93217-00060
June 2005

Kawasaki

SHOP MANUAL

WHEEL LOADER

135ZV

General Information
Standard Measurement Values for Performance Check
Function & Structure
Check & Adjustment

Powered by CUMMINS QST30-C ENGINE

Serial No.13C1-0201~

93217-00060
June 2005

Foreword

To ensure good machine performance, reduce failures or problems, and prolong the service life of each component, it is necessary to operate the machine as is directed in the Operator and Maintenance Manual.

To effectively diagnose and repair the machine, it is important to follow the guidelines laid out in this Shop Manual.

General Information
Functions and structure

For the engine, refer to the engine Shop Manual provided by the engine manufacturer.

The purpose of this manual is to provide information on the product and the correct maintenance and repair methods. Please read this manual to ensure correct troubleshooting and good repair service.

This manual will be periodically reviewed and revised for more satisfactory content. If you have any opinion or requests, please inform us.

Safety Precautions

The most important point in providing repair service is safety. To ensure safety, observe the general cautions described below.

●This manual is intended for properly trained and equipped service technicians.

●Any work on the machine must be performed by the trained personnel only.

●Carefully read this manual to thoroughly understand the operation method before you operate or repair the machine.

●Be sure to wear appropriate clothes and protectors, such as safety boots, hard hat and goggles.

●Place the machine on level and solid ground, and place chocks against the wheels to prevent movement.

●Remove the cable from the battery before starting the service work, and attach a "DO NOT OPERATE!" tag on the operation board.

●Be sure to release the internal pressure before you remove a pipe, such as the hydraulic oil, air, or engine coolant pipe.

●Be sure to apply the articulation stopper before starting work.

●While supporting the bottom of the chassis using a jack, be sure to support the chassis using the blocks.

●When the boom or bucket is raised or when a unit is lifted by a crane, be sure to place a stand or adequate cribbing under the unit to prevent unexpected dropping.

●Do not start to work in an enclosed area if adequate ventilation is not provided.

●To remove a heavy unit (20kgf (40 lbs) or more), be sure to use a crane or other lifting tool.

●Just after stopping operation, be careful not to directly touch a hot component. You may get burned.

●Contact tire manufacturer's local dealer for tire servicing and changing.

●Always store the tools in good condition, and use them properly.

●Keep the work area clean. Clean up spills immediately.

●Avoid the use of flammable solvents and cleaners.

●When working outdoors keep work areas, ladders, steps, decks and work platforms clear of snow, ice, and mud.

●Use safe work platforms to reach higher areas of the machine.

Safety Symbols

An accident may occur if you disregard safety rules.
In this manual, several expressions are used according to levels of danger for inspection and repair work as shown below. Read the work procedures and cautions described in this manual, and take preventive measures against possible problems before starting service work.

⚠ DANGER

This danger symbol identifies special warnings or procedures which, if not strictly observed, will result in death or serious injury.

⚠ WARNING

This warning symbol identifies special warnings or procedures which, if not strictly observed, could result in death or serious injury.

⚠ CAUTION

This caution symbol identifies special instructions or procedures which, if not strictly observed, may result in minor or moderate injury.

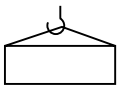
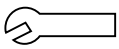
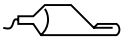
IMPORTANT

This important symbol identifies special instructions or procedures which, if not correctly followed, may result in serious machine damage.

We cannot predict all possible accidents or incidents that may occur during service work. Therefore, an accident that is not specifically mentioned in this manual may occur. To protect yourself from all accidents, be careful when doing service work.

Symbols

For safe and effective service work, the following symbols are used for notes and useful information in this manual.

Symbol	Item	Description
	Reference	Shows the condition or procedure that will be useful or efficient in doing service work.
	Weight	Shows the weight of a part or unit. The weight should be considered in selecting wire rope or cable for slinging work or determining the working posture.
	Tightening torque	Shows the tightening torque of a section that should be carefully tightened during assembly work.
	Coating	Shows the type of coating or adhesive and the coating section.
	Oil or water supply	Shows the oil or water supply port and the refill amount.
	Drainage	Shows the oil or water drain port and the drain amount.

IMPORTANT
If the specified conditions are not satisfied or the specified procedure is not observed, there is a strong possibility that the product will be damaged or the performance of the product will be reduced. **The message shows the preventive measures.**

Abbreviation

To save space, abbreviations are used in sentences. To understand the contents of this manual, refer to the following abbreviation list.

