

# Curso Técnico de Motores Caterpillar serie 3500



# DURACION DEL CURSO

- Desde el Lunes 13 de Agosto  
al Viernes 17 Septiembre
- HORARIO 08:30 -17:30 Hrs.



## **Horario:**

**Inicio de la Instrucción 08:30Hrs.**

**Coffe Brake 10:30Hrs.**

**Almuerzo 13:00 – 14:00Hrs.**

**Coffe Brake 15:30Hrs.**

**Finalización 17:30Hrs.**



**Objetivos:** Al termino del Curso el alumno sera capaz de identificar un motor Caterpillar, explicar sus cuatro Sistemas que lo componen y realizar los ajustes minimos que requiere una mantención programada.



# Introducción



Para la clasificación de sus productos les asigna letras o números, por ejemplo:

- Los motores están clasificados con el número 3.
- El segundo número corresponde a la familia a que pertenece.
- Los últimos dos números corresponde a la cantidad de cilindros o a alguna modificación que haya sufrido el motor.

**3126**

**3304**

**3508**

**3516B**

**3126B**

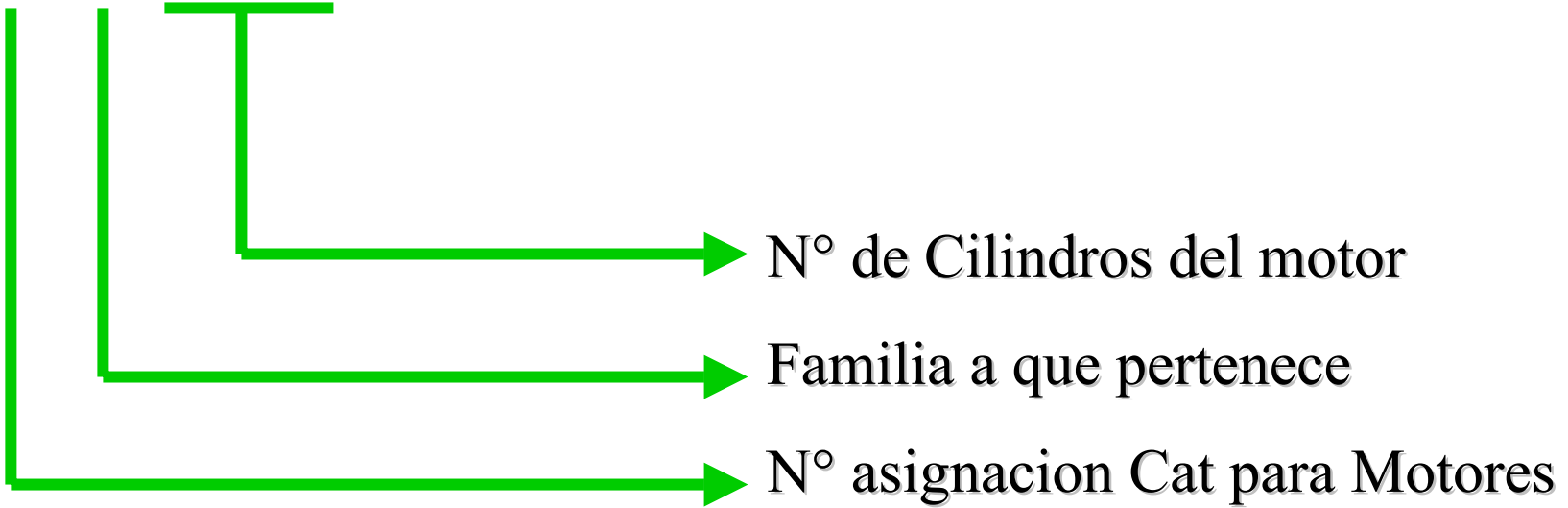
**G3306**

**G3612**

**3412E**



3XXX







## **Caterpillar actualmente tiene 6 Familias de Motores definidas en produccion:**

**3000** 3054 3056 3066 (Mitsubishi –Perkins)

**3100** 3114 3116 3126

**3200** 3204 3208

**3300** 3304 3306

**3400** 3406 3408 3412

**3500** 3508 3512 3516 3520 3524 3532

**3600** 3606 3608 3612 3616 3618





# Diseño de los Motores Caterpillar

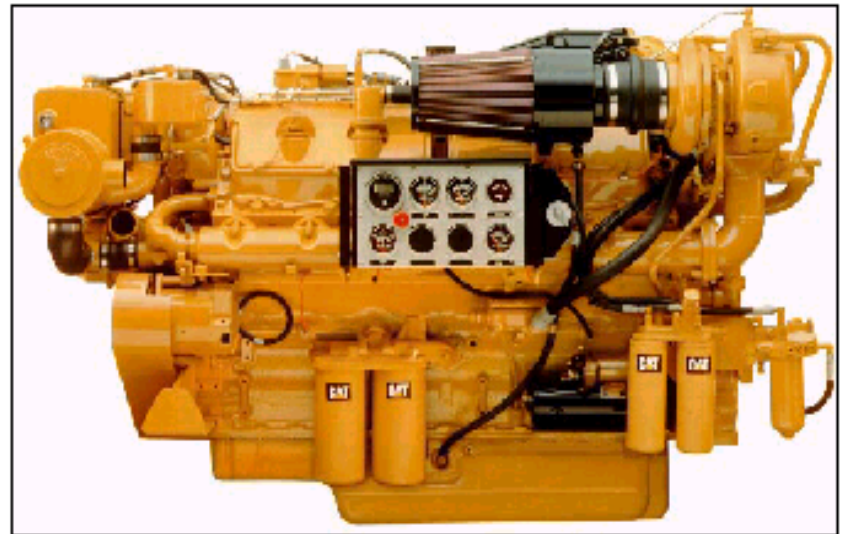
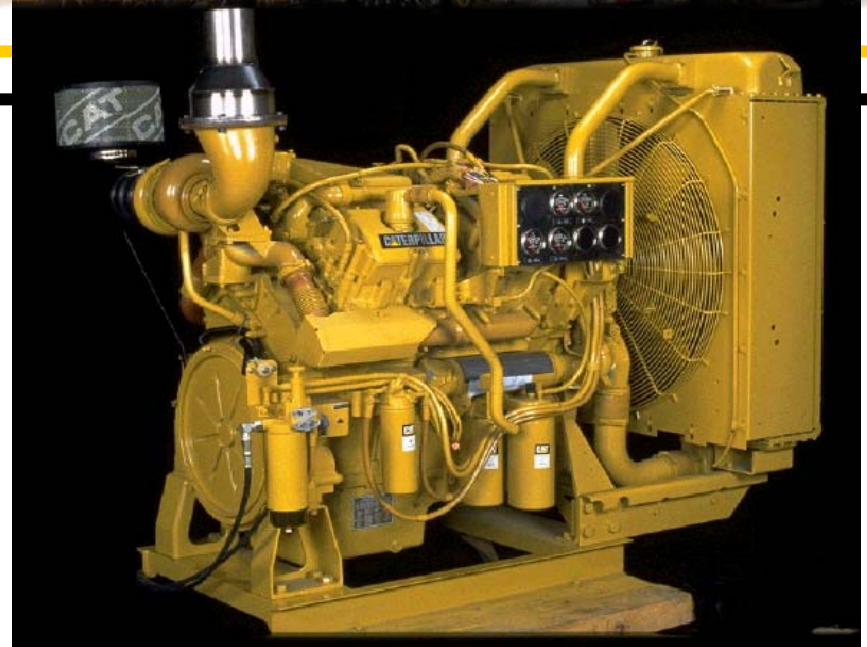
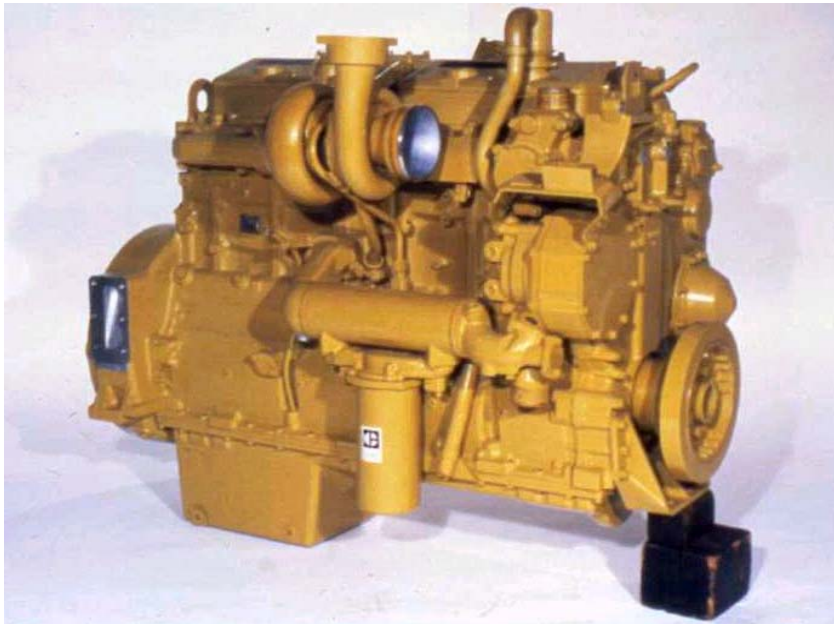




**3300**



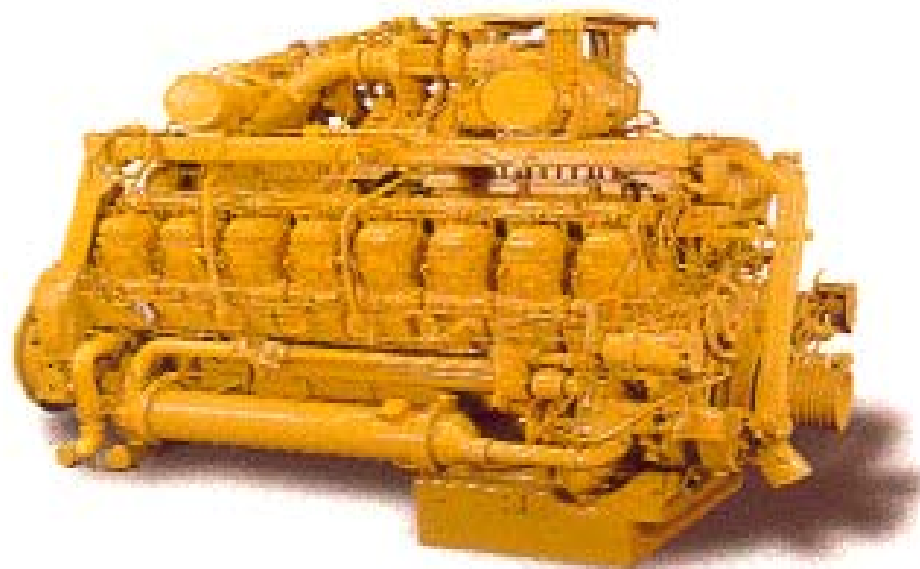
**3400**



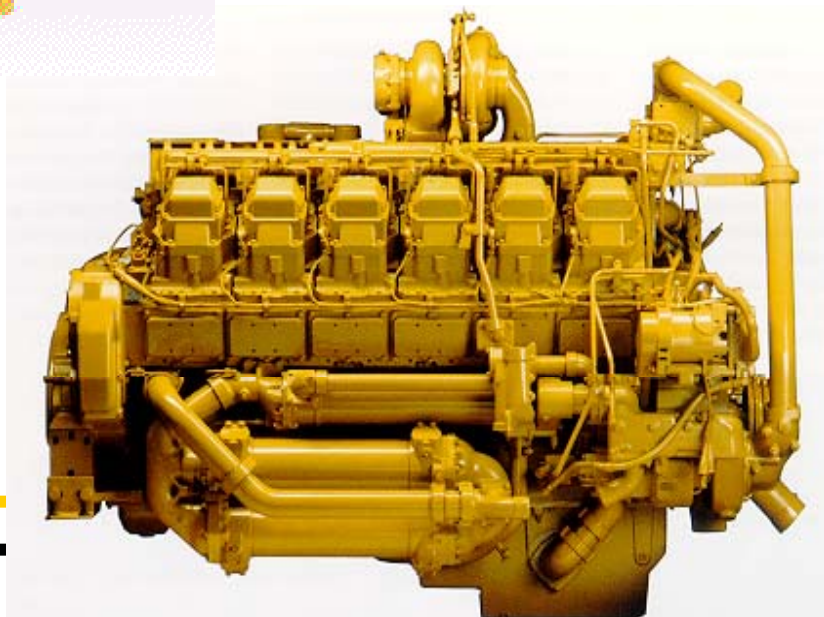


INTAKE ○  
0.38 mm  
(.015 in)

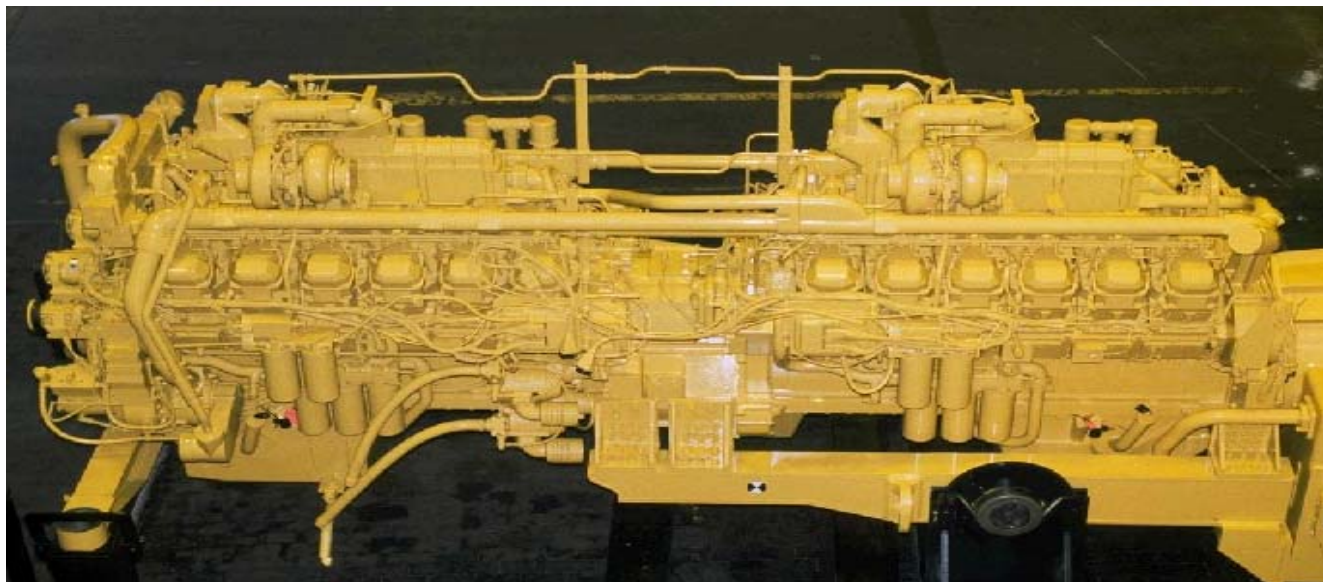
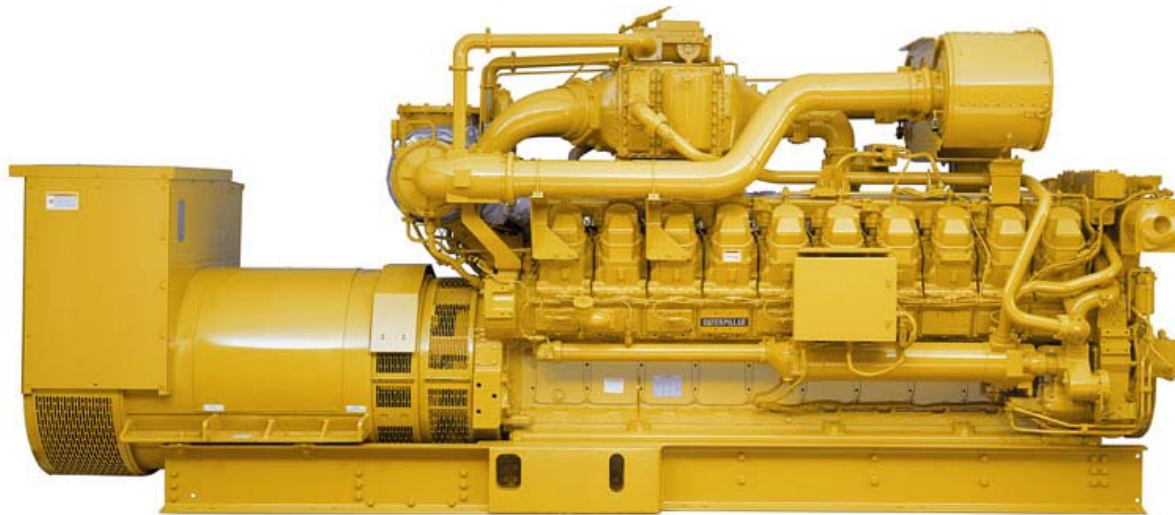
● EXHAUST  
0.76 mm  
(.030 in)

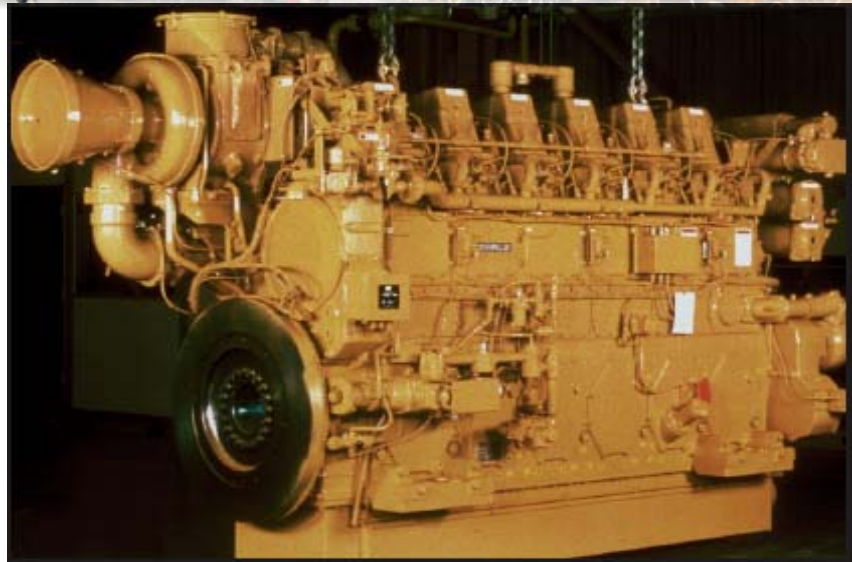


**3500**

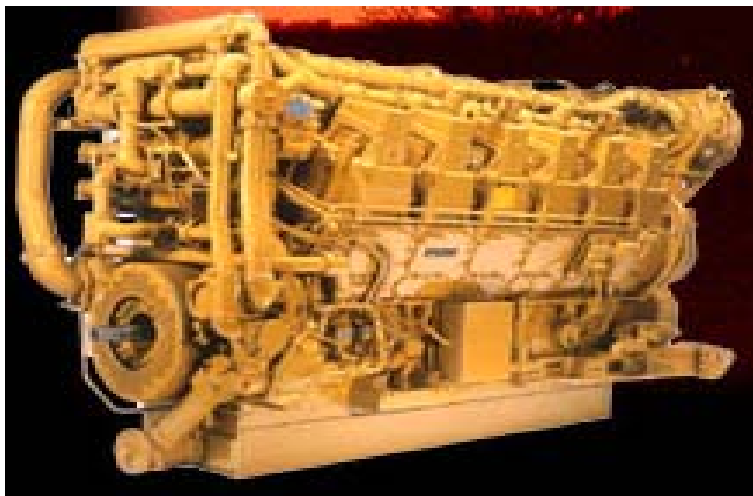


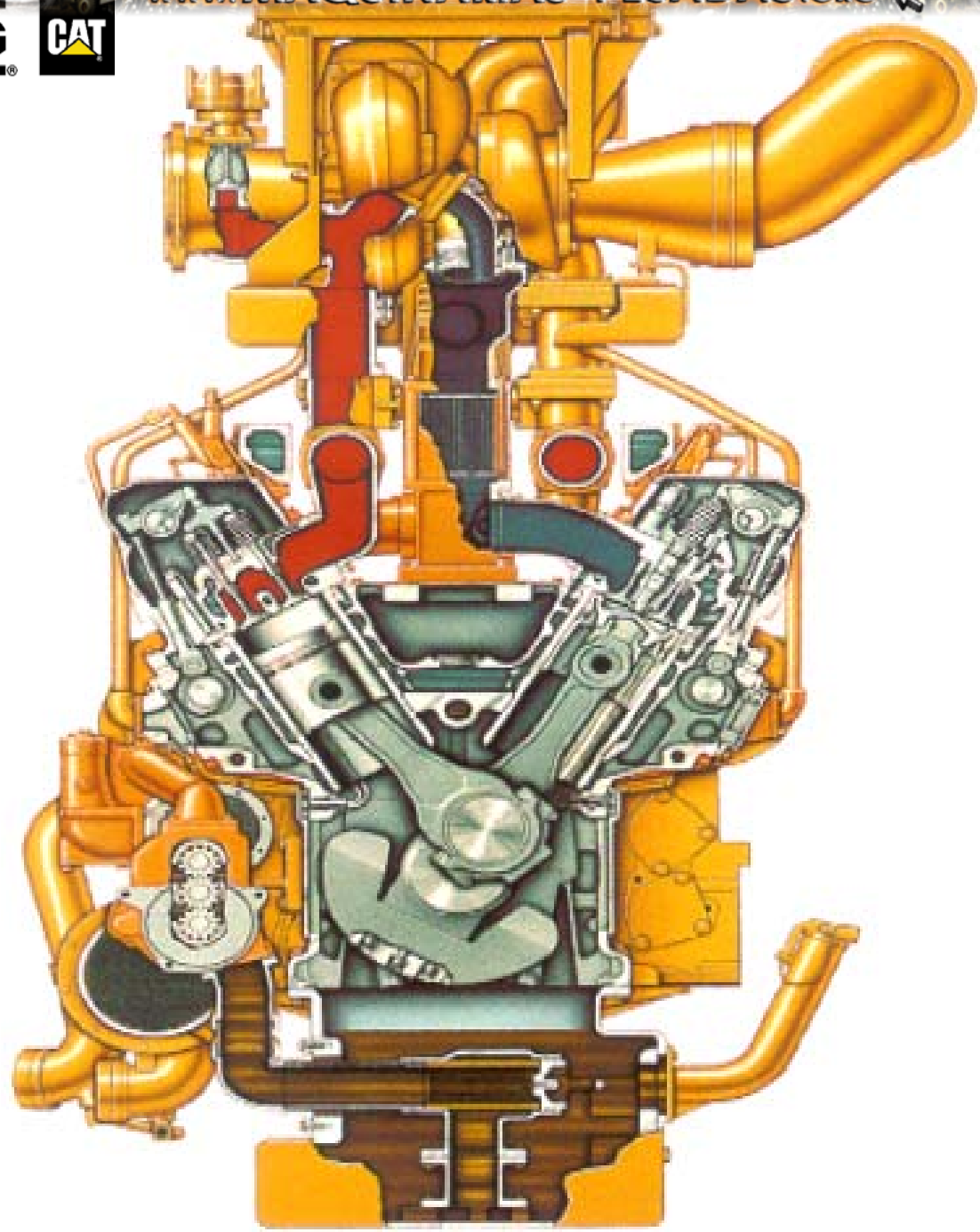






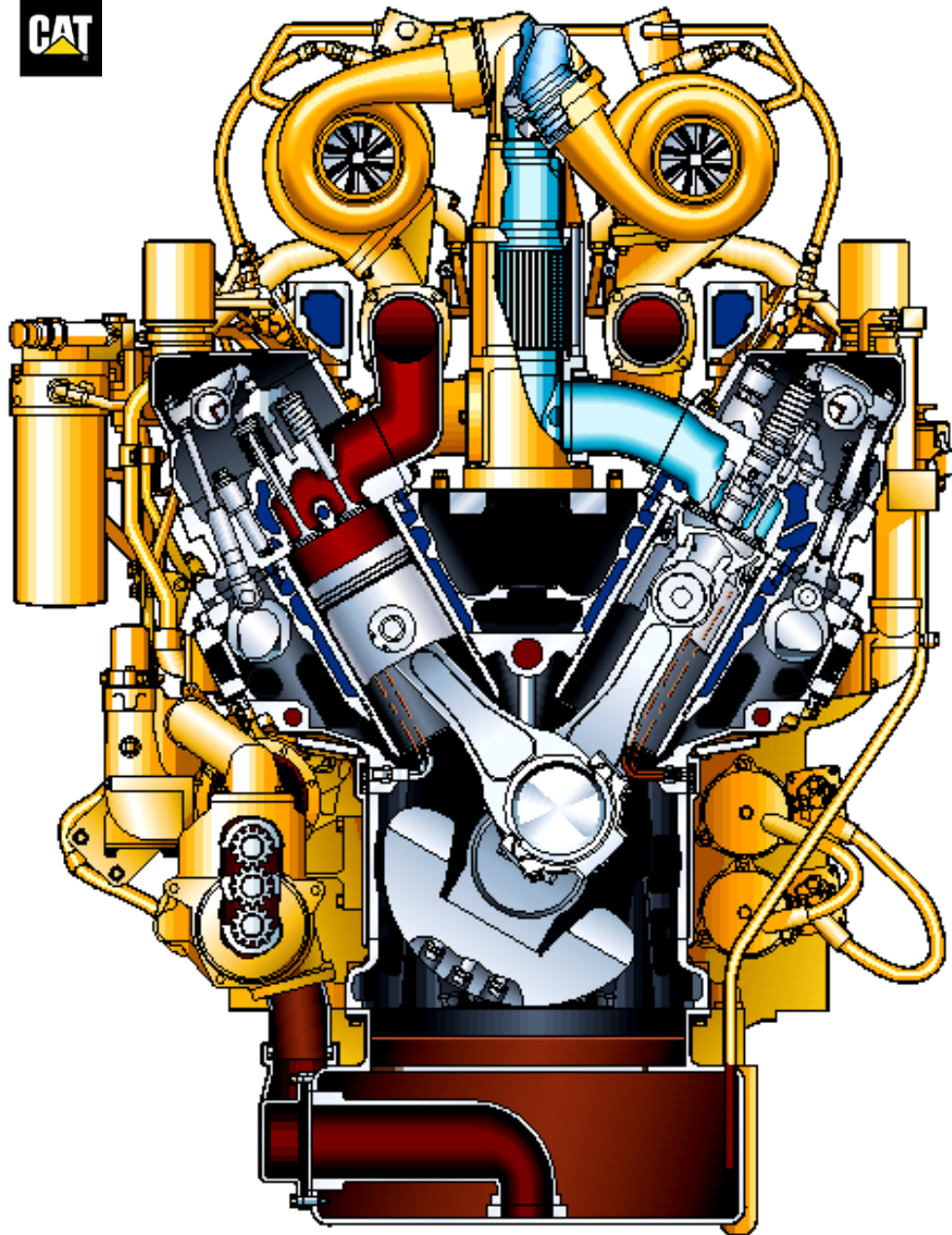
**3600**



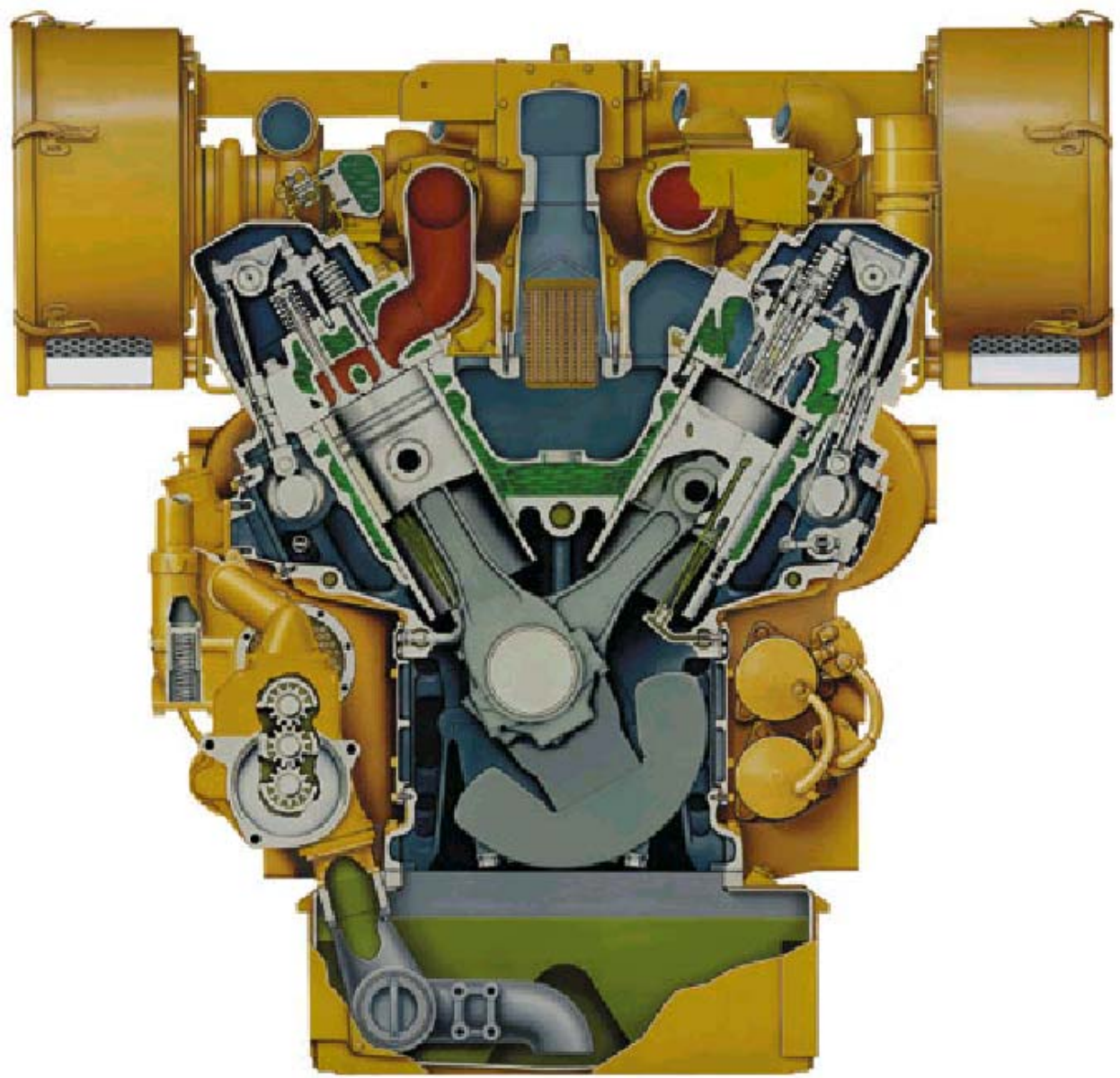




**FINNING**



**FINNING** 



# Caterpillar 3508B Engine

- V-8 Diesel
- 34.5 Liter (2105 cu. in.) Displacement
- Twin Turbocharged
- Ratings To 1500 Hp

