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*Note: All warranty claims will be processed through Eagle Engine

Marine Engine Warranty

THIS LIMITED WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Note: All warranty claims will be processed through Eagle Engine

COMPLETE ASSEMBLY/LONG BLOCK

NEW AND REMANUFACTURED MARINE ENGINES are warranted for a period of twelve [12] months from the date of invoice with unlimited hours for pleasure craft, and six [6] months or 500 hours for commercial use.

NEW AND REMANUFACTURED MARINE PERFORMANCE ENGINES are warranted on a start-up basis only against manufactured defects.

RACE AND/OR HOT ROD APPLICATIONS are excluded from any and all warranty coverage regardless of cause.

- (A) Warranty service is available by calling 1-800-811-9328 Monday through Friday during the hours of 7:00 a.m. to 5:00 p.m. Central Standard Time. No repair of the product will be covered by this warranty without the specific prior knowledge and consent of Eagle Engine. Return of defect shall be made to Eagle within thirty (30) days of discovery and prior to the expiration of the warranty.
- (B) Eagle will, at its option, repair, replace or refund any Eagle product which is determined to be defective in material or workmanship, upon receipt of product. Eagle Engine Sales, Inc. reserves the right to a factory inspection on any alleged warranty engines prior to repair or replacement.
- (C) Eagle's liability under this limited warranty, for the cost of labor for removal and reinstallation of any engine which is found to be defective in material or workmanship and which is repaired or replaced is limited to the labor expense determined from hours at flat rate of \$50.00 per hour. Eagle's liability for parts replacement is limited to only jobber cost of parts (i.e. gasket kit, oil pump, etc.). In no event shall the total amount of labor cost exceed \$750.00. A \$100.00 crane allowance will be allowed on cabin cruisers 24 feet or longer, in addition to the limitation of labor costs.
- (D) This warranty is also expressly in lieu of all other obligations or liabilities, including liability for indirect incidental, consequential or special damages or any other economic loss with respect to the sale or use of the items warranted. Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or exclusions may not apply to you.
- (E) This warranty does not apply to normal maintenance or adjustments, normal wear due to working conditions, failure of associated parts, components and assemblies not included in the sale of the product, products which have been damaged by improper installation, accident, misuse, or neglect or which have been repaired or altered by someone other than Eagle Engine or its authorized representative, or to products used outside specified application including marine, stationary uses, propane conversion, or to products which are not operated in accordance with the printed instructions of seller or which have been operated beyond the rated capacity of the product; or to products damaged by overheating and/or improper lubrication.

(F) This warranty is a fully integrated document consisting of the entire scope of the warranty to original purchaser and no agent, employee or representative of seller has any authority to bind seller to any affirmation, representation or warranty concerning the products unless said affirmation, representation or warranty is specifically included within this document. There shall be no oral modifications to this warranty and any legal rights, and you may also have other rights which may vary from state to state.

WHAT IS NOT COVERED BY WARRANTY

1. Shop supplies used in performing warranty work (i.e. rags, sealants, lubricants, etc.).
2. Incidental and consequential damages (storage charges, telephone or rental charges of any type, inconvenience or loss of time or income).
3. Minor adjustments and tune-ups; including checking, cleaning or adjusting spark plugs, carburetor setting, filters, belts, controls and checking lubrication.
4. Failure caused by neglect, lack of maintenance, accident, abnormal operation, improper installation, improper preparation, improper winterization, improper dealer set-up or improper service or normal wear and tear.
5. Haul-out, launch, towing charges; removal and/or replacement of boat partitions or material because of boat design for necessary access to the product.
6. Transportation charges and/or travel time.
7. Service requested by customer other than that necessary to satisfy the warranty obligation.
8. Use of other than Eagle Engine Sales, Inc. authorized replacement parts and labor to install these parts when making warranty repairs.
9. Oil, lubricants or fluids used in normal maintenance.
10. Participation in or preparing for racing or other competitive activity.
11. Starter motors and/or armatures or field coil assembly, which are damaged from excessive cranking, condensation, or submersion.
12. Water entering the engine via the intake or exhaust system or submersion.
13. Use of fuels and lubricants that are not suitable for use with or on the product.
14. Failure of any parts caused by lack of cooling water, which results from starting motor out of water or foreign materials blocking intake passages.
15. Air freight, next-day or second-day air, or any special delivery fees, unless authorized by Eagle Engine Sales, Inc. prior to ordering of parts.
16. Certain parts may be tested on receipt by Eagle Engine Sales, Inc. Parts found to be free of defects will be returned to the dealer and no credit will be issued. If the part has already been credited, the dealer account will be debited.
17. A heat tab is a metal disk with a special center material that is designed to melt, distort, or dimple if the engine exceeds a safe operating temperature. **The warranty is void if the heat tab is missing, melted distorted or dimpled in any way.**

ENGINE OIL REQUIREMENTS

Eagle Engine Sales, Inc. recommends a high quality 15W-40 Marine Oil. Any 15W40 oil meeting the API specifications of SJ/CH4/CG4 is acceptable. If engine is to be used in conditions below 20°F (-7°C) use 10W30 API SJ/CD motor oil.

SYNTHETIC OIL

Synthetic oil that meets our requirements of 15W40 SJ/CH4/CG4 is acceptable to use after 100 hours of operation with the recommended conventional oil. The use of synthetic oil does not change the requirement of 50 hour oil change intervals.

RECOMMENDED INITIAL START-UP AND BREAK IN PROCEDURES

Before Initial Start-Up

1. Prime Oil Pump (see enclosed).
2. Check Oil level.
3. Check Fuel quality and prime the system to avoid unnecessary cranking.
4. Be sure the distributor is properly installed and the timing has been statically set to minimize cranking during initial start-up.

Initial Start-Up (prior to installation in the boat)

1. Verify proper oil pressure.
2. Verify proper cooling/water flow. Cooling system must be bled of all air prior to operation.
3. Check ignition timing. Set engine speed to 1,500 r.p.m. for a period of 15 minutes, to insure proper break-in of the camshaft and valve train.
4. Check for possible water, oil or fuel leaks (prior to installation in boat).

Engine Break-In Period

The break-in period of your Eagle Engine Sales, Inc. engine is the first 25 hours of operation. Proper engine break-in is essential to achieve maximum performance and longevity. During the break-in period, the following guidelines must be followed.

1. Do not operate the engine below 1,500 r.p.m. for extended periods of time for the first 10 hours of operation.
2. Do not operate the engine at any one speed for extended periods of time.
3. Do not exceed 3/4 throttle during the first 10 hours of operation. During the next 15 hours, intermittent periods of no more than 5 minutes maximum of wide-open throttle are acceptable.
4. Avoid full throttle acceleration from idle speed.
5. Allow engine to come to full operating temperature before operating at full throttle.
6. Be sure the engine is able to obtain the rated r.p.m. at wide open throttle. Over or under propping will cause severe damage and shorten engine life. Check the manufacture recommendation for this specification.

Recommended 25-Hour Inspection

After the first 25 hours of operation, it is recommended that your Eagle Engine Sales, Inc. marine engine be given an inspection. You should make an appointment with your dealer to perform the necessary checks and adjustments to ensure proper engine performance. The following maintenance should be performed.

1. Change oil and filter.
2. Ignition Systems inspected adjust timing and verify ignition advance at wide open throttle.
3. Check carburetor adjustments.
4. Check engine alignment.
5. Inspect accessory drive belts and tension.
6. Check all fluids.

7. Check throttle and shift cable adjustments and check the ease of movement.
8. Inspect the cooling system; check all hoses and hose clamps.
9. Inspect the entire Exhaust System for leaks, damage, deterioration, or restrictions.
10. Inspect the entire engine for loose, missing, or damaged parts. Pay close attention to the engine mounts, alternator, and mounting fasteners.

Note: CrateEngineDepot.com assumes no responsibility for the costs related to the 25-hour inspection. This is the customer's responsibility.

REMANUFACTURER'S RESPONSIBILITIES AND LIABILITY:

The liability of re-manufacturer under this warranty is limited solely to the repair or replacement of defective parts or workmanship, except as otherwise may be provided by applicable state law, re-manufacturer shall not be liable for any incidental, special, consequential or exemplary damages, or for any service not expressly provided for herein, relating to or arising from failure of the engine or its internal parts.

PURCHASER'S RESPONSIBILITIES IN THE EVENT OF ANY ENGINE PROBLEM WITHIN THE WARRANTY PERIOD:

(A) WHO TO CONTACT: Contact the seller of the engine. The seller is the administrator of the warranty and will contact the re-manufacturer. You will be referred back to your installer or to a repair facility. (The seller is the business from which the engine was purchased.)

If you are in another town or state, likewise contact the seller. You will be directed to an approved repair facility near you.

(B) PRIOR APPROVAL: All warranty repairs, including any replacement parts or labor charges, must have prior approval of remanufacture. It is the seller's responsibility to contact the remanufacture in event of a warranty problem. Your failure to contact the seller to obtain prior approval for any warranty repair will void the owner's warranty.

(C) RETURN OF PARTS: Claims for repair work must be substantiated with defective parts and work order. Upon arrival at re-manufacturer's factory, all claimed defective merchandise is inspected. Credit will be allowed providing that the engine or part is defective in material and/or workmanship—and is within the warranty period.

(D) AUTHORIZED REPAIRS: Any repair that has been authorized by remanufacture must be guaranteed by the dealer making the repair. Repairs or replacement do not extend the warranty period beyond the time period of the original purchase.