E/G .....Engine
T/C .....Torque converter
T/M .....Transmission
SOL .....Solenoid valve
SW .....Switch
F .....Front or Forward
QUAD .....Quick Up and Down Shift
A/M .....Auto/Manual

B .....Battery
R .....Rear or Reverse
RH .....Right hand side
LH .....Left hand side
H .....High
L .....Low
GND .....Ground [or E]
OPT .....Option
Assy .....Assembly

1st .....1st speed
2nd .....2nd speed
3rd .....3rd speed
DD .....Dynamic Damper
M/C .....Machine
min^{-1} .....RPM

MEMO

OUTLINE

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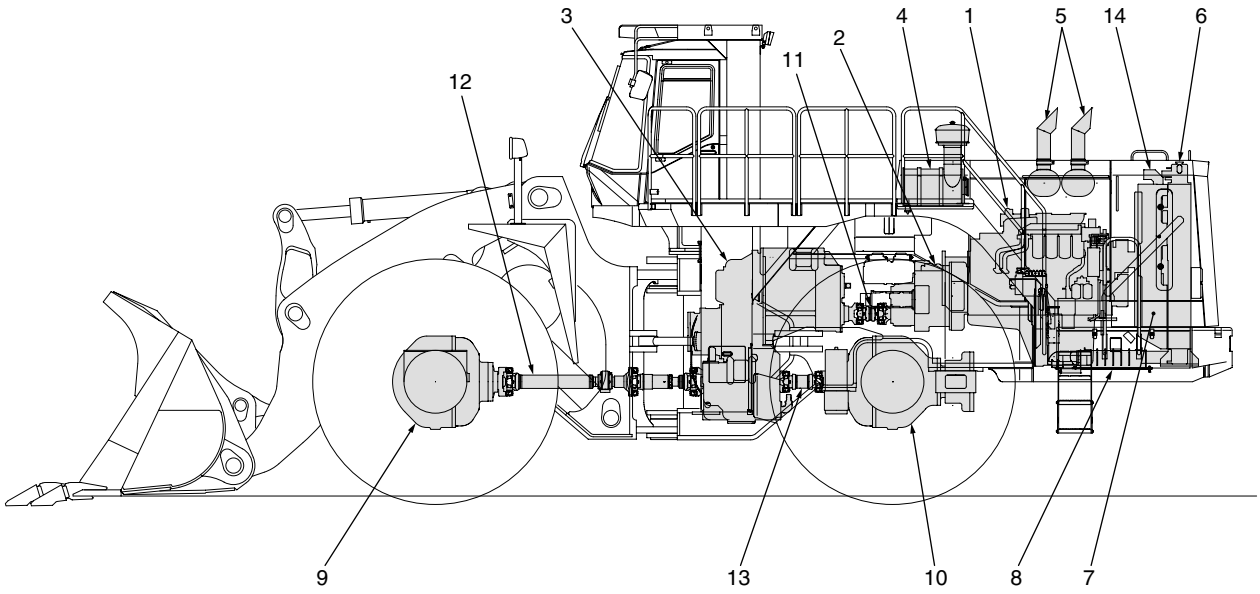
Layout of Main Components



135ZV00001

1. Engine
2. Torque converter
3. Transmission
4. Air cleaner
5. Muffler
6. Radiator
7. Hydraulic oil cooler
8. Torque converter oil cooler
9. Front axle assembly
10. Rear axle assembly
11. 1st propeller shaft
12. 2nd propeller shaft
13. 3rd propeller shaft
14. Engine charge air cooler

Recommended Lubricants

	Kind of Oil	Refill capacity (Approximate)	Ambient Temperature -22°F -4 14 32 50 68 86 104 -30°C -20 -10 0 10 20 30 40	Change Interval (Hours)
Engine	Engine oil (CH4)	142liter (37.5gal.)	SAE10W SAE10W-30 SAE15W-40	500
Transmission	Engine oil (CD) Mobil TRANSHD-10 ATF	200liter (52.8gal.)	SAE10W Mobil TRANS HD-10 Valvoline DT10 Multi-Purpose ATF	1,000
Hydraulic & Brake system	Engine oil (CD)	720liter (190.2gal.) ∗1 [310liter refill (81.9gal.)]	SAE10W	2,000
Differential & Planetary	Gear Lubricant	Front: 317liter(83.7gal.) Rear: 317liter (83.7gal.)	Mobil TRANS HD-50 Valvoline DT50	2,000
Fuel tank	Diesel fuel	1050liter (277.4gal.)	ASTM D975 No.1 ASTM D975 No.2	daily

Note: ∗1 shows "Hydraulic tank oil capacity at level gauge center."

