

**ap AURORA®**  
Pentair Pump Group

# INSTRUCTION MANUAL

## TROUBLESHOOTING

### GASOLINE AND DIESEL ENGINE

# 5

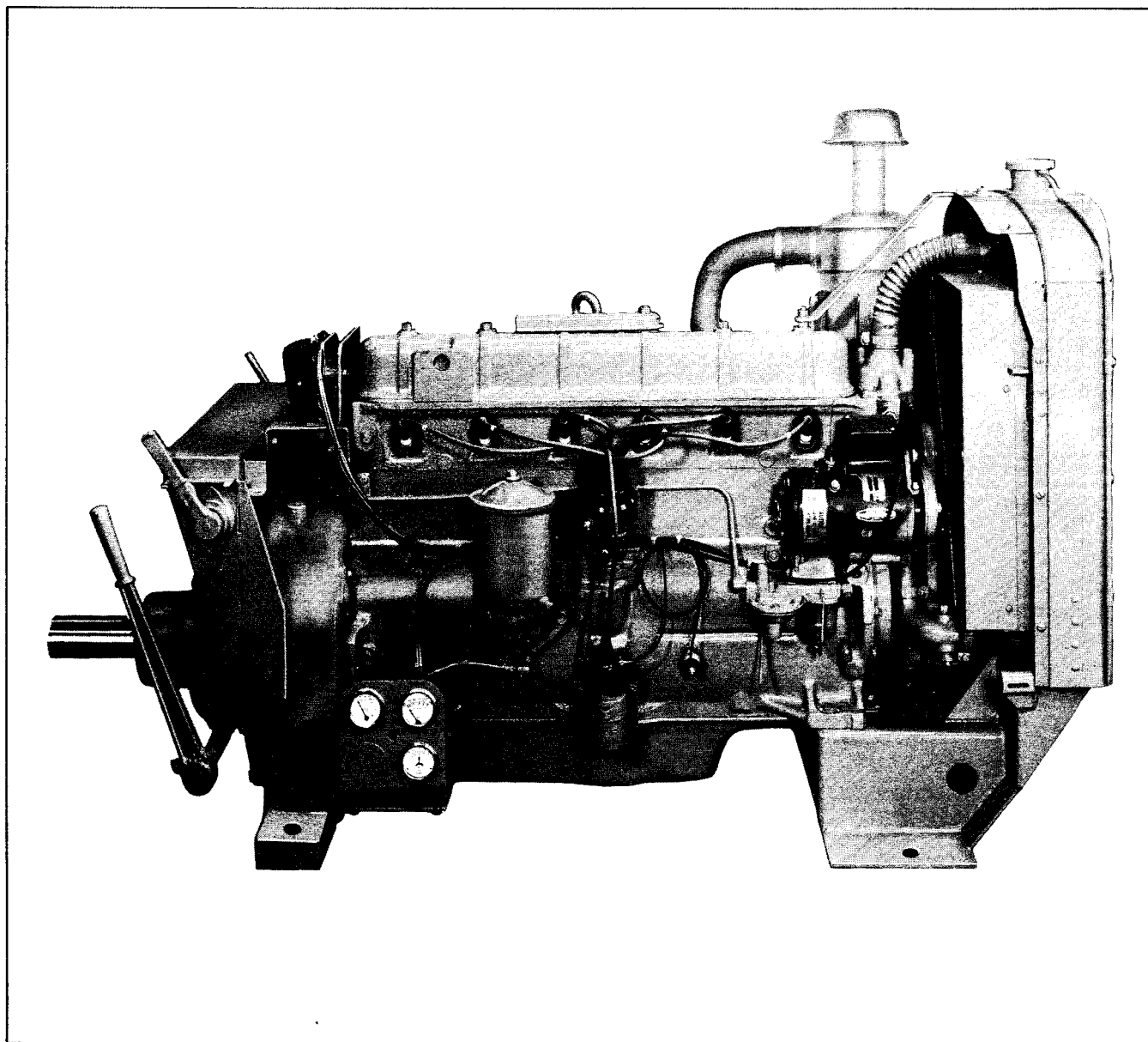
The following troubleshooting chart is furnished to you as part of Aurora Pump's continuing efforts to provide total service to their customers.

The troubles, probable causes and remedies contained in this troubleshooting chart will aid you in quickly determining and correcting most driver malfunctions, as they occur. It is not the intent of Aurora Pump to replace the engine manufacturer's operation and maintenance recommendations, but rather to supplement such data. Any specific ques-

tions or problems regarding your engine should be directed to the engine manufacturer.

