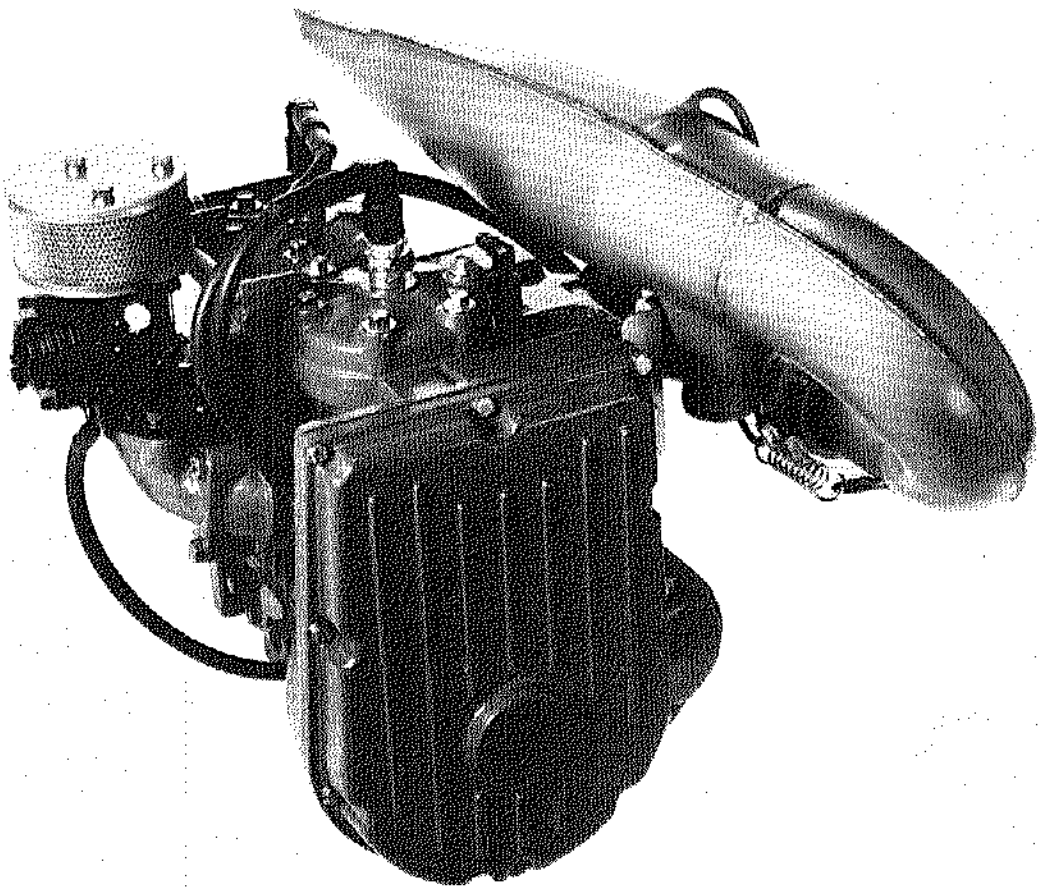
Cuyuna Engines



LIQUID COOLED MARINE
ENGINE

SERVICE MANUAL

ADDENDUM

CUYUNA ENGINES SERVICE MANUAL ADDENDUM

COVERING THE

CUYUNA LIQUID COOLED MARINE ENGINES

FORWARD

This Addendum to the Cuyuna Engines Service Manual covers the differences in servicing the Cuyuna Liquid Cooled Marine engines compared to servicing the Cuyuna Air Cooled engines.

Many components and most service operations of the the two lines of engines are the same or very similar.

As used in this Addendum:

> The numbers in the various paragraphs refer to the reference numbers of the exploded view of the Cuyuna Liquid Cooled Marine engine attached to this Addendum.

We believe it best to completely review this Addendum before starting work and then to refer to the referenced section(s) of the Cuyuna Engines Service Manual for further information. This way you will have in mind the differences between the components and servicing required for the two types of engines.

The Cuyuna Engines Service Manual also contains a great deal of general information on break-in procedures, fuel mixing, preparation for and removal from storage, general engine overhaul information, fuel systems, ignition and electrical systems and troubleshooting of the engine and related systems. This information should prove to be beneficial, especially to the first time or home mechanic.

