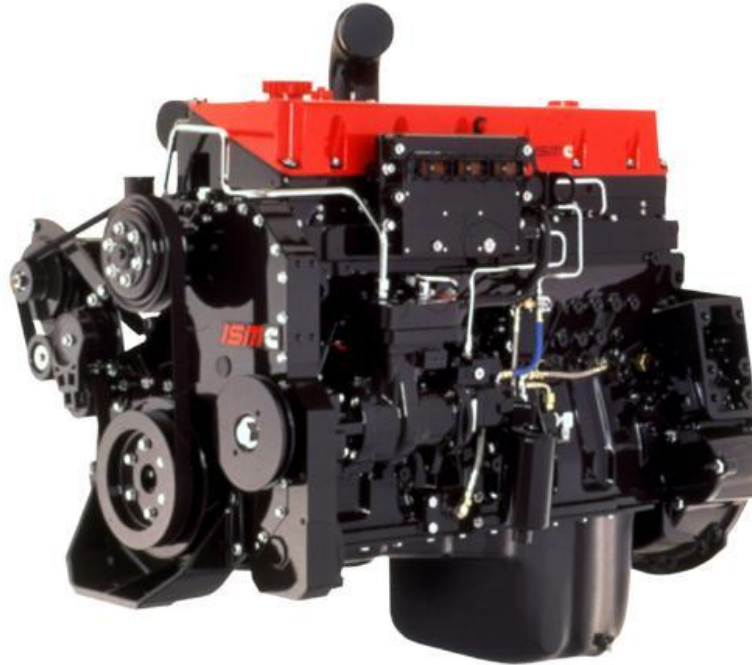


# Cummins Engine Company LTD



**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.
-



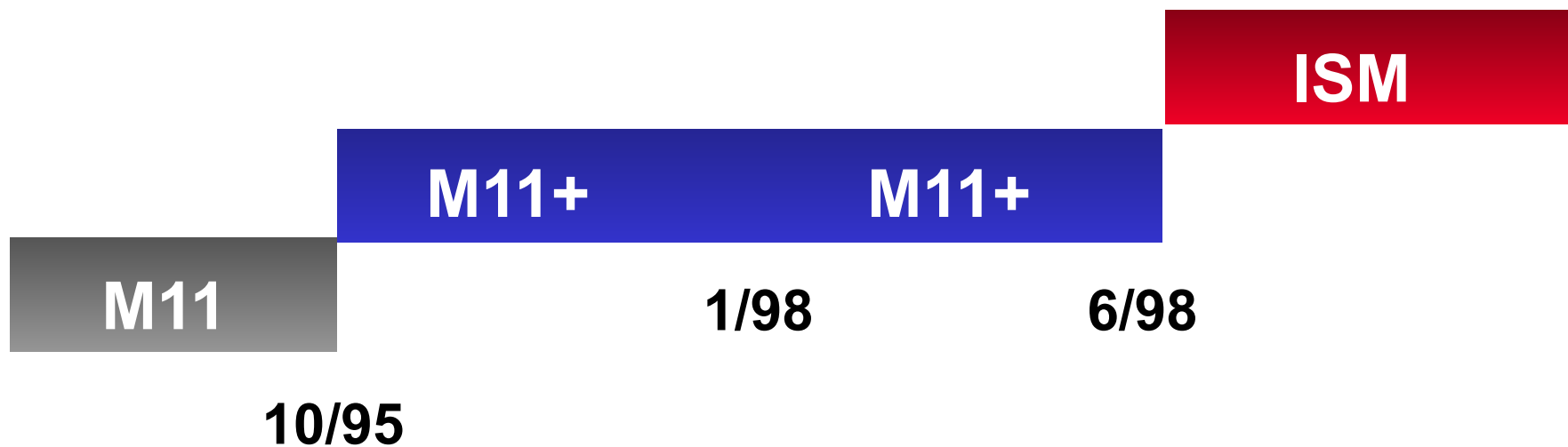
## ***ISM Evolution Strategy***

- 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
-



■ ***ISM at a glance***

- Dry Weight                                      2114 lbs.
  - Oil capacity                                      10.3 US Galls.
  - HP Range                                         280 - 440
  - Peak Torque range                            1050 - 1550 ft.lbs
  - Max Governed Speed                        2100 rpm
  - Pk Torque Speed                              1200 rpm
-

