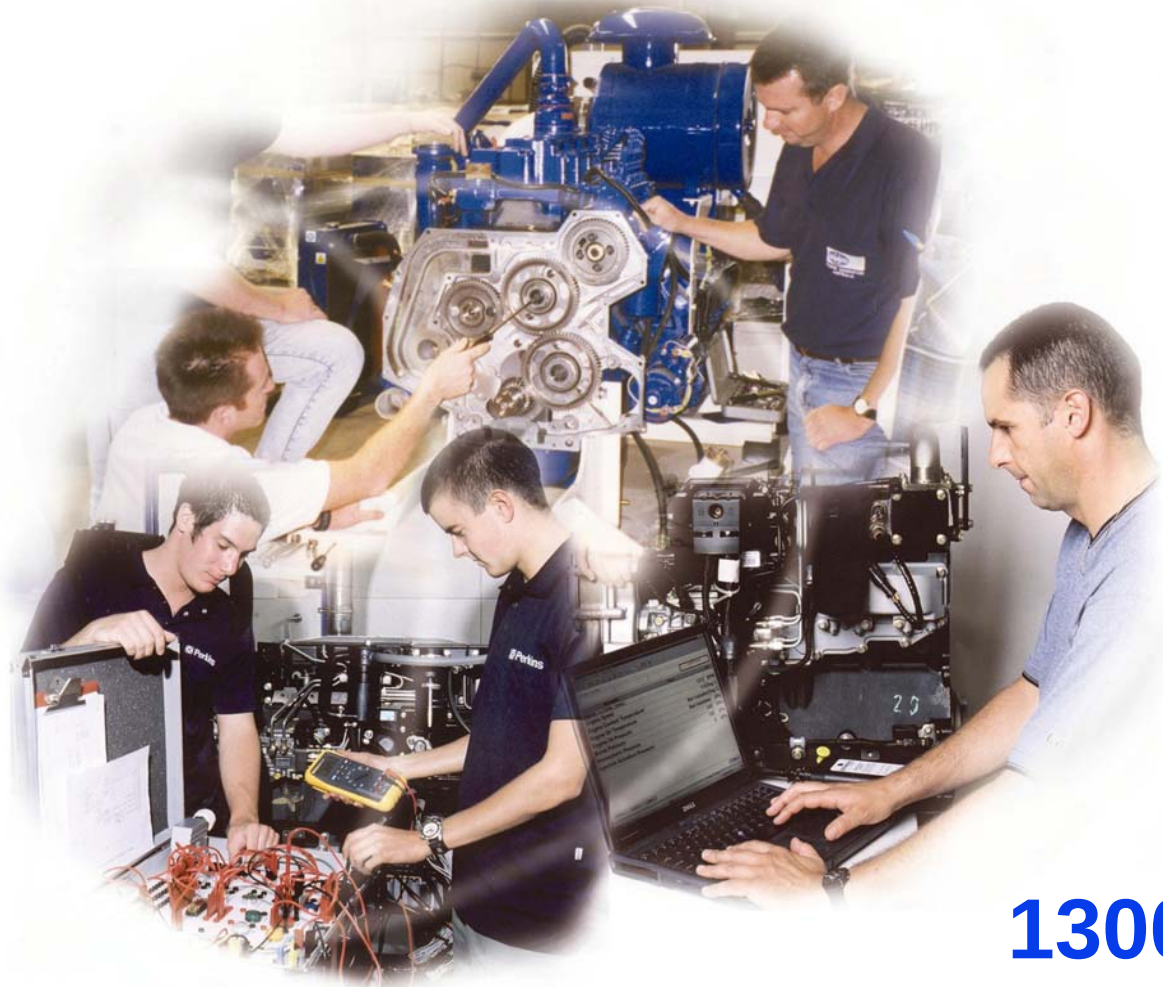




Perkins Product Training

1300 Edi Series Electronic Engine Training

Please Note:

- The Product Training information is distributed for informational purposes only. It is not to be construed as creating or becoming part of Perkins Engines contractual or warranty obligations.
- The appropriate service literature and 'Service Bulletins' available on www.perkins.com should always be the final authority and source of information.
- Electrical Circuits, connections and termination points may change, make sure you have the correct drawings.

'Off Road' Emissions Legislation

Tier 0

"A" rated engines can be used in regions without Emissions Legislation.

Tier 1

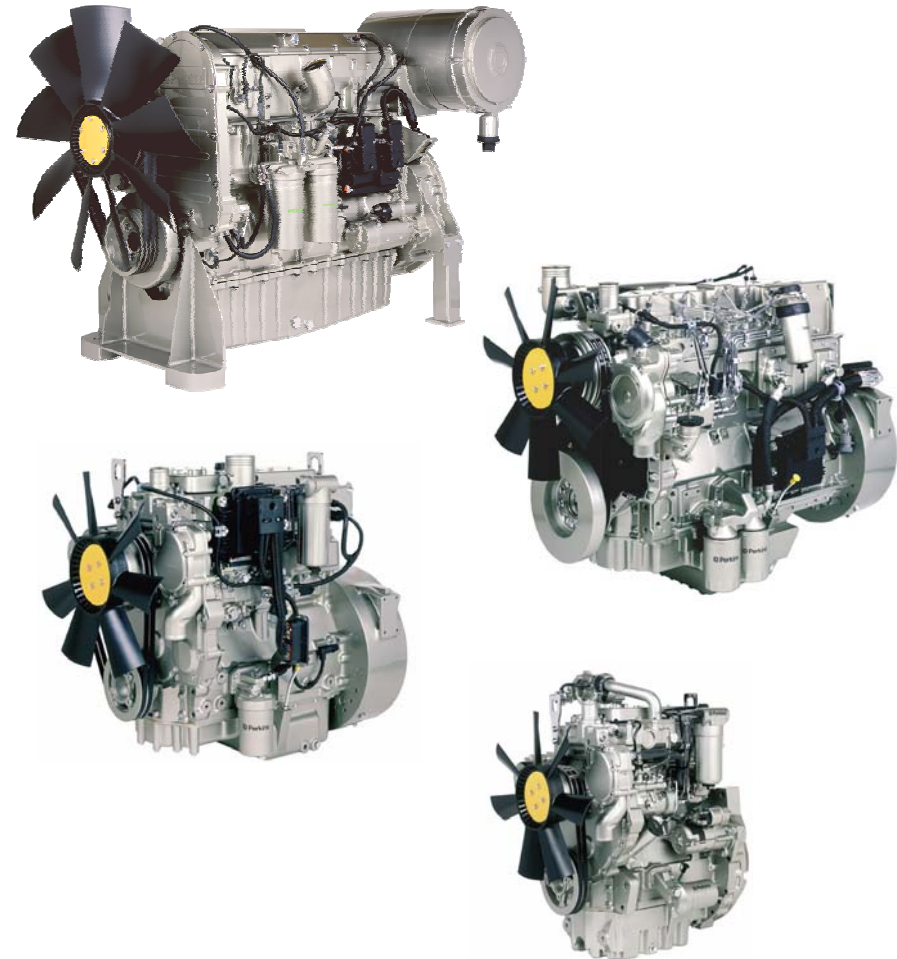
"B" rated engines are suitable for regions with Tier 1/Stage I Emissions Legislation

Tier 2

"C" rated engines are suitable for regions with Tier 2/Stage II Emissions Legislation.

Tier 3

"D" rated engines are suitable for regions with Tier 3/Stage III Emissions Legislation.



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Product Training Sept 2004



**Nitrous Oxide
(NOx) 10.00g/kWh**

Electronic Engine Benefits

Electronic Engine Management system gives:

- Improved Specific Fuel Consumption (SFC) through precise control of Injection Timing and Duration.
- Machine protection under extreme operating conditions.
- Easy servicing and fault diagnostics, Electronic Service Tool, (EST)
- Exceeds emissions legislation and has a lower noise level.
- Better engine 'responsiveness'.
- Improved reliability, engine monitoring and protection.
- Further cost savings through integration into 'Genset' design (CAN)
- Improved torque, different torque curves available, torque 'shaping'
- Rating changes available, Base Load, Prime, Standby, 1500/1800
- Configuration files, gives the customer flexibility, droop, etc



Gen Set Power Selector Chart

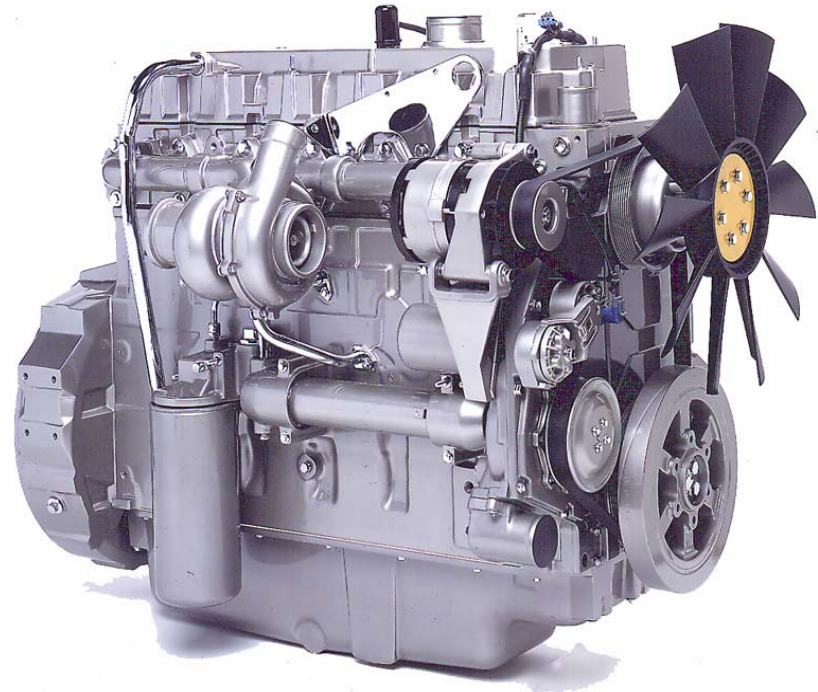
Model offering for Unregulated Territories

50Hz

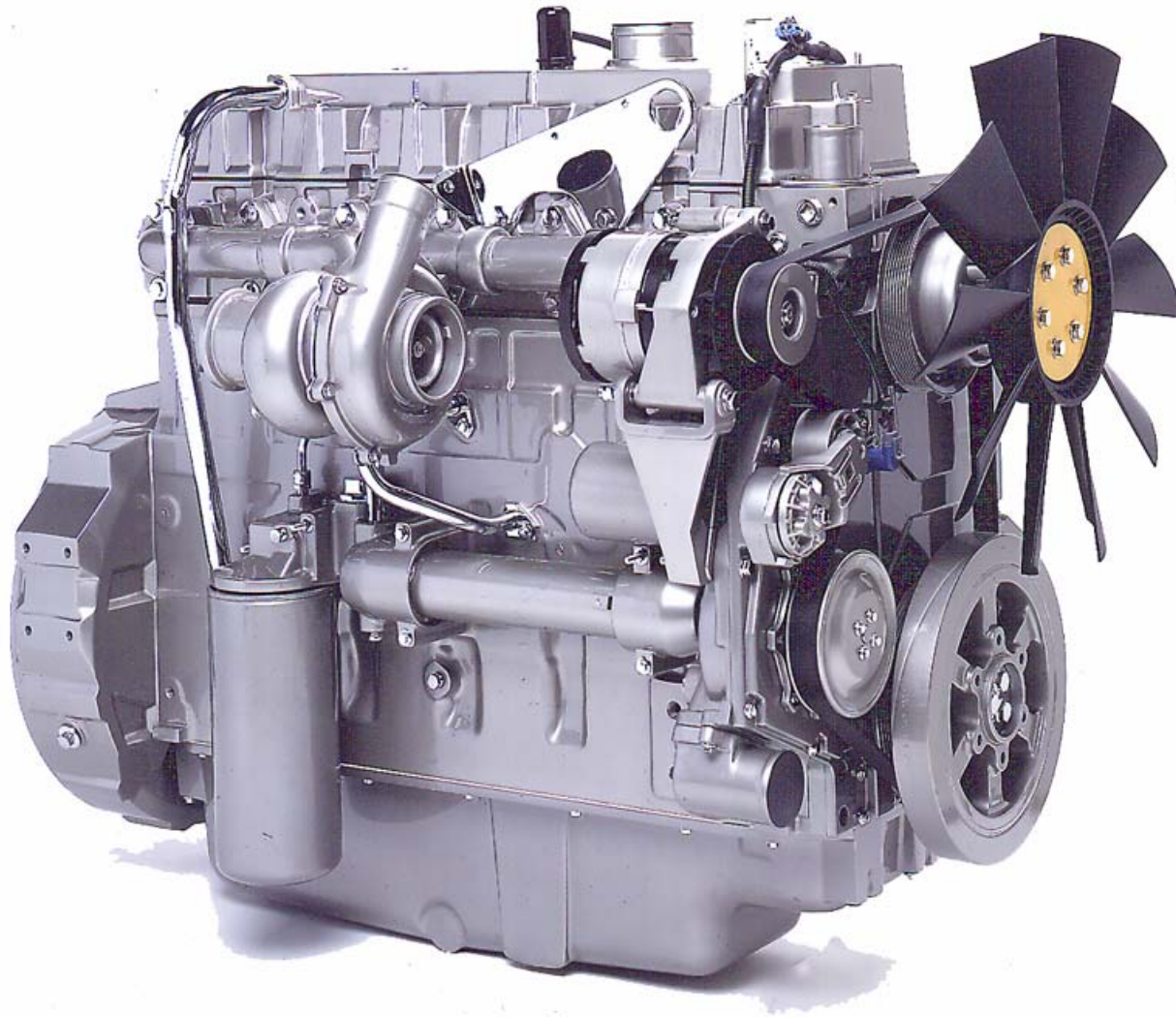
30Hz		Net Engine Output			Typical Generator Efficiency	Typical Power Factor	Typical Generating Set Output						1500/1800 rev/min switchable.
							Baseload		Prime		Standby		
		Model	Baseload kWm	Prime kWm	Standby kWm		%	kWe	kVA	kWe	kVA	kWe	
1306C-E87TAG3		164	180	199	92	0.8	151	189	166	208	183	229	■
1306C-E87TAG4		179	198	217	92	0.8	165	205	182	228	200	250	■
1306C-E87TAG5		185	204	224	92	0.8	170	213	188	235	206	258	
1306C-E87TAG6		198	218	239	92	0.8	182	228	200	250	220	275	

Never Forget it's A Diesel Engine

- Electronics gives control!
- It needs a good flow of ;
Clean Air and Fuel.
- Also needs Compression!



1300 Edi Series-Industrial Open Power Unit

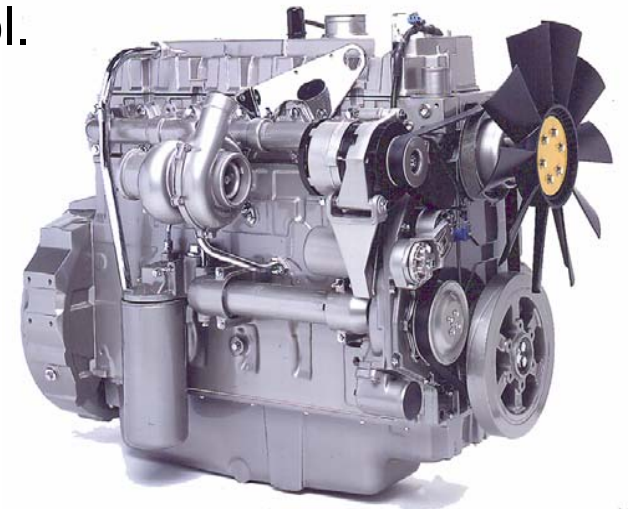


1300 Edi Series-Industrial Open Power Unit

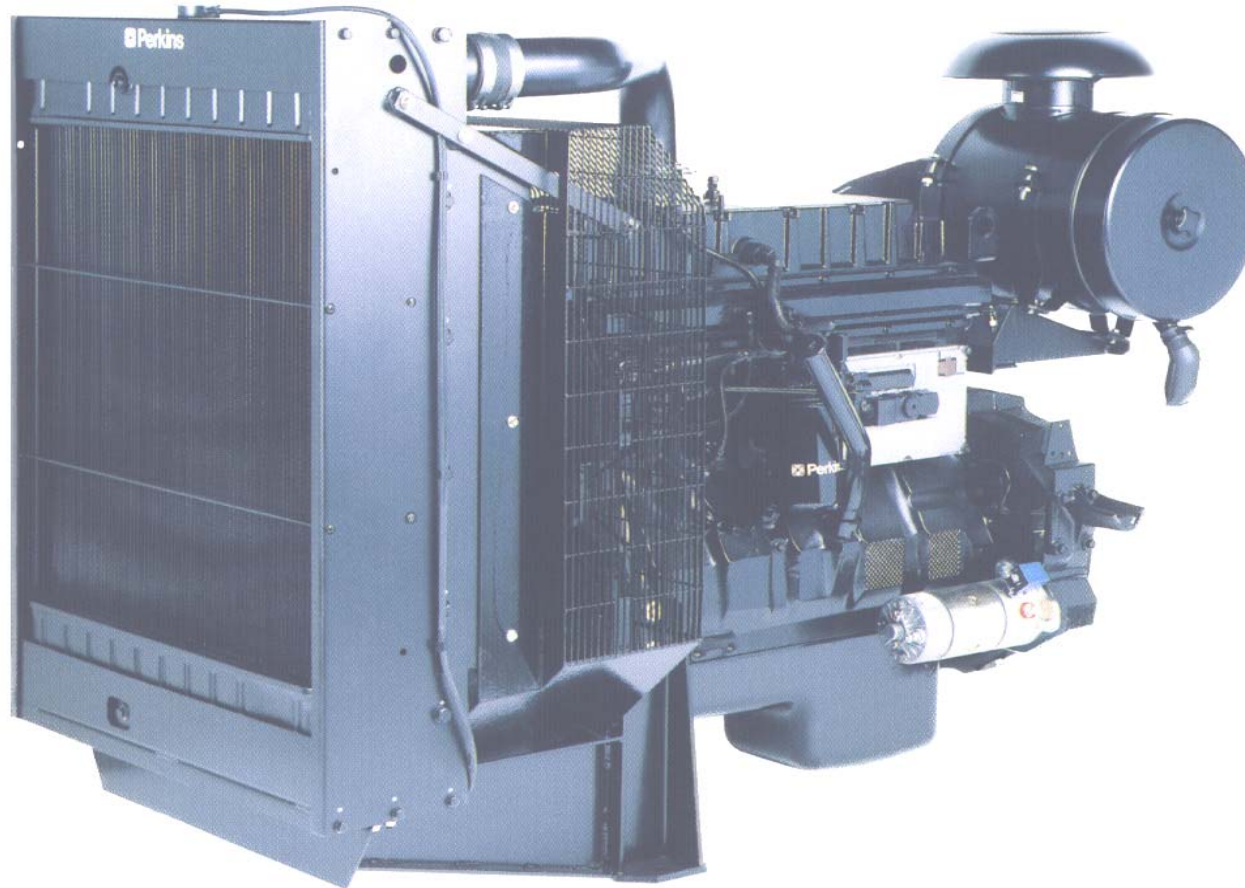
- **IOPU 1** -Variable Speed Droop, with analogue throttle and Idle validation switch. (mobile applications)
- **IOPU 2** - Variable Speed Isochronous with analogue hand throttle, (no IVS - non Mobile Applications)
- **IOPU 3** - Variable Set Speed Isochronous Control.
- **IOPU 4** - With Pre-Set Speed Isochronous Control.

- **12 Volt and 24 Volt ECM's available.**

If you are not sure of the voltage and markings have been removed
check PIN 35 to ground 1.4K Ohms – 12 volts / 2.8K Ohms – 24 volts.

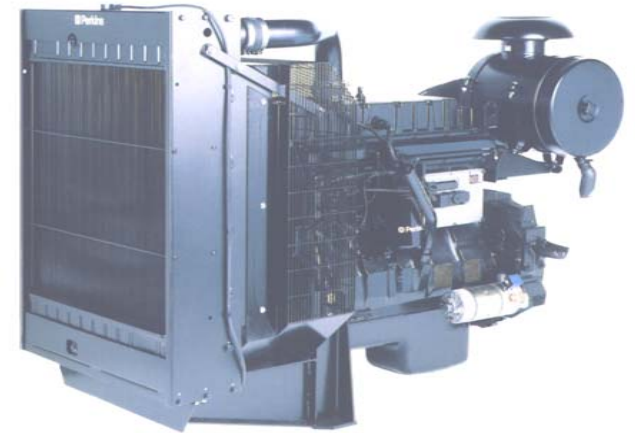


1300 Edi Series-Electropack

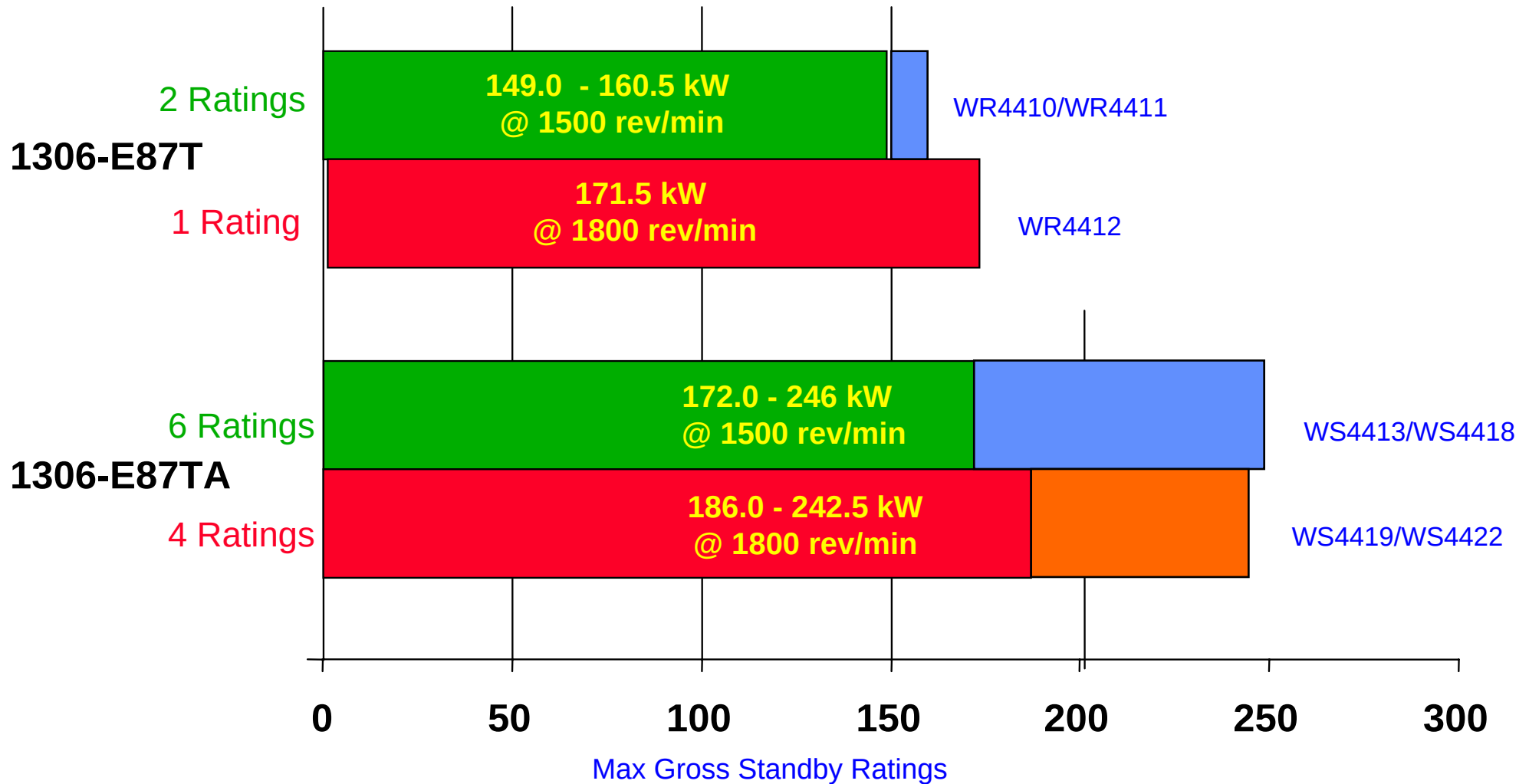


1300 Edi Series-Electropack

- **1500/50 Hertz**, can be wired 3 ways,
(auto or manual, (load share) or stand alone, (isochronous))
- **1800/60Hertz**, can be wired 3 ways
(auto or manual, (load share) or stand alone, (isochronous))
- **1500/1800 Switchable**, can be wired 2 ways
1500 or 1800, Isochronous Only
- **12 Volt and 24 Volt ECM's available.**
If you are not sure of the voltage and the markings have been removed
check PIN 35 to ground 1.4K Ohms – 12 volts / 2.8K Ohms – 24 volts.

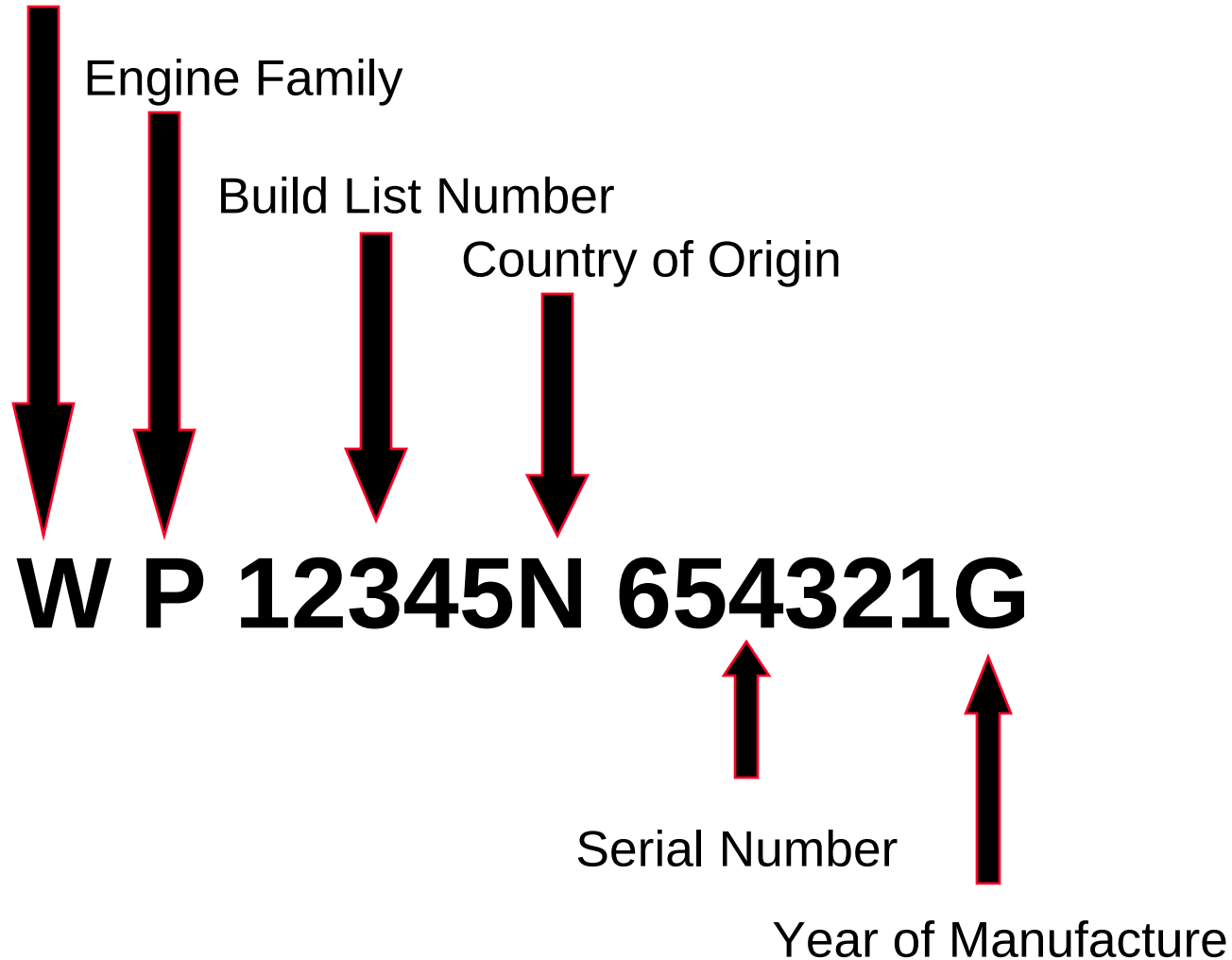


Gen Set Power Range



Engine Identification

- Engine Type



Engine Identification



Engine Serial Number



Engine Identification

1306.E87TA



1300 Series



6 Cylinder



Electronic



8.7 Litre



Turbo charged



After cooled

1300 Edi Engine Sensors

On Engine (Gray Connector)

- Engine Coolant Temperature. (ECT)
- Engine Oil Temperature. (EOT)
- Manifold Absolute Pressure. (MAP)
- Engine Oil Pressure. (EOP)
- Camshaft Motion Pickup. (CMP)
- Injection Control Pressure (ICP)

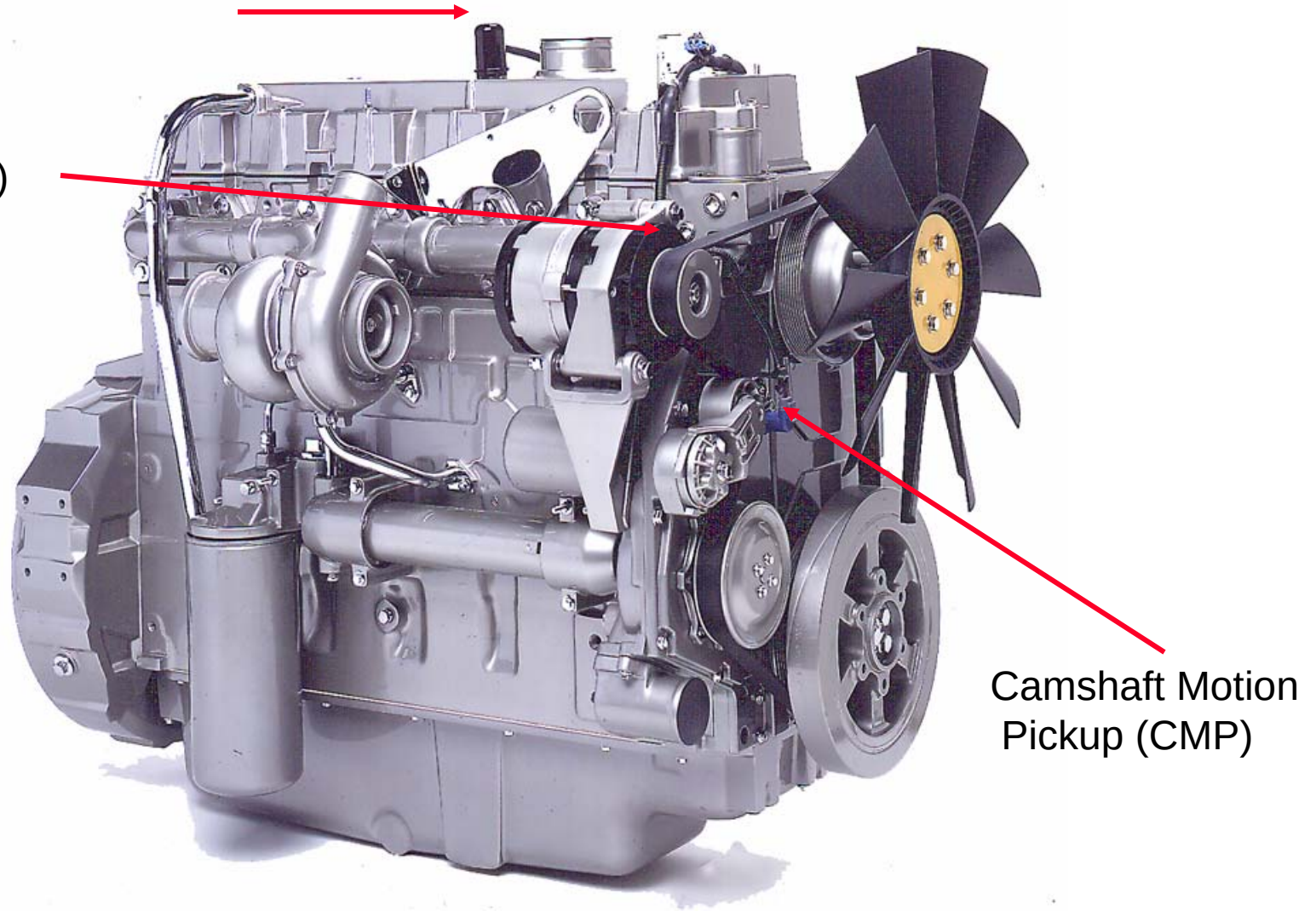
Off Engine (Black Connector)

- Inlet Air Temperature. (IAT)
- Barometric Pressure. (Baro)

1300 Edi Series Sensor Layout

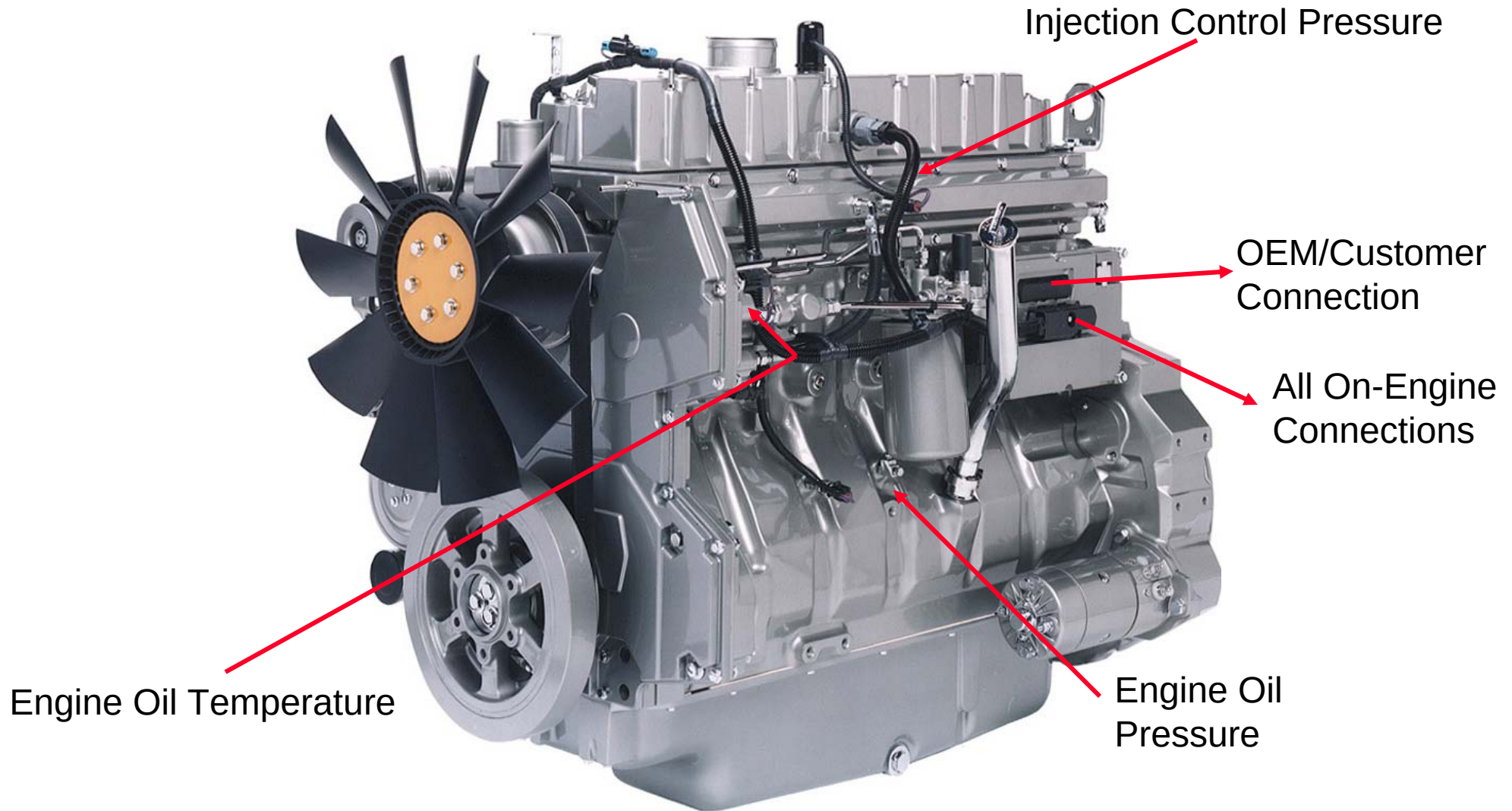
Manifold Absolute Pressure (MAP)

