

YANMAR



YANMAR

MINI TILLER

YK322, YK322E, YK382, YK382Y, YK402,
YK422, YK422Y, YK462, YK482, YK582,
YK682, YK682C, YK682G, YK782C,
YK782G, YK822,
Te200, Te500

WORK SHOP MANUAL



YANMAR AGRICULTURAL EQUIPMENT CO., LTD.

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Thank you for purchasing this Yanmar product.

This manual describes the mechanism and general maintenance procedures in order that you can keep your machine in the best working condition and operate it safely. A safe and proper operation can be ensured by properly understanding the contents and carrying out instructions correctly as described in this manual.

And keep this manual with care for your long utilization even after you have read through it.

To improve or upgrade this machine in quality or performance or for some other reason, parts are sometimes changed, so some part of the description of this manual may not apply to your machine. Please understand such circumstances beforehand.

In the text of this manual, special mentions are given which follow the safety symbol  and notice symbol **NOTE**:

Please read them carefully and be sure to follow their instructions on full understanding.

AS TO SYMBOLS USED:

These are "absolutely necessary items for you to read" for insuring safety in work through your full understanding of the machine.



NOTE:

This symbol indicates "special instructions or procedures for you to follow indispensably" for insuring safety in operation.

This symbol indicates special instructions or procedures for insuring maximum performance in operation of this machine.

DIRECTION:

"Right" and "Left" sides of the machine are determined by facing in the direction of machine forward travel.



This machine is of metric design. All hardware is therefore metric. Make sure you use the specified metric hardware when replacement becomes necessary.

1. SPECIFICATIONS

1.1 Specifications

Model		YK322 YK322(E)	YK382(Y) YK(402)	YK422(Y) YK(462)	YK482	YK582	YK682	YK682C(G)	YK782C(G)	YK882	
Engine	Model	YANMAR GA90E- SKB(A)	YANMAR GA120E-SKB(A)	YANMAR GA120E- SKA	YANMAR GA160E- SKA	YANMAR GA180E- SKA	YANMAR GA160	YANMAR GA180	YANMAR GA220E- SKA		
	Type	OHV(4Cycle-Gasoline)									
	Bore x Stroke	mm	1-53 x 40	1-58 x 43		1-64 x 48	1-68 x 48	1-64 x 48	1-68 x 48	1-70 x 56	
	Displacement	cc	88	113		154	174	154	174	215	
	Output(max)	ps/rpm	3.0/2000	4.0/2000		5.8/2000	6.2/2000	5.8/2000	6.2/2000	8.0/2000	
	Oil Capacity	lit	0.4	0.5				0.6		1.0	
	Air Cleaner		Dual-Element(Oil-Bath)			Oil-Bath		Dual-Element (Oil-Bath)	Oil-Bath		
Fuel Tank Capa.	lit	1.8	2.2		3.0	4.3	3.0		4.3		
Dimensions	Overall Length	mm	1250	1320	1350	1460	1620	1460		1620	
	Overall Width	mm	610			616	630	616		630	
	Overall Height	mm	800(from Axle Center)	790(from Axle Center)	795(from Axle Center)	835(from Axle Center)		790(from Axle Center)	835(from Axle Center)		
Weight(dry)	W/O Tires	kg	33	40	42(44)	49	52	65	51	54	
Speed- Change	Speeds		F2R2	F4R2		F6R2					
	Shifting		Sliding-Gear & Belt-Exchange		Sliding-Gear & Super-Exchange		Sliding- Gear	Sliding-Gear & Super-Exchange		Sliding- Gear	
Axle	Forward Speed at Rated Engine Speed	1st	rpm	72	33	33	19	11	10	18	10
		2nd	rpm	120	54	51	23	14	16	23	16
		3rd	rpm	-	73	74	46	46	31	46	31
		4th	rpm	-	120	113	57	57	48	57	48
		5th	rpm	-	-	-	90	90	76	90	76
		6th	rpm	-	-	-	110	110	118	110	118
	Reverse Speed	1st	rpm	19	27	27	22	13	13	22	13
2nd		rpm	31	44	42	27	16	20	27	20	
Shape of Axle	mm	Hexagon (Face to Face 23)				Hexagon (Face to Face 26)		Hexagon (Face to Face 23)		Hexagon (Face to Face 26)	
Clutch	Main Clutch		Belt Tension Clutch (Deadman Lever System)								
	Side Clutch		No	No (yes)	Yes						
Hitch Size	mm	95 (Rear)			95 (Front & Rear)						
P.T.O	Speed	rpm	-	Low:863 High:1322	Low:948 High:1168	700	Low:948 High:1168	700			
	Shape of Shaft		-	ø17 with key			ø20 with key	ø17 with key		ø20 with key	
Tension Oil	Capacity	lit	1.0	1.0(1.3)	2.0	2.8	2.0		2.8		
Adjusting Area of Handle	Horizontal		No	No (Yes:One- Touch Lever)	Yes:One-Touch Lever						
	Vertical		Yes								

NOTE:

This specifications may change without notice.

SPECIFICATIONS

Model		Te 200
Engine	Model	Yanmar GE20
	Type	SIDE VALVE
	Displacement cc	78
	Max. output kw(ps)/rpm	1.5(2.0)/3600
	Starting system	Recoil starter
	Air cleaner	DRY ELEMENT
	Fuel tank capacity	1.2
Dimensions	Overall length mm	1210
	Overall width mm	610
	Over height mm	990
Weight (Dry)kg		27
Axle	Dia. of Axle	ø20
	Max. Rotor Dia.	ø330
Clutch		Belt tension(Emergency stop clutch)
Adjusting area of handle		Vertical

Specifications subject to change without notice.

SPECIFICATIONS

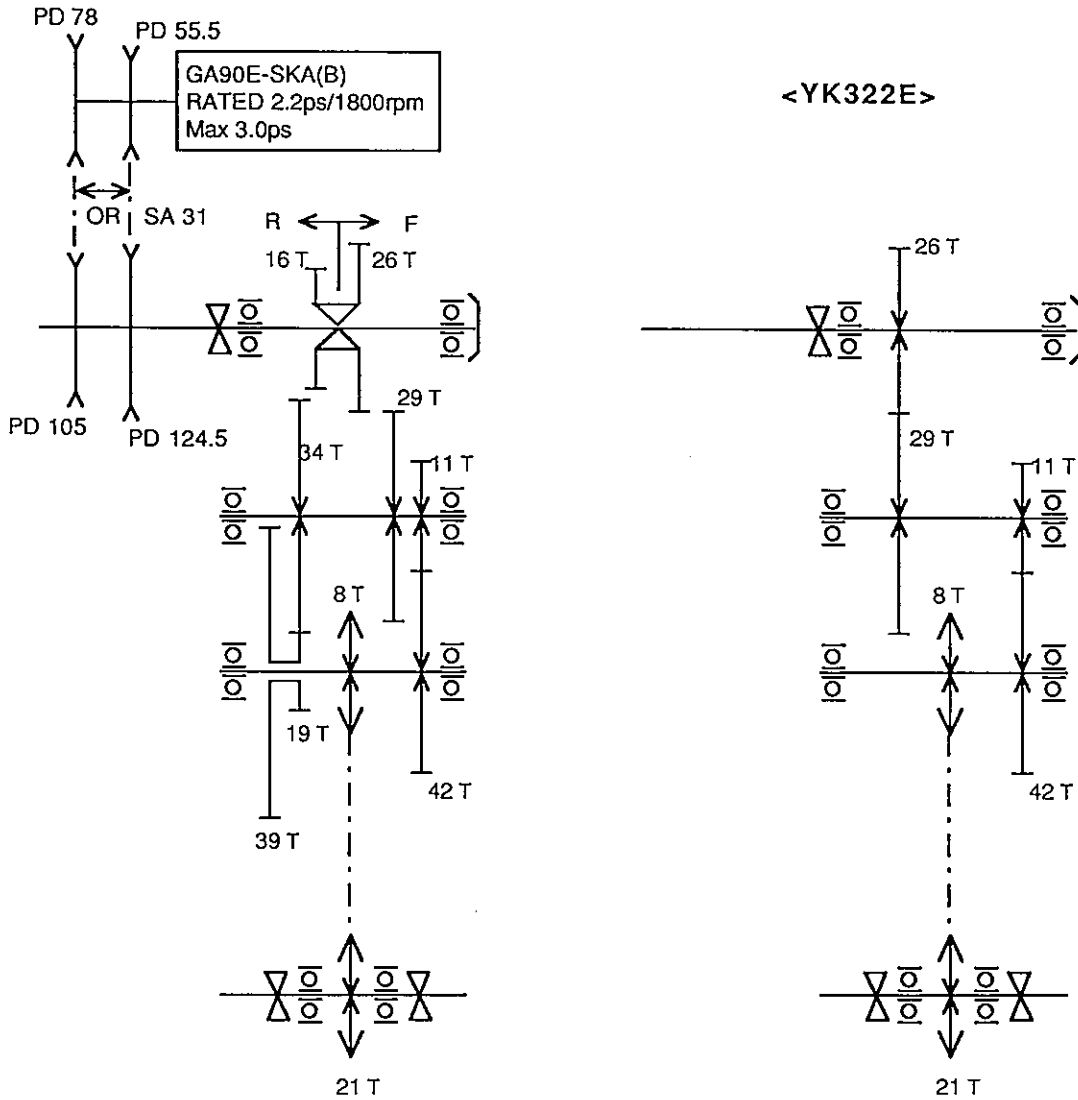
Model		Te 500	Te 600
Engine	Model	Yanmar GA140	Yanmar GA160
	Type	OHV(4 Cycle Gas)	
	Displacement cc	130	154
	Max. output kw(ps)/rpm	3.7 (5.0)/1800	4.2 (5.8)/1800
	Starting system	Recoil starter	
	Air cleaner	OIL BATH	
	Fuel tank capacity	2.2	3.0
Dimensions	Overall length mm	1410	
	Overall width mm	625	
	Over height mm	970	
Weight (Dry)kg		43	45
Axle	Shape of Axle	Hexagon/23	
	Max. Rotor Dia.	ø380	
Clutch		Belt tension(Emergency stop clutch)	
Adjusting area of handle		Vertical	

Specifications subject to change without notice.

1.2 Mechanism

Model : YK322, YK322E

• Power Transmission



<YK322>

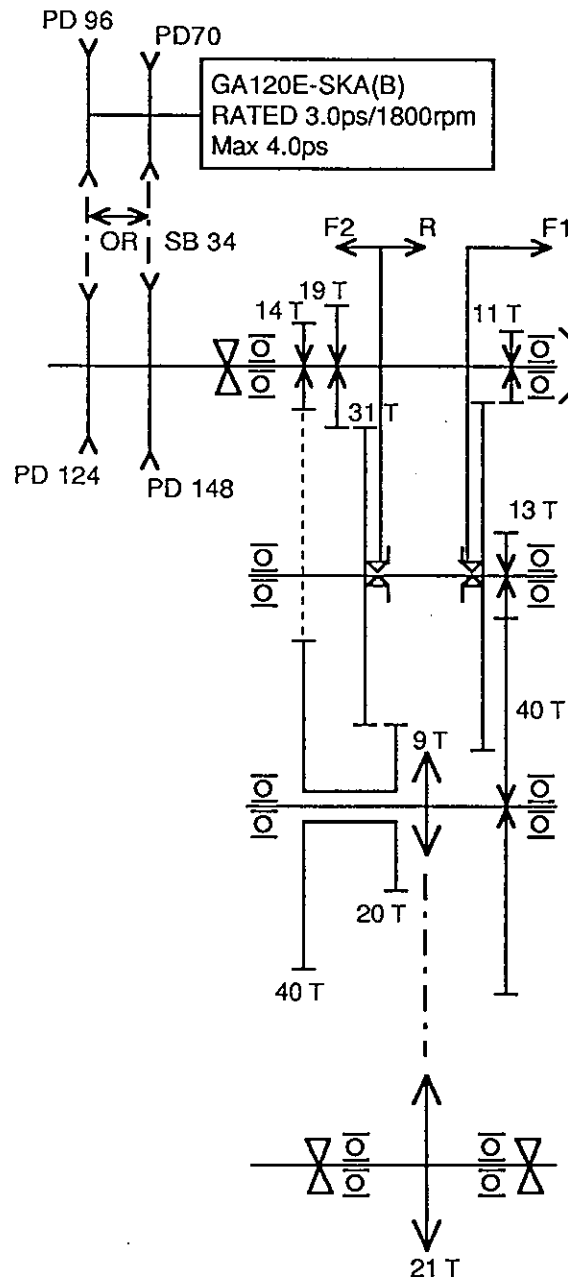
At rated Engine Speed	Pulley Ratio	PTO (rpm)	Classification Speed Change	PTO (rpm)	Gear Arrangement	Wheel Shaft (rpm)
1800rpm	(60/129) 55.5/124.5	802rpm	F1	802	26/29x11/42x8/21	71.7
			F2	1337	26/29x11/42x8/21	119.6
	(82.5/109.5) 78/105	1337rpm	R1	802	16/39x19/34x11/42x8/21	18.3
			R2	1337		30.6

<YK322E>

At rated Engine Speed	Pulley Ratio	PTO (rpm)	Classification Speed Change	PTO (rpm)	Gear Arrangement	Wheel Shaft (rpm)
1800rpm	(60/129) 55.5/124.5	802rpm	F1	802	26/29x11/42x8/21	71.7
		1337rpm	F2	1337	26/29x11/42x8/21	119.6

Model : YK382(Y), YK402

• Power Transmission

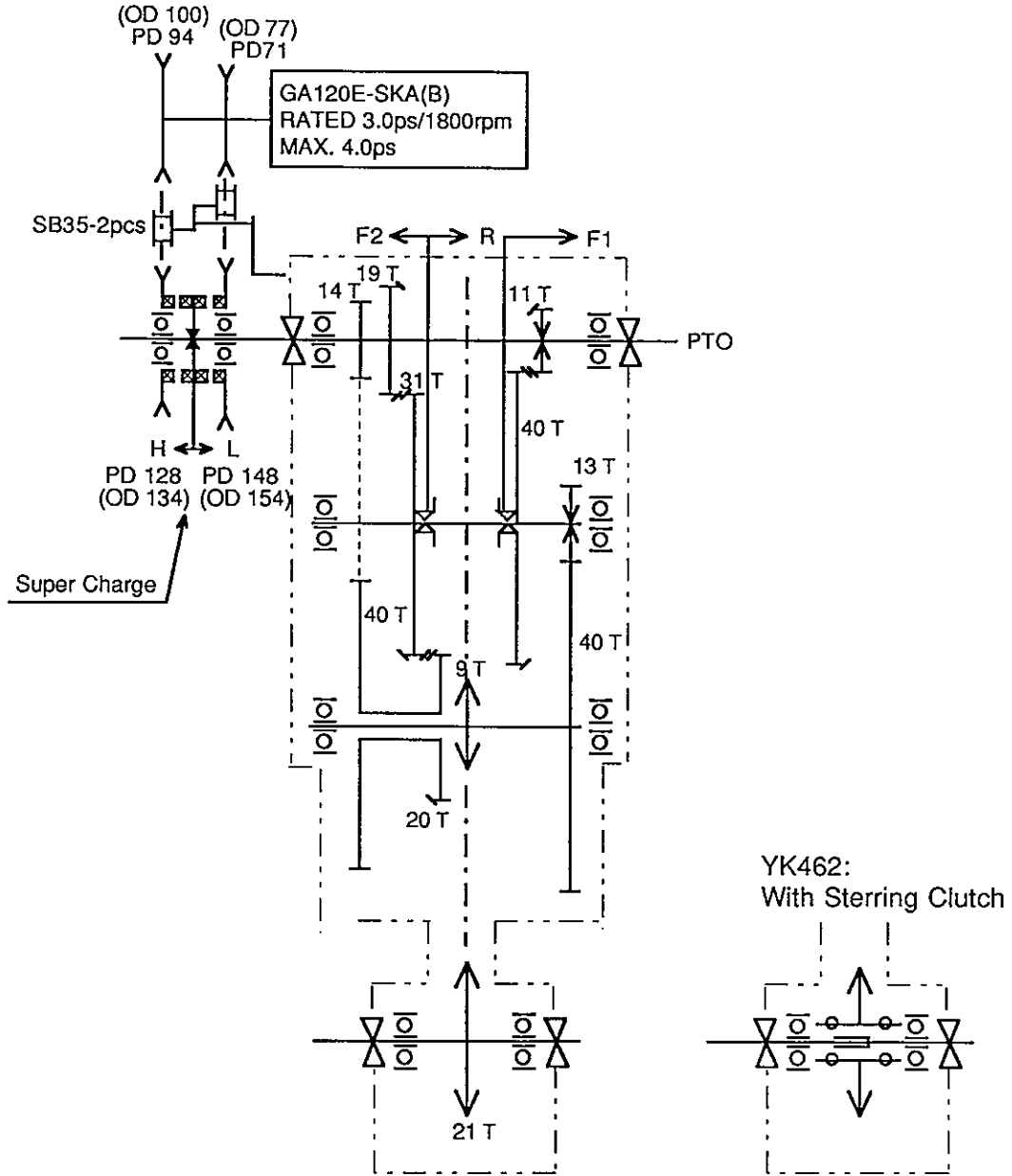


<YK382(Y)>, <YK402>

At rated Engine Speed	Pulley Ratio	PTO (rpm)	Classification Speed Change	PTO (rpm)	Gear Arrangement	Wheel Shaft (rpm)
1800rpm	(76/154)70/148	851rpm	F1	851	11/40x13/40x9/21	32.6
			F2	1394	11/40x13/40x9/21	53.4
			F3	851	19/31x13/40x9/21	72.6
	(102/130)96/124	1394rpm	F4	1394	19/31x13/40x9/21	119
			R1	851	14/40x20/31x13/40x9/21	26.8
			R2	1394	14/40x20/31x13/40x9/21	43.8

