Service Manual Outline

SECTION 1 - Important Information
- A - General Information
- B - Maintenance
- C - Troubleshooting

SECTION 2 - Removal and Installation
- A - Sterndrive (MCM) Models
- B - Inboard (MIE) Models

SECTION 3 - Engine
- A - Mechanical

SECTION 4 - Electrical System
- A - Starting System
- B - Charging System
- C - Glow Plug System
- D - Instrumentation
- E - Wiring Diagrams

SECTION 5 - Fuel System
- A - Fuel Delivery Pump and Fuel Filter
- B - Fuel Injectors
- C - Injection Pump

SECTION 6 - Cooling System
- A - Seawater Cooled Section
- B - Closed Cooled Section

SECTION 7 - Intake and Exhaust System
- A - Intercooler
- B - Manifolds, Elbows and Risers

SECTION 8 - Drive Systems
- A - Hurth Down Angle Transmissions
- B - Propeller Shaft Models

SECTION 9 - Power Steering System
- A - Pump and Related Components

Important Information 1

Removal and Installation 2

Engine 3

Electrical System 4

Fuel System 5

Cooling System 6

Intake and Exhaust System 7

Drive Systems 8

Power Steering System 9

APERÇU — Engine Manual — fichier complet disponible après achat 1/10

Notice

Throughout this publication, Dangers, Warnings and Cautions (accompanied by the International HAZARD Symbol ⚠) are used to alert the mechanic to special instructions concerning a particular service or operation that may be hazardous if performed incorrectly or carelessly. **OBSERVE THEM CAREFULLY!**

These Safety Alerts alone cannot eliminate the hazards that they signal. Strict compliance to these special instructions when performing the service, plus common sense operation, are major accident prevention measures.

⚠ DANGER

Immediate hazards which will result in severe personal injury or death.

⚠ WARNING

Hazards or unsafe practices which could result in severe personal injury or death.

⚠ CAUTION

Hazards or unsafe practices which could result in minor personal injury or product or property damage.

Notice to Users of This Manual

This service manual has been written and published by the Service Department of Mercury Marine to aid our dealers' mechanics and company service personnel when servicing the products described herein.

It is assumed that these personnel are familiar with marine product servicing procedures. Furthermore, it is assumed that they have been trained in the recommended service procedures of Mercury MerCruiser product, including the use of mechanics' common hand tools and the special Mercury Marine or recommended tools from other suppliers.

We could not possibly know of and advise the marine trade of all conceivable procedures and of the possible hazards and/or results of each method. Therefore, anyone who uses a service procedure and/or tool, which is not recommended by the manufacturer, first must completely satisfy himself that neither his nor the product's safety will be endangered.

All information, illustrations and specifications contained in this manual are based on the latest product information available at the time of publication. As required, revisions to this manual will be sent to all dealers contracted by us to sell and/or service these products.

We reserve the right to make changes to this manual without prior notification.

Refer to dealer service bulletins, operation, maintenance, and warranty manuals and installation manuals for other pertinent information concerning the products described in this manual.

APERÇU — Engine Manual — fichier complet disponible après achat 2/10

Precautions

It should be kept in mind, while working on the product, that the electrical system and ignition system are capable of violent and damaging short circuits or severe electrical shocks. When performing any work where electrical terminals could possibly be grounded or touched by the mechanic, the battery cables should be disconnected at the battery.

Any time the intake or exhaust openings are exposed during service they should be covered to protect against accidental entrance of foreign material which could enter the cylinders and cause extensive internal damage when the engine is started.

It is important to note, during any maintenance procedure, replacement fasteners must have the same measurements and strength as those removed. Numbers on the heads of the metric bolts and on the surfaces of metric nuts indicate their strength. American bolts use radial lines for this purpose, while most American nuts do not have strength markings. Mismatched or incorrect fasteners can result in damage or malfunction, or possibly personal injury. Therefore, fasteners removed should be saved for reuse in the same locations whenever possible. Where the fasteners are not satisfactory for re-use, care should be taken to select a replacement that matches the original.