CUYUNA MARINE
ENGINE SPECIFICATIONS

Model	25 H.P.	40-50 H.P.
Bore: in./mm	2.657/67.5	2.657/67.5
Stroke: in./mm	2.362/60	2.362/60
Displacement: cc	215	428 cc
Compression Ratio:	7.0:1	7.0:1 - 8.0:1
Base Mounting Holes:	7/16-14 UNC	
Cylinder:	Aluminum with Cast Iron Liner	
Upper Rod Bearing:	Needle	
Lower Rod Bearing:	Needle	
Connecting Rod Material:	Forged Steel	
Main Bearings:	Heavy Duty Ball Bearings	
Ignition System:	C.D.I.	
Lighting System:	12 VDC - 120 WATT	
Spark Plug Type:	N.G.K. BR8ES or Champion RN-3C	
Rotation:	Counterclockwise Viewed From P.T.O. End	
Fuel-Oil Mixture:	40:1	
Fuel Requirement	Good Brand of Regular or Premium Leaded or Unleaded Gasoline and Cuyuna Oil or Good Brand of -TC-W 2 Cycle Oil	
Starter:	Electrict Start	
Approximate Weight: lbs.	42 lbs.	65 lbs.

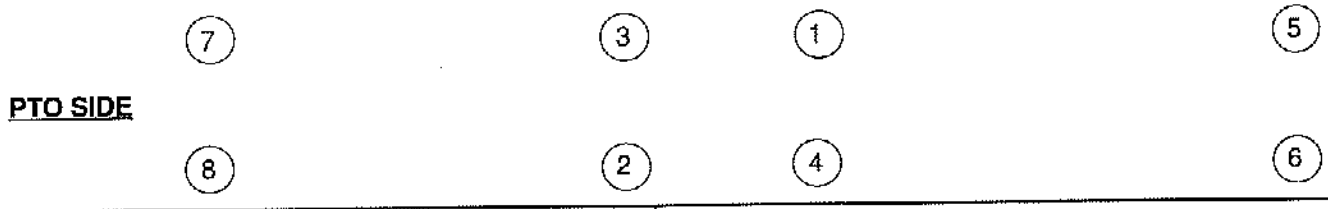
CUYUNA MARINE
ENGINE SPECIFICATIONS

ENGINE		
Engine Model	25 H.P.	40 & 50 H.P.
Displacement	214.7 cc (13.1 Cu. In.)	429.4 cc (26.2 Cu. In.)
Bore x Stroke	67.5 x 60 mm (2.657 x 2.362 In.)	67.5 x 60 mm (2.657 x 2.362 In.)
Piston-Ring End Gap Range	.18 - .43 mm (.007 - .031 In.)	.18 - .43 mm (.007 - .031 In.)
Piston Skirt/Cylinder Clearance Range	.13 - .25 mm (.005 - .010 In.)	.13 - .25 mm (.005 - .010 In.)
Piston-Pin Diameter Range	15.996 - 16.000 mm (.6298 - .6299 In.)	15.996 - 16.000 mm (.6298 - .6299 In.)
Piston-Pin Bore Diameter Range	16.004 - 16.030 mm (.6301 - .6311 In.)	16.004 - 16.030 mm (.6301 - .6311 In.)
Connecting-Rod Small End Diameter Range	22.000 - 22.013 mm (.8661 - .8667 In.)	22.000 - 22.013 mm .8661 - .8667 In.)
Crankshaft End Play Range	.51 - .90 mm (.020 - .035 In.)	.51 - .90 mm (.020 - .035 In.)
Crankshaft Runout (max.) (Total Indicator Reading)	.08 mm (.003 In.)	.08 mm (.003 In.)
Max Out Of Round and Taper Not to exceed	.10 mm (.004 In.)	.10 mm (.004 In.)
Ignition Timing @ 6000 RPM	18° 1.8 - 2.0 mm (.070 - .078 In.)	18° 1.8 - 2.0 mm (.070 - .078 In.)
Spark Plug Gap	0.9 - 1.0 mm (.035 - .040 In.)	0.9 - 1.0 mm (.035 - .040 In.)

