

SHOP MANUAL KOMATSU WA450-2 WHEEL LOADER

MACHINE MODEL	SERIAL NUMBERS
WA450-2	A25001 and up

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CONTENTS

No. of page

10 ENGINE

12 TESTING AND ADJUSTING	12-1
13 DISASSEMBLY AND ASSEMBLY	13-1
14 MAINTENANCE STANDARD	14-1

20 POWER TRAIN

21 STRUCTURE AND FUNCTION	21-1
22 TESTING AND ADJUSTING	22-1
23 DISASSEMBLY AND ASSEMBLY	23-1
24 MAINTENANCE STANDARD	24-1

40 STEERING SYSTEM

41 STRUCTURE AND FUNCTION	41-1
42 TESTING AND ADJUSTING	42-1
43 DISASSEMBLY AND ASSEMBLY	43-1
44 MAINTENANCE STANDARD	44-1

50 BRAKE AND AIR SYSTEM

51 STRUCTURE AND FUNCTION	51-1
52 TESTING AND ADJUSTING	52-1
53 DISASSEMBLY AND ASSEMBLY	53-1
54 MAINTENANCE STANDARD	54-1

60 WORK EQUIPMENT SYSTEM

61 STRUCTURE AND FUNCTION	61-1
62 TESTING AND ADJUSTING	62-1
63 DISASSEMBLY AND ASSEMBLY	63-1
64 MAINTENANCE STANDARD	64-1

80 ELECTRIC AND ELECTRONIC SYSTEM

81 STRUCTURE AND FUNCTION	81-1
82 TESTING AND ADJUSTING	82-1
83 DISASSEMBLY AND ASSEMBLY	83-1

90 OTHERS

91 LOGGING SPECIFICATIONS	91-1
93 DISASSEMBLY AND ASSEMBLY	93-1
97 GEAR PUMP	97-1
99 METRIC CONVERSION TABLE	99-1



WARNING! IMPORTANT SAFETY NOTICE

Proper service and repair is extremely important for the safe operation of your machine. The service and repair techniques recommended and described in this manual are both effective and safe methods of operation. Some of these operations require the use of tools specially designed for the purpose.

To prevent injury to workers, the symbol shown is used to mark safety precautions in this manual. The cautions accompanying these symbols should always be followed carefully. If any dangerous situation arises or may possibly arise, first consider safety, and take the necessary actions to deal with the situation.



SAFETY

GENERAL PRECAUTIONS

Mistakes in operation are extremely dangerous. Read the Operation and Maintenance Manual carefully BEFORE operating the machine.

1. Before carrying out any greasing or repairs, read all the precautions given on the decals which are fixed to the machine.
2. When carrying out any operation, always wear safety shoes and helmet. Do not wear loose work clothes, or clothes with buttons missing.
-Always wear safety glasses when hitting parts with a hammer.
-Always wear safety glasses when grinding parts with a grinder, etc.
3. If welding repairs are needed, always have a trained, experienced welder carry out the work. When carrying out welding work, always wear welding gloves, apron, glasses, cap and other clothes suited for welding work.
4. When carrying out any operation with two or more workers, always agree on the operating procedure before starting. Always inform your fellow workers before starting any step of the operation. Before starting work, hang UNDER REPAIR signs on the controls in the operator's compartment.
5. Keep all tools in good condition and learn the correct way to use them.
6. Decide a place in the repair workshop to keep tools and removed parts. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dirt or oil on the floor.

Smoke only in the areas provided for smoking. Never smoke while working.

PREPARATIONS FOR WORK

7. Before adding oil or making repairs, park the machine on hard, level ground, and block the wheels or tracks to prevent the machine from moving.
8. Before starting work, lower blade, ripper, bucket or any other work equipment to the ground. If this is not possible, insert the safety pin or use blocks to prevent the work equipment from falling. In addition, be sure to lock all the control levers and hang warning signs on them.
9. When disassembling or assembling, support the machine with blocks, jacks or stands before starting work.
10. Remove all mud and oil from the steps or other places used to get on and off the machine. Always use the handrails, ladders or steps when getting on or off the machine. Never jump on or off the machine. If it is impossible to use the handrails, ladders or steps, use a stand to provide safe footing.
11. When removing the oil filler cap, drain plug or hydraulic pressure measuring plugs, loosen them slowly to prevent the oil from spurting out. Before disconnecting or removing components of the oil, water or air circuits, first remove the pressure completely from the circuit.

PRECAUTIONS DURING WORK

SAFETY

12. The water and oil in the circuits are hot when the engine is stopped, so be careful not to get burned. Wait for the oil and water to cool before carrying out any work on the oil or water circuits.

13. Before starting work, remove the leads from the battery. Always remove the lead from the negative (-) terminal first.

14. When raising heavy components, use a hoist or crane.

Check that the wire rope, chains and hooks are free from damage.

Always use lifting equipment which has ample capacity.

Install the lifting equipment at the correct places. Use a hoist or crane and operate slowly to prevent the component from hitting any other part. Do not work with any part still raised by the hoist or crane.