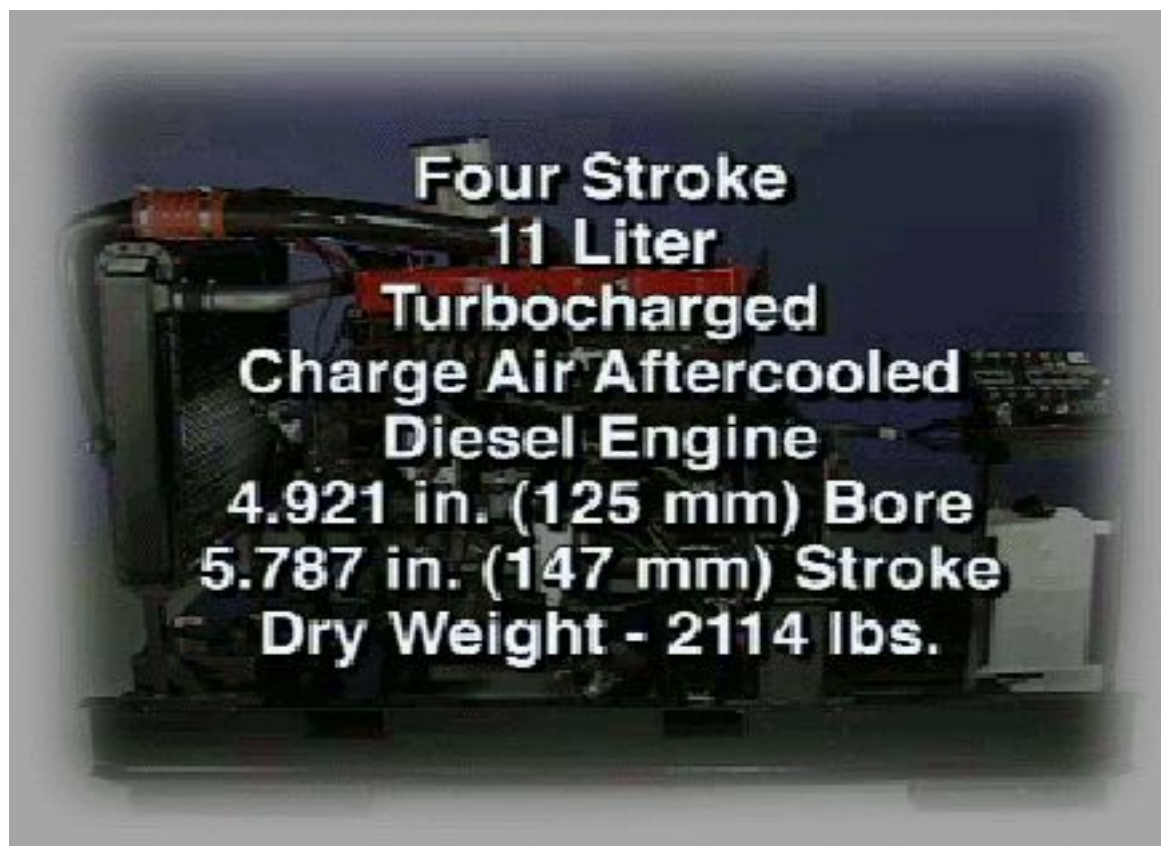


**INTERACT™**  
**SYSTEM**

ISM/CM 570 Controller

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■ ***Specifications***







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The ISM logo, consisting of the letters 'ISM' in a bold, red, italicized sans-serif font, enclosed in a white rectangular box with a grey drop shadow.

**ISM**

**CM 570 ECM**

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■ ***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)
-



