SUZUKI OUTBOARD MOTOR

DF90 / 115

DF140 FOUR STROKE

For '03 model

SUPPLEMENTARY SERVICE MANUAL

99501-90J10-01E

DF90/115/140 "K3" (2003) MODEL

FOREWORD

This supplementary service manual describes the outline, technical data and servicing procedures for the "K3" (2003) models outboard motor.
Please read and thoroughly familiarize yourself with this information before using it for your service activities.

NOTE:
Use this supplement with the following service manual:
DF90/115/(140) Service Manual (P/no, 99500-90J0 • -01E)

CONTENTS

*SPECIFICATIONS (DF90T/115T/115W)

* These specifications are subject to change without notice.

Item	Unit	Data	
		DF90T	DF115T/115W
PRE-FIX		09001F	11501F

DIMENSIONS & WEIGHT

Overall length (front to back)		mm (in)	779 (30.7)
Overall width (side to side)		mm (in)	481 (18.9)
Overall height	L	mm (in)	1556 (61.3)
	UL	mm (in)	1683 (66.3)
Weight (without engine oil)	L	kg (lbs)	189.0 (416)
	UL	kg (lbs)	194.0 (427)
Transom height	L	mm (inch type)	539 (20)
	UL	mm (inch type)	666 (25)

PERFORMANCE

Maximum output	kW (PS)	66.2 (90)	84.6 (115)
Recommended operating range	r/min	4500 – 5500	5000 – 6000
Idle speed	r/min	625 ± 25 (in-gear : approx. 625)	

POWERHEAD

Engine type		4-stroke DOHC
Number of cylinders		4
Bore	mm (in)	84.0 (3.31)
Stroke	mm (in)	88.0 (3.46)
Total displacement	cm^3 (cu in)	1950 (119.0)
Compression ratio	: 1	9.8
Spark plug	NGK	BKR6E
Ignition system		Full-transistorized ignition
Fuel supply system		Multi-point sequential electronic fuel injection
Exhaust system		Through prop exhaust
Cooling system		Water cooled
Lubrication system		Wet sump by trochoid pump
Starting system		Electric
Throttle control		Remote control

Item	Unit	Data	
		DF90T	DF115T/115W

FUEL & OIL

Fuel		Suzuki highly recommends that you use alcohol-free unleaded gasoline with a minimum pump octane rating of 87 ($\frac{R+M}{2}$ method) or 91 (Research method). However, blends of unleaded gasoline and alcohol with equivalent octane content may be used.
Engine oil		API classification SE, SF, SG, SH, SJ Viscosity rating 10W-40
Engine oil amounts	L (US/Imp. qt)	5.5 (5.8 / 4.8) : Oil change only 5.7 (6.0 / 5.0) : Oil filter change
Gear oil		SUZUKI Outboard Motor Gear Oil (SAE #90 hypoid gear oil)
Gearcase oil capacity	ml (US/Imp. oz)	1050 (35.5 / 37.0)

BRACKET

Trim angle		PTT system
Number of trim position		PTT system
Maximum tilt angle	degree	75

LOWER UNIT

Reversing system	Gear
Transmission	Forward-Neutral-Reverse
Reduction system	Bevel gear
Gear ratio	12 : 25 (2.08)
Drive line impact protection	Spline drive rubber hub
Propeller	Blade × Diam. (in) × Pitch (in)
	3 × 14 × 17 3 × 14 × 19 3 × 14 × 21 3 × 14 × 23

REDUCTION SYSTEM

1st reduction gear ratio (Crankshaft drive gear: Driven gear)	29 : 36 (1.24)
2nd reduction gear ratio (Lower unit gear)	12 : 25 (2.08)
Total reduction gear ratio	$2.59 \left(\frac{36}{29} \times \frac{25}{12} \right)$

*SPECIFICATIONS (DF140T/140W/140Z)

* These specifications are subject to change without notice.

Item	Unit	Data	
		DF140T/140W	DF140Z
PRE-FIX		14001F	14001Z

DIMENSIONS & WEIGHT

Overall length (front to back)		mm (in)	779 (30.7)
Overall width (side to side)		mm (in)	481 (18.9)
Overall height	L	mm (in)	1611 (63.4)
	UL	mm (in)	1738 (68.4)
Weight (without engine oil)	L	kg (lbs)	186.0 (410)
	UL	kg (lbs)	191.0 (421)
Transom height	L	mm (inch type)	539 (20)
	UL	mm (inch type)	666 (25)

PERFORMANCE

Maximum output	kW (PS)	103 (140)
Recommended operating range	r/min	5600 – 6200
Idle speed	r/min	700 ± 50 (in-gear: approx. 700)

POWERHEAD

Engine type		4-stroke DOHC
Number of cylinders		4
Bore	mm (in)	86 (3.39)
Stroke	mm (in)	88 (3.46)
Total displacement	cm^3 (cu in)	2044 (124.6)
Compression ratio	: 1	9.7
Spark plug	NGK	BKR6E
Ignition system		Full-transistorized ignition
Fuel supply system		Multi-point sequential electronic fuel injection
Exhaust system		Through prop exhaust
Cooling system		Water cooled
Lubrication system		Wet sump by trochoid pump
Starting system		Electric
Throttle control		Remote control

Item	Unit	Data	
		DF140T/140W	DF140Z

FUEL & OIL

Fuel		Suzuki highly recommends that you use alcohol-free unleaded gasoline with a minimum pump octane rating of 87 ($\frac{R+M}{2}$ method) or 91 (Research method). However, blends of unleaded gasoline and alcohol with equivalent octane content may be used.
Engine oil		API classification SE, SF, SG, SH, SJ Viscosity rating SAE10W-40
Engine oil amounts	L (US/Imp. qt)	5.5 (5.8/4.8) : Oil change only 5.7 (6.0/5.0) : Oil filter change
Gear oil		SUZUKI Outboard Motor Gear Oil (SAE #90 hypoid gear oil)
Gearcase oil capacity	ml (US/Imp. oz)	1050 (35.5/37.0)

BRACKET

Trim angle		PTT system
Number of trim position		PTT system
Maximum tilt angle	degree	75

LOWER UNIT

Reversing system		Gear
Transmission		Forward-Neutral-Reverse
Reduction system		Bevel gear
Gear ratio		12 : 23 (1.92)
Drive line impact protection		Spline drive rubber hub
Propeller shaft rotation (when shift into forward)	clockwise	counterclockwise
Propeller	Blade × Diam. (in) × Pitch (in)	
	☆ 3 × 13-1/2 × 15	
	☆ 3 × 14 × 17	
	☆ 3 × 14 × 19	
	☆ 3 × 14 × 21	
	☆ 3 × 14 × 23	
	★ 3 × 14 × 18	★ 3 × 14 × 18
	★ 3 × 14 × 20	★ 3 × 14 × 20
☆: Aluminum propeller	★ 3 × 14 × 22	★ 3 × 14 × 22
★: Stainless steel propeller	★ 3 × 14 × 24	★ 3 × 14 × 24

REDUCTION SYSTEM

1st reduction gear ratio (Crankshaft drive gear: Driven gear)	29 : 36 (1.24)
2nd reduction gear ratio (Lower unit gear)	12 : 23 (1.92)
Total reduction gear ratio	$2.38 \left(\frac{36}{29} \times \frac{23}{12} \right)$

*SERVICE DATA (DF90T/115T/115W)

* These service data are subject to change without notice.

Item	Unit	Data	
		DF90T	DF115T/115W

POWERHEAD

Recommended operating range	r/min	4500 – 5500	5000 – 6000
Idle speed	r/min	625 ± 25 (in-gear : approx. 625)	
**Cylinder compression	kPa (kg/cm², psi)	1300 – 1700 (13 – 17, 185 – 242)	
**Cylinder compression max. difference between any two cylinders	kPa (kg/cm², psi)	100 (1.0, 14)	
**Engine oil pressure	kPa (kg/cm², psi)	550 – 600 (5.5 – 6.0, 78 – 85) at 3000 r/min. (at normal operating temp.)	
Engine oil		API classification SE, SF, SG, SH, SJ Viscosity rating SAE 10W-40	
Engine oil amounts	L (US/Imp. qt)	5.5 (5.8 / 4.8) : Oil change only 5.7 (6.0 / 5.0) : Oil filter change	
Thermostat operating temperature	°C (°F)	58 – 62 (136 – 144)	

