WaveRunner FX140

Four Stroke Waverunner FX140

Train The Trainer in Japan, December 2001

- Model Outline
- Performance
- Features & Benefits
- Technical Tips
- Service Tips
- Other Information

YAMAHA

Model Outline

YAMAHA

~INDUSTRIAL/YAMAHA FIRST 4 Stroke PWC~

ALL NEW Body 3Seater 2002Model YMMC Production

ALL NEW 4stroke 998cc 5Valve-4Cylinder Engine

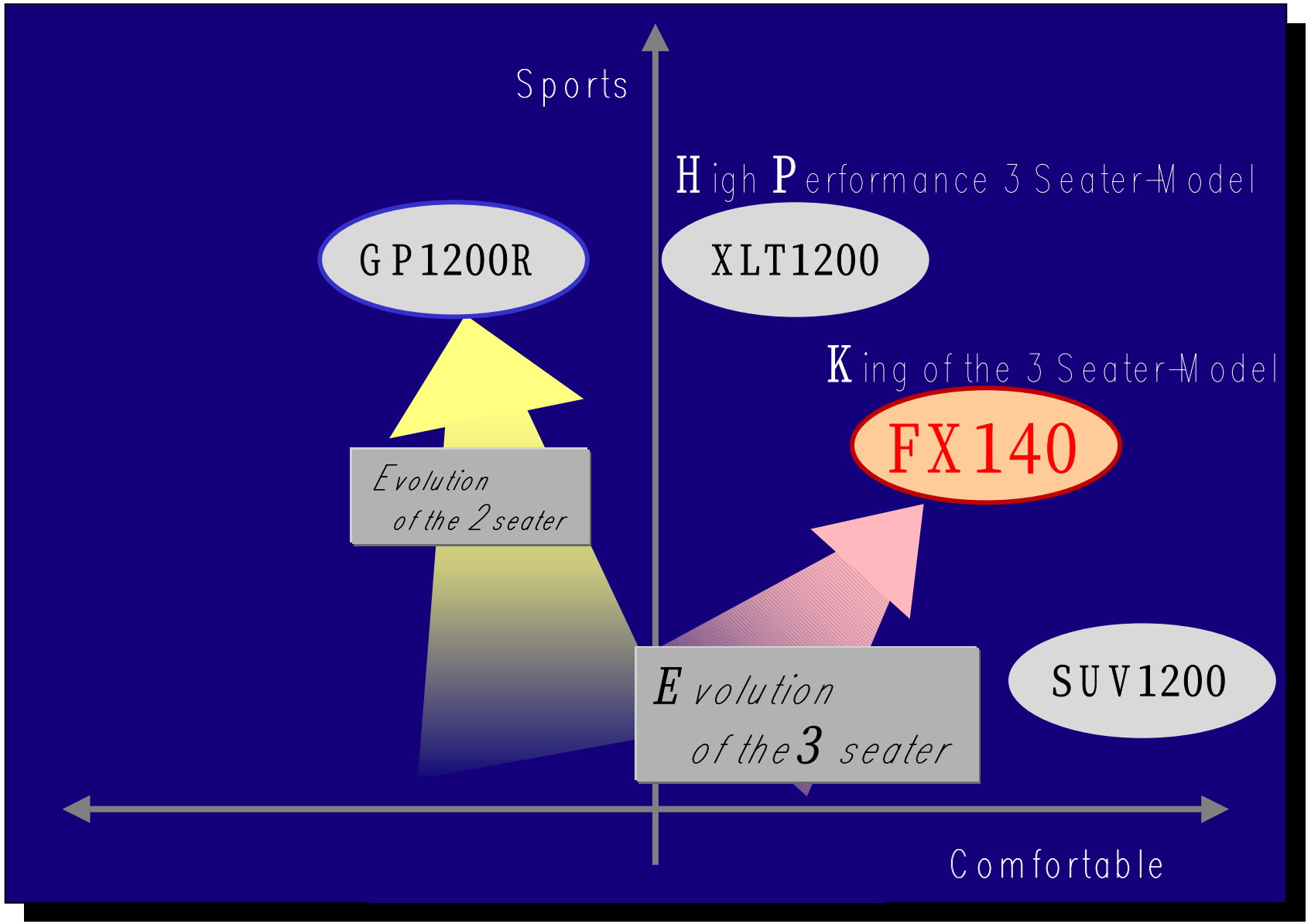
- Conceptand Target
- ModelPositioning in YAMAHA
- ModelPositioning in Market
- ModelPositioning in Society
- Feature
- ProductPlan
- Specifications

YAMAHA

Next Generation Three-Seater

Which harmonized environment and PWC fun character

Model Positioning in Market



Model Positioning in Society

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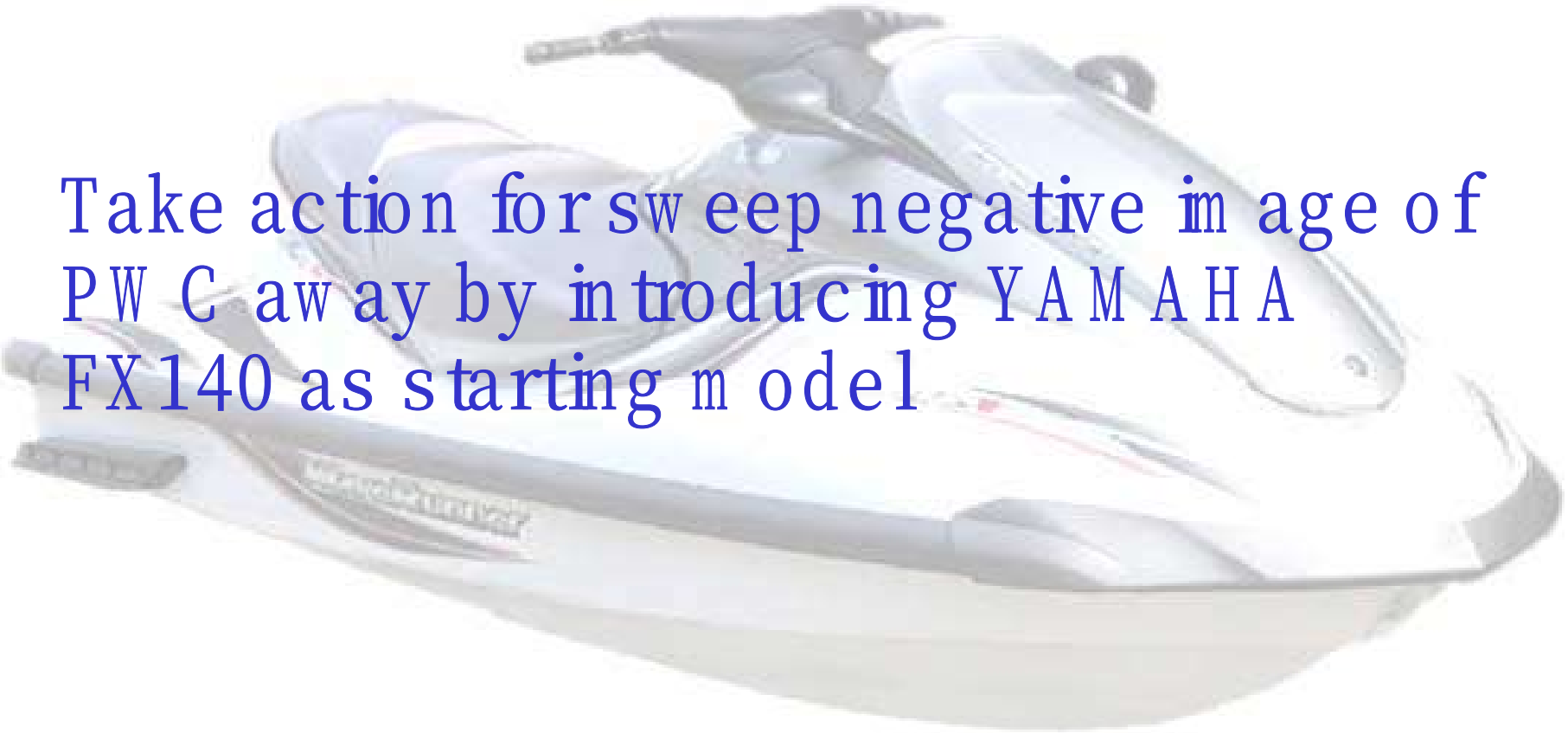
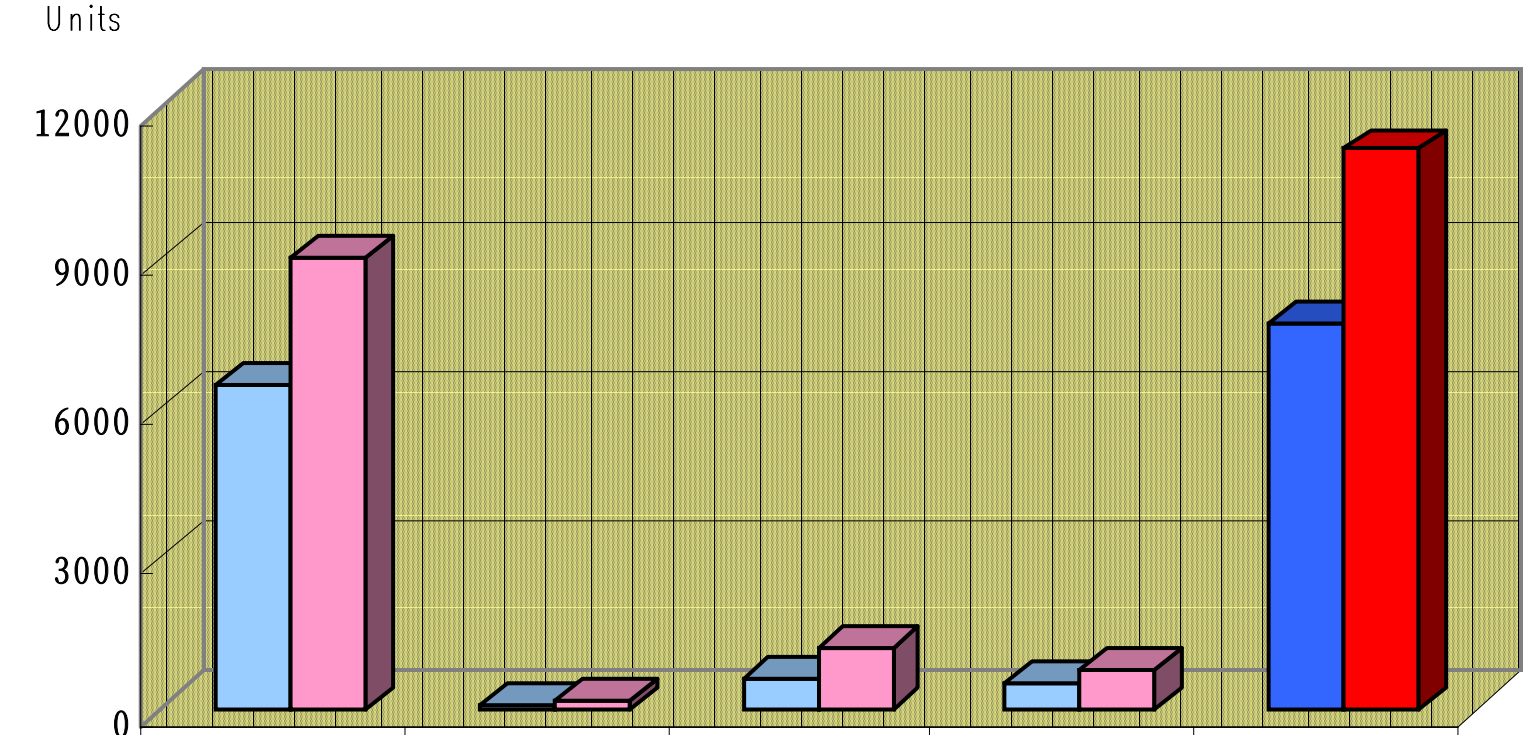
Active approach to gain the positive image of PWC



Take action for sweep negative image of PWC away by introducing YAMAHA FX140 as starting model

Product Plan



	US	CAN	EUR	JPN	TOTAL
2002	6500	100	600	500	7700
2003	9000	130	1250	800	11180

Specifications

YAMAHA

Boat		
Sales Name	WaveRunner FX140	
Model Name	FX1000	
Body Tipe	F1B	
Engine & Jet Type	F1B	
Length	m (In)	3.34 (131.5)
Width	m (In)	1.23 (48.4)
Height	m (In)	1.16 (45.7)
Dry Weight	Kg (Lbs)	362 (798)
Material	Hull: SMC	Deck: SMC
Capacity	3 person or MAX. Kg (Lbs)	240 (529)
Max. Output (Catalog)	kw (ps)/rpm	103.0 (140) / 10,000
Max. Output (JCI/EPA)	kw (ps)/rpm	95.6 (130) / 10,000
Max. Fuel Consumption	Liter/Hrs (Gal/Hrs)	44.0 (11.6)
Full Throttle Cruising Hour	Hrs	1.56

Specifications

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Engine		
Engine Type	4 Stroke L4	
Engine Weight	Kg (lbs)	105 (231.5)
Valve Type	DOHC 5 Valve	
Cooling System	Water-Cooled	
Displacement	cc (cubic in)	998 (60.9)
Starting System	Erectric Starter	
Bore ラ Stroke	mm	74 ラ 58
Generation System	Flywheel Magneto	
Compression Ratio	11.4 :1	
Generator Output	12V - (A/rpm)	(15 ア 6,000)
Fuel Supply System	EFI	
Ignition System	TCI	
Ignition Timing	° BTDC	31
Lubrication System	Dry Sump	
Total Oil Capacity	Liter (Gal)	5.0 (1.3)
Battery Capacity	V - AH	12 - 19
Exhaust System	Wet Exhaust	
Gear Ratio	19:28	

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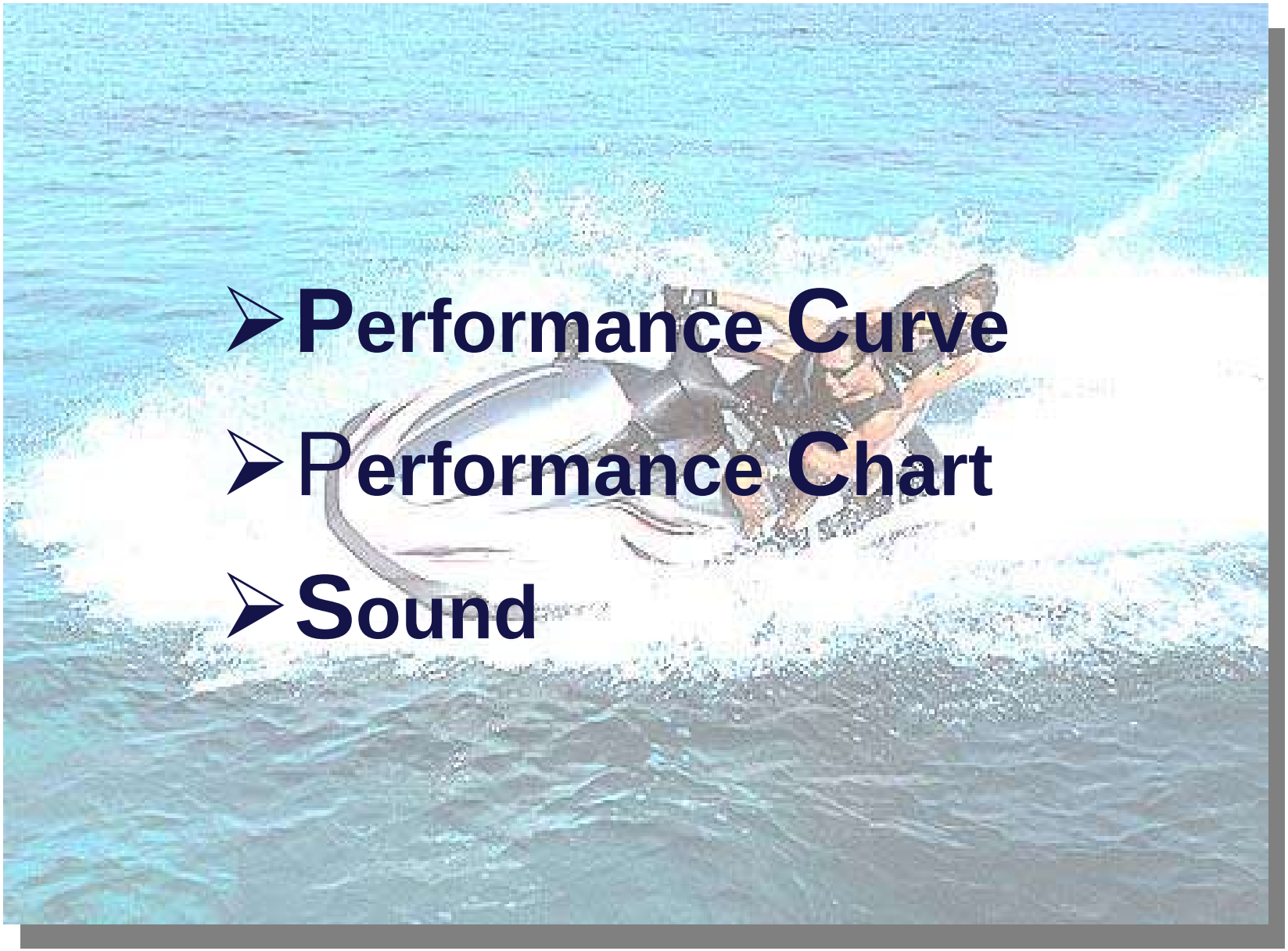
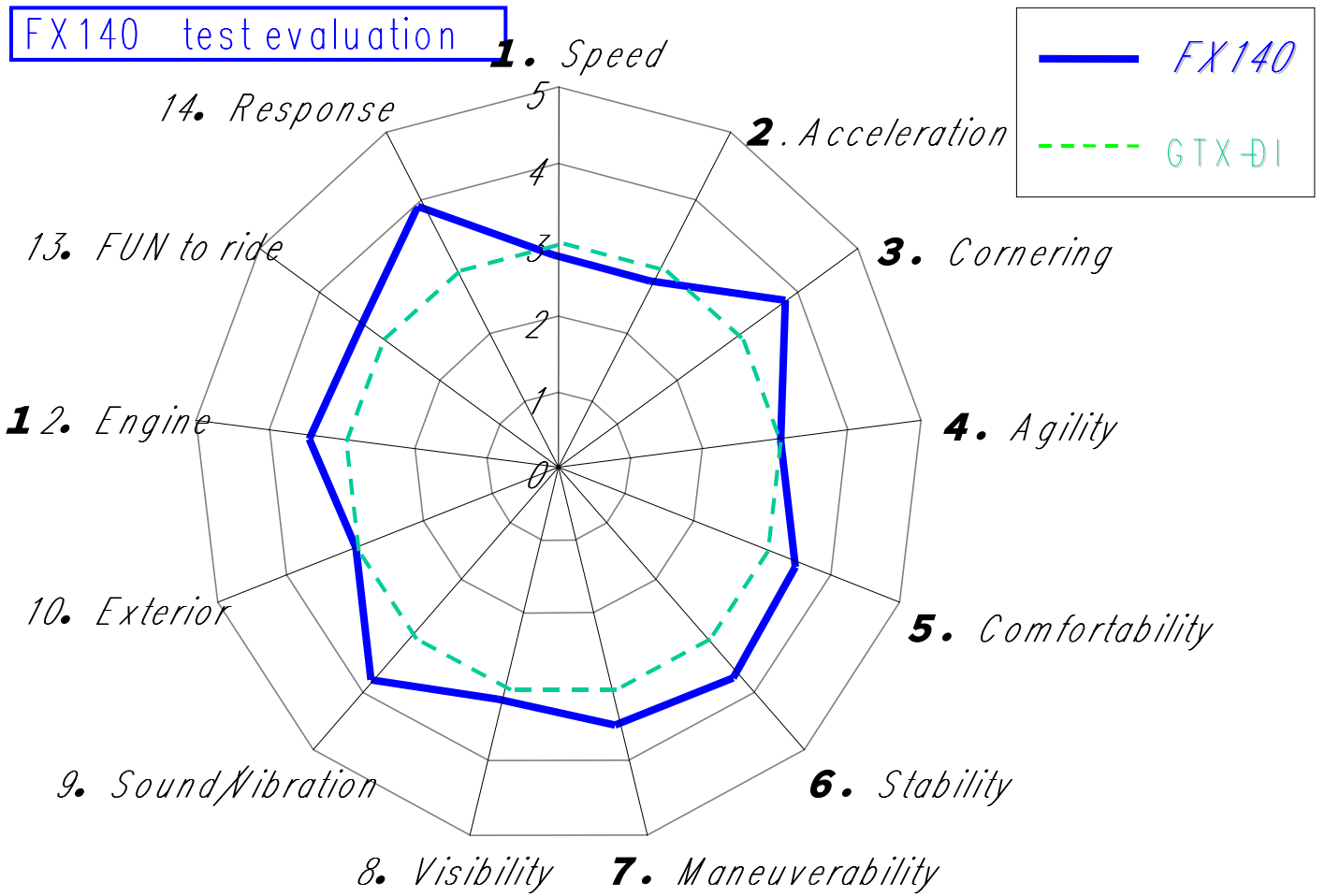
Drive Unit		
Propulsion System	Jet Pump	
Jet Pump Weight	Kg (lbs)	18 (39.9)
Jet Pump Type	Axial Flow Single Stage with Reverse	
Jet Pump Diameter	mm	▪ 55
Impeller Rotation	Counter Clockwise (Rear View)	
Impeller Blade/Pitch	3 blade 16.3 degree (68N)	
Transmission	Direct Drive from Engine	
Shift Operation	F-R	
Trim Adjust System	QSTS	
Trim Adjust Angle	5 Position (degree)	(-10, -5, 0, 5, 10)
Nozzle Trim Angle	degree	5
Nozzle Steering Angle	degree	24.0ｱ1
Fule Oil		
Fuel	Unleaded Regular Gasoline	
Recommended Oil	SAE 10W-30	API SE, SF, SG, SH, SJ
Fuel Tank Capacity Incl. Reserve	Liter (Gal)	70.0 (18.5)
Other	Liter (Gal)	100 (26.4)

Performance

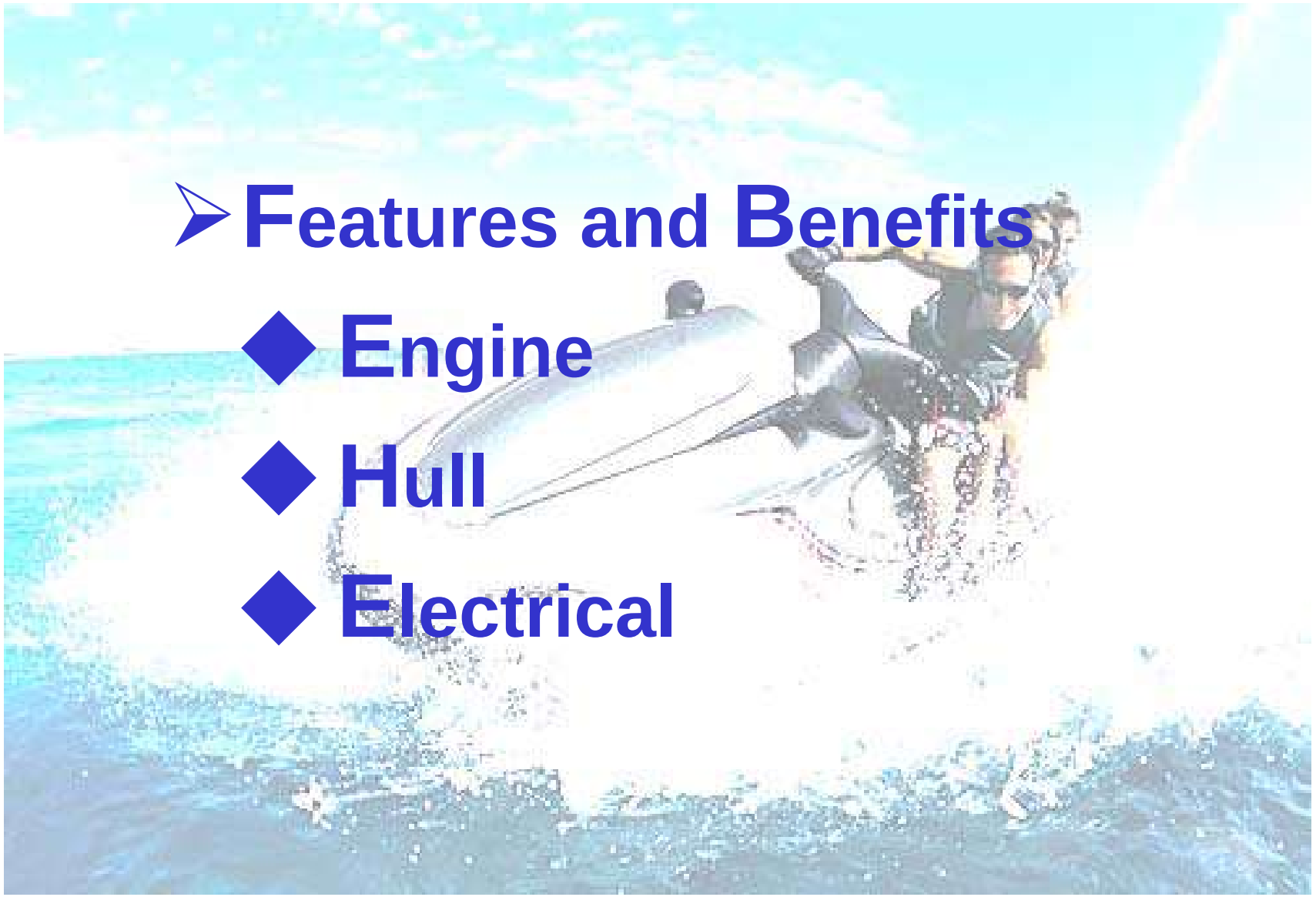


- Performance Curve
- Performance Chart
- Sound

Performance Chart



Features & Benefits



- Features and Benefits
  - Engine
  - Hull
  - Electrical

Features & Benefits

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Specifications

Length/Width/Height	:	3.34m/1.23m/1.16m
Capacity	:	3 persons
Dry Weight	:	362kg

WaveRunner FX 140

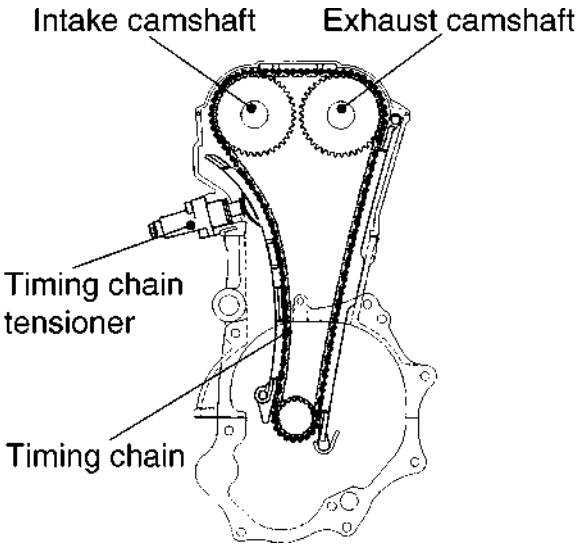
Engine

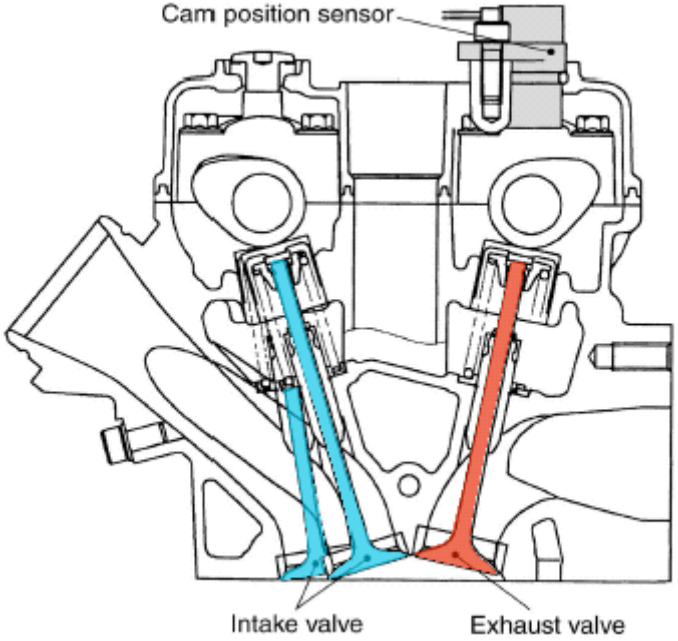
YAMAHA

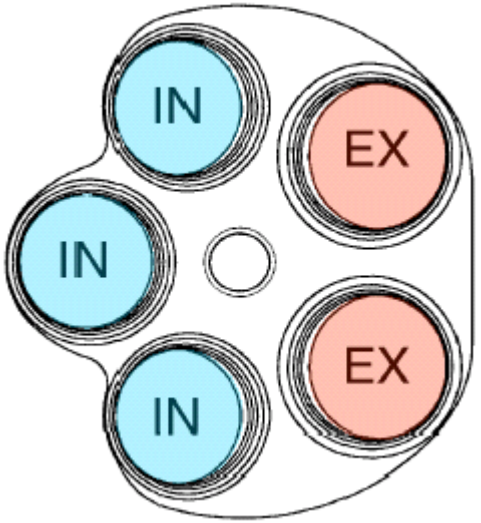
MR1

Cylinder Head and Valve Train

- 3 intake valve and 2 exhaust valves
- Double overhead cam shafts
- Cam position sensor

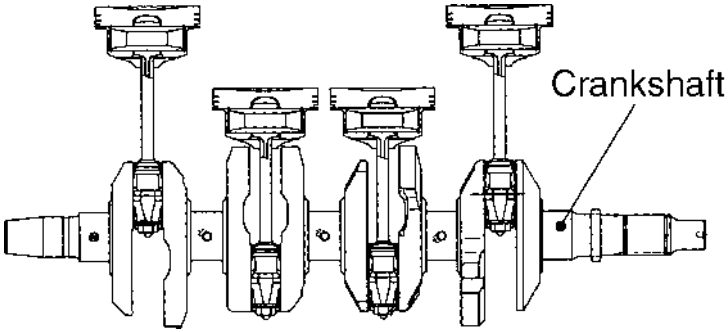


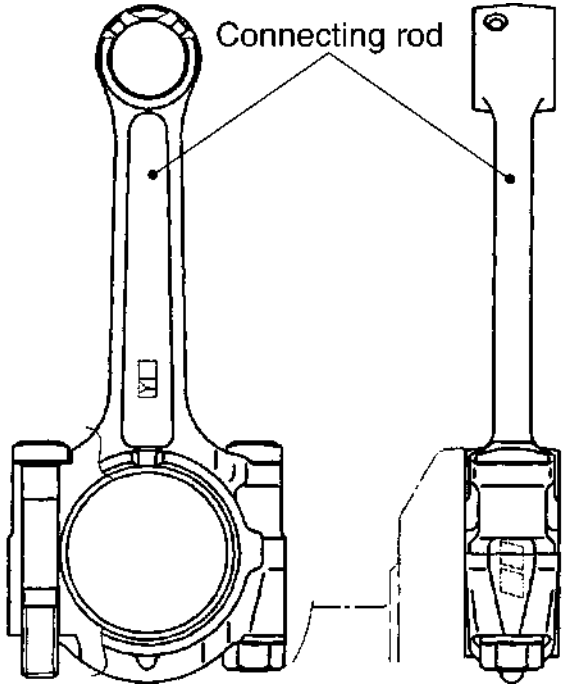


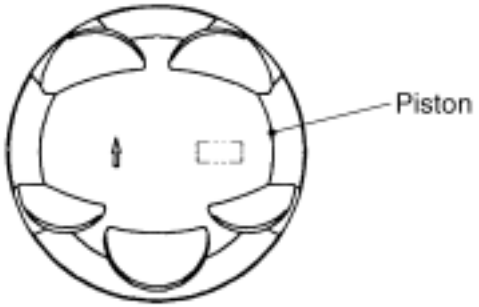


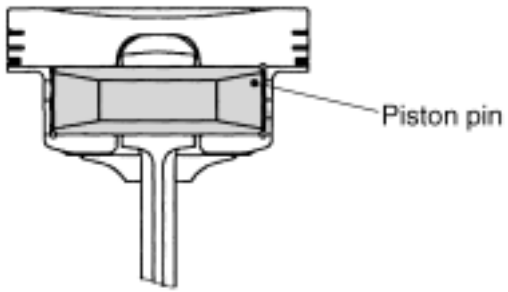
Crankshaft and Pistons

- Lightweight piston, piston pin and connecting rod
- High compression ratio realized with piston head shape



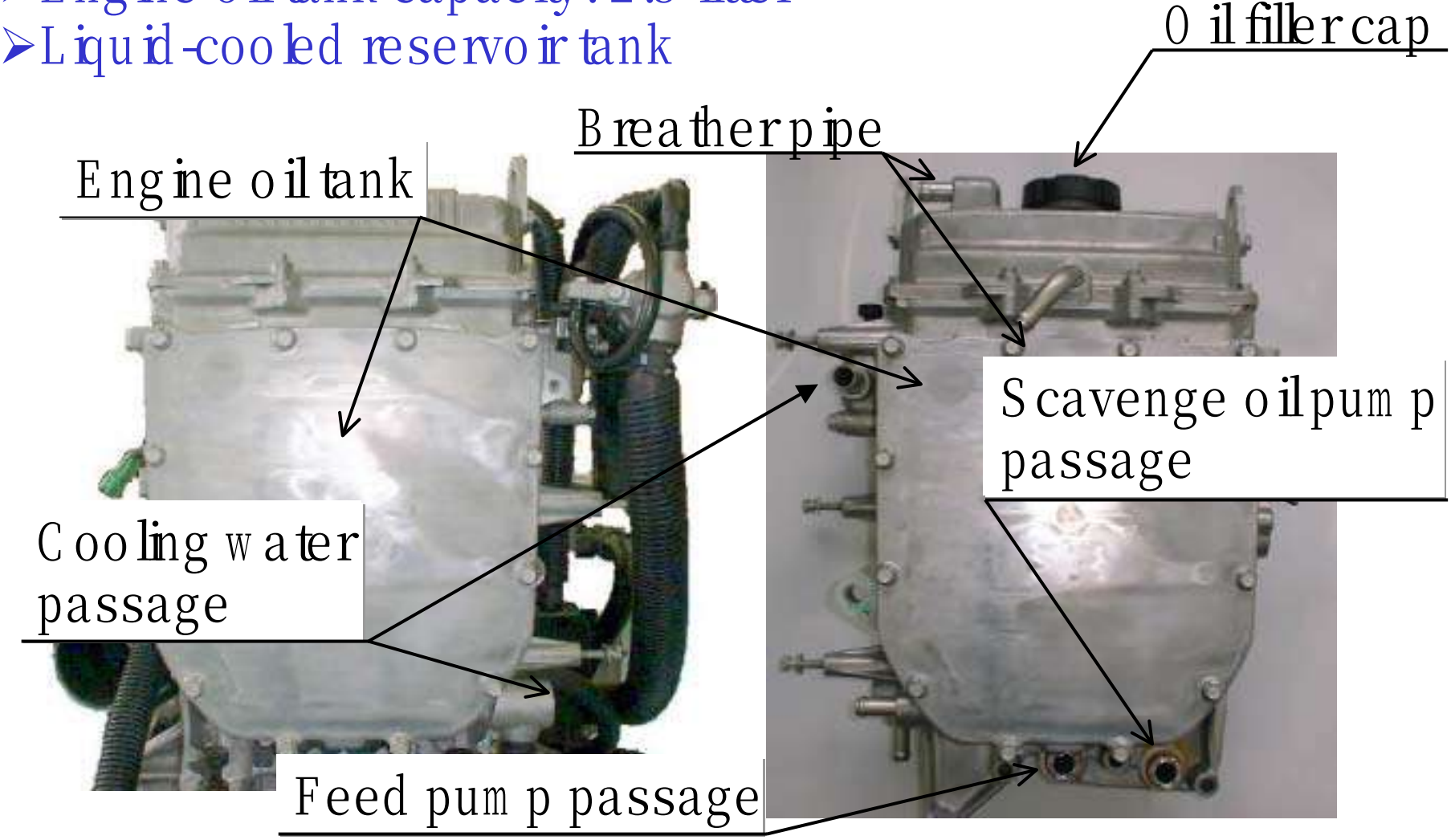




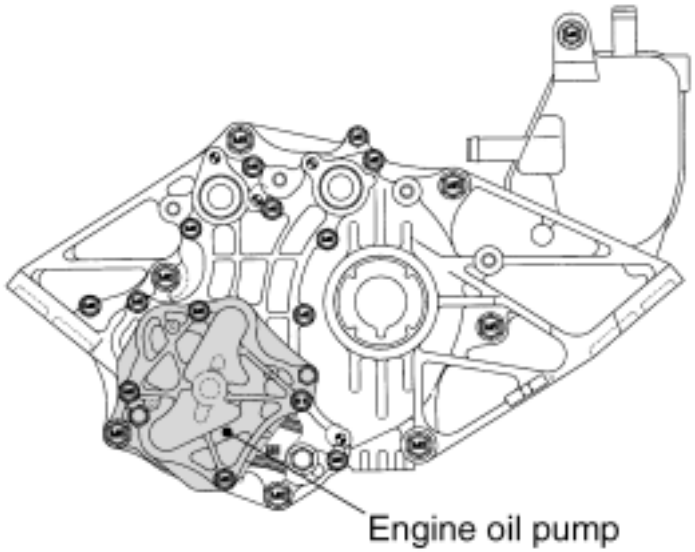


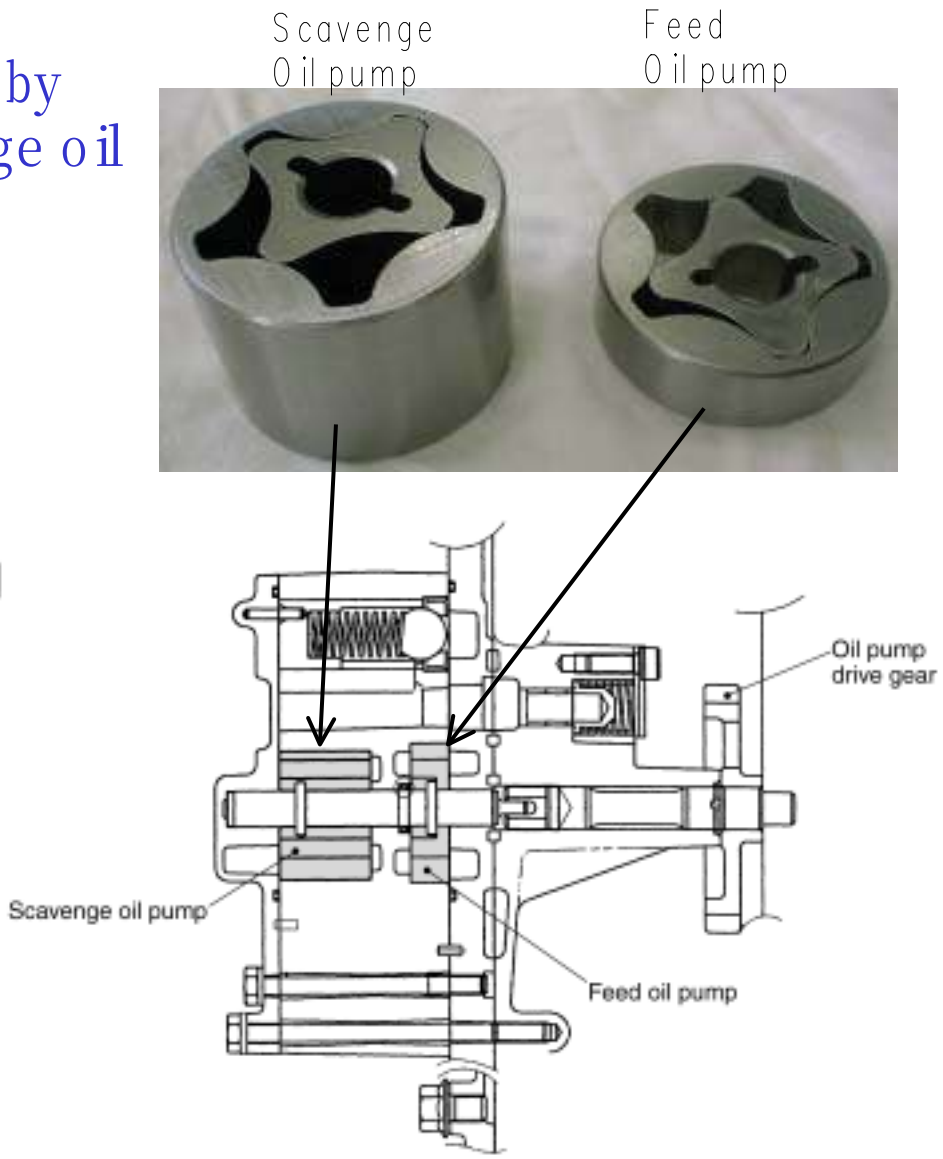
Lubrication

- Dry sump engine oil system
- Engine oil tank capacity: 2.8 litter
- Liquid-cooled reservoir tank

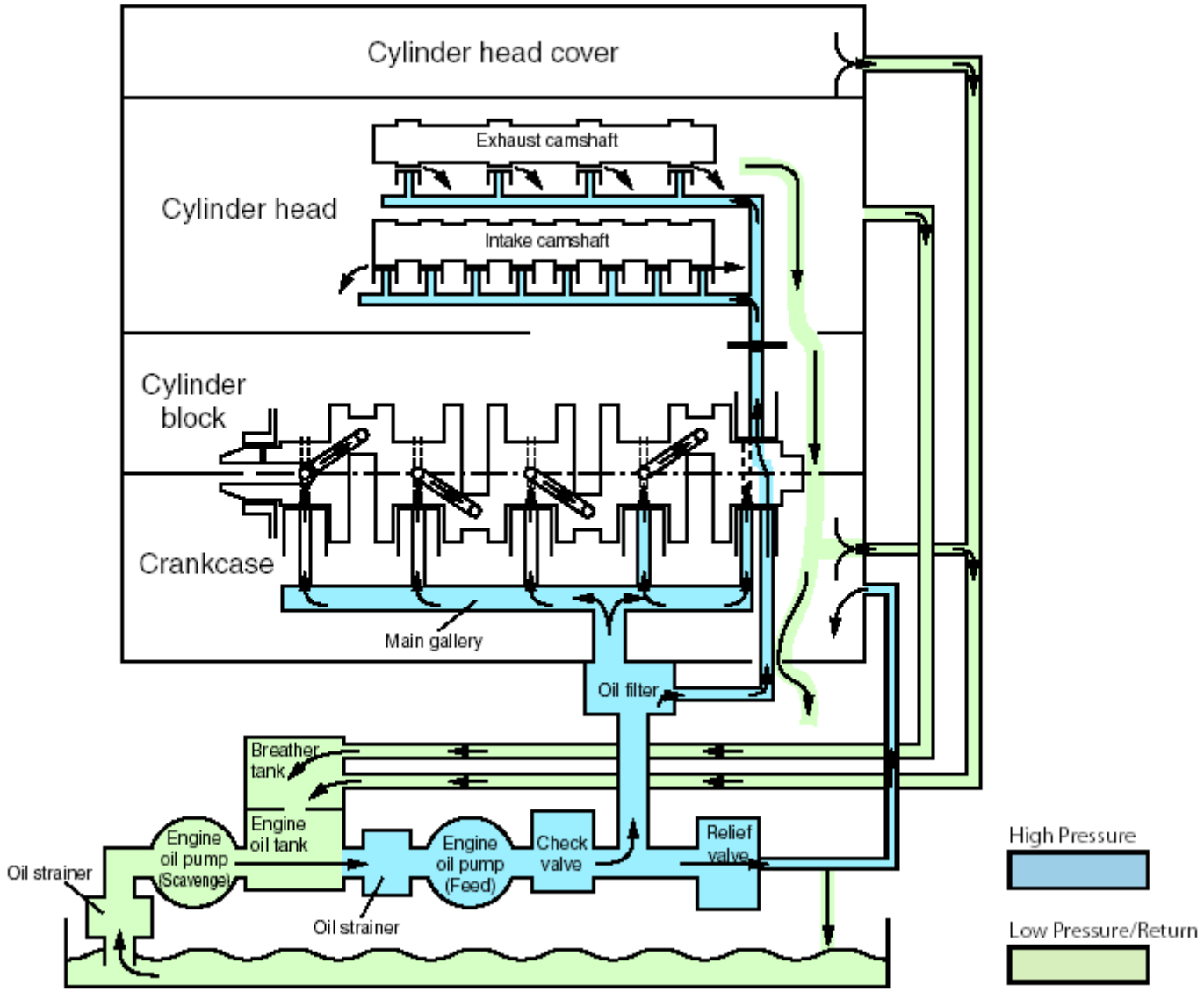


- The engine oil pump is driven by the same axle as the scavenge oil pump and feed oil pump.