TRANSFER OF WARRANTY

Transfer Procedure. This limited warranty is transferable by any Purchaser to the next owner(s) of the vessel in which the new or remanufactured engine was installed during the term of the limited warranty as stated above, provided Manufacturer receives written notice of transfer of title from the original owner and payment of \$150.00 within thirty (30) days of the date of title transfer. The notice must include the Manufacturer's serial number, the previous owner's name as registered with Manufacturer, vehicle information, the name of the current owner(s) of the engine and the date of original purchase from the Manufacturer. Failure to file the required transfer notice and pay the required \$150.00 fee within thirty (30) days shall relieve Manufacturer of any obligation to such next owner(s) under the terms of this Limited Warranty. No transfer of the warranty shall extend the warranty term provided by this Limited Warranty.

General Information

HYDRO-LOCK

Water can enter the engine cylinders through the exhaust system. Beware of these situations:

1. **Following Wakes:** Sudden slow-downs may cause the boat wake to flow over the transom of your boat.
2. **Engine Shutdown:** Sudden engine shutdown while the boat is moving may force water into the exhaust system.
3. **Improper Installation:** Refer to exhaust pipe section. An exhaust system without flappers and the specified incline increases the likelihood of water entering the engine.
4. **Improper Hoisting:** Operators are sometimes tempted to reduce hoisting time for propeller changes by hoisting only the boat stern. Such hoisting can cause residual water in the exhaust system to enter engine cylinders.

Water entering engine cylinders will cause the engine to lock because water does not compress. To remedy this situation, take the following steps:

1. Change engine oil & filters.
2. Remove all spark plugs.
3. Remove coil wire.
4. Crank engine for 15 seconds.
5. Replace spark plugs and reattach coil wire.
6. Start engine - if there are any abnormal sounds **STOP ENGINE** immediately and contact your dealer.

WATER INVERSION

Water inversion is water that is pulled back into the exhaust and usually ends up in the piston cylinder. Most of the time this happens under the following conditions:

- Shutting off engine at high RPM's
- Water comes up the exhaust after a quick slowdown
- Long periods of idling
- Exhaust drop not sufficient

Usually the water is not found until the next time the boat is used. In some cases this may not be for weeks. In the case of a salt water environment this is catastrophic due to the rusting. To minimize this problem Eagle Engine requires the installation of flappers at the transom and in the exhaust hose just after the exhaust riser or elbow.

DETONATION AND / OR PRE-IGNITION

Detonation is most commonly known as “pinging”, “spark knock” or “fuel knock”. It is the abnormal combustion of the fuel which causes the fuel to explode severely within the combustion chamber.

In a four-cycle engine, normal combustion or burning starts at the spark plug and a wave of flames move across the combustion chamber. This results in an even pressure rise in the combustion chamber which pushes the piston downward.

Detonation begins as normal combustion with the spark-ignited flame progressing across the combustion chamber while applying the heat and pressure to the unburned portion of

fuel. Instead of continuing to burn evenly, the last portion of the fuel explodes violently which in turn causes overheating of the pistons, valves and spark plugs.

This may occur at any speed and is not often detected, serious and tragic engine damage may occur.

There are many causes of detonation, with the most common being the use of a low-octane gasoline. Detonation may also occur when using the proper octane gasoline if engine maintenance has been neglected.

- Poor or improper fuel quality/octane
- Improper initial ignition timing setting
- Improper propeller selection
- Engine overload, such as operating twin-engine boat with only one engine
- Improper cooling operation resulting in engine overheating
- Fuel starvation or vapor lock resulting from poor fuel quality / lean out
- Malfunctioning carburetor causing lean mixture
- Operating engine that is out of proper tune, dead cylinder, defective distributor cap
- Excessive exhaust back pressure caused by restricted exhaust mufflers or outlets

ENGINE ROTATION

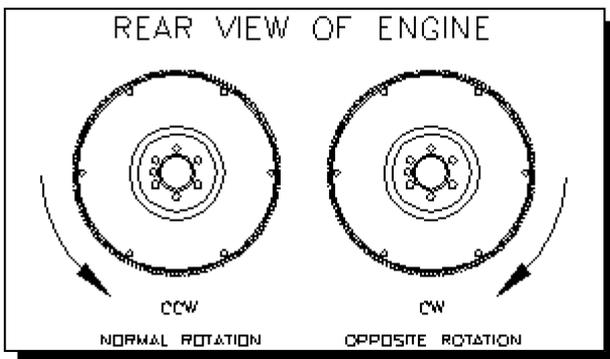
Directional references used in this section are given as if standing behind the boat, looking forward:

- front of boat is bow
- rear of boat is stern
- right side is starboard
- left side is port

The raw water (or seawater) pump is located at the front of the engine on the crankshaft pulley. Engine rotation can be determined by looking at the stern end of the engine and observing the flywheel rotation. Do not assume engine rotation by looking at the propeller rotation; it may not be the same. This information is critical when ordering parts for your engine.

Left Hand Engines: CCW or Normal Rotation

Right Hand Engines: CW or Opposite Rotation



PROPELLER WARNING

The propeller selected should allow the engine to operate at or near the recommended wide open throttle RPM range with a normal load. Wide Open Throttle RPM range is listed in *Engine Specification Section*.

WARNING! Using a propeller too large will not allow the engine to reach its rated RPM range which will create an overloaded condition and possible destructive detonation that can be harmful to the engine's performance and life.

PROPELLER INFORMATION

Diameter, pitch or coupling of a propeller will affect engine rpm and boat performance. Configuration of the blade also effects performance. Even propeller from different manufacturers with the same pitch and diameter will perform differently.

Testing for a correct propeller is accomplished by operating the boat (with an average load) at Wide Open Throttle (WOT) rpm's should be at the high end of the specified range and checked with an accurate tachometer. This will allow the engine not to fall below the rpm specified range under a heavy load condition. If the engine rpm is above or below the specified range, a change in the diameter and/or pitch of the propeller is required. Newly installed engines operating 100 - 300 RPM below wide open throttle is usually a propeller problem.

Scheduled Maintenance by Owner

SERVICE:	ENGINE STARTUP EACH DAY	AFTER FIRST 10 HOURS OF OPERATION	EVERY 50 HOURS OF OPERATION	EVERY 100 HOURS OF OPERATION
CHECK ENGINE OIL LEVEL*	✗			✗
INSPECT FUEL LINES AND CONNECTIONS FOR LEAKS	✗			✗
CHECK COOLANT LEVEL IN TANK (IF EQUIPPED WITH CLOSED COOLING)	✗			✗
INSPECT AND CLEAN SEA STRAINER (IF EQUIPPED)	✗			✗
INSPECT ENTIRE POWER PACKAGE FOR LEAKS (WATER, FUEL, OIL, EXHAUST, ETC.)		✗	✗	✗
INSPECT BELTS FOR TENSION AND WEAR		✗	✗	✗
INSPECT BATTERY (TERMINALS AND FLUID LEVELS)		✗	✗	✗
CHECK BATTERY CONNECTION TO ENGINE		✗	✗	✗
TOUCH UP EXTERIOR SURFACE WITH MARINE POWER PAINT		✗	✗	✗
INSPECT ZINC ANODES IN HEAT EXCHANGER FOR DETERIORATION (IF EQUIPPED WITH CLOSED COOLING)		✗	✗	✗
CHECK POWER STEERING FLUID (IF EQUIPPED)				✗
CHECK TRANSMISSION FLUID LEVEL	✗		✗	✗
LUBRICATE STARTER PINION AND SHAFT			✗	✗

* ENGINE START-UP EACH DAY AND ONCE EVERY EIGHT (8) HOURS OF OPERATION

Scheduled Maintenance by Qualified Technician

SERVICE:	ENGINE STARTUP EACH DAY	AFTER FIRST 10 HOURS OF OPERATION	EVERY 50 HOURS OF OPERATION	EVERY 100 HOURS OF OPERATION
CHANGE ENGINE OIL AND FILTERS	✗	✗		✗
CHANGE FILTER ON FUEL/WATER SEPARATOR		✗		✗
CHECK ENGINE MOUNTS (TIGHTNESS)	✗		✗	✗
CHECK RISER AND MANIFOLD BOLTS FOR TIGHTNESS	✗	✗	✗	✗
CHECK FOR LOOSE, DAMAGED OR MISSING ENGINE PARTS			✗	✗
CHECK WIRE HARNESS PLUGS FOR CORROSION AND CONNECTIONS			✗	✗
INSPECT DISTRIBUTOR FOR CRACKS OR DETERIORATION			✗	✗
CHECK CONDITION OF SPARK PLUGS (REPLACE IF NECESSARY)			✗	✗
INSPECT HOSES FOR DETERIORATION			✗	✗
REPLACE IMPELLER IN SEAWATER PUMP			✗	✗
CHECK PROPELLER AND SHAFT ALIGNMENT				✗
CHECK AND ADJUST IGNITION TIMING (Carbureted Engine Only)				✗
CHECK AND ADJUST CARBURETOR				✗
CLEAN AND INSPECT FLAME ARRESTOR AND CRANK CASE VENT HOSE			✗	✗
CLEAN AND INSPECT CARBURETOR FILTER			✗	✗
CHANGE TRANSMISSION FLUID				✗
CHANGE COOLANT (IF EQUIPPED WITH CLOSED COOLING)				✗
CLEAN SEAWATER SECTION OF HEAT EXCHANGER				✗

Suggested Installation Procedures and Instructions for Gasoline Engines

TO INSTALLING MECHANIC OR TECHNICIAN

This engine has been carefully remanufactured to precision standards. It will perform properly IF certain steps are taken by the person making the installation.

An engine is a complex component that requires the highest degree of technical knowledge to install. It is recommended that you, the installer, have an ABYC certificate or the equivalent before you accept the RESPONSIBILITY of properly installing an engine.

When a properly remanufactured engine fails to give satisfactory service, it can be due to detonation, pre-ignition or “lugging,” overheating or excessively rich air-fuel ratio, under-lubrication, dirt, coolant seepage, ineffective air filtering. The above mentioned reasons for failure are the responsibility, and under the control, of the installing mechanic/technician not the engine rebuilder.

