Overall

1. Main Data

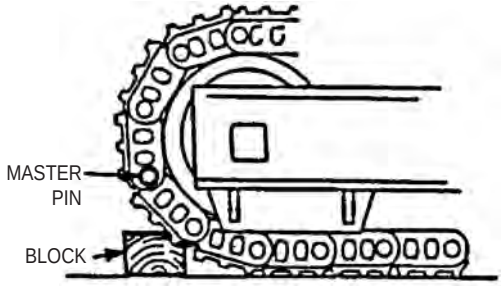
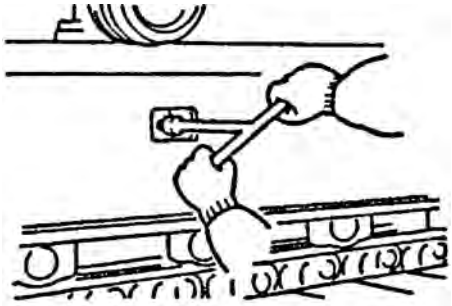
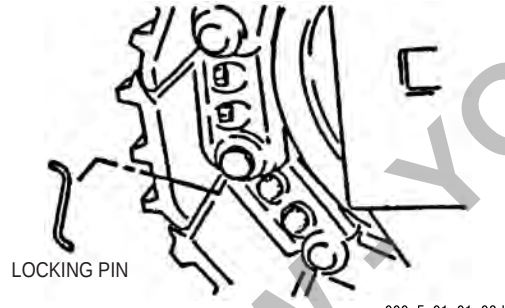
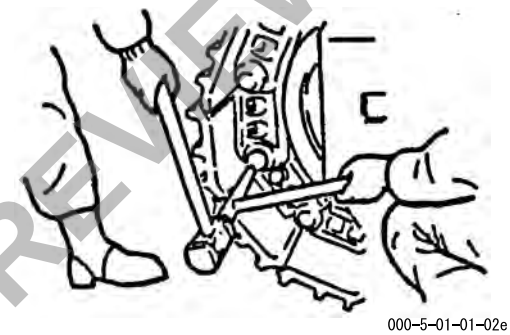
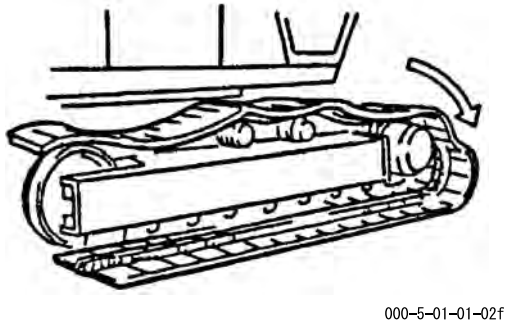
Model name	135	135 (BLADE)
Operating weight	29750 lb	