Model : YK422(Y), YK462

• Power Transmission

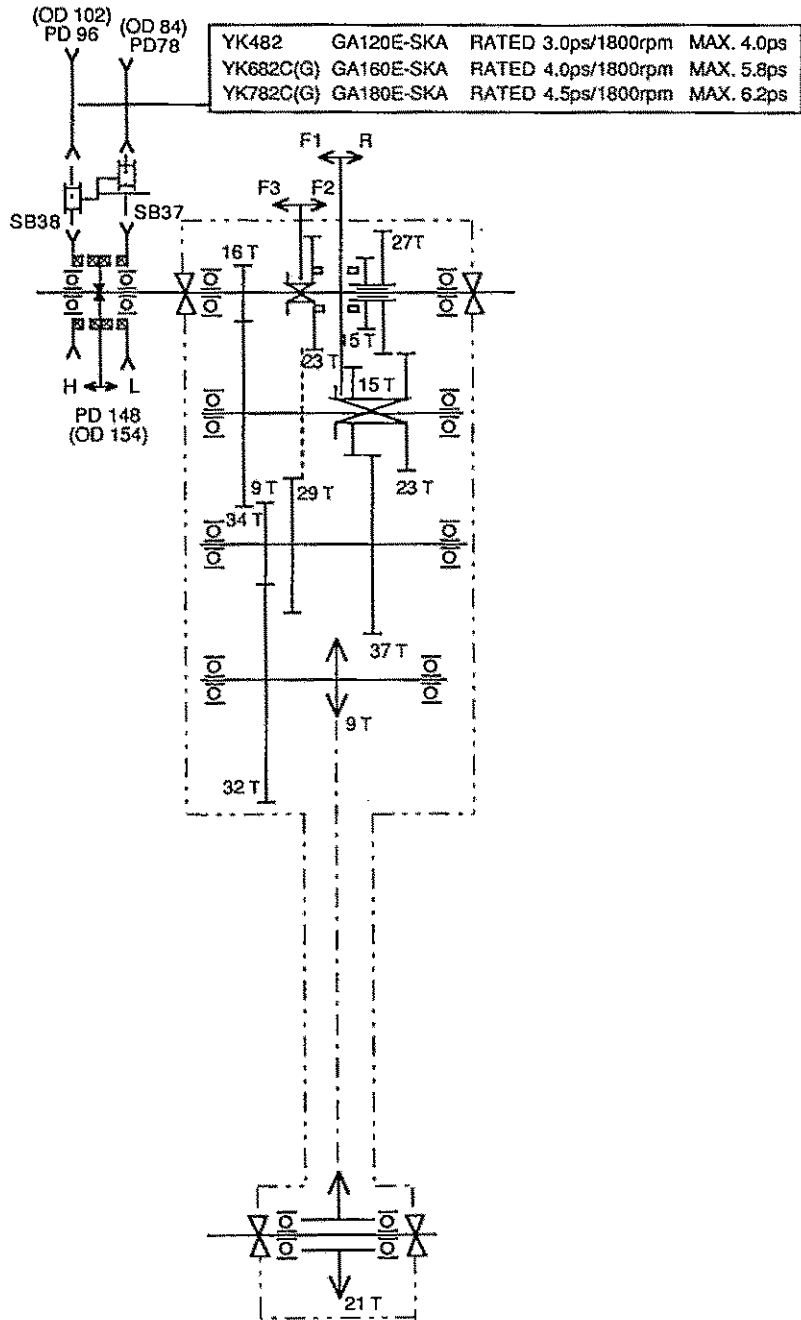


<YK422(Y)>, <YK462>

	At rated Engine Speed	Pulley Ratio	PTO(rpm)	Classification Speed Change	PTO (rpm)	Gear Arrangement	Wheel Shaft(rpm)
Low	1800	71/148	863.5	F1	863.5	11/40x13/40x9/21	33.0
				F2	1322	11/40x13/40x9/21	50.6
				F3	863.5	19/31x13/40x9/21	73.7
High	1800	94/128	1322	F4	1322	19/31x13/40x9/21	113
				R1	863.5	14/40x20/31x13/40x9/21	27.2
				R2	1322	14/40x20/31x13/40x9/21	41.6

Model : YK482, YK682C(G), YK782C(G)

• Power Transmission

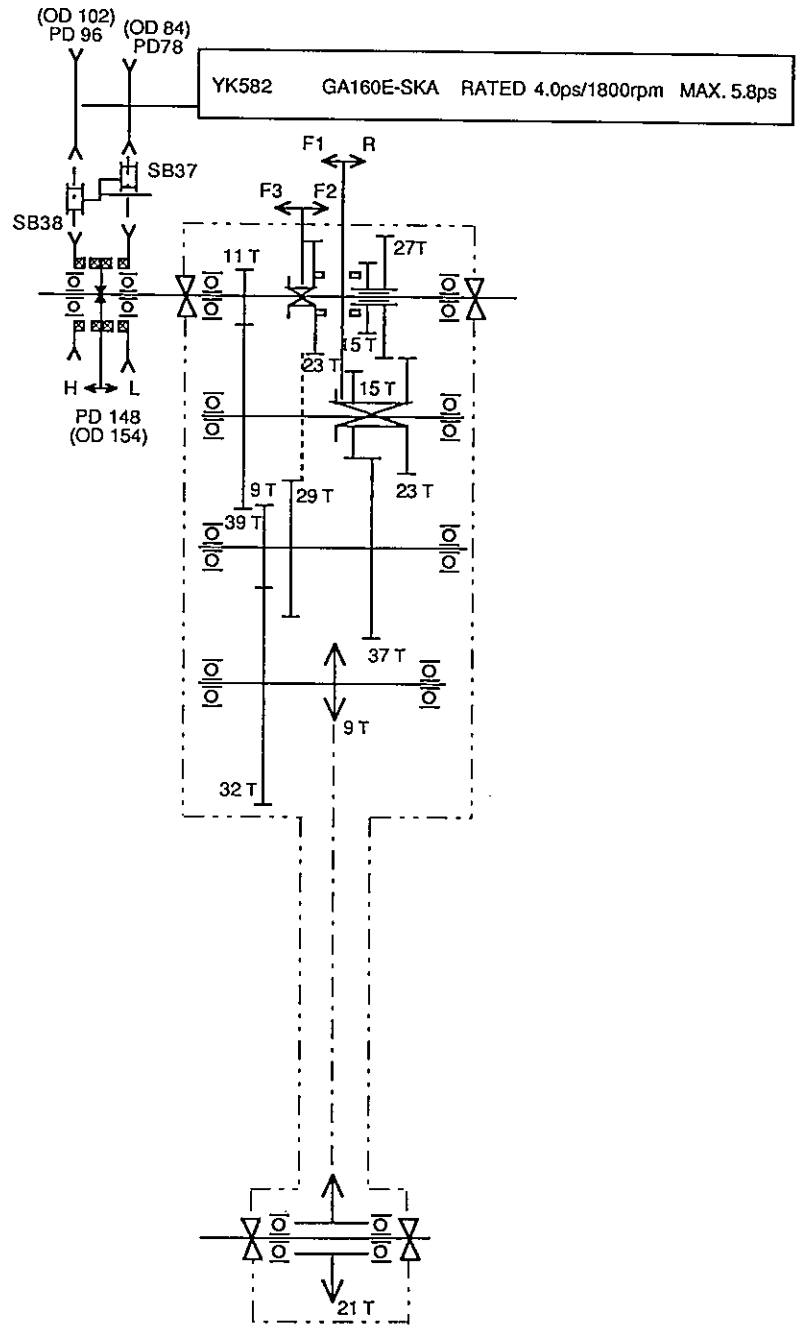


<YK482>, <YK682C,G>, <YK782C,G>

	At rated Engine Speed	Pulley Ratio	PTO(rpm)	Classification Speed Change	PTO (rpm)	Gear Arrangement	Wheel Shaft (rpm)
Low	1800	78/148	948	F1	948	16/34x23/27x15/37x9/32x9/21	18.6
				F2	1168	16/34x23/27x15/37x9/32x9/21	22.8
				F3	948	15/37x9/32x9/21	46.3
High	1800	94/128	1322	F4	1322	15/37x9/32x9/21	57.1
				F5	948	23/29x9/32x9/21	90.0
				F6	1168	23/29x9/32x9/21	110
				R1	948	16/34x15/37x9/32x9/21	21.8
R2	1168	16/34x15/37x9/32x9/21	26.8				

Model : YK582

• Power Transmission

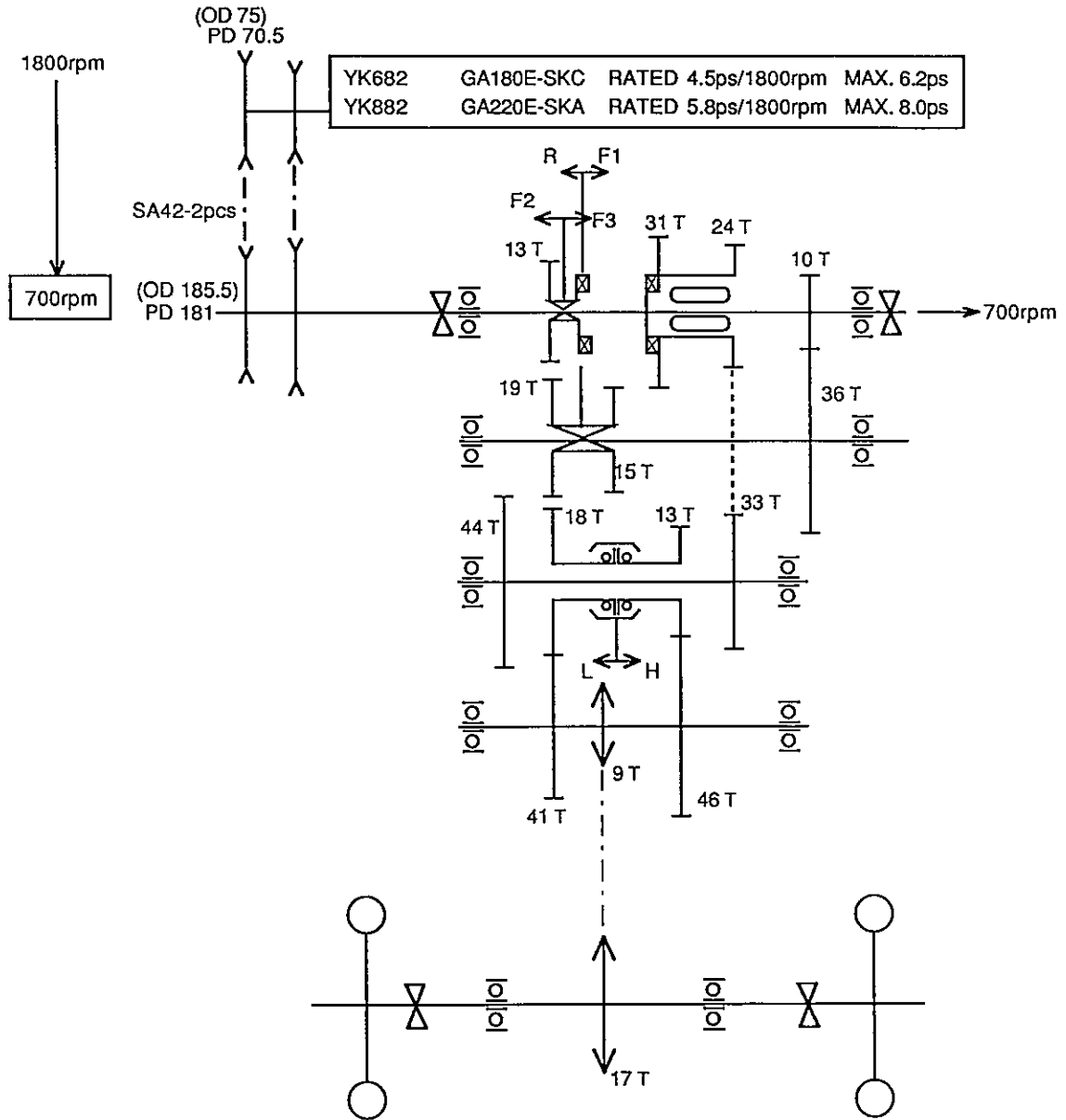


<YK582>

	At rated Engine Speed	Pulley Ratio	PTO(rpm)	Classification Speed Change	PTO (rpm)	Gear Arrangement	Wheel Shaft (rpm)
Low	1800	78/148	948	F1	948	11/39x23/27x15/37x9/32x9/21	11.1
				F2	1168	11/39x23/27x15/37x9/32x9/21	13.7
				F3	948	15/37x9/32x9/21	46.3
High	1800	96/148	1168	F4	1168	15/37x9/32x9/21	57.1
				F5	948	23/29x9/32x9/21	90.0
				F6	1168	23/29x9/32x9/21	110
				R1	948	11/39x15/37x9/32x9/21	13.1
				R2	1168	11/39x15/37x9/32x9/21	16.1

Model : YK682, YK882

• Power Transmission



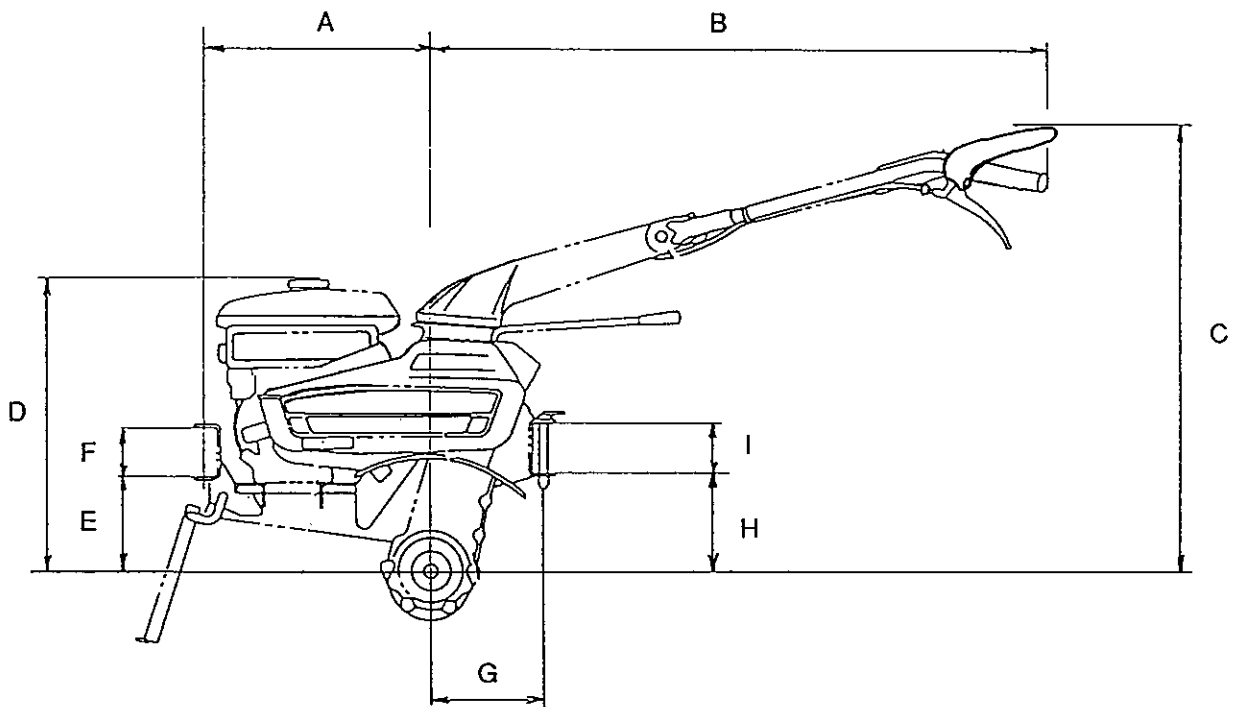
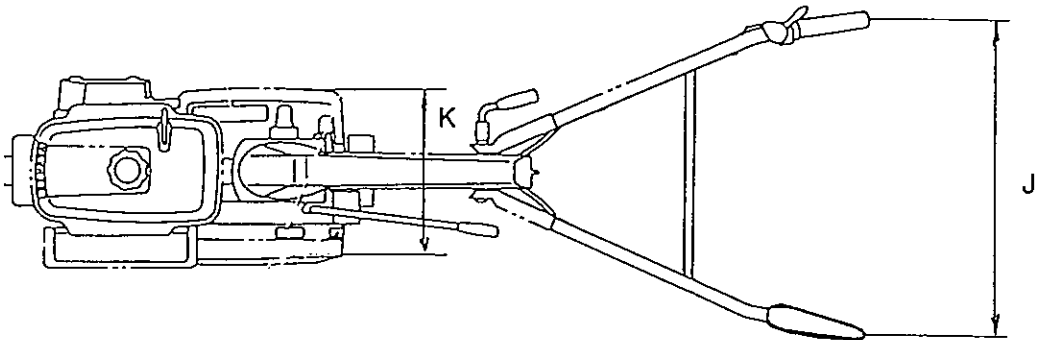
<YK682>, <YK882>

Classification Speed Change	Main Shift	Auxiliary Shift	Gear Arrangement	Reduction gear ratio	Wheel Shaft(rpm)
F1	1	L	10/36x15/31x24/33x13/46x9/17	0.01463(1/68.4)	10.24
F2	1	H	10/36x15/31x24/33x13/41x9/17	0.02272(1/44)	15.90
F3	2	L	13/44X13/46X9/17	0.04420(1/22.6)	30.94
F4	2	H	13/44X13/41X9/17	0.06867(1/14.6)	48.07
F5	3	L	24/33X13/46X9/17	0.10881(1/8.39)	76.17
F6	3	H	24/33X13/41X9/17	0.16904(1/5.92)	118.3
R1	R	L	10/36x19/44x13/46x9/17	0.01795(1/55.7)	12.56
R2	R	H	10/36x17/44x18/41x9/17	0.02788(1/35.9)	19.52

1.3 General Dimensions

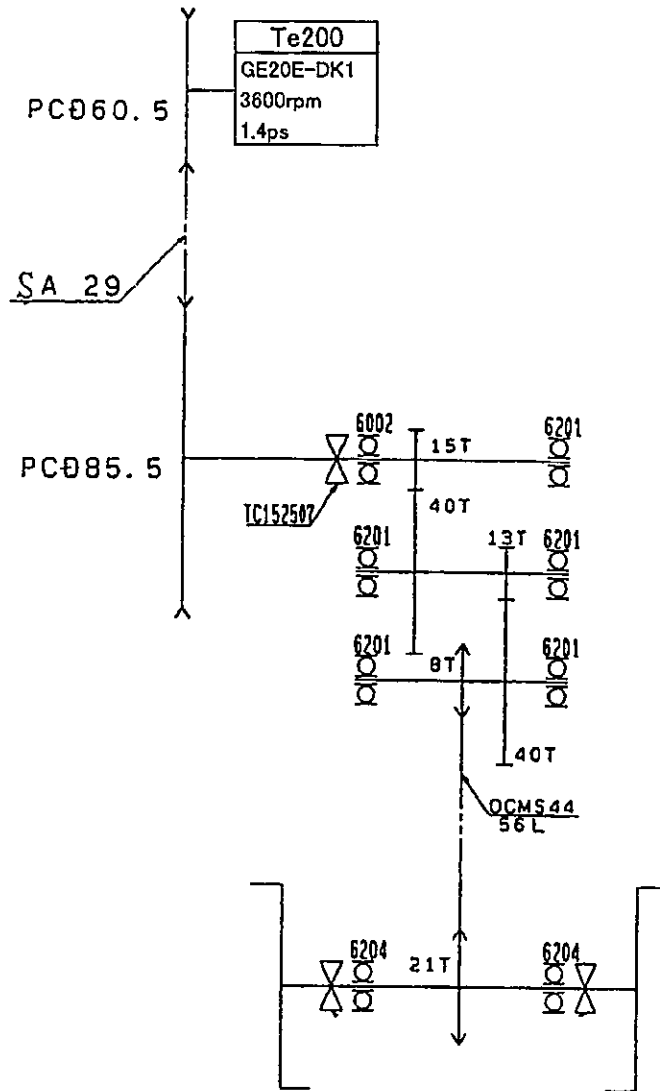
	YK322(E)	YK382(Y), YK402	YK422(Y), YK(462)	YK482	YK582	YK682C(G) YK782C(G)	YK682	YK882
A	317	388	382	381.5	381.5	381.5	489.5	489.5
B	934	920	920	1060	1140	1060	1120	1120
C	790	780	780(860)	800	830	800	780	780
D	504	500	500	518	550	550	570	570
E	-	-	116	128	128	128	201	201
F	-	-	95.5	95.5	95.5	95.5	95.5	95.5
G	238.4	190.3	190.3	220.7	220.7	220.7	250	250
H	155.1	141.7	141.7	172.2	172.2	172.2	154.6	154.6
I	95.5	95.5	95.5	95.5	95.5	95.5	95.5	95.5
J	580	580	580	580	590	590 </td <td>600</td> <td>600</td>	600	600
K	240	240	240	242	242	240	313	313

