III IV V

DDEC

DDEC

DDEC

DDEC

DDEC

Detroit Diesel Electronic Controls

WITH EXHAUST GAS RECIRCULATION

DDEC AGENDA

- Pre-Test
- Objectives
- Review Manuals
- Features & Components
- System Hardware
- Repair Tools
- Basic Electricity
- System Operation
- Trouble Shooting
- DDEC Reprogramming
- Post-Test, Evaluations

What is DDEC?

An advanced electronic fuel injection control system that can be integrated into many applications

DDEC Consists of:

- Sensors and switches
- Conductors and connections
- ECM (computer)
  - Hardware
  - Software
- Injectors

DDEC History

- DDEC I Introduced in 1985 on 92 Series
- Series 60 Introduced in 1987 As the First Engine Ever Designed Exclusively for Electronic Controls
- DDEC II Introduced in 1987
- DDEC III Introduced April, 1993
- DDEC III Full Production January, 1994
- DDEC IV Initial Release, August, 1997
- *DDEC IV Full Production, January, 1998*
- *DDEC IV Series 60 EGR, October, 2002*
- *DDEC V Series 60 EGR, December, 2003*

Electronic Engine Advantages

- Engine Protection
- Engine Diagnostics
- Reduced Maintenance
- Improved Engine Governing
- Fuel Economy Optimization
- Enhanced Cold Starting
- Smoke Control
- Reduced Emission Levels

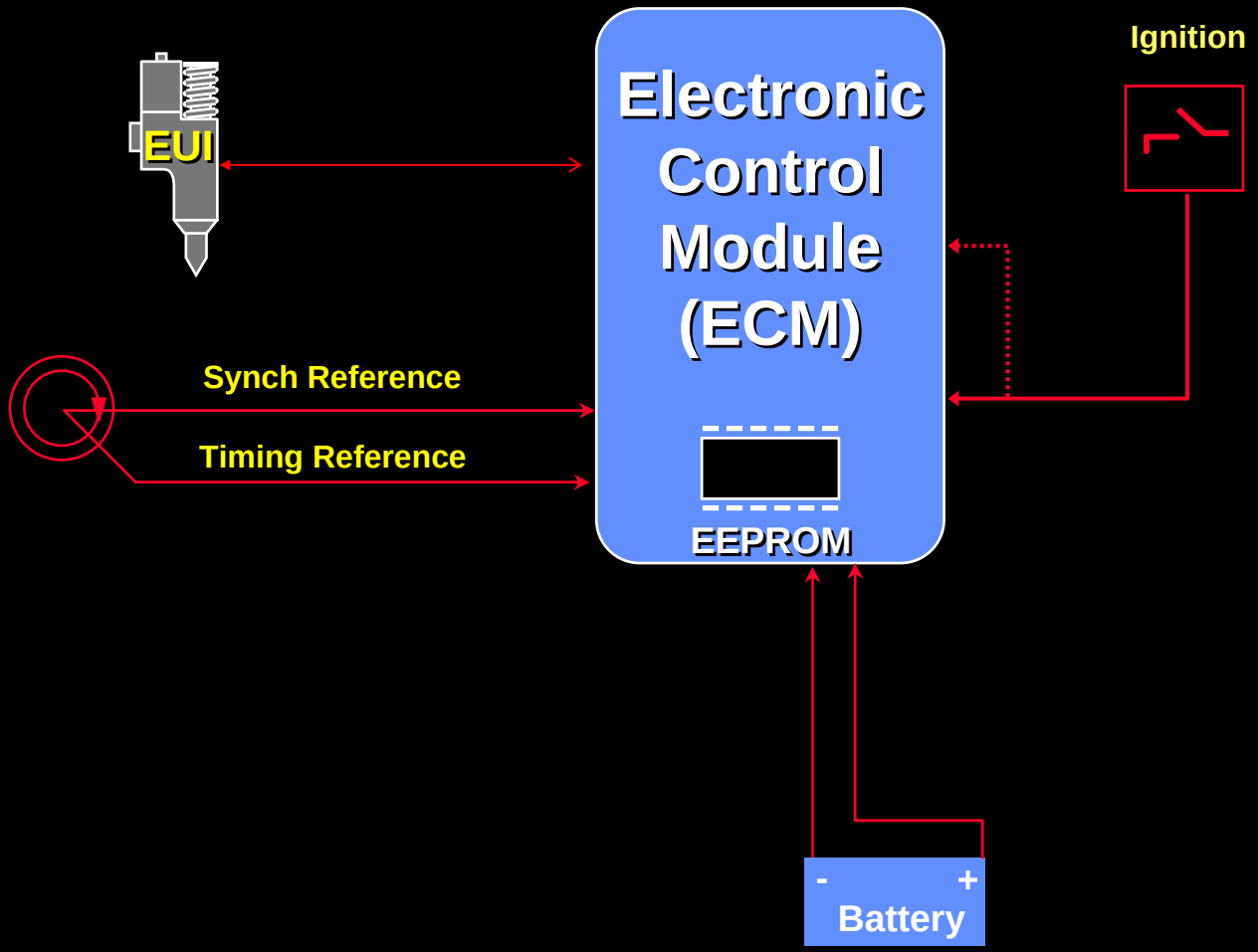
DDEC IV Features

- **Four New ECM's**

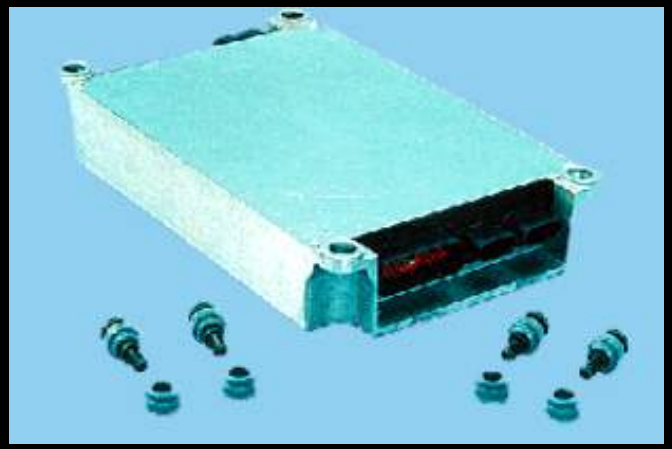
ECM Description			
Standard Truck	6 Cylinder	12 Volt	23519307
Universal	8 Cylinder	12/24 Volt	23519308
S4000	8 Cylinder	12/24 Volt	23519309
Natural Gas	8 Cylinder	12/24 Volt	23519310

- **Increased Memory - 57% Over DDEC III**
- **Faster Processing Time - 50% Over DDEC III**
- **J1939 Communication Link - Standard**
- **Battery Backed Real Time Clock & Calendar**
- **DDEC Data (Enhanced ECM Data Pages) Standard**

DDEC Necessities



Electronic Control Module



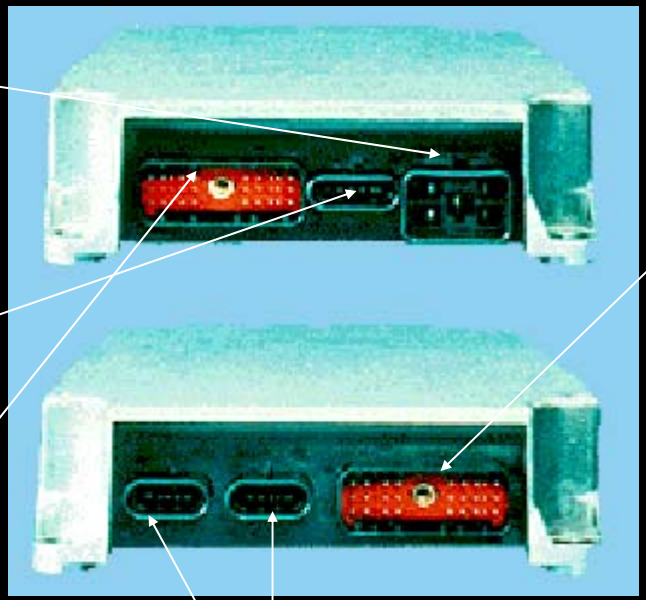
Electronic Control Module

OEM responsibility

Mandatory circuits Power and Ground

J1922,J1939, Ignition

Throttle position sensor
Optional circuits Manual fan on switch, Jake Brake, 439 Ignition wire

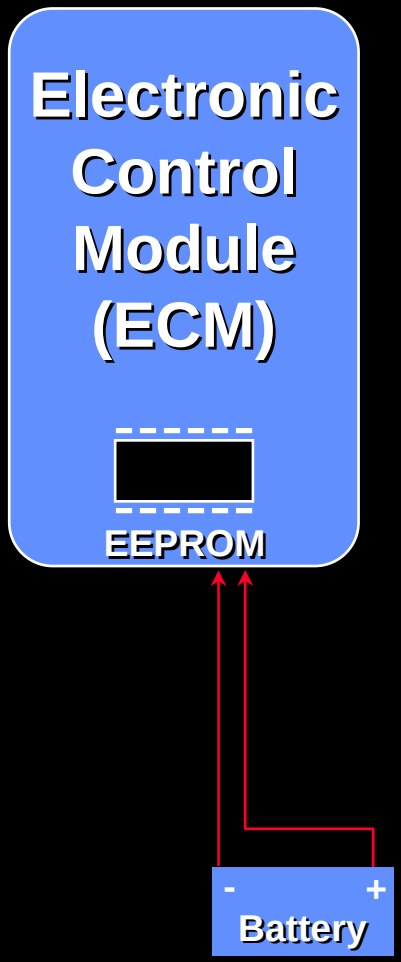


DDC responsibility

Engine sensors, harness, & connectors

Injector harness & connectors
Injectors

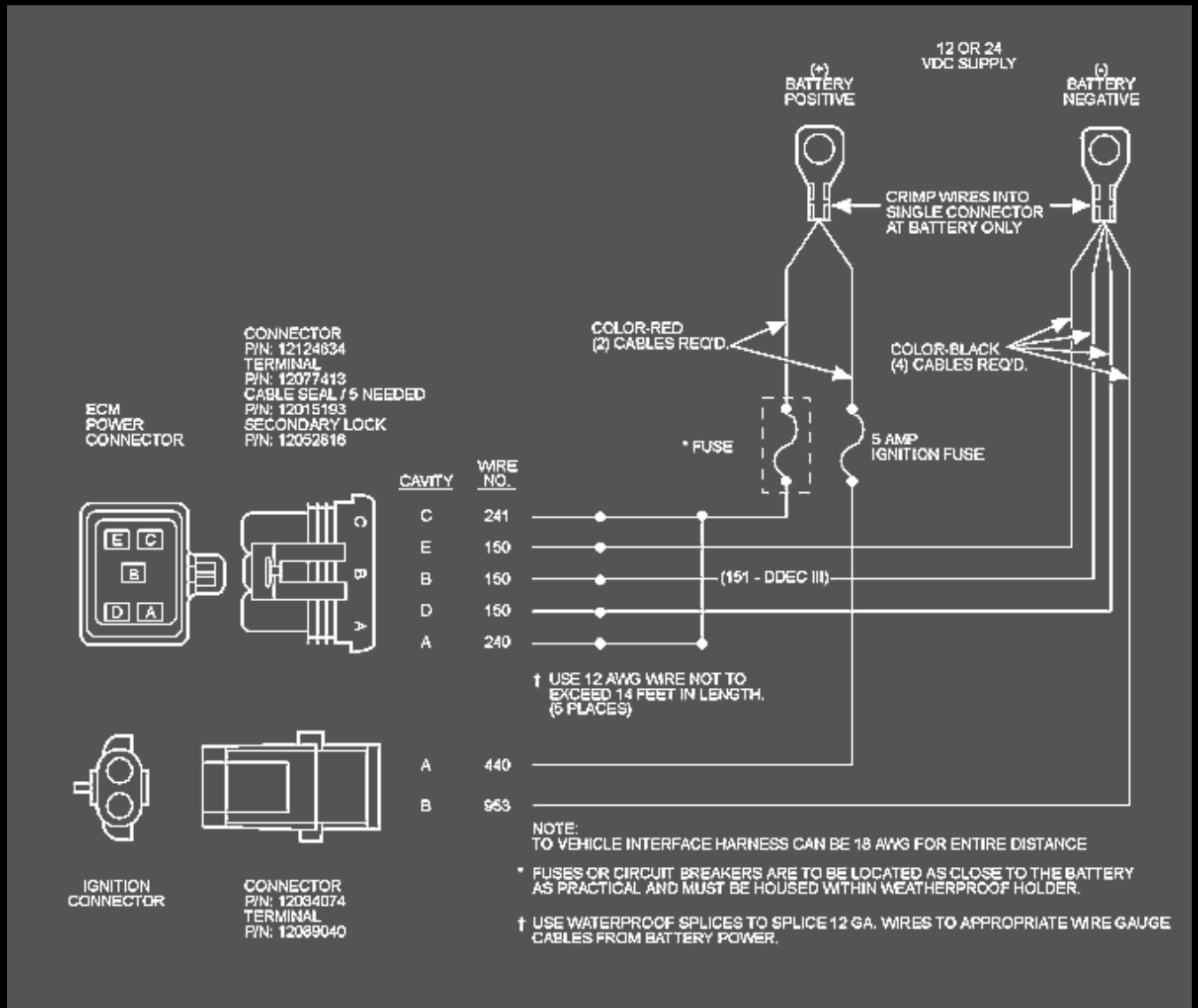
Schematic Diagram DDEC III / IV



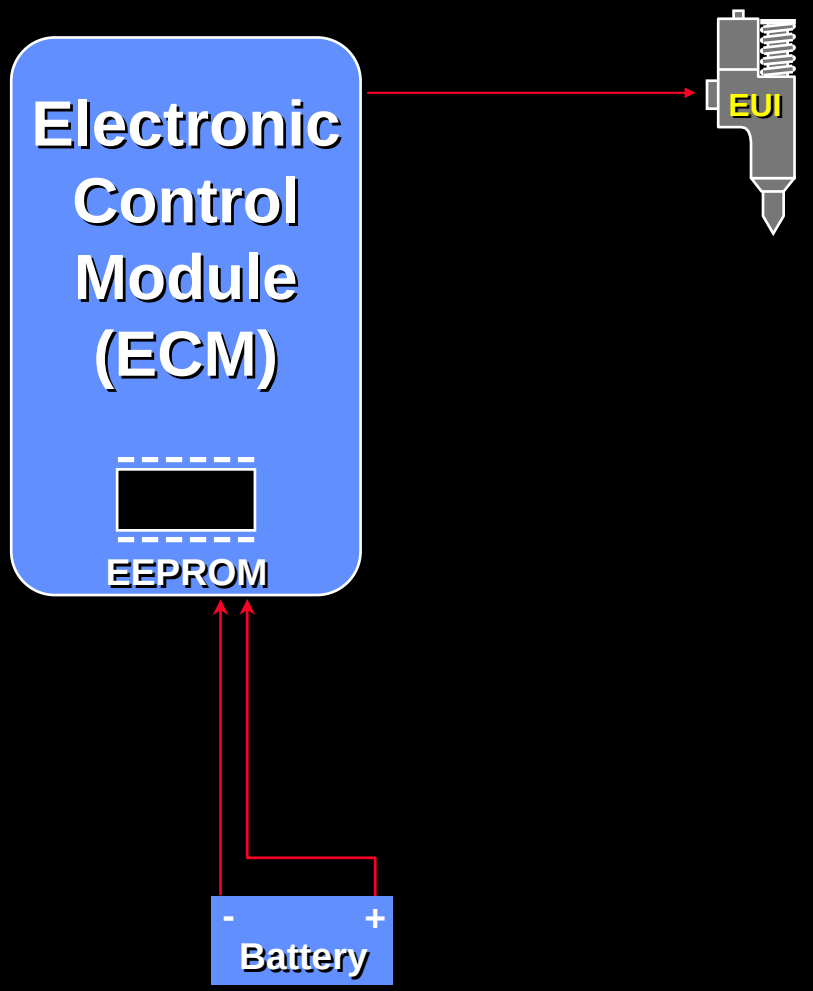
Power Supply

- DDEC II - 12 Volt
- DDEC III – 12 / 24 Volt
- DDEC IV- 12 or 24 Volt
- Source must be Isolated from any other Vehicle Accessory
- The ECM Power Source must be Fused with the Proper Amp
- The ECM Must Be Incorporated with a 5 Amp Fuse on the 440 wire going into the 439 wire.
- The ECM Case Must be Electrically Isolated from any Chassis Ground

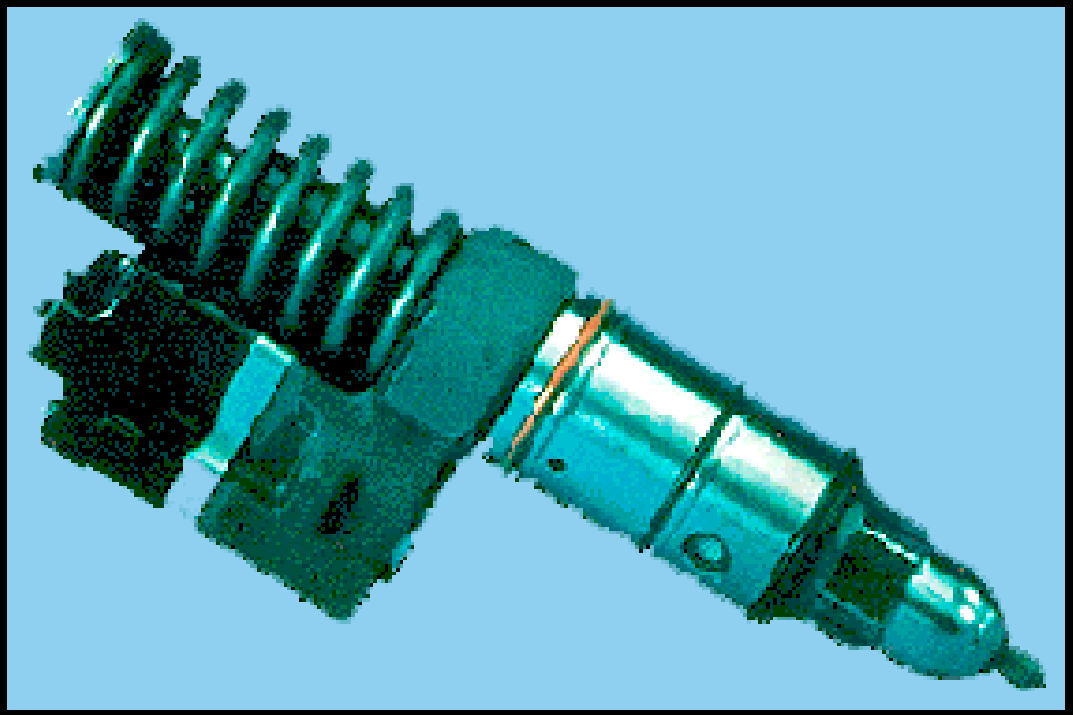
Power Supply DDEC III / IV with or without EGR



Schematic Diagram DDEC III / IV

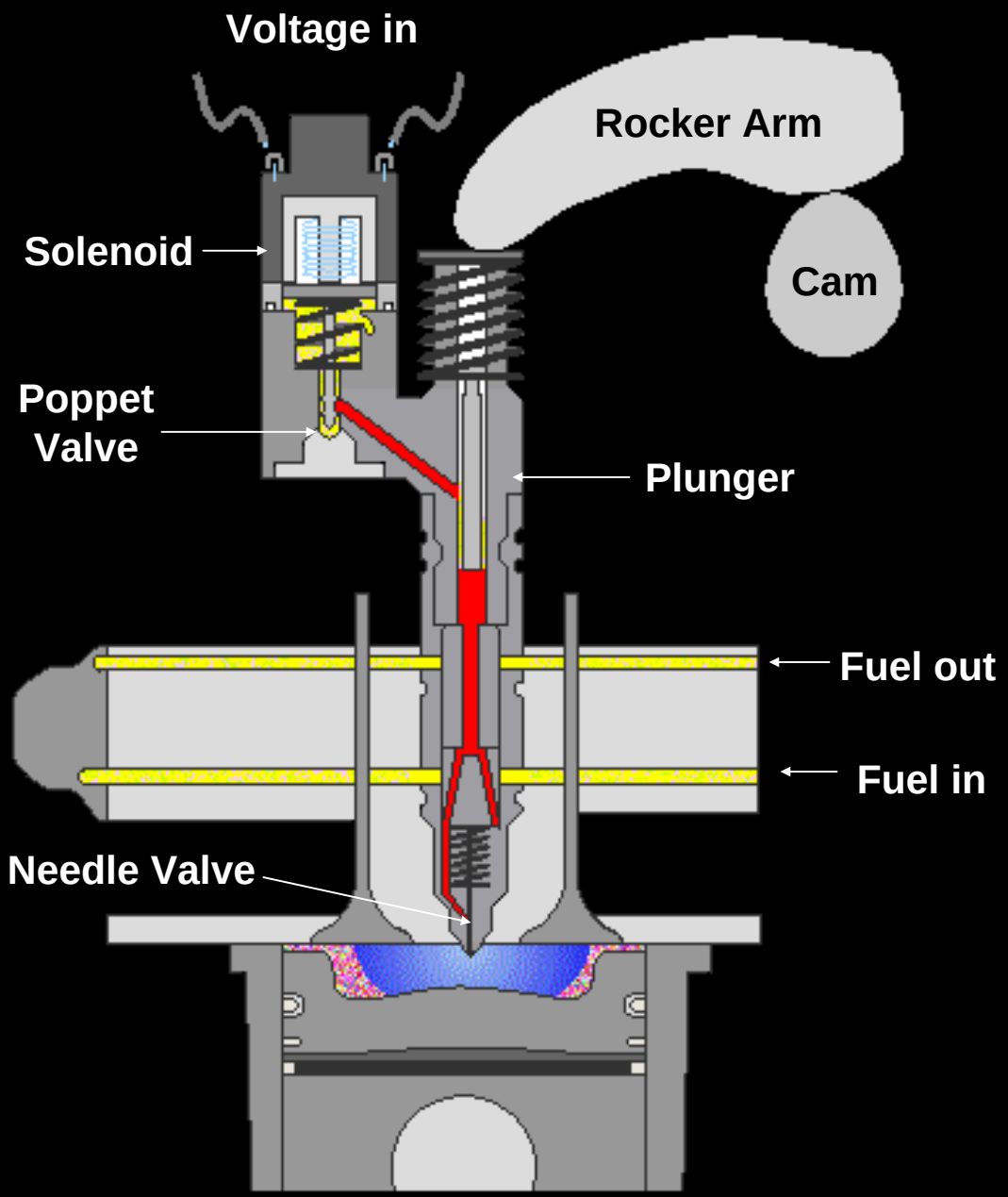


Electronic Unit Injectors

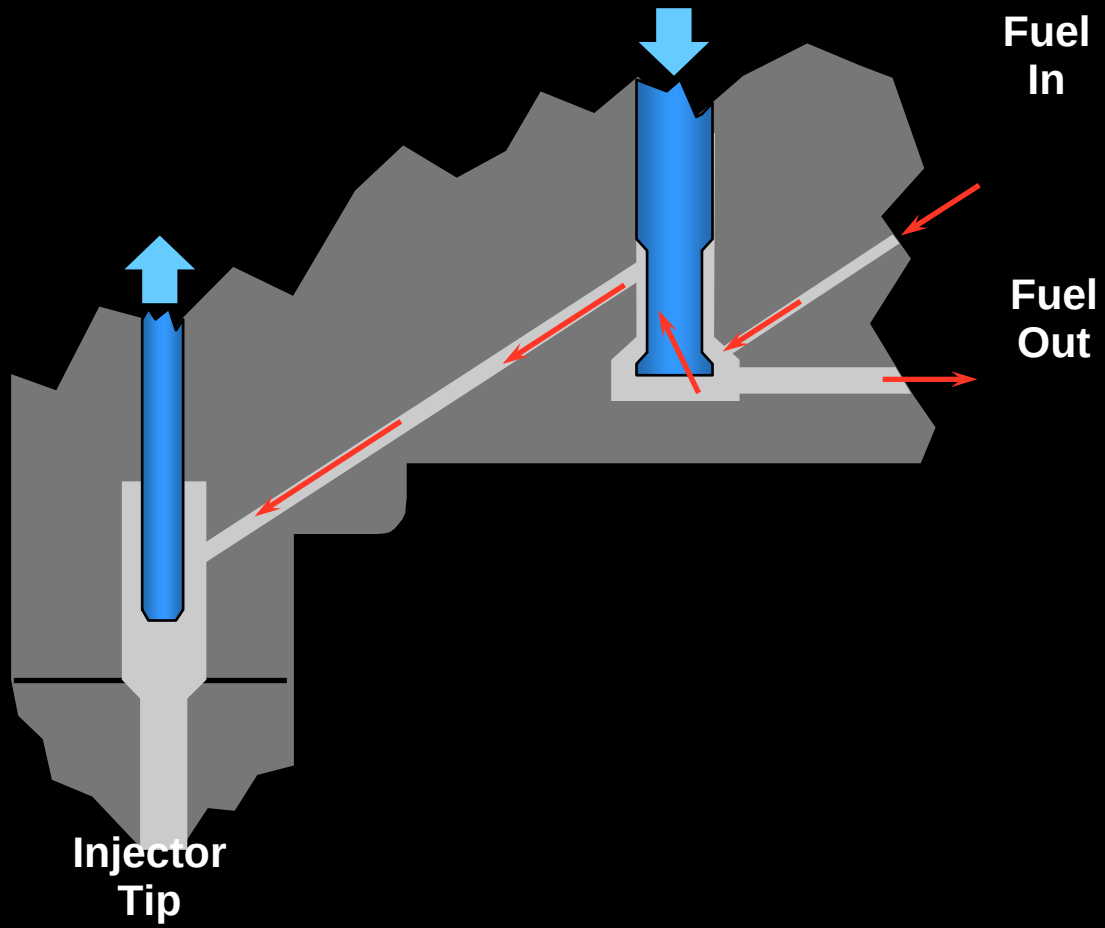


Series 50/60 EUI

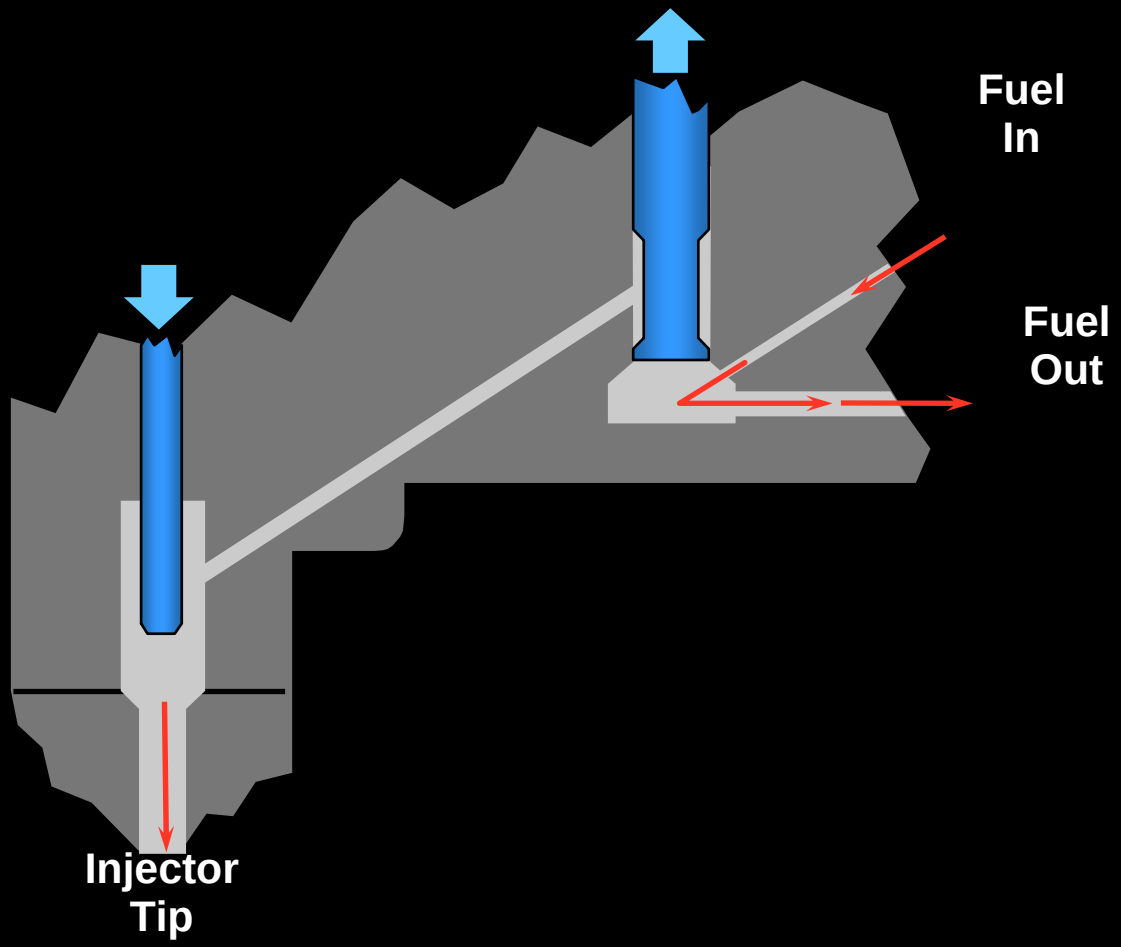
Series 50/60 Injector Animation



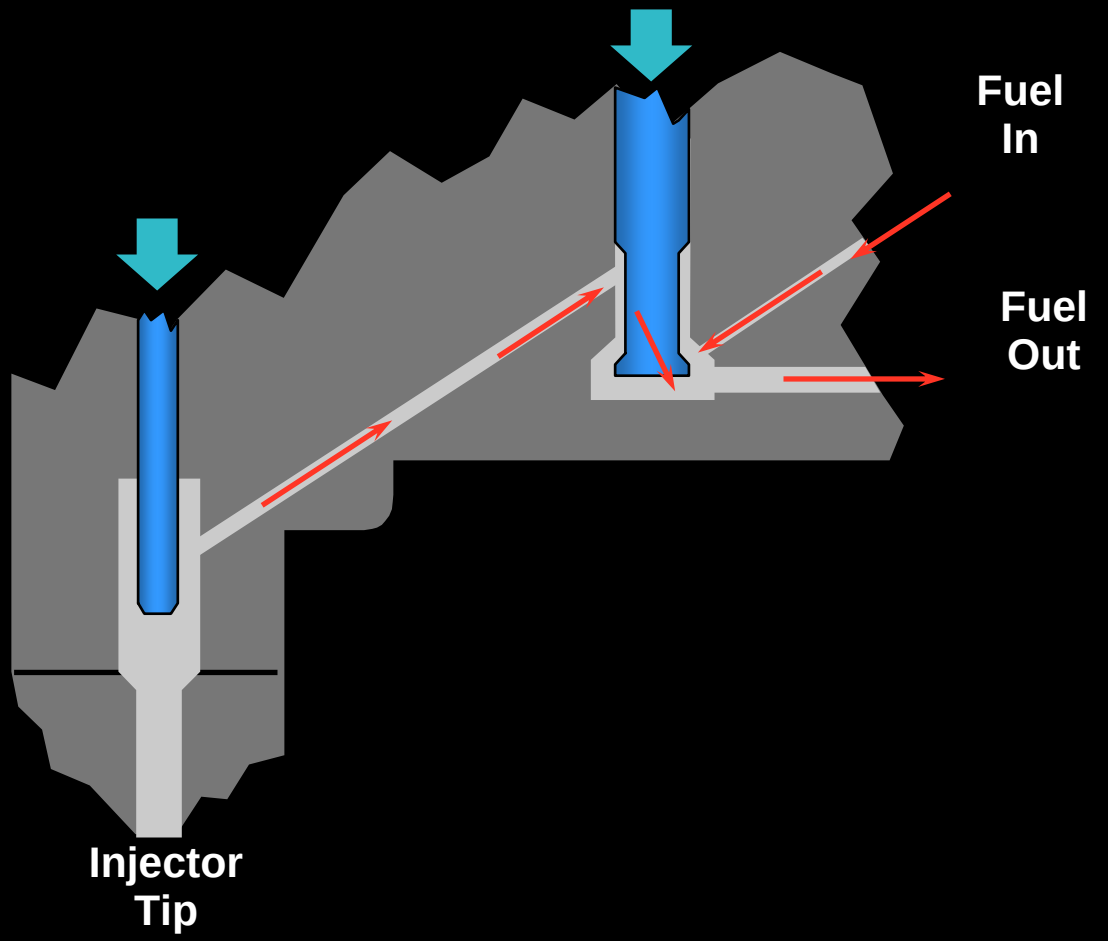
Top Of Stroke



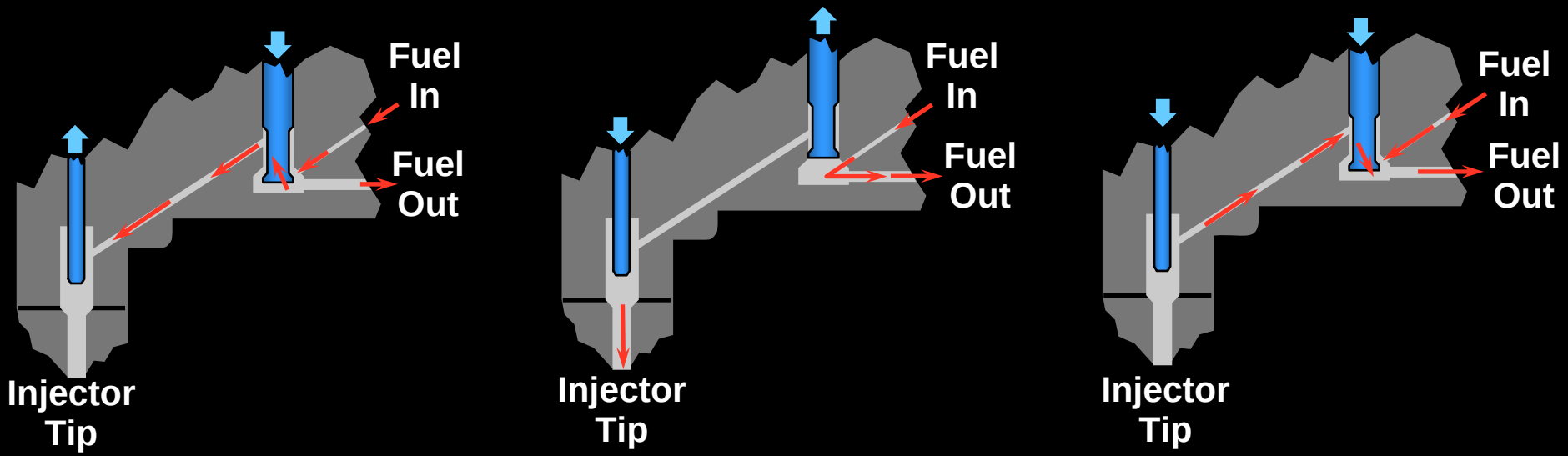
Start Of Injection



End Of Injection

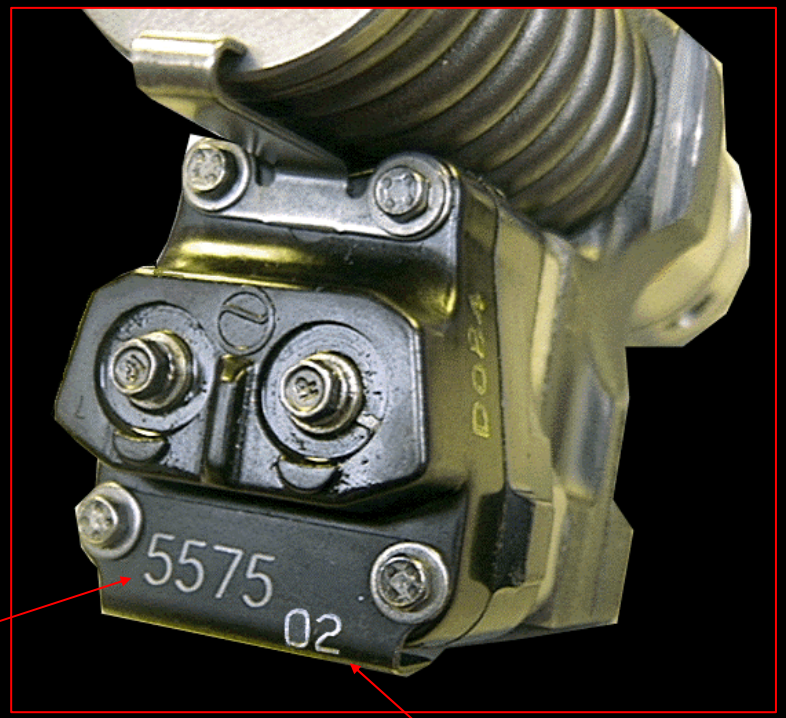


Injection Sequence



Injector Calibration Codes

- DDEC II No Calibration Codes
- DDEC III/ IV Calibration Codes From 00-99



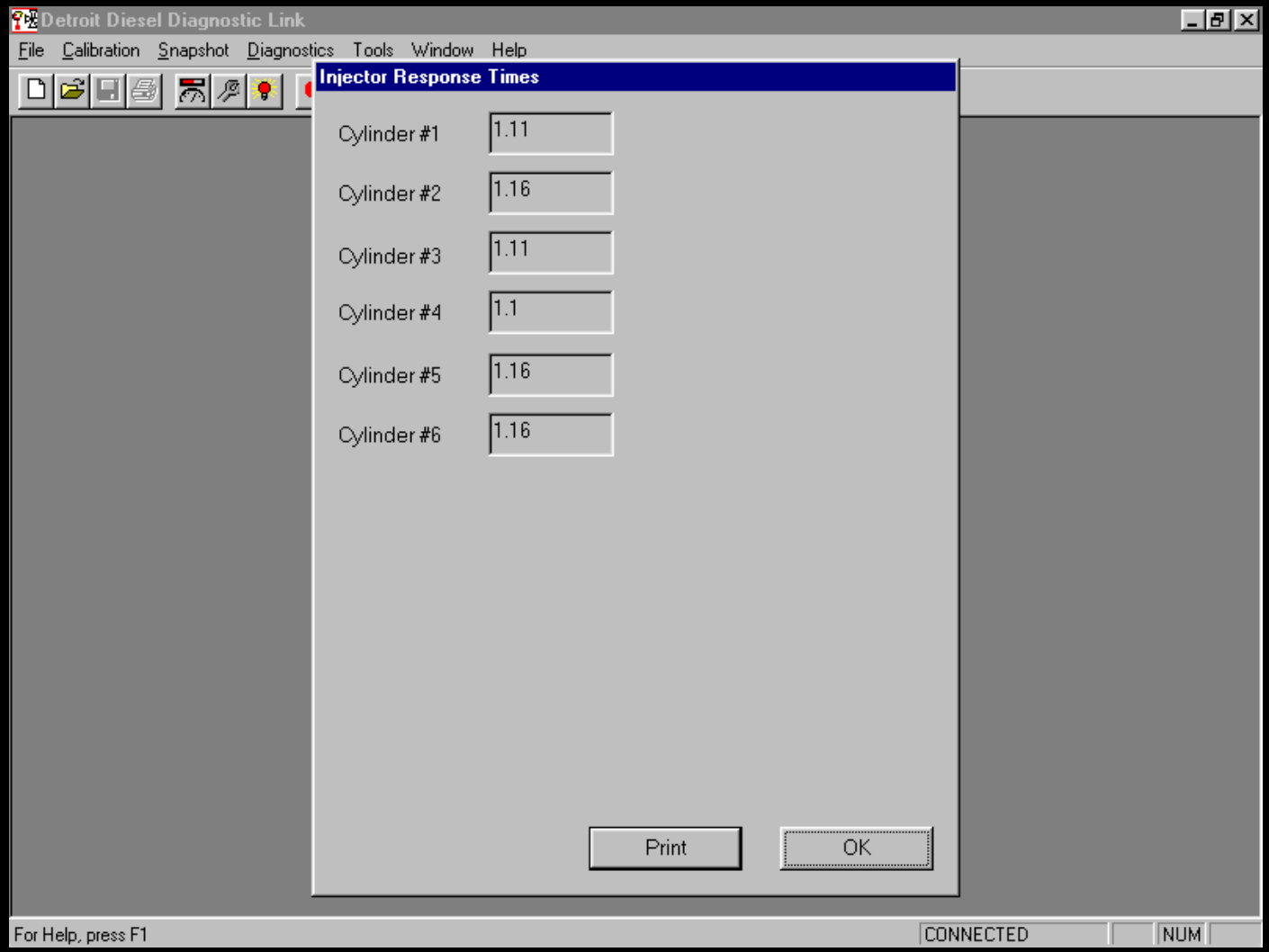
Injector Cycle Terminology

- **IRT** Injector Response Time - Length of Time (ms) required to close the Control Valve

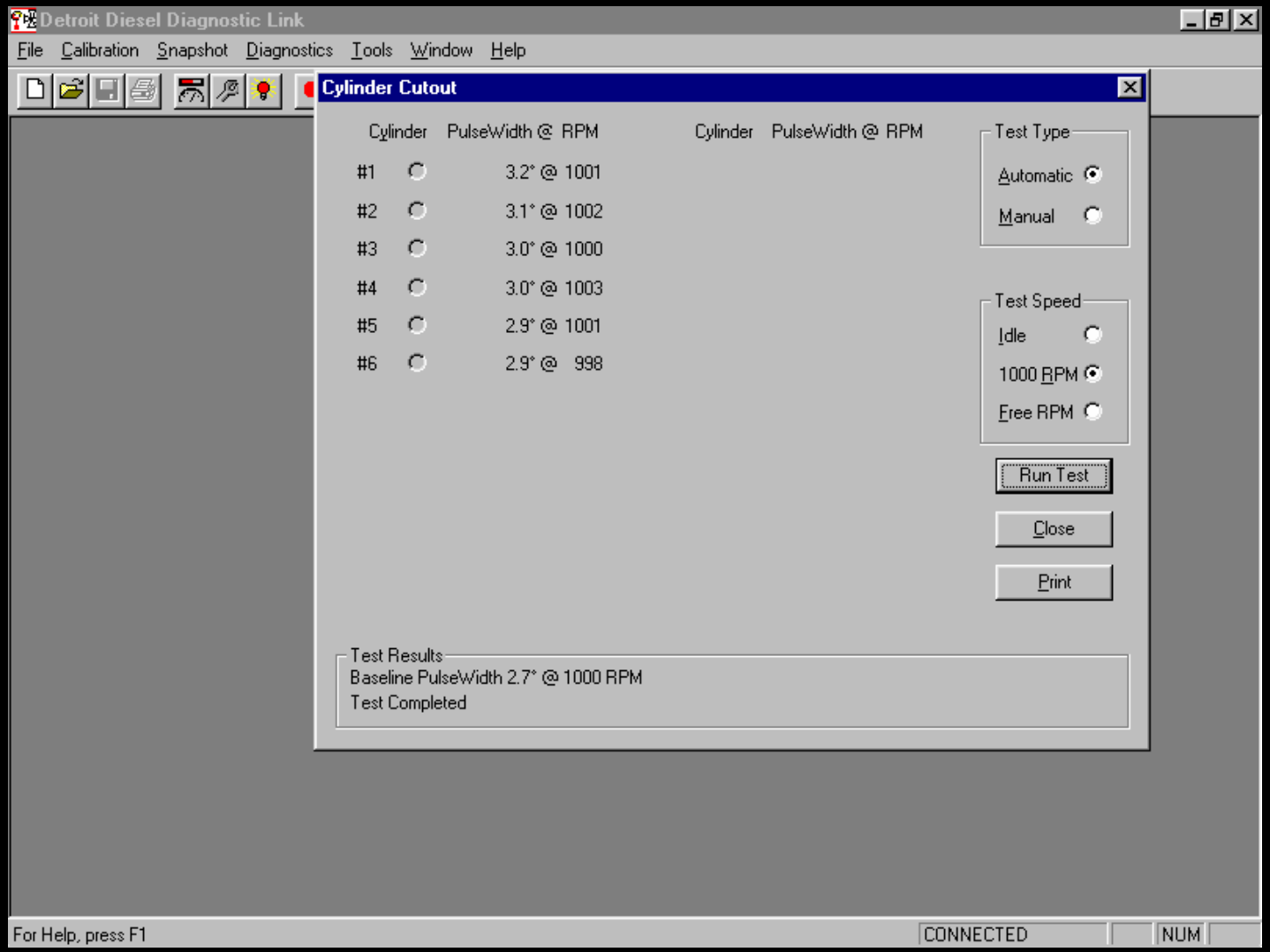
- **PW** Pulse Width - Degrees of Crankshaft Rotation when Fuel is Injected

- **BOI** Beginning Of Injection – When Fuel Injection Starts in Crankshaft Degrees **(Not Available in DDEC III-IV Systems)**

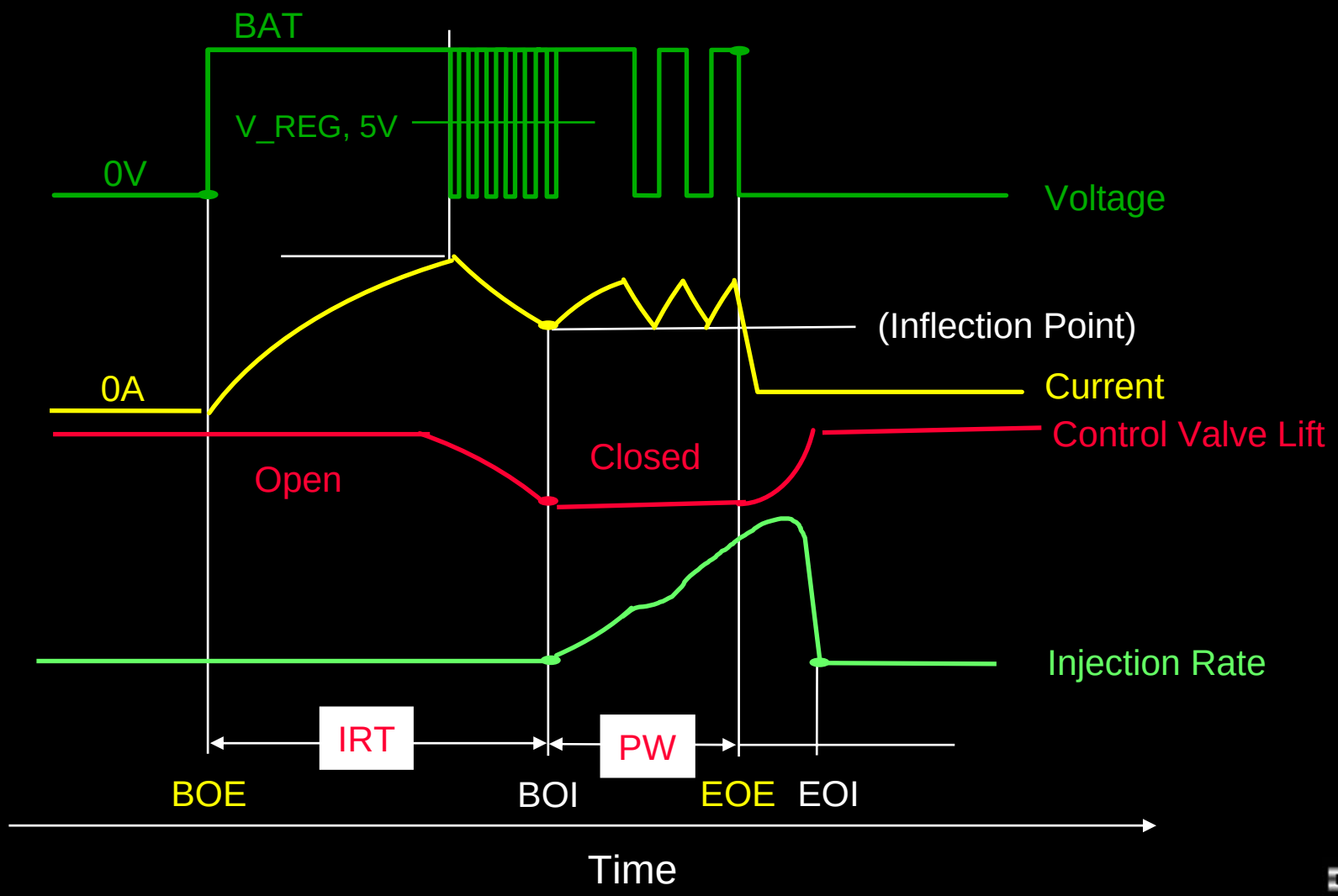
Injector Response Times



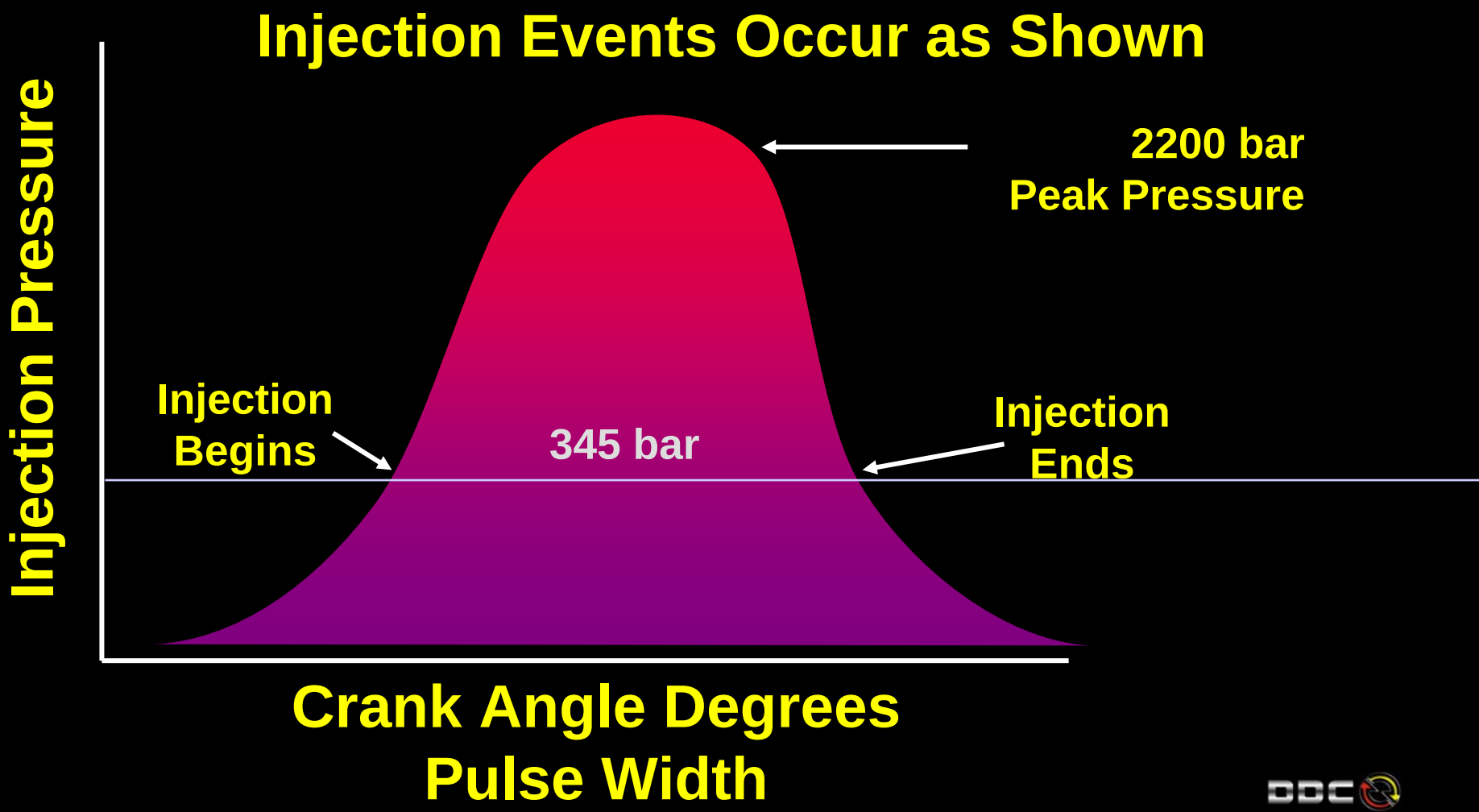
Cylinder Cut-Out



Injection Cycle



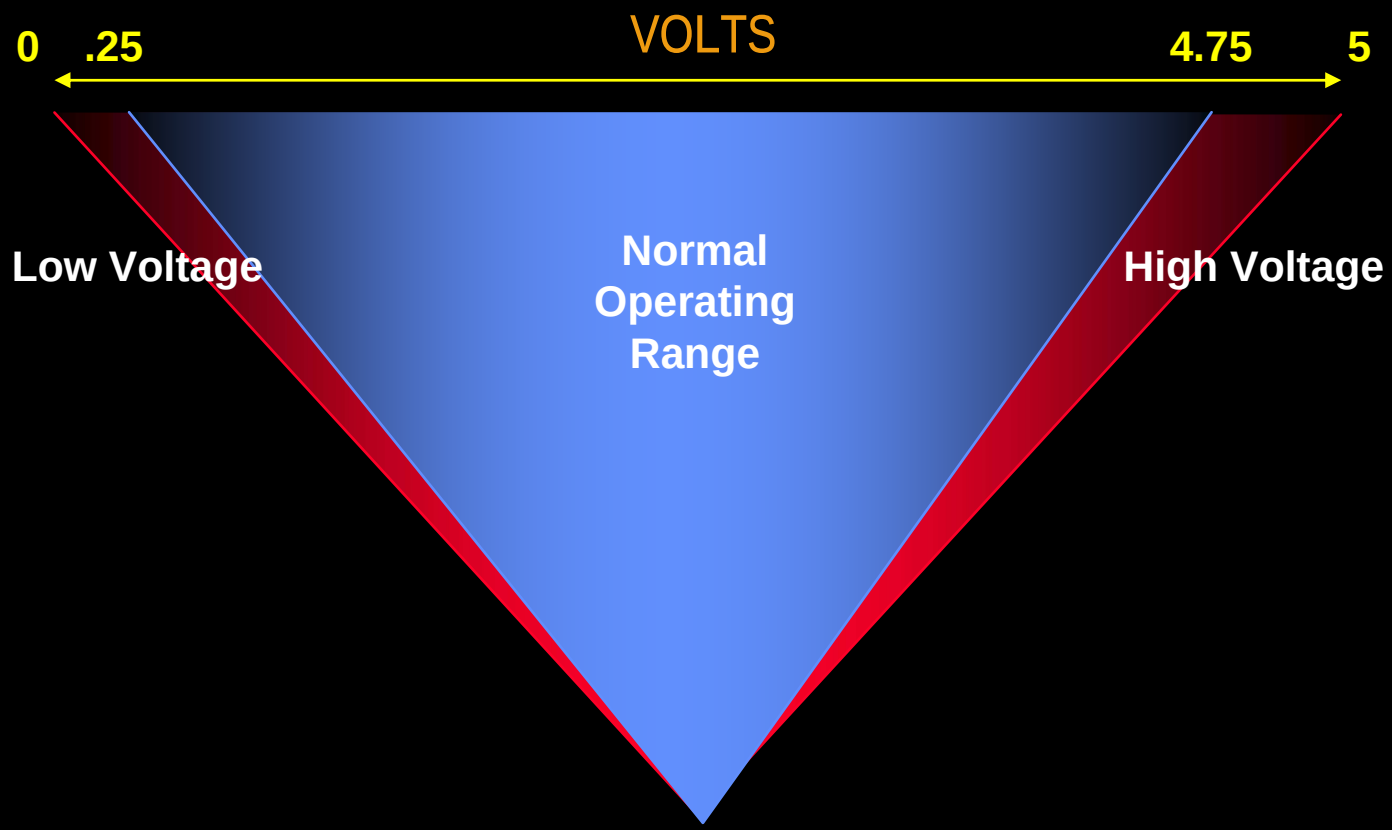
Typical EUI Fuel Injection Systems



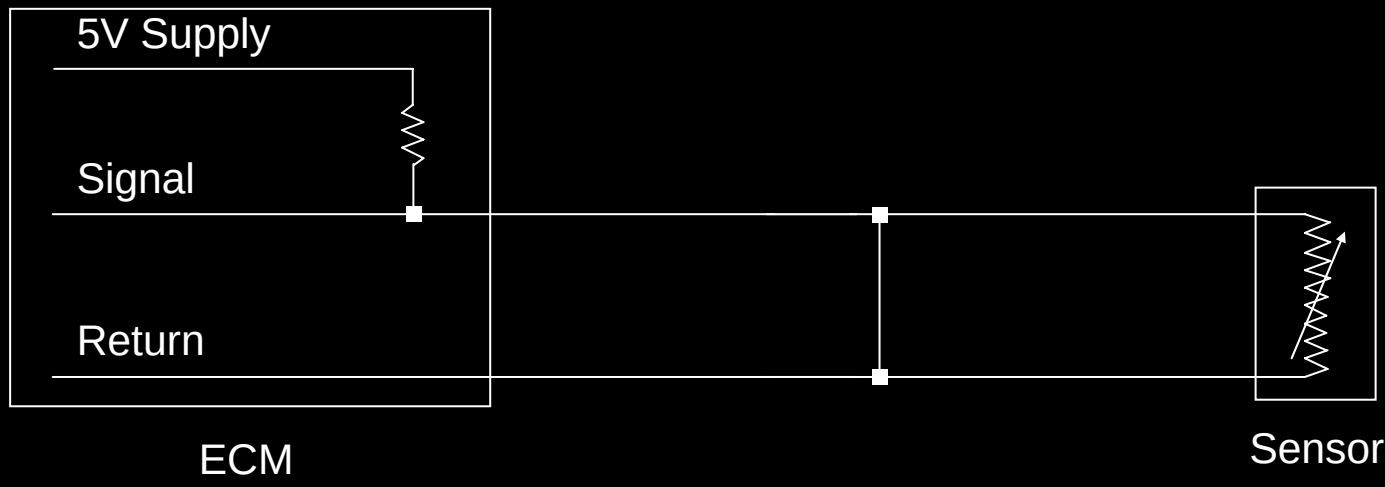
Sensor types

- Two wire sensors are called **Thermistors**
  - Common return wire is #452
  - Range -40* to +150* C
  - As the temperature increases the resistance decreases.
- Three wire sensors are called **Piezoresistive.**
  - These are pressure sensors.
  - Voltage is proportional to pressure.
- Also, two other sensors with twisted wires and a two pin connector are the TRS and SRS called **Variable Reluctance**

