MASSEY FERGUSON

MF 4600

Series Tractors

Models: 4608 / 4609 / 4610

SERVICE MANUAL

FROM MASSEY FERGUSON

4608 / 4609 / 4610 Service Manual

1. Introduction

1.1 Introduction

1.1.1 The service manual

Read the table of contents and basic layout. Become familiar with all parts of this service manual. This service manual gives the technician very important information.

Machine movement when in normal use determines right-hand and left-hand.

This manual covers general safety practices for this machine.

The photos, illustrations, and data used in this manual were current at the time of printing. Inline production changes can make machines vary from the information in the service manual. The manufacturer reserves the right to redesign and change the machine as necessary without notification.

WARNING:
In some of the illustrations and photos used in this manual, shields or guards may have been removed for clarity. Never operate the machine with any shields or guards removed. If the removal of shields or guards is necessary to make a repair, they must be replaced before operation.

1.1.2 Replacement parts

To receive prompt efficient service, remember to have the following information:

Correct part description and part number
Model number of the machine
Serial number of the machine

1.1.3 Units of measurement

Measurements are given in metric units followed by the equivalent in US units. Hardware sizes are given in millimeters for metric hardware and inches for US hardware.

1.1.4 Machine identification

Each machine is identified by a model and a serial number.

Record these numbers in the spaces given.

Give the model number and serial number to your dealer when parts or service are required.

Machine model number:	
Machine serial number:	

Date of delivery:	

Dealer name:	
Dealer address:	
Dealer telephone number:	
Dealer e-mail address:	
Dealer fax number	

1.1.5 Serial number plate

The serial number plate (1) is located below the operator seat.

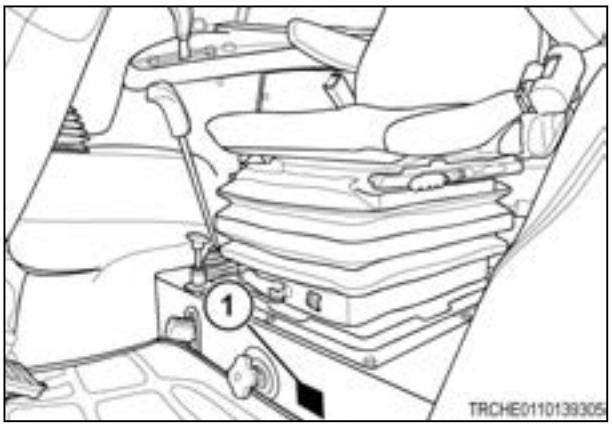


Fig. 1

The serial number plate contains the model number and serial number.

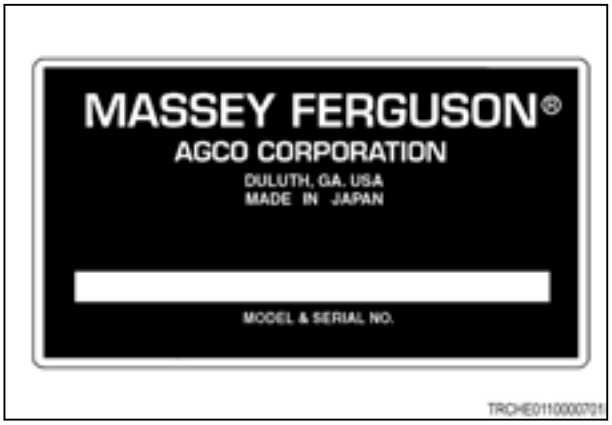


Fig. 2

1.1.6 Engine identification

The engine model number (1) is cast on the right-hand side of the engine block, below the injection pump.

The engine serial number (2) is stamped into the cylinder block, below the engine model number.

Engine model number:	
Engine serial number:	

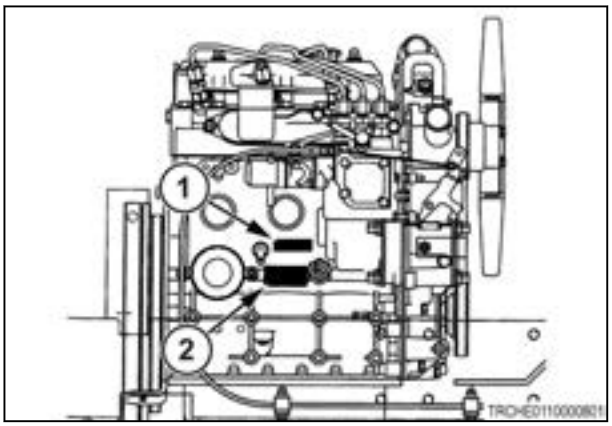


Fig. 3

1.1.7 Chassis number

The chassis number (1) is stamped in right-hand side of front frame.

Chassis number:	

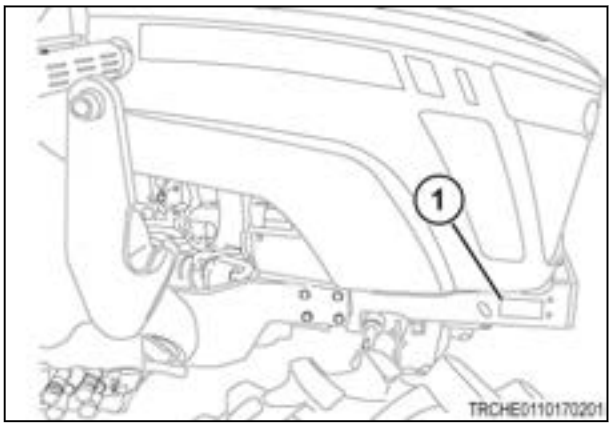


Fig. 4

1.2 Specifications

1.2.1 Engine specifications

	4608	4609	4610
Type	Four stroke diesel engine		
Model	33 AWIC		
Make	AGCO power		
Number of cylinders	3		
Aspiration	Turbocharged and air to air intercooled		
Injection	Direct		
Bore	108 mm		
Stroke	120 mm		
Displacement	3.3 L		
Rated speed	2200 rpm		
Low idle speed	912 to 988 rpm		
High idle speed	2218 to 2402 rpm		
Maximum torque at rpm	346 Nm at 1500 rpm	387 Nm at 1500 rpm	410 Nm at 1500 rpm
Engine horse power (Maximum output)	63 kW at 2000 rpm	71 kW at 2000 rpm	75 kW at 2000 rpm
Engine cooling	Liquid, forced circulation		
Air cleaner	Dual stage, dry element		
Air intake	Engine cover grille		
Cold starting aid	Intake heater		
Firing order	1-2-3		
Valve clearance (cold)	0.35 mm		