	TE200	TE500
A	278	393
B	1018.5	1022.4
C	818.6	834.9
D	556.5	507.5
E	---	---
F	---	---
G	250.6	195.6
H	126	153.8
I	30, 60	75.5
J	565.1	589.6
K	608	600



Model : Te200

•Power Transmission

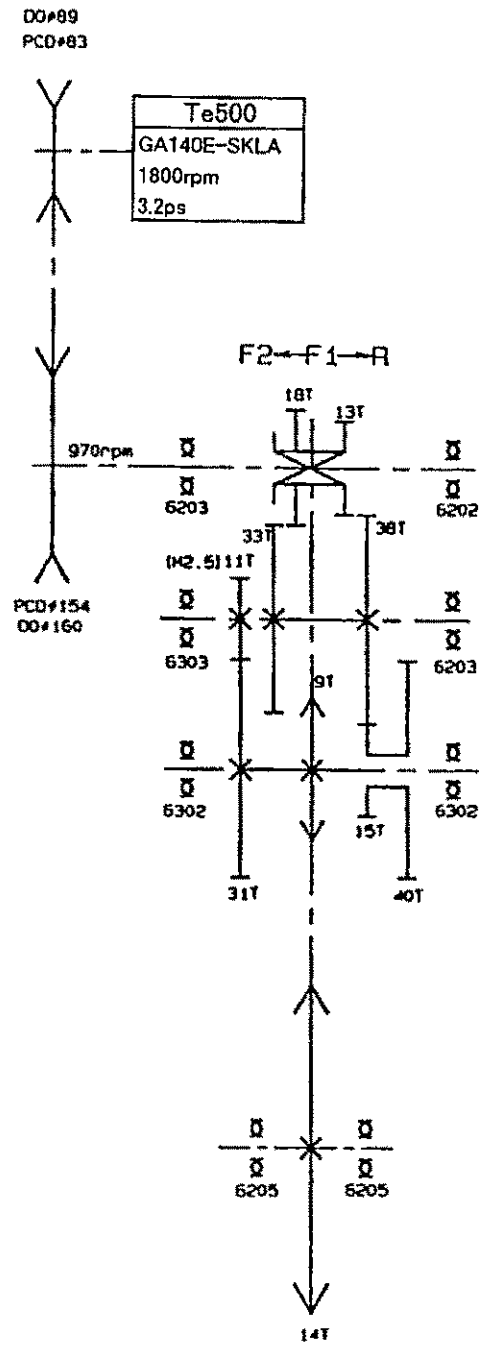


Model : Te200

At rated engine speed (rpm)	Main shaft (rpm)	Speed change	Gear Arrangement	Axle shaft (rpm)
3600	2553	F1	15/40x13/40x8/21	118.5

Model : Te500

-Power Transmission

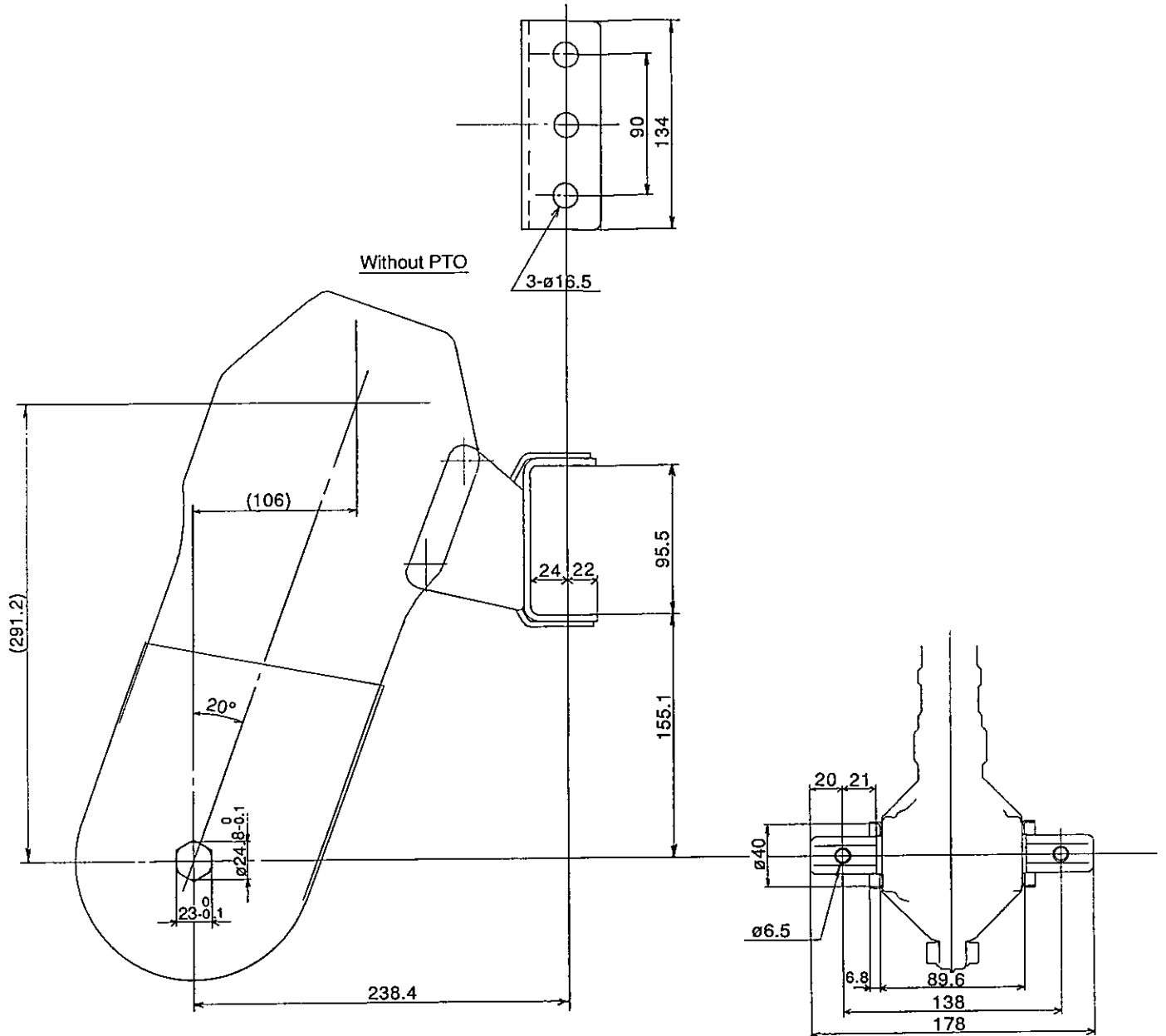


Model : Te500

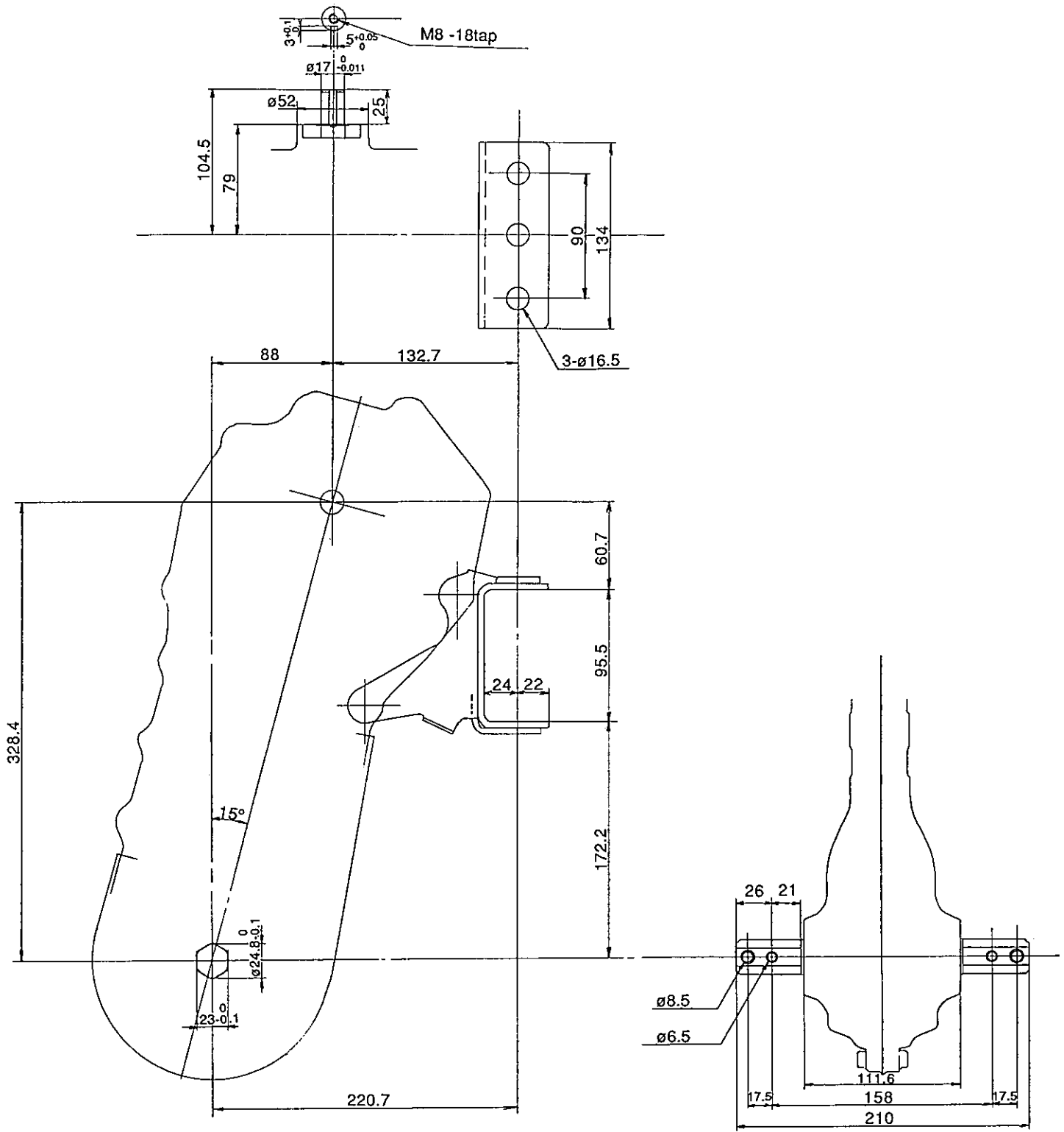
At rated engine speed (rpm)	Main shaft (rpm)	Speed change	Gear Arrangement	Axle shaft (rpm)
1800	970	F1	13/38x11/31x9/14	75.7
		F2	18/33x11/31x9/14	120.7
		R	13/40x15/38x11/31x9/14	28.4

1.4 General Dimensions (PTO, HITCH, AXLE)

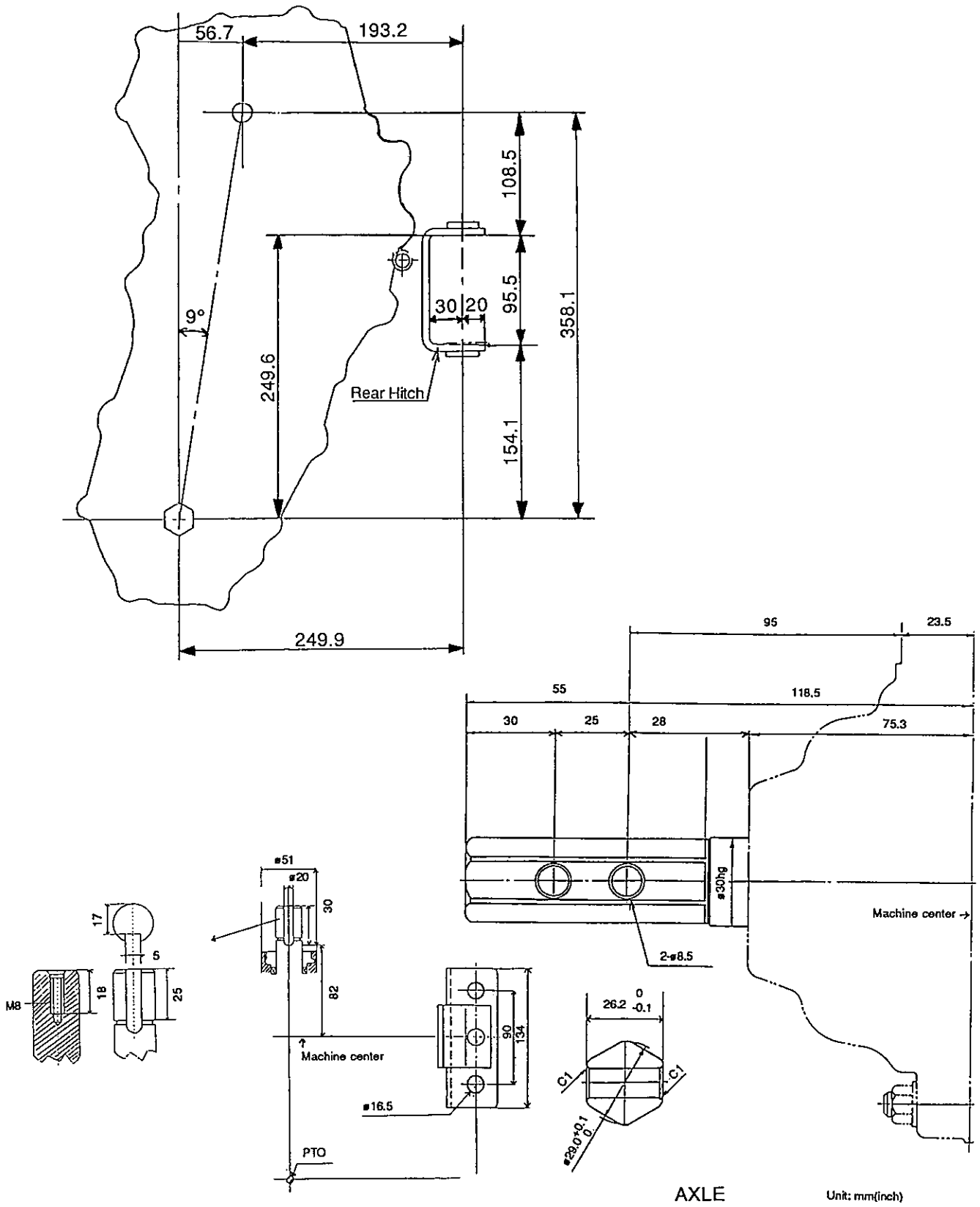
Model : YK322(E)



Model : 482, 582, 682C(G), 782C(G)