5 Volt Sensor Operation



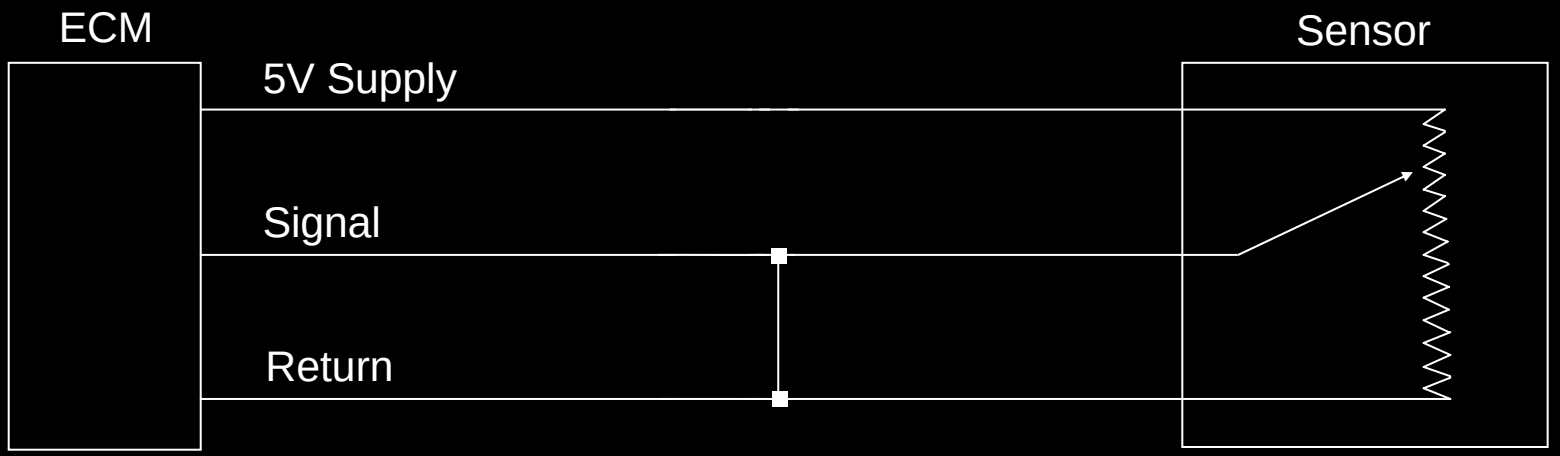
2-wire Sensors



Open = HIGH VOLTAGE

Short = LOW VOLTAGE

3-wire Sensors



Open Supply	**=**	**LOW VOLTAGE**
Open Signal	**=**	**LOW VOLTAGE**
Open Return	**=**	**HIGH VOLTAGE**
Supply short to Signal	**=**	**HIGH VOLTAGE**
Supply short to Return	**=**	**LOW VOLTAGE**
Signal short to Return	**=**	**LOW VOLTAGE**

Electrical System

Definitions

- **Open Circuit**
  - **An “open” describes a complete break in the path of current at some point in the circuit. The result of an “open” is that one or more loads in the circuit do not work.**

452

120

Open

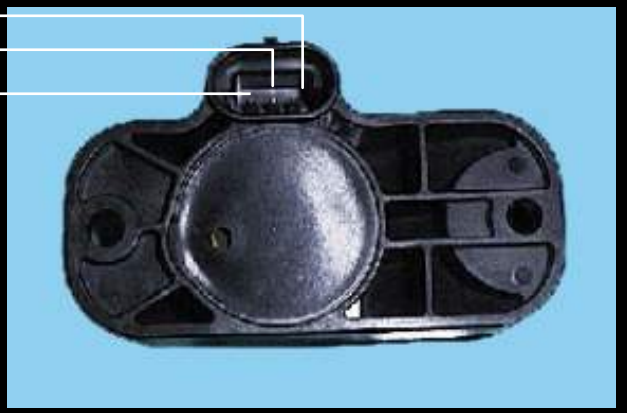
High voltage code

Electrical System

452 — Cavity A
432 — Cavity B
416 — Cavity C

Open

Low voltage code



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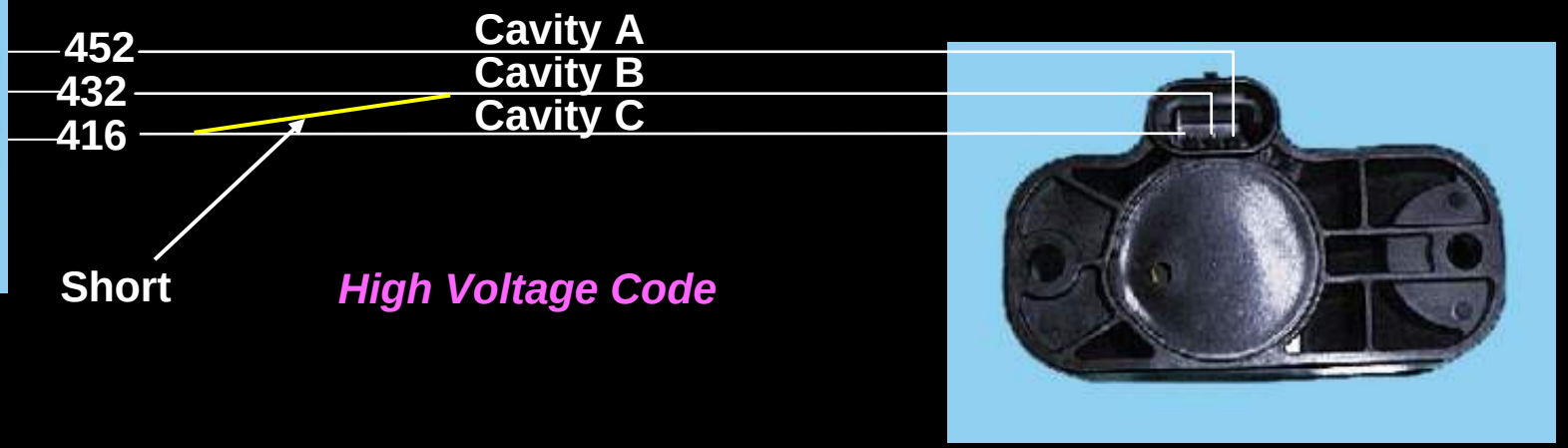
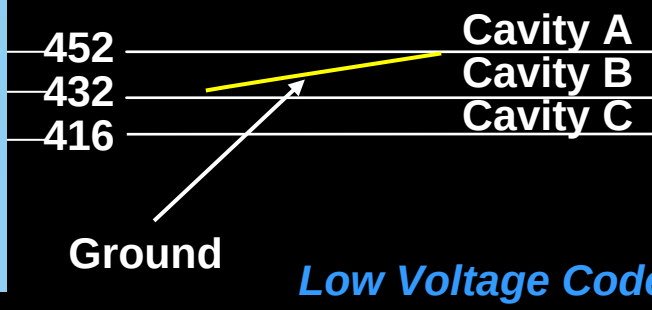
Electrical System

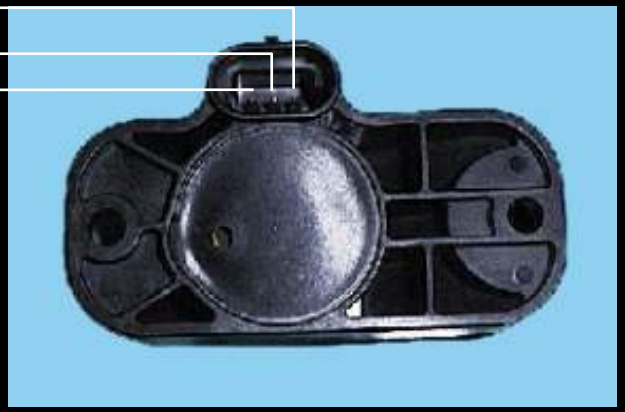


Definitions

- **Short Circuit**
  - A “short” occurs when a load in the circuit is accidentally bypassed. Electricity will always take the path of least resistance. The result of a “short” is that higher current flows, causing excessive heat or action from a device protecting the circuit (blown fuse or activated circuit breaker).

Electrical System





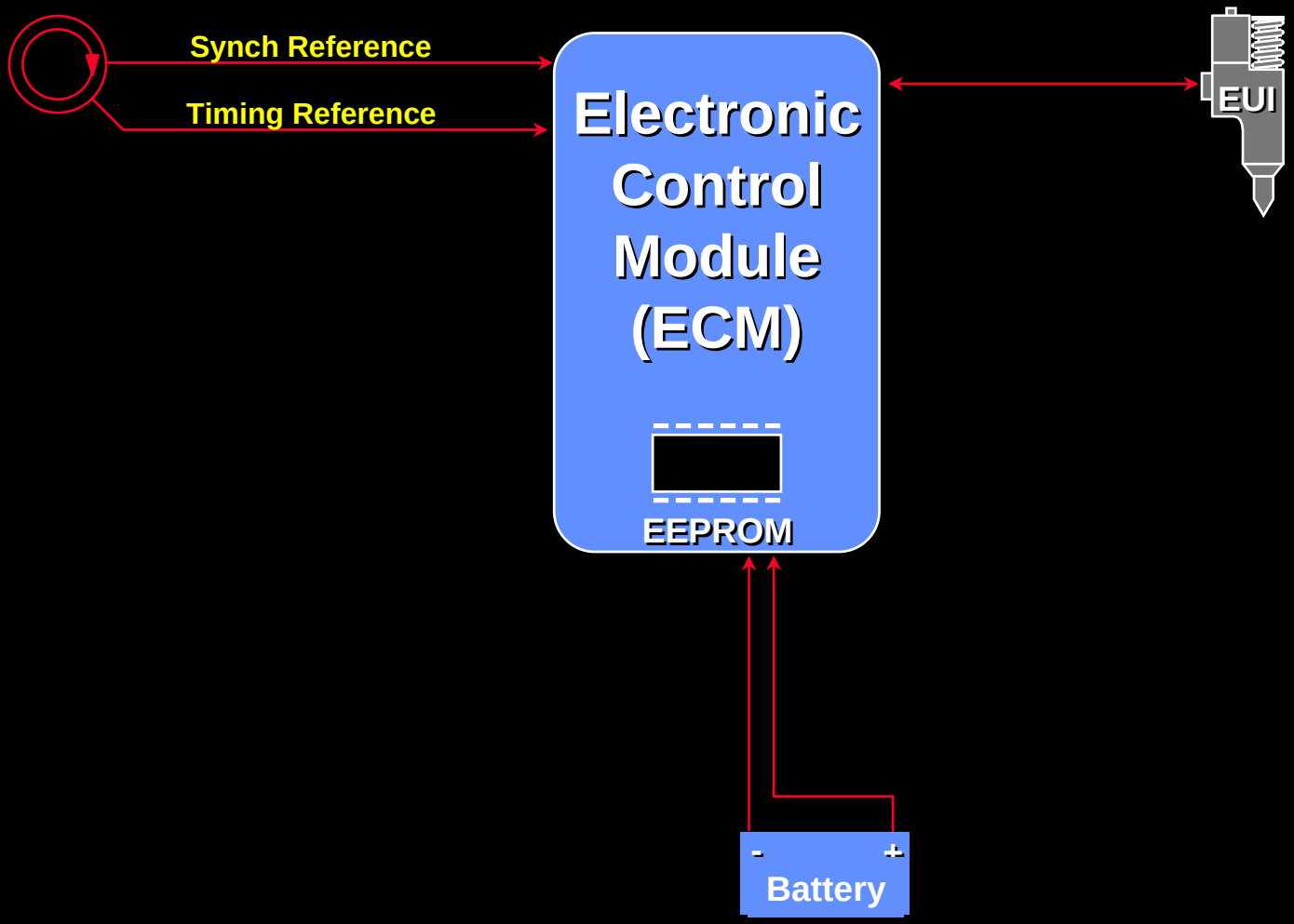
Definitions

- **Grounded Circuit**
  - A “ground” is similar to a “short” because current accidentally bypasses a load in the circuit. The difference is that the bypass connects directly to the negative terminal of the power source by way of the chassis ground path.

SRS/TRS Sensors

- **SRS/TRS: Magnetic pickup sensors generate alternating current (A.C.). The frequency will change dependent on the speed of the pulse wheel (RPM of engine).**

Schematic Diagram DDEC III / IV



Series 50/60
SRS/TRS Sensors

SRS/TRS

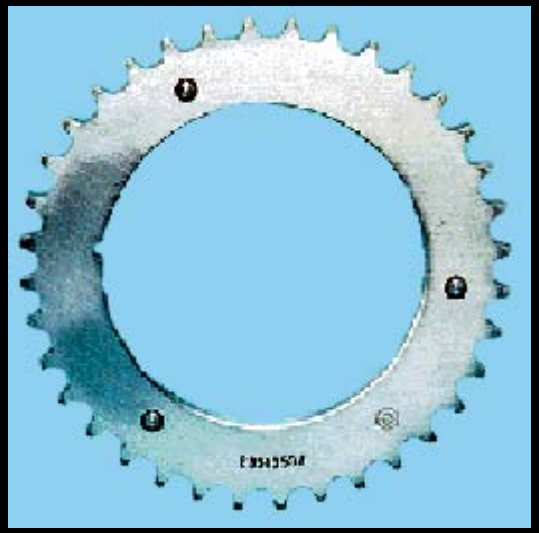
DDEC II Bull Gear

Timing Wheel
DDEC II

Series 50/60
SRS/TRS Sensors

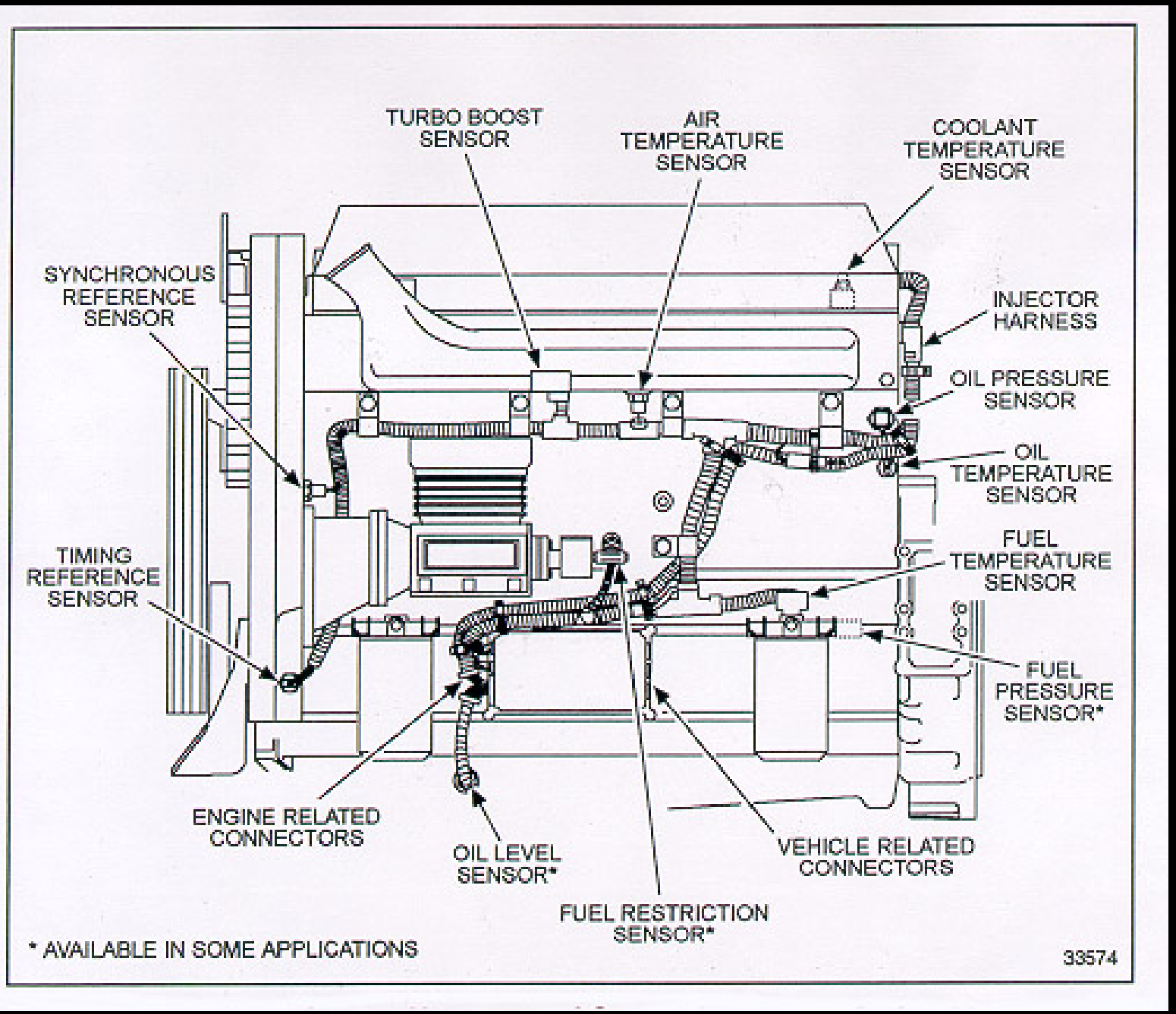
SRS/TRS

Bull Gear
DDEC III/ IV

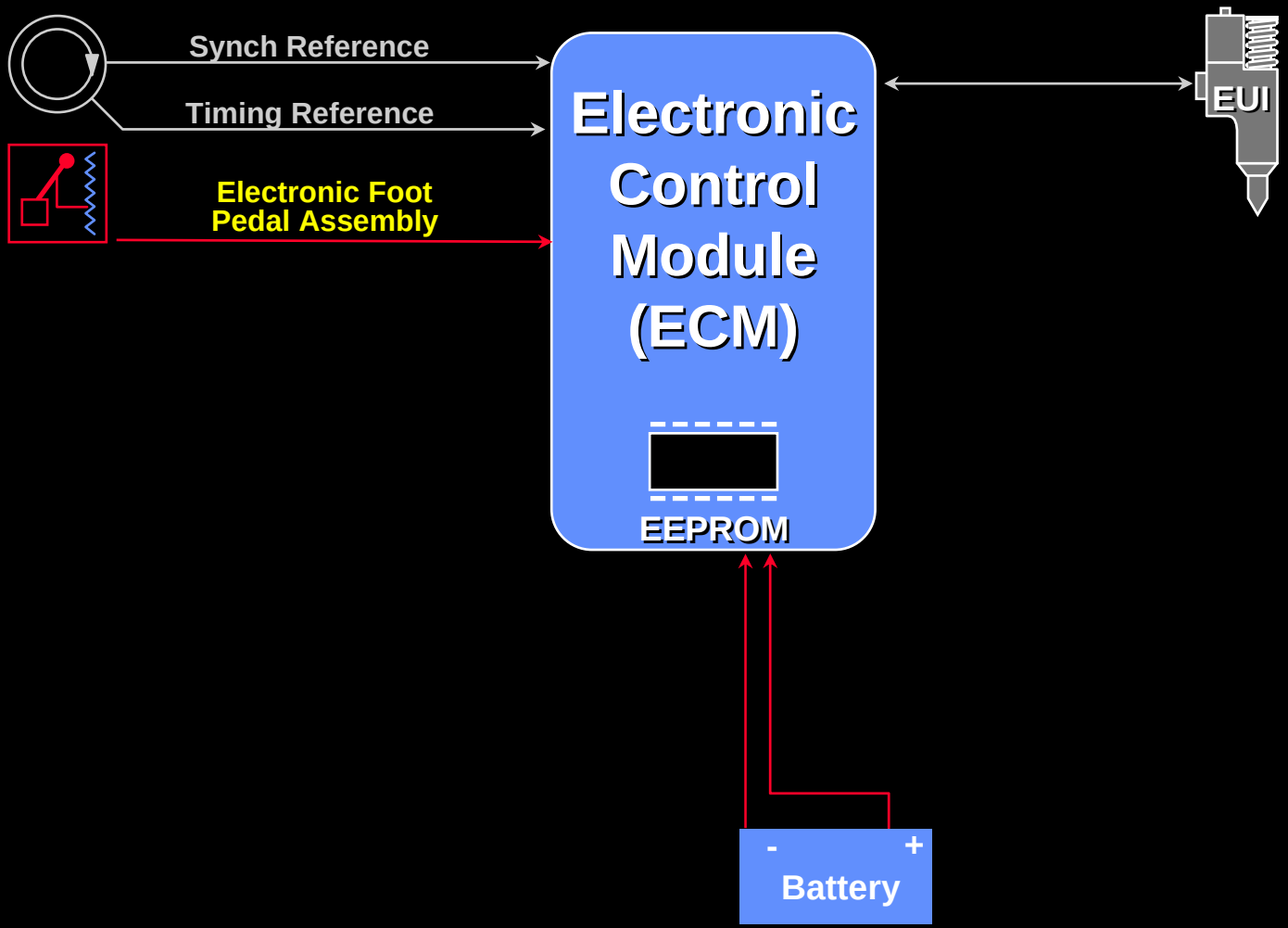


Timing Wheel
DDEC III/ IV

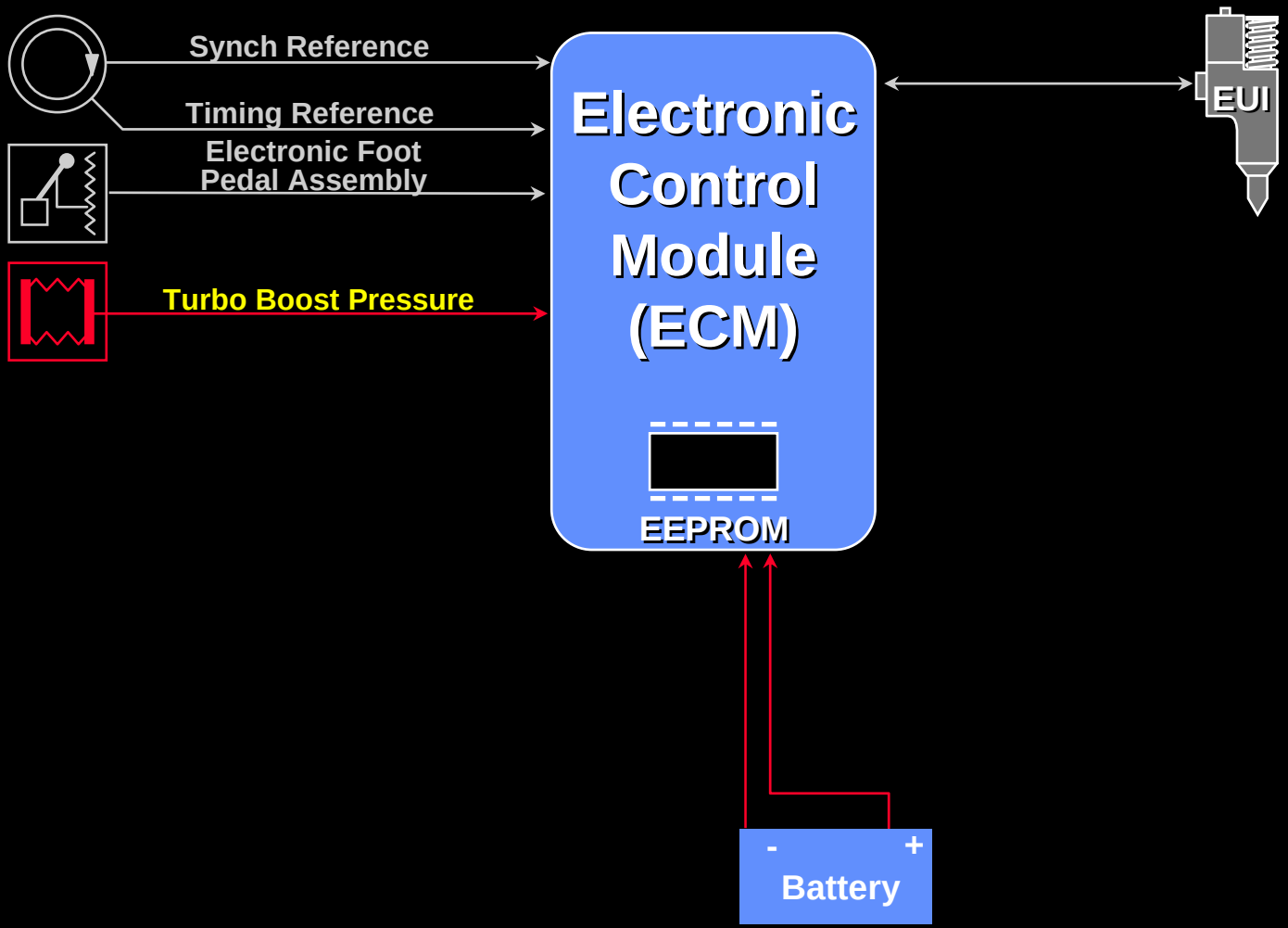
Series 60 Sensor Locations



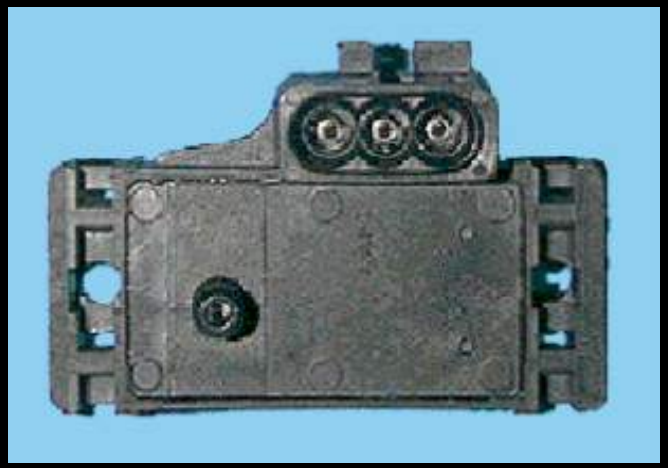
Schematic Diagram DDEC IV



Schematic Diagram DDEC IV



Turbo Boost Sensor

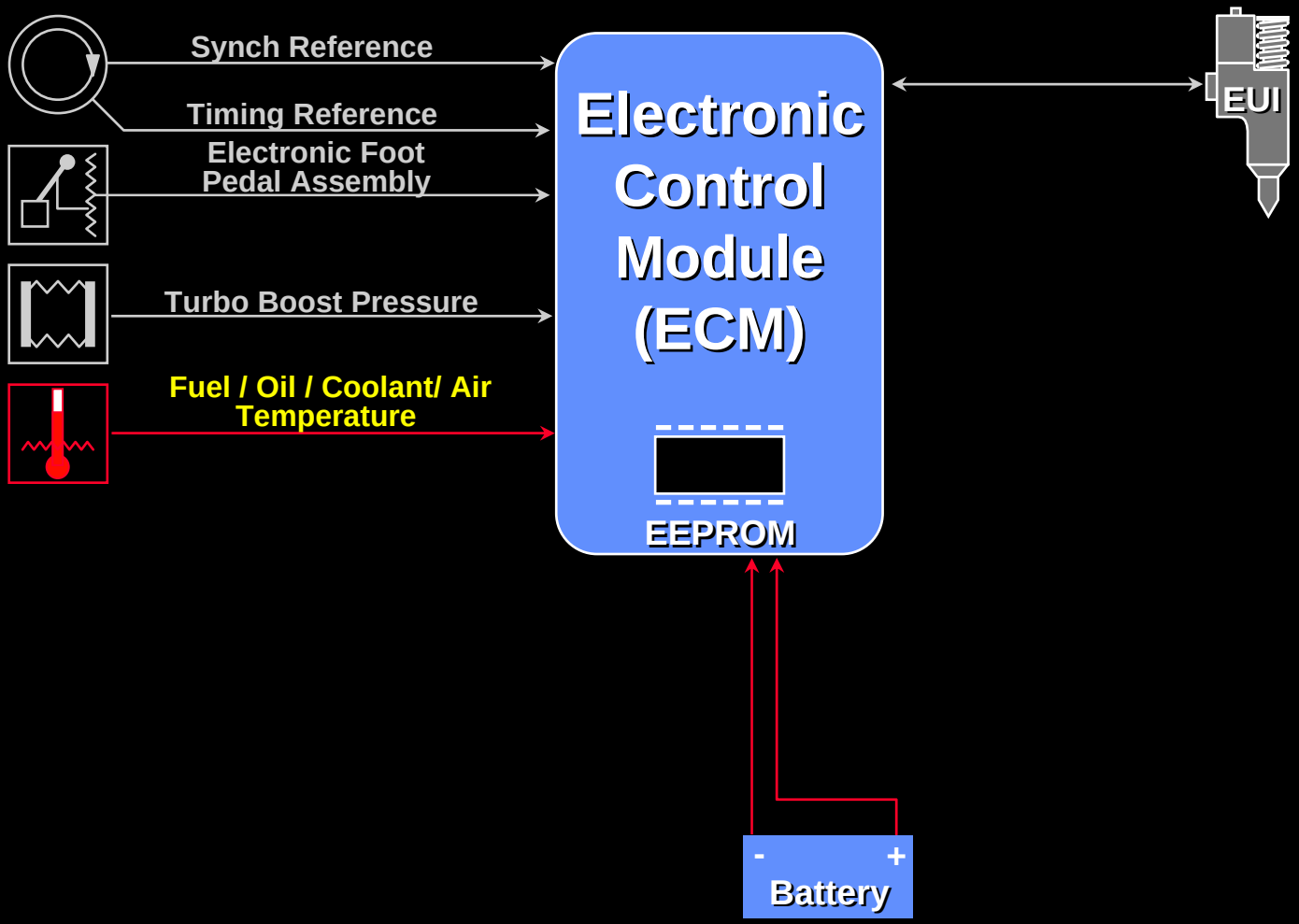


Series 50/60 DDEC III

Series 50/60
DDEC IV V
W/EGR

Series 50/60 DDEC IV

Schematic Diagram DDEC III / IV



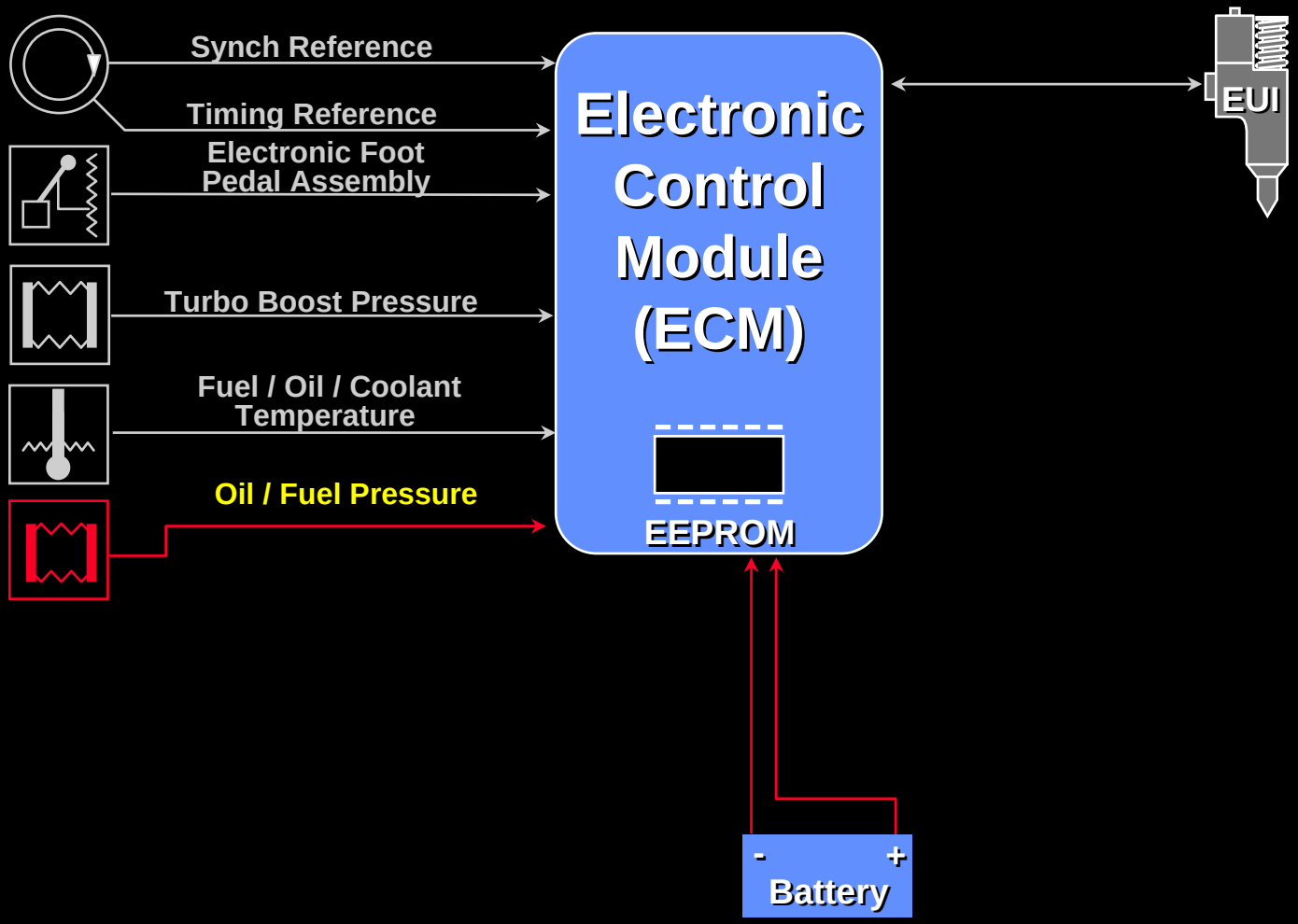
Temperature Sensors

Coolant Temperature Sensor
Series 50/60

Fuel/Oil/Coolant Temperature Sensor
Series 50/60

Air Temperature Sensor
Series 50/60

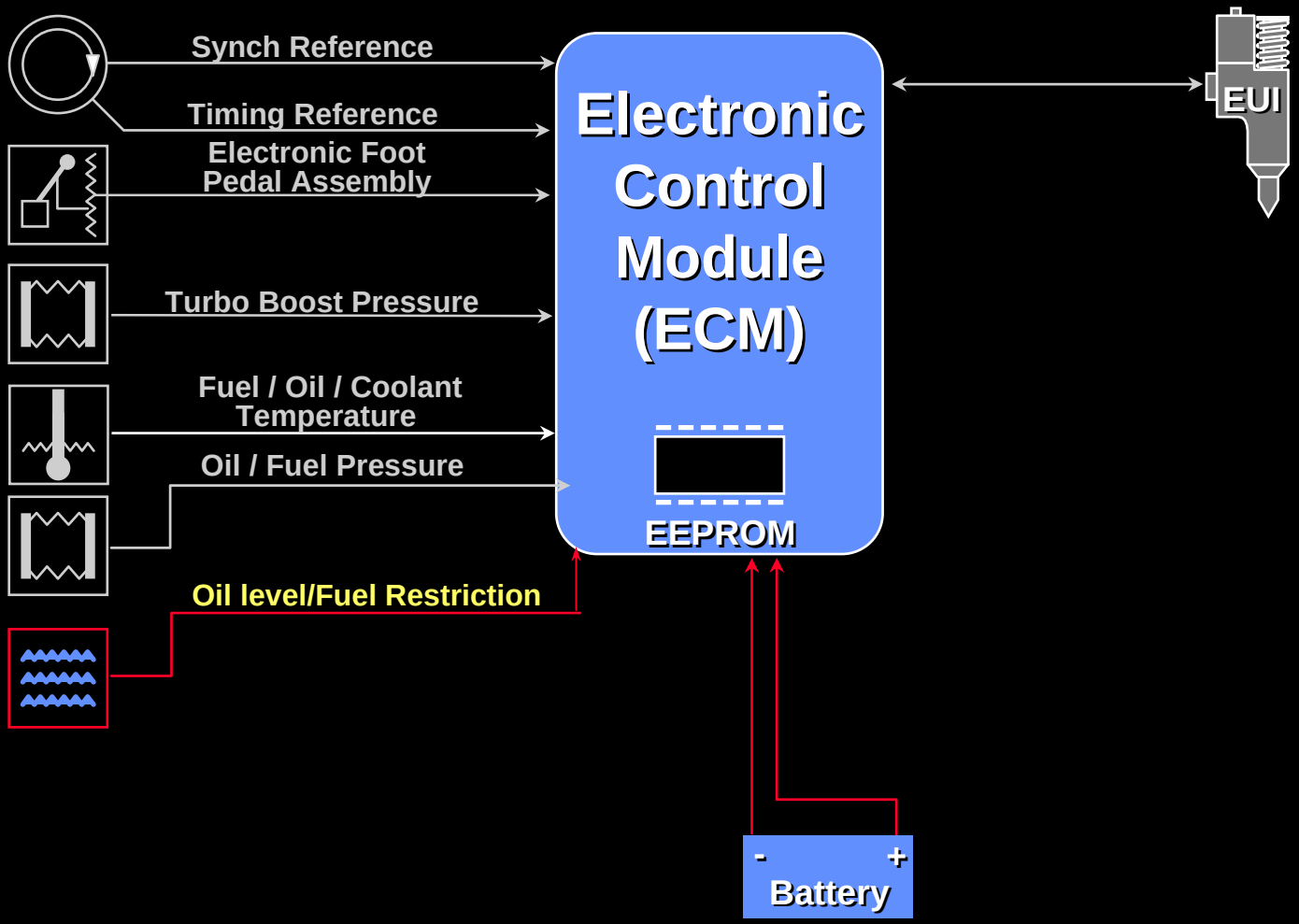
Schematic Diagram DDEC III / IV



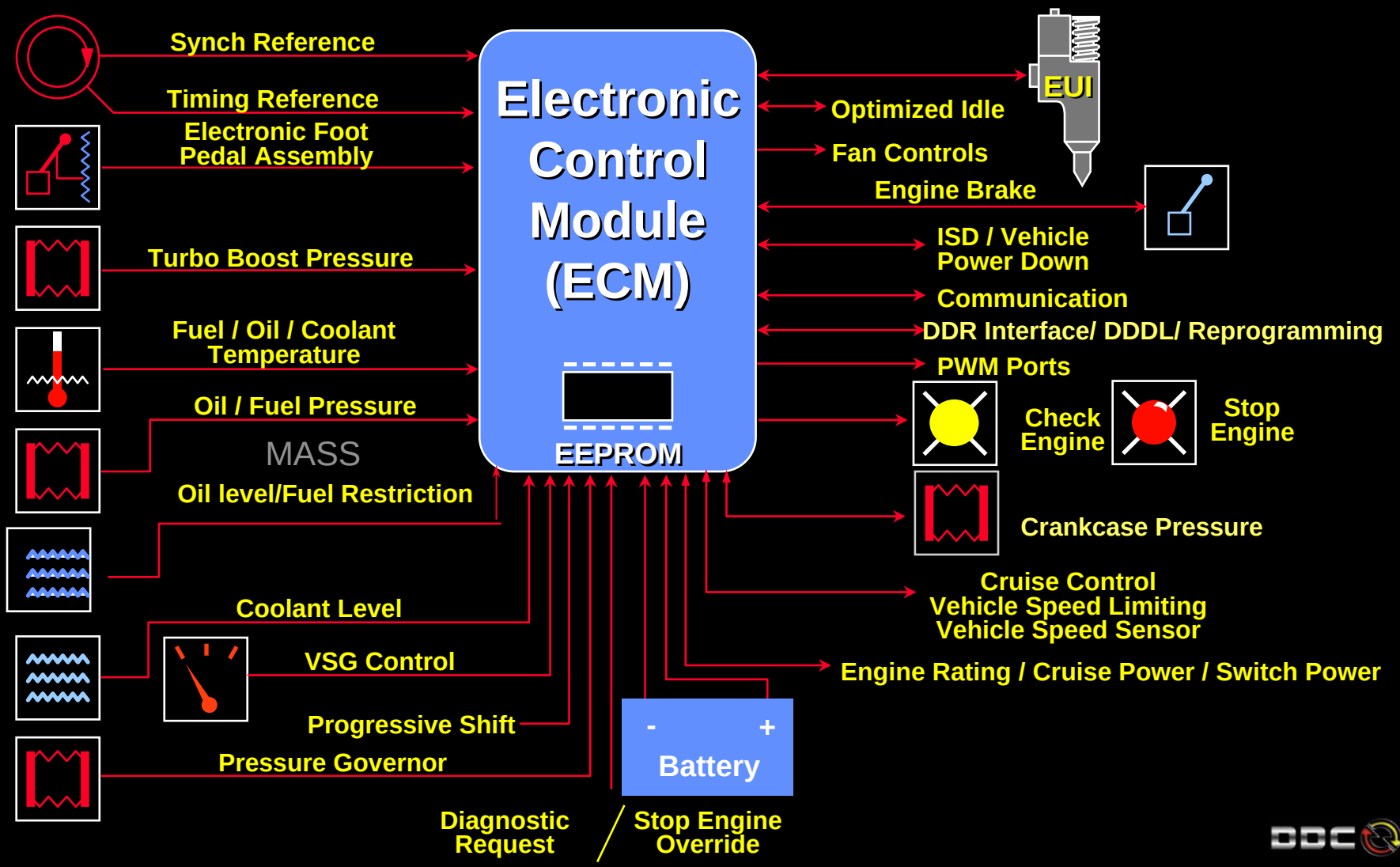
Pressure Sensors

Series 50/60
Oil Pressure

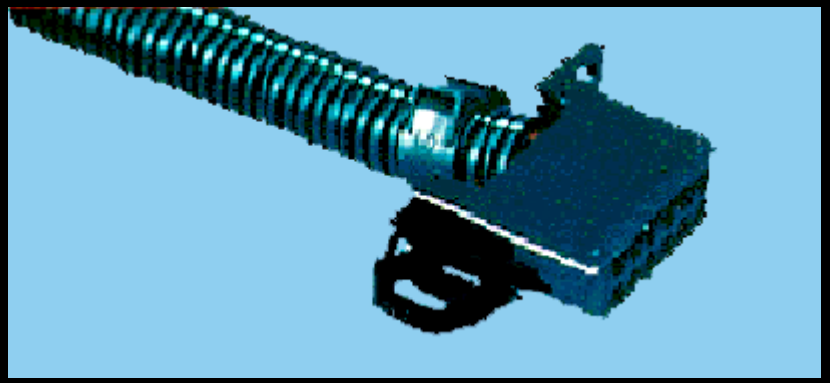
Schematic Diagram DDEC III / IV



Schematic Diagram DDEC III / IV non EGR



DDR Communication- On Highway



DDEC II or III
12-Pin

DDEC III/ IV
6-Pin

DDR Communication- On Highway

DDEC IV

9 Pin

Diagnostic Socket

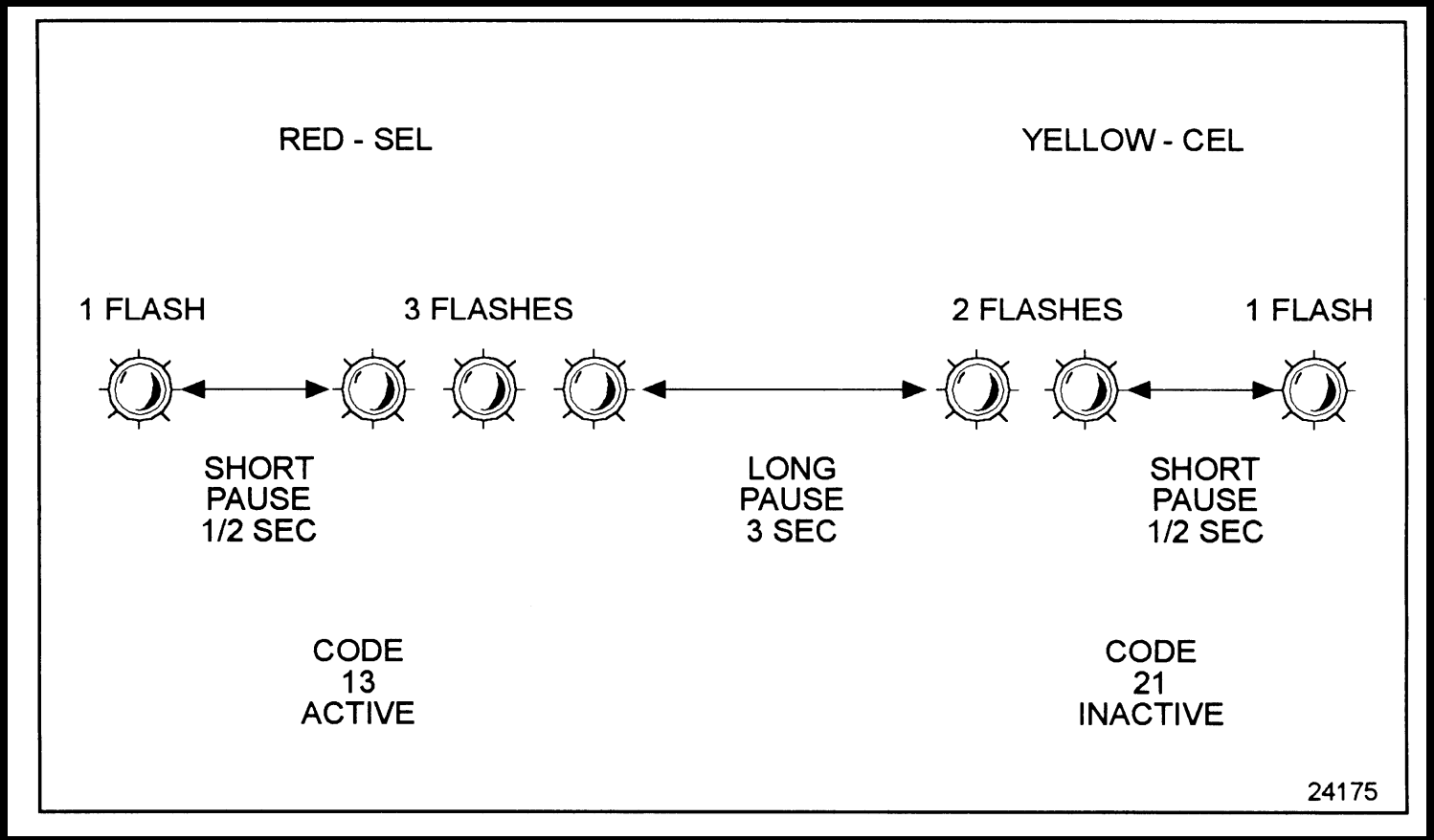
Pin- Outs for On-Highway Cable

6 Pin Deutsche		9 Pin Deutsche	
C	12V	B	12V
E	Ground	A	Ground
A	J1587 +	F	J 1587 +
B	J1587 –	G	J 1587 –
		C	J 1939 +
		D	J 1939 –

DDR Interface with MPSI Printer

Diagnostics

Flash Codes


RED - SEL
YELLOW - CEL
1 FLASH
3 FLASHES
2 FLASHES
1 FLASH
SHORT PAUSE 1/2 SEC
LONG PAUSE 3 SEC
SHORT PAUSE 1/2 SEC
CODE 13 ACTIVE
CODE 21 INACTIVE
24175

Troubleshooting Tools

Volt-Ohm Meter

- To properly probe terminals use Kentmoore jumper wire kit number J39197. Within this kit the proper leads are provided.

