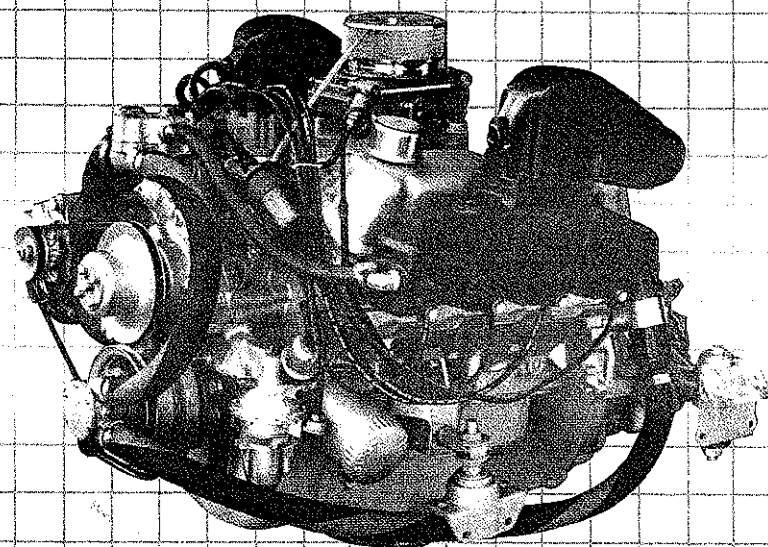


Indmar
**MARINE
ENGINES**



OWNER'S MANUAL

A WORD TO INDMAR ENGINE OWNERS

This manual has been prepared to acquaint you with the operation and maintenance of your new Indmar engine, and to provide important safety information. We urge you to read this publication carefully and follow all recommendations to assure you the most enjoyable and trouble-free operation of your Indmar powered boat.

To insure the finest in marine power for your boat, all Indmar engines are carefully assembled at our factory and submitted to exacting operational and performance tests. Your authorized Indmar dealer will be happy to answer any questions you may have regarding operation and maintenance of your engine and drive.

When it comes to service — remember your Indmar dealer knows your boat best and is interested in your complete satisfaction. Return to him for maintenance, service or any other assistance you may require.

We would like to take this opportunity to thank you for choosing an Indmar product and to assure you of our continuing interest in your boating pleasure and satisfaction.

**Indmar Products Co.
Memphis, Tennessee**

INDMAR WARRANTY REGISTRATION

Name _____	
OWNER:	Address _____
	City _____ State _____ Zip _____
PRINCIPAL USE:	☐ Pleasure ☐ Commercial ☐ Fresh Water ☐ Salt Water ☐ Cruising ☐ Water Skiing ☐ Fishing ☐ Other
ENGINE:	Model _____ Serial Number _____
DRIVE:	Make _____ Model _____ Serial No. _____
BOAT:	Manufacturer _____ Model _____ Length _____ Serial No. _____
Firm Name _____	
DEALER:	Address _____
	City _____ State _____ Zip _____
Pre-Delivery Inspection Completed and Signed _____	
Date First Put into Service _____ Date of Sale _____	
Signed _____	_____
	OWNER DEALER

Owner — be certain your dealer has completed and signed the pre-delivery inspection on page 2.

Pre-Delivery Inspection

BEFORE STARTING ENGINE

- | | |
|--|--|
| ☐ Engine Oil Level | ☐ Electrical Connections Tight & Properly Installed |
| ☐ Fuel Lines Tight — No Leakage | ☐ Water Drain Petcocks Closed |
| ☐ Oil Lines & Filter Tight — No Leakage | ☐ Throttle Control Properly Adjusted |
| ☐ Water Lines Tight — No Leakage | ☐ Shift Control Properly Adjusted |
| ☐ Alternator Belt — Proper Tension | ☐ Steering Properly Installed & Operational |
| ☐ Exhaust Hoses & Clamps Tight | ☐ Battery Charged and Properly Connected |
| ☐ Engine Properly Aligned and Installed | ☐ Engine Compartment Clean and Properly Vented |
| ☐ Engine Mounts Tight | |

OPERATIONAL INSPECTION

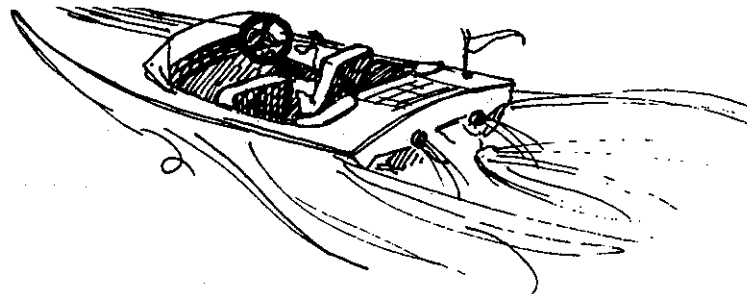
- | | |
|--|--|
| ☐ Boat Launched or Backed into Test Pit | ☐ Check Timing and Dwell — (See specifications) |
| ☐ Check Bilge for Water Leaks | ☐ Set Idle — (see specifications) |
| ☐ Start Engine — Check Instruments | ☐ Check Cooling System |

I have completed the above inspection this _____ date.

By _____

Dealership _____

DON'T MISS THE BOAT



MAIL YOUR COMPLETED WARRANTY FORM

The Federal Boat Safety Act of 1971 requires that registrations of marine products sold in the United States be maintained by the manufacturer and dealers of those products. It is imperative that Indimar Products Company receives your registration form properly completed for warranty purposes and also to comply with federal regulations. This registration also enables us to contact you, if it should become necessary, to change or improve the product for your protection. **WARRANTY REGISTRATION MUST BE RECEIVED WITHIN 10 DAYS AFTER DATE OF PURCHASE BY FIRST OWNER — NON COMPLIANCE VOIDS ALL WARRANTIES.**

In order to obtain maximum enjoyment from your newly purchased boat, we, at Indimar, stress the importance of following the recommendations set forth in this manual. The knowledge obtained through careful study of this Owners Manual will assure you the utmost in service, performance, and lasting satisfaction.

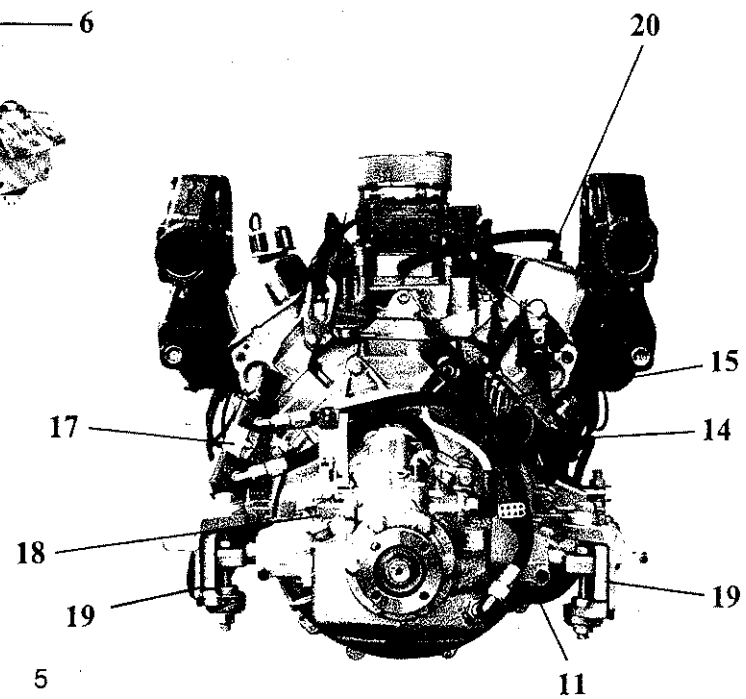
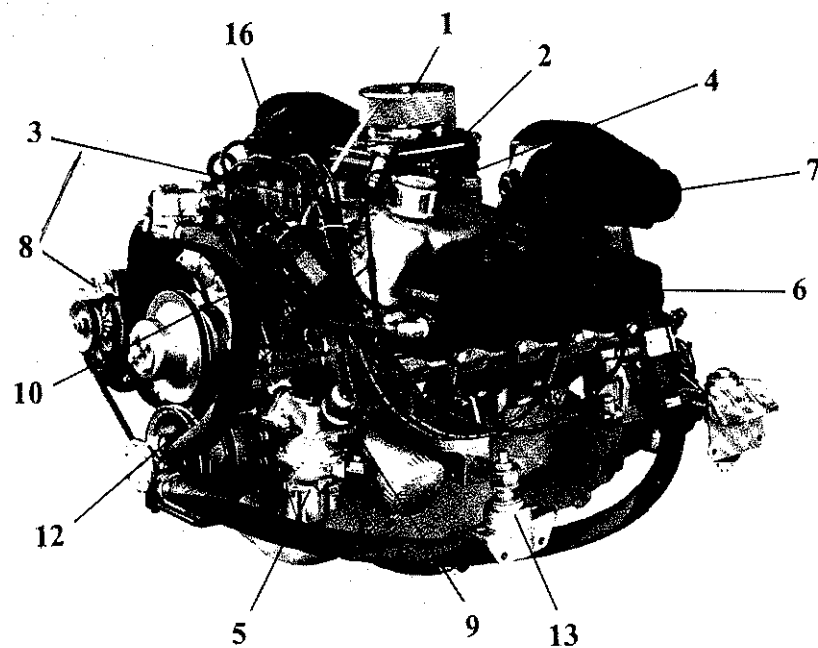
Further information regarding the care, operation, required equipment or specifications for your boat may be obtained from your local US Coast Guard, Auxiliary US Power Squadron, state boating authorities, or the American Red Cross. Know the law and your responsibilities as a boat owner.