CAUTION, these recommended installation procedures and instructions are a partial list intended only as a guide. If you are not qualified to undertake this installation, do not attempt it as you may be liable for resulting engine failure.

Replacing all of the following with new or remanufactured units is recommended: oil pump screen with new screen, spark plugs, points (if applicable), condenser, motor mounts, oil filter, air filters, water pump, thermostats, PCV valve & grommets and clean lines (Note: A plugged line or faulty valve may cause excessive oil consumption and blowby), carburetor (may be rebuilt) and make sure the EGR valve is operating to OEM specifications.

Follow the manufacturer's installation procedures; especially proper torque values. Inspect the rocker cover baffle for possible restrictions.

Contamination is an engine's worst enemy. We recommend that you thoroughly clean parts that will be attached to the remanufactured engine.

Any and all parts not included with a remanufactured engine or engine component should be cleaned properly before installing on a new remanufactured engine.

INSPECTION OF ENGINE PRIOR TO INSTALLATION

- Check for freight damage and dirt contamination of the engine.
- Check for proper valve train timing.
- Check that ALL oil gallery plugs are installed, tight and sealed.
- Check that ALL freeze plugs are installed and sealed.
- Check that temperature recording labels or heat tabs on the block and the heads are installed.
- Check application of product - make sure the mounting holes, bell housing, crank shaft snout, flywheel mounting flange, bolt hole patterns, pilot shaft hole, smog/non-smog application, etc., are the same on new product as the old by comparing casting numbers.
- Clean all accessories to be transferred to the new product, from the old one. Resurfacing of the intake manifold and machine gasket surfaces is required.
- Abrasive discs of any type are not to be used for cleaning and will void your warranty.

TIMING COVERS

- Inspect for erosion, breakage, warpage, porosity and abnormal wear patterns.
- Measure covers containing oil pump for wear and replace if not within OE tolerances.
- Install new timing chain tensioners, dampners, etc.

VALVE LIFTERS - Flat, Roller, HLC (Hydraulic Lash Compensators)

- Pre-lube cam & lifters with extreme pressure lube.
- Do not preload lifters (it causes undo stress to camshaft and lifters which may lead to early failure).
- Lifter rattle at cold start is not uncommon, and does not cause engine damage.
- Hydraulic Lash Compensators (HLC) are generally reusable, but may need to be purged of all air.

ENGINES EQUIPPED WITH FLAT CAMSHAFTS

Use high-lubricity, high-ZDDP content engine oil to help during the break-in process and always use a Camshaft Break-In Oil Additive (ZDDP)

Break-In Preparation

Always remove the inner spring during break-in when using dual or high pressure valve springs. An alternative solution that addresses this same concern is using a set of low-ratio break-in rocker arms. Both of these solutions provide your best chance of proper camshaft break-in and long term durability. While these tips may be a slight inconvenience, a little time and effort on the front-end is much better than destroying your new engine.

Proper Procedure

As soon as the engine fires, bring the rpm up to 2000 to 2500 during the first 30 minutes of operation. Slower engine speeds will not supply the camshaft with an adequate amount of oil for the break-in period. The engine rpm may be varied periodically from 2000 to 2500 to direct oil splash to different areas of the camshaft. After the 30 minute break-in period, change the oil and filter again to be sure all contaminants and break-in lube are removed from the engine. The inner valve springs should now be replaced and the correct rocker arms installed.

DRIVE PULLEY (Harmonic Balancer)

- Check seal surface of pulley hub and repair or replace if grooved or damaged (harmonic balancer seal surface wear sleeves may be available).
- Lubricate seal surface prior to installation to prevent damage to seal.
- Check outer ring for slippage as this could cause "O" timing mark to not indicate top dead center.
- Replace balancers set in rubber. (The interior rubber deteriorates with age, allowing the balancer to slip, possibly causing timing problems and detonation, overheating, vibration and unexplained noises).

CYLINDER HEAD TORQUE

- Properly torque cylinder head at installation to OE specifications in the correct sequence. (Use new bolts when OE requires).

VALVE LASH

- Consult shop service manual for dry lash setting for nonadjustable rocker arms.
- Check dry lash at time of installation (if applicable).
- Check and adjust lash at 500 miles (if applicable).

INTAKE MANIFOLD MUST BE CLEANED

- Clean off carbon (remove steel heat shield, if equipped, clean and reinstall).
- Magnetic particle inspect or die check for cracks.
- Blow out with compressed air to avoid having foreign material enter combustion chamber.
- Remove baffle (where applicable) so that all collected contaminants can be removed.

- All EGR passages must be cleaned and free of obstruction.
- Do not over torque manifold bolts. Use OE torque specifications and sequence ONLY.
- Do not glass bead intake manifolds to clean.
- Check water outlet for corrosion.

DISTRIBUTOR

- Check bushing, mechanical advance, vacuum advance, and total advance.
- Check to see that distributor is fully engaged and locked in the oil pump to proper depth.
- Adjust ignition timing to factory specifications.
- Check distributor drive gear for wear and replace as needed.

FUEL SYSTEM

- Carefully service or replace all aspects of the fuel system, i.e. pump, lines, carburetor or fuel injection components.
- Check fuel lines for breaks and crimps. Use only approved steel lines.
- Check fuel pump for proper pressure.
- Check double diaphragm type for faulty vacuum booster which may pump oil through the intake system.

FILTERS

- Replace all filters at time of installation and at O.E. recommended intervals. These filters include air, oil, fuel, and crankcase.
- Use cleaning procedure outlined previously above to clean air cleaner housing, crankcase vent tubes coolers, air compressors, Donaldson valves, etc.

OIL SYSTEM

- Fill to proper level.
- Use only OE specified lubricants or equivalent to full levels before operation.
- Use a pressure tank at about 40 pounds pressure to prime (pre-lube) engine as this will insure vital parts are lubricated properly to avoid a dry start. (Spinning of the oil pump to accomplish this is not recommended).
- If pressure tank is unavailable, use an aftermarket assembly lubricator kit for prelubing of system before initial fire up (follow recommended procedures). Call for further information.
- Install new oil pump and pickup screen. Install new oil filter filled with new oil prior to installation.
- Check oil pump intermediate shaft for correct size and shape to match distributor and oil pump, if applicable.
- Oil pump may need to be primed before starting. (Run at 800 rpm at intervals before releasing to customer for use to assure proper cylinder lubrication.)
- Replace oil pressure sending unit.

RUBBER GOODS

- Don't overlook small parts such as belts, hoses (those that carry liquids and air) and motor mounts which become weak and worn with age. We suggest that these items be replaced at time of engine replacement.

ACCESSORIES

- Be sure to service and inspect accessories such as alternator, starter, water pump, air compressor, fuel system, EGR valves and all sensors to avoid premature engine failure.

FLYWHEEL

- On engines that use a 1-piece full circle rear main seal and flangeless flywheel mounting system, over torque of the flywheel bolts may distort the rear seal area and cause an oil leak.

ENGINE START-UP

- Check oil pressure.
- Engine should start, excessive cranking may be present.
- Check for oil and water leaks.

EXHAUST MANIFOLD PRESSURE & SYSTEM

- Replace oxygen sensor with a low pressure gauge.
- Run engine at 2500 RPM for 1 minute.
- High pressure reading should be less than 2.5 pounds.
- A pressure reading over 2.5 pounds indicates an exhaust system restrictions which will cause engine damage. Check catalytic converters and exhaust systems for restrictions.
- Inspect exhaust manifold for internal and external cracks, especially on marine applications.

ENGINE ANALYSIS

- Make an engine analysis data sheet (either a diagnostic printout or handwritten form) showing the status of the engine and the Engine Support System before installation, after installation and at the 500 mile checkup.
- Check engine or service engine soon lights (computer-control problems).
- Check for any trouble codes, this may be a clue to why the engine previously failed.
- Check for correct vacuum hose routing and for vacuum leaks.
- Replace distributor, wiring, coil, and spark plugs to avoid poor performance. On V-8's, check plug routing.
- Final road test vehicle, do not return to customer unless you consider vehicle operating according to OE specifications
- Give customer printout of exhaust gas analysis.
- Load sensors
- M.A.P.
- V.A.C.
- BARO
- Throttle position sensor (TIS)
- Stepper motor
- Mixture control solenoid
- Incorrect PROM (on GM cars)
- Catalytic Converter Sensor
- EGO sensor
- EGR flow sensor
- Airflow sensor
- Coolant temperature sensor
- Crankshaft position sensor
- Engine RPM sensor
- Electronic spark controls
- Idle speed control (ISC)
- Air temperature sensor
- Air conditioning sensor (switch)
- Knock sensor
- Halleffect switch
- Turbo boost limiting system (wastegate)
- Torque converter clutch
- Road Speed sensor
- Oil and temperature sending Unit/gauges *

On computerized emission control systems, check the following items that are applicable:

* The failure of some of these sensors can result in abnormal combustion temperatures and pressures, blown head gaskets, burnt pistons, piston scuffing and burnt valves, bearing failure and lack of power and may result in eventual engine failure.

Technician/Installer Information

454 CID (7.4L) / 502 CID (8.2L) 454R / 5026-TX / GM Part# 25161284
Oil Filter By-Pass Valve and Adaptor

⚠ CAUTION ⚠

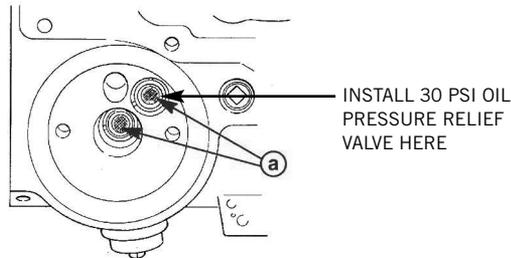
Engine with front mounted vertical oil cooler **MUST** have a 30 psi oil pressure relief valve installed. Severe engine damage or failure will occur if not installed.