15. When removing covers which are under internal pressure or under pressure from a spring, always leave two bolts in position on opposite sides. Slowly release the pressure, then slowly loosen the bolts to remove.

16. When removing components, be careful not to break or damage the wiring. Damaged wiring may cause electrical fires.

17. When removing piping, stop the fuel or oil from spilling out. If any fuel or oil drips on to the floor, wipe it up immediately. Fuel or oil on the floor can cause you to slip, or can even start fires.

18. As a general rule, do not use gasoline to wash parts. In particular, use only the minimum of gasoline when washing electrical parts.

19. Be sure to assemble all parts again in their original places.

Replace any damaged part with new parts.

- When installing hoses and wires, be sure that they will not be damaged by contact with other parts when the machine is being operated.

20. When installing high pressure hoses, make sure that they are not twisted. Damaged tubes are dangerous, so be extremely careful when installing tubes for high pressure circuits. Also check that connecting parts are correctly installed.

21. When assembling or installing parts, always use the specified tightening torques. When installing protective parts such as guards, or parts which vibrate violently or rotate at high speed, be particularly careful to check that they are installed correctly.

22. When aligning two holes, never insert your fingers or hand. Be careful not to get your fingers caught in a hole.

23. When measuring hydraulic pressure, check that the measuring tool is correctly assembled before taking any measurements.

24. Take care when removing or installing the tracks of track-type machines.

When removing the track, the track separates suddenly, so never let anyone stand at either end of the track.

FOREWORD

This shop manual has been prepared as an aid to improve the quality of repairs by giving the serviceman an accurate understanding of the product and by showing him the correct way to perform repairs and make judgements. Make sure you understand the contents of this manual and use it to full effect at every opportunity.

This shop manual mainly contains the necessary technical information for operations performed in a service workshop.

For ease of understanding, the manual is divided into chapters for each main group of components; these chapters are further divided into the following sections.

STRUCTURE AND FUNCTION

This section explains the structure and function of each component. It serves not only to give an understanding of the structure, but also serves as reference material for troubleshooting.

TESTING AND ADJUSTING

This section explains checks to be made before and after performing repairs, as well as adjustments to be made at completion of the checks and repairs. Troubleshooting charts correlating "Problems" to "Causes" are also included in this section.

DISASSEMBLY AND ASSEMBLY

This section explains the order to be followed when removing, installing, disassembling or assembling each component, as well as precautions to be taken for these operations.

MAINTENANCE STANDARD

This section gives the judgement standards when inspecting disassembled parts.

NOTICE

The specifications contained in this shop manual are subject to change at any time and without any advance notice. Contact your distributor for the latest information.

HOW TO READ THE SHOP MANUAL

VOLUMES

Shop manuals are issued as a guide to carrying out repairs. They are divided as follows:

Chassis volume: Issued for every machine model
Engine volume: Issued for every engine series

These various volumes are designed to avoid duplication the same information. Therefore to deal with all repairs for any model, it is necessary that chassis and engine volumes are ready.

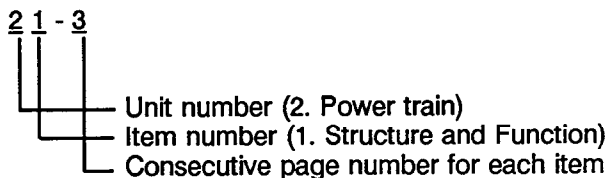
DISTRIBUTION AND UPDATING

Any additions, amendments or other changes will be sent to your distributors. Get the most up-to-date information before you start any work.

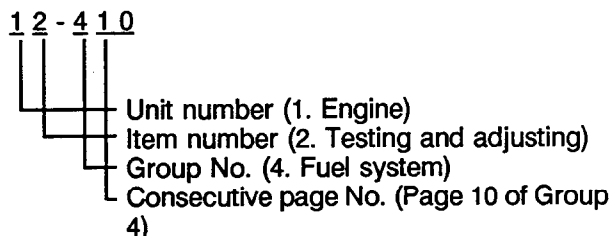
FILING METHOD

1. See the page number on the bottom of the page. File the pages in correct order.
2. Following examples show how to read the page number:

Example 1 (Chassis volume):



Example 2 (Engine volume):



3. Additional pages: Additional pages are indicated by a hyphen (-) and numbered after the page number.

File as in the example.
 Example:

21-4		12-203
21-4-1	Added pages	12-203-1
21-4-2		12-203-2
21-5		12-204

REVISED EDITION MARK ([1] [2] [3])

When a manual is revised, an edition mark is recorded on the bottom outside corner of the pages.

REVISIONS





Revised pages are shown at the LIST OF REVISED PAGES on the between the title page and SAFETY page.

SYMBOLS

So that the shop manual can be of ample practical use, important places for safety and quality are marked with the following symbols.

