

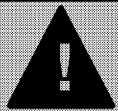


## OPERATING, MAINTENANCE, PARTS MANUAL

### COMPRESSOR MODELS

**NHP1500WCU  
10/425**

**Code:**



**This manual contains important safety information.**

**Do not destroy this manual.**

**This manual must be available to the personnel who operate and maintain this machine.**

Doosan purchased Bobcat Company from Ingersoll-Rand Company in 2007. Any reference to Ingersoll-Rand Company or use of trademarks, service marks, logos, or other proprietary identifying marks belonging to Ingersoll-Rand Company in this manual is historical or nominative in nature, and is not meant to suggest a current affiliation between Ingersoll-Rand Company and Doosan Company or the products of either.



**Portable Power  
P.O. Box 868 - 501 Sanford Ave  
Mocksville, N.C. 27028**

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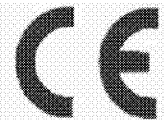
**CALIFORNIA**  
**Proposition 65 Warning**

**Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.**

Machine models represented in this manual may be used in various locations worldwide. Machines sold and shipped into European common market countries requires that the machine display the EC Mark and conform to various directives. In such cases, the design specification of this machine has been certified as complying with EC directives. Any modification to any part is absolutely prohibited and would result in the CE certification and marking being rendered invalid. A declaration of that conformity follows:

### ***Declaration of Conformity with EC Directives***

98/37/EC, 93/68/EEC, 89/336EEC



Ingersoll-Rand Company  
P.O. Box 868  
501 Sanford Avenue  
Mocksville, North Carolina 27028

We  
Represented In EC By:

Ingersoll-Rand Company Limited  
Swan Lane, Hindley Green  
Wigan WN2 4EZ  
United Kingdom

Declare that, under our sole responsibility for manufacture and supply, the product(s)

**10/425**

To which this declaration relates, is (are) in conformity with the provisions of the above directives using the following principal standards

EN1012-1, EN29001, EN292, EN60204-1  
PN8NTC2, EN 50081, EN50082

Issued at Mocksville on 1-1-02

Ric Lunsford  
Manager of Quality Control

Issued at Hindley Green on 1-1-02

H. Seddon, Q.A. Manager

#### **EC Pressure Equipment Directive and Related Regulations**

We declare that this product has been assessed according to the Pressure Equipment Directive (97/23/EC) and, in accordance with the terms of this Directive, has been excluded from the scope of this Directive. It may carry "CE" marking in compliance with other applicable EC Directives.

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Nothing contained in this document is intended to extend any promise, warranty or representation, expressed or implied, regarding the Ingersoll-Rand products described herein. Any such warranties or other terms and conditions of sale of products shall be in accordance with the standard terms and conditions of sale for such products, which are available upon request.

This manual contains instructions and technical data to cover all routine operation and scheduled maintenance tasks by operation and maintenance staff. Major overhauls are outside the scope of this manual and should be referred to an authorized Ingersoll-Rand service department.

All components, accessories, pipes and connectors added to the compressed air system should be:

- of good quality, procured from a reputable manufacturer and, wherever possible, be of a type approved by Ingersoll-Rand.
- clearly rated for a pressure at least equal to the machine maximum allowable working pressure.
- compatible with the compressor lubricant/coolant.
- accompanied with instructions for safe installation, operation and maintenance.

Details of approved equipment are available from Ingersoll-Rand Service departments.

The use of repair parts other than those included within the Ingersoll-Rand approved parts list may create hazardous conditions over which Ingersoll-Rand has no control. Therefore, Ingersoll-Rand cannot be held responsible for equipment in which non-approved repair parts are installed.

Ingersoll-Rand reserves the right to make changes and improvements to products without notice and without incurring any obligation to make such changes or add such improvements to products sold previously.

The intended uses of this machine are outlined below and examples of unapproved usage are also given. However, Ingersoll-Rand cannot anticipate every application or work situation that may arise. **If in doubt, consult supervision.**

This machine has been designed and supplied for above ground operation to be used for compression of normal ambient air containing no additional gases, vapors or particles within the ambient temperature range specified in the general data section of this manual.

**This machine should not be used:**

- A. For direct or indirect human consumption of the compressed air.
- B. Outside the ambient temperature range of minus 20°F to 115°F.
- C. When an actual or foreseeable risk of hazardous levels of flammable gases or vapors exists.
- D. With other than Ingersoll-Rand approved components.
- E. With guards, or controls or switches missing or disabled.
- F. For storage or transportation of materials inside or on the enclosure.

This company accepts no responsibility for errors in translation of this manual from the original English version.

You as the customer are expected to provide certain service and maintenance items. Your Ingersoll-Rand dealer will provide all other more detailed service and maintenance items on a special preventive maintenance schedule for each machine. It is very important that the minimum service and maintenance requirements explained in this Guide be performed at the required intervals. Exceeding these intervals may reduce the reliability of the machine.

This document has been specially prepared for the rental customer of the NHP1500 unit. The purpose of this Guide is to train the rental operator with functions, operation, and basic service and maintenance requirements of the compressor. During the preparation of this Guide, every effort was made to ensure the adequacy and accuracy of the contents.



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Your Ingersoll-Rand dealer will assist with setup and initial startup of the compressor. He will also provide brief operating and service instructions and will insure that a copy of this Guide is included with the machine. Before starting the compressor, this Guide and instructions should be carefully read to obtain a thorough knowledge of the duties to be performed as a Rental Customer. Please take pride in the compressor, keep it clean, and in good mechanical condition.

To enable proper maintenance records, Ingersoll-Rand provides a Noise Emission Control Maintenance Log Book (PCD Form 685) with each compressor shipped from the factory. This Log Book contains a recommended schedule and space so that the serviceman can note what service and maintenance was done, by whom, where, and when.

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# SECTION 1- SAFETY

## **SAFETY PRECAUTIONS**

### **General Information**

Ensure that the operator reads and understands the decals and consults the manuals before maintenance or operation.

Ensure that the Operation and Maintenance manual, and the manual holder if equipped, are not removed permanently from the machine.

Ensure that maintenance personnel are adequately trained, competent and have read the manuals.

Make sure that all protective covers are in place and that the canopy/doors are closed during operation.

The specification of this machine is such that the machine is not suitable for use in flammable gas risk areas. If such an application is required then all local regulations, codes of practice and site rules must be observed. To ensure that the machine can operate in a safe and reliable manner, additional equipment such as gas detection, exhaust spark arrestors, and intake (shut-off) valves may be required, dependent on local regulations or the degree of risk involved.

Air discharged from this machine may contain carbon monoxide or other contaminants which will cause serious injury or death. Do not breathe this air.

Compressed air can be dangerous if incorrectly handled. Before doing any work on the unit, ensure that all pressure is vented from the system and that the machine cannot be started accidentally.

Ensure that the machine is operating at the rated pressure and that the rated pressure is known to all relevant personnel.

All air pressure equipment installed in or connected to the machine must have safe working pressure ratings of at least the machine safety valve rating.

If more than one compressor is connected to one common downstream plant, effective check valves and isolation valves must be fitted and controlled by work procedures, so that one machine cannot accidentally be pressurized or over pressurized by another.

Compressed air must not be used for a feed to any form of breathing apparatus or mask.

The discharged air contains a very small percentage of compressor lubricating oil and care should be taken to ensure that downstream equipment is compatible.

If the discharged air is to be ultimately released into a confined space, adequate ventilation must be provided.

When using compressed air, always use appropriate personal protective equipment.

All pressure containing parts, especially flexible hoses and their couplings, must be regularly inspected, be free from defects and be replaced according to the Manual instructions.

Avoid bodily contact with compressed air.

Never operate unit without first observing all safety warnings and carefully reading the operation and maintenance manual shipped from the factory with this machine.

Never operate the engine of this machine inside a building without adequate ventilation. Avoid breathing exhaust fumes when working on or near the machine. Do not alter or modify this machine.

A battery contains sulfuric acid and can give off gases which are corrosive and potentially explosive. Avoid contact with skin, eyes and clothing. In case of contact, flush area immediately with water.

Exercise extreme caution when using booster battery. To jump battery, connect ends of one booster cable to the positive (+) terminal of each battery. Connect one end of other cable to the negative (-) terminal of the booster battery and other end to a ground connection away from dead battery (to avoid a spark occurring near any explosive gases that may be present). After starting unit, always disconnect cables in reverse order.

Never operate unit without first observing all safety warnings and carefully reading the operation and maintenance manual shipped from the factory with this machine.

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This machine may include such materials as oil, diesel fuel, antifreeze, brake fluid, oil/air filters and batteries which may require proper disposal when performing maintenance and service tasks. Contact local authorities for proper disposal of these materials.

High Pressure Air can cause serious injury or death. Relieve pressure before removing filler plugs/caps, fittings or covers.

Air pressure can remain trapped in air supply line which can result in serious injury or death. Always carefully vent air supply line at tool or vent valve before performing any service.

This machine produces loud noise with the doors open or service valve vented. Extended exposure to loud noise can cause hearing loss. Always wear hearing protection when doors are open or service valve is vented.

Never inspect or service unit without first disconnecting battery cable(s) to prevent accidental starting.

Do not remove the pressure cap from a HOT radiator. Allow radiator to cool down before removing pressure cap.

Do not use petroleum products (solvents or fuels) under high pressure as this can penetrate the skin and result in serious illness. wear eye protection while cleaning unit with compressed air to prevent debris from injuring eye(s).

Disconnected air hoses whip and can cause serious injury or death. Always attach a safety flow restrictor to each hose at the source of supply or branch line in accordance with OSHA Regulation 29CFR Section 1926.302(b).

Hot pressurized fluid can cause serious burns. Do not open radiator while hot.

Rotating fan blade can cause serious injury. Do not operate without guard in place.

Use care to avoid contacting hot surfaces (engine exhaust manifold and piping, air receiver and air discharge piping, etc.).

Ether is an extremely volatile, highly flammable gas. USE SPARINGLY! Do NOT use ETHER if unit has GLOW Plug starting aid. Engine damage will result.

Never allow the unit to sit stopped with pressure in the receiver-separator system. As a precaution, open the manual blowdown valve.

Never operate unit with guards, covers or screens removed. Keep hands, hair, clothing, tools, blow gun tips, etc. well away from moving parts.

Make sure wheels, tires and tow bar connectors are in safe operating condition and tow bar is properly connected before towing.

Whenever the machine is stopped, air will flow back into the compressor system from devices or systems downstream of the machine unless the service valve is closed. Install a check valve at the machine service valve to prevent reverse flow in the event of an unexpected shutdown when the service valve is open.

### **Hazardous Substance Precaution**

The following substances are used in the manufacture of this machine and may be hazardous to health if used incorrectly.

**Precaution:** Avoid ingestion, skin contact and breathing fumes for the following substances: Antifreeze, Compressor Oil, Engine Lubricating Oil, Preservative Grease, Rust Preventative, Diesel Fuel and Battery Electrolyte.

The following substances may be produced during the operation of this machine and may be hazardous to health:

Avoid build-up of Engine Exhaust Fumes in confined spaces.

Avoid breathing Exhaust Fumes.

Avoid breathing Brake Lining Dust during maintenance.

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## **SAFETY LABELS**

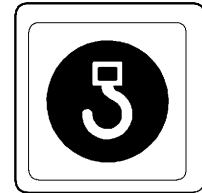
Look for these signs on machines shipped to international markets outside North America, which point out potential hazards to the safety of you and others. Read and understand thoroughly. Heed warnings and follow instructions. If you do not understand, inform you supervisor.



**Corrosion risk**



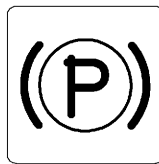
**Hot Surface**



**Lifting point**



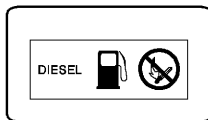
**WARNING: Electrical shock risk.**



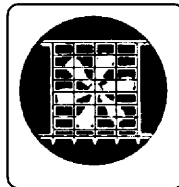
**Parking Brake**



**No open flame**



**Diesel Fuel.  
No open flame.**



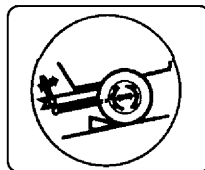
**Do not operate the machine  
without guard being fitted.**



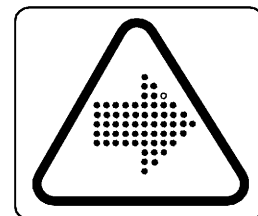
**Lifting point**



**WARNING - Flammable liquid.**



**When parking use prop stand,  
handbrake and wheel chocks.**



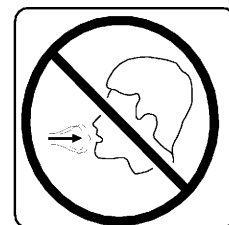
**Air/gas flow or Air discharge.**



**WARNING - Hot and harmful exhaust gas.**



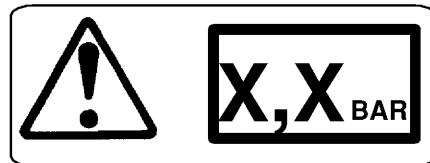
**Tie down point**



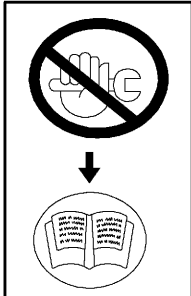
**Do not breathe the compressed  
air from this machine.**



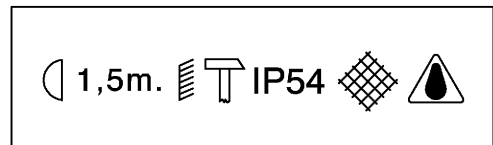
Read the Operation and Maintenance manual before operation or maintenance of this machine is undertaken.



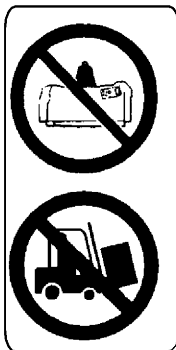
**WARNING - Maintain correct tire pressure.**  
(Refer to the *GENERAL INFORMATION* section of this manual).



**WARNING:** Consult the operation and maintenance manual before performing any maintenance.

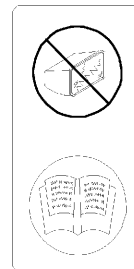


**Rough Service Designation  
Wet Location Operation**

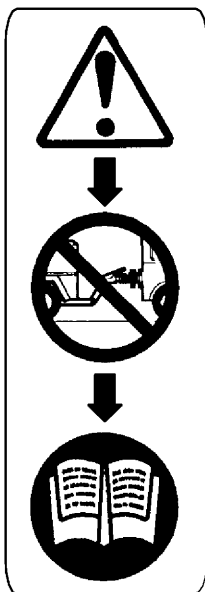


**Do not stack**

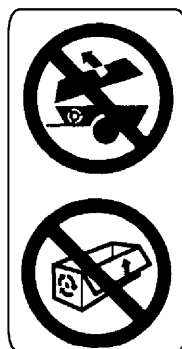
**Do not use fork lift truck from this side**



**Replace any cracked protective shield.**



**Do not operate with the doors or enclosure open.**



**On (power).**

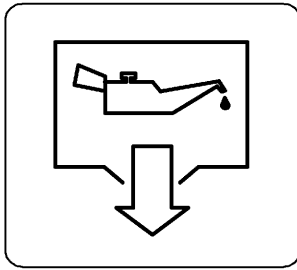


**Off (power).**

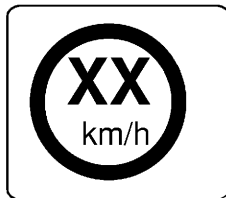


**Emergency stop.**

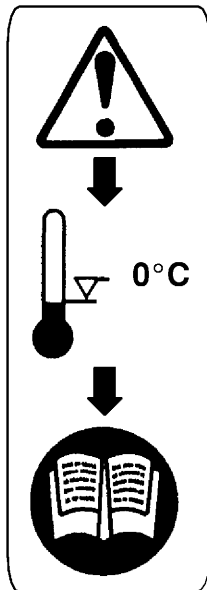
**WARNING - Before connecting the tow bar or when preparing to tow, consult the operation and maintenance manual.**



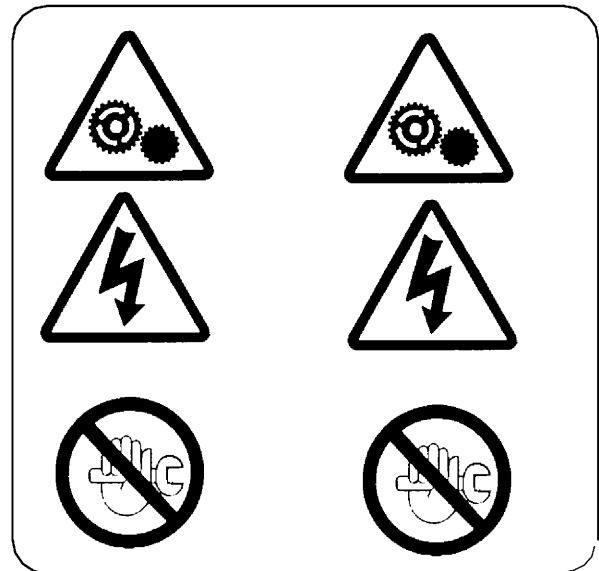
Oil Drain



Do not exceed the speed limit.



**WARNING** - For operating temperature below 0°C, consult the operation and maintenance manual.



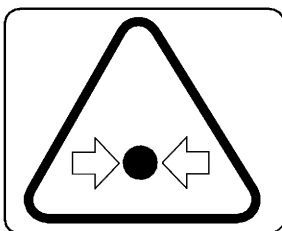
**WARNING** - Do not undertake any maintenance on this machine until the electrical supply is disconnected and the air pressure is totally relieved.



Read the Operation and Maintenance manual before operation or maintenance of this machine is undertaken



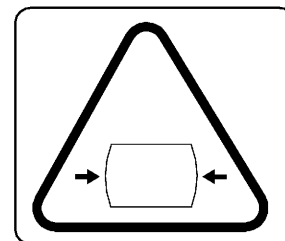
Do not remove the Operating and Maintenance manual and manual holder from this machine.



Pressurized vessel.



Use fork lift truck from this side only.



Pressurized component or system.

Look for these signs on machines shipped to markets in North America, which point out potential hazards to the safety of you and others. Read and understand thoroughly. Heed warnings and follow instructions. If you do not understand, inform your supervisor.



(Red Background)

Indicates the presence of a hazard which **WILL** cause serious injury, death or property damage, if ignored.



(Orange Background)

Indicates the presence of a hazard which **CAN** cause serious injury, death or property damage, if ignored.



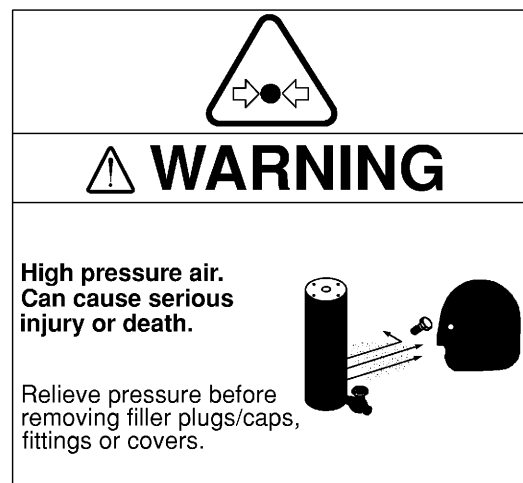
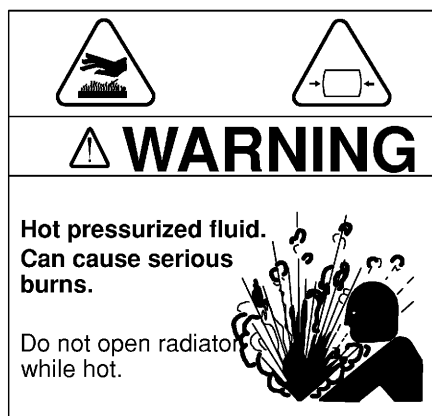
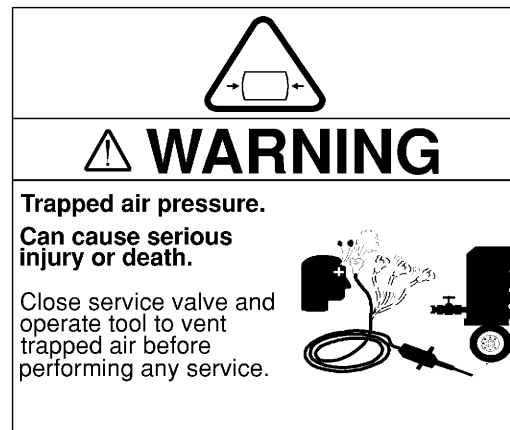
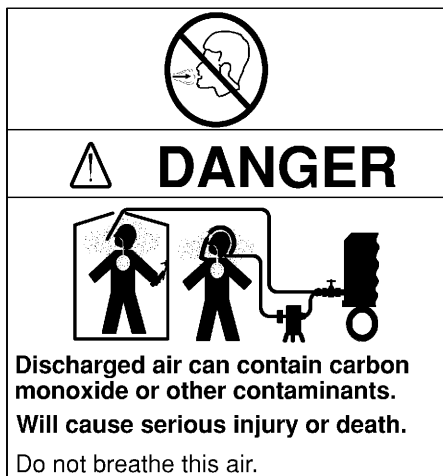
(Yellow Background)

Indicates the presence of a hazard which **WILL** or can cause injury or property damage, if ignored.



(Blue Background)

Indicates important set-up, operating or maintenance information.







## **WARNING**

**Improper operation of this equipment.  
Can cause serious injury or death.**

Read Operator's Manual supplied with this machine before operation or servicing.

**Modification or alteration of this machine.  
Can cause serious injury or death.**

Do not alter or modify this machine without the express written consent of the manufacturer.



## **WARNING**

**Collapsing jackstand.  
Can cause serious injury.**

Insert locking pin completely.



**Excessive towing speed.  
Can cause serious injury or death.**

Do NOT exceed 65 mph  
(105 km/hr.)



## **WARNING**

**Rotating fan blade.  
Can cause serious injury.**

Do not operate without guard in place.

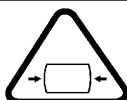


## **WARNING**

**Falling off machine.**

**Can cause serious injury or death.**

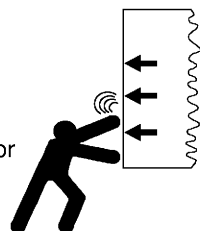
Access lifting bail from inside machine.



## **WARNING**

**Door under pressure.  
Can cause serious injury.**

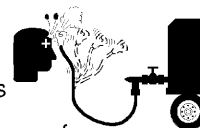
Use both hands to open door when machine is running.



## **WARNING**

**Disconnected air hoses whip.  
Can cause serious injury or death.**

When using air tools attach safety device (OSHA Valve) at source of air supply for each tool.



## **CAUTION**

**DO NOT WELD.**

**ELECTRONIC DAMAGE  
WILL OCCUR.**

This engine is equipped with an electronic engine controller and other electronic components.



## **WARNING**

**Combustible gas.**

**Can cause serious burns,  
blindness or death.**

Keep sparks and open flames away from batteries.



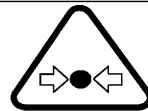


## CAUTION

**DO NOT USE ETHER.**

**ENGINE DAMAGE WILL OCCUR.**

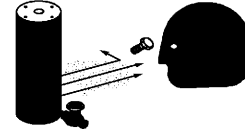
This engine is equipped with an electric heater starting aid.



## WARNING

**High pressure air.  
Can cause serious  
injury or death.**

Relieve pressure before  
removing filler plugs/caps,  
fittings or covers.



## USE DIESEL FUEL ONLY



## NOTICE

### COOLANT FILL INSTRUCTIONS

#### Adding:

Do NOT remove radiator cap. Top off at overflow reservoir. Use same anti-freeze mixture as in radiator.

#### Replacing:

With system cool, remove radiator cap. Drain coolant and close drain. At radiator, refill system. Replace radiator cap. At reservoir, fill to "Hot" level. Run for 30 minutes. Stop and allow to cool. At reservoir, add coolant as necessary to reach "Cold" level.

## FREE SAFETY DECALS!

To promote communication of Safety Warnings on products manufactured by the Portable Compressor Division in Mocksville, N.C., Safety Decals are available free of charge. Safety decals are identified by the decal heading: **DANGER, WARNING or CAUTION.**

Decal part numbers are on the bottom of each decal and are also listed in the compressor's parts manual. Submit orders for Safety Decals to the Mocksville Parts Service Department. The no charge order should contain only Safety Decals. Help promote product safety! Assure that decals are present on the machines. Replace decals that are not readable.

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## SECTION 2 - Warranty

Ingersoll-Rand, through its distributor, warrants that each item of equipment manufactured by it and delivered hereunder to the initial user will be free of defects in material and workmanship for a period of three (3) months from initial operation or six (6) months from the date of shipment to the initial user, whichever occurs first.

With respect to the following types of equipment, the warranty period enumerated below will apply in lieu of the foregoing warranty period.

- A. **Aftercoolers** – The earlier of nine (9) months from date of shipment to or six (6) months from start up by initial user.
- B. **Portable Compressors, Portable Generator Sets (GENSET) 8KW, 11KW, 20KVA thru 575KVA, Portable Light Towers and Air Dryers** – The earlier of twelve (12) months from shipment to or the accumulation of 2,000 hours of service by the initial user.  
**3.5KW thru 7.0KW and 10KW**– The earlier of twelve (12) months from shipment to or the accumulation of 2,000 hours of service by the initial user, whichever occurs first. Ingersoll-Rand will provide a new part or repaired part, at its election, in place of any part which is found to be defective in material or workmanship during the period described above. Labor cost to replace the part is the responsibility of the user.
- C. **Portable Compressor Air Ends** – The earlier of twenty-four (24) months from shipment to or the accumulation of 4,000 hours of service by the initial user. For Air Ends, the warranty against defects will include replacement of the complete Air End, provided the original Air End is returned assembled and unopened.
- C.1 **Portable Compressor Airend Limited Optional Warranty** – The earlier of sixty (60) months from shipment to or the accumulation of 10,000 hours of service. The optional warranty is limited to defects in rotors, housings, bearings and gears and provided all the following conditions are met:
  - 1. The original air end is returned assembled and unopened.
  - 2. Continued use of genuine Ingersoll-Rand parts, fluids, oil and filters.
  - 3. Maintenance is performed at prescribed intervals.**Oil-Free airends are fee-based and may require a maintenance agreement. Formal enrollment is required.**
- D. **Genset Generators 8KW, 11KW, 20KVA thru 575KVA** – The earlier of twenty-four (24) months from shipment to or the accumulation of 4,000 hours of service by the initial user.  
**3.5KW thru 7.0KW and 10KW** – The earlier of twelve (12) months from shipment to or the accumulation of 2,000 hours of service.
- E. **Portable Light Tower Generators**– The earlier of twelve (12) months from shipment to or the accumulation of 2,000 hours of service by the initial user. Light Source model only, the earlier of twenty-four (24) months from shipment to or the accumulation of 4,000 hours of service.
- F. **Ingersoll-Rand Engines** – The earlier of twenty-four (24) months from shipment to or the accumulation of 4,000 hours of service.

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G. **Ingersoll-Rand Platinum Drive Train Warranty (Optional)** – Platinum drive train pertains to the Ingersoll-Rand Engine and Airend combination. The earlier of sixty (60) months from shipment to, or the accumulation of 10,000 hours of service. The starter, alternator, fuel injection system and all electrical components are excluded from the extended warranty. The airend seal and drive coupling are included in the warranty (airend drive belts are not included). The optional warranty is automatically available when meeting the following conditions:

1. The original airend is returned assembled and unopened.
2. Continued use of genuine Ingersoll-Rand parts, fluids, oil and filters.
3. Maintenance is performed at prescribed intervals.

It is the obligation of the user to provide verification that these conditions have been satisfied when submitting warranty claims.

F. **Spare Parts**– Six (6) months from date of shipment.

Ingersoll-Rand will provide a new part or repaired part, at its election, in place of any part which is found upon its inspection to be defective in material and workmanship during the period prescribed above. Such part will be repaired or replaced without charge to the initial user during normal working hours at the place of business of an Ingersoll-Rand distributor authorized to sell the type of equipment involved or other establishment authorized by Ingersoll-Rand. User must present proof of purchase at the time of exercising warranty.

The above warranties do not apply to failures occurring as a result of abuse; misuse, negligent repairs, corrosion, erosion and normal wear and tear, alterations or modifications made to the product without express written consent of Ingersoll-Rand; or failure to follow the recommended operating practices and maintenance procedures as provided in the product's operating and maintenance publications.

Accessories or equipment furnished by Ingersoll-Rand, but manufactured by others, including, but not limited to, engines, tires, batteries, engine electrical equipment, hydraulic transmissions, carriers, shall carry whatever warranty the manufacturers have conveyed to Ingersoll-Rand and which can be passed on to the initial user.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, (EXCEPT THAT OF TITLE), AND THERE ARE NO WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.

# GENERAL WARRANTY INFORMATION

GENERAL WARRANTY			Extended Coverage
Portable Compressor	Package	1 year/2000 hrs	
	Airend	2 yrs/4000 hrs	5 yrs/10,000 hrs Limited warranty, major components (refer to operator's manual).

Portable Genset 8kW, 11KW, 20KVA thru 575KVA	Package	1 yr/2000 hrs	None
	Generator	2 yrs/4000 hrs	None

Portable Genset 3.5KW thru 7.0KW and 10KW	Package	1 yr/2000 hrs (parts only)	None
	Generator	1 yrs/2000 hrs (parts only)	None

Light Tower	Package	1 yr/2000 hrs	
	Generator	1 yr/2000 hrs	2 years/4000 hours, for Lightsource introduced 8/16/99.

ENGINES			
CATERPILLAR	Months	Hours	Extended Coverage
	12	unlimited	Available at dealer
CUMMINS	24	2000	Major components 3 yrs/10,000 hrs Available at dealer
JOHN DEERE (in compressors)	24	2000	5 yrs/5000 hrs using OEM fluids and filters with \$250 deductible
(in generators as of 1/1/01)	24	2000	2 yrs/4000 hrs using IR fluids and filters
DEUTZ	24	2000	Available at dealer
INGERSOLL-RAND	24	4000	5 yrs/10,000 hrs when using genuine Ingersoll- Rand fluids and parts. Refer to operator's manu- al.
KUBOTA (North America only)	24	2000	Major components 36 mo/3000 hrs (parts only)
(Western Europe & Oceania)	24	2000	None
(Central & South America, Asia, Middle East & Africa)	12	1000	None
MITSUBISHI	24	2000	2 yrs/4000 hrs using IR fluids & filters
VOLVO	24	2000	2 yrs/4000 hrs using ir fluids & filters
HONDA	12	unlimited	None
VANGUARD	24	unlimited	None

PARTS			
	Months	Hours	Coverage
Ingersoll-Rand	6	No Limit	Parts Only

AIREND EXCHANGE			
	Months	Hours	Extended Coverage
Airend	12	2000 hours	2 yrs/4000 hrs - available from IR.

Note: Actual warranty times may change. Consult the manufacturer's warranty policy as shipped with each new product.

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# ***WARRANTY REGISTRATION***

## **Complete Machine Registration**

Machines shipped to locations within the United States do not require a warranty registration unless the machine status changes (i.e. change of ownership).

Machines shipped outside the United States require notification be made to initiate the machine warranty.



**Fill out the Warranty Registration Form in this section, keep a copy for your records and mail form to:**

Ingersoll-Rand Company  
Portable Compressor Division  
P.O. Box 868  
Mocksville, North Carolina 27028  
Attn: Warranty Department

**Note: Completion of this form validates the warranty.**

**Selling Distributor**

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_  
County \_\_\_\_\_  
State \_\_\_\_\_  
Zip Code \_\_\_\_\_  
Telephone \_\_\_\_\_

**Servicing Distributor**

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_  
County \_\_\_\_\_  
State \_\_\_\_\_  
Zip Code \_\_\_\_\_  
Telephone \_\_\_\_\_

**WARRANTY REGISTRATION**

Owner/User Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_  
County \_\_\_\_\_  
State \_\_\_\_\_  
Zip Code \_\_\_\_\_  
Telephone \_\_\_\_\_

***Complete the Applicable Blocks*****Owner/User Type of Business (check one only)**

- |   |  |                                      |  |
|---|--|--------------------------------------|--|
| <input type="checkbox"/> Construction-Heavy<br>(highway, excavation, etc.)                  | <input type="checkbox"/> Asphalt Contractor                                | <input type="checkbox"/> Coal Mining | <input type="checkbox"/> Other Mining                                    |
| <input type="checkbox"/> Construction-Light<br>(carpentry, plumbing, pools,<br>mason, etc.) | <input type="checkbox"/> Government<br>(municipal, state,<br>county, etc.) | <input type="checkbox"/> Quarry      | <input type="checkbox"/> Shallow Oil & Gas                               |
| <input type="checkbox"/> Rental<br>(rental center, rental fleet, etc.)                      | <input type="checkbox"/> Building Contractor                               | <input type="checkbox"/> Waterwell   | <input type="checkbox"/> Utility Company<br>(gas, electric, water, etc.) |
| <input type="checkbox"/> Industrial (plant use)   | <input type="checkbox"/> Other<br>specify _____                            | <input type="checkbox"/> Exploration | <input type="checkbox"/> Utility Contractor                              |

**Model****Unit S/N****Engine S/N****Date Delivered****Unit-Hours****Airend S/N****Truck S/N****Truck Engine S/N****SERVICING DISTRIBUTOR/USER ACKNOWLEDGEMENT**

1. The Purchaser has been instructed and/or has read the manual and understands proper preventative maintenance, general operation and safety precautions.
2. The warranty and limitation of liability has been reviewed and understood by the owner/user.
3. In the event that this unit is to be used within a nuclear facility, the owner/user shall notify Ingersoll-Rand of such use so that Ingersoll-Rand may arrange for appropriate nuclear liability protection from the owner-licensee of the facility.
4. Ingersoll-Rand reserves the right to make design changes or modifications of Ingersoll-Rand products at anytime without incurring any obligation to make similar changes or modifications on previously sold units.

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***Attention: Warranty Department***

***Ingersoll-Rand Company  
Portable Compressor Division  
P.O. Box 868  
Mocksville, North Carolina 27028***

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*fold*  
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## SECTION 3 - GENERAL DATA

### UNIT MODELS ..... NHP1500WCU

Air Delivery – cfm (litres/sec) ..... 1500 (708)

### COMPRESSOR

Rated Operating Pressure – psi (kPa) ..... 60 –150 (415–1050)

### ENGINE (Diesel)

Manufacturer ..... Cummins

Model ..... QSX-15

Rated Horsepower at 1800 rpm ..... 600

Electrical System ..... 24 VDC

Full Load Speed – rpm ..... 1800

No Load Speed – rpm ..... 1200

### FLUID CAPACITIES – U.S. Gallons (litres)

Hydraulic Oil ..... 27 (102)

Compressor Lubricant ..... 25 (95)

Engine Lube (including filter) ..... 10.5 (40)

Engine Coolant (Radiator) ..... 21 (79.5)

Fuel Tank (Clean DIESEL fuel) ..... 300 (1135)

### UNITS MEASUREMENTS/WEIGHTS (feet (meters))

Overall Length ..... 19.6 (5.97)

Overall Height ..... 8 (2.44)

Overall Width ..... 7.4 (2.25)

Gross Weight – pounds (kg) (all fluids) ..... 22,000 (9979)

### RUNNING GEAR

Tire Size ..... 18x9

Towing Speed (Maximum) mph (km/hr) ..... 15 (24)

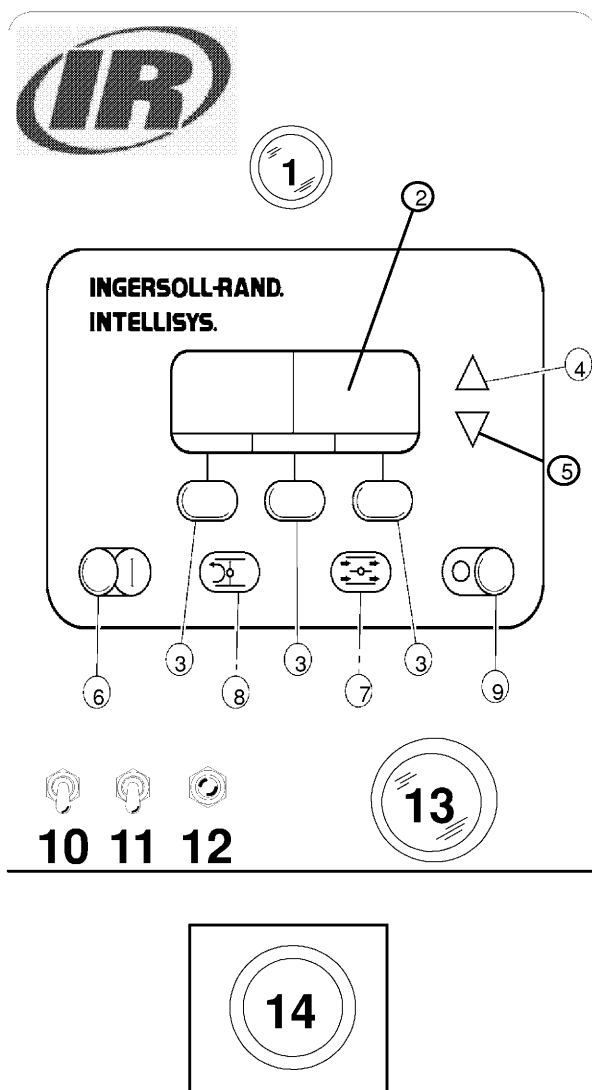
Inflation Pressure ..... Solid

### EXPENDABLE SERVICE PARTS

Part Number	Description	Where Used	Quantity
39911615	Filter, Oil	Hyd & Airend	2
36864379	Filter, Inlet Primary	Engine & AE inlet	2
36864361	Filter, Inlet Secondary	Engine & AE inlet	2
54662028	Filter Oil, Engine	Qsx15	1
54662051	Filter Coolant, Engine	Qsx15	1
54662036	Filter, Fuel Engine	Qsx15	1
54661590	Filter, Fuel Primary	Fuel/Water Filter	2
54758339	IR Hydraulic Fluid, 55 gallon		
54758321	IR Hydraulic Fluid, 5 gallon		
54758347	275 gallon tote		

**CAUTION: Any departure from the specifications may make this equipment unsafe.**

## SECTION 4 - OPERATING INSTRUCTIONS



### OPERATING CONTROLS AND INSTRUMENTS

The operating controls and instruments are arranged on the control panel as shown on previous page. A description of each panel device is as follows:

1. **Lamp:** Controlled by Switch 11.
2. **Message Display:** Provides operator with diagnostics and status messages as well as name of measured parameter (temperature, pressure, etc.)
3. **Menu Selection:** Buttons used to select different menus viewed in message display. (status, main menu, etc).

4. **Scroll Up Button:** Press this button to scroll up the parameter menu as shown in the Message Display.
5. **Scroll Down Button:** Press this button to scroll down the parameter menu as shown in Message Display.
6. **Start Button:** Press this button to start machine.
7. **Load Button:** Press this button to load machine after warm-up period is complete.
8. **Unload Button:** Press this button to "unload" machine prior to stopping. Note: Pressing this button will close air intake and decrease engine speed to idle condition.
9. **Stop Button:** Press this button to initiate a controlled stop to the machine following "unload".
10. **Power On-Off Switch:** Use this switch to turn power "ON" or "OFF" to controller. Switch must be in On position for machine to operate. Note: Always use Stop button (item 9) to stop machine before switching to "OFF."
11. **Lights Switch:** Operates Lamp
12. **Ether Inject Button:** Injects a measured shot of ether for aid in cold weather starting of engine. Caution: Use sparingly.
13. **Hourmeter:** Indicates running time for maintenance purposes.
14. **Emergency Stop Button:** Press this button to immediately stop machine. Use this button **ONLY** during emergency conditions. The Stop button (item 9) should be used for normal stops.

Another emergency stop is located on drawbar end of machine.

15. **Warning Lights (flashing):** Located on each end of machine. Indicates alert, shutdown condition, or starting.

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## **WARNING**

**Do not climb on top of unit.**

### **LIFTING UNIT**

Fork Tubes

- drawbar vertical stowing position
- fork truck lifting capacity per gross weight (see general data)

Four Corner Lifting Pockets

- Use 2 spreader bars
- Hoist/crane per machines gross weight (see general data)

### **WHEEL CHOCK**

- Located inside of front door
- Secure unit with chocks before disconnecting drawbar from tow vehicle.

### **BEFORE TOWING**

- When lifting or lowering drawbar, always grasp drawbar firmly and stand to one side.
- Ensure that the tires, wheels and running gear are in good condition and secure.

### **TOWING**

- Do not tow this unit in excess of 15 mph (24km/hr).
- Use a tow vehicle whose towing capacity is greater than the gross weight of this unit. (see general data).
- Machine is not designed to be Highway Towable.

### **SETTING UP (ALL UNITS)**

Place the unit in an open, well-ventilated area. Position as level as possible. The design of these units permits a maximum 5 degree limit on out-of-level operation.

When the unit is to be operated out-of-level it is important: (1) to keep the engine crankcase oil level near the high level mark (with the unit level), and (2) to have the compressor oil level gauge show no more than mid-scale (with the unit running at full load). Do not overfill either the engine crankcase or the compressor lubricating oil system.

Chock wheels.

This unit is equipped with on-board fuel tanks with a total capacity of 260 gallons which provides 10–11 hours of full load operation.

### **COMPRESSOR MOUNTING**

Portable compressors, which are modified to remove the running gear and mount the machine direct to trailers, truck beds or frames, etc. may experience failure of the enclosure, frame, and/or other components. It is necessary to isolate the compressor package from the carrier base with a flexible mounting system. Such a system must also prevent detachment of the package from the carrier base in the event the isolators fail. Contact Ingersoll-Rand representative for flexible mounting kits.

Warranty does not cover failures attributable to mounting of the compressor package to the carrier base unless it is an Ingersoll-Rand provided system.

### **FOR REMOTE FUELING**

- one 3/4" female connector (supply)
- one 3/4" male connector (return)

Open rear door and locate fuel manifold.

Lever handle in the vertical position permits fueling from onboard tanks.

Lever handle in the horizontal position allows remote fueling.

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## WARNING

Do not connect the air discharge on this unit onto a common header with any other unit of any description, or any other source of compressed air, without first making sure a check-valve is used between the header and the unit. If this unit is connected in parallel with another unit of higher discharge pressure and capacity, a safety hazard could occur in a back-flow condition.

## WARNING

Unrestricted air flow from a hose will result in a whipping motion of the hose which can cause serious injury or death. A safety device must be attached to the hose at the source of supply to reduce pressure in case of hose failure or other sudden pressure release. Reference: OSHA regulation 29 CFR Section 1926.302 (b).

Air hose restraining cable installation:

Secure hose restraining cable at each end to prevent accidental hose whipping. At the machine-side of the air hose, install and secure one end of the hose restraining cable on the 3" nipple on the inlet side of the 3" service valve. Install the other end of the hose restraining cable over the main hose connector.

Install suitable 3" air hose between service valve on unit and point of air use. The air hose must be rated for outdoor use and for pressurized air service. Minimum rating is 200 psig (1379kPa) and 250°F (121C) .

For plant air systems, adhere to the following additional setup guidelines:

Insure that a isolation valve is installed at the header where the 3" hose is connected. This allows a machine to be removed without shutting down the plant.

## WARNING

Before removing a machine or disconnecting the air hose, first close the isolation valve at the plant air header. Allow machine to self vent after shutdown and assure output pressure is 0 psi. Unrestricted air flow from a hose will result in a whipping motion of the hose which can cause severe injury or death.

If a check valve is installed at the customer header and if one of the two automatic line pressure modulation modes will be used, an additional pressure signal line must be used to provide the unit control system with air pressure on the plant-side of the check valve. INTELLISYS Controller remote pressure must be on.

If no check valve is installed at the customer header, plant air pressure will be sensed in the on-board discharge pipe. Therefore, it is not necessary to install the additional pressure sense line. Note: The NHP1500 unit has a check valve installed at the outlet side of the 2nd stage piping in order to prevent large backflow of plant air when the machine is idling or shutdown.

Make a final inspection of the machine and all connections before starting the unit. Insure that all connections are tight and that proper hose restraining cables and isolation valve are installed.

## SETTING UP MULTIPLE UNITS

Many applications will require multiple machines operating in parallel in order to meet the flow requirements of the application. Use the following guidelines in setting up multiple machines.

1. Position each unit in an open, well-ventilated area. Position and space each unit sufficiently apart from each other so that doors can be opened fully for service and maintenance. Recommended minimum clearance between multiple machines is 8 feet (2.4m).
2. Perform the "single-unit" setup steps above.
3. For two or three NHP1500 machines, recommended combined flow hose size is 4". It is important that air pressure drop from each machine to the plant air header be properly balanced for best operation. Thus, plumbing of the air lines should be given close attention.

- 
4. For only two NHP1500 machines, plumb the 3" air hose from each machine into either a 3" x 3" x 4" tee or Y-lateral fitting. Each 3" air hose should ideally be of equal length in order to match pressure drops. Be sure to install a 3" isolation valve at both inlets to the tee or Y-lateral. This will allow one machine to be moved or disconnected without shutting down the other machine. Be sure to use a hose restraining cable at each end of each 3" hose to prevent accidental hose whipping.
  5. For three NHP1500 machines, plumb the 3" air hose from each machine into a 3-unit manifold (IR Kit #36012243). Each 3" air hose should ideally be of equal length in order to match pressure drops. Be sure to install a 3" isolation valve at all three inlets to the manifold to allow one machine to be moved or disconnected without shutting down the other machines. Be sure to use a hose restraining cable at each end of each 3" hose to prevent accidental hose whipping.
  6. Install a suitable 4" air hose between the manifold and the point of air use. The air hose must be rated for outdoor use and for pressurized air service. Minimum rating is 200 psig (1379kPa) and 250°F (121°C). Be sure that a hose restraining cable is installed at both ends of the 4" air hose to prevent accidental hose whipping.
  7. For more than 3 machines in parallel, use multiples of the above as required to insure balanced pressure drops from each machine to the point of use.
  8. Insure that a isolation valve is installed at the plant air header where the main outlet hose is connected.
  9. **WARNING: Before removing a machine or disconnecting the air hose, first close the isolation valve at the air header. Allow machine to self vent after shutdown and assure output pressure is 0 psi. Unrestricted air flow from a hose will result in a whipping motion of the hose which can cause severe injury or death.**
  10. If a check valve is installed at the customer header, an additional pressure signal line must be used to provide the unit control system with air pressure on the plant-side of the check valve. One pressure signal line must be plumbed to each machine. Each machine must have remote pressure selection through INTELLISYS Controller User Options Menu.
  11. If no check valve is installed at the customer header, plant air pressure will be sensed in the on-board discharge pipe. Therefore, it is not necessary to install the additional pressure sense line. Note: the NHP1500 unit has a check valve to prevent backflow of plant air into the airend when the machine is idling or shutdown.
  12. Make a final inspection of the machines and all connections before starting the units. Insure that all connections are tight and that proper hose restraining cables and isolation valves are installed.

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## **SETTING UP THE PLANT AIR PRESSURE SIGNAL**

A separate plant air pressure signal line must be used when a check valve is installed at the customer plant air header and if one of the two automatic line pressure modulation modes is to be used. This allows each machine to automatically modulate as required to maintain the desired plant air pressure. Use the following guidelines in installing this signal air line.

1. Install a hose restraining cable at each end of the signal pressure line to prevent accidental hose whipping
2. Connect a #4 pressure hose (1/4") from a connection port on the plant air side of the check valve to each machine. Note; This signal air line should be maintained as short as possible for optimum response to changing plant air pressure.
3. Install an isolation valve at the pressure source to each signal air line. This allows a machine to be moved without affecting operation of other machines.
4. Connect the #4 hose to the signal air port on each machine. This port is located above the discharge valve on the machine and is factory-fitted with a -4 JIC plug. Remove the pipe cap and install #4 hose with -4 JIC connections.
5. It will be necessary to program the INTELLISYS Controller to use this pressure port for pressure control and regulation. These instructions are provided in "USER OPTIONS MENU". **NOTE:** When the Controller is turned on, the default selection is chosen.

## **BEFORE STARTING**

Open service valves.

Inspect the complete installation including remote fuel lines (if any) and air hose routing and connections.

Check battery for proper connections and condition.

### **WARNING**

**Combustible gas can cause severe burns, blindness or death. Keep sparks and open flame away from battery.**

- Check the compressor lubricating oil level. The proper oil level is labeled on the compressor sump dipstick. Add oil when required. Do not overfill.
- . Check the hydraulic oil level. The proper oil level is mid-way on the sight gauge. Add oil if the level falls to the bottom of the sight gauge. Do not overfill.
- Check engine oil level. The proper level is labeled on the engine sump dipstick. Add oil when required. Do not overfill.
- To jump-start, connect the positive booster/charger cable to the 24VDC positive (+) terminal of the battery. Then connect the negative booster/charger cable to the engine block...Not to the negative (-) terminal of the weak battery. After starting, disconnect the negative (-) cable from engine block; then from the booster battery/charger. Disconnect positive (+) cable from both batteries.

### **WARNING**

**Do not remove the cap from a HOT engine radiator. The sudden release of pressure from a heated cooling system can result in a loss of coolant and possible severe personal injury.**

## WARNING

**Hot pressurized fluid can cause serious burns. Do not open radiator while hot.**

Check coolant bottle to assure coolant level is at minimum level when the unit is cold.

Check engine coolant level by removing the radiator top cap and looking for coolant in the filler neck of the radiator. Add coolant as required. Insure that radiator cap is installed properly and tightened.

Note: This machine will not allow engine starting if engine coolant is low.

**NOTICE:** If the appropriate mixture of antifreeze is not used during freezing temperatures, failure to drain the engine may cause costly engine damage. Never use water only as corrosion inhibitors are required in engine coolant fluid.

## CAUTION

**No smoking, sparks, or open flame near fuel.**

Check the fuel level. Add only CLEAN DIESEL fuel for maximum service from the engine. Refer to the Engine Operator's Section for fuel specifications.

## NOTICE

**To minimize condensation (water) in the fuel tank, it is recommended to fill the tank at the end of each day.**

## WARNING

**This machine produces loud noise with doors open. Extended exposure to loud noise can cause hearing loss. Wear hearing protection when doors or valve(s) are open.**

- Close the side doors to maintain a cooling air path and to avoid recirculation of hot air. This will maximize the life of the engine and compressor and protect the hearing of surrounding personnel.

- Make sure no one is IN or ON the compressor unit.

### STARTING -

1. Flip the POWER switch to "ON". INTELLISYS Controller display will be activated.
2. Insure that the "EMERGENCY STOP" switch is not depressed. Reset this switch by pulling out the knob.
3. Insure that the service valve is open.
4. Press the START button to initiate the start sequence. If certain conditions exist that would prevent a normal start, the engine will not be allowed to start and the condition will be displayed in the Message Display.

**NOTE:** PRESS "STOP" BUTTON TO ABORT A START SEQUENCE.

The AUDIBLE ALARM will sound for 10 seconds to alert the operator or anyone around or in the machine that the machine is about to start. At the end of the 10 second alarm period, the engine will begin cranking.

The INTELLISYS Controller will allow up to three automatic start attempts with a 10 second wait between each start attempt. If the engine has not started after the 3rd try, the START sequence must be manually reinstated by the Operator. If after two complete start sequences the engine has still not started, begin troubleshooting to determine the cause of the problem.

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## CAUTION

**Ether is an extremely volatile, high flammable gas. Use Sparingly! If too much is injected, the uncontrolled explosion may result in costly damage to the engine.**

5. In cold weather, as required, press the ETHER INJECT button once or twice only while the engine is cranking. This injects a measured amount of ETHER to the engine.
6. Following a successful start, the engine will accelerate to idle speed of 1200 RPM for warm-up. "UNLOADED MANUAL" will be displayed in the Message Display. If this message is not displayed or any other diagnostic message is shown, the machine should be stopped and the cause of the diagnostic message investigated.
7. Press the LOAD button. "WARMING UP" will be displayed until coolant temperature reaches above 80°F. "LOADING" will be displayed and the engine will increase speed up to 1800 rpm until the pressure reaches the desired set point (default to 150 psi).

### **NORMAL OPERATION**

The Operator may observe and monitor operating parameters using the STATUS and SCROLL buttons. In the event the machine controller detects a parameter outside normal operating limits, first an ALERT message will appear on the Message Display.

In the event the machine controller detects a parameter at a dangerously high or low level, the machine will be automatically unloaded and stopped with the cause of the SHUTDOWN shown on the Message Display and warning lights will flash.

Delivered air volume at set point pressure is accomplished by two methods:

- 1) Compressor inlet butterfly valve and blowdown valve are controlled by a solenoid which directs oil to a cylinder by the INTELLISYS Controller logic (valves synchronized together).

The compressor is either loaded (inlet valve fully open/blowdown valve fully closed) or unloaded (inlet valve fully closed/blowdown valve fully open).

- 2) Engine speed varies between 1200 RPM and 1800 RPM while compressor is loaded to match the required volume flow.

Full flow at set point pressure at 1200 RPM is approximately 1000 CFM. Full flow at set point pressure at 1800 RPM is 1500 CFM.

#### **Operation – Loaded**

Assume engine has been started and is running in the unload state at 1200 RPM. If there is air demand (pressure falls below the load point pressure), compressor will load at 1200 RPM by oil pressure to the cylinder (opens the butterfly valve and closes the blowdown valve). This provides 1000 CFM of air. As air demand rises and falls, engine speed is controlled between 1200 RPM and 1800 RPM to match the required flow while maintaining rated pressure. Full flow is 1500 CFM at 1800 RPM.

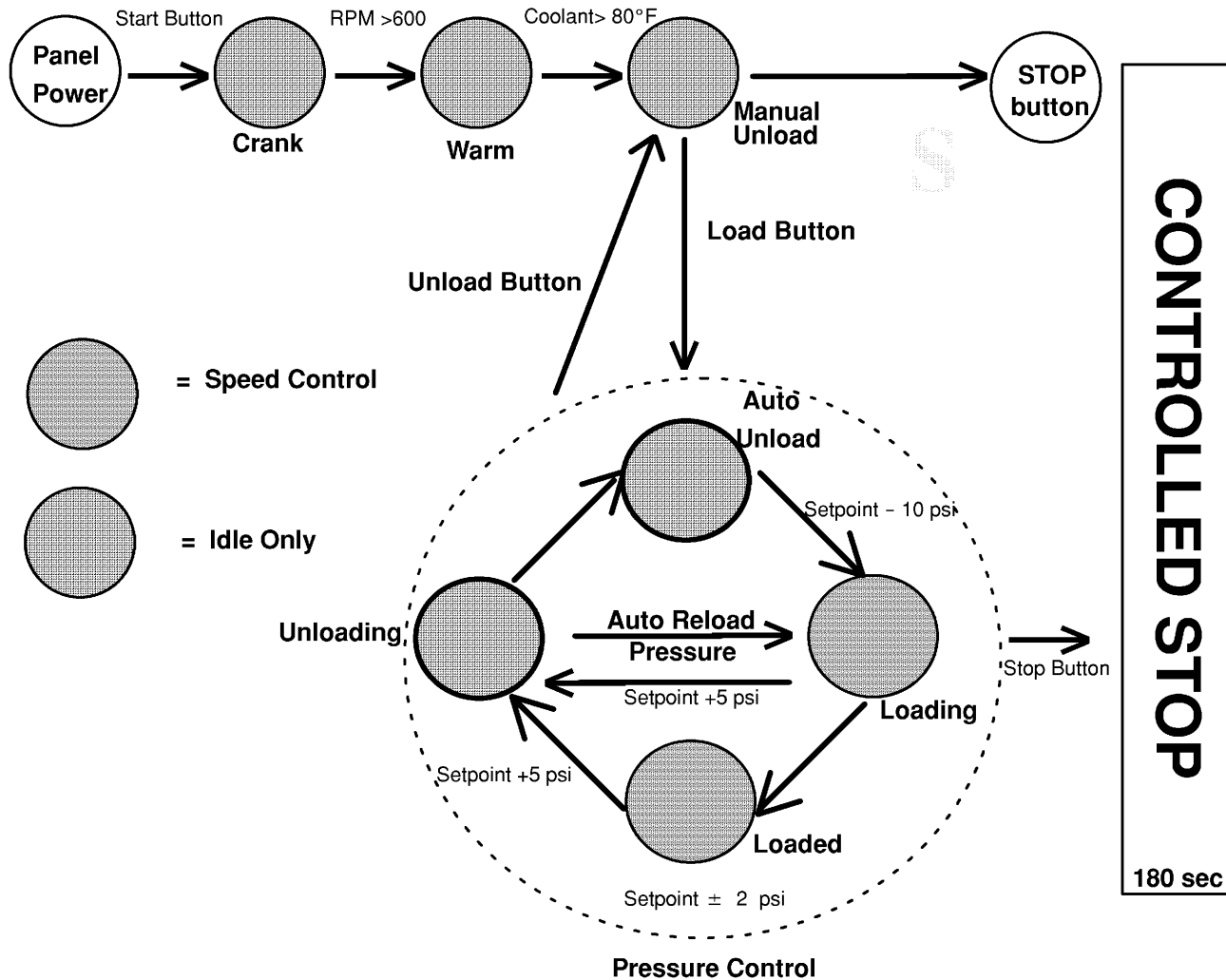
#### **Operation – Unloaded**

If air demand falls below 1000 CFM at 1200 RPM (Pressure rises above the unload point pressure), the compressor will unload by relieving the oil pressure in the cylinder, thereby closing the inlet valve and opening the blowdown valve. The unit then runs at 1200 RPM unloaded with no air delivery. If air demand increases (pressure falls to below the load point pressure), the compressor reloads as stated in (1) above to meet the required air demand.

See following page for INTELLISYS CONTROLLER LOGIC Diagram.



# INTELLISYS CONTROLLER LOGIC



Special information and operating guidelines for certain normal applications of the NHP1500 machine are given below:

1. **PRIMARY AIR FOR PLANT AIR SYSTEMS:**  
In these applications, the compressor is used to provide primary air for a plant air system. The PRESSURE setpoint should be set at the desired system pressure and other backup compressors (if any) set at lower pressures in order that they sequence on as required by the operational profile of the plant.

2. **EMERGENCY OR BACKUP AIR FOR PLANT AIR SYSTEMS:** In these applications, the compressor is operated in a "stand-by" mode and is set to load and furnish air if plant air pressure falls to a certain value.

Typically, the PRESSURE setpoint would be set at value lower than the desired operating pressure of the plant with the primary stationary compressors set at a higher range.

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## AUTO START/STOP OPERATION

The NHP1500 compressor may include an Automatic Start/Stop feature as an option from the factory. This feature is selectable from the USERS MENU under the MAIN MENU on the Intellisys Controller (See Intellisys Controller Display section). This feature is an extension of the automatic load/unload described under NORMAL OPERATION section of the manual. This mode is selectable at any machine state, but is not engaged until the compressor is started and loaded (Note: The controller display will show Autostart – OFF until the unit is started and loaded). This mode improves fuel economy during periods of needed and to automatically start and load when required.

**NOTICE:** Set the line pressure to REMOTE or ON-BOARD based on your application prior to using AUTOSTART/STOP. Ingersoll-Rand recommends the use of a check valve and REMOTE PRESSURE in all AUTO START/STOP applications.

The compressor has two methods of autostart/stop control.

**1) AUTO START/STOP-PRESSURE** – This mode uses the line pressure either onboard or remote pressure signal (based on user selected option). When line pressure drops below AUTO START PRESSURE, the compressor will automatically start and load.

The compressor will then perform as stated in the Normal Operation Section, loading and unloading based on customer demand requirements. If the compressor remains in the unloaded state continuously for a time greater than AUTOSTOP TIME, the compressor will stop and the display will read Autostart Engaged, Autostart ON.

If the SETPOINT PRESSURE is changed while AUTO START/STOP is ON, the RELOAD PRESSURE and AUTO START PRESSURE reset to the default values. Note: If the user presses the unload button, autostart is suspended until the load button is pushed. This is true while the unit is running or stopped.

**2) AUTO START/STOP - REMOTE** – This mode uses a customer-supplied signal applied to the remote contact closure terminal strip. When the remote signal is CLOSED, the compressor will automatically start and load. The compressor will then perform as stated in the Normal Operation section, loading and unloading based on customer demand requirements. If the contact switch OPENS, the compressor will unload and wait for the AUTO STOP TIME to expire.

The compressor will stop and then display will read Autostart Engaged, Autostart-On. If during the AUTO STOP TIME, the contacts CLOSE, the compressor will load and perform normal operation.

## STOPPING

Press the STOP button. The unit will unload and begin timed cool down (180 seconds). Once the timed cool down is complete, the engine will shutdown.

During a normal “non-emergency” stop, the following stopping procedure should be followed:

1. Press STOP button. the compressor will unload and engine speed will go to idle.
2. A three minute cool down will begin.
3. When the cool down is complete, the engine will stop.
4. Switch the POWER switch to “OFF”.

## NOTICE

**Once the engine stops, the automatic blowdown valve will continue to relieve all pressure from the check valve to discharge valve piping.**

## WARNING

Even after pressure is relieved from the piping system, any air supply line from the compressor to a tool or machine could remain under pressure and cause serious personal injury or death. After the compressor stops, carefully open a valve at any tool or machine to exhaust the pressure in any line prior to removal or servicing.

### REMOTE START STOP and ENUCIATION KIT

The NHP1500 compressor may include an Automatic Start/Stop feature as an option from the factory. This option includes a box which contains 3 terminal blocks. The three blocks are defined as follows:

**REMOTE CONTACTS** - used as part of the Autostart/Stop features if required. (See Section Auto Start & STop, Item 2).

**SHUTDOWN CONTACTS** - used to signal that the compressor has been stopped due to a shutdown and needs to be reviewed by operator.

**MACHINE STATE CONTACTS** - indicates if machine is running or stopped.

The intent of these contacts is to allow the user a method of connecting the machine to a plant system for communication purposes. Any additional requirements, consult the factory.

### INTELLISYS Controller Display

The Message Display program is based on a top-level menu structure with various sub-menus for more informational detail. The menu structure is accessed by three buttons on the front panel and built around the following three commands and three screens.

**SELECT:** Used to select an option.

**SET:** Used to set the value displayed for the selected option.

**CALIBRATE:** Used to calibrate the selected pressure transducer.

**HOME:** The top-level screen, displays discharge pressure, pressure setpoint, and fuel level. It gives access to the "MAIN MENU" and "STATUS" screens and the "SET" command, which can be used to adjust the pressure setpoint.

**A. MAIN MENU:** Displays a link to the following sub-menus:

**1. User options:** Displays the following options:

**A. Pressure Setpoint:** Press "SELECT" then adjust using the toggle up and down buttons and pressing "SET".

**B. Auto ReLoad Pressure:** Setpoint -10 (default).

**C. Pressure Signal:** Press "SELECT" then using the toggle up and down buttons "SET" either Onboard or Remote.

**D. Auto Start/Stop:** OFF (default). Press "SELECT" then using the toggle up and down buttons "SET" either PRESSURE or REMOTE.

**E. Auto Stop Time:** 10 minutes (default). Selectable from 3 minutes to 120 minutes.

**F. Auto Start Pressure:** Auto Reload Pressure - 5 psi (default). Selectable from default to 0 psi.

**G. Screen Contrast:** Press "SELECT" then adjust between 0 and 9 using the toggle up and down buttons and pressing "SET".

**2. Sensor calibration:** Displays the pressure transducers (PT1 through PT7) that can be selected and calibrated using the "SELECT" and "CALIBRATE" buttons (the unit must be completely cooled down so that all temperatures and pressures are equivalent to ambient conditions).

**3. Shutdown history:** Displays the past fifteen shutdown alert messages.

---

**B. STATUS:** Displays the following sensor values:

**1. Package Discharge Temp:** Displays package discharge air temperature measured at the service valve.

**2. Package Discharge Pressure:** Displays package discharge air pressure measured at the service valve.

**3. Stg 1 Inlet Temp:** Displays airend stage 1 inlet temperature measured in the inlet duct before the inlet valve.

**4. Stg 1 Disch Temp:** Displays airend stage 1 discharge temperature measured in the venturi elbow.

**5. Stg 1 Inlet Vacuum:** Displays airend stage 1 inlet suction pressure measured in the inlet valve.

**6. Interstage Pressure:** Displays the airend stage 2 inlet pressure measured in the interstage moisture separator.

**7. Stg 2 Inlet Temp:** Displays the airend stage 2 inlet temperature measured in the interstage moisture separator.

**8. Stg 2 Disch Temp:** Displays the airend stage 2 discharge temperature measured in the stage 2 discharge venturi.

**9. Remote Press:** Displays the pressure from an external tap measured downstream of the package discharge. If REMOTE PRESS is selected from user menu.

**10. Comp Filter In Press:** Displays the pressure at the compressor oil filter inlet.

**11. Comp Filter Out Press:** Displays the pressure at the compressor oil filter outlet.

**12. Comp Oil Inject Temp:** Displays the airend injected oil temperature.

**13. Eng Speed:** (rpm) Displays the rotational speed of the engine flywheel.

**14. Eng Coolant Temp:** Displays the engine coolant temperature entering the radiator.

**15. Battery Voltage:** (volts) Displays the onboard battery voltage.

**16. Time:** (hours) Displays the total engine run hours.

**17. Software Version**

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## SECTION 5 - MAINTENANCE

### GENERAL

In addition to periodic inspections, many of the components in these units require periodic servicing to provide maximum output and performance. Servicing may consist of pre-operation and post-operation procedures to be performed by the operating or maintenance personnel. The primary function of preventive maintenance is to prevent failure, and consequently, the need for repair. Preventive maintenance is the easiest and the least expensive type of maintenance. Maintaining your unit and keeping it clean at all times will facilitate servicing.

### SCHEDULED MAINTENANCE

The maintenance schedule is based on normal operation of the unit. This page can be reproduced and used as a checklist by the service personnel. In the event unusual environmental operating conditions exist, the schedule should be adjusted accordingly.

### COMPRESSOR OIL LEVEL

The oil level is most consistent when the unit is NOT running and should be checked at this time. Remove the dipstick located on the right side of the aircend. The oil level should be between the high/low indicators on the dipstick.

### COMPRESSOR OIL

This machine was factory filled with Ingersoll-Rand IR Hydraulic Fluid.

### AIR CLEANER

This unit is equipped with an AIR FILTERS RESTRICTED message on the instrument panel.

When this message is viewed, both the engine and aircend filters should be replaced.

Also weekly squeeze the rubber valve (precleaner dirt dump) on each air cleaner housing to ensure that they are not clogged.

NOTICE: Holes or cracks downstream of the air cleaner housing will cause the restriction indicators to be ineffective.

To service the air cleaners on all units proceed as follows:

1. Loosen outer wing nut and remove with outer element. Inspect red window on special inner wing nut to find small dot. If dot is not visible, remove cotter pin and special wing nut and inner (safety) element.
2. Inspect air cleaner housing for any condition that might cause a leak and correct as necessary.
3. Wipe inside of air cleaner housing with a clean, damp cloth to remove any dirt accumulation, especially in the area where the element seals against the housing.
4. Inspect the primary element by placing a bright light inside and rotating slowly. If any holes or tears are found in the paper, discard this element. If no ruptures are found, the element can be cleaned by one of the following procedures.
5. If a new air filter element is to be used check it closely for shipping damage. To reset the signal indicator in the special wing nut, apply suction to the red window.
6. Install cleaned or new elements in the reverse order to the above. Tighten wing nuts firmly and replace cotter pin.
7. Inspect to ensure that the end cap seals tightly 360 degrees around the air cleaner body.

---

The air cleaner system (housing and piping) should be inspected every month for any leakage paths or inlet obstructions. Make sure the air cleaner mounting bolts and clamps are tight. Check the air cleaner housing for dents or damage which could lead to a leak. Inspect the air transfer tubing from the air cleaner to the compressor and the engine for holes. Make sure that all clamps and flange joints are tight.

## **GAUGES**

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The instruments or gauges are essential for safety, maximum productivity and long service life of the machine. Inspect the gauges and test any diagnostic lamps prior to start-up. During operation observe the gauges and any lamps for proper functioning. Refer to Operating Controls for the normal readings.

## **FUEL TANK**

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This unit is equipped with dual tanks that can be filled from either side. Using clean fuel in the fuel tanks is important and every precaution should be taken to ensure that only clean fuel is either poured or pumped into the tank. When filling the fuel tank on this unit, by methods other than a pump and hose, use a CLEAN non-metallic funnel.

Every six months the drain plugs should be removed from the tanks so that any sediment or accumulated condensate may be drained. When replacing the drain plugs, make sure they are tightened securely.

## **BATTERY**

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Heavy-duty, diesel cranking type batteries were installed at the factory and these should be inspected weekly. Keep the battery posts-to-cable connections clean, tight and lightly coated with a grease. Also the electrolyte level in each cell should cover the top of the plates. If necessary, top-up with clean distilled water.

## **COMPRESSOR OIL, HYDRAULIC OIL and FUEL COOLERS**

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The coolers are cooled by means of the fin and tube-type oil cooler. The hydraulic oil, compressor oil and fuel flow internally through the core sections. Fluid is cooled by the air stream from the cooling fan flowing past the core section. When grease, oil and dirt accumulate on the exterior surfaces of the coolers, their efficiency is impaired.

Each month it is recommended that the coolers be cleaned by directing compressed air which contains a nonflammable safety solvent through the core of the coolers. This should remove the accumulation of grease, oil and dirt from the exterior surfaces of the cooler core so that the entire cooling area can transmit the heat of the fluid to the air stream.

If foreign deposits, such as sludge and lacquer, accumulate in the coolers, high temperature is likely to occur, causing shut down of the unit.

## **RADIATOR**

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### **WARNING**

**Do not remove the cap from a HOT engine radiator. The sudden release of pressure from a heated cooling system can result in serious personal injury.**

The engine cooling system is filled at the factory with a 50/50 mixture of water and ethylene glycol. This permanent type antifreeze contains rust inhibitors and provides protection to -35° F (-37°C).

The use of such a mixture is recommended for both summer and winter operation. When using water alone, be sure to add a reputable brand of rust inhibitor to prevent internal corrosion.

It is recommended to test the freezing protection of the coolant every six months or prior to freezing temperatures. Replenish with a fresh mixture every twelve months. A drain for the system is located in the bottom radiator tank.

Each month, inspect the radiator exterior for obstructions (dirt, bugs, etc.). If present, blow water or compressed air containing a nonflammable solvent between the fins in a direction opposite the normal air flow. Should the radiator be clogged internally, standard automotive practices should be followed.

## HOSES

Each month it is recommended that all of the intake lines to and from the air cleaners, the engine cooling system hoses and all of the flexible hoses used for air, oil, and fuel be inspected.

To prevent leaks, regular inspection of these connections for wear or deterioration is a definite "must" if regulator servicing of the air cleaners is not to prove futile.

Premature wear of both the engine and compressor is ASSURED if dust-laden air is permitted to enter the engine or the compressor.

The flexible hoses used in the fuel, oil and air lines on these units are primarily used for their ability to accommodate relative movement between components. It is extremely important they be periodically inspected for wear and deterioration. Clamps are used to prevent hose cover abrasion through vibration. This abrasion may occur when two hose lines cross, or when a hose line rubs against a fixed point; therefore, it is necessary that all clamps be replaced if missing. It is also important the operator does not use the hoses as convenient hand hold or steps. Such use can cause early cover wear and hose failure.

## NOTICE

**Piping systems operating at less than 150 psi (1050 kPa) may use a special nylon tubing. The associated fittings are also of a special "push-in" design.**

Pulling on the tubing will cause the inner sleeve to withdraw and compress, thus tightening the connection. The tubing can be withdrawn only while holding the sleeve against the fitting. The tubing can be removed and replaced numerous times without losing its sealing ability.

To install the nylon tubing, make a mark (with tape or grease pencil) approximately 7/8 inch from the end of the tubing. Insert the tubing into the sleeve and "push-in" past the first resistance to the bottom. The mark should be approximately 1/16 inch from the sleeve, for the 3/8 inch O.D. tubing; 1/8 inch for the 0.25 inch O.D. tubing. This will ensure that the tubing is fully engaged in the sealing mechanism.

## NOTICE

**The flex joint that isolates the water separator from the aircend does require periodic re-torque of the fasteners to 10 ft-lbs.**

## COMPRESSOR OIL FILTERS

The compressor lubrication and hydraulic oil systems include spin-on, throw away type oil filters, each with an internal bypass valve. With a clean, new filter element, all of the oil flows through the full element area, from the outside/inside. As each element becomes contaminated with dirt, a pressure differential is created in the filter housing between the oil inlet and outlet ports. As this differential approaches 25 psi (175 kPa), the bypass valve starts to open, thus permitting a small quantity of oil to bypass the filter. As the contaminants continue to build up, more and more of the oil bypasses the filter media itself.

This bypass does not provide any filtration but does allow a maximum flow of compressor lubricating and hydraulic oil to preclude any possible damage from loss of oil. Also the design of the filter prevents any washing-off of any dirt during oil bypassing.

---

## NOTICE

**The oil filter must be replaced every 1000 hours of operation.**

To service the oil filters it will first be necessary to shut the unit down. Wipe off any external dirt and oil from the exterior of the filter to minimize any contamination from entering the lubrication system. Proceed as follows:

## WARNING

**High pressure air can cause severe injury or death from hot oil and flying parts. Always relieve pressure before removing caps, plugs, covers or other parts from pressurized air system.**

1. Open the service air valve(s) to ensure that system is relieved of all pressure. Close the valve(s).

2. Turn the spin-on filter element counterclockwise to remove it from the filter housing. Inspect the filter element and then discard.

**Note:** If there is any indication of formation of varnishes, shellacs or lacquers on the oil filter element, it is a warning the compressor lubricating oil has improper characteristics and should be immediately changed.

3. Inspect the oil filter head to be sure the gasket was removed with the oil filter element. Clean the gasket seal area on the oil filter head.

Installing a new oil filter element when the old gasket remains on the oil filter head will cause an oil leak and can cause property damage.

4. Lubricate the new filter gasket with the same oil being used in the machine.

5. Install new filter by turning element clockwise until gasket makes initial contact. Tighten an additional 1/2 to 3/4 turn.

6. Start unit and allow to build up to rated pressure. Check for leaks before placing unit back into service.

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## FASTENERS

Visually check entire unit in regard to bolts, nuts and screws being properly secured. Spot check several capscrews and nuts for proper torque. If any are found loose, a more thorough inspection must be made. Take corrective action.

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## COMPRESSOR and HYDRAULIC OIL

The lubricating and cooling oil must be replaced every 1000 hours of operation or six (6) months, whichever comes first.

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## ENGINE COOLING FAN DRIVE

The heat exchanger or cooling fan is driven by a single belt arrangement from the engine. Inspect the cooling fan belt weekly. These belts should be maintained at the proper tension by the auto tension system on the engine.

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## AIR COOLING FAN DRIVE

Hydraulically operated fan requires maintenance. Grease fittings every 3 months, 500 hours.

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## EXTERIOR FINISH CARE

This unit was painted and heat cured at the factory with a high quality, thermoset polyester powder coating. The following care will ensure the longest possible life from this finish.

1. **If necessary to remove dust, pollen, etc. from housing, wash with water and soap or dish washing liquid detergent. Do not scrub with a rough cloth, pad, etc.**
2. **If grease removal is needed, a fast evaporating alcohol or chlorinated solvent can be used. Note: This may cause some dulling of the paint finish.**
3. **If the paint has faded or chalked, the use of a commercial grade, non-abrasive car wax may partially restore the color and gloss.**



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### Field Repair of Texture Paint

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1. The sheet metal should be washed and clean of foreign material and then thoroughly dried.
2. Clean and remove all grease and wax from the area to be painted using Duponts 3900S Cleaner prior to sanding.
3. Use 320 grit sanding paper to repair any scratches or defects necessary.
4. Scuff sand the entire area to be painted with a red scotch brite pad.
5. Wipe the area clean using Duponts 3900S.
6. Blow and tack the area to be painted.
7. Apply a smooth coat of Duponts 1854S Tuffcoat Primer to all bare metal areas and allow to dry.
8. Apply 2 medium - wet coats of Duponts 222S Adhesion Promoter over the entire area to be painted, with a 5 minute flash in between coats.
9. To apply the texture coat, use Duponts 1854S Tuffcoat Primer. The proper technique to do this is to spray the Tuffcoat Primer using a pressure pot and use about 2-5 pounds of air pressure. This will allow the primer to splatter causing the textured look. Note: you must be careful not to put too much primer on at one time, this will effect the amount of texture that you are trying to achieve. Allow the texture coat to flash for 20 minutes or until dry to touch.
10. Apply any of Duponts Topcoat Finishes such as Imron™ or Centari™ according to the label instructions.

**Note:** To re-topcoat the textured surfaces when sheet metal repairs are not necessary, follow steps 1, 2, 4, 5, 6, 8 and 10.

### CAUTION

- Any unauthorized modification or failure to maintain this equipment may make it unsafe and out of factory warranty.
- If performing more than visual inspections, disconnect battery cables and open manual blowdown valve.
- Use extreme care to avoid contacting hot surfaces (engine exhaust manifold and piping, air receiver and air discharge piping, etc.).
- Never operate this machine with any guards removed.
- Inch and metric hardware was used in the design and assembly of this unit. Consult the parts manual for clarification of usage.

**Notice:** Disregard any maintenance pertaining to components not provided on your machine.

### NOTICE

Drain the frame after power-washing/cleaning or heavy rains.

# MAINTENANCE SCHEDULE

These time periods should be reduced if operating in extreme conditions (very hot, cold, dusty or wet).

	Daily	Weekly	Monthly	3 MOS .	6 MOS.	12 MOS.
<b>LARGE UNITS</b>				500 hours	1000 hours	2000 hours
**Hydraulic Oil Level		C			R	
Compressor Oil Level	C					
Engine Oil Level	C					
**Radiator Coolant Level	C					
Gauges/Lamps	C					
Air Cleaner Service Indicators	C					
Fuel Tank (fill at end of day)	C				DRAIN	
**Fuel/Water Separator DRAIN	C					
Air Cleaner Precleaner Dumps		C				
Fan/Alternator Belts		C				
Battery Connections/Electrolyte		C				
**Tire Pressure and Surface		C				
**Wheel Lug Nuts			C			
Hoses (oil, air, intake, etc.)			C			
Automatic Shutdown System Test			C			
Air Cleaner System Visual			C			
Compressor Oil Cooler Exterior			C	CLEAN		
**Engine Radiator Exterior			C	CLEAN		
Fasteners, Guards				C		
Air Cleaner Elements				WI		
** Fuel/Water Separator Element					R	
*Compressor Oil Filter Element					R	
*Compressor Oil					R	
**Wheels (bearings, seals, etc)					C	C
Engine Coolant Test					C	R
Shutdown Switch Settings Test						C
Scavenge Orifice & related parts						CLEAN
Oil Separator Element						R
**Lights (running, brake, & turn)	CBT					
**Pintle Eye Bolts	CBT					
Engine (oil changes, oil & fuel filters, etc)				R		

\*\*Disregard if not appropriate for this particular machine.

**R**=replace, **C**=check (adjust if necessary), **WI**=OR when indicated, **CBT** = check before towing.

Refer to specific sections of the operator's manual for more information.

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## SECTION 6 - LUBRICATION

### GENERAL INFORMATION

Lubrication is an essential part of preventive maintenance, affecting to a great extent the useful life of the unit. Different lubricants are needed and some components in the unit require more frequent lubrication than others. Therefore, it is important that the instructions regarding types of lubricants and the frequency of their application be explicitly followed. Periodic lubrication of the moving parts reduces to a minimum the possibility of mechanical failures.

The Preventive Maintenance Schedule shows those items requiring regular service and the interval in which they should be performed. A regular service program should be developed to include all items and fluids. These intervals are based on average operating conditions. In the event of extremely severe (hot, cold, dusty or wet) operating conditions, more frequent lubrication than specified may be necessary. Details concerning lubrication of the running gear are in Maintenance Section.

All filters and filter elements for air and compressor lubricant must be obtained through Ingersoll-Rand to assure the proper size and filtration for the compressor.

### COMPRESSOR & HYDRAULIC OIL CHANGE

These units are normally furnished with an initial supply of oil sufficient to allow operation of the unit for approximately 6 months or 1000 hours, whichever comes first. If a unit has been completely drained of all oil, it must be refilled with new oil before it is placed in operation. Refer to specifications in Lubrication Table.

#### **NOTICE**

Some oil types are incompatible when mixed and result in the formation of varnishes, shellacs, or lacquers which may be insoluble. Such deposits can cause serious troubles including clogging of the filters. Where possible, do NOT mix oils of different types and avoid mixing different brands. A type or brand change is best made at the time of a complete oil drain and refill.

If the unit has been operated for the time/ hours mentioned above, it should be completely drained of oil. If the unit has been operated under adverse conditions, or after long periods in storage, an earlier change period may be necessary as oil deteriorates with time as well as by operating conditions.

#### **WARNING**

**High pressure air can cause severe injury or death from hot oil and flying parts. Always relieve pressure before removing caps, plugs, covers or other parts from pressurized air system. Ensure the following conditions are met:**

- Discharge air pressure gauge reads zero (0).
- No air discharging from an "open" manual blow-down valve.

An oil change is good insurance against the accumulation of dirt, sludge, or oxidized oil products.

Completely drain the reservoir, piping, and cooler. If the oil is drained immediately after the unit has been run for some time, most of the sediment will be in suspension and, therefore, will drain more readily. However, the fluid will be hot and care must be taken to avoid contact with the skin or eyes.

After the unit has been completely drained of all old fluid, close the drain valve. Add oil in the specified quantity at the filler plug. Tighten the filler plug and run the machine to circulate the oil. Check the oil level when unit is warm and not running. If not near the middle of the sight tube, stop the unit and make corrections. DO NOT OVERFILL.

#### **NOTICE**

Ingersoll-Rand provides compressor oil specifically formulated for Portable Compressors and requires the use of these fluids in order to obtain extended limited air end warranty.

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## **COMPRESSOR LUBRICATION**

<b>Recommended Fluids</b>	<b>Usage</b>	<b>5 Gal. (18.9 litres)</b>	<b>55 gal. (208 Litres)</b>	<b>275 gal. (1039.5 litres)</b>
IR Hydraulic Fluid -10° - 125°F (-23°C to 52°C)	Compressor Oil Hydraulic Oil	54758321	54758339	54758347
Pro-Tec™	Engine Oil	36875938	36866903	

Premium grade oils API, CG -4 or CH-4 are recommended for the QSX15 engine.

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# **SECTION 7 - Trouble Shooting**

## **INTRODUCTION**

Trouble shooting for a portable air compressor is an organized study of a particular problem or series of problems and a planned method of procedure for investigation and correction. The trouble shooting chart that follows includes some of the problems that an operator may encounter during the operation of a portable compressor.

The chart does not attempt to list all of the troubles that may occur, nor does it attempt to give all of the answers for correction of the problems. The chart does give those problems that are most apt to occur. To use the trouble shooting chart:

- A. Find the "complaint" depicted as a bold heading.
- B. Follow down that column to find the potential cause or causes. The causes are listed in order (1,2,3 etc.) to suggest an order to follow in trouble shooting.

## **ACTION PLAN**

### **A. Think Before Acting**

Study the problem thoroughly and ask yourself these questions:

- (1) What were the warning signals that preceded the trouble?
- (2) Has a similar trouble occurred before?
- (3) What previous maintenance work has been done?
- (4) If the compressor will still operate, is it safe to continue operating it to make further checks?

### **B. Do The Simplest Things First**

Most troubles are simple and easily corrected. For example, most complaints are "low capacity" which may be caused by too low an engine speed or "compressor over- heats" which may be caused by low oil level.

Always check the easiest and most obvious things first; following this simple rule will save time and trouble.

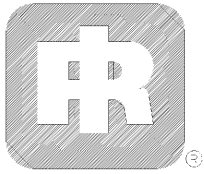
**Note:** For trouble shooting electrical problems, refer to the Wiring Diagram Schematic found in Parts List Section.

### **C. Double Check Before Disassembly**

The source of most compressor troubles can be traced not to one component alone, but to the relationship of one component with another. Too often, a compressor can be partially disassembled in search of the cause of a certain trouble and all evidence is destroyed during disassembly. Check again to be sure an easy solution to the problem has not been overlooked.

### **D. Find And Correct Basic Cause**

After a mechanical failure has been corrected, be sure to locate and correct the cause of the trouble so the same failure will not be repeated. A complaint of "premature breakdown" may be corrected by repairing any improper wiring connections, but something caused the defective wiring. The cause may be excessive vibration.



# TROUBLE SHOOTING CHART

**Bold Headings depict the COMPLAINT - Subheadings suggest the CAUSE**

Note: Subheadings suggest sequence to follow troubleshooting.

## 1. **Unit Shutdown:**

Out of Fuel  
Compressor Oil Temp. Too High  
Engine Water Temp. Too High  
Engine Oil Pressure Too Low  
Broken Engine Fan Belt  
Loose Wire Connection  
Low Fuel Level Shutdown  
Defective Sensor  
Malfunctioning Relay  
Blown Fuse  
Engine Malfunctioning  
\* Airend Malfunctioning

### **Corrective Action**

Add CLEAN diesel Fuel  
See Complaint 10  
Check coolant level. If necessary, Add.  
See Complaint 3 and Complaint 4.  
Replace fan belt.  
Wiggle wires at switches & connector blocks. Make repairs.  
Replace fuel sender.  
Replace sensor.  
Replace relay.  
Replace fuse.  
See Trouble Shooting in Engine Manual.  
See Complaint 10.

## 2. **Won't Start/Run:**

Low Battery Voltage  
Blown Fuse  
Malfunctioning Start Switch  
Clogged Fuel Filters  
Out of Fuel  
Compressor Oil Temp. Too High  
Engine Water Temp. Too High  
Engine Oil Pressure Too Low  
Loose Wire Connection  
Defective Sensor  
Malfunctioning Relay  
Engine Malfunctioning  
Airend Malfunctioning

Check electrolyte level. Check connections.  
Replace fuse.  
Replace switch.  
Service filters. See Engine Operator's Manual.  
Add CLEAN fuel.  
See Complaint 10.  
Check fluid level. If necessary, Add.  
See Complaint 3 and Complaint 4.  
Repair or replace connection.  
Replace sensor.  
Replace relay.  
See Trouble Shooting in Engine Manual.  
See Complaint 10.

## 3. **High Engine Temperature**

Broken Engine Fan Belt  
  
\* Ambient Temp. >115°F  
Dirty Operating Conditions  
Dirty Cooler  
\* Out of Level >5 degrees  
Operating Pressure Too High  
Recirculation of Cooling Air  
Loose Wire Connection

Replace fan belt set.  
  
Above spec limit.  
Move unit to cleaner environment.  
Clean exterior of cooler.  
Relocate or reposition unit.  
Reduce pressure to spec.  
Close side doors.  
Repair or replace.

\* : > = greater than, < = less than

---

#### **4. Low Engine Oil Pressure**

Low Oil Level  
Out of Level >15 degrees  
Wrong Lube Oil  
Clogged Oil Filter Element(s)  
Engine Malfunctioning  
Loose Wire Connection.

#### **Corrective Action**

Add oil.  
Relocate or reposition.  
See Engine Oil Spec. Change oil.  
Replace element(s).  
See Trouble Shooting in Engine Manual.  
Repair or replace.

#### **5. Alternator Low Voltage**

Loose or Broken Belts  
Loose Wire Connection  
Low Battery Voltage

Malfunctioning Alternator

Tighten or replace belt set.  
Repair or replace connection.  
Check electrolyte level. Add if necessary.  
Check connectors. Clean & tighten.  
Recharge battery.  
Repair or replace alternator.

#### **6. High Compressor Oil Temperature:**


Ambient Temp. > 115°F  
Out of Level > 5 degrees  
Low Oil Level  
Wrong Lube Oil  
Dirty Cooler  
Dirty Operating Conditions  
Clogged Oil Filter Elements  
Loose or Broken Belts  
Operating Pressure Too High  
Recirculation Of Cooling Air  
Malfunctioning Thermostat  
Malfunctioning Fan  
Defective Oil Cooler Relief Valve  
Defective Minimum Pressure Valve  
Blocked or Restricted Oil Lines  
Airend Malfunctioning

#### **Corrective Action**

Above spec limit.  
Relocate or reposition unit.  
Add oil. Look for any leaks.  
Check spec in this manual.  
Clean exterior surfaces.  
Move unit to cleaner environment.  
Replace elements. Change oil.  
Tighten or replace belt set.  
Reduce pressure to spec.  
Close side doors. Replace belly pan.  
Replace thermostat in bypass valve.  
Check fan belt tension. Tighten or replace belt set.  
Replace valve.  
Repair or replace valve.  
Clean by flushing or replace.  
See Complaint 11, 12, 13, 15, 16 or 18.

#### **7. Low Compressor Oil Pressure**

Low Oil Level  
Wrong Lube Oil  
Clogged Oil Filter  
Low Relief Valve Setting

 Add Oil. Check for leaks.  
Check spec in manual.  
Replace element. Change Oil.  
Adjust pressure relief valve to 43 psi @ 1800 RPM.

#### **8. Engine RPM Down:**

Clogged Fuel Filter (primary)  
  
Operating Pressure Too High  
Dirty Air Filter  
Wrong Air Filter Element  
Engine Malfunctioning  
Airend Malfunctioning

Replace primary filter. Replace final filter. Drain tanks. Add CLEAN fuel.  
Reduce pressure to spec limit.  
Clean or replace elements.  
Install correct element.  
See Trouble Shooting in Engine Manual.  
Refer to Factory.

---

**9. Excessive Vibration:**

Rubber Mounts, Loose or Damaged  
Defective Fan  
Drive Coupling Defective  
Engine Malfunctioning  
Airend Malfunctioning  
Engine idle speed too low.

**Corrective Action**

Tighten or replace.  
Replace fan.  
Replace coupling.  
See Trouble Shooting in Engine Manual.  
See Complaint 15 and 17.  
See Engine Manual.

**10. Low CFM:**

Dirty Air Filter  
Incorrect Linkage Adjustment  
Malfunctioning Inlet Unloader/Butterfly Valve  
Malfunctioning Hydraulic Cylinder  
Wrong Air Filter Element

Clean or replace elements.  
Make adjustment per Section 6.  
Inspect valve. Make adjustment per Section 6.  
Replace hydraulic cylinder.  
Install correct element.

**11. Short Air Cleaner Life:**

Dirty Operating Conditions  
Inadequate Element Cleaning  
Incorrect Stopping Procedure  
Wrong Air Filter Element

Move unit to cleaner environment.  
Install new element.  
Read procedure in this manual.  
Install proper element.

**12. Will Not Unload:**

Malfunctioning Inlet Butterfly Valve  
Ice in Regulation Lines/Orifice  
Load Solenoid Leak  
Plugged Vent Leak

Inspect valve fit. Re-adjust per Section 6.  
Apply heat to line(s) and or orifice.  
Replace load solenoid.  
Clean and/or replace.

**13. Safety Valve Relieves:**

Operating Pressure Too High  
Malfunctioning Inlet Unloader/Butterfly Valve  
Defective Safety Valve  
Unit Will Not Unload Fast Enough

Reduce pressure to spec limit.  
Inspect valve fit. Readjust per Section 6.  
Replace safety valve.  
Apply heat to lines and/or orifice.

**14. Low Hydraulic Fan Speed**

Low Ambient Temperature  
Low Hydraulic Pressure

Dirty Filter  
Blocked or restricted oil lines  
Bypass in manifold block  
Worn pump  
Worn motor

Normal operation.  
Remove diode on proportional cartridge on manifold block.  
Set pressure with relief valve to 2250 psi @ 1800 rpm.  
Install Diode  
Replace filter and change oil.  
Clean by flushing and replace.  
Inspect orings on cartridges, replace if required.  
Replace pump.  
Replace motor.



## General Information

### Diagnostic Fault Codes

The control system can show and record operation abnormalities that present themselves as fault codes. These codes will make troubleshooting easier. The fault codes are recorded in the ECM. They can be read using the fault lamps in the control panel using a diagnostic switch, or with INSITE™.

There are two types of fault codes:

- Engine electronic control fault codes (fault has been detected with the engine or control system).
- Information codes (event that can provide important information has occurred with the engine or control system).

All fault codes recorded will either be active (fault code is currently active on the engine) or inactive (fault code was active at one time but is not currently active).

The WARNING light is yellow and indicates the need to repair the fault at the first available opportunity.

The STOP light is red and indicates the need to stop the engine as soon as it can be safely done. The engine must remain shut down until the fault can be repaired.

The MAINTENANCE lamp will illuminate, indicating some form of maintenance is required. This lamp could indicate water in the fuel filter, low coolant level, high coolant temperature, high intake air temperature, or high oil temperature.

To check for active engine electronic fuel system and engine protection system fault codes, turn the panel power to the OFF position, and move the diagnostic switch to the ON position.

Turn the panel power to ON position.

If no active fault codes are recorded, both red and yellow lights come on, go out in sequence and remain off. If active fault codes are recorded, both lights come on momentarily, then begin to flash the code of the recorded faults. The fault code will flash in the following sequence:

1. WARNING (yellow) light will flash
2. There will be a short 1–2 second pause after which the number of the recorded fault code will flash in STOP (red). There will be a 1–2 second pause between each number. When the number has finished flashing in red, a yellow light will appear again. The three-digit code will repeat in the same sequence.

To skip to the next fault code, move the increment switch momentarily to the increment (+) position. The operator can go back to the previous fault code by momentarily moving the increment switch to the increment (–) position. If only one active fault is recorded, the same fault code displays continuously when either (+) or (–) switch is depressed.

The explanation and correction of the fault codes is in the Section TF of the Signature/ISX/QSX15 Engines and the ISM/QSM11 Engines, Electronic Control System, Troubleshooting and Repair Manuals.

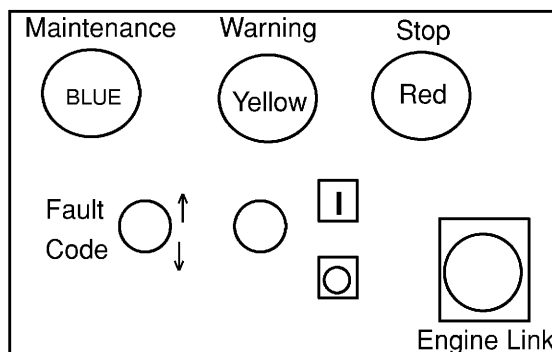
When not using the diagnostic system, turn off the diagnostic switch.

### Fault Code Snapshot Data

This is additional fault code information that can be obtained by using INSITE™. The snapshot data records the value or state of the control system sensors and switches at the time a fault occurred. This data is stored for the first occurrence of the fault, since it was last cleared, and the most recent occurrence. This data can be very valuable when trying to recreate or determine engine operating conditions at the time of a fault.

Consult local Cummins representative or review operator/maintenance manual Industrial and Power Generator OSX15 Engines.

### ELECTRONIC CONTROL SYSTEM THEORY OF OPERATION



# INTELLISYS CONTROLLER

## ALERTS AND SHUTDOWNS

	Parameter	Units	ALERTS		SHUTDOWNS	
			Value	Type	Value	Type
AIREND						
Hi Inlet Restriction	PT1	psiv	1.4	1	> 3.05	3
					> 13.5	3
Hi Stg 2 Inlet Press	PT2	psig	> 43 & RT1>430F	3	>5 psi & PT1 > 5	3
Hi Stg 2 Disch Press	PT3	psig			>200	4
					>75 <sup>(2)</sup>	3
Hi Pkg Disch Press	PT4	psig	>Pset+10	1		
Lo Compr Oil Inj Pres	PT6	psig			< 20 <sup>(2)</sup>	2
Hi Stg 1 Disch Temp	RT1	deg F	>450	1	> 460	3
Hi Stg 2 Inlet Temp	RT2	deg F	>135	1		
Hi Stg 2 Disch Temp	RT3	deg F	>510	1	> 520	3
Hi Compr Oil Inj Temp	RT5	deg F	>165	1	> 170	1
Change Compr Oil Filter	T5-PT6	psid	> 18 & RT5 > 115	1		
PACKAGE						
Lo Fuel Level	FL	Counts	=1	1	=0	1
Lo Batt Volts	G2	Volts	< 24	1		
Too many start attempts	Nstarts				> 3	4
Lo Speed @ Startup		time / rpm			> 10 <sup>(1)</sup> & 0< RPM <800	4
Low speed	G1	rpm	< 1000	1	< 800	1
Overspeed	G1	rpm			> 2050	4
Low Hyd. Oil level					On or Off	2
E-STOP pushed					Pushed	4
Hi Coolant Temp	RT7	Deg F	> 220	1	> 240	1
Note 1: 10 sec is measure from starter disengagement (checked right after the beep						
Note 2: 15 sec. delay upon entering unloaded modes.						

Note: Above table for Software Version 1.4

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## SECTION 8 – ELECTRICAL

### INTELLISYS Controller

The INTELLISYS Controller is the heart of the NHP1500 machine monitor and control system. It provides data collection, alarming and control functions for compressor operations. It is an Intel microcontroller based unit with analog and digital inputs and outputs.

The first function of the INTELLISYS Controller is to scan all analog and digital inputs at a given time interval. The analog and digital inputs are scanned every 100 milliseconds. The analog values are then compared against minimum and maximum values and an ALERT or SHUTDOWN is issued, if a value is out of range. The various ALERTS and SHUTDOWNS are listed in section 10 of this manual.

The second function of the INTELLISYS Controller is machine speed control based upon air demand. The INTELLISYS monitors discharge air pressure, PT4, and varies the engine speed to maintain the discharge air pressure at the desired setpoint.

The third function of the INTELLISYS Controller is to communicate with the diesel engine via the J1939 CAN network. The INTELLISYS Controller provides the engine speed setpoint (software versions 2.0 and greater) to the engine controller and retrieves diagnostic information from the engine.

Software versions under 2.0 use the frequency throttle to communicate with the engine. A square wave frequency signal from 150 Hz to 375 Hz is sent from the INTELLISYS controller to the engine controller. The signal is a linear signal from 150 Hz at engine idle (1200 RPM) to 375 Hz at maximum run speed (1800 RPM). The software revision with this capability does not support engine diagnostics.

Figure 9-2 shows signals between the engine controller and the INTELLISYS Controller.

### Sensors and Transducers

The electronics system contains sensors and transducers that are used to collect process data from the compressor. There are two types of temperature sensors, RTD's and thermistors. Both of these devices exhibit a change in resistance as the temperature changes. This resistance change causes an input voltage change to the INTELLISYS controller input

and is interpreted as a temperature change. The temperature probes look similar but have different connectors. They are not interchangeable.

The electronics system also contains pressure transducers to measure process pressure changes. These devices have an output signal of .45 VDC to 4.5 VDC, corresponding to 0 psi and the maximum psi for a selected transducer which will be 100, 225, or 15. The 0-15 psi transducer is a vacuum transducer and the 100 and 225 psi units are gauge pressure devices. A 5 VDC excitation signal is provided to power the transducers. There are three wire devices: excitation, signal and ground connections.

### Digital Inputs and Outputs

The controller scans digital inputs or switch contacts. These are either on (24 VDC) or off (0 VDC). They are the emergency stop buttons (ESTOP) and the inputs associated with the autostart function.

### Controller Outputs

The INTELLISYS Controller has three different types of outputs: frequency, pulse width modulated (PWM) and 24 VDC digital (On / Off). The frequency output is used as a throttle signal for the engine (software revisions less than 2.0). The INTELLISYS Controller varies the frequency from 150 Hz to 375 Hz, corresponding to 1200 to 1800 RPM. The frequency signal is a 50% duty cycle, 24 VDC, square wave.

The PWM signal is used to control the speed of the aftercooler fan. It is a 125 Hz frequency signal, 24 VDC with a duty cycle of 5% to 90%.

The INTELLISYS controller provides 24 VDC digital outputs to control solenoids, alarm horn, strobe lights, DC heaters and fuel pump. These are 24 VDC ON and 0 VDC OFF. They are current limited and short circuit protected. They may have a voltage level of .5 VDC to 1.4 VDC in the OFF state due to transistor leakage of the darlington drivers in the controller.

### Pressure Control Loop

The INTELLISYS controls discharge pressure by modulating engine speed. The discharge pressure setpoint is entered at the controller front panel. The control loop will modulate the engine speed between 1200 and 1800 RPM to maintain the selected discharge pressure.

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## Electronic Engine

The NHP1500 machine contains an emissions certified diesel engine. In order to meet the emissions requirements, the engine has an electronic control system.

The control system handles all the monitor, alarm and control functions for the engine. The INTELLISYS controller communicates with the engine controller over the J1939 CAN network.

The INTELLISYS controller sends speed setpoints to the engine (software versions 2.0 and greater) and receives diagnostic and run time data from the engine over the J1939 CAN network. A frequency throttle interface with the engine is used for software versions earlier than 2.0. Figure 9-2 shows the connections between the engine and INTELLISYS controller.

Ref: J1939 Data Link – The CAN network is a single pair shielded cable located with or attached to the W1 main harness. Figure 9-3 shows a layout of the CAN harness or backbone as it is referred to. The termination resistors (Terminator) are important to prevent reflections on the transmission line and must be in place for the network to function properly. The shield from the cable is connected to the machine frame at the INTELLISYS controller end.

The engine diagnostics connector is located inside the control panel. This is used to connect the engine manufacturer's service tools to the CAN network. This connector also provides 24 VDC to power these service tools.

## Electrical System

The electrical system consists of the wiring harness and associated electrical devices such as relays, switches, lights, solenoids and alarm horn. There are four wiring harnesses in the NHP1500 machine. They are as follows:

54631791 W1 Chassis Main Wiring Harness

54597497 W2 Control Panel Wiring Harness

54631312 W3 Fuse Box Wiring Harness

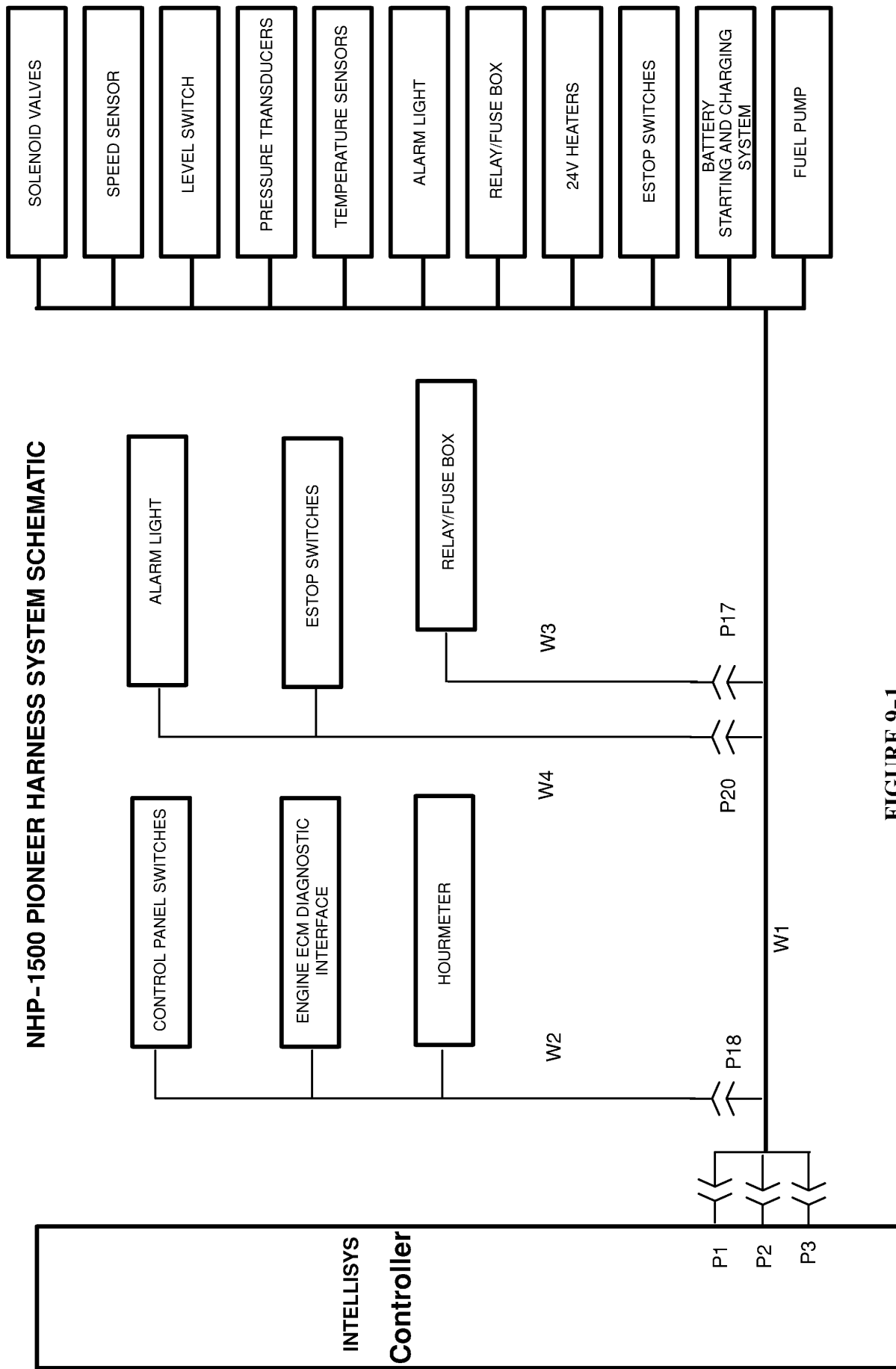
54631809 W4 Enclosure Wiring Harness

The schematic diagrams show the connections for these harnesses. Figure 9-1 is a system diagram showing harness connection with devices and controllers. The troubleshooting section includes information on how to make harness repairs and information on the connectors used.

The electrical circuits are protected using ATC style fuses. A fuse should only be replaced with one of the same rating. Replacing a fuse with one of a larger rating could lead to harness damage. If a fault occurs and the circuit does not have the appropriate size fuse, wires could be burned in the harness and damage other circuits.

## Aftercooler Fan Control Loop

The NHP1500 machine has a variable speed aftercooler fan control loop. This control loop varies the speed of a hydraulically driven fan, using a pulse width modulated (PWM) signal. The signal has a base frequency of 125 Hz and a duty cycle of 5% to 90%. The fan speed range is from 300 to 1640 RPM.



**FIGURE 9-1**

SGP TO ENGINE INTERFACE  
CUMMINS ENGINE

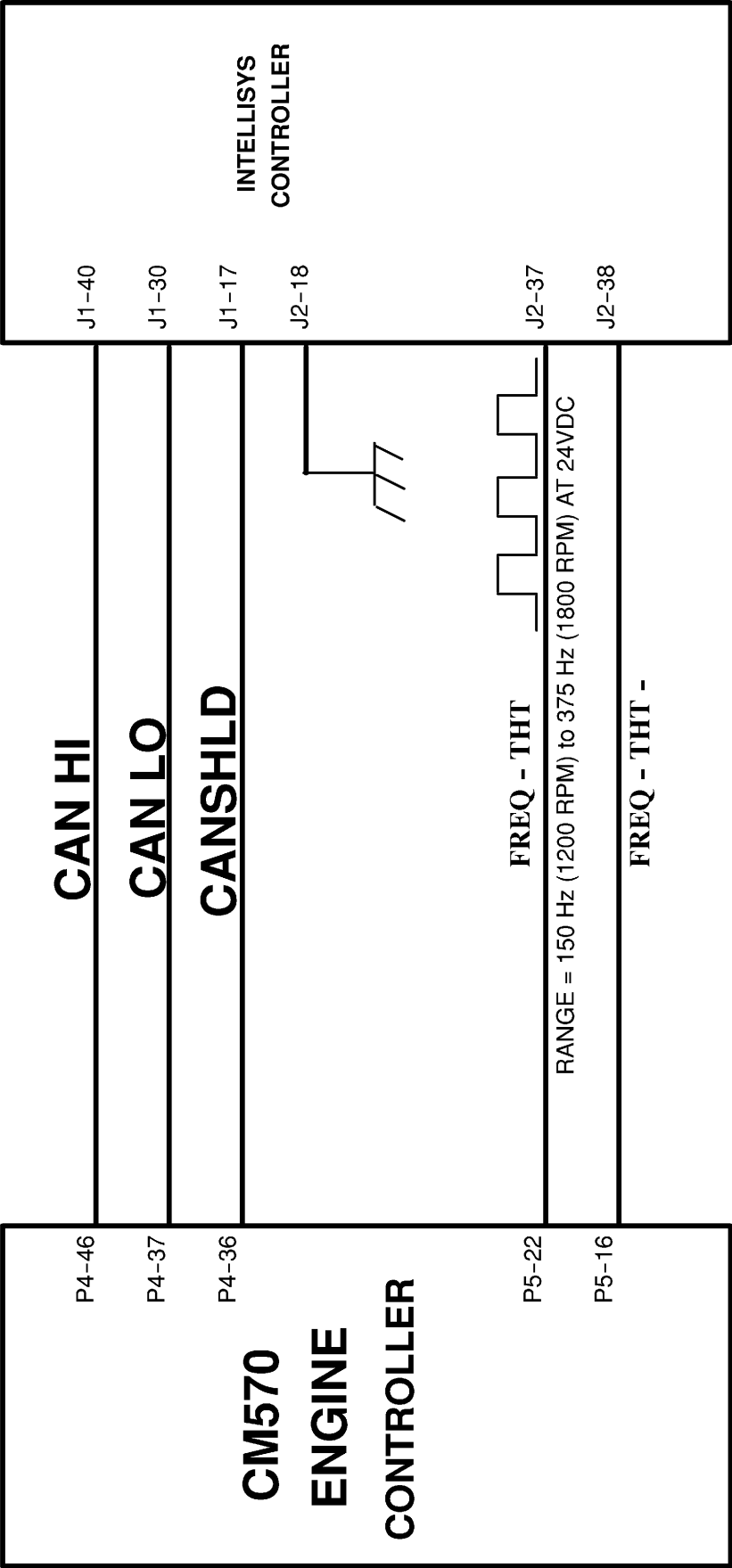


FIGURE 9-2

# J1939 CAN COMMUNICATIONS SCHEMATIC

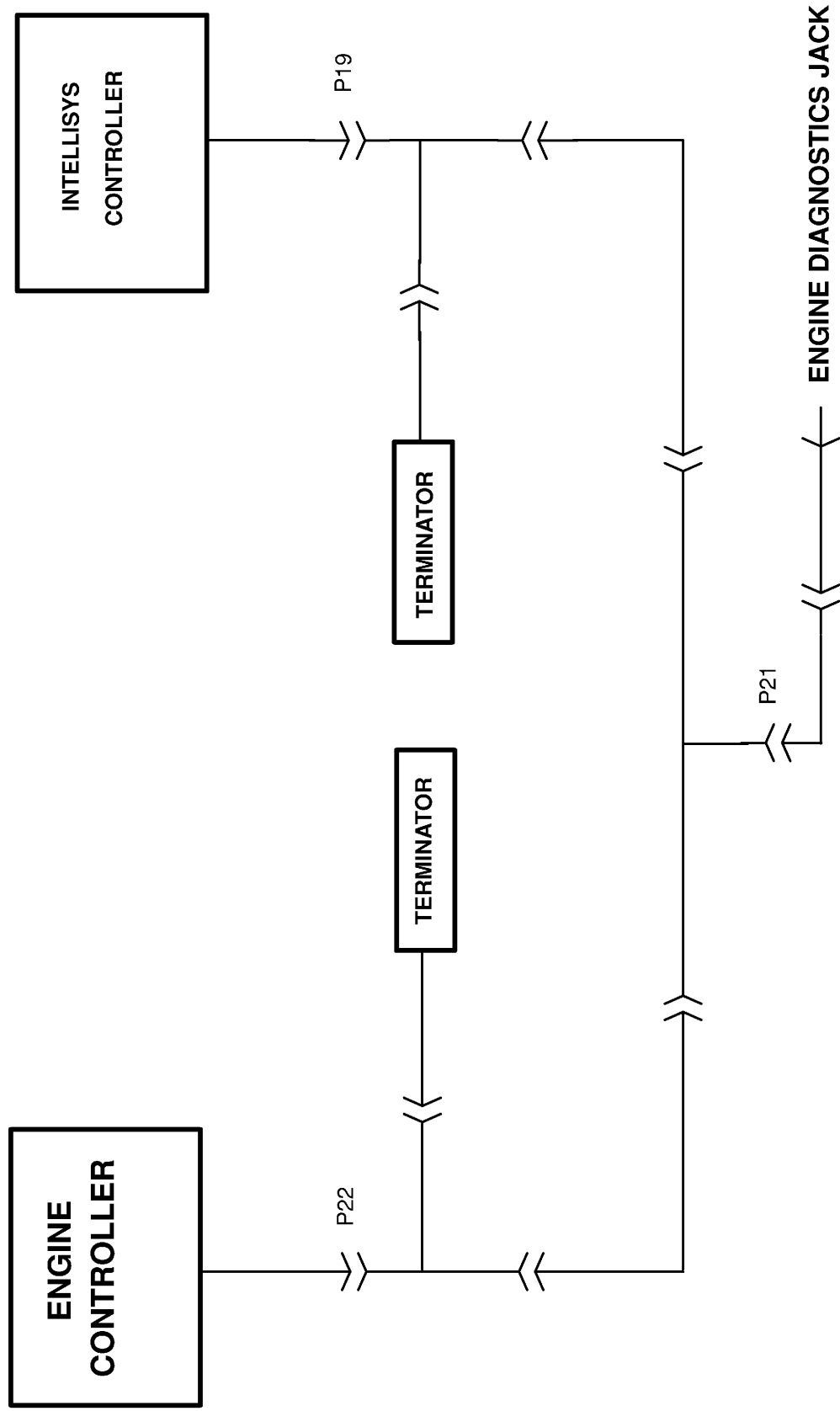


FIGURE 9-3

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# ELECTRONIC CONTROL SYSTEMS

## TROUBLESHOOTING

PROBLEM	CORRECTION
Control Panel Power Switch On, Intellisys Controller Does Not Come On	Make Sure Battery Disconnect Switch is ON Check Fuse F4 Check Seating of P3 Connector at SGP Battery Voltage Too Low Check Control Panel ON / OFF Switch Check Wiring From BAT to SGP
Intellisys Controller ON But Start Button Does Not Work	Defective Membrane Panel Switch
The Machine Will Not Load When the Load Button is Pressed	Defective Membrane Panel Switch 24 VDC Signal Not Being Supplied To Inlet Valve Solenoid
The Machine Will Not Unload When the Un- load Button Is Pressed	Defective Membrane Panel Switch 24 VDC Signal Not Being Removed From Inlet Valve Solenoid
Engine Speed Will Not Increase When Load Button is Pressed	Defective Switch on Membrane Panel Intellisys Controller J1939 Throttle Command To Engine Not Working or Intellisys Controller Frequency Throttle Signal Not Working
Engine Idle Speed Is Less Than 1200 RPM	Intellisys Controller Frequency Throttle Intellisys Controller J1939 Throttle Command Engine Fueling
Engine Cranks But Will Not Start After Multiple Crank Cycles	Ensure the Engine Keyswitch Signal is 24 VDC If Low Ambient, May Need Ether Assisted Start Estop Button(s) Pressed
Machine Shuts Down on Sensor Fault	Perform Transducer Calibration Replace Suspect Transducer



SECTION 9  
SYSTEM DIAGRAMS

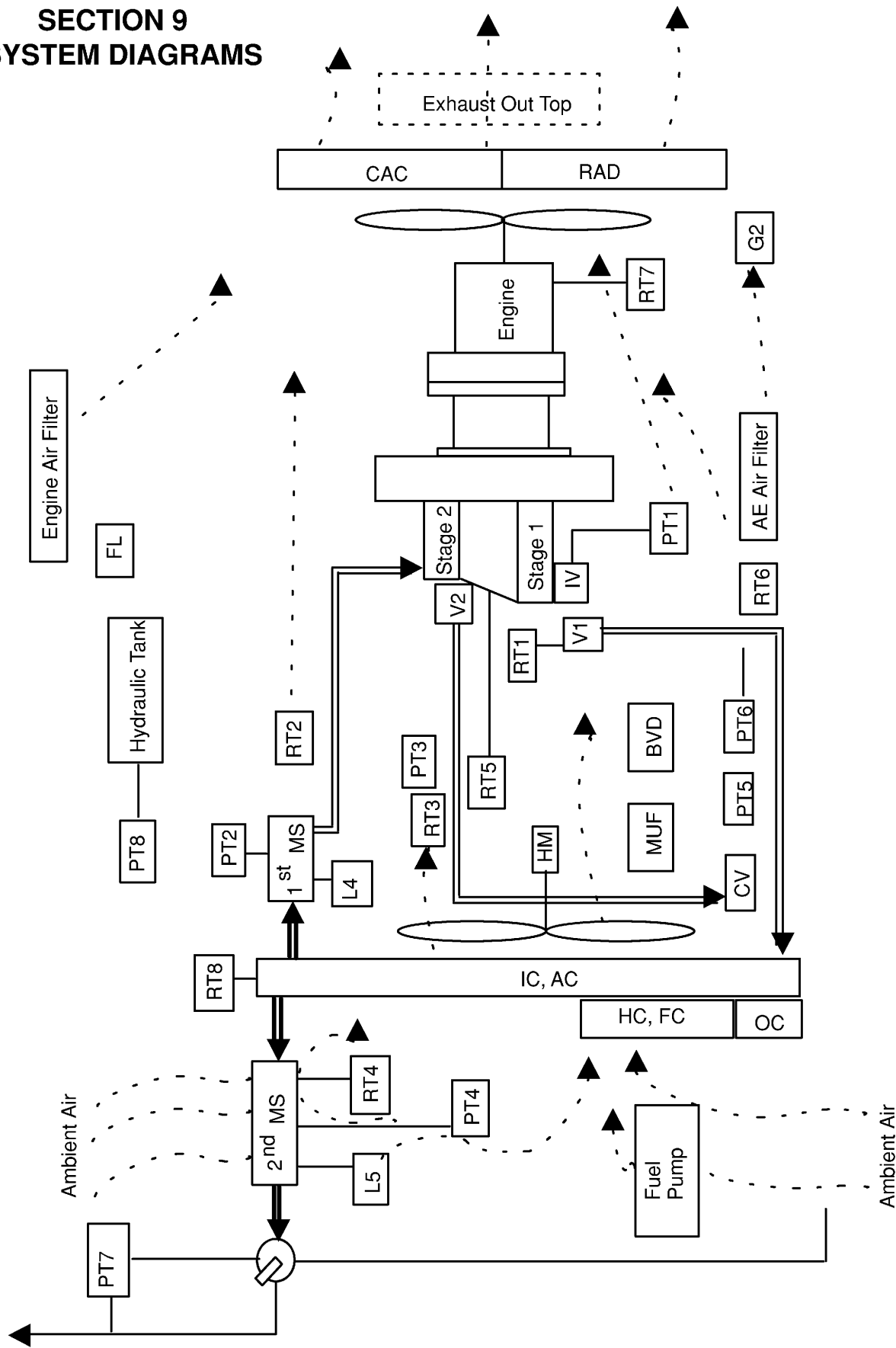


Figure 1: Air Flow Schematic

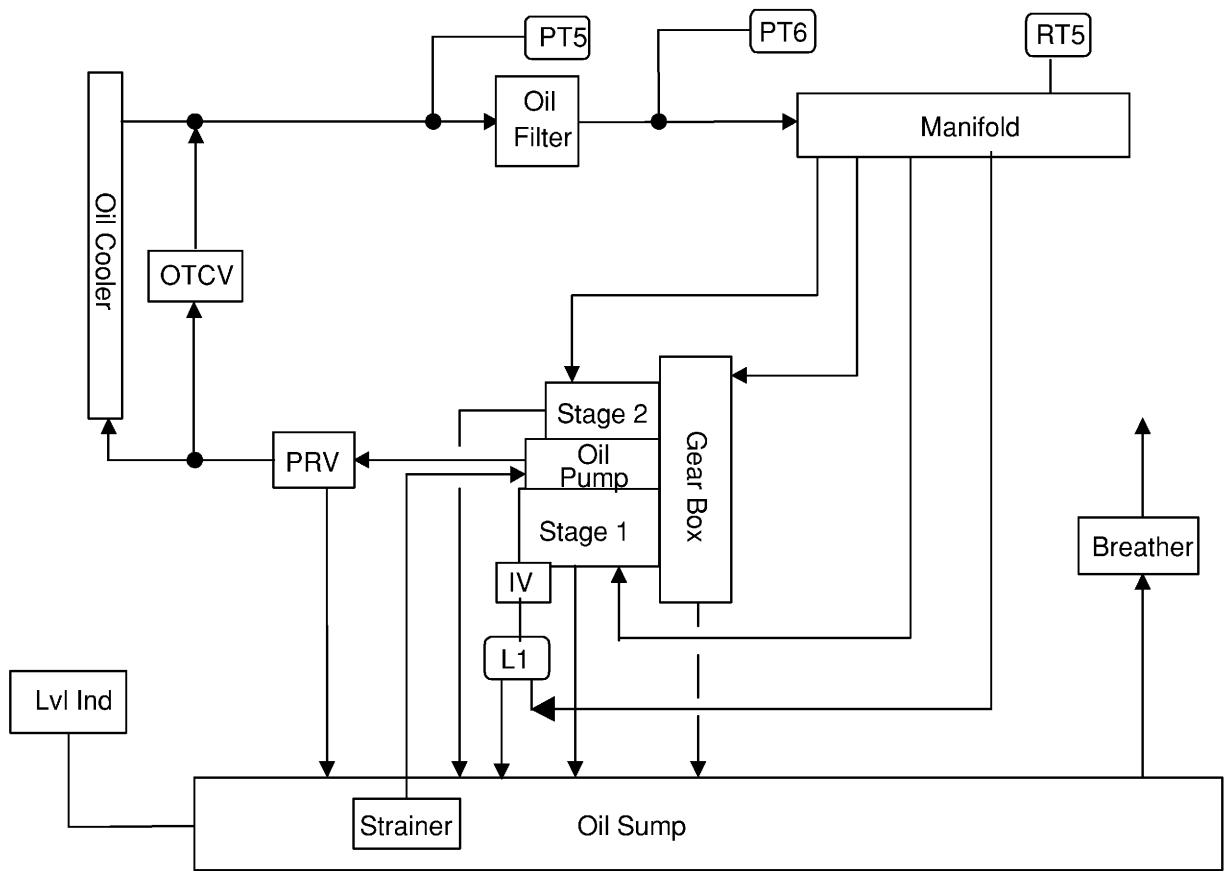
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### **Legend: Electrical Components**

PT1	- Stg 1 Inlet Vacuum
PT2	- 2nd Stg Inlet Pressure
PT3	- 2nd Stg Discharge Pressure
PT4	- Package Discharge Pressure
PT5	- Oil Filter In Pressure
PT6	- Oil Filter Out Pressure
PT7	- Remote Pressure
PT8	- Hyd. Level Switch
RT1	- 1st Stg Out Temp
RT2	- 2nd Stg In Temp
RT3	- 2nd Stg Out Temp
RT4	- Package Discharge Air Temp
RT5	- Oil Injection Temp
RT6	- 1st Stg Inlet Temp
RT7	- Coolant Temp
RT8	- Intercooler Out Temp
FL	- Fuel Level
G2	- Battery Voltage
L4	- Condensate Solenoid Valve (IC)
L5	- Condensate Solenoid Valve (AC)

### **Legend: Mechanical Components**

IV	- Inlet Valve
BDV	- Blowdown Valve
MUF	- Blowdown Muffler
V1	- 1st Stage Venturi
1st MS	- 1st Stage Moisture Separator
V2	- 2nd Stage Venturi
2nd MS	- 2nd Stage Moisture Separator
CV	- Check Valve
HM	- Hydraulic Motor
HC	- Hydraulic Cooler
CAC	- Engine Charge Air Cooler
FC	- Fuel Cooler



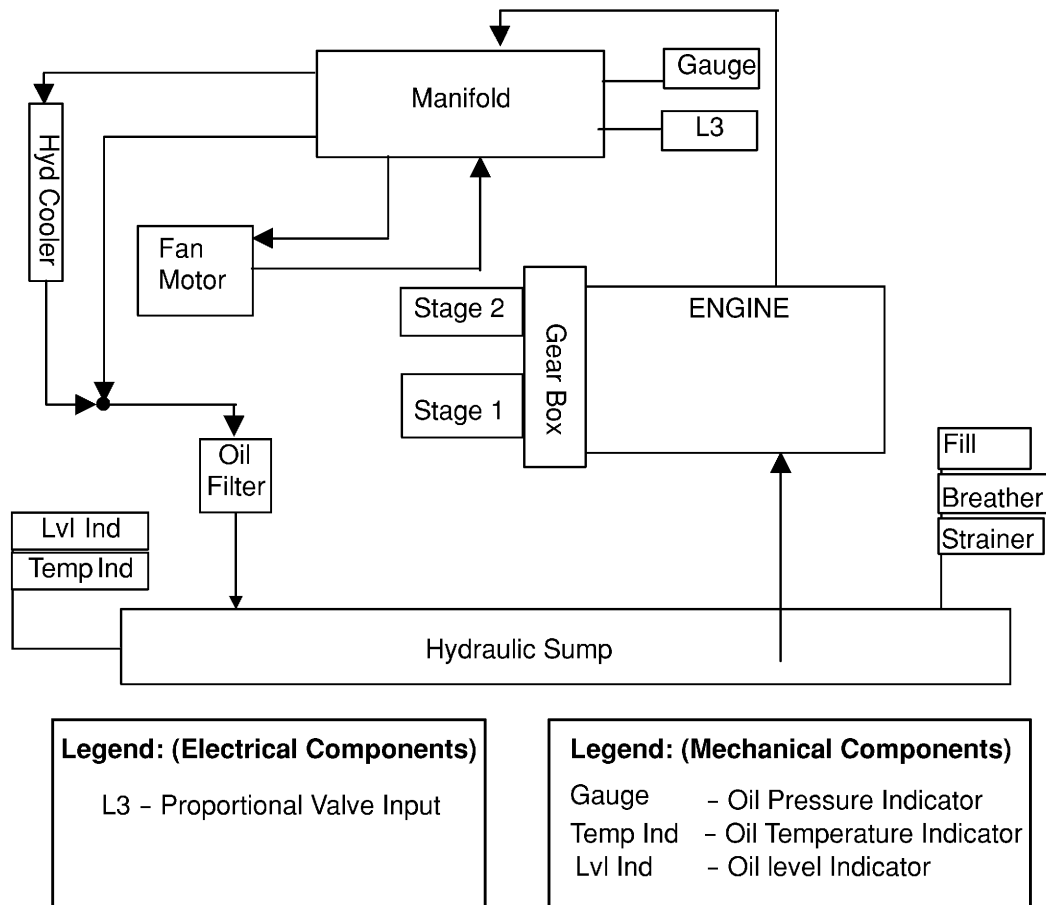
**Figure 2: Lube Oil System Schematic**

**Legend: (Electrical Components)**

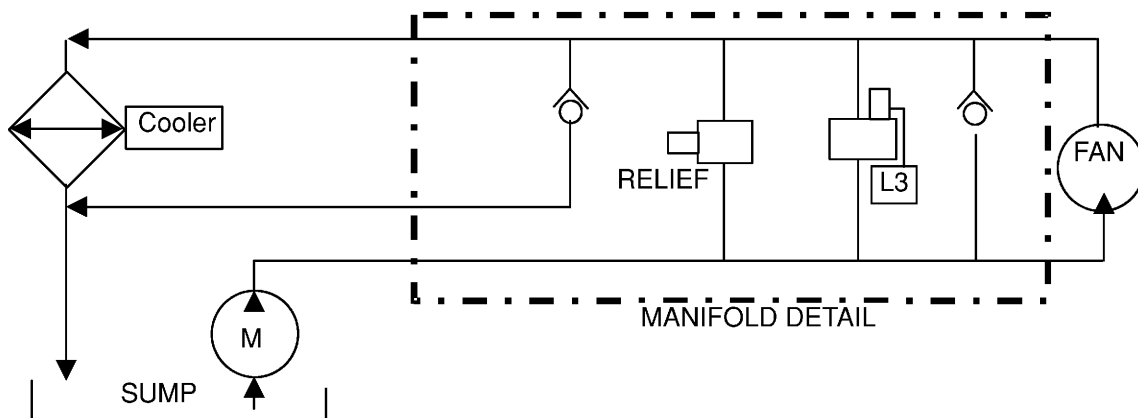
PT5 – Oil Filter Inlet Pressure  
 PT6 – Oil Filter Outlet Pressure  
 RT5 – Comp Oil Injection Temp  
 L1 – 3 Way Solenoid Valve

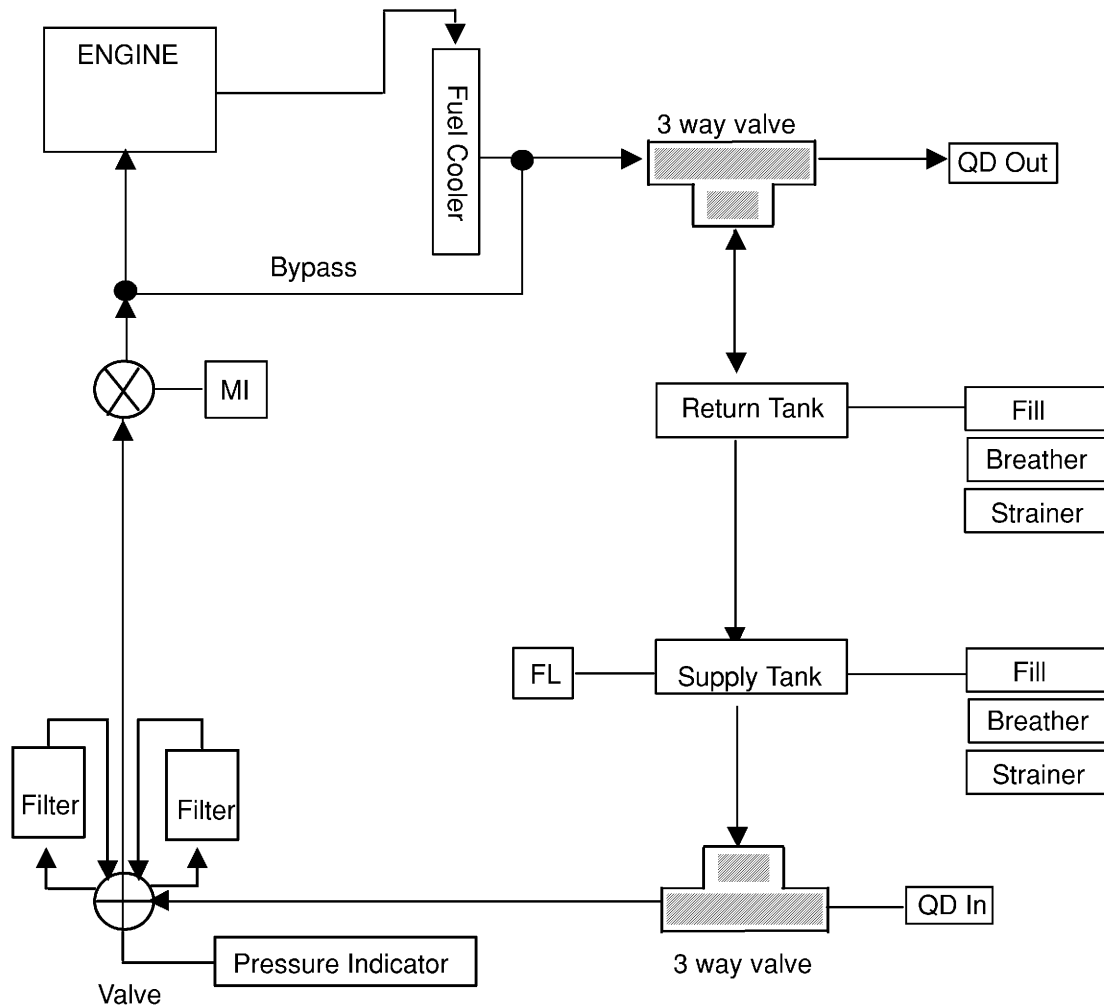
**Legend: ( Mechanical Components)**

OTCV – Oil Temp Control Valve  
 PRV – Pressure Relief Valve  
 Lvl Ind – Oil Level Indicator  
 IV – Inlet Valve



**Figure 3: Hydraulic System Schematic**





**Figure 4: Fuel System Schematic**

**Legend: (Electrical Components)**

FL - Fuel Level  
MI - Run Fuel Pump

**Legend: (Mechanical Components)**

Gauge - Oil Pressure Indicator  
Temp Ind - Oil Temperature Indicator  
Lvl Ind - Oil level Indicator



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**Legend: (Electrical Components)**

ORF1	- IC Orifice Heater
ORF2	- AC Orifice Heater
L3	- Hydraulic Fan Motor Speed
RAC1	- Fuel Heater
RAC2	- Fuel Heater
K2	- DC Heater Relay

**Legend: (Mechanical Components)**

IV	- Inlet Valve
BDV	- Blowdown Valve
MUF	- Blowdown Muffler
V1	- 1st Stage Venturi
1st MS	- 1st Stage Moisture Separator
V2	- 2nd Stage Venturi
2nd MS	- 2nd Stage Moisture Separator
CV	- Check Valve
HM	- Hydraulic Motor
HC	- Hydraulic Cooler
CAC	- Engine Charge Air Cooler
FC	- Fuel Cooler

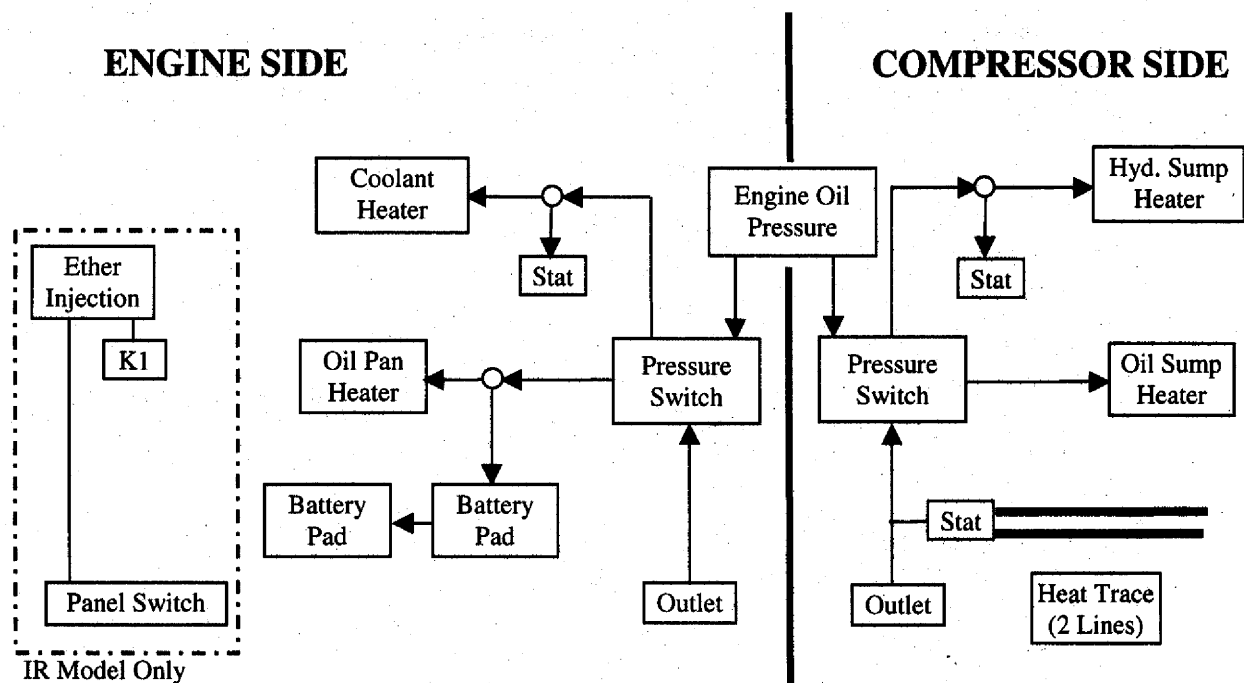
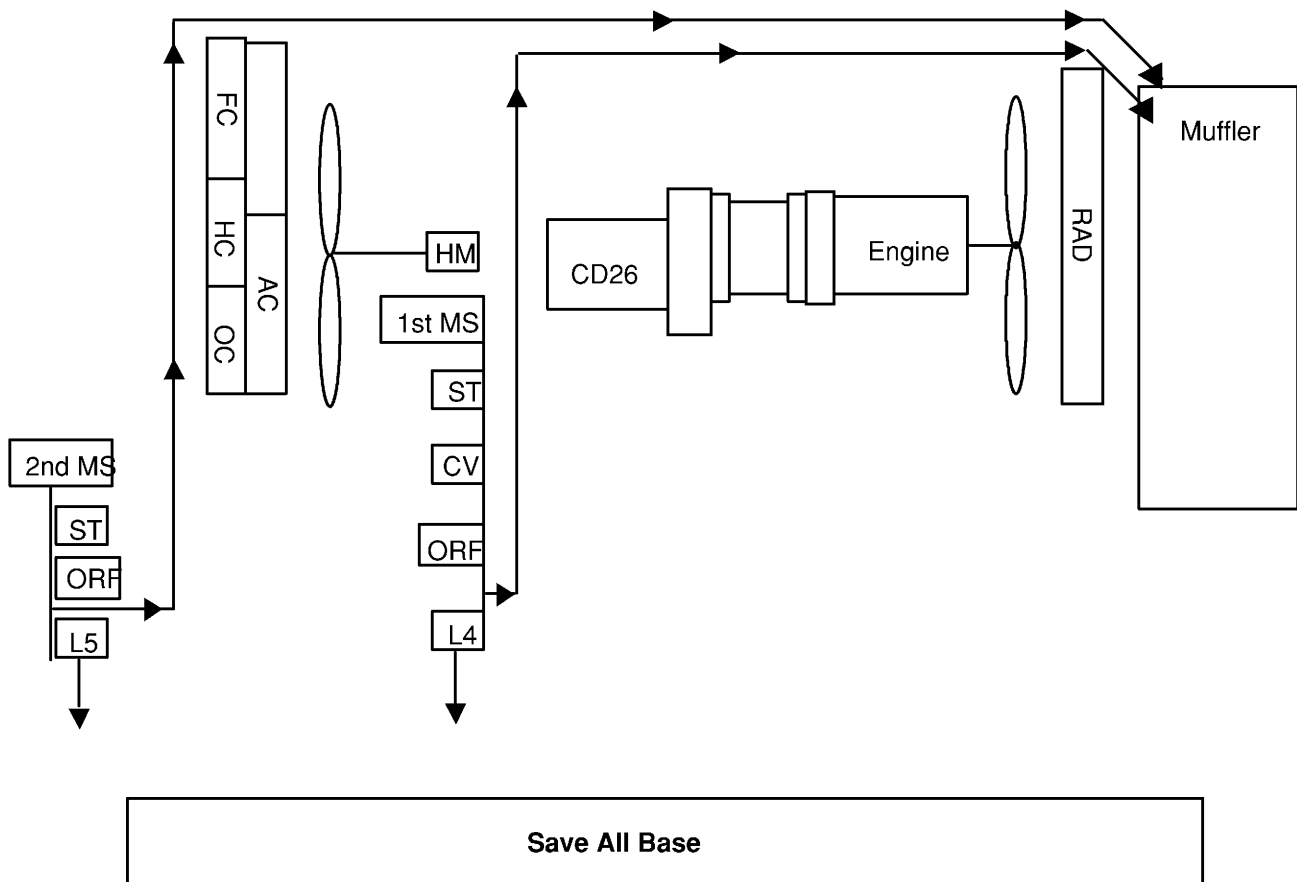


Figure 6: AC Cold Start System Schematic

**Legend: (Electrical Components)**

K1 - Aux. Start Relay





**Figure 7: Condensate Flow Schematic**

**Legend: (Electrical Components)**

- L4 - Condensate Solenoid Valve (IC)
- L5 - Condensate Solenoid Valve (AC)

**Legend: (Mechanical Components)**

- 1st MS - 1st Stage Moisture Separator
- 2nd MS - 2nd Stage Moisture Separator
- HM - Hydraulic Motor
- HC - Hydraulic Cooler
- CAC - Engine Charge Air Cooler
- FC - Fuel Cooler
- TP - Tail Pipe
- CV - Check Valve
- ST - Strainer
- ORF - Bleed Orifice

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# SECTION 10 - PARTS ORDERING

## GENERAL

This publication, which contains an illustrated parts breakdown, has been prepared as an aid in locating those parts which may be required in the maintenance of the unit. All of the compressor parts, listed in the parts breakdown, are manufactured with the same precision as the original equipment. For the greatest protection always insist on genuine Ingersoll-Rand Company parts for your compressor.

## **NOTICE**

Ingersoll-Rand Company can bear no responsibility for injury or damages resulting directly from the use of non-approved repair parts.

Ingersoll-Rand Company service facilities and parts are available worldwide. There are Ingersoll-Rand Company Construction Equipment Group Sales Offices and authorized distributors located in the principal cities of the United States. In Canada our customers are serviced by the Canadian Ingersoll-Rand Company, Limited. There are also Ingersoll-Rand International autonomous companies and authorized distributors located in the principal cities throughout the free world.

Special order parts may not be included in this manual. Contact the Mocksville Parts Department with the unit serial number for assistance with these special parts.

## DESCRIPTION

The illustrated parts breakdown illustrates and lists the various assemblies, subassemblies and detailed parts which make up this particular machine. This covers the standard models and the more popular options that are available.

A series of illustrations show each part distinctly and in

location relative to the other parts in the assembly. The part number, the description of the part and the quantity of parts required are shown on each illustration or on adjacent page. The quantities specified are the number of parts used per one assembly and are not necessarily the total number of parts used in the machine. Where no quantity is specified the quantity is assumed to be one.

Each description of a part is based upon the "noun first" method, i.e., the identifying noun or item name is always the first part of the description. The noun name is generally followed by a single descriptive modifier. The descriptive modifier may be followed by words or abbreviations such as upper, lower, inner, outer, front, rear, RH, LH, etc. when they are essential.

In referring to the rear, the front or to either side of the unit, always consider the **drawbar end** of the unit as the **front**. Standing at the rear of the unit facing the drawbar (front) will determine the right and left sides.

## FASTENERS

Both SAE/inch, ISO/metric hardware have been used in the design and assembly of these units. In the disassembly and reassembly of parts, extreme care must be taken to avoid damaging threads by the use of wrong fasteners. In order to clarify the proper usage and for exact replacement parts, all standard fasteners have been identified by part number, size and description. This will enable a customer to obtain fasteners locally rather than ordering from the factory. These parts are identified in tables that will be found at the rear of the parts illustrations. Any fastener that has not been identified by both part number and size is a specially engineered part that must be ordered by part number to obtain the exact replacement part.

## **MARKINGS AND DECALS**

### **NOTICE**

**Do not paint over safety warnings or instructional decals. If safety warning decals become illegible, immediately order replacements from the factory.**

Part numbers for original individual decals and their mounting locations are shown within Parts List Section. These are available as long as a particular model is in production.

Afterwards, service sets of exterior decals and current production safety warning decals are available. Contact the Product Support Group at Mocksville for your particular needs and availability.

### **HOW TO USE PARTS LIST**

- a. Turn to Parts List.
- b. Locate the area or system of the compressor in which the desired part is used and find illustration page number.
- c. Locate the desired part on the illustration by visual identification and make note of part number and description.

### **HOW TO ORDER**

The satisfactory ordering of parts by a purchaser is greatly dependent upon the proper use of all available information. By supplying your nearest sales office, autonomous company or authorized distributor, with complete information, you will enable them to fill your order correctly and to avoid any unnecessary delays.

In order that all avoidable errors may be eliminated, the following instructions are offered as a guide to the purchaser when ordering replacement parts:

- a. Always specify the model number of the unit as shown on the general data decal attached to the unit.
- b. Always specify the serial number of the unit. **THIS IS IMPORTANT.** The serial number of the unit will be found stamped on a plate attached to the unit. (The serial number on the unit is also permanently stamped in the metal of the frame side rail.)

- c. Always specify the number of the parts list publication.
- d. Always specify the quantity of parts required.
- e. Always specify the part number, as well as the description of the part, or parts, exactly as it is given on the parts list illustration.

In the event parts are being returned to your nearest sales office, autonomous company or authorized distributor, for inspection or repair, it is important to include the serial number of the unit from which the parts were removed.

### **TERMS AND CONDITIONS ON PARTS ORDERS**

**Acceptance:** Acceptance of an offer is expressly limited to the exact terms contained herein. If purchaser's order form is used for acceptance of an offer, it is expressly understood and agreed that the terms and conditions of such order form shall not apply unless expressly agreed to by Ingersoll-Rand Company ("Company") in writing. No additional or contrary terms will be binding upon the Company unless expressly agreed to in writing.

**Taxes:** Any tax or other governmental charge now or hereafter levied upon the production, sale, use or shipment of material and equipment ordered or sold is not included in the Company's price and will be charged to and paid for by the Purchaser.

Shipping dates shall be extended for delays due to acts of God, acts of Purchaser, acts of Government, fires, floods, strikes, riot, war, embargo, transportation shortages, delay or default on the part of the Company's vendors, or any other cause beyond the Company's reasonable control.

