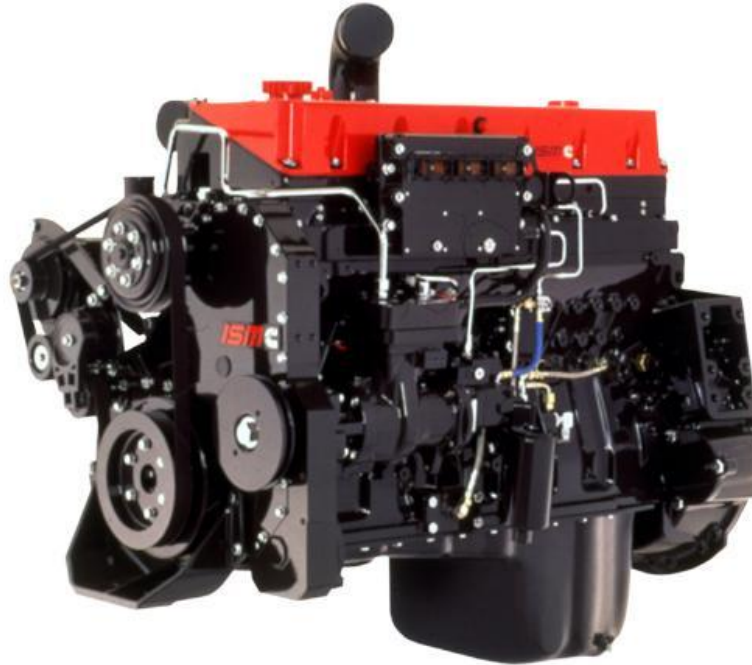


Cummins Engine Company LTD



Daventry Service Training Centre



• Introduction

- Instructor Introduction
 - ISM/CM 570 Course Defined
 - Course times
 - 09.00 - 12.00
 - 13.00 - 17.00
 - No Smoking Policy
 - Mobile Phones **OFF** during course times
-



- **Introduction**

- Lunch Vouchers
 - WC Location
 - Fire Alarms/Exits
 - Safety - (Glasses & Ear Defenders to be worn while engine is running)
 - Message Waiting
 - Registration
-



- **Day I**

- Introduction
 - ISM Engine Overview
 - ISM wiring diagram Overview
 - Component Location & Identification
(On Engine)
 - ISM Engine Written Examination
-



- **Day 2**

- Review of Monday
 - CM 570 Electronic Features & Controls
 - CD ROM Learning
 - **PC Based**
 - **Four CD's**
 - **Incorporating Interim Tests**
 - **Create a student floppy disk (Bookmark & Scores)**
 - **Instructor Assistance Available**
 - **Maximum of 30 Minutes per session at PC**
-



- **Day 3**

- Review of Tuesday
 - **Agenda continued from Tuesday**
 - CM 570 Electronic Features & Controls
 - Complete CD Rom Learning
 - **Insite v 5.2 Practice (Important)**
 - **Simulator Mode**
 - **Review New Features & Parameters**
 - **Maximum of 30 Minutes per session at PC**
-



- **Day 4**

- Review of Wednesday
- JI587/I708 & JI939 Review
- INLINE 1 & 2 Adaptors - Functionality
- Connecting to Engine Harness
- INSITE 5.2 (On Engine) Practice





- **Day 5**

- Review of Thursday
 - INSITE Competency Test (90% Min.Pass Mark)
 - **I Hour per person**
 - **Use of PC and INSITE**
 - Course Summary
 - Evaluation Form
 - Present Certificates
-



■ Aim

- Introduce ISM
 - Build On Existing MII Plus Experience
 - Review CM 570 with New Features & Parameters
 - ISM Benefits vs MII Plus
-



■ Objective

- The ISM engine has built on the success of the MII Plus engine and has both internal and external hardware improvements and a new engine control package.

 - After completing this course, students will be able to demonstrate an understanding of ISM engine components.
-



- What Does '**IS**' stand for?
 - Traditionally engines operated separately from Transmissions, Brake systems etc.
 - The *Interact System* allows other on-board vehicle micro-processors to be electronically connected through the CM 570 ECM.
-



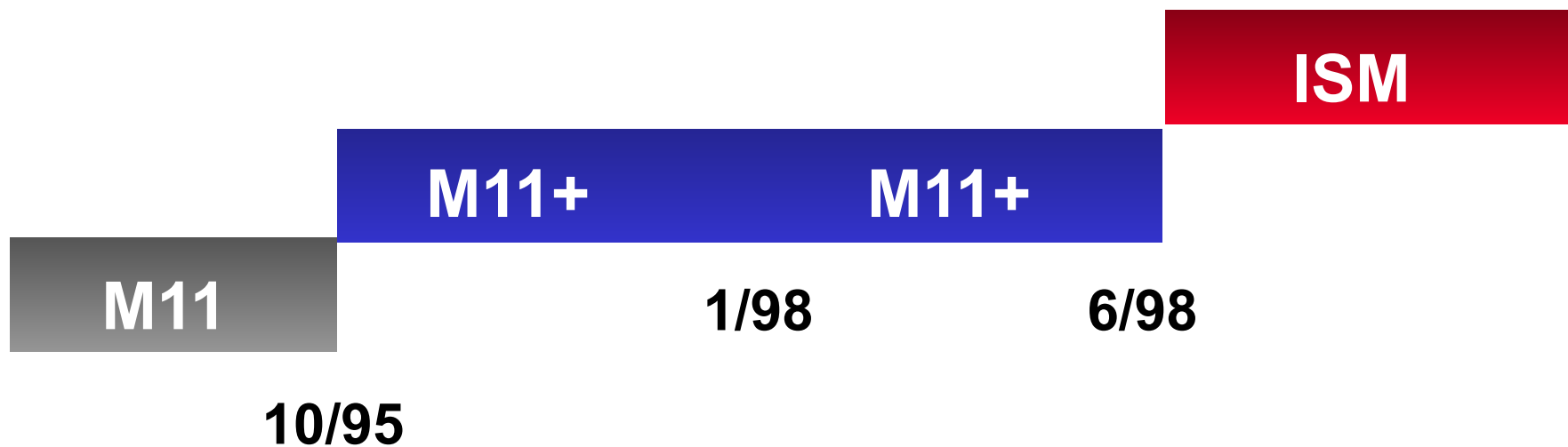
ISM Evolution Strategy

- Original Platform - began in 1982
 - MII launched in 1994
 - Second Major Platform Evolution
 - Answered power/weight/efficiency needs
 - MII Plus refined customer features
 - Competition focused on response to MII
 - A World Class Product
 - Continue to obsolete our own products
-