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Engine — Use oil that meets engine oil classification API CH4 or CG4.
Engine oil drain intervals need to be reduced by 50% when fuel sulfur content exceeds 0.5%.

Transmission — Use engine oil classification API CD, SAE 10W
Use Mobil TRANS HD-10, Valvoline DT10 or equivalent.
Multi-purpose Automatic Transmission Fluid.
Never mix engine oil, Mobil TRANS HD-10, Valvoline DT10 and/or ATF.
TO-4 SAE30W or SAE15W-40 engine oil can be used for the machines operating in high ambient temperatures.

Hydraulic & Brake System — Use engine oil classification SAE 10W.
Use industrial-type hydraulic oils which are certified by suppliers having anti-wear, anti-foam, anti-rust and anti-oxidation additive properties for heavy duty use.
Never mix engine oil and hydraulic oil.

Differential & Planetary — Use Mobil TRANS HD-50, Valvoline DT50 or equivalent with 5% “Antichatter” additive or friction modifier.

Lubricating Grease — Use multipurpose-type EP/MOLY grease for most applications.
NLGI NO.2 grease is suitable for most temperatures.
NLGI NO.1 or NO.0 grease for extremely low temperature.
Use lithium base grease for a needle bearing.

Coolant

Coolant Specification

The machine is originally filled with Long Life Coolant which need not be replaced for the first two years or 3000 hours.

If Long Life Coolant (permanent type) is not used for the replacement, it should be replaced every six months.

Recommended Mixture of Antifreeze

Expected Minimum Ambient Temperature		-35 °C (-31 °F)	-30 °C (-22 °F)	-25 °C (-13 °F)	-20 °C (-4 °F)	-15 °C (5 °F)
Pure Water	(liter) (gal)	127 (33.5)	140 (37)	154 (40.7)	167 (44.1)	181 (47.8)
Antifreeze	(liter) (gal)	143 (37.8)	130 (34.3)	116 (30.6)	103 (27.2)	89 (23.5)
Mixture Ratio (%)		53	48	43	38	33

- Too much antifreeze in the coolant mixture may cause engine overheating.