- The use of the lead ends of the volt ohm meter to probe the terminal ends will damage the DDEC connectors and will cause intermittent codes.
  - DVOM w/jumper wire kit J39197
  - VEHICLE INTERFACE MODULE
  - BREAK OUT BOX
  - DDEC SENSOR TESTER

Troubleshooting Tools

Breakout Box (30 Pin)
J35634

DDEC II III IV

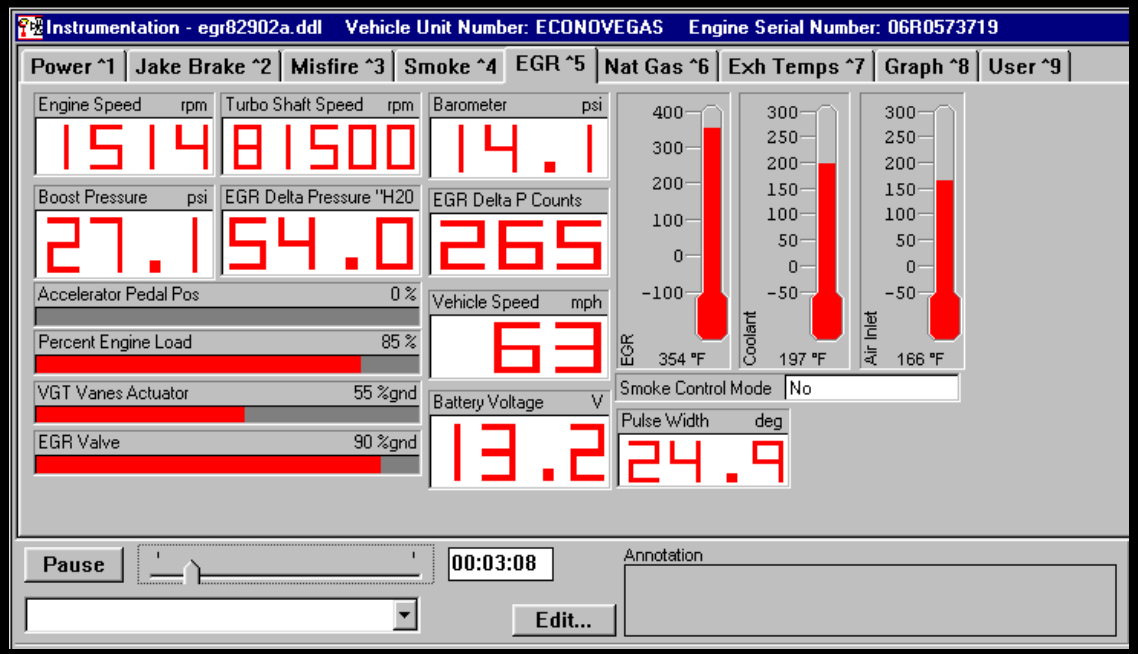
DDEC III/IV Interface
J41005

DDEC V with J-41005-5
CABLE

Diagnostic Tools

- **DDEC II- III- IV- V Electronic Tools**

Pro-Link Suite 8



Detroit Diesel Diagnostic Link 6.2

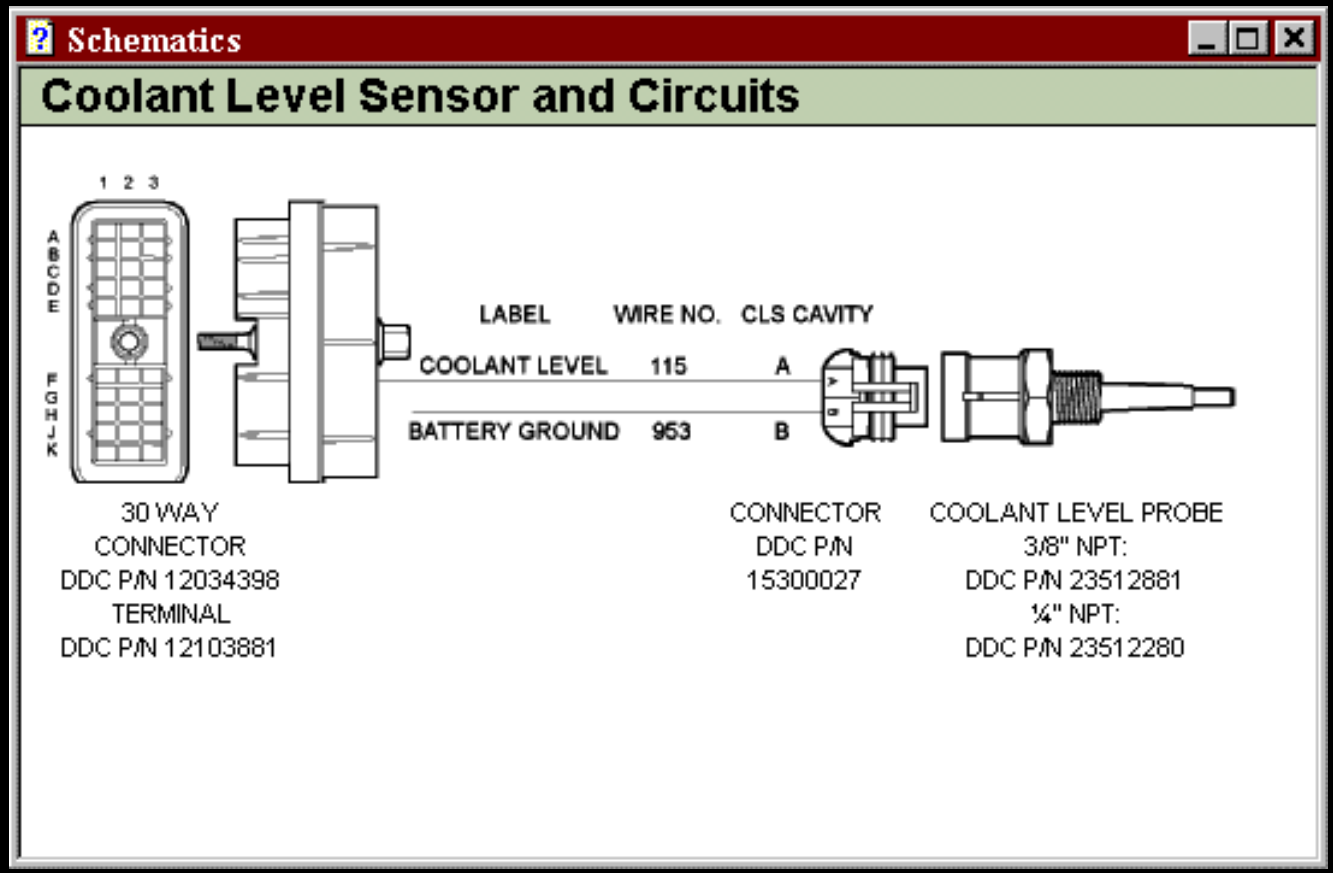
Detroit Diesel Diagnostic Link

- **HARDWARE KIT # J-42384-GCD**
- **SOFTWARE KIT # J-DDDL-6.2 CD**

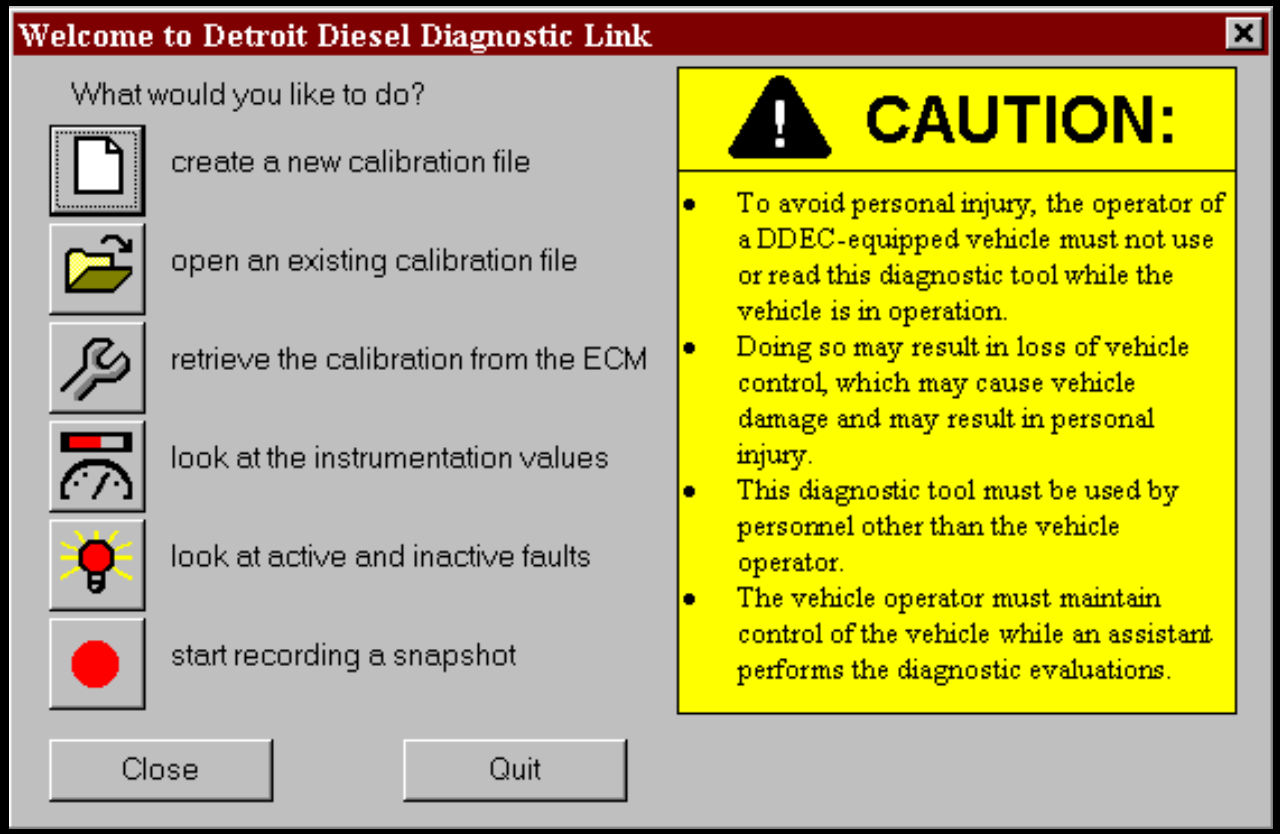
DDDL Information

- New PC based DDEC service tool
  - Release 6.2
    - » Windows 95 / 98 / 2000
    - » VGA color monitor
    - » Pentium, 300MHz, 128MB RAM
    - » Supports all DDEC Systems including EGR & MBE On-Highway
    - » Support Data Extractions & Trip Reporting Features

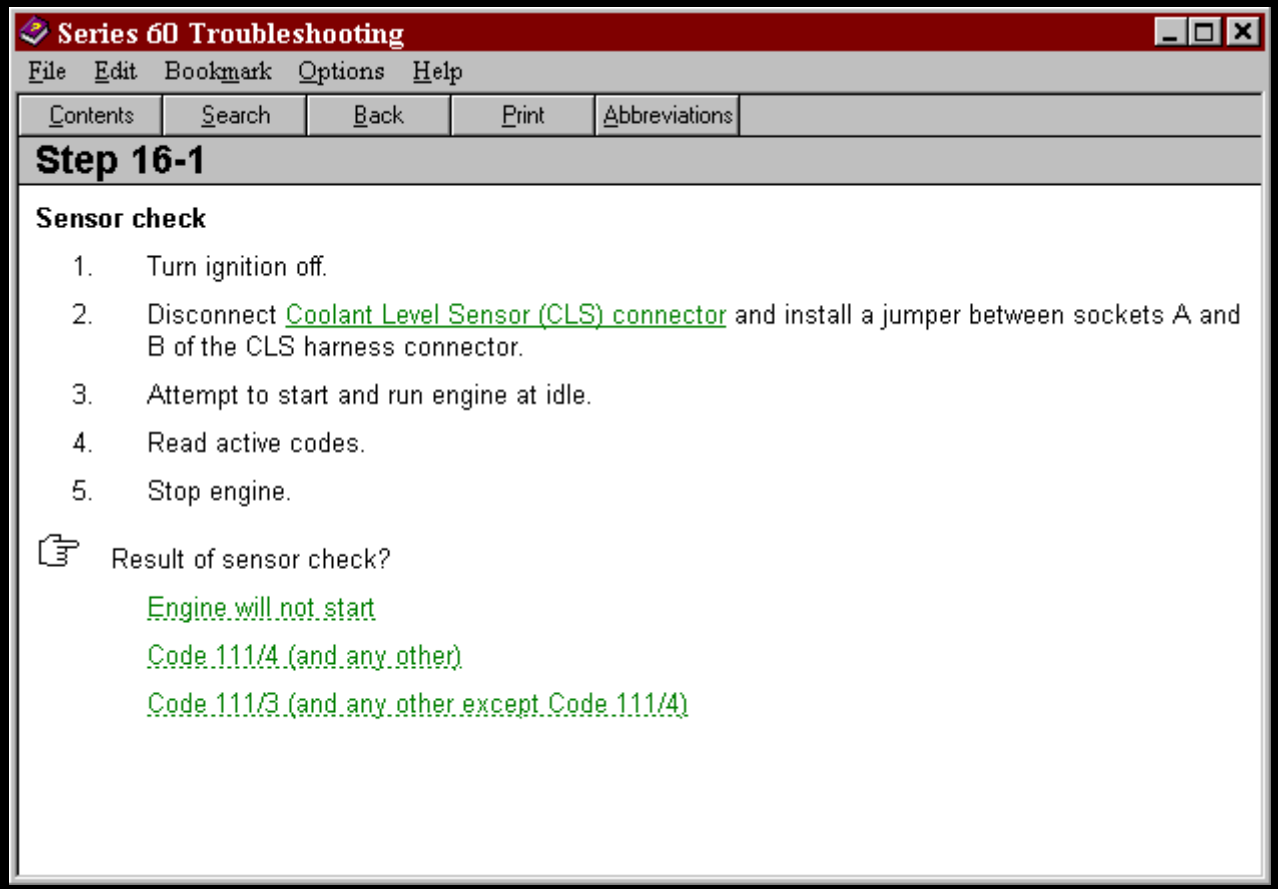
Detroit Diesel
Diagnostic Link



Detroit Diesel
Diagnostic Link

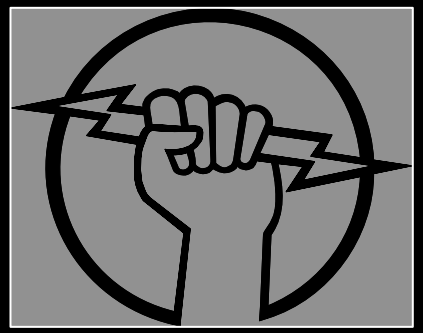


Detroit Diesel Diagnostic Link



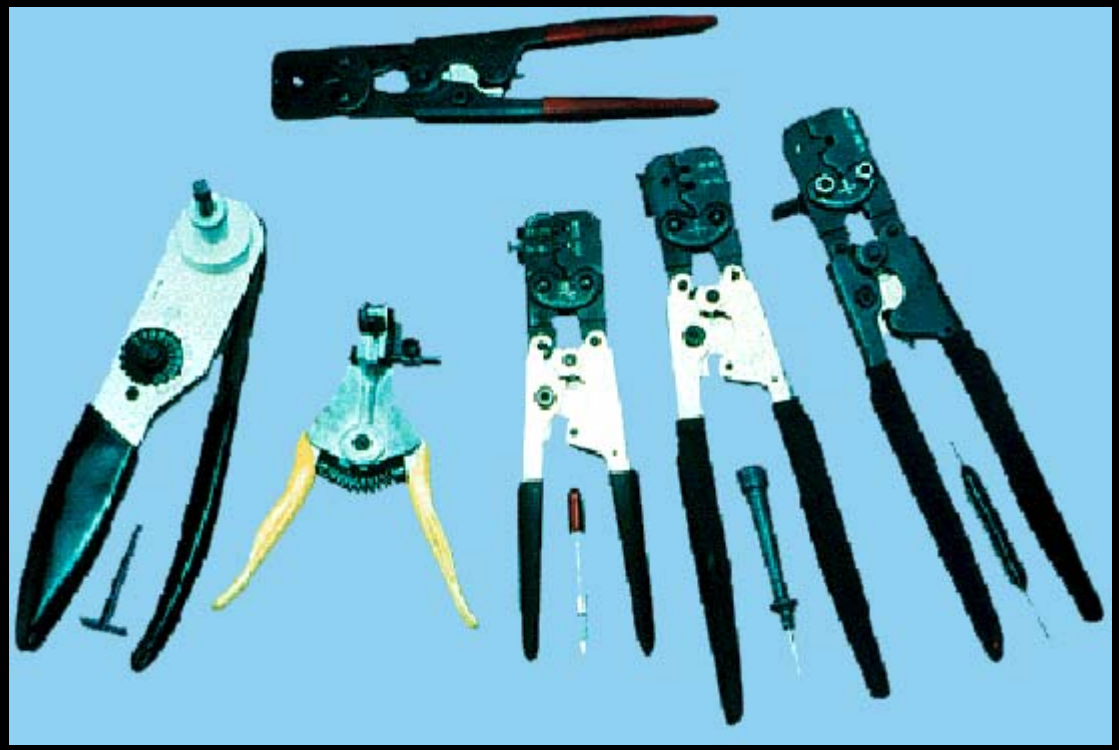
BASIC ELECTRICITY

- Volts
- Amps
- Ohms
- Shorts
- Open
- Grounds
- Resistance
- DVOM
- Soldering
- Shrink Tube
- Wiring Schematics



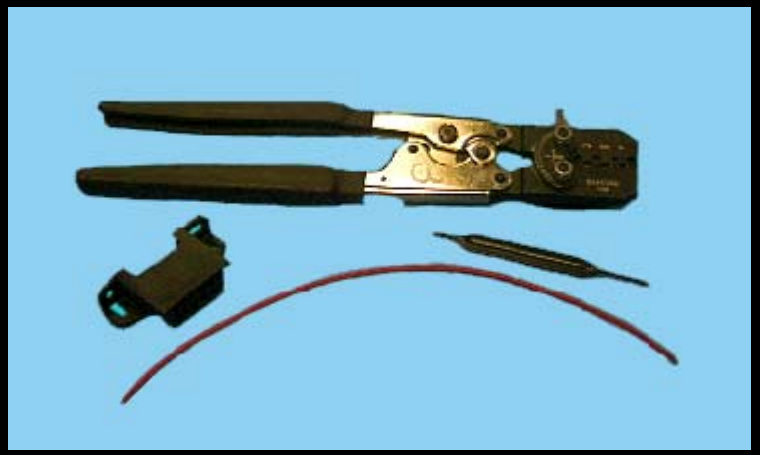
Wire Crimping Exercise

Wire Crimping Tools

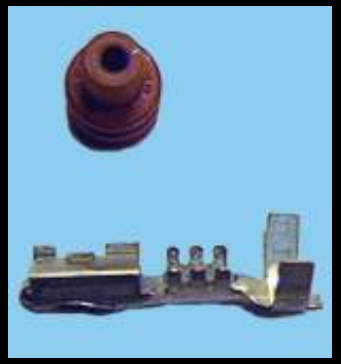


Wire Crimping Tools

Wire Crimping Tools



Wire Crimping Tools



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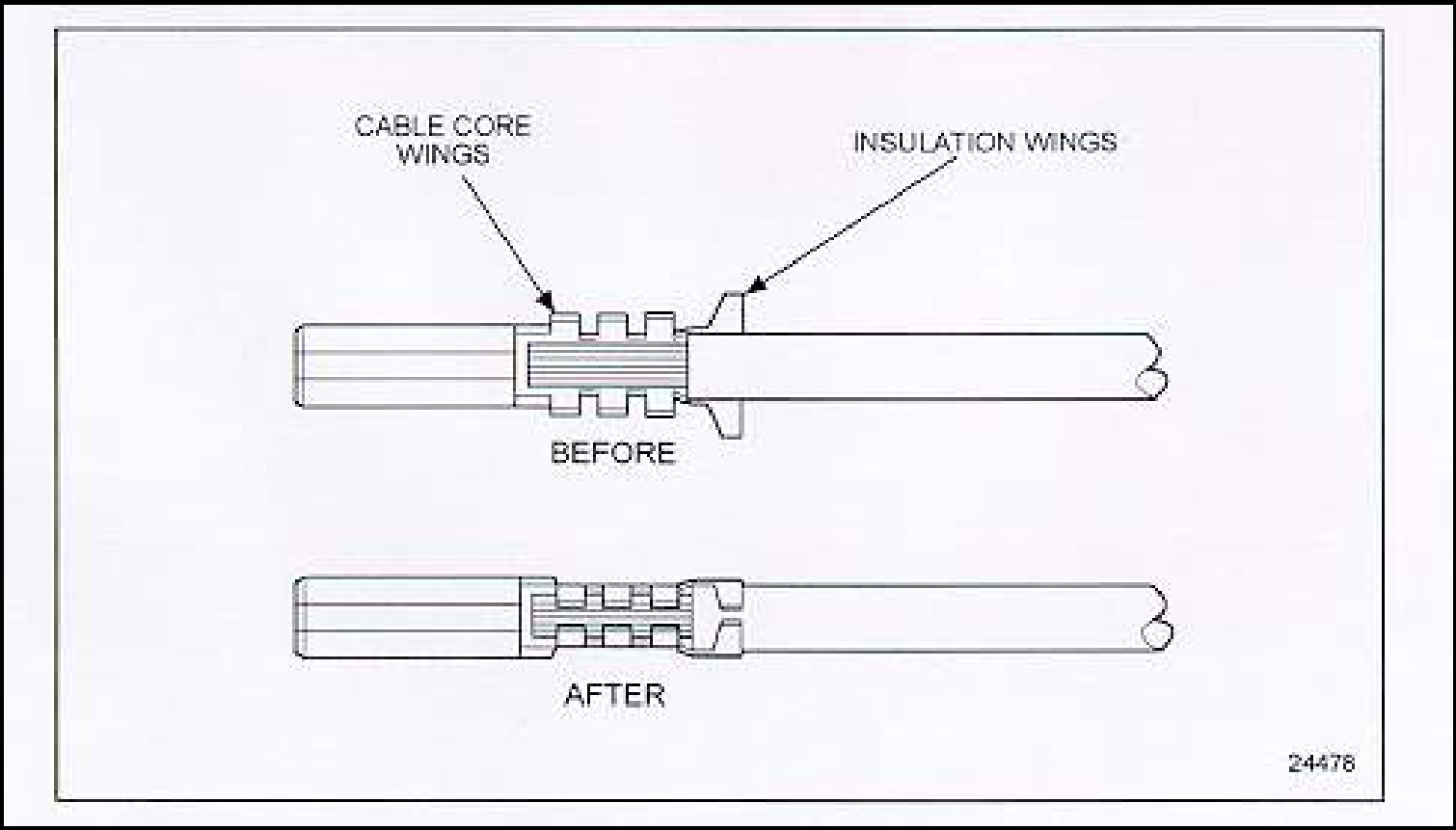
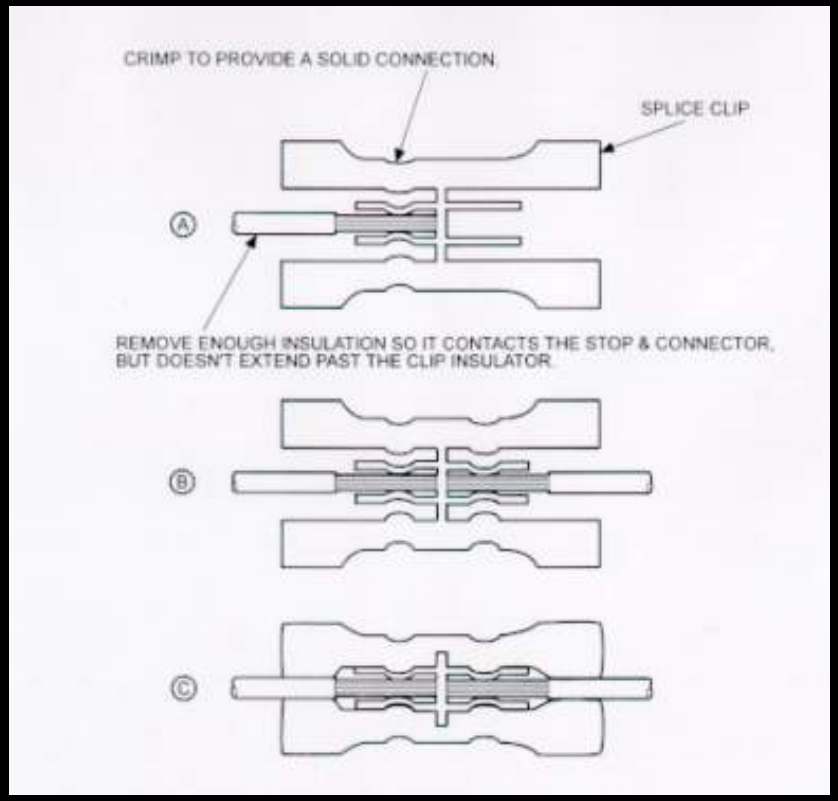
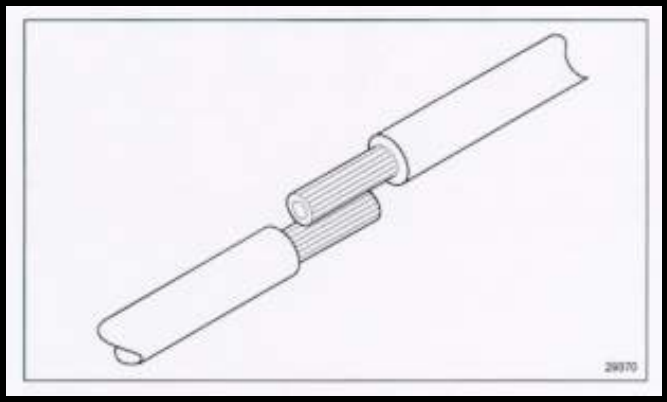
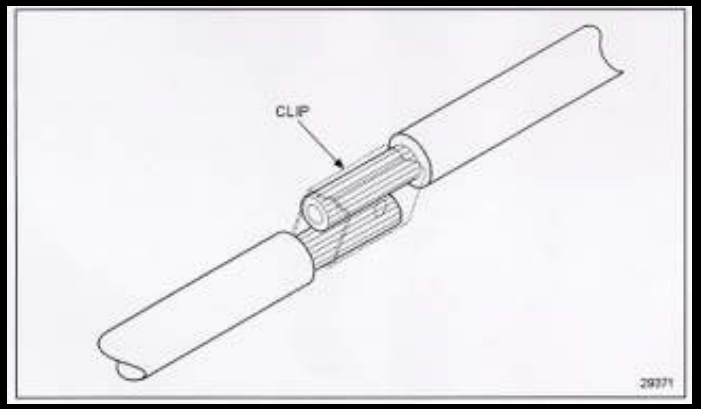


Wire Splicing

Wire Splicing Tools







DDEC IV
Additional EGR Sensors and Circuits

DDEC IV EGR Electronics

- Utilizes New Tyco/AMP Connectors for Improved Harness Design and Reliability
- Uses Framatome (FCI) Connectors for Sensors
  - Connectors were introduced for EGR engines in Oct 2002
- Has Full Support for J1587 and J1939 Data Links (J1922 is not supported)
- Maintains Same Footprint as DDEC III / IV
- Application and Installation Manual Now Available on the DDC Extranet

Series 60 EGR

EGR System Sensors

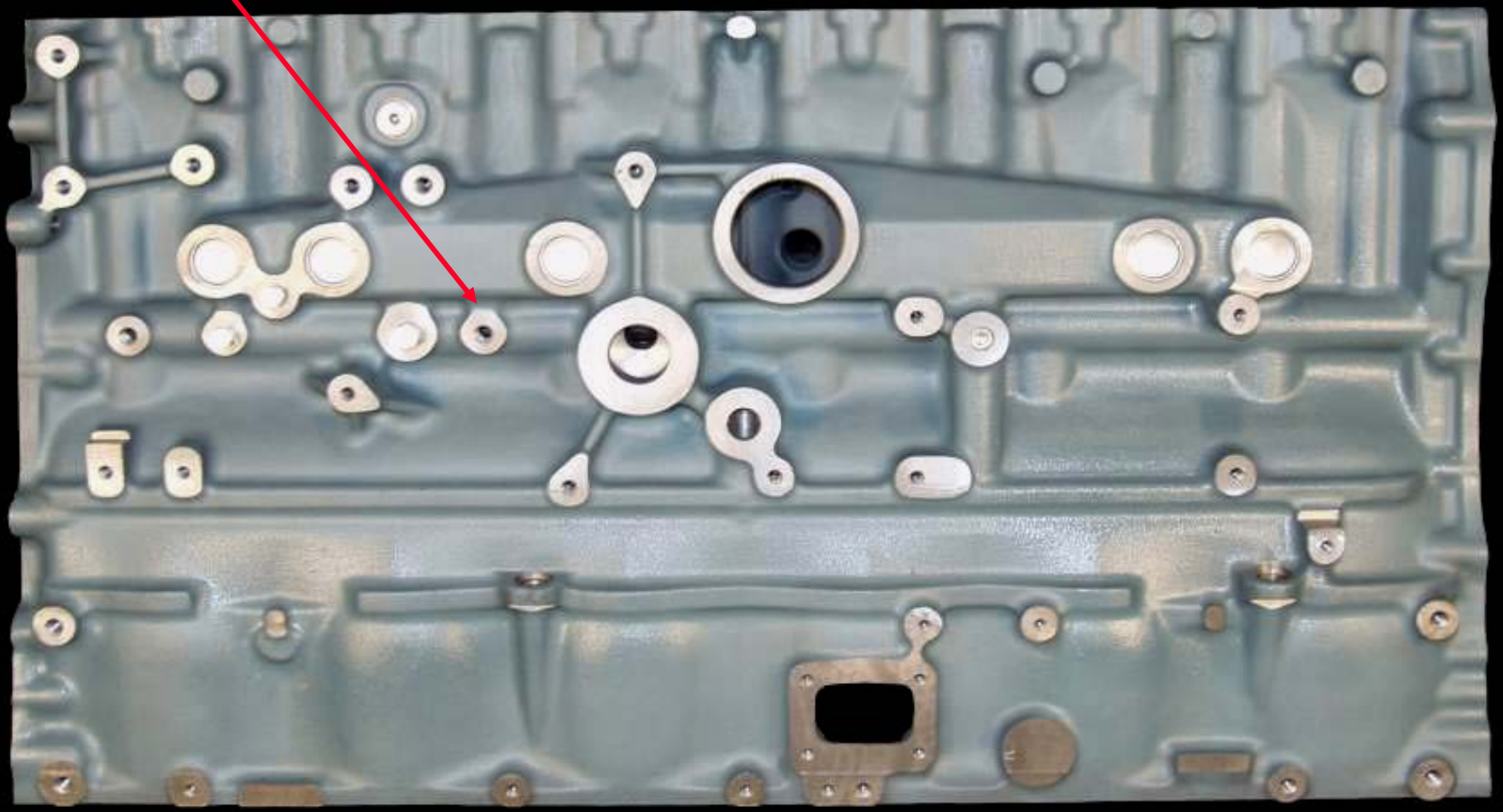
- New Sensors
  - Barometric Pressure
  - Turbo Compressor Inlet Temperature & Relative Humidity
  - EGR Differential Pressure/Delta
  - Turbo Compressor Outlet Temperature
  - **Turbocharger Speed**
  - **EGR Temperature**
- New Software
  - AECD Controls
  - Diagnostics

Series 50 EGR Sensors

DDEC IV System

Right Side View

Oil Temp Sensor



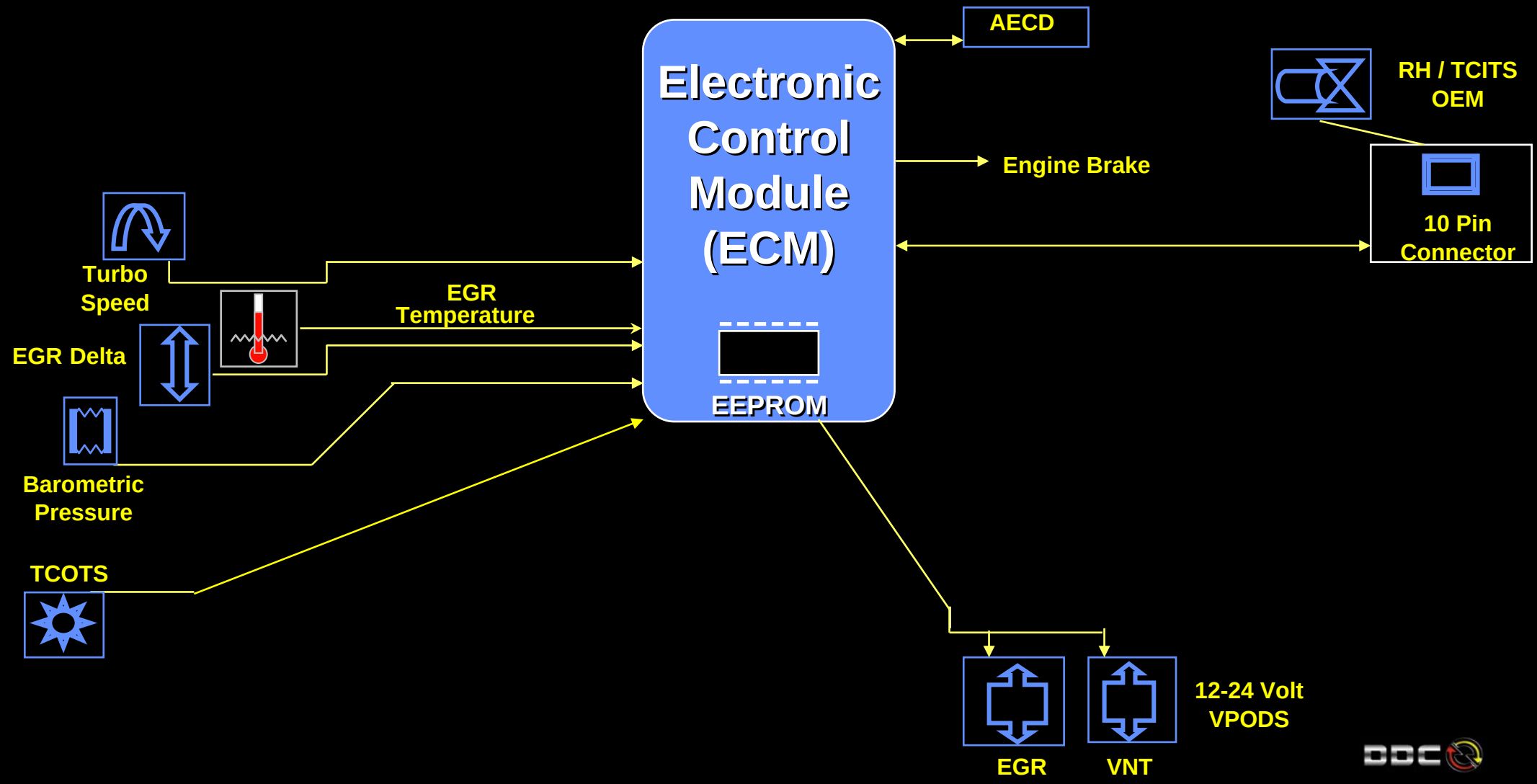
Auxiliary Emission Control Device

AECD Function

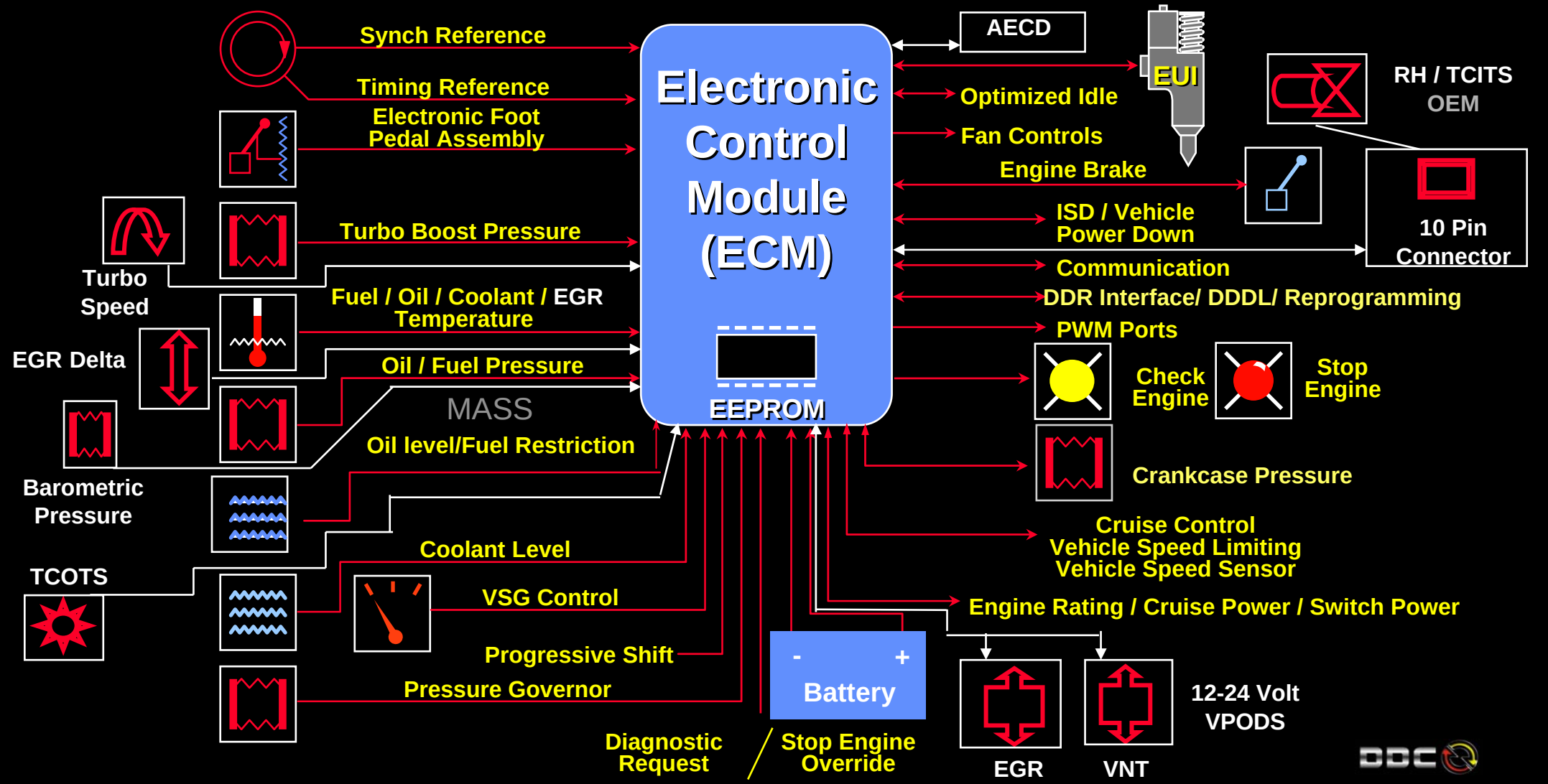
- **Shuts Off EGR Flow to Protect Engine from Damage when Conditions Produce High Levels of Condensation.**
- **AECD's are EPA Approved**
- **High Altitude above 6500 ft.**
- **High Humidity / Low Ambient Temperature**
- **Low Engine Temperature**

Schematic Diagram DDEC III / IV

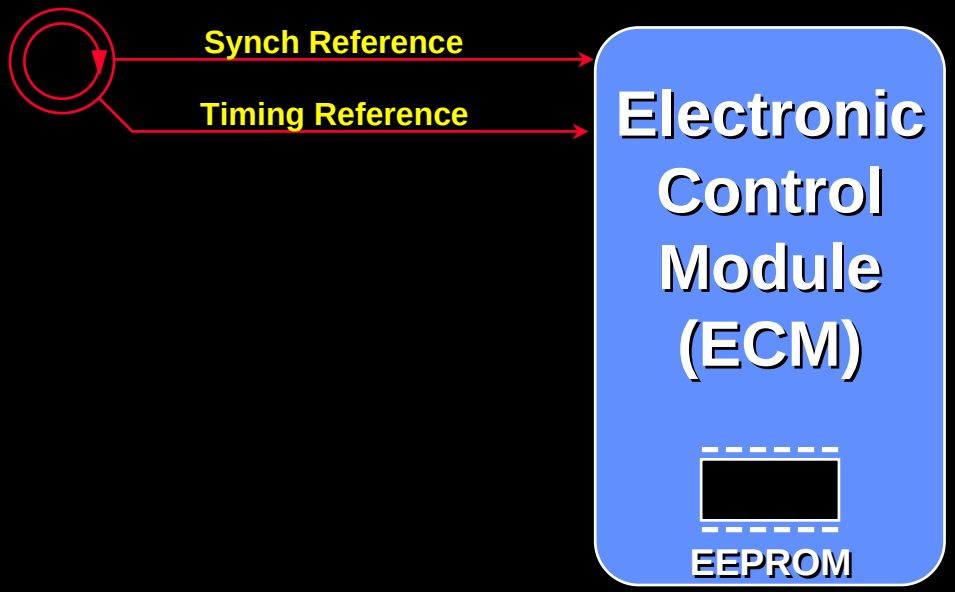
Additional EGR Sensors and Circuits



Schematic Diagram DDEC III / IV with EGR

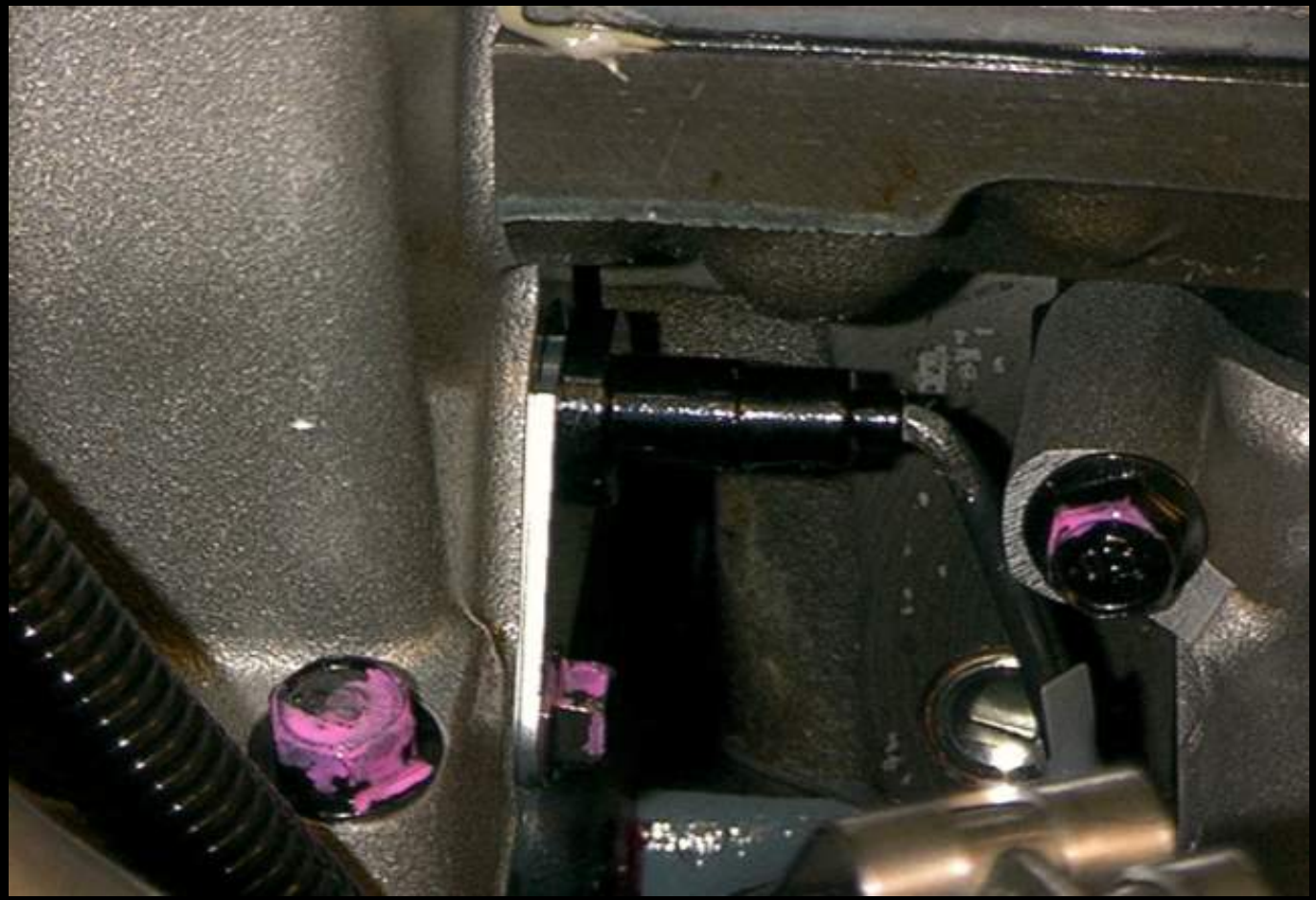


Schematic Diagram DDEC III / IV with EGR

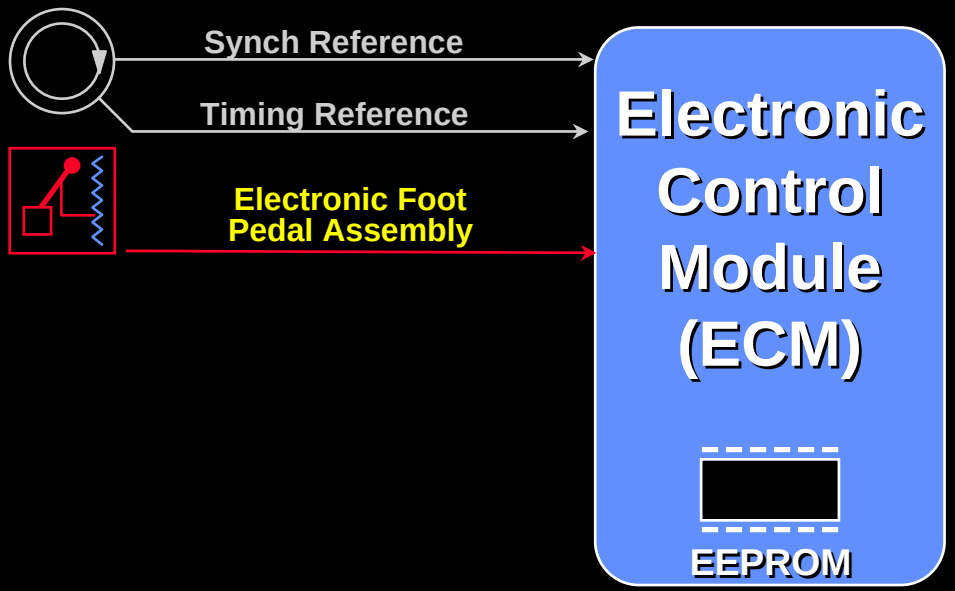


Series 60 EGR Cam Gear

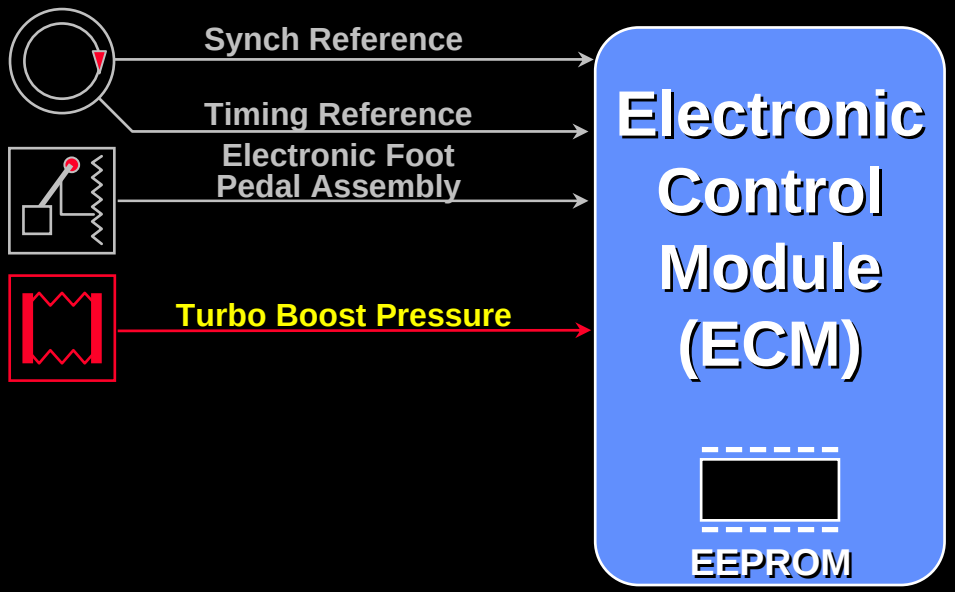
Series 60 EGR SRS Sensor



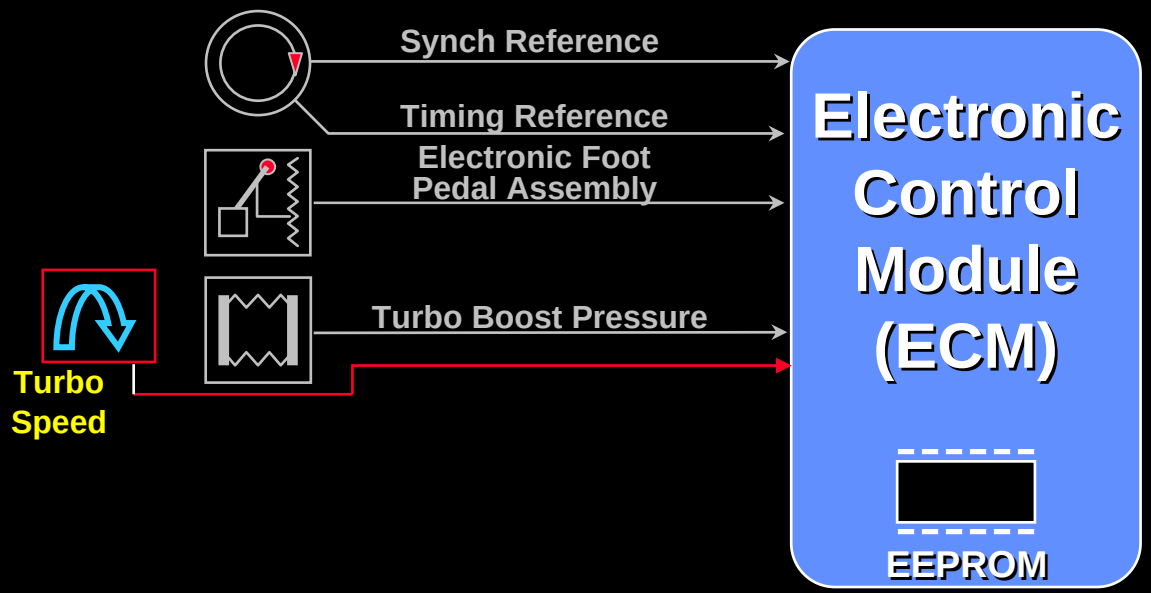
Schematic Diagram DDEC III - IV with EGR