Oil flow diagram



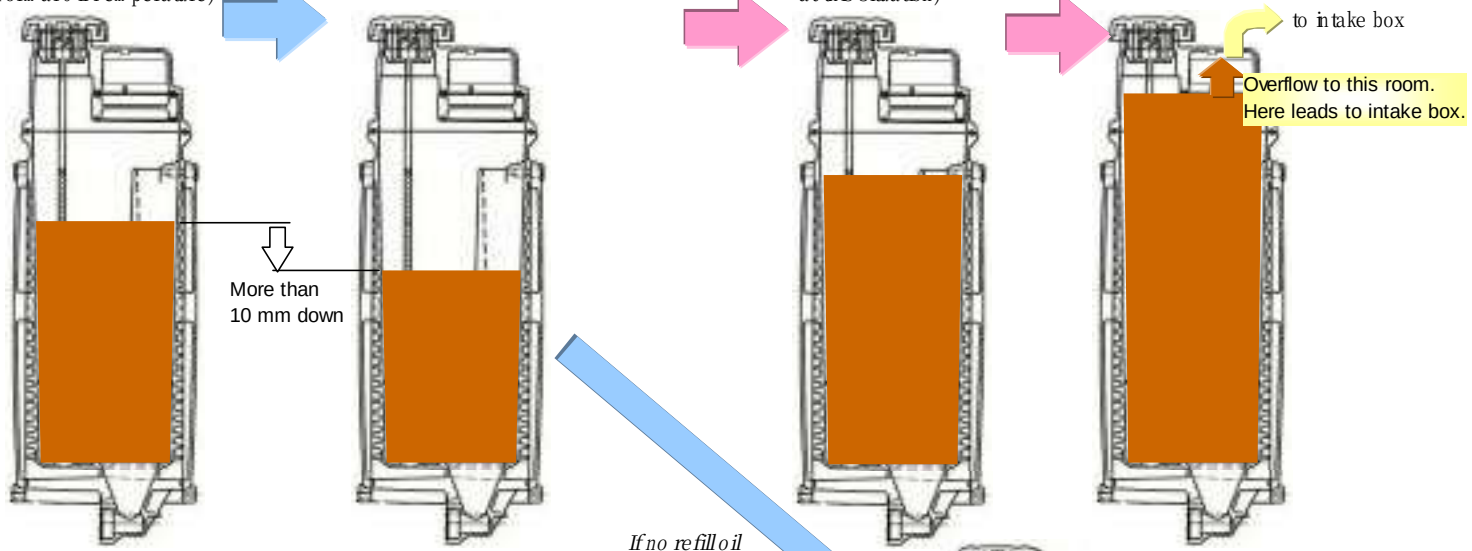
Mechanism of Oil Overflow Problem

Standard Oil Level with 4.3 litter included volume inside cylinder block. (Normal Oil Temperature)

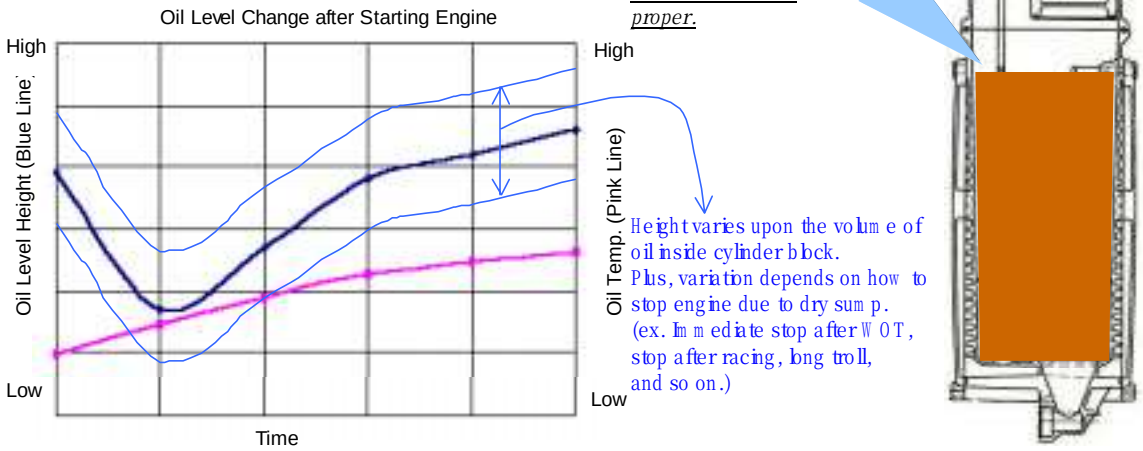
Oil Level after doing the instruction of pre-prod. *(= check point after 2 minutes' trolling from cold start)*

Oil Level after refill (Total amount is more than 6 L included volume inside C/Block at this situation)

Oil Level during operation (Hot Oil on Trolling just after WOT)

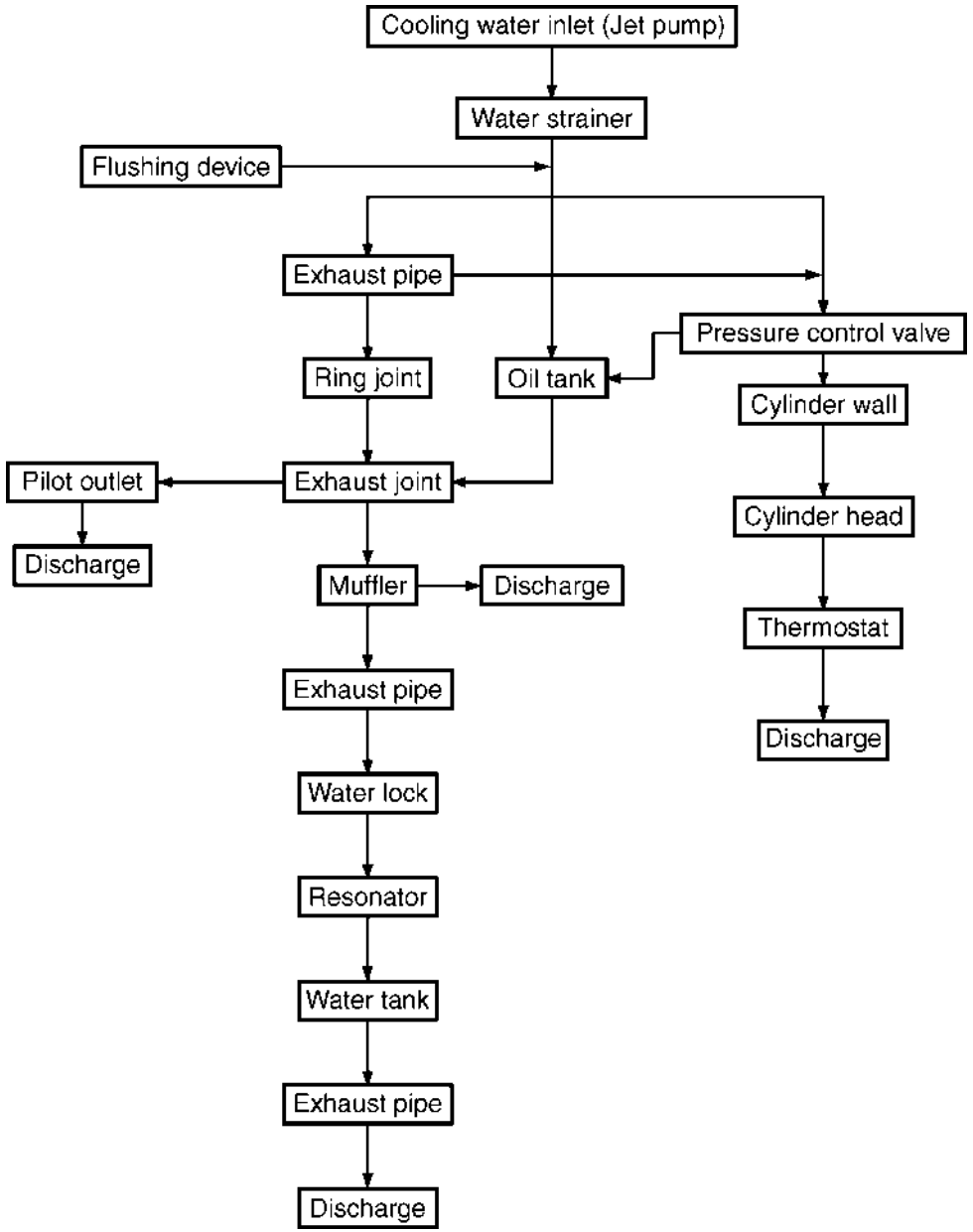


If no refill oil
No overflow happen.
This means that instruction was not proper.

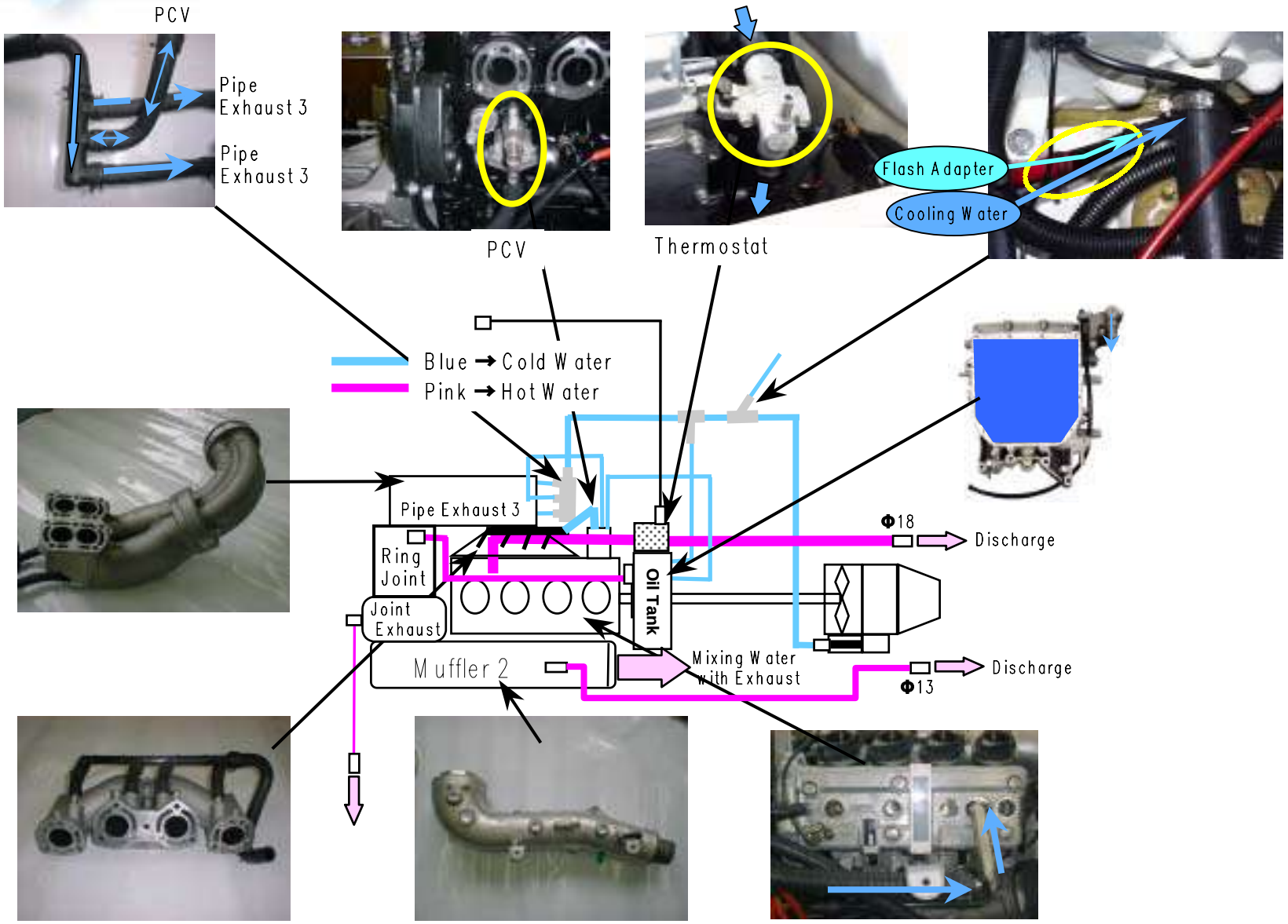


Height varies upon the volume of oil inside cylinder block.
Plus, variation depends on how to stop engine due to dry sump.
(ex. Immediate stop after WOT, stop after racing, long troll, and so on.)

Cooling system

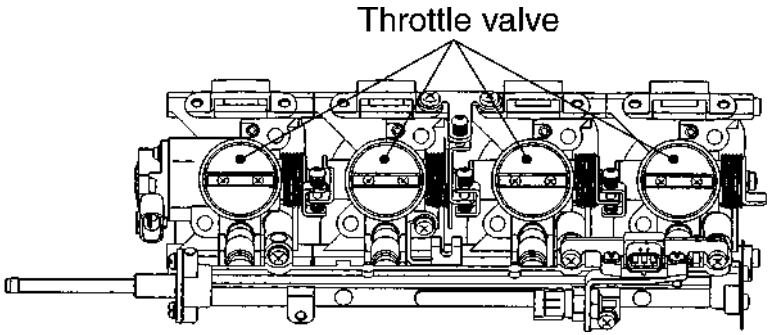


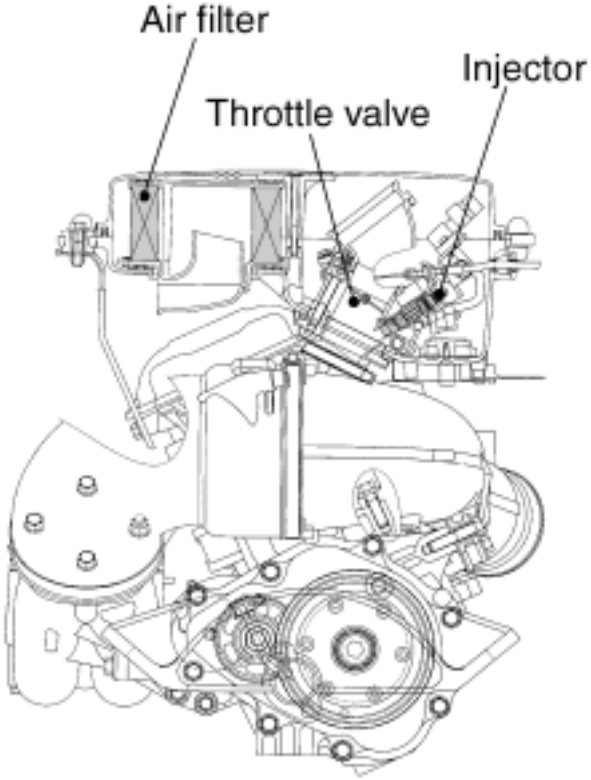
Cooling system

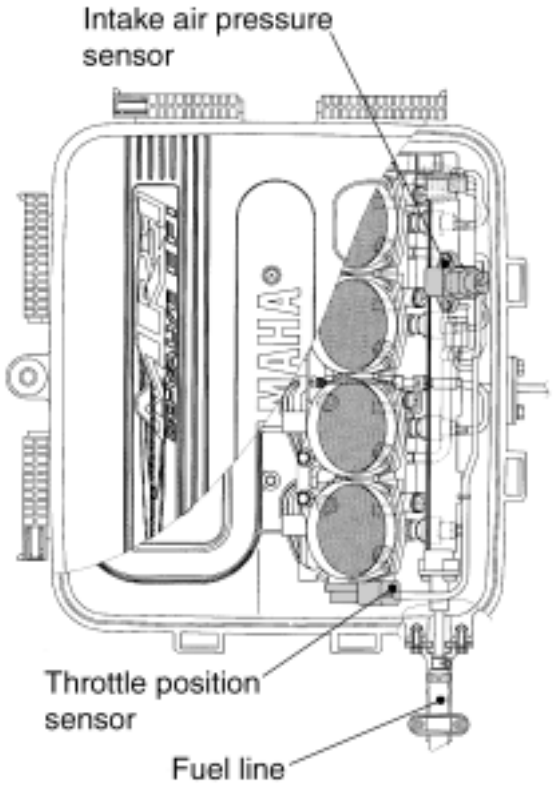


Intake

- Electrical Fuel Injection
- 4 in-line, independent throttles
- Large air filter box

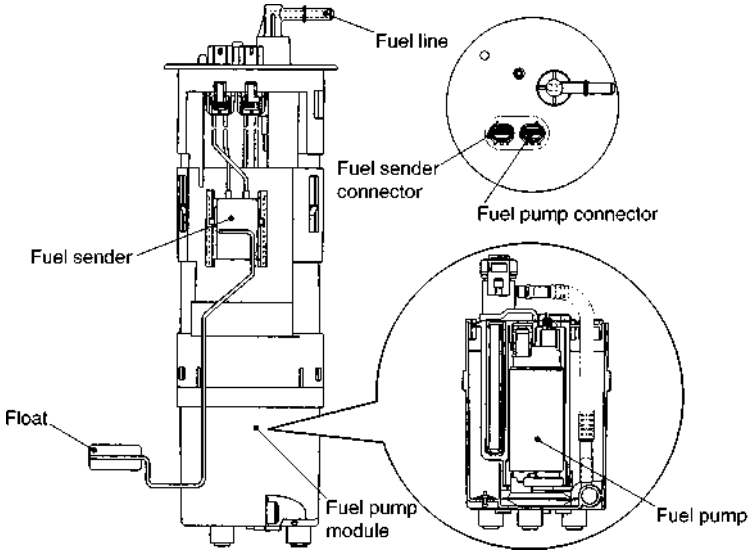


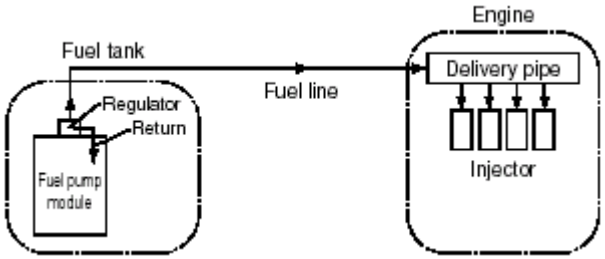




Fuel Supply

- Installed in fuel tank
- Fuel sender
- No return from the delivery pipe





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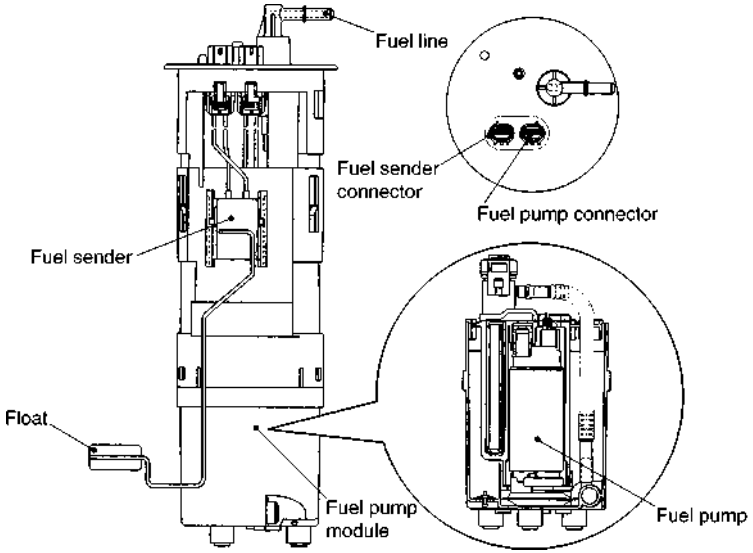
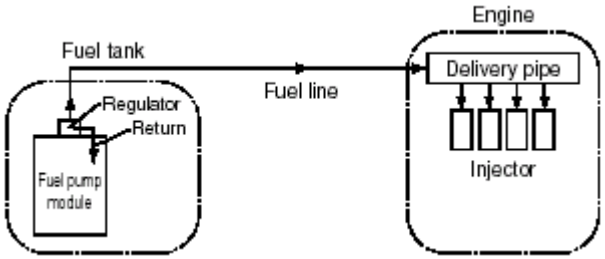
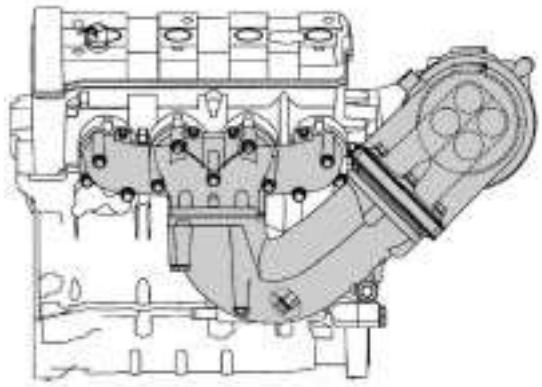




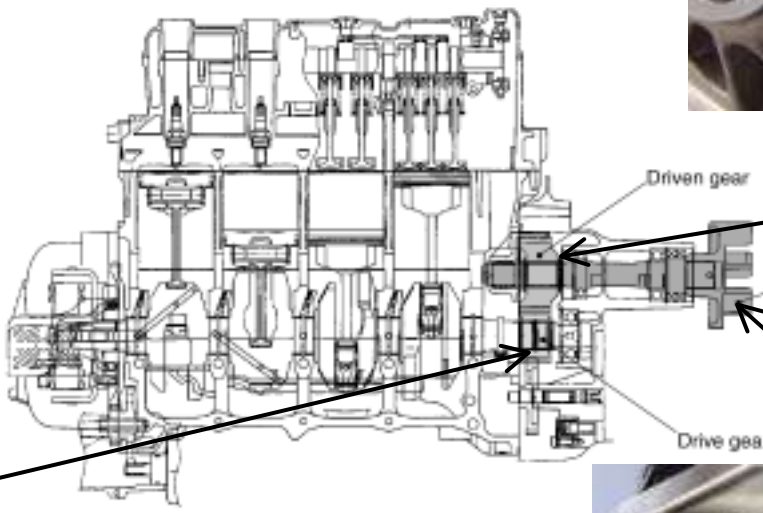
Exhaust

- Each cylinder with equally lengthened exhaust pipes
- Dual pipe structure



- Reduction Gear ratio: 1.47:1

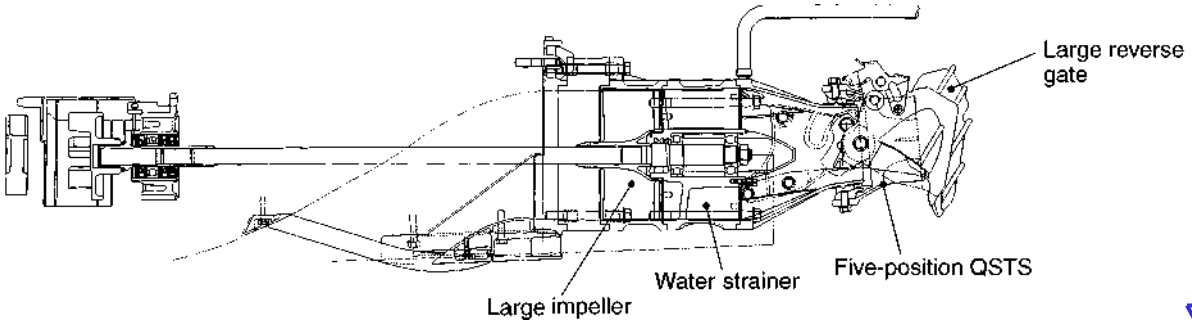
Drive gear



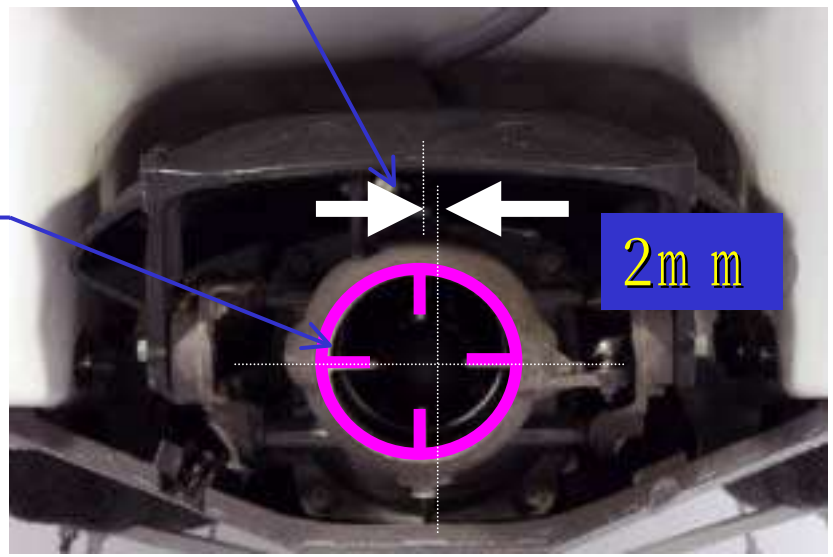
Driven gear

Coupler

- Big jet pump with large, three-blade stainless steel, impeller with an outer diameter of 155mm
- Five-position QSTS

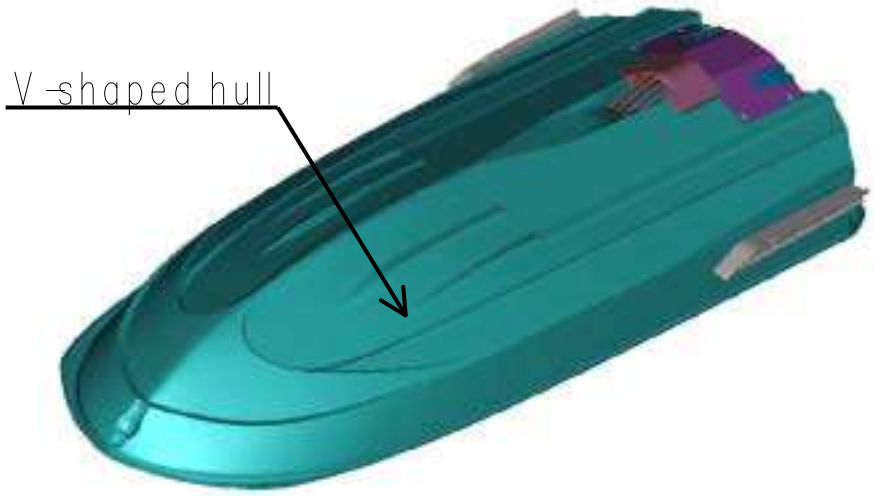


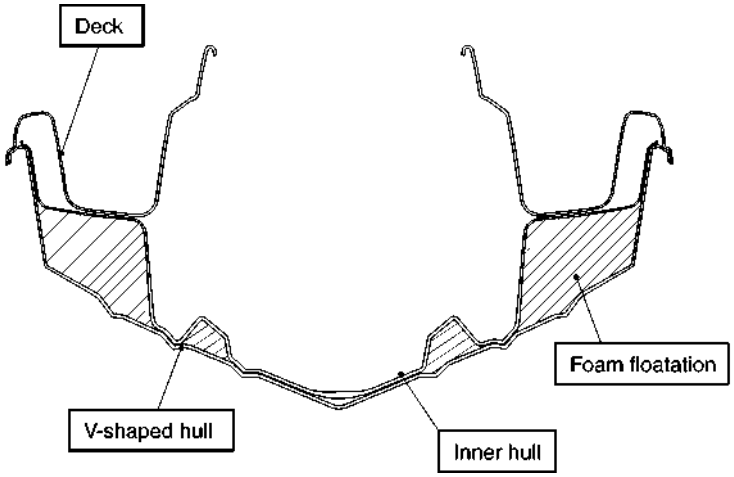
TDE:
Thrust Directional Enhancer



Hull

- V-shaped hull
- Foam floatation in innerhull
- New sponson





Deck

Front compartment
with remote release lever

Stylish big front bumper

Large glove box with drink holder

Tow hook

Pneumatic lid support

Two-piece, three-passenger seat

Large removable rear
storage tub

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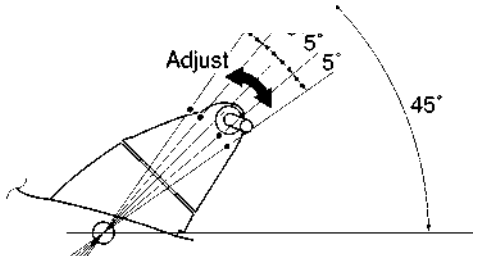
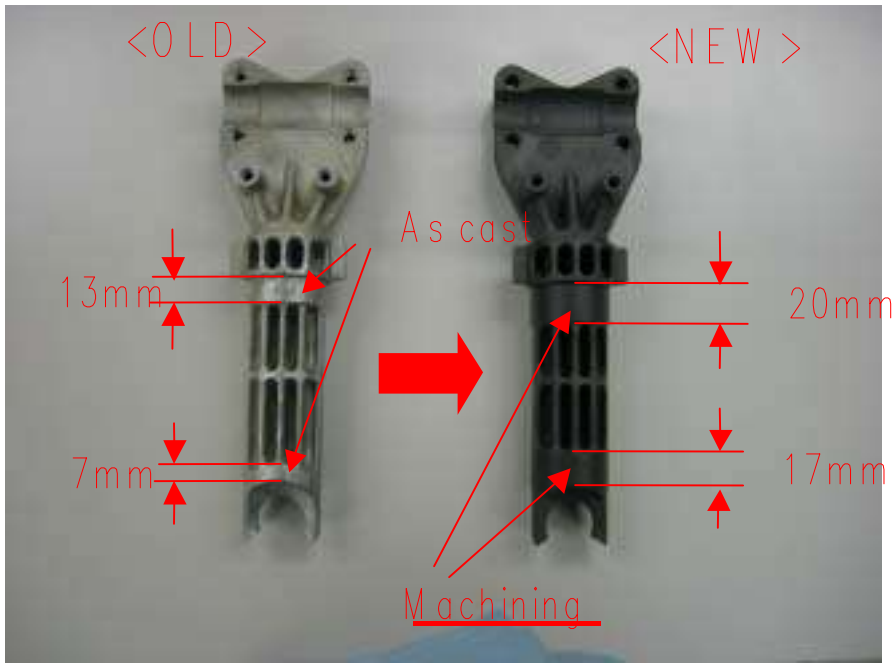
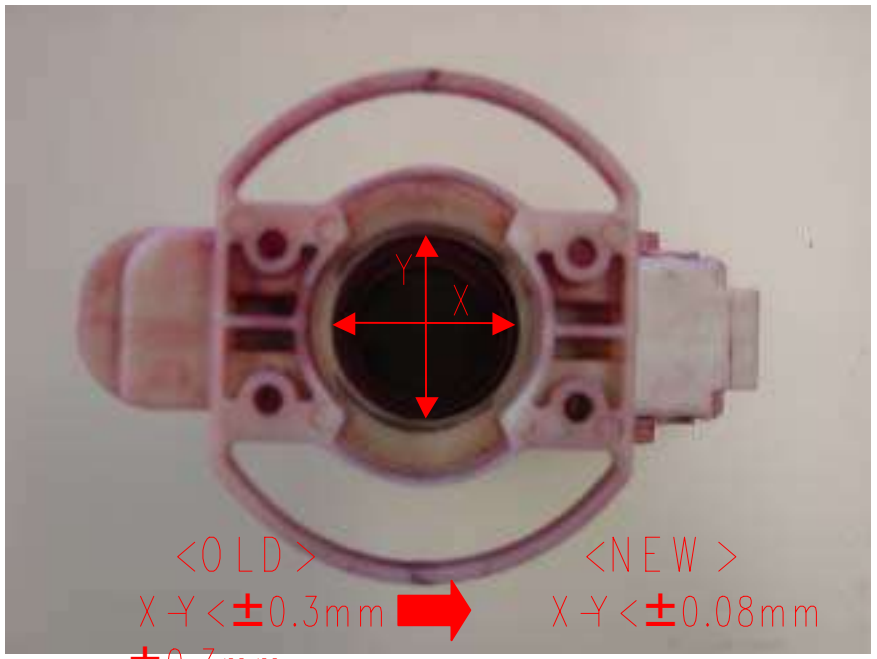
- Five-position
  Adjustable tilt steering





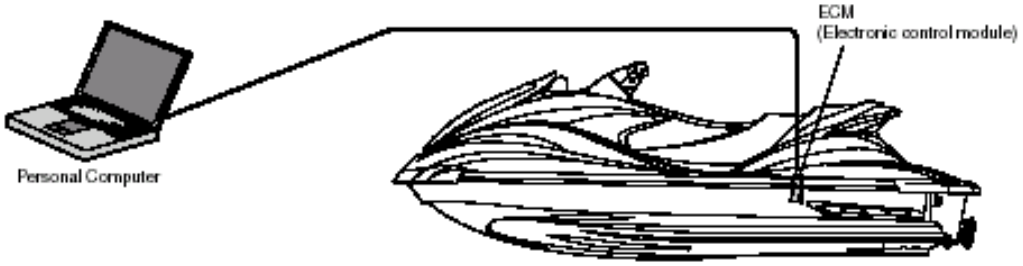


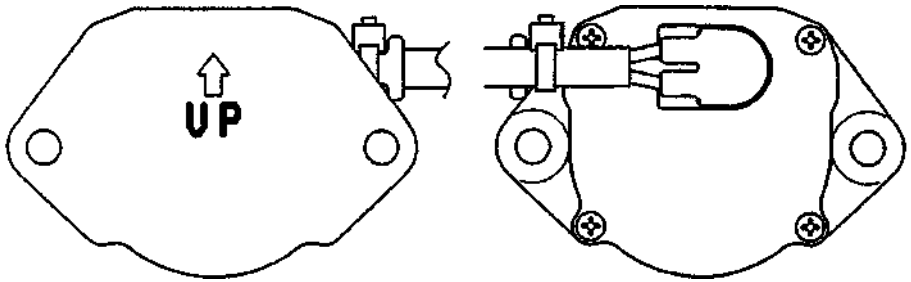
Controls

- QSTS
- Reverse lever

Electrical

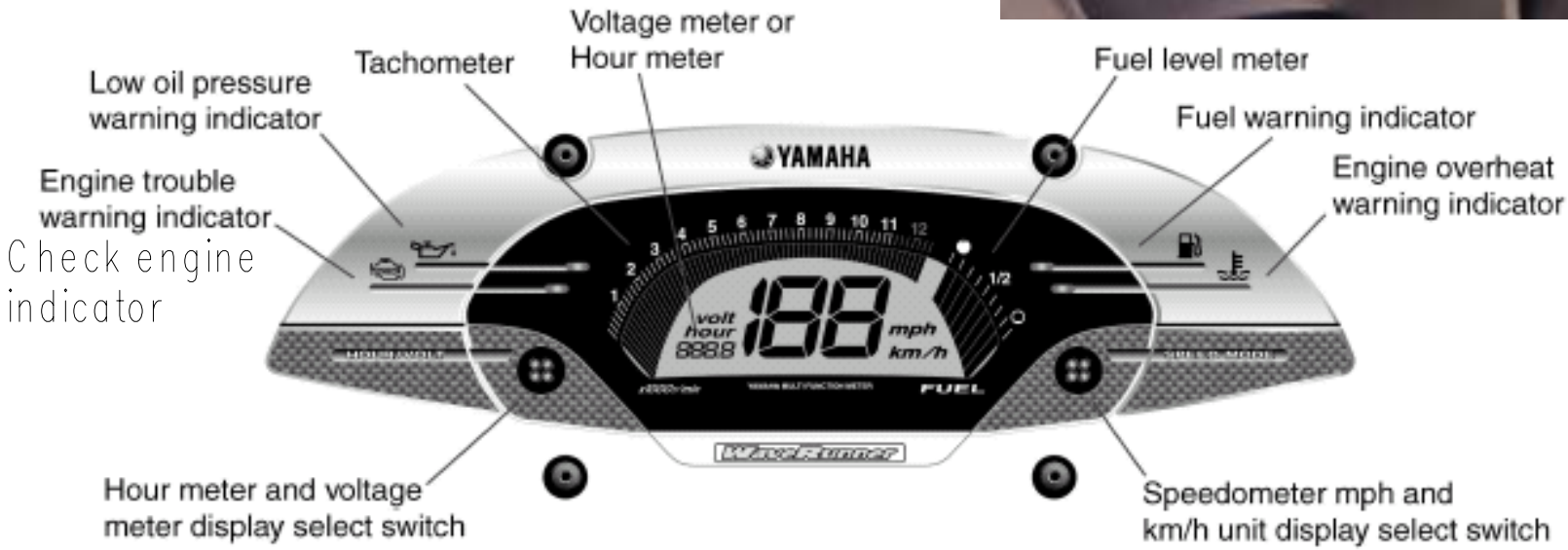
- Multifunction LCD meter
- Electric bilge pump
- Y.D.I.S.
- Slant detection switch





Instruments

- Newly designed multifunction meter
- Meter panel with dual-mode mile or kilometer
- Diagnostic code display



Diagnostic Code	
Display Code	Item
01	Normal
13	Pulser coil error
15	Thermal sensor
18	Throttle sensor
19	Battery voltage
23	Intake air sensor
24	Cam angle sensor
29	Intake air pressure sensor
33	Cooling control
39	Oil pressure
47	Rollover detection switch
48	Communication

Electric Bilge Pump

YAMAHA

Actual drain capacity : 19 Litter/minutes
(at FX140)

Pump Catalogue Data

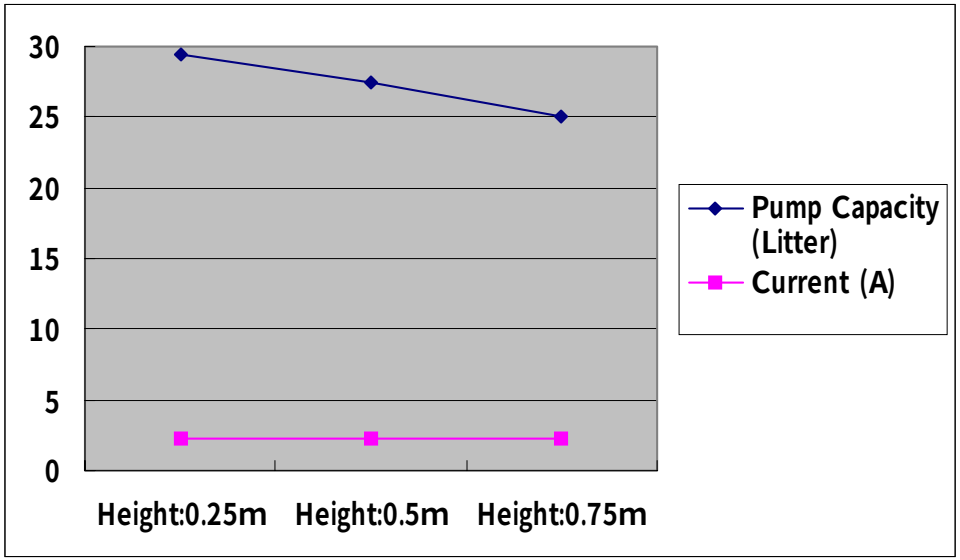
(Reference data)

Rated Performance
- Rated Voltage : DC12V
- Fuse size : 2.5A
- Rated Pump Capacity : 31Litters/minutes

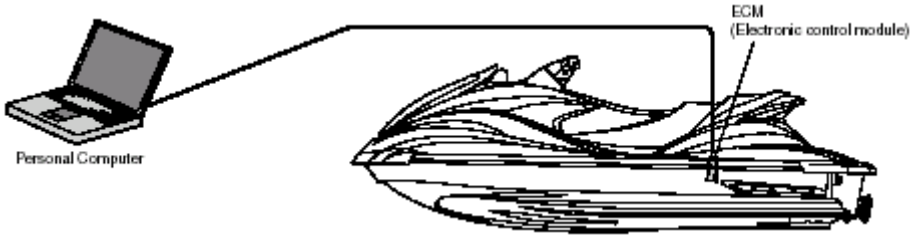
- Pump Capacity (Reference Data)/ Hose Height

Fixed Condition :DC14V,Hose Length:0.5m

	Height:0.25m	Height:0.5m	Height:0.75m
Pump Capacity (Litter)	29.5	27.5	25.1
Current (A)	2.3	2.3	2.3



Diagnostics

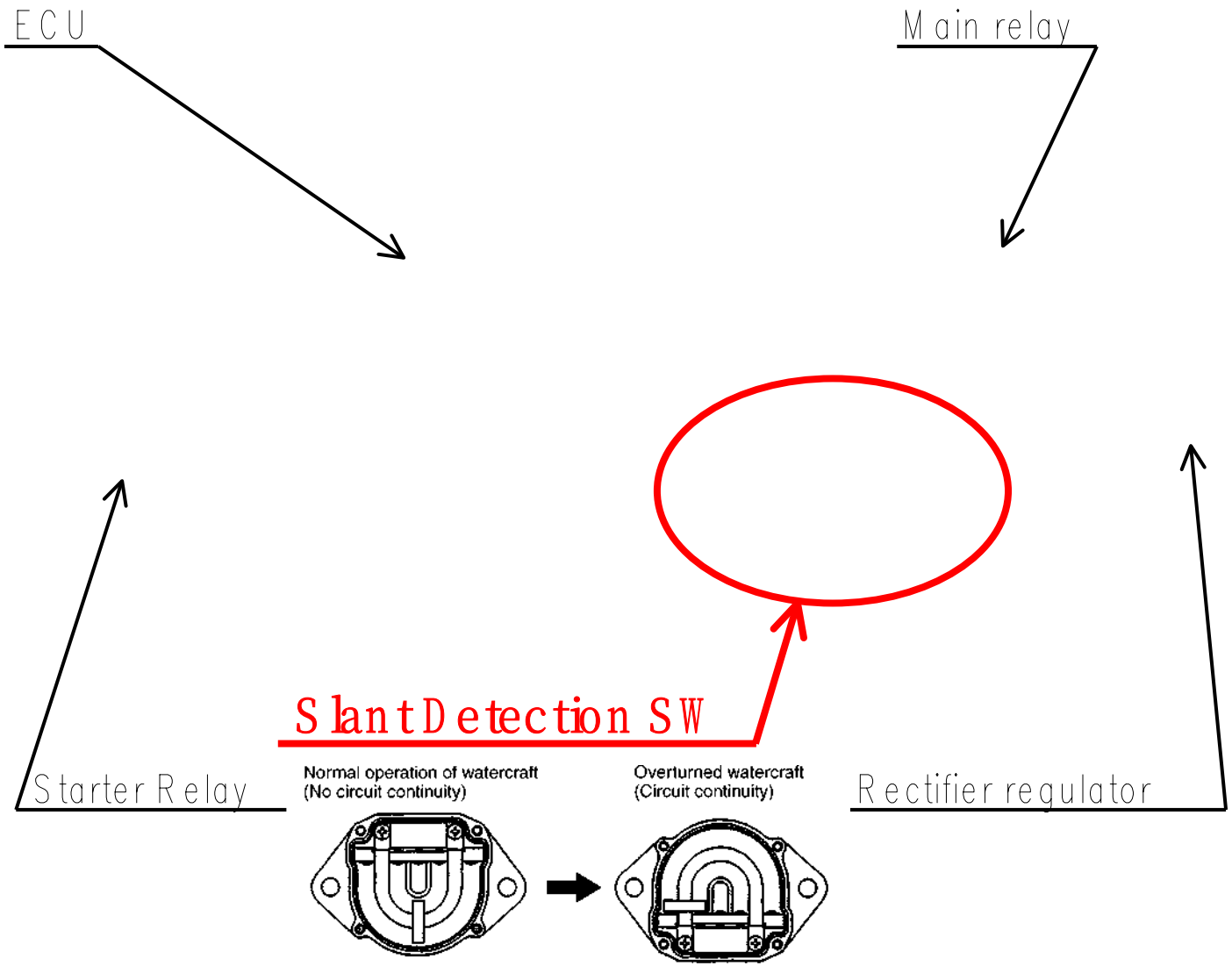


RS232C terminal

YDS functions

Diagnosis	To find malfunctioning parts and controls quickly
Diagnosis record	To check the engine's record of malfunctions.
Engine monitor	To find malfunctioning parts quickly. You can monitor rpm, ignition timing etc.
Stationary test	Without engine run, without engine disassembling, you can check ignition coil, fuel injector, fuel pump functions.
Active test	By stop ignition each cylinder, check which cylinder is malfunctioning.
Operation hours	Indicate how many hours the engine run in each rpm range.
Data logger	To check engine situation which is recorded and stored in ECU, after engine stopped or failed.
ECU Information	ECU's parts number will be indicated.
Identification Watercraft and Outboards	To identify which system is under operation, picture of OM or Watercraft will be indicated on up left corner of PC screen.