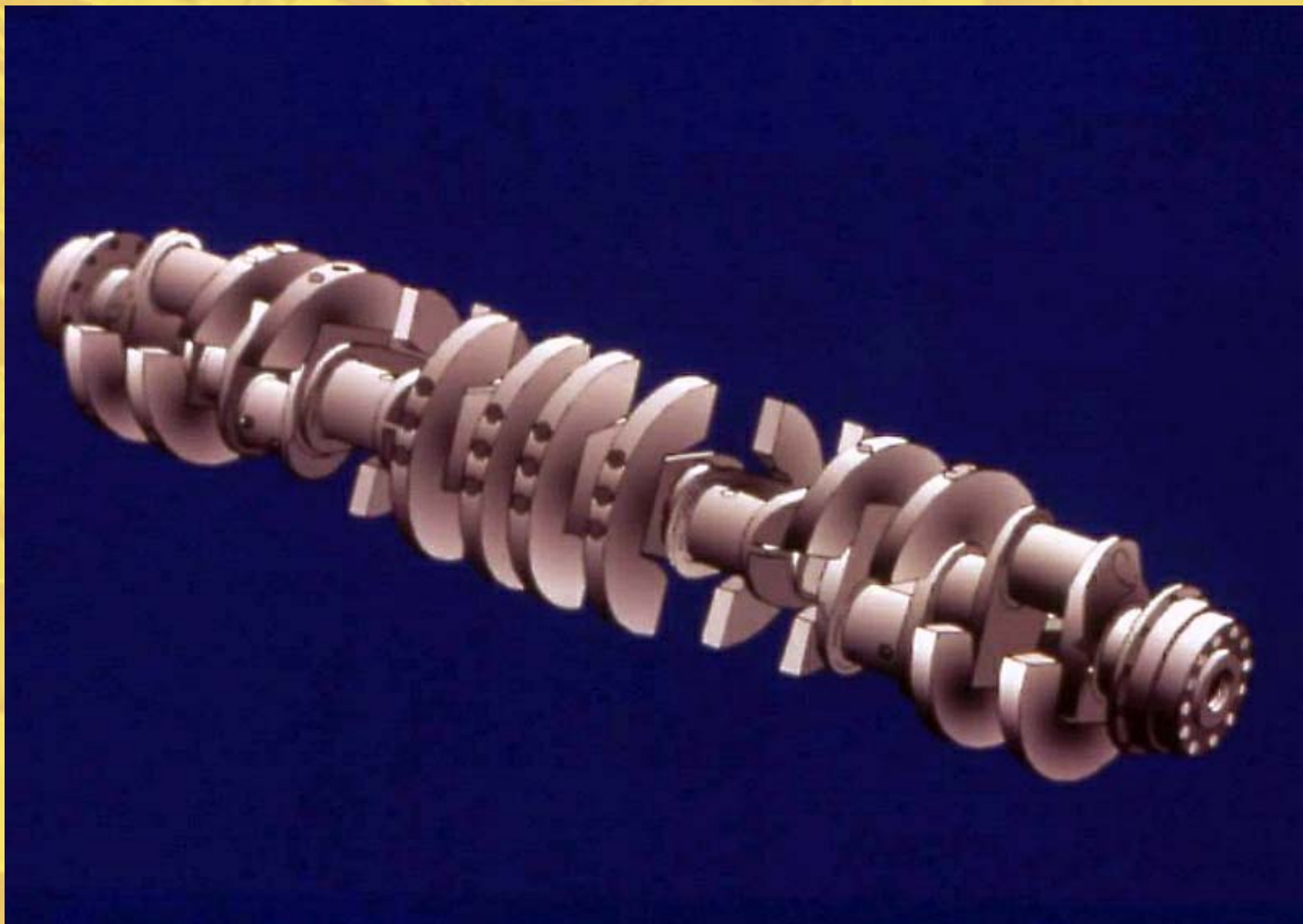


# Caterpillar 3512B Engine

- V-12 Diesel
- 51.8 Liter (3158 cu. in.) Displacement
- Quad Turbocharged - Genset
- Ratings To 2250 Hp

# Caterpillar 3516B Engine

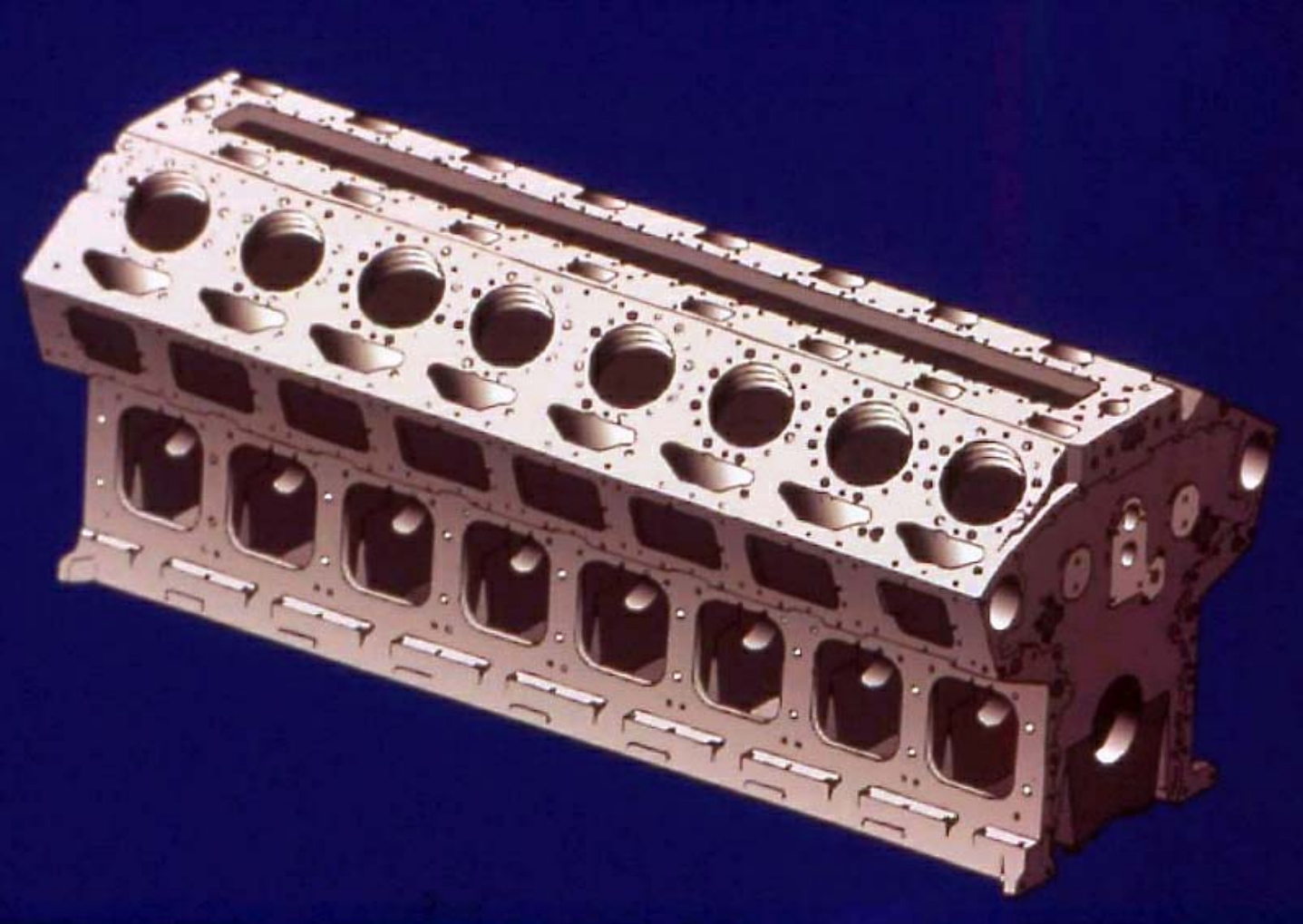
- V-16 Diesel
- 69 Liter (4211 cu. in.) Displacement
- Quad Turbocharged - Genset
- Rating To 3500 Hp











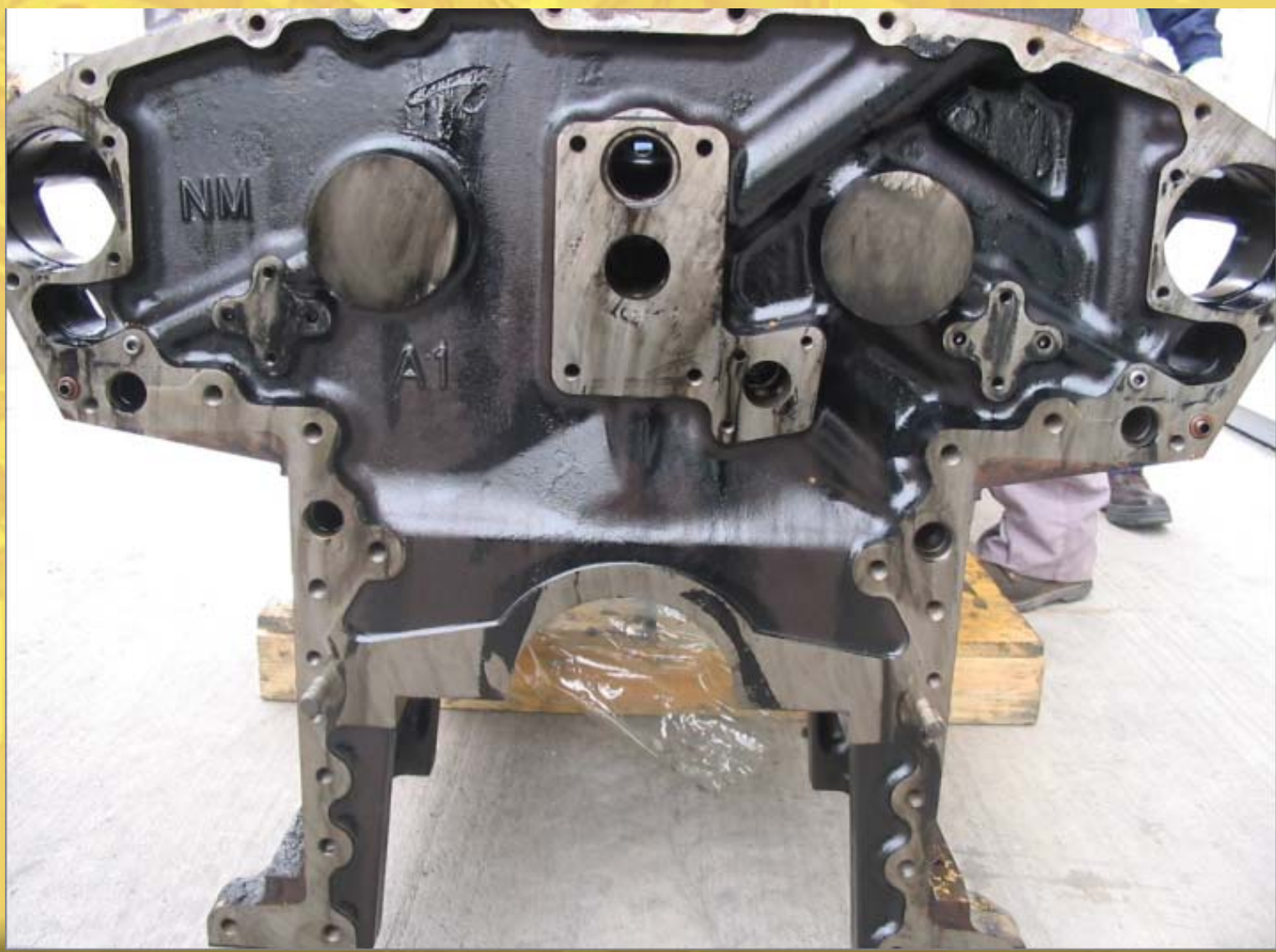






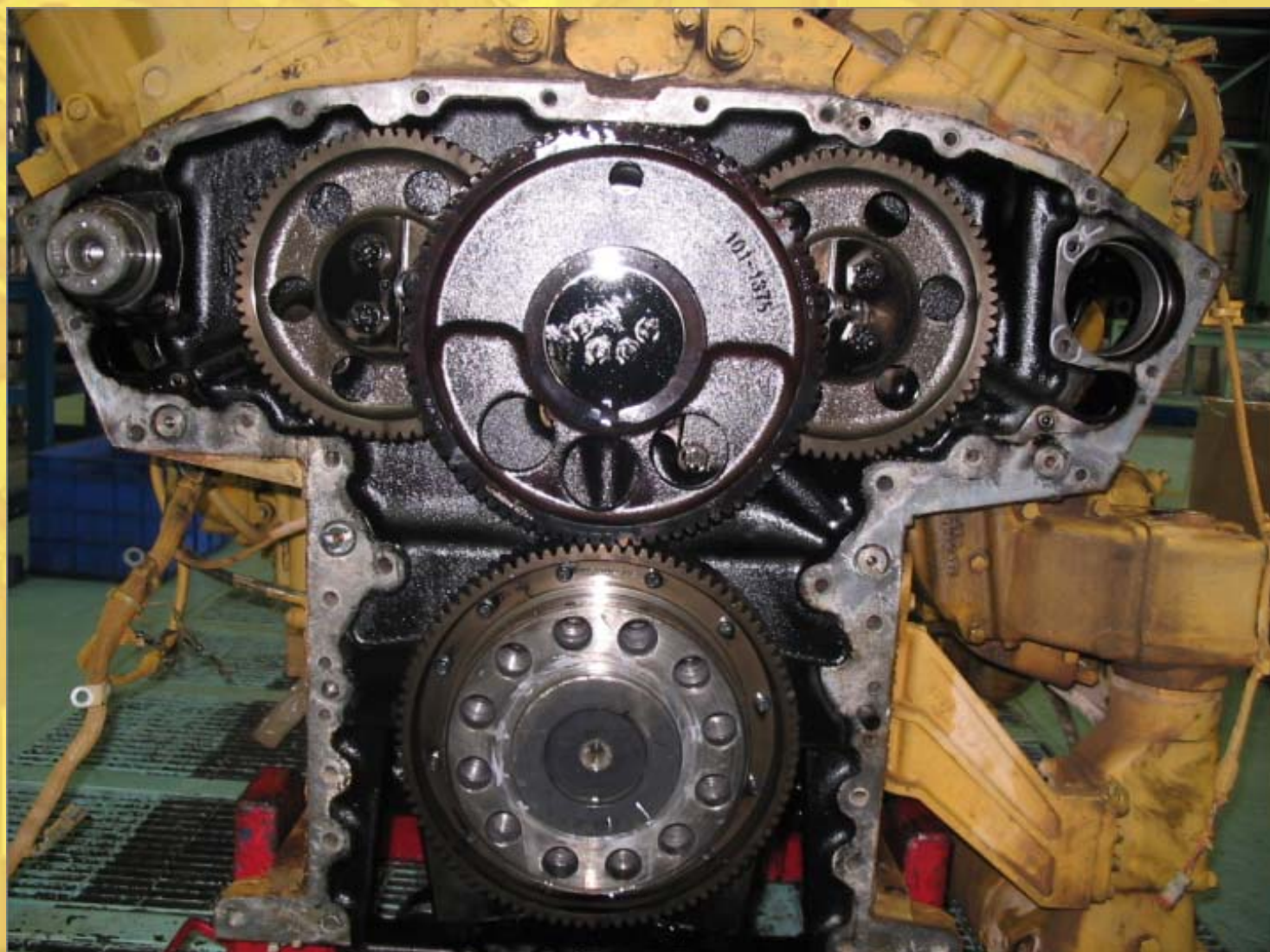








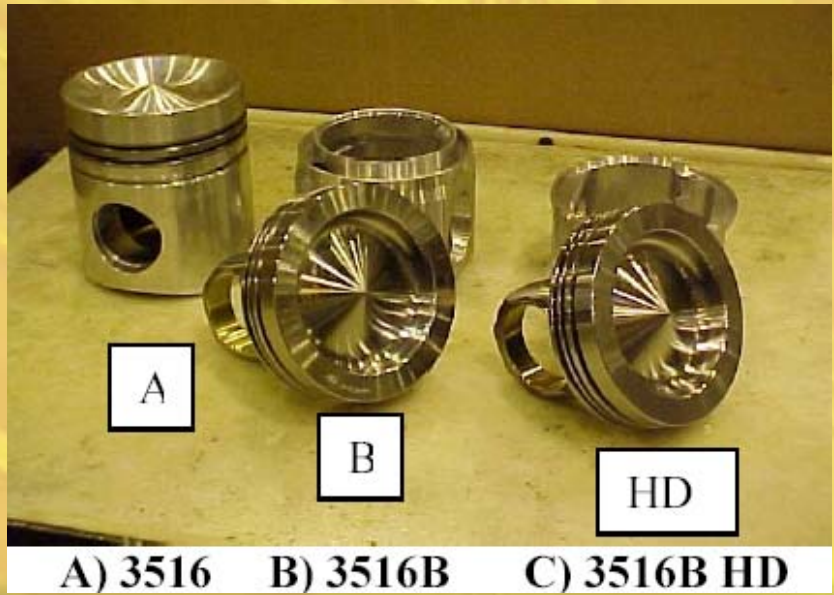
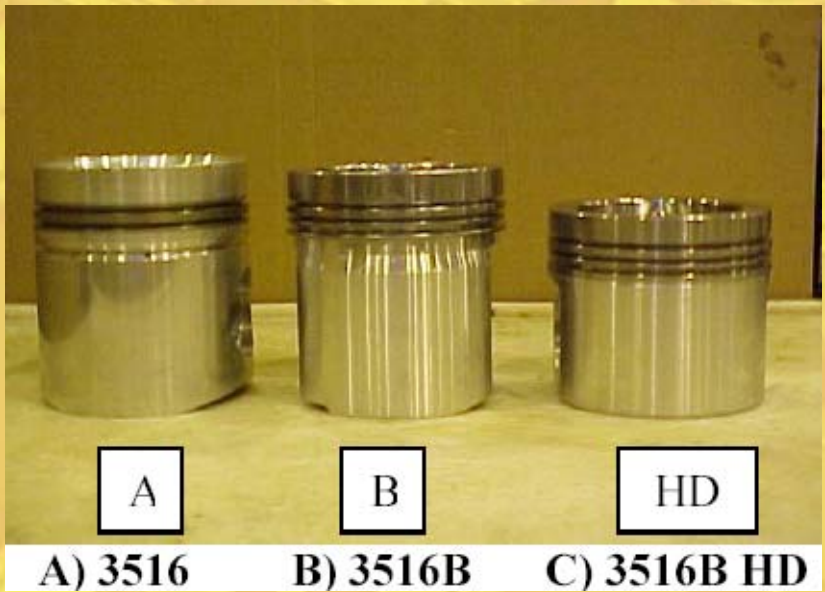