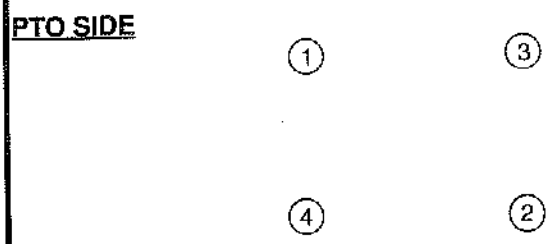
CUYUNA MARINE ENGINE
TORQUE SPECIFICATIONS

FASTENER	TORQUE SPECIFICATIONS
Cylinder Head Bolts:	16-18 Ft.-Lbs.
Cylinder Base Nuts:	16-18 Ft.-Lbs.
Intake Manifold Bolts:	16-18 Ft-Lbs.
Exhaust Manifold Bolts:	32-36 Ft.-Lbs.
Spark Plugs:	20-22 Ft.-Lbs.
Ignition Housing Screws:	16-18 Ft.-Lbs.
Water Manifold Bolts:	6-8 Ft.-Lbs.
Ignition Cover Bolts:	6-8 Ft.-Lbs.
Impulse Fittings & Plugs:	50-60 In.-Lbs.
Flywheel Nut:	46-50 Ft.-Lbs.
All 6 mm Screws:	6-8 Ft.-Lbs.
All 5 mm Screws:	40-50 In.-Lbs.

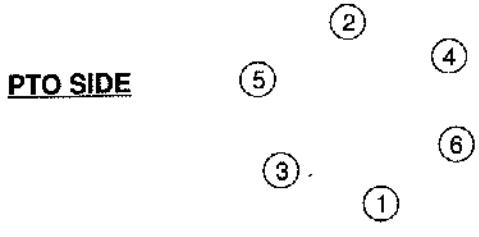
Tightening Sequence for Cylinder Base Nuts
40 & 50 H.P.



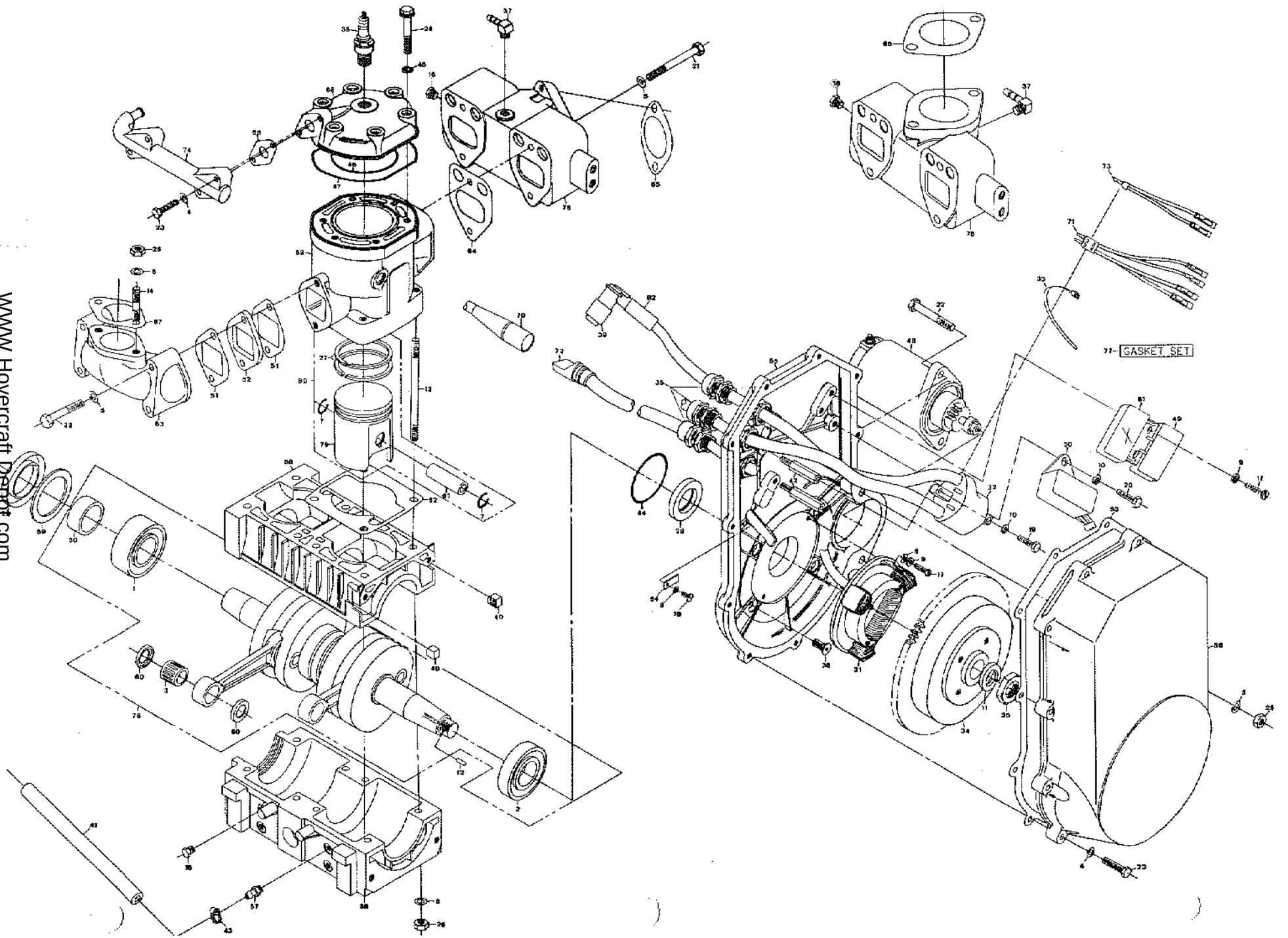
Tightening Sequence for
Cylinder Base Nuts
25 H.P.