Slant Detection Swich



Technical Tips

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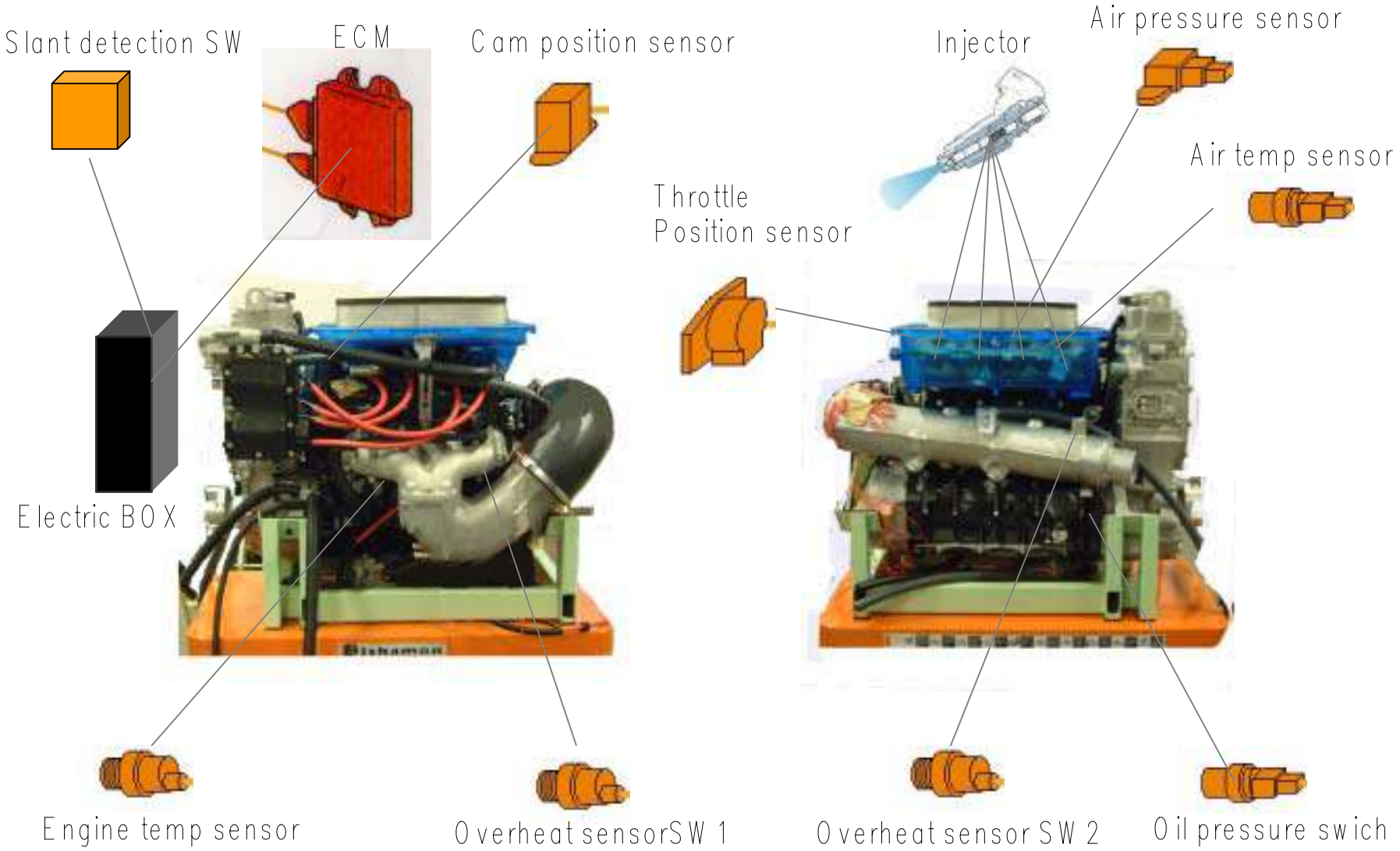
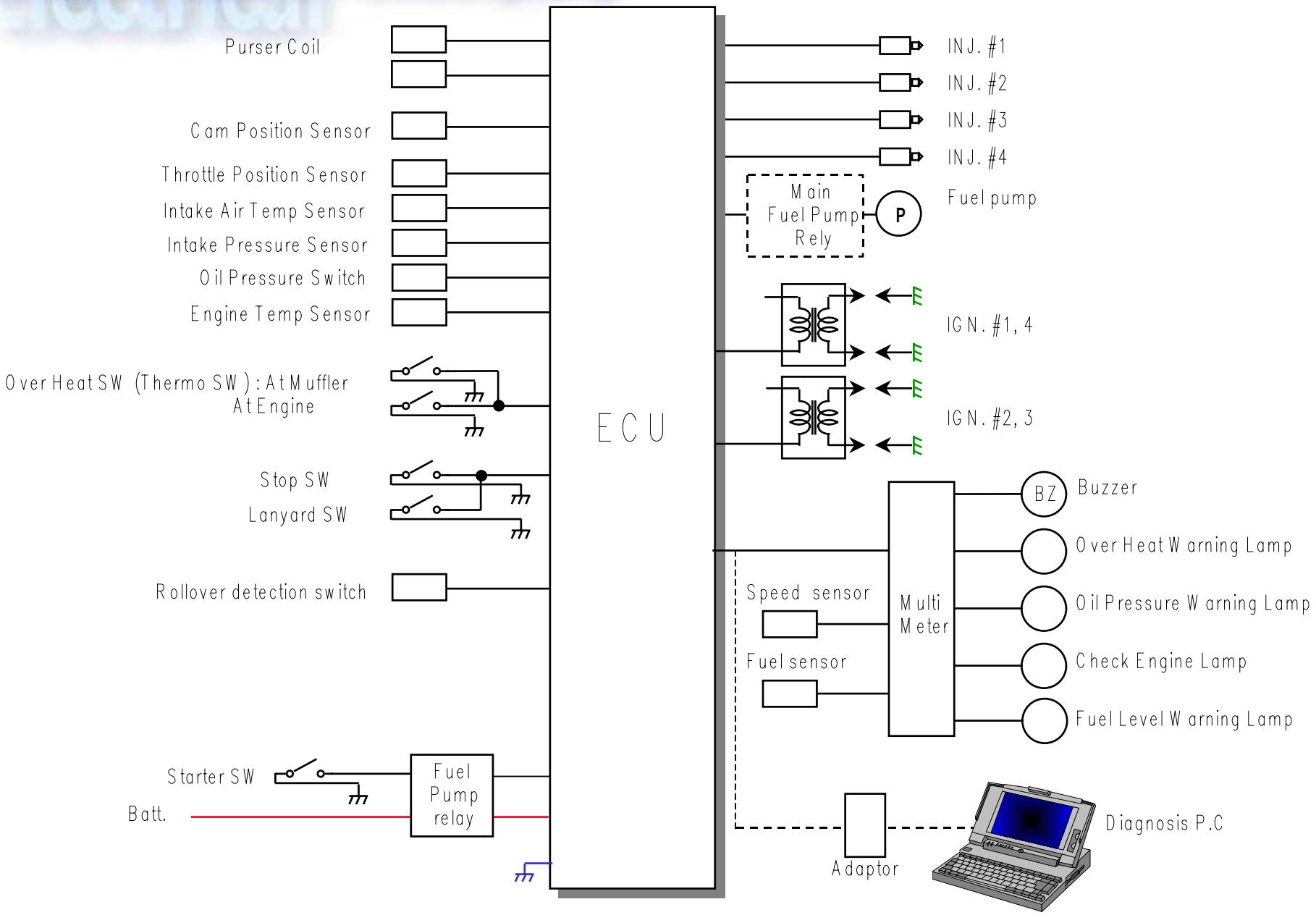
- Sensor & Switches
- ECM
- Fuel Injection & Ignition Timing
- Overheat Mode
- Oil Pressure mode


Slant detection SW
ECM
Cam position sensor
Injector
Air pressure sensor
Air temp sensor
Throttle
Position sensor
Electric BOX
Engine temp sensor
Overheat sensorSW 1
Overheat sensor SW 2
Oil pressure swich

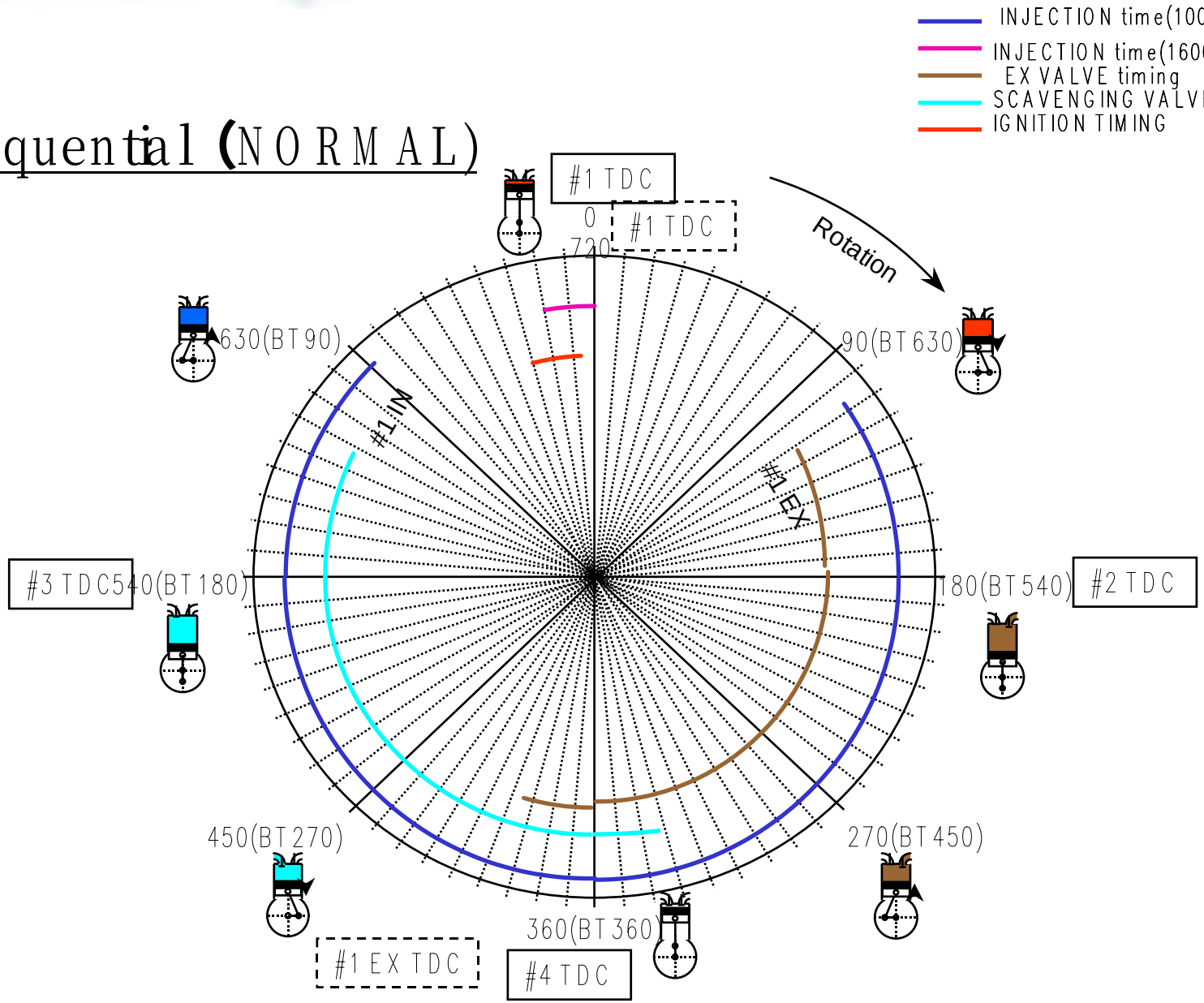
ITEM	INJECTOR	IGNITION	SENSOR							
			CAM POSITION SENSOR	TPS	INTAKE PRESSURE SENSOR	INTAKE TEMP SENSOR	ENGINE TEMP	OIL PRESSURE S/W	THERMO S/W 1	THERMO S/W 2
STARTING FUEL INJECTION	GROUP INJECTION	BTDC15～20	○	○	○	○	○	N/A	N/A	N/A
NORMAL FUEL INJECTION	SEQUENTIAL INJECTION	N/A (BTDC5～30)	○	○	○	○	○	N/A	N/A	N/A
WARMING UP	SEQUENTIAL INJECTION		N/A	N/A	N/A	○	○	N/A	N/A	N/A
ACCELERATION	SEQUENTIAL INJECTION		N/A	○	N/A	N/A	N/A	N/A	N/A	N/A
OVER HEAT	#1/#4 FUEL CUT		○	○	N/A	N/A	○	N/A	○	○
LOW OIL PRESSURE	#1/#4 FUEL CUT		○	N/A	N/A	N/A	N/A	○	N/A	N/A
OVER REV	#1/#4 FUEL CUT		○	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Electronic Control Module (ECM)



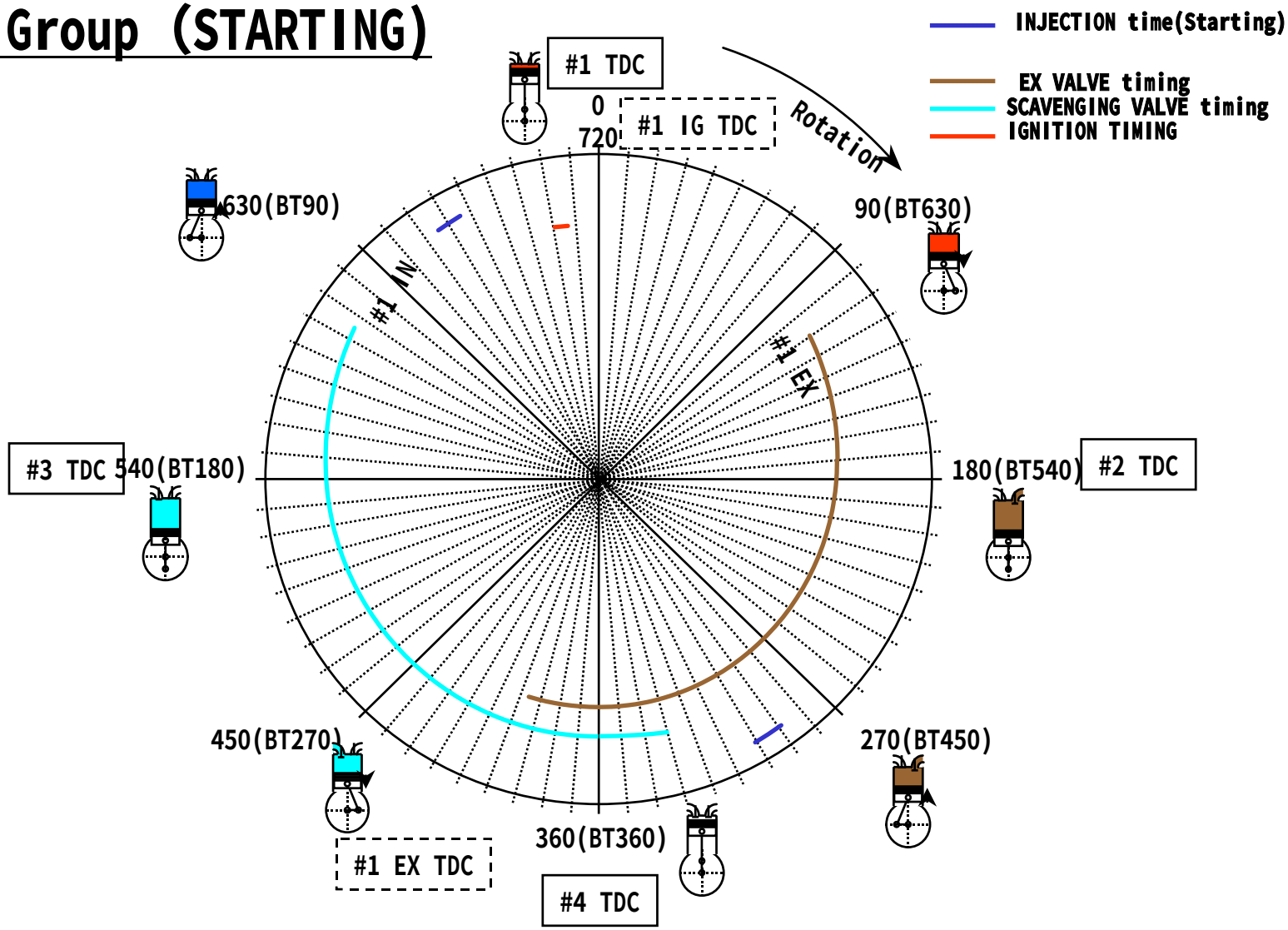
YAMAHA

- Sequential (NORMAL)



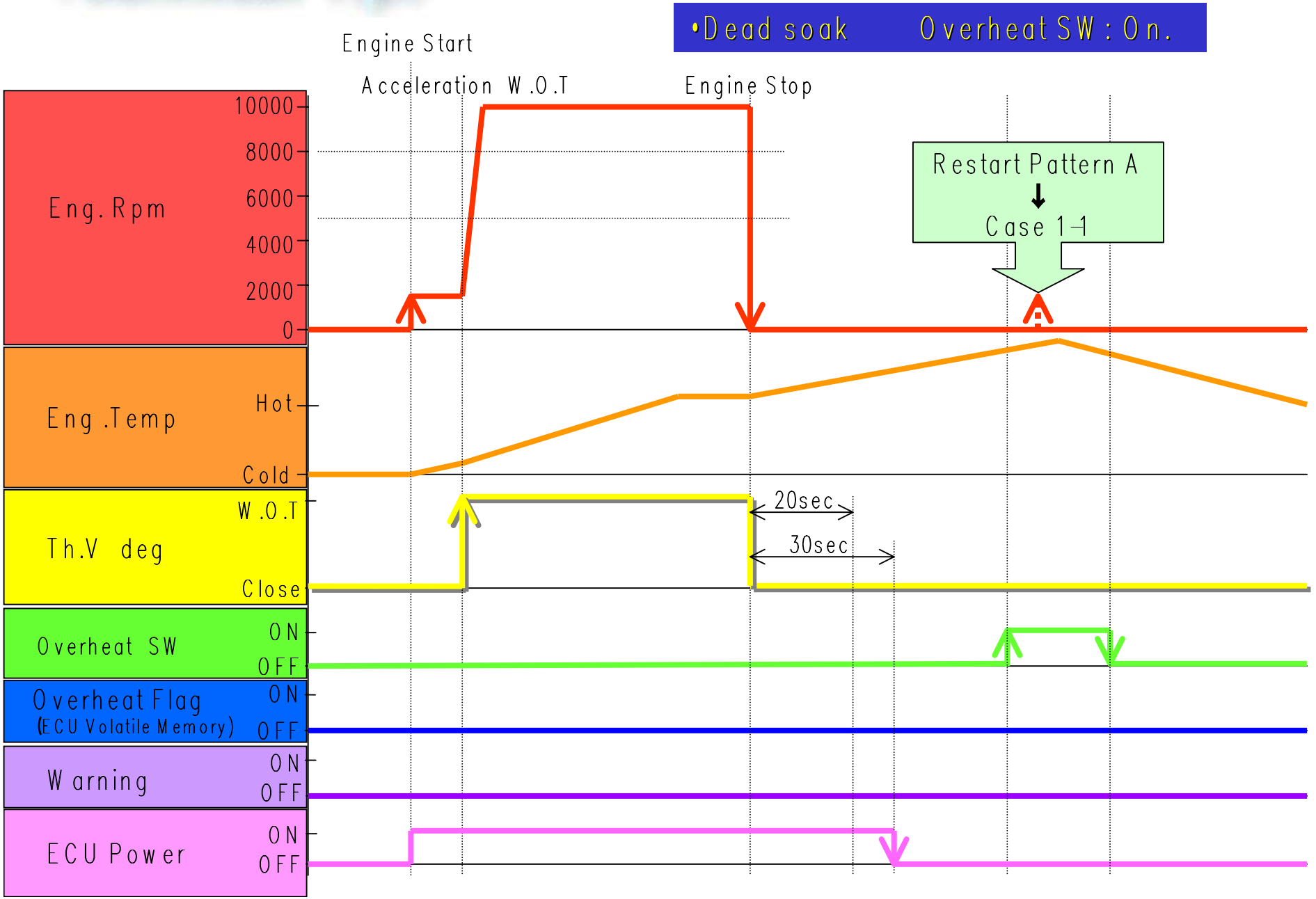
YAMAHA

• Group (STARTING)



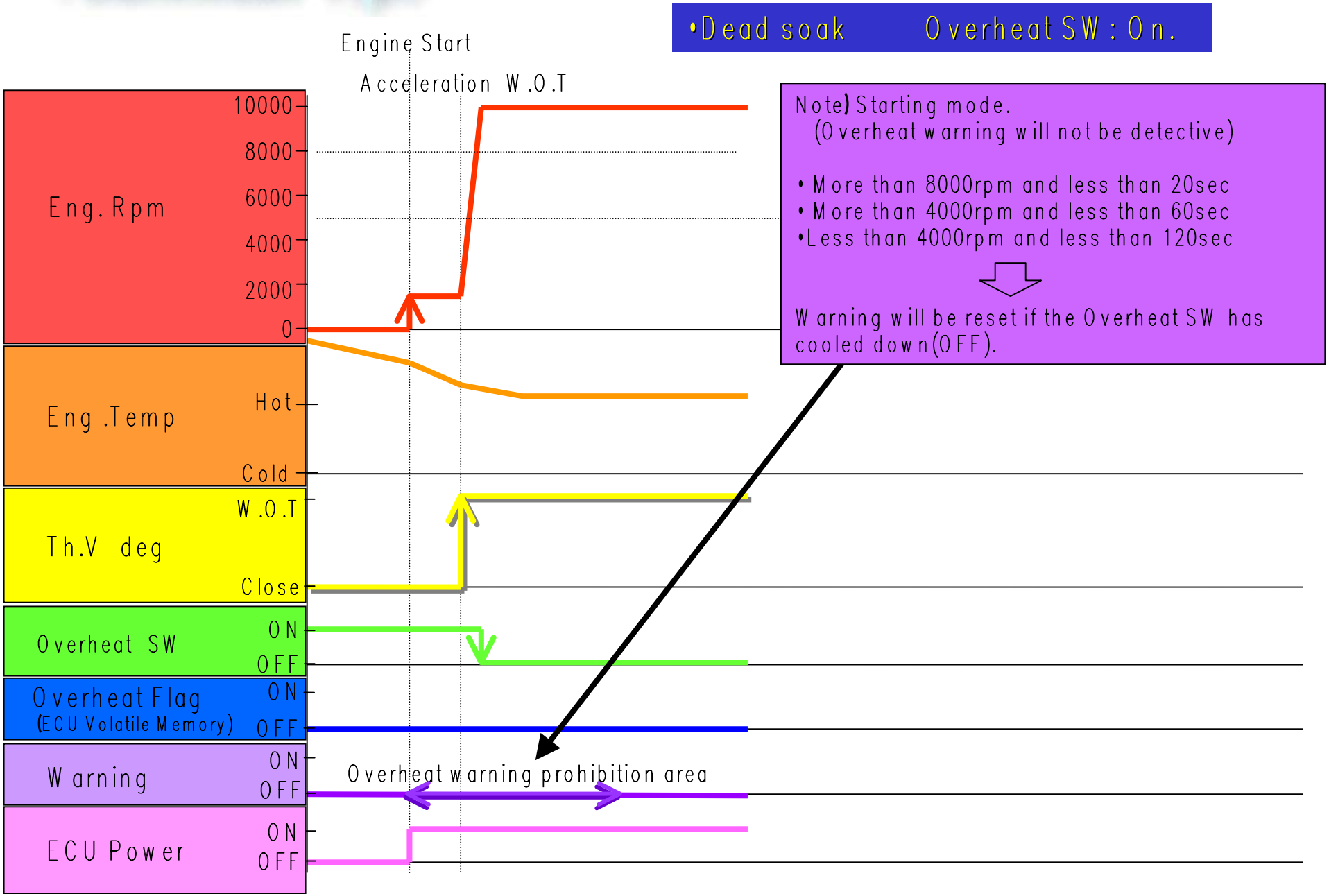
Overheat Mode

YAMAHA



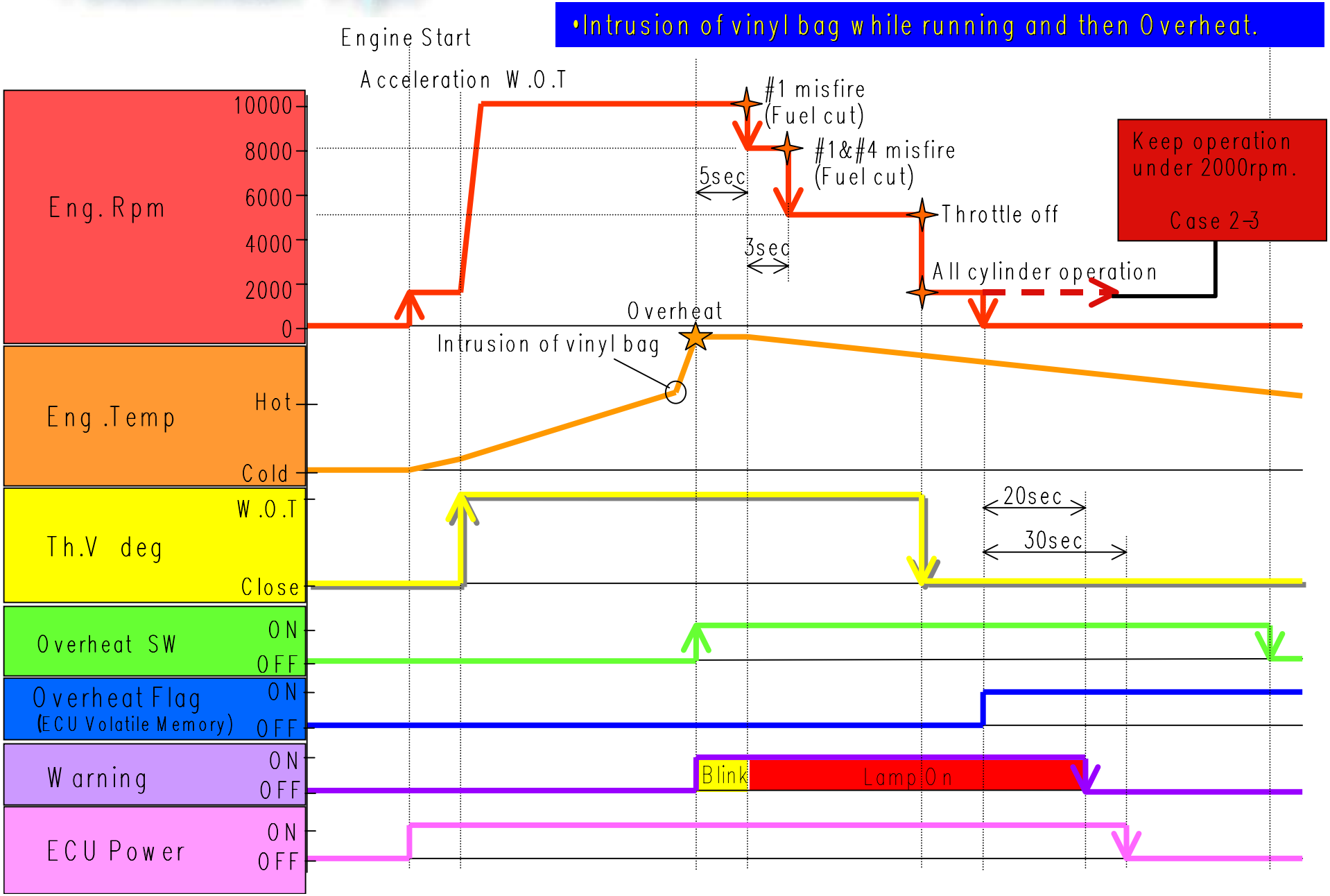
Overheat Mode

YAMAHA

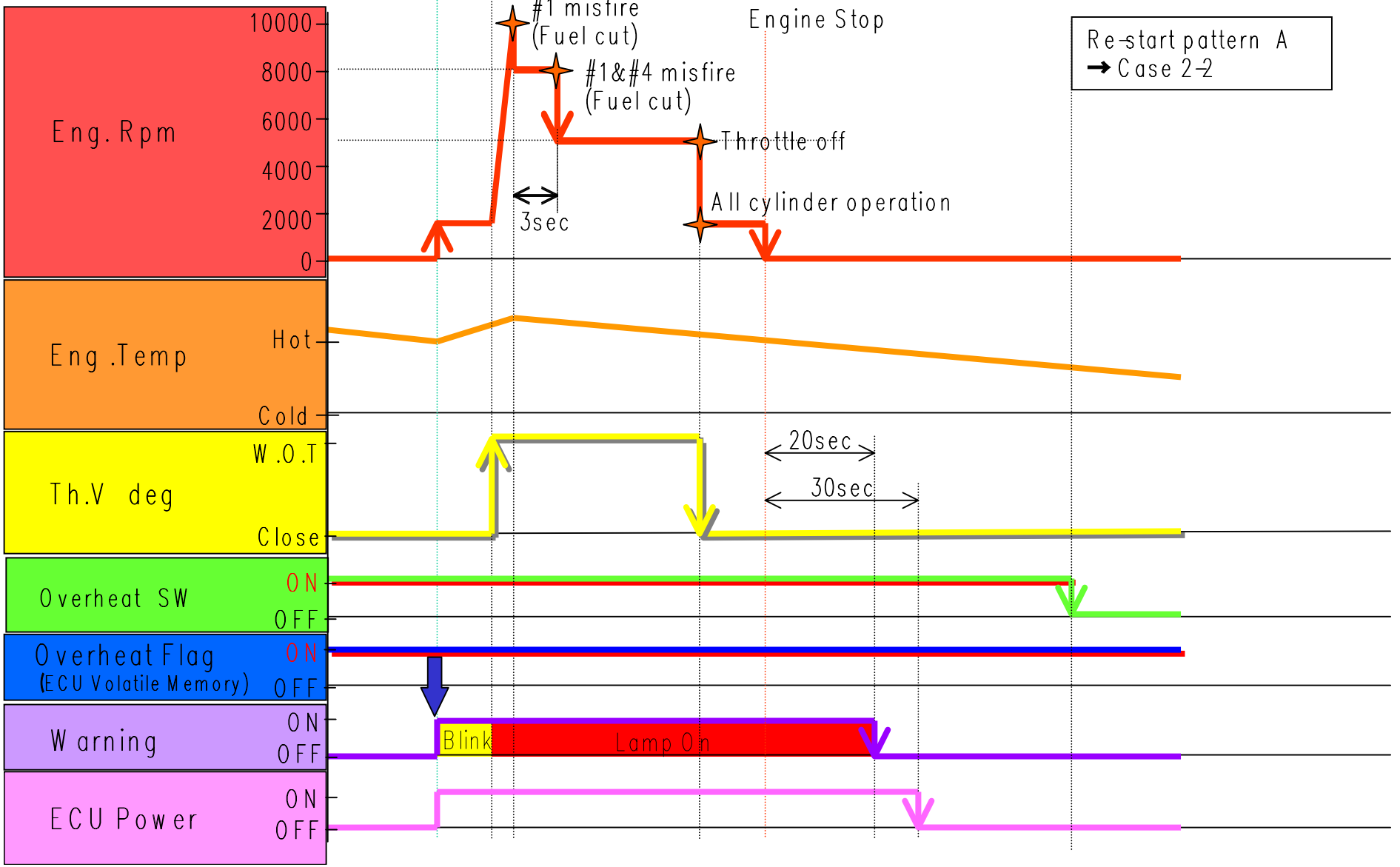


Overheat Mode

YAMAHA



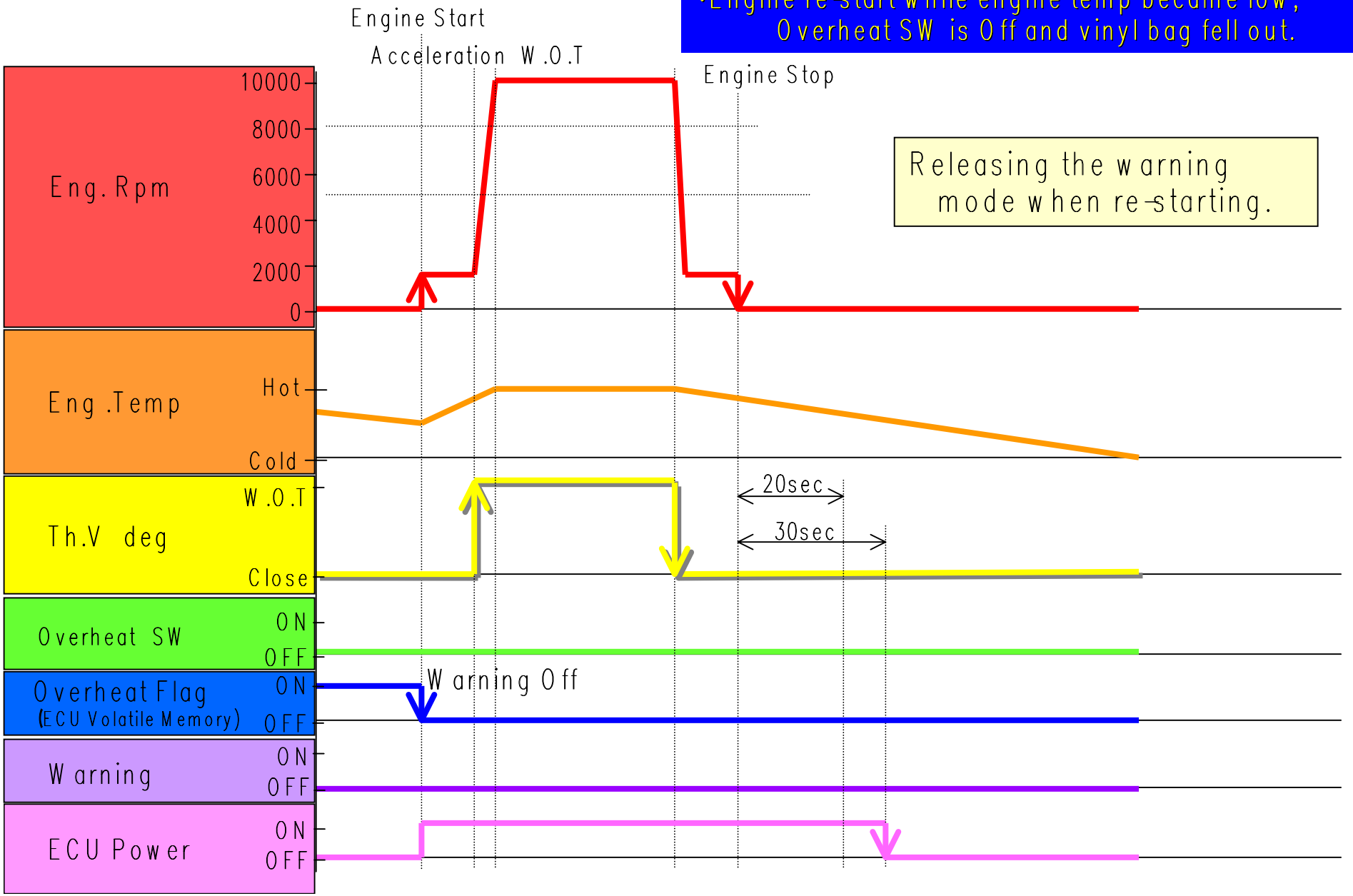
Overheat Mode



Overheat Mode

YAMAHA

• Engine re-start while engine temp became low, Overheat SW is Off and vinyl bag fell out.

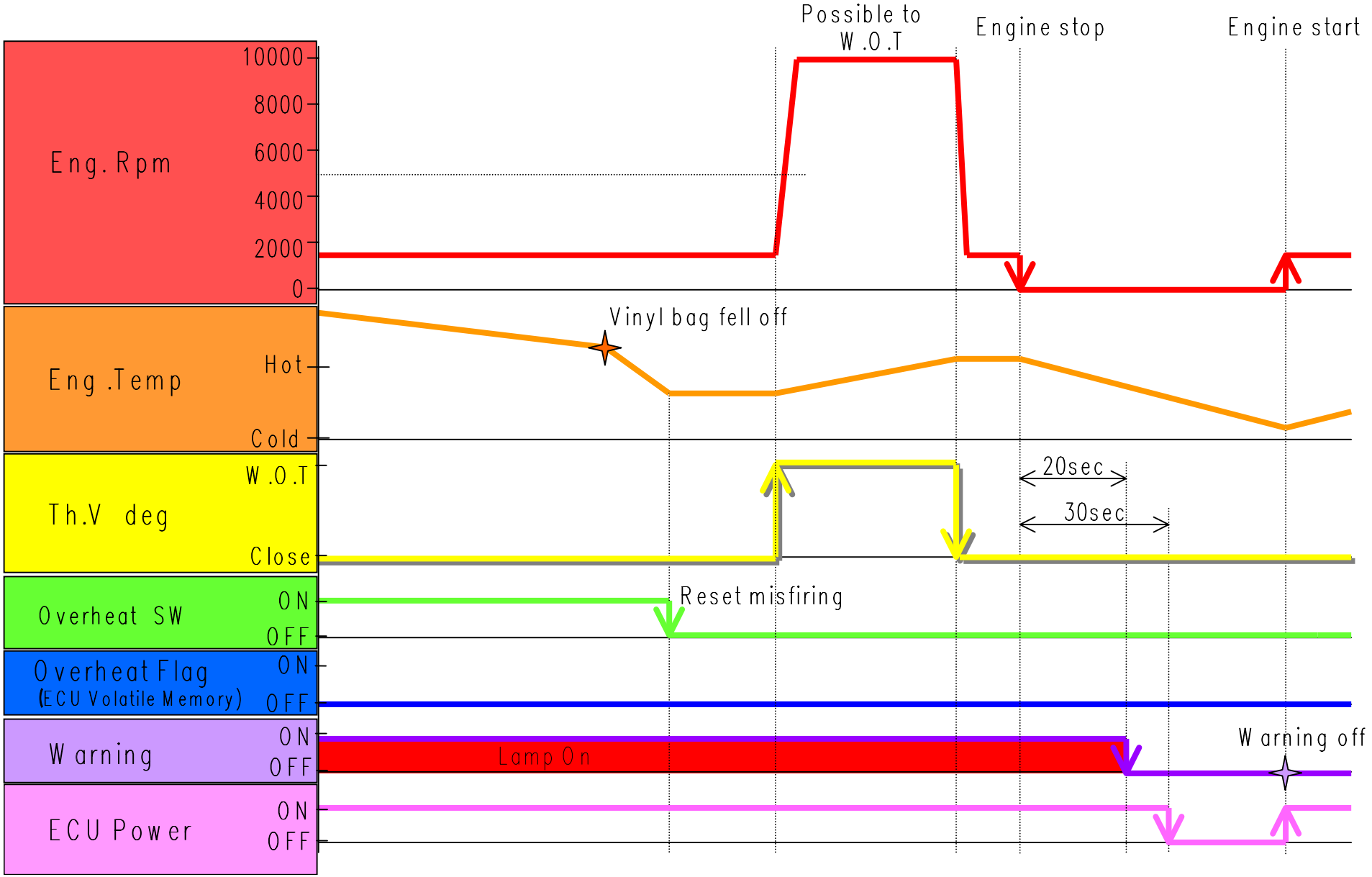


Overheat Mode

Technical Tips

YAMAHA

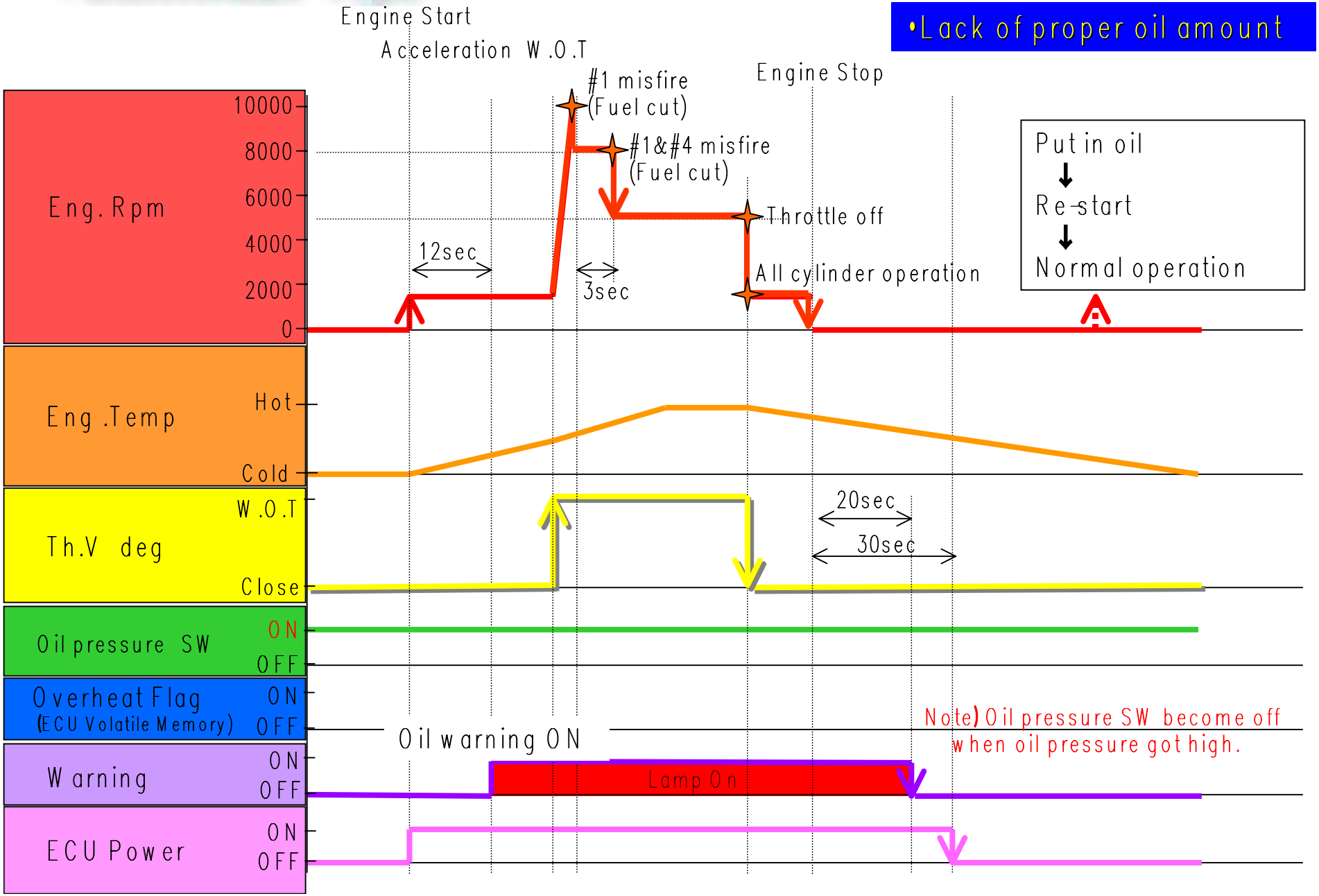
•Vinyl bag fell off when vehicle keeping operation with overheat condition.