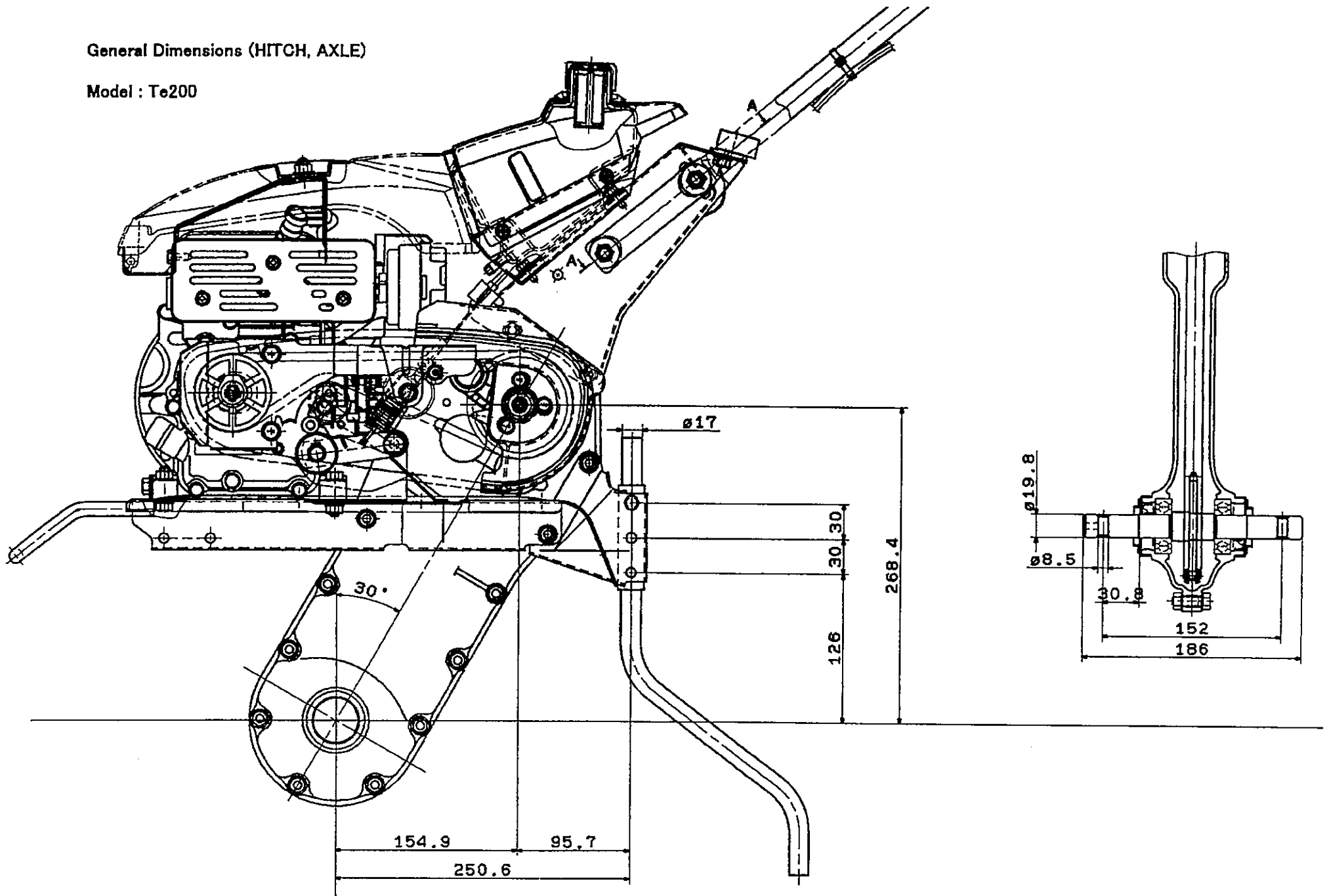


Model : 682, 882



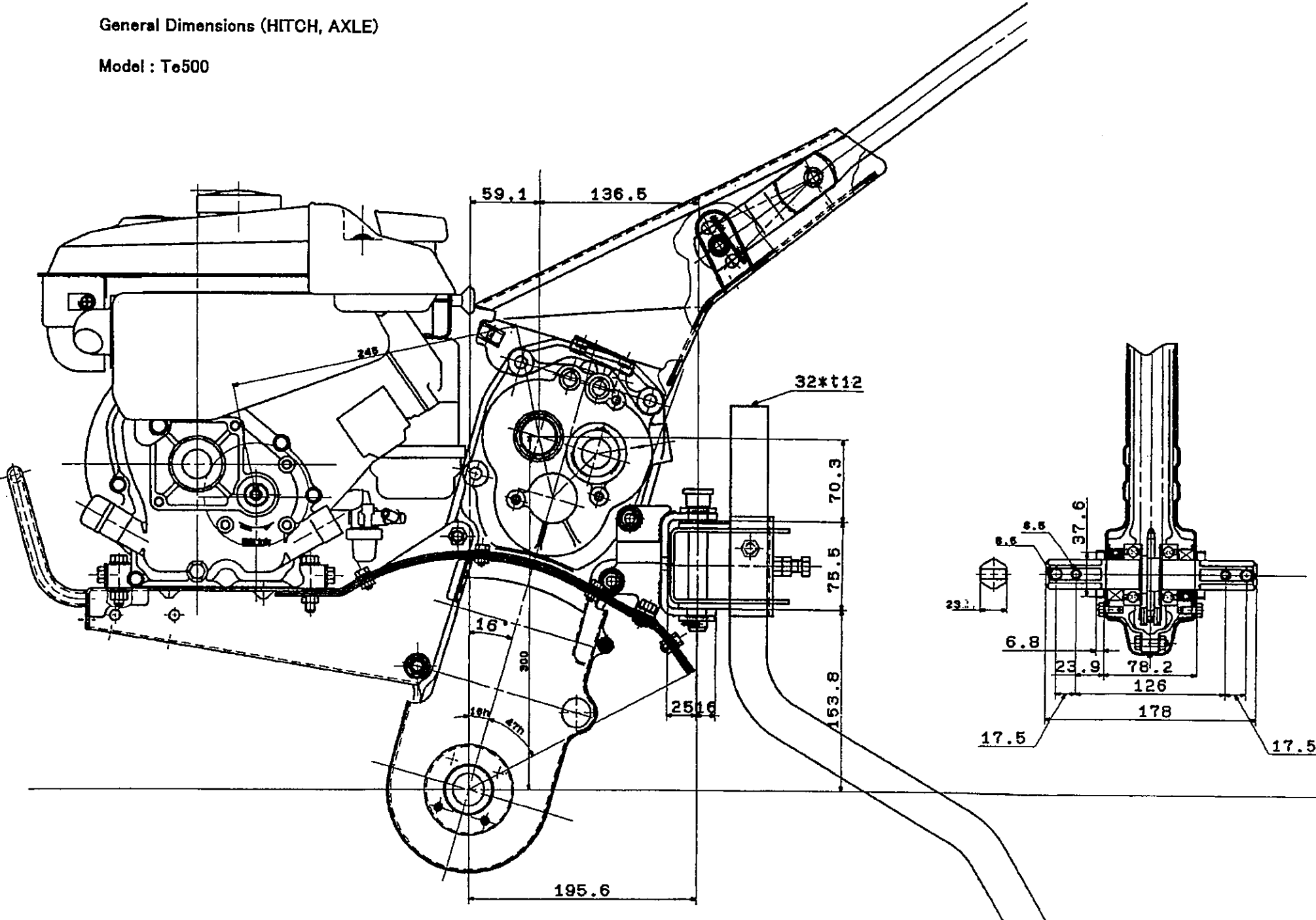
General Dimensions (HITCH, AXLE)

Model : Te200



General Dimensions (HITCH, AXLE)

Model : Te500



2. MAINTENANCE STANDARDS

2.1 Safe Practice

From the aspect of safety in particular, the following recommendations should be carefully observed.

- Do not use in poor ventilated areas.
Operating the Mini-tiller in a poor ventilated area can result in gas poisoning from toxic carbon monoxide contained in the exhaust gas.
- Avoid exposure to fire during refueling of gasoline.
When refueling gasoline, always stop the engine and do not allow any lighted cigarettes, lighters, candles or any other cause of inflammables to come near. Attempting to illuminate the inside of the fuel tank with open fire or refueling while smoking a cigarette can be the cause of fire.
Care should be taken not to spill any gasoline outside by using a lubrication pump or a funnel. Wipe clean any spilled gasoline before starting the engine.

2.2 Preventive Maintenance

- Be sure to use Yanmar genuine or Yanmar recommended parts and lubricants or equivalent quality goods.
Parts which do not meet the Yanmar design specifications can result in damaging the machine.
- Use special tools that are designed to fit the machine.
- Use new gaskets and O-rings when re-assembled.
- Unless otherwise specified, begin the tightening of bolts and nuts with those of large diameters or from the bolts at the inner side and then tighten bolts at the opposite angle to its specified torque.
- Clean all parts thoroughly with cleaning solution when disassembled and apply lubricant to the sliding surface when assembling.
- Check and see if the machine functions properly after assembly.
- As numerous tapped screws are used in this machine, care should be taken so as not to damage the screw threads from excessive tightening.
- Only tools of the metric system should be used when servicing this machine. Metric bolts, nuts and screws do not fit with other systems. The use of improper tools can be the cause of damage to the machine.

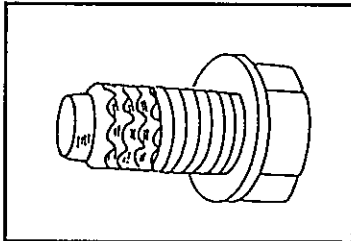
2.3 Tightening Torque Values

Location	Screw size(mm)	Tightening torque kg·cm (ft·lb)
Cylinder head	8 Bolt	245-255(17.7-18.4)
Connecting rod	6	100-110(7.2x8.0)
	7	145-155(10.5x11.2)
Fly wheel	12 Nut	300-350(21.7x25.3)
	14 Nut	575-625(41.6x45.2)
	16 Nut	825-875(59.7x63.3)
Spark plug	14 Bolt	180-220(13.0x15.9)
Drain plug	12 Bolt	200-250(14.5x18.1)
Fan case	6 Bolt	70-110(5.1x8.0)
Engine	8 Bolt. Nut	130-170(9.4x12.3)
	10 Bolt. Nut	250-330(18.1x23.9)
Transmission case	6 Bolt. Nut	60-80(4.3x5.8)
	8 Bolt. Nut	130-170(9.4x12.3)
	10 Bolt. Nut	300-420(21.7x30.4)
Standard torque	6 Tapping bolt	100-140(7.2x10.1)
	8 Tapping bolt	260-300(18.8x21.7)
	6 Bolt. Nut	60-80(4.3x5.8)
	8 Bolt. Nut	130-170(9.4x12.3)
	10 Bolt. Nut	300-420(21.7x30.4)
Strong type	8(7T Bolt)	230-300(16.7x21.7)
	10(7T Bolt)	540-720(39.1x52.1)

NOTE:

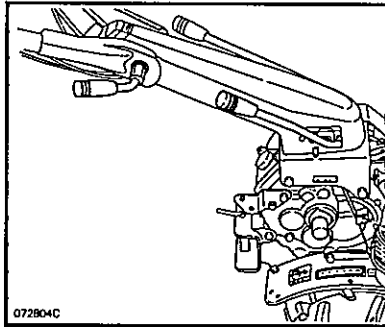
When re-assembling with tapping bolts, Place to fasten.

Tighten to: For 6 mm
50-70kg·cm
(3.6-5.1 ft.lb)
For 8 mm
130-170 kg·cm
(9.4-12.3 ft.lb)

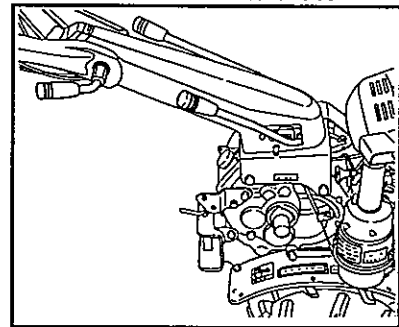


Self-tapping bolt

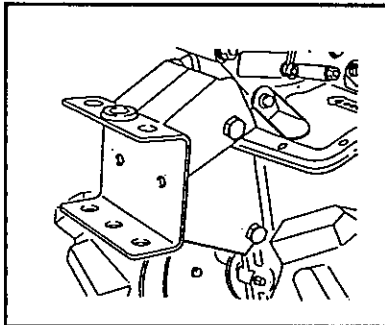
Handle lock lever



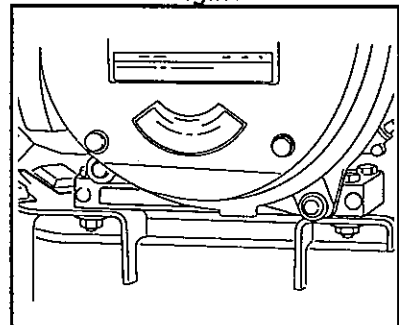
Handle mount lock lever



Bolt to fix hitch



Bolt to fix engine



2.4 Periodical Inspection

Inspection interval		Before each operation	Initial 20hr	Each 50hr	Each 100hr	Each 300hr
Engine oil	inspect oil level	x				
	Change		x	x		
Air cleaner	Inspect	x				
	clean, oil change			x*1		
Fuel level	Inspect	x				
Looseness of all bolts and nuts	Inspect	x				
V-belt	Inspect	x				
	Adjust		x		x	
Fuel strainer	Clean			x		
Transmission oil	Inspect	x				
	Change			x first		x
Spark plug	Clean				x	
Clutch cable	Adjust					x
Throttle cable	Adjust					x
Valve clearance	Adjust					x
Combustion chamber	Clean					x
Fuel hose	Inspect(Replace)					x

*1: Clean frequency when used in dusty area.

2.5 Troubleshooting

Start checking after engine is stopped.

• Engine

Probable Causes	Action to be taken
Difficulty in starting 1) Clogged fuel strainer 2) Poor adjustment of carburetor 3) Damaged transistor unit 4) Faulty spark plug 5) Improper valve clearance	1) Clean. 2) Re-adjust. 3) Replace. 4) Replace. 5) Re-adjust.
Insufficient output 1) Faulty spark plug 2) Poor adjustment of governor 3) Improper valve clearance 4) Wear or damage of valve seat 5) Wear in cylinder or piston 6) Dust is accumulated in air cleaner 7) Engine oil gets scarce 8) Attachment is too big 9) Belt tension is too tight	1) Replace. 2) Re-adjust. 3) Re-adjust. 4) Repair. 5) Re-adjust. 6) Clean. 7) Feed engine oil. Replace it with fresh one if it gets dirty. 8) Change it with adequate size one. 9) Adjust it to properly loose.
Faulty engine rotation 1) Poor adjustment of carburetor	1) Re-adjust.
Faulty rotation at high speed 1) Faulty spark plug 2) Poor adjustment of governor	1) Replace. 2) Re-adjust.
Faulty rotation at low speed 1) Poor adjustment of governor 2) Improper valve clearance	1) Re-adjust. 2) Re-adjust.

Trouble	Probable Cause	Action to be taken
Difficult to start engine	1) No fuel in tank 2) Fuel in tank. But Plug is wet. 3) Plug is not wet. But no sparks or sparks feeble. 4) Satisfactory sparks. But Insufficient compression.	1) Refill with fuel. 2) Restart by cleaning plug. Check overflow of carburetor. 3) Replace spark plug and check. Check disconnection of plug cord. Check disconnection of transistor unit. 4) Check clearance of faulty valve. Check looseness in bolt tightening cylinder. Check carbon accumulation in combustion chamber. Check for any defects in cylinder head gasket, valve and valve seat. Check wear of piston ring, piston, cylinder.

- **Main assembly**

- **Clutch**

Probable Causes	Action to be taken
Clutch lever is engaged, but Tiller fails to move forward. 1) Clutch cable is too loose.	1) Adjust. (Refer to page 26.)
Clutch lever is disengaged, but Tiller fails to stop. 1) Clutch cable is too tight.	1) Adjust. (Refer to page 26.)

- **Speed Control Lever**

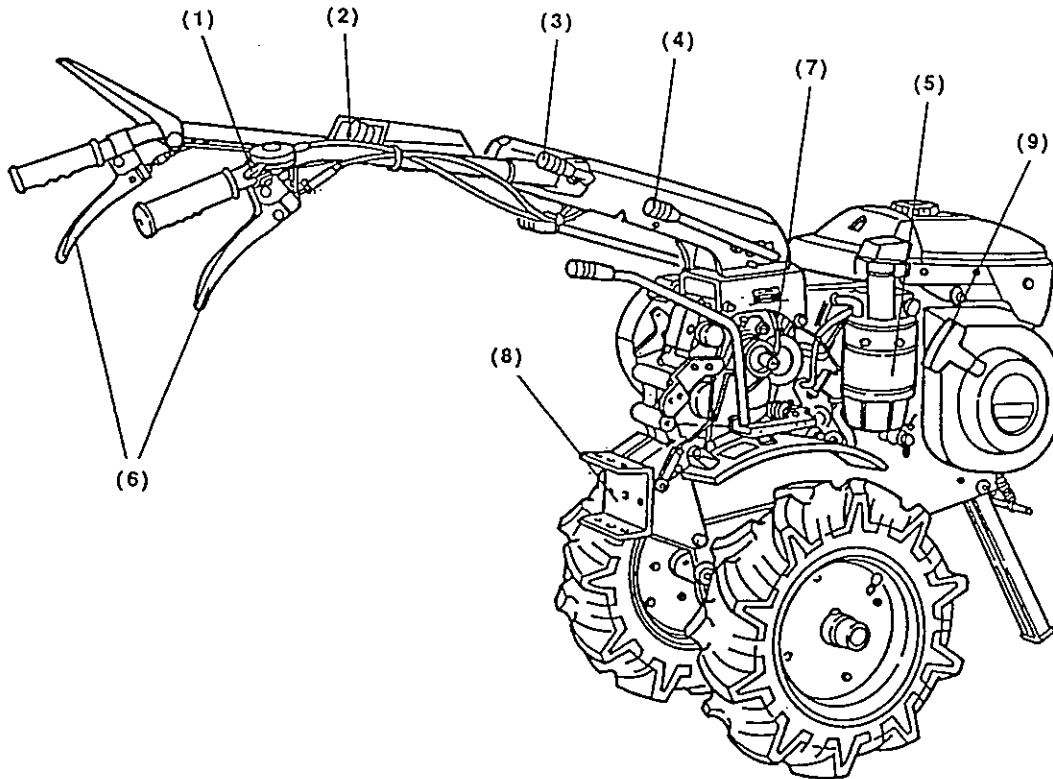
Probable Causes	Action to be taken
Difficulty in shifting into gear. 1) Shifter gear is worn out or damaged. 2) Set spring tension of fork shaft is insufficient.	1) Replace. (Refer to page 27.) 2) Re-adjust. (Refer to page 27.)

- **Vibration of various parts**

Probable Causes	Action to be taken
Engine is vibrated.	Fasten fixing bolt for engine.
Handle and handle mount are vibrated.	Fasten handle lock lever and handle base lock lever.
Attachment is vibrated.	Align main unit and attachment at the center. Fasten bolt for hitch.

3. MAINTENANCE

3.1 Name of Parts



(1) Accelerator Lever

(2) Engine Switch

(3) Handle Lock Lever

(4) Handle Frame Lock Lever

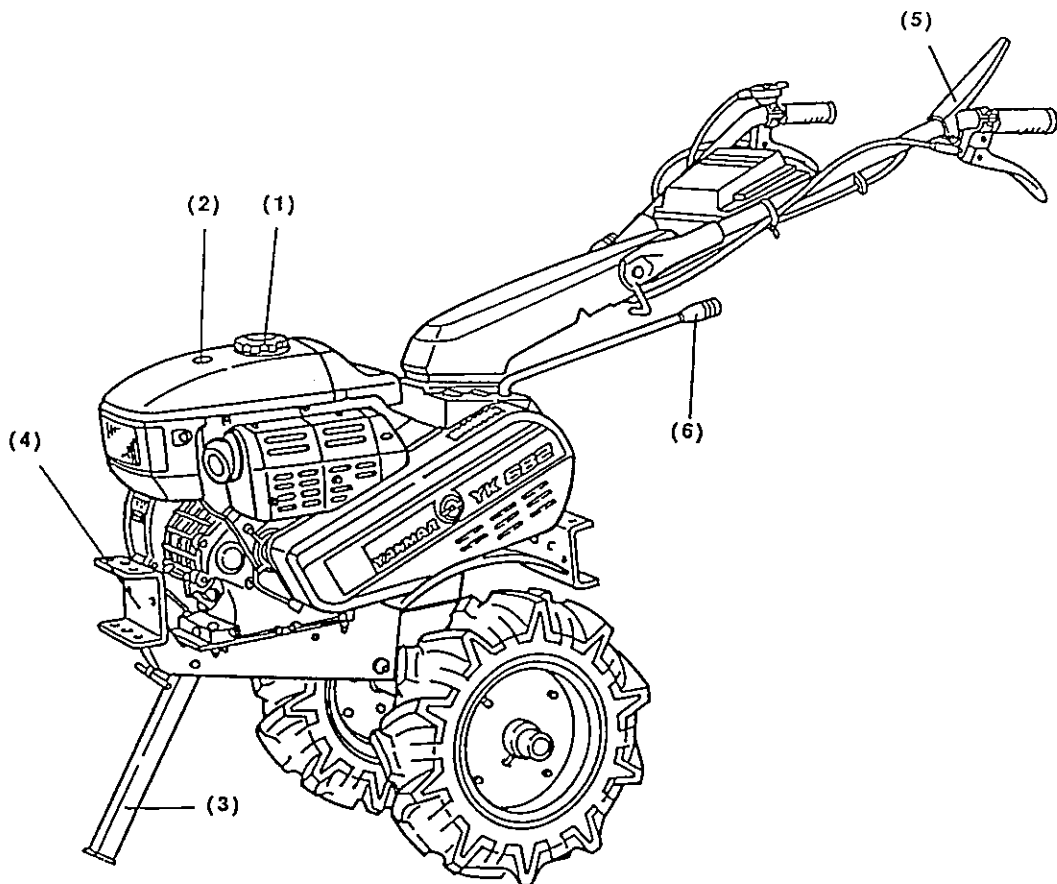
(5) Oil Bath Air Cleaner
Cleans the air entering the engine to keep the engine serviceable for long.