Should Purchaser request special shipping instruction, such as exclusive use of shipping facilities, including air freight when common carrier has been quoted and before change order to purchase order can be received by the Company, the additional charges will be honored by the Purchaser.

**Warranty:** The Company warrants that parts manufactured by it will be as specified and will be free from defects in materials and workmanship. The Company's liability under this warranty shall be limited to the repair or replacement of any part which was defective at the time of shipment provided Purchaser notifies the Company of any such defect promptly upon discovery, but in no event later than three (3) months from the date of shipment of such part by the Company. The only exception to the previous statement is the extended warranty as it applies to the special airend exchange program.

Repairs and replacements shall be made by the Company F.O.B. point of shipment. The Company shall not be responsible for costs of transportation, removal or installation.

Warranties applicable to material and equipment supplied by the Company but wholly manufactured by others shall be limited to the warranties extended to the Company by the manufacturer which are able to be conveyed to the Purchaser.

**Delivery:** Shipping dates are approximate. The Company will use best efforts to ship by the dates specified; however, the Company shall not be liable for any delay or failure in the estimated delivery or shipment of material and equipment or for any damages suffered by reason thereof.

The company makes no other warranty or representation of any kind whatsoever, expressed or implied, except that of title, and all implied warranties, including any warranty of merchantability and fitness for a particular purpose, are hereby disclaimed.

**Limitation of Liability:**

The remedies of the Purchaser set forth herein are exclusive, and the total liability of the Company with respect to this order whether based on contract, warranty, negligence, indemnity, strict liability or otherwise, shall not exceed the purchase price of the part upon which such liability is based. The Company shall in no event be liable to the Purchaser, any successors in interest or any beneficiary of this order for any consequential, incidental, indirect, special or punitive damages arising out of this order or any breach thereof, or

any defect in, or failure of, or malfunction of the parts hereunder, whether based upon loss of use, lost profits or revenue, interest, lost goodwill, work stoppage, impairment of other goods, loss by reason of shut-down or non-operation, increased expenses of operation or claims of customers of Purchaser for service interruption whether or not such loss or damage is based on contract, warranty, negligence, indemnity, strict liability or otherwise.

**AIREND EXCHANGE PROGRAM**

Your Ingersoll-Rand Company Construction Equipment Group Sales Offices and authorized distributors as well as Ingersoll-Rand International autonomous companies and authorized distributors now have an airend exchange program to benefit portable compressor users.

**On the airend exchange program the exchange price is determined by the age and condition of the airend and may be classified by one of the following categories.**

**Category "A":** The airend must not be over two years old and must have reusable rotor housing(s) and rotor(s).

**Category "B":** The airend must be between two and five years old and returned with two or more reusable major castings.

**Category "C":** The airend must be over five years old. Your nearest sales office, autonomous company or authorized distributor must first contact the Parts Service Department at the factory at which your portable air compressor was manufactured for an airend exchange number. The airend must be tagged with this preassigned number and returned to the factory prepaid. The airend must be intact, with no excluded parts, otherwise the exchange agreement may be cancelled. The warranty on an exchange or factory rebuilt airend is 365 days.

Airends being returned to the factory in connection with a WARRANTY CLAIM must be processed through the Customer Service Department. If returned without a Warranty MRR (Material Return Request) Number, no warranty claim will be considered.

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# NOTES

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# NOTES

## **SECTION 11 - PARTS LIST INDEX**

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FRAME

RUNNING GEAR ASSEMBLY

ENGINE ASSEMBLY

EXHAUST COMPLETE

AIR END ASSEMBLY

AIR END PIPING

AIR END COOLING

ENGINE COOLING

AIR INTAKE ASSEMBLY

FUEL TANK AND PIPING

FUEL FILTER

HYDRAULIC FAN ASSEMBLY

BATTERY AND MOUNTING

INSTRUMENT / CONTROL PANEL

ELECTRICAL COMPONENTS LOCATION

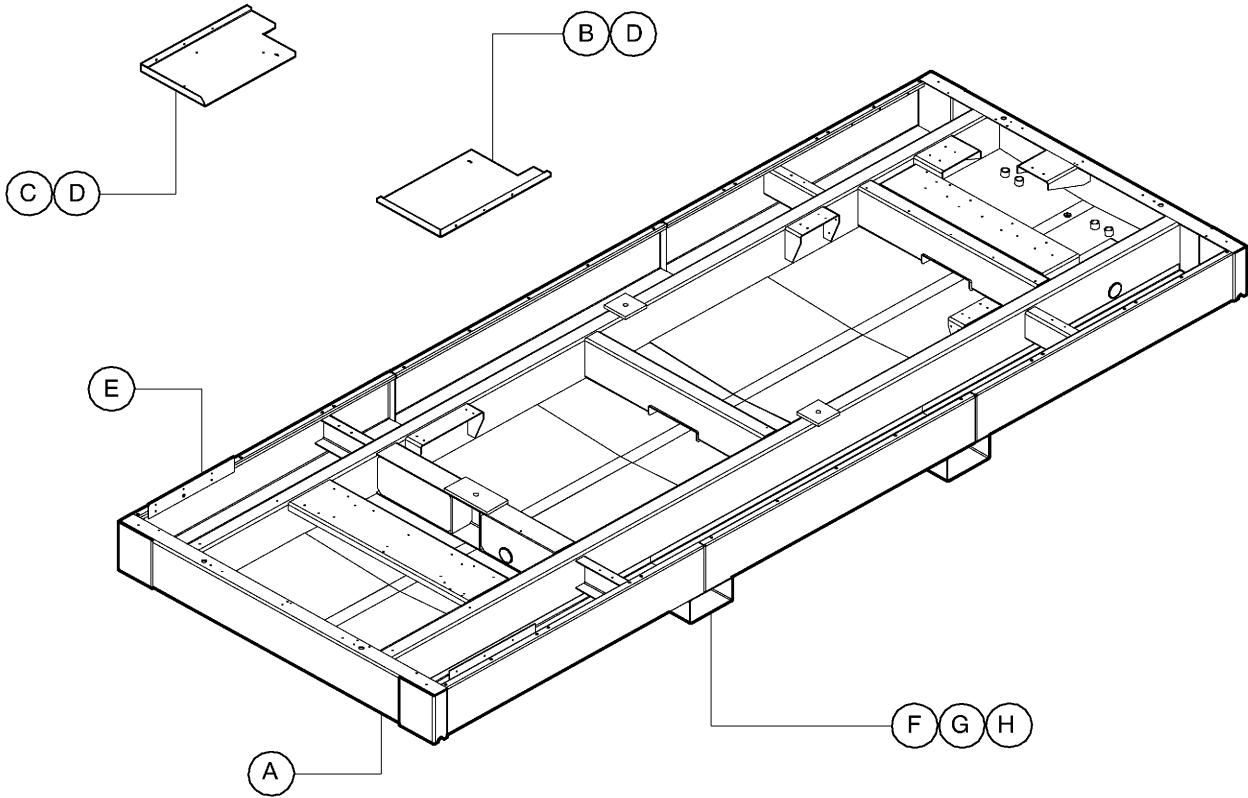
WIRING DIAGRAM

ENCLOSURE ASSEMBLY

ACOUSTIC ASSEMBLY

DECAL LOCATION

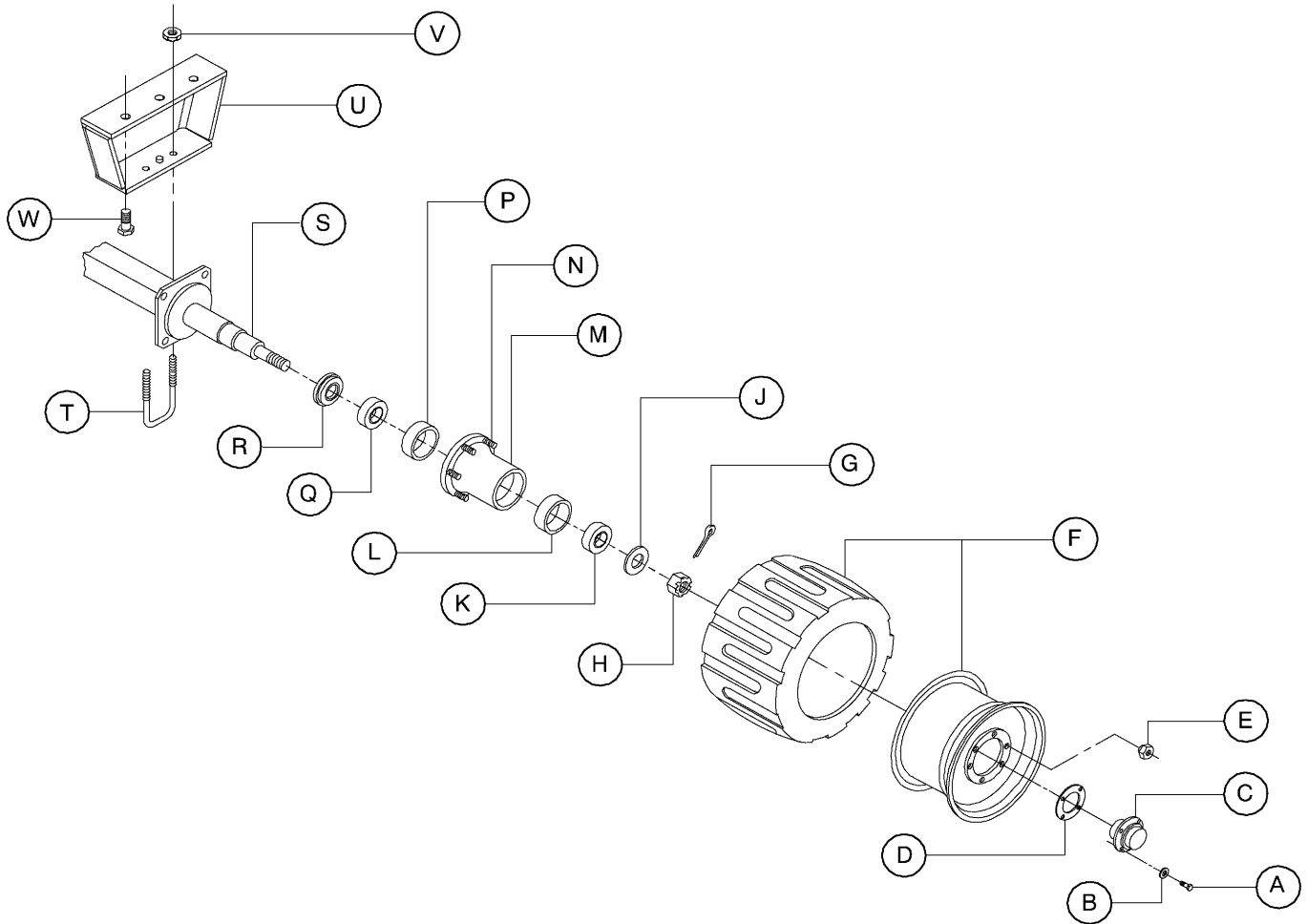
FRAME ASSEMBLY



ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	36922185	1	FRAME ASSEMBLY				
B	54631684	1	PLATE , R.H. COVER				
C	54631676	1	PLATE , L.H. COVER				
D	35279025	----	SCREW				
E	54631668	2	SUPPORT , PLATE				
F	54500798	2	TUBE , FORKLIFT				
G	36763670	8	SCREW				
H	54676796	8	WASHER				

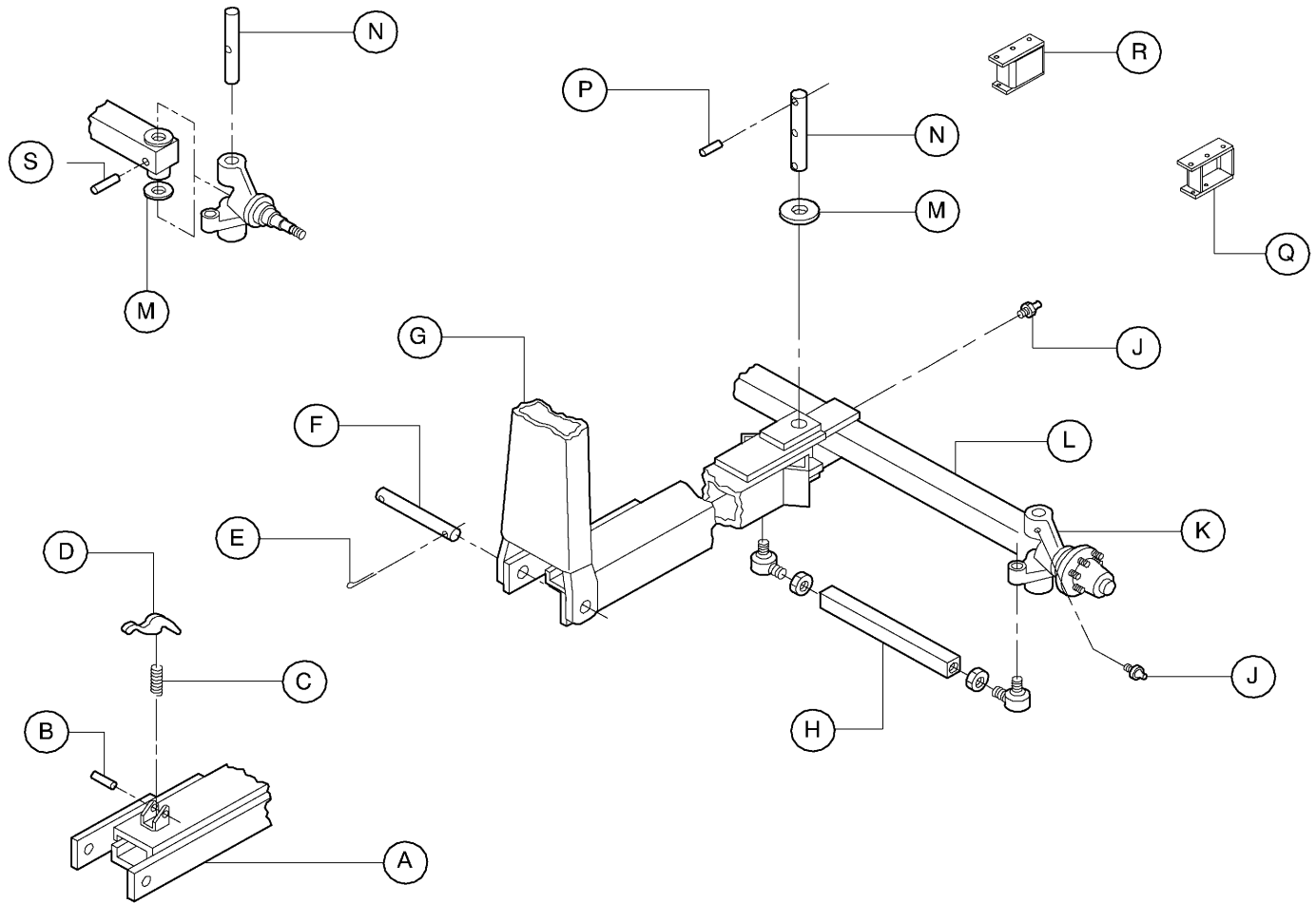


# RUNNING GEAR ASSEMBLY



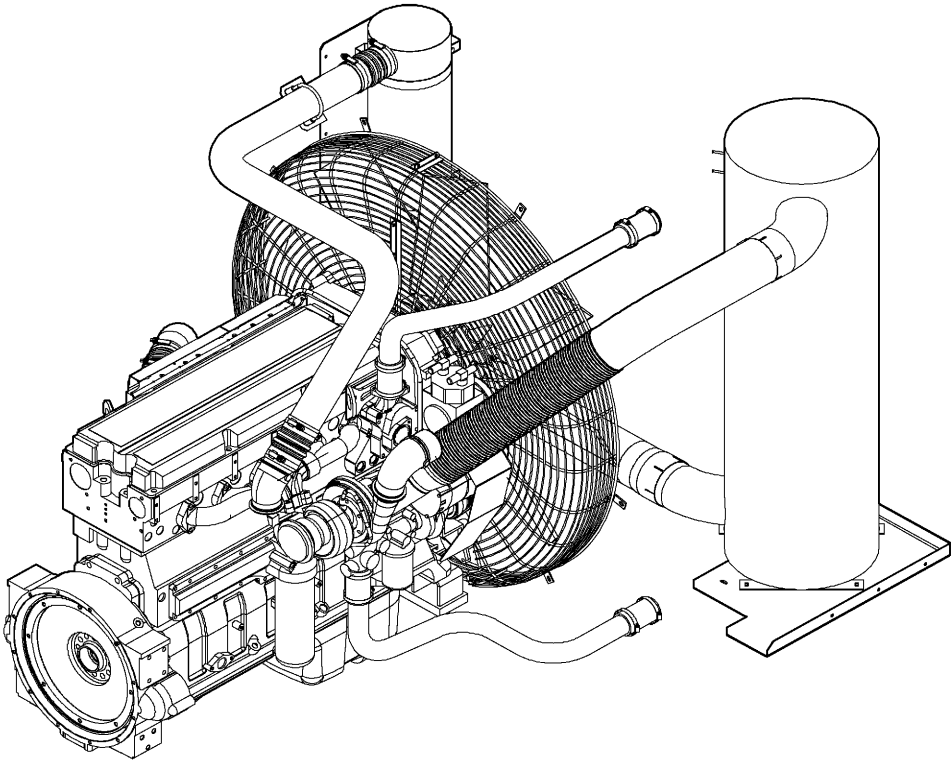
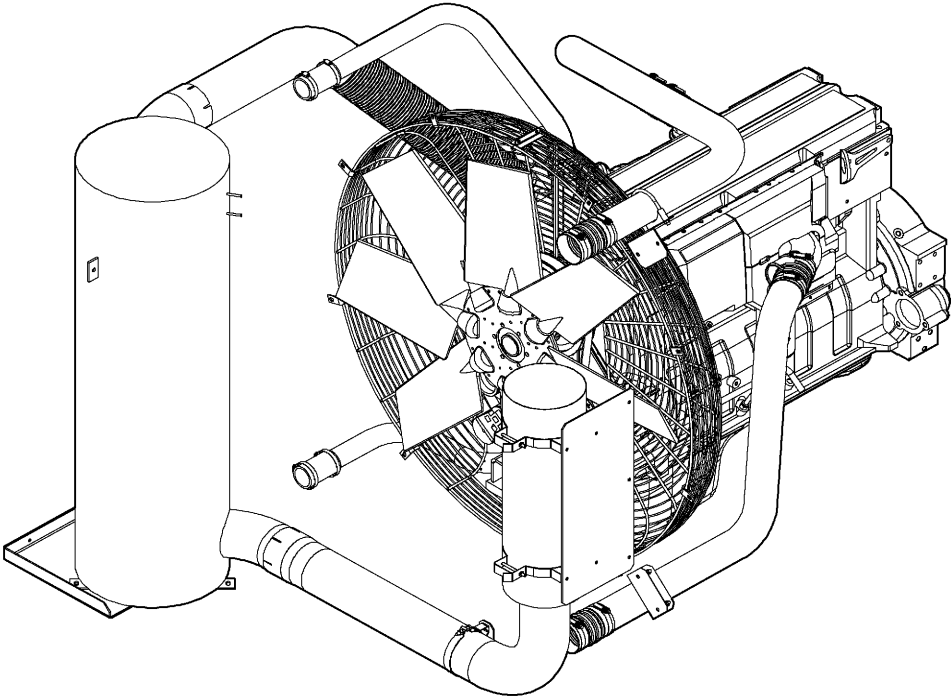
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54677240	24	SCREW				
B	54677257	24	WASHER				
C	54677224	6	CAP , GREASE				
D	54677232	6	GASKET				
E	54676705	36	NUT				
F	54676689	6	WHEEL AND TIRE ASSEMBLY				
G	35281229	6	PIN , COTTER				
H	35360098	6	NUT , SPINDLE				
J	35360080	6	WASHER , SPINDLE				
K	54677182	6	CONE , OUTER BEARING				
L	54677190	6	CUP , OUTER BEARING				
M	54676853	2	FRONT HUB ASSEMBLY				
	54676879	4	REAR HUB ASSEMBLY				
N	54677265	36	STUD , WHEEL				
P	54677208	6	CUP , INNER BEARING				
Q	54677174	6	CONE , INNER BEARING				
R	54677216	6	SEAL				
S	54676648	2	REAR AXLE ASSEMBLY				
T	54676747	8	U-BOLT				
U	54385752	4	SUPPORT , REAR AXLE				
V	54676762	16	NUT				
W	36763670	12	SCREW				

# RUNNING GEAR ASSEMBLY

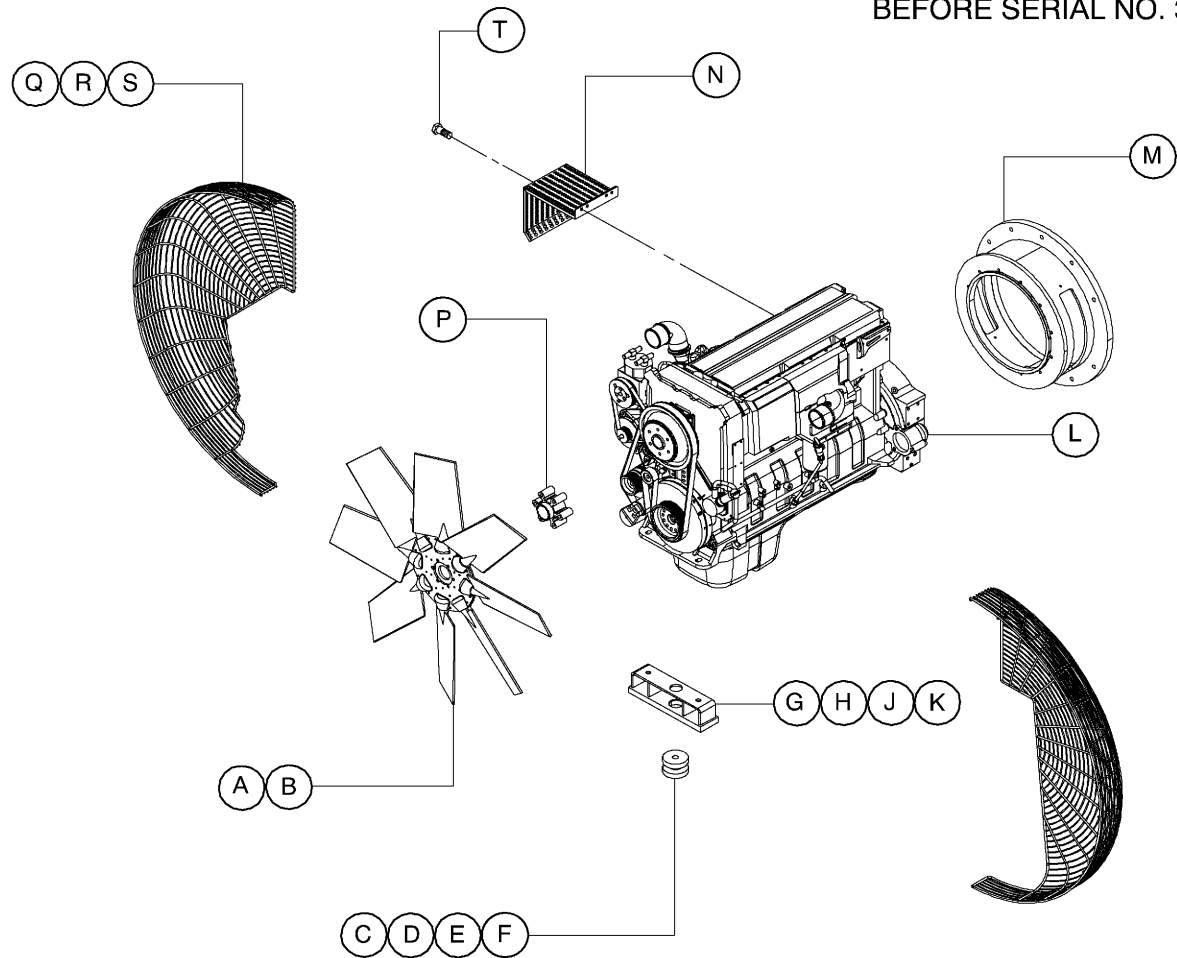


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54676804	1	CENTER ARM ASSEMBLY				
B	35281666	1	PIN , ROLL				
C	35281674	1	SPRING				
D	54676812	1	LATCH , PEDAL				
E	NO PART NUMBER						
F	NO PART NUMBER						
G	54676663	1	DRAWBAR ASSEMBLY				
H	54676796	2	TIE ROD ASSEMBLY				
J	35281773	6	FITTING , LUBE				
K	54676838	1	KNUCKLE ASSEMBLY , R.H.				
	54676820	1	KNUCKLE ASSEMBLY , L.H.				
L	54676622	1	FRONT AXLE ASSEMBLY				
M	54676903	4	WASHER				
N	54677166	3	PIN , KING				
P	54676945	1	PIN , SPRING				
Q	54424114	1	SUPPORT , L.H.				
R	54424569	1	SUPPORT , R.H.				
S	54676929	2	PIN , ROLL				
	35603661	2	BRACKET , WHEEL CHOCK				
	35333830	2	STRAPS , WHEEL CHOCK				
	35603190	2	CHOCK , WHEEL				

MANUAL NO. — DRAWING NO. DATE / REV:  
54665302 4 04/01 A

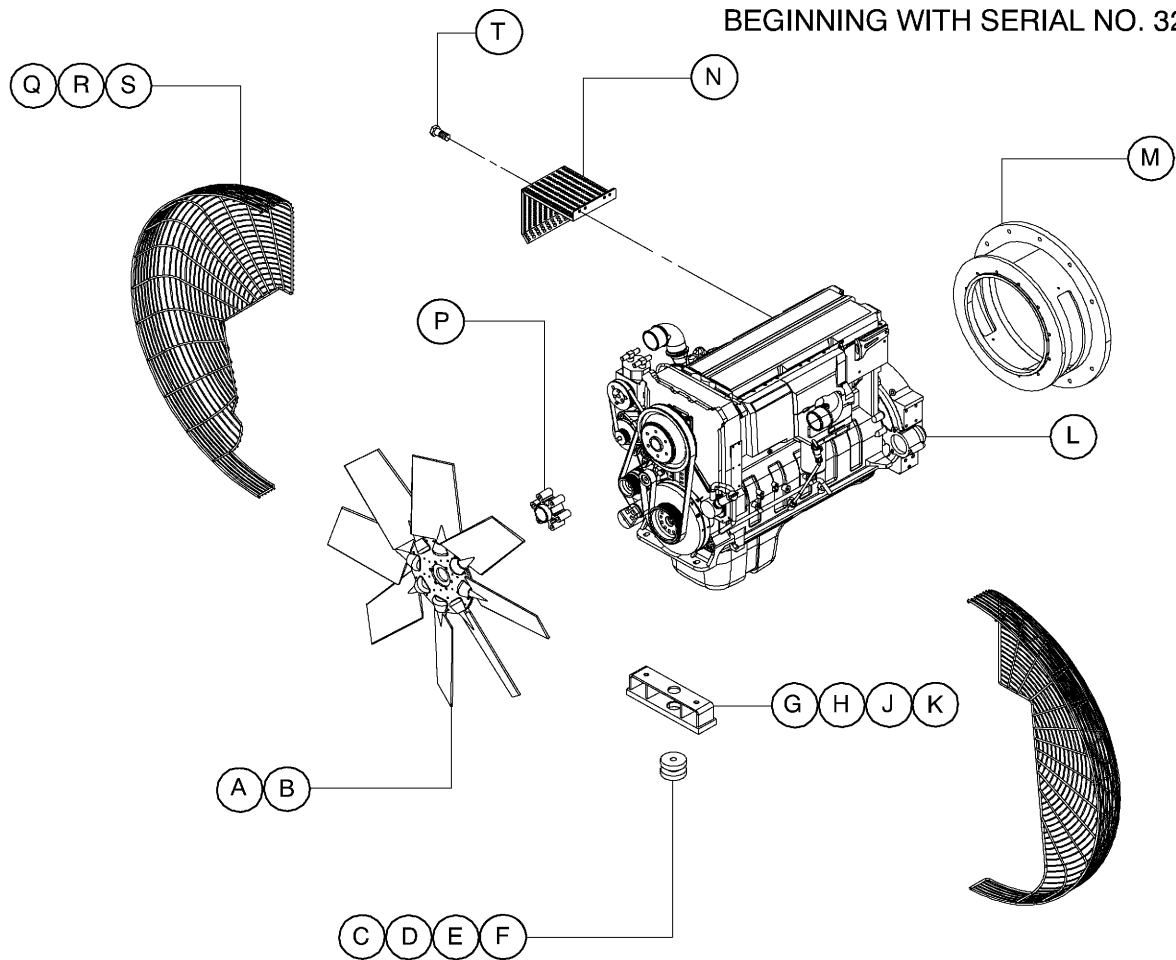


BEFORE SERIAL NO. 325561



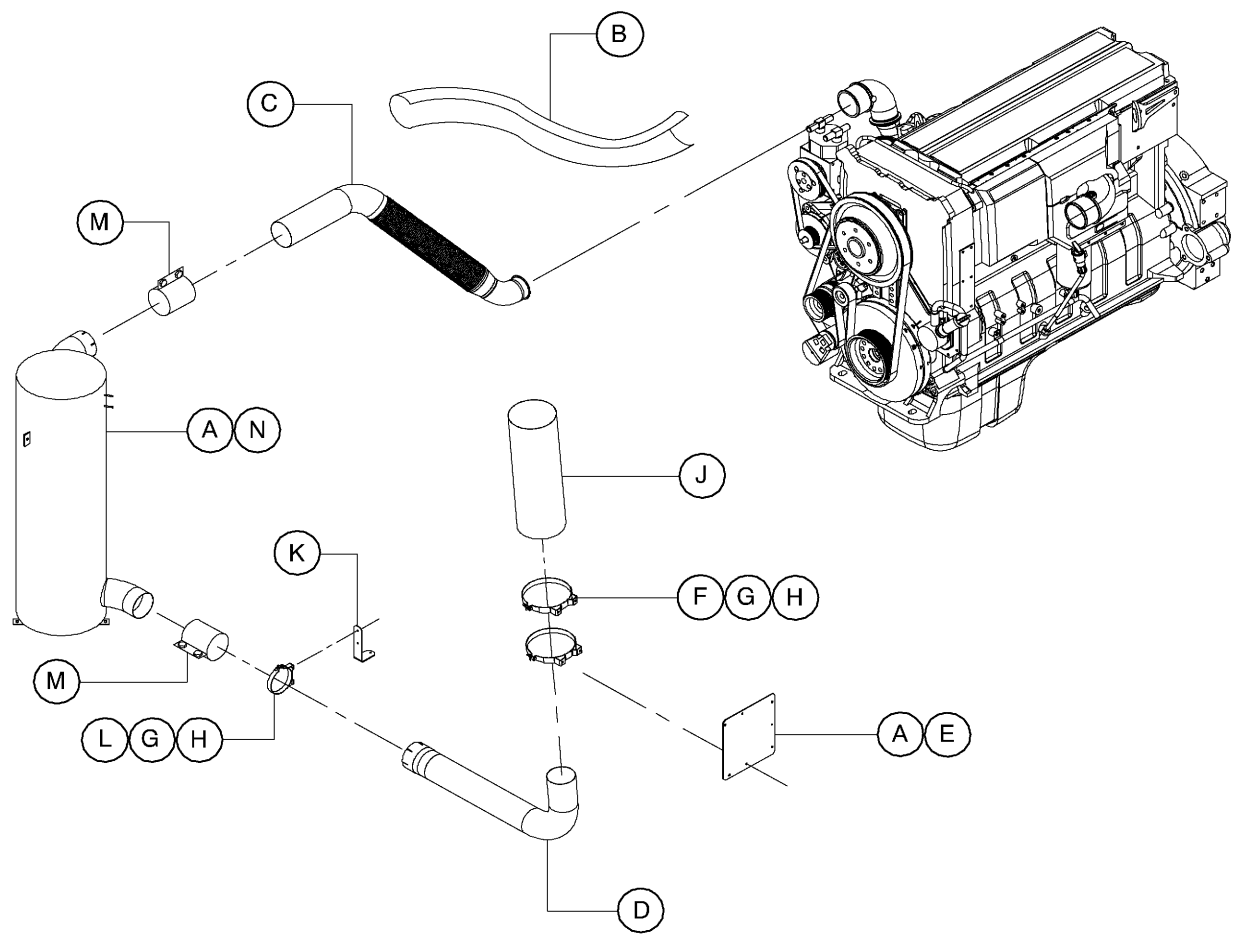
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	36884047	1	FAN , 54 INCH				
B	95104303	6	SCREW				
C	36921302	1	MOUNT , RUBBER				
D	54610621	1	WASHER				
E	54720768	1	SCREW				
F	51206787	1	NUT				
G	36921492	1	MOUNT , ENGINE				
H	36763670	2	SCREW				
J	95935011	2	WASHER				
K	35297340	2	NUT				
L	54482427	1	ENGINE				
M	54592951	1	ADAPTER , AIR END				
N	54687322	1	GUARD , TURBO				
P	54409339	1	SPACER , FAN				
Q	54501085	1	GUARD , FAN				
R	35279025	8	SCREW				
S	36898096	2	SCREW				
T	36879492	2	SCREW				
	54604343	1	PUMP , HYDRAULIC				
	54662028	1	FILTER , ENGINE OIL				
	54662036	1	FILTER , ENGINE FUEL				
	54662051	1	FILTER , ENGINE COOLANT				
	54728696	1	BELT , ENGINE FAN				
	54728688	1	BELT , ALTERNATOR				

BEGINNING WITH SERIAL NO. 325561

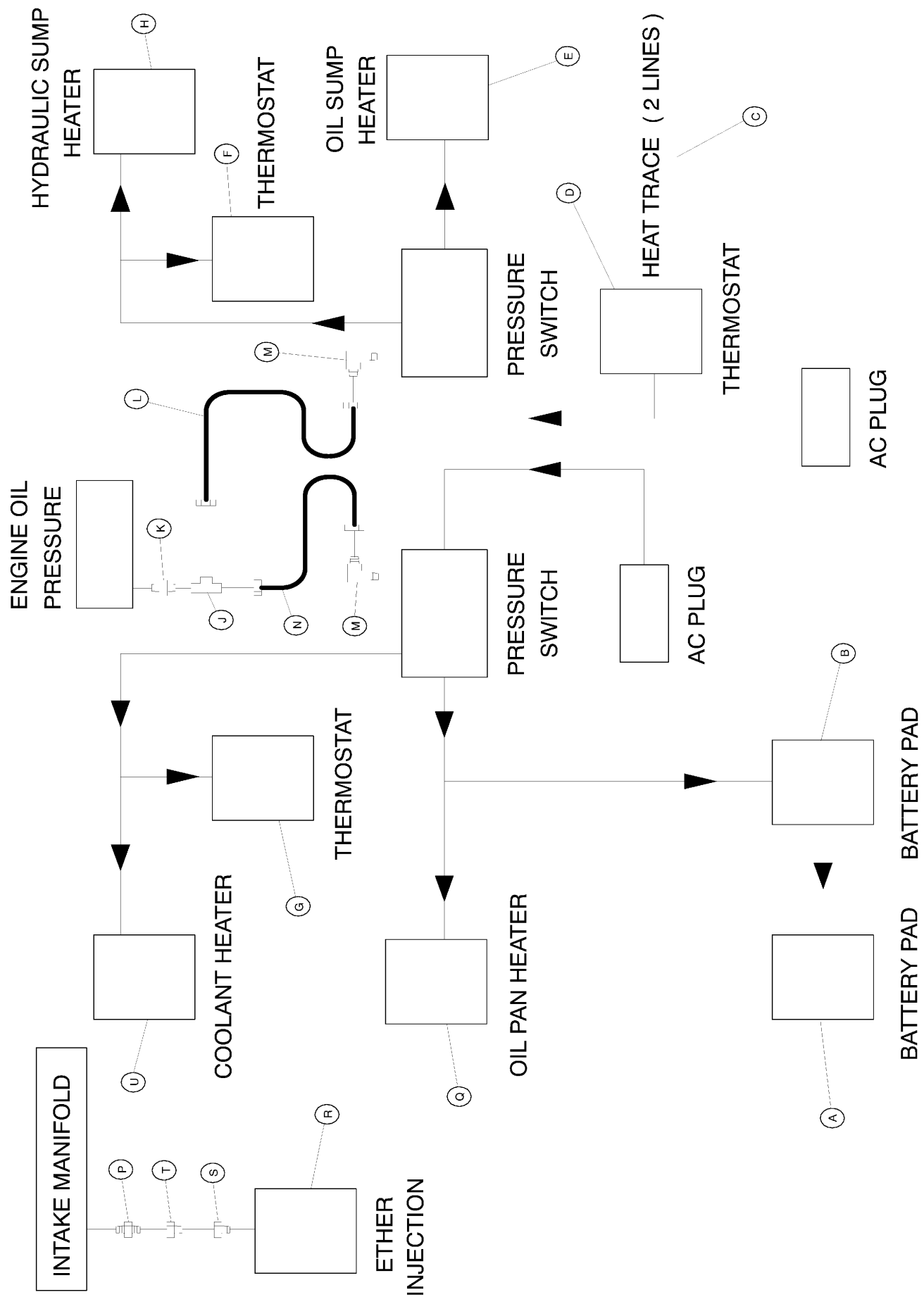


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	36884047	1	FAN , 54 INCH				
B	95104303	6	SCREW				
C	36921302	1	MOUNT , RUBBER				
D	54610621	1	WASHER				
E	54720768	1	SCREW				
F	51206787	1	NUT				
G	36921492	1	MOUNT , ENGINE				
H	36763670	2	SCREW				
J	95935011	2	WASHER				
K	35297340	2	NUT				
L	22065908	1	ENGINE				
M	54592951	1	ADAPTER , AIR END				
N	54687322	1	GUARD , TURBO				
P	54409339	1	SPACER , FAN				
Q	54501085	1	GUARD , FAN				
R	35279025	8	SCREW				
S	36898096	2	SCREW				
T	36879492	2	SCREW				
	54604343	1	PUMP , HYDRAULIC				
	54662028	1	FILTER , ENGINE OIL				
	54662036	1	FILTER , ENGINE FUEL				
	54662051	1	FILTER , ENGINE COOLANT				
	54728696	1	BELT , ENGINE FAN				
	22065916	1	BELT , ALTERNATOR				

EXHAUST ASSEMBLY

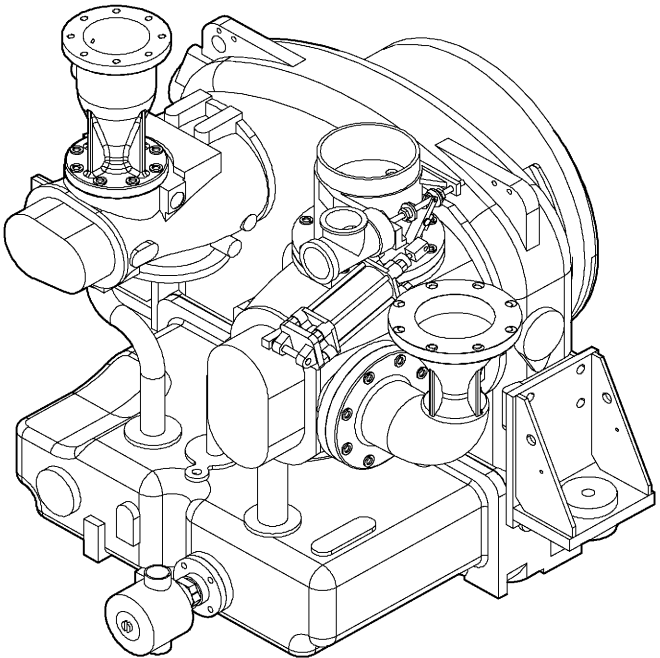
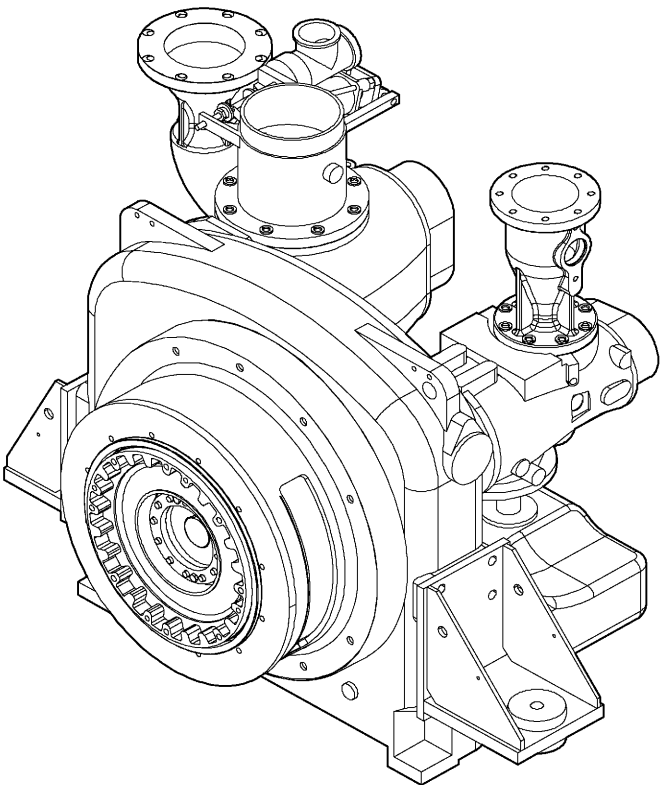


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	35279025	----	SCREW				
B	54662010	1	INSULATION , EXHAUST				
C	54648159	1	PIPE , FLEX TURBO				
D	54648209	1	PIPE , EXHAUST				
E	54656624	1	PLATE , SUPPORT				
F	36787026	2	CLAMP , BAND				
G	36889608	----	SCREW				
H	36881886	----	NUT				
J	36787034	1	TUBE , EXHAUST				
K	54656632	1	BRACKET , SUPPORT				
L	35303361	1	CLAMP , BAND				
M	36799807	2	CLAMP , SEAL				
N	54615752	1	MUFFLER				

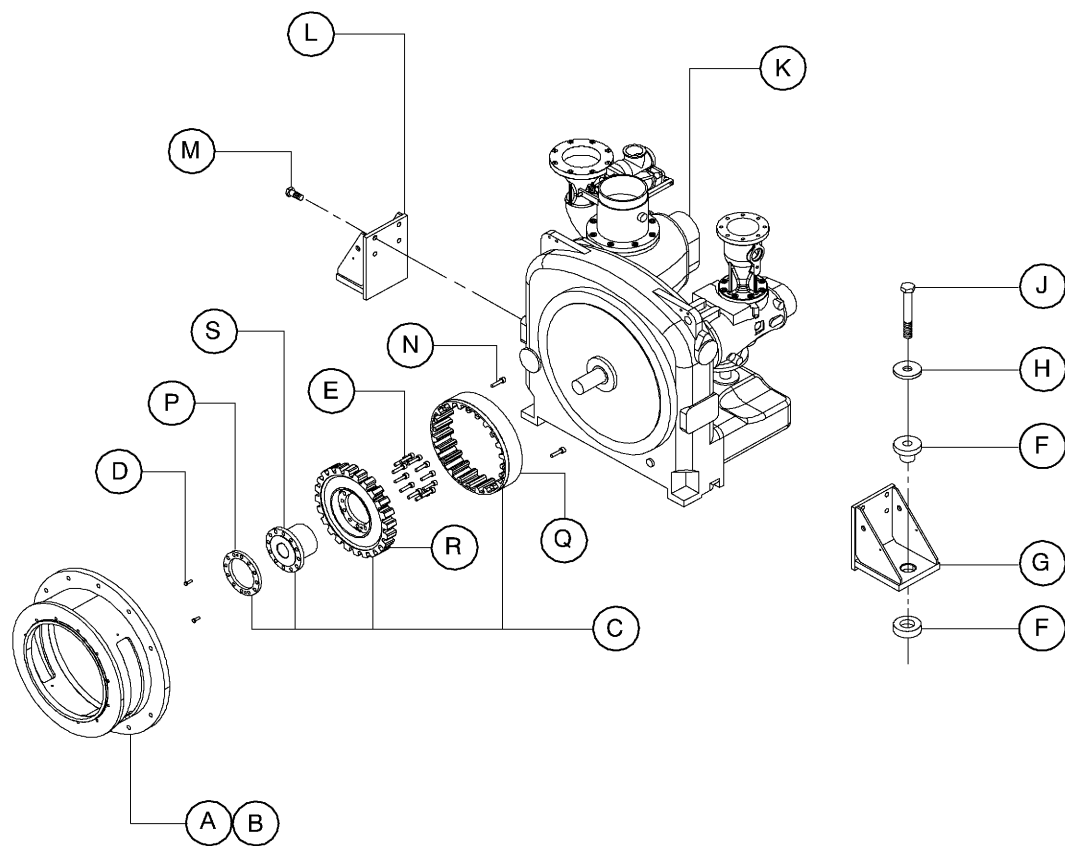


	120V / 60HZ	220V / 50HZ	
(A)	36920346	54392634	HEATER , BATTERY PAD ( 1 LEAD )
(B)	36920338	54392626	HEATER , BATTERY PAD ( 2 LEADS )
(C)	54733217	54733217	HARNESS , HEAT TRACE THERMOSTAT
(D)	54736889	54736889	HEAT TRACE ASSEMBLY
(E)	54671607	54678941	HEATER , AIR END OIL SUMP
(F)	36858751	36858751	WELL , HYDRAULIC THERMOSTAT
(G)	54480298	54480298	WELL , ENGINE THERMOSTAT
(H)	54464631	54678982	HEATER , HYDRAULIC RESERVOIR
(J)	95419073	95419073	TEE
(K)	54720719	54720719	ADAPTER
(L)	35284520	35284520	HOSE ASSEMBLY
(M)	35283464	35283464	ELBOW
(N)	54718929	54718929	HOSE ASSEMBLY
(P)	54720719	54720719	ADAPTER
(Q)	54464623	54678438	HEATER , ENGINE OIL PAN
(R)	35357052	35357052	ETHER KIT
(S)	35602812	35602812	ATOMIZER , ETHER
(T)	95930301	95930301	BUSHING
(U)	54758404	54701057	HEATER , ENGINE COOLANT
	54464664	54678784	HARNESS , ENGINE HEATERS
	54464672	54678826	HARNESS , AIR END HEATERS
	54464607	54678511	ENG. COLD START HEATER ASSY.
	54464615	54678875	AIR END COLD START HEATER ASSY.



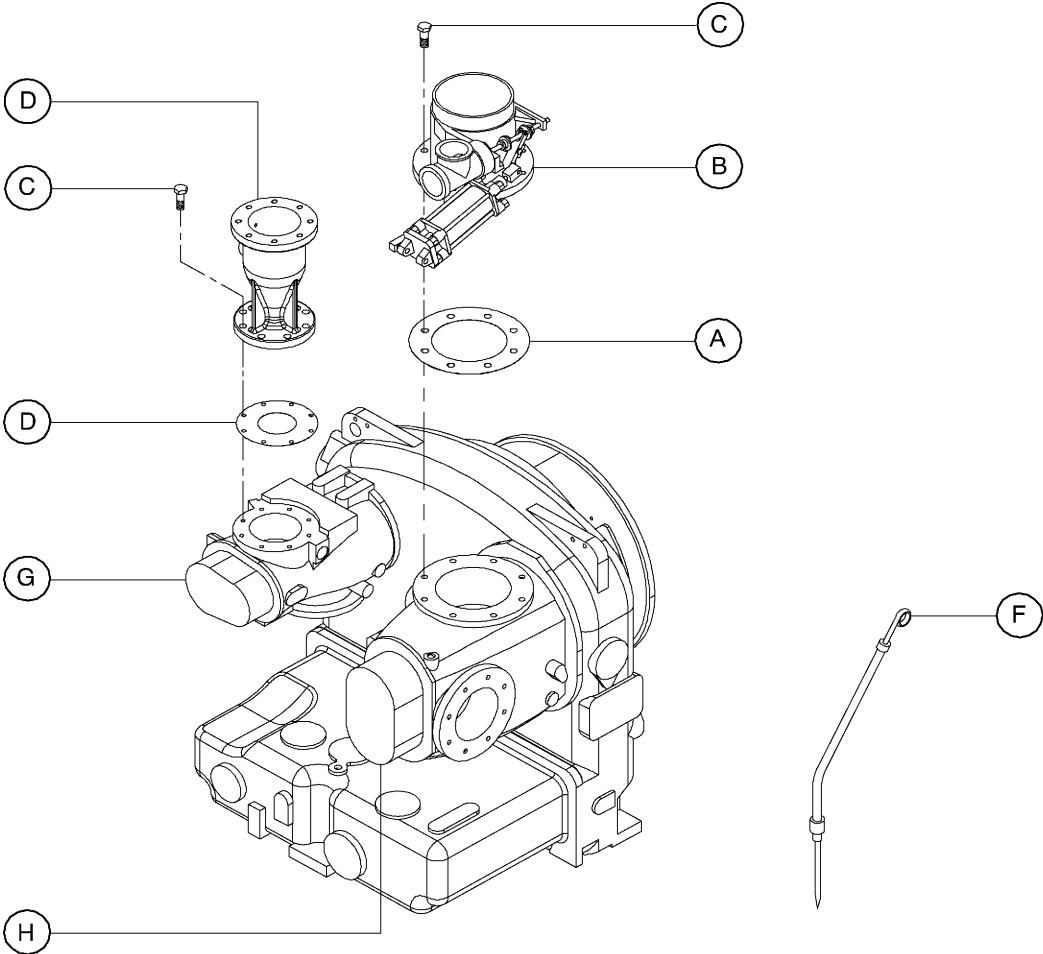


AIR END COUPLING & MOUNTING



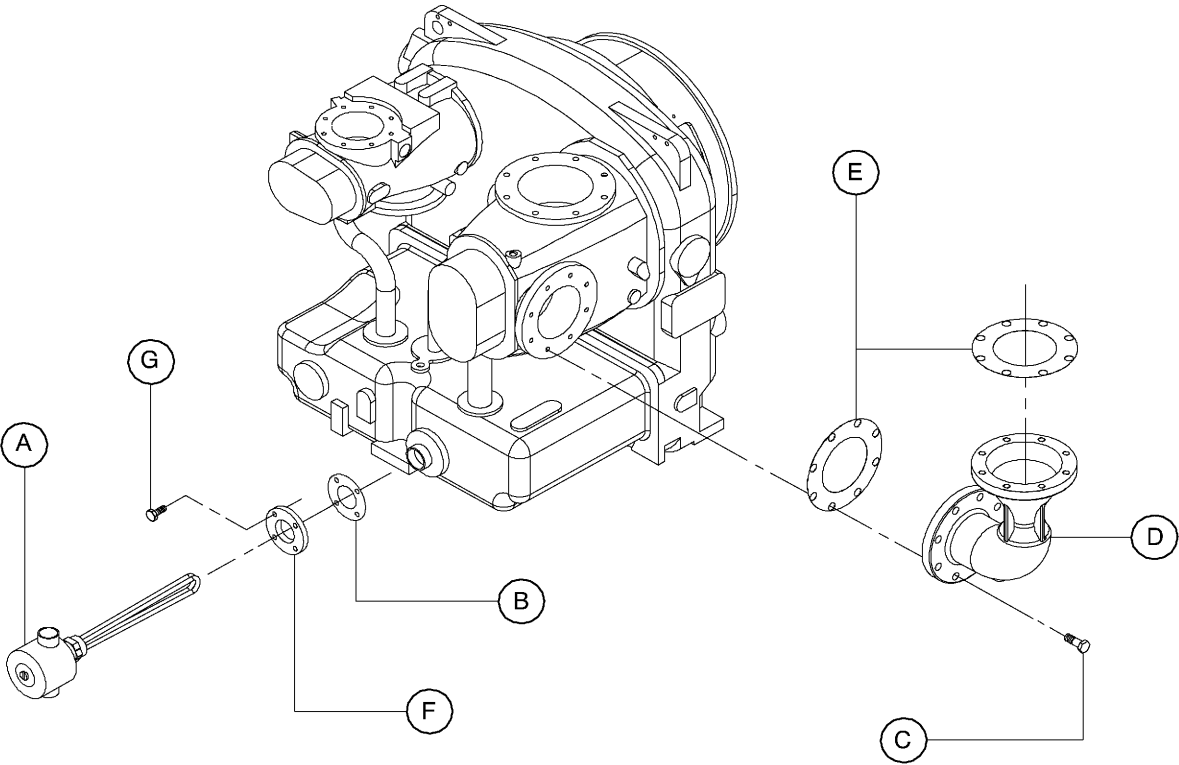
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54592951	1	ADAPTER , AIR END				
B	39179072	10	SCREW				
C	54740691	1	AIR END COUPLING ASSEMBLY				
D	35271154	2	SCREW				
E	96725130	12	SCREW				
F	36921302	2	MOUNT , RUBBER				
G	36921351	1	MOUNT , L.H. AIR END				
H	54610621	2	WASHER				
J	54720768	2	BOLT				
K	54434147	1	AIR END ASSEMBLY				
	39330741	1	LOW PRESSURE AIR END ASSEMBLY				
	39330758	1	HIGH PRESSURE AIR END ASSEMBLY				
L	36923886	1	MOUNT , R.H. AIR END				
M	35375377	8	SCREW				
N	95104303	8	BOLT				
P	54758305	1	SPACER , COUPLING				
Q	54758297	1	RING , OUTER				
R	54758263	1	RING , INNER				
S	54758271	1	BUSHING , SPLIT				
	54690102	2	ADAPTER , COVER				
	35279025	4	SCREW				
	39213442	1	OIL PUMP KIT				
	54432612	1	GEAR SET				

AIR END INLET VALVE



ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	39330279	1	GASKET				
B	39911110	1	VALVE , AIR INLET				
C	39179072	16	SCREW				
D	39330303	1	GASKET				
E	39913777	1	VENTURI , SECOND STAGE				
F	54579057	1	OIL DIP STICK ASSEMBLY				
G	39330758	1	AIR END , HIGH PRESSURE				
H	39330741	1	AIR END , LOW PRESSURE				
	39213442	1	KIT , OIL PUMP				
	54656657	1	PUMP , OIL				
	54628151	1	COUPLER , OIL PUMP				
	39925425	1	DRIVER , OIL PUMP				
	54432612	1	SET , GEAR				

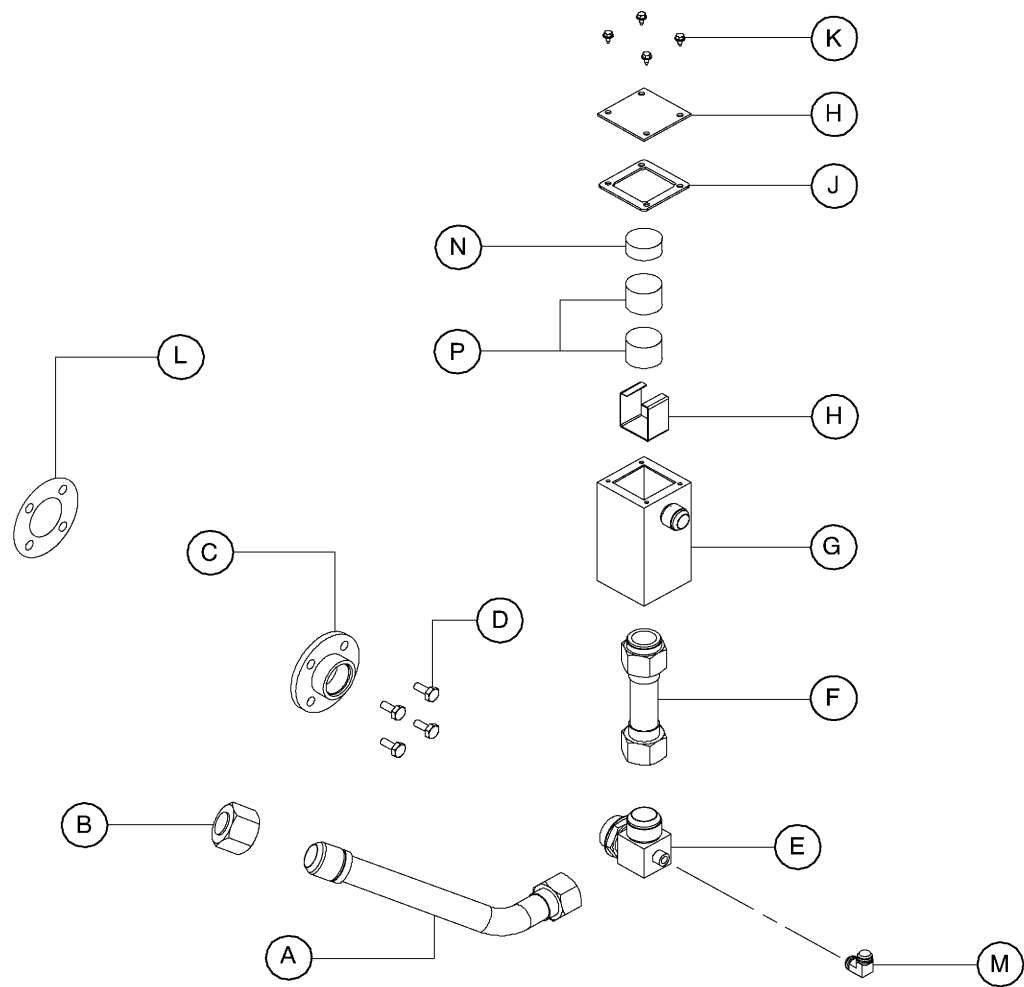
AIR END 1ST STAGE INLET



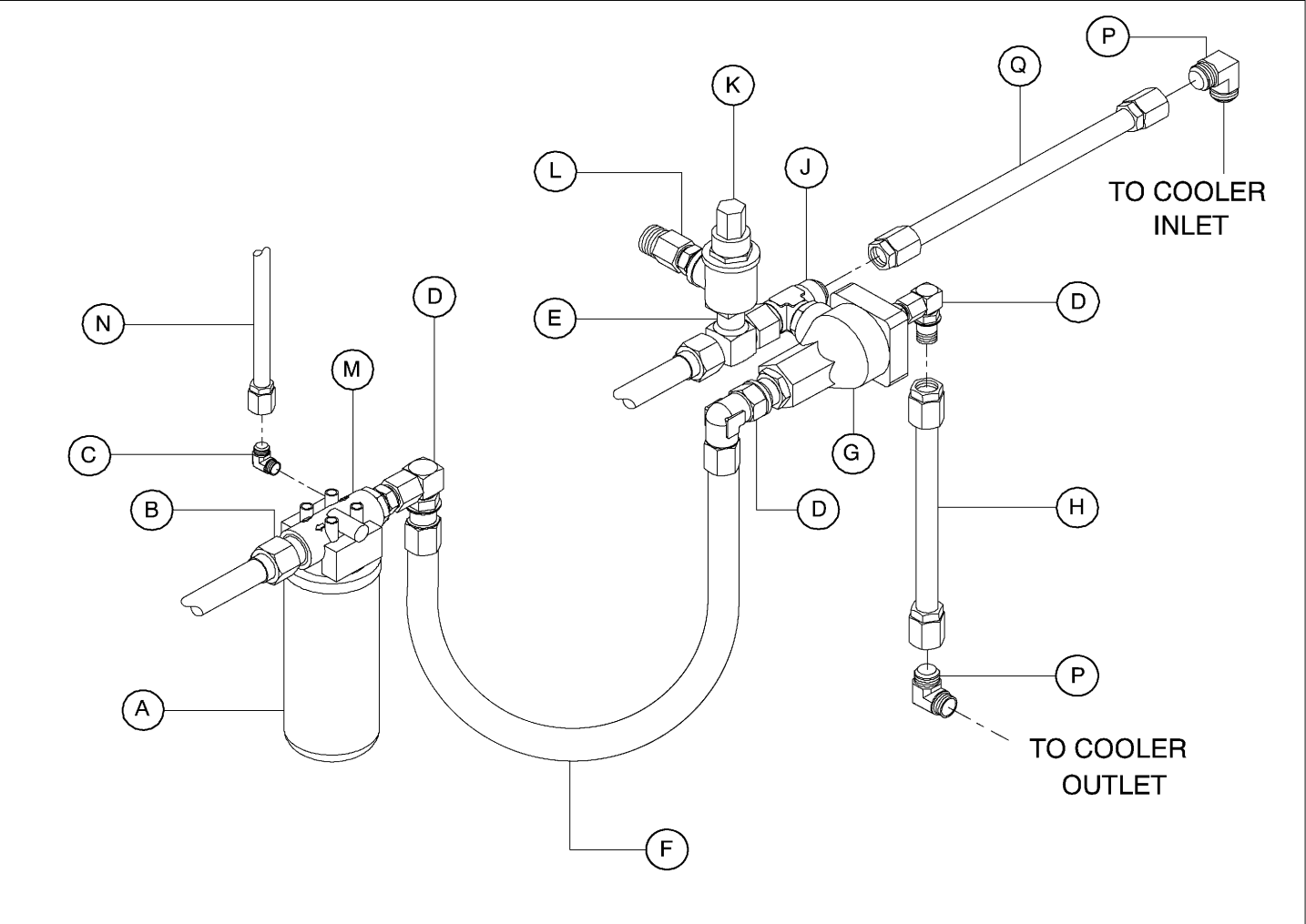
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54671607	1	HEATER , 120V SUMP				
	54678941	1	HEATER , 240V SUMP				
B	39497904	1	GASKET , HEATER				
C	39179072	8	SCREW				
D	39913124	1	VENTURI , FIRST STAGE				
E	39464433	1	GASKET				
F	39497912	1	PLATE				
G	36877793	4	SCREW				

MANUAL NO. — DRAWING NO. DATE / REV:  
54665302 12 04/01 A

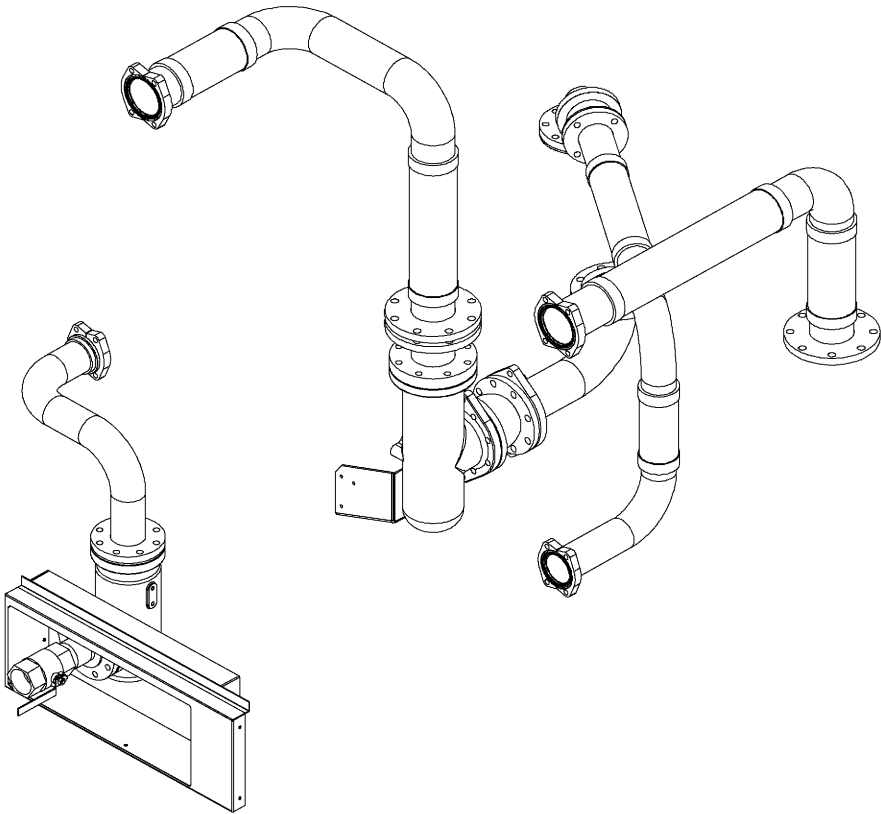
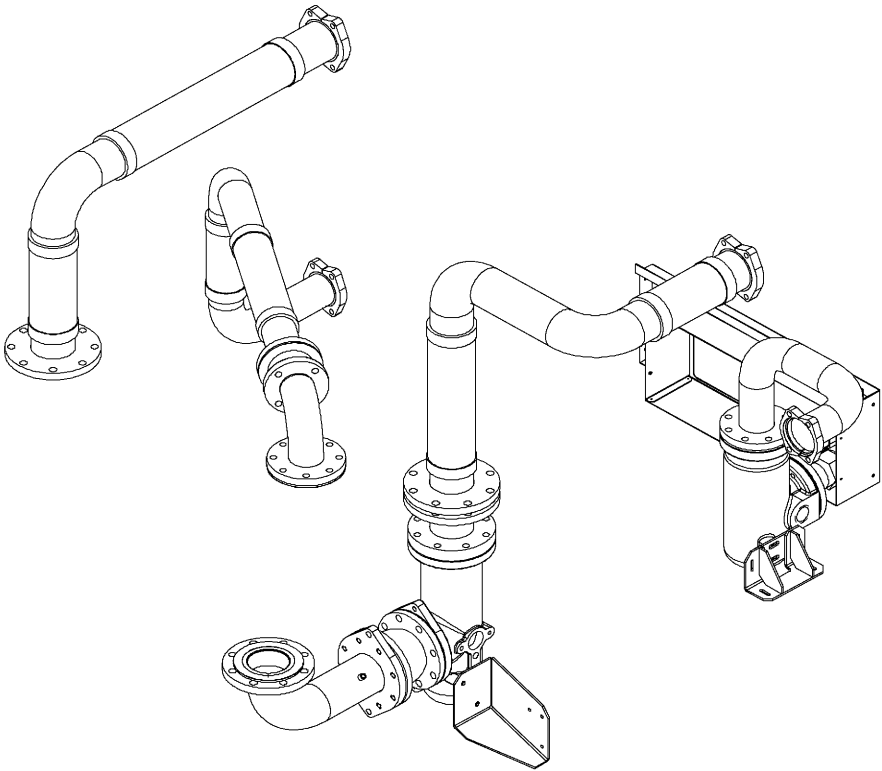
AIR END BREATHER ASSEMBLY



ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	39917323	1	TUBE ASSEMBLY				
B	95972873	1	NUT , TUBE				
C	39497003	1	FLANGE , MOUNTING				
D	39173463	4	SCREW				
E	39590542	1	MANIFOLD				
F	39917315	1	TUBE ASSEMBLY				
G	39560180	1	BOX , BREATHER				
H	39489646	1	COVER ASSEMBLY				
J	39491741	1	GASKET				
K	39133145	4	SCREW				
L	39464367	1	GASKET				
M	35279934	1	ELBOW				
N	40068371	1	ELEMENT , FOAM				
P	40068389	2	ELEMENT , METALLIC				

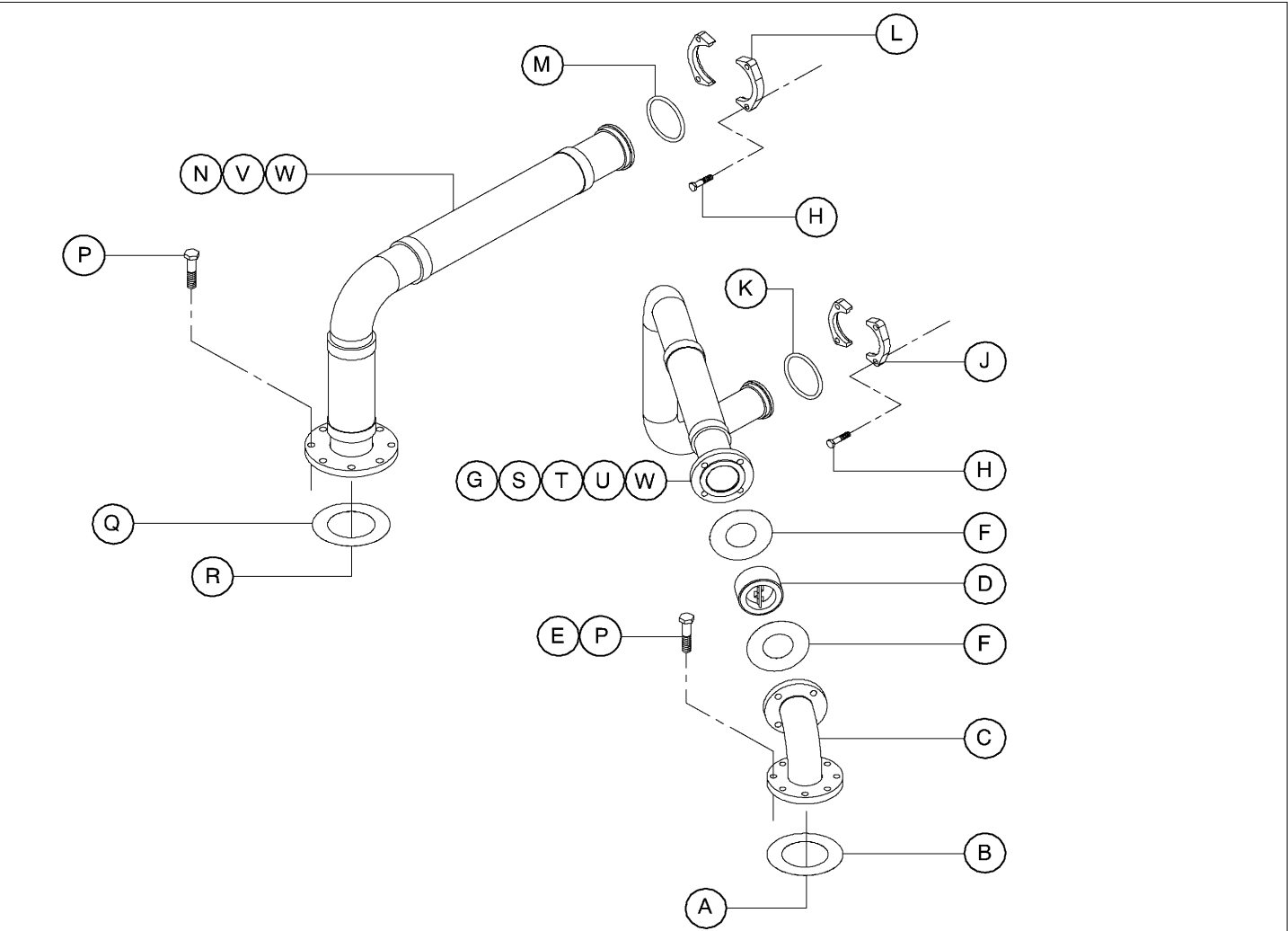


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	39911615	1	ELEMENT , FILTER				
B	95955993	1	CONNECTOR				
C	35306687	2	ELBOW				
D	35291384	1	ELBOW				
E	95591565	1	TEE				
F	36792000	1	HOSE ASSEMBLY				
G	39467634	1	VALVE , TEMPERATURE				
H	54718739	1	HOSE ASSEMBLY				
J	35306554	1	TEE				
K	39167119	1	VALVE				
L	95937512	1	CONNECTOR				
M	39871165	1	HEAD , FILTER				
P	95368890	1	ELBOW				
Q	35118272	1	HOSE ASSEMBLY				



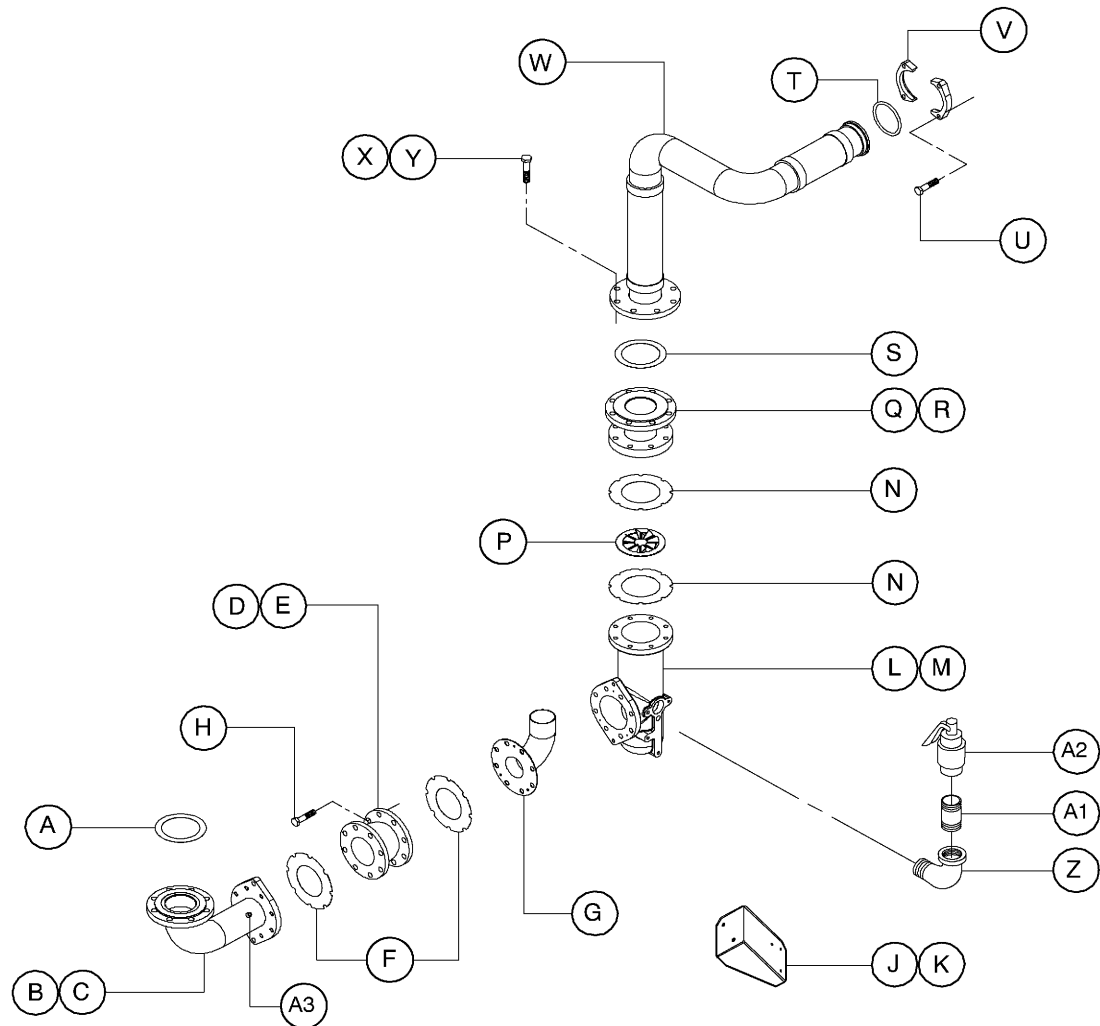


AIR END PIPING

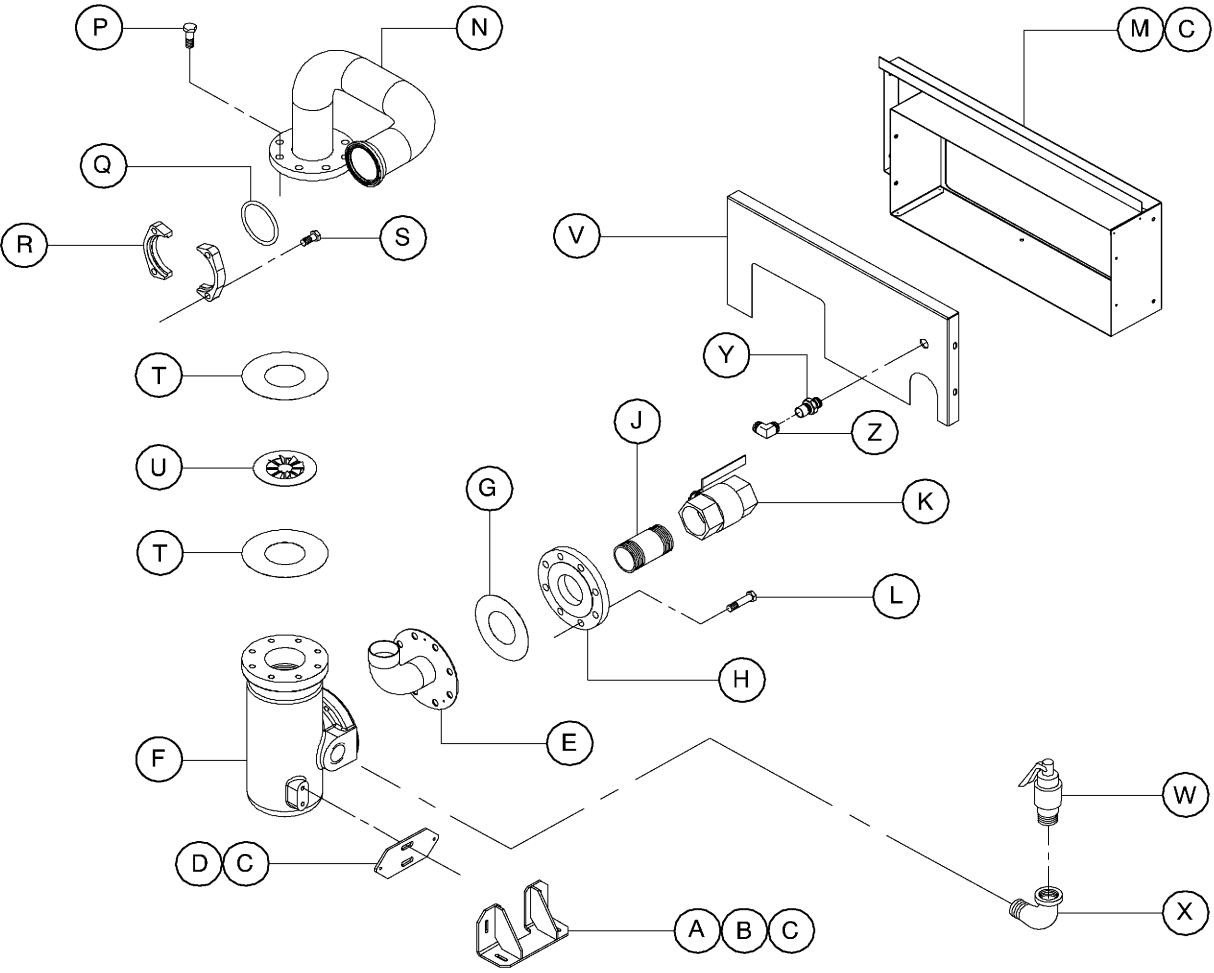


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	TO TOP OF VENTURI ON 2ND STAGE AIR END						
B	39330295	1	GASKET				
C	36922938	1	TUBE , 2ND STAGE OUTLET				
D	39911128	1	VALVE , CHECK				
E	95934170	7	SCREW				
F	39330287	1	GASKET				
G	54620588	1	TUBE , AFTERCOOLER INLET				
H	95060745	----	SCREW				
J	39481593	2	FLANGE , SPLIT				
K	39188479	1	O-RING				
L	95985735	2	FLANGE , SPLIT				
M	95060745	1	O-RING				
N	54534847	1	TUBE , INTERCOOLER INLET				
P	95035465	----	SCREW				
Q	39330303	1	GASKET				
R	TO 2ND STAGE AIR END INLET						
S	96721659	4	SCREW				
T	36879211	4	NUT				
U	54719752	1	INSULATION , 2ND STAGE				
V	54719745	1	INSULATION , INTERCOOLER IN				
W	54721105	1	WIRE , STAINLESS STEEL				
	54719737	1	INSULATION , VENTURI				
	54719729	1	INSULATION , 1ST STAGE				
	54662010	1	INSULATION , EXHAUST PIPE				

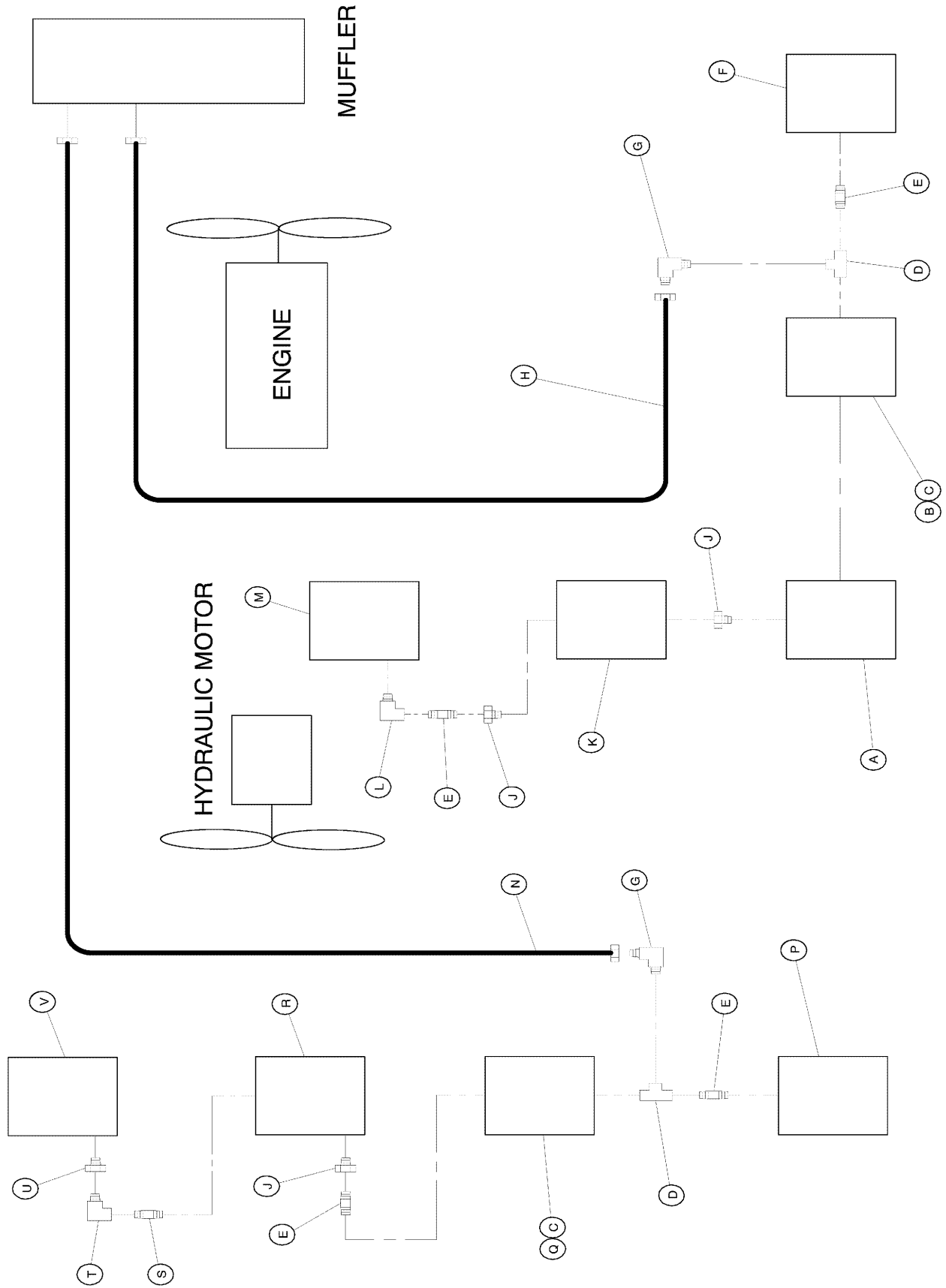
ASSEMBLY PART NUMBER 54719760



ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	39464425	1	GASKET	Z	95946281	1	ELBOW
B	54597745	1	TUBE , 2ND STAGE INLET	A1	95953808	1	NIPPLE
C	39179072	8	SCREW	A2	39918214	1	VALVE , SAFETY
D	39912795	1	JOINT , PIPE	A3	54557087	1	RTD ( RT-2 )
E	95934386	8	SCREW				
F	39487426	1	GASKET				
G	39913025	1	TUBE ASSEMBLY				
H	35356039	8	SCREW				
J	54379649	1	BRACKET , WATER SEPARATOR				
K	36889608	3	SCREW				
L	39915087	1	SEPARATOR , WATER				
M	95934634	2	SCREW , MOUNTING				
N	39330253	1	GASKET				
P	54362819	1	ELEMENT				
Q	54380449	1	TUBE , WATER SEPARATOR				
R	95934170	8	SCREW				
S	39464425	1	GASKET				
T	95060745	1	O-RING				
U	95930723	4	SCREW				
V	95985735	2	FLANGE , SPLIT				
W	54597737	1	TUBE , INTERCOOLER OUTLET				
X	95934253	8	SCREW				
Y	95922928	8	NUT				

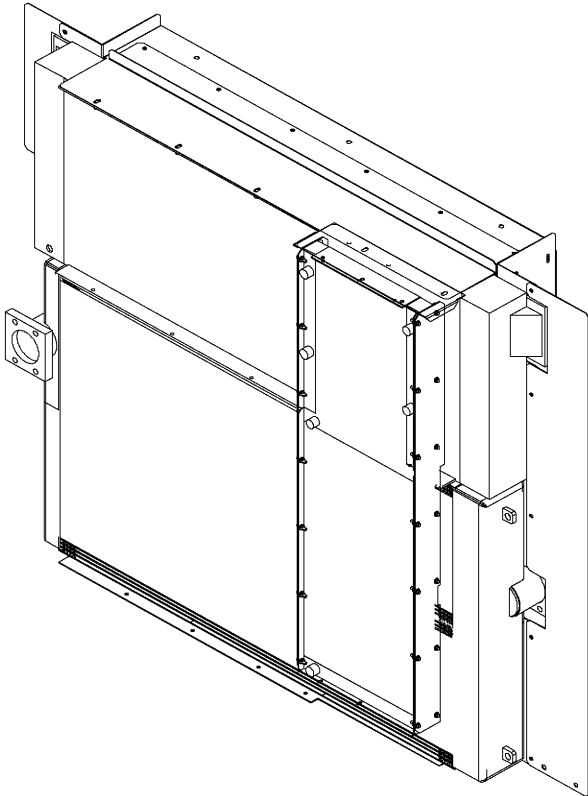
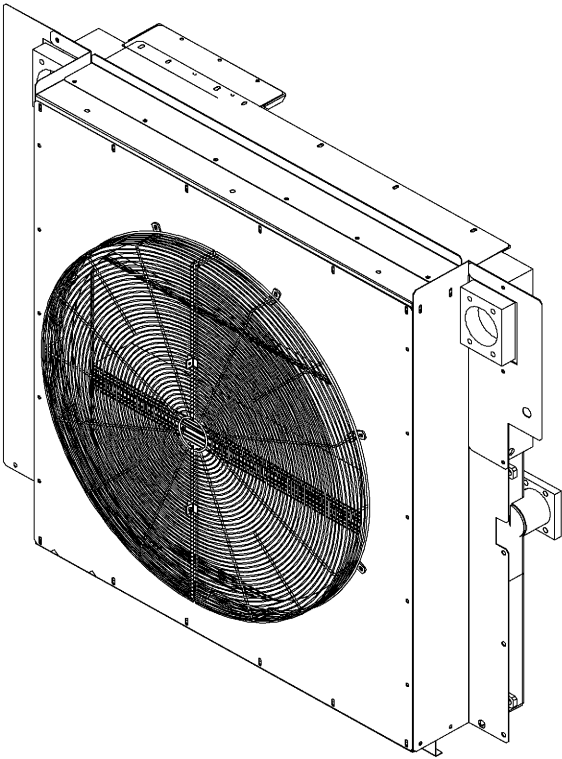


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54688163	1	BRACKET , WATER SEPARATOR				
B	95934642	2	SCREW				
C	35279025	----	SCREW				
D	54688171	1	PLATE , MOUNTING				
E	39890926	1	TUBE ASSEMBLY				
F	39922800	1	SEPARATOR , WATER				
G	39925532	1	GASKET				
H	95991105	1	FLANGE				
J	54728654	1	NIPPLE				
K	36755718	1	VALVE , BALL				
L	39928007	1	SEPARATOR , MOISTURE				
M	54690755	1	LOWER REAR PANEL ASSEMBLY				
N	54383468	1	TUBE , AFTERCOOLER OUTLET				
P	95934170	8	SCREW				
Q	39188479	1	O-RING				
R	39481593	2	FLANGE , SPLIT				
S	95930723	4	SCREW				
T	39487434	2	GASKET				
U	39891171	1	FILTER				
V	54690771	1	COVER , END PANEL				
W	39918206	1	VALVE , SAFETY				
X	95953311	1	ELBOW				
Y	95365151	1	FITTING , BULKHEAD				
Z	35290352	1	ELBOW				

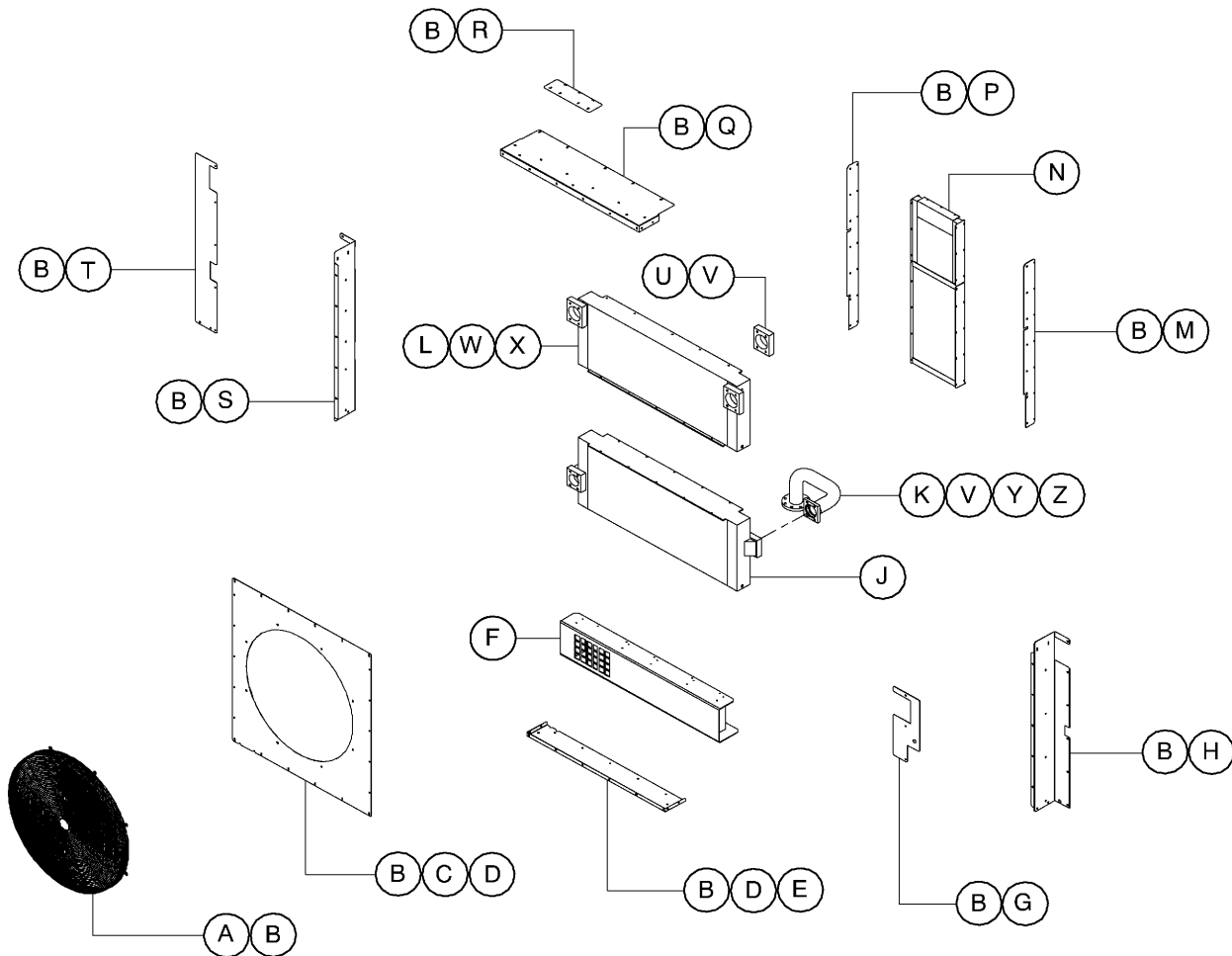


# CONDENSATE BURN-OFF PIPING

(A)	35248145	VALVE , CHECK
(B)	35248319	ORIFICE , .094
(C)	36841526	HEATER , 24 VOLT
(D)	95954194	TEE
(E)	95944575	NIPPLE
(F)	36842318	VALVE , SOLENOID
(G)	35279934	ELBOW
(H)	54718663	HOSE ASSEMBLY
(J)	95940748	BUSHING
(K)	36844579	STRAINER
(L)	95944666	ELBOW
(M)	39915087	SEPARATOR , INTERSTAGE
(N)	54718671	HOSE ASSEMBLY
(P)	36842318	VALVE , SOLENOID
(Q)	37081528	ORIFICE , .063
(R)	36844579	STRAINER
(S)	95953618	NIPPLE
(T)	95300943	ELBOW
(U)	95245353	BUSHING
(V)	39928007	SEPARATOR , DISCHARGE

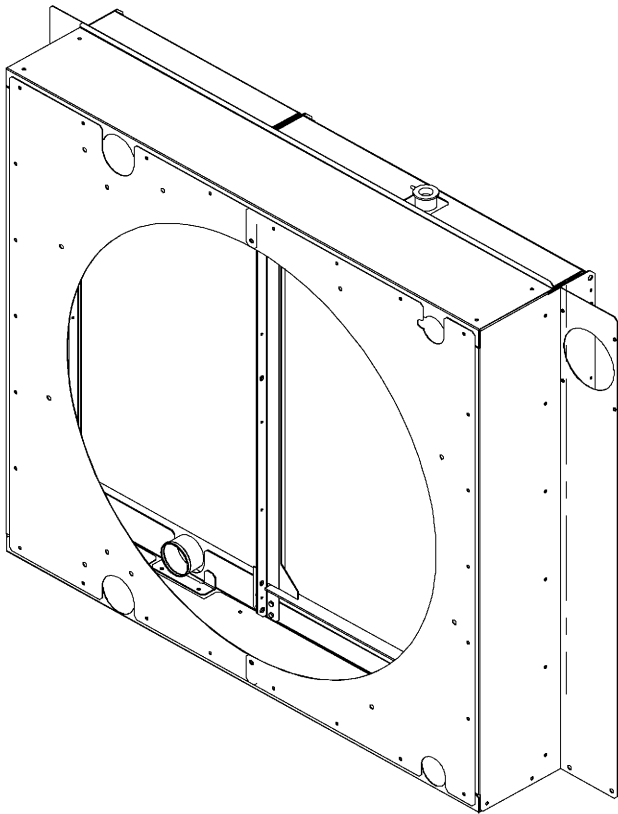
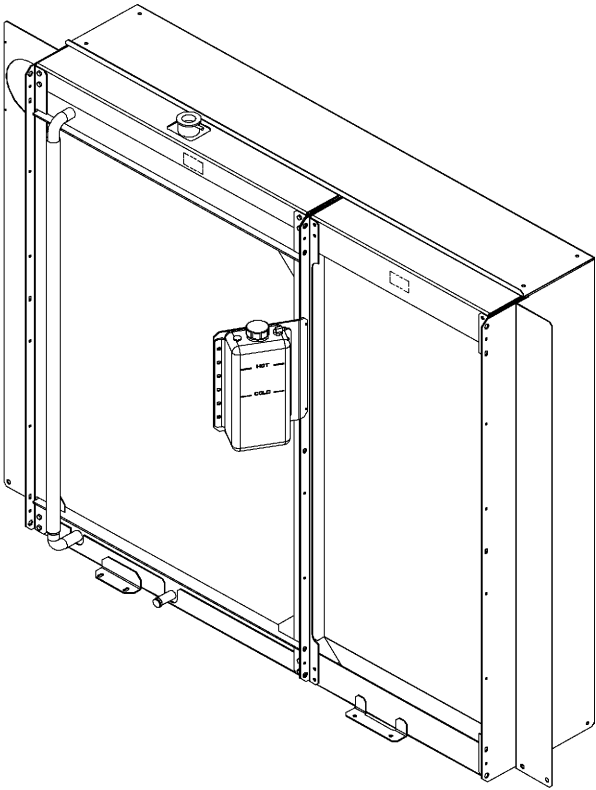


# AIR END COOLERS



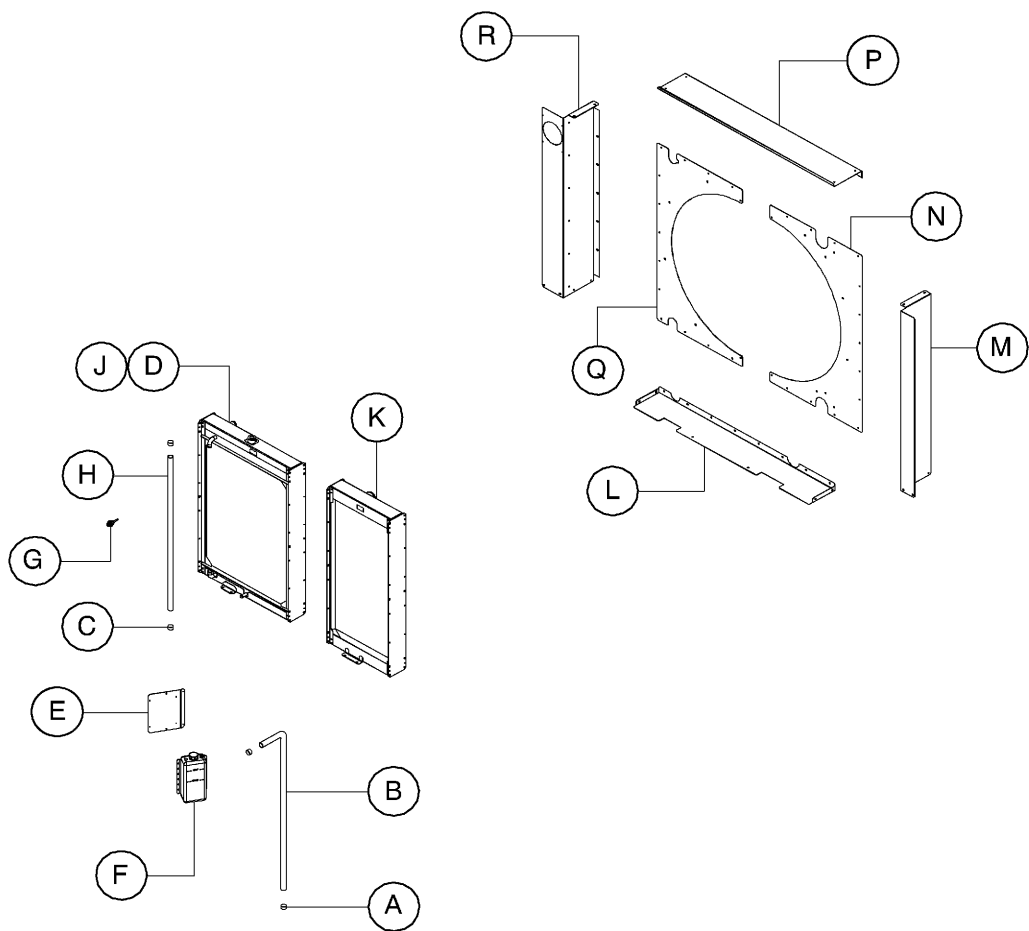
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54672688	1	GUARD , FAN				
B	35279025	----	SCREW				
C	54406715	1	ORIFICE , FAN				
D	36895746	----	NUTSERT				
E	54407549	1	SHROUD , BOTTOM				
F	54638135	1	SUPPORT , COOLER ( NOT REQUIRED FOR STAINLESS STEEL AFTERCOOLER )				
G	54416037	1	BRACKET , SHROUD				
H	54407564	1	SHROUD , L.H.				
J	54637236	1	AFTERCOOLER , ALUMINUM				
	54584594	1	AFTERCOOLER , STAINLESS STEEL				
K	54672746	1	TUBE , ALUMINUM				
	54383468	1	TUBE , STAINLESS STEEL				
L	54550827	1	INTERCOOLER , AIR END				
M	54673553	1	SUPPORT , DUAL COOLER				
N	54543343	1	COOLER , DUAL				
P	54673553	1	SUPPORT , DUAL COOLER				
Q	54407523	1	SHROUD , TOP				
R	54642368	1	PLATE , COOLER				
S	54407556	1	SHROUD , R.H. INSIDE				
T	54416029	1	SHROUD , R.H. OUTSIDE				
U	54745559	1	FLANGE				
V	39188479	2	O-RING				
W	36889608	10	SCREW				
X	36881886	10	NUT				
Y	39481593	2	CLAMP				
Z	95930723	4	SCREW				

MANUAL NO. — DRAWING NO. DATE / REV:  
54665302 20A 04/01 A



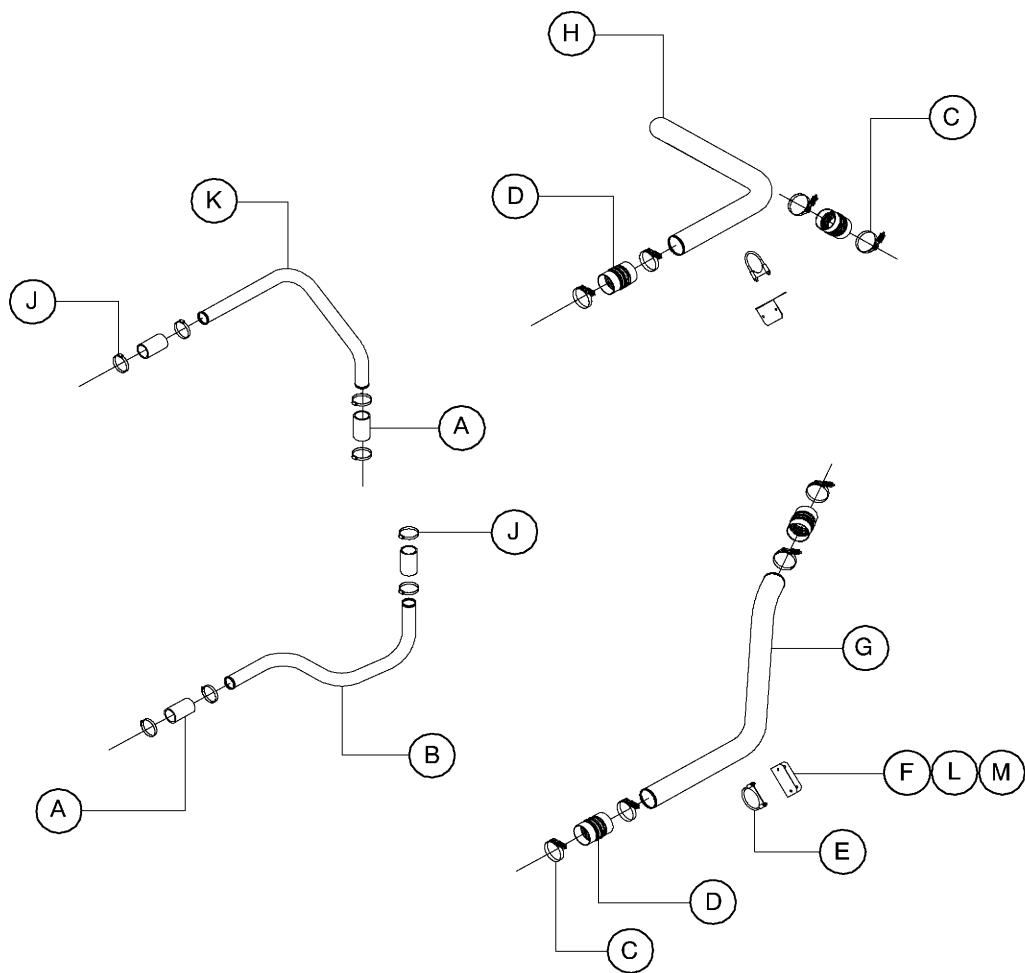


ENGINE RADIATOR AND COOLER

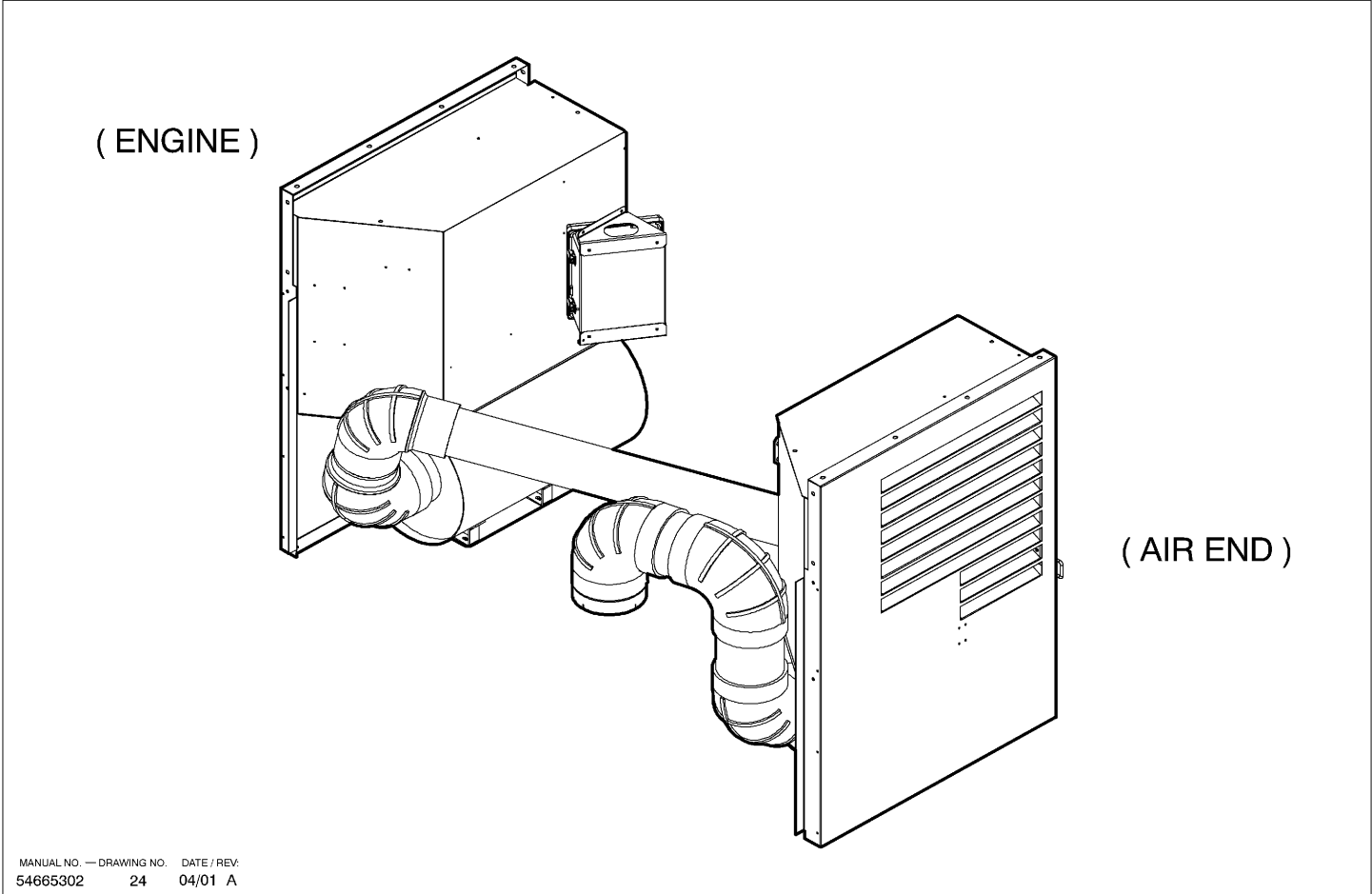
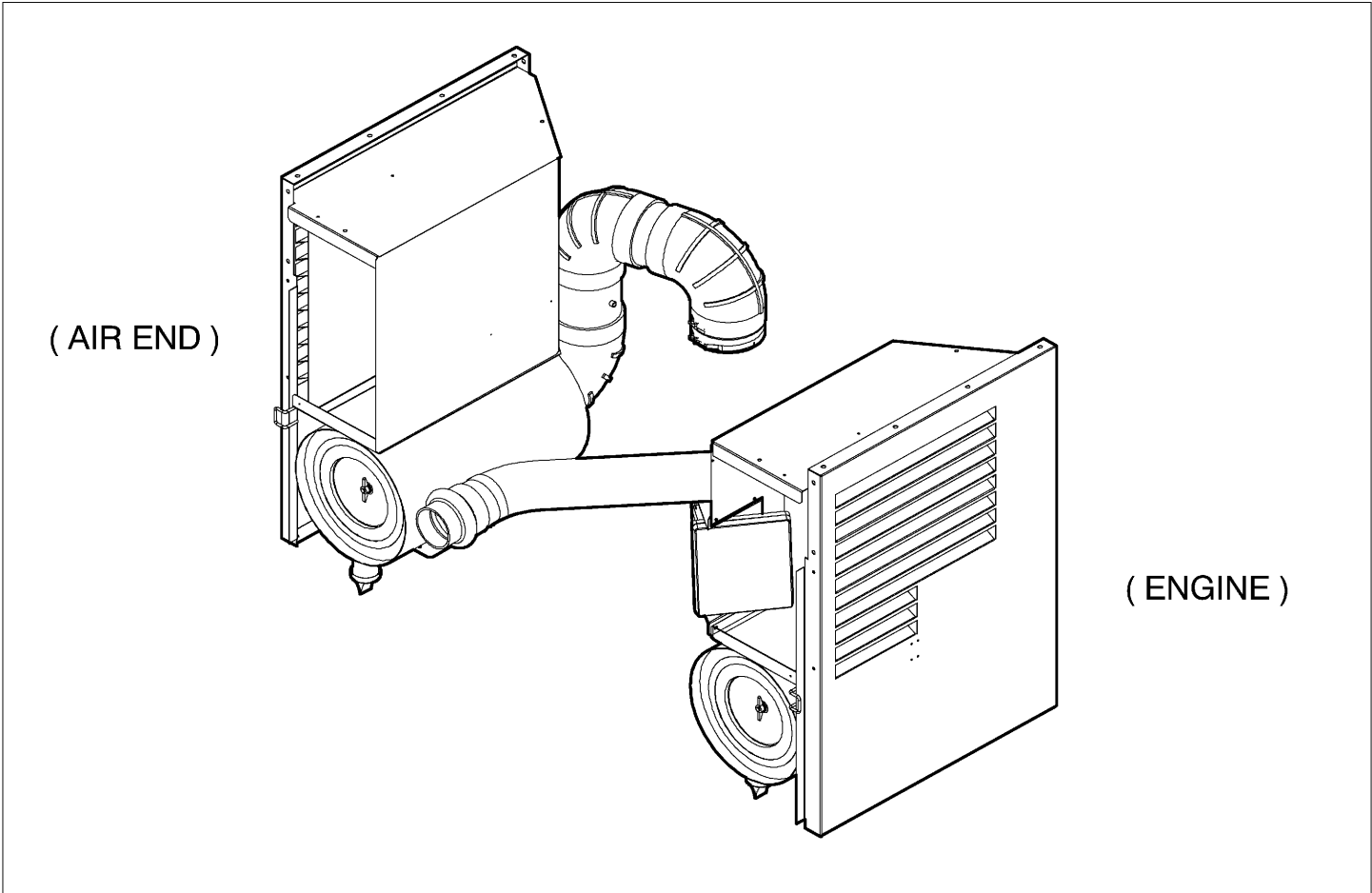


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	95235131	2	CLAMP				
B	35360775	1	56" TUBING				
C	35296342	2	CLAMP				
D	35279025	----	SCREW				
E	54660899	1	BRACKET , COOLANT OVERFLOW				
F	36845600	1	BOTTLE , COOLANT RECOVERY				
G	54404280	1	SENDER				
H	35135458	1	HOSE , RUBBER				
J	54521067	1	RADIATOR				
K	54521075	1	COOLER , CHARGE AIR				
L	54421714	1	SHROUD , BOTTOM				
M	54421722	1	SHROUD , L.H.				
N	54427802	1	ORIFICE , L.H. FAN				
P	54421706	1	SHROUD , TOP				
Q	54427810	1	ORIFICE , R.H. FAN				
R	54421730	1	SHROUD , R.H.				
	54474572	1	PROBE , LOW WATER				

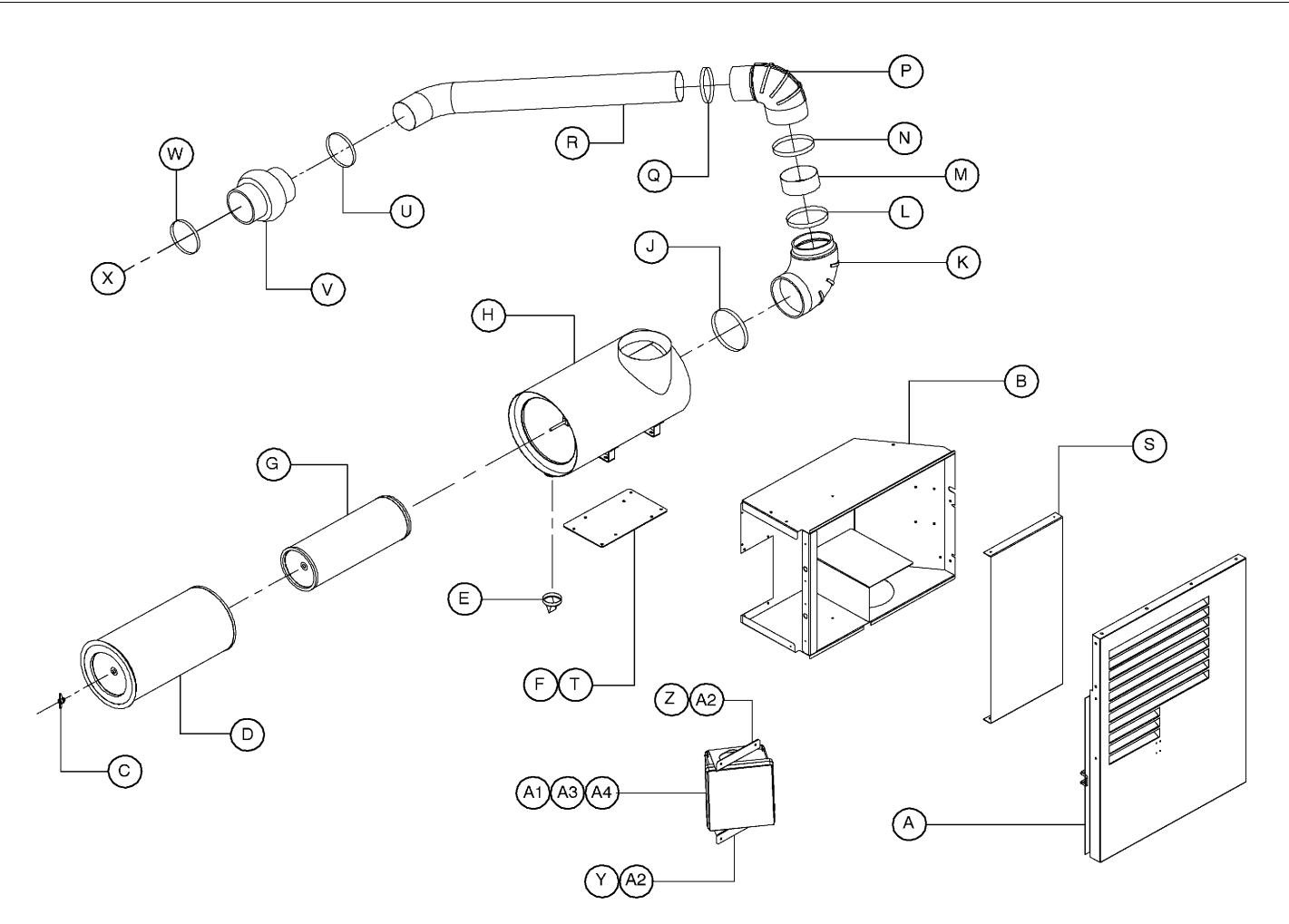
ENGINE COOLING PIPING



ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	35330570	4	CONNECTOR , RUBBER				
B	54454251	1	TUBE , LOWER RADIATOR				
C	54444427	8	CLAMP				
D	54422522	4	CONNECTOR , RUBBER				
E	35111731	2	CLAMP				
F	54661459	2	SUPPORT				
G	54422555	1	TUBE , CHG. AIR INLET				
H	54633920	1	TUBE , CHG. AIR				
J	31497357	8	CLAMP				
K	54454244	1	TUBE , UPPER RADIATOR				
L	36895746	4	NUT				
M	35279025	4	SCREW				
	35285600	1	58" HOSE				
	35296342	2	CLAMP				

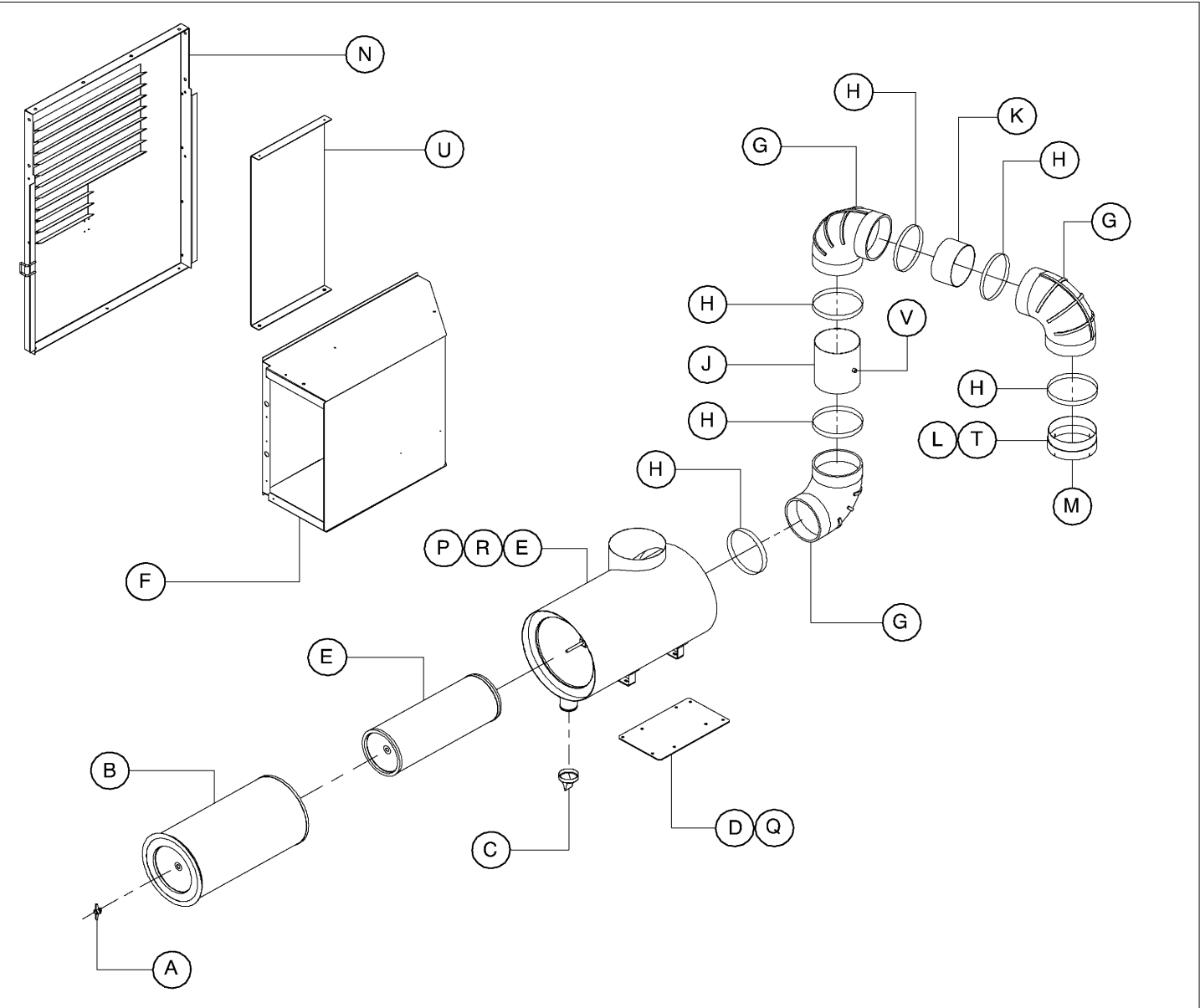


ENGINE AIR INTAKE



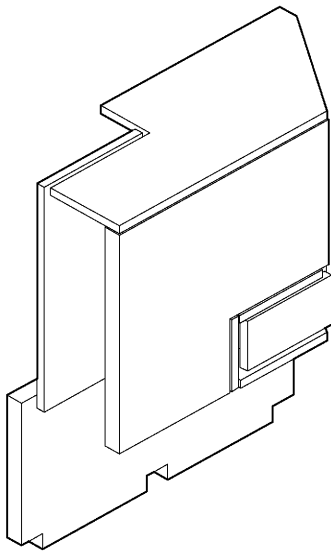
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54656194	1	INTAKE GRILL , STREET SIDE	A1	54631312	1	BOX , POWER DISTRIBUTOR ( FUSE )
B	54656491	1	INTAKE HOUSING , STREET SIDE	A2	35300771	4	SCREW
C	35388982	1	NUT , WING	A3	36898096	4	SCREW
D	36864361	1	ELEMENT , PRIMARY	A4	36898104	4	NUT
E	36867778	1	VALVE , EVACUATOR				
F	54631338	1	PLATE , MOUNTING				
G	36864379	1	ELEMENT , SAFETY				
H	54625926	1	HOUSING , AIR CLEANER				
J	35119858	1	CLAMP				
K	36759025	1	ELBOW , RUBBER				
L	35119858	1	CLAMP				
M	35112648	1	TUBING				
N	35119858	1	CLAMP				
P	35315894	1	ELBOW , RUBBER				
Q	35123496	1	CLAMP				
R	54674007	1	TUBE				
S	54656517	1	BAFFLE , VERTICAL				
T	35279025	4	SCREW				
U	35123496	1	CLAMP				
V	35264415	1	HOSE , HUMP				
W	35161025	1	CLAMP				
X	TO ENGINE TURBO						
Y	54656533	1	BRACKET , BOTTOM				
Z	54656525	1	BRACKET , TOP				

AIREND AIR INTAKE

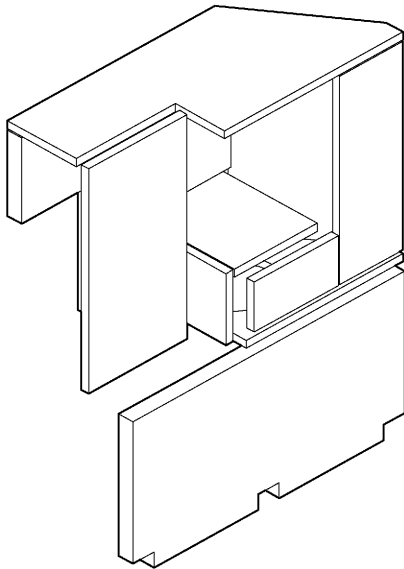


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	35388982	1	NUT , WING				
B	36864361	1	ELEMENT , PRIMARY				
C	36867778	1	VALVE , EVACUATOR				
D	54631338	1	PLATE , MOUNTING				
E	36864379	1	ELEMENT , SAFETY				
F	54656509	1	INTAKE HOUSING , CURB SIDE				
G	35120211	3	ELBOW , RUBBER				
H	35129071	6	CLAMP				
J	54638143	1	TUBE				
K	35300110	1	TUBE				
L	39919352	1	TUBE , ADAPTER				
M	TO AIR END INTAKE						
N	54656202	1	INTAKE GRILL , CURB SIDE				
P	36864346	1	HOUSING , AIR CLEANER				
Q	35279025	4	SCREW				
R	35376953	4	SCREW				
S	36879195	4	NUT				
T	39919360	1	GASKET				
U	54656517	1	BAFFLE , VERTICAL				
V	54557095	1	THERMISTER ( RT-6 )				

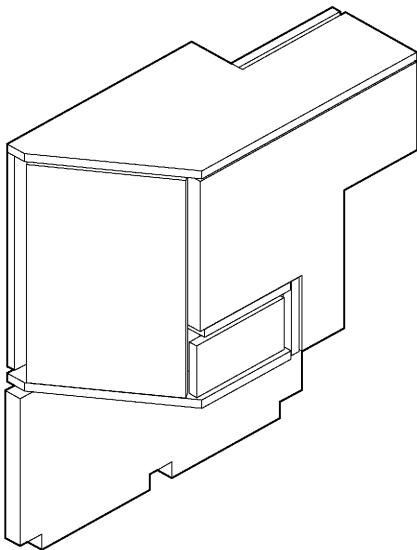
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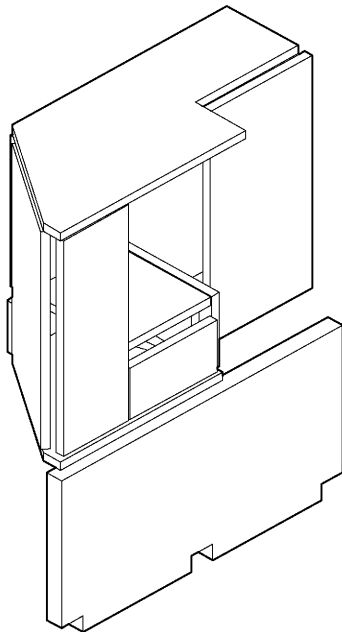
( ENGINE )



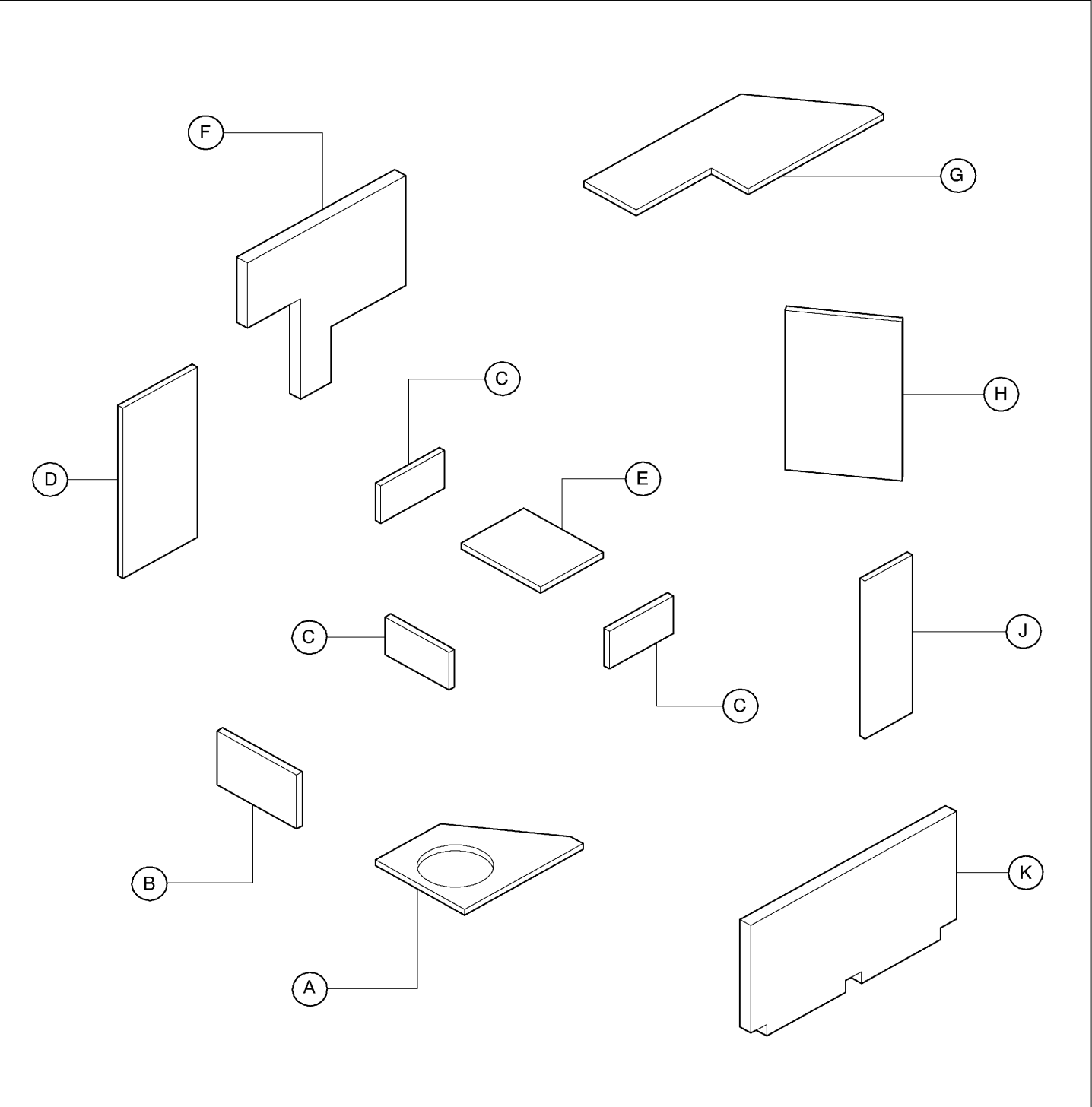
( ENGINE )



( AIR END )

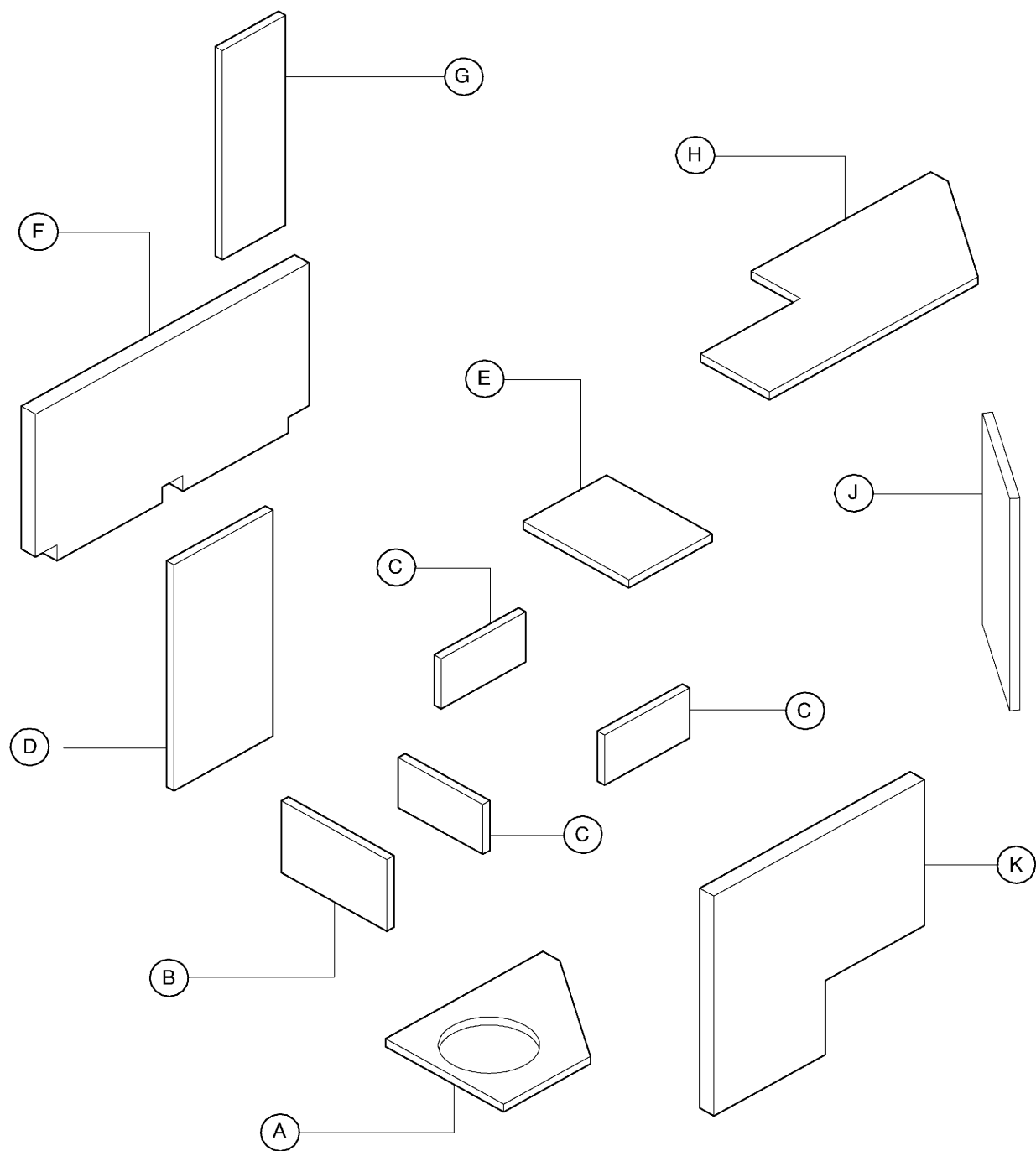


ENGINE AIR INTAKE ACOUSTICS



ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54659289	1	FOAM , ENGINE AIR INTAKE ( BOTTOM )				
B	54659271	1	FOAM , INTAKE ( SIDE )				
C	54659255	3	FOAM , INTAKE BOX				
D	54659222	1	FOAM , INTAKE ( REAR )				
E	54659263	1	FOAM , INTAKE BOX ( TOP )				
F	54659339	1	FOAM , INTAKE REAR				
G	54659305	1	FOAM , INTAKE ( TOP )				
H	54659347	1	FOAM , INTAKE ( SIDE )				
J	54659248	1	FOAM , INTAKE ( SIDE )				
K	54659230	1	FOAM , INTAKE ( FRONT )				

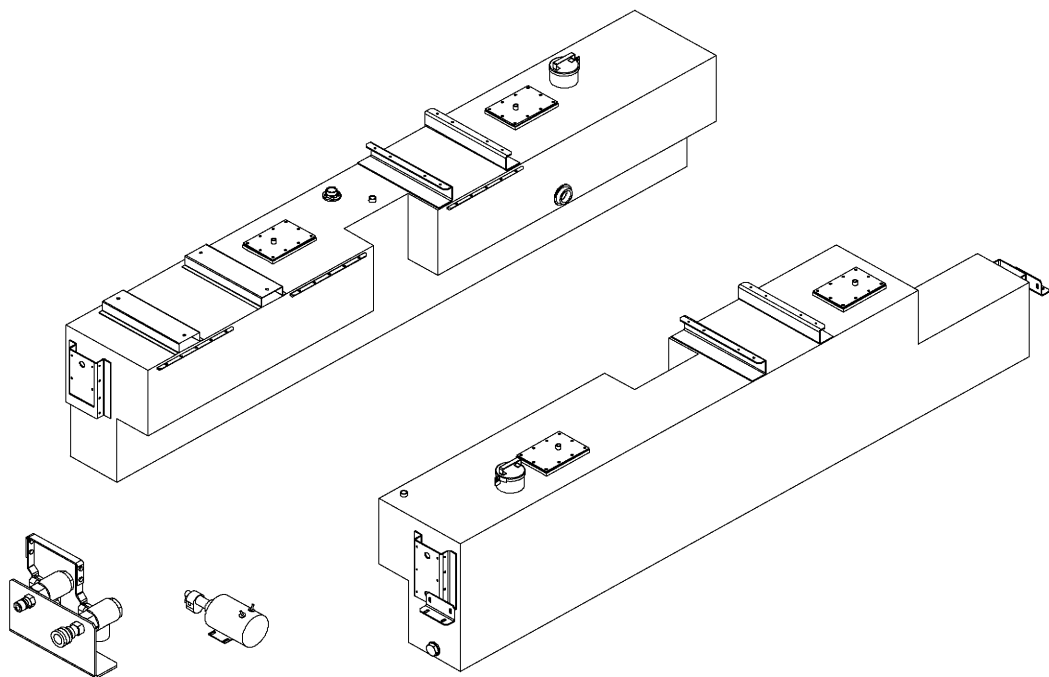
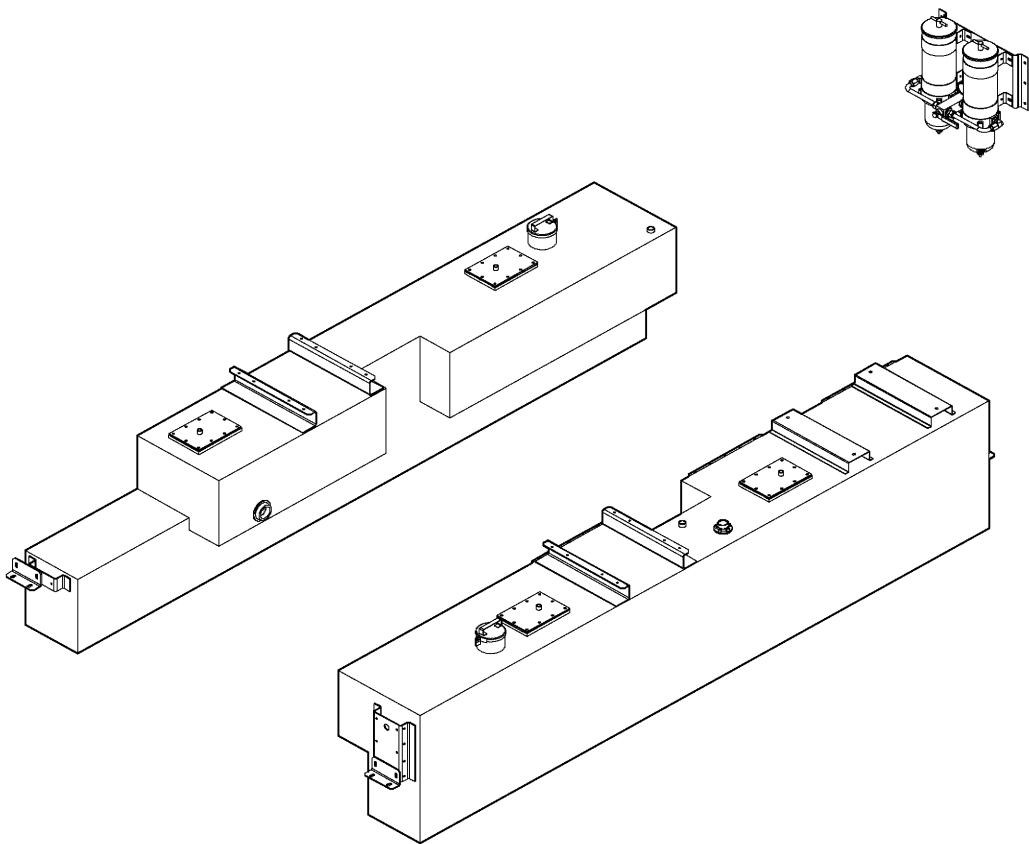
AIR END AIR INTAKE ACOUSTICS



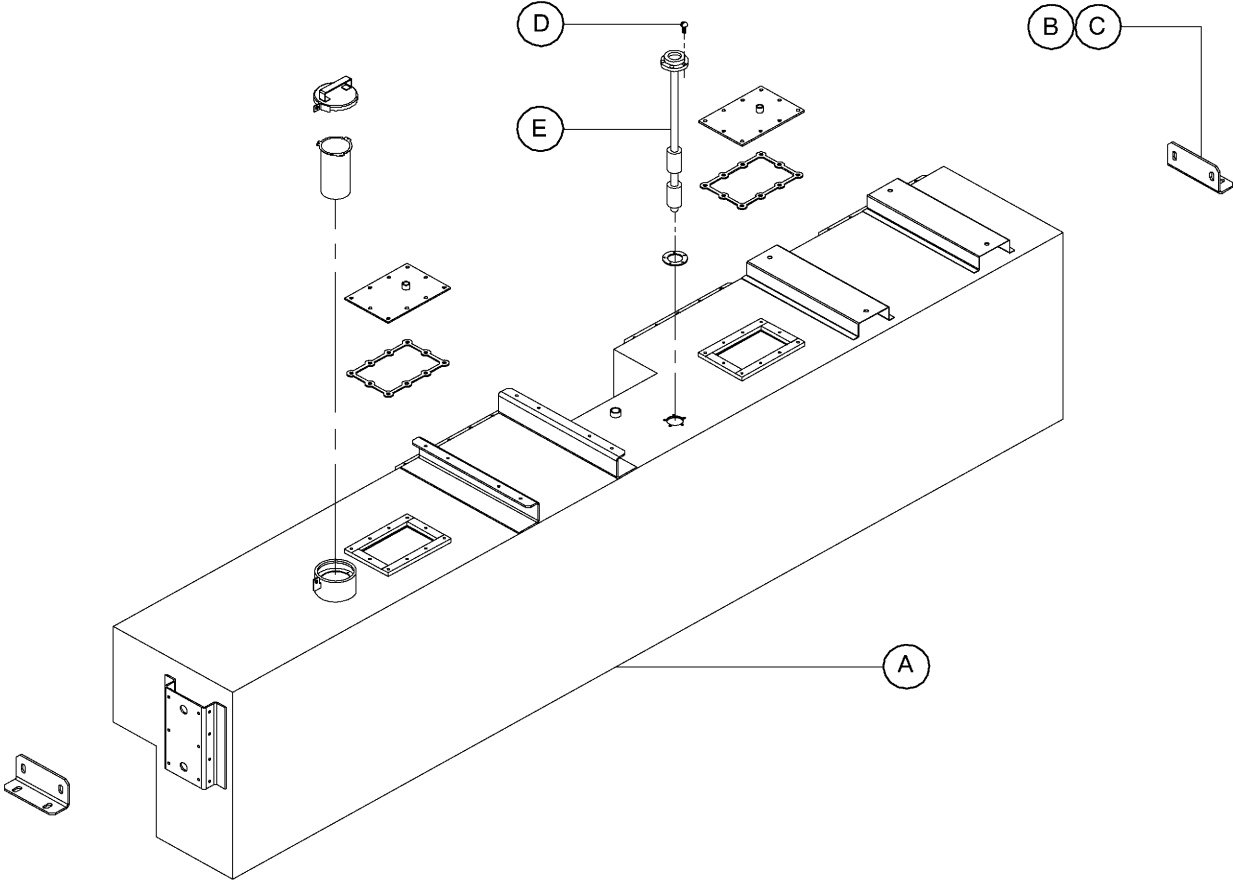
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54659297	1	FOAM , AIR END AIR INTAKE ( BOTTOM )				
B	54659271	1	FOAM , INTAKE ( SIDE )				
C	54659255	3	FOAM , INTAKE BOX				
D	54659222	1	FOAM , INTAKE ( REAR )				
E	54659263	1	FOAM , INTAKE BOX ( TOP )				
F	54659230	1	FOAM , INTAKE REAR				
G	54659248	1	FOAM , INTAKE ( FRONT )				
H	54659313	1	FOAM , INTAKE ( TOP )				
J	54659347	1	FOAM , INTAKE ( SIDE )				
K	54659321	1	FOAM , INTAKE ( REAR )				