Oil Pressure Mode

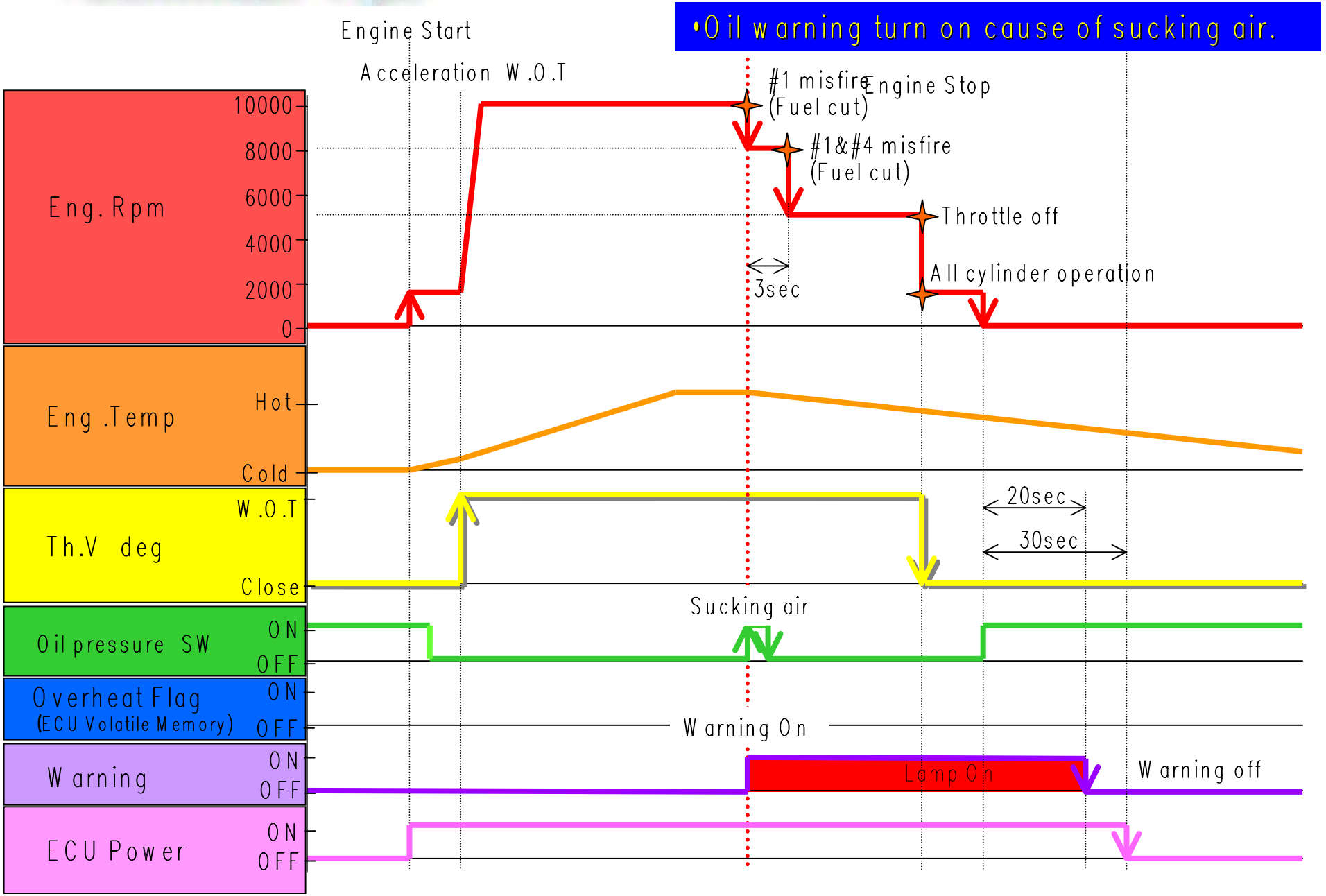
YAMAHA

• Lack of proper oil amount

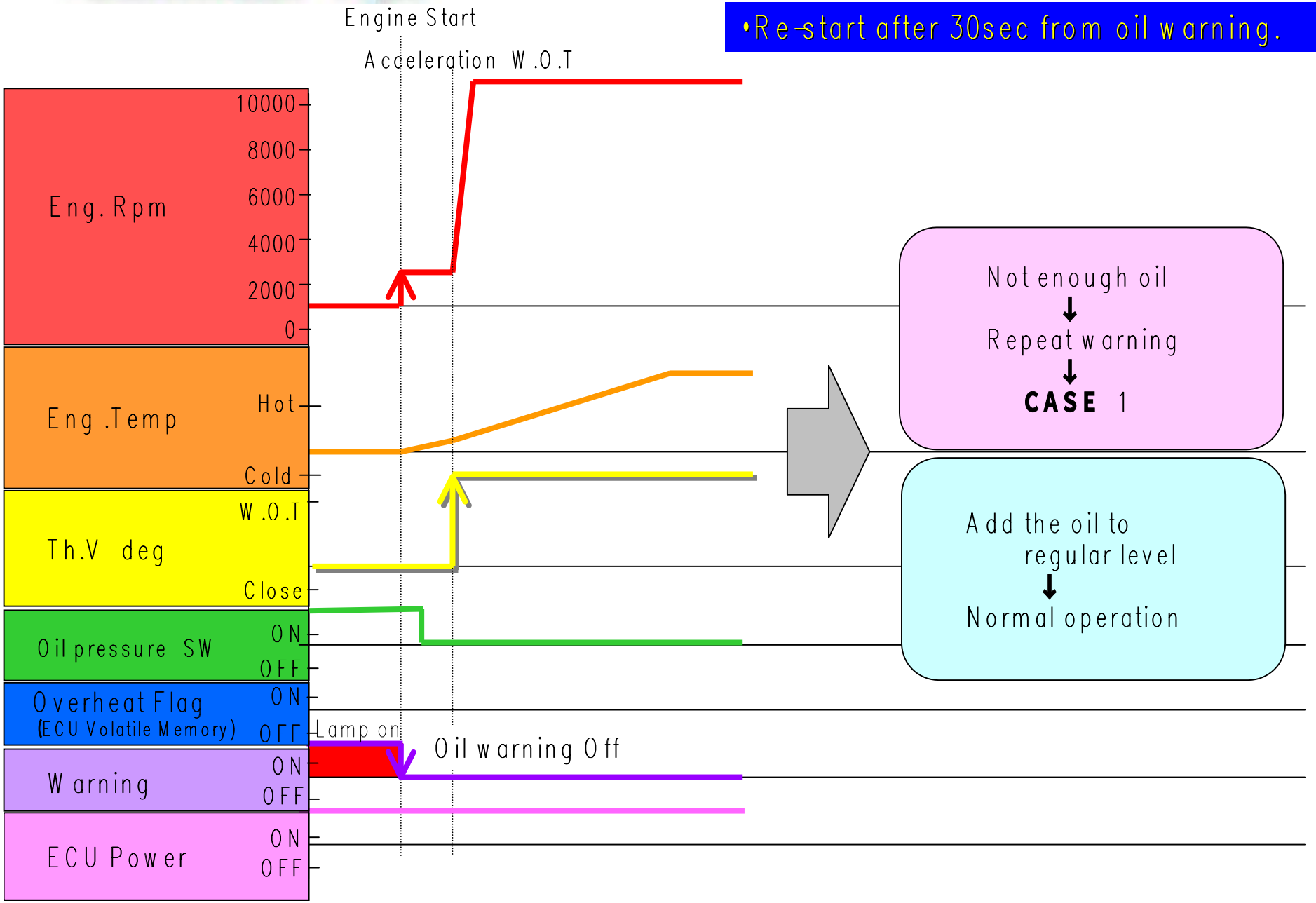


Oil Pressure Mode

YAMAHA



Oil Pressure Mode



Service Tips

- Periodic Inspection
- Oil maintenance
- Synchronization (Throttle Body)
- Engine Removing
- Valve Clearance
- Bearing Selection
- Other Information

Perlodic Inspection Chart

YAMAHA

PERLODIC INSPECTION CHART

●: INDICATES THE CHECKUPS WHICH YOU MAY DO YOURSELF
○: INDICATES WORK TO BE DONE BY YOUR WATER VEHICLE DEALER

ITEM \ MAINTENANCE INTERVAL		INITIAL			THERE AFTER EVERY	
		10h	50h	100h	100h／1year	200h／2year
SPARKPLUG	INSPECT/CLEANING/ADJUSTMENT	●	●	●	●	
LUBRICATION POINT	GREASING			●	●	
INTERMEDIATE	GREASING	○*1		●*2	●*2	
FUEL SYSTEM	INSPECT			○	○	
FUEL TANK	CLEANING			○	○	
FUEL FILTER	INSPECT, CLEAN			○	○	
TROLLING SPEED	ADJUSTMENT	○		○	○	
THROTTLE SHAFT	INSPECT			○	○	
COOLING SYSTEM	CLEANING／FLUSHING	● (AFTER EVERY RIDE)				
WATER INLET STRAINER	INSPECT, CLEAN			○	○	
BILGE STRAINER	INSPECT			○	○	
ELECTRICAL BILGE PUMP STRAINER	INSPECT, CLEAN			○	○	
IMPELLER	INSPECT		●	●	●	
STEERING CABLE	INSPECT		●	●	●	
STEERING BOSS	INSPECT	○		○	○	
QSTS MECHANISM	INSPECT	●		○	○	
SHIFT SYSTEM	INSPECT/ADJUSTMENT			○	○	
THROTTLE CABLE	INSPECT/ADJUSTMENT			●	●	
DRAIN PLUG	INSPECT/REPLACEMENT			○	○	
BATTERY	INSPECT	● (INSPECT FLUID LEVEL BEFORE EVERY RIDE)				
RUBBER COUPLING	INSPECT					○
ENGINE MOUNT	INSPECT					○
BOLT & NUT	INSPECT	○		○	○	
AIR FILTER ELEMENT	INSPECT				●	
ENGINE OIL	REPLACEMENT	●		●	●	
OIL FILTER	REPLACEMENT					○
VALVE CLEARANCE	INSPECT/ADJUSTMENT					○

*1: GREASE＝33.0～35.0c?
*2: GREASE＝6.0～8.0c?

Oil Maintenance

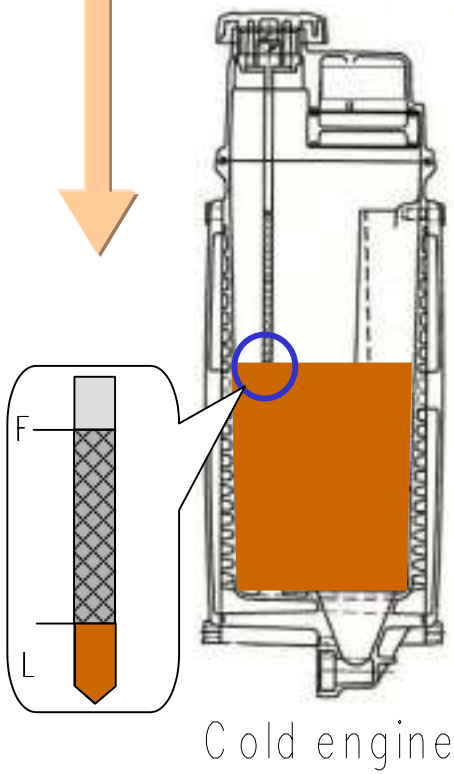
Engine Oil Amount for Each place		
ENGINE	1.3	
FILTER	0.2	
OILTANK	2.8	
TOTAL	4.3	(LITER)

Oil Maintenance

Engine Oil Amount for Each place		
ENGINE	1.3	
FILTER	0.2	
OILTANK	2.8	
TOTAL	4.3	(LITER)

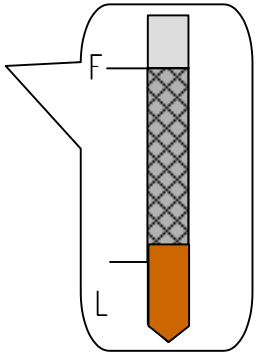
OIL LEVEL CHECK

Check oil level in cold engine situation before every operation.

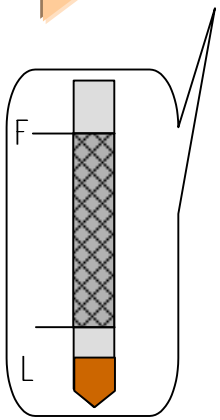


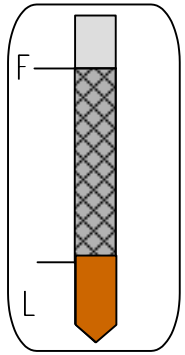
Cold engine

It is possible for 1day to use, if there is more than .L. mark



If oil level is under than .L. mark, Fill the oil around .L. mark on gauge.

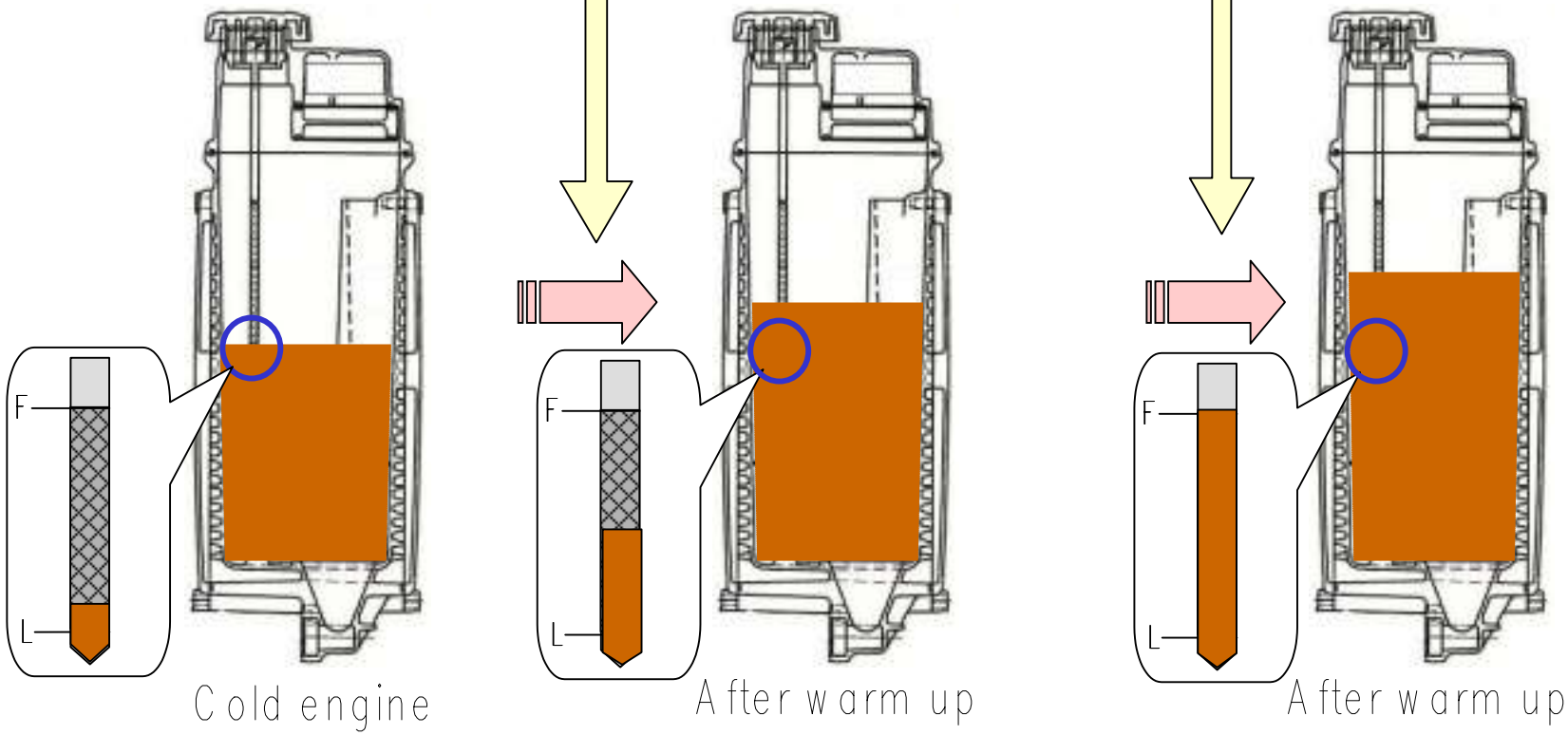




OIL LEVEL ADJUSTMENT

Before oil level checking, fully warm up the engine, and then keep the trolling about 2min before engine stop.