Engine Coolant
Temperature (ECT)

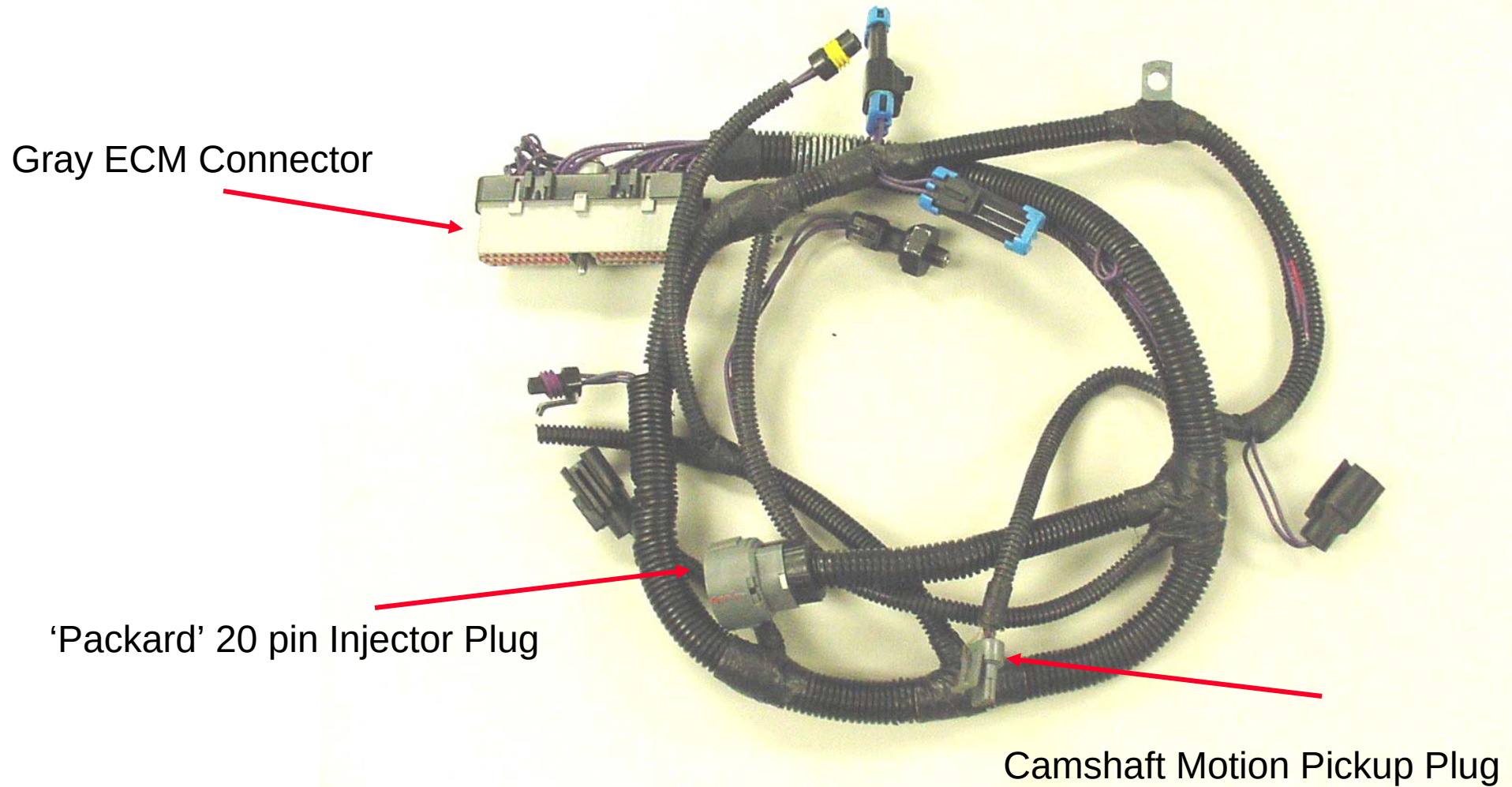


Camshaft Motion
Pickup (CMP)

1300 Edi Series Sensor Layout



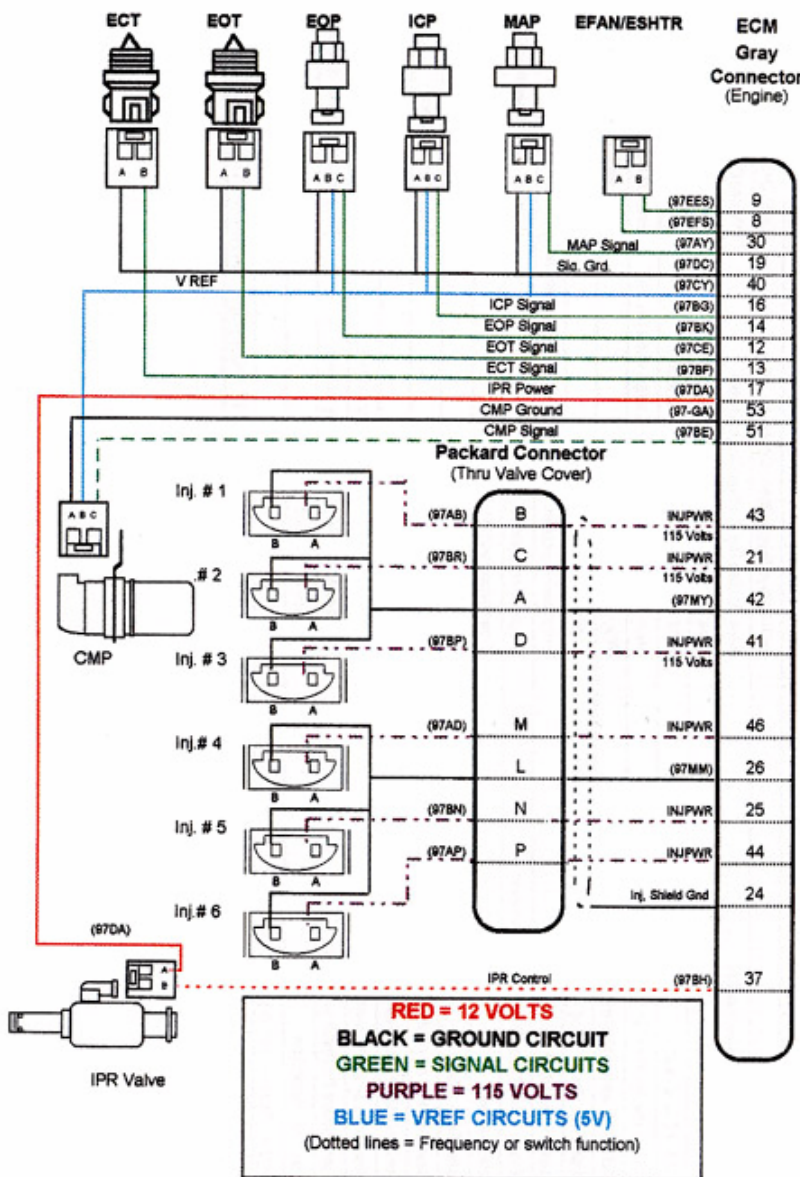
Typical 1300 Edi 'On Engine' Wiring Harness



'On Engine' Connections (Gray Connector)

- The injector solenoids are controlled by a 110v DC.pulse.
(110 Volt DC is a dangerous voltage)
- Pressure Sensors and Cam Motion Pickup require 5 volt dc.
- The Injection Pressure Regulator Valve requires a Pulse Width Modulated (PWM) signal.

All 'On Engine' Connections



1300 Edi Series 'On Engine' Wiring Harness

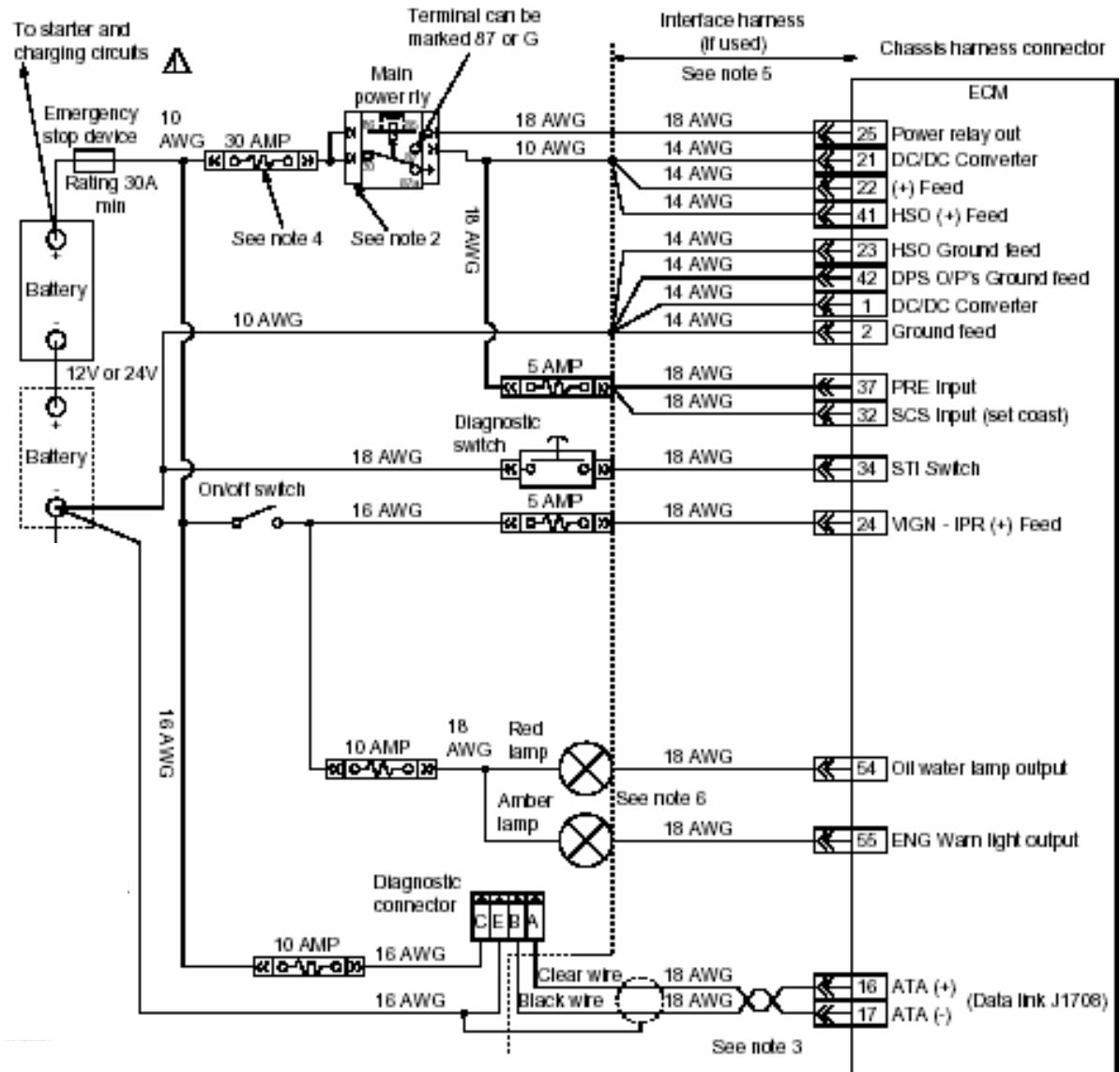
- The Harness is protected by a plastic tubing.
- It is mechanically fixed to the engine via clips, to keep the harness secure and away from potential damage.
- All connectors are 'keyed' to ensure correct orientation.
- Make sure all seals are correctly positioned. Blanking plugs must be fitted on any unused pins, to prevent any liquid ingress.
(SPECIAL PowerPart grease is recommended for ECM Plug)

1300 Edi Series 'On Engine' Wiring Harness

- We have a very 'Fault Tolerant' extremely reliable system. Inevitably after many years service, faults may occur.
- Traditionally, if the problem is 'Electrical', wiring / connectors are most likely to be the cause.
- Shorts / open circuits / high resistance connections, can be caused by any combination of corrosion / abrasion / burning / vibration / fatigue and 'liquid ingress'.

(Black Connector)

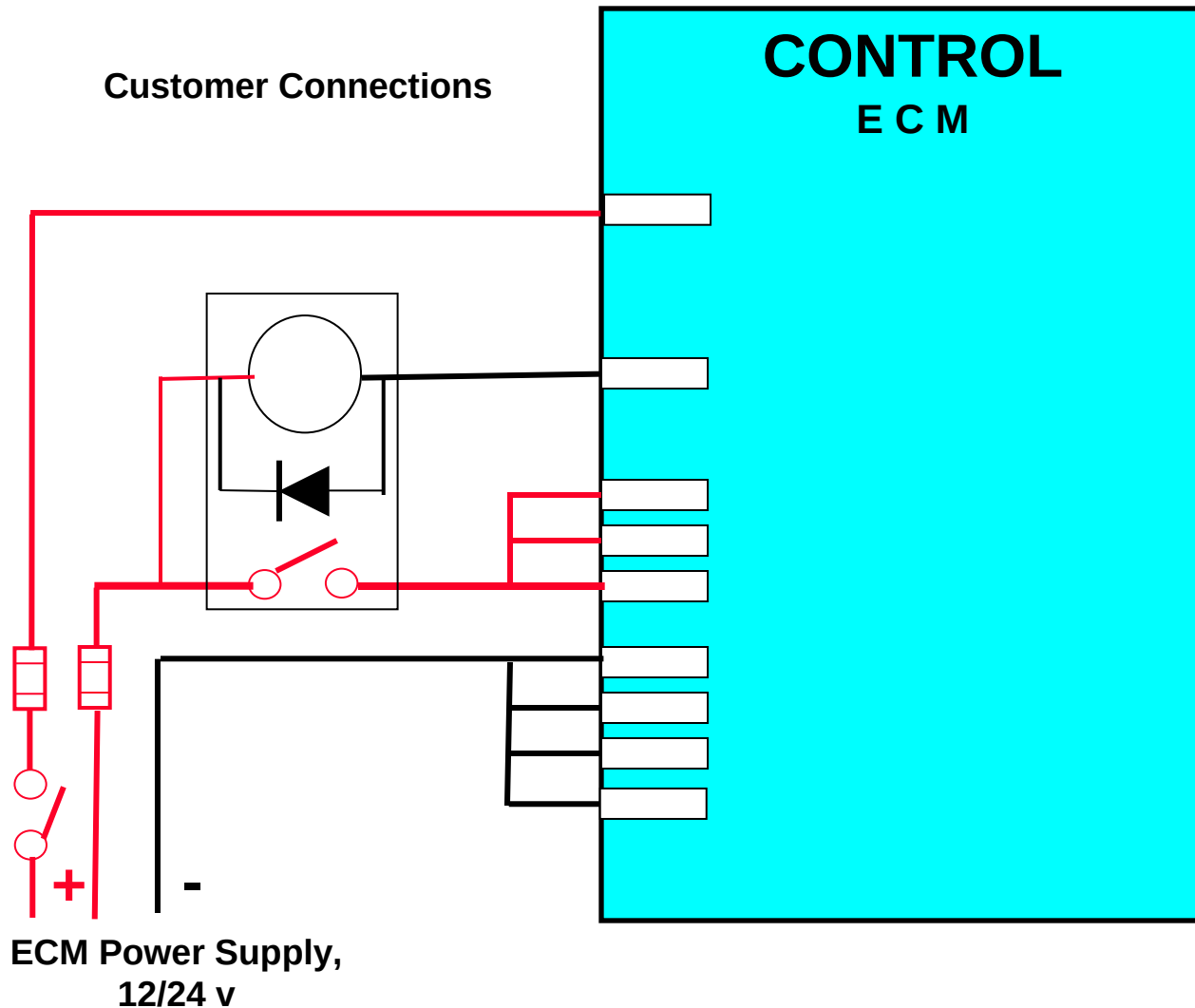
All OEM/Customer Connections



OEM/Customer side, Connections

- All Battery **Positive** and **Negative** connections to the ECM, should be connected to prevent Voltage drop.
- It is important that ECM power cables be connected directly to battery **Positive** and **Negative** –
- Correct cable sizes and fuses, should be always be used.
- Make sure of the current rating of the power relay contacts.
- Protect against 'back EMF' by installing a diode across relay
- Install 6 pin Deutsch Diagnostic Connector, for Communications.
- Install warning lamps, **Amber/Red** and Diagnostics push button

Minimum Connections, to run a 1300 Series



Note.

We do suggest that a connection is made to Service Tool to allow Communication with The ECM via the ATA

For Example 16 ATA +
17 ATA -
+ on pin C
- on pin E

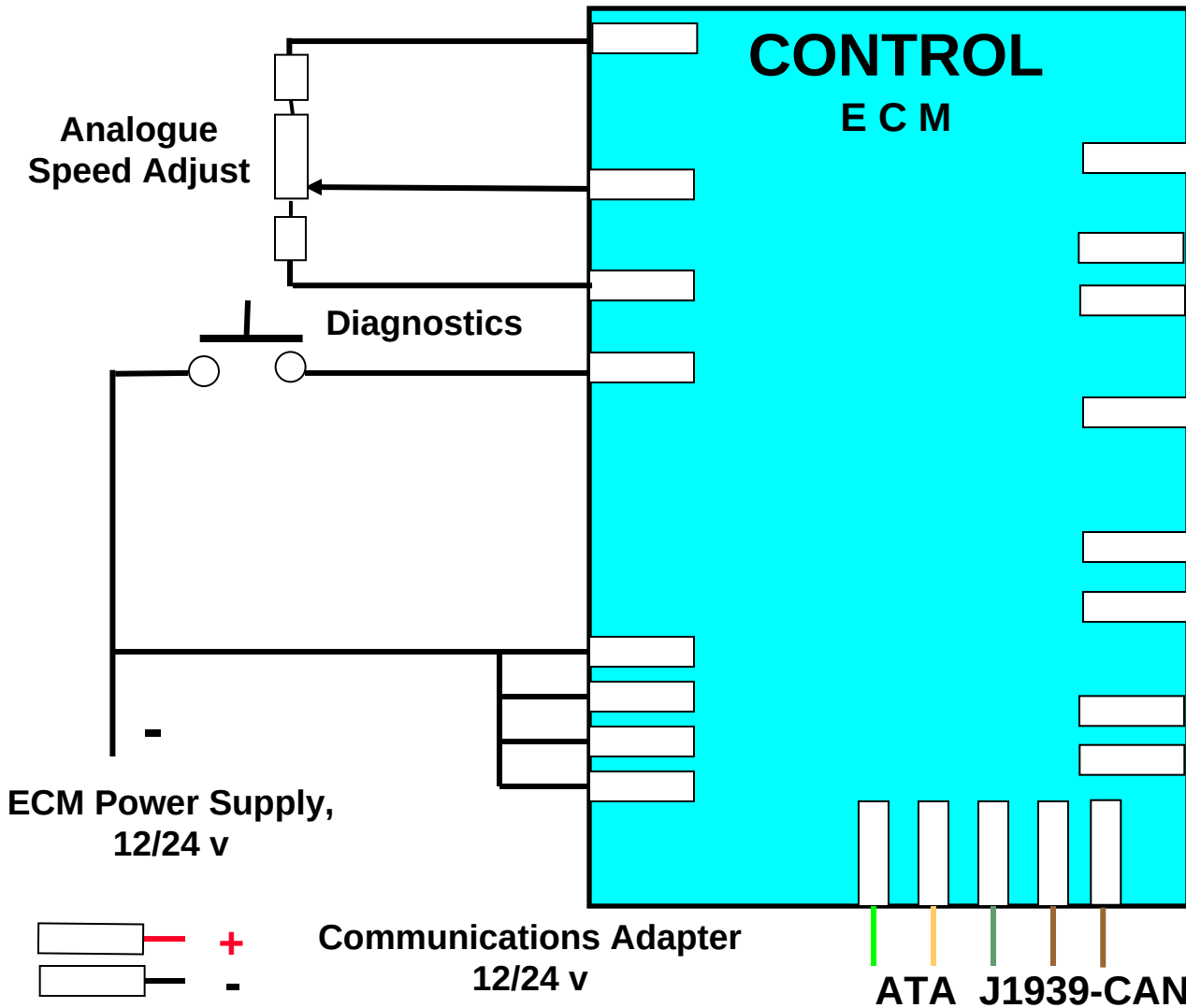
Alternative:

SAE J1939. 18 CAN Screen
19 CAN High +
20 CAN Low -

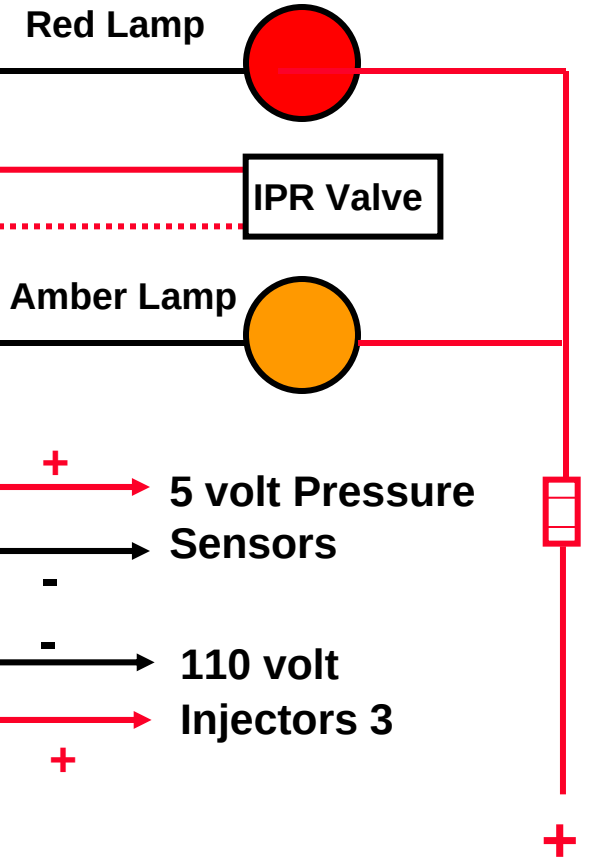
(minimal information)

Some Typical Connections - 1300 Series ECM

INPUTS



OUTPUTS



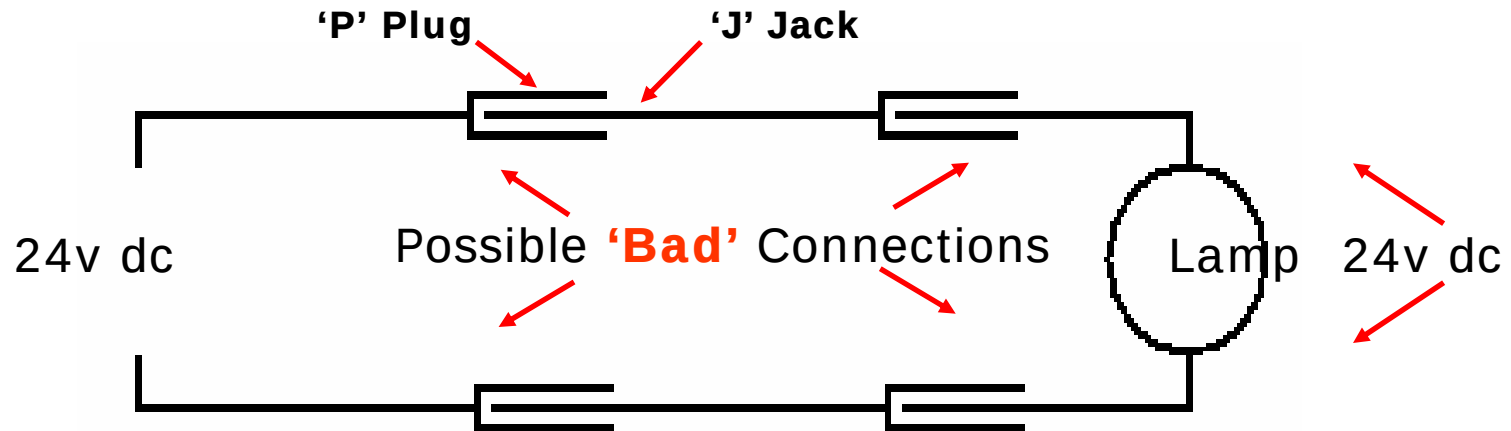
Connectors

- Always use high quality connectors. (Gold/Nickel Plated)
- Keep connections to a minimum.
- Make sure all rubber seals are correctly fitted.
- Remember...

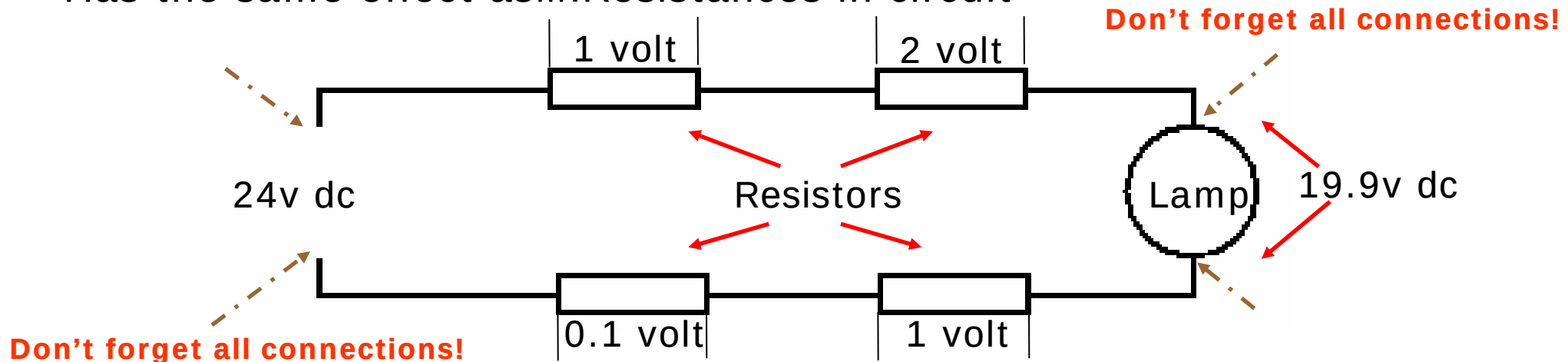
‘BAD’ CONNECTIONS CAUSE RESISTANCE!

RESISTANCE CAUSES VOLTAGE DROP!

Effects of 'Bad' (Resistance) Connections



Has the same effect as....Resistances in circuit



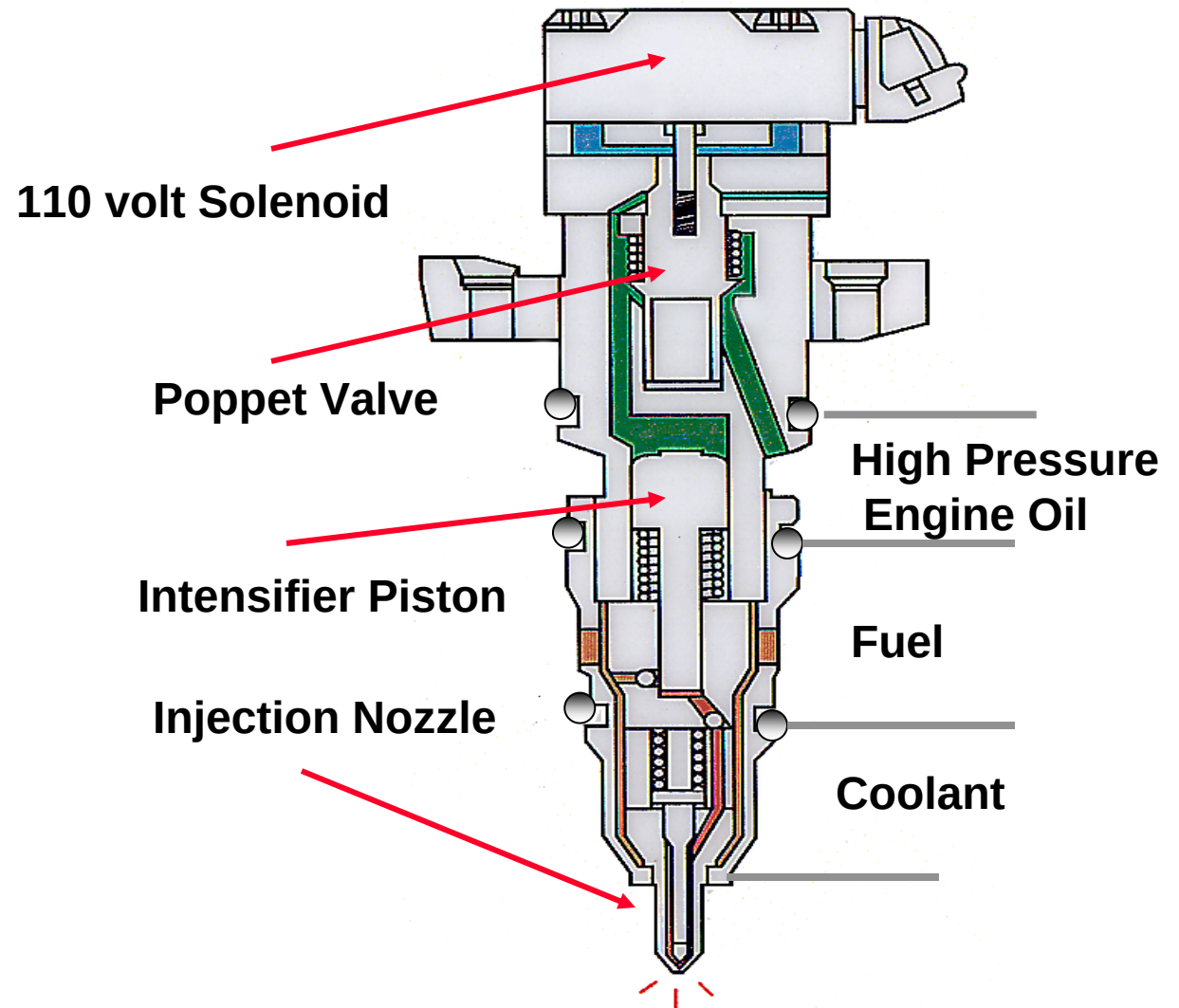
HYDRAULICALLY ACTUATED **E**LECTRONICALLY CONTROLLED **U**NIT **I**NJECTION

- HEUI is the fuel system used in place of the mechanical high pressure fuel injection pump and nozzles
- Hydraulically actuated using High Pressure Engine lubrication oil as power medium
- Injection controlled by an 110 volt electrical solenoid
- Solenoid controlled by Electronic Control Module (ECM)

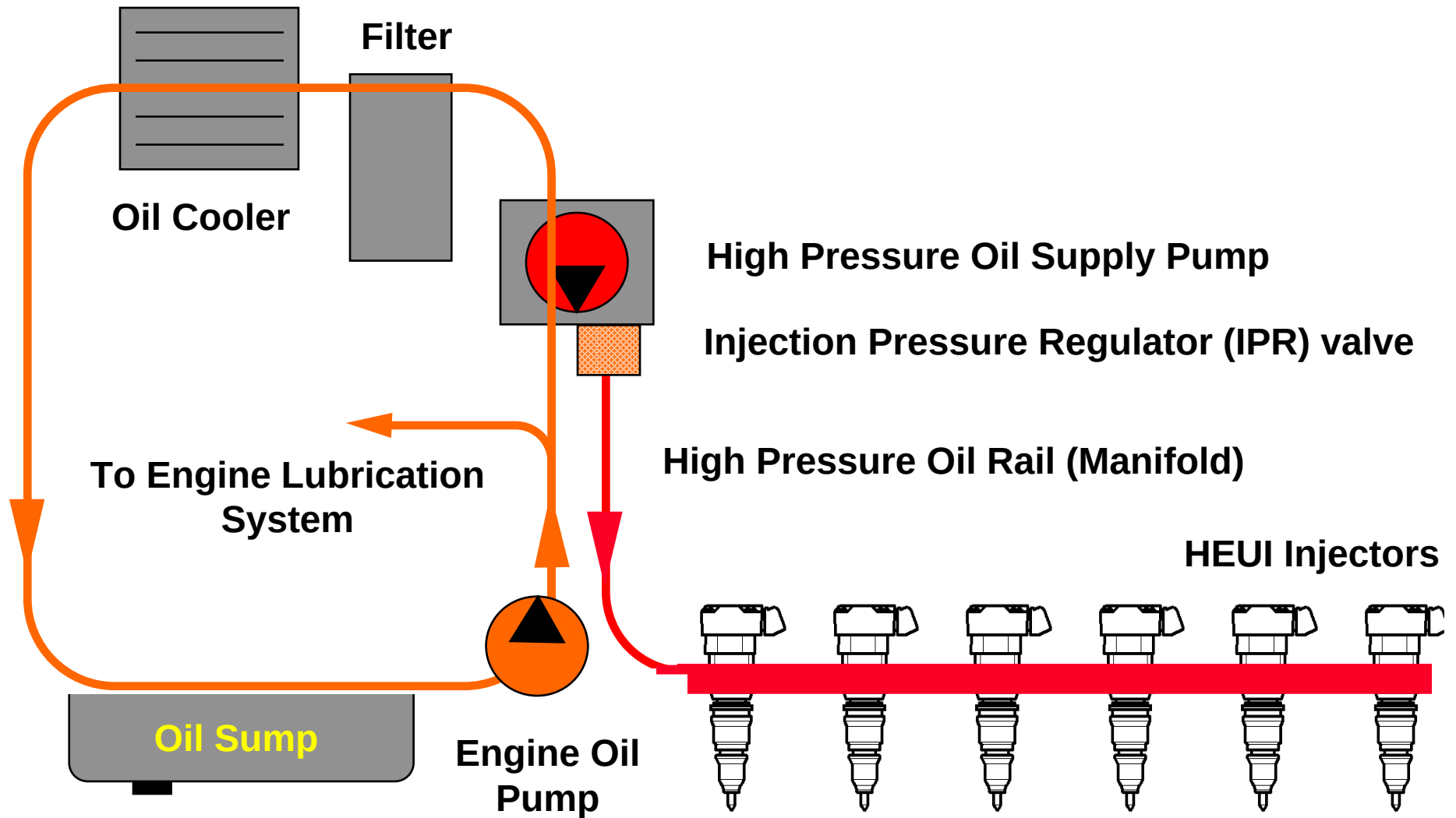
H.E.U.I. Injector

Enables control of:

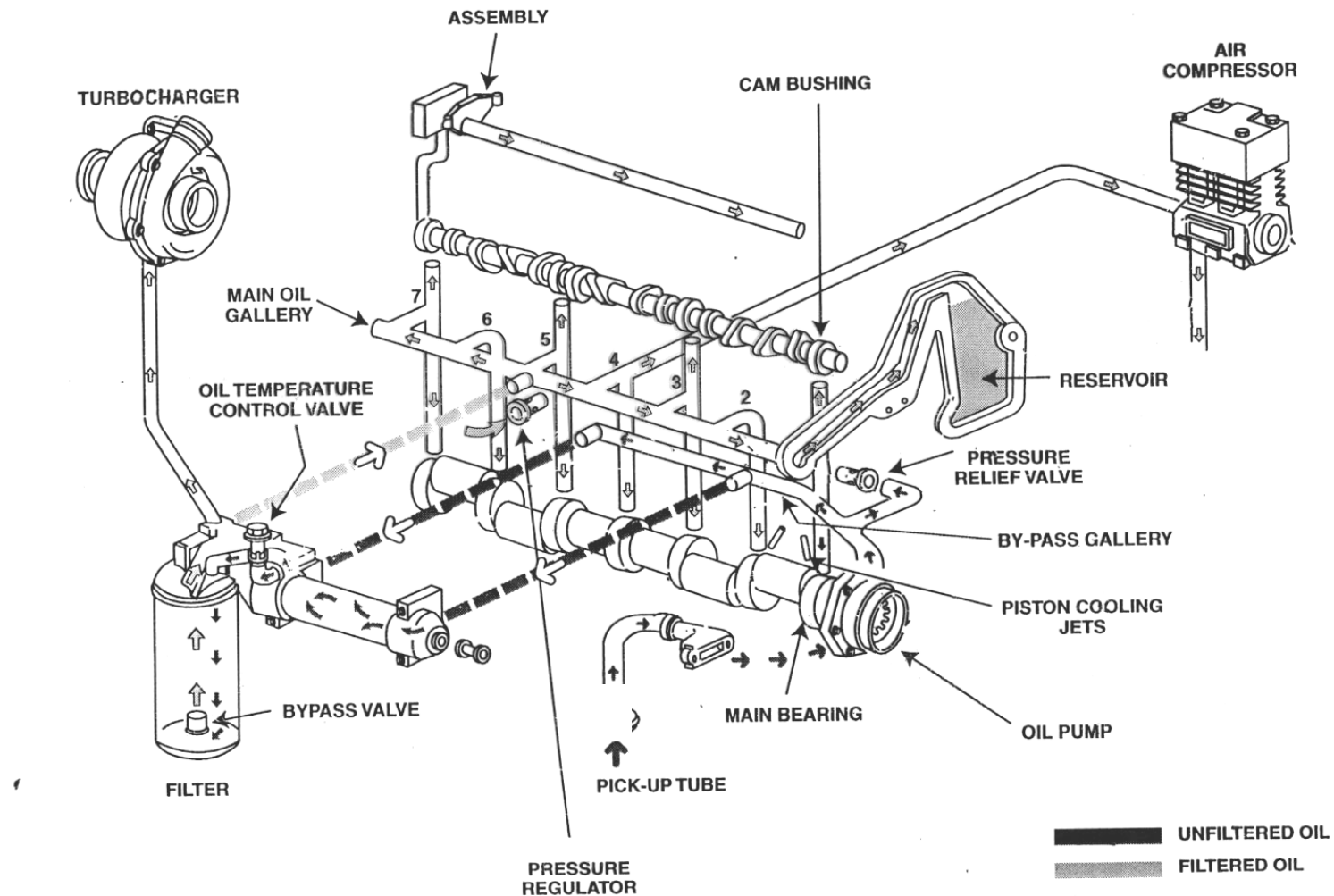
- Injection Pressure
- Injection Rate
- Injection Timing



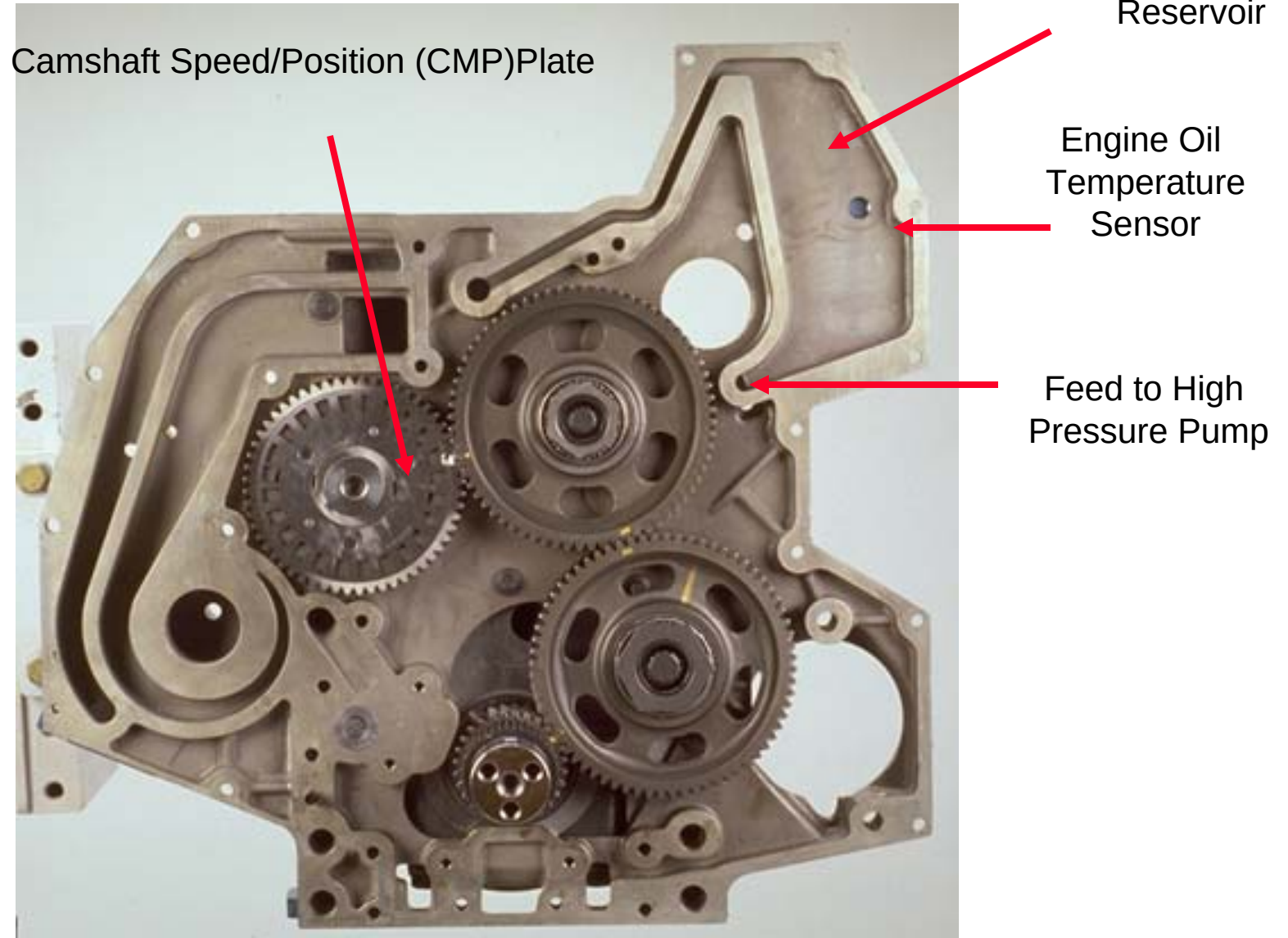
H.E.U.I. Oil System



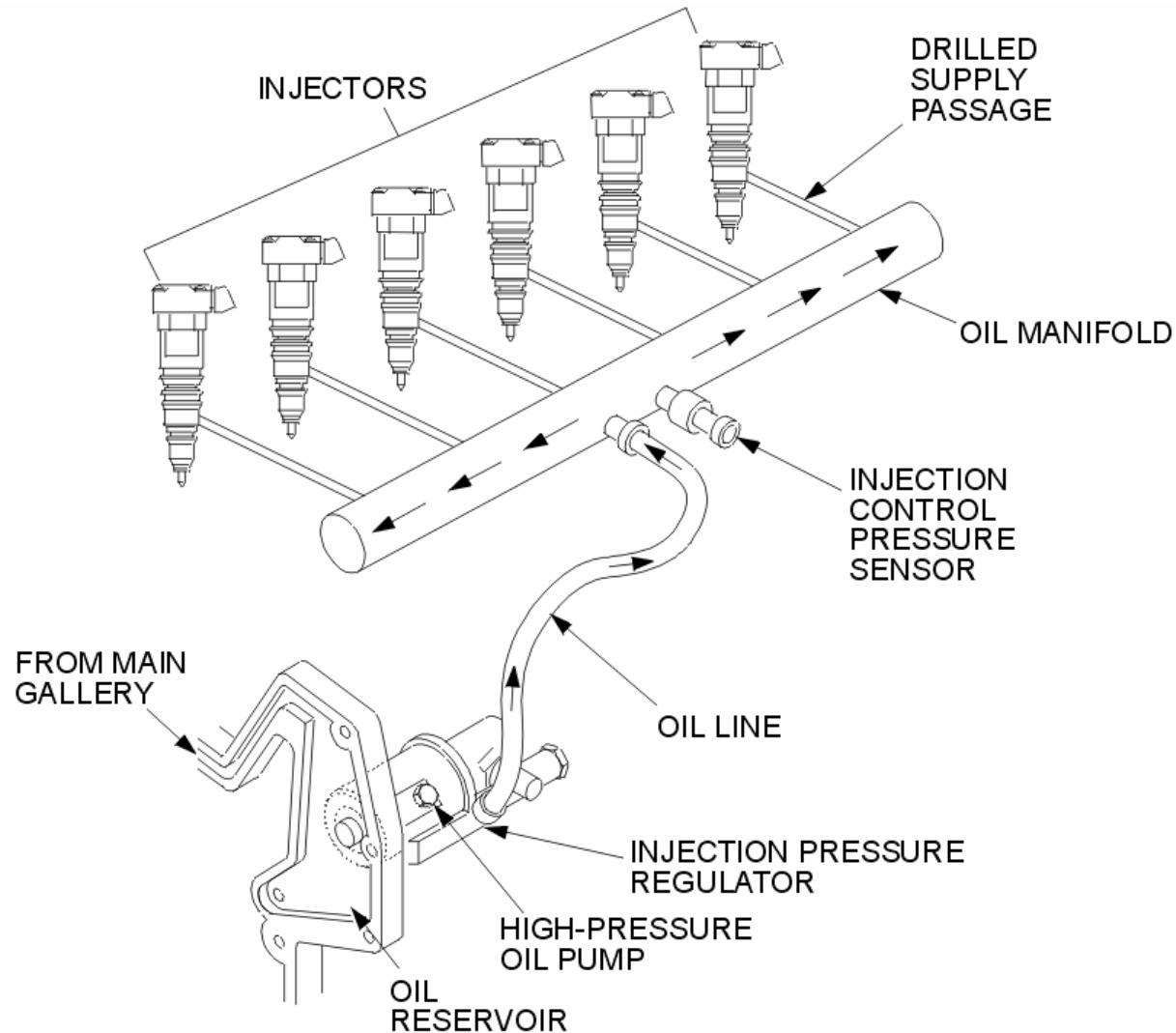
1300 Edi Oil Lubrication System



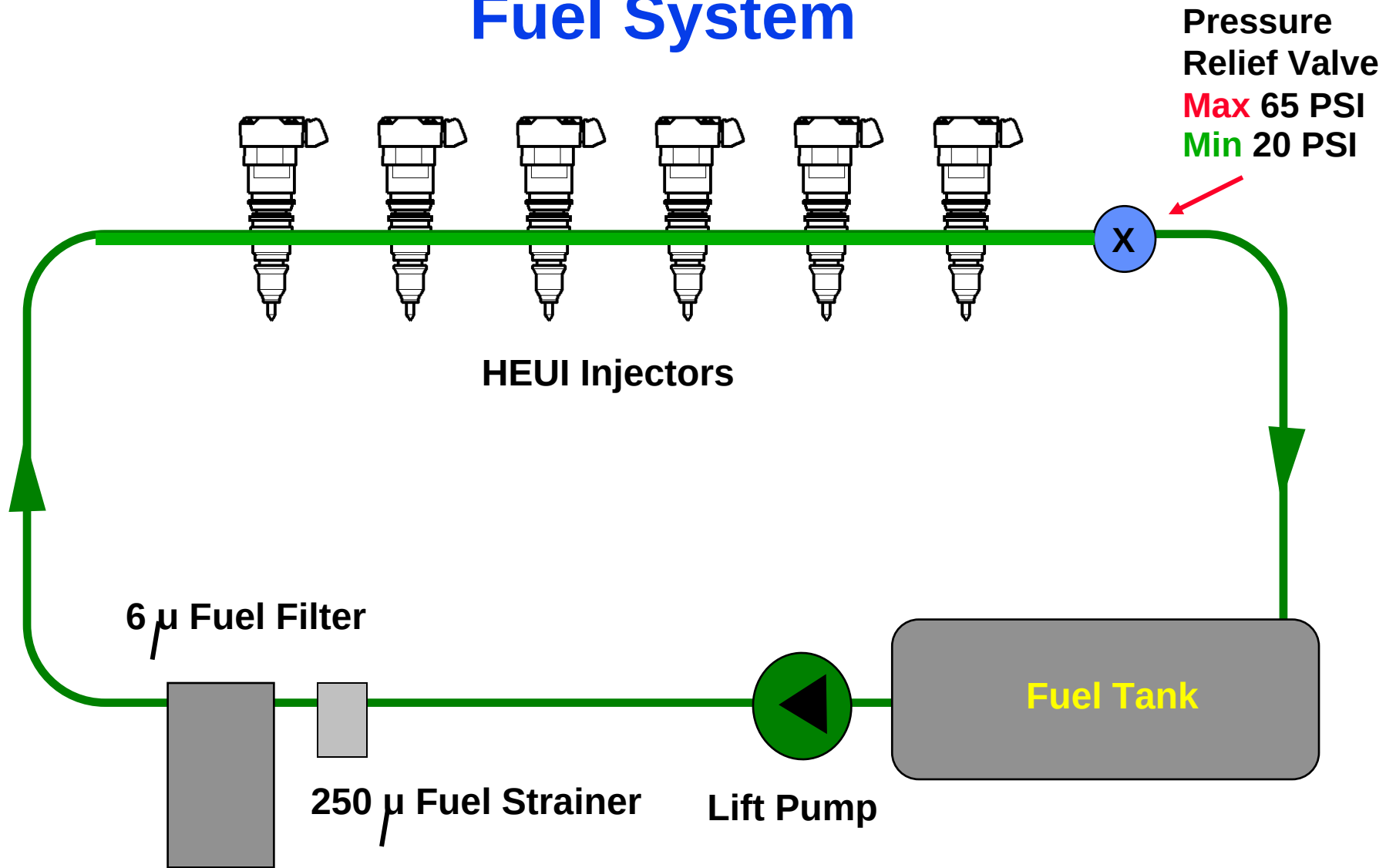
1300 Edi Front View

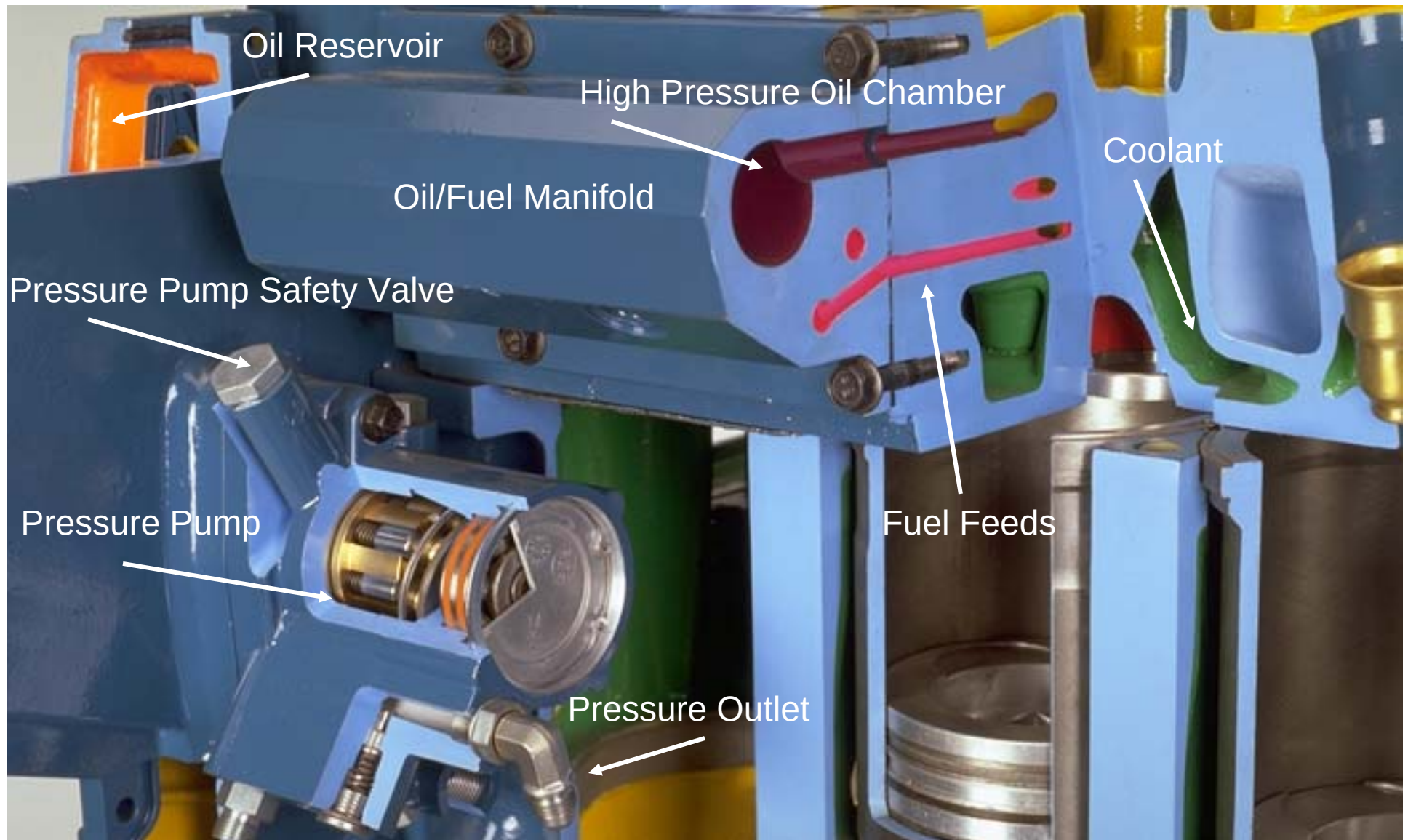


H.E.U.I. Oil Supply and Pressure System

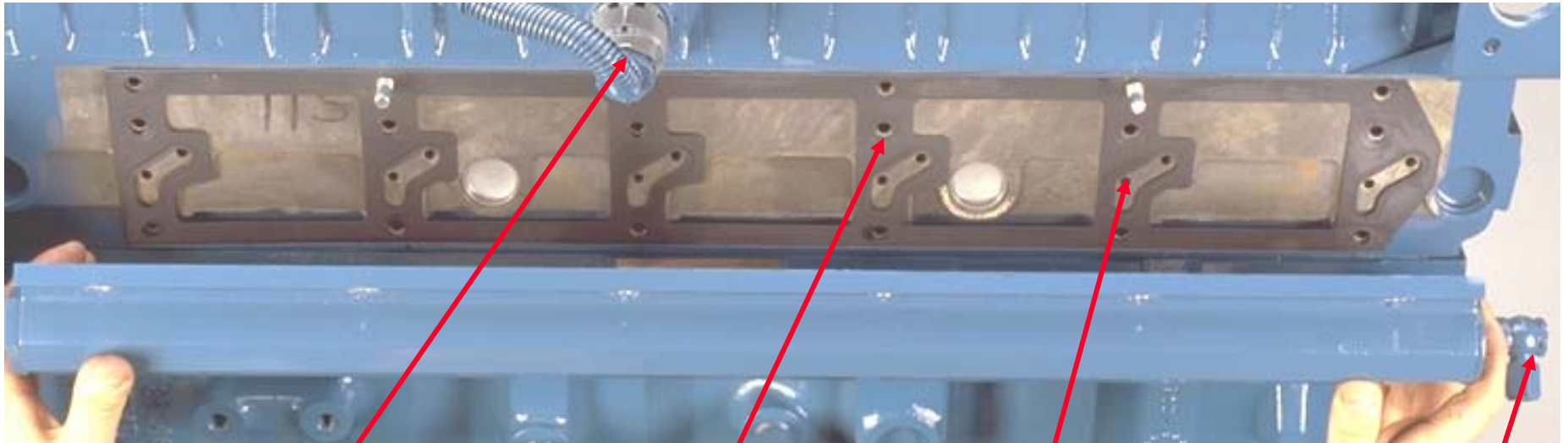


Fuel System





1300 Edi High Pressure Oil / Fuel Manifold



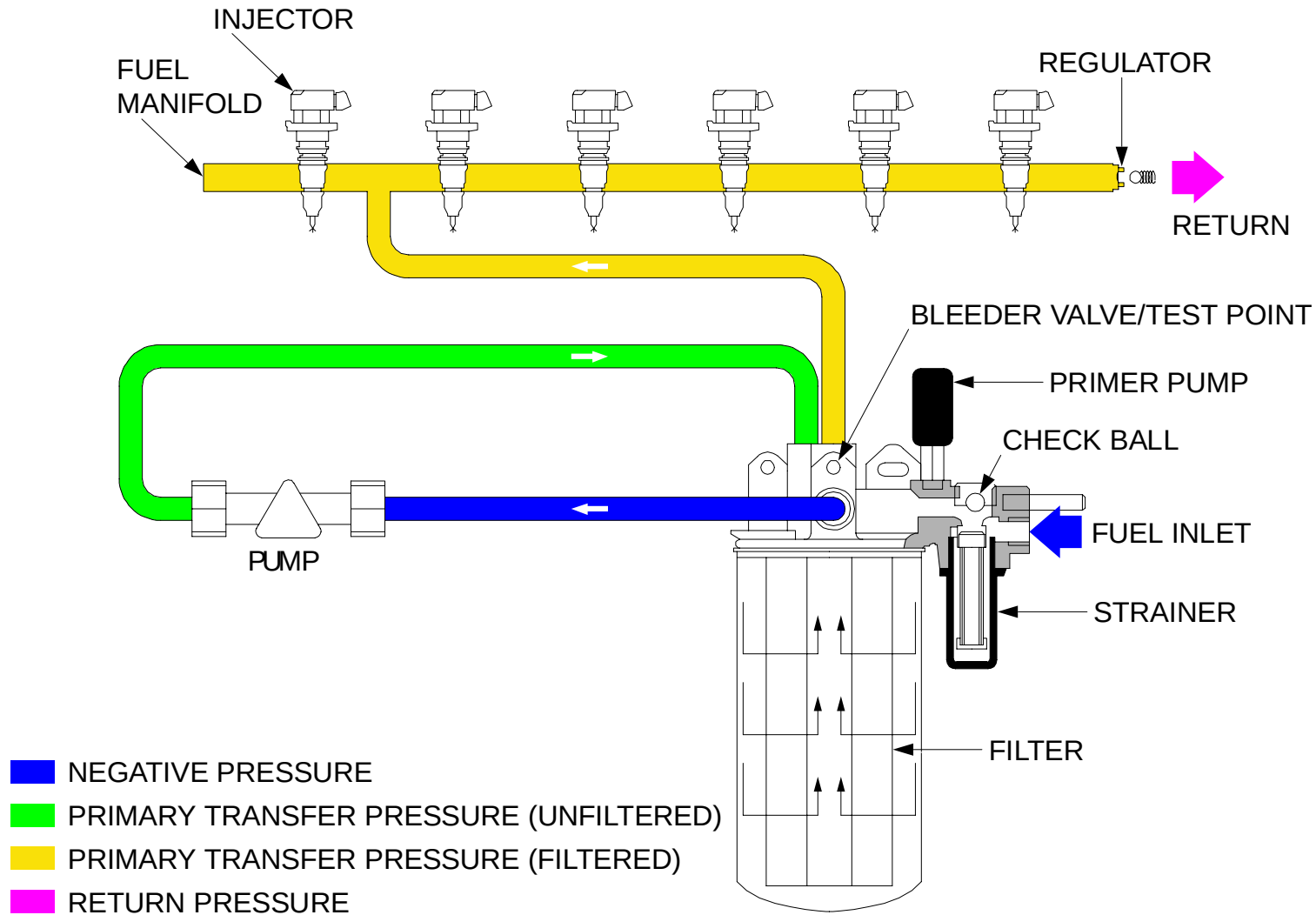
110 volt Injector Solenoid Supply

High Pressure Oil Supply

Fuel Supply

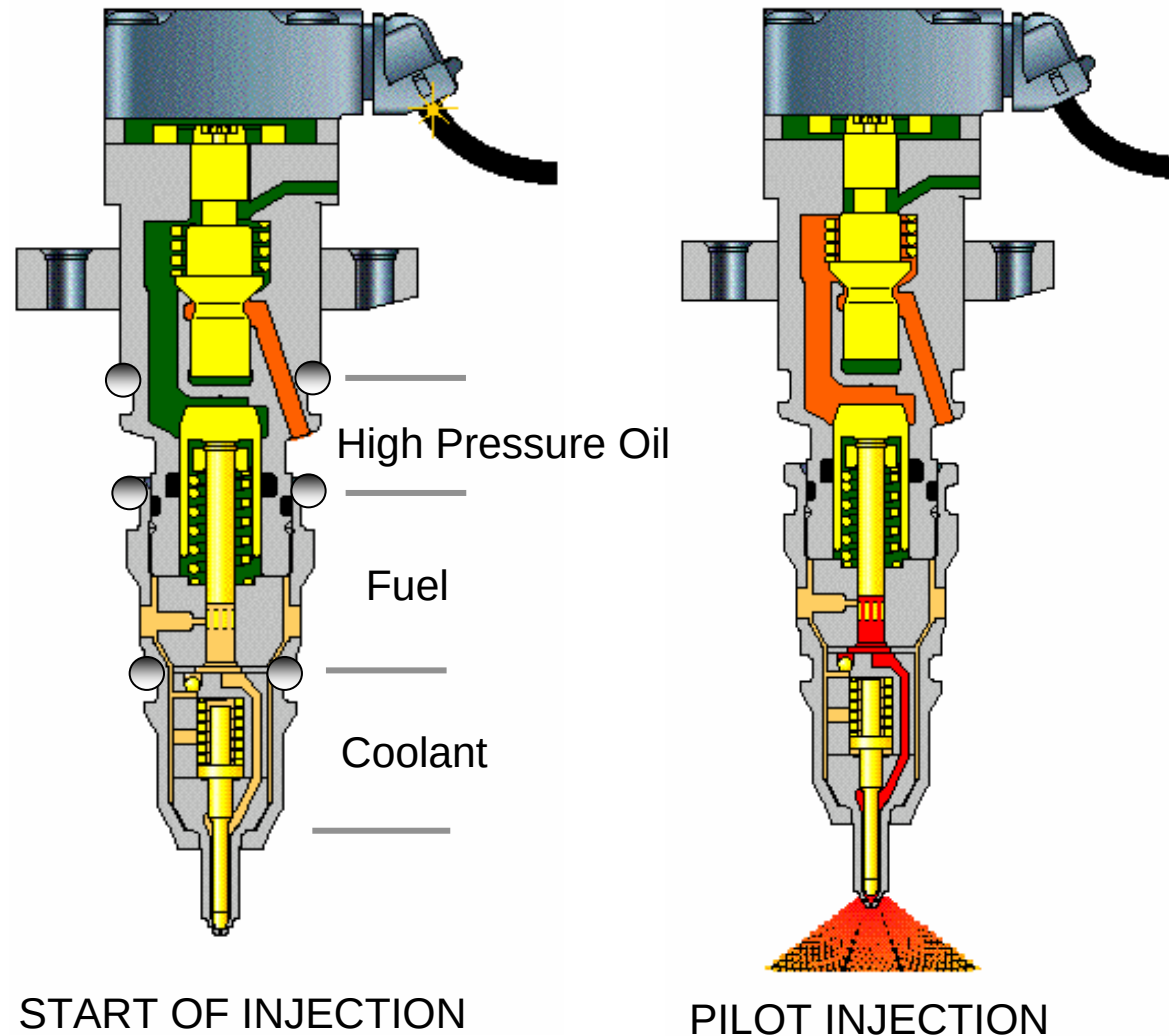
Fuel Pressure Relief Valve, 60/65 PSI

FUEL FLOW

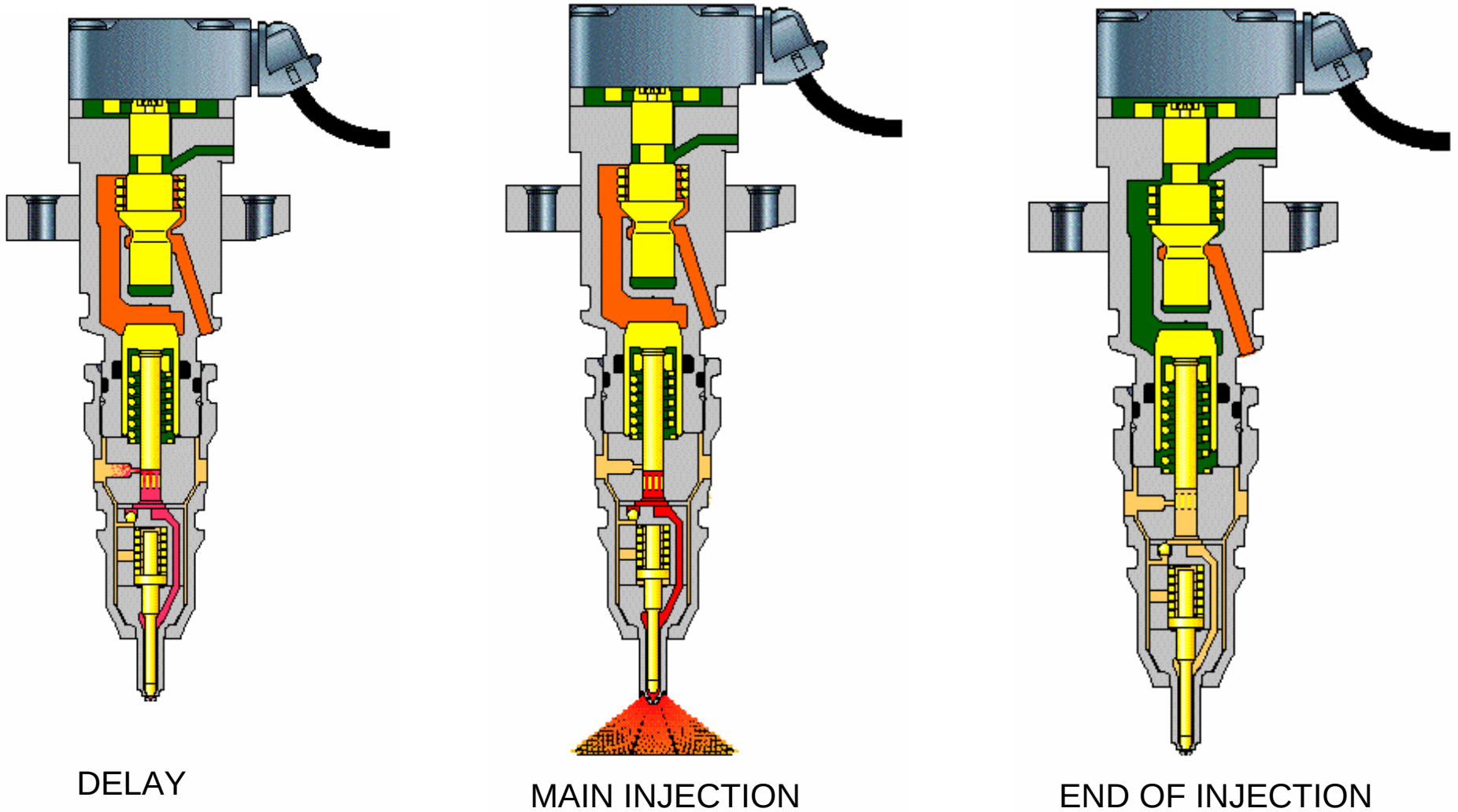


HEUI TWO STAGE INJECTORS

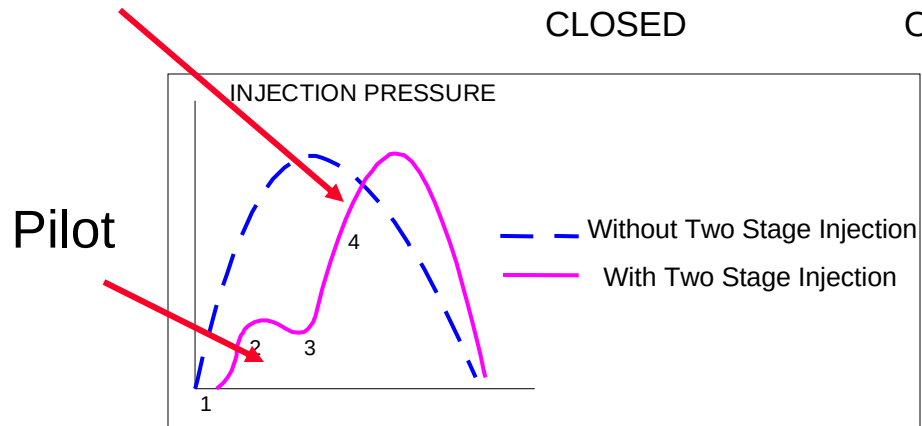
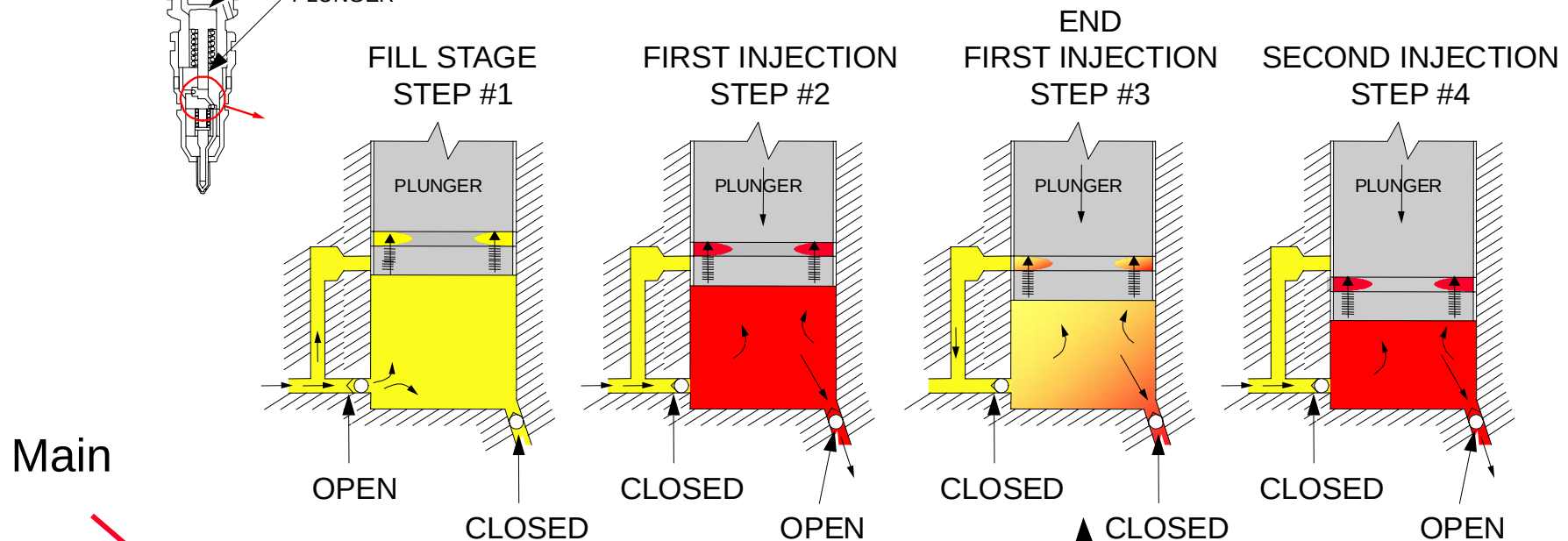
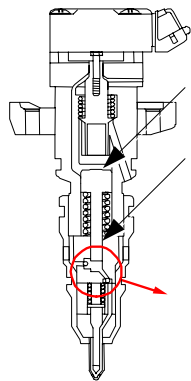
- **Higher Injection Pressures Give:**
 - Lower Particulate Emissions.
 - Improved Consumption.
 - Improved Performance.
- **Injection Rate shaping.**
 - Lower NOx Emissions.
 - Reduced Combustion Noise.
- **Sharper End of Injection gives:**
 - Reduced Particulate emissions.