Engine Specifications

INDMAR ENGINE MODEL								
Item	140	200	225	250	275	300	350	400
Bore	4.00	4.00	4.00	4.00	4.00	4.00	4.25	4.25
Stroke	3.60	3.00	3.00	3.50	3.48	3.48	4.00	4.00
Cubic Inch Displacement	181	302	302	351	350	350	454	454
Compression	8.5:1	8.4:1	8.4:1	8.3:1	9.0:1	9.0:1	8.8:1	8.8:1
Carburetor	Holley 2 Barrel	Holley 2 Barrel	Holley 4 Barrel	Holley 4 Barrel	Holley 4 Barrel	Holley 4 Barrel	Holley 4 Barrel	Holley 4 Barrel
Fuel Required	Reg. or Unleaded	Reg. or Unleaded	Reg. or Unleaded	Reg. or Unleaded	Reg. or Unleaded	Reg. or Unleaded	Reg. or Unleaded	Reg. or Unleaded
Idle RPM	600 In Gear	600 In Gear	600 In Gear	600 In Gear	600 In Gear	600 In Gear	600 In Gear	600 In Gear
Point Dwell	30°	31°	31°	31°	30°	30°	30°	30°
Timing	5° at 750	10° at 600	10° at 600	10° at 600	10° at 1000	10° at 1000	10° at 1000	10° at 1000
Spark Plugs	MR43T	BRF-3 or ARF-32	BRF-3 or ARF-32	BRF-3 or ARF-32	MR43T	MR43T	MR43T	MR43T
Plug Gap	.035	.035	.035	.035	.035	.035	.035	.035
Firing Order	1-3-4-2	1-5-4-2-6-3-7-8	1-5-4-2-6-3-7-8	1-3-7-2-6-5-4-8	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2
Oil Filter	AC PF-25	FL1A	FL1A	FL1A	AC PF-25	AC PF-25	AC PF-25	AC PF-25
Alternator	Motorola 51 AMP	Motorola 51 AMP	Motorola 51 AMP	Motorola 51 AMP	Motorola 51 AMP	Motorola 51 AMP	Motorola 51 AMP	Motorola 51 AMP
Distributor	Prestolite	Prestolite	Prestolite	Prestolite	Prestolite or Mallory	Prestolite or Mallory	Prestolite or Mallory	Prestolite or Mallory
Starter	Delco	Motorcraft	Motorcraft	Motorcraft	Delco	Delco	Delco	Delco

Engine Components

1. Flame Arrestor
2. Carburetor
3. Fuel Line
4. Oil Filler Cap
5. Fuel Pump
6. Exhaust Manifold
7. Exhaust Riser
8. Alternator
9. Oil Press Sender
10. Water Temp Sender
11. Starter
12. Oil Dip Stick
13. Engine Mount
14. Electrical Junction
15. Circuit Breaker
16. Distributor
17. Transmission Cooler
18. Transmission Oil Dip Stick
19. Transmission Mounts
20. PVC Valve



FIRST TRIP OUT

Before reaching the lake you and your crew should become familiar with all controls, switches, gauges, and all safety devices installed in your new boat. A few minutes studying this manual and the other manuals included in your owners packet will cover the basic information needed. Your marine dealer will be more than glad to answer any questions you may have that are not covered in this manual.



BEFORE STARTING ENGINE

1. Check fuel level
2. Have battery fully charged
3. Check engine oil level
4. Make a visual inspection of bilge for loose gear, leakage, etc.
5. Operate bilge blower at least two minutes before cranking the engine. This will remove any possible gas fumes from the engine compartment.

STARTING THE ENGINE

SPECIAL NOTE: *Do not launch the boat before checking*

the hull drain plug FIRST. Back slowly into the water, when the hull has submerged pass the water intake, STOP — you are now ready to start engines.

Check Shift Control

1. Single Lever Control

- a. Place in Neutral detent.
- b. Pull out shift, disengage button.
- c. Prime cold engine by moving throttle two or three times, return to Idle position before starting. A HOT ENGINE does not require priming.

NOTE: *Do NOT operate starter for more than 15 seconds without a 2 minute "cool-down" period.*

ENGINE IN OPERATION

1. Check oil pressure.
2. Allow engine to obtain water temperature before running past Idle position.
3. When equipped with MVB control, move throttle to Neutral position, push button in — you are now ready to operate your boat.

—or—

With foot throttle equipment, move shift control to proper position to depart from mooring.

PROPER ENGINE BREAK-IN REQUIREMENTS

To insure maximum longevity of your Indmar Engine, the following engine break-in schedule is recommended:

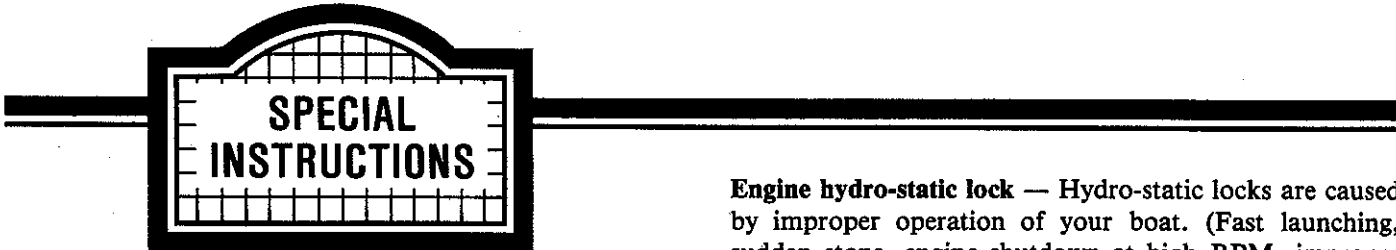
First Hour — Maximum 2,000 RPM.

Next Four Hours — Excelerate to plane, vary RPM not exceeding 3000 RPM.

First Ten Hours — Vary RPM — Do not operate at full throttle setting.

During the break-in period, close attention to the following is very important.

1. Proper oil level
2. Over-heating
3. Oil or water leaks
4. Drive (check your Drive owners manual for proper drive maintenance.)
5. Abnormal vibration or noises
6. Loose mountings, fittings, nuts, bolts and clamps.



SPECIAL INSTRUCTIONS

Dry land operation — Your Indmar engine may be checked out of water by connecting a water hose to the engine water intake. Do not exceed 2000 RPM or five minutes operation.

Launching — Back slowly. (A fast launch may force water past the exhaust and flappers and into the engine, causing serious damage.)

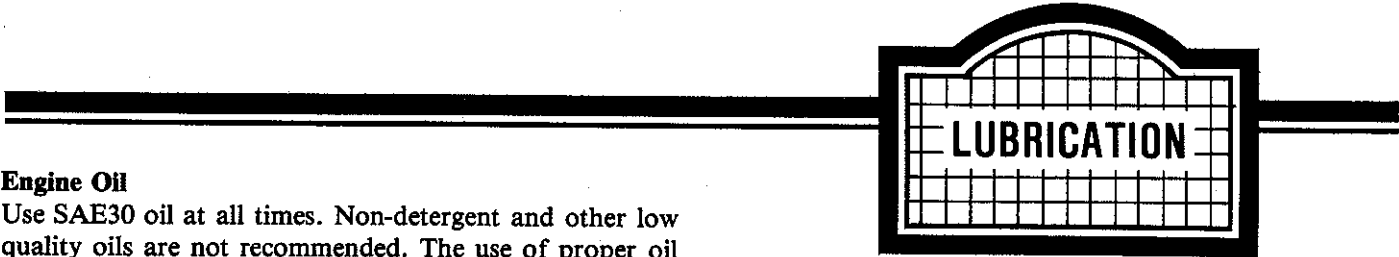
Following wake — Sudden deceleration may cause the following wake to flow over the transom of your boat. Advance throttle slightly to prevent wake from reaching transom.

Engine Shutdown — Your boat should be static, and the engine at full idle before turning the ignition switch to OFF. This will prevent engine hydro-locking.

Engine hydro-static lock — Hydro-static locks are caused by improper operation of your boat. (Fast launching, sudden stops, engine shutdown at high RPM, improper installation, and loss of exhaust flappers are a few of the causes of hydro-static lock.)

If water should enter the engine cylinders — the following steps should be taken:

1. Remove all spark plugs
2. Loosen exhaust risers
3. Remove coil wire
4. Crank engine 15 seconds
5. Reinstall spark plugs, tighten risers, and reinstall coil wire.
6. Crank engine — if there are any abnormal sounds STOP OPERATION and contact your Indmar dealer to completely check out your engine. CONTINUED OPERATION MAY CAUSE SERIOUS DAMAGE.



LUBRICATION

Engine Oil

Use SAE30 oil at all times. Non-detergent and other low quality oils are not recommended. The use of proper oil and oil change intervals are your best assurance of continued reliability and performance of your Indmar engine.

Engine oil and filter must be changed at the 10 hour inspection and should be changed every 50 hours of operation, or 60 days, whichever comes first, thereafter.

Draining Oil

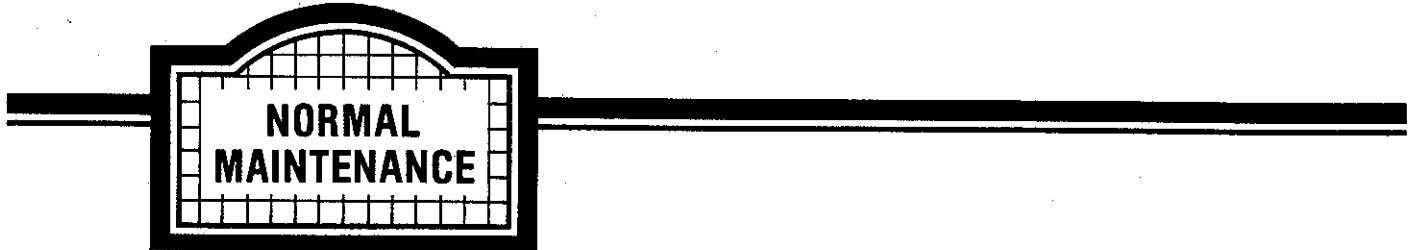
Your Indmar Engine is equipped with a Quick-Drain oil fixture. Remove the hull drain plug — insert quick-drain through hull opening (outside hull). Remove cap on quick-drain hose and allow to flow into disposing container. When all the oil has drained from the engine — replace the cap and return the quick-drain to its storage position. Remove the oil filter (conveniently located for ease of removal and new filter installation). Replace engine oil through oil filler tubes.