(6) Side Clutch Lever

(7) PTO Shaft
Used for taking off power from this machine or driving farming appliances such as the rotary unit.
(When put out of use, put the cap over)

(8) Hitvh (Rear)

(9) Recoil Starter



- (1) Fuel Tank
- (2) Fuel Gauge
- (3) Stand

- (4) Front Hitch
- (5) Deadman Clutch Lever
- (6) Main Gear Change Lever

3.2 Engine

Periodic maintenance

General

Regular check and adjustment are essential to keep the engine in optimum condition for satisfactory performance. If the engine should be out of order, check and diagnose the trouble point, and carry out appropriate service. Never tamper with or disassemble parts recklessly without appropriate check and adjustment to avoid misjudgment of trouble causes or additional troubles.

Checking is performed in two ways; visually and with instruments. Adjustment should be carried out by using instruments necessary for accurate judgment.

Check for oil leakage daily, on external parts in particular. In case of leakage, ascertain the place from which fuel or engine oil is coming out and give appropriate service to eliminate the possibilities of a fire or engine burning.

Shown in the following table are regular check points and check intervals. The checking items with a white circle in the table are the responsibility of the user, so instruct users on correct checking procedure.

Check interval	Daily	50 h	100 h	200 h	500 h	1000 h	Replace	Remarks
Bolts and nuts	x				x		Tighten the bolts.	
Engine oil	x							
Replace engine oil		x						1st: 20 h
Fuel oil	x							
Fuel oil filter	xWater			x Clean				
Oil leak	x						3 years *	* Pipes
Air cleaner		x Clean					Element 500 h	Replace often in dusty area
Cooling fan			x					50 h in dusty area
Spark plug			x				Plug 150 h	
Sparking condition			x					
Compression						x		
Valve clearance					x			
Valve seat contact					x			
Combustion chamber					x			
Replace piston ring						x		
Overhaul						x		

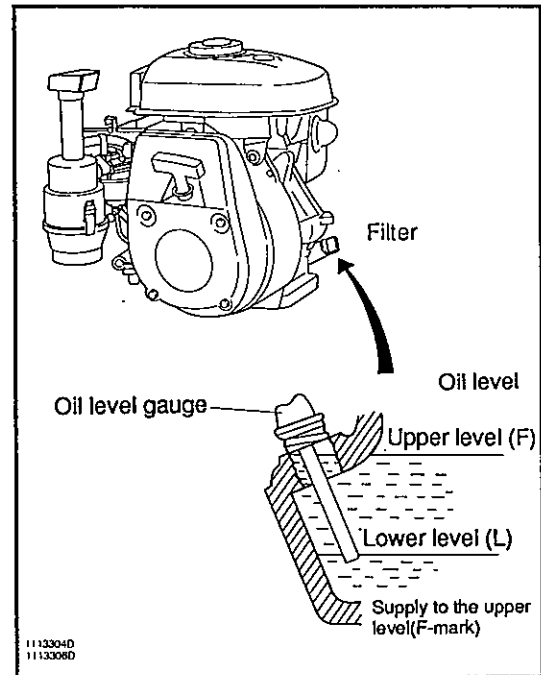
1 Engine oil

1. Oil level check

Check oil level by placing the engine horizontally. Remove the filter cap on cylinder side cover and check the oil level with the dip stick attached to the cap. Supply recommended engine oil to the upper level if oil is low.

2. Oil change

In changing oil, warm up the engine and drain oil by removing the drain plug while the oil is warm.



3. Engine oil class

Use oil of SC grade or higher SAE (A.P.I.) and select viscosity according to the table depending upon ambient temperature.

Temperature	SAE viscosity range
10° – 20°C (spring and fall)	SAE #20
20°C or more (summer)	SAE #30
10°C or less (winter)	SAE 10W #30

(L)

	GA90	GA120	GA160	GA180	GA220	GA280
Oil capacity	0.4	0.5	0.6	0.6	1.0	1.2

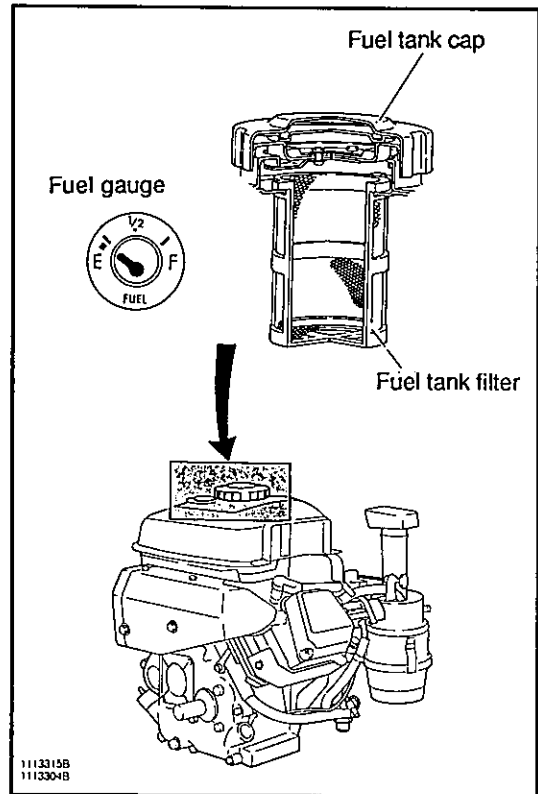
2 Fuel

- (1) Check the fuel level by the fuel gauge on the tank.
- (2) Use regular grade gasoline

	GA90	GA120SK	GA160SK	GA180	GA220SK	GA280SK
Fuel tank capacity (L)	1.8	2.2	3.0	4.3	4.3	4.3

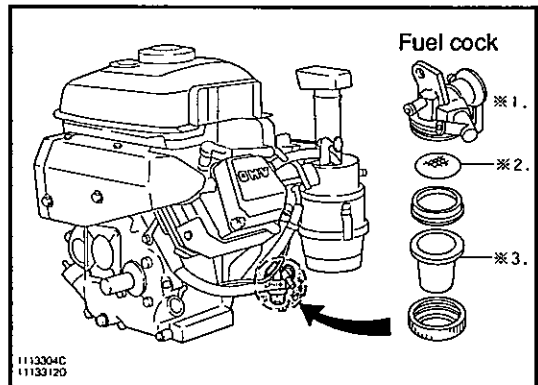
NOTE:

Unleaded gasoline is preferably recommended because of the less deposit in the combustion chamber.



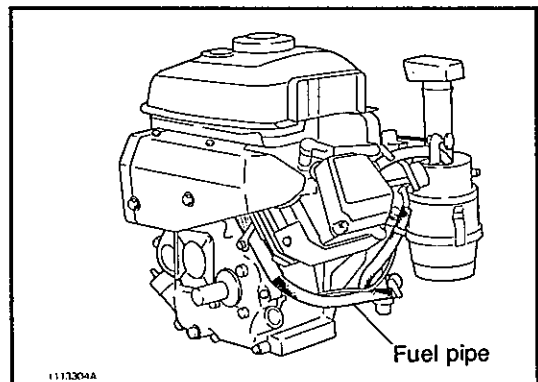
3 Cleaning of fuel filter

Separate the bowl from the fuel cock and clean the filter and the bowl inside surface. Always shut off the fuel cock when the engine is not being used.



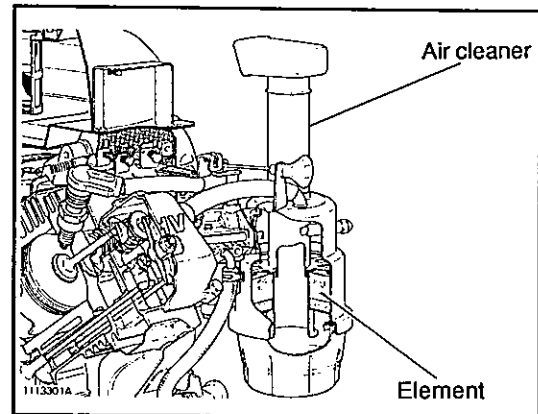
4 Check of fuel pipe

Check the fuel pipe clamps and joints for fuel leakage and the pipe for crevices.



5 Cleaning of air cleaner

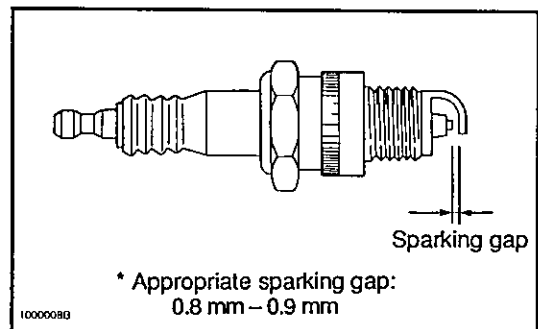
At regular intervals, take the element off the air cleaner unit, and wash the element with gasoline. Soak the element in mixed oil (mixing ratio 2-4 parts gasoline to one part engine oil), then squeeze the element until no oil drops from it or sufficiently shake the oil off the element before assembling the air cleaner unit. Never use an element with a hole in it.



6 Ignition plug

1. Check of ignition plug

At regular intervals, remove the ignition plug to check it for burning and wear conditions. Clean the plug with a wire brush and adjust the sparking gap.



Standard sparking gap for adjustment	0.8 - 0.9 mm
--------------------------------------	--------------

2. Chipping and cracks in plug insulator

Carefully check the plug insulator for chipping and cracks and replace a defective plug with a new one.

Spark plug	NGK (BP6ES)
	DENSO (W20EP-U)

3. Burning condition

The ignition plug is proved satisfactory when porcelain insulator surrounding electrodes is burnt white, light brown, or light gray.

Good burning	If the porcelain insulator surrounding electrodes is burnt white, light brown or light gray, the burning condition is good.. The ignition plug functions perfectly.
Burning with fouling	<ul style="list-style-type: none"> • Smoking (Fouling by cold) The igniter (whole surface) is covered with the deep-black dried carbon, and the spark is weakened and then no ignition dine. So, starting is not in good condition and the low-speed rotation not stable, thereby causing engine stopping or bad acceleration. • Covering (Fouling by wetting) Wet carbon gathers, or the gasoline or oil makes wet. Fouling (smoking, covering, etc.) is caused by bad condition of ignition system or fuel system excluding a plug, bad maintenance of engine, unsuitable condition of use, excessive cold ignition plug, etc.
Excessive burning	If the ignition plug is excessively burnt, the engine power is reduced and the rotation not increased. The porcelain insulator becomes deep-white like exposed, and the central electrode is consumed early, or the porcelain may be cracked. As their reasons, there are use of plug easily to be burnt, excessively advanced ignition time, excessively thin mixed gas, short cooling of engine, attachment in combustion chamber, use of low-octane gasoline, etc.

4. In re-attaching the plug, screw it in by hand and tighten it with a plug wrench.

Ignition plug tightening torque: 180 – 230 kg-cm

Note for fastening the plug:
Clean the plug insulator and fitting base. See to the gasket and hand-tighten it then further secure for 1/4 to 1/3 turn with a correct plug wrench (1/5–1/4 in case of reuse). Be careful not to damage the insulator.

5. Selecting suitable plug.

Different manufacturers have different type numbers.

(Ref) Guide to selection of plug				
Heat value	2	4	5	6 7
Thermal property	Hot type		↔	Cool type
Plug condition	Insulator contaminated with carbon		↔	Electrodes abnormally worn adjustor burnt whit
Engine condition	Misfire		↔	Early ignition
Engine operation condition	Low speed, low load		↔	High speed, heavy load

NOTE:

If a new engine causes spark plug insulator to be contaminated with carbon or results in misfire, it is called early burn. In this case, the plug should be cleaned of carbon or replaced with a new plug.

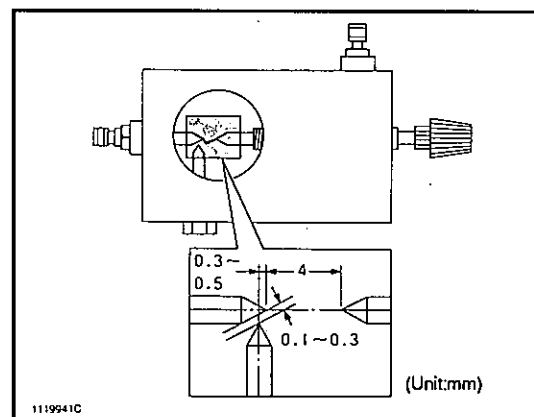
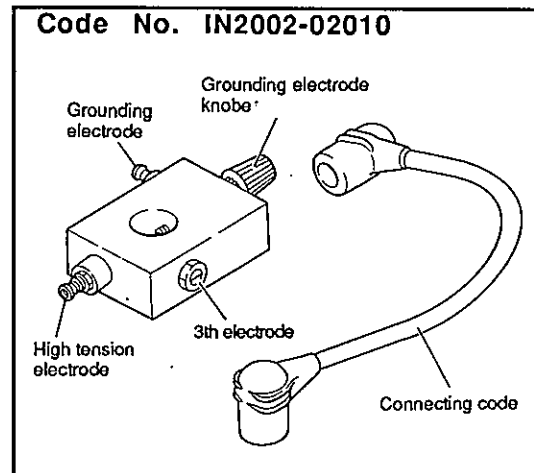
7 Check of sparking

Connect the detached ignition plug to the high tension plug cap and ground the plug thread to the cylinder block as shown in right. Pull the starter rope to check sparking between the electrodes.

NOTE:

1. Ensure sufficient insulation before pulling the rope to avoid a dangerous electric shock, because pulling the starter rope with while touching the high tension cord may cause such an accident.
2. Never check sparking at a position near the plug hole, because it may cause fuel coming out of the cylinder to ignite.
3. Check sparks after wiping off fuel scattered and adhered on the engine body near the ignition plug to be tested, because there is a danger of such fuel igniting.

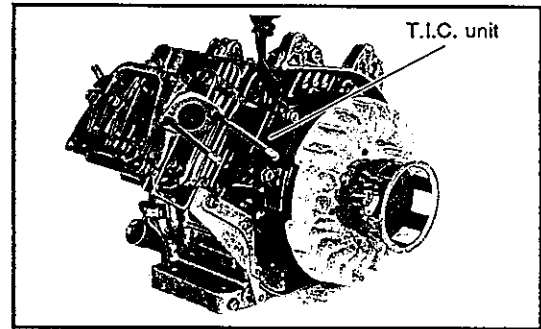
If the plug generates no spark or a weak spark in the test, the ignition system must then be checked. See Ignition system, for the procedure.



8 T.I.C. unit

1. Check of T.I.C. unit

Check the diodes and circuits in T.I.C. unit by removing the high-tension cord cap from the spark plug, rotating the flywheel with the recoil starter, and observing sparks at the tip of the high-tension cord cap. Reject the unit if it does not produce a spark.



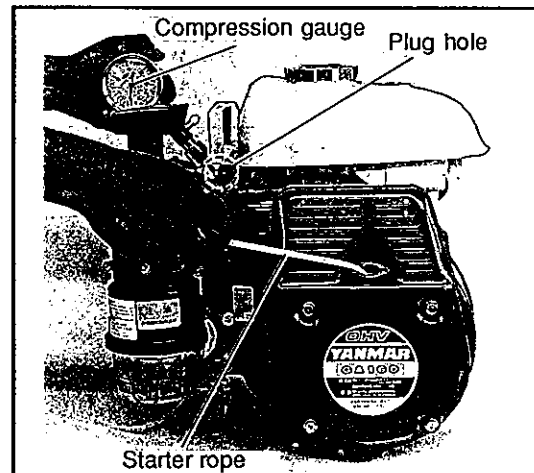
2. Check of stop circuit

The black lead wire of T.I.C. unit is connected to the stop unit, the wire grounds ignition coil current when the stop switch is turned OFF, which restrains ignition and stops the engine.

The stop circuit is proved normal by spark test with disconnected spark plug when sparks do not generate in OFF position but generate in ON.

9 Check of compressed pressure

Remove the ignition plug and set a compression gauge in the plug hole. Keep the engine cool, open the choke valve full, set the regulator handle at the high-speed position, and rotate the engine by cranking it with the starter rope. Measure the compressed pressure with the gauge at the engine RPM where the gauge pointer becomes stable.



Standard compressed pressure	Cranking method	Engine RPM	GA90-180	GA220-280
			Compressed pressure	
	Starter rope	600 rpm	Min. 3.0 4 kg/cm ²	4
	*Starter motor	750rpm	4	5

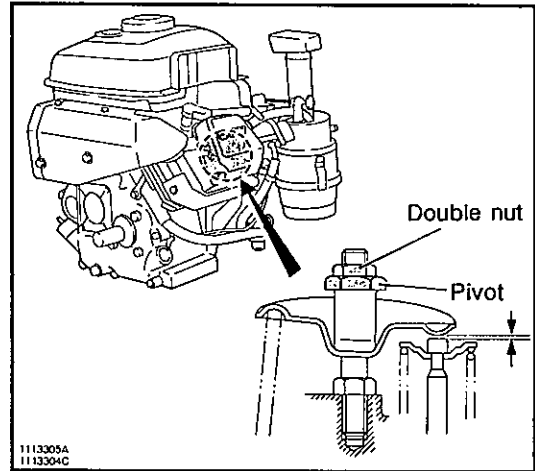
*For engines equipped with starter motors.

If compressed pressure cannot reach the standard, overhaul the engine to ascertain the cause of compression drop and service it.

10 Check of tappet clearance

Measure the valve-to-rocker arm clearances on both intake and exhaust sides with a thickness gauge. The measurement should be made with the engine in cool condition and by setting the flywheel at T.D.C. position in compression stroke.