HEUI TWO STAGE INJECTORS



HEUI TWO STAGE INJECTORS



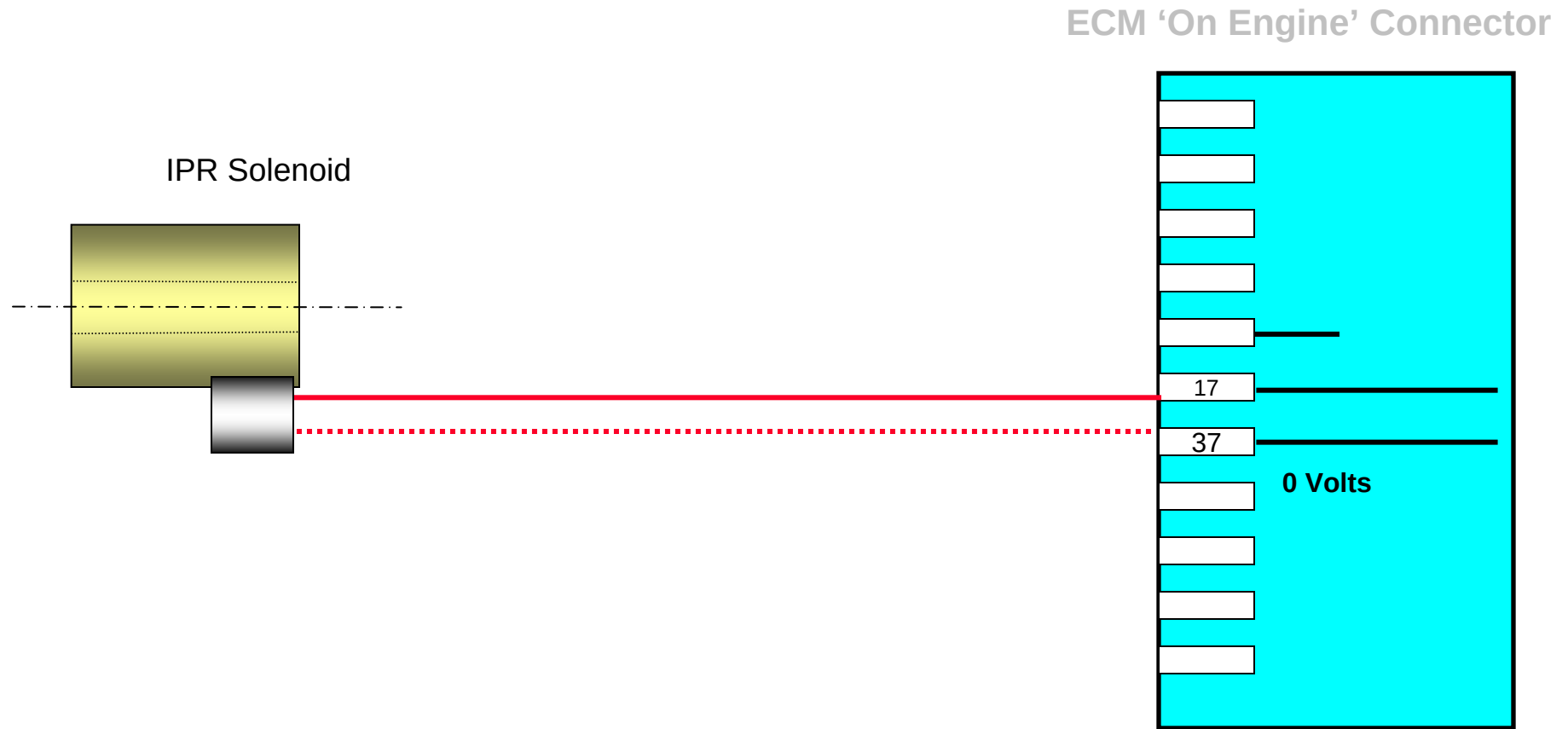
↑
**PRESSURE
RELIEVED**

TRANSFER PUMP PRESSURE
 INJECTION PRESSURE

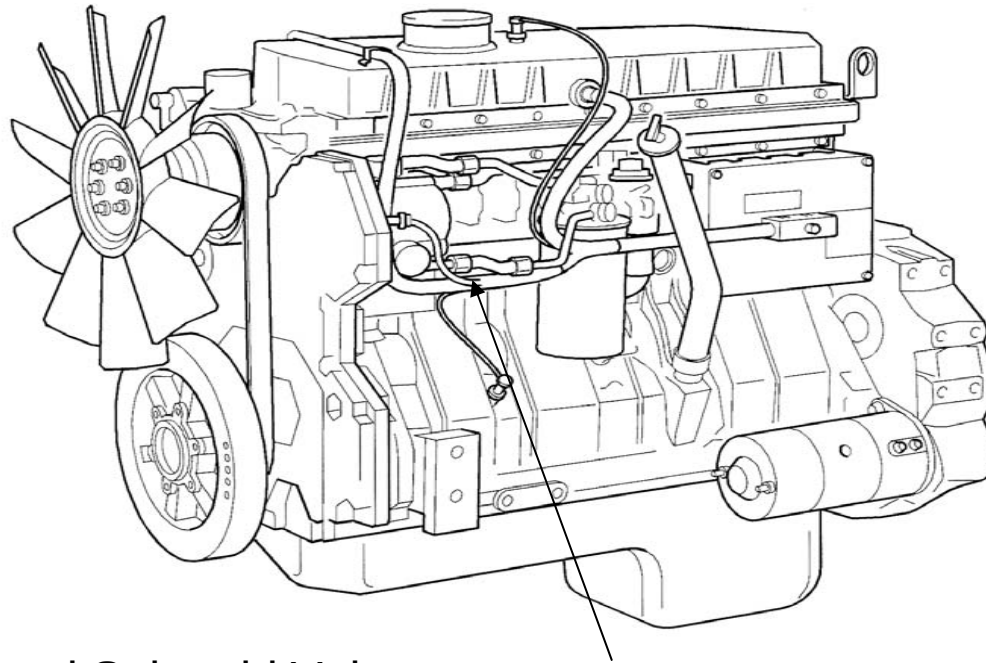
HEUI Injectors : Essential Messages

- Service life > 10,000 hours (**If:** you look after your Fuel System)
- Fault diagnostics by Diagnostic Tool/Service Tool
(combined with other tests)
- All seals must be replaced if injector is removed and refitted
- Not field serviceable
 - No nozzle replacement
 - Tamper evident

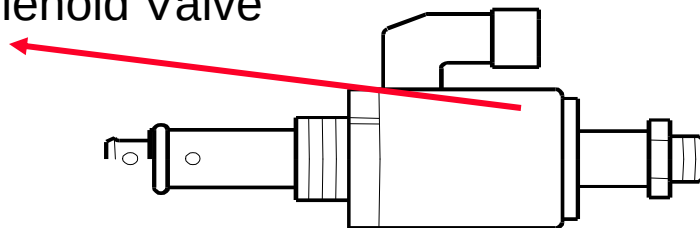
Injection Pressure Regulator Solenoid



INJECTION PRESSURE REGULATOR (IPR) VALVE



Pulse Width Modulated Solenoid Valve



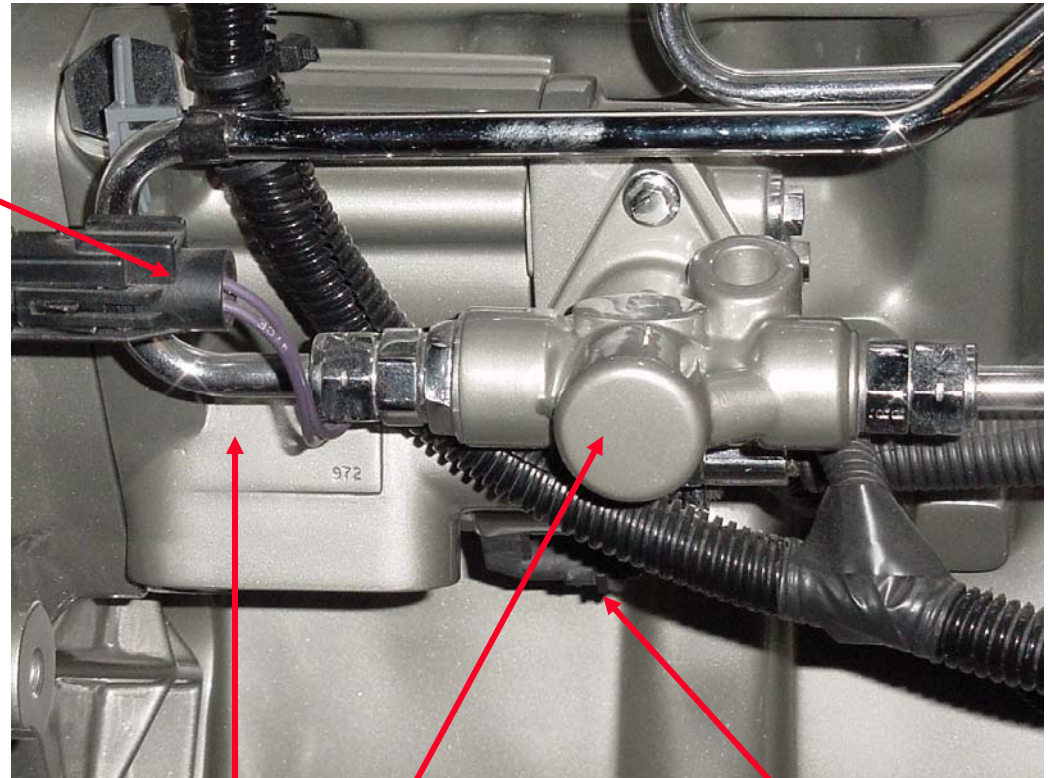
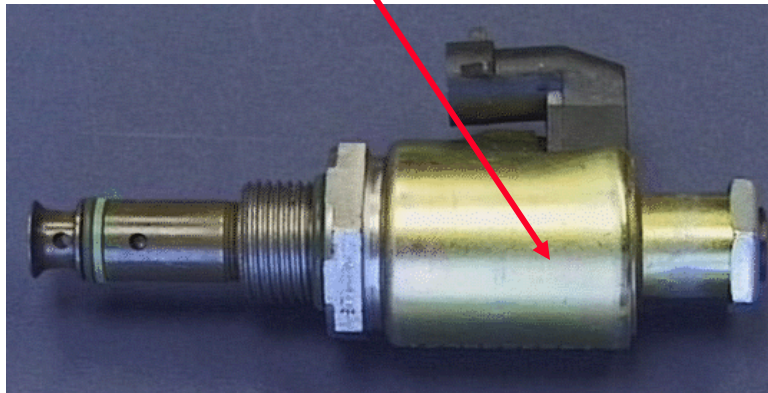
I P R

I N J E C T I O N P R E S S U R E
R E G U L A T O R

Injection Pressure Regulator Valve (IPR)

Oil Temperature Sensor

IPR valve Solenoid



Remember; The **Higher** the Solenoid voltage
The **Higher** the Injection Pressure

Fuel Pressure Pump

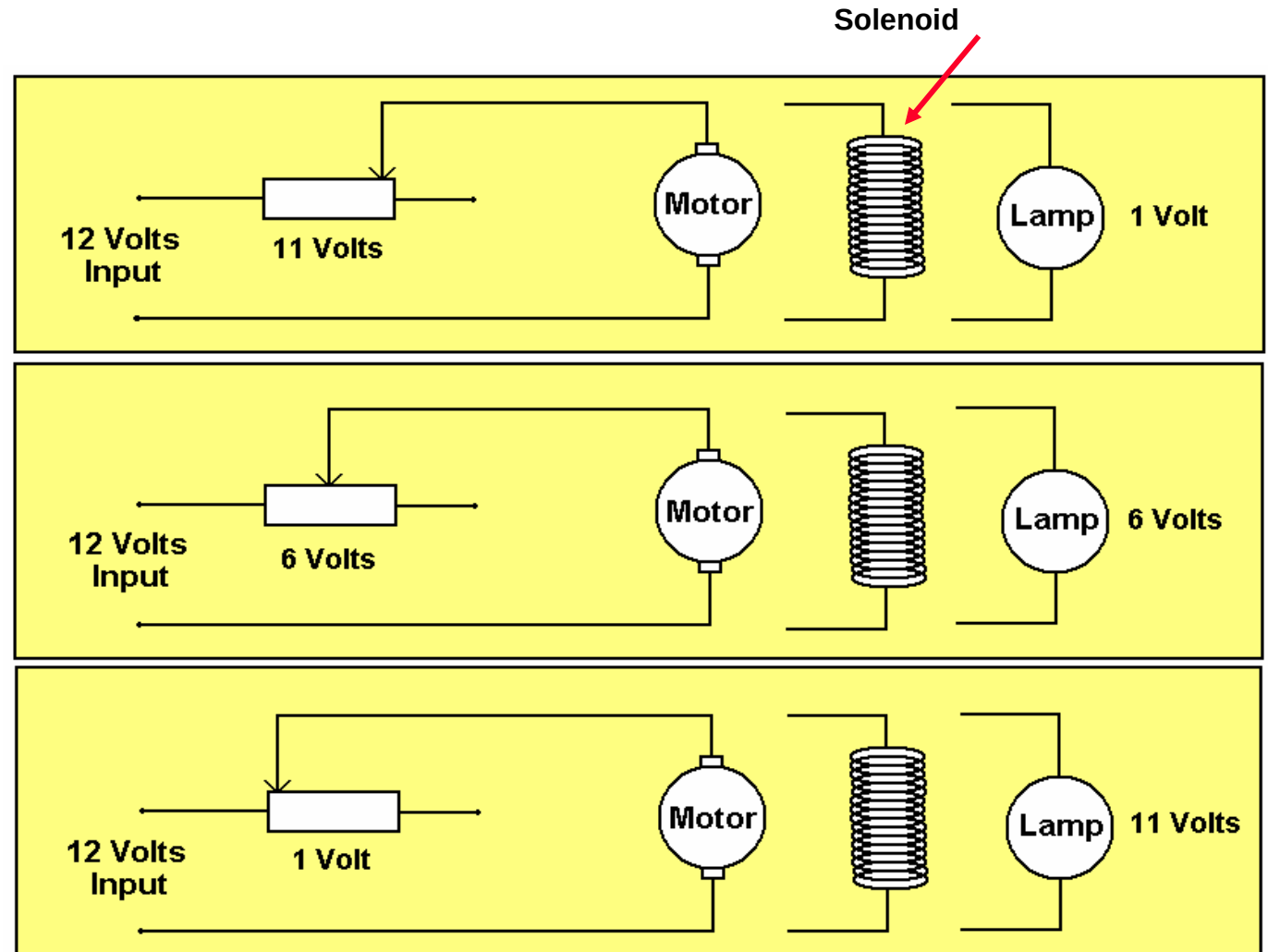
High Pressure Lube Oil Pump

Injection Pressure Regulator valve

Controlling A DC voltage-For High Power circuits

- Potentiometers/Variable Resistances

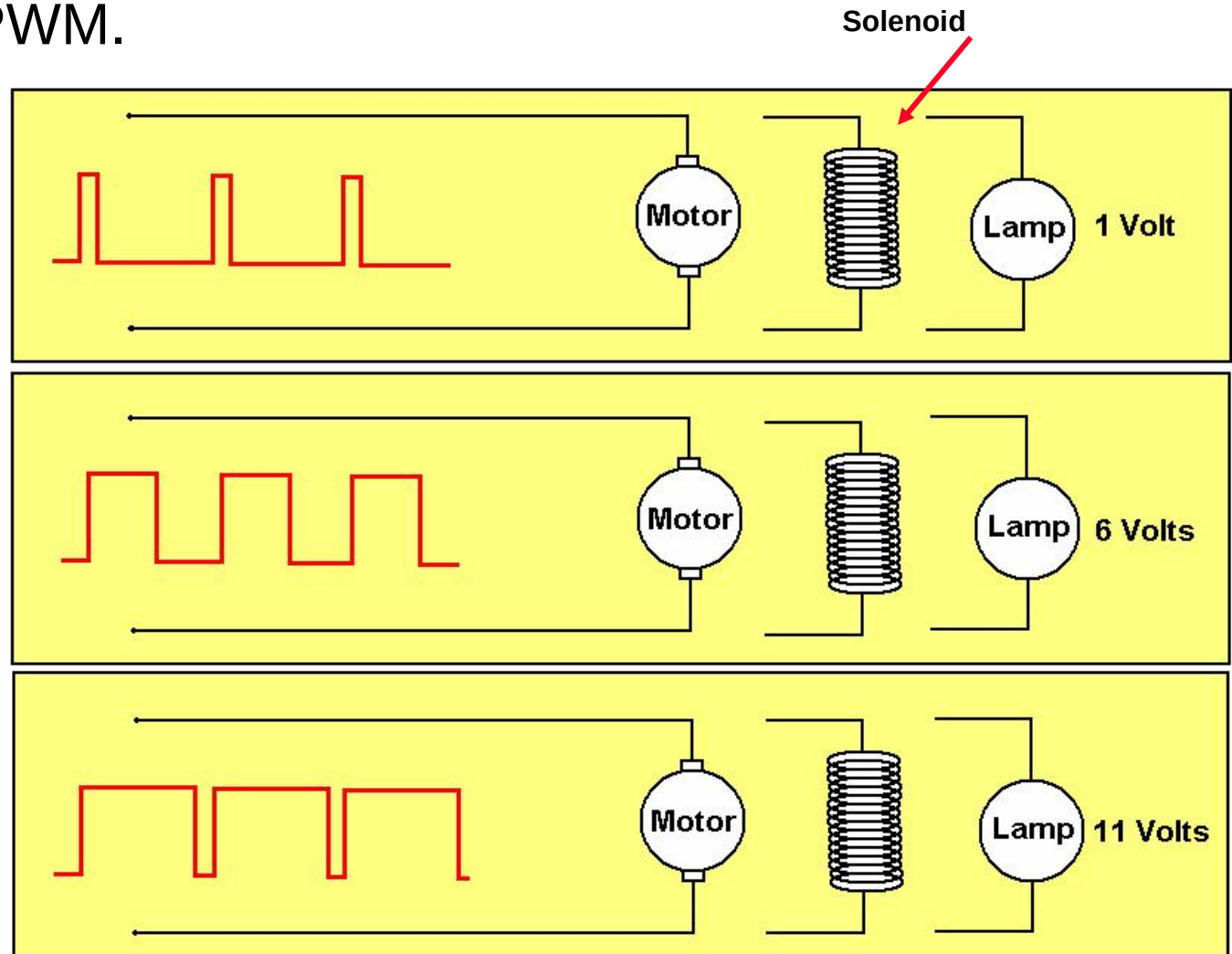
- The 'Old' Way.
- Inefficient.
- Wasteful.
- Large Power supply needed.



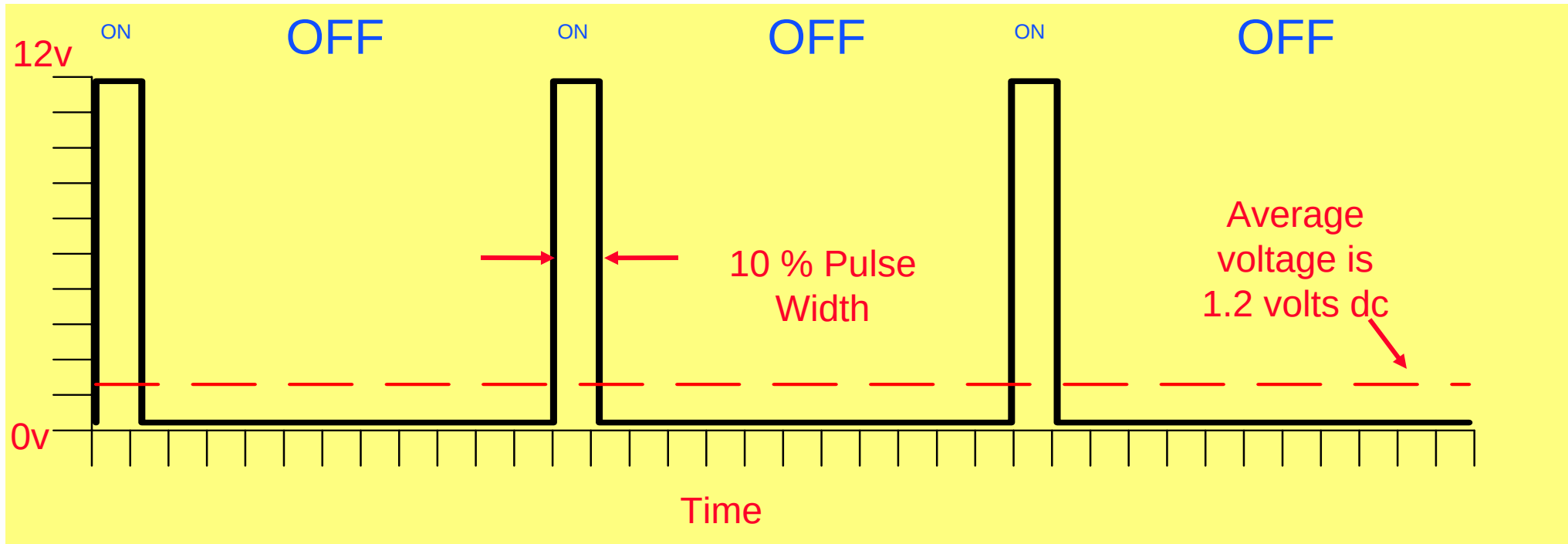
Controlling A DC voltage - For any circuits

- Why we use PWM.

- The 'New' Way.
- More efficient.
- Less Wasteful.
- Small Power supply needed.

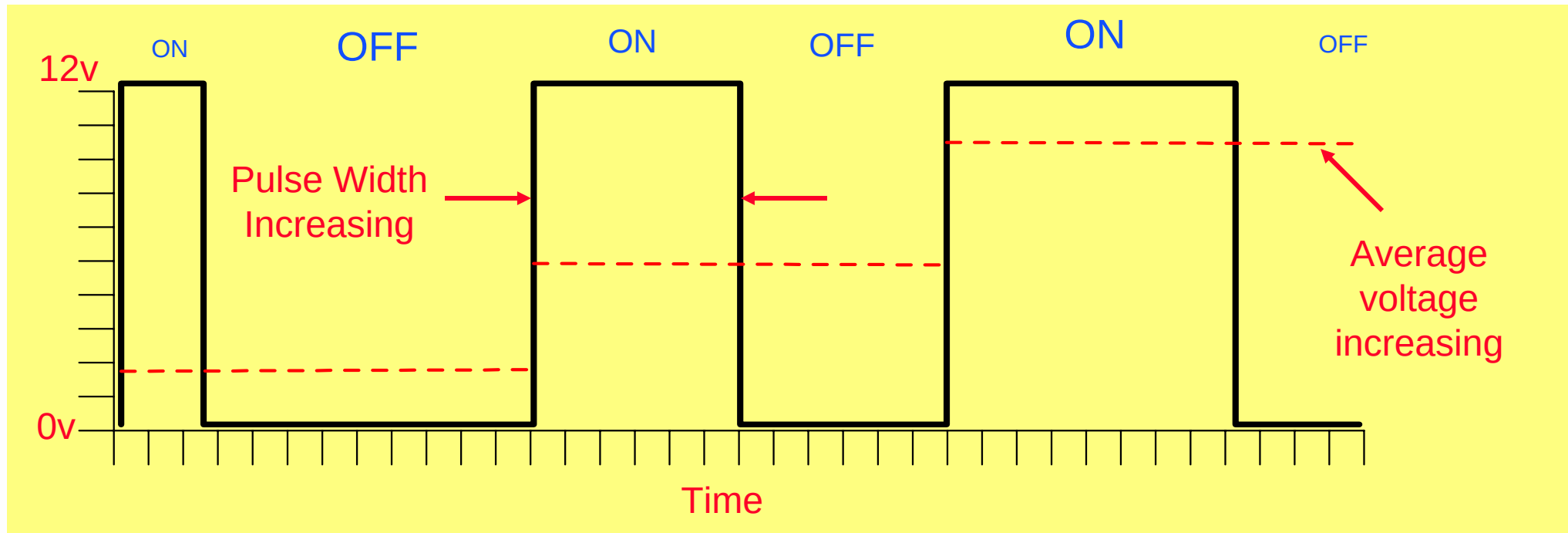


Pulse Width Modulation (PWM)



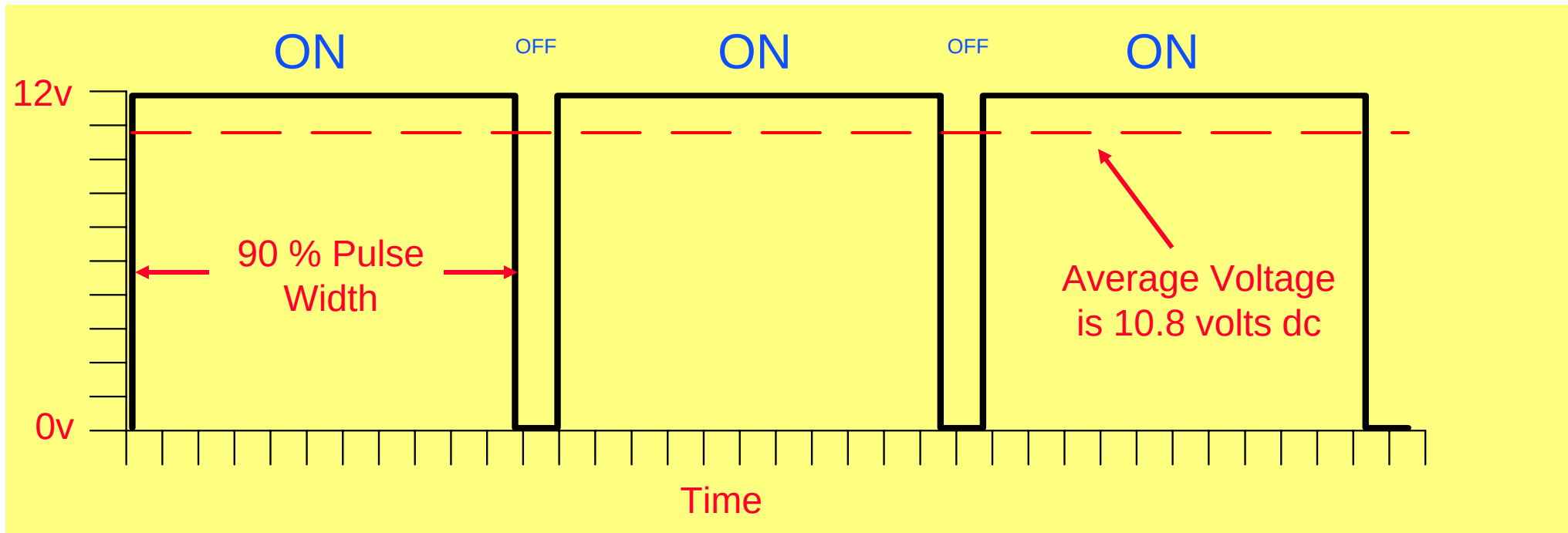
- Average time on (Pulse Width) = average voltage.
- Pulse runs at 500Hz.

Pulse Width Modulation (PWM)



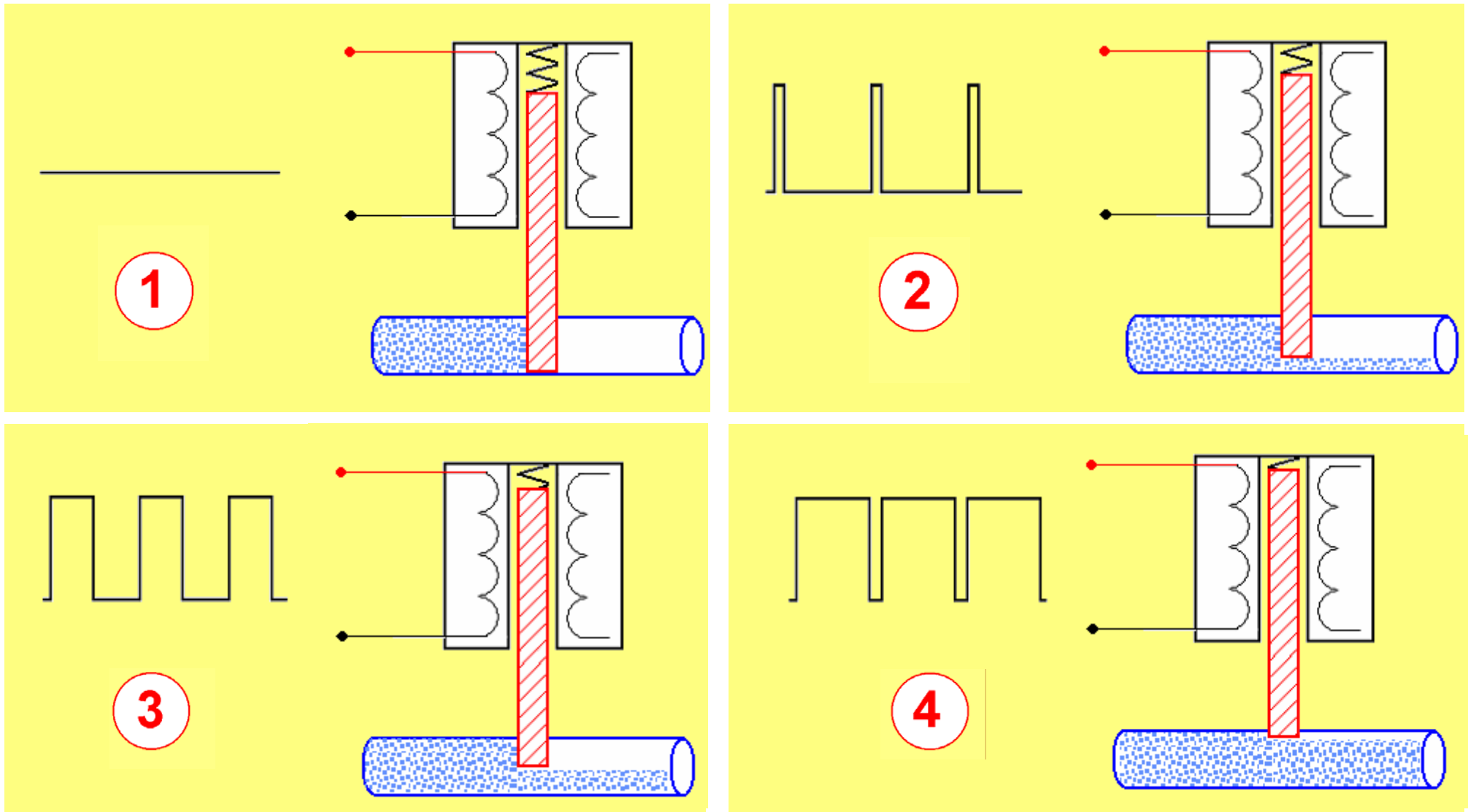
- As demand increases so does pulse width
- Average time on (Pulse Width) = average voltage.
- Pulse runs at 500Hz.