** Figures shown are guidelines only, not absolute service limits.

Item			Unit	Data	
				DF90T	DF115T/115W

CYLINDER HEAD / CAMSHAFT

** New "K3" service data

Cylinder head distortion		Limit	mm (in)	0.05 (0.002)	
Manifold seating faces distortion		Limit	mm (in)	0.10 (0.004)	
Cam height	IN	STD	mm (in)	36.920 – 37.080 (1.4535 – 1.4598)	38.820 – 38.980 (1.5283 – 1.5346)
		Limit	mm (in)	36.820 (1.4496)	38.720 (1.5244)
	EX	STD	mm (in)	36.630 – 36.790 (1.4421 – 1.4484)	** 38.820 – 38.980 (1.5283 – 1.5346)
		Limit	mm (in)	36.530 (1.4173)	** 38.720 (1.5244)
Camshaft journal oil clearance	Top, 2nd, 3rd, 4th	STD	mm (in)	0.020 – 0.062 (0.0008 – 0.0024)	
		Limit	mm (in)	0.120 (0.0047)	
	5th	STD	mm (in)	0.045 – 0.087 (0.0018 – 0.0034)	
		Limit	mm (in)	0.120 (0.0047)	
Camshaft journal (housing) inside diameter	Top, 2nd, 3rd, 4th	STD	mm (in)	23.000 – 23.021 (0.9055 – 0.9063)	
		Limit	mm (in)	23.171 (0.9122)	
	5th	STD	mm (in)	26.000 – 26.021 (1.0236 – 1.0244)	
		Limit	mm (in)	26.171 (1.0304)	
Camshaft journal outside diameter	Top, 2nd, 3rd, 4th	STD	mm (in)	22.959 – 22.980 (0.9039 – 0.9047)	
		Limit	mm (in)	22.869 (0.9004)	
	5th	STD	mm (in)	25.934 – 25.955 (1.0210 – 1.0219)	
		Limit	mm (in)	25.844 (1.0175)	
Camshaft runout		Limit	mm (in)	0.10 (0.004)	
Cylinder head bore to tappet clearance		STD	mm (in)	0.025 – 0.066 (0.0010 – 0.0026)	
		Limit	mm (in)	0.150 (0.0059)	
Tappet outer diameter		STD	mm (in)	30.959 – 30.975 (1.2189 – 1.2195)	
Cylinder head bore		STD	mm (in)	31.000 – 31.025 (1.2203 – 1.2215)	

Item	Unit	Data	
		DF90T	DF115T/115W

VALVE/VALVE GUIDE

Valve diameter		IN	mm (in)	33 (1.3)
		EX	mm (in)	28 (1.1)
Tappet clearance (Cold engine condition)	IN	STD	mm (in)	0.23 – 0.27 (0.009 – 0.011)
	EX	STD	mm (in)	0.23 – 0.27 (0.009 – 0.011)
Valve seat angle	IN		——	15°, 45°, 60°
	EX		——	15°, 45°
Valve guide to valve stem clearance	IN	STD	mm (in)	0.020 – 0.047 (0.0008 – 0.0019)
		Limit	mm (in)	0.070 (0.0028)
	EX	STD	mm (in)	0.045 – 0.072 (0.0018 – 0.0028)
		Limit	mm (in)	0.090 (0.0035)
Valve guide inside diameter	IN,EX	STD	mm (in)	6.000 – 6.012 (0.2362 – 0.2367)
Valve guide protrusion	IN,EX	STD	mm (in)	13.5 (0.53)
Valve stem outside diameter	IN	STD	mm (in)	5.965 – 5.980 (0.2348 – 0.2354)
	EX	STD	mm (in)	5.940 – 5.955 (0.2339 – 0.2344)
Valve stem end deflection	IN	Limit	mm (in)	0.14 (0.006)
	EX	Limit	mm (in)	0.18 (0.007)
Valve stem runout	IN,EX	Limit	mm (in)	0.05 (0.002)
Valve head radial runout	IN,EX	Limit	mm (in)	0.08 (0.003)
Valve head thickness	IN	STD	mm (in)	1.0 (0.04)
		Limit	mm (in)	0.7 (0.03)
	EX	STD	mm (in)	1.20 (0.05)
		Limit	mm (in)	0.7 (0.03)
Valve seat contact width	IN	STD	mm (in)	1.1 – 1.3 (0.04 – 0.05)
	EX	STD	mm (in)	1.1 – 1.3 (0.04 – 0.05)
Valve spring free length		STD	mm (in)	42.7 (1.68)
		Limit	mm (in)	41.0 (1.61)
Valve spring tension		STD	N (kg, lbs)	167 – 193 (16.7 – 19.3, 36.8 – 42.5) for 32.6 mm (1.28 in)
		Limit	N (kg, lbs)	151 (15.1, 33.3) for 32.6 mm (1.28 in)
Valve spring squareness		Limit	mm (in)	2.0 (0.08)

Item			Unit	Data	
				DF90T	DF115T/115W

CYLINDER/PISTON/PISTON RING

Cylinder distortion		Limit	mm (in)	0.05 (0.002)	
Piston to cylinder clearance		STD	mm (in)	0.020 – 0.040 (0.0008 – 0.0016)	
		Limit	mm (in)	0.100 (0.0039)	
Cylinder bore		STD	mm (in)	84.000 – 84.020 (3.3071 – 3.3079)	
Cylinder measuring position			mm (in)	50 (2.0) from cylinder top surface	
Piston skirt diameter		STD	mm (in)	83.970 – 83.990 (3.3059 – 3.3067)	
Piston measuring position			mm (in)	26.5 (1.04) from piston skirt end.	
Cylinder bore wear		Limit	mm (in)	0.100 (0.0039)	
Piston ring end gap	1st	STD	mm (in)	0.20 – 0.35 (0.008 – 0.014)	
		Limit	mm (in)	0.70 (0.028)	
	2nd	STD	mm (in)	0.35 – 0.50 (0.014 – 0.020)	
		Limit	mm (in)	1.00 (0.039)	
Piston ring free end gap	1st	STD	mm (in)	Approx. 11.3 (0.44)	
		Limit	mm (in)	9.0 (0.354)	
	2nd	STD	mm (in)	Approx. 11.0 (0.43)	
		Limit	mm (in)	8.8 (0.347)	
Piston ring to groove clearance	1st	STD	mm (in)	0.030 – 0.070 (0.0012 – 0.0028)	
		Limit	mm (in)	0.12 (0.005)	
	2nd	STD	mm (in)	0.020 – 0.060 (0.0008 – 0.0024)	
		Limit	mm (in)	0.10 (0.004)	
Piston ring groove width	1st	STD	mm (in)	1.22 – 1.24 (0.048 – 0.049)	
	2nd	STD	mm (in)	1.51 – 1.53 (0.059 – 0.060)	
	Oil	STD	mm (in)	2.51 – 2.53 (0.099 – 0.100)	
Piston ring thickness	1st	STD	mm (in)	1.17 – 1.19 (0.046 – 0.047)	
	2nd	STD	mm (in)	1.47 – 1.49 (0.058 – 0.059)	
Pin clearance in piston pin hole		STD	mm (in)	0.006 – 0.017 (0.0002 – 0.0007)	
		Limit	mm (in)	0.040 (0.0016)	
Piston pin outside diameter		STD	mm (in)	20.997 – 21.000 (0.8267 – 0.8268)	
		Limit	mm (in)	20.980 (0.8260)	
Piston pin hole diameter		STD	mm (in)	21.006 – 21.014 (0.8270 – 0.8273)	
		Limit	mm (in)	21.040 (0.8283)	
Pin clearance in conrod small end		STD	mm (in)	0.003 – 0.014 (0.0001 – 0.0006)	
		Limit	mm (in)	0.050 (0.0020)	
Conrod small end bore		STD	mm (in)	21.003 – 21.011 (0.8269 – 0.8272)	

Item		Unit	Data	
			DF90T	DF115T/115W

CRANKSHAFT / CONROD

Conrod small end inside diameter	STD	mm (in)	21.003 – 21.011 (0.8269 – 0.8272)
Conrod big end oil clearance	STD	mm (in)	0.020 – 0.040 (0.0008 – 0.0016)
	Limit	mm (in)	0.065 (0.0026)
Conrod big end inside diameter	STD	mm (in)	47.000 – 47.018 (1.8504 – 1.8511)
Crank pin outside diameter	STD	mm (in)	43.982 – 44.000 (1.7316 – 1.7323)
Crank pin outside diameter difference (out of round and aper)	Limit	mm (in)	0.010 (0.0004)
Conrod bearing thickness	STD	mm (in)	1.484 – 1.502 (0.0584 – 0.0591)
Conrod big end side clearance	STD	mm (in)	0.100 – 0.250 (0.0039 – 0.0098)
	Limit	mm (in)	0.350 (0.0138)
Conrod big end width	STD	mm (in)	21.950 – 22.000 (0.8642 – 0.8661)
Crank pin width	STD	mm (in)	22.100 – 22.200 (0.8700 – 0.8740)
Crankshaft center journal runout	Limit	mm (in)	0.04 (0.002)
Crankshaft journal oil clearance	STD	mm (in)	0.020 – 0.040 (0.0008 – 0.0016)
	Limit	mm (in)	0.065 (0.0026)
Crankcase bearing holder inside diameter	STD	mm (in)	62.000 – 62.018 (2.4409 – 2.4417)
Crankshaft journal outside diameter	STD	mm (in)	57.994 – 58.012 (2.2832 – 2.2839)
Crankshaft journal outside diameter difference (out of round and taper)	Limit	mm (in)	0.010 (0.0004)
Crankshaft bearing thickness	STD	mm (in)	1.990 – 2.006 (0.0783 – 0.0790)
Crankshaft thrust play	STD	mm (in)	0.11 – 0.31 (0.004 – 0.012)
	Limit	mm (in)	0.35 (0.014)
Crankshaft thrust bearing thickness	STD	mm (in)	2.425 – 2.475 (0.0955 – 0.0974)