Check oil level and fill the oil till .F. mark



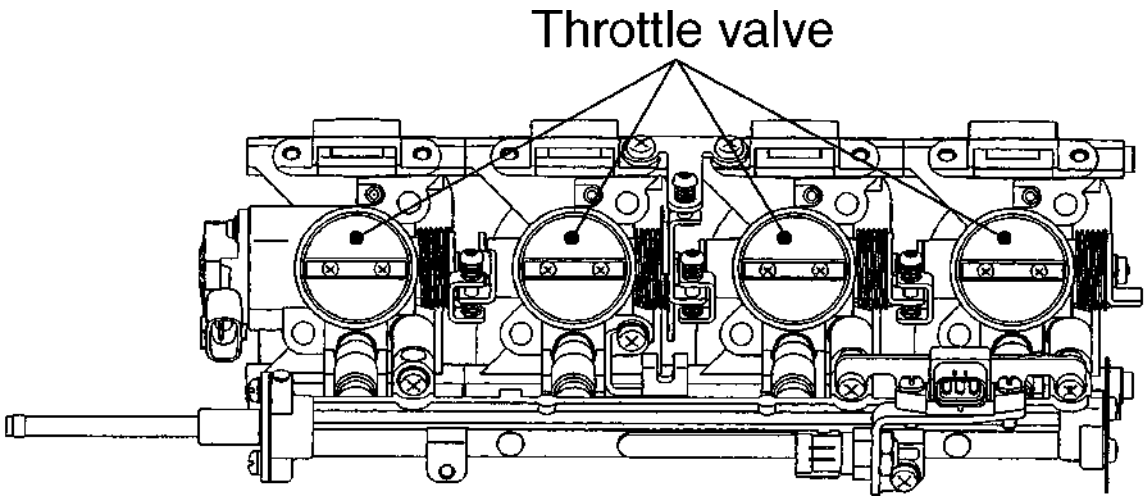
Cold engine

After warm up

After warm up

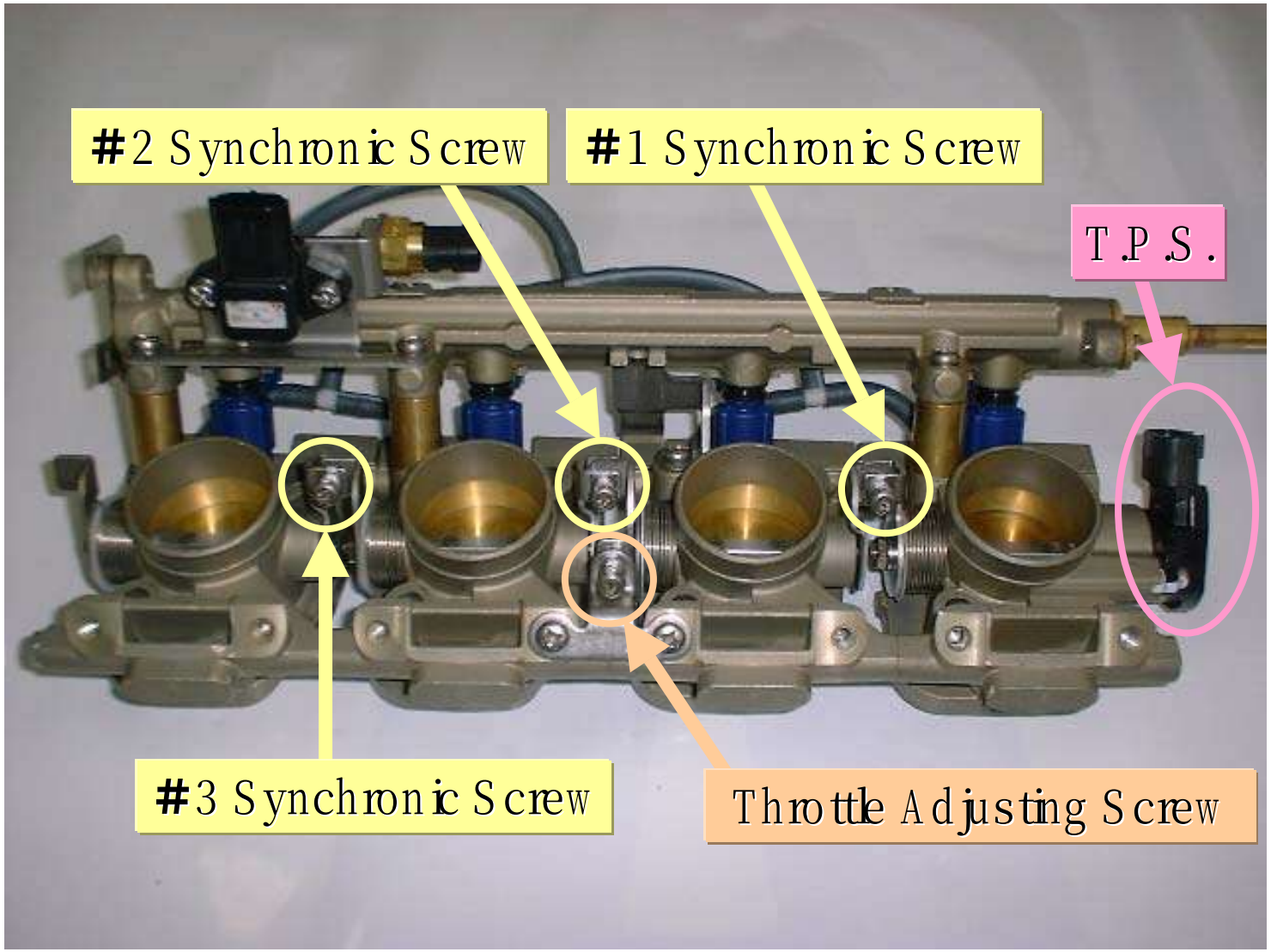
➢ Throttle Body

Synchronization Procedure



YAMAHA

Name of Adjustment Screw



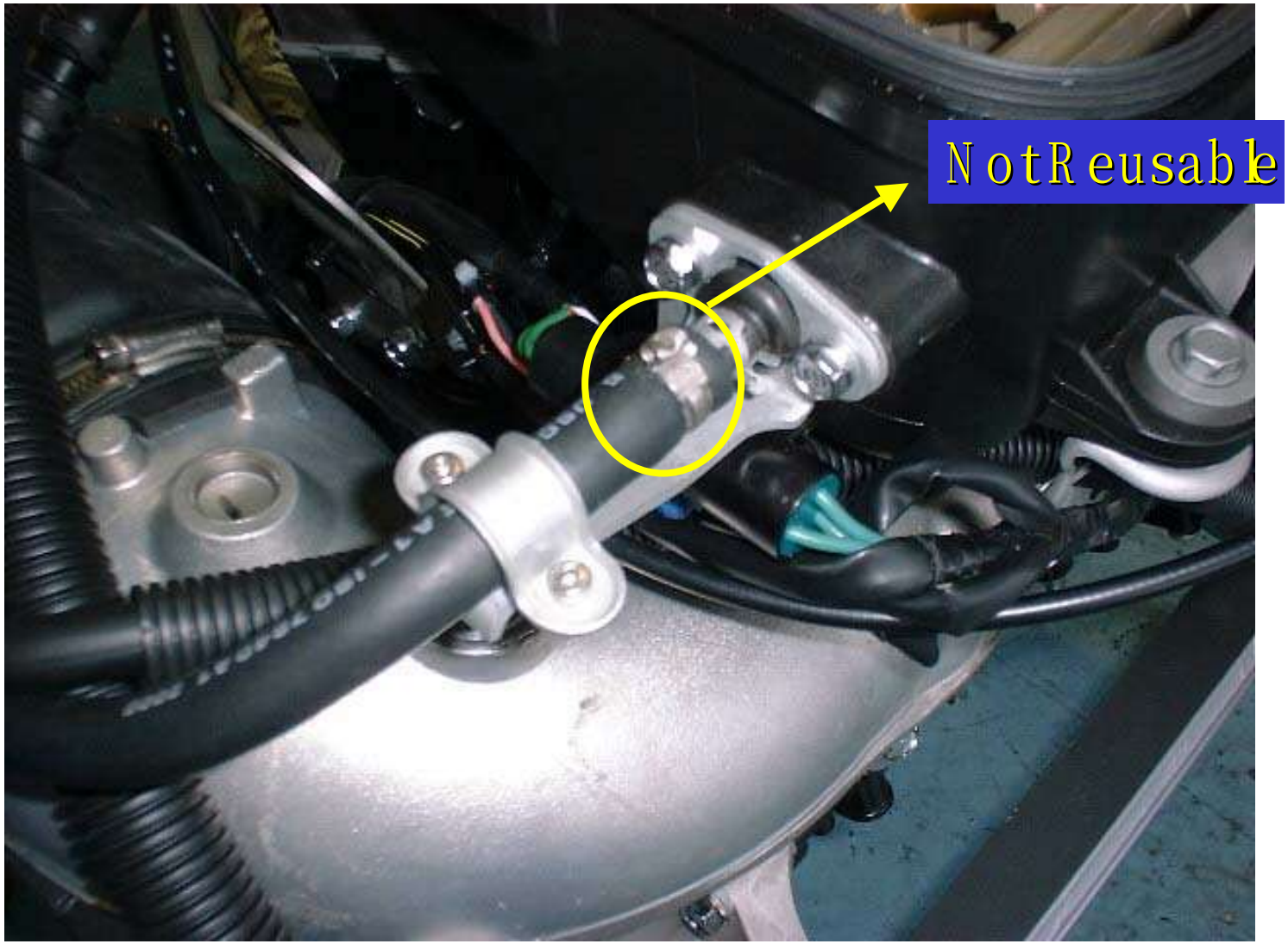
Throttle Body Synchronization

FRAME ARRESTER

Throttle Body Synchronization

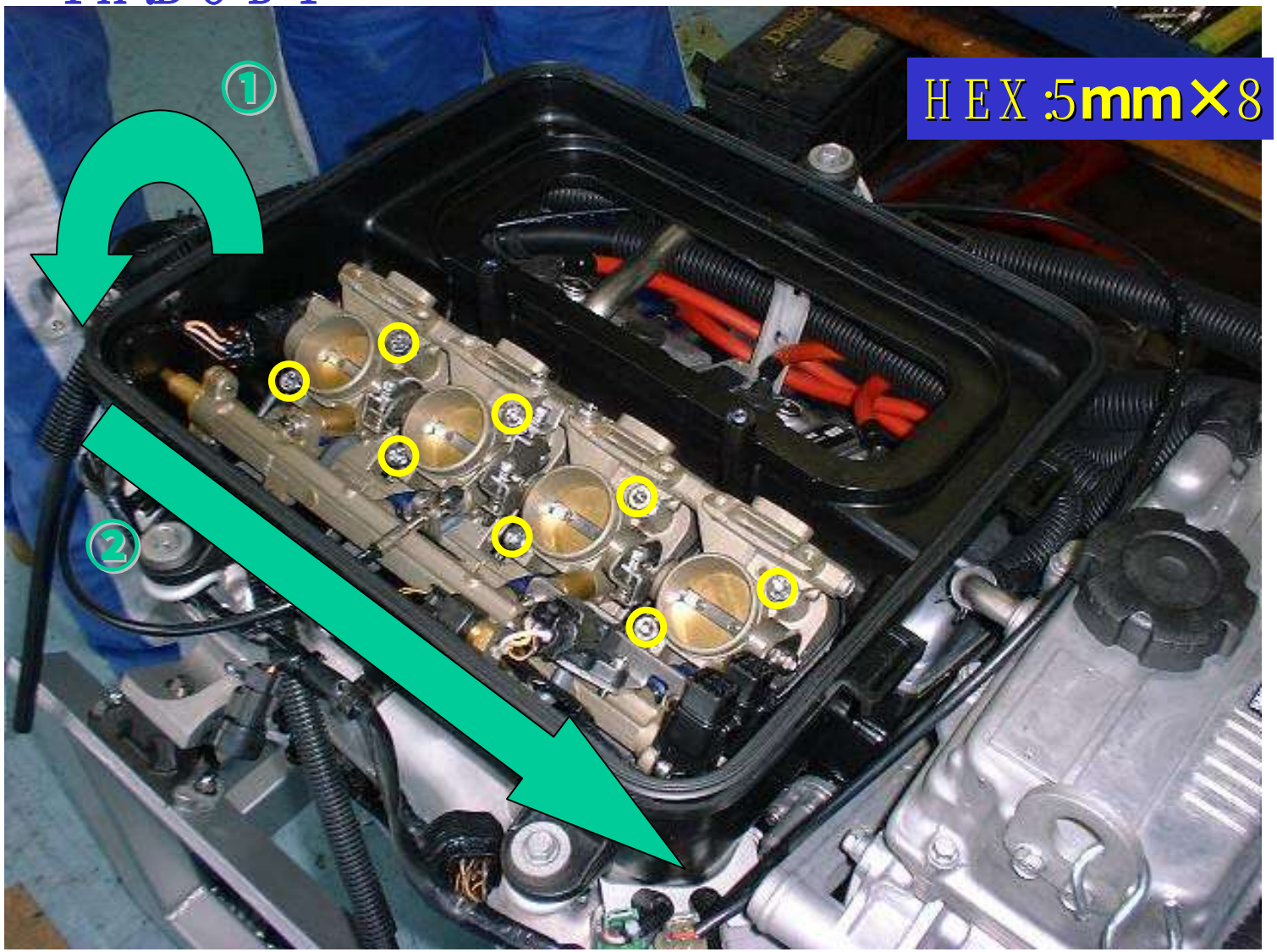
【ZOOM】　　FRAME ARRESTER

FUEL HOSE DISASSEMBLING



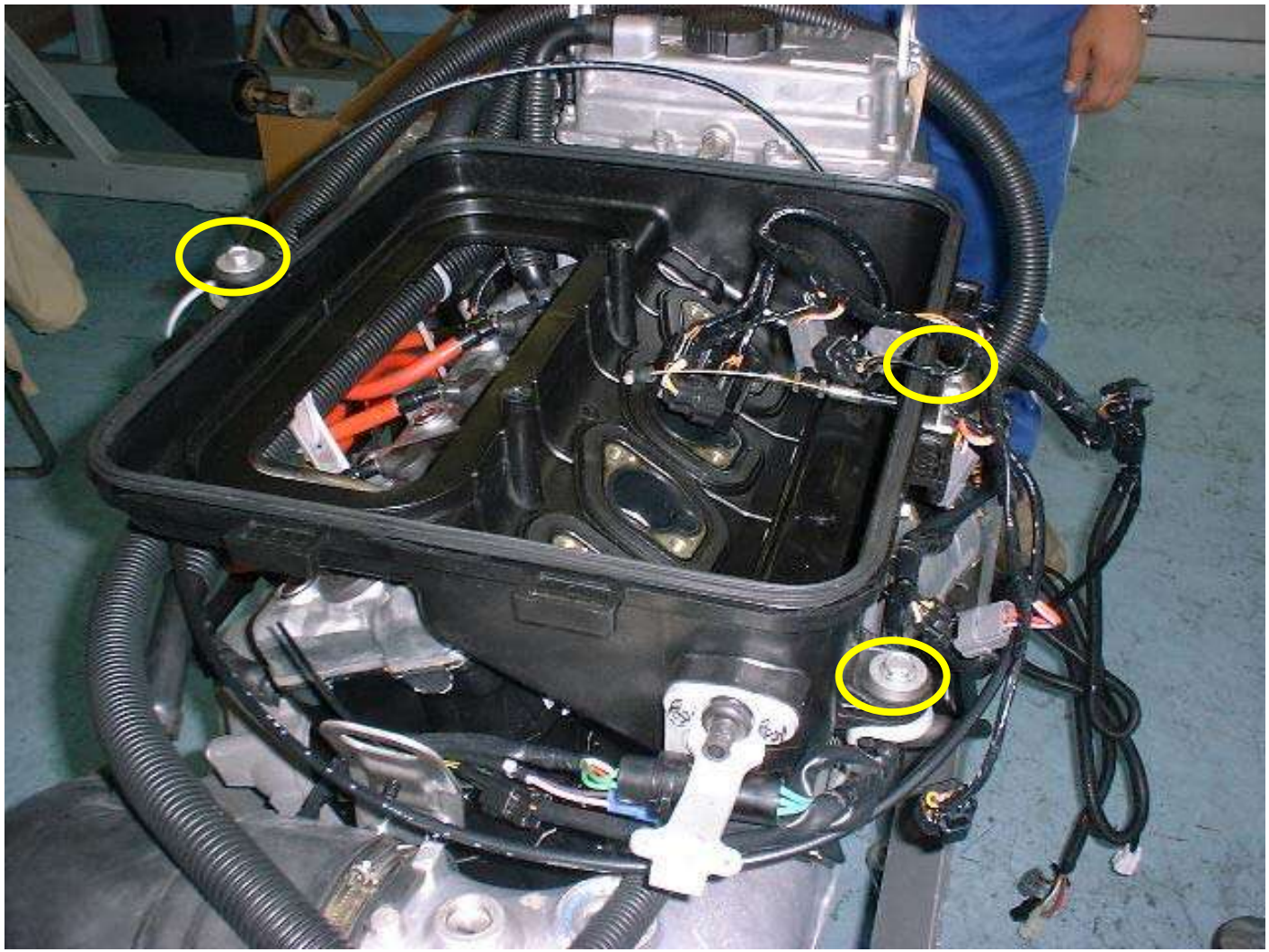
Throttle Body Synchronization

Th.BODY

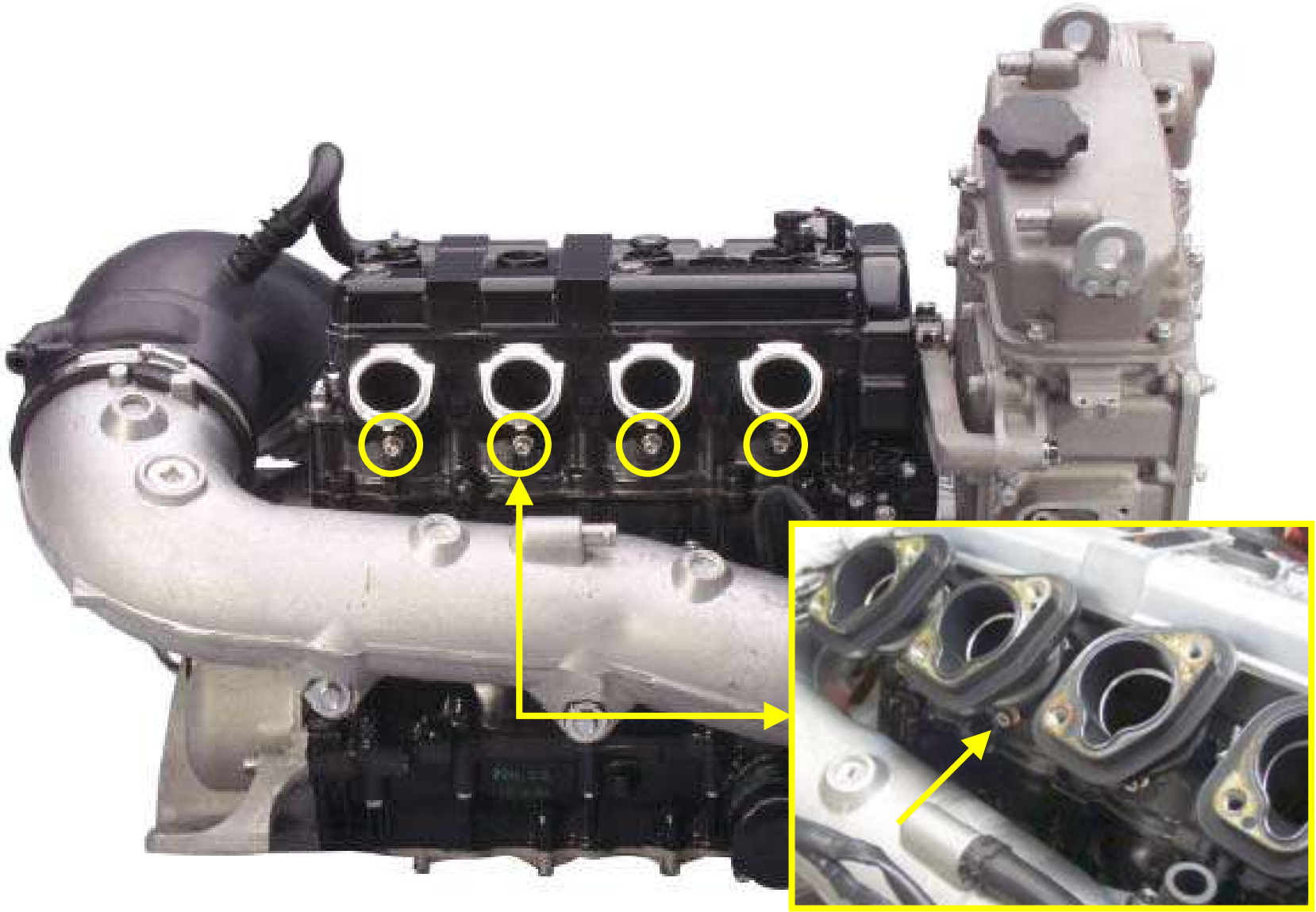


Throttle Body Synchronization

AIR CLEANER BOX ASSY



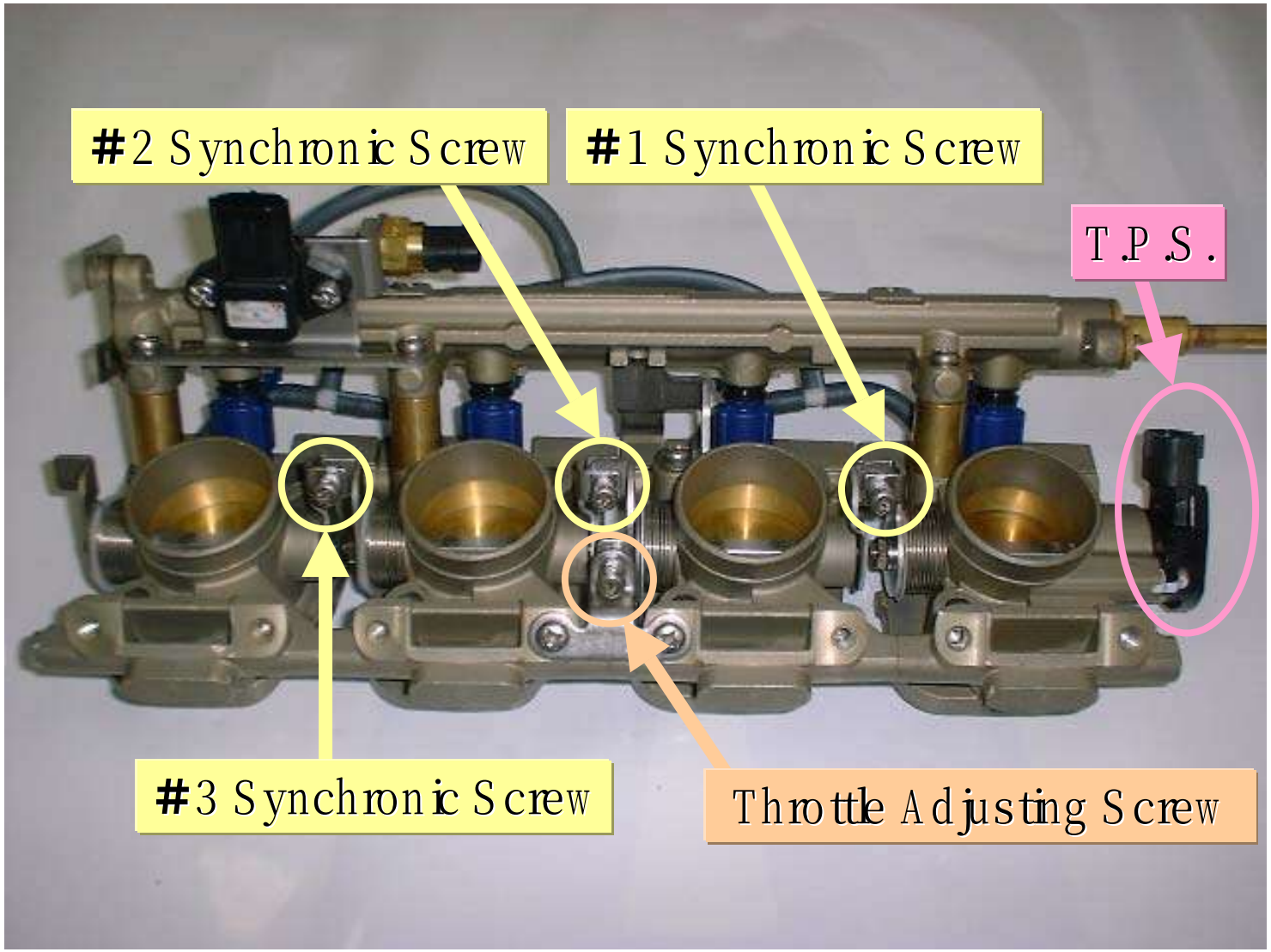
Throttle Body Synchronization



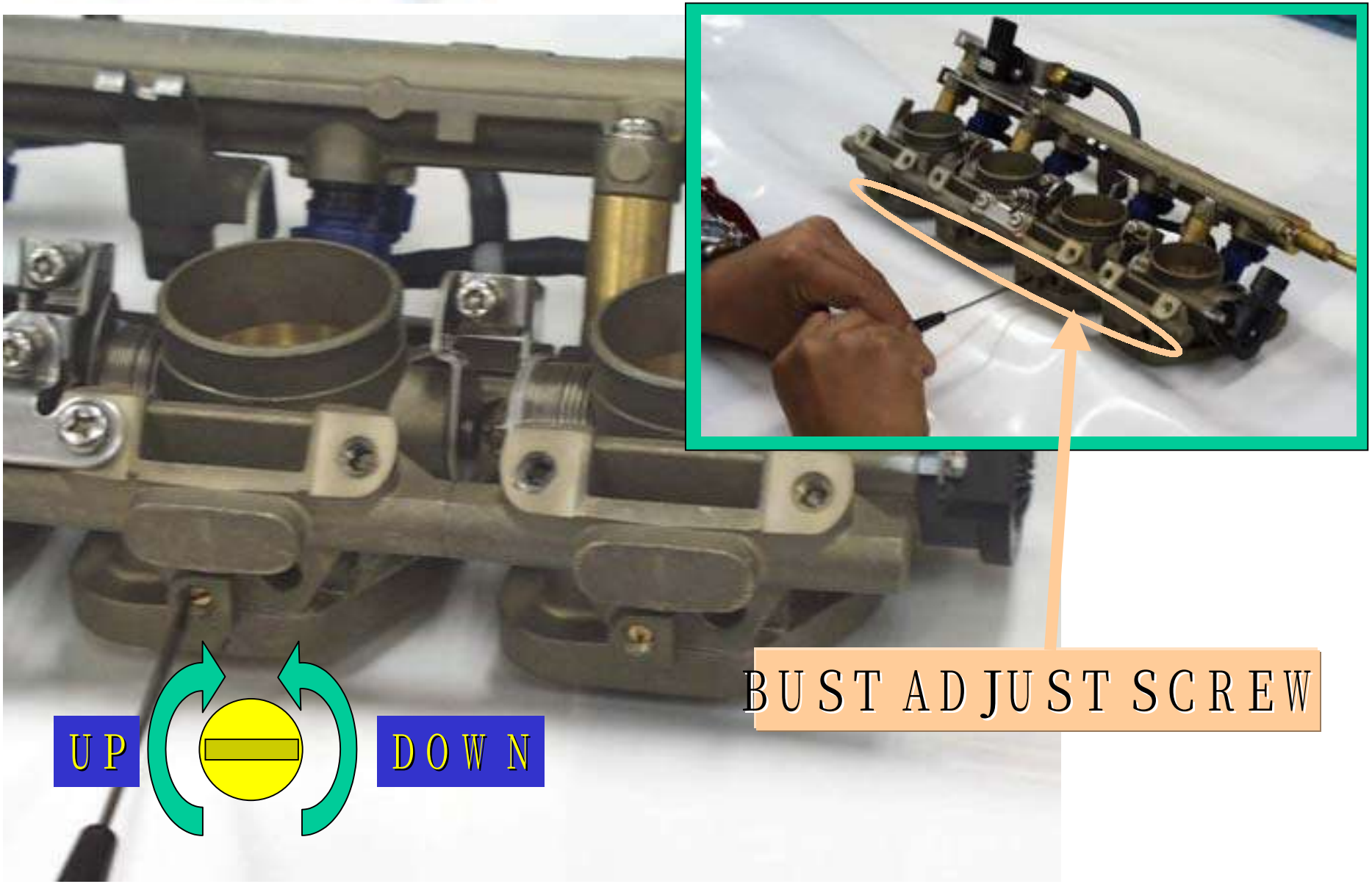
Throttle Body Synchronization

YAMAHA

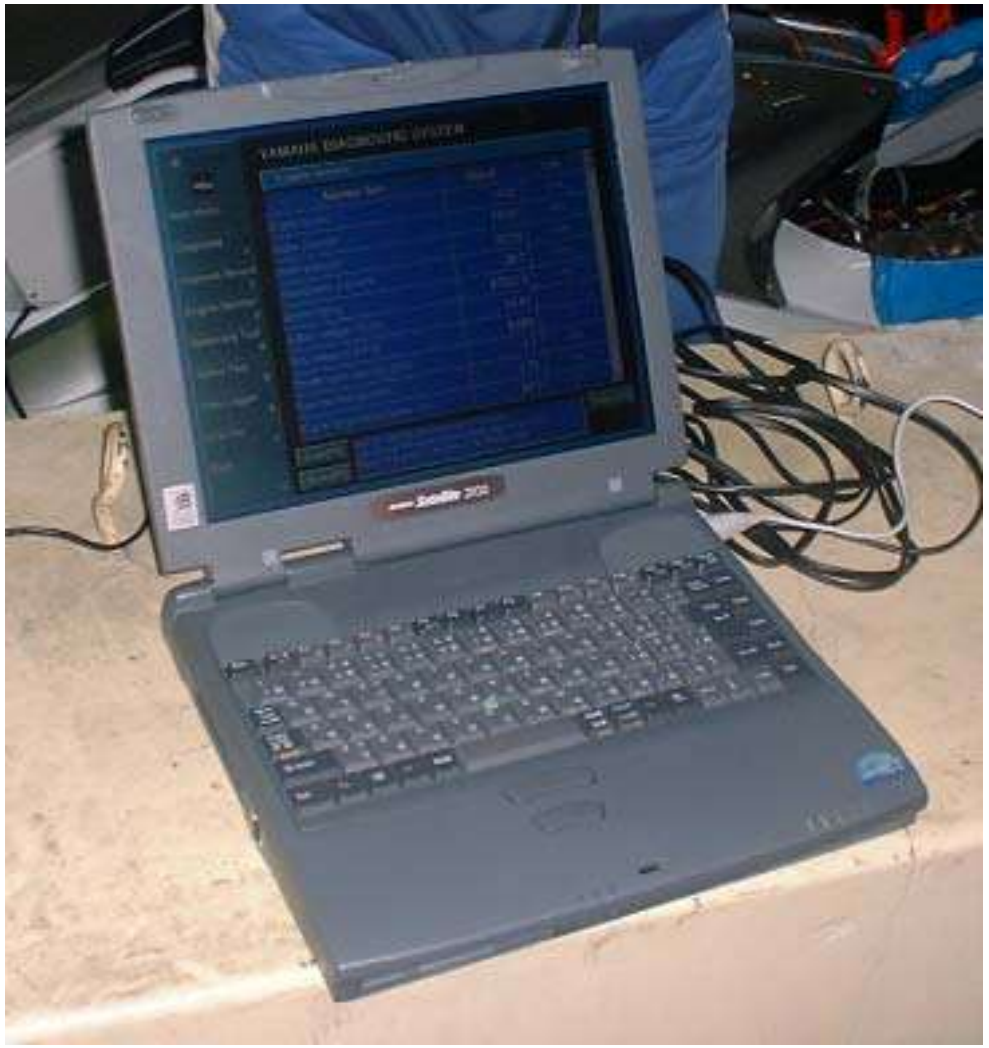
Name of Adjustment Screw



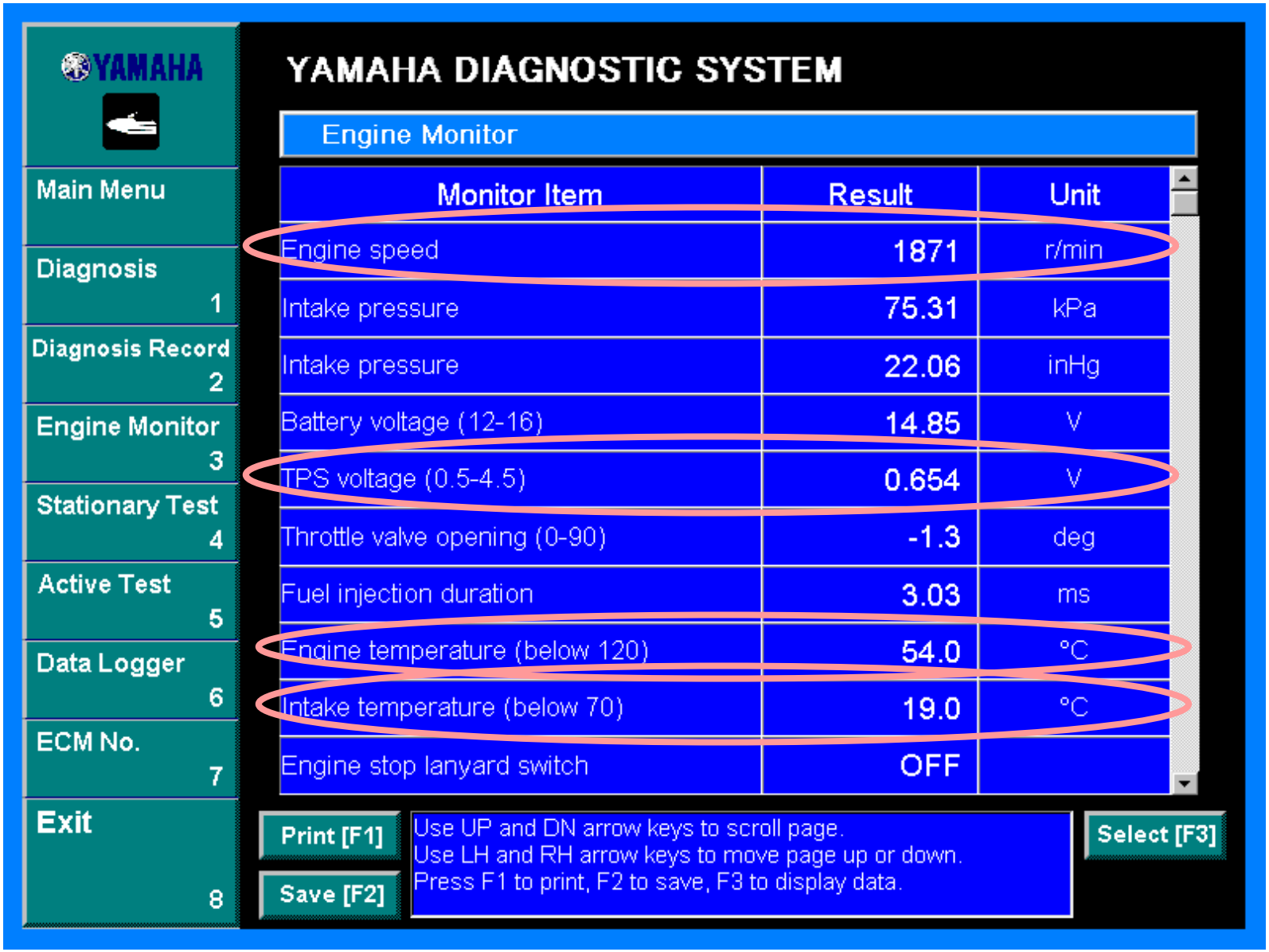
Throttle Body Synchronization



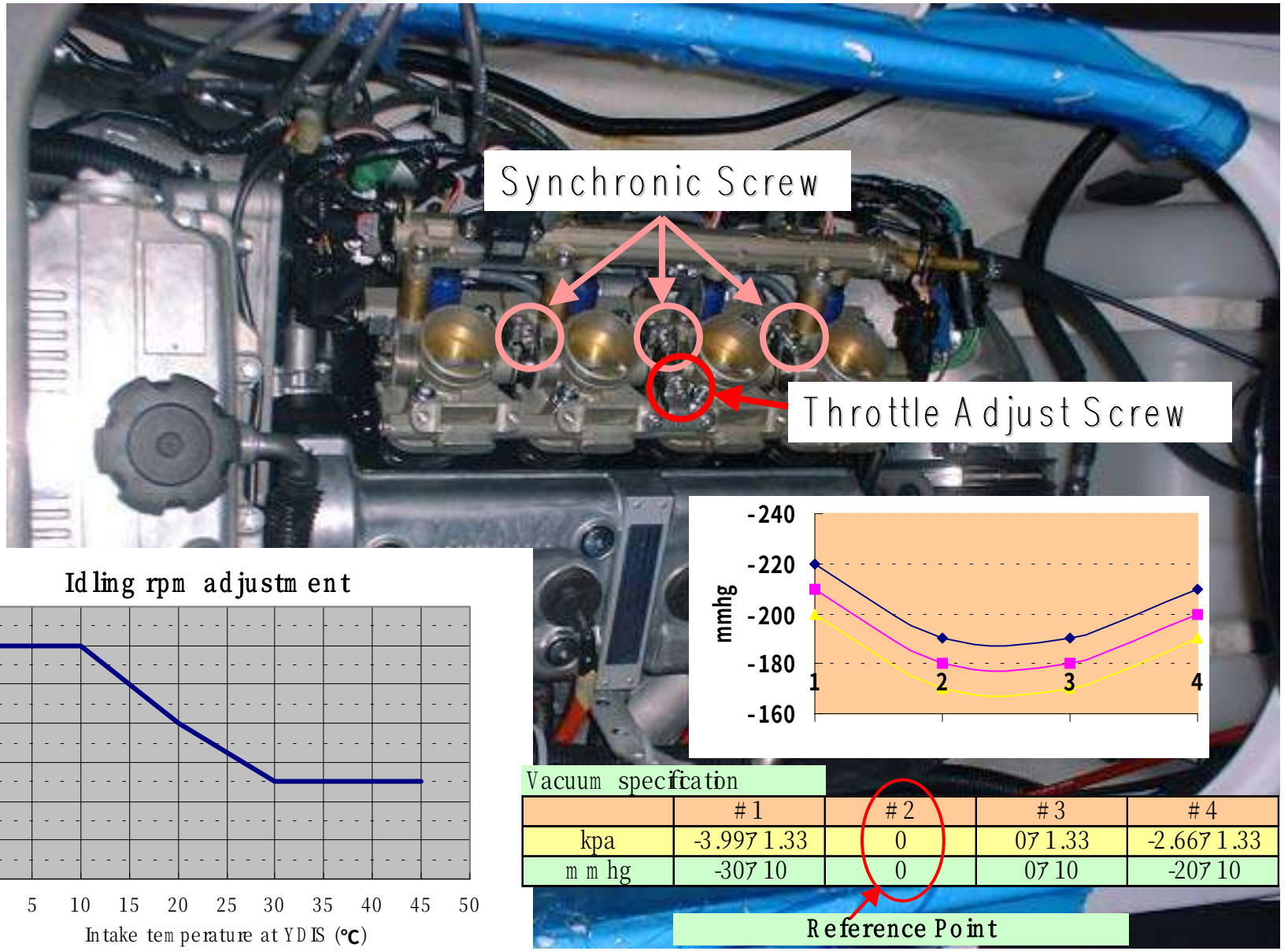
Throttle Body Synchronization

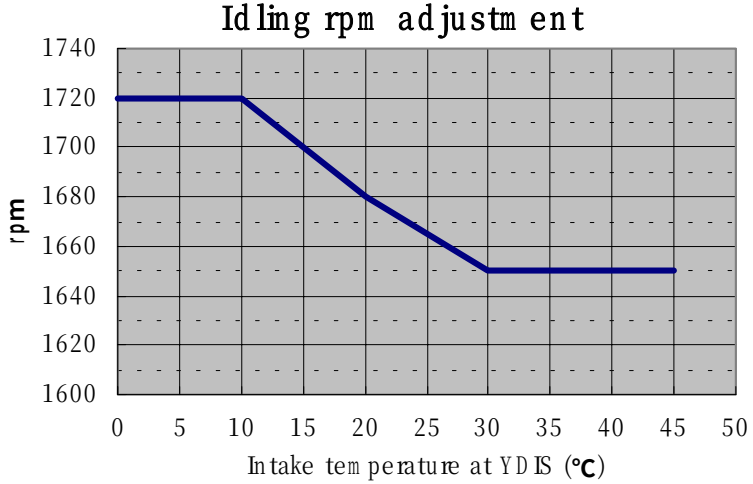


Throttle Body Synchronization



Throttle Body Synchronization



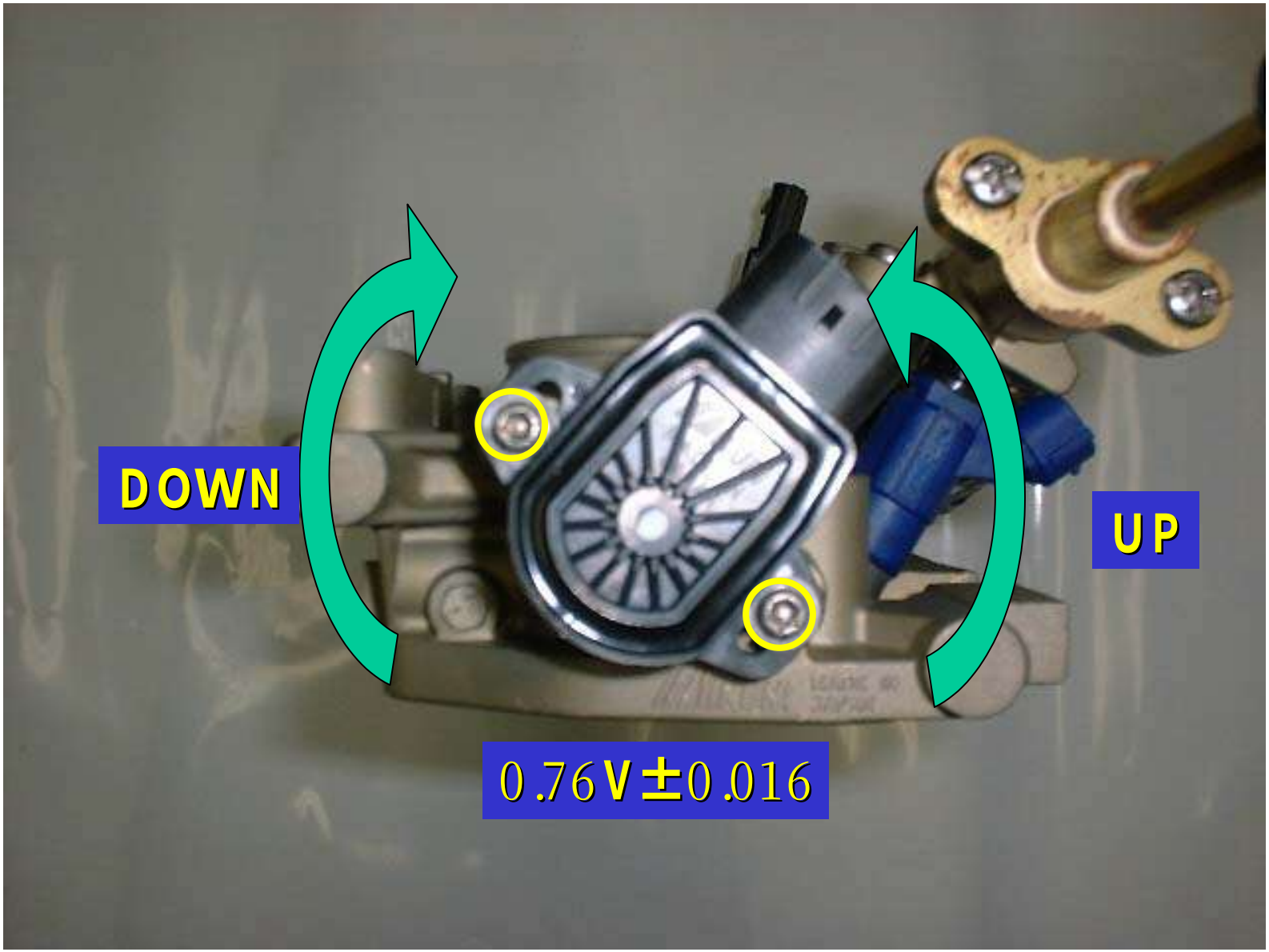


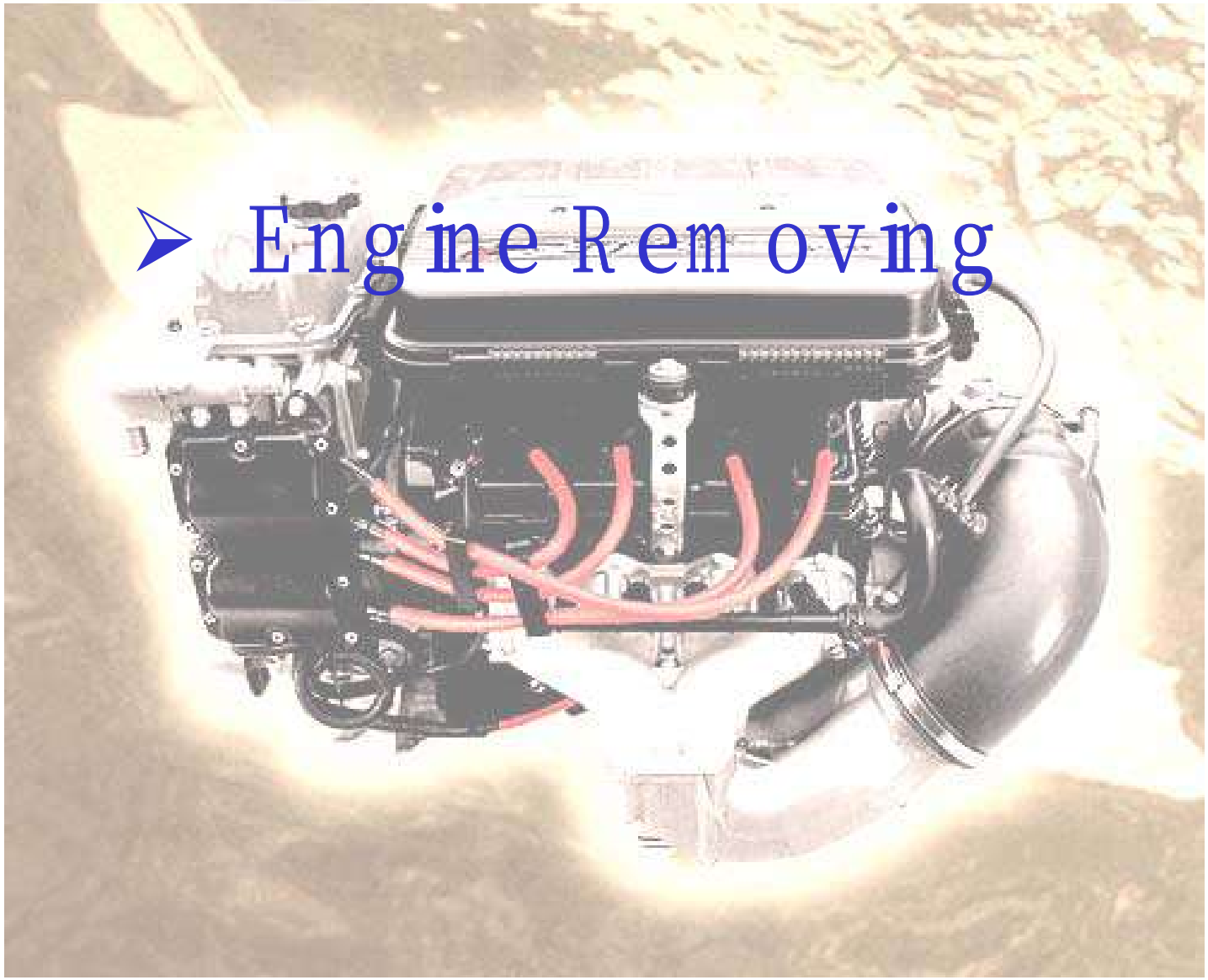
Vacuum specification

	#1	#2	#3	#4
kpa	-3.99 / 1.33	0	0 / 1.33	-2.66 / 1.33
mmhg	-30 / 10	0	0 / 10	-20 / 10

Reference Point

Throttle Body Synchronization




➢ Engine Removing

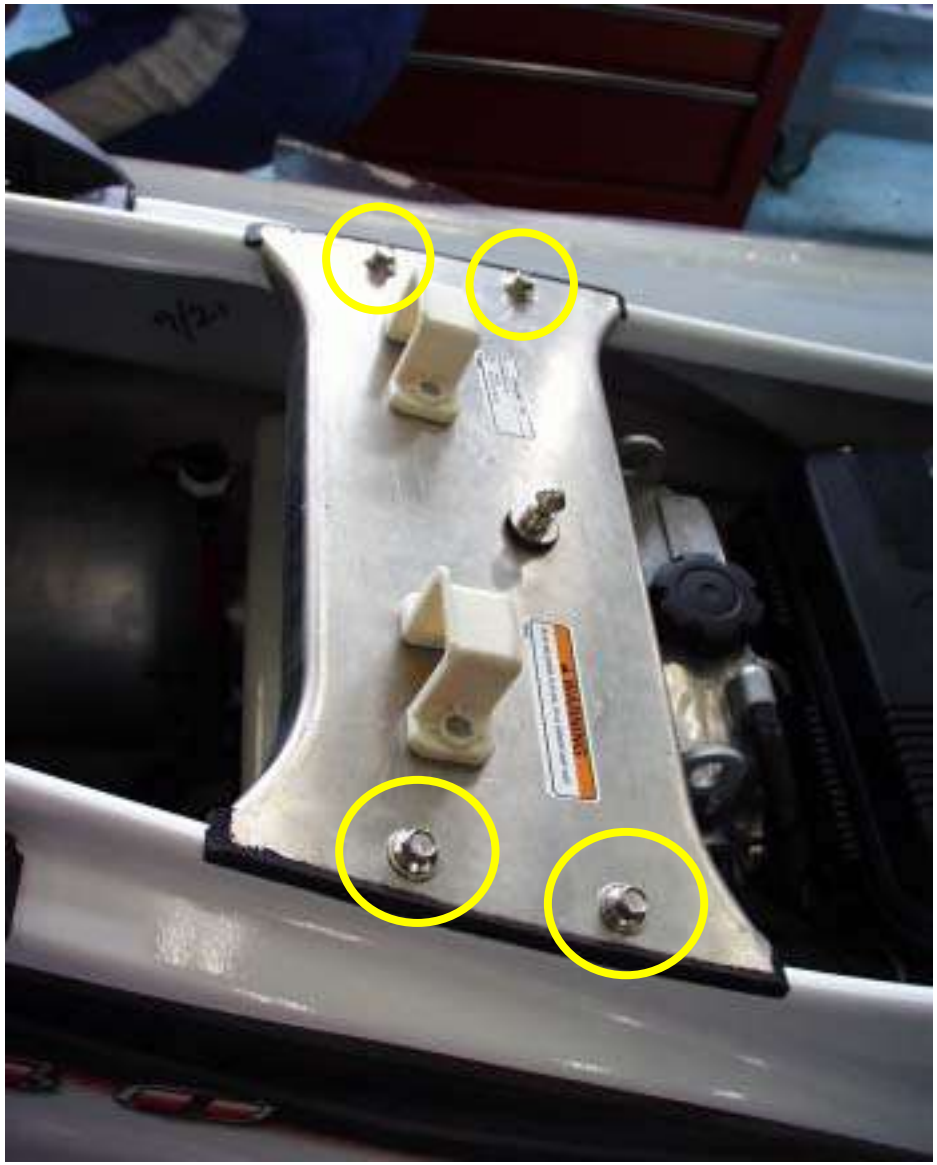
Engine Removing

Service Tips

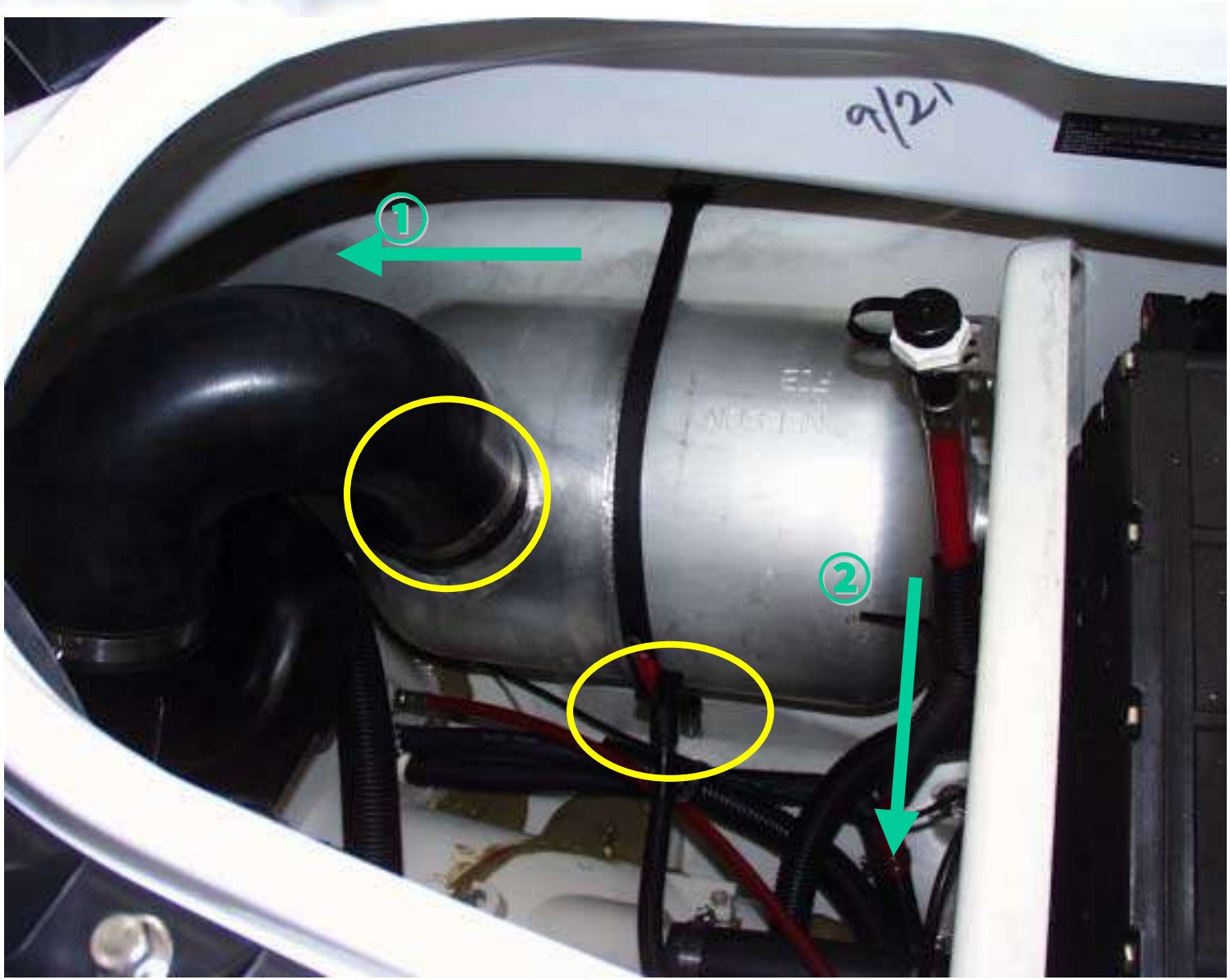
YAMAHA

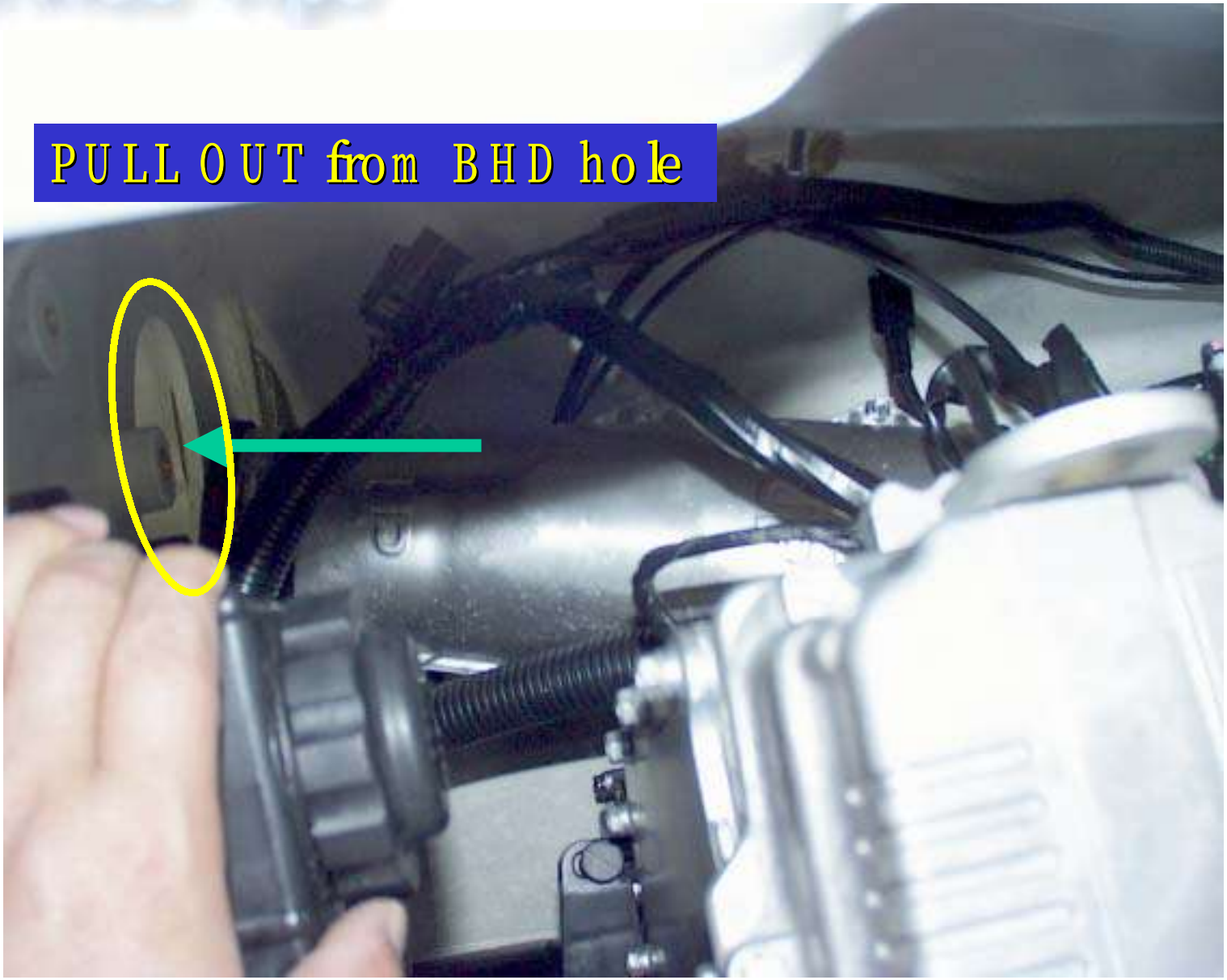
	Subjects	Notes
1.	Beam deck	
2.	Water lock assy	
3.	Exhaust pipe assy	Pull out for rear side from bak head
4.	Air cleaner case cover	
5.	Throttle cable (at the engine end)	Then re-assemble the air cleaner & case cover temporary to avoid any enter of foreign materials
6.	Fuel hose connector	Disconnect with cloth to avoid spread out of a fuel
7.	Piping for pilot water	
8.	Piping for cooling water	Pull out the hose from bak head
9.	Front inspection hatch	
10.	Each couplers on the wire harness (5 positions)	Fuel sender, speed sender, switches (start and stop), meter
11.	Coupling cover	
12.	Greasing hose for bearing housing	
13.	Oil filter	Oil will be flow out from the filter
14.	Bolt for engine mounting bolts (4pcs)	
15.	Hang up bit the engine with front and rear hook on the engine	
16.	Remove the engine to forward for the coupling off	
17.	Hang up with only rear hook, (pull down the engine once)	Keep engine position vertically
18.	Removing up the engine to protect some parts	Exhaust pipe & oil filter installation area on port side, then exhaust manifold on starboard side
19.	Remove up a part of the engine mount front on port side	with leans on the engine front for starboard side, and rear side for port side

Engine Removing



Engine Removing




PULL OUT from BHD hole

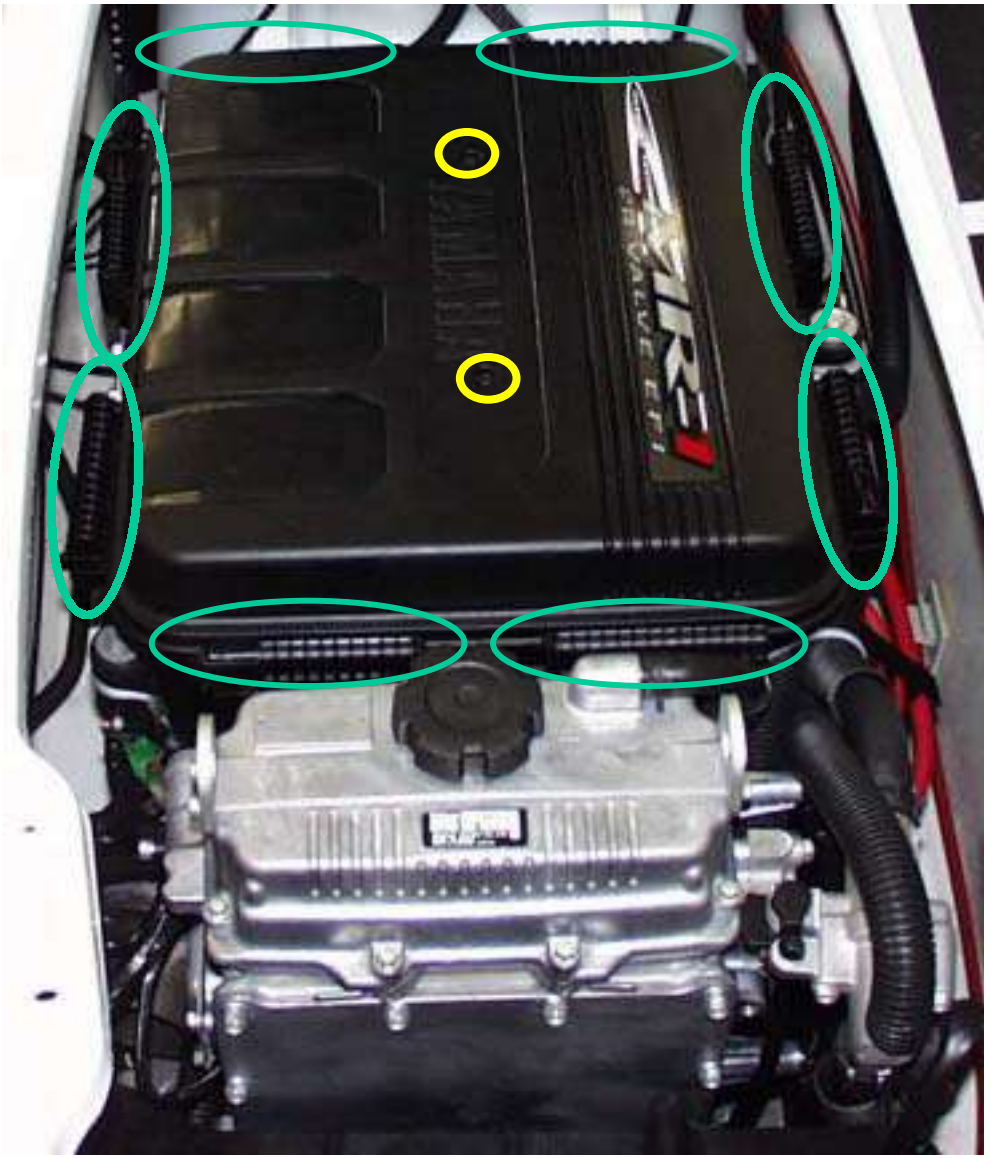
UP mark indicated

Engine Removing

Service Tips

YAMAHA

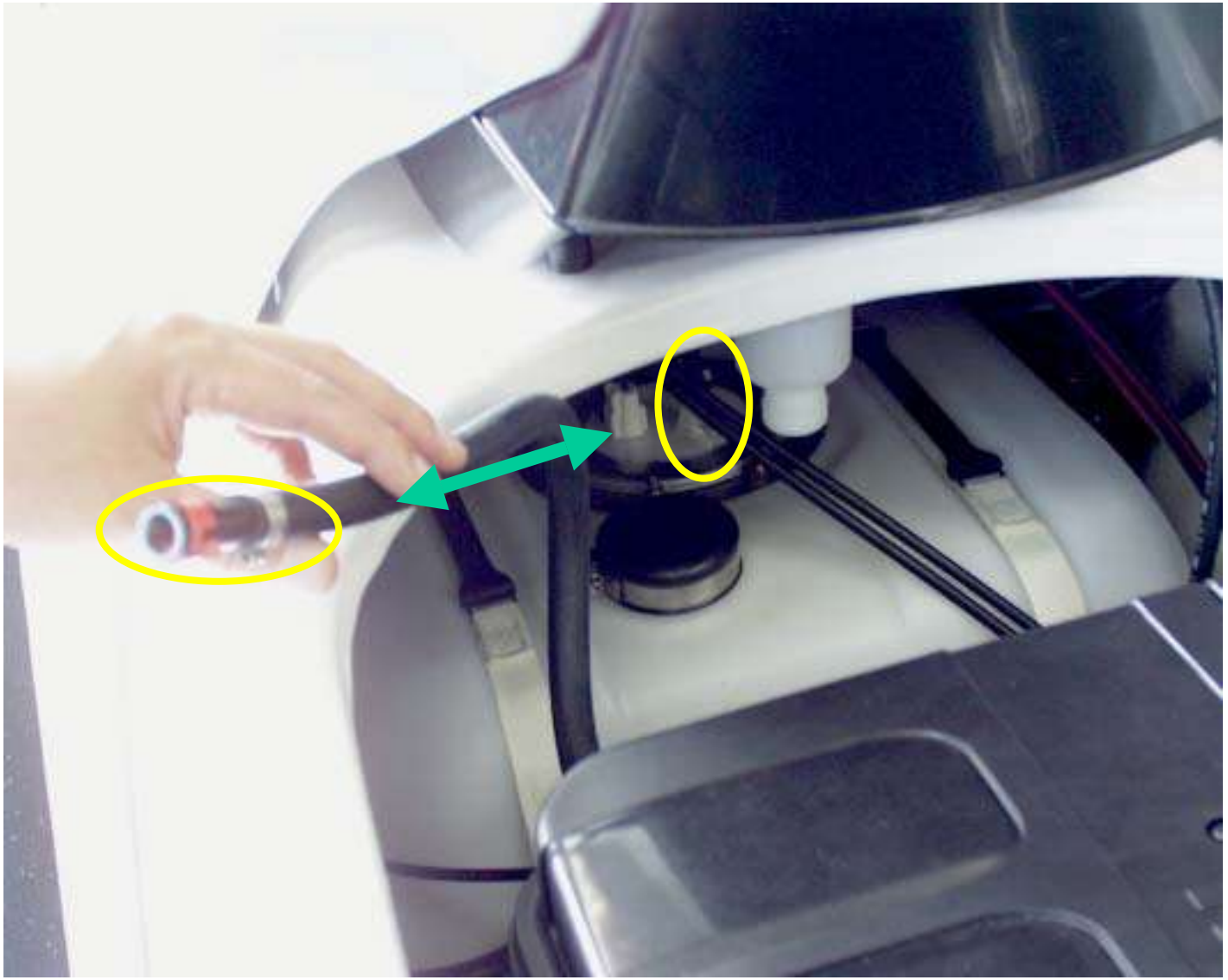
- Screw x 2



Engine Removing

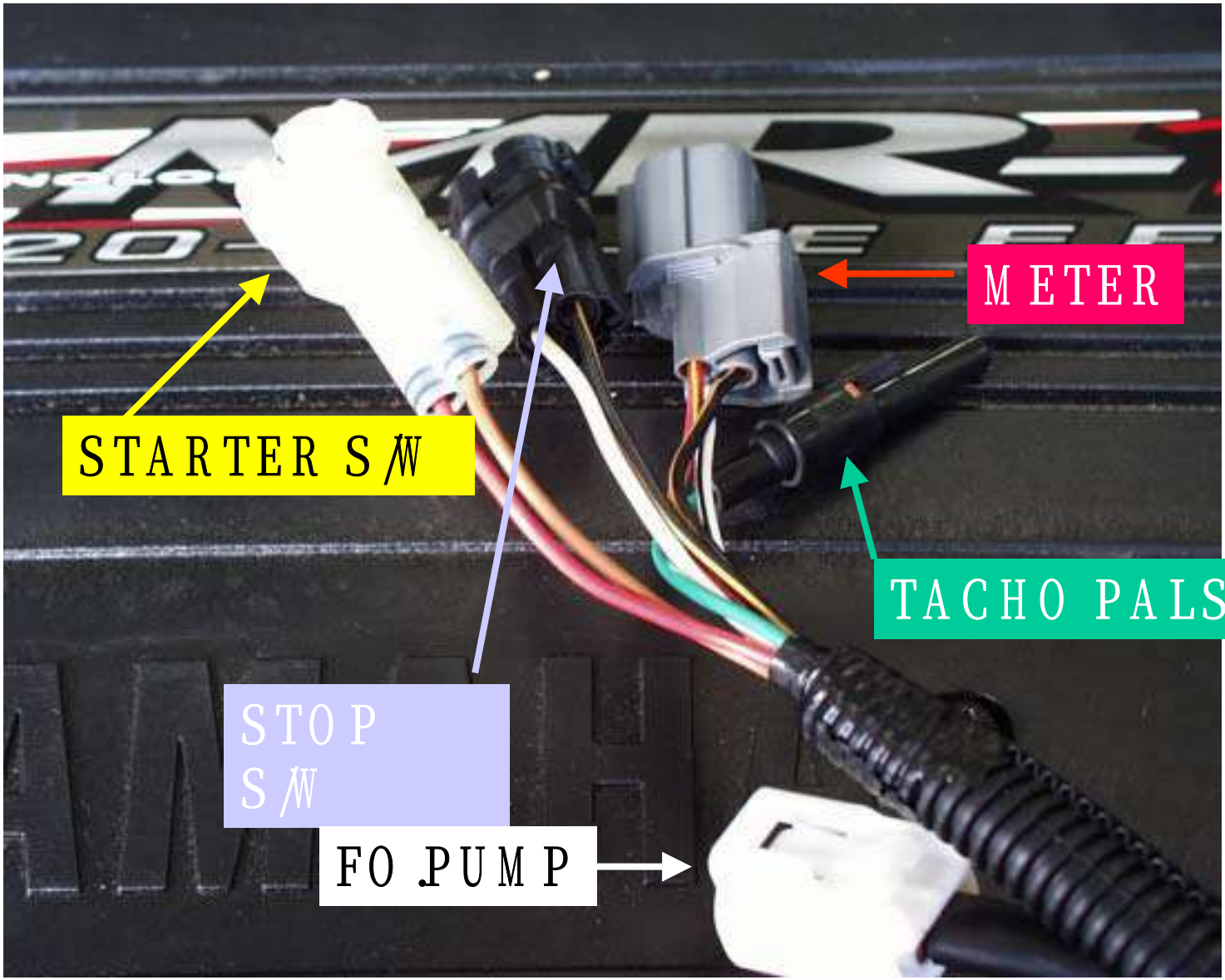
Engine Removing

Engine Removing



Engine Removing

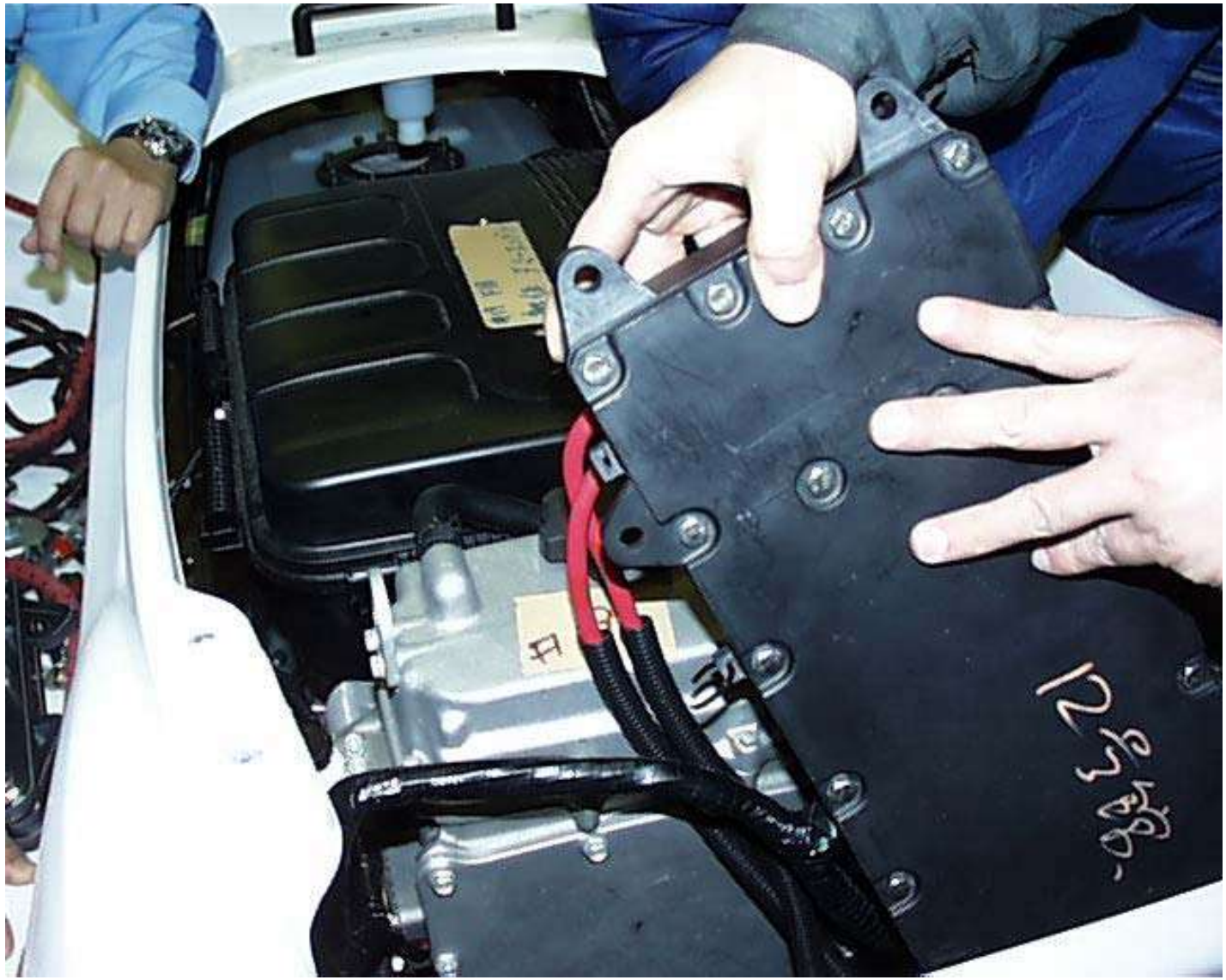
CAUTION!
Do not damage the plastic parts