Pulse Width Modulation

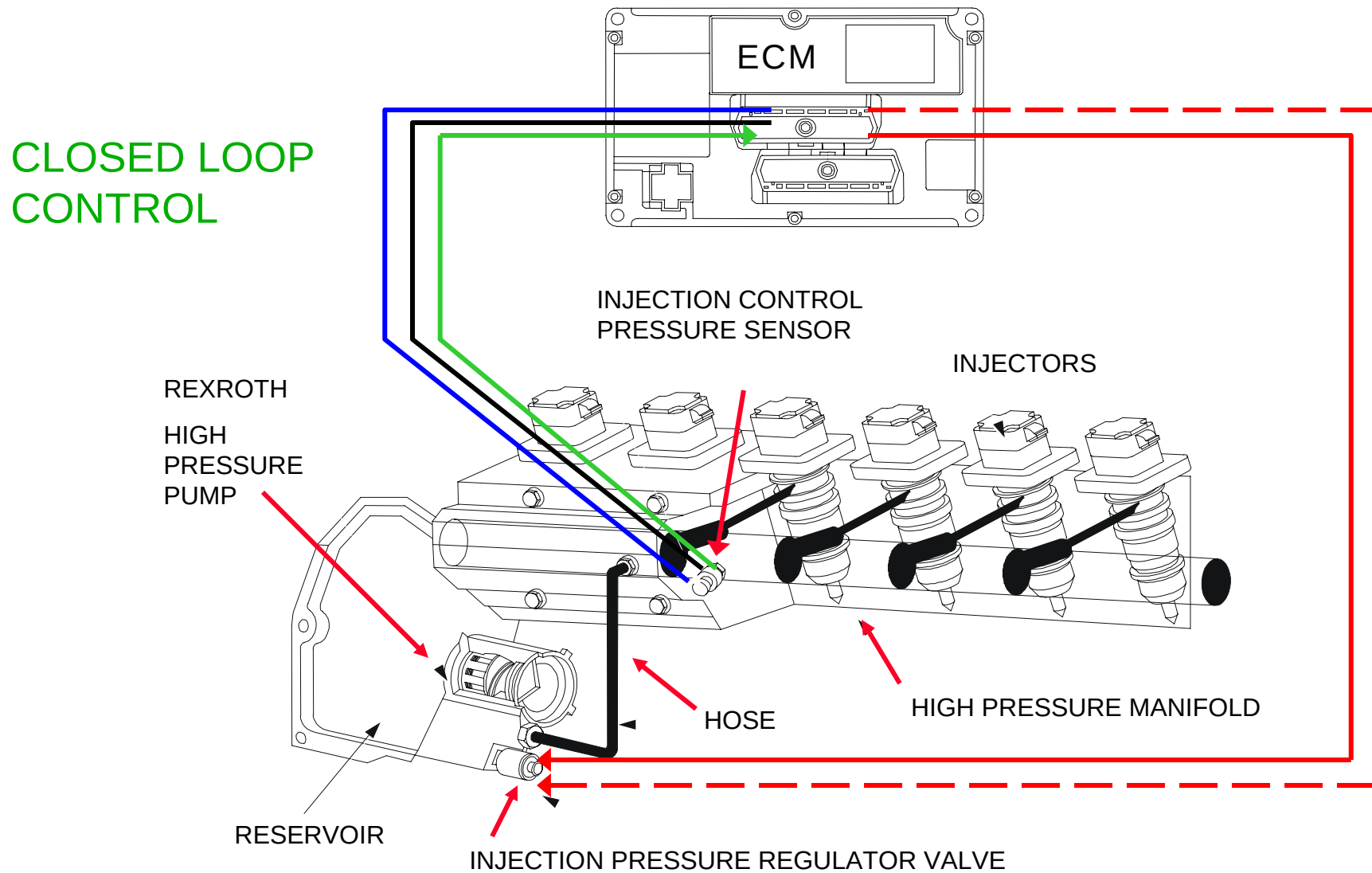


- Average time on (Pulse Width) = average voltage.
- Pulse runs at 500Hz.

PWM Operated, Injection Pressure Regulator



Injection Pressure Control System



Electronic Control Module (ECM)

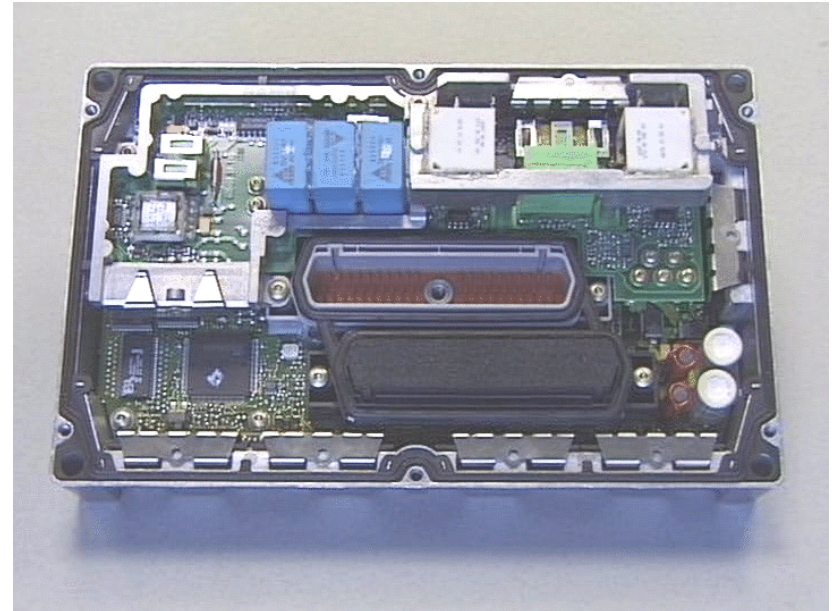
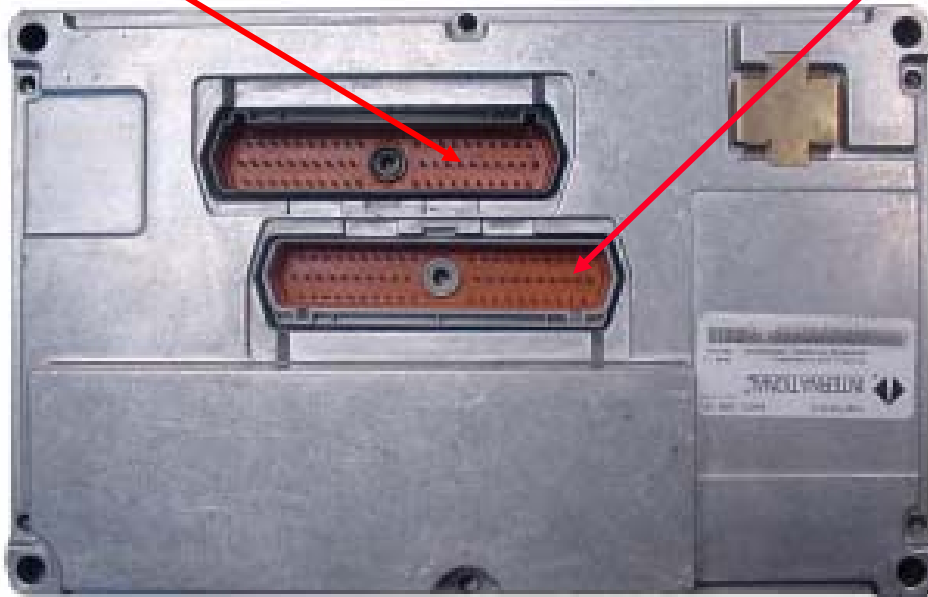
Inside the ECM is the Management System that Controls and Provides:

- Speed Governing.
- Air/Fuel Ratio.
- Start/Stop Sequence.
- Engine Protection Devices and Diagnostics.
- 110 volt Injection Solenoid voltage.

Electronic Control Module (ECM)

All OEM/Customer
Connections

All 'On Engine'
Connections



- Do not Paint ECM

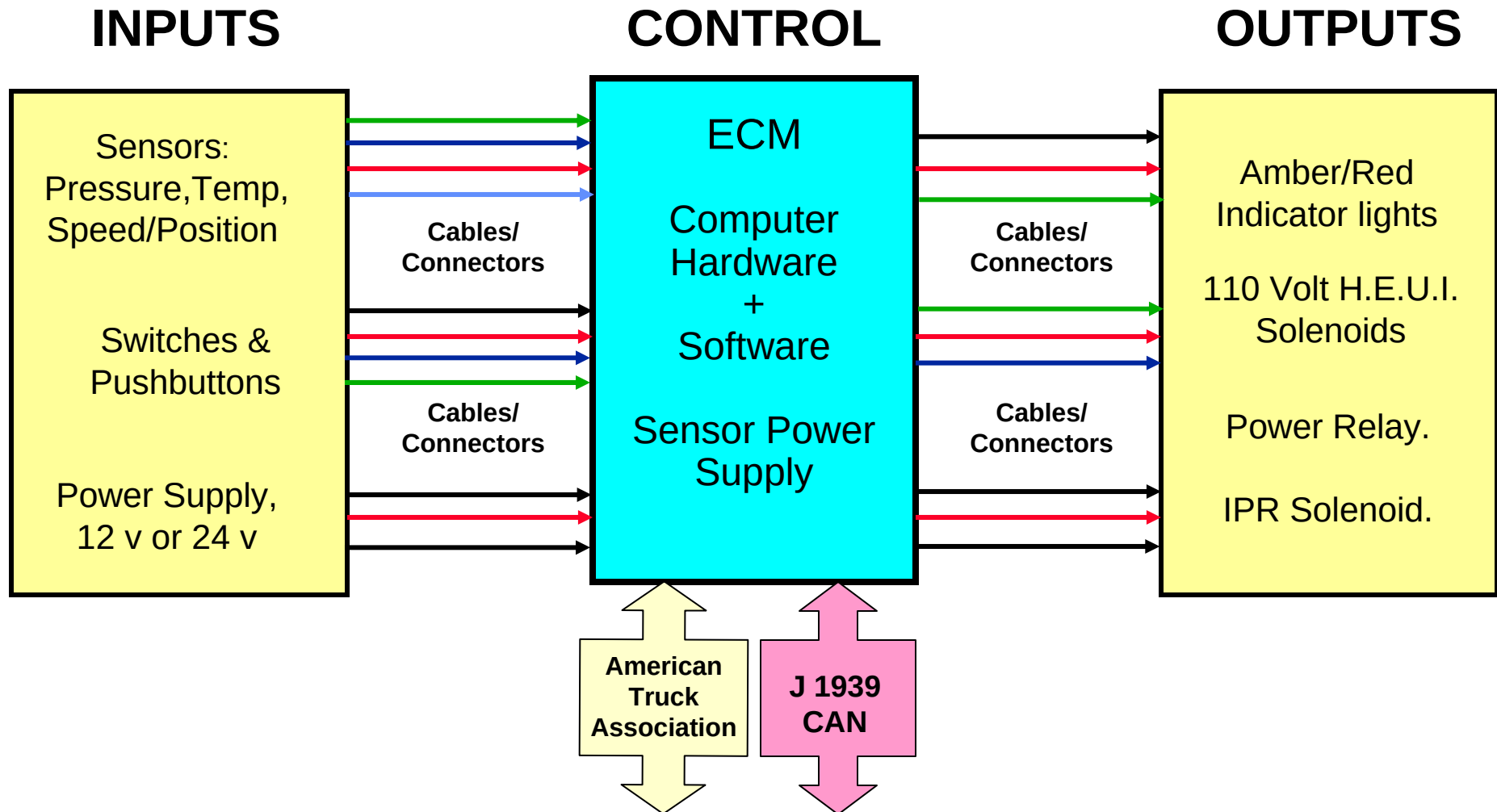
ECM Grounding

- Grounding
 - The 1300 Series ECM **does not need** a ground strap, it is connected to the aluminum ECM body internally.
 - This connection prevents EMI, Electro Magnetic Interference, affecting the interior electronic circuits of the ECM.

WARNING!

When carrying out welding or electrostatic paint spraying, special precautions should always be followed.

1300 Series Basic System - Interactions



1300 Series - ECM System Inputs

- Convert physical action into electrical signals.
- Typically on a 1300 Series engine they include:
 - Temperature, Pressure and Speed/Position Sensor.
 - Pushbuttons and Switches.
 - 12/24 Volt Battery Supply
 - Analogue Potentiometer speed control signals

1300 Series - ECM System Outputs

- Convert electrical signal into physical action, or readable data/information in J1939 for the Electronic Service Tool, (EST) and ATA J1708 information that the Service Tool understands.
- Typically include:
 - Injector solenoids pulses (110 volts)
 - Relay, correct current rating, 40 A. (don't forget diode protection)
 - Lamps, **Red**, **Amber**, Diagnostics/Coolant/Oil,etc
 - Service Tool, (ATA) SAE J1708
 - Controller Area Network, (CAN) SAE J1939 (minimal information)

1300 Series ECM: Essential Messages

- High Reliability.
- External connectors most vulnerable: bent pins, over tightened ECM plugs etc.
- No internal fuses or serviceable parts.
- Never replace an ECM without first connecting the Service Tool (ST) or (EST) and carrying out basic diagnostic checks.
- The ECM is the **LAST** component you should suspect.
- Before an ECM is returned:- Please contact the **'Technical Support Centre'**

Technical Support Centre



If you need Technical advice
contact our dedicated Engineers

Use the Request Form
on the Perkins Secured Internet @
<http://www.perkins.com/perkins/cda/technicalSupportRequest/1,4077,,00.html>

Or
Send an e-mail to:
technical_help@perkins.com

For URGENT queries only, telephone +44 (0) 1733 58 2858

1300 Edi Engine Sensors

On Engine (Gray Connector)

- Engine Coolant Temperature. (ECT)
- Engine Oil Temperature. (EOT)
- Manifold Absolute Pressure. (MAP)
- Engine Oil Pressure. (EOP)
- Injection Control Pressure (ICP)
- Camshaft Motion Pickup. (CMP)

Off Engine (Black Connector, only IOPU)

- Inlet Air Temperature. (IAT)
- Barometric Pressure. (Baro)

SENSORS

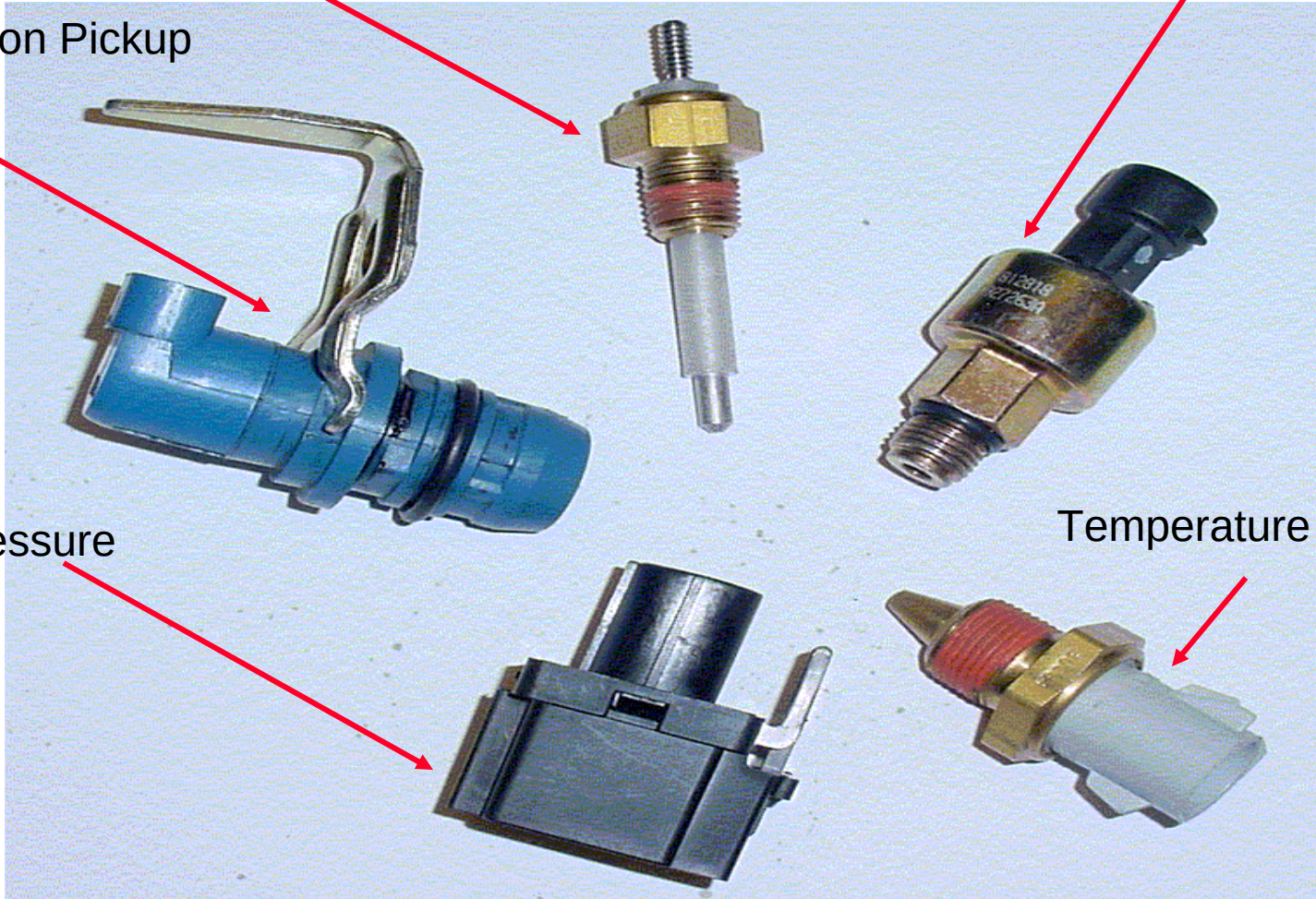
Coolant Level

Injection Control Pressure

Camshaft Motion Pickup

Barometric Pressure

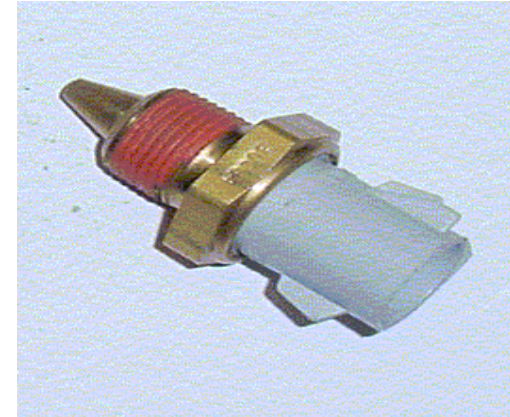
Temperature



System Components - Temperature Sensors

Thermistors:

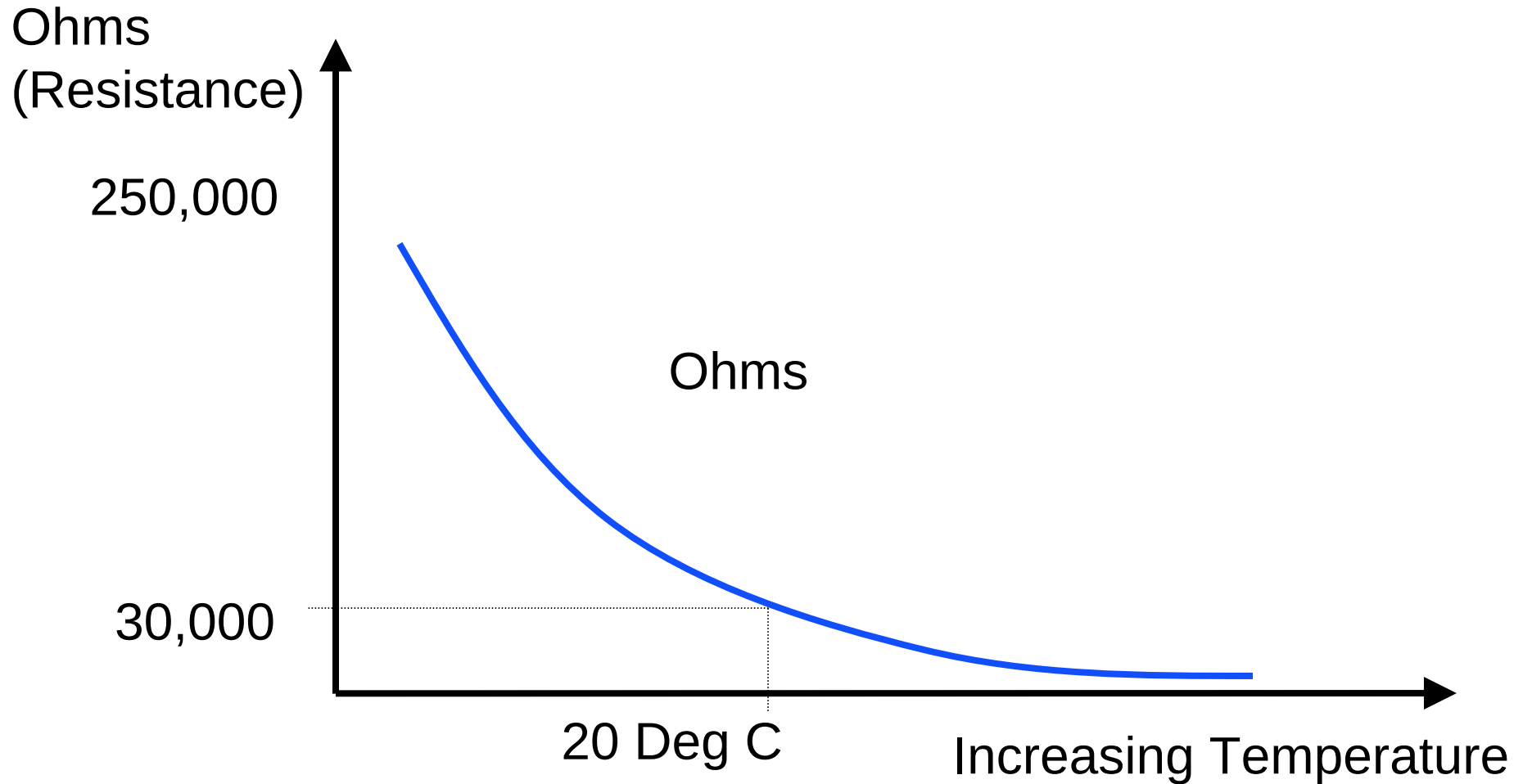
- Semiconductor sensing devices
- Resistance varies with temperature
- Negative Temperature Coefficient (NTC) i.e. As temperature increases its resistance decreases



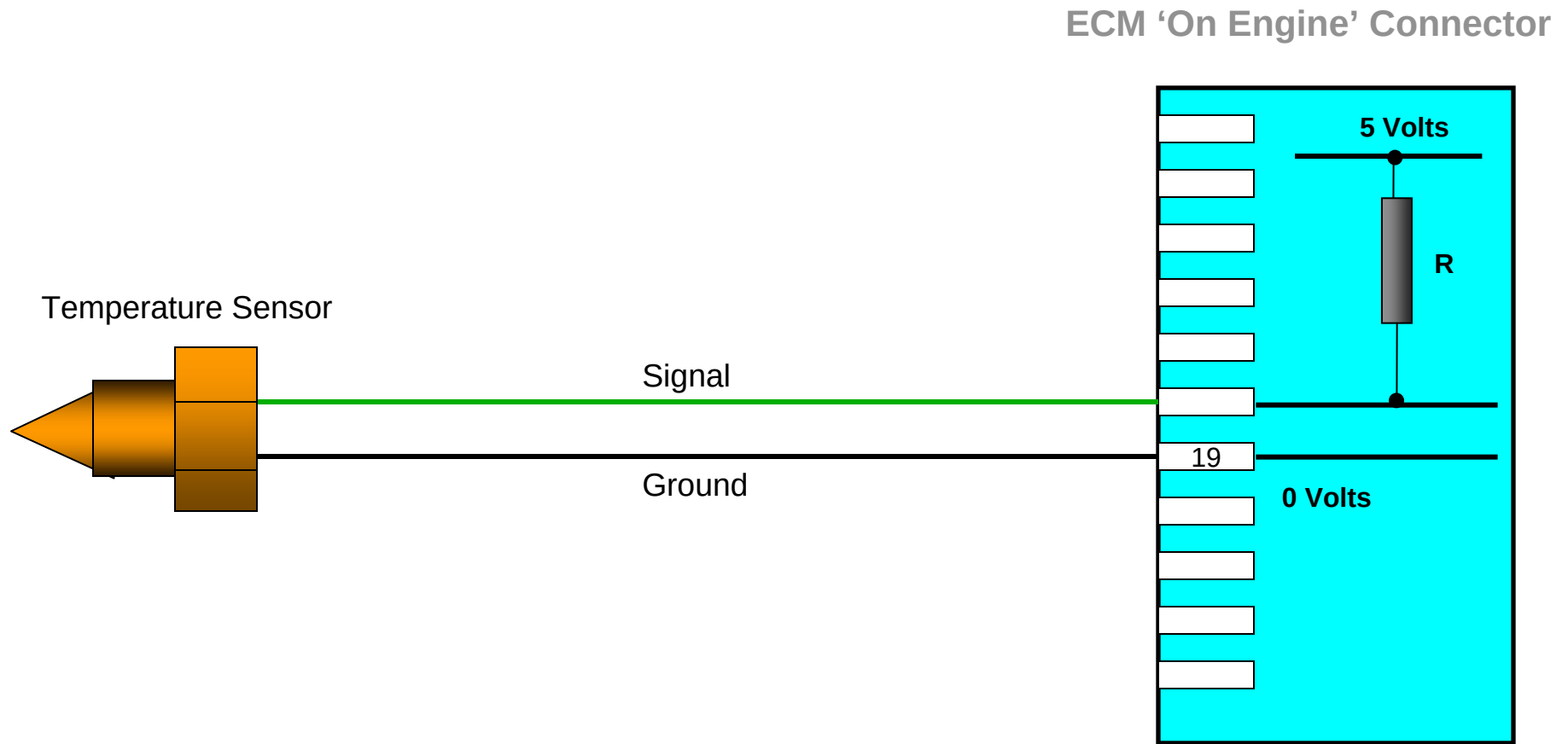
System Components - Temperature Sensors

- Engine Oil Temperature (EOT) Sensor
 - Used to determine the timing and quantity of fuel required to optimize starting over all temperature conditions.
 - Provides a Temperature reading for the Service Tool.
- Fuel Quantity and Timing is Controlled to Compensate for oil Viscosity Changes.
- If Fault Code is 311 or 312, the ECM default to ECT Value and the Warning Lamp will illuminate. If both ECT & EOT are not working the ECM will assume –1.7 Degree C for Starting and 100 Degrees C for Engine Running.

System Components - Temperature Sensors

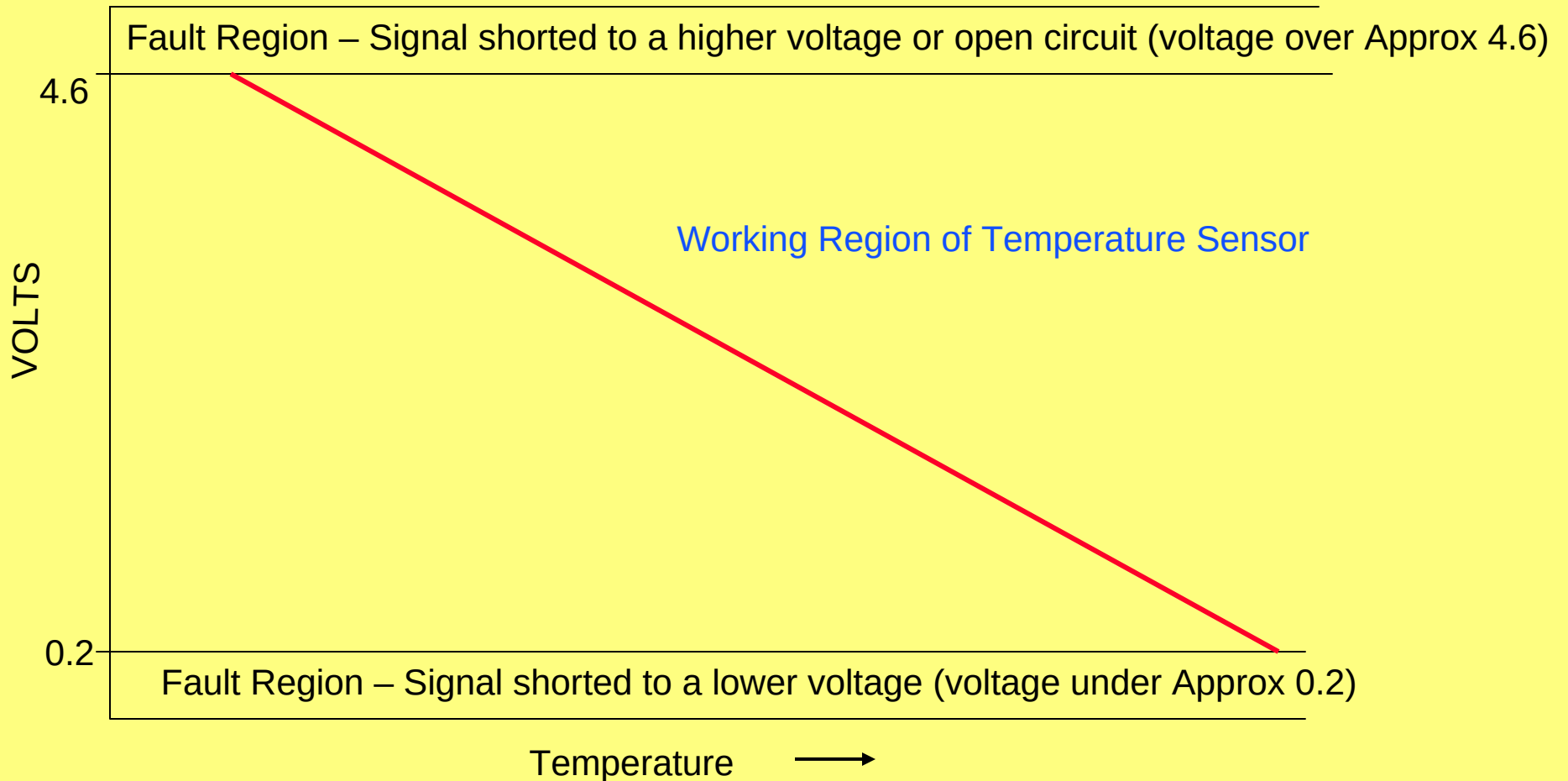


Temperature Sensor Operation



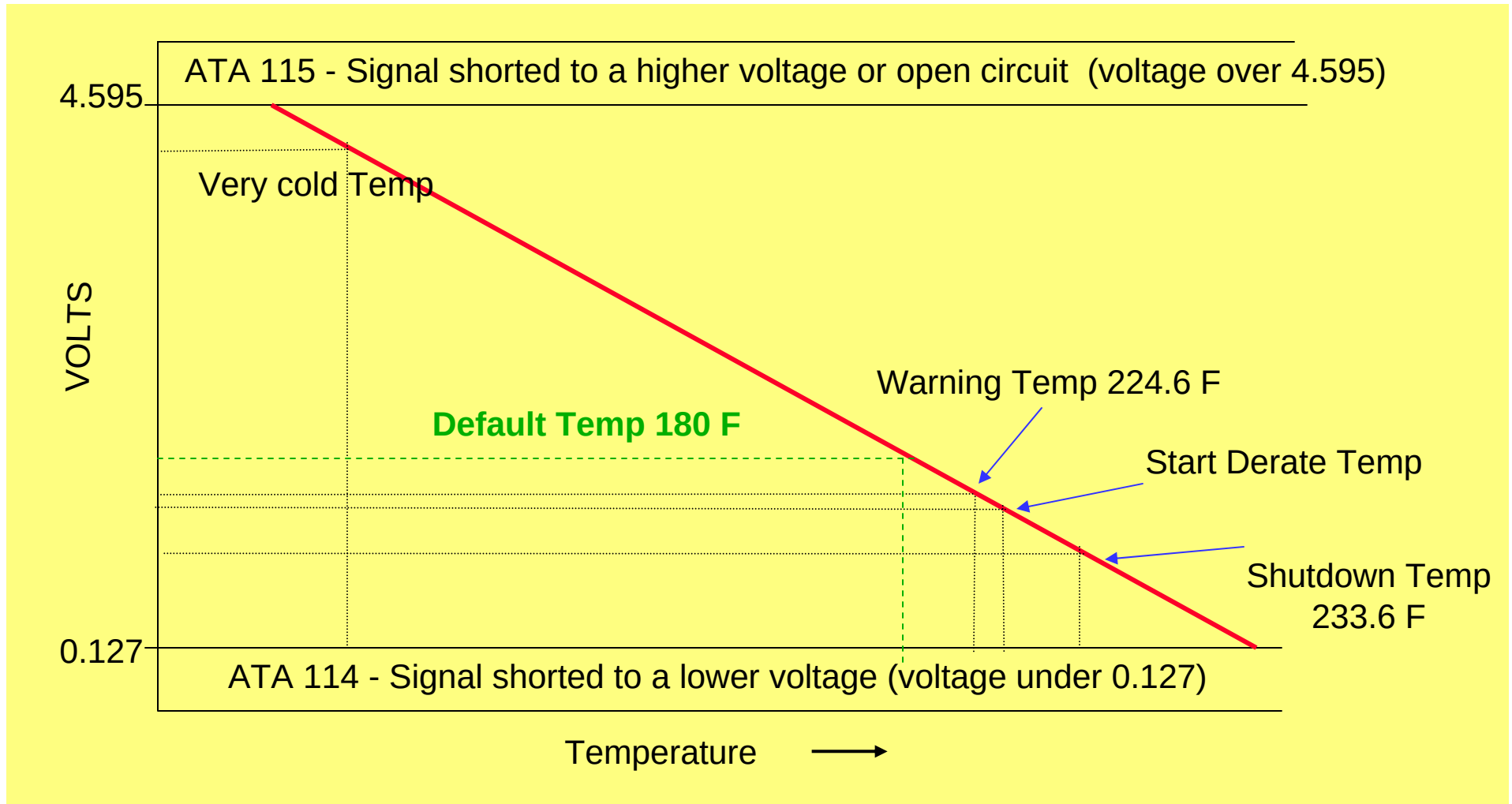
Temperature Sensor Operation

Change of Signal Voltage with Temperature



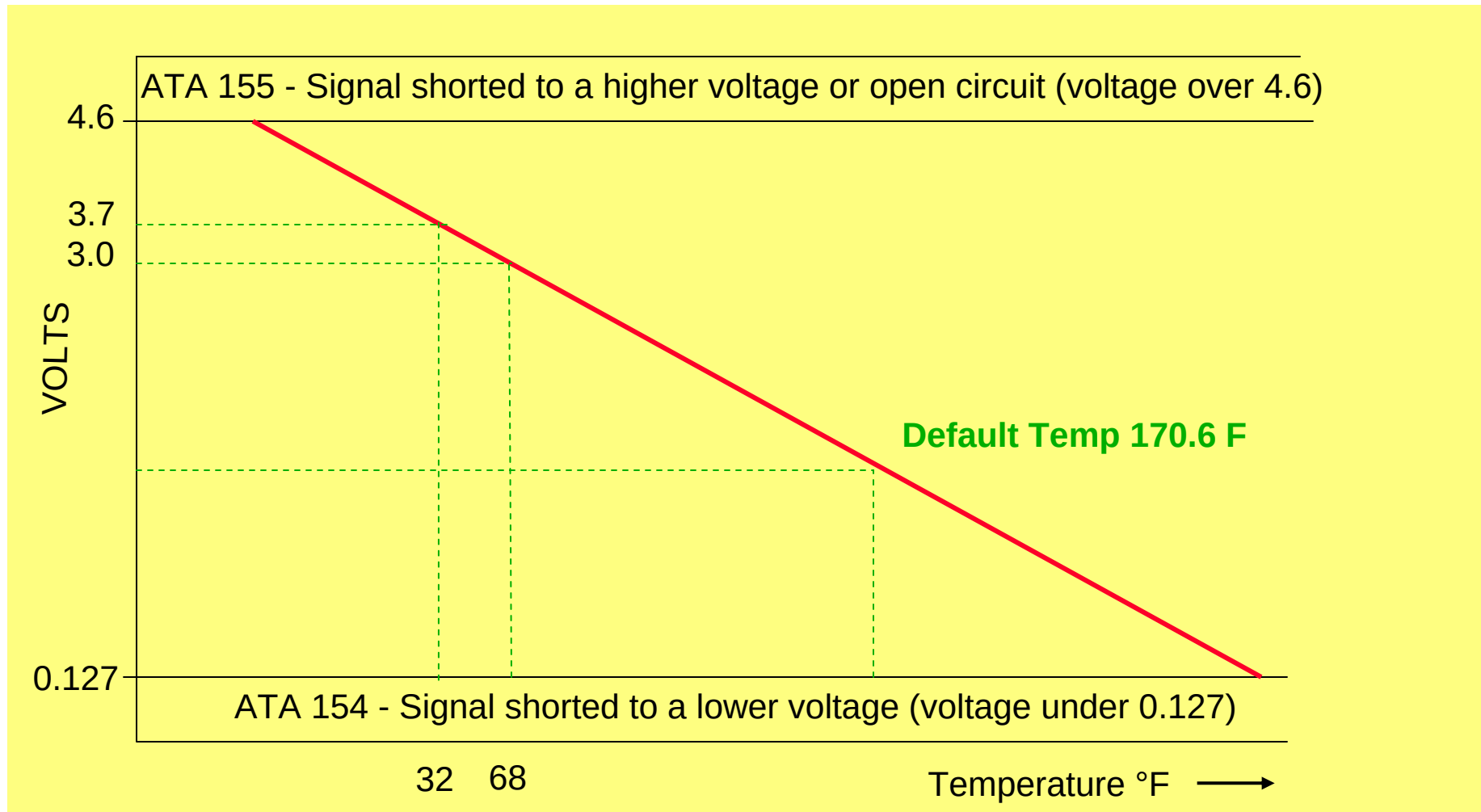
Engine Coolant Temperature Sensor (ECT)