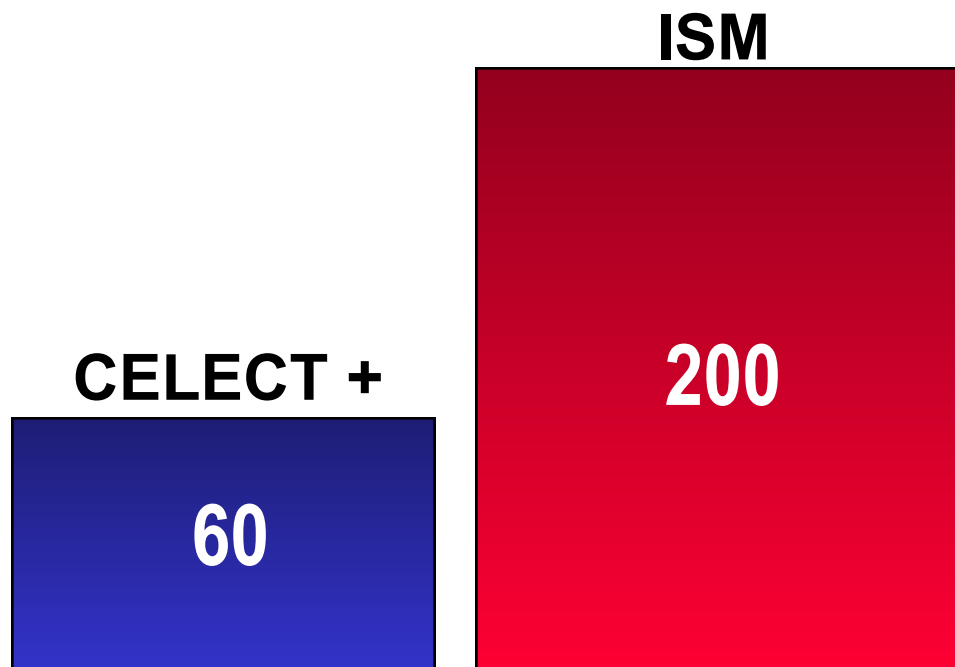
■ **ECM 570**

- 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**

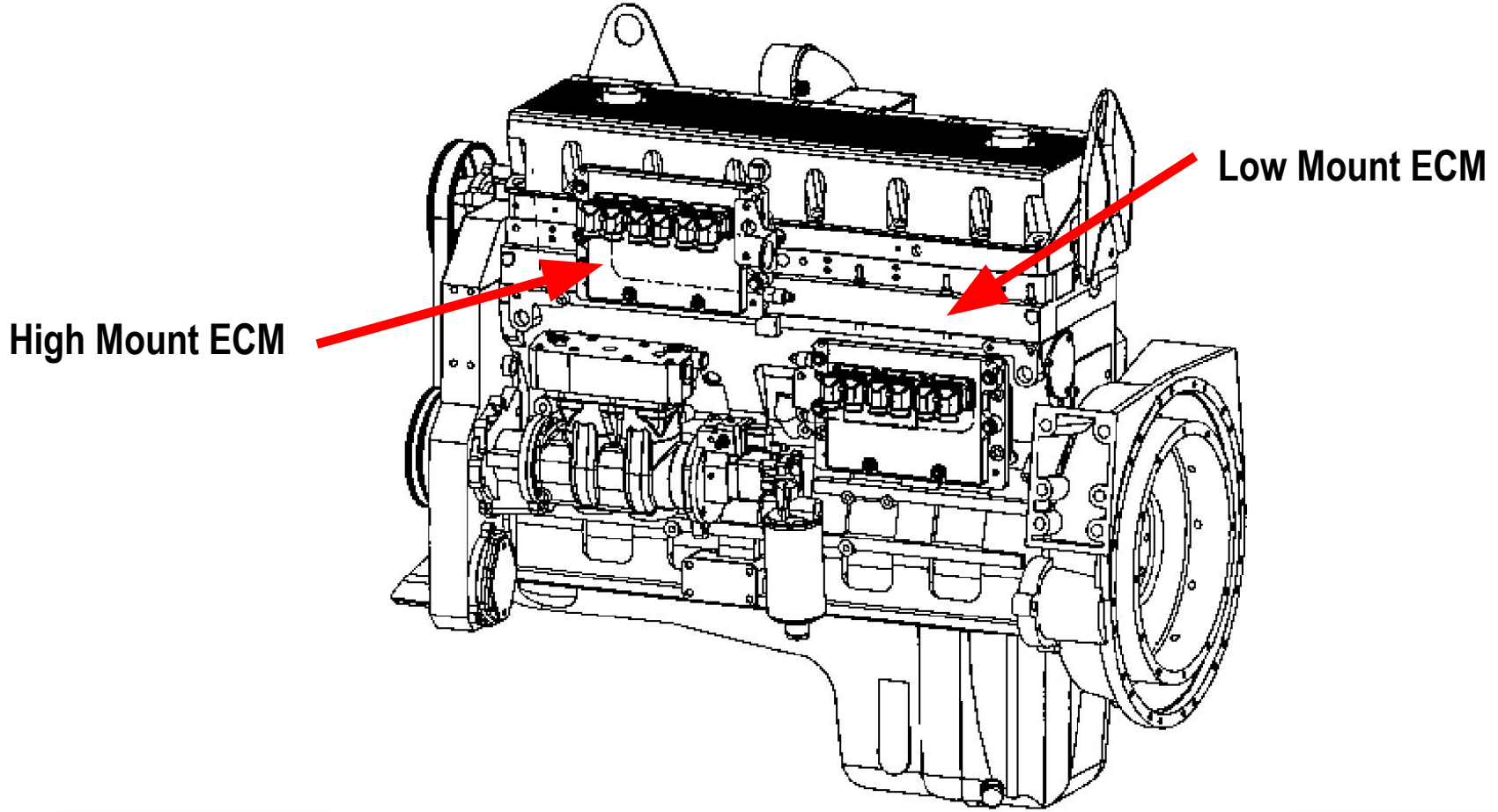


■ ***ECM High Mount***

- 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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ISM/CM 570 Controller

■ **ECM**



**Full Time Double Pulse Injection**



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**ISM**

***SENSORS***

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■ ***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**