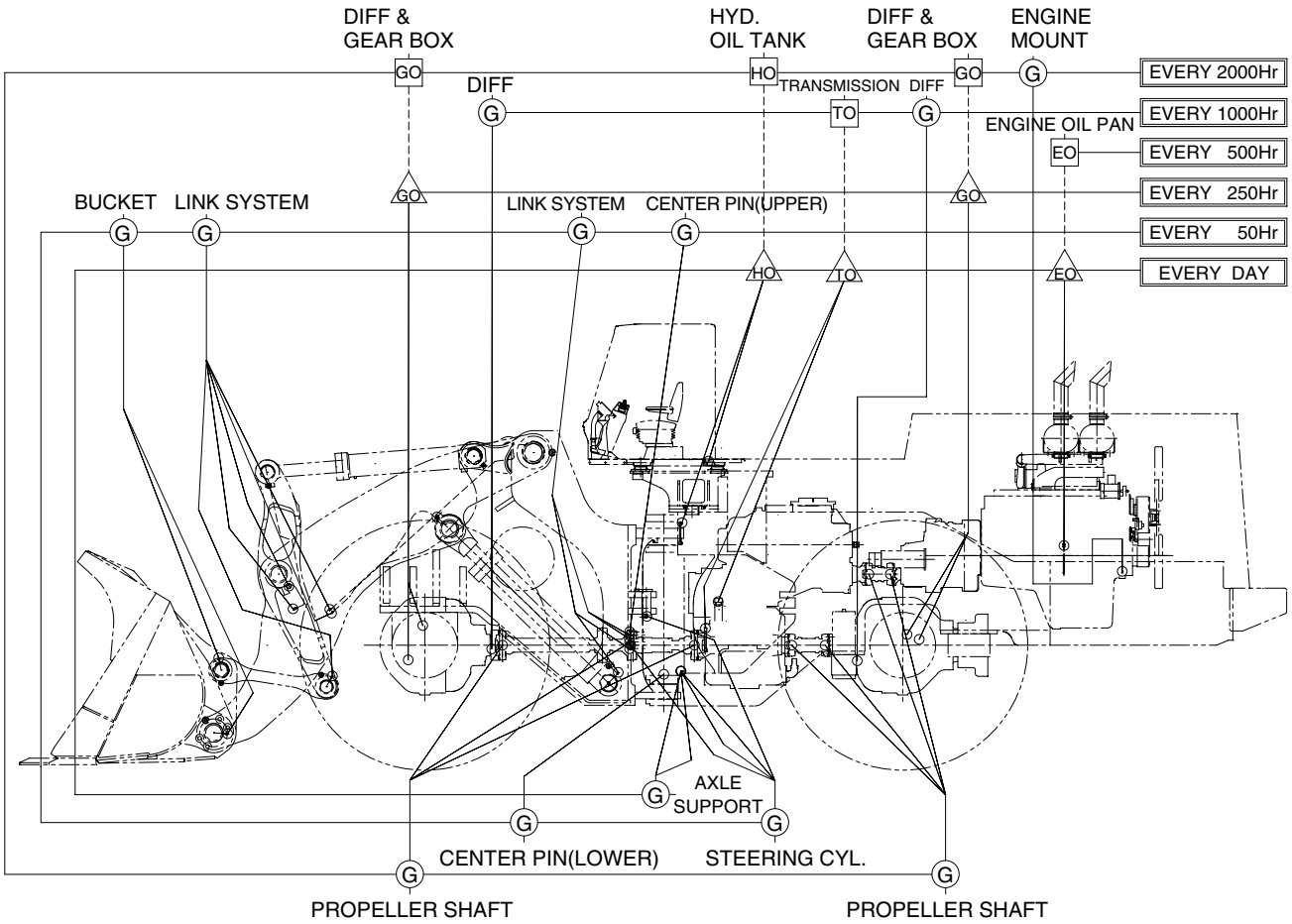
  Keep 33 % antifreeze mixture (same as the mixture for a minimum ambient temperature of -15 °C (5 °F)) if the engine overheats in a high ambient temperature.

- Do not use hard water or water with high levels of calcium and magnesium ions as the coolant water.

IMPORTANT

Do not mix different brands of antifreeze because they each contain special additives.
Careless mixing often diminishes the effect of these additives and causes packing damage or water leakage.

Lubrication Chart



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○ ·····Grease point
△ ·····Check and add if necessary
□ ·····Oil replacement

G ·····Multipurpose grease
GO·····Gear oil
EO ·····Engine oil

HO ·····Hydraulic oil
TO·····Engine oil

Weight of Main Components

Item			Approx. Weight (kg)	Approx. Weight (lb)	Remarks
Unit name	Part name				
Chassis	Bucket		7,100	15,650	RVT bucket
	Boom		5,900	13,000	
	" Z " -Lever		800/pc	1,760/pc	
	Link (Bucket to Lever)		165/pc	360/pc	
	Screen board		105	230	
	Engine room assembly		590	1,300	
	Hydraulic tank	Main tank	470	1,030	Excluding oil
		Sub tank	110	240	
	Fuel tank		610	1,345	Excluding fuel
	Deck	Left side	140	310	With handrail
		Right side	140	310	
		Center	75	165	
	Cab		335	740	
	Floor board		340	750	Including air conditioner unit and seat
	Rops		1,190	2,620	
	Front chassis		6,690	14,720	
	Rear chassis		6,300	13,860	
	Counterweight		1,125	2,480	
Power line	Engine		3,200	7,055	Excluding water and oil
	Radiator		970	2,140	Excluding water and oil
	Torque converter		500	1,100	Excluding oil
	Transmission		3,850	8,480	Excluding oil
	First propeller shaft		40	90	
	Second propeller shaft		210	460	
	Third propeller shaft		45	100	
	Air cleaner		25/pc	55/pc	
	Exhaust silencer (Muffler)		30/pc	65/pc	
	Front axle assembly		6,430	14,150	Excluding tires and oil
	Rear axle assembly		7,375	16,230	Excluding tires and oil (Including axle support)
	Differential	Front	1,180	2,600	
		Rear	1,270	2,800	
Hydraulic system	Multiple control valve		100	220	
	Steering valve		80	180	
	Hydraulic pump	Main	125	275	
		Switch	85	190	
		Triple	50	100	
	Boom cylinder		810/pc	1,780/pc	
	Bucket cylinder		385/pc	850/pc	
	Steering cylinder		130/pc	290/pc	
Other	Tire		2,900/pc	6,380/pc	With rim (45/65-R39); No Hydro Inflation
	Battery		60/pc	130/pc	

