Service Manual Outline

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Notice

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

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

⚠ DANGER

DANGER - Immediate hazards which WILL result in severe personal injury or death.

⚠ WARNING

WARNING - Hazards or unsafe practices which COULD result in severe personal injury or death.

⚠ CAUTION

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

Notice to Users of This Manual

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

It is assumed that these personnel are familiar with the servicing procedures of these products, or like or similar products manufactured and marketed by Mercury Marine, that they have been trained in the recommended servicing procedures of these products which includes the use of mechanics' common hand tools and the special Mercury Marine or recommended tools from other suppliers.

We could not possibly know of and advise the service trade of all conceivable procedures by which a service might be performed and of the possible hazards and/or results of each method. We have not undertaken any such wide evaluation. Therefore, anyone who uses a service procedure and/or tool, which is not recommended by the manufacturer, first must completely satisfy himself that neither his nor the products safety will be endangered by the service procedure selected.

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

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

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

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

Cleanliness and Care of Outboard Motor

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

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

Personnel should not work on or under an outboard which is suspended. Outboards should be attached to work stands, or lowered to ground as soon as possible.

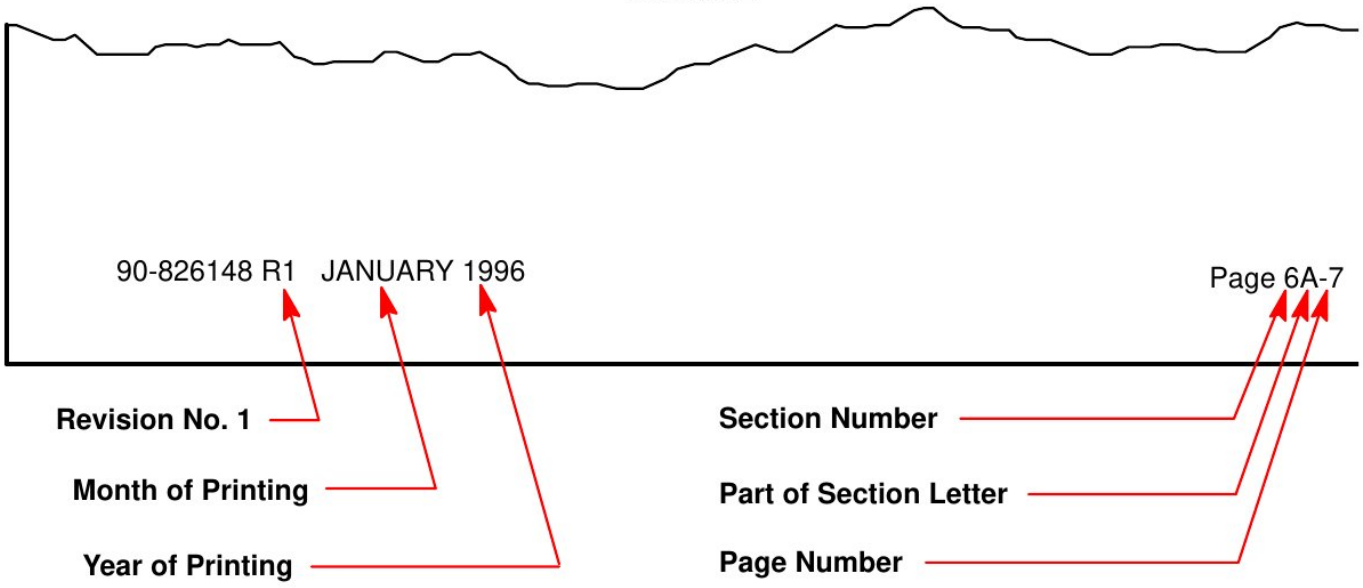
We reserve the right to make changes to this manual without prior notification.

Refer to dealer service bulletins for other pertinent information concerning the products described in this manual.

Page Numbering

Two number groups appear at the bottom of each page. The example below is self-explanatory.