METER
STARTER S/W
TACHO PALSE
STOP
S/W
FO PUMP

Engine Removing

Engine Removing

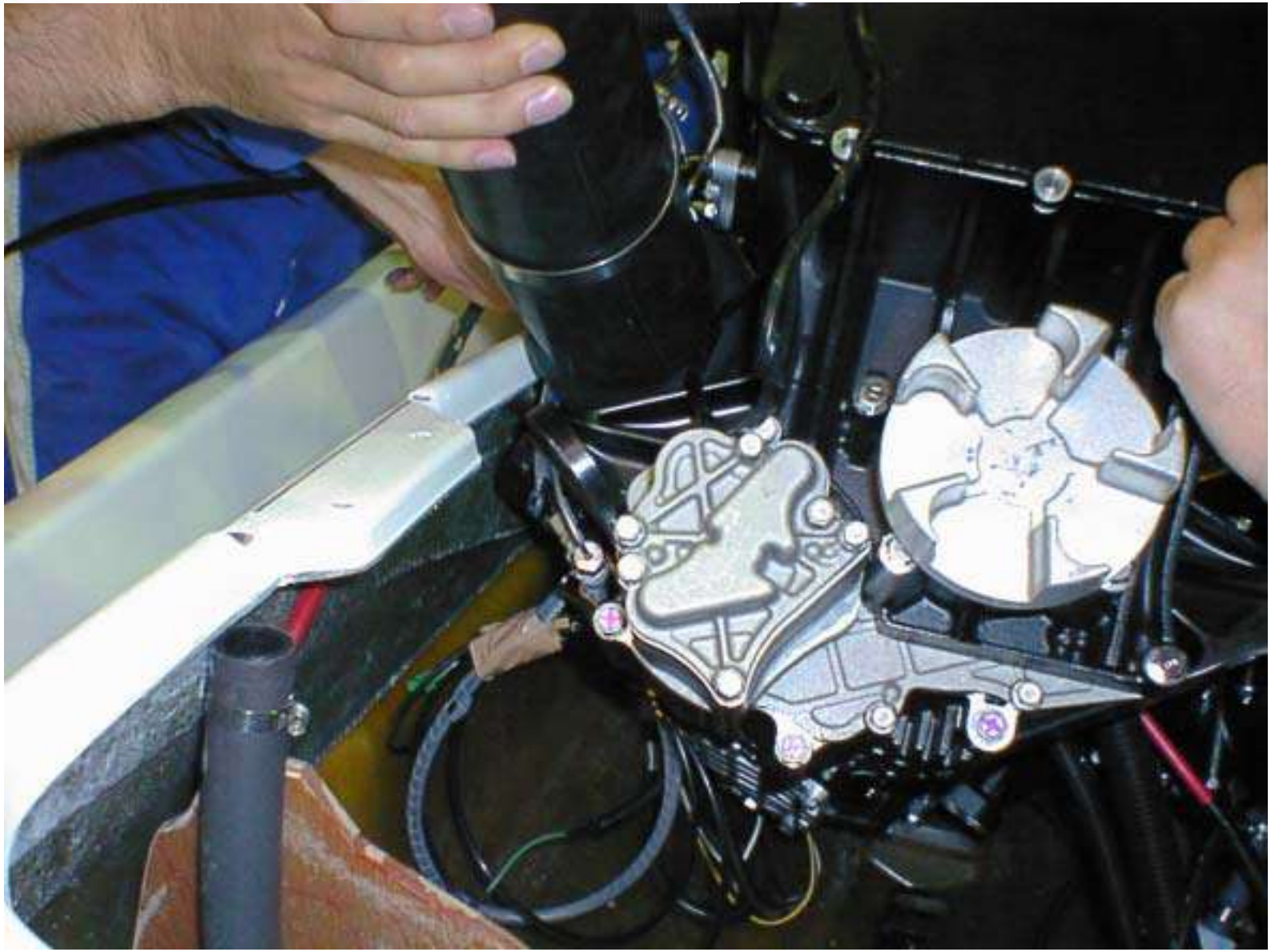
Engine Removing



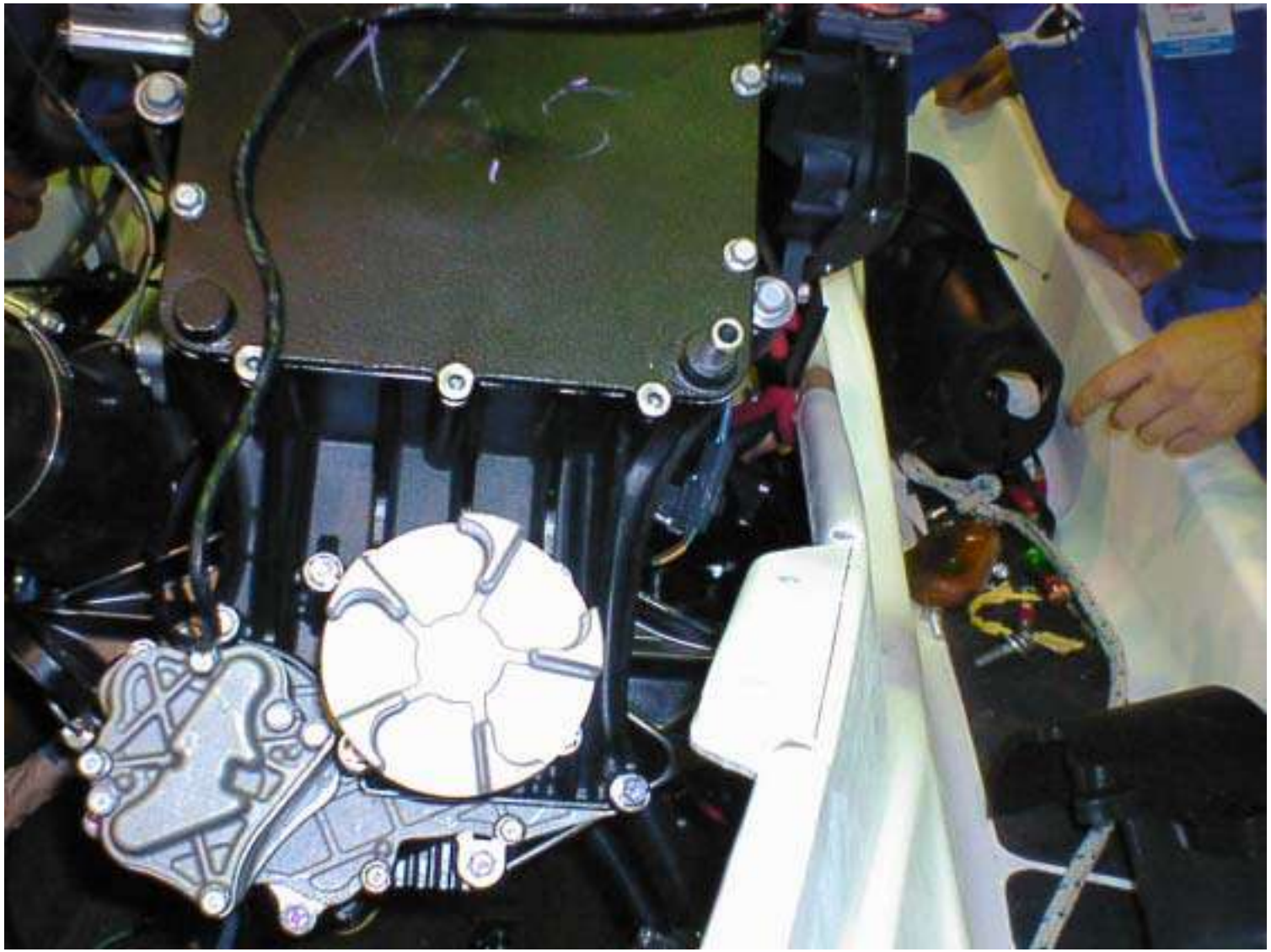
Engine Removing

Engine Removing

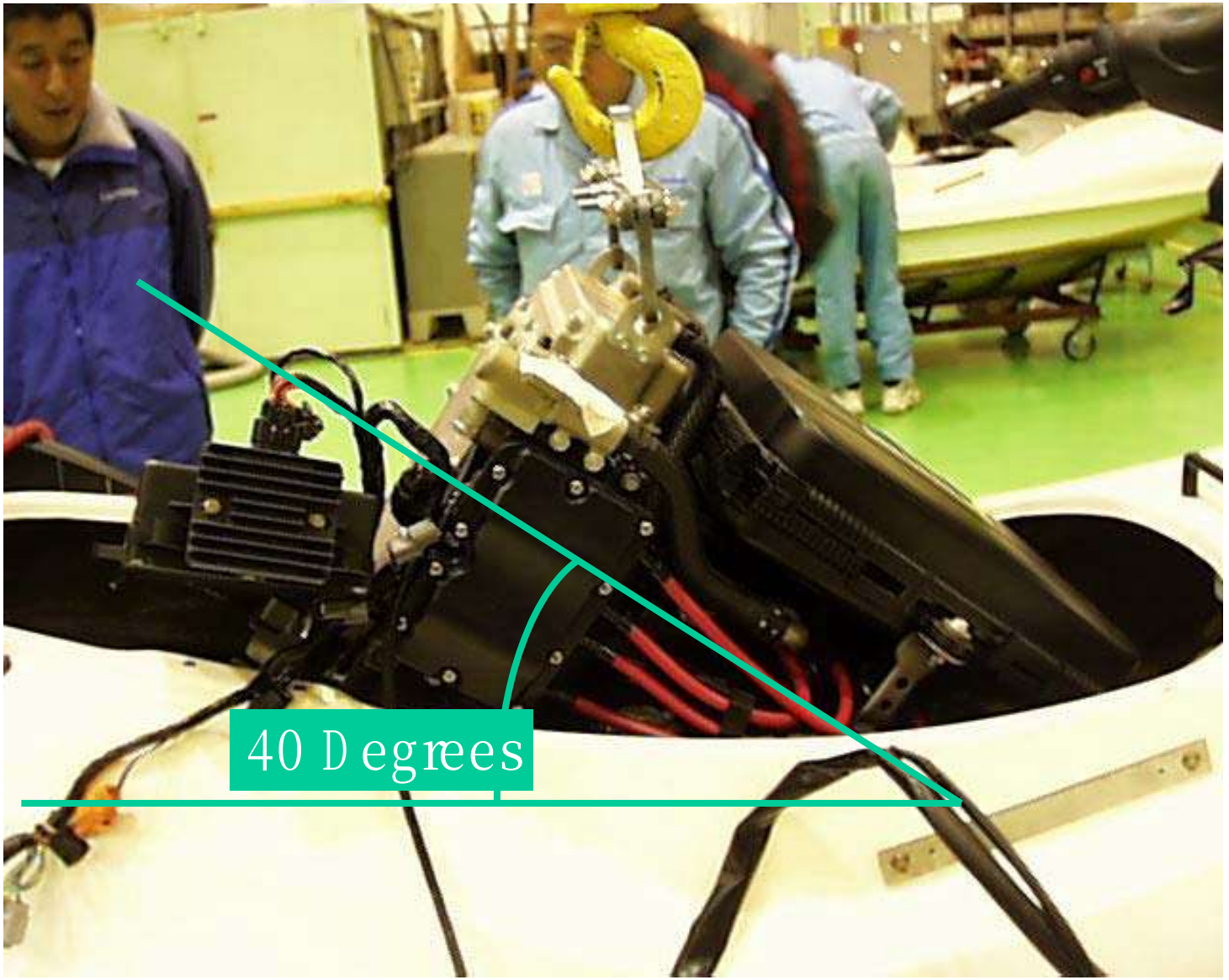
Engine Removing



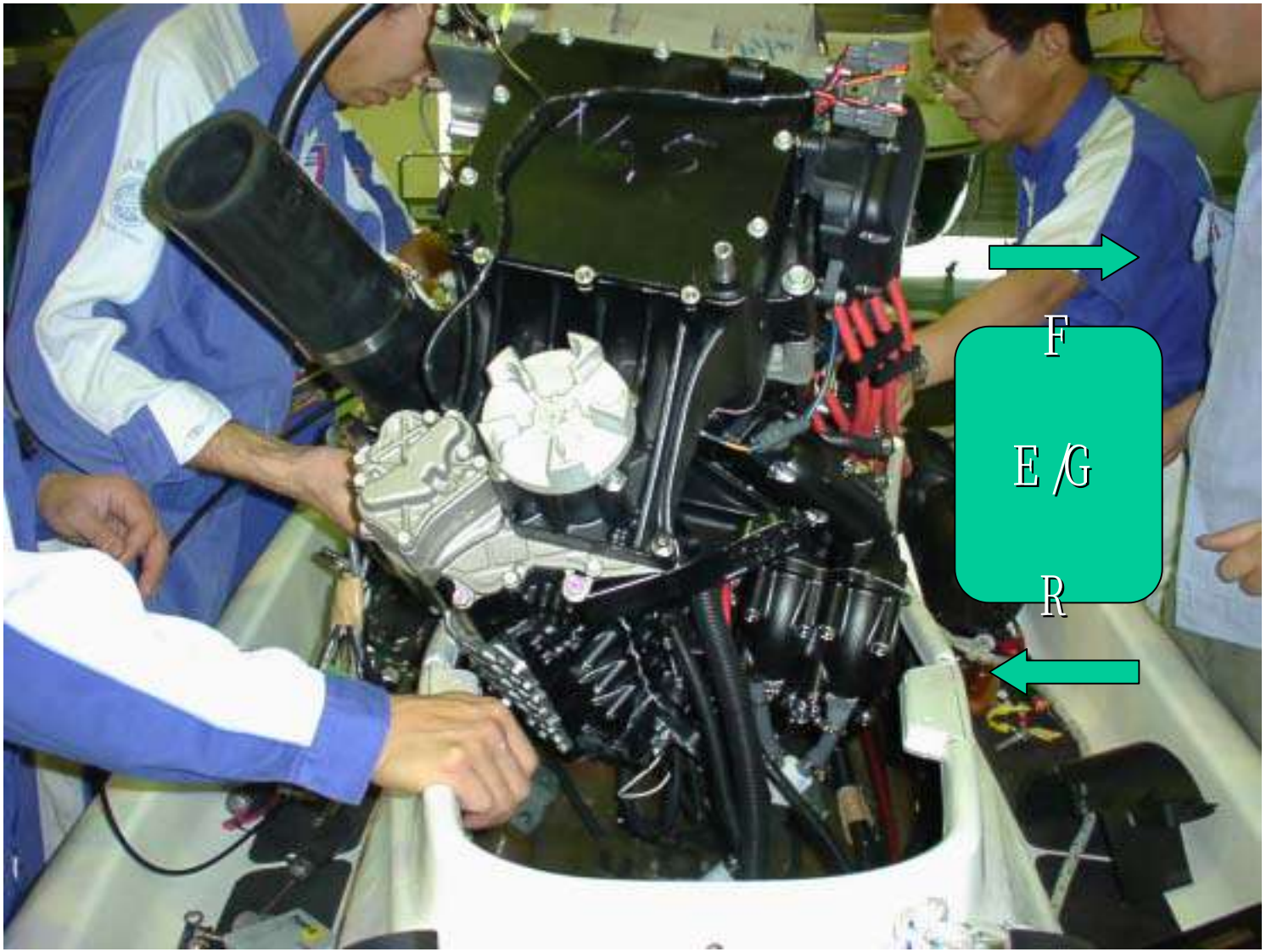
Engine Removing



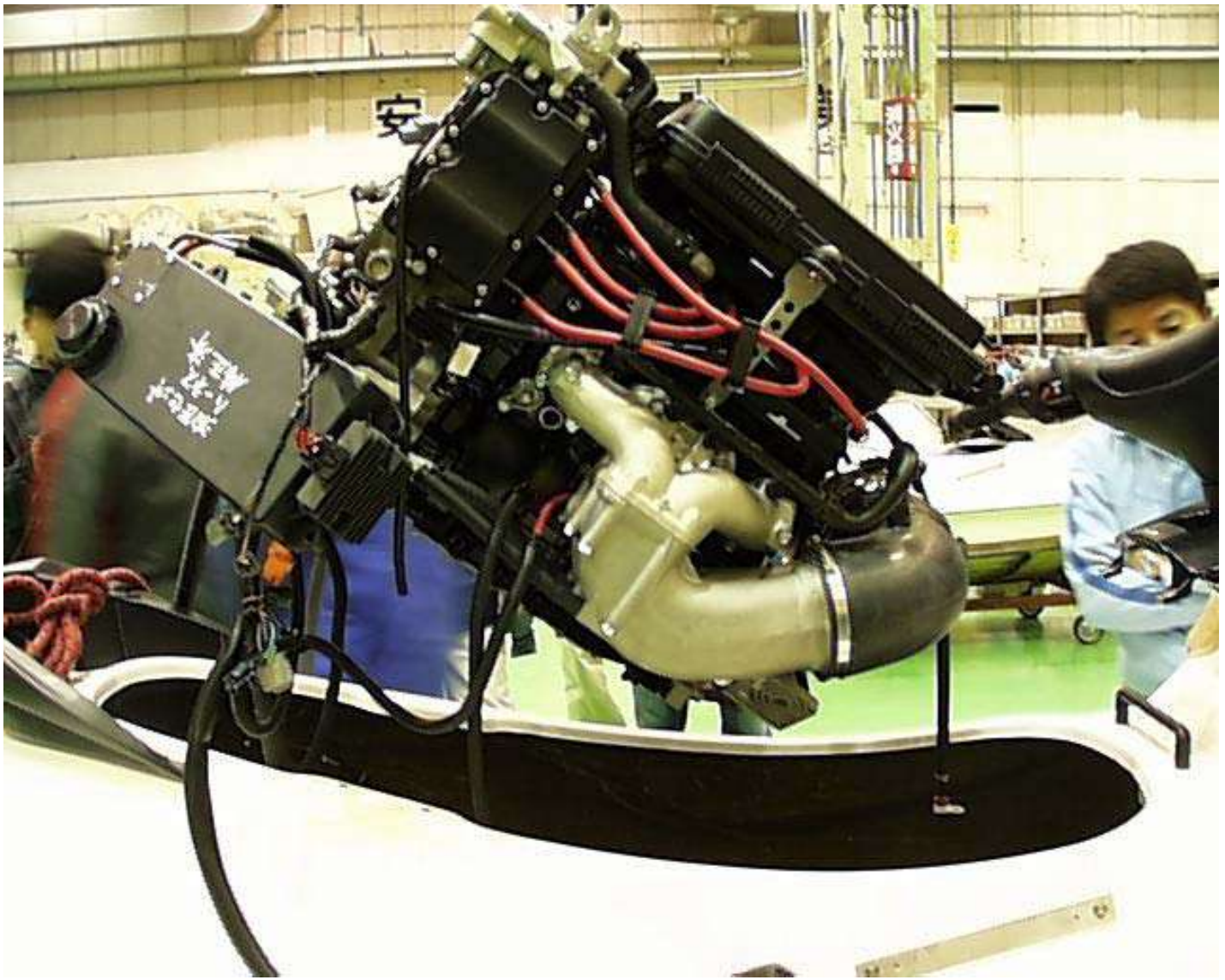
Engine Removing

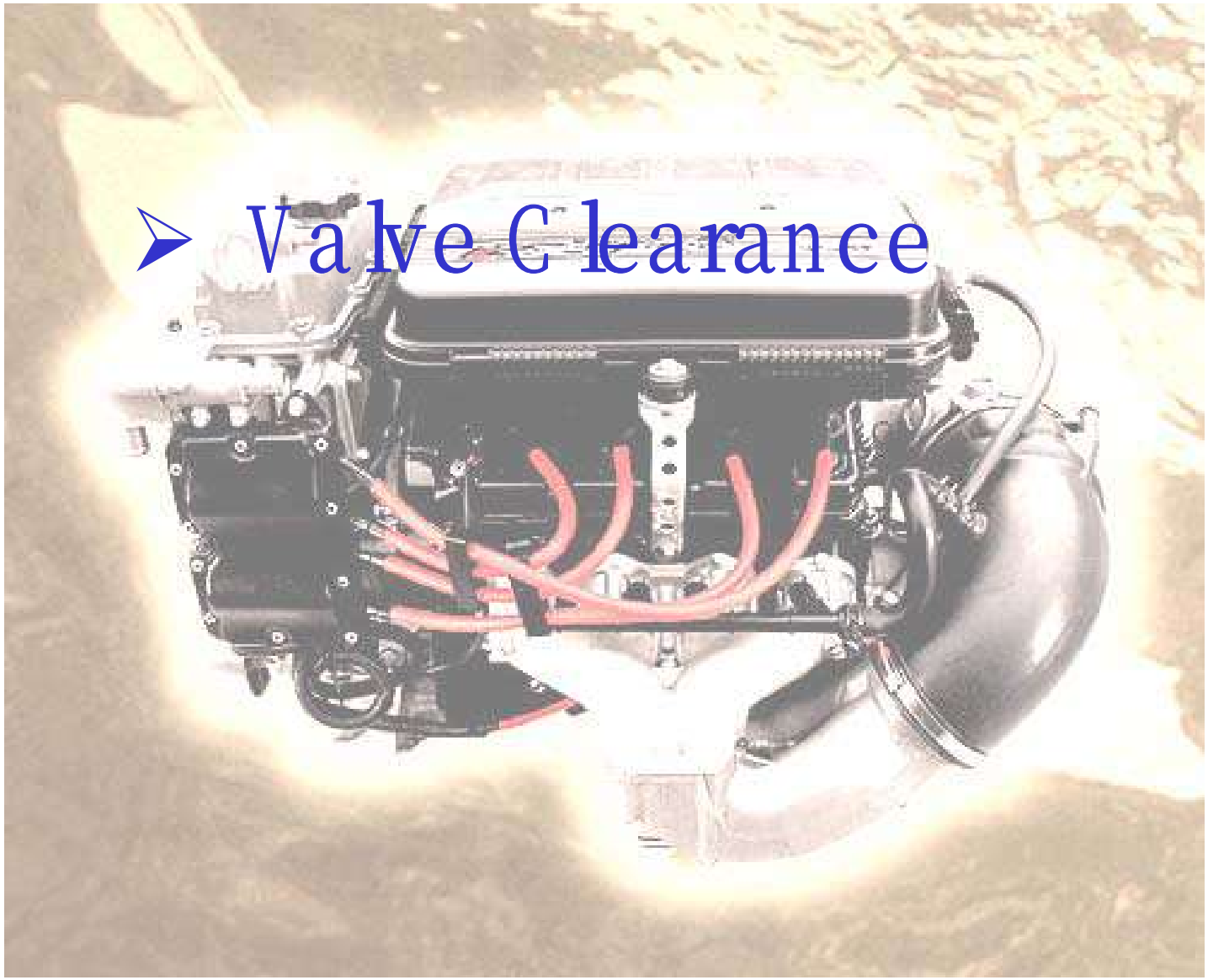


Engine Removing



Engine Removing




➢ Valve Clearance

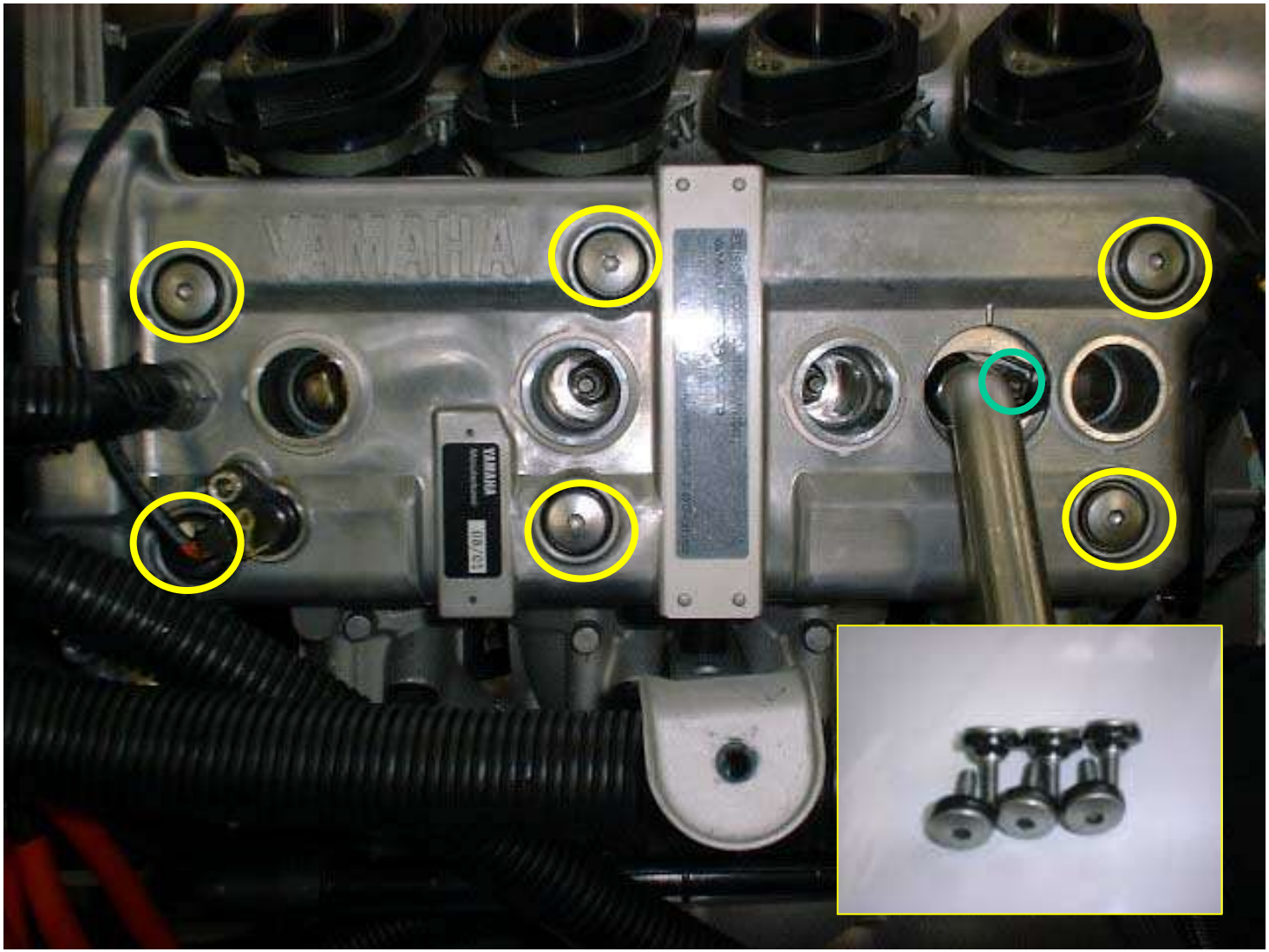
Valve Clearance

Service Tips

YAMAHA

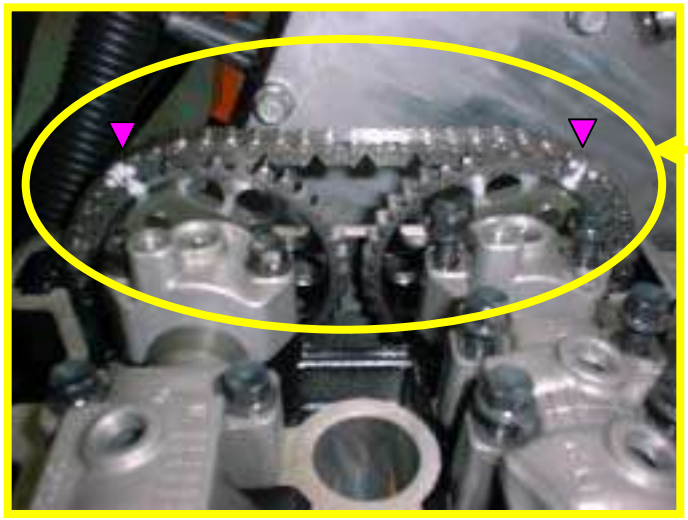
	Subjects	Notes
1.	Air cleaner case cover	
2.	Air filter	
3.	Frame arrester assy	
4.	Throttle cable (at the engine end)	
5.	Fuel hose connector	Disconnect with cloth to avoid spread out of a fuel
6.	Throttle body assy	
7.	Air cleaner case (bottom)	
8.	Head cover assy	
9.	Spark plugs	
10.	Aligne the mark on cam shaft (exhaust & intake) and cam shaft cover	by rotating the crankshaft (if you check without removing the complete engine from the unit, use SST for rotate by sprocket
11.	Check clearance for all valve from	Out of specification: Follow to next step
12.	Return to No.10 (Aligne cam shaft), then make a mark for both of the sprockets and	Mark on both exhaust & intake. This is for easy installation of aligne to set the chain and sprockets
13.	Make a free the chain tensioner	Return the screw till end
14.	Cam shafts (exhaust, intake)	Do not make any damage the cam shafts
15.	Valve lifters	Control a position of all lifters (do not mix up)
16.	Pads	Ditto
17.	Calculate a correct pads size	
18.	Assemble to return till No.10 to the above	Set the cam shaft and the chain with aligning the marks on the above No.12. About the chain tensioner; tighten fully