Symbol	Item	Remarks
	Safety	Special safety precautions are necessary when performing the work.
		Extra special safety precautions are necessary when performing the work because it is under internal pressure.
★	Caution	Special technical precautions or other precautions for preserving standards are necessary when performing the work.
	Weight	Weight of parts or systems. Caution necessary when selecting hoisting wire or when working posture is important, etc.


HOW TO READ THE SHOP MANUAL

Symbol	Item	Remarks
	Torque	Places that require special attention for tightening the torque during assembly.
	Coat	Places to be coated with adhesives and lubricants etc.
	oil water	Places where oil, water or fuel must be added, and the capacity.
	Drain	Places where oil or water must be drained, and quantity to be drained.



HOISTING INSTRUCTIONS



Heavy parts (25 kg or more) must be lifted with a hoist etc. In the **Disassembly and Assembly** section, every part weighing 25 kg or more is indicated clearly with the symbol 

1. If a part cannot be smoothly removed from the machine by hoisting, the following checks should be made:

- Check for removal of all bolts fastening the part to the relative parts.
- Check for existence of another part causing interface with the part to be removed.

2. Wire ropes

- 1) Use adequate ropes depending on the weight of parts to be hoisted, referring to the table below:

Wire ropes
(Standard "Z" or "S" twist ropes
without galvanizing)

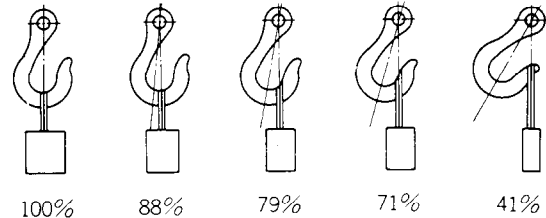
Rope diameter (mm)	Allowable load (tons)
10	1.0
11.2	1.4
12.5	1.6
14	2.2
16	2.8
18	3.6
20	4.4
22.4	5.6
30	10.0
40	18.0
50	28.0
60	40.0

The allowable load value is estimated to be one-sixth or one-seventh of the breaking strength of the rope used.

- 2) Sling wire ropes from the middle portion of the hook.

Slinging near the edge of the hook may cause

the rope to slip off the hook during hoisting, and a serious accident can result. Hooks have maximum strength at the middle portion.



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- 3) Do not sling a heavy load with one rope alone, but sling with two or more ropes symmetrically wound on to the load.

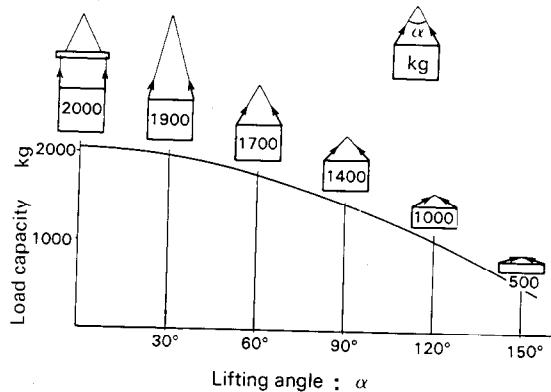


Slinging with one rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original winding position on the load, which can result in a dangerous accident.

- 4) Do not sling a heavy load with ropes forming a wide hanging angle from the hook.

When hoisting a load with two or more ropes, the force subjected to each rope will increase with the hanging angles. The table below shows the variation of allowable load (kg) when hoisting is made with two ropes, each of which is allowed to sling up to 1000 kg vertically, at various hanging angles.

When two ropes sling a load vertically, up to 2000 kg of total weight can be suspended. This weight becomes 1000 kg when two ropes make a 120° hanging angle. On the other hand, two ropes are subject to an excessive force as large as 4000 kg if they sling a 2000 kg load at a lifting angle of 150°.



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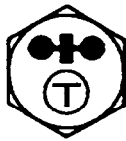

STANDARD TIGHTENING TORQUE

STANDARD TIGHTENING TORQUE



1. STANDARD TIGHTENING TORQUE OF BOLTS AND NUTS.

The following charts give the standard tightening torques of bolts and nuts. Exceptions are given in sections of "Disassembly and Assembly".

Thread diameter of bolt (mm)	Width across flat (mm)		
		kgm	Nm
6	10	1.35±0.15	13.2±1.4
8	13	3.2±0.3	31.4±2.9
10	17	6.7±0.7	65.7±6.8
12	19	11.5±1.0	112±9.8
14	22	18.0±2.0	177±19
16	24	28.5±3	279±29
18	27	39±4	383±39
20	30	56±6	549±58
22	32	76±8	745±78
24	36	94.5±10	927±98
27	41	135±15	1320±140
30	46	175±20	1720±190
33	50	225±25	2210±240
36	55	280±30	2750±290
39	60	335±35	3280±340

This torque table does not apply to the bolts with which nylon packings or other non-ferrous metal washers are to be used, or which require tightening to otherwise specified torque.