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54665302 29 04/01 A



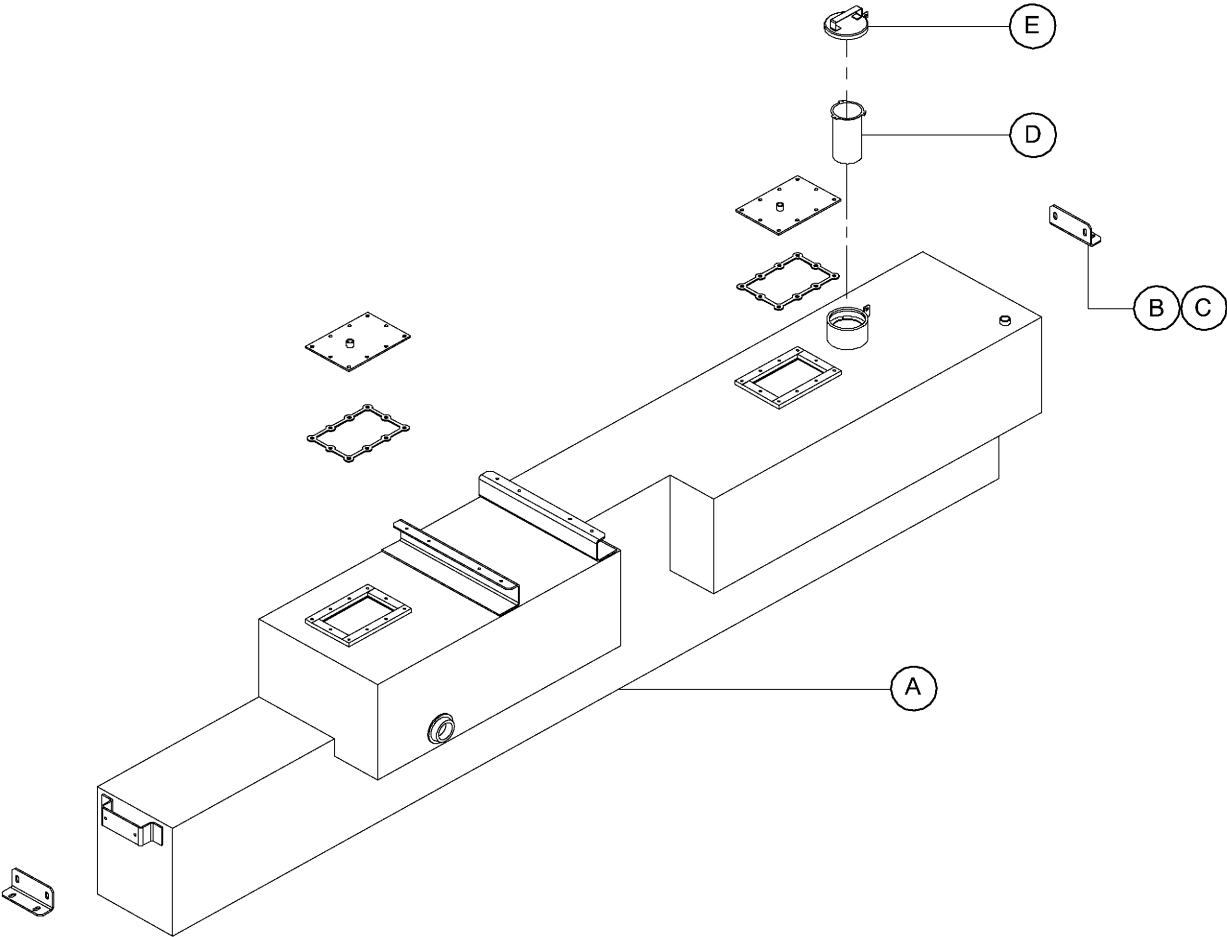


FUEL TANK



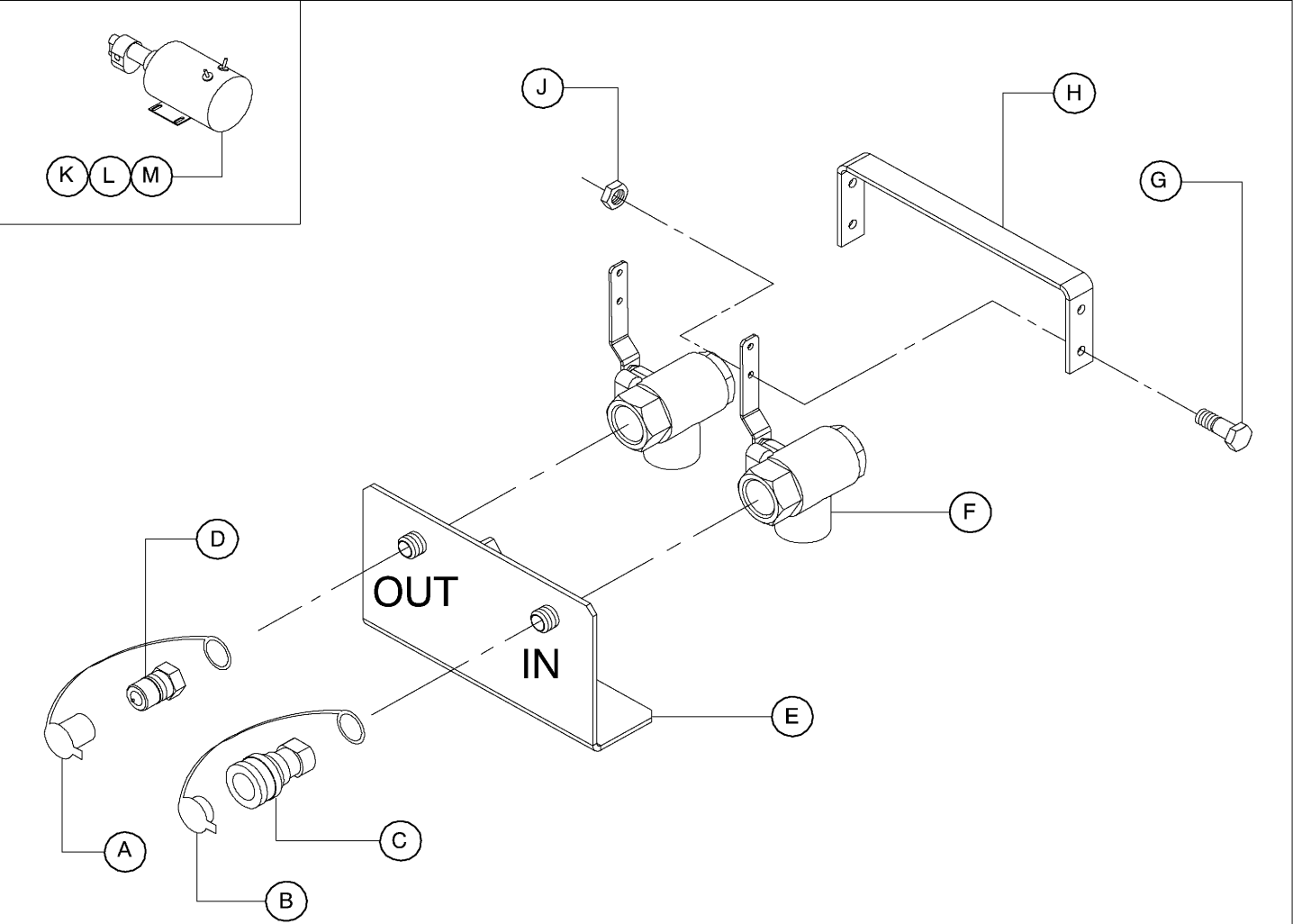
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54377585	1	TANK , FUEL				
B	54381769	2	BRACKET , MOUNTING				
C	35279025	8	SCREW				
D	36842102	5	SCREW				
E	36876845	1	SENDER , FUEL				

FUEL TANK



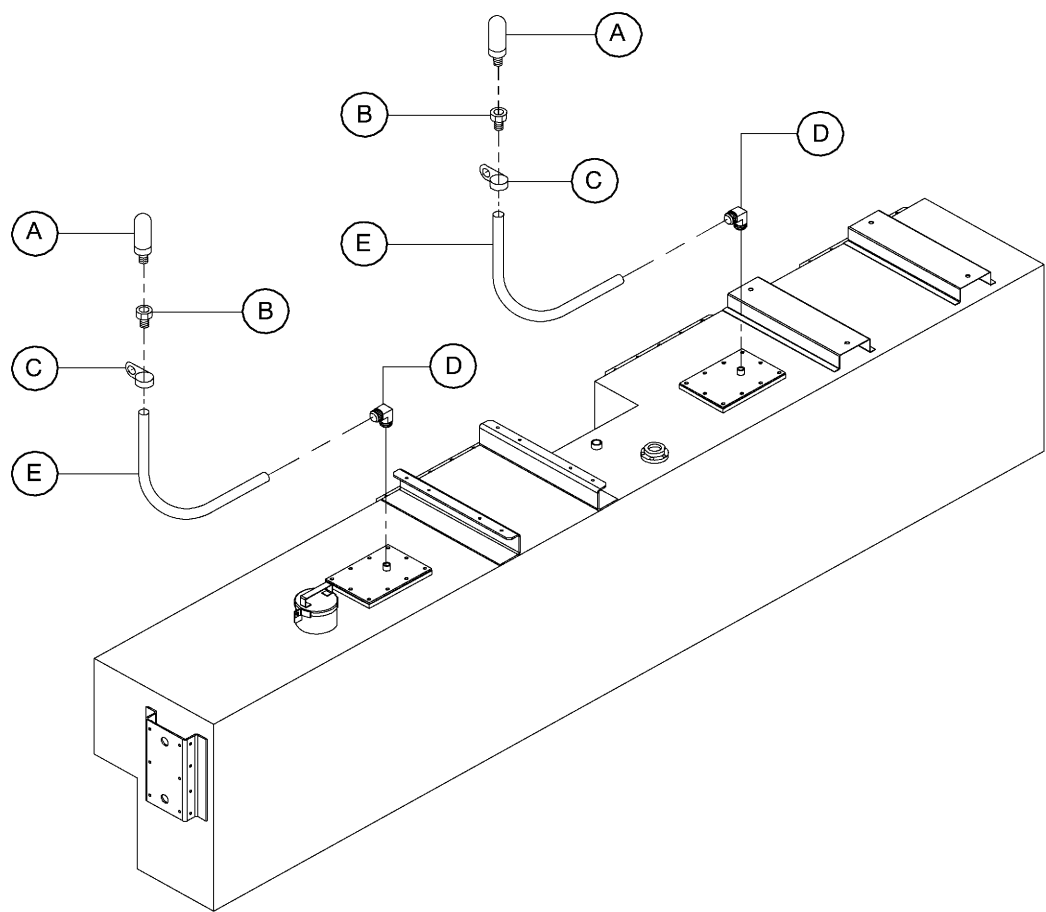
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54381793	1	TANK , FUEL				
B	54381769	2	BRACKET , MOUNTING				
C	35279025	8	SCREW				
D	36845022	1	STRAINER				
E	36845014	1	CAP , FUEL				

FUEL TANK FILLER



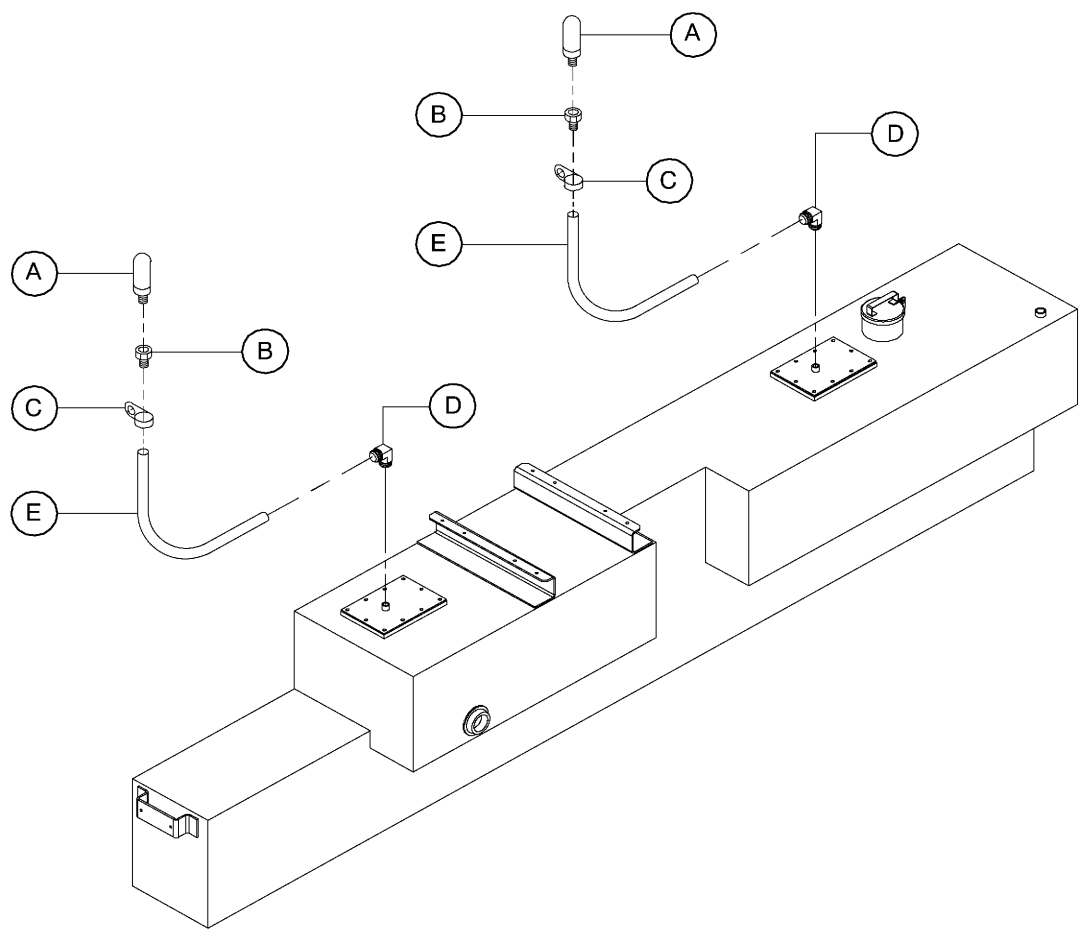
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54720222	1	PLUG , DUST				
B	54720230	1	PLUG , DUST				
C	54489109	1	CONNECTOR				
D	54489125	1	COUPLER				
E	54454103	1	BRACKET , FUEL COUPLER				
F	54726575	2	VALVE , 3-WAY				
G	36898096	4	BOLT				
H	54720248	1	LEVER , VALVE				
J	36898104	4	NUT				
K	54661962	1	FUEL PUMP ASSEMBLY				
L	54728605	1	MOTOR , FUEL PUMP				
M	54728639	1	HEAD , FUEL PUMP				

FUEL TANK



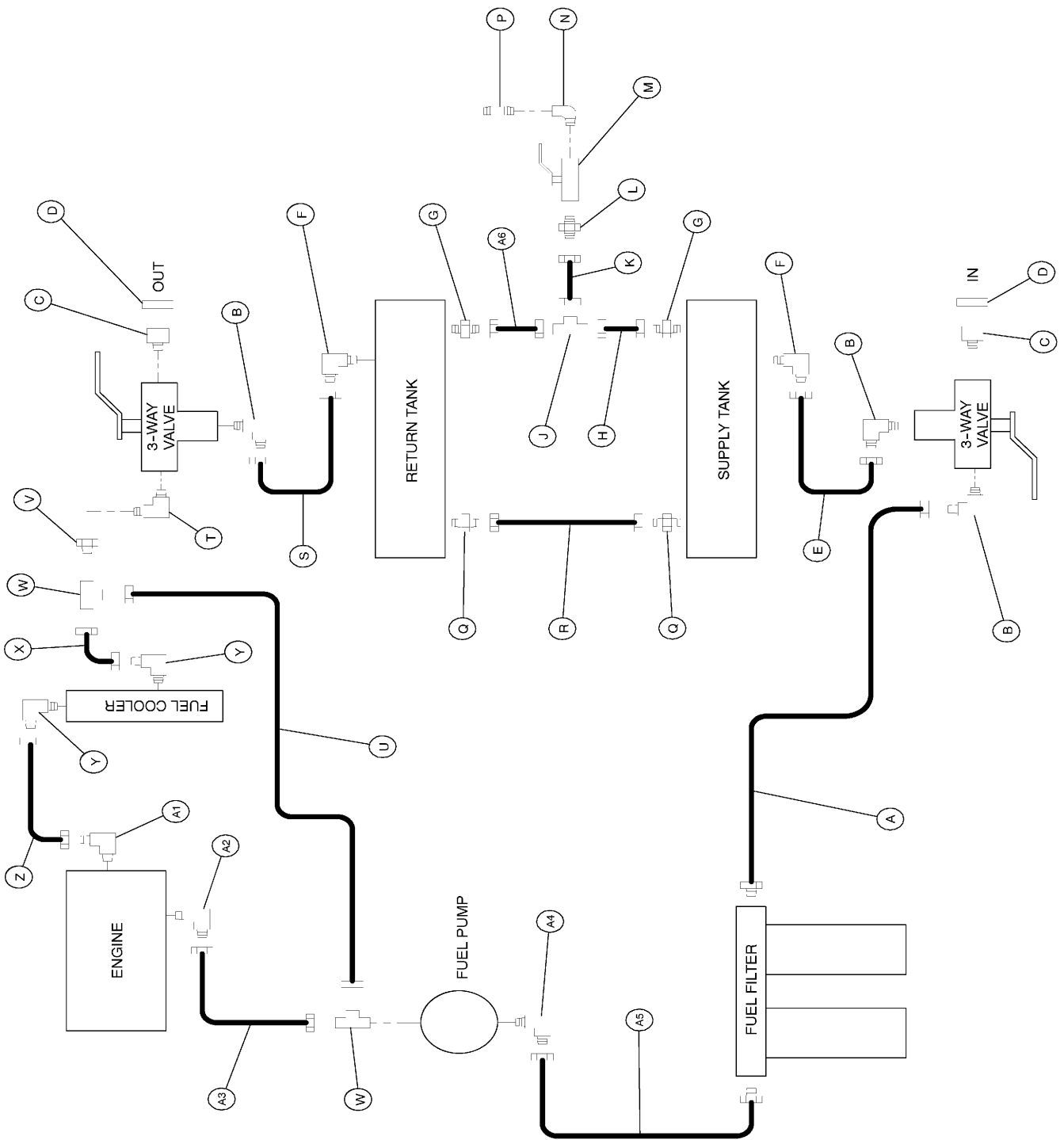
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	35369354	1	ELBOW				
B	35356484	1	TUBING				
C	35253038	1	CLAMP				
D	35369339	1	CONNECTOR				
E	35322395	1	SILENCER				

FUEL TANK



ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	35369354	1	ELBOW				
B	35356484	1	TUBING				
C	35253038	1	CLAMP				
D	35369339	1	CONNECTOR				
E	35322395	1	SILENCER				



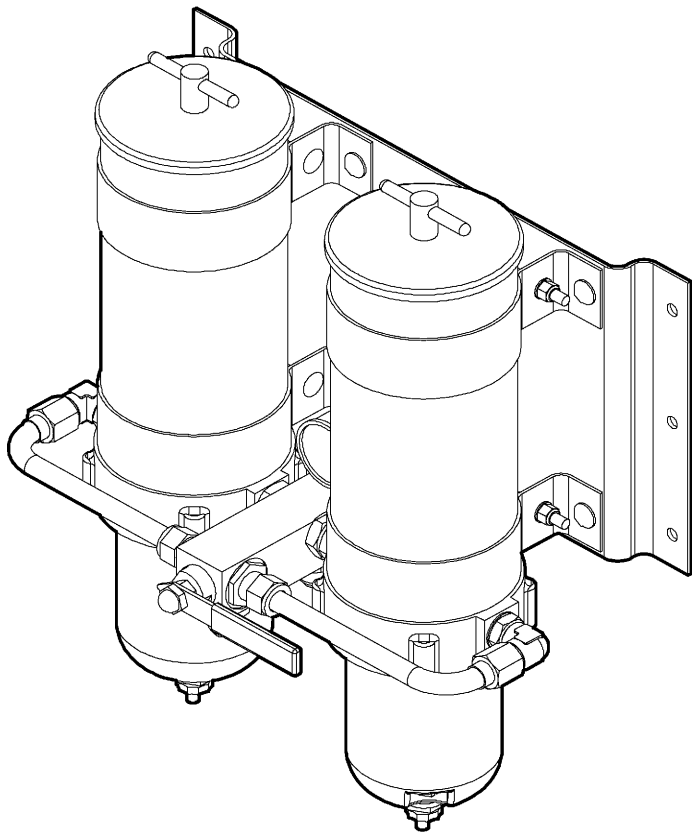




# FUEL PIPING

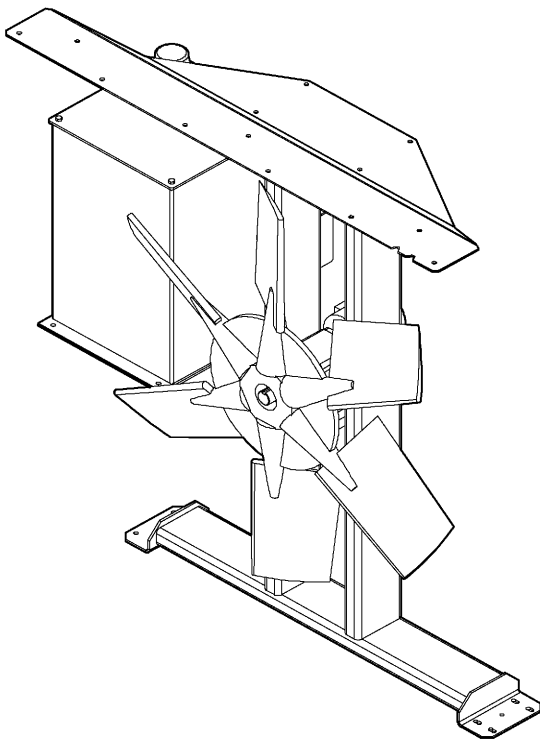
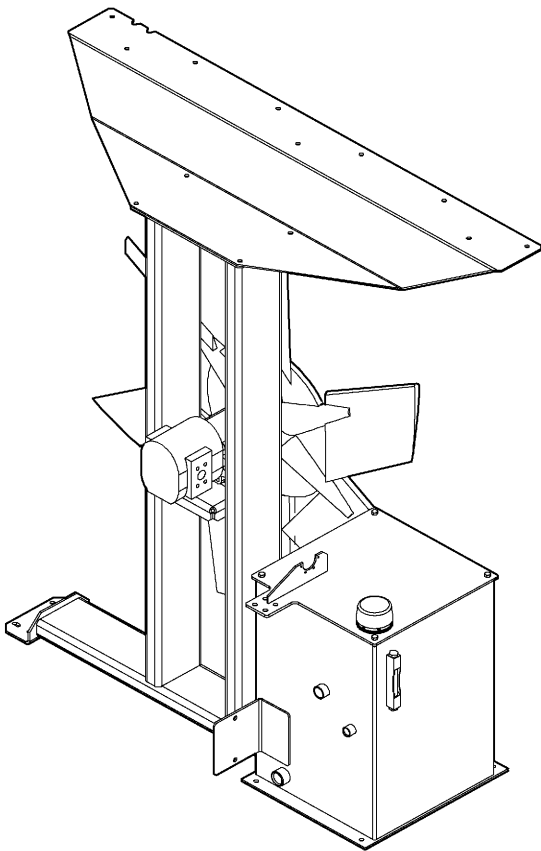
(A)	35291863	HOSE ASSEMBLY
(B)	95937637	ELBOW
(C)	54489125	COUPLER
(D)	54720230	PLUG , DUST
(E)	35286939	HOSE ASSEMBLY
(F)	35286756	ELBOW
(G)	36846061	ADAPTER
(H)	36792018	HOSE ASSEMBLY
(J)	95774220	TEE
(K)	54718747	HOSE ASSEMBLY
(L)	95328761	ADAPTER
(M)	35576123	VALVE , BALL
(N)	95928180	ELBOW
(P)	95946117	NIPPLE
(Q)	35335124	ADAPTER
(R)	54718754	HOSE ASSEMBLY
(S)	54718887	HOSE ASSEMBLY
(T)	95928172	ELBOW
(U)	54718655	HOSE ASSEMBLY
(V)	95953956	BUSHING
(W)	35315977	TEE
(X)	54718861	HOSE ASSEMBLY
(Y)	95992863	ELBOW
(Z)	54718853	HOSE ASSEMBLY
(A1)	35287911	ELBOW
(A2)	35305648	ELBOW
(A3)	54718846	HOSE ASSEMBLY
(A4)	35286525	ELBOW
(A5)	35291863	HOSE ASSEMBLY
(A6)	35142199	HOSE ASSEMBLY

WATER FILTER ASSEMBLY

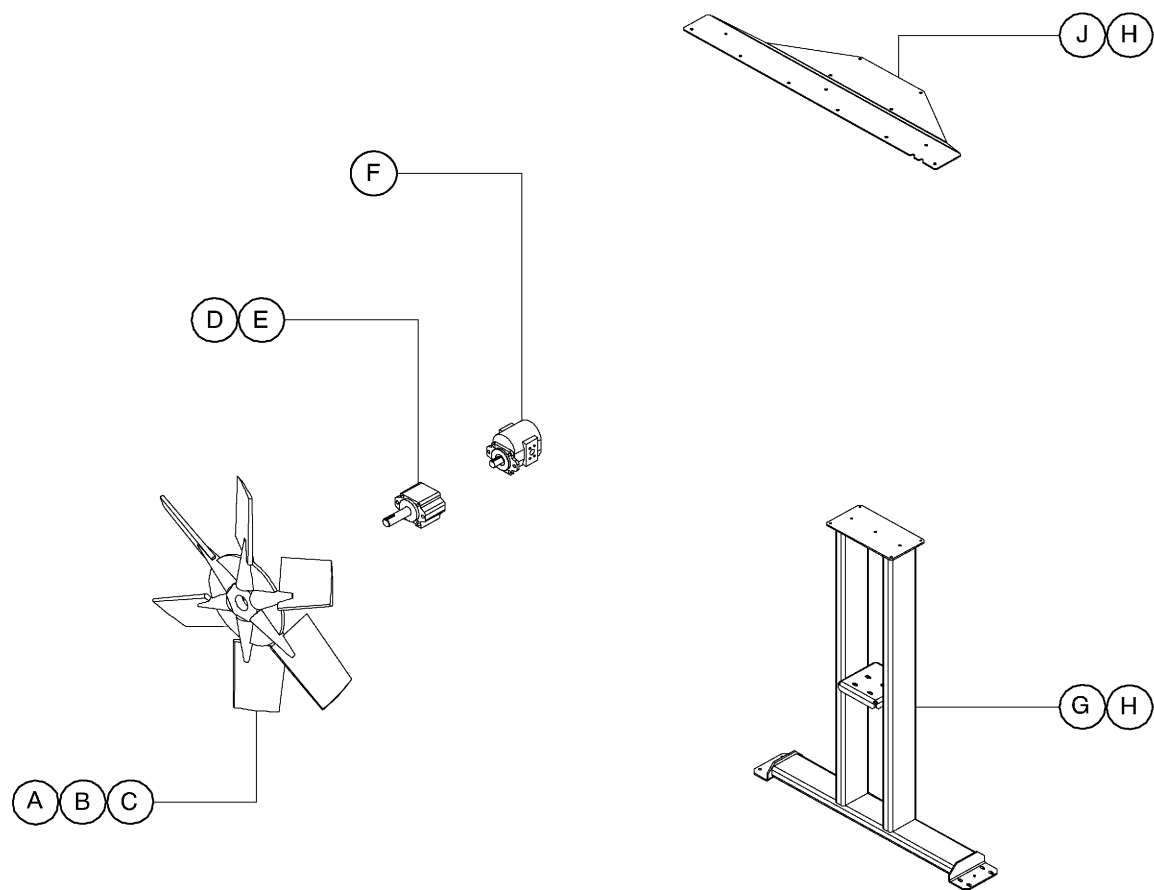


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54661582	1	FILTER ASSEMBLY				
B	✕ 54726971	1	GAUGE , VACUUM				
C	✕ 54726965	2	HEATERS , 24 VOLT / 300 WATT				
D	✕ 54661590	2	ELEMENTS , REPLACEMENT				

✕ INCLUDED WITH ASSEMBLY

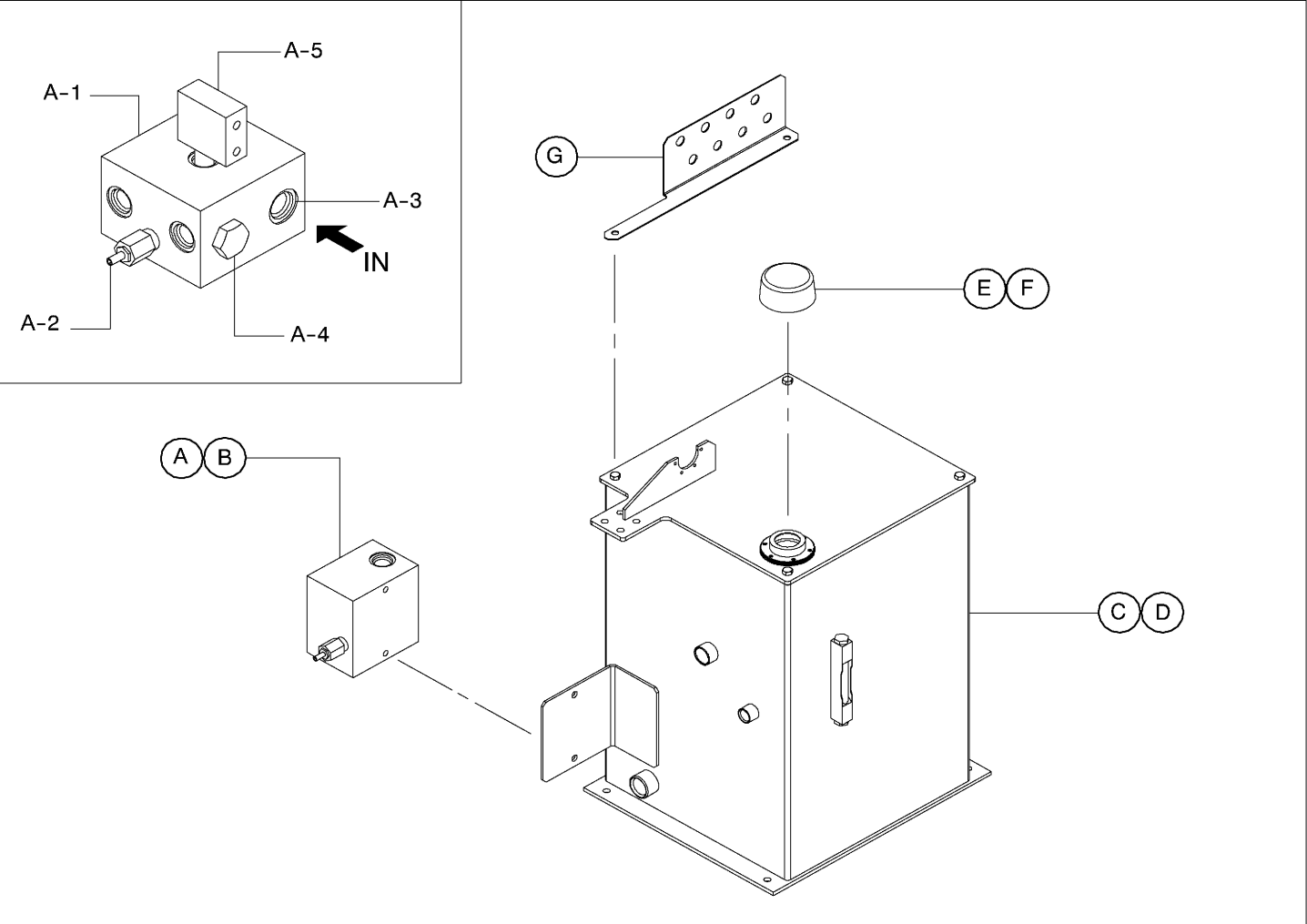


HYDRAULIC FAN ASSEMBLY



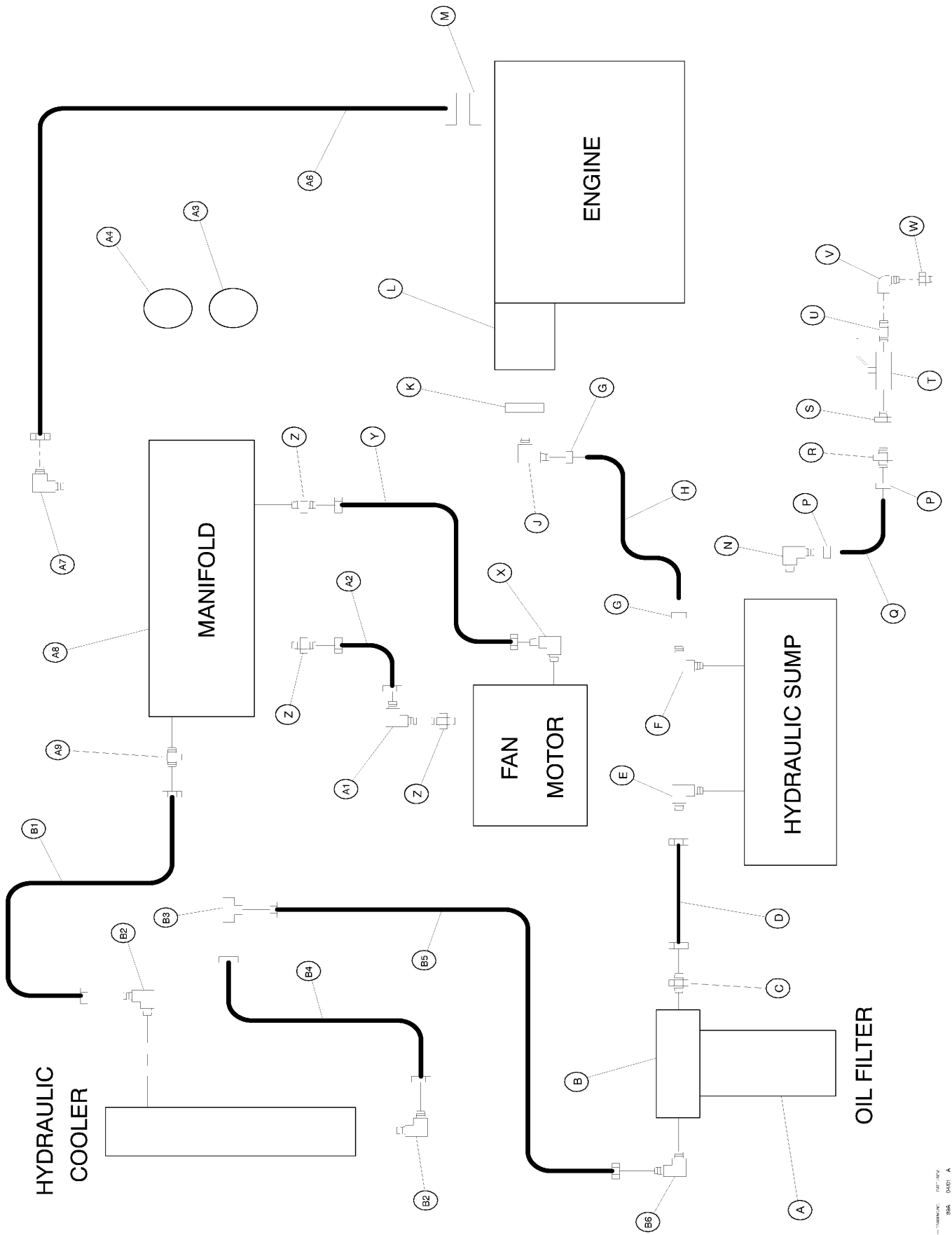
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54721188	1	FAN				
B	36863389	1	BUSHING , FAN				
C	35321421	1	KEY , BUSHING				
D	43205327	1	ADAPTER , OVERHUNG LOAD				
E	95955548	2	SCREW				
F	54661442	1	MOTOR , HYDRAULIC FAN				
G	54597588	1	SUPPORT , HYDRAULIC FAN				
H	35279025	----	SCREW				
J	54601620	1	PLATE , TOP				

HYDRAULIC TANK ASSEMBLY



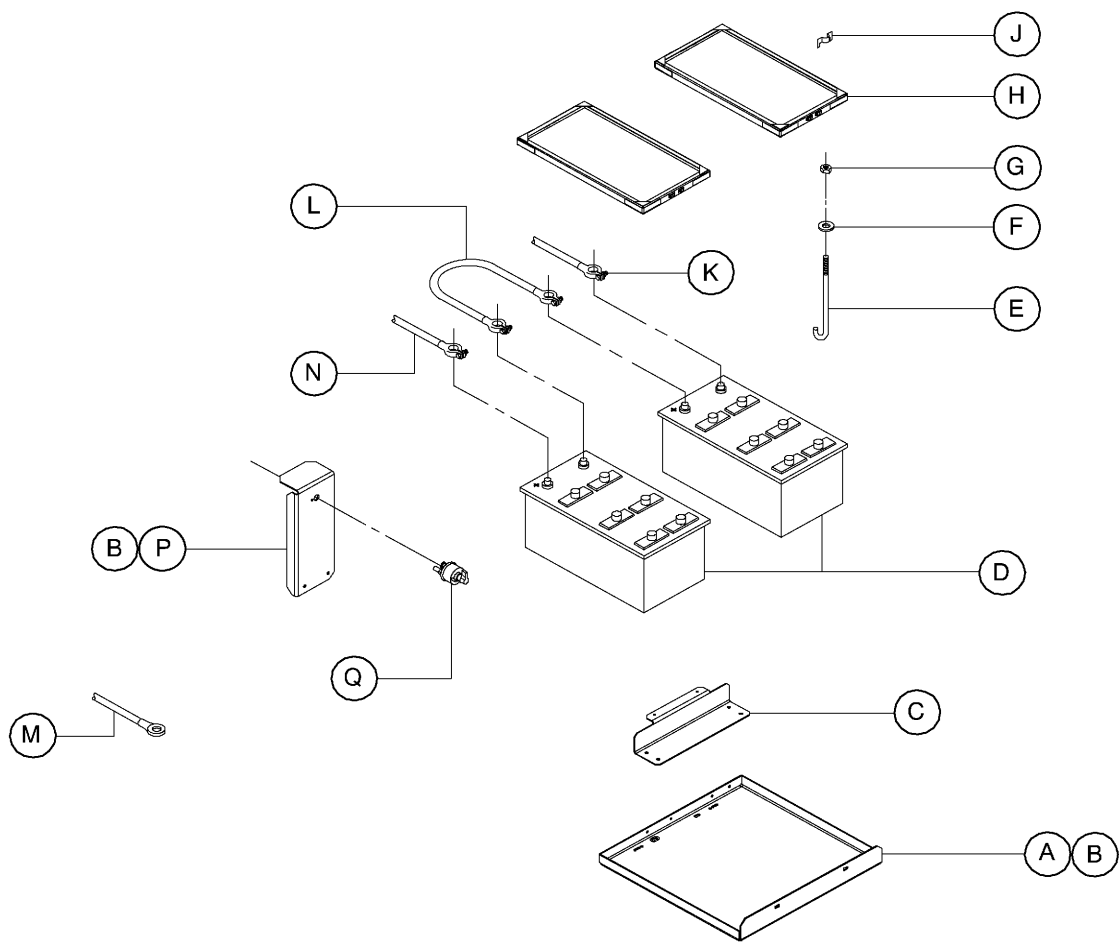
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54603865	1	RELIEF VALVE ASSEMBLY				
A-1	54631924	1	BLOCK , RELIEF VALVE				
A-2	54661517	1	CARTRIDGE , ADJUSTABLE RELIEF				
A-3	54661525	1	CARTRIDGE , CHECK VALVE				
A-4	54661541	1	VALVE , CHECK				
A-5	54661509	1	VALVE , PROPORTIONAL				
	35279827	1	ELBOW				
	35367846	1	NUT , SWIVEL				
	54661574	1	ISOLATOR , NEEDLE VALVE GAUGE				
	54661566	1	GAUGE , 0-3000 PSI				
B	95934618	2	SCREW				
C	54457072	1	TANK ASSEMBLY				
D	35279025	4	SCREW				
E	43205384	1	CAP				
F	43205392	1	GASKET				
G	54576327	1	BRACKET , TRANSDUCER				

NOT ILLUSTRATED



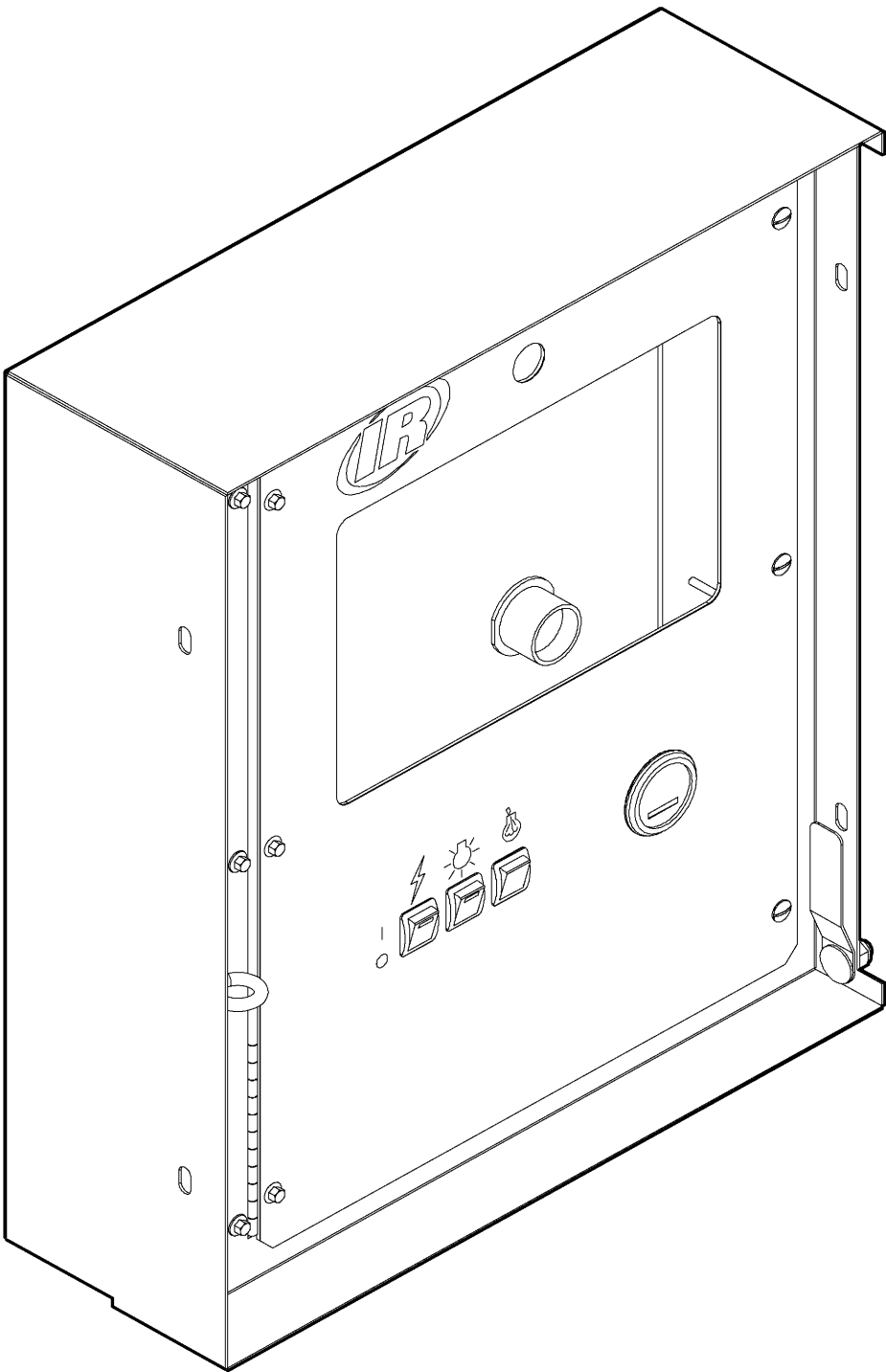
# HYDRAULIC PIPING

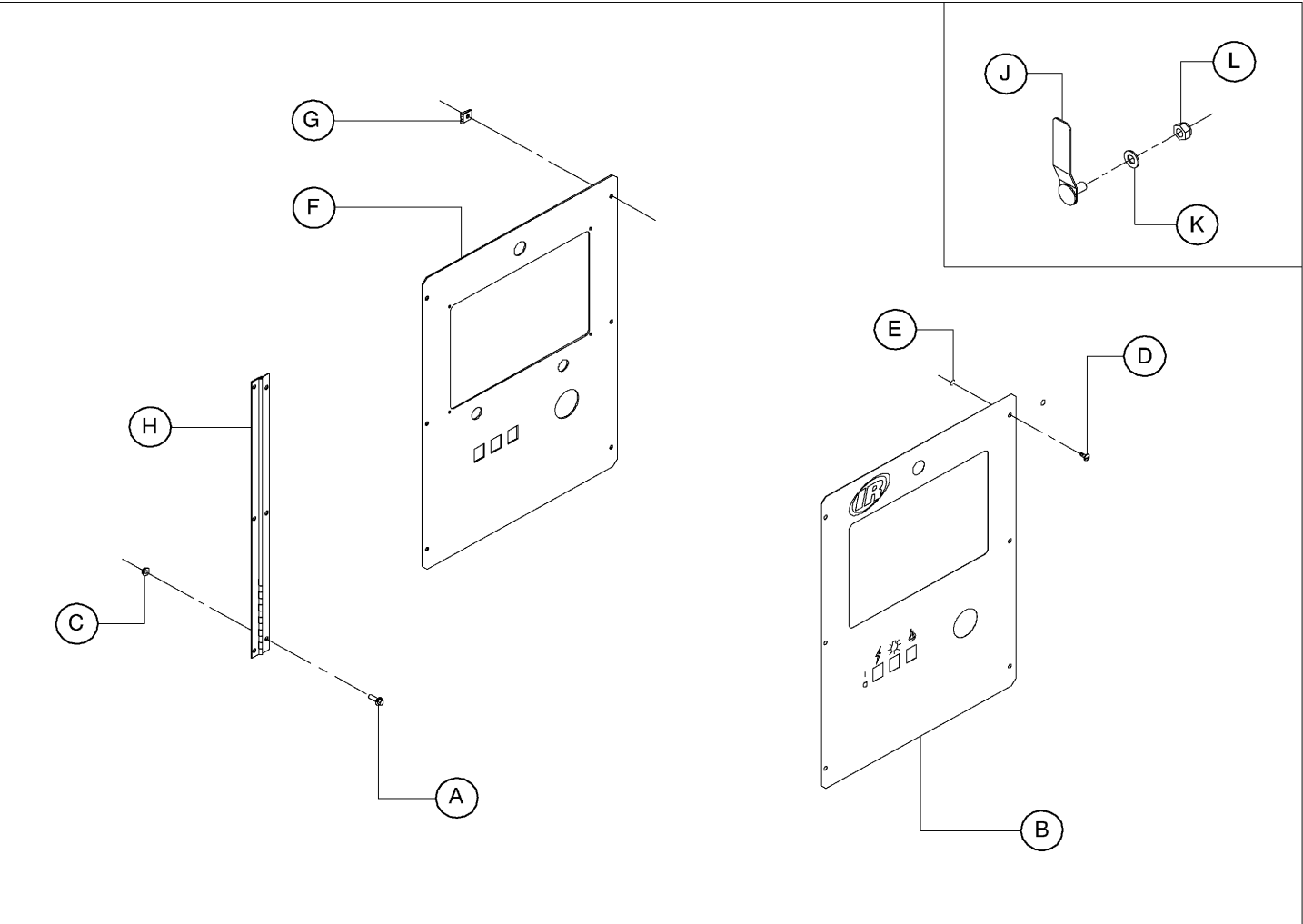
(A)	39911615	ELEMENT , FILTER	(A1)	35292051	ELBOW
(B)	39871165	HEAD , FILTER	(A2)	54718705	HOSE ASSEMBLY
(C)	95356978	CONNECTOR	(A3)	54661509	VALVE , PROPORTIONAL
(D)	54718697	HOSE ASSEMBLY	(A4)	54661566	GAUGE
(E)	95219853	ELBOW	(A5)	54661574	ISOLATOR
(F)	54603733	ELBOW	(A6)	54718721	HOSE ASSEMBLY
(G)	54603816	CLAMP	(A7)	35291384	ELBOW
(H)	54603790	HOSE ( 104" )	(A8)	54603865	MANIFOLD
(J)	54603782	ELBOW	(A9)	35295880	CONNECTOR
(K)	54603758	FLANGE , SPLIT	(B1)	54718788	HOSE ASSEMBLY
(L)	54604343	PUMP , HYDRAULIC	(B2)	35294750	ELBOW
(M)	54603766	FLANGE , SPLIT	(B3)	35332030	TEE
(N)	35366665	ELBOW	(B4)	54718762	HOSE ASSEMBLY
(P)	95220844	CLAMP	(B5)	54718689	HOSE ASSEMBLY
(Q)	35326578	HOSE ( 96" )	(B6)	59798322	ELBOW
(R)	35326560	ADAPTER			
(S)	95953949	BUSHING			
(T)	35576115	VALVE , BALL			
(U)	95647939	NIPPLE			
(V)	95928172	ELBOW			
(W)	95944617	BUSHING			
(X)	35291384	ELBOW			
(Y)	54718705	HOSE ASSEMBLY			
(Z)	95955993	CONNECTOR			



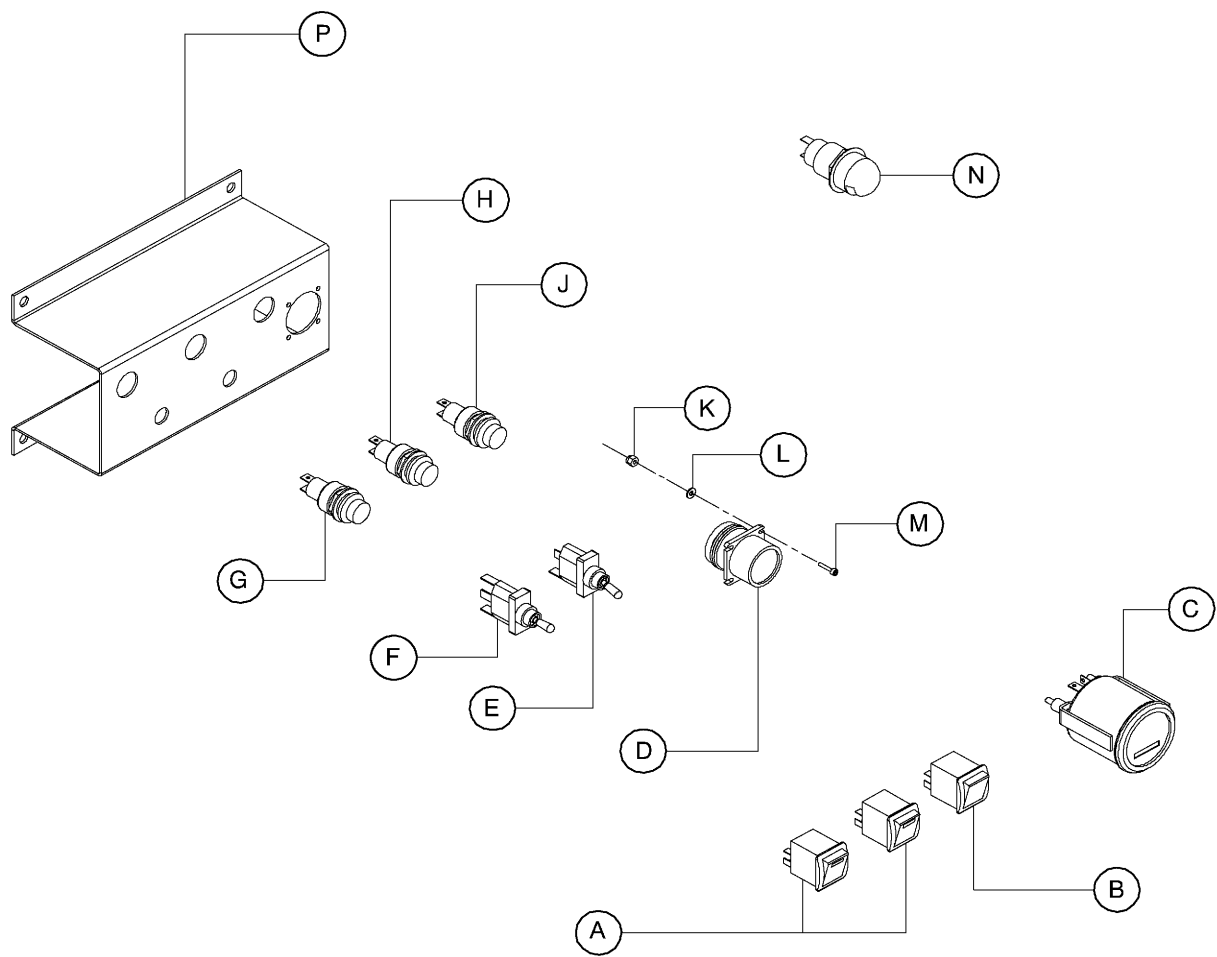
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54618640	1	TRAY , BATTERY				
B	35279025	----	SCREW				
C	54619952	1	SUPPORT , TRAY				
D	35225788	2	BATTERY				
E	36860005	4	J-BOLT				
F	95935029	4	WASHER				
G	35144492	4	NUT				
H	35562156	2	HOLD-DOWN , BATTERY				
J	35108216	4	CLIP				
K	54511258	1	CABLE , NEGATIVE				
L	35128982	1	CABLE , JUMPER				
M	54511274	1	CABLE , POSITIVE				
N	54511282	1	CABLE , DISCONNECT SWITCH				
P	54690789	1	BRACKET , MASTER DISCONNECT SWITCH				
Q	36896975	1	SWITCH , MASTER DISCONNECT				
	54511241	1	GROUND STRAP FROM STARTER				
	35293075	1	GROUND STRAP TO RH OF ENGINE				





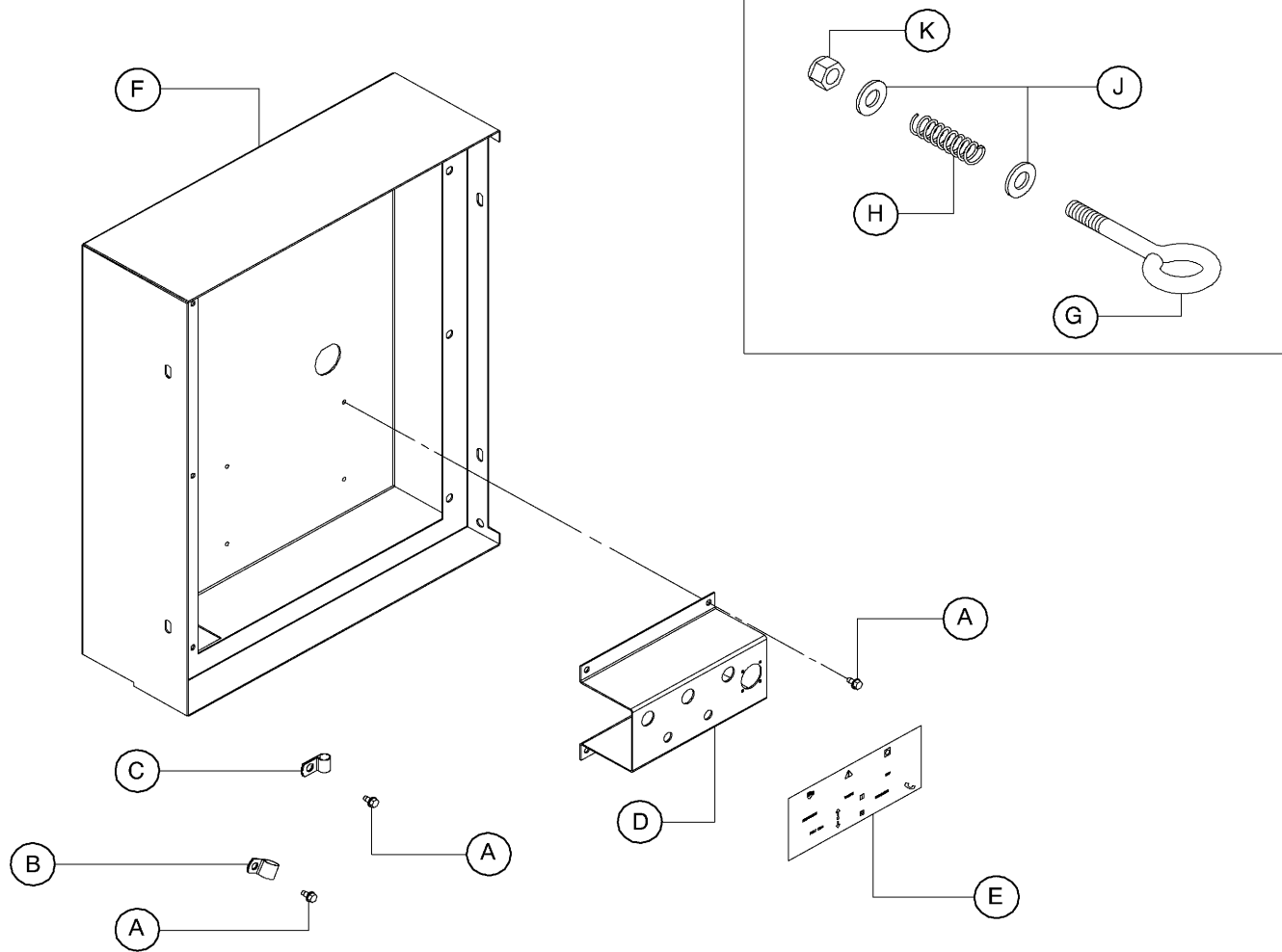


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	36898096	6	SCREW				
B	54631767	1	LAMINATE , CONTROL PANEL				
C	36898104	6	NUT				
D	36844124	3	SCREW				
E	35369180	3	RETAINER				
F	54631908	1	PANEL , CONTROL / INSTRUMENT				
G	35314582	3	FASTENER				
H	36840908	1	HINGE				
J	35603349	1	LATCH				
K	95935037	2	WASHER				
L	35273366	1	NUT				



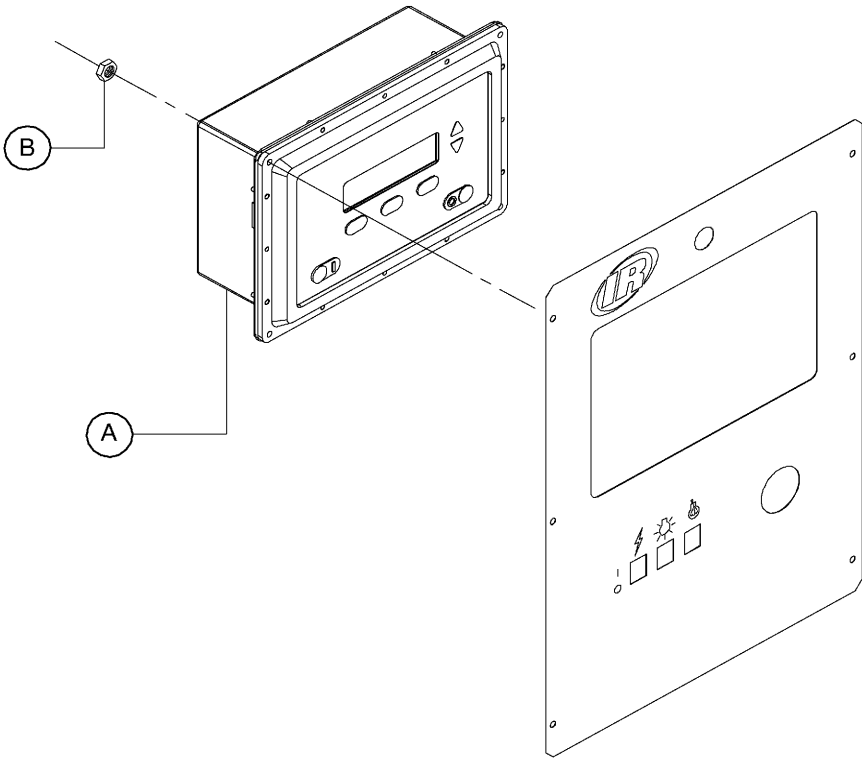
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54475686	2	SWITCH , ROCKER				
B	54475777	1	SWITCH , ROCKER				
C	36841245	1	HOURLMETER				
D			PART OF HARNESS CONNECTOR				
E	54615091	1	SWITCH , TOGGLE				
F	54615109	1	SWITCH , TOGGLE				
G	54615075	1	LIGHT , BLUE INDICATOR				
H	54615083	1	LIGHT , AMBER INDICATOR				
J	54615067	1	LIGHT , RED INDICATOR				
K	54720818	4	NUT				
L	95115812	4	WASHER				
M	95868816	4	SCREW				
N	36841252	1	LIGHT , CONTROL PANEL				
P	54623392	1	PANEL ,				

INSTRUMENT / CONTROL PANEL MOUNTING



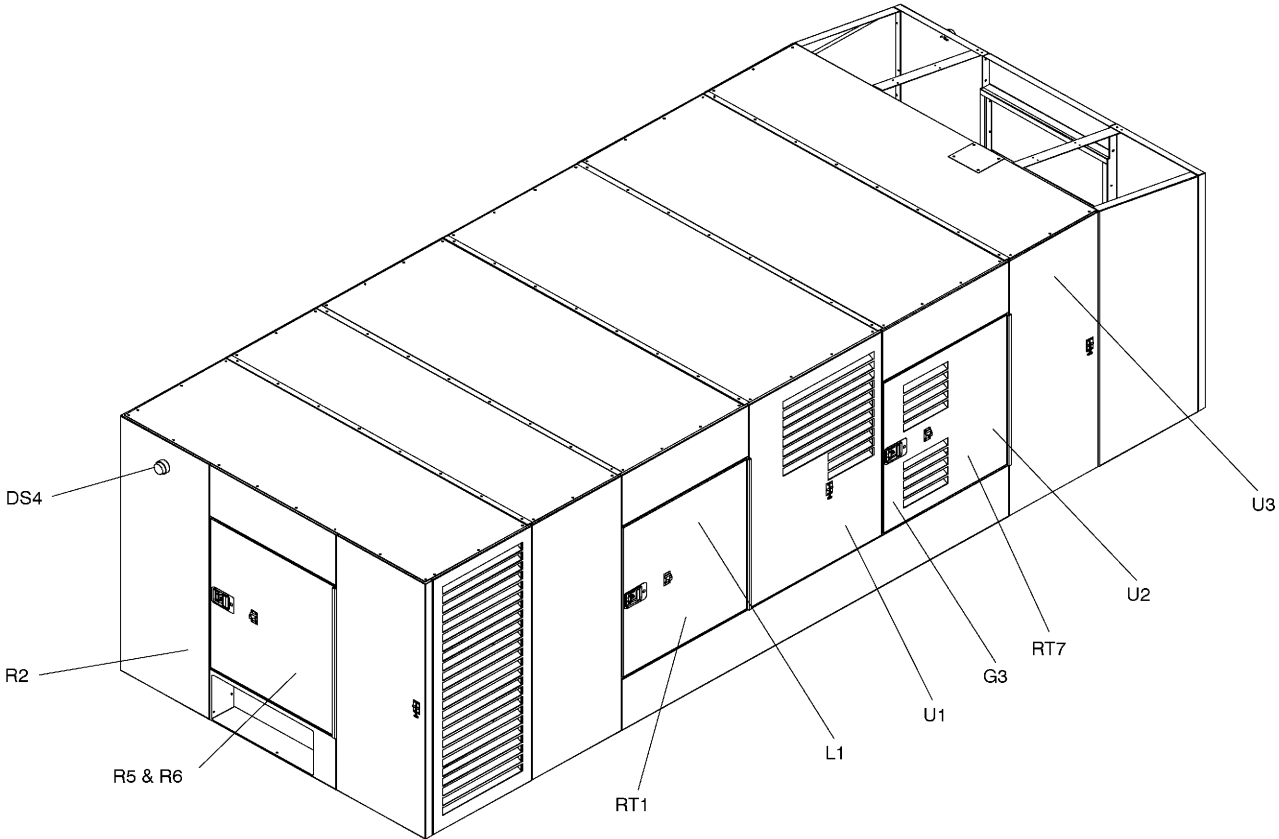
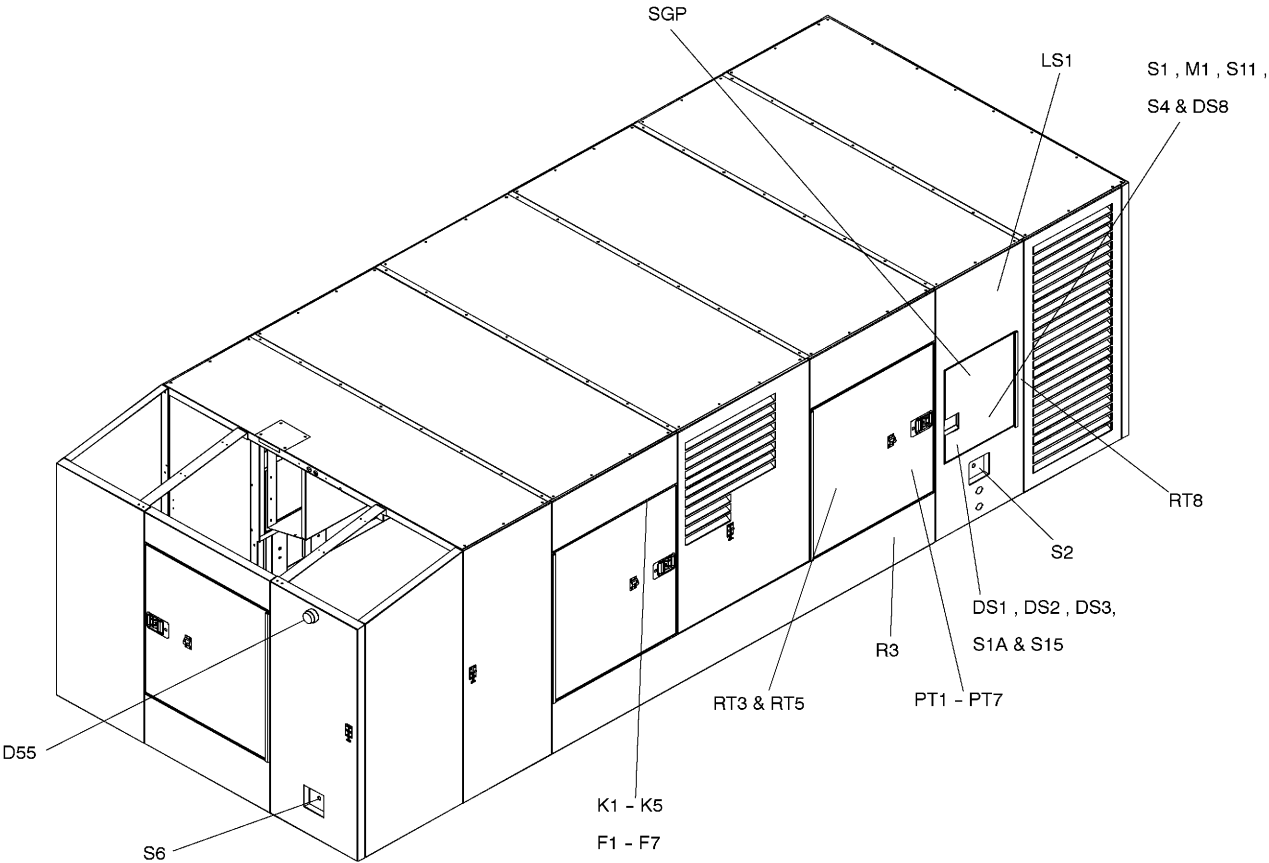
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	36797652	6	SCREW				
B	35225077	1	CLAMP				
C	35225093	1	CLAMP				
D	54623392	1	PANEL , SWITCH				
E	54632757	1	DECAL , PANEL				
F	54621552	1	BOX , CONTROL PANEL				
G	35327303	1	BOLT , EYE				
H	35327311	1	SPRING				
J	95934998	1	WASHER				
K	95923314	1	NUT				

CONTROLLER ASSEMBLY

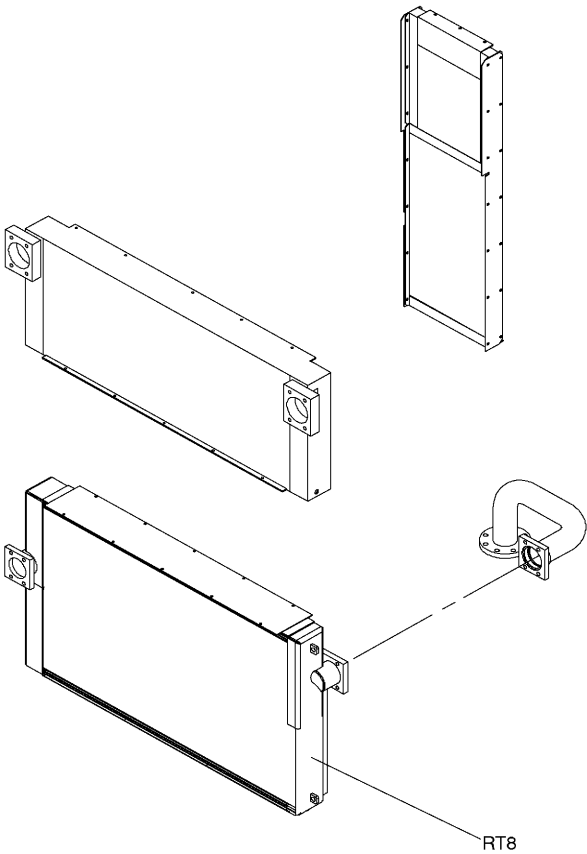


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54441753	1	CONTROLLER				
B	95928800	4	NUT				

ELECTRICAL COMPONENTS LOCATION

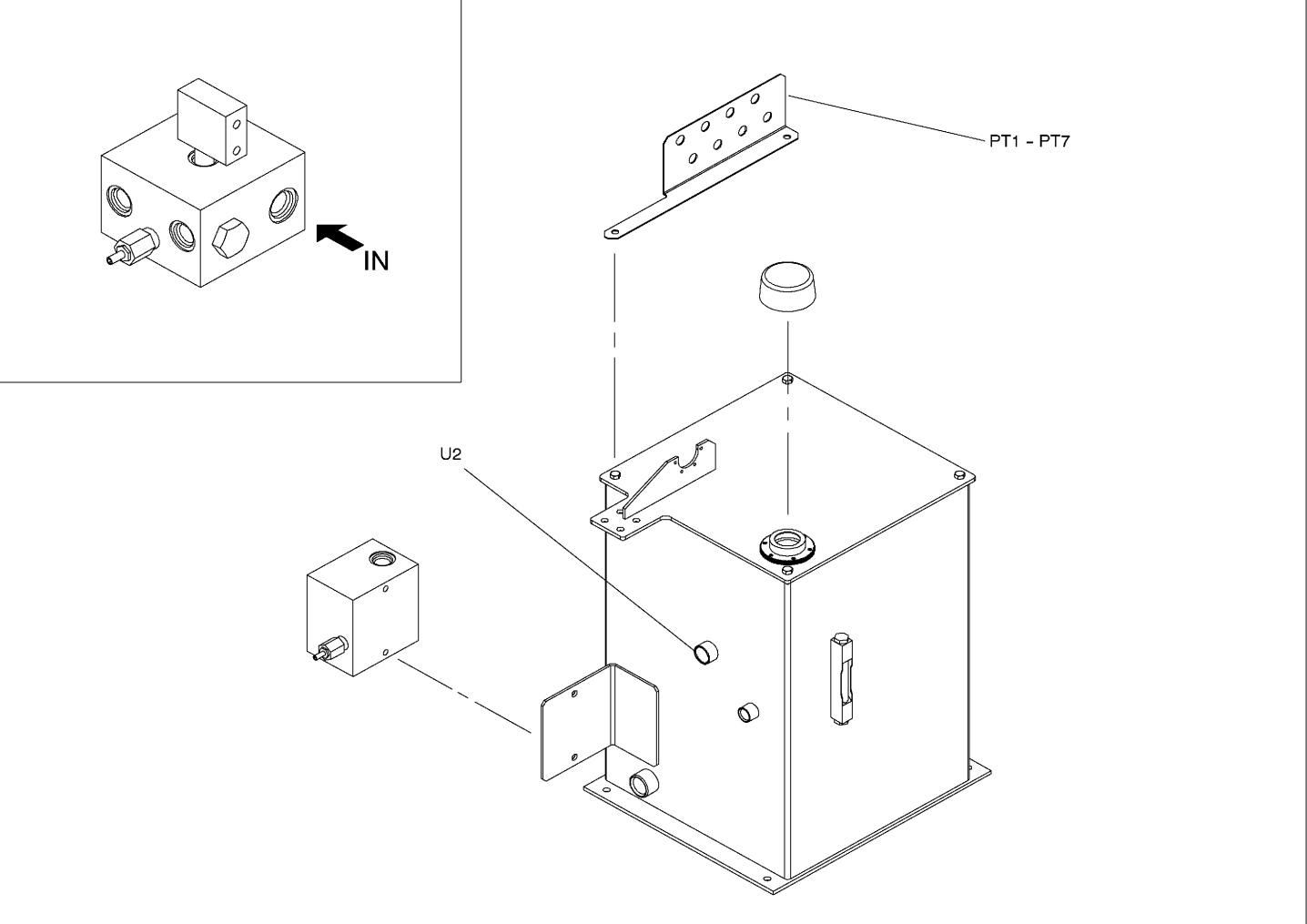


ELECTRICAL COMPONENTS LOCATION



ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
RT8	54557087	1	SENSOR				

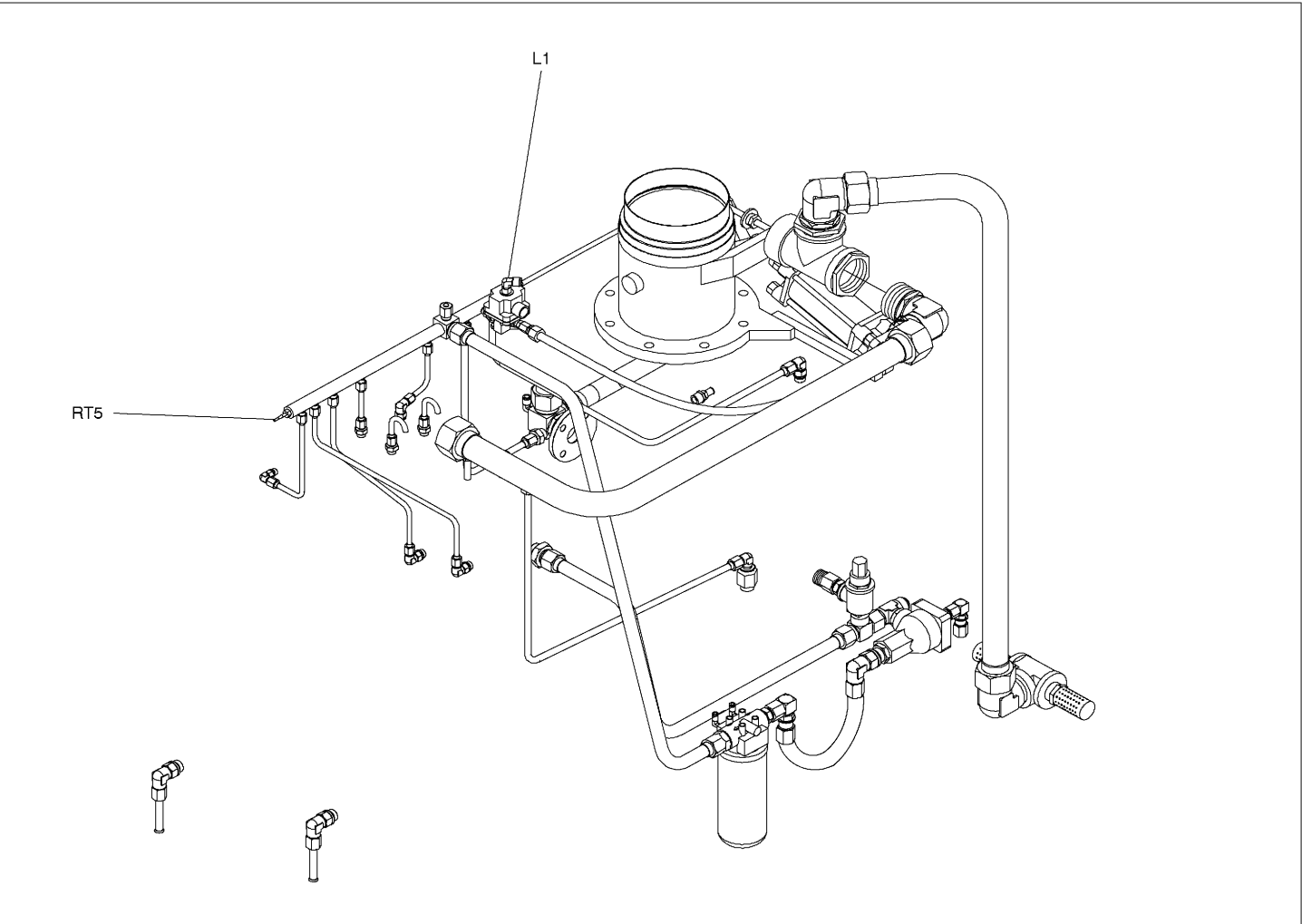
ELECTRICAL COMPONENTS LOCATION



ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
PT1	54757232	1	TRANSDUCER , 0-30 VACUUM				
PT2	36920825	1	TRANSDUCER , 0-100 VACUUM				
PT3	54496773	1	TRANSDUCER , 0-225 VACUUM				
PT4	54496773	1	TRANSDUCER , 0-225 VACUUM				
PT5	36920825	1	TRANSDUCER , 0-100 VACUUM				
PT6	36920825	1	TRANSDUCER , 0-100 VACUUM				
PT7	54496773	1	TRANSDUCER , 0-225 VACUUM				
U2	54581327	1	TRANSDUCER , LEVEL				

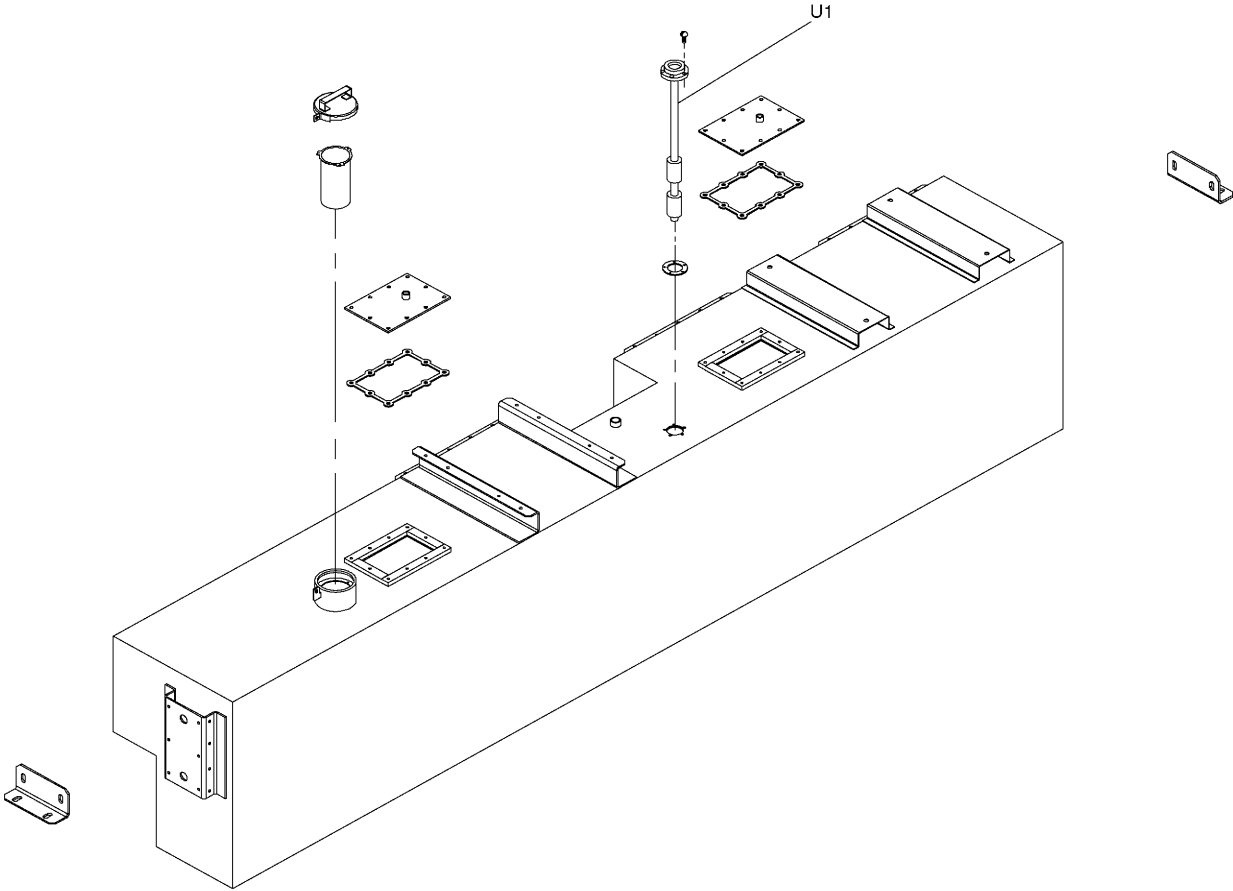


ELECTRICAL COMPONENTS LOCATION



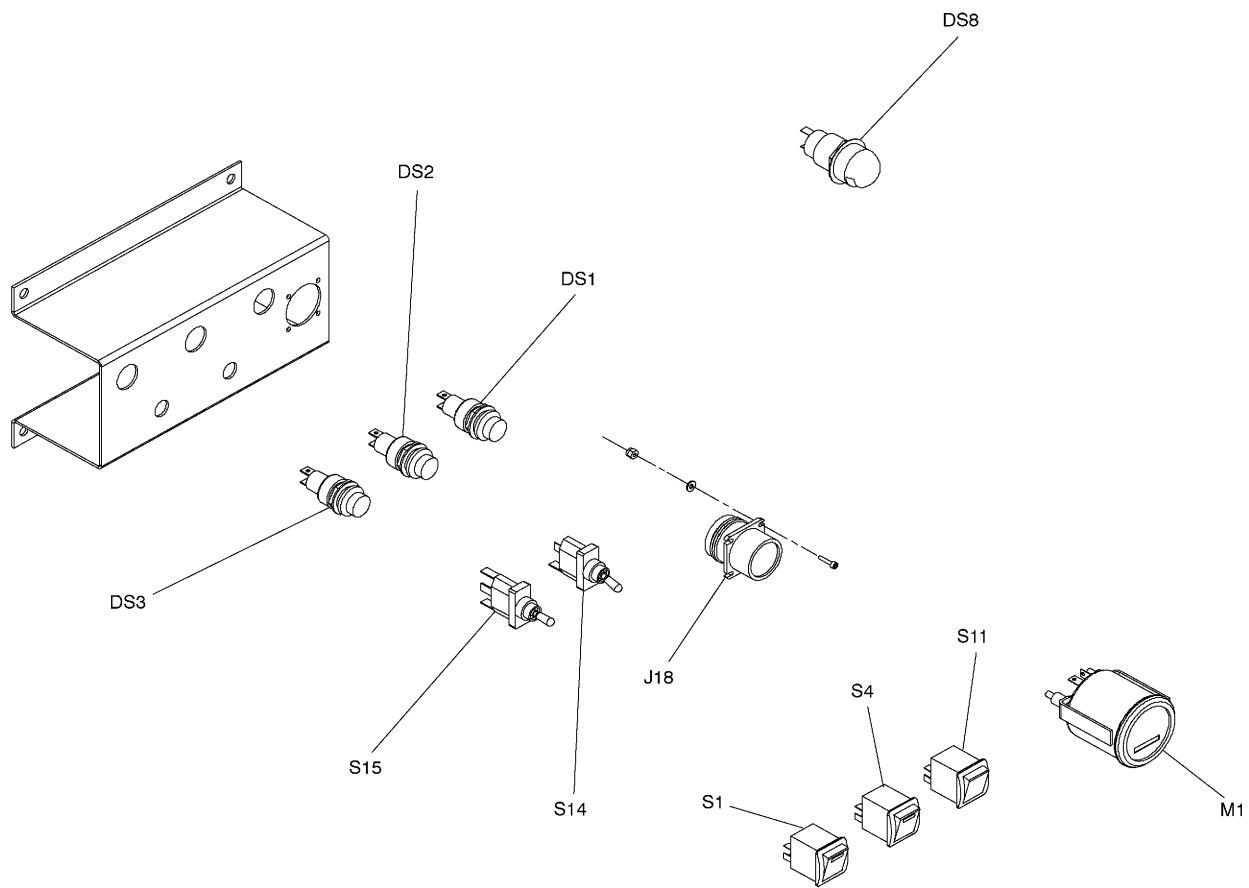
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
L1	54512611	1	VALVE , SOLENOID				
RT5	54557087	1	SENSOR				

ELECTRICAL COMPONENTS LOCATION



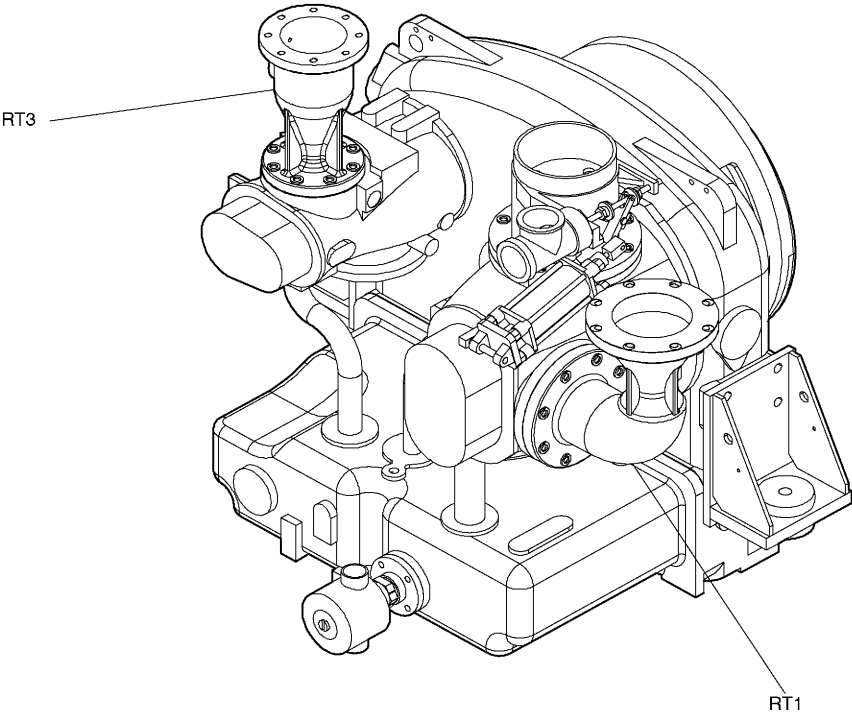
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
U1	36876845	1	SENDER , FUEL				

ELECTRICAL COMPONENTS LOCATION

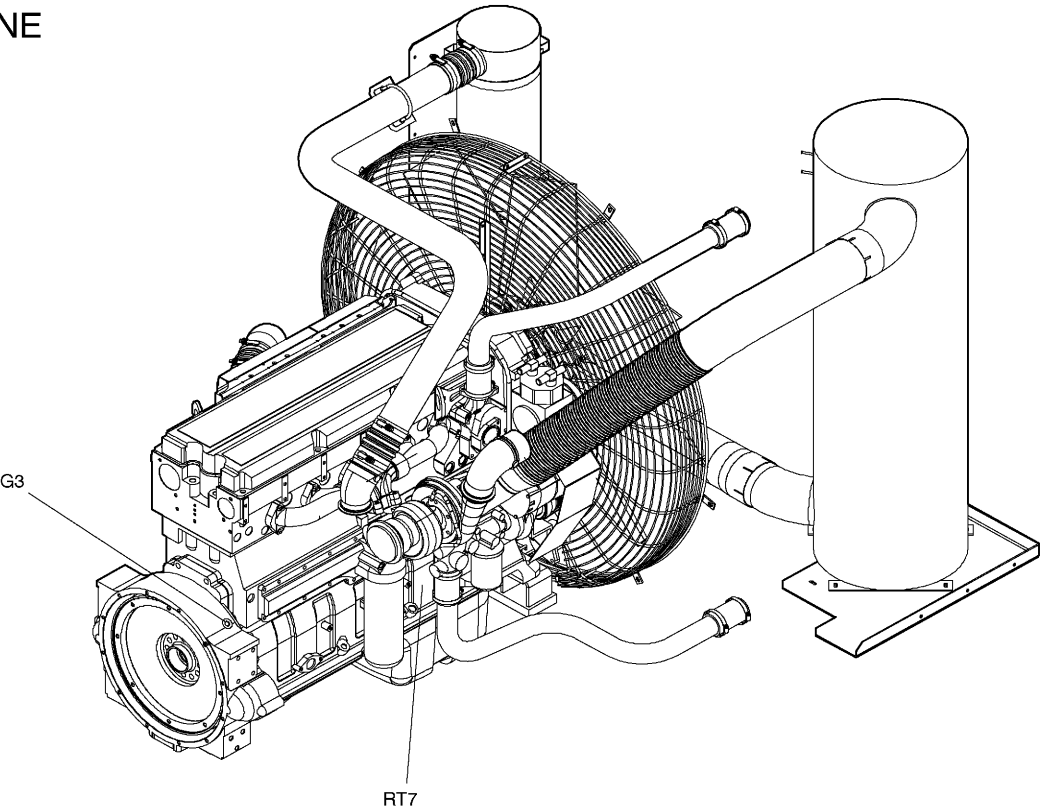


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
DS1	54615067	1	LIGHT , RED INDICATOR				
DS2	54615083	1	LIGHT , AMBER INDICATOR				
DS3	54615075	1	LIGHT , BLUE INDICATOR				
DS8	36841252	1	LIGHT , CONTROL PANEL				
J18			PART OF HARNESS CONNECTOR				
M1	36841245	1	HOURLMETER				
S1	54475686	1	SWITCH , ROCKER				
S4	54475686	1	SWITCH , ROCKER				
S11	54475777	1	SWITCH , ROCKER				
S14	54615091	1	SWITCH , TOGGLE				
S15	54615109	1	SWITCH , TOGGLE				

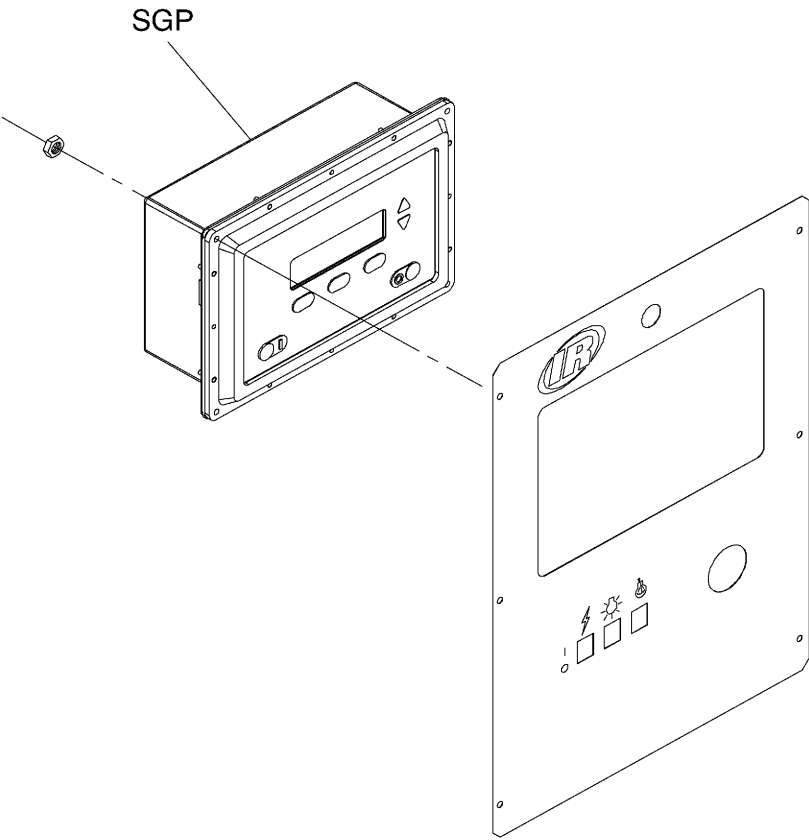
AIR END



ENGINE



ELECTRICAL COMPONENTS LOCATION



ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
SGP	54441753	1	CONTROLLER				

## CONTROL PANEL LOCATED DEVICES

REF. DESIGNATOR	DESCRIPTION	PART NUMBER
S1 , S4	ROCKER SWITCH , LIGHTED	54475686
S11	ROCKER SWITCH , MOMENTARY	54475777
M1	HOURLMETER	36841245
	SGP CONTROLLER	54441753
DS8	PANEL , LIGHT	36841252
	PANEL LIGHT BULB	35290089
W2	WIRING HARNESS	54597497
<u>ENGINE DIAGNOSTIC PANEL:</u>		
S14	TOGGLE SWITCH SPST	54615091
S15	TOGGLE SWITCH SPDT MOMENTARY	54615109
DS1	RED INDICATOR LAMP	54615067
DS2	AMBER INDICATOR LAMP	54615083
DS3	BLUE INDICATOR LAMP	54615075

## ENCLOSURE LOCATED DEVICES

REF. DESIGNATOR	DESCRIPTION	PART NUMBER
DS4 , DS5	STROBE LIGHT	54477286
S2 , S6	ESTOP BUTTON	54494778
LS1	ALARM HORN	36785145

## HYDRAULIC TANK LOCATED DEVICES

REF. DESIGNATOR	DESCRIPTION	PART NUMBER
PT1	0-30 IN. HG VACUUM TRANSDUCER	54757232
PT2	0-100 PSIG PRESSURE TRANSDUCER	36920825
PT3	0-225 PSIG PRESSURE TRANSDUCER	54496773
PT4	0-225 PSIG PRESSURE TRANSDUCER	54496773
PT5	0-100 PSIG PRESSURE TRANSDUCER	36920825
PT6	0-100 PSIG PRESSURE TRANSDUCER	36920825
PT7	0-225 PSIG PRESSURE TRANSDUCER	54496773
U2	LEVEL TRANSDUCER	54581327



### ENGINE LOCATED DEVICES

REF. DESIGNATOR	DESCRIPTION	PART NUMBER
RT7	100 OHM RTD	54557987
	STARTER GROUND STRAP	35293075
G3	MAGNETIC PICKUP	36785319

## RADIATOR LOCATED DEVICES

REF. DESIGNATOR	DESCRIPTION	PART NUMBER
U3	COOLANT LEVEL SWITCH	54474572

## AIREND LOCATED DEVICES

REF. DESIGNATOR	DESCRIPTION	PART NUMBER
L1	INLET SOLENOID	54512611
L2 , L3	CONDENSATE SOLENOIDS	36842318
RT1	100 OHM RTD	54557087
RT2	100 OHM RTD	54557087
RT3	100 OHM RTD	54557087
RT4	100 OHM RTD	54557087
RT5	10K OHM THERMISTER	54557095
RT6	10K OHM THERMISTER	54557095

## COOLER LOCATED DEVICES

REF. DESIGNATOR	DESCRIPTION	PART NUMBER
RT8	100 OHM RTD	54557087

### FRAME LOCATED DEVICES

---

REF. DESIGNATOR	DESCRIPTION	PART NUMBER
S8	BATTERY DISCONNECT SWITCH	36896975
	BATTERY JUMPER CABLE	35128982
	POSITIVE BATTERY CABLE	54658331
	POS. BATTERY JUMPER CABLE	54511282
	NEGATIVE BATTERY CABLE	54658323
	FRAME GROUND STRAP	54511241
U1	FUEL LEVEL SENDER	36842011
D1 THRU D6	DIODE	35376169
W1	CHASSIS HARNESS	54631791
W4	ALARM HARNESS	54631809

#### POWER DISTRIBUTION BOX :

	POWER DISTRIBUTION BOX ( INCLUDES W-3 HARNESS )	54631312
D1	DIODE	35376169
K1	AUXILIARY START RELAY	35577873
K2	RELAY , 24VDC SPDT	36892362
K3	RELAY , 24VDC SPDT	36892362
K4	RELAY , 24VDC SPDT	36892362
K5	RELAY , 24VDC SPDT	36892362

### FRAME LOCATED DEVICES

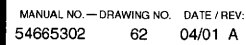
REF. DESIGNATOR	DESCRIPTION	PART NUMBER
S8	BATTERY DISCONNECT SWITCH	36896975
	BATTERY JUMPER CABLE	35128982
	POSITIVE BATTERY CABLE	54658331
	POS. BATTERY JUMPER CABLE	54511282
	NEGATIVE BATTERY CABLE	54658323
	FRAME GROUND STRAP	54511241
U1	FUEL LEVEL SENDER	36842011
D1 THRU D6	DIODE	35376169
W1	CHASSIS HARNESS	54631791
W4	ALARM HARNESS	54631809

### POWER DISTRIBUTION BOX :

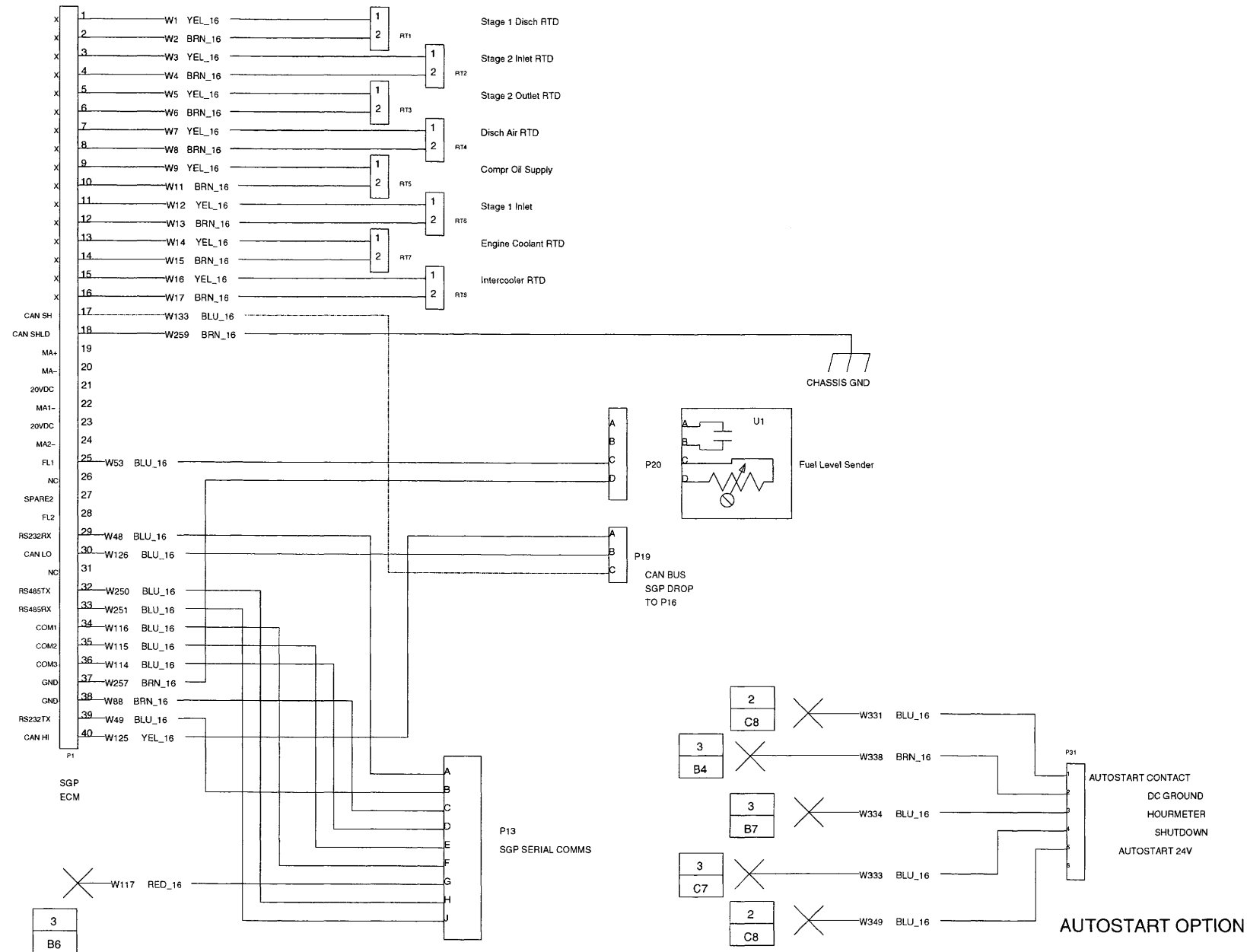
	POWER DISTRIBUTION BOX ( INCLUDES W-3 HARNESS )	54631312
D1	DIODE	35376169
F1,F2,F3	10 AMP	22071591
F4	25 AMP	36793651
F5,F6,F7	15 AMP	22071575
K1	AUXILIARY START RELAY	35577873
K2	RELAY , 24VDC SPDT	36892362
K3	RELAY , 24VDC SPDT	36892362
K4	RELAY , 24VDC SPDT	36892362
K5	RELAY , 24VDC SPDT	36892362



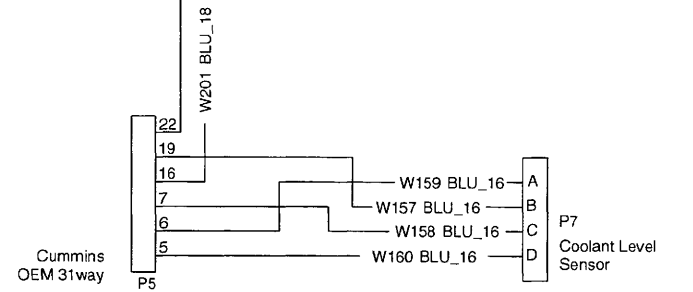
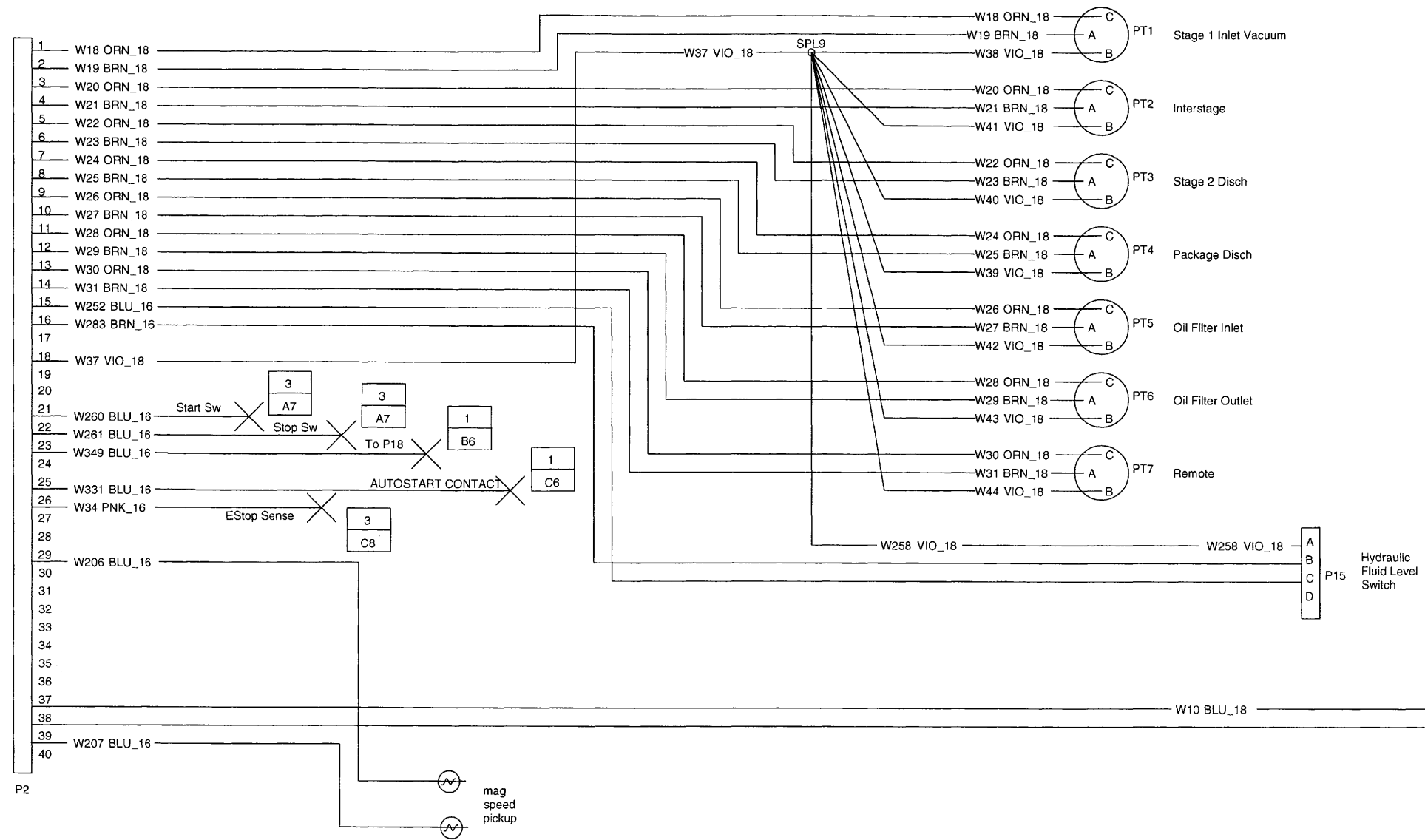
## 10 / 425 SCHEMATIC

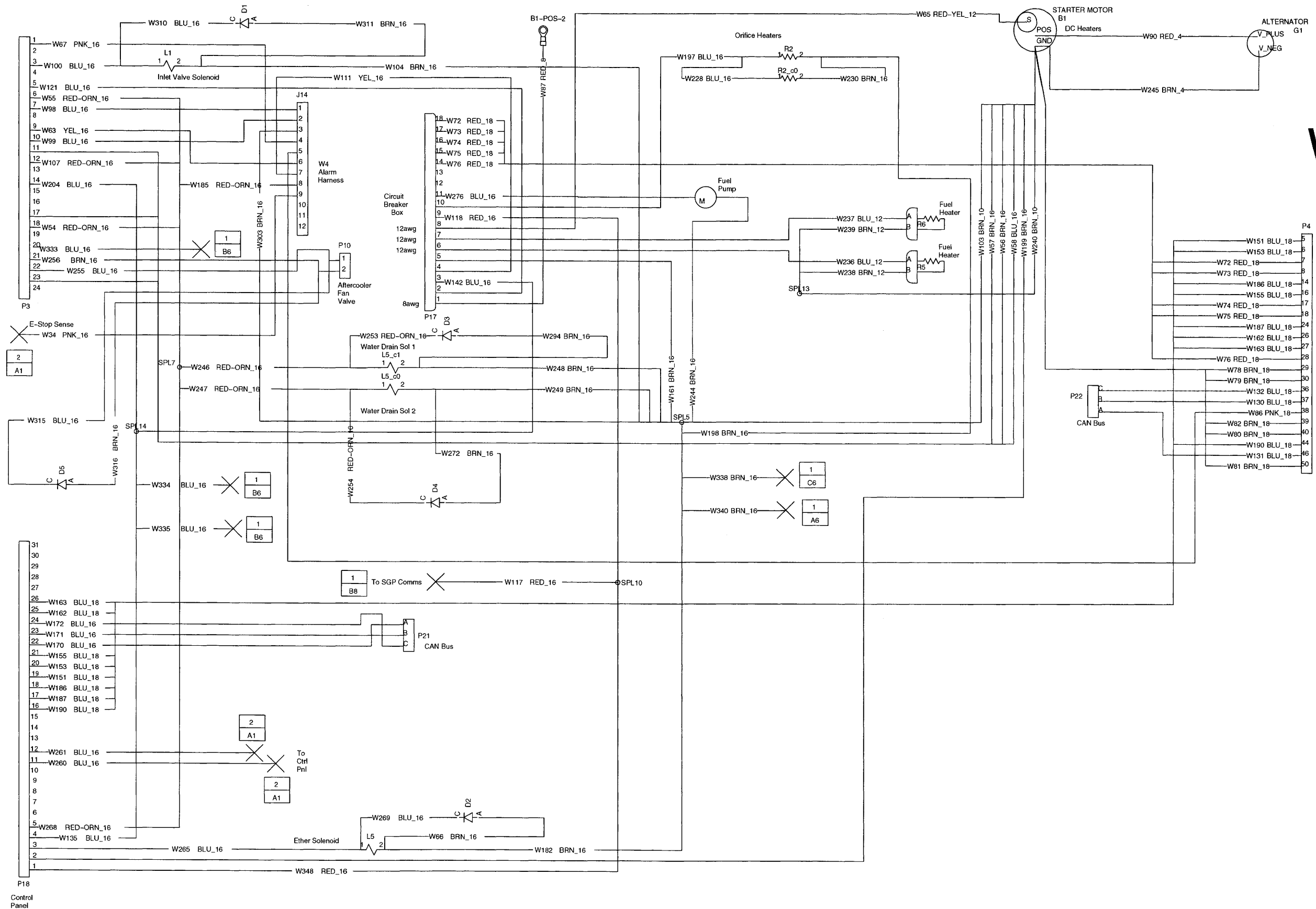


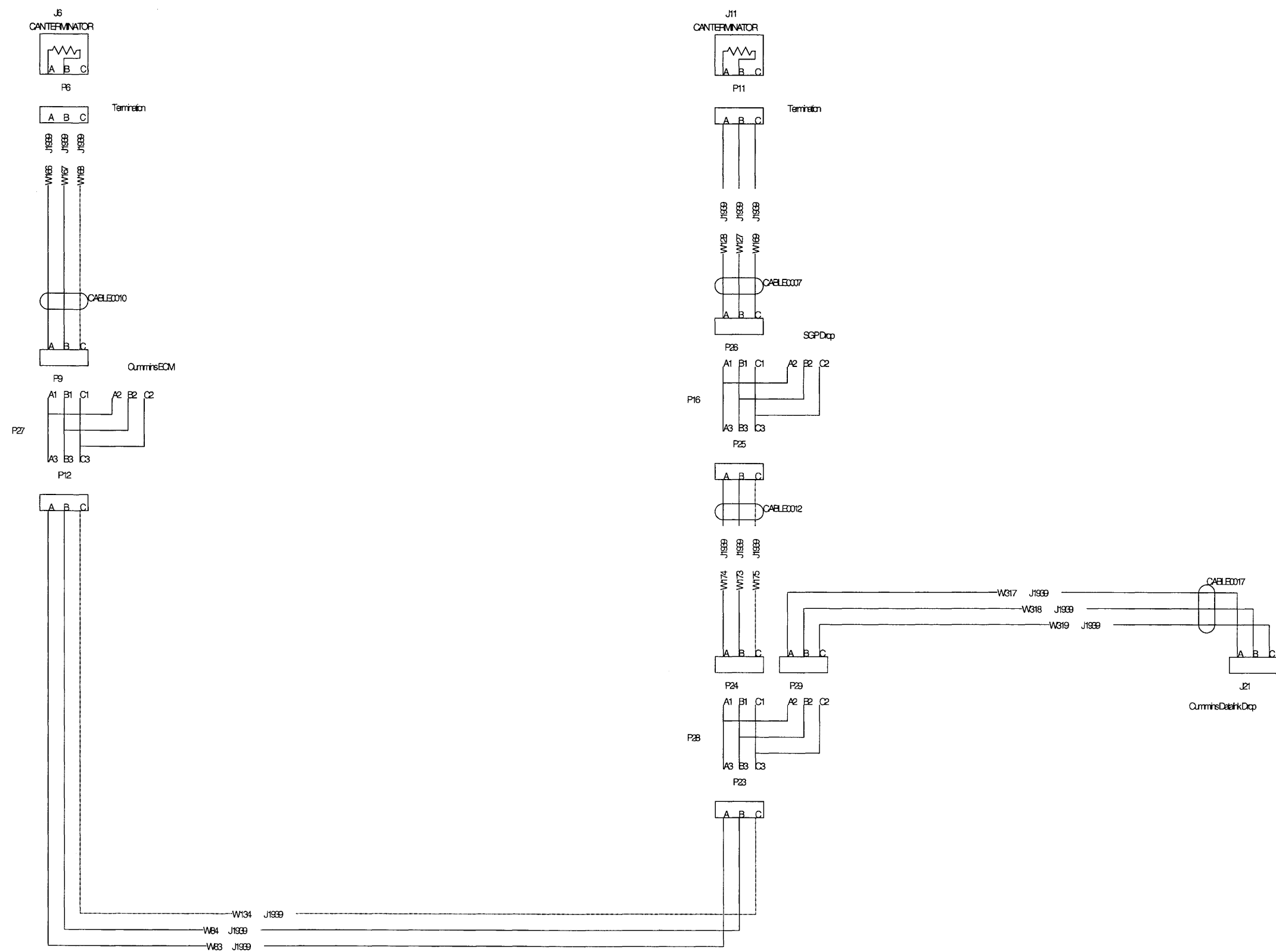




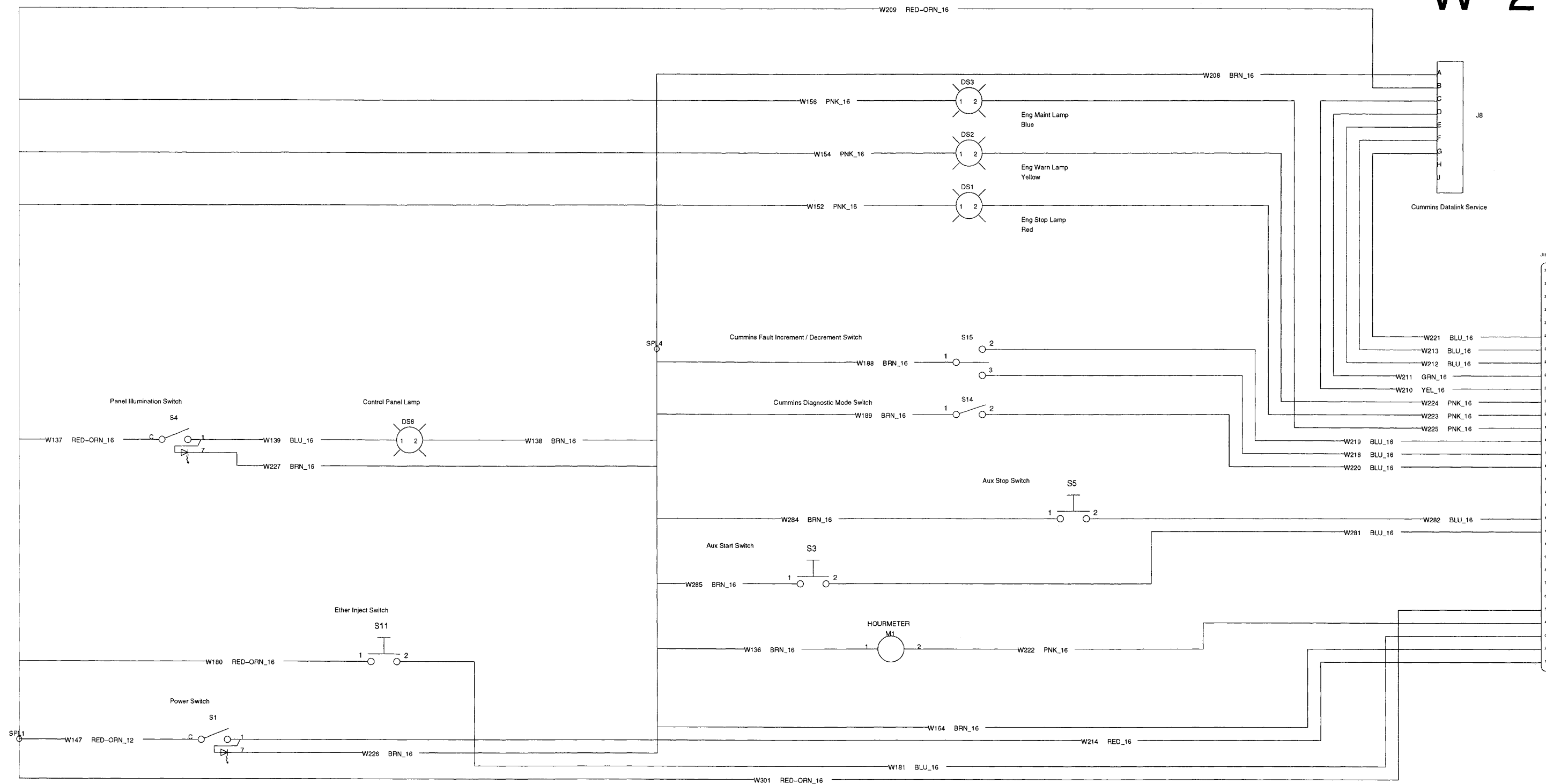
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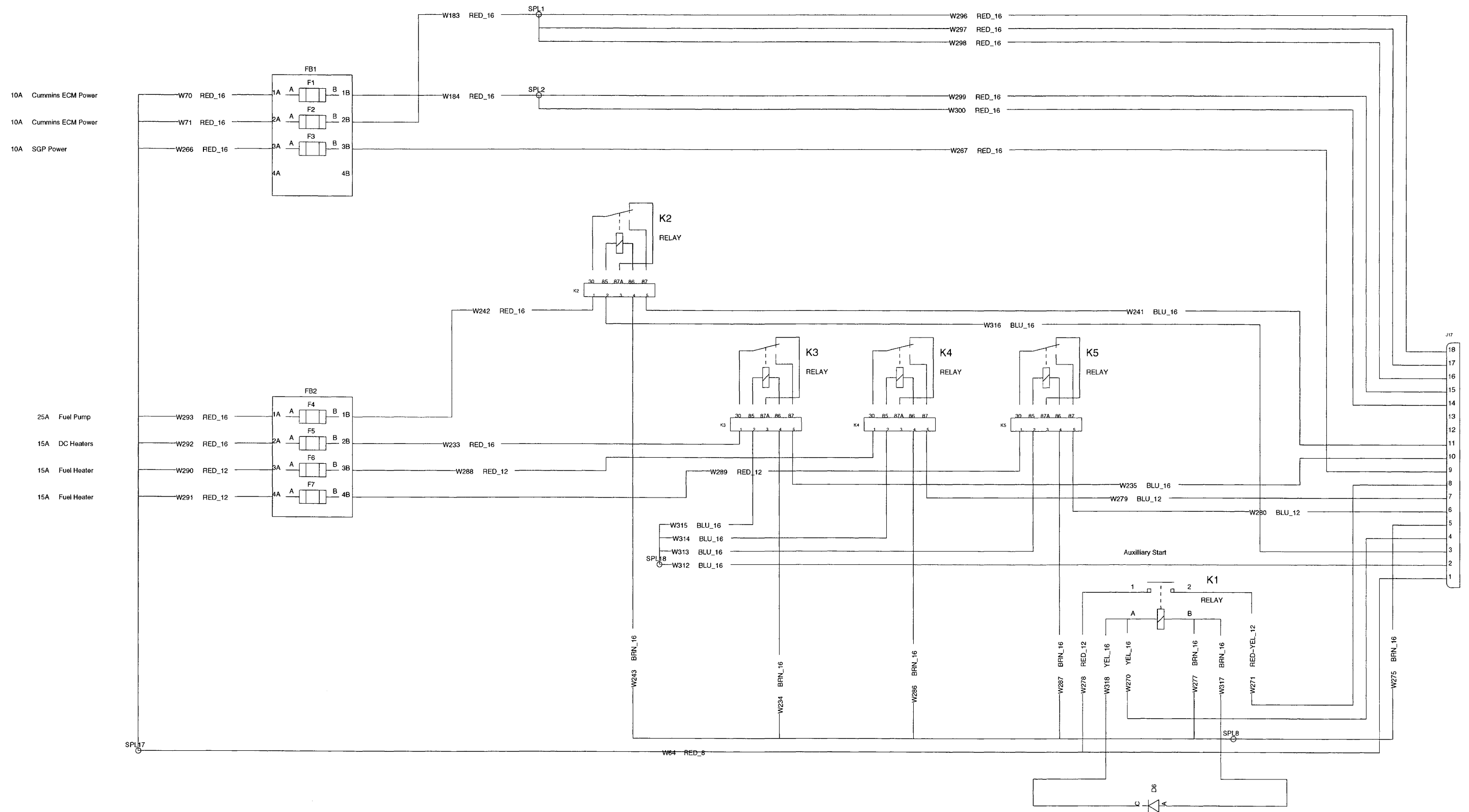


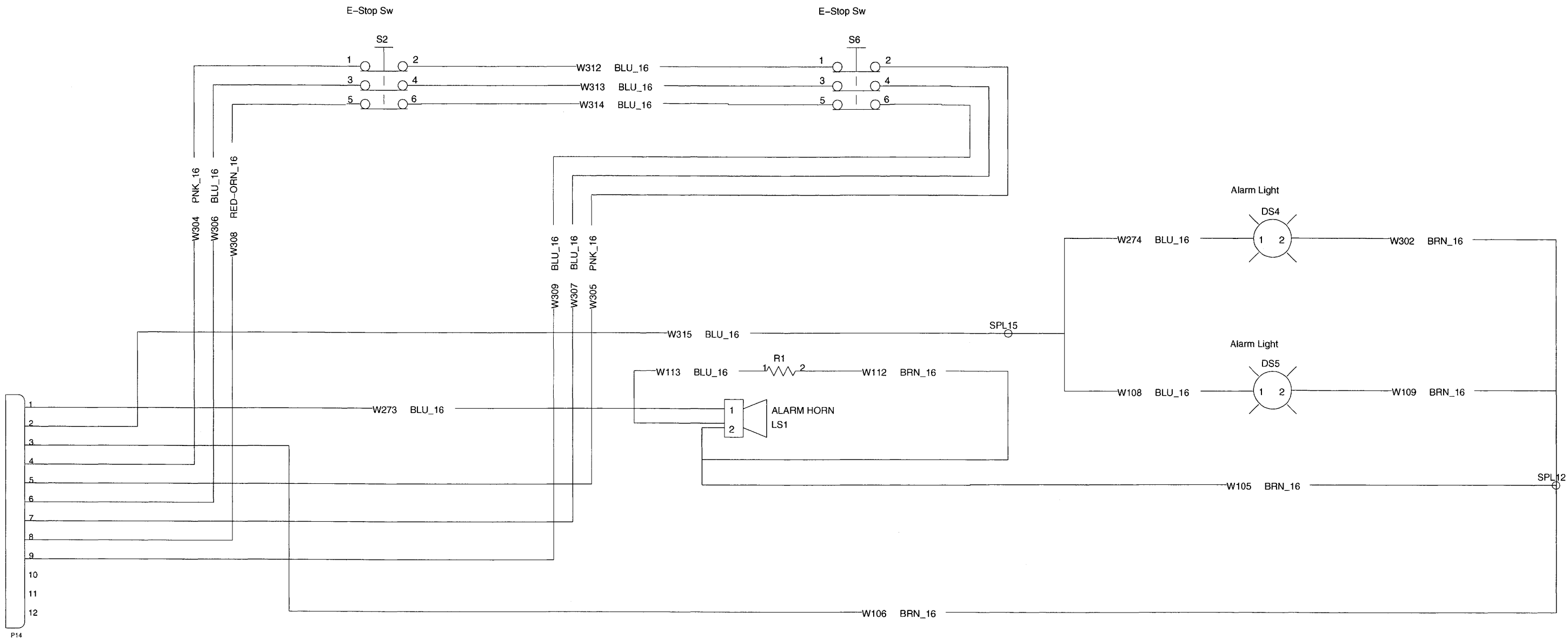


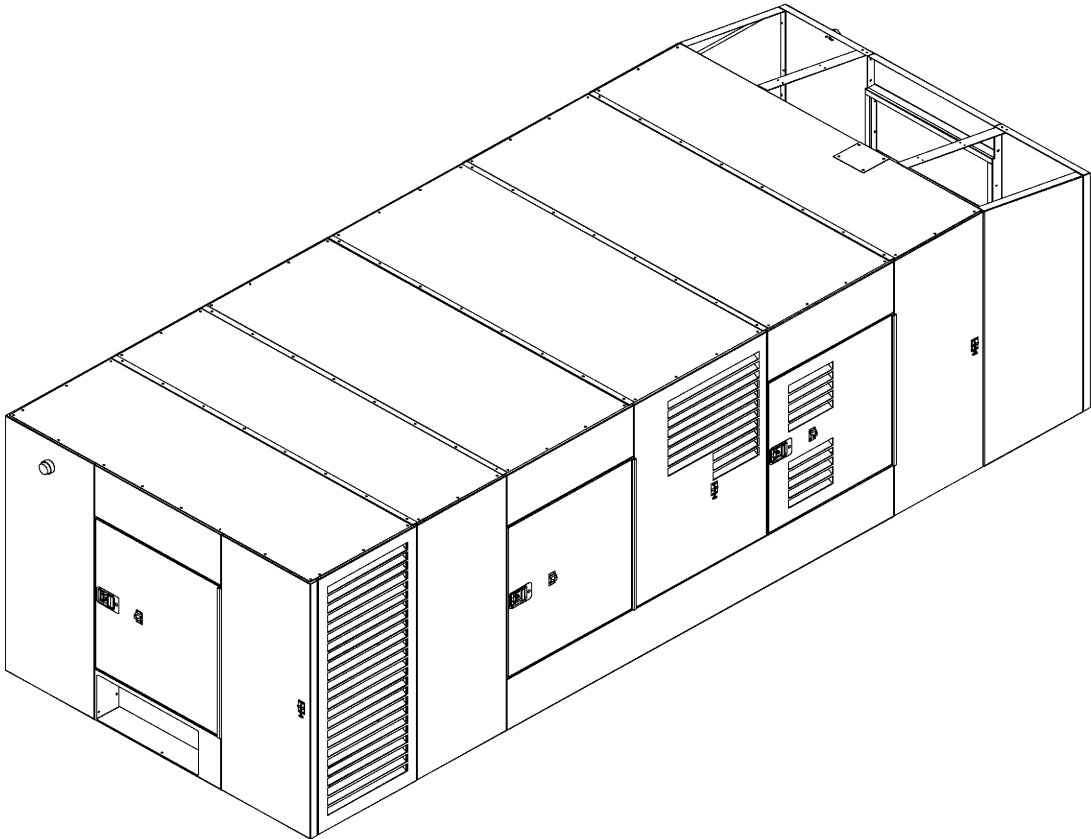
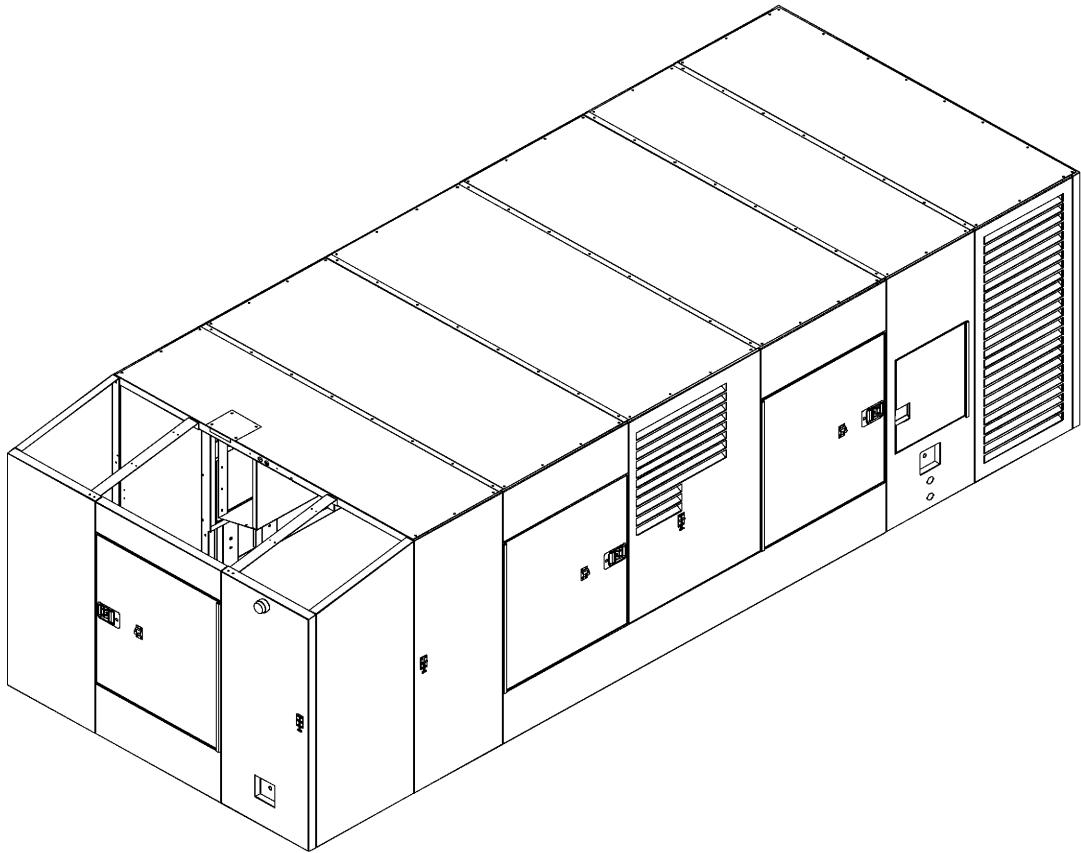
# W-2



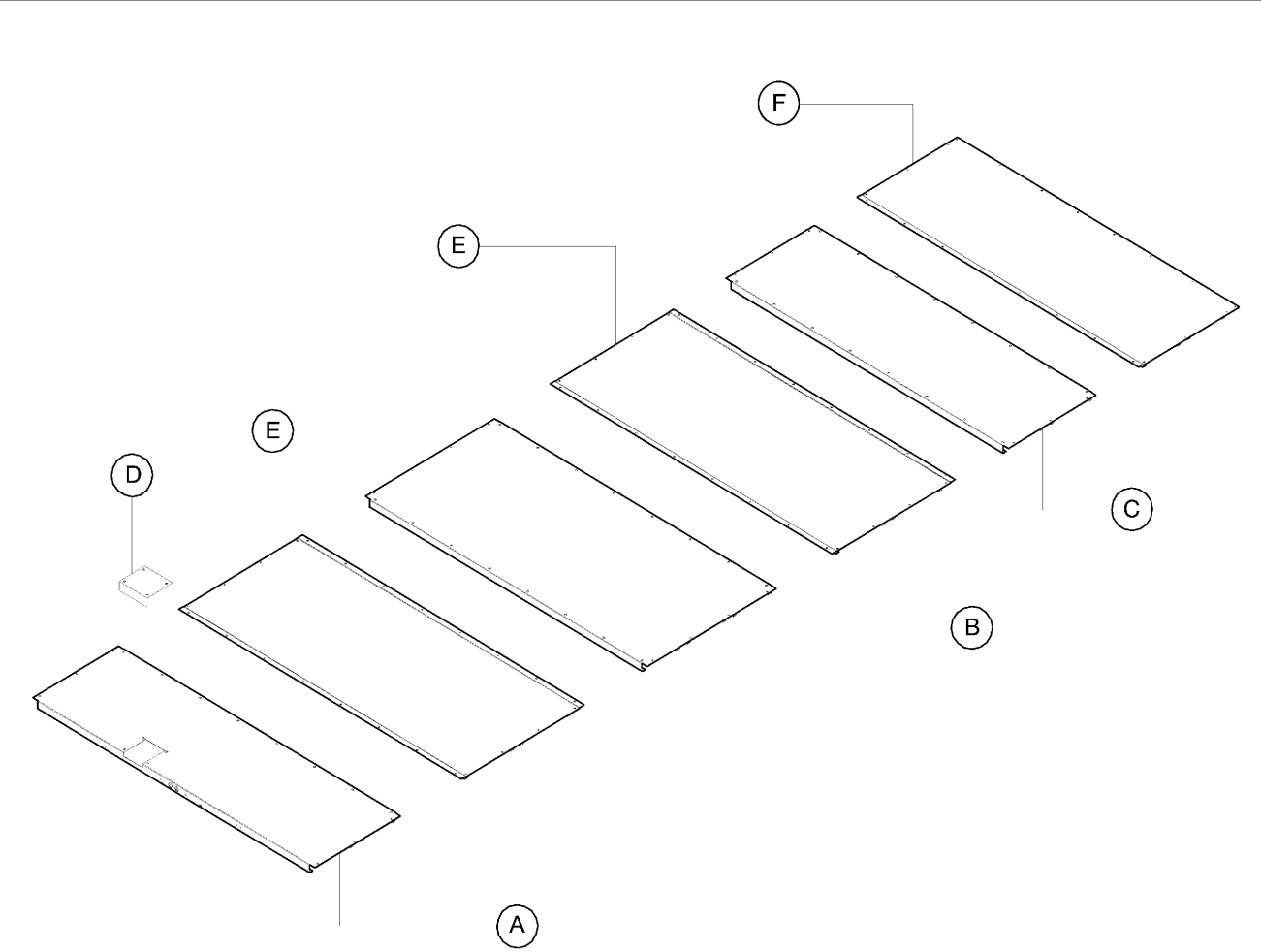
**W-3**





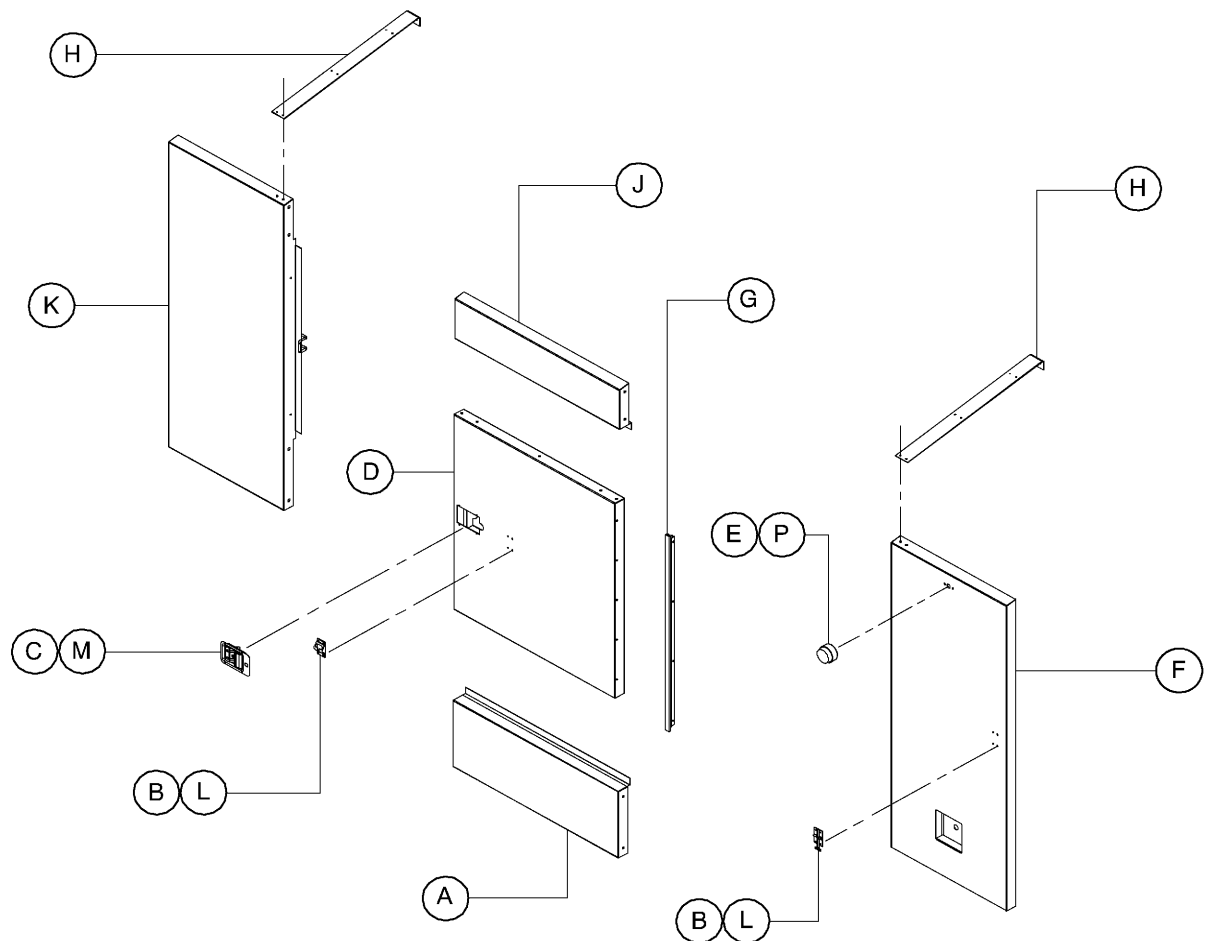




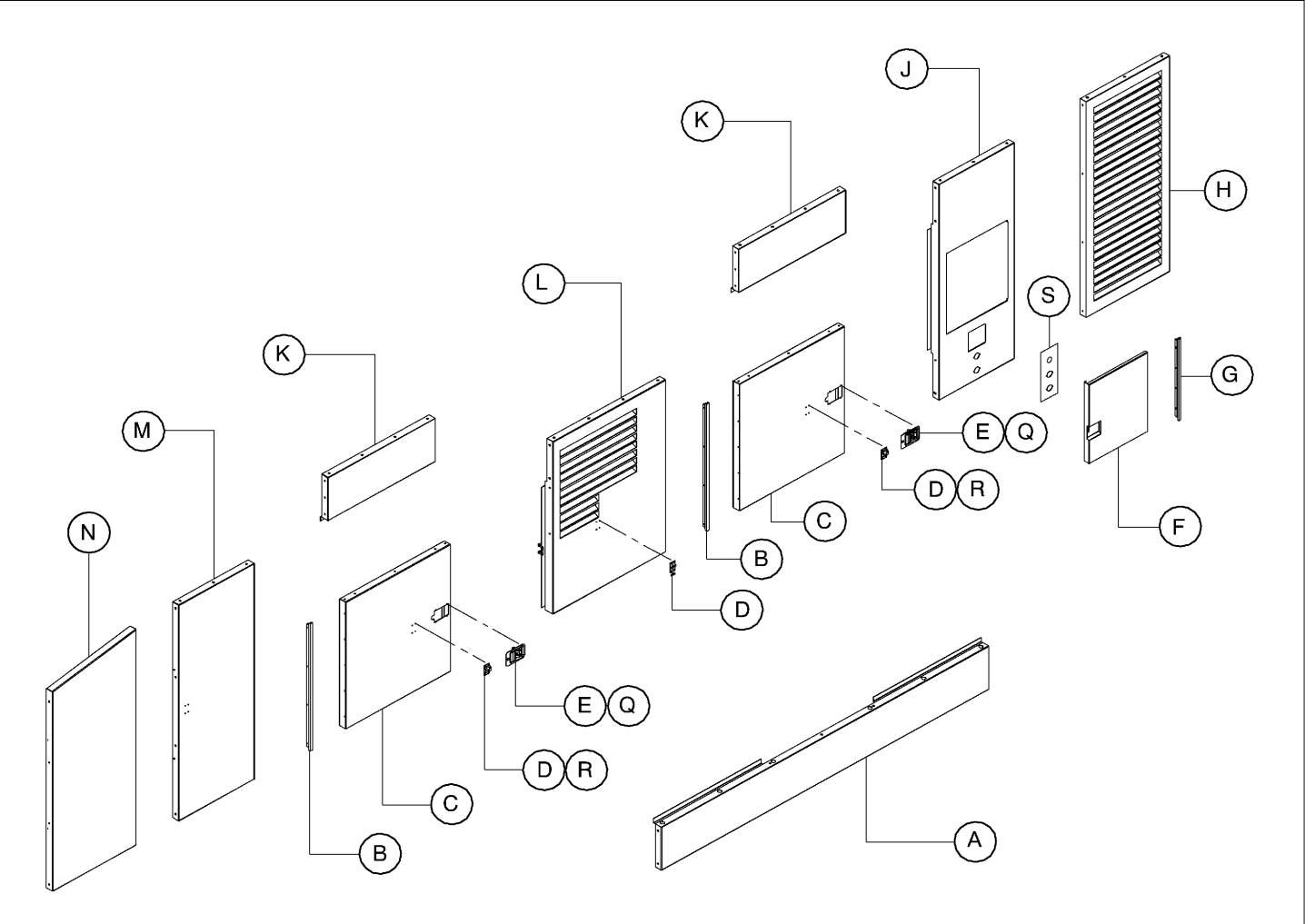


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	36924231	1	PANEL , FRONT TOP				
B	36924223	1	PANEL , THIRD TOP				
C	36924207	1	PANEL , FIFTH TOP				
D	35924256	1	COVER , RADIATOR FILL				
E	36924215	1	PANEL , SECOND & FOURTH TOP				
F	36924199	1	PANEL , REAR TOP				
G	36889608	----	SCREW , TOP PANEL				

ENCLOSURE FRONT PANELS

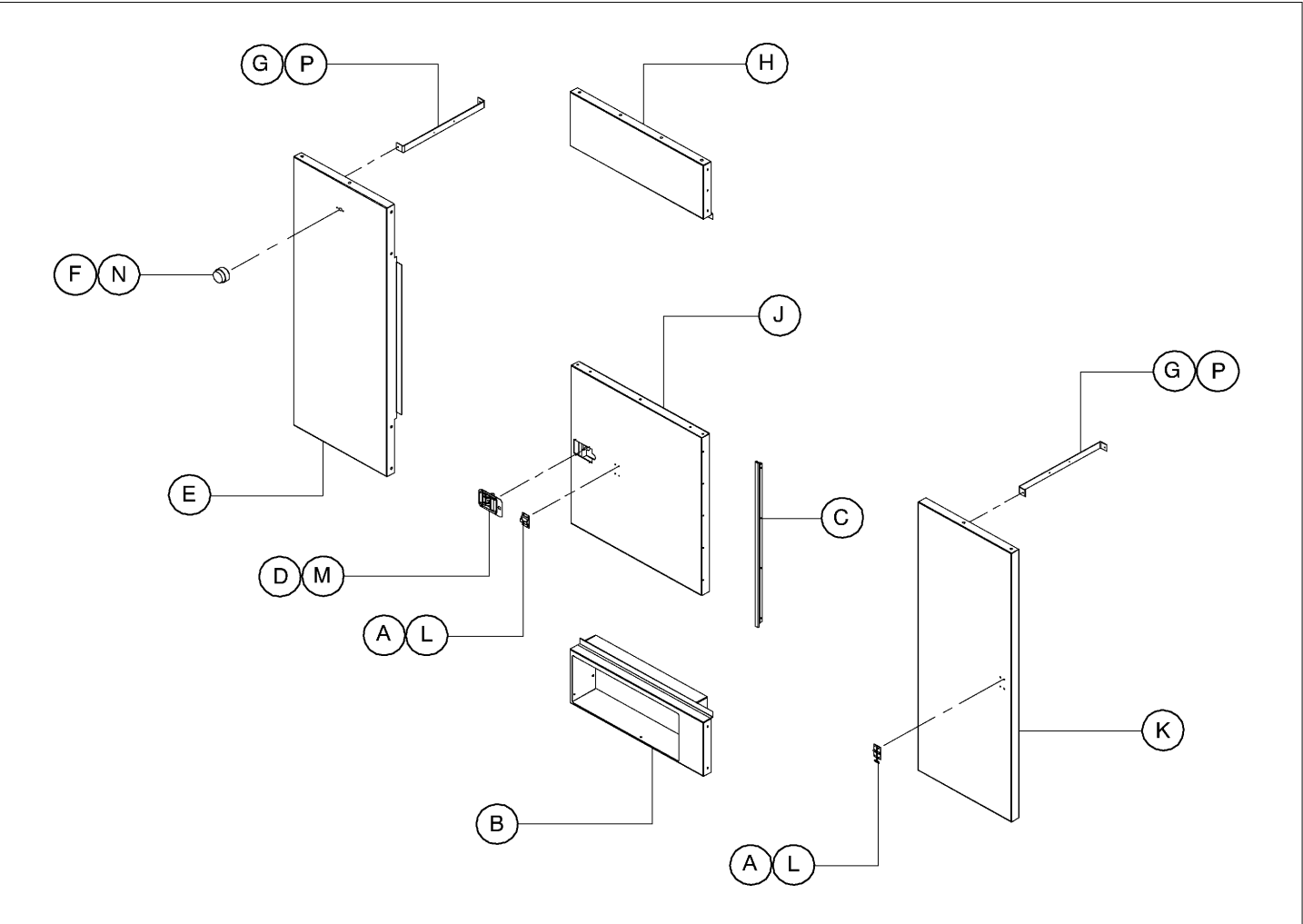


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	36924249	1	PANEL , FRONT BOTTOM				
B	54485404	1	LATCH , TEE				
C	36793602	1	LATCH , SLAM				
D	54483722	1	DOOR , FRONT				
E	54477286	1	LIGHT , AMBER WARNING				
F	36924017	1	PANEL , STREET SIDE FRONT				
G	54373113	1	HINGE , DOOR				
H	54461736	2	STRAP , SUPPORT				
J	36924066	1	PANEL , FRONT TOP				
K	36924009	1	PANEL , CURB SIDE FRONT				
L	36843282	8	RIVET				
M	36794816	4	RIVET				
N	35279025	----	SCREW				
P	96702055	4	SCREW				



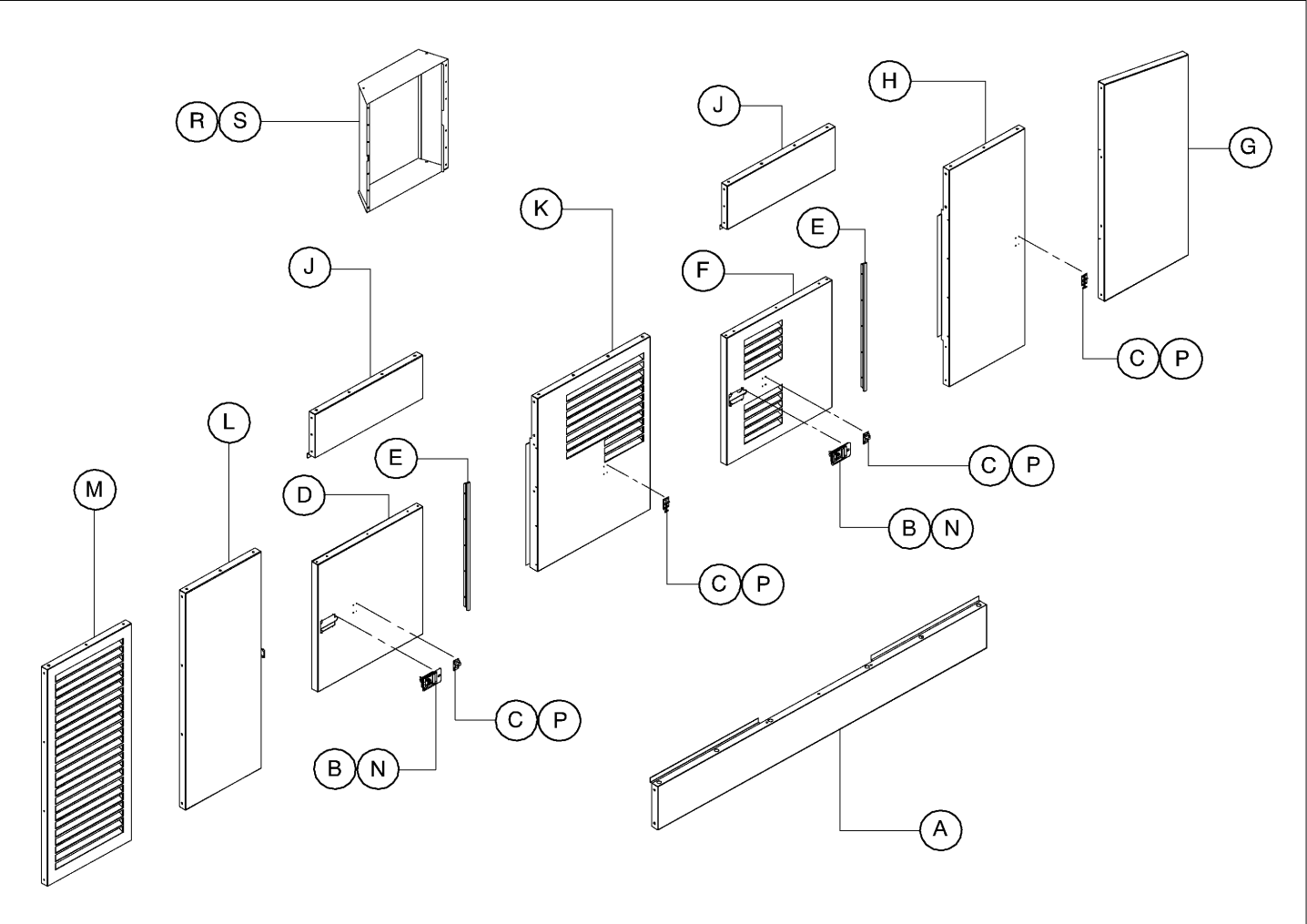
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	36924280	1	PANEL , BOTTOM CENTER				
B	54373113	1	HINGE , DOOR				
C	54483722	1	DOOR , STREET SIDE				
D	54485404	1	LATCH , TEE				
E	36793602	1	LATCH , SLAM				
F	54621560	1	DOOR , CONTROL PANEL				
G	54623889	1	HINGE , DOOR				
H	36924074	1	PANEL , REAR GRILL				
J	54737820	1	PANEL , CONTROL DOOR				
K	36924058	1	PANEL , TOP DOOR				
L	54656194	1	PANEL , CENTER GRILL				
M	36924140	1	PANEL , SECOND FRONT				
N	36924165	1	PANEL , FRONT SIDE				
P	35279025	----	SCREW				
Q	36794816	8	RIVET				
R	36843282	12	RIVET				
S	54737838	1	PLATE , RECEPTACLE ( 120V / 60 HZ )				
	54737846	1	PLATE , RECEPTACLE ( 240V / 50 HZ )				
	39249875	----	SEAL , DOOR ( AROUND EDGE OF EACH DOOR)				