Because of the variety of problems encountered with engines, the troubleshooting chart is divided into major sections.

- SECTION A. ENGINE
- B. STARTING SYSTEM
- C. FUEL SYSTEM
- D. ELECTRICAL SYSTEM
- E. LUBRICATING SYSTEM
- F. COOLING SYSTEM



GASOLINE AND DIESEL ENGINE TROUBLESHOOTING

A. ENGINE

TROUBLE	POSSIBLE CAUSES	REMEDY
1. Engine will not turn	<ul style="list-style-type: none"> <li>a. Batteries weak</li> <li>b. Starter or starter switch inoperative</li> <li>c. Engine is locked or seized</li> </ul>	<ul style="list-style-type: none"> <li>a. Recharge or replace batteries.</li> <li>b. Repair or replace defective parts. Refer to Starter Section.</li> <li>c. Refer to Manufacturer's Maintenance for corrective action.</li> </ul>
2. Engine will not start	<ul style="list-style-type: none"> <li>a. Insufficient fuel supply to carburetor or fuel injection system</li> <li>b. Engine controls are out of adjustment</li> <li>c. Faulty electrical system</li> <li>d. Engine too cold</li> </ul>	<ul style="list-style-type: none"> <li>a. Check fuel system.</li> <li>b. Check linkage of all engine controls, and adjust per Manufacturer's Maintenance Manual.</li> <li>c. Check electrical system.</li> <li>d. Use starting aid such as ether.</li> </ul>
3. Engine hard to start	<ul style="list-style-type: none"> <li>a. Batteries weak</li> <li>b. Insufficient fuel in fuel tank</li> <li>c. Incorrect grade of fuel</li> <li>d. Carburetor or fuel injection system is not functioning properly</li> <li>e. Spark plugs are fouled</li> <li>f. Air in fuel system</li> <li>g. Valves are warped or pitted</li> <li>h. Piston rings are worn</li> <li>i. Engine is improperly timed</li> <li>j. Insufficient air supply to cylinders</li> </ul>	<ul style="list-style-type: none"> <li>a. Recharge or replace batteries.</li> <li>b. Check fuel level in tank. Fill with specified fuel if necessary.</li> <li>c. Drain fuel system. Fill the tank with the specified fuel.</li> <li>d. Test and adjust carburetor or fuel injection nozzles; replace defective parts.</li> <li>e. Clean and test spark plugs; replace if necessary.</li> <li>f. Check suction side of fuel pump for air leaks; vent fuel system.</li> <li>g. Recondition or replace valves; refer to Manufacturer's Maintenance Manual.</li> <li>h. Replace parts as required per Manufacturer's Maintenance Manual.</li> <li>i. Set timing per Manufacturer's recommendation or replace.</li> <li>j. Clean or replace air filter.</li> </ul>
4. Engine stops frequently	<ul style="list-style-type: none"> <li>a. Idling speed too low</li> <li>b. Restricted fuel supply</li> </ul>	<ul style="list-style-type: none"> <li>a. Adjust low idling speed.</li> <li>b. Check fuel system.</li> </ul>
5. Engine stops suddenly	<ul style="list-style-type: none"> <li>a. Out of fuel</li> <li>b. Restricted fuel supply</li> <li>c. Broken or loose fuel lines</li> <li>d. Defective electrical component</li> </ul>	<ul style="list-style-type: none"> <li>a. Fill fuel tank with specified fuel and vent the fuel system.</li> <li>b. See 4.b above.</li> <li>c. Correct or replace defective parts.</li> <li>d. Check electrical system.</li> </ul>
6. Engine overheats	<ul style="list-style-type: none"> <li>a. Leak in cooling system</li> <li>b. Radiator core clogged</li> <li>c. Radiator air passages clogged</li> <li>d. Fan drive belts too loose</li> <li>e. Thermostats inoperative</li> <li>f. Engine oil cooler clogged</li> <li>g. Improper engine lubrication</li> <li>h. Water pump malfunctioning</li> </ul>	<ul style="list-style-type: none"> <li>a. Correct all leaks and fill cooling system.</li> <li>b. Clean and flush radiator.</li> <li>c. Remove debris from radiator core.</li> <li>d. Adjust fan drive belts to proper tension.</li> <li>e. Test the thermostats for proper operation.</li> <li>f. Clean or replace the oil cooler core.</li> <li>g. Check for proper operation of engine lubricating oil pump.</li> <li>h. Repair or replace the water pump.</li> </ul>