Tightening Sequence for
Cylinder Head Bolts



Cuyuna Liquid Cooled



The following instructions will be referring to the Cuyuna Engines Service Manual from time to time to cover various service procedures.

Prior to disassembly refer to the note in the upper left hand corner of page 8 of the Cuyuna Engines Service Manual. Pay special attention to any NOTES, CAUTIONS, or WARNINGS that appear in the referenced sections.

ENGINE DISASSEMBLY

STARTER MOTOR REMOVAL:

Remove the bolts (22), nuts (26), and washers (5) securing the starter motor (48) to the ignition housing (55) and the ignition cover (56) and remove the starter.

> CAUTION: Do not hammer on the starter motor as internal damage to the starter motor may occur.

IGNITION HOUSING COVER REMOVAL:

Remove the bolts (23) and washers (4) securing the ignition cover (56) and gasket (53) to the ignition housing (55). A few light taps with a plastic hammer may be necessary to separate the ignition cover and gasket from the ignition housing.

FLYWHEEL REMOVAL:

Using paragraphs 3-1 to 5-1 and 1-2 to 4-2 of the Cuyuna Engines Service Manual as a guide, remove the nut (25), washer (11) and flywheel (34).

IGNITION HOUSING REMOVAL:

The removal of the ignition housing (55) and all the associated electrical components is similar to the removal of the fan housing and stator plate referred to in paragraphs 1-3 to 5-3 of the Cuyuna Engines Service Manual. Remove the bolts (36) securing the ignition housing (55) to the crankcase (58) and remove the housing.

CRANKSHAFT END SEAL REMOVAL:

Using paragraph 1-5 of the Cuyuna Engines Service Manual as a guide, remove the seal (28) from the ignition housing (55).

INTAKE MANIFOLD REMOVAL:

Using paragraphs 1-6 to 3-6 of the Cuyuna Engines Service Manual as a guide, remove the bolts (22) and washers (5) securing the intake manifold (63), gaskets (51) and insulator blocks (52) to the cylinders (69). A few light taps with a plastic hammer may be necessary to separate the intake manifold, gaskets and insulator blocks from the cylinders.

EXHAUST MANIFOLD REMOVAL:

Remove the bolts (21) and washers (5) securing the exhaust manifold (75 or 76) and gaskets (64) to the cylinders (69). A few light taps with a plastic hammer may be necessary to separate the exhaust manifold and gaskets from the cylinders.

WATER MANIFOLD REMOVAL:

Remove the bolts (23) and washers (4) securing the water manifold (74) and gaskets (66) to the cylinder heads (68). A few light taps with a plastic hammer may be necessary to separate the water manifold and gaskets from the cylinders.

CYLINDER HEAD REMOVAL:

Using paragraph 1-7 of the Cuyuna Engines Service Manual as a guide, remove the bolts (24) and O-rings (45) securing the cylinder heads (68) and O-rings (46 and 47) to the cylinders (69). Remove the cylinder heads and discard the O-rings from the top of the cylinders.

CYLINDER REMOVAL:

Using paragraphs 1-8 to 3-8 of the Cuyuna Engines Service Manual as a guide, remove the nuts (26) and washers (5) that secure the cylinders (69) and gaskets (62) to the crankcase (58). A few light taps with a plastic hammer may be required to separate the cylinders and gaskets from the crankcase.