ENCLOSURE REAR PANELS



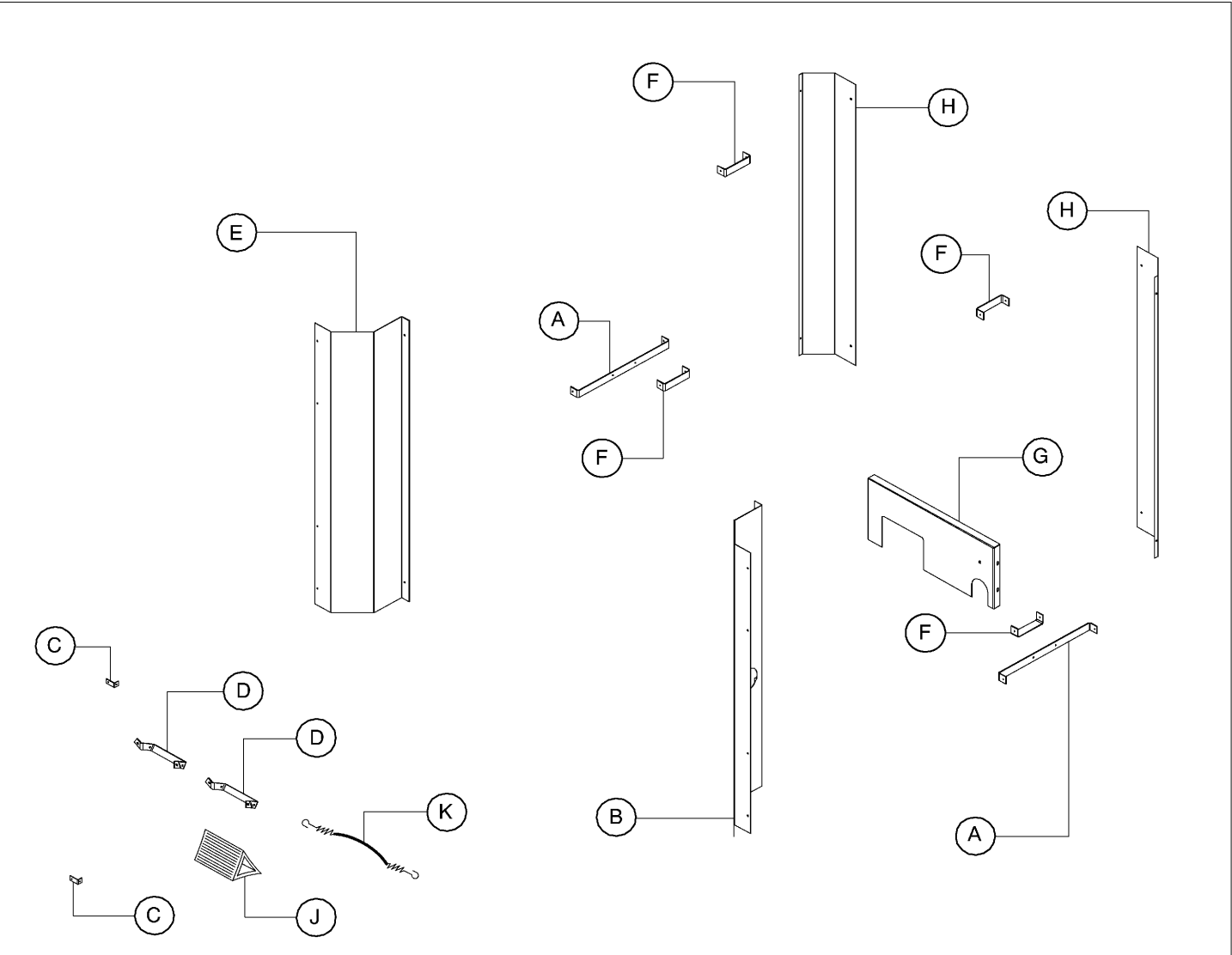
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54485404	1	LATCH , TEE				
B	54690755	1	PANEL , SERVICE ACCESS				
C	54373113	1	HINGE , DOOR				
D	36793602	1	LATCH , SLAM				
E	36924033	1	PANEL , STREET SIDE REAR				
F	54477286	1	LIGHT , AMBER WARNING				
G	54430855	1	STRAP , REAR SUPPORT				
H	36924058	1	PANEL , REAR MIDDLE TOP				
J	54483722	1	DOOR , REAR				
K	36924025	1	PANEL , CURB SIDE REAR				
L	36843282	8	RIVET				
M	36794816	4	RIVET				
N	96702055	2	SCREW				
P	36797652	4	SCREW				
Q	35279025	----	SCREW				

ENCLOSURE SIDE PANELS

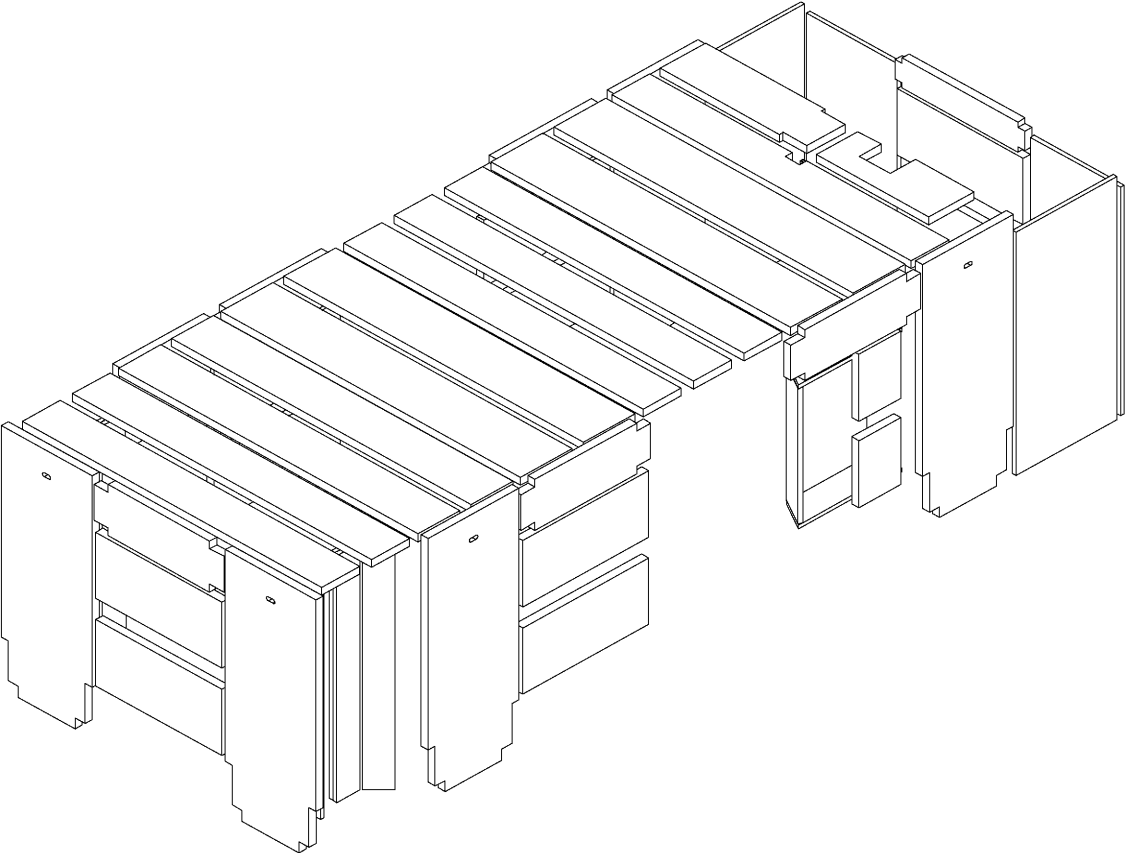
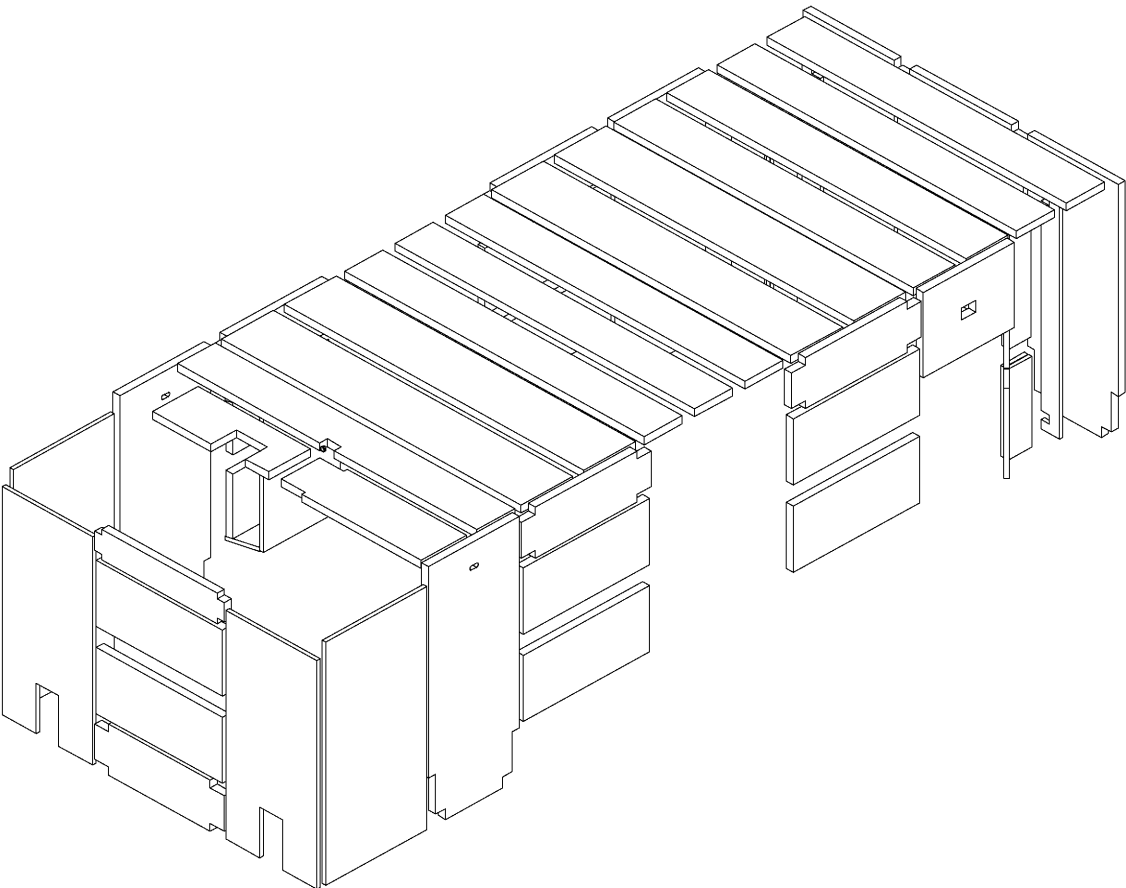


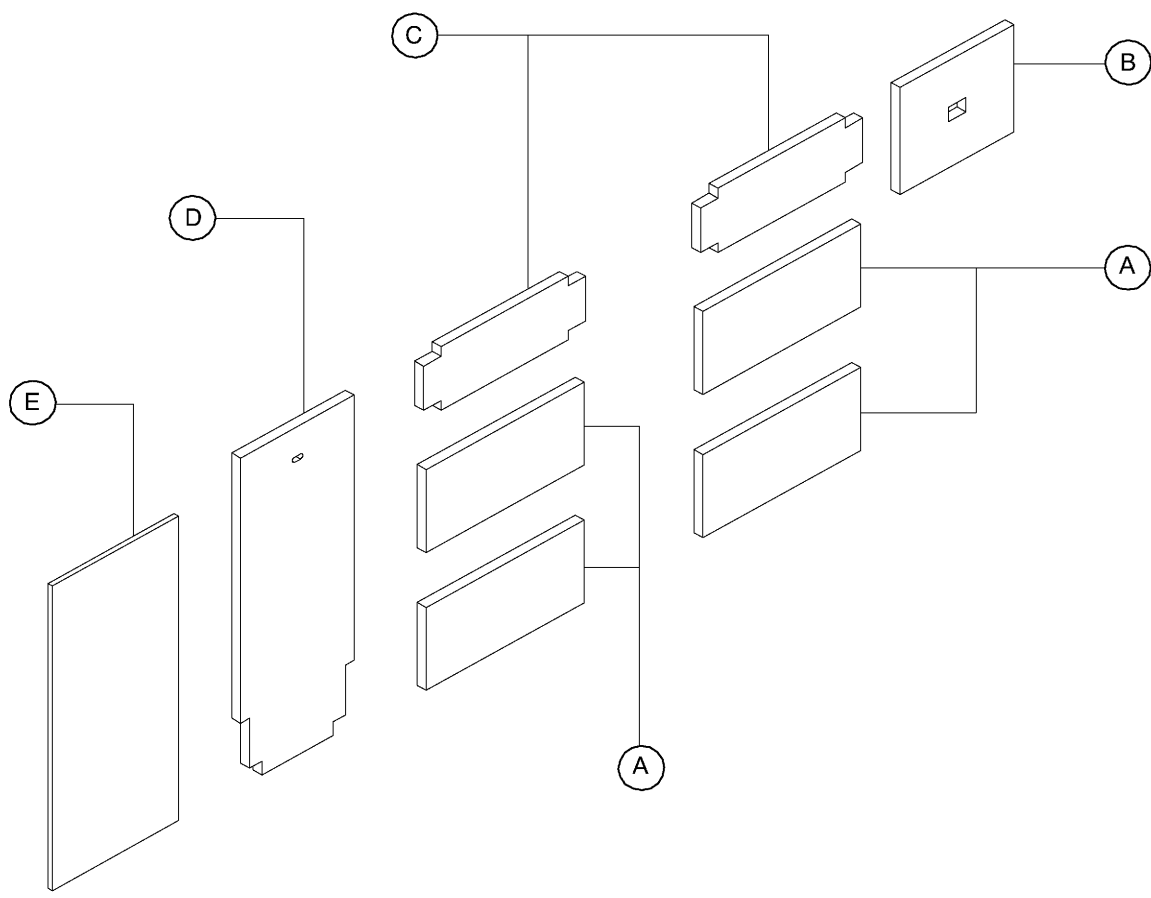
ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	36924280	1	PANEL , BOTTOM CENTER				
B	36793602	1	LATCH , SLAM				
C	54485404	1	LATCH , TEE				
D	54483722	1	DOOR , SIDE				
E	54373113	1	HINGE , DOOR				
F	36924173	1	DOOR , VENTED SIDE				
G	36924157	1	PANEL , CURB SIDE FRONT				
H	36924132	1	PANEL , CURB SIDE SECOND				
J	36924058	1	PANEL , TOP DOOR				
K	54656202	1	PANEL , CENTER GRILL				
L	36924090	1	PANEL , REAR SIDE				
M	36924074	1	PANEL , REAR GRILL				
N	36794816	8	RIVET				
P	36843282	12	RIVET				
Q	35279025	----	SCREW				
R	54419510	1	HOUSING , AIR INTAKE				
S	36797652	12	SCREW				
	39249875	----	SEAL , DOOR ( AROUND EDGE OF EACH DOOR)				

ENCLOSURE INTERNAL PANELS



ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54430855	1	BRACKET , SUPPORT				
B	54656228	1	BAFFLE , STREET SIDE INTAKE				
C	54656269	1	STRAP , FRONT FOAM				
D	35603661	1	BRACKET , WHEEL CHOCK				
E	54656210	1	BAFFLE , CURB SIDE INTAKE				
F	54656244	1	SUPPORT , INTAKE				
G	54690771	1	COVER , INTAKE				
H	54656236	1	BAFFLE , REAR INTAKE				
J	35603190	2	CHOCK , WHEEL				
K	35333830	2	STRAP , WHEEL CHOCK				

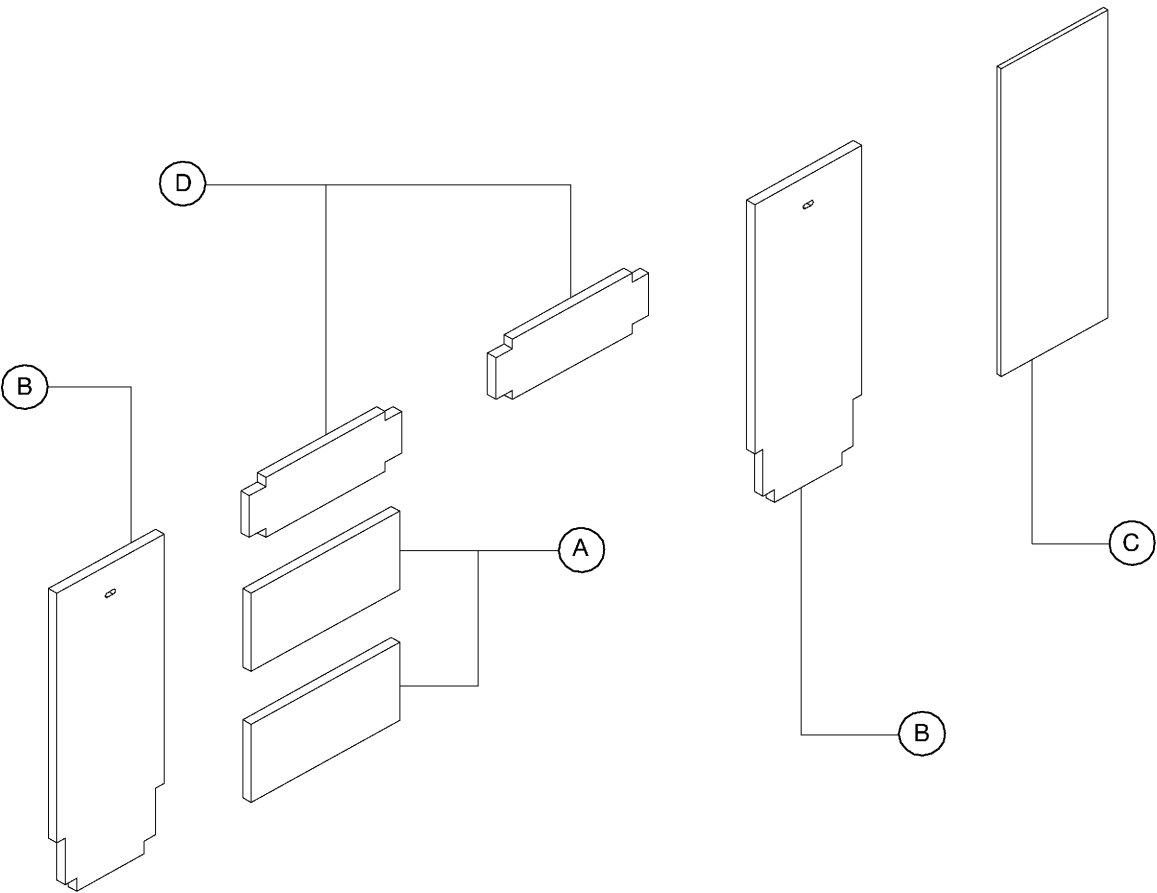




ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54659107	1	FOAM , DOOR				
B	54659131	1	FOAM , ABOVE CONTROL PANEL				
C	54659099	1	FOAM , ABOVE DOOR				
D	54659040	1	FOAM , SECOND PANEL				
E	54652425	1	FIBERGLASS , FRONT PANEL				

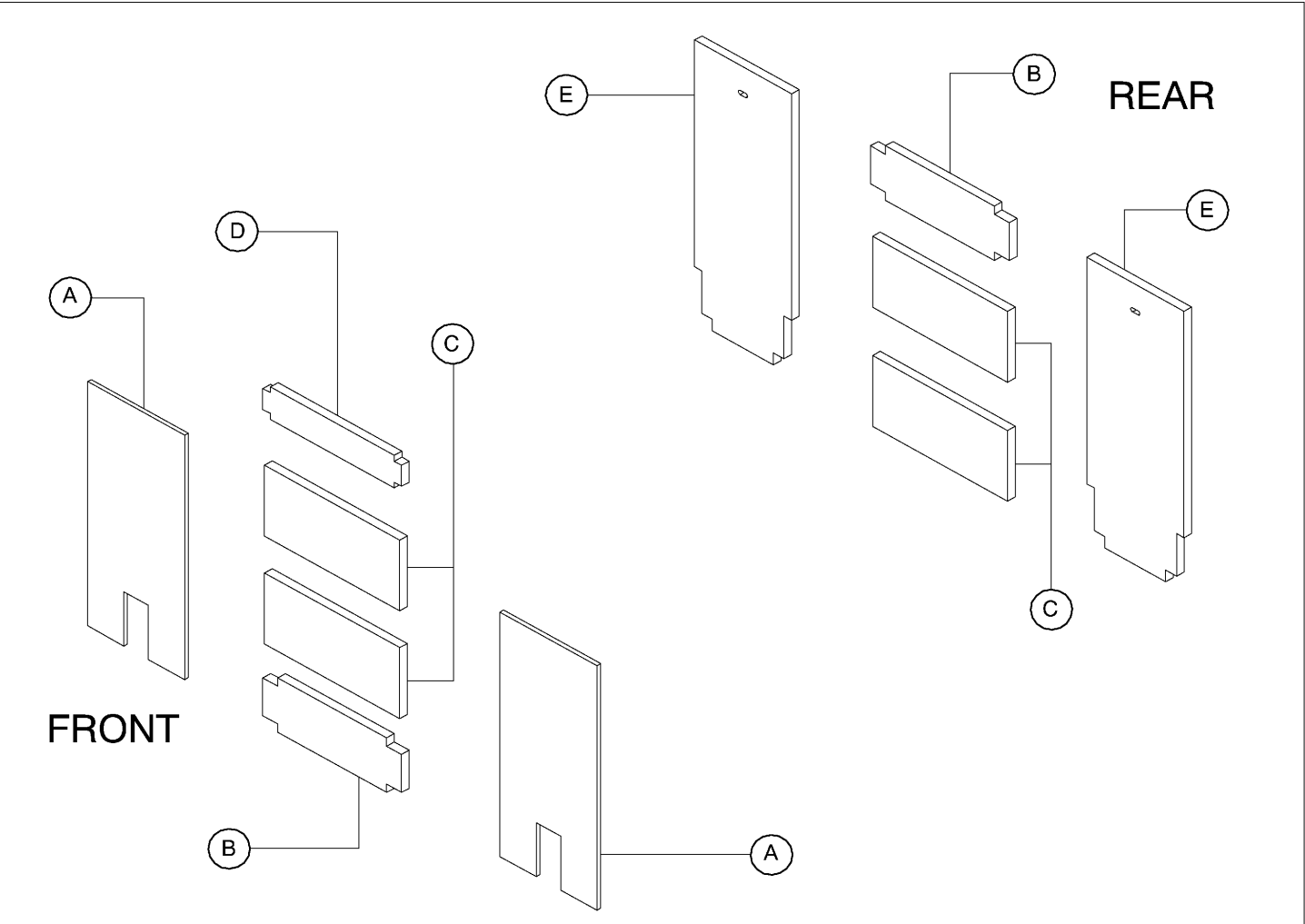


SIDE FOAM

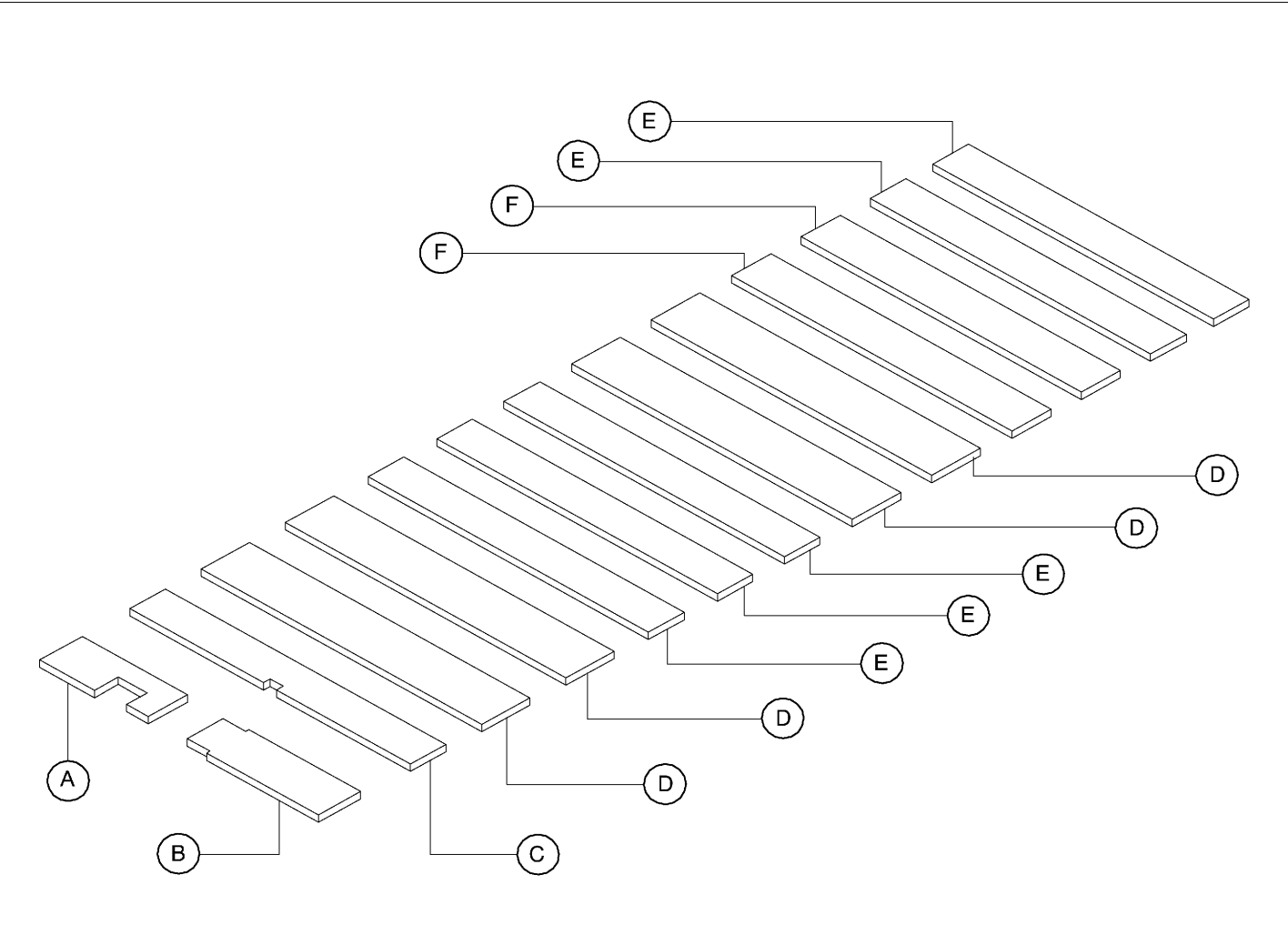


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54659107	1	FOAM , DOOR				
B	54659040	1	FOAM , SIDE				
C	54652425	1	FIBERGLASS , FRONT PANEL				
D	54659099	1	FOAM , ABOVE DOOR				

FRONT AND REAR FOAM

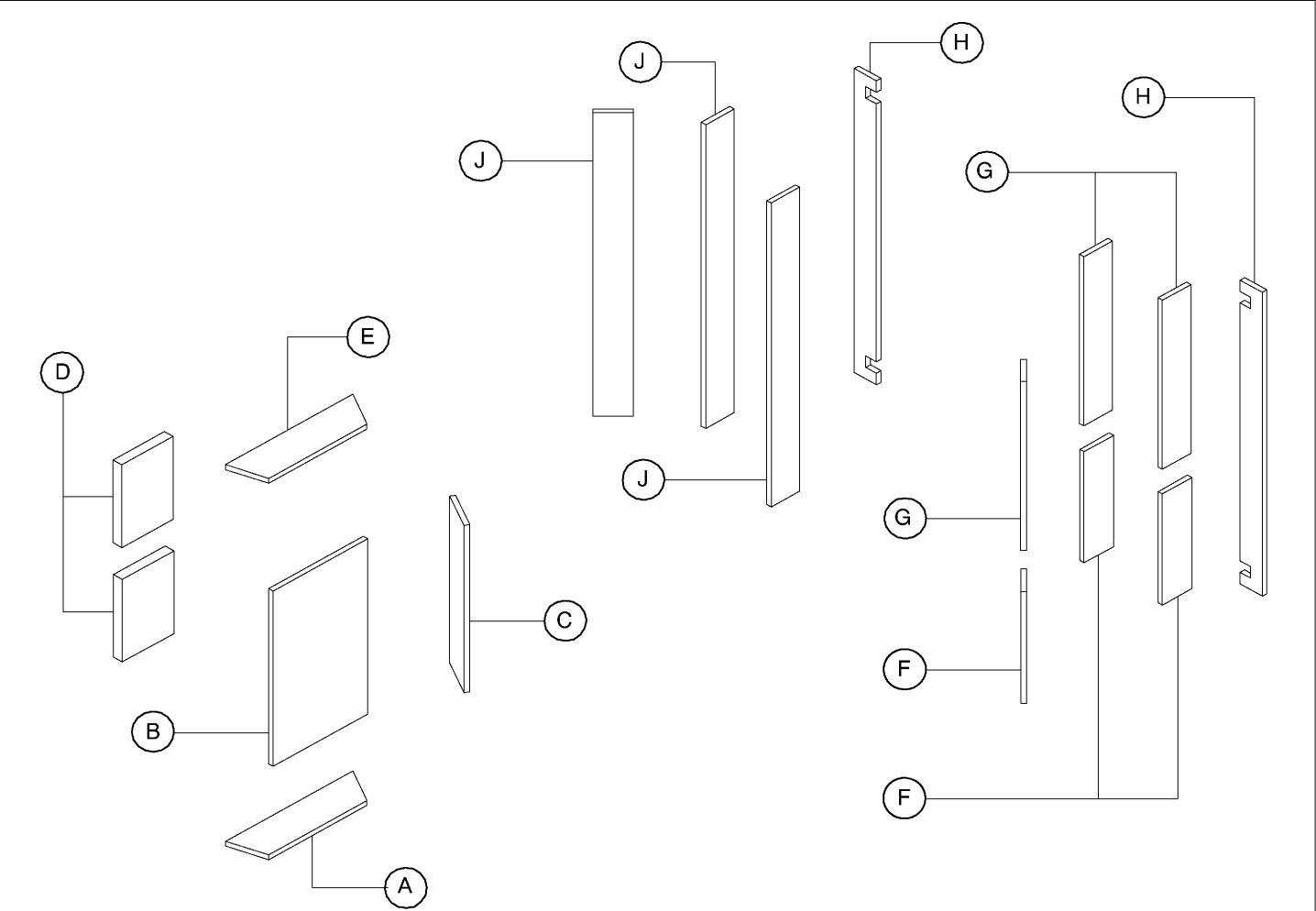


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54652417	1	FIBERGLASS , FRONT SIDE				
B	54659099	1	FOAM , BOTTOM & TOP DOOR				
C	54659107	1	FOAM , CENTER DOOR				
D	54659115	1	FOAM , OVER DOOR				
E	54659040	1	FOAM , REAR SIDE				

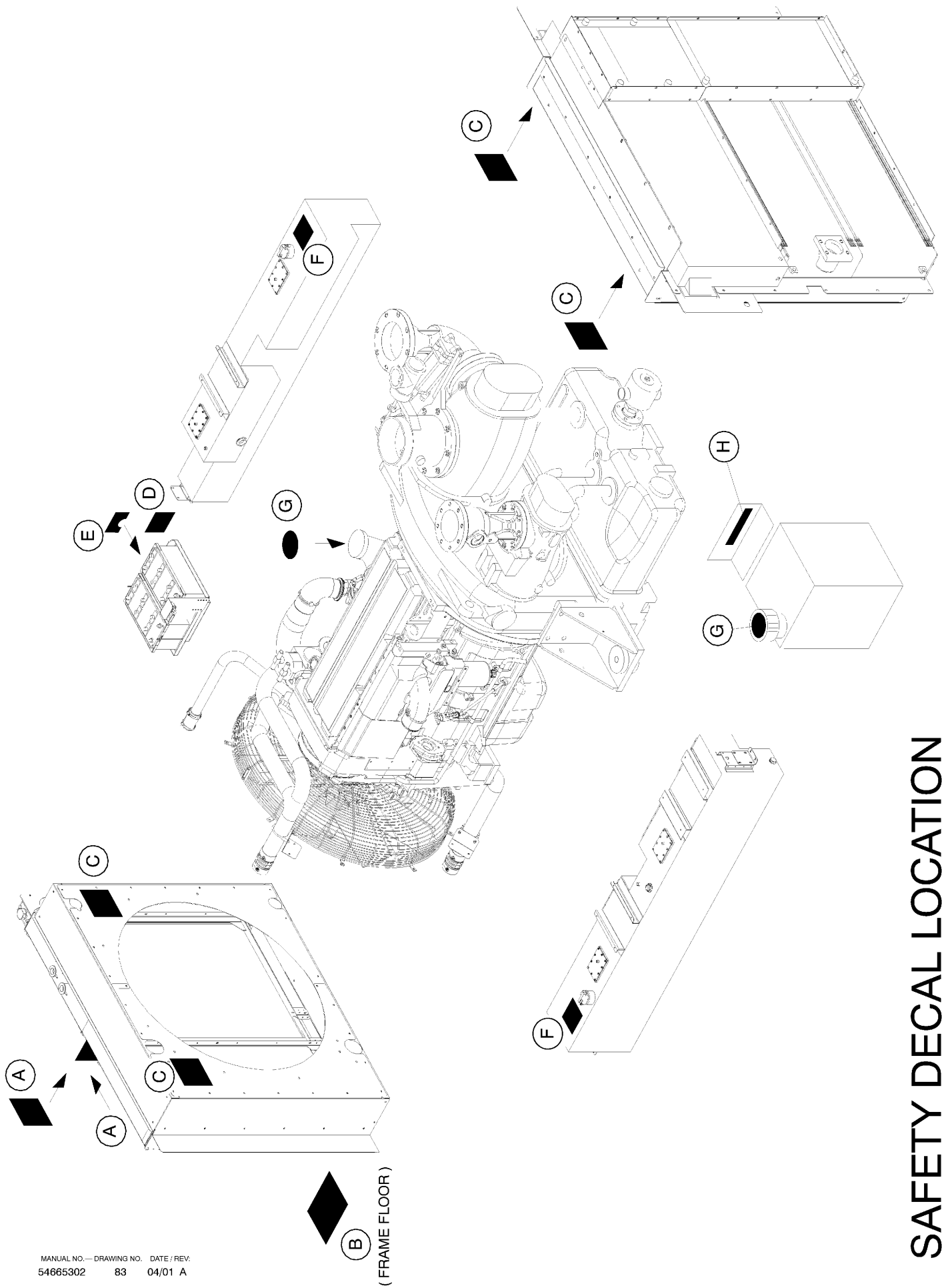


ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54659057	1	FOAM , CURB SIDE TOP				
B	54672274	1	FOAM , STREET SIDE TOP				
C	54672282	1	FOAM , FIRST TOP				
D	54659081	1	FOAM , 2ND, 3RD, 7TH, & 8TH TOP				
E	54659073	1	FOAM , 4TH, 5TH, 6TH, 11TH, & 12TH TOP				
F	54659123	1	FOAM , 9TH & 10TH TOP				

INSIDE BAFFLE FOAM



ITEM	CPN	QTY	DESCRIPTION	ITEM	CPN	QTY	DESCRIPTION
A	54659206	1	FOAM , BOTTOM INTAKE				
B	54659198	1	FOAM , BACK INTAKE				
C	54659032	1	FOAM , SIDE INTAKE				
D	54659180	1	FOAM , INSIDE INTAKE				
E	54659214	1	FOAM , TOP INTAKE				
F	54659164	1	FOAM , BOTTOM BAFFLE				
G	54659156	1	FOAM , TOP BAFFLE				
H	54659172	1	FOAM , REAR BAFFLE				
J	54659149	1	FOAM , CURB SIDE BAFFLE				



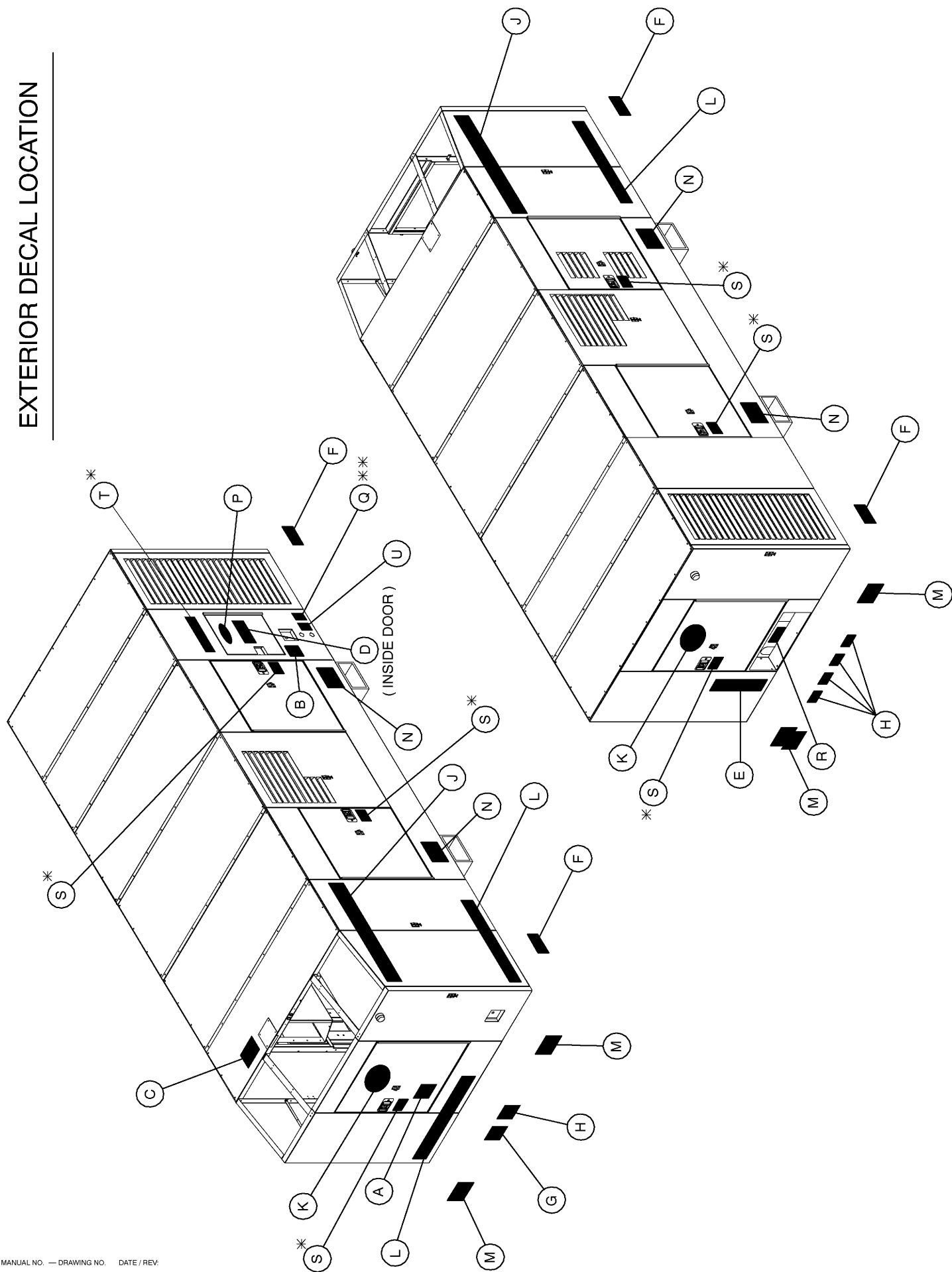
MANUAL NO. — DRAWING NO. DATE / REV:  
 54665302 83 04/01 A

# DECAL LOCATION

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	STANDARD	CE MARK	
		( DECAL SHEET - 54687256 )	
		LETTER	
(A)	54604962	G	COOLANT FILL DECAL ( 2 REQD )
(B)	54568761	E	HOT PRESSURIZED FLUID DECAL
(C)	54568779	B	ROTATING FAN DECAL ( 4 REQD )
(D)	54568753	C	COMBUSTIBLE GAS DECAL
(E)	54642327	54642327	BATTERY DISCONNECT DECAL
(F)	54625207	H	DIESEL FUEL DECAL ( 2 REQD )
(G)	54604970	54604970	OIL FILL PLUG DECAL ( 2 REQD )
(H)	54686852	54686852	TRANSDUCER LOCATION DECAL

# EXTERIOR DECAL LOCATION



## DECAL LOCATION

\* AUTOSTART OPTION ONLY

\*\* BATTERY CHARGER OPTION ONLY

STANDARD

CE MARK  
( DECAL SHEET - 54687256 )  
LETTER

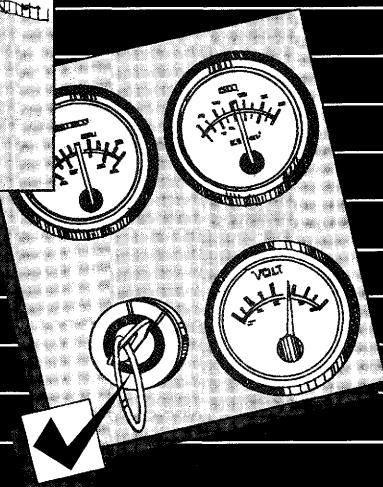
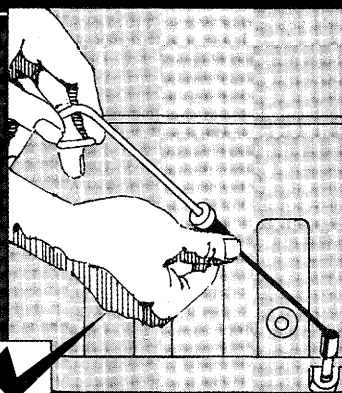
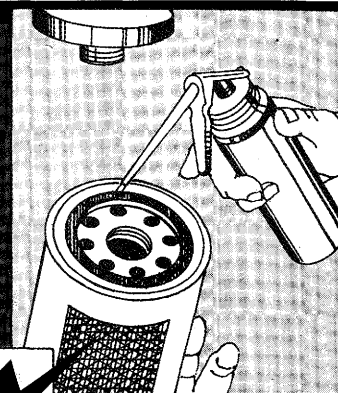
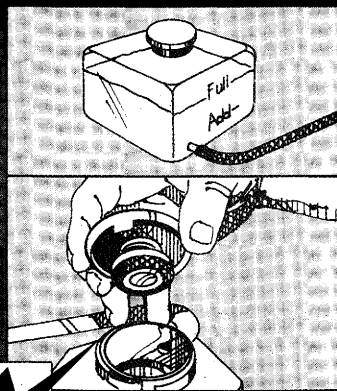
(A)	54604988	D	DOOR UNDER PRESSURE DECAL
(B)	54568787	N/A	NO UNAUTHORIZED MODIFICATIONS DECAL
(C)	54568761	E	HOT PRESSURIZED FLUID DECAL
(D)	54652532	54652532	OPERATING INSTRUCTIONS DECAL
(E)	54629944	J	3-PART DANGER / WARNING DECAL
(F)	54699400	A	LIFT POINT DECAL ( 4 REQD )
(G)	54699392	K	TOWING SPEED DECAL
(H)	54629977	54629977	CENTRAL DRAIN DECAL
(J)	54672324	54672332	CHEVRON DECAL ( 2 REQD )
(K)	54638333	54638333	IR SWOOSH DECAL ( 2 REQD )
(L)	54630181	N/A	OIL FREE AIR DECAL ( 3 REQD )
(M)	54749205	M	NO WELD DECAL ( 4 REQD )
(N)	54749213	N	FORK TUBE POCKETS DECAL ( 4 REQD )
(P)	54640024	54640024	I-R GENUINE PARTS DECAL
** (Q)	54749155	54749155	BATTERY CHARGER DECAL
(R)	54625207	H	DIESEL FUEL DECAL
* (S)	54687777	L	AUTOSTART WARNING DECAL ( 6 REQD )
* (T)	36511244	36511244	AUTOSTART DECAL
(U)	54749171	54749171	AC HEATER DECAL







# Operation and Maintenance Manual Industrial and Power Generation QSX15 Engines



Cummins Customer Assistance Center  
1-800-DIESELS (1-800-343-7357)  
APPLICABLE ONLY IN U.S.A. AND CANADA





NO POSTAGE  
NECESSARY  
IF MAILED  
IN THE  
UNITED STATES

**BUSINESS REPLY MAIL**

FIRST CLASS PERMIT NO. 15, COLUMBUS INDIANA

—POSTAGE WILL BE PAID BY ADDRESSEE—

Cummins Engine Company, Inc.  
Product Registration Dept. (CAC)  
P O Box 3005 M/C 91200  
Columbus, IN 47202-3005



In order to serve you better it is very important that you fill out and return this card **within 30 days of purchase.**

---

Customer Name \_\_\_\_\_

Address \_\_\_\_\_

City / State \_\_\_\_\_

Zip Code \_\_\_\_\_

Home Phone Number (\_\_\_\_) \_\_\_\_\_

Truck Phone / Cell Phone (\_\_\_\_) \_\_\_\_\_

E-mail Address \_\_\_\_\_

Engine Serial Number \_\_\_\_\_

Date Purchased \_\_\_\_/\_\_\_\_/\_\_\_\_ VIN # \_\_\_\_\_

THANK YOU!!

From: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Place  
Stamp  
Here

To: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Please refer to Section S of the Operation and Maintenance Manual for the address of your nearest Cummins distributor.

PRODUCT REGISTRATION CARD

Engine Serial Number: \_\_\_\_\_

Engine Model: \_\_\_\_\_

Equipment Name and Model: \_\_\_\_\_

Your Name: \_\_\_\_\_

Company Name: \_\_\_\_\_

Company Address: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

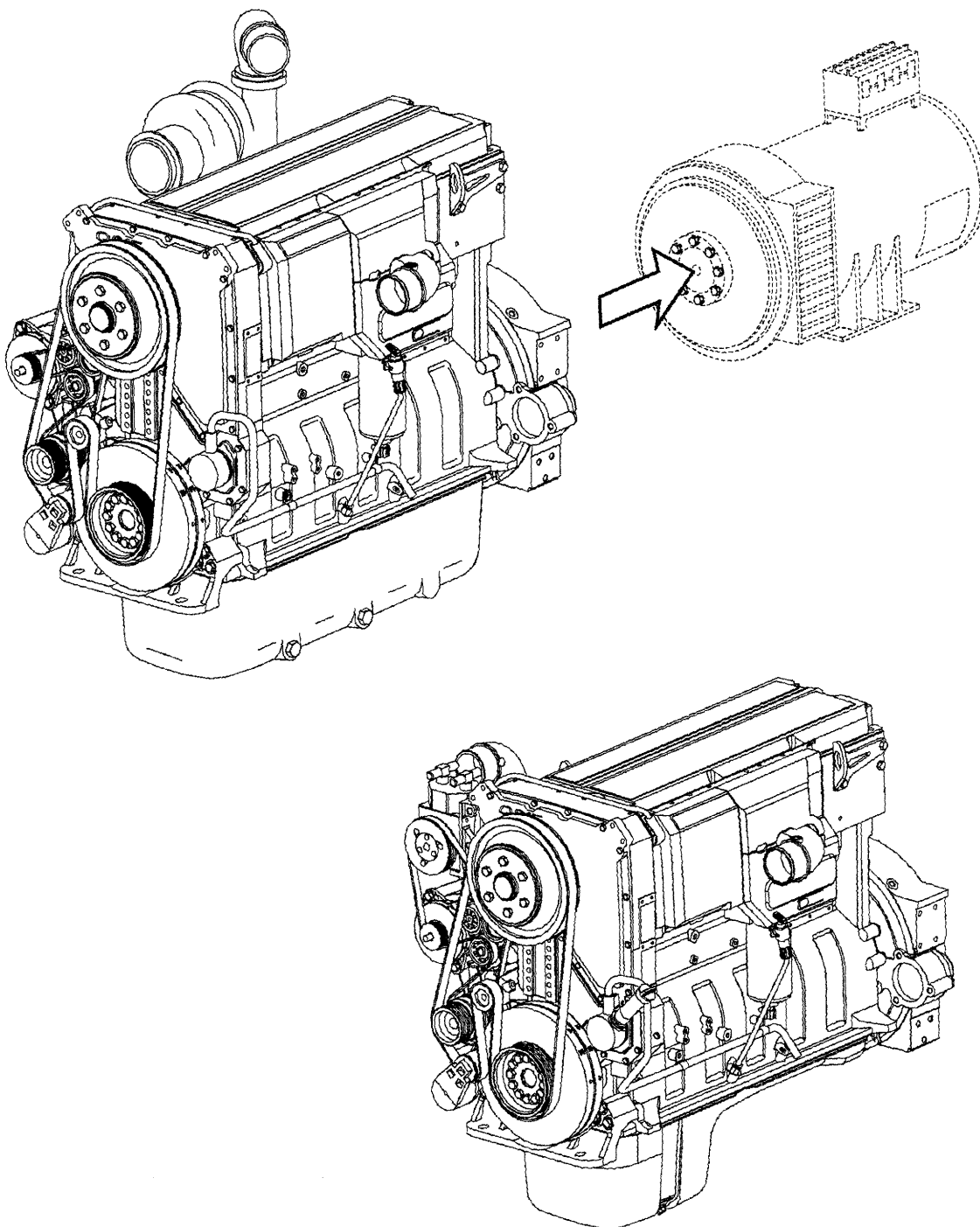
Company Phone No.: \_\_\_\_\_

Date Engine Went Into Service: \_\_\_\_\_

**Please fill in the above card and send to your local Cummins distributor. Cummins distributor addresses are found in Section S of this manual. This Product Registration Card is to inform your local Cummins distributor that you have purchased and are operating Cummins powered equipment. This notification will allow the local Cummins agent that you identified to contact you and discuss your future service requirements.**



# Operation and Maintenance Manual Industrial and Power Generation QSX15 Engines



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## Foreword

This manual contains information for the correct operation and maintenance of your Cummins engine. It also includes important safety information, engine and systems specifications, troubleshooting guidelines, and listings of Cummins Authorized Repair Locations and component manufacturers.

**Read and follow all safety instructions. Refer to the WARNING in the General Safety Instructions in Section i - Introduction.**

Keep this manual with the equipment. If the equipment is traded or sold, give the manual to the new owner.

The information, specifications, and recommended maintenance guidelines in this manual are based on information in effect at the time of printing. Cummins Engine Company, Inc. reserves the right to make changes at any time without obligation. If you find differences between your engine and the information in this manual, contact your local Cummins Authorized Repair Location or call 1-800-DIESELS (1-800-343-7357) toll free in the U.S. and Canada.

The latest technology and the highest quality components were used to produce this engine. When replacement parts are needed, we recommend using only genuine Cummins or ReCon® exchange parts. These parts can be identified by the following trademarks:



**Note: Warranty information is located in Section W. Make sure you are familiar with the warranty or warranties applicable to your engine.**

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# Important Reference Numbers

Fill in the part name and number in the blank spaces provided below. This will give you a reference whenever service or maintenance is required.

Part Name	Part Number	Part Number
Engine Model		
Engine Serial Number (ESN)		
Control Parts List (CPL)		
Fuel Pump Part Number		
Electronic Control Module (ECM)		
Electronic Control Module Serial Numbers (ECM)		
Filter Part Numbers:		
• Air Cleaner Element		
• Lubricating Oil Filter		
• Fuel		
• Fuel-Water Separator		
• Coolant		
• Remote Gas		
Governor Control Module (GCM) (if applicable)		
Belt Part Numbers:		
•		
•		
•		
Clutch or Marine Gear (if applicable):		
• Model		
• Serial Number		
• Part Number		
• Oil Type		
• Sea Water Pump		
– Model		
– Part Number		

## Section i - Introduction

### Section Contents

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## To the Owner and Operator

Preventative maintenance is the easiest and least expensive type of maintenance. Follow the maintenance schedule recommendations outlined in Maintenance Guidelines (Section 2).

Keep records of regularly scheduled maintenance.

Use the correct fuel, oil, and coolant in your engine as specified in Maintenance Specifications (Section V).

Cummins Engine Company, Inc. uses the latest technology and the highest quality components to produce its engines. Cummins recommends using **only** genuine Cummins parts and ReCon® exchange parts.

Personnel at Cummins Authorized Repair Locations have been trained to provide expert service and parts support. If you have a problem that can **not** be resolved by a Cummins Authorized Repair Location, follow the steps outlined in Service Assistance (Section S).

## About the Manual

This manual contains information needed to correctly operate and maintain your engine as recommended by Cummins Engine Company, Inc. Additional service literature can be ordered from your Cummins distributor. For problems with literature orders, contact 1-800-DIESELS (1-800-343-7357) (for U.S.A. and Canada).

This manual does **not** cover vehicle or equipment maintenance procedures. Consult the vehicle or equipment manufacturer for specific maintenance recommendations.

Both metric and U.S. customary values are listed in this manual. The metric value is listed first, followed by the U.S. customary in brackets.

Numerous illustrations and symbols are used to aid in understanding the meaning of the text. Refer to the complete listing of symbols and their definitions in this section.

Each section is preceded by a Section Contents to aid in locating information.

## How to Use the Manual

This manual is organized according to intervals at which maintenance on your engine is to be performed. A table that states the required intervals and the checks to be made is located in Section 2. Locate the interval at which you are performing maintenance. Then, follow the steps given in that section for all the procedures to be performed. In addition, all of the procedures done under previous maintenance intervals **must** be performed.

Keep a record of all the checks and inspections made. A record form for recording date, miles/kilometers or hours, and which maintenance checks were performed is located in Section 2.

Refer to Section TS for a guide to troubleshooting your engine. Follow the directions given in Section TS to locate and correct the cause of the symptom.

Refer to Section V for specifications recommended by Cummins Engine Company, Inc., for your engine. Specifications and torque values for each engine system are given in that section.

## Symbols

### General Information

The following symbols have been used in this manual to help communicate the intent of the instructions. When one of the symbols appears, it conveys the meaning defined below:



**WARNING** - Serious personal injury or extensive property damage can result if the warning instructions are **not** followed.



**CAUTION** - Minor personal injury can result or a part, an assembly, or the engine can be damaged if the caution instructions are **not** followed.



Indicates a **REMOVAL** or **DISASSEMBLY** step.



Indicates an **INSTALLATION** or **ASSEMBLY** step.



**INSPECTION** is required.



**CLEAN** the part or assembly.



**PERFORM** a mechanical or time **MEASUREMENT**.



**LUBRICATE** the part or assembly.



Indicates that a **WRENCH** or **TOOL SIZE** will be given.



**TIGHTEN** to a specific torque.



**PERFORM** an electrical **MEASUREMENT**.



Refer to another location in this manual or another publication for additional information.



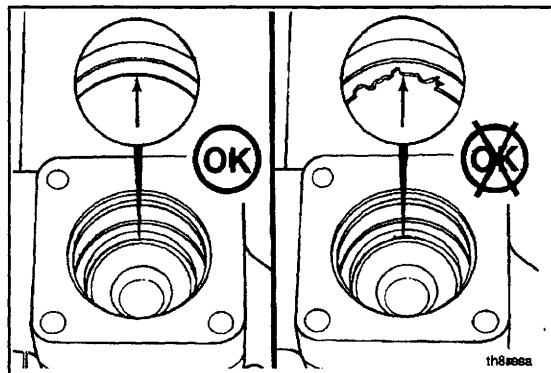
The component weighs 23 kg [50 lb] or more. To avoid personal injury, use a hoist or get assistance to lift the component.

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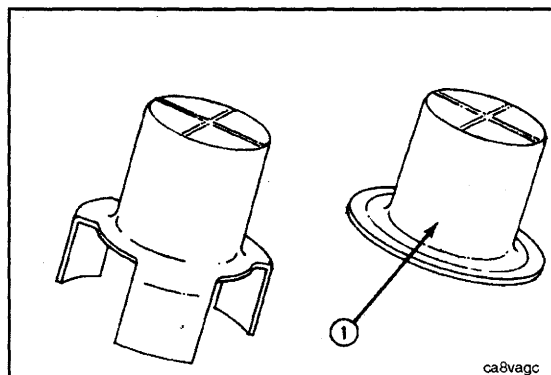
## Illustrations

### General Information

Some of the illustrations throughout this manual are generic and will **not** look exactly like the engine or parts used in your application. The illustrations can contain symbols to indicate an action required and an acceptable or **not** acceptable condition.



The illustrations are intended to show repair or replacement procedures. The procedure will be the same for all applications, although the illustration can differ.





## General Safety Instructions

### Important Safety Notice

#### **WARNING**

**Improper practices or carelessness can cause burns, cuts, mutilation, asphyxiation or other bodily injury or death.**

Read and understand all of the safety precautions and warnings before performing any repair. This list contains the general safety precautions that **must** be followed to provide personal safety. Special safety precautions are included in the procedures when they apply.

- Make sure the work area surrounding the product is dry, well lit, ventilated, free from clutter, loose tools, parts, ignition sources and hazardous substances. Be aware of hazardous conditions that can exist.
- **Always** wear protective glasses and protective shoes when working.
- Rotating parts can cause cuts, mutilation or strangulation.
- Do **not** wear loose-fitting or torn clothing. Remove all jewelry when working.
- Disconnect the battery (negative [-] cable first) and discharge any capacitors before beginning any repair work. Disconnect the air starting motor if equipped to prevent accidental engine starting. Put a "Do **Not** Operate" tag in the operator's compartment or on the controls.
- Use **ONLY** the proper engine barring techniques for manually rotating the engine. Do **not** attempt to rotate the crankshaft by pulling or prying on the fan. This practice can cause serious personal injury, property damage, or damage to the fan blade(s) causing premature fan failure.
- If an engine has been operating and the coolant is hot, allow the engine to cool before you slowly loosen the filler cap and relieve the pressure from the cooling system.
- Do **not** work on anything that is supported **ONLY** by lifting jacks or a hoist. **Always** use blocks or proper stands to support the product before performing any service work.
- Relieve all pressure in the air, oil, fuel and the cooling systems before any lines, fittings, or related items are removed or disconnected. Be alert for possible pressure when disconnecting any device from a system that utilizes pressure. Do **not** check for pressure leaks with your hand. High pressure oil or fuel can cause personal injury.
- To prevent suffocation and frostbite, wear protective clothing and **ONLY** disconnect fuel and liquid refrigerant (freon) lines in a well ventilated area. To protect the environment, liquid refrigerant systems **must** be properly emptied and filled using equipment that prevents the release of refrigerant gas (fluorocarbons) into the atmosphere. Federal law requires capturing and recycling refrigerant.
- To avoid personal injury, use a hoist or get assistance when lifting components that weigh 23 kg [50 lb] or more. Make sure all lifting devices such as chains, hooks, or slings are in good condition and are of the correct capacity. Make sure hooks are positioned correctly. **Always** use a spreader bar when necessary. The lifting hooks **must not** be side-loaded.
- Corrosion inhibitor, a component of SCA and lubricating oil, contains alkali. Do **not** get the substance in your eyes. Avoid prolonged or repeated contact with skin. Do **not** swallow internally. In case of contact, immediately wash skin with soap and water. In case of contact, immediately flood eyes with large amounts of water for a minimum of 15 minutes. **IMMEDIATELY CALL A PHYSICIAN. KEEP OUT OF REACH OF CHILDREN.**
- Naptha and Methyl Ethyl Ketone (MEK) are flammable materials and **must** be used with caution. Follow the manufacturer's instructions to provide complete safety when using these materials. **KEEP OUT OF REACH OF CHILDREN.**
- To avoid burns, be alert for hot parts on products that have just been turned off, and hot fluids in lines, tubes, and compartments.
- **Always** use tools that are in good condition. Make sure you understand how to use them before performing any service work. Use **ONLY** genuine Cummins or Cummins ReCon® replacement parts.
- **Always** use the same fastener part number (or equivalent) when replacing fasteners. Do **not** use a fastener of lesser quality if replacements are necessary.
- Do **not** perform any repair when fatigued or after consuming alcohol or drugs that can impair your functioning.
- Some state and federal agencies in the United States of America have determined that used engine oil can be carcinogenic and can cause reproductive toxicity. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil.
- Coolant is toxic. If **not** reused, dispose of in accordance with local environmental regulations.

## General Repair Instructions

### General Information

This engine incorporates the latest technology at the time it was manufactured; yet, it is designed to be repaired using normal repair practices performed to quality standards.

- **Cummins Engine Company, Inc. does not recommend or authorize any modifications or repairs to engines or components except for those detailed in Cummins Service Information. In particular, unauthorized repair to safety-related components can cause personal injury or death. Below is a partial listing of components classified as safety-related:**

Air Compressor  
Air Controls  
Air Shutoff Assemblies  
Balance Weights  
Cooling Fan  
Fan Hub Assembly  
Fan Mounting Bracket(s)  
Fan Mounting Capscrews  
Fan Hub Spindle  
Flywheel  
Flywheel Crankshaft Adapter

Flywheel Mounting Capscrews  
Fuel Shutoff Assemblies  
Fuel Supply Tubes  
Lifting Brackets  
Throttle Controls  
Turbocharger Compressor Casing  
Turbocharger Oil Drain Line(s)  
Turbocharger Oil Supply Line(s)  
Turbocharger Turbine Casing  
Vibration Damper Mounting Capscrews

- **Follow all safety instructions noted in the procedures**
  - Follow the manufacturer's recommendations for cleaning solvents and other substances used during the repair of the engine. Some solvents and used engine oil have been identified by government agencies as toxic or carcinogenic. Avoid excessive breathing, ingestion and contact with such substances. **Always** use good safety practices with tools and equipment.
- **Provide a clean environment and follow the cleaning instructions specified in the procedures**
  - The engine and its components **must** be kept clean during any repair. Contamination of the engine or components will cause premature wear.
- **Perform the inspections specified in the procedures**
- **Replace all components or assemblies which are damaged or worn beyond the specifications**
- **Use genuine Cummins new or ReCon® service parts and assemblies**
  - The assembly instructions have been written to use again as many components and assemblies as possible. When it is necessary to replace a component or assembly, the procedure is based on the use of new Cummins or Cummins ReCon® components. All of the repair services described in this manual are available from all Cummins Distributors and most Dealer locations.
- **Follow the specified disassembly and assembly procedures to avoid damage to the components**

Complete rebuild instructions are available in the shop manual which can be ordered or purchased from a Cummins Authorized Repair Location. Refer to Section L — Service Literature for ordering instructions.

### Welding on a Vehicle with an Electronic Controlled Fuel System

#### CAUTION

**Disconnect both the positive (+) and negative (-) battery cables from the battery before welding on the vehicle. Attach the welder ground cable no more than 0.61 meters [2 feet] from the part being welded. Do not connect the ground cable of the welder to the ECM cooling plate or ECM. Welding on the engine or engine mounted components is not recommended.**

## Acronyms and Abbreviations

### General Information

<b>AFC</b>	Air Fuel Control	<b>kPa</b>	Kilopascal
<b>API</b>	American Petroleum Institute	<b>LNG</b>	Liquid Natural Gas
<b>ASA</b>	Air Signal Attenuator	<b>LTA</b>	Low Temperature Aftercooling
<b>ASTM</b>	American Society of Testing and Materials	<b>MIP</b>	Mixer Inlet Pressure
<b>°C</b>	Celsius	<b>MPa</b>	Megapascal
<b>CARB</b>	California Air Resources Board	<b>mph</b>	Miles Per Hour
<b>C.I.D.</b>	Cubic Inch Displacement	<b>mpq</b>	Miles Per Quart
<b>CNG</b>	Compressed Natural Gas	<b>N•m</b>	Newton-meter
<b>CPL</b>	Control Parts List	<b>NG</b>	Natural Gas
<b>cSt</b>	Centistokes	<b>OEM</b>	Original Equipment Manufacturer
<b>ECM</b>	Electronic Control Module	<b>ppm</b>	Parts Per Million
<b>ECS</b>	Emission Control System	<b>psi</b>	Pounds Per Square Inch
<b>EPA</b>	Environmental Protection Agency	<b>PTO</b>	Power Takeoff
<b>EPS</b>	Engine Position Sensor	<b>rpm</b>	Revolutions Per Minute
<b>°F</b>	Fahrenheit	<b>SAE</b>	Society of Automotive Engineers
<b>GVW</b>	Gross Vehicle Weight	<b>SCA</b>	Supplemental Coolant Additive
<b>Hg</b>	Mercury	<b>STC</b>	Step Timing Control
<b>hp</b>	Horsepower	<b>VS</b>	Variable Speed
<b>H<sub>2</sub>O</b>	Water	<b>VSS</b>	Vehicle Speed Sensor
<b>ICM</b>	Ignition Control Module		
<b>km/l</b>	Kilometers per Liter		

## Section E - Engine Identification

### Section Contents

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## Engine Identification

### Engine Dataplate

The engine dataplate, located on top of the rocker lever cover, provides the model identification and other important data about the engine.

Have the following engine data available when communicating with a Cummins Authorized Repair Location. The data on the dataplate are **mandatory** when sourcing service parts:

1. Engine serial number (ESN)
2. Control parts list
3. Model
4. Advertised horsepower and rpm.

Engine Cert. ID	Displacement pouce	CPL	Model Modele	FEL	EPA	CARB	E.C.S.	 <p><b>IMPORTANT ENGINE INFORMATION:</b> This engine conforms to U.S. EPA and California regulations applicable to Model Year New Heavy Duty Diesel Engines. This engine has a primary intended service application as a heavy heavy-duty diesel engine. This engine is certified to operate on diesel fuel. This engine is not certified for use in and urban bus as defined at 40 CFR 85.093-2. Sales of this engine for use in an urban bus is a violation of Federal Law under the Clean Air Act.</p>
Fuel Rail/Alt. Advert. HP	Debit/Combust. a Pulss. Indiquee	Engine No. Moteur No.	NOx			Date of Mfg. Date Fabrication		
Advertised HP	At	Family	Pm			Inj. Timing Code		
Pulse Iniques (ch)	a	Family				Coureur d'injection		
Valve Lash Cold (mm)	Int. Adm.	Exh. Ech.	Ref. No.			Idle Speed (RPM) Vitesse Rotative		

Made in U.S.A.  
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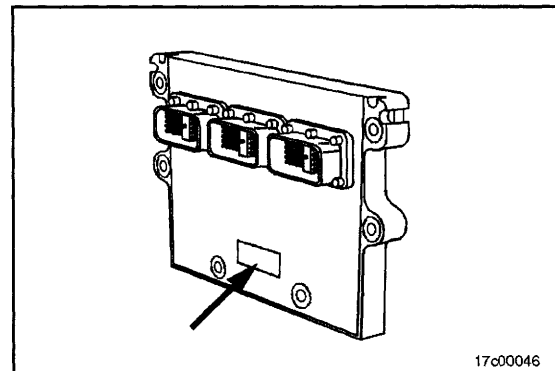
### ECM Dataplate

#### Industrial

The electronic control module (ECM) dataplate is located on the front of the ECM.

The abbreviations on the dataplate are explained as follows:

- P/N = Part number
- S/N = Serial number
- D/C = Date code.



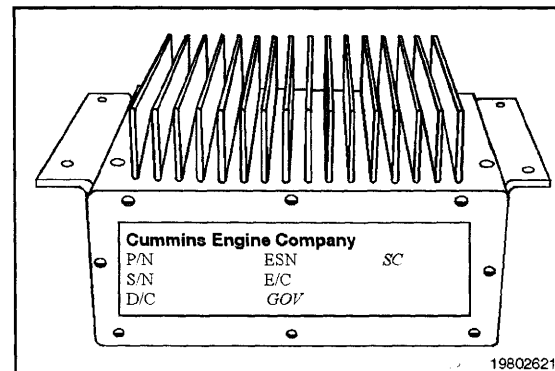
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#### Power Generation

The electronic control module (ECM) dataplate is located on the front of the ECM.

The abbreviations on the dataplate are explained as follows:

- P/N = Part number
- S/N = Serial number
- D/C = Date code.



19802621

## Specifications

### General Specifications

Listed below are general specifications for this engine.

Horsepower .....	Refer to the engine dataplate
Engine Speed .....	Refer to the engine dataplate
Displacement .....	15 liters [912 C.I.D.]
Bore and Stroke .....	137 mm [5.40 in] x 169 mm [6.65 in]
Dry Engine Weight:	
Power Generation .....	1370 kg [3020 lb]
Industrial .....	1524 kg [3360 lb]
Wet Engine Weight:	
Power Generation .....	1475 kg [3250 lb]
Industrial .....	1628 kg [3590 lb]
Firing Order .....	1-5-3-6-2-4
Crankshaft Rotation (viewed from front of engine) .....	<b>Clockwise</b>
Overhead Adjustment:	
Intake Valve Adjustment .....	0.36 mm [0.014 in]
Exhaust Valve Adjustment .....	0.69 mm [0.027 in]
Injector Lash Adjustment Torque .....	8 N•m [70 in-lb]
Engine Brake Adjustment .....	7.0 mm [0.276 in]

### Fuel System

Maximum Allowable Restriction to Pump with or without Fuel Cooler:	
With Clean Filter .....	203 mm Hg [8 in Hg]
With Dirty Filter .....	305 mm Hg [12 in Hg]
Maximum Allowable Fuel Return Line Restriction .....	229 mm Hg [9.0 in Hg]
Minimum Allowable Fuel Tank Vent Capability .....	2.0 m <sup>3</sup> /hr [70 ft <sup>3</sup> /hr]
Maximum Allowable Fuel Inlet Temperature .....	71°C [160°F]
Fuel Shutoff Solenoids' Resistance .....	7 to 8 ohms

### Lubricating Oil System

Oil Pressure at Idle (minimum allowable at 93°C [200°F] oil temperature) .....	103 kPa [15 psi]
Oil Pressure at No-Load Governed Speed (industrial <b>only</b> ) .....	241 to 276 kPa [35 to 40 psi]
Oil Capacity of Standard Engine:	
Combination Full-Flow/Bypass Filter Capacity .....	3.78 liters [1 gal]
Oil Pan Capacity:	
Power Generation (OP 1493)	
High .....	94.6 liters [25 gal]
Low .....	83.3 liters [22 gal]
Oil Change Capacity (oil pan and filter filled to capacity) .....	98.4 liters [26 gal]
Oil Pan Capacity:	
Industrial	
High .....	41.6 liters [11 gal]
Low .....	34.1 liters [9 gal]
Oil Change Capacity (oil pan and filter filled to capacity) .....	45.4 liters [12 gal]
Total Lubricating Oil System Capacity Including Filter:	
Power Generation (OP 1493) .....	98.4 liters [26 gal]
Industrial .....	45.4 liters [12 gal]
Oil Pressure Range:	
Cold Engine .....	Up to 900 kPa [130 psi]
Warm Engine .....	241 to 276 kPa [35 to 40 psi]

## Cooling System

Coolant Capacity (engine <b>only</b> )	24 liters [25 qt]
Standard Modulating Thermostat Range	82 to 93°C [180 to 200°F]
Maximum Coolant Pressure (exclusive of pressure cap - closed thermostat at the maximum no-load governed speed)	227 kPa [33 psi]
Coolant Alarm Activation Temperature (industrial <b>only</b> )	110°C [230°F]
Maximum Allowable Top Tank Temperature:	
Industrial	102°C [215°F]
Power Generation (Standby/Prime)	110°C [230°F]/104°C [220°F]
Minimum Recommended Top Tank Temperature	70°C [158°F]
Minimum Allowable Drawdown or 11 Percent of System Capacity (whichever is greater)	2.6 liters [2.75 qt]
Minimum Recommended Pressure Cap	
Industrial	50 kPa [7 psi]
Power Generation	70 kPa [10 psi]
Minimum Fill Rate (without low-level alarm)	19 liters/min [5 gpm]
Maximum Deaeration Time	25 minutes
Fan-on Coolant Temperature (industrial <b>only</b> )	95°C [203°F]
Fan-on Intake Air Temperature (industrial <b>only</b> )	66°C [150°F]
Shutter Opening Temperature (industrial <b>only</b> ):	
Coolant	85°C [185°F]
Intake Air	60°C [140°F]

## Air Intake System

### △ CAUTION △

**Engine intake air must be filtered to prevent dirt and debris from entering the engine. If air intake piping is damaged or loose, unfiltered air will enter the engine and cause premature wear.**

Maximum Temperature Rise between Ambient Air and Engine Air Inlet (ambient above 0°C [32°F]):	
Industrial	-1°C [30°F]
Power Generation	6°C [43°F]
Maximum Inlet Restriction (clean filter) Normal-Duty Element:	381 mm H <sub>2</sub> O [15 in H <sub>2</sub> O]
Maximum Inlet Restriction (dirty filter)	635 mm H <sub>2</sub> O [25 in H <sub>2</sub> O]
Maximum Allowable Pressure Drop across Charge Air Cooler:	
Industrial	
psi	14 kPa [2 psi]
Hg (mercury)	102 mm Hg [4 in Hg]
Maximum Allowable Pressure Drop from Turbo Outlet to Intake Manifold:	
Power Generation	
psi	14 kPa [2 psi]
Hg (mercury)	102 mm Hg [4 in Hg]
Four-Step Wastegate Controller Solenoid Resistance (industrial <b>only</b> )	7 to 8 ohms



## Exhaust System

Maximum Allowable Exhaust Back Pressure Created by Piping and Silencer:

Industrial	
- Hg (mercury)	76 mm Hg [3 in Hg]
- H <sub>2</sub> O (water)	1016 mm H <sub>2</sub> O [40 in H <sub>2</sub> O]
Power Generation	
-Hg (mercury)	51 mm Hg [2 in Hg]
-H <sub>2</sub> O (water)	682 mm H <sub>2</sub> O [27 in H <sub>2</sub> O]

Exhaust Pipe Size (normally acceptable inside diameter):

Industrial	127 mm [5 in]
Power Generation	152 mm [6 in]

## Electrical System

Minimum Recommended Battery Capacity:

System Voltage		Ambient Temperatures	
		-18°C [0°F]	
		Cold Cranking Amperes	Reserve Capacity* Amperes
12 VDC	Industrial	2700	360
	Power Generation	1800	540
24 VDC**	Industrial	1350	360
	Power Generation	900	270

\* The number of plates within a given battery size determines reserve capacity. Reserve capacity determines the length of time that sustained cranking can occur.

\*\*CCA ratings are based on two 12-VDC batteries in series.

A minimum of 6 VDC at the OEM connector is required to power up the ECM.

## Batteries (Specific Gravity)

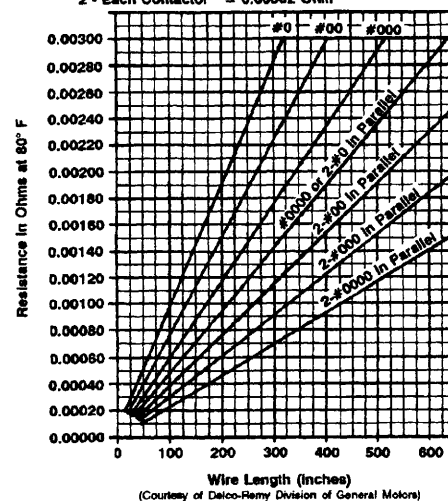
Specific Gravity at 27°C [80°F]	State of Charge
1.26 to 1.28	100%
1.23 to 1.25	75%
1.20 to 1.22	50%
1.17 to 1.19	25%
1.11 to 1.13	Discharged

Maximum resistance of starting motor circuit:

12-VDC Starting Motor (ohms) 0.00075  
24-VDC Starting Motor (ohms) 0.002

Cable resistances can be obtained in the accompanying Battery Cable Resistance Chart. If the frame is in ground circuit, the frame length **must** be considered to be a cable of the same size as that used in the balance of the system.

Deduct the Following from the Total Circuit Resistance Recommended Before Determining Wire Sizes for a Given Length:  
1 - Each Connection = 0.00001 Ohm  
2 - Each Contactor = 0.00002 Ohm



(Courtesy of Delco-Remy Division of General Motors)

oi800v07

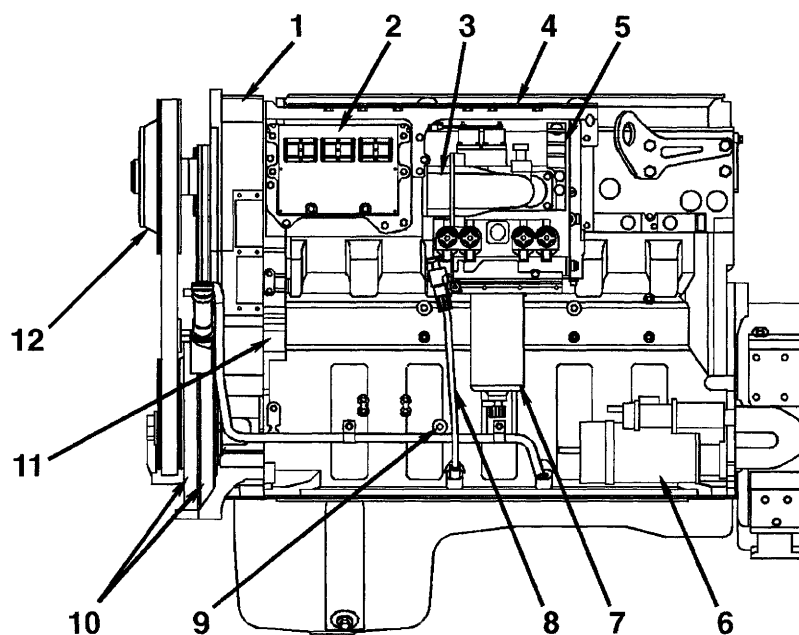
Item  
Connection  
Additional Contactor  
(Series-Parallel Switch,  
Relays, etc.)

Resistance Ohms  
0.00001  
0.00020

## Engine Diagrams

### Engine Views

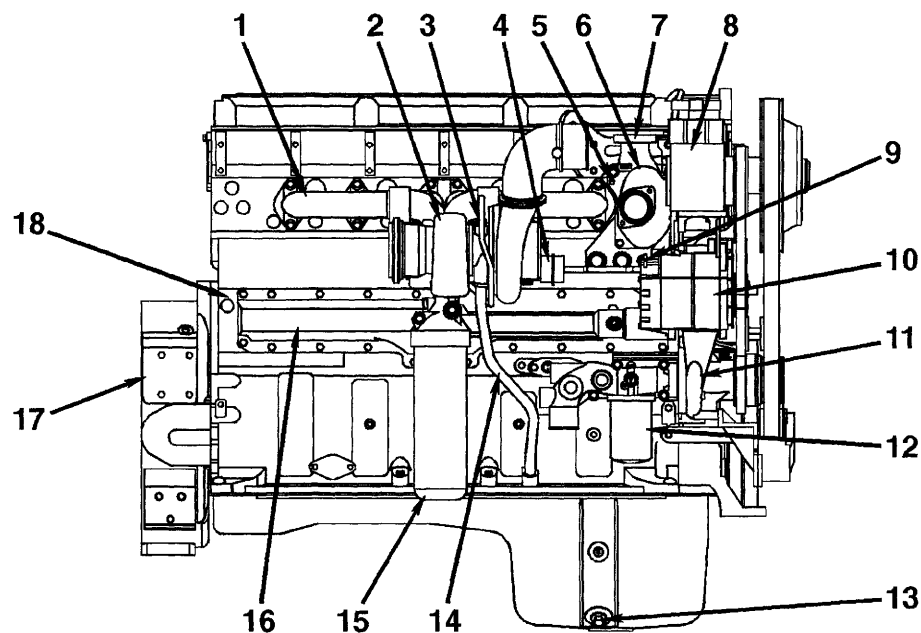
The following illustrations show the locations of the major external engine components, filters, and other service and maintenance points. Some external components will be at different locations for different engine models.



00c00054

**Intake Side  
Industrial**

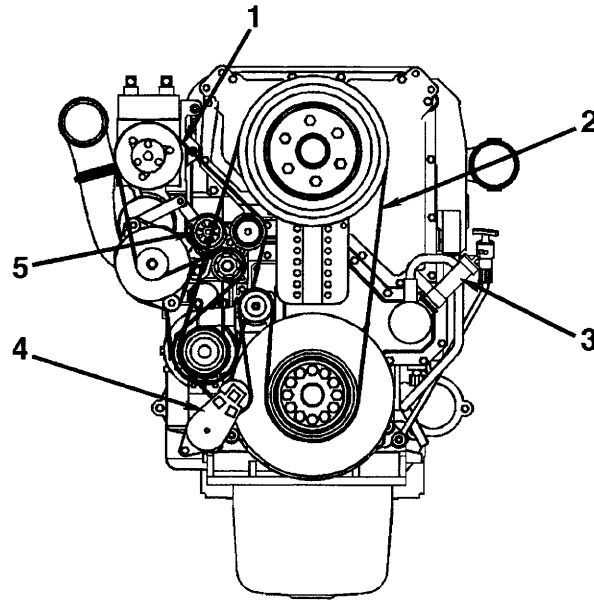
- |                                    |                                   |
|------------------------------------|-----------------------------------|
| 1. Gear Housing                    | 7. Fuel Filter                    |
| 2. Electronic Control Module (ECM) | 8. Lubricating Oil Dipstick       |
| 3. Air Intake                      | 9. Crankshaft Timing Pin Port     |
| 4. Engine Dataplate                | 10. Vibration Dampers             |
| 5. Fuel Pump                       | 11. Barring Device/Air Compressor |
| 6. Starter                         | 12. Fan Hub.                      |



00c00055

**Exhaust Side  
Industrial**

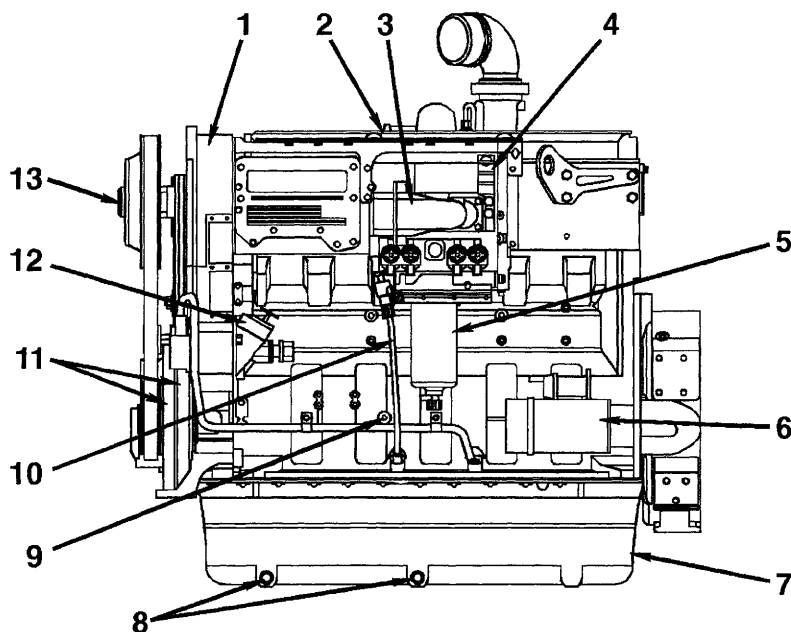
- |  |   |
|--|---|
| 1. Exhaust Manifold                    | 10. Alternator  |
| 2. Turbocharger                        | 11. Water Pump  |
| 3. Oil Inlet to Turbocharger           | 12. Coolant Filter                                      |
| 4. Wastegate Actuator                  | 13. Lubricating Oil Drain                               |
| 5. Thermostat Housing Vent             | 14. Turbocharger Oil Drain                              |
| 6. Thermostat Housing                  | 15. Combination Full Flow/Bypass Lubricating Oil Filter |
| 7. Engine Coolant Outlet (to Radiator) | 16. Lubricating Oil Cooler Assembly                     |
| 8. Freon Compressor                    | 17. Flywheel Housing                                    |
| 9. Coolant Temperature Sensor          | 18. Engine Serial Number.                               |



00c00056

**Front  
Industrial**

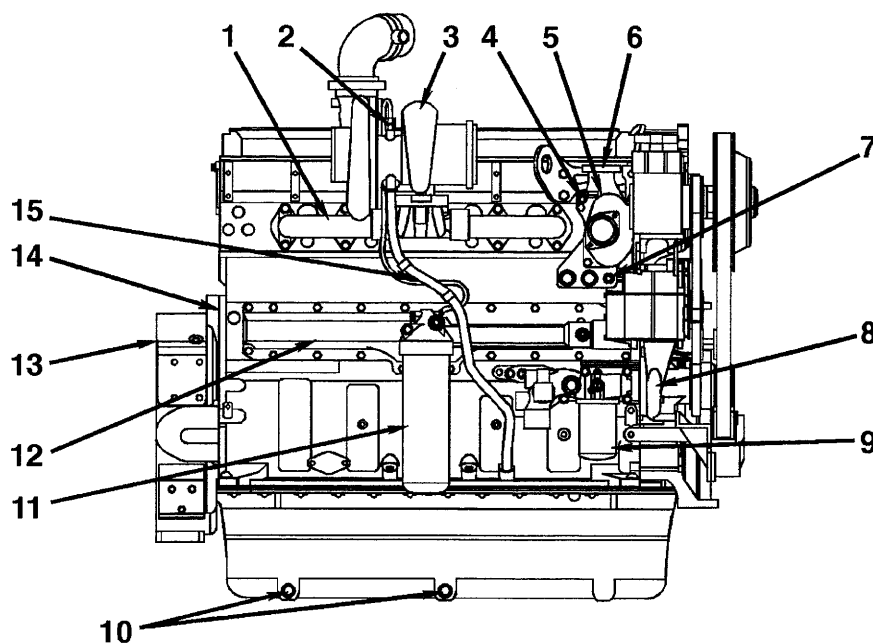
1. Accessory Drive Belt
2. Water Pump/Fan Drive Belt
3. Lubricating Oil Fill
4. Water Pump/Fan Drive Belt Tensioner
5. Accessory Drive Belt Tensioner.



00c00057

**Intake Side  
Power Generation**

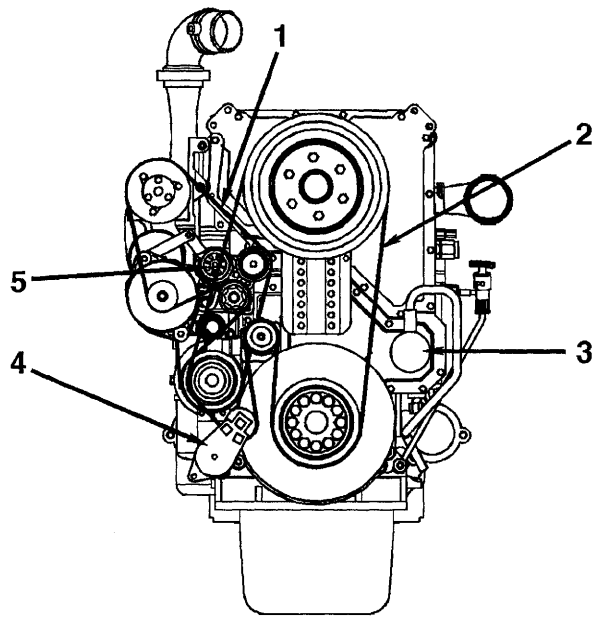
- |                     |   |
|---------------------|---|
| 1. Gear Cover       | 7. Lubricating Oil Pan                  |
| 2. Engine Dataplate | 8. Lubricating Oil Drains               |
| 3. Air Intake       | 9. Crankshaft Timing Pin Port           |
| 4. Fuel Pump        | 10. Lubricating Oil Dipstick            |
| 5. Fuel Filter      | 11. Vibration Dampers                   |
| 6. Starter          | 12. Lubricating Oil Fill/Barring Device |
|                     | 13. Fan Hub.                            |



00c00058

**Exhaust Side  
Power Generation**

- |  |   |
|--|---|
| 1. Exhaust Manifold                      | 9. Coolant Filter                                       |
| 2. Lubricating Oil Inlet to Turbocharger | 10. Lubricating Oil Drains                              |
| 3. Turbocharger                          | 11. Combination Full Flow/Bypass Lubricating Oil Filter |
| 4. Thermostat Housing Vent               | 12. Lubricating Oil Cooler Assembly                     |
| 5. Thermostat Housing                    | 13. Flywheel Housing                                    |
| 6. Engine Coolant Outlet (to Radiator)   | 14. Engine Serial Number                                |
| 7. Coolant Temperature Sensor            | 15. Turbocharger Lubricating Oil Drain.                 |
| 8. Water Pump                            |   |



00c00059

**Front**  
**Power Generation**

1. Accessory Drive Belt
2. Water Pump/Fan Drive Belt
3. Crankcase Breather
4. Water Pump/Fan Drive Belt Tensioner
5. Accessory Drive Belt Tensioner.



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# Section 1 - Operating Instructions

## Section Contents

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## Operating Instructions - General Information

Correct care of your engine will result in longer life, better performance, and more economical operation.

Follow the daily maintenance checks listed in Maintenance Guidelines, Section 2.

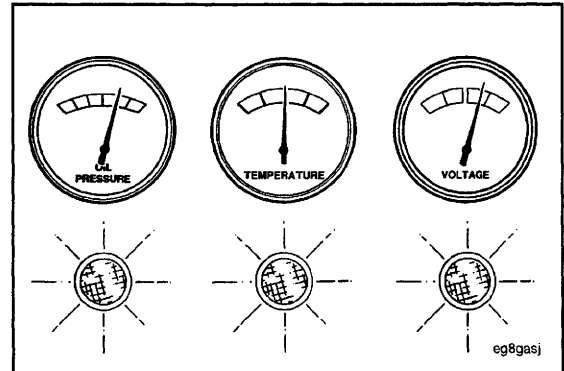
The new Cummins engine associated with this manual does **not** require a break-in procedure. Section 1 of this manual provides all of the necessary information required for correct engine operation.



Cummins Engine Maintenance Schedule: Oil or					
Daily or Running	Every 25,000 km (15,500 mi), 100 Hours or 1 Year	Every 50,000 km (31,000 mi), 200 Hours or 2 Years	Every 100,000 km (62,000 mi), 400 Hours or 4 Years	Every 200,000 km (125,000 mi), 800 Hours or 8 Years	Every 400,000 km (250,000 mi), 1600 Hours or 16 Years
<b>Maintenance Checks:</b>	<b>Change Oil:</b>	<b>Change Oil:</b>	<b>Maintenance Checks:</b>	<b>Change Oil:</b>	<b>Maintenance Checks:</b>
<ul style="list-style-type: none"> <li>Check operator's report</li> <li>Check and correct engine oil level</li> <li>Check fuel lines and hoses</li> <li>Check water level</li> <li>Check coolant level</li> <li>Check air filter</li> <li>Check exhaust system</li> <li>Check battery</li> <li>Check electrical system</li> <li>Check for leaks</li> <li>Check for unusual noises</li> <li>Check for unusual vibrations</li> <li>Check for unusual smells</li> <li>Check for unusual smoke</li> <li>Check for unusual engine temperature</li> <li>Check for unusual engine speed</li> <li>Check for unusual engine load</li> <li>Check for unusual engine fuel consumption</li> <li>Check for unusual engine oil consumption</li> <li>Check for unusual engine wear</li> <li>Check for unusual engine damage</li> <li>Check for unusual engine failure</li> </ul>	<ul style="list-style-type: none"> <li>Replace engine oil</li> <li>Check and correct engine oil level</li> <li>Check fuel lines and hoses</li> <li>Check water level</li> <li>Check coolant level</li> <li>Check air filter</li> <li>Check exhaust system</li> <li>Check battery</li> <li>Check electrical system</li> <li>Check for leaks</li> <li>Check for unusual noises</li> <li>Check for unusual vibrations</li> <li>Check for unusual smells</li> <li>Check for unusual smoke</li> <li>Check for unusual engine temperature</li> <li>Check for unusual engine speed</li> <li>Check for unusual engine load</li> <li>Check for unusual engine fuel consumption</li> <li>Check for unusual engine oil consumption</li> <li>Check for unusual engine wear</li> <li>Check for unusual engine damage</li> <li>Check for unusual engine failure</li> </ul>	<ul style="list-style-type: none"> <li>Replace engine oil</li> <li>Check and correct engine oil level</li> <li>Check fuel lines and hoses</li> <li>Check water level</li> <li>Check coolant level</li> <li>Check air filter</li> <li>Check exhaust system</li> <li>Check battery</li> <li>Check electrical system</li> <li>Check for leaks</li> <li>Check for unusual noises</li> <li>Check for unusual vibrations</li> <li>Check for unusual smells</li> <li>Check for unusual smoke</li> <li>Check for unusual engine temperature</li> <li>Check for unusual engine speed</li> <li>Check for unusual engine load</li> <li>Check for unusual engine fuel consumption</li> <li>Check for unusual engine oil consumption</li> <li>Check for unusual engine wear</li> <li>Check for unusual engine damage</li> <li>Check for unusual engine failure</li> </ul>	<ul style="list-style-type: none"> <li>Check all hose connections for leaks or disconnections</li> <li>Check the engine and fan</li> <li>Check the exhaust system</li> <li>Check the engine oil level</li> <li>Check the engine coolant level</li> <li>Check the engine air filter</li> <li>Check the engine battery</li> <li>Check the engine electrical system</li> <li>Check for leaks</li> <li>Check for unusual noises</li> <li>Check for unusual vibrations</li> <li>Check for unusual smells</li> <li>Check for unusual smoke</li> <li>Check for unusual engine temperature</li> <li>Check for unusual engine speed</li> <li>Check for unusual engine load</li> <li>Check for unusual engine fuel consumption</li> <li>Check for unusual engine oil consumption</li> <li>Check for unusual engine wear</li> <li>Check for unusual engine damage</li> <li>Check for unusual engine failure</li> </ul>	<ul style="list-style-type: none"> <li>Change the coolant</li> <li>Check the engine and fan</li> <li>Check the exhaust system</li> <li>Check the engine oil level</li> <li>Check the engine coolant level</li> <li>Check the engine air filter</li> <li>Check the engine battery</li> <li>Check the engine electrical system</li> <li>Check for leaks</li> <li>Check for unusual noises</li> <li>Check for unusual vibrations</li> <li>Check for unusual smells</li> <li>Check for unusual smoke</li> <li>Check for unusual engine temperature</li> <li>Check for unusual engine speed</li> <li>Check for unusual engine load</li> <li>Check for unusual engine fuel consumption</li> <li>Check for unusual engine oil consumption</li> <li>Check for unusual engine wear</li> <li>Check for unusual engine damage</li> <li>Check for unusual engine failure</li> </ul>	<ul style="list-style-type: none"> <li>Check all hose connections for leaks or disconnections</li> <li>Check the engine and fan</li> <li>Check the exhaust system</li> <li>Check the engine oil level</li> <li>Check the engine coolant level</li> <li>Check the engine air filter</li> <li>Check the engine battery</li> <li>Check the engine electrical system</li> <li>Check for leaks</li> <li>Check for unusual noises</li> <li>Check for unusual vibrations</li> <li>Check for unusual smells</li> <li>Check for unusual smoke</li> <li>Check for unusual engine temperature</li> <li>Check for unusual engine speed</li> <li>Check for unusual engine load</li> <li>Check for unusual engine fuel consumption</li> <li>Check for unusual engine oil consumption</li> <li>Check for unusual engine wear</li> <li>Check for unusual engine damage</li> <li>Check for unusual engine failure</li> </ul>

Check the oil pressure indicators, temperature indicators, warning lights, and other gauges daily to make sure they are operational.

Avoid exposure of your engine to corrosive chemicals.



### ⚠ WARNING ⚠

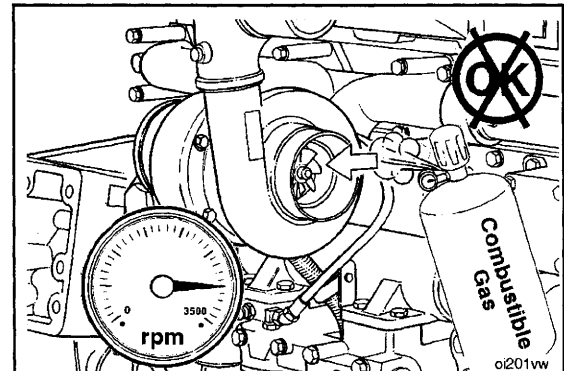
Do not operate a diesel engine where there are or can be combustible vapors. These vapors can be sucked through the air intake system and cause engine acceleration and overspeeding, which can result in a fire, an explosion, and extensive property damage.

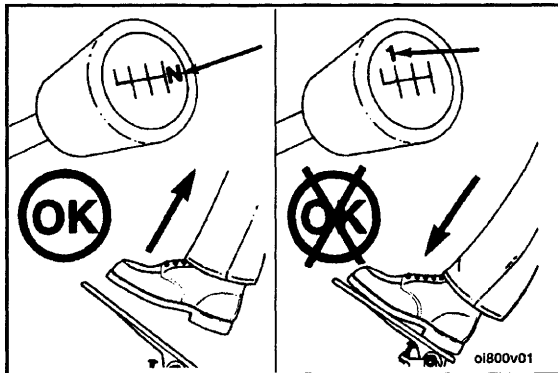
### ⚠ WARNING ⚠

Numerous safety devices are available, such as air intake shutoff devices, to minimize the risk of overspeeding in which an engine, because of application, might operate in a combustible environment (from a fuel spill or gas leak, for example).

### ⚠ WARNING ⚠

Cummins Engine Company, Inc., does not know how you will use your engine. The equipment owner and operator, therefore, is responsible for safe operation in a hostile environment. Consult your Cummins Authorized Repair Location for further information.





## Normal Starting Procedure

### General Information

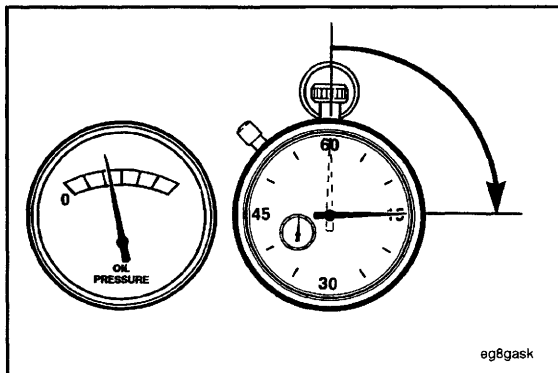
#### ⚠ CAUTION ⚠

To prevent damage to the starter, do not engage the starting motor for more than 30 seconds. Wait 2 minutes between each attempt to start (electrical starting motors only).

Disengage the driven unit, or, if equipped, put the transmission in neutral. On generator sets, open the main circuit breaker.

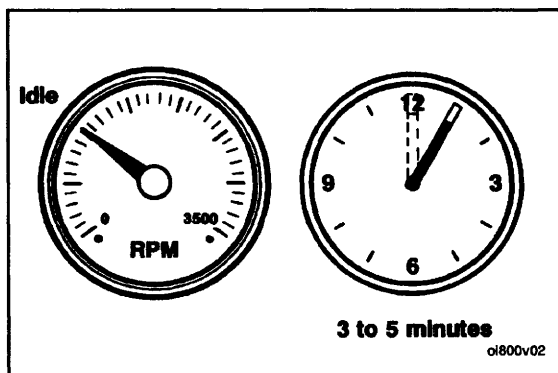
Start the engine with the throttle in the idle position.

**NOTE:** Engines equipped with air starting motors require a minimum of 480 kPa [70 psi].

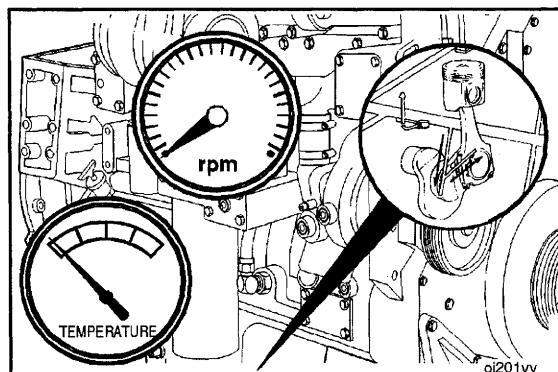


#### ⚠ CAUTION ⚠

The engine must have adequate oil pressure within 15 seconds after starting. If the warning light indicating low oil pressure has not gone out or there is no oil pressure indicated on a gauge within 15 seconds, shut off the engine immediately to avoid engine damage. Confirm the correct oil level in the oil pan.



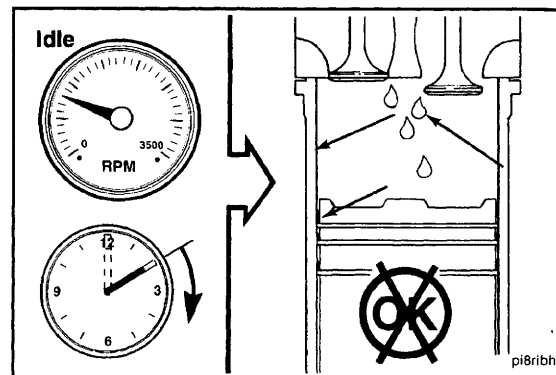
Idle the engine 3 to 5 minutes before operating with a load.



Increase the engine speed (rpm) slowly to provide adequate lubrication to the bearings and to allow the oil pressure to stabilize. Allowing the oil pressure to stabilize before applying a load can greatly increase the service life of the engine.

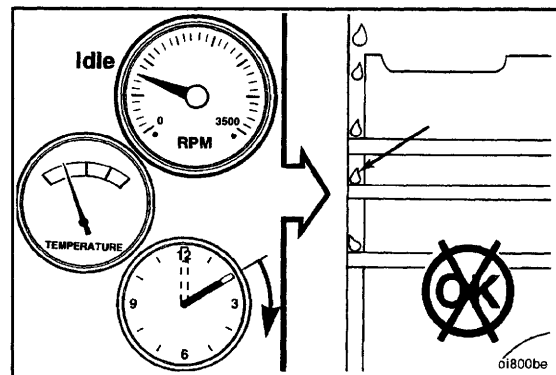
**⚠ CAUTION ⚠**

Do not keep the engine at low idle for long periods. Long periods (more than 10 minutes) at low idle can damage an engine because combustion chamber temperatures drop so low the fuel will not burn completely. This will cause carbon to build up around the injector spray holes and piston rings and can cause the valves to stick.



**⚠ CAUTION ⚠**

If the engine coolant temperature becomes too low, 60°C [140°F], raw fuel will wash the lubricating oil off the cylinder walls and dilute the crankcase oil. Fuel dilution weakens lubricating oil properties and can shorten engine life. Operating the engine at rated speed reduces the possibility of these undesirable effects.



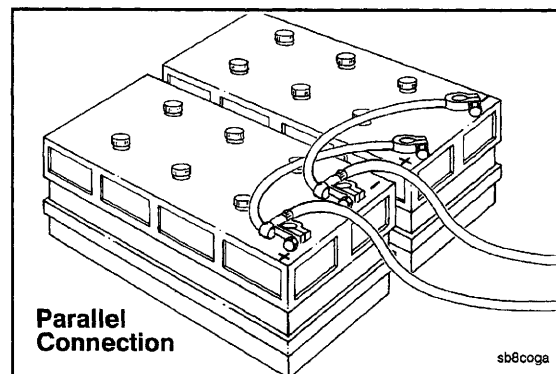
**⚠ WARNING ⚠**

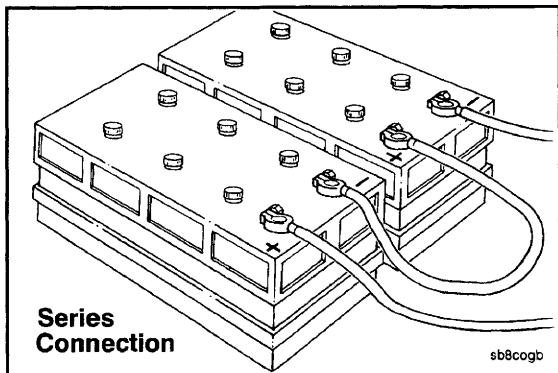
Batteries can emit explosive gases. To avoid personal injury, always ventilate the compartment before servicing the batteries. To avoid arcing, remove the negative (-) battery cable first and attach the negative (-) battery cable last.

**⚠ CAUTION ⚠**

When using jumper cables to start the engine, make sure to connect the cables in parallel: Positive (+) to positive (+) and negative (-) to negative (-). When using an external electrical source to start the engine, turn the keyswitch to the OFF position. Remove the key before attaching the jumper cables.

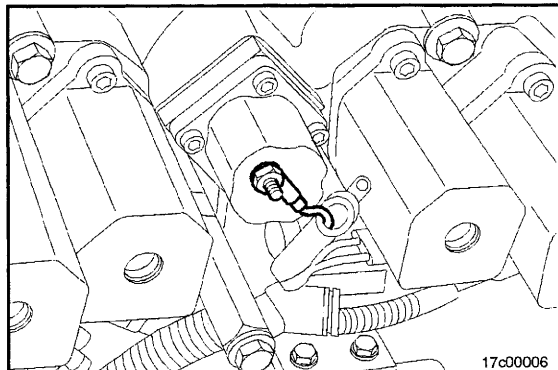
The accompanying illustration shows a typical parallel battery connection. This arrangement doubles the cranking amperage.





This illustration shows a typical series battery connection. This arrangement, positive (+) to negative (-), doubles the voltage.

**NOTE:** Power Generation uses a 24-VDC electrical system.



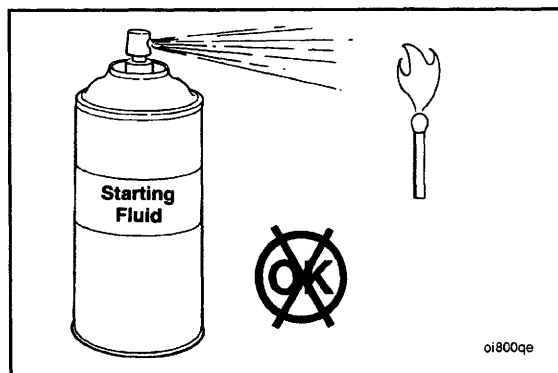
## Fuel Shutoff Valve

### General Information

#### ⚠ CAUTION ⚠

The QSX15 ECM provides a voltage output in the harness to control the fuel shutoff valve solenoid. The output voltage is equal to the battery voltage (system voltage). This must be the only wire connected to the fuel shutoff valve solenoid. Excessive current draw will cause possible engine shutdowns and fault codes to be logged.

**NOTE:** Power Generation engines have two wires connected to the fuel shutoff valve solenoid. The output voltage is 12 VDC. These must be the only wires attached to the solenoid.

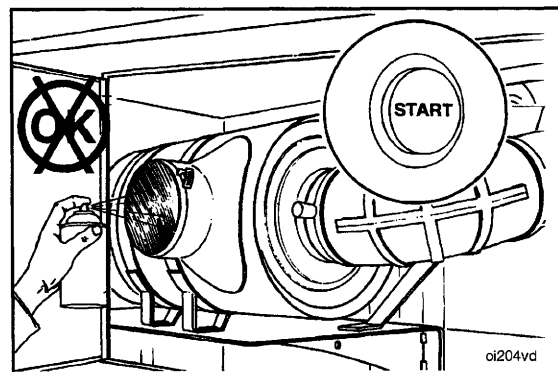


## Cold Weather Starting Using Starting Fluid

### With Mechanical or Electrical Metering Equipment (Ether)

#### ⚠ WARNING ⚠

Because of the potential for an explosion, do not use volatile cold starting aids in underground mine or tunnel operations. Ask the local U.S. Bureau of Mines inspector for instructions.

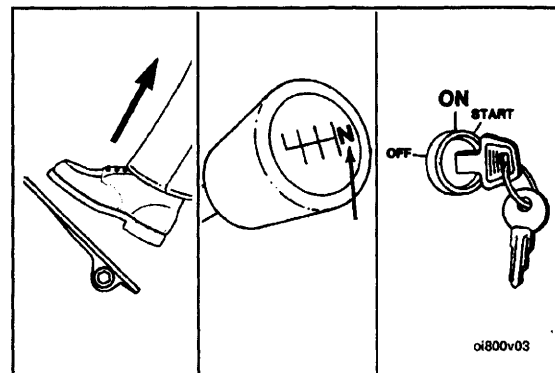


#### ⚠ WARNING ⚠

Starting fluid is highly flammable and explosive. Do not smoke anywhere near the vicinity. Keep flames, sparks, and arcing equipment and switches away from starting fluid.

Because of increased safety hazards and potential for engine damage, do not use starting fluid without metering equipment.

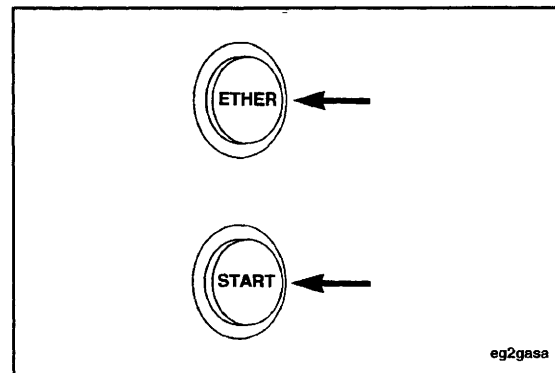
1. Set the throttle at idle.
2. Disengage any driven accessories and, if equipped, put the transmission in NEUTRAL.
3. Turn on the keyswitch to power up the electronic control module (ECM).



**⚠ CAUTION ⚠**

**Do not use excessive amounts of starting fluid when starting an engine. The use of too much starting fluid will cause engine damage.**

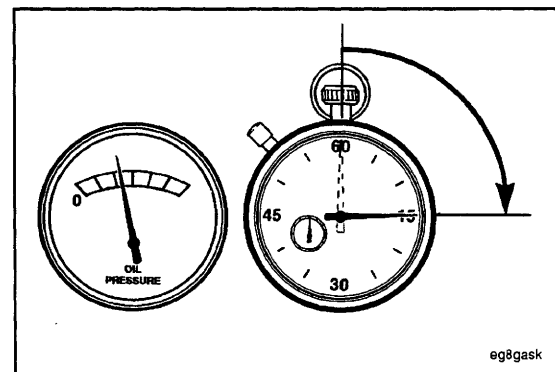
4. While cranking the engine, inject a metered amount of starting fluid.



**⚠ CAUTION ⚠**

**The engine must have adequate oil pressure within 15 seconds after starting. If the warning light indicating low oil pressure has not gone out or there is no oil pressure indicated on a gauge within 15 seconds, shut off the engine immediately to avoid engine damage.**

Confirm the correct oil level in the oil pan.

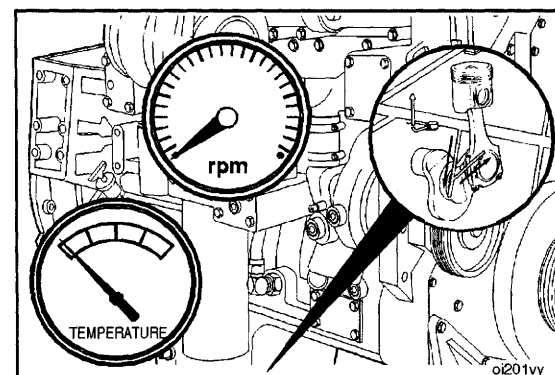


**Do not** increase the engine speed above low idle until the coolant temperature gauge needle starts to move or 10 minutes have elapsed. This will provide adequate lubrication to the bearings.

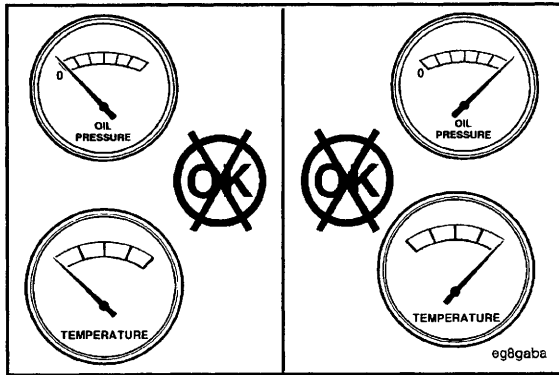
Monitor the oil pressure after normal operation is initiated.

For the first start after a significant maintenance action, running the engine initially at low idle can reduce leaks due to improperly seated gaskets.

**NOTE:** For Generator Set Engines, operating the engine at low-idle speed is **not** necessary.







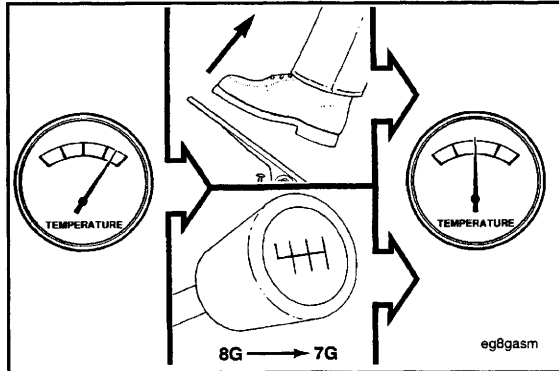
## Operating the Engine

### General Information

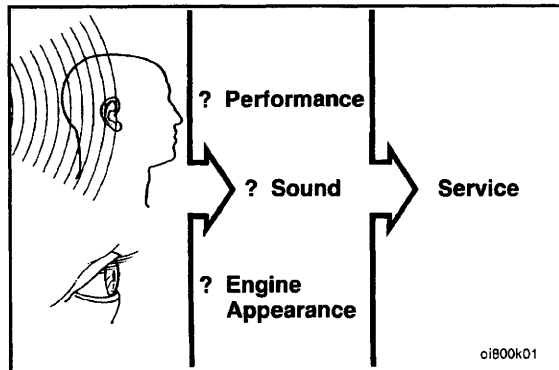


Monitor the oil pressure and coolant temperature gauges frequently. Refer to Lubricating Oil System Specifications and Cooling System Specifications in Section V for recommended operating pressures and temperatures. Shut off the engine if any pressure or temperature does **not** meet the specifications.

**NOTE:** Continuous operation with a low coolant temperature, below 60°C [140°F], or a high coolant temperature, above 110°C [230°F], can damage the engine.

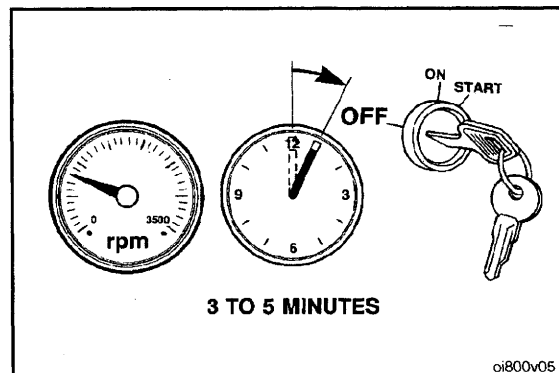


If an overheating condition starts to occur, reduce the load on the engine by releasing the throttle pedal pressure or shifting the transmission to a lower gear, or both, until the temperature returns to the normal operating range. If the engine temperature does **not** return to normal, shut off the engine and refer to Section TS, or contact a Cummins Authorized Repair Location.



Most failures give an early warning. Look and listen for changes in performance, sound, or engine appearance that can indicate service or engine repair is needed. Some changes to look for are as follows:

- Engine misfires
- Vibration
- Unusual engine noises
- Sudden changes in engine operating temperatures or pressures
- Excessive smoke
- Loss of power
- An increase in oil consumption
- An increase in fuel consumption
- Fuel, oil, or coolant leaks.



Allow the engine to idle 3 to 5 minutes before shutting it off after a full-load operation. This allows adequate cooldown of pistons, cylinder liners, bearings, and turbocharger components.

## Engine Operating Range

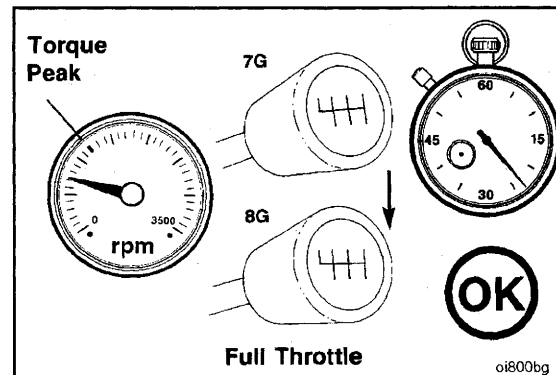
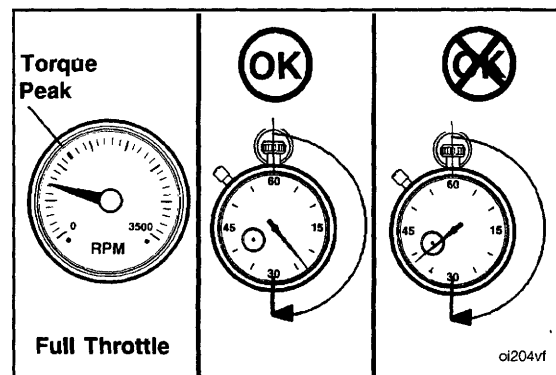
### General Information

#### ⚠ CAUTION ⚠

Do not operate the engine at full throttle below peak torque rpm (refer to engine dataplate for peak torque rpm) for more than 30 seconds. This condition will shorten engine life to overhaul, can cause serious engine damage, and is considered driver abuse.

Cummins engines are designed to operate successfully at full throttle under transient conditions down to peak torque engine speed. This is consistent with recommended operating practices.

Operation of the engine below peak torque rpm can occur during gear shifting because of the difference in ratios between transmission gears, but engine operation **must not** be sustained for more than 30 seconds at full throttle below peak torque rpm.

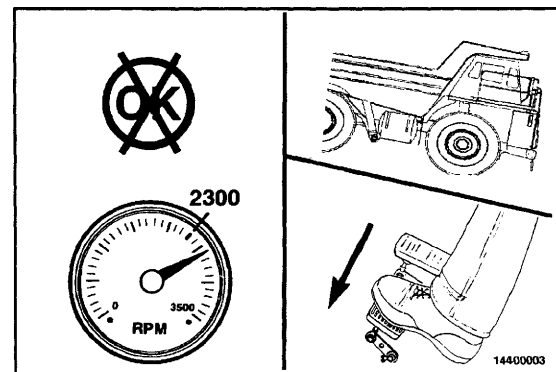


#### ⚠ CAUTION ⚠

Do not operate the engine beyond high-idle speed. Operating the engine beyond high-idle speed can cause severe engine damage. The engine speed must not exceed 2300 rpm under any circumstances. When descending a steep grade, use a combination of transmission gears and engine or service brakes to control the vehicle and engine speed.

#### ⚠ CAUTION ⚠

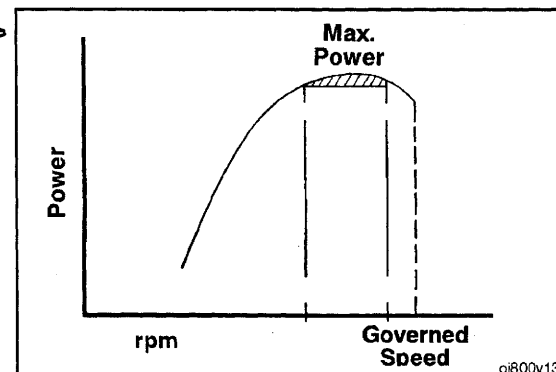
To prevent damage to the camshaft and the valve train when using an engine compression brake, do not exceed governed speed.



QSX15 engines produce maximum power at an rpm less than governed engine speed. Placement of maximum power has been changed on QSX15 engines to encourage operation in the most fuel efficient engine speed range.

To obtain optimum engine performance under load, allow the engine speed to load down to near torque peak. This will result in an engine operating speed in the maximum power zone.

Refer to the engine dataplate for torque peak rpm and governed speed rpm.



## Cold Weather Operation

### General Information

It is possible to operate diesel engines in extremely cold environments if they are properly prepared and maintained. The correct lubricants, fuels, and coolants **must** be used for the cold weather range for which the vehicle is being operated. Refer to the chart below for recommendations for different operating ranges.

Winterize 0 to -32°C [32 to -25°F]	Arctic Specifications -32 to -54°C [-25 to -65°F]
Use 50-percent ethylene or propylene glycol anti-freeze and 50-percent water mixture.	Use 60-percent ethylene or propylene glycol anti-freeze and 40-percent water mixture.
Use multiviscosity oil meeting CES 20,076*.	Use arctic oil meeting CES 20,076*.
Fuel to have maximum cloud and pour points 6°C [10°F] lower than ambient temperatures in which engine operates.	Fuel to have maximum cloud and pour points 6°C [10°F] lower than ambient temperature in which engine operates.

\* For information on CES (Cummins Engineering Standard) 20,076, write or call toll free:

Cummins Customer Assistance Center - 41403  
Cummins Engine Company, Inc.  
Box 3005  
Columbus, IN 47202-3005

**1-800-DIESELS**  
(1-800-343-7357)

The following cold weather operating aids are often required for cold weather situations, depending on engine application:

Cold Weather Operating Aids										
Temperature	Starting Aid	Coolant Heater	Oil Heater	Under-hood Air	Fuel Heater	Battery Heater	Radiator Shutters	Engine Enclosure	Winter Front	Thermatic Fan
50 to 32° F 10 to 0° C										
32 to -10° F 0 to -23° C	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
-10 to -25° F -23 to -32° C	Required	Required	Required	Required	Required	Required	Required	Required	Required	Required
-25 to -65° F -32 to -54° C	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

\* Required dependent upon viscosity/pour point.

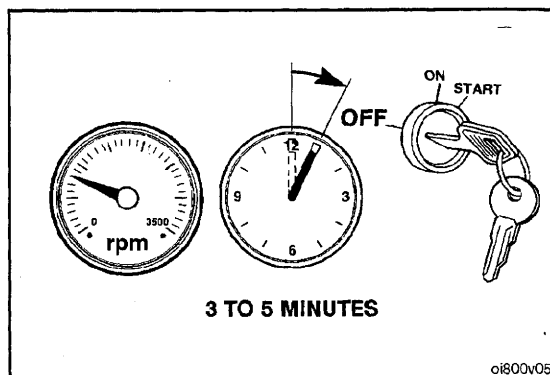
oi202vj

**NOTE:** Generator Sets do **not** require underhood air, radiator shutters, winterfronts, or thermatic fan.

## Engine Shutdown

### General Information

1. Allow the engine to idle 3 to 5 minutes before shutting it off after a full-load operation. This allows adequate cooldown of pistons, cylinders, bearings, and turbo-charger components.
2. Turn the ignition keyswitch to the OFF position.



## Engine Braking System

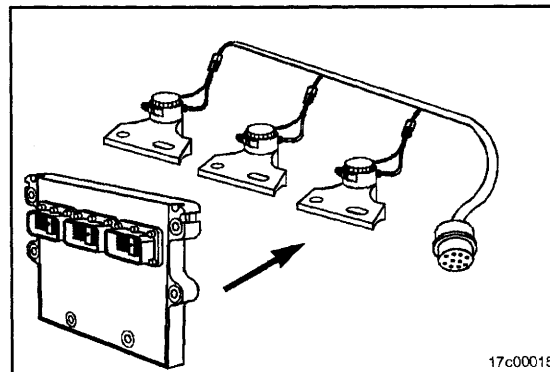
### General Information



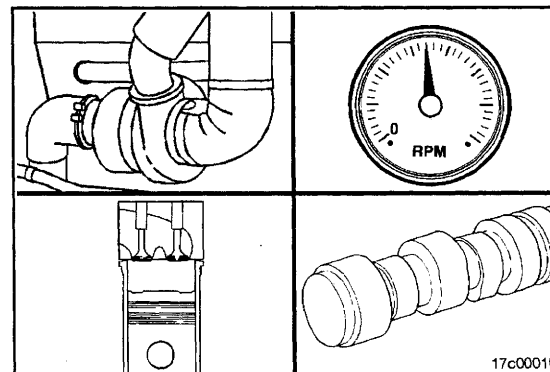
**Do not exceed governed engine speed when operating engine brakes. Engine damage can occur. The engine brakes are designed to assist the vehicle's service brakes to slow down the vehicle.**

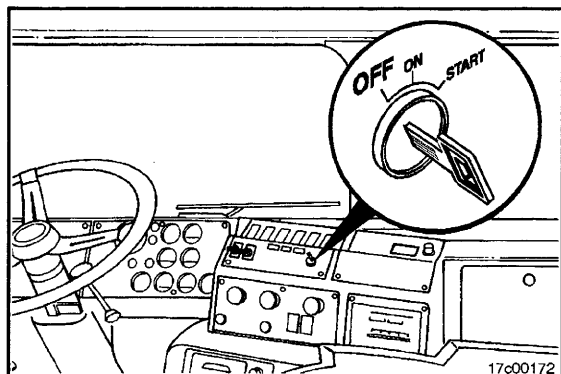
The Intebrake™ system (engine brakes) are optional on Qsx15 engines.

Engine brakes use the energy of engine compression to provide vehicle retardation by converting the engine to an energy-absorbing device to reduce vehicle speed. This is accomplished by a hydraulic circuit that opens the exhaust valves near the end of the compression stroke.



The amount of braking power available on Qsx15 engines is up to 600 hp. Braking power is managed by the Intebrake™ system (engine brakes).





**△ CAUTION △**

**Do not operate the engine if the engine brakes will not deactivate. To do so will cause severe engine damage.**

If the engine brakes will **not** shut off, shut off the engine immediately, and contact a Cummins Authorized Repair Facility.

## Electronic Controlled Fuel System

### General Information

#### Industrial

The Qsx15 fuel system is an electronically controlled system designed to optimize engine control and reduce exhaust emissions. The Qsx15 fuel system controls engine speed and fuel pressure based on input from the electric throttle and other equipment-specific and/or model-specific features.

#### Qsx15 Fuel System

- Optimized Engine Control
- Reduced Exhaust Emissions.

The Qsx15 engine has the capability of controlling the fan clutch actuator if an electronically controlled fan clutch is used.

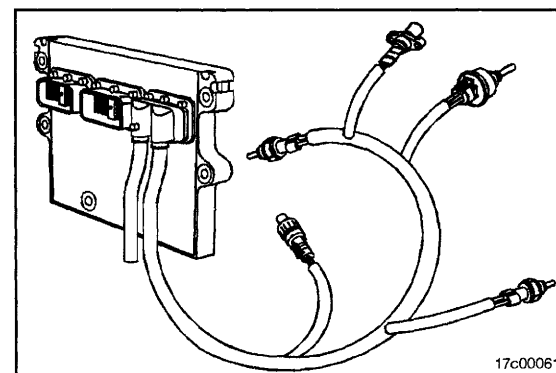
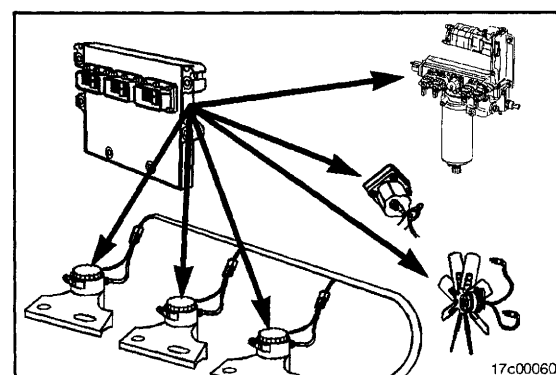
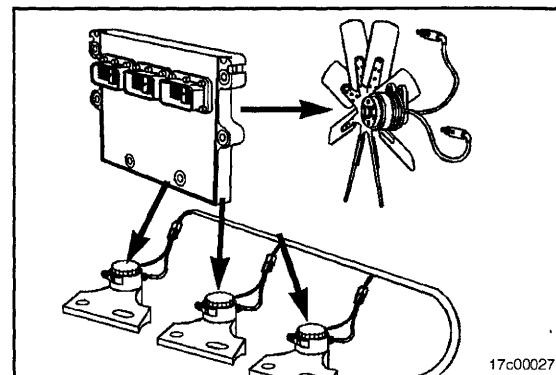
The Qsx15 engine also allows the engine brakes to be activated by controlling the engine brake solenoids, if applicable.

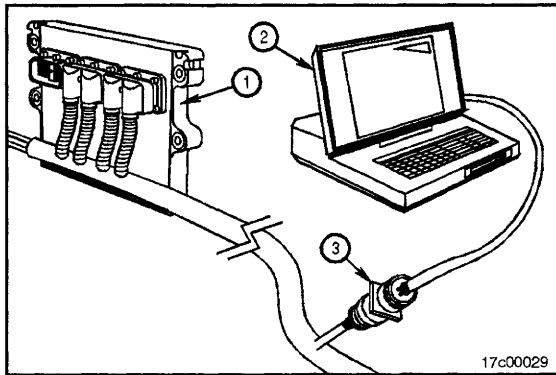
The ECM sends signals to the following components to control the vehicle:

- Fuel shutoff valve solenoid
- Integrated fuel system module
- Fan clutch
- Engine brake solenoid valves, if applicable.

The following sensors are connected to the ECM with the engine wiring harness:

- Intake air pressure/temperature sensor
- Oil pressure/temperature sensor
- Coolant temperature
- Ambient air pressure sensor
- Fuel pressure sensor
- Water-in-fuel sensor
- Crankshaft position sensor
- Camshaft position sensor
- Wet tank pressure sensor.

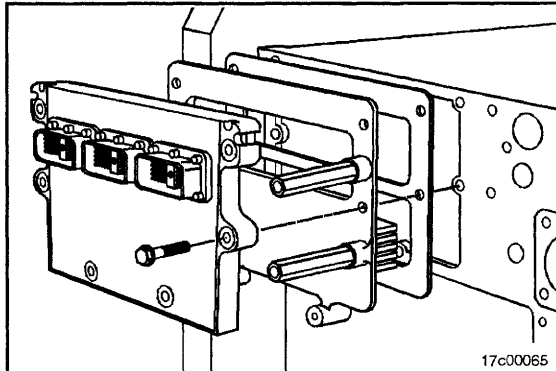




The ECM (1) has a datalink (2) for electronic service tools (3). Electronic service tools can be used to read and program owner-specified information into the ECM by a Cummins Authorized Repair Location. The electronic service tools can also be used to aid in troubleshooting the engine in the event of a failure, by reading and displaying fault codes.

The datalink connector is located on the OEM harness and can be one of several designs:

- 2-pin Weather-Pack
- 6-pin Deutsch
- 8-pin AMP
- 9-pin Deutsch.



The engine has a cooling plate that is mounted to the cylinder head within the air intake port. The ECM is mounted to the cooling plate. The intake air flows over the cooling plate and cools the electronics in the ECM.

### Power Generation

The QSX15 fuel system is an electronic control system designed to optimize engine control and reduce exhaust emissions. This system is based on the PT fuel system design, yet it is specific to the QSX15 products. It controls engine speed and fuel pressure utilizing electronic sensors within the Quantum™ system.

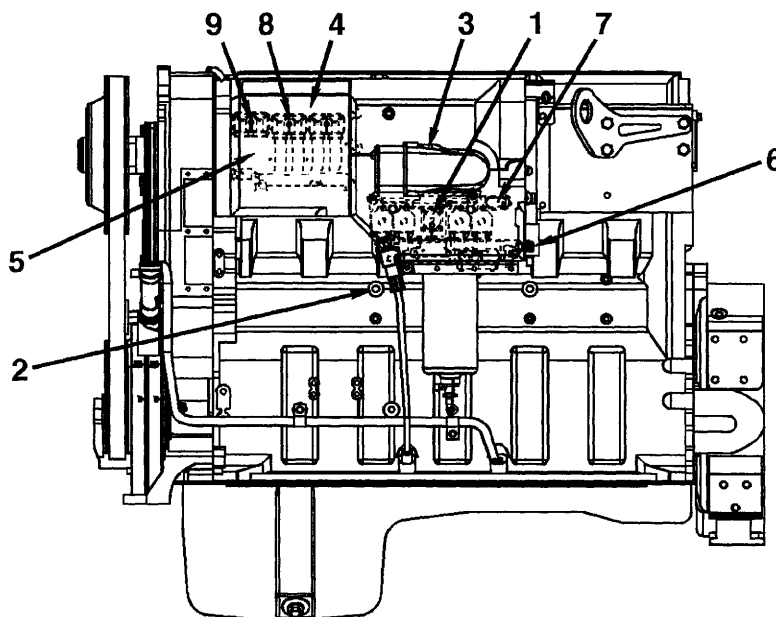
### QSX15 Fuel System

- Optimized Engine Control
- Reduced Exhaust Emissions.

## Fuel System Description

### Engine Diagrams

The illustrations that follow show the locations of the major fuel system components.

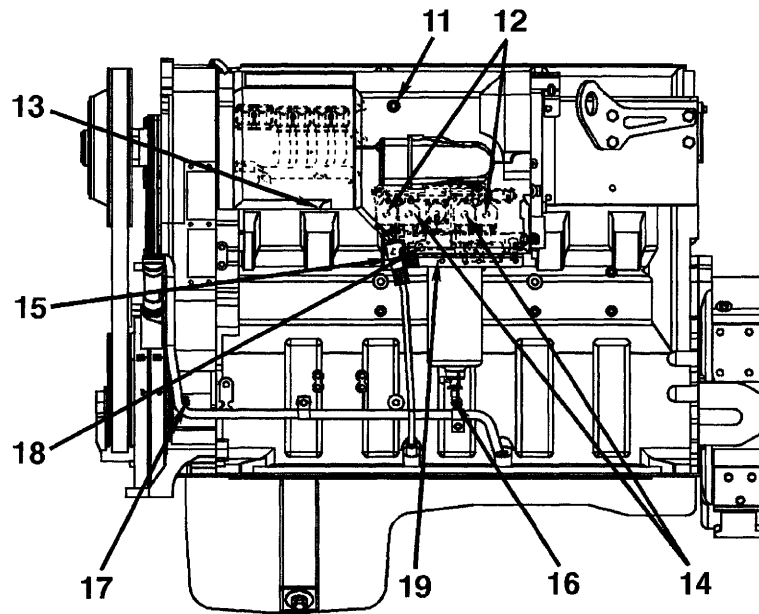


19c00616

The QSX15 electronically controlled fuel system consists of:

- |  |  |
|--|--|
| 1. Fuel Shutoff Valve                          | 6. Fuel In                                     |
| 2. Oil Pressure/Temperature Sensor             | 7. Fuel Out                                    |
| 3. Intake Manifold Pressure/Temperature Sensor | 8. ECM Actuator Harness Port (Industrial only) |
| 4. Cooling Plate (behind ECM)                  | 9. ECM OEM Harness Port (Industrial only).     |
| 5. Electronic Control Module                   |  |





19c00617

The QSX15 electronically controlled fuel system consists of:

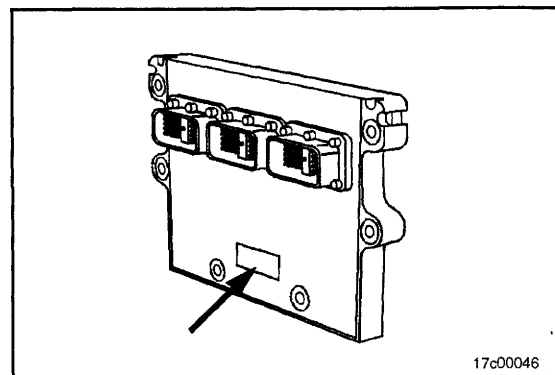
- |                                 |   |
|---------------------------------|---|
| 11. Camshaft Position Sensor    | 16. Water-in-Fuel Separator                         |
| 12. Fueling Actuators           | 17. Crankshaft Position Sensor                      |
| 13. Ambient Air Pressure Sensor | 18. Front and Rear Rail Pressure Sensor             |
| 14. Timing Actuators            | 19. Fuel Inlet Restriction Sensor                   |
| 15. Fuel Pressure Sensor        | 20. Coolant Level Sensor (In Radiator) - Optional*. |

**\* Not in this view.**

### Electronic Control Module (ECM) Dataplate

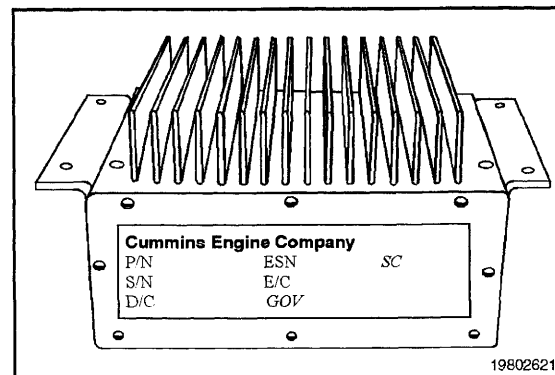
#### Industrial

The data tag for the ECM is located on the front of the module housing.



#### Power Generation

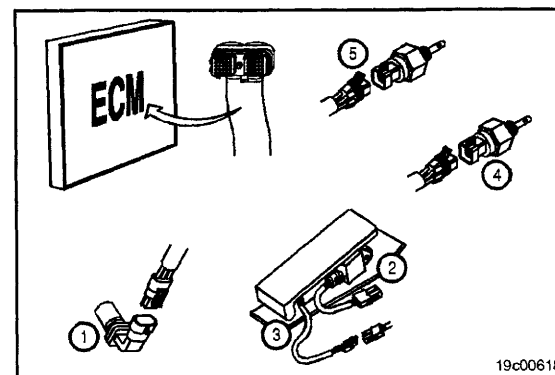
The data tag for the ECM is located on the side of the ECM opposite the ECM connectors.



### Electronic Control Module Inputs

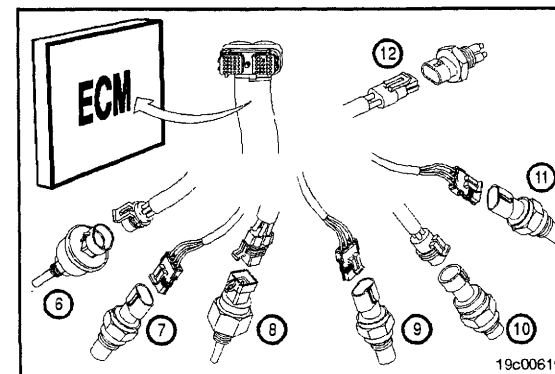
Electronic Control Module (ECM) Inputs:

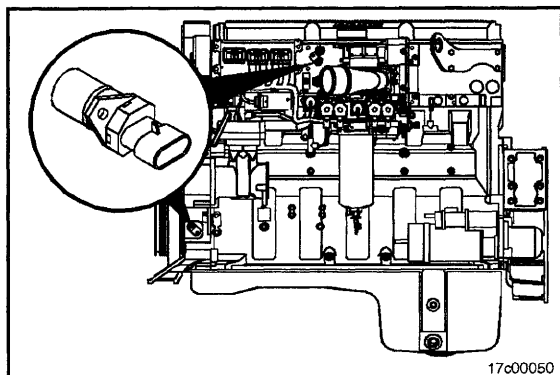
1. Engine Camshaft or Crankshaft Position Sensor
2. Throttle Position Sensor (industrial **only**)\*
3. Idle Validation Switch\*
4. Intake Air Pressure/Temperature Sensor
5. Coolant Temperature Sensor



6. Coolant Level Sensor\*
7. Ambient Air Pressure Sensor
8. Oil Pressure/Temperature Sensor
9. Wet Tank Pressure Sensor\*
10. Unintended Fuel Diagnostic Sensor (industrial **only**)
11. Fuel Pressure Sensor
12. Water-in-Fuel Sensor (industrial **only**).

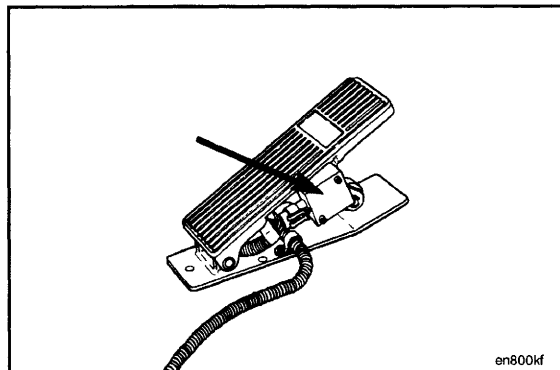
\*These are OEM sensors that are **not** installed on the engine.



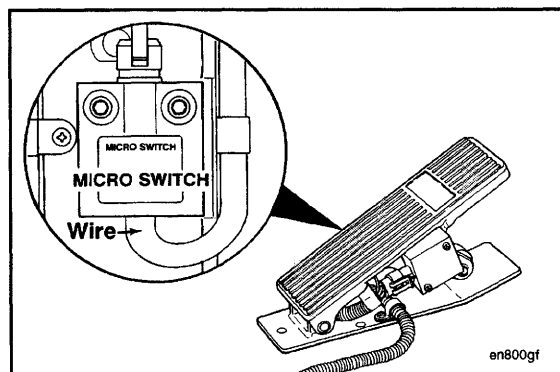


The **engine cam and crank position sensors** provide engine speed and position information.

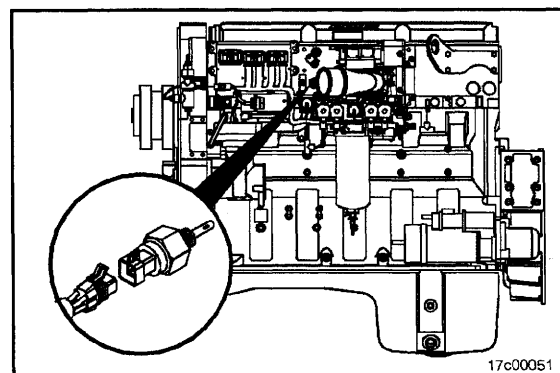
The cam position sensor is located between the ECM and fuel pump. The crank position sensor is located below the air compressor drive or the barring device.



The **throttle position sensor (industrial only)** is located in the throttle foot pedal assembly. When the foot pedal is at idle, the engine brakes can be activated. When the throttle pedal is depressed, the sensor deactivates the engine brakes and the PTO. The accelerator pedal can override the cruise control and PTO (if the throttle override in PTO is enabled).

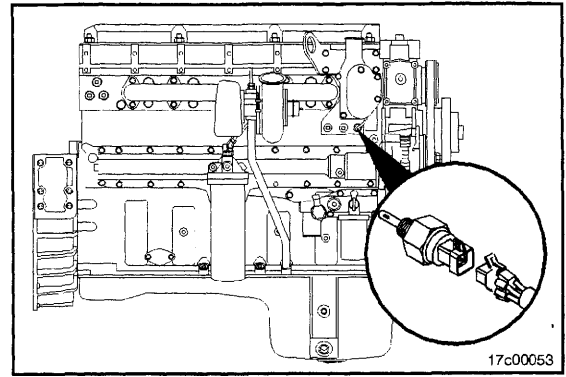


The **idle validation switch** is added to the throttle pedal assembly and will verify that the throttle pedal is in the low-idle position.



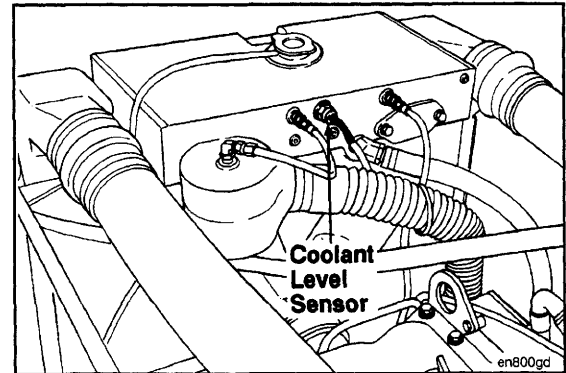
The **intake air pressure/temperature sensor**, located in the front of the intake air connection, monitors positive manifold pressure and turbocharged intake air temperature. Both are used in the fuel control function. The intake air pressure/temperature sensor is also used in the engine protection system.