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TROUBLE	POSSIBLE CAUSES	REMEDY
7. Engine shows loss of power	<ul style="list-style-type: none"> <li>a. Insufficient supply of air to cylinders</li> <li>b. Insufficient supply of fuel to cylinders</li> <li>c. Governor not operating properly</li> <li>d. Air in fuel system</li> <li>e. Clogged fuel filters</li> <li>f. Valves are not seating properly</li> <li>g. Loss of compression</li> <li>h. Fouled or inoperable spark plugs</li> <li>i. Inadequate oil supply</li> </ul>	<ul style="list-style-type: none"> <li>a. Clean air system.</li> <li>b. Check fuel system.</li> <li>c. Inspect and adjust governor.</li> <li>d. Vent fuel system. Check for air leaks on suction side of fuel pump.</li> <li>e. Change filter elements.</li> <li>f. Check timing; adjust valve clearance per Manufacturer's Maintenance Manual.</li> <li>g. Check compression; refer to Manufacturer's Maintenance Manual for proper procedural data.</li> <li>h. Clean and test spark plugs; replace if necessary.</li> <li>i. Check oil level in reservoir and fill if necessary.</li> </ul>
8. Engine runs unevenly with excessive vibration	<ul style="list-style-type: none"> <li>a. Governor not operating properly</li> <li>b. Fuel supply erratic or insufficient</li> <li>c. Engine operating temperature too low</li> <li>d. Carburetor or fuel injection system malfunctions</li> <li>e. Valves are bad</li> <li>f. Engine is improperly timed</li> <li>g. Fouled or inoperable spark plugs</li> </ul>	<ul style="list-style-type: none"> <li>a. Adjust governor and linkage.</li> <li>b. Check fuel system.</li> <li>c. Check thermostats.</li> <li>d. Check carburetor or fuel injection pump and nozzles.</li> <li>e. Recondition valves; refer to Manufacturer's Maintenance Manual.</li> <li>f. Set timing per Manufacturer's Maintenance Manual.</li> <li>g. Clean and test spark plugs; replace if necessary.</li> </ul>

**B. STARTING SYSTEM**

1. Starter will not crank engine	<ul style="list-style-type: none"> <li>a. Batteries weak</li> <li>b. Cables and/or connections loose or corroded</li> <li>c. Starter switch inoperative</li> <li>d. Starter brushes worn or not contacting properly</li> <li>e. Starter brush springs weak</li> <li>f. Starter commutator dirty or worn</li> <li>g. Starter armature shaft bushings worn (armature drags on fields)</li> <li>h. Starter armature burned out.</li> </ul>	<ul style="list-style-type: none"> <li>a. Check batteries.</li> <li>b. Tighten all loose connections and clean corrosion from all terminals.</li> <li>c. Replace switch.</li> <li>d. Install new brushes or fit brushes to conform to contour of commutator.</li> <li>e. Check brush spring tension, replace springs if necessary.</li> <li>f. Polish commutator, machine commutator and under-cut mica if necessary.</li> <li>g. Replace worn bushings and related items.</li> <li>h. Replace armature.</li> </ul>
2. Starter pinion will not engage with fly-wheel ring gear	<ul style="list-style-type: none"> <li>a. Grease and/or dirt in starter drive mechanism</li> <li>b. Broken or excessively worn parts</li> </ul>	<ul style="list-style-type: none"> <li>a. Disassemble and clean the drive assembly.</li> <li>b. Replace broken or worn parts.</li> </ul>

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TROUBLE	POSSIBLE CAUSES	REMEDY
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**C. FUEL SYSTEM**