Schematic Diagram DDEC III / IV w/EGR



Schematic Diagram DDEC III / IV with EGR

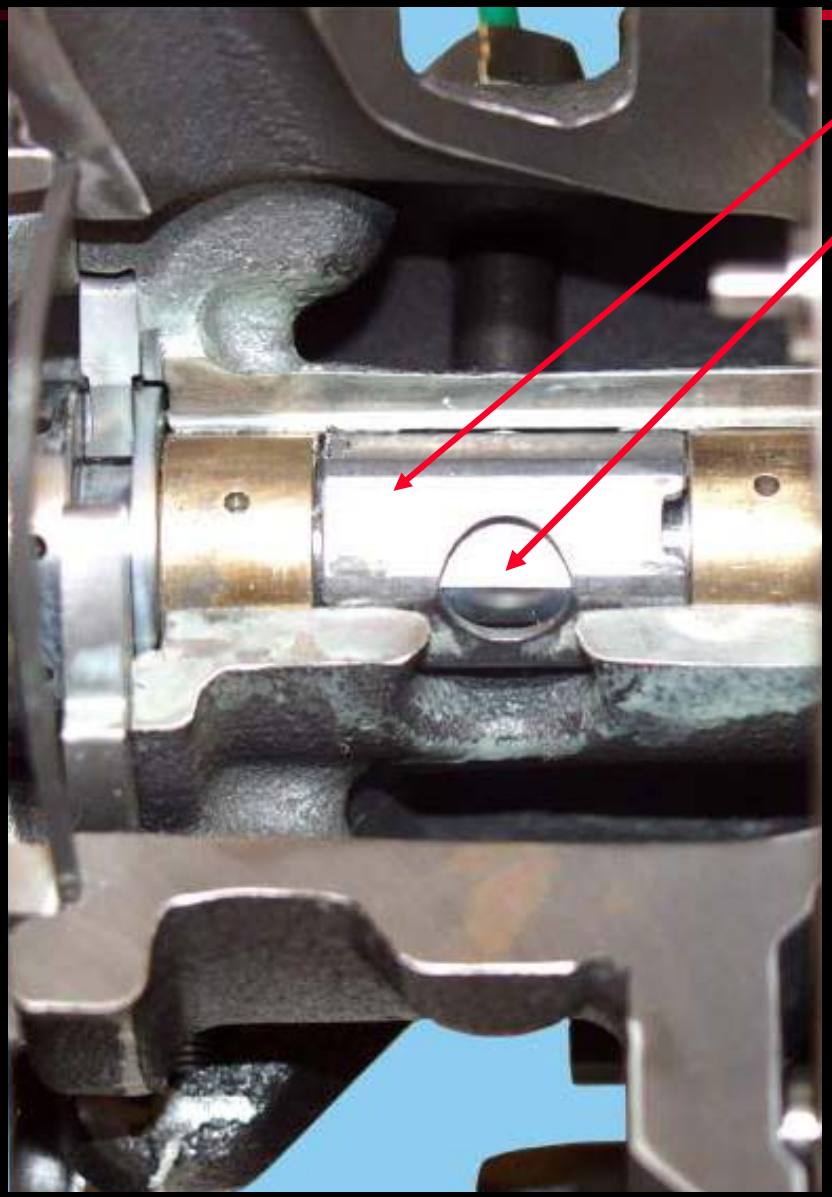


TSS

- **Turbo Speed Sensor**
- **Measures Shaft Speed in 500 RPM Increments**
- **Protects Turbo and Charge Air Cooler**
- **Magnetic Pick Up Signals From Turbo Shaft**
- **Displays Shaft Speed in k-rpm**

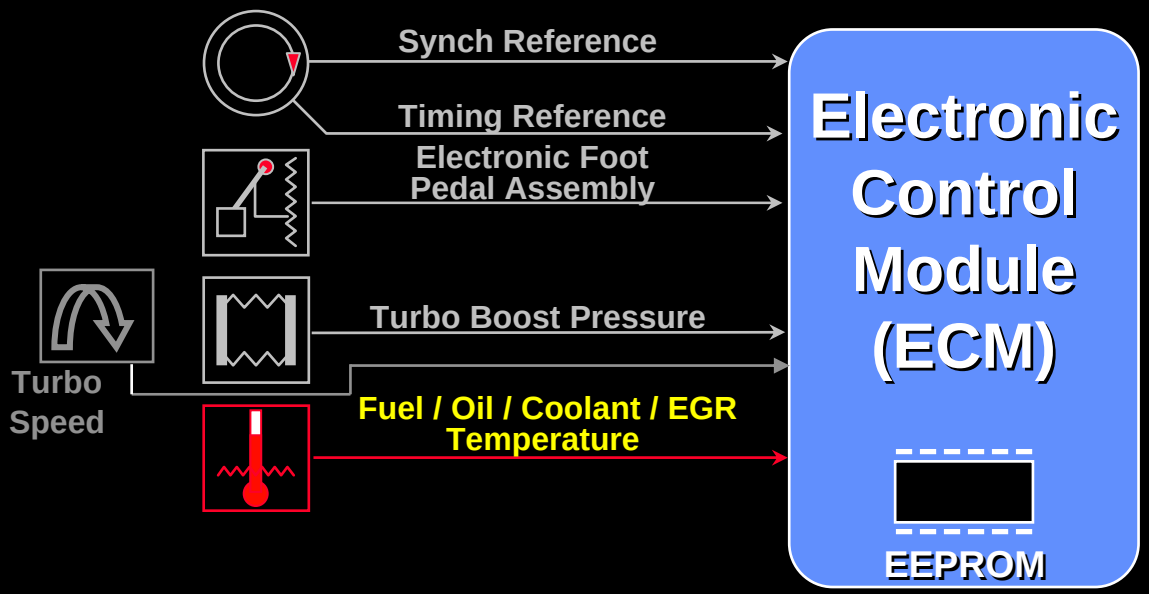
Turbo Speed Sensor

Variable Nozzle Turbocharger



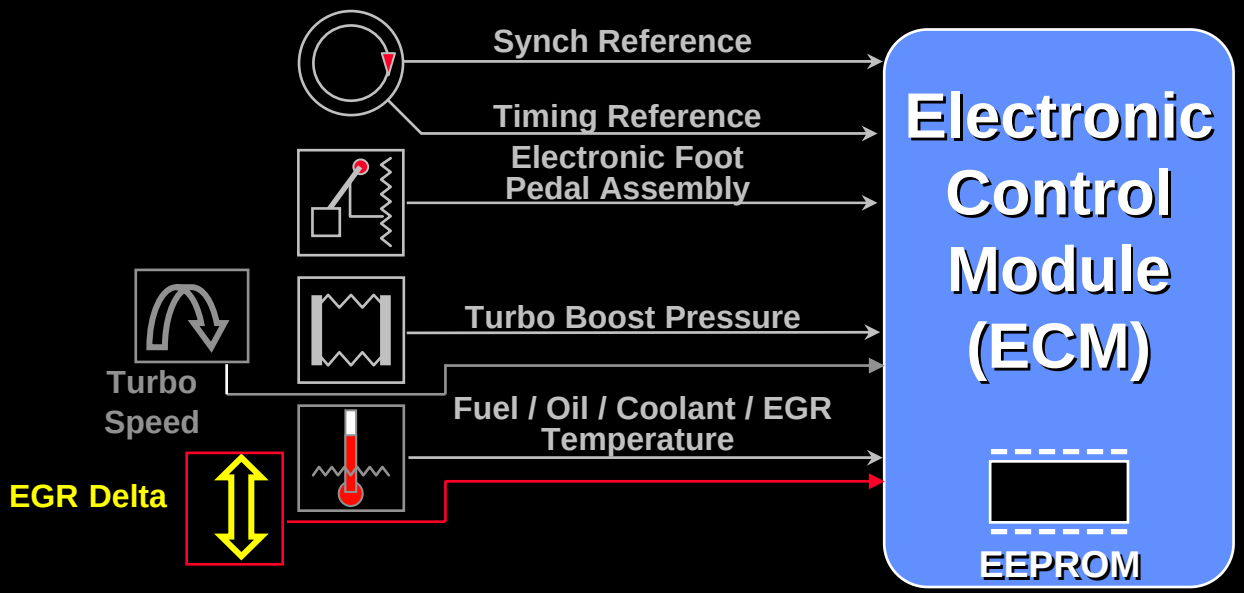
- Turbo Speed Sensor Spacer
- Flat on Shaft Generates Pulse
- DDEC Limits Turbo Speed
  - 98k @ Sea Level

Schematic Diagram DDEC III / IV with EGR



EGR Temperature Sensor

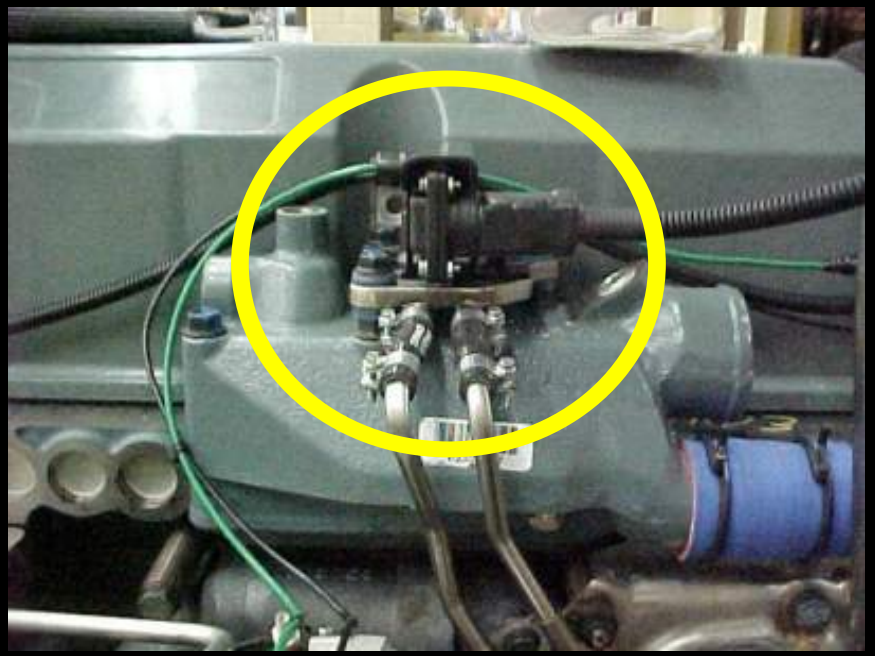
Schematic Diagram DDEC III / IV with EGR



EGR Delta Pressure Sensor

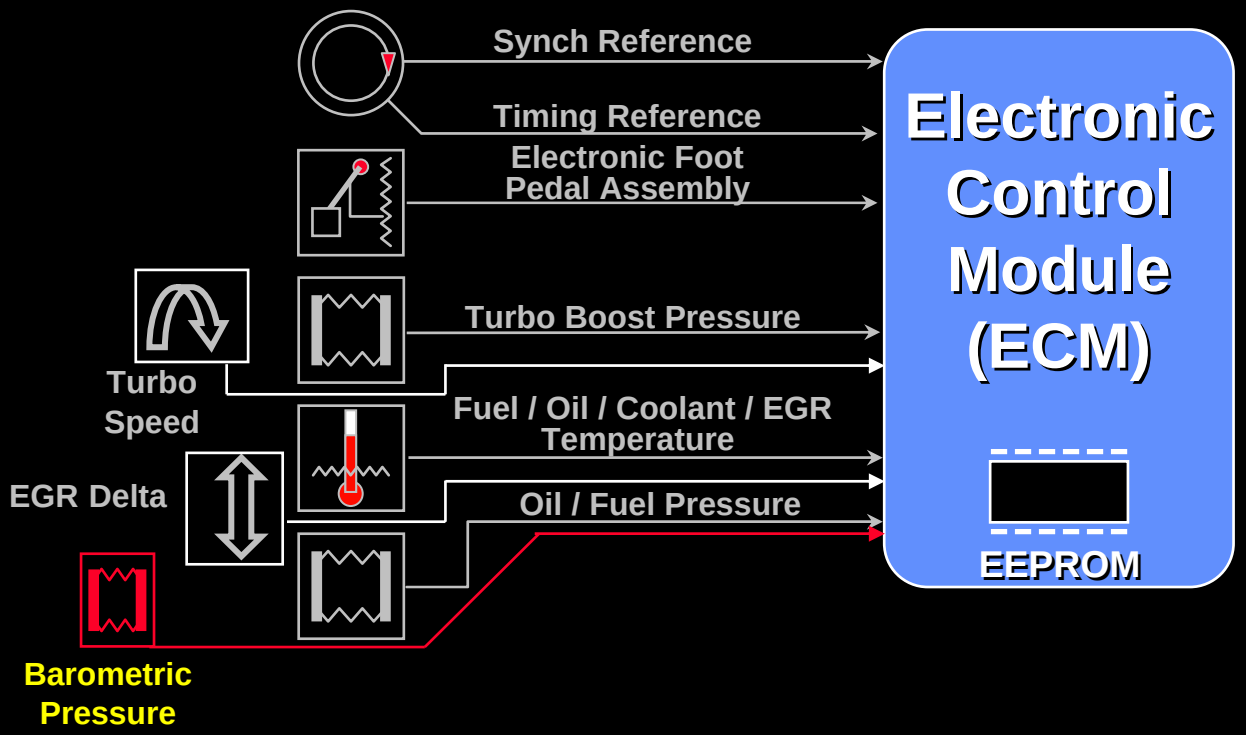
- Provides DDEC With Measurements Resulting In EGR Flow Rate
- Pressure Differential (Delta P) Between Venturi Inlet and Throat, Along with EGR Temperature, Are Converted to Mass Flow Rate in DDEC
- Actual Rate is Displayed as in.H2O and Counts
- A Temperature sensor allows DDEC to correct for density variations that result from temperature changes.
- This feedback is used only in the EGR mode

Delta Pressure Sensor



Delta P Sensor

Schematic Diagram DDEC III / IV with EGR



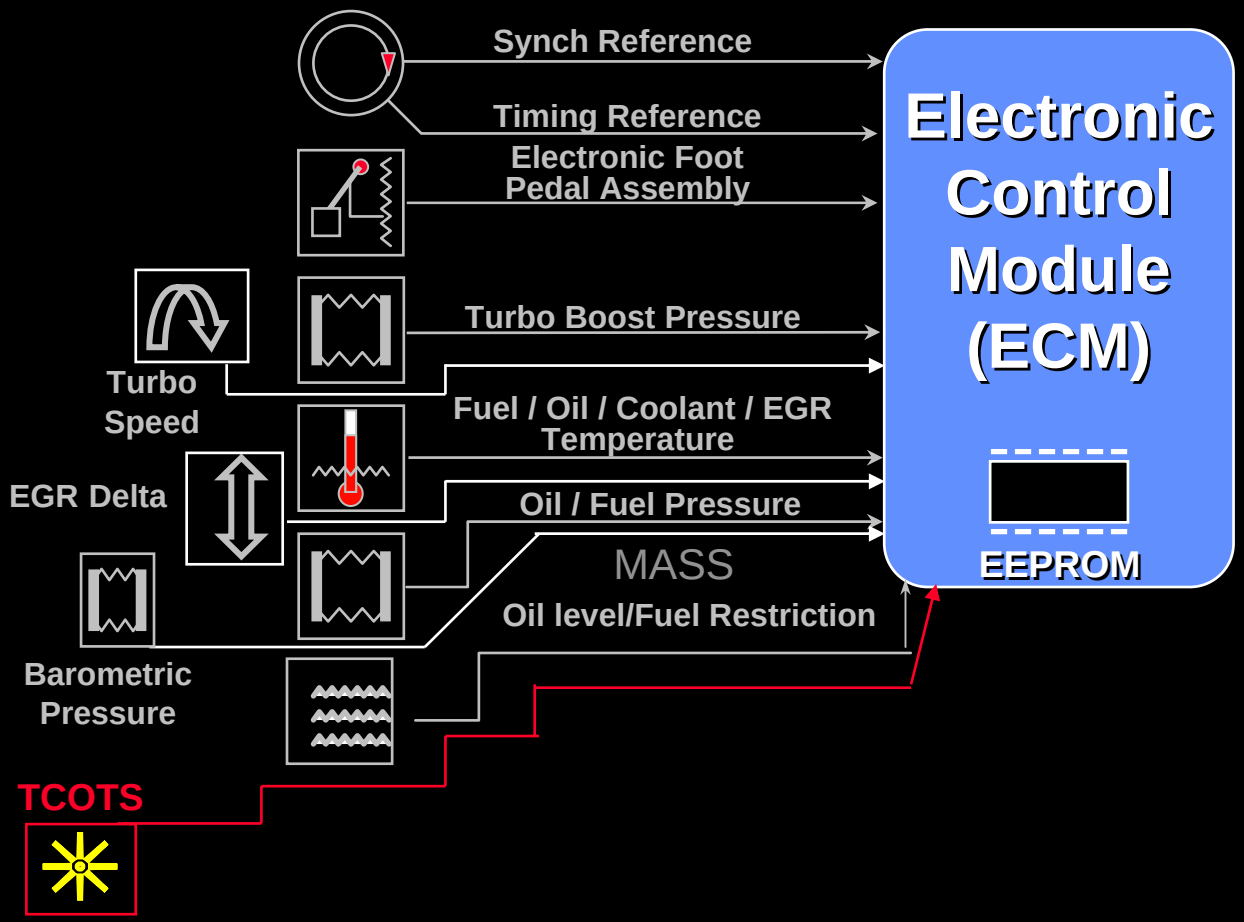
Barometric Pressure Sensor

- **Used to Calculate Fuel Tables at Various Altitudes and AECD Controls**

BARO

- **Barometric Pressure Sensor**
- **Smoke Control**
- **Fuel Table Calculation**
- **High Altitude Turbo Protection**

Schematic Diagram DDEC III / IV with EGR



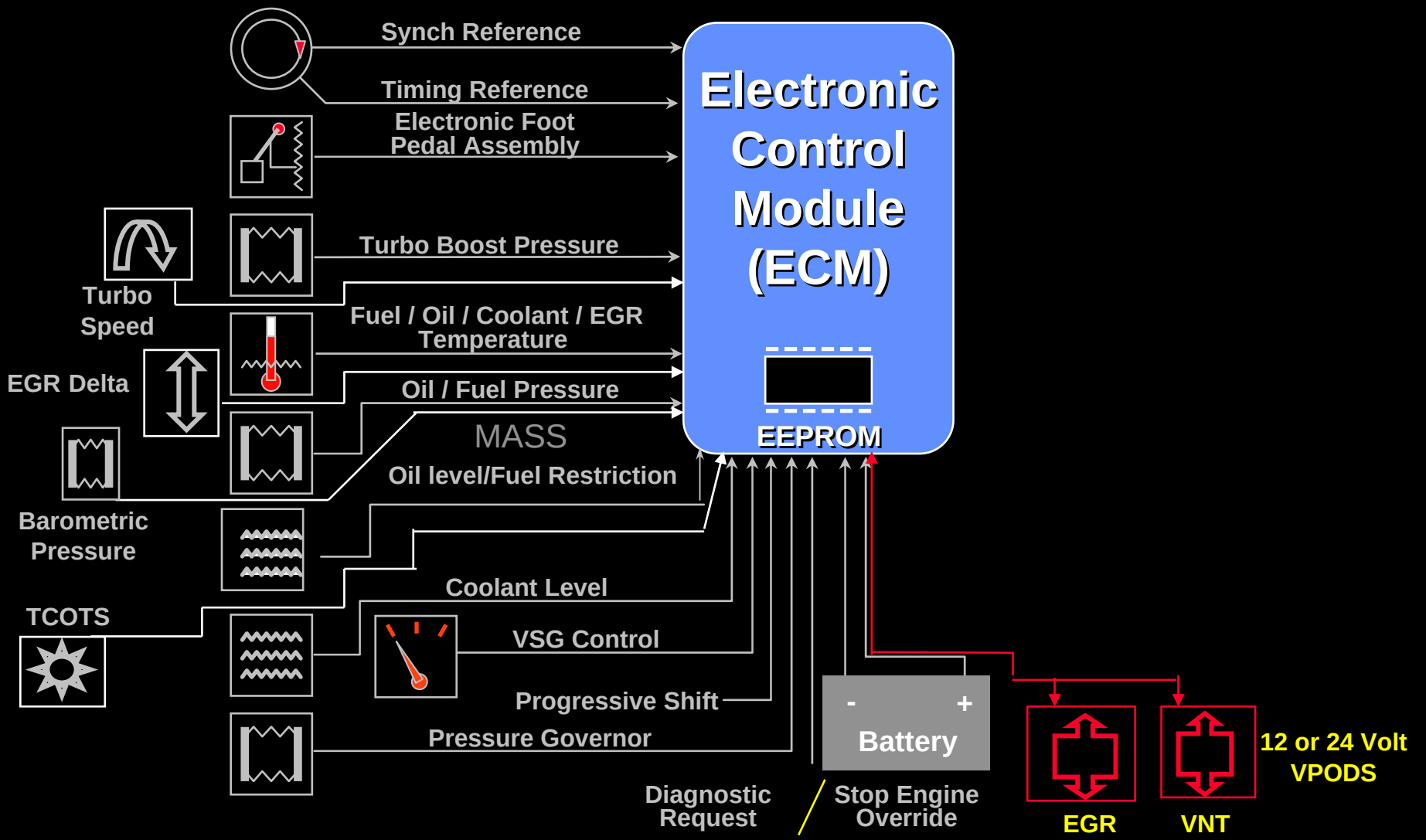
Turbo Compressor Outlet Temp Sensor

- **CAC Protection**

Turbo Compressor Outlet Temperature Sensor

- **TCOTS**
- **Protects Charge Air Cooler**
- **Located in Turbo Compressor Outlet Housing**
- **Used for AECD Controls**

Schematic Diagram DDEC III / IV with EGR



Variable Pressure Operating Device

- **VPOD**
- **VPOD Signal is PWM Output from DDEC**
- **Electric Proportional Solenoid Valve**
- **12V and 24V Options**
- **Modulates Air Pressure to VNT and EGR Valve**
- **VPODS Regulate EGR Valve and VNT Positions**
- **VPODS are Slewable**

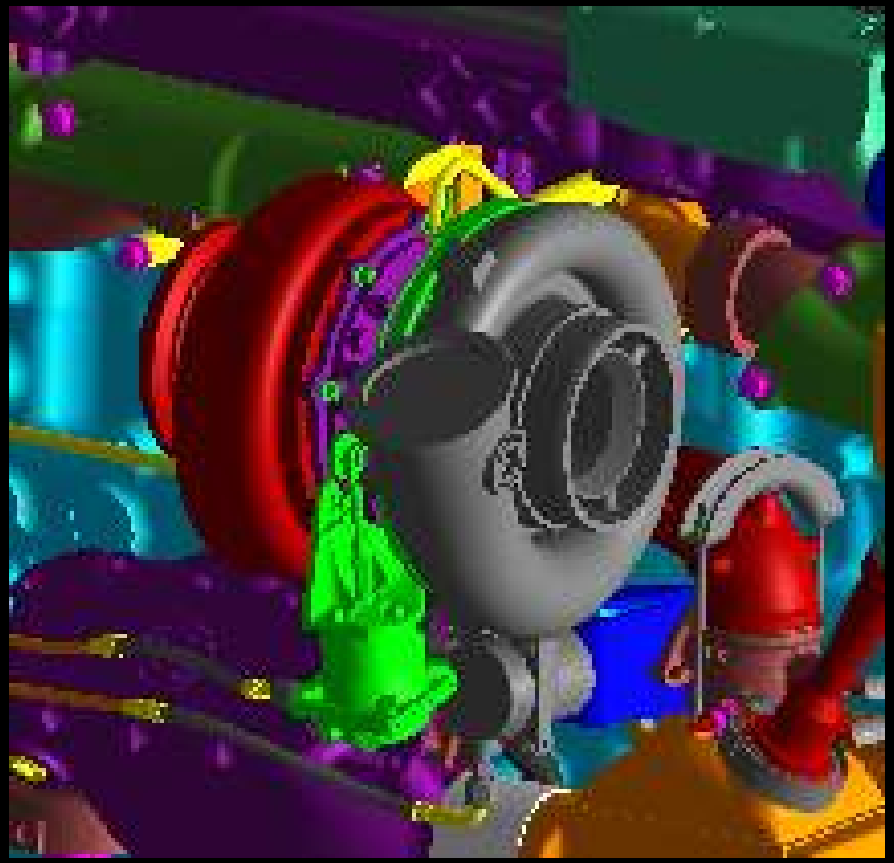
VPOD

- PWM 4 VNT Control/Left VPOD
- PWM 2 EGR Control/Right VPOD
- Rear Mount VPOD Option

Series 60 EGR Components

Variable Nozzle Turbocharger

- **Uses Exhaust Energy To Provide Intake Boost And Exhaust Pressure To Drive EGR**
  - **Pneumatically Actuated Vane Set**
  - **Turbo Speed Sensor (TSS)**
  - **Turbocharger Compressor Outlet Temperature Sensor (TCOTS)**

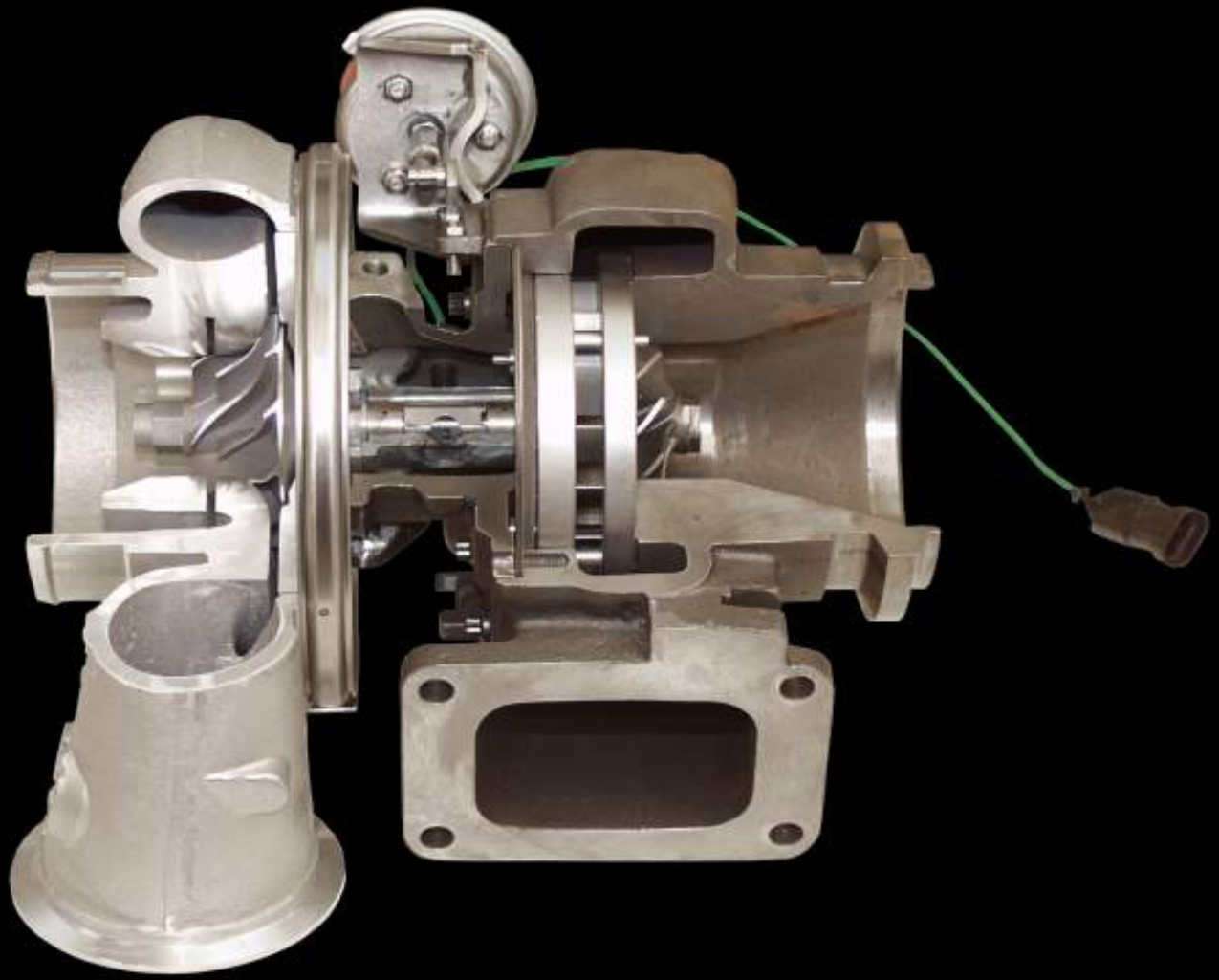


Series 60 EGR

Variable Nozzle Turbocharger

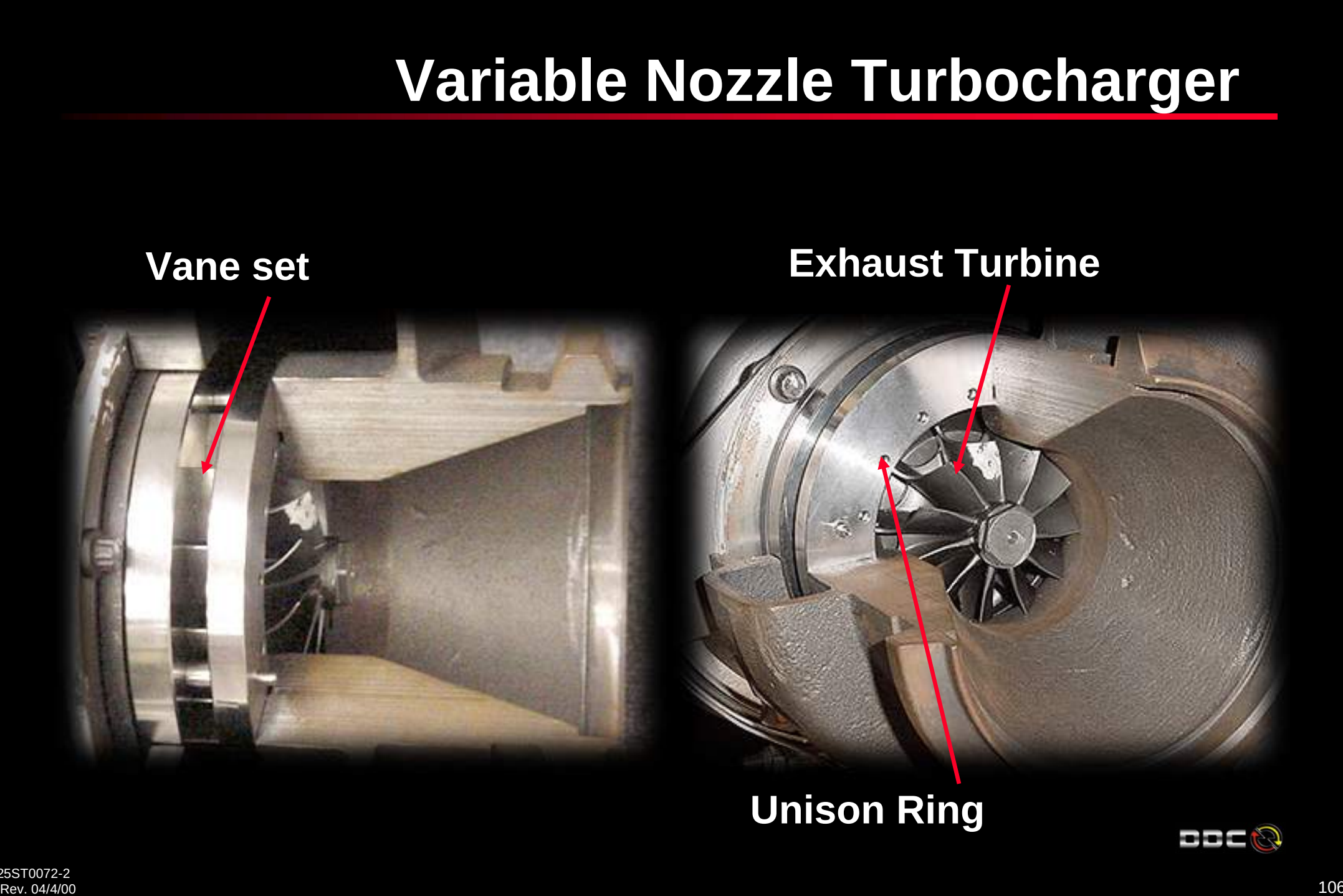
- Provides the means to drive EGR by a set of moveable vanes which increase the exhaust manifold pressure
- Can be varied to change EGR rate in EGR mode or boost level when in the boost mode
- Controlled via PWM signal from ECM to a Variable Pressure Operating Device (VPOD)

Variable Nozzle Turbocharger



- Garrett GT 42

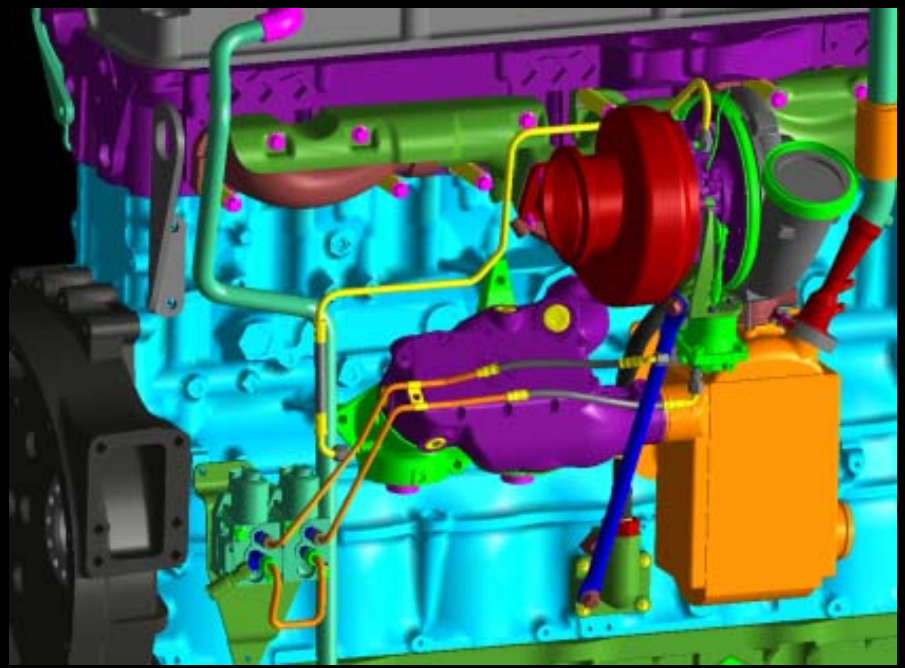
Variable Nozzle Turbocharger

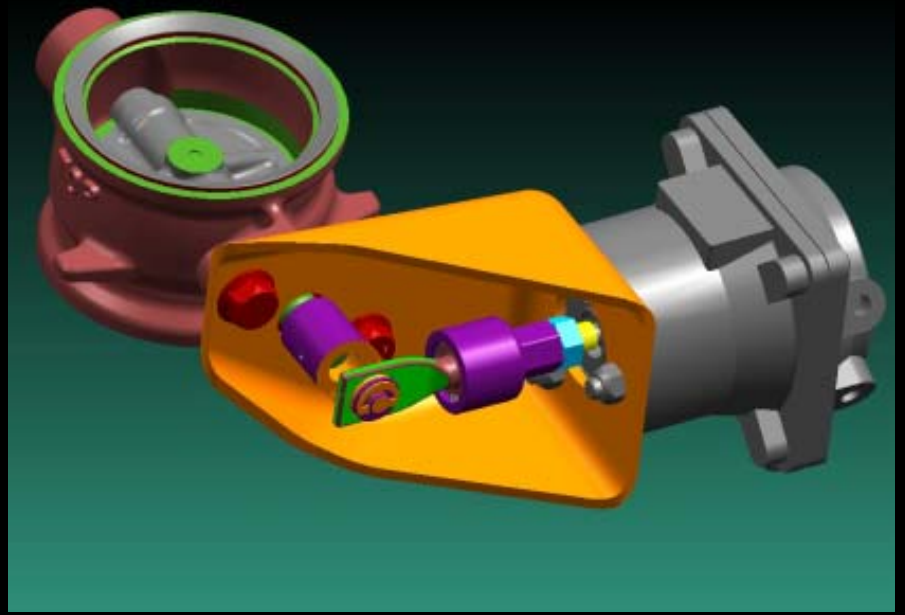


EGR Valve & Actuator

Oct 2002 thru 2003:

Pneumatic Actuator & Control Valve



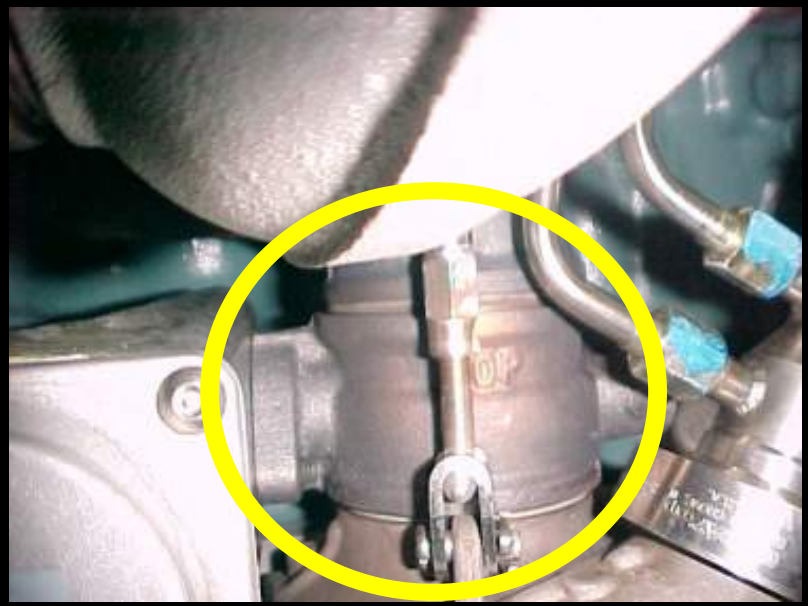


Series 60 EGR Components

EGR Hot pipe

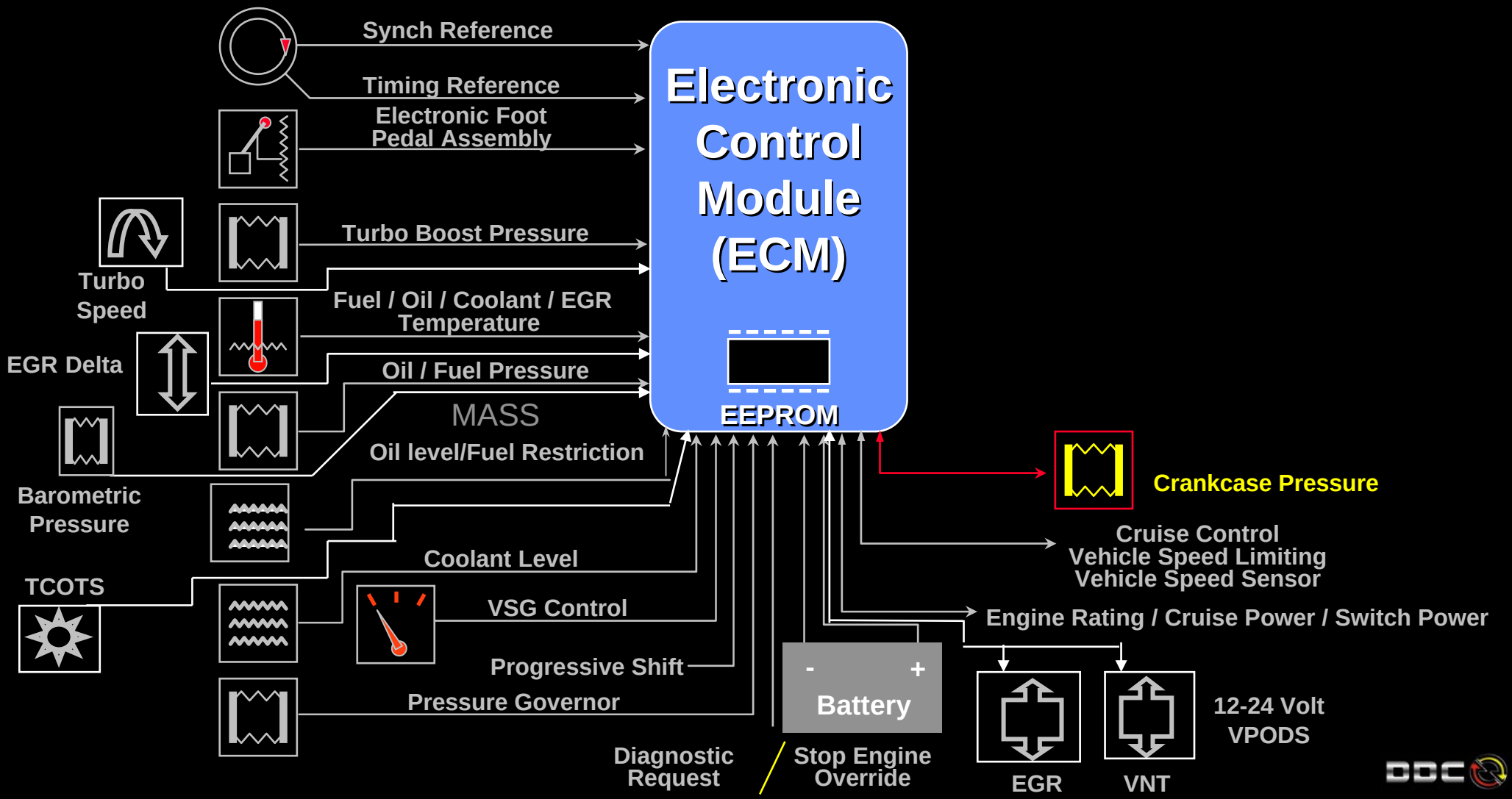
Series 60 EGR Components

EGR Butterfly Valve



Valve Actuator

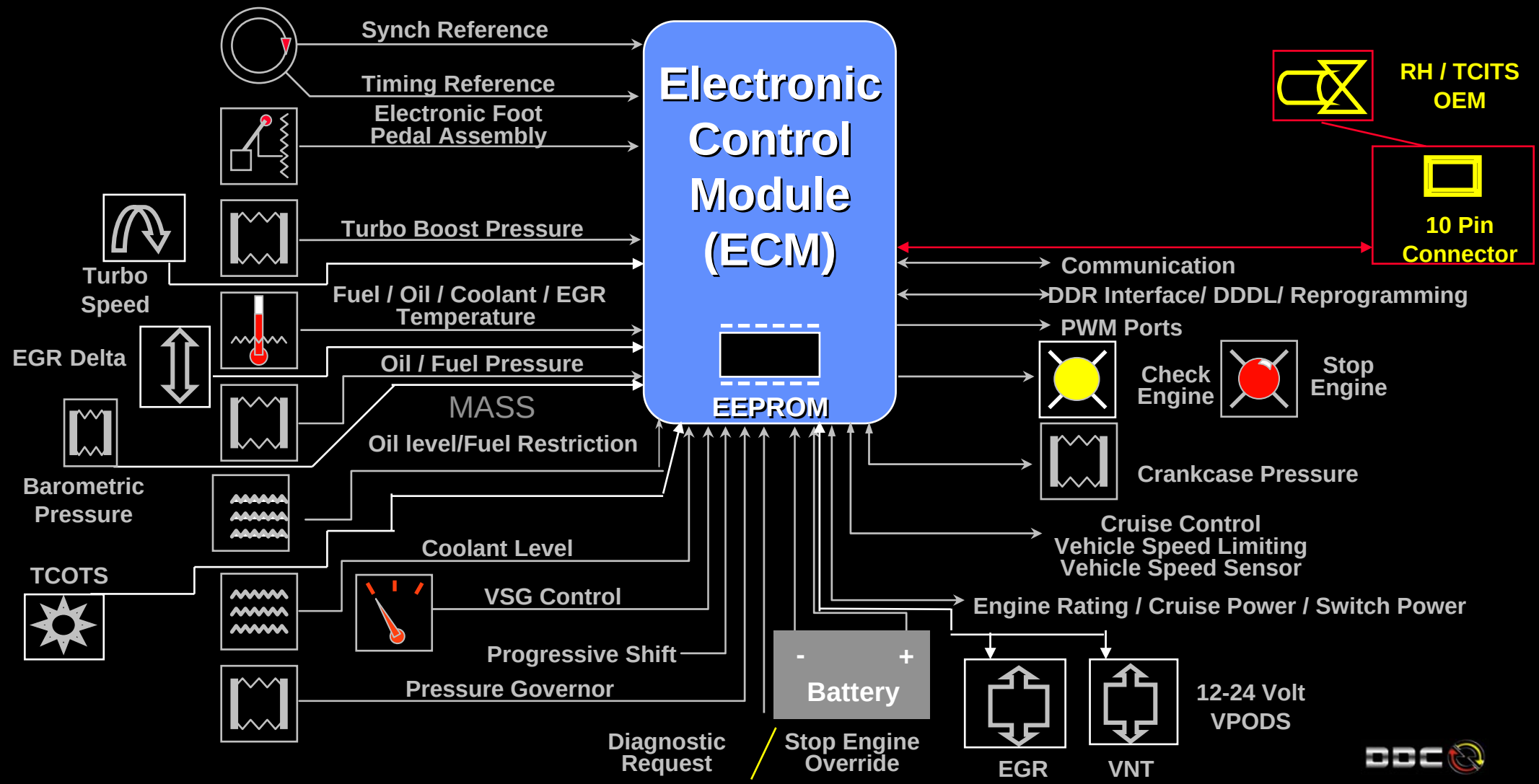
Schematic Diagram DDEC III / IV with EGR



Crankcase Pressure

Series 60 CCM

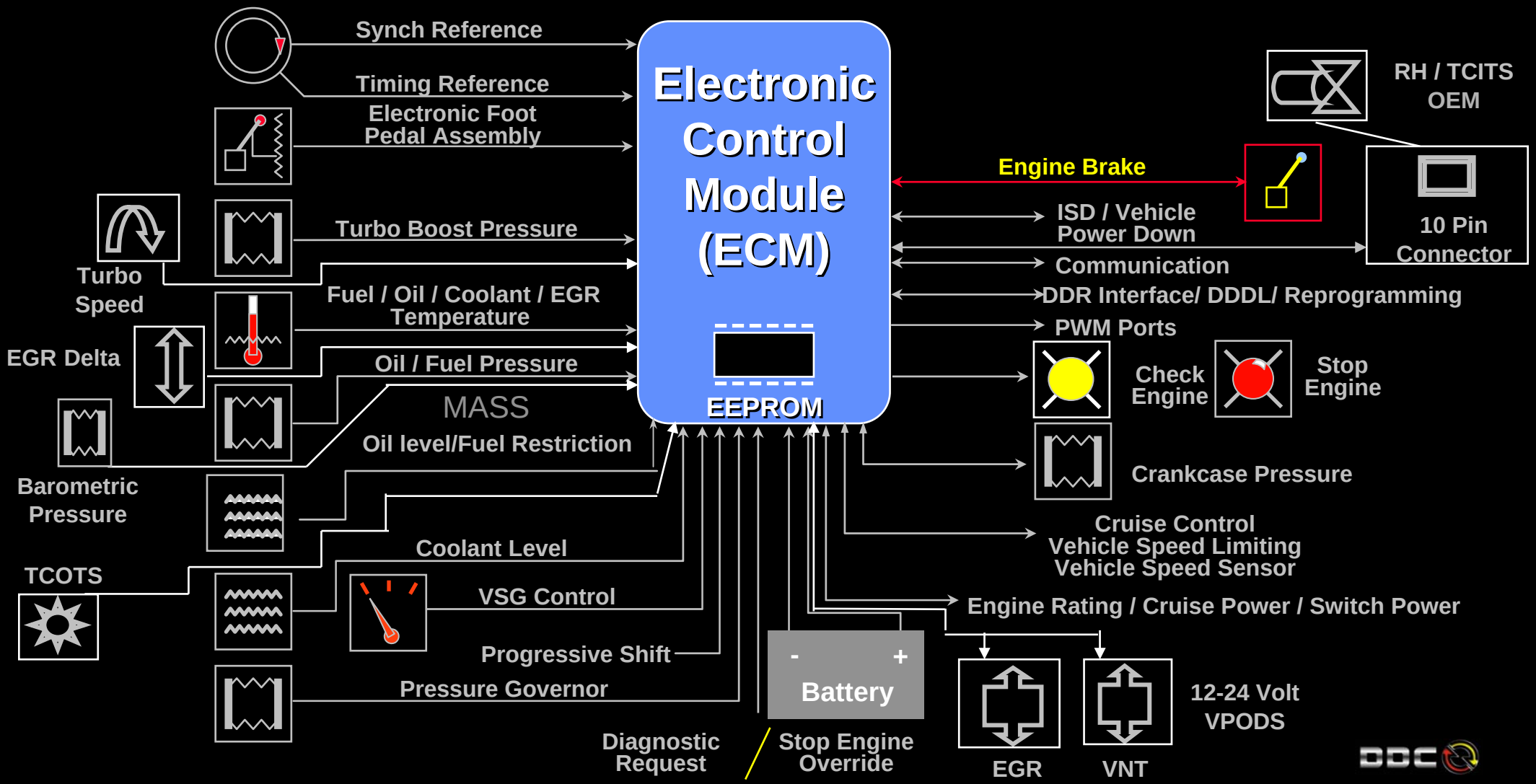
Schematic Diagram DDEC III / IV with EGR



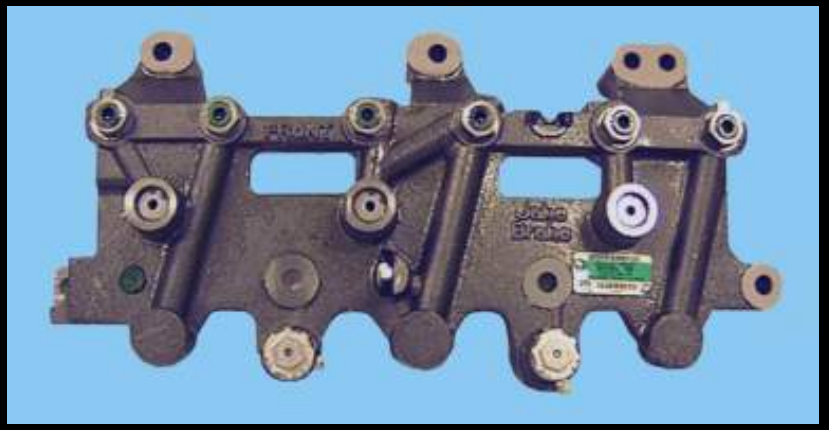
Relative Humidity and Compressor Inlet Temperature Sensor

- Reports Humidity and Compressor Inlet Temperature for AECD Controls
- OEM Installed in Air Intake System
- Connects to Ten Pin Engine Sensor Harness Pigtail for OEM Interface

Schematic Diagram DDEC III / IV with EGR

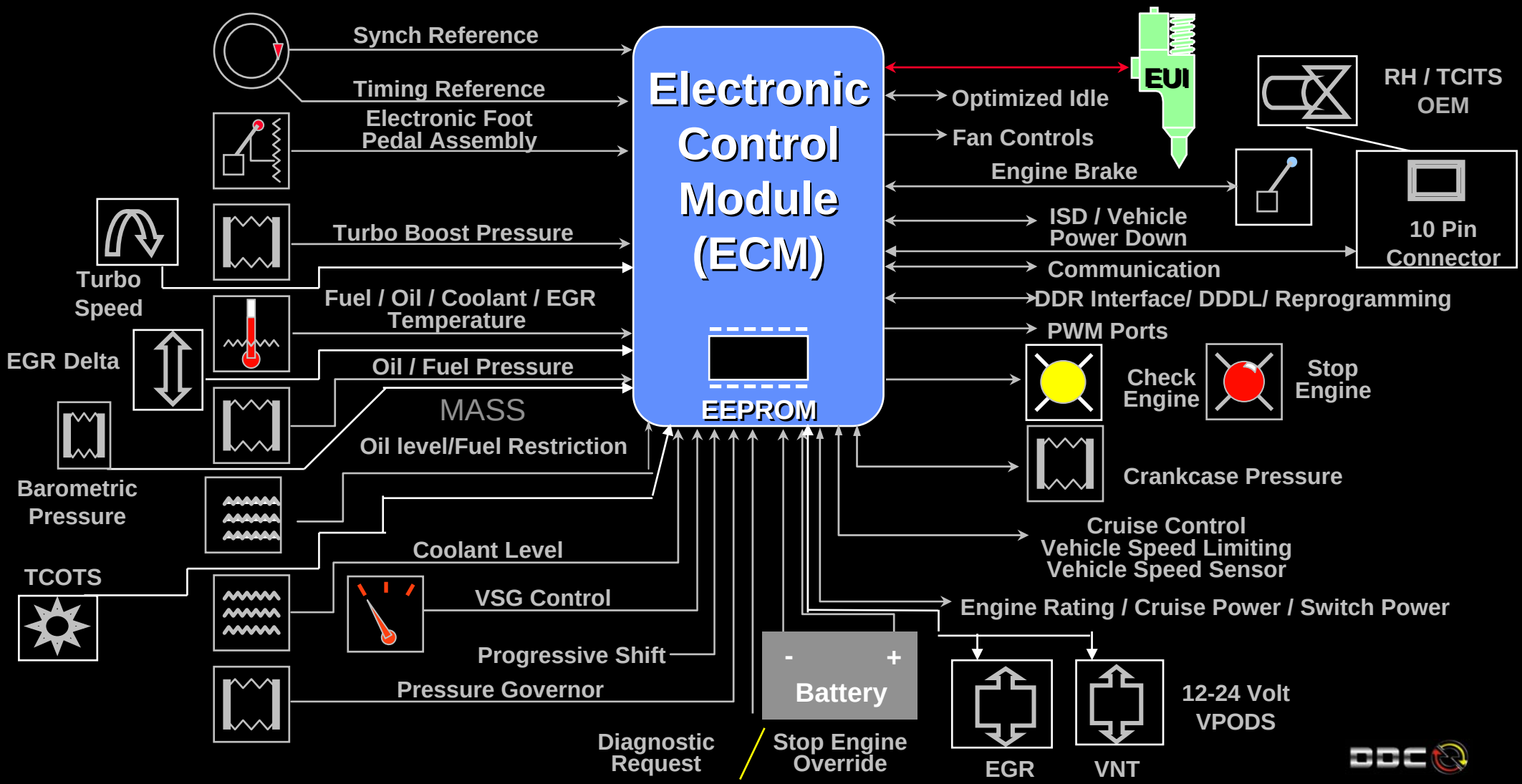


DDEC III/IV Engine Brakes (NON EGR)

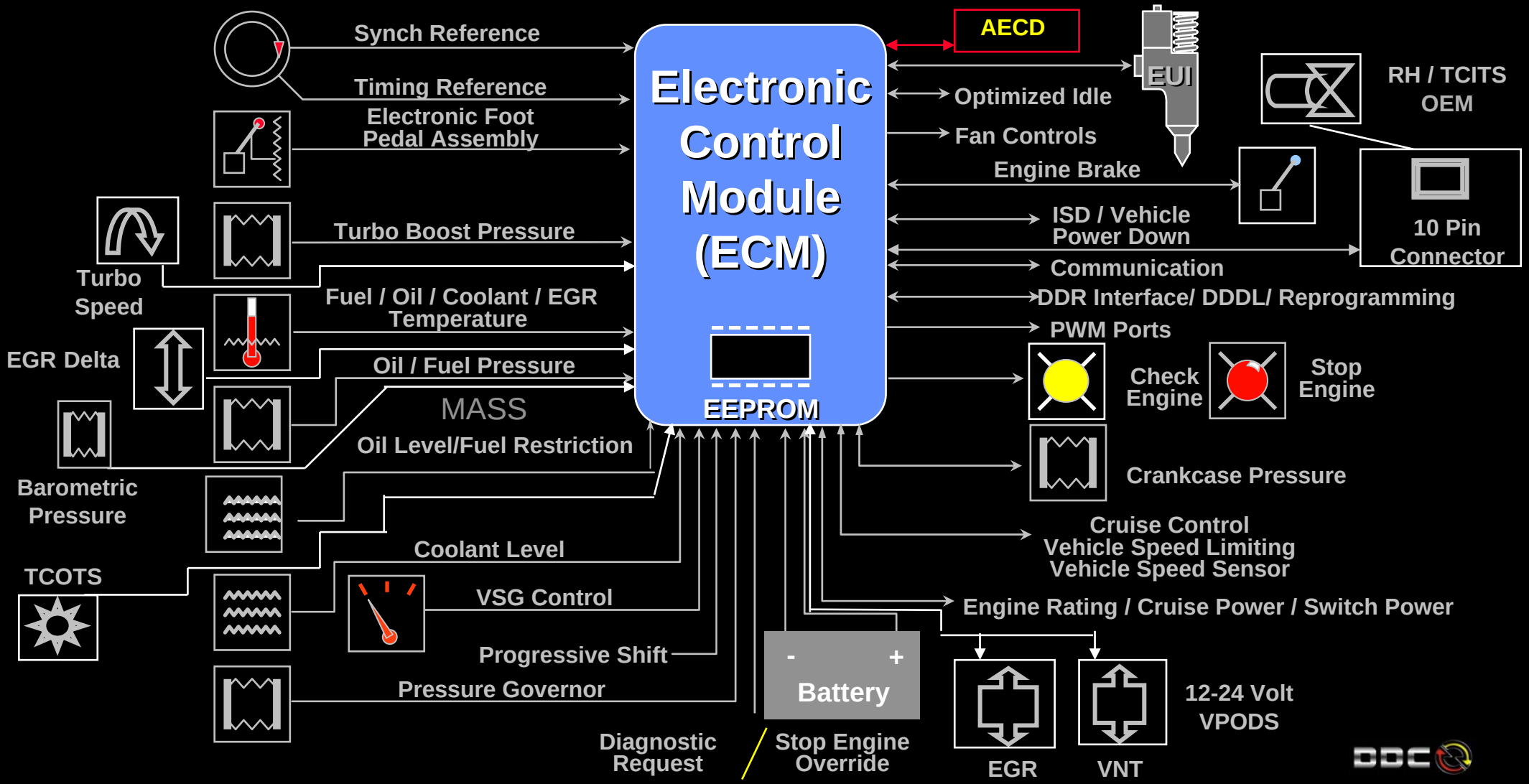


- DDEC III/IV *controls* engine brake operation
- If configured for “cruise control engine brake” the ECM will automatically turn on the brake if the set speed is exceeded.
- Two digital inputs and two ‘positive’ outputs are used to control the brake.