Engine Mechanical Components

Many of the engine mechanical components are designed for marine applications. Unlike automotive engines, marine engines are subjected to extended periods of heavy load and wide open throttle operation and, therefore, require heavy-duty components. Special marine engine parts have design and manufacturing specifications that are required to provide long life and dependable performance. Marine engine parts also must be able to resist the corrosive action of salt or brackish water that will rust or corrode standard automotive parts within a short period of time.

Failure to use recommended Quicksilver service replacement parts can result in poor engine performance and/or durability, rapid corrosion of parts subjected to salt water and possibly complete failure of the engine.

Replacement Parts

Use of parts other than the recommended service replacement parts, will void the warranty on those parts that are damaged as a result.

⚠ WARNING

Electrical, ignition, and fuel system components on Mercury MerCruiser Engines and Sterndrives are designed and manufactured to comply with U.S. Coast Guard Rules and Regulations to minimize risks of fire or explosion.

Use of replacement electrical, ignition, or fuel system components, which do not comply to these rules and regulations, could result in a fire or explosion hazard and should be avoided.

When servicing the electrical, ignition, and fuel systems, it is extremely important that all components are properly installed and tightened. If not, any electrical or ignition component opening would permit sparks to ignite fuel vapors from fuel system leaks, if they existed.

APERÇU — Engine Manual — fichier complet disponible après achat 3/10

Cleanliness and Care of Product

A marine power product is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the ten thousands of an inch/mm. When any product component is serviced, care and cleanliness are important. Throughout this manual, it should be understood that proper cleaning and protection of machined surfaces and friction areas is a part of the repair procedure. This is considered standard shop practice even if not specifically stated.

Personnel should not work on or under an engine that is suspended. Engines should be attached to work stands, or lowered to ground as soon as possible.

Whenever components are removed for service, they should be retained in order. At the time of installation, they should be installed in the same locations and with the same mating surfaces as when removed.

APERÇU — Engine Manual — fichier complet disponible après achat 4/10

Models Covered in This Manual

Sterndrive (MCM) Model	Serial Number
D4.2L LD	0L344381 and Above

Inboard (MIE) Model	Serial Number
D4.2L LD	0L344381 and Above

APERÇU — Engine Manual — fichier complet disponible après achat

Table of Contents

Section 1A - General Information

Introduction 1A-2
How to Use This Manual 1A-2
Page Identification 1A-2
Engine Serial Number Locations 1A-3
Operation / Duty Cycle 1A-4
Mercury/Quicksilver Lubricants and Sealants 1A-5

Section 1B - Maintenance

Torque Specifications 1B-2
Lubricants / Sealants / Adhesives 1B-3
Special Tools 1B-4
Precautions 1B-5
Engine Specifications 1B-6
D4.2L LD 1B-6
Fluid Specifications 1B-7
Engines 1B-7
Sterndrives 1B-7
Transmissions 1B-7
Maintenance Schedules 1B-8
Maintenance Intervals 1B-8
Sterndrive (MCM) Engines 1B-9
Scheduled Maintenance* 1B-10
Inboard (MIE) Engines 1B-12
Engine External Views 1B-14
Front 1B-14
Starboard 1B-15
Engine Oil 1B-16
Overfilled Engine Crankcase 1B-16
Checking 1B-17
Filling 1B-18
Changing Engine Oil and Oil Filter . . 1B-19
Flushing The Power Package - Sterndrive (MCM) 1B-22
Sterndrive Water Pickups 1B-22
Alternative Water Pickups 1B-25
Flushing The Power Package - Inboard (MIE) 1B-28
Fuel 1B-30
Precautions 1B-30
General Information 1B-31
Fuel Filter 1B-32
Sterndrive Unit Oil 1B-37
Checking 1B-37
Filling 1B-38
Changing 1B-39
Power Trim Pump Fluid 1B-41
Checking 1B-41
Filling 1B-42
Changing 1B-42
Power Steering Pump Fluid 1B-43
Checking 1B-43
Filling and Bleeding 1B-45
Transmission Fluid 1B-46
Checking 1B-46
Changing and Filling 1B-47
Water Pickups 1B-48
Sterndrive 1B-48
Though the Hull or Through the Transom Pickups 1B-48
Seawater Strainer 1B-49
Closed Cooling System 1B-50
Coolant Requirement 1B-50
Checking Level 1B-51
Draining 1B-52
Filling 1B-54
Engine Anodes 1B-55
Removal 1B-55
Inspection 1B-55
Disassembly 1B-56
Reassembly 1B-56
Installation 1B-56
Sterndrive Anodes 1B-57
Propeller Shaft 1B-60
Power Package Surfaces 1B-61
Painting Your Power Package 1B-61
Battery 1B-62
Instruments 1B-62
Gimbal Ring / Steering Connection 1B-62
Lubrication 1B-63
Throttle Cable 1B-63
Shift Cable 1B-63
Transmission Linkage 1B-64
Sterndrive Components 1B-64
Continuity Circuit 1B-67
Continuity Circuit (continued) 1B-68
MerCathode 1B-69
Engine Mounts 1B-69
Electrical System 1B-69
Air Filter 1B-70
Removal 1B-70
Inspection 1B-70
Cleaning 1B-71
Installation 1B-71
Drive Belts 1B-71
General Information 1B-71
Inspection 1B-72
Engine Water Circulating Pump Belt . 1B-72
Alternator Belt 1B-73
Power Steering Pump Belt 1B-75
Charging System 1B-77
Freezing Temperature and Cold Weather Operation 1B-77
Power Package Layup 1B-78
Draining 1B-79
Recommissioning 1B-85