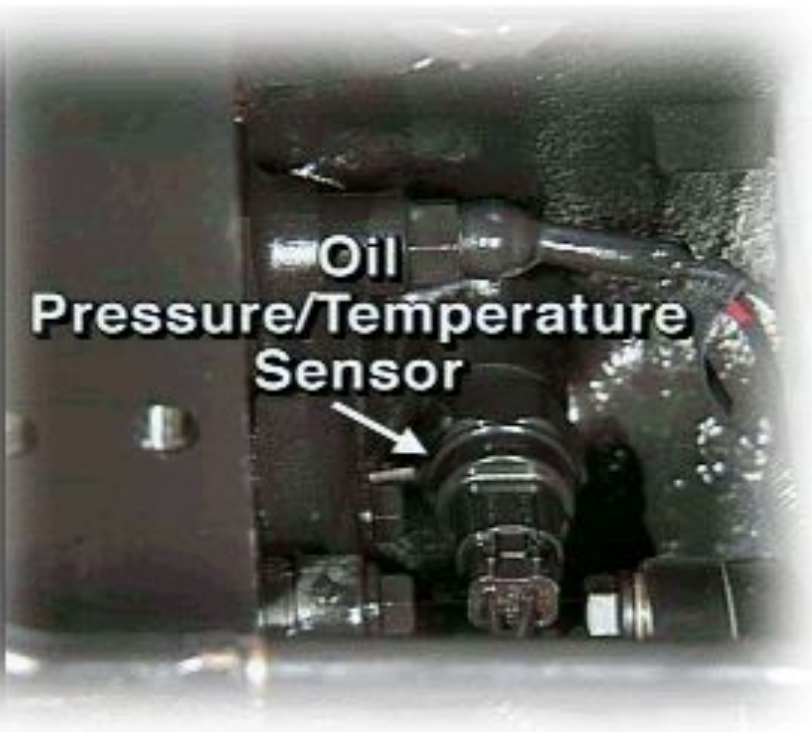
■ ***Combination Sensor***

- 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**



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**SYSTEM**

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■ ***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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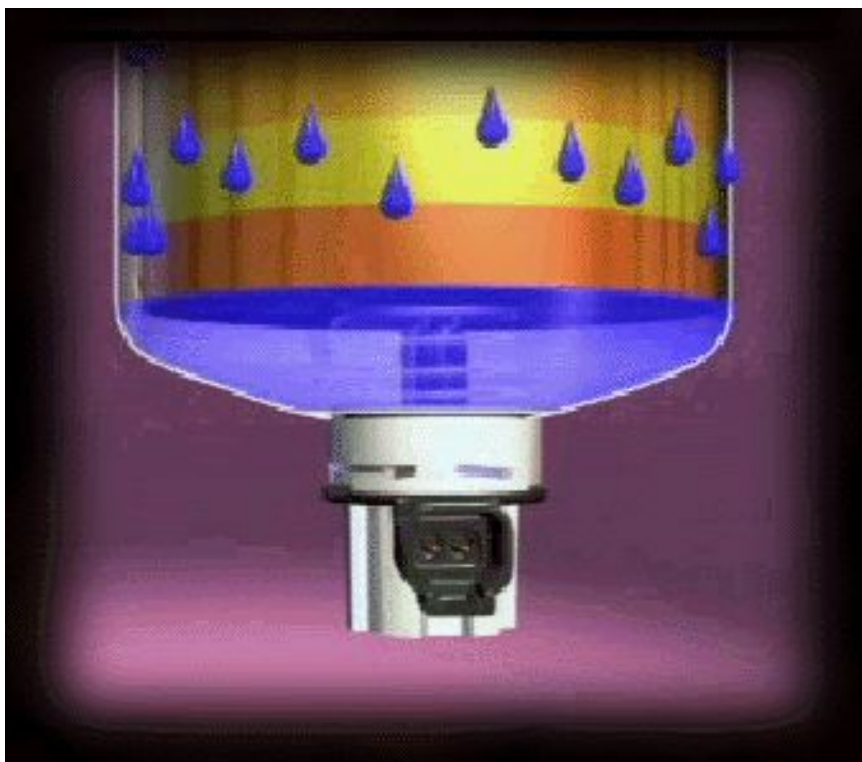


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■ ***Sensors***



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

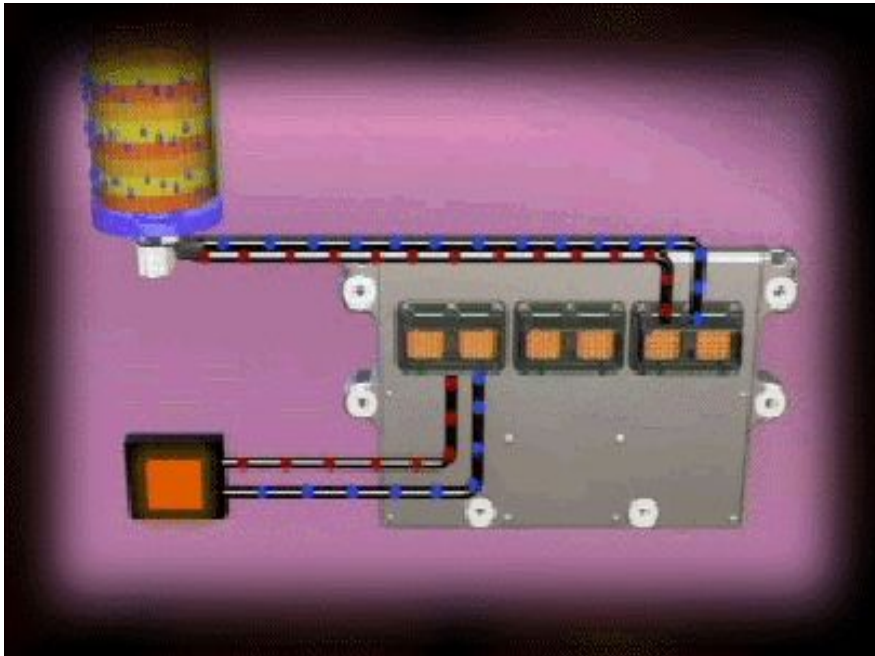




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■ **Sensors**



**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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## ■ **Combination Oil Filter**