1.2.2 Electrical specifications

	4608	4609	4610
System voltage	12 volt		
Grounding	Negative		
Battery cold cranking amperes (cca) @ - 18 °C	799 cca		
Battery JIS type	130E41R		
Battery case dimensions			
Length	410 mm		
Width	175 mm		
Height	234 mm		
Alternator	12 volt, 95 ampere		
Starter	12 volt, 3.0 kW		

1.2.3 Transmission specifications

	4608	4609	4610
Primary transmission	Six speed synchronized		
Range transmission	Without creep gear, two speed sliding mesh		
	With creep gear, three speed sliding mesh		
Mechanical shuttle	Electro-hydraulic control with multi plate weet disc, 95% reverse reduction		
Gear speeds			
Power shuttle	Without creep gear, 12 forward, 12 reverse		
	With creep gear, 18 forward, 18 reverse		
Clutch	Multiple stage wet with 128 mm disc		

1.2.4 Power takeoff specifications

	4608	4609	4610
Type	Independent, engine driven		
Control	Electro-hydraulic control		
Clutch	Hydraulically engaged, multi-plate wet disk		
Output	Clockwise rotation from the rear of the tractor		
Shaft			
540 rpm (North America only)	35 mm diameter, 6 spline, ISO type 1		
1000 rpm (North America only)	35 mm diameter, 21 spline, ISO type 2		
540/750 rpm (Australia)	35 mm diameter, 6 spline, ISO type 1		
Engine speed			
540 rpm	1993 rpm		
1000 rpm (North America only)	2178 rpm		
750 rpm (Australia only)	2129 rpm		

1.2.5 Front axle specifications

	4608	4609	4610
Engagement	Mechanical		
Joint on axle	Bevel gear		
Oscillation angle	6 to 8 degrees		
Steering	Hydrostatic		
Rear wheel to front wheel drive ratio	1:1 .45	1:1 .4	

1.2.6 Rear axle specifications

	4608	4609	4610
Final reduction	Planetary		

1.2.7 Brake specifications

	4608	4609	4610
Type	Wet multi disc		
Actuation	Mechanical		
Braking area	467.36 sq cm (72.68 sq in) x 8 pieces		
Parking brake	Hook type		

1.2.8 Hydraulic specifications

	4608	4609	4610
Main hydraulic system			
Pump	Transmission mounted		
Maximum output	66.5 l/min		
Pressure	19.6 mPa		
Steering system			
Type	Hydrostatic		
Pump	Transmission mounted		
Maximum output	25.7 l/min		
Pressure	15.8 mPa		
Rear linkage			
Type	Three-point hitch		
Size	Category II		
Control	Single control lever		
Lift capacity - measured at ball ends			
Standard:	2500 kg		
Optional:	3300 kg		
Lift capacity - measured at 610 mm			
Standard:	1500 kg		
Optional:	2000 kg		

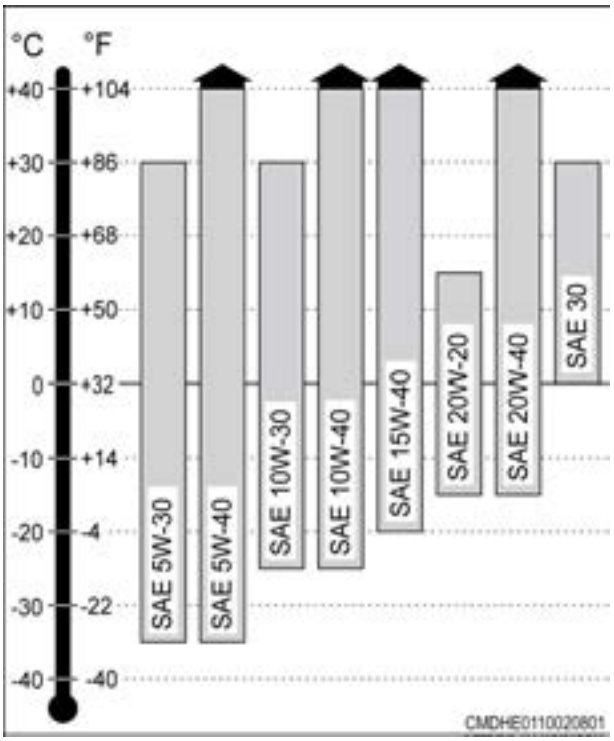
1.2.9 Fuel specifications

	4608	4609	4610
Type	Ultra low sulfur fuel only		
Above 4 °C	No. 2-D		
Below 4 °C	No. 1-D		

1.2.10 Operating slope angle

	4608	4609	4610
Up/down	20 degrees		
Side to side	20 degrees		

1.2.11 Lubrication specifications

	4608	4609	4610
Lubrication			
Lubrication fittings	Massey Ferguson M-1105 or equivalent lithium base grease No. 2		
Engine oil	Massey Ferguson Multiguard® or equivalent in the correct SAE viscosity. Oil must meet or exceed MIL-L-46152 requirements, API Service CJ-4, ACEA Service E7.		
Engine oil viscosity			
Transmission and differential housing (including hydraulic system)	AGCO Permatran® 821XL		
Front axle	AGCO Permatran® 821XL		
Engine coolant			
Freezing protection (original factory fill)	-34 °C		
Recommended coolant	50/50 mixture ethylene glycol and water		