Inspection and / or Replacement

Oil by-pass valve and adaptor should be inspected whenever engine is disassembled for major repair or whenever inadequate oil filtration is suspected.

Refer to "Engine Parts List" when ordering parts for oil filter by-pass valve, adaptor assembly or remote oil filter parts.

1. Remove oil hoses from adaptor.
2. Remove hose fitting and seal from adaptor.
3. Remove connector.
4. Clean parts in solvent and blow dry with compressed air.
5. Inspect fiber valves for cracks or other damage. Check that valves fit tightly against seats. Push each valve down and release it. Valves should return freely to their seats. If valve operation is questionable, by-pass valve should be replaced.



Typical By-Pass Valve and Adaptor

a - Fiber Valves (Ensure That Valves Fit Tightly Against Their Seals)

6. Wipe out valve chamber in cylinder block to remove any foreign material.
7. Install by-pass valve (if replaced) and connector. Torque adaptor nut to 20 lb-ft (27 Nm).
8. Lubricate adaptor seal with engine oil. Install hose fitting and torque to specifications.
9. Apply Perfect Seal to hose threads. Install and tighten securely.

Service Bulletin

ALL 3.0 GM ENGINES (4752 and 4752-S) PLEASE READ FIRST!!

Eagle Engine Sales Inc. requires the use of an adaptor plate along with the intake/exhaust manifold **ONLY** when installing an older style manifold with larger ports to our new 3.0L engine. This adaptor plate mounts between the manifold and engine head and allows for a smooth transition from the older style manifold with large intake and exhaust ports to the new style head in which the intake and exhaust ports are considerably smaller in size. If the intake/exhaust manifold you are installing was originally made for engines during 1968 to 1991 you may need this adaptor plate.

Please **BE AWARE** that if this plate is needed and not used it can cause raw fuel from the fuel/air mixture to “puddle” at the mating surface. Also not installing the plate if needed can also cause a “lean” condition because of the sudden changes in size from one port to the other. Both of these conditions can cause pre-ignition and/or detonation which can cause major engine damage including (but not limited to) a blown head gasket! If the ports on your original style manifold match the ports on the engine then you DO NOT need the adaptor plate!



(1) Adaptor to Head Gasket



(2) Adaptor Plate



(3) Manifold to Adaptor gasket

The dimension of the exhaust port on the head of the new style 3.0L is 1 1/8” square. The dimension of the intake port on the head of the new style 3.0L is 1 3/8” square. The opposite side of the adaptor plate should accommodate your old style manifold if both your exhaust and intake ports measure 1 7/8” X 1 1/2”.

IF YOUR OLD STYLE MANIFOLD HAS DIFFERENT DIMENSIONS THEN THIS YOU MAY HAVE TO PURCHASE ANOTHER MANIFOLD BECAUSE THE ADAPTOR PLATE MAY NOT WORK!

This adaptor plate is not supplied with the engine but can be purchased from your engine supplier. **Kit # K730**

NOTE: The adaptor plate moves the manifold away from the engine approximately 1/2”. This extra distance may require you to adjust your throttle cable and may require a longer breather hose from the valve cover to the flame arrester!

INSTALLING YOUR OLD STYLE MANIFOLD TO THE NEW 3.0L/181 C.I.D. ENGINE WITHOUT THIS ADAPTOR PLATE WILL VOID THE WARRANTY!

ALL 3.0 GM ENGINES (4752 and 4752-S)

1. CHECK TORQUE ON HEAD BOLTS BEFORE RUNNING ENGINE AND RE-TORQUE 1 HOUR AFTER RUNNING; BOTH TIMES 90 FT. LBS. (IN PROPER SEQUENCE)
2. SET BASE TIMING (IN BASE TIMING MODE) AT "1 DEGREE BTDC"!!
3. USE THE ADAPTOR PLATE BETWEEN THE HEAD AND THE EXHAUST/INTAKE MANIFOLD ANY TIME YOU ARE USING YOUR OLD STYLE MANIFOLD.

***** ANY ENGINE DAMAGE INCLUDING (BUT NOT LIMITED TO) BLOWN HEAD GASKETS DUE TO PRE-IGNITION AND/OR DETONATION ABSOLUTELY WILL NOT BE COVERED UNDER YOUR ENGINE'S WARRANTY! *****

ALL 8.1L GM ENGINES (8025 and 8050)

Priming Oil System

IMPORTANT! If the oil system is not primed before the engine is started, bearing failure will occur.

IMPORTANT! This procedure is mandatory for all models.

This engine assembly needs to be filled with oil and primed. You should add the specified oil (see Operator's Manual) to your new engine. Check the engine oil level on the dipstick and add accordingly.

The engine needs to be primed with oil prior to starting. Do not install valve covers until priming is complete. Follow the instructions enclosed with the tool. To prime the engine, first remove the distributor or oil pump drive to allow access to the oil pump drive shaft. On 8.1 applications this must be done before the intake manifold is installed.



Install the oil priming tool, Melling part number PT13 or equivalent. The lower collar on this type of priming tool directs oil flow to both banks of cylinders. Do not attempt to prime using only a shaft to turn the oil pump.

Using a 1/2" drill motor, rotate the engine oil priming tool clockwise. Filling oil filter with oil and loosening the oil filter until oil reaches the filter may prevent an air pocket and assist in priming. While you are priming the engine, have someone else rotate the crankshaft clockwise by hand to supply oil throughout the engine and to all the bearing surfaces before the engine is initially started. Prime engine until oil is flowing from all rocker arms, oil should partially fill the rocker and drip from the valve side tip of the rocker. This will insure oil to the bearings before you start the engine for the first time.

Also, prime the engine if it sits for extended periods of time. Reinstall the distributor in the same orientation as it was removed.

FAILURE TO FOLLOW THESE INSTRUCTIONS WILL RESULT IN ENGINE BEARING DAMAGE WHICH WILL NOT BE COVERED BY EAGLE ENGINE SALES.

DELCO EST IGNITION

USING THE TIMING TOOL: Carbureted Engine

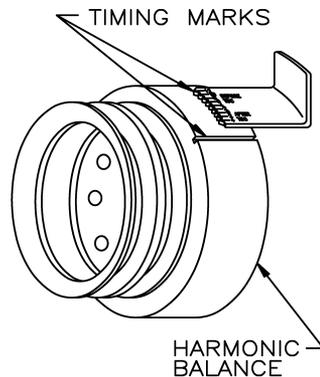
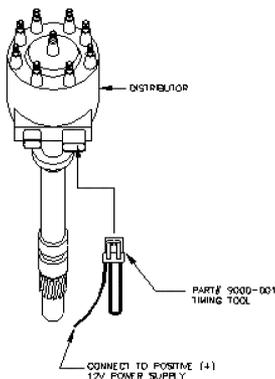
The timing tool is used in setting the initial engine timing on carbureted engines. This connector by-passes the electronic spark timing of the engine and allows the initial timing to be adjusted by rotating the distributor. Use the following procedure (become familiar with entire procedure before beginning):

The ignition timing marks are located on the engine's front cover. A saw slot on the balancer indicates engine at (TDC) Top Dead Center. Adjust ignition timing as follows:

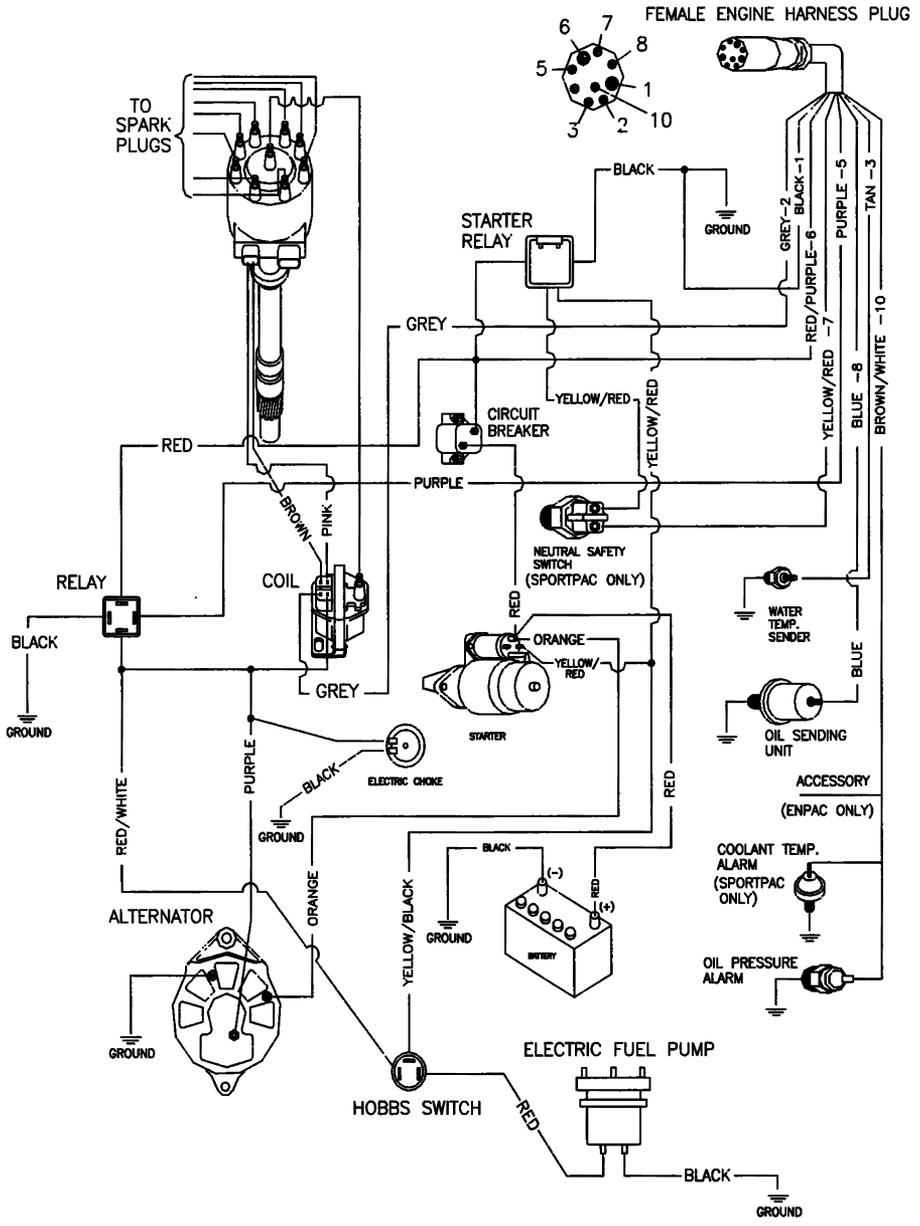
1. Connect a timing light to the number one (1) spark plug wire. Connect the timing light power lead to a 12 volt power source. **DO NOT CONNECT TO 12 VOLTS ON ALTERNATOR.**
2. Start engine and allow to warm to operating temperature. Bring engine to idle (650-800 RPM).
3. **WHILE ENGINE IS RUNNING**, install the timing tool into the terminal connector on the distributor.
4. Loosen distributor clamp just enough to rotate distributor in place.