Item	Unit	Data	
		DF90T	DF115T/115W

ELECTRICAL

Ignition timing		Degrees at r/min	BTDC 1° – BTDC 44°	BTDC 3° – BTDC 44°
Over revolution limiter		r/min	6200	
CKP sensor resistance		Ω at 20°C	168 – 252	
CMP sensor resistance		Ω at 20°C	——	
Ignition coil resistance	Primary	Ω at 20°C	1.9 – 2.5	
	Secondary	kΩ at 20°C	No.2–No.3 : 18–34 (including H.T.cord and spark plug cap) No.1–No.4 : 19–36 (including H.T.cord and spark plug cap)	
High tension cord resistance		kΩ/m at 20°C	Approx.16	
Battery charge coil resistance		Ω at 20°C	0.16 – 0.24	
Battery charge coil output (12V)		Watt	480	
Standard spark plug	Type	NGK	BKR6E	
	Gap	mm (in)	0.7 – 0.8 (0.028 – 0.031)	
Fuse amp. rating		A	Main fuse : 60 Sub fuse : 30	
Recommended battery capacity (12V)		Ah (kC)	100 (360) or larger	
Fuel injector resistance		Ω at 20°C	11.0 – 16.5	
IAC valve resistance		Ω at 20°C	8 – 12	
IAT sensor / Cylinder temp. sensor / Ex- mani. temp. sensor (Thermistor characteristic)		kΩ at 25°C	1.8 – 2.3	
ECM main relay resistance		Ω at 20°C	80 – 120	
Starter relay coil resistance		Ω at 20°C	80 – 120	
PTT motor relay coil resistance		Ω at 20°C	3.0 – 4.5	

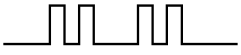
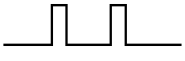
STARTER MOTOR

Max. continuous time of use		Sec	30
Motor output		kW	1.4
Brush length	STD	mm (in)	16.0 (0.63)
	Limit	mm (in)	12.0 (0.47)
Commutator undercut	STD	mm (in)	0.5 – 0.8 (0.02 – 0.03)
	Limit	mm (in)	0.2 (0.01)
Commutator outside diameter	STD	mm (in)	29.0 (1.14)
	Limit	mm (in)	28.0 (1.10)
Commutator outside diameter difference	STD	mm (in)	0.05 (0.002)
	Limit	mm (in)	0.40 (0.016)

Item		Unit	Data	
			DF90T	DF115T/115W
PTT MOTOR				
Brush length	STD	mm (in)	9.8 (0.39)	
	Limit	mm (in)	5.5 (0.22)	
Commutator outside diameter	STD	mm (in)	22.0 (0.87)	
	Limit	mm (in)	21.0 (0.83)	

SELF-DIAGNOSTIC SYSTEM INDICATION

When the abnormality occurs in a signal from sensor, switch, etc., the “CHECK ENGINE” lamp on the monitor-tachometer flashes (lights intermittently) according to the each code pattern with buzzer sounding.

PRIORITY *	FAILED ITEM	CODE	LAMP FLASHING PATTERN	FAIL-SAFE SYSTEM ACTIVATING
1	MAP sensor 1	3 – 4	on / off 	YES
2	CKP sensor	4 – 2	on / off 	YES
3	IAC valve / By-pass air screw adjustment	3 – 1	on / off 	NO
4	CMP sensor	2 – 4	on / off 	YES
5	CTP switch	2 – 2	on / off 	NO
6	Cylinder temp. sensor	1 – 4	on / off 	YES
7	IAT sensor	2 – 3	on / off 	YES
8	MAP sensor 2 (Pressure detect passage)	3 – 2	on / off 	NO
9	Rectifier & regulator (Over-charging)	1 – 1	on / off 	NO
10	Exhaust manifold temp. sensor	1 – 5	on / off 	YES
11	Fuel injector	4 – 3	on / off 	NO

** If more than two items fail at once, the self-diagnostic indication appears according to priority order. The indication repeats three times.*

*SERVICE DATA (DF140T/140W/140Z)

* These service data are subject to change without notice.

Item	Unit	Data	
		DF140T/140W	DF140Z

POWERHEAD

Recommended operating range	r/min.	5600 – 6200
Idle speed	r/min.	700 ± 50 (in-gear : approx.700)
**Cylinder compression	kPa (kg/cm², psi)	1200 – 1600 (12 – 16, 171 – 228)
**Cylinder compression max. difference between any three cylinders	kPa (kg/cm², psi)	100 (1.0, 14)
**Engine oil pressure	kPa (kg/cm², psi)	440 – 490 (4.5 – 5.0, 64 – 71) at 3000 r/min. (at normal operating temp.)
Engine oil		API classification SE, SF, SG, SH, SJ Viscosity rating SAE 10W-40
Engine oil amounts	L (US/Imp. qt)	5.5 (5.8/4.8) : Oil change only 5.7 (6.0/5.0) : Oil filter change
Thermostat operating temperature	°C (°F)	58 – 62 (136 – 143)

** Figures shown are guidelines only, not absolute service limits.

Item			Unit	Data	
				DF140T/140W	DF140Z

CYLINDER HEAD/CAMSHAFT

Cylinder head distortion		Limit	mm (in)	0.05 (0.002)	
Manifold seating faces distortion		Limit	mm (in)	0.10 (0.004)	
Cam height	IN	STD	mm (in)	39.520 – 39.680 (1.5560 – 1.5622)	
		Limit	mm (in)	39.420 (1.5520)	
	EX	STD	mm (in)	39.320 – 39.480 (1.5480 – 1.5543)	
		Limit	mm (in)	39.220 (1.5441)	
Camshaft journal oil clearance	Top, 2nd, 3rd, 4th	STD	mm (in)	0.020 – 0.062 (0.0008 – 0.0024)	
		Limit	mm (in)	0.120 (0.0047)	
	5th	STD	mm (in)	0.045 – 0.087 (0.0018 – 0.0034)	
		Limit	mm (in)	0.120 (0.0047)	
Camshaft journal (housing) inside diameter	Top, 2nd, 3rd, 4th	STD	mm (in)	23.000 – 23.021 (0.9055 – 0.9063)	
		Limit	mm (in)	23.171 (0.9122)	
	5th	STD	mm (in)	26.000 – 26.021 (1.0236 – 1.0244)	
		Limit	mm (in)	26.171 (1.0304)	
Camshaft journal outside diameter	Top, 2nd, 3rd, 4th	STD	mm (in)	22.959 – 22.980 (0.9039 – 0.9047)	
		Limit	mm (in)	22.869 (0.9004)	
	5th	STD	mm (in)	25.934 – 25.955 (1.0210 – 1.0219)	
		Limit	mm (in)	25.844 (1.0175)	
Camshaft runout		Limit	mm (in)	0.10 (0.004)	
Cylinder head bore to tappet clearance		STD	mm (in)	0.025 – 0.066 (0.0010 – 0.0026)	
		Limit	mm (in)	0.150 (0.0059)	
Tappet outer diameter		STD	mm (in)	30.959 – 30.975 (1.2189 – 1.2195)	
Cylinder head bore		STD	mm (in)	31.000 – 31.025 (1.2203 – 1.2215)	

Item			Unit	Data	
				DF140T/140W	DF140Z

VALVE/VALVE GUIDE

Valve diameter		IN	mm (in)	33 (1.2992)
		EX	mm (in)	28 (1.1024)
Tappet clearance (Cold engine condition)	IN	STD	mm (in)	0.23 – 0.27 (0.009 – 0.011)
	EX	STD	mm (in)	0.23 – 0.27 (0.009 – 0.011)
Valve seat angle	IN		——	15°, 45°, 60°
	EX		——	15°, 45°
Valve guide to valve stem clearance	IN	STD	mm (in)	0.020 – 0.047 (0.0008 – 0.0019)
		Limit	mm (in)	0.070 (0.0028)
	EX	STD	mm (in)	0.045 – 0.072 (0.0018 – 0.0028)
		Limit	mm (in)	0.090 (0.0035)
Valve guide inside diameter	IN,EX	STD	mm (in)	6.000 – 6.012 (0.2362 – 0.2367)
Valve guide protrusion	IN,EX	STD	mm (in)	13.5 (0.5315)
Valve stem outside diameter	IN	STD	mm (in)	5.965 – 5.980 (0.2348 – 0.2354)
	EX	STD	mm (in)	5.940 – 5.955 (0.2339 – 0.2344)
Valve stem end deflection	IN	Limit	mm (in)	0.14 (0.0055)
	EX	Limit	mm (in)	0.18 (0.0071)
Valve stem runout	IN,EX	Limit	mm (in)	0.05 (0.0020)
Valve head radial runout	IN,EX	Limit	mm (in)	0.08 (0.0031)
Valve head thickness	IN	STD	mm (in)	1.0 (0.0394)
		Limit	mm (in)	0.7 (0.0276)
	EX	STD	mm (in)	1.20 (0.0472)
		Limit	mm (in)	0.7 (0.0276)
Valve seat contact width	IN	STD	mm (in)	1.1 – 1.3 (0.0433 – 0.0512)
	EX	STD	mm (in)	1.1 – 1.3 (0.0433 – 0.0512)
Valve spring free length		STD	mm (in)	42.73 (1.6823)
		Limit	mm (in)	41.02 (1.6150)
Valve spring tension		STD	N (kg, lbs)	164 – 190 (16.7 – 19.3, 36.7 – 42.5) for 32.6 mm (1.28 in.)
		Limit	N (kg, lbs)	151 (15.1, 33.3) for 32.6 mm (1.28 in.)
Valve spring squareness		Limit	mm (in)	2.0 (0.079)