1.2.12 Capacities

	4608	4609	4610
Engine crankcase with filter	12.5 L		
Cooling system	11 L		
Fuel tank	105 L		
Transmission and differential housing (including hydraulic system)	58 L		
Front drive axle	8 L	10 L	

1.2.13 Maximum load capacity

Four-wheel drive maximum load capacity

Model	Ag tires	4608	4609	4610
	Front	9.5-24	12.4-24	12.4-24
	Rear	16.9-30	16.9-30	16.9-34
Platform tractors				
Front axle weight				
	NA type	1150 kg	1200 kg	
	Aus type	1155 kg	1205 kg	
Rear axle weight				
	NA type	1815 kg		
	Aus type	1835 kg		
Total weight				
	NA type	2965 kg	3015 kg	
	Aus type	2990 kg	3040 kg	
Cab tractor				
Front axle weight				
	NA type	1250 kg	1300 kg	
	Aus type	1255 kg	1305 kg	
Rear axle weight				
	NA type	1900 kg		
	Aus type	1920 kg		
Total weight				
	NA type	3150 kg	3200 kg	
	Aus type	3175 kg	3225 kg	
Maximum weight capacities				

Model	Ag tires	4608	4609	4610
	Front	9.5-24	12.4-24	12.4-24
	Rear	16.9-30	16.9-30	16.9-34
Front axle capacity		3400 kg	3800 kg	
Rear axle capacity		4000 kg	4800 kg	
Total capacity		5200 kg	6500 kg	

NA = North American tractors

Aus = Australian tractors

NOTE:
The machines used to calculate the specifications above are equipped with a joystick. To calculate a different total weight:

- *A machine without a joystick - subtract 60 kg*

Two-wheel drive maximum load capacity

Model	Tire	4608	4609	4610
Specifications based on tire size	Front	7.5-16	7.5-18	7.5-18
	Rear	16.9-30	18.4-30	18.4-30
Platform tractors				
Front axle weight		995 kg	1015 kg	
Rear axle weight		1705 kg	1735 kg	
Total weight		2700 kg	2750 kg	
Cab Tractors				
Front axle weight		1065 kg	1085 kg	
Rear axle weight		1835 kg	1865 kg	
Total weight		2900 kg	2950 kg	
Maximum weight capacities				
Front axle capacity		3400 kg	3800 kg	
Rear axle capacity		4000 kg	4800 kg	
Total capacity		5200 kg	6500 kg	

NOTE:
The machines used to calculate the specifications above are equipped with a joystick. To calculate a different total weight:

- *A machine without a joystick - subtract 60 kg*

1.2.14 Wheel bolt torque chart

Wheel bolts	Torque
Front wheel lug nut	285 Nm
Rear wheel lug nut	285 Nm
Rear wheel center to rim bolts (Ag and industrial tires only)	230 Nm

1.2.15 Tire inflation pressures

Four-wheel drive

Model	Tire type	Tire location	Tire size	Pressure
4608	AG	Front	9.5-24	207 kPa
		Rear	16.9-30	124 kPa
	R4	Front	10.5/80-18	228 kPa
		Rear	19.5L-24	165 kPa
4609 4610	AG	Front	11.2-24	248 kPa
		Rear	16.9-30	124 kPa
		Front	12.4-24	221 kPa
		Rear	18.4-30	110 kPa
		Front	12.4-24	221 kPa
		Rear	16.9-34	165 kPa
	R4	Front	12.5/80-18	317 kPa
		Rear	19.5L-24	164 kPa
4610 low profile	AG	Front	12.5/80-18	317 kPa
		Rear	16.9-24	124 kPa
		Front	9.5-24	207 kPa
		Rear	18.4-26	110 kPa

Two-wheel drive

Model	Tire Type	Tire Location	Tire Size	Pressure
4608	AG	Front	7.5-16	303 kPa
		Rear	16.9-30	124 kPa
		Front	9.5-15	310 kPa
		Rear	16.9-30	124 kPa
4609 4610	AG	Front	9.5L-15	310 kPa
		Rear	16.9-30	124 kPa
		Front	7.5-18	303 kPa
		Rear	16.9-30	124 kPa
		Front	10-16	221 kPa
		Rear	18.4-30	110 kPa
		Front	10-16	221 kPa
		Rear	16.9-34	165 kPa

The maximum tire pressures for maximum loads are given. Tire pressure can be reduced as the load on the tire is reduced.

Tire pressures vary according to make, load, and speed as well as to the type of work being carried out. Refer to the inflation tables issued by the tire manufacturers.