Starter

Your starter has been sprayed with lubrication to extend the starter longevity. We highly recommend an oil application to the starter bendix every month or 50 hours of operation.

Shift and Throttle Cable

Spray oil on the exposed throttle cable ends located at the engine and transmission — work the cable and re-spray to completely lubricate. In highly corrosive conditions a complete cable lubrication system may be purchased through your local dealer.



NORMAL MAINTENANCE

After the first 10 hours of operation, we highly recommend returning your new boat to your marine dealer for a "10 hour inspection". Your marine dealer is completely familiar with Indmar marine engines. A thorough inspection by his qualified mechanics will insure continuing top quality performance. The Maintenance Service Check List should be followed as well as the Pre-Delivery Inspection on page 2.

Alternator

The Motorola or Delco alternator has a built-in solid-state voltage regulator. The regulator requires no adjustment. At 1500 RPM and above, the alternator output is 35 amperes. A 40 amp circuit breaker, located on the engine bell housing, is installed on many models to protect the electrical system. Proper belt tension must be maintained — check after 10 hours of operation and periodically thereafter.

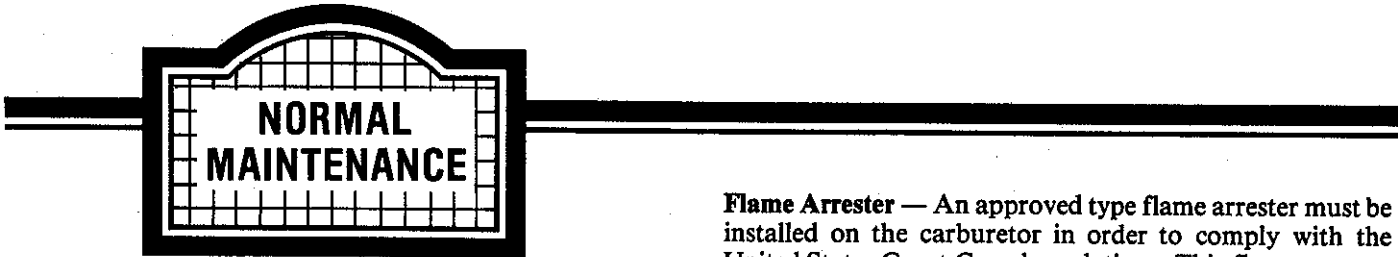
Battery

Your 12 volt battery should have a minimum rating of 78 plate, 73 ampere/hour. Battery cables should be as short as possible. If the total combined length of the positive and negative cable is less than 8 feet, number 2 gauge may be used; less than 16 feet, number 1 gauge wire may be used.

Connect the positive (+) cable to the positive stude, the negative (-) cable to a proper ground.

Maintenance Service Check List

Maintenance Interval (Time in Hours)	10	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750
Engine Oil Change Inspect for loose fittings, belts, clamps, hoses or bolts	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Inspect for fuel, oil, or water leaks	EACH TIME THE ENGINE IS USED															
Inspect fuel line																
Lubricate starter gear and shaft	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Engine Oil Filter — Replace	x	x	x		x		x		x		x		x		x	
Crankcase Ventilation Filter			x		x		x		x		x		x		x	
Crankcase Ventilation Valve Inspect — Replace —			x		x		x		x		x		x		x	
	Every 24 Months															
Carburetor Fuel Filter Replace —			x		x		x		x		x		x		x	
Battery and Terminals Clean —			x		x		x		x		x		x		x	
Flame Arrester			x		x		x		x		x		x		x	
Engine Tune-up			x		x		x		x		x		x		x	



NORMAL MAINTENANCE

Crankcase Breather

A crankcase breather, located on the valve cover, is used to protect your engine. If plugged it can cause condensation of blow-by fumes in the crankcase resulting in the formation of acids, sludge build-up, oil dilution, oil blow-by, high oil consumption, and rust. It is therefore most important that you clean the breather at each oil change.

Positive Crankcase Ventilation Valve

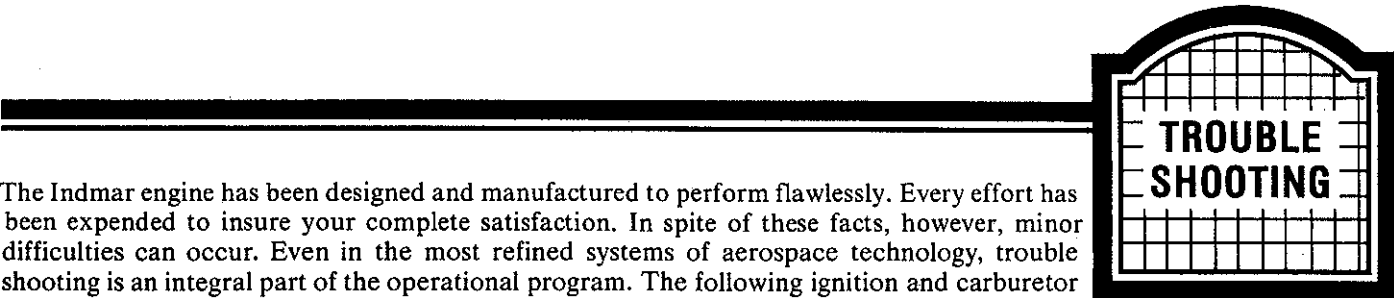
The PCV valve is located on the valve cover. This valve should be inspected at each oil change and replaced if necessary. Complete replacement is recommended every 24 months.

Fuel System

Fuel Pump — A marine type fuel pump is installed on the Indmar engine. This pump is designed to incorporate a clear plastic hose which is routed from the fuel pump to the rear of the carburetor. If fuel should appear in this hose a *malfunction* exists and the fuel pump must be replaced.

Flame Arrester — An approved type flame arrester must be installed on the carburetor in order to comply with the United States Coast Guard regulations. This flame arrester should be checked and cleaned at every 100 hours of operation.

The carburetor has been adjusted at the factory and should not need adjusting. Minor adjustments may be necessary due to fuel, climate, or altitude. Bring the engine to operating temperature, adjust idle screw a quarter turn at a time until maximum RPM is indicated on the tachometer, adjust idle to 1000 RPM.



TROUBLE SHOOTING

The Indmar engine has been designed and manufactured to perform flawlessly. Every effort has been expended to insure your complete satisfaction. In spite of these facts, however, minor difficulties can occur. Even in the most refined systems of aerospace technology, trouble shooting is an integral part of the operational program. The following ignition and carburetor diagnosis charts and suggestions for more general areas will provide you with the information necessary to pinpoint any problem that should arise. They have been reprinted (and modified in part to comply with the engine wiring system) by permission of Ford Motor Company and General Motors Corporation.

Gas Mileage

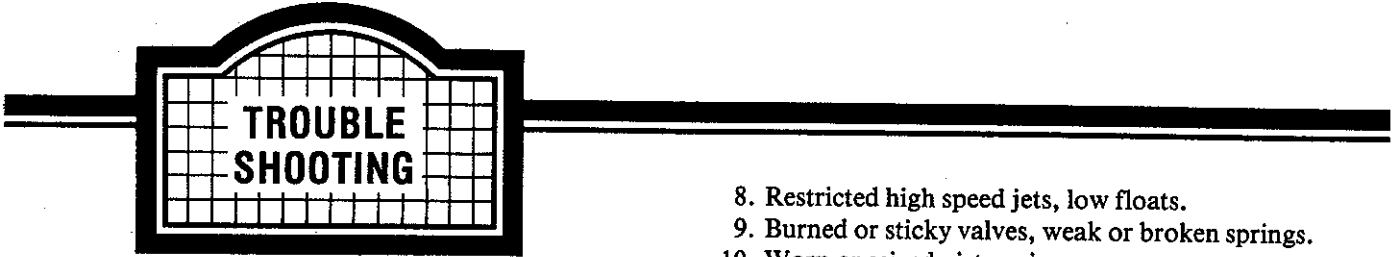
1. Distributor points burned or misadjusted.
2. Incorrect dwell and ignition timing.
3. Low engine vacuum.
4. Spark plugs fouled.
5. Plugged flame arrester.
6. Driver's habits.
7. Closed or partially closed choke.
8. Plugged positive crankcase ventilation system.
9. Incorrect air/fuel ratio at 1500 RPM test.
10. Black smoke at exhaust outlet shows rich gas mixture.
11. High or misaligned floats.

12. High fuel pump pressure.

13. Stuck power piston or wrong size in metering jets.

Hard Start Cold

1. Low battery.
2. Choke stuck open.
3. Loose coil or ignition wires.
4. Distributor points burned or misadjusted.
5. Flooding condition.
6. Spark plugs fouled.
7. Lack of fuel at carburetor.
8. Weak or shorted coil.



TROUBLE SHOOTING

9. Starter drawing excessive amperage.
10. Battery cables loose or corroded.
11. Shorted distributor condenser.
12. Low compression.
13. Ignition switch problems.
14. Carburetor unloader misadjusted.
15. Foreign material or water in fuel system.