**Camshafts**



Motores 3500

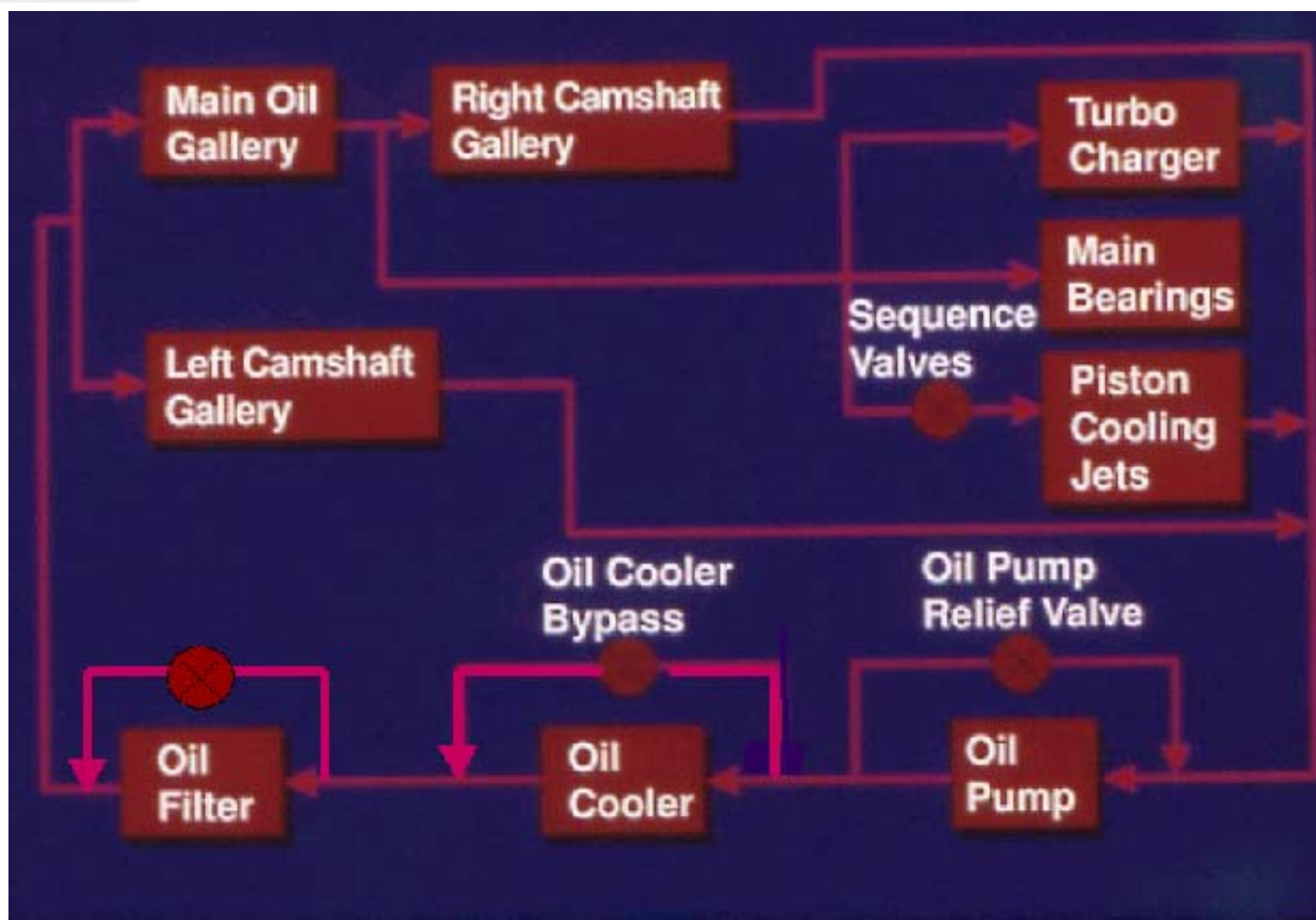
**CAT**<sup>®</sup>

# Sistema de Lubricación

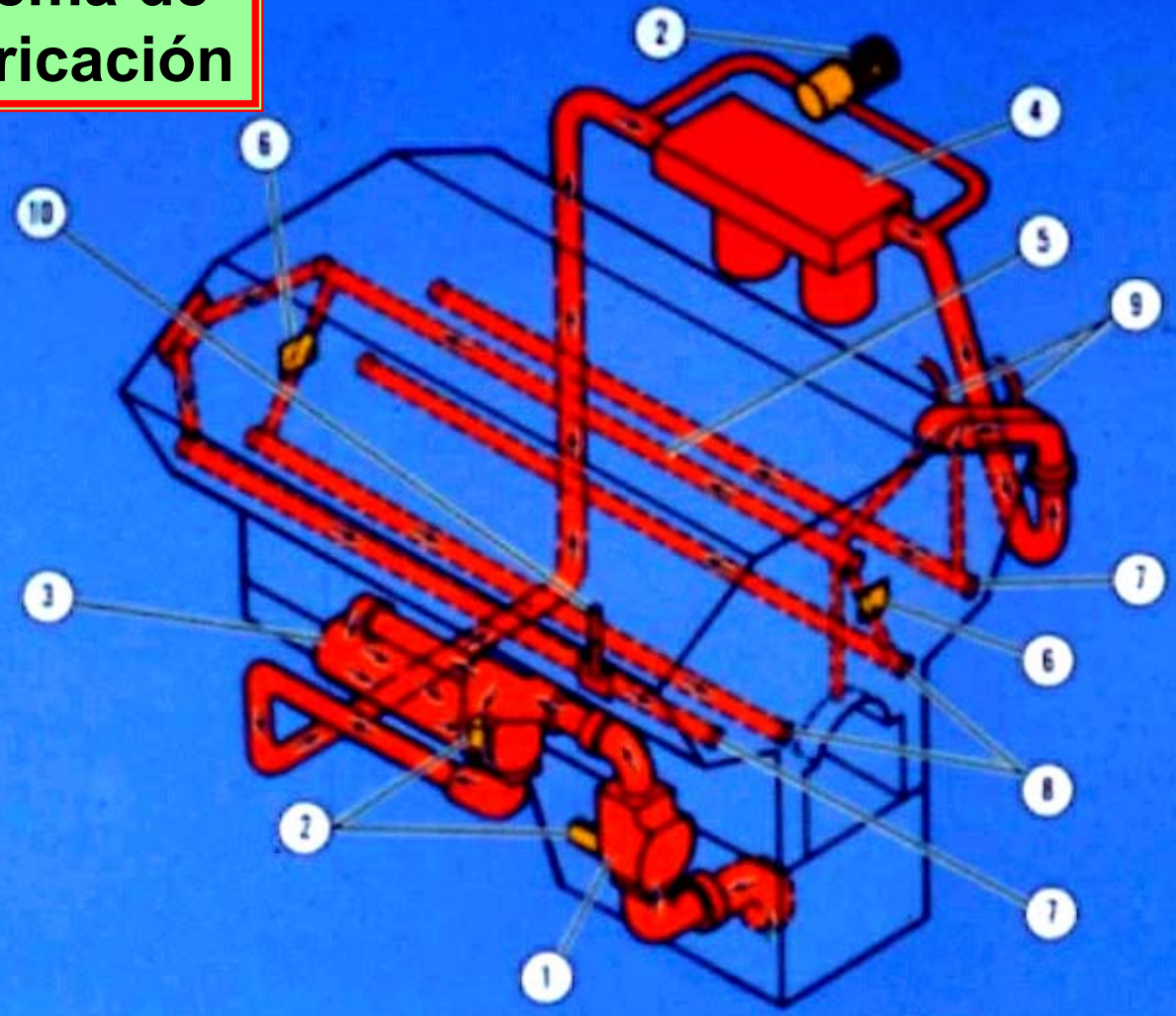






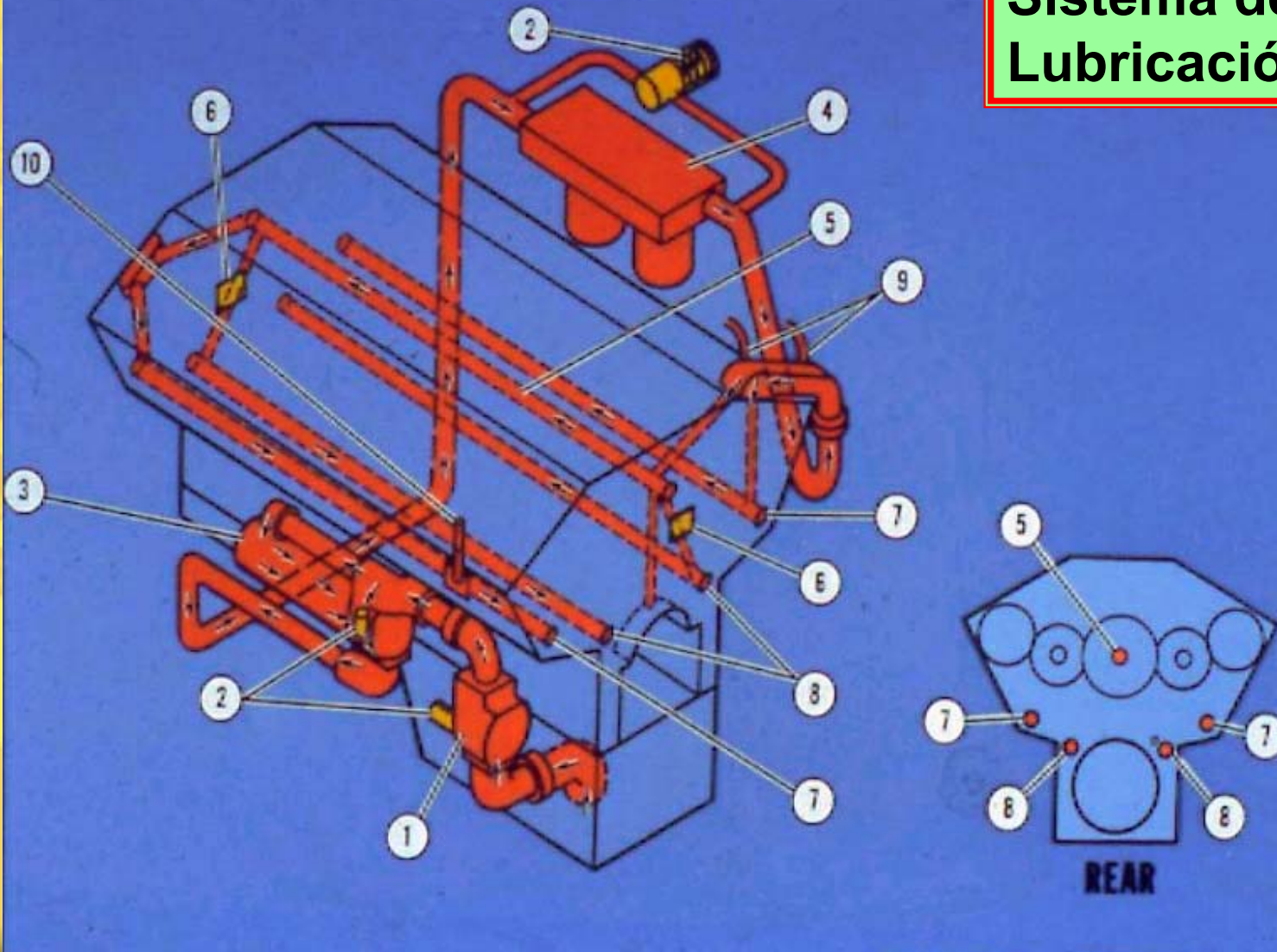


# Sistema de Lubricación

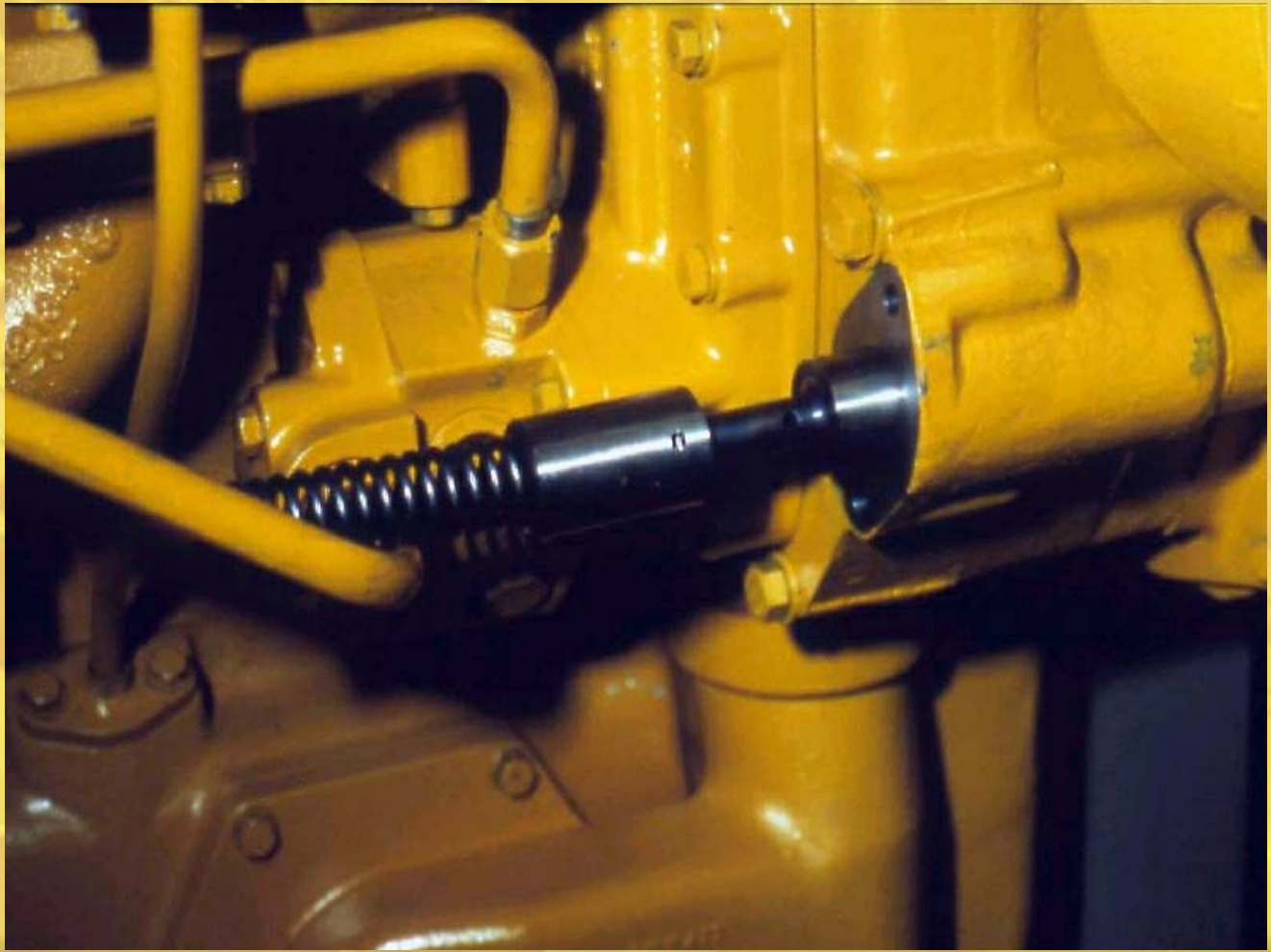




# Sistema de Lubricación

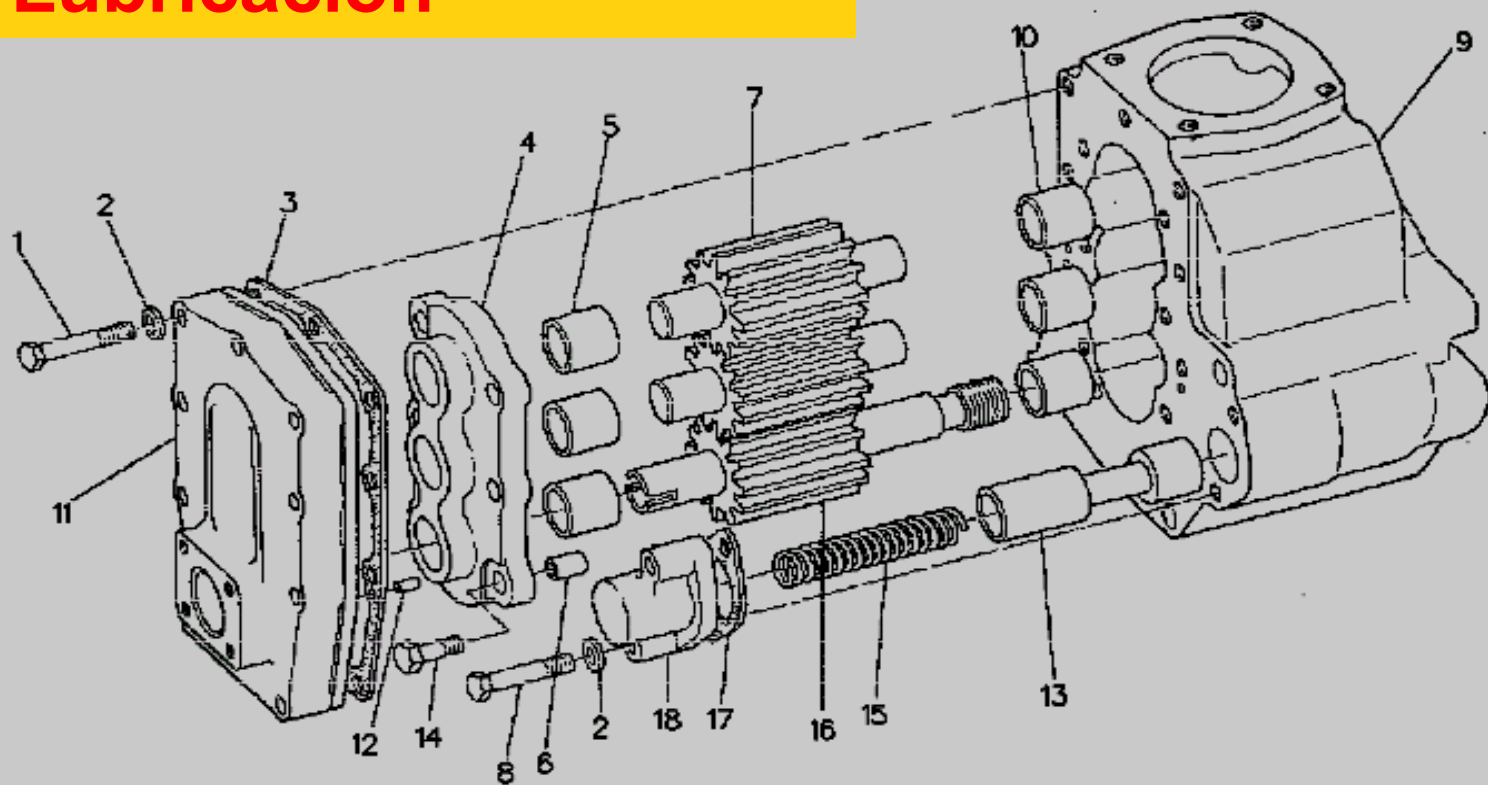


# Válvula de Alivio de Presión

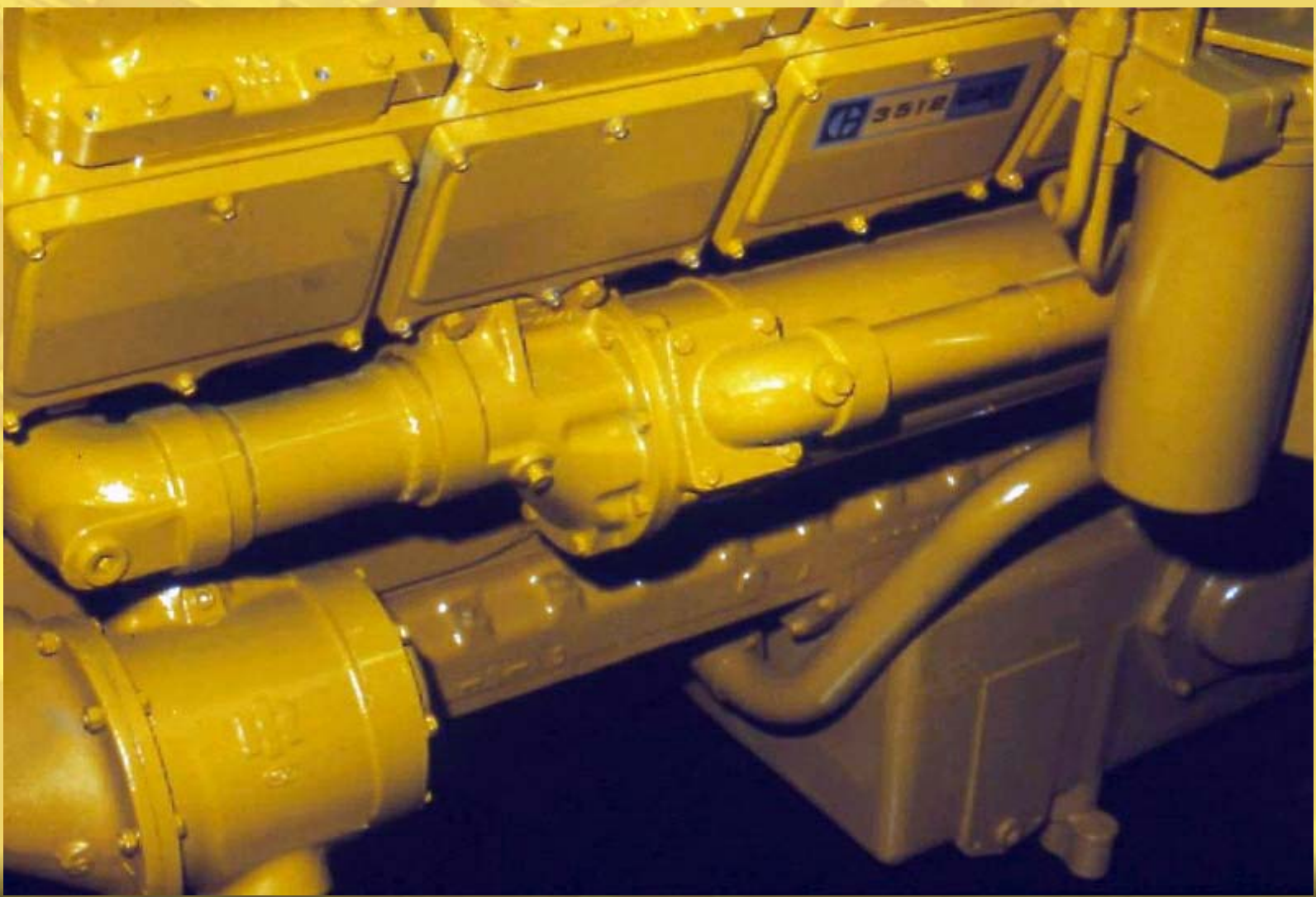




# Bomba de Aceite de Lubricación

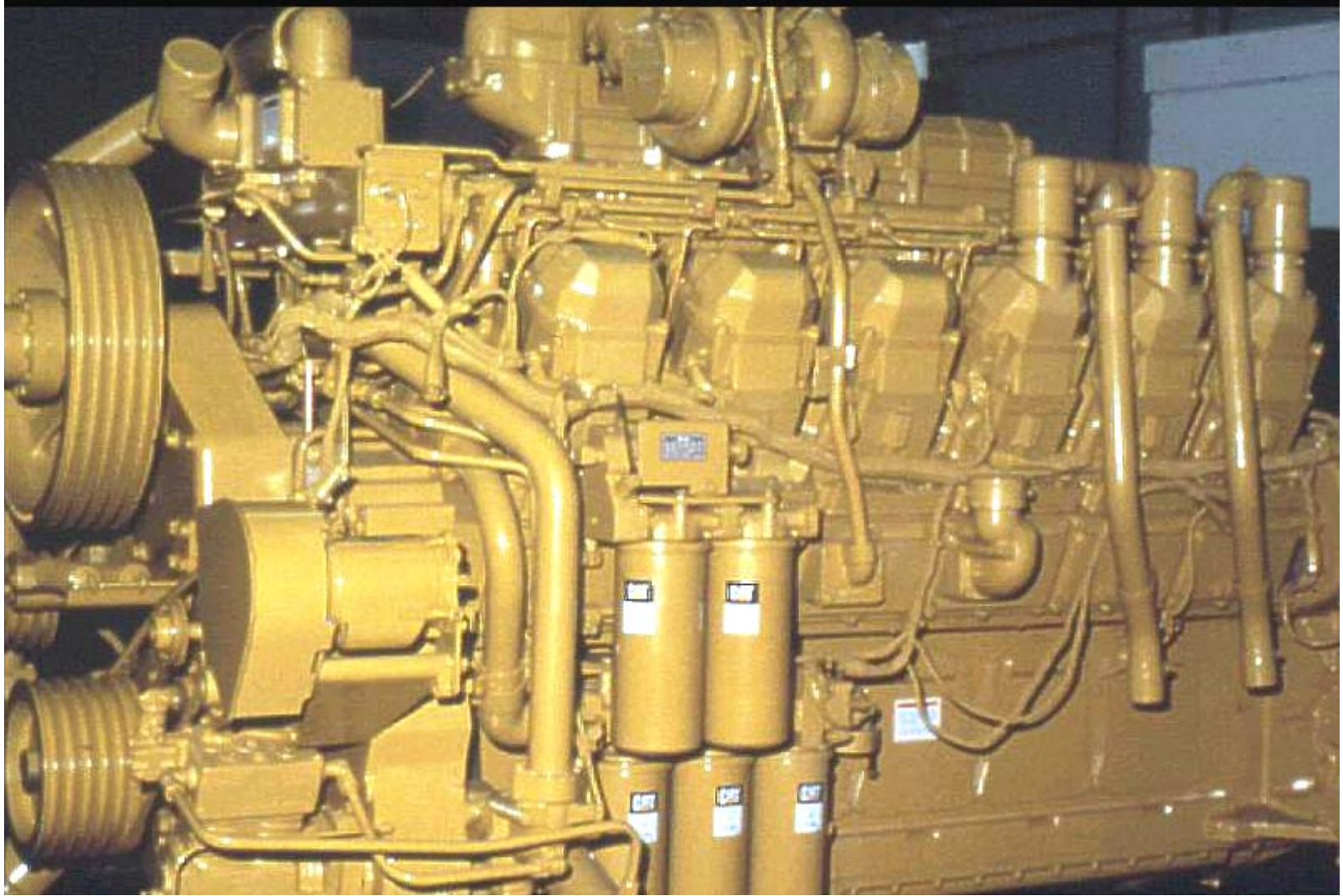


# Enfriador de Aceite



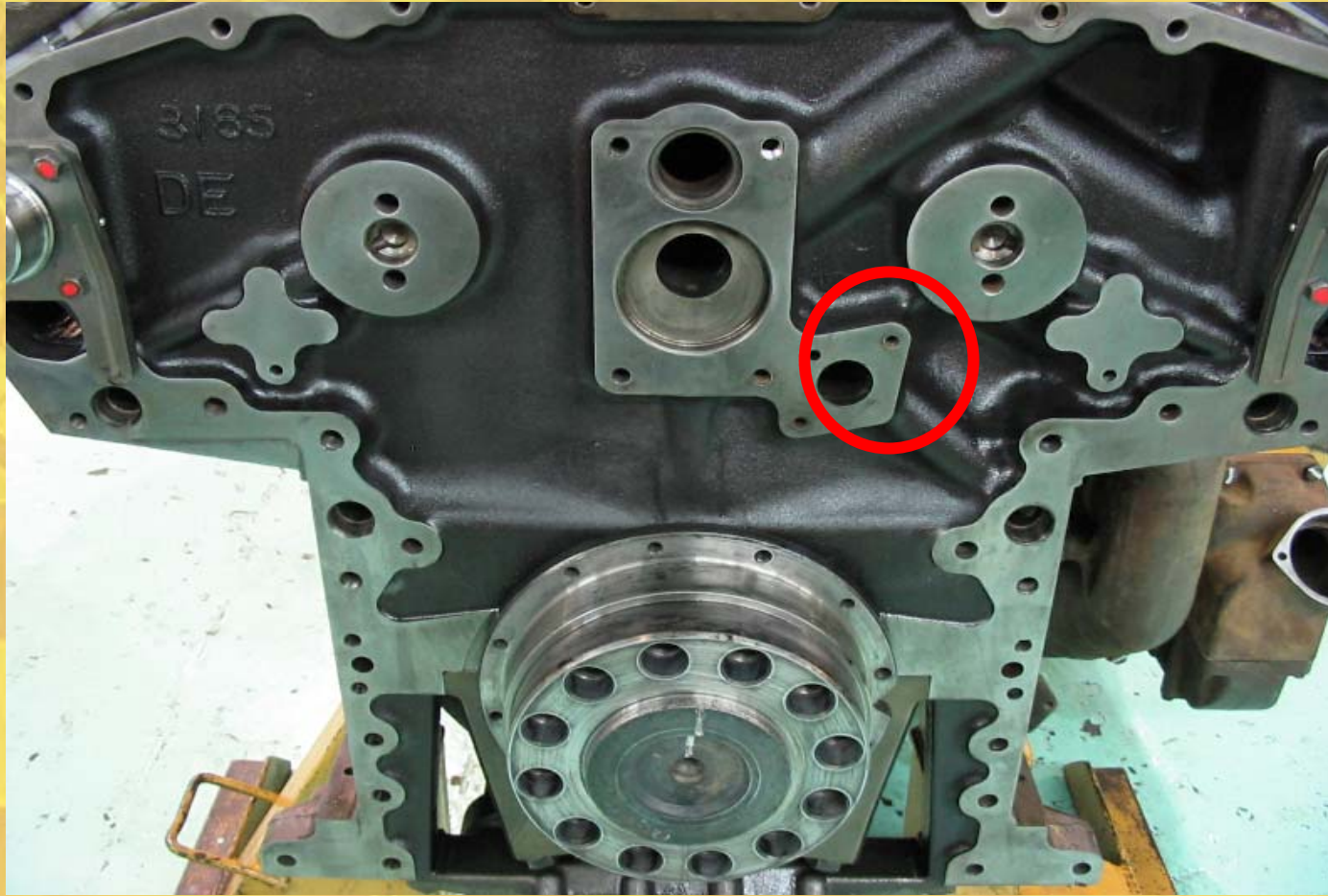




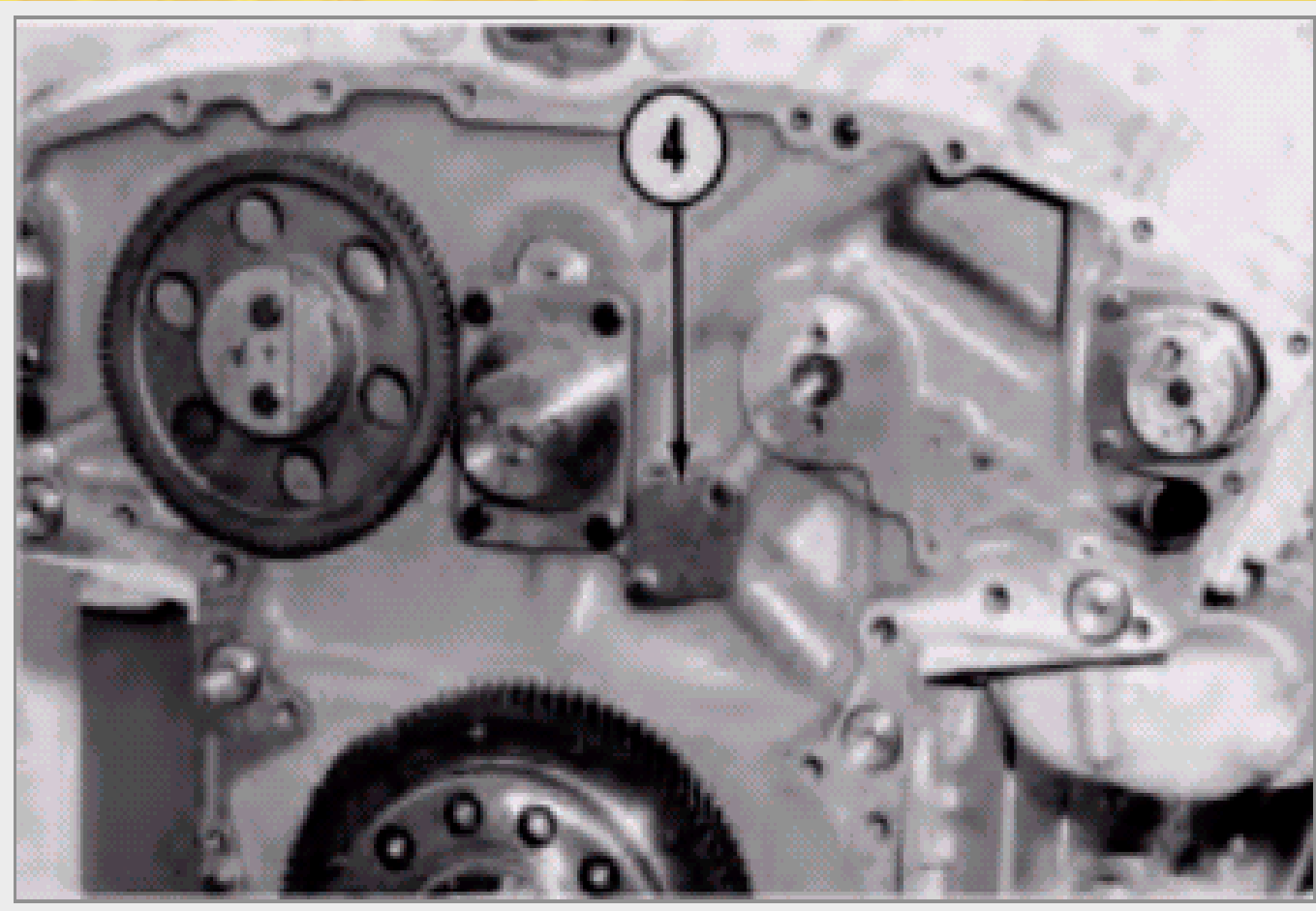




# Alojamiento de la Válvula



# Válvulas de Secuencia





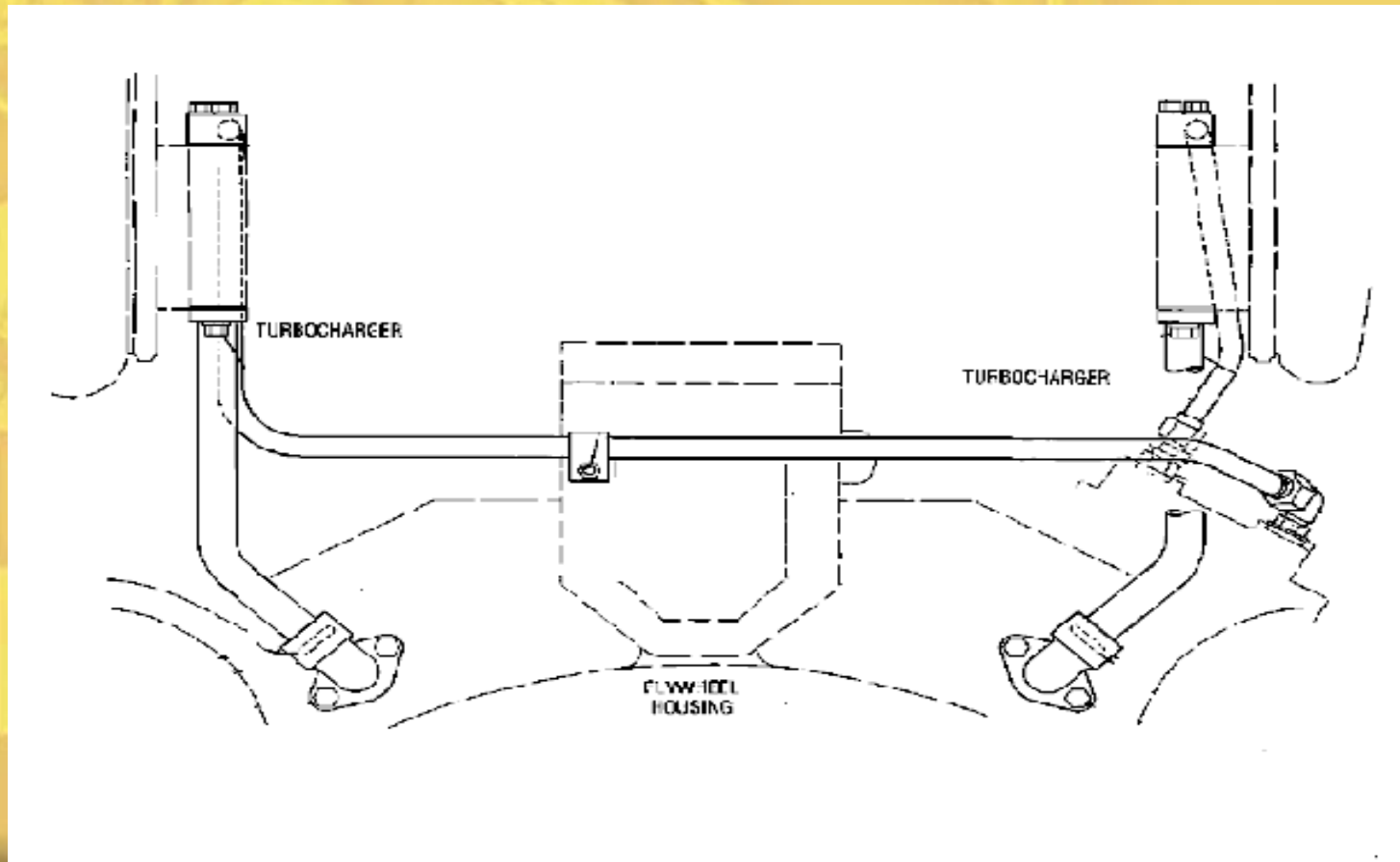
# Válvulas de Secuencia



# Válvulas de Secuencia



# Alimentación y retorno de aceite de Turbocargadores.



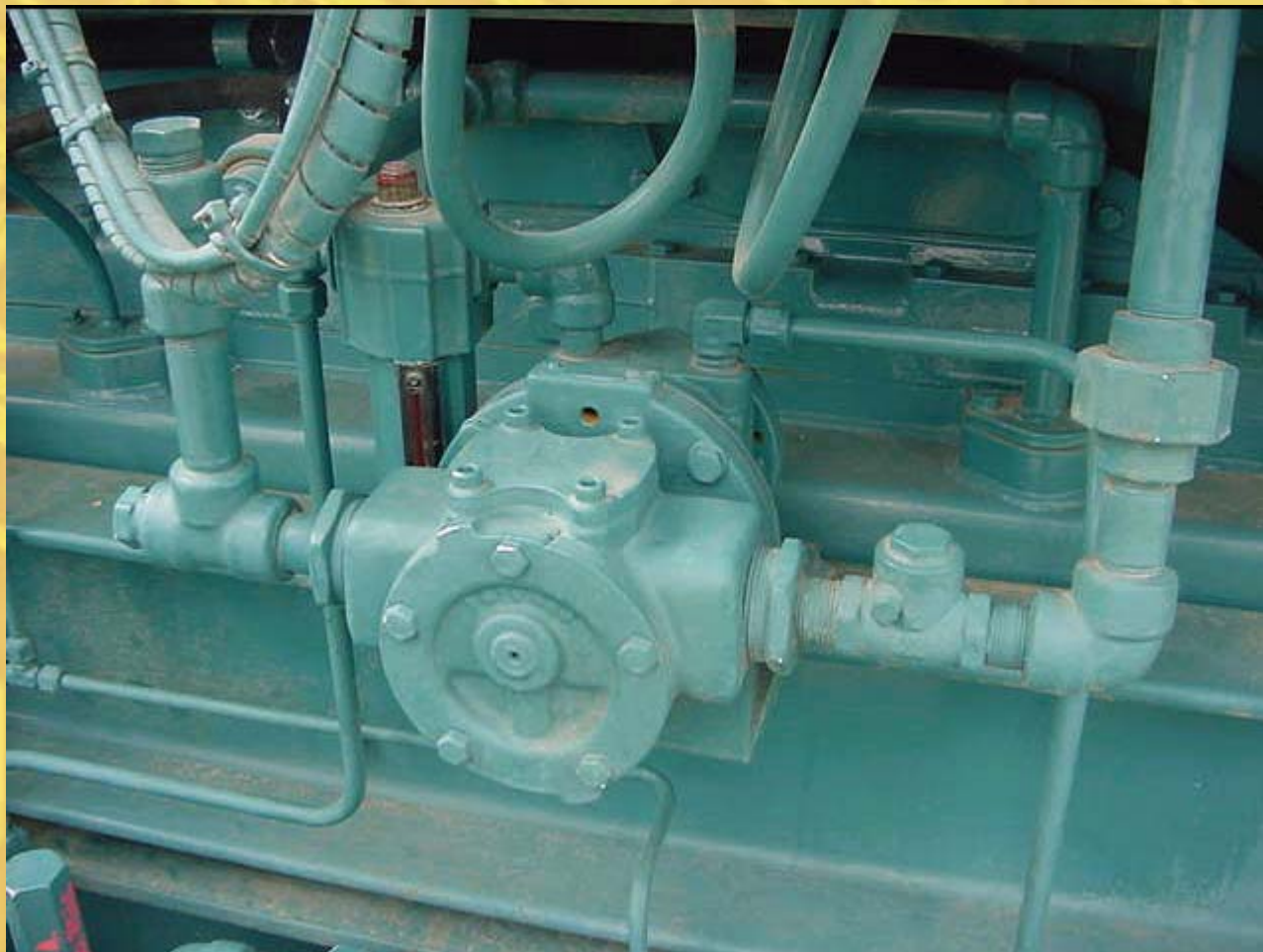


# Montaje de los turbo alimentadores





# Bomba de Pre y Pos lubricación



Motores 3500

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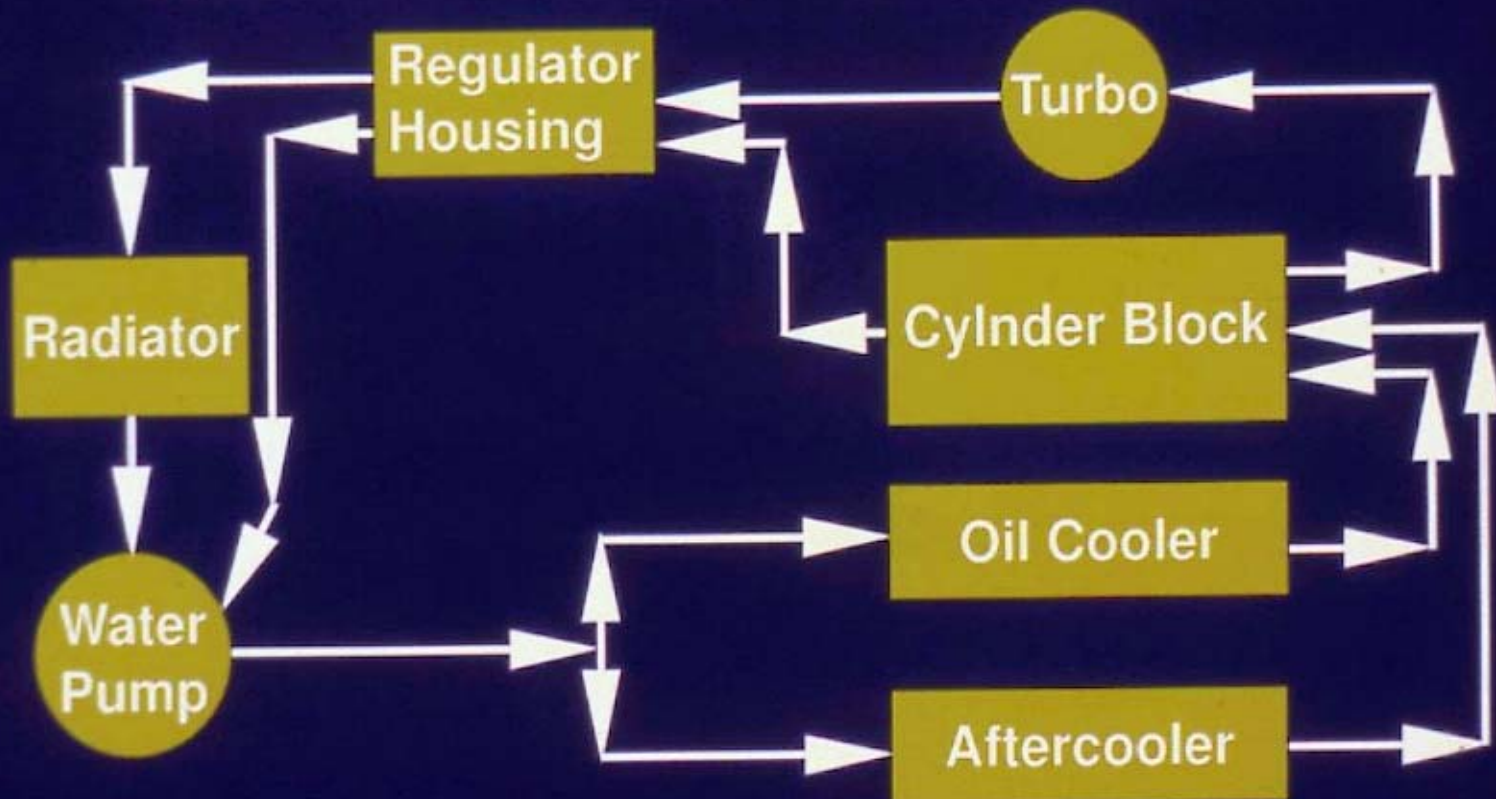
# Sistema de Refrigeración