Bolt Tightening Torque

Hexagon Bolt

1) Thread type: Metric thread
Unified thread
2) Bolt strength: 8.8 (8T) ~ 10.9 (11T)
3) Thread pitch: Metric thread: Coarse pitch thread (C), fine pitch thread (F)
Unified thread: Coarse pitch thread (UNC), fine pitch thread (UNF)

(N-m)

Type	Bolt size			Bolt strength	
	Nominal Dimension	Nominal Dia.	Pitch	8.8 (8T)	10.9 (11T)
Metric thread	M8	8	(C) 1.25	26	38
	M10	10	(C) 1.5	53	76
			(F) 1.25	55	80
	M12	12	(C) 1.75	90	132
			(F) 1.25	96	142
	M14	14	(C) 2.0	142	206
			(F) 1.5	152	221
	M16	16	(C) 2.0	216	314
			(F) 1.5	226	330
	M18	18	(C) 2.5	299	436
			(F) 1.5	324	476
	M20	20	(C) 2.5	417	608
			(F) 1.5	451	662
	M22	22	(C) 2.5	559	814
			(F) 1.5	598	878
	M24	24	(C) 3.0	721	1,030
			(F) 2.0	770	1,128
	M27	27	(C) 3.0	1,030	1,520
			(F) 2.0	1,128	1,618
	M30	30	(C) 3.5	1,422	2,109
			(F) 2.0	1,569	2,256
	M33	33	(C) 3.5	1,912	2,844
			(F) 2.0	2,059	3,040
Unified thread	5/16	05	18 UNC	25	35
	3/8	06	16 UNC	44	65
	7/16	07	14 UNC	71	103
	1/2	08	13 UNC	103	147
	9/16	09	12 UNC	147	216
	5/8	10	11 UNC	201	294
	3/4	12	10 UNC	358	525
	7/8	14	9 UNC	554	809
	1	16	8 UNC	868	1,275

Note: Tighten the bolts according to the above list, unless otherwise specified.

(kgf-m)

Type	Bolt size			Bolt strength	
	Nominal Dimension	Nominal Dia.	Pitch	8.8 (8T)	10.9 (11T)
Metric thread	M8	8	(C) 1.25	2.7	3.9
	M10	10	(C) 1.5	5.4	7.8
			(F) 1.25	5.6	8.2
	M12	12	(C) 1.75	9.2	13.5
			(F) 1.25	9.8	14.5
	M14	14	(C) 2.0	14.5	21.0
			(F) 1.5	15.5	22.5
	M16	16	(C) 2.0	22.0	32.0
			(F) 1.5	23.0	33.7
	M18	18	(C) 2.5	30.5	44.5
			(F) 1.5	33.0	48.5
	M20	20	(C) 2.5	42.5	62.0
			(F) 1.5	46.0	67.5
	M22	22	(C) 2.5	57.0	83.0
			(F) 1.5	61.0	89.5
	M24	24	(C) 3.0	73.5	105.0
			(F) 2.0	78.5	115.0
	M27	27	(C) 3.0	105.0	155.0
			(F) 2.0	115.0	165.0
	M30	30	(C) 3.5	145.0	215.0
			(F) 2.0	160.0	230.0
	M33	33	(C) 3.5	195.0	290.0
			(F) 2.0	210.0	310.0
Unified thread	5/16	05	18 UNC	2.5	3.6
	3/8	06	16 UNC	4.5	6.6
	7/16	07	14 UNC	7.2	10.5
	1/2	08	13 UNC	10.5	15.0
	9/16	09	12 UNC	15.0	22.0
	5/8	10	11 UNC	20.5	30.0
	3/4	12	10 UNC	36.5	53.5
	7/8	14	9 UNC	56.5	82.5
	1	16	8 UNC	88.5	130.0

Note: Tighten the bolts according to the above list, unless otherwise specified.