★ Nm (newton meter): 1Nm ≈ 0.1 kgm

STANDARD TIGHTENING TORQUE



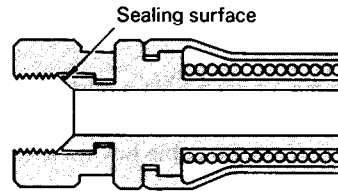
2. TIGHTENING TORQUE OF SPLIT FLANGE BOLTS

Use these torques for split flange bolts.

Thread diameter of bolt (mm)	Width across flats (mm)	Tightening torque	
		kgm	Nm
10	14	6.7±0.7	65.7±6.8
12	17	11.5±1	112±9.8
16	22	28.5±3	279±29

3. TIGHTENING TORQUE FOR NUTS OF FLARED

Use these torques for nut part of flared.



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Thread diameter of nut part (mm)	Width across flats of nut part (mm)	Tightening torque	
		kgm	Nm
14	19	2.5±0.5	24.5±4.9
18	24	5±2	49±19.6
22	27	8±2	78.5±19.6
24	32	14±3	137.3±29.4
30	36	18±3	176.5±29.4
33	41	20±5	196.1±49
36	46	25±5	245.2±49
42	55	30±5	294.2±49



COATING MATERIALS

The recommended coating materials prescribed in the shop manuals are listed below.

Nomenclature	Code	Applications
Adhesives	LT-1A	Used to apply rubber pads, rubber gaskets, and cork plugs.
	LT-1B	Used to apply resin, rubber, metallic and non-metallic parts when a fast, strong seal is needed.
	LT-2 ^o	Preventing bolts, nuts, and plugs from loosening and leaking oil.
	LT-3	Provides an airtight, electrically insulating seal. Used for aluminum surfaces.
Liquid gasket	LG-1	Used with gaskets and packings to increase sealing effect.
	LG-3	Heat-resistant gasket for precombustion chambers and exhaust piping.
	LG-4	Used by itself on mounting surfaces on the final drive and transmission cases. (Thickness after tightening: 0.07 - 0.08 mm).
	LG-5	Used by itself to seal grease fittings, tapered screw fittings and tapered screw fittings in hydraulic circuits of less than 50 mm in diameter.
Antifriction compound (Lubricant including molybdenum disulfide)	LM-P	Applied to bearings and taper shafts to facilitate press-fitting and to prevent sticking, burning or rusting.
Grease (Lithium grease)	G2-LI	Applied to bearings, sliding parts and oils seals for lubrication, rust prevention and facilitation of assembling work.
Vaseline	---	Used for protecting battery electrode terminals from corrosion.

•LT-2 is also called **LOCTITE** in the shop manuals.

ELECTRIC WIRE CODE

In the wiring diagrams, various colors and symbols are employed to indicate the thickness of wires. This wire code table will help you understand WIRING DIAGRAMS.

Example: 05WB indicates a cable having a nominal number 05 and white coating with black stripe.

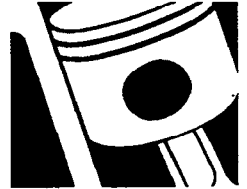
CLASSIFICATION BY THICKNESS

Nominal number	Copper wire			Cable O.D. (mm)	Current rating (A)	Applicable circuit
	Number strands	Dia. of strands (mm)	Cross section (mm ²)			
0.85 (01)*	11	0.32	0.88	2.4	12	Starting, lighting, signal etc.
2 (02)*	26	0.32	2.09	3.1	20	Lighting, signal etc.
5 (05)*	65	0.32	5.23	4.6	37	Charging and signal
15	84	0.45	13.36	7.0	59	Starting (Glow plug)
40	85	0.80	42.73	11.4	135	Starting
60	127	0.80	63.84	13.6	178	Starting
100	217	0.80	109.1	17.6	230	Starting

* Old numbers

ENGINE

12 TESTING AND ADJUSTING



STANDARD VALUE TABLE	2
TOOL LIST FOR TESTING AND ADJUSTING	5
ADJUSTING VALVE CLEARANCE	6
FUEL INJECTION TIMING	7
MEASURING BLOW-BY PRESSURE	8
FAN BELT TENSION	9
MEASURING EXHAUST GAS COLOR	11
MEASURING ACCELERATOR PEDAL OPERATING FORCE AND OPERATING ANGLE	13

★ The following precautions are necessary when using the Standard Value Tables to make judgements during troubleshooting or during testing and adjusting.

1. The values in these tables are based on the values for new machines leaving the plant, so they should be used as target values when repairing or when estimating wear after a period of use.
2. The standard values in these tables for judgement when troubleshooting are estimated values based on the standard values for the machine when shipped from the plant, and on the results of various tests. Therefore, they should be used as reference in combination with repair and operating records when making judgements.
3. These standard value tables must not be used for standard values when judging claims. In addition, do not use these values alone to make simple judgements.