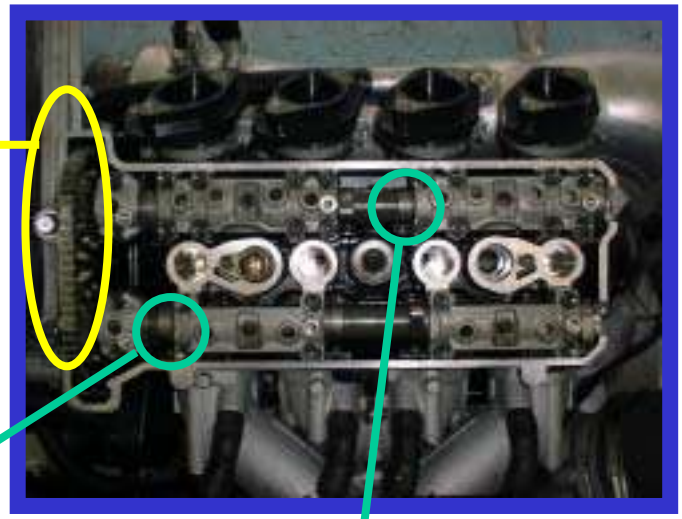
Valve Clearance

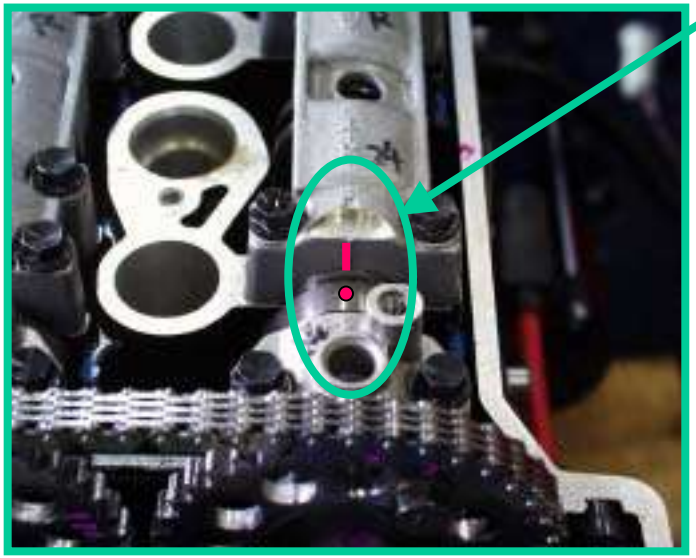


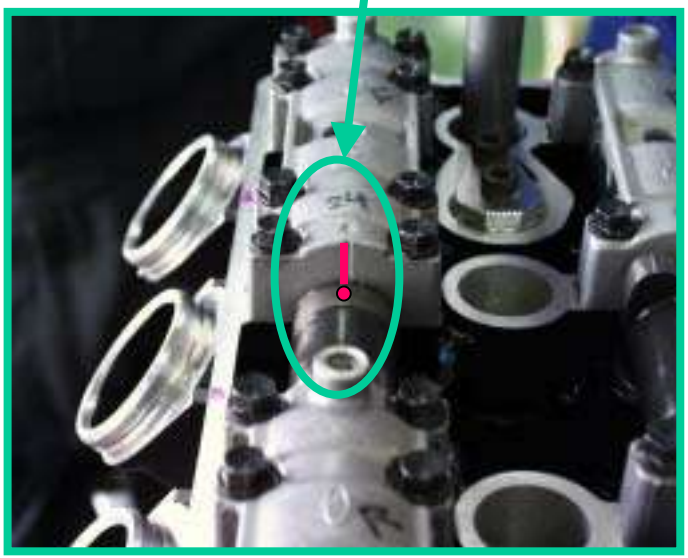
Valve Clearance

Valve Clearance

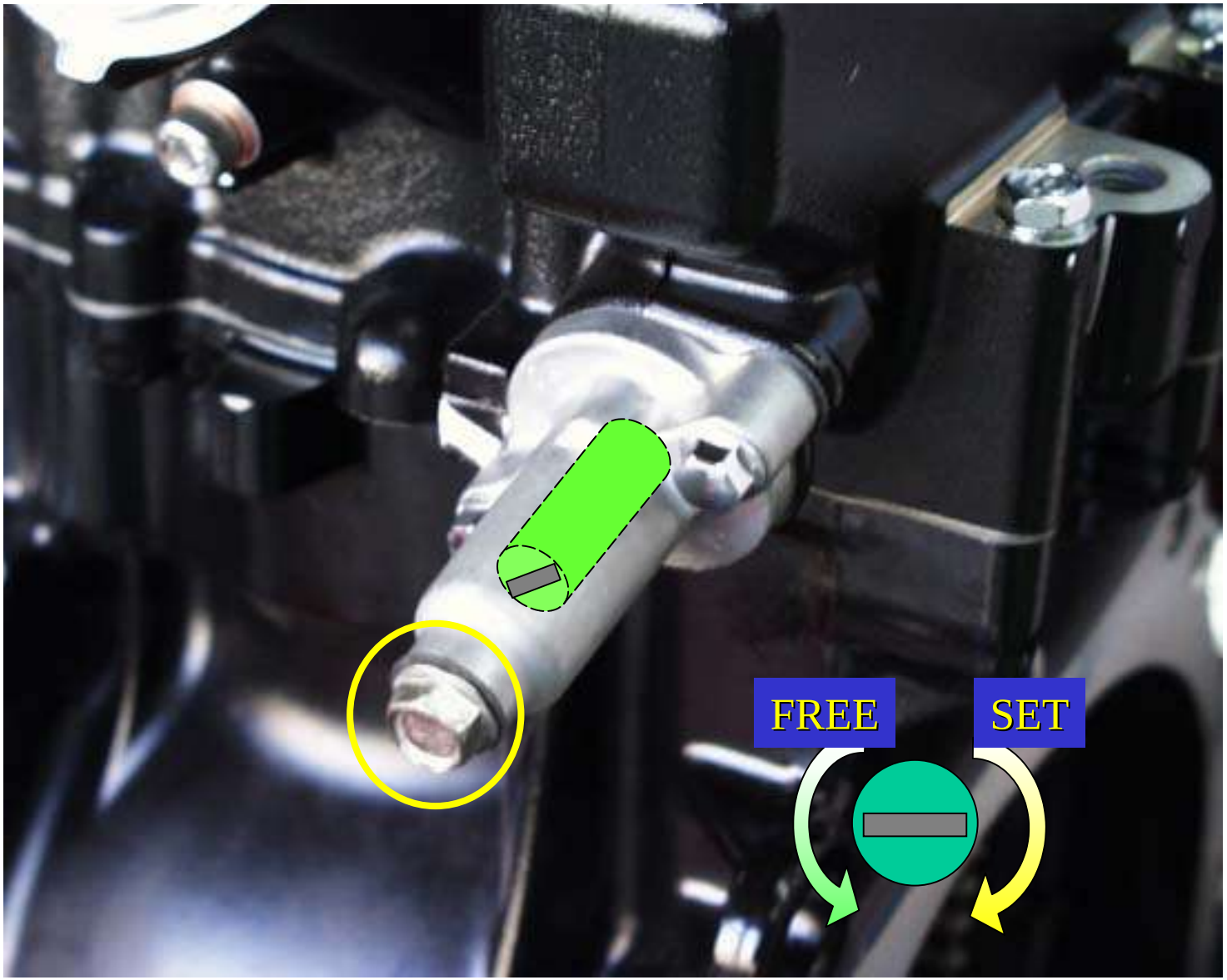




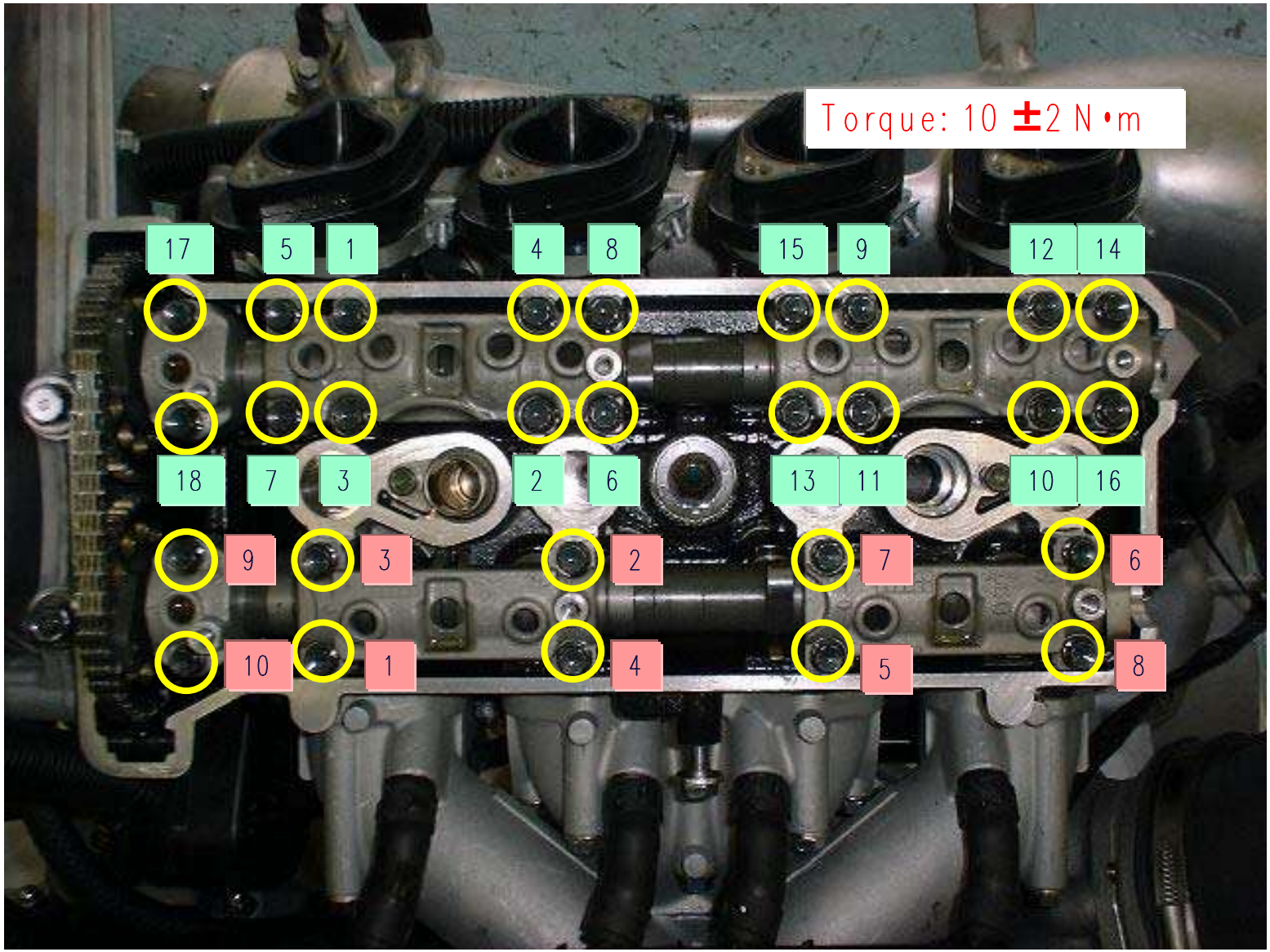




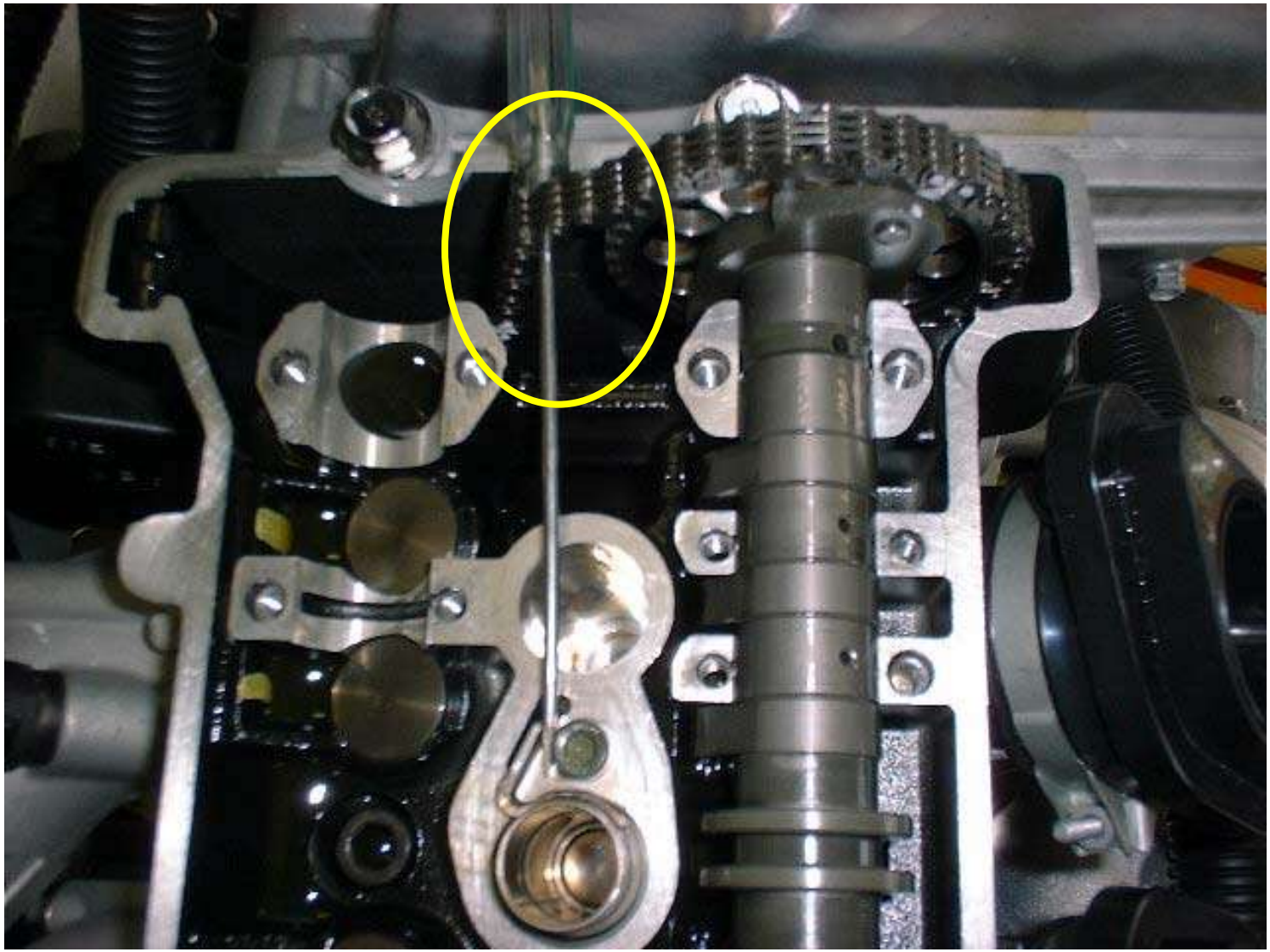
Valve Clearance



Valve Clearance



Valve Clearance



Valve Clearance

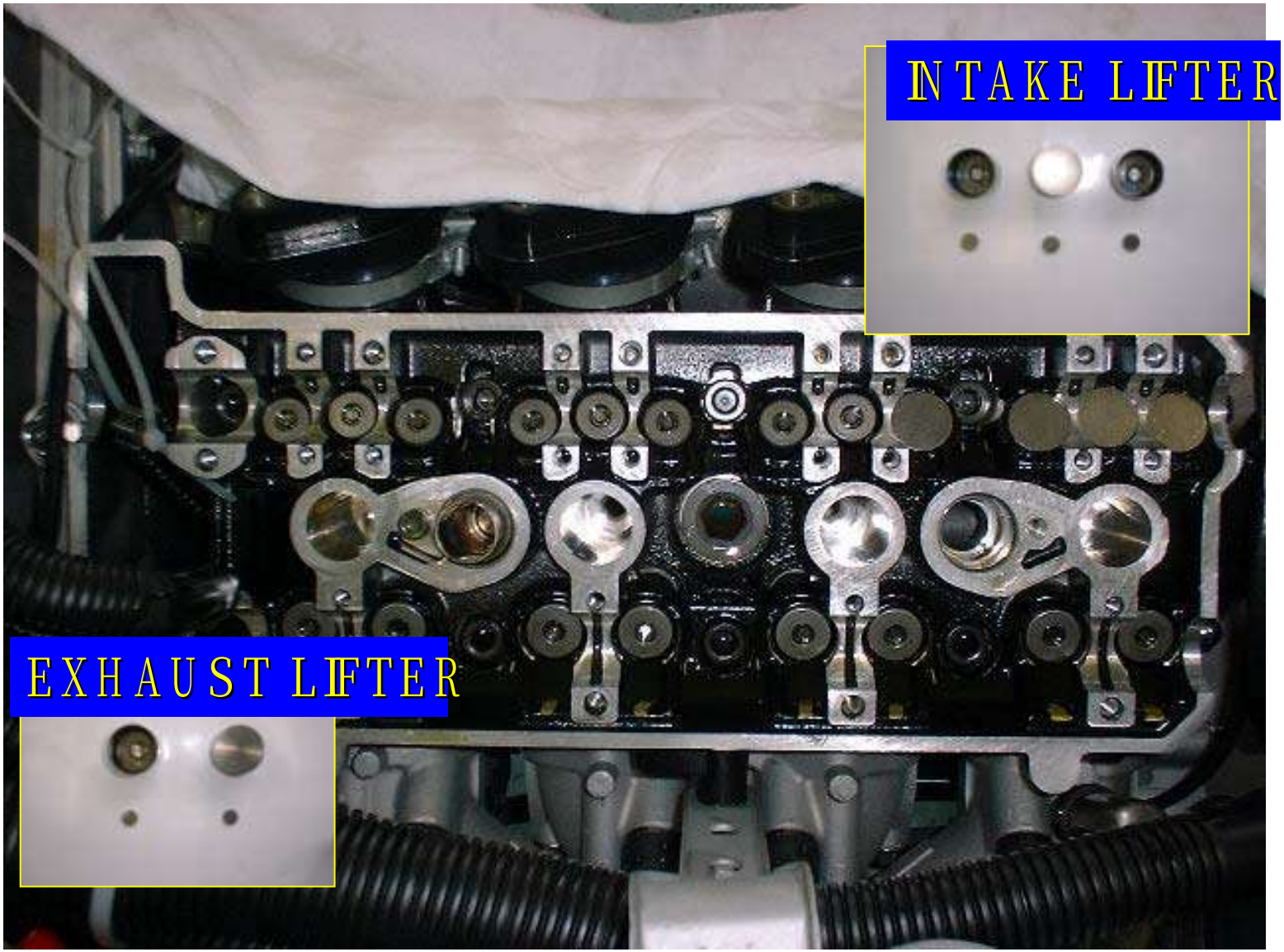
Service Tips

YAMAHA

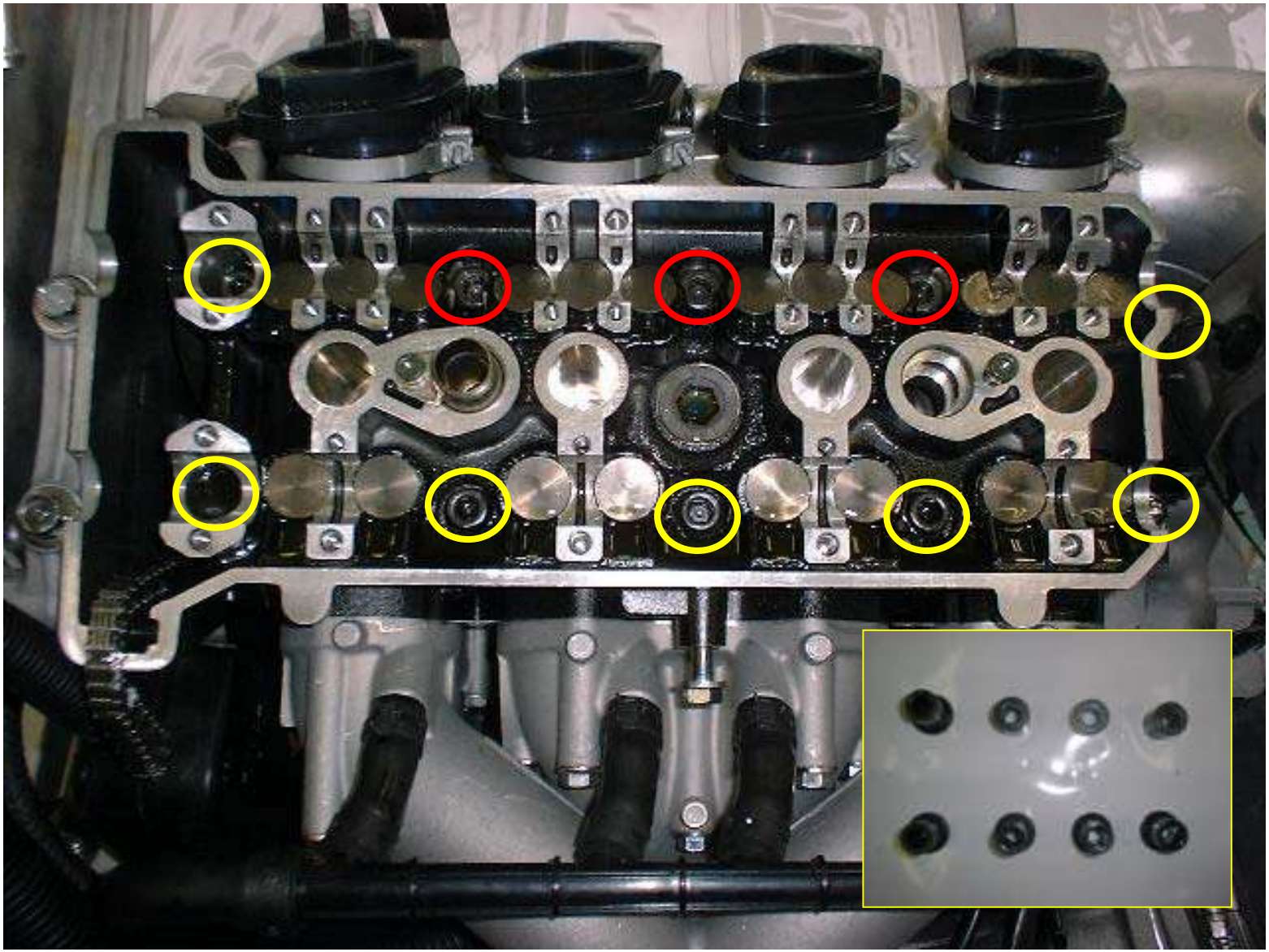
INTAKE

EXHAUST

Valve Clearance



Valve Clearance



Valve Clearance

YAMAHA

MEASURED CLEARANCE	ORIGINAL VALVE PAD NUMBER																								
	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240
0.00 - 0.02				120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225
0.03 - 0.07			120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230
0.08 - 0.10		120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235
0.11 - 0.20	STANDARD CLEARANCE																								
0.21 - 0.22	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240	
0.23 - 0.27	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240		
0.28 - 0.32	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240			
0.33 - 0.37	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240				
0.38 - 0.42	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240					
0.43 - 0.47	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240						
0.48 - 0.52	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240							
0.53 - 0.57	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240								
0.58 - 0.62	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240									
0.63 - 0.67	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240										
0.68 - 0.72	175	180	185	190	195	200	205	210	215	220	225	230	235	240											
0.73 - 0.77	180	185	190	195	200	205	210	215	220	225	230	235	240												
0.78 - 0.82	185	190	195	200	205	210	215	220	225	230	235	240													
0.83 - 0.87	190	195	200	205	210	215	220	225	230	235	240														
0.88 - 0.92	195	200	205	210	215	220	225	230	235	240															
0.93 - 0.97	200	205	210	215	220	225	230	235	240																
0.98 - 1.02	205	210	215	220	225	230	235	240																	
1.03 - 1.07	210	215	220	225	230	235	240																		
1.08 - 1.12	215	220	225	230	235	240																			
1.13 - 1.17	220	225	230	235	240																				
1.18 - 1.22	225	230	235	240																					
1.23 - 1.27	230	235	240																						
1.28 - 1.32	235	240																							
1.33 - 1.37	240																								

Example:

Intake Valve Clearance (cold)

0.11-0.20 mm

Rounded value 150

Measured valve clearance is 0.24 mm

Replace pad 150 with pad 160

Pad No. 150 = 1.50 mm

Pad No. 160 = 1.60 mm

Valve Clearance

Service Tips

YAMAHA

MEASURED CLEARANCE	ORIGINAL VALVE PAD NUMBER																								
	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240
0.00 - 0.01							120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210
0.02 - 0.06						120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215
0.07 - 0.11					120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220
0.12 - 0.16				120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225
0.17 - 0.21			120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230
0.22 - 0.24		120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235
0.25 - 0.34	STANDARD CLEARANCE																								
0.35 - 0.37	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240	
0.38 - 0.42	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240		
0.43 - 0.47	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240			
0.48 - 0.52	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240				
0.53 - 0.57	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240					
0.58 - 0.62	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240						
0.63 - 0.67	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240							
0.68 - 0.72	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240								
0.73 - 0.77	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240									
0.78 - 0.82	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240										
0.83 - 0.87	175	180	185	190	195	200	205	210	215	220	225	230	235	240											
0.88 - 0.92	180	185	190	195	200	205	210	215	220	225	230	235	240												
0.93 - 0.97	185	190	195	200	205	210	215	220	225	230	235	240													
0.98 - 1.02	190	195	200	205	210	215	220	225	230	235	240														
1.03 - 1.07	195	200	205	210	215	220	225	230	235	240															
1.08 - 1.12	200	205	210	215	220	225	230	235	240																
1.13 - 1.17	205	210	215	220	225	230	235	240																	
1.18 - 1.22	210	215	220	225	230	235	240																		
1.23 - 1.27	215	220	225	230	235	240																			
1.28 - 1.32	220	225	230	235	240																				
1.33 - 1.37	225	230	235	240																					
1.38 - 1.42	230	235	240																						
1.43 - 1.47	235	240																							
1.48 - 1.52	240																								

Example:

Exhaust Valve Clearance (cold)

0.25-0.34 mm

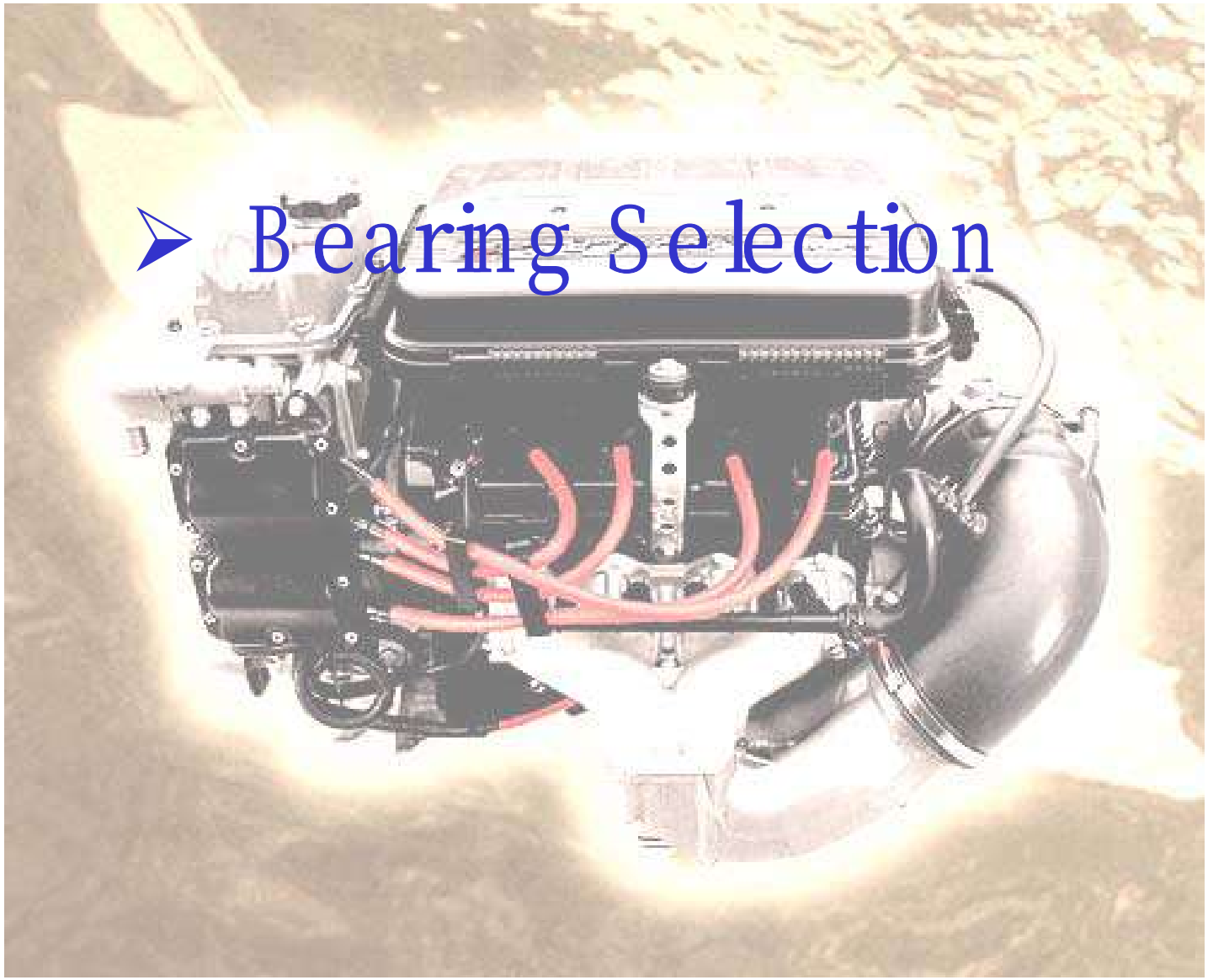
Rounded value 170

Measured valve clearance is 0.45 mm

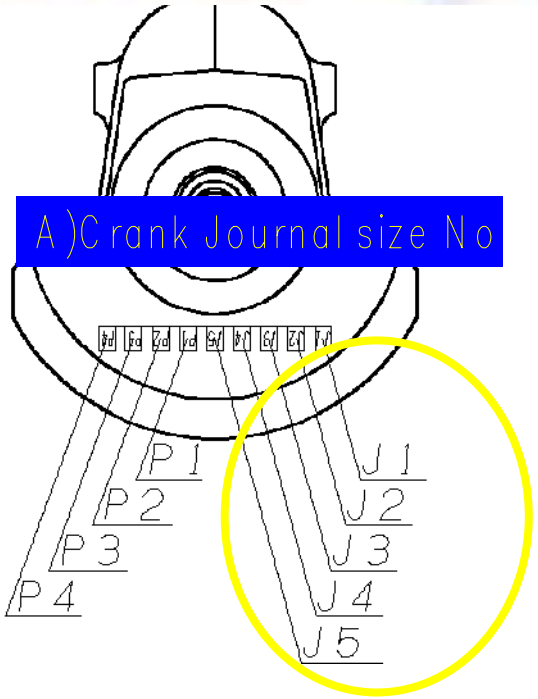
Replace pad 170 with pad 185

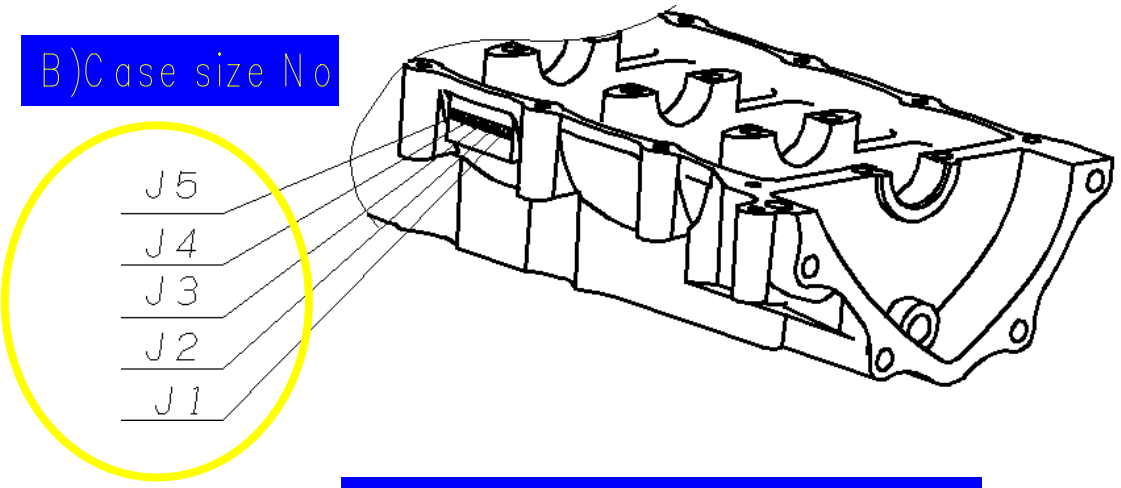
Pad No. 170 = 1.70 mm

Pad No. 185 = 1.85 mm


➢ Bearing Selection

Bearing Selection



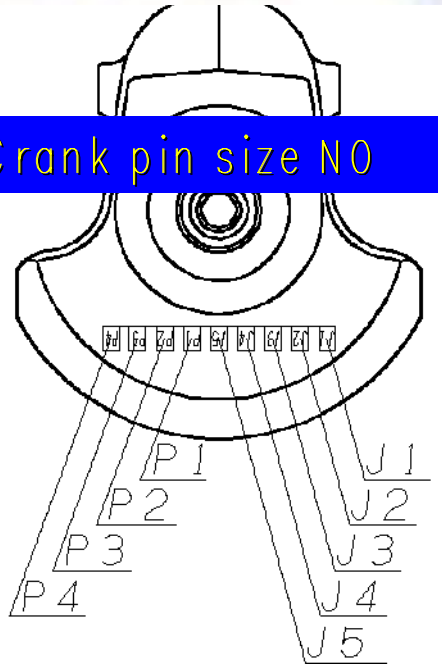


Journal Bering size
= B - A

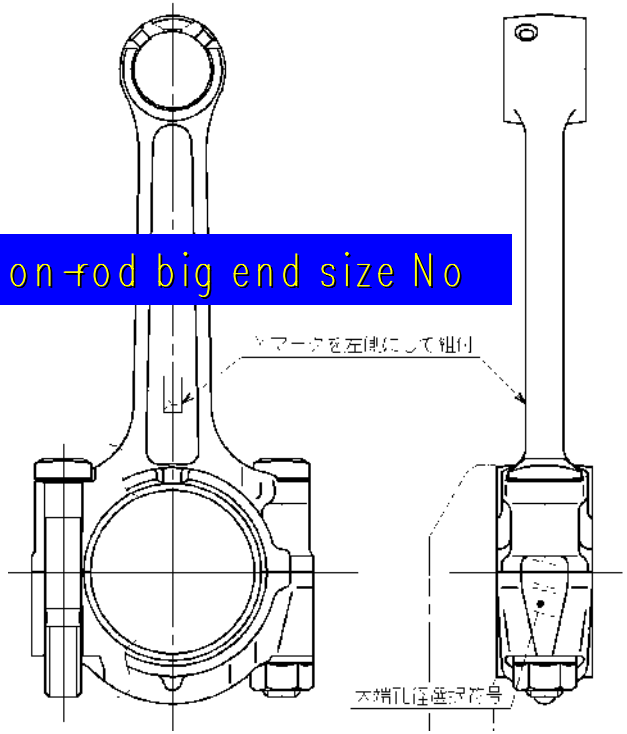
JOURNAL BEARING IDENTIFICATION				
BRG NO,	P.NO,	COLOR	THICKNESS	
1	60E-11416-00	BR	1.5	+0.010～+0.014
2	60E-11416-10	B	1.5	+0.006～+0.010
3	60E-11416-20	L	1.5	+0.002～+0.006
4	60E-11416-30	G	1.5	-0.002～+0.002
5	60E-11416-40	Y	1.5	-0.002～-0.006

Bearing Selection

A)Crank pin size NO



B)Con-rod big end size No



PIN BRG NO =B－A

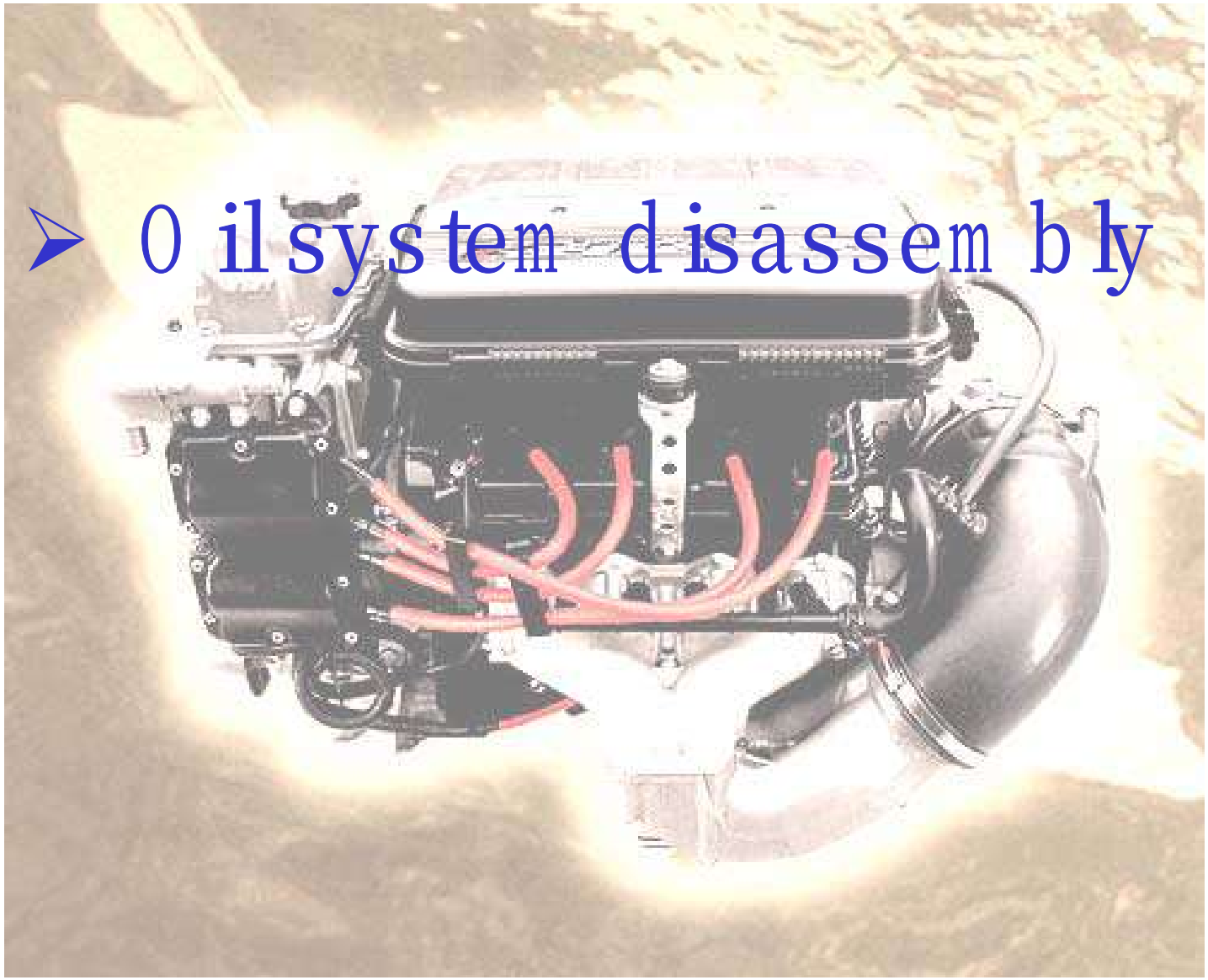
CRANK PIN BEARING				
BRG NO,	**P.NO,**	**Color**	**Thickness**	
1	**60E-11656-00**	**BR**	**1.5**	**0～+0.004**
2	**60E-11656-10**	**B**	**1.5**	**-0.004～0**
3	**60E-11656-20**	**L**	**1.5**	**-0.004～-0.008**
4	**60E-11656-30**	**G**	**1.5**	**-0.008～+0.012**

Other Information

- Other Information
  - Oil system disassembly
  - Exhaust disassembly
  - Peak Voltage
  - Service material publication plan
  - Service Special Tools
  - Parts Information