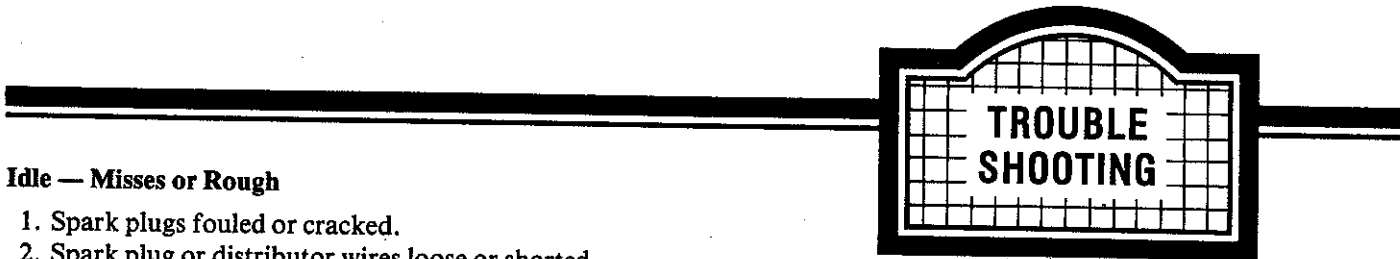
High Speed Performance

1. Distributor points or incorrect dwell and ignition timing.
2. Spark plugs fouled, incorrect gap or heat range.
3. Stuck power valve or piston.
4. Closed or partially closed choke.
5. Foreign material or water in fuel.
6. Lack of fuel at carburetor.
7. Low fuel pump pressure.

8. Restricted high speed jets, low floats.
9. Burned or sticky valves, weak or broken springs.
10. Worn or seized piston rings.
11. Vapor lock.
12. Excessive carbon in heads.
13. Restricted exhaust system.
14. Plugged flame arrester.
15. Insufficient vacuum advance.
16. Weak or shorted coil or condenser.
17. Retarded valve timing.
18. High engine oil pump pressure.

Engine Will Crank But Won't Start

1. Weak or shorted coil, no spark at plugs.
2. Distributor points misadjusted or burned, or shorted condenser.
3. Lack of fuel at carburetor.
4. Low battery.
5. Starter drawing excessive amperage.
6. Low compression.
7. Retarded or advanced valve timing.



TROUBLE SHOOTING

Idle — Misses or Rough

1. Spark plugs fouled or cracked.
2. Spark plug or distributor wires loose or shorted.
3. Plugged positive crankcase ventilation system.
4. Vacuum leak.
5. Plugged idle jets or improperly adjusted idle screws.
6. Weak or shorted coil.
7. Distributor points burned.
8. Burned or sticky valves, weak or broken springs.
9. Leaky head gaskets.
10. High fuel pump pressure.
11. Worn cam lobe.
12. Carburetor icing.

Hard Start Hot

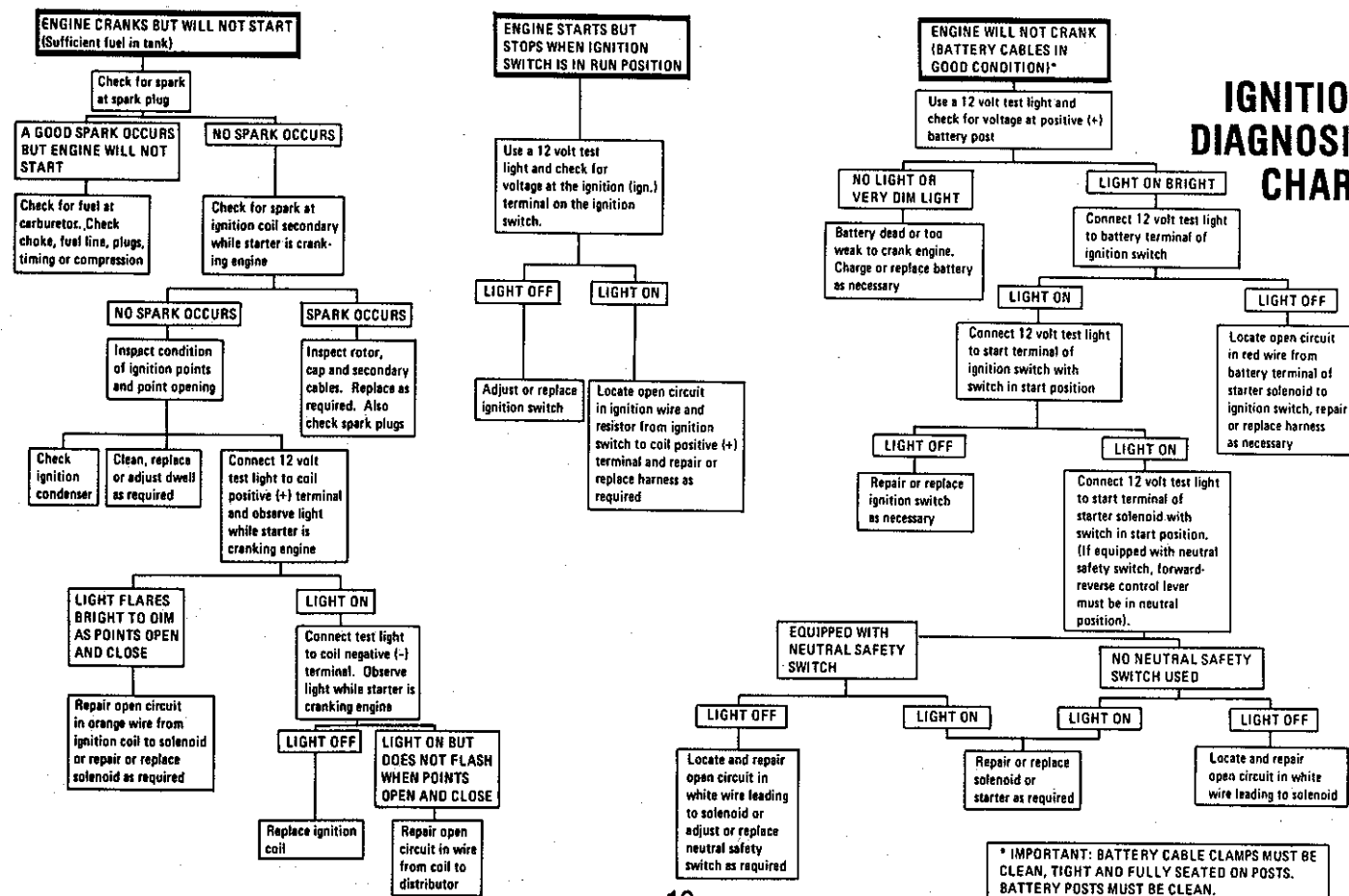
1. Flooding condition.
2. Distributor points burned or misadjusted.
3. Closed choke.
4. Plugged flame arrester.
5. Spark plugs fouled.

6. Low compression.
7. Weak or shorted coil.
8. Loose coil or ignition wires.
9. Battery cables loose or corroded.
10. Low battery.
11. Starter drawing excessive amperage.

Engine Won't Crank

1. Low battery and loose or corroded cables.
2. Misadjusted or defective neutral safety switch.
3. Defective starter motor.
4. Ignition switch problems.
5. Hydrostatic lockup. Remove spark plugs to look for water or gasoline in cylinders.
6. Seized engine. Turn crank pulley with socket and ratchet.

IGNITION DIAGNOSIS CHART



ENGINE RUNS ROUGH,SURGES

CHECK FUEL PUMP PRESSURE AND VOLUME

FUEL FILTERS OR SCREENS PLUGGED OR DIRTY

MAIN METERING JETS PLUGGED, LOOSE OR WRONG PART

PRIMARY METERING RODS BENT, ALTERED OR INCORRECT PART

POWER PISTON STICKING, DIRTY, SPRING MISSING, OR INCORRECT PART

FLOAT ADJUSTMENT INCORRECT

FLOAT BENT OR MISALIGNED

ADJUST IDLE SPEED TO SPECIFICATIONS

CHECK IDLE SYSTEM FOR DIRTY OR PLUGGED PASSAGES

GASKETS NOT SEALING MAY BE HARD OR BRITTLE CHECK FOR LOOSE SCREWS

SECONDARY THROTTLE VALVES STICKING OPEN OR MISALIGNED

POOR GAS MILEAGE

RUN MILEAGE TEST CHECK DRIVER HABITS

IF MILEAGE IS POOR, CHECK THE FOLLOWING

CHECK CHOKE VALVE AND LINKAGE FOR BINDING OR STICKING

CHECK POWER PISTON FOR STICKING OR BEING BENT

CHECK POWER PISTON VACUUM PASSAGES FOR LEAKS OR BEING PLUGGED

CHECK POWER PISTON SPRING FOR DISTORTION

CHECK METERING RODS FOR BEING BENT OR WRONG PART

MAKE SURE GASKETS SEAL PROPERLY ON ALL VACUUM PASSAGES

CHECK MAIN METERING JETS FOR BEING PLUGGED, LOOSE, OR INCORRECT PART

CARBURETOR FLOODING

CHECK FLOAT NEEDLE SEAT FOR LEAKAGE FROM DIRT, WEAR, DAMAGE, LOOSENESS.