Note: An adjustable timing light is required to set initial and total timing.

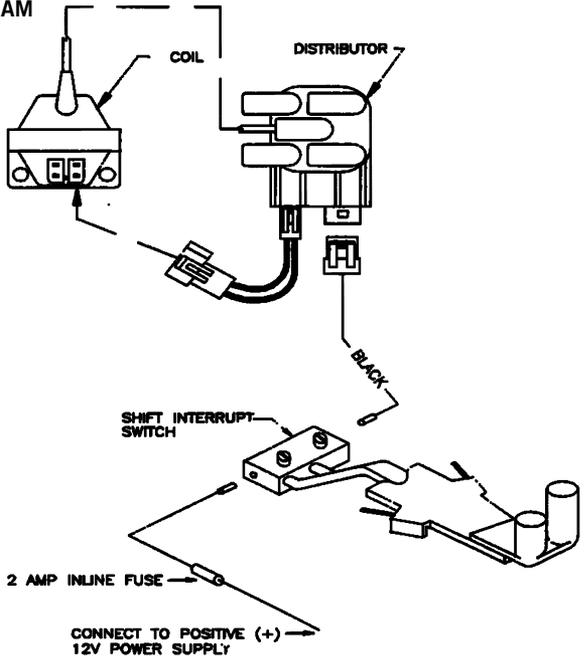
5. Secure the bare wire end of the timing tool to battery positive (+) voltage. (the most convenient location of this voltage is on the cranking motor solenoid.) If desired, a suitable clip, such as an alligator clip may be permanently attached to the bare wire end of the timing tool to hold it in place.
6. Rotate distributor to set mechanical timing. **REFER TO THE ORIGINAL OWNERS MANUAL FOR CORRECT TOTAL AND INITIAL TIMING SETTINGS FOR YOUR ENGINE.**
7. Tighten distributor clamp to hold in position when initial timing is obtained.
8. Recheck timing.
9. Remove the timing tool from distributor.
10. Check total timing at 4000 RPM. (See Engine Specifications Section.)
11. Disconnect and remove the timing light.



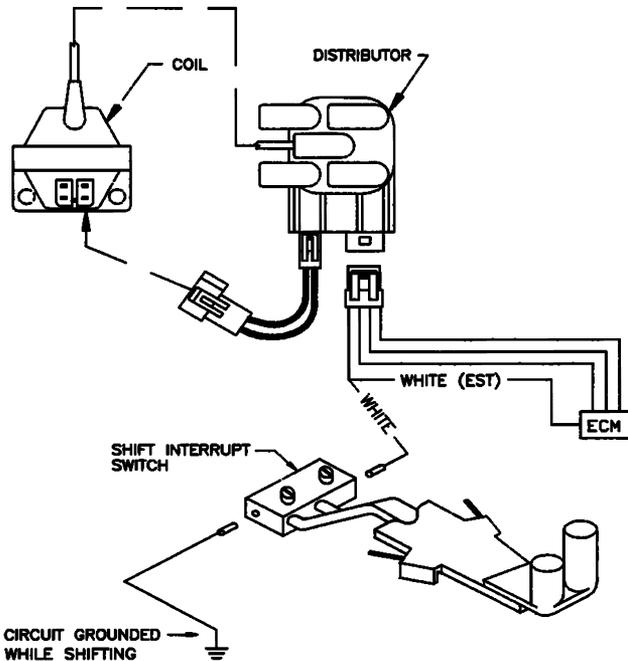
**PRIMARY ENGINE WIRING HARNESS 3.0L, 4.3L, 5.7L, 454, 502
CARBURETED / ELECTRIC FUEL PUMP**



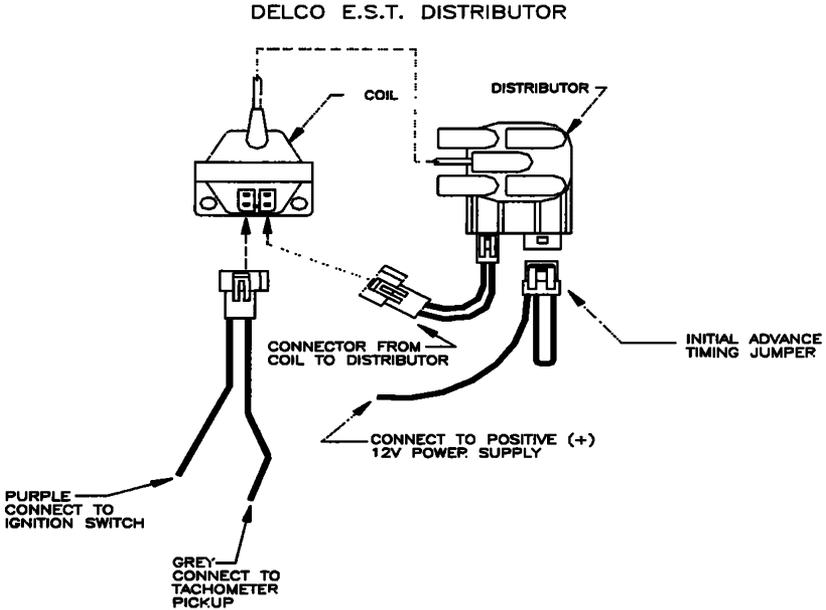
SHIFT ASSIST WIRING DIAGRAM
 Carbureted Mercruiser
 & Early OMC Applications