1.3 General dimensions

1.3.1 Platform tractor dimensions

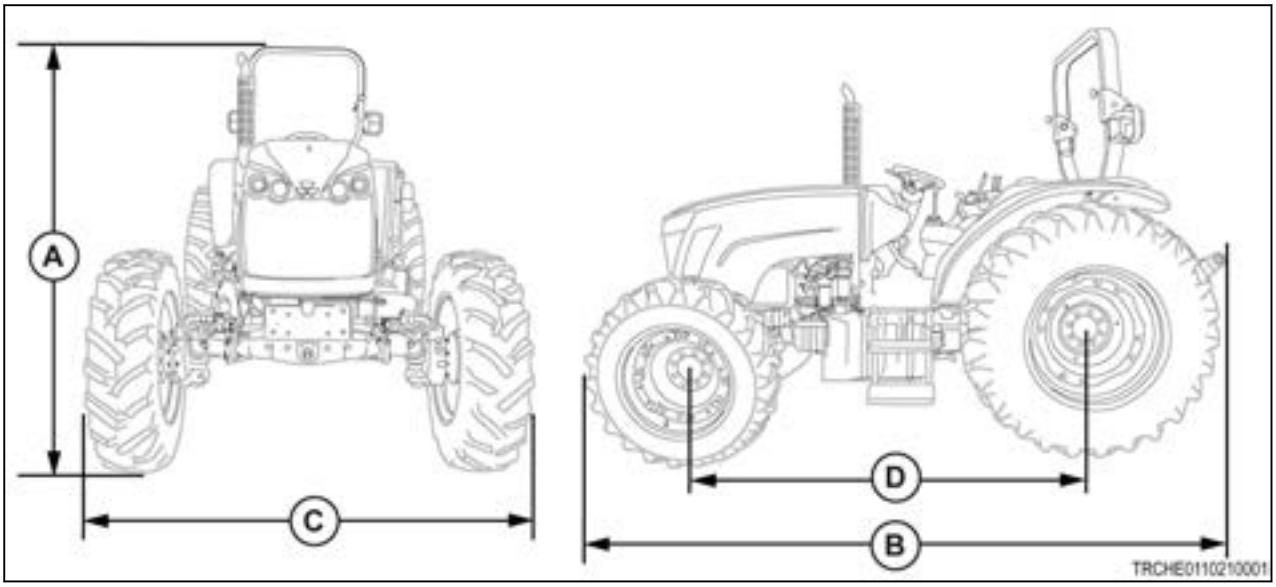


Fig. 5

Four-wheel drive model dimensions

General dimensions		Tires	4608	4609	4610 standard	4610 low profile
Specifications based on tire size		Front	9.5-24	12.4-24	12.4-24	12.5-80/18
		Rear	16.9-30	16.9-30	16.9-34	16.9-24
A	Overall height		2650 mm	2710 mm		2624 mm
B	Overall length (front grille to end of the three-point hitch	NA	3815 mm	3875 mm		3792 mm
		Aus	3895 mm	3955 mm		
C	Minimum width		2045 mm	2050 mm		2002 mm
D	Wheelbase		2260 mm			
Ground clearance			460 mm	470 mm		343 mm
Front wheel tread			1450 mm			1610 mm
Rear wheel tread			1550 mm			1542 mm
Turning radius (with brake)			3300 mm			
Weight		NA	2965 kg	3015 kg		3105 kg
		Aus	2960 kg	3040 kg		

NA = North American tractors / Aus = Australian tractors

Two-wheel drive model dimensions

General dimensions		Tires	4608	4609	4610 standard
Specifications based on tire size		Front	9.5-24	12.4-24	12.4-24
		Rear	16.9-30	16.9-30	16.9-34
A	Overall height		2650 mm	2710 mm	
B	Overall length (front grille to end of the three-point hitch		3825 mm	3845 mm	3865 mm
C	Minimum width		2000 mm		
D	Wheelbase		2250 mm		
Ground clearance			555 mm		
Front wheel tread			1543 mm		
			1643 mm		
			1743 mm		
			1843 mm		
Rear wheel tread			1176 to 1855 mm (46.3 to 73 in)	1144 to 1854 mm (45 to 73 in)	
Turning radius (with brake)			3300 mm		
Weight			2700 kg	2750 kg	

NA = North American tractors / Aus = Australian tractors

1.3.2 Cab tractor dimensions

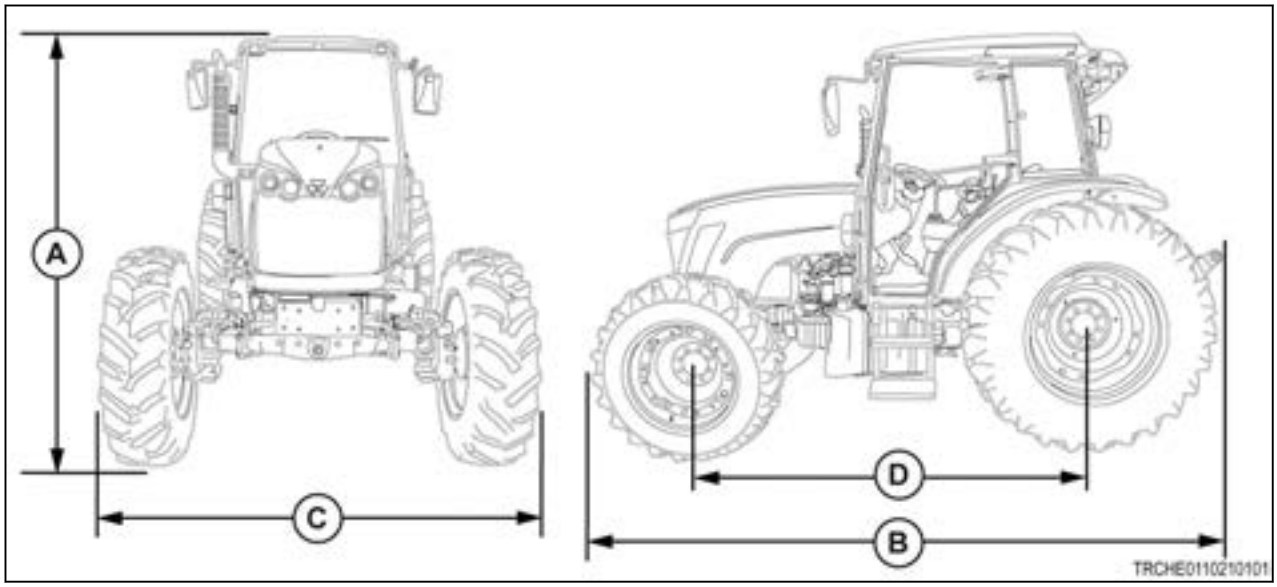


Fig. 6

Four-wheel drive dimensions

General Dimensions		Tires	4608	4609	4610
Specifications based on tire size		Front	9.5-24	12.4-24	12.4-24
		Rear	16.9-30	16.9-30	16.9-34
A	Overall Height		2550 mm	2600 mm	
B	Overall Length (front grill to end of three-point)	NA	3815 mm	3875 mm	
		Aus	3895 mm	3955 mm	
C	Minimum Width		2045 mm	2050 mm	
D	Wheelbase		2260 mm		
Ground Clearance			460 mm	470 mm	
Front Wheel Tread			1450 mm		
Rear Wheel Tread			1550 mm		
Turning Radius (with brake)			3300 mm		
Weight		NA	3150 kg	3200 kg	
		Aus	3175 kg	3225 kg	