		GA90	GA120	GA160	GA180	GA220	GA280
		(mm)					
Standard clearance	Intake side	0.1 ± 0.02					
	Exhaust side	0.1 ± 0.02					

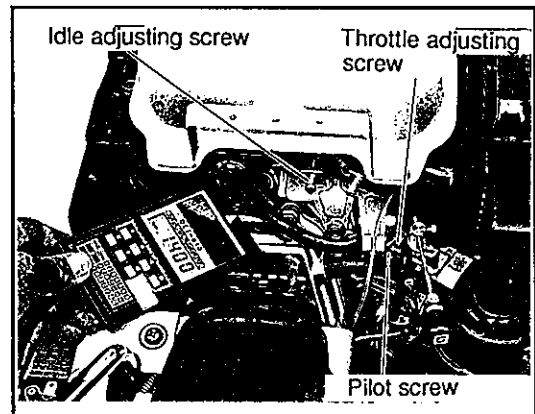


11 Adjustment of idling speed

On completion of governor adjustment, adjust the engine idling speed by the following procedure:

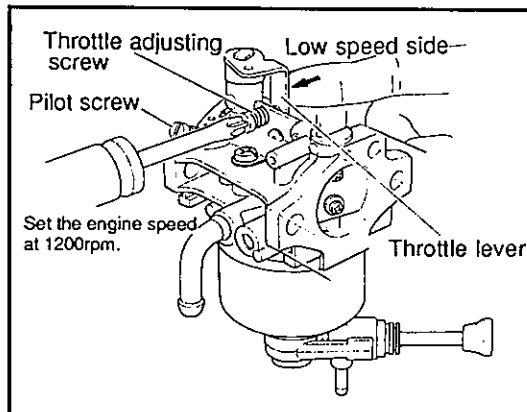
	GA90-GA280
Minimum idling speed	$1,400 \pm 50$ rpm

- (1) Start engine to warm up and perform the following adjustment with the engine running.
- (2) Progressively lower the regulator handle to the lowest-speed position and adjust the idle-adjusting screw for minimum engine speed. If operations 1 and 2 cannot produce a stable low speed, the following procedure should be followed:



	GA90	GA120	GA160	GA180	GA220	GA280
Type	BV18TH	BV18TH	BV18TH	BV18TH	BV24TH	BV26TH
Pilot screw	1-1/4TURN	1-1/4TURN	1-3/4TURN	1-3/4TURN	1-3/8TURN	1-1/4TURN

- (3) Screw the pilot screw clockwise all the way with a standard flat-headed screwdriver, and adjust the pilot screw opening by 1 to 1 1/4 turn.
- (4) Turn the pilot screw clockwise or counterclockwise to the position where engine runs stably and its speed increases.
- (5) Re-adjust the idle-adjusting screw to set the engine speed at the minimum speed.
- (6) Set the engine speed at 1200 rpm to push the throttle lever to low speed side by screwing the throttle adjusting screw.



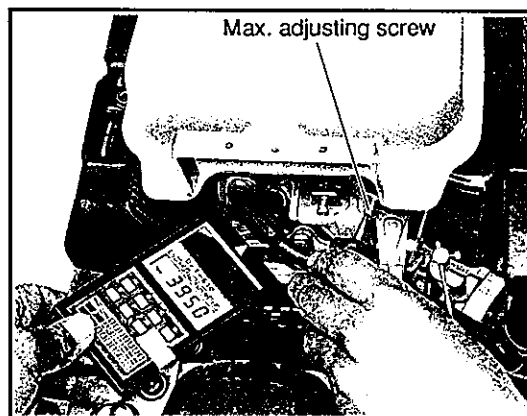
12 Adjustment of maximum idling speed

On completion of governor and idling adjustments, adjust the maximum idling speed by the following procedure:

	(rpm)
	GA90, GA120, GA160, GA180, GA220, GA280
Maximum idling speed	4000 - $\begin{matrix} 0 \\ 100 \end{matrix}$

(Crankshaft)

- (1) Raise engine speed progressively with the regulator handle to the maximum speed, and adjust the max. speed limiter bolt to set the maximum speed at 4000 rpm, then fix the limiter bolt with the lock nut.
- (2) On adjustment, ascertain that the engine speed declines smoothly.



13 Governor

1. Check of governor link

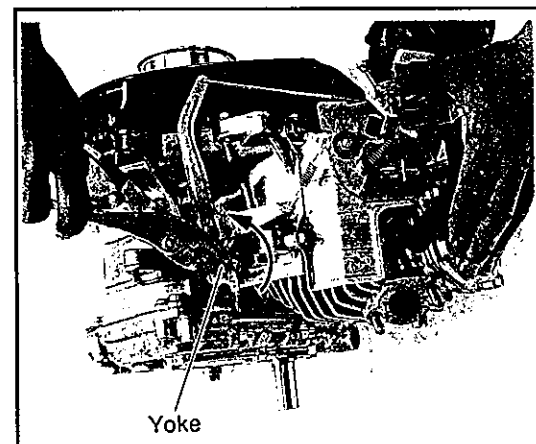
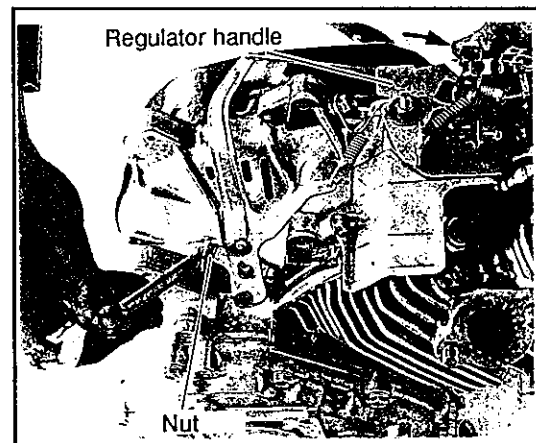
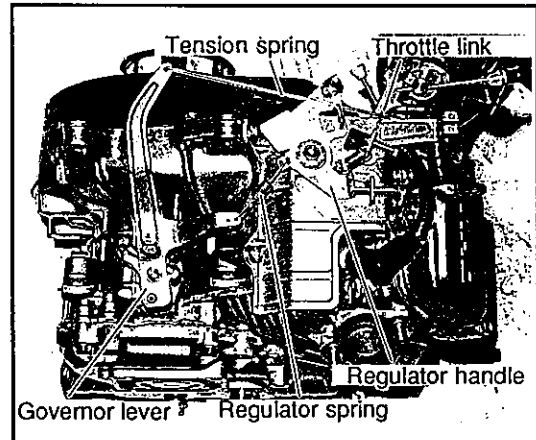
Check the hooks of the regulator spring and of throttle-link to tension-spring for wear as well as the governor lever holes for wear which can result in excessive play.

Replace excessively worn parts. (The wear will cause unstable rotation of the engine.)

2. Governor regulation on reassembly

The governor must be regulated at time of carburetor regulation or engine overhaul. Regulate the governor according to the following procedure:

- (1) Position the regulator handle at high speed with fingers.
(Open the throttle valve fully)
- (2) Loosen the governor lever lock nut and release the governor yoke.
- (3) Turning the governor yoke all the way counterclockwise with pliers, hold the yoke at this position, and tighten the governor lever lock nut.



14 Carburetor

Check and service

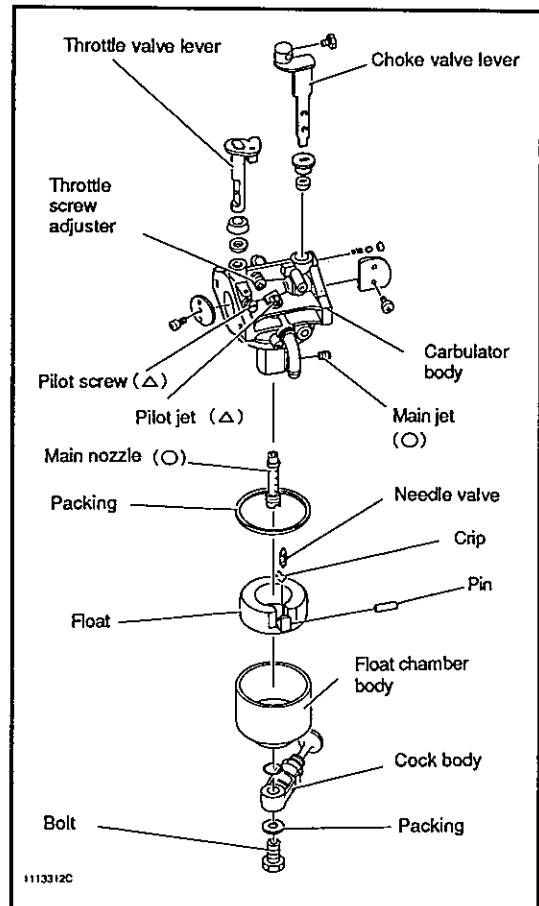
If engine running condition is unsatisfactory, check the carburetor unless an abnormality is found in wiring, compression, or fuel.

1. Overhaul for carburetor cleaning

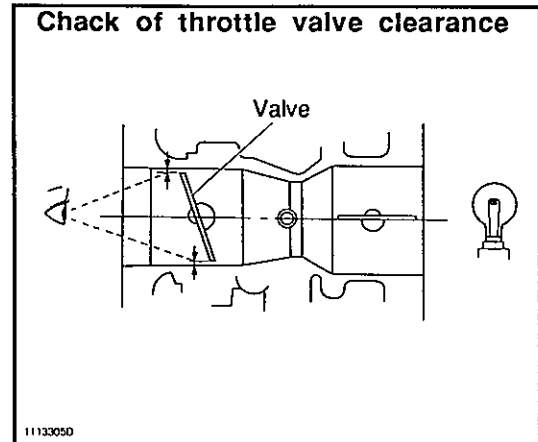
Overhaul the carburetor to remove dirt in the venturi or dust in the main jet, pilot jet, fuel port, air bleed, and overflow port. Carefully wash these parts with fresh gasoline before blowing residual dirt off the air bleed, fuel port, and overflow port with compressed air.

NOTE:

Never use wires or the like to clean the jets. They can enlarge the jet bore causing further troubles due to increased fuel flow.



- 2. Venturi-throttle valve clearance**
Visually check the clearance by setting a lamp on the other side of the venturi. The throttle valve position is satisfactory when no light is seen with the valve closed. Reset or replace the throttle valve by loosening the valve set-screw, if the clearance is uneven or excessive.



- 3. Carburetor mounting surface**
Check the mounting surface for flatness or flaws, and refit it if any defect is found. Replace the mounting surface if it has excessive deformation or flaws because such surfaces will reduce the airtightness even when packing is used. Check the packings and spacer for damage in mounting, to eliminate the cause of irregular engine running, because such damage can allow air to leak in the cylinder to produce an excessively lean mixture.
- 4. Adjustment after re-assembly**
Perform the following adjustment after reassembly of the carburetor:
- (1) Governor regulation
(Refer to page 29)
 - (2) Idling speed adjustment
(Refer to page 27)
 - (3) Maximum idling speed adjustment
(Refer to page 28)

NOTE:

1. Clean the fuel line, including the fuel tank, fuel cock, and air cleaner element, as well as the carburetor for optimum cleaning effect.
2. Carefully observe the marks stamped on nozzles and valves for the proper mating of carburetor parts to be changed.

15 Cooling system

Check and service

1. Check of cooling fins

Check the cooling fins on the cylinder and cylinder head after removing the cooling fan case and the airway board. Remove deposited dirt from the cooling fin because dirty or defective cooling fins lower cooling effect and flammable dirt may cause a fire.

Excessively damaged cooling fins must be replaced with new parts.

2. Check of cooling fan

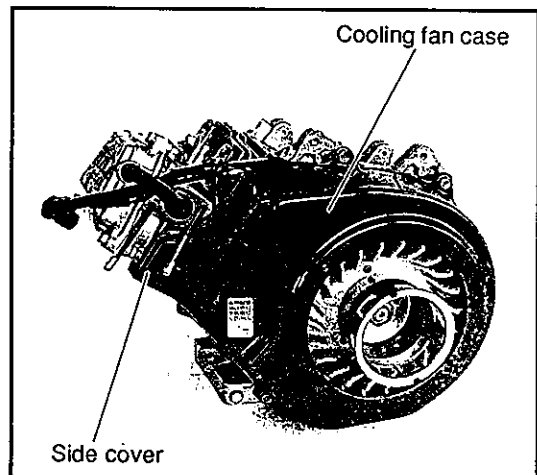
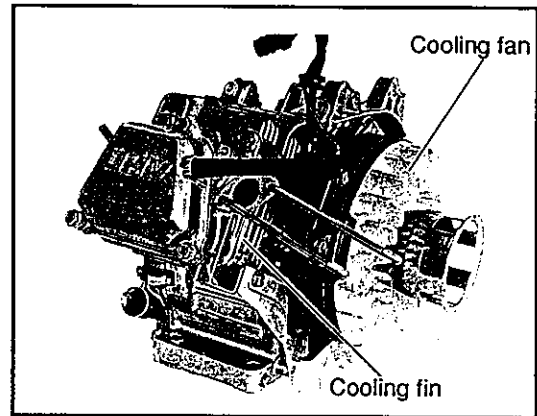
Check the cooling-fan blades attached to the outer surface of the flywheel for cracks or damage.

Missing blades reduce intake of air, and can lead to engine overheating.

3. Check of cooling fan case and side cover

Check the cooling fan case and side cover.

Remove the cloggings from the cooling fan case and side cover.



16 Breather valve

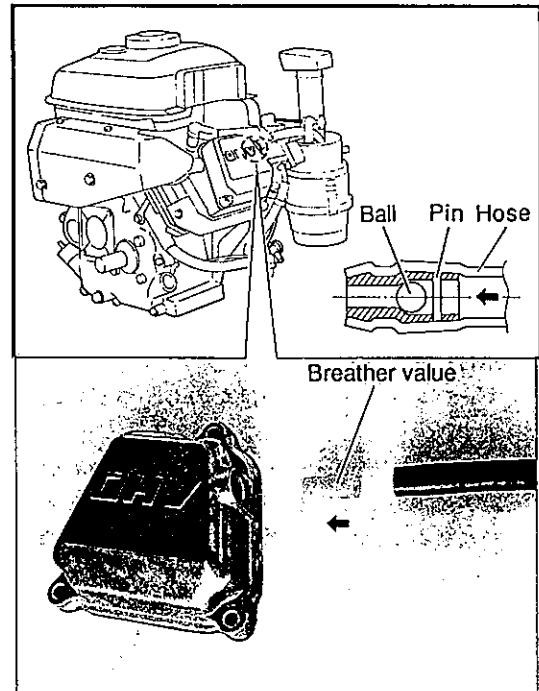
Check and cleaning of breather valve

Remove the breather hose from bonnet cover and check and clean the breather valve, if lubrication oil leaks from the oil seal, governor yoke, crankcase and other mounting surfaces. Replace the ball valve of a defective breather.

Take care not to mistake the assembling order and the situation of the parts in reassembly.

NOTE:

Instruct users that daily check, supply, and change of engine oil should be made as described in the maintenance instructions, because engine oil is very important for engine maintenance.



3.3 Pulley

Model : YK322(E)
 Model : YK382(Y), YK402

Model : YK422(Y)
 Model : YK462

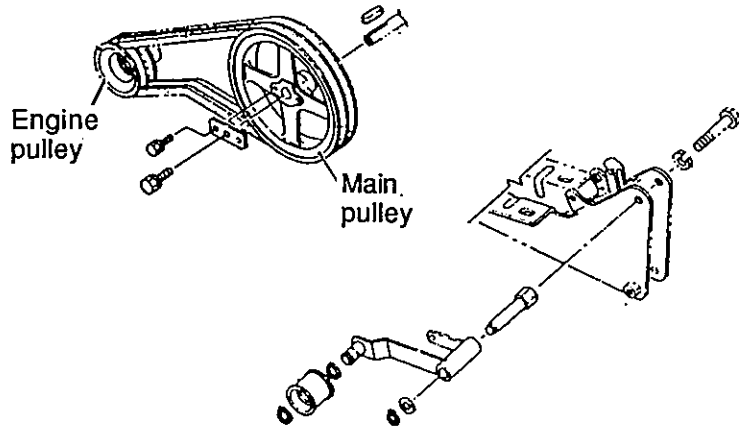
Model : YK482

Model : YK582

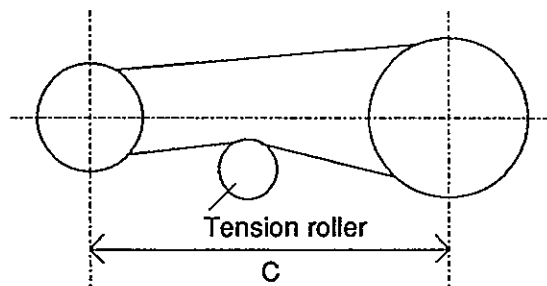
Model : YK682C(G)
 Model : YK782C(G)

Model : YK682

Model : YK882



- Pulley Centers and V-Belt Size



When the main clutch lever is at "OFF",
 the belt should be stopped.

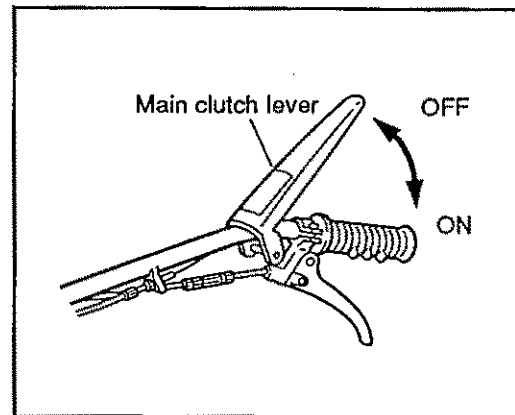
Model	C	V-Belt Size	
YK322(Y)	245	SA31H x 1	Belt Change
YK382, YK402	248	SB34H x 1	Belt Change
YK422, YK462	256	SB35H x 2	Super Change
YK482, YK582, YK682C, YK682G, YK782C, YK782G	281	SB37H x 1	Inside Low
		SB38H x 1	Outside High
YK682	322	SA42H x 2	
YK882	322	SA42H x 2	

3.4 Deadman Clutch Lever

Checkup:

The function of "engaging and releasing" should be reliable and the belt should not run dragged by the drive-side pulley in a "released" condition.