FLOAT BENT, STICKING, MISALIGNED, MISADJUSTED

CHECK AND ADJUST IDLE SPEED

GASKETS NOT SEALING OR CASTINGS LEAKING

PUMP DISCHARGE BALL NOT SEATING. CHECK FOR DIRT, DEFECTIVE SEAT OR DISCHARGE SPRING

POOR HIGH SPEED PERFORMANCE

CHECK FOR FULL THROTTLE OPENING AT CARBURETOR ADJUST THROTTLE LINKAGE AS NECESSARY

AIR VALVE BINDING, STICKING

AIR VALVE OR SECONDARY VALVES NOT UNLOCKING

SECONDARY METERING RODS BENT OR INCORRECT PART

POWER PISTON STUCK OR BINDING CHECK FOR DISTORTED SPRING

FLOAT SETTING INCORRECT

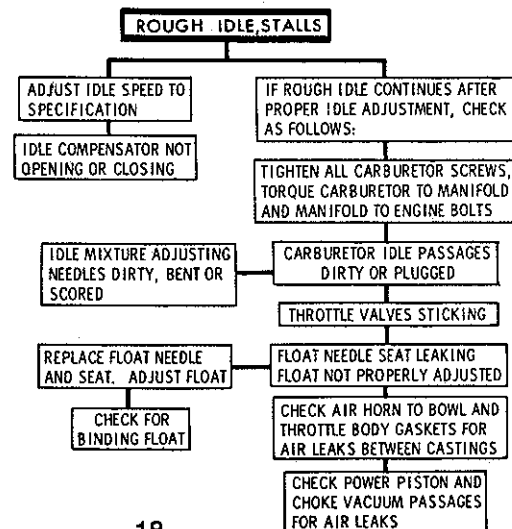
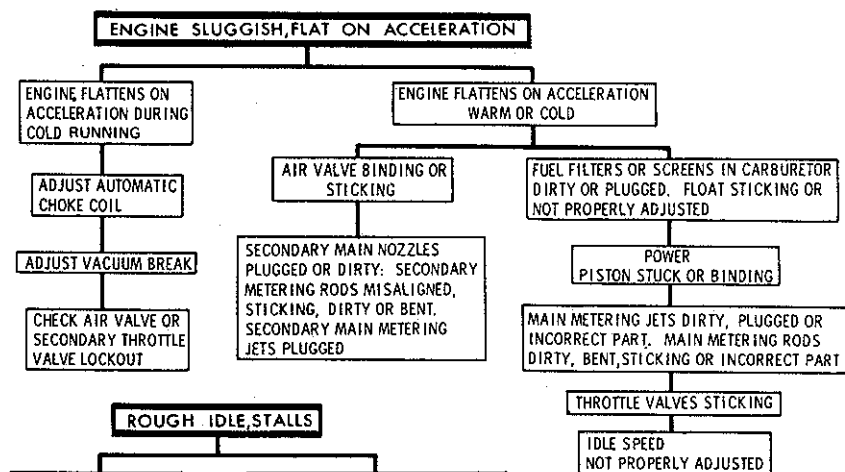
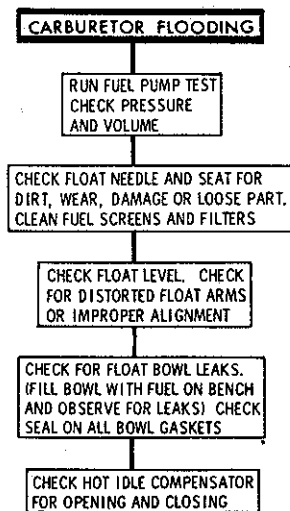
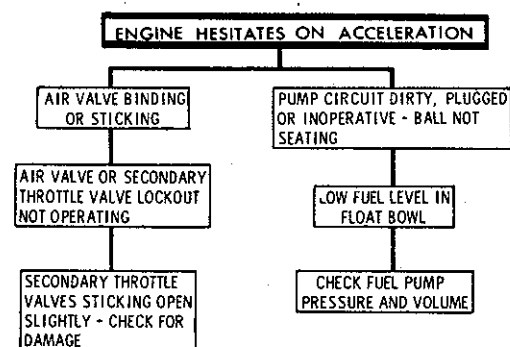
FLOAT STICKING, MISALIGNED

MAIN METERING JETS PLUGGED, DIRTY OR INCORRECT PART

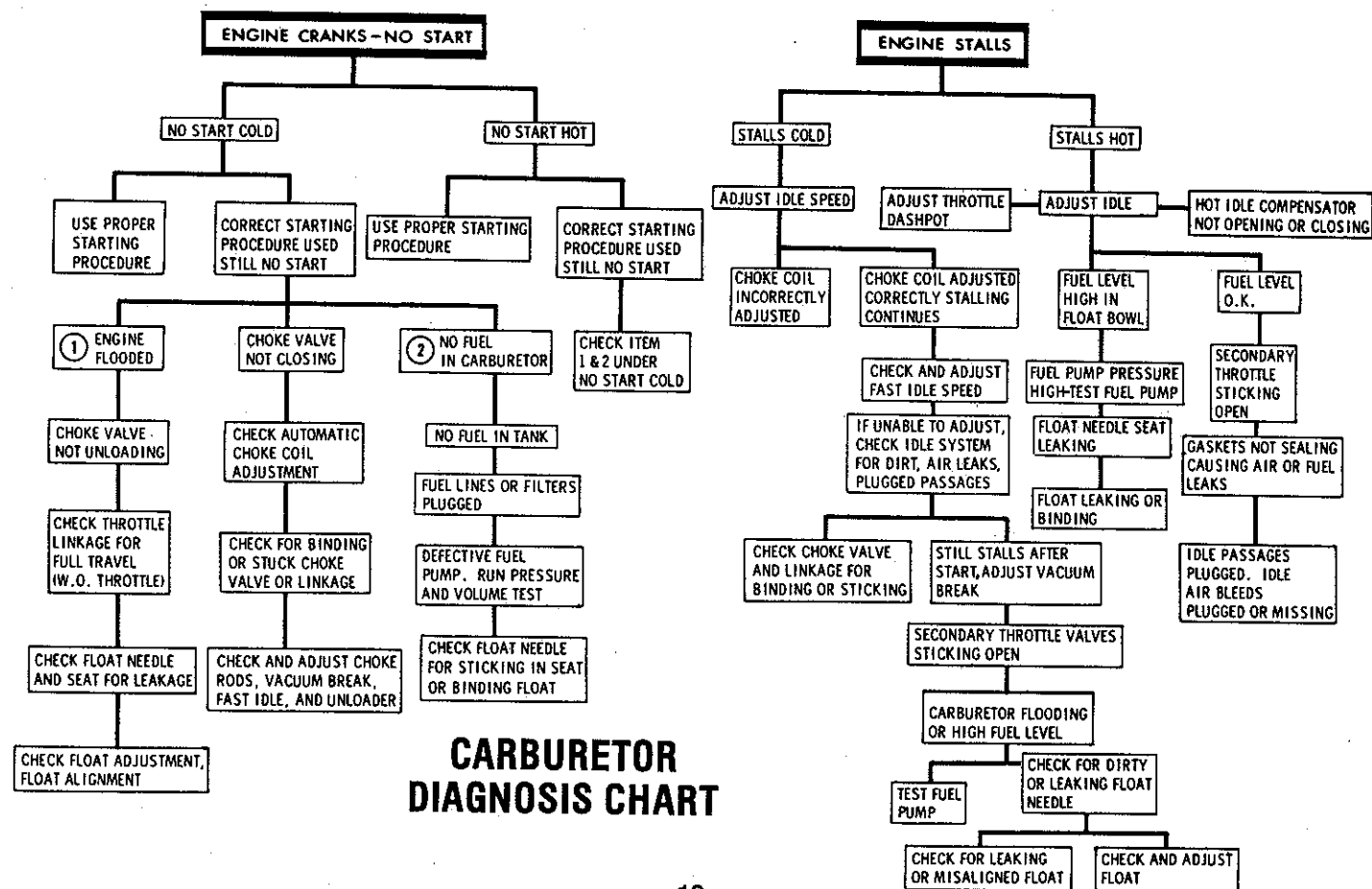
METERING RODS ALTERED, BENT OR INCORRECT PART

GASKETS NOT SEALING MAY BE HARD OR BRITTLE CHECK FOR LOOSE SCREWS

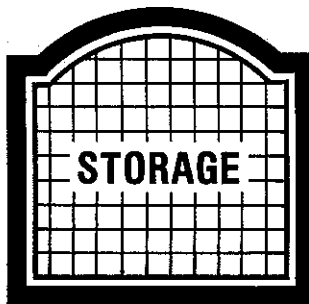
CARBURETOR DIAGNOSIS CHART



CARBURETOR DIAGNOSIS CHART



CARBURETOR DIAGNOSIS CHART



STORAGE

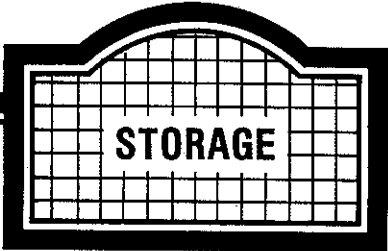
PREPARATION OF ENGINE FOR STORAGE OR WINTER LAY-UP

Certain precautions should be undertaken with regard to engines used in marine craft for either limited or extended periods of storage or winter lay-up.

Special consideration may be required when conditions of high humidity, extreme temperatures or outdoor storage is encountered. Consult your local dealer concerning additional protective measures for such conditions. **SPECIAL NOTE:** *Refer to manufacturers recommendations for storage and reactivation of transmission or jet pump assemblies used with the Oldsmobile engine in marine craft.*

LESS THAN 30-DAY STORAGE

1. Completely flush engine (see section on engine flushing procedure).
2. Check engine coolant level and if necessary increase "antifreeze" protection.
3. Check battery and charge if below 1.255 specific gravity to avoid freezing and deterioration. Both battery cables should be disconnected at the battery to prevent gradual discharge and the possibility of fire due to short circuits.
4. Marine craft are best stored in a clean, dry, closed or roofed area. If the craft or engine is subject to corrosive fumes or bird droppings, they should be completely covered.
5. Run engine until completely warmed up before shutting off ignition (at fast idle for a minimum of 15 minutes).
6. Check marine craft for personal items that might freeze or deteriorate with time.