NA = North American tractors / Aus = Australian tractors

Two-wheel drive dimensions

General Dimensions		Tires	4608	4609	4610
Specifications based on tire size		Front	7.5-16	7.5-18	7.5-18
		Rear	16.9-30	18.4-30	18.4-30
A	Overall Height		2550 mm	2600 mm	
B	Overall Length (front grill to end of three-point)	NA	3825 mm	3845 mm	3865 mm
		Aus	3895 mm	3955 mm	
C	Minimum Width		2000 mm		
D	Wheelbase		2250 mm		
Ground Clearance			555 mm		
Front Wheel Tread			1543 mm		
			1643 mm		
			1743 mm		
			1843 mm		
Rear Wheel Tread			1176 to 1855 mm (46.3 to 73 in)	1144 to 1854 mm (45 to 73 in)	
Turning Radius (with brake)			3300 mm		
Weight			2900 kg	2950 kg	

NA = North American tractors / Aus = Australian tractors

1.4 Lubrication / fill points

1.4.1 Lubrication and maintenance chart

Severe conditions or conditions that are not normal will require more frequent lubrication.

See the machine specifications for correct type and quantity of lubricant.

Daily	100 hours	200 hours	Other	
X				Check the engine oil level, fill if necessary.
X				Check the transmission oil level, fill if necessary.
X				Clean the air cleaner element.
X				Check the radiator coolant level, fill if necessary.
X				Inspect and clean the radiator fins.
X				Inspect and clean the fuel filter sediment bowl.
X				Lubricate the lubrication fittings.
		X		Inspect the windshield wiper, replace if necessary.
			Weekly	Check the windshield washer fluid reservoir, fill if necessary.
X		X		Inspect the air conditioner belt, replace if necessary.
X	X			Inspect the engine belt, replace if necessary.
X	X		Yearly	Inspect the radiator hoses, replace if necessary.
X		X		Inspect and correct the tire air pressure.
X	X			Inspect and tighten wheel bolts and nuts.
			Weekly	Drain water from the fuel prefilter.
	X			Drain moisture from the clutch housing.
	X		Yearly	Inspect the power steering hoses, replace if necessary.
	X		Yearly	Inspect air conditioning hoses, replace if necessary.
	X		Yearly	Inspect the fuel hoses, replace if necessary.
		X		Check the front axle oil level, fill if necessary.
		X		Inspect and adjust the brake pedal free play.
		X		Inspect the steering joint. If adjustment or service is necessary, see your dealer.
		X		Inspect the toe in. If adjustment or service is necessary, see your dealer.

Daily	100 hours	200 hours	Other	
		X		Inspect and tighten the tie rod end. If adjustment or service is necessary, see your dealer.
		X		Clean the air conditioner condenser.
			Monthly	Clean the air conditioner filter.
			400 hours	Change the engine oil and replace the filter.
			400 hours	Change the transmission oil and replace the filter.
			600 hours	Replace the air filter element.
			600 hours	Change the front axle oil.
			1000 hours	Replace the fuel filter element. See your dealer.
			1000 hours	Replace the engine belt.
			First 500 hours, then yearly	Inspect and adjust the engine valve clearance. If adjustment or service is necessary, see your dealer.
			Yearly	Inspect and replace the electrical wiring. If service is necessary, see your dealer.
			Yearly	Inspect the lamps, replace if necessary.
			Yearly	Inspect the warning device. If service is necessary, see your dealer.
			Yearly	Inspect rubber cab mounts, replace if necessary.
			Yearly	Inspect and the hydraulic hoses (joystick, hydraulic pump), replace if necessary.
			Yearly	Inspect the assist cylinder hoses, replace if necessary.
			Yearly	Inspect the oil cooler hose, replace if necessary.
			Yearly	Drain, flush, and replace the radiator coolant.

1.4.2 Initial lubrication and maintenance chart

After first 50 hours	
X	Change the engine oil and replace the filter.
X	Inspect the engine belt, replace if necessary.
X	Change the transmission oil and replace the filter.
X	Change the front axle oil.
X	Inspect and adjust the brake pedal free play.
X	Inspect and adjust the steering joint. If adjustment or service is necessary, see your dealer.
X	Inspect and adjust the toe in. If adjustment or service is necessary, see your dealer.

After first 50 hours	
X	Inspect and adjust the tie rod end. If adjustment or service is necessary, see your dealer.
X	Inspect and correct the tire air pressure.
X	Inspect and adjust the wheel bolts and nuts.
X	Inspect the power steering hose, replace if necessary.
X	Inspect the fuel hose, replace if necessary.
X	Inspect the electrical wiring, replace if necessary.
X	Inspect the lamps, replace if necessary.
X	Inspect the warning device, replace if necessary.
X	Inspect the air conditioner belt, replace if necessary.
X	Clean the air conditioner condenser.

