

TABLE OF CONTENTS

1- DESCRIPTION AND OPERATION

| | |
|--|-----|
| BRIEF HISTORY | 1-1 |
| PRINCIPLES OF OPERATION | 1-1 |
| ENGINE AND JET DRIVE | 1-4 |
| Cooling System | 1-5 |
| Bilge System | 1-6 |
| DEBRIS REMOVAL AND ENGINE OVERHEATING | 1-7 |
| TEST TANKS | 1-8 |

2- SAFETY

| | |
|--|-----|
| INTRODUCTION | 2-1 |
| Craft Classification | 2-1 |
| Information | 2-1 |
| MINIMUM LEGAL REQUIREMENTS FOR EQUIP. | 2-2 |
| Personal Flotation Devices | 2-2 |
| Bells, Horns, and Whistles | 2-3 |
| Fire Extinguishers | 2-4 |
| Visual Distress Signals | 2-4 |
| MINIMUM LEGAL REQUIREMENTS FOR CRAFT | 2-5 |
| SAFETY PRACTICES | 2-5 |
| BOATING ACCIDENT REPORTS | 2-8 |
| SECURITY | 2-8 |

3- TUNING

| | |
|---------------------------|------|
| INTRODUCTION | 3-1 |
| TUNE-UP SEQUENCE | 3-1 |
| COMPRESSION CHECK | 3-2 |
| SPARK PLUG INSPECTION | 3-3 |
| ELECTRICAL POWER SUPPLY | 3-3 |
| FUEL SYSTEM | 3-5 |
| FUEL PUMPS | 3-8 |
| CRANKING MOTOR & SOLENOID | 3-9 |
| JET PUMP | 3-10 |
| ROTARY VALVE DESCRIPTION | 3-10 |
| "RAVE" VALVE | 3-12 |

4- MAINTENANCE

| | |
|--|------|
| INTRODUCTION | 4-1 |
| INITIAL TASKS | 4-2 |
| After Use Tasks | 4-3 |
| Cooling | 4-3 |
| Pump Impeller | 4-3 |
| SERIAL NUMBERS | 4-4 |
| LUBRICATION -- COMPLETE UNIT | 4-5 |
| Throttle & Choke Cable | 4-5 |
| Steering Cable | 4-5 |
| Maintenance Chart | 4-6 |
| Fuel/Oil Mixture | 4-7 |
| Engine Oil & Tank | 4-8 |
| Jet Pump | 4-8 |
| INSPECTION & SERVICE | 4-9 |
| Fuel Tank Check Valve | 4-9 |
| Oil Tank Check Valve | 4-9 |
| IMPELLER-TO-IMPELLER HSG. WEAR RING CLEARANCE | 4-10 |
| Engine Alignment | 4-11 |
| PRE-SEASON PREPARATION | 4-11 |
| SEALANTS, ADHESIVES, LUBRI- CANTS, & FUEL STABILIZERS | 4-13 |
| Lubricants and Adhesives | 4-14 |
| FIBERGLASS HULLS | 4-15 |
| SUBMERGED ENGINE SERVICE | 4-15 |
| Salt Water Submersion | 4-16 |
| Submerged While Running | 4-16 |
| Fresh Water Submersion | 4-16 |
| WINTER STORAGE | 4-17 |
| BATTERY STORAGE | 4-18 |
| PRE-SEASON CHECK | 4-19 |

5- TROUBLESHOOTING

| | |
|------------------------|-----|
| INTRODUCTION | 5-1 |
| Low Engine rpm | 5-1 |
| High Engine rpm | 5-1 |
| Engine Troubleshooting | 5-2 |
| Cranking System Test | 5-2 |