APERÇU — Engine Manual — fichier complet disponible après achat 6/10

Section 1C - Troubleshooting

Precautions 1C-2
Poor Boat Performance and/or Poor Maneuverability 1C-4
Improper Full Throttle Engine RPM 1C-5
RPM Too High 1C-5
RPM Too Low 1C-5
Engine Cranks Over But Will Not Start Or Starts Hard 1C-6
Electrical 1C-6
Fuel System 1C-6
Fuel System (continued) 1C-7
Miscellaneous 1C-8
Engine Will Not Crank Over or Starter Inoperative 1C-8
Glow Plugs Inoperative 1C-9
Charging System Inoperative 1C-10
Noisy Alternator 1C-10
Engine Operates Poorly at Idle 1C-11
Engine Operates Poorly At High Rpm . . 1C-12
Poor Fuel Economy 1C-13
Engine Smoking 1C-14
Black Smoke 1C-14
Blue Smoke 1C-15
White Smoke 1C-15
Exhaust Gas Temperature 1C-16
High 1C-16
Low 1C-16
Turbocharger 1C-17
Engine Noise 1C-18
Valve Cover Area 1C-19
Cylinder Area 1C-19
Camshaft Area 1C-20
Crankshaft Area 1C-21
Miscellaneous 1C-22
Oil Pressure 1C-22
Low Oil Pressure 1C-24
High Oil Pressure 1C-24
Excessive Oil Consumption 1C-25
Water / Coolant in Engine 1C-26
Important Information 1C-26
Water / Coolant In Crankcase Oil . . . 1C-26
Water / Coolant On Top Pistons 1C-27
Engine Overheats 1C-28
Cooling System 1C-28
Mechanical 1C-29
Power Steering 1C-30
Poor, Erratic or No Assist 1C-30
Noisy Pump 1C-31
Fluid Leaks 1C-31
Insufficient Water Flow From Belt Driven Seawater Pump 1C-32
ZF Marine / Hurth Hydraulic Transmission 1C-33

Section 2A - Sterndrive (MCM) Models

Torque Specifications 2A-2
Lubricants / Sealants / Adhesives 2A-3
Special Tools 2A-3
Removal 2A-4
Installation 2A-6
Battery Cable Connection 2A-6
Engine Installation / Alignment 2A-7
Engine Connections 2A-14
Throttle Cable Installation and Adjustment 2A-20
Shift Cable Installation and Adjustment 2A-22
Troubleshooting Shift Problems 2A-27
Battery Connection 2A-29

Section 2B - Inboard (MIE) Models

Torque Specifications 2B-2
Lubricants / Sealants / Adhesives 2B-2
Removal 2B-3
Engine Removal 2B-3
Installation 2B-6
Battery Cable Connection 2B-6
Engine Installation And Initial Alignment 2B-7
Engine Final Alignment 2B-11
Engine Connections 2B-16
Throttle Cable Installation And Adjustment 2B-20
Shift Cable Installation And Adjustment 2B-22
Battery Connection 2B-22