(ATA Codes - 114, 115,)



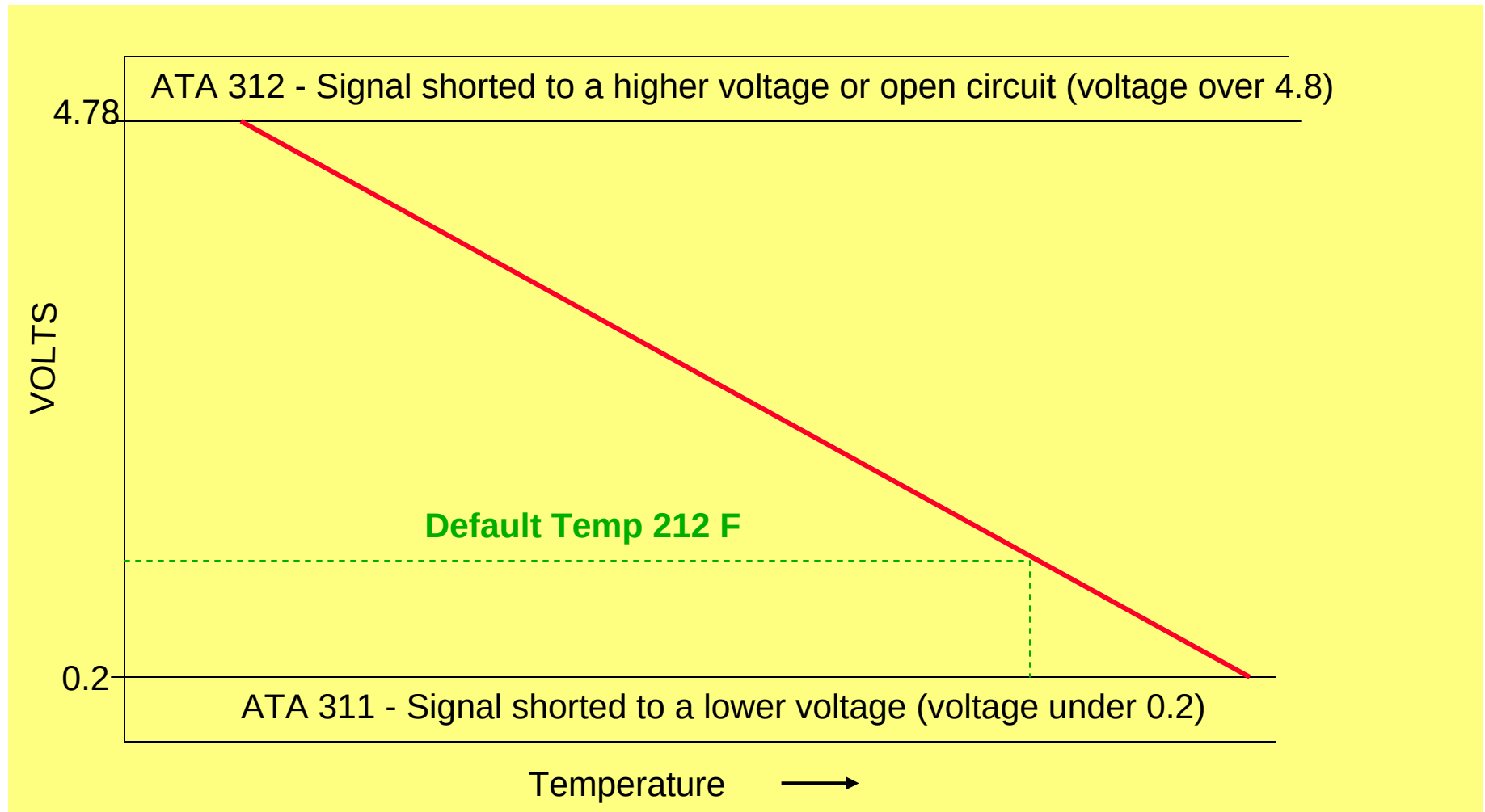
Intake Air Temperature Sensor (IAT)

(ATA Codes - 154,155)



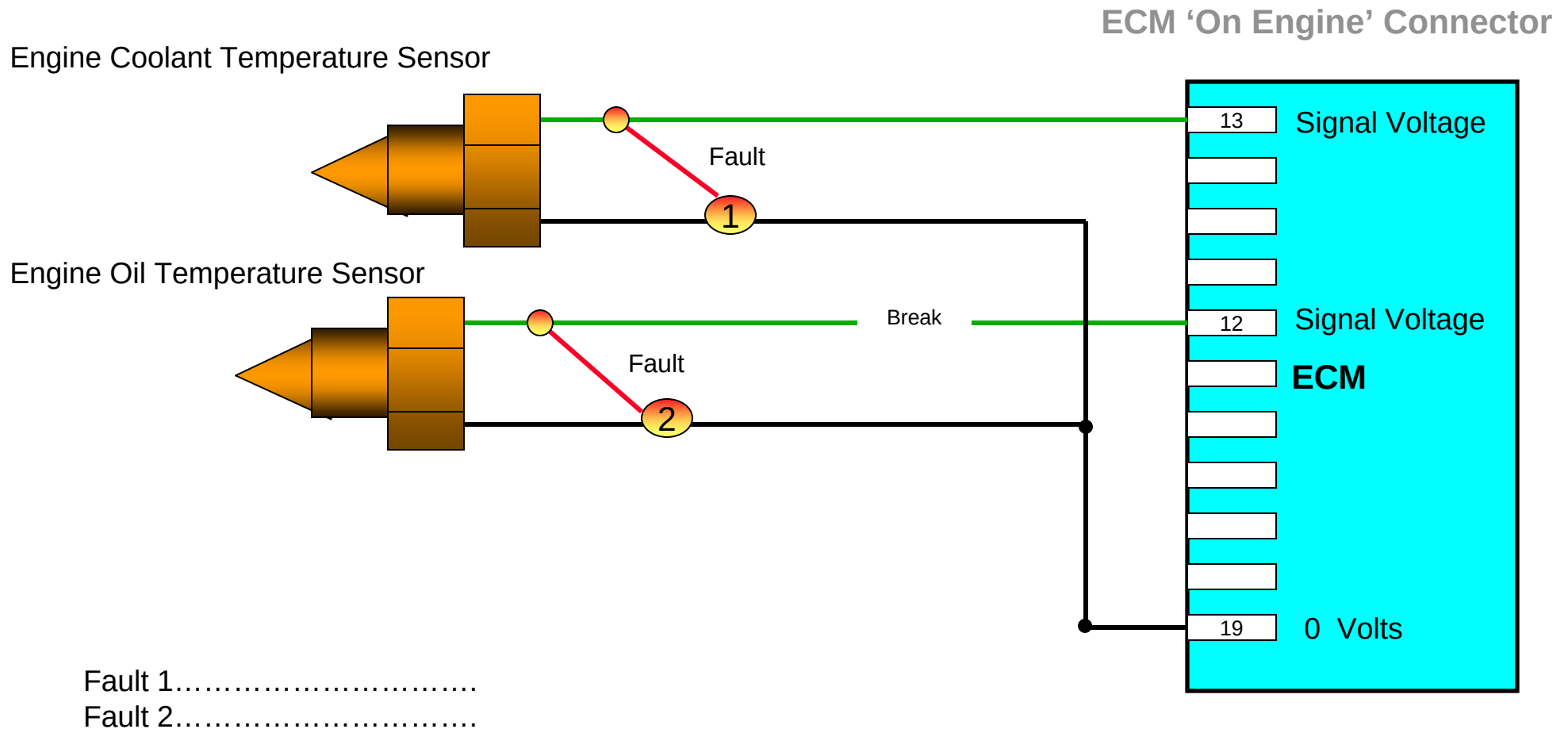
Engine Oil Temperature Sensor (EOT)

(ATA Codes - 311, 312)



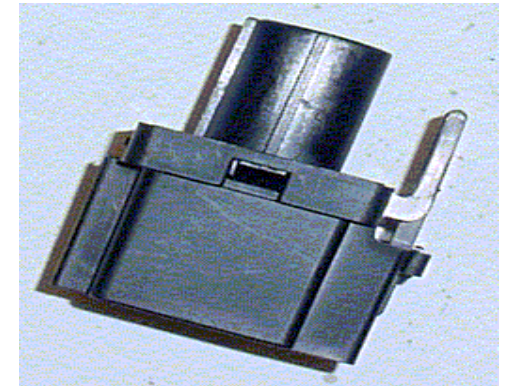
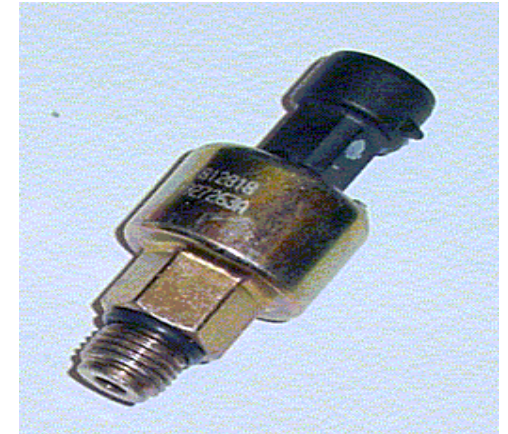
Temperature Sensors

Different Fault codes and how they could be created?



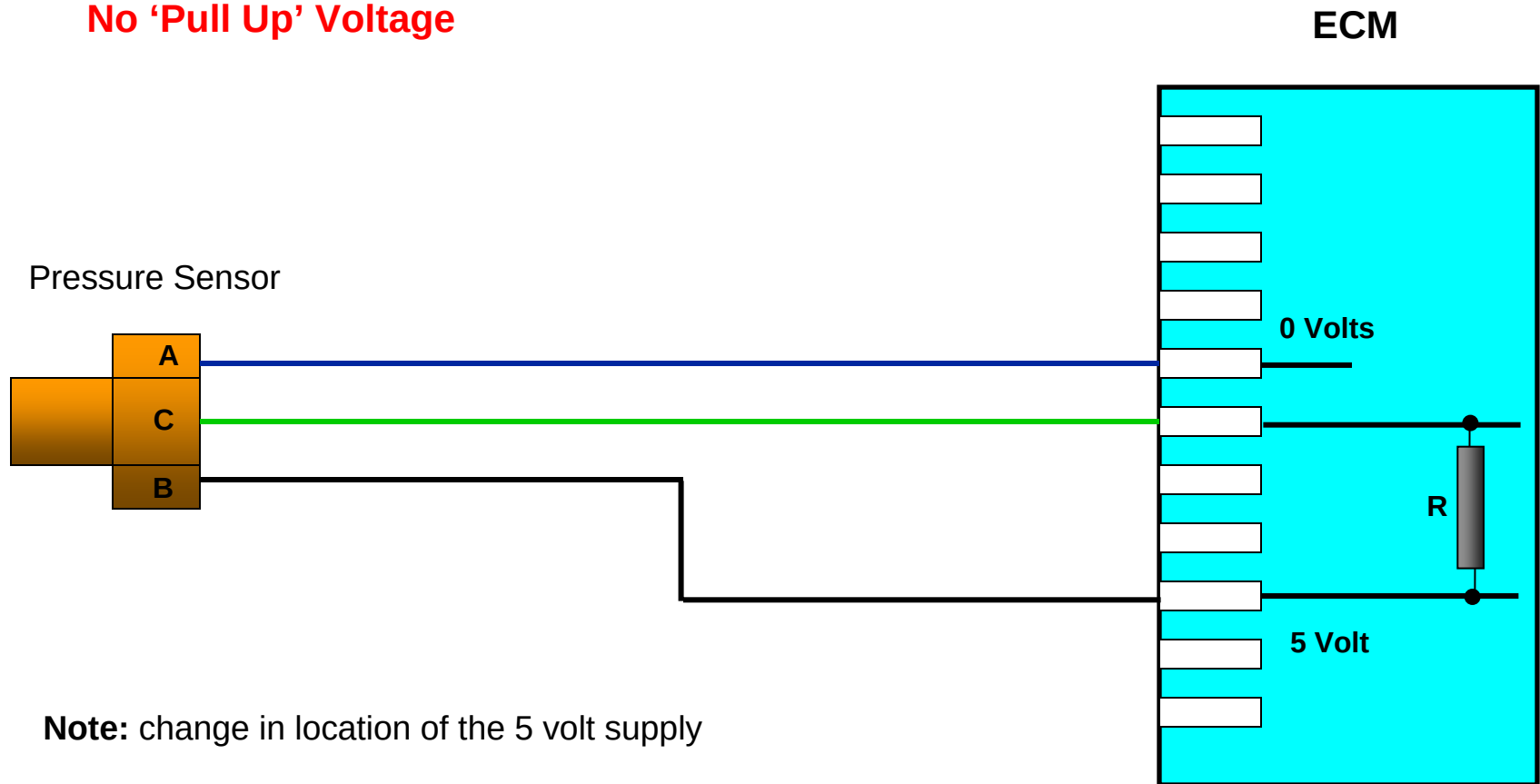
1300 Series Pressure Sensors

- Manifold Absolute Pressure Sensor. (MAP)
- Injection Control Pressure Sensor.(ICP)
- Engine Oil Pressure Sensor. (EOP)
- Barometric Pressure Sensor.(Baro)

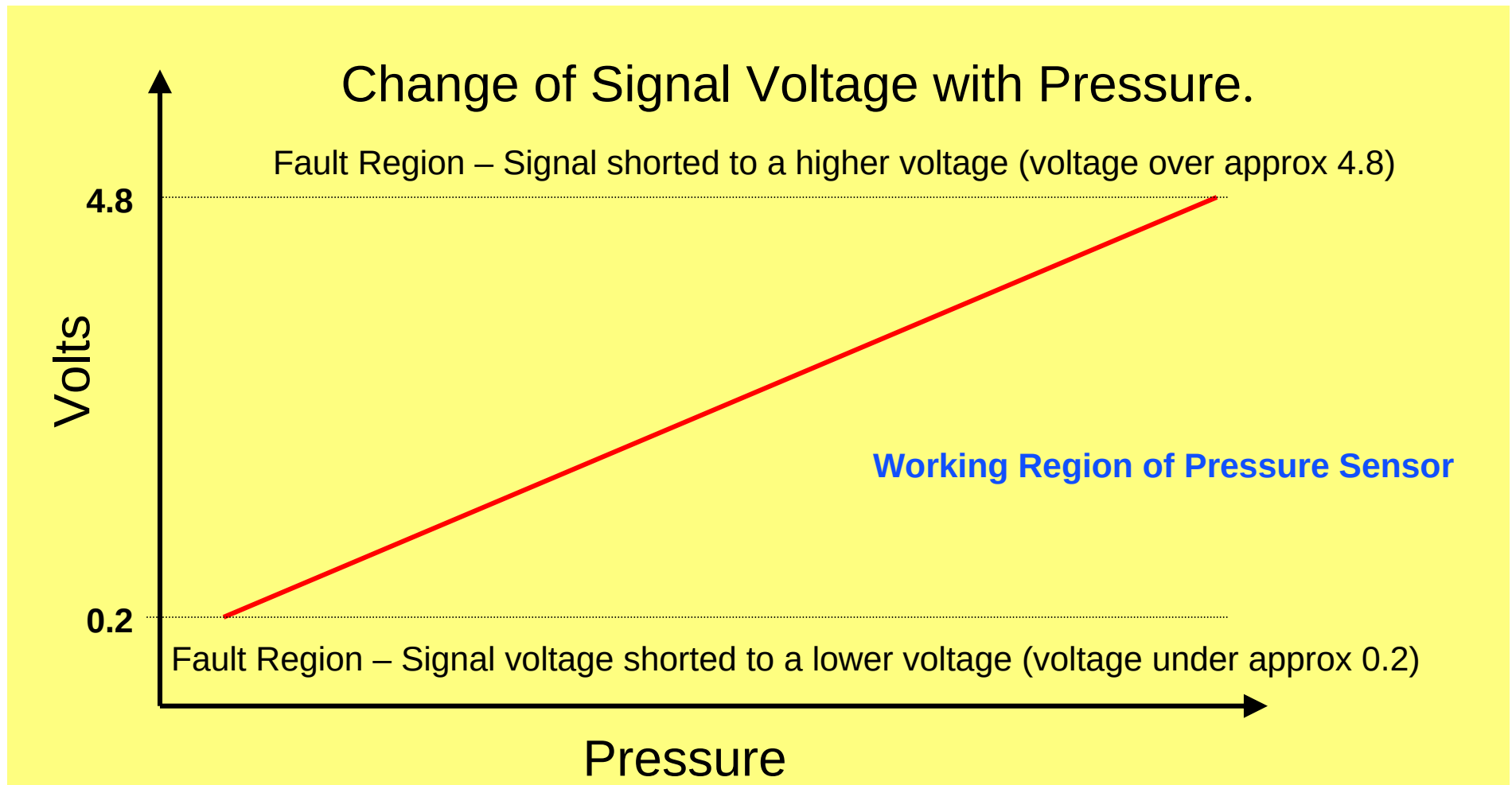


1300 Edi Pressure Sensor Operation

No 'Pull Up' Voltage

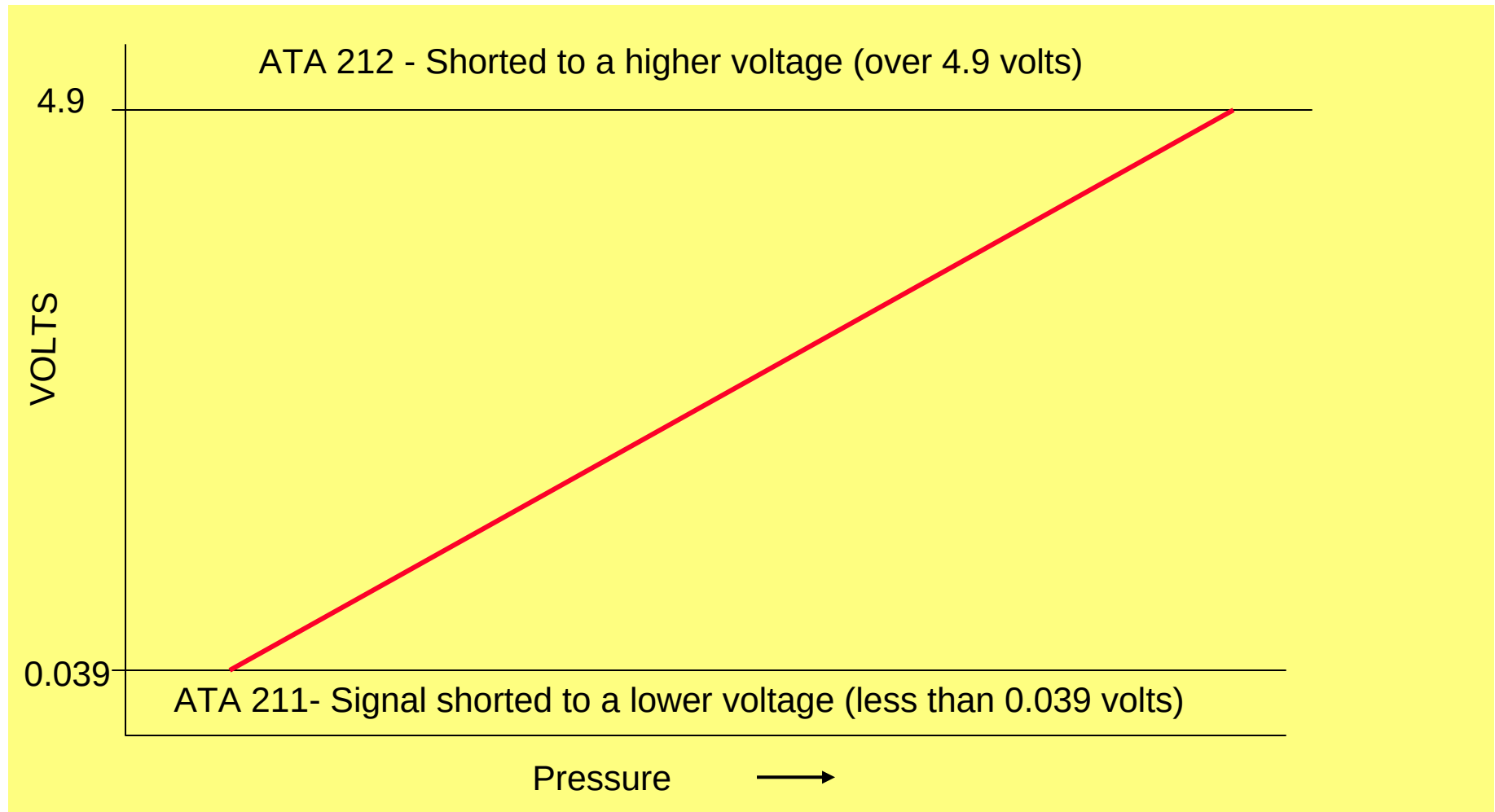


Engine Mounted Pressure Sensors



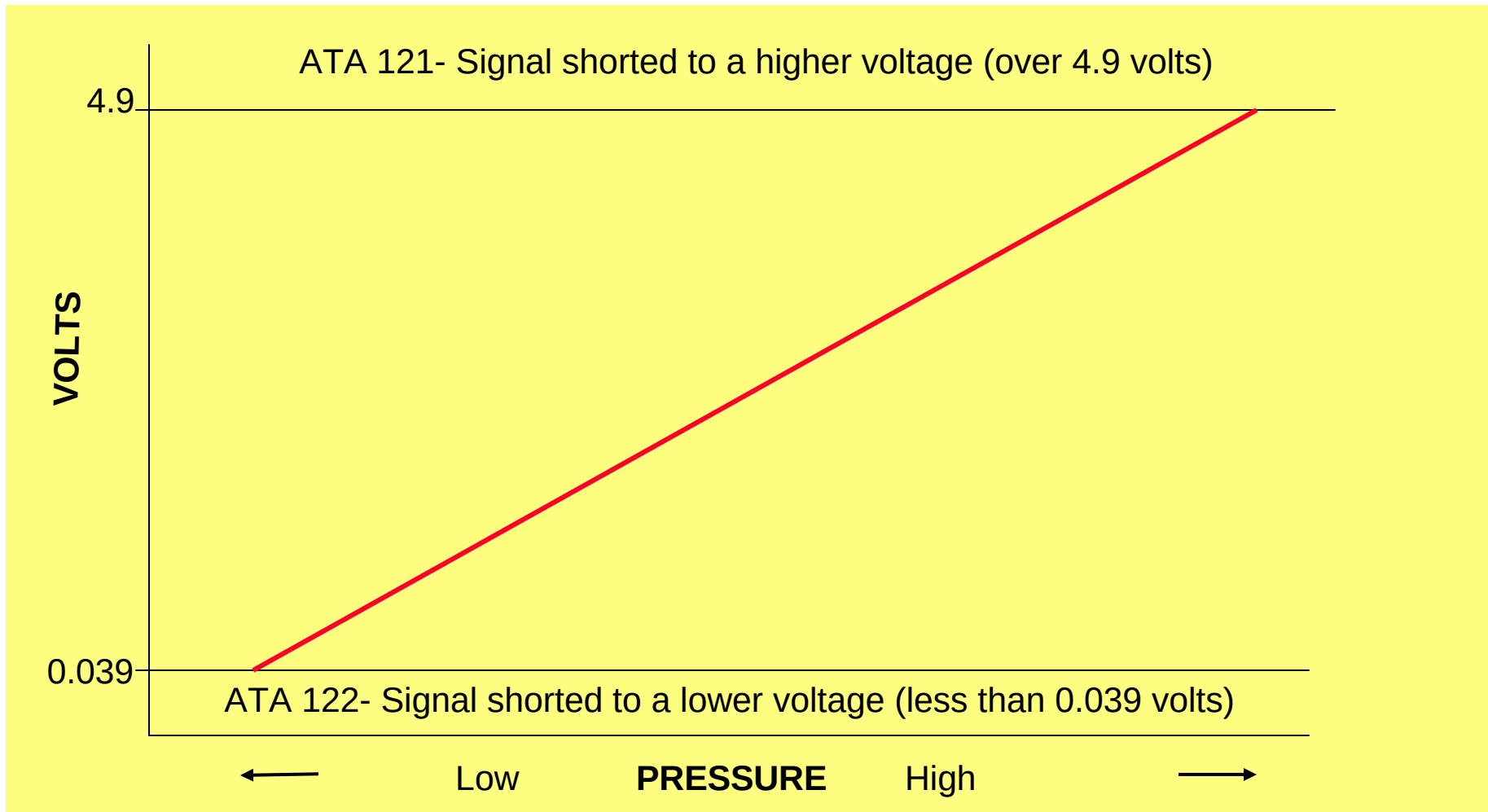
Engine Oil Pressure Sensor (EOP)

(ATA Codes -211, 212)



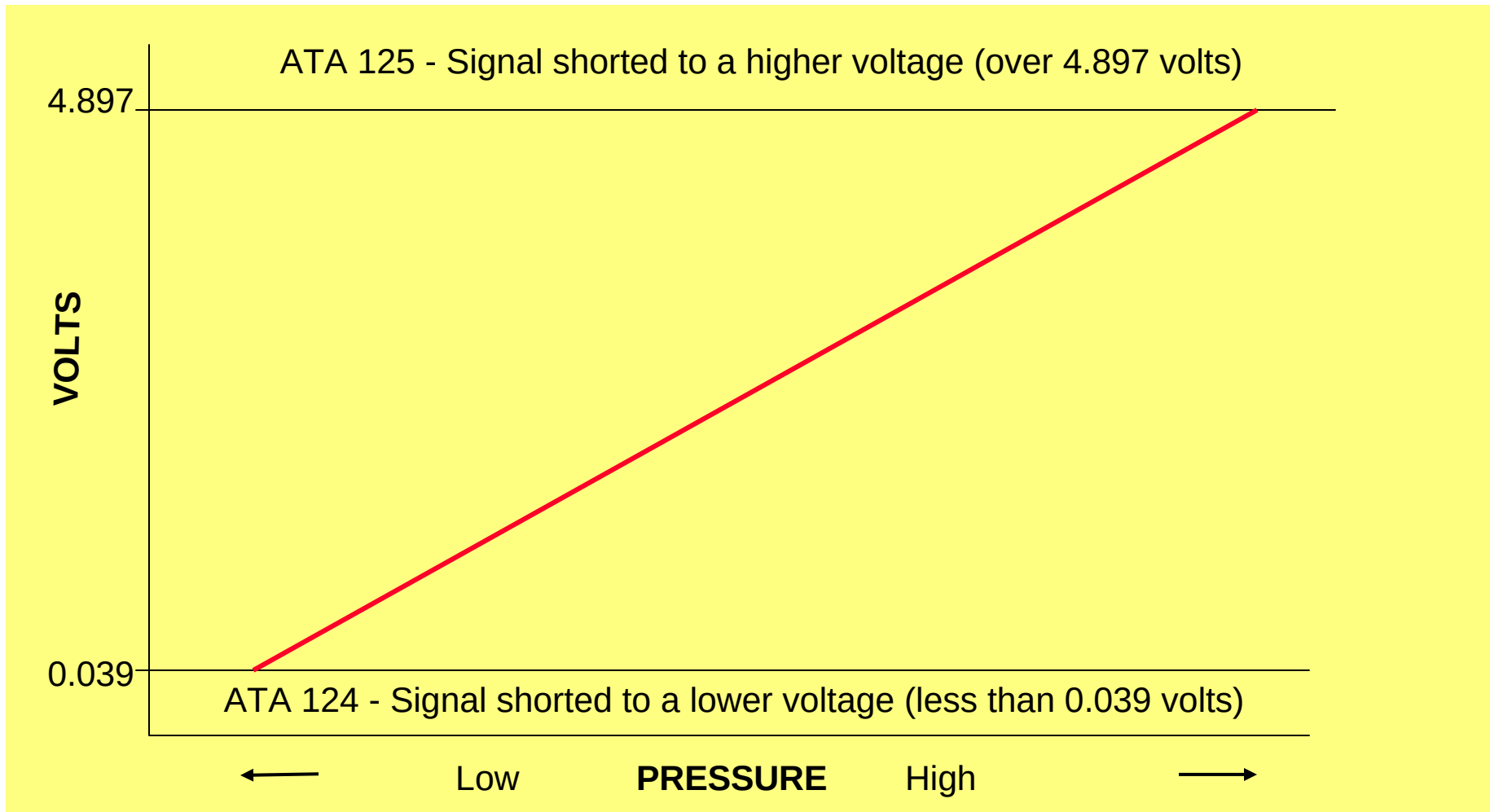
Manifold Absolute Pressure Sensor (MAP)

(ATA Codes -121,122)



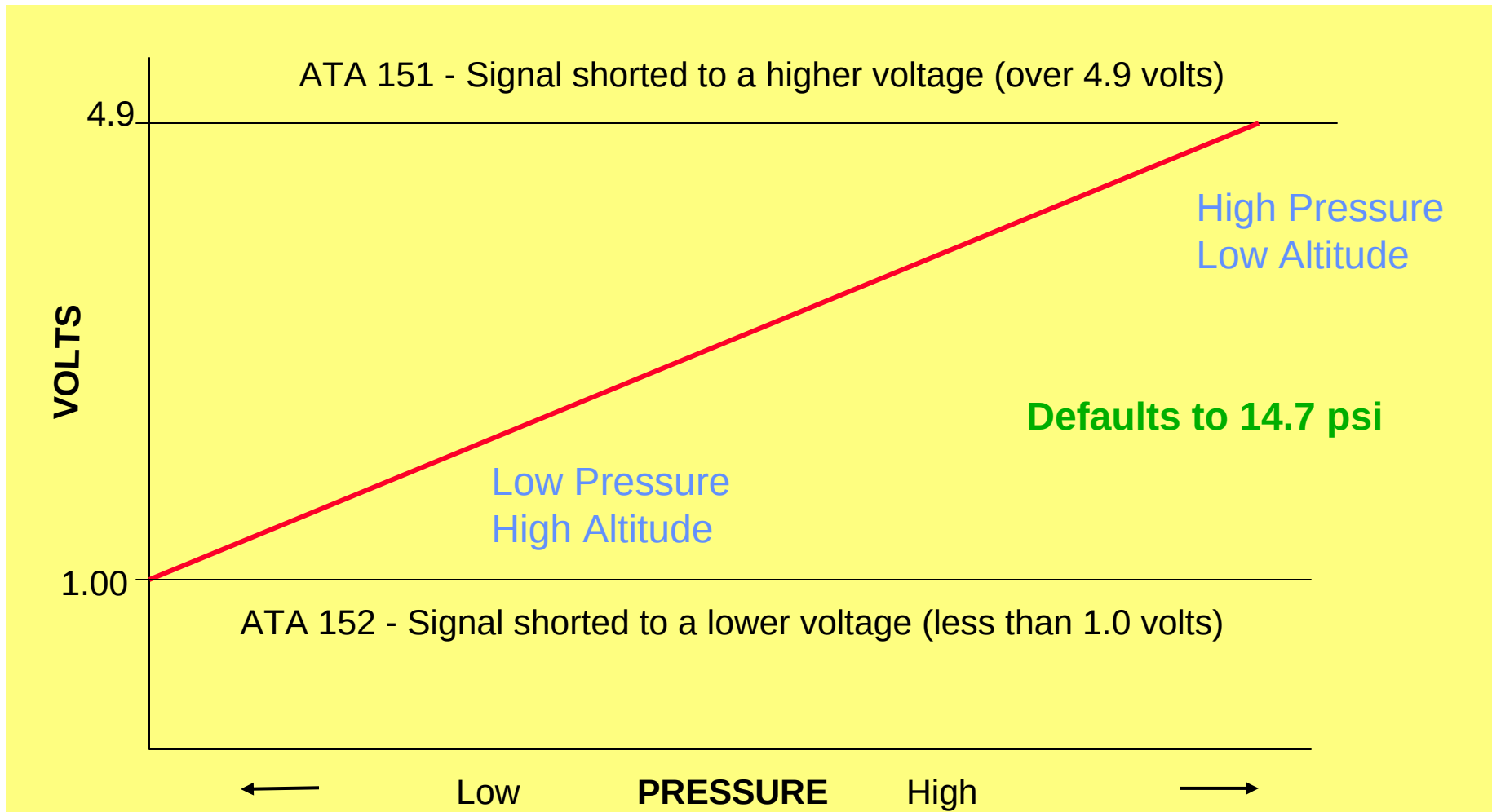
Injection Control Pressure Sensor (ICP)

(ATA Codes – 124, 125)



Barometric Pressure Sensor

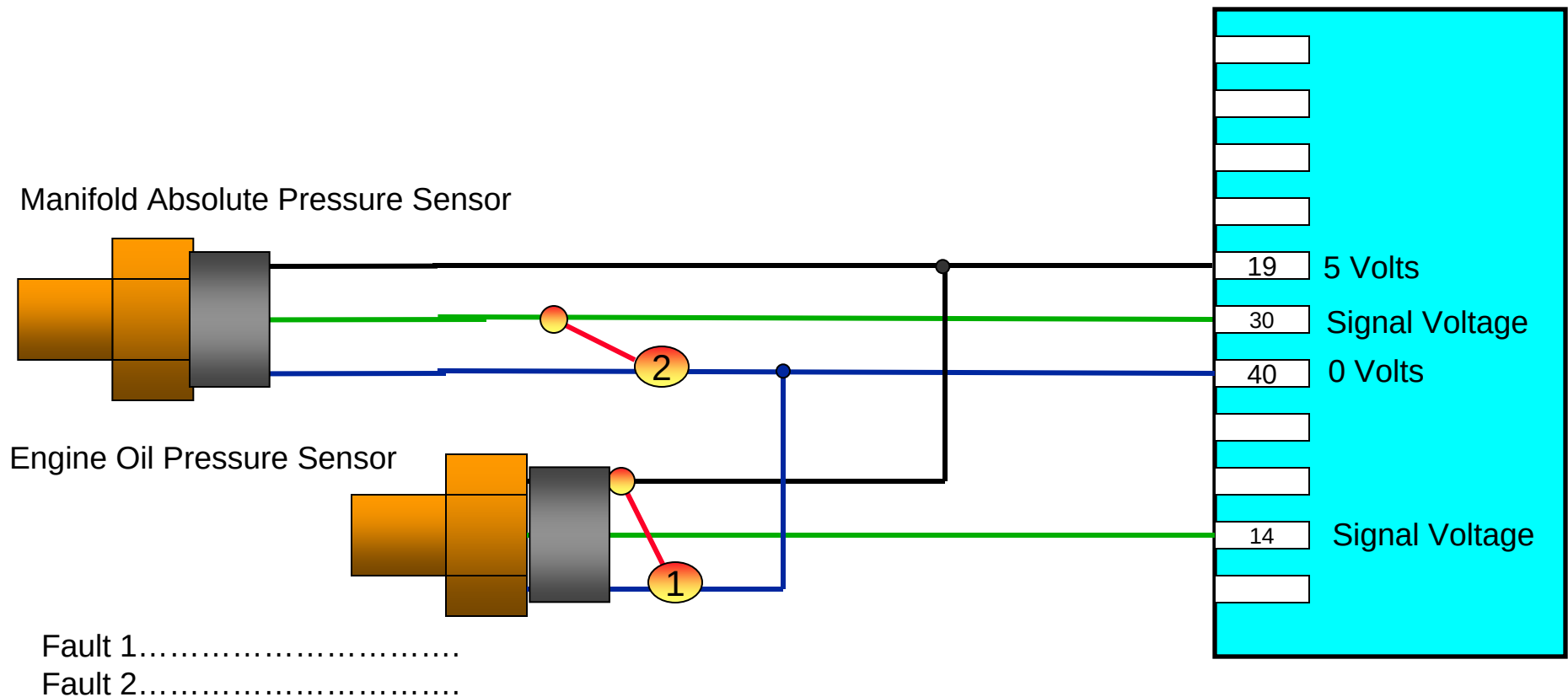
(ATA Codes – 151, 152)



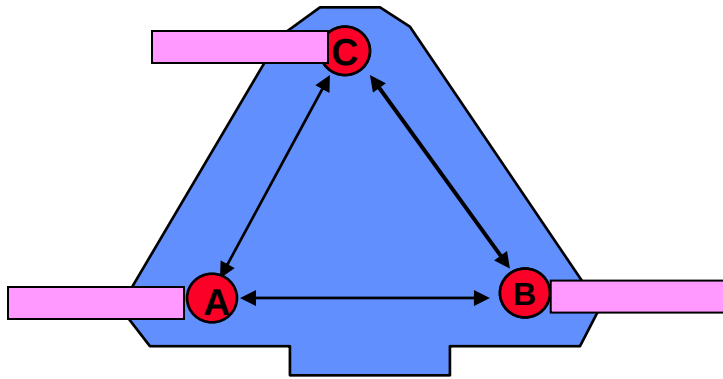
Pressure Sensors

Different Fault codes and how they could be created?