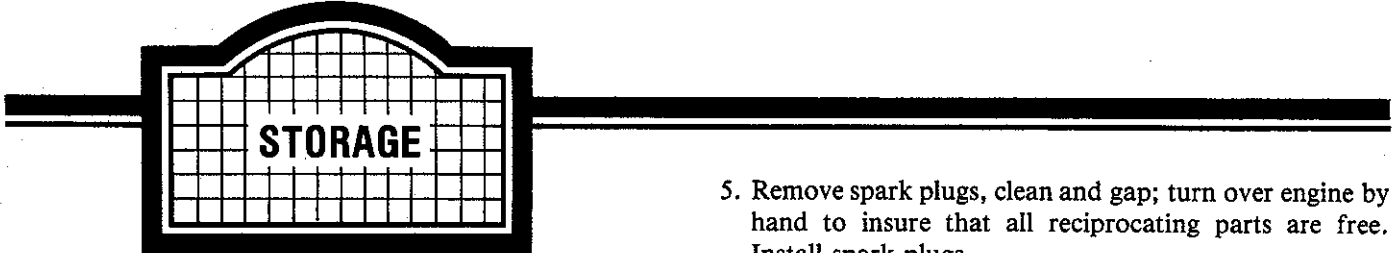


STORAGE

EXTENDED STORAGE BEYOND 30-DAYS

In the event the marine craft is to be stored for periods beyond 30 days or for seasonal or winter lay-up, the following items are suggested in addition to the steps given above for engine or craft that are to be stored less than 30 days.

1. Start and run engine until completely warm.
2. After warm-up, completely flush engine (see section on engine flushing procedure). Drain engine oil and replace filter element, refill with fresh oil. After the oil and filter change is completed, run the engine to circulate the new oil throughout the engine to warm it up thoroughly. If the engine is equipped with air conditioning, the unit should be operated during this final engine warm-up to lubricate compressor seals.
3. Drain all coolant from both sides of the engine, the oil cooler, heat exchanger, exhaust manifolds and risers.
4. Remove the battery from the boat and store in a cool, dry area at above freezing temperature. **CAUTION:** As part of the normal function of an electrical storage battery, hydrogen gas is produced through chemical action. This gas is toxic and extremely combustible when mixed with air. Do not store battery where it will be exposed to sparks or open flame, nor where exposed to children.
5. Drain gasoline from fuel tank, fuel lines and carburetor to reduce fire hazard and to prevent gumming of the fuel as it evaporates.
6. Coat all electrical connections with a light coating of rust preventative.
7. Cover the intake area of the flame arrester with tape. Plug the exhaust ports with rags, or tape them closed.



STORAGE

REACTIVATING ENGINE AFTER EXTENDED STORAGE

1. Check all fuel, oil, coolant and refrigerant levels and replenish as necessary in the following components — engine block crankcase, fuel tank and transmission.
2. Check bilge area and around engine for nesting creatures and evidence of leakage of oils or fluids or physical damage to engine components.
3. Clean battery end of cables and install fully charged battery.
4. Remove the tape from the flame arrester and clean; unplug the exhaust ports.
5. Remove spark plugs, clean and gap; turn over engine by hand to insure that all reciprocating parts are free. Install spark plugs.
6. Install new carburetor fuel filter.
7. Review boat manufacturers starting procedure, start engine. A certain amount of cranking may be necessary to allow the fuel pump to fill the carburetor bowl. As soon as the engine starts, check the oil pressure gauge. The reading should not be less than 35 psi at idle when engine is cold. Recheck for oil, fuel or water leaks and listen for any abnormal noises.

A convenient maintenance service chart is included in this manual which indicates a recommended schedule for performing various service maintenance operations.

VELVET DRIVE TRANSMISSION

1-1. Every Velvet Drive® marine transmission is self-contained, having its own sump and hydraulic pump separate from the engine. The gear driven pump affords assurance of positive lubrication.

1-2. The Velvet Drive® In-Line hydraulic transmission is available in three (3) models with numerous final drive ratios suitable for inboard pleasure and work boats.

1-3. The Velvet Drive® CR2 was designed specifically for twin screw applications. The counter rotating (CR) capability eliminates the need for opposite rotating engines.

1-4. The two (2) models of the V-Drive transmissions deliver the same horsepower ratings as the CR2. Gear or chain driven final drive will accommodate twin screw applications using same rotating engines.

1-5. The identification tag that appears on all Velvet Drive® transmissions is located on the top of the left-hand transmission mount and contains valuable information concerning the trans-

mission. This information is as follows:

- Model Number** — This appears below the words "Velvet Drive."
- Ratio** — The gear ratio appears in the left-center of the identification tag.
- Serial Number** — Appears at the right-center under the model number.

1-6. Transfer the information on your identification tag to the Warranty Registration on page 1 of this manual. Additionally, the color of the identification tag should be noted in the appropriate space and the date placed in operation.

1-7. The model number and serial number is required on all correspondence.

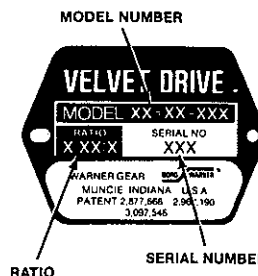
Table 1-1. General Specifications

Model	Ratios*	Fluid Capacity** Qts./Liters	Dry Weight Lbs./Kgs.
10-04	1.21:1 thru 2.50:1	4/3.8	190/86.2
10-05	1.21:1 thru 2.50:1	4/3.8	203/92.1
10-06	1:1	2/1.9	135/61.2
10-08	1.5:1 thru 3:1	3/2.8	185/83.9
10-13	1.58:1 thru 2.93:1	4/3.8	162/73.5
10-14	2.47:1 thru 2.93:1	4/3.8	175/79.4
10-17	1:1	2/1.9	95/43.1
10-17	1.52:1 thru 2.91:1	3/2.8	145/65.8
10-18	1:1	2/1.9	109/49.4
10-18	1.52:1 thru 2.91:1	3/2.8	154/69.9

* Gear ratios vary depending on model number.

** Fluid capacity is approximate and depends on installation angle and cooling system.

GENERAL INFORMATION



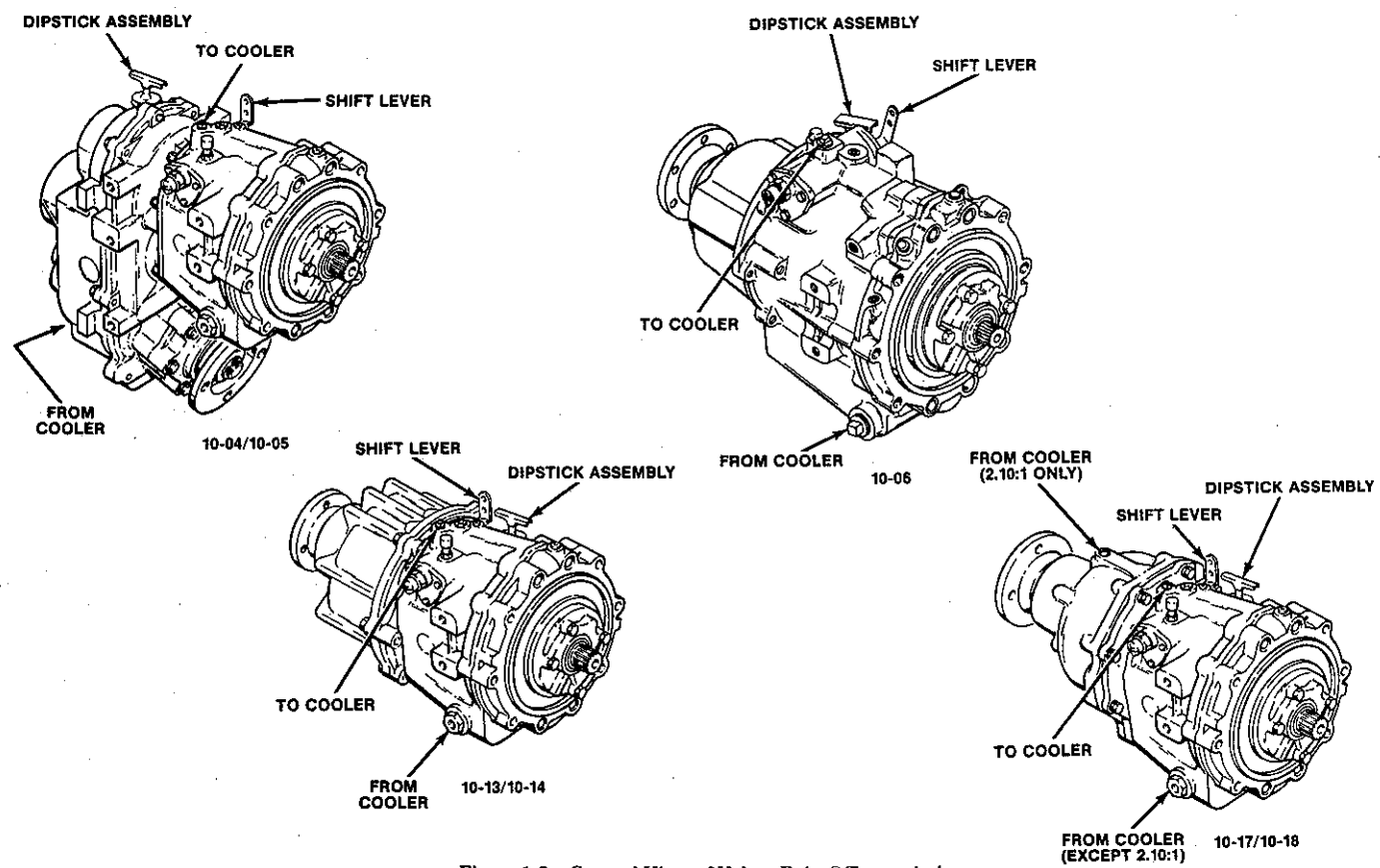


Figure 1-2. General View of Velvet Drive® Transmissions

LAUNCH MAINTENANCE

2-1. The following maintenance should be performed after launching your boat to ensure optimum performance and life from your Velvet Drive® transmission.

CAUTION

Vibration, gear noise, loss of rpm and premature oil seal and bearing failure can be caused by misalignment of propeller shaft coupling and transmission output coupling flange.