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

**LF9000**



**LF3000**

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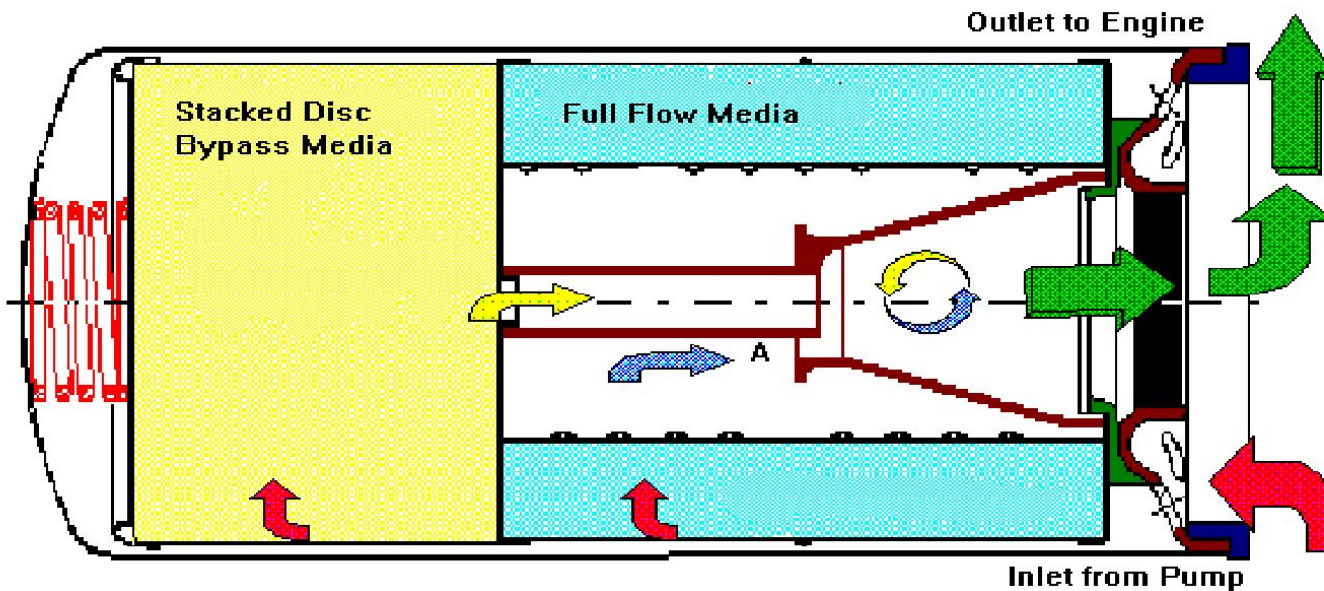
■ ***Venturi Combination Oil Filter***

