

Contents

Introduction v

Chapter 1 Shop Routine 1



Part 1 Safety, 1; Part 2 Tools and Shop Equipment, 4; Part 3 Fasteners, 30;
Part 4 Lines and Fittings, 33; Part 5 Gaskets, Seals, and Bearings, 35;
Self-Check, 39; *Performance Evaluation*, 39

Chapter 2 Engine Principles 41



Part 1 Energy Conversion, 41; Part 2 Basic Engine Components, 45; Part 3 Four-Stroke-Cycle Engine Operation, 45; Part 4 Two-Stroke-Cycle Engine Operation, 47;
Part 5 Diesel Engine Classifications, 49; Part 6 Engine Measurements and Performance, 49; Part 7 Dynamometer Testing, 53; *Self-Check*, 55; *Performance Evaluation*, 55

Chapter 3 Engine Components 57



Part 1 Cylinder Block and Cylinder Liners, 57; Part 2 Crankshaft, Bearings, Harmonic Balancer, and Flywheel, 69; Part 3 Pistons, Rings, and Connecting Rods, 77;
Part 4 Camshafts, Bearings, and Drives, 90; Part 5 Accessory Drives, Gears, and Covers, 99; Part 6 Valve-Operating Mechanisms, 99; Part 7 Cylinder Heads, Valves, and Covers, 105; *Self-Check*, 111; *Performance Evaluation*, 112

Chapter 4 Lubrication Systems 113



Part 1 Lubrication Principles, 113; Part 2 Lubricating Oils, 117; Part 3 Oil Pumps and Pressure Regulation, 122; Part 4 Oil Filters, Lines, and Coolers, 125;
Part 5 Crankcase Ventilation, 130; Part 6 Lubrication System Diagnosis and Service, 131; *Self-Check*, 138; *Performance Evaluation*, 138

Chapter 5 Cooling Systems 139



Part 1 Cooling System Principles, 139; Part 2 Radiators and Caps, 144;
Part 3 Water Pumps, Fans, and Drives, 147; Part 4 Thermostats, Hoses, and Clamps, 152; Part 5 Shutters and Shutter Controls, 155; Part 6 Cooling System Diagnosis and Service, 157; *Self-Check*, 168; *Performance Evaluation*, 168

Chapter 6 Engine Diagnosis and Service 169



Part 1 Engine Removal and Disassembly, 184; Part 2 Cylinder Block and Cylinder Liner Service, 195; Part 3 Crankshaft Assembly Service, 208; Part 4 Connecting Rod, Piston, and Ring Service, 213; Part 5 Camshaft, Balance Shaft, and Drive Service, 222; Part 6 Cylinder Head and Valve Service, 226; Part 7 Valve- and Injector-Operating Mechanism Service, 239; Part 8 Start-Up and Break-In Procedure, 246; *Self-Check*, 249; *Performance Evaluation*, 250

Chapter 7 Induction and Exhaust Systems 253



Part 1 Air Cleaners and Intake Manifolds, 253; Part 2 Turbochargers and Superchargers, 259; Part 3 Exhaust System, 273; Part 4 Induction and Exhaust System Service, 274; *Self-Check*, 290; *Performance Evaluation*, 291

Chapter 8 Fuel Systems 293



Part 1 Diesel Fuels, 293; Part 2 Air Pollution, 303; Part 3 Fuel Supply System, 311; Part 4 Pumping, Metering, and Injection Timing, 317; Part 5 Governing Fuel Delivery, 358; Part 6 Fuel Injectors and Combustion Chambers, 431; *Self-Check*, 453; *Performance Evaluation*, 454

Chapter 9 Fuel System Diagnosis and Service 455



Part 1 General Service Procedures, 457; Part 2 Diagnostic Charts and Service Procedures, 462; Detroit Diesel, 462; Caterpillar, 471; Bosch, 485; Cummins, 490; Roosa Master, 505; Injector Service, 513; Part 3 Tuneup Procedure, 515; *Self-Check*, 518; *Performance Evaluation*, 518

Chapter 10 Electrical Principles 523



Part 1 Electricity and Magnetism, 523; Part 2 Batteries, 530; Part 3 Battery Diagnosis and Service, 535; Part 4 Circuits, Switches, Relays, Solenoids, and Fuses, 538; Part 5 Electrical Circuit Diagnosis and Service, 549; *Self-Check*, 552; *Performance Evaluation*, 553

Chapter 11 Cranking Systems 555



Part 1 Electrical Cranking System, 555; Part 2 Electric Cranking System Diagnosis and Service, 564; Part 3 Hydraulic Cranking System, 571; Part 4 Hydraulic Cranking System Diagnosis and Service, 575; Part 5 Air Cranking System, 584; Part 6 Air Cranking System Diagnosis and Service, 585; *Self-Check*, 586; *Performance Evaluation*, 587

Chapter 12 Charging Systems 589



Part 1 Direct Current (D.C.) Generators, 589; Part 2 D.C. Generator Regulators, 592; Part 3 D.C. Generator Charging System Diagnosis and Service, 595; Part 4 Alternating Current (A.C.) Generators, 597; Part 5 A.C. Generator Regulators, 606; Part 6 A.C. Charging System Diagnosis and Service, 612; *Self-Check*, 618; *Performance Evaluation*, 619

Reference Charts 621

Index 630