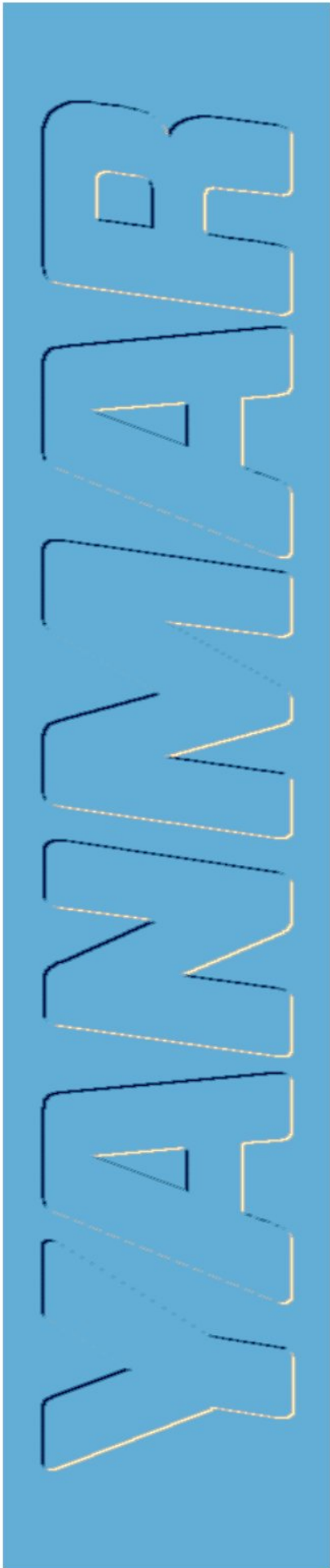




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SERVICEMANUAL

MARINE DIESEL ENGINE

6CX-ETYE

2000. 3. 10

FOREWORD

This service manual outlines procedures for servicing and maintaining Yanmar 6CX–ETYE engines to obtain maximum life and performance. It explains about the structure, performance, dis– and re–assembly procedures, important inspection points, servicing instructions and the wear limit of parts. For a full understanding of this manual, also refer to the Operation Manual and Parts Catalog. Besides reference use at your service shop, this manual can also be used as a text for your service engineers. You should understand the contents of this manual fully to offer accurate and efficient service to your customers.

For accurate and efficient work, the following preparations are necessary:

1. Check the service date of your customer

- ①When was the last service?
- ②How many months or hours has the engine been used since the last service?
- ③What was the trouble and what parts were replaced in the last service?
- ④What parts must be replaced in the present service?

2. Preparation of Parts

Check the inventory of parts that are necessary for servicing.

3. Preparation of Report Forms

Inspection and service check sheets, parts measurement record form, operation test record form.

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1. Specifications

1-1. Major Specification

(Without marine gear)