STANDARD VALUE TABLE

- FOR ENGINE ON TEST BENCH

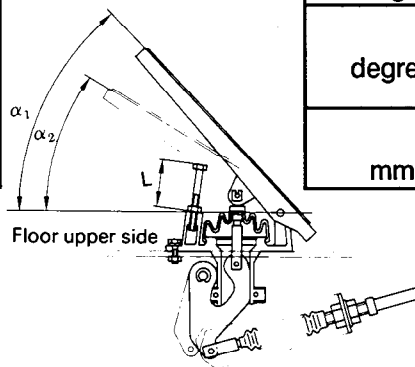
Category	Engine			LTA 10	
	Item	Condition, etc.	Unit	Standard value	Permissible value
Performance	Flywheel horse power		HP/rpm	268/2100	--
	Maximum torque		kgm/rpm	117/1300	--
	Engine speed	High idling speed Low idling speed	rpm rpm	2400±50 850-900	2400±50 850-900
	Necessary starting speed	0°C -20°C (Using starting aid)(Ether aided)	rpm rpm	Min 150 Min 120	-- --
Intake and exhaust system	Intake resistance	All speed	mmH ₂ O	Max 380	Max 635
	Exhaust pressure	All speed (Exhaust back pressure)	mmHg	Max 75	
	Exhaust temperature	All speed (Intake air temp.: 20°C)	°C	Max 554 (Turbine outlet)	
	Exhaust gas color	Quick acceleration At high idling	Bosch scale	Max 6.0 Max 1.0	Max 6.0 Max 2.0
	Valve clearance at 20°C	Intake valve Exhaust valve	mm mm	0.35 0.68	-- --
Engine body	Blow-by pressure (Turbo and air compressor)	At rated speed Oil temp.:min.70°C	mmH ₂ O	Max 457 (New limit)	Max 610 (Worn limit)
Lubrication system	Oil Pressure (SAE 15W-40 Oil temp.: 80°C min.)	At rated speed At low idling	kg/cm ² kg/cm ²	2.1 ~ 3.5 Min 0.7	
	Oil temperature	All speed (Oil in oil pan)	°C	80 ~ 110	120
	Oil consumption ratio	At continuous rated output (Ratio to fuel consumption)	%	Max 0.5	1.0
Fuel system	Fuel injection pressure	Nozzle tester	kg/cm ²	N/A	
	Fuel injection timing	Push rod travel	mm	2.11~2.21	
Cooling system	Coolant temperature	All speed (At engine outlet)	°C	80~90	Max 100

Engine				LTA 10	
Category	Item	Condition, etc.	Unit	Standard value	Permissible value
Cooling system (Continued)	Thermostat function	Valve cracking temp. Full opening temp. Full opening lift	°C °C mm	N/A 94 N/A	94
	Radiator pressure valve function	Opening pressure (Differential pressure)	kg/cm ²	0.7±0.15	
	Fan speed (Speed ratio 1.0)	At high idling speed	rpm	2400	
	Fan belt tension	Belt tension gauge	kg	86~95	70~75

Note: The values given in the Testing and Adjusting data are NOT for adjustment of the output. Do not use these values as a guide to change the setting of the fuel injection pump.

● FOR ENGINE ON CHASSIS

Engine				LTA 10	
Category	Check item	Conditions	Unit	Standard value	Permissible value
Performance	Engine speed	High idling speed Low idling speed	rpm rpm	2350±50 850±50	2350±50 850±
Intake and exhaust system	Exhaust gas color	At abrupt acceleration	Bosch index.	Max 6.0	Max 6.0
		At high idling	Bosch index.	Max 1.0	Max 1.0
	Valve clearance	Intake valve (20°C)	mm	0.35	0.35
		Exhaust valve (20°C)	mm	0.68	0.68
Body	Blow-by pressure (Turbo and air compressor connected)	(Water temp. inside operating range) At high idling, SAE 15W-40 oil	mmH ₂ O	Max 457 (New limit)	Max 610 (Worn limit)
Lubrication system	Oil pressure (SAE 15W-40, oil temp.: min. 80°C)	(Water temperature inside operating range) At rated speed	kg/cm ²	2.1~3.5	2.1~3.5
		At low idling	kg/cm ²	Min 0.7	Min 0.7
	Oil temp.	Whole speed range (inside oil pan)	°C	80~110	120
Fuel system	Fuel injection timing	Push rod travel	mm	2.11~2.21	
Cooling system	Fan belt tension	Belt tension gauge	kg	86~95	70~75
Acceleration pedal	Operating force		kg	4 - 7	Max 10.5
	Operating angle	∠ ₁	degree	45	--
		∠ ₂		31	--
	Stopper height	L ₁	mm	42 - 52	



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TOOL LIST FOR TESTING AND ADJUSTING