PISTON PIN REMOVAL:

Using paragraphs 1-9 to 4-9 of the Cuyuna Engines Service Manual as a guide, remove the circlips (7) and piston pins (61) from the pistons (79). Remove the check plates (60) and the piston pin bearings (3) from the connecting rods.

CRANKCASE DISASSEMBLY:

Using paragraphs 1-10 to 2-10 of the Cuyuna Engines Service Manual as a guide, separate the crankcase (58) and remove the crankshaft (78).

CRANKSHAFT BEARING REMOVAL AND REPLACEMENT:

Using paragraph 1-11 to 4-12 of the Cuyuna Engines Service Manual as a guide, remove and/or replace the sleeve (50), PTO bearing (1) and the MAG bearing (2) on the crankshaft (78).

CLEANING, INSPECTION AND MEASURING OF THE ENGINE COMPONENTS:

Using paragraphs 1-13 to 4-23 of the Cuyuna Engines Service Manual as a guide, perform any necessary cleaning, inspection and measuring of the engine components.

Prior to assembly refer to the note in the lower left hand corner of page 20 of the Cuyuna Engines Service Manual. Pay special attention to any NOTES, CAUTIONS, or WARNINGS that appear in the referenced sections.

ENGINE ASSEMBLY

CRANKCASE, PISTON, CYLINDER AND INTAKE MANIFOLD ASSEMBLY:

Using paragraphs 1-24 to 16-24 of the Cuyuna Engines Service Manual as a guide, install the crankshaft (78) into the crankcase (58). Next install the piston rings (27) onto the pistons (79), the pistons onto the connecting rods using piston pin bearings (3), check plates (60), piston pins (61) and circlips (7). The cylinders (69) and new gaskets (62) are then installed finger tight using the washers (5) and nuts (26). The intake manifold (63) with new gaskets (51) and insulator blocks (52) are installed next by torquing the bolts (22) and washers (5) to 16-18 Ft.-lbs. in a crisscross pattern. Complete this stage of the assembly by torquing the crankcase nuts in three even steps to 16-18 Ft.-lbs. in the torque pattern shown on page 4 of this Addendum.

CYLINDER HEAD AND WATER MANIFOLD ASSEMBLY:

Install the water manifold (74) and new gaskets (66) to the cylinder heads (68) by finger tightening the bolts (23) and washers (4). Be sure the O-ring grooves in the top of the cylinders (69) are cleaned of any foreign material and install new O-rings (46 and 47). Install the cylinder heads to the cylinders (69) using the bolts (24) and O-rings (45). A light coat of grease on the bolt O-rings will keep the O-rings from distorting while the bolts are being torqued in three even step to 16-18 Ft.-lbs. following the torque pattern shown on page 4 of this Addendum. Complete this stage of the assembly by torquing the water manifold bolts to 6-8 Ft.-lbs. in a crisscross pattern.

IGNITION HOUSING ASSEMBLY:

Using paragraphs 8-25, 10-25 to 12-25 of the Cuyuna Engines Service Manual as a guide, press a new seal (28) into the ignition housing (55). Install the stator (31) to the ignition housing using the screws (17) and washers (6 and/or 9). Install a new O-ring (44) onto the ignition housing. A light coat of RTV silicone sealant should be applied to any of the housing surfaces that could allow water to leak into the housing during use. Install the housing to the crankcase torquing the screws (36) and washers (4) to 16-18 Ft.-lbs. in a crisscross pattern.

If the stator (31) has been removed install it now using paragraph 10-25 of the Cuyuna Engines Service Manual as a guide being careful to align the timing marks properly and not to pinch any wires. The timing marks have proven to be very accurate but to insure precise ignition timing (or if you suspect an ignition problem) you may chose to follow the Ignition Timing Procedure on page 12 of this Addendum.

FLYWHEEL ASSEMBLY:

Using paragraph 14-25 of the Cuyuna Engines Service Manual as a guide, install the flywheel (34), flywheel key (12), washer (11) and nut (25). Torque the nut to 46-50 Ft.-lbs.

IGNITION HOUSING COVER ASSEMBLY:

Install the ignition housing cover (56) using a new gasket (53) by inserting the bolts (23) and washers (4) and torquing to 6-8 Ft.-lbs.

STARTER MOTOR ASSEMBLY:

Apply a sufficient amount of RTV silicone sealant to the starter motor (48) flange to prevent any water leaks during use. Slide the motor into place in the ignition housing (55) and install bolts (22), washers (5) and nuts (26) and torque to 16-18 Ft.-lbs.