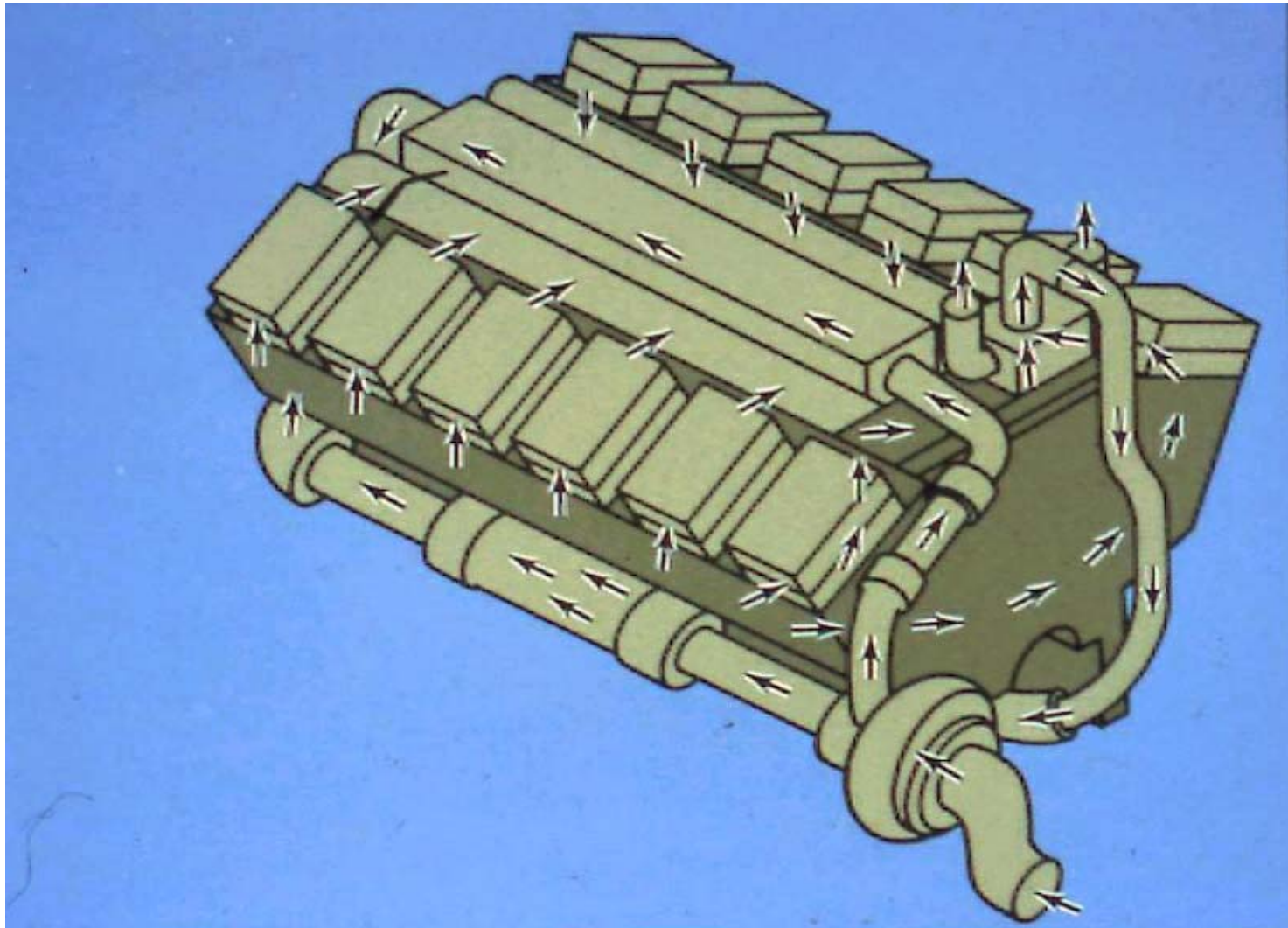


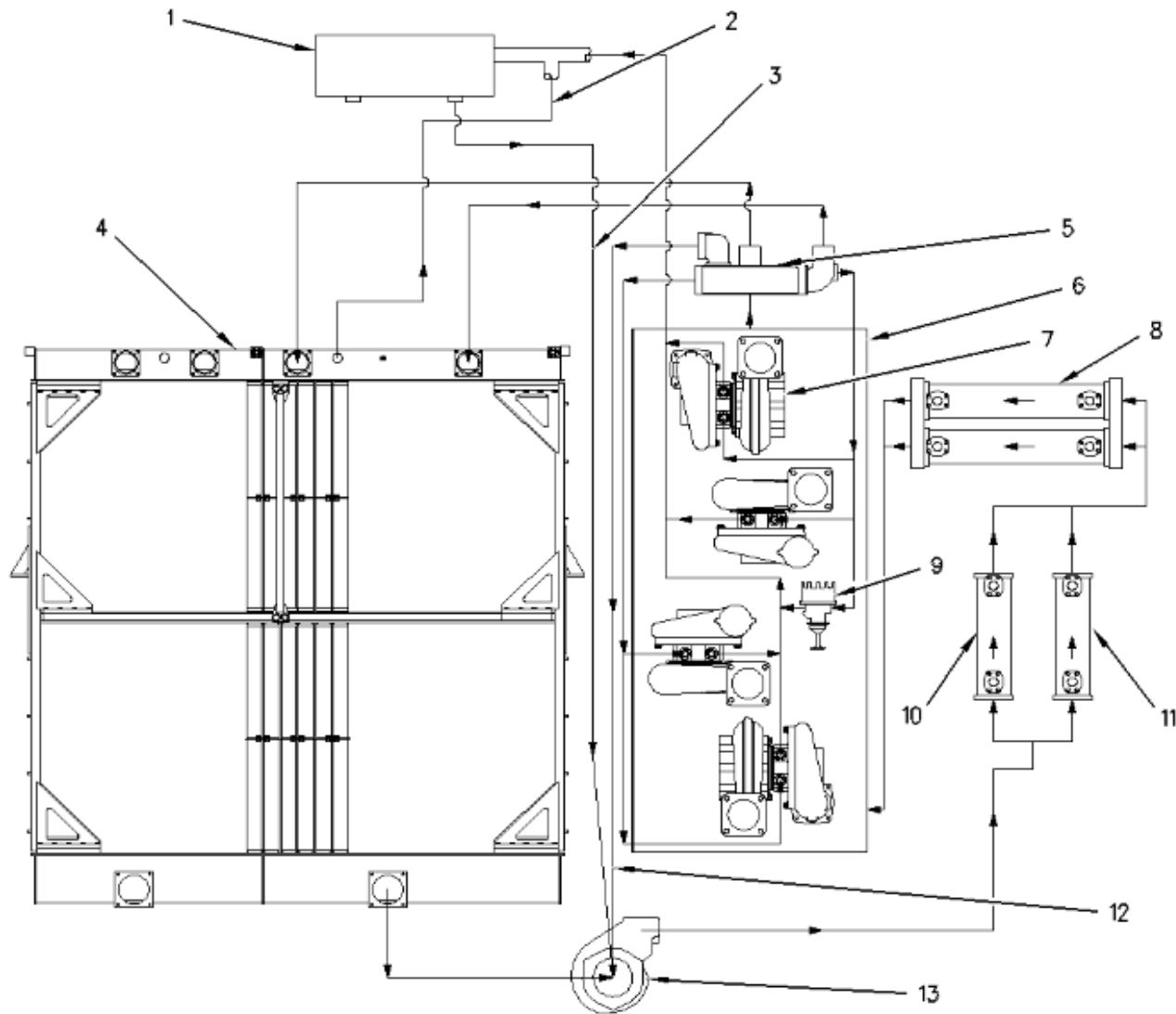




# Jacket Water Aftercooler



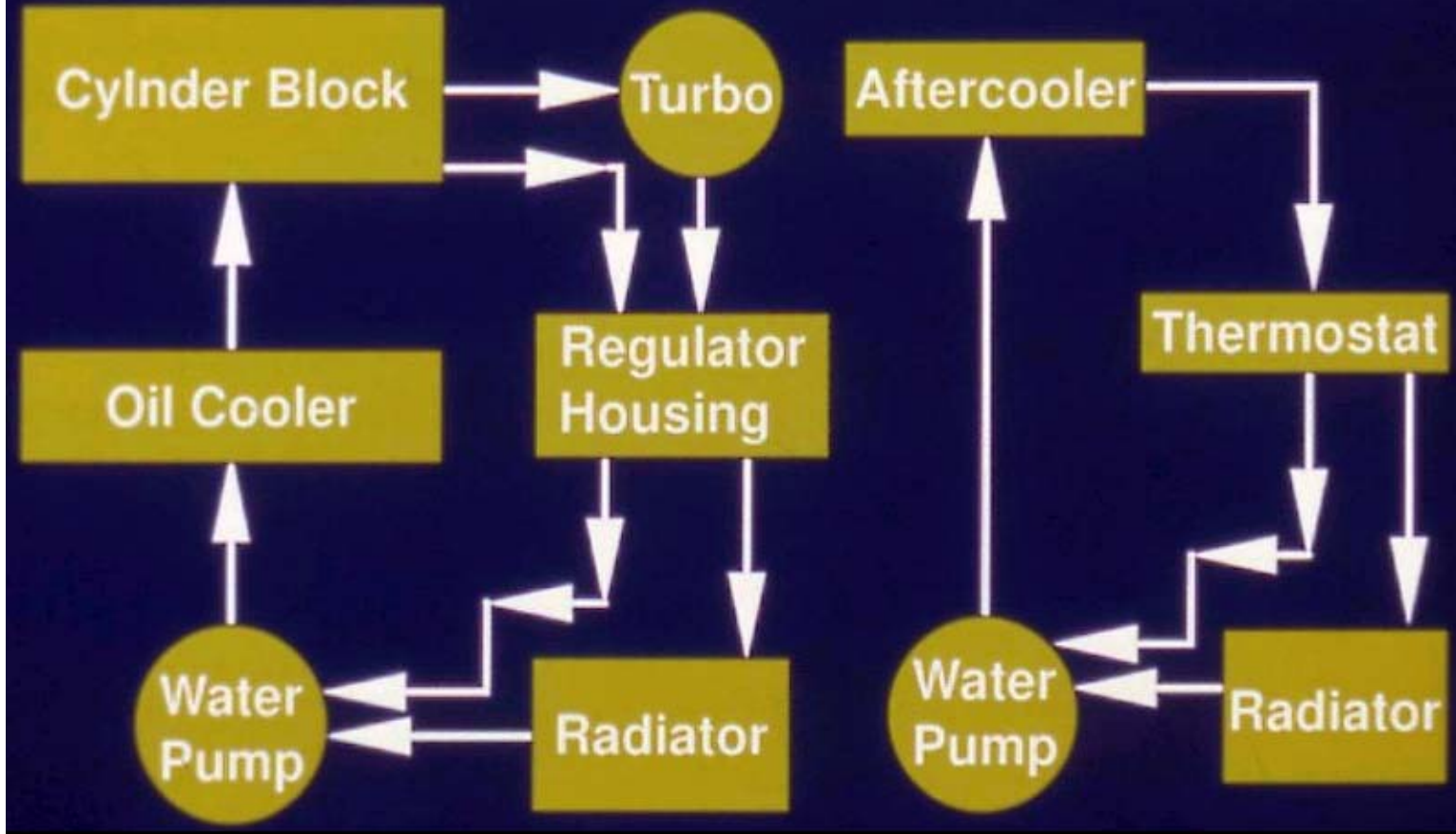


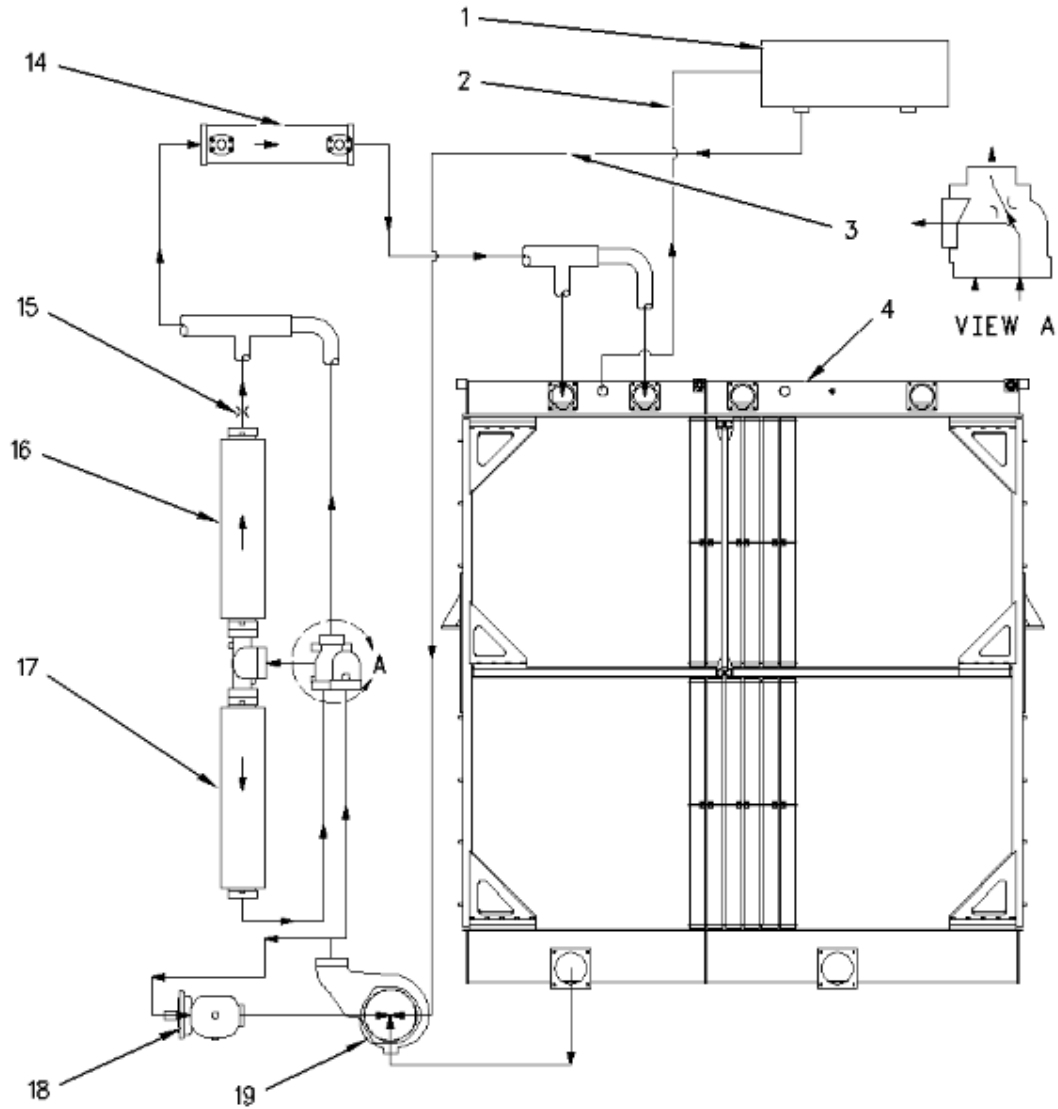


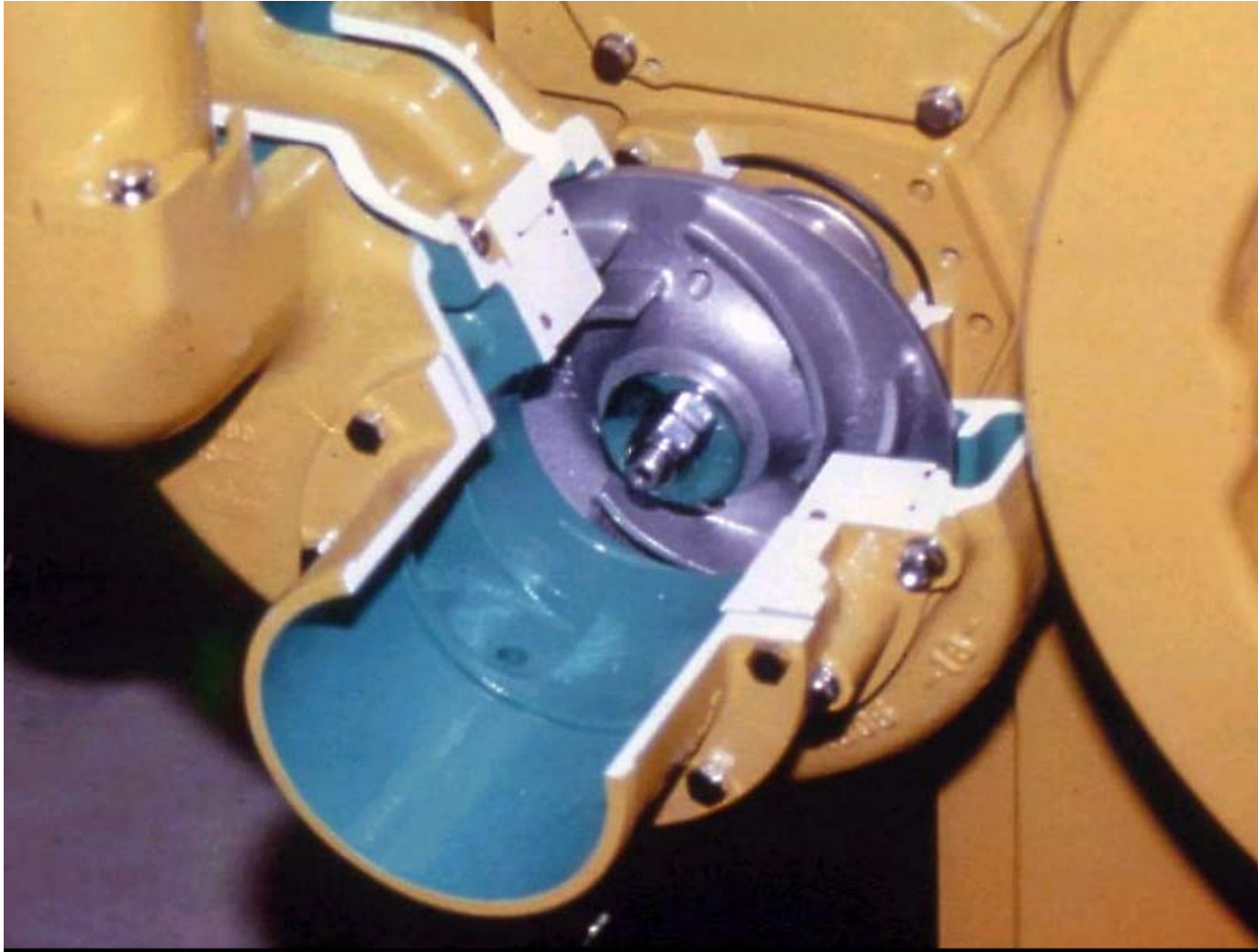




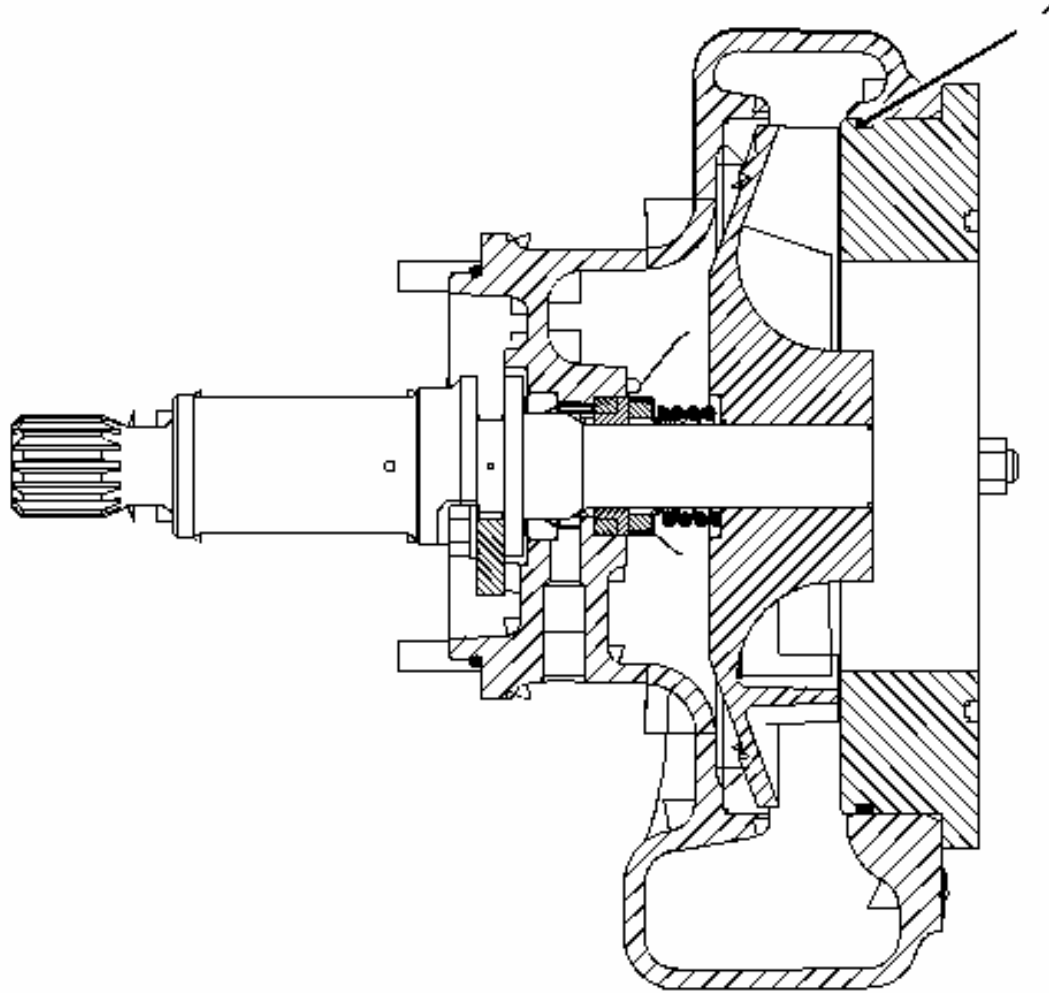
# Separate Circuit Aftercooler

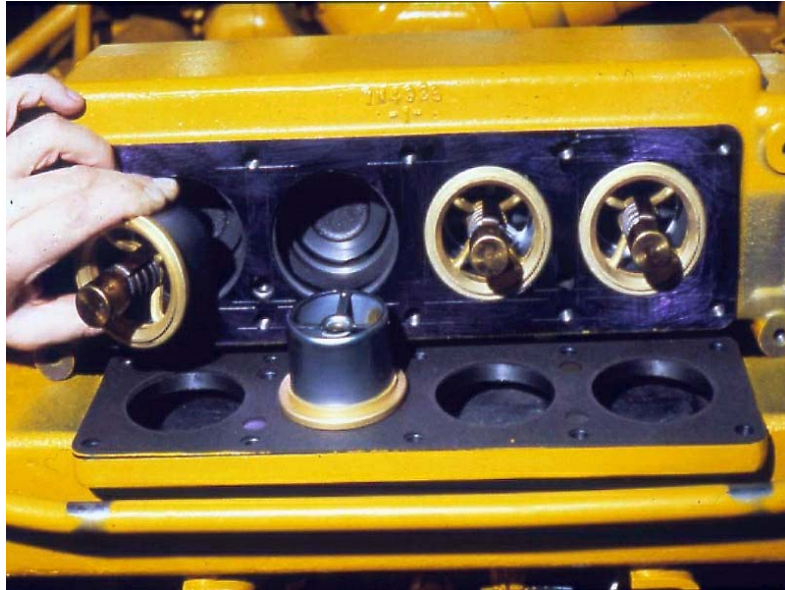








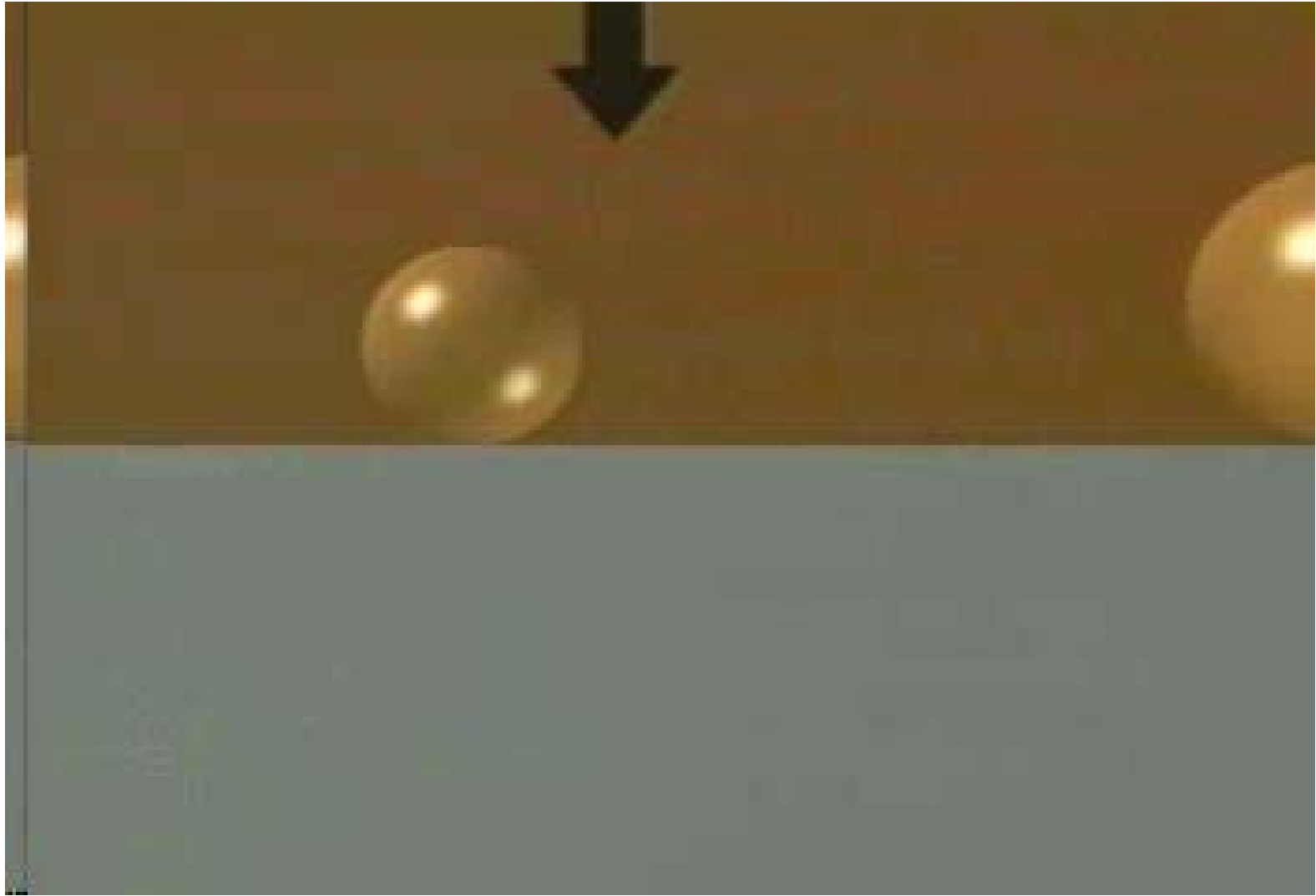




# Aditivo Suplementario









1. Se producen burbujas.



2. Comienza la desintegración.



3. La implosión disipa energía a la pared del cilindro, sacando la película de óxido.

4. Con el tiempo, se producen erosión y picaduras si no se usa aditivo.

Efectos acumulativos de la cavitación y de las picaduras en la pared del cilindro.

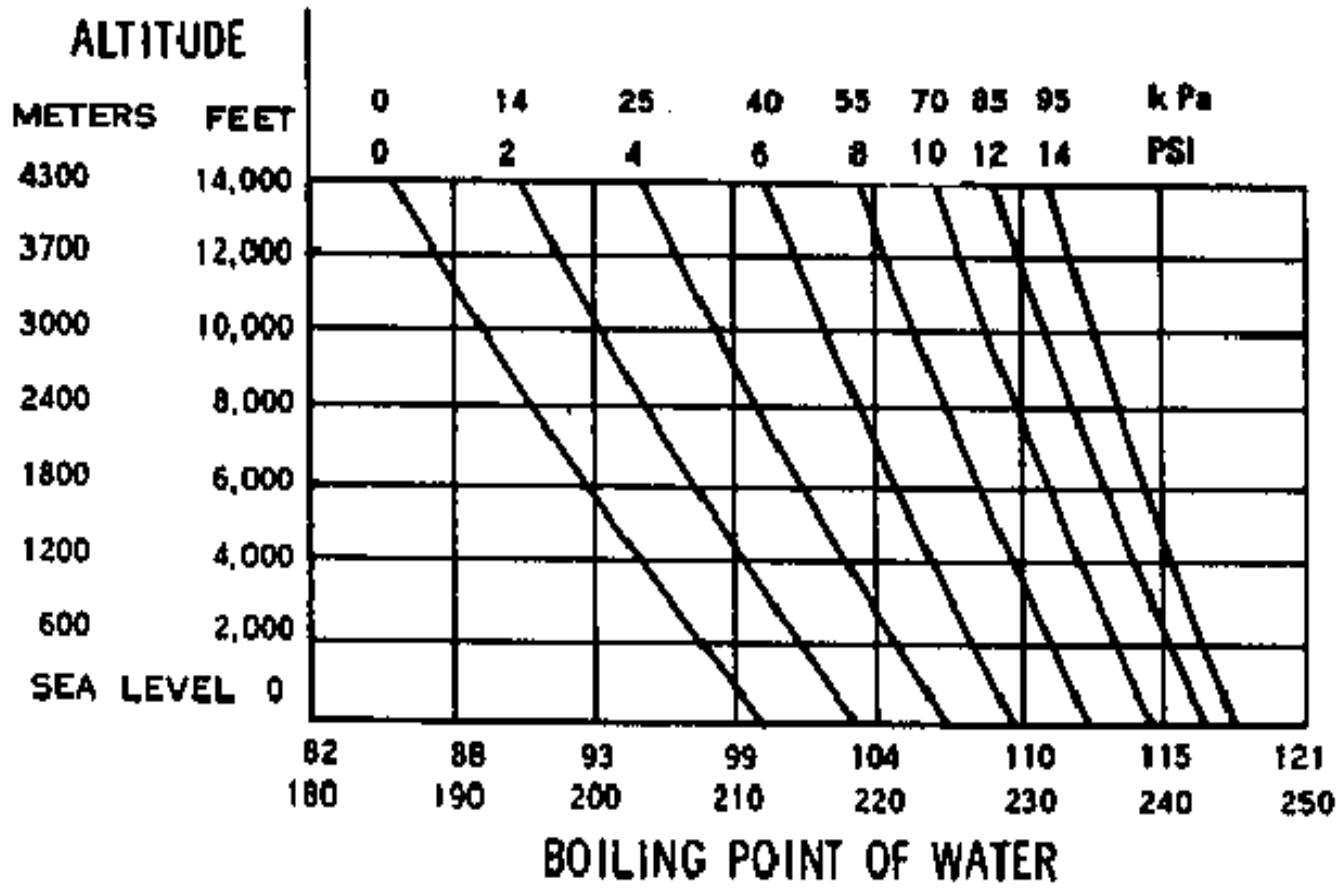


Con el tiempo, una picadura puede penetrar la pared del cilindro y permitir fugas de refrigerante en el mismo.