No	Testing and measuring item	tool name	Part number	Remarks
1	Engine speed	Tachometer	799-203-8000	Digital display 60-19999 rpm
2	Battery specific gravity	Battery coolant tester	795-500-1000	1.1 - 1.3
3	Coolant freezing temperature			-5 - -50°C
4	Water temperature, oil temperature, intake temperature	Thermistor temperature gauge	790-500-1300 or 799-101-6000	0 - 200°C
5	Exhaust temperature			0 - 1000°C
6	Lubricating oil pressure	Engine pressure measuring kit	799-203-2002	0 - 10 kg/cm ²
7	Fuel pressure			0 - 20 kg/cm ²
8	Intake pressure, exhaust pressure			0 - 1500 mmHg
9	Blow-by pressure			0 - 1000 mmH ₂ O
10	Intake resistance			-1000 - 0 mmH ₂ O
11	Compression pressure	Compression gauge	795-502-1204	0 - 70 kg/cm ²
12	Blow-by pressure	Manometer		0 - 1270 mmH ₂ O
13	Valve clearance	Fleur gauge	795-125-1360	0.35, 0.68 mm
14	Exhaust gas color	Smoke meter	Commercially available	Discoloration 0 to 70% standard color (Discoloration % × 1/10 = Bosch index)
15	Fuel on water mixed in oil	Engine oil checker	799-201-6000	Water content 0.1%, 0.2% in standard sample
16	Coolant quality	Water quality tester	799-202-7001	PH, nitrous acid ion concentration
17	Leakage from cooling system	Cap tester	799-202-9001	0 - 2 kg/cm ²
18	Fuel injection pressure Nozzle injection condition	Nozzle tester	Commercially available	0 - 300 kg/cm ²
19	Electrical circuit	Tester	Commercially available	Current, voltage, resistance
20	Accelerator pedal force	push-pull scale	79A-262-0020	Commercially available 0 - 25 kg

No	Testing and measuring item	tool name	Part number	Remarks
21	Belt tension	Belt tension gauge	ST-1293 (Cummins)	
22	Fuel injection timing	Injector timing tool	3375522 (Cummins)	



When carrying out testing, adjusting or troubleshooting, stop machine on level ground, insert the safety pins and block the tracks.



When checking the water level in the radiator wait for the water to cool. Do not remove the radiator cap while the water is hot. Boiling water may spurt out.



When working in groups, use agreed signals and do not allow unauthorized persons near the machine.



Be careful not to get caught in rotating parts.

ADJUSTING VALVE CLEARANCE

- ★ Condition: Engine is cold.
- ★ Adjust clearance between valve and rocker lever as follows.

Unit: mm

Intake valve		Exhaust valve
Cold	0.35	0.68

Special tool

Part number	Part name	Q'ty
A	795-125-1360 Feeler gauge (mm)	1

1. Adjusting valve clearance

For details of adjusting valve clearance, see Cummins engine shop manual (L10 Series Engine).

FUEL INJECTION TIMING

- ★ Measurement condition
- Coolant temperature: Inside operating range.

Unit : mm

Item	Condition	Standard value	Permissible value
Fuel Injection timing	push rod travel	2.11 ~ 2.21	

Special tool		
Part number	Part name	quantity
3375522 (Cummins)	Injector timing tool	1

TESTING FUEL INJECTION TIMING

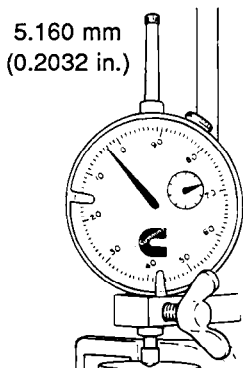
Injection timing refers to injecting fuel in the combustion chamber at the correct time during the compression stroke. The timing **must be** checked when the piston is on the compression stroke at 5.160 mm (0.2032 inch) Before Top Dead Center. When the piston is at this position, measure the amount of travel left in the injector push rod with the Part No. 3375522 Injector Timing Tool. The amount of push rod travel establishes the amount of injector plunger travel in the injector.

Timing Code	Push Rod Travel @ 5.161 mm (0.2032 in.) BTDC Piston Travel Position
FC	2.11 ~ 2.21 mm (0.083 - 0.087 inch)

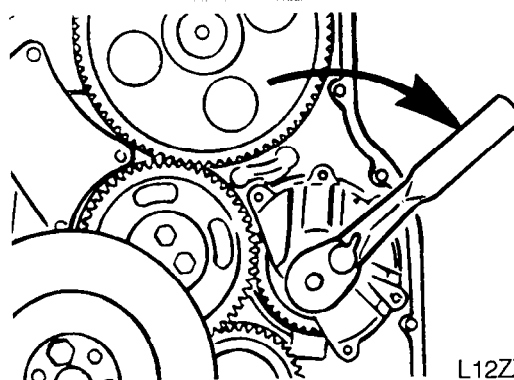
To verify the correct injection timing for a particular engine, check the Control Parts List (CPL) number on the engine dataplate, then refer to the CPL Bulletin No. 3379133.

ADJUSTING FUEL INJECTION TIMING

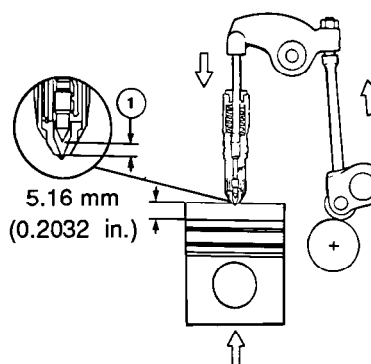
- For details of adjusting fuel injection timing, see Cummins engine shop manual (L10 Series Engine).