ISM/CM 570 Controller

ISM Evolution Strategy





■ ***Evolution of the ISM***

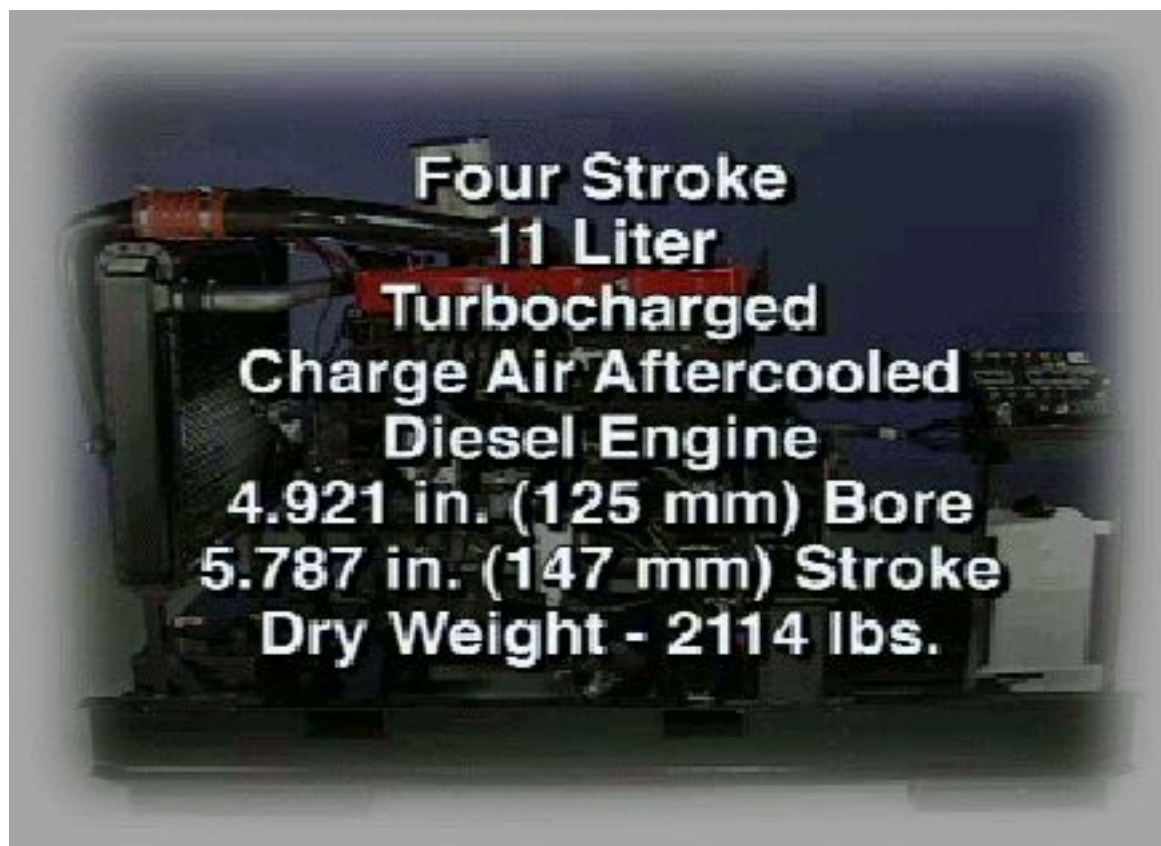
- Hardware improvements (internal and external) over MII
 - All new engine control Module (CM570)
 - Two mount options offered (standard and low)
 - Combination oil pressure/temperature sensor
 - New fuel and lube filters (FS1003 -LF9000)
 - Redesigned filter head
 - New Valve Cover
-



INTERACT™
SYSTEM

ISM/CM 570 Controller

■ ***Specifications***





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ISM

CM 570 ECM



■ ***ECM 570***

Most advanced and capable system available in the market today

- State-of-the art hardware platform
 - Core-based software
 - Accessories, powertrain, vehicle integration
-



■ ***ECM 570***

- Polymoid plastic film board
 - Motorola 68332, 32 Bit processor, 16MHz
 - 128Kb Ram
 - 8Kb EEPROM (Customer Adjustments)
 - 2 x 8Kb Flash memory (Parameter Blocks)
 - 480Kb Program memory
 - 16Kb Flash Ram (Boot Memory)
-



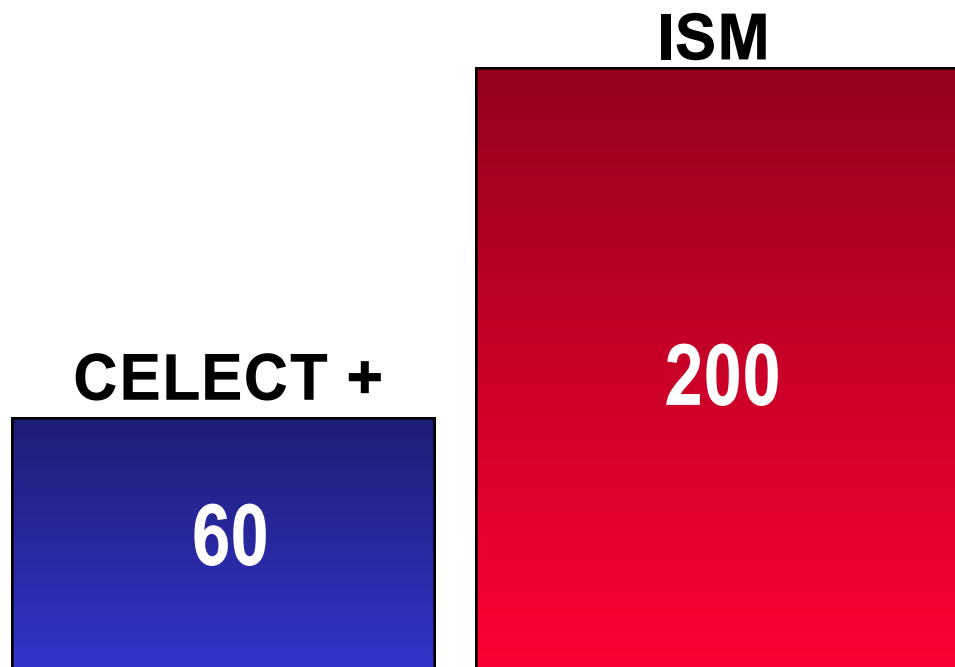
■ **ECM 570**

- 10 x Greater capacity and processing power over Celect Plus ECM C
 - 150 Pins through 3 connectors
 - 70 Base engine features
 - 35 Automotive features
 - 30 Fuel system specific features
 - Uses both J1939 and J1708
 - J1708 for RoadRelay
-



■ ***Programmable Features & Parameters***

- An opportunity
- Enhance customer flexibility
- Improved vehicle integration





■ **ECM 570**

- New Sensor Technology
- Software
- Information Systems
- J1939 Datalink
- Module Design:
 - Thinner
 - Lighter
 - 150 pins vs 84
 - Remains fuel - cooled