| | | | |
|-----------------------------------|------|-------------------------------------|------|
| 5- TROUBLESHOOTING (Cont.) | | | |
| Ignition System Test | 5-2 | Low Speed Mixture | 6-33 |
| Compression Test | 5-3 | Idle Speed Adjustment | 6-34 |
| MECHANICAL ENGINE PROBLEMS | 5-4 | Choke Cable Adjustment | 6-35 |
| Twisted Crankshaft | 5-4 | OIL INJECTION -- ALL ENGINES | 6-35 |
| FUEL SYSTEM PROBLEMS | 5-5 | Oil Mixture | 6-35 |
| Engine Surge | 5-6 | System Components | 6-36 |
| Rough Engine Idle | 5-6 | Oil Tank | 6-36 |
| IGNITION SYSTEM FAULTS | 5-6 | Oil Injection Pump | 6-37 |
| SPARK PLUG EVALUATION | 5-8 | System Inspection | 6-37 |
| CRANKING SYSTEM FAILURES | 5-9 | Troubleshooting | 6-37 |
| Faulty Symptoms | 5-9 | First Checks -- Oil Delivery | 6-37 |
| Cranking Circuit System Tests | 5-10 | Purging Air from Oil System | 6-38 |
| CRANKING MOTOR SOLENOID | 5-12 | Oil Injection Pump Synchro. | 6-39 |
| CHARGING SYSTEM | | Injection Pump Operational Test | 6-39 |
| MALFUNCTIONS | 5-13 | Oil Pump Removal -- | |
| TROUBLESHOOTING CHARTS | 5-14 | All except 787 Series Engine | 6-40 |
| | | Oil Pump Installation -- | |
| | | All Engines Except 787 Series | 6-41 |
| 6- FUEL AND OIL | | Oil Pump Removal -- 787 Engine | 6-41 |
| | | Oil Pump Installation -- 787 | 6-42 |
| INTRODUCTION | 6-1 | 7- IGNITION | |
| GENERAL CARBURETION INFO. | 6-1 | INTRODUCTION | 7-1 |
| Diaphragm Carburetors | 6-1 | SPARK PLUG EVALUATION | 7-2 |
| Fuel/Oil Mixture | 6-3 | CDI & CHARGING SYSTEM -- | |
| Air/Fuel Mixture | | ALL EXCEPT 787 ENGINES | 7-4 |
| Throttle and Choke Valves | 6-4 | IGNITION CIRCUIT DESCRIP. | |
| Engine Revolution Limiter | 6-4 | AND OPERATION | 7-4 |
| FUEL PUMP | 6-4 | Charge Circuit | 7-5 |
| Integral Fuel Pump | 6-5 | Ignition Generating Circuit | 7-5 |
| FUEL IN THE SYSTEM | 6-5 | Timing Advance | 7-5 |
| LONG TIME STORAGE | 6-6 | Charging System | 7-5 |
| SHORT TIME STORAGE | 6-6 | TROUBLESHOOTING CDI SYSTEM | 7-5 |
| TROUBLESHOOTING | 6-7 | Spark Plugs | 7-6 |
| Fuel Filter and Sediment Bowl | 6-7 | Compression | 7-7 |
| Choke Problems | 6-8 | TROUBLESHOOTING CHARGING | |
| Rough Engine Idle | 6-8 | SYSTEM | 7-7 |
| Excessive Fuel Consumption | 6-8 | Magneto Assembly Resistance | 7-8 |
| SERVICE MIKUNI SUPER BN | 6-8 | Generating Coil Test | 7-9 |
| Removal -- 587, 657 & 717 Engines | 6-9 | Battery Charging Coil Test | 7-9 |
| Removal -- 787 Engines | 6-12 | Ignition Coil Test | 7-9 |
| Disassembly | 6-14 | Trigger Coil Test -- 787 Only | 7-12 |
| Assembly | 6-21 | CHARGING CIRCUIT | 7-12 |
| Bench Adjustments | 6-27 | General Information | 7-12 |
| Low Speed & Idle Mixture | 6-27 | Charging Circuit Output Test | 7-12 |
| Synchronize Throttle Valves | 6-28 | Amperage Output Test | 7-13 |
| Synchronize Choke Valves | 6-28 | Voltage Output Test | 7-13 |
| Installation -- All Engines | | Ignition Module Test | 7-13 |
| Except 787 Series | 6-28 | Stator Test -- 787 Series Only | 7-13 |
| Installation -- 787 Series Only | 6-31 | FLYWHEEL AND MAGNETO | 7-13 |
| FUEL ADJUSTMENTS | 6-32 | "Pulling" the Flywheel | 7-14 |
| Main Jet Selection | 6-32 | Stator Plate/Magneto Assembly | 7-16 |
| Throttle Cable Adjustment | 6-33 | | |

| | |
|---|------|
| 7- IGNITION (Cont.) | |
| Generating Coil Removal/ Installation | 7-16 |
| Battery Charging Coil Removal & Installation | 7-17 |
| Cleaning & Inspecting | 7-17 |
| Magneto Assembly Installation | 7-19 |
| Flywheel Installation | 7-19 |
| TIMING ADJUSTMENTS | 7-20 |
| Static Tests | 7-20 |
| Timing Marks | 7-20 |
| Dynamic Testing | 7-21 |
| Ignition Timing Adjustment All Engines Except 787 Series | 7-22 |
| Spark Advance | 7-23 |
| DESS SYSTEM | 7-24 |