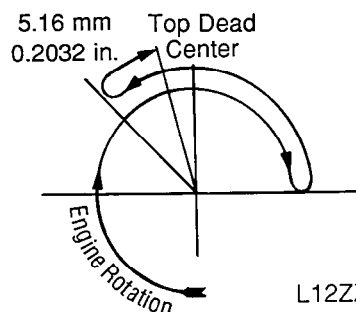
L12ZZ003



L12ZZ004



L12ZZ005



L12ZZ006

MEASURING BLOW-BY PRESSURE

- ★ Measurement condition
- Coolant temperature: Inside operating range
- Engine valve clearance : Standard value

Unit: mmH₂O

Item	Standard value	Permissible value
Blow-by pressure	Max 457 (new limit)	Max 610 (worn limit)

Special tool

	Part number	Part name	Q'ty
		Manometer	1
1	3375788 (Cummins)	Engine blow-by tool	1



When taking measurements, be careful not to touch the exhaust manifold or muffler, or to get caught in rotating parts.

1. Measuring blow-by

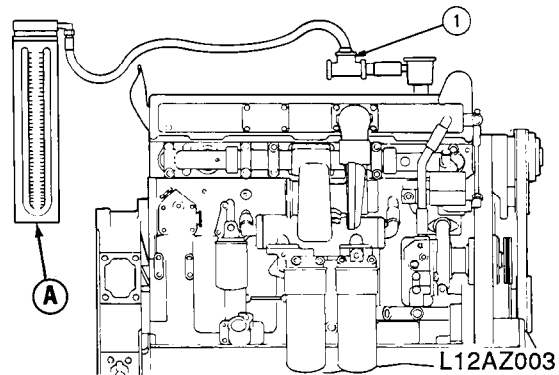
- 1) When measuring the blow-by, warm the engine up thoroughly.
- 2) Stop engine and install engine blow-by tool or manometer on engine breather hose (1).
- 3) Connect adapter and blow-by A (0-1270 mmH₂O) to hose.
- 4) Run the engine at rated idling and measure the blow-by pressure.

2. Precautions when measuring blow-by

- ★ The blow-by should be measured with the engine running at rated output.

- When measuring in the field, a similar valve can be obtained at stall speed.
- If it is impossible to check at rated output or stall speed, measure at high idling. --- In this case, the blow-by valve will be about 80% of the value at rated output.

- ★ Blow-by may vary greatly according to the condition of the engine, so if there is any abnormality in the reading, check for any problem related to defective blow-by, such as excessive oil consumption, defective exhaust gas color, or early deterioration or contamination of the oil.



FAN BELT TENSION

BELT TENSION CHART

Belt tension chart (kg)			
Belt width	Belt gauge	New Belt Min-Max	Used Belt Min-Max
0.380 0.440 ½ 1-11/16	ST-1274	59~68	36.1~54
¾ 7/8	ST-1138	63~73	41~54
5 or 6 Rib	ST-1293	86~95	70~75
8 Rib	ST-1293		

● Adjust used belts to the values in this column. If below tension, retention to maximum.

- Belts will loosen during use. They **must** be adjusted to the values listed in the Belt Tension Chart.
- A belt is considered used if it has been in operation for 10 minutes or longer.

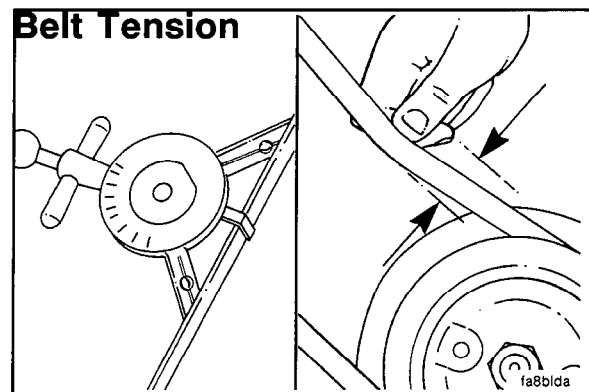
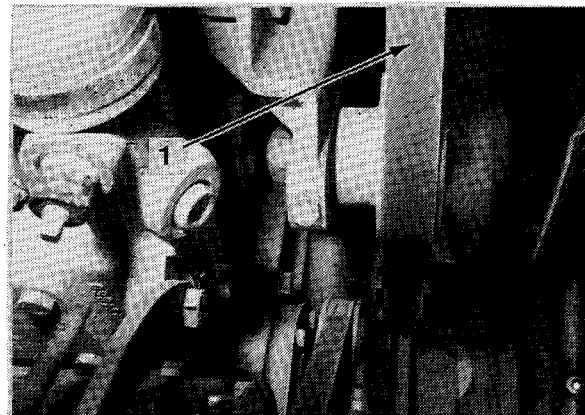
TESTING FAN BELT TENSION

Use Part No. ST-1293(A), Belt Tension Gauge to measure the tension of the belt. If the belt tension is less than 50 kg it **must** be adjusted. Refer to the Belt Tension Chart. An alternate method (deflection method) can be used to check belt tension by applying 11.3 kg force between the pulleys on v-belts. If the deflection is more than one (1) belt thickness per foot of pulley center distance, the belt tension **must** be adjusted.