Schematic Diagram DDEC III / IV with EGR



Schematic Diagram DDEC III / IV with EGR



Maintenance Alert Sensors System

- Designed to Provide Preventative Maintenance Information to Mechanics and Operators
- Reduces Unexpected Downtime
- Optimizes Normal Routine Service
- Used on Highway Trucks only at this time
- **CANNOT** Be Used with DDEC IV **EGR** Programming

Maintenance Alert System

- **Overview**
  - Based on Inputs from Customers, the Maintenance Alert System Provides Preventative Maintenance Information to Mechanics and Drivers to Reduce Unexpected Downtime and to Assist Normal Routine Service Scheduling
- **Features**
  - Uses DDEC IV ECM
  - New DDEC Software Processes Information
  - Incorporates Four New Sensors (Both On and Off Engine)
  - Optional Remote Mounted Monitor Display Unit Available

Maintenance Alert System

Oil Level Sensor

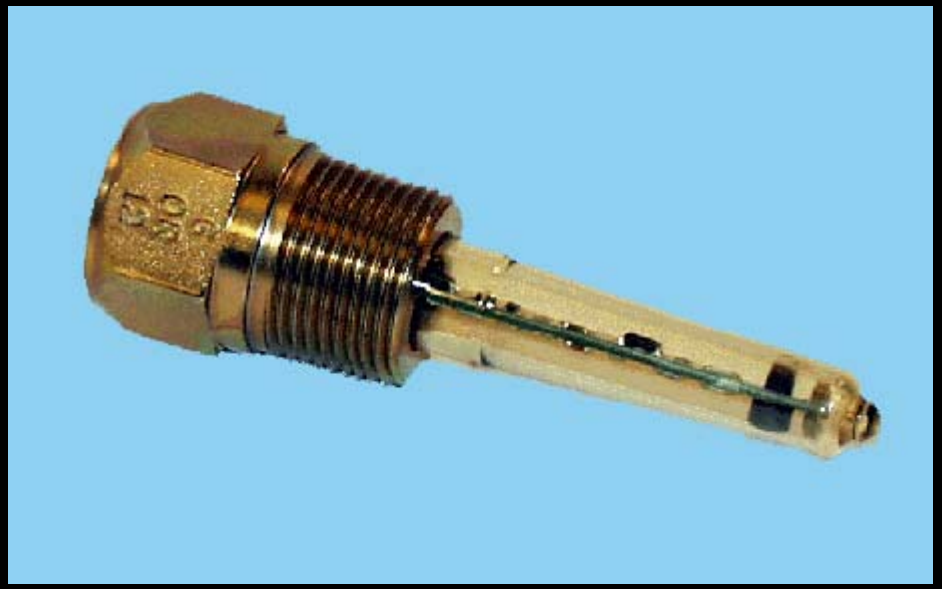
Air Filter Restriction Sensor

2nd Coolant Level Sensor

Fuel Restriction Sensor

Monitor Display Unit

On Engine Components



- **Oil Level Sensor**
  - Mounts in Front Sump Non-metal Oil Pan
  - Utilizes Optical Technology to "See" Oil Level
  - Engine Must Be Off (Zero RPM) for "X" Minutes (Based on Oil Temp.) to Drain Oil Back to the Pan
  - Switches at Four Quart Low Level
  - OEM Impact
    - » Order Maintenance Alert System on the Engine

On Engine Components

- **Fuel Restriction Sensor**
  - Measures Fuel System Restriction at Fuel Pump Inlet
  - Sensor Measures Actual Inlet Restriction
  - OEM Impact
    - » Order Maintenance Alert System on the Engine

DDC Installed Components

- **Includes Two Maintenance Alert System Sensors**
  - **Oil Level Sensor (Requires Front Sump Non-metal Oil Pan) Will not work on Rear Sump Applications**
  - **Fuel Restriction Sensor**

OEM Installed Components

- **2nd Coolant Level Sensor (CLS)**
  - **Separate Sensor from Current Primary CLS**
  - **Mounted in Coolant Surge Tank Above Primary CLS**
  - **Requires Interface Module**
  - **OEM Impact**
    - **Order Engine Mounted Sensors**
    - **Purchase CLS Sensor and Module from PDC**
    - **Mount Sensor in Surge Tank**
    - **Mount Interface Module**
    - **Provide Wiring Between the Sensor/Module/Engine Harness**
    - **Use VEPS(Vehicle Engine Program Station) to "Turn On" OEM Only**

OEM Installed Components

- **Air Filter Restriction Sensor**
  - Electronic Version of the Mechanical Filter Minder®
  - Switch Points at 15 and 20 Inches of Water
  - OEM Impact
    - » Order Engine Mounted Sensors
    - » Purchase Sensor from Engineered Products or PDC
    - » Install into Turbo Inlet Tube
    - » Provide Wiring from Sensor to Engine Harness Pigtail
    - » Use VEPS to "Turn On"

OEM Installed Components

- Monitor Display Unit
  - 2 Buttons and 8 LEDs (Green, Red, & Yellow)
  - Mounted in Cab
  - Reads Engine J1587 Data Link for Information
  - Can Access Maintenance Information with Ignition On or Up to 2 Hours After Ignition Off
  - Stores Status after 2 Hours for Later Display
  - OEM Impact
    - » Order Engine Mounted Sensors
    - » Purchase Display from PDC
    - » Design and Install Display Bracket
    - » Provide Wiring to Display

Service Tools

- **Diagnostic Data Reader-(DDR) (Version 24.0 and higher**
- **Detroit Diesel Diagnostic Link (DDDL) - Version 3.0 and higher**

  - **Sensor Alerts Due to Failed Sensors**
  - **Quick Access Screen to Show Maintenance Alert System Alerts**
    - **Clear Maintenance Alert System (MAS) Filter Alerts**
  - **Maintenance Alert System sensors added to Data List**
  - **Warning Light Option Programming**

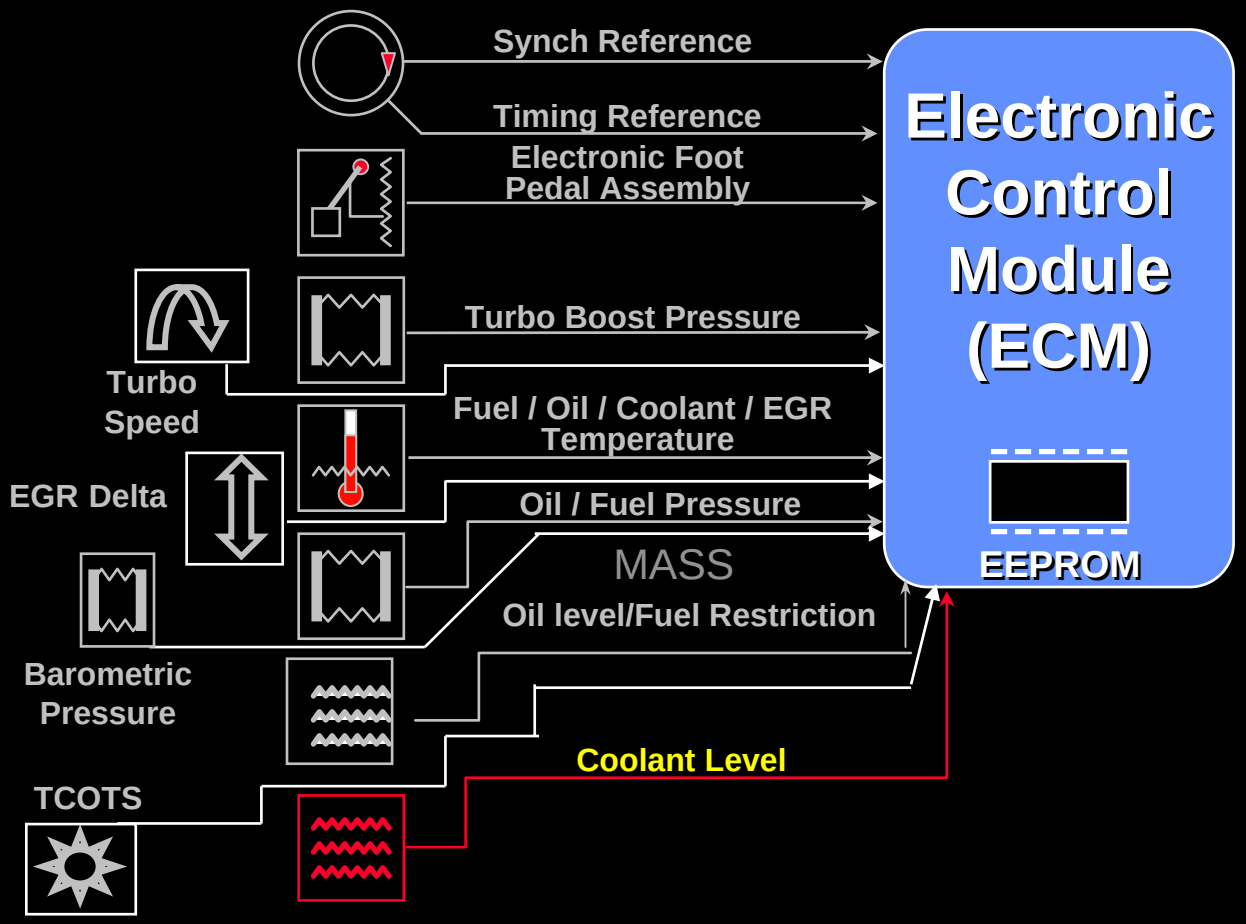
Summary

- **Monitors and Displays Service Requirements**
  - Oil Level
  - Fuel System Restriction
  - Air Filter Restriction
  - 2nd Coolant Level
  - Monitor Display Unit - in Cab
  - DDR and DDDL

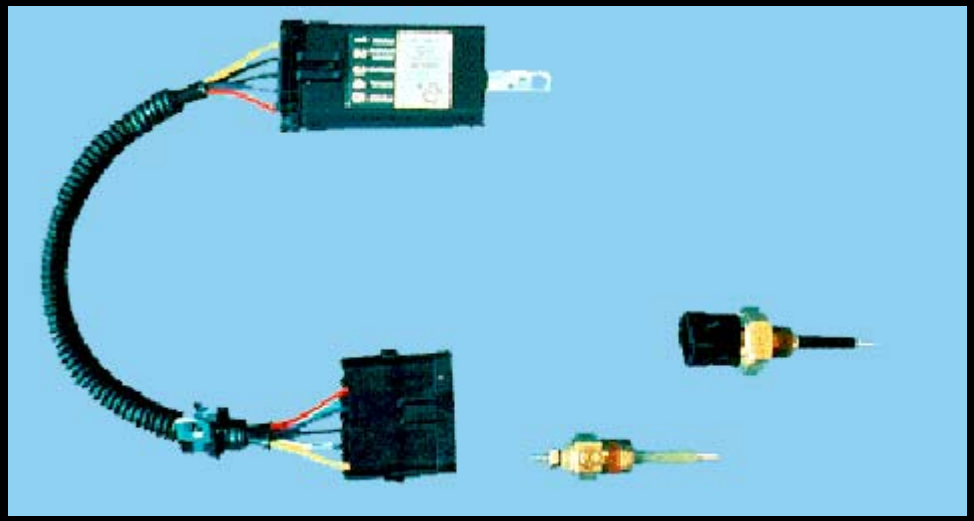
  Oil Level, Fuel System Restriction: Engine

  Air Filter Restriction, 2nd Coolant Level, Monitor Display Unit - in Cab: Vehicle
- **Engine Only or Engine and Any Vehicle Sensors**
- **Oil Level Requires Front Sump Plastic Plan**
- **Display is Optional**

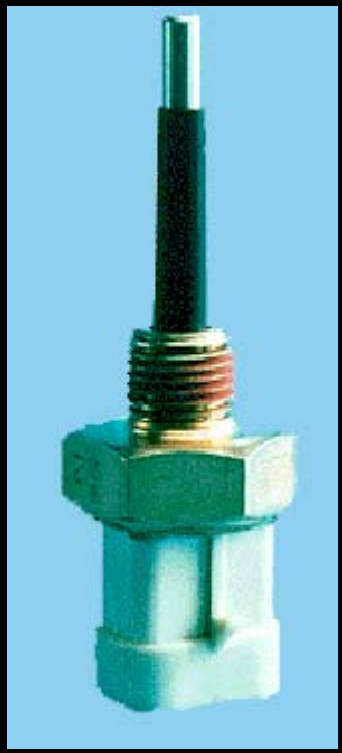
Schematic Diagram DDEC III / IV with EGR



Coolant Level Sensor

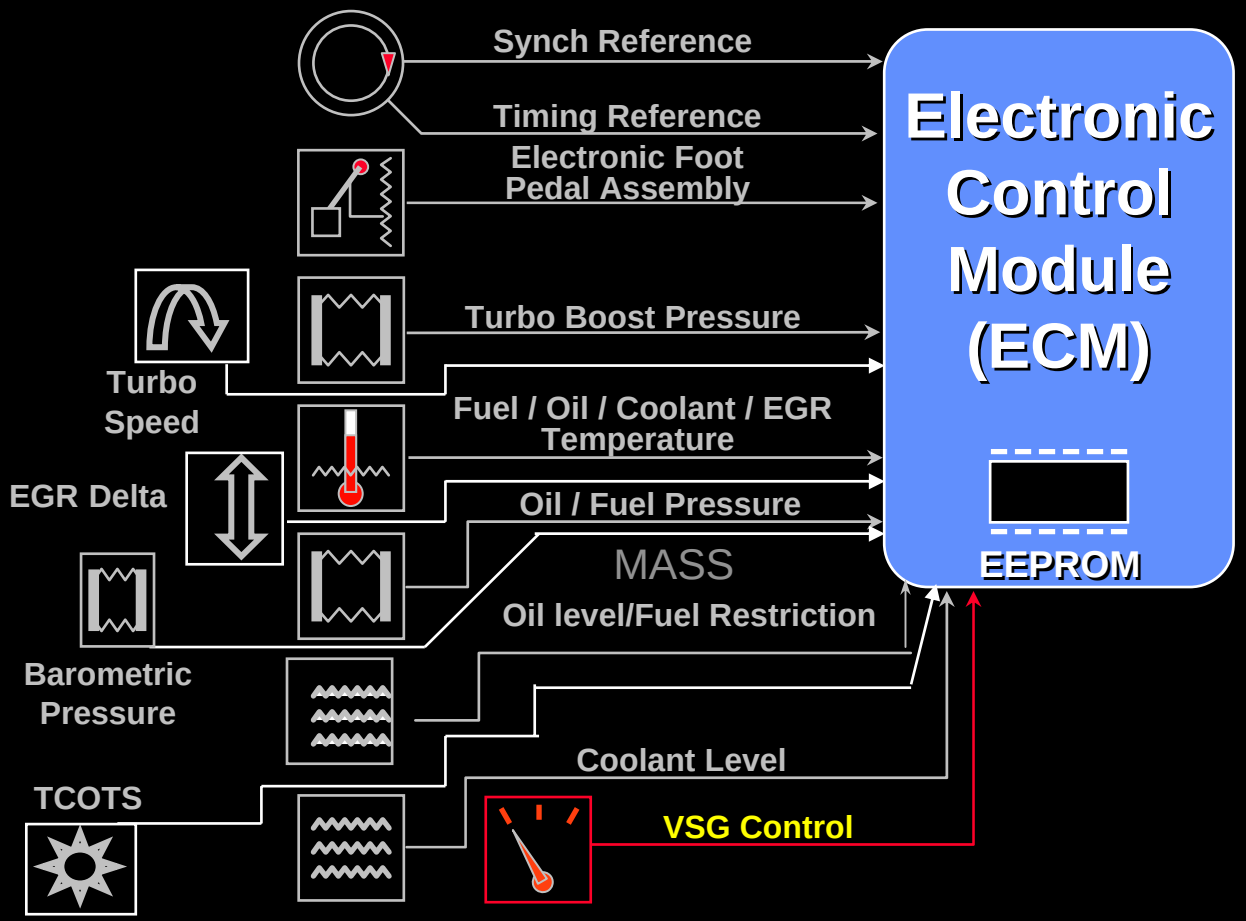


DDEC II/ III Coolant Level Sensor

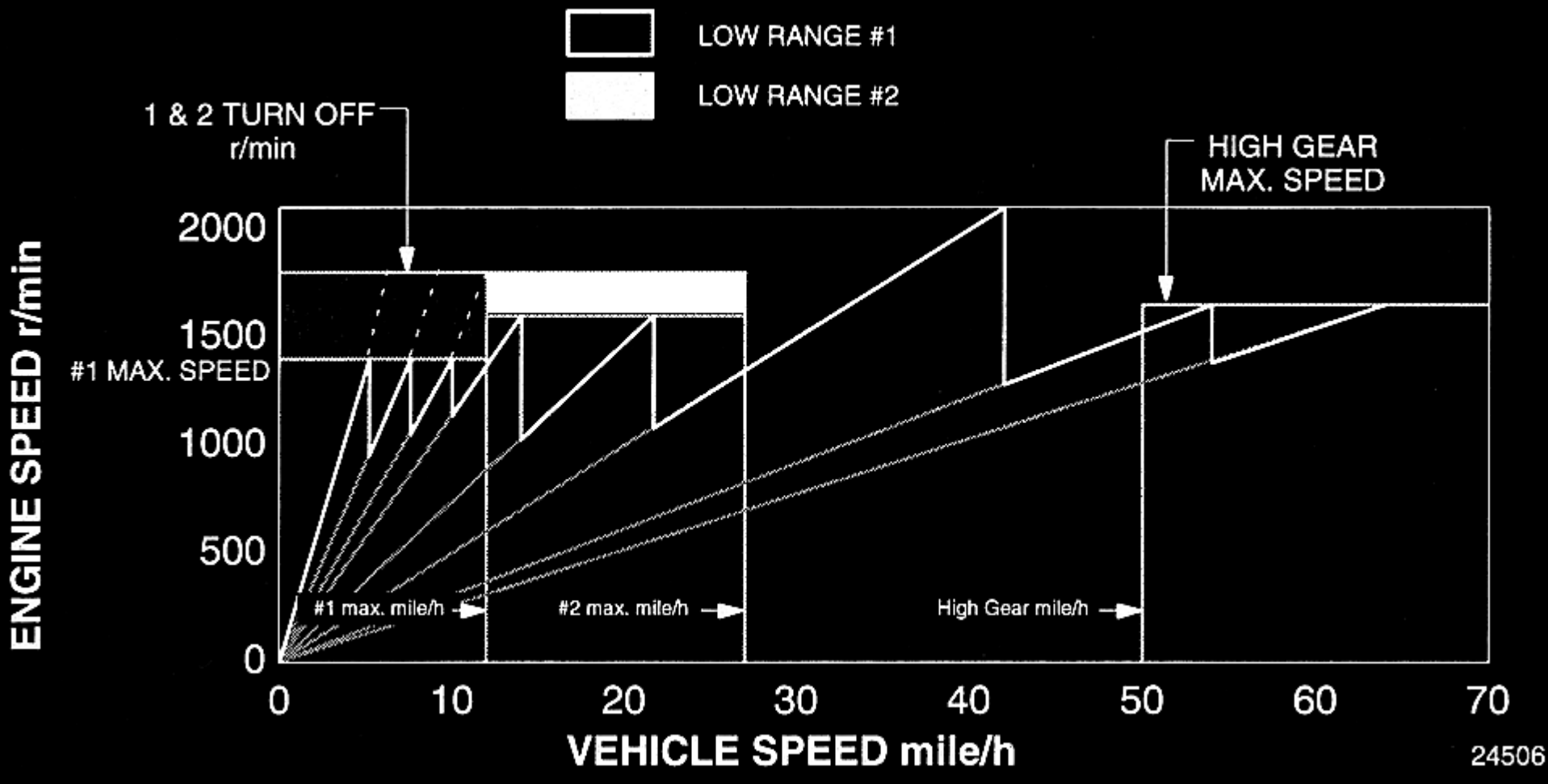


DDEC III-IV-V
Coolant Level Sensor

Schematic Diagram DDEC III / IV with EGR



Progressive Shift



VSG Control

- **Variable Speed Governor**
  - **Throttle Position Controls RPM**
- **Droop**
  - **Difference in RPM Between Full Load (Rated Speed) and Maximum Engine RPM (No Load)**
  - **Allows the engine to overrun the rated or governed engine speed.**

Pressure Governor

- **Fire Commander and Mastermind use the same digital inputs and outputs as cruise control**

Fire Commander

Mastermind

High Pressure Sensor

Electronic Fire Commander

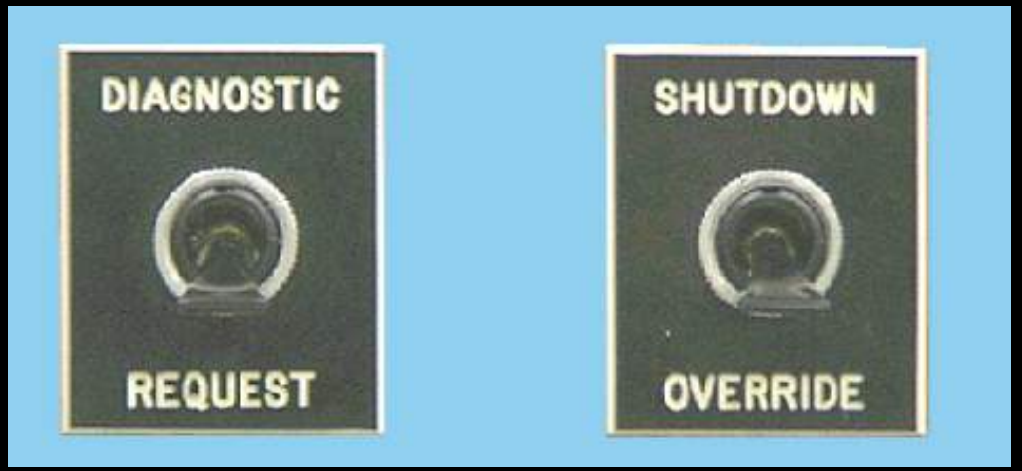
Engine Data

System Status

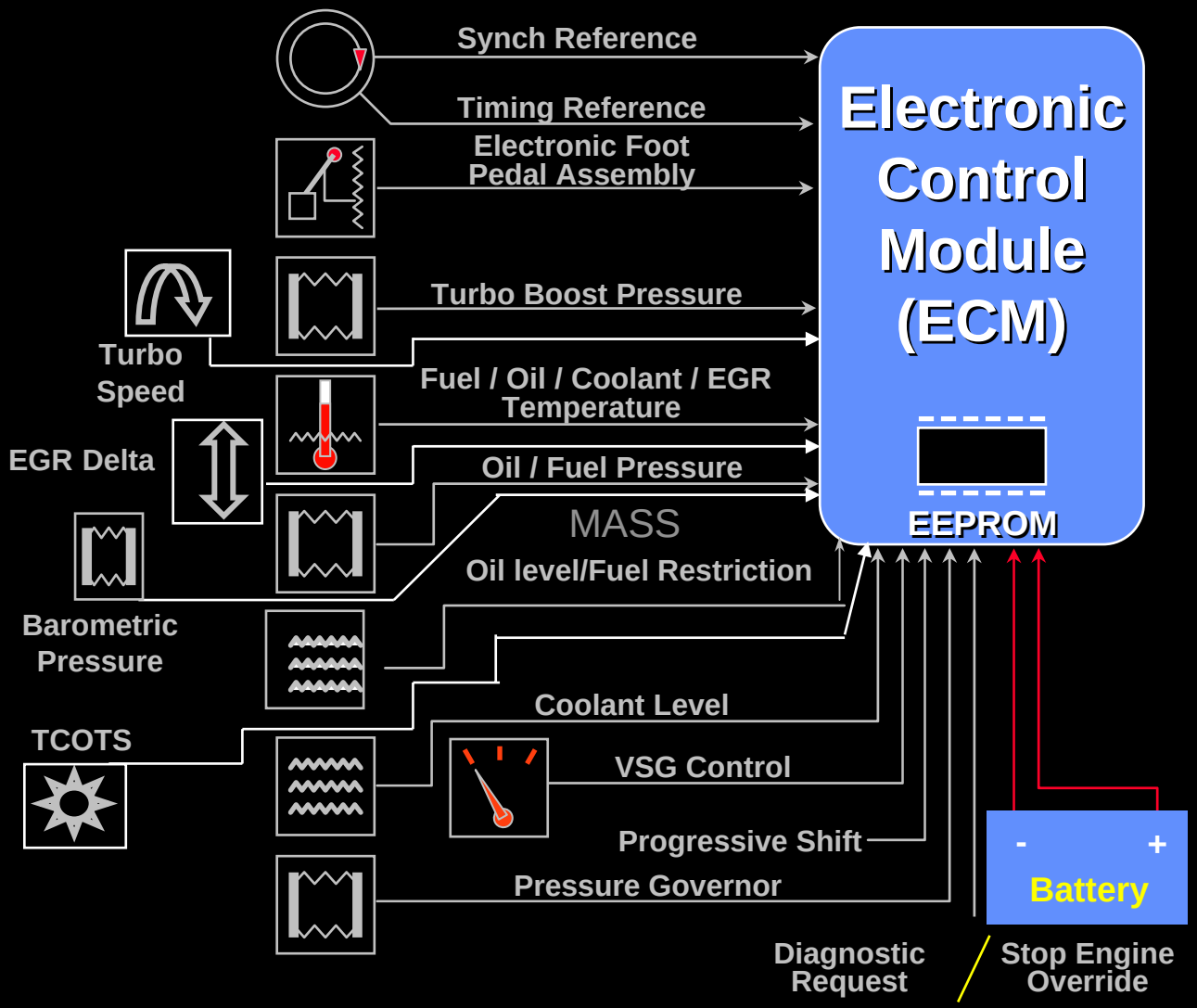
Control Buttons

Message Window

Diagnostic Request and Stop Engine Override



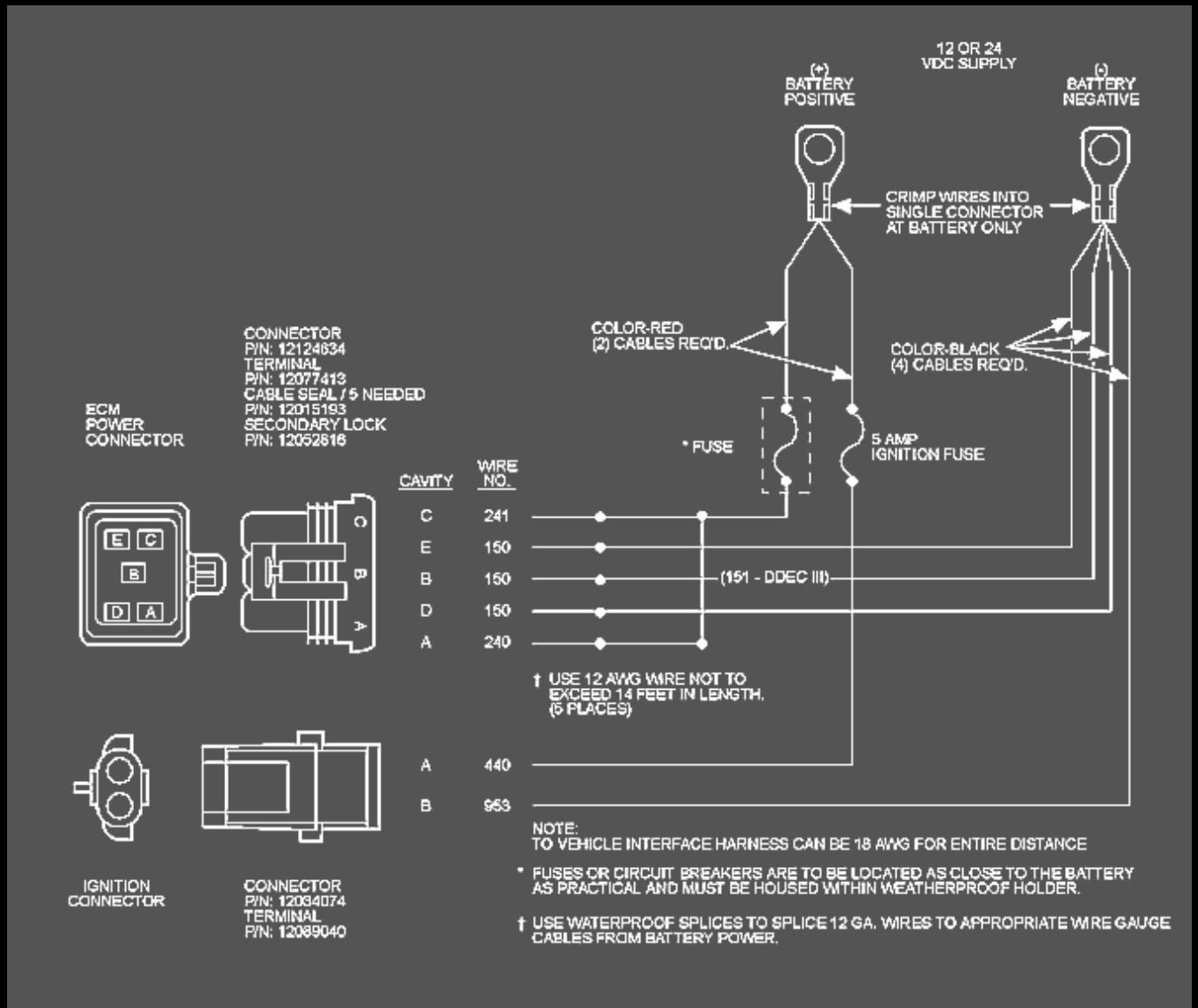
Schematic Diagram DDEC III / IV with EGR



Power Supply

- DDEC II - 12 Volt
- DDEC III - 12/24 Volt
- DDEC IV- 12 or 24 Volt
- Source must be Isolated from any other Vehicle Accessory
- The ECM Power Source must be Fused with the Proper Amp
- The ECM Must Be Incorporated with a 5 Amp Fuse on the 440 wire going into the 439 wire.
- The ECM Case Must be Electrically Isolated from any Chassis Ground

Power Supply DDEC III / IV with or without EGR



Multiple Horsepower Ratings

- Three Independent Ratings
- One Dependent Cruise Power Rating

Example #1		Example #2	
430 bhp @ 2100 r/min	Rating #0	470 bhp @ 2100 r/min	Rating #0
400 bhp @ 2100 r/min	Rating #1	470 bhp @ 1800 r/min	Rating #1
370 bhp @ 2100 r/min	Rating #2	430 bhp @ 1800 r/min	Rating #2
370/430 bhp @ 2100 r/min	Rating #3	430/470 bhp @ 1800 r/min	Rating #3

- Switch Power Options (C&I)
  - Max. Power for Fully Loaded Engine
  - Min. Power for a Lightly Loaded Engine

Cruise Control

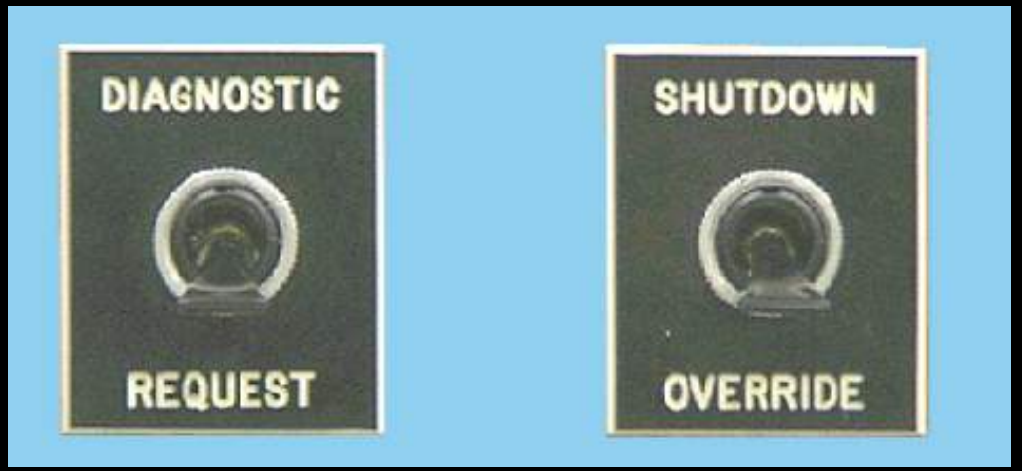
- Determined by vehicle speed (VSS) or engine speed (RPM) DDEC IV changed
- Must be above **20 MPH** or **1100 RPM** to set
- Cruise Power can provide higher HP while in cruise control by using the C. P. rating.
- Uses up to 5 digital inputs and one digital output
- VSG can be controlled by the cruise switch
- Use cruise switches to set PTO high idle and lower high idle..

Vehicle Speed Sensor

- Revs per Mile (Tires)
  High Gear Ratio (Transmission)
  Rear End Ratio (Ring & Pinion)
  Sensor Type (Magnetic or Switched)
  # of teeth on Pulse Wheel (Trans. or Wheel End)

- Vehicle Speed Limit
- Vehicle Overspeed with Fuel (typically set 3-4 mph above road speed limit)
- Vehicle Overspeed without Fuel (typically set 5-6 mph above road speed limit)
- VSS Antitamper
  - Will not go above Idle
  - Code will be logged

Diagnostic Request and Stop Engine Override



Check Engine / Stop Engine Lights

External Fault

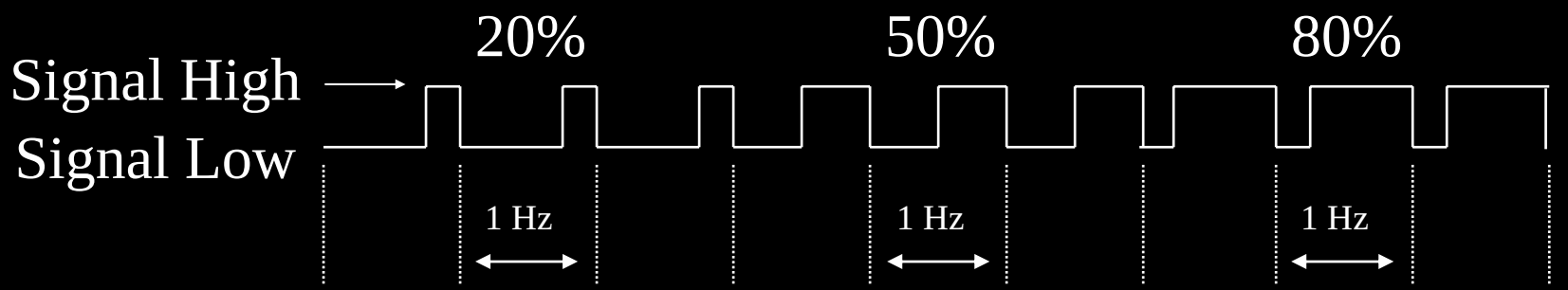
Internal Fault

Engine Protection

- Warning- Illumination of CEL,SEL only
- Rampdown- Immediate reduction to 70% power, ramping down to 40% over 30 seconds and maintains 40% power.
- Shutdown- Same as rampdown except engine is shutdown at the end of 30 seconds.
- ENGINE PROTECTION NOT AVAILABLE ON ALL APPLICATIONS

Pulse Width Modulated Outputs

- **Signals sent by the ECM to other microprocessor controlled systems**



- **50 Hz duty cycle modulated**
- **Four ports available-- circuits 908, 909, 910, 911**
- **Factory programmed only**

NON EGR PWM CIRCUTS

	Circuit No.	Wire Color
• PWM #1 Output - VIH (Transmission)	908	White
• PWM #2 Output - ESH (Throttle/GAS)	909	Lt. Green
• PWM #3 Output - ESH (Gas Valve/GAS)	910	Orange
• PWM #4 Output - ESH (Fan Control)	911	Pink

- ESH = Engine Sensor Harness
- VIH = Vehicle Interface Harness

EGR PWM CIRCUTS

	Circuit No.	Wire Color
• PWM #1 Output - VIH (Transmission)	908	White
• PWM #2 Output - ESH (EGR Control)	909	Lt. Green
• PWM #3 Output - ESH (OI STARTER)	910	Orange
• PWM #4 Output - ESH (VNT Control)	911	Pink

- ESH = Engine Sensor Harness
- VIH = Vehicle Interface Harness

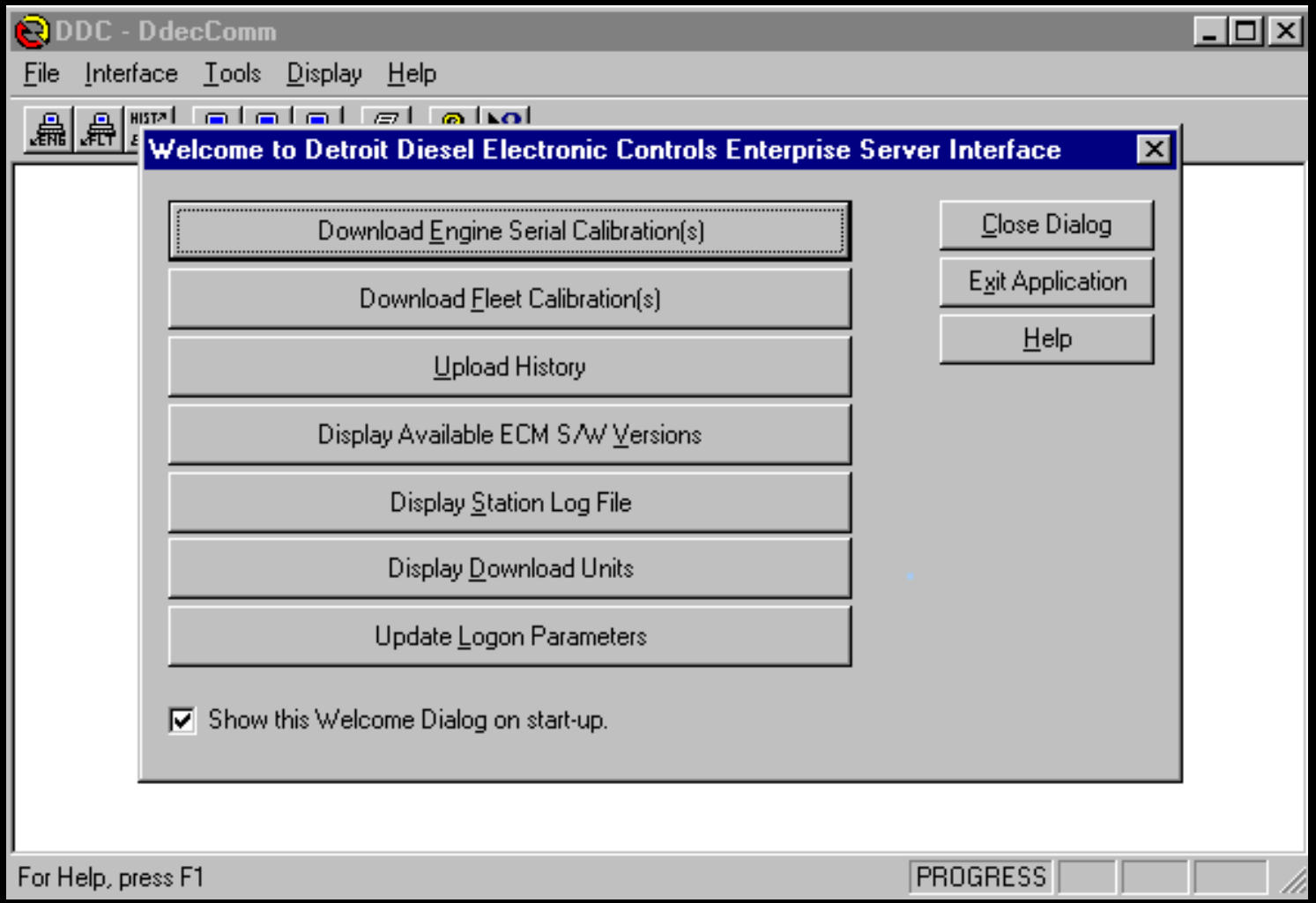
DDEC III / IV / V Reprogramming

Reprogramming Station

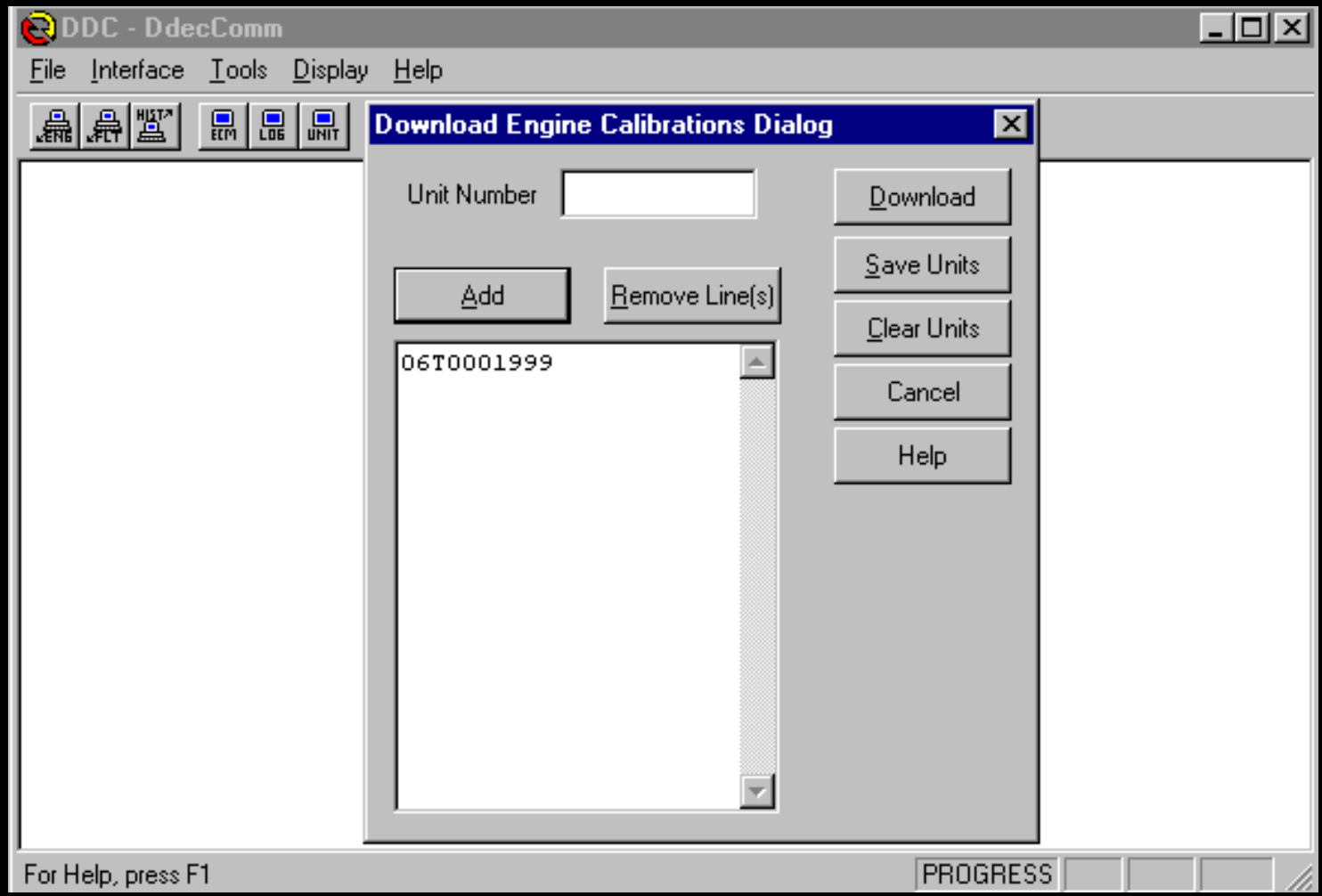
Software

- Software is programmable
- Numbered like computer software
  - Major version changes number before dot (X.00)
  - Minor version changes number after dot (9.XX)
- DDEC III software will be 19.XX or lower
  - Current DDEC III software is 9.00
- DDEC IV software will be 20.00 or higher
  - Current DDEC IV software is 36.00
- Software level can ONLY go UP, it can NEVER go back down

Reprogramming Station
Windows Based for Download



Reprogramming Station
Windows Based for Download



Reprogramming Station
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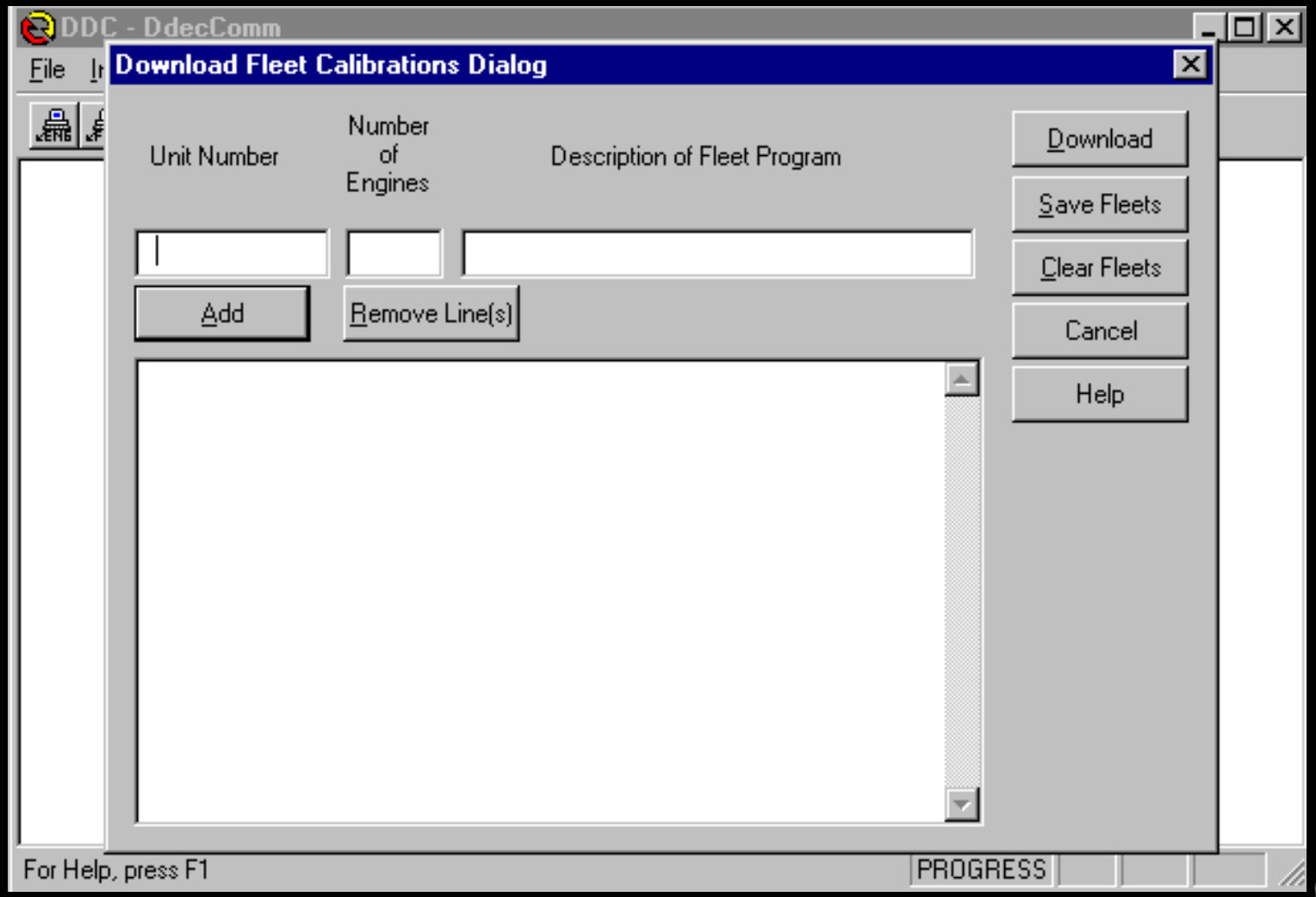
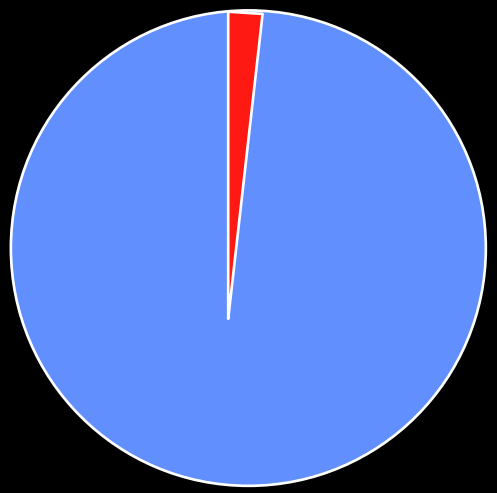


Idle Shut Down (ISD) / Vehicle Power Shutdown

- **Idle Shut Down (ISD): Turns engine off after programmed idle time has elapsed (optional “override” disables idle timer if the engine speed is increased by 100 during last 90 seconds of ISD sequence. The check engine light (CEL) will flash during this 90 seconds.**
- **Vehicle Power Shutdown relay (optional/OEM) turns off electrical power to the vehicle as well as stopping the engine**



2 - 100 Minutes

Fan Control

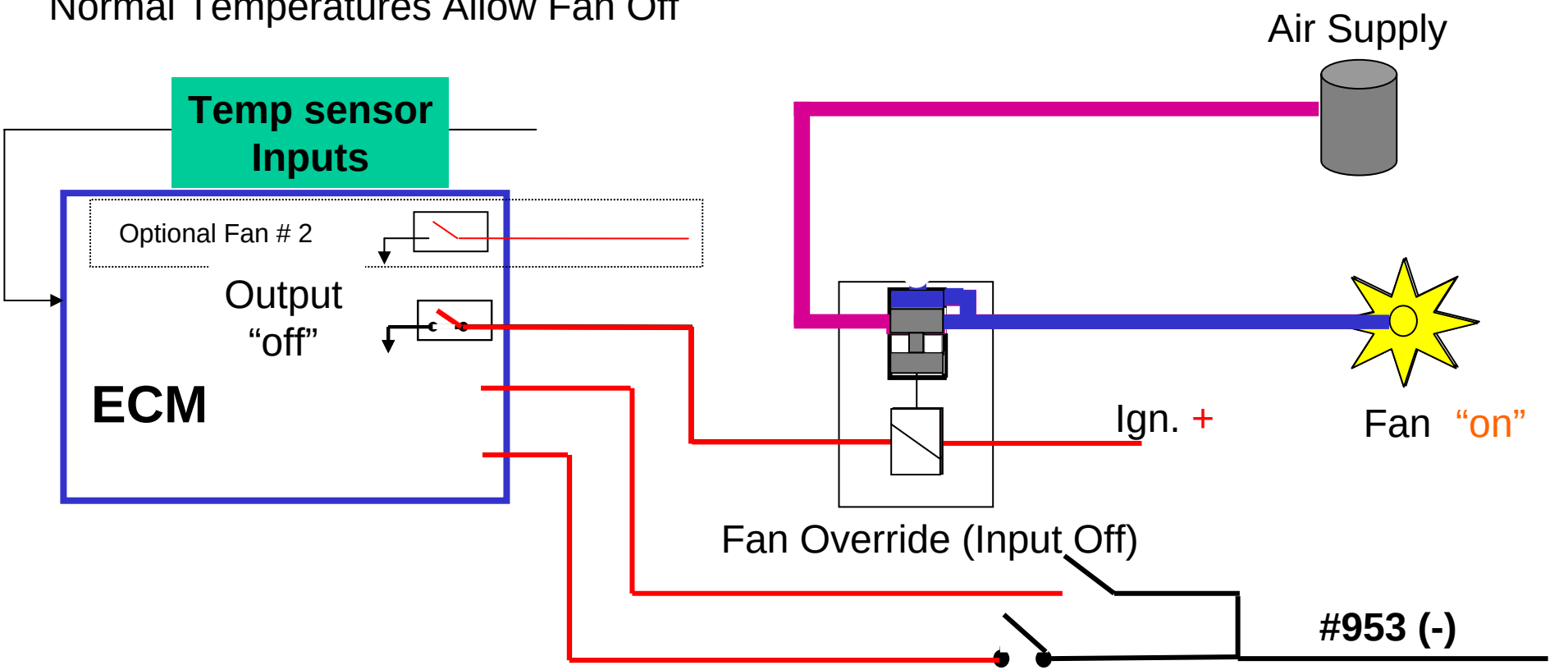
- Four fan configurations can be used
  - Single fan
  - Dual fans
  - Two speed fan
  - Variable speed fan (PWM) # 4 Hydraulically Operated (Coach)
- Fan controlled by digital output(s)
- “Fan override” & “air conditioning active” digital inputs can force the fan on
- Series 4000 uses (PWM) #2 To Operate a Rockford Fan

Fan Control

- Conditions which activate the fan;
  - High Oil, Coolant, or Air Inlet Temp
  - Circuit fault codes (HI VOLT, LO VOLT) on any of these three sensors
  - A/C Compressor On
  - Fan Override input
  - Dynamic Braking (Fan is Activated During Engine Overspeed to Help Slow The Vehicle)

DDEC Fan Controls

Normal Temperatures Allow Fan Off



Aux. Fan Control (Input Off)
Air Conditioning - On
(Fan on for at least 3 minutes)

Optimized Idle

- Automatic Starting and Stopping of the Engine
- Maintains Engine Temperature and / or Battery Voltage
- Optional Sleeper Thermostat
- Truck Skin Temperature Sensor is used for continuous run
- Saves Fuel by Running the Engine Only When Needed
- Warm Engines Start Much Easier With Less Exhaust Emissions
- Engine Mode – Thermostat Mode – Customer Mode

Requirements for Optimized Idle

- Cruise Enable Switch
- Idle Shutdown Enabled
- Vehicle Power Down Relay
- Op Idle light on dash
- Park Brake Switch
- Transmission Neutral Switch (Some transmissions require high range in Neutral)
- Hood Switch
- Under-hood Alarm
- Start Relay
- Overlay Relay
- VSS Enabled
- Optional Sleeper Thermostat

Optimized Idle Shutdown Sequence

- Park Brake set with hood closed and transmission in Neutral supplies ground to the Park Brake input and the Overlay Relay. Idle Timer starts and the Overlay Relay closes supplying power to the Start Relay.
- Optimized Idle is activated by turning on the Cruise Enable Switch which supplies ground on the Cruise Enable input.
- Optimized Idle Light flashes until the engine shuts down then remains on.