CM570

ECM C

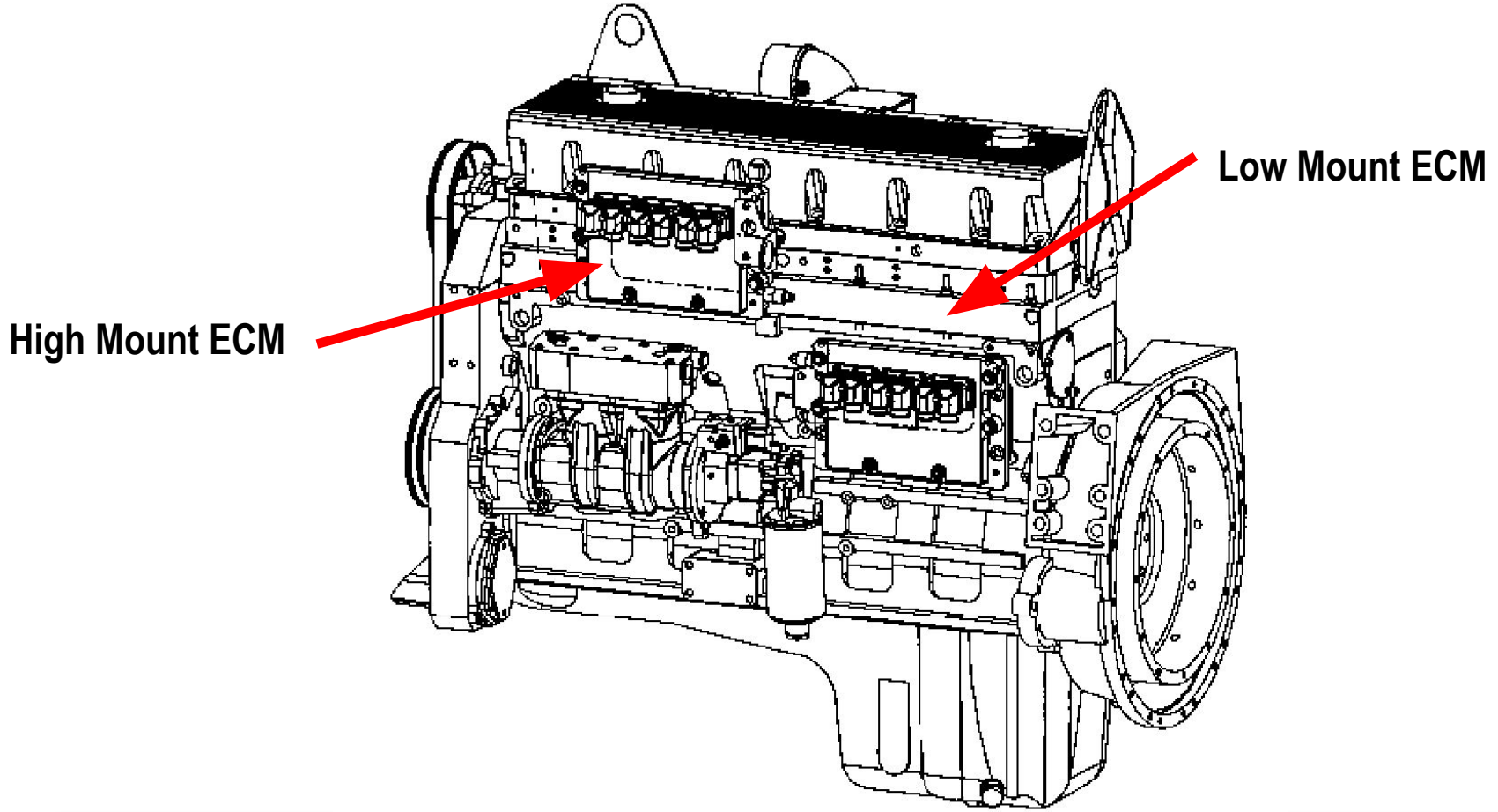


■ ***ECM High Mount***

- Mounts over air compressor at front of engine
 - Improved accessibility for many chassis
 - 3I pin OEM connector located just rearward of the ECM (same OD as 2I pin connector used on MII+)
 - 3I pin connector located directly above ECM for standard mount option
-



■ **ECM Mounting**

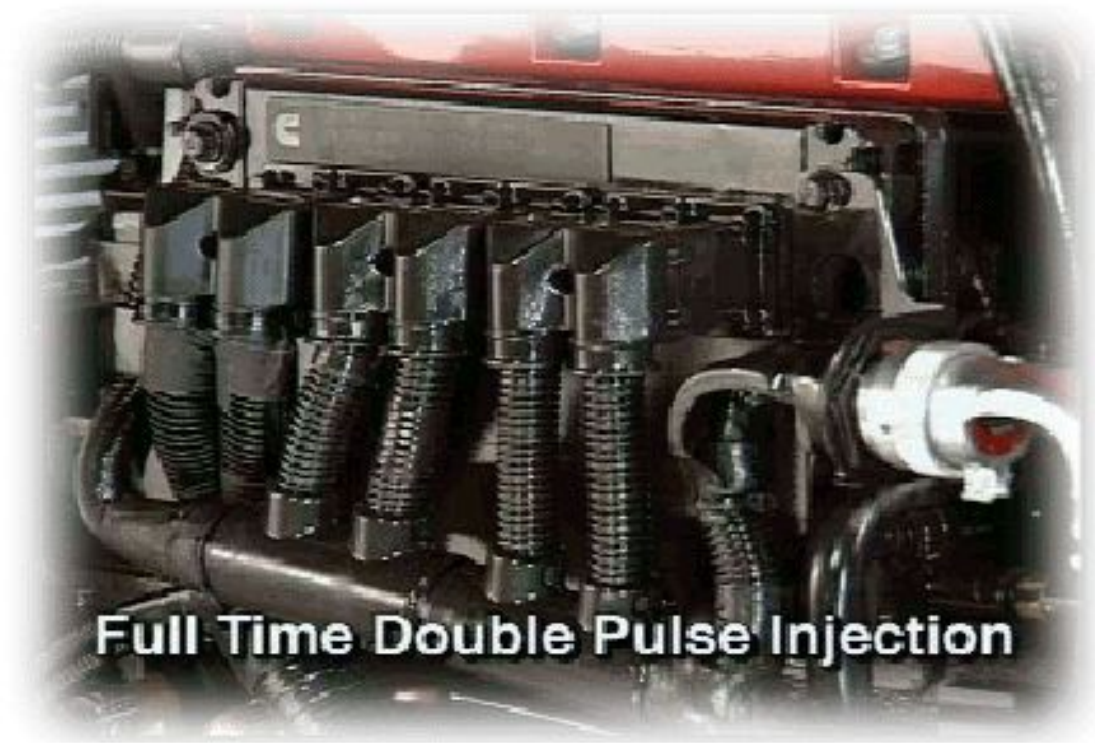




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■ **ECM**



Full Time Double Pulse Injection



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ISM

SENSORS



■ ***Combination Sensor***

- Sealed sensors eliminate water intrusion
 - Improves reliability
- Combined temp and pressure for reduced number of parts
- Improved diagnostics help find faulty sensor the first time
- Improved accuracy for better control :
 - Throttle response
 - Emissions