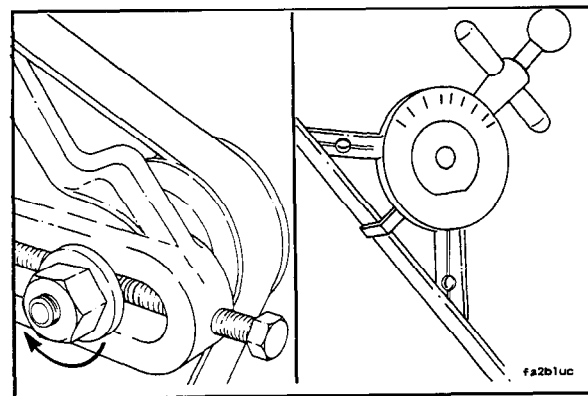
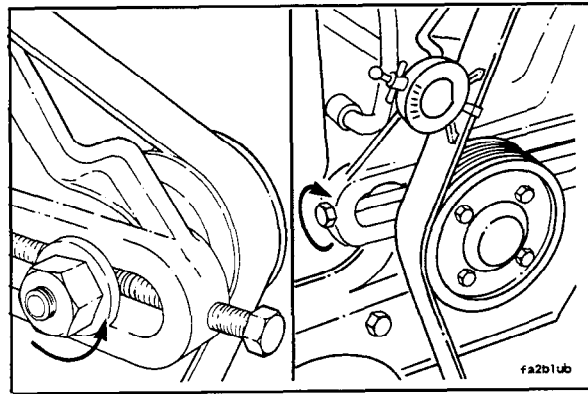
ADJUSTMENT PROCEDURE

Caution: Do not adjust belt tension to full value with the adjusting screw (1). Belt tension can increase when the lock nut (2) is tightened and cause reduced belt and bearing life.

- Loosen the idler pulley shaft lock nut.



- Adjust the belt tension to:
 - a. New Belt :86~95 kg
 - b. Used Belt :70~75 kg
- Tighten the idler pulley shaft lock nut:
Torque Value: 16.6~19.4 kgm



MEASURING EXHAUST GAS COLOR


- ★ Measurement condition
- Coolant temperature: Inside operating range
- Valve clearance: Standard value

Unit: Bosch index

Item		Standard value	Permissible value
Exhaust color	Acceleration	Max 6.0	Max 6.0
	High idling	Max 1.0	Max 1.0

Special tool

	Part number	Part name	Q'ty
A	Commercially available	Smoke meter	1

 When measuring the exhaust color, be careful not to touch the exhaust pipe.

★ When measuring the exhaust color, warm the engine up thoroughly (oil temperature 60°C).

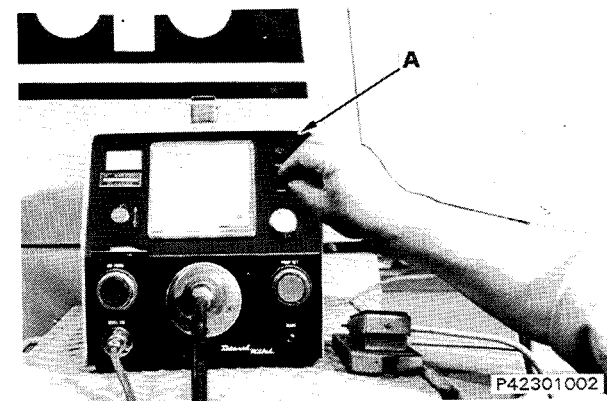
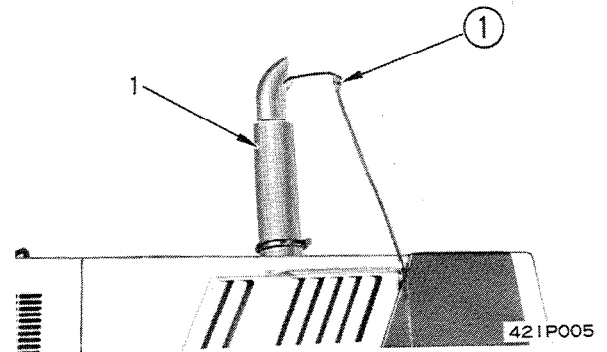
1. Insert probe (1) in outlet of exhaust pipe [1] and secure to exhaust pipe with clip.
2. Connect probe hose, connector hose of accelerator switch and air hose to smoke checker A.

★ The pressure of the air supply should be under 15 kg/cm².

3. Connect power cord to AC 100 V socket.

★ Check that the power switch is OFF before connecting the cord.

4. Loosen cap nut of suction pump and insert filter paper.
5. Turn power switch ON.





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