### COOLING SYSTEM PRESSURE









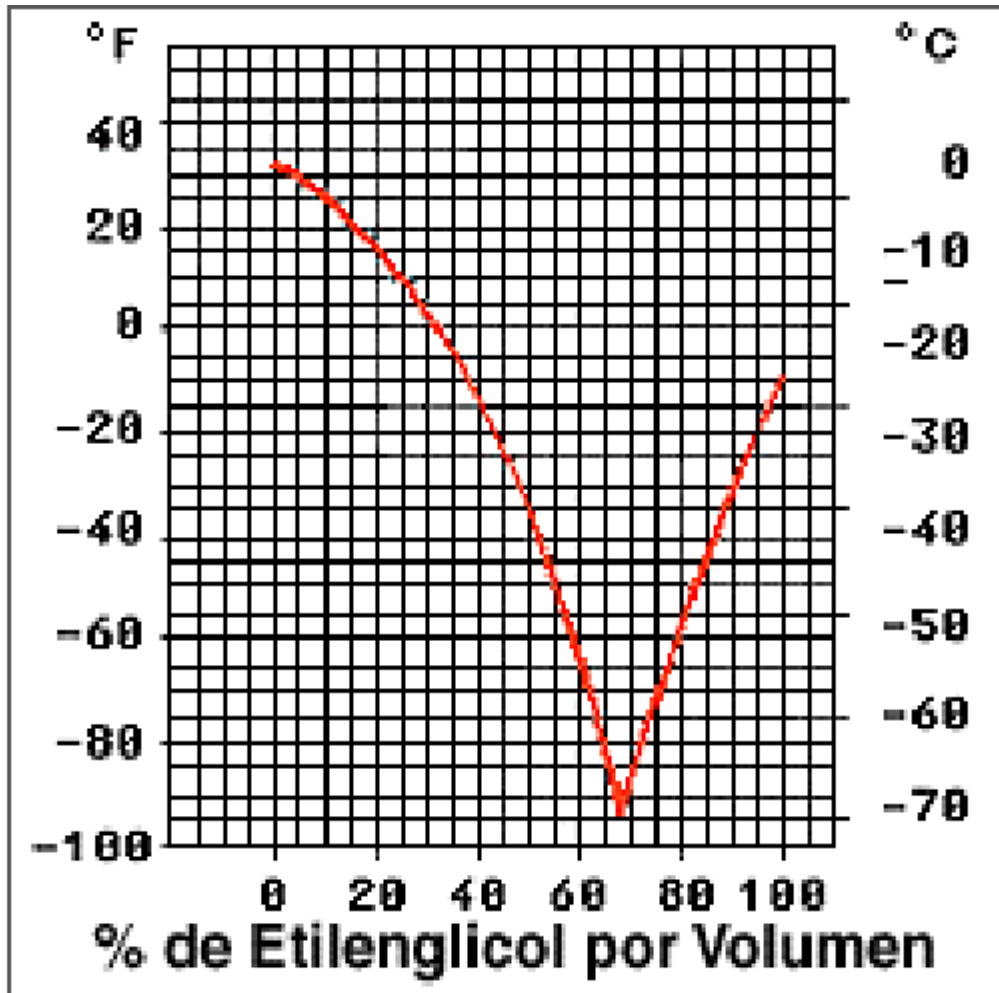


**Capacidad del Sistema (galones o cuartos)**

6	5	-34					
7		-18	-54				
8		-7	-34				
9		0	-20	-47			
10		5	-12	-34	-62		
11			-5	-22	-44		
12			0	-16	-34	-56	
	2	3	4	5	6	7	8

**Concentración del Anticongelante (galones o cuartos)**

**Tabla de Protección del Anticongelante**



**Curva del Punto de Congelación**







# Salida del refrigerante del turbocargador



Motores 3500

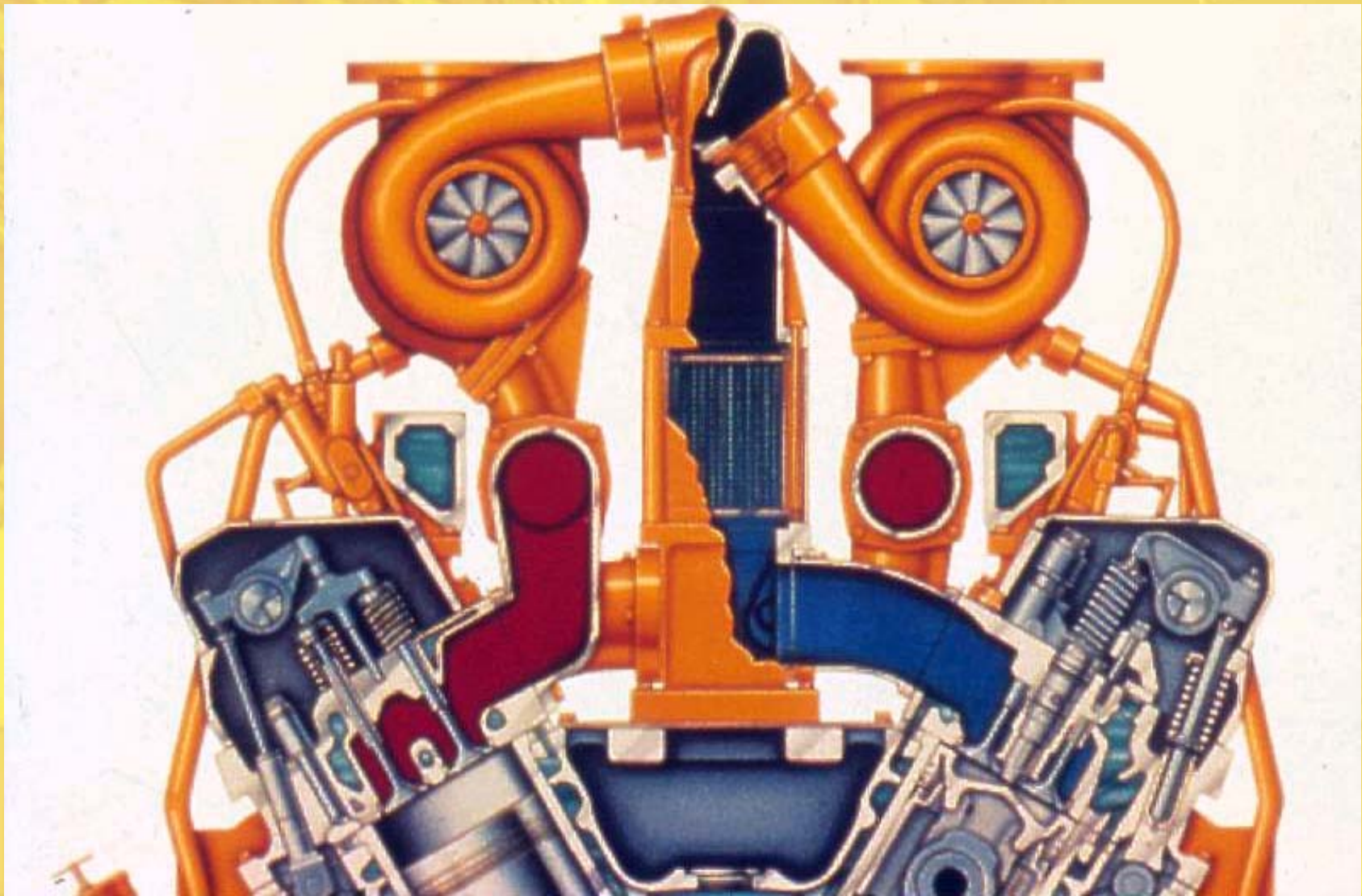
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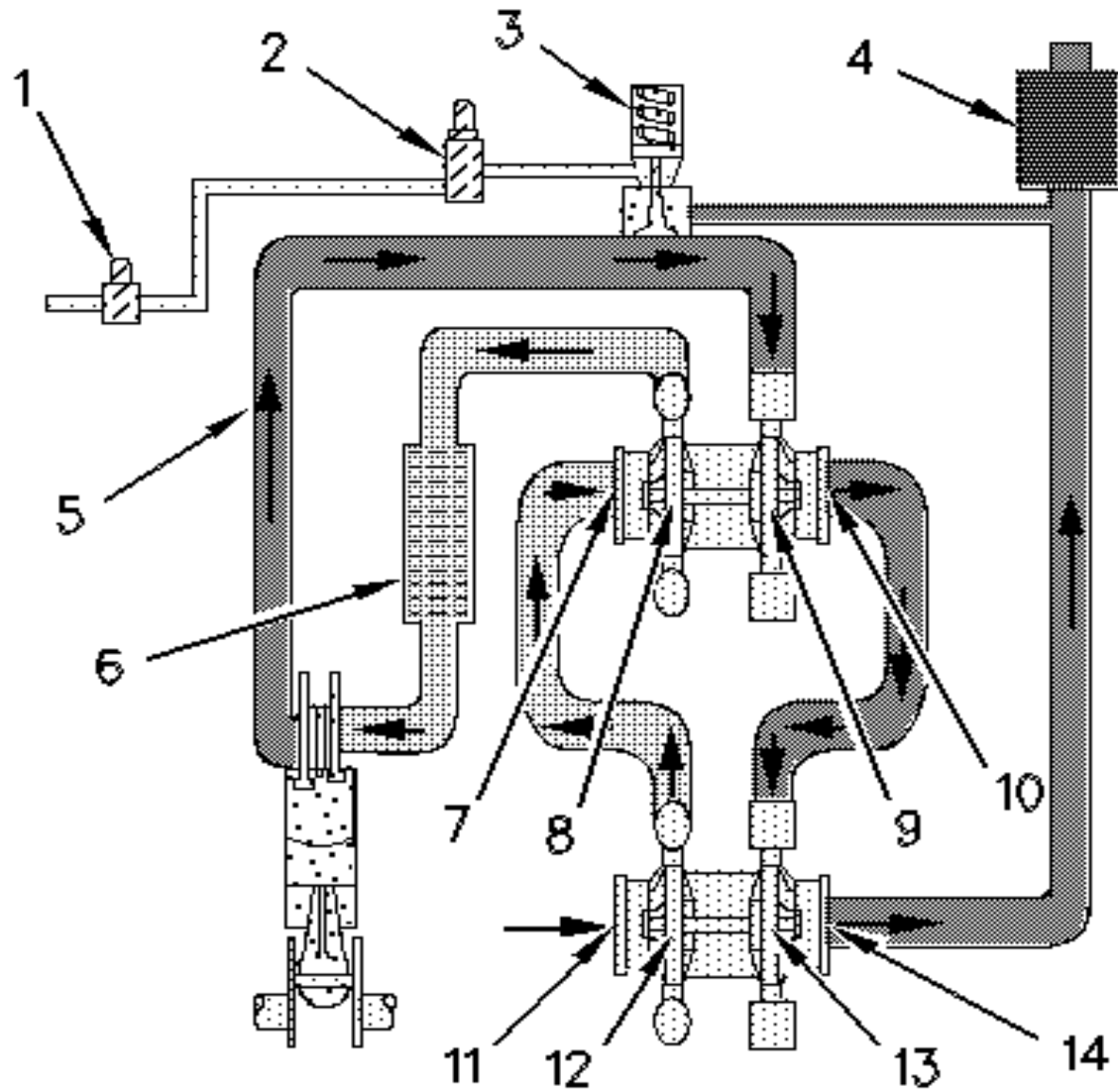