Optimized Idle Shutdown Sequence

- With Battery Voltage above 12.2V, Oil Temp between 15ºC/60ºF and 40ºC/104F, and Sleeper Temp within limits, the Idle Timer shuts the engine down.
- Vehicle Power Down Relay opens powering down the vehicle Ignition Circuit.
- With Ignition key on, the ECM is still awake and it continuously monitors Battery Voltage, Oil Temperature and Sleeper Temperature.

Optimized Idle Start Sequence

- With the hood closed, Transmission in Neutral, Park Brake set, and the Optimized Idle dash light ON,the ECM supplies ground on PWM #2, wire 909 which activates the under-hood alarm.
- ECM then supplies ground on PWM #3, wire 910 which closes the Start Relay.
- After the engine starts, the ECM supplies ground to the Vehicle Power Down relay which closes to supply Ignition power to the vehicle

Communication

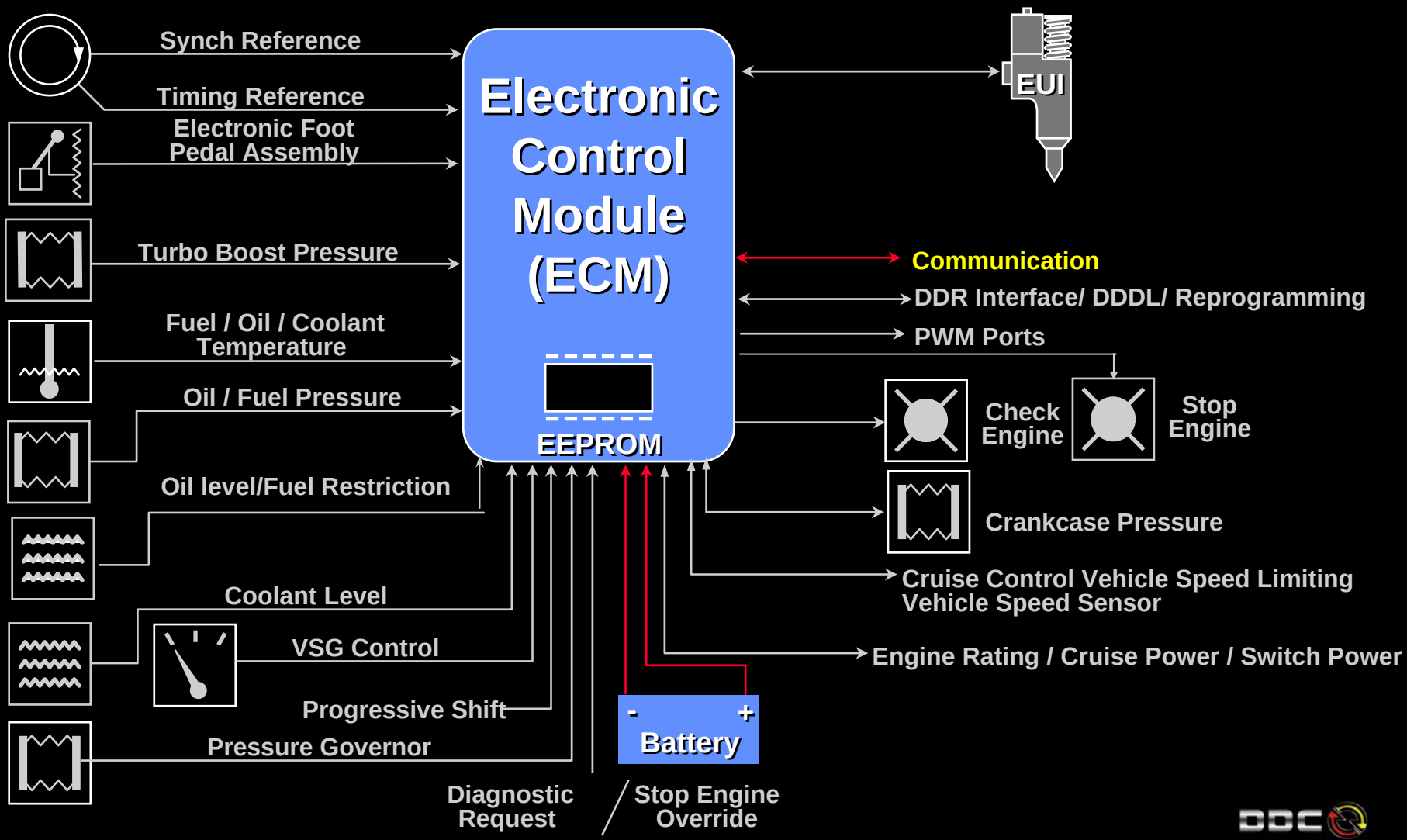
- **J1587**
  - 9600 Baud Rate, used to transmit sensor and engine data (electronic dash display, vehicle management systems and electronic transmissions). MPSI readers, DDDL
- **J1922**
  - 9600 Baud Rate, controls Transmissions, braking systems and retarders
- **J1939**
  - 250k Baud Rate, controls Transmissions, braking systems and retarders also used as the proprietary data link in multi ECM engines

Infrared Information System

Infrared Information System

- The IRIS System Consists of Simple Infrared Transceivers
- One Transceiver is Mounted on the Vehicle & Another Transceiver is Mounted at the Location where the Vehicle Owner Wants to Extract Information
- Once the Vehicle is in Position, an Indicator Light Lets the Driver Know the Infrared Connection has Been Made
- Information Can Then Begin to Flow

Schematic Diagram DDEC III / IV



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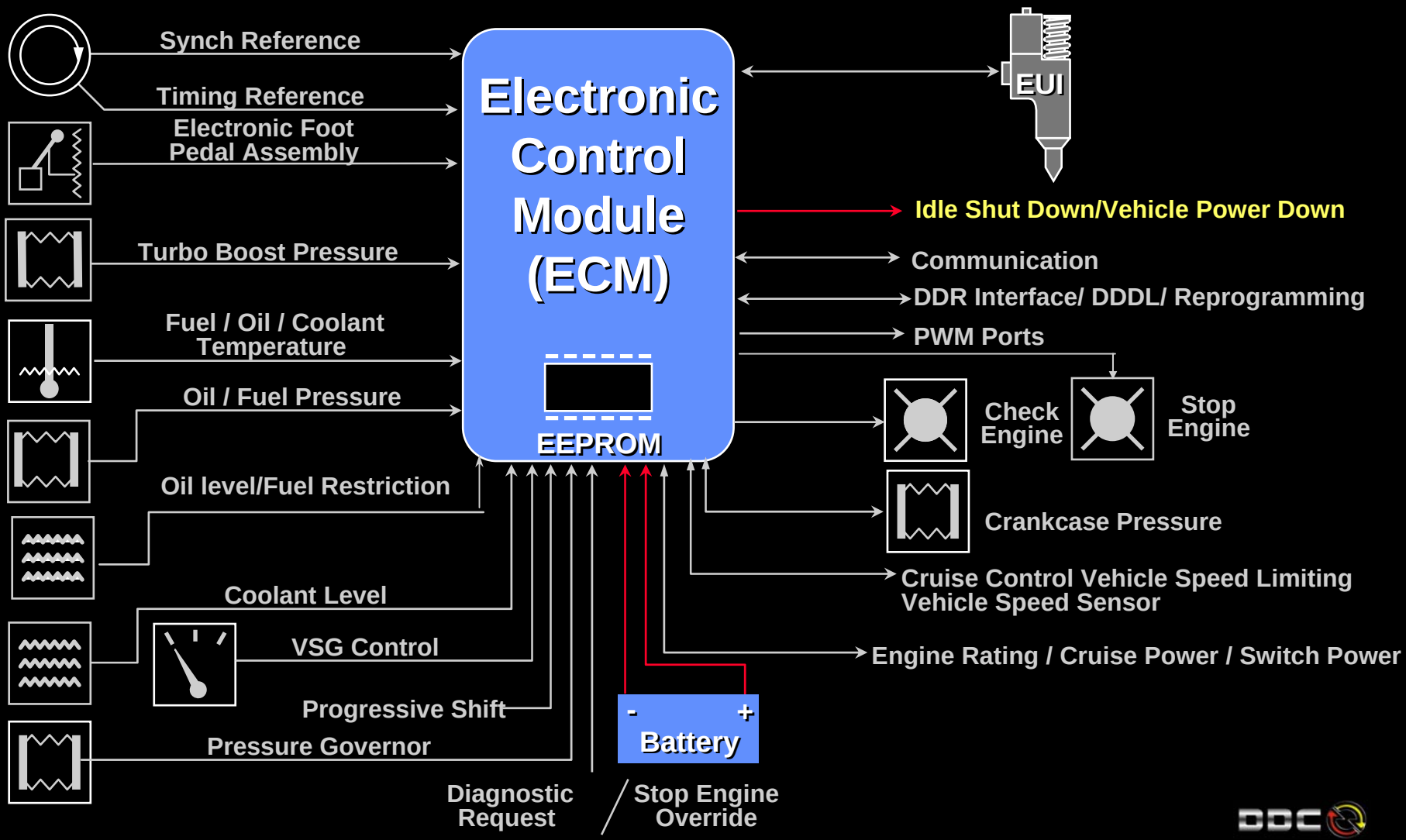
Schematic Diagram DDEC III / IV



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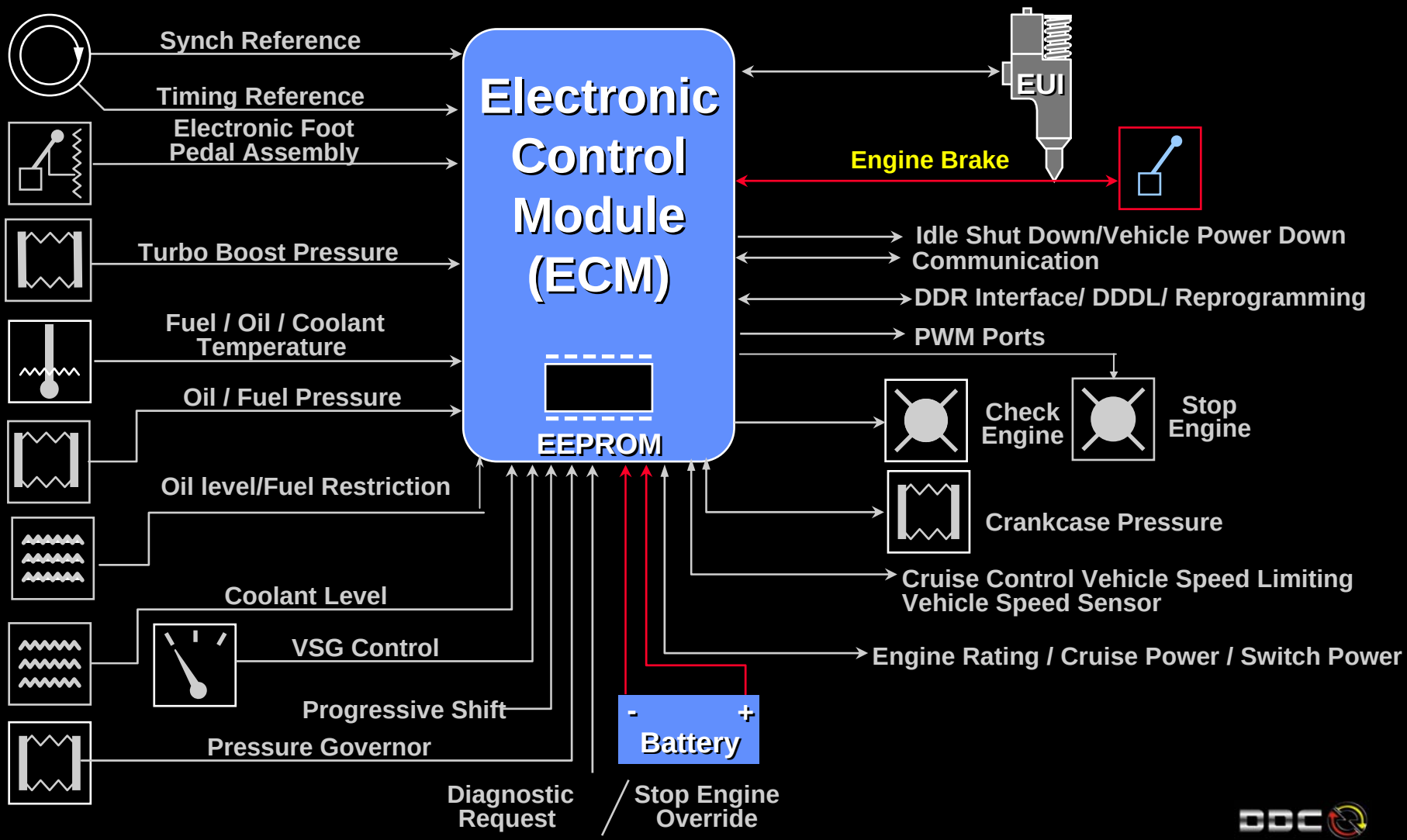
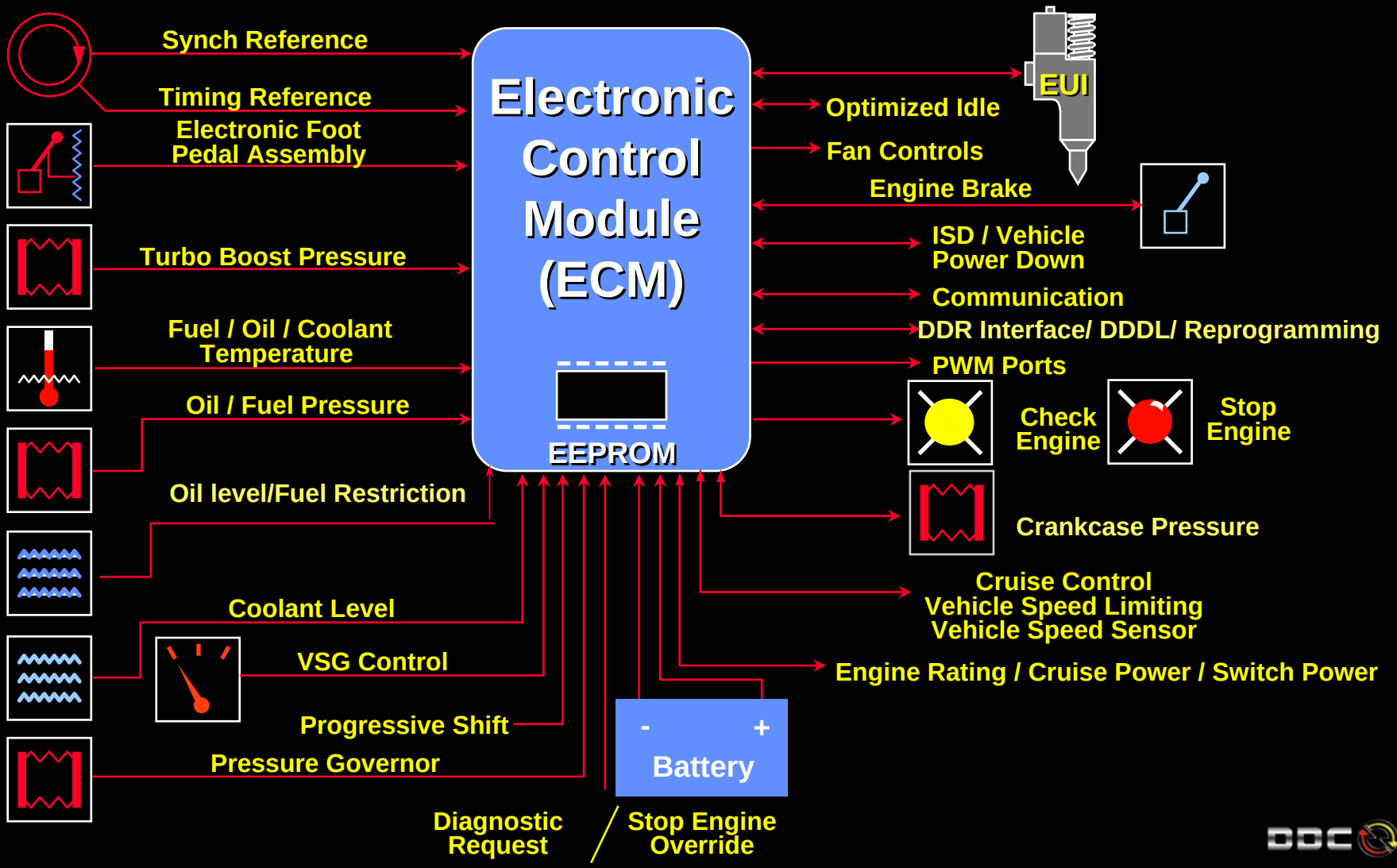


Schematic Diagram DDEC III / IV

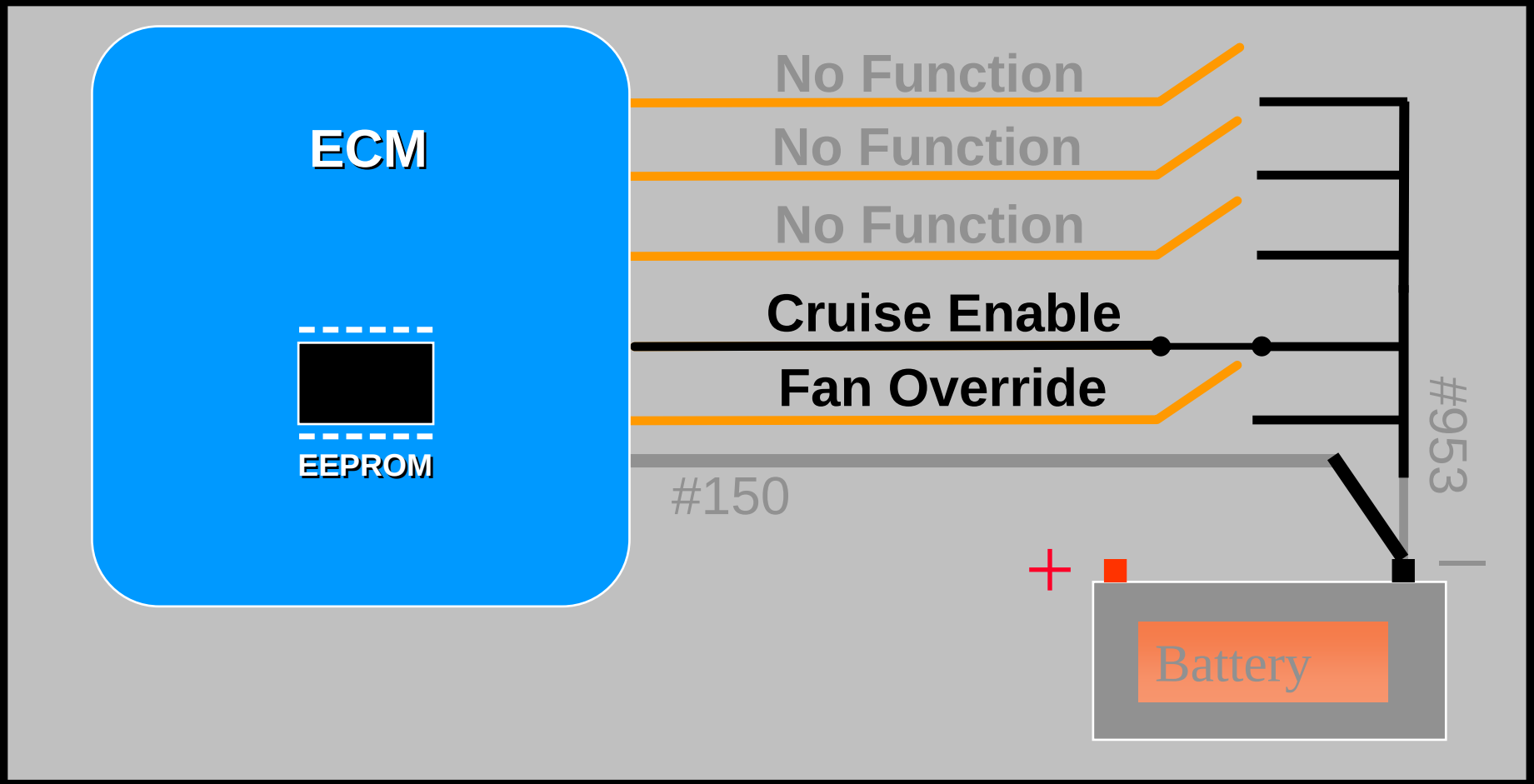


Digital Inputs

Digital Input Functions

- External Switch Requests Function from the ECM
- 37 Options to Choose from
- 12 pins Available on the 30 Pin Vehicle Harness Connector for Input Functions
- Functions are Assignable to any of these Pins through the use of a “Reprogramming Station”

DDEC III – IV Digital Inputs



DDEC III – IV Digital Inputs

- Air Compressor Controls
  - Air Compressor Load Switch
- Cruise Control (Uses Up to Five Inputs)
  - Cruise Enable
  - Clutch Released
  - Service Brake Released
  - Set / Coast On (Decrease)
  - Resume / Acceleration On (Increase)
- Engine Brake
  - Engine Brake Disable
  - Engine Brake Low
  - Engine Brake Medium
- Engine Protection
  - Auxiliary Input Protection #1
  - Auxiliary Input Protection #2
  - Diagnostic Request Switch
  - SEO/Diagnostic Request Switch
- Engine Ratings
  - Limiting Torque Curve
  - Rating Switch #1
  - Rating Switch #2
- Fan Control
  - Transmission Retarder Status (Release 2.00 or Later only)
  - Air Conditioner Status
  - Fan Control Override

DDEC III – IV Digital Inputs (Cont'd)

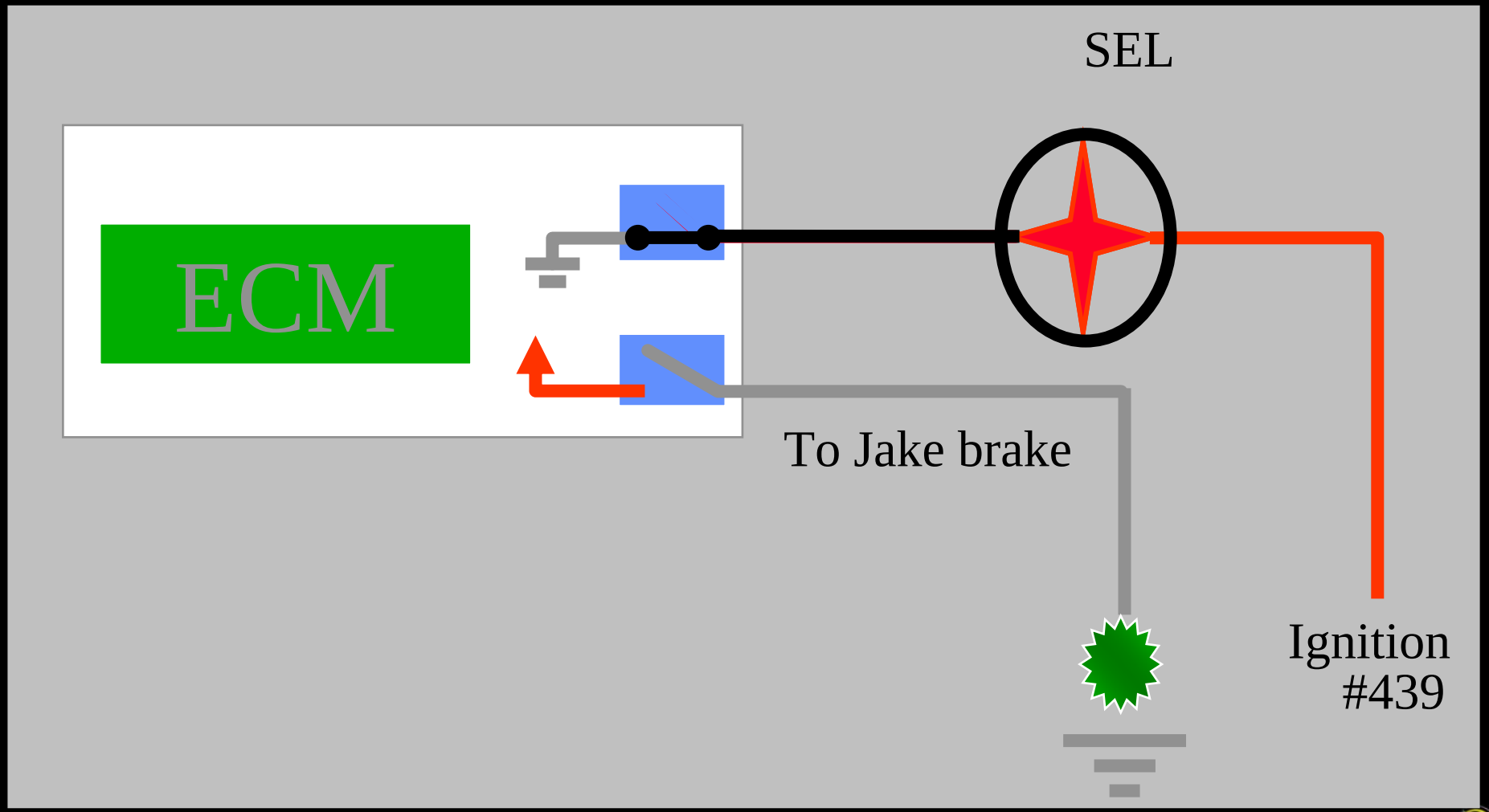
- Throttle Control
  - Alternate Minimum VSG/Fast Idle (Release 2.00 or Later Only)
  - Dual Throttle (LSG)
  - Idle Validation Switch
  - Throttle Inhibit
  - VSG Station Change
  - VSG Station Complement
- Pressure Governor System (PGS) (Uses Five Inputs)
  - Pressure Governor System Enable
  - Pressure/RPM Mode Switch
  - Set/Coast On (Decrease)
  - Resume/Acceleration On (Increase)
- Additional Functions
  - Auxiliary Coolant Level Sensor
  - Parking Brake Interlock

Digital Outputs

DDEC III – IV Digital Output Functions

- ECM Commands (Internal Switches) Action of some External Device- Fan Control
- 32 Output Options
- 6 Pins Available, 3 on the 30 pin Vehicle Connector, 3 on the 30 Pin Engine Harness Connector (Auxiliary Outputs)
- Configurable with the Distributor or Dealer Reprogramming Station

Outputs



DDEC III – IV – Digital Outputs

- Coolant Level Low Light
- Cruise Control Active Light
- Deceleration Light
- Engine Brake Active
- Fan Control #1
- Fan Control #2
- Low DDEC Voltage
- Pressure Mode Light
- Starter Lockout
- Transmission Retarder
- Vehicle Power Shutdown
- VSG Active Indication
- Low Oil Pressure Light
- High Oil Temperature Light
- High Coolant Temp. Light
- Ether Injection
- Low Coolant Pressure Light
- High Crankcase Pressure Light
- Optimized Idle Active Light
- Gas Solenoid Shutdown
- Fuel Regulator Solenoid

DDEC –III – IV Digital Outputs (Cont'd)

- Air Compressor Solenoid
- Exhaust Brake Enabled
- Fuel Supply Solenoid
- Low Range Solenoid
- High Range Solenoid
- Turbo Recirculation Valve
- Cold Engine Signal
- Rpm Synchronize Light
- Shift Lockout
- Shift Solenoid

Fuel Economy Incentive

- Encourages better driving habits by rewarding good fuel economy with extra road speed
- If driver exceeds the target fuel economy extra road speed will automatically be added to his maximum vehicle speed

Fuel Economy Incentive

Parameter	Range	Example
Min MPG	5-10 mpg	7.0
Max MPH	0-10 mph	4
Scaler MPH/MPG	0.1-20 mph/mpg	10.0
Calc Type	Filtered/Trip	Trip

If Scaler is set at:

- 20.0 = 1 extra mph for every .05 mpg above target mpg
- 10.0 = 1 extra mph for every .1 mpg above target mpg
- 5.0 = 1 extra mph for every .2 mpg above target mpg
- 2.0 = 1 extra mph for every .5 mpg above target mpg
- 1.0 = 1 extra mph for every 1.0 mpg above target mpg

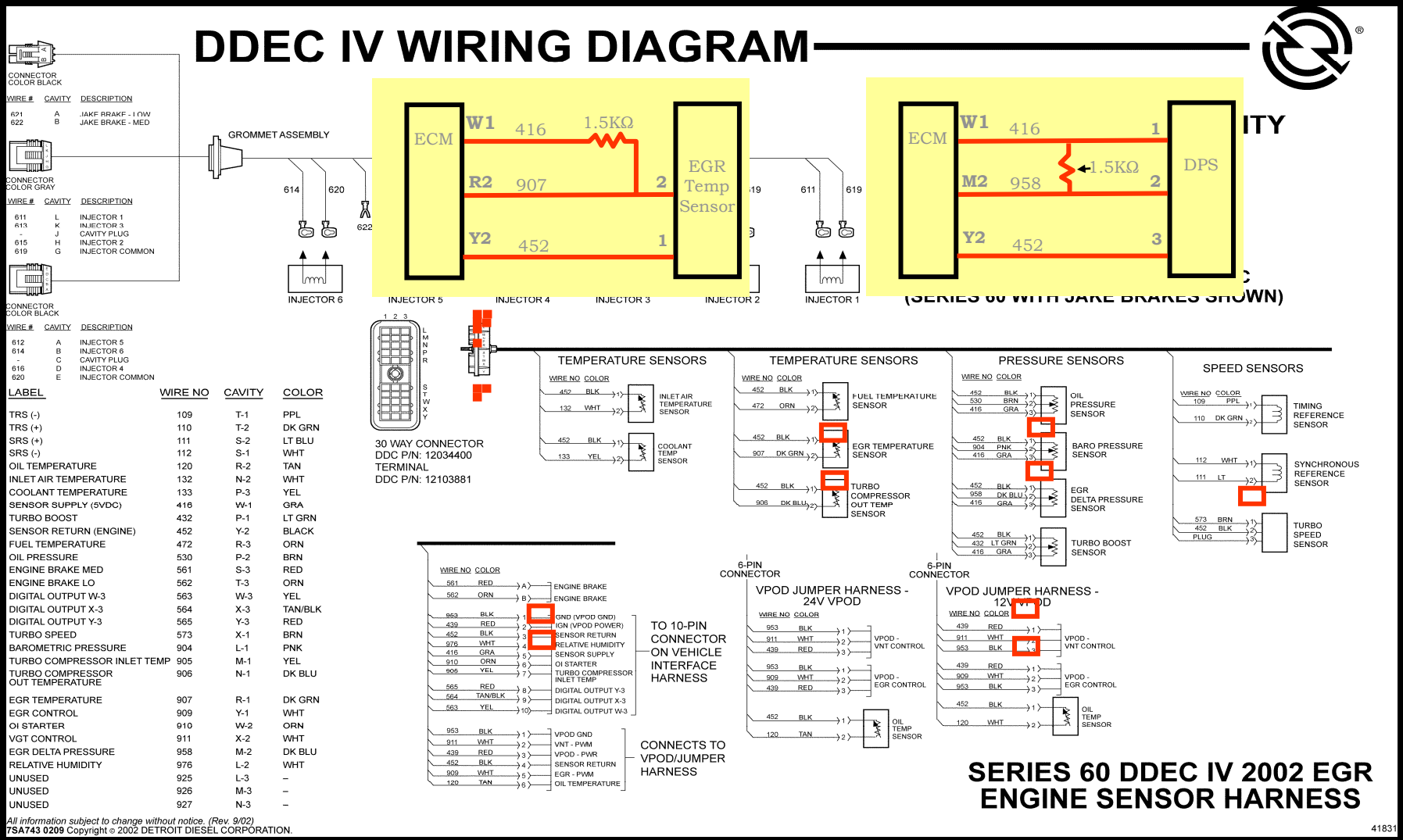
If Calc Type is set at:

- Filtered - Calculates using Total Engine Data
- Trip - Calculates using Trip Data

PasSmart

- **Electronically Controlled Increased Passing Speed**
  - **PasSmart is an electronic feature that enables a fleet manager to enable a second Vehicle Speed Limit (VSL) to assist drivers during passing.**
  - **This second Vehicle Speed Limit (VSL) is programmed for a limited duration during a given period This feature is available with DDEC IV Software version R28.00.**
  - **As and example: If the fleet policy is 65 Miles Per Hour (MPH) the fleet manager can increase the Vehicle Speed Limit (VSL) an additional 5-20 MPH for 1- 255 minutes per day.**

Series 60 EGR Electrical Schematic



LABEL	WIRE NO	CAVITY	COLOR
TRS (-)	109	T-1	PPL
TRS (+)	110	T-2	DK GRN
SRS (+)	111	S-2	LT BLU
SRS (-)	112	S-1	WHT
OIL TEMPERATURE	120	R-2	TAN
INLET AIR TEMPERATURE	132	N-2	WHT
COOLANT TEMPERATURE	133	P-3	YEL
SENSOR SUPPLY (5VDC)	416	W-1	GRA
TURBO BOOST	432	P-1	LT GRN
SENSOR RETURN (ENGINE)	452	Y-2	BLACK
FUEL TEMPERATURE	472	R-3	ORN
OIL PRESSURE	530	P-2	BRN
ENGINE BRAKE MED	561	S-3	RED
ENGINE BRAKE LO	562	T-3	ORN
DIGITAL OUTPUT W-3	563	W-3	YEL
DIGITAL OUTPUT X-3	564	X-3	TAN/BLK
DIGITAL OUTPUT Y-3	565	Y-3	RED
TURBO SPEED	573	X-1	BRN
BAROMETRIC PRESSURE	904	L-1	PNK
TURBO COMPRESSOR INLET TEMP	905	M-1	YEL
TURBO COMPRESSOR OUT TEMPERATURE	906	N-1	DK BLU
EGR TEMPERATURE	907	R-1	DK GRN
EGR CONTROL	909	Y-1	WHT
OI STARTER	910	W-2	ORN
VGT CONTROL	911	X-2	WHT
EGR DELTA PRESSURE	958	M-2	DK BLU
RELATIVE HUMIDITY	976	L-2	WHT
UNUSED	925	L-3	–
UNUSED	926	M-3	–
UNUSED	927	N-3	–

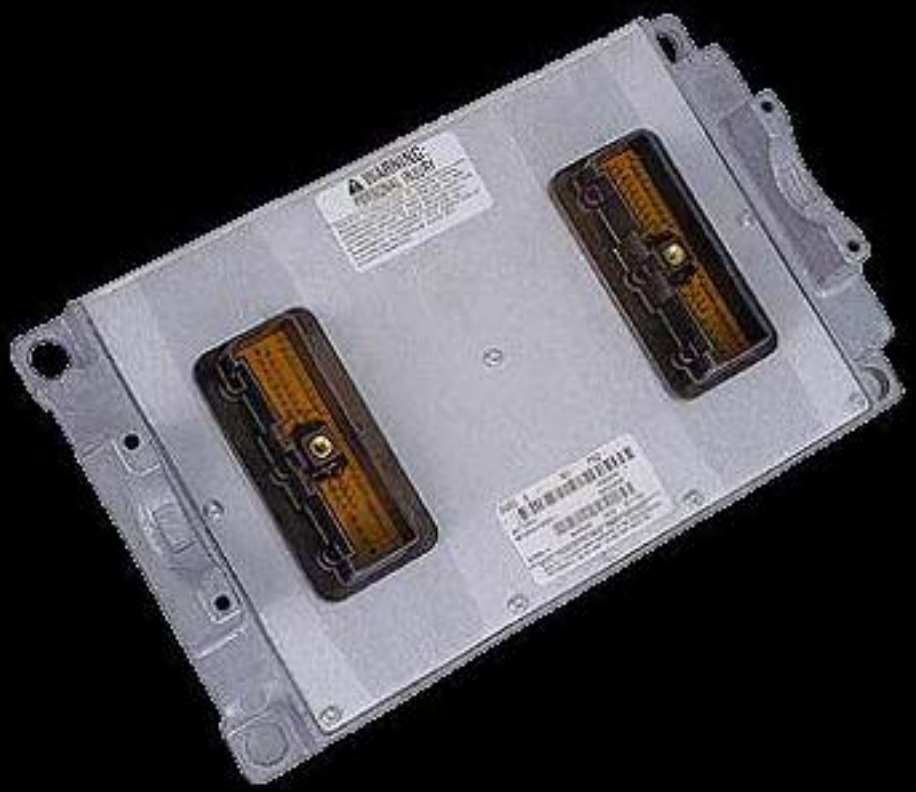
DDEC V

History of DDEC V

- 1999 - Kick off for use with EGR in Oct 2002
  - Designed for Common Rail Injection
- 2001 - Removed Common Rail and Went back to Unit Injectors
- 2002-2003 – Field Test
  - SOP Dec. 1 2003

DDEC V Features

- DDEC V Electronic Control Module (ECU)
  - 4 Times More Memory
  - Two 68 Pin Connectors Instead of Current Six Connectors
- Benefits
  - Ability to Add Options to EGR Engines
    - » Maintenance Alert System
  - New Connectors With Improved Seals to Prevent Water Intrusion
  - Improved Vehicle Integration With Other Control Systems



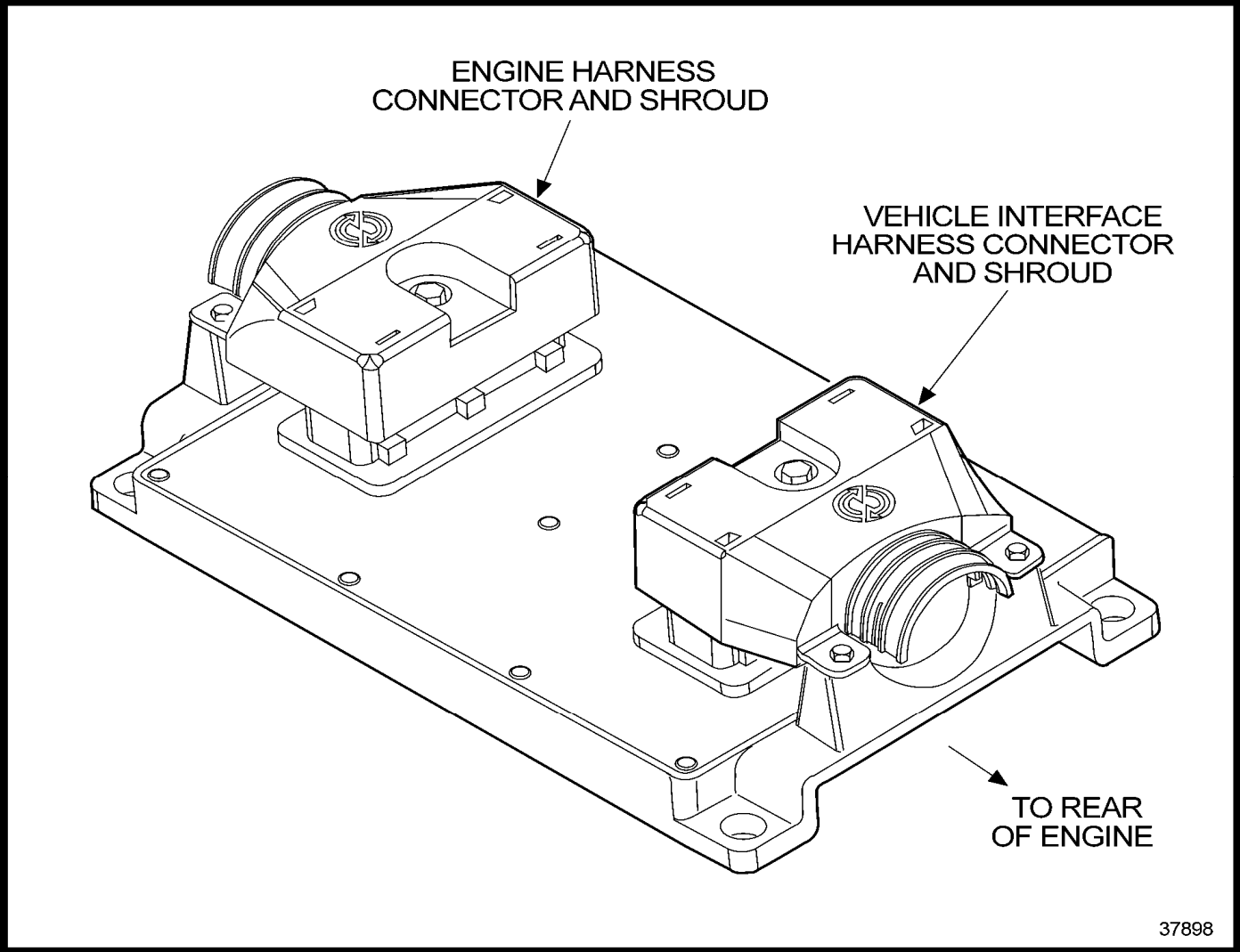
DDEC V Improvements Over DDEC IV

- More Terminal Pins (136 vs. 81)
- More Flexible Inputs
  - Frequency Inputs: 6 vs. 4
    - » OEM has 2 Frequency Inputs
- Digital Outputs: 19 (8 Hi),B+ (11 Lo)B- vs. 10 (2 Hi, 8 Lo)
    - » OEM has 10 Low Side Digital Inputs – 2 are used for CEL/SEL
- PWM Outputs: 6 vs. 4 (Low Side)
    - » OEM has 2 PWM Outputs

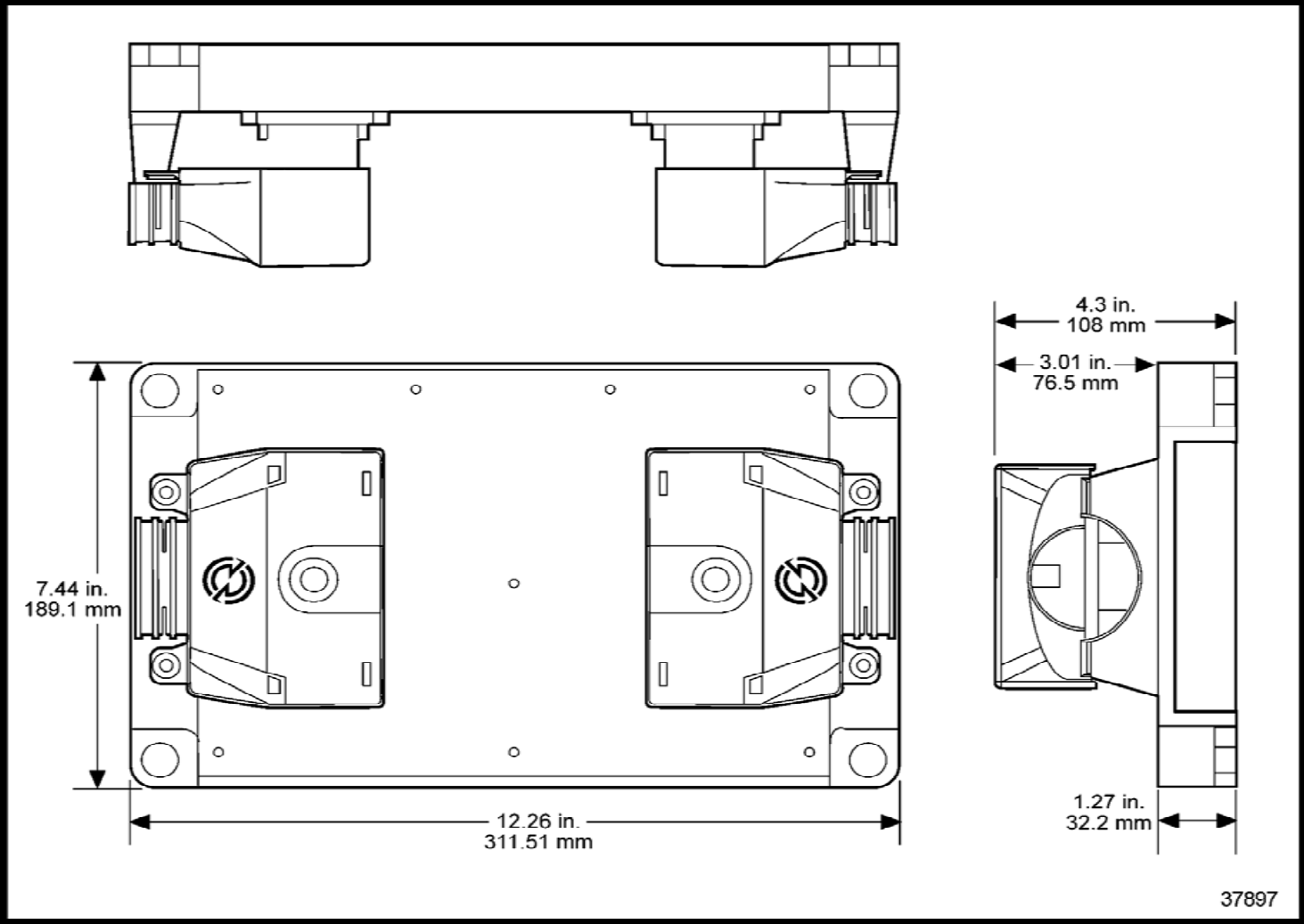
DDEC V Improvements over DDEC IV (cont.)