1. Insufficient fuel supply to carburetor or fuel injection nozzles	<ul style="list-style-type: none"> <li>a. No fuel in fuel tank</li> <li>b. Inoperative fuel pump</li> <li>c. Fuel injection nozzle valve binding in valve body</li> <li>d. Fuel lines and/or fuel filters clogged</li> <li>e. Fuel injection pump malfunctioning</li> <li>f. Fuel injection nozzles improperly adjusted</li> <li>g. Carburetor float level is incorrect</li> <li>h. Needle valve is dirty</li> </ul>	<ul style="list-style-type: none"> <li>a. Fill fuel tank with specified fuel. Vent fuel system.</li> <li>b. Repair or replace fuel pump.</li> <li>c. Replace valve assembly in nozzle holder body.</li> <li>d. Clean fuel lines, replace fuel filter elements.</li> <li>e. Replace fuel injection pump.</li> <li>f. Adjust fuel injection nozzles.</li> <li>g. Adjust carburetor float level.</li> <li>h. Clean needle valve and float chamber.</li> </ul>
2. Air in fuel system	<ul style="list-style-type: none"> <li>a. Loose fuel line fitting or leak in fuel line on suction side of fuel pump</li> <li>b. Damaged gasket on first stage fuel filter</li> </ul>	<ul style="list-style-type: none"> <li>a. Tighten loose fitting or replace damaged line.</li> <li>b. Replace gasket.</li> </ul>
3. Carburetor or fuel injection pump malfunctions	<ul style="list-style-type: none"> <li>a. Dirt in carburetor or fuel injection pump</li> <li>b. Worn parts</li> </ul>	<ul style="list-style-type: none"> <li>a. Dismantle and clean, per Manufacturer's Maintenance Manual.</li> <li>b. Replace worn parts per Manufacturer's Maintenance Manual.</li> </ul>

**D. ELECTRICAL SYSTEM**

1. Generator/Alternator not charging	<ul style="list-style-type: none"> <li>a. Drive belt loose or broken</li> <li>b. Regulator inoperative</li> <li>c. Generator/Alternator inoperative</li> </ul>	<ul style="list-style-type: none"> <li>a. Adjust or replace drive belt.</li> <li>b. Remove regulator for repair or replacement.</li> <li>c. Remove unit for repairs or replacement.</li> </ul>
2. Generator/Alternator output low and/or unsteady	<ul style="list-style-type: none"> <li>a. Drive belt improperly adjusted</li> <li>b. Regulator operating improperly</li> <li>c. Generator brushes sticking in holders</li> <li>d. Generator brush spring tension too low</li> <li>e. Generator commutator dirty or worn</li> <li>f. Alternator circuit components damaged</li> </ul>	<ul style="list-style-type: none"> <li>a. Adjust drive belt.</li> <li>b. Remove regulator for repair or replacement.</li> <li>c. Free brushes.</li> <li>d. Replace brush springs.</li> <li>e. Clean commutator or remove generator for repair or replacement.</li> <li>f. Remove alternator for repair or replacement.</li> </ul>
3. Batteries will not hold charge	<ul style="list-style-type: none"> <li>a. Loose terminals or connections</li> <li>b. Short in electrical system</li> <li>c. Short circuit in battery</li> <li>d. Electrolyte level low (regulator output excessive or battery case cracked)</li> <li>e. Regulator inoperative</li> </ul>	<ul style="list-style-type: none"> <li>a. Tighten affected parts.</li> <li>b. Correct short.</li> <li>c. Remove and repair or replace battery.</li> <li>d. Reduce charging rate. Remove and repair or replace battery.</li> <li>e. Remove regulator for repair or replacement.</li> </ul>

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4. Faulty ignition	<ul style="list-style-type: none"> <li>a. Ignition switch defective</li> <li>b. Ignition points are pitted or worn</li> <li>c. Ignition coil is defective</li> <li>d. Distributor cap is cracked</li> <li>e. Loose or corroded connections</li> </ul>	<ul style="list-style-type: none"> <li>a. Repair or replace switch.</li> <li>b. Replace ignition points.</li> <li>c. Replace coil.</li> <li>d. Replace distributor cap.</li> <li>e. Tighten all connections; clean corroded parts and replace if required.</li> </ul>