EXAMPLE:



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IMPORTANT INFORMATION

Section 1A - Specifications

1 A

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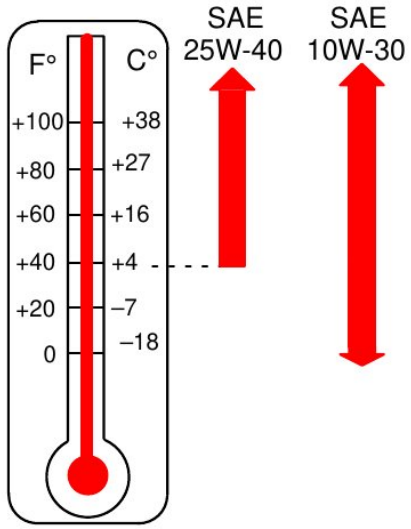
Specifications

Models 9.9/15 (4-Stroke)		
HORSEPOWER (kW)	**9.9** **15**	7.4 kW (9.9 hp) 11.2 kW (15 hp)
OUTBOARD WEIGHT	**9.9/15 ML** **9.9/15 EL** **9.9/15 EL Bigfoot**	50.8 kg (112 lb) 2.6 kg (116 lb) 58.0 kg (128 lb)
FUEL	**RECOMMENDED GASOLINE**	Automotive Unleaded with a Minimum Pump Posted Octane Rating of 87
FUEL SYSTEM	**Fuel Pump Type** **Fuel Pump:** **Pressure** **Plunger Stroke** **Fuel Tank Capacity**	External (Plunger/Diaphragm) 21-41 kPa (3-6 psi) 3.52 - 6.58 mm (0.14 - 0.27 in.) 12 L (3.2 US Gal.)
OIL	**OIL FILTER** **OIL FILTER WRENCH** **OIL PAN CAPACITY** **ENGINE OIL** 	p/n 35-822626A1 p/n 91-802653 Either 1 Quart or 1 Liter SAE 10W-30 viscosity oil is recommended for use in all temperatures. SAE 25W-40 viscosity oil may be used at temperatures above 4° C (40° F). Use 4-Cycle Marine Oil with the proper viscosity for the expected temperature in your area (see range thermometer on left). If not available, use a premium quality 4-cycle engine oil, certified to meet or exceed anyone of the following American Petroleum Institute (API) service classifications SH, SG, SF, CF-4, CE, CD, CDII.

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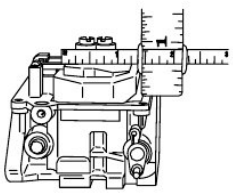
IGNITION SYSTEM Readings taken @ 20°C (68°F).	**Type**	Capacitor Discharge Ignition
	Spark Plug	
	Type	NGK DPR6EA-9
	Gap	1.0 mm (0.035 in.)
	Hex	18 mm
	Firing Order	1-2
	Ignition Timing:	
	Below 800 rpm	5° B.T.D.C.
	@ 2800-3300 rpm	30° B.T.D.C.
	Charge Coil Resistance	270 - 410 Ω (Bown - Blue)
	Crank Position Sensor Resistance	230 - 350 Ω (Green/White - Black)
	Ignition Coil Resistance:	
	Primary	0.16 - 0.24 Ω
	Secondary (W/o Boots)	3.9 - 5.9 k Ω
	ECM Engine Speed Limiter	
	Spark Cut-Out Reduction (Percentages of ignition spark are Cut-Out)	5850 rpm
	ECM Low Oil Pressure Speed Control	Approximately 2000 rpm
	Oil Pressure Switch	Below 17 kPa (2.5 psi) Continuity
CHARGING SYSTEM Readings taken @ 20°C (68°F).	**Alternator Type**	Single Phase (6 Pole)
	6 AMP Manual (Standard) Alternator:	
	Output	12 Volts-6 Amps. (Rectified)
	Battery Charging Resistance	0.48 - 0.72 Ohms (Green-Green)
	10 AMP Electric (Standard) Alternator:	
	Output	12V-10 Amps. (Rectified/Regulated)
	Battery Charging Coil Resistance	0.24 - 0.36 Ohms (Green-Green)
	Quicksilver Tachometer Setting	"6C" or "2"
STARTING SYSTEM	**Manual Start**	Recoil Starter
	Electric Start:	
	Starter Type	Bendix
	Output	0.8 kW
	Ampere Draw Under:	
	(Load)	106.0 Amps
	(No Load)	21.1 Amps
BATTERY	**Battery Rating**	
	Minimum Requirement	465 Marine Cranking Amps (MCA) or 350 Cold Cranking Amps (CCA)
	For operation below 0° C (32° F)	1000 Marine Cranking Amps (MCA) or 775 Cold Cranking Amps (CCA)
CARBURETOR	**Idle rpm (Out Of Gear)**	950 ± 50 rpm
	Idle rpm (In Forward Gear)	850 ± 50 rpm
	Wide Open Throttle rpm (WOT)	
	Standard Model Range	4500-5500
	Bodensee Model Range	5200-5700
	Standard Model	
	Main Jet Size	
	9.9 hp	#68
	15 hp	#104
	Pilot Jet	#45
	Bodensee Model	
	Main Jet Size	
	9.9 hp	#68
	15 hp	#103
	Pilot Jet	#45
	Float Height	15.5 ± 1.0 mm (0.61 ± 0.04 in.)