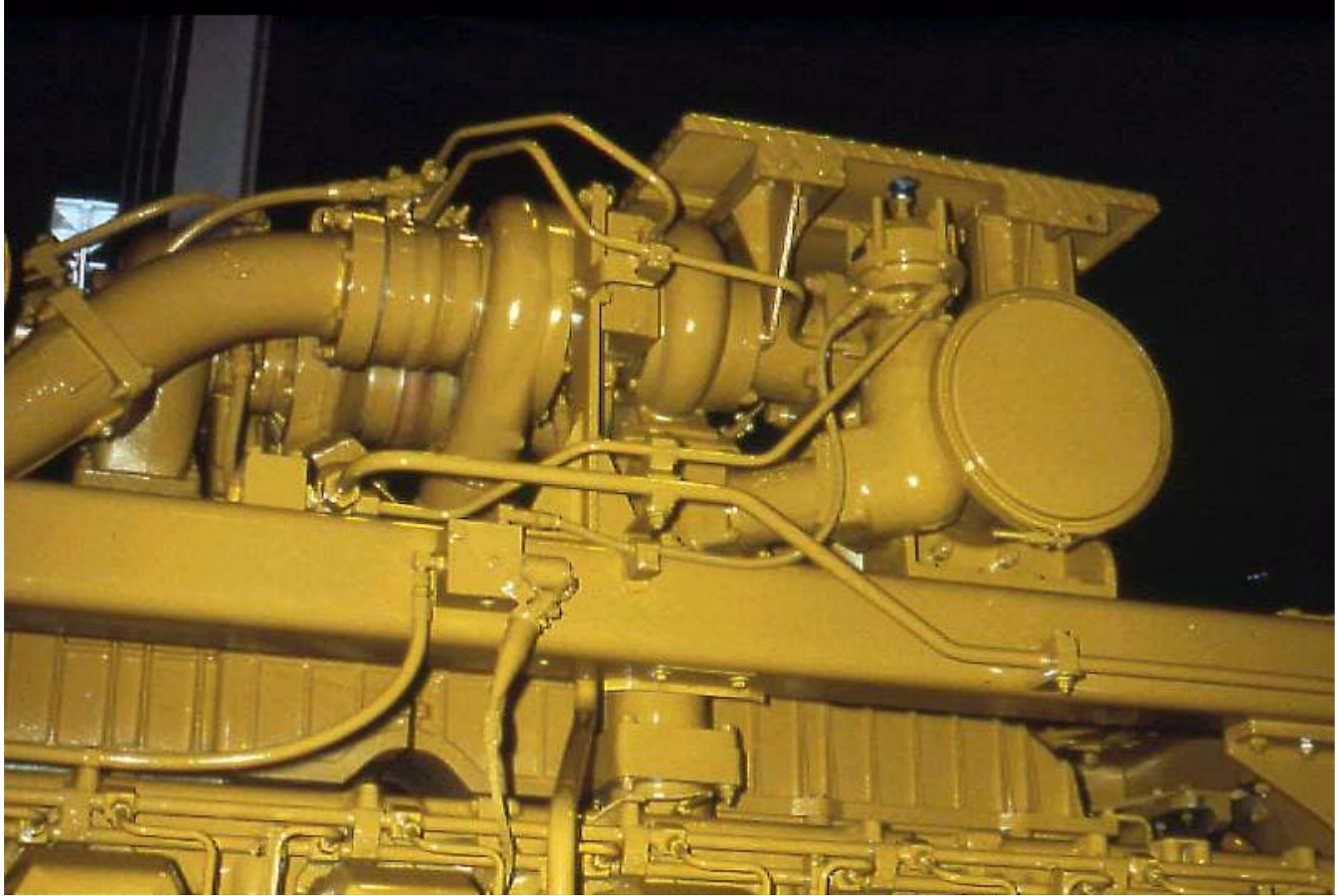
# Sistema de Admisión





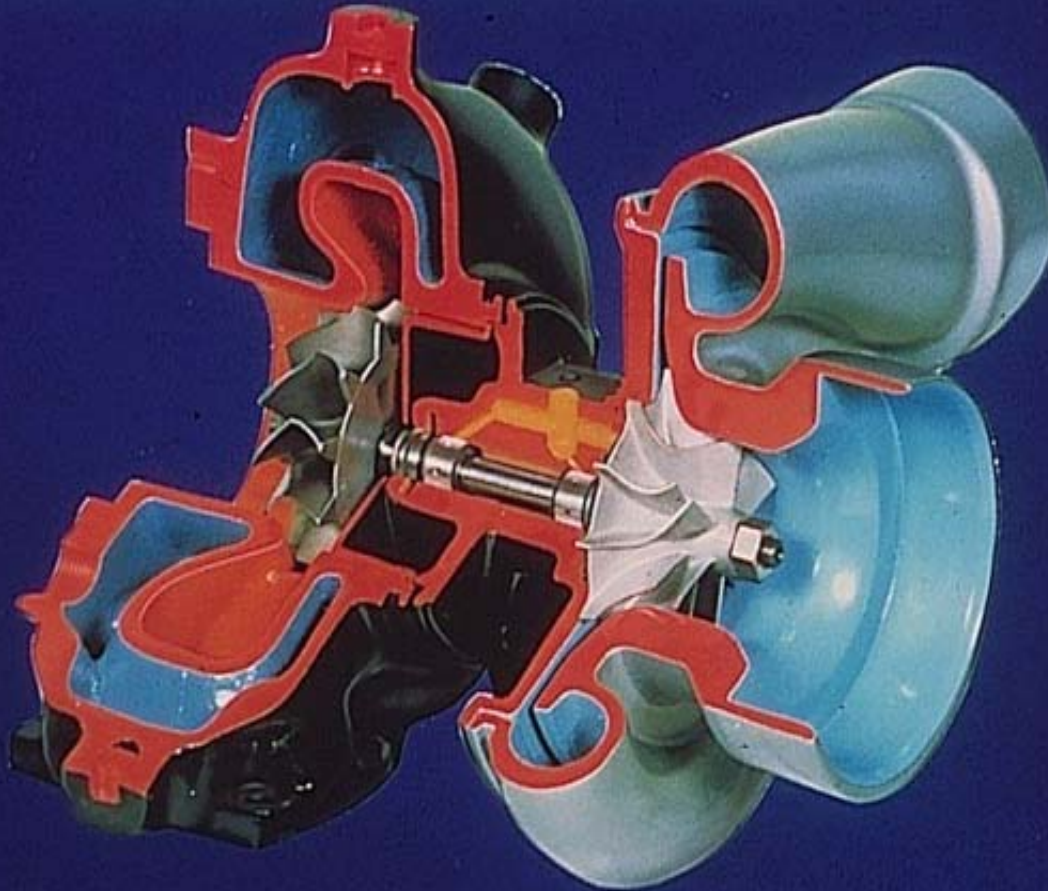








## WATERCOOLED TURBOCHARGER







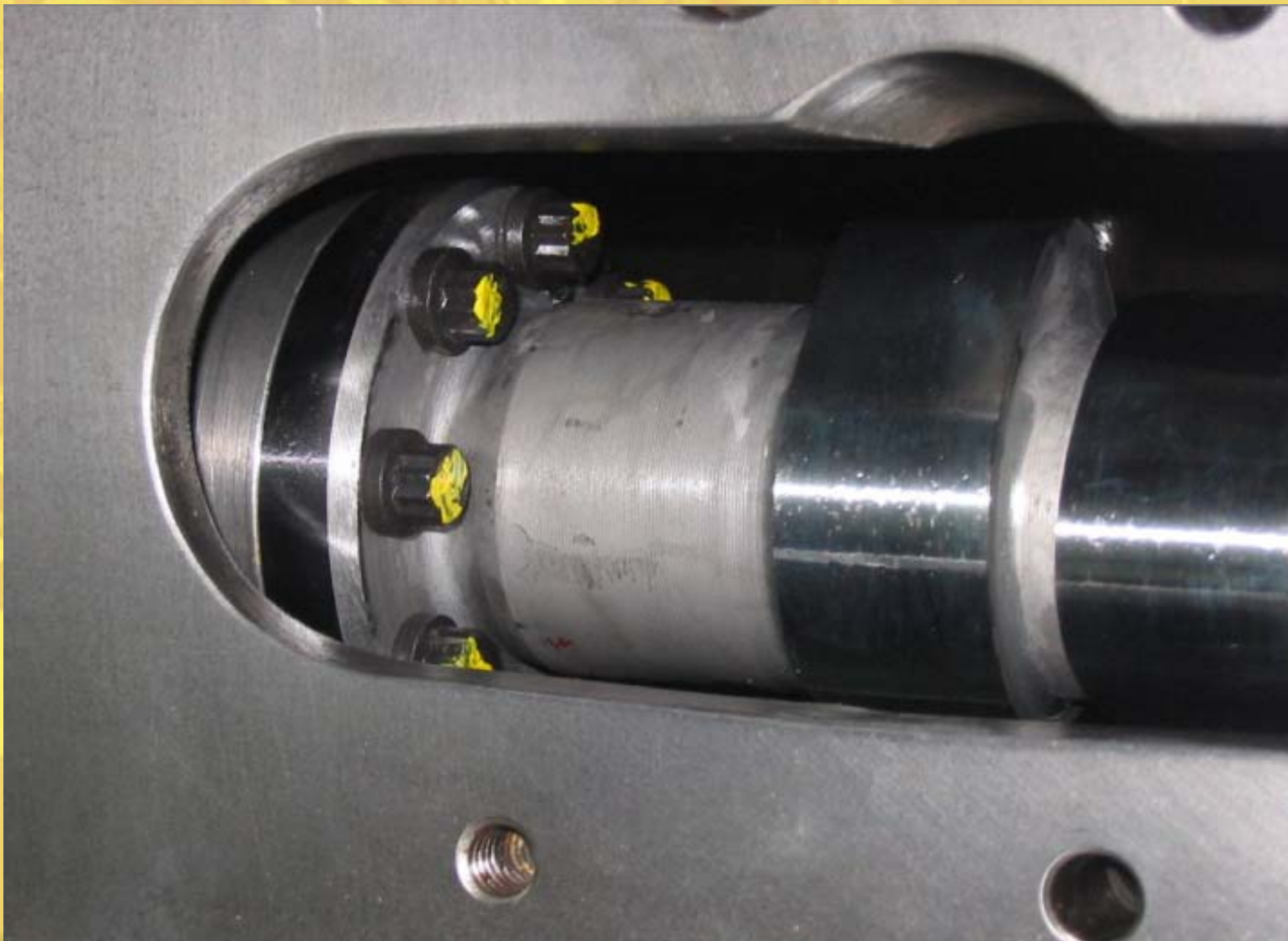






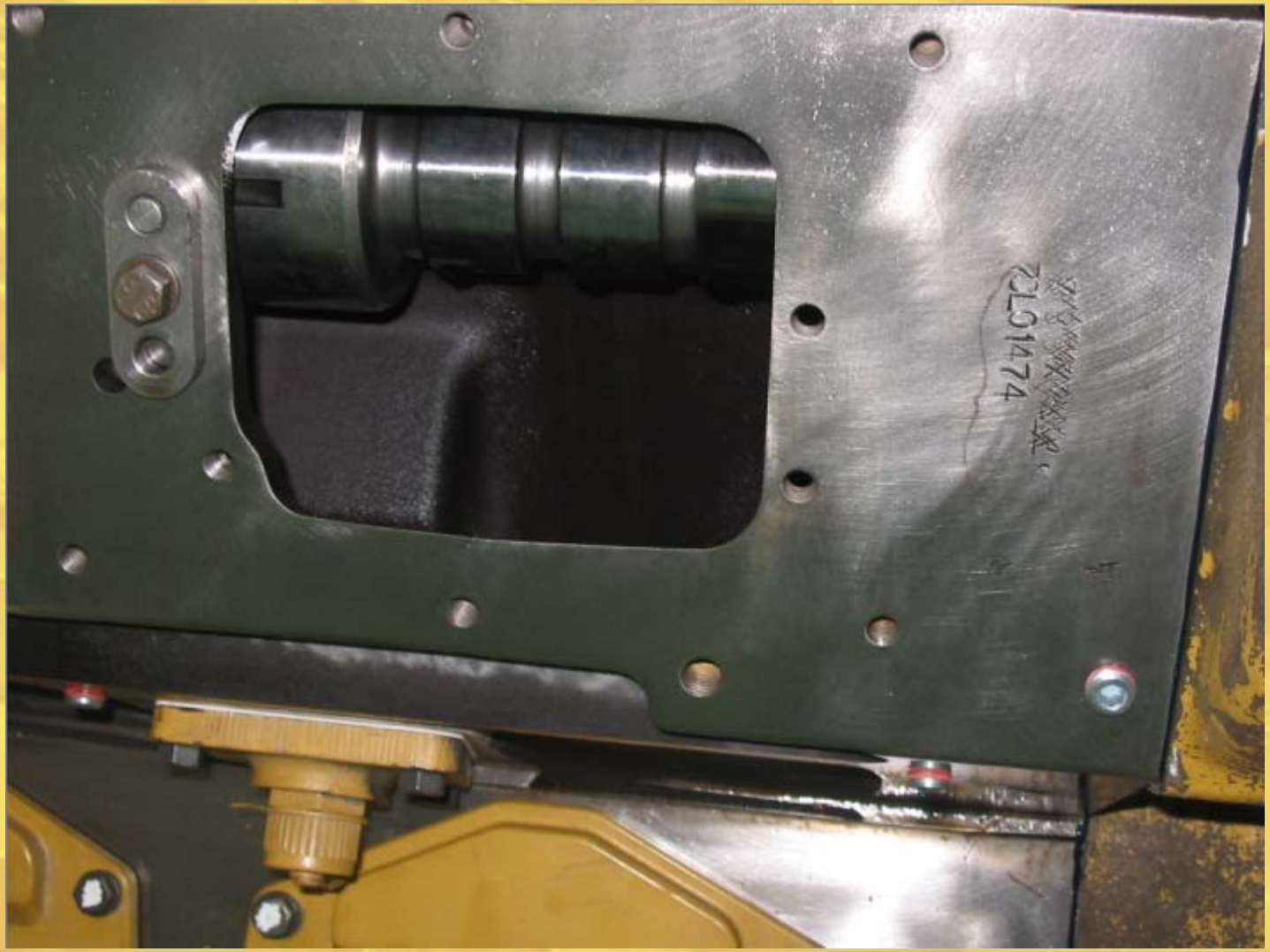










































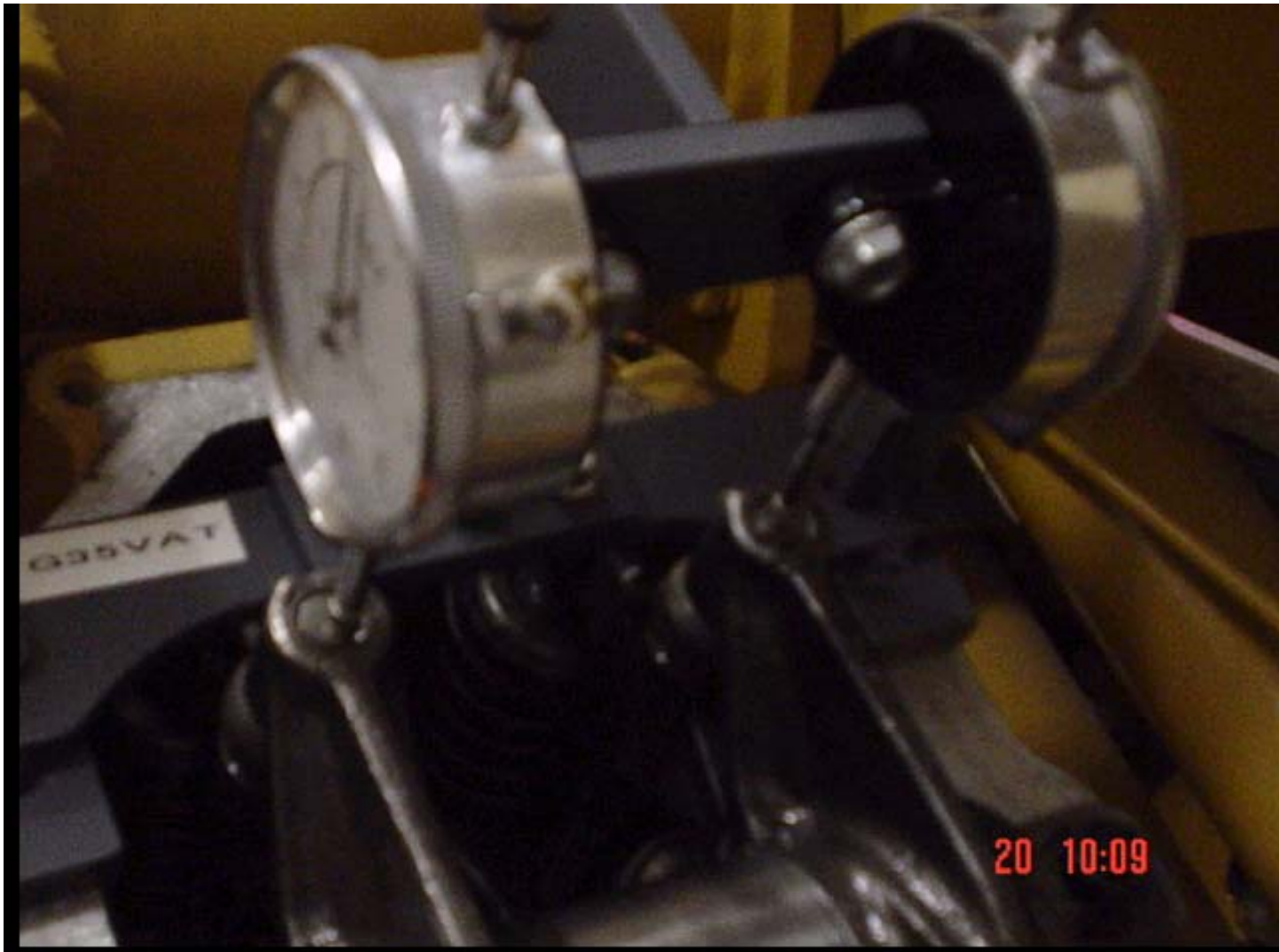












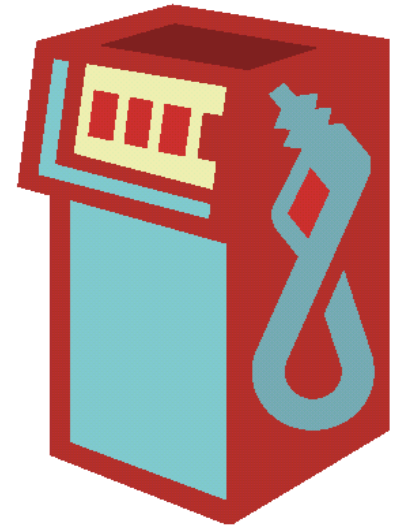
Motores 3500

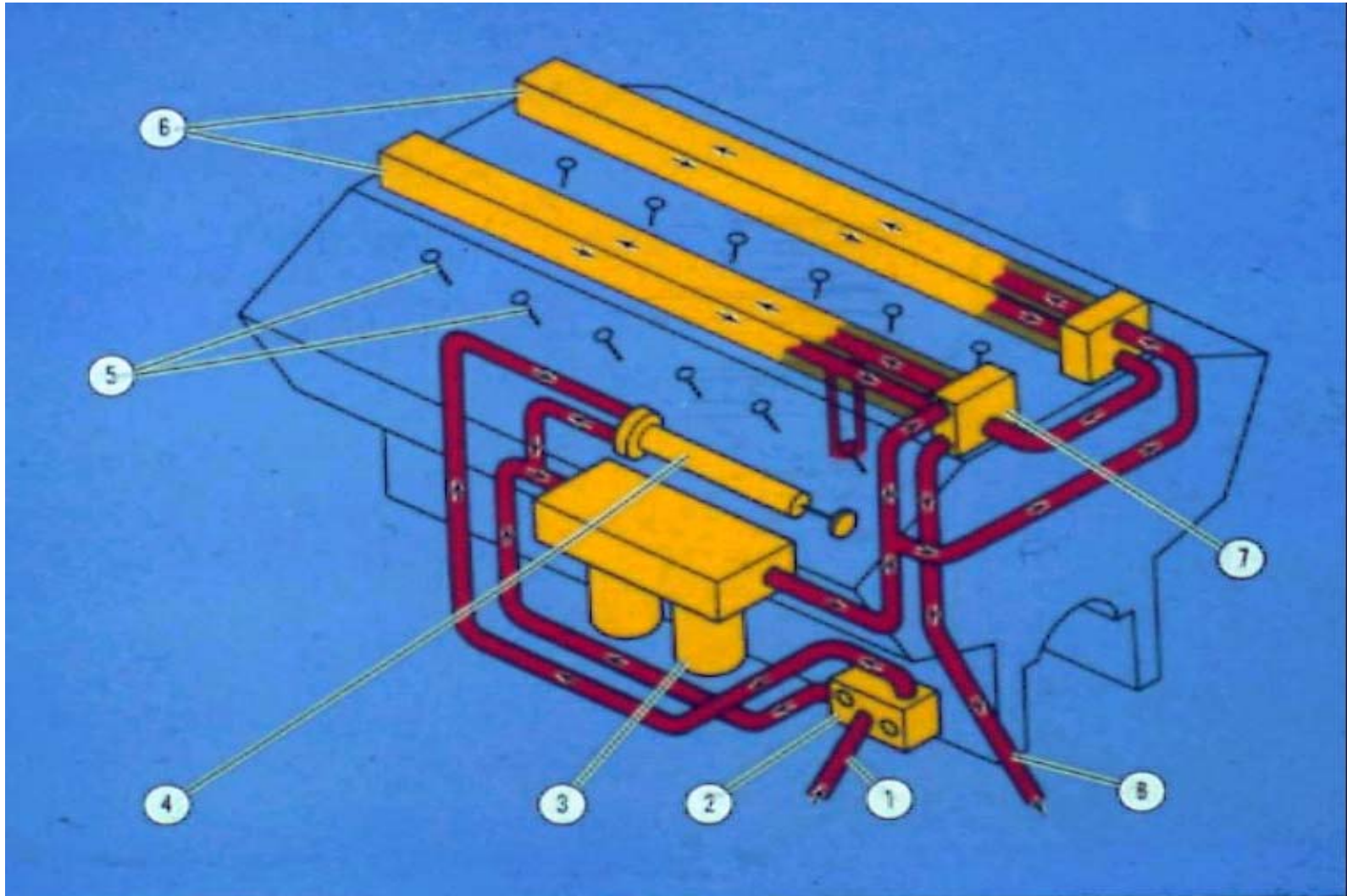


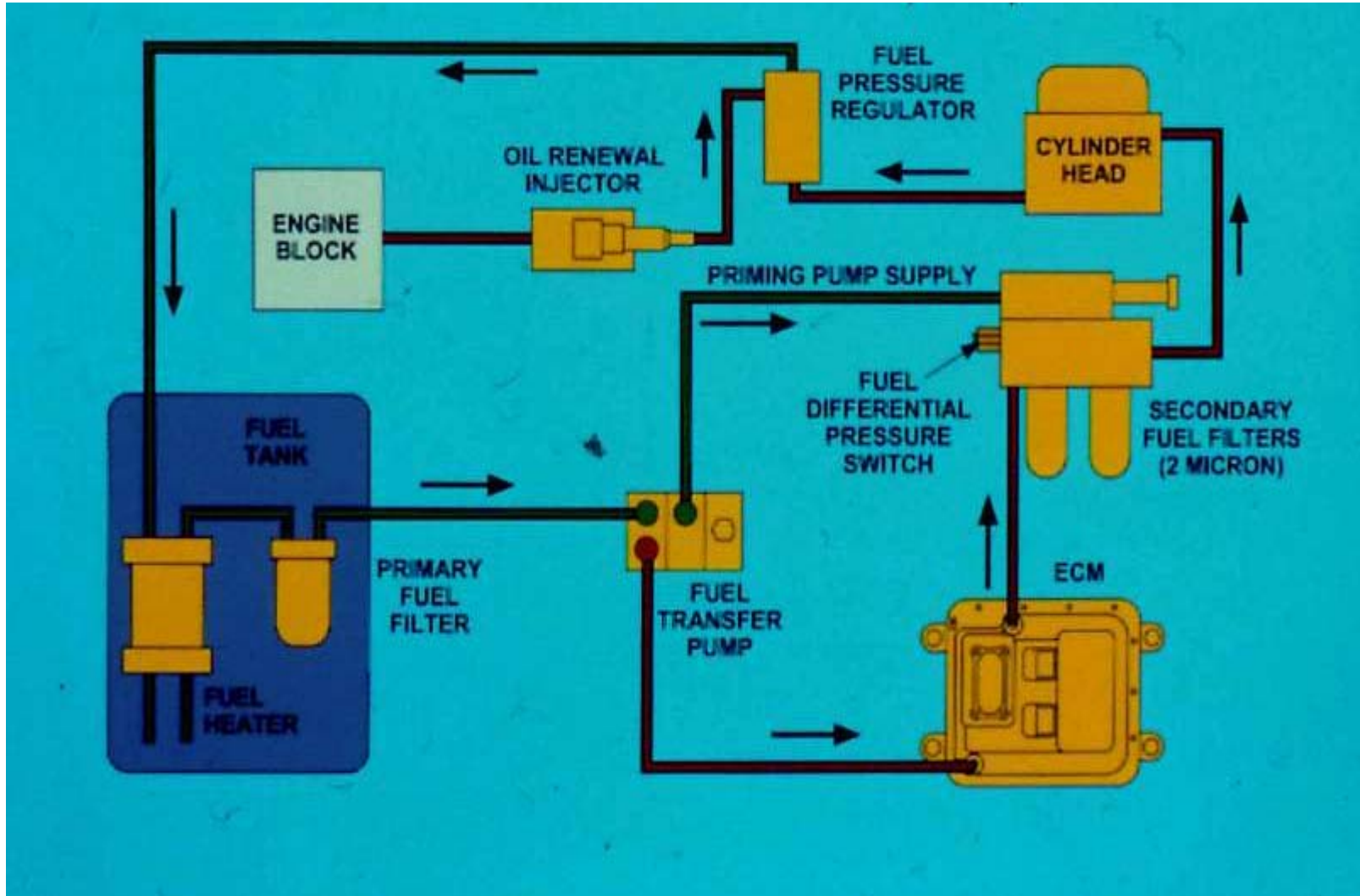




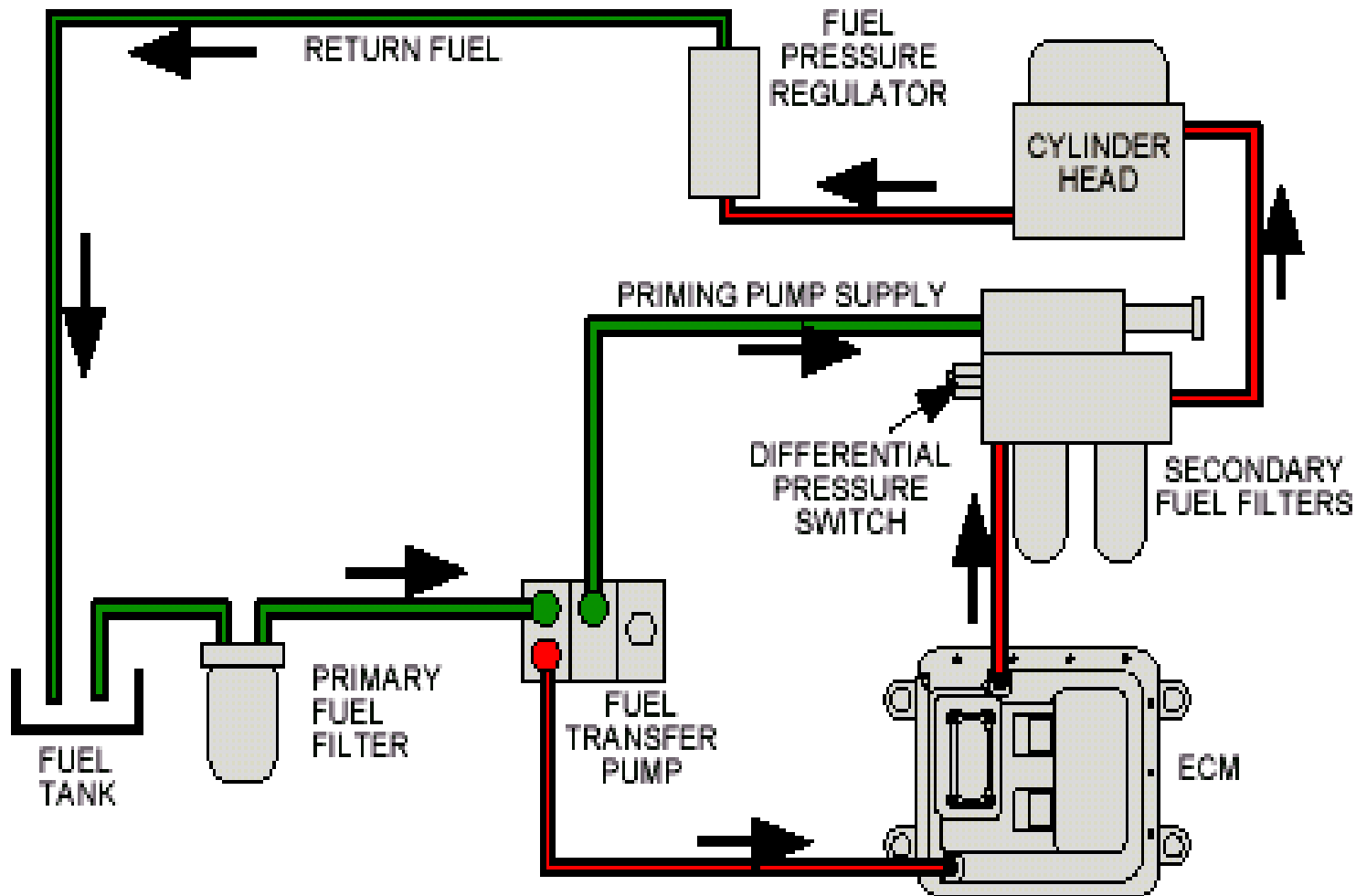
# Sistema de Combustible

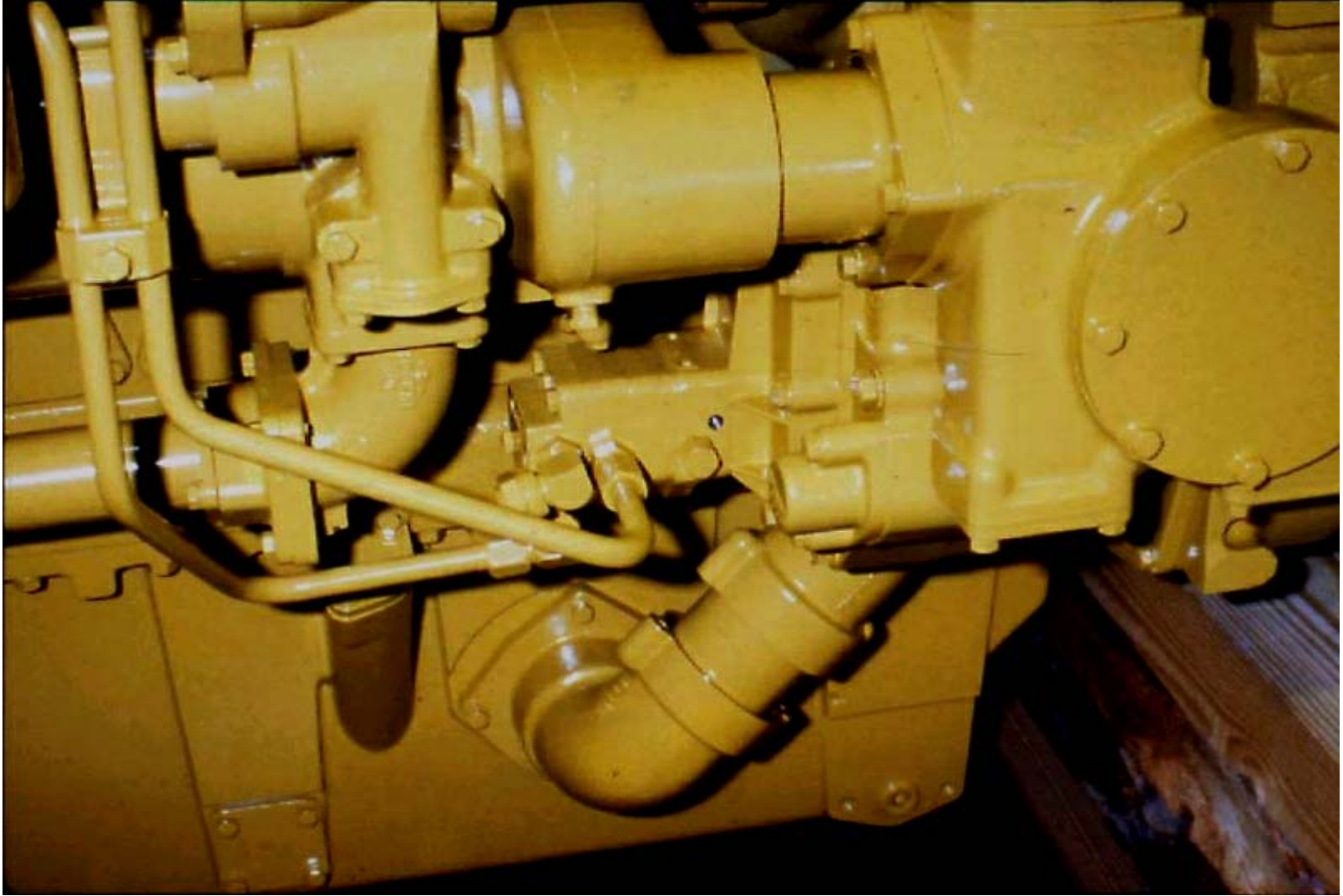
















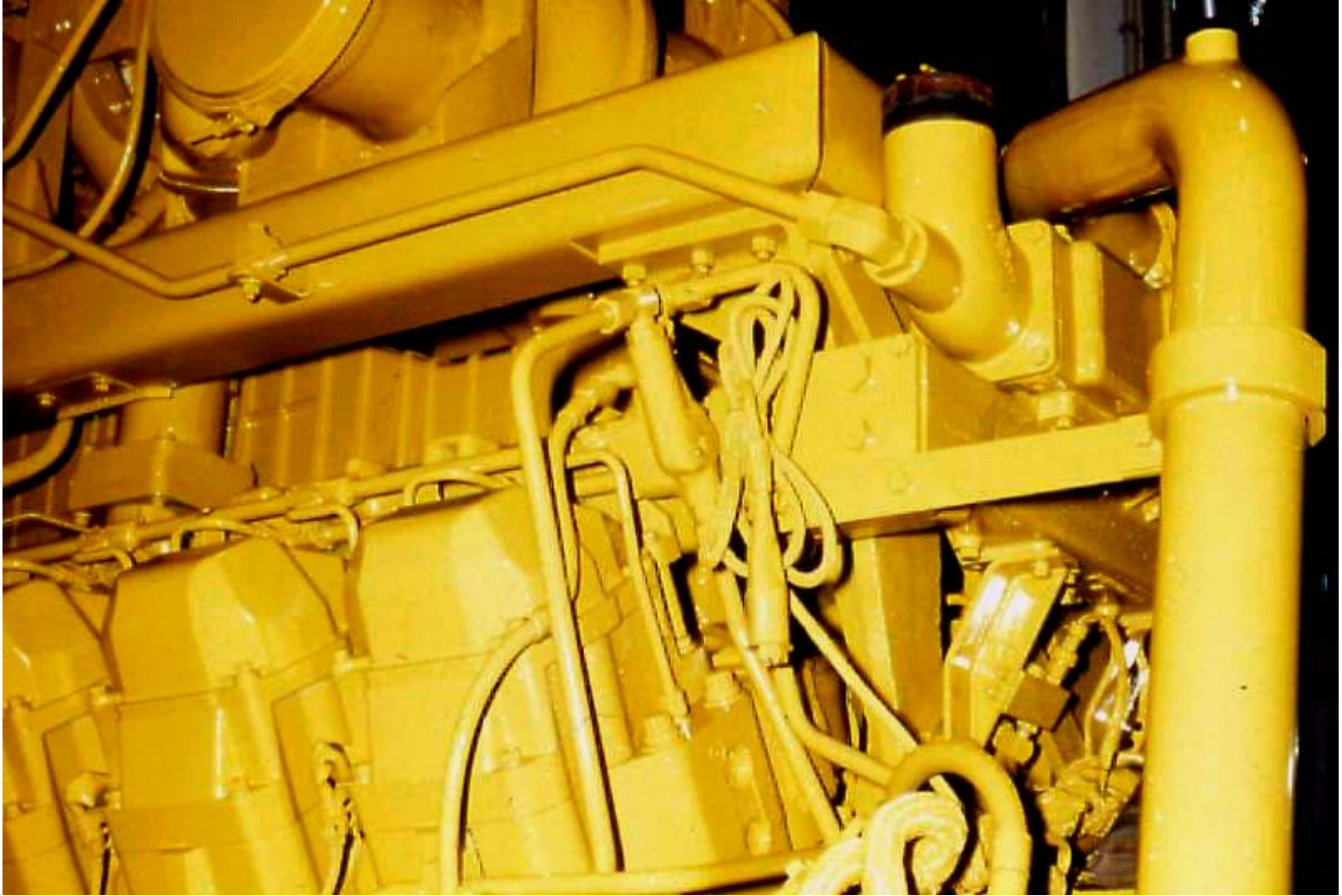


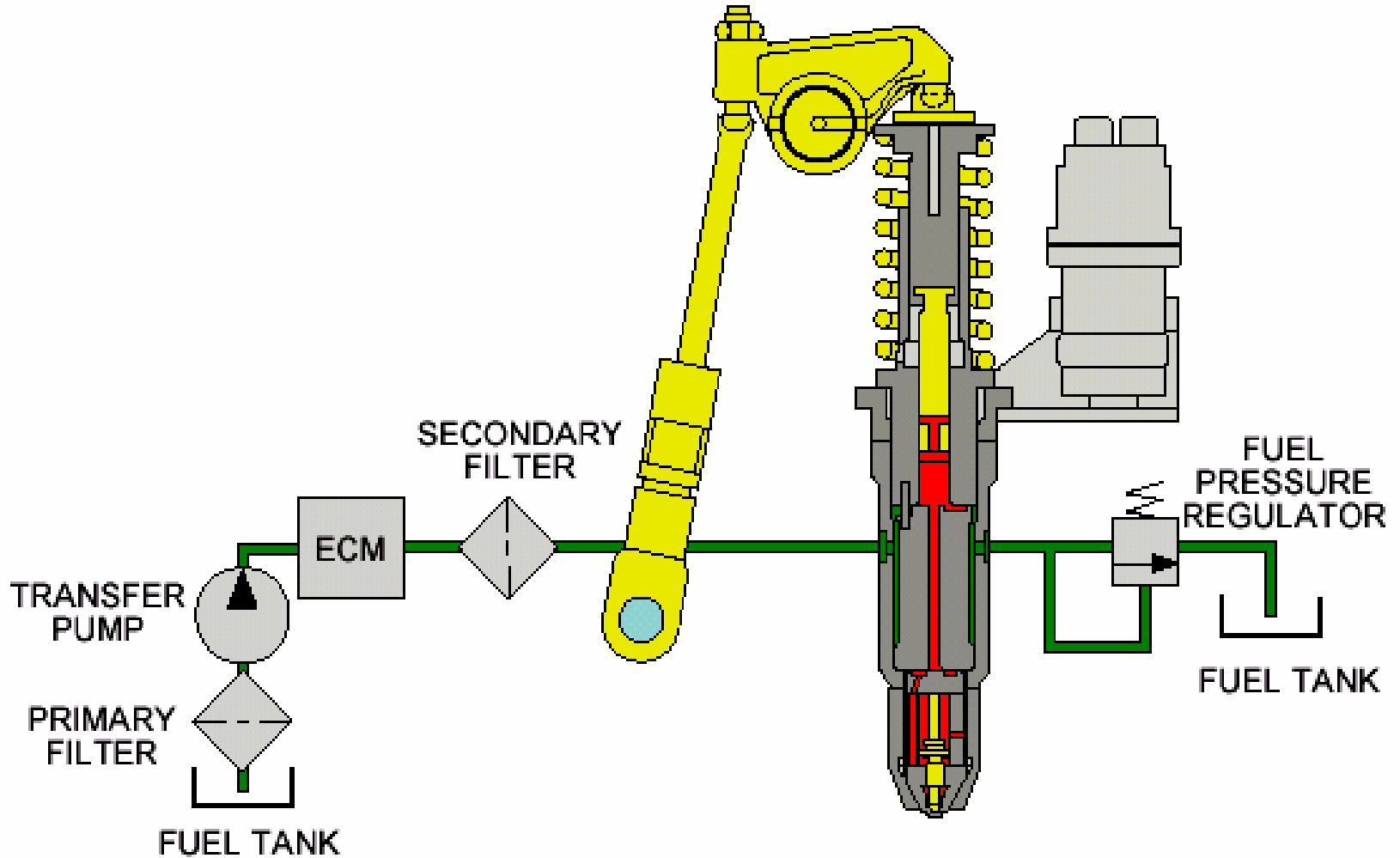








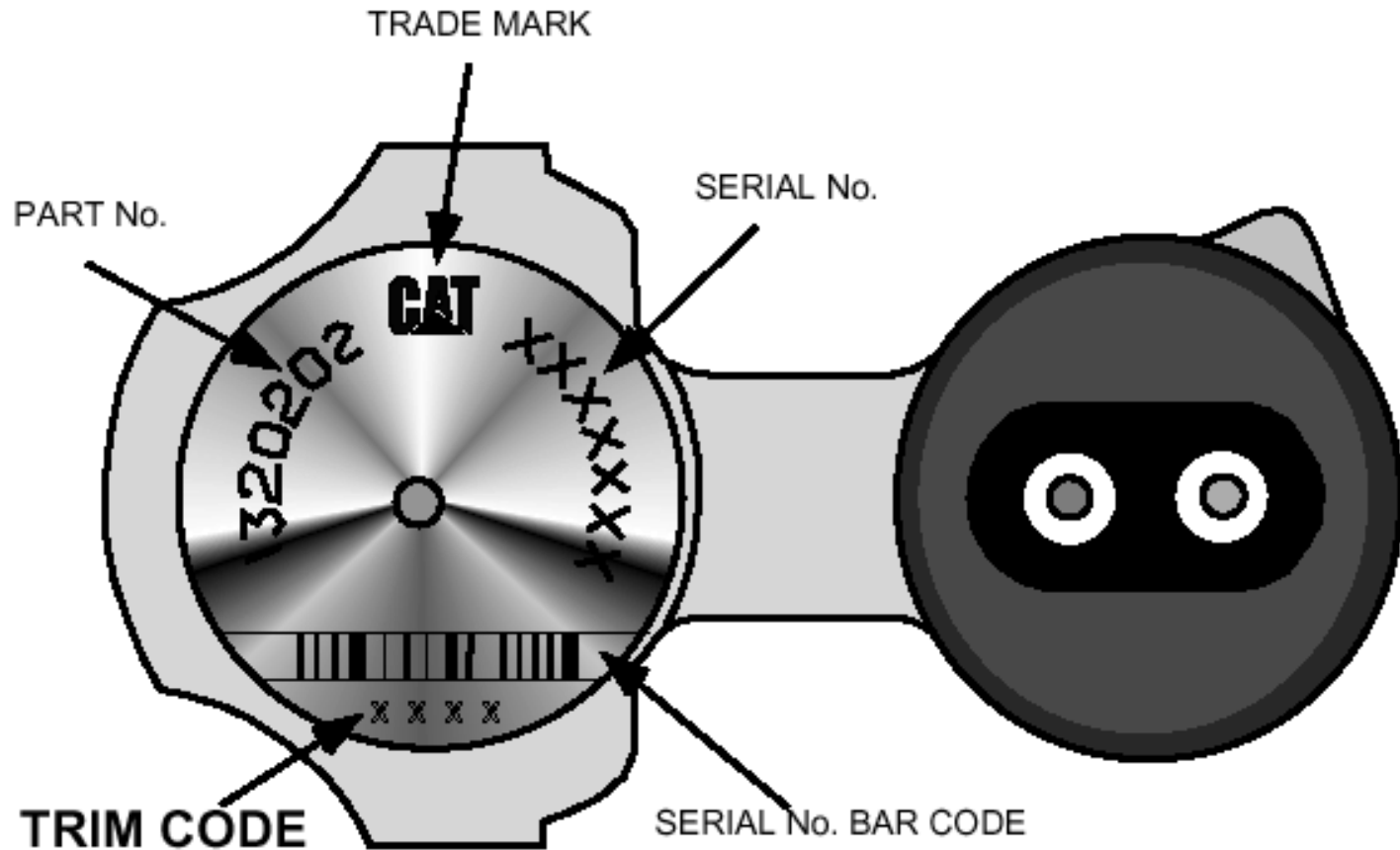


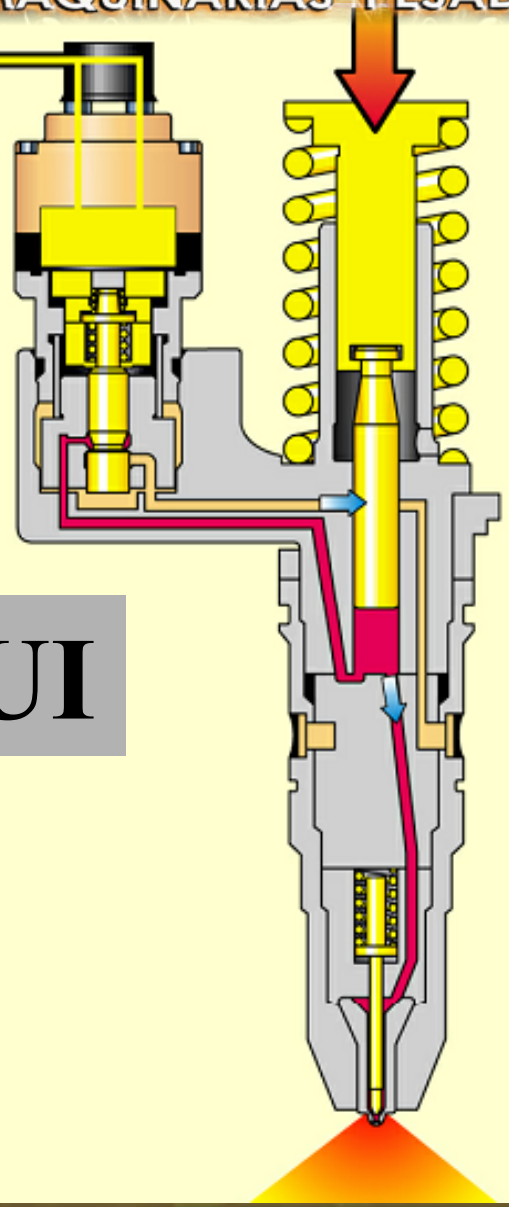






# Identificacion de la Unidad Inyectora MEUI





MEUI



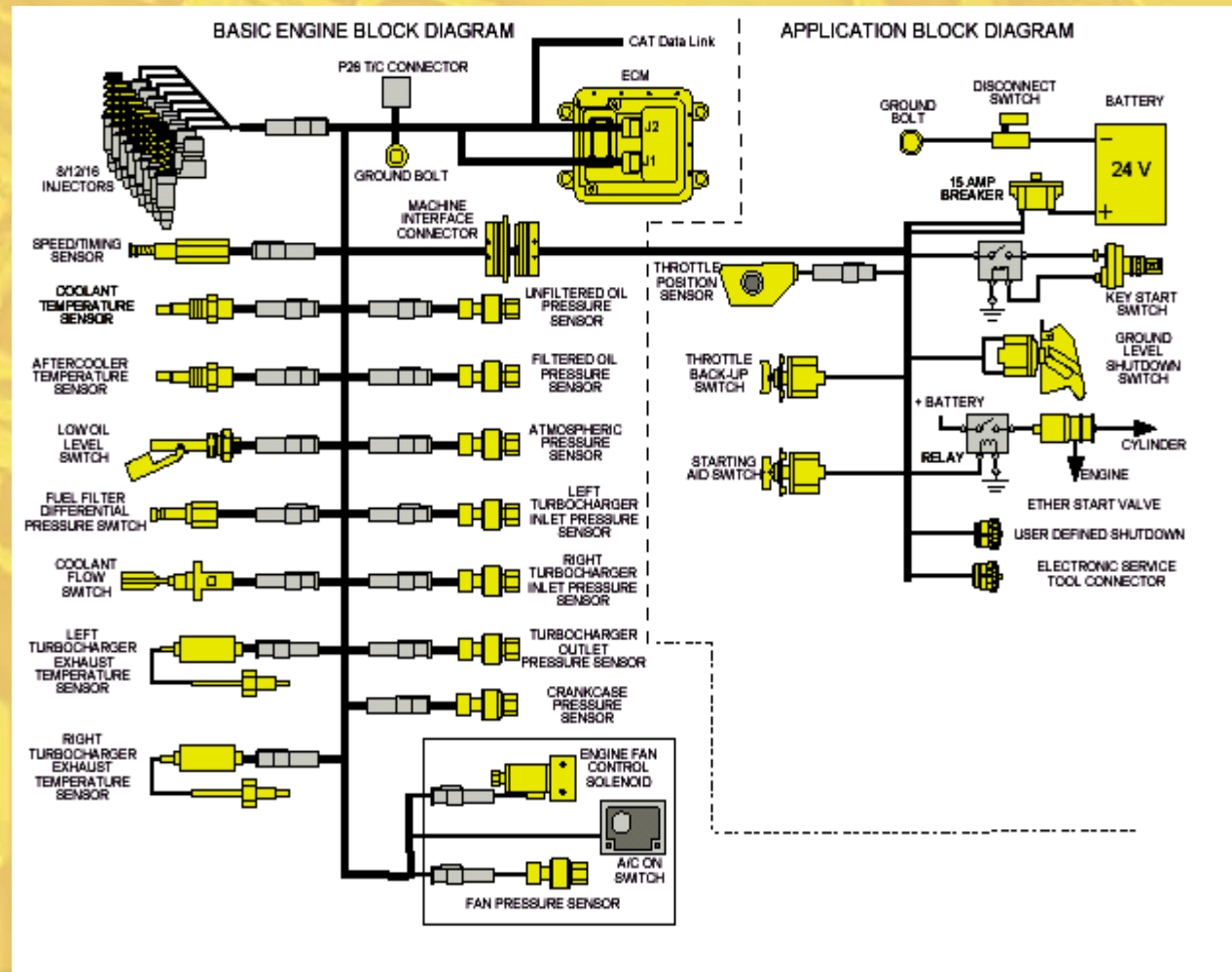




Motores 3500

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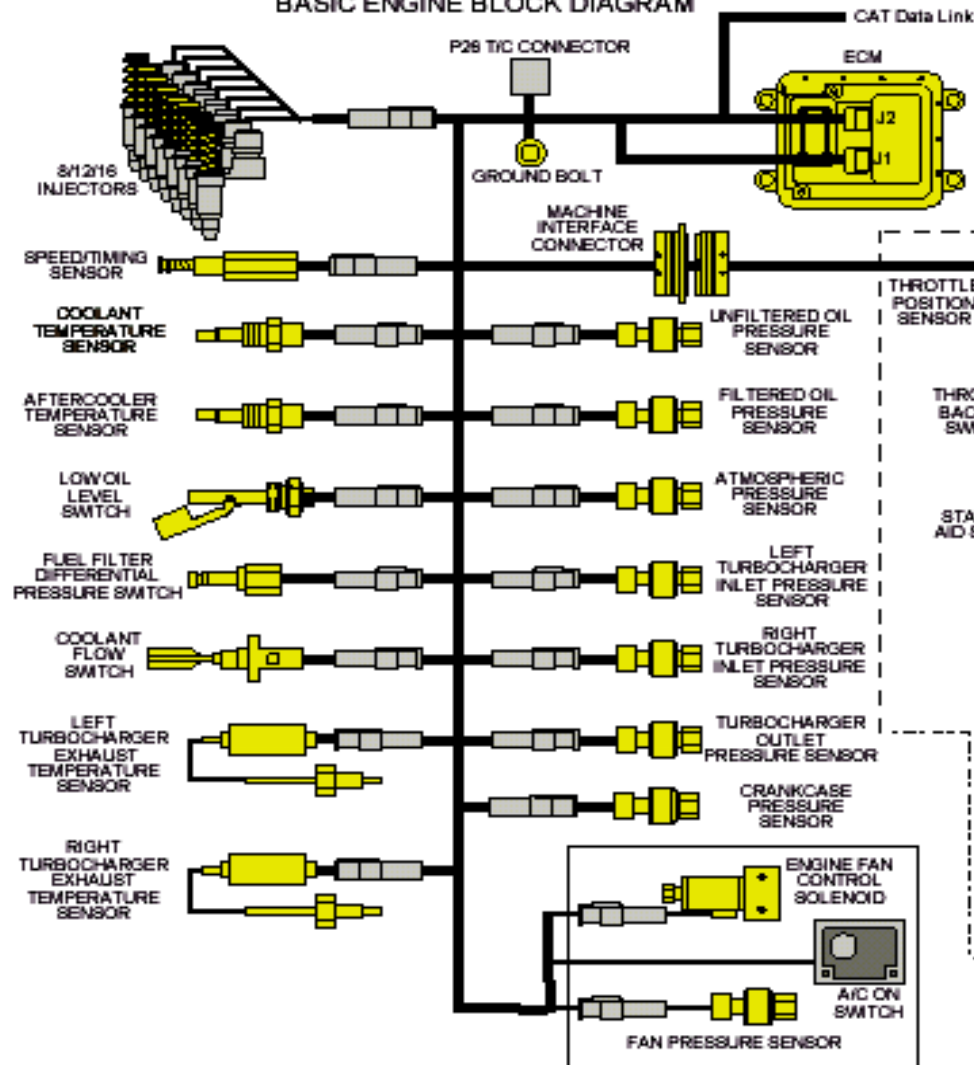
# Sistema Electrónico de motor 3500