Item			Unit	Data	
				DF140T/140W	DF140Z

CYLINDER/PISTON/PISTON RING

Cylinder distortion		Limit	mm (in)	0.05 (0.0020)
Piston to cylinder clearance		STD	mm (in)	0.020 – 0.040 (0.0008 – 0.0016)
		Limit	mm (in)	0.100 (0.0039)
Cylinder bore		STD	mm (in)	86.000 – 86.020 (3.3858 – 3.3866)
Cylinder measuring position			mm (in)	50 (1.969) from cylinder top surface
Piston skirt diameter		STD	mm (in)	85.970 – 85.990 (3.3846 – 3.3854)
Piston measuring position			mm (in)	26.5 (1.043) from piston skirt end
Cylinder bore wear		Limit	mm (in)	0.100 (0.0039)
Piston ring end gap	1st	STD	mm (in)	0.20 – 0.35 (0.0079 – 0.0138)
		Limit	mm (in)	0.70 (0.0276)
	2nd	STD	mm (in)	0.35 – 0.50 (0.0138 – 0.0197)
		Limit	mm (in)	1.00 (0.0394)
Piston ring free end gap	1st	STD	mm (in)	Approx. 11.6 (0.4567)
		Limit	mm (in)	9.3 (0.3661)
	2nd	STD	mm (in)	Approx. 11.5 (0.4528)
		Limit	mm (in)	9.2 (0.3622)
Piston ring to groove clearance	1st	STD	mm (in)	0.030 – 0.070 (0.0012 – 0.0028)
		Limit	mm (in)	0.12 (0.0047)
	2nd	STD	mm (in)	0.020 – 0.060 (0.0008 – 0.0024)
		Limit	mm (in)	0.10 (0.0039)
Piston ring groove width	1st	STD	mm (in)	1.22 – 1.24 (0.0480 – 0.0488)
	2nd	STD	mm (in)	1.51 – 1.53 (0.0594 – 0.0602)
	Oil	STD	mm (in)	2.51 – 2.53 (0.0988 – 0.0996)
Piston ring thickness	1st	STD	mm (in)	1.17 – 1.19 (0.0461 – 0.0469)
	2nd	STD	mm (in)	1.47 – 1.49 (0.0579 – 0.0587)
Pin clearance in piston pin hole		STD	mm (in)	0.006 – 0.017 (0.0002 – 0.0007)
		Limit	mm (in)	0.040 (0.0016)
Piston pin outside diameter		STD	mm (in)	20.997 – 21.000 (0.8267 – 0.8268)
		Limit	mm (in)	20.980 (0.8260)
Piston pin hole diameter		STD	mm (in)	21.006 – 21.014 (0.8270 – 0.8273)
		Limit	mm (in)	21.040 (0.8283)
Pin clearance in conrod small end		STD	mm (in)	0.003 – 0.014 (0.0001 – 0.0006)
		Limit	mm (in)	0.05 (0.002)
Conrod small end bore		STD	mm (in)	21.003 – 21.011 (0.8269 – 0.8272)

Item		Unit	Data	
			DF140T/140W	DF140Z

CRANKSHAFT/CONROD

Conrod small end inside diameter	STD	mm (in)	21.003 – 21.011 (0.8269 – 0.8272)
Conrod big end oil clearance	STD	mm (in)	0.020 – 0.040 (0.0008 – 0.0016)
	Limit	mm (in)	0.065 (0.0026)
Conrod big end inside diameter	STD	mm (in)	47.000 – 47.018 (1.8504 – 1.8511)
Crank pin outside diameter	STD	mm (in)	43.982 – 44.000 (1.7316 – 1.7323)
Crank pin outside diameter difference (out of round and taper)	Limit	mm (in)	0.010 (0.0004)
Conrod bearing thickness	STD	mm (in)	1.484 – 1.502 (0.0584 – 0.0591)
Conrod big end side clearance	STD	mm (in)	0.100 – 0.250 (0.0039 – 0.0098)
	Limit	mm (in)	0.350 (0.0138)
Conrod big end width	STD	mm (in)	21.950 – 22.000 (0.8642 – 0.8661)
Crank pin width	STD	mm (in)	22.100 – 22.200 (0.8700 – 0.8740)
Crankshaft center journal runout	Limit	mm (in)	0.04 (0.0016)
Crankshaft journal oil clearance	STD	mm (in)	0.020 – 0.040 (0.0008 – 0.0016)
	Limit	mm (in)	0.065 (0.0026)
Crankcase bearing holder inside diameter	STD	mm (in)	62.000 – 62.018 (2.4409 – 2.4417)
Crankshaft journal outside diameter	STD	mm (in)	57.994 – 58.012 (2.2832 – 2.2839)
Crankshaft journal outside diameter difference (out of round and taper)	Limit	mm (in)	0.01 (0.0004)
Crankshaft bearing thickness	STD	mm (in)	1.990 – 2.006 (0.0783 – 0.0790)
Crankshaft thrust play	STD	mm (in)	0.11 – 0.31 (0.0043 – 0.0122)
	Limit	mm (in)	0.35 (0.0138)
Crankshaft thrust bearing thickness	STD	mm (in)	2.425 – 2.475 (0.0955 – 0.0974)

Item	Unit	Data	
		DF140T/140W	DF140Z

ELECTRICAL

Ignition timing		Degrees at r/min	BTDC 5° – BTDC 45°
Over revolution limiter		r/min	6500
CKP sensor resistance		Ω at 20°C	168 – 252
CMP sensor resistance		Ω at 20°C	——
Ignition coil resistance	Primary	Ω at 20°C	1.9 – 2.5
	Secondary	kΩ at 20°C	No.2 – No.3 : 18 – 34 (including H.T.cord and spark plug cap) No.1 – No.4 : 19 – 36 (including H.T.cord and spark plug cap)
High tension cord resistance		kΩ/m at 20°C	Approx.16
Battery charge coil resistance		Ω at 20°C	0.16 – 0.24
Battery charge coil output (12V)		Watt	480
Standard spark plug	Type	NGK	BKR6E
	Gap	mm (in)	0.7 – 0.8 (0.028 – 0.031)
Fuse amp. rating		A	Main fuse : 60 Sub fuse : 30
Recommended battery capacity (12V)		Ah (kC)	100 (360) or larger
Fuel injector resistance		Ω at 20°C	11.0 – 16.5
IAC valve resistance		Ω at 20°C	8 – 12
IAT sensor / Cylinder temp. sensor / Ex- mani. temp. sensor (Thermistor characteristic)		kΩ at 25°C	1.8 – 2.3
ECM main relay resistance		Ω at 20°C	80 – 120
Starter relay coil resistance		Ω at 20°C	80 – 120
PTT motor relay coil resistance		Ω at 20°C	3.0 – 4.5

STARTER MOTOR

Max. continuous time of use		Sec	30
Motor output		kW	1.4
Brush length	STD	mm (in)	16.0 (0.63)
	Limit	mm (in)	12.0 (0.47)
Commutator undercut	STD	mm (in)	0.5 – 0.8 (0.02 – 0.03)
	Limit	mm (in)	0.2 (0.008)
Commutator outside diameter	STD	mm (in)	29 (1.14)
	Limit	mm (in)	28 (1.10)
Commutator outside diameter difference	STD	mm (in)	0.05 (0.002)
	Limit	mm (in)	0.40 (0.016)

Item		Unit	Data	
			DF140T/140W	DF140Z

PTT MOTOR

Brush length	STD	mm (in)	9.8 (0.39)
	Limit	mm (in)	5.0 (0.20)
Commutator outside diameter	STD	mm (in)	22.0 (0.87)
	Limit	mm (in)	21.0 (0.83)

SELF-DIAGNOSTIC SYSTEM INDICATION

When the abnormality occurs in a signal from sensor, switch, etc., the "CHECK ENGINE" lamp on the monitor-tachometer flashes (lights intermittently) according to the each code pattern with buzzer sounding.

PRIORITY *	FAILED ITEM	CODE	LAMP FLASHING PATTERN	FAIL-SAFE SYSTEM ACTIVATING
1	MAP sensor 1	3 – 4	on / off 	YES
2	CKP sensor	4 – 2	on / off 	YES
3	IAC valve/By-pass air screw adjustment	3 – 1	on / off 	NO
4	CMP sensor	2 – 4	on / off 	YES
5	CTP switch	2 – 2	on / off 	NO
6	Cylinder temp. sensor	1 – 4	on / off 	YES
7	IAT sensor	2 – 3	on / off 	YES
8	MAP sensor 2 (Pressure detect passage)	3 – 2	on / off 	NO
9	Rectifier & regulator (Over-charging)	1 – 1	on / off 	NO
10	Exhaust manifold temp. sensor	1 – 5	on / off 	YES
11	Fuel injector	4 – 3	on / off 	NO

* If more than two items fail at once, the self-diagnostic indication appears according to priority order. The indication repeats three times.

TIGHTENING TORQUE

* Tightening torques have been changed from the middle of 2003 year model.