APERÇU — Engine Manual — fichier complet disponible après achat 7/10

Section 3A - Engine Mechanical

Identification 3A-4
Engine 3A-4
Torque Specifications 3A-5
Cylinder Head Gasket - Torque Sequence and Specifications 3A-7
Lubricants / Sealants / Adhesives 3A-10
Tools 3A-12
Special Tools 3A-12
Kent-Moore Tools 3A-13
Snap-On Tools 3A-13
Engine Specifications 3A-14
Pistons 3A-14
Piston Rings 3A-14
Cylinder Liner Diameter 3A-15
Cylinder Liner Protrusion 3A-15
Head Gaskets 3A-15
Cylinder Head 3A-16
Oil Pump 3A-16
Oil Thermostat 3A-16
Camshaft 3A-17
Valve Lifter 3A-18
Rocker Arm 3A-18
Valve Adjustment 3A-18
Valve 3A-19
Valve Seat 3A-19
Valve Guide 3A-20
Valve Spring 3A-20
Crankshaft 3A-21
Connecting Rods 3A-22
Connecting Rod Bushings 3A-22
Flywheel 3A-22
Precautions 3A-23
General Information 3A-24
Engine Rotation 3A-24
Engine Firing Order 3A-24
Lubrication System 3A-25
Examples of Bearing Failures 3A-26
Compression Testing Procedure 3A-27
Valve Covers 3A-28
Removal 3A-28
Cleaning 3A-29
Inspection 3A-30
Installation 3A-30
Oil Separator / Vent System 3A-32
Exploded View 3A-32
Removal 3A-33
Inspection 3A-33
Installation 3A-33
Coolant Manifold 3A-34
Exploded View 3A-34
Removal 3A-35
Disassembly 3A-35
Cleaning 3A-36
Inspection 3A-36
Installation 3A-36
Cylinder Head 3A-38
Exploded View 3A-38
Removal 3A-40
Disassembly 3A-42
Cleaning 3A-42
Inspection 3A-43
Repair 3A-48
Assembly 3A-50
Cylinder Head Installation 3A-54
Rocker Arm 3A-61
Removal 3A-61
Cleaning 3A-61
Inspection 3A-61
Assembly 3A-62
Installation 3A-64
Valve Adjustment 3A-67
Timing Gear Cover 3A-68
Exploded View 3A-68
Removal 3A-69
Cleaning 3A-69
Inspection 3A-69
Installation 3A-70
Oil Pump 3A-73
Removal 3A-73
Cleaning 3A-73
Inspection 3A-74
Reassembly 3A-75
Installation 3A-75

APERÇU — Engine Manual — fichier complet disponible après achat 8/10

Section 3A - Engine Mechanical (continued)

Oil Pressure Relief Valve 3A-76
Removal 3A-76
Disassembly 3A-77
Cleaning 3A-77
Inspection 3A-78
Assembly 3A-78
Installation 3A-79
Oil Pan 3A-80
Removal 3A-80
Cleaning 3A-82
Inspection 3A-82
Installation 3A-82
Oil Adapter / Oil Thermostat 3A-85
Removal 3A-85
Disassembly 3A-86
Cleaning and Inspection 3A-86
Testing 3A-87
Installation 3A-89
Camshaft 3A-91
Exploded View 3A-91
Testing - Measuring Lobe Lift 3A-92
Removal 3A-92
Inspection 3A-93
Installation 3A-97
Camshaft Bearings 3A-99
Inspection 3A-99
Removal 3A-99
Installation 3A-100
Valve Lifters 3A-101
Removal 3A-101
Cleaning 3A-102
Inspection 3A-102
Installation 3A-103
Valve Pushrods 3A-104
Removal 3A-104
Cleaning 3A-104
Inspection 3A-104
Installation 3A-105
Connecting Rod, Bearings and Piston Assembly 3A-106
Connecting Rod Bearing Clearance - Engine Assembled 3A-107
Removal 3A-109
Disassembly 3A-110
Cleaning 3A-111
Inspection 3A-112
Assembly 3A-117
Installation 3A-118
Rear Oil Seal 3A-121
Removal 3A-121
Installation 3A-122
Crankshaft and Main Bearings 3A-124
Removal 3A-124
Cleaning 3A-128
Inspection 3A-129
Installation 3A-133
Cylinder Liners 3A-145
Removal 3A-145
Identification 3A-146
Cleaning and Inspection 3A-147
Installation 3A-149
Flywheel Housing Assembly 3A-154
Exploded View 3A-154
Engine Mounts 3A-158
Front Mounts 3A-158
MIE (Inboard) Transmission Mounts . 3A-159
Engine Break-In 3A-160
Initial Break-In Procedure 3A-160
Engine 20-Hour Break-In Period 3A-161
After Break-in Period 3A-161