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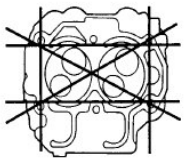
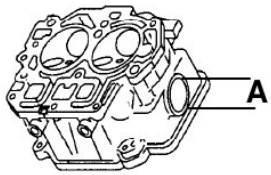
CYLINDER BLOCK	**Type** **Displacement** **Number of Cylinders**	4 Stroke Cycle – Over Head Camshaft 323 cc (19.7 cu. in.) 2
STROKE	**Length**	59 mm (2.323 in.)
CYLINDER BORE	**Diameter** **Standard** **Oversize-0.25 mm (0.010 in.)** **Oversize-0.50 mm (0.020 in.)** **Taper/Out of Round Maximum** **Bore Type**	 59.00-59.02 mm (2.3228-2.3236 in.) 59.25-59.27 mm (2.3327-2.3335 in.) 59.50-59.52 mm (2.3425-2.3433 in.) 0.08 mm (0.003 in.) Cast Iron
PISTON	**Piston Type** **O.D. at Skirt** **Standard** **Oversize-0.25mm (0.010 in.)** **Oversize-0.50mm (0.020 in.)**	Aluminum 58.950 - 58.965 mm (2.3209 - 2.3214 in.) 59.200 - 59.215 mm (2.3307 - 2.3313 in.) 59.450 - 59.465 mm (2.3406 - 2.3411 in.)
PISTON CLEARANCE	**Piston to Cylinder Clearance**	0.035 - 0.065 mm (0.0014 - 0.0026 in.)
RINGS	**Ring End Gap (Installed)** **Top** **Middle** **Bottom (Oil Ring)** **Side Clearance:** **Top** **Middle**	 0.15 - 0.30 mm (0.006 - 0.012 in.) 0.30 - 0.50 mm (0.012 - 0.020 in.) 0.20 - 0.70 mm (0.008 - 0.028 in.) 0.04 - 0.08 mm (0.0016 - 0.0032 in.) 0.03 - 0.07 mm (0.0012 - 0.0028 in.)
COMPRESSION RATIO	**Compression Ratio** **Cylinder Compression (cold engine @ W.O.T.)** **Manual Models With Compression Release, S/N OT178500 and Above**	9.3:1 185 - 190 psi (Peak) 40 lbs. - 60 lbs.
PISTON PIN	**Piston Pin Diameter**	13.996 - 14.000 mm (0.5510 - 0.5512 in.)
CONNECTING ROD	**Oil Clearance (Big End)** **Small End Inside Diameter**	0.021 - 0.045 mm (0.0008 - 0.0018 in.) 14.015 - 14.029 mm (0.5518 - 0.5523 in.)
CRANKSHAFT	**Main Bearing Clearance** **Crankshaft Run-out**	0.011 - 0.039 mm (0.0004 - 0.0015 in.) 0.02 mm (0.0008 in.)
TIMING BELT	**Deflection**	10 mm (0.39 in.)
CYLINDER HEAD	**Warp Limit**  ***Line s indicate straight edge measurement** **Camshaft Bore Diameter** 	0.1 mm (0.004 in.) A = 18.000 - 18.018 mm (0.7087 - 0.7094 in.)

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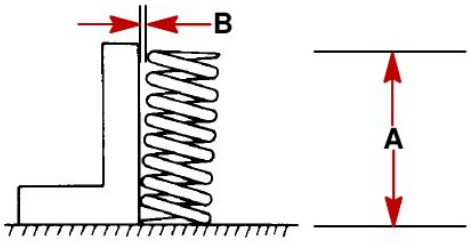
VALVE SPRING	**Free Length A** **Tilt Limit B**  **Compressed Pressure (Installed)** **Intake** **Exhaust** **Dir. of Winding (Intake & Exhaust)**	A = 34.4 mm (1.354 in.) B = Less than 1.1 mm (0.043 in.) 10.5 - 11.5 kg (23.1 - 25.4 lb) 10.5 - 11.5 kg (23.1 - 25.4 lb) Right Hand
VALVE GUIDES	**Valve Guide Inside Diameter**	5.500 - 5.512 mm (0.2165 - 0.2170 in.)