**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





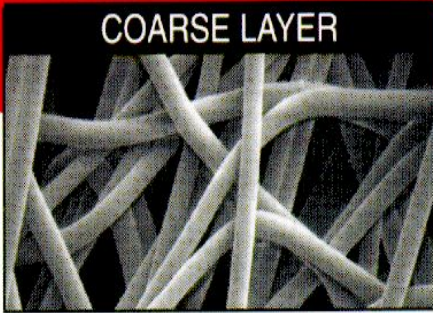
**INTERACT**™  
SYSTEM

ISM/CM 570 Controller

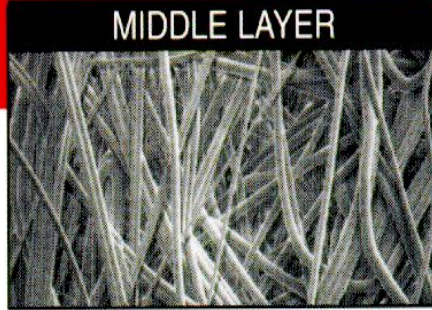
■ **Lubricating Oil Filter - Media**

**StrataPore**

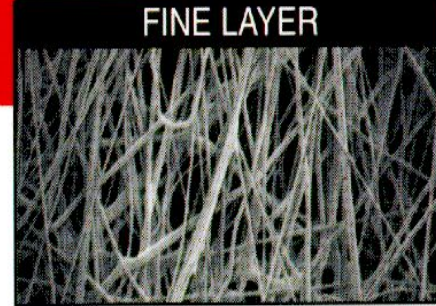
COARSE LAYER



MIDDLE LAYER

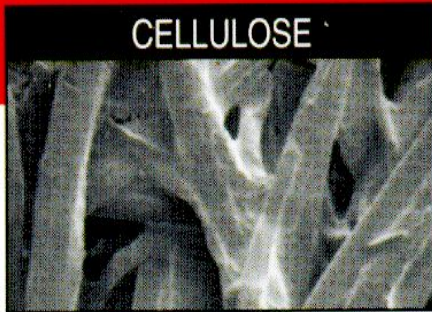


FINE LAYER

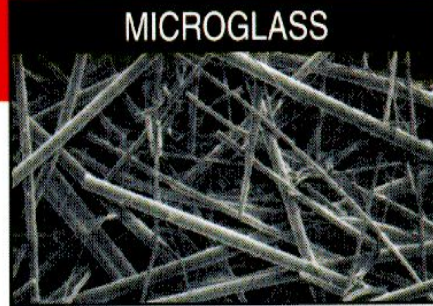


**Conventional Technology**

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**

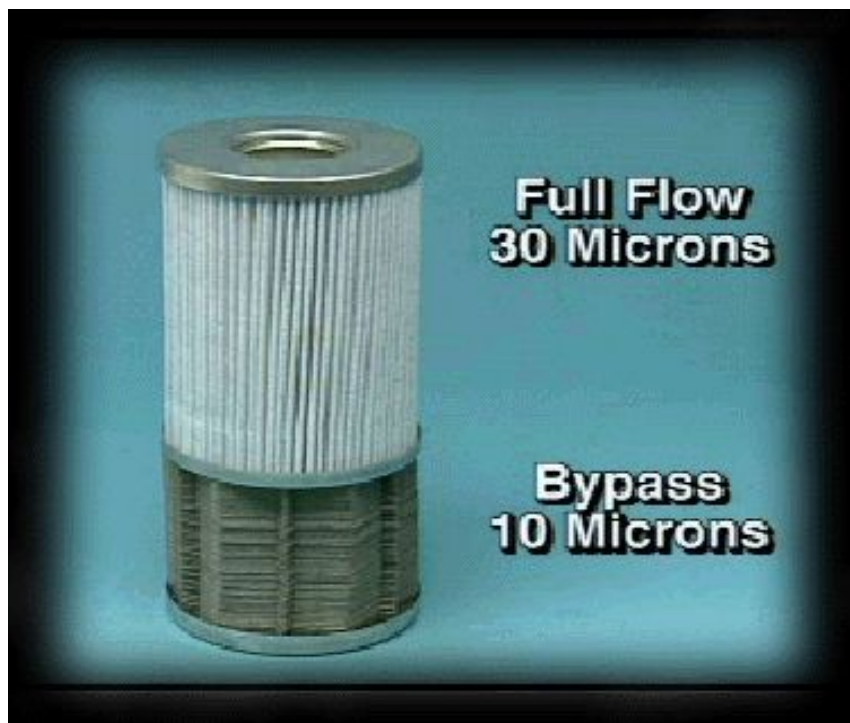


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■ ***Oil Filter***



**Combined filter package**

**Stratapore media**

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**SYSTEM**

ISM/CM 570 Controller

■ ***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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ISM/CM 570 Controller

■ ***Fuel System***



**Regulated fuel pressure**

**Positive displacement**

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



**INTERACT™**  
**SYSTEM**

ISM/CM 570 Controller

■ ***Fuel System***



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

**Reduced parasitic losses**

**Additional fuel tubing on fuel pump**



**INTERACT™**  
**SYSTEM**

ISM/CM 570 Controller

■ ***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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ISM/CM 570 Controller

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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***

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■ ***Auto Tensioning Belt Option***

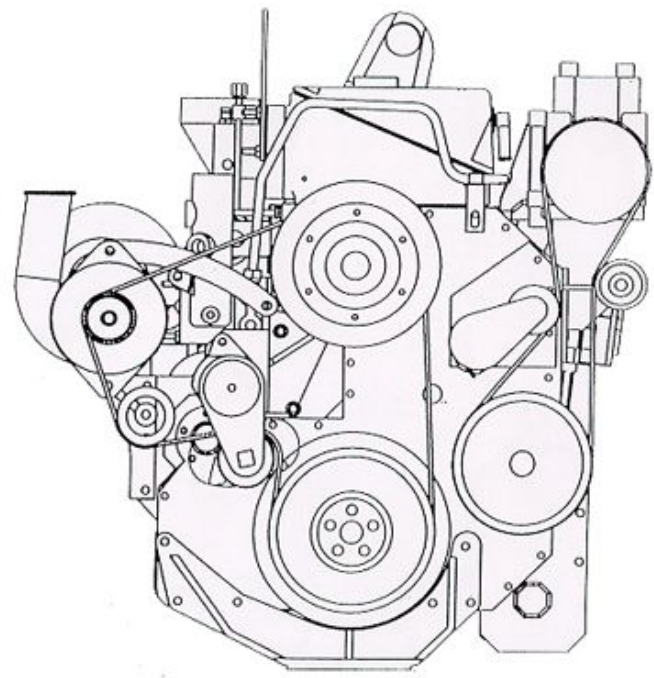
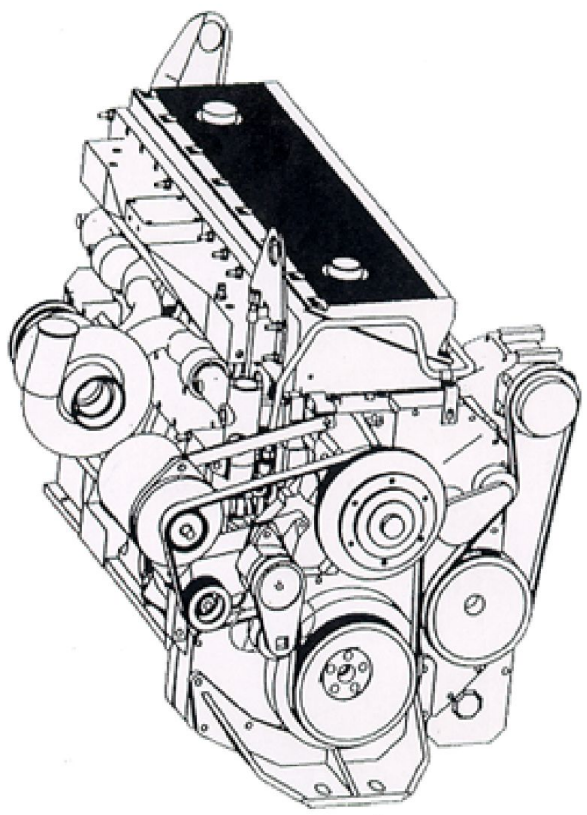
- One belt drives both **fan** and **alternator**
    - Increased power capacity
    - Reduced maintenance
    - Eliminates over-tightening
    - Reduced belt replacement time from 20 minutes to 2 minutes
    - Belt life increased to 250,000 miles. Reduced operation costs.
    - Fewer total parts to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