The **engine coolant temperature sensor**, located in the thermostat housing, monitors engine coolant temperature used in the fuel control function and engine protection system.

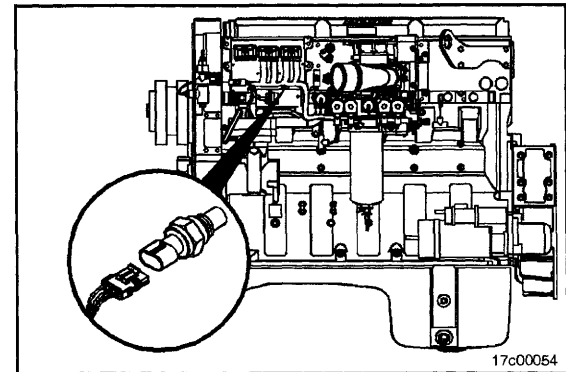


The **coolant level sensor** is mounted in the radiator top tank or surge tank, depending on the OEM. It is a fluid-level-actuated switch required for the engine protection system.

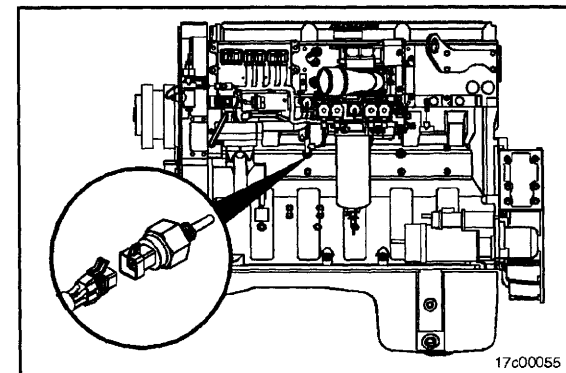
**NOTE:** This is an optional sensor that will or will **not** be on all vehicles.

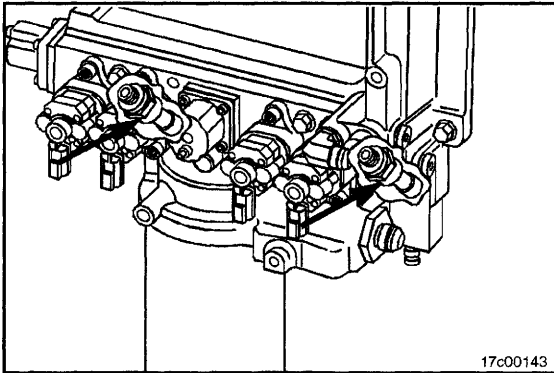


The **ambient air pressure sensor** is located on the fuel pump side of the engine, just below the ECM. It is used to control fueling.

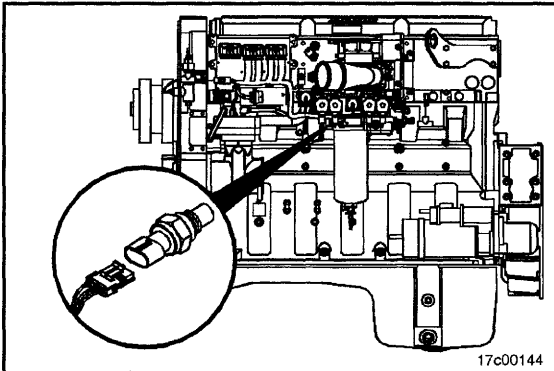


The **oil pressure/temperature sensor**, located on the fuel pump side of the engine, monitors lubricating oil pressure and temperature for the engine protection system.

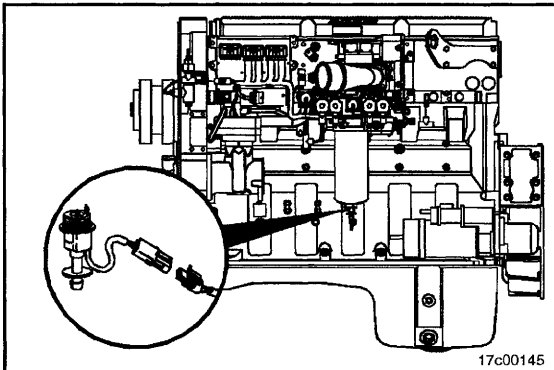




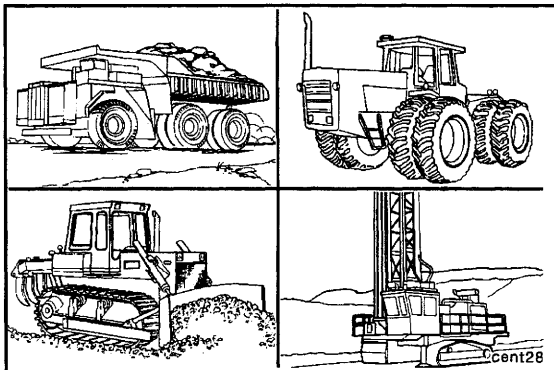
The **unintended fuel diagnostic sensors** (industrial only), located behind the fuel actuators on the integrated fuel system module, monitor the fuel actuator's passage pressure.



The **fuel pressure sensor**, located on the integrated fuel system module, monitors actuator supply rail pressure.



The **water-in-fuel sensor** (industrial only), located on the fuel filter, monitors water in fuel.



## Programmable Features

### Industrial

The QSX15 fuel system has been designed to be flexible to meet the wide variety of engine control specifications for off-highway equipment.

### Automotive/Variable-Speed (VS) Governor

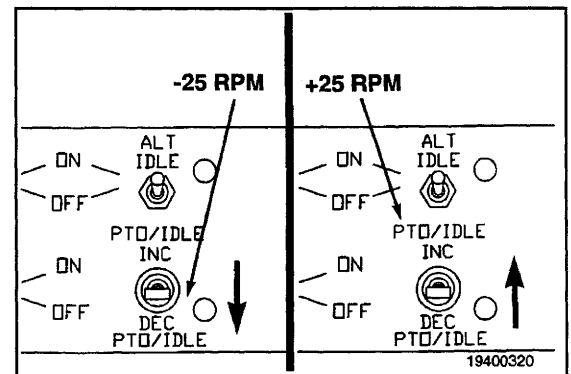
The automotive/variable-speed (VS) governor provides a choice of engine governors. The automotive governor operates like a conventional pressure-timed (PT®) governor, which provides constant fueling for a given throttle position (engine speed varies with load). The VS governor maintains a constant engine speed for a given throttle position under varying load conditions. Governor type can be selected by using electronic service tool.

**Automatic Governor**  
Engine Speed  
Varies with Load

**Variable-Speed Governor**  
Engine Speed Is Constant  
Under Varying Loads

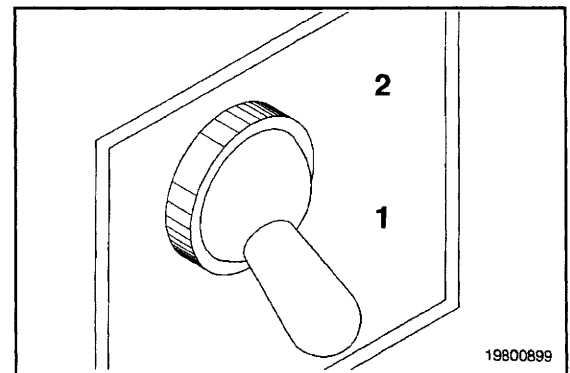
### Low-Idle Adjustment

This feature allows the idle or intermediate-speed control 1 (ISC1) speed to be increased or decreased in 25-rpm increments through an operator-controlled switch. This switch can be disabled by turning this feature off with INSITE™. If this feature is turned off, the low-idle speed can still be adjusted using an electronic service tool.

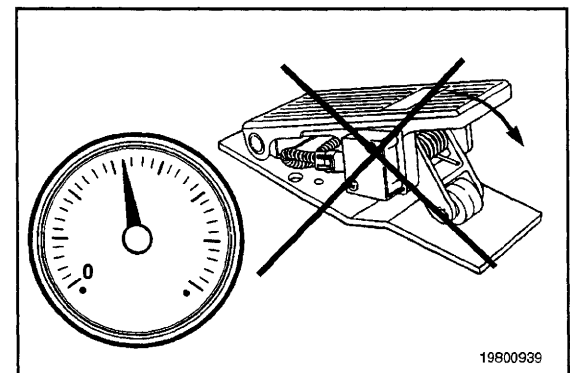


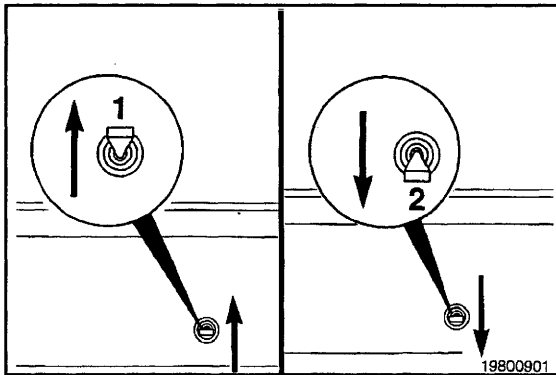
### Intermediate-Speed Control (ISC)

This feature provides, depending on OEM availability, the ability to select an ISC set speed by way of an OEM-provided switch (1 = off, 2 = on).



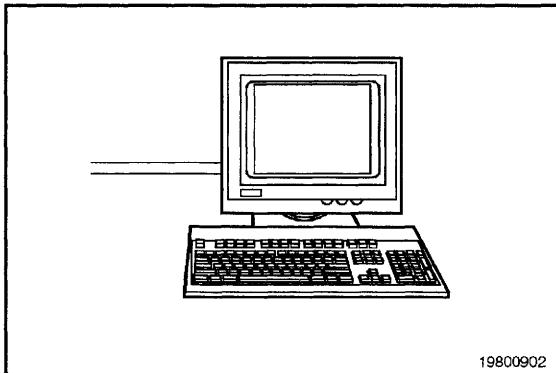
The intermediate-speed control feature will override the throttle and control the engine speed to its setting.



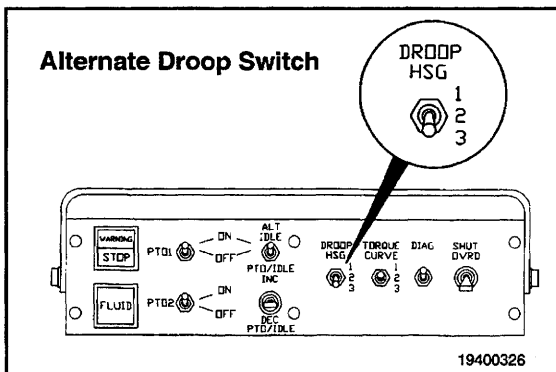


The intermediate-speed control set speed can be adjusted by the idle/intermediate-speed control increment/decrement switch. Set speed changes using this switch will be saved to the ECM at key off.

To increase the intermediate-speed control set speed, position the switch up (1). To decrease the set speed, position the switch down (2).



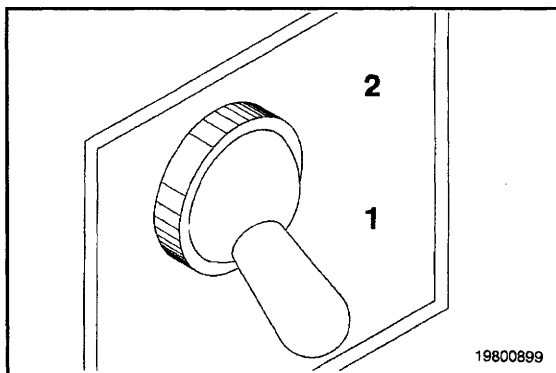
The intermediate-speed control feature can be enabled or disabled by an electronic service tool. The intermediate-speed control set speeds, maximum intermediate-speed control speed, and the intermediate-speed control droop can also be adjusted by an electronic service tool.



#### Alternate Droop

The alternate droop feature allows droop characteristics to be changed for high engine-governed speeds or the high-speed governor (HSG) and for the variable-speed governor (VSG). Droop is usually expressed as a percentage. Less governor droop provides a more responsive governor for more precise engine control. More governor droop provides smoother shifting and smoother mechanical clutch engagement.

The alternate droop feature provides, depending on OEM availability, the ability to select up to two additional alternate droop settings by way of an OEM-provided switch.

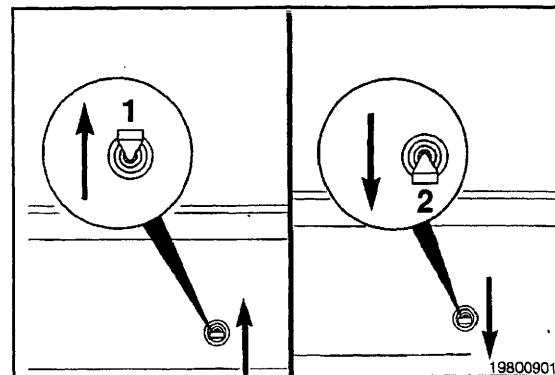


#### Alternate Low-Idle Speed Control

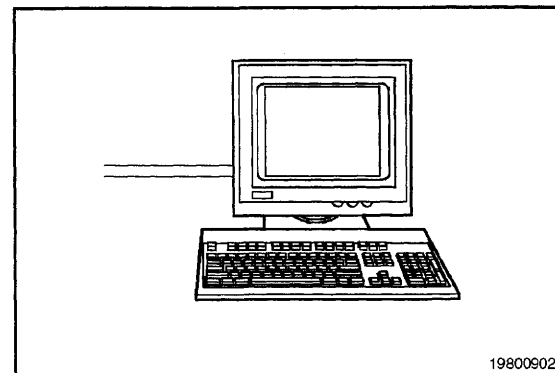
This feature allows the operator to switch between the low-idle speed setting and an alternate low-idle speed setting.

The alternate low-idle speed control feature provides, depending on OEM availability, the ability to select an alternate-idle speed by way of an OEM-provided switch (1 = off, 2 = on).

The alternate low-idle speed can **not** be adjusted by the idle/intermediate-speed control increment/decrement switch.



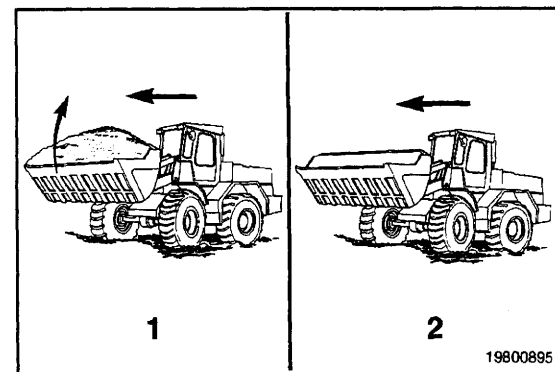
The alternate low-idle speed can **only** be adjusted with an electronic service tool.



### Alternate Torque Control

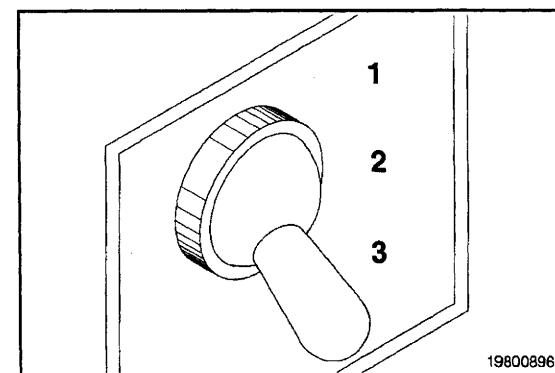
The alternate torque control feature allows the operator to switch between the 100-percent throttle torque curve and up to two derated torque curves.

This feature improves operating efficiency in loaded (1) versus unloaded (2) conditions.

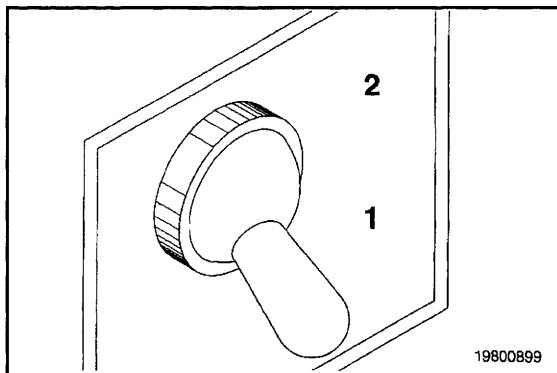


The alternate torque control feature provides, depending on OEM availability, the ability to select up to two additional derated torque curves by way of an OEM-provided switch.

The alternate torque control can **only** be adjusted with an electronic service tool.

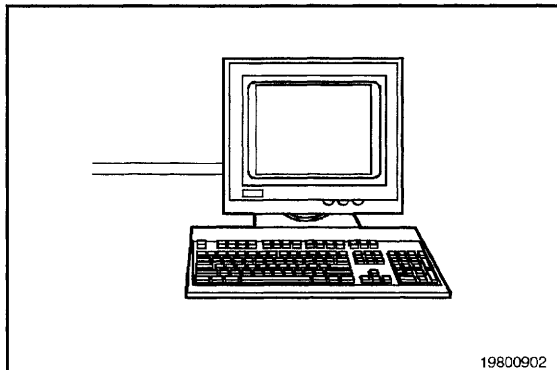






### Auxiliary-Speed Governor (ASG)

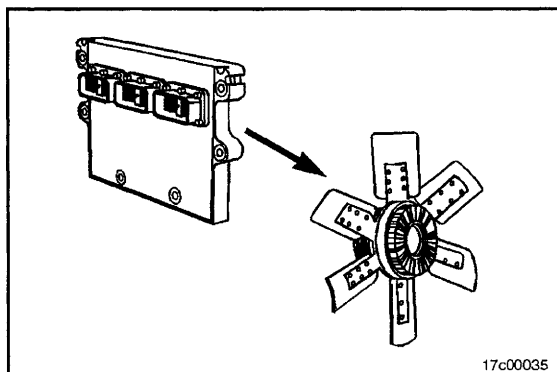
The auxiliary-speed governor is an application-specific feature that allows the engine to be governed by either an auxiliary speed or pressure signal. The feature uses a manual switch input to turn the governor operation on (2) or off (1).



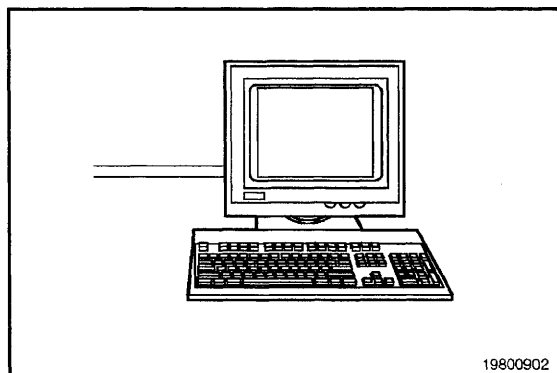
### Boost Power

Boost power is a torque curve that is calibrated for higher than rated torque/power. If the feature is enabled, boost power can be engaged by a cab-mounted switch or automatically if the automatic boost power feature is enabled. The additional power is limited by a calibrated time period, as well as thresholds for intake manifold temperature, coolant temperature, and engine speed.

An electronic service tool can enable or disable the boost power tool. The service tool can also monitor the cab-mounted boost power switch and boost power engaged, which is the status of the additional power provided by the boost power feature.



The electronic fan clutch feature provides a pulse width modulated signal to control a variable-speed fan clutch based on the need provided by five possible sensor inputs, or an input from an electronic service tool. This feature can reduce fuel consumption by minimizing fan-on time and lengthening belt life by eliminating belt hop and slippage.



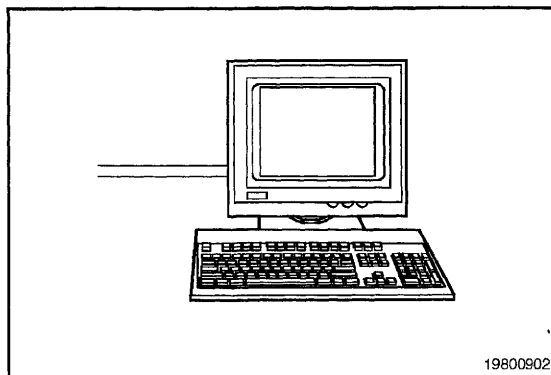
### Fuel Consumption Rate Logger

The fuel consumption rate logger allows a Cummins electronic service tool to access, display, and reset fuel consumption data. This includes a resettable short-term fuel consumption history, the current point being recorded in the short-term history, the current instantaneous fuel consumption, and a lifetime history.

### Hot Shutdown Monitor

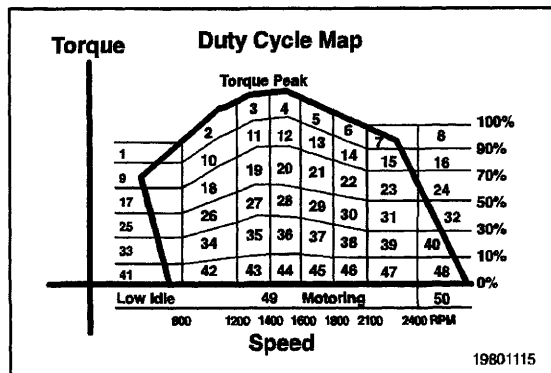
The hot shutdown monitor is a selectable feature within an electronic service tool. If this feature is enabled, the ECM will log an inactive fault when the engine is turned off while still "hot" by the operator or by the engine protection feature.

An engine is considered "hot" when the hot shutdown load percent of the engine is above the threshold set by the electronic service tool. The hot shutdown load percent is based on the duty-cycle load factor, which is determined from engine fueling levels.

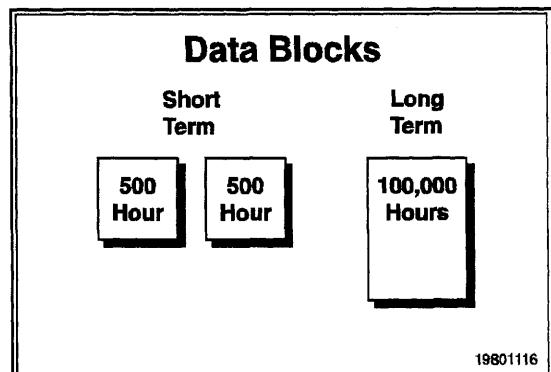


### Duty Cycle Monitor

The duty-cycle monitor tracks the time the engine spends in 50 different operating regions. These operating regions are based on engine speed and engine torque.



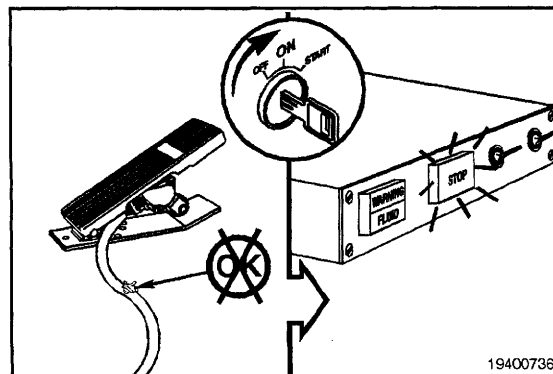
This feature provides two short-term, 500-hour resettable data blocks and one long-term, 100,000-hour nonresettable data block.

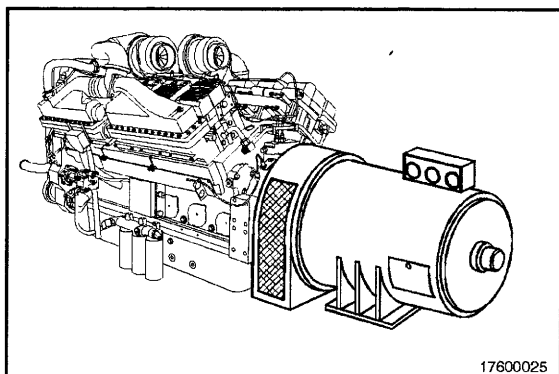


### Throttle-Activated Diagnostic Switch

The throttle-activated diagnostic switch is intended to eliminate the need for a dash-mounted diagnostic switch, which is used to activate the diagnostic mode to display active fault codes in a sequence of flashing lamps. The throttle-activated diagnostic switch feature eliminates the need for a dash-mounted diagnostic switch by providing a simple sequence of throttle movements that activate the diagnostic mode.

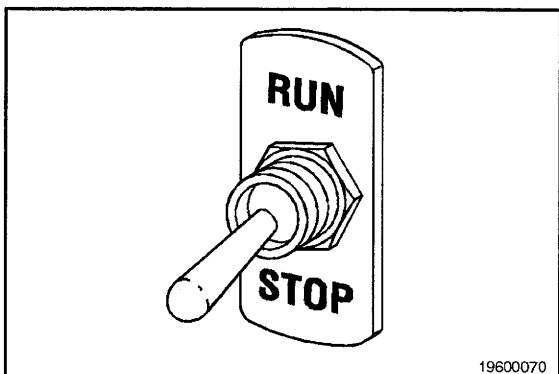
**NOTE:** This feature will work with all throttle types.





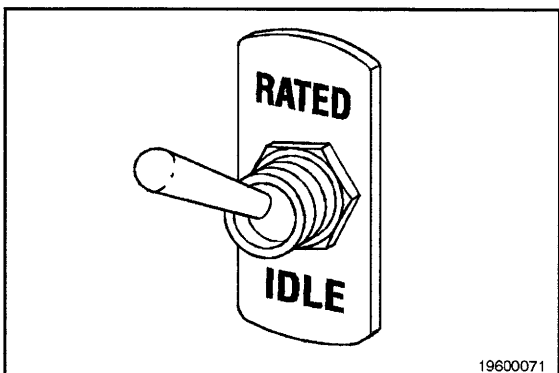
### Power Generation

The QSX15 fuel system has been designed to be flexible to meet the wide variety of engine control specifications for power generation.



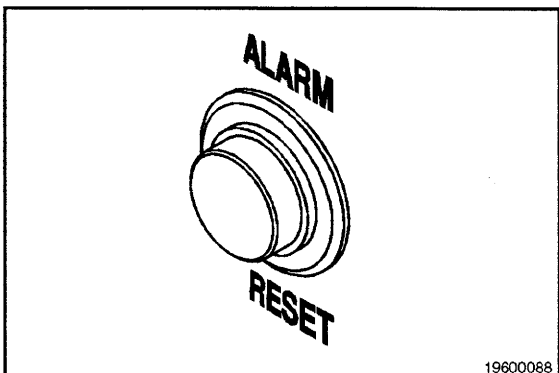
### Run/Stop Switch

A customer-supplied run/stop input switch supplies 24-VDC battery positive (switched B+) to the ECM. B+ supplied to the ECM allows the ECM to energize the fuel shutoff valve when cranking. This switch can be monitored via the electronic service tool.



### Idle/Rated Speed Switch

A customer-supplied idle/rated switch allows the selection of idle or rated speed mode. This switch can be monitored via the electronic service tool.

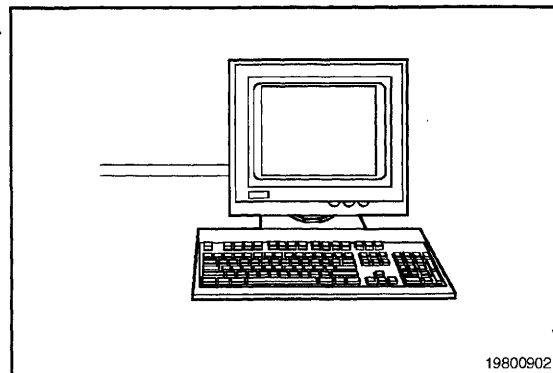


### Alarm Reset Switch

A customer-supplied switch resets all shutdown/warning functions and inactive fault codes. Warning relay drivers and relay contacts can be reset while the engine is running or shut down. Shutdown relay drivers and contacts, and inactive fault codes can be reset **only** when the engine is shut down. Before restarting the engine after a fault induced shutdown, check the ECM for fault codes via the electronic service tool.

### Programmable Idle Speed

Idle speed is adjustable via the electronic service tool. Refer to the manual for the electronic service tool for details on the feature.



### Alternate Frequency Switch

A customer-supplied alternate frequency switch allows the selection of 50 or 60 Hz rated speed operation without requiring an electronic service tool recalibration. This switch can be monitored via the electronic service tool.

To change frequencies, the engine **must** first be shut down, or brought to idle, then back to rated speed.

#### Frequency

Alternate



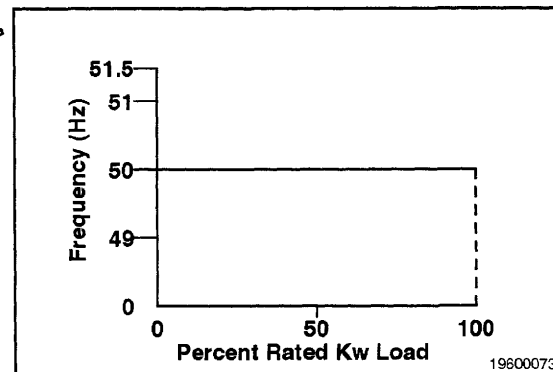
Normal

00a00030

### Isochronous and Droop Speed Governing

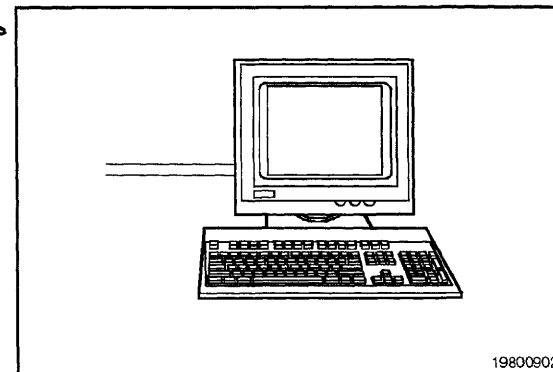
For isochronous speed operation, the governor droop setting needs to be set at 0 percent.

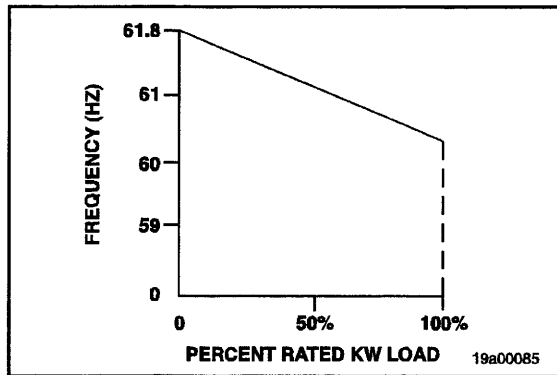
If required, the governor droop setting can be adjusted using the electronic service tool. Refer to the electronic service tool manual for details on the feature.



For droop speed operation, the governor droop setting is adjustable between 0 and 10 percent.

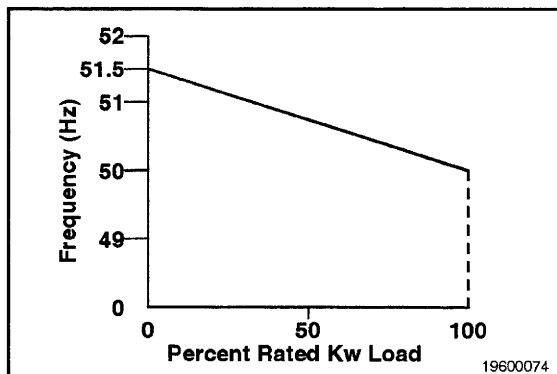
If required, the governor droop setting can be adjusted using the electronic service tool. Refer to the electronic service tool manual for details on the feature.





Engine-generator sets that are to operate at 60-Hz full load **must** have the engine no-load governed speed adjusted to:

61.8 Hz [1854 rpm] for 3-percent speed droop  
or  
63.0 Hz [1890 rpm] for 5-percent speed droop



Engine-generator sets that are to operate at 50-Hz full load **must** have the engine no-load governed speed adjusted to:

51.5 Hz [1545 rpm] for 3-percent speed droop  
or  
52.5 Hz [1575 rpm] for 5-percent speed droop

Percent speed droop on the engine-generator set can be verified by noting no-load and full-load speeds and using the speed droop formula.

$$\%S_{\text{Droop}} = \frac{(S_{\text{NL}} - S_{\text{FL}}) \times 100}{S_{\text{FL}}}$$

Where:  $\%S_{\text{Droop}}$  = Percent Speed Droop  
 $S_{\text{FL}}$  = Full-Load Speed  
 $S_{\text{NL}}$  = No-Load Speed

$$\text{Example: } \frac{1854 \text{ rpm} - 1800 \text{ rpm}}{1800 \text{ rpm}} \times 100 = 3\%$$

Droop governed speed under the available load can be calculated when full-load kW is **not** available using this formula.

$$S_{\text{al}} = S_{\text{nl}} - \left( \left( \frac{\text{Available kW Load}}{\text{Rated kW}} \right) \times (S_{\text{nl}} - S_{\text{fl}}) \right)$$

Where:

$S_{\text{al}}$  = Speed at Available kW Load  
 $S_{\text{fl}}$  = Speed at Full kW Load  
 $S_{\text{nl}}$  = Speed at No Load

Example:

Available kW Load = 400  
Rated kW = 500 (Generator rating)  
Speed at Full kW Load = 1800  
Speed at No Load = 1854

$$1854 \text{ rpm} - \left( \left( \frac{400 \text{ kW}}{500 \text{ kW}} \right) \times (1854 - 1800) \right)$$

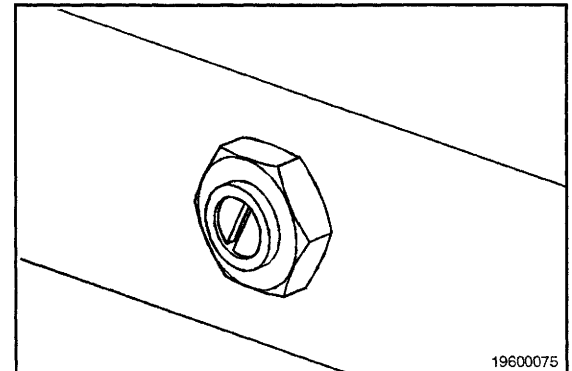
$$1854 \text{ rpm} - (0.8 \times 54) = 43.2 \text{ rpm}$$

$$1854 \text{ rpm} - 43.2 \text{ rpm} = 1810.8 \text{ or } 1811 \text{ rpm}$$

### Droop Adjust

The droop adjust potentiometer, located in the control panel, allows the adjustment of the engine speed governor droop without the aid of the electronic service tool.

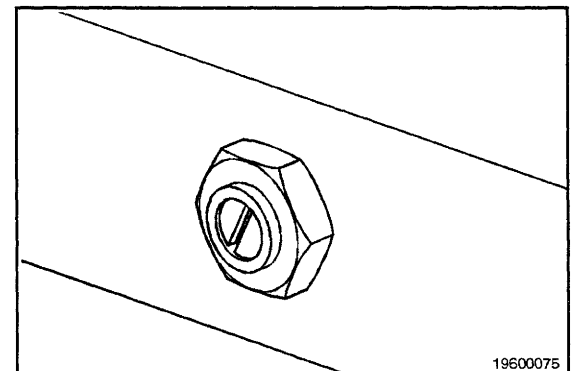
See isochronous and droop speed governing for more information on droop.



### Frequency Adjust

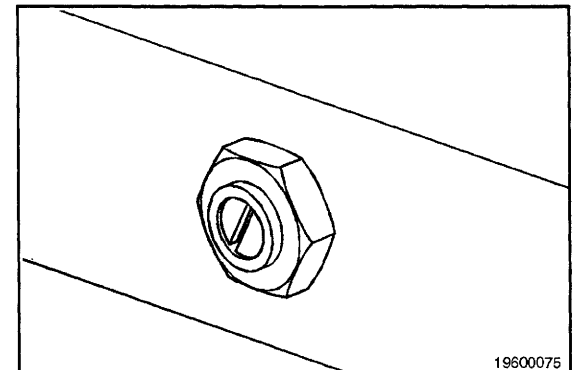
The frequency adjust potentiometer, located in the control panel, allows the adjustment of the engine speed without the aid of the electronic service tool.

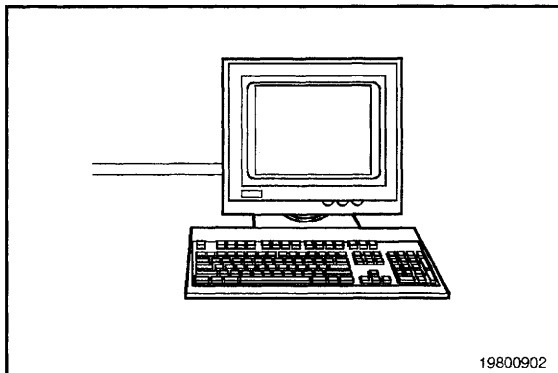
**NOTE:** This is **only** a fine adjustment with minimal range.



### Gain Adjust

The gain adjust potentiometer, located in the control panel, allows the adjustment of the governor gain without the aid of the electronic service tool.

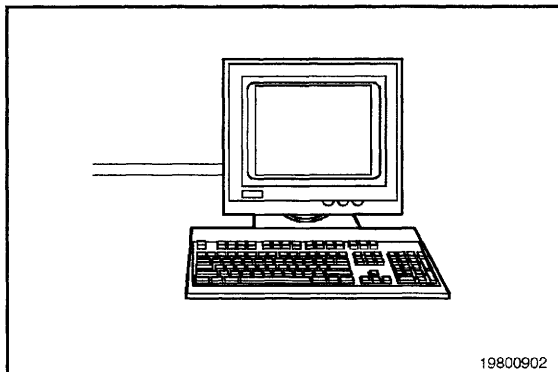




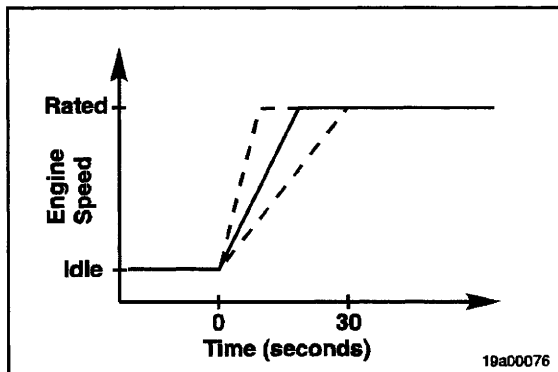
**⚠ CAUTION ⚠**

It takes a few seconds to initiate each gain adjustment (via the potentiometer or electronic service tool). It is recommended that any increases in the governor gain setting be made in increments not exceeding 3 percent. This will prevent prolonged periods of unwanted instability.

Governor gain can be adjusted for optimum engine performance. The governor gain is adjustable between 1 and 100 percent using the electronic service tool.



**NOTE:** Typical engine-generator combinations will **not** require adjustments to the Governor Gain settings as both 1500- and 1800-rpm generator sets ordinarily exhibit satisfactory steady state stability and acceptable transient performance with the gain value as set from the factory.



**Speed Ramp Adjustments**

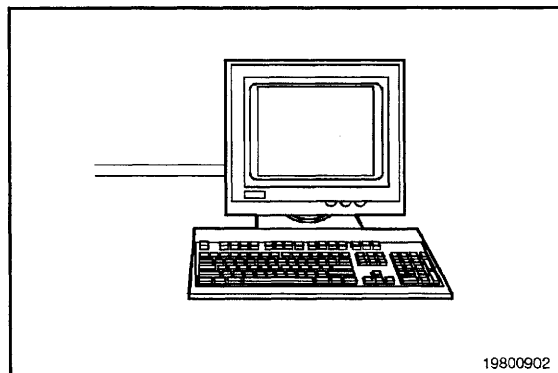
The ECM provides for two speed acceleration ramp functions that are adjustable using the electronic service tool.

- Crank to Rated - Ramp Time
- Idle to Rated - Ramp Time
- Rated to Idle - Ramp Time.

Crank-to-rated ramp time provides for speed ramping between cranking and rated speeds.

Idle-to-rated ramp time provides for speed ramping between idle and rated speeds.

Rate-to-idle ramp time provides for speed ramping between rate and idle speeds.



Refer to the electronic service tool manual for details on the features and for a table that lists the ramp times.

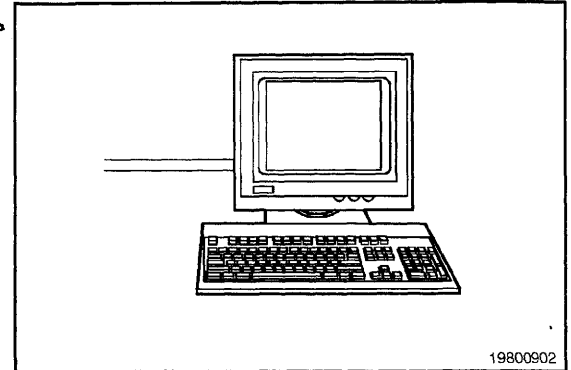
**NOTE:** Ramp times (in seconds) are dependent on idle and rated speed settings. Desired ramp times are selected by choosing ramp numbers, **not** ramp times directly.

### Barber-Colman & Woodward Speed Bias Inputs

The feature provides the ability to integrate the ECM with either a Barber-Colman or Woodward Load Sharing, Auto Synchronizing, Load Commander, and so forth.

The hardware can be either analog or digital.

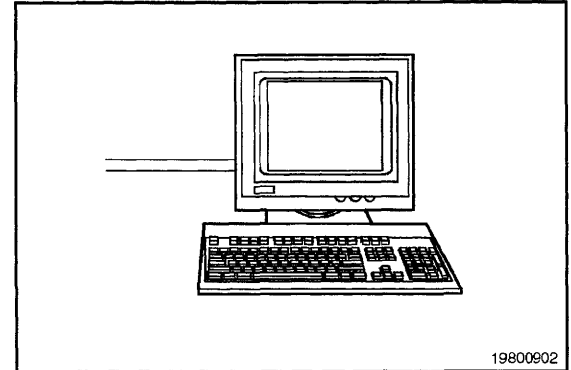
The feature is selectable via the electronic service tool. Refer to the electronic service tool manual for details on this feature.



### Internal Engine Hour Meter

This feature is monitorable via the electronic service tool. It allows viewing how many hours the engine generator has been in service.

Fault code snapshots will be stamped with a corresponding time stamp.

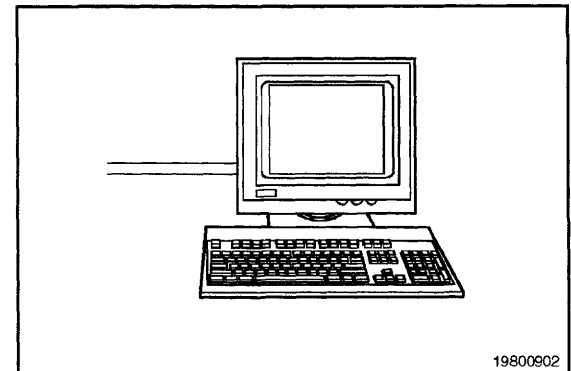


### Customer-Selectable Sensor Options

This feature allows the customer to add features to the electronic sensor package if desired. The optional sensors are:

- Oil Level Switch
- Coolant Level Switch
- Aftercooler Water Inlet Temperature Sensor.

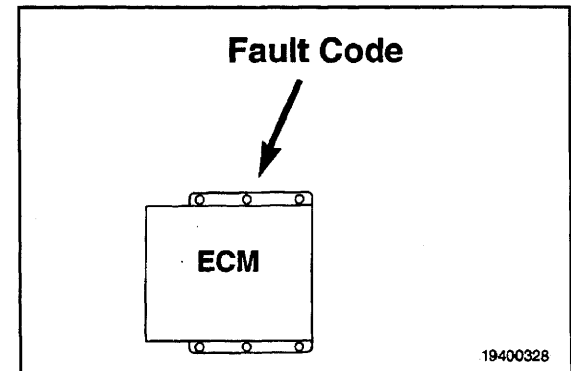
These sensors can be activated via the electronic service tool. Refer to the electronic service tool manual for details on how to activate each of the sensors.



### Diagnostic Fault Codes

#### Industrial

The QSX15 fuel system can display and record certain detectable fault conditions. These failures are displayed as fault codes, which make troubleshooting easier. The fault codes are retained in the electronic control module (ECM).



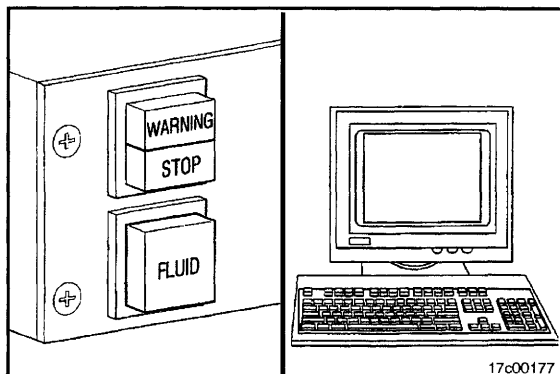


There are two types of fault codes. There are engine electronic fuel system fault codes and engine protection system fault codes.

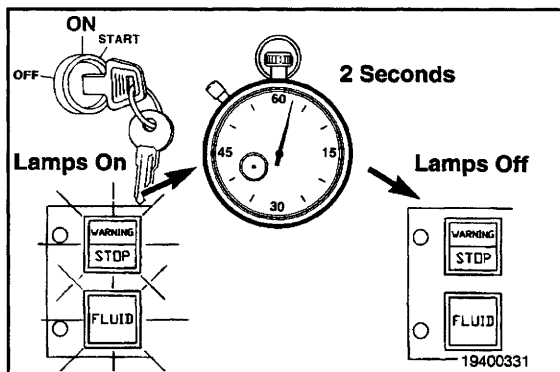
All fault codes recorded will either be active (fault code is presently active on the engine) or inactive (fault code was active at some time, but is **not** presently active).

### Diagnostic Fault Codes

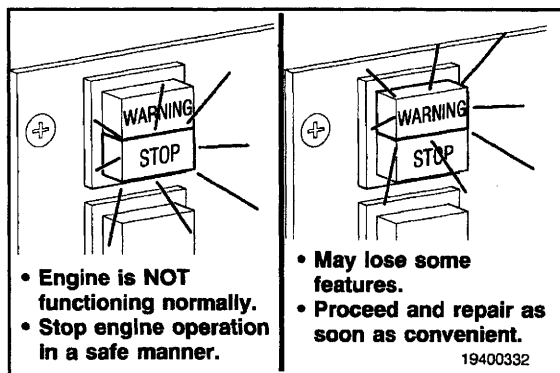
- Engine Electronic Fuel System Fault Codes
- Engine Protection System Fault Codes.



Active fault codes can be read using the warning (amber) and stop lamps (red) in the cab panel or electronic service tool. Inactive fault codes can **only** be viewed with an electronic service tool.



When the vehicle keyswitch is turned on and the diagnostic switch is off, the fault code lamps (red, yellow, and maintenance) will illuminate for approximately 2 seconds, one after the other, to check their operation.



The lights will remain off until a fault code is recorded. If a stop (red) light comes on while the engine is in operation, the fault can be engine-disabling. Stop the engine in a safe manner as soon as possible.

If the warning (amber) light illuminates, the engine can still be operated, but it can lose some system features that can sometimes result in a power loss. The failure **must** be repaired as soon as is convenient.

- Engine is **NOT** functioning normally.
- Stop engine operation in a safe manner.

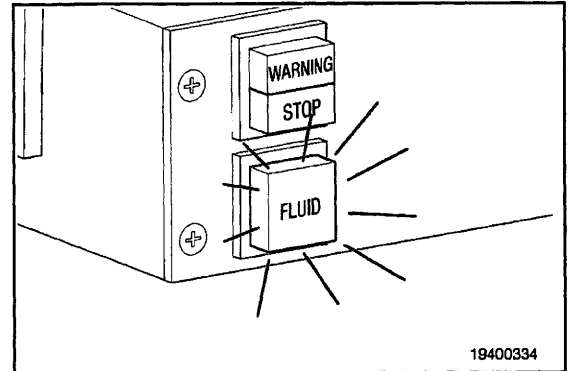
- May lose some features.
- Proceed and repair as soon as convenient.

The engine protection system records separate fault codes when an out-of-range condition is found for any of the sensors in the engine protection system. Engine protection is **only** available when the engine protection feature is enabled.

- Coolant Temperature
- Coolant Level
- Intake Manifold Temperature
- Oil Pressure.

The engine protection system will light the maintenance lamp (orange) when an out-of-range condition occurs.

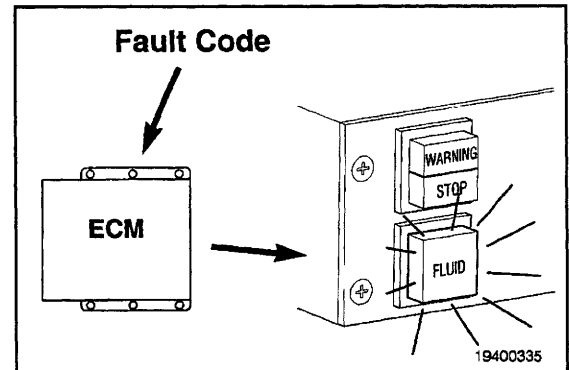
**NOTE:** Lamp colors and labels will vary by OEM.



19400334

If the engine protection maintenance lamp comes on while driving, it means that a fault code has been recorded. The light will remain on as long as the fault is occurring.

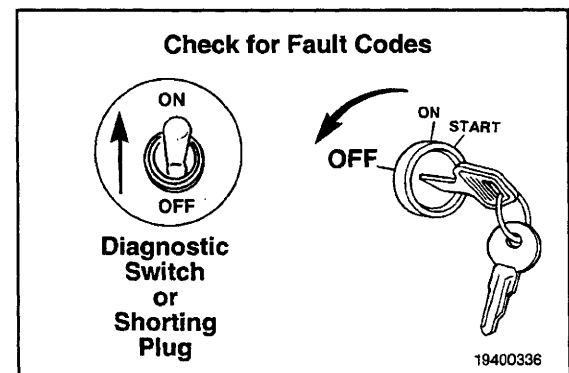
The light will begin to flash if the condition continues to get worse. The engine power and/or speed will be gradually reduced. If the engine protection shutdown feature is enabled, the engine will shut down to prevent engine damage.



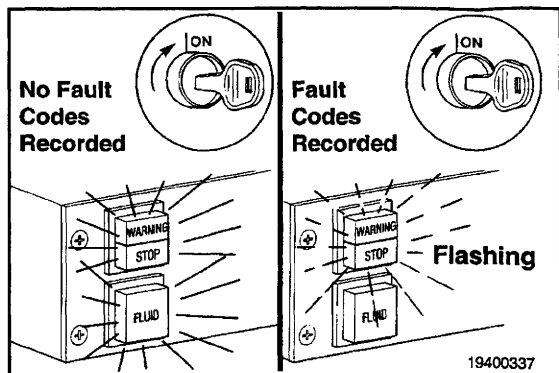
19400335

To check for active fault codes, first turn the vehicle keyswitch to the OFF position. Move the diagnostic switch to the ON position.

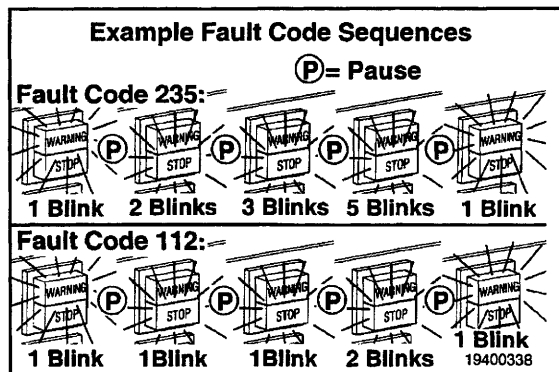
**NOTE:** Some OEMs use a shorting plug.



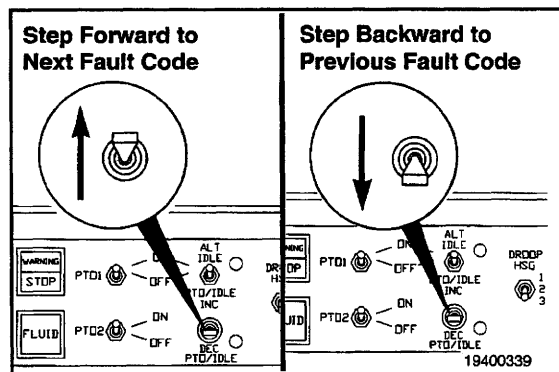
19400336



Turn the vehicle keyswitch to the ON position. If no active fault codes are recorded, all three lights will come on and stay on. If active fault codes are recorded, all three lights will come on momentarily. The amber (warning) and red (stop) lights will begin to flash the code of the recorded fault.



The fault code will flash in the following sequence. First, the amber (warning) lamp will flash. Then there will be a short 1-second pause when both the amber and red lights are off. Then the numbers of the recorded fault code will flash in red. There will be a 1-second pause between each number. When the number has stopped flashing, an amber light will appear again. The number will repeat in the same sequence.



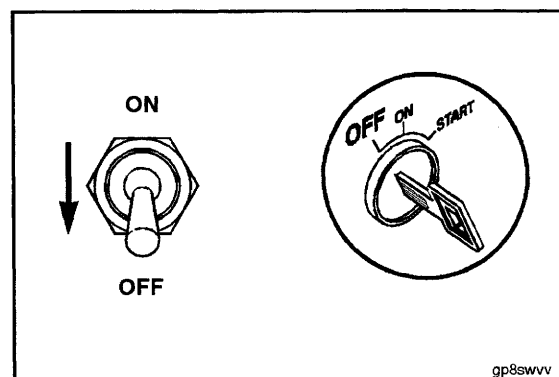
The lights will continue to flash the same fault code until the system has advanced to the next active fault code. To go to the second fault code, move the idle-speed adjust switch to "+," then release it. You can also go back to the previous fault code by moving the switch to "-", then releasing it. To check the third or fourth fault code, move the switch to "+," then release it when all active fault codes have been viewed. Moving the switch to "+" will go back to the first fault code.

The explanation and correction of all fault codes is in the troubleshooting charts of the QSX15 fuel manual. Refer to Troubleshooting and Repair Manual, Electronic Control System, Signature, ISX and QSX15 Engines, Bulletin No. 3666259.

Electronic fault code troubleshooting trees are in ascending numerical order. An index is located at the beginning of the section.

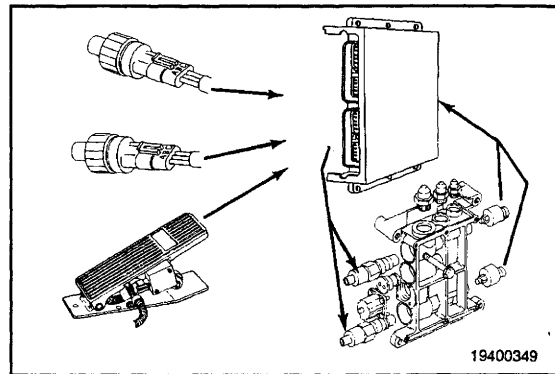
To stop the diagnostic system, move the diagnostic switch to the OFF position, or remove the shorting plug. Turn the vehicle keyswitch to the OFF position.

**NOTE:** Some OEMs use a shorting plug.



### Fault Code Snapshot Data

When a diagnostic fault code is recorded in the ECM, ECM input and output data are recorded from all sensors and switches. Snapshot data allow the relationships between ECM inputs and outputs to be viewed and used during troubleshooting.



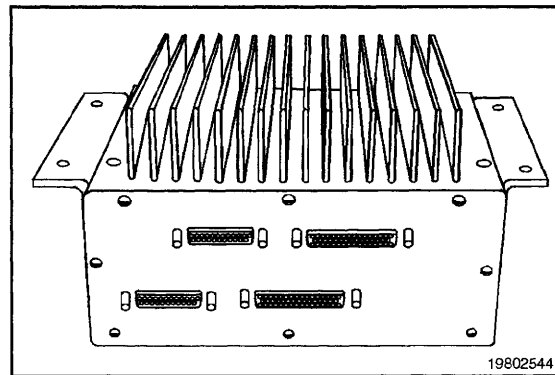
### Power Generation

The QSX15 fuel system can display and record certain detectable fault conditions. These failures are displayed as fault codes, which make troubleshooting easier. The fault codes are retained in the ECM.

There are two types of diagnostic codes:

**Information codes** are to inform the operator and electronic system (paralleling controllers, smart switch gear) that an event has occurred.

**Fault codes** are to report to the operator and the electronic system that there is a problem or potential problem with the engine or fuel system.



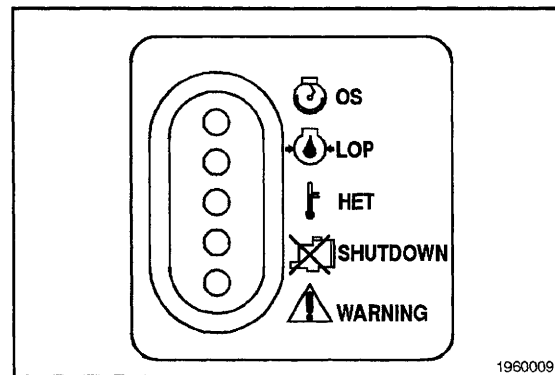
Fault codes can be accessed in three different ways:

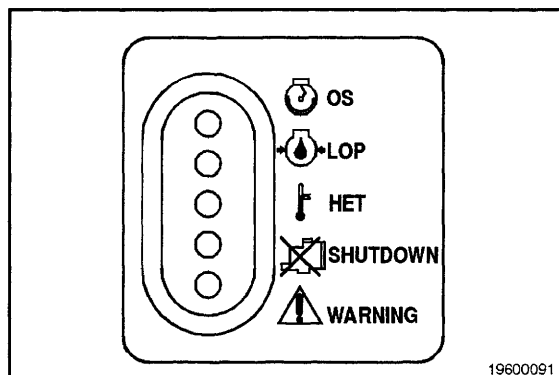
1. Flash Out
2. Electronic Service Tool
3. Operator Interface Panel.

### Generator-Drive Control System ECM Diagnostic Lamps

The generator-drive control system ECM has five LEDs for diagnostics. Typical lights will include:

1. OS - Overspeed
2. LOP - Low Oil Pressure
3. HET - High Engine Temperature
4. Shutdown - Engine Protection Shutdown Has Occurred
5. Warning - Engine Protection Warning Condition Exists.

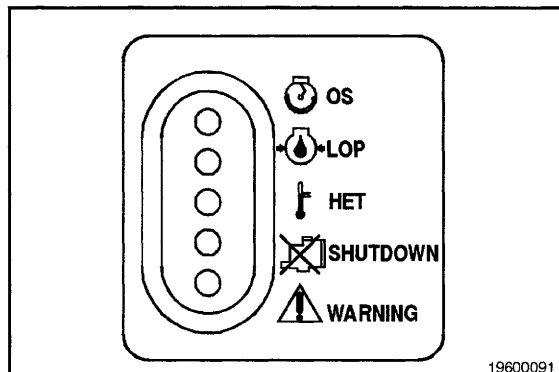




### Generator-Drive Control System Relay Drivers

The generator-drive control system has seven relay drivers for customer-supplied relays.

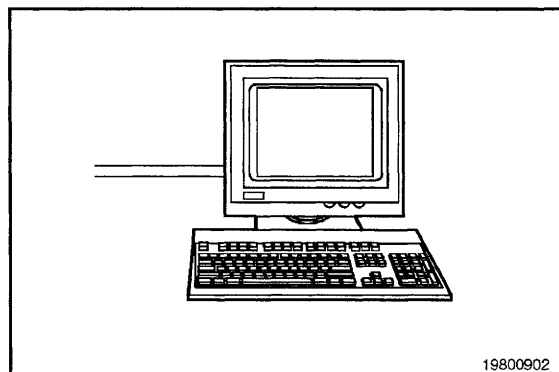
- Overspeed
- Low Oil Pressure
- High Engine Temperature
- Engine Protection Shutdown Has Occurred
- Engine Protection Warning Condition Exists
- Prelow Oil Pressure
- Prehigh Engine Temperature.



### Fault Code Flash-out

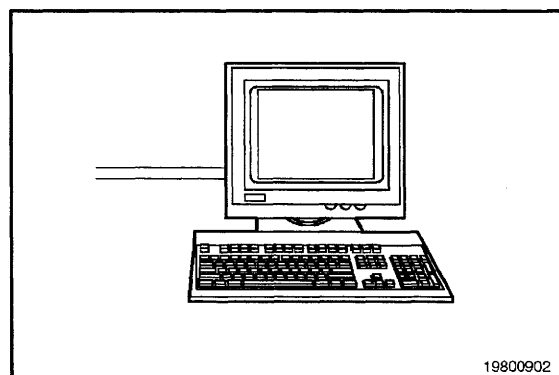
To “flash out” a fault code, the ECM **must** be put into the diagnostic mode. Enter the diagnostic mode by removing the diagnostic connector shorting the plug from the engine harness, turning the plug, and reinserting it, or using the diagnostic mode switch.

The warning lamp will flash (signifying the start of a new fault code), and then the fault code will flash out on the shutdown lamp.



### Fault Codes - Electronic Service Tool

The electronic service tool can be used to read the fault codes. Connect a personal computer, with the electronic service tool installed, to the engine using the service harness, Part No. 3163156. Refer to the electronic service tool manual for specifics about how to use the tool to read the fault codes.

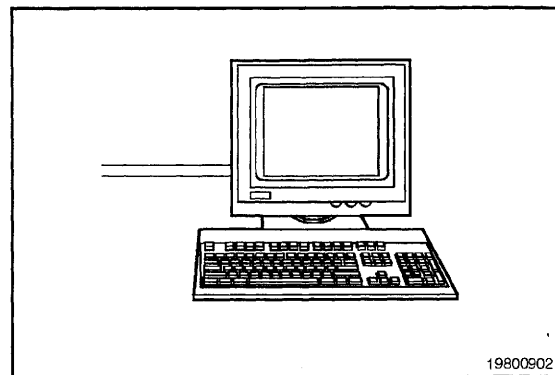


### Fault Code - Operator Interface Panel

If the customer supplied an operator interface panel, it has been integrated with the generator-drive control system using the RS485 datalink. The ability to display fault codes is one plus of this panel; refer to the manuals supplied with the unit for more details.

### Fault Code Snapshot Data

When a diagnostic fault code is recorded in the ECM, the ECM input and output data are recorded from all sensors and switches. Snapshot data allow the relationships between ECM inputs and outputs to be viewed and used during troubleshooting.



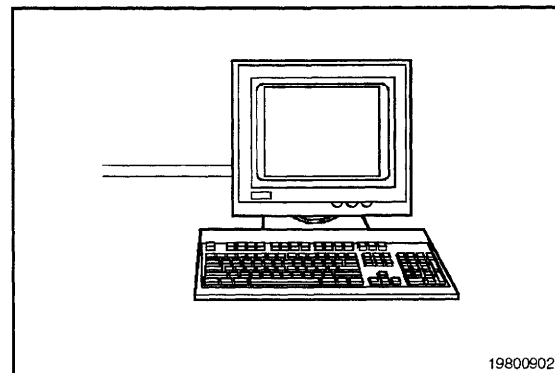
### To Clear a Fault Code

**Only** inactive fault codes can be cleared. There are two ways to clear an inactive fault code:

1. The **reset switch** on the operator interface panel
2. The **electronic service tool**.

**NOTE:** The engine **must** be shut down to clear inactive shutdown faults.

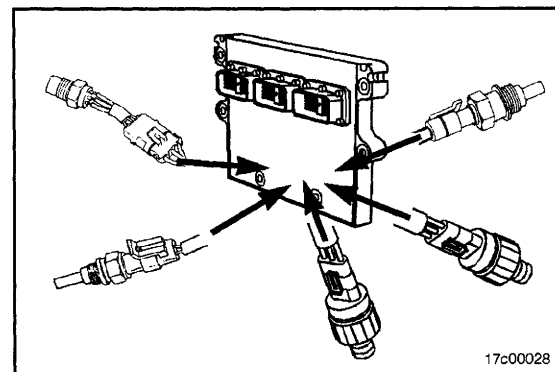
All fault codes recorded will either be active (fault code is presently active on the engine) or inactive (fault code was active at some time, but is **not** presently active).



### Engine Protection System

QSX15 engines are equipped with an engine protection system. The system monitors critical engine temperatures and pressures and will log diagnostic faults when an abnormal operating condition occurs. If an out-of-range condition exists and engine derate action is to be initiated, the operator will be alerted by an in-cab warning light. The warning light will blink or flash when out-of-range conditions continue to worsen. The driver **must** pull to the side of the road, when it is safe to do so, to reduce the possibility of engine damage.

**NOTE:** Engine power and speed will be gradually reduced, depending on the level of severity of the observed condition. The engine protection system will **not** shut down the engine unless the engine protection shutdown feature has been selected. If the feature has been selected and the engine does shut down, the engine can be started again by turning off the keyswitch and then turning it back on.



## Electromagnetic Interference (EMI)

### General Information

Some heavy-duty diesel engine applications utilize accessories (CB radios, mobile transmitters, etc.) that generate and use radio frequency energy that, if **not** installed and used correctly, can cause electromagnetic interference (EMI) between the accessory and Cummins QSX15 electronically controlled fuel system. Cummins **is not** liable for any performance problems with either the QSX15 fuel system or the accessory that are due to EMI. EMI **is not** considered by Cummins to be an engine failure and therefore **is not** warrantable.

### System EMI Susceptibility

Your Cummins product has been designed and tested for minimum sensitivity to incoming electromagnetic energy. Testing has shown that there is no engine performance degradation at relatively high energy levels; however, if very high energy levels are encountered, then some noncritical diagnostic fault code logging can occur. The QSX15 fuel system EMI susceptibility level will protect your engine from most, if **not** all, electromagnetic energy-emitting devices that meet the FCC legal requirements.

### System EMI Radiation Levels

Your Cummins product has also been designed and tested to emit minimum electromagnetic energy. Testing has shown that the QSX15 fuel system, when properly installed on vehicles, meets or exceeds by a wide margin Part 15 of the FCC Rules and SAE J1551 specifications. Other accessories **must** be designed with the correct filtering to reject electromagnetic noise emission from their system. Experience has shown that the QSX15 electronic fuel system on vehicles will **not** interfere with onboard communication equipment for urban and suburban background electromagnetic noise levels; however, the system, if used with accessories that are **not** installed correctly or do **not** utilize adequate filtering designs, can interfere with onboard communications equipment in rural applications where background radio frequency noise levels are very low. If an interference condition is observed, follow the suggestions below to reduce the amount of interference:

1. Locate the receiving antenna as far away from the engine and as high as possible.
2. Locate the receiving antenna as far away as possible from all metal obstructions (exhaust stacks, etc.).
3. Consult a representative of the accessory supplier in your area to:
  - Accurately calibrate the device for correct frequency, power output, and sensitivity (both base- and remote-site devices **must** be correctly calibrated)
  - Obtain antenna reflective energy data measurements to determine the optimal antenna location
  - Obtain optimum antenna type and mounting arrangement for your application
  - Make sure your accessory equipment model is built for maximum filtering to reject incoming electromagnetic noise.

**Section 2 - Maintenance Guidelines**  
**Section Contents**

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<b>Maintenance Record Form .....</b>	<b>2-8</b>
<b>Maintenance Schedule .....</b>	<b>2-2</b>
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<b>Tool Requirements .....</b>	<b>2-1</b>



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## Maintenance Guidelines - General Information

Cummins Engine Company, Inc. recommends that the engine be maintained according to the Maintenance Schedule in this section.

If the engine is operating in ambient temperatures consistently below -18°C [0°F] or above 38°C [100°F], perform maintenance at shorter intervals. Shorter maintenance intervals are also required if the engine is operated in a dusty environment or if frequent stops are made. See your Cummins Authorized Repair Location for recommended intervals.

**NOTE:** Some of these maintenance procedures require special tools or **must** be completed by qualified personnel. These procedures are outlined in the specific manuals as follows:

Procedure	Bulletin No.	Description
● Repair and rebuild components*	—	
● Troubleshoot and repair engines	3666239	<i>Troubleshooting and Repair Manual, Signature Engines/ISX/QSX</i>
● Troubleshoot and repair fuel system and electronics	3666259	<i>Troubleshooting and Repair Manual, QSM11/QSX Fuel System, Signature Engines</i>
	3666393	<i>Troubleshooting and Repair Manual Generator-Drive Control System QSX, QSK45 and QSK60 Engines</i>
	3666394	<i>Troubleshooting and Repair Manual PowerCommand Control QSX, QSK45 and QSK60 Generator Sets</i>

Use the chart provided in this section as a convenient way to record maintenance.

\* If your engine is equipped with a component or an accessory **not** manufactured by Cummins Engine Company, Inc., refer to the component manufacturer's maintenance recommendations. A listing of suppliers' addresses and telephone numbers is provided in Component Manufacturers, Section M.

## Tool Requirements

Most of the maintenance operations described in this manual can be performed with common hand tools (metric and SAE wrenches, sockets, and screwdrivers).

The following is a list of special service tools required for some maintenance operations:

3376807	Coolant Filter Wrench
3375049	Oil and Fuel Filter Wrench
3375044	Torque Wrench
3163530	Brake Feeler Gauge - 7.00 mm [0.276 in]

Refer to the appropriate sections for a description of the tools and how to use them.

Contact your nearest Cummins Authorized Repair Location for the required service tools.

## Maintenance Schedule

QSX15 Engine Maintenance Schedule: <sup>(1), (2)</sup>				
Daily or Refueling	Every 625 Hours or 6 months <sup>(1), (4)</sup>	Every 1500 Hours or 1 Year <sup>(2), (3)</sup>	Every 3000 Hours or 2 Years <sup>(3)</sup>	Every 10,000 Hours or 5 Years <sup>(3)</sup>
Maintenance Check/Drain	Change/Replace	Change/Replace	Change/Replace	Maintenance Check/Adjust
<ul style="list-style-type: none"> <li>● Check operators report</li> <li>● Drain air tanks and reservoirs</li> <li>● Drain fuel-water separator</li> <li>● Check and correct               <ul style="list-style-type: none"> <li>– Engine oil level</li> <li>– Coolant level</li> </ul> </li> <li>● Inspect cooling fan</li> <li>● Inspect drive belts</li> <li>● Inspect intake air piping and CAC</li> <li>● Check crankcase breather tube.</li> </ul>	<ul style="list-style-type: none"> <li>● Lubricating oil</li> <li>● Lubricating oil filter</li> <li>● Operate the engine and check for coolant leaks and coolant SCA concentration level.</li> </ul>	<ul style="list-style-type: none"> <li>● Coolant filter</li> <li>● Fuel filter</li> <li>● Inspect automatic belt tensioner</li> <li>● Operate engine and check intake air and exhaust systems</li> <li>● Check air cleaner restriction</li> <li>● Replace element on air compressor</li> <li>● Check engine wiring harness.</li> </ul>	<ul style="list-style-type: none"> <li>● Check all hose connections for leaks or deterioration</li> <li>● Check the shutters and fan</li> <li>● Steam-clean engine</li> <li>● Check engine mounting bolts</li> <li>● Clean crankcase breather tube</li> <li>● Check the vibration dampers</li> <li>● Adjust valves, injectors, and engine brakes<sup>(5)</sup>.</li> </ul>	<ul style="list-style-type: none"> <li>● Check the fan hub</li> <li>● Check air compressor carbon buildup.</li> </ul>
<ol style="list-style-type: none"> <li>1. Lubricating oil drain intervals can be adjusted based on fuel consumption and engine duty cycle. Refer to Section 2 in this manual for more details.</li> <li>2. Follow the manufacturer's recommended maintenance procedures for the starter, alternator, generator, batteries, electrical components, charge air cooler. Refer to Section M for addresses and telephone numbers.</li> <li>3. Perform maintenance at whichever interval occurs first. At each scheduled maintenance interval, perform all previous maintenance checks that are due for scheduled maintenance.</li> <li>4. Test the SCA concentration level every 6 months unless concentration is over 3 units; then check at every oil drain interval until concentration is below 3 units.</li> <li>5. The valves, injectors and engine brakes should be adjusted every 3000 hours. It is <b>not</b> necessary to adjust the valve, injectors, or engine brakes every 2 years.</li> </ol>				

## Oil Drain Intervals

### Industrial Engines Only

For industrial engines, the oil drain intervals are based on the duty cycle (as reflected by fuel consumption) and lubricating oil quality. The table below specifies the maximum oil drain interval for the listed lubricating oil classifications based on the three different duty cycles: heavy, medium, and light.

- Follow oil drain interval heavy if your equipment uses more than 57 l (15 gal) of fuel per hour.
- Follow oil drain interval medium if your equipment uses between 42 to 57 l (11 to 15 gal) of fuel per hour.
- Follow oil drain interval light if your equipment uses less than 42 l (11 gal) of fuel per hour.

**NOTE:** Extending the oil and filter change interval beyond the recommendation will decrease engine life due to factors such as corrosion, deposits, and wear.

Oil Classification	Duty Cycle (Fuel Consumption)		
	Heavy > 57 liters/hour [15 gallons/hour]	Medium 42 to 57 liters/hour [11 to 15 gallons/hour]	Light < 42 liters/hour [11 gallons/hour]
API CD-4, CE-4, CF-4 <sup>1,3</sup>	125	250	375
API CG-4 <sup>3</sup>	250	375	500
API CH-4 <sup>3</sup>	400	525	650
CES 20,076 <sup>2,3</sup>	500	625	750

**NOTE:**

1. The oil classifications CD, CE, and CF have been obsolete by API and should **not** be used, as their specifications are no longer controlled.
2. Valvoline Premium Blue and Premium Blue 2000 meet CES 20,076 standards.
3. Refer to the lubricating oil filter specification table in Section V.

The table below list typical duty cycles by application.

**NOTE:** The actual duty cycle can vary from the below chart. In those cases, it is necessary to change the lubricating oil as a function of average fuel consumption. Therefore, select a column based on the representative fuel consumption range.

Typical Duty Cycles by Applications		
Heavy	Medium	Light
Air Compressor	Articulated Dump Truck	Crane
Combine	Irrigation Equipment	Rear Dump Truck
Dozer	Scraper	
Dragline	Skidder	
Excator		
Farm Tractors		
Forage Harvester		
Front-End Loader		
Rock Drill		
Tub Grinder		

### Generator Drive Engines Only

This service interval is based on load factor (as reflected by fuel usage), lubricating oil quality, lubricating system capacity, and operating speed 1500 rpm (50 Hz) or 1800 rpm (60 Hz). Premium grade oils (API CG-4, CH-4, and CES 20,076) are recommended for the QSX15 engine. The oil grades CD, CE, and CF have been obsolete by API and should **not** be used, as their specifications are no longer controlled. There are two recommended methods for determining the proper oil change interval:

- Fixed hour method; based on fixed hours of operation or months of service, whichever occurs first.
- Chart method; based on known fuel consumption rates.

### Fixed Hour Method

If the chart method is **not** used or, for all stand-by power applications, the oil should be changed at a regular interval or 12 months, whichever occurs first:

Operating Speed	Sump Size	Change Interval
1500 rpm (50 Hz)	12 gal	125 hrs or 12 months
	25 gal	250 hrs or 12 months
1800 rpm (60 Hz)	12 gal	250 hrs or 12 months
	25 gal	500 hrs or 12 months

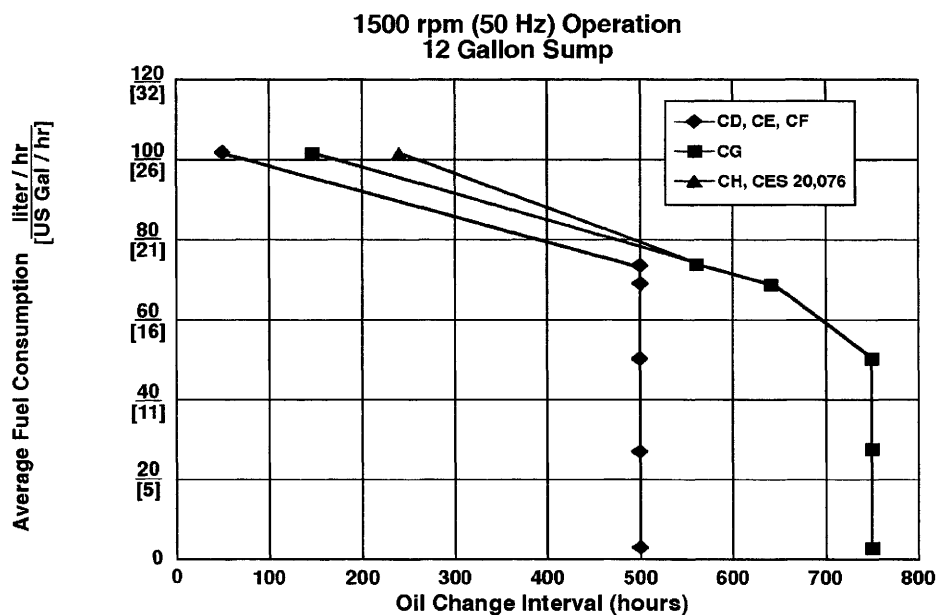
### Chart Method

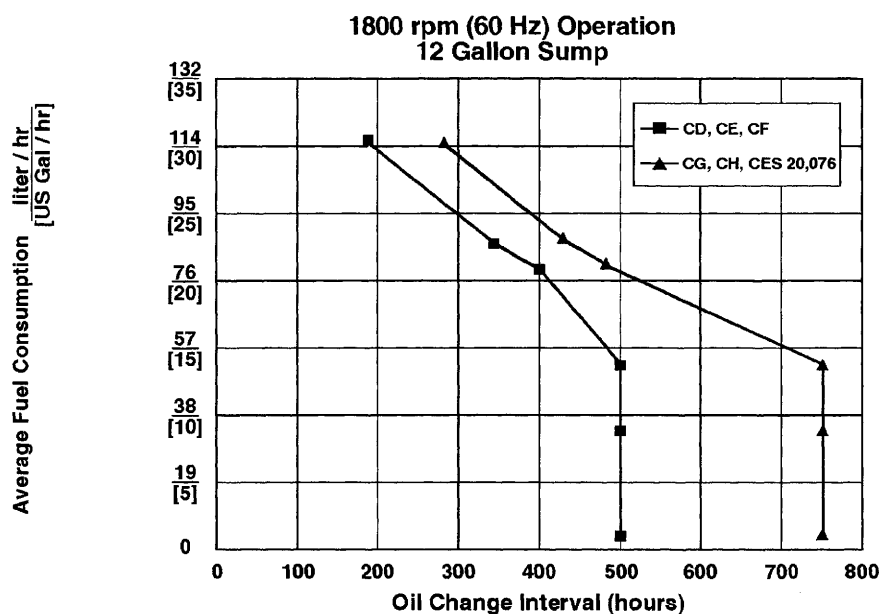
The chart method is recommended to provide the lowest total cost of operation while still protecting the engine. Due to differing availability outside North America, lower grade oils (CD, CE, and CF) are also depicted, however their classifications have been obsoleted by API, and oil change intervals are greatly reduced.

The charts should be used as guidelines because actual oil drain intervals will also depend on operation and maintenance practices. It is suggested that oil analysis should be used periodically for prime power applications (every 100 hours) to ensure the proper oil change interval is being applied.

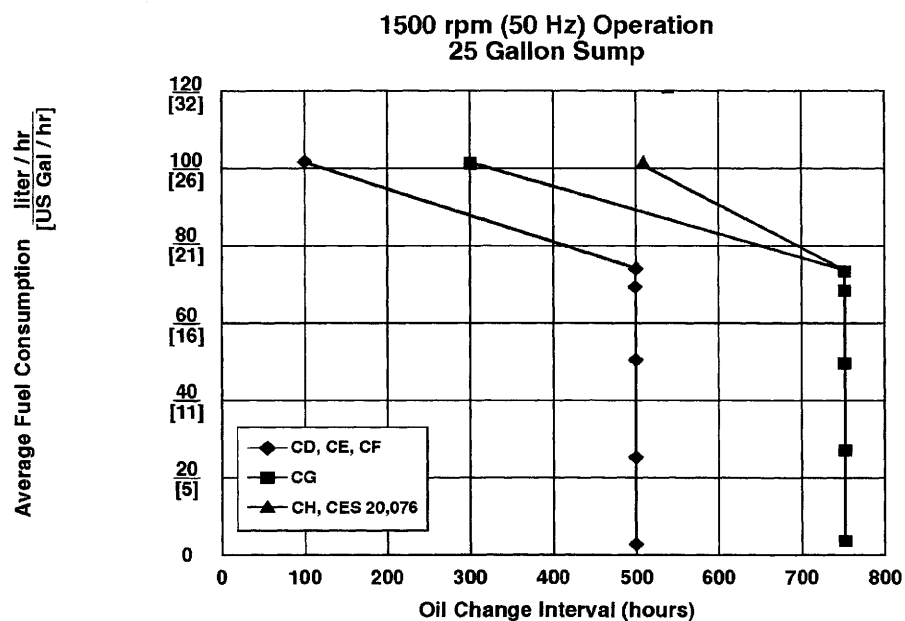
To use the charts, locate the chart for the appropriate sump size and operating speed. Find the fuel consumption rate in U.S. gallons per hour or liters per hour on the left vertical axis. Draw a horizontal line from left to right across the chart, parallel with the bottom of the chart, until it intersects the curve.

From the intersection point on the curve, draw a line perpendicular to the bottom of the chart. The number the line intersects across the bottom of the chart represents the recommend oil change interval in hours.

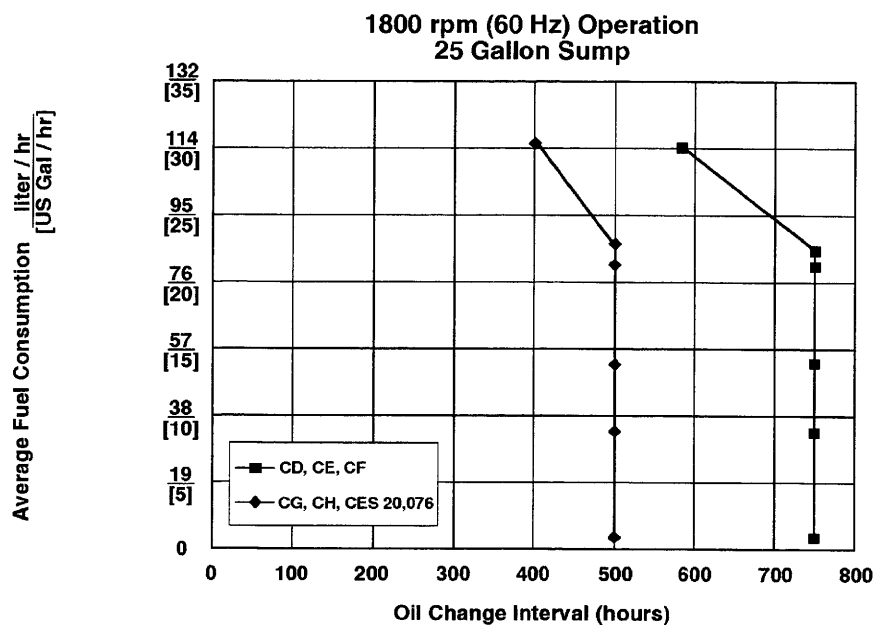




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## Page References for Maintenance Instructions

For your convenience, listed below are the page numbers that contain specific instructions for performing the maintenance checks listed in the maintenance schedule.

### Daily or Refueling

• Air Intake Piping - Maintenance Check .....	3-4
• Air Tanks and Reservoirs - Drain .....	3-5
• Charge-Air Piping - Maintenance Check .....	3-4
• Coolant Level - Maintenance Check .....	3-2
• Cooling Fan - Maintenance Check .....	3-3
• Crankcase Breather Tube - Maintenance Check .....	3-5
• Drive Belts - Maintenance Check .....	3-4
• Fuel-Water Separator - Drain .....	3-2
• Lubricating Oil Level - Maintenance Check .....	3-2

### Every 250 Hours or 6 Months

• Lubricating Oil - Drain and Fill .....	4-2
• Lubricating Oil Filter - Replace .....	4-2
• Supplemental Coolant Additive (SCA) - Maintenance Check .....	4-5

### Every 1500 Hours or 1 Year

• Air Cleaner Restriction - Maintenance Check .....	5-7
• Air Leaks, Air Intake and Exhaust Systems - Maintenance Check .....	5-6
• Automatic Belt Tensioner - Inspect .....	5-4
• Coolant Filter - Replace (if necessary) .....	5-2
• Engine Wiring Harness - Maintenance Check .....	5-8
• Fuel Filter (Spin-on Type) - Remove and Install .....	5-3

### Every 3000 Hours or 2 Years

• Cold Weather Starting Aids (Shutters and Thematic Fan)- Maintenance Check .....	6-2
• Crankcase Breather Tube - Inspect .....	6-3
• Engine Brake Assembly - Adjust .....	6-11
• Engine Hoses - Maintenance Check .....	6-2
• Engine Mounting Bolts - Maintenance Check .....	6-3
• Engine Steam Cleaning - Clean .....	6-2
• Vibration Damper - Maintenance Check .....	6-5
• Overhead Set - Adjust .....	6-5

### Every 10,000 Hours or 5 Years

• Air Compressor Carbon Buildup - Maintenance Check .....	7-2
• Belt Driven Fan Hub - Maintenance Check .....	7-2



Maintenance Record	
Engine Serial No.:	Engine Model:
Owner's Name:	Equipment Name/Number:

A = Date  
B = km [Miles], Hours or Time Interval  
C = Actual km [Miles] or Hours  
D = Maintenance Check Performed  
E = Check Performed By  
F = Comments

[illegible]

## Section 3 - Maintenance Procedures at Daily Interval

### Section Contents

	Page
<b>Air Intake Piping</b> .....	3-4
Maintenance Check .....	3-4
<b>Air Tanks and Reservoirs</b> .....	3-5
Drain .....	3-5
<b>Charge-Air Piping</b> .....	3-4
Maintenance Check .....	3-4
<b>Coolant Level</b> .....	3-2
Maintenance Check .....	3-2
<b>Crankcase Breather Tube</b> .....	3-5
Maintenance Check .....	3-5
<b>Daily Maintenance Procedures - General Information</b> .....	3-1
<b>Drive Belts</b> .....	3-4
Maintenance Check .....	3-4
<b>Fan, Cooling</b> .....	3-3
Maintenance Check .....	3-3
<b>Fuel-Water Separator</b> .....	3-2
Drain .....	3-2
<b>Lubricating Oil Level</b> .....	3-2
Maintenance Check .....	3-2

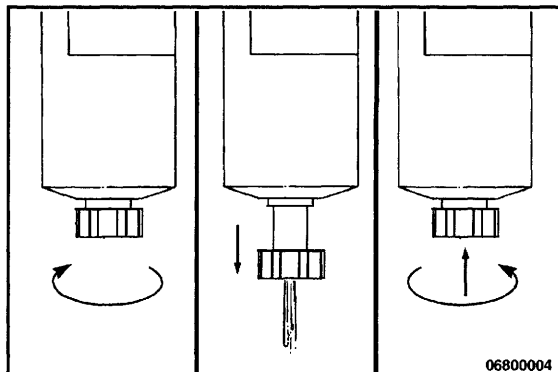
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## **Daily Maintenance Procedures - General Information**

Preventative maintenance begins with day-to-day awareness of the condition of the engine and its systems.

Before starting the engine, check the oil and coolant levels. Look for:

- Leaks
- Loose or damaged parts
- Worn or damaged belts
- Any change in engine appearance.



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## Fuel-Water Separator

### Drain

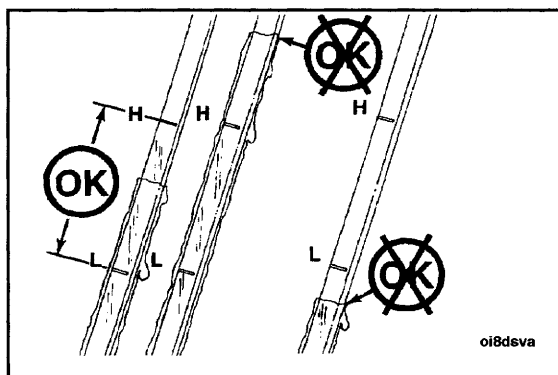
**NOTE:** Water and sediment can contain petroleum products. Please consult the local environmental agency for recommended disposal guidelines.

Cummins requires that a fuel-water separator or fuel filter and water separator be installed in the fuel supply system. Drain the water and sediment from the separator daily.

Shut off the engine. Loosen the drain valve nut completely so the valve drops down from the filter 1 inch. Drain the filter sump of water until clear fuel is visible.

**NOTE:** The thumb nut **must** be loosened enough so that the valve drops down to expose the vent slots in the valve.

Tighten the drain valve nut to stop draining.



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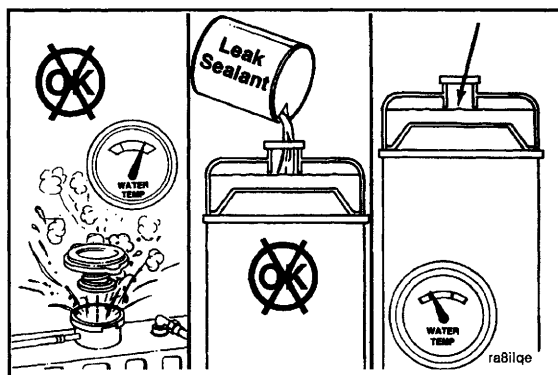
## Lubricating Oil Level

### Maintenance Check

Check the oil level daily.

**Never** operate the engine with the oil level below the L (low) mark or above the H (high) mark. Wait at least 15 minutes after shutting off the engine to check the oil. This allows time for the oil to drain to the oil pan.

**NOTE:** The engine **must** be level when checking the oil level to make sure the measurement is correct.



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## Coolant Level

### Maintenance Check

#### ▲ WARNING ▲

**Do not remove the pressure cap from a hot engine. Wait until the temperature is below 50°C [120°F] before removing the pressure cap. Failure to do so can result in personal injury from heated coolant spray or steam. Remove the filler cap slowly to relieve coolant system pressure.**

**Never** use a sealing additive to stop leaks in the coolant system. This can result in coolant system plugging and inadequate coolant flow, causing the engine to overheat.

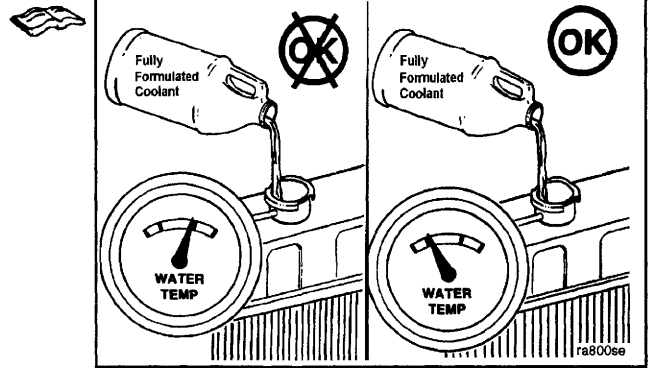
The coolant level **must** be checked daily.

**⚠ CAUTION ⚠**

**Do not add cold coolant to a hot engine. Engine castings can be damaged. Allow the engine to cool to below 50°C [120°F] before adding coolant.**

Makeup coolant added to the engine **must** be mixed with the correct proportions of antifreeze, supplemental coolant additive, and water to avoid engine damage.

Refer to Coolant Recommendations and Specifications in Section V for details on correct mixing of coolant.

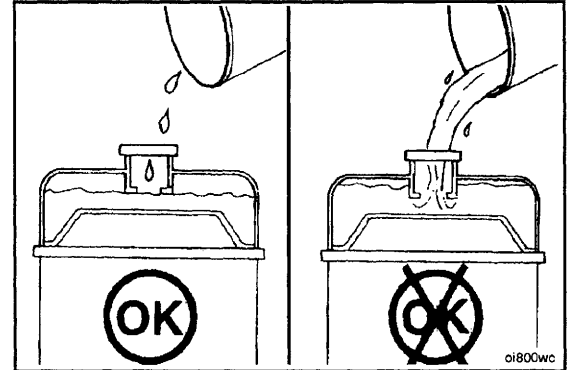


**⚠ WARNING ⚠**

**Coolant is toxic. If not reused, dispose of in accordance with local environmental regulations.**

Fill the cooling system with coolant to the bottom of the fill neck in the radiator fill or expansion tank.

**NOTE:** Some radiators have two fill necks, both of which **must** be filled when the cooling system is drained.

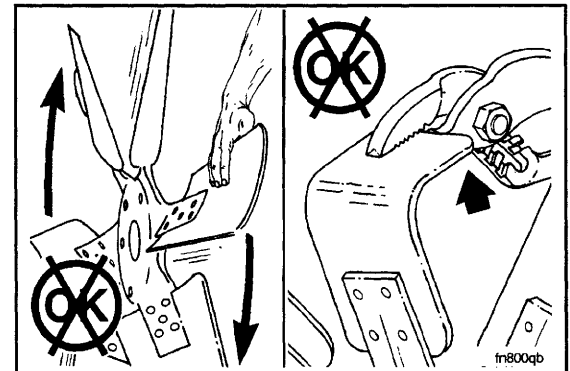


## Fan, Cooling

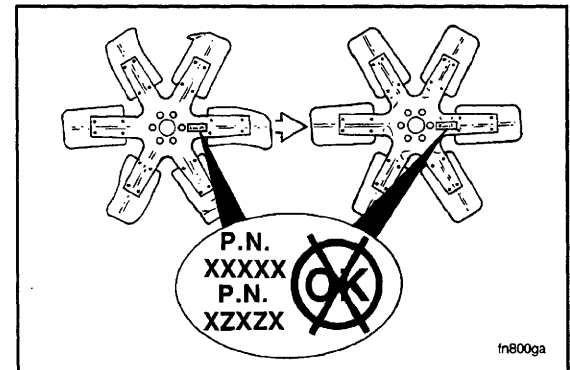
### Maintenance Check

**⚠ WARNING ⚠**

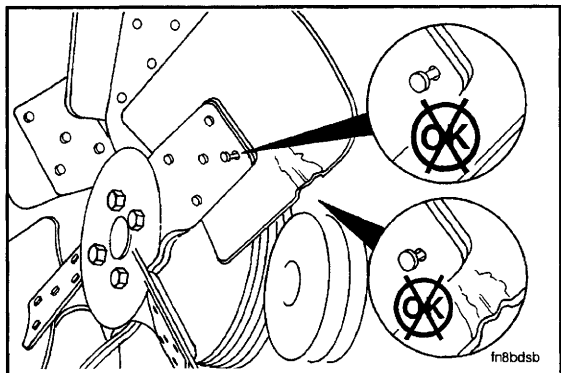
**Do not straighten a bent fan blade or continue to use a damaged fan. A bent or damaged fan blade can fail during operation and cause personal injury or property damage.**



**NOTE:** Replace the original equipment fan with a fan of the identical part number. Cummins Engine Company, Inc. **must** approve any other fan changes.



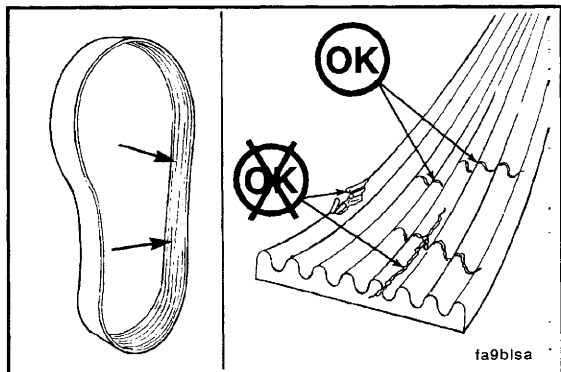
### Section 3 - Maintenance Procedures at Daily Interval



An inspection of the cooling fan is required daily. Check for cracks, loose rivets, bent or loose blades, and for contact between the fan blade tips and the fan shroud. Check the fan to make sure it is securely mounted. Tighten the capscrews if necessary. Replace any fan that is damaged.



Refer to the vehicle manufacturer's specifications for fan capscrew torque value.



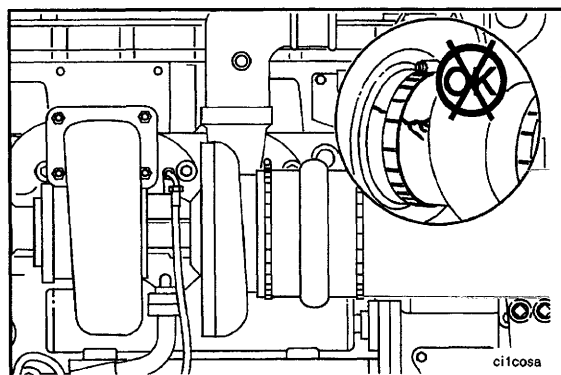
## Drive Belts

### Maintenance Check

Inspect the belts for damage, daily. Transverse (across the belt width) cracks are acceptable. Longitudinal (direction of belt length) cracks that intersect with transverse cracks are **not** acceptable. Replace the belt if it has unacceptable cracks, is frayed, or has pieces of material missing.

Belt damage can be caused by:

- Incorrect tension
- Incorrect size or length
- Pulley misalignment
- Incorrect installation
- Severe operating environment
- Oil or grease on the belts.



## Air Intake Piping

### Maintenance Check



Inspect the intake piping, daily, for cracked hoses, loose clamps, or punctures that can damage the engine.

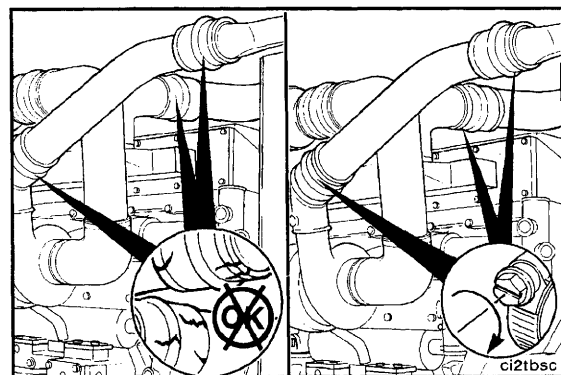
Tighten or replace parts, as necessary, to make sure the air intake system does **not** leak.



**Torque Value:** 8.5 N•m [75 in-lb]



Check for corrosion of the intake system piping under the clamps and hoses. Corrosion can allow corrosive products and dirt to enter the intake system. Disassemble and clean as required.



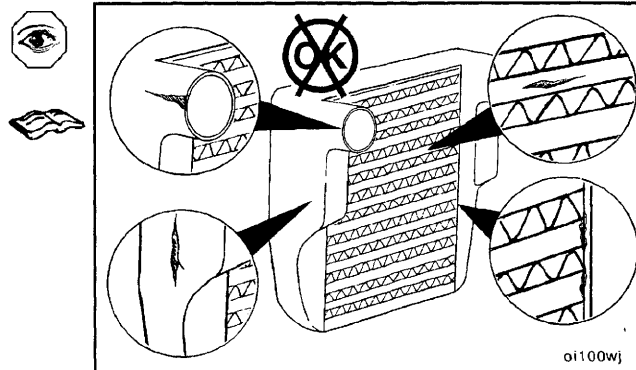
## Charge-Air Piping

### Maintenance Check



Inspect the charge air piping and hoses, daily, for leaks, holes, cracks, or loose connections. Tighten the hose clamps if necessary. Refer to the manufacturer's specifications for the correct torque value.

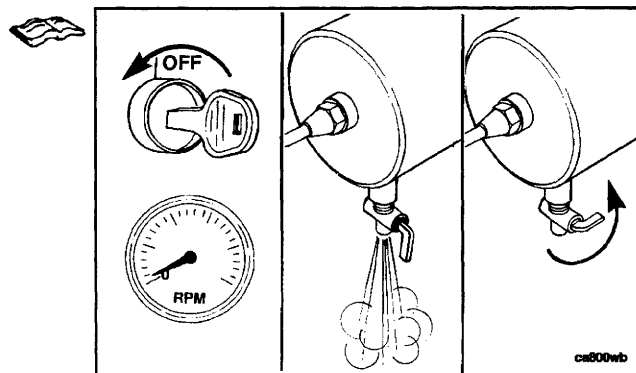
Inspect the charge air cooler for dirt and debris blocking the fins. Check for cracks, holes, or other damage. If damage is found, refer to the OEM dealer.



## Air Tanks and Reservoirs

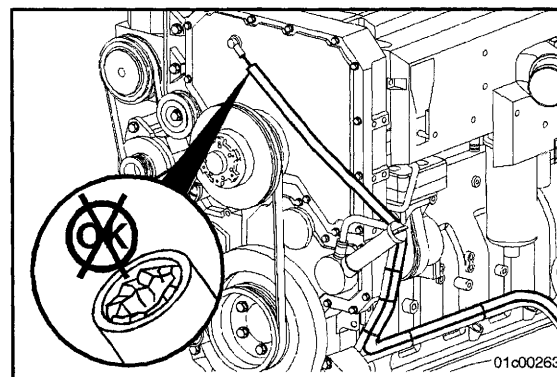
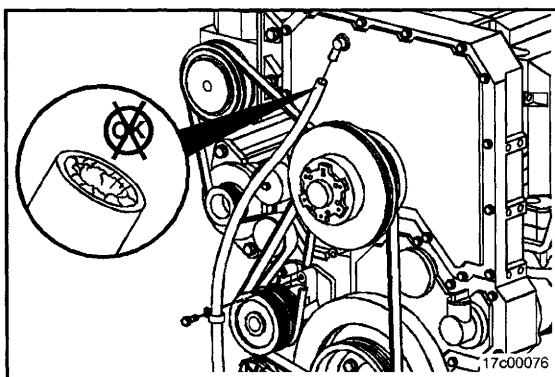
### Drain

Open the draincock on the wet tank to drain any moisture accumulated in the air system. If oil is present, the air compressor **must** be checked. Refer to the *Signature /ISX/ QSX15 Troubleshooting and Repair Manual*, Bulletin No. 3666239.



## Crankcase Breather Tube

### Maintenance Check



Inspect the breather tube for sludge or debris on or in the tube.  
Inspect the tube more frequently in icy conditions.





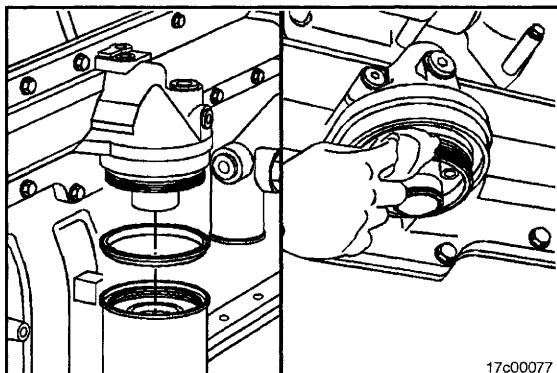
**Maintenance Procedures at 625 Hours or 6 Months**  
**Section Contents**

	<b>Page</b>
<b>Lubricating Oil and Filters</b> .....	4-2
Drain .....	4-2
Fill .....	4-3
Remove .....	4-2
<b>Maintenance Procedures - General Information</b> .....	4-1
<b>Supplemental Coolant Additive (SCA)</b> .....	4-5
Maintenance Check .....	4-5

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## **Maintenance Procedures - General Information**

All checks or inspections listed under daily or previous maintenance intervals **must** also be performed at this time, in addition to those listed under this maintenance interval.



## Lubricating Oil and Filters

### Remove



Clean the area around the lubricating oil filter head. Remove the filter. Clean the gasket surface of the filter head.

Use oil filter wrench, Part No. 3375049.

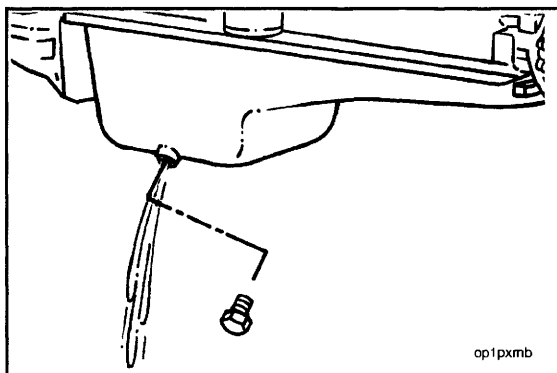


**NOTE:** The o-ring can stick on the filter head. Make sure it is removed.

**NOTE:** If the lubricating oil filter head adapter comes off during the removal of the lubricating oil filter, then reinstall the oil filter head adapter. Use a small amount of loctite on the threads of the oil filter head adapter and tighten.

**Torque Value:** 203 N•m [150 ft-lb]

**NOTE:** Refer to the Lubricating Oil Filter Specifications Chart in Section V.



### Drain

#### ⚠ WARNING ⚠



Some state and federal agencies in the United States of America have determined that used engine oil can be carcinogenic and can cause reproductive toxicity. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil. Always use the proper procedures to dispose of the oil.

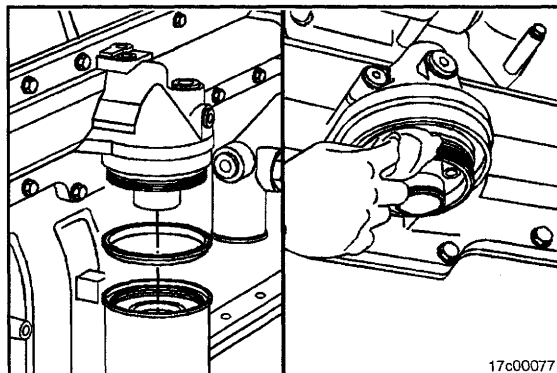
#### ⚠ WARNING ⚠

To avoid personal injury, avoid direct contact of hot oil with your skin.

Change the lubricating oil and filters at every oil change interval.

The oil drain intervals outlined in Section V are based on duty cycles for severe-duty, normal-duty, and light-duty operation. Refer to Oil Drain Intervals in Section V to determine which interval fits your application.

Operate the engine until the water temperature reaches 60°C [140°F]. Shut off the engine. Remove the oil drain plug. Drain the oil immediately to make sure all the oil and suspended contaminants are removed from the engine.



Clean the area around the lubricating oil filter head. Remove the filter. Clean the gasket surface of the filter head.

Use oil filter wrench, Part No. 3375049.



**NOTE:** The o-ring can stick on the filter head. Make sure it is removed.



**NOTE:** Refer to the Lubricating Oil Filter Specifications Chart in Section V.

## Fill



Fill the oil filter with clean lubricating oil before installing it on the engine. Lack of engine lubrication while the filter is being pumped full of oil is harmful to the engine.

Use the correct oil filter for your engine.

## Combination Full-Flow/Bypass Lubricating Oil Filter

Apply a thin film of lubricating oil to the filter gasket before installing the new filter.

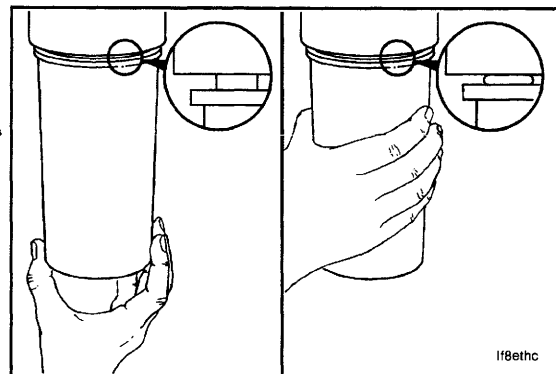
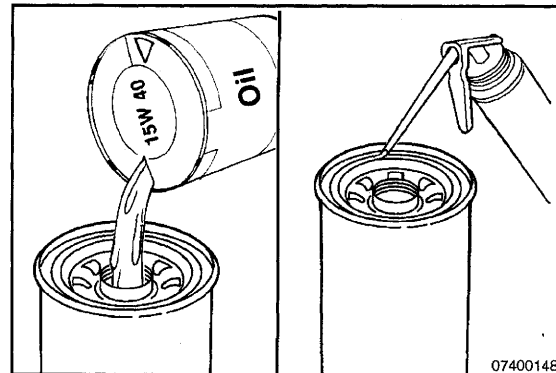
Oil filter **must** meet Cummins Engine Company Source Approval Method 10,765.

## Install



Mechanical overtightening can distort the threads or damage the filter element seal.

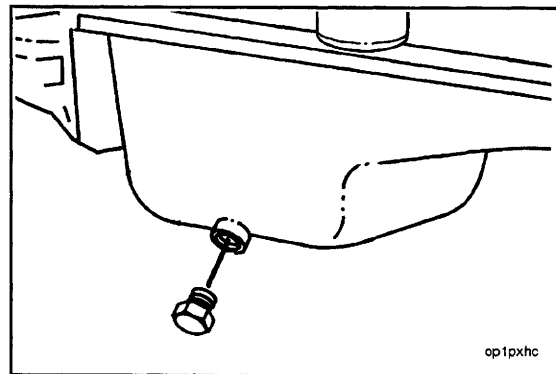
Tighten the filter an additional 3/4 of a turn after the gasket contacts the filter head surface, or as specified by the manufacturer.

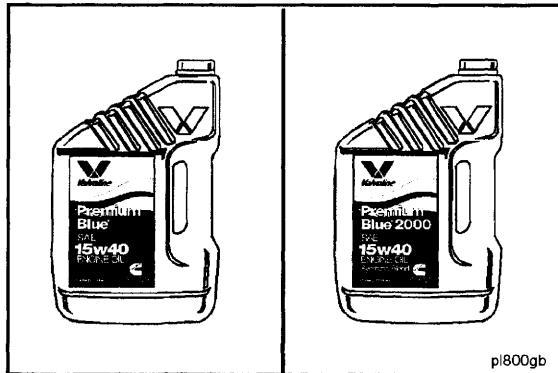


Clean and check the oil drain plug threads, o-ring, and the seal surface.

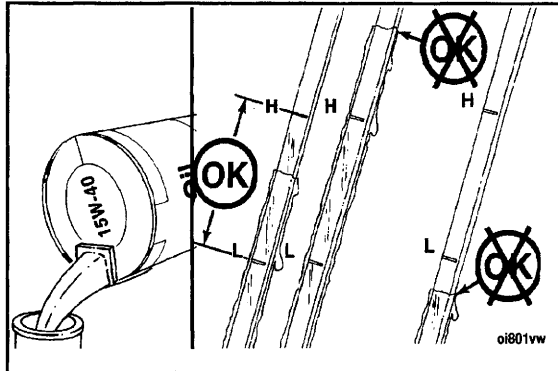
Install and tighten the oil drain plug.

**Torque Value:** 47 N•m [35 ft-lb]





Use a high-quality 15W-40 multiviscosity oil that meets Cummins Engineering Standard 20,076, such as Valvoline® Premium Blue® or Premium Blue® 2000, in Cummins engines. Choose the correct oil for your operating climate as outlined in Section V.

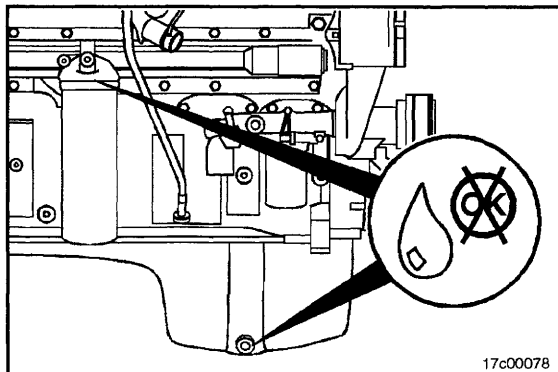


Fill the engine with clean oil to the correct level. Total system capacity for the standard engine including filter is 49.2 liters [12 gal].

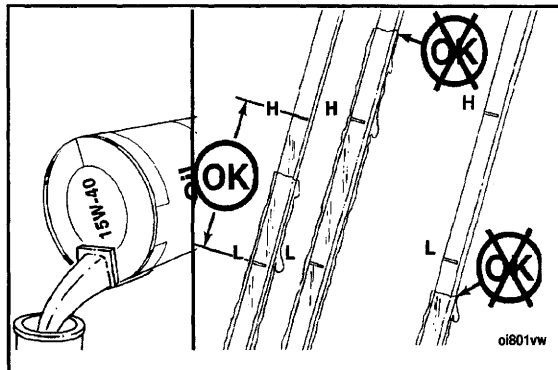
Total system capacity with the full sump pan including filter is 98.4 liters [26 gal].

After an oil change, the standard engine requires approximately 45.4 liters [11 gal] to fill the oil pan and another 3.8 liters [1 gal] to fill the new oil filter.

The engine with the full sump pan requires approximately 94.6 liters [25 gal] to fill the oil pan and another 3.8 liters [1 gal] to fill the new oil filter.



Operate the engine at idle speed to inspect for leaks at the oil filter and the drain plug.



Shut off the engine. Wait approximately 15 minutes to let the oil drain from the upper parts of the engine. Check the oil level again.

Add oil, as necessary, to bring the oil level to the H (high) mark on the dipstick.

## Supplemental Coolant Additive (SCA)

### Maintenance Check

#### ⚠ WARNING ⚠

Coolant is toxic. If not reused, dispose of in accordance with local environmental regulations.

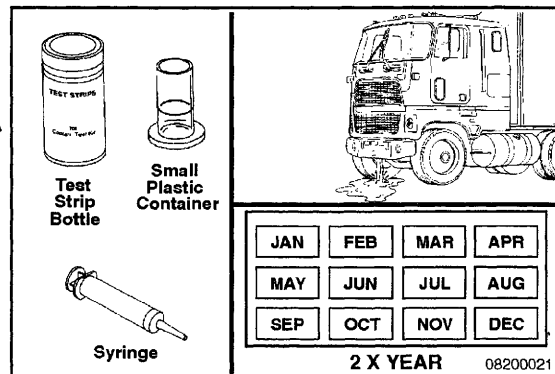
#### ⚠ CAUTION ⚠

Insufficient concentration of the coolant additives can result in liner pitting and engine failure. Insufficient concentration can also cause damage to aluminum components such as the water inlet connection, thermostat housing, and air compressor cylinder head.

Check the SCA concentration level at least every 6 months, and anytime the coolant condition is unknown or corrosion is apparent within the cooling system.

Use Fleetguard® Nelson® coolant test kit, CC2602, to check the concentration level. Instructions are included with the test kit.

Refer to Coolant Recommendations and Specifications in Section V for more information.





## This image shows a full page of blank, lined paper. It features approximately 20 evenly spaced horizontal black lines across its entire width, typical of notebook or primary writing paper. The background is a solid off-white color, and there are no margins, text, or other markings present.

## Maintenance Procedures at 1500 Hours or 1 Year

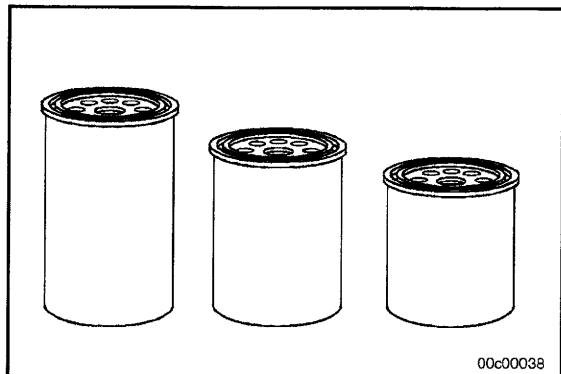
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## **Maintenance Procedures - General Information**

All checks or inspections listed under daily or previous maintenance intervals **must** also be performed at this time, in addition to those listed under this maintenance interval.

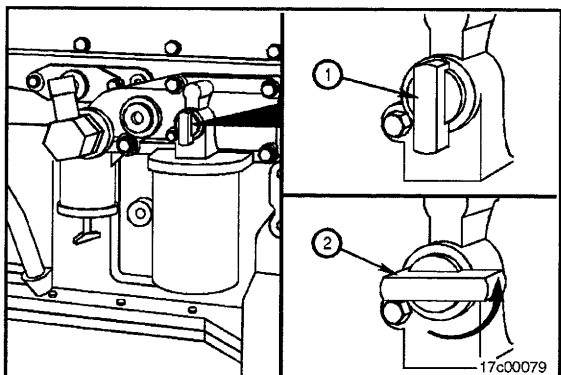


## Coolant Filter

### General Information

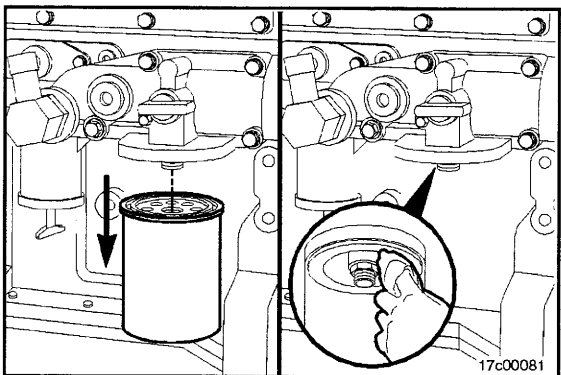
Change the coolant filter at every coolant maintenance interval. Since coolant filter change (service) intervals are being extended, a fully formulated, heavy-duty antifreeze that meets TMC 329 or 330 **must** be used.

Refer to Coolant Recommendations and Specifications in Section V.



An on/off valve is provided to prevent coolant leakage while changing the coolant filter.

With the valve in the ON position (1), the coolant flows to and from the coolant filter. In the OFF position (2), the coolant flow is cut off to and from the coolant filter.



### Remove

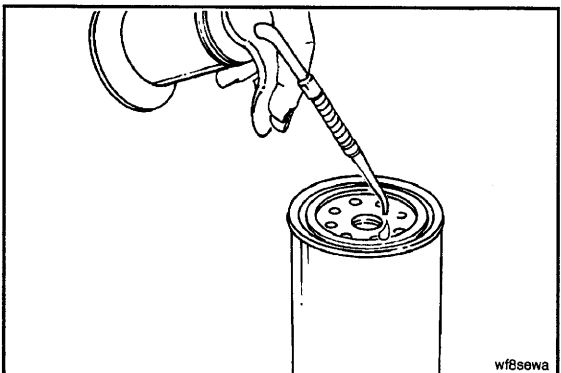
#### ⚠ WARNING ⚠



**Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [120°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.**

**NOTE:** To remove the coolant filter, the on/off valve **must** be in the OFF position.

Remove and discard the coolant filter. Clean the gasket surface on the filter head.



### Install

Apply a thin film of clean engine oil, or its equivalent, to the coolant filter gasket sealing surface before installing the coolant filter.



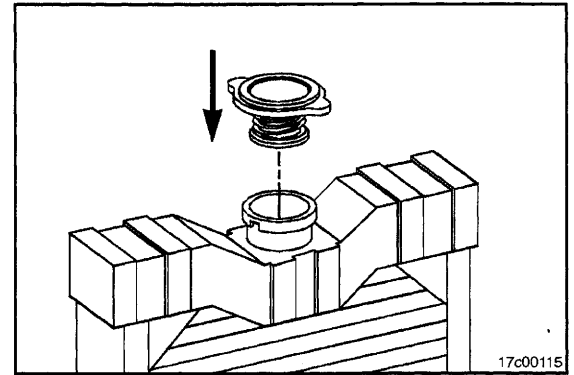
#### ⚠ CAUTION ⚠

**Mechanical overtightening can distort the threads or damage the filter head.**

**NOTE:** After installing the coolant filter, the ON mark on the coolant filter collar **must** be properly aligned. If necessary, rotate the collar by hand to the proper position.

Tighten the coolant filter 1/2 to 3/4 of a turn after initial gasket contact, or as specified by the manufacturer.

Install the radiator pressure cap.

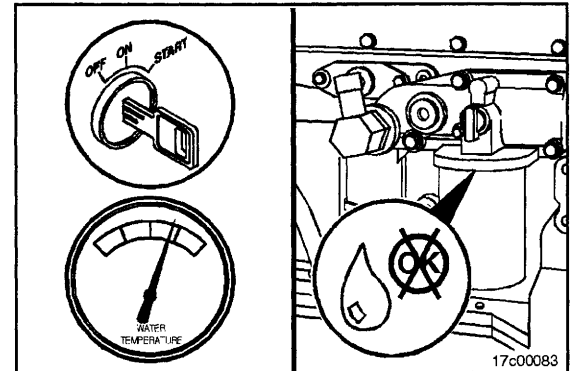


**⚠ WARNING ⚠**

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [120°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

Operate the engine until the coolant temperature is above 82°C [180°F], and check for coolant leaks.

After the air has been purged from the system, check the coolant level again.



## Fuel Filter (Spin-On Type)

### Remove

**⚠ WARNING ⚠**

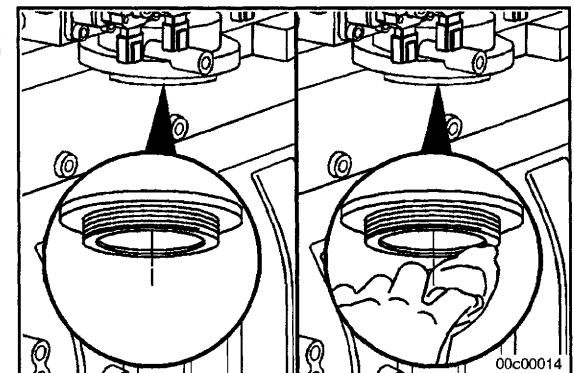
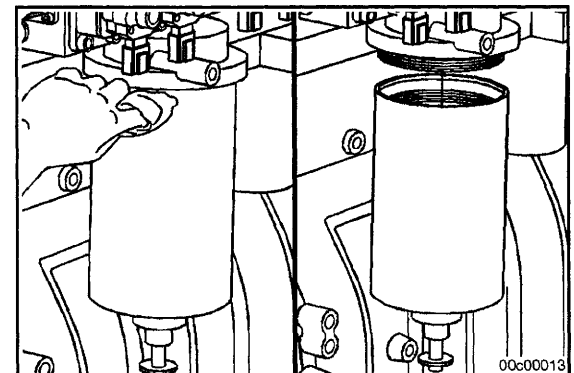
Fuel is flammable. Keep all cigarettes, flames, pilot lights, arcing equipment, and switches out of the work area and areas sharing ventilation to avoid severe personal injury or death when working on the fuel system.

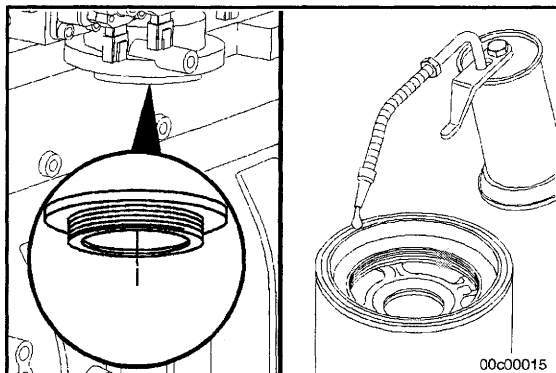
Every 1500 hours or 1 year, whichever comes first, the fuel filter **must** be replaced.

Clean the area around the fuel filter head and filter. Disconnect the wiring harness from the water-in-fuel sensor.

Remove the fuel filter with filter wrench, Part No. 3375049.

Use a clean, lint-free towel to clean the filter head gasket surface.

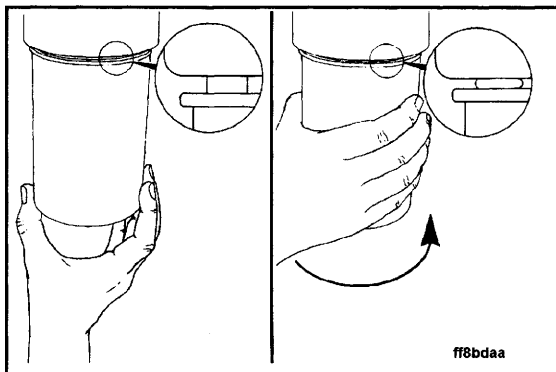




## Install

Use the correct filter(s) for your engine. Cummins Engine Company requires a fuel-water separator be installed in the fuel supply system. It **must** meet Cummins Engineering Standards 14,223 and 14,225, and remove a minimum of 95 percent of free and emulsified water. It **must** also have a minimum of 98.7 percent at 10-micron particle-removal efficiency.

Apply a thin coating of clean engine oil to the filter gasket surface.



## CAUTION

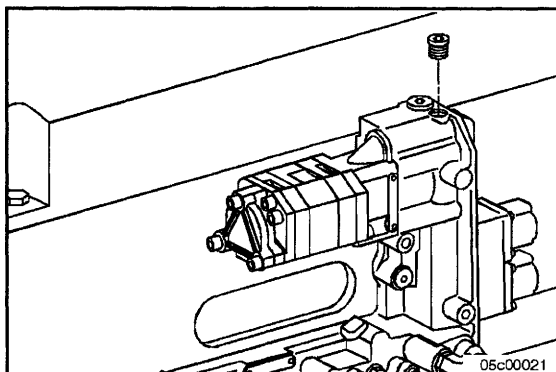
**Mechanical overtightening of the filter can distort the threads or damage the filter element seal.**

**NOTE:** Fill the filter with clean fuel prior to installation.

Install the filter onto the filter head. Turn the filter until the gasket contacts the filter head surface.

Tighten the filter an additional  $\frac{3}{4}$  of a turn after the gasket contacts the filter head surface, or as specified by the filter manufacturer.

**NOTE:** Rotate the water-in-fuel sensor on the filter to desired location, and connect the wiring harness.



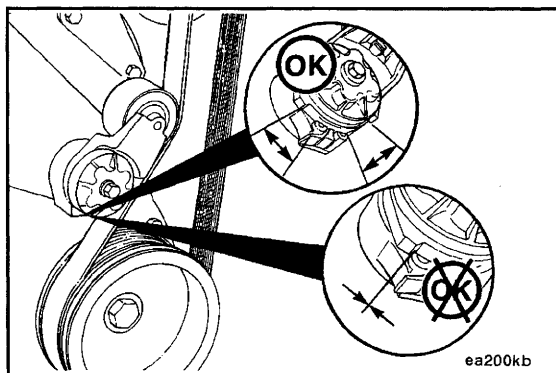
Remove the external hex plug on the top of the integrated fuel system module. Crank the engine until a solid stream of fuel comes out of the port.

Reinstall the hex plug.

Crank the engine for 20 seconds. If the engine does **not** start within 20 seconds, wait 2 minutes. It will probably be necessary to remove the filter, fill the filter with clean fuel, and install the filter.

Repeat these steps until the engine starts.

**NOTE:** The engine will, perhaps, run rough for several minutes until the air is out of the system.



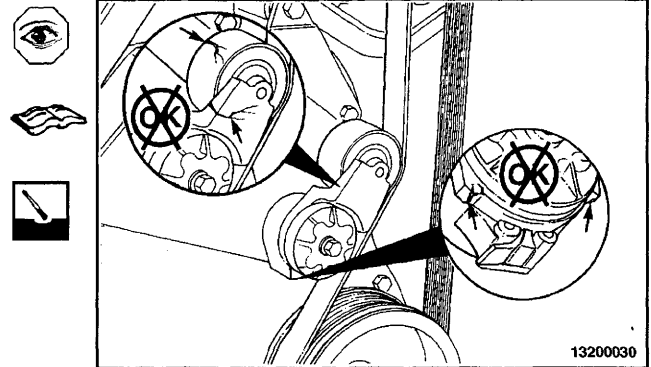
## Belt Tensioner, Automatic

### Inspect for Reuse

With the engine turned off, verify that neither the top nor bottom tensioner arm stop is touching the cast boss on the tensioner body. If either of the stops is touching a boss, the alternator belt **must** be replaced. Check to make sure the correct belt part number is being used if either condition exists.

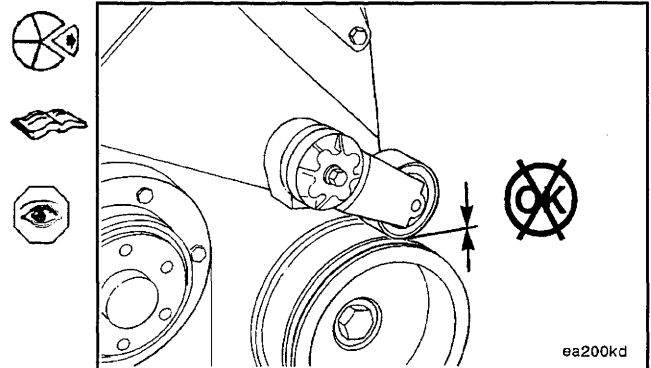
Check the tensioner pulley and body for cracks. If any cracks are noticed, the tensioner **must** be replaced.

Check the tensioner for dirt buildup. If this condition exists, the tensioner **must** be removed and steam-cleaned.



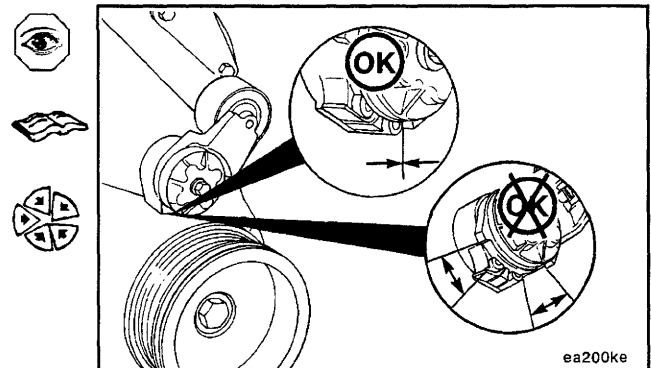
Remove the alternator belt.

If the tensioner pulley touches the accessory drive pulley after the tensioner has been fully relaxed, the bottom tensioner arm stop boss has broken and the tensioner **must** be replaced.

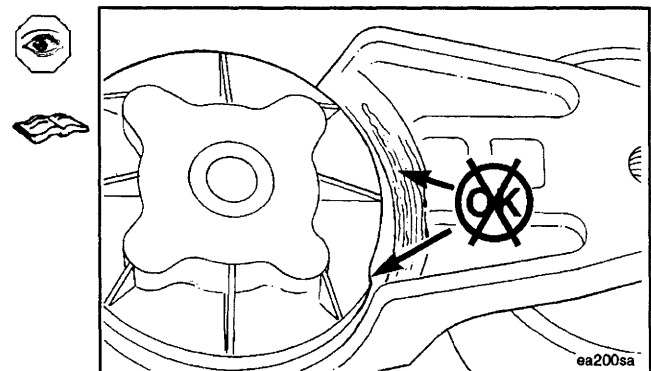


Check that the bottom tensioner arm stop is in contact with the bottom tensioner arm stop boss on the tensioner body. If these two are **not** contacting, the tensioner **must** be replaced.

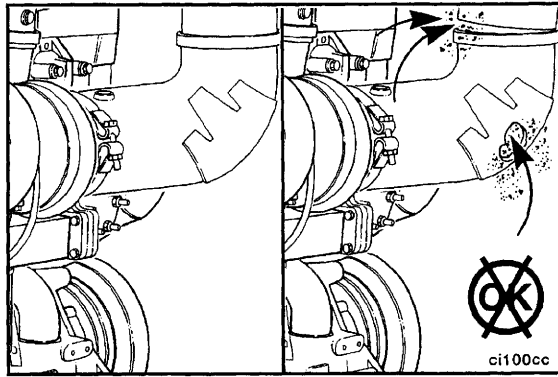
Install the alternator belt.



Inspect the tensioner for evidence of the pivoting tensioner arm contacting the stationary circular base. If there is evidence of these two areas contacting, the pivot tube bushing has failed and the tensioner **must** be replaced.







## Air Leaks, Air Intake and Exhaust Systems

### Maintenance Check

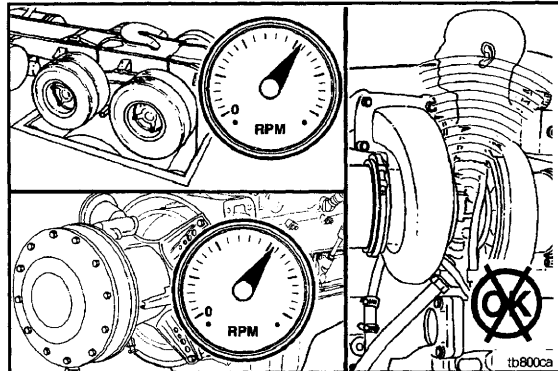
#### ⚠ CAUTION ⚠

Engine intake air must be filtered to prevent dirt and debris from entering the engine. If intake air piping is damaged or loose, unfiltered air will enter the engine and cause premature wear.

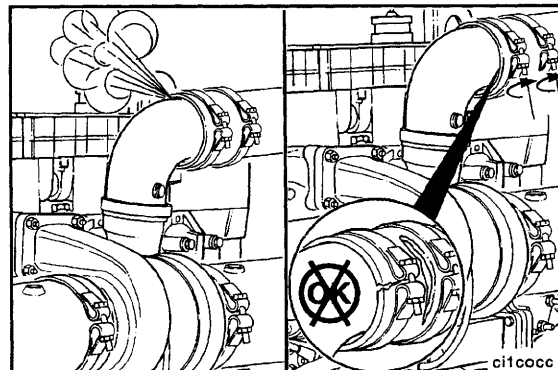
Inspect for loose clamps or damage between the intake air piping, air cleaner, turbocharger, CAC, and intake manifold.

Replace damaged pipes, and tighten loose clamps.

**Torque Value:** 9 N•m [80 in-lb]



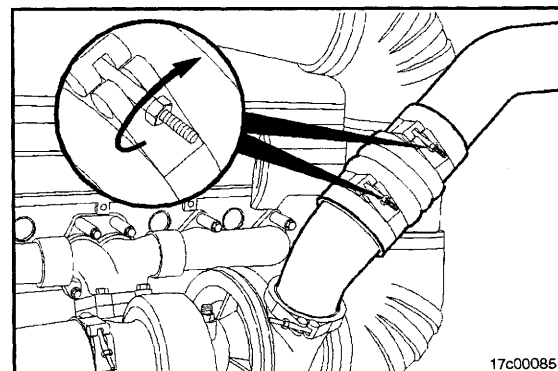
Operate the engine at full throttle and maximum load, and check for air leaks. Listen for whistling noise caused by high-pressure air leaks.



The noise can be caused by an air leak from the following:  
Turbocharger-to-CAC elbow connection.

- Inspect the connection and o-ring seal for damage.
- Tighten the v-band clamps.

**Torque Value:** 14 N•m [120 in-lb]



Any CAC piping or connecting hose.

- Inspect the hose and piping for damage.
- Tighten the hose clamps.

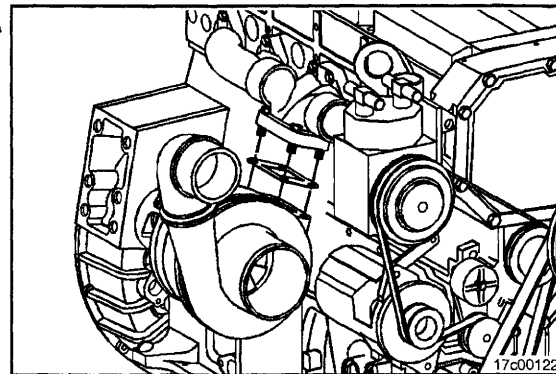
**Torque Value:** 9 N•m [80 in-lb]



Turbocharger-to-exhaust-manifold mounting gasket.

- Replace the gasket.

Refer to Procedure 010-033 in the Troubleshooting and Repair Manual, Signature, ISX, and QSX15 Engines, Bulletin No. 3666239, for turbocharger removal and installation.

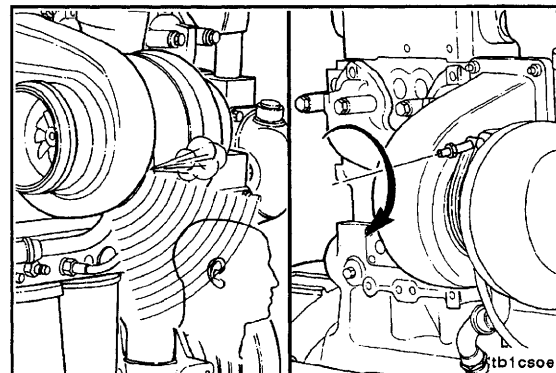


Turbine housing sealing surface air leak.

- Tighten the v-band clamp.

**Torque Value:** 14 N•m [120 in-lb]

- Check for an air leak.
- If an air leak is still present, remove and replace the turbocharger.

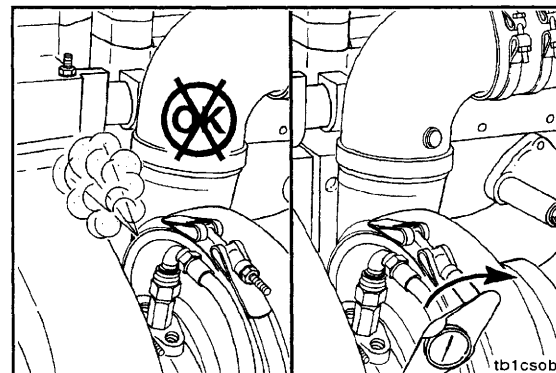


Compressor housing sealing surface air leak.

- Tighten the v-band.

**Torque Value:** 9 N•m [80 in-lb]

- Check for an air leak.
- If an air leak is still present, remove and replace the turbocharger.

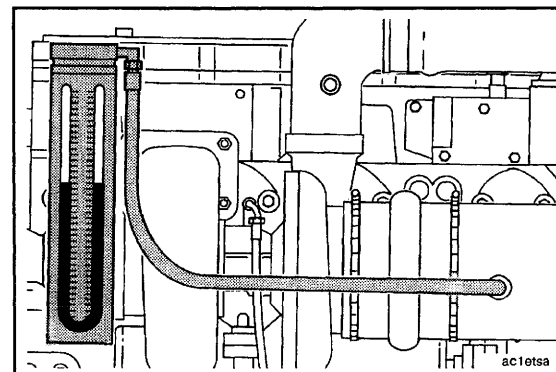


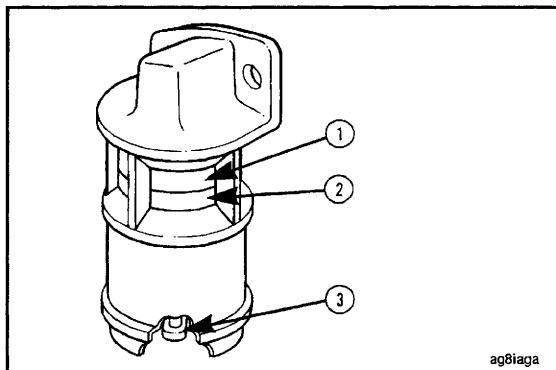
## **Air Cleaner Restriction**

### **Maintenance Check**

Every 300 hours or 6 months (whichever comes first), check the air cleaner restriction. Maximum intake air restriction is 64 cm H<sub>2</sub>O [25.0 in H<sub>2</sub>O].

The engine **must** be operated at maximum horsepower rpm and full load to check maximum intake air restriction. Replace or clean the air cleaner element when the restriction reaches the maximum available limit.





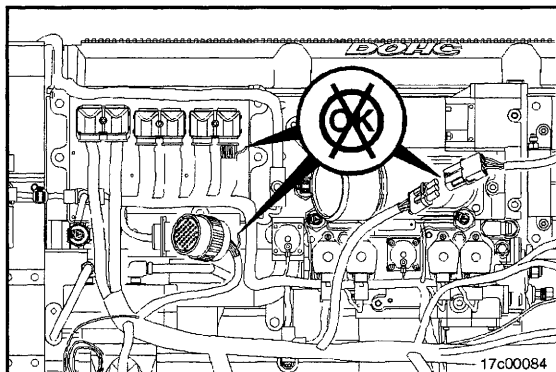
**NOTE:** Never operate the engine without an air cleaner. Intake air **must** be filtered to prevent dirt and debris from entering the engine and causing premature wear.



Follow the manufacturer's instructions when cleaning or replacing the air cleaner element.

Check the air cleaner service indicator, if equipped. Change the filter element when the red indicator flag (2) is at the raised position in the window (1).

After the air cleaner has been serviced, reset the button (3) in the end of the service indicator.



## Engine Wiring Harness

### Maintenance Check

#### ⚠ WARNING ⚠

To avoid personal injury, do not touch the wiring connections when the keyswitch is turned on. Electrical shock can result.

Check all wire connections and the wiring harness for damage. Faulty wiring can cause improper engine operation and poor performance.

## Maintenance Procedures at 3000 Hours or 2 Years

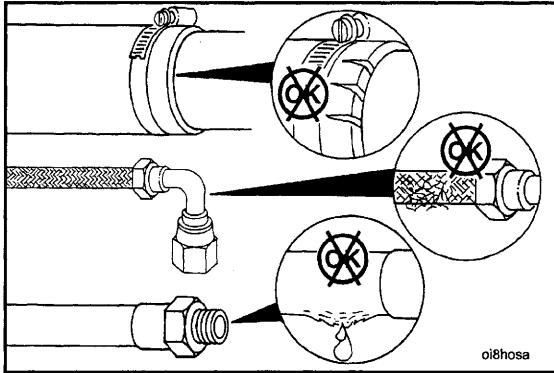
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## **Maintenance Procedures - General Information**

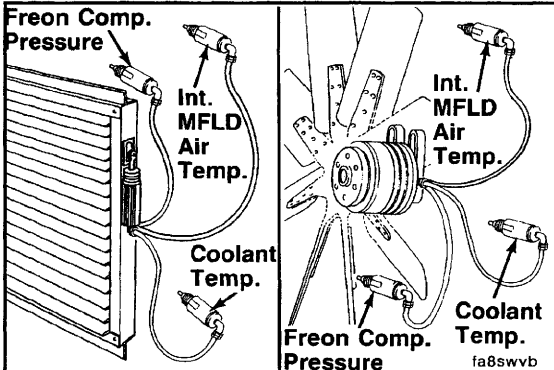
All checks or inspections listed under daily or previous maintenance intervals **must** also be performed at this time, in addition to those listed under this maintenance interval.



## Hoses, Engine

### Maintenance Check

Inspect the cooling system hoses and hose connections for leaks or deterioration. Particles of deteriorated hose can be carried through the cooling system and slow or partially stop circulation.



## Cold Weather Starting Aids

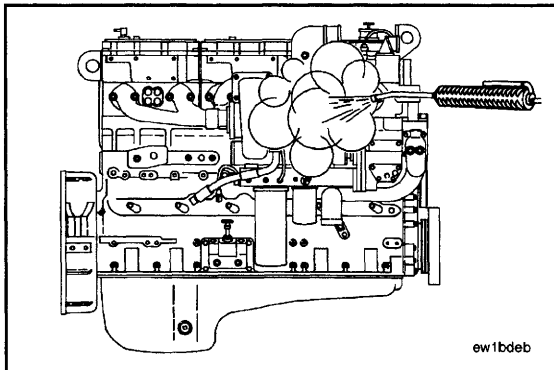
### Maintenance Check

Check the shutterstats and the thermatic fan.

**NOTE:** Parallel control systems are required for automatic radiator **shutters** and **thermatic fans**. Shutters **must** open and fans turn on whenever the intake manifold air temperature, the engine coolant outlet temperature, or the freon compressor pressure rises above their sensor set points. Any one of the following conditions **must** activate the shutters and/or fan:

- High coolant temperature
- High intake manifold temperature
- High freon compressor pressure.

Shutterstat and thermatic fan controls **must** operate in the same temperature range as the thermostat with which they are used. Refer to the Thermal Control Settings Graph in this section.



## Engine Steam Cleaning

### Clean

#### ▲ WARNING ▲

**When using a steam cleaner, wear safety glasses or a face shield, as well as protective clothing. Hot steam can cause serious personal injury.**

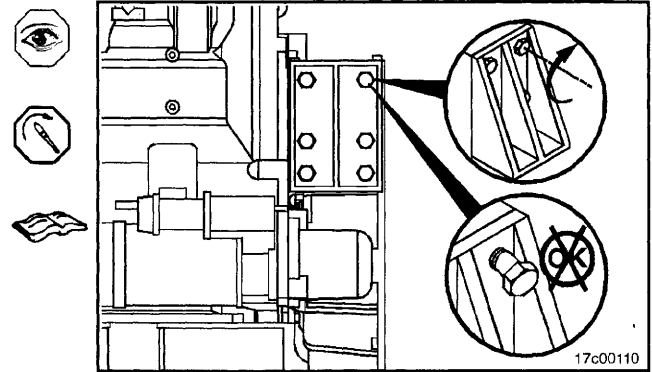
The engine **must** be steam-cleaned annually. Steam is the best method of cleaning a dirty engine or a piece of equipment. If steam is **not** available, use a solvent to wash the engine.

Protect all electrical components, openings, and wiring from the full force of the cleaner spray nozzle.

## Engine Mounting Bolts

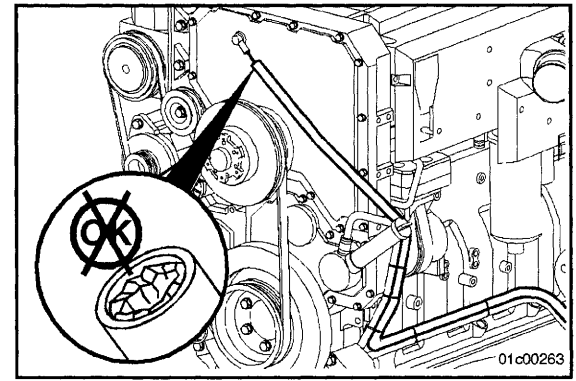
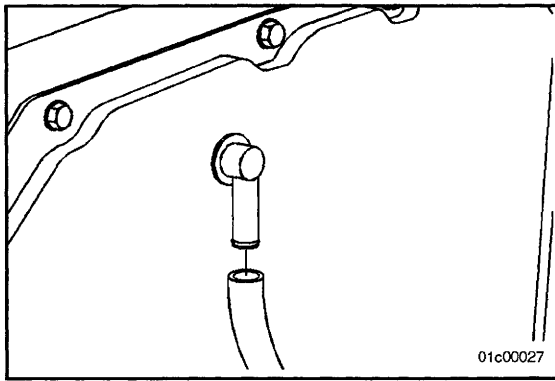
### Maintenance Check

Check the torque on the engine-mounting nuts and bolts. Tighten any that are loose. Refer to the equipment manufacturer for torque specifications. Inspect the rubber for deterioration and age hardening. Replace any broken or lost bolts, capscrews, or damaged rubber.