EXHAUST MANIFOLD ASSEMBLY:

Install the exhaust manifold (75 or 76) using new gaskets (64) by inserting the bolts (21) and washers (5) and torquing to 32-36 Ft.-lbs.

GENERAL ELECTRICAL INFORMATION:

Since the introduction of the Cuyuna Liquid Cooled Marine Engines there have been two types of capacitor discharge ignition systems used, but there have been various configurations of other electrical components such as voltage regulator/rectifiers, and rev limiters installed. The wiring diagrams on page 11 of this Addendum cover the most common variations. In order to gain some understanding of electrical systems in general, it is suggested that you read pages 61 through 64 of the Cuyuna Engines Service Manual.

ELECTRICAL SYSTEM TESTING:

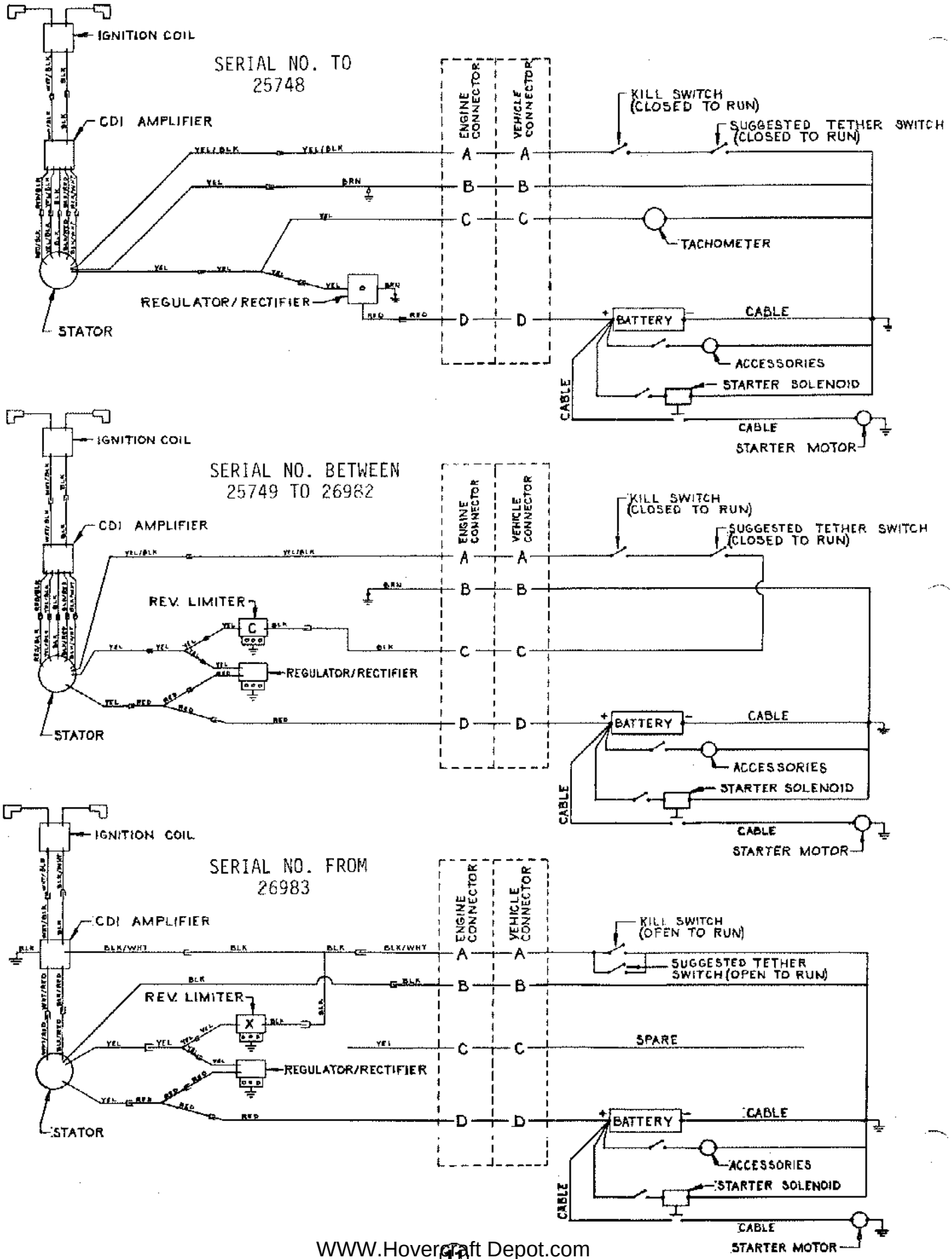
The following information is provided for the mechanic that is familiar with the instruments and techniques required for electrical component testing. It is suggested that before any electrical system tests are performed, the engine electrical system be isolated from the product electrical system in order to establish which of these two systems is causing the electrical problem.