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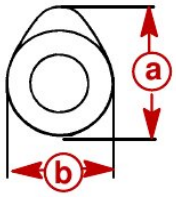
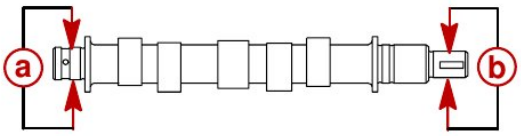
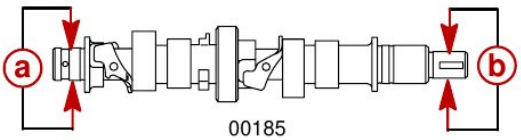
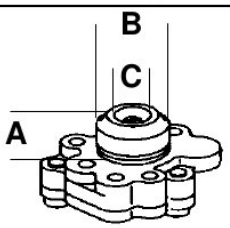
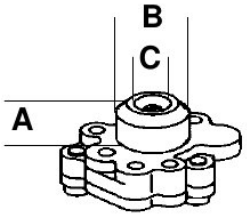
CAMSHAFT	**Camshaft Dimensions**	1999 Model Year and Newer (Manual/Electric)
	Intake & Exhaust "a"	23.90 - 24.00 mm (0.941 - 0.945 in.)
	Intake & Exhaust "b"	19.95 - 20.05 mm (0.785 - 0.789 in.)
		2001 Model Year and Newer (Manual only)
	Intake & Exhaust "a"	27.66 - 27.69 mm (1.089 - 1.090 in.)
	Intake & Exhaust "b"	23.96 - 24.02 mm (0.943 - 0.946 in.)
	Run-out Limit	0.03 mm (0.001 in.)
	Camshaft Bearing Diameter	
	Cylinder Head Upper "b"	15.97 -15.98 mm (0.628 - 0.629 in.)
	Oil Pump Housing Lower "a"	17.97 - 17.99 mm (0.707 - 0.708 in.)
		1999 Model Year and Newer (Manual/Electric)
	 00185	2001 Model Year and Newer (Manual Only)
Oil Pump	**1999 and Newer** 	1999 and Newer Manual/Electric A = 23.8 mm (0.937 in.) B = 32.0 mm (1.26 in) C = 16.000 - 16.0188 mm (0.6299 - 0.63066 in.)
	2001 and Newer 	2001 and Newer Manual only A = 21.39 mm (0.842 in.) B = 34.98 mm (1.378 in.) C = 16.000 - 16.0188 mm (0.6299 - 0.63066 in.)

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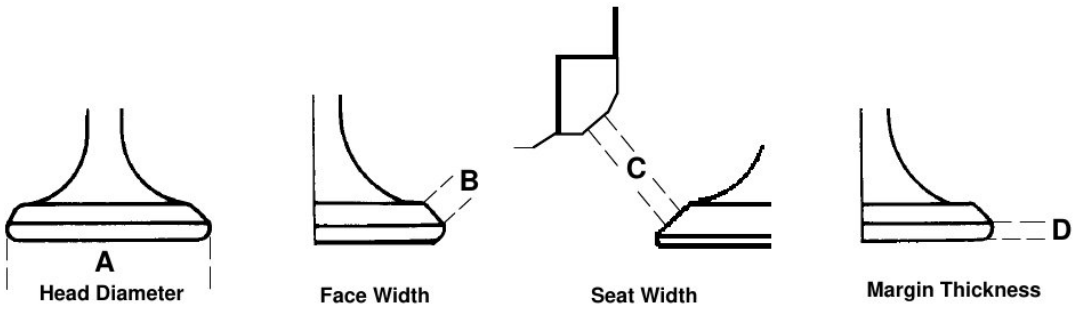
VALVES	**Valve/Valve Seat/Valve Guides:**	
	Valve Clearance (cold)	
	Intake	0.15 - 0.25 mm (0.006 - 0.010 in.)
	Exhaust	0.20 - 0.30 mm (0.008 - 0.012 in.)
	Valve Dimensions:	
	"A" Head Diameter	
	Intake	27.9 - 28.1 mm (1.098 - 1.106 in.)
	Exhaust	21.9 - 22.1 mm (0.862 - 0.870 in.)
	"B" Face Width	
	Intake	2.00 - 3.14 mm (0.079 - 0.124 in.)
	Exhaust	2.00 - 3.14 mm (0.079 - 0.124 in. ()
	"C" Seat Width	
	Intake	0.6 - 0.8 mm (0.024 - 0.031 in.)
	Exhaust	0.6 - 0.8 mm (0.024 - 0.031 in.)
	"D" Margin Thickness	
	Intake	0.5 - 0.9 mm (0.020 - 0.035 in.)
	Exhaust	0.5 - 0.9 mm (0.020 - 0.035 in.)
	Stem Outside Diameter	
	Intake	5.475 - 5.490 mm (0.2156 - 0.2161 in.)
	Exhaust	5.460 - 5.475 mm (0.2150 - 0.2156 in.)
	Guide Inside Diameter	
	Intake	5.500 - 5.512 mm (0.2165 - 0.2170 in.)
	Exhaust	5.500 - 5.512 mm (0.2165 - 0.2170 in.)
	Stem To Guide Clearance	
	Intake	0.010 - 0.037 mm (0.0004 - 0.0015 in.)
	Exhaust	0.025 - 0.052 mm (0.0010 - 0.0020 in.
	Stem Run-out Limit (max.)	0.016 mm (0.0006 in.)