**Combined
Sensors**

**Current
Sensors**



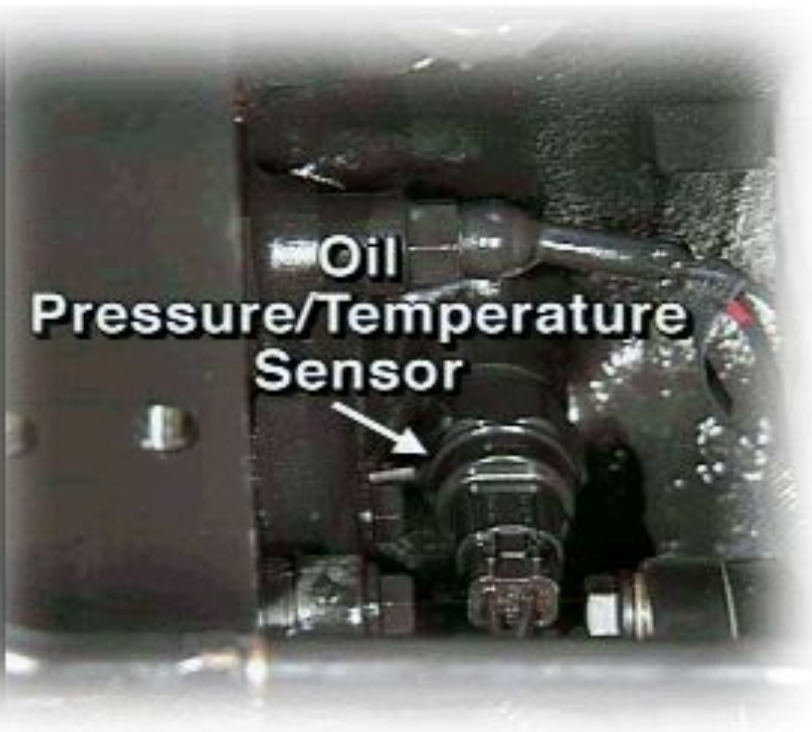
■ ***Combination Sensor***

- Combination oil pressure/Temperature sensor introduced
- Relocated to accessory drive area for improved serviceability





■ ***Sensors***



Installed in main oil rifle

Sensor input signals utilised for engine protection system

Four pin connector

Individual breakout test harness



■ ***Sensors***



Bracket mounted

Located close to rear of fuel pump

**Same sensor location for low and high
mount ECM**

Signal utilised for altitude derate purposes



■ ***Sensors***



Relocated in intake manifold

Sensor input signals utilised for engine protection system

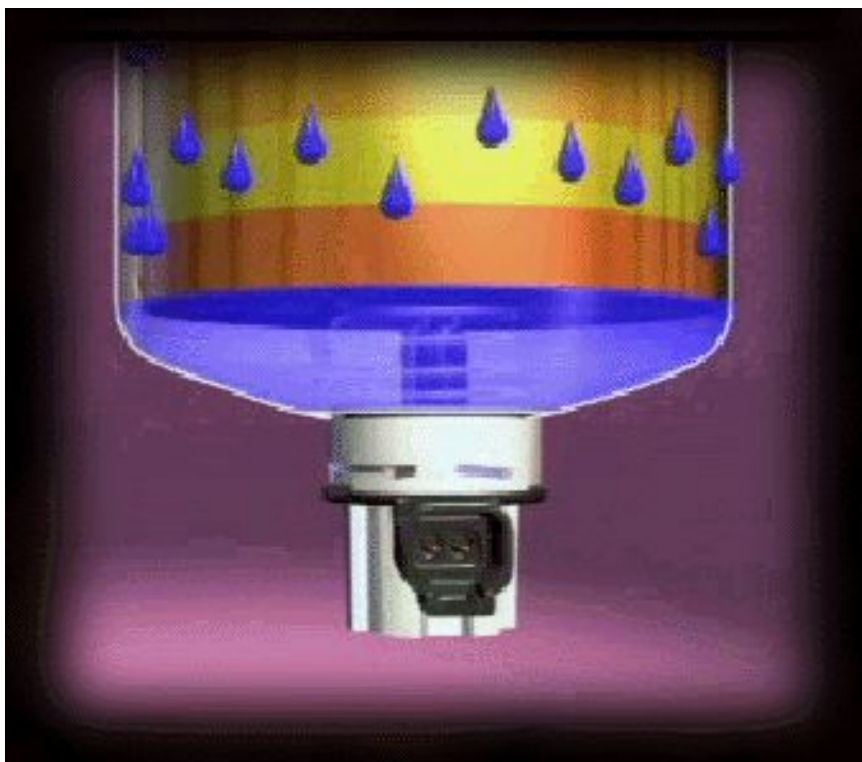
Signal utilised for fuel metering and timing commands



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■ ***Sensors***



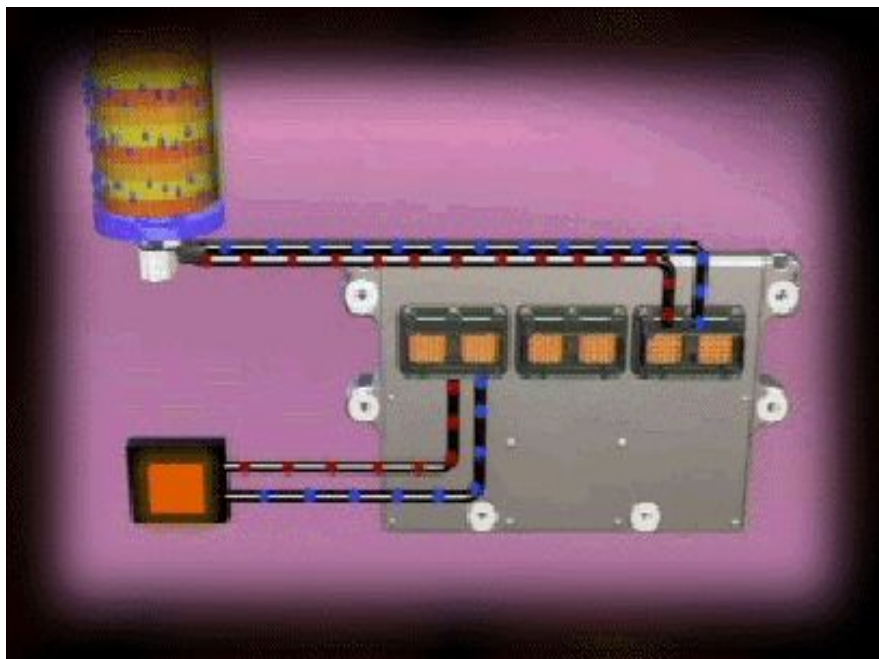
Integral WIF sensor in filter body
Senses water level in base of filter