Section 4A - Starting System

Identification 4A-2
Specifications 4A-2
Torque Specifications 4A-2
Lubricants / Sealants / Adhesives 4A-3
Wire Color Code Abbreviations 4A-3
Precautions 4A-3
Replacement Parts Warning 4A-3
Starting System Components 4A-4
Inspection 4A-5
Periodic Inspection 4A-5
Testing Voltage 4A-5
Testing Voltage Drop 4A-6
Removal 4A-7
Starter Motor 4A-7
Solenoid Switch 4A-8
Installation 4A-9
Solenoid Switch 4A-9
Starter Motor 4A-10

APERÇU — Engine Manual — fichier complet disponible après achat 9/10

Section 4B - Charging System

Identification 4B-2
Specifications 4B-2
Torque Specifications 4B-2
Lubricants / Sealants / Adhesives 4B-3
Wire Color Code Abbreviations 4B-3
Special Tools 4B-3
Precautions 4B-4
Replacement Parts Warning 4B-4
System Components 4B-5
Battery Isolators 4B-6
Dual Battery Charging Systems Using a Battery Isolator 4B-6
Periodic Maintenance 4B-7
Drive Belt Adjustment 4B-7
Alternator 4B-7
Troubleshooting Tests (Alternator on Engine) 4B-8
Circuitry Test 4B-8
Output Circuit 4B-9
Harness Voltage Test 4B-10
Open Diode-Trio Test 4B-11
Current Output Test 4B-12
Voltage Output Test 4B-13
Exploded View 4B-14
Removal 4B-15
Installation 4B-16
Battery Isolator Diagram 4B-17

Section 4C - Glow Plug System

Identification 4C-2
Specifications 4C-2
Torque Specifications 4C-2
Lubricants / Sealants / Adhesives 4C-2
Wire Color Code Abbreviations 4C-2
Special Tools 4C-3
Description 4C-3
Precautions 4C-3
Glow Plug Testing (Prior to Removal) . . 4C-4
Removal 4C-5
Cleaning 4C-6
Inspection 4C-6
Installation 4C-7
Glow Plug Actuator Relay And Auxiliary Relay 4C-8
Removal 4C-8
Cleaning 4C-8
Inspection 4C-8
Testing 4C-8
Installation 4C-9
Glow Plug Circuit Diagram 4C-10

Section 4D - Instrumentation

Identification 4D-2
Gauges 4D-2
Panels 4D-2
Specifications 4D-3
Torque Specification 4D-3
Tools 4D-3
Special Tools 4D-3
Kent-Moore Tools 4D-4
Lubricants / Sealants / Adhesives 4D-4
Wire Color Abbreviations 4D-4
Precautions 4D-5
General Information 4D-6
Special Information 4D-6
Tachometer 4D-6
QSI Series Gauge Lighting Options 4D-7
Gauges 4D-8
Removal 4D-8
Testing 4D-8
Installation 4D-11
Senders 4D-11
Oil Pressure 4D-11
Water Temperature - Primary Station 4D-13
Primary Station Switches 4D-16
Ignition (Key) Switch 4D-16
Stop Switch 4D-18
Audio Warning Test and Panel Light Switch 4D-20
Audio Warning System 4D-22
Alarm 4D-22
Oil Pressure Switch 4D-23
Water Temperature Switch / Sender 4D-24
Transmission Fluid Temperature Switch 4D-28
Remote Control / Neutral Start Safety Circuit 4D-31
Primary Station 4D-31
Secondary Station 4D-32

APERÇU — Engine Manual — fichier complet disponible après achat 10/10