(lb-ft.)

Type	Bolt size			Bolt strength	
	Nominal Dimension	Nominal Dia.	Pitch	8.8 (8T)	10.9 (11T)
Metric thread	M8	8	(C) 1.25	19.5	28
	M10	10	(C) 1.5	39	56
			(F) 1.25	40	59
	M12	12	(C) 1.75	66	97
			(F) 1.25	70	105
	M14	14	(C) 2.0	105	150
			(F) 1.5	110	160
	M16	16	(C) 2.0	160	230
			(F) 1.5	165	245
	M18	18	(C) 2.5	220	320
			(F) 1.5	235	350
	M20	20	(C) 2.5	305	450
			(F) 1.5	330	490
	M22	22	(C) 2.5	410	600
			(F) 1.5	440	650
	M24	24	(C) 3.0	530	760
			(F) 2.0	565	830
	M27	27	(C) 3.0	760	1,120
			(F) 2.0	830	1,190
	M30	30	(C) 3.5	1,050	1,550
			(F) 2.0	1,160	1,660
	M33	33	(C) 3.5	1,410	2,100
			(F) 2.0	1,520	2,240
Unified thread	5/16	05	18 UNC	18.0	26
	3/8	06	16 UNC	32	47
	7/16	07	14 UNC	52	76
	1/2	08	13 UNC	76	105
	9/16	09	12 UNC	110	160
	5/8	10	11 UNC	150	215
	3/4	12	10 UNC	265	385
	7/8	14	9 UNC	410	595
	1	16	8 UNC	640	940

Note: Tighten the bolts according to the above list, unless otherwise specified.

Flanged Hexagon Bolt

1) Bolt type: Metric thread
2) Bolt strength: 8.8 (8T)
3) Thread pitch: Coarse pitch thread (C)

(N-m)

Type	Bolt size		Bolt strength
	Nominal Dimension	Pitch	8.8 (8T)
Metric thread	M5	0.8	7
	M6	1	12
	M8	1.25	28
	M10	1.5	53
	M12	1.75	94
	M16	2	231
	M20	2.5	441
	M24	3	765

(kgf-m)

Type	Bolt size		Bolt strength
	Nominal Dimension	Pitch	8.8 (8T)
Metric thread	M5	0.8	0.7
	M6	1	1.2
	M8	1.25	2.9
	M10	1.5	5.4
	M12	1.75	9.6
	M16	2	23.5
	M20	2.5	45.0
	M24	3	78.0

(lb-ft)

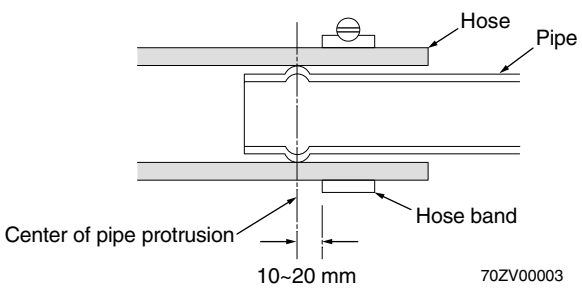
Type	Bolt size		Bolt strength
	Nominal Dimension	Pitch	8.8 (8T)
Metric thread	M5	0.8	5.0
	M6	1	8.6
	M8	1.25	20.9
	M10	1.5	38.9
	M12	1.75	69.1
	M16	2	169.2
	M20	2.5	324.0
	M24	3	561.6

Hose Band Tightening Torque

Low pressure hose (heat resisting hose)		Hose band	Tightening torque (N-m)	Tightening torque (kgf-cm)	Tightening torque (lb-ft)
Inner dia.(mm)	Outer dia.(mm)				
6.3	16.5	HH022W	1.6	16	1.2
7.9	18.5	HH022W			
9.5	20.5	HH022W			
12.7	24.5	HH027W	4	40	2.9
15.9	29.9	HH031W			
19.0	30.0	HH031W			
25.4	38.0	HH044W			
31.8	45.8	HH052W			
38.1	52.1	HH057W			
50.8	67.8	HH071W			
60.5	76.0	HH082W			
75.5	93.0	HH095W			