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■ **Sensors**



WIF sensor provides input signal to ECM

ECM illuminates dash mounted warning light

Real time feedback to operator



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ISM

Oil System



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SYSTEM

ISM/CM 570 Controller

■ **Combination Oil Filter**

- Industry-Leading
- Cummins next generation filtration technology
 - ISM
 - Signature 600
- Longer life Stratapore media capable of extended service

LF9000



LF3000



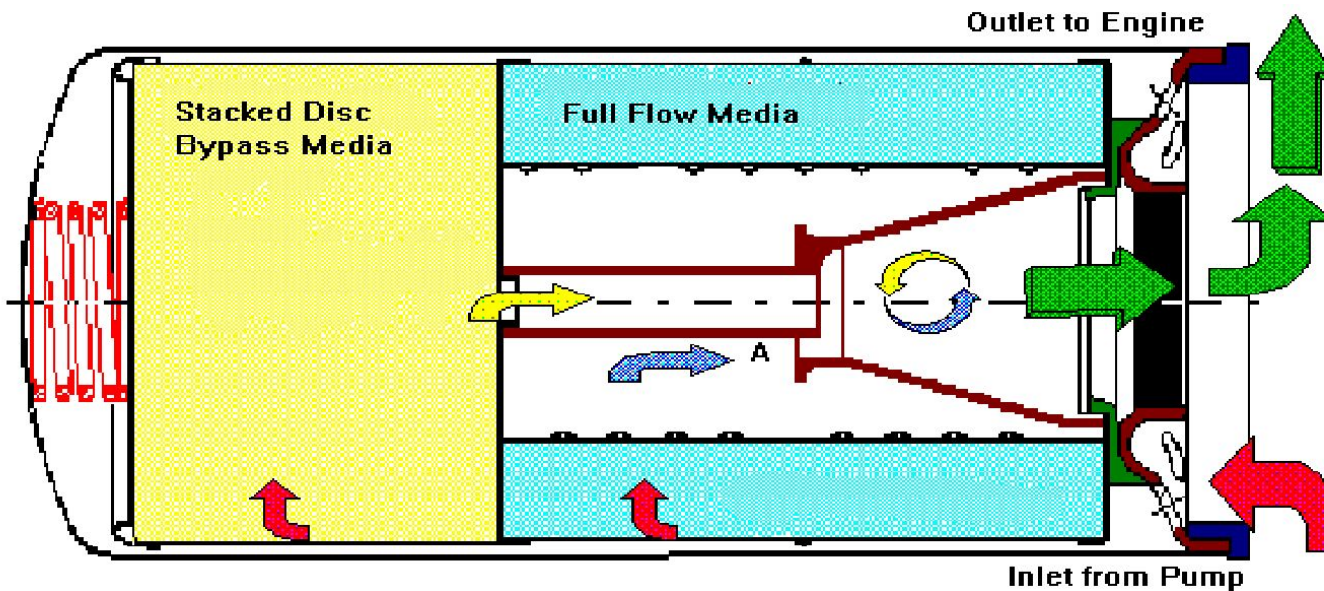
■ ***Venturi Combination Oil Filter***

What does it do??

- Generates flow through the highly efficient/restrictive bypass media.
 - **How does it do it??**
 - The flow through full flow element is restricted by the nozzle throat, forcing more flow through the bypass section.
-

■ **Lubricating Oil Filter**

- Combined full flow and bypass filter
- Extension of oil and filter change intervals