8- ENGINE

| | |
|---|------|
| INTRODUCTION | 8-1 |
| Repair Procedures | 8-1 |
| Torque Values | 8-1 |
| TWO-STROKE ENGINE DESCRIP. AND OPERATION | 8-2 |
| ROTARY VALVE OPERATION | 8-2 |
| COMPLETE SERVICE -- MODEL 587, 657, & 717 ENGINE | 8-3 |
| Removal | 8-3 |
| Disassembling | 8-13 |
| Assembling | 8-24 |
| Installation | 8-34 |
| Engine Build Up | 8-35 |
| Closing Tasks | 8-43 |
| Break-in Procedures | 8-44 |
| COMPLETE SERVICE -- MODEL 787 ENGINE | 8-45 |
| Removal | 8-45 |
| Disassembling | 8-52 |
| Assembling | 8-60 |
| Installation | 8-70 |
| Engine Build-up | 8-73 |
| Break-in Procedures | 8-76 |
| CLEANING AND INSPECTING | 8-76 |

9- ELECTRICAL

| | |
|---|------|
| BATTERIES | 9-1 |
| TACHOMETER | 9-8 |
| ELECTRICAL SYSTEM | |
| GENERAL INFORMATION | 9-8 |
| CRANKING MOTOR CIRCUIT SERVICE | 9-9 |
| CRANKING MOTOR TROUBLE- SHOOTING | 9-10 |

| | |
|--|------|
| CRANKING MOTOR SOLENOID REMOVAL | 9-12 |
| CRANKING MOTOR SERVICE | 9-13 |
| Removal | 9-13 |
| Disassembling | 9-14 |
| Cleaning & Inspecting | 9-16 |
| Testing Parts | 9-18 |
| Assembling | 9-20 |
| Installation | 9-23 |
| TESTING OTHER COMPONENTS | 9-24 |

10- JET PUMP

| | |
|--|-------|
| INTRODUCTION | 10-1 |
| PRINCIPLES OF OPERATION | 10-1 |
| ENGINE & JET DRIVE | 10-2 |
| IMPELLERS | 10-3 |
| CHECKING IMPELLER-TO- WEAR RING CLEARANCE | 10-5 |
| JET PUMP SERVICE | 10-6 |
| PUMP REMOVAL AND DISASSEMBLING | 10-6 |
| Impeller Removal | 10-11 |
| Wear Ring Removal | 10-13 |
| Seal Carrier Service | 10-14 |
| CLEANING AND INSPECTING | 10-14 |
| Driveshaft Runout | 10-15 |
| Impeller Shaft Radial "Play" | 10-16 |
| Impeller Shaft End "Play" | 10-16 |
| PUMP ASSEMBLING | 10-17 |
| Seal Carrier | 10-17 |
| Impeller Housing Bearing and Seal Installation | 10-18 |
| Wear Ring Installation | 10-19 |
| Impeller Installation | 10-20 |
| Driveshaft Assembling | 10-21 |

11- CONTROL ADJUSTMENTS

| | |
|----------------------------------|------|
| INTRODUCTION | 11-1 |
| STEERING CABLE ADJUSTMENT | 11-1 |
| REVERSE CAPABILITY | 11-3 |
| REVERSE CABLE ADJUSTMENT | 11-4 |
| VTS ACTUATOR ADJUSTMENT | 11-6 |

APPENDIX

| | |
|--------------------------------|------|
| METRIC CONVERSION CHART | A-1 |
| TAP DRILL SIZES | A-2 |
| ENGINE TORQUE VALUES | A-3 |
| ENGINE SPECIFICATIONS | A-8 |
| TUNE-UP ADJUSTMENTS | A-12 |
| WIRING DIAGRAMS | A-14 |