1.4.3 Lubrication fill and drain locations

- Grease fittings
- Fill location
- Drain location
- Oil level check location

Ref	Description	Type
1	Engine	Engine oil
2	Radiator overflow reservoir	Coolant
3	Fuel tank	Diesel fuel
4	Transmission housing	Hydraulic oil
5	Front axle, four-wheel drive only	Hydraulic oil
6	Axle pivots	Grease
7	Front spindles	Grease
8	Ball joint	Grease
9	Front brake pivots	Grease
10	Brake arm pivots	Grease
11	Parking brake pivots	Grease
12	Lift rod	Grease
13	Top link	Grease

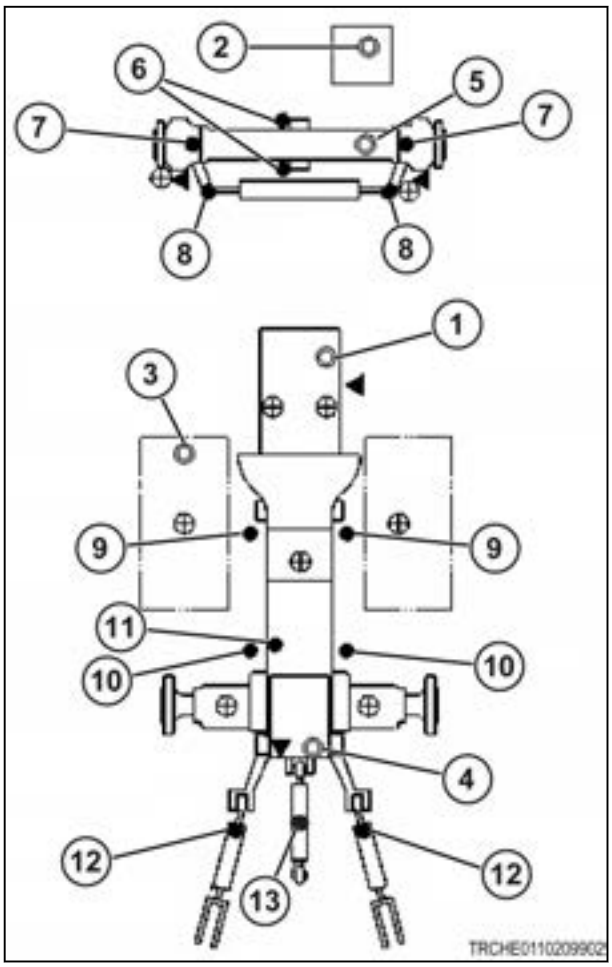


Fig. 7

1.5 General precautions for disassembly and installation

1.5.1 Precautions for disassembling and installing

Before Operation

Always be safety conscious in selecting clothes to wear and correct tools to use.

Before disassembly, make sure that you become familiar with the assembled condition to assist in assembly.

Keep parts, and tools in the correct order during operations.

When assembling disassembled parts, discard used gasket, O-rings, or oil seals and install new ones.

When lifting, tip only the front, or rear part of the tractor, make sure to wedge the grounded wheels.

When the tractor is jacked up, make sure to support the full tractor with a stand. Do not raise the tractor with only a jack. This is a dangerously unstable procedure.

1.5.2 Precautions when installing according to standards parts

Bearings

Use an installer when installing a bearing in a housing by the outer race. The installer is specially designed to push only the outer race and vice versa.

The installer must be designed to install the bearing on the shaft in a parallel position.

When installing a bearing which looks the same on both sides, install the face with the identification number visible. Install all bearings in the transmission case with their identification number pointing outward.

A bearing installed in a shaft or a hole with an inner seat, must be pushed in fully until seated.

Bearings must turn smoothly.

Oil seals

A oil seal installer must not deform the oil seals.

During installation, be careful not to damage the lips. Make sure that the bearing is pushed in parallel to the shaft or hole.

Installed oil seals must have no turnover of the lips and no dislocation of the springs.

When a multi-lip seal is installed, the grooves between the lips must be filled with grease.

Use a lithium-based grease.

There must not be any oil or water leaks around the new seals.

O-rings

Coat O-rings with grease before installing.

Installed O-rings must not have any tension or twist.

Installed O-rings must keep correct tightness.

Snap rings

Snap ring installers must be designed so as not to permanently deform the snap rings (1).

Installed snap rings must be installed correctly in the groove.

Be careful not to overload the snap ring to the point that the snap ring is permanently deformed.

Install a snap ring as shown in the figure, with its round edge turned toward the retained part. This round edge is formed when the snap ring is pressed out.

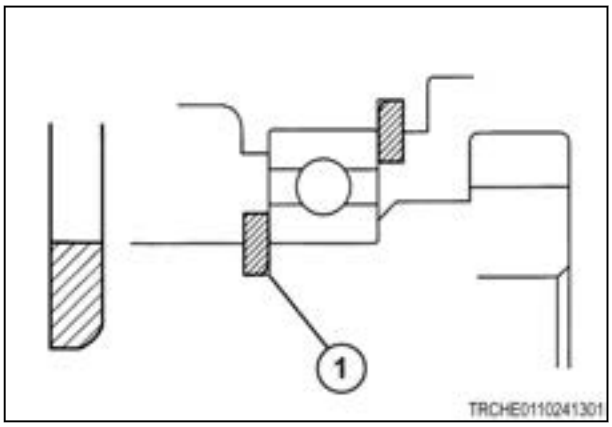


Fig. 8

Spring (roll) pin

Spring pins must install tightly.

Spring pins must be installed so that the seams point to the direction from which the load is applied.

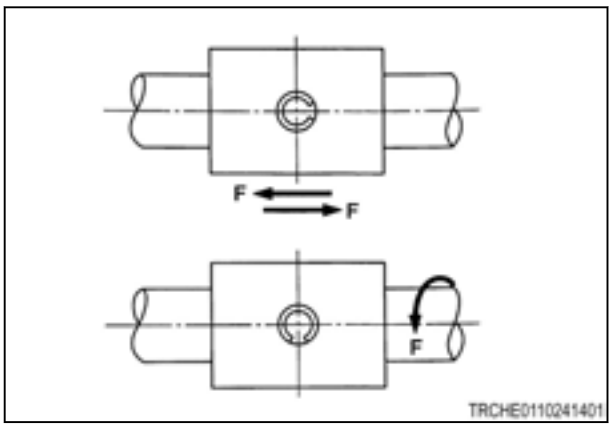


Fig. 9

Cotter pins

Correctly bend the cotter pins at the ends as shown in the figure when installing.