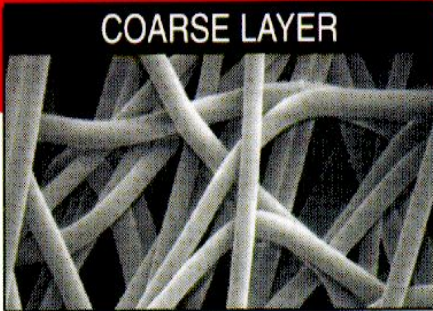
INTERACT™
SYSTEM

ISM/CM 570 Controller

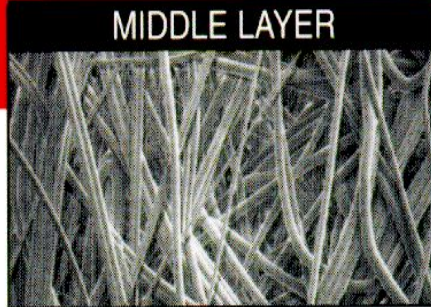
■ **Lubricating Oil Filter - Media**

StrataPore

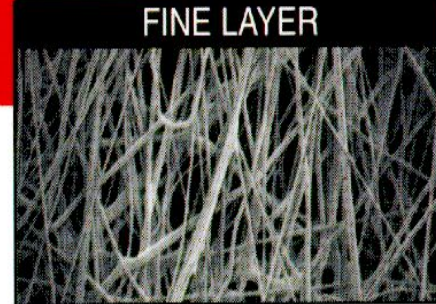
COARSE LAYER



MIDDLE LAYER

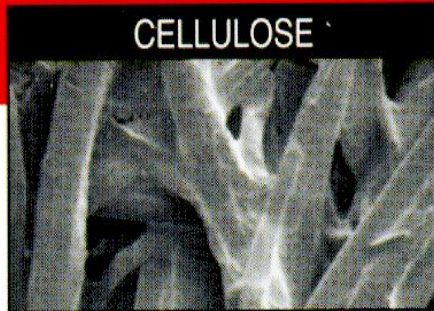


FINE LAYER

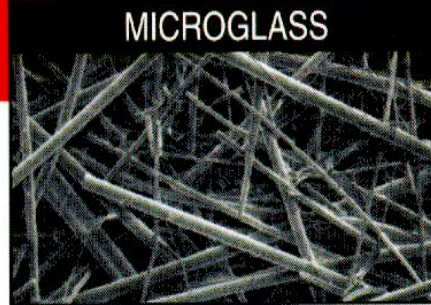


Conventional Technology

CELLULOSE



MICROGLASS





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■ ***Oil Filter***



Stratapore media

Multi layer design

Maximum dirt holding capacity

High efficiency

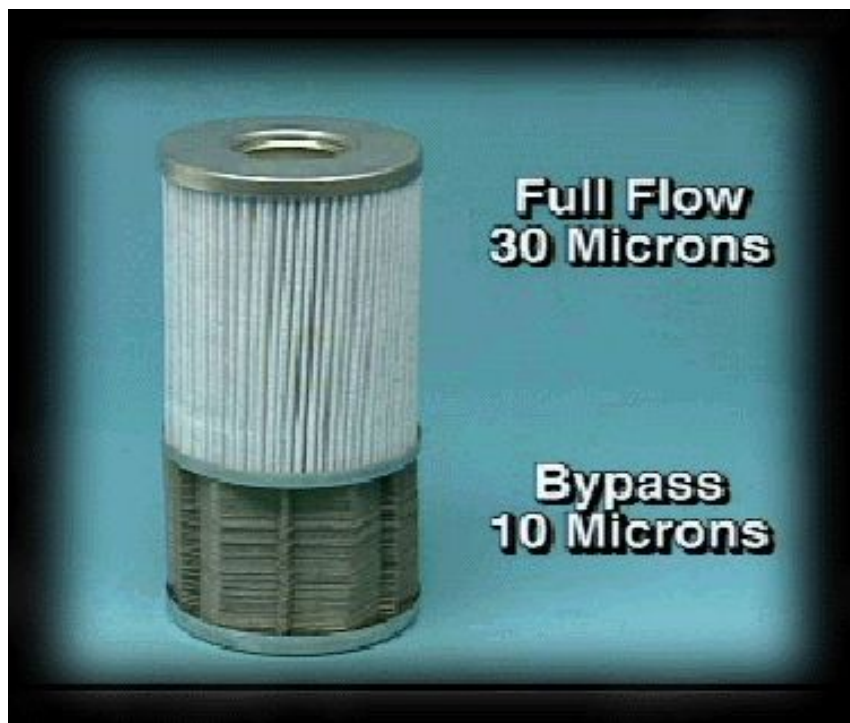
Less restriction to cold oil flow



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■ ***Oil Filter***



Combined filter package

Stratapore media



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■ ***Oil Filter***



By pass return circuit eliminated

Increased by- pass flow compared to LF 3000

More efficient sludge and particle removal

Reduced engine component wear



■ **Oil Filter**



LF 9000 oil filter components



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■ **Oil Filter**



LF 9000 series filters

Two inches longer than MII filter

Not interchangeable with LF 3000

ES System compatible



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ISM

Fuel System



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SYSTEM

ISM/CM 570 Controller

■ ***Fuel System***



Regulated fuel pressure

Positive displacement

**Relatively constant pressure to injectors
from low idle to high idle speeds**



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■ ***Fuel System***



**Excess Fuel Flow Is Returned To
The Inlet Side Of The Fuel Pump**

Reduced parasitic losses

Additional fuel tubing on fuel pump



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■ ***Fuel System***



**Re designed to for increased
fuel flow**

**Larger spray holes compared to MII Plus
injector**

Camshaft Actuated

Integral Control Valve



■ **Fuel System**



- Fleetguard FS 1003 filter**
- Stratapore filter media**
- Specific design for component protection**
- 98.7% efficient**
- Removes particles >10microns**



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■ ***Fuel System***



Internal Suction tube

Central Location

Fuel Drawn from lower Level

Quicker engine starts

Prevents air entry at start up



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ISM

Drive Belt



■ ***Auto Tensioning Belt Option***

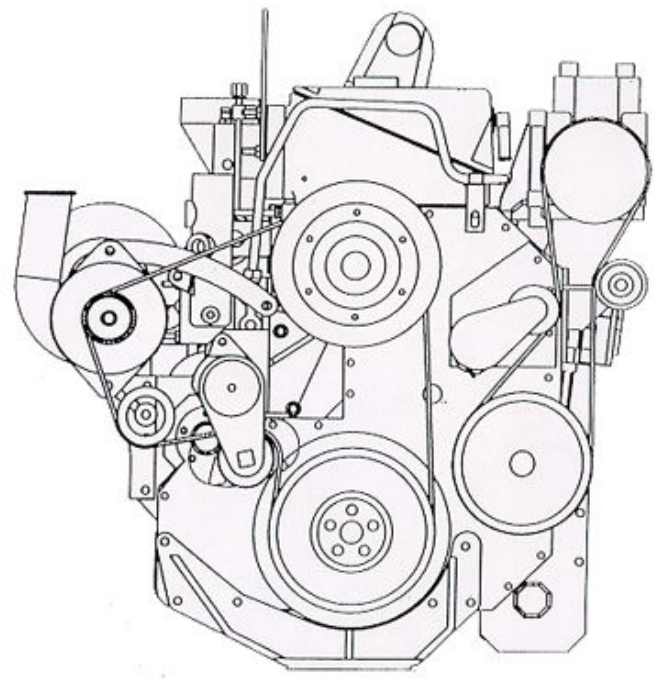
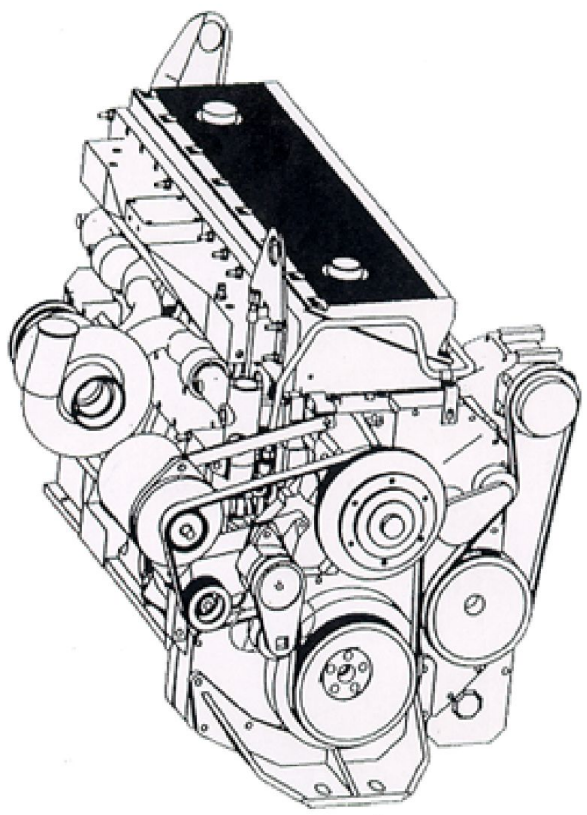
- One belt drives both **fan** and **alternator**
 - Increased power capacity
 - Reduced maintenance
 - Eliminates over-tightening
 - Reduced belt replacement time from 20 minutes to 2 minutes
 - Belt life increased to 250,000 miles. Reduced operation costs.
 - Fewer total parts to drive fan and alternator (II vs. I7)
-