Tightening Torque – Important Fasteners

ITEM		THREAD DIAMETER	TIGHTENING TORQUE		
			N · m	kg-m	lb.-ft
Cylinder head cover bolt		6 mm	11	1.1	8.0
Cylinder head bolt		8 mm	*25	*2.5	*18.0
		10 mm	70	7.0	50.0
Crankcase bolt		8 mm	25	2.5	18.0
		10 mm	55	5.5	40.5
Conrod cap nut		8 mm	40	4.0	29.0
Camshaft housing bolt		6 mm	11	1.1	8.0
Camshaft timing sprocket bolt		10 mm	78	7.8	55.5
Timing chain guide bolt		6 mm	10	1.0	7.0
Intake manifold bolt / nut		8 mm	23	2.3	16.5
Oil pressure switch		———	13	1.3	9.5
Fuel delivery pipe bolt		8 mm	23	2.3	16.5
Fuel delivery pipe plug / union bolt		12 mm	35	3.5	25.5
Fuel return pipe bolt (nut)		8 mm	23	2.3	16.5
Low pressure fuel pump bolt		6 mm	10	1.0	7.0
Thermostat cover bolt		6 mm	10	1.0	7.0
Flywheel bolt		16 mm	245	24.5	177.0
Starter motor mounting bolt		8 mm	23	2.3	16.5
		10 mm	50	5.0	36.0
Engine oil filter		———	14	1.4	10.0
Engine oil drain plug		12 mm	13	1.3	9.5
Oil relief valve		———	27	2.7	19.5
Engine holder upper bolt		8 mm	25	2.5	18.0
Engine holder bolt		8 mm	23	2.3	16.5
Power unit mounting bolt		8 mm	23	2.3	16.5
		10 mm	50	5.0	36.0
Driveshaft housing bolt		10 mm	50	5.0	36.0
Upper mount nut	Front	12 mm	85	8.5	61.5
	Rear	12 mm	80	8.0	58.0
Upper mount cover bolt		10 mm	50	5.0	36.0
Lower mount bolt / nut		12 mm	60	6.0	43.0
Clamp bracket shaft nut		22 mm	43	4.3	31.0
Water pump case bolt		8 mm	*23	*2.3	*16.5
Gearcase bolt		10 mm	55	5.5	40.0
Propeller shaft bearing housing bolt		8 mm	*23	*2.3	*16.5
Pinion nut	DF90/115	14 mm	100	10.0	72.5
	DF140		120	12.0	87.0
Propeller nut		18 mm	55	5.5	40.0

ECM

DF90/115

- For EU model and general market model, the map of fuel injection has been changed.
- For U. S. model, the motion under operation of the emergency stop switch has been changed.
- The IAC valve operating duty at idle speed (625 r/min) has been changed from 15 % to 30 %.
  This duty can be monitored by using the Suzuki Diagnostic System (SDS).

DF140

- For U. S. model, the motion under operation of the emergency stop switch has been changed.

NOTE:

- *EC model and general model have not been changed.*

NOTE:

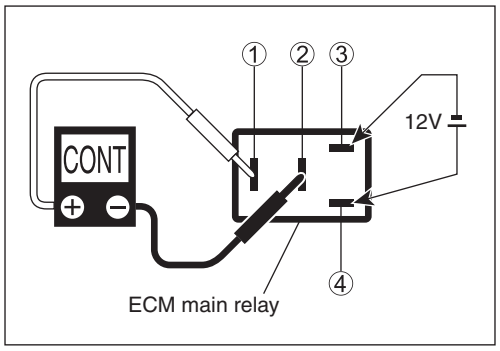
From 2003 year model, ECM identification code recorded in its memory has been changed.
Use the Suzuki Diagnostic System (SDS) updated by the database version 4.10 (program version 4.00) in order to communicate with the ECM on 2003 year model DF90/115/140.

ECM MAIN RELAY AND STARTER MOTOR RELAY

09930-99320 : Digital tester

Tester range : (Continuity)

(1) Disconnect relay from wire.
(2) Check continuity between terminal ① and ② each time 12 V is applied. Connect positive (+) side to terminal ④, and negative (–) side to terminal ③.



Relay function :

12 V power	Continuity
Applied	Yes
Not applied	No

CAUTION

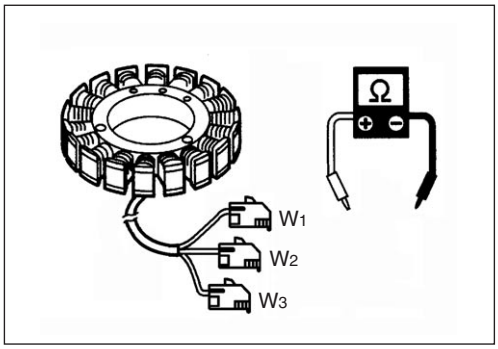
Be careful not to touch 12 V power supply wires to each other or with other terminals.

BATTERY CHARGE COIL

Battery charge coil has been changed in shape of connector.
Measure battery charge coil resistance.

09930-99320 : Digital tester

Tester range : Ω (Resistance)



1. Disconnect battery charge coil leads from rectifier & regulator.
2. Measure resistance between leads in the combinations shown.

Battery charge coil resistance :

Terminal for tester probe connection	Resistance
White 1 to White 2	0.16 – 0.24 Ω
White 2 to White 3	
White 3 to White 1	

If out of specification, replace battery charge coil.

RECTIFIER & REGULATOR

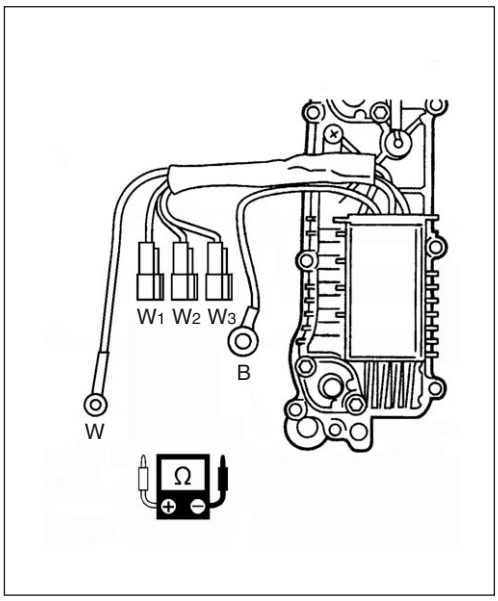
Rectifire & Regulator has been changed in shape of connector.

09900-25002 : Pocket tester

Tester range : ×1 kΩ (Resistance)

1. Disconnect all lead wires of rectifier & regulator.
2. Measure resistance between leads in combinations shown.

NOTE:
The values given below are for a SUZUKI pocket tester.
As thyristors, diodes, etc. are used inside this rectifier & regulator, the resistance values will differ when an ohmmeter other than SUZUKI pocket tester is used.



Rectifier & regulator resistance : **Unit : kΩ**

		Tester probe ⊕ (Red)				
		Black	White	White 1	White 2	White 3
Tester probe ⊖ (Black)	Black		1~20	0.5~100	0.5~100	0.5~100
	White	3~60		4~80	4~80	4~80
	White 1	4~80	0.5~10		5~100	5~100
	White 2	4~80	0.5~10	5~100		5~100
	White 3	4~80	0.5~10	5~100	5~100	

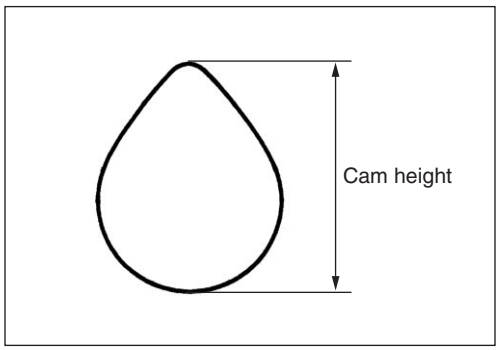
If measurement exceeds specification, replace rectifier & regulator.

EXHAUST CAMSHAFT (FOR DF115 ONLY)

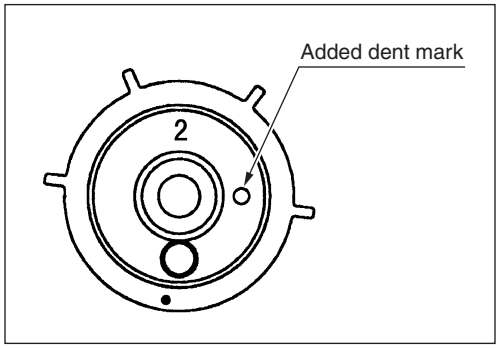
The profile of exhaust cam has been changed.
As the result of this change, cam height has been changed.

Cam height (DF115 exhaust cam)

Standard : 38.820 – 38.980 mm
(1.5283 – 1.5346 in)
Limit : 38.720 mm (1.5244 in)

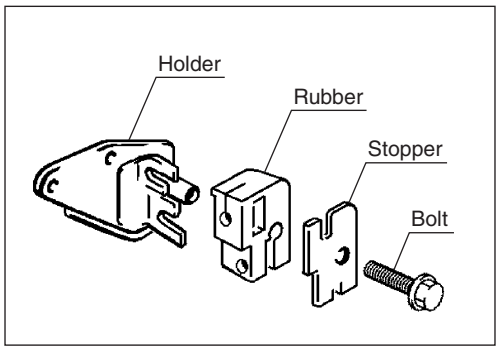


The indentification (dent) mark has been added on the top end of the late camshaft.



REMOTE CONTROL CABLE HOLDER

The remote control cable holder, stopper and bolt have been changed.
The remote control cable rubber has been added between the holder and stopper.

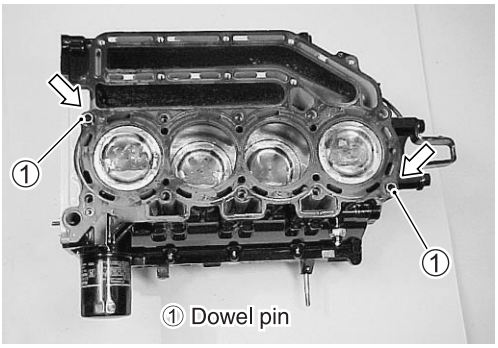


CYLINDER HEAD INSTALLATION

Installation is in reverse order of removal with special attention to the following steps.