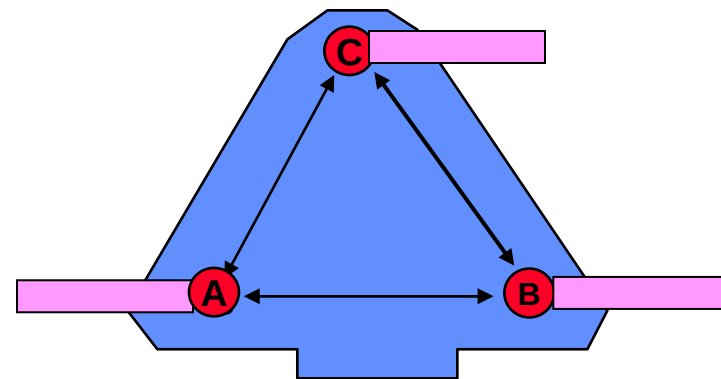
ECM 'On Engine' Connector



Pressure Sensor Feeds, Harness Voltages



Engine Oil Pressure Sensor (EOP)



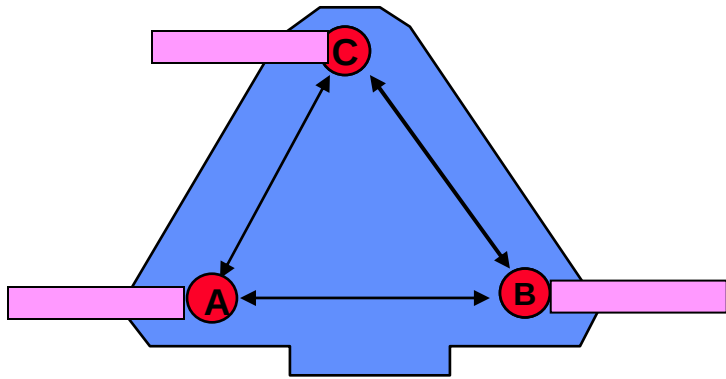
Manifold Absolute Pressure Sensor (MAP)

- Voltage between A & B,
- Voltage between B & C
- Voltage between A & C

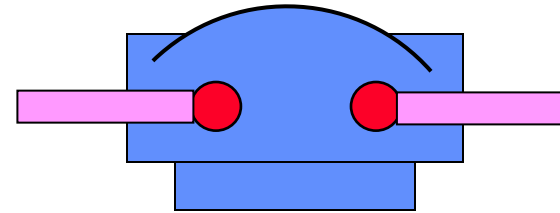
- Voltage between A & B,
- Voltage between B & C
- Voltage between A & C

- **Wiring Harness Plug Connections,**
(Checks the harness to ECM, Gray Connector)

Pressure Sensor Feeds, Harness Voltages



Injection Control Pressure Sensor (ICP)



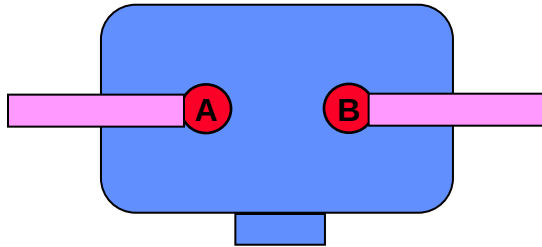
Injection Pressure Regulator Valve Solenoid (IPR)

- Voltage between A & B,
- Voltage between B & C
- Voltage between A & C

- Voltage between A & B,
- Voltage between A & B, (OCC Test)

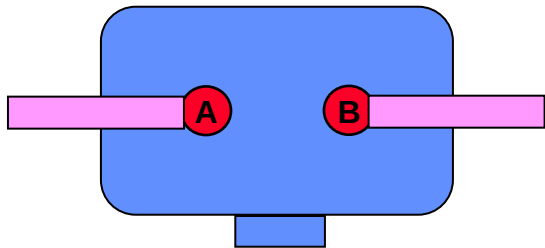
- **Wiring Harness Plug Connections,**
(Checks the harness to ECM, Gray Connector)

Temperature Sensor Feeds, Harness Voltages



Coolant Temperature Sensor.

- Voltage between A & B.....

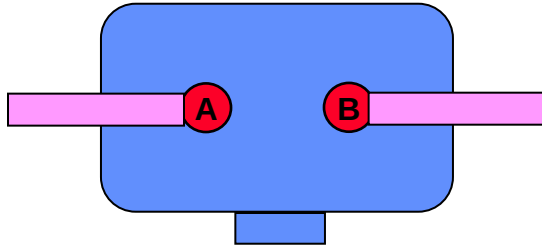


Engine Oil Temperature Sensor

- Voltage between A & B.....

- **Wiring Harness Plug Connections,**
(Checks the harness to ECM Gray Connector)

Temperature Sensor Feeds, Harness Voltages



Inlet Air Temperature Sensor.

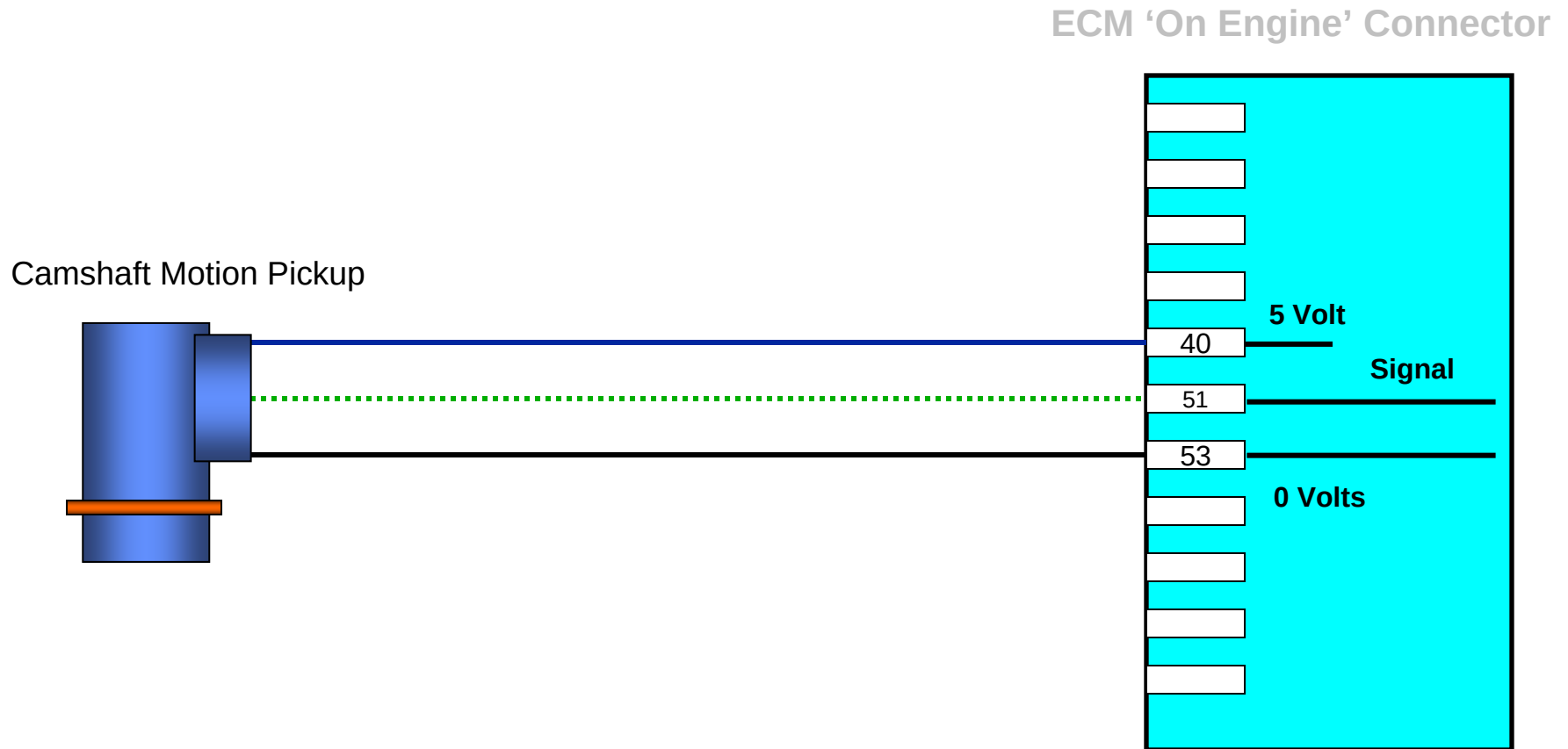
- Voltage between A & B.....

- **Customer Wiring Harness Plug Connections,**
(Checks the harness to ECM Black Connector)

1300 Edi Series Sensor Summary

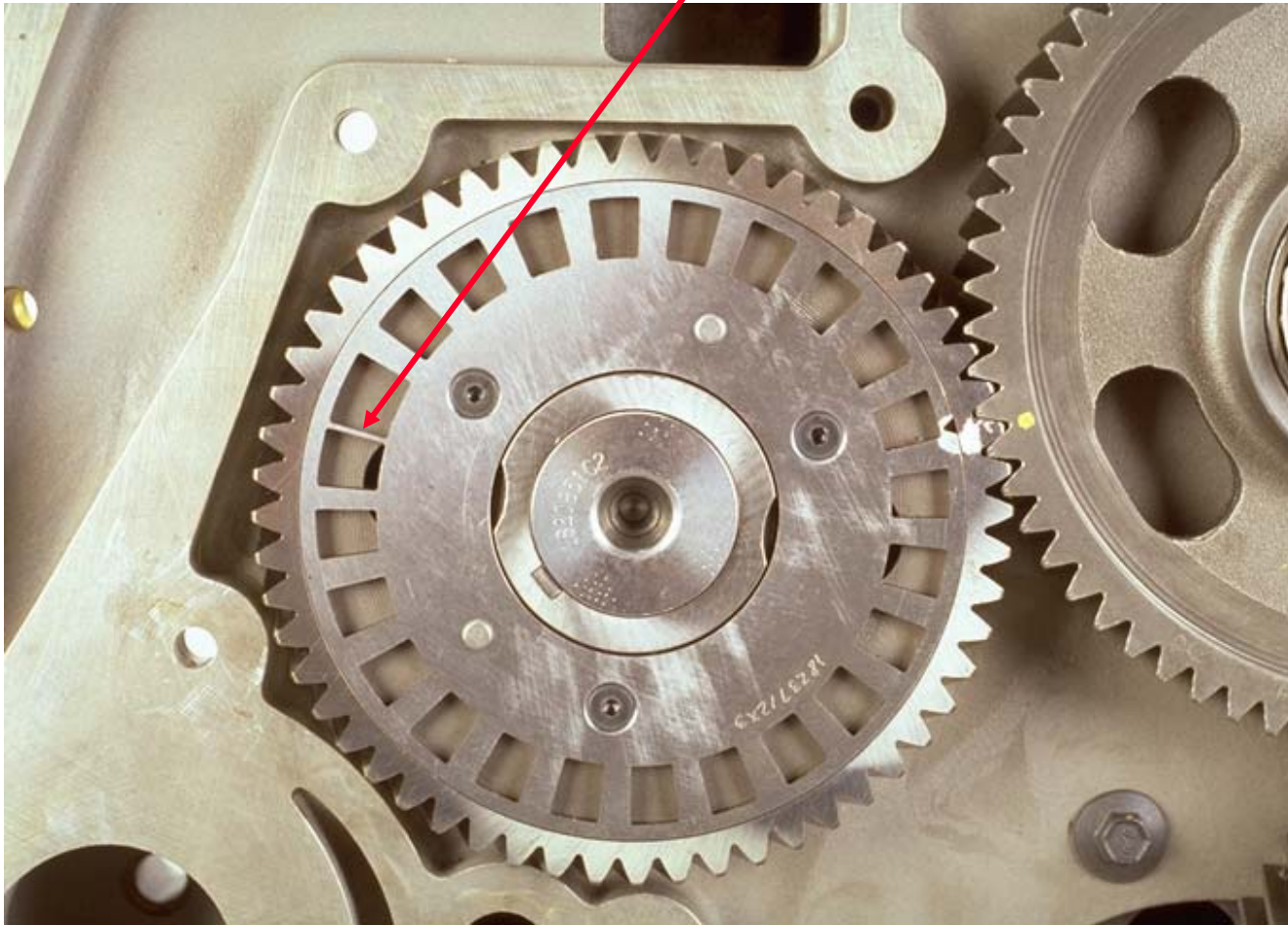
- **Thermistor:-** Sensor used to determine temperature. A thermistor changes it's resistance value in relation to temperature change. The sensors used on most electronic engines are negative temperature coefficient, on temperature rise the resistance falls.
- **Pressure sensor:-** Variable Capacitance sensors are used to measure pressure. The pressure which is measured is applied to a ceramic material. This forces the ceramic to move closer to a thin metal disk, this alters the capacitance value. This change of capacitance is fed to an integrated circuit, with it's own 5 volt power supply, inside the sensor body, which in turn sends an appropriate voltage signal, dependant on pressure, to the ECM.

Camshaft Motion Pickup (CMP) Operation



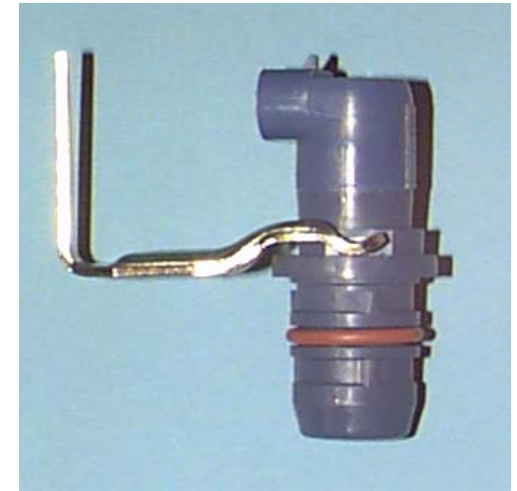
Camshaft Motion Pickup (CMP)

Narrow slot 90 Degree before TDC on number 1

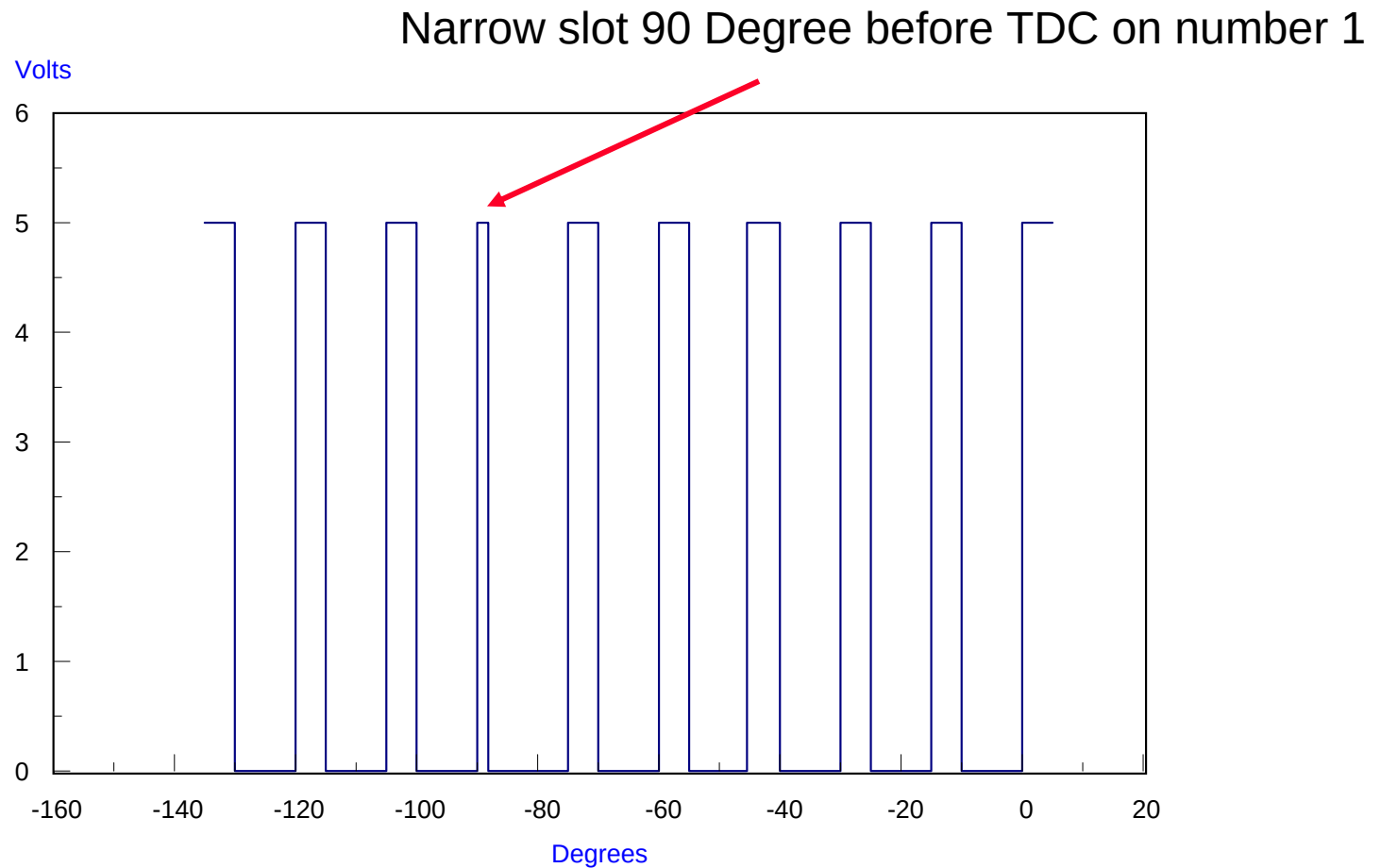


Cam Motion Pickup;

3 Wire **+ 5volts** –
0volts + Digital Signal



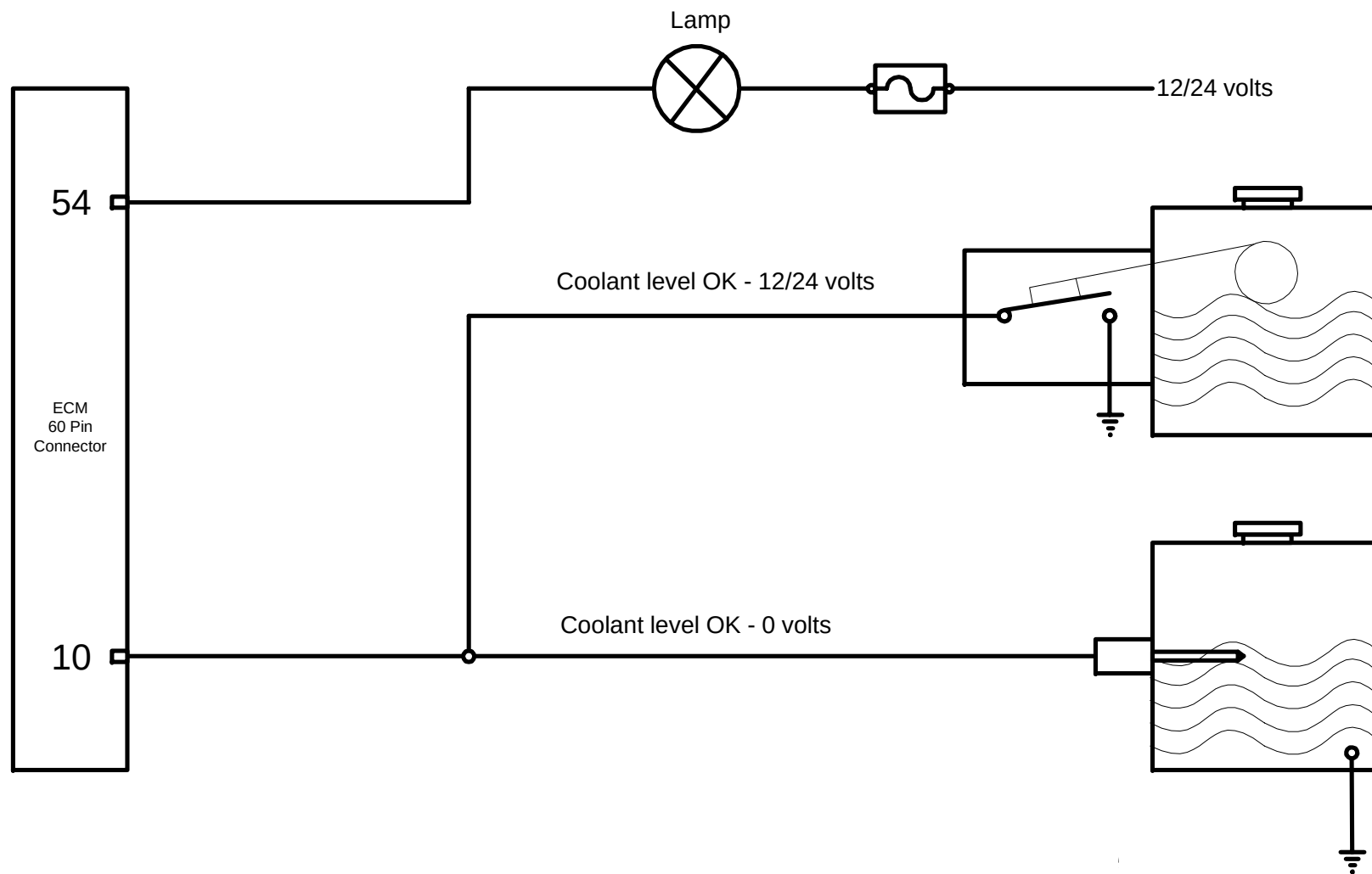
Camshaft Motion Pickup (CMP) Output Voltages (ATA Codes 143, 144, 145,)



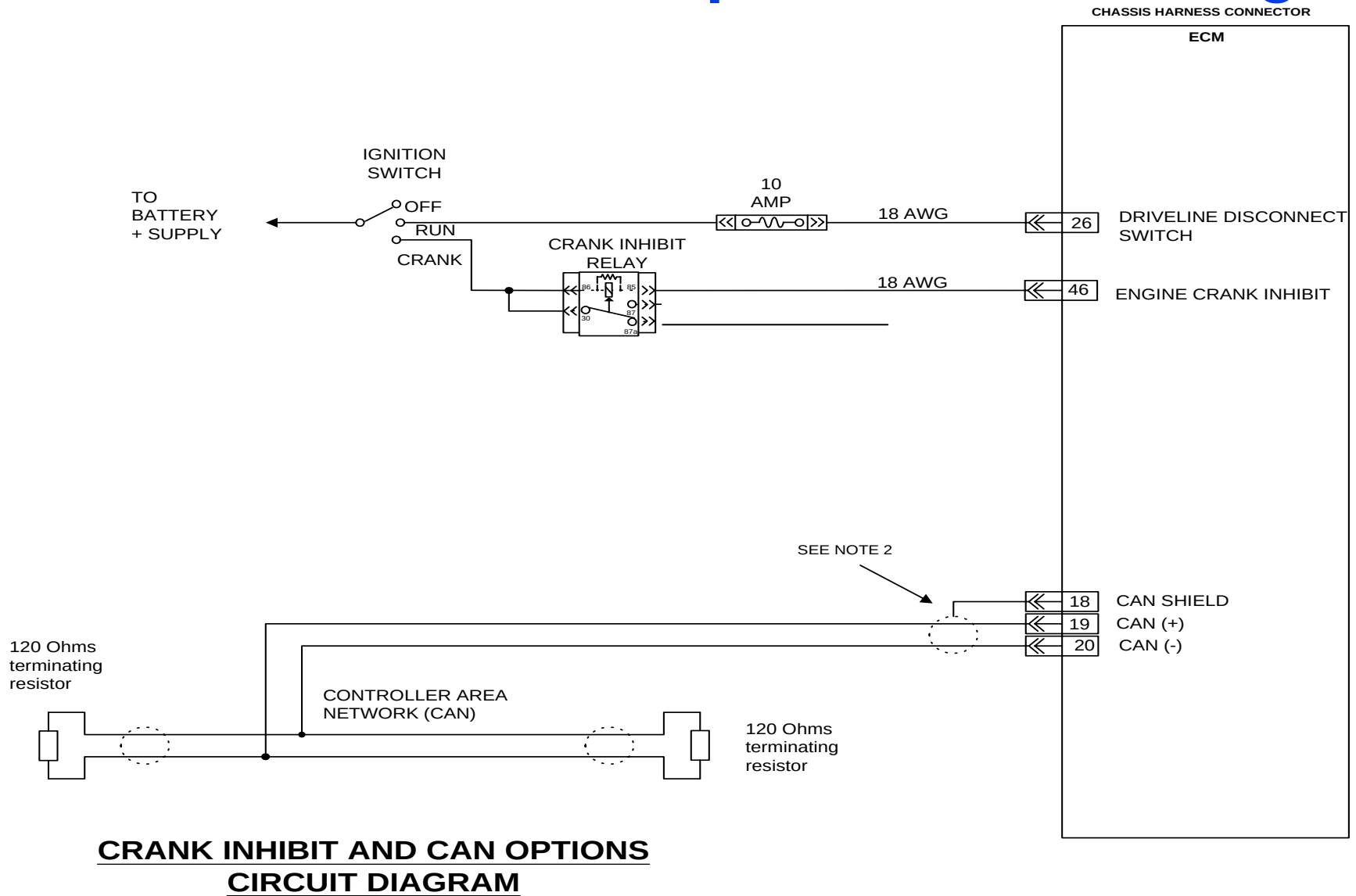
1300 Edi Series Options

Warning Options

Engine Coolant Level



Crank Inhibit and CAN Options Circuit Diagram



Engine Warning (Lamps) and Protection (Shutdown)

(All Have Options have Overspeed Protection)

- **Standard Warning**

- The ECM has no warning or protection system enabled.

- **2 way warning**

- The ECM monitors 'coolant temp' and 'oil pressure'. If the safe limit is exceeded on either parameter a warning light is illuminated.

- **2 way protection**

- The ECM monitors 'coolant temp' & 'oil pressure'. If the safe limit is exceeded on either parameter the engine shuts down.

Engine Warning and Protection

- **3 way warning**
 - The ECM monitors 'coolant temp', 'oil pressure' & 'coolant level'. If the safe limit is exceeded on any parameter a warning light is illuminated.
- **3 way protection**
 - The ECM monitors 'coolant temp', 'oil pressure' & 'coolant level'. If the safe limit is exceeded on any parameter the engine shuts down.

NOTE: A COOLANT LEVEL SENSOR MUST BE INSTALLED IF 3 WAY WARNING OR PROTECTION IS REQUIRED

Engine Warning Modes

EWPS Option	Coolant temp high	Oil pressure low	Coolant level low	Genset speed control fault (1)	Engine Overspeed
Standard warning	Lights OWL	N/A	N/A	Lights WARN	Lights OWL
2 way warning	Lights OWL	Lights OWL	N/A	Lights WARN	Lights OWL
2 way protection (2)	Lights OWL, plus shutdown	Lights OWL, plus shutdown	N/A	Lights WARN	Lights OWL
3 way warning	Lights OWL	Lights OWL,	Lights OWL	Lights WARN	Lights OWL
3 way protection	Lights OWL, plus shutdown	Lights OWL, plus shutdown	Lights OWL, plus shutdown	Lights WARN	Lights OWL
4 way warning	Lights OWL	Lights OWL	Lights OWL	Lights WARN & OWL	Lights OWL

MPSI Diagnostic Tool



6 Pin Diagnostic connector

1300 Edi Series Service Tool



American Truck Association - ATA link - J 1708 Communications Adapter



Diagnostic Functions on the Service Tool



This option allows you to view all fault codes and clear inactive codes.

Diagnostic test are used to test the continuity of the electrical circuits and certain functions in the ECM.

A data list is a list of fixed of variable data items that the ECM monitors.

You may change the value of some parameters on the engine to customize its operation

The data recording facility allows you to capture data from the engine data list over a specified time period and save the recorded data to a file.