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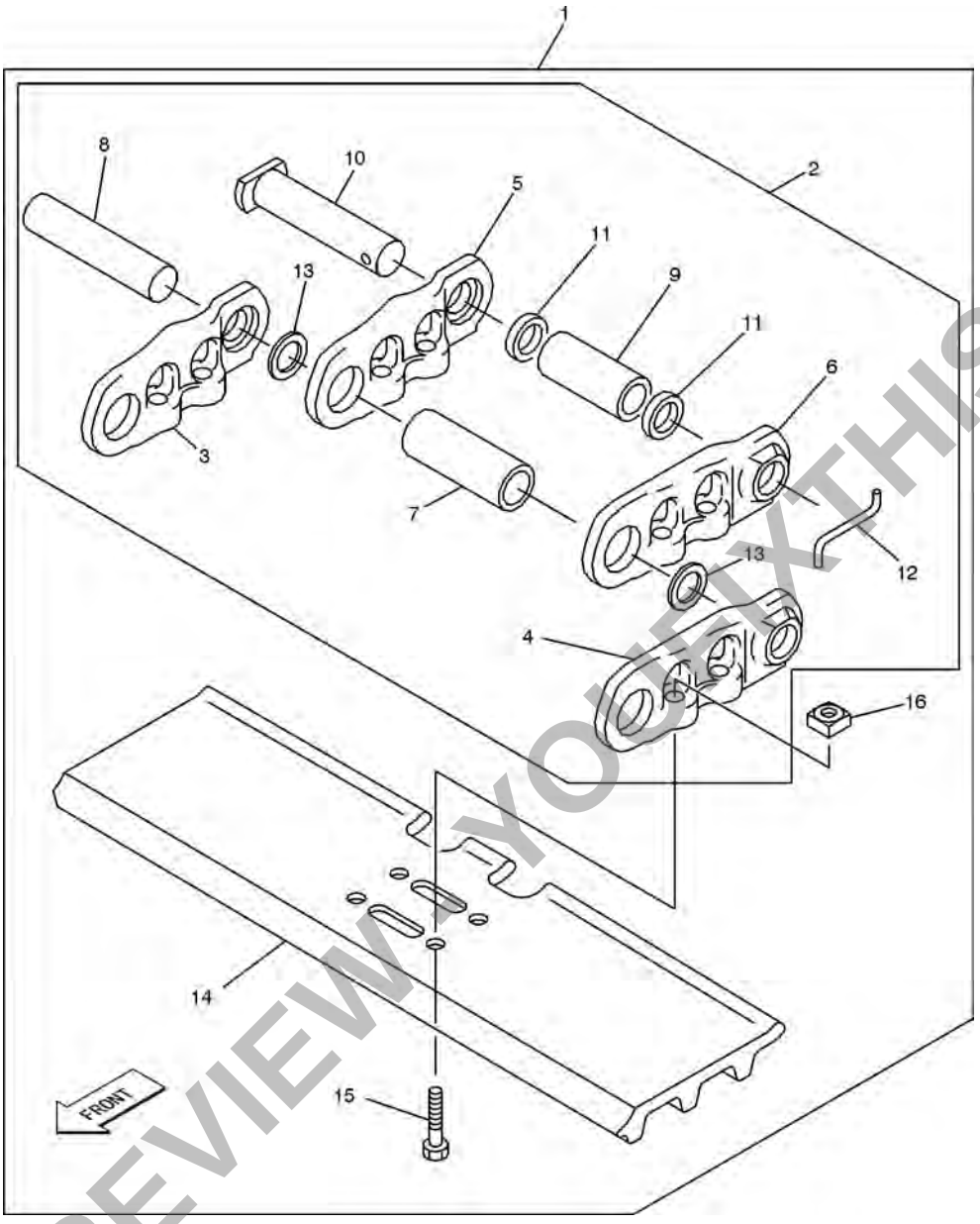
1. Disassembly

1	 000-5-01-01-02b	Position the master pin of the track shoe as shown in the drawing on the left. Place track shoe support blocks as shown in the drawing.
2	 000-5-01-01-02c	Loosen the track shoe. **CAUTION:** Discharge the grease from the grease cylinder gradually by loosening the cylinder check valve. Loosen the check valve slowly and carefully. Stop loosening when the grease starts to comes out. (If the valve is loosened too much, the extremely high pressure inside may cause grease to erupt or the plug to pop out.)
3	 000-5-01-01-02d	Separate the track shoe. ・ Remove the locking pin. ・ Pull out the master pin using a jig. ・ Remove the track shoe supporting blocks.
4	 000-5-01-01-02e	
5	 000-5-01-01-02f	Lift one side of the lower frame about 20 cm and hold it there. **CAUTION:** Place protection blocks under the lower frame and secure them. Move the travel unit as shown in the drawing to the left to remove the track shoe.

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Track Shoe

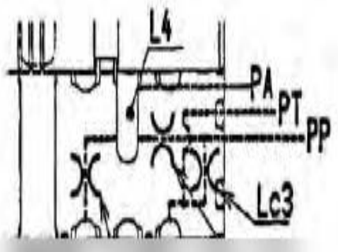


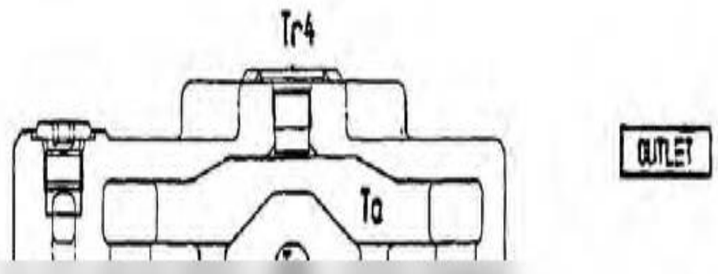
SYMBOL	PART NAME
1	GROUSER SHOE
2	TRACK LINK ASSEMBLY
3	TRACK LINK (RIGHT)
4	TRACK LINK(LEFT)
5	MASTER LINK (RIGHT)
6	MASTER LINK(LEFT)
7	TRACK BUSHING
8	TRACK PIN
9	MASTER BUSHING
10	MASTER PIN
11	COLLAR
12	LOCKING PIN
13	SEAL
14	SHOE PLATE
15	SHOE BOLT
16	SHOE NUT

000–5–01–01–02a

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Electrical Components and Wiring for Upper Frame (Frame)



DESCRIPTION	SYM	QTY
PRESS SENSOR (5 MPa) G1/4	1	3
HORN (KF2L-24)	2	1

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3. Diagnostic Trouble Code (monitor display)