2-2. Propeller shaft coupling flange and transmission output flange alignment is performed after launching of your boat as well as any time your boat strikes a heavy object or after your boat has been hoisted or pulled from the water.

CAUTION

Remove attaching hardware from transmission output flange and propeller shaft coupling flange before removing boat from water and separate flanges.

2-3. Check the alignment of the transmission out-put flange and propeller shaft coupling flange using the following procedure with boat in water:

- Disconnect the battery.
- Remove attaching hardware from coupling flanges.
- Check clearance around coupling with .003 feeler gage and flange pilot engaged.
- Rotate coupling flanges together one complete revolution, stopping every 90° to check clearance with .003 feeler gage.
- Alignment is satisfactory when the transmission output flange and propeller shaft coupling flange with pilot seated are within .003 inch (.076mm) of parallel.

- If alignment is unsatisfactory, an adjustment is required (see paragraph 2-4).
 - When alignment is satisfactory, tighten attaching hardware.
- 2-4. Propeller and Output Shaft Adjustment

CAUTION

Do not lift or pry against transmission output flange or coupling to move engine.

This adjustment is accomplished at the boat motor and transmission mounts **ONLY**. This procedure should be accomplished by a skilled marine mechanic.

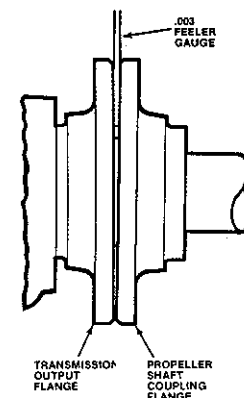


Figure 2-1. Coupling Shaft Alignment

2-5. Shift Lever Positioning

The selector control mechanism and linkage must position the shift lever on the transmission exactly in Forward (F), Neutral (N), and Reverse (R) shifting positions. A detent ball located behind the transmission shift lever must work freely to center the lever in each position. (see Figure 2-2). The selector control positions at the helm(s) must be coordinated with those of the Velvet Drive® shift lever through shift mechanism adjustments. An improperly adjusted shift mechanism can cause damage to the transmission.

NOTE: When moving from Neutral Position to:
Forward is always towards engine.
Reverse is always away from engine.

CAUTION

Clutch failure will occur if transmission shift lever does not fully engage detent ball positions.

The shifting mechanism and transmission shift lever should be free of dirt to ensure proper operation.

CAUTION

Do not remove detent ball.

2-6. Transmission Connections

- Visually check for oil leaks at hydraulic connections, worn

hydraulic lines.

- Check for broken or loose fasteners.
- Replace all worn hydraulic lines, tighten all connections where an oil leak has occurred, and secure all hydraulic lines.
- Visually check all electrical connections for loose terminals and worn wires.
- Repair or replace all worn or broken wires to U.S. Coast Guard specifications and tighten all loose connections.

2-7. Transmission Bolts

- Check all exterior transmission bolts for tightness.
- Tighten all loose bolts to recommended torque specifications.
- Tighten all coupling bolts.

2-8. Change Transmission Oil

A seasonal transmission oil change is recommended for all pleasure boats. Work boats require transmission oil changes every 1,000 hours. Oil must be changed anytime it becomes contaminated, changed anytime it becomes contaminated, changes color, or becomes rancid smelling.

WARNING

Do not use gasoline or any other volatile or highly combustible liquid as a solvent.

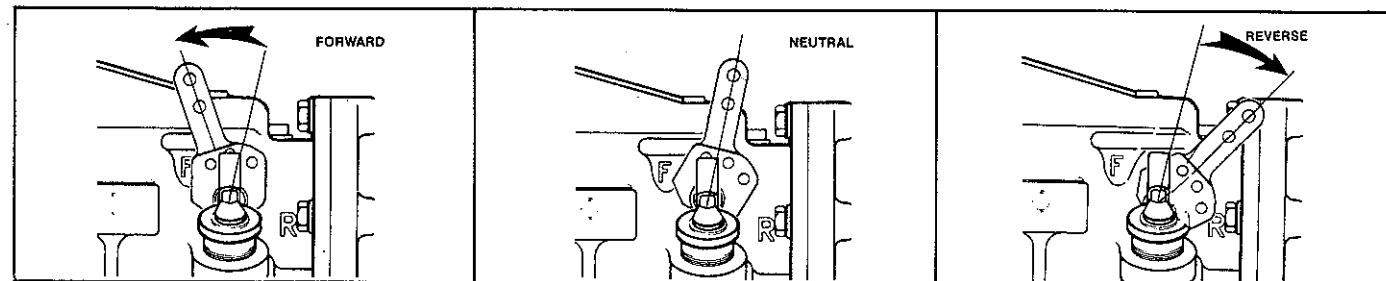


Figure 2-2.
Transmission Shift Lever Positions

2-9. Removing Transmission Oil (Oil Filler Cap)

- a. Place an appropriate size container near oil cooler return line.
- b. Remove oil filler cap and dipstick assembly (see Figure 2-3).
- c. Remove oil cooler return line.
- d. Allow oil from return line to drain into container.
- e. Connect oil cooler return line and torque to 25-35 ft.-lbs. (34-47 N•m).
- f. Use a suction pump in the oil filler cap hole to remove remaining oil in the transmission.

2-10. Fill Transmission With Oil

The quantity of oil depends upon the model Velvet Drive® (see Table 1-1 for capacity) angle of installation and oil cooling system capacity.

NOTE Oil capacities in Table 1-1 are for transmission only. Additional oil will be required for oil cooling system.

- a. Using suitable transmission oil (see Table 2-1), fill transmission through dipstick hole until oil reaches full mark on dipstick.

Table 2-1. Recommended Transmission Oil

Oil+	Conditions
Dexron® II, Type F	Recommended
Transmission Fluid*	Recommended
SAE #30*	Preferred**
SAE #40*	Acceptable**
	(High Temperature Only)
Multi-Viscosity Oil	Not Acceptable

* Detroit Diesel Allison Type C3 Specification

**Detroit Diesel Allison Type C3 Specification, Engine Speed Below 3,000 rpm.

+ SAE-API Service Class CD Recommended, Class CC Acceptable.

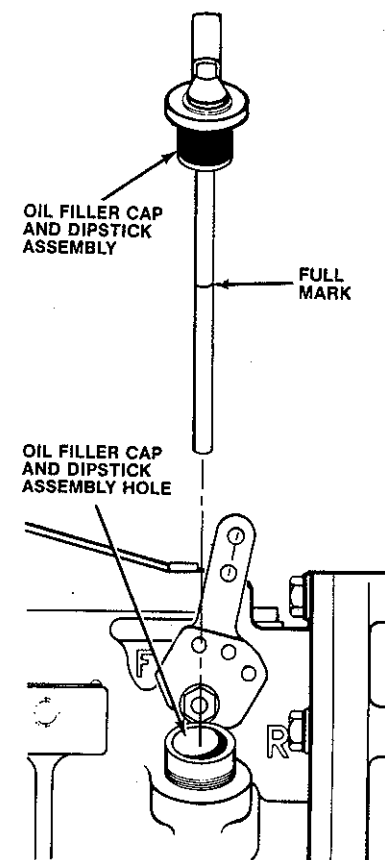


Figure 2-3. Dipstick Assembly

- b. Replace oil filler cap and dipstick assembly in hole. Press to bottom and turn clockwise until finger tight.

CAUTION

Before running engine replace oil filler cap and dipstick assembly. Hot oil through dipstick hole could cause burns.

- c. Connect battery and run engine to fill oil cooling system. With engine off promptly recheck oil dipstick and fill as required.
- 2-11. Transmission Housing
- a. Wipe transmission housing free of dirt and grease and visually check for wear points and stress cracks.
 - b. Make a note of these areas on the Maintenance Record.
 - c. Make necessary adjustments to allow clearance in these areas.
 - d. Using suitable paint, touch up these areas.
- 2-12. Preoperation maintenance is a precaution against a potentially costly major overhaul. The preoperation maintenance procedure needs to be completed on a daily basis before starting engine.
- a. Check transmission oil level on dipstick before operation. Add suitable oil as required (See Table 2-1).

- b. Check for oil leakage in the bell housing, output shaft and other gasket sealed areas.
- c. Visually check the general condition of the transmission and wipe clean.

- 2-13. During operation, be aware of any unusual noises or vibrations and investigate to determine the cause.

CAUTION

System related noises or vibrations can occur at low engine speeds which can cause gear rattle resulting in damage to the boat engine and/or transmission. Warner Gear is not responsible for total system related torsional vibration of this type.

- 2-14. Oil temperature maximum is 190°F (105°C) during operation. A transmission warning light (optional) will illuminate if oil temperature is too high. Should this occur, check transmission oil level or consult your nearest Velvet Drive® distributor.

CAUTION

If drainback occurs, oil level must be compensated. To correct this, see your authorized Velvet Drive® transmission service facility.

- 2-15. Service manuals can be obtained by contacting the nearest Velvet Drive® distributor.

OPERATION

- 3-1. Perform all preoperation maintenance on the Velvet Drive® transmission (see paragraph 2-12).
- 3-2. At the helm place transmission selector control in Neutral before starting engine. Shifts from any selector position to any

other selector position may be made at any time below 1000 rpm and in any order. Shifts should be made at the lowest practical engine speed.

CAUTION

Shifting above 1000 rpm can severely damage boat, transmission and engine.

- a. **Neutral** — Move selector lever to the middle position. You should feel the detent center the shift lever on the transmission through the linkage to the selector lever. With the control in this position, hydraulic power is completely interrupted and the output shaft of the transmission does not turn.
- b. **Forward** — Move selector lever to the forward position. You should feel the detent. The shift lever on the transmission is in the forward position. The output shaft and the propeller should move the boat in a forward direction.