Low pressure hose		Hose band	Tightening torque (N-m)	Tightening torque (kgf-cm)	Tightening torque (lb-ft)
Inner dia.(mm)	Outer dia.(mm)				
6	16.5	HH022W	1.6	16	1.2
8	18.5	HH022W			
9	20.5	HH022W			
9	22.0	HH023W	4	40	2.9
12	24.5	HH027W			
12	26.0	HH027W			
15	29.0	HH031W			
15	30.5	HH031W			
19	32.0	HH038W			
19	34.0	HH038W			
25	39.5	HH044W			
25	41.5	HH044W			
32	46.0	HH052W			
32	48.0	HH052W			
38	54.0	HH057W			
50	70.5	HH076W			
50	73.0	HH076W			

To connect the hose to the pipe, tighten the hose band at the following position:



Liquid Gasket and Screw Lock Agent

To reassemble the disassembled parts, be sure to use the specified liquid gasket or screw lock agent or the equivalent according to the following lists:

	Code	Manufacturer	Product name
Liquid Gasket	AA01	Loctite®	Plastic Gasket 568
	AA02	Loctite®	Hydraulic sealant
	AA03	Three Bond	Three Bond 1215
Screw Lock Agent	AB01	Loctite®	Loctite® 262
	AB02	Three Bond	Three Bond 1327
	AB03	Three Bond	Three Bond 1374

Cautions regarding parts removal

If a screw or shaft to be removed has been locked by one of the above agents, remove the screw or shaft using a general tool, such as a wrench or puller.

If it is difficult to remove the screw or shaft, heat the bolt to soften the agent (200 to 250°C) using a soldering iron or gas torch.

Caution: If there is a seal near the screw or shaft to be removed, carefully use the heating method for removal, to avoid damage to the seal.

If heat has been used to remove the bolt a new bolt should be used during reassembly.

Cautions regarding reassembly

To reassemble a screw:

Completely remove the hardened lock agent from the screw and the threaded hole before reassembling the screw.

Note: A piece of hardened lock agent may be peeled off and remain in the component. The remaining piece may cause malfunction during fastener installation.

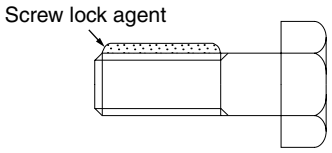
To bond a plane or to fit a shaft:

Remove the hardened lock agent using a wire brush or the like, and polish the surface using sand paper. Use of a loctite primer like Locquic® Primer T cleans threads and speeds curing time.

Screw lock agent application procedure

Through-hole

Apply screw lock agent one or two lines on the male threads.



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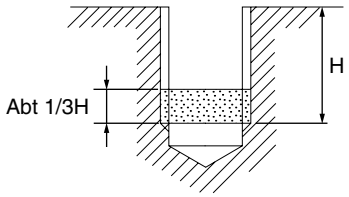
Blind hole

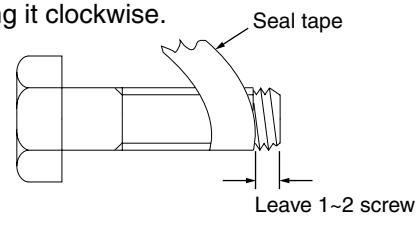
Apply screw lock agent all-round on the female threads at 1/3 of the female thread length from the bottom.



65ZV00003

How to wind a seal tape

To avoid a piece of seal tape left in the circuit, leave 1 or 2 screws from the end of the thread and start threading it clockwise.



65ZV00004

Antiseize Agent

Code	Manufacturer	Product name
AC01	Loctite®	Loctite® 767 (Paste or spray)

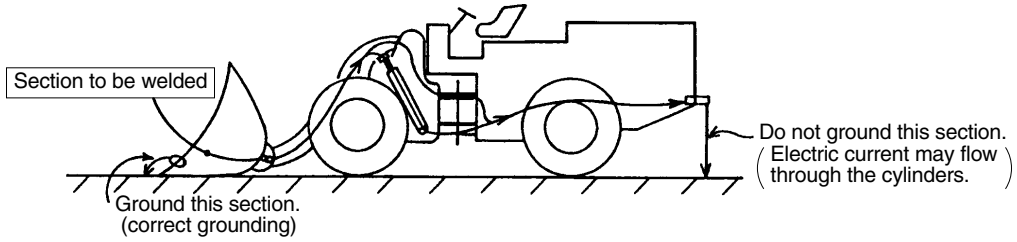
Cautions Regarding Welding Repair Service

If welding is needed to repair the chassis, observe the following precautions to protect the hydraulic cylinders, hydraulic units, gear sets, and electrical units from possible damage.