**INTERACT™**  
**SYSTEM**

ISM/CM 570 Controller

■ ***Auto Tensioning Belt Option***





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■ ***Drive Belt***





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**ISM**

***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.**

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**INTERACT™**  
**S Y S T E M**

ISM/CM 570 Controller

■ ***Piston Crown***



**Re designed piston bowl**

**Matches injector design features**

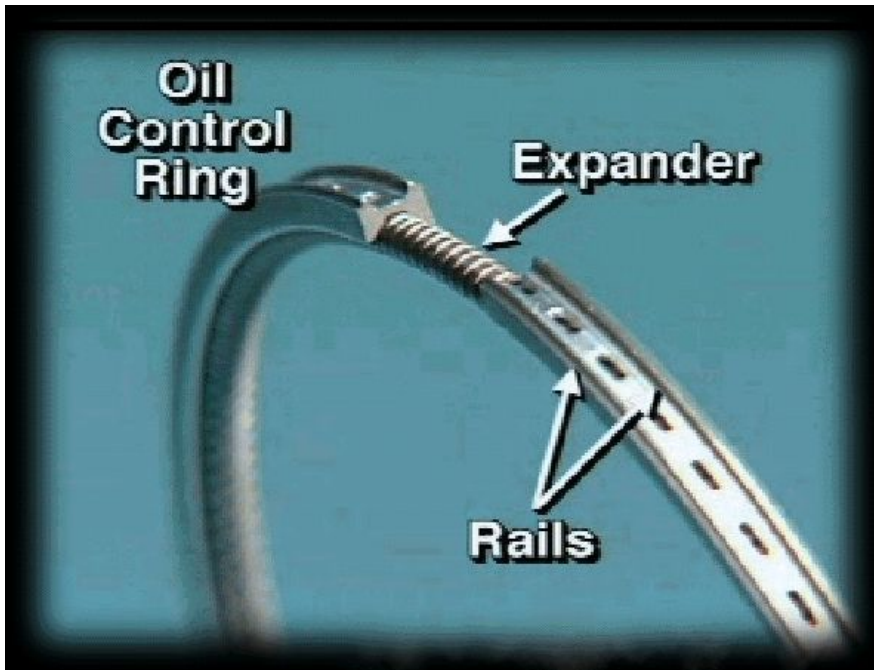
**High quality forged steel crown**

**Resists thermal fatigue cracking**





■ ***Oil Control Ring***



**Redesigned piston ring pack**

**Improved oil control**

**New expander**

**Lower tension**

**Narrow rails**

**Less frictional losses**



ISM/CM 570 Controller

■ ***Valve Rocker Levers***



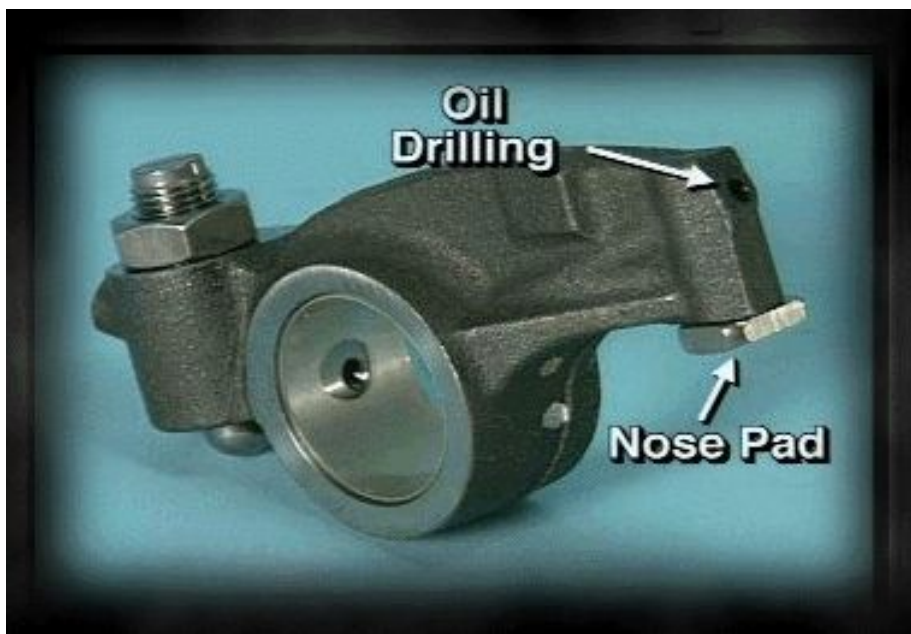
**Cast steel construction**

**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**

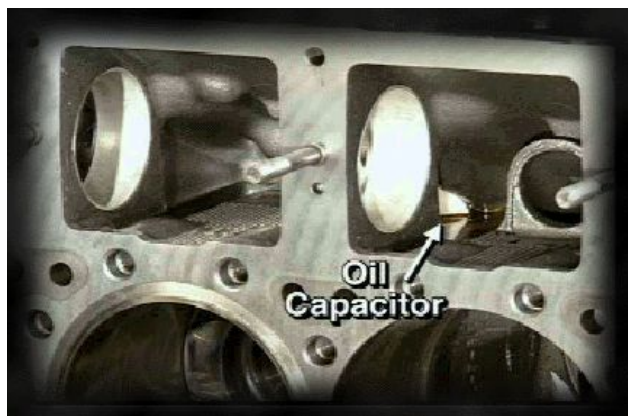