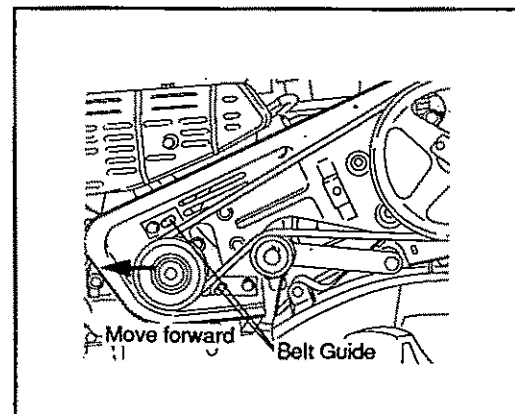
In short, the deadman clutch lever should insure engaging and disengaging of the main clutch.



How to Adjust:

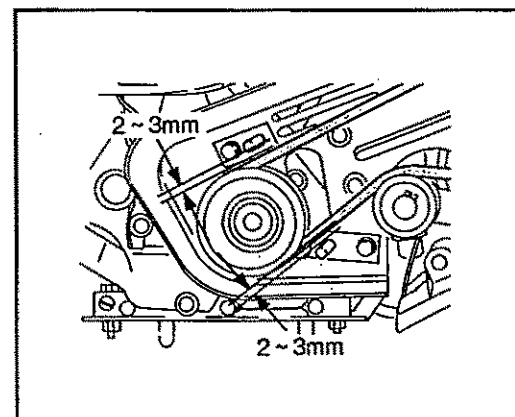
Adjust the wire with the main clutch wire adjuster to such extent that the belt doesn't slip in operation.

If there is no more margin of adjustment by the adjuster, move the engine forward and adjust the engine position so that the gaps between the belt and belt guides will be 2~3mm when the deadman clutch lever is in the "engaged" position.



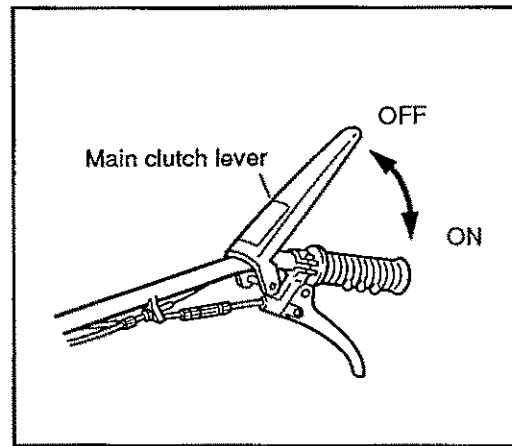
Be sure to obey the following instruction.

- Be sure to reinstall removed covers.

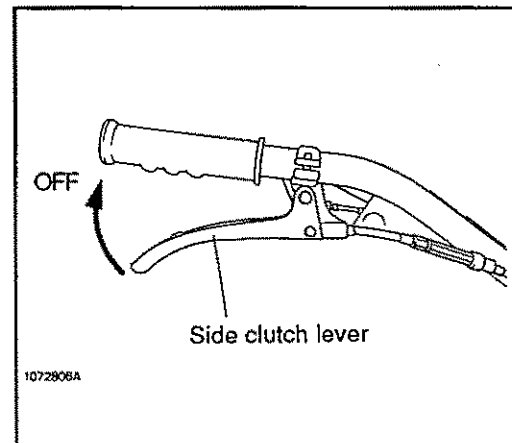


3.5 Clutch

- **Main clutch lever (Deadman clutch lever)**
"ON" and "OFF" have to work precisely. Furthermore, belt is not turning around (twisted) in "OFF".



- **Side clutch lever**
Checkup:
The clutch should be surely disengaged in the condition where the lever is being grasped. (When the machine is pushed with the lever grasped, it should move lightly.)

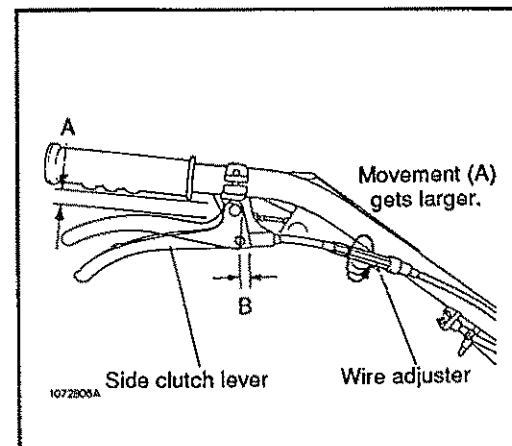


How to Adjust:

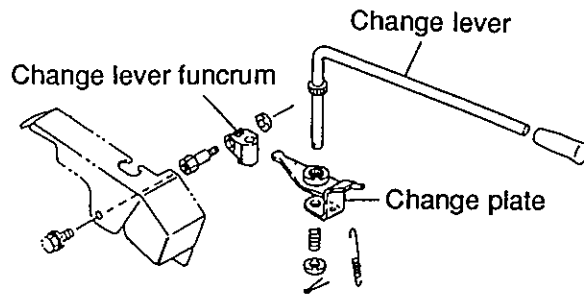
Adjust the wire with the side clutch wire adjuster so that the clutch will be released when the gap between the side clutch lever and the handle grip is about 10mm (dimension (A)). And also adjust the play in natural state (the state where the lever is not grasped) so that the dimension (B) will be 1~3mm.

NOTE:

After adjusting the clutch, be sure to confirm that it works surely.



3.6 Speed Control



Four or six positions for forward and two positions for backward are available in combination of main speed control and auxiliary speed control lever. Find the most adequate speed for given job.

Model : YK322(E)
 Model : YK382(Y), YK402

Model : YK422(Y)
 Model : YK462

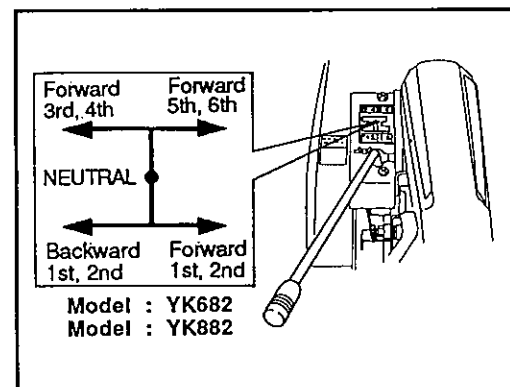
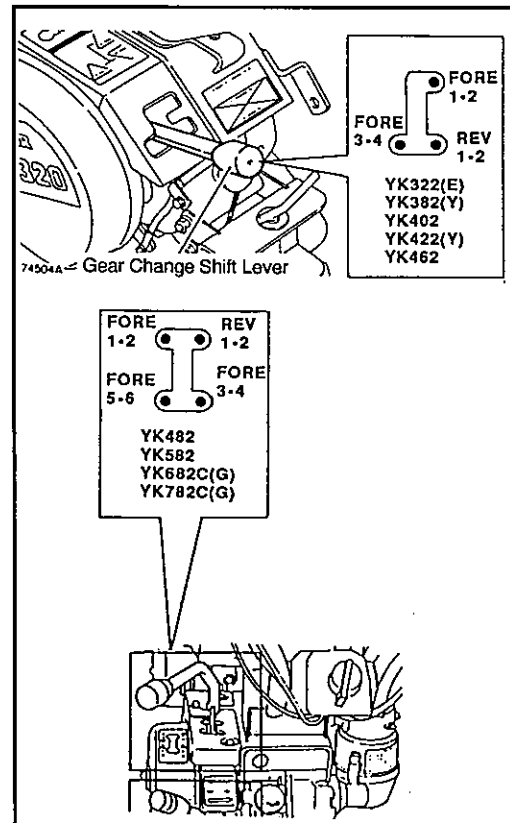
Model : YK482

Model : YK582

Model : YK682C(G)
 Model : YK782C(G)

Model : YK682

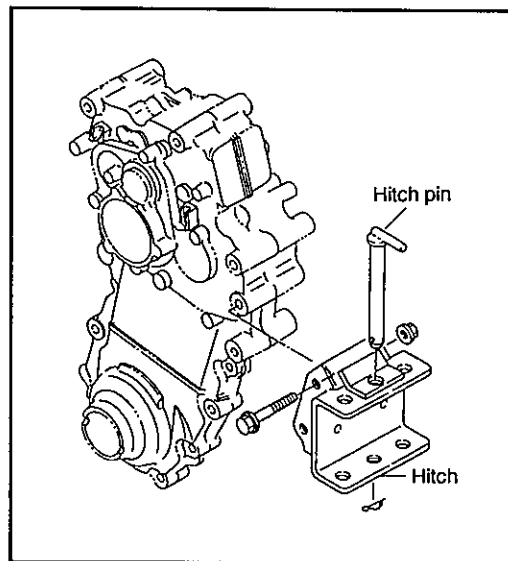
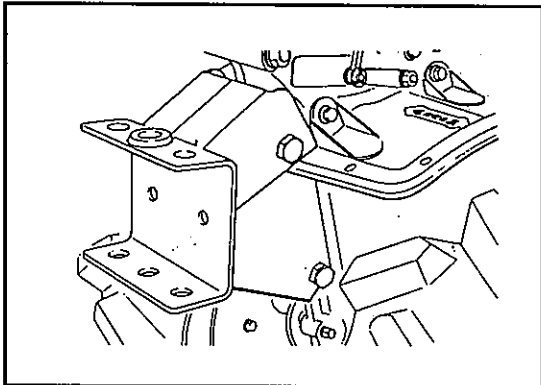
Model : YK882



3.7 Hitch, PTO

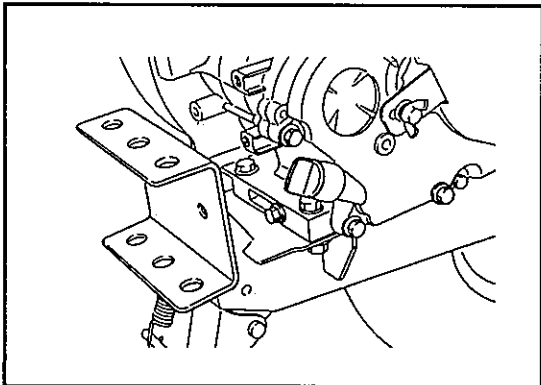
- **Hitch (rear)**

This is recommended to use in fixing pulling units to main (operating) unit such as rotary, resistant bar, ridger and mulch layer.



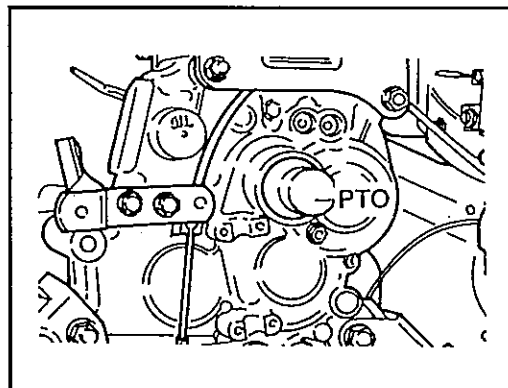
- **Front hitch**

It is used to fix front weight or front carrier.



- **PTO shaft**

It is used to get rotating power for rotary and others. PTO shaft rotates without working unit once main clutch is turned on. Cap is provides for safety purpose.



When oil gets dirty, it may give bad influence over machine. It can be a reason of poor function of machine, or even can cause problems. So, it is recommended to change oil regularly.

Checkup:

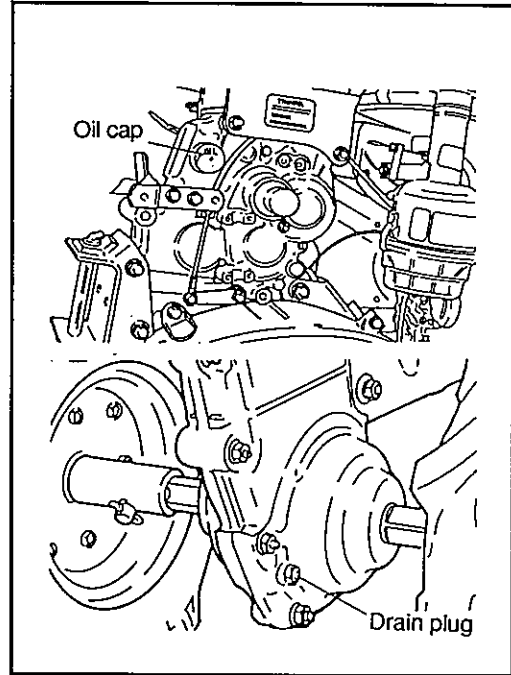
Check to see that there is no oil leakage.

Change:

Drain dirty oil by removing the drain plug provided at the bottom of the traveling transmission case. When oiling, supply new oil till it overflows through the level checking bolt.

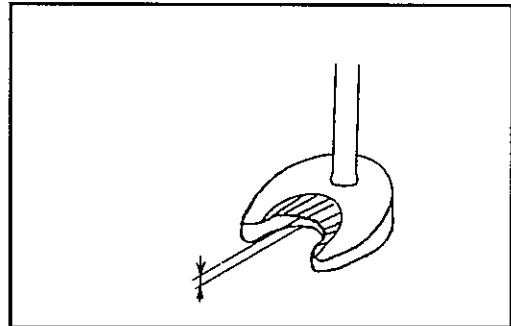
NOTE :

- Use recommended kind of oil for feeding SAE #90.
- Drainage will be easier if it is done while the traveling transmission is still warm.

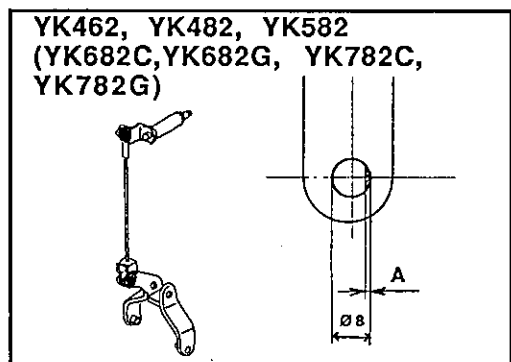


INSPECTION

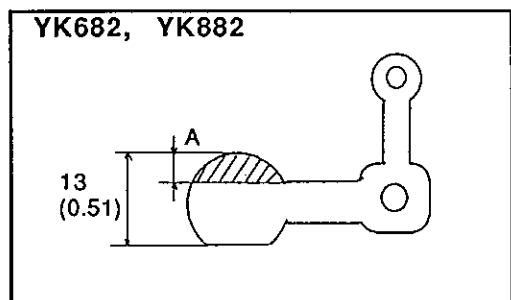
- **Fork plate abrasion**
When the plate abrasion exceeds 0.5mm (0,02), replace the plate.



- **Side clutch fork**
When the abrasion at part A exceeds 1mm (0.039), replace the fork.

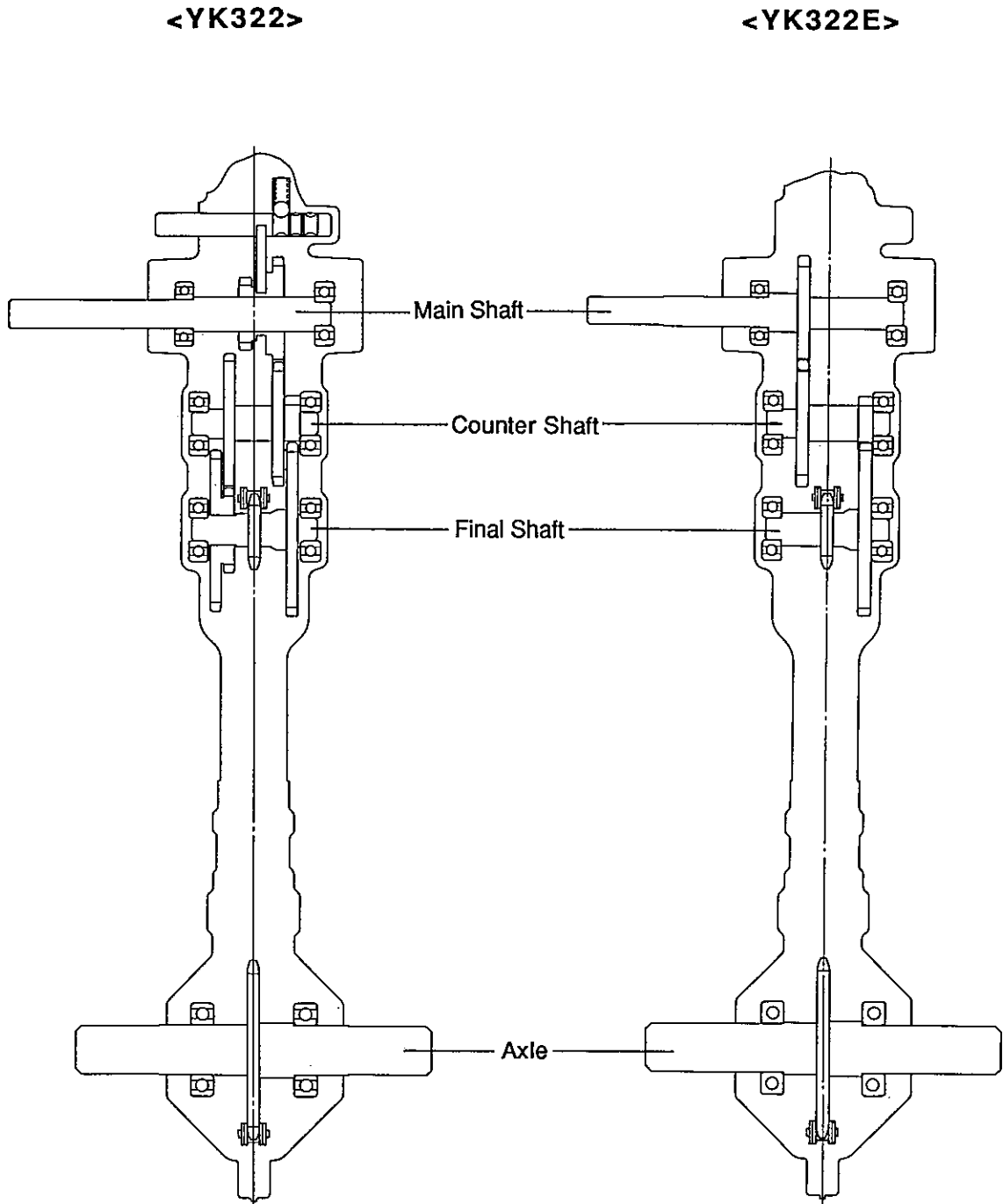


- **Axis**
If the side clutch ball groove has any defect or wear, replace the axis.