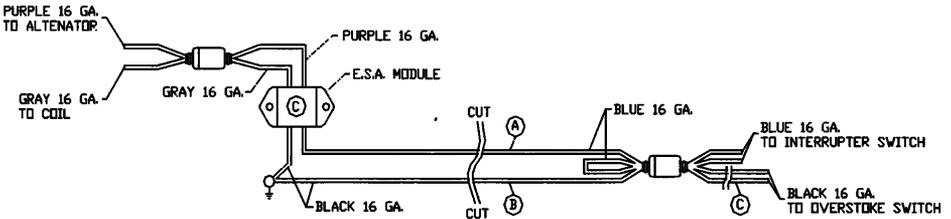
TBI SHIFT INTERRUPT WIRING DIAGRAM



INITIAL TIMING JUMPER WIRING DIAGRAM



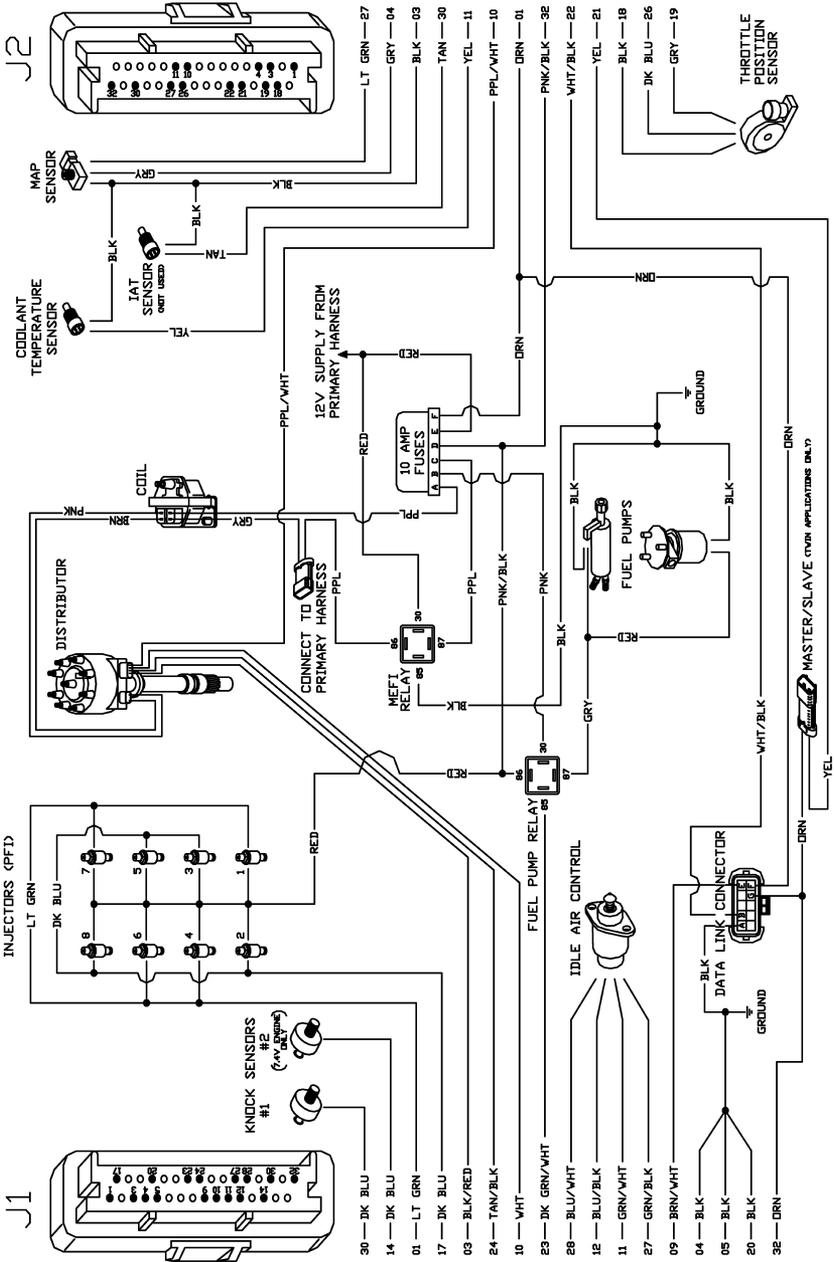
SHIFT INTERRUPT OMC

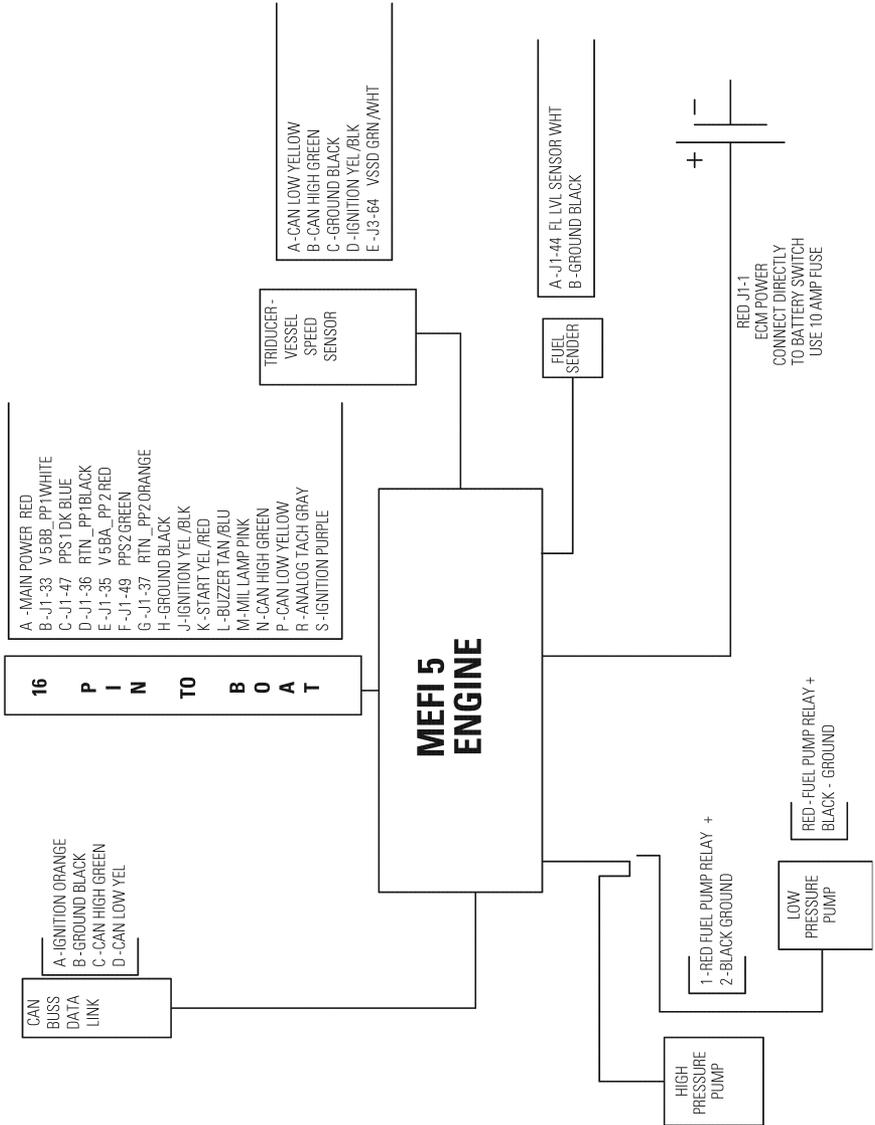


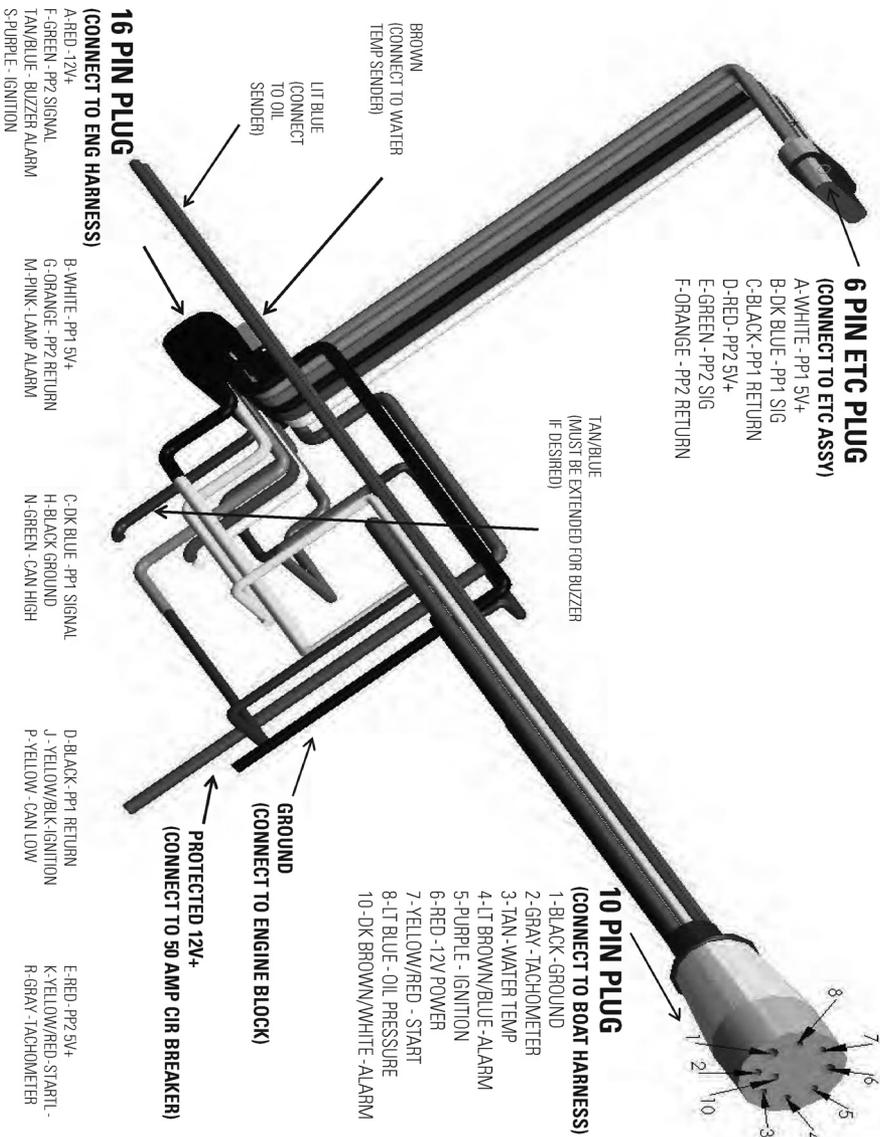
Installation Instructions

1. Cut the blue 16 gauge wire (A) and connect to 12V positive supply when ignition switch is in the "ON" position with 2 amp in-line fuse
2. Cut the black 16 gauge wire (B) and connect the shift interrupt wire on the engine. (Refer to shift cutout wiring diagram.)
3. Cut the black 16 gauge wire (C). The over stroke switch and the E.S.A. module are no longer used.

EFI SECONDARY WIRING HARNESS







6 PIN ETC PLUG
(CONNECT TO ETC ASSY)

- A-WHITE - Pp1 5V+
- B-DK BLUE - Pp1 SIG
- C-BLACK - Pp1 RETURN
- D-RED - Pp2 5V+
- E-GREEN - Pp2 SIG
- F-ORANGE - Pp2 RETURN

TAN/BLUE
(MUST BE EXTENDED FOR BUZZER
IF DESIRED)

10 PIN PLUG
(CONNECT TO BOAT HARNESS)

- 1-BLACK - GROUND
- 2-GRAY - TACHOMETER
- 3-TAN - WATER TEMP
- 4-LT BROWN/BLUE - ALARM
- 5-PURPLE - IGNITION
- 6-RED - 12V POWER
- 7-YELLOW/RED - START
- 8-LT BLUE - OIL PRESSURE
- 10-DK BROWN/WHITE - ALARM

16 PIN PLUG
(CONNECT TO ETC ASSY)

- A-RED - 12V+
- F-GREEN - Pp2 SIGNAL
- TAN/BLUE - BUZZER ALARM
- S-PURPLE - IGNITION

16 PIN PLUG
(CONNECT TO ENG HARNESS)

- B-WHITE - Pp1 5V+
- G-ORANGE - Pp2 RETURN
- M-PINK - LAMP ALARM

- C-DK BLUE - Pp1 SIGNAL
- H-BLACK - GROUND
- N-GREEN - CAN HIGH

- D-BLACK - Pp1 RETURN
- J-YELLOW/BLK - IGNITION
- P-YELLOW - CAN LOW

- E-RED - Pp2 5V+
- K-YELLOW/RED - START
- R-GRAY - TACHOMETER

Troubleshooting Guide

The following troubleshooting hints are not all inclusive but are the most common found. In all cases, if the cause of the problem is outside your capability to repair or correct contact your dealer.