**Maximum strength and reliability**

**Incorporates replaceable bushing**

**Drilled for oil flow**



■ **Oil Capacitors**



**Integral with block casting**

**Slows return oil flow back to pan**

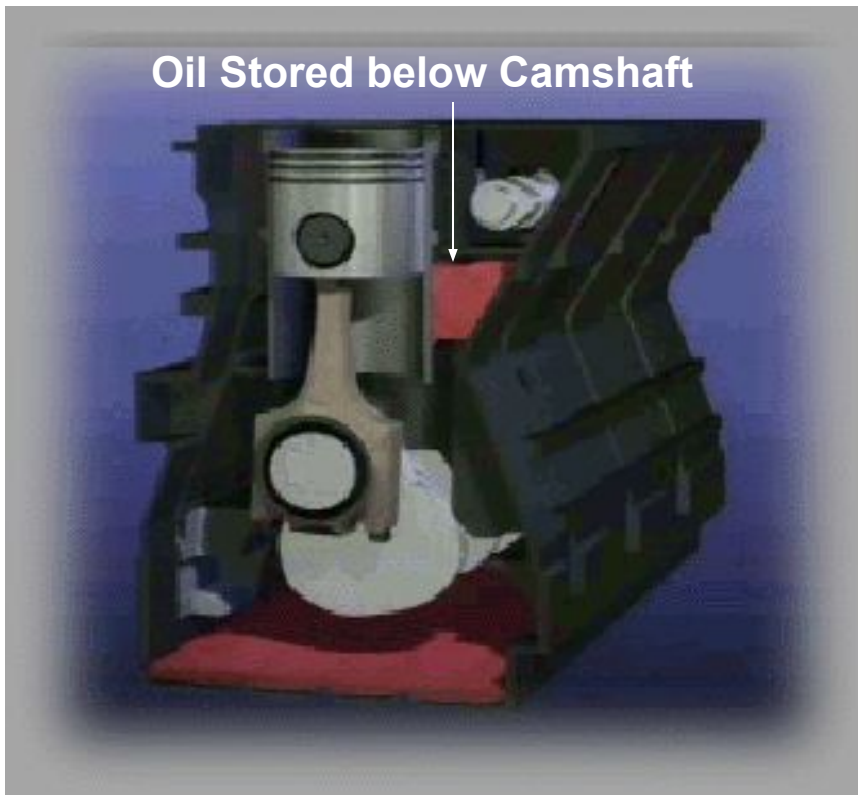
**Same oil capacity as MII Plus**

**Increased durability**





■ **Oil Capacitor**



**Oil stored in valley below camshaft**

**Lowers oil pan level**

**Reduced parasitic losses**

**Prevents 'Rod Dipping'**

**Prevents oil aeration**



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**SYSTEM**

ISM/CM 570 Controller

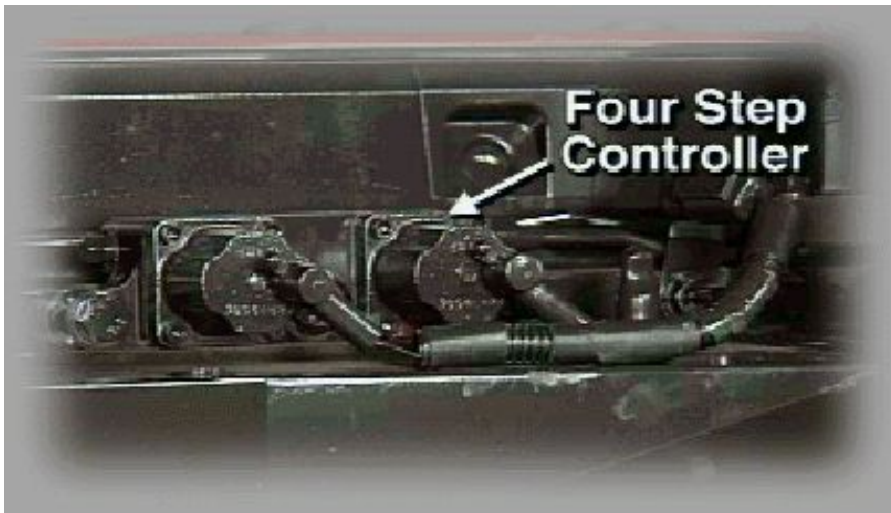
■ ***Turbocharger***



- 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**

---



ISM/CM 570 Controller

■ ***Vibration Damper***



**Upgraded vibration damper**

**Up to 440 hp at rated speed**

**Reduced torsional vibrations**

**Increased crankshaft durability**



■ ***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**
-