- **Memory:**
  - DDEC IV: 512 kB Flash, 66 kB RAM, 32 kB EEPROM
  - DDEC V: 2496 kB Flash, 282 kB RAM, No EEPROM
- **High Speed Programming**
  - New DDEC Multilink Translator (J1708, CAN & J1939)
    - » Uses Same J1708 Cables as DDC RP1202 Translator
    - » Translator Now Available: P/N 23528022

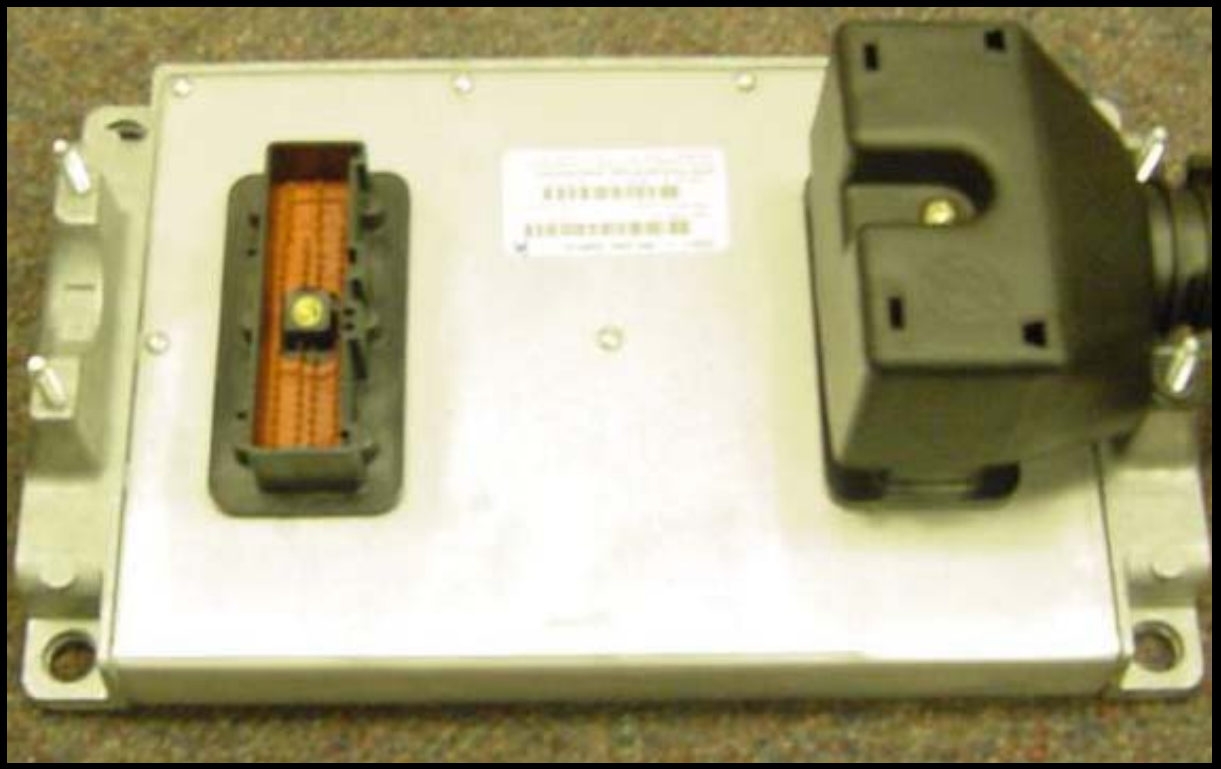
DDEC V ECU


ENGINE HARNESS
CONNECTOR AND SHROUD
VEHICLE INTERFACE
HARNESS CONNECTOR
AND SHROUD
TO REAR
OF ENGINE
37898

DDEC V ECU


4.3 in.
108 mm
3.01 in.
76.5 mm
7.44 in.
189.1 mm
12.26 in.
311.51 mm
1.27 in.
32.2 mm
37897

DDEC V – Hardware changes

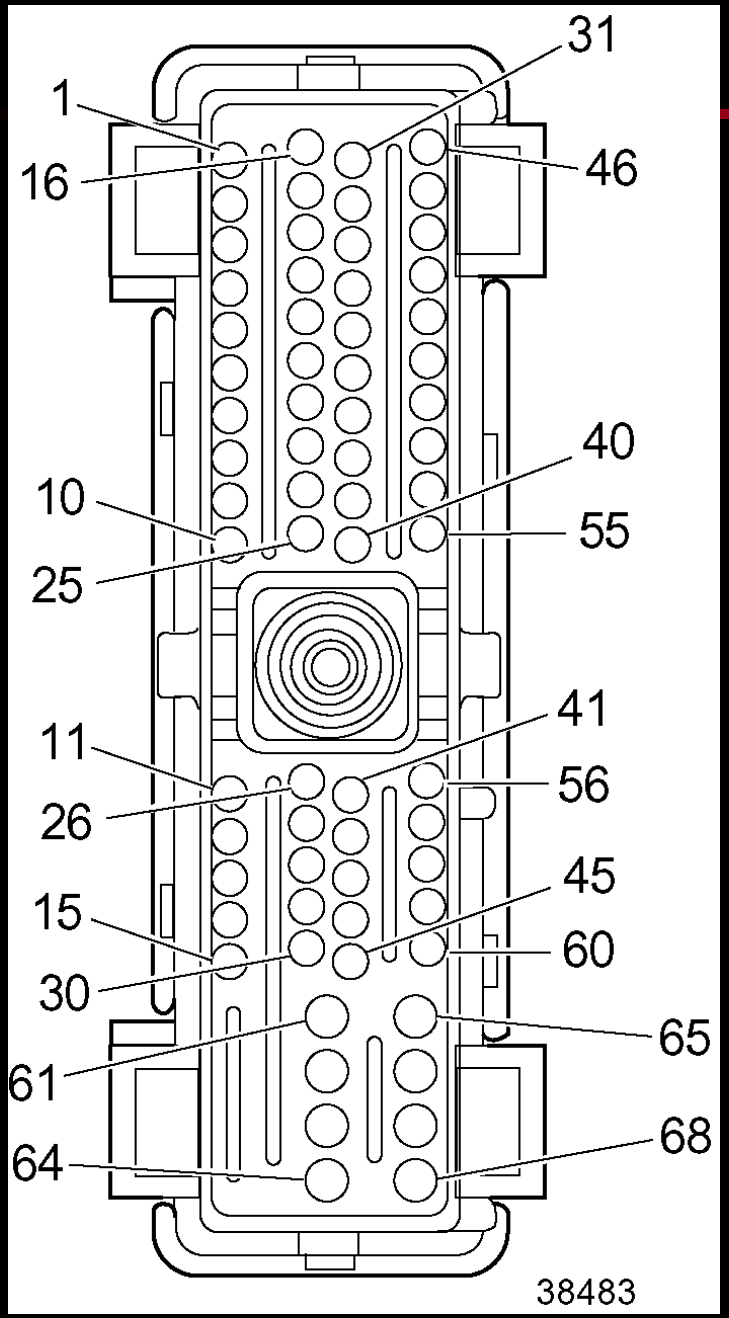


- Stud thread is M6 x 1, stud height above the shroud will be about 12 mm
- Corrosion resistant, plated, nylon insert or prevailing torque lock-nuts are recommended

DDEC V Electronics

- Utilizes New Tyco/AMP Connectors for Improved Harness Design and Reliability
- Uses Framatome (FCI) Connectors for Sensors
  - Connectors were introduced for EGR engines in Oct 2002
- Has Full Support for J1587 and J1939 Data Links (J1922 is not supported)
- Maintains Same Footprint as DDEC II / III / IV
- Application and Installation Manual Now Available on the DDC Extranet

DDEC V ECU Connectors



Terminal Side of Connector

Pins 1 to 60 are for 18 gauge wire
Pins 61 to 68 are for 14 gauge wire
Both the wire end and the terminal end are different sizes

On the Engine Harness Connector, EHC, pins 61- 68 are used for the EUI's

On the Vehicle Harness Connector, VHC, pins 61- 68 are used for the Battery connection

DDEC V Software

- First Release for December 2003
  - R 1.0 Includes all DDEC IV Software Features
    - » Return of Maintenance Alert System
  - J1939 ECU Programming
  - J1708 Diagnostics

DDEC V – Software changes

- **Fan control**
  - **The fan control outputs will stay on when the ignition is turned off until the engine speed is zero**
  - **Requirement for FL – must wire the fan controls to +12V for feature to work**
    - » **If switched +12V is used, fan will turn off with ignition and freewheel**

DDEC V A&I Manual

- **First Official Complete Edition**
  - **Publication Number: 7SA821**
  - **Available on the DDC Extranet**

DDEC V Codes

Sensor	Function
Barometric Pressure Sensor (Baro Sensor)	Senses barometric pressure.
Camshaft Position Sensor (CMP Sensor)	Senses crankshaft position and engine speed for functions such as fuel control strategy.
Crankshaft Position Sensor (CKP Sensor)	Indicates a specific cylinder in the firing order.
Engine Coolant Temperature Sensor (ECT Sensor)	Senses coolant temperature for functions such as engine protection, fan control and engine fueling.
Engine Oil Level (EOL Sensor)	Detects oil level at four quarts low. Used in the Maintenance Alert System.

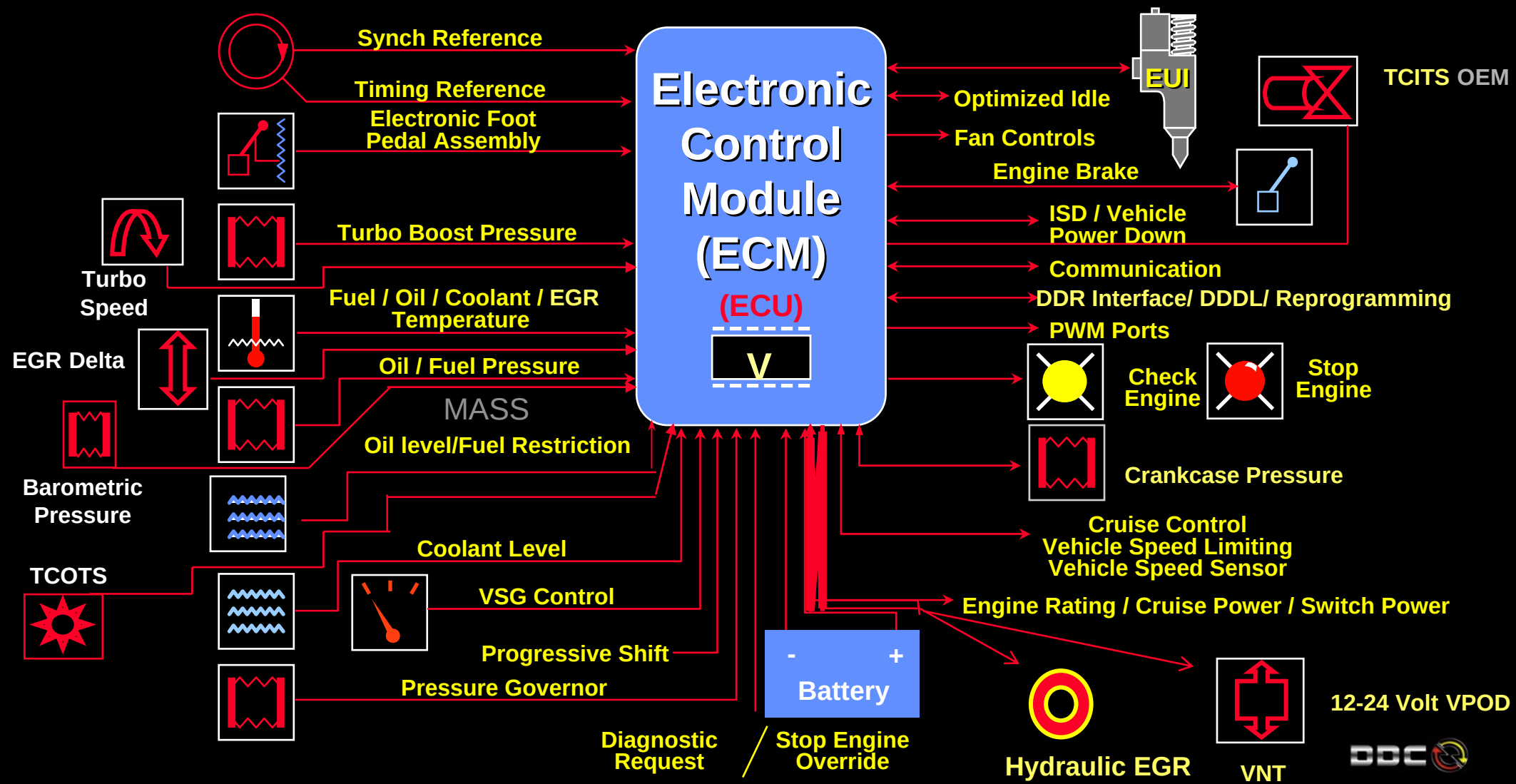
DDEC V Codes *(cont.)*

Sensor	Function
Engine Oil Pressure Sensor (EOP Sensor)	Senses gallery oil pressure for functions such as engine protection.
Engine Oil Temperature Sensor (EOT Sensor)	Senses oil temperature for functions such as reducing variation in fuel injection and fan control.
Fuel Restriction Sensor	Detects fuel restriction for replacement of fuel filter. Used in the Maintenance Alert System.
Intake Air Temperature Sensor (IAT Sensor)	Senses air temperature for functions such as fan control and engine fueling.
Intake Manifold Pressure Sensor (IMP Sensor)	Senses turbo boost for functions such as smoke control and engine protection.

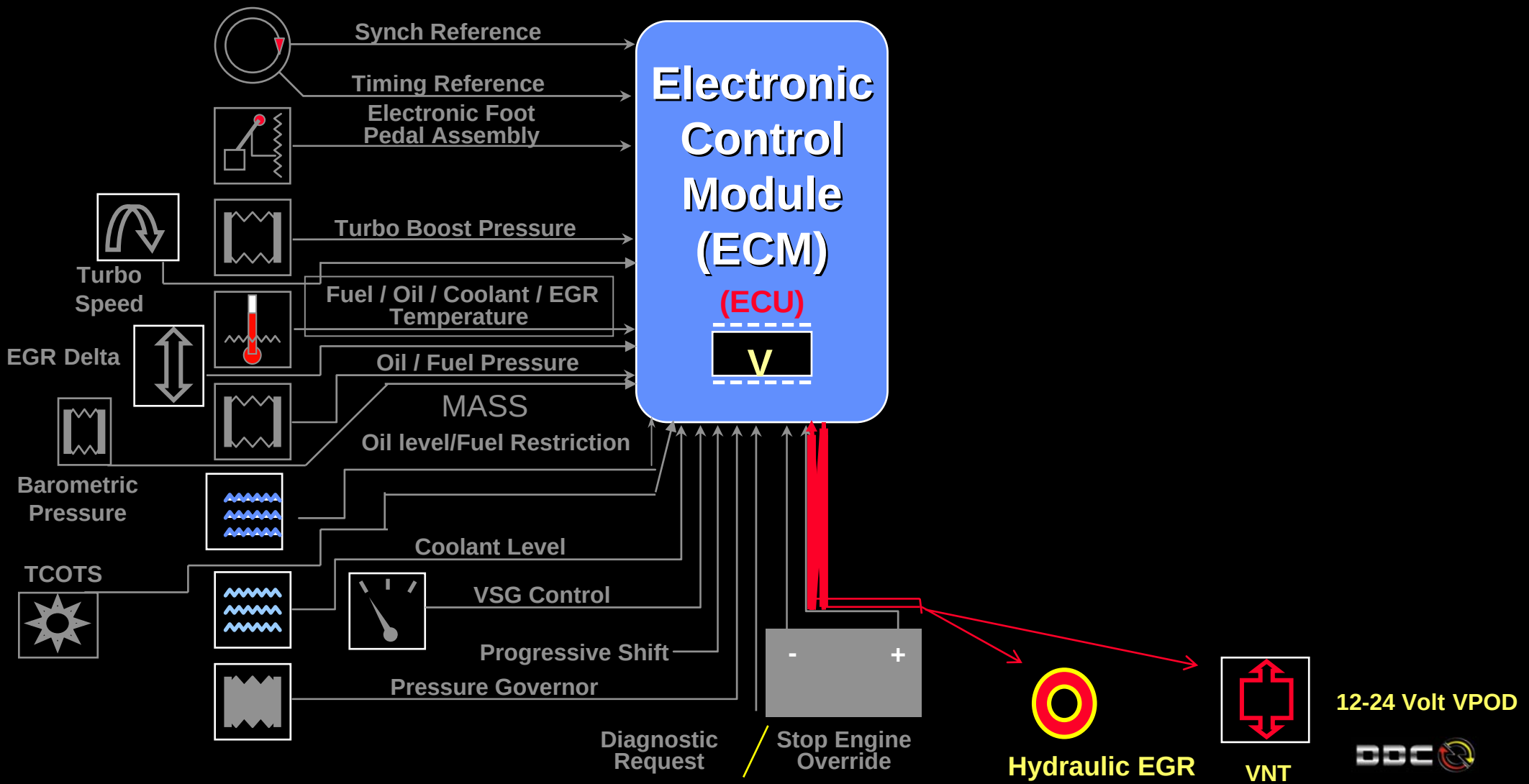
DDEC V Codes *(cont.)*

Sensor	Function
Supply Fuel Temperature Sensor (SFT Sensor)	Senses fuel temperature for functions such as engine fueling.
Turbo Compressor Temperature Out Sensor	Senses turbo out air temperature.
Turbo Speed Sensor (TSS)	Senses turbo speed for over-speed conditions.

Schematic Diagram DDEC V



Schematic Diagram DDEC V



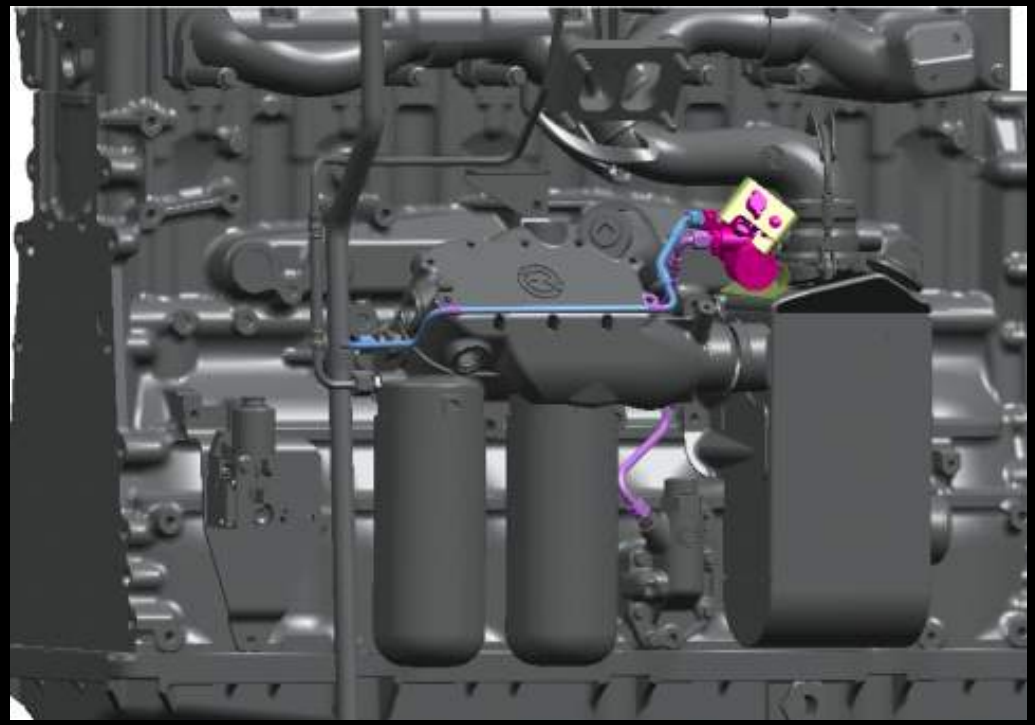
DDEC V Hydraulic EGR Valve

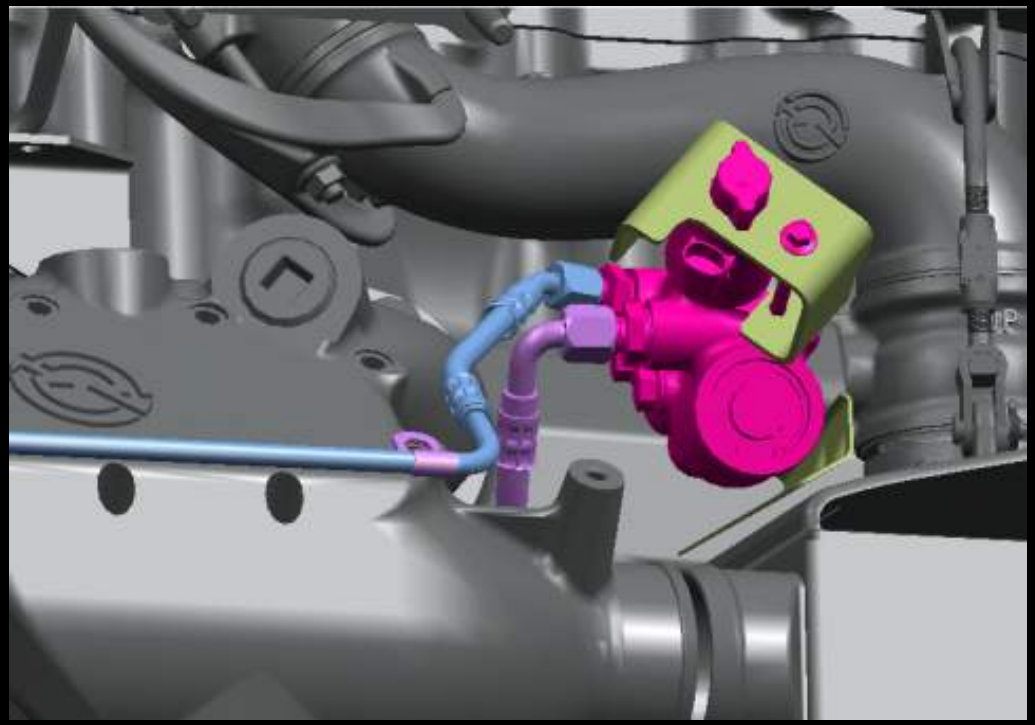
- Current Controlled from DDEC
- Actual Current Displayed in DDDL Using Mill volts
- Increasing Current Allows More Oil Flow to Hydraulically Open EGR Valve

EGR Valve & Actuator

December 2004

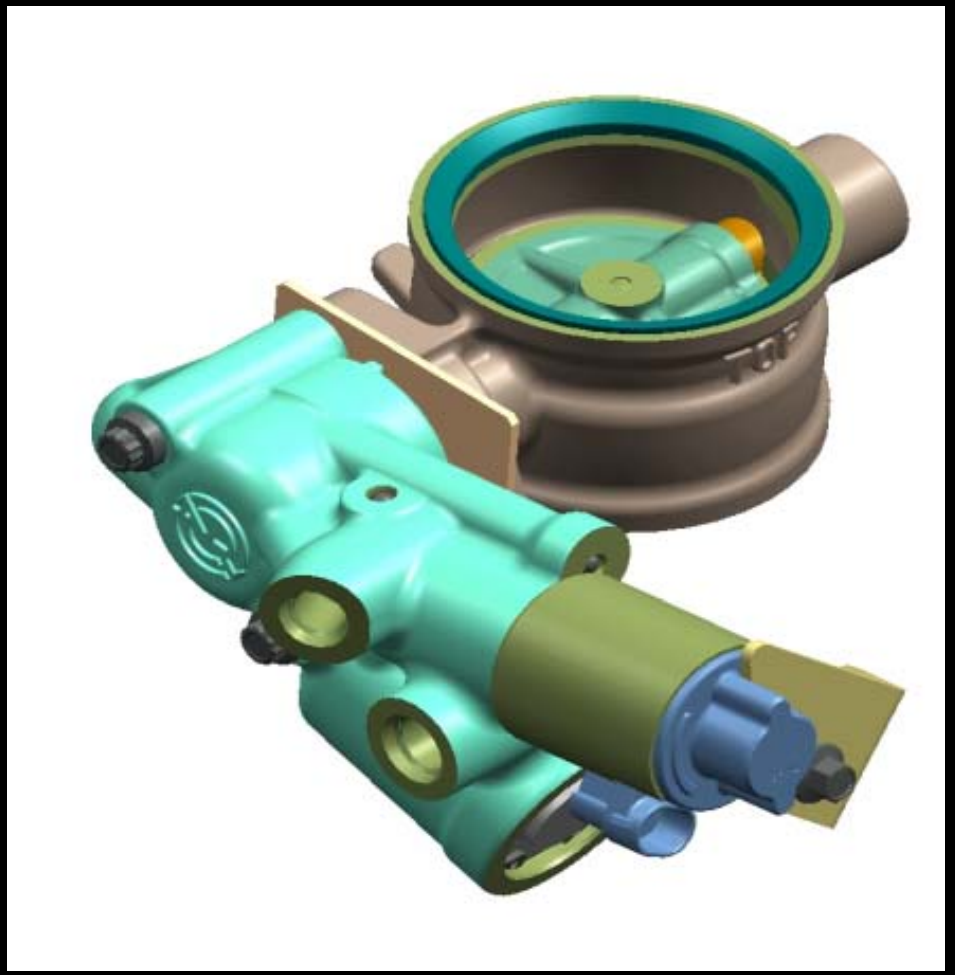
Hydraulic Actuator & Control Valve



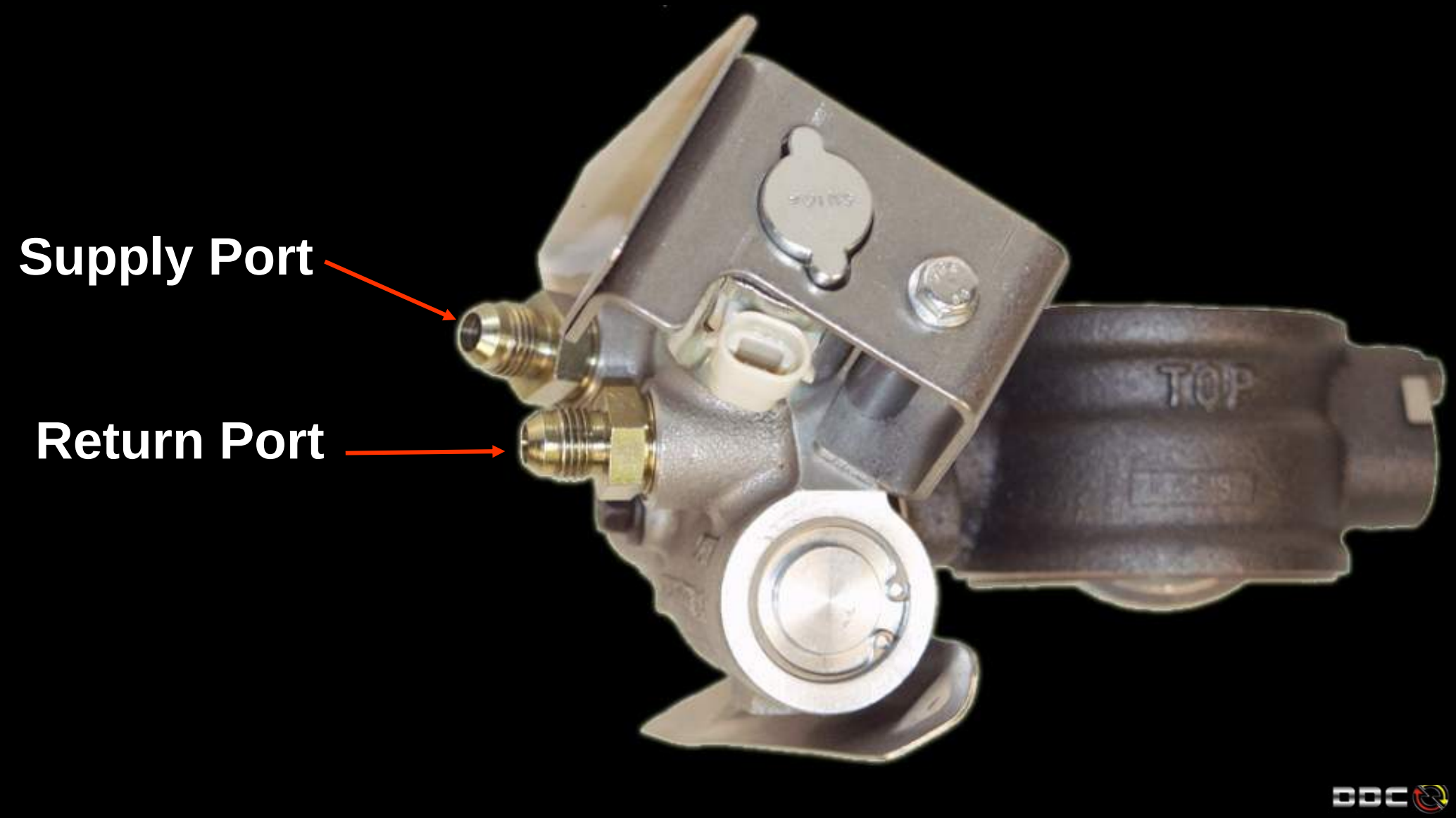


Series 60 ‘04 EGR

- New EGR Valve Design
- Electronically Controlled Hydraulic Valve Actuation
  - Utilizes Engine Oil to “Power” the Valve With Supply Line from the Oil Cooler Adapter
  - Direct DDEC Input
  - Reduced Linkage “Parts”
- Replaces Pneumatic Actuator, Air Lines and EGR VPOD



EGR Valve Assy.



Series 60 2004 DDEC V
Reprogramming Station

Factory/Distributor Tools DDEC V

- **Distributor Reprogramming System**
  - **V3.61 Released to key distributors on Aug 24**
    - » **Supports engineering test calibrations**
    - » **Supports most customer features, not fully functional**
- **Production release of DRS on Dec 15**

Distributor Reprogramming DDEC V

- **DDEC V Electronic Tools**

  DDEC V Hardware Components for Programming Station (DRS)

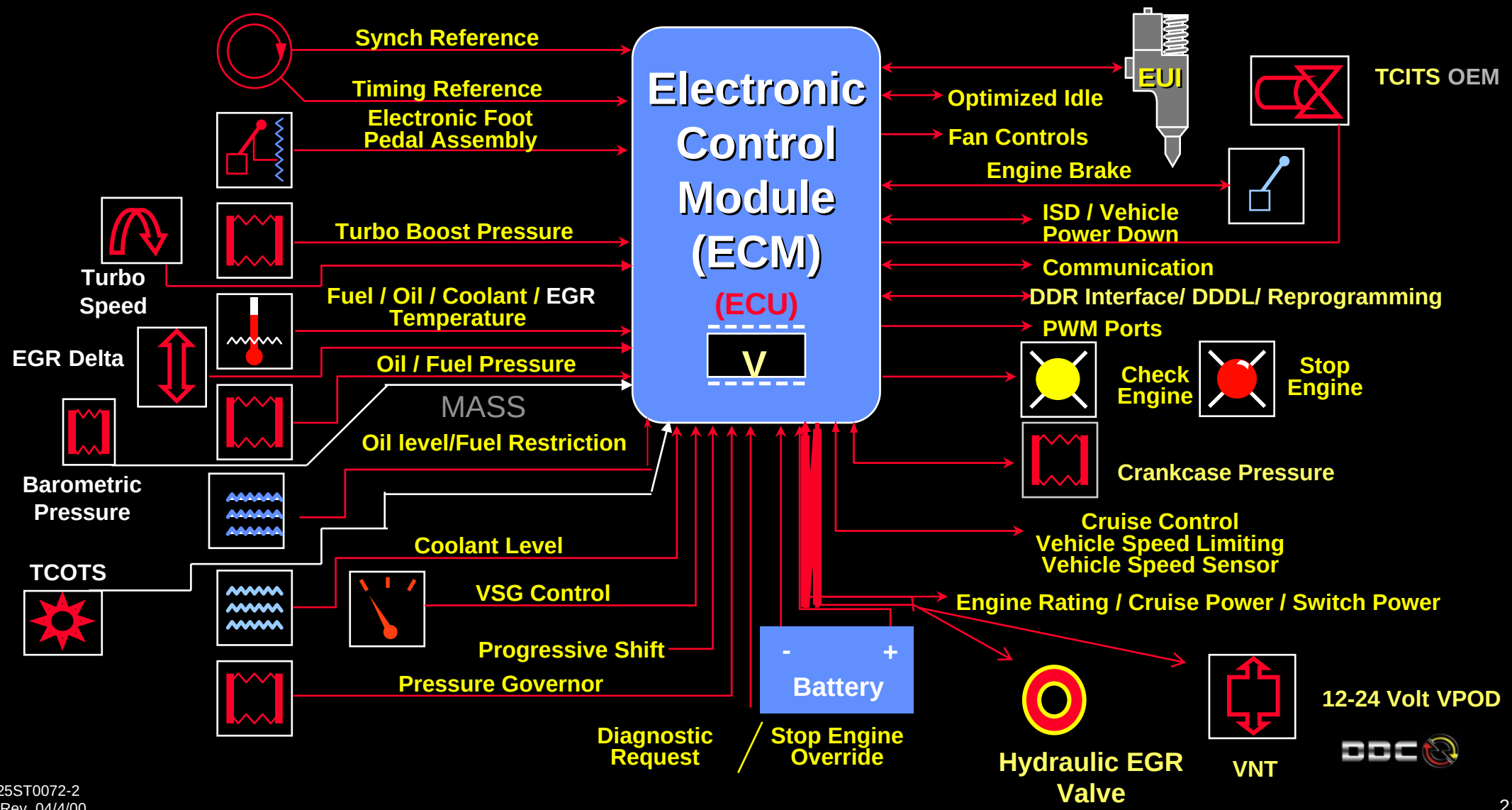
  DDEC V Programming Software Supporting Test Vehicles

  Production Version Scheduled for Release 12/1/03

  New High Speed Kit Features J-1939 Connection

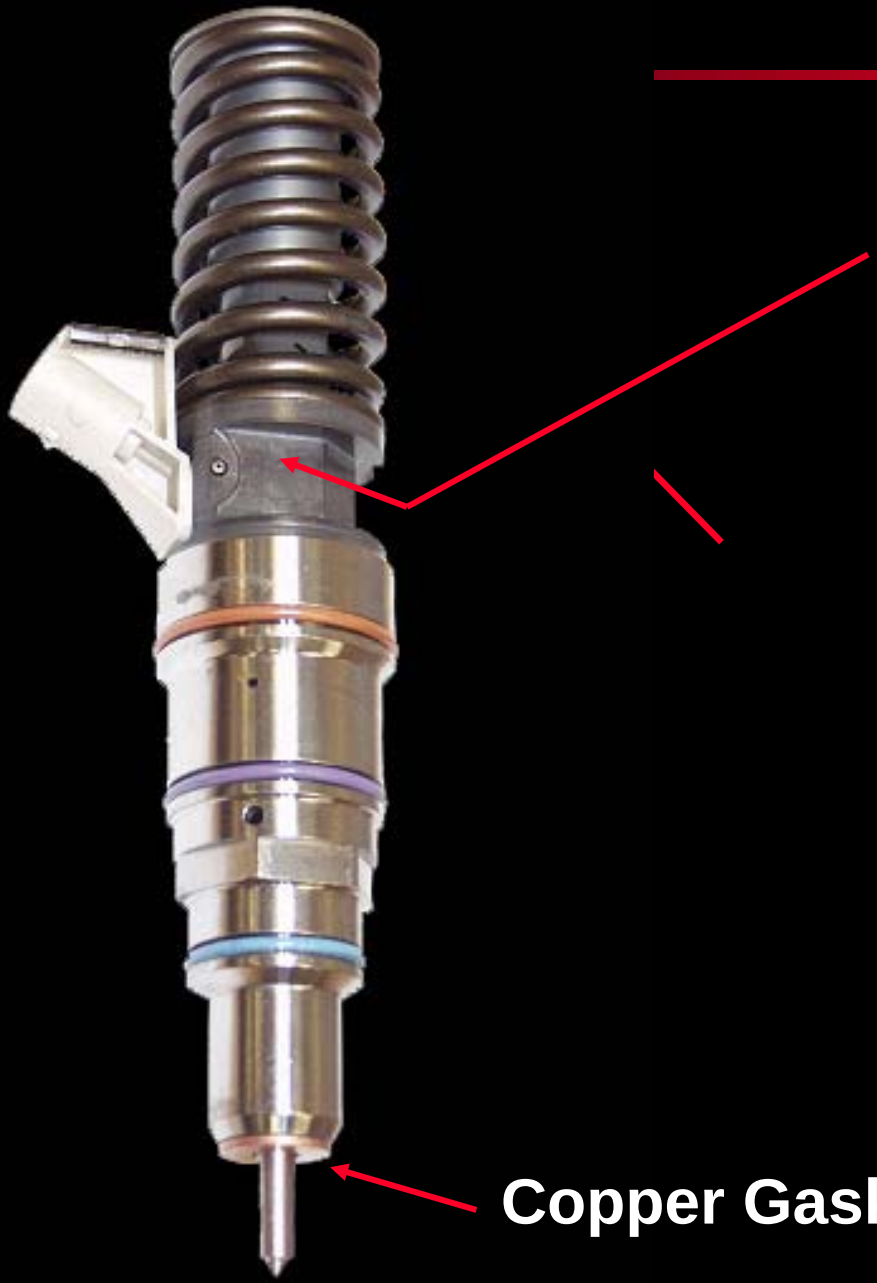
Distributor Reprogramming Kit

Schematic Diagram DDEC V



Bosch N-3 Fuel Injector

Bosch N3



- Removal Force Applied to this Surface Only !

Insert pry bar

Copper Gasket

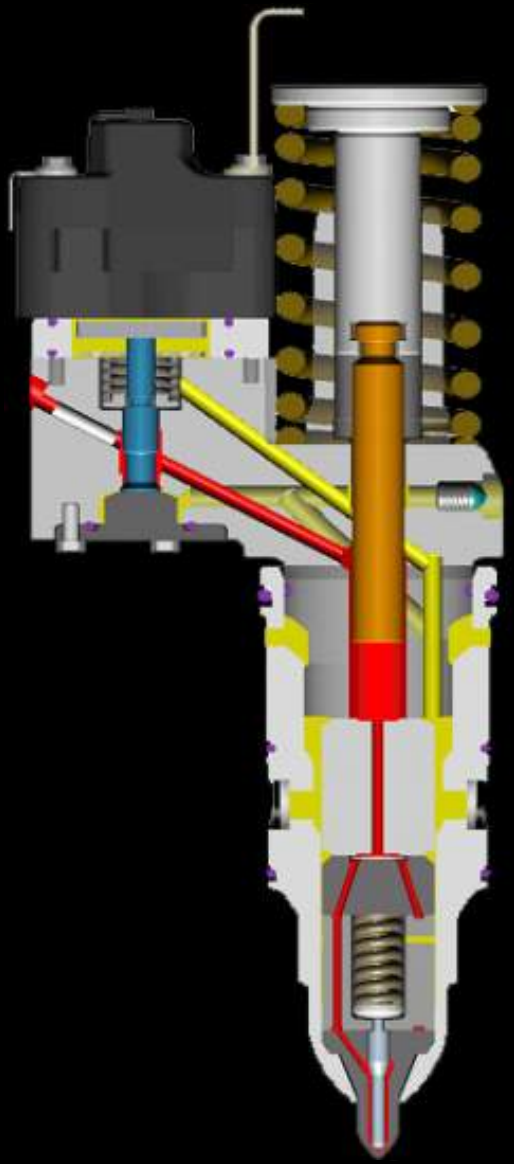
Bosch N3

- **Electronic Fuel Injector**
  - Internal Solenoid
  - Reduced Internal Fuel Volume
  - Utilize Electrical Connector Instead of Ring Terminals
  - Designed to Accept SS Injector Sleeve
- **Benefits**
  - Improved Reliability Due to Higher Design Factor of Safety (1.6)
    - » Less Susceptible to Tip and Body Cracks
  - Crisper Injection Event (Efficiency)

Bosch N-3 Injector

- Improved Response Times .7-.9ms
- Continue to Utilize High Injection Pressure for Optimization of Emissions and Efficiency Tradeoffs
  - 2200 bar Peak Injection Pressure

N3 Advantages over S60 N2

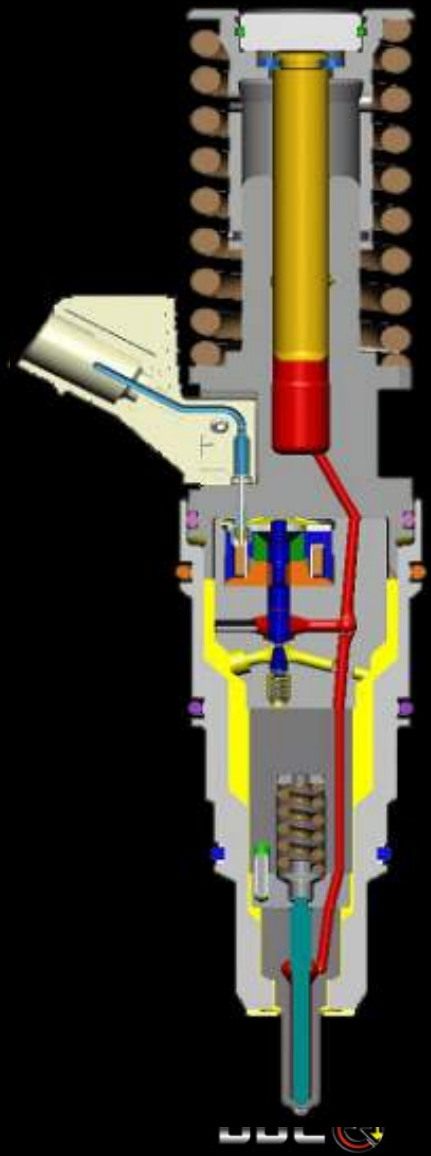


Reliability

- 40% Improved Strength
- Reduced External Leakage Potential
- Improved Nut Design

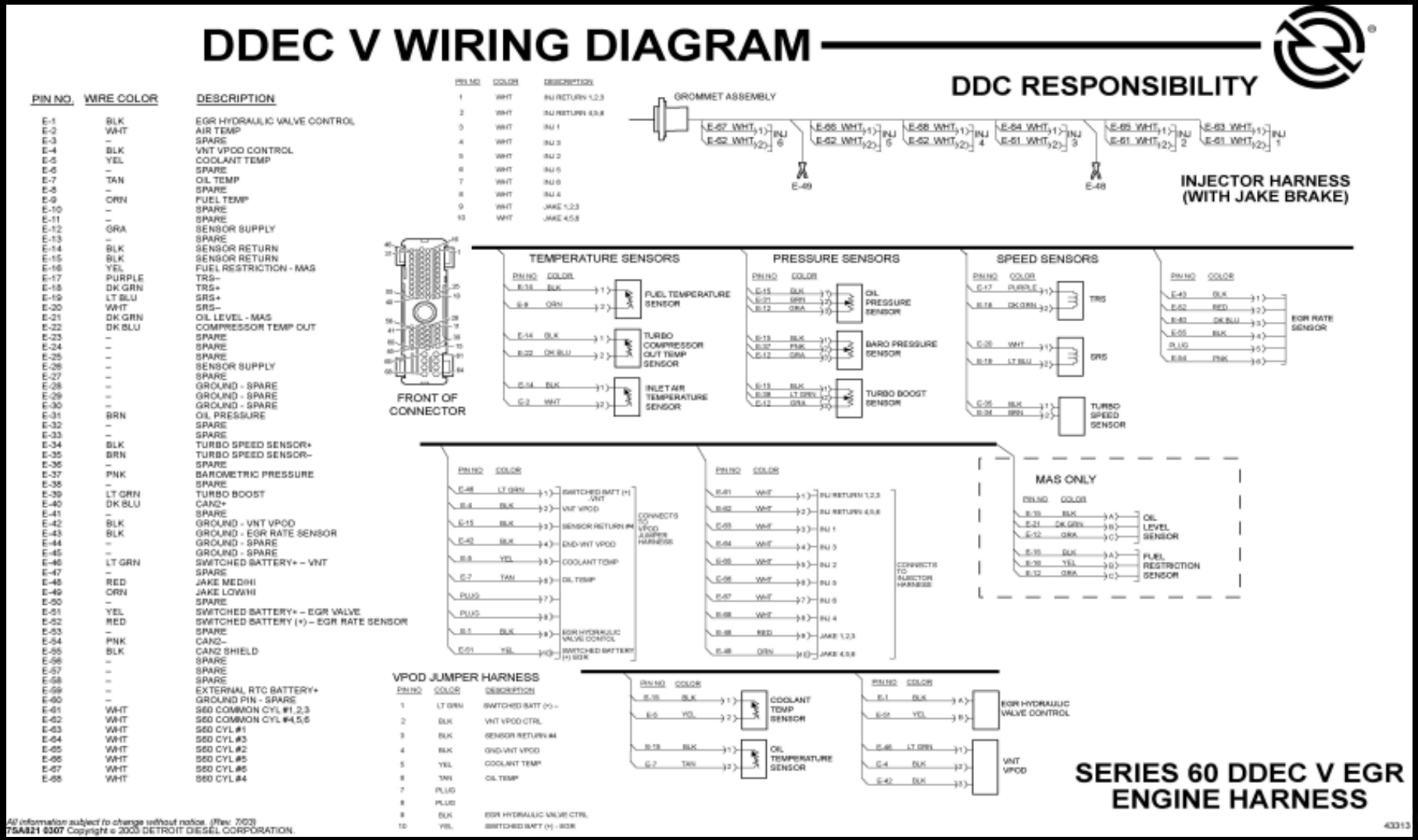
Performance

- Reduced Trapped Volume
- Faster Response Time
- Improved End of Injection Behavior
- Reduced Weight (~15 lb. per engine)



DDEC V
Sensor Wiring

DDEC V *ESH* Schematic



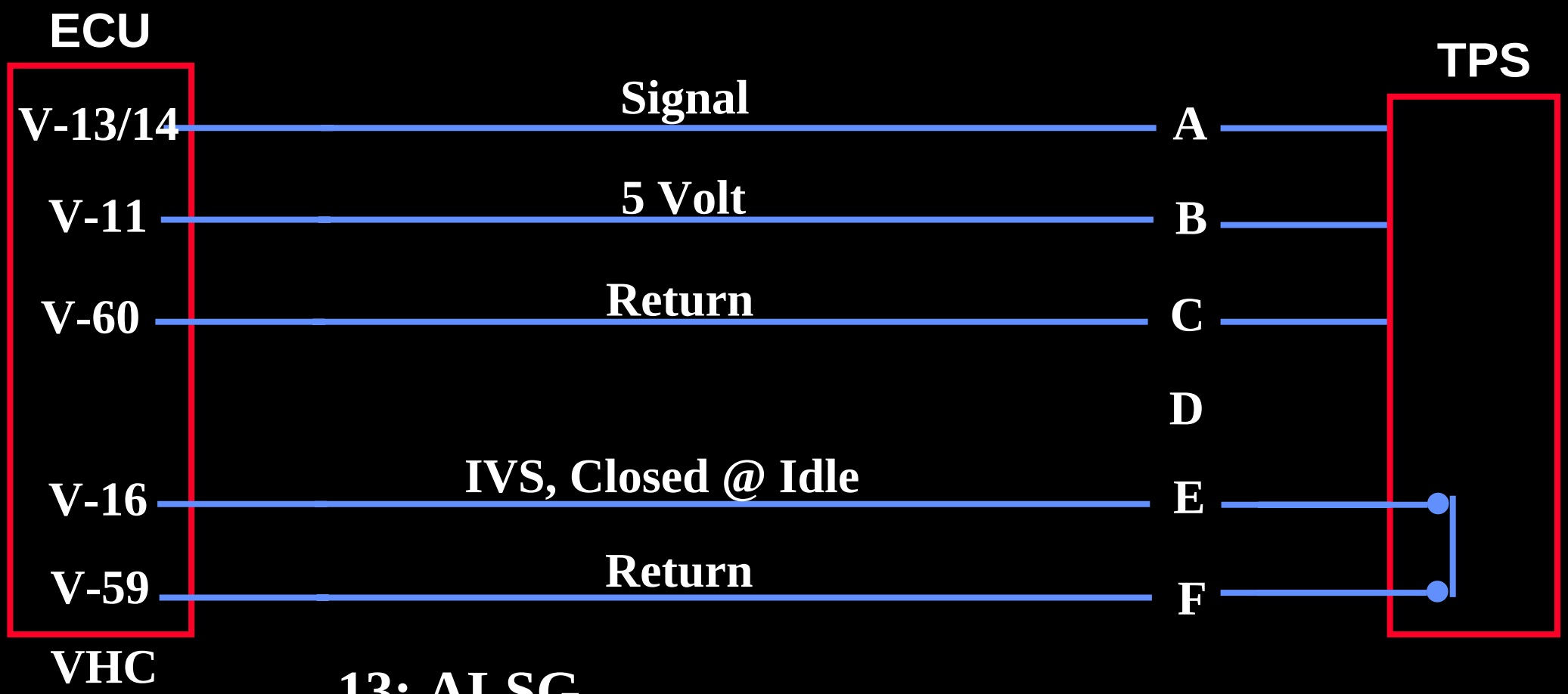
PIN NO.	WIRE COLOR	DESCRIPTION
E-1	BLK	EGR HYDRAULIC VALVE CONTROL
E-2	WHT	AIR TEMP
E-3	–	SPARE
E-4	BLK	VNT VPOD CONTROL
E-5	YEL	COOLANT TEMP
E-6	–	SPARE
E-7	TAN	OIL TEMP
E-8	–	SPARE
E-9	ORN	FUEL TEMP
E-10	–	SPARE
E-11	–	SPARE
E-12	GRA	SENSOR SUPPLY
E-13	–	SPARE
E-14	BLK	SENSOR RETURN
E-15	BLK	SENSOR RETURN
E-16	YEL	FUEL RESTRICTION - MAS
E-17	PURPLE	TRS–
E-18	DK GRN	TRS+
E-19	LT BLU	SRS+
E-20	WHT	SRS–
E-21	DK GRN	OIL LEVEL - MAS
E-22	DK BLU	COMPRESSOR TEMP OUT
E-23	–	SPARE
E-24	–	SPARE
E-25	–	SPARE
E-26	–	SENSOR SUPPLY
E-27	–	SPARE
E-28	–	GROUND - SPARE
E-29	–	GROUND - SPARE
E-30	–	GROUND - SPARE
E-31	BRN	OIL PRESSURE
E-32	–	SPARE
E-33	–	SPARE
E-34	BLK	TURBO SPEED SENSOR+
E-35	BRN	TURBO SPEED SENSOR–
E-36	–	SPARE
E-37	PNK	BAROMETRIC PRESSURE
E-38	–	SPARE
E-39	LT GRN	TURBO BOOST
E-40	DK BLU	CAN2+
E-41	–	SPARE
E-42	BLK	GROUND - VNT VPOD
E-43	BLK	GROUND - EGR RATE SENSOR
E-44	–	GROUND - SPARE
E-45	–	GROUND - SPARE
E-46	LT GRN	SWITCHED BATTERY+ – VNT
E-47	–	SPARE
E-48	RED	JAKE MED/HI
E-49	ORN	JAKE LOW/HI
E-50	–	SPARE
E-51	YEL	SWITCHED BATTERY+ – EGR VALVE
E-52	RED	SWITCHED BATTERY (+) – EGR RATE SENSOR
E-53	–	SPARE
E-54	PNK	CAN2–
E-55	BLK	CAN2 SHIELD
E-56	–	SPARE
E-57	–	SPARE
E-58	–	SPARE
E-59	–	EXTERNAL RTC BATTERY+
E-60	–	GROUND PIN - SPARE
E-61	WHT	S60 COMMON CYL #1,2,3
E-62	WHT	S60 COMMON CYL #4,5,6
E-63	WHT	S60 CYL #1
E-64	WHT	S60 CYL #3
E-65	WHT	S60 CYL #2
E-66	WHT	S60 CYL #5
E-67	WHT	S60 CYL #6
E-68	WHT	S60 CYL #4

PIN NO	COLOR	DESCRIPTION
1	WHT	INJ RETURN 1,2,3
2	WHT	INJ RETURN 4,5,6
3	WHT	INJ 1
4	WHT	INJ 3
5	WHT	INJ 2
6	WHT	INJ 5
7	WHT	INJ 6
8	WHT	INJ 4
9	WHT	JAKE 1,2,3
10	WHT	JAKE 4,5,6

PIN NO	COLOR	DESCRIPTION
1	LT GRN	SWITCHED BATT (+) –
2	BLK	VNT VPOD CTRL
3	BLK	SENSOR RETURN #4
4	BLK	GND-VNT VPOD
5	YEL	COOLANT TEMP
6	TAN	OIL TEMP
7	PLUG	
8	PLUG	
9	BLK	EGR HYDRAULIC VALVE CTRL
10	YEL	SWITCHED BATT (+) - EGR