E. LUBRICATING SYSTEM

1. No lubricating oil pressure	<ul style="list-style-type: none"> <li>a. Insufficient oil in crankcase</li> <li>b. Oil pressure gauge inoperative</li> <li>c. Lubricating oil pump screens clogged</li> <li>d. Lubricating oil pump inoperative</li> <li>e. Oil lines loose or broken inside crankcase</li> </ul>	<ul style="list-style-type: none"> <li>a. Fill crankcase to proper level.</li> <li>b. Replace gauge.</li> <li>c. Remove and clean the screens.</li> <li>d. Repair or replace oil pump.</li> <li>e. Repair or replace affected parts.</li> </ul>
2. Low lubricating oil pressure with proper oil level in crankcase	<ul style="list-style-type: none"> <li>a. Oil pressure gauge inaccurate</li> <li>b. Oil pressure relief valve or regulator valve stuck in open position</li> <li>c. Oil lines in crankcase loose or broken</li> <li>d. Improper lubricant</li> <li>e. Main and/or connecting rod bearings worn</li> <li>f. Camshaft bearings worn</li> <li>g. Accessory drive shaft bushings worn</li> <li>h. Lubricating oil pump worn</li> </ul>	<ul style="list-style-type: none"> <li>a. Check gauge. Replace if necessary.</li> <li>b. Clean, repair, or replace affected parts.</li> <li>c. Repair or replace affected items.</li> <li>d. Fill crankcase with specified lubricant.</li> <li>e. Replace bearings.</li> <li>f. Replace bearings.</li> <li>g. Replace bushings and inspect related parts.</li> <li>h. Repair or replace oil pump.</li> </ul>
3. Excessive lubricating oil pressure	<ul style="list-style-type: none"> <li>a. Oil pressure gauge inaccurate</li> <li>b. Oil pressure regulating valve improperly adjusted</li> <li>c. Improper lubricant.</li> </ul>	<ul style="list-style-type: none"> <li>a. Check gauge. Replace if necessary.</li> <li>b. Adjust valve to obtain proper pressure.</li> <li>c. Fill crankcase with specified lubricant.</li> </ul>
4. Overheating of lubricating oil	<ul style="list-style-type: none"> <li>a. Insufficient oil in crankcase</li> <li>b. Improper lubricant</li> <li>c. Engine oil cooler clogged</li> </ul>	<ul style="list-style-type: none"> <li>a. Fill crankcase to proper level.</li> <li>b. Fill crankcase with specified lubricant.</li> <li>c. Clean or replace the oil cooler.</li> </ul>
5. Excessive oil consumption	<ul style="list-style-type: none"> <li>a. External oil leakage (gaskets, etc.)</li> <li>b. Engine oil seals worn or damaged</li> <li>c. Lubricating oil too light</li> </ul>	<ul style="list-style-type: none"> <li>a. Correct all external leaks.</li> <li>b. Replace oil seals.</li> <li>c. Fill crankcase with specified lubricant.</li> </ul>

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TROUBLE	POSSIBLE CAUSES	REMEDY
	<ul style="list-style-type: none"> <li>d. Pistons, rings, and/or cylinder sleeves worn</li> <li>e. Oil rings stuck in piston ring grooves</li> <li>f. Valve guides worn</li> </ul>	<ul style="list-style-type: none"> <li>d. Replace affected parts.</li> <li>e. Clean ring grooves and replace rings.</li> <li>f. Replace valve guides. Check related parts.</li> </ul>
6. Rapid wear on engine parts	<ul style="list-style-type: none"> <li>a. Lubricating oil contaminated</li> <li>b. Improper engine lubricating oil being used</li> </ul>	<ul style="list-style-type: none"> <li>a. Fill system with clean engine oil. Replace engine oil filters.</li> <li>b. Fill system with engine lubricating oil of proper specifications.</li> </ul>

F. COOLING SYSTEM

1. Engine operating temperature too high with ample coolant in system	<ul style="list-style-type: none"> <li>a. Temperature gauge inoperative</li> <li>b. Radiator air passages restricted</li> <li>c. Thermostats inoperative</li> <li>d. Loose or broken fan drive belts</li> <li>e. Lime deposits in water passages of radiator, cylinder heads and/or cylinder block</li> <li>f. Water passages in oil cooler restricted</li> <li>g. Water pump inoperative</li> <li>h. Excessive load</li> <li>i. Engine speed set too high</li> </ul>	<ul style="list-style-type: none"> <li>a. Check gauge. Replace if necessary.</li> <li>b. Clean exterior of radiator.</li> <li>c. Replace thermostats.</li> <li>d. Adjust or replace fan drive belts.</li> <li>e. Thoroughly clean affected parts.</li> <li>f. Remove and clean oil cooler core.</li> <li>g. Repair or replace water pump.</li> <li>h. Reduce load.</li> <li>i. Adjust speed to within specified RPM limits.</li> </ul>
2. Engine operating temperature too high due to loss of coolant	<ul style="list-style-type: none"> <li>a. External leaks</li> <li>b. Ruptured oil cooler core (oil in coolant)</li> <li>c. Engine cylinder head gaskets leaking</li> <li>d. Engine cylinder heads cracked</li> <li>e. Engine cylinder block cracked</li> </ul>	<ul style="list-style-type: none"> <li>a. Repair affected parts.</li> <li>b. Replace oil cooler core.</li> <li>c. Replace gaskets and torque cylinder head nuts as specified.</li> <li>d. Replace cylinder head.</li> <li>e. Replace cylinder block.</li> </ul>