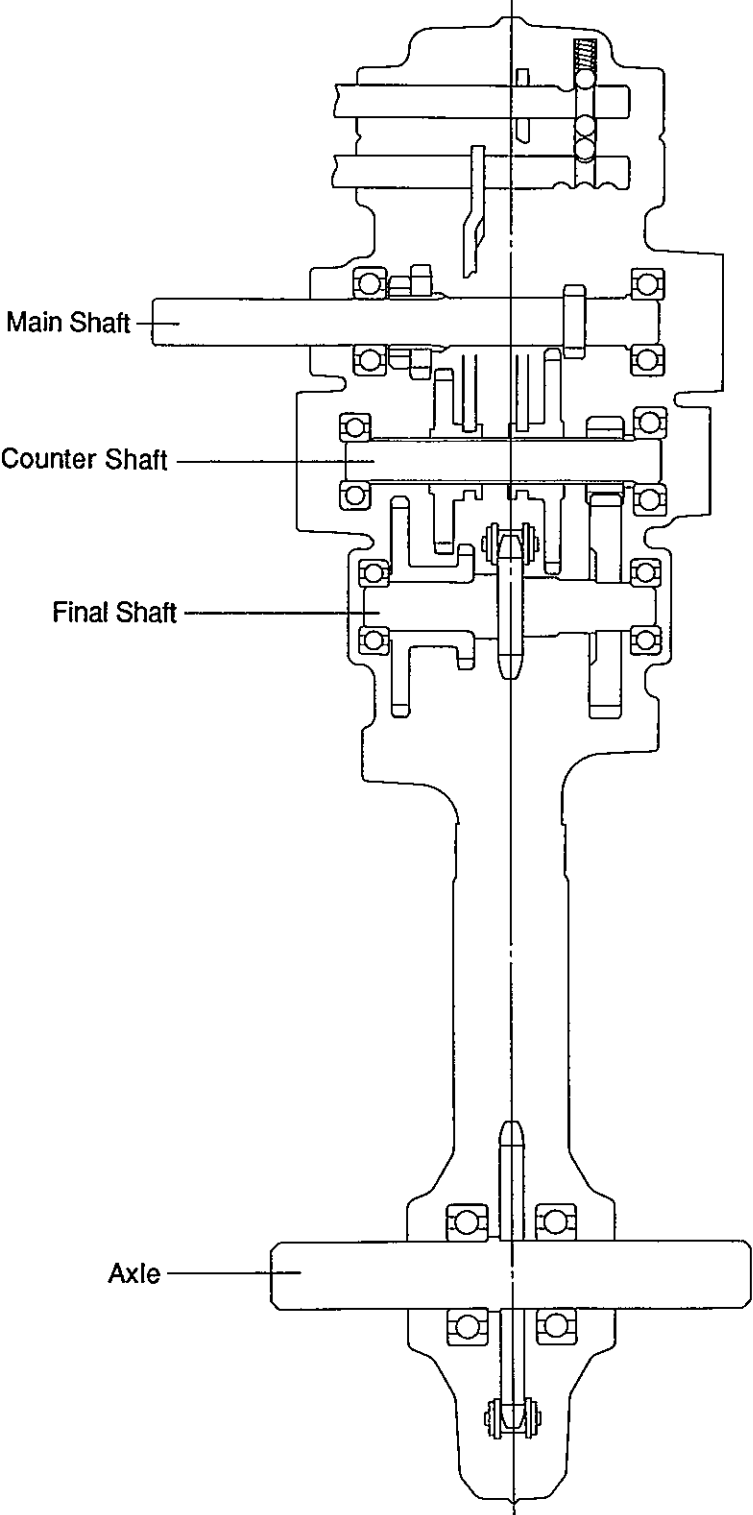


3.8 Transmission Case

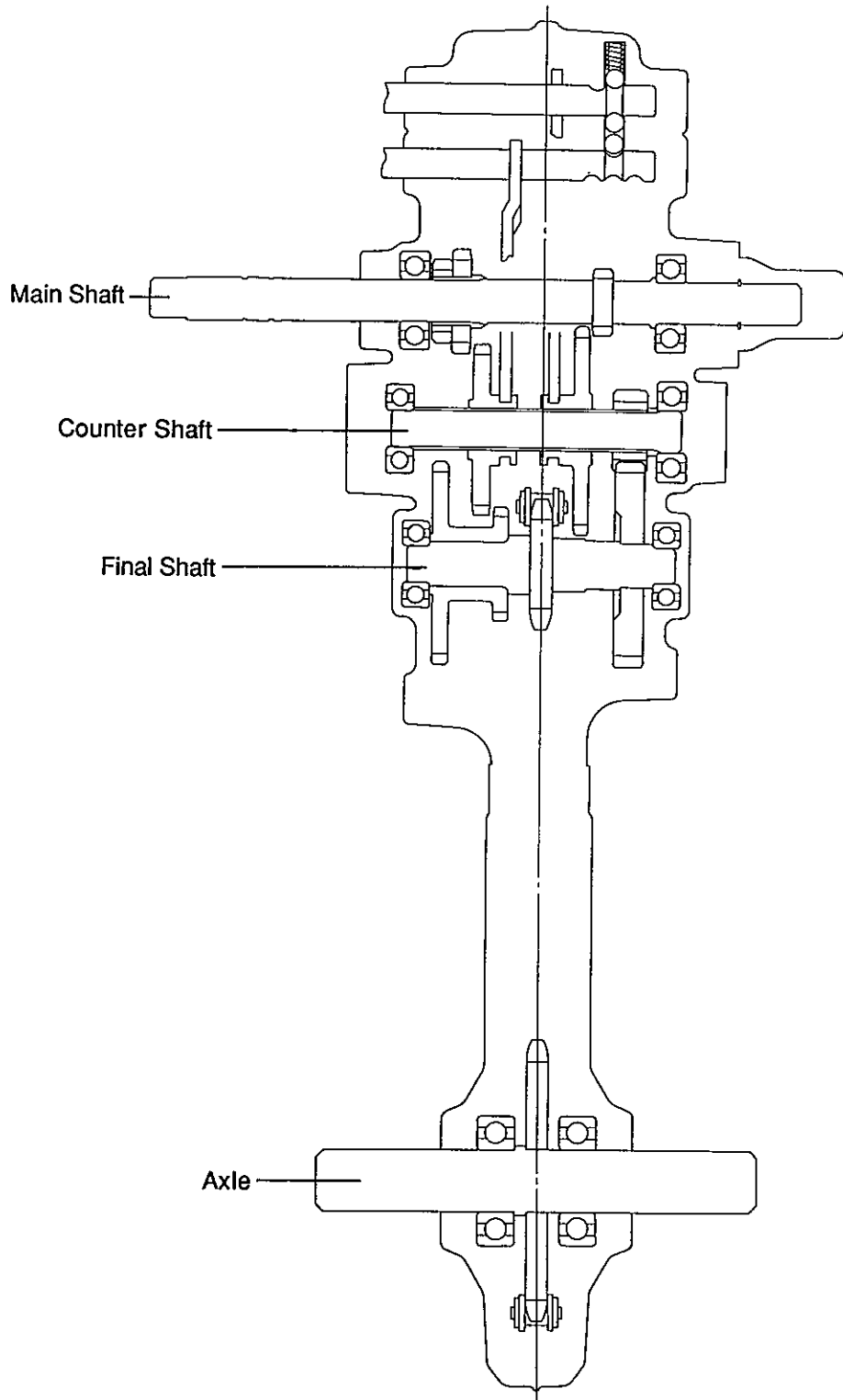
Model : YK322, YK322E



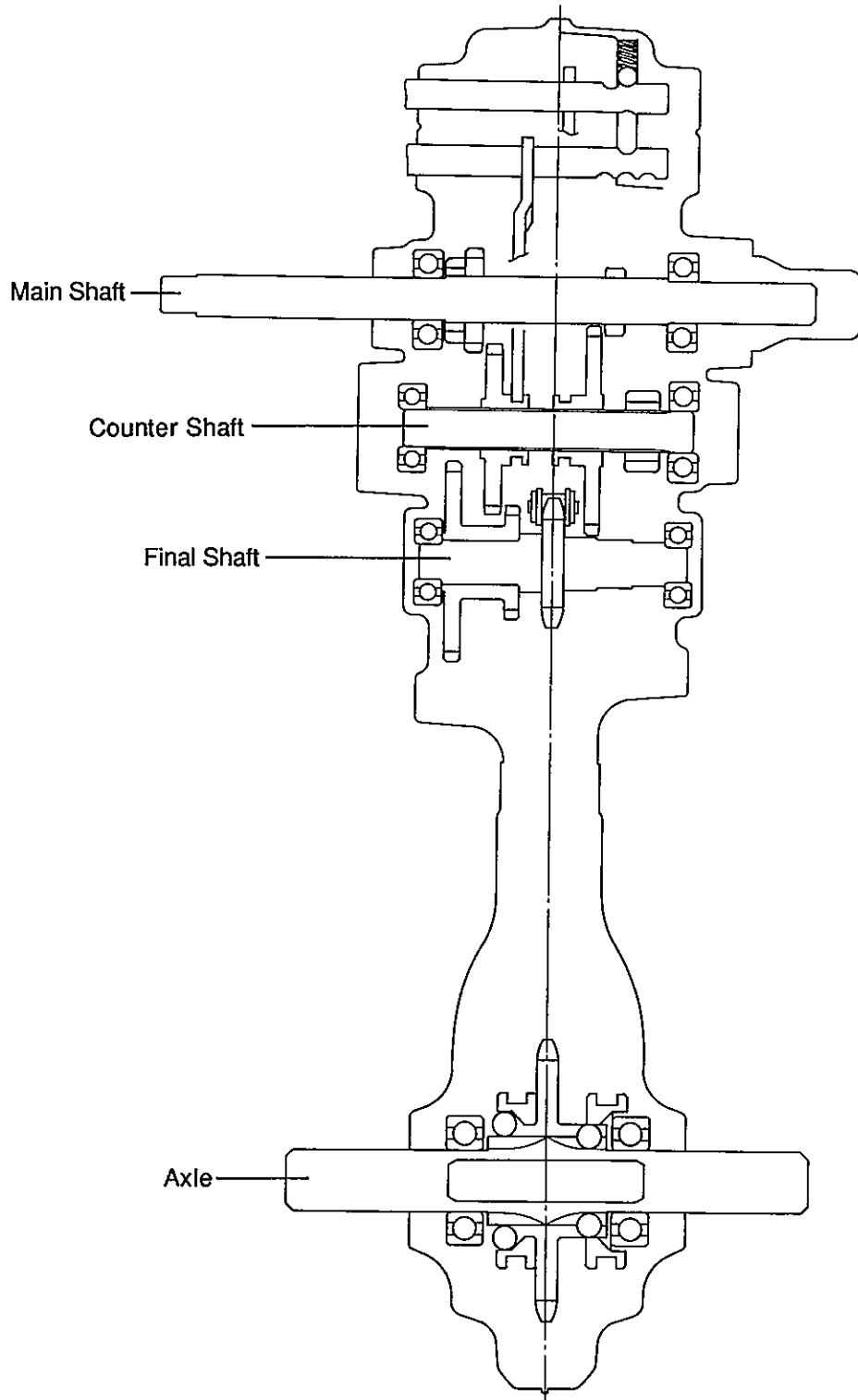
Model : YK382(Y), YK402



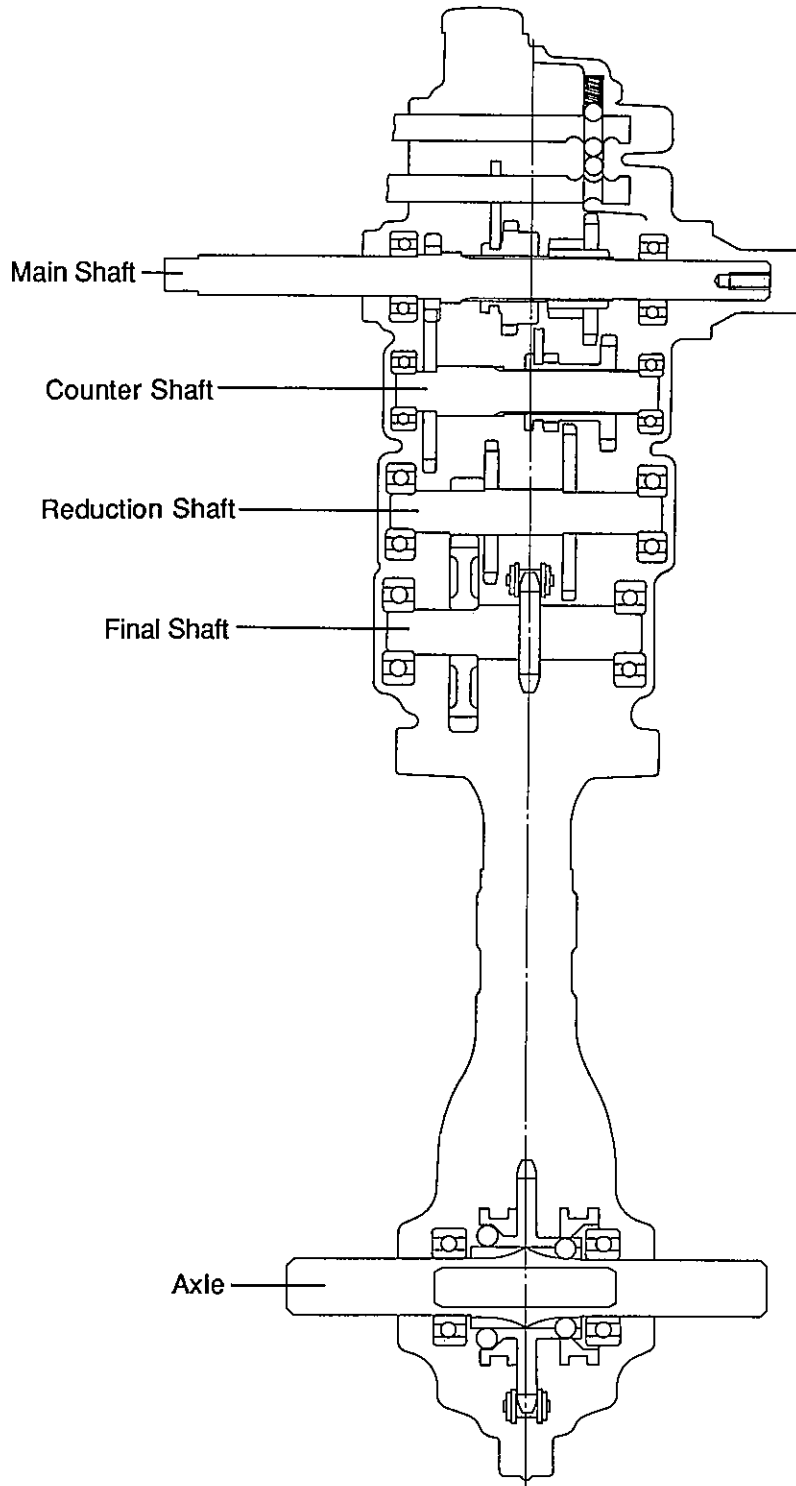
Model : YK422(Y)



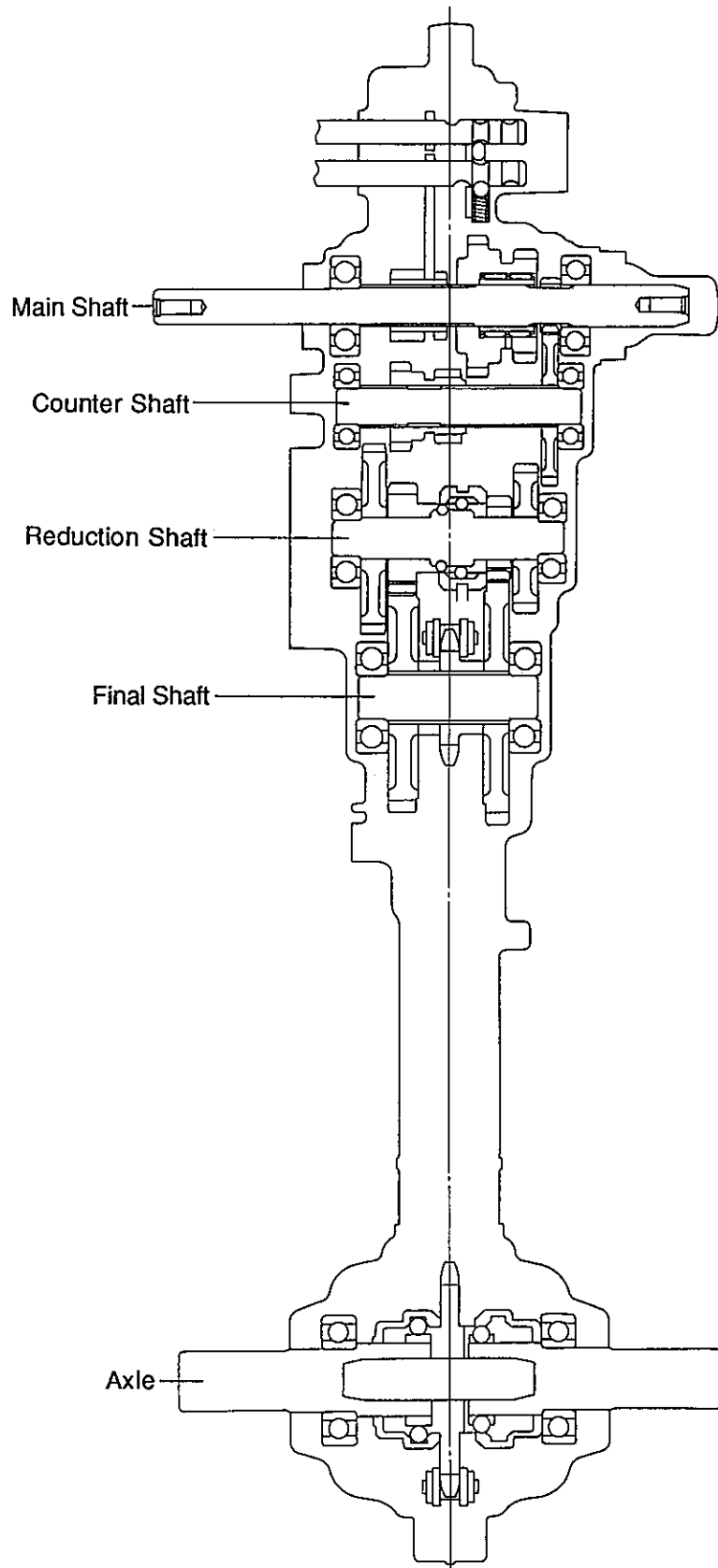
Model : YK462



Model : YK482
Model : YK582
Model : YK682C(G)
Model : YK782C(G)



Model : YK682
Model : YK882





YANMAR AGRICULTURAL EQUIPMENT CO., LTD.

1-32, Chayamachi, Kita-ku, OSAKA 530-8321, JAPAN

Tel : 06-6376-6336~8 Fax : 06-6373-9474 Cable : YANMAR OSAKA

PRINTED IN JAPAN

CODE NO. 0B211-G00200