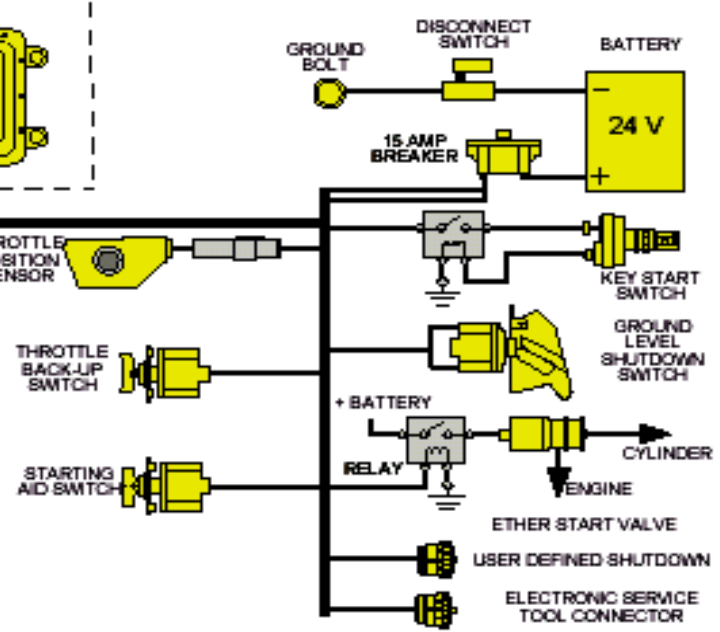


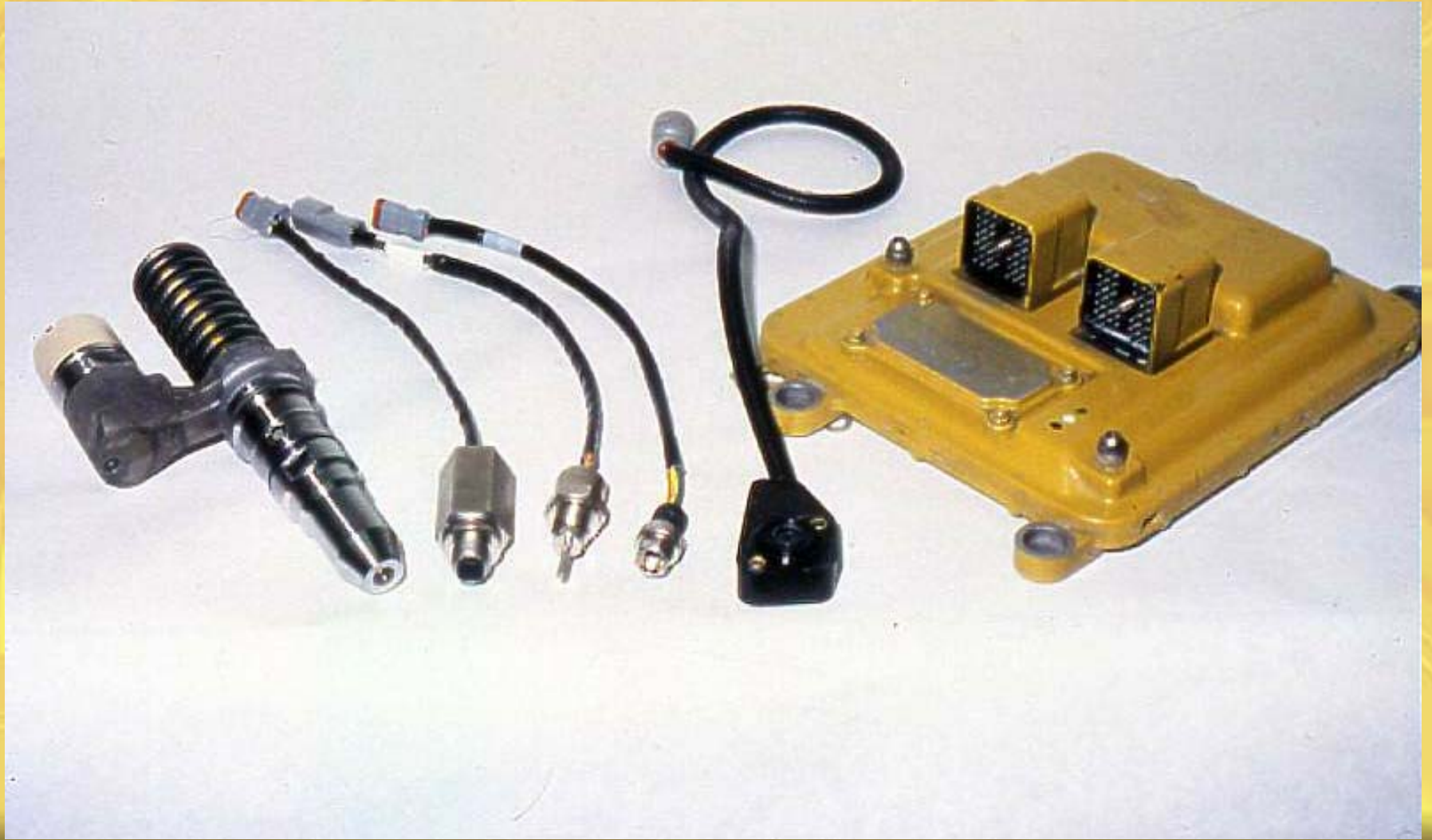


**BASIC ENGINE BLOCK DIAGRAM**



**APPLICATION BLOCK DIAGRAM**



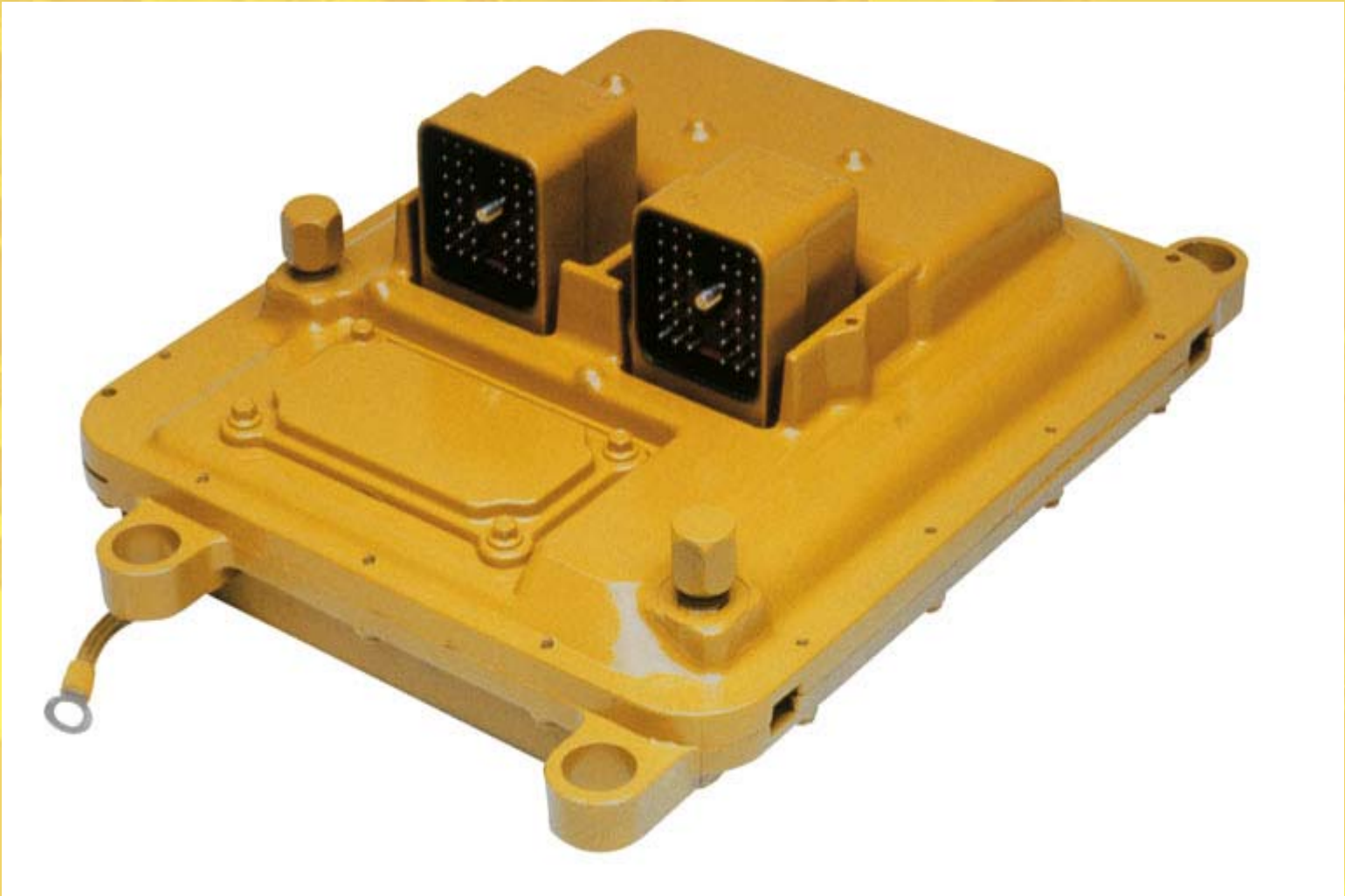




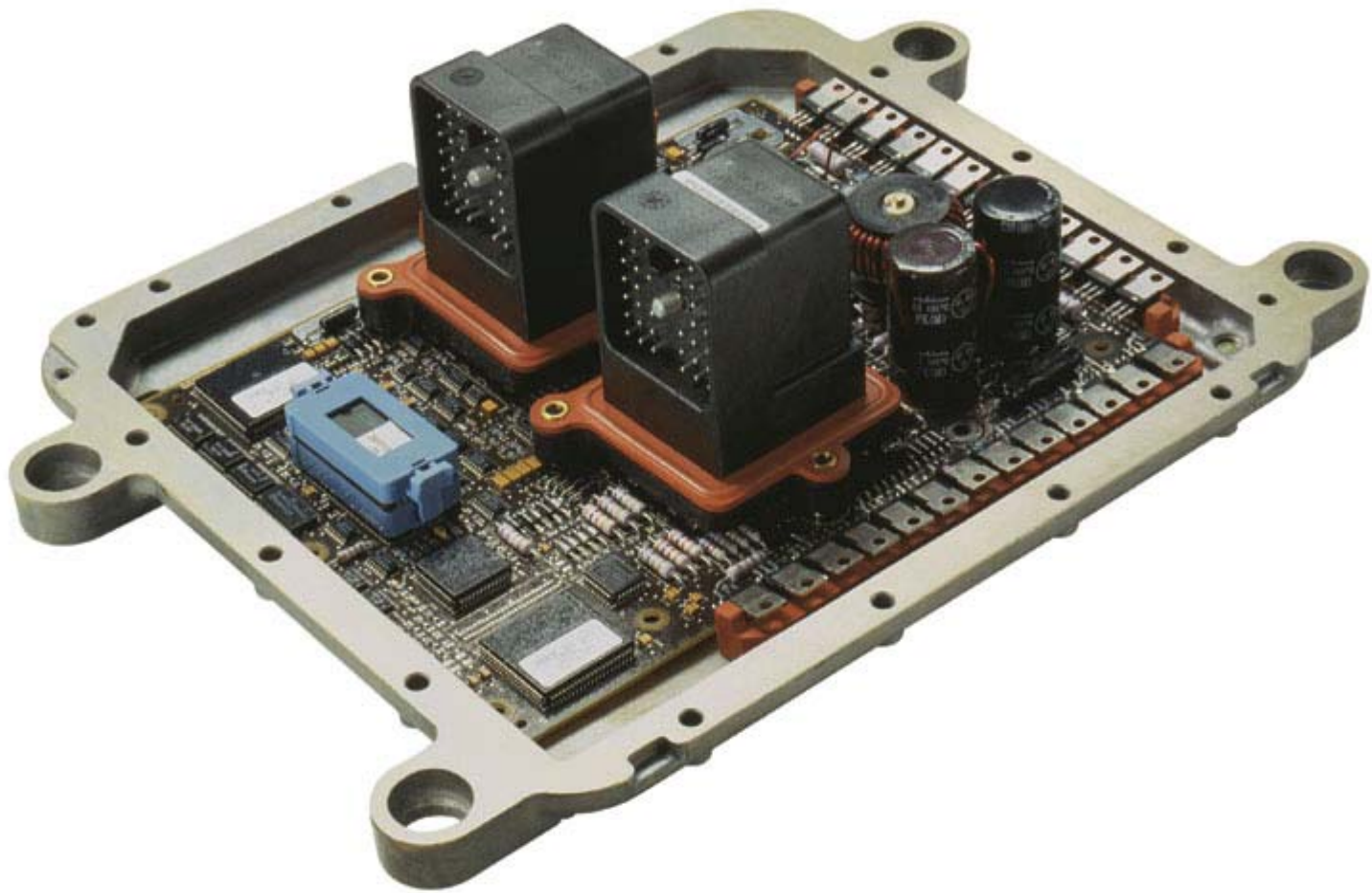












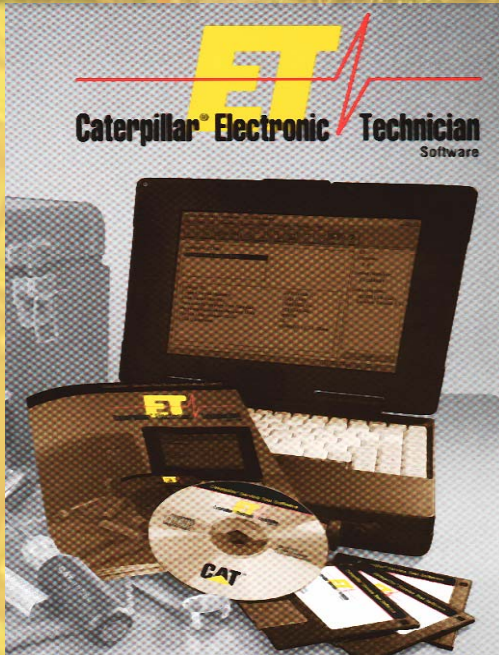


# CAT ET



**FINNING**





**CONFIGURACIÓN DEL SISTEMA  
DE MONITOREO DE ALARMAS  
DE MOTOR**

**CALIBRACIÓN DE SENSORES**

**HISTOGRAMA DE SOBREVELOCIDADES**

**REALIZAR GRAFICOS DE PARAMETROS  
EN TIEMPO REAL**

**DATA LOGGER PROGRAMABLE**

**VISUALIZACION DE PARAMETROS  
EN TIEMPO REAL**





# Perform Electronic Diagnostic Tests

Identify, Understand, and Correct

- Active Faults
- Logged Faults
- Logged Events
- Read and Change Programmable Parameters
- View Status Screen
- Injector Solenoid Test
- Cylinder Cutout Test
- Special Tests

Perform Diag

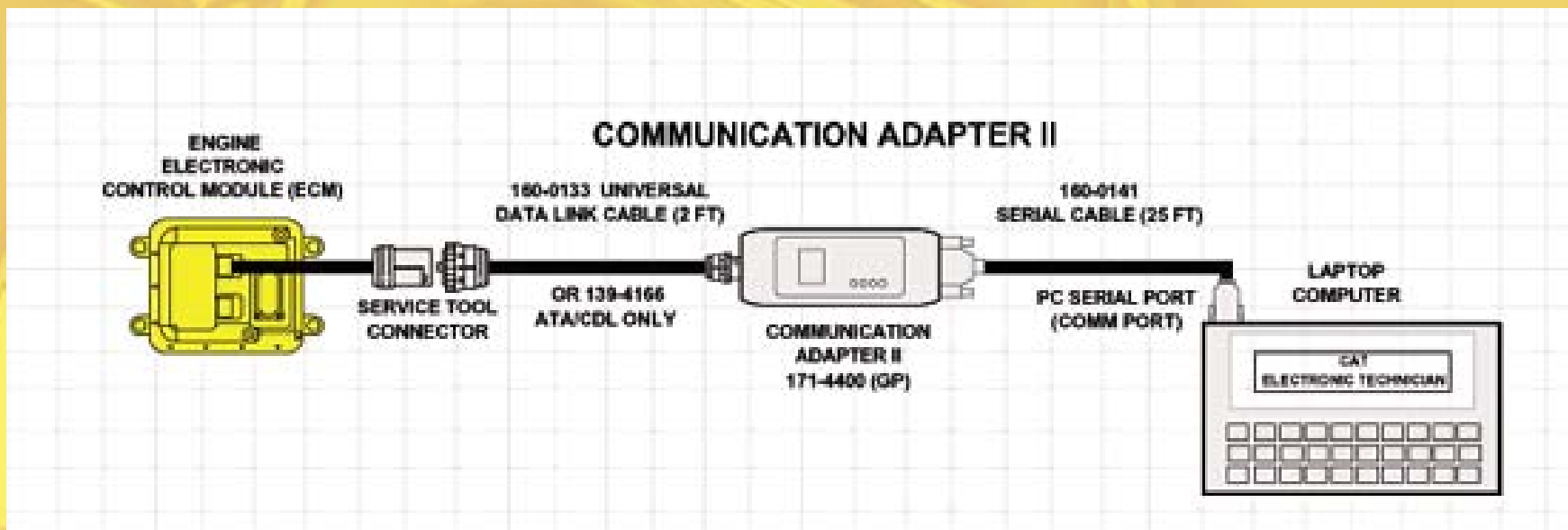
©2000 Caterpillar

**FINNING**



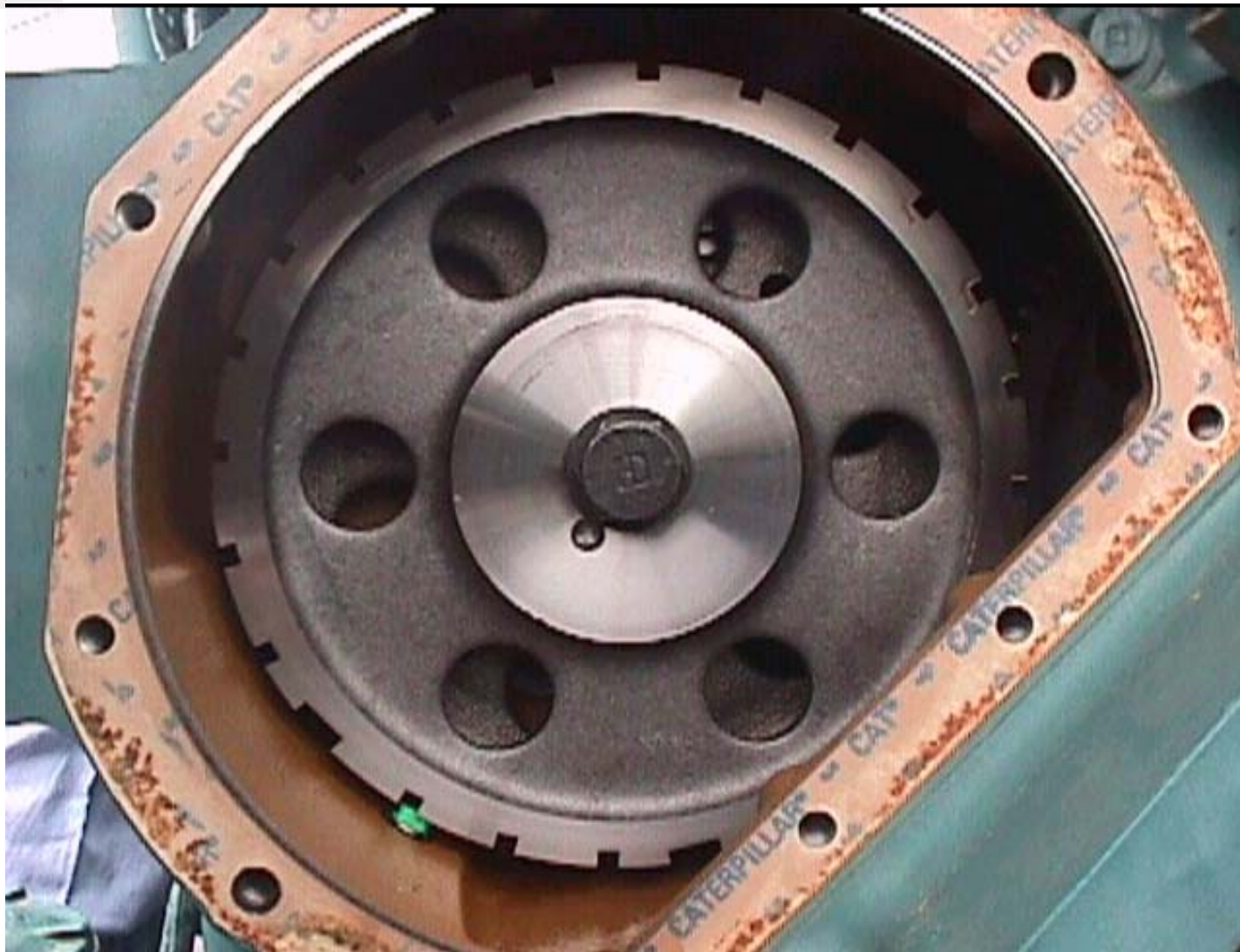


# Conexión de Herramienta de Servicio ET

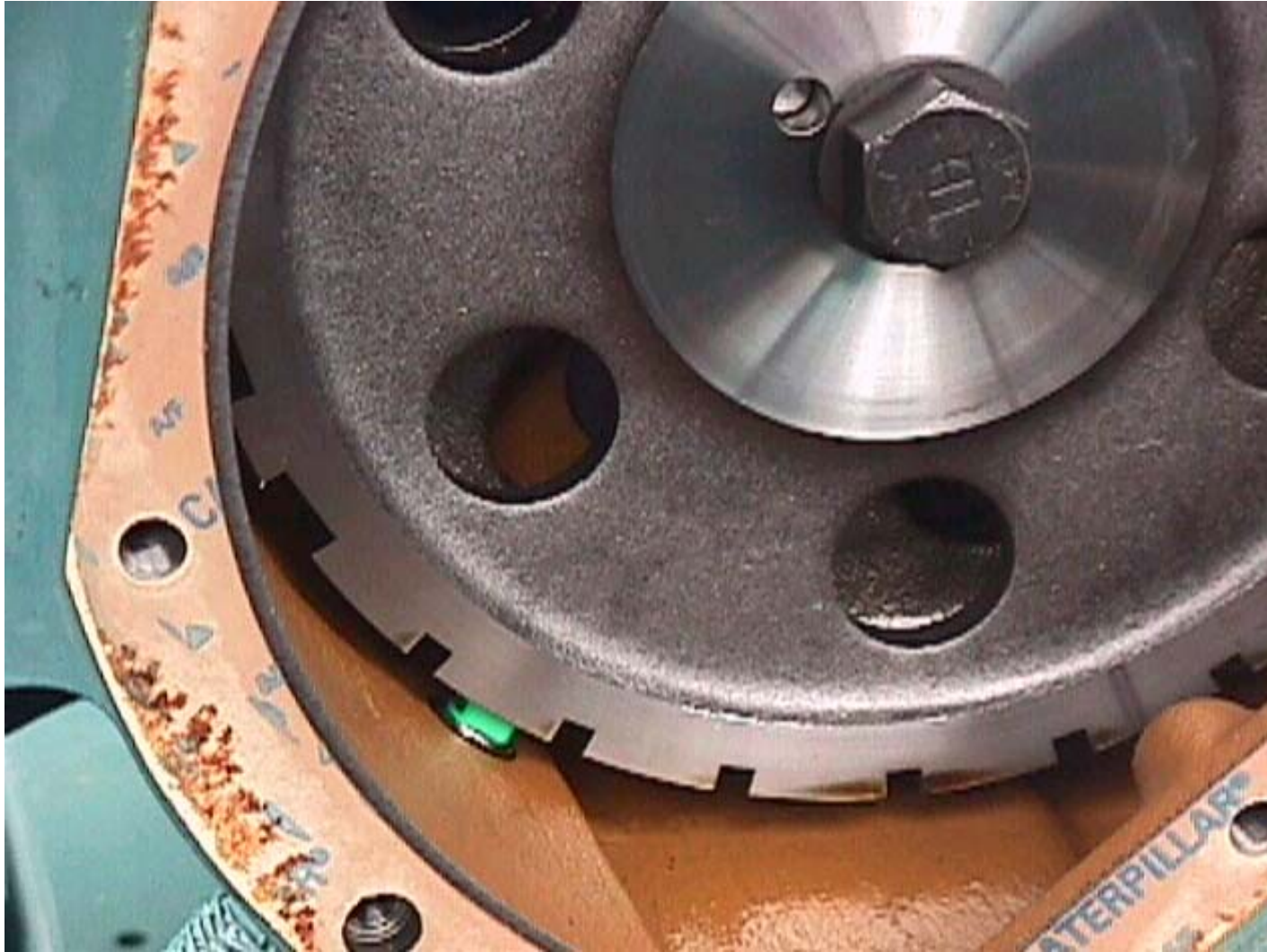




# Engranaje



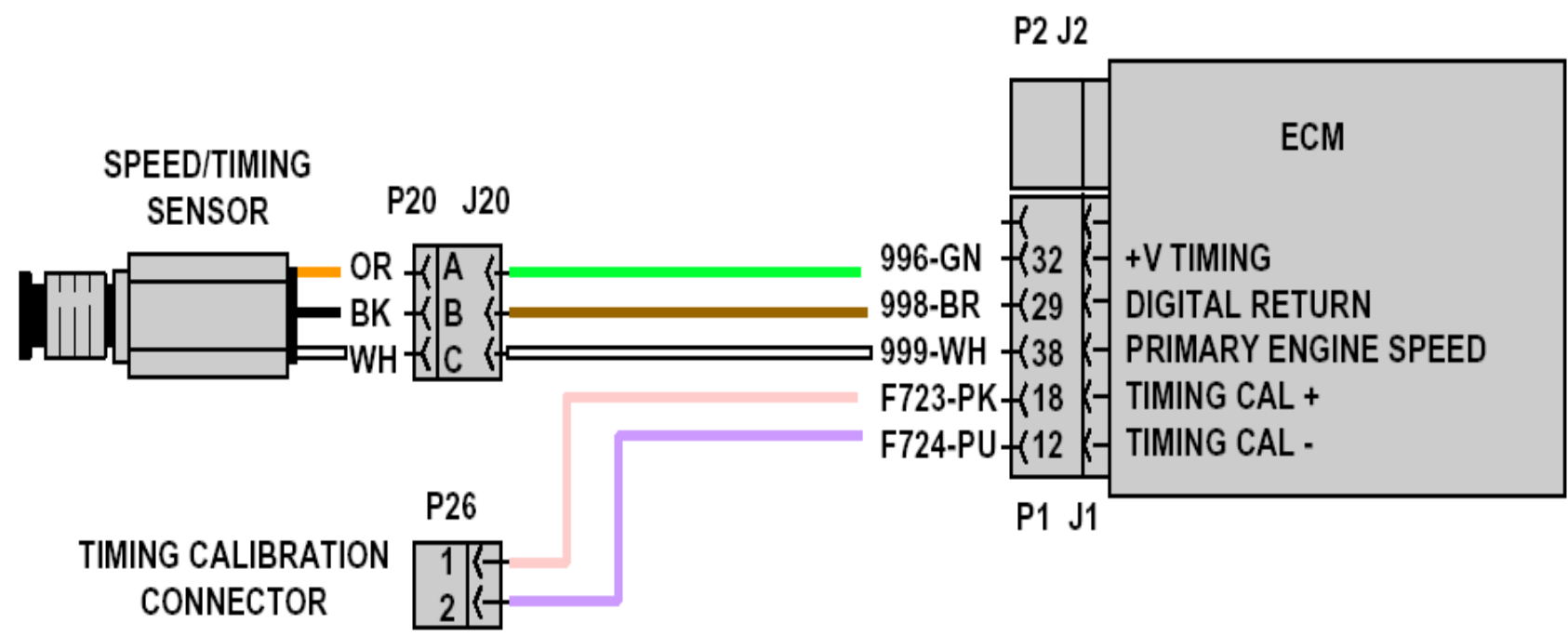




# Ajuste Ceru



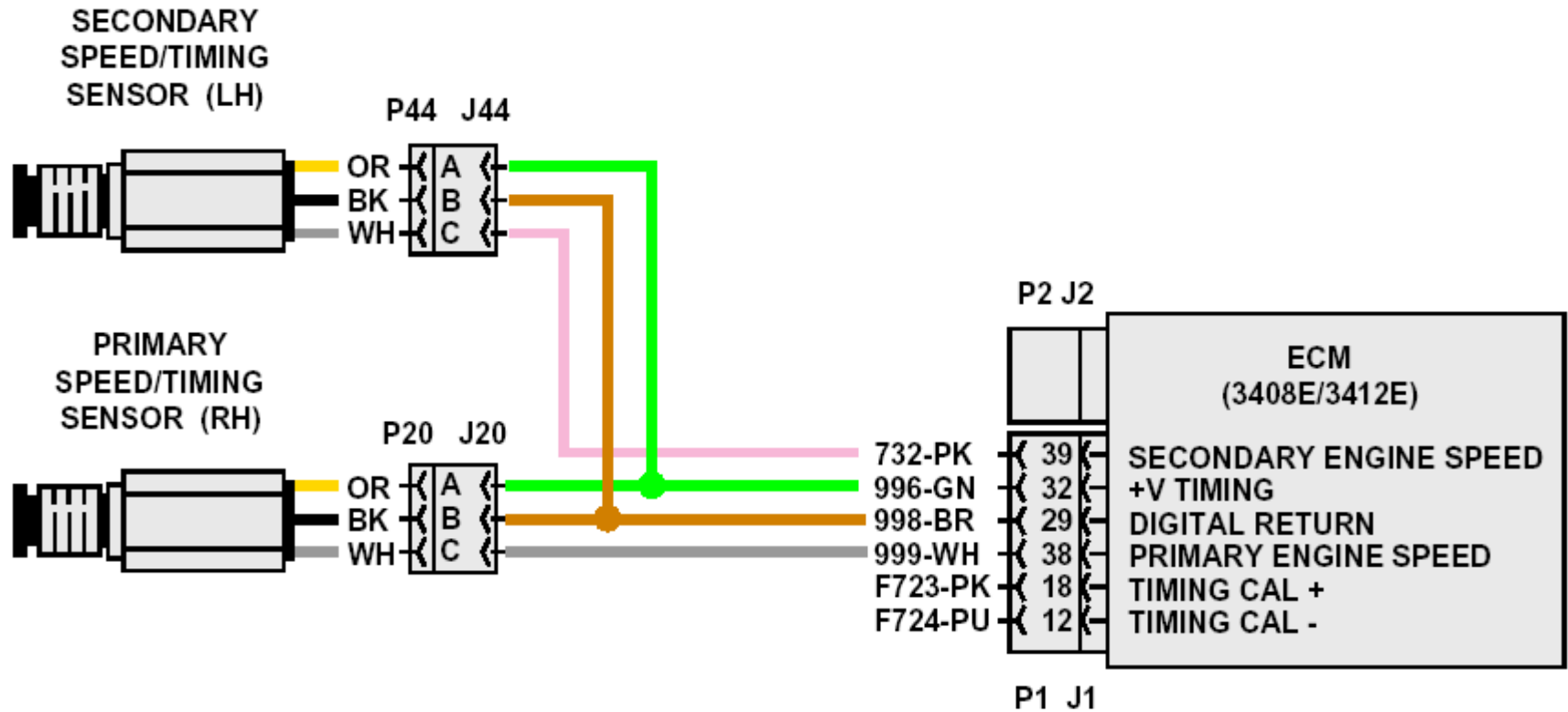
# SPEED/TIMING SENSOR





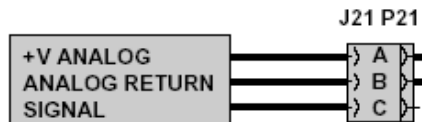


## SPEED/TIMING SENSOR POWER SUPPLY 12.5 ± 1 VOLTS

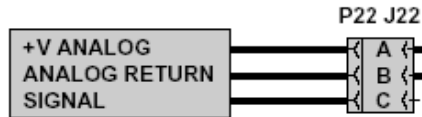




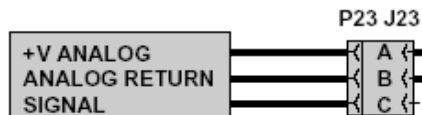
ENGINE COOLANT  
TEMPERATURE SENSOR



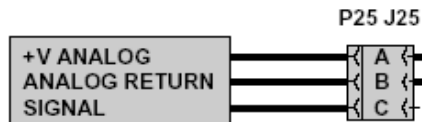
FILTERED OIL  
PRESSURE SENSOR



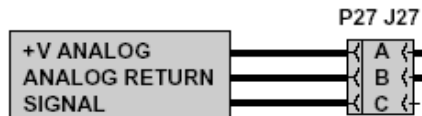
TURBO OUTLET  
PRESSURE SENSOR



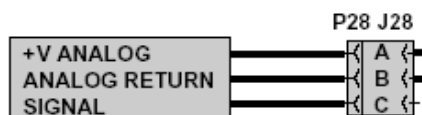
RIGHT TURBO INLET  
PRESSURE SENSOR



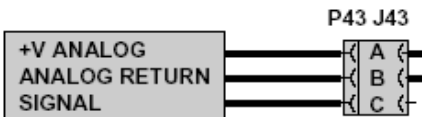
ATMOSPHERIC  
PRESSURE SENSOR



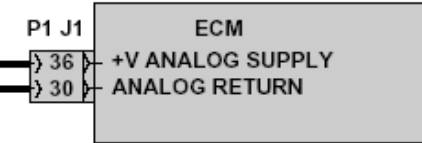
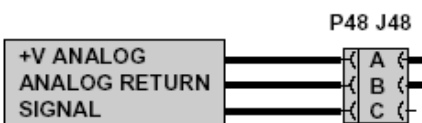
LEFT TURBO INLET  
PRESSURE SENSOR