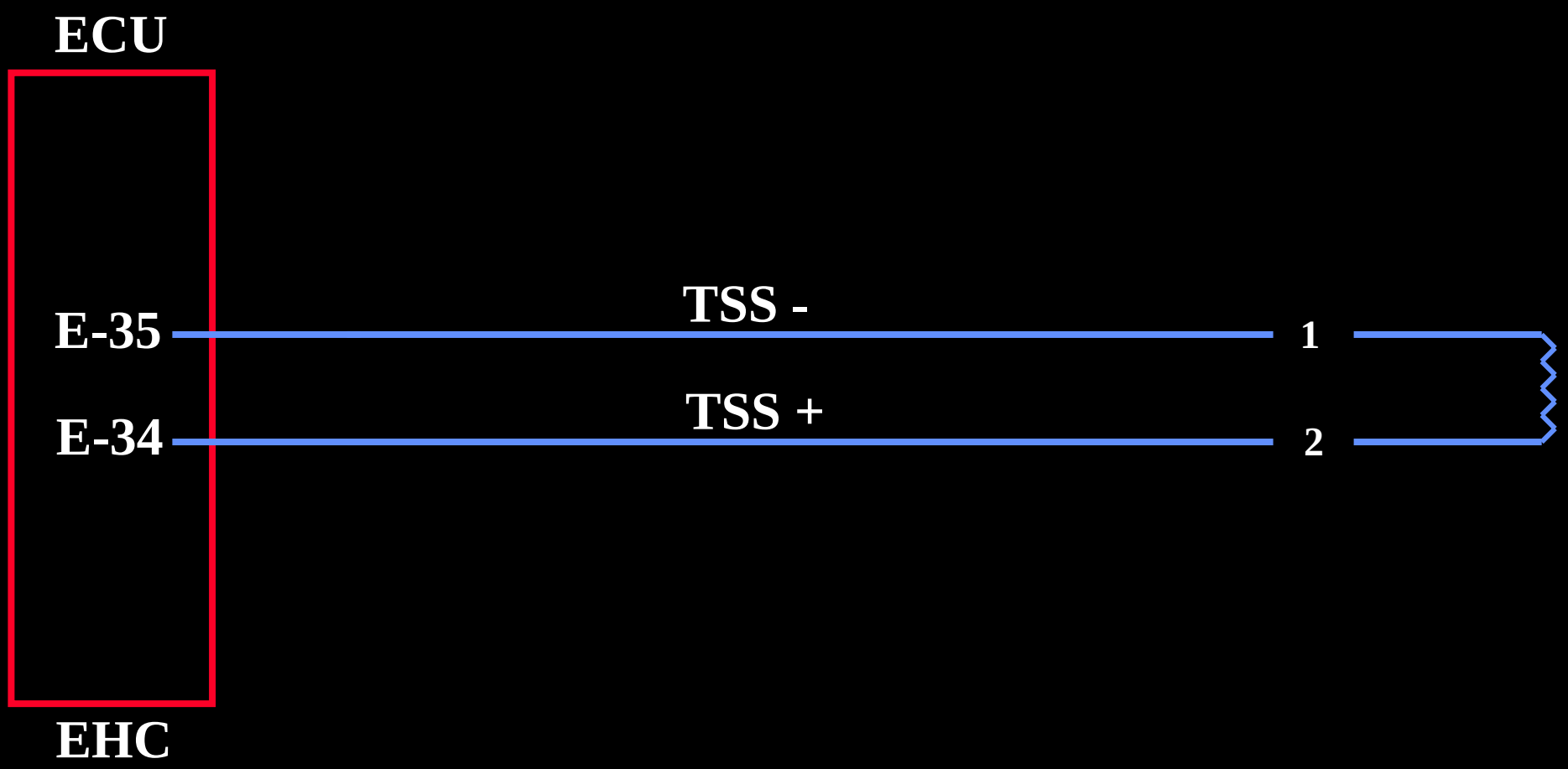
DDEC V TRS/SRS Sensor

DDEC V On-Highway Governors

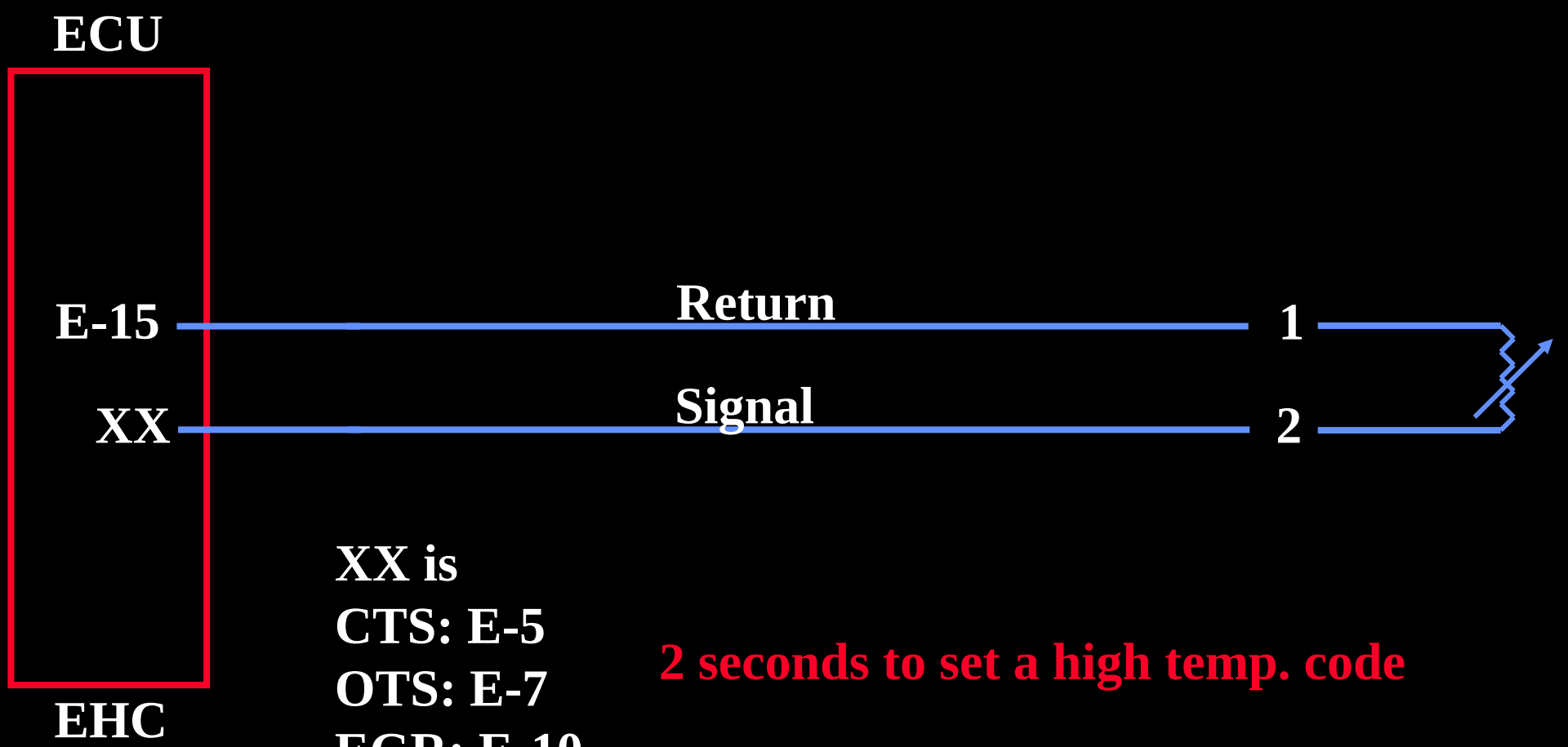


13: ALSG
14: VSG

DDEC V Turbo Speed Sensor



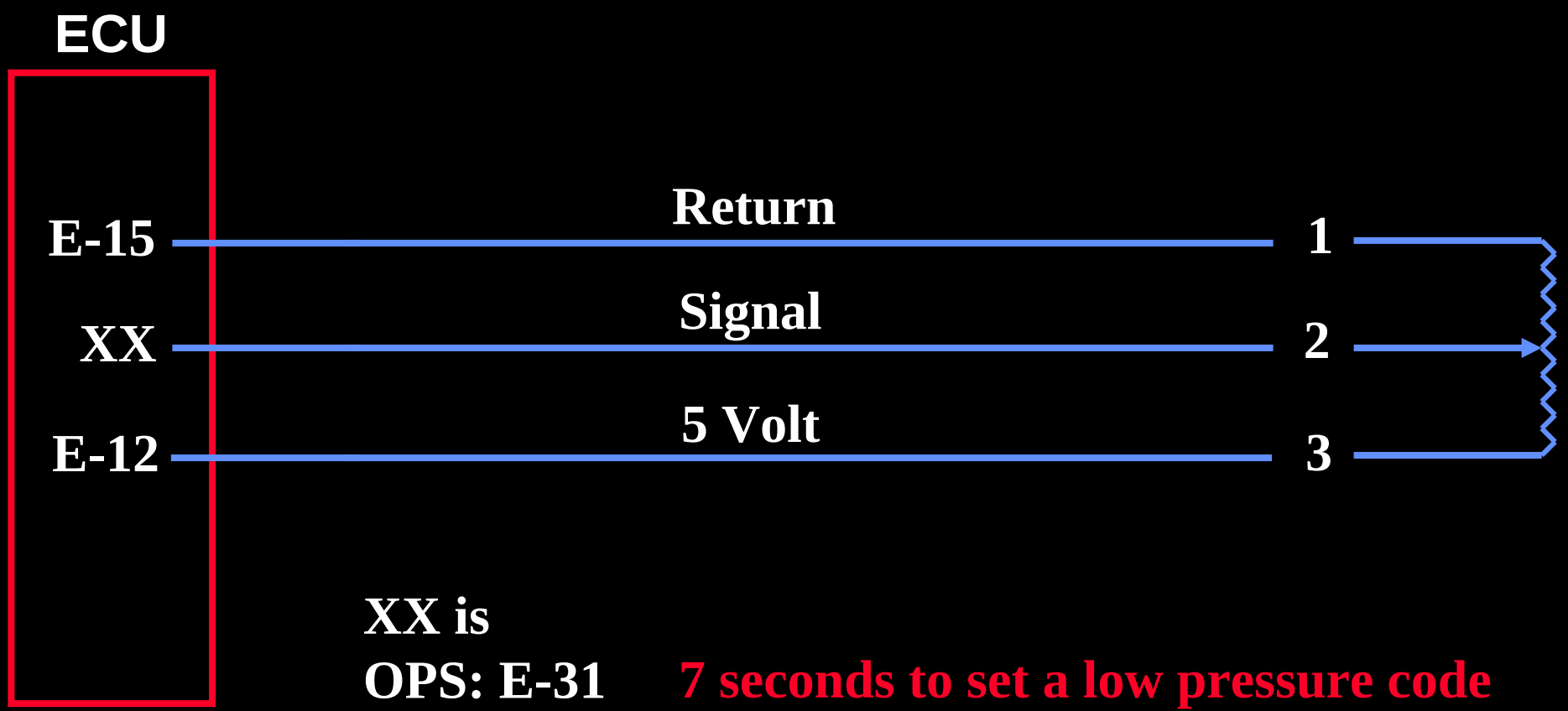
DDEC V Temperature Sensor



XX is
CTS: E-5
OTS: E-7
EGR: E-10

2 seconds to set a high temp. code

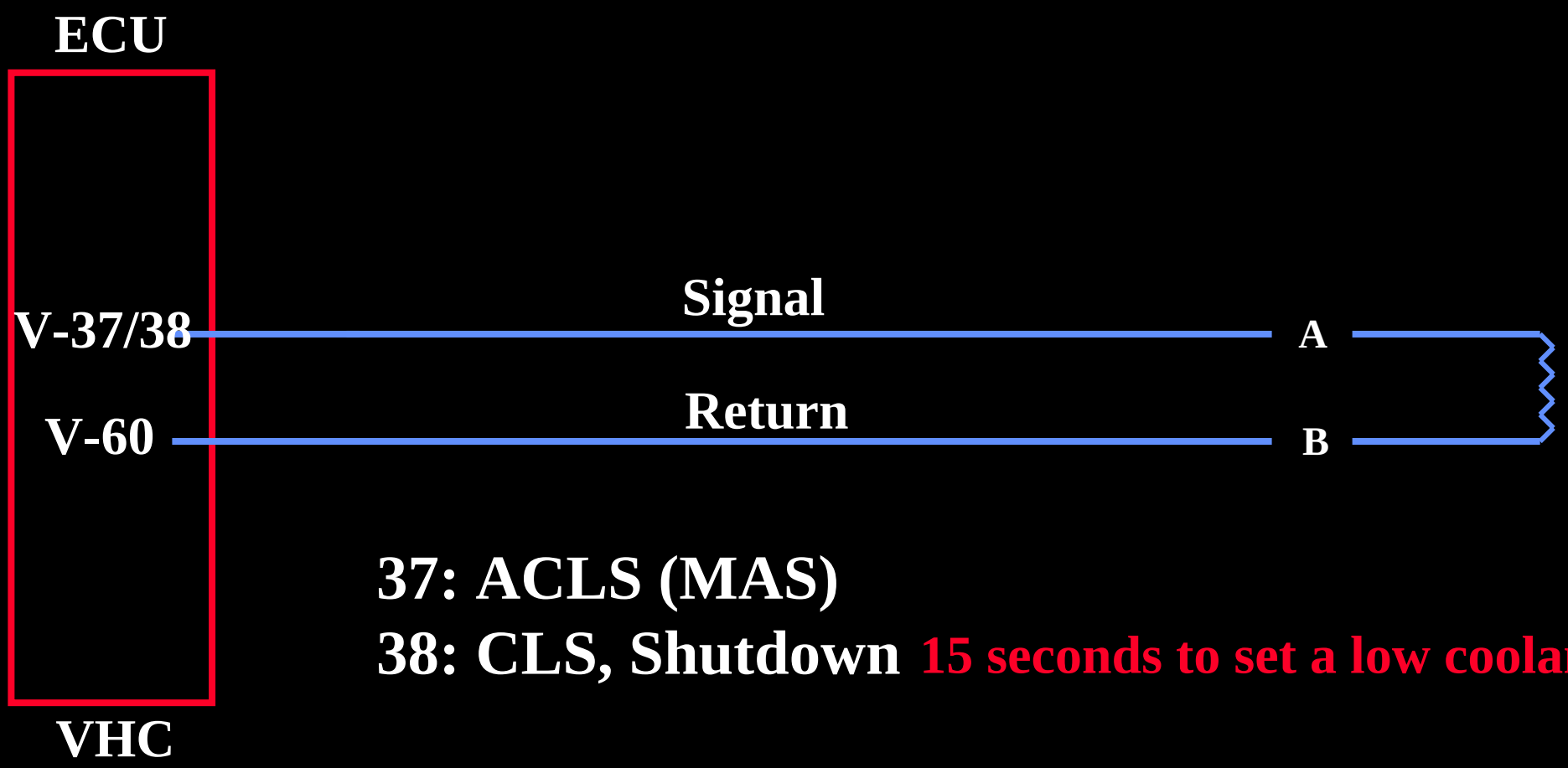
DDEC V Three Wire Engine Sensors



XX is
OPS: E-31
BPS: E-37
TBS: E-39

7 seconds to set a low pressure code

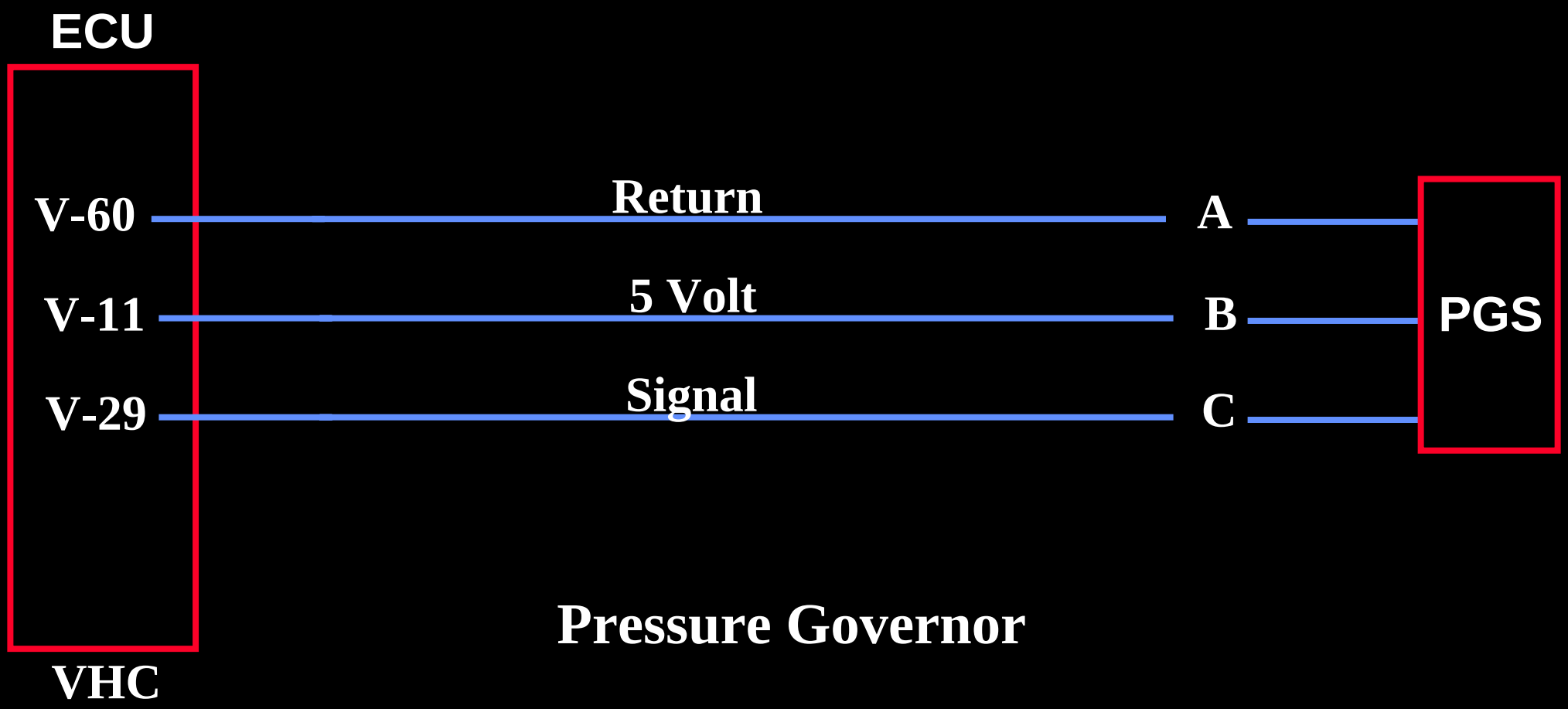
DDEC V Coolant Level Sensors



37: ACLS (MAS)

38: CLS, Shutdown 15 seconds to set a low coolant code

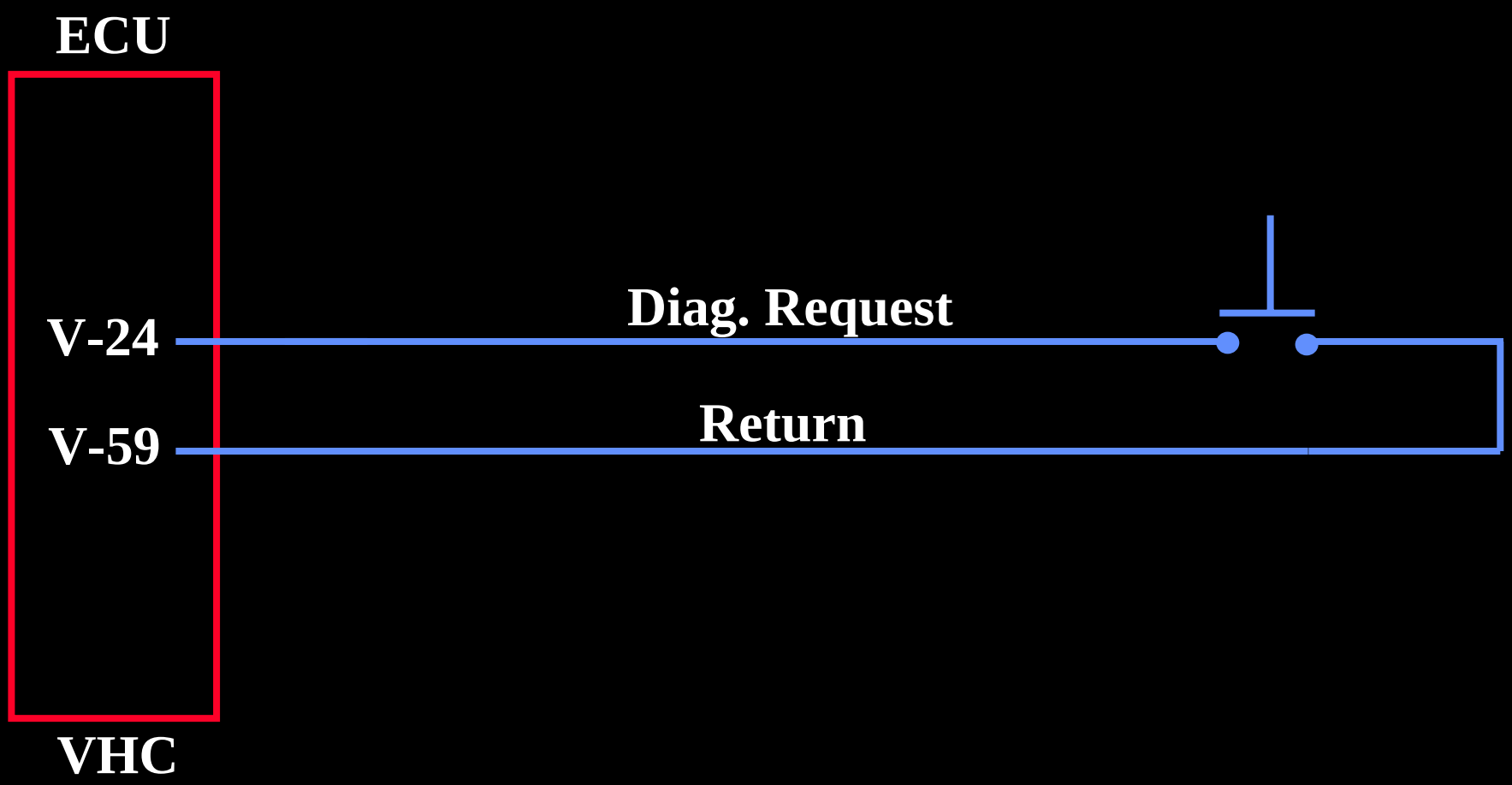
DDEC V Three Wire Vehicle Sensor



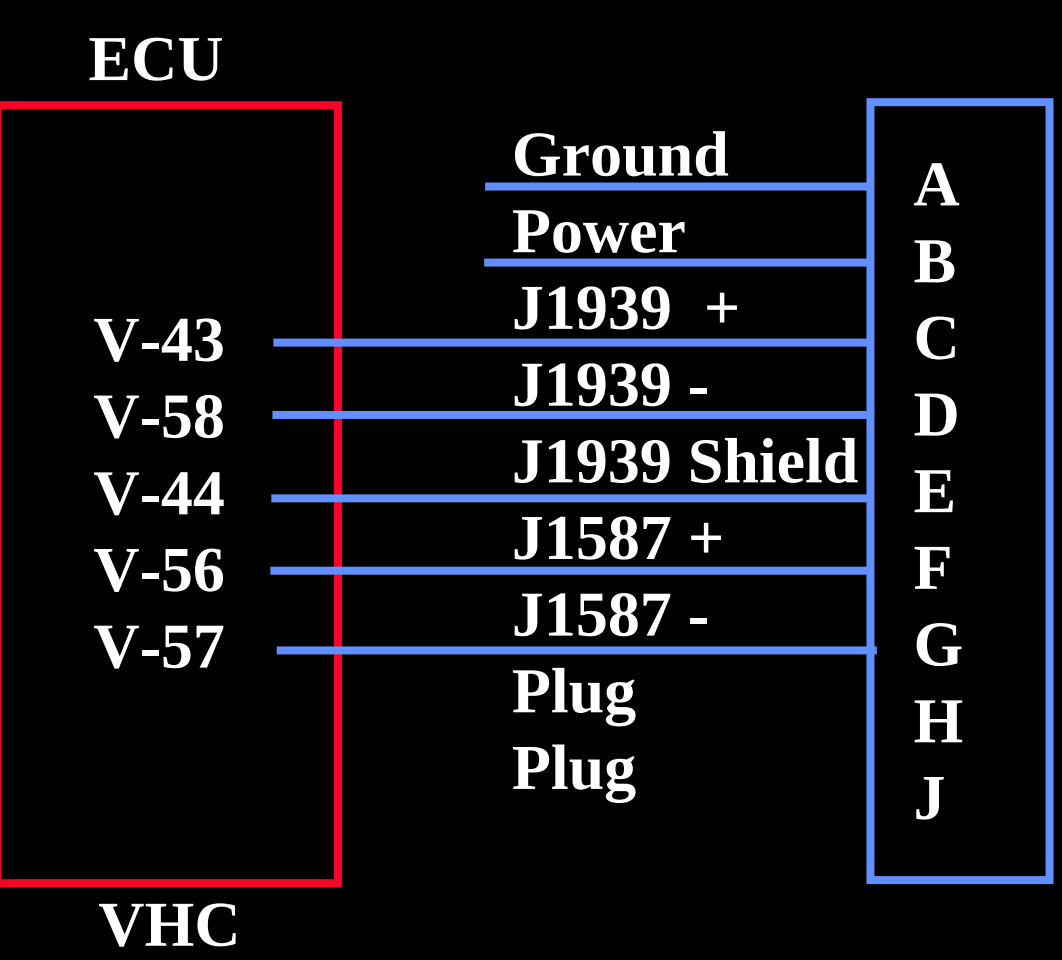
Pressure Governor

Diagnostic Test Mode/Stop Engine Override

DDEC V Switch - DTM/SEO

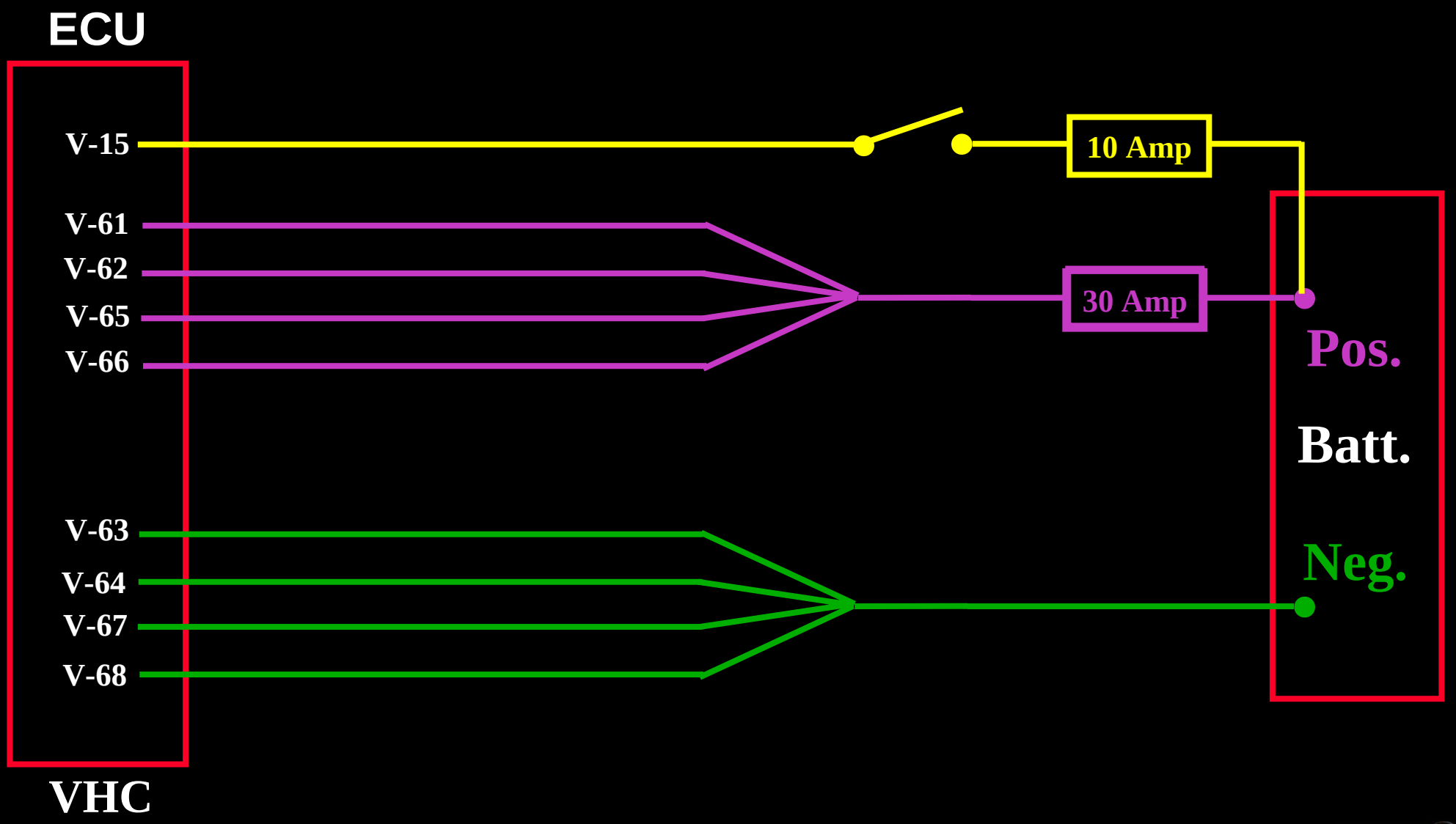


DDEC V Diagnostic Connector

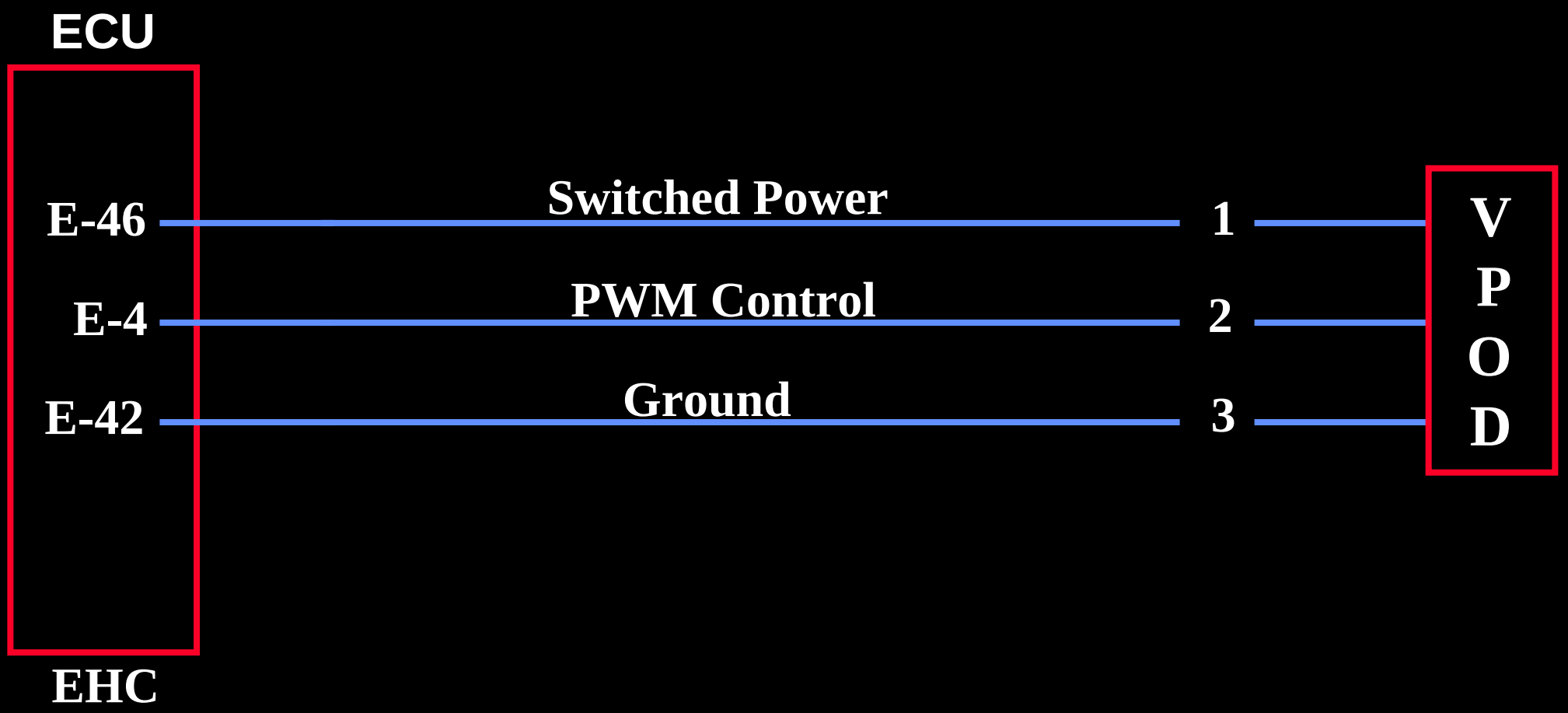


J 1587 & 1939

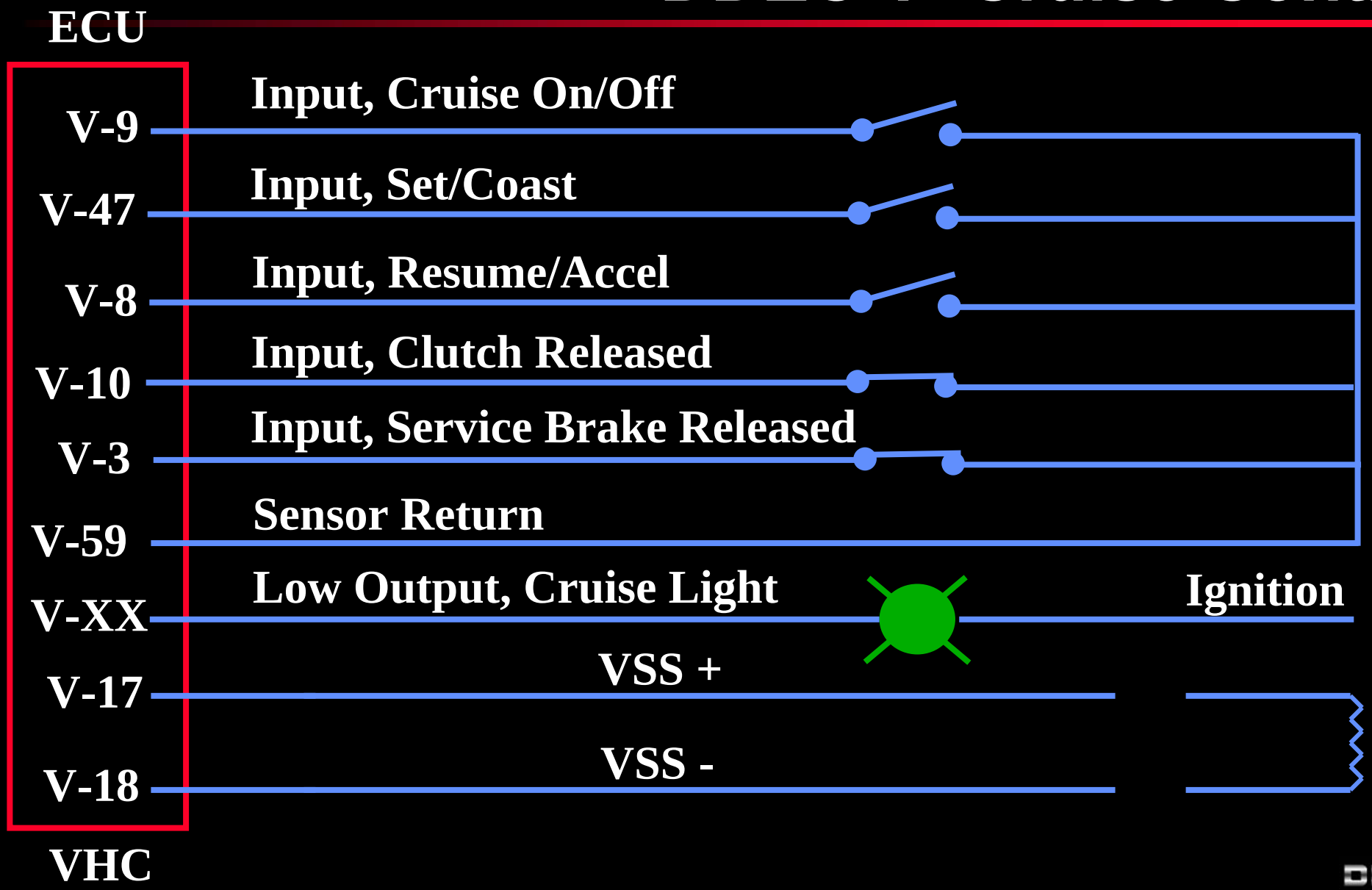
DDEC V Power, Ground, and Ignition



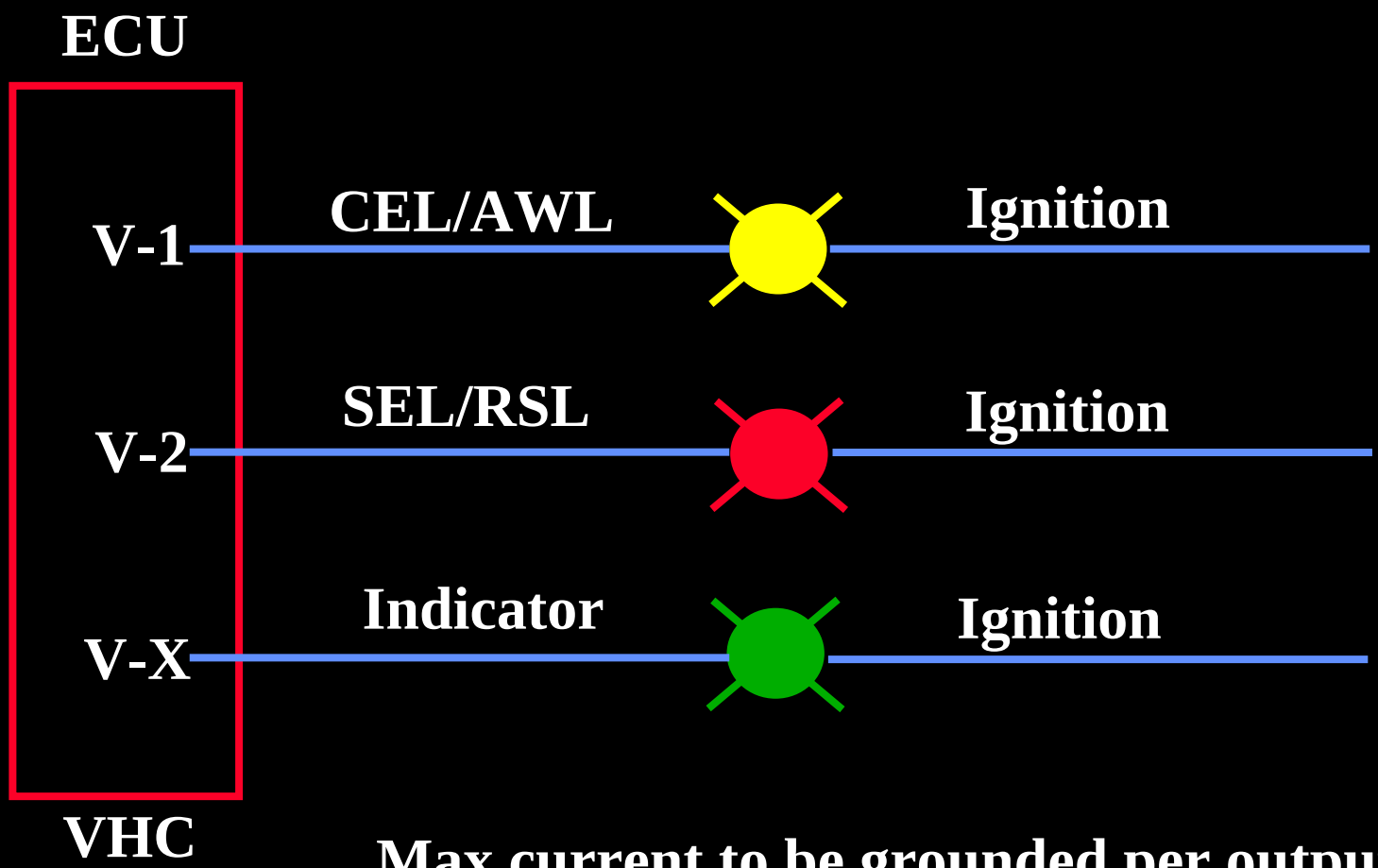
DDEC V VNT VPOD



DDEC V Cruise Control

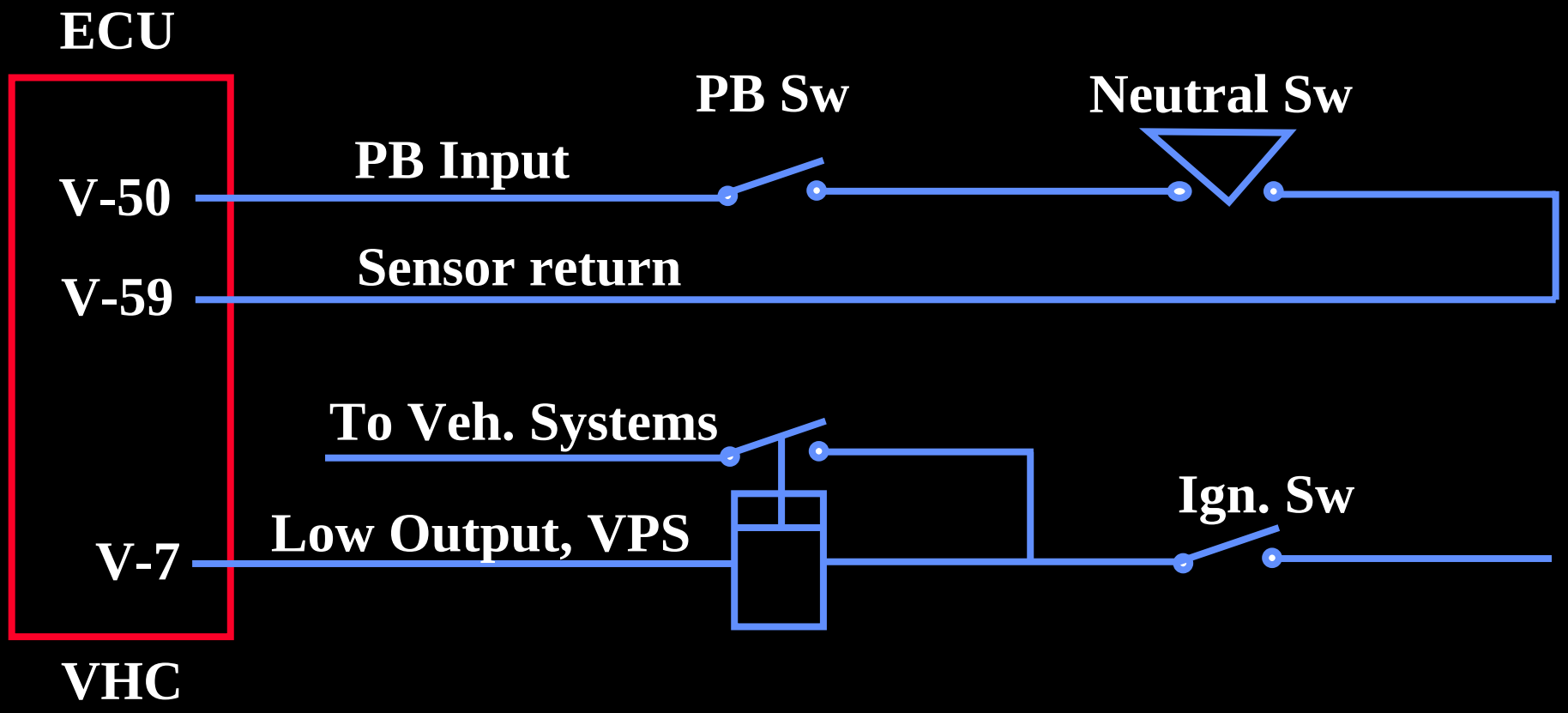


DDEC V Warning Lights

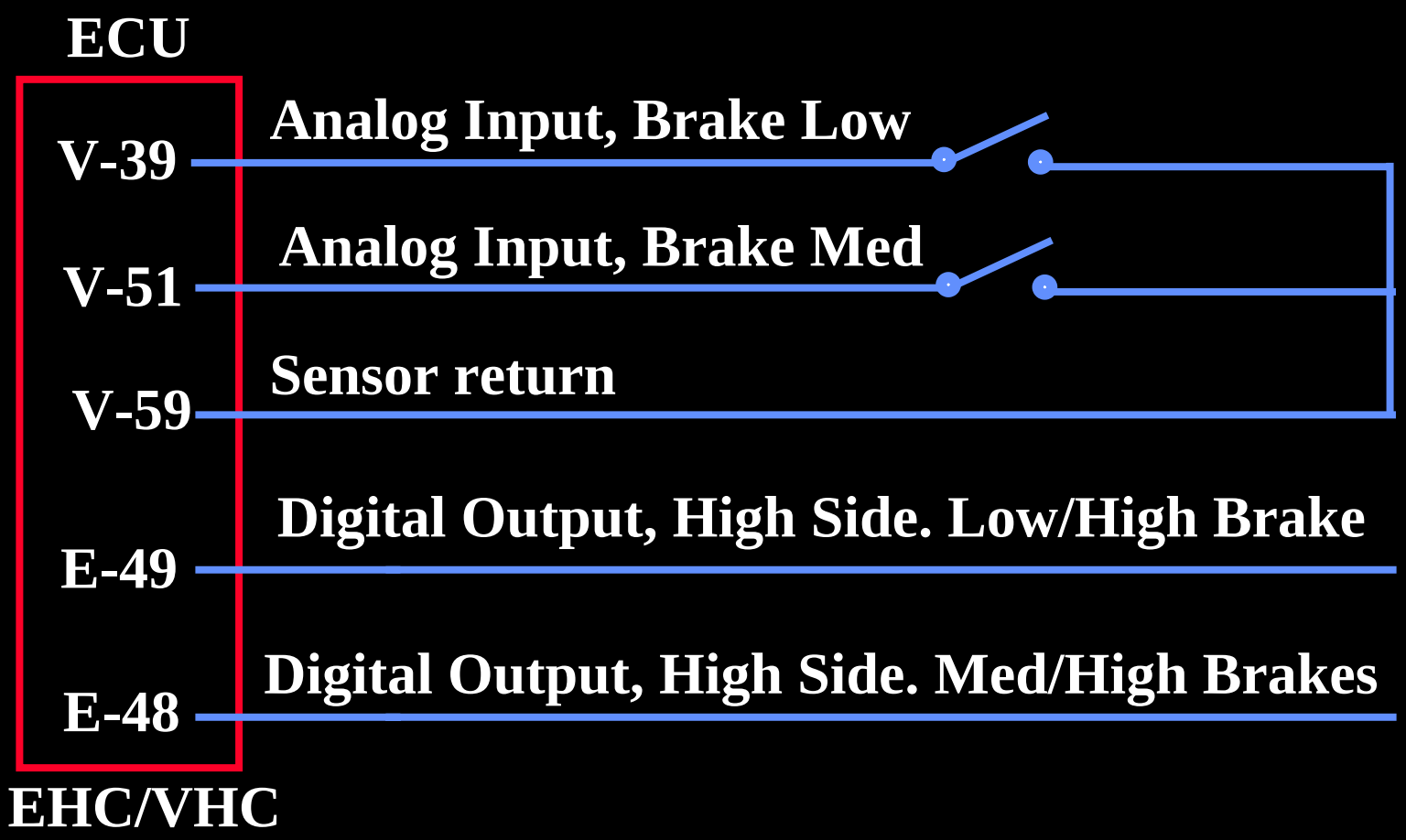


Max current to be grounded per output 2.0 A.
Max total current for all 10 low-side D.O.'s is 10.0 A.

DDEC V ISD and Vehicle Power Shutdown

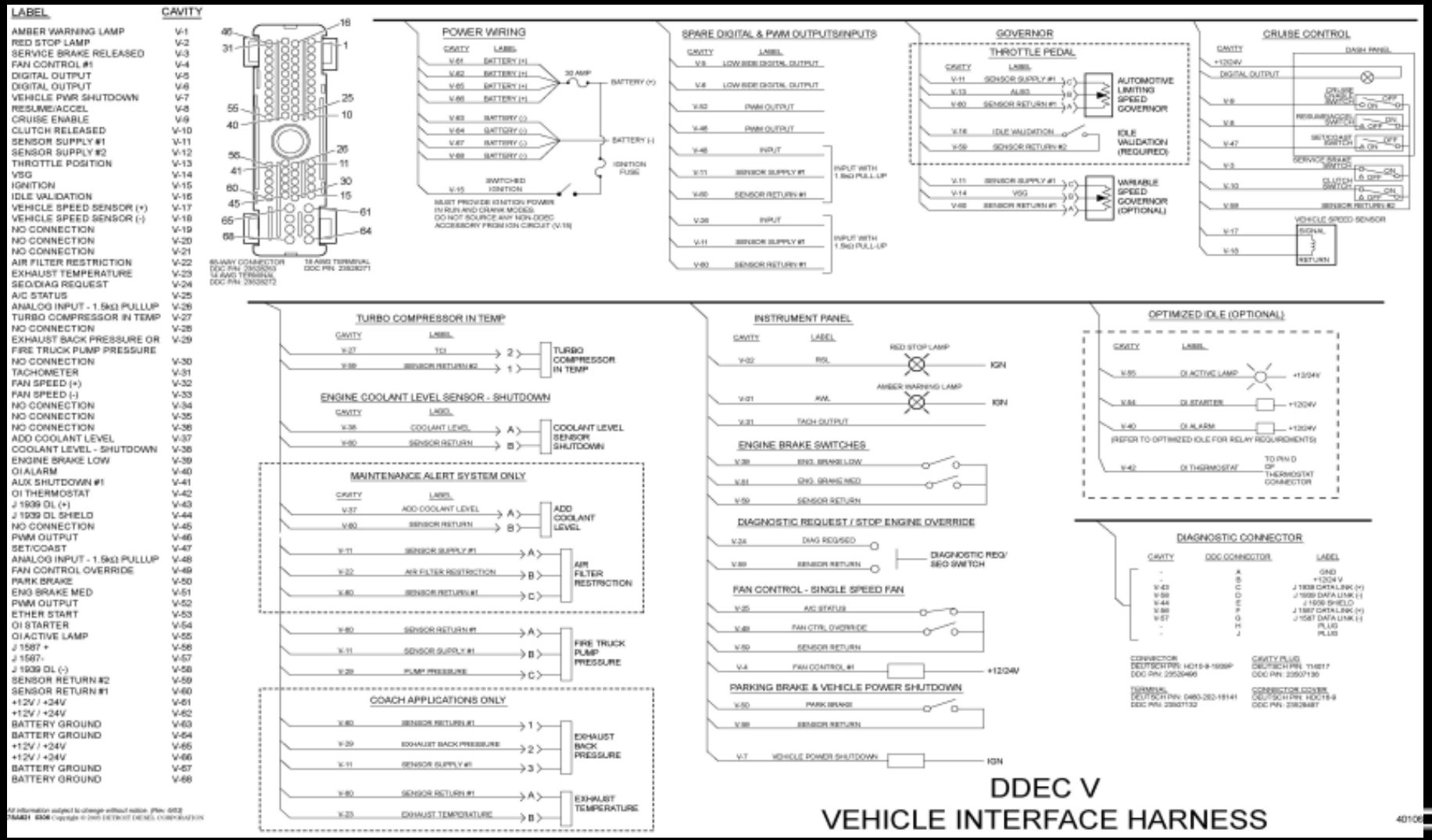


DDEC V Jakes


ECU
V-39
Analog Input, Brake Low
V-51
Analog Input, Brake Med
V-59
Sensor return
E-49
Digital Output, High Side. Low/High Brake
E-48
Digital Output, High Side. Med/High Brakes
EHC/VHC

DDEC V Series 60 Injector Wiring

DDEC V *VIH* Schematic



DDEC V
Service Tools

Service Tools

DDEC V Test ECM

Test Sensors

DDEC V Harness Repair Kit

Summary of Major Benefits

- Improved Component Reliability
  - EGR Cooler
  - Injector
  - Overhead
  - EGR Valve
- Reduced Ring/Liner Wear and Oil Soot Loading
- Eliminated Compressor Surge at Altitude
- Enhanced Technology With DDEC V
- Reduced Engine Weight
- Potential for Fuel Economy Improvements From 2003 Depending on Current Driveline Gearing

We Define Performance