Functions on the Service Tool

1300 EDI Genset - Data List - Perkins Engine Diagnostics

Parameter	Value
Battery Voltage	24.3 V
Engine speed (N)	1492 rpm
Injection Control Pressure (ICP)	9.80 MPa

1300 EDI Genset - Data List - Perkins Engine Diagnostics

Parameter	Value
Battery Voltage	24.7 V
Engine speed (N)	0 rpm
Injection Control Pressure (ICP)	N/A

Select Data List

Available Data Lists

- Engine Data
- Engine Information
- Customs List
- Customs List 1

OK Cancel Create Custom Delete Custom

Data List Preview

- Active Codes
- Inactive Codes
- Engine Hours
- Total Fuel units
- Battery Voltage
- Engine Oil Temperature
- Inlet Air Temperature
- Engine Coolant Temperature (ECT)
- Speed Control %
- Engine speed (N)
- Boost Pressure
- Injection Control Pressure (ICP)
- Fuel flow rate
- Coolant Level %
- Engine Oil Pressure (EOP)
- PTO Control Mode
- PTO Accelerate Switch
- PTO Pressure Switch
- PTO Coast Switch
- PTO Set Switch
- PTO Control Switch
- PTO set reset/stop
- Radiator shutoff

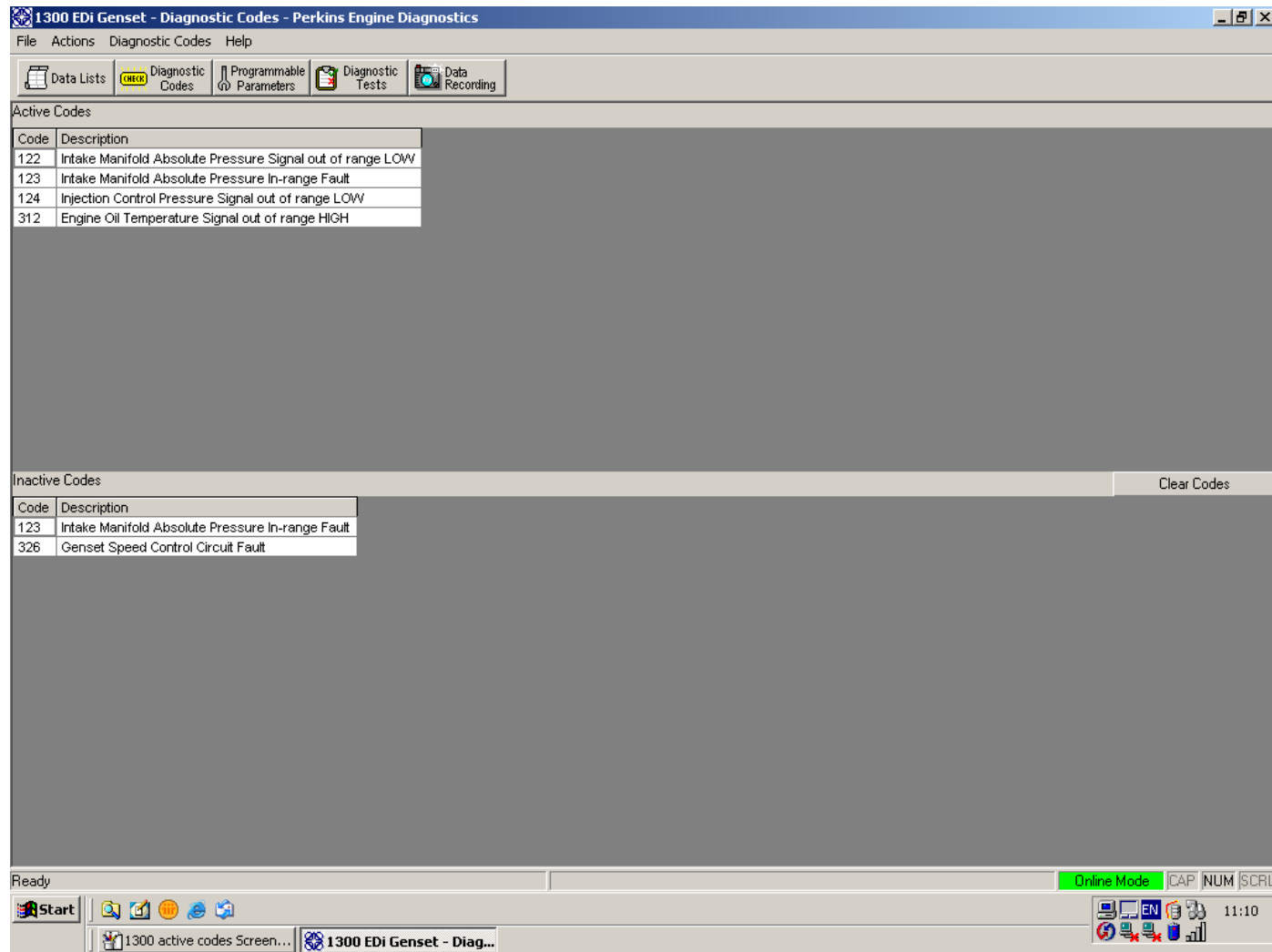
Ready Start 11:13

1300 EDI Genset - Data List - Perkins Engine Diagnostics

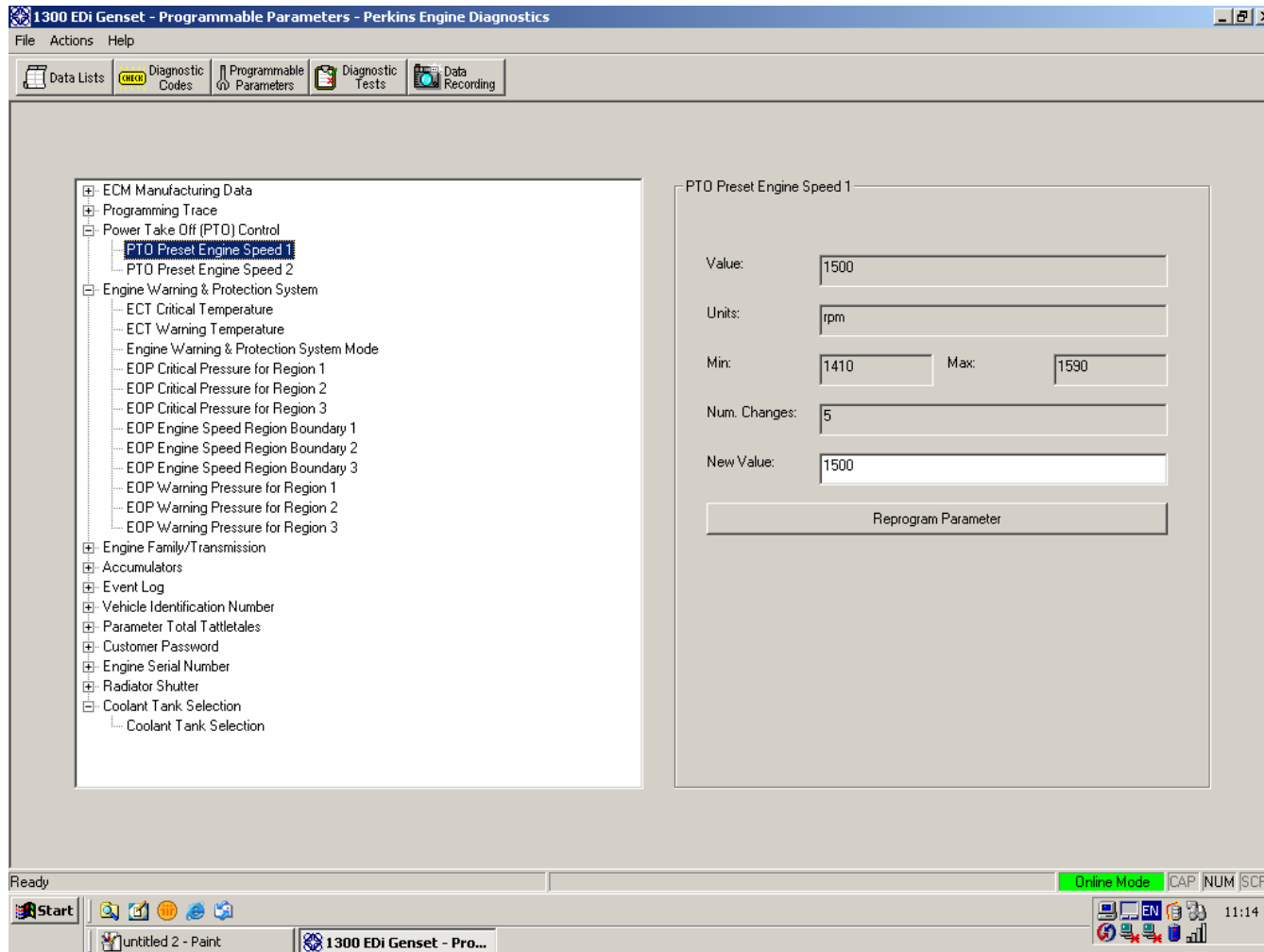
Parameter	Value
Battery Voltage	19.3 V
Engine speed (N)	294 rpm
Injection Control Pressure (ICP)	1270.45 psi

Ready Start 11:25

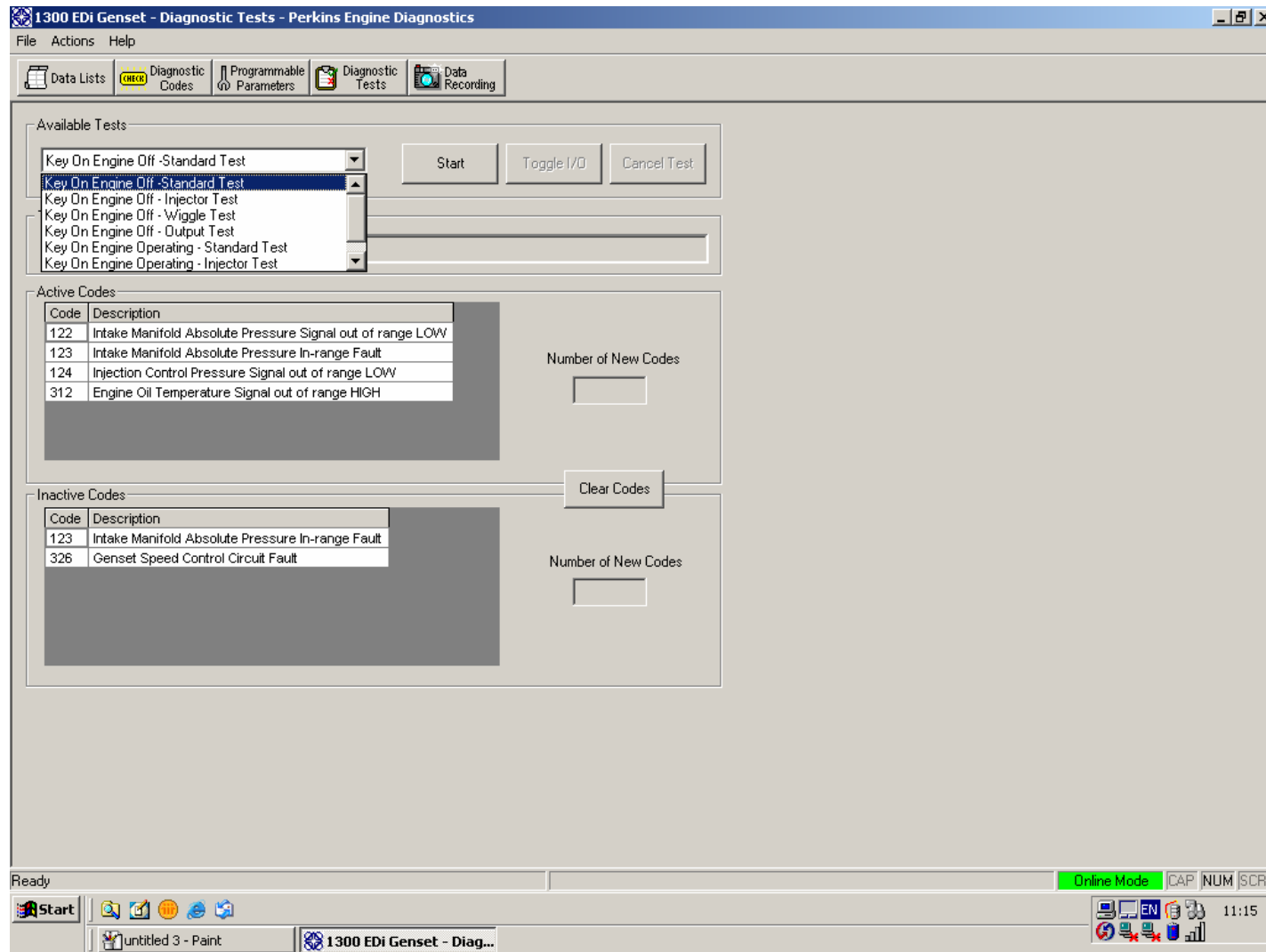
Functions on the Service Tool



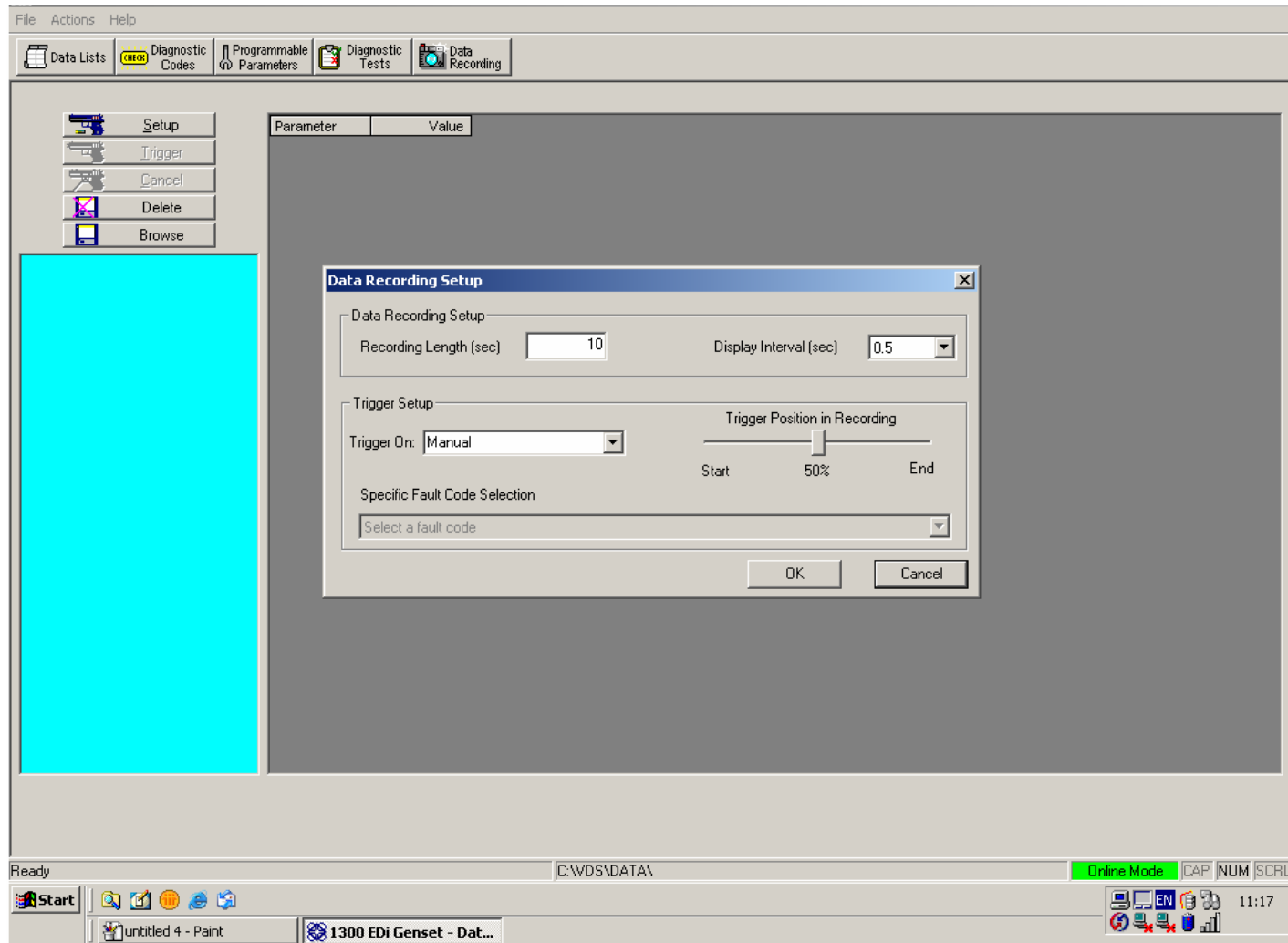
Functions on the Service Tool



Functions on the Service Tool



Functions on the Service Tool



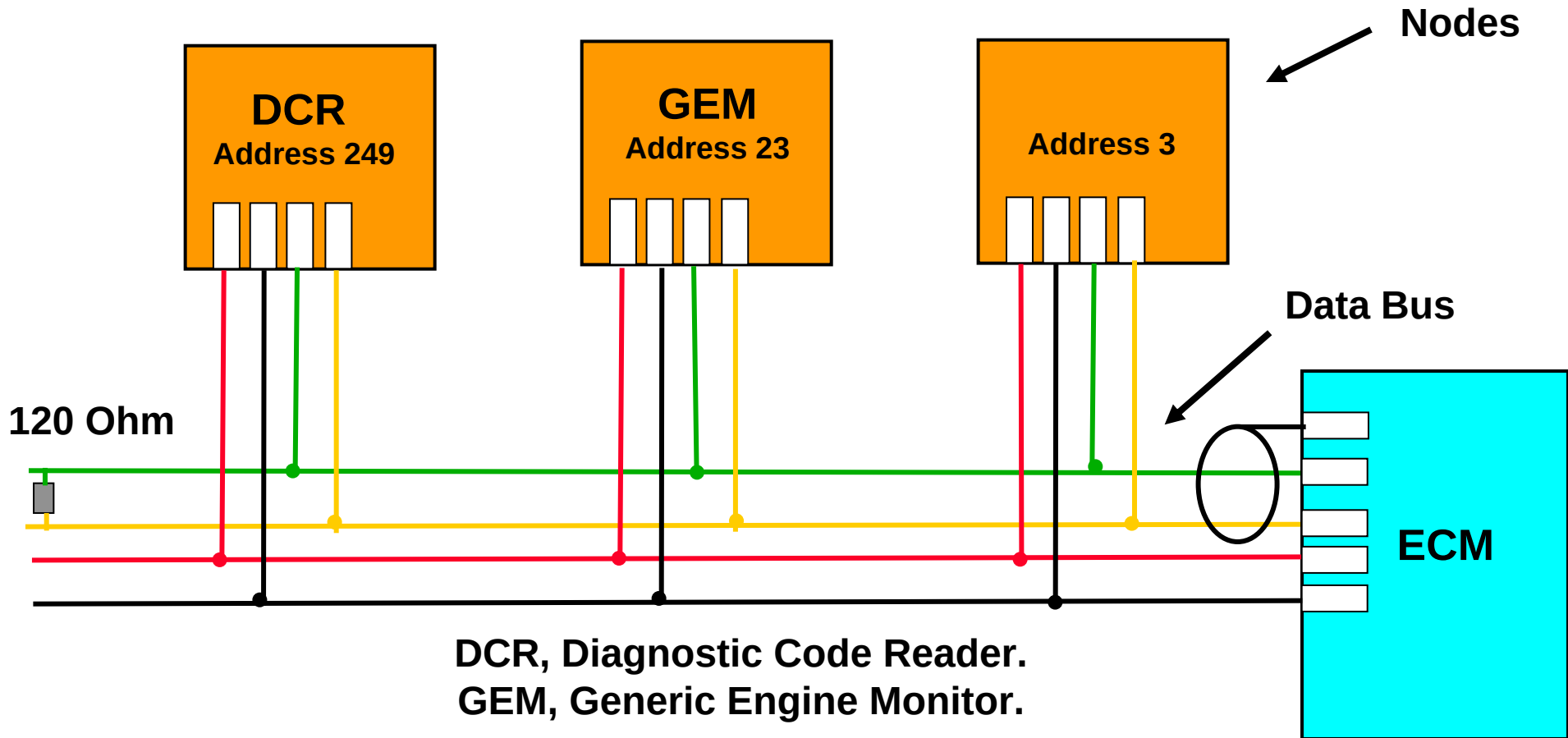
Controller Area Network (SAE J1939 CAN)

Controller Area Networks (CAN)

- Introduction:
- CAN is the communication network between intelligent electronic devices used on an application.
- Ground based equipment use a version of CAN that conforms to an international standard known as J1939
- Application control, monitoring and diagnostics is possible using J1939.

Example of CAN Wiring

Note. CAN wiring **must** be twisted, to prevent interference



CAN 18 Screen, 19 CAN + High, 20 CAN - Low

Controller Area Networks (SAE J1939 CAN)

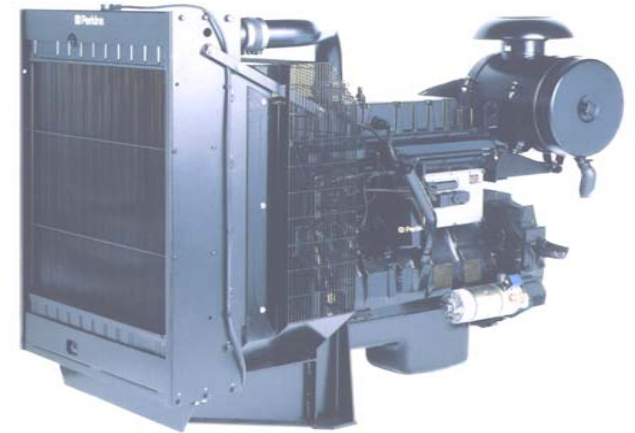
- Advantages
 - Uses less wiring » (power supply/signal), hence, lower weight, lower cost, etc.
 - Uses less connections » hence more reliable.
 - Easier to install. (but, needs twisting and screening)
 - Improved quality of signal.
 - Transmission of huge amounts of Data.

Controller Area Networks

- Types of messages
 - Commands
 - Requests for data
- Types of addressing
 - Point to point
 - Broadcast

1300 Edi Series-Electropack

- **1500/50 Hertz**, can be wired 3 ways,
(auto or manual, (load share) or stand alone, (isochronous))
- **1800/60Hertz**, can be wired 3 ways
(auto or manual, (load share) or stand alone, (isochronous))
- **1500/1800 Switch-able**, can be wired 2 ways
1500 or 1800, Isochronous Only
- **12 Volt and 24 Volt ECM's available.**
If you are not sure of the voltage and the markings have been removed
check PIN 35 to ground 1.4K Ohms – 12 volts / 2.8K Ohms – 24 volts.

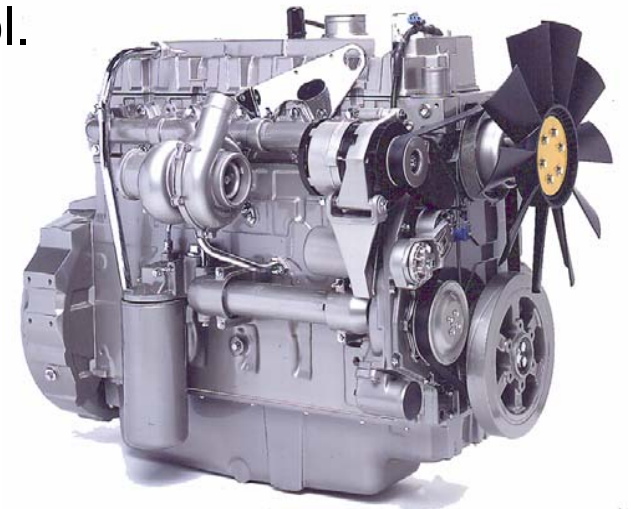


1300 Edi Series-Industrial Open Power Unit

- **IOPU 1** -Variable Speed Droop, with analogue throttle and Idle validation switch. (mobile applications)
- **IOPU 2** - Variable Speed Isochronous with analogue hand throttle, (no IVS - non Mobile Applications)
- **IOPU 3** - Variable Set Speed Isochronous Control.
- **IOPU 4** - With Pre-Set Speed Isochronous Control.

- **12 Volt and 24 Volt ECM's available.**

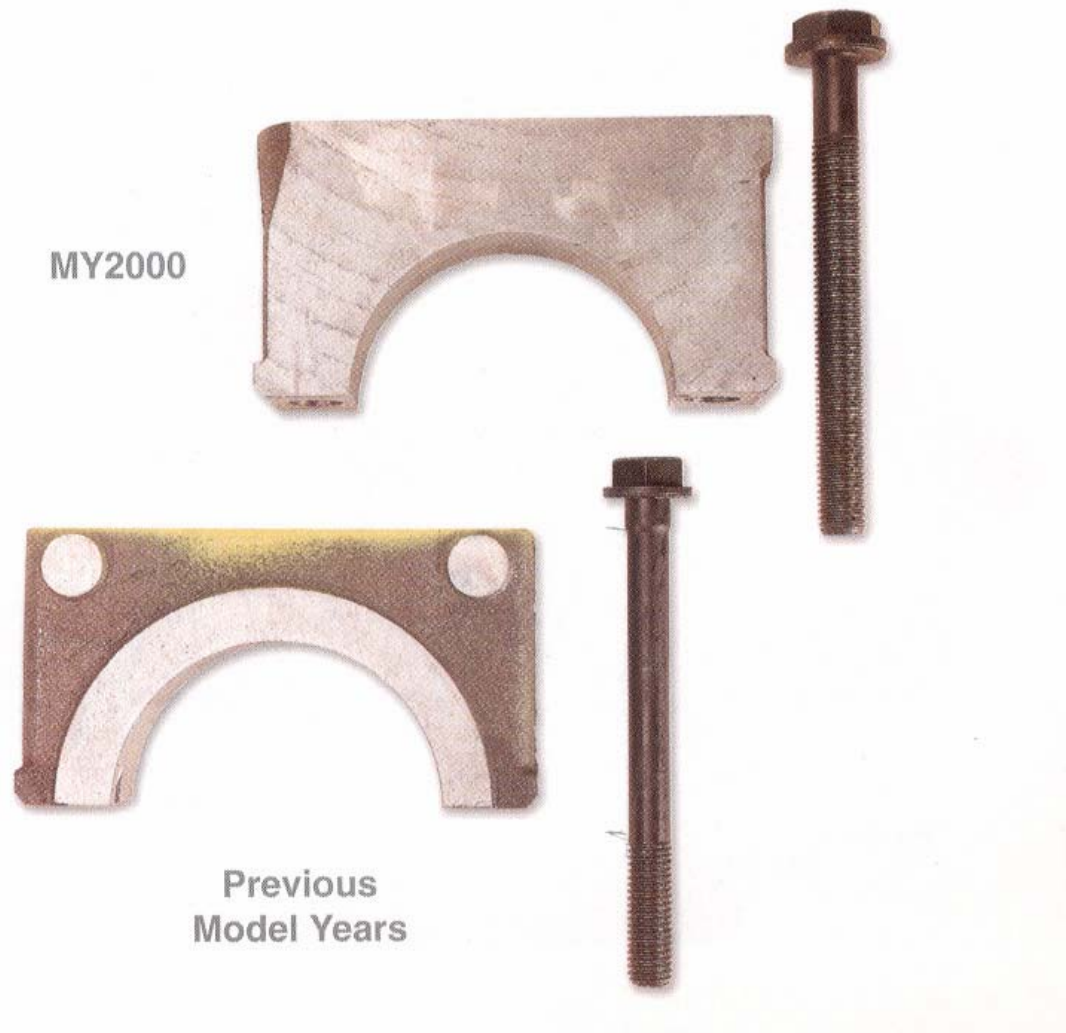
If you are not sure of the voltage and markings have been removed
check PIN 35 to ground 1.4K Ohms – 12 volts / 2.8K Ohms – 24 volts.



1300 Edi Mechanical Enhancements

(Since Year Model Year (MY) 2000)

Main Bearing Caps



Bearing Shells

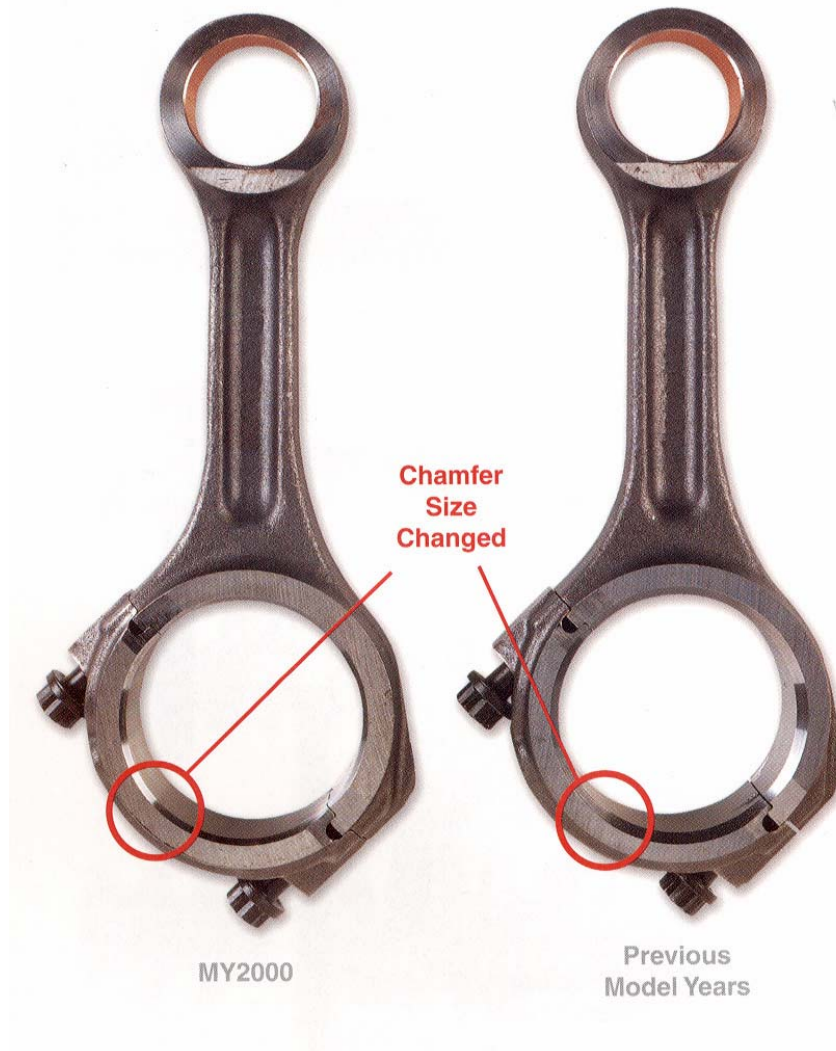


Previous Model Years



MY2000

Con-rods



Pistons



MY2000



Previous
Model Years

'Articulated' Pistons



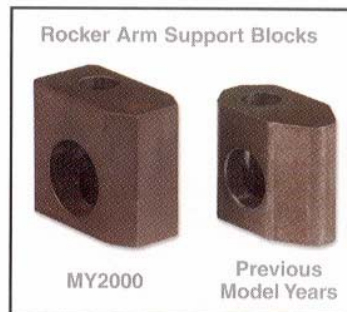
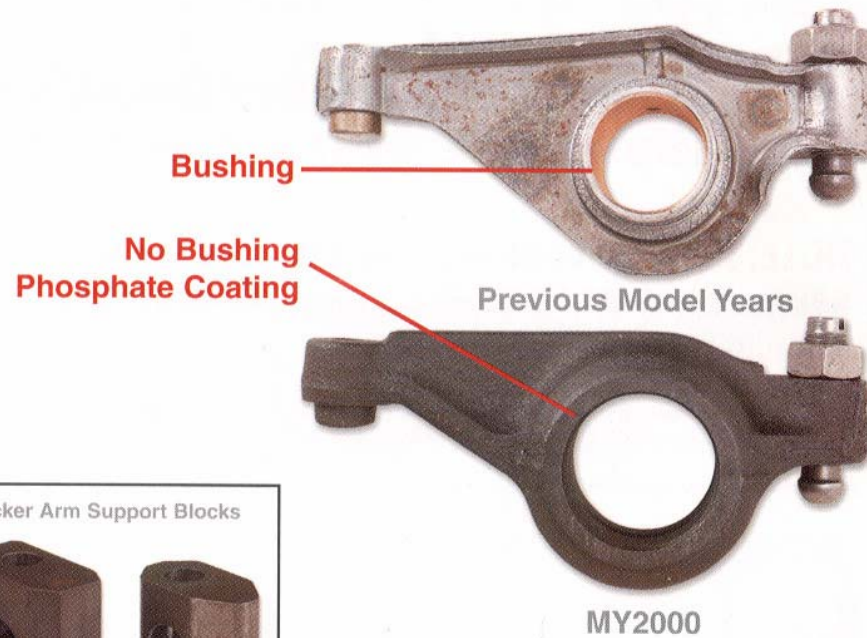
Testing Compression



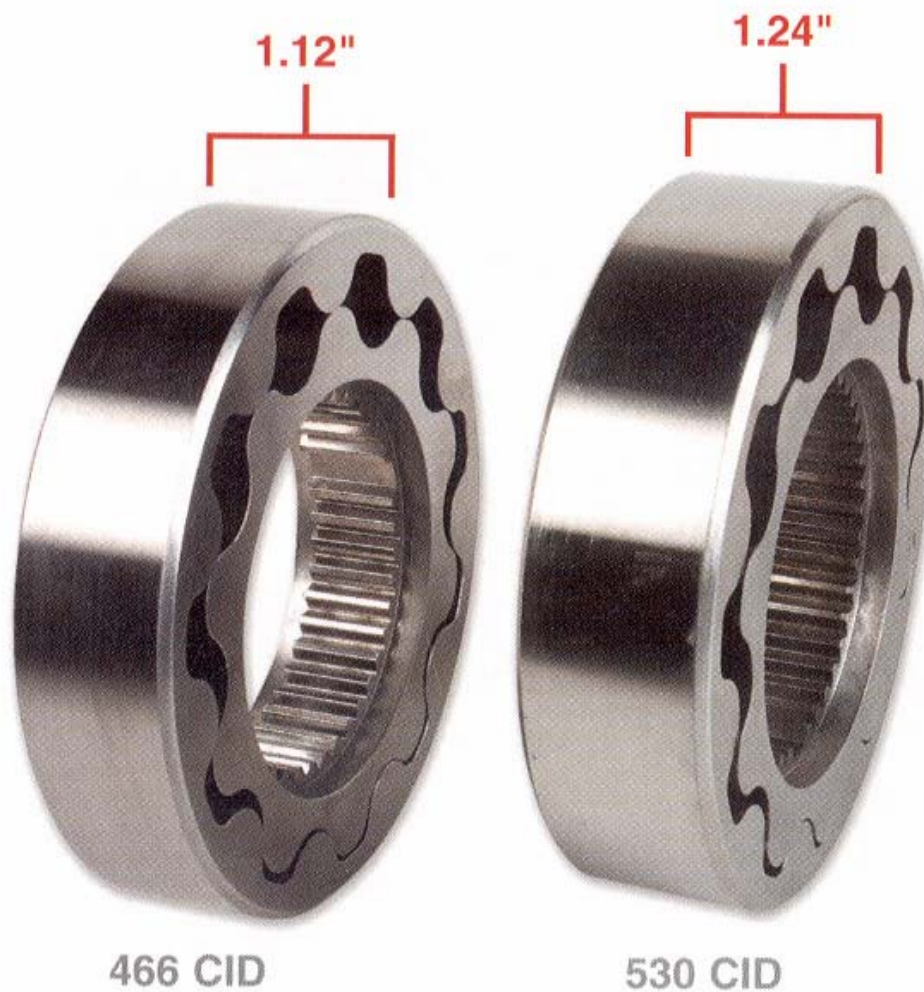
Valves



Rockers & Shaft



Oil Pump



Injector Sleeve



Injector Sleeve

Injector Washers

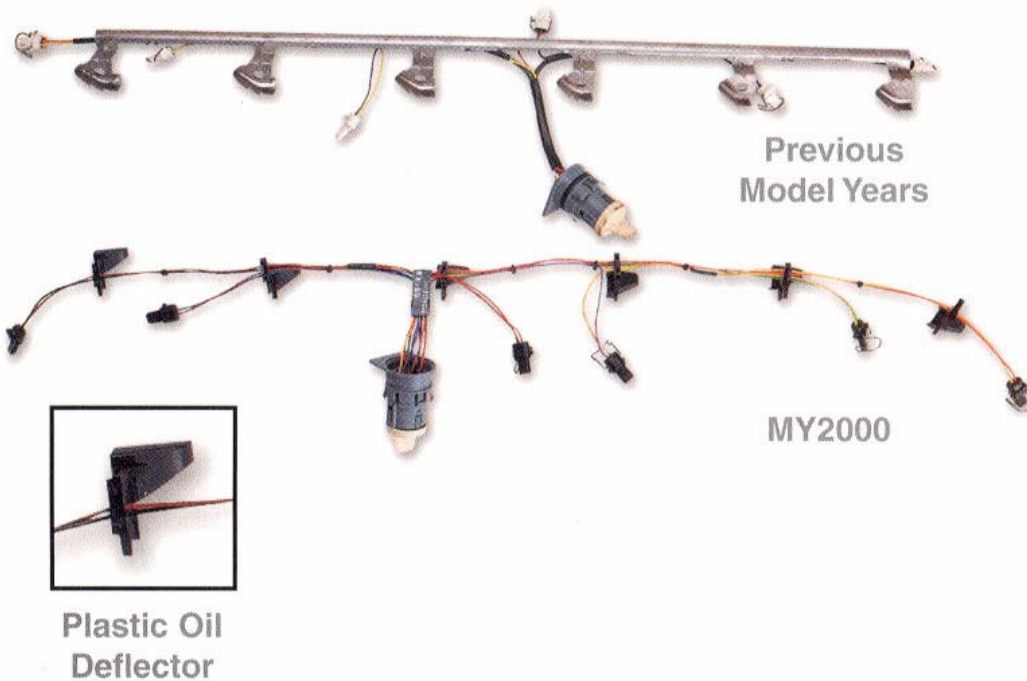


**Previous
Model Years**



MY2000

Injector Wiring



REPLACE OIL SEAL IF CONNECTOR IS REMOVED
FROM ROCKER COVER

WARNING
INJECTORS OPERATE AT
110 VOLTS D.C.

'Packard' 20 pin injector feeds/returns