Engine Will Not Turn Over

POSSIBLE CAUSE	REMEDY	
<input type="checkbox"/> Low Battery or Bad Connection	Check / Charge / Replace. Requires 12 -14 Volts	
<input type="checkbox"/> Faulty Battery Cable		
<input type="checkbox"/> Trip Circuit Breaker		
<input type="checkbox"/> Faulty Neutral Switch		
<input type="checkbox"/> Bad Starter Solenoid or Motor		
<input type="checkbox"/> Faulty Fuel Pump		
<input type="checkbox"/> Shift control in Gear		
<input type="checkbox"/> Faulty Relay Solenoid		
<input type="checkbox"/> Hydro Lock		Remove spark plug look for water in the cylinder

Engine Cranks But Will Not Start

POSSIBLE CAUSE	REMEDY
<input type="checkbox"/> Faulty Fuel Pump	Check / Charge / Replace. Requires 12 -14 Volts
<input type="checkbox"/> Blown Fuel Pump Fuse	
<input type="checkbox"/> Faulty Oil Pressure Switch	Replace
<input type="checkbox"/> Insufficient Fuel Supply	Check Fuel Supply Shut Off Valve, Check Fuel Filter
<input type="checkbox"/> Insufficient Cranking RPM's	Check Battery Voltage
<input type="checkbox"/> Check Distributor Cap & Rotor	Replace
<input type="checkbox"/> Fouled Plugs	Replace
<input type="checkbox"/> Engine Timing	Re-time
<input type="checkbox"/> Correct Firing Order	Check / Correct
<input type="checkbox"/> Low Compression	
<input type="checkbox"/> Bad / Old Fuel	
<input type="checkbox"/> Fouled Carburetor	

ENSURE A TUNE UP IS DONE EVERY 100 HOURS OR EVERY SEASON

Engine Starts and Stops (Carbureted)

POSSIBLE CAUSE	REMEDY
<input type="checkbox"/> Cold Engine	When engine starts, move throttle to a higher rpm (Carburetor Only)
<input type="checkbox"/> Engine Idle Too Slow	Adjust Choke (Carbureted Engine Only)
<input type="checkbox"/> Faulty Key Switch	
<input type="checkbox"/> Faulty Carburetor	Check in line filter. Check carburetor filter
<input type="checkbox"/> Internal Failure	
<input type="checkbox"/> Compression	

Engine Starts and Stops (EFI)

POSSIBLE CAUSE	REMEDY
<input type="checkbox"/> Faulty Fuel Pump Operation	Verify fuel supply and return not reversed.
<input type="checkbox"/> Vapor Lock	Verify fuel supply and pickup not sucking air.
<input type="checkbox"/> Insufficient Fuel Supply	

Engine Runs Poorly At Idle and Acceleration

POSSIBLE CAUSE

- Incorrect Firing Order
- Incorrect Ignition Timing
- Choke Adjustment
- Faulty Spark Plug
- Contaminated Carburetor

- Internal Cylinder Head Problem
- Engine Surge, Stall, Lack Power

REMEDY

Check / Adjust / Replace

Check for sticking or burnt valve or broken valve spring.

Carburetor float adjustment, Power Piston, Leaking Gaskets

Engine Runs Poorly At High RPM

POSSIBLE CAUSE

- Low Grade or Old Fuel
- Ignition Timing
- In Need of a Tune-UP
- Ignition Coil
- Engine Overheating
- Restricted Exhaust
- Overfilled Crankcase
- Plugged Fuel Tank Vent
- Restricted Anti-Siphon Valve
- Restricted Exhaust
- Low Compression

REMEDY

Check / Clean / Replace

ENGINE PERFORMANCE CAN BE GREATLY AFFECTED BY BOAT HULL AND PROP CONDITION

High Speed Miss

POSSIBLE CAUSE

- Water in fuel
- Clogged fuel filter
- Insufficient fuel supply
- Spark plug or wires
- Faulty distributor Module
- Loose ignition connection
- Ignition coil
- Ignition timing. Total advance incorrect
- Faulty tachometer
- Faulty fuel pump
- Loose electrical connection at fuel pump
- Detonation

REMEDY

Inspect / Clean / Replace

Fuel System - Rich

POSSIBLE CAUSE

- Dirty / Clogged Flame Arrester
- Carburetor Float Adjustment
- Carburetor Gasket Leaking
- Return Line Not Directed Back To Tank

REMEDY

Check / Clean / Replace

Fuel System - Lean

POSSIBLE CAUSE

- Empty Fuel Tank
- Vapor Lock
- Automatic choke

REMEDY

Stuck open, adjust

Poor Fuel Economy

POSSIBLE CAUSE

- Boat Hull Dirty
- Incorrect Prop Size or Damage
- Clogged Flame Arrester
- Tune -up
- Low Engine Compression
- Engine Running Too Hot or Cold
- Incorrect Fuel Grade
- Boat Overload
- Weight Distribution
- Carburetor Settings
- Incorrect Spark Plug or Gap
- Initial or Advanced Timing Wrong
- Plugged or Restricted Exhaust
- Clean / Check / Adjust

REMEDY

Check / Clean / Adjust

Oil Pressure - Low

POSSIBLE CAUSE

- Low oil level in crankcase
- Excessive oil in crankcase

- Erroneous oil gauge readings

- Incorrect Dipstick
- Oil line position and routing
- Incorrect oil viscosity or diluted
- Oil Pump malfunctioning
- Oil leak
- Excessive Bearing Clearance

REMEDY

Refer to owner manual for correct oil levels
Remove excess oil. Refer to owner manual for correct oil levels
Contact dealer to perform a mechanical oil pressure check

Rod, Cam or Main Bearings

Engine oil pressure as low as of 5 pounds at idle is acceptable. At 2000 rpm 30 pounds is acceptable

Oil Pressure - High

POSSIBLE CAUSE

- Oil too thick - Wrong Viscosity
- Erroneous oil gauge readings

- Clogged or restricted oil passage
- Oil valve relief valve stuck closed

REMEDY

Change oil
Contact dealer to perform a mechanical oil pressure check
Contact dealer
Contact dealer

Excessive Oil Consumption

POSSIBLE CAUSE

- External Leak
- Excessive oil in crankcase
- Oil / Fuel dilution
- Extended excessive RPM's
- Incorrect oil viscosity
- Incorrect dipstick
- Excessive oil temperature
- Defective oil cooler
- Remote oil lines installed wrong
- Engine breather tubes blocked
- Defective piston rings
- Defective Cylinders
- Excessive bearing Clearance

REMEDY

Clean / Check / Adjust

The amount of oil used is greatly dependent upon engine speed. Oil usage will be greater at higher rpm's

Engine Overheating

VERIFY IF ENGINE IS ACTUALLY OVERHEATING.

POSSIBLE CAUSE

- Clogged seawater intake
- Clogged seawater strainer
- Improperly installed strainer
- Loose hose connections
- Seawater hose kinked or collapsed
- Water turbulence under boat
- Defective thermostat
- Seawater pump impeller worn
- Obstruction in cooling system
- Engine circulating pump defective
- Low coolant level
- Antifreeze not properly mixed
- Heat exchanger core plugged.
- Water hoses reversed
- Exhaust riser obstruction
- Transmission cooler blocked
- Air leak in hose
- Slipping circulating pump belt
- Head gasket failure

REMEDY

Clear intake. Ensure that all hoses after the intake are clear.

Tighten hose connections

Replace seasonally

Mix to a 50 /50 ratio

Mix to a 50 /50 ratio

Riser should be changed every three to four years.

See dealer

Water In Engine Cylinder or Base

POSSIBLE CAUSE

- Operator error
- Exhaust restricted or blocked
- Engine and exhaust too low in boat
- Defective exhaust riser gasket
- Defective exhaust manifold or riser
- Cylinder head gasket leak
- Cracked block or cylinder head
- Intake manifold gasket
- Incorrect engine rotation

REMEDY

See Boater's Beware.
REMOVE water from engine immediately

Repair or Replace.
REMOVE water from engine immediately

Redesign add riser spacers.
REMOVE water from engine immediately

Contact dealer.
REMOVE water from engine immediately.

Remove water by removing spark plugs and turning the engine over by hand. Once water is removed spray cylinder with Marvel Mystery Oil or two cycle engine oil. Drain all the oil and change the oil filter(s). Again, turn the engine over by hand to circulate the oil. Contact your dealer immediately to make the required repairs. Upon completion of repairs, run the engine and again change the oil.

Terms and Conditions of Sale

1. EFFECT OF THESE TERMS AND CONDITIONS OF SALE. The following terms and conditions shall apply to all quotations, purchase orders, order acknowledgments and other documents, dealings and transactions relating to the sale of Seller's goods. Buyer's ordering, acceptance or use of any goods of Seller shall constitute an acceptance of the following terms and conditions. Seller shall not be deemed to have waived any of the following terms or conditions, even if Seller fails to object to any contrary or inconsistent provision appearing on, attached to, or incorporated by reference in any purchase order or other document issued by Buyer. Seller's acceptance of any such purchase order or other document of Buyer shall be conditioned upon the understanding that these terms and conditions shall control, notwithstanding any such contrary or inconsistent term or condition of Buyer.

2. PRICES. Unless otherwise agreed upon in writing by Seller, all prices, payments and references thereto shall be in U.S. dollars. Prices do not include freight charges. All goods are shipped F.O.B., Carol Stream, Illinois, or Lakeland, Florida U.S.A. Additionally, prices do not include sales taxes, use or excise taxes, import or export duties, special financing fees, value added taxes, income or royalty taxes, special permits or licenses, or similar charges. Buyer shall either pay such charges or provide Seller with acceptable exemption certificates.