## Crankcase Breather Tube

### Disassemble



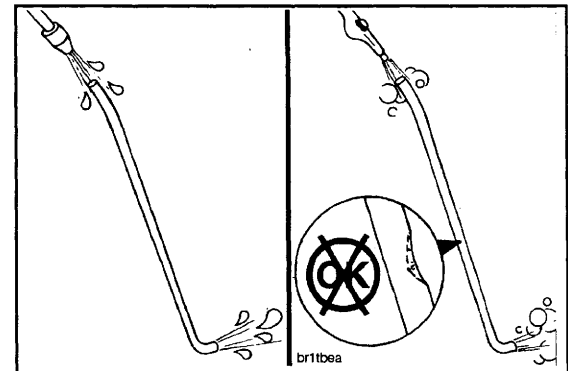
Every 3000 hours or 2 years, clean and check the crankcase breather tube.

Remove the crankcase breather tube from the breather vent tube.

Use solvent to clean the inside of the crankcase breather tube, and dry with compressed air.

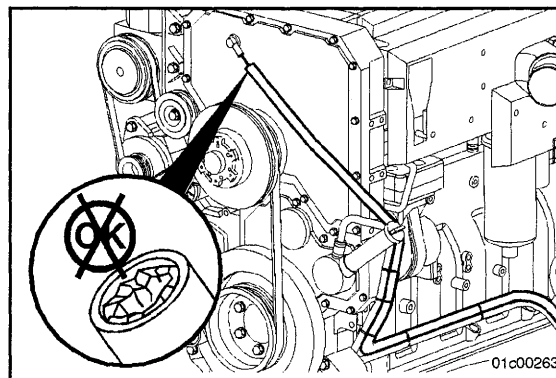
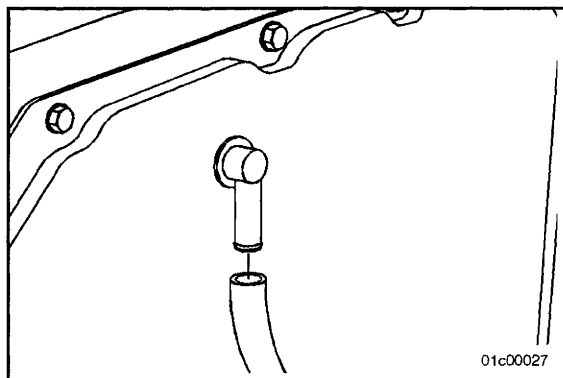
Use air pressure to blow through the vent tube.

Replace the vent tube if it is clogged.

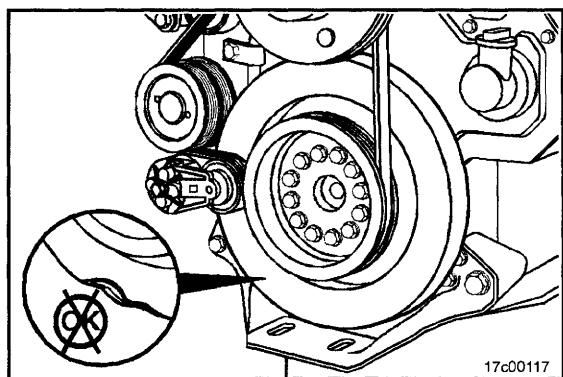




## Assemble



Install the crankcase breather tube on the engine.



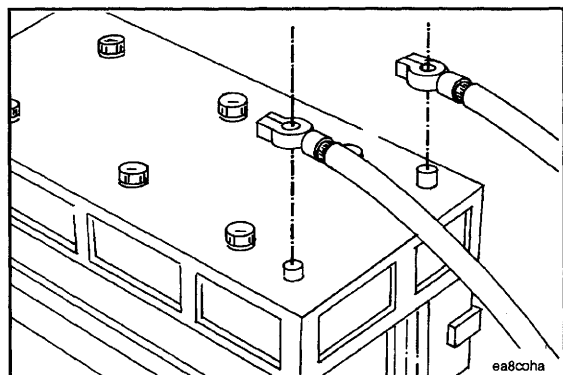
## Vibration Damper

### Maintenance Check

#### ⚠ CAUTION ⚠

The silicone fluid in the damper will become solid after extended service and will make the damper inoperative. An inoperative damper can cause major engine or drive-line failures.

Check the dampers for evidence of fluid loss, dents, and wobble. Inspect the vibration damper thickness for any deformation or raising of the damper front cover plate.



## Overhead Set

### General Information

#### ⚠ WARNING ⚠

Batteries can emit explosive gases. To avoid personal injury, always ventilate the compartment before servicing the batteries. To avoid arcing, remove the negative (-) battery cable first and attach the negative (-) battery cable last.

Disconnect the battery.

**NOTE:** Read the entire procedure for overhead adjustment before attempting to perform this operation.

Valves, injectors, and engine brake (if equipped) **must** be correctly adjusted for the engine to operate efficiently. Valve, injector, and engine brake adjustment **must** be performed using the values listed in this section.

Adjust the valves, injectors, and engine brakes every 3,000 hours. Adjustment should be made after any major repair. After a major repair, the adjustment interval again becomes every 3000 hours.



**QXS15**  
**Valve, Brake, and Injector**  
**Adjustment Values**

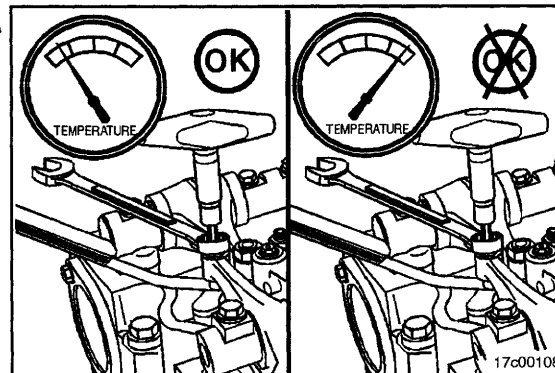
QXS15 Injector Adjustment is 8 N·m [70 in-lb].

	mm	in
Intake Valve	0.35	0.014
Exhaust Valve	0.68	0.027
Engine Brake	7.00	0.276

17c00178

**Adjust**

All overhead valve, injector, and brake adjustments **must** be made when the engine is cold (any stabilized coolant temperature at 60°C [140°F] or below).



17c00108

**△ CAUTION △**

**Do not use solvent to clean the rocker cover gasket. Solvent can damage the gasket material and cause it to swell.**

Locate the valve set marks on the outside of the vibration damper.

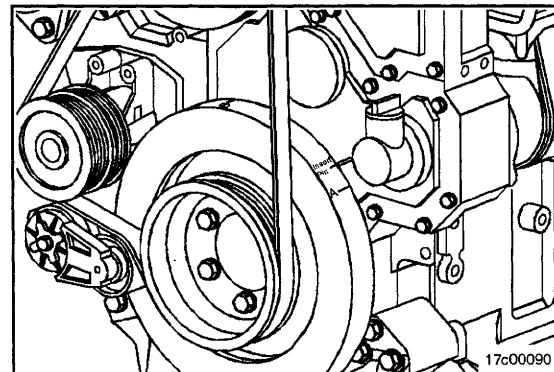
The set marks are A, B, and C:

Set to mark A to adjust cylinders 1 or 6.

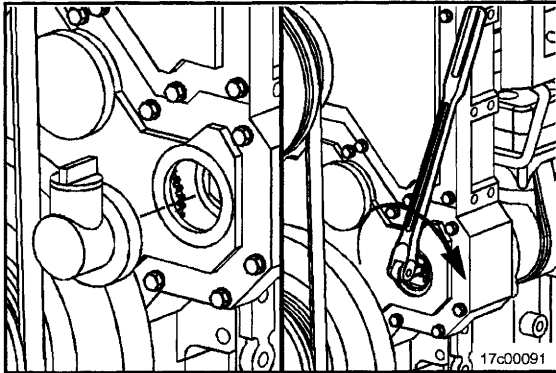
Set to mark B to adjust cylinders 2 or 5.

Set to mark C to adjust cylinders 3 or 4.

**NOTE:** Two complete revolutions are required to set all valves and injectors.



17c00090



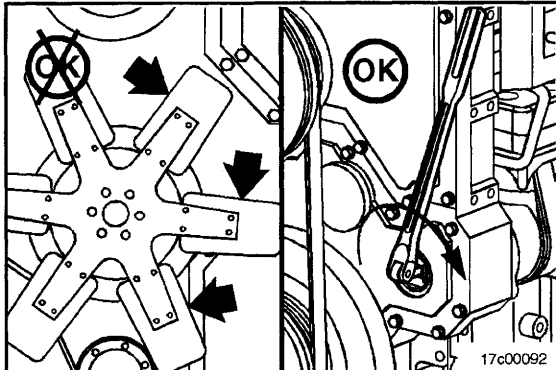
#### With Air Compressor

Remove the oil fill connector from the lower gear case cover.



Use a 3/4-inch drive breaker bar and extension, and insert it into the air compressor drive.

Rotate the air compressor drive **clockwise** when viewed from the front of the engine.



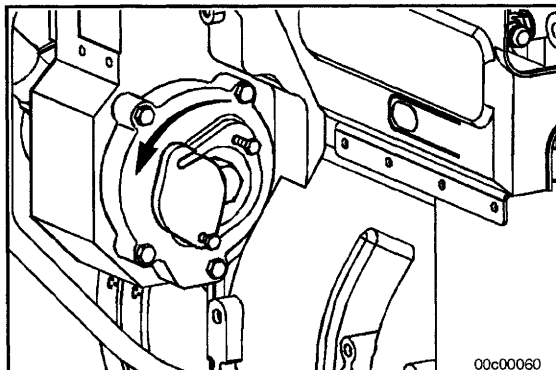
#### ⚠ WARNING ⚠

**Do not straighten a bent fan blade or continue to use a damaged fan. A bent or damaged fan blade can fail during operation and cause personal injury or property damage.**

The crankshaft rotation is **clockwise** as viewed from the front of the engine.

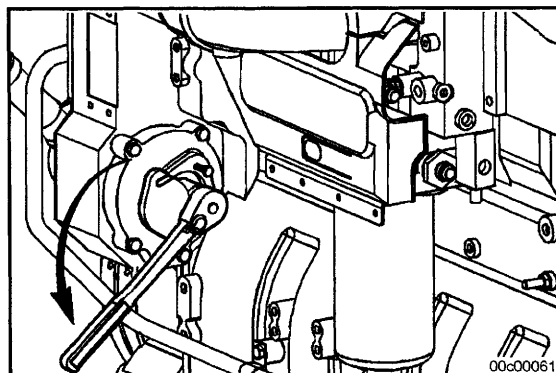
The cylinders are numbered from the front of the engine (1-2-3-4-5-6).

The engine firing order is 1-5-3-6-2-4.



#### Barring Device

Remove one cap screw and loosen the second cap screw, then rotate cover.

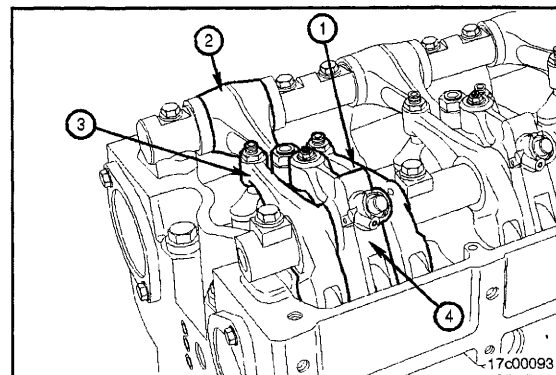


Use a 1-1/2-inch socket, and bar engine over **counter-clockwise**.

**NOTE:** Rock the barring device back and forth until it disengages.

Each cylinder has four rocker levers:

- The exhaust valve rocker lever (1)
- The injector rocker lever (2)
- The intake valve rocker lever (3)
- The engine brake rocker lever (4).



The valves and the injectors on the same cylinder are adjusted at the same index mark on the vibration damper.

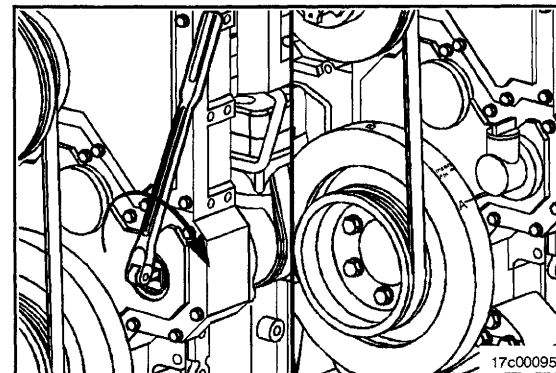
Qsx15 Injector and Valve Adjustment Sequence			
Bar Engine in Direction of Rotation	Pulley Position	Set Cylinder Injector Valve	
Start	A	1	1
Advance to	B	5	5
Advance to	C	3	3
Advance to	A	6	6
Advance to	B	2	2
Advance to	C	4	4
Firing Order: 1-5-3-6-2-4			

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Rotate the air compressor drive in the direction of engine rotation, **clockwise**. Align the A mark on the vibration damper with the pointer on the gear cover.



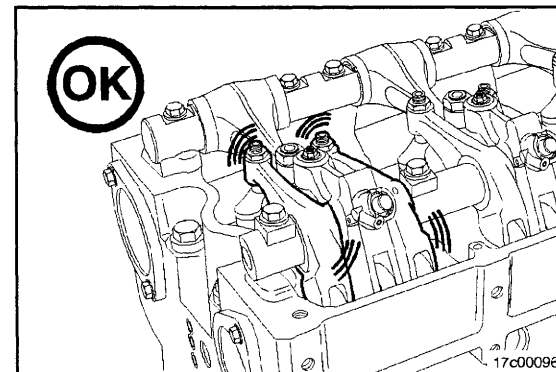
**NOTE:** For illustrative purposes, position A is shown as the first step. It is **not** necessary to start with position A, as long as the proper sequence is followed.

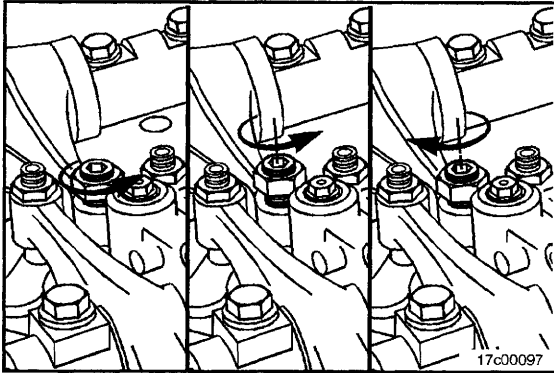


Check the valve rocker levers on the given cylinder to see if both exhaust valves are closed.



**NOTE:** Both valves are closed when both rocker levers are loose. If both valves are **not** closed, rotate the compressor drive gear one complete revolution, and align the A mark on the front damper with the pointer again.





Loosen the injector adjusting screw locknut on the cylinder.

Use a dial-type torque wrench, Part No. 3375044 with a range of 0 to 150 in-lb to tighten the injector rocker lever adjusting screw. If the screw chatters during setting. Repair the screw and lever as required.

**NOTE:** Do not use a click-type torque wrench.

Back out the adjusting screw one or two turns.

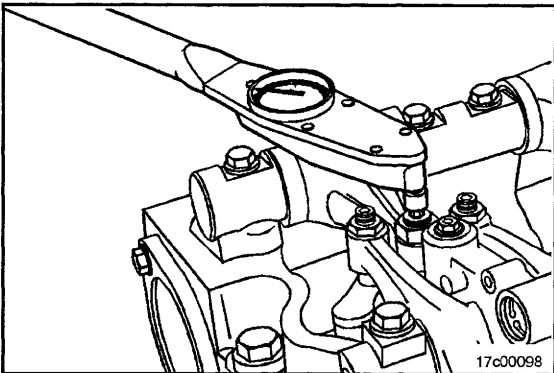
Hold the torque wrench in a position that allows you to look in a direct line at the dial. This is to make sure the dial will be read accurately.

Make sure the parts are aligned, and squeeze the oil out of the valve and injector train by tightening the adjusting screw.

**NOTE:** Use this initial adjustment to preload the valve train and injector.

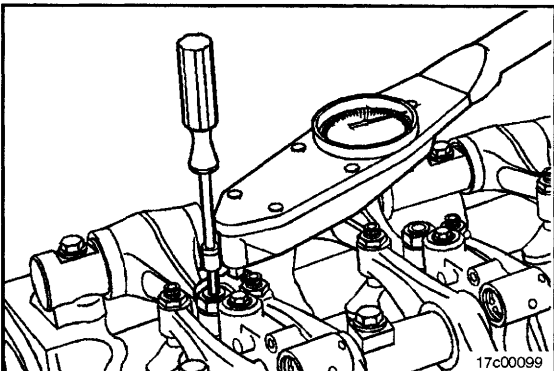
Tighten the injector adjusting screw.

**Torque Value:** 8 N•m [70 in-lb]



Tighten the injector lever adjusting screw.

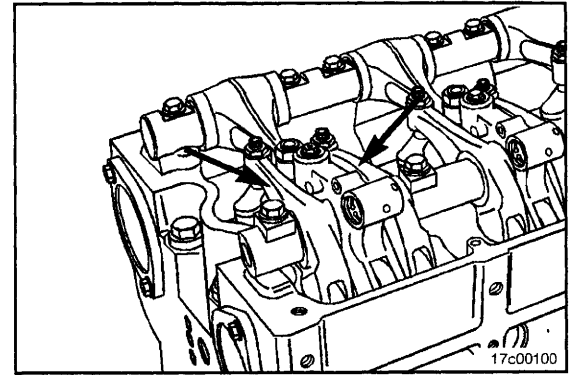
**Torque Value:** 8 N•m [70 in-lb]



Hold the injector lever adjusting screw, and tighten the adjusting screw locknut.

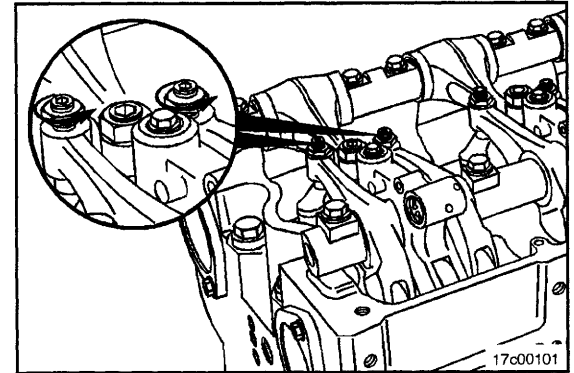
**Torque Value:** 75 N•m [55 ft-lb]

After setting the injector on a cylinder, set the valves on the same cylinder.



With the set mark aligned with the pointer on the gear cover and both valves closed on the cylinder, loosen the locknuts on the intake and exhaust valve adjusting screws.

Back out the adjusting screw one or two turns.



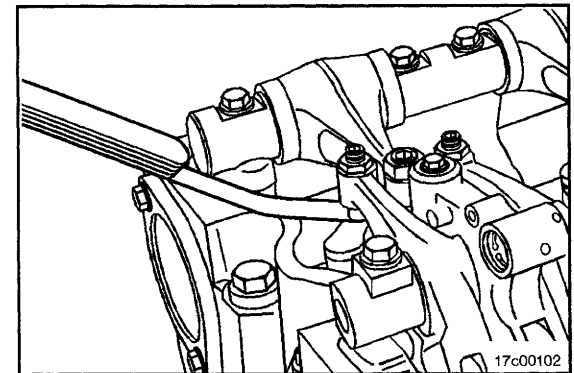
Select a feeler gauge for the correct valve lash specification.



**Valve Lash Specifications**

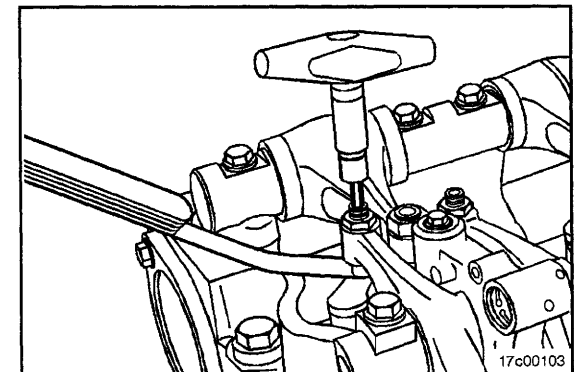
Intake	Exhaust
0.36 mm [0.014 in]	0.69 mm [0.027 in]

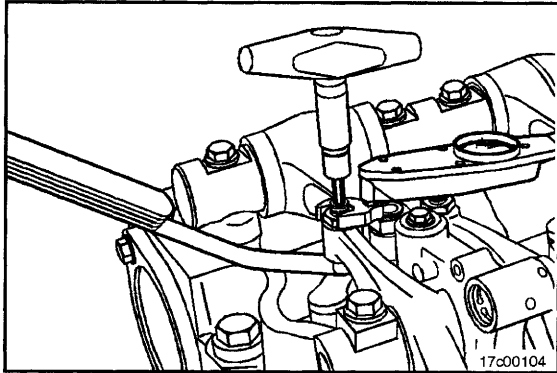
Insert the feeler gauge between the top of the crosshead and the rocker lever nose pad.



Tighten the adjusting screw.

**Torque Value:** 0.6 N•m [5 in-lb]

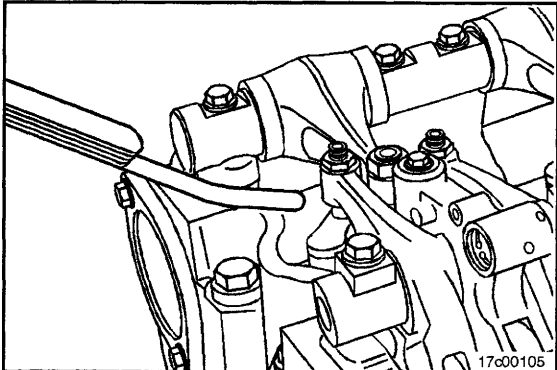




**NOTE:** Use torque wrench adapter, Part No. 3375044, to tighten the locknut.

Hold the adjusting screw in this position. The adjusting screw **must not** turn when the locknut is tightened.

**Torque Value:** 45 N•m [33 ft-lb]



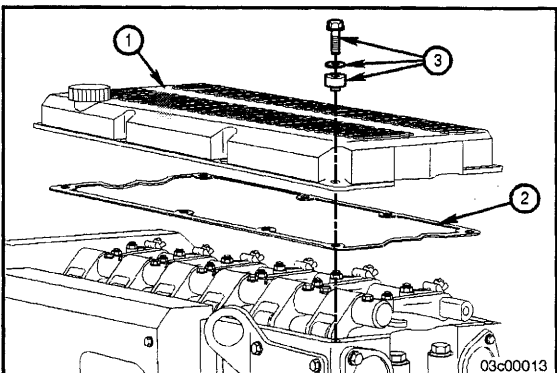
After tightening the locknut to the correct torque value, remove the feeler gauge.

QSX15 Injector and Valve Adjustment Sequence			
Bar Engine in Direction of Rotation	Pulley Position	Set Cylinder	
		Injector	Valve
Start	A	1	1
Advance to	B	5	5
Advance to	C	3	3
Advance to	A	6	6
Advance to	B	2	2
Advance to	C	4	4

Firing Order: 1-5-3-6-2-4

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Repeat the process to adjust all injectors and valves according to the chart shown earlier in this procedure.



## Engine Brake Assembly Adjust

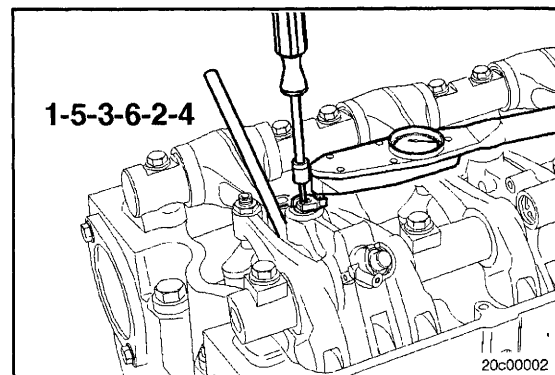


**CAUTION**

To get maximum brake operating efficiency and to prevent engine damage, you must follow the instructions in this section.

Remove the eight capscrews and isolator assemblies (3), rocker lever cover (1), and rocker lever cover gasket (2).

The engine brake setting is to be made in the same sequence as the firing order (1-5-3-6-2-4).



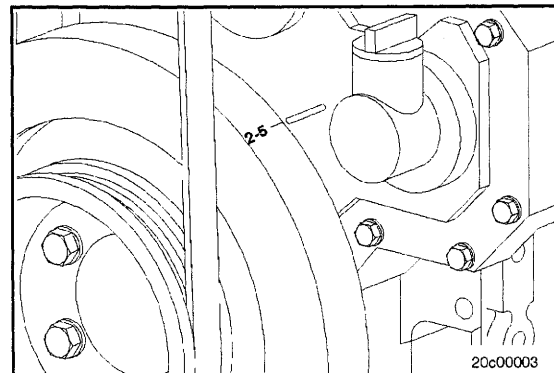
Locate the engine brake set marks on the outside of the vibration damper.

The set marks are BRAKE SET 1 - 6, BRAKE SET 2 - 5, and BRAKE SET 3 - 4:

"BRAKE SET 1 - 6": cylinder 1 or 6 adjust

"BRAKE SET 2 - 5": cylinder 2 or 5 adjust

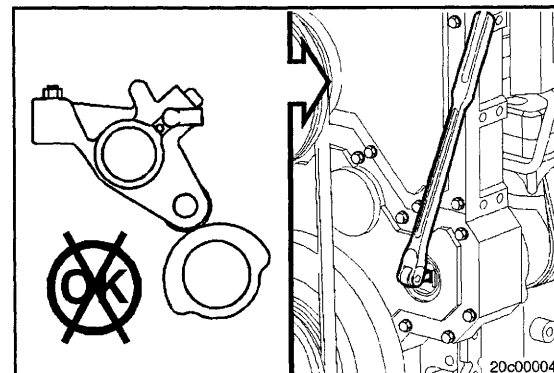
"BRAKE SET 3 - 4": cylinder 3 or 4 adjust



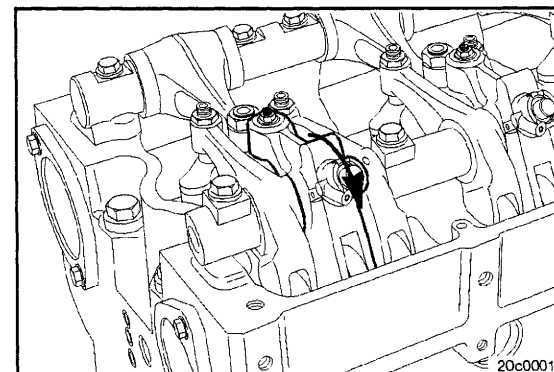
Remove the oil filler tube.

Using a 3/4-inch drive breaker bar with extension, rotate the engine **clockwise** until set mark 1-6 on the vibration damper aligns with the stamped mark on the front gear cover.

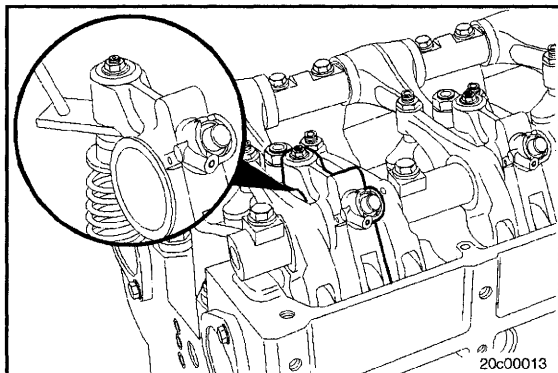
Check the engine brake lever on the given cylinder. When adjusting cylinder No. 1, both the intake and exhaust valves on cylinder No. 1 **must** be closed. The camshaft follower of the engine brake lever **must** be on the inner base circle of the valve camshaft lobe. If **not**, rotate the engine one full revolution to set mark 1-6.



Press the engine brake lever down to verify that the camshaft follower is in contact with the camshaft.

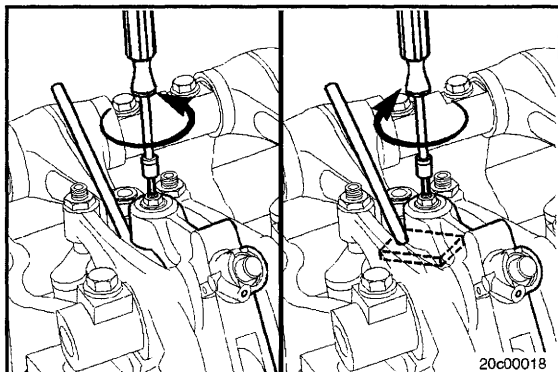




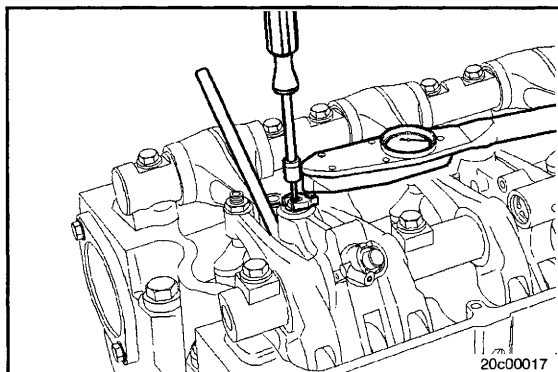


Loosen the locknut on the brake lever adjusting screw, and back out the adjusting screw one turn.

Insert the feeler gauge, Part No. 3163530, between the bottom of the engine brake piston and top of exhaust valve pin on exhaust valve crosshead.



Tighten adjusting screw until drag on feeler gauge is felt. Proper drag means that there is no motion of the brake lever camshaft follower against the cam lobe.



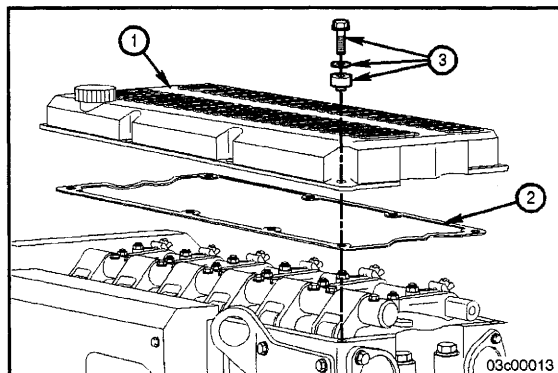
Hold engine brake lever adjusting screw, and tighten the locknut.

**Torque Value:** 20 N•m [15 ft-lb]



Remove the feeler gauge.

**NOTE:** Repeat the previous steps on the remaining cylinders.



Install the rocker lever cover gasket (2), rocker lever cover (1), and the eight isolators and capscrews (3). Tighten the capscrews.

**Torque Value:** 25 N•m [18 ft-lb]



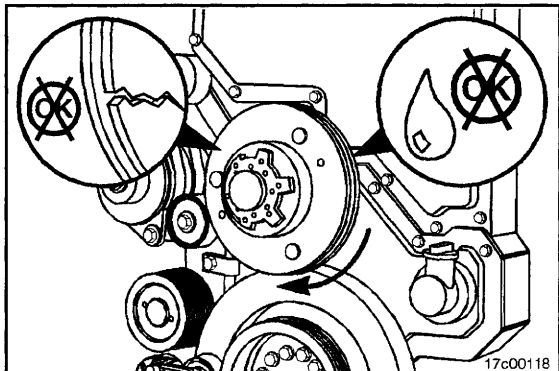
**Maintenance Procedures at 10,000 Hours or 5 Years**  
**Section Contents**

	<b>Page</b>
<b>Air Compressor Carbon Buildup .....</b>	<b>7-2</b>
Maintenance Check .....	7-2
<b>Fan Hub, Belt Driven.....</b>	<b>7-2</b>
Maintenance Check .....	7-2
<b>Maintenance Procedures - General Information .....</b>	<b>7-1</b>

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## **Maintenance Procedures - General Information**

All checks or inspections listed under daily or previous maintenance intervals **must** also be performed at this time, in addition to those listed under this maintenance interval.



## Fan Hub, Belt Driven

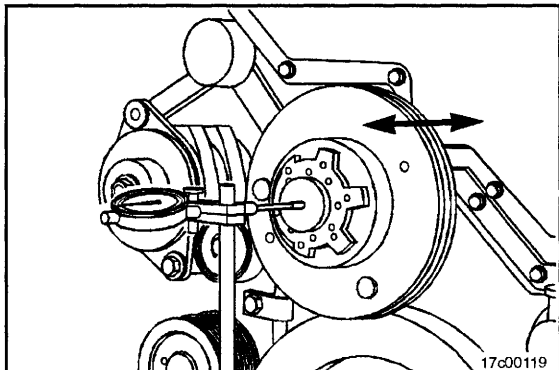
### Maintenance Check



Inspect the fan hub for the following:

- Freedom of rotation
- Cracks
- Grease seal leakage.

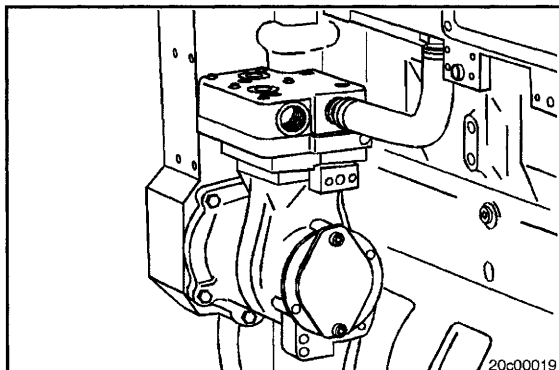
Repair or replace the fan hub if the fan hub does **not** rotate freely or if there is evidence of cracks or grease seal leakage.



Measure the fan hub end clearance. Fan hubs with “step-bore” shafts and no bearing spacers **must** be 0.08 to 0.25-mm [0.003 to 0.010-in] end clearance.



Fan hubs with “through-bore” shafts with inner and outer bearing spacers **must** be 0.08 to 0.41-mm [0.003 to 0.016-in] end clearance.

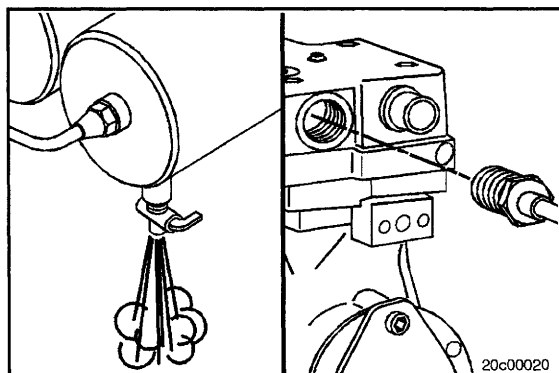


## Air Compressor Carbon Buildup

### Maintenance Check

Complete air compressor inspection is required every 800,000 km [500,000 mi], 10,000 hours, or 5 years.

**NOTE:** All air compressors have a small amount of oil carryover that lubricates the piston rings and moving parts. When this oil is exposed to normal air compressor operating temperatures over time, it will form varnish or carbon deposits. If the following inspections are **not** done, the air compressor piston rings can be affected by high operating temperatures and pressures and possibly will **not** seal correctly.

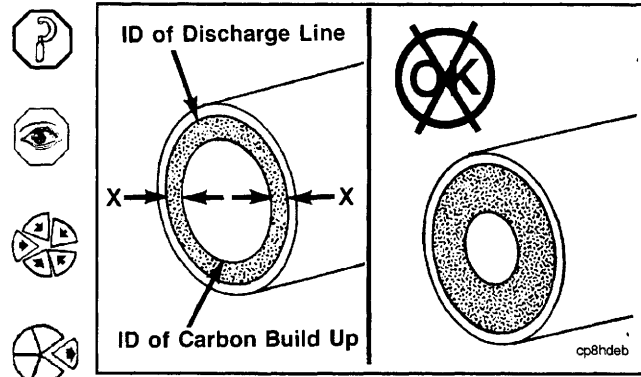


### Air Compressor Discharge — Inspection

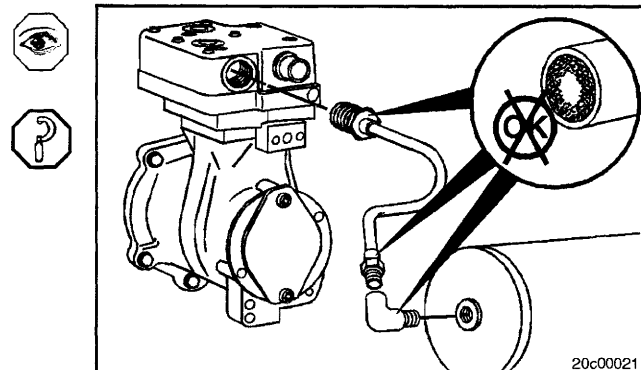
Drain the air system wet tank to release the system air pressure. Remove the air discharge line from the air compressor.

Measure the total carbon deposit thickness inside the air discharge line as shown. If the total carbon deposit ( $X + X$ ) exceeds 2 mm [1/16 in], inspect the cylinder head assembly and the discharge line. Replace if necessary.

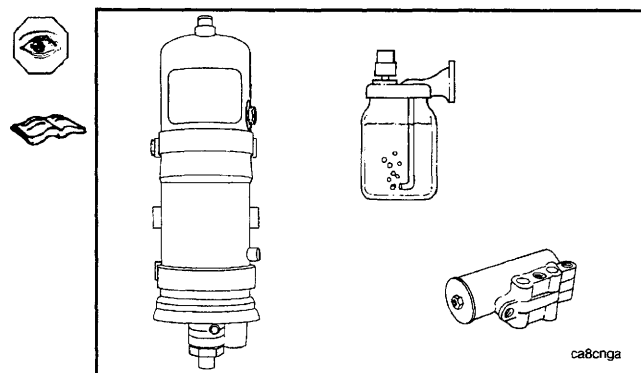
**NOTE:** If cylinder head replacement does **not** correct the problem, replace the compressor assembly.



If the total carbon deposit exceeds specifications, continue checking the air discharge line connections, up to the first tank, until total carbon deposit is less than 2 mm [1/16 in]. Replace any lines or connections that exceed this specification.



Inspect any air driers, downstream air valves, and the air governor for carbon deposits or malfunctioning parts. Inspect for air leaks. Maintain and repair the parts according to the manufacturer's specifications.



## This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

## Section A - Adjustment, Repair, and Replacement

### Section Contents

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<b>Air Starting Motor</b> .....	A-1
General Information .....	A-1
<b>Battery Cables and Connections</b> .....	A-2
General Information .....	A-2
<b>Engine Storage - Long Term</b> .....	A-5
General Information .....	A-5
<b>Turbocharger</b> .....	A-2
Install .....	A-3
Remove .....	A-2



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## Air Starting Motor

### General Information

The air starting motor system (tanks, line sizes, and valves) is designed and installed by the original equipment manufacturers and the starting motor suppliers. Refer any questions about the air starting systems to the manufacturer.

- Do **not** operate the air starting motor with air pressure lower than 480 kPa [70 psi].
- Maintain the air starting motor according to the manufacturer's recommendations.
- For maximum efficiency, the hoses, tubes, and lines **must not** leak.
- Refer to the original equipment manufacturers' and starting motor manufacturers' manuals for specific information regarding the starting motors, valves, and systems.

## Battery Cables and Connections

### General Information

#### Parallel and Series Connections



**WARNING**

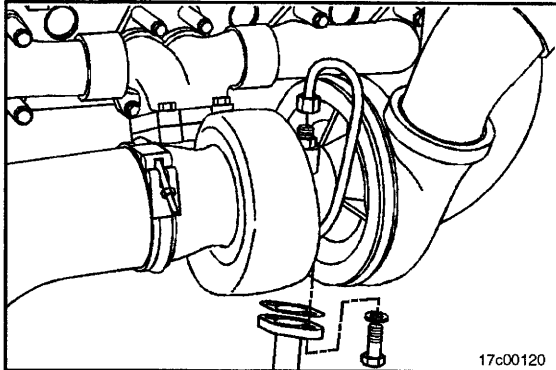
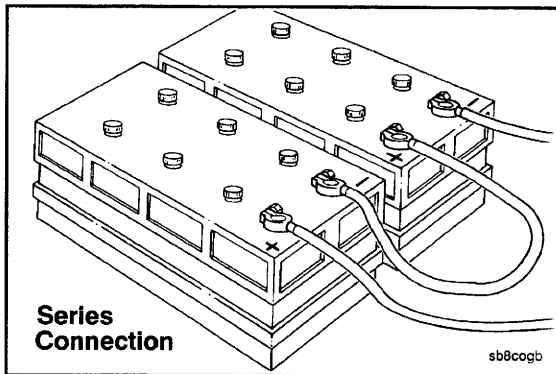
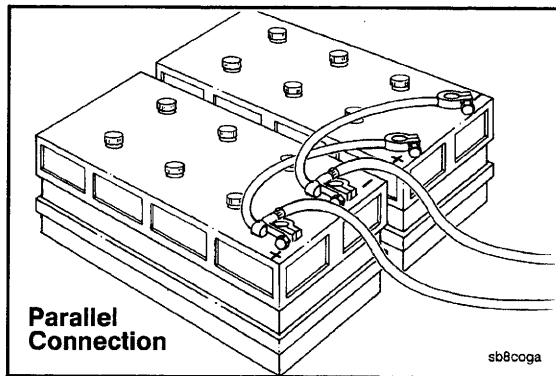


To avoid electrical shock and potential eye danger when using jumper cables to start the engine, make sure to connect the cables in parallel: Positive (+) to positive (+) and negative (-) to negative (-). When using an external electrical source to start the engine, turn the disconnect switch to the OFF position, and remove the key before attaching the jumper cables.

The accompanying illustration shows a typical parallel battery connection. This arrangement doubles the cranking amperage.

This illustration shows a typical series battery connection. This arrangement, positive (+) to negative (-), doubles the voltage.

For optimum electrical system and starting motor performance, keep battery connections clean and tight.

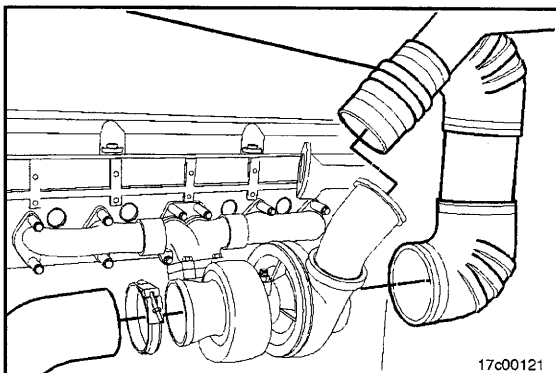


### Turbocharger

#### Remove

Remove the oil supply and the oil drain tubes from the turbocharger.

Remove the wastegate actuator, if equipped.



Remove the intake and the exhaust pipes from the turbocharger.

Remove the CAC piping from the discharge elbow.

**▲ WARNING ▲**

This component weighs 23 kg [50 lb] or more. To avoid personal injury, use a hoist or get assistance to lift this component.

**NOTE:** In some applications the turbocharger will not clear the lubricating oil cooler assembly during removal and installation. It will, perhaps, be necessary to remove the exhaust manifold and turbocharger together, then separate the two components.

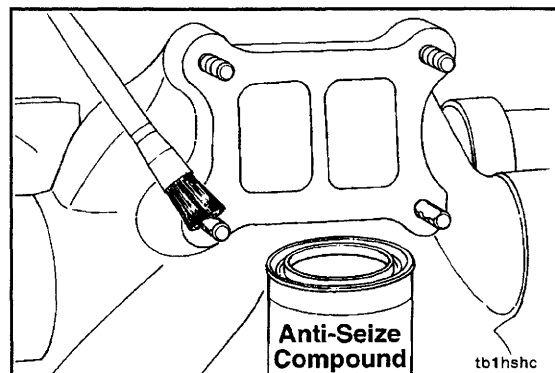
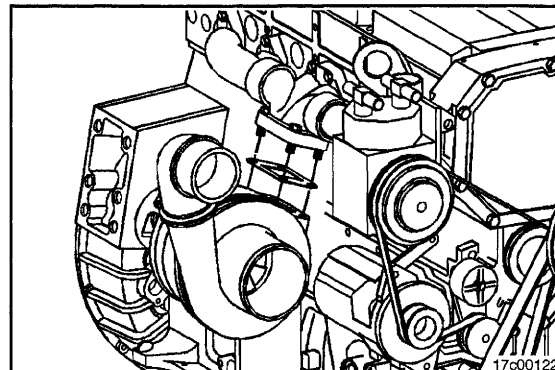
Remove the four turbocharger mounting nuts.

Remove the turbocharger, and discard the gasket.

**NOTE:** If the turbocharger mounting nuts do not loosen freely, split the nuts to avoid breaking a mounting stud.

**Install**

Apply a film of high-temperature anti-seize compound, Part No. 3823097, to the turbocharger mounting studs.



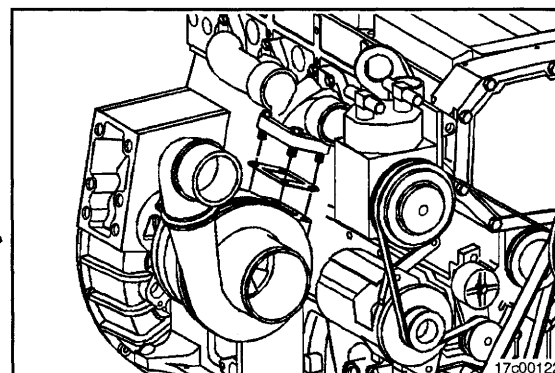
**▲ WARNING ▲**

This component weighs 23 kg [50 lb] or more. To avoid personal injury, use a hoist or get assistance to lift this component.

Install a new mounting gasket, the turbocharger, and the four mounting nuts.

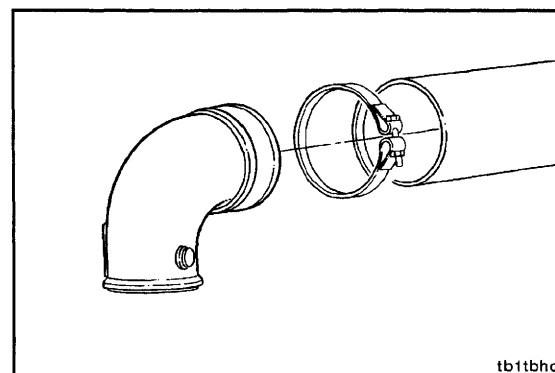
Tighten the mounting nuts.

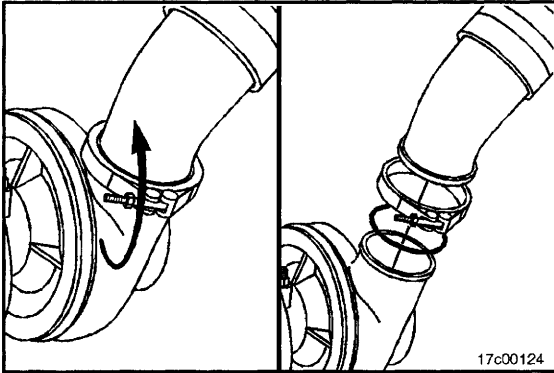
**Torque Value:** 60 N•m [45 ft-lb]



Install the discharge elbow and clamp onto the CAC pipe connection.

**NOTE:** Do not tighten the clamp until the elbow is installed on the turbocharger.

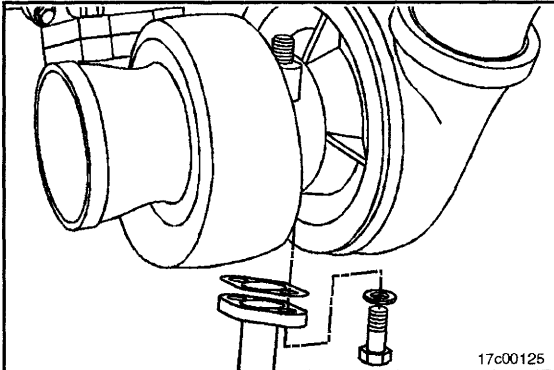




Install a new o-ring seal, the clamp, and the discharge elbow to the turbocharger.

Tighten the clamps.

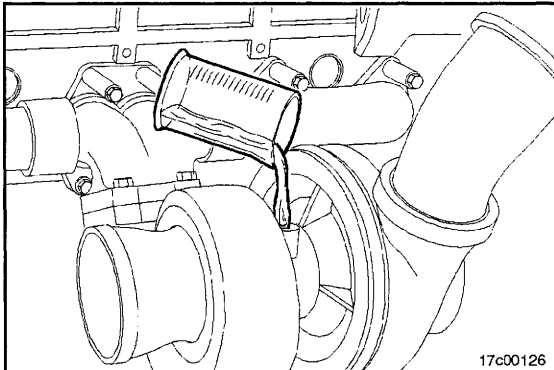
**Torque Value:** 9 N•m [75 in-lb]



Install a new gasket, oil drain tube, and capscrews.

Tighten the capscrews.

**Torque Value:** 25 N•m [18 ft-lb]



Install wastegate actuator hose, if equipped.

Pour 50 to 60 cc [2 to 3 oz] of clean engine oil into the turbocharger oil supply opening.

**⚠ CAUTION ⚠**

Proper routing of the turbocharger oil supply tube is critical to prevent failure. Avoid any tube-to-metal contact. (The inlet supply fitting must be oriented slightly off vertical to allow proper alignment.)

If installing a new turbocharger, make sure the turbocharger is aligned, loosen the turbocharger v-bands, and adjust as needed. Tighten the v-bands.

**Torque Value:** 9 N•m [75 in-lb]

If installing a new turbocharger, install the male union elbow.

**Torque Value:** 30 N•m [22 ft-lb]

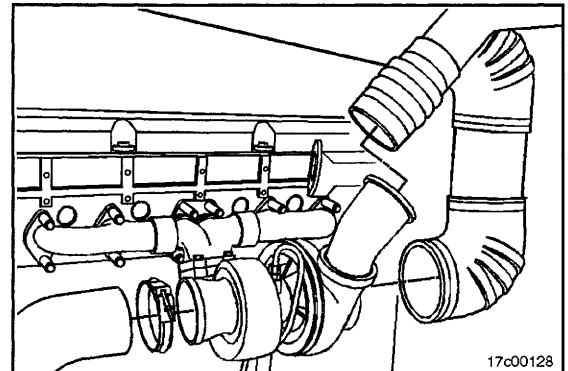
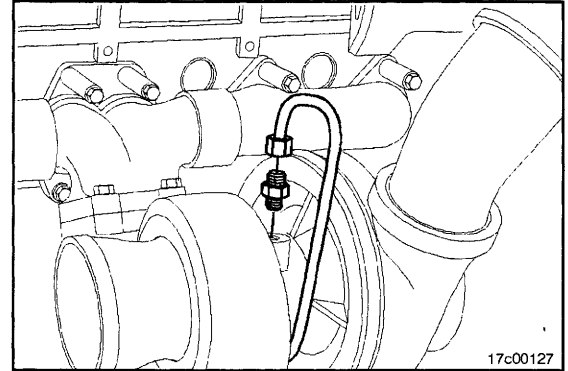
Install the turbocharger oil supply tube on the elbow.

**Torque Value:** 30 N•m [22 ft-lb]

Install the intake and exhaust pipes to the turbocharger, and tighten the clamps.

**Torque Value:** 9 N•m [75 in-lb]

Operate the engine, and check for air and oil leaks.



## Engine Storage - Long Term

### General Information

If the engine will be out of service longer than 6 months, take special precautions to prevent rust. Contact the nearest Cummins Authorized Repair Location for information concerning engine storage procedures.



## This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

**Section D - System Diagrams**  
**Section Contents**

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<b>Flow Diagram, Air Intake System</b> .....	D-8
<b>Flow Diagram, Compressed Air System</b> .....	D-10
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<b>Flow Diagram, Cooling System</b> .....	D-6
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<b>Flow Diagram, Exhaust System</b> .....	D-9
<b>Flow Diagram, Fuel System</b> .....	D-2
<b>Flow Diagram, Lubricating Oil System</b> .....	D-3
<b>System Diagrams - General Information</b> .....	D-1



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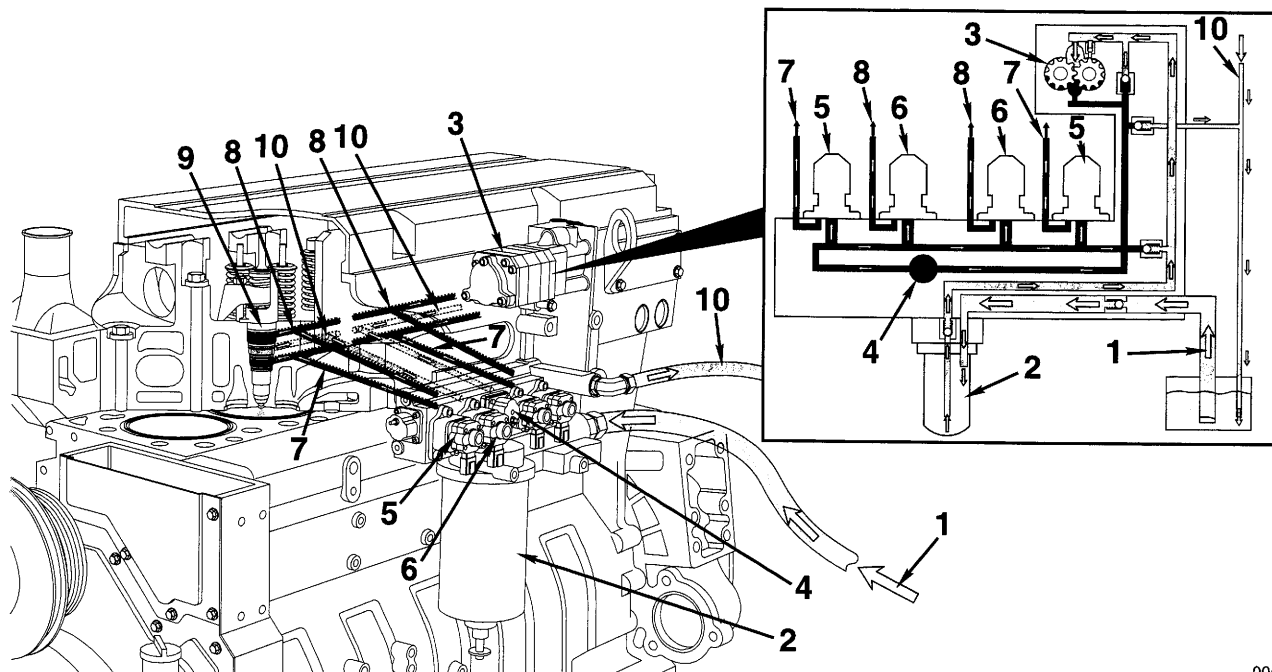
## **System Diagrams - General Information**

The following drawings show the flow through the engine systems. Although parts can change between different applications and installations, the flow remains the same. The systems shown are:

- Fuel system
- Lubricating oil system
- Cooling system
- Air intake system
- Exhaust system
- Compressed air system
- Engine brake oil.

Knowledge of the engine systems can help you in troubleshooting, service, and general maintenance of your engine.

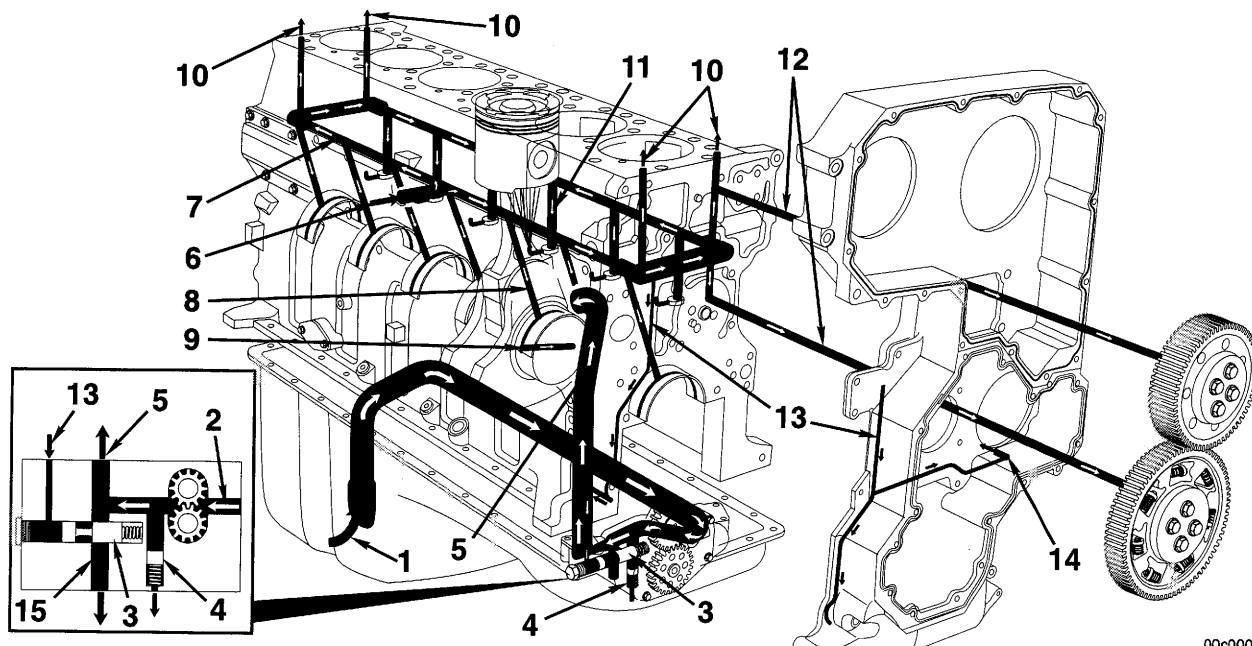
## Flow Diagram, Fuel System



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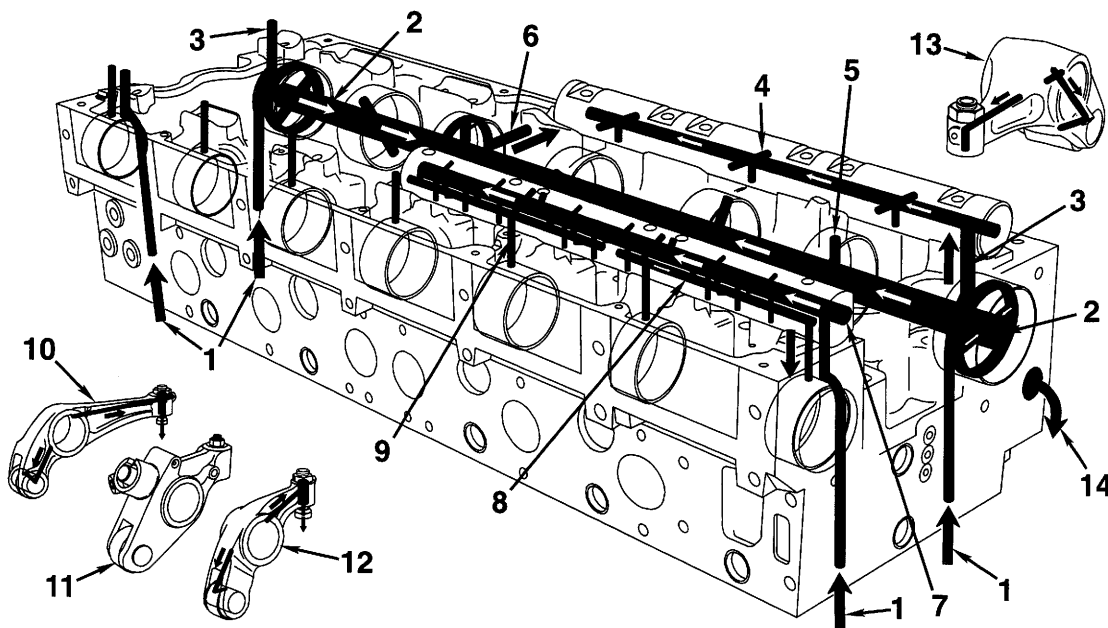
- |                           |                                     |
|---------------------------|-------------------------------------|
| 1. Fuel Supply from Tank  | 6. Timing Actuator                  |
| 2. Fuel Filter            | 7. Rail Metering Supply to Injector |
| 3. Gear Pump              | 8. Timing Fuel Supply to Injector   |
| 4. Fuel Shutoff Valve     | 9. Injector                         |
| 5. Rail Metering Actuator | 10. Fuel Drain to Tank.             |

## Flow Diagram, Lubricating Oil System



- |   |  |
|---|--|
| 1. Lubricating Oil Flow from Oil Pan through Suction Tube           | 9. Flow from Main Bearing to Crankshaft    |
| 2. Flow from Suction Tube to Oil Pump                               | 10. Flow to Cylinder Head                  |
| 3. Pressure Regulator   | 11. Flow to Piston Cooling Nozzle          |
| 4. High-Pressure Relief Valve                                       | 12. Flow to Idler Gears                    |
| 5. Flow from Oil Pump to Oil Cooler/Filter Head Housing             | 13. Oil Transfer from Main Oil Rifle       |
| 6. Oil Return from Oil Cooler/Filter Head Housing to Main Oil Rifle | 14. Flow to Air Compressor                 |
| 7. Main Oil Rifle   | 15. Rifle Sensing Regulator Pump to Inlet. |
| 8. Flow to Main Bearing   |  |

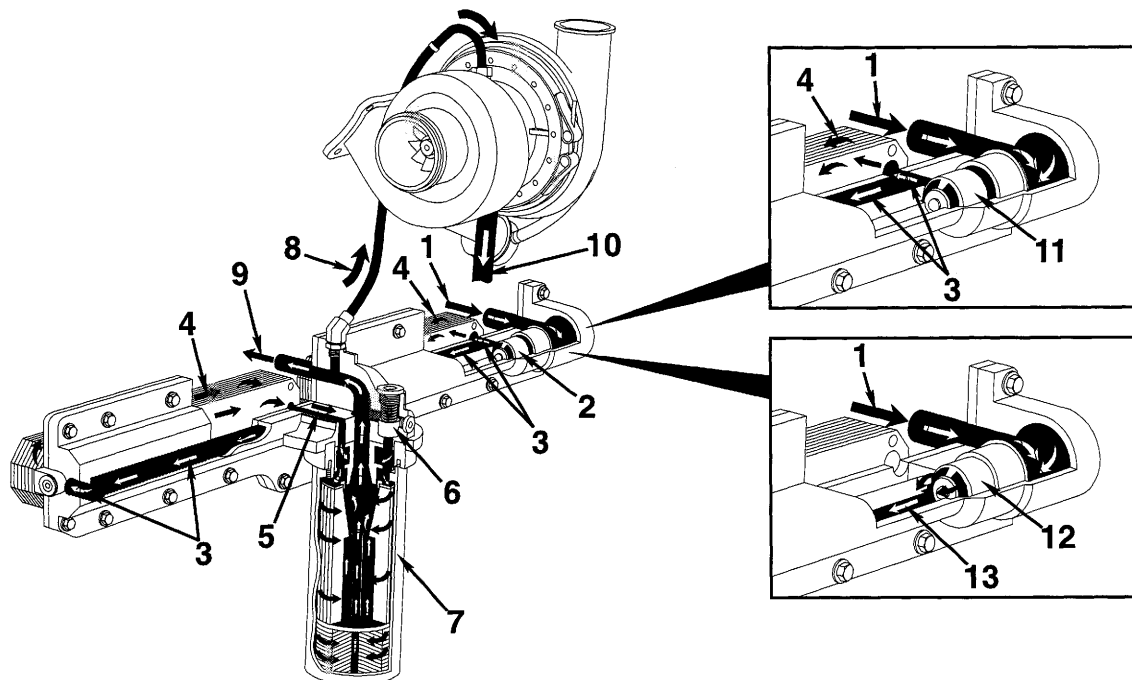
Flow Diagram, Lubricating Oil System



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- |   |   |
|---|---|
| 1. Lubricating Oil Flow from Cylinder Block to Cylinder Head            | 8. Flow to Valve Rocker Levers                |
| 2. Flow around Grooved Head to Drilled Camshaft and Rocker Lever Shafts | 9. Flow to Valve Camshaft Journal Bearings    |
| 3. Flow to Injector Rocker Lever Shafts                                 | 10. Intake Valve Rocker Lever                 |
| 4. Flow to Injector Rocker Levers                                       | 11. Engine Brake Lever                        |
| 5. Flow to Injector Camshaft Journal Bearings                           | 12. Exhaust Valve Rocker Lever                |
| 6. Flow to Fuel Pump  | 13. Injector Rocker Lever                     |
| 7. Flow to Valve Rocker Lever Shaft                                     | 14. Oil Drain from Overhead (Front and Rear). |

Flow Diagram, Lubricating Oil System

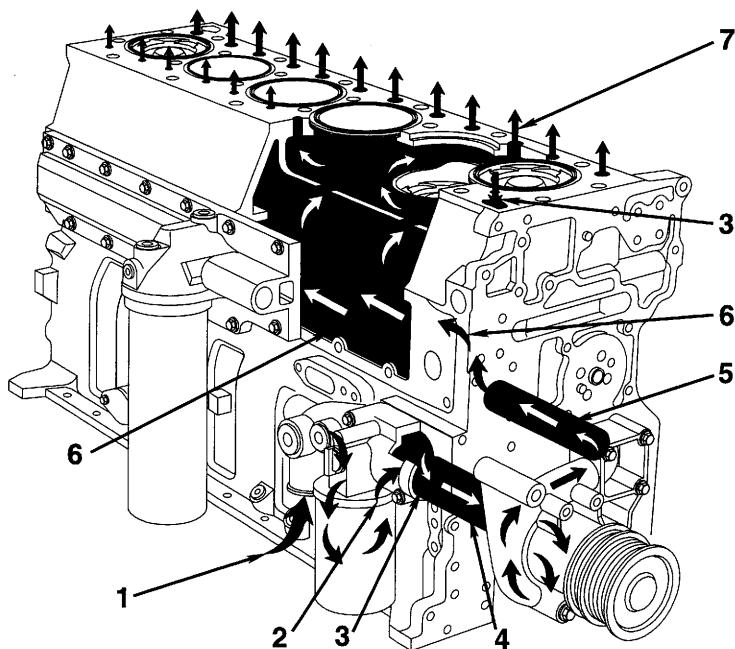


00c00003

1. Lubricating Oil Flow from Oil Pump
2. Thermostat
3. Oil Cooler Bypass Flow
4. Flow through Oil Coolers
5. Flow Return to Filter Head
6. Filter Bypass Valve
7. Oil Filter

8. Flow to Turbocharger
9. Flow to Main Oil Rifle
10. Oil Drain from Turbocharger
11. Thermostat Open - Oil Flows through Oil Coolers
12. Thermostat Closed - Oil Flows Directly to Oil Filter
13. Flow to Oil Filter.

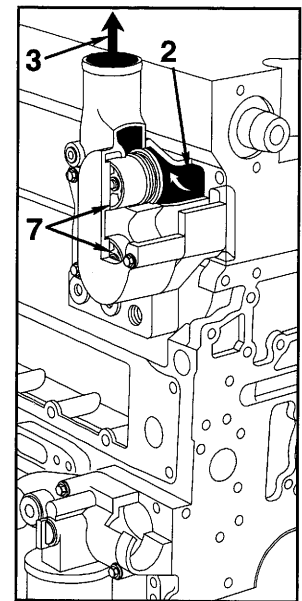
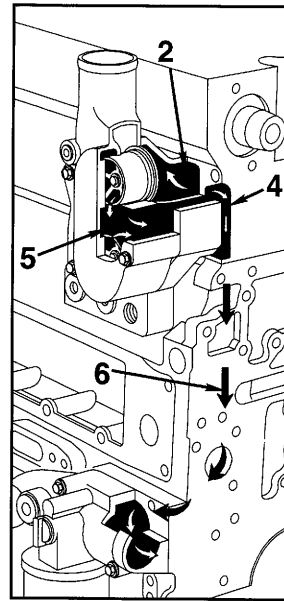
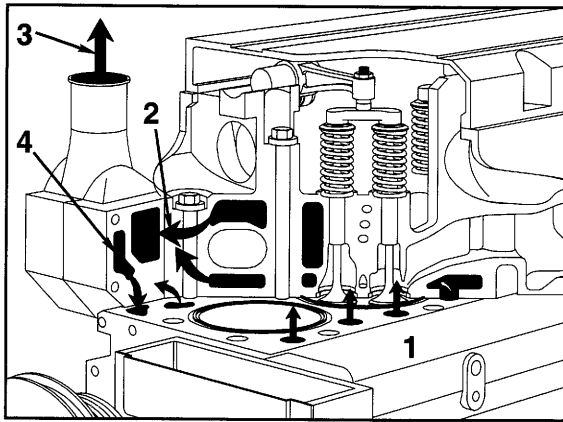
## Flow Diagram, Cooling System



00c00041

- |  |                                   |
|--|-----------------------------------|
| 1. Coolant Inlet                       | 5. Coolant Flow from Water Pump   |
| 2. Coolant Flow from Coolant Filter    | 6. Coolant Flow past Oil Cooler   |
| 3. Coolant Bypass Flow from Thermostat | 7. Coolant Flow to Cylinder Head. |
| 4. Coolant Flow to Water Pump          |                                   |

Flow Diagram, Cooling System



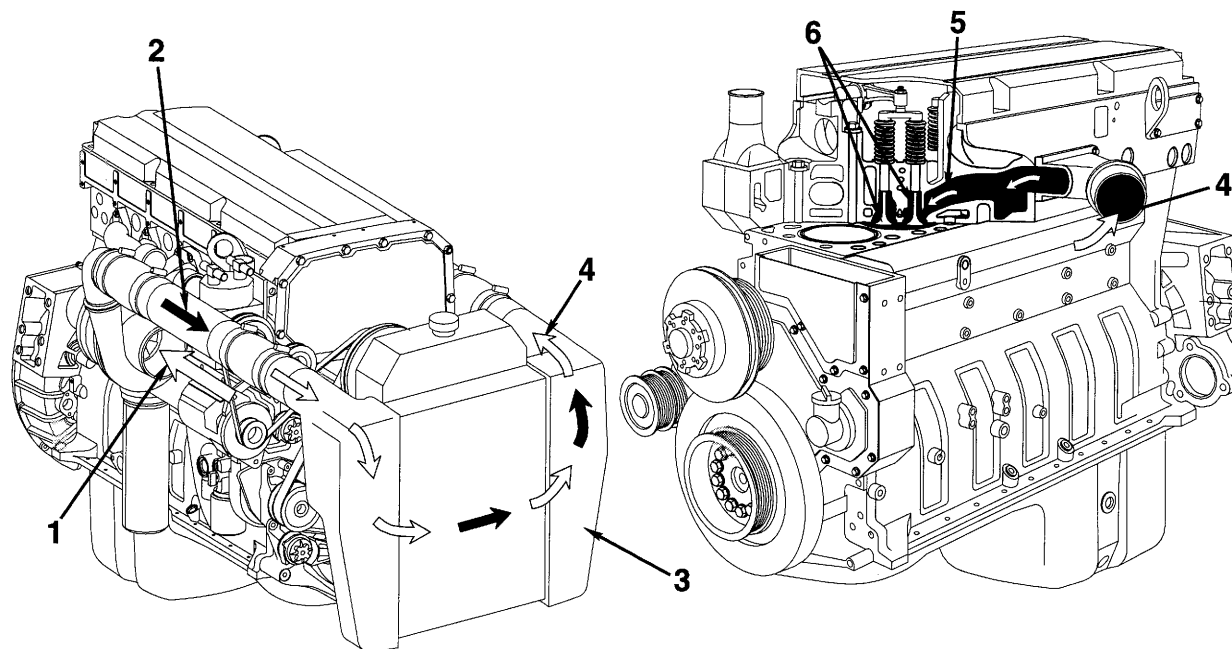
00c00042

1. Coolant Flow from Cylinder Block to Cylinder Head
2. Coolant Flow from Cylinder Head to Thermostat Housing
3. Coolant Flow to Radiator
4. Coolant Bypass Passage

5. Coolant Bypass Flow to Water Pump
6. Coolant Bypass Closed
7. Thermostats.



## Flow Diagram, Air Intake System

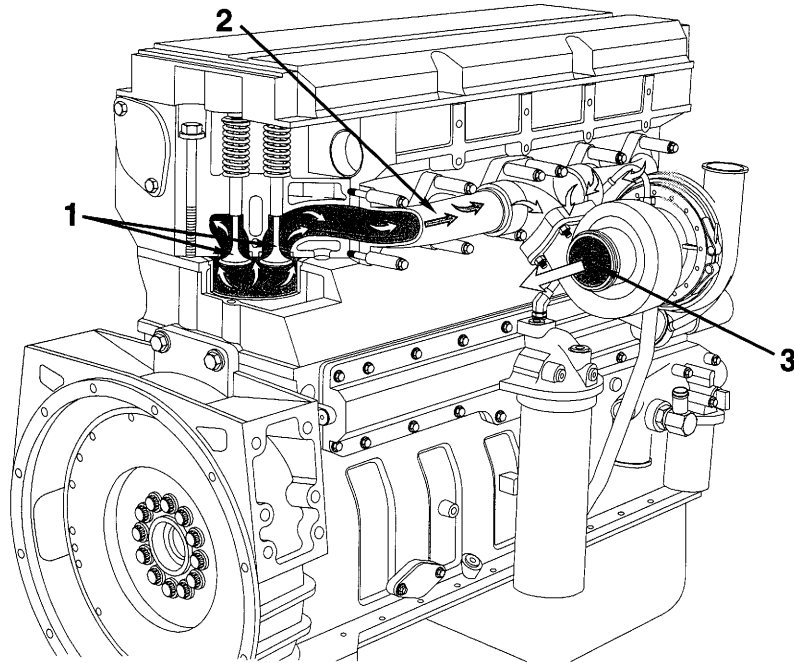


00c00005

1. Intake Air Inlet to Turbocharger
2. Turbocharger Air to Charge Air Cooler
3. Charge Air Cooler

4. From Charge Air Cooler to Intake Manifold
5. Intake Valve Port
6. Intake Valves.

## Flow Diagram, Exhaust System



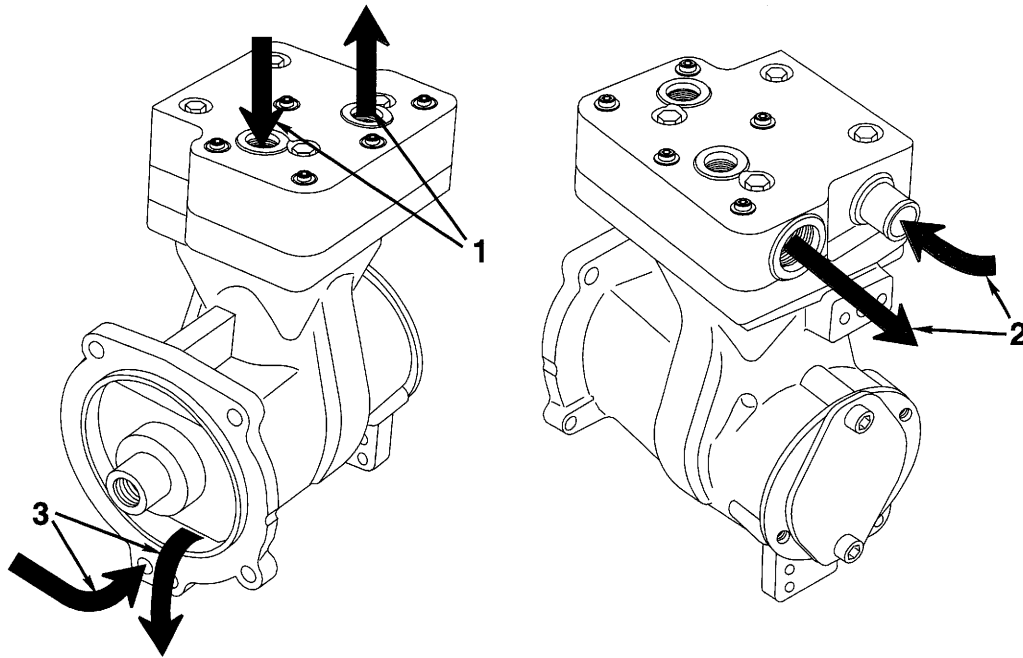
00c00006

- 1. Exhaust Valve Ports
- 2. Exhaust Manifold

- 3. Turbocharger Turbine.

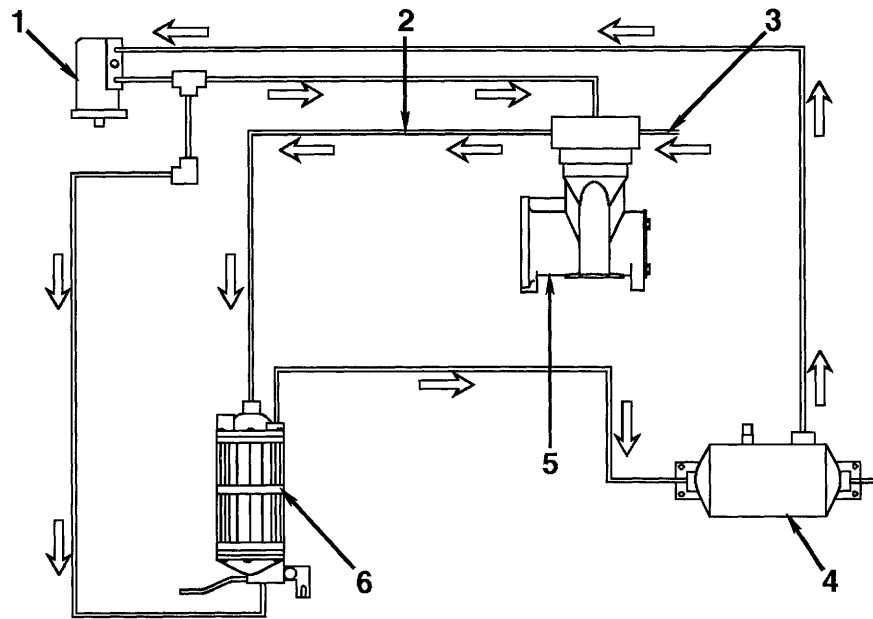
## Flow Diagram, Compressed Air System

### General Information



00c00007

1. Coolant
2. Air
3. Lubricant.

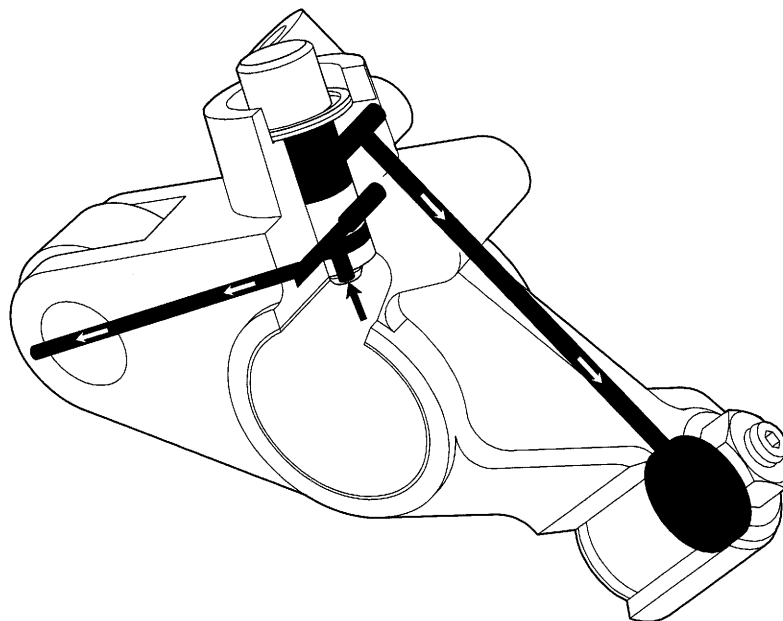


00c00008

1. Governor
2. Discharge
3. Intake
4. Wet Tank Reservoir
5. Air Compressor
6. Air Dryer.

## Flow Diagram, Engine Brake Oil

### General Information



00c00010

**Section L - Service Literature**  
**Section Contents**

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<b>Service Literature Ordering Location.....</b>	<b>L-2</b>

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## **Additional Service Literature**

The following publications can be purchased from your local Cummins distributor:

<b>Bulletin No.</b>	<b>Title of Publication</b>
3379001	Fuel For Cummins Engines
3379034	Publications and Training Aids Price List
3387251	Coolant Additives and Filtration
3387266	Cold Weather Operation
3666239	Troubleshooting and Repair Manual, Signature, ISX, and QSX15 Engines
3666259	Fuel System Troubleshooting and Repair Manual, Signature, ISX, and QSX15 Engines
3666209	Cooling System Maintenance Extended Interval
3666393	Troubleshooting and Repair Manual Generator-Drive Control System QSX15, QSK45, and QSK60 Engines
3666394	Troubleshooting and Repair Manual PowerCommand Control QSX15, QSK45, and QSK60 Generator Sets
3672139	Cummins Customized Parts Catalog
3810340	Cummins Engine Oil Recommendations



## Service Literature Ordering Location

Region	Ordering Location
United States and Canada	Cummins Distributors or Contact 1-800-DIESELS (1-800-343-7357)
U.K., Europe, Mid-East, Africa, and Eastern European Countries	Cummins Engine Co., Ltd. Royal Oak Way South Daventry Northants, NN11 5NU, England
South and Central America (excluding Brazil and Mexico)	Cummins Americas, Inc. 16085 N.W. 52nd Avenue Hialeah, FL 33104
Brazil and Mexico	Cummins Engine Co., Inc. International Parts Order Dept., MC 40931 Box 3005 Columbus, IN 47202-3005
Far East (excluding Australia and New Zealand)	Cummins Diesel Sales Corp. Literature Center 8 Tanjong Penjuru Jurong Industrial Estate Singapore
Australia and New Zealand	Cummins Diesel Australia Maroondah Highway, P.O.B. 139 Ringwood 3134 Victoria, Australia

Obtain current price information from your local Cummins Distributor.

## Section M - Component Manufacturers

### Section Contents

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## **Component Manufacturers' Addresses**

**NOTE:** The following list contains addresses and telephone numbers of suppliers of accessories used on Cummins engines. Suppliers can be contacted directly for any specifications **not** covered in this manual.

### **Air Compressors**

Bendix Heavy Vehicles Systems  
Div. of Allied Automotive  
901 Cleveland Street  
Elyria, OH 44036  
Telephone: (216) 329-9000

Holset Engineering Co., Inc.  
1320 Kemper Meadow Drive  
Suite 500

Cincinnati, OH 45240  
Telephone: (513) 825-9600

Midland-Grau  
Heavy Duty Systems  
Heavy Duty Group Headquarters  
10930 N. Pamona Avenue  
Kansas City, MO 64153  
Telephone: (816) 891-2470

### **Air Cylinders**

Bendix Ltd.  
Douglas Road  
Kingswood  
Bristol  
England  
Telephone: 0117-671881

Catching Engineering  
1733 North 25th Avenue  
Melrose Park, IL 60160  
Telephone: (708) 344-2334

TEC - Hackett Inc.  
8909 Rawles Avenue  
Indianapolis, IN 46219  
Telephone: (317) 895-3670

### **Air Heaters**

Fleetguard, Inc.  
1200 Fleetguard Road  
Cookeville, TN 38502  
Telephone: (615) 526-9551

Kim Hotstart Co.  
P.O. Box 11245  
Spokane, WA 99211-0245  
Telephone: (509) 534-6171

### **Air Starting Motors**

Ingersoll Rand  
Chorley New Road  
Horwich  
Bolton  
Lancashire  
England  
BL6 6JN  
Telephone: 01204-65544

Ingersoll-Rand Engine  
Starting Systems  
888 Industrial Drive  
Elmhurst, IL 60126  
Telephone: (708) 530-3875

StartMaster  
Air Starting Systems  
A Division of Sycon Corporation  
9595 Cheney Avenue  
P. O. Box 491  
Marion, OH 43302  
Telephone: (614) 382-5771

### **Alternators**

Robert Bosch Ltd.  
P.O. Box 98  
Broadwater Park  
North Orbital Road  
Denham  
Uxbridge  
Middlesex UD9 5HG  
England  
Telephone: 01895-833633

Bute Electric  
Cleveland Road  
Leyland  
PR5 1XB  
England  
Telephone: 01744-21663

C.A.V. Electrical Equipment  
P.O. Box 36  
Warple Way  
London  
W3 7SS  
England  
Telephone: 01-743-3111

A.C. Delco Components Group  
Civic Offices  
Central Milton Keynes  
MK9 3EL  
England  
Telephone: 01908-66001

C. E. Niehoff & Co.  
2021 Lee Street  
Evanston, IL 60202  
Telephone: (708) 866-6030

Delco-Remy America  
2401 Columbus Avenue  
P.O. Box 2439  
Anderson, IN 46018  
Telephone: (317) 646-3528

Leece-Neville Corp.  
400 Main Street  
Arcade, NY 14009  
Telephone: (716) 492-1700

### **Auxiliary Brakes**

The Jacobs Manufacturing Company  
Vehicle Equipment Division  
22 East Dudley Town Road  
Bloomfield, CT 06002  
Telephone: (203) 243-1441

### **Belts**

Dayco Rubber U.K.  
Sheffield Street  
Stockport  
Cheshire  
SK4 1RV  
England  
Telephone: 061-432-5163

T.B.A. Belting Ltd.  
P.O. Box 77  
Wigan  
Lancashire  
WN2 4XQ  
England  
Telephone: 01942-59221

Dayco Mfg.  
Belt Technical Center  
1955 Enterprize  
Rochester Hills, MI 48309  
Telephone: (810) 853-8300

Gates Rubber Company  
900 S. Broadway  
Denver, CO 80217

Goodyear Tire and  
Rubber Company  
Industrial Products Div.  
2601 Fortune Circle East  
Indianapolis, IN 46241  
Telephone: (317) 898-4170

### **Catalytic Converters**

Donaldson Company, Inc.  
1400 West 94th Street  
P.O. Box 1299  
Minneapolis, MN 55440  
Telephone: (612) 887-3835

Nelson Division  
Exhaust and Filtration Systems  
1801 U.S. Highway 51 P.O. Box 428  
Stoughton, WI 53589  
Telephone: (608) 873-4200

Walker Manufacturing  
3901 Willis Road  
P.O. Box 157  
Grass Lake, MI 49240  
Telephone: (517) 522-5500

### **Coolant Level Switches**

Robertshaw Controls Company  
P.O. Box 400  
Knoxville, TN 37901  
Telephone: (216) 885-1773

### **Clutches**

Twin Disc International S.A.  
Chaussee de Namur  
Nivelles  
Belguim  
Telephone: 067-224941

Twin Disc Incorporated  
1328 Racine Street  
Racine, WI 53403  
Telephone: (414) 634-1981

### **Coolant Heaters**

Fleetguard, Inc.  
1200 Fleetguard Road  
Cookeville, TN 38502  
Telephone: (615) 526-9551

### **Drive Plates**

Detroit Diesel Allison  
Division of General Motors  
Corporation  
P.O. Box 894  
Indianapolis, IN 46206-0894  
Telephone: (317) 242-5000

### **Electric Starting Motors**

Bute Electric  
Cleveland Road  
Leyland  
PR5 1XB  
England  
Telephone: 01744-21663

C.A.V. Electrical Equipment  
P.O. Box 36  
Warple Way  
London  
W3 7SS  
England  
Telephone: 01-743-3111

A.C. Delco Components Group  
Civic Offices  
Central Milton Keynes  
MK9 3EL  
England  
Telephone: 0908-66001

Delco-Remy America  
2401 Columbus Avenue  
P.O. Box 2439  
Anderson, IN 46018  
Telephone: (317) 646-3528

Leece-Neville Corp.  
400 Main Street  
Arcade, NY 14009  
Telephone: (716) 492-1700

Nippondenso Inc.  
2477 Denso Drive  
P.O. Box 5133  
Southfield, MI 48086  
Telephone: (313) 350-7500

### **Electronic Switches**

Cutler-Hammer Products  
Eaton Corporation  
4201 N. 27th Street  
Milwaukee, WI 53216  
Telephone: (414) 449-6600

### **Engine Protection Controls**

Flight Systems Headquarters  
Hemphill Road  
P.O. Box 25  
Mechanicsburg, PA 17055  
Telephone: (717) 697-0333

The Nason Company  
2810 Blue Ridge Blvd.  
West Union, SC 29696  
Telephone: (803) 638-9521

Teddington Industrial  
Equipment  
Windmill Road  
Sunburn on Thames  
Middlesex  
TW16 7HF  
England  
Telephone: 09327-85500

### **Fan Clutches**

Kysor Cooling Systems N.A.  
6040 West 62nd Street  
Indianapolis, IN 46278  
Telephone: (317) 328-3330

Holset Engineering Co. Ltd.  
P.O. Box A9  
Turnbridge  
Huddersfield, West Yorkshire  
England HD6 7RD  
Telephone: 01484-22244

Horton Industries, Inc.  
P.O. Box 9455  
Minneapolis, MN 55440  
Telephone: (612) 378-6410  
Rockford Clutch Company  
1200 Windsor Road  
P.O. Box 2908  
Rockford, IL 61132-2908  
Telephone: (815) 633-7460

### **Fans**

Truffo Ltd.  
Westwood Road  
Birmingham  
B6 7JF  
England  
Telephone: 021-557-4101

Hayes-Albion Corporation  
Jackson Manufacturing Plant  
1999 Wildwood Avenue  
Jackson, MI 49202  
Telephone: (517) 782-9421

Engineered Cooling Systems, Inc.  
201 W. Carmel Drive  
Carmel, IN 46032  
Telephone: (317) 846-3438

Brookside Corporation  
P.O. Box 30  
McCordsville, IN 46055  
Telephone: (317) 335-2014

TCF Aerovent Company  
9100 Purdue Rd., Suite 101  
Indianapolis, IN 46268-1190  
Telephone: (317) 872-0030

Kysor-Cadillac  
1100 Wright Street  
Cadillac, MI 49601  
Telephone: (616) 775-4681

Schwitzer  
6040 West 62nd Street  
P.O. Box 80-B  
Indianapolis, IN 46206  
Telephone: (317) 328-3010

### **Fault Lamps**

Cutler-Hammer Products  
Eaton Corporation  
4201 N. 27th Street  
Milwaukee, WI 53216  
Telephone: (414) 449-6600

### **Filters**

Fleetguard International Corp.  
Cavalry Hill Industrial Park  
Weedon  
Northampton NN7 4TD  
England  
Telephone: 01327-41313  
Fleetguard, Inc.  
1200 Fleetguard Road  
Cookeville, TN 38502  
Telephone: 1-800-22-Filter  
(1-800-223-4583)

### **Flexplates**

Corrugated Packing and  
Sheet Metal  
Hamsterley  
Newcastle Upon Tyne  
England  
Telephone: 01207-560-505

Allison Transmission  
Division of General Motors  
Corporation  
P.O. Box 894  
Indianapolis, IN 46206-0894  
Telephone: (317) 242-5000

Midwest Mfg. Co.  
29500 Southfield Road, Suite 122  
Southfield, MI 48076  
Telephone: (313) 642-5355

Wohlert Corporation  
708 East Grand River Avenue  
P.O. Box 20217  
Lansing, MI 48901  
Telephone: (517) 485-3750

### **Fuel Coolers**

Hayden, Inc.  
1531 Pomona Road  
P.O. Box 848  
Corona, CA 91718-0848  
Telephone: (909) 736-2665

### **Fuel Pumps**

Robert Bosch Corp.  
Automotive Group  
2800 South 25th Ave.  
Broadview, IL 60153

### **Fuel Warmers**

Fleetguard, Inc.  
1200 Fleetguard Road  
Cookeville, TN 38502  
Telephone: (615) 526-9551

## **Gauges**

A.I.S.  
Dyffon Industrial Estate  
Ystrad Mynach  
Hengoed  
Mid Glamorgan  
CF8 7XD  
England  
Telephone: 01443-812791

Grasslin U.K. Ltd.  
Vale Rise  
Tonbridge  
Kent  
TN9 1TB  
England  
Telephone: 01732-359888

Icknield Instruments Ltd.  
Jubilee Road  
Letchworth  
Herts  
England  
Telephone: 04626-5551

Superb Tool and Gauge Co.  
21 Princip Street  
Birmingham  
B4 61E  
England  
Telephone: 021-359-4876

Kabi Electrical and Plastics  
Cranborne Road  
Potters Bar  
Herts  
EN6 3JP  
England  
Telephone: 01707-53444

Datcon Instruments  
P.O. Box 128  
East Petersburg, PA 17520  
Telephone: (717) 569-5713

Rochester Gauges, Inc.  
11616 Harry Hines Blvd.  
P.O. Box 29242  
Dallas, TX 75229  
Telephone: (214) 241-2161

## **Governors**

Woodward Governors Ltd.  
P.O. Box 15  
663/664 Ajax Avenue  
Slough  
Bucks  
SL1 4DD  
England  
Telephone: 01753-26835

Woodward Governor Co.  
P.O. Box 1519  
Fort Collins, CO 80522  
Telephone: (303) 482-5811  
(800) 523-2831

Barber Colman Co.  
1354 Clifford Avenue  
Loves Park, IL 61132  
Telephone: (815) 637-3000

United Technologies  
Diesel Systems  
1000 Jorie Blvd.  
Suite 111  
Oak Brook, IL 69521  
Telephone: (312) 325-2020

## **Heat Sleeves**

Bentley Harris Manufacturing Co.  
100 Bentley Harris Way  
Gordonville, TN 38563  
Telephone: (313) 348-5779

## **Hydraulic and Power Steering Pumps**

Hobourn Automotive  
Temple Farm Works  
Priory Road  
Strood  
Rochester  
Kent, England  
ME2 2BD  
Telephone: 01634-71773

Honeywell Control Systems Ltd.  
Honeywell House  
Charles Square  
Bracknell  
Berks RG12 1EB  
Telephone: 01344-4245

Sundstrand Hydratec Ltd.  
Cheney Manor Trading Estate  
Swindon  
Wiltshire  
SN2 2PZ  
England  
Telephone: 01793-30101

Sperry Vickers  
P.O. Box 302  
Troy, MI 48084  
Telephone: (313) 280-3000

Z.F.  
P.O. Box 1340  
Grafvonsoden Strasse  
5-9 D7070  
Schwaebisch Gmuend  
Germany  
Telephone: 7070-7171-31510

## **In-Line Connectors**

Pioneer-Standard Electronics, Inc.  
5440 Neiman Parkway  
Solon, OH 44139  
Telephone: (216) 349-1300

Deutsch  
Industrial Products Division  
37140 Industrial Avenue  
Hemet, CA 92343  
Telephone: (714) 929-1200

## **Oil Heaters**

Fleetguard, Inc.  
1200 Fleetguard Road  
Cookeville, TN 38502  
Telephone: (615) 526-9551

Kim Hotstart Co.  
P.O. Box 11245  
Spokane, WA 99211-0245  
Telephone: (509) 534-6171

## **Prelubrication Systems**

RPM Industries, Inc.  
Suite 109  
55 Hickory Street  
Washington, PA 15301  
Telephone: (412) 228-5130

## **Radiators**

JB Radiator Specialties, Inc.  
P.O. Box 292087  
Sacramento, CA 95829-2087  
Telephone: (916) 381-4791

The G&O Manufacturing Company  
100 Gando Drive  
P.O. Box 1204  
New Haven, CT 06505-1204  
Telephone: (203) 562-5121

Young Radiator Company  
2825 Four Mile Road  
Racine, WI 53404  
Telephone: (910) 271-2397

L and M Radiator, Inc.  
1414 East 37th Street  
Hibbing, MN 55746  
Telephone: (218) 263-8993

## **Throttle Assemblies**

Williams Controls, Inc.  
14100 SW 72nd Avenue  
Portland, OR 97224  
Telephone: (503) 684-8600

## **Torque Converters**

Twin Disc International S.A.  
Chaussee de Namur  
Nivelles  
Belgium  
Telephone: 067-224941

Twin Disc Incorporated  
1328 Racine Street  
Racine, WI 53403-1758  
Telephone: (414) 634-1981

Rockford Powertrain, Inc.  
Off-Highway Systems  
1200 Windsor Road  
P.O. Box 2908  
Rockford, IL 61132-2908  
Telephone: (815) 633-7460

Modine Mfg. Co.  
1500 DeKoven Avenue  
Racine, WI 53401  
Telephone: (414) 636-1640

## NOTES

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## Section S - Service Assistance

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## Service Assistance

### Routine Service and Parts

Personnel at Cummins Authorized Repair Locations can assist you with the correct operation and service of your engine. Cummins has a worldwide service network of more than 5,000 Distributors and Dealers who have been trained to provide sound advice, expert service, and complete parts support. Check the telephone directory yellow pages or refer to the directory in this section for the nearest Cummins Authorized Repair Location.

### Emergency and Technical Service

The Cummins Customer Assistance Center provides a 24-hour, toll free telephone number to aid in technical and emergency service when a Cummins Authorized Repair Location can **not** be reached or is unable to resolve an issue with a Cummins product.

If additional assistance is required, call Toll-Free:

1-800-DIESELS  
(1-800-343-7357)

- Includes all 50 states, Bermuda, Puerto Rico, Virgin Islands, and the Bahamas.
- Outside of North America contact your Regional Office. Telephone numbers and addresses are listed in the International Directory.



## Problem Solving

Normally, any problem that arises with the sale, service, or repair of your engine can be handled by a Cummins Authorized Repair Location in your area. Refer to the telephone directory yellow pages for the one nearest you. If the problem has **not** been handled satisfactorily, follow the steps outlined below:

1. If the disagreement is with a Dealer, talk to the Cummins Distributor with whom he has his service agreement.
2. If the disagreement is with a Distributor, call the nearest Cummins Division or Regional Office; however, most problems are solved below the Division or Regional office level. Telephone numbers and addresses are listed in this section. Before calling, write down the following information:
  - a. Engine model and serial number
  - b. Type and make of equipment
  - c. Total kilometers [miles] or hours of operation
  - d. Warranty start date
  - e. Nature of problem
  - f. Summary of the current problem arranged in the order of occurrence
  - g. Name and location of the Cummins Distributor or Dealer
3. If a problem can **not** be resolved satisfactorily through your Cummins Authorized Repair Location or Division Office, write to:

Cummins Customer Assistance Center - 41403, Cummins Engine Company, Inc., Box 3005, Columbus, IN 47202-3005

## **Division and Regional Offices**

**NOTE:** The following list contains offices in U.S., Canada, Australia, New Zealand, and Puerto Rico.

### **United States**

#### **Southern Division Office**

Cummins Engine Company, Inc.  
425 Franklin Road S.W.  
Suite 500  
Marietta, GA 30067  
Telephone: (770) 423-1108  
FAX: (770) 499-8240

#### **Plains Regional Office**

Cummins Engine Company, Inc.  
1901 Central Drive  
Suite 356  
Bedford, TX 76021  
Telephone: (817) 267-3172  
FAX: N/A

### **Canada**

#### **Canadian Division Office**

Cummins Diesel of Canada, Ltd.  
5575 North Service Road  
Burlington, Ontario L7R 6M1  
Telephone: (905) 331-5944  
FAX: (905) 331-0276

#### **Western Canada Regional Office**

Cummins Diesel of Canada, Ltd.  
18452 - 96th Avenue  
Surrey, B.C. V3T 4W2  
Telephone: (604) 882-5727  
FAX: (604) 882-9110

#### **Eastern Canada Regional Office**

Cummins Diesel of Canada Ltd.  
7200 Trans Canada Hwy.  
Pt. Cuaire, Quebec H9R 1C0  
Telephone: (514) 695-2402  
FAX: (514) 695-8917

#### **Central Canada Regional Office**

Cummins Diesel of Canada Ltd.  
4887 - 35th Street SE  
Calgary, Alberta T2B 3C6  
FAX: (403) 569-9974

### **Australia Regional Office**

#### **Cummins Engine Company Pty. Ltd.**

2 Caribbean Drive  
Scoresby, Victoria 3179  
Australia  
Telephone: (61-3) 9765-3222  
FAX: (61-3) 9763-0079

**NOTE:** This office also serves New Zealand.

### **Cummins Americas Regional Office**

### **Cummins Latin America**

3088 N. Commence Parkway  
MPC #14, Building A  
Miramar, FL 33025  
Telephone: (305) 621-1300

**NOTE:** This office serves Puerto Rico and South America excluding Brazil.

## Distributors and Branches - United States

### Alabama

#### Birmingham Distributor

Cummins Alabama, Inc.  
2200 Pinson Highway  
P.O. Box 1147  
Birmingham, AL 35201  
Telephone: (205) 841-0421  
FAX: (205) 849-5926

#### Mobile Branch

Cummins Alabama, Inc.  
1924 N. Beltline Hwy.  
Mobile, AL 36601-1598  
Telephone: (334) 456-2236  
FAX: (334) 452-6419

#### Mobile Onan/Marine Branch

Cummins Alabama, Inc.  
3422 Georgia Pacific Avenue  
Mobile, AL 36617  
Telephone: (334) 452-6426  
FAX: (334) 473-6657

#### Montgomery Branch

Cummins Alabama, Inc.  
2325 West Fairview Avenue  
Montgomery, AL 36108  
Telephone: (205) 263-2594  
FAX: (205) 263-2594

### Alaska

#### Anchorage - (Branch of Seattle)

Cummins Northwest, Inc.  
2618 Commercial Drive  
Anchorage, AK 99501-3095  
Telephone: (907) 279-7594  
FAX: (907) 276-6340

### Arizona

#### Phoenix Distributor and Branch

Cummins Southwest, Inc.  
2239 N. Black Canyon Hgwy  
Phoenix, AZ 85009  
Telephone: (602) 252-8021  
FAX: (602) 253-6725

#### Tucson Branch

Cummins Southwest, Inc.  
1912 West Prince Road  
Tucson, AZ 85705  
Telephone: (520) 887-7440  
FAX: (520) 887-4173

### Arkansas

#### Little Rock - (Branch of Memphis)

Cummins Mid-South, Inc.  
6600 Interstate 30  
Little Rock, AR 72209  
Telephone:  
Sales: (501) 569-5600  
Service: (501) 569-5656  
Parts: (501) 569-5613  
FAX: (501) 565-2199

### California

#### San Leandro Distributor

Cummins West, Inc.  
14775 Wicks Blvd.  
San Leandro, CA 94577-6779  
Telephone: (510) 351-6101  
FAX: (510) 352-3925

#### Arcata Branch

Cummins West, Inc.  
4801 West End Road  
Arcata, CA 95521  
Telephone: (707) 822-7392  
FAX: (707) 822-7585

#### Bakersfield Branch

Cummins West, Inc.  
4601 East Brundage Lane  
Bakersfield, CA 93307  
Telephone: (805) 325-9404  
FAX: (805) 861-8719

#### Fresno Branch

Cummins West, Inc.  
2740 Church Avenue  
Fresno, CA 93706  
Telephone: (209) 495-4745  
FAX: (209) 486-7402

#### Redding Branch

Cummins West, Inc.  
20247 Charianne Drive  
Redding, CA 96001  
Telephone: (916) 222-4070  
FAX: (916) 224-4075

#### Stockton Branch

Cummins West, Inc.  
41 West Yokuts Avenue  
Suite 131  
Stockton, CA 95207  
Telephone: (209) 473-0386  
FAX: (209) 478-2454

#### West Sacramento Branch

Cummins West, Inc.  
2661 Evergreen Avenue  
West Sacramento, CA 95691  
Telephone: (916) 371-0630  
FAX: (916) 371-2849

#### Los Angeles Distributor

Cummins Cal Pacific Inc.  
1939 Deere Avenue (Irvine)  
Irvine, CA 92606  
Telephone: (949) 253-6000  
FAX: (949) 253-6080

#### Montebello Branch

Cummins Cal Pacific Inc.  
1105 South Greenwood Avenue  
Montebello, CA 90640  
Telephone: (323) 728-8111  
FAX: (323) 889-7422

### Bloomington Branch

Cummins Cal Pacific Inc.  
3061 S. Riverside Avenue  
Bloomington, CA 92377  
Telephone: (909) 877-0433  
FAX: (909) 877-3787

### San Diego Branch

Cummins Cal Pacific Inc.  
310 N. Johnson Avenue  
El Cajon, CA 92020  
Telephone: (619) 593-3093  
FAX: (619) 593-0600

### Ventura Branch

Cummins Cal-Pacific Inc.  
3958 Transport St.  
Ventura, CA 93003  
Telephone: (805) 644-7281  
FAX: (805) 644-7284

### Colorado

#### Denver Distributor

Cummins Rocky Mountain, Inc.  
5100 East 58th Avenue  
Commerce City, CO 80022  
Telephone: (303) 287-0201  
FAX: (303) 288-7080

#### Denver Onan/Industrial Branch

Cummins Rocky Mountain, Inc.  
5100 East 58th Ave.  
Commerce City, CO 80022  
Telephone: (303) 286-7697  
FAX: (303) 287-4837

#### Durango Branch

Cummins Rocky Mountain, Inc.  
13595 County Road 213  
Durango, CO 81301  
Telephone: (970) 259-7470  
FAX: (970) 259-7482

#### Grand Junction Branch

Cummins Rocky Mountain, Inc.  
2380 U.S. Highway 6 & 50  
P.O. Box 339  
Grand Junction, CO 81501  
Telephone: (303) 242-5776  
FAX: (303) 243-5495

### Connecticut

#### Rocky Hill - (Branch of Bronx)

Cummins Metropower, Inc.  
914 Cromwell Ave.  
Rocky Hill, CT 06067  
Telephone: (860) 529-7474  
FAX: (860) 529-7524

**Florida**

**Tampa Distributor**

Cummins Southeastern Power, Inc.  
Corporate Office  
5421 N. 59th Street  
Tampa, FL 33610  
Telephone: (813) 621-7202  
FAX: (813) 621-8250

**Ft. Myers Branch**

Cummins Southeastern Power, Inc.  
2671 Edison Avenue  
Ft. Myers, FL 33902  
Telephone: (941) 337-1211  
FAX: (941) 337-5374

**Jacksonville Branch**

Cummins Southeastern Power, Inc.  
755 Pickettville Rd.  
Jacksonville, FL 32220  
Telephone: (904) 378-1902  
FAX: (904) 378-1904

**Hialeah (Miami) Branch**

Cummins Southeastern Power, Inc.  
9900 N.W. 77th Avenue  
Hialeah Gardens, FL 33016  
Telephone: (305) 821-4200  
FAX: (305) 557-2992

**Ocala Branch**

Cummins Southeastern Power  
321 Southwest 52nd Ave.  
Ocala, FL 34474-1892  
Telephone: (352) 861-1122  
FAX: (352) 861-1130

**Orlando Branch**

Cummins Southeastern Power, Inc.  
4020 North  
Orange Blossom Trail  
Orlando, FL 32810  
Telephone: (407) 298-2080  
FAX: (407) 290-8727

**Tampa Branch**

Cummins Southeastern Power, Inc.  
5912 E. Hillsborough Avenue  
Tampa, FL 33610  
Telephone: (813) 626-1101  
FAX: (813) 628-4183

**Georgia**

**Atlanta Distributor**

Cummins South, Inc.  
5125 Georgia Highway 85  
College Park, GA 30349  
Telephone: (404) 763-0151  
FAX: (404) 766-2132

**Albany Branch**

Cummins South, Inc.  
1915 W. Oakridge Drive  
Albany, GA 31707-4938  
Telephone: (912) 888-6210  
FAX: (912) 883-1670

**Atlanta Branch**

Cummins South, Inc.  
100 University Avenue, S.W.  
Atlanta, GA 30315-2202  
Telephone: (404) 527-7800  
FAX: (404) 527-7832

**Augusta Branch**

Cummins South, Inc.  
1255 New Savannah Road  
Augusta, GA 30901-3891  
Telephone: (706) 722-8825  
FAX: (706) 722-7553

**Savannah Branch**

Cummins South, Inc.  
8 Interchange Court  
Savannah, GA 31401-1627  
Telephone: (912) 232-5565  
FAX: (912) 232-5145

**Hawaii**

**Kapolei Distributor**

Cummins Hawaii Diesel Power, Inc.  
91-230 Kalaeloa Blvd.  
Kapolei, HI 96707  
Telephone: (808) 682-8110  
FAX: (808) 682-8477

**Idaho**

**Boise - (Branch of Salt Lake City)**

Cummins Intermountain, Inc.  
2851 Federal Way City  
Boise, ID 83705  
Telephone: (208) 336-5000  
FAX: (208) 338-5436

**Pocatello - (Branch of Salt Lake City)**

Cummins Intermountain, Inc.  
14299 Highway 30 West  
Pocatello, ID 83201  
Telephone: (208) 234-1661  
FAX: (208) 234-1662

**Illinois**

**Chicago Distributor**

Cummins Northern Illinois, Inc.  
7145 Santa Fe Drive  
Hodgkins, IL 60525  
Telephone: (708) 579-9222  
FAX: (708) 352-7547

**Bloomington-Normal - (Branch of Indianapolis)**

Cummins Mid-States Power, Inc.  
(at U.S. 51 N and I-55)  
414 W. Northtown Road  
Bloomington-Normal, IL 61761  
Telephone: (309) 452-4454  
FAX: (309) 452-1642

**Onan Branch**

Cummins/Onan Northern Illinois  
8745 W. 82nd Place  
Justin, IL 60458  
Telephone: (708) 563-7070  
FAX: (708) 563-7095

**Harrisburg (Branch of St. Louis)**

Cummins Gateway, Inc.  
Highway 45 North  
Harrisburg, IL 62946  
Telephone: (618) 273-4138  
FAX: (618) 273-4531

**Rock Island - (Branch of Omaha)**

Cummins Great Plains Diesel, Inc.  
7820 - 42nd Street West  
Rock Island, IL 61204  
Telephone: (309) 787-4300  
FAX: (309) 787-4397

**Onan Branch**

Cummins Gateway, Inc.  
#1 Extra Mile Drive  
Collinsville, IL 62234  
Telephone: (618) 345-0123  
FAX: (314) 531-6604

**Indiana**

**Indianapolis Distributor**

Cummins Mid-States Power, Inc.  
P.O. Box 42917  
3762 West Morris Street  
Indianapolis, IN 46242-0917  
Telephone: (317) 243-7979  
FAX: (317) 240-1925

**Evansville - (Branch of Louisville)**

Cummins Cumberland, Inc.  
7901 Highway 41 North  
Evansville, IN 47711  
Telephone: (812) 867-4400  
FAX: (812) 421-3282

**Ft. Wayne Branch**

Cummins Mid-States Power, Inc.  
3415 Coliseum Blvd. West  
(At Jct. I-69 & 30/33)  
Ft. Wayne, IN 46808  
Telephone: (219) 482-3691  
FAX: (219) 484-8930

**Gary - (Branch of Chicago)**

Cummins Northern Illinois, Inc.  
1440 Texas Street  
Gary, IN 46402  
Telephone: (219) 885-5591  
FAX: (219) 883-4817

**Indianapolis Branch**

Cummins Mid-States Power, Inc.  
P. O. Box 42917  
3621 West Morris Street  
Indianapolis, IN 46242-0917  
Telephone: (317) 244-7251  
FAX: (317) 240-1215

**Onan Branch**

Mid-States Power, Inc.  
4301 W. Morris Street  
P.O. Box 42917  
Indianapolis, IN 46240-0917  
Telephone: (317) 240-1967  
FAX: (317) 240-1975

## Iowa

### Cedar Rapids - (Branch of Omaha)

Cummins Great Plains Diesel, Inc.  
625 - 33rd Avenue SW  
Cedar Rapids, IA 52406  
Telephone: (319) 366-7537 (24 hours)  
FAX: (319) 366-7562

### Des Moines - (Branch of Omaha)

Cummins Great Plains Diesel, Inc.  
1680 N.E. 51st Avenue  
P.O. Box B  
Des Moines, IA 50313  
Telephone: (515) 262-9591  
Parts: (515) 262-9744  
FAX: (515) 262-0626

### Des Moines - (Branch of Omaha)

Midwestern Power Products  
Division of Cummins Great Plains Diesel, Inc.  
5194 N.E. 17th Street  
Des Moines, IA 50313  
Telephone: (515) 264-1650  
FAX: (515) 264-1651

## Kansas

### Colby - (Branch of Kansas City, Missouri)

Cummins Mid-America, LLC.  
1880 South Range  
Colby, KS 67701  
Telephone: (785) 462-3945  
FAX: (785) 462-3970

### Garden City - (Branch of Kansas City, Missouri)

Cummins Mid-America, Inc.  
1285 Acraway  
Garden City, KS 67846  
Telephone: (316) 275-2277  
FAX: (316) 275-2533

### Wichita - (Branch of Kansas City, Missouri)

Cummins Mid-America, Inc.  
5101 North Broadway  
Wichita, KS 67201  
Telephone: (316) 838-0875  
FAX: (316) 838-0704

## Kentucky

### Louisville Distributor

Cummins Cumberland, Inc.  
(Corporate Office)  
2301 Nelsonville Parkway  
Louisville, KY 40223  
Telephone: (502) 254-3363  
FAX: (502) 254-9272

### Hazard Branch

Cummins Cumberland, Inc.  
Highway 15 South  
P.O. Box 510  
Hazard, KY 41701  
Telephone: (606) 436-5718  
FAX: (606) 436-5038

## Louisville Branch

Cummins Cumberland, Inc.  
9820 Bluegrass Parkway  
Louisville, KY 40299  
Telephone: (502) 491-4263  
FAX: (502) 499-0896

## Louisiana

### Morgan City - (Branch of Memphis)

Cummins Mid-South, Inc.  
Hwy. 90 East  
P.O. Box 1229  
Amelia, LA 70340  
Telephone: (504) 631-0576  
FAX: (504) 631-0081

### New Orleans - (Branch of Memphis)

Cummins Mid-South, Inc.  
110 E. Airline Highway  
Kenner, LA 70062  
Telephone: (504) 468-3535  
FAX: (504) 465-3408

## Maine

### Bangor (Branch of Boston)

Cummins Northeast, Inc.  
221 Hammond Street  
Bangor, ME 04401  
Telephone: (207) 941-1061  
FAX: (207) 945-3170

### Scarborough - (Branch of Boston)

Cummins Northeast, Inc.  
10 Gibson Road  
Scarborough, ME 04074  
Telephone: (207) 883-8155  
FAX: (207) 883-5526

## Maryland

### Baltimore Distributor

Cummins Power Systems, Inc.  
1907 Parkwood Drive  
MD 21061  
Telephone: (410) 590-8700  
FAX: (410) 590-8723

## Massachusetts

### Boston Distributor

Cummins Northeast, Inc.  
100 Allied Drive  
Dedham, MA 02026  
Telephone: (781) 329-1750  
FAX: (781) 329-4428

### Springfield Branch

Cummins Northeast, Inc.  
177 Rocus Street  
Springfield, MA 01104  
Telephone: (413) 737-2659  
FAX: (413) 731-1082

## Mexico

### Tijuana - (Branch of Los Angeles)

Distribuidora Cummins De Baja  
Blvd. 3ra. Oeste No. 17523  
Fracc. Industrial  
Garita de Otay C.P. 22400  
Tijuana, Baja California  
Mexico  
Telephone: 011-52-66-238433  
FAX: 011-52-66-238649

## Michigan

### Detroit (Novi) Distributor

Cummins Michigan, Inc.  
41216 Vincent Court  
Novi, MI 48375  
Telephone: (248) 478-9700  
FAX: (248) 478-1570

### Blissfield, Michigan

Diesel Fuel Systems, Inc.  
Subsidiary of Cummins Michigan Inc.  
211 N. Jipson Street  
Blissfield, MI 49228  
Telephone: (517) 486-4324  
FAX: (517) 486-3614

### Dearborn Branch

Cummins Michigan, Inc.  
3760 Wyoming Avenue  
Dearborn, MI 48120  
Telephone: (313) 843-6200  
FAX: (313) 843-6070

### Grand Rapids Branch

Cummins Michigan, Inc.  
3715 Clay Avenue, S.W.  
Grand Rapids, MI 49508  
Telephone: (616) 538-2250  
FAX: (616) 538-3830

### Grand Rapids Branch

Standby Power, Inc.  
7580 Expressway Drive S.W.  
Grand Rapids, MI 49548  
Telephone: (616) 281-2211  
FAX: (616) 281-3177

### Iron Mountain - (Branch of De Pere)

Cummins Great Lakes, Inc.  
1901 Stevenson Avenue  
Iron Mountain, MI 49801  
Telephone: (906) 774-2424  
(800) 236-2424  
FAX: (906) 774-1190

### Novi Branch

Cummins Michigan, Inc.  
25100 Novi Road  
Novi, MI 48375  
Telephone: (248) 380-4300  
FAX: (248) 380-0910

### Power Products (Branch of Detroit)

Cummins Michigan, Inc.  
41326 Vincent Ct.  
Novi, MI 48375  
Telephone: (248) 426-9300  
FAX: (248) 473-8560

**Saginaw Branch**

Cummins Michigan, Inc.  
722 N. Outer Drive  
Saginaw, MI 48605  
Telephone: (517) 752-5200  
FAX: (517) 752-4194

**Standby Power - (Branch of Detroit)**

Cummins Michigan, Inc.  
12130 Dixie  
Redford, MI 48239  
Telephone: (313) 538-0200  
FAX: (313) 538-3966

**Minnesota**

**St. Paul Distributor**

Cummins North Central, Inc.  
3030 Centre Pointe Drive  
Suite 500  
Roseville, MN 55113  
Telephone: (651) 636-1000  
FAX: (651) 638-2442

**Duluth Branch**

Cummins Diesel Sales, Inc.  
3115 Truck Center Drive  
Duluth, MN 55806-1786  
Telephone: (218) 628-3641  
FAX: (218) 628-0488

**St. Paul Branch**

Cummins North Central, Inc.  
2690 Cleveland Ave. North  
St. Paul, MN 55113  
Telephone: (651) 636-1000  
FAX: (651) 638-2497

**Mississippi**

**Jackson - (Branch of Memphis)**

Cummins Mid-South, Inc.  
325 New Highway 49 South  
Jackson, MS 39288-4224  
Telephone:  
Admin.: (601) 932-7016  
Parts: (601) 932-2720  
Service: (601) 939-1800  
FAX: (601) 932-7399

**Missouri**

**Kansas City Distributor and Branch**

Cummins Mid-America, Inc.  
8201 NE Parvin Road  
Kansas City, MO 64161  
Telephone: (816) 414-8200  
FAX: (816) 414-8299

**Joplin Branch**

Cummins Mid-America, Inc.  
3507 East 20th Street  
Joplin, MO 64801  
Telephone: (417) 623-1661  
FAX: (417) 623-1817

**Springfield Branch**

Cummins Mid-America, Inc.  
3637 East Kearney  
Springfield, MO 65803  
Telephone: (417) 862-0777  
FAX: (417) 862-4429

**St. Louis Distributor**

Cummins Gateway, Inc.  
7210 Hall Street  
St. Louis, MO 63147  
Telephone: (314) 389-5400  
FAX: (314) 389-9671

**Columbia Branch**

Cummins Gateway, Inc.  
5221 Highway 763 North  
Columbia, MO 65202  
Telephone: (314) 449-3711  
FAX: (314) 449-3712

**Sikeston Branch**

Cummins Gateway, Inc.  
101 Keystone Drive  
Sikeston, MO 63801  
Telephone: (314) 472-0303  
FAX: (314) 472-0306

**Industrial Power Branch**

Cummins Gateway, Inc.  
3256 E. Outer Road  
Scott City, MO 63788  
Telephone: (573) 335-9399  
FAX: (573) 335-7062

**Montana**

**Billings - (Branch of Denver)**

Cummins Rocky Mountain, Inc.  
5151 Midland Road  
Billings, MT 59101  
Telephone: (406) 245-4194  
FAX: (406) 245-7923

**Great Falls - (Branch of Denver)**

Cummins Rocky Mountain, Inc.  
415 Vaughn Road  
Great Falls, MT 59404  
Telephone: (406) 452-8561  
FAX: (406) 452-9911

**Missoula - (Branch of Seattle)**

Cummins Northwest, Inc.  
4950 North Reserve Street  
Missoula, MT 59802-1498  
Telephone: (406) 728-1300  
FAX: (406) 728-8523

**Nebraska**

**Omaha Distributor and Branch**

Cummins Great Plains Diesel, Inc.  
5515 Center Street  
P.O. Box 6068  
Omaha, NE 68106  
Telephone: (402) 551-7678 (24 Hours)  
FAX: (402) 551-1952

**Kearney Branch**

Cummins Great Plains Diesel, Inc.  
515 Central Avenue  
Kearney, NE 68847  
Telephone: (308) 234-1994  
FAX: (308) 234-5776

**Nevada**

**Elko - (Branch of Salt Lake City)**

Cummins Intermountain, Inc.  
5370 East Idaho Street  
Elko, NV 89801  
Telephone: (775) 738-6405  
FAX: (775) 738-1719

**Las Vegas - (Branch of Salt Lake City)**

Cummins Intermountain, Inc.  
2750 Losee Road  
North Las Vegas, NV 89030  
Telephone: (702) 399-2339  
FAX: (702) 399-7457

**Sparks - (Branch of Salt Lake City)**

Cummins Intermountain, Inc.  
150 Glendale Avenue  
Sparks, NV 89431  
Telephone: (775) 331-4983  
FAX: (775) 331-7429

**New Jersey**

**Newark - (Branch of Bronx)**

Cummins Metropower, Inc.  
41-85 Doremus Ave.  
Newark, NJ 07105  
Telephone: (973) 491-0100  
FAX: (973) 578-8873

**New Mexico**

**Albuquerque - (Branch of Phoenix)**

Cummins Southwest, Inc.  
1921 Broadway N.E.  
Albuquerque, NM 87102  
Telephone: (505) 247-2441  
FAX: (505) 842-0436

**Farmington - (Branch of Phoenix)**

Cummins Southwest, Inc.  
1101 North Troy King Road  
Farmington, NM 87401  
Telephone: (505) 327-7331  
FAX: (505) 326-2948

**New York**

**Bronx Distributor**

Cummins Metropower, Inc.  
890 Zerega Avenue  
Bronx, NY 10473  
Telephone: (718) 892-2400  
FAX: (718) 892-0055

**Albany - (Branch of Boston)**

Cummins Northeast, Inc.  
101 Railroad Avenue  
Albany, NY 12205  
Telephone: (518) 459-1710  
FAX: (518) 459-7815

**Buffalo - (Branch of Boston)**

Cummins Northeast, Inc.  
480 Lawrence Bell Dr.  
Williamsville, NY 14221-7090  
Telephone: (716) 631-3211  
FAX: (716) 626-0799



**Syracuse - (Branch of Boston)**

Cummins Northeast, Inc.  
29 Eastern Avenue  
Syracuse, NY 13211  
Telephone: (315) 437-2751  
FAX: (315) 437-8141

**North Carolina**

**Charlotte Distributor**

Cummins Atlantic, Inc.  
11101 Nations Ford Road (28273)  
P.O. Box 240729  
Charlotte, NC 28224-0729  
Telephone: (704) 588-1240  
FAX: (704) 587-4870

**Charlotte Branch**

Cummins Atlantic, Inc.  
3700 North Interstate 85  
Charlotte, NC 28206  
Telephone: (704) 596-7690  
FAX: (704) 596-3038

**Greensboro Branch**

Cummins Atlantic, Inc.  
513 Preddy Boulevard (27406)  
P.O. Box 22066  
Greensboro, NC 27420-2066  
Telephone: (336) 275-4531  
FAX: (336) 275-8304

**Wilson Branch**

Cummins Atlantic, Inc.  
1514 Cargill Avenue (27893)  
P.O. Box 1177  
Wilson, NC 27894-1117  
Telephone: (252) 237-9111  
FAX: (252) 237-9132

**North Dakota**

**Fargo - (Branch of St. Paul)**

Cummins North Central, Inc.  
3801 - 34th Ave. SW  
Fargo, ND 58104  
Telephone: (701) 282-2466  
FAX: (701) 277-5399

**Grand Forks - (Branch of St. Paul)**

Cummins North Central, Inc.  
4728 Gateway Drive  
Grand Forks, ND 58201  
Telephone: (701) 775-8197  
FAX: (701) 775-4833

**Minot - (Branch of St. Paul)**

Cummins North Central, Inc.  
1501 - 20th Avenue, S.E.  
Minot, ND 58702  
Telephone: (701) 852-3585  
FAX: (701) 852-3588

**Ohio**

**Columbus Distributor and Branch**

Cummins Interstate Power, Inc.  
4000 Lyman Drive  
Hilliard (Columbus), OH 43026  
Telephone: (614) 771-1000  
FAX: (614) 771-0769

**Columbus Distributor**

Cummins Interstate Power, Inc.  
2297 Southwest Bldv., Suite K  
Grove City, OH 43123  
Telephone: (614) 771-1000  
FAX: (614) 527-2576

**Cincinnati Branch**

Cummins Interstate Power, Inc.  
10470 Evendale Drive  
Cincinnati, OH 45241  
Telephone: (513) 563-6670  
FAX: (513) 563-0594

**Cleveland Branch**

Cummins Interstate Power, Inc.  
7585 Northfield Road  
Cleveland, OH 44146  
Telephone: (440) 439-6800  
FAX: (440) 439-7390

**Strasburg Branch**

Cummins Interstate Power, Inc.  
777 South Wooster Avenue  
Strasburg, OH 44680  
Telephone: (216) 878-5511  
FAX: (216) 878-7666

**Toledo Branch**

Cummins Interstate Power, Inc.  
801 Illinois Avenue  
Maumee  
(Toledo), OH 43537  
Telephone: (419) 893-8711  
FAX: (419) 893-5362

**Youngstown Branch**

Cummins Interstate Power, Inc.  
7145 Masury Road  
Hubbard  
(Youngstown), OH 44425  
Telephone: (216) 534-1935  
FAX: (216) 534-5606

**Oklahoma**

**Oklahoma City - (Branch of Arlington)**

Cummins Southern Plains, Inc.  
5800 West Reno  
Oklahoma City, OK 73127  
Telephone: (405) 946-4481 (24 hours)  
FAX: (405) 946-3336

**Tulsa - (Branch of Arlington)**

Cummins Southern Plains, Inc.  
16525 East Skelly Drive  
Tulsa, OK 74116  
Telephone: (918) 234-3240  
FAX: (918) 234-2342

**Oregon**

**Bend - (Branch of Seattle)**

Cummins Northwest, Inc.  
3500 N. Highway 97 (97701-5729)  
P.O. Box 309  
Bend, OR 97709-0309  
Telephone: (541) 389-1900  
FAX: (541) 389-1909

**Coburg/Eugene - (Branch of Seattle)**

Cummins Northwest, Inc.  
91201 Industrial Parkway  
Coburg, OR 97401  
(Mailing Address)  
P.O. Box 10877  
Eugene, OR 97440-2887  
Telephone: (541) 687-0000  
FAX: (541) 687-1977

**Medford - (Branch of Seattle)**

Cummins Northwest, Inc.  
4045 Crater Lake Highway  
Medford, OR 97504-9796  
Telephone: (541) 779-0151  
FAX: (541) 772-2395

**Pendleton - (Branch of Seattle)**

Cummins Northwest, Inc.  
223 S.W. 23rd Street  
Pendleton, OR 97801-1810  
Telephone: (541) 276-2561  
FAX: (541) 276-2564

**Portland - (Branch of Seattle)**

Cummins Northwest, Inc.  
4711 N. Basin Avenue  
P. O. Box 2710 (97208-2710)  
Portland, OR 97217-3557  
Telephone: (503) 289-0900  
FAX: (503) 286-5938

**Pennsylvania**

**Philadelphia Distributor**

Cummins Power Systems, Inc.  
2727 Ford Road  
Bristol, PA 19007  
Telephone: (215) 785-6005 and  
(609) 563-0005  
FAX: (215) 785-4085

**Bristol Branch**

Cummins Power Systems, Inc.  
2727 Ford Road  
Bristol, PA 19007  
Telephone: (215) 785-6005 and  
(609) 563-0005  
FAX: (215) 785-4728

**Pittsburgh Branch**

Cummins Power Systems, Inc.  
3 Alpha Drive  
Pittsburgh, PA 15238-2901  
Telephone: (412) 820-8300  
FAX: (412) 820-8308

**Harrisburg Branch**

Cummins Power Systems, Inc.  
4499 Lewis Road  
Harrisburg, PA 17111-2541  
Telephone: (717) 564-1344  
FAX: (717) 558-8217

**Puerto Rico**

**Puerto Nuevo - (Branch of Tampa)**

Cummins Diesel Power, Inc.  
#31 Calle "C"  
El Matadero  
Puerto Nuevo, Puerto Rico 00920  
Telephone: (787) 793-0300  
FAX: (787) 793-1072

**South Carolina**

**Charleston - (Branch of Charlotte)**

Cummins Atlantic, Inc.  
3028 West Montague Avenue  
Charleston, SC 29418-5593  
Telephone: (843) 554-5112  
FAX: (843) 745-0745

**Charleston - (Branch of Charlotte)**

Cummins Atlantic Inc.  
231 Farmington Road  
Charleston, SC 29483  
Telephone: (843) 851-9819  
FAX: (843) 875-4338

**Columbia - (Branch of Charlotte)**

Cummins Atlantic, Inc.  
1233 Bluff Road (29201)  
P.O. Box 13543  
Columbia, SC 29201-3543  
Telephone: (803) 799-2410  
FAX: (803) 779-3427

**South Dakota**

**Sioux Falls - (Branch of Omaha)**

Cummins Great Plains Diesel, Inc.  
701 East 54th Street North  
Sioux Falls, SD 57104  
Telephone: (605) 336-1715  
FAX: (605) 336-1748

**Tennessee**

**Memphis Distributor & Distribution Center**

Cummins Mid-South, Inc.  
666 Riverside Drive  
Memphis, TN 38703  
Telephone: (901) 577-0666  
FAX: (901) 522-8758

**Chattanooga - (Branch of Atlanta)**

Cummins South, Inc.  
1509 East 26th Street  
Chattanooga, TN 37407-1095  
Telephone: (615) 629-1447  
FAX: (615) 629-1494

**Knoxville - (Branch of Louisville)**

Cummins Cumberland, Inc.  
1211 Ault Road  
Knoxville, TN 37914  
Telephone: (423) 523-0446  
FAX: (423) 523-0343

**Memphis Branch**

Cummins Mid-South, Inc.  
1784 E. Brooks Road  
Memphis, TN 38116  
Telephone:  
Sales/Admin.: (901) 345-7424  
Parts: (901) 345-1784  
Service: (901) 345-6185  
FAX: (901) 346-4735

**Nashville - (Branch of Louisville)**

Cummins Cumberland, Inc.  
706 Spence Lane  
Nashville, TN 37217  
Telephone: (615) 366-4341  
FAX: (615) 366-5693

**Texas**

**Arlington Distributor**

Cummins Southern Plains, Inc.  
600 N Watson Road  
Arlington, TX 76004-3027  
Telephone: (817) 640-6801  
FAX: (817) 640-6852

**Amarillo Branch**

Cummins Southern Plains, Inc.  
5224 Interstate 40 -  
Expressway East  
P.O. Box 31570  
Amarillo, TX 79120-1570  
Telephone: (806) 373-3793 (24 hours)  
FAX: (806) 372-8547

**Dallas Branch**

Cummins Southern Plains, Inc.  
3707 Irving Boulevard  
Dallas, TX 75247  
Telephone: (214) 631-6400 (24 hours)  
FAX: (214) 631-2322

**El Paso - (Branch of Phoenix)**

Cummins Southwest, Inc.  
14333 Gateway West  
El Paso, TX 79927  
Telephone: (915) 852-4200  
FAX: (915) 852-3295

**Fort Worth Branch**

Cummins Southern Plains, Inc.  
3250 North Freeway  
Fort Worth, TX 76111  
Telephone: (817) 624-2107 (24 hours)  
FAX: (817) 624-3296

**Houston Branch**

Cummins Southern Plains, Inc.  
4750 Homestead Road  
P.O. Box 1367  
Houston, TX 77251-1367  
Telephone: (713) 675-7421 (24 hours)  
FAX: (713) 675-1515

**Mesquite Branch**

Cummins Southern Plains, Inc.  
2615 Big Town Blvd.  
Mesquite, TX 75150  
Telephone: (214) 321-5555 (24 hours)  
FAX: (214) 328-2732

**Odessa Branch**

Cummins Southern Plains, Inc.  
1210 South Grandview  
P.O. Box 633  
Odessa, TX 79760-0633  
Telephone: (915) 332-9121 (24 hours)  
FAX: (915) 333-4655

**San Antonio Branch**

Cummins Southern Plains, Inc.  
6226 Pan Am Expressway North  
P.O. Box 18385  
San Antonio, TX 78218-0385  
Telephone: (512) 655-5420 (24 hours)  
FAX: (512) 655-3865

**Houston Onan Branch**

Southern Plains Power  
A Division of Cummins Southern Plains  
1155 West Loop North  
Houston, TX 77055  
Telephone: (713) 956-0020  
FAX: (713) 956-0266

**Utah**

**Salt Lake City Distributor**

Cummins Intermountain, Inc.  
1030 South 300 West  
Salt Lake City, UT 84101  
Telephone: (801) 355-6500  
FAX: (801) 524-1351

**Vernal Branch**

Cummins Intermountain, Inc.  
1435 East 335 South  
Vernal, UT 84078  
Telephone: (435) 789-5732  
FAX: (435) 789-2853

**Virginia**

**Cloverdale - (Branch of Charlotte)**

Cummins Atlantic, Inc.  
263 Simmons Drive  
Cloverdale, VA 24077  
Telephone: (540) 966-3169  
FAX: (540) 966-3749

**Richmond - (Branch of Charlotte)**

Cummins Atlantic, Inc.  
3900 Deepwater Terminal Road  
Richmond, VA 23234  
Telephone: (804) 232-7891  
FAX: (804) 232-7428

**Tidewater - (Branch of Charlotte)**

Cummins Atlantic, Inc.  
Atlantic Power Generation  
3729 Holland Blvd.  
Chesapeake, VA 23323  
Telephone: (757) 485-4848  
FAX: (757) 485-5085

## **Washington**

### **Seattle Distributor**

Cummins Northwest, Inc.  
811 S.W. Grady Way (98055-2944)  
P.O. Box 9811  
Renton, WA 98057-9811  
Telephone: (425) 235-3400  
FAX: (425) 235-8202

### **Chehalis Branch**

Cummins Northwest, Inc.  
926 N.W. Maryland  
Chehalis, WA 98532-0339  
Telephone: (360) 748-8841  
FAX: (360) 748-8843

### **Spokane Branch**

Cummins Northwest, Inc.  
11134 W. Westbow Blvd.  
Spokane, WA 99204  
Telephone: (509) 455-4411  
FAX: (509) 624-4681

### **Tacoma Branch**

Cummins Northwest, Inc.  
3701 Pacific Highway East  
Tacoma, WA 98424-1135  
Telephone: (253) 922-2191  
FAX: (253) 922-2379

### **Yakima Branch**

Cummins Northwest, Inc.  
1905 East Central Avenue (98901-3609)  
P.O. Box 9129  
Yakima, WA 98909-0129  
Telephone: (509) 248-9033  
FAX: (509) 248-9035

## **West Virginia**

### **Charleston - (Branch of Louisville)**

Cummins Cumberland, Inc.  
3100 MacCorkle Ave. SW  
P.O. Box 8456  
South Charleston, WV 25303  
Telephone: (304) 744-6373  
FAX: (304) 744-8605

### **Fairmont - (Branch of Louisville)**

Cummins Cumberland, Inc.  
South Fairmount Exit, I-79  
145 Middletown Road  
Fairmont, WV 26554  
Telephone: (304) 367-0196  
FAX: (304) 367-1077

## **Wisconsin**

### **DePere Distributor**

Cummins Great Lakes, Inc.  
Corporate Office  
875 Lawrence Drive  
P.O. Box 5070  
DePere, WI 54115-5070  
Telephone: (920) 337-1991  
FAX: (920) 337-9746

### **Chippewa Falls Branch**

Cummins Great Lakes, Inc.  
2030 St. Highway 53  
Chippewa Falls, WI 54729  
Telephone: (715) 720-0680  
FAX: (715) 720-0685

### **DePere Branch**

Cummins Great Lakes, Inc.  
939 Lawrence Drive  
P. O. Box 5070  
DePere, WI 54115-5070  
Telephone: (920) 336-9631  
(800) 236-1191  
FAX: (920) 336-8984

### **Milwaukee Branch**

Cummins Great Lakes, Inc.  
9401 South 13th Street  
P.O. Box D  
Oak Creek, WI 53154  
Telephone: (414) 768-7400  
(800) 472-8283  
FAX: (414) 768-9441

### **Wausau Branch**

Cummins Great Lakes, Inc.  
4703 Rib Mountain Drive  
Wausau, WI 54401  
Telephone: (715) 359-6888  
(800) 236-3744  
FAX: (715) 359-3744

## **Wyoming**

### **Gillette - (Branch of Denver)**

Cummins Rocky Mountain, Inc.  
2700 Hwy. 14 & 16 North  
P.O. Box 1207 (82717)  
Gillette, WY 82716  
Telephone: (307) 682-9611  
FAX: (307) 682-8242

### **Rock Springs - (Branch of Salt Lake City)**

Cummins Intermountain, Inc.  
2000 Foothill Blvd.  
P.O. Box 1634  
Rock Springs, WY 82901  
Telephone: (307) 362-5168  
FAX: (307) 362-5171

## **Distributors and Branches - Canada**

### **Alberta**

#### **Edmonton Distributor and Branch**

Cummins Alberta  
11751 - 181 Street  
Edmonton, AB T5S 2K5  
Telephone: (780) 455-2151  
FAX: (780) 454-9512

#### **Calgary Branch**

Cummins Alberta  
4887 - 35th Street S.E.  
Calgary, Alberta T2B 3H6, Canada  
Telephone: (403) 569-1122  
FAX: (403) 569-0027

#### **Grande Prairie**

Cummins Alberta - Grande Prairie  
RR2, Site 9, Box 22  
Sexsmith, AB CN T0H 3C0  
Telephone: (780) 568-3359  
FAX: (780) 568-2263

#### **Hinton Branch**

Cummins Alberta  
135 Veats Avenue  
Hinton, Alberta T7V 1S8, Canada  
Telephone: (780) 865-5111  
FAX: (780) 865-5714

#### **Lethbridge Branch**

Cummins Alberta  
240 - 24th Street North  
Lethbridge, Alberta T1H 3T8, Canada  
Telephone: (403) 329-6144  
FAX: (403) 320-5383

### **British Columbia**

#### **Vancouver Distributor**

Cummins British Columbia  
18452 - 96th Avenue  
Surrey, B.C., Canada  
V4N 3P8  
Telephone: (604) 882-5000  
FAX: (604) 882-5080

#### **Kamloops Branch**

Cummins British Columbia  
976 Laval Crescent  
Kamloops, B.C. Canada V2C 5P5  
Telephone: (250) 828-2388  
FAX: (250) 828-6713

#### **Prince George Branch**

Cummins British Columbia  
102- 3851- 18th Avenue  
Prince George, B.C. V2N 1B1  
Telephone: (250) 564-9111  
FAX: (250) 564-5853

#### **Sparwood Branch**

Cummins British Columbia  
731 Douglas Fir Road  
Sparwood, B.C. V0B 2G0, Canada  
Telephone: (250) 425-0522  
FAX: (250) 425-0323

#### **Tumbler Ridge Branch**

Cummins British Columbia  
Industrial Site, Box 226  
Tumbler Ridge, B.C.  
Canada VOC 2W0  
Telephone: (250) 242-4217  
FAX: (250) 242-4906

### **Manitoba**

#### **Winnipeg Distributor**

Cummins Mid-Canada Ltd.  
489 Oak Point Road  
P.O. Box 1860  
Winnipeg, MB R3C 3R1, Canada  
Telephone: (204) 632-5470  
FAX: (204) 697-0267

### **New Brunswick**

#### **Fredericton - (Branch of Montreal)**

Cummins Eastern Canada, Inc.  
R.R.#1 Doak Road  
P.O. Box 1178, Station 'A'  
Fredericton,  
New Brunswick E3B 4X2, Canada  
Telephone: (506) 451-1929  
FAX: (506) 451-1921

### **Newfoundland**

#### **St. John's - (Branch of Montreal)**

Cummins Eastern Canada, Inc.  
122 Clyde Avenue  
Donovans Industrial Park  
Mount Pearl, Newfoundland A1N 2C2  
Canada  
Telephone: (709) 747-0176  
FAX: (709) 747-2283

#### **Wabush - (Branch of Montreal)**

Cummins Eastern Canada, Inc.  
Wabush Industrial Park  
Wabush, Newfoundland A0R 1B0  
Telephone: (709) 282-3626  
FAX: (709) 282-3108

### **Nova Scotia**

#### **Halifax - (Branch of Montreal)**

Cummins Eastern Canada, Inc.  
50 Simmonds Drive  
Dartmouth, Nova Scotia B3B 1R3  
Telephone: (902) 468-7938  
FAX: (902) 468-5177  
Parts: (902) 468-6560

### **Ontario**

#### **Toronto Distributor**

Cummins Ontario, Inc.  
7175 Pacific Circle  
Mississauga, ON L5T 2A5  
Telephone: (905) 795-0050  
FAX: (905) 795-0021

#### **Kenora - (Branch of Winnipeg)**

Cummins Mid-Canada Ltd.  
Highway 17 East  
P.O. Box 8  
Kenora, Ontario P9N 3X1  
Telephone: (807) 548-1941  
FAX: (807) 548-8302

#### **Ottawa Branch**

Cummins Ontario Inc.  
3189 Swansea Crescent  
Ottawa, Ontario K1G 3W5,  
Telephone: (613) 736-1146  
FAX: (613) 736-1202

#### **Thunder Bay Branch**

Cummins Ontario Inc.  
1400 W. Walsh Street  
Thunder Bay  
Ontario P7E 4X4  
Telephone: (807) 577-7561  
FAX: (807) 577-1727

#### **Whitby Branch**

Cummins Ontario Inc.  
1311 Hopkins Street  
Whitby, Ontario L1N 2C2, Canada  
Telephone: (905) 668-6886  
FAX: (905) 668-1375

### **Quebec**

#### **Montreal Distributor**

Cummins Eastern Canada, Inc.  
7200 Trans Canada Highway  
Pointe Claire, Quebec H9R 1C2,  
Telephone: (514) 695-8410  
FAX: (514) 695-8917

#### **Montreal Branch**

Cummins Eastern Canada, Inc.  
7200 Trans Canada Highway  
Pointe Claire, Quebec H9R 1C2,  
Canada  
Telephone: (514) 695-8410  
Sales: (514) 695-4555  
Parts: (514) 694-5880  
FAX: (514) 695-8917

#### **Dorval Onan Branch**

Cummins, Eastern Canada, Inc.  
580 Lepihe  
Dorval, Quebec H9H 1G2  
Telephone: (514) 631-5000  
FAX: (514) 631-0104

#### **Quebec City Branch**

Cummins Diesel  
Branch of Cummins Americas, Inc.  
2575 Dalton Street  
Ste. Foy, Quebec G1P 3S7  
Telephone: (418) 653-6411  
FAX: (418) 653-5844

**Val D'Or Branch**

Cummins, Eastern Canada, Inc.  
1025 Rue Del  
Val D'Or, Quebec 59P 4P6  
Telephone: (819) 825-0993  
FAX: (819) 825-8488

**Saskatchewan**

**Lloydminster - (Branch of Winnipeg)**

Cummins Mid-Canada Ltd.  
4005 52nd  
Lloydminster, SK S9V 0Y9  
Telephone: (305) 825-2062  
FAX: (305) 825-6702

**Regina - (Branch of Winnipeg)**

Cummins Mid-Canada Ltd.  
110 Kress Street  
P.O. Box 98  
Regina, SK S4P 2Z5  
Telephone: (306) 721-9710  
FAX: (306) 721-2962

**Saskatoon - (Branch of Winnipeg)**

Cummins Mid-Canada, Ltd.  
3001 Faithful Avenue  
P.O. Box 7679  
Saskatoon, SK S7K 4R4, Canada  
Telephone: (306) 933-4022  
FAX: (306) 242-1722

## Distributors and Branches - Australia

### Branches:

#### Gepps Cross

Cummins Engine Company, Pty. Ltd.  
P.O. Box 108  
Blair Athol, 5084  
South Australia, Australia  
Location:  
45-49 Cavan Road  
Gepps Cross, 5094  
Telephone: (61-8) 8262-5211

#### Dosra

Cummins Engine Company, Pty. Ltd.  
P.O. Box 124  
Darra, 4076  
Queensland, Australia  
Location:  
33 Kimberley Street  
Darra, 4076, Australia  
Telephone: (61-7) 3375-3277

#### Bunbury

Cummins Engine Company, Pty. Ltd.  
P.O. Box 1751  
Bunbury, WA 6230  
Australia  
Location:  
11 Dryanda Court  
Picton, WA 6230  
Telephone: (61-8) 9725-6777  
FAX: (61-8) 9725-6444

#### Cairns

Cummins Engine Company, Pty. Ltd.  
P.O. Box 7189  
Cairns Mail Centre, 4870  
Queensland, Australia  
Location:  
Liberty Street  
Cairns, 4870  
Telephone: (61-7) 935-2999

#### Campbellfield

Cummins Engine Company, Pty. Ltd.  
Private Bag 9  
Campbellfield, 3061  
Victoria, Australia  
Location:  
1788-1800 Hume Highway  
Campbellfield, 3061  
Telephone: (613) 9357-9200