CAUTION

Do not re-use gasket once removed. Always use a new gasket.

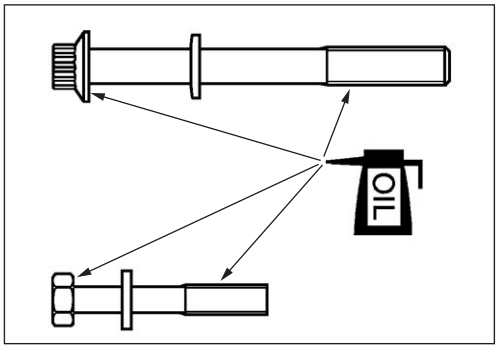


1. Insert dowel pins and place cylinder head gasket into position on cylinder.

2. Position cylinder head on cylinder.

3. Apply engine oil lightly to cylinder head bolts and tighten them gradually as follows.

   (a) Tighten all bolts to 50 percent (%) of specified torque according to numerical order in figure.

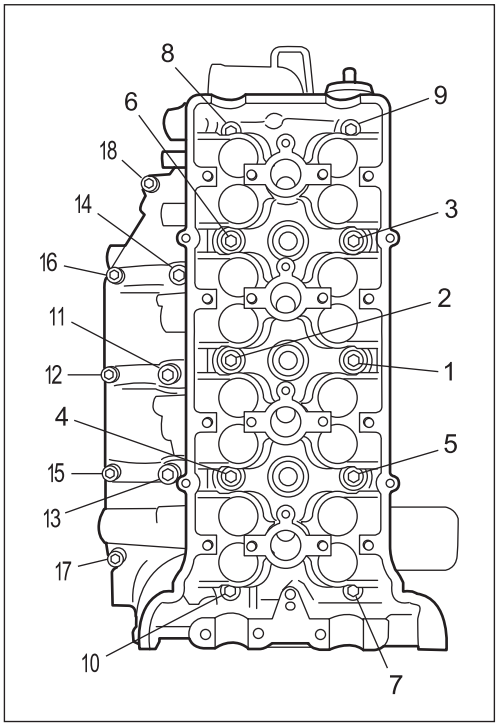


Cylinder head bolt :
1 st step 10 mm 35 N·m (3.5 kg-m, 25.5 lb.-ft.)
8 mm 12 N·m (1.2 kg-m, 8.5 lb.-ft.)

   (b) Loosen all bolts to 0 N·m (0 kg-m, 0 lb.-ft.) according to reverse order in figure.

   (c) Again tighten all bolts to 50 percent (%) of specified torque according to numerical order in figure.

Cylinder head bolt :
3 rd step 10 mm 35 N·m (3.5 kg-m, 25.5 lb.-ft.)
8 mm 12 N·m (1.2 kg-m, 8.5 lb.-ft.)



   (d) Finally tighten all bolts to specified torque according to numerical order in figure.

Cylinder head bolt :
Final step 10 mm 70 N·m (7.0 kg-m, 50.5 lb.-ft.)
8 mm 25 N·m (2.5 kg-m, 18.0 lb.-ft.)

NOTE:
Use special tool (10 mm deep socket wrench) when tightening cylinder head bolts.

TOOL **09919-16010 : Deep socket wrench (10 mm)**

CRANKCASE TO CYLINDER INSTALLATION

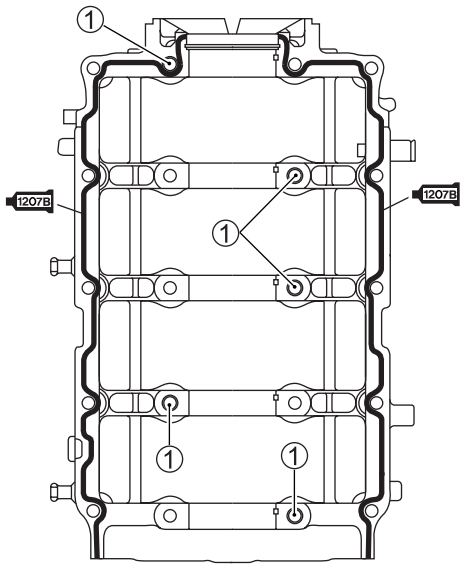
1. Clean mating surface of cylinder and crankcase.
2. Apply Suzuki Bond to mating surface of crankcase as shown in figure.

1207B **99000-31140 : Suzuki Bond 1207B**

CAUTION

Apply bond to mating surface only.
Do not allow bond to contact surface of bearing.

3. Install five (5) dowel pins ①.

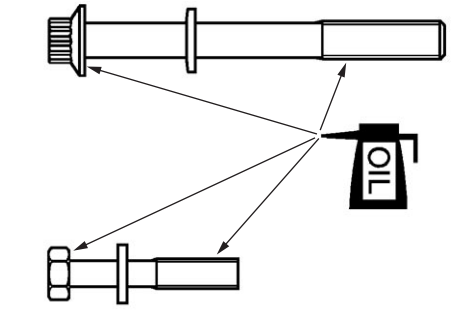


4. Install crankcase to cylinder.
5. Apply engine oil lightly to crankcase bolts.
6. Tighten crankcase bolts in three (3) steps according to the order shown below and in figure.

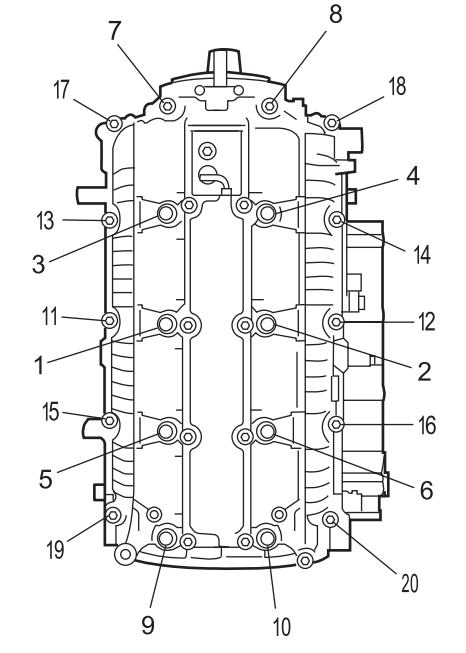
NOTE:
After tightening crankcase bolts, check to be sure that crankshaft rotates smoothly when turned by hand.

Crankcase bolt :

1st step	**8 mm**	**5 N·m (0.5 kg-m, 3.5 lb.-ft.)**
	10 mm	**11 N·m (1.1 kg-m, 8.0 lb.-ft.)**
2nd step	**8 mm**	**20 N·m (2.0 kg-m, 14.5 lb.-ft.)**
	10 mm	**45 N·m (4.5 kg-m, 31.0 lb.-ft.)**
Final step	**8 mm**	**25 N·m (2.5 kg-m, 18.0 lb.-ft.)**
	10 mm	**56 N·m (5.6 kg-m, 40.5 lb.-ft.)**



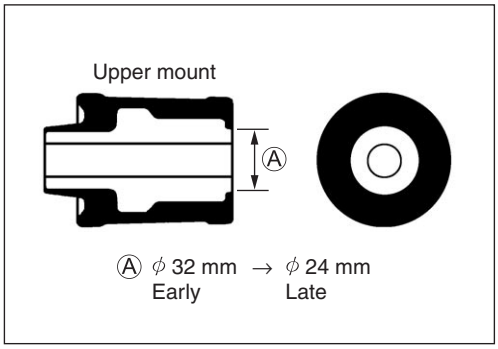
Tightening order

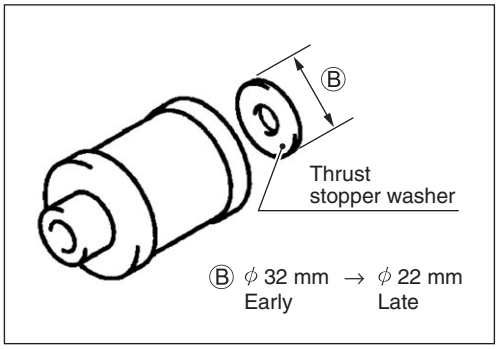


UPPER MOUNT

FOR DF90/115

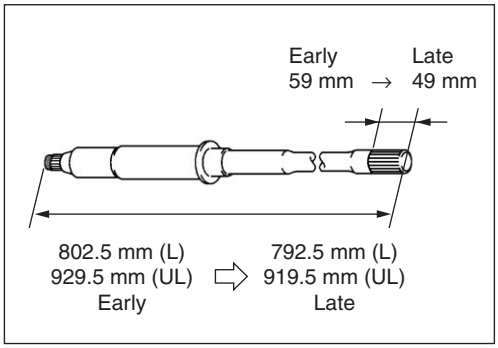
The upper mount has been changed in shape of core metal.
In accordance with this change, the thrust stopper washer has been changed in diameter.