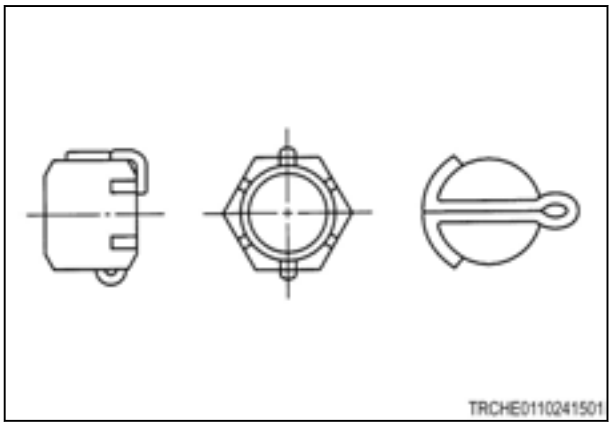


Fig. 10

Bolts and Nuts

Special bolts are installed at some locations, so make sure not to interchange the special bolts with the other bolts.

Use a torque wrench to tighten the bolts and nuts to their specified torque .

When locking the bolts or nuts with wire, take note in the winding direction to hold the bolt tight.

When locking the bolts or nuts with a tab lock washer, bend the tab against the hex, to give secure locking.

When locking bolts and nuts with an adhesive apply the adhesive on the thread and tighten correctly.

Apply a sealant to parts which have any risk of oil leaks, such as stud bolts and treaded holes.

Tighten each lock nut tight.

See the tightening torque table in introduction section when tightening the bolts and nuts.

Grease fittings

After installation, fill each grease fitting with grease.

When installing 45° or 90° grease fittings, make sure to turn the fitting in a direction that will let easy access for a grease gun.

Other precautions

Make sure not to damage any finished surfaces or parts.

Always refrain from forcing installation.

Install each lever knob coated with an adhesive.

Coat each contact surface with an adhesive and tighten equally with bolts. Install adhesive coated surfaces within 30 minutes after application of the adhesive.

The contact surface must be flawless and free from unwanted material. Remove all grease before application of the adhesive.

Precautions for applying adhesives:

- The surface or the thread where an adhesive is to be applied must be fully free of chips.
- The surface of the thread where an adhesive is to be applied must be fully free of oil.

1.6 Tightening torque chart

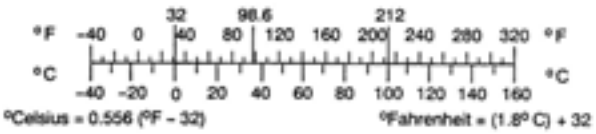
Main components	Parts to be tightened	Tightening torque		Size	Quantity
		Nm	lbf ft		
Cylinder head	Cylinder head	83.4 to 88.3	61.5 to 65.1	M11 X 1.5	18
	Cylinder head cover	9.8 to 19.6	7.2 to 14.5	M8 X 1.25	3
	rocker shaft	13.7 to 23.5	10.1 to 17.3	M8 X 1.25	4
	Injection nozzle	13.7 to 23.5	10.1 to 17.3	M8 X 1.25	4
	Fuel pipe	9.81 to 14.7	7.2 to 10.8	M8 X 1.25	4
	Glow plug	14.7 to 19.6	10.8 to 14.5	M10 X 1.25	4
	Glow plug connector	0.98 to 1.47	0.7 to 1.1	M4 X 0.7	4
	Hanger	13.7 to 23.5	10.1 to 17.3	M8 X 1.25	4
Cylinder block	Bearing cap	137.3 to 156.9	101.3 to 115.7	M14 X 1.5	10
	Front plate	13.7 to 23.5	10.1 to 17.3	M8	4
	Thrust plate	5.85 to 9.85	4.3 to 7.3	M6 X 1.0	2
	Rear plate	74.5 to 90.1	55.0 to 66.5	M12 X 1.5	8
	Oil pan	13.7 to 23.5	10.1 to 17.3	M8 X 1.25	24
	Strainer clamp	13.7 to 23.5	10.1 to 17.3	M8 X 1.25	1
	Injection pump cover	5.85 to 9.85	4.3 to 7.3	M6 X 1.0	4
Crankshaft	Connecting rod cap	34.3 to 44.1	25.3 to 32.5	M9 X 1.0	8
	Flywheel	127.3 to 146.9	93.9 to 108.3	M14 X 1.5	8
	Crankshaft pulley	166.7 to 203.9	123.0 to 150.4	M16 X 1.5	1
	Gear case	13.7 to 23.5	10.1 to 17.3	M8 X 1.25	16
	Plug	7.9 to 17.7	5.8 to 13.0	M8	1
	Oil pump	5.8 to 9.8	4.3 to 7.2	M6 X 1.0	3
	Relief valve	14.7 to 24.5	10.8 to 18.1	M8 X 1.5	1
	Adaptation unit	19.6 to 29.4	14.5 to 21.7	M16 X 1.5	1
Injection pump	Injection pump	13.7 to 23.5	10.1 to 17.3	M8 X 1.25	6
	Connector	19.6 to 24.5	14.5 to 18.1	M12 X 1.5	1
	Injection pipe	14.7 to 24.5	10.8 to 18.07	M12 X 1.5	8
	Delivery valve holder	39.2 to 44.1	28.9 to 32.5	M18 X 1.5	4
	Governor weight bracket	5.85 to 9.85	4.3 to 7.3	M6 X1.0	3
Others	Water pump	13.7 to 23.5	10.1 to 17.3	M8 X 1.25	4
	Thermostat housing	13.7 to 23.5	10.1 to 17.3	M8 X 1.25	2