#### Dandenong

Cummins Engine Company, Pty. Ltd.  
Lot 7 Greens Road  
Dandenong, 3175  
Victoria, Australia  
Telephone: (613) 9706-8088

#### Darwin

Cummins Engine Company, Pty. Ltd.  
P.O. Box 37587  
Winnellie, 0821  
Northern Territory, Australia  
Location:  
Lot 1758 Graffin Crescent  
Winnellie, 0821  
Telephone: (61-8) 8947-0766

#### Devonport

Cummins Engine Company, Pty. Ltd.  
P.O. Box 72E  
Tasmania, Australia  
Location:  
2 Matthews Way  
Devonport, 7310  
Telephone: (61-3) 6424-8800

#### Emerald

Cummins Engine Company, Pty. Ltd.  
P.O. Box 668  
Emerald, 4720  
Queensland, Australia  
Location:  
Capricorn Highway  
Emerald, 4720  
Telephone: (61-7) 4982-4022

#### Grafton

Cummins Engine Company, Pty. Ltd.  
P.O. Box 18  
South Grafton, 2461  
New South Wales, Australia  
Location:  
18-20 Induna Street  
South Grafton, 2461  
Telephone: (61-2) 6642-3655

#### Hexham

Cummins Engine Company, Pty. Ltd.  
21 Gallegghan Street  
Hexham  
New South Wales, Australia  
Telephone: (61-2) 4964-8466  
FAX: (61-2) 4964-8616

#### Kalgoorlie

Cummins Engine Company, Pty. Ltd.  
P.O. Box 706  
Kalgoorlie, 6430  
Western Australia, Australia  
Location:  
16 Atbara Street  
Kalgoorlie, 6430  
Telephone: (61-8) 9021-2588

#### Karratha

Cummins Engine Company, Pty. Ltd.  
P.O. Box 377  
Karratha, WA 6714  
Australia  
Location:  
1490 Lambert Road  
Karratha, WA 6714  
Australia  
Telephone: (61-8) 9144-4646  
FAX: (61-8) 9143-1507

#### Laverton

Cummins Engine Company, Pty. Ltd.  
Locked Bag 1  
Laverton, Victoria 3028  
Australia  
Location:  
195 Boundary Road  
Laverton North, Victoria 3028  
Australia  
Telephone: (61-3) 9360-0800  
FAX: (61-3) 9360-0438

#### Leeton

Cummins Engine Company, Pty. Ltd.  
P.O. Box 775  
Leeton, NSW 2705  
Australia  
Location:  
29 Brady Way  
Leeton, NSW 2705  
Australia  
Telephone: (61-2) 6953-3077  
FAX: (61-2) 6953-3109

#### Mackay

Cummins Engine Company, Pty. Ltd.  
P.O. Box 842  
Mackay, 4740  
Queensland, Australia  
Location:  
4 Presto Avenue  
Mackay, 4746  
Telephone: (61-7) 4955-1222

#### Mount Gambier

Cummins Engine Company, Pty. Ltd.  
P.O. Box 2219  
Mount Gambier, 5290  
South Australia, Australia  
Location:  
2 Avey Road  
Mount Gambier, 5290  
Telephone: (61-87) 25-6422

#### Penrith

Cummins Engine Company, Pty. Ltd.  
P.O. Box 132  
Cambridge Park, 2747  
New South Wales, Australia  
Location:  
7 Andrews Road  
Penrith, 2750  
Telephone: (61-2) 4729-1313

#### Queanbeyan

Cummins Engine Company, Pty. Ltd.  
P.O. Box 527  
Queanbeyan, 2620  
New South Wales, Australia  
Location:  
15-27 Bayldon Road  
Queanbeyan, 2620  
Telephone: (61-2) 6297-3433  
FAX: (61-2) 6297-6709

**Regency Park**

Cummins Engine Company, Pty. Ltd.  
P.O. Box 2147  
Regency Park, SA 5942  
Australia  
Location:  
11 Manton Street  
Hindmarsh, SA 5942  
Australia  
Telephone: (61-8) 8346-3832  
FAX: (61-8) 8340-2045

**Swan Hill**

Cummins Engine Company, Pty. Ltd.  
P.O. Box 1264  
Swan Hill, 3585  
Victoria, Australia  
Location:  
5 McAllister Road  
Swan Hill, 3585  
Telephone: (61-3) 5032-1511

**Tamworth**

Cummins Engine Company, Pty. Ltd.  
P.O. Box 677  
Tamworth, 2320  
New South Wales, Australia  
Location:  
Lot 65 Gunnedah Road  
Tamworth, 2340  
Telephone: (61-2) 6765-5455

**Townsville**

Cummins Engine Company, Pty. Ltd.  
P.O. Box 7339  
Garbutt Business Centre, QLD4814  
Australia  
Location:  
704-710 Ingham Road  
Townsville, QLD 4814  
Telephone: (61-7) 4774-7733  
FAX: (61-7) 4774-7640

**Welshpool**

Cummins Engine Company, Pty. Ltd.  
P. O. Box 52  
Welshpool, 6986  
Western Australia, Australia  
Location:  
50 Kewdale Road  
Welshpool, 6106  
Telephone: (61-8) 9458-5911

**Wetherill Park**

Cummins Engine Company, Pty. Ltd.  
Private Bag 150  
Wetherill Park, NSW 2164  
Australia  
Location:  
492-494 Victoria Street  
Wetherill Park, NSW 2164  
Australia  
Telephone: (61-2) 9616-5300  
FAX: (61-2) 9616-5399

**Wodonga**

Cummins Engine Company, Pty. Ltd.  
P.O. Box 174  
Wodonga, 3690  
Victoria, Australia  
Location:  
9-11 McKoy Street  
Wodonga, 3690  
Telephone: (61-2) 6024-3655

**Distributors and Branches - New Zealand**

**Auckland**

Cummins Diesel Sales & Service (NZ)  
Ltd.  
Private Bag 92804  
Penrose, Auckland, New Zealand  
Location:  
440 Church Street  
Penrose  
Telephone: (64-9) 579-0085

**Branches:**

**Auckland**

Cummins Diesel Engines  
Private Bag 92804  
Penrose, Auckland, New Zealand  
Location:  
440 Church Street  
Penrose  
Telephone: (64-9) 579-0085

**Christchurch**

Cummins Diesel Engines  
P.O. Box 16-149  
Hornby, Christchurch, New Zealand  
Location:  
35 Parkhouse Road  
Sockburn, Christchurch  
Telephone: (64-3) 348-8170

**Mt. Maunganui**

Cummins Diesel Engines  
P.O. Box 4005  
Mt. Maunganui, New Zealand  
Location:  
101 Totara Street  
Mt. Maunganui  
Telephone: (64-7) 575-0545

**Palmerston North**

Cummins Diesel Engines  
P.O. Box 9024  
Palmerston North, New Zealand  
Location:  
852-860 Tremaine Avenue  
Telephone: (64-6) 356-2209



## Regional Offices - International

### North Africa Regional Office - Algiers

Cummins Corporation  
Bureau de Liaison  
38, Lotissement Benachour Abdelkader  
Cheraga  
42300 Wilaya de Tipasa  
Algeria  
Telephone: (213) 2374326

Country  
Covered: Algeria

### European Regional Office - Mechelen

Cummins Diesel N.V.  
Blarenberglaan 4  
Industriepark Noord 2  
2800 Mechelen  
Brussels  
Telephone: (32-15) 20003

Countries  
Covered: Austria Luxembourg  
Belgium Netherlands  
Czech Republic Norway  
Denmark Portugal  
Finland Slovakia  
Greece Spain  
Hungary Sweden  
Iceland Switzerland  
Israel

### Cumbrasa Regional Office - Brazil

Cummins Brasil S.A.  
Rua Jati, 266  
07180-900 Guarulhos  
Sao Paulo, Brazil  
Mailing Address:  
P.O. Box 13  
07180-900 Guarulhos  
Sao Paulo, Brazil  
Telephone: (55-11) 945-9811

Country  
Covered: Brazil

### Beijing Regional Office - China

Cummins Corporation  
China World Tower, Suite 917  
China World Trade Center  
No. 1 Jian Guo Men Wai  
Beijing 100004  
People's Republic of China  
Telephone: (86-1) 505-4209/10

Countries  
Covered: China  
Mongolia

### Bogota Regional Office - Colombia

Cummins Engine Co. de Colombia S.A.  
Carrera 11A No. 90-15 Of. 601/602  
Bogota, D.E., Colombia  
Telephone: (57-1) 610-4849  
Mailing Address:  
Apartado Aereo 90988  
Bogota D.E., Colombia

Countries  
Covered: Argentina Ecuador  
Bolivia Paraguay  
Chile Peru  
Colombia Uruguay

### Lyon Regional Office - France

Cummins Diesel Sales Corporation  
39, rue Ampere - Zone Industrielle  
69680 Chassieu  
France  
Telephone: (33) 72-22-92-72

Countries  
Covered: Algeria Martinique  
France New Caledonia  
Guadeloupe Reunion  
Guyana

### Gross-Gerau Regional Office - Germany

Cummins Diesel Deutschland GmbH  
Odenwaldstr. 23  
D-6080 Gross-Gerau  
Germany  
Telephone: (49-6152) 174-0

Countries  
Covered: Albania Poland  
Bulgaria Romania  
\*Czech Republic Southeastern  
Germany Europe  
Luxembourg Slovika

\*Marine Only

### Hong Kong Regional Office - Hong Kong

Cummins Engine H.K. Ltd.  
Unison Industrial Centre  
15th Floor, Units C & D  
27-31 Au Pui Wan Street  
P. O. Box 840 Shatin  
Fo Tan, Shatin, N.T.  
Hong Kong  
Telephone: (852) 606-5678

Country  
Covered: Hong Kong

### Pune Kirloskar Regional Office - India

Kirloskar Cummins Limited  
Kothrud  
Pune - 411 029, India  
Telephone: (91-212) 33-0240, 33-5435, 33-1105

Countries  
Covered: Bhutan  
India  
Nepal

### Milan Regional Office - Italy

Cummins Diesel Italia S.P.A.  
Piazza Locatelli 8  
Zona Industriale  
20098 San Giuliano Milanese  
Milan, Italy  
Telephone: (39-2) 982-81235/6/7

Country  
Covered: Italy

### North Asia Regional Office - Japan

Cummins Diesel Sales Corporation  
1-12-10 Shintomi  
Chuo-ku, Tokyo 104  
Japan  
Telephone: (81-3) 3555-3131/2/3/4/5

Country  
Covered: Japan

### Seoul Regional Office - Korea

Cummins Korea Ltd.  
5th Floor, Hye Sung Building  
35-26 Sam Sung Dong, Kang Nam Ku  
Seoul, South Korea  
Telephone: (82-2) 516-0431/2/3, 517-3370/1

Country  
Covered: South Korea

### Cummsa Regional Office - Mexico

Cummins, S.A. de C.V.  
Arquimedes No. 209  
Col. Polanco  
11560 Mexico, D.F.  
Mexico  
Telephone: (52-5) 254-3822/3783/3622  
Mailing/Shipping Address:  
Gonzalez de Castilla Inc.  
P.O. Box 1391  
4605 Modern Lane  
Modern Industrial Park  
Laredo, TX 78040  
Telephone: (512) 722-5207

Country  
Covered: Mexico

### Moscow Regional Office - Russia

Cummins Engine Co., Inc.  
Park Place  
Office E708  
Leninsky Prospect 113  
Russia 11798  
Telephone: (7-502) 256-5122 or 256-5123

Countries  
Covered:

Armenia	Lithuania
Azerbaijan	Moldova
Bolarus	Russia
Estonia	Tadzhikstan
Georgia	Turkmenistan
Kirghizia	Ukraine
Latvia	Uzbekistan

### South And East Asia Area Office - Singapore

Cummins Diesel Sales Corporation  
8 Tanjong Penjuru  
Jurong Industrial Estate  
Singapore 2260  
Telephone: (65) 265-0155

Countries  
Covered:

Bangladesh	Malaysia
Brunei	Mongolia
Burma/Mynamar	Philippines
Cambodia	Singapore
China	Sri Lanka
Hong Kong	Taiwan
Indonesia	Thailand
Laos	Vietnam
Macau	

### Taipei Regional Office - Taiwan

Cummins Corporation - Taiwan  
12th Floor, No. 149  
Min-Sheng E. Road  
Section 2  
Taipei, Taiwan  
R.O.C. 104  
Telephone: (886-2) 515-0891

Country  
Covered: Taiwan

### Turkey and Iran Regional Office - Turkey

Cummins Corporation  
Istanbul Office  
Buyukdere Cad.  
Beytem Han, Kat 11  
Sisli 80220  
Istanbul  
Telephone: (90-1) 246-2575/2775/2545

Countries  
Covered: Iran  
Turkey

### Middle East Regional Office - Daventry (U.K.)

Cummins Engine Company Ltd.  
Royal Oak Way South  
Daventry, Northants NN11 5NU  
England  
Telephone: (44-1327) 76000

Countries Covered:

MIDEAST		
Afghanistan	Jordan	Saudi Arabia
Bahrain	Kuwait	Sudan
Cyprus	Lebanon	Syria
Djibouti	Oman	U.A.E.
Egypt	Pakistan	Yemen
Iraq	Qatar	

### Africa Regional Office - Daventry (U.K.)

Cummins Engine Company Ltd.  
Royal Oak Way South  
Daventry, Northants NN11 5NU  
England  
Telephone: (44-1327) 76000

Countries Covered:

**NORTH/WEST AFRICA**

Benin	Gabon	Mauritania
Burkina-Paso	Gambia	Morocco
Cameroon	Ghana	Niger
Cape Verde	Guinea	Nigeria
Central African Republic	Guinea-Bissau	Sao Tome & Principe
Chad	Liberia	Senegal
Cote d'Ivoire	Libya	Siera Leone
Equatorial Guinea	Mali	Togo
	Malta	Tunisia

**SOUTH AFRICA**

Botswana	Namibia	Swaziland
Lesotho	South Africa	

### New Malden Regional Office - U.K.

Cummins Engine Company Limited  
46-50 Coombe Road  
New Malden  
Surrey KT3 4QL  
England  
Telephone: (44-81) 949-6171

Countries

Covered: Ireland  
United Kingdom

### Latin America Regional Office - Miramar (U.S.A.)

Cummins Americas, Inc.  
Miramar Park of Commerce  
3450 Executive Way  
Miramar, FL 33025  
Telephone: (305) 431-5511

Countries

Covered:	Argentina	Guatemala
	Bolivia	Honduras
	Chile	Nicaragua
	Colombia	Panama
	Costa Rica	Paraguay
	Dominican Republic	Peru
	El Salvador	Uruguay
	Ecuador	Venezuela

### Caracas Regional Office - Venezuela

Cummins Engine Company  
Oficina de Delegado  
Torre La Primera, Oficina 5-D  
Av. Francisco de Miranda  
Chacao, Caracas 1060

Mailing Address:

Cummins Engine Company M-227  
c/o Jet Cargo International  
P.O. Box 020010  
Miami, FL 33102-0010 U.S.A.  
Telephone: (58-2) 32-0563, 32-718

Counties

Covered:	Costa Rica	Honduras
	Dominican Republic	Nicaragua
	El Salvador	Panama
	Guatemala	Venezuela

### East/Southern Africa Regional Office - Harare, Zimbabwe

Cummins Zimbabwe (Private) Limited  
72 Birmingham Road  
Southerton  
Harare, Zimbabwe

Mailing Address:

P.O. Box ST363  
Southerton  
Harare, Zimbabwe  
Telephone: (263-4) 67645, 60553, 69220

Countries

Covered:	Angola	Reunion
	Burundi	Rwanda
	Comoros Island	Seychelles
	Congo	Somalia
	Ethiopia	Tanzania
	Kenya	Uganda
	Madagascar	Zaire
	Malawi	Zambia
	Mauritius	Zimbabwe
	Mozambique	

## Distributors - International

### ABU DHABI

- See United Arab Emirates

### AFGHANISTAN

- See Middle East Regional Office

### ALBANIA

- See Germany Regional Office -  
Gross-Gerau

### ALGERIA

#### Algiers

Cummins Corporation  
Bureau de Liaison  
38, Lotissement Benachour Abdelkader  
Cheraga  
43200 Wilaya de Tipasa  
Algeria  
Telephone: (213) 237-43-26

### AMERICAN SAMOA

- See South Pacific Regional Office

### ANDORRA

- See European Regional Office -  
Mechelen

### ANTIGUA

Miami (Office In U.S.A.)  
Cummins Southeastern Power, Inc.  
9900 N.W. 77 Court  
Hialeah Gardens, FL 33016  
Telephone: (305) 821-4200

### ARGENTINA

#### Buenos Aires

Distribuidora Cummins, S.A.  
(DICUMAR)  
Av. Del Libertador 602 Piso 5  
Buenos Aires, Argentina  
Telephone: (54-1)814-1895/1395/1393

### ARUBA, ISLAND OF

- See Netherlands Antilles

### AUSTRIA

#### Neudoerfl

Cummins Diesel Motorenvertriebsges  
m.b.H. Trenner & Co.  
Bickfordstr. 25  
A-7201 Neudoerfl  
Austria  
Telephone: (43-2622) 77418/77625

### BAHAMAS

#### Miami (Office in U.S.A.)

Cummins Southeastern Power, Inc.  
9900 N.W. 77 Court  
Hialeah Gardens, FL 33016  
Telephone: (305) 821-4200

### BAHRAIN

#### Bahrain

Yusuf Bin Ahmed Kanoo W.L.L.  
P.O. Box 45, Manama  
Bahrain  
Telephone: (973) 400414/400506

### BALEARIC ISLANDS

#### Madrid (Office in Spain)

Cummins Ventas y Servicio, S.A.  
Torrelaguna, 56  
28027 Madrid, Spain  
Telephone: (34-91) 367-2000  
376-2404

### BANGLADESH

#### Dhaka

Equipment & Engineering Co., Ltd.  
G.P.O. Box 2339  
Dhaka 1000, Bangladesh  
Location:  
56, Dilkusha Commercial Area  
2nd Floor/Eastern Block  
Telephone: (880-2) 234357, 234060

### BARBADOS

#### Miami (Office in U.S.A.)

Cummins Southeastern Power, Inc.  
9900 N.W. 77 Court  
Hialeah Gardens, FL 33016  
Telephone: (305) 821-4200

### BELGIUM

#### Brussels

Cummins Distributor  
Belgium S.A.  
623/629 Chaussee de Haecht  
B-1030 Brussels, Belgium  
Telephone: (24 hr.)  
(32-2) 216-81-10

### BELIZE

#### Tampa (Office in U.S.A.)

Cummins Southeastern Power, Inc.  
5421 N. 59th Street  
Tampa, FL 33610  
Telephone: (813) 621-7202

### BENIN

- See Togo

### BERMUDA

#### Bronx (Office in U.S.A.)

Cummins Metropower, Inc.  
890 Zerega Avenue  
Bronx, NY 10473  
Telephone: (718) 892-2400

### BHUTAN

#### Pune (Office in India)

Cummins Diesel Sales &  
Service (India) Ltd.  
35A/1/2, Erandawana  
Pune - 411 038, India  
(State of Maharashtra) India  
Telephone: (91-212) 331234/331554/  
331635/330066/  
330166/330356/  
31703

### BOLIVIA

#### La Paz

Machinery & Auto Service  
Casilla 4042  
La Paz, Bolivia  
Location:  
Av. 20 de Octubre Esq.  
Rosendo Gutierrez  
Telephone: (591-2) 379650, 366394

### BONAIRE, ISLAND OF

- See Netherlands Antilles

### BOTSWANA

- See East and Southern Africa Re-  
gional Office - Harare

### BRAZIL

#### Ananindeua

Marcos Marcelino & Companhia  
Ltda.  
Rodovia BR-316, Km 9  
67020-010 Ananindeua, Para,  
Brazil  
Telephone: (55-91) 235-4100/4132/  
4143/4012

#### Belo Horizonte

Distribuidora Cummins  
Minas S.A.  
31950-640 Olhos D'Agua Norte  
Belo Horizonte, MG  
Brazil  
Telephone: (55-31) 288-1344

#### Campo Grande

Distribuidora Cummins  
Mato Grosso Ltda.  
Rodovia BR 163 Km 01  
79060-000 Campo Grande  
Mato Grosso do Sul, Brazil  
Telephone: (55-67) 787-1166

#### Curitiba

Distribuidora Cummins Parana S.A.  
Rua Brasilio Itibere, 2195  
80230 Curitiba, Parana  
Brazil  
Telephone: (55-41) 222-4036

### **Fortaleza**

Distribuidora Cummins Diesel  
Do Nordeste Ltda.  
Av. da Abolicao, 3882,  
Mucuripe  
60165-081 Fortaleza, Ceara  
Brazil  
Telephone: (55-85) 263-1212

### **Goianian**

Distribuidora de Motores Cummins  
Centro Oeste Ltda.  
Av. Caiapo 777 - Setor Sta. Genoveva  
74672-400 Goiania, Goias  
Brazil  
Telephone: (55-62) 207-1010

### **Manaus**

Distribuidora Cummins  
Amazonas Ltda.  
Estrada da Ponta Negra, 6080 - Sao  
Jorge  
69037 Manaus, Amazonas,  
Brazil  
Telephone: (55-92) 656-5444

### **Porto Alegre**

Distribuidora Cummins  
Meridional S.A.  
Rua Dona Alzira, 98, Sarandi  
91110-010 Porto Alegre,  
Rio Grande do Sul, Brazil  
Telephone: (55-51) 340-8222

### **Rio de Janeiro**

Distribuidora Cummins  
Leste Ltda.  
Rua Sariema, 138-Olaria  
21030-550 Rio de Janeiro,  
Rio de Janeiro, Brazil  
Telephone: (55-21) 290-7899

### **Sao Paulo**

Companhia Distribuidora  
de Motores Cummins  
Rua Martin Burchard, 291 - Bras  
03043-020 Sao Paulo,  
Sao Paulo, Brazil  
Telephone: (55-11) 270-2311

### **BRITISH VIRGIN ISLANDS**

- See Puerto Rico

### **BRUNEI**

- See Malaysia

### **BURKINA - FASO**

- See North/West Africa Regional  
Office - Daventry

### **BULGARIA**

- See Germany Regional Office - Gross-  
Gerau

## **BURMA**

### **Kuala Lumpur (Office In Malaysia)**

Contact: Scott &  
English (M) Sdn Bhd  
P.O. Box 10324  
50710 Kuala Lumpur  
West Malaysia  
Location:  
16 Jalan Chan Sow Lin  
55200 Kuala Lumpur  
West Malaysia  
Telephone: (60-3) 2211033

## **BURUNDI**

### **Brussels (Office in Belgium)**

Bia, S.A.  
Rameistraat, 123  
B-3090 - Overijse, Belgium  
Telephone: (32-2) 6892811

## **CAMBODIA**

- See South & East Asia Regional Office  
- Singapore

## **CANARY ISLANDS**

### **Madrid (Office in Spain)**

Cummins Ventas y  
Servicio, S.A.  
Torrelaguna, 56  
28027 Madrid, Spain  
Telephone: (34-91) 3672000/3672404

## **CAPE VERDE**

- See North/West Africa Regional Office  
- Daventry

## **CENTRAL AFRICAN REPUBLIC**

- See North/West Africa Regional Office  
- Daventry

## **CEYLON**

- See Sri Lanka

## **CHAD**

- See North/West Africa Regional Office  
- Daventry

## **CHILE**

### **Santiago**

Distribuidora Cummins Diesel  
S.A.C.I.  
Casilla Postal 1230  
Calle Bulnes 1203  
Santiago, Chile  
Corporate Office:  
Av. Providencia 2653, Office 1901  
Santiago, Chile  
Telephone: (56-2) 698-2113/4/5,  
697-3566/7/8,  
697-2709

## **CHINA, PEOPLE'S REPUBLIC**

- See China Regional Office - Beijing

## **COLOMBIA**

### **Barranquilla**

Cummins de Colombia S.A.  
Apartado Aereo 5347  
Barranquilla, Colombia  
Location: Calle 30, No. 19 - 21  
Telephone: (57-58) 40-02-06/40-13-46

### **Bogota**

Cummins Colombiana Ltda.  
Apartado Aereo No. 7431  
Bogota, D.E. Colombia  
Location:  
Av. Americas X Carrera  
42C No. 19-45  
Telephone: (57-1) 244-5688/5882

### **Bucaramanga**

Cummins API, Ltda.  
Apartado Aereo 352  
Bucaramanga, Colombia  
Location:  
Autopista a Giron, Km 7  
Telephone: (57-76) 468060

### **Cali**

Distribuidora Cummins del Valle, Ltda.  
Apartado Aereo No. 6398  
Cali, Colombia  
Location:  
Av. 3a. # 39-35 - Vipasa  
Telephone: (57-3) 65-4343

### **Medellin**

Equipos Tecnicos Ltda.  
Apartado Aereo No. 2046  
Medellin, Colombia  
Location: Carrera 52 No. 10-184  
Telephone: (57-4) 255-4200

### **Pereira**

Equipos Tecnicos Ltda. C.Q.R.  
Apartado Aereo No. 1240  
Pereira, Colombia  
Location: Carrera 8a. No. 45-39  
Telephone: (57-63) 366341

## **COMOROS**

- See East and Southern Africa Re-  
gional Office - Harare

## **CONGO, PEOPLE'S REPUBLIC**

### **Brussels (Office in Belgium)**

Bia, S.A.  
Rameistraat, 123  
B-3090  
Overijse, Belgium  
Telephone: (32-2) 6892811

## **CORSICA**

- See France

## **COSTA RICA**

### **San Jose**

Servicios Unidos, S.A.  
P.O. Box 559  
San Jose, Costa Rica  
Location:  
100 metros al este de  
Excelsior Antiguo  
Curridabat, San Jose  
Telephone Office: (506) 53-93-93  
Telephone Service Shop:  
(506) 26-00-76

## **CUBA**

### **Miami (Office in U.S.A.)**

Cummins Southeastern Power, Inc.  
9900 N.W. 77 Court  
Hialeah Gardens, FL 33016  
Telephone: (305) 821-4200

## **CYPRUS**

### **Nicosia**

Alexander Dimitriou & Sons Ltd.  
P.O. Box 1932  
Nicosia, Cyprus  
Location:  
4 Salamis Avenue  
Telephone: (357-2) 349450

## **CZECH REPUBLIC**

- See European Regional Office -  
Mechelen

## **DENMARK**

### **Glostrup**

Preben Lange Industrimaskiner A/S  
Post Box 166  
2605 Broendby, Denmark  
Location:  
Midtager 22  
Telephone: (45-43) 96-21-61

## **DJIBOUTI**

- See Middle East Regional Office -  
Daventry

## **DOMINICA**

### **Miami (Office in U.S.A.)**

Cummins Southeastern Power, Inc.  
9900 N.W. 77 Court  
Hialeah Gardens, FL 33016  
Telephone: (305) 821-4200

## **DOMINICAN REPUBLIC**

### **Santo Domingo**

Argico C. Por A.  
P.O. Box 292-2 Feria  
Santo Domingo  
Dominican Republic, ZP-6  
Location:  
Calle Jose A. Soler  
No. 3, ESQ.  
Avenida Lope de Vega  
Telephone: (809) 562-6281

## **DUBAI**

- See United Arab Emirates

## **ECUADOR**

### **Guayaquil**

Motores Cummins (MOTCUM) S.A.  
P.O. Box 1062  
Guayaquil, Ecuador  
Location:  
Avenida Carlos Julio  
Arosemena Km. 4  
Telephone: (593-4) 203995/201177

### **Quito**

Rectificadora Botar S.A.  
P.O. Box 17-01-3344  
Quito, Ecuador  
Location:  
Av. 10 de Agosto No. 5980  
Telephone: (593-2) 465-176/177/  
178/195/197

## **EGYPT**

### **Cairo**

ADAT  
P.O. Box 1572  
Cairo, Egypt  
Sales and Service Location:  
25, Pyramid Road  
Giza, Cairo, Egypt  
Telephone: (20-2) 384-6607/384-6609  
385-4001/2/4/5/6/8/9

## **EL SALVADOR**

### **San Salvador**

Salvador Machinery  
Company, S.A. de C.V.  
P.O. Box 125  
San Salvador, El Salvador  
Location:  
Blvd. Ejercito Nacional  
Telephone: (503) 711022, 228388

## **ENGLAND**

- See United Kingdom

## **EQUATORIAL GUINEA**

- See North/West Africa Regional Office  
- Daventry

## **ESTONIA**

- See Moscow Regional Office - Moscow

## **FAROE ISLANDS**

### **Wellingborough (Office in United Kingdom)**

Cummins Diesel  
Denington Industrial Estate  
Wellingborough  
Northants NN8 2QH,  
England  
Telephone: (44-933) 276231

## **FERNANDO PO**

- See Spain

## **FIJI**

- See Cummins Diesel Sales & Service  
New Zealand Ltd.

## **FINLAND**

### **Helsinki**

Machinery OY  
P.O. Box 56  
SF 00511 Helsinki, Finland  
Location:  
Teollisuuskatu 29  
Telephone: Int: (358-9) 77221

## **FRANCE**

### **Lyon**

Cummins Diesel  
Sales Corporation  
39, rue Ampere Z.I.  
69680 Chassieu, France  
Telephone: (33) 72-22-92-72  
Parts and Service Telephone:  
(33) 72-22-92-69

## **GABON**

- See North/West Africa Regional Office  
- Daventry

## **GAMBIA**

Senegal (Matforce)

## **GEORGIA**

- See Moscow Regional Office - Moscow

## **GERMANY**

### **Gross-Gerau**

Cummins Diesel Deutschland GmbH  
P.O. Box 1134  
D-6080 Gross-Gerau,  
Germany  
Location: Odenwaldstr. 23  
Telephone: (49-6152) 174-0

## **GHANA**

### **Accra**

Leyland DAF (Ghana) Ltd.  
P.O. Box 2969  
Accra, Ghana  
Location:  
39/40 Ring Road South  
Industrial Estate  
Telephone: (233-21) 22-88-06

## **GREECE**

### **Athens**

Eliopoulos Brothers Ltd.  
P.O.B. 51528  
14 Km. National Rd.  
Athens-Lamia  
14510 Kifissia, Greece  
Telephone: (30-1) 6202401/6202066/  
6201955

## **GREENLAND**

- See Denmark

## GRENADA

### Miami (Office in U.S.A.)

Cummins Southeastern Power, Inc.  
9900 N.W. 77 Court  
Hialeah Gardens, FL 33016  
Telephone: (305) 821-4200

## GUADELOUPE

### Miami (Office in U.S.A.)

Cummins Southeastern Power, Inc.  
9900 N.W. 77 Court  
Hialeah Gardens, FL 33016  
Telephone: (305) 821-4200

## GUAM

### Barrigada

Mid-Pac Far East, Inc.  
Airport Industrial Park  
825 Tiyan Parkway  
Barrigada, Guam 96921  
Telephone: (671) 632-5160

## GUATEMALA

### Guatemala City

Maquinaria y Equipos, S.A.  
P.O. Box 2304  
Guatemala City, Guatemala  
Location:  
Carretera Amatitlan  
Km 12 zona 12  
Telephone: (502-2) 773334/7/9

## GUINEA BISSAU

- See North/West Africa Regional Office  
- Daventry

## GUYANA

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## HAITI

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Hialeah Gardens, FL 33016  
Telephone: (305) 821-4200

## HOLLAND

- See Netherlands

## HONDURAS

### Tegucigalpa

Comercial Laeisz  
Honduras, S.A.  
P.O. Box 1022  
Tegucigalpa, D.C., Honduras  
Location:  
Zona La Burrera,  
Blvd. Toncontin  
Frente a Gasolinera Esso.  
Telephone: (504) 333570/335615

## HONG KONG

### Kowloon

Cummins Engine H. K. Ltd.  
P.O. Box 840 Shatin  
N.T., Hong Kong  
Location:  
Unison Industrial Centre  
15th Floor, Units C & D  
27-31 Au Pui Wan Street  
Fo Tan, Shatin, Hong Kong  
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## INDIA

### Pune

Cummins Diesel Sales &  
Service (India) Ltd.  
35A/1/2, Erandawana  
Pune - 411 038, (State of Maharashtra)  
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331635, 330066,  
330166, 330356,  
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### Bombay

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Service (I) Ltd.  
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Bombay 400001, India  
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### Calcutta

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Telephone: (91-33) 2478065/2470481/  
2470774

### New Delhi

Cummins Diesel Sales &  
Service (I) Ltd.  
Flat No. 307, Meghdoot Building  
94 Nehru Place  
New Delhi 110 019, India  
Telephone: (91-11) 6431051/6445756/  
6452817

## Raipur

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Service (I) Ltd.  
Plot No. 15, Jalashay Marg  
Choube Colony  
Raipur 492 001 (Madhya Pradesh),  
India  
Telephone: (91-771) 24994/23157/29498

## Ranchi

Cummins Diesel Sales &  
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'Shanti Kunj' C-202, Vidyalaya Marg  
Road No. 1, Ashoknagar  
Ranchi 834 002 (Bihar)  
India  
Telephone: (91-651) 301948/303623

## INDONESIA

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Jakarta Selatan 12330, Indonesia  
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Telephone: (62-21) 736-1978/736-3302

## IRAN

### Tehran

Technical Service Development  
Company  
P.O. Box 13445/741  
No. 152 Sohravardi Crossing  
Dr. Beheshti Avenue  
Tehran, Iran  
Telephone:  
Head Office: (98-21) 846666, 851021-7  
Work Shop: (98-21) 995021-2/993240

## IRAQ

- See Middle East Regional Office -  
Daventry

## IRELAND

### Wellingborough (Office in England)

Cummins Diesel  
Denington Estate  
Wellingborough  
Northants NN8 2QH, England  
Telephone: (44-933) 276231

## ISRAEL

### Tel Aviv

Israel Engines &  
Trailers Co. Ltd.  
Levinson Brothers Engineers  
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33 Hahashmal Street  
Tel Aviv, Israel 61003  
Telephone: (972-3) 5607671

## **ITALY**

### **Milan**

Cummins Diesel Italia S.p.A.  
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Zona Industriale Sesto Ulteriano  
20098 S. Giuliano  
Milanese (Milan), Italy  
Telephone: (39-2) 9828-1235/6/7

## **IVORY COAST**

- See Cote d' Ivoire

## **JAMAICA**

### **Miami (Office in U.S.A.)**

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## **JAPAN**

### **Tokyo**

Cummins Diesel (Japan) Ltd.  
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## **JORDAN**

### **Amman**

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Amman, Jordan  
Telephone: (962-6) 621867/621884

## **KENYA**

### **Nairobi**

Werrot & Company Limited  
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Nairobi, Kenya  
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Lusaka Road  
Telephone: (254-150) 20316

## **KOREA, SOUTH**

### **Seoul**

Hwa Chang Trading Co., Ltd.  
Central P.O. Box No. 216  
Seoul, South Korea  
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143-11 Doksan-dong, Kuro-ku  
Telephone: (82-2) 854-0071/2/3/4/5,  
869-1411/2/3

## **KUWAIT**

### **Kuwait**

General Transportation &  
Equipment Co.  
(Sales Department)  
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13011 Safat, Kuwait  
Location:  
Shuwaikh Behind  
Canada Dry Factory  
Telephone: (965) 4833380/1/2

## **Kuwait**

General Transportation &  
Equipment Co.  
(Service Department)  
East Ahmadi Area  
13011 Safat, Kuwait  
Telephone: (965) 3981577

## **LAOS**

- See South and East Asia Regional Office - Singapore

## **LATVIA**

- See Moscow Regional Office - Moscow

## **LEBANON**

### **Beirut**

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B.P. 16-6726  
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Location:  
Corniche du Fleuve  
Telephone: (961-1) 425040/41

## **LESOTHO**

- See South Africa

## **LIBYA**

- See North/West Africa Regional Office  
- Davenport

## **LIECHTENSTEIN**

- See Switzerland

## **LUXEMBOURG**

### **Gross-Gerau (Office in Germany)**

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## **MACAU**

- See Hong Kong

## **MADAGASCAR**

- See East and Southern Africa Regional Office - Harare

## **MADEIRA ISLANDS**

- See Portugal

## **MALAYSIA**

### **Kuala Lumpur**

Cummins Diesel Sales & Service  
Div. of Scott & English  
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50710 Kuala Lumpur, West Malaysia  
Location:  
16 Jalan Chan Sow Lin  
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## **MALI**

- See Senegal (Matforce)

## **MALTA**

### **Valletta**

Plant & Equipment Ltd.  
Regency House  
254, Republic Street  
Valletta, Malta  
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23-16-23, 24-75-17

## **MARTINIQUE**

### **Miami (Office in U.S.A.)**

Cummins Southeastern Power, Inc.  
9900 N.W. 77 Court  
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## **MEXICO**

### **Guadalajara**

Cummins Del Occidente, S.A.  
Lazaro Cardenas No. 2950  
Fracc. Alamo Industrial  
45560 Guadalajara, Jal. Mexico  
Telephone: (52-3) 670-93-06, 670-53-38,  
670-63-61, 670-62-33

### **Monterrey**

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### **Merida**

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Esquina Calle 100  
Col. Sambula  
97259 Merida, Yucatan, Mexico  
Telephone: (52-99) 24-11-55, 24-00-15

### **Puebla**

Cummins de Oriente, S.A. de C.V.  
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Puebla, Pue. Mexico  
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### **Queretaro**

Distribuidor Cummins Del Centro, S.A.  
de C.V.  
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Telephone: (52-42) 12-41-90, 12-58-90,  
12-62-94, 14-04-16,  
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### **Tlalnepantla**

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Sor Juana Ines de la Cruz No. 555  
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390-12-27



## MOROCCO

### Casablanca

Societe Auto-Hall, S.A.  
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31-90-56, 31-70-44

## MOZAMBIQUE

- See East and Southern Africa Regional Office - Harare

## NAMIBIA (Southwest Africa)

### Windhoek

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7 Nasmyth Street  
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## NEPAL

### Pune (Office in India)

Cummins Diesel Sales &  
Service (India) Ltd.  
35A/1/2, Erandawana  
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331635, 330066,  
330166, 330356,  
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## NETHERLANDS

### Dordrecht

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Service, b.v.  
Galvanistraat 35  
3316 GH Dordrecht  
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## NEW CALEDONIA

- See South Pacific Regional Office - Melbourne

## NEW GUINEA

- See Papua New Guinea

## NICARAGUA

### Managua

F. Alf. Pellas & Cia.  
Apartado Postal No. 46  
Managua, Nicaragua  
Location:  
6a. Calle  
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Telephone: (505-2) 660616

## NIGERIA

### Lagos

SCOATRAC MOSEL  
P.M.B. 21108  
Ikeja, Lagos  
Nigeria  
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### Paris (Office in France)

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## NORTHERN IRELAND

- See United Kingdom

## NORWAY

### Oslo

Cummins Diesel Saig & Service A/S  
P.O. 6288  
Etterstad 0603, Oslo 6  
Norway  
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Telephone: (47) 22326110

## OMAN

### Ruwi

Universal Engineering  
Services L.L.C.  
P.O. Box 5688  
Ruwi  
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## PAKISTAN

### Karachi

- See Middle East Regional Office - Daventry

## PANAMA

### Panama City

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Apartado Postal #55-0549  
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## PAPUA NEW GUINEA

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Cummins Diesel Sales & Service  
P.O. Box 150  
Cabramatta, 2166  
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## PARAGUAY

### Asuncion

Automotores y Maquinaria,  
S.R.L.  
Yegros y Fulgencio R. Moreno  
P.O. Box 1160  
Asuncion, Paraguay  
Telephone: (595-21) 493111, 493115

## PERU

### Lima

Comercial Diesel  
del Peru S.A.  
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3144/2281

## PHILIPPINES

### EDSA

Power Systems, Inc. EDSA  
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Philippines 1501  
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Mandaluyong, Metro Manila  
Telephone: (63-2) 791769, 791771,  
5311945, 5315448,  
5311934, 5312531,  
53414513

## POLAND

- See Germany Regional Office - Gross-Gerau

## PORTUGAL

### Lisbon

Electro Central  
Vulcanizadora, Lda.  
P.O. Box 3077  
1302 Lisbon, Portugal  
Location:  
Rua Conselheiro  
Martins de Carvalho  
Lote 1480  
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Telephone: (351-1) 3015361

## QATAR

### Doha

Jaidah Motors & Trading Co.  
P.O. Box 150  
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Telephone: (974) 810000

## REUNION

- See Lyon Regional Office - Lyon

## RIO DE ORO

- See Spain

**ROMANIA**

- See Germany Regional Office - Gross-Gerau

**RUSSIA**

- See Moscow Regional Office - Moscow

**RWANDA**

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**SAN MARINO**

- See Italy

**SAO TOME AND PRINCIPE**

- See North/West Africa Regional Office  
- Daventry

**SAUDI ARABIA**

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General Contracting Company  
P.O. Box 5111  
Dammam 31422, Saudi Arabia  
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**SCOTLAND**

- See United Kingdom

**SENEGAL**

**Dakar**

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**SEYCHELLES**

- See East/Southern Africa Regional Office - Harare

**SIERRA LEONE**

- See North/West Africa Regional Office  
- Daventry

**SINGAPORE**

**Singapore**

Applied Diesel Sales & Service Pte Ltd  
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**SLOVAKIA**

- See European Regional Office - Mechelen

**SOLOMON ISLANDS**

- See South Pacific Regional Office - Melbourne

**SOMALIA**

- See East and Southern Africa Regional Office - Harare

**SOUTH AFRICA**

**Johannesburg**

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South Africa  
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Kelvin 2054  
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**SOUTHWEST AFRICA**

- See Namibia

**SPAIN**

**Madrid**

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**SPANISH GUINEA**

- See Spain

**SRI LANKA**

**Colombo**

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575005

**SUDAN**

**Khartoum**

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70306

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**SWAZILAND**

- See South Africa

**SWEDEN**

**Stockholm**

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**SWITZERLAND**

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8105 Regensdorf  
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**SYRIA**

**Damascus**

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Damascus, Syria  
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Abou Baker El Saddik Street  
Kafar Sousse Square  
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**TAHITI, ISLAND OF**

- See French Polynesia

**TAIWAN**

**Taipei**

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**TANZANIA**

**Dar es Salaam**

Riddoch Motors 1987 Ltd  
P.O. Box 40040  
Dar es Salaam  
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Telephone: (255-51) 44493, 41140

**THAILAND**

**Bangkok**

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## **TOGO (and BENIN)**

### **Lome**

Togomat  
B.P. 1641  
Lome, Togo  
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## **TONGA, ISLAND OF**

- See South Pacific Regional Office -  
Melbourne

## **TRINIDAD and TOBAGO**

### **Miami (Office in U.S.A.)**

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## **TURKEY**

### **Istanbul**

Hamamcioglu Muesseseleri  
Ticaret T.A.S.  
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Istanbul, Turkey  
Location:  
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80260 Sisli  
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Telephone: (90-1) 231-3406, 234-5123

## **UKRAINA**

- See Moscow Regional Office - Moscow

## **UNITED ARAB EMIRATES**

### **Abu Dhabi**

Technical Oilfield Supplies Centre  
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## **UNITED KINGDOM**

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## **UPPER VOLTA**

- See Burkina - Faso

## **URUGUAY**

### **Montevideo**

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## **U.S.S.R.**

- See Moscow Regional Office - Moscow

## **VATICAN CITY**

- See Italy

## **VENEZUELA**

### **Caracas**

Sudimat  
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Carmelitas  
Caracas 1010  
Venezuela  
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Final Avenida San Martin  
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Caracas 1061  
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## **VIETNAM**

### **Hanoi**

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### **Ho Chi Minh City**

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## **WESTERN SAMOA**

- See South Pacific Regional Office -  
Melbourne

## **YEMEN ARAB REPUBLIC**

### **Sana'a**

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Sana'a, Yemen Arab Republic  
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## **YEMEN, SOUTH**

- See Middle East Regional Office -  
Daventry

## **YUGOSLAVIA**

- See Southeastern Europe

## **ZAIRE**

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## **ZAMBIA**

### **Ndola**

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## **ZIMBABWE**

### **Harare**

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## Section TS - Troubleshooting Symptoms

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## Troubleshooting Procedures and Techniques

### General Information

This guide describes some typical engine operating problems, their causes, and some acceptable corrections to those problems. Unless noted otherwise, the problems listed are those which an operator can diagnose and repair.

#### **WARNING**

**Performing troubleshooting procedures NOT outlined in this section can result in equipment damage or personal injury or death. Troubleshooting must be performed by trained, experienced technicians. Consult a Cummins Authorized Repair Location for diagnosis and repair beyond that which is outlined, and for symptoms not listed in this section. Before beginning any troubleshooting, refer to General Safety Instructions in Section i of this manual.**

Follow the suggestions below for troubleshooting:

- Study the complaint thoroughly before acting
- Refer to the engine system diagrams
- Do the easiest and most logical things first
- Find and correct the cause of the complaint

## Troubleshooting Symptoms Charts

### General Information

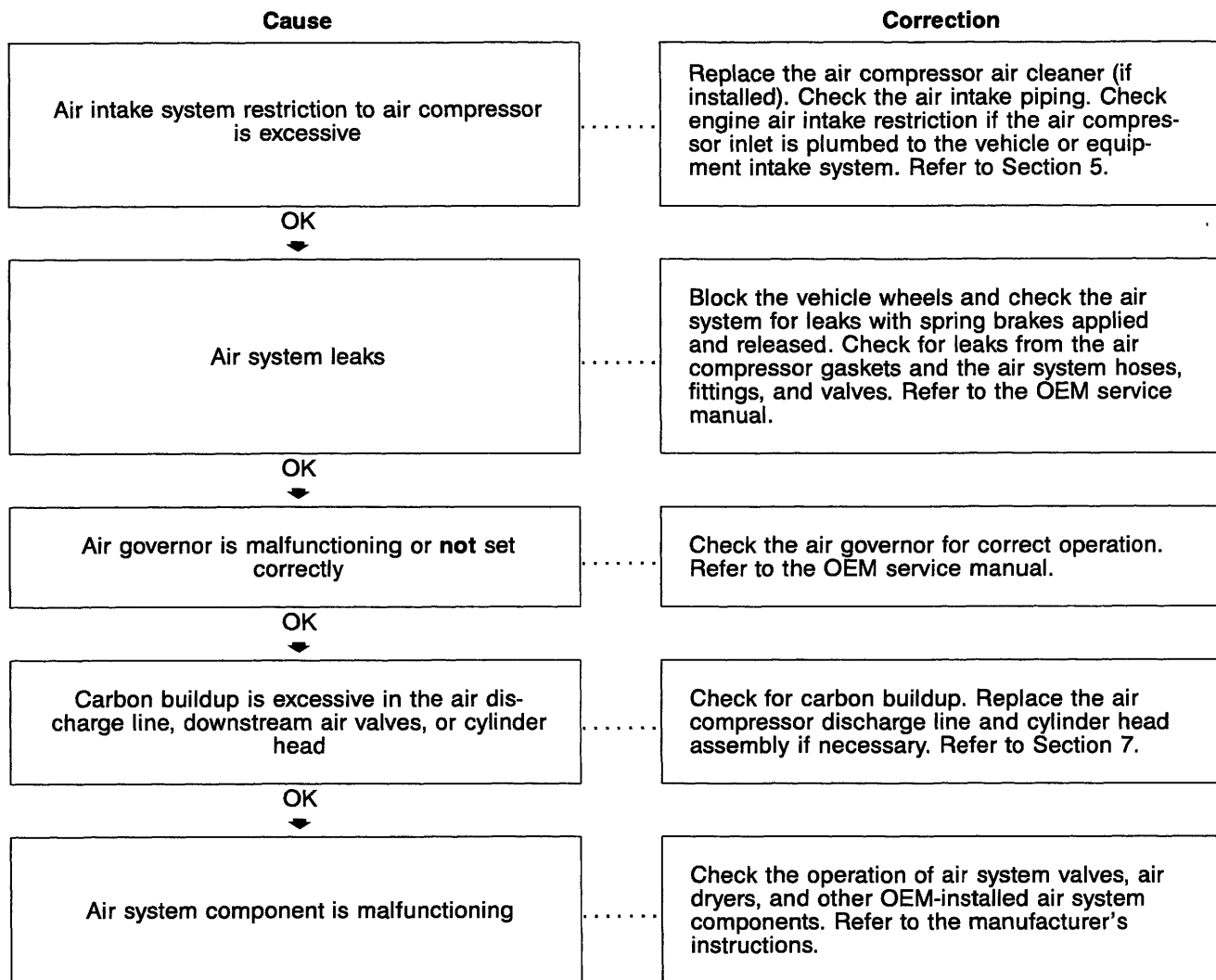
Use the following charts to aid in diagnosing specific engine symptoms. Read each row of blocks from top to bottom. Follow the arrows through the chart to identify corrective action.



**Troubleshooting presents the risk of equipment damage, personal injury or death. Troubleshooting must be performed by trained experienced technicians.**

### Air Compressor Air Pressure Rises Slowly

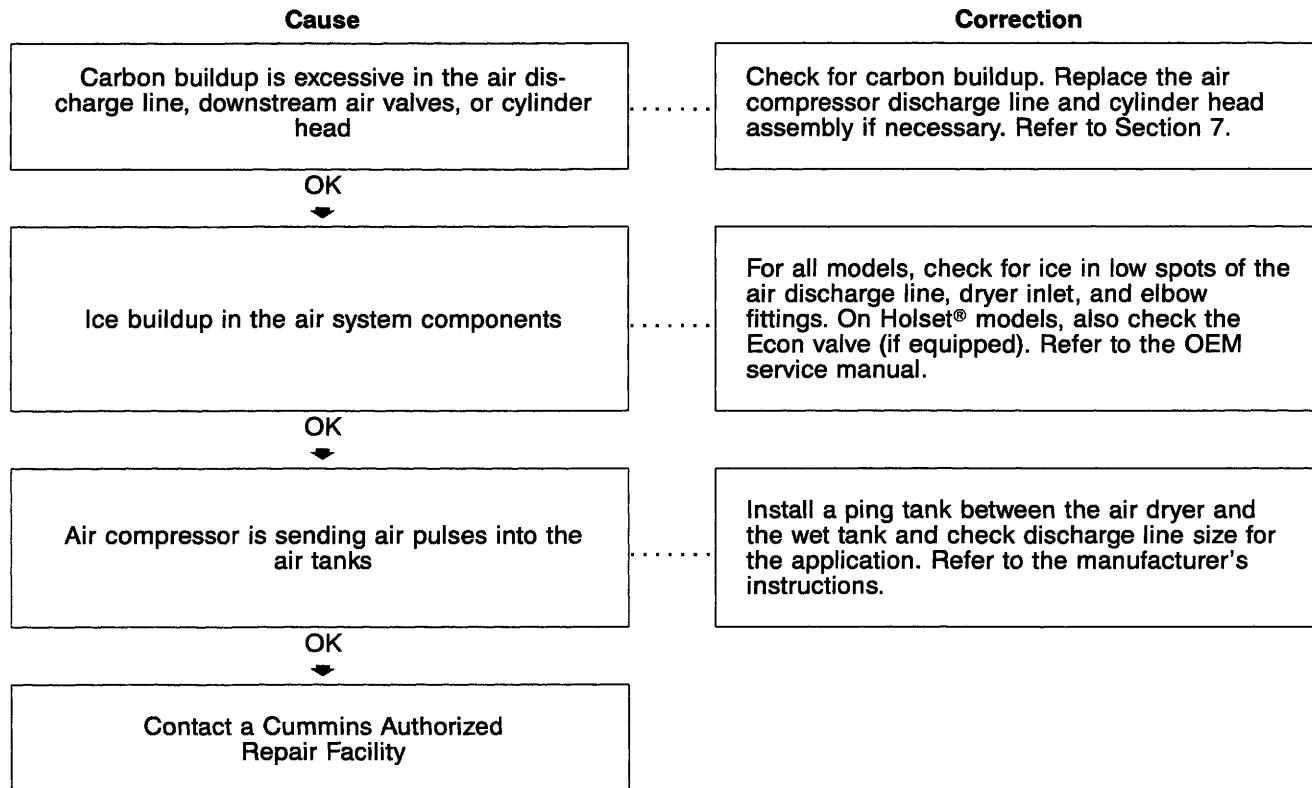
This is symptom tree t004.





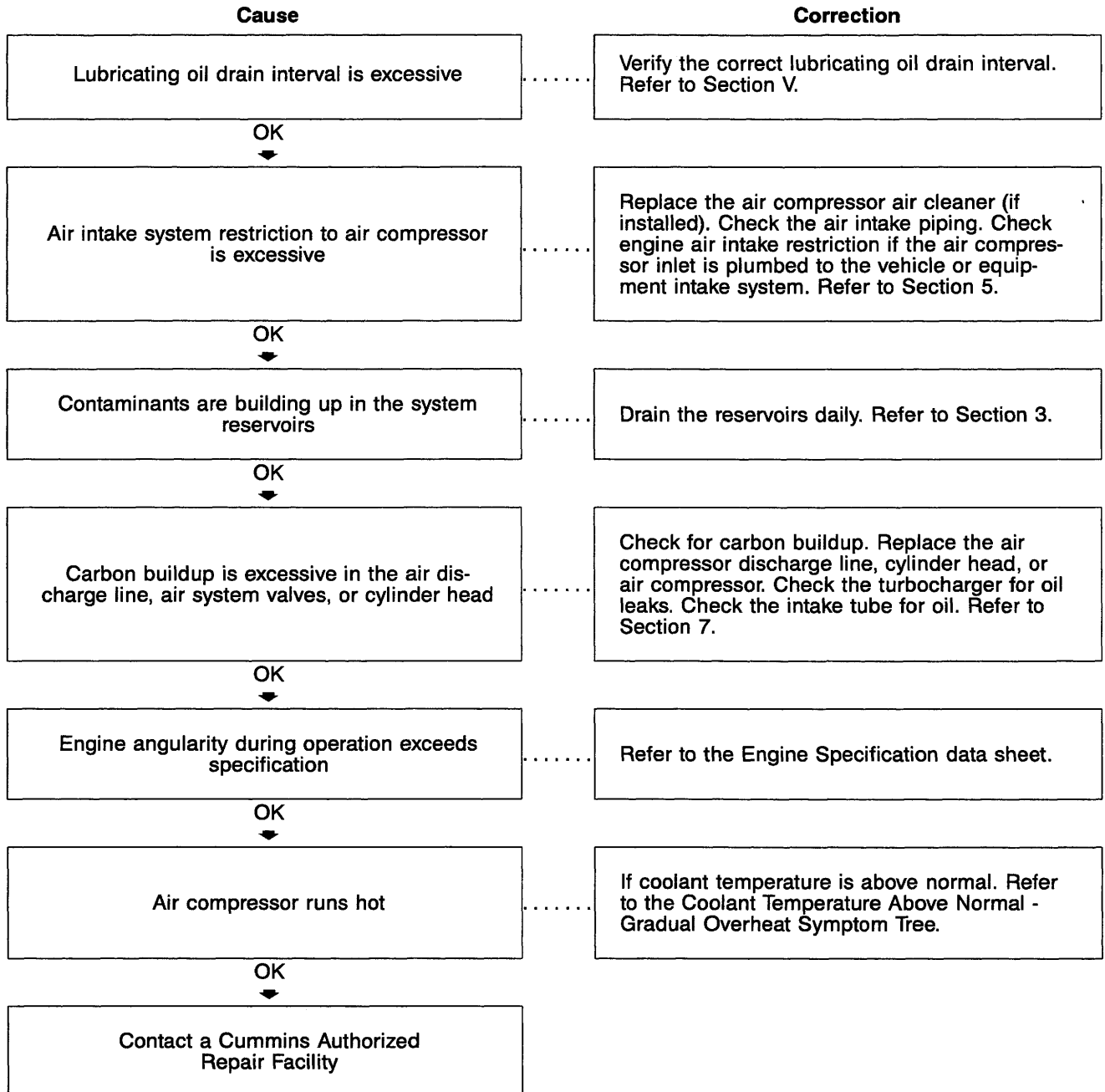
## Air Compressor Noise is Excessive

This is symptom tree t006.



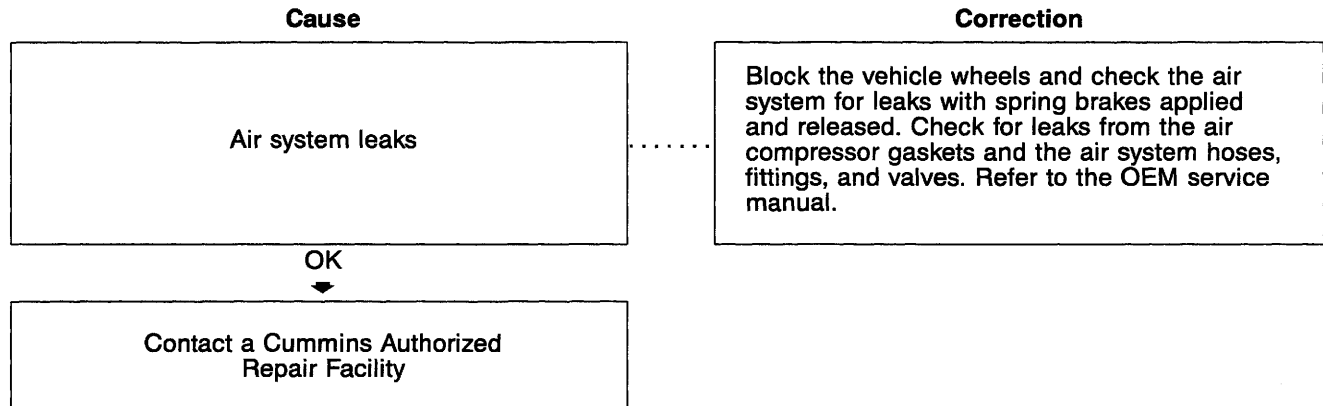
## Air Compressor Pumping Excess Lubricating Oil into the Air System

This is symptom tree t007.



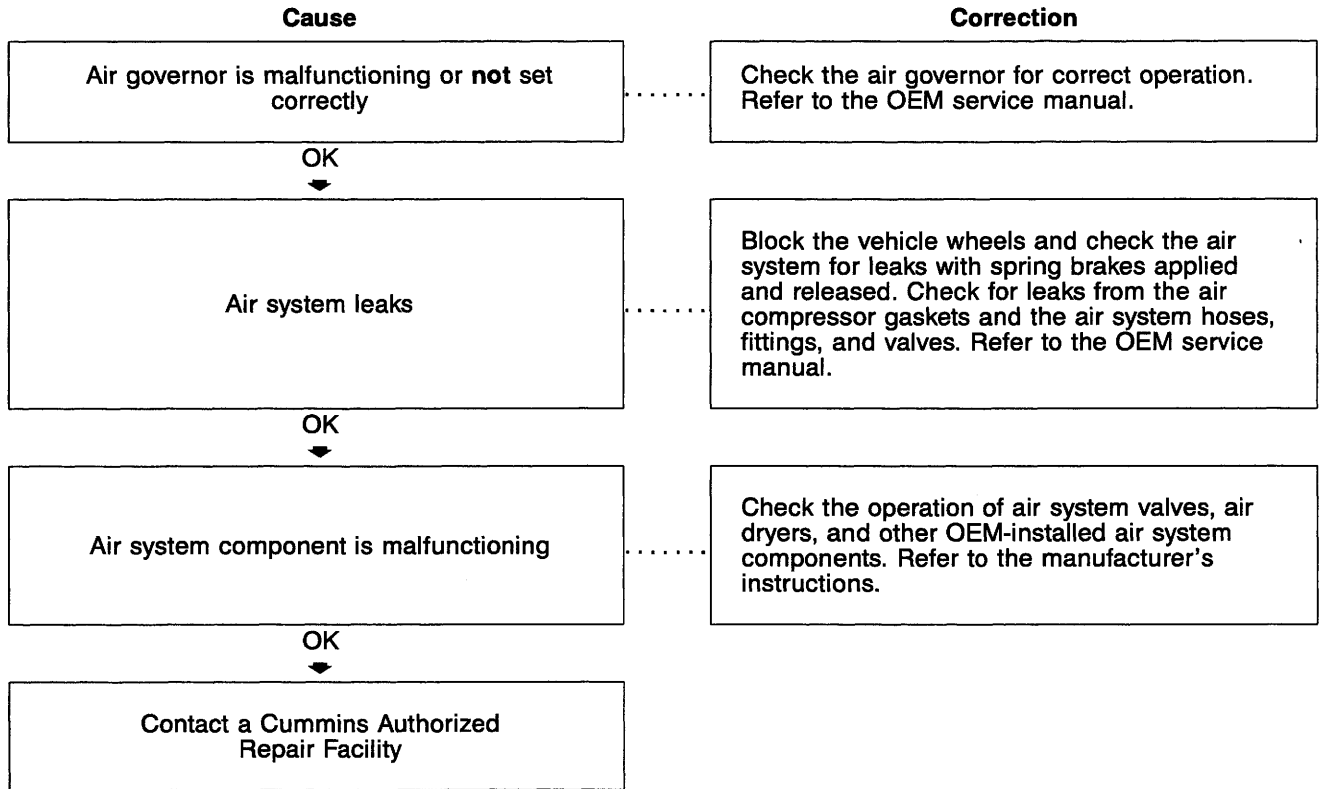
**Air Compressor Will Not Maintain Adequate Air Pressure (Not Pumping Continuously)**

This is symptom tree t008.



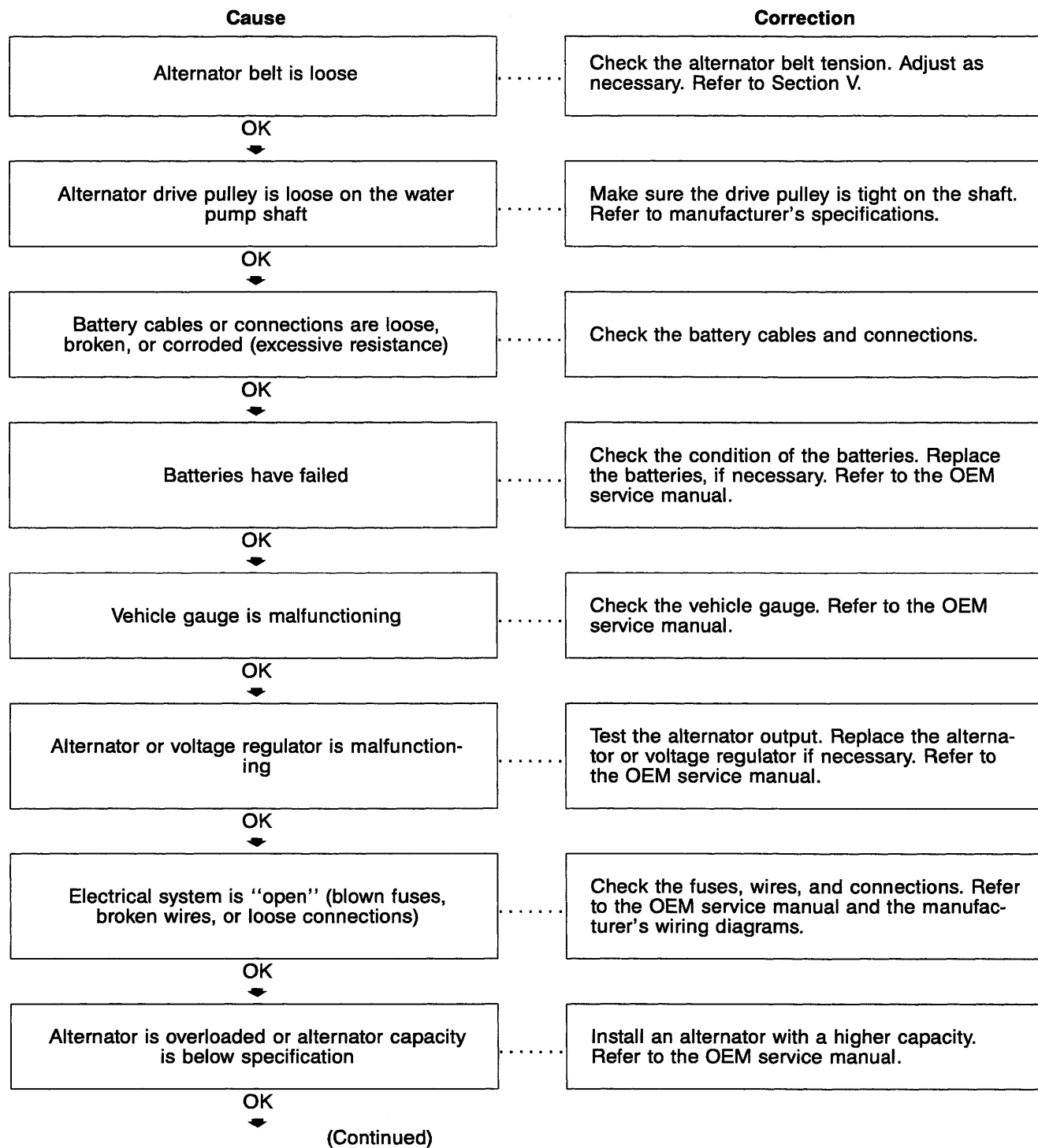
## Air Compressor Will Not Stop Pumping

This is symptom tree t010.



## Alternator Not Charging or Insufficient Charging

This is symptom tree t013.

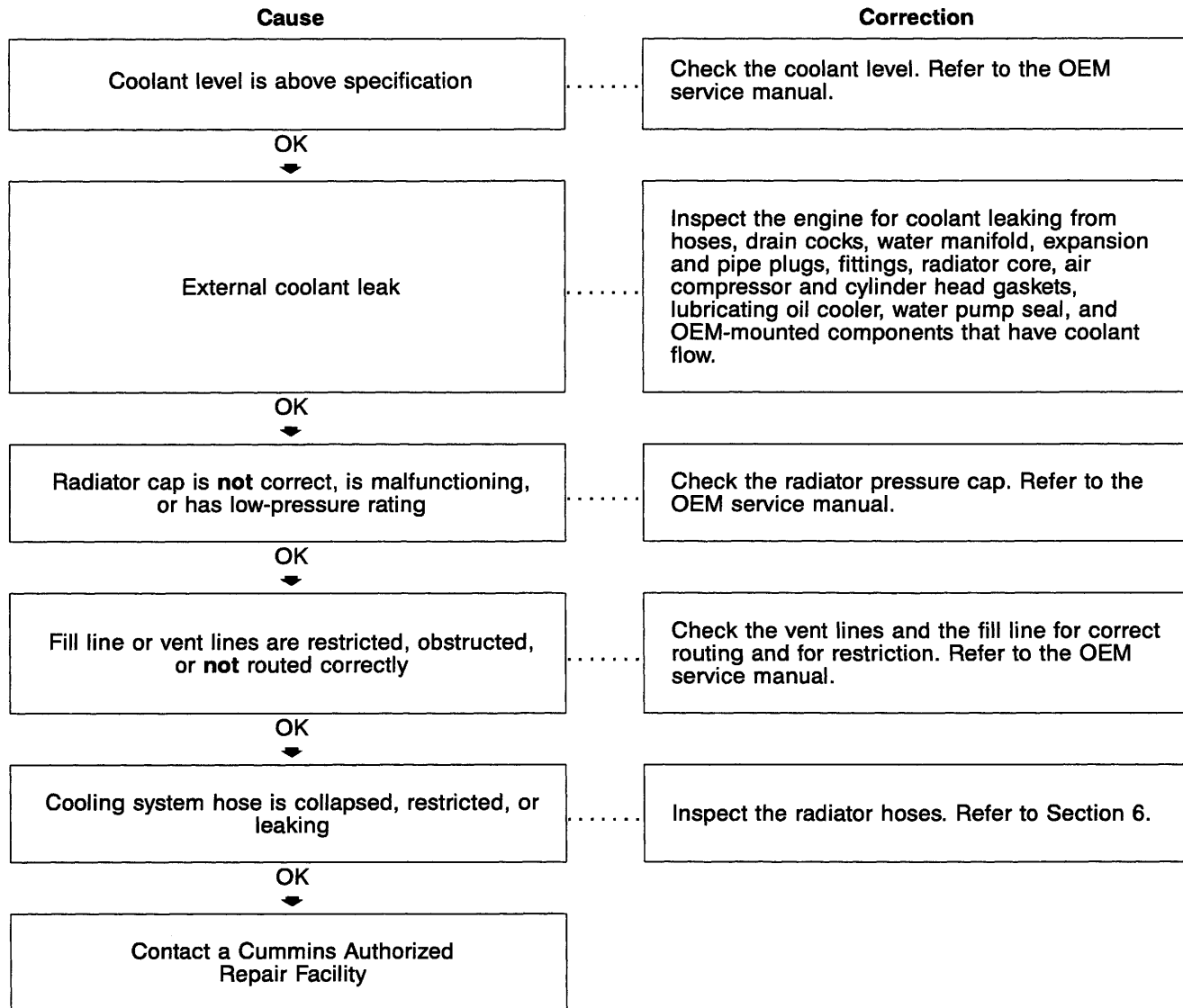


**Alternator Not Charging or Insufficient Charging (Continued)**

Cause	Correction
<div>Battery temperature is above specification</div>	<div>Position the batteries away from heat sources. Refer to the OEM service manual.</div>
<div>OK</div> <div>↓</div> <div>Contact a Cummins Authorized Repair Facility</div>	

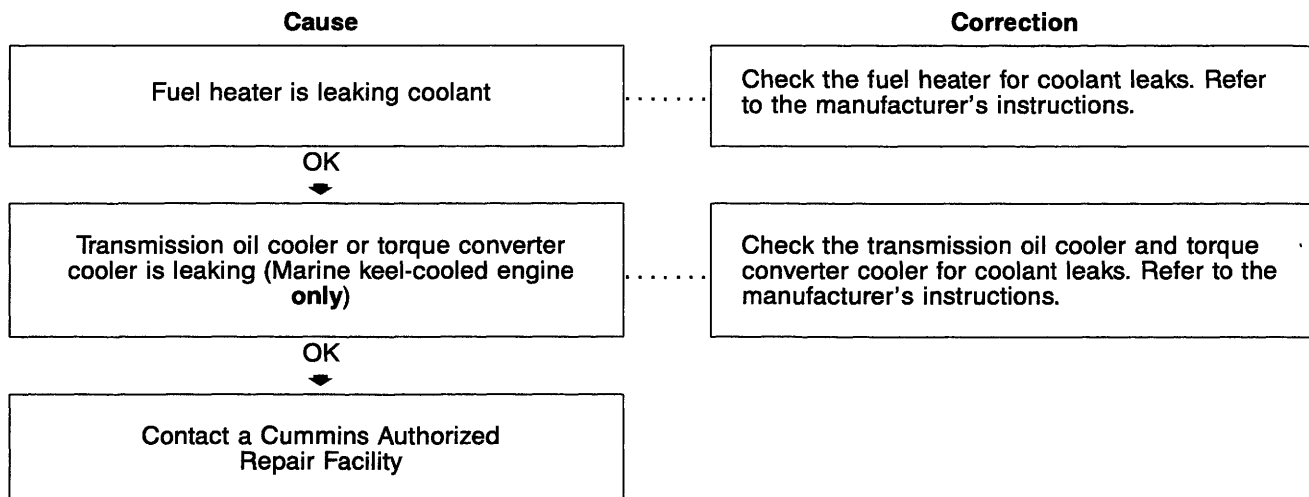
### Coolant Loss – External

This is symptom tree t020.



### Coolant Loss – Internal

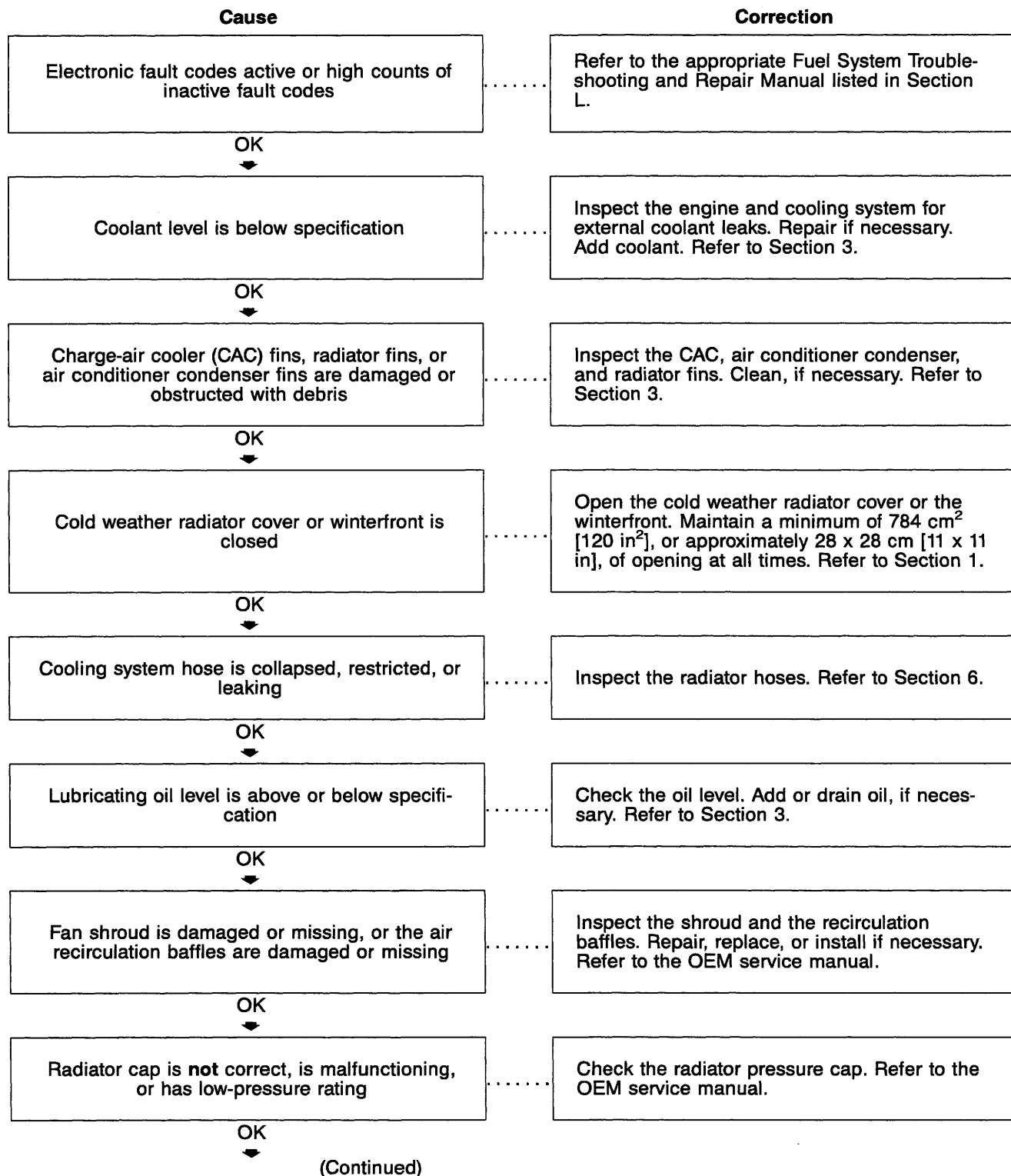
This is symptom tree t021.





## Coolant Temperature Above Normal – Gradual Overheat

This is symptom tree t022.

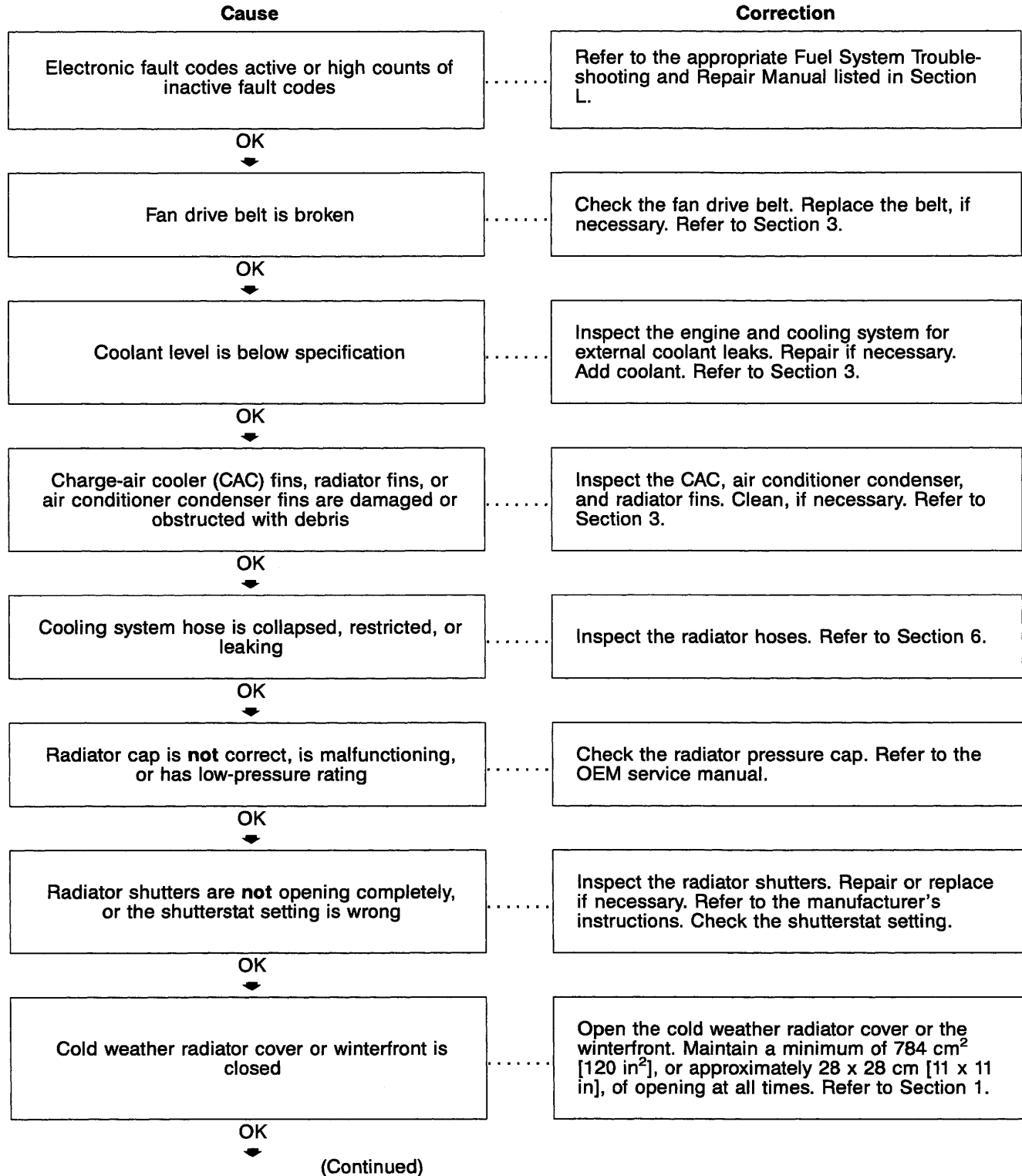


## Coolant Temperature Above Normal – Gradual Overheat (Continued)

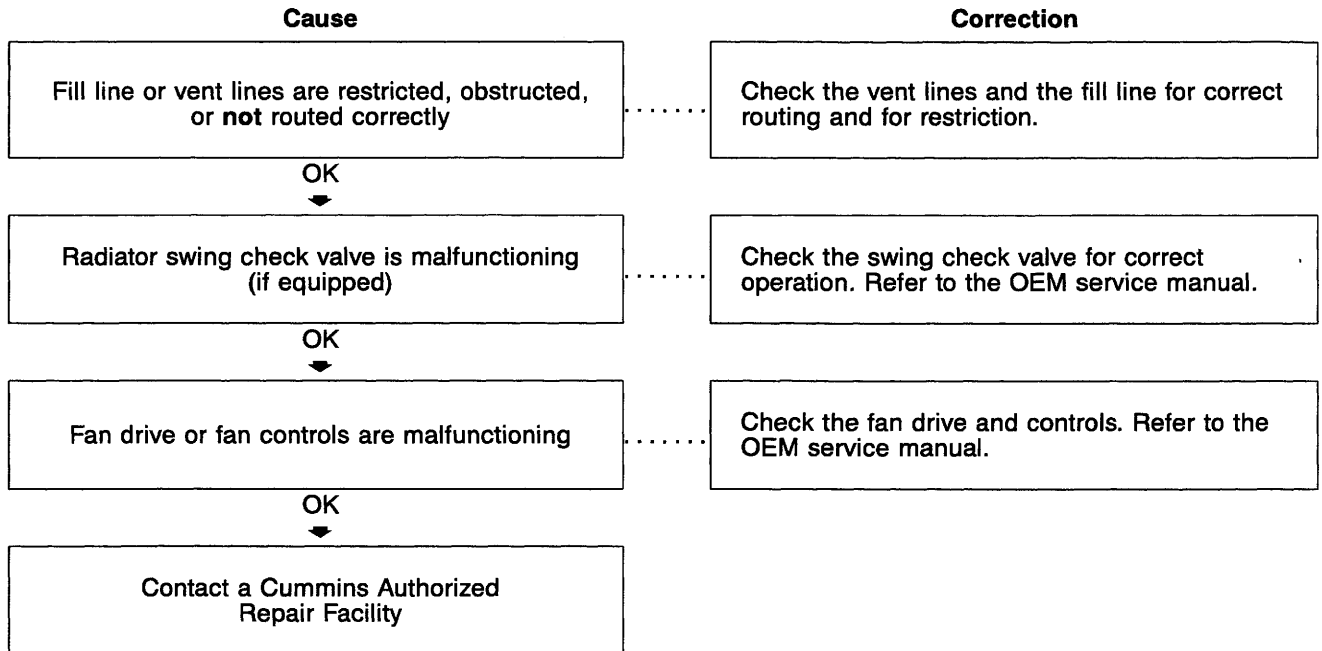
Cause	Correction
Intake manifold air temperature is above specification	Refer to the Intake Manifold Air Temperature Above Specification symptom tree.
OK ↓	
Coolant temperature gauge is malfunctioning	Test the temperature gauge. Repair or replace the gauge if necessary. Refer to the OEM service manual.
OK ↓	
Thermostat is <b>not</b> correct or is malfunctioning	Check the thermostat for the correct part number and for correct operation. Contact a Cummins Authorized Repair Facility.
OK ↓	
Radiator shutters are <b>not</b> opening completely, or the shutterstat setting is wrong	Inspect the radiator shutters. Repair or replace if necessary. Refer to the manufacturer's instructions. Check the shutterstat setting.
OK ↓	
Radiator swing check valve is malfunctioning (if equipped)	Check the swing check valve for correct operation. Refer to the OEM service manual.
OK ↓	
Vehicle cooling system is <b>not</b> adequate	Verify that the engine and vehicle cooling systems are using the correct components. Refer to the OEM service manual.
OK ↓	
Torque converter is malfunctioning	Check the torque converter. Refer to the OEM service manual.
OK ↓	
Contact a Cummins Authorized Repair Facility	

## Coolant Temperature is Above Normal – Sudden Overheat

This is symptom tree t023.

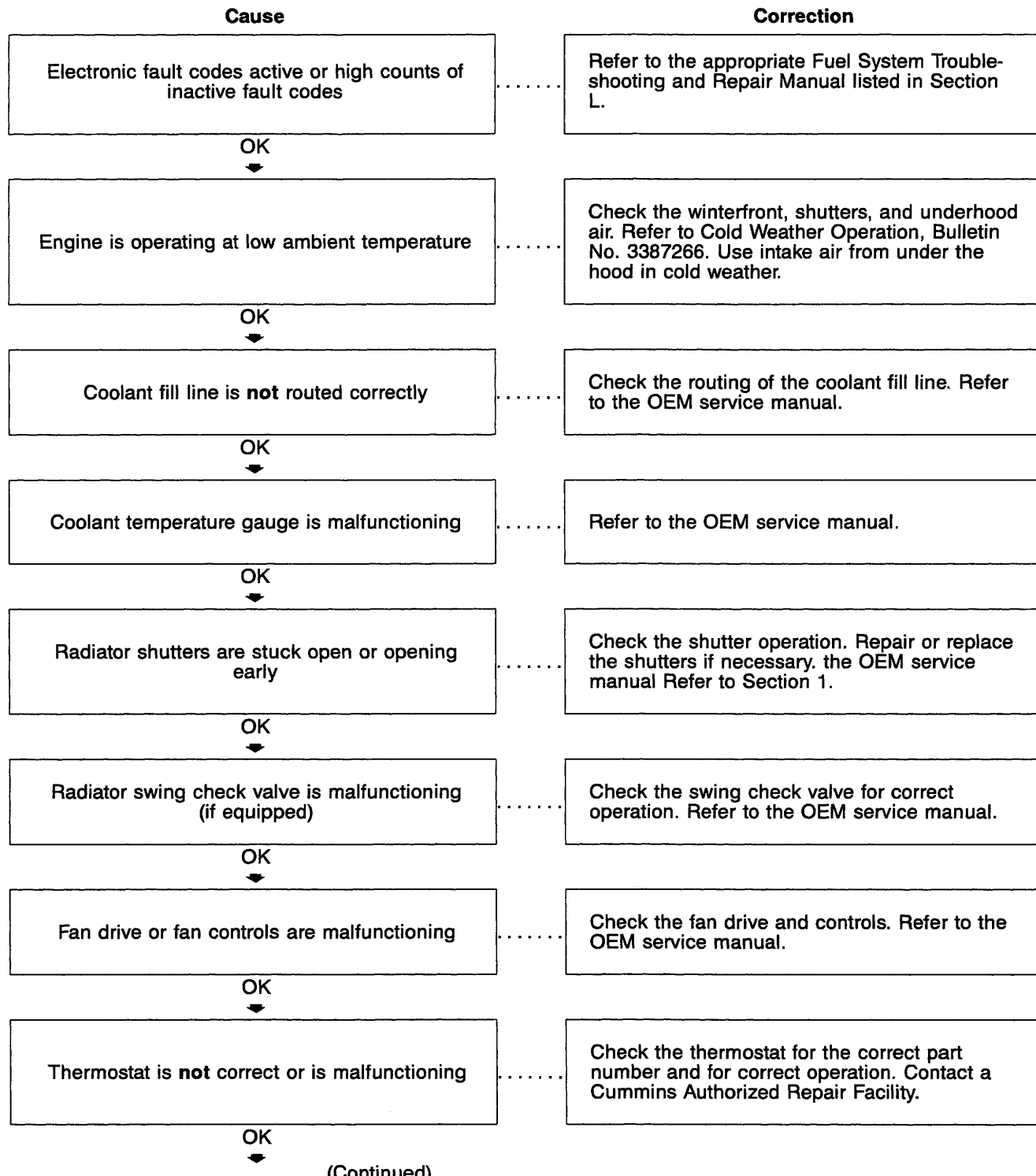


**Coolant Temperature is Above Normal – Sudden Overheat (Continued)**

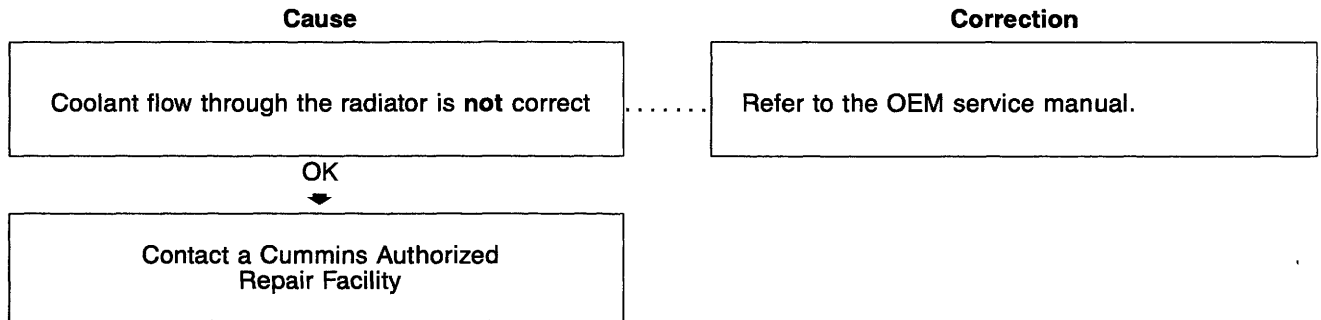


## Coolant Temperature is Below Normal

This is symptom tree t024.

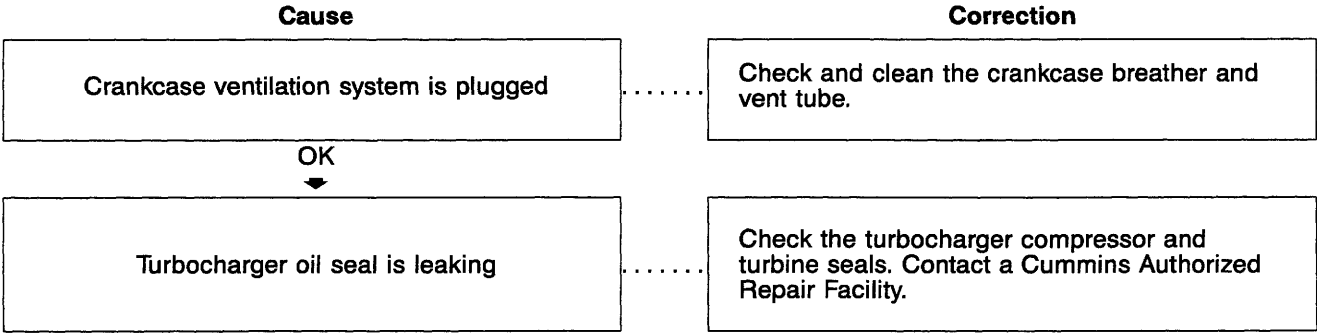


**Coolant Temperature is Below Normal (Continued)**



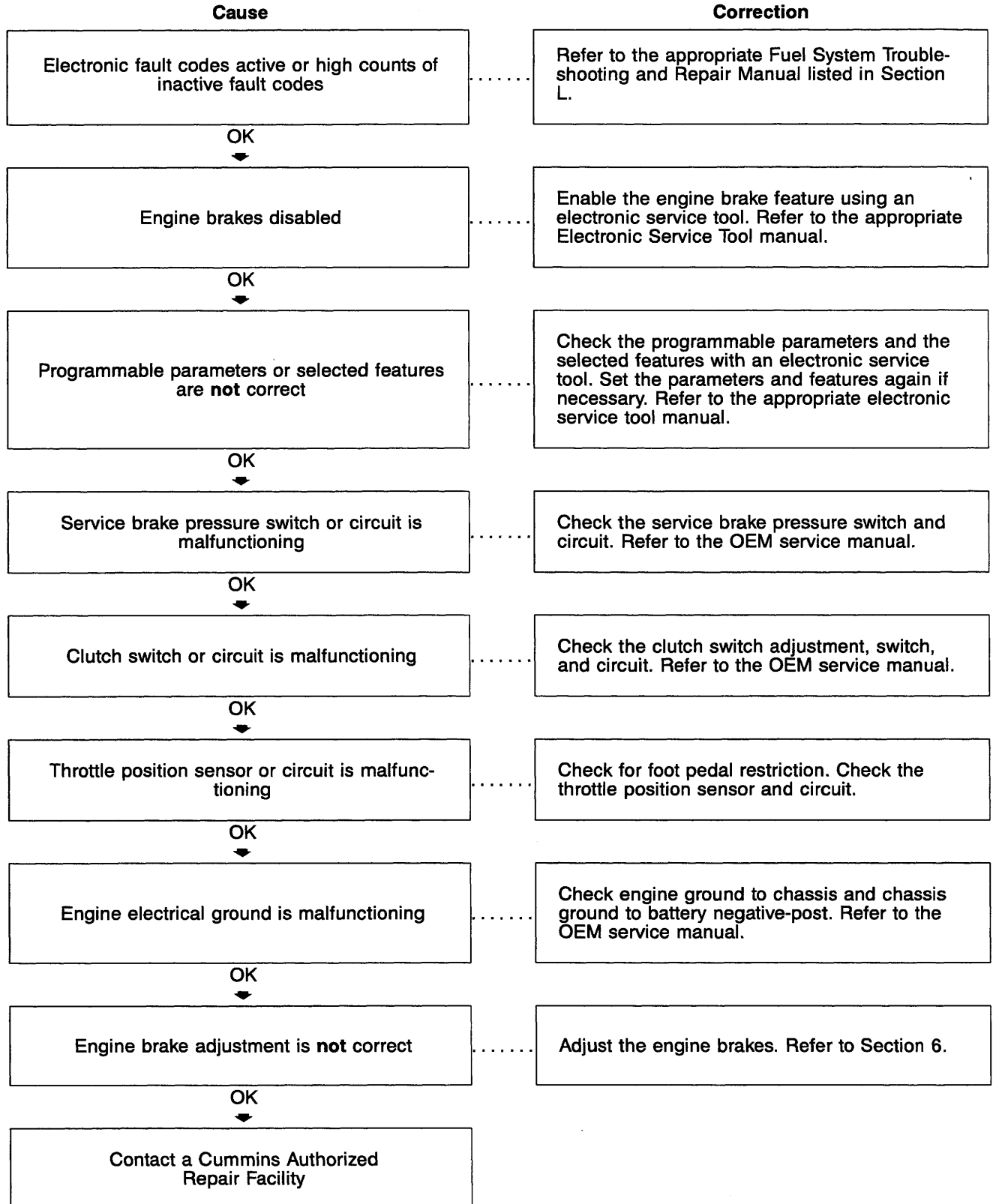
Crankcase Gases (Blowby) Excessive

This is symptom tree t027.



## Engine Brake Does Not Operate

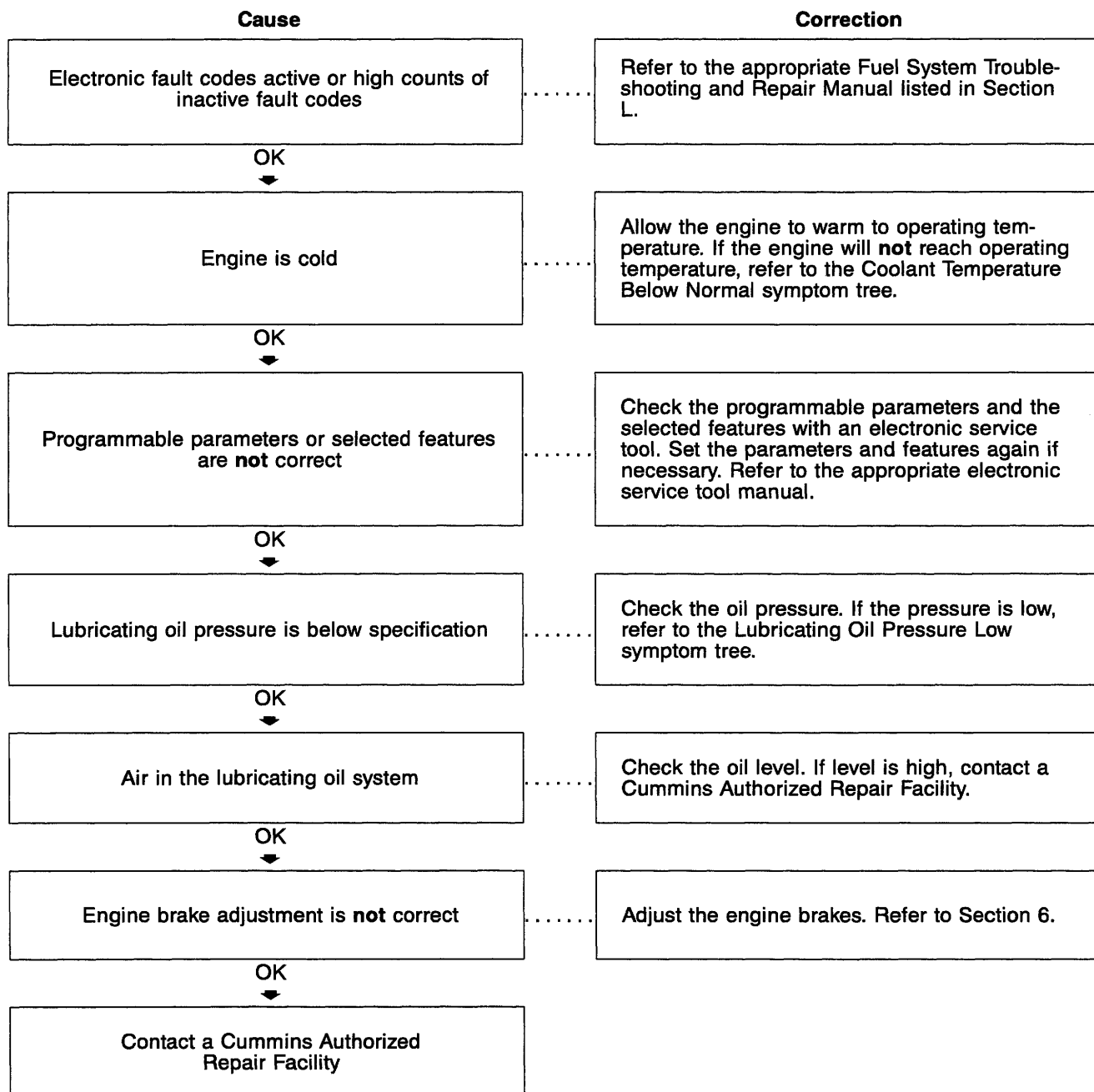
This is symptom tree t036.





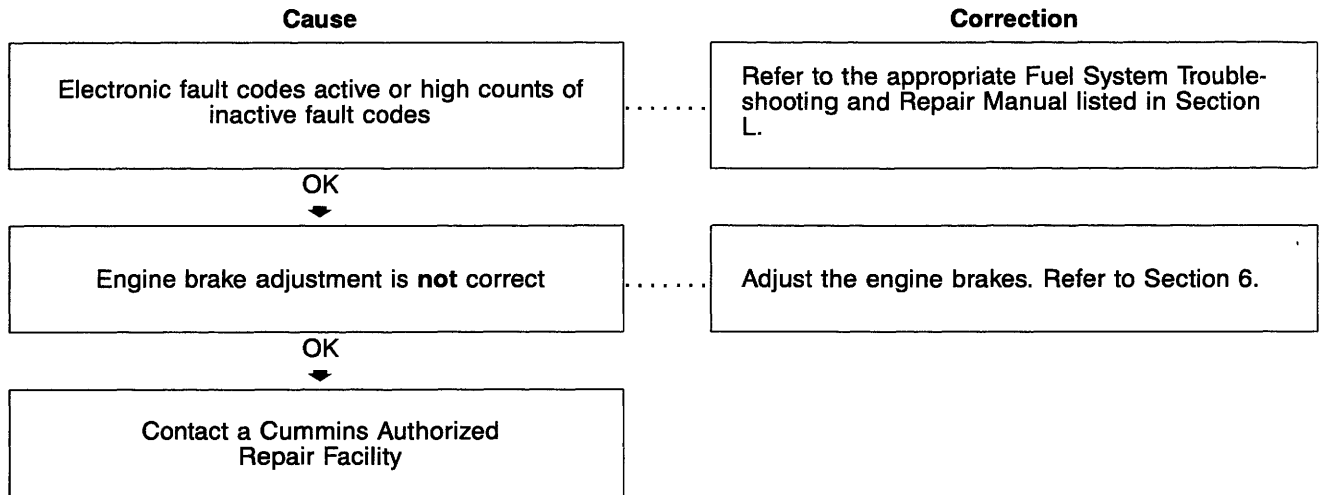
## Engine Brake – Low Retarding Power or Slow to Activate

This is symptom tree t037.



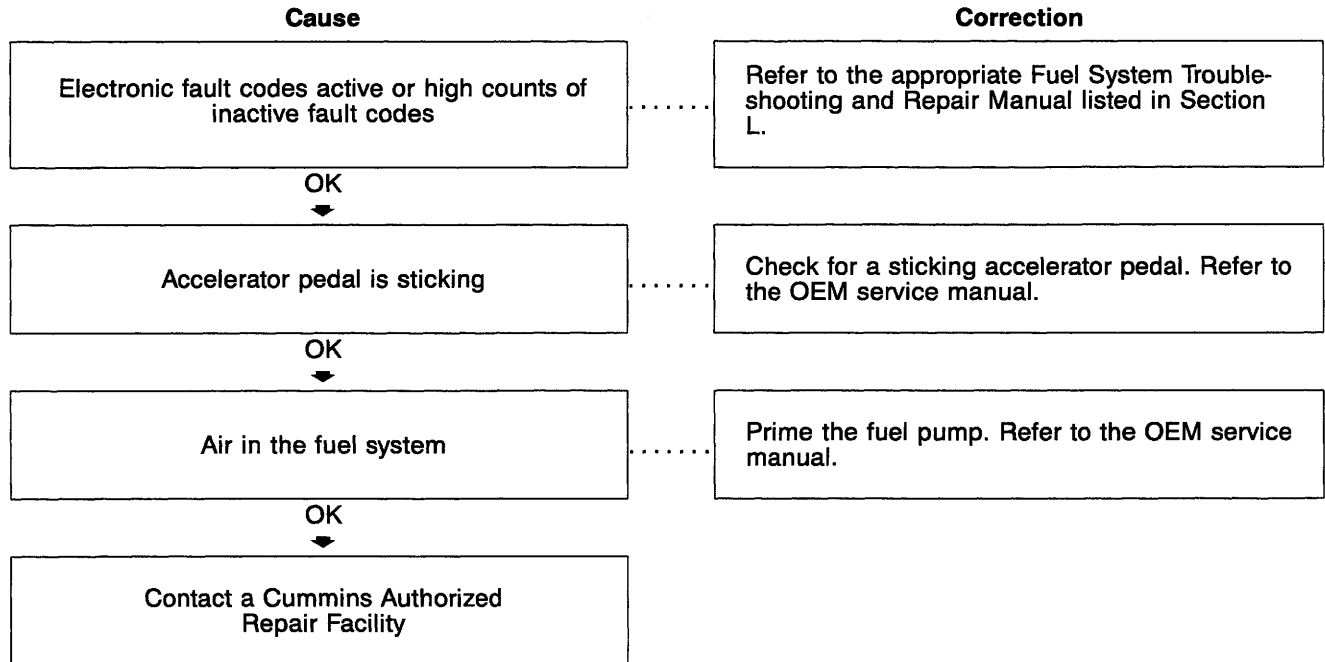
## Engine Brake — One or More Cylinders Braking with Power Switch Off

This is symptom tree t038.



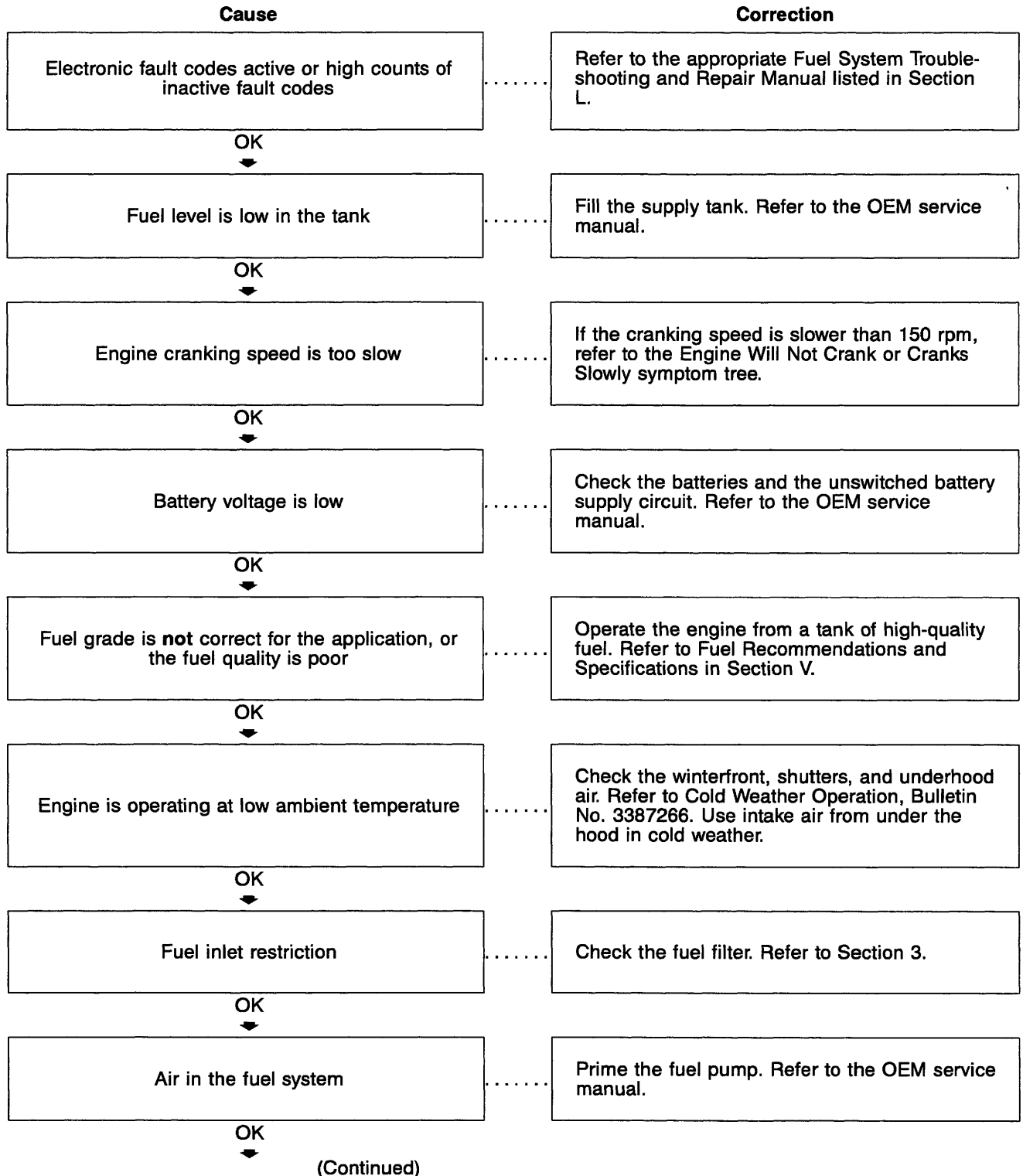
### Engine Decelerates Slowly

This is symptom tree t041.



## Engine Difficult to Start or Will Not Start (Exhaust Smoke)

This is symptom tree t043.

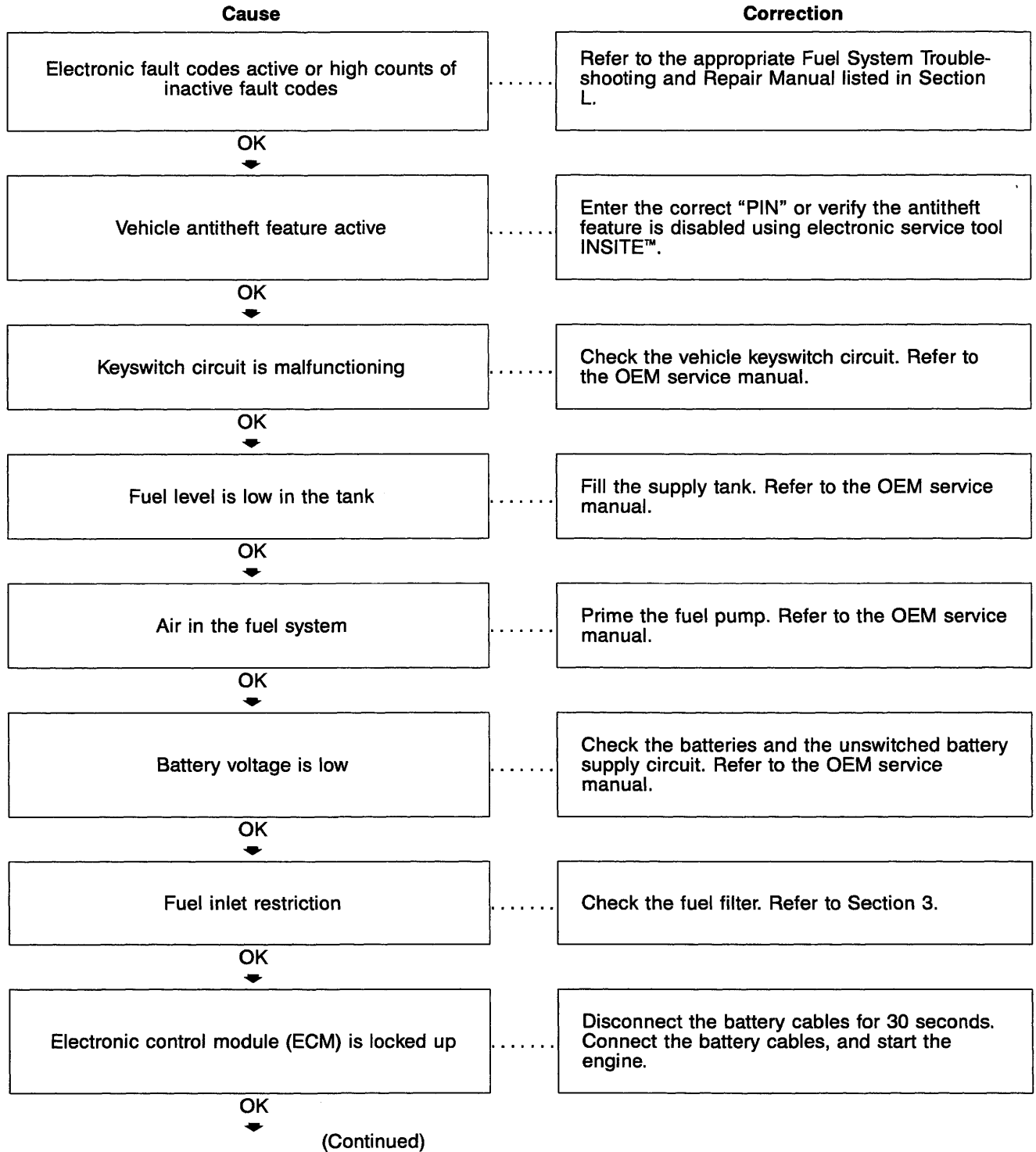


### Engine Difficult to Start or Will Not Start (Exhaust Smoke) (Continued)

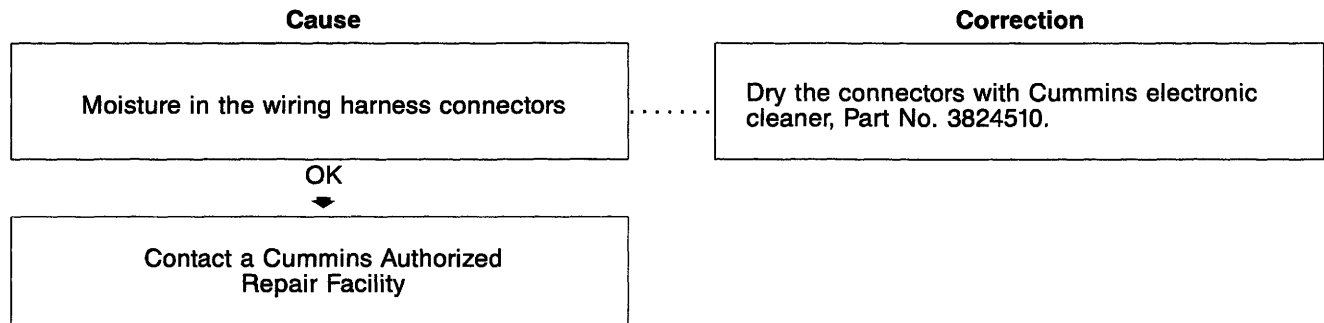
Cause	Correction
Vehicle parasitics are excessive	Refer to the OEM service manual.
OK ↓	
Air intake system restriction is above specification	Check the air intake system for restriction. Clean or replace the air filter and inlet piping as necessary. Refer to Section 5.
OK ↓	
Overhead adjustments are <b>not</b> correct	Measure and adjust the overhead settings. Refer to Section 6.
OK ↓	
Engine brakes are malfunctioning	Check the engine brake operation, adjustment, and solenoid resistance. Repair or adjust as necessary. Refer to Section 6.
OK ↓	
Exhaust system restriction	Check the exhaust system for any restrictions. Refer to Section V for specifications.
OK ↓	
Contact a Cummins Authorized Repair Facility	

## Engine Difficult to Start or Will Not Start (No Exhaust Smoke)

This is symptom tree t044.

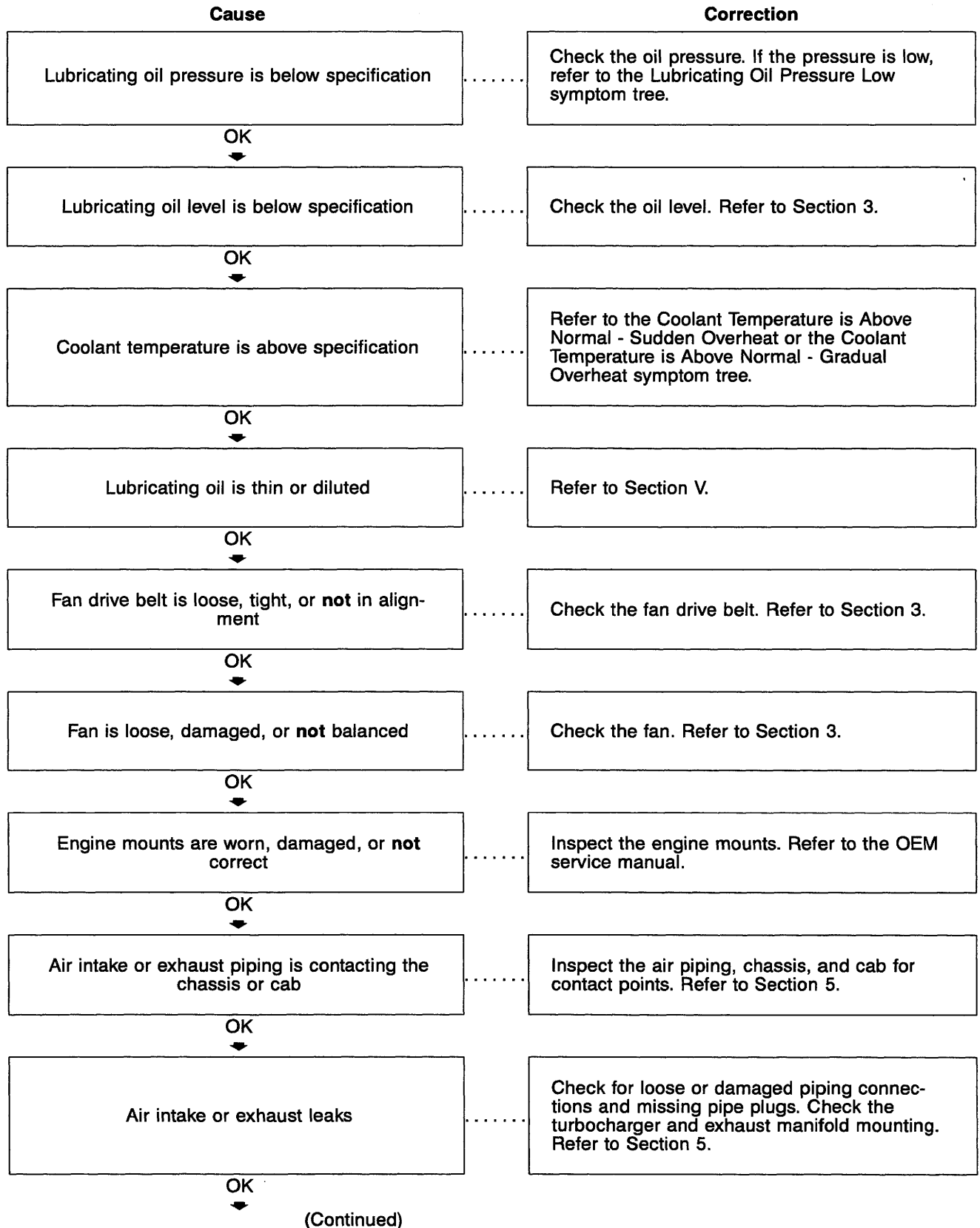


**Engine Difficult to Start or Will Not Start (No Exhaust Smoke) (Continued)**



## Engine Noise Excessive

This is symptom tree t047.



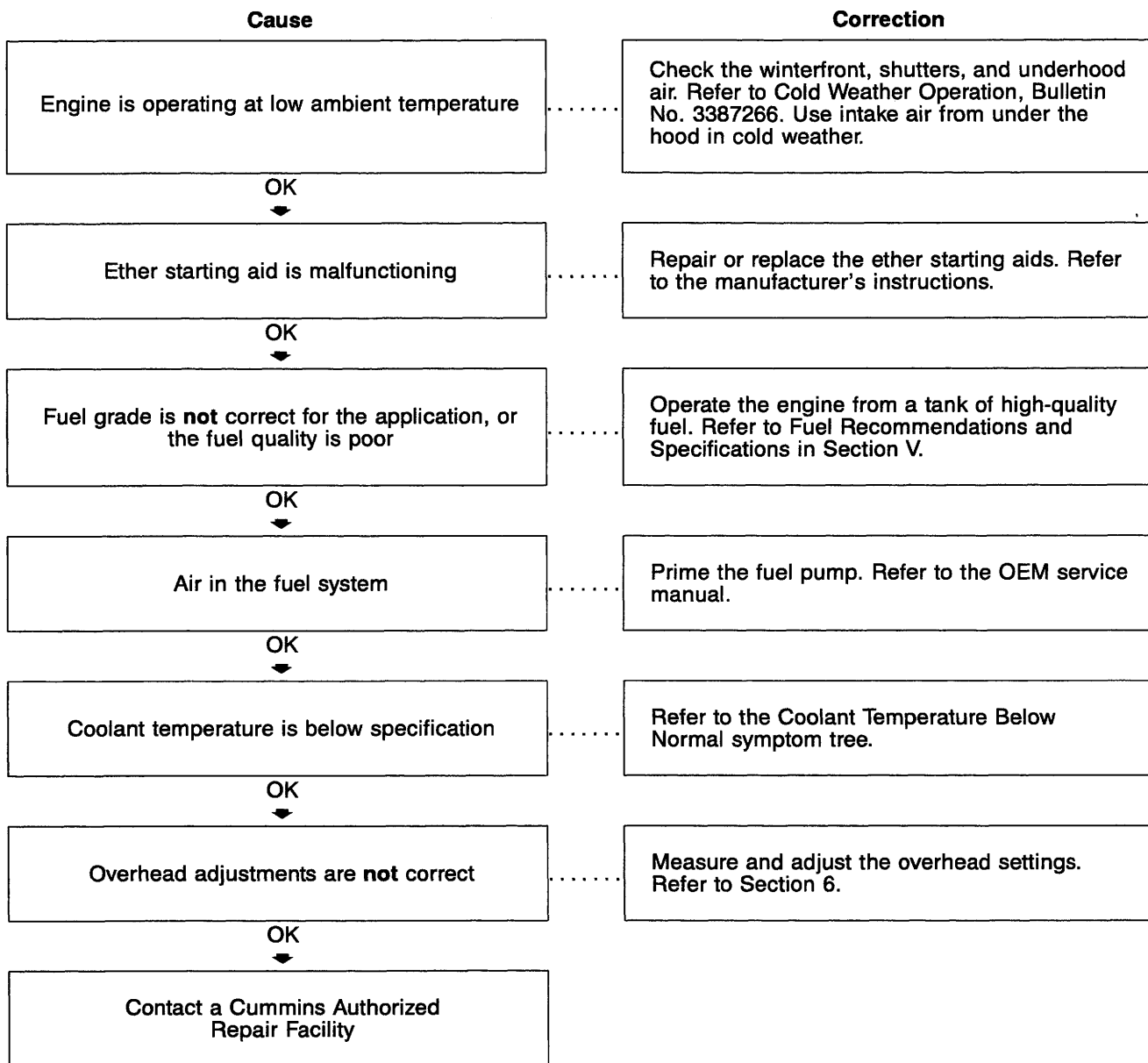


### Engine Noise Excessive (Continued)

Cause	Correction
Turbocharger noise	Turbocharger fluttering noises can be heard during deceleration or quick throttle closing. This noise is normal.
OK ↓	
Overhead adjustments are <b>not</b> correct	Measure and adjust the overhead settings. Refer to Section 6.
OK ↓	
Vibration damper is damaged	Inspect the vibration damper. Refer to Section 6.
OK ↓	
Air compressor noise is excessive	Refer to the Air Compressor Noise Is Excessive - Air Compressor symptom tree.
OK ↓	
Fan clutch, hydraulic pump, or freon compressor noise is excessive	Isolate each component, and check for noise. Refer to the OEM service manual.
OK ↓	
Drivetrain noise is excessive	Disconnect the drivetrain. Check for engine noise. Refer to the OEM service manual.
OK ↓	
Contact a Cummins Authorized Repair Facility	

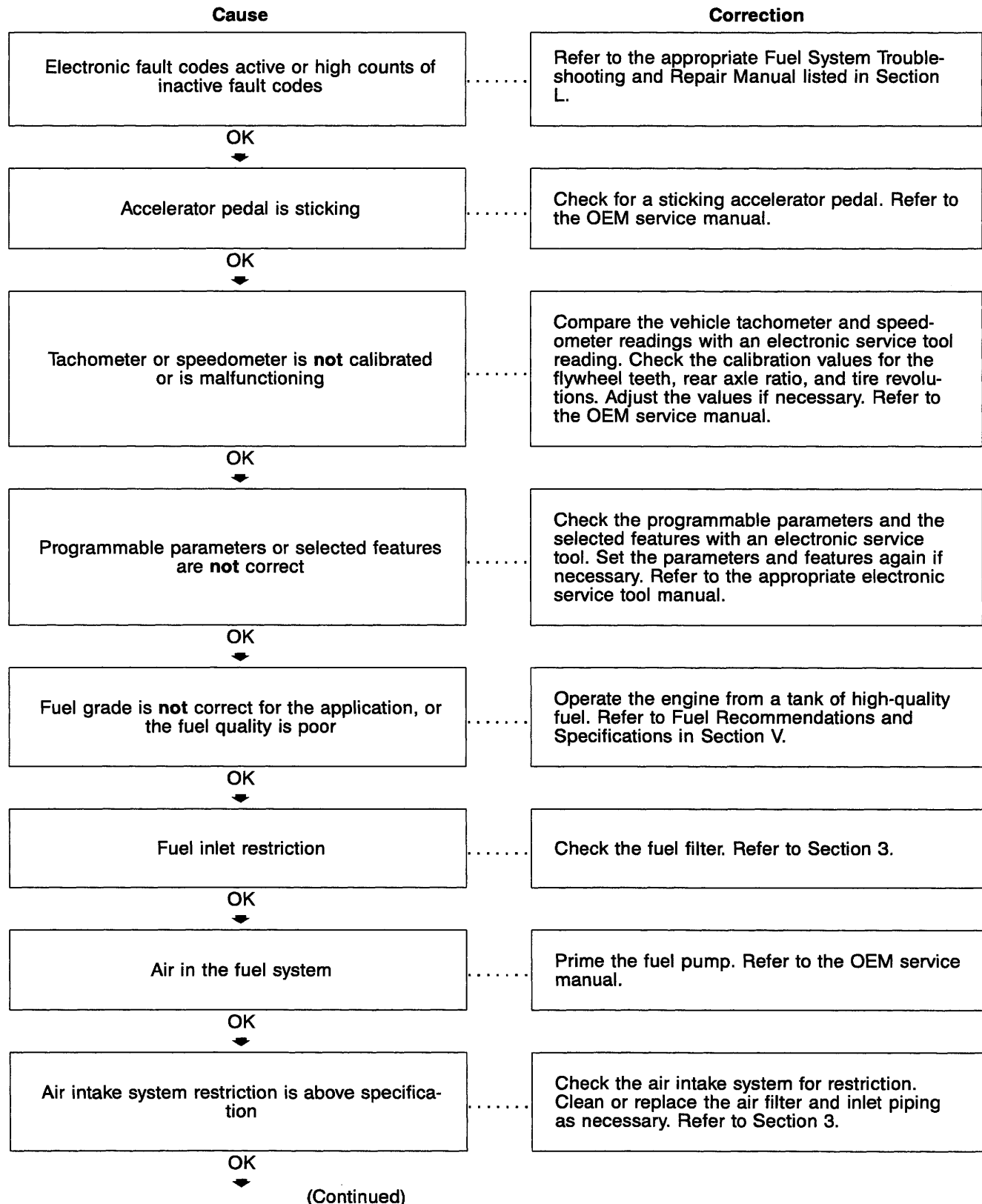
## Engine Noise Excessive — Combustion Knocks

This is symptom tree t048.



## Engine Power Output Low

This is symptom tree t057.

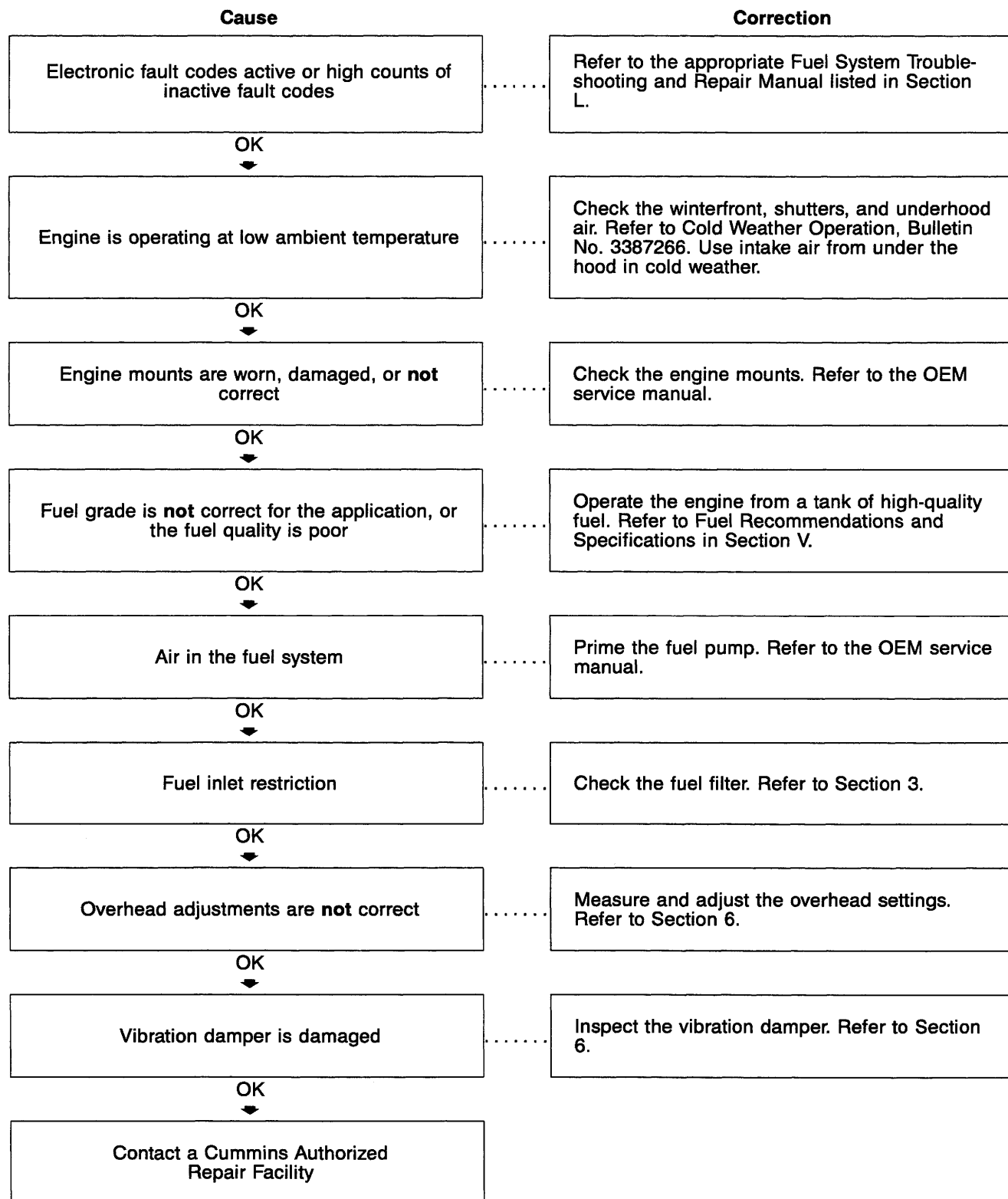


## Engine Power Output Low (Continued)

Cause	Correction
Air intake or exhaust leaks	Check for loose or damaged piping connections and missing pipe plugs. Check the turbocharger and exhaust manifold mounting. Refer to Section 5.
OK ↓	
Charge-air cooler (CAC) is restricted or leaking	Inspect the CAC for air restrictions or leaks.
OK ↓	
Drivetrain is <b>not</b> correctly matched to the engine	Check for correct gearing and drivetrain components. Refer to the OEM vehicle specifications.
OK ↓	
Exhaust system restriction is above specification	Check the exhaust system for restrictions. Refer to the OEM service manual.
OK ↓	
Vehicle parasitics are excessive	Refer to the OEM service manual.
OK ↓	
Lubricating oil level is above specification	Check the oil level. Verify the dipstick calibration and oil pan capacity. Fill the system to the specified level. Refer to Section 3.
OK ↓	
Overhead adjustments are <b>not</b> correct	Measure and adjust the overhead settings. Refer to Section 6.
OK ↓	
Engine brake adjustment is <b>not</b> correct	Adjust the engine brakes. Refer to Section 6.
OK ↓	
Contact a Cummins Authorized Repair Facility	

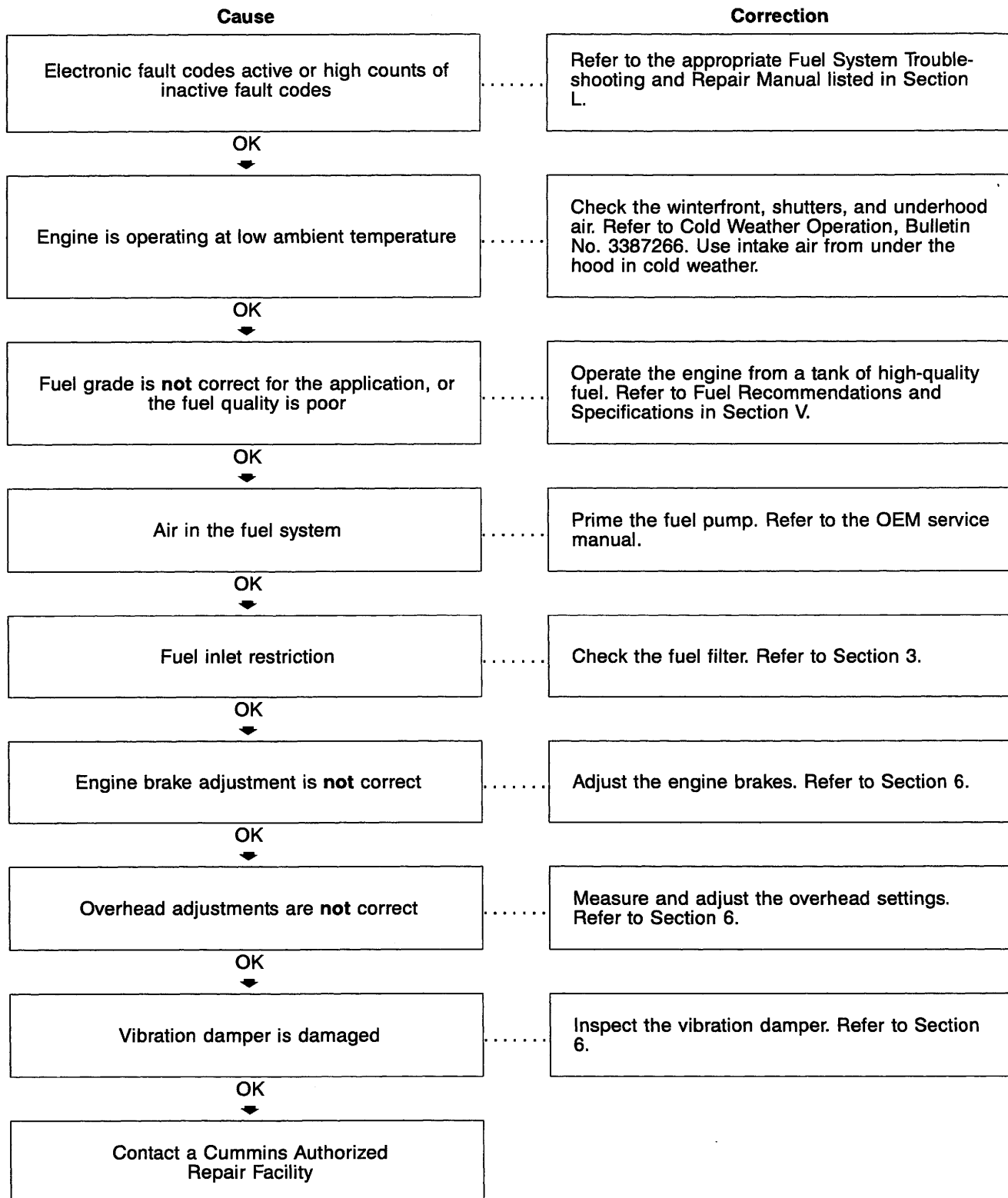
## Engine Runs Rough at Idle

This is symptom tree t061.



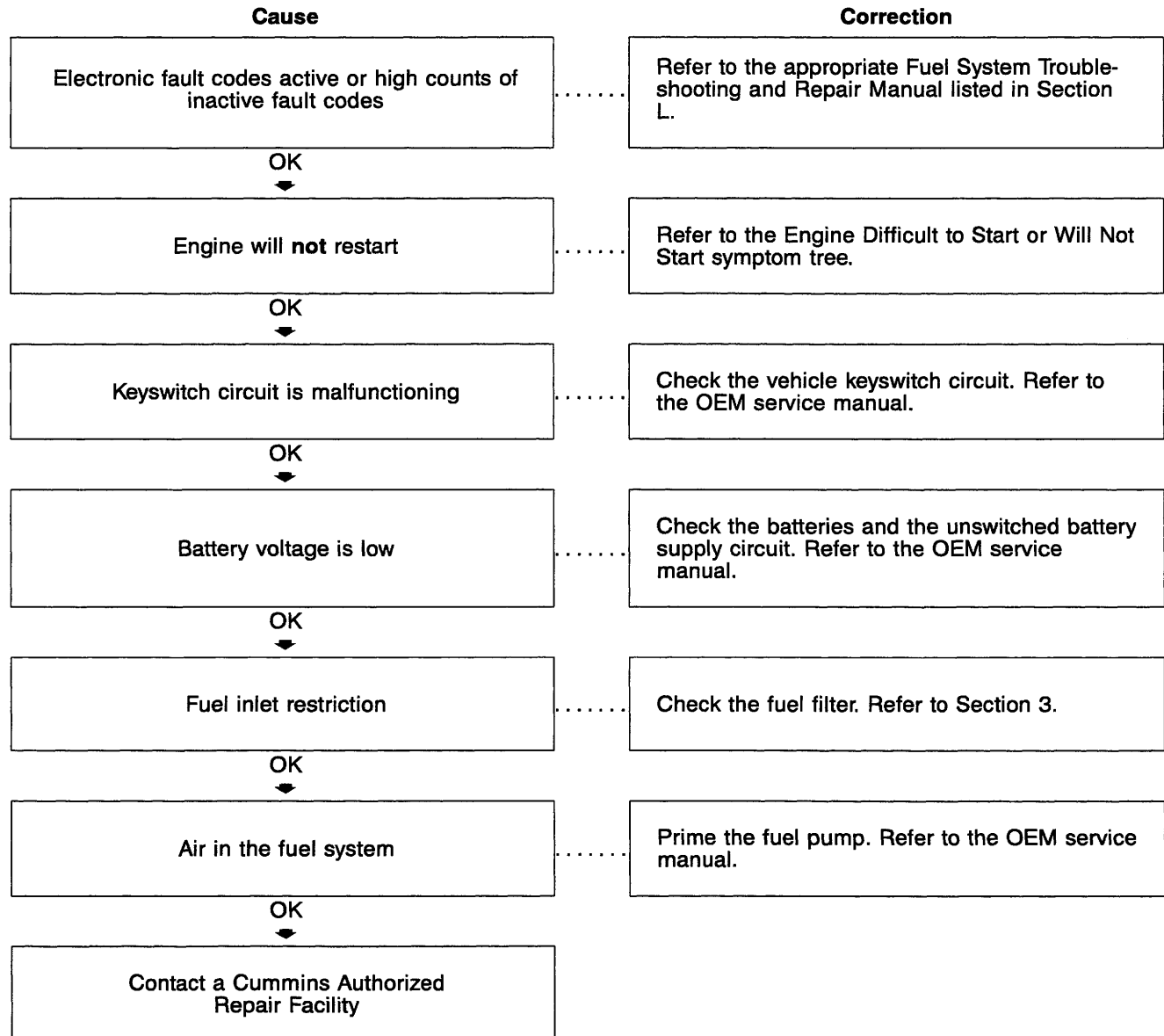
## Engine Runs Rough or Misfires

This is symptom tree t062.



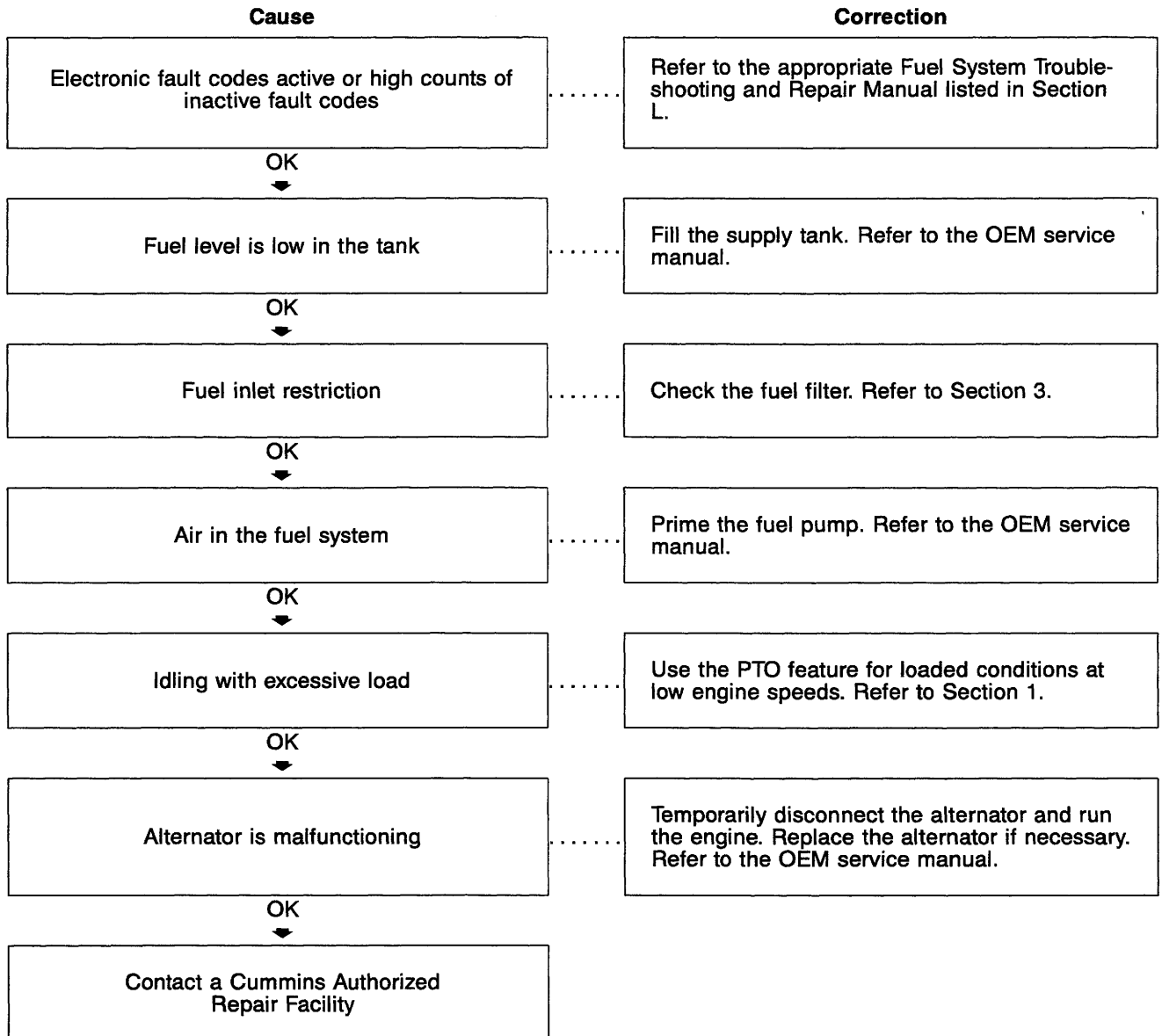
## Engine Shuts Off Unexpectedly or Dies During Deceleration

This is symptom tree t064.



### Engine Speed Surges at Low or High Idle

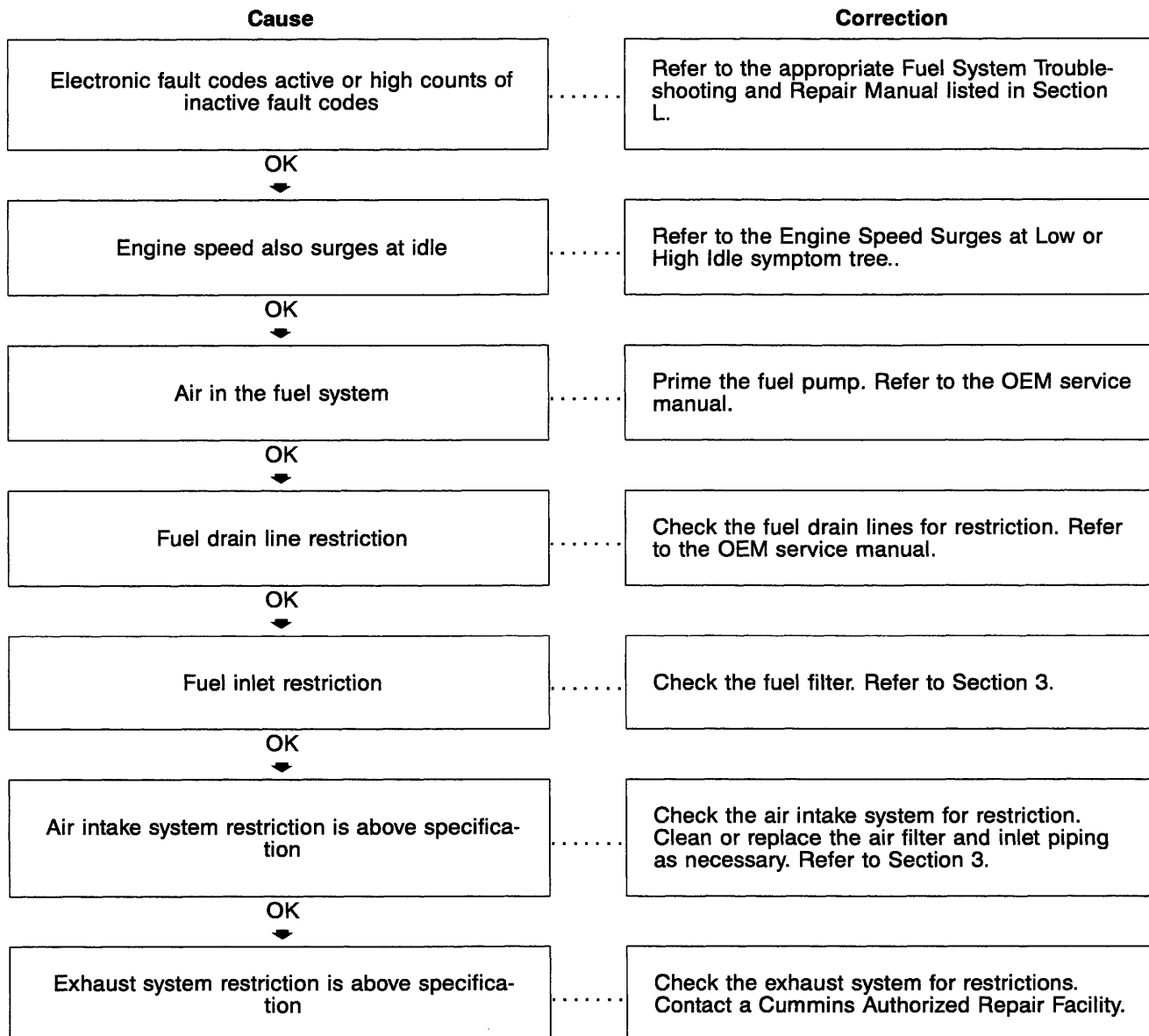
This is symptom tree t066.