ENGINE MODEL			UNIT	6CX-ETYE			
Type				Vertical, water-cooling, 4-cycle diesel engine			
Combustion system				Direct injection			
Aspiration				Turbocharger with air cooler			
No. of cyl.- bore×Stroke			mm	6-110×125			
Displacement			ℓ	7.127			
Continuous rating	Output/Crankshaft speed		HP/rpm	320/2600			
	Brake mean effective pressure		kgf/cm ²	15.54			
	Piston speed		m/sec	10.83			
Max. rating	Specifications			Flywheel end			
	Output/Crankshaft speed		HP/rpm	350/2700			
	Brake mean effective pressure		kgf/cm ²	16.37			
	Piston speed		m/sec	11.25			
Non-load rotation speed(Max./Min)			rpm	3000±25/450; ⁵⁾			
Starting system				Electric starting, 24V-4kW			
Firing order				1-4-2-6-3-5-1			
Direction of rotation (viewed from stem)	Crankshaft			Counter-clockwise			
	Propeller shaft			Bi-rotation			
Lub. oil capacity	Max.		ℓ	33			
	Effect		ℓ	19			
Marine gear	Model			YX-71-1			
	Type			Hydraulic wet multi-disk type			
	Reduction ratio(forward)			2.07	2.58	2.91	
	Propeller shaft speed(at cont. rating)		rpm	1256	1008	893	
	Direction of rotation(propeller shaft)			Clockwise or counterclockwise viewed from stem			
	Dry weight		kg	212			
	Lubricating oil capacity	Max.	ℓ	6			
		Effective	ℓ	0.5			
	Hydraulic oil pressure		kgf/cm ²	22±5			
	Fuel system	Fuel injection pump			In-line type		
Injection timing			b.T.D.C 12±1				
Type of injection nozzle degree			Hole type 5-φ0.33×150°				
Injection pressure		kgf/cm ²	240±5				
Applicable fuel			Diesel oil or light oil(Cetane value≥45)				
Fuel filter			Paper element				
Engine lub. oil system	Lubrication			Forced lubrication by geared pump			
	Lub. oil discharge volume		ℓ /hr./rpm	≥6720/2600			
	Lub. oil pressure		kgf/cm ²	5±0.5			
	Lub. oil			API Service grade CD			
	Lub. oil filter			(Suction side) Perforated steel plate		(Discharge side) Paper element	
Cooling water system	Sea water pump			Rubber impeller type, gear driving type			
	Freshwater pump			Center type, V-belt driving type			
	Cooling			Fresh water cooling			
	Pump discharge volume		ℓ /hr./rpm	Seawater : ≥9820/2600 Fresh water : ≥13000/2600			
	Fresh water capacity inside engine		ℓ	35			
	Fresh water capacity in sub-tank		ℓ	1.1			
Turbocharger	Type			Garret T51			
	Cooling			Air cooling			
	Lubrication			Common with engine			
Air cooler	Type and capacity			Fin tube type 6.5m ²			
	Cooling			Seawater cooling			
Engine dimension: Overall length × overall width × overall height			mm	1586×896×964			
Piston stroke height(from installation floor)				764			
Engine dry weight(inc. clutch)			kg	1050			

NOTE Max. rating: Continuous operation hours at max. below 0.5 hours.

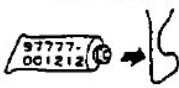
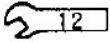
1-2. Marine Gear

Reduction and reversing gear	Model		YX-71-1		
	Type		Constant mesh gear with multiple disc clutch		
	Reduction ratio(Ahead/Astern)		2.07/2.07	2.58/2.58	2.91/2.91
	Propeller speed(Ahead)(at continuous rating)	rpm	1256/1256	1008/1008	—
Direction of rotation	Crankshaft		Counterclockwise viewed from stern		
	Propeller shaft		Changeable(Clockwise/conter-clockwise)		
Hydraulic oil pressure			22kg/cm ² ±0.5/2700rpm		
Lube oil pressure			2.5kg/cm ² ±0.5/2700rpm		
API Service grade			CD		
Dry weight		kg	212		

2. Disassembly and Reassembly

2-1. Preparations before Disassembly and Reassembly

2-1-1 Visual Mark List for Disassembly and Reassembly

Visual Mark		Visual Mark	
	See		※1 Apply liquid packing
	Caution		Safety
	Measure		Clean
	Oil supply		※2 Use torque wrench

※1 THREE BOND 38-388-055

※2 The figure shows the widths across flat of the hexagonal part.

2-1-2 Disassembly

- (1) Prepare the disassembly tools, measuring devices and record forms.
- (2) Prepare the cleaning machine and cleaning cans.
- (3) Prepare a place for putting parts and parts containers.
- (4) Extract cooling water and lube oil.
- (5) Put the disassembled parts in order.
- (6) Return bolts and nuts to their original positions temporarily to avoid confusion with different bolt and nut types.
- (7) Locate the cause of trouble accurately before disassembly, and do not remove or disassemble unnecessary parts.

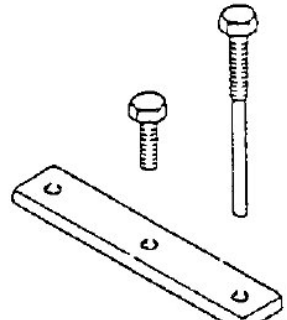
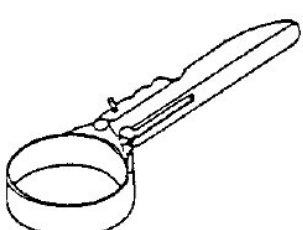
2-1-3 Reassembly

- (1) Clean and inspect the disassembled parts completely.
- (2) Apply clean engine oil to the sliding and rotational parts before installation.
- (3) Replace all gaskets and O-rings.
- (4) Apply liquid packing to the necessary parts to prevent water or oil leakage.
- (5) Check and ensure the correct oil and thrust clearance during reassembly.
- (6) Install the parts according to the alignment marks when they are provided. Take care of the combination of the parts with selective engagement.
- (7) Do not mix up bolts, nuts and washers. Tighten the major bolts and nuts to the specified tightening torque. Take special care when tightening aluminum alloy parts.
- (8) Apply engine oil to the threads and seat of the major bolts and tighten them to the specified tightening torque.