3. PAYMENT. All orders are subject to Seller's approval. If Seller deems Buyer's financial condition or payment practices to be unsatisfactory, cash payment or other security may be required. If Buyer fails to meet such requirements, Seller may discontinue the delivery of goods to Buyer and treat such failure at any time thereafter as reasonable grounds for the lawful termination of any pending order. Seller shall have the right to issue invoices to Buyer upon readiness of goods for delivery, unless otherwise agreed upon in writing by Seller. Unless otherwise specified by Seller, invoices shall be due and payable NET 30 DAYS following date of invoice without regard to delays of transportation or inspection. Interest shall accrue on any overdue payment at the rate of 1.5% per month, or at the maximum lawful rate of interest, whichever is less. Buyer hereby grants Seller, and Seller shall retain, a security interest in all goods shipped or delivered to Buyer until payment of the total purchase price is received. Seller shall have the right to take all lawful measures to protect and preserve Seller's security interest in the goods, including, but not limited to, the filing of Uniform Commercial Code financing statements.

4. TITLE AND RISK OF LOSS. All goods supplied to Buyer shall have marketable title, free and clear of any security interest, lien or encumbrance of any third party. Title to, and risk of loss, shall pass to Buyer upon notice to Buyer of readiness of the goods for shipment. Freight and shipping obligations shall have no bearing on transfer of title or risk of loss. Claims for damages or shortages attributable to Seller must be filed with Seller within 10 days following receipt of goods or notice of loss, whichever occurs first, and must be accompanied by Seller's packing slip and a detailed description of any such claim.

5. LIMITED WARRANTY. Except as otherwise specifically set forth herein, Seller warrants only that the goods supplied to Buyer shall be free from defects in materials and workmanship when properly installed and operated under normal conditions and in accordance with all applicable instruction manuals, recommendations and specifications. This limited warranty shall begin on the original invoice date, specific to the terms described in this Manual / Warranty listed on pages 2-3. To obtain consideration under this limited warranty, Buyer must first send written notice to Seller in Carol Stream, Illinois, U.S.A., stating in what respects the goods are believed by Buyer to be defective. Failure to give notice within the warranty period shall be a waiver of this limited warranty and no assistance or other action thereafter taken by Seller shall be deemed to extend or revive the warranty period. Any goods believed by Buyer to be defective shall be returned by Buyer to Seller's facility in Carol Stream, Illinois, U.S.A., transportation prepaid, for examination by Seller. No goods shall be returned to Seller unless Buyer first obtains a return authorization from Seller. If, in Seller's sole judgment, the goods returned by Buyer are not defective or for some other reason are not covered under this limited warranty, Buyer shall pay Seller's applicable service time charges for said examination. If, in Seller's sole judgment, the goods returned by Buyer are defective and covered under this limited warranty, Seller shall have the option of repairing, rebuilding or replacing such goods, at its charge, provided that such goods are returned to Seller's facility in Carol Stream, Illinois, U.S.A., transportation prepaid. This limited warranty shall not apply to products which, in Seller's sole judgment, have been the subject of negligence, abuse, accident, misapplication, tampering or alteration; nor shall it apply to products damaged by acts of God, war or civil insurrection, acts of terrorism, improper installation, operation, maintenance or storage, or other than normal application, use or service, including, without limitation, operational failures caused by corrosion, erosion, wear and tear, rust or other foreign materials in the system in which they are utilized. Further, this limited warranty shall not apply to any products, parts, accessories or other goods not manufactured by Seller, provided that Seller, upon request by Buyer, shall advise Buyer of any warranties known to Seller that may be offered by the manufacturer of such goods. This limited warranty shall not cover, and Seller shall not under any circumstances be liable for, damages for injuries to persons or property; loss of product; loss of profits; loss of use; expenses of labor, travel or other items relating to the removal or replacement of defective goods; damages resulting from the removal of defective goods or the installation of repaired, rebuilt or replaced goods; expenses relating to the transportation of goods to and from Seller's facility; any consequential, incidental, contingent or special damages, whether arising in contract, in tort or under statute; or any other damages or expenses not agreed upon in writing by Seller, even if Seller has been advised of the potential for any such damages or expenses. THIS LIMITED WARRANTY IS IN LIEU OF ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ALL WARRANTIES OF MERCHANTABILITY AND

FITNESS FOR A PARTICULAR PURPOSE OR USE. No person is authorized to give any other warranty or to assume any other liability on Seller's behalf.

6. FORCE MAJEURE. In no event shall Seller be liable for any non-performance, delay in performance, or any other variation from Seller's performance obligations, nor for any loss or damage to any goods supplied to Buyer, when occasioned directly or indirectly by any cause beyond the reasonable control of Seller or its suppliers, vendors, subcontractors, or other representatives or agents, including, but not limited to, communication line failures; power failures; natural disasters or acts of God; acts of criminals or a public enemy; war; riot; acts of terrorism; official or unofficial acts, contracts, regulations or restrictions of any foreign or domestic governmental agency; acts of Buyer or its employees, representatives or agents; strikes or labor difficulties; or failures, shortages or delays in Seller's usual sources of labor or materials. Seller shall automatically be entitled to a reasonable extension of all periods of performance when delayed by any such cause.

7. MODIFICATION OR SUSPENSION OF ORDERS. Requests by Buyer for any modification or change of any order, including, but not limited to, any change in specifications, quantities or delivery obligations, shall be subject to Seller's written consent, and may result in adjustments to prices and delivery schedules. Any request by Buyer for a suspension of any order or a delay in any delivery shall be in writing, and shall be subject to the written consent of Seller. Such suspensions or delays may result in adjustments to prices, payments and delivery schedules. The time required for the subsequent fulfillment of any order may exceed the period of suspension or delay due to Seller's scheduling constraints or other reasons.

8. ASSIGNMENT/SUBCONTRACTING. Seller shall have the right to assign any of its rights or obligations under any order, and shall be entitled to subcontract the performance of any of its obligations under any order. Any attempted assignment by Buyer of any of its rights or obligations under any order shall be null and void in the absence of Seller's prior written consent.

9. INDEPENDENT CONTRACTOR. At all times, Seller shall be deemed an independent contractor of Buyer, and not a partner, joint venturer, employee or agent of Buyer.

10. LIMITATION OF LIABILITY. To the full extent permitted by laws, Buyer waives all rights against Seller for any damage to its property or that of third parties, or for injury to any person, however caused. In no event shall Seller's total liability exceed the specified purchase price of the goods covered by the applicable order.

11. REGULATORY COMPLIANCE. Buyer shall comply with all applicable laws, regulations and rules governing goods supplied by Seller, including, but not limited to, safety and health standards, environmental regulations, technical standards, and export controls.

12. SELLER'S OPPORTUNITY TO CURE. In the event that Buyer believes that Seller is not in full compliance with its obligations hereunder, Buyer shall notify Seller in writing and Seller shall have the right to remedy the alleged non-compliance within 30 days following its receipt of said notice.

13. VENUE; WAIVER OF JURY TRIAL. BUYER HEREBY IRREVOCABLY SUBMITS TO THE JURISDICTION OF ANY STATE OR FEDERAL COURT SITTING IN CHICAGO, ILLINOIS, OVER ANY ACTION OR PROCEEDING BASED HEREON, AND BUYER HEREBY IRREVOCABLY AGREES THAT ALL CLAIMS IN RESPECT OF SUCH ACTION OR PROCEEDING SHALL BE HEARD AND DETERMINED IN SUCH STATE OR FEDERAL COURT. BUYER HEREBY IRREVOCABLY WAIVES, TO THE FULLEST EXTENT IT MAY EFFECTIVELY DO SO, THE DEFENSE OF AN INCONVENIENT FORUM TO THE MAINTENANCE OF SUCH ACTION OR PROCEEDING. BUYER IRREVOCABLY CONSENTS TO THE SERVICE OF ANY AND ALL PROCESS IN ANY SUCH ACTION OR PROCEEDING BY THE MAILING OF COPIES OF SUCH PROCESS TO BUYER AT ITS ADDRESS AS SPECIFIED IN THE RECORDS OF SELLER. BUYER AGREES THAT A FINAL JUDGMENT IN ANY SUCH ACTION OR PROCEEDING SHALL BE CONCLUSIVE AND MAY BE ENFORCED IN ANY OTHER JURISDICTION BY SUIT ON THE JUDGMENT OR IN ANY OTHER MANNER PROVIDED BY LAW. BUYER KNOWINGLY, VOLUNTARILY AND INTENTIONALLY WAIVES IRREVOCABLY THE RIGHT IT MAY HAVE TO TRIAL BY JURY WITH RESPECT TO ANY LEGAL PROCEEDING BASED HEREON, OR ARISING OUT OF, UNDER OR IN CONNECTION WITH ANY ORDER. BUYER SHALL REIMBURSE SELLER, UPON DEMAND, FOR ALL COSTS AND EXPENSES (INCLUDING REASONABLE ATTORNEYS' FEES AND COURT COSTS) INCURRED BY SELLER IN ANY ACTION OR PROCEEDING.

14. INTERPRETATION. These terms and conditions shall be governed by and construed in accordance with the laws of the State of Illinois, including such State's Uniform Commercial Code, without giving effect to principles of conflict of laws. Whenever any conflict exists between these terms and conditions and any provision of such Uniform Commercial Code, these terms and conditions shall govern. The section headings contained herein have been inserted for convenience only, and shall not be considered in interpreting any term or condition hereof. If any term or condition contained herein is found to be invalid or unenforceable, it shall be deemed stricken herefrom without affecting the remaining terms or conditions hereof.

15. NOTICE. All notices required hereunder shall be in writing and delivered by overnight delivery or certified or registered mail, postage prepaid, return receipt requested. Any such notice shall be deemed to have been given on the date it is received, even if refused, during regular office hours at the address listed on the applicable order or at such other address as the affected party may have previously designated for notices.

