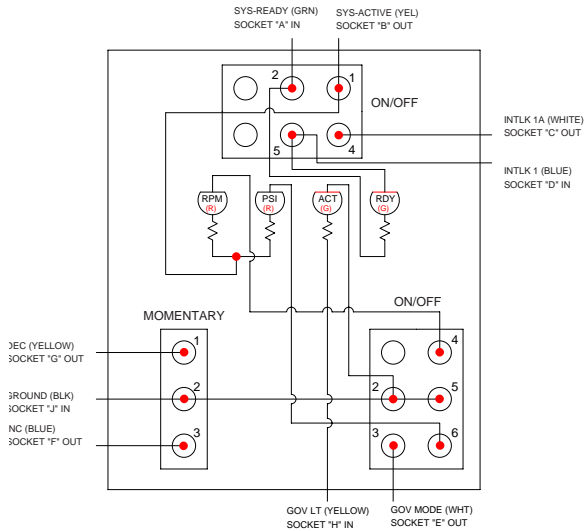
ACTDIRA and ACTDIRB are the Ignition and Ground feed to the actuator motor, direction is controlled by the polarity on this pair of wires.

ACTOUT controls the direction of the actuator motor, when active the motor will move the throttle toward its idle position.

## PTEC II

For any operation, the **INTERLOCKS** must be present.

These can be checked in to the Control Head at **A and D** and out to the ECM at **B and C**.



A	SYS Ready	Positive Input
B	SYS Active	Positive Output
C	INTLK 1A	Ground Output
D	INTLK 1	Ground Input
E	GOV Mode	Ground Output
F	INC	Ground Output
G	DEC	Ground Output
H	GOV LT	Positive Input
J	Ground	Ground Input

The interlocks can be visually checked with the LED's on the panel. If both the READY and ACTIVE LED's are ON, then the interlocks are present and the ECU is operational.

Any ground input to the ECU must be below 700 mV potential. The most common source of erratic or unexpected operation is resistance in the ground interlock circuit, most notably from the Park Brake Switch.

### Pressure Transducer

This is a voltage output device based on pressure. The ECU provides 5 VDC and Signal Ground to the transducer at terminals B and A respectively. This is a gauge type sensor and the range is 680 mV at atmospheric pressure (0 Pump PSI) and 4.7 VDC at 300 PSI pump pressure. The output is linear, so at 150 Pump PSI the output would be 2.7 VDC at terminal C. There is a Packard Weatherpack 3 pin terminal to connect the transducer to the harness. The signal and 5 VDC wires are "crossed" at this connector. Use caution when troubleshooting that you have the correct wires.



CONN: PACKARD # 12015793  
 TERM: # 12089305 (PINS)  
 SOCKET WIRE  
 A PSI GND  
 B PPSI  
 C 5VDC

Weatherpack Terminal	Function	Metripack Terminal	Function
A	PSI GND	A	PSI GND
B	PPSI	B	5 VDC
C	5 VDC	C	PPSI

If the transducer voltage goes out of limits low (300 mV) or high (4.85 VDC) the ECU will code the error (43) for review with the diagnostic connector (page 11).

The most common symptom of a failed transducer will be that the governor "does not respond to pressure changes".

## PTEC II

Notes:

The most common failure in an older system is the transducer circuit. This can be either wiring, corrosion or a failure in the transducer itself. The common complaint is of no response to changing pressures

The second most common failure is with the Park Brake circuit ground. Either a failing pressure switch or high resistance wiring and connections. It is usually evidenced by intermittent operation and the engine dropping to Idle unexpectedly.

## Connector Pinout

### ECU Connector 1

1	2	3
A PLUG	PLUG	PLUG
B DEC	MAG PU	INC
C DIAGNOSTIC	PLUG	PLUG
D PLUG	PLUG	PLUG
E INTLK 1A	GOV MODE	PLUG
F PLUG	PLUG	PLUG
G PLUG	PPSI	PLUG
H PLUG	PLUG	PLUG
J PLUG	PLUG	PSI GND
K PLUG	PLUG	ACT IN/ON

### ECU Connector 2

1	2	3
A PLUG	PLUG	ACT OUT
B PLUG	PLUG	PLUG
C PLUG	GOV LIGHT	PLUG
D PLUG	PLUG	GROUND
E PLUG	PLUG	PLUG
F SYS ACTIVE	5V OUT	MAG GND

### INTERFACE Connector

A Act OUT
B PLUG
C PLUG
E GROUND
F BATT +
L INTLK #1A
M ACT IN/ON
N ACT DIR A
P ACT DIR B

### PUMP LIGHT CONNECTOR

A SYS READY
B SYS ACTIVE
C INTLK #1A
D INTLK #1
E INC
F DEC
G GOV LGT
H GROUND

### DASH CONNECTOR

A BATT +
B SYS READY
C DIAGNOSTIC
D GROUND
E INTLK #1

### ACTUATOR Connector

A PLUG
B PLUG
C Ground
D Act Dir A
E Act Dir B

### PRESSURE TRANSDUCER

A PSI GND
B +5 VDC
C PPSI

### SPEED SENSOR

A MAG PU
B MAG GND