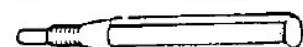
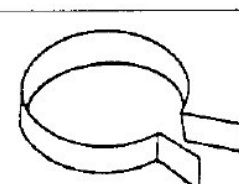
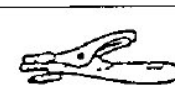
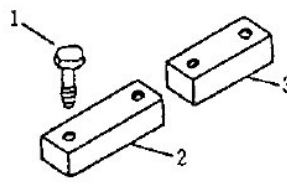
2-2. Disassembly and Reassembly Tools

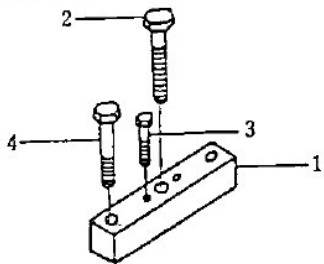
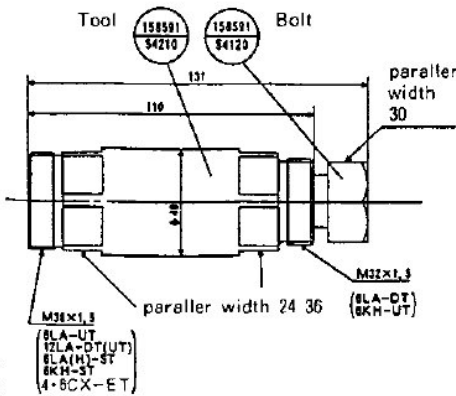
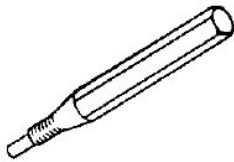
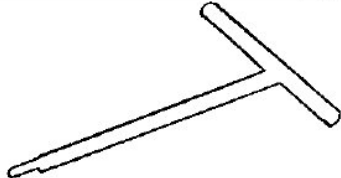
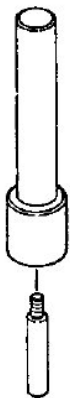
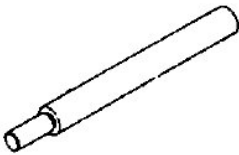
Standard tools

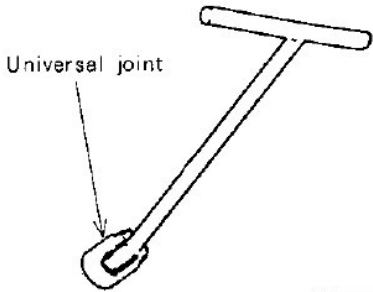
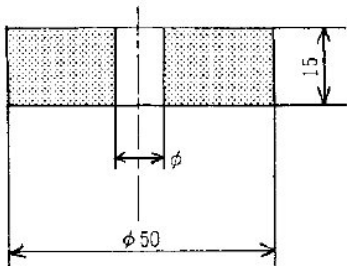
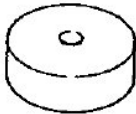
The following are the standard disassembly and reassembly tools:

Name of tool	Size	Shape
Double-headed wrench	8 × 10, 12 × 14, 13 × 17 19 × 22, 24 × 27	(for removing fuel valve)
Wrench	7, 26	
Monkey wrench	200	
Screw driver	⊕, ⊖ changeable	
Hexagon bar wrench	(for clutch emergency bolt)	
Double-head wrench	17 × 19	
Pliers		
Box wrench	19 × 12 (for cyl. head) 13 × 17 (for fuel oil pump)	
Extractor	(for fuel valve adiabatic pecking) 127610-92910	
Extractor	(for removing fuel valve) 127616-92500	(Filter wrench)
Clearance gauge	(for adjusting intake/exhaust valve clearance)	
Hammer		
Filter wrench	(for removing filters) 127610-92750	
Oiler		
Turning handle		