Main components	Parts to be tightened	Tightening torque		Size	Quantity
		Nm	lbf ft		
	Water outlet pipe	13.7 to 23.5	10.1 to 17.3	M8 X 1.25	2
	Intake manifold	13.7 to 23.5	10.1 to 17.3	M8 X 1.25	8
	Exhaust manifold	13.7 to 23.5	10.1 to 17.3	M8 X 1.25	8
	Cooling fan	5.85 to 9.85	4.3 to 7.3	M6 X 1.0	4
	Starter motor	74.5 to 90.1	55.0 to 66.5	M12 X 1.25	2
	Generator fulcrum	34.3 to 46.1	25.3 to 34.0	M10 X 1.25	1
	Generator adjusting plate	13.7 to 23.5	10.1 to 17.3	M8 X 1.25	1
	Solenoid	5.85 to 9.85	4.3 to 7.3	M6 X 1.0	2
Standard bolts and nuts torques		5.89 to 9.87	4.3 to 7.3	M6 X 1.0	
		13.7 to 23.5	10.1 to 17.3	M8 X 1.25	
		34.3 to 46.1	25.3 to 34.0	M10 X 1.25	
		74.6 to 91.2	55.0 to 67.3	M12 X 1.25	

1.7 Conversion table

	MULTIPLY:	BY:		To Get: MULTIPLY	BY:		To Get:
LINEAR	inches	x 25.4	=	millimeters (mm)	x 0.03937	=	inches
	feet	x 0.3048	=	meters (m)	x 3.281	=	feet
	yards	x 0.9144	=	meters (m)	x 1.0936	=	yards
	miles	x 1.6093	=	kilometers (km)	x 0.6214	=	miles
	inches	x 2.54	=	centimeters (cm)	x 0.3937	=	inches
	microinches	x 0.0254	=	micrometers (um)	x 39.37	=	microinches
AREA	inches²	x 645.16	=	millimeters² (mm²)	x 0.00155	=	inches²
	inches²	x 6.4516	=	centimeters² (cm²)	x 0.155	=	inches²
	feet²	x 0.0929	=	meters² (m²)	x 10.764	=	feet²
	yards²	x 0.8361	=	meters² (m²)	x 1.196	=	yards²
	acres	x 0.4047	=	hectometers² (hm²)	x 2.471	=	acres
			=	hectares (ha)			
VOLUME	inches³	x 16387	=	millimeters³ (mm³)	x 0.000061	=	inches³
	inches³	x 16.387	=	centimeters³ (cm³)	x 0.06102	=	inches³
	inches³	x 0.01639	=	liters	x 61.024	=	inches³
	quarts	x 0.94635	=	liters	x 1.0567	=	quarts
	gallons	x 3.7854	=	liters	x 0.2642	=	gallons
	feet³	x 28.317	=	liters	x 0.03531	=	feet³
	feet³	x 0.02832	=	meters³ (m³)	x 35.315	=	feet³
	fluid oz.	x 29.57	=	milliliters (ml)	x 0.03381	=	fluid oz.
	yards³	x 0.7646	=	meters³ (m³)	x 1.3080	=	yards³
	teaspoons	x 4.929	=	milliliters (ml)	x 0.2029	=	teaspoons
	cups	x 0.2366	=	liters	x 4.227	=	cups
	bushel	x 35.239	=	liters	x 0.02838	=	bushels
	bushel	x 0.03524	=	meters³ (m³)	x 28.378	=	bushels
MASS	ounces (av)	x 28.35	=	grams (g)	x 0.03527	=	ounces (av)
	pounds (av)	x 0.4536	=	kilograms (kg)	x 2.2046	=	pounds (av)
	tons (2000 lbs)	x 907.18	=	kilograms (kg)	x 0.001102	=	tons (2000 lbs)
	tons (2000 lbs)	x .90718	=	metric tons(t)	x 1.1023	=	tons(2000 lbs)
	tons (long) (2240 lbs)	x 1016.05	=	kilograms (kg)	x .000984	=	tons (long) (2240 lbs)
FORCE	ounces - f (av)	x 0.278	=	newtons (N)	x 3.597	=	ounces - f (av)
	pounds - f (av)	x 4.488	=	newtons (N)	x 0.2248	=	pounds - f (av)
	kilograms - f	x 9.807	=	newtons (N)	x 0.10197	=	kilograms - f
PRESSURE OR STRESS	pounds/sq.in.	x 6.895	=	kilopascals (kPa)	x 0.145	=	pounds/sq. in.
	pounds/sq.in.	x 0.0689	=	bar	x 14.503	=	pounds/sq. in.
POWER	horsepower	x 0.746	=	kilowatts (kW)	x 1.34	=	horsepower
	ft-lbf/min.	x 0.0226	=	watts (W)	x 44.25	=	ft - lbf/min.
TORQUE	pound - inches	x 0.11298	=	newton-meters (N.m)	x 8.851	=	pound-inches
	pound - feet	x 1.3558	=	newton-meters (N.m)	x 0.7376	=	pound-feet
VELOCITY	miles/hour	x 1.6093	=	kilometers/hour (km/h)	x 0.6214	=	miles/hour
	feet/sec.	x 0.3048	=	meters/sec. (m/s)	x 3.281	=	feet/sec.
	kilometers/hr.	x 0.27778	=	meters/sec. (m/s)	x 3.600	=	kilometers/hr.
	miles/hours	x 0.4470	=	meters/sec. (m/s)	x 2.237	=	miles/hour

TEMPERATURE



°Celsius = 0.556 (°F – 32)

°Fahrenheit = (1.8° C) + 32

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Fig. 11

2. Safety