Other Information

YAMAHA

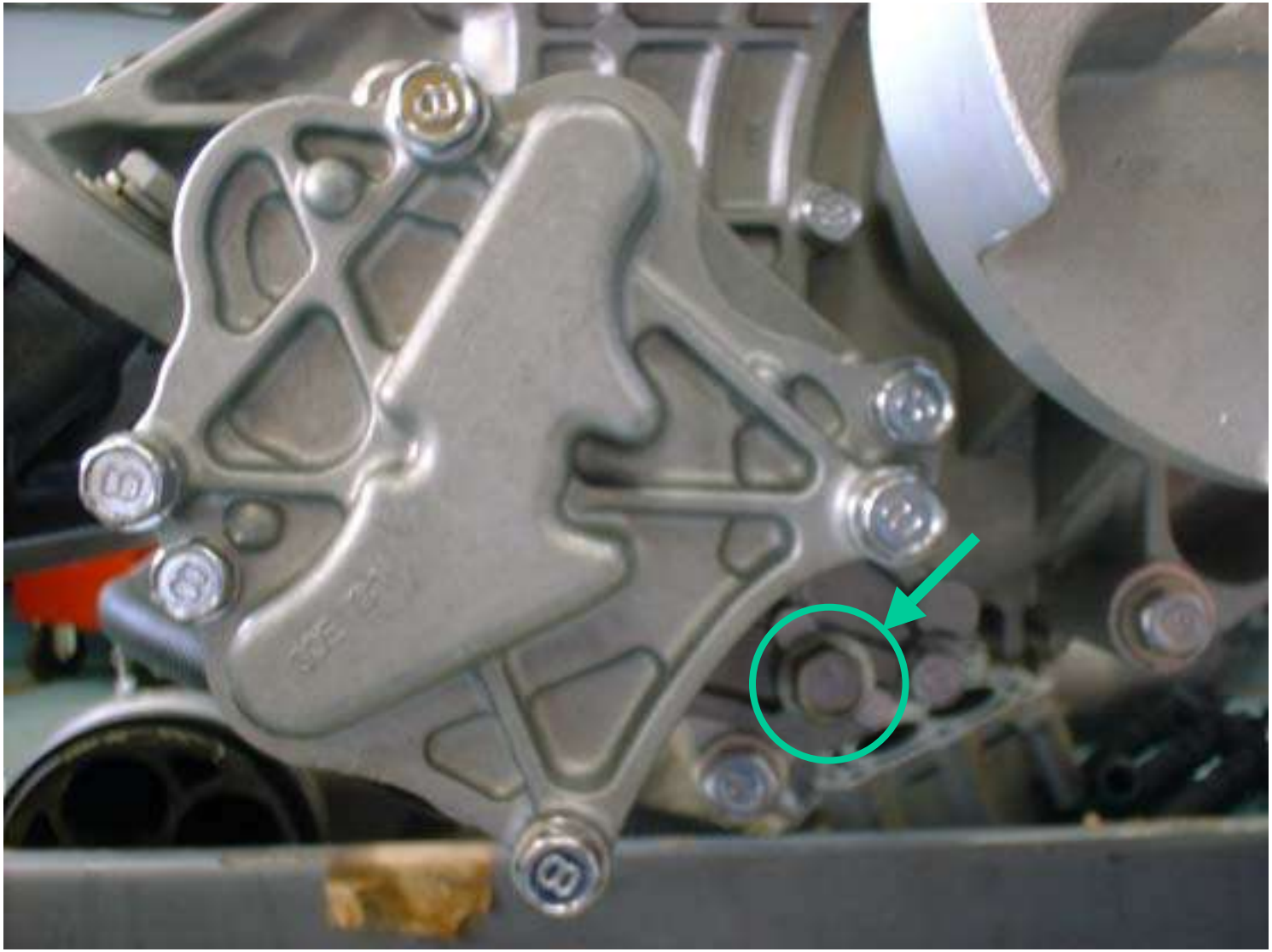


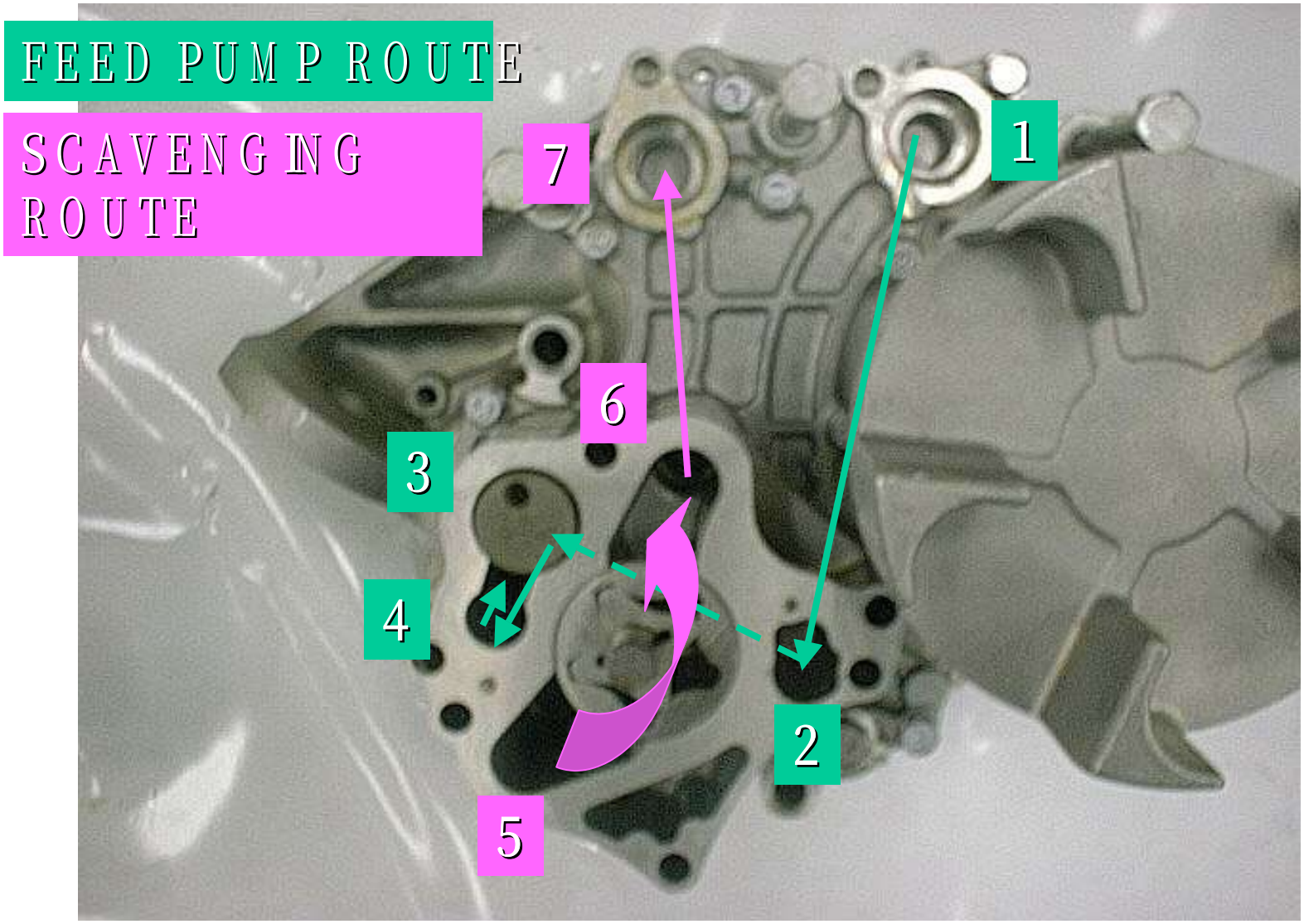
- Oil system disassembly

Oil System Disassembly

Oil System Disassembly

Oil System Disassembly




FEED PUMP ROUTE
SCAVENGING ROUTE
1
2
3
4
5
6
7

Oil System Disassembly

FEED PUMP ROUTE

SUPPLY OIL to ENGINE

CORRECT OIL to OIL TANK

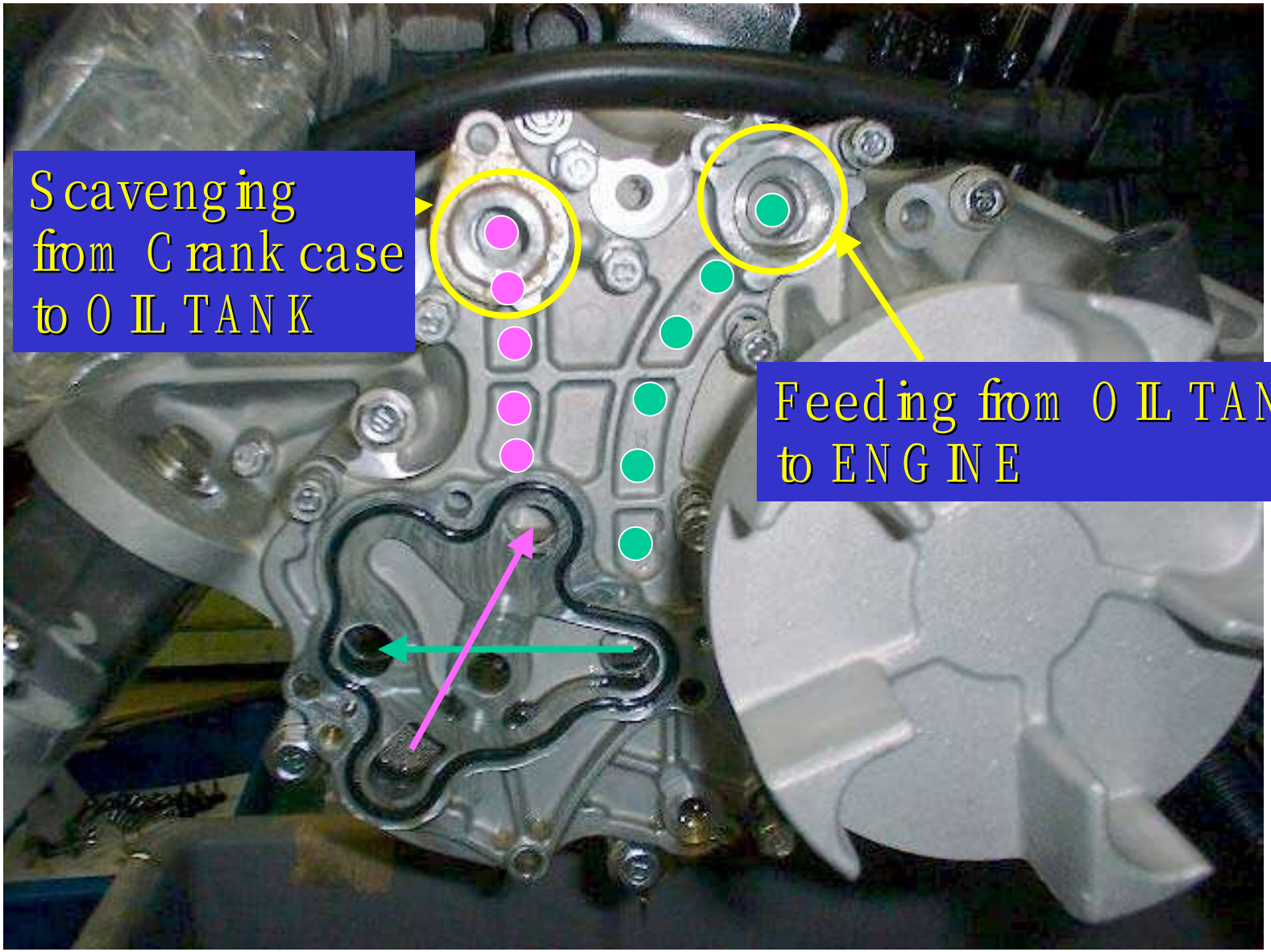
SCAVENGING ROUTE

Oil System Disassembly

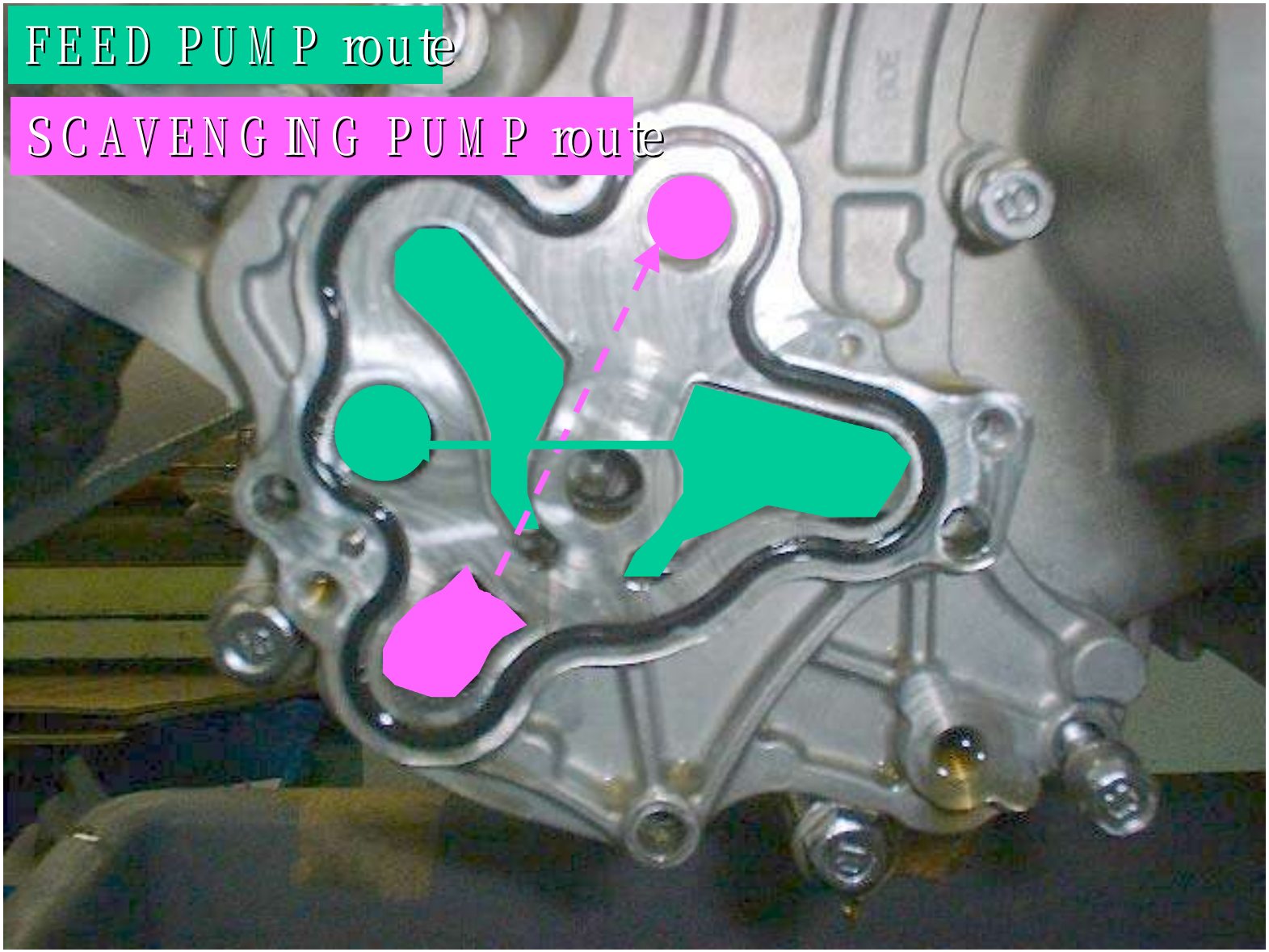
SCAV. side

FEED side

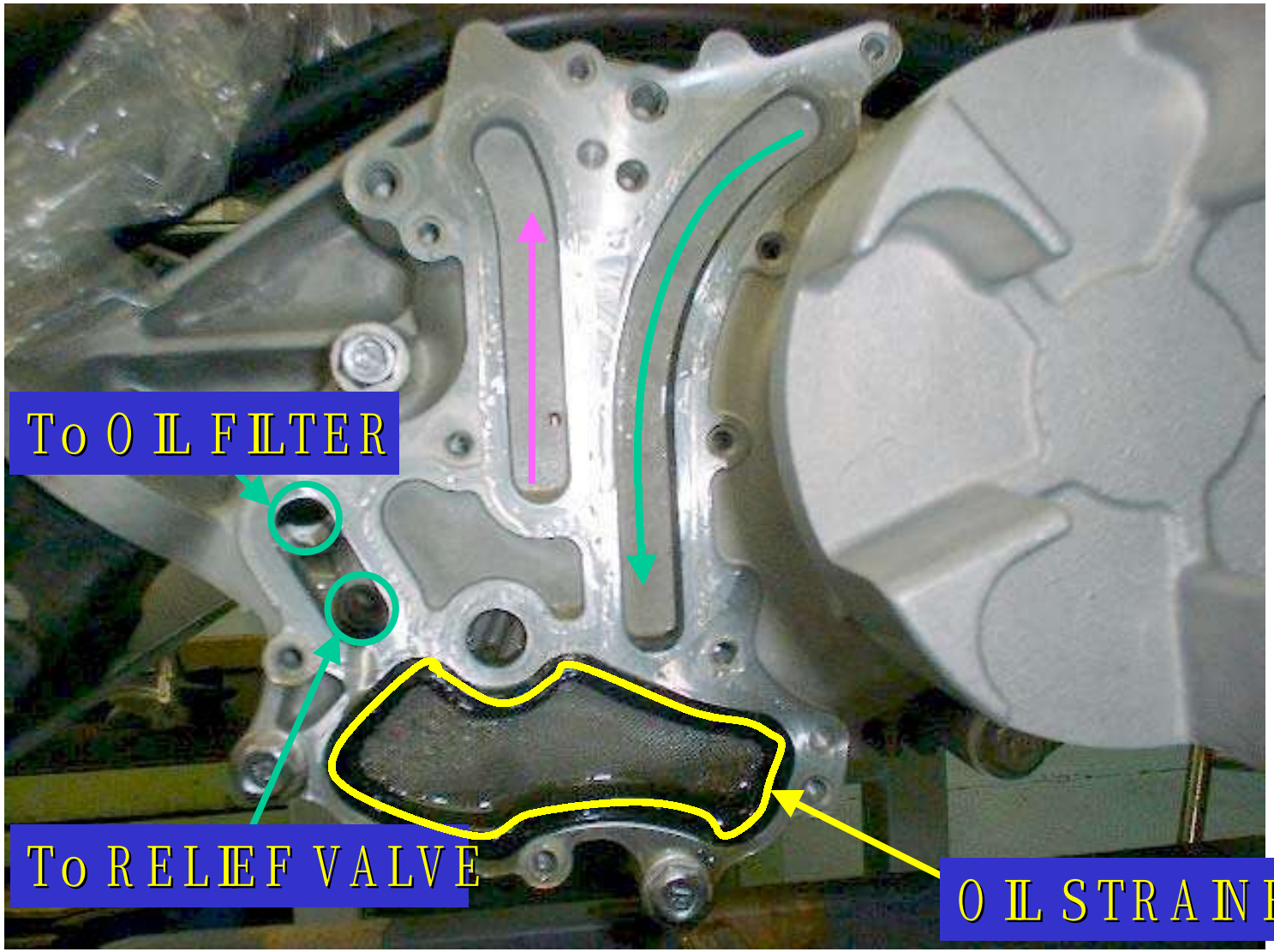
Oil System Disassembly



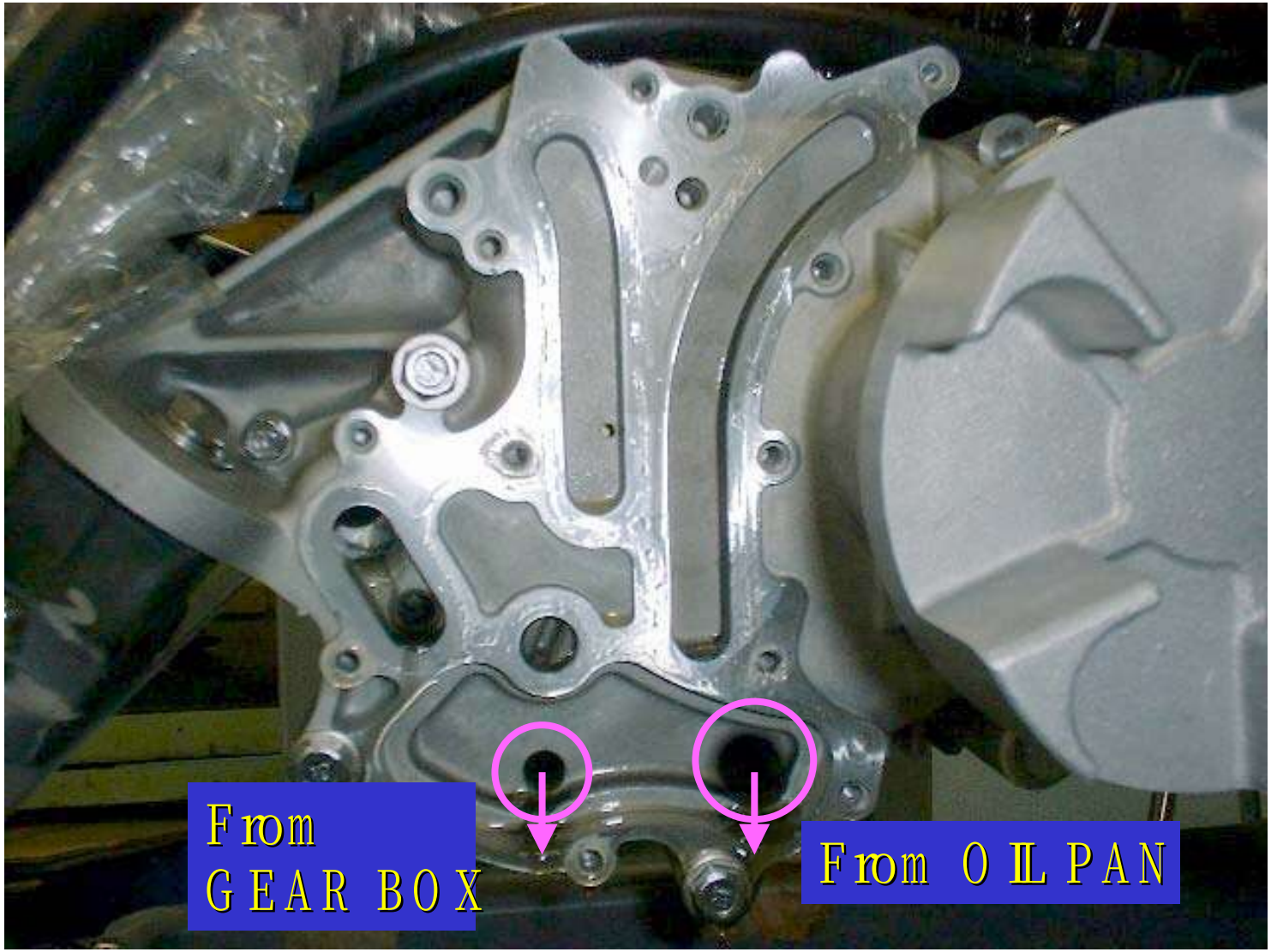
Oil System Disassembly



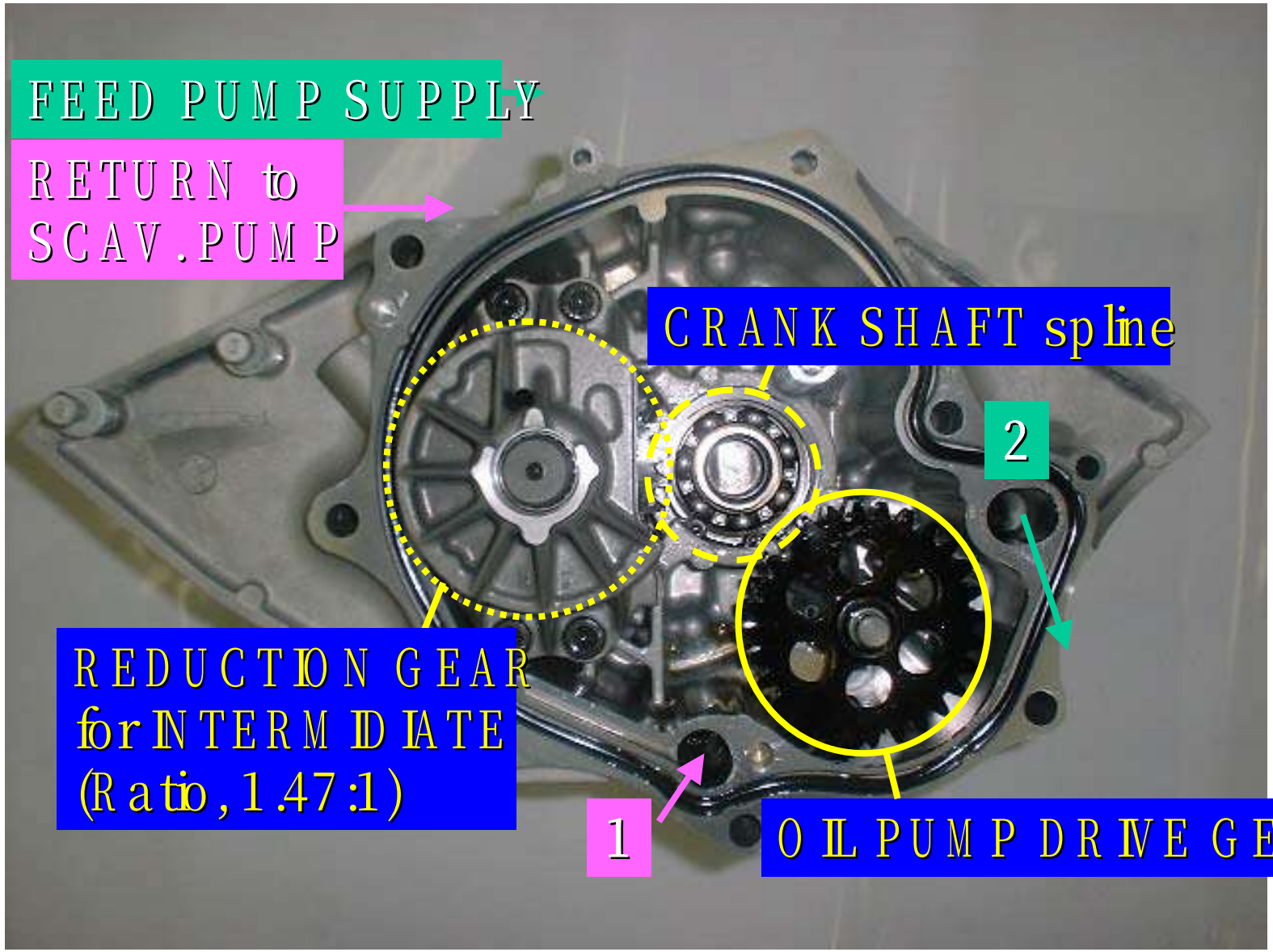
Oil System Disassembly



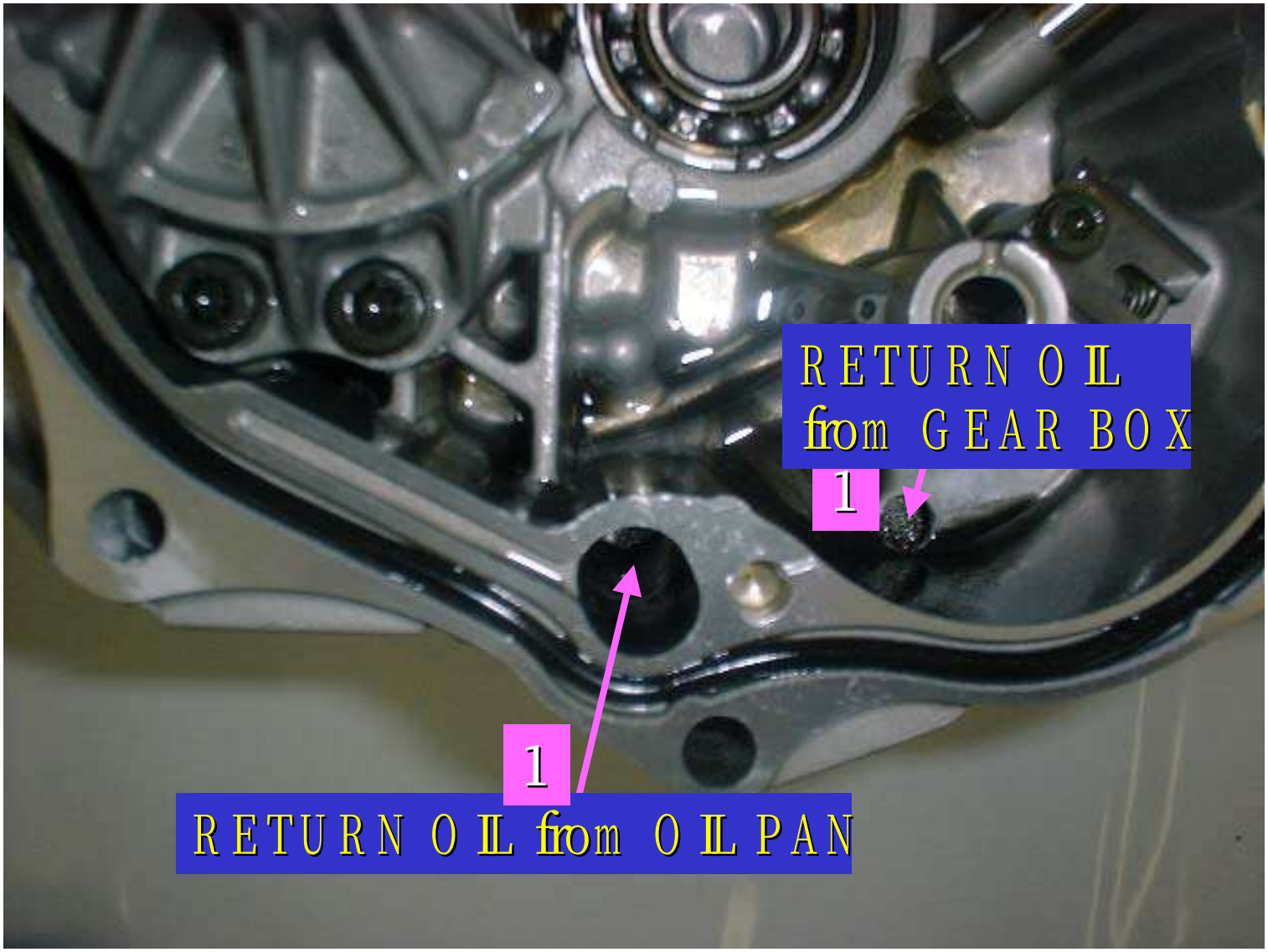
Oil System Disassembly



Oil System Disassembly



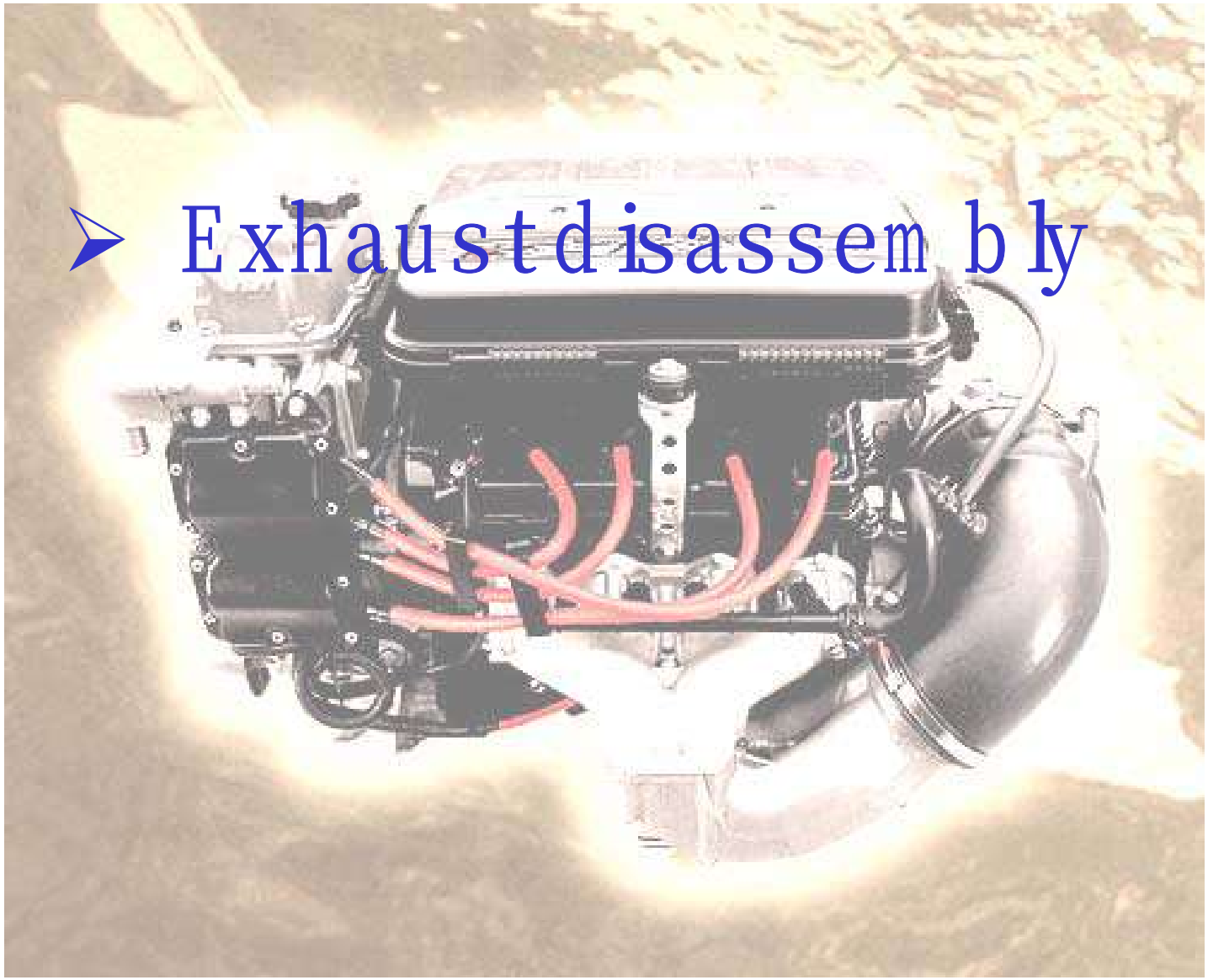
Oil System Disassembly



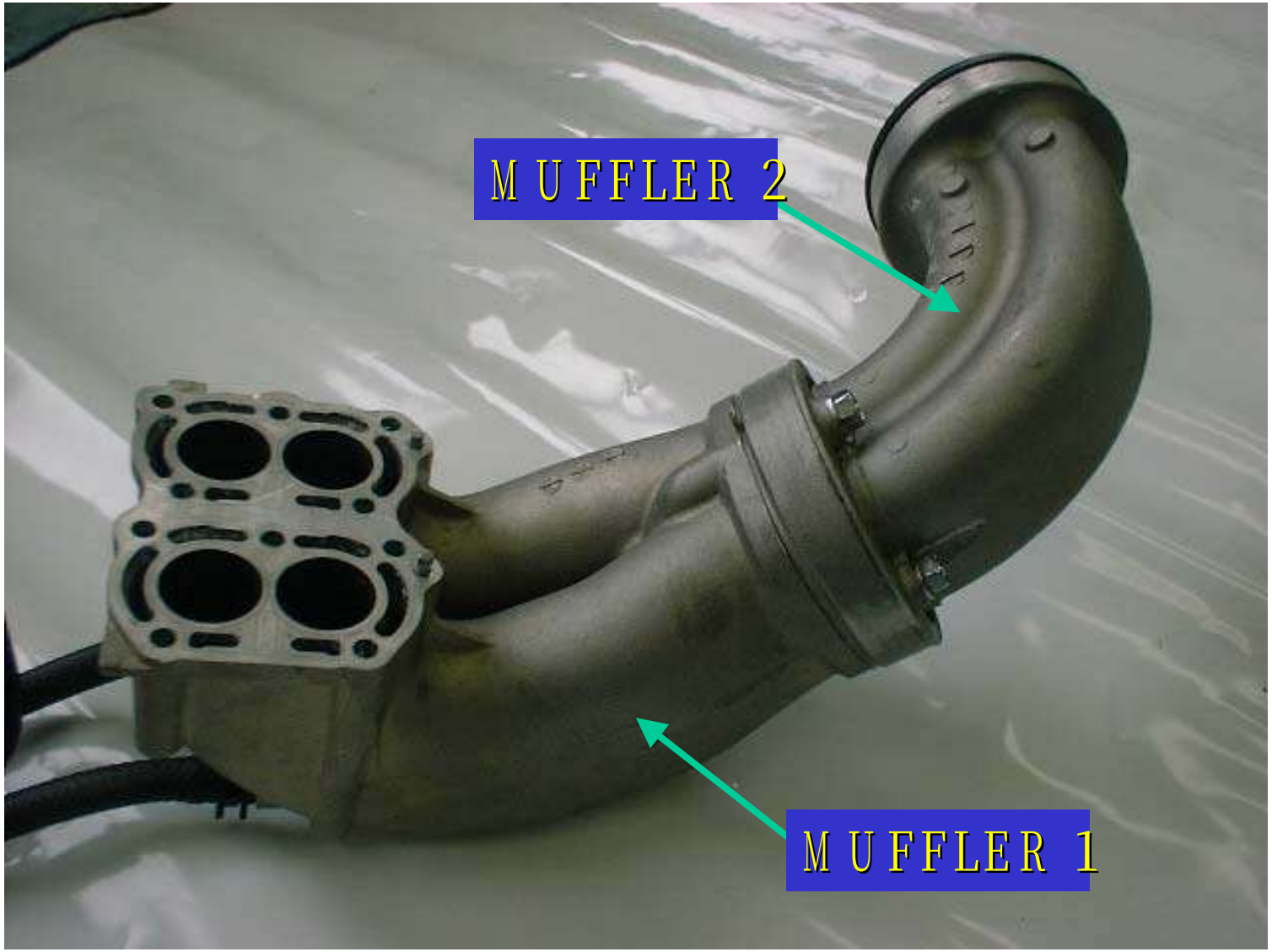
Other Information

YAMAHA

- Exhaust disassembly

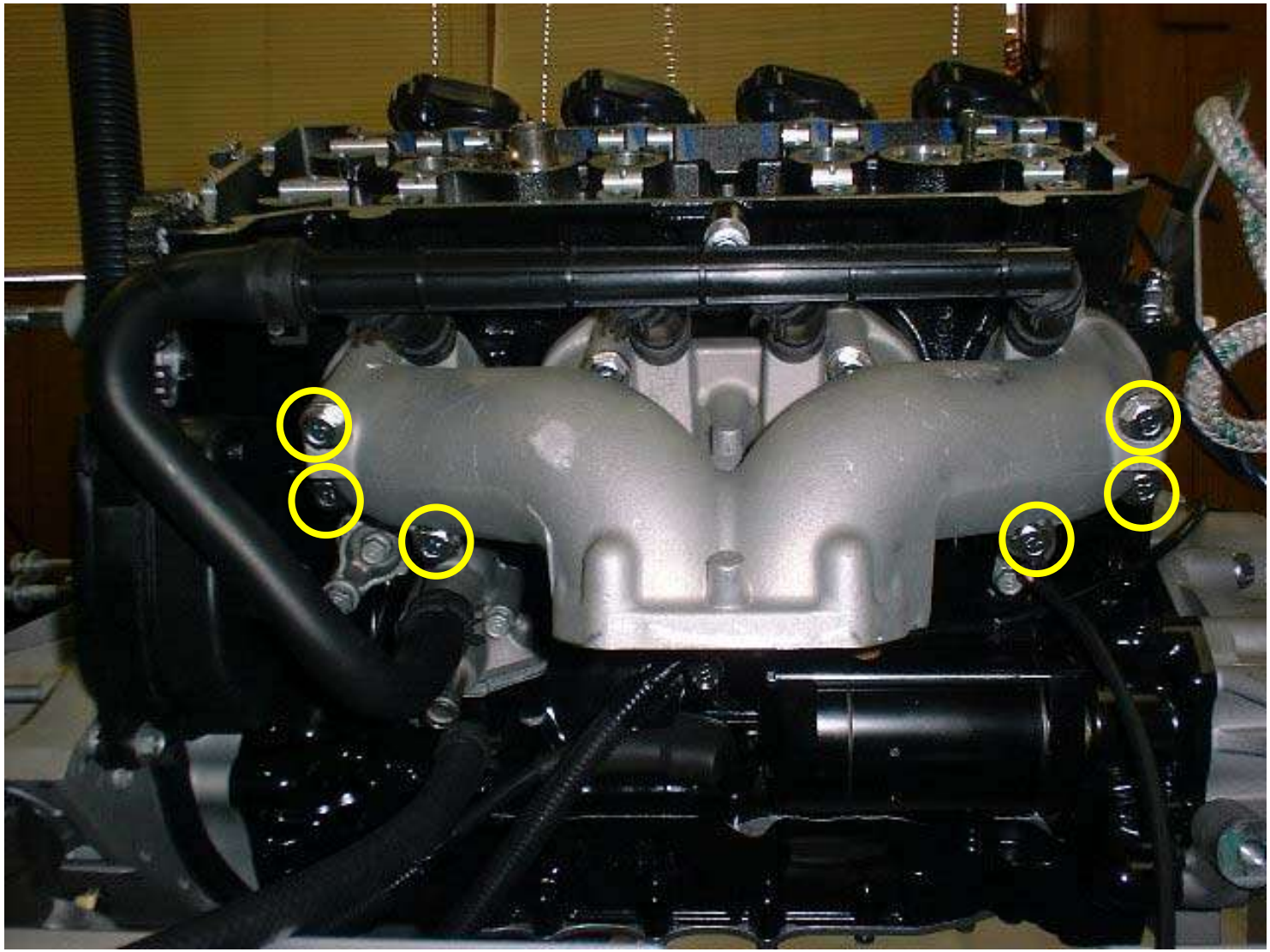


Exhaust Disassembly


MUFFLER 2
MUFFLER 1

Exhaust Disassembly

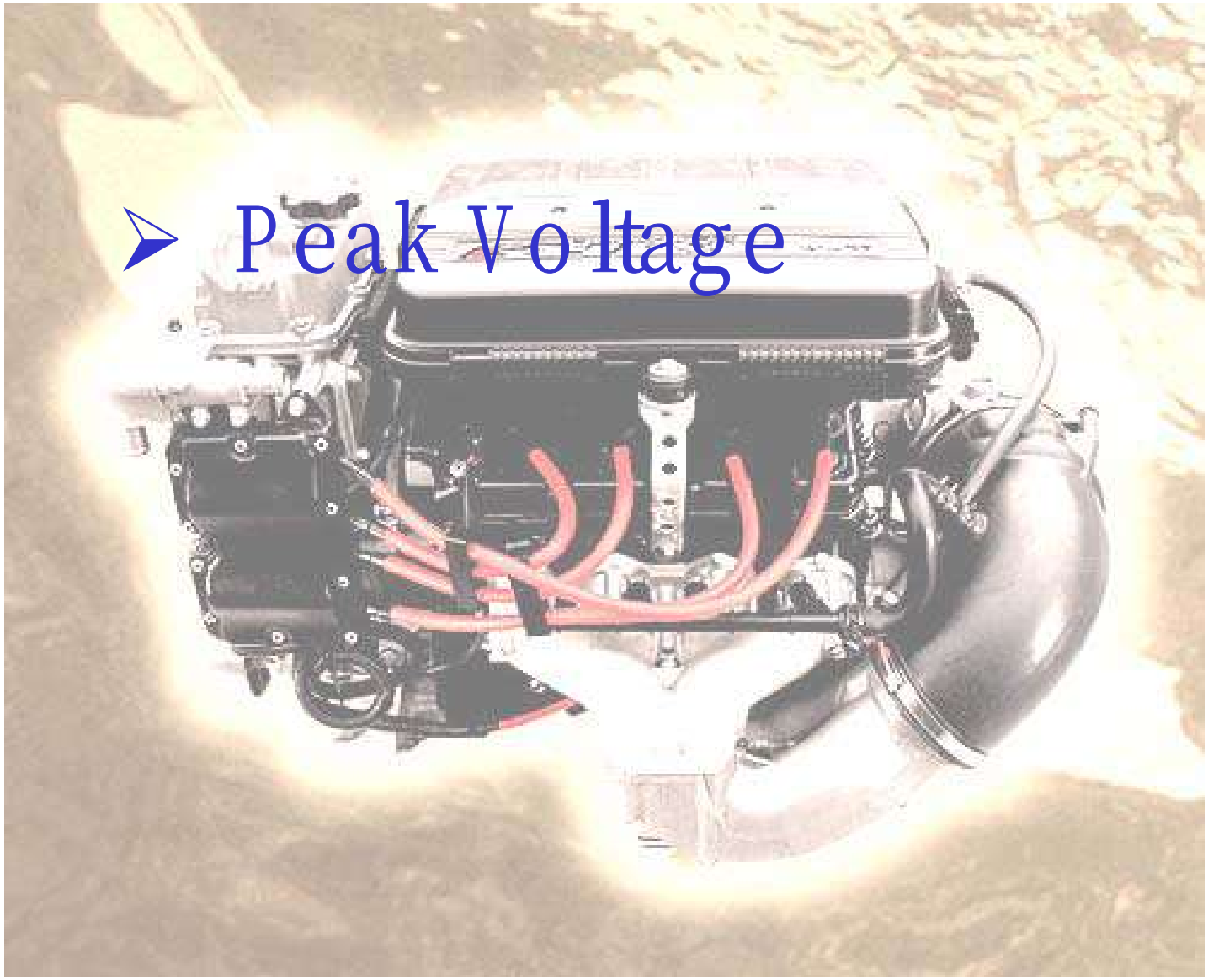
Exhaust Disassembly



Exhaust Disassembly

Other Information

YAMAHA



- Peak Voltage

Peak Voltage

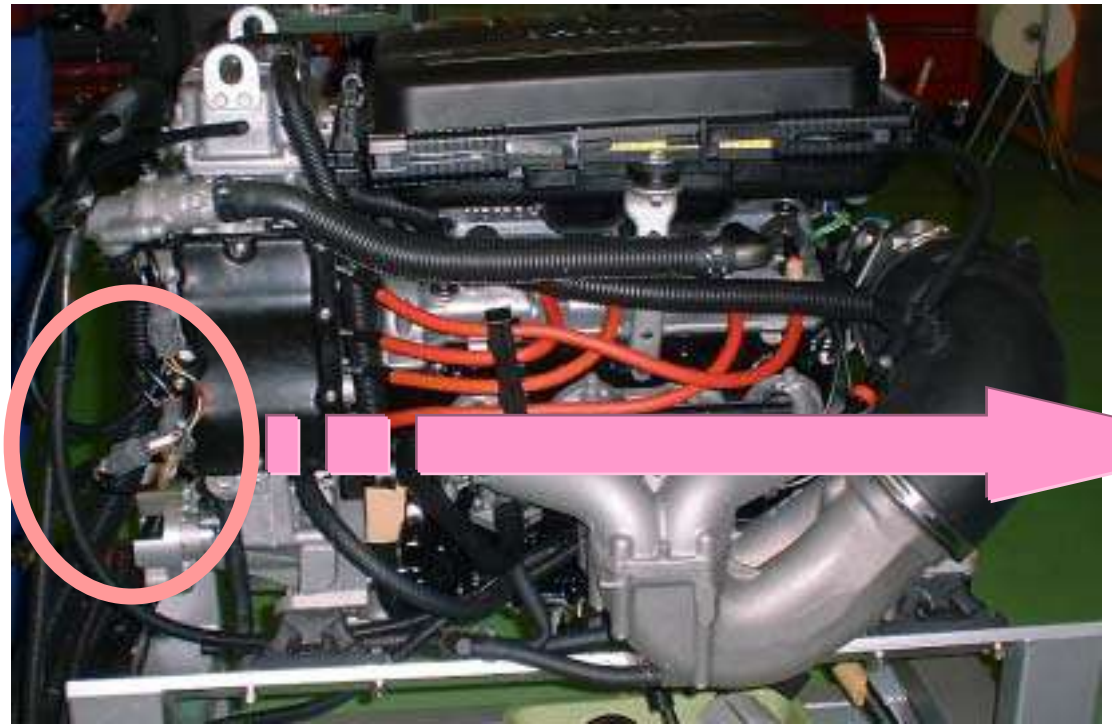
	Connector Color	Test harness	Unloaded	Loaded		
			Cranking		2,000 rpm	3,500 rpm
ECM	#1/#4 : B/R - R/Y	06792	-	7.0	258.0	258.0
	#2/#3 : B/W - R/Y					
Pulser Coil	#1/#4 : W/B - B/O	06791	4.0	4.0	23.0	38.0
	#2/#3 : W/R - B/O					
Lighting Coil	G - G	06770	9.0	8.0	11.0	12.0
Rectifier/Regulator	R - B	06790	-	-	-	14.5

Peak Voltage

ECM

	Connector Color	Test harness	Unloaded	Loaded		
			Cranking		2,000 rpm	3,500 rpm
ECM	#1/#4:B/R -R/Y	06792	-	7.0	258.0	258.0
	#2/#3:B/W -R/Y					

90890-06792



Peak Voltage

PULSER COIL

	Connector Color	Test harness	Unloaded	Loaded		
			Cranking		2,000 rpm	3,500 rpm
Pulser Coil	#1/#4 : W/B - B/O	06791	4.0	4.0	23.0	38.0
	#2/#3 : W/R - B/O					

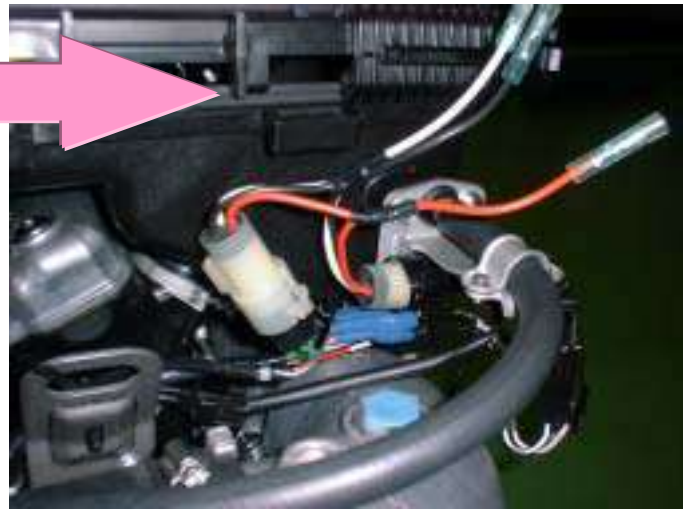
90890-06791

Peak Voltage

PULSER COIL

	Connector Color	Test harness	Unloaded	Loaded		
			Cranking		2,000 rpm	3,500rpm
Lighting Coil	G -G	06770	9.0	8.0	11.0	12.0

90890-06770

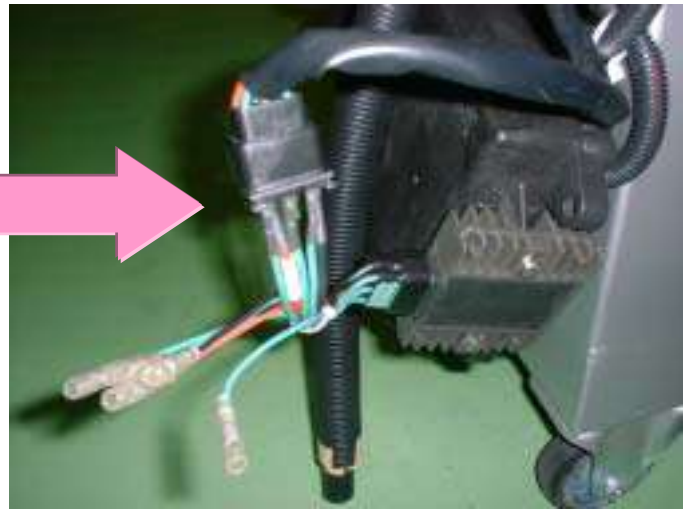


Peak Voltage

RECTIFIER/REGULATOR

	Connector Color	Test harness	Unloaded	Loaded		
			Cranking		2,000 rpm	3,500 rpm
Rectifier/Regulator	R - B	06790	-	-	-	14.5

90890-06790



Other Information

- Service material Publication Plan

Service Material Publication Plan

Service material publication plan

Service manual	Manual number	Publication
USA	F1B-28197-1E-11	End of February (PDF Data)
CAN	F1B-28197-2E-C1	End of March
W.W.	F1B-28197-ZE-C1	End of March
JPN	F1B-28197-0E-01	End of March

Service guide	Manual number	Publication
USA/CAN	90894-64630-60	End of January (PDF Data)
W.W.	90894-64630-61	End of February
JPN	90894-64630-63	End of February

Assembly manual	Manual number	Publication
USA	F1B-28107-1E-11	End of January (PDF Data)
CAN	F1B-28107-2E-C1	End of February
W.W.	F1B-28107-ZE-C1	End of February
JPN	F1B-28107-0E-01	End of March

Parts list	Manual number	Publication
USA	1AF1B-100E1	End of February (PDF Data)
CAN	1AF1B-100E1	End of February (PDF Data)
EUR	2AF1B-300E1	End of March (PDF Data)
JPN	1AF1B-010E1	End of March

Other Information

YAMAHA

- Service Special Tools

Service Special Tools

New Tools

NO,	PARTS NO,	NAME	REMARK
	90890		
1	〃 6582	Compression Gauge extension M10	
2	〃 6583	Dialgauge stand M10x173	
3	〃 6584	Dialgauge needle 173	
4	〃 6585	Dialgauge stand set	
5	〃 6862	Test connecter FW Y-8	TPS
6	〃 6842	Fuel P.gauge adapter	
7	〃 6811	Valve seat cutter holder 4.0	
8	〃 6812	Valve seat cutter holder 4.5	
9	〃 6813	Valve seat cutter 60deg-20	
10	〃 6814	Valve seat cutter 45deg-24	
11	〃 6815	Valve seat cutter 30deg-24	
12	60E-85300-01	YDIS KIT	
13	60E-WS853-00	YDIS CD-ROM	

Service Special Tools

Same as Motorcycle's Tools

NO,	PARTS NO,	NAME	REMARK
	90890		
1	〃 01080	Rotor puller	
2	〃 04114	Valve spring compressor attchment	
3	〃 04111	Valve guide remover 4mm	
4	〃 04112	Valve guide installer 4mm	
5	〃 04113	Valve guide reamer 4mm	
6	〃 01399	Special Thickness gauge	Width 6mm
7	〃 04116	Valve guide remover 4.5mm	
8	〃 04117	Valve guide installer 4.5mm	
9	〃 04118	Valve guide reamer 4.5mm	
10	〃 04119	Cam shaft wrench	

Service Special Tools

Existent Tools

NO,	PARTS NO,	NAME	REMARK
	90890		
1	» 01701	Sheave holder	
2	» 06551	Coupler wrench	
3	» 04019	Valve spring compressor	
4	» 04108	Valve spring compressor attchment	
5	» 01426	Oil filter wrench	
6	» 03094	Vacuum gauge	
7	—03060	Vacuum gauge attachment	
8	» 03160	Compression gauge	
9	» 06754	Fuel pressure gauge	
10	» 03174	Digital circuit tester	
11	» 03172	Peak voltage adapter B	
12	» 06754	Spark gap tester	
13	» 06760	Digital tachometer	
14	» 06552	Crankshaft holder 20	
15	» 06519	Drive shaft holder 5	

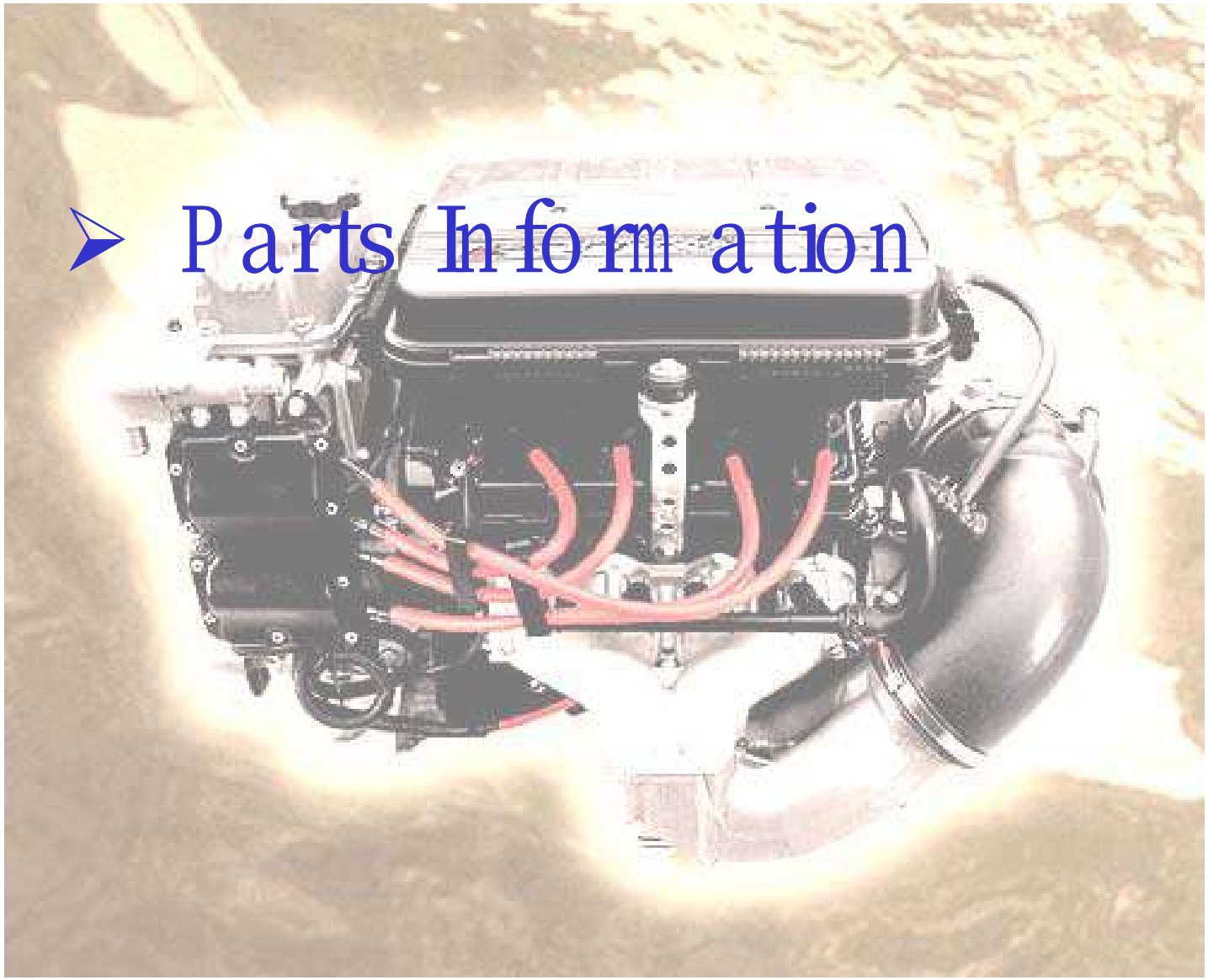
Service Special Tools

Existent Tools

NO,	PARTS NO,	NAME	REMARK
	90890		
16	〃 06770	Test harness SMT250-3	Lighting coil
17	〃 06790	Test harness FSW-6	Rect./Regu.
18	〃 06791	Test harness FWY-3-L	Pulser coil
19	〃 06792	Test harness SMHW090-2	ECM unit
20	〃 06793	Test harness SMHW099-3	TPS
21	〃 06315	Valve seat cutter 60deg-26	
22	〃 06312	Valve seat cutter 45deg-27.5	
23	〃 06328	Valve seat cutter 30deg-27	
24	〃 05158	Piston ring compressor	
25	〃 06769	Test harness EJ-2-2	**Intake Air Pressure**
26	〃 06756	Vacuum/pressure pump gauge set	**Intake Air Pressure**
27	〃 06777	Test harness HM090-3	Cam position

Other Information

YAMAHA



- Parts Information

【MC】 COMMON PARTS

No.	PARTS NO,	NAME
1	90201-10013	WASHER,PLAIN
2	90201-10019	WASHER,PLAIN
3	90179-10006	NUT
4	90179-10414	NUT
5	4KG-1111G-00	RUB.,MOUNT
6	4XV-15155-00	NOZZLE,3
7	93210-04092	O-RING
8	4XV-11633-00	PIN,PISTON
9	90468-12069	CLIP
10	5PW -11650-00	CONN.ROD ASSY.,1
11	5JW -11654-10	BOLT,CONNECTING ROD BIG END
12	90179-08327	NUT
13	4XV-12176-00	SPROCKET
14	90105-07342	BOLT,FLG.
15	4XV-12111-00	VALVE,1

【MC】 COMMON PARTS

No.	PARTS NO,	NAME
16	4XV-12112-00	VALVE,INT. 2
17	5LV-12121-00	VALVE,2
18	1HX-12116-01	SEAT,VALVE SPRING
19	3GM-12126-00	SEAT,VALVE SPRG. 2
20	4XV-12113-00	SPRG.,1
21	4XV-12114-00	SPRG.,2
22	1HX-12117-00	RET.,VALVE SPRING
23	1WG-12117-00	RET.,VALVE SPRING
24	1HX-12118-00	LOCK,VALVE SPRING RETAINER
25	1WG-12118-00	LOCK,VALVE SPRING RETAINER
26	4TV-12119-00	SEAL,VALVE STEM OIL
27	4SV-12119-00	SEAL,VALVE STEM OIL
28	1HX-12168-00	PAD,ADJUSTING 2
29	3FV-12153-00	LIFTER,VALVE
30	5BE-12241-00	GUIDE,STOPPER 2

【MC】 COMMON PARTS

No.	PARTS NO,	NAME
31	4FM-12213-00	GASKET,TENSIONER CASE 1
32	4XV-12251-00	DAMPER,CHAIN 1
33	4XV-12252-00	DAMPER,CHAIN 2
34	3LD-13113-00	SEAT,CHECK BALL
35	93505-08030	BALL
36	90501-105L2	SPRG.,COMPRESSION
37	1HX-13310-10	ROTOR ASSY.,1
38	5GH-13440-00	OIL CLEANER ASSY.
39	4WM-13484-00	SPRG.
40	4XV-14275-00	SPRG.
41	4WM-15590-00	STARTER ONE-WAY ASSY.

【W C/O M】 COMMON PARTS

No.	PARTS NO,	NAME
1	67F-11325-00	ANODE,1
2	682-84385-01	CAP,1
3	61L-5169A-00	GREASE,NIPPLE
4	6E5-11325-00	ANODE,1
5	68F-11119-00	HANGER,ENGINE
6	6A0-82317-00	DAMPER,IGNITION COIL
7	65L-85886-00	SENSOR,AIR TEMPERATURE
8	69J-85885-00	THROTTLE SENSOR ASSY.
9	66V-13898-00	HOLDER
10	67X-12590-00	CONDUCTION ASSY.
11	67X-12590-20	CONDUCTION ASSY.
12	67X-44517-10	MOUNT,RUBBER UPPER
13	66V-44532-00	STOPPER,UPR.MOUNT RUB.
14	68F-85335-00	ADAPTER,INTERFACE
15	68F-8533A-00	CABLE,INTERFACE

【WC/OM】 COMMON PARTS

No.	PARTS NO,	NAME
16	66V-8132W -00	CAP
17	66V-81844-00	PKG.
18	67F-2812A-00	PULLER,FUSE
19	68V-81960-00	RECTIFIER REGULATOR ASSY.
20	6R7-83623-40	MARK,3
21	6A0-82317-00	DAMPER,IGNITION COIL
22	68N-81940-00	STARTER RELAY ASSY.
23	66V-82119-00	COVER,LEAD WIRE
24	66V-82119-00	COVER,LEAD WIRE
25	67F-82154-10	CASE
26	67F-8215D-10	SEAL,WIRE
27	67F-8215C-10	TERMINAL
28	67F-8215D-00	SEAL,WIRE
29	67F-8215C-00	TERMINAL
30	68V-82504-00	SW.,OIL PRESSURE

No.	PARTS NO,	NAME
1	60E-R1311-00	DUCT,INTAKE
2	60E-R1333-00	SCREEN,INTAKE
3	60E-G5831-00	PLATE,TRANSOM
4	60E-51317-00	HSG.,IMPELLER 2
5	68Y-45511-00	SHAFT,DRIVE 1
6	68N-R1321-00	IMPELLER
7	60E-51313-00	NOZZLE,DEFLECTOR
8	60E-51190-00	RING,TRIM

WaveRunner FX 140

Thank you
for your kind attention.