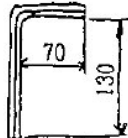
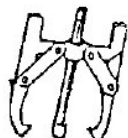
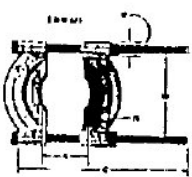
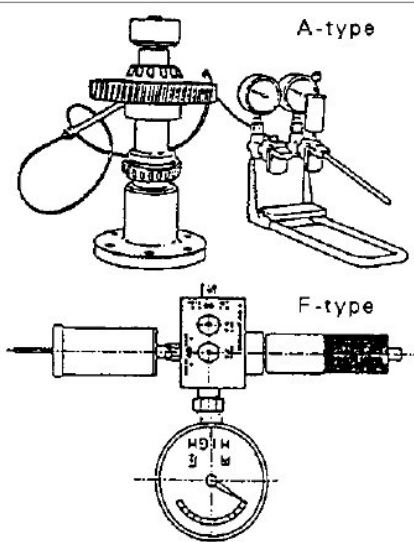
Tools (to be specially ordered)

Name of tool	Code No.	Shape
Socket (for rod bolt)	127610-92730	
Extractor for valve guide	127411-92160	
Extractor for fuel oil valve	127616-92500	
Piston insertion tool	122310-92140	
Piston rings fitting/removal tool	135410-92140	
Oil pan positioning tool	1. Bolt (4pcs) 127610-92700 2. Spacers A 127610-92680 3. Spacers B 127610-92690	

Name of tool	Code No.	shape
Fresh water pump impeller (cam gear puller) (Press-fitting type)	1. Spacer 127610-92430 2. Bolt 124160-77511 3. Bolt (for impeller) × 2 26116-060302 4. Bolt (for cam gear) × 2 26116-080502	 
Automatic timer tool (adiabatic material puller)	158591-54120 158591-54200	
Adiabatic material puller	127610-92910 (Standard)	
Protector puller	127695-92910	
Stem seal insertion tool		
Valve guide puller		

Name of tool	Code No.	shape
Exhaust manifold puller		
Fuel valve puller tool 127616-92500		

Special tools for clutch

No.	Name of tool	Note	shape
1	Emergency bolt span	For tightening the emergency bolt on clutch failure	
2	Gear puller		
3	Bearing separator	For removing bearing; used together with the gear puller	
4	Hydraulic fitting tool	For disassembly of output shaft joint Output shaft joint and large gear	

Name		for using		
Liquid packing (THREEBOND auxiliary packing):		The silver grey semi-dry type viscoelastic liquid packing based on extreme heat-resisting synthetic rubber and synthetic resin. Apply the packing to the seal surface and join the part after several minutes when the packing has become semi-dry. The white liquid packing based on nylon resin. Brush the packing on the seal surface and join the part after several minutes when the packing has become semi-dry. Be sure to stir well before use.		
White paint		Coat the paint on the contact area with the cylinder body before inserting the cylinder liner to prevent rust and water leakage. (Use the oil type make-up paint.)		
Name		quantity	Code No.	Note
Scale removing agent	UNICON	1 case (4kg × 4)	974100-01460	The strong scaling agent removes scale quickly (1-10 hrs.). Dissolve the agent in 10 parts of water or seawater (by weight ratio) and stir it well. Scale can be removed by just immersing the disassembled parts. To speed up the treatment, stir the solution. When the cleaning performance drops, neutralize the solution and throw it away.
	Counteragent (caustic soda)	1 case (2kg × 4)	974100-0200	
	PH test paper		974100-04200	
Anti-rust agent		2l	974100-04200	Mix the agent in ten parts of fresh water and stir the solution by operating the engine for about 5 minutes. The anti-rust performance lasts for about 6 months.
Yanmar Super Freeze				Can be used both as anti-freeze in winter and coolant in summer. The performance lasts for 2 years. The Super Freeze can safely be mixed with anti-rust agent.

Temp.	- 5°C	- 10°C	- 15°C	- 20°C	- 25°C	- 30°C	- 35°C	- 40°C
Volume ratio	15%	25%	30%	35%	40%	45%	50%	55%