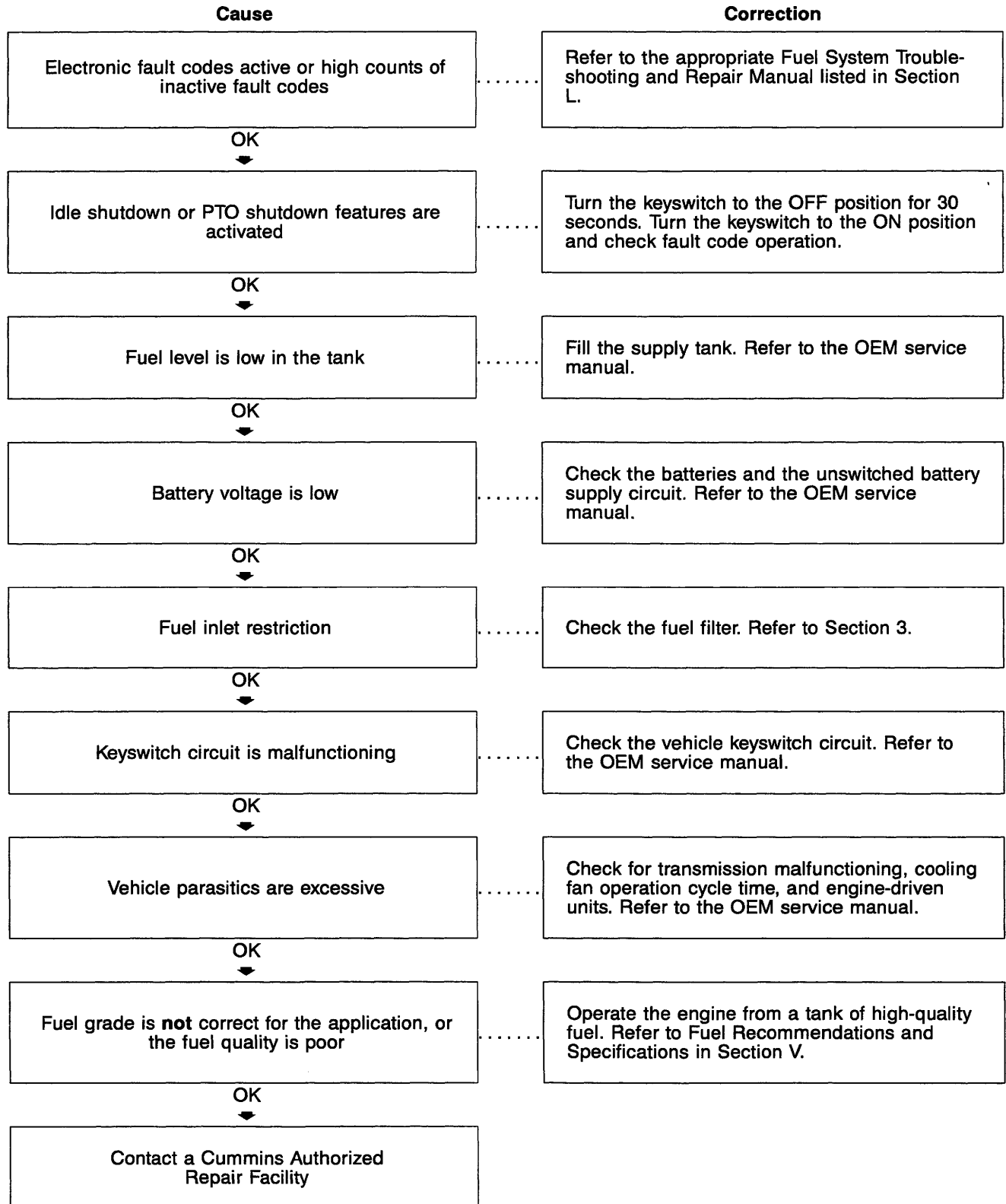
## Engine Speed Surges Under Load or in Operating Range

This is symptom tree t067.



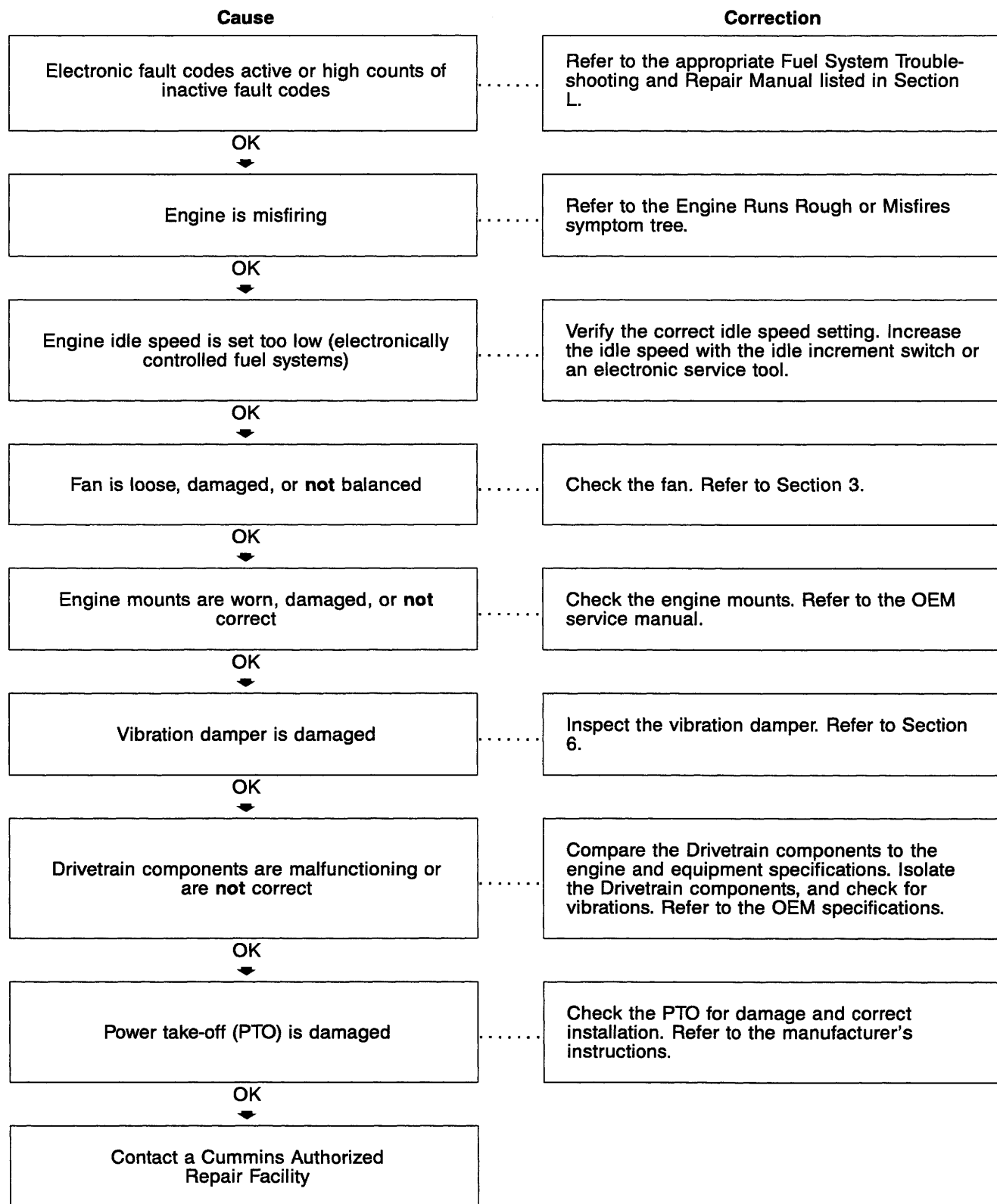
## Engine Starts But Will Not Keep Running

This is symptom tree t072.



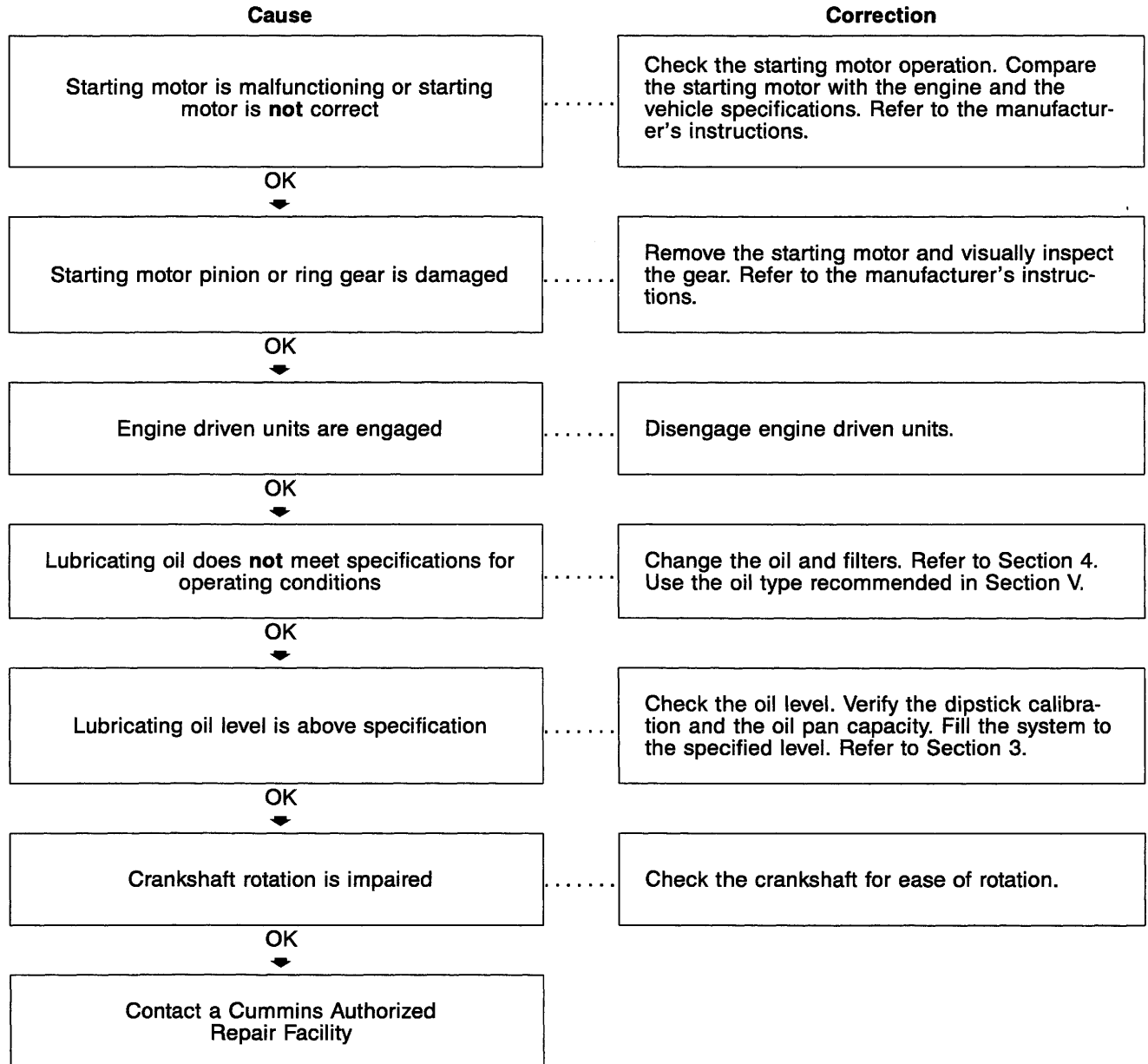
## Engine Vibration Excessive

This is symptom tree t075.



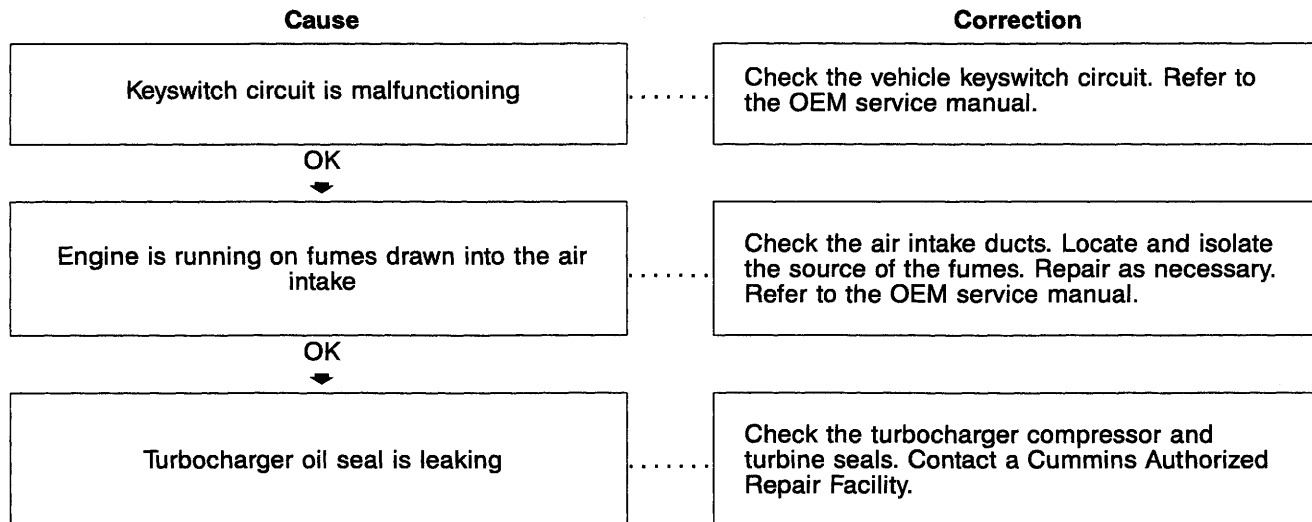
## Engine Will Not Crank or Cranks Slowly

This is symptom tree t077.



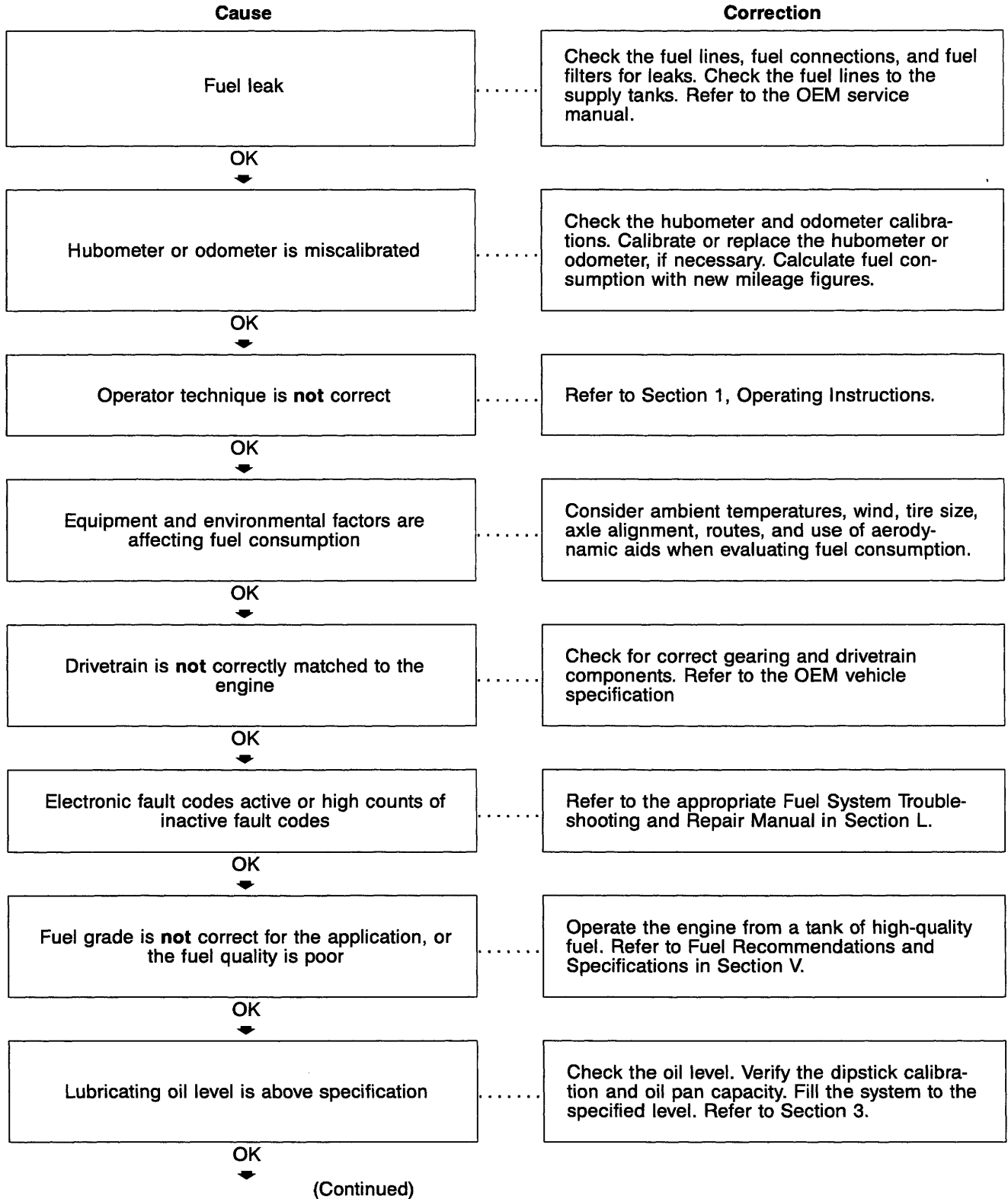
### Engine Will Not Shut Off

This is symptom tree t081.

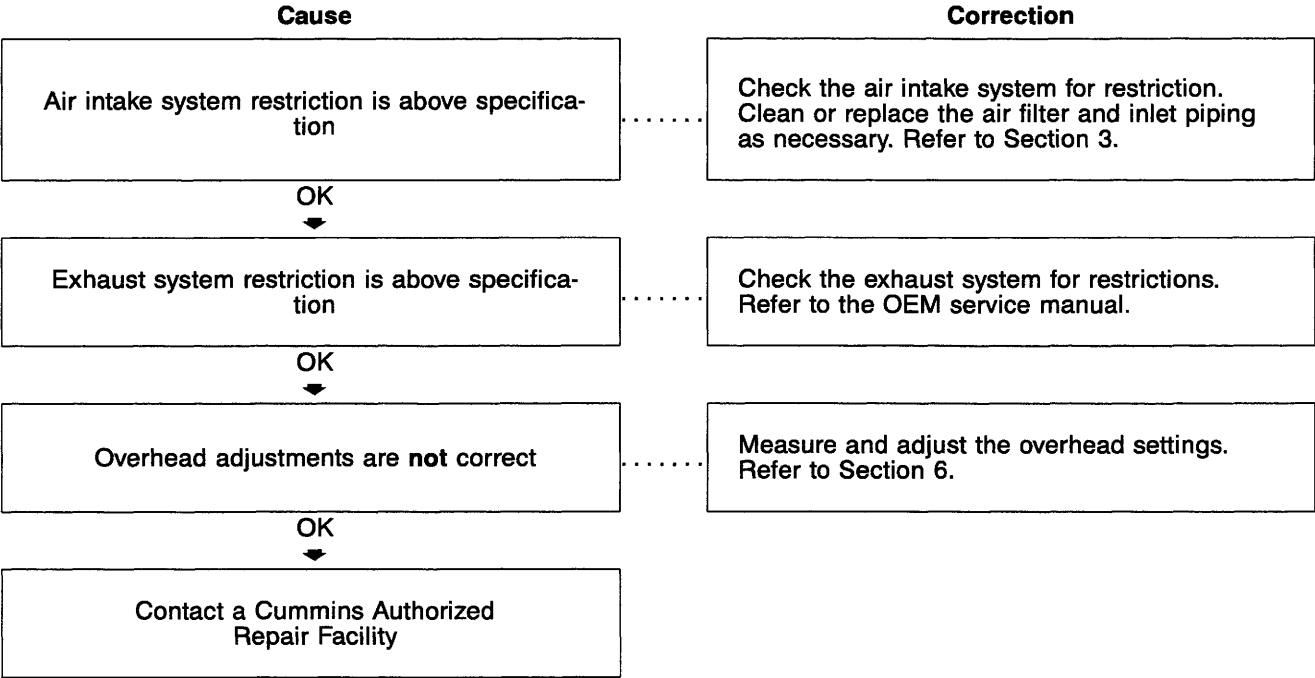


## Fuel Consumption Excessive

This is symptom tree t087.

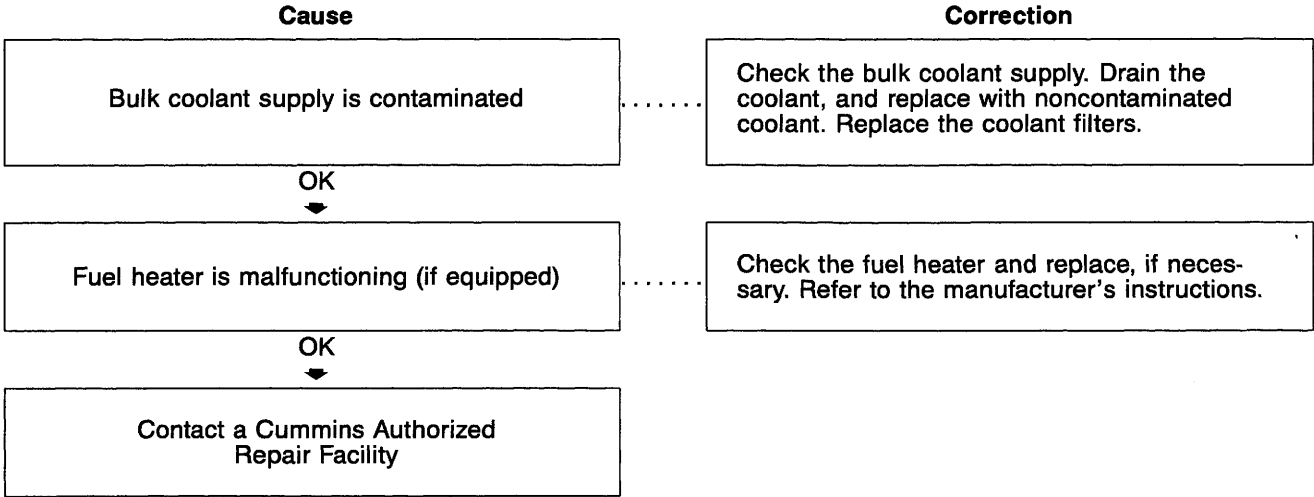


Fuel Consumption Excessive (Continued)



**Fuel in Coolant**

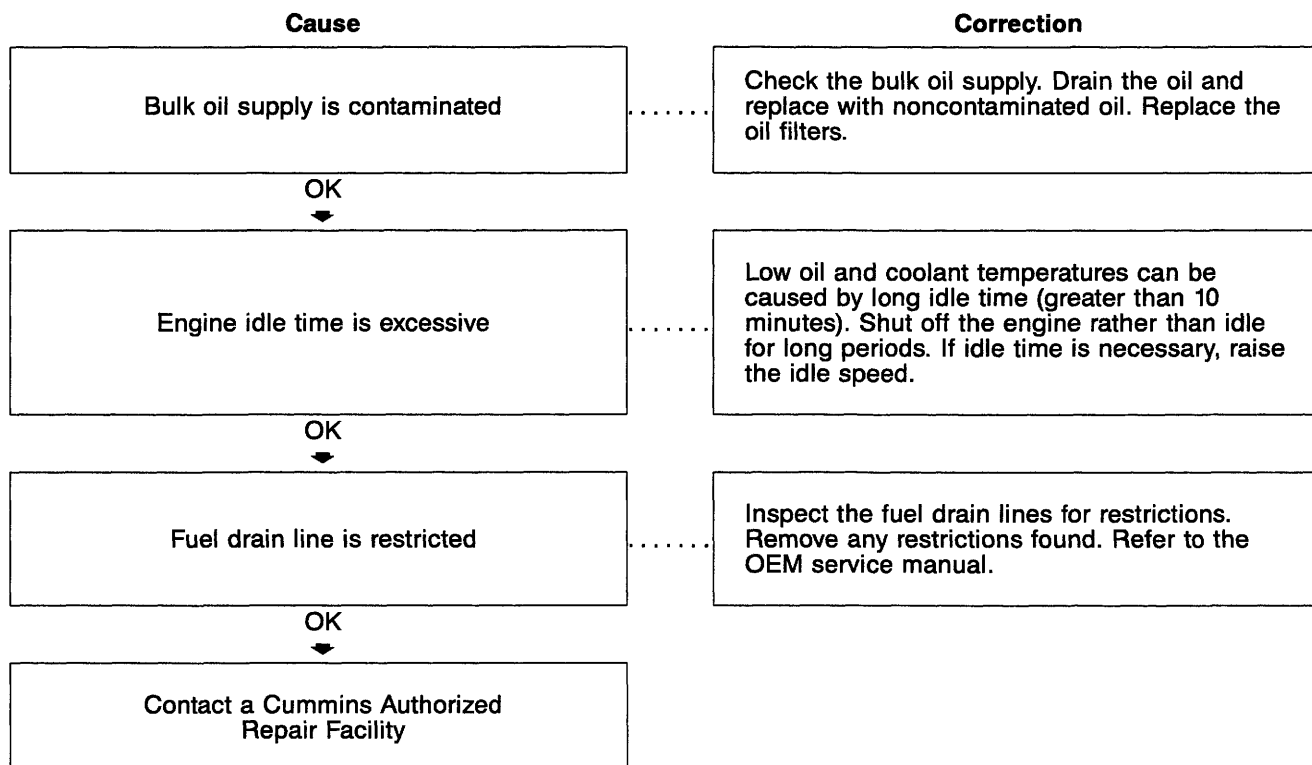
This is symptom tree t091.





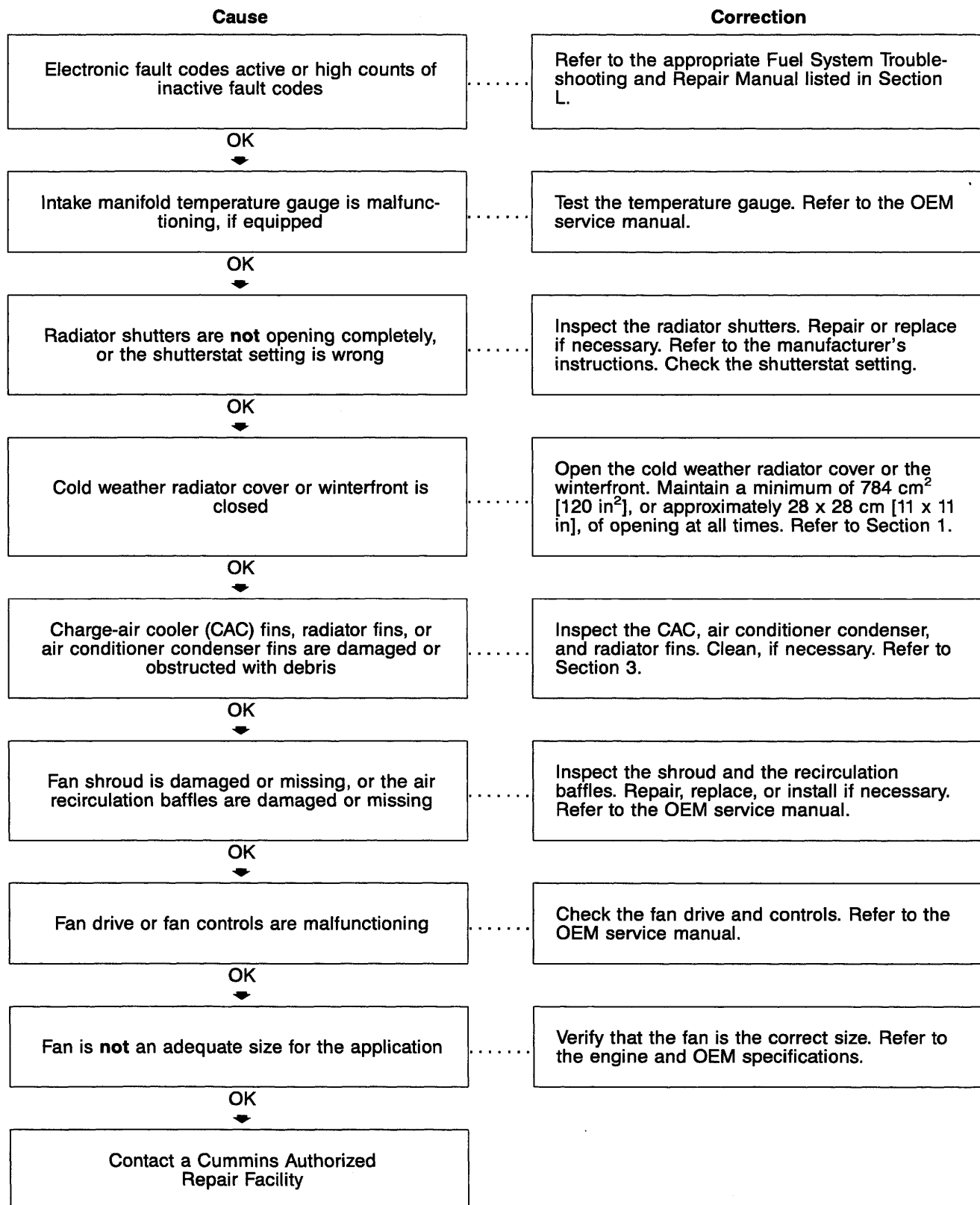
## Fuel in the Lubricating Oil

This is symptom tree t092.



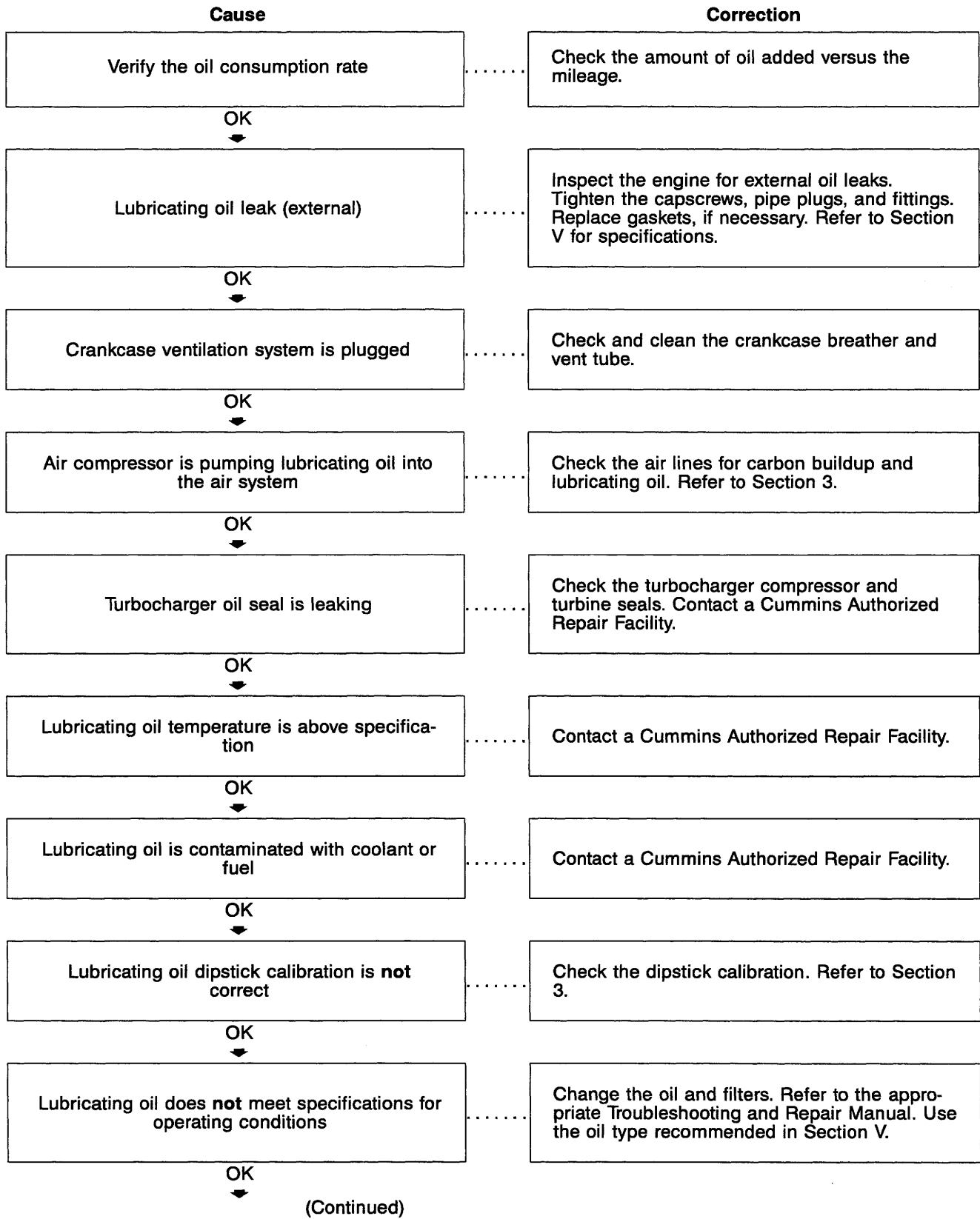
## Intake Manifold Air Temperature Above Specification

This is symptom tree t096.

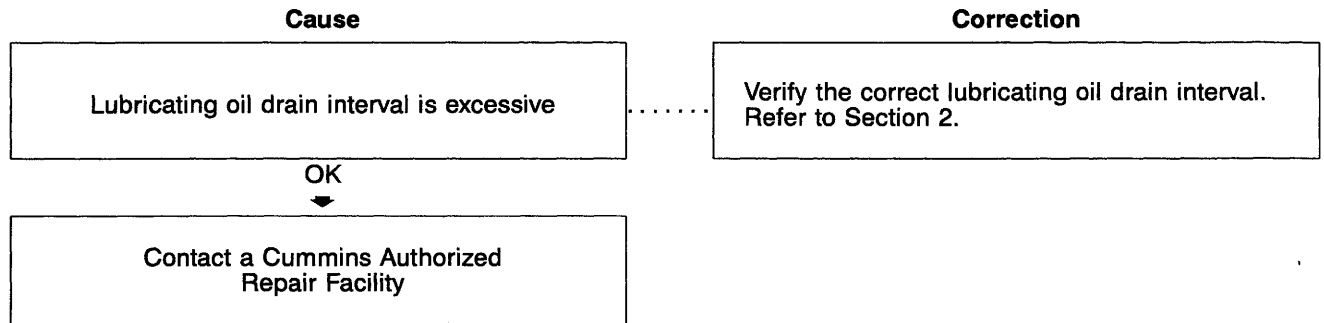


## Lubricating Oil Consumption Excessive

This is symptom tree t102.

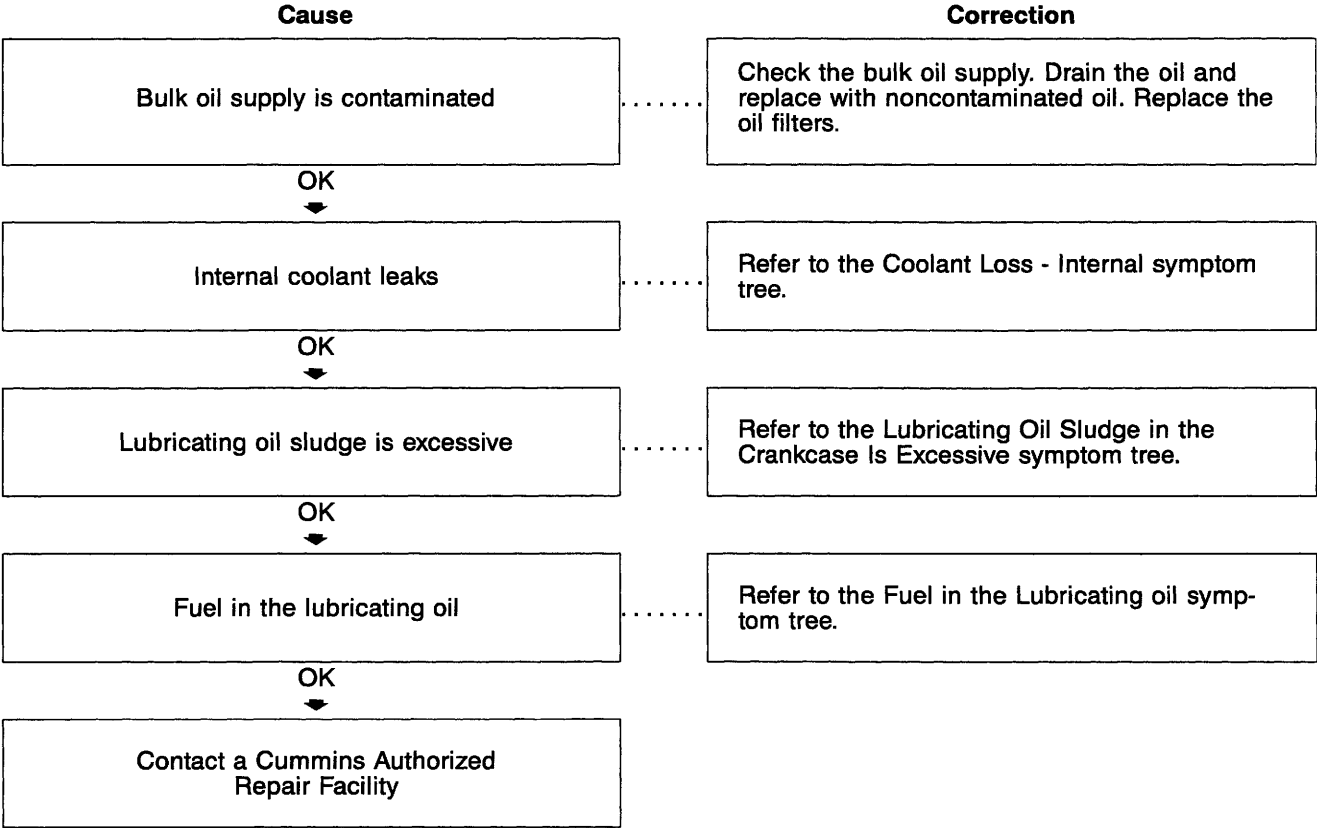


**Lubricating Oil Consumption Excessive (Continued)**



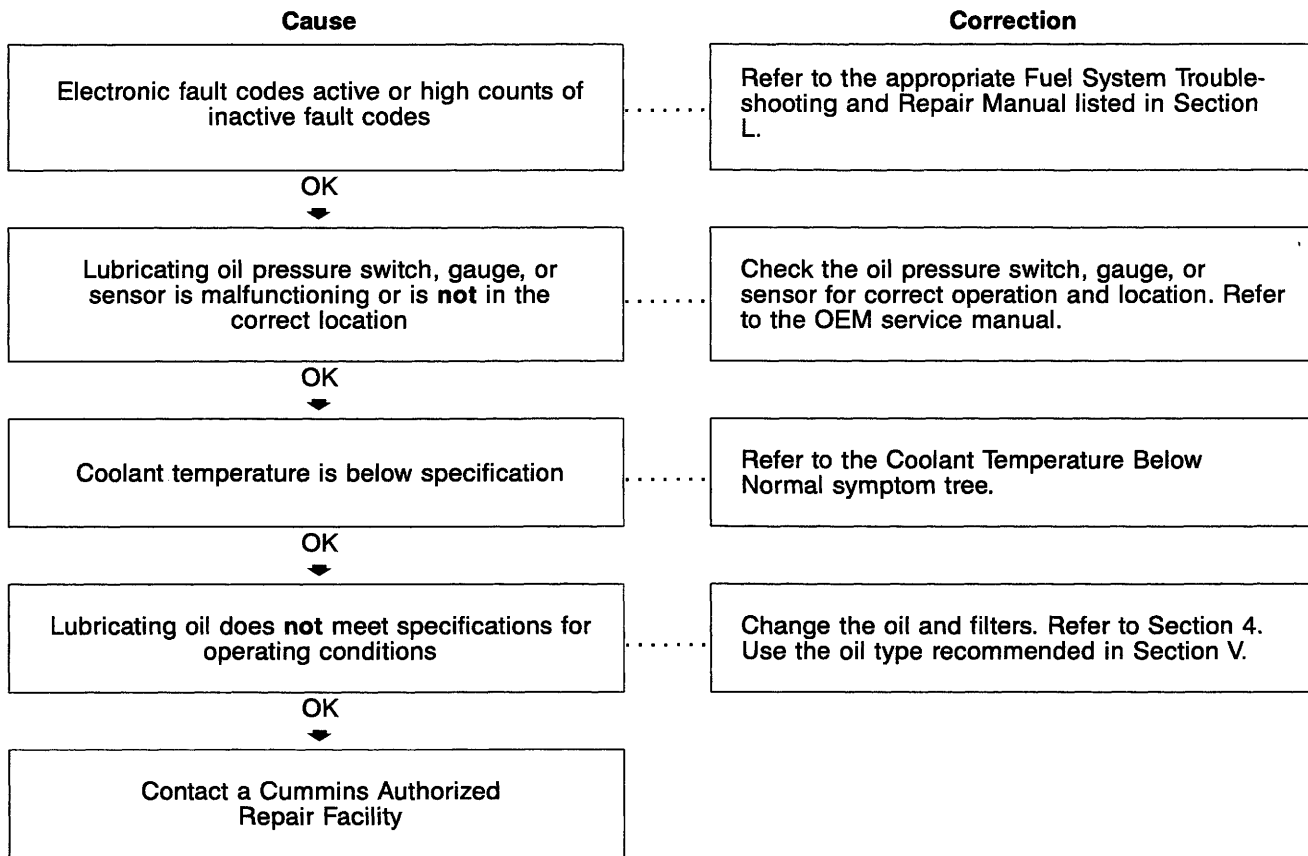
**Lubricating Oil Contaminated**

This is symptom tree t103.



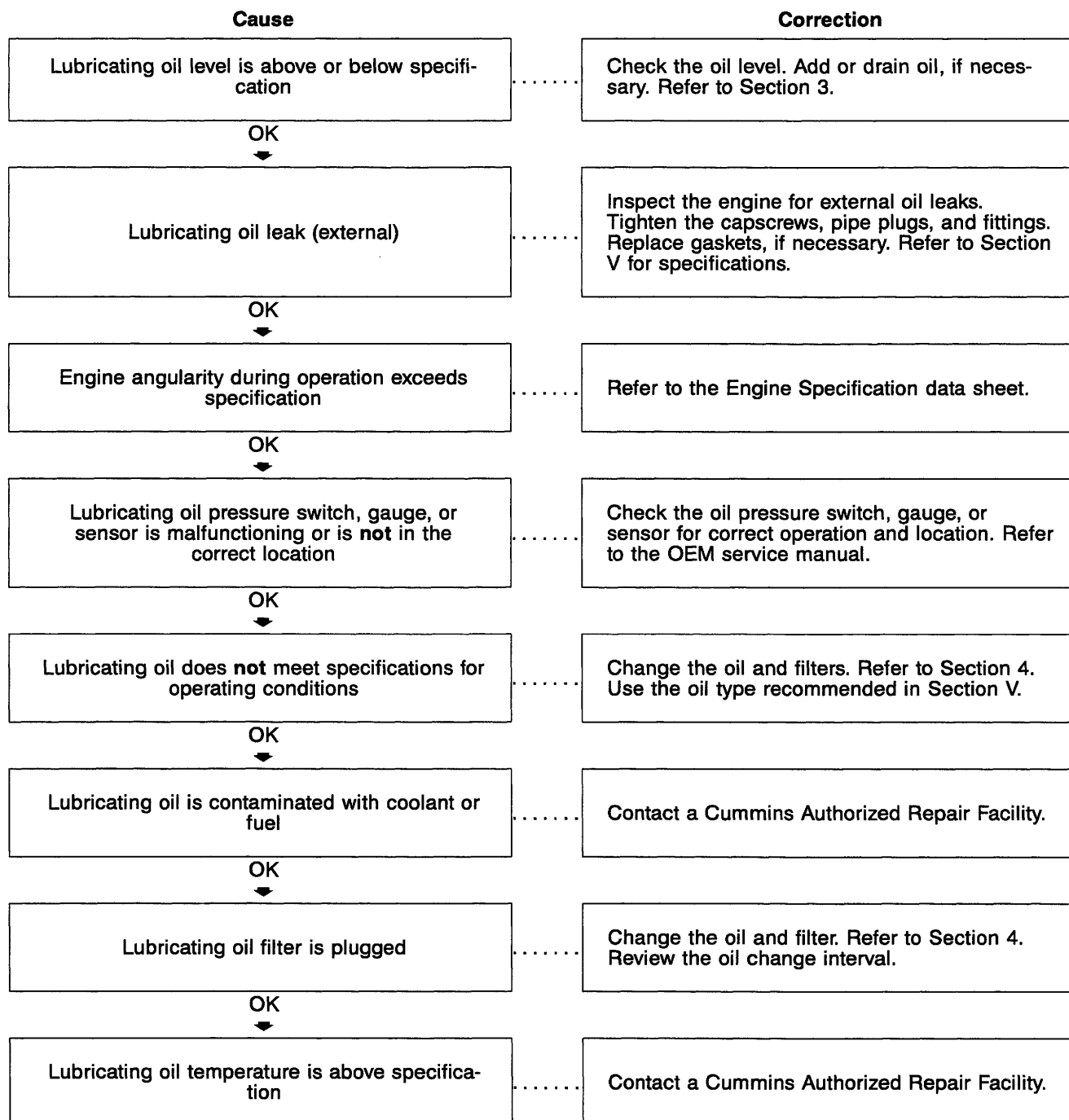
### Lubricating Oil Pressure High

This is symptom tree t104.



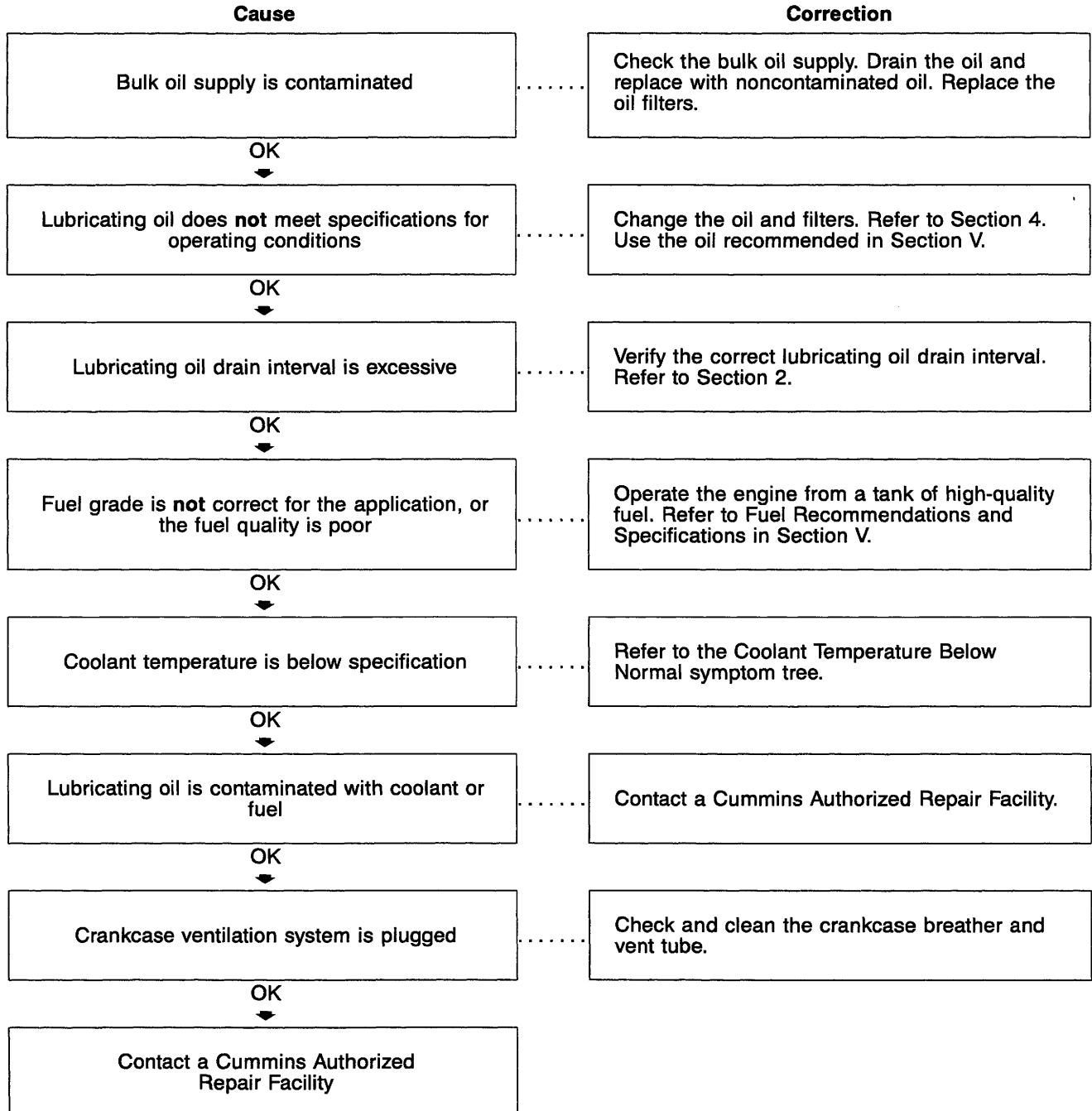
## Lubricating Oil Pressure Low

This is symptom tree t105.



### Lubricating Oil Sludge in the Crankcase Excessive

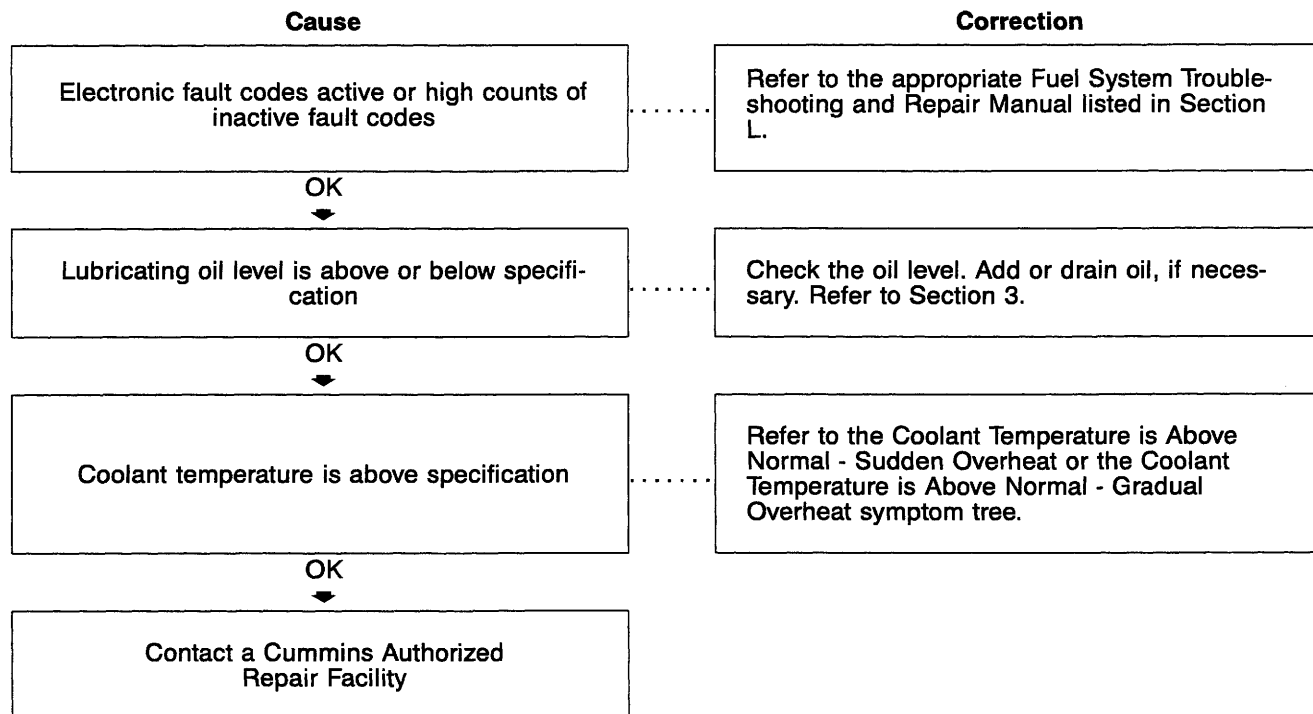
This is symptom tree t106.





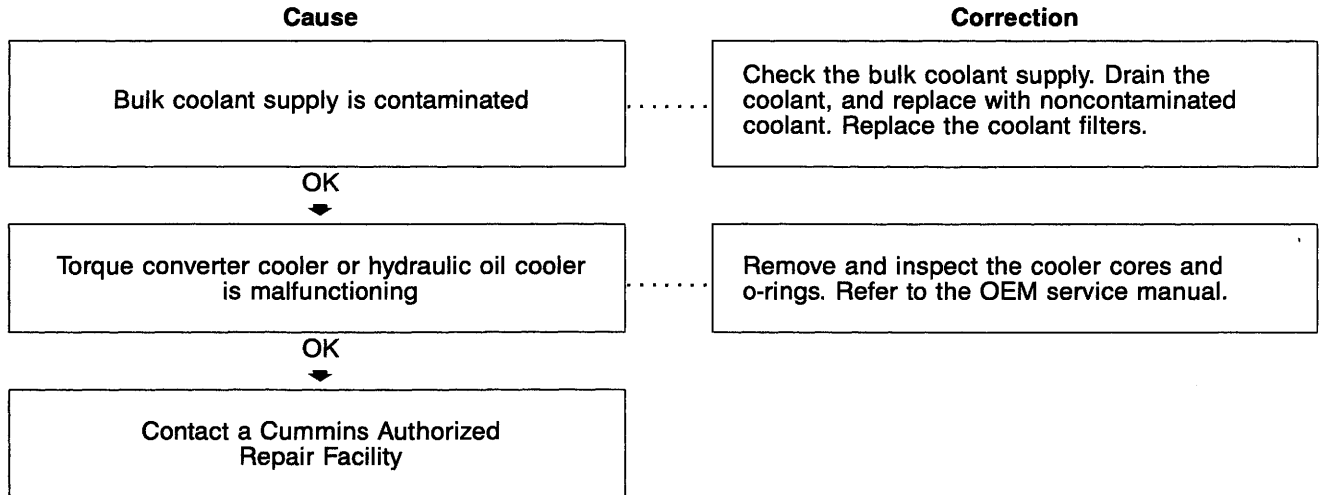
### Lubricating Oil Temperature Above Specification

This is symptom tree t107.



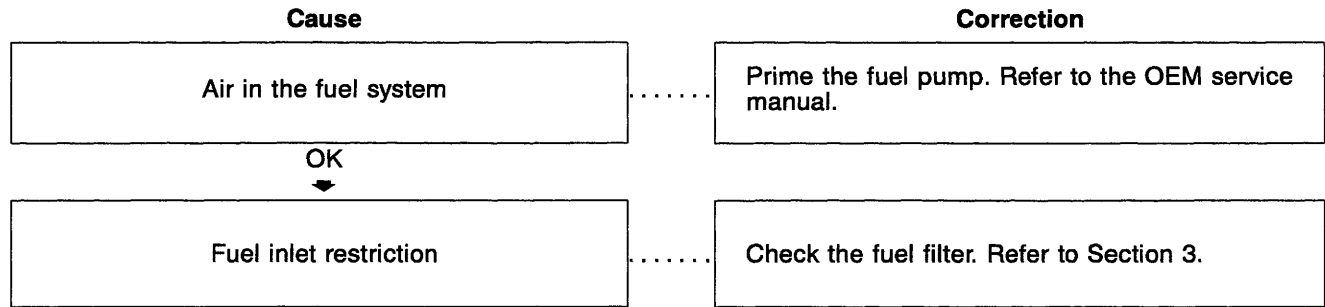
### Lubricating or Transmission Oil in the Coolant

This is symptom tree t108.



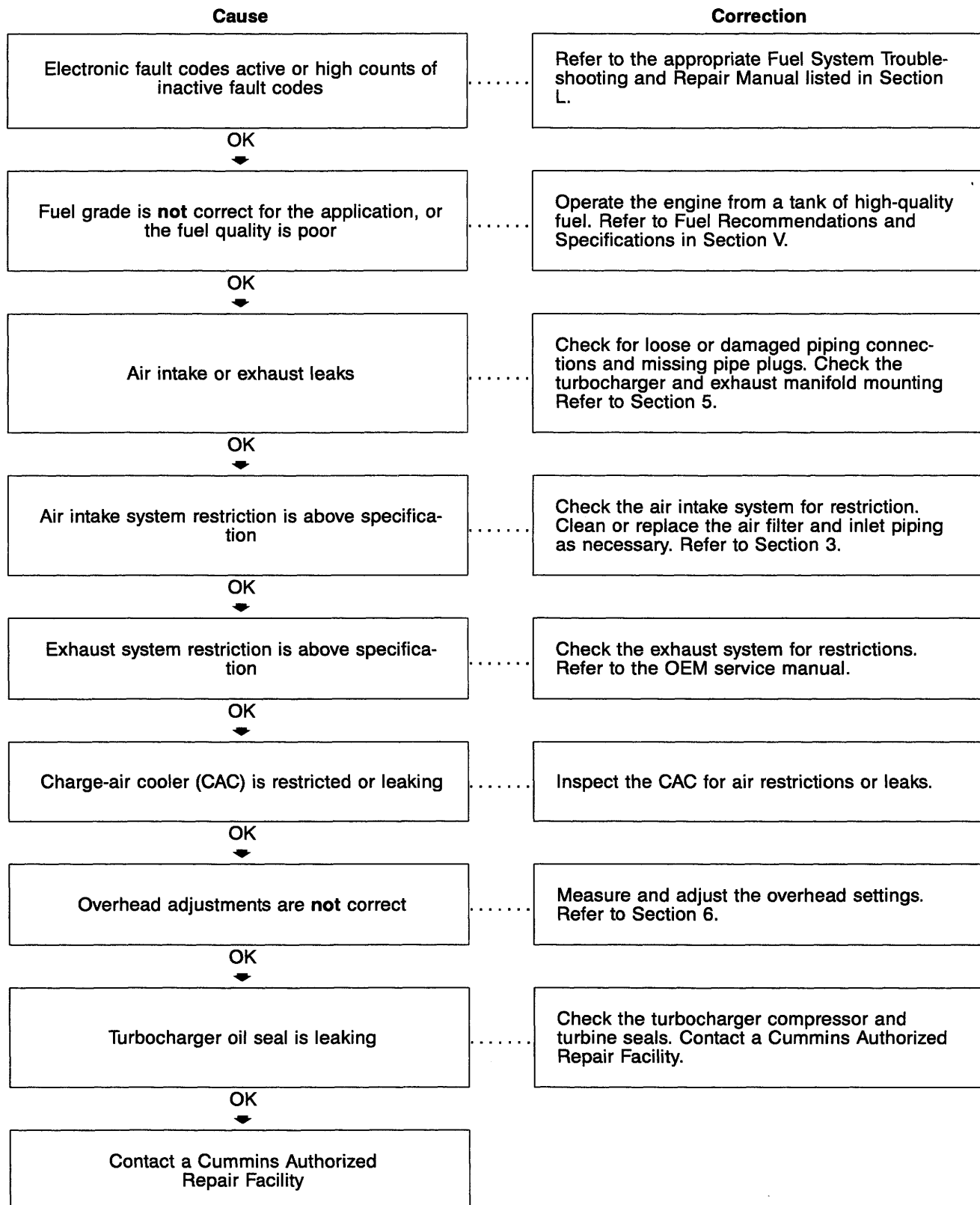
### Operating Fuel Pressure is Low

This is symptom tree t109.



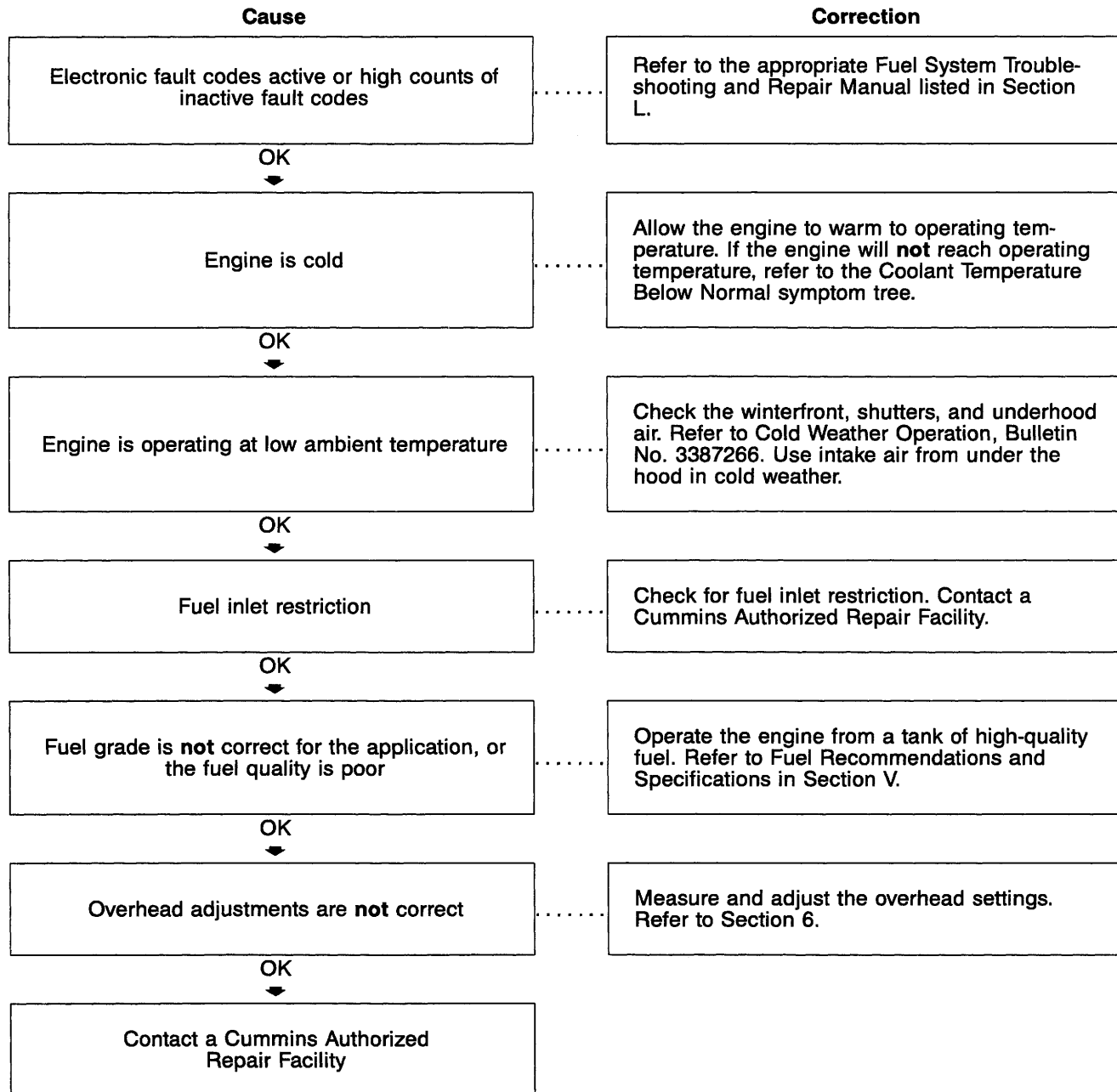
## Smoke, Black — Excessive

This is symptom tree t116.



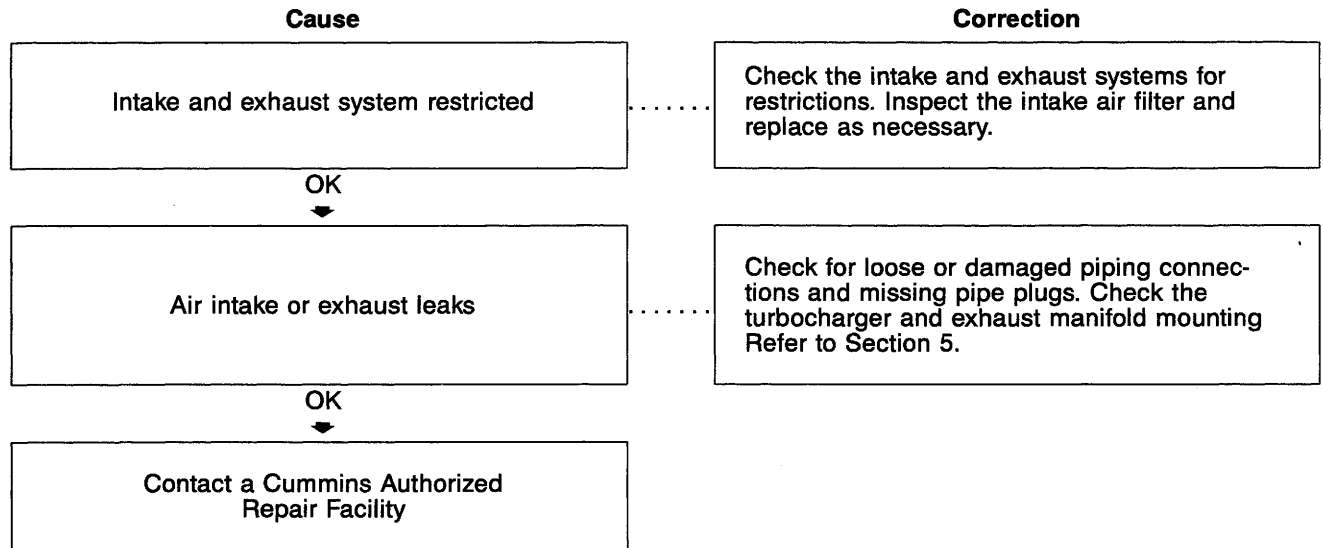
### Smoke, White — Excessive

This is symptom tree t118.



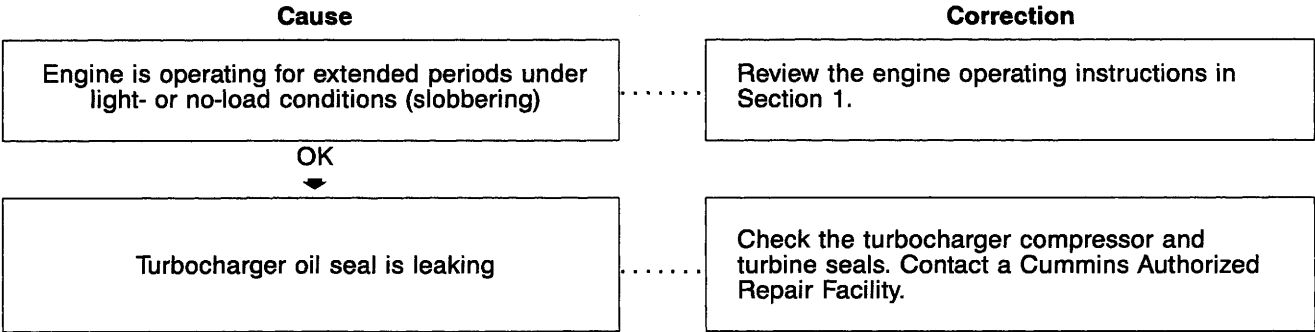
### Turbocharger Boost Pressure Low

This is symptom tree t121.



Turbocharger Leaks Engine Oil or Fuel

This is symptom tree t122.



## Section V - Maintenance Specifications

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## Specifications

### General Specifications

Listed below are general specifications for this engine.

Horsepower .....	Refer to the engine dataplate
Engine Speed .....	Refer to the engine dataplate
Displacement .....	15 liters [912 C.I.D.]
Bore and Stroke .....	137 mm [5.40 in] x 169 mm [6.65 in]
Dry Engine Weight:	
Power Generation .....	1370 kg [3020 lb]
Industrial .....	1524 kg [3360 lb]
Wet Engine Weight:	
Power Generation .....	1475 kg [3250 lb]
Industrial .....	1628 kg [3590 lb]
Firing Order .....	1-5-3-6-2-4
Crankshaft Rotation (viewed from front of engine) .....	<b>Clockwise</b>
Overhead Adjustment:	
Intake Valve Adjustment .....	0.36 mm [0.014 in]
Exhaust Valve Adjustment .....	0.69 mm [0.027 in]
Injector Lash Adjustment Torque .....	8 N•m [70 in-lb]
Engine Brake Adjustment .....	7.0 mm [0.276 in]

### Fuel System

Maximum Allowable Restriction to Pump with or without Fuel Cooler:	
With Clean Filter .....	203 mm Hg [8 in Hg]
With Dirty Filter .....	305 mm Hg [12 in Hg]
Maximum Allowable Fuel Return Line Restriction .....	229 mm Hg [9.0 in Hg]
Minimum Allowable Fuel Tank Vent Capability .....	2.0 m <sup>3</sup> /hr [70 ft <sup>3</sup> /hr]
Maximum Allowable Fuel Inlet Temperature .....	71°C [160°F]
Fuel Shutoff Solenoids' Resistance .....	7 to 8 ohms

### Lubricating Oil System

Oil Pressure at Idle (minimum allowable at 93°C [200°F] oil temperature) .....	103 kPa [15 psi]
Oil Pressure at No-Load Governed Speed (industrial <b>only</b> ) .....	241 to 276 kPa [35 to 40 psi]
Oil Capacity of Standard Engine:	
Combination Full-Flow/Bypass Filter Capacity .....	3.78 liters [1 gal]
Oil Pan Capacity:	
Power Generation (OP 1493)	
High .....	94.6 liters [25 gal]
Low .....	83.3 liters [22 gal]
Oil Change Capacity (oil pan and filter filled to capacity) .....	98.4 liters [26 gal]
Oil Pan Capacity:	
Industrial	
High .....	41.6 liters [11 gal]
Low .....	34.1 liters [9 gal]
Oil Change Capacity (oil pan and filter filled to capacity) .....	45.4 liters [12 gal]
Total Lubricating Oil System Capacity Including Filter:	
Power Generation (OP 1493) .....	98.4 liters [26 gal]
Industrial .....	45.4 liters [12 gal]
Oil Pressure Range:	
Cold Engine .....	Up to 900 kPa [130 psi]
Warm Engine .....	241 to 276 kPa [35 to 40 psi]

## Cooling System

Coolant Capacity (engine <b>only</b> )	24 liters [25 qt]
Standard Modulating Thermostat Range	82 to 93°C [180 to 200°F]
Maximum Coolant Pressure (exclusive of pressure cap - closed thermostat at the maximum no-load governed speed)	227 kPa [33 psi]
Coolant Alarm Activation Temperature (industrial <b>only</b> )	110°C [230°F]
Maximum Allowable Top Tank Temperature:	
Industrial	102°C [215°F]
Power Generation (Standby/Prime)	110°C [230°F]/104°C [220°F]
Minimum Recommended Top Tank Temperature	70°C [158°F]
Minimum Allowable Drawdown or 11 Percent of System Capacity (whichever is greater)	2.6 liters [2.75 qt]
Minimum Recommended Pressure Cap	
Industrial	50 kPa [7 psi]
Power Generation	70 kPa [10 psi]
Minimum Fill Rate (without low-level alarm)	19 liters/min [5 gpm]
Maximum Deaeration Time	25 minutes
Fan-on Coolant Temperature (industrial <b>only</b> )	95°C [203°F]
Fan-on Intake Air Temperature (industrial <b>only</b> )	66°C [150°F]
Shutter Opening Temperature (industrial <b>only</b> ):	
Coolant	85°C [185°F]
Intake Air	60°C [140°F]

## Air Intake System



**Engine intake air must be filtered to prevent dirt and debris from entering the engine. If air intake piping is damaged or loose, unfiltered air will enter the engine and cause premature wear.**

Maximum Temperature Rise between Ambient Air and Engine Air Inlet (ambient above 0°C [32°F]):	
Industrial	-1°C [30°F]
Power Generation	6°C [43°F]
Maximum Inlet Restriction (clean filter) Normal-Duty Element:	381 mm H <sub>2</sub> O [15 in H <sub>2</sub> O]
Maximum Inlet Restriction (dirty filter)	635 mm H <sub>2</sub> O [25 in H <sub>2</sub> O]
Maximum Allowable Pressure Drop across Charge Air Cooler:	
Industrial	
psi	14 kPa [2 psi]
Hg (mercury)	102 mm Hg [4 in Hg]
Maximum Allowable Pressure Drop from Turbo Outlet to Intake Manifold:	
Power Generation	
psi	14 kPa [2 psi]
Hg (mercury)	102 mm Hg [4 in Hg]
Four-Step Wastegate Controller Solenoid Resistance (industrial <b>only</b> )	7 to 8 ohms

## Exhaust System

Maximum Allowable Exhaust Back Pressure Created by Piping and Silencer:

Industrial

- Hg (mercury) ..... 76 mm Hg [3 in Hg]  
- H<sub>2</sub>O (water) ..... 1016 mm H<sub>2</sub>O [40 in H<sub>2</sub>O]

Power Generation

-Hg (mercury) ..... 51 mm Hg [2 in Hg]  
-H<sub>2</sub>O (water) ..... 682 mm H<sub>2</sub>O [27 in H<sub>2</sub>O]

Exhaust Pipe Size (normally acceptable inside diameter):

Industrial ..... 127 mm [5 in]  
Power Generation ..... 152 mm [6 in]

## Electrical System

Minimum Recommended Battery Capacity:

System Voltage		Ambient Temperatures	
		-18°C [0°F]	
12 VDC	Industrial	Cold Cranking Amperes	Reserve Capacity* Amperes
	Power Generation	2700	360
24 VDC**	Industrial	1800	540
	Power Generation	1350	360
	Industrial	900	270
	Power Generation		

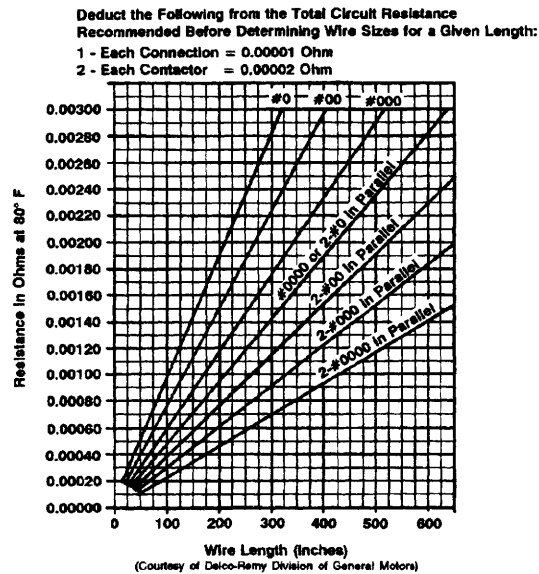
\* The number of plates within a given battery size determines reserve capacity. Reserve capacity determines the length of time that sustained cranking can occur.

\*\*CCA ratings are based on two 12-VDC batteries in series.

A minimum of 6 VDC at the OEM connector is required to power up the ECM.

## Batteries (Specific Gravity)

Specific Gravity at 27°C [80°F]	State of Charge
1.26 to 1.28	100%
1.23 to 1.25	75%
1.20 to 1.22	50%
1.17 to 1.19	25%
1.11 to 1.13	Discharged



oi800v07

Item  
Connection  
Additional Contactor  
(Series-Parallel Switch,  
Relays, etc.)

Resistance Ohms  
0.00001  
0.00020

Maximum resistance of starting motor circuit:

12-VDC Starting Motor (ohms) 0.00075

24-VDC Starting Motor (ohms) 0.002

Cable resistances can be obtained in the accompanying  
Battery Cable Resistance Chart. If the frame is in ground  
circuit, the frame length **must** be considered to be a cable  
of the same size as that used in the balance of the system.

## Cummins/Fleetguard®/Nelson Filter Specifications



**QSX engine fuel filters must have an efficiency of 98.7 percent at 10 microns.**

Fleetguard® Nelson® is a subsidiary of Cummins Engine Company, and Fleetguard® Nelson® filters are developed through joint testing at Cummins and Fleetguard® Nelson®. Fleetguard® Nelson® filters are standard on new Cummins engines and Cummins recommends their use.

Fleetguard® Nelson® products meet all of Cummins source approval test standards to provide the quality filtration necessary to achieve the engine's design life. If other brands are substituted, the purchaser **must** insist on products that the supplier has tested to meet CES 14,223 and 14,225, such as Fleetguard® Nelson® FS1007. For information on CES 14,223 and 14,225, write or call toll free:

Cummins Customer Assistance Center - 41403  
Cummins Engine Company, Inc.  
Box 3005  
Columbus, IN 47202-3005

**1-800-DIESELS**  
**(1-800-343-7357)**

Cummins can **not** be responsible for problems caused by nongenuine filters that do **not** meet Cummins' performance or durability requirements.

## Fuel Recommendations and Specifications

### General Information

#### **WARNING**

**Do not mix gasoline, alcohol, or gasahol with diesel fuel. This mixture can cause an explosion.**

Cummins Engine Company, Inc. recommends the use of ASTM No. 2 D fuel. The use of No. 2 diesel fuel will result in optimum engine performance. At operating temperatures below 0°C [32°F], acceptable performance can be obtained by using blends of No. 2 D and No. 1 D. The use of lighter fuels can reduce fuel economy.

The viscosity of the fuel **must** be kept above 1.3 cSt at 100°C [212°F] to provide adequate fuel system lubrication.

For a more detailed description of fuel properties, refer to *Fuel for Cummins Engines*, Bulletin No. 3379001. See ordering information in the back of this manual.

## Lubricating Oil Recommendations and Specifications

### General Information

The use of quality engine lubricating oils, combined with appropriate oil drain and filter change intervals, is a critical factor in maintaining engine performance and durability.

Cummins Engine Company, Inc. recommends the use of a high-quality 15W-40 multiviscosity heavy-duty engine oil that meets the requirements of Cummins Engineering Specification CES 20071 or CES 20076 (such as Valvoline® Premium Blue® or Premium Blue® 2000). American Petroleum Institute (API) specification CH-4 can be used as an alternative to CES 20071. Oils that meet API specification CG-4 can be used, but at a reduced drain interval according to the Oil Drain Intervals chart listed in Section 2. The oil grades CC, CD, CE, and CF have been obsoleted by API and should **not** be used.

Shortened drain intervals can be required with monograde oils as determined by close monitoring of the oil condition with scheduled oil sampling. Use of single-grade oils can affect engine oil control.

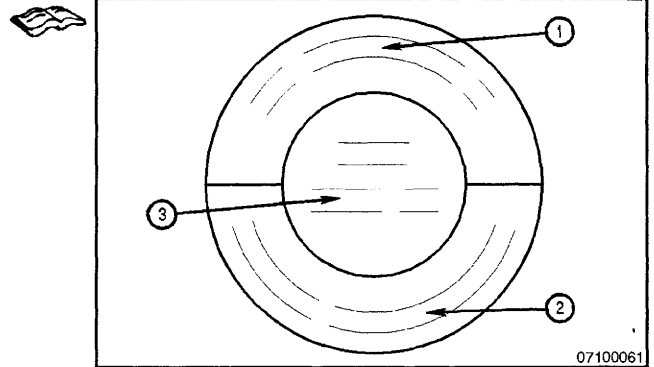
Synthetic engine oils, API category III, are recommended for use in Cummins engines operating in ambient temperature conditions consistently below -25°C [-13°F]. Above this temperature it is recommended that the petroleum-based multigrade lubricants be used. Synthetic 0W-30 oils that meet API category III can be used in operations where the ambient temperature **never** exceeds 0°C [32°F]. Multiviscosity oils rated 0W-30 do **not** offer the same level of protection against fuel dilution as do higher multigrade oils. Higher cylinder wear can be experienced when using 0W-30 oils in high-load situations.

For further details and an explanation of engine lubricating oils for Cummins engines, refer to Cummins Engine Oil Recommendations, Bulletin No. 3810340.

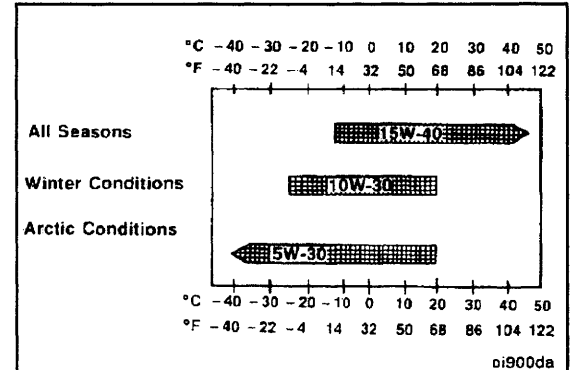
Additional information regarding lubricating oil availability throughout the world is available in the Engine Manufacturing Association (EMA) Lubricating Oils Data Book for Heavy-Duty Automotive and Industrial Engines. The data book can be ordered from Engine Manufacturers Association, One Illinois Center, 111 East Wacker Drive, Chicago, IL, U.S.A. 60601; (312) 644-6610.

The API service symbols are shown in the accompanying illustration.

1. The upper half of the symbols displays the appropriate oil categories.
2. The lower half contains words to describe oil energy-conserving features.
3. The center section identifies the SAE oil viscosity grade.



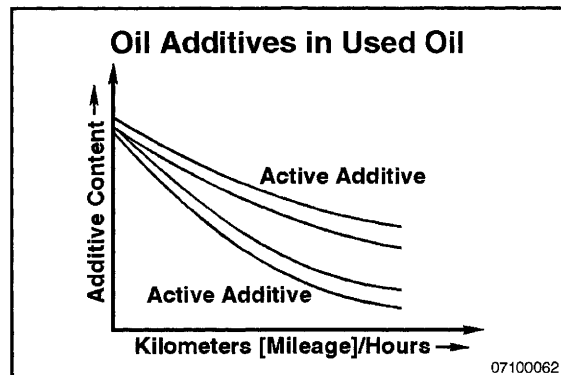
Oil viscosity should be chosen according to the typical climate conditions experienced by the user. Use of 15W-40 is recommended for the best engine durability at higher ambient temperature. For temperate or cold conditions, 10W-30 or 5W-30 viscosity can be used for easier starting, improved oil flow, and improved fuel economy.





## New Engine Break-in Oils

Special "break-in" engine lubricating oils are **not** recommended for new or rebuilt Cummins engines. In general, use the same oil during break-in as that used in normal operation. Synthetic or partially synthetic engine lubricating oils, however, can **not** be used during break-in of a new or rebuilt engine. To make sure the piston rings seat properly, use a high-quality, petroleum-based engine lubricating oil during the first engine oil drain period.



## Oil Drain Intervals

### Industrial Applications

As the engine oil becomes contaminated, essential oil additives are depleted. Lubricating oils protect the engine as long as these additives are functioning properly. Progressive contamination of the oil between oil and filter change intervals is normal. The amount of contamination will vary depending on the operation of the engine, kilometers or miles on the oil, fuel consumed, and new oil added.

**NOTE:** Extending the oil and filter change interval beyond the recommendation will decrease engine life due to factors such as corrosion, deposits, and wear.

Refer to the oil drain chart in Section 2 to determine which oil drain interval to use for your application.

## ⚠ CAUTION ⚠

**The use of synthetic-base oil does not justify extended oil change intervals. Extended oil change intervals can decrease engine life due to factors such as corrosion, deposits, and wear.**

Maximum oil drain intervals are based upon the use of fuel with 0.05-percent sulfur. Refer to Cummins Engine Oil Recommendations, Bulletin No. 3810340, for further details. If there are any questions about fuel sulfur content, ask your fuel supplier to provide a written analysis of the fuel.

The lubricating oil filter is to be replaced at each oil drain with a high-quality filter that meets the Cummins Source Approval Method 10,765 specification, including the cold-flow specifications.

### Aftermarket Oil Additive Usage

Cummins Engine Company does **not** recommend the use of aftermarket oil additives. Present high-quality fully additive engine lubricating oils are very sophisticated, with precise amounts of additives blended into the lubricating oil to meet stringent requirements defined by Cummins Engineering Specification CES 20071 that is similar to API CH-4 and in CES 20076. These furnished oils meet performance characteristics that conform to the lubricant industry's standards. Aftermarket lubricating oil additives are **not** necessary to enhance engine oil performance and in some cases can reduce the finished oil's capability to protect the engine.

## Arctic Operation

### General Information

If an engine is operated in ambient temperatures consistently below -23°C [-10°F] and there are no provisions to keep the engine warm when it is **not** in operation, use a synthetic CF-4/SG or CG-4/SH engine oil with adequate low-temperature properties, such as 5W-30.

The oil supplier **must** be responsible for meeting the performance service specifications.

### **△ CAUTION △**

The use of a synthetic-base oil does not justify extended oil change intervals. Extended oil change intervals can decrease engine life due to factors such as corrosion, deposits, and wear. Use oil meeting CES 20,076 for maximum oil change interval.

## Lubricating Oil Filter (Spin-On)

### General Specifications

Cummins Engine Company, Inc. requires a lubricating oil filter be used that meets Cummins Source Approval Method 10,765.

**NOTE:** Lubricating oil filter LF9000 (Cummins Part No. 3406810) meets these specifications.

For information on Cummins Source Approval Method 10,765, write or call toll free:

Cummins Customer Assistance Center - 41403  
Cummins Engine Company, Inc.  
Box 3005  
Columbus, IN 47202-3005

**1-800-DIESELS**  
(1-800-343-7357)

or contact Fleetguard® Nelson® at:

**1-800-22FILTER**  
(1-800-223-4583)

Cummins can **not** be responsible for problems caused by nongenuine filters that do **not** meet Cummins performance or durability requirements.

## Coolant Recommendations and Specifications

### General Information

Cummins **strongly** recommends the use of fully formulated antifreeze or coolant containing a precharge of supplemental coolant additive (SCA). The antifreeze or coolant **must** meet the specifications outlined in The Maintenance Council (TMC) Recommended Practice (RP) 329 (ethylene glycol) or RP 330 (propylene glycol). The use of fully formulated antifreeze or coolant significantly simplifies cooling system maintenance.

Copies of TMC specifications can be obtained through Cummins Engine Company, Inc., or by contacting:

**The Maintenance Council  
American Trucking Association  
2200 Mill Road  
Alexandria, VA 22314-5388  
Phone: (703) 838-1763  
Fax: (703) 836-6070**

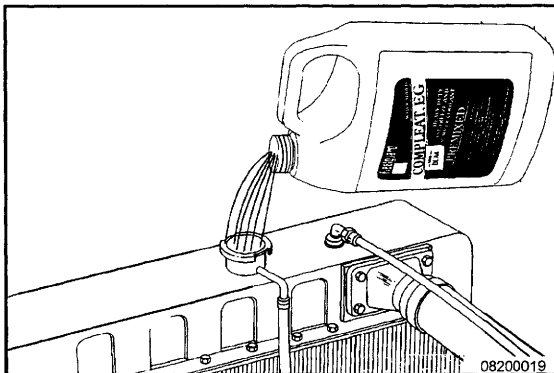
Fully formulated **antifreeze** contains balanced amounts of antifreeze, SCA, and buffering compounds, but does **not** contain 50-percent water. Fully formulated **coolant** contains balanced amounts of antifreeze, SCA, and buffering compounds already premixed 50/50 with deionized water.

Fleetguard® Nelson®'s Extended Service (ES) Cooling System maintenance is described in Cummins Service Bulletin 3666209.

The following pages will give an explanation of water, antifreeze, and SCA. They will also explain how to test antifreeze and SCA levels.

### ⚠ CAUTION ⚠

The QSX15 engine uses aluminum parts that are in contact with the coolant. Improper coolant, coolant filter selection, and maintenance will likely result in perforation of one of these parts.



### Fully Formulated Coolant/Antifreeze

Cummins Engine Company, Inc. recommends using either a 50/50 mixture of good-quality water and fully formulated antifreeze, or fully formulated coolant when filling the cooling system. The fully formulated antifreeze or coolant **must** meet TMC RP329 or TMC RP330 specifications.

**NOTE:** Use of products meeting TMC RP329 or RP330 is necessary for 50,000-mile and 150,000-mile service intervals.

**NOTE:** Low-silicate antifreeze meeting ASTM D4985 is inadequate for these extended service intervals.

Water Quality	
Calcium Magnesium (Hardness)	Maximum 170 ppm as (CaCO <sub>3</sub> + MgCO <sub>3</sub> )
Chloride	40 ppm as(Cl)
Sulfur	100 ppm as (SO <sub>4</sub> )

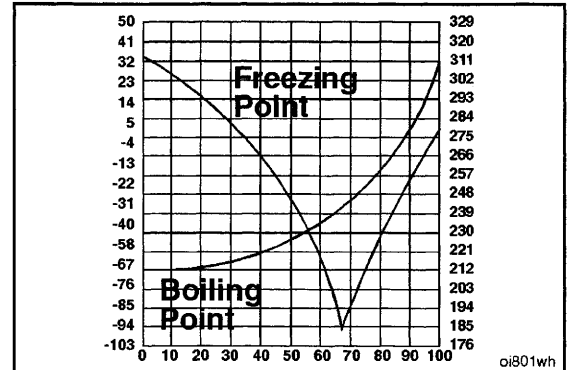
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Good-quality water is important for cooling system performance. Excessive levels of calcium and magnesium contribute to scaling problems, and excessive levels of chlorides and sulfates cause cooling system corrosion.

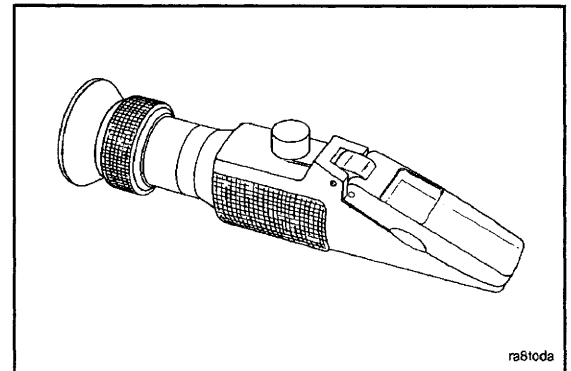
Cummins Engine Company, Inc. recommends using Fleetguard® Nelson® Compleat. It is available in glycol forms (ethylene and propylene) and complies with TMC RP329 and RP330 standards.



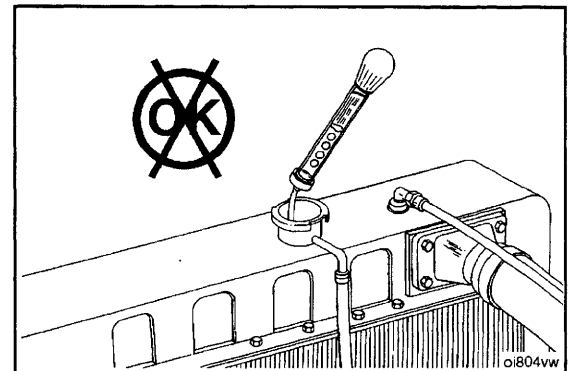
Fully formulated antifreeze **must** be mixed with quality water at a 50/50 ratio (40-percent to 60-percent working range). A 50/50 mixture of antifreeze and water gives a  $-36^{\circ}\text{C}$  [ $-34^{\circ}\text{F}$ ] freezing point and a  $110^{\circ}\text{C}$  [ $228^{\circ}\text{F}$ ] boiling point, which is adequate for locations in North America. The actual lowest freezing point of ethylene glycol anti-freeze is 68 percent. Using higher concentrations of anti-freeze will raise the freezing point of the solution and increase the possibility of a silica gel problem.

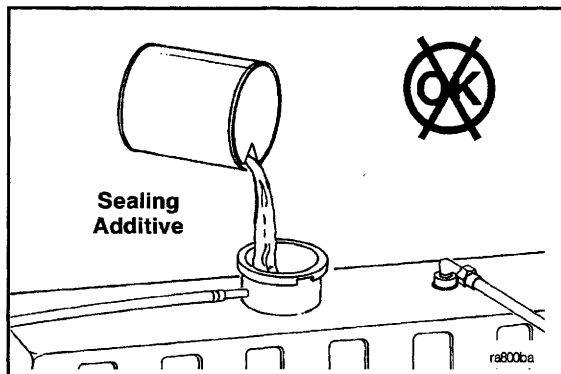


A refractometer **must** be used to measure the freezing point of the coolant **accurately**.



Do **not** use a floating ball hydrometer. Using a floating ball hydrometer can give an incorrect reading.

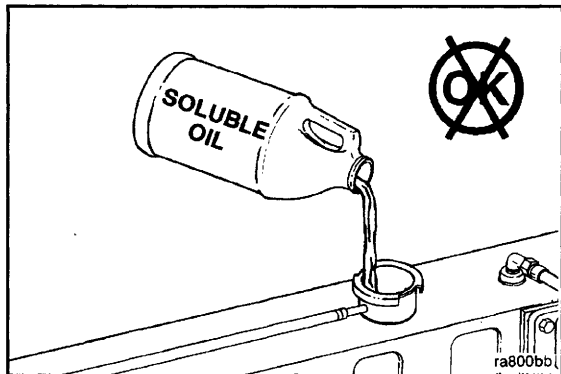




### Cooling System Sealing Additives

Do **not** use sealing additives in the cooling systems. The use of sealing additives can:

- Build up in coolant low-flow areas
- Clog coolant filters
- Plug radiator and oil cooler.



### Cooling System Soluble Oils

Do **not** use soluble oils in the cooling system. The use of soluble oils can:

- Allow cylinder liner pitting
- Corrode brass, aluminum, and copper
- Damage heat transfer surfaces
- Damage seals and hoses.

## Fleetguard® Nelson® DCA4 Service Filters and Liquid Precharge

### QSX Series Coolant Filter Options

**WF2125** – This filter is designed for use with Fleetguard® Nelson®'s extended service cooling system, which extends cooling system service to 1 year, 150,000 miles, or 4000 hours, whichever comes first. This filter is used for cooling systems up to 20 gallons. Refer to Cummins Service Bulletin No. 3666209. Fleetguard® Nelson® ES coolant **must** be used for all fill and top-off, which is critical for extended cooling system maintenance intervals.

**WF2126** – This filter is designed for extended service intervals up to 50,000 miles when using TMC RP329 or RP330 coolants and is used for cooling systems up to 20 gallons. Refer to Cummins Service Bulletin No. 3666132, Section 3.

**WF2127** – This filter has been designed for extended service intervals of 50,000 to 150,000 miles. It has no chemical additives and can be used in the following systems:

- Cooling systems above 20 gallons in capacity.
- See maintenance chart below.

**When using WF2127 filter, the following volumes of treatment must be added at the designated mileages:**

Cooling System Capacity	50,000-Mile Service Interval with RP329/330 Coolant or Treated Water (Fleetcool or DCA4)	150,000-Mile Service Interval with ES Coolant (ES Liquid)
0 to 20 gallons	1 qt (10 units)	1 qt (15 units)
20 to 40 gallons	2 qt (20 units)	2 qt (30 units)
40 to 60 gallons	3 qt (30 units)	3 qt (45 units)
60 to 80 gallons	4 qt (40 units)	4 qt (60 units)
80 to 100 gallons	5 qt (50 units)	5 qt (75 units)

**NOTE:** Filters **must** meet Cummins SAM 10,769. Fleetguard® Nelson® filters meet Cummins SAM 10,769.

**NOTE:** The standard filter for the Signature engine is Fleetguard® Nelson® WF2126.

**NOTE:** For systems larger than 100 gallons, use 1 quart per 20 gallons.

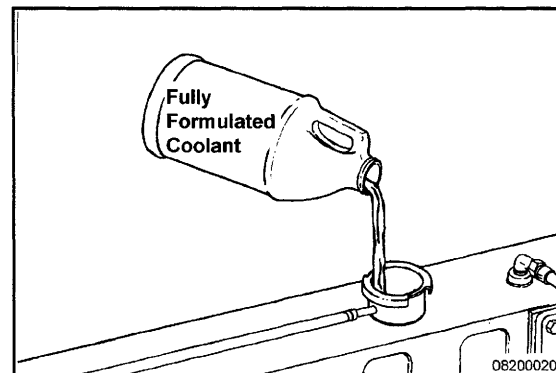
**NOTE:** Consult vehicle manufacturer for total cooling system capacity.

### Supplemental Coolant Additive (SCA)



The QSX engine uses aluminum parts that are in contact with the coolant. Improper coolant, coolant filter selection, and maintenance will likely result in perforation of one of these parts. Insufficient concentration of the coolant additives will result in liner pitting and engine failure.

Fully formulated products contain SCAs and are required to protect the cooling system from scale and fouling, solder blooming, and general corrosion. The coolant filter is required to protect the cooling system from abrasive materials, debris, and precipitated coolant additives.



### Testing SCA Concentration Level CC-2602 Test Kit

Carefully follow the instructions to test the coolant and take the appropriate action recommended by the kit.

- The coolant sample to be tested **must** be between 10 and 54 °C [50 and 130 °F]. If the sample is too cold or too hot, you will get incorrect results.
- To get the best color match results, compare test strip pads to the color chart in daylight or under cool white fluorescent lighting. If unsure about a specific color match when a test does fall between two colors on the color chart, choose the lower numbered block. It is safer to underestimate your results than to overestimate.
- The test strips do have a limited shelf life and are sensitive to humidity and extreme heat. Proper handling and storage is necessary to protect the life of the strips.
- Keep the cap tightly sealed on the test strip bottle **except** when removing a strip. Store away from direct sunlight and in an area where the temperature will generally stay below 32°C [90°F].
- Do **not** use the test strips after the expiration date stamped on the bottle.

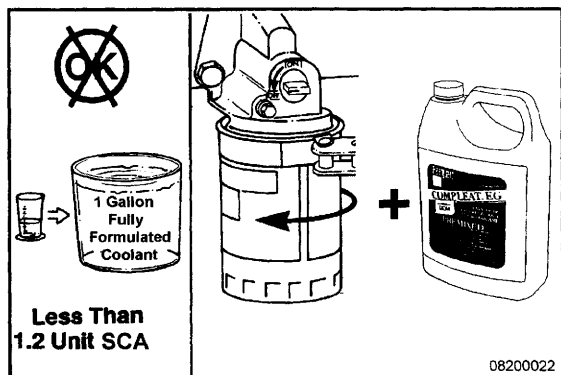
- Discard the kit if any of the pads on the unused strips have turned light brown or pink.
- Use one strip at a time and take care **not** to touch any of the pads on the strip. Doing so will contaminate the pads and skew the test results.
- If the strip container is left uncapped for 24 hours, moisture in the air will render the strips useless, even though no discoloration will be evident.
- **Only** use the color chart supplied with the kit.
- Clean and dry the sample cup and syringe after each use. This will prevent contaminating future samples.
- Following the correct test times is very important. Use a clock or stopwatch.
- Do **not** utilize the test kit to maintain minimum SCA concentration levels (i.e., 1.5 units).
- When performing service that requires draining the cooling system, take special precautions to collect coolant in a clean container, seal coolant to prevent contamination, and save for reuse.

#### Coolant Testing

- Probablizer:
  - 3318169S Plug – Installs on the engine for easy coolant sampling
  - 3318168S Cap – Use with Monitor C bottle to sample coolant
  - CC2700 Monitor C™ – Lab analysis of coolant samples for more detailed analysis.

#### CC2602 Coolant Test Kit

- Works with any SCA formulation. (Call 1-800-521-4005 if you have this test kit and the color chart does **not** show the number of units of SCA gallon of coolant.)



#### Test Intervals



#### WARNING



**Do not remove the pressure cap from a hot engine. Wait until coolant temperature is below 50°C [120°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.**

Testing is recommended if the operator is **not** sure of his cooling system condition due to leaks, uncontrolled topping off of the system, or major coolant loss.

If the concentration is below 1.2 units per gallon, replace the filter and precharge with liquid.

Check the SCA concentration level at least every 6 months, and anytime the coolant condition is unknown or corrosion is apparent within the cooling system.

Use Fleetguard® Nelson® coolant test kit, CC2602, to check the concentration level. Instructions are included with the test kit.

**Call the following numbers to get answers to any questions you have about cooling system maintenance:**

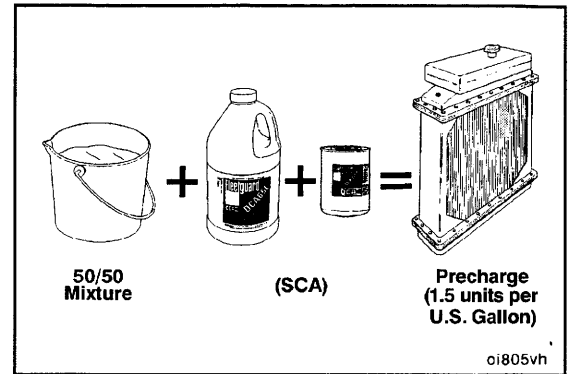
**Cummins**  
**1-800-DIESELS**  
**1-800-343-7357**

**Fleetguard®**  
**Nelson®**  
**1-800-22FILTER**  
**1-800-223-4583**

### Coolant Replacement Requirements

Drain and flush the cooling system after 6000 hours or 3 years of service. However, if Fleetguard® Nelson®'s ES coolant and ES filters are used, check chloride, sulfate, and pH levels according to Service Bulletin to determine whether the coolant **must** be replaced. Refer to Bulletin No. 3666209. Refill with either new fully formulated coolant or ES coolant.

**NOTE:** Dispose of used coolant/antifreeze in accordance with federal, state, and local laws and regulations.





## Engine Component Torque Values

Component	Wrench Size	Torque Value	
		N•m	ft-lb
Oil Pan Drain Plug		47	35
Rocker Cover Capscrews	10 mm	25	16
Air Intake Piping V-Band Clamps	7/16	8.5	75 in-lb
Injector Adjusting Screw Locknut	24 mm	75	55
Injector Adjusting Screw	8 mm	8	70 in-lb
Valve Adjusting Screw	6 mm	0.6	5 in-lb
Valve Adjusting Screw Locknut	19 mm	45	33
Engine Brake Adjusting Screw	3 mm	N/A	N/A
Engine Brake Adjusting Screw Locknut	13 mm	20	15
Turbocharger Oil Drain Capscrews	13 mm	25	16
Turbocharger Male Union Elbow	22 mm	30	22
Turbocharger Oil Supply Line Fitting	21 mm	30	22
Turbocharger V-Band Clamps	7/16	8.5	75 in-lb
Turbocharger Mounting Nuts	15 mm	60	45

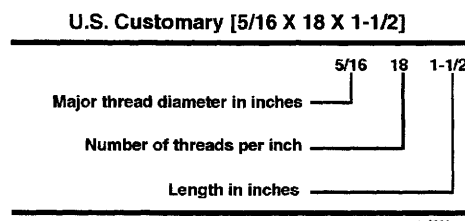
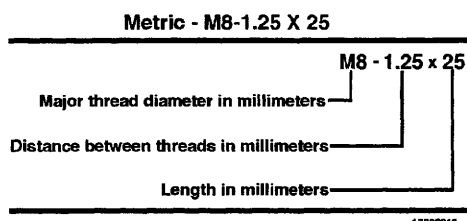
## Capscrew Markings and Torque Values

### △ CAUTION △

When replacing capscrews, always use a capscrew of the same measurement and strength as the capscrew being replaced. Using the wrong capscrews can result in engine damage.

Metric capscrews and nuts are identified by the grade number stamped on the head of the capscrew or on the surface of the nuts. U.S. Customary capscrews are identified by radial lines stamped on the head of the capscrew.

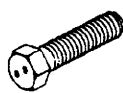
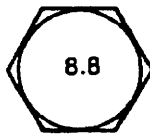
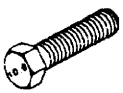

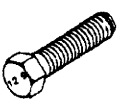

The following examples indicate how capscrews are identified:



### NOTES:

1. **Always** use the torque values listed in the following tables when specific torque values are **not** available.
2. Do **not** use the torque values in place of those specified in other sections of this manual.
3. The torque values in the table are based on the use of lubricated threads.
4. When the ft-lb value is less than 10, convert the ft-lb value to in-lb to obtain a better torque with an in-lb torque wrench. Example: 6 ft-lb equals 72 in-lb.

## Capscrew Markings and Torque Values - Metric


Commercial Steel Class														
8.8					10.9				12.9					
Capscrew Head Markings														
														
Body Size		Torque				Torque				Torque				
Diameter		Cast Iron		Aluminum		Cast Iron		Aluminum		Cast Iron		Aluminum		
mm		N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	
6		9	5	7	4	13	10	7	4	14	9	7	4	
7		14	9	11	7	18	14	11	7	23	18	11	7	
8		23	17	18	14	33	25	18	14	40	29	18	14	
10		45	33	30	25	65	50	30	25	70	50	30	25	
12		80	60	55	40	115	85	55	40	125	95	55	40	
14		125	90	90	65	180	133	90	65	195	145	90	65	
16		195	140	140	100	280	200	140	100	290	210	140	100	
18		280	200	180	135	390	285	180	135	400	290	180	135	
20		400	290	—	—	550	400	—	—	—	—	—	—	

Capscrew Markings and Torque Values - U.S. Customary


SAE Grade Number

Capscrew Head Markings


These are all SAE Grade 5 (3 line)



5



8



Capscrew Torque - Grade 5 Capscrew

Capscrew Torque - Grade 8 Capscrew

Capscrew Body Size	Cast Iron		Aluminum		Cast Iron		Aluminum	
	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
1/4 - 20	9	7	8	6	15	11	8	6
1/4 - 28	12	9	9	7	18	13	9	7
5/16 - 18	20	15	16	12	30	22	16	12
5/16 - 24	23	17	19	14	33	24	19	14
3/8 - 16	40	30	25	20	55	40	25	20
3/8 - 24	40	30	35	25	60	45	35	25
7/16 - 14	60	45	45	35	90	65	45	35
7/16 - 20	65	50	55	40	95	70	55	40
1/2 - 13	95	70	75	55	130	95	75	55
1/2 - 20	100	75	80	60	150	110	80	60
9/16 - 12	135	100	110	80	190	140	110	80
9/16 - 18	150	110	115	85	210	155	115	85
5/8 - 11	180	135	150	110	255	190	150	110
5/8 - 18	210	155	160	120	290	215	160	120
3/4 - 10	325	240	255	190	460	340	255	190
3/4 - 16	365	270	285	210	515	380	285	210
7/8 - 9	490	360	380	280	745	550	380	280
7/8 - 14	530	390	420	310	825	610	420	310
1 - 8	720	530	570	420	1100	820	570	420
1 - 14	800	590	650	480	1200	890	650	480

## Drive Belt Tension

SAE Belt Size	Belt Tension Gauge Part No.		Belt Tension New		Belt Tension Range Used*	
	Click-type	Burroughs	N	lbf	N	lbf
0.380 in	3822524		620	140	270 to 490	60 to 110
0.440 in	3822524		620	140	270 to 490	60 to 110
1/2 in	3822524	ST-1138	620	140	270 to 490	60 to 110
11/16 in	3822524	ST-1138	620	140	270 to 490	60 to 110
3/4 in	3822524	ST-1138	620	140	270 to 490	60 to 110
7/8 in	3822524	ST-1138	620	140	270 to 490	60 to 110
4 rib	3822524	ST-1138	620	140	270 to 490	60 to 110
5 rib	3822524	ST-1138	670	150	270 to 530	60 to 120
6 rib	3822525	ST-1293	710	160	290 to 580	65 to 130
8 rib	3822525	ST-1293	890	200	360 to 710	80 to 160
10 rib	3822525	3823138	1110	250	440 to 890	100 to 200
12 rib	3822525	3823138	1330	300	530 to 1070	120 to 240
12 rib K section	3822525	3823138	1330	300	890 to 1070	200 to 240

**NOTE:** This chart does not apply to automatic belt tensioners.

- \* A belt is considered used if it has been in service for ten minutes or longer.
- \* If used belt tension is less than the minimum value, tighten the belt to the maximum used belt value.

[illegible]

**Section W - Warranty**  
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## Off-Highway Engines United States and Canada

### Coverage

#### Products Warranted

This warranty applies to new Engines sold by Cummins and delivered to the first user on or after April 1, 1999, that are used in industrial (off-highway) applications in the United States\* and Canada, except for Engines used in marine, generator drive and certain defense applications, for which different warranty coverage is provided.

#### Base Engine Warranty

This warranty covers any failures of the Engine, under normal use and service, which result from a defect in material or factory workmanship (Warrantable Failures).

Coverage begins with the sale of the Engine by Cummins. Coverage continues for two years or 2,000 hours of operation, whichever occurs first, from the date of delivery of the Engine to the first user, or from the date the unit is first leased, rented or loaned, or when the Engine has been operated for 50 hours, whichever occurs first. If the 2,000 hour limit is exceeded during the first year, Coverage continues until the end of the first year.

#### Extended Major Components Warranty

The Extended Major Components Warranty covers Warrantable Failures of the Engine cylinder block, camshaft, crankshaft and connecting rods (Covered Parts).

Bushing and bearing failures are not covered.

This Coverage begins with the expiration of the Base Engine Warranty and ends three years or 10,000 hours of operation from the date of delivery of the Engine to the first user, or from the date the unit is first leased, rented or loaned, or from when the Engine has been operated for 50 hours, whichever occurs first.

#### Consumer Products

The warranty on Consumer Products in the United States is a LIMITED warranty. **CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.** Any implied warranties applicable to Consumer Products in the United States terminate concurrently with the expiration of the express warranties applicable to the product. In the United States, some states do not allow the exclusion of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the limitations or exclusions herein may not apply to you.

**These warranties are made to all Owners in the chain of distribution, and Coverage continues to all subsequent Owners until the end of the periods of Coverage.**

### Cummins' Responsibilities

#### During The Base Engine Warranty

Cummins will pay for all parts and labor needed to repair the damage to the Engine resulting from a Warrantable Failure.

Cummins will pay for the lubricating oil, antifreeze, filter elements, and other maintenance items that are not reusable due to the Warrantable Failure.

Cummins will pay reasonable costs for mechanics to travel to and from the equipment site, including meals, mileage and lodging, when the repair is performed at the site of the failure.

Cummins will pay reasonable labor costs for Engine removal and reinstallation when necessary to repair a Warrantable Failure.

#### During The Extended Major Components Warranty

Cummins will pay for the repair or, at its option, replacement of the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered part.

### Owner's Responsibilities

#### During The Base Engine Warranty

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items provided during warranty repairs unless such items are not reusable due to the Warrantable Failure.

#### During The Extended Major Components Warranty

Owner is responsible for the cost of all labor needed to repair the Engine, including the labor to remove and reinstall the Engine. When Cummins elects to repair a part instead of replacing it, Owner is not responsible for the labor needed



to repair the part.

Owner is responsible for the cost of all parts required for the repair except for the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered Part.

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items replaced during repair of a Warrantable Failure.

### **During The Base Engine and Extended Major Components Warranties**

Owner is responsible for the operation and maintenance of the Engine as specified in the applicable Cummins Operation and Maintenance Manual. Owner is also responsible for providing proof that all recommended maintenance has been performed.

Before the expiration of the applicable warranty, Owner must notify a Cummins distributor, authorized dealer or other repair location approved by Cummins of any Warrantable Failure and make the Engine available for repair by such facility. Locations in the United States and Canada are listed in the Cummins Off Highway Authorized Dealer Directory.

Owner is responsible for communication expenses, meals, lodging and similar costs incurred as a result of a Warrantable Failure.

Owner is responsible for non-Engine repairs, "downtime" expenses, cargo damage, fines, all applicable taxes, all business costs and other losses resulting from a Warrantable Failure.

### **Limitations**

Cummins is not responsible for failures or damage resulting from what Cummins determines to be abuse or neglect, including, but not limited to: operation without adequate coolants or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the Engine. Cummins is also not responsible for failures caused by incorrect oil or fuel or by water, dirt or other contaminants in the fuel or oil.

For power units and fire pumps (package units), this warranty applies to accessories, except for clutches and filters, supplied by Cummins which bear the name of another company.

Except for power units and fire pumps, this warranty does not apply to accessories which bear the name of another company. Such non-warranted accessories include, but are not limited to: alternators, starters, fans\*, air conditioning compressors, clutches, filters, transmissions, torque converters, steering pumps, and non-Cummins fan drives, engine compression brakes and air compressors.

Cummins Compusave units are covered by a separate warranty.

Before a claim for excessive oil consumption will be considered, Owner must submit adequate documentation to show that consumption exceeds Cummins published standards.

Failures of belts and hoses supplied by Cummins are not covered beyond the first 500 hours or one year of operation, whichever occurs first.

Parts used to repair a Warrantable Failure may be new Cummins parts, Cummins-approved rebuilt parts, or repaired parts. Cummins is not responsible for failures resulting from the use of parts not approved by Cummins.

A new Cummins or Cummins-approved rebuilt part used to repair a Warrantable Failure assumes the identity of the part it replaced and is entitled to the remaining coverage hereunder.

**CUMMINS DOES NOT COVER WEAR OR WEAROUT OF COVERED PARTS.**

**CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.**

**THESE WARRANTIES SET FORTH HEREIN ARE THE SOLE WARRANTIES MADE BY CUMMINS IN REGARD TO THESE ENGINES. CUMMINS MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

## **Emission Warranty**

### **Products Warranted**

This emission warranty applies to new Engines marketed by Cummins that are used in the United States\* in vehicles designed for Industrial off-highway use. This warranty applies to Engines delivered to the ultimate purchaser on or after April 1, 1999 for engines up to 750 horsepower, on or after January 1, 2000 for engines 751 horsepower and over.

## **Coverage**

Cummins warrants to the ultimate purchaser and each subsequent purchaser that the Engine is designed, built and equipped so as to conform at the time of sale by Cummins with all U.S. Federal emission regulations applicable at the time of manufacture and that it is free from defects in workmanship or material which would cause it not to meet these regulations within the longer of the following periods: (A) Five years or 3,000 hours of operation, whichever occurs first, as measured from the date of delivery of the Engine to the ultimate purchaser, or (B) The Base Engine Warranty.

If the vehicle in which the Engine is installed is registered in the state of California, a separate California Emission Warranty also applies.

## **Limitations**

Failures, other than those resulting from defects in materials, or workmanship, are not covered by this warranty.

Cummins is not responsible for failures or damage resulting from what Cummins determines to be abuse or neglect, including, but not limited to: operation without adequate coolant or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the Engine. Cummins is also not responsible for failures caused by incorrect fuel or by water, dirt or other contaminants in the fuel.

Cummins is not responsible for non-Engine repairs, "downtime" expenses, cargo damage, fines, all business costs or other losses resulting from a Warrantable Failure.

## **CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.**

\* Includes American Samoa, the Commonwealth of Northern Mariana Islands, Guam, Puerto Rico, and the U.S. Virgin Islands.

\*\* Alternators, starters, and fans ARE covered for the duration of the base engine warranty on B3.3 engines.

## Off-Highway Engines International

### Coverage

#### PRODUCTS WARRANTED

This warranty applies to new Engines sold by Cummins and delivered to the first user on or after April 1, 1999, that are used in industrial (off-highway) applications anywhere in the world where Cummins-approved service is available, except the United States\* and Canada. Different warranty coverage is provided for Engines used in marine, generator drive and certain defense applications.

#### BASE ENGINE WARRANTY

This warranty covers any failures of the Engine, under normal use and service, which result from a defect in material or factory workmanship (Warrantable Failure).

Coverage begins with the sale of the Engine by Cummins. Coverage continues for two years or 2,000 hours of operation, whichever occurs first, from the date of delivery of the Engine to the first user, or from the date the unit is first leased, rented or loaned, or when the Engine has been operated for 50 hours, whichever occurs first. If the 2,000 hour limit is exceeded during the first year, coverage continues until the end of the first year.

#### EXTENDED MAJOR COMPONENTS WARRANTY

The Extended Major Components Warranty covers Warrantable Failures of the Engine cylinder block, camshaft, crankshaft and connecting rods (Covered Parts).

Bushing and bearing failures are not covered.

This coverage begins with the expiration of the Base Engine Warranty and ends three years or 10,000 hours of operation, from the date of delivery of the Engine to the first user, or from the date the unit is first leased, rented or loaned, or from when the Engine has been operated for 50 hours, whichever occurs first.

**These warranties are made to all Owners in the chain of distribution, and Coverage continues to all subsequent Owners until the end of the periods of Coverage.**

### Cummins' Responsibilities

#### DURING THE BASE ENGINE WARRANTY

Cummins will pay for all parts and labor needed to repair the damage to the Engine resulting from a Warrantable Failure.

Cummins will pay for the lubricating oil, antifreeze, filter elements, and other maintenance items that are not reusable due to a Warrantable Failure.

Cummins will pay reasonable costs for mechanics to travel to and from the equipment site, including meals, mileage and lodging, when the repair is performed at the site of the failure.

Cummins will pay reasonable labor costs for Engine removal and reinstallation when necessary to repair a Warrantable Failure.

#### DURING THE EXTENDED MAJOR COMPONENTS WARRANTY

Cummins will pay for the repair or, at its option, replacement of the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered part.

### Owner's Responsibilities

#### DURING THE BASE ENGINE WARRANTY

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items replaced during warranty repairs unless such items are not reusable due to the Warrantable Failure.

#### DURING THE EXTENDED MAJOR COMPONENTS WARRANTY

Owner is responsible for the cost of all labor needed to repair the Engine, including the labor to remove and reinstall the Engine. When Cummins elects to repair a part instead of replacing it, Owner is not responsible for the labor needed to repair the part.

Owner is responsible for the cost of all parts required for the repair except for the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered Part.

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items replaced during repair of a Warrantable Failure.

## **DURING THE BASE ENGINE AND EXTENDED MAJOR COMPONENTS WARRANTIES**

Owner is responsible for the operation and maintenance of the Engine as specified in the applicable Cummins Operation and Maintenance Manual. Owner is also responsible for providing proof that all recommended maintenance has been performed.

Before the expiration of the applicable warranty, Owner must notify a Cummins distributor, authorized dealer or other repair location approved by Cummins of any Warrantable Failure and make the product available for repair by such facility. Locations are listed in the Cummins International Sales and Service Directory.

Owner is responsible for communication expenses, meals, lodging and similar costs incurred as a result of a Warrantable Failure.

Owner is responsible for non-Engine repairs, "downtime" expenses, cargo damage, fines, all applicable taxes, all business costs and other losses resulting from a Warrantable Failure.

## **Limitations**

Cummins is not responsible for failures or damage resulting from what Cummins determines to be abuse or neglect, including, but not limited to: operation without adequate coolants or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the Engine. Cummins is also not responsible for failures caused by incorrect oil or fuel or by water, dirt or other contaminants in the fuel or oil.

For power units and fire pumps (package units) the warranty applies to accessories, except for clutches and filters supplied by Cummins which bear the name of another company.

Starters, alternators, power steering pumps and non-Cummins air compressors supplied by Cummins on B or C Series Engines that are not supplied as part of a package unit are covered for six months\* from the date of delivery of the Engine to the first user, or the date the Engine is first leased, rented or loaned, or from when the Engine has been operated for 50 hours, whichever occurs first.

Except for the accessories noted previously, Cummins does not warrant accessories which bear the name of another company. Such non-warranted accessories include, but are not limited to: alternators, starters, fans\*, air conditioning compressors, clutches, filters, transmissions, torque converters, steering pumps, non-Cummins fan drives, and air cleaners.

Cummins Compusave units are covered by a separate warranty.

Before a claim for excessive oil consumption will be considered, Owner must submit adequate documentation to show that consumption exceeds Cummins published standards.

Failures of belts and hoses supplied by Cummins are not covered beyond the first 500 hours or one year of operation, whichever occurs first.

Parts used to repair a Warrantable Failure may be new Cummins parts, Cummins-approved rebuilt parts, or repaired parts. Cummins is not responsible for failures resulting from the use of parts not approved by Cummins.

A new Cummins or Cummins-approved rebuilt part used to repair a Warrantable Failure assumes the identity of the part it replaced and is entitled to the remaining coverage hereunder.

**CUMMINS DOES NOT COVER WEAR OR WEAROUT OF COVERED PARTS.**

**CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.**

**THESE WARRANTIES SET FORTH HEREIN ARE THE SOLE WARRANTIES MADE BY CUMMINS IN REGARD TO THESE ENGINES. CUMMINS MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

In case of consumer sales, in some countries, the Owner has statutory rights which cannot be affected or limited by the terms of this warranty.

Nothing in this warranty excludes or restricts any contractual rights the Owner may have against third parties.

\* Alternators, starters, and fans ARE covered for the duration of the base engine warranty on B3.3 engines.

## Worldwide Generator Drive

### Engines Warranted

This warranty applies to new Engines sold by Cummins and delivered to the first user on or after April 1, 1999 that are used in generator drive application anywhere in the world where Cummins approved service is available. These Engines will have the following rating designations:

#### Standby Power Rating

Engines of this rating are applicable for supplying emergency power for the duration of the utility power outage. No overload capability is available for this rating. Under no condition is an Engine allowed to operate in parallel with the public utility at the Standby Power rating. This rating should be applied where reliable utility power is available. A standby rated engine is to be sized for a maximum of an 80 percent average load factor and 200 hours of operation per year. This includes less than 25 hours per year at the Standby Power rating. Standby rating should never be applied except in true emergency power outages. Negotiated power outages contracted with a utility company are not considered an emergency.

#### Unlimited Time Running Prime Power Rating

Engines with this rating are available for an unlimited number of hours per year in a variable load application. Variable load is not to exceed a 70 percent average of the Prime Power Rating during any operating period of 250 hours. Total operating time at 100 percent Prime Power shall not exceed 500 hours per year.

A 10 percent overload capability is available for a period of one hour within a twelve hour period of operation. Total operating time at the 10 percent overload power shall not exceed 25 hours per year.

#### Limited Time Running Prime Power Rating

Engines of this rating are available for a limited number of hours in a non-variable load application. It is intended for use in situations where power outages are contracted, such as in utility power curtailment. Engines may be operated in parallel to the public utility up to 750 hours per year at power levels never to exceed the Prime Power rating.

Limited Time Running Prime Power ratings differ from Unlimited Time Running in that even though the maximum power output of the engines are the same, the Limited Time Running allows the Engine to be parallel to Public Utility and run at the full Prime Power rating and must never exceed the Prime Power rating.

#### Continuous/Base Power Rating

Engines with this rating are available for supplying utility power at a constant 100 percent load for an unlimited number of hours per year. No overload capability is available for this rating.

Continuous/Base Power ratings differ from Unlimited Time Running Prime Power ratings in that the Continuous/Base Load ratings are significantly reduced from the Prime Power ratings. Continuous/Base Load ratings have no load factor or application restrictions.

### Coverage

#### Base Engine Warranty

This warranty covers any failures of the Engine, under normal use and service, which result from a defect in material or factory workmanship (Warrantable Failure).

Coverage begins with the sale of the Engine by Cummins and continues for the Duration stated below. The Duration commences either on the date of delivery of the Engine to the first user, or on the date the Engine is first leased, rented or loaned, or when the Engine has been operated for 50 hours, whichever occurs first.

#### Base Engine Warranty

Rating	Duration Whichever Occurs First	
	Months	Hours
Standby Power	24	400
Unlimited Prime Power	12	Unlimited
Limited Prime Power	12	750
Continuous/Base Power	12	Unlimited

## Extended Major Components Warranty

The Extended Major Components Warranty applies to Engines other than B and C series and covers Warrantable Failures of the Engine cylinder block, camshaft, crankshaft and connecting rods (Covered Parts). Bushing and bearing failures are not covered. This coverage begins with the expiration of the Base Engine Warranty and continues for the following stated Duration. The Duration commences either on the date of delivery of the Engine to the first user, or on the date the Engine is first leased, rented or loaned, or when the Engine has been operated for 50 hours, whichever occurs first.

Rating	Extended Major Components Warranty	
	Duration Which ever Occurs First	
	Months	Hours
Standby Power	36	600
Unlimited Prime Power	36	10,000
Limited Prime Power	36	2,250
Continuous/Base Power	36	10,000

## Consumer Products

This warranty on Consumer Products in the United States is a LIMITED warranty. **CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.** Any implied warranties applicable to Consumer Products terminate concurrently with the expiration of the express warranties applicable to the product. In the United States, some states do not allow the exclusion of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the limitations or exclusions herein may not apply to you.

**These warranties are made to all Owners in the chain of distribution, and Coverage continues to all subsequent Owners until the end of the periods of Coverage.**

## Cummins Responsibilities

### During Base Engine Warranty

Cummins will pay for all parts and labor needed to repair the damage to the Engine resulting from a Warrantable Failure when performed during normal business hours. All labor costs will be paid in accordance with Cummins published Standard Repair Time guidelines.

Cummins will pay for the lubricating oil, antifreeze, filter elements, and other maintenance items that are not reusable due to the Warrantable Failure.

Cummins will pay reasonable travel expenses for mechanics to travel to and from the Engine site, including meals, mileage, and lodging when the repair is performed at the site of the failure.

Cummins will pay reasonable labor costs for Engine removal and reinstallation when necessary to repair a Warrantable Failure.

### During the Extended Major Components Warranty

Cummins will pay for the repair or, at its option, replacement of the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered Part.

## Owner's Responsibilities

### During the Base Engine Warranty

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items replaced during warranty repairs unless such items are not reusable due to the Warrantable Failure.

### During the Extended Major Components Warranty

Owner is responsible for the cost of all labor needed to repair the Engine, including the labor cost for Engine removal and reinstallation. When Cummins elects to repair a part instead of replacing it, the Owner is not responsible for the labor needed to repair the part.

Owner is responsible for the cost of all parts required for the repair except for the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered Part.

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items replaced during repair of a Warrantable Failure.

## During the Base Engine and Extended Major Components Warranties

Owner is responsible for the operation and maintenance of the Engine as specified in the applicable Cummins Operation and Maintenance Manual. Owner is also responsible for providing proof that all recommended maintenance has been performed.

Before the expiration of the applicable warranty, Owner must notify a Cummins distributor, authorized dealer or other repair location approved by Cummins of any Warrantable Failure and make the Engine available for repair by such facility. Locations in the United States\* and Canada are listed in the Cummins United States and Canada Sales and Service Directory; other locations are listed in the Cummins International Sales and Service Directory.

Owner is responsible for communication expenses, meals, lodging and similar costs incurred as a result of a Warrantable Failure.

Owner is responsible for non-Engine repairs, "downtime" expenses, fines, all applicable taxes, all business costs and other losses resulting from a Warrantable Failure.

Owner is responsible for providing sufficient access to and reasonable ability to remove the Engine from the installation in the event of a Warrantable Failure.

Owner is responsible for maintaining an operating Engine hourmeter. If the hourmeter is not operational, engine usage will be estimated at 400 hours per month.

## Limitations

Cummins is not responsible for failures or damage resulting from what Cummins determines to be abuse or neglect, including, but not limited to: operation without adequate coolants or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications to the Engine. Cummins is also not responsible for Engine performance problems or failures caused by incorrect oil or fuel, or by water, dirt or other contaminants in the fuel or oil.

This warranty does not apply to accessories supplied by Cummins which bear the name of another company. Such non-warranted accessories include, but are not limited to: alternators, starters, fans\*\*, air conditioning compressors, clutches, filters, transmissions, air cleaners and safety shutdown switches.

Before a claim for excessive oil consumption will be considered, Owner must submit adequate documentation to show that consumption exceeds Cummins published standards.

Failure of belts and hoses supplied by Cummins are not covered beyond the first 500 hours or one year of operation, whichever occurs first after the warranty start date.

Parts used to repair a Warrantable Failure may be new Cummins parts, Cummins approved rebuilt parts, or repaired parts. Cummins is not responsible for failures resulting from the use of parts not approved by Cummins.

A new Cummins or Cummins-approved rebuilt part used to repair a Warrantable Failure assumes the identity of the part it replaced and is entitled to the remaining coverage hereunder.

Cummins is not responsible for Engine performance problems or failures resulting from:

1. Use or application of the Engine inconsistent with its rating designation as set forth above.
2. Inadequate or incorrect installations deviating from Cummins Generator Drive Installation Guidelines.

**CUMMINS IS NOT RESPONSIBLE FOR WEAR OR WEAROUT OF COVERED PARTS.**

**CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.**

**THE WARRANTIES SET FORTH HEREIN ARE THE SOLE WARRANTIES MADE BY CUMMINS IN REGARD TO THESE ENGINES. CUMMINS MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

In the United States\* and Canada, this warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Outside the United States\* and Canada, in case of consumer sales, in some countries, the Owner has statutory rights which cannot be affected or limited by the terms of this warranty.

Nothing in this warranty excludes or restricts any contractual rights the owner may have against third parties.

\* Includes American Samoa, the Commonwealth of Northern Mariana Islands, Guam, Puerto Rico, and the U.S. Virgin Islands.

\*\* Alternators, starters, and fans ARE covered for the duration of the base engine warranty on B3.3 engines.

## California Emission Control System Warranty, Off-Highway

### Products Warranted

This Emission Control System Warranty applies to off-road diesel engines certified with the California Air Resources Board beginning with the year 1996 for engines up to 750 horsepower, beginning with the year 2000 for 751 horsepower and over, marketed by Cummins, and registered in California for use in industrial off-highway applications.

### Your Warranty Rights and Obligations

The California Air Resources Board and Cummins Engine Company, Inc., are pleased to explain the emission control system warranty on your engine. In California, new off-road diesel engines must be designed, built and equipped to meet the State's stringent anti-smog standards. Cummins must warrant the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system may include parts such as the fuel injection system and the air induction system. Also included may be hoses, belts, connectors and other emission-related assemblies.

Where a warrantable condition exists, Cummins will repair your off-road diesel engine at no cost to you including diagnosis, parts and labor.

### Manufacturer's Warranty Coverage

This warranty coverage is provided for 5 years or 3,000 hours of engine operation, whichever first occurs from the date of delivery of the engine to the first user. If any emission-related part on your engine is defective, the part will be repaired or replaced by Cummins.

### Coverage

This emission control system warranty applies only to the following emission control parts:

#### **Turbocharger**

Compressor Wheel  
Turbine Wheel  
Turbine Oil Seal  
Wastegate Valve  
Wastegate Actuator/Controller

#### **Intake Manifold**

Charge Air Cooler

#### **Exhaust Manifold**

#### **Fuel System**

Actuators (Fueling & Timing)  
Fuel Pressure Sensor

#### **Injectors (TP)**

Barrel/Plunger  
Cup  
Brass Spring  
Nozzle Spring  
Timing C.U.  
Fueling C.U.  
Spill Ring

#### **Electronic Control System**

Control Module  
Intake Manifold Pressure Sensor  
Coolant Temperature Sensor

### Owner's Warranty Responsibilities

As the off-road diesel engine owner, you are responsible for the performance of the required maintenance listed in your Cummins Operation and Maintenance Manual. Cummins recommends that you retain all receipts covering maintenance on your off-road diesel engine, but Cummins cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

You are responsible for presenting your off-road diesel engine to a Cummins dealer as soon as a problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

As the off-road diesel engine owner, you should also be aware that Cummins may deny you warranty coverage if your off-road diesel engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

Your engine is designed to operate on diesel fuel only. Use of any other fuel may result in your engine no longer operating in compliance with California's emissions requirements.

If you have any questions regarding your warranty rights and responsibilities, you should contact Cummins Customer Assistance Department at 1-800-343-7357 (1-800-DIESELS) or the California Air Resources Board at 9528 Telstar Avenue, El Monte, CA 91731.

Prior to the expiration of the applicable warranty, Owner must give notice of any warranted emission control failure to a Cummins distributor, authorized dealer or other repair location approved by Cummins and deliver the engine to such



facility for repair. Repair locations are listed in Cummins United States and Canada Service Directory.

Owner is responsible for incidental costs such as: communication expenses, meals, lodging incurred by Owner or employees of Owner as a result of a warrantable failure.

Owner is responsible for business costs and losses, "downtime" expenses, and cargo damage resulting from a warrantable failure. CUMMINS IS NOT RESPONSIBLE FOR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCIDENTAL OR CONSEQUENTIAL DAMAGES INCLUDE BUT ARE NOT LIMITED TO FINES, THEFT, VANDALISM OR COLLISIONS.

## **Replacement Parts**

Cummins recommends that any service parts used for maintenance, repair or replacement of emission control systems be new, genuine Cummins or Cummins approved rebuilt parts and assemblies, and that the engine be serviced by a Cummins distributor, authorized dealer or the repair location approved by Cummins. The owner may elect to have maintenance, replacement or repair of the emission control parts performed by a facility other than a Cummins distributor, an authorized dealer or a repair location approved by Cummins, and may elect to use parts other than new genuine Cummins or Cummins approved rebuilt parts and assemblies for such maintenance, replacement or repair; however, the cost of such service or parts will not be covered under this emission control system warranty.

## **Cummins Responsibilities**

Repairs and service will be performed by any Cummins distributor, authorized dealer or other repair location approved by Cummins using new, genuine Cummins or Cummins approved rebuilt parts and assemblies. Cummins will repair any of the emission control parts found by Cummins to be defective without charge for parts or labor (including diagnosis which results in determination that there has been a failure of a warranted emission control part).

## **Emergency Repairs**

In the case of an emergency where a Cummins distributor, authorized dealer, or other repair location approved by Cummins is not available, repairs may be performed by any available repair location using any replacement parts. Cummins will reimburse the Owner for expenses (including diagnosis), not to exceed the manufacturer's suggested retail price for all warranted parts replaced and labor charges based on the manufacturer's recommended time allowance for the warranty repair and the geographically appropriate hourly labor rate. A part not being available within 30 days or a repair not being complete within 30 days constitutes an emergency. Replaced parts and paid invoices must be presented at a Cummins authorized repair facility as a condition of reimbursement for emergency repairs not performed by a Cummins distributor, authorized dealer, or other repair location approved by Cummins.

## **Warranty Limitations**

Cummins is not responsible for failures resulting from Owner or operator abuse or neglect, such as: operation without adequate coolant, fuel or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or air intake systems; improper storage, starting, warm-up, run-in or shutdown practices.

The manufacturer warrants to the ultimate purchaser and each subsequent purchaser that the engine is designed, built, and equipped so as to conform with all applicable regulations adopted by the Air Resources Board, and that it is free from defects in materials and workmanship which cause the failure of a warranted part.

Any warranted part which is not scheduled for replacement as required maintenance, or which is scheduled only for regular inspection to the effect of "repair or replace as necessary" is warranted for the warranty period.

Any warranted part which is scheduled for replacement as required maintenance is warranted for the period of time prior to the first scheduled replacement point for that part.

The owner will not be charged for diagnostic labor which leads to the determination that a warranted part is defective, if the diagnostic work is performed at a warranty station.

The manufacturer is liable for damages to other engine components caused by the failure under warranty of any warranted part.

Cummins is not responsible for failures resulting from improper repair or the use of parts which are not genuine Cummins or Cummins approved parts.

These warranties, together with the express commercial warranties and emission warranty are the sole warranties of Cummins. There are no other warranties, express or implied, or of merchantability or fitness for a particular purpose.

## Moteurs tout terrain Etats-Unis et Canada

### Garantie

#### Produits garantis

La présente garantie s'applique aux nouveaux moteurs vendus par Cummins et livrés au premier utilisateur à compter du 1er avril 1999 pour un usage dans des applications industrielles (tout terrain) aux Etats-Unis\* et au Canada, à l'exception des moteurs utilisés dans des applications marines et d'entraînement de générateur, ainsi que dans certaines applications militaires, pour lesquelles une couverture de garantie différente est fournie.

#### Garantie de base du moteur

La présente garantie couvre toute panne du moteur, dans des conditions normales d'utilisation et d'entretien, provenant d'un défaut de matériau ou de fabrication en usine (pannes couvertes).

La garantie prend effet à dater de la vente du moteur. Elle s'étend sur une période de deux ans ou 2 000 heures d'utilisation, suivant lequel de ces termes intervient en premier, à compter de la date de livraison du moteur au premier utilisateur ou de la date à laquelle le moteur est mis en location de courte ou longue durée ou en prêt pour la première fois, ou encore lorsque le moteur a été utilisé pendant 50 heures, suivant lequel de ces termes intervient en premier. En cas d'une utilisation dépassant 2 000 heures durant la première année, la période de garantie s'étend jusqu'à la fin de la première année.

#### Garantie étendue des composants principaux

La Garantie prolongée des principaux éléments couvre les pannes justifiables du bloc-cylindre, de l'arbre à cames, du vilebrequin, des bielles du moteur (pièces couvertes).

Les pannes de bagues et roulement de paliers ne sont pas garanties.

Cette couverture prend effet à la date d'expiration de la garantie de base du moteur et se termine trois ans ou 10 000 heures d'utilisation après la date de livraison du moteur au premier utilisateur ou à compter de la date à laquelle le moteur est mis en location de courte ou longue durée ou en prêt pour la première fois, ou encore lorsque le moteur a été utilisé pendant 50 heures, suivant lequel de ces termes intervient en premier.

#### Produits de consommation

La garantie sur les produits de consommation aux États-Unis est LIMITEE. CUMMINS N'EST PAS RESPONSABLE DES DOMMAGES INDIRECTS OU INDUITS Aux États-Unis, toute garantie implicite applicable aux produits de consommation vient à échéance à l'expiration des garanties expresses applicables au produit. Certains Etats d'Amérique réfutent l'exclusion des détériorations provoquées par des dommages indirects ou induits, ou les limitations de durée de garanties implicites.

Ces garanties s'appliquent à tous les propriétaires du circuit de distribution et la couverture s'applique à tous les propriétaires ultérieurs jusqu'à la fin de la période de couverture.

### Responsabilités Cummins

#### Pendant la garantie de base du moteur

Cummins réglera tous les frais des pièces détachées et de la main d'oeuvre nécessaires à la réparation du produit endommagé en raison d'une panne justifiable.

Cummins prend en charge l'huile, l'antigel, les cartouches de filtre ainsi que d'autres pièces ou fournitures d'entretien non réutilisables en raison d'une panne sous garantie.

Cummins paie la majeure partie des frais de déplacement des mécaniciens ce qui comprend les frais de repas, les frais kilométriques et les frais d'hébergement, dans le cas où une réparation doit être effectuée sur les lieux de la panne.

Cummins prend en charge une partie des frais de main d'oeuvre lorsqu'il est nécessaire de déposer et de remonter le moteur lors d'une panne sous garantie.

#### Pendant la garantie étendue des principaux composants

Cummins réglera la réparation ou, s'il préfère, le remplacement de la pièce couverte défectueuse et de toute pièce couverte endommagée par une panne justifiable de la pièce couverte défectueuse.

## **Responsabilités du propriétaire**

### **Pendant la garantie de base du moteur**

Le propriétaire doit régler l'huile de graissage, l'antigel, les éléments filtrants et les autres articles d'entretien remplacés au cours des réparations effectuées dans le cadre de la garantie à moins que ces articles ne puissent plus être utilisés en raison d'une panne justifiable.

### **Pendant la garantie étendue des principaux composants**

Le propriétaire est responsable de tous les frais de la main-d'oeuvre nécessaire à la réparation du moteur, y compris les frais de main-d'oeuvre pour démonter et réinstaller le moteur. Lorsque Cummins choisit de réparer une pièce plutôt que de la remplacer, le propriétaire n'est pas responsable de la main-d'oeuvre nécessaire à la réparation de la pièce.

Le propriétaire supporte les frais occasionnés par le remplacement des pièces excepté pour la pièce défectueuse sous garantie et toute pièce garantie dont la détérioration a été provoquée par une panne sous garantie de la pièce défectueuse sous garantie.

Le propriétaire supporte les frais de remplacement de l'huile, de l'antigel, des cartouches de filtre ainsi que des autres pièces ou fournitures lors d'une réparation en raison d'une panne sous garantie.

### **PENDANT LA PÉRIODE DE GARANTIE DE BASE DU MOTEUR ET DE GARANTIE ETENDUE DES COMPOSANTS PRINCIPAUX**

Le propriétaire est responsable de l'utilisation et de l'entretien du moteur comme il est spécifié dans le manuel d'utilisation et d'entretien Cummins. Le propriétaire doit également pouvoir prouver que tous les travaux d'entretien recommandés ont été effectués.

Avant la date d'expiration de la garantie en vigueur, le propriétaire doit avertir un concessionnaire Cummins, un concessionnaire agréé ou un autre site de réparation homologué, de toute panne sous garantie et pouvoir confier le moteur afin qu'il puisse être réparé. Les sites de réparation aux États-Unis ainsi qu'au Canada sont énumérés dans le répertoire des concessionnaires moteur tout terrain Cummins agréé.

Le propriétaire supporte les frais de communication, de repas, d'hébergement et d'autres frais similaires occasionnés par une panne sous garantie.

Le propriétaire est responsable des réparations autres que celles du moteur, des dépenses de temps mort, des dommages au chargement, des amendes, de toutes les taxes en vigueur, de tous les coûts commerciaux et de toute autre dépense résultant d'une panne sous garantie.

## **Limites**

Cummins décline toute responsabilité en cas de pannes ou de détériorations résultant de ce que Cummins considère comme un abus ou une négligence de la part du propriétaire, notamment et non limitativement: une utilisation sans les lubrifiants ou les liquides de refroidissement appropriés; surremplissage de carburant; vitesse trop élevée; négligence d'entretien des systèmes d'admission, de refroidissement ou de lubrification; mauvaises conditions d'entreposage, pratiques inappropriées de démarrage, de chauffage, de rodage ou d'arrêt; modifications non homologuées du moteur. Cummins n'est également pas responsable des pannes provoquées par l'utilisation d'une huile, d'un carburant ou d'une eau non appropriés, ainsi que des pannes provoquées par la présence de dépôts dans le carburant ou dans l'huile.

Pour les générateurs de courant et les pompes à incendie (unités conditionnées), cette garantie s'applique aux accessoires, sauf pour les embrayages et filtres fournis par Cummins qui portent le nom d'une autre société.

Mis à part les générateurs de courant et les pompes à incendie, Cummins ne garantit pas les accessoires portant le nom d'une autre société. Ces accessoires comprennent: les alternateurs, les démarreurs, les ventilateurs\*\*, les compresseurs d'air conditionnés, les embrayages, les filtres, les transmissions, les convertisseurs de couple, les pompes d'assistance de direction, les entraînements ventilateurs d'une marque différente de celle de Cummins, les freins de compression moteur et les compresseurs d'air.

Les unités Compusave Cummins sont assujetties à une garantie différente.

Avant qu'une réclamation concernant une consommation excessive en huile soit prise en compte, le propriétaire doit fournir une documentation adéquate afin de pouvoir prouver que la consommation dépasse celle définie par Cummins.

Les détériorations des courroies et flexibles fournis par Cummins ne sont pas garanties au-delà des 500 premières heures ou après un an d'utilisation, suivant lequel de ces termes intervient en premier.

Les pièces utilisées pour la réparation d'une panne sous garantie peuvent être des pièces Cummins neuves, des pièces reconditionnées homologuées ou des pièces réparées. Cummins n'est pas responsable des pannes résultant de l'utilisation de pièces non homologuées.

Une nouvelle pièce Cummins ou une pièce reconditionnée homologuée utilisée pour la réparation d'une panne sous garantie est alors identifiée comme la pièce originale remplacée en vertu de cette garantie.

**CUMMINS NE COUVRE PAS L'USURE DES PIÈCES COUVERTES.**

**CUMMINS N'EST PAS RESPONSABLE DES DOMMAGES INDIRECTS OU INDUITS**

**LES PRESENTES GARANTIES SONT LES GARANTIES EXCLUSIVES DE CUMMINS CONCERNANT CES MOTEURS. CUMMINS NE CONSENT AUCUNE AUTRE GARANTIE EXPRESSE OU IMPLICITE ET AUCUNE GARANTIE DE BONNE QUALITÉ COMMERCIALE OU D'ADAPTATION A UN USAGE SPÉCIFIQUE.**

Cette garantie vous procure certains droits qui peuvent varier d'un État à l'autre.

## **Garantie concernant l'émission de polluants**

### **Produits garantis**

Cette garantie s'applique aux nouveaux moteurs commercialisés par Cummins et utilisés aux États-Unis\* sur des véhicules à usage industriel tout-terrain. La présente garantie s'applique aux moteurs livrés à l'acheteur final à compter du 1er avril 1999 pour les moteurs jusqu'à 750 chevaux ou à compter du 1er janvier 2000 pour les moteurs d'au moins 751 chevaux.

### **Garantie**

Cummins garantit au dernier acheteur et à chaque futur acheteur que le moteur a été conçu, construit et équipé selon les lois américaines en vigueur portant sur la pollution et qu'il ne comporte aucun défaut de fabrication des composants, ce qui engendrerait une non-conformité du moteur pendant les périodes suivantes: (A) cinq ans ou 3 000 heures d'utilisation, suivant lequel de ces termes intervient en premier, et à dater de la livraison du moteur à l'acquéreur final ou (B) la garantie de base des moteurs.

Si le véhicule muni du moteur Cummins est enregistré dans l'Etat de Californie, une autre garantie du système antipollution s'applique également.

### **Limites**

Les pannes autres que celles résultant d'un défaut de matériaux ou de main d'oeuvre, ne sont pas garanties.

Cummins décline toute responsabilité en cas de pannes ou de détériorations résultant de ce que Cummins considère comme un abus ou une négligence de la part du propriétaire, notamment et non limitativement: une utilisation sans les lubrifiants ou les liquides de refroidissement appropriés; suremplissage de carburant; vitesse trop élevée; négligence d'entretien des systèmes d'admission, de refroidissement ou de lubrification; mauvaises conditions d'entreposage, pratiques inappropriées de démarrage, de chauffage, de rodage ou d'arrêt; modifications non homologuées du moteur. Cummins n'est également pas responsable des pannes provoquées par l'utilisation d'une huile, d'un carburant ou d'une eau non appropriés, ainsi que des pannes provoquées par la présence de dépôts dans le carburant ou dans l'huile.

Cummins n'est pas responsable des réparations autres que celles du moteur, des dépenses de temps mort, des dommages au chargement, des amendes, de toutes les taxes en vigueur, de tous les coûts commerciaux et de toute autre dépense résultant d'une panne sous garantie.

**CUMMINS N'EST PAS RESPONSABLE DES DOMMAGES INDIRECTS OU INDUITS**

\*Doivent être pris en compte l'archipel américain Samoa, le Commonwealth des îles Mariannes du nord, les îles Guam, Porto Rico et les îles américaines Vierges.

\*\* Les alternateurs, les démarreurs et les ventilateurs SONT couverts pendant la durée de la garantie de base des moteurs B3.3.

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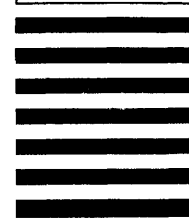
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