Valve Dimensions



ROCKER SHAFT	**Outside Diameter**	12.941 - 12.951 mm (0.5095 - 0.5099 in.)
ROCKER ARM	**Inside Diameter of Bore**	13.000 - 13.018 mm (0.5118 - 0.5125)
THERMOSTAT	**Valve Opening Temperature**	58° C - 62° C (136° F - 143° F)
	Full Open Temperature	70° C (158° F)
	Valve Lift (Minimum)	3 mm (0.12 in.)

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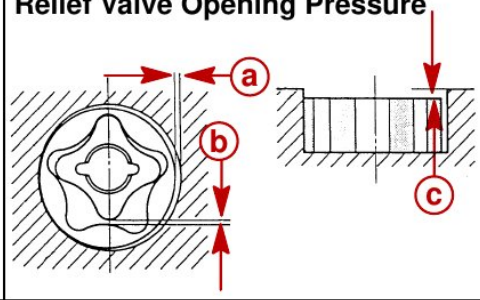
LUBRICATION SYSTEM	**Pump Type** **Engine Oil Pressure** **Oil Pressure Switch** **Oil Pump:** **Outer Rotor to Housing "a"** **Inner Rotor to Outer Rotor "b"** **Rotor to Housing "c"** **Relief Valve Opening Pressure** 	Trochoid 207 - 279kPa (30-40 psi) at 3000 rpm (Warm Engine) Below 17 kPa (2.5 psi) Continuity 0.06 - 0.11 mm (0.0024 - 0.0043 in.) 0.02 - 0.15 mm (0.0008 - 0.0059 in.) 0.02 - 0.07 mm (0.008 - 0.003 in.) 3.88-4.50 Kg/cm^2 (55-64 psi) 388-450 kPa Test Fitting p/n 22-883147 1/8 x 28 B/S
MID-SECTION	**Transom Height:** **Short Shaft** **Long Shaft** **Steering Pivot Range** **Tilt Pin Positions** **Full Tilt Up Angle** **Allowable Transom Thickness**	 38 cm (15 in.) 51 cm (20 in.) 70° 5 + Shallow Water 66° 60.3 mm (2-3/8 in.)
GEAR HOUSING NON-BIGFOOT (2.0:1)	**Gear Ratio** **Gearcase Capacity** **Lubricant Type** **Forward Gear** **Number of Teeth** **Pinion Gear** **Number of Teeth** **Pinion Height** **Forward Gear Backlash** **Reverse Gear Backlash** **Water Pressure** **@ Idle** **@ WOT**	2.0:1 200 mL (6.8 fl oz) Gear Lube-Premium Blend 26 Spiral/Bevel 13 Spiral/Bevel Floating No Adjustment No Adjustment 3.44 - 10.34 kPa (0.5 – 1.5 psi) @ 950 rpm 34.4 - 48.2 kPa (5-7 psi) @ 5000 rpm
GEAR HOUSING BIGFOOT (2.42:1)	**Gear Ratio** **Gearcase Capacity** **Lubricant Type** **Forward Gear** **Number of Teeth** **Pinion Gear** **Number of Teeth** **Pinion Height** **Forward Gear Backlash** **Water Pressure (With Thermostat)** **@ Idle** **@ WOT**	2.42:1 230 mL (7.8 fl oz) Gear Lube-Premium Blend 29 Spiral/Bevel 12 Spiral/Bevel 0.64 mm (0.025 in.) No Adjustment 6.8 - 27.5 kPa (1 - 4 psi) @ 950 rpm 41.3 - 62 kPa (6 - 9 psi) @ 5000 rpm

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