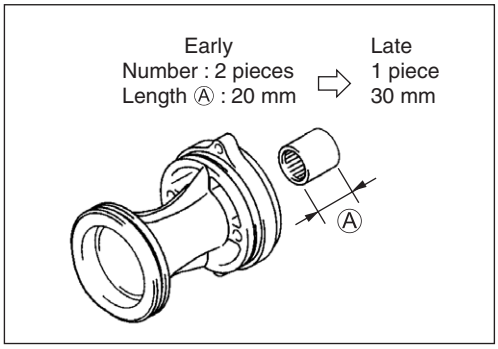
DRIVESHAFT

The drive shaft has been changed in length.

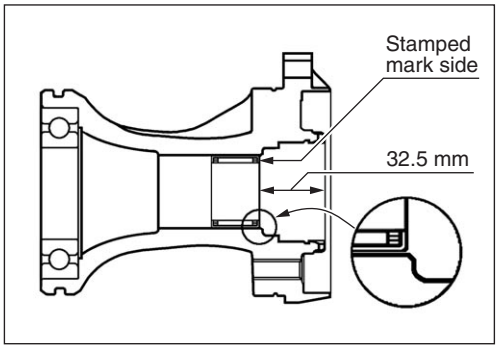


PROPELLER SHAFT BEARING HOUSING

The propeller shaft bearing has been changed in number and size.



When installing the bearing, stamped mark of bearing must face outside.
Place bearing in the position shown figure.

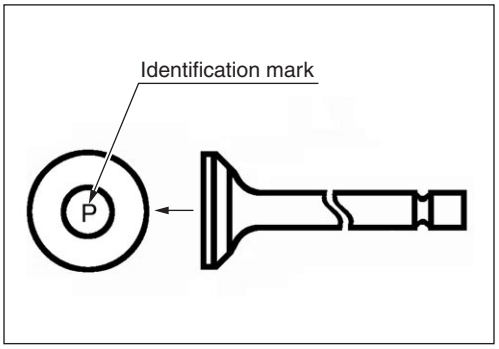


DF115W AND DF140W

This section describes servicing procedures which differ from those of the DF115/140 “K2” models.

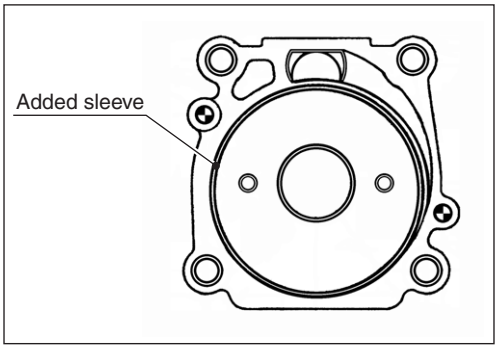
EXHAUST VALVE

The exhaust valve has been changed in surface treatment.
The identification mark “P” has been added on the valve head.



WATER PUMP CASE

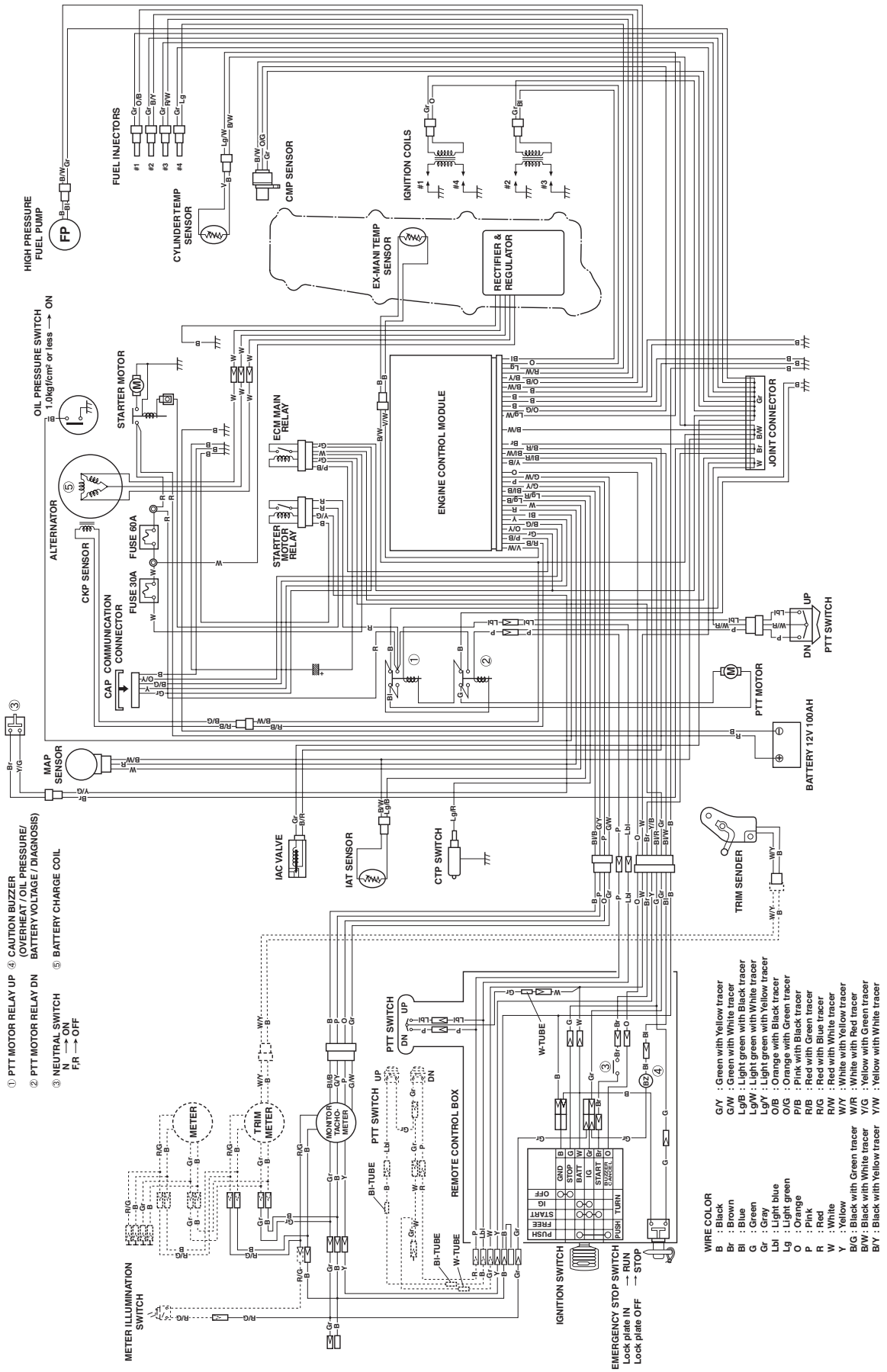
The sleeve has been added inside of water pump case.