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■ ***Auto Tensioning Belt Option***

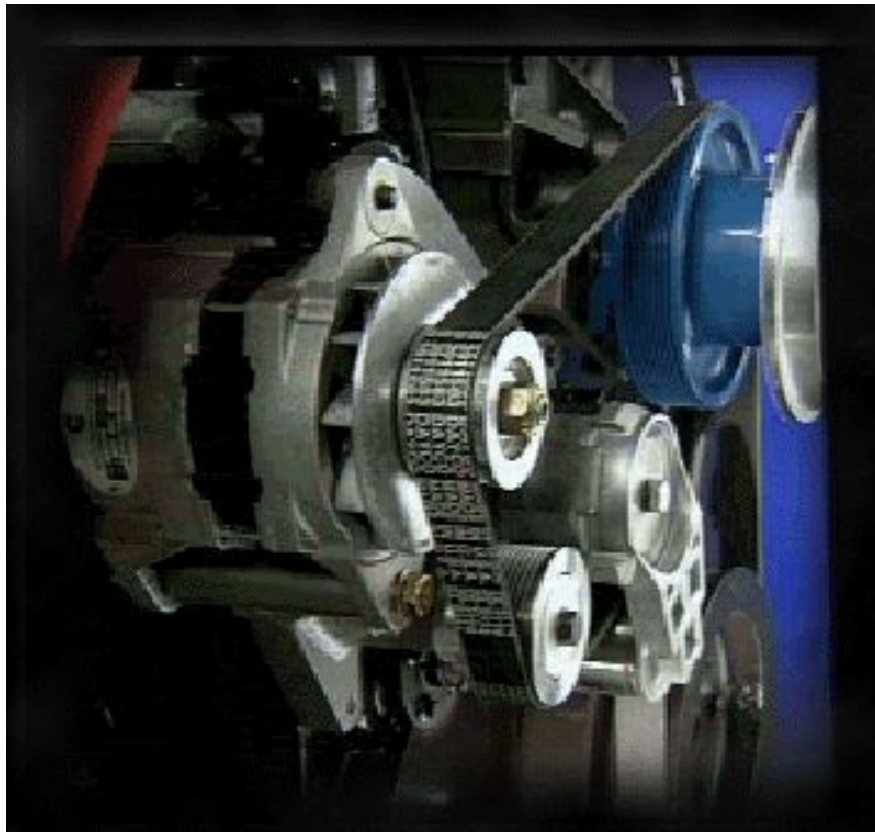




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■ ***Drive Belt***





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Internal/External Components



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■ **Camshaft - Full Time Double Pulse**



Redesigned injector cam lobe combined with the increased processing power of the CM570 ECM allows full time Double-Pulse injection.

Idle speed through to Rated Speed.