WARNING

If boat moves backwards with the selector control in the forward position, shut off engine (see paragraph 2-5) or consult your nearest Velvet Drive® distributor.

NOTE: This problem can be a result of improper installation by the boat builder or service facility.

CAUTION

Early gear failure will occur when the transmission is operated in reverse to obtain forward propulsion.

- c. **Reverse** — Move selector lever to the rearward position. You should feel the detent. The shift lever on the transmission is in the reverse position. The output shaft and the propeller should move the boat in a reverse direction.

3-3. Velvet Drive® Transmission Operation

- a. Place selector control in the Neutral position.
- b. Start engine and set throttle at idle speed and warm up transmission oil for a few minutes.
- c. Be aware of any unusual noises or vibrations and investigate to determine the cause.

CAUTION

Before checking oil, shut off engine. Hot oil could cause burns.

- d. Shut off engine and check transmission oil level and add oil, if required, to the full mark on the dipstick.
- e. Restart engine.

WINTER STORAGE

- 4-1. Storage requires special care. Before winter storage one must:
 - a. Disconnect battery.
 - b. Drain water from the transmission oil cooling system.
 - c. Wipe transmission free of dirt, grime and grease.
 - d. Touch up unpainted areas of the transmission using suitable paint.
 - e. Loosen attaching hardware from transmission output flange and propeller shaft coupling flange before removing boat from water and separate flanges.

TROUBLE SHOOTING

5-1. Velvet Drive® is a self-contained, precision built marine transmission. Should trouble occur, consult Table 5-1 for remedy.

Table 5-1. Velvet Drive® Troubleshooting

SYMPTOM	CAUSE	REMEDY
Oil in fly wheel housing.	Unknown.	Service facility.
Oil on transmission.	Loose bolts. Loose fittings. Loose dipstick. Loose drain plug. Unknown.	Tighten to specifications. Tighten, replace. Tighten, replace. Tighten, replace. Service facility.
Oil around retainer.	Retainer bolts loose. Unknown.	Tighten to specifications. Service facility.
Oil and water mixed.	Damaged oil cooler.	Service facility.
High oil temperature.	Oil level low. Oil level high. Dirty oil cooler. Low water level. Unknown.	Add oil. Drain oil to full mark on dipstick. Replace cooler. Fill cooling system. Service facility.
Shifts hard.	Selector control. Linkage. Detent ball. Unknown.	Service facility. Adjust, replace. Clean, lubricate. Service facility.
Slow engagement.	Selector control. Low oil level. Linkage. Detent ball. Unknown.	Service facility. Add oil. Adjust, replace. Clean, lubricate. Service facility.
Boat won't move.	Improper selector position. Low oil level. Propeller missing. Propeller shaft broken. Transmission malfunction. Engine malfunction. Charging pump reversed.	Adjust, replace. Add oil. Replace. Service facility. Service facility. Service facility. Service facility.

[illegible]

[illegible]

WARRANTY

Indmar Products Co., Inc., 5400 Old Millington Road, Millington, Tennessee 38053 ("Indmar") warrants marine propulsion engines sold by it (the "product"):

- a. For a period of twelve (12) months commencing from the date of purchase or the date of commencement of the product use, whichever sooner occurs, in the case of non-commercial use, and
- b. For a period of three (3) months commencing from the date of purchase or the date of commencement of the product use, whichever sooner occurs, in the case of commercial use.

This warranty is granted SOLELY upon the following terms:

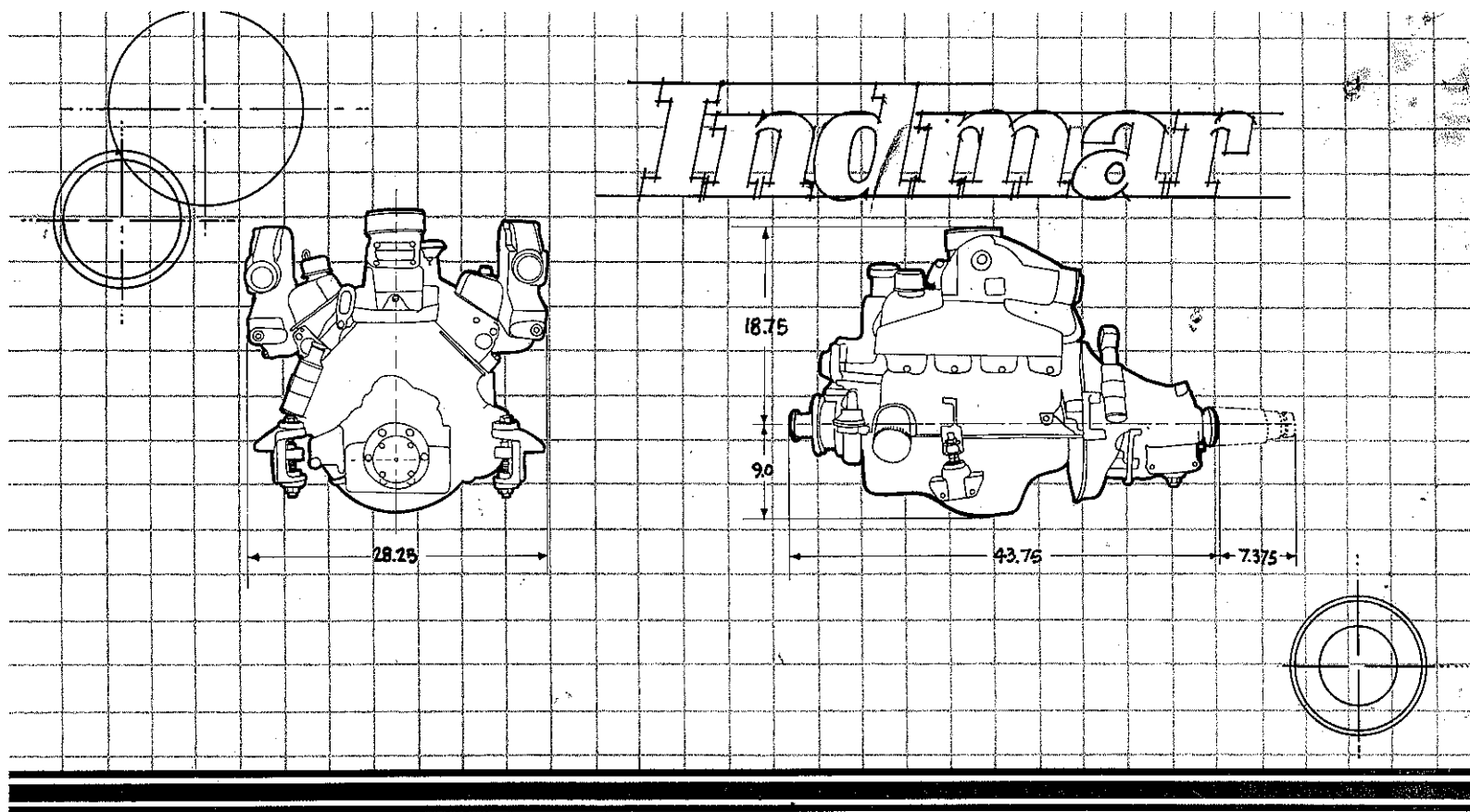
- a. **Persons Applicable.** This warranty is extended ONLY to the original retail purchaser. Warranties of any nature to any other person are hereby specifically excluded.
- b. **Implied Warranties.** ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR THE PARTICULAR PURPOSE ARE SPECIFICALLY LIMITED IN DURATION TO THE FOREGOING PERIODS OF THIS LIMITED WARRANTY. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.
- c. **Coverage.** The product is warranted to be free from defects in material and workmanship under normal use and service during the period of this Limited Warranty. If the product or defective part thereof is, upon examination, determined to be thus defective, Indmar shall repair or, at its option, provide a replacement of equivalent quality (new or rebuilt, at its option).
- d. **Procedure.** Within ten (10) days from the date of purchase by the original retail purchaser of the product, the Indmar Warranty Registration Card must be properly completed and mailed to Indmar. No warranty claims will be honored without prior receipt of the Indmar Warranty Registration Card. For warranty claims to be asserted hereunder, the product or defective part thereof, together with a written notice of itemized defects must be returned to the retailer from whom the product was purchased or to any other convenient Indmar dealer. To obtain the location of an authorized dealer or service center in your

area, write to Indmar requesting such information. In the event that the local Indmar dealer is unable to remedy a warranted defect in the product, the product or defective part thereof, together with a written notice of itemized defects, must be returned to Indmar at the above address with freight and insurance charges prepaid. All insurance and freight charges for return by Indmar of the product (or its substitute) to the original retail purchaser shall be paid by the original retail purchaser. Expenses for labor incurred by Indmar in the repair of any warranted product shall be paid by the original retail purchaser to the extent that such expenses for labor exceed the specified service rates of Indmar in effect at the date of receipt of the product by Indmar. A schedule of service rates of Indmar may be obtained from any authorized Indmar dealer.

- e. **Consequential Damages.** THIS WARRANTY SHALL NOT EXTEND TO CONSEQUENTIAL OR INCIDENTAL DAMAGES OR COSTS INCURRED BY THE ORIGINAL RETAIL PURCHASER. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.
- f. **Trade Accessories.** No warranty of any character is made with respect to trade accessories not manufactured by Indmar.
- g. **Voiding Warranty.** This warranty is specifically voided and shall NOT apply under the following conditions:
 - i. When the product or any part thereof is subjected to accident, alteration, abuse, misuse, neglect or improper maintenance.
 - ii. When the product is serviced by unauthorized persons.
 - iii. When damage to the product results from causes not arising out of defects in material or workmanship.

Indmar does not authorize any person, firm or corporation to alter this Limited Warranty or create any other obligation relating to the product. This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Indmar Products Co., Inc.
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Millington, Tennessee 38053



Indmar Products Co., Inc., • P.O. Box 27184 • Memphis, Tennessee 38127