Trouble contents	Diagnostic trouble code	Main symptoms when trouble occurs	Diagnostic trouble code display conditions	Back-up function	Conceivable cause	Patterns for recovery from trouble
No pump pressure send (2nd stage)	1093	Engine vibration, idle instability, drop of output power, rev-up defect, black smoke, engine stalling	The ratio for the fuel flow command signal to the SCV is 33 % or less. Differential pressure send amount is 2800 mm^3/s or longer When any of the above occurs and the condition below At 1200 rpm or higher, actual rail pressure is 5075 psi or more below the target rail pressure for 5s or longer	Multi-injection stop Target common rail pressure upper limit (11600 psi)	Fuel system clogged, line (hose) blocked Charge fuel pump defect (discharge defect) Wiring defect (short) between ECM and common rail pressure sensor Injector defect Supply pump defect Common rail pressure sensor defect (common rail) Pressure limiter defect (common rail)	1
Faulty boost temperature sensor (abnormally low voltage)	1112	Nothing in particular	The boost temperature sensor voltage is 0.1 V or lower for 4 s or longer.	No backup	Wiring defect (disconnection, short, high resistance) between ECM and boost temperature sensor Boost temperature sensor defect ECM internal defect	*2
Faulty boost temperature sensor (abnormally high voltage)	1113	Nothing in particular	The boost temperature sensor voltage is 4.95 V or higher for 4 s or longer.	No backup	Wiring defect (disconnection, short, high resistance) between ECM and boost temperature sensor Boost temperature sensor defect ECM internal defect	*2
Overheat	1173	Drop of output power If the coolant temperature exceeds 226.4℉ during overheating, the fuel flow is restricted.	The coolant temperature is higher than 248℉ for 5 s or longer.	No backup	Wiring defect (short) between ECM and engine coolant sensor Engine cooling system trouble (radiator clog or the like) Engine coolant level too low Engine coolant sensor defect	2
Faulty injection nozzle common 1 drive system	1261	Engine vibration, idling instability, drop of output power Possibility of rev-up defect, engine stalling	Injector monitor inputs for all common 1 system No signal for 3 s or longer	Common 1 stop (No. 1, 4 cylinder stop) EGR stop	No 1, 4 injector harness defect (disconnection, short) Injector defect ECM defect	1
Faulty injection nozzle common 2 drive system	1262	Engine vibration, idling instability, drop of output power Possibility of rev-up defect, engine stalling	Injector monitor inputs for all common 2 system No signal for 3 s or longer	Common 2 stop (No. 2, 3 cylinder stop) EGR stop	No 2, 3 injector harness defect (disconnection, short) Injector defect ECM internal defect	1
CMP sensor out of phase	1345	No fault during engine rotation, but when it is stopped once, it cannot be restarted.	No correct CMP sensor pulse in crank gap position	No change when error occurs (shift to crank sensor) However, engine cannot be restarted.	Wiring defect (disconnection, short, high resistance) between ECM and CMP sensor Camshaft gear installation defect Flywheel installation defect	1
Faulty main relay	1625	Engine starting difficulty, power supply not cut off	Main relay input power supply voltage 1 V or lower for 2 s or longer Even when the main relay coil OFF command is issued, the relay does not cut off within 5 s	No backup	Wiring defect (disconnection, short, high resistance) between ECM and main relay Wiring defect (disconnection, short, high resistance) with fusible link main relay Main relay defect ECM internal defect	2
Faulty A/D conversion	1630	Drop of output power, black smoke	Analog / digital conversion not possible	Analog sensor system default processing (sensors operating with default values, because conversion not possible) Multi-injection stop Target common rail pressure upper limit (11600 psi)	ECM internal defect	2
Faulty 5 V power supply 2 voltage (atmospheric pressure sensor power supply)	1632	Black smoke at high altitudes, insufficient output at low altitudes	Key switch power supply voltage 5.5 V or higher or 4.5 V or lower for 0.5 s or longer	EGR control stop Default value setting 11.6 psi (equivalent to 2500 m {8202.1 ft})	Power supply circuit wiring defect (short) between ECM and atmospheric pressure sensor ECM internal defect	2
Faulty 5 V power supply 3 voltage (engine oil pressure sensor)	1633	Poor starting and black smoke at low temperatures	Key switch power supply voltage 5.5 V or higher or 4.5 V or lower for 0.5 s or longer	Control using default values	Power supply circuit wiring defect (short) between ECM and oil pressure sensor ECM internal defect	2
Faulty 5 V power supply 4 voltage (boost pressure sensor)	1634	Black smoke	Key switch power supply voltage 5.5 V or higher or 4.5 V or lower for 0.5 s or longer	Control using default values	Power supply circuit wiring defect (short) between ECM and boost pressure sensor ECM internal defect	2
Faulty 5 V power supply 5 voltage (common rail pressure sensor, EGR position sensor)	1635	Possibility of poor engine rev-up, drop of output power, back smoke, engine stalling	Key switch power supply voltage 5.5 V or higher or 4.5 V or lower for 0.5 s or longer	Control using default values	Power supply circuit wiring defect (short) between ECM and common rail pressure sensor ECM internal defect	2
Faulty CAN bus	2104	Engine speed down to 1500 rpm (1700 rpm for 240).	Engine rotation that computer A sends with CAN stops for 1 s or longer.	Engine speed down to 1500 rpm.	Wiring defect (disconnection, short, high resistance) between ECM and computer A ECM internal defect Computer A internal defect	2
Faulty CAN time-out	2106	Control from actual machine side stops working because CAN communication become impossible. Engine speed down to 1500 rpm (1700 rpm for 240).	Engine rotation that computer A sends with CAN stops for 2 s or longer.	Engine speed down to 1500 rpm.	Wiring defect (disconnection, short, high resistance) between ECM and computer A ECM internal defect Computer A internal defect	2
No pump pressure send (fuel leak)	0087	Possibility of engine vibration, idle instability, drop of output power, black smoke, excess output	Actual rail pressure of 2900 psi or lower for 3 s or longer	Multi-injection stop Target common rail pressure upper limit (11600 psi)	Fuel system clogged (element), line (hose), etc. blocked Wiring defect (short) between ECM and common rail pressure sensor Injector defect Common rail pressure sensor defect Supply pump defect Pressure limiter defect	1