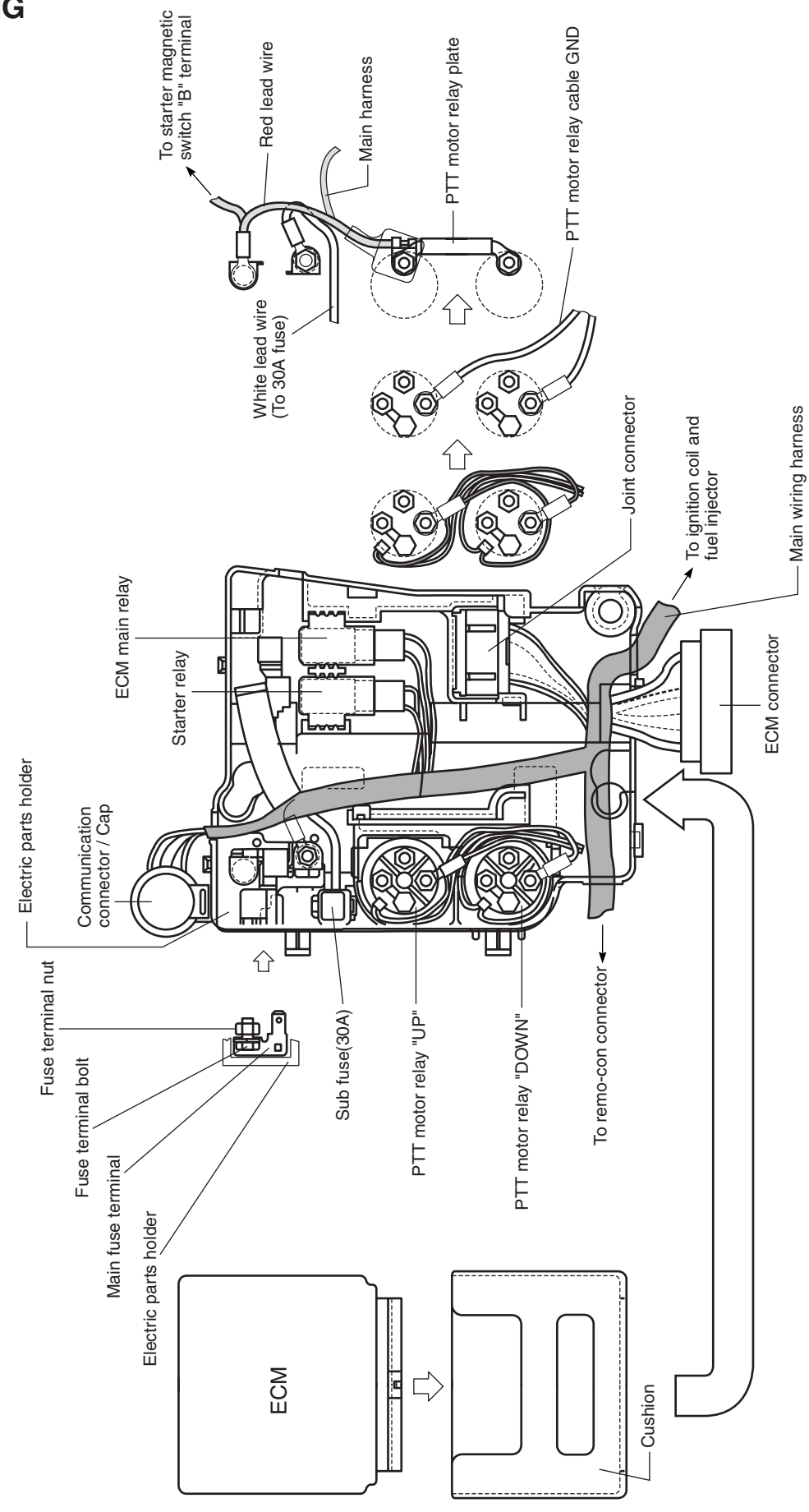
ECM

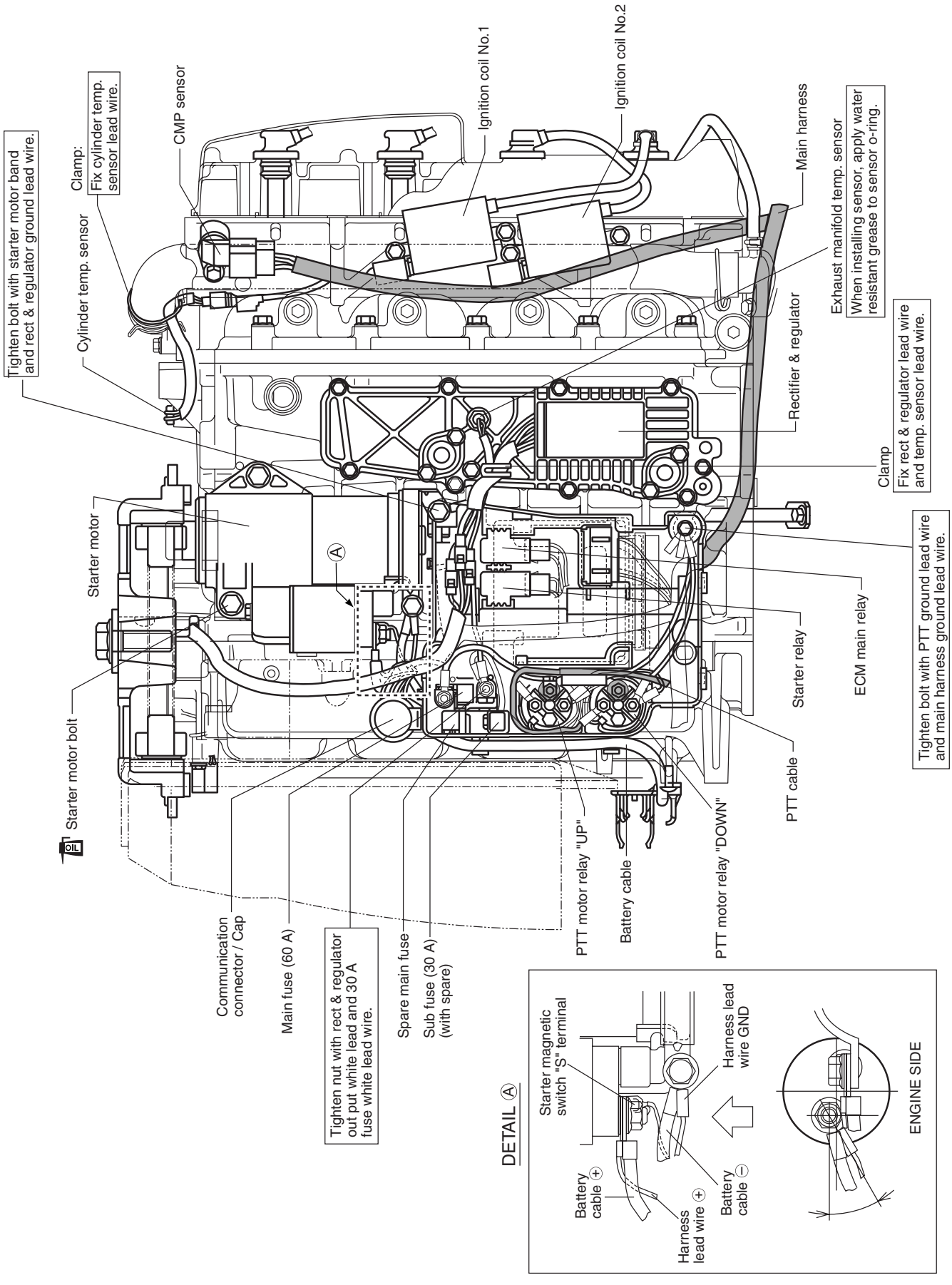
The motion under operation of the emergency stop switch has been changed.

WIRING DIAGRAM

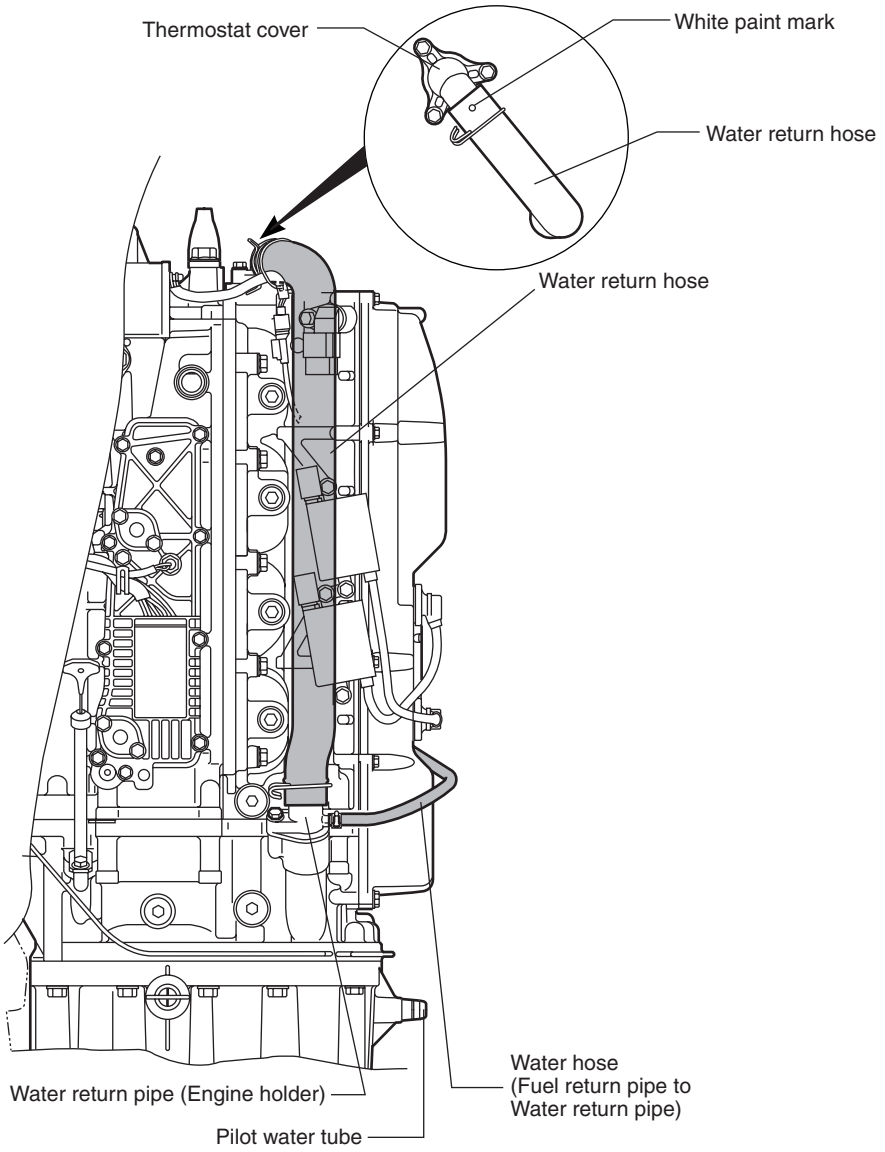


WIRE ROUTING




Tighten bolt with starter motor band and rect & regulator ground lead wire.
Clamp: Fix cylinder temp. sensor lead wire.
CMP sensor
Ignition coil No.1
Ignition coil No.2
Main harness
Cylinder temp. sensor
Exhaust manifold temp. sensor When installing sensor, apply water resistant grease to sensor o-ring.
Rectifier & regulator
Clamp Fix rect & regulator lead wire and temp. sensor lead wire.
Starter motor
Starter motor bolt
OIL
Tighten bolt with PTT ground lead wire and main harness ground lead wire.
ECM main relay
Starter relay
PTT cable
PTT motor relay "DOWN"
Battery cable
PTT motor relay "UP"
Communication connector / Cap
Main fuse (60 A)
Tighten nut with rect & regulator out put white lead and 30 A fuse white lead wire.
Spare main fuse
Sub fuse (30 A) (with spare)
DETAIL Ⓐ
Starter magnetic switch "S" terminal
Battery cable ⊕
Harness lead wire ⊕
Battery cable ⊖
Harness lead wire GND
ENGINE SIDE

WATER HOSE ROUTING



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