■ ***Piston Crown***



Re designed piston bowl

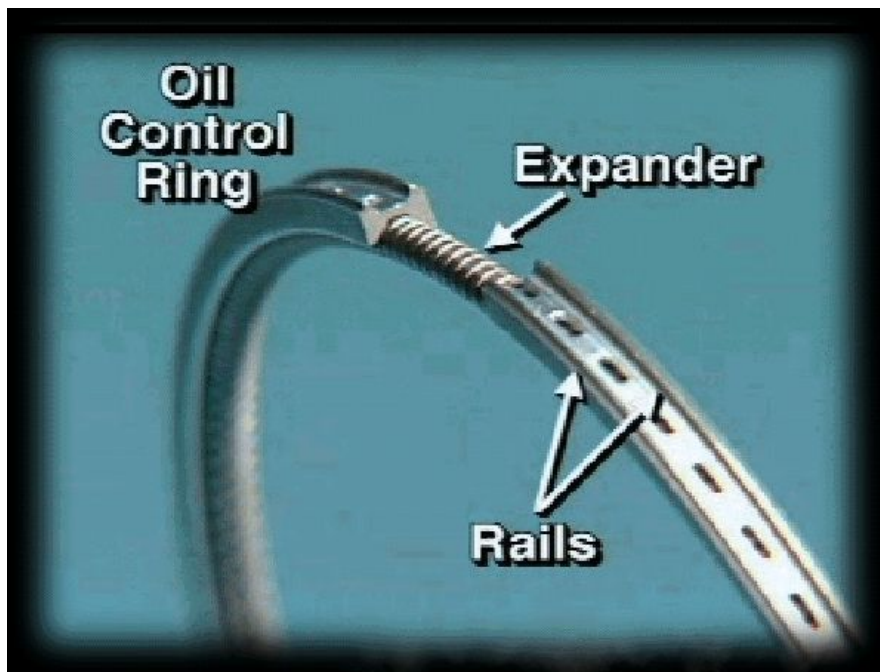
Matches injector design features

High quality forged steel crown

Resists thermal fatigue cracking



■ ***Oil Control Ring***



Redesigned piston ring pack

Improved oil control

New expander

Lower tension

Narrow rails

Less frictional losses



■ ***Valve Rocker Levers***



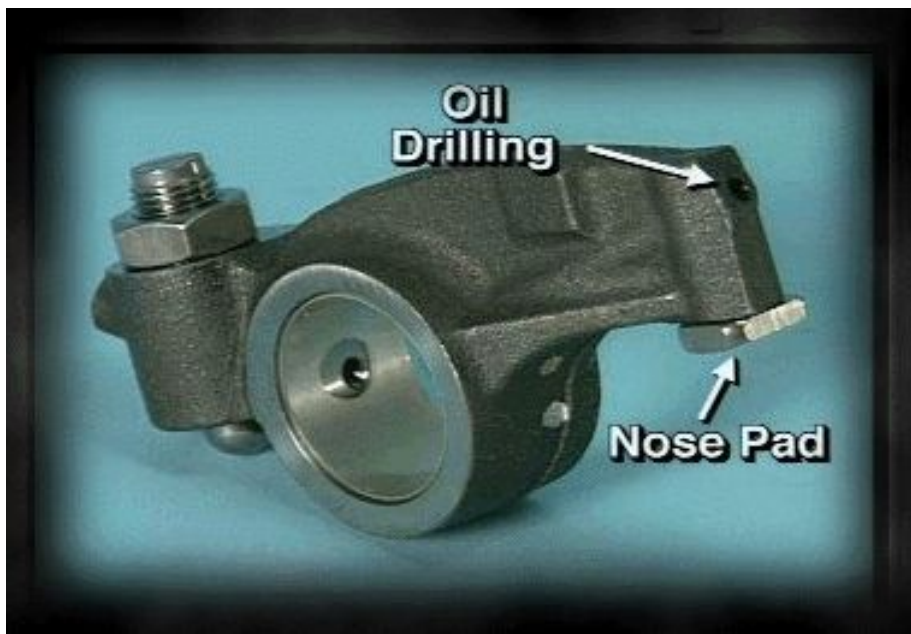
Cast steel construction

Right hand and left hand levers

Integral replaceable bushing



■ ***Valve Rocker Levers***



Integral nose pad in both levers

Increased durability

Open oil drilling

Lubrication to pad contact area



■ ***Injector Rocker Lever***



High quality forged steel construction

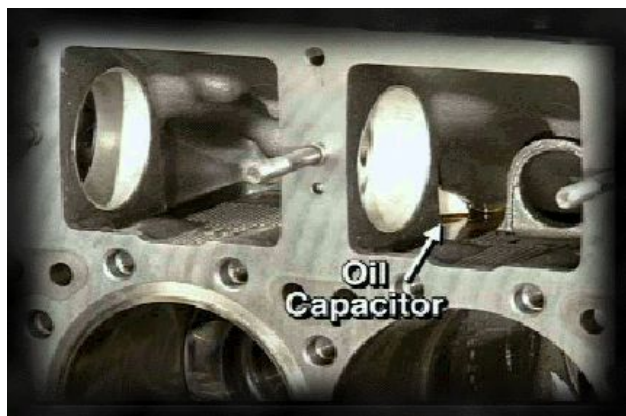
Maximum strength and reliability

Incorporates replaceable bushing

Drilled for oil flow



■ **Oil Capacitors**



Integral with block casting

Slows return oil flow back to pan

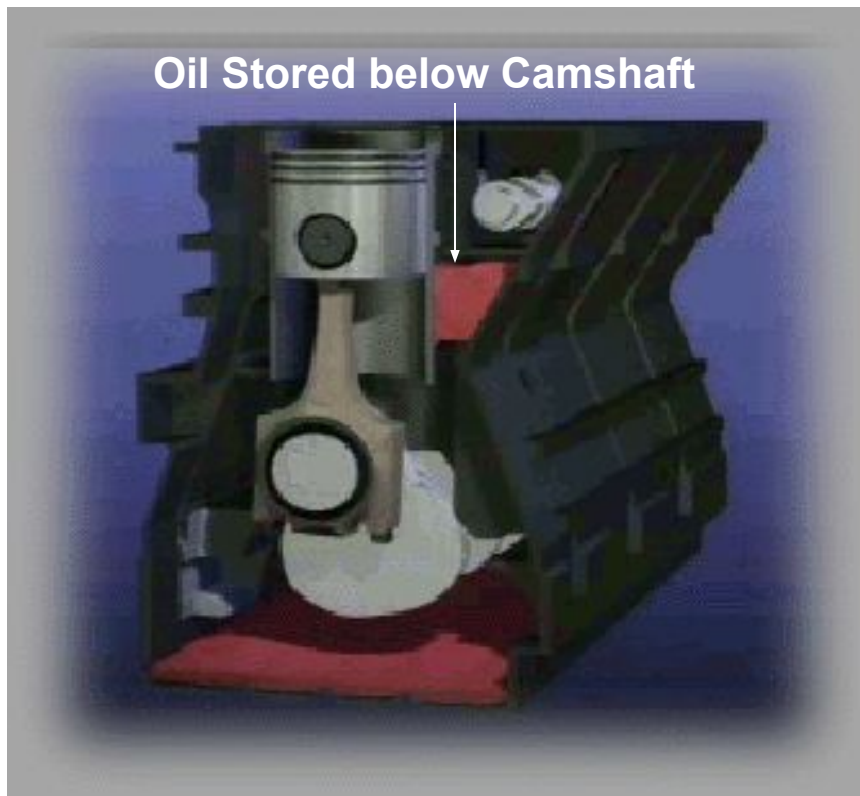
Same oil capacity as MII Plus

Increased durability





■ **Oil Capacitor**



Oil Stored below Camshaft

Oil stored in valley below camshaft

Lowers oil pan level

Reduced parasitic losses

Prevents 'Rod Dipping'

Prevents oil aeration



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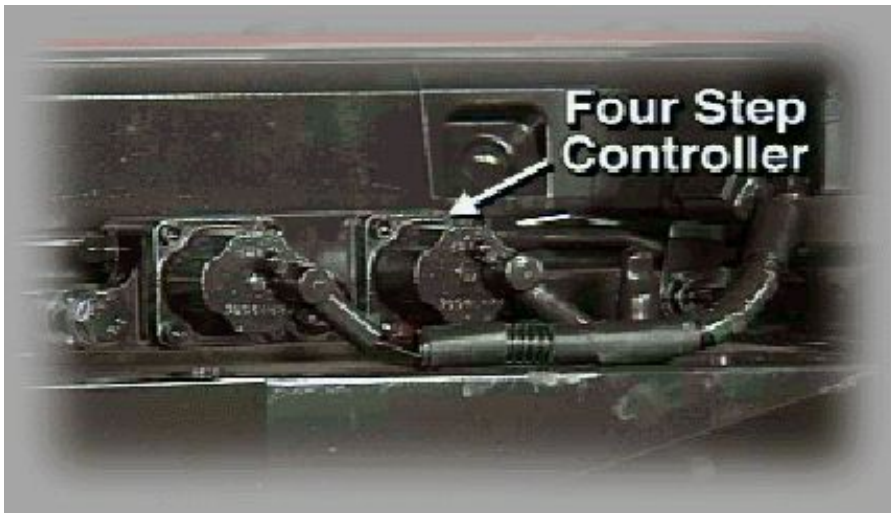
■ **Turbocharger**



- Located on top of air intake manifold**
- Available with new HX 55 Holset turbo**
- Fitted to higher hp ratings**
- Four operating steps throughout engine speed range**



■ **Turbocharger**



Four orifice flow device

Two solenoid valves

ECM controlled

Controls signal to wastegate canister



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■ ***Air Compressor***



Air compressor 'Smart Governor'

Improved fuel efficiency

ECM monitors vehicle air system pressure

ECM activates compressor

Compressor 'ON' - Light loaded engine

Compressor 'OFF' - Heavy loaded engine



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■ ***Vibration Damper***



Upgraded vibration damper

Up to 440 hp at rated speed

Reduced torsional vibrations

Increased crankshaft durability



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■ ***Thermostat***



Improved seal

Better sealing between thermostat and seal face





■ ***Valve Cover***

- **New internal breather system developed for the ISM**
- **Eliminate oil carryover**
- **Breather tube routes and ends in same location as today's MII/MII+**





■ ***ISM Literature***

- **Operation and Maintenance - 36664II**
 - **Features Manual - 3666320**
 - **Wiring Diagram - 3666269**
 - **Engine T/R Manual - 3666322**
 - **Electronic T/R Manual - 3666266**
-