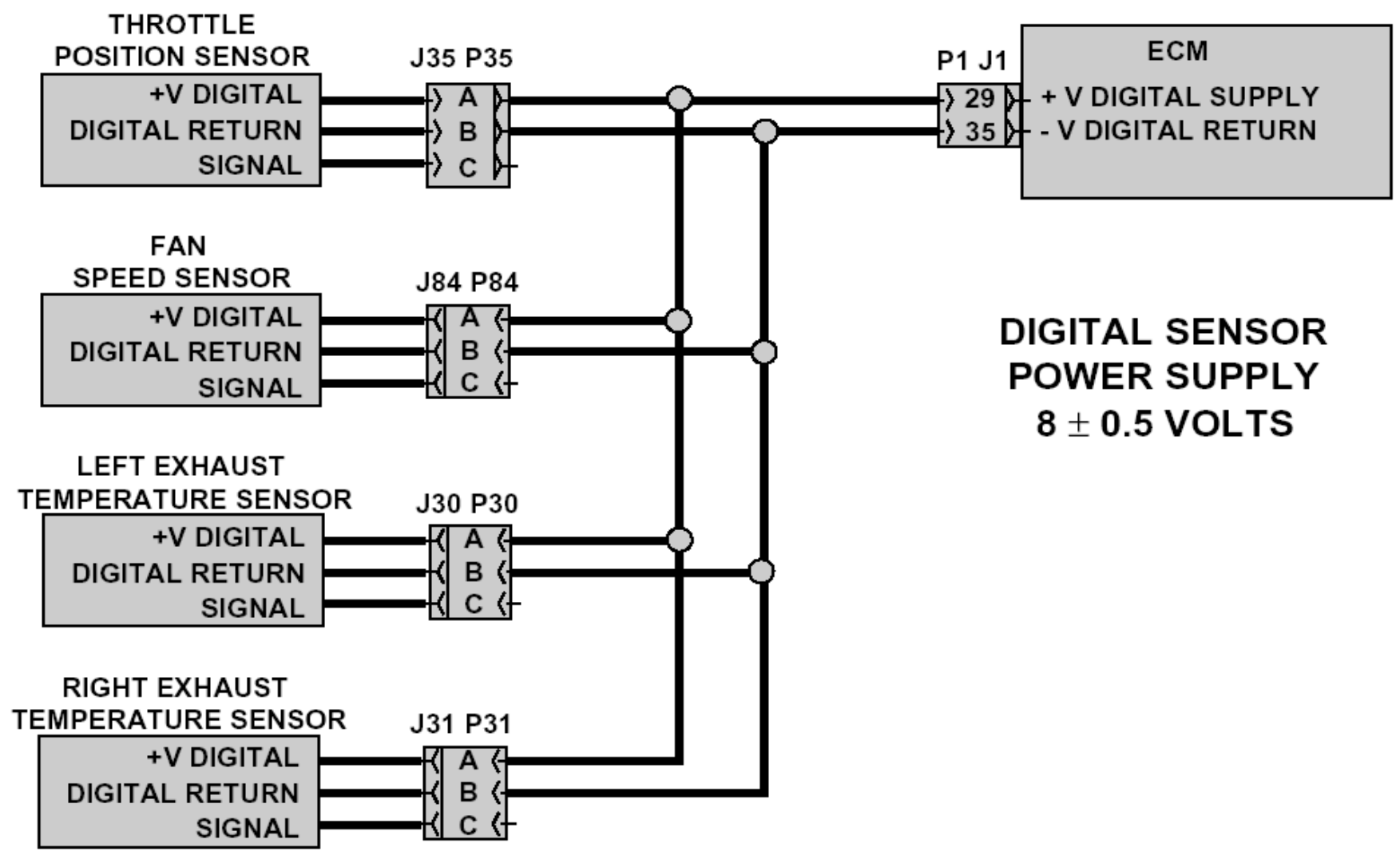
CRANKCASE  
PRESSURE SENSOR



UNFILTERED OIL  
PRESSURE SENSOR



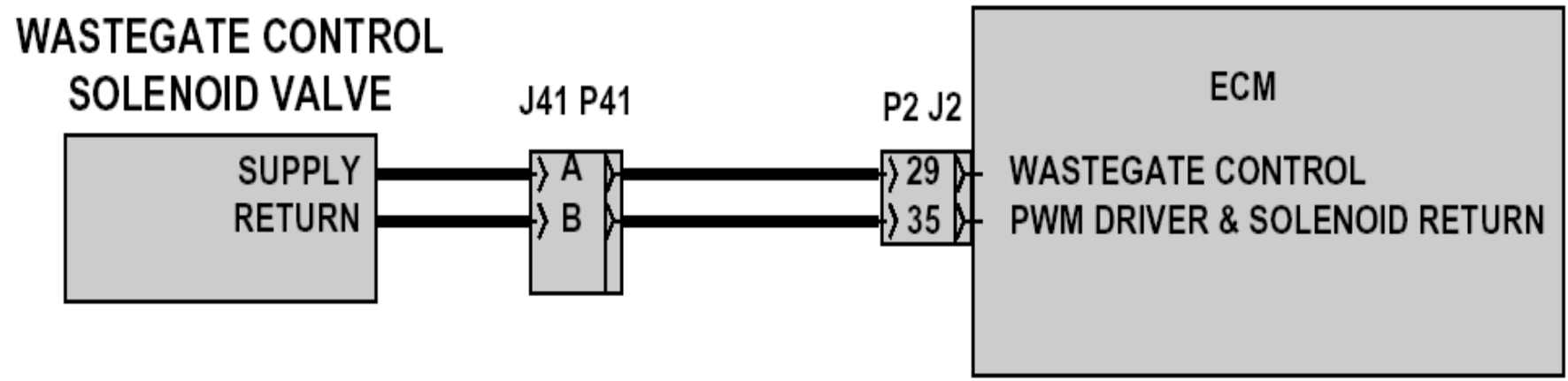
**3500B ANALOG SENSOR  
POWER SUPPLY**  
 $5 \pm 0.5$  VOLTS







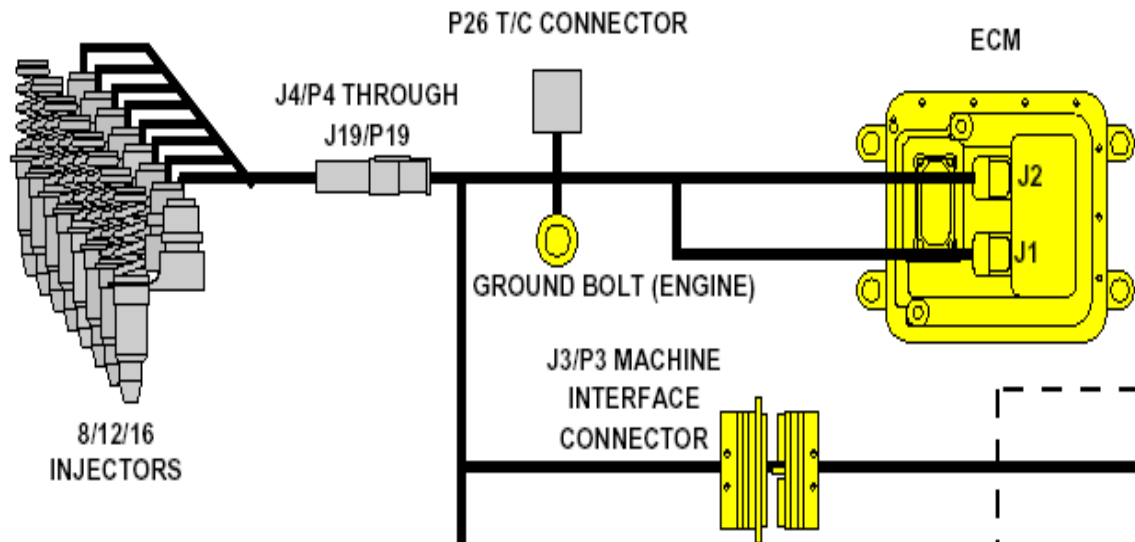
# WASTEGATE CONTROL SOLENOID POWER SUPPLY 0 TO 1.04 Amps PWM



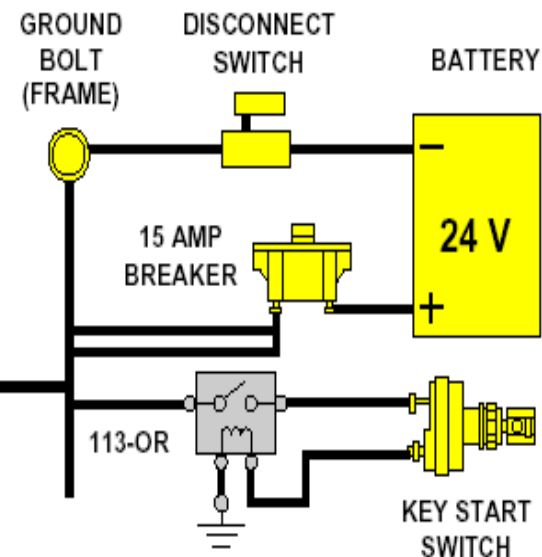


## ECM POWER SUPPLY BLOCK DIAGRAM

### BASIC ENGINE BLOCK DIAGRAM

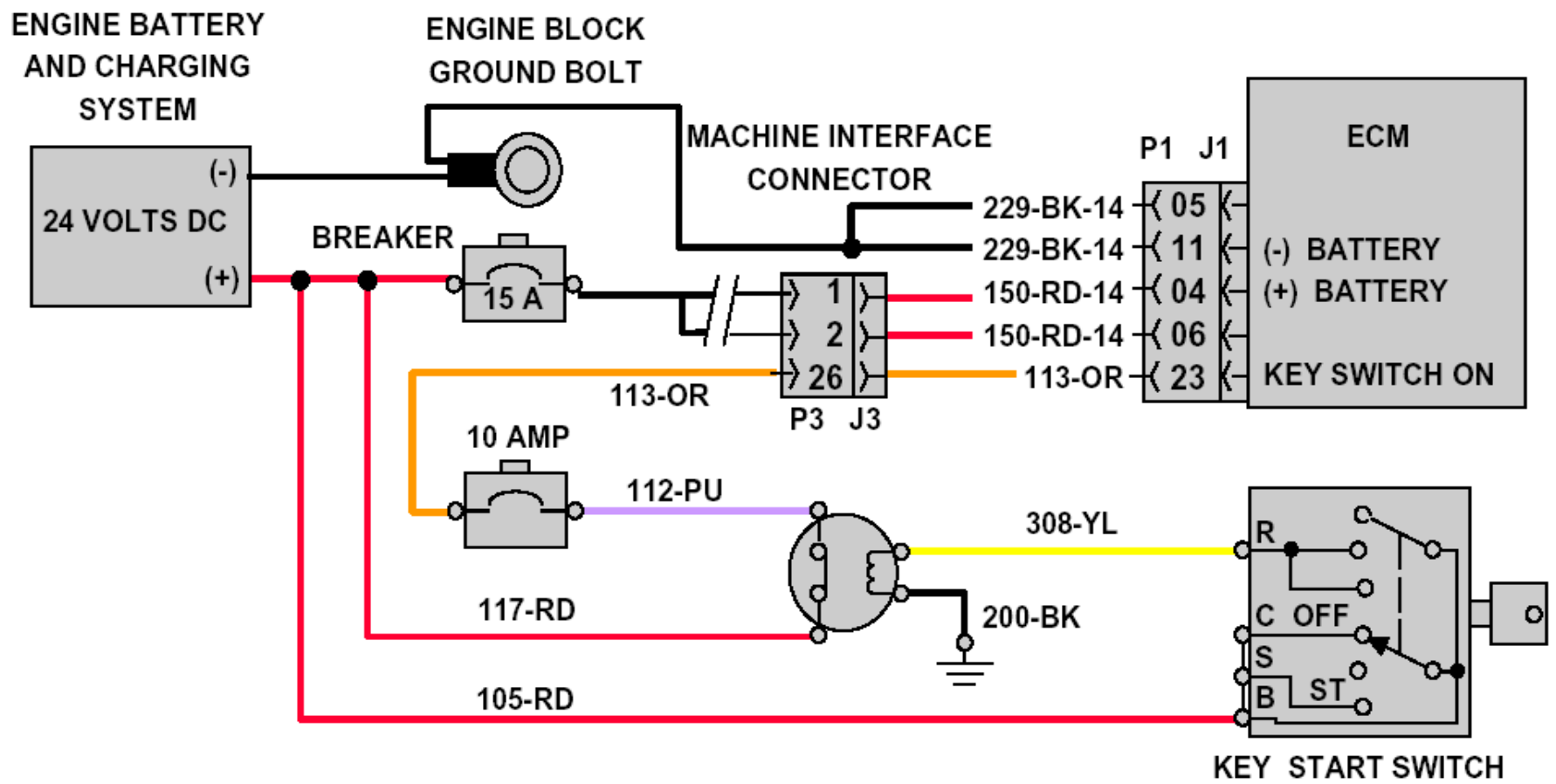


### APPLICATION BLOCK DIAGRAM





# ECM POWER SUPPLY CIRCUIT

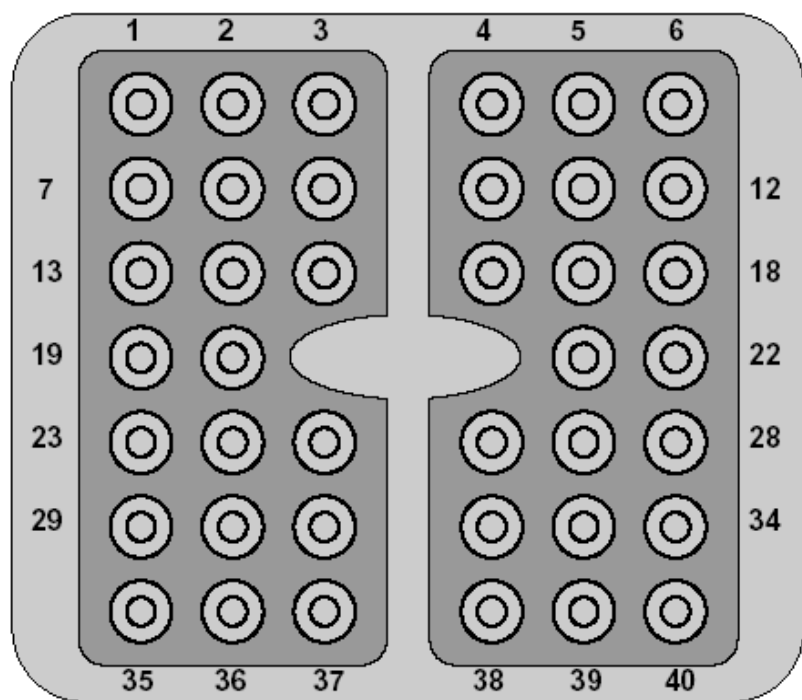




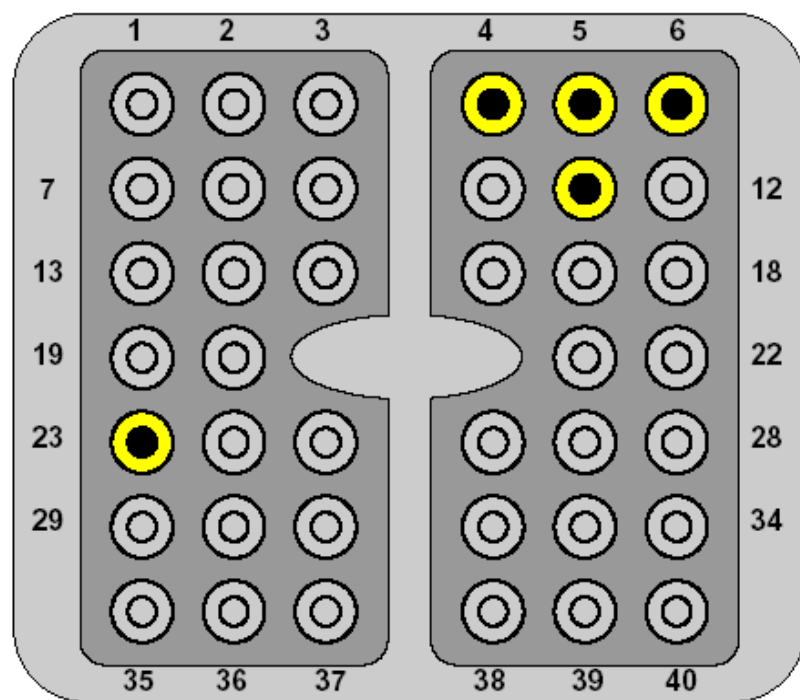
# ECM CONNECTORS

## 40 PINS, WIRE SIDE

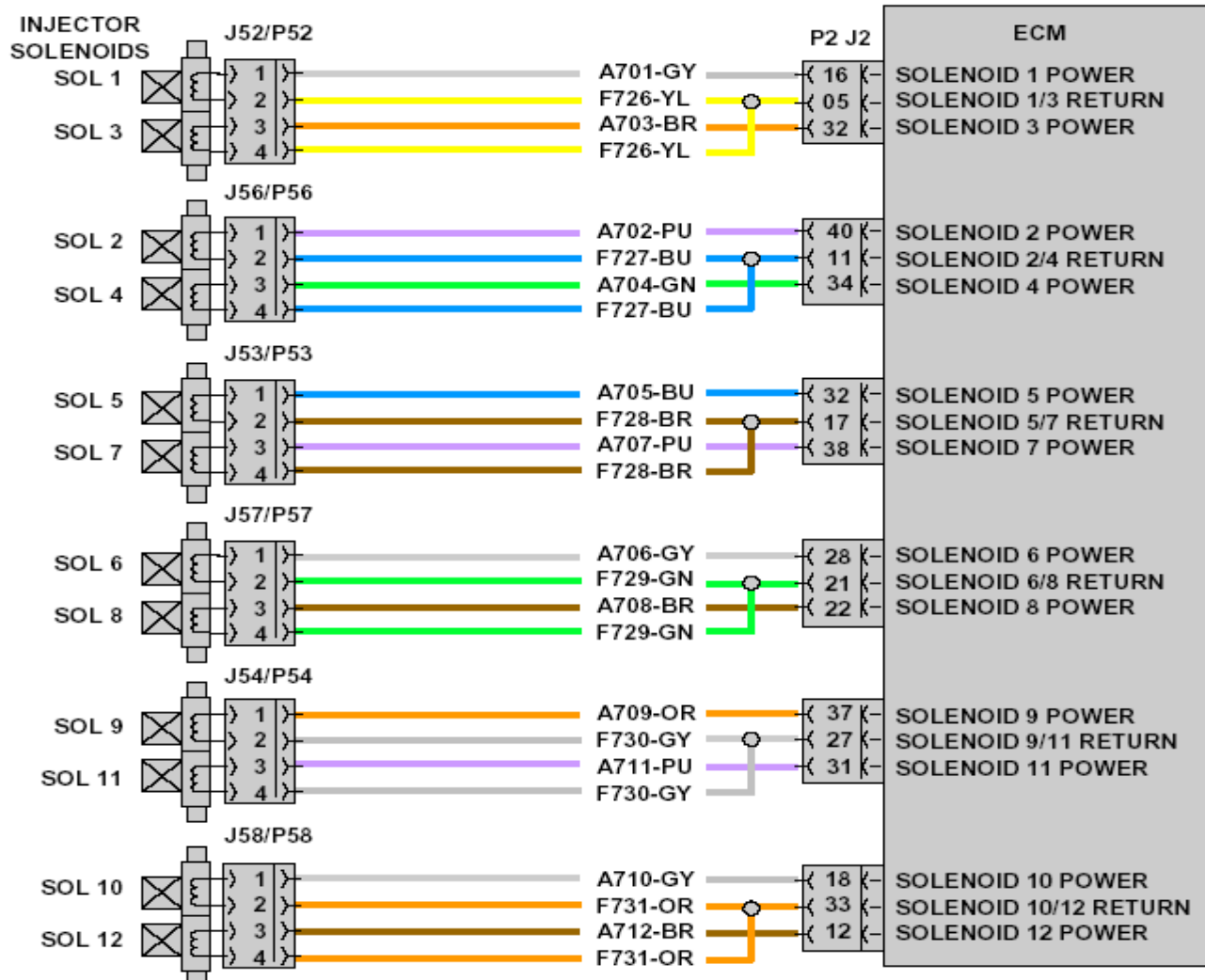
P2



P1



### 3512B INJECTOR WIRING SCHEMATIC





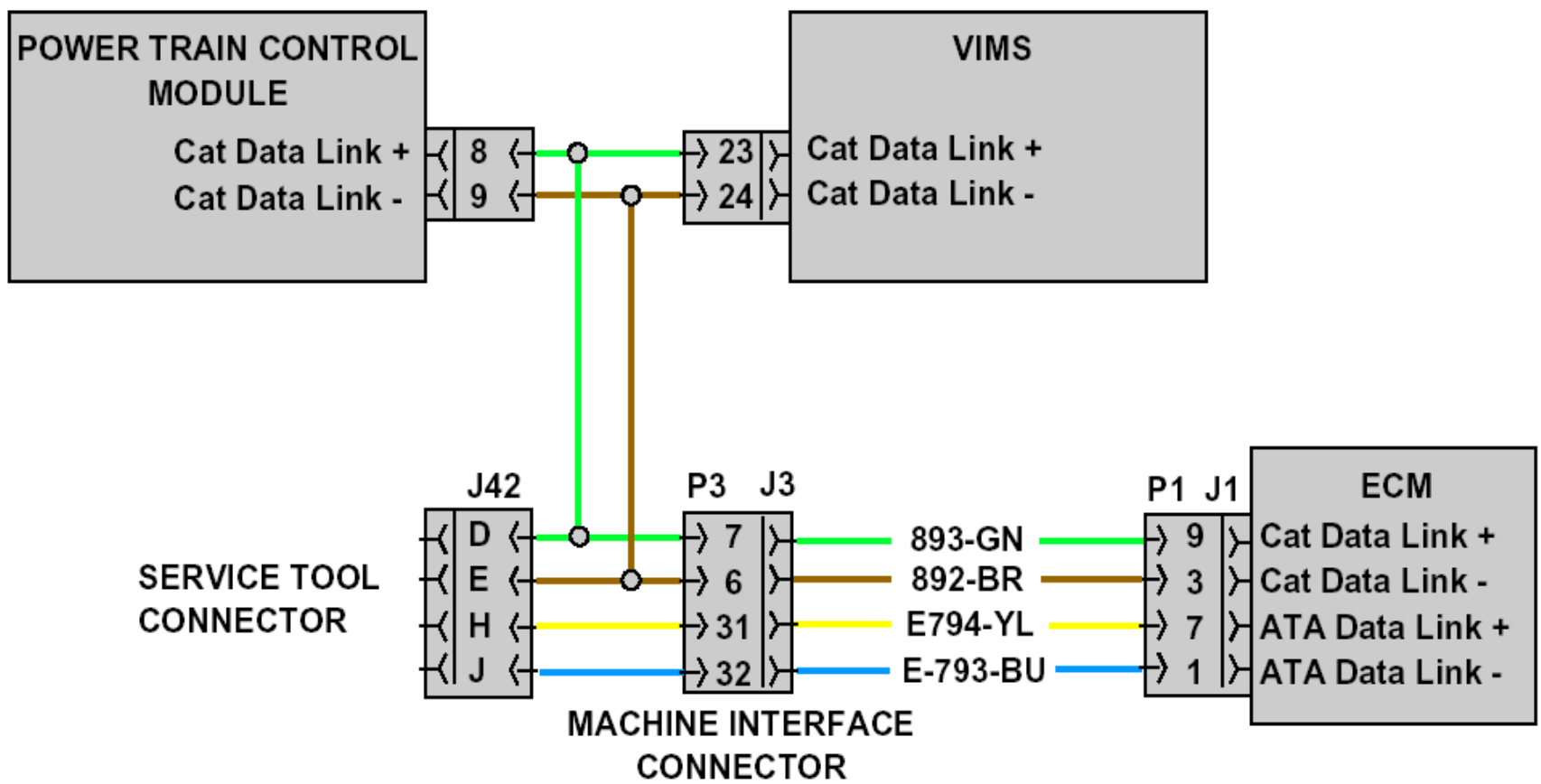
## 3500B SYSTEM POWER SUPPLIES

- **ECM: 24 VOLTS**
- **SPEED/TIMING SENSORS: 12.5 VOLTS**
- **INJECTORS: 105 VOLTS**
- **ANALOG SENSORS: 5 VOLTS**
- **DIGITAL SENSORS: 8 VOLTS**
- **WASTEGATE CONTROL SOLENOID: 0 - 24 VOLTS**





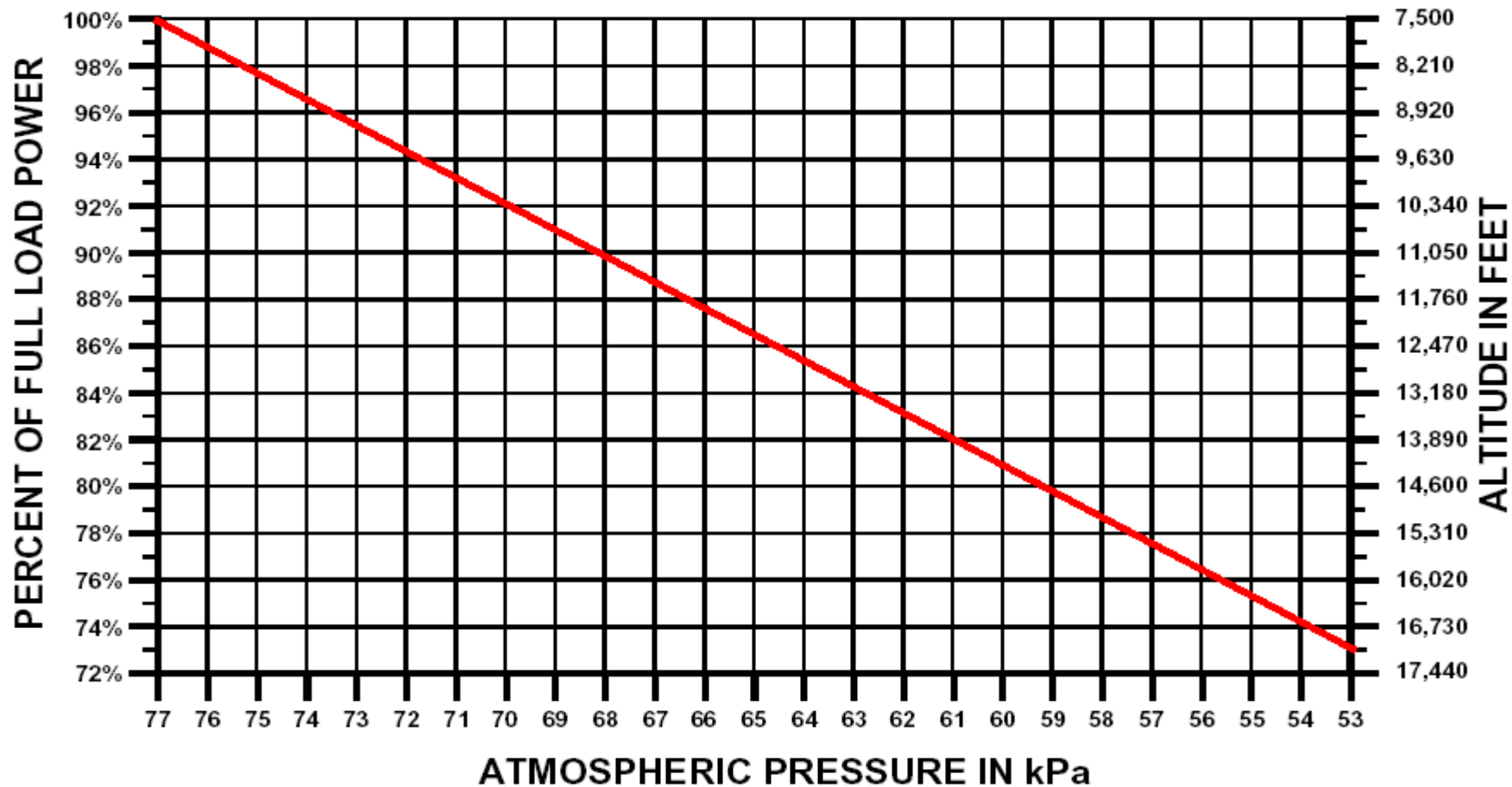
## TYPICAL CAT DATA LINK CIRCUIT







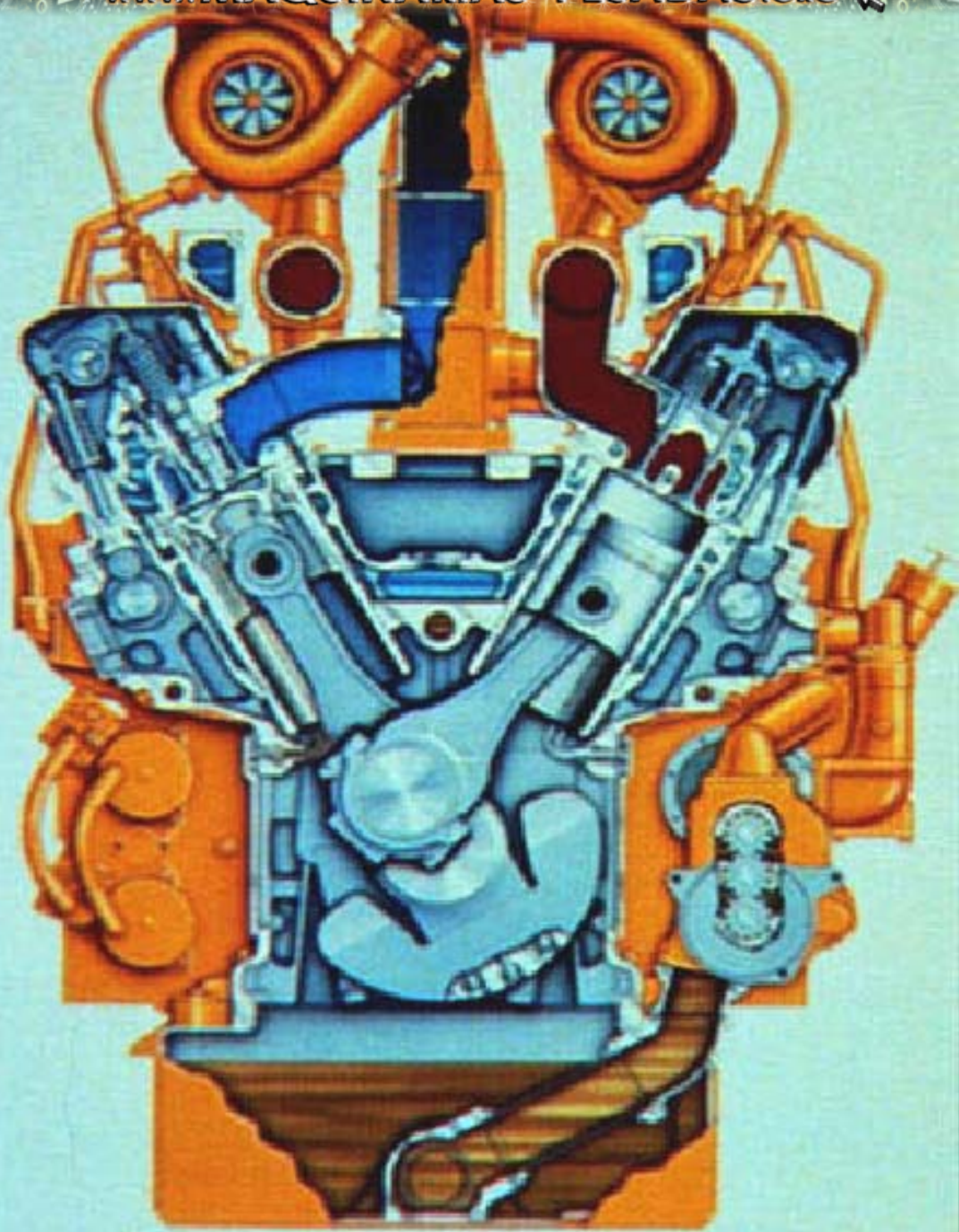
## ENGINE POWER DERATING MAP ACCORDING TO ATMOSPHERIC PRESSURE





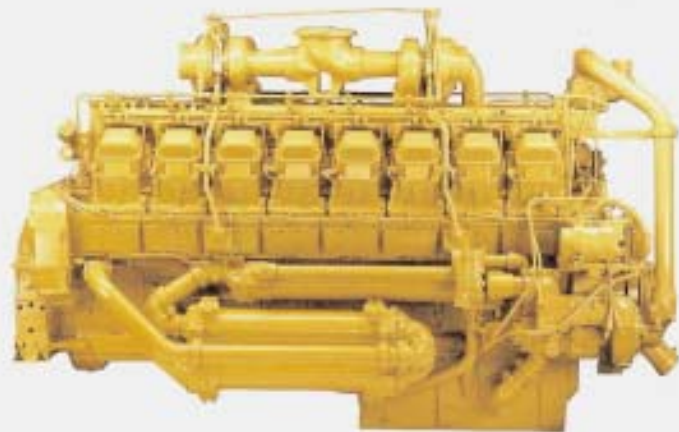
Motores 3500

**CAT**<sup>®</sup>





Standard Stroke (SS) Engine.



High Displacement (HD) Engine