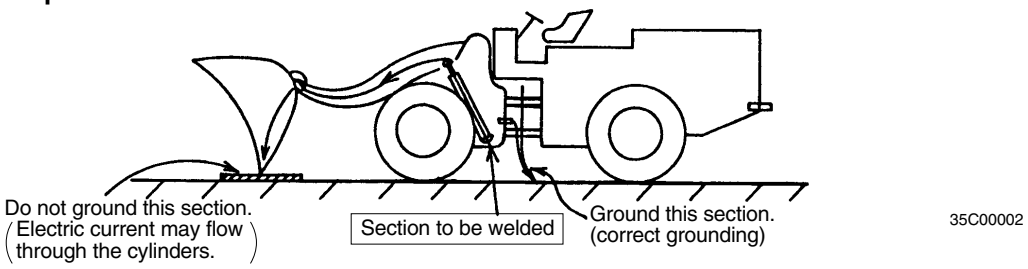
Cautions:

1) Turn the starter switch OFF.
2) Remove the battery terminals both positive and negative sides from the battery.
3) Turn OFF controller circuit protector.
4) Route welding leads away from machine to avoid inductive voltage transfer.
5) Ground the welder near the section to be welded.
6) To ground the welder, check that the electric current will not flow through the cylinders.
   Cylinder head covers for some models have a low-conductive metal that will cause spark if the welding current flows through it. The spark may damage the cylinder rod or other parts.

Example 1:

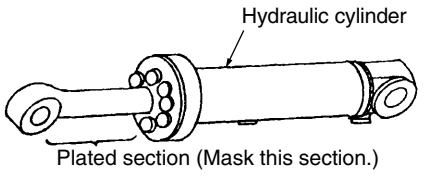


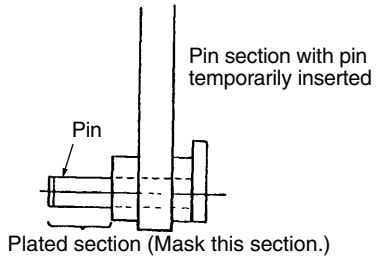
Example 2:



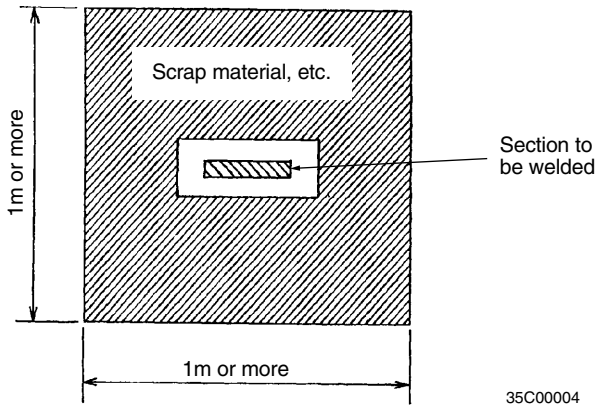
7) The weld spattered on the hydraulic cylinders and on the plated sections of pins will damage the cylinders and pins. There are other parts that may be damaged by the spatter; hydraulic units, harnesses, hydraulic hoses, and nylon tubes.
Be sure to mask these units and parts before welding.

a) Plated section
Cover the plated sections with heat-resistant cloth, such as glass wool or canvas.
Note: The weld spattered on the plated sections causes corrosion.

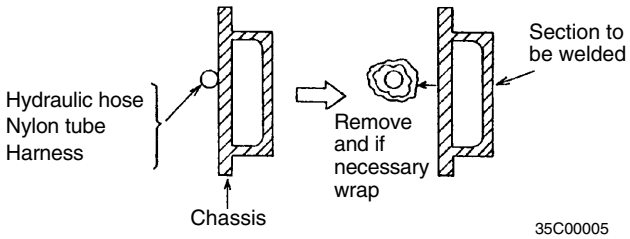




b) Cover the hydraulic units, electrical units, harnesses, hydraulic hoses, nylon tubes, etc. with heat-resistant cloth (glass wool or canvas) or scrap material to protect them from spatter.



c) Hydraulic hoses, nylon tubes, or harnesses are easily damaged by the heat during welding. To protect them from the heat, remove them from the section to be welded to make enough clearance.



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