Some of the electrical components such as the CDI amplifier, rev limiter and voltage regulator/rectifier cannot be conveniently checked and therefore should be replaced with a known good unit if the other electrical components test good and a problem persists. If you are in doubt as to how to perform electrical component tests properly, solicit the aid of an experienced two cycle engine mechanic.

ELECTRICAL SYSTEM TEST SPECIFICATIONS

	DESCRIPTION	RESISTANCE TEST	TEST CONNECTIONS
SERIAL NO. TO 26982	Ignition Coil-Primary	.30 ohms ± 15%	Blue/White & Black
	Ignition Coil-Secondary	3900 ohms ± 20%	Plug lead & Plug lead
	Charge Coil	180 ohms ± 10%	Red/Black & Black/Red
	Trigger Coil	2.2 ohms ± 10%	Black/White & Black/Red
	Lighting Coil	.18 ohms ± 10%	Yellow & Yellow
	Spark Plug Cap	4750 ohms ± 10%	Across Plug Cap
SERIAL NO. FROM 26983	Ignition Coil-Primary	.30 ohms ± 15%	White/Blue & Black/White
	Ignition Coil-Secondary	6100 ohms ± 20%	Plug lead & Plug lead
	Charge/Trigger Coil	160 ohms ± 10%	Black/Red & Red/White
	Lighting Coil	.25 ohms ± 10%	Yellow & Yellow
	Spark Plug Cap	4750 ohms ± 10%	Across Plug Cap

TYPICAL WIRING DIAGRAMS



IGNITION TIMING PROCEDURE:

Using paragraphs 1-62 to 6-62 of the Cuyuna Engines Service Manual as a guide place timing marks on the flywheel and ignition housing that reflect a piston position of .073" (18 degrees) before top dead center. At 6000 RPM the timing marks should align when viewed using a good quality timing light.

GENERAL CARBURETOR INFORMATION:

The MIKUNI BN-38-34-41C carburetor is mechanically simple, but it cannot function properly if dirt particles are blocking any passages, if any diaphragms are damaged, if there are any air or fuel leaks or if it is improperly adjusted. Proper maintenance will ensure peak carburetor performance.

CARBURETOR DISASSEMBLY:

Completely disassemble the carburetor (refer to the exploded diagram of the carburetor on page 14 of this Addendum) for cleaning and inspect for any damage, making sure all old gasket material is removed and that all the fuel and air passages are clear of any obstructions. If any components are found defective or questionable they should be replaced.

CARBURETOR ASSEMBLY:

It is suggested that during reassembly (refer to the exploded diagram of the carburetor on page 14 of this Addendum) of the carburetor, that a complete carburetor overhaul kit be installed. During reassembly, place the control arm spring in it's hole and install the control arm with the rounded projection seating down into the top of the spring. When installed correctly, the long side of the arm must be level with the base of the chamber. If it is not, remove the arm and bend it carefully as required. This is a critical adjustment and must be performed accurately or the operation of the carburetor will be impaired.

Reinstall the carburetor on the engine and connect the control cables per the product manufacturer's instructions. Make sure that the flame arrestor is properly attached and that the fasteners are secured with a thread locking adhesive (Locktite). This is very important in order to prevent engine damage due to the ingestion of foreign objects.

CARBURETOR ADJUSTMENT:

After reinstallation of the carburetor on the engine, the low and high speed mixture screws and the idle speed screw must be adjusted. The recommended starting settings for these screw are as follows:

Low Speed (front, lower) 7/8 turns open from lightly seated.
High Speed (rear, upper) 1 turn open from lightly seated.
Idle Speed (throttle arm) set for an idle speed of approximately 1500 to 1800 RPM.

The proper settings for these adjustments are critical to the performance of the engine. If you are in doubt as to how to adjust the carburetor properly, solicit the aid of an experienced two cycle engine mechanic.

CARBURETOR