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Tightening Bolts and Nuts

- Tighten bolts and nuts right to left and up and down alternately so that tightening force is applied evenly.



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Swing Unit

Problems and Remedies

Problem	Cause	Remedy
Pressure does not rise (swing motor does not rotate).	Relief pressure in circuit is not set correctly.	Adjust pressure to the specified value.
	Poppet is sticking.	Repair or replace section that is sticking in relief valve. Disassemble and clean.
	Throttle in poppet is blocked..	
	Hydraulic oil leaks from poppet seat	Check seat and replace if damaged.
	Hydraulic oil leaks from anti-reverse valve seat.	Replace the anti-reverse valve cartridge or block.
Pressure rises (swing motor does not rotate).	Overloaded.	Remove load.
	Moving part is seized.	Check and repair inside of motor.
	Release pressure is influencing brake.	Check pressure in brake circuit. Check brake switch-over valve.
	Brake piston is sticking.	Disassemble and check braking section.
	Friction plate is seized.	Disassemble and check. Replace seized portion.
Swing motor does not reach specified revolution.	Insufficient oil inflow.	Check pump delivery and circuit to motor.
	Excessive leakage from sliding parts.	Check oil temperature. If it is hot, find out why. Check oil viscosity and replace with appropriate oil. Disassemble to check and replace parts that are worn out.
Insufficient braking torque.	Friction plate is worn.	Disassemble to check and replace parts that are worn out.
	Brake piston is sticking.	Disassemble and check.
	Unable to release brake pressure.	Check circuit pressure. Check brake switch-over valve.
	The spline on friction plate is damaged.	Disassemble to check and replace parts that are worn out.
When external driving torque acts on hydraulic motor, motor slips a lot.	Relief pressure in the circuit is not set correctly.	Adjust pressure to specified value.
	Poppet is sticking.	Repair or replace portion sticking in the relief valve. Disassemble and clean.
	Hydraulic oil leaks from poppet seat.	Check seat and replace if damaged.
	Seat section in make-up check is leaking.	Check seat section and repair if repairable. If not repairable, replace the motor.
	Hydraulic oil leaks from anti-reverse valve seat section.	Replace anti-reverse valve cartridge or block.
Oil leaks from oil seal.	Pressure in motor casing is abnormally high, and oil seal is damaged.	Check drain piping for abnormality and repair or replace if necessary.
Oil flow in reduction gears increases, and viscosity is low.	Oil seal is damaged by dirt blocked in seal lips.	Replace oil seal.

⚠	**CAUTION** When swing motors or reduction gears are disassembled/reassembled, it may be necessary to carry out adjustments under the bench test to maintain the proper motor performance.

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Hydraulic Circuit Section
- Port Locations
  - Hydraulic Pump
  - Control Valve (MONO BOOM)
  - Control Valve (MONO BOOM with Blade)
  - Control Valve (OFFSET BOOM with Blade) (Option for Europe)
- Pilot Hose Connection Diagrams
  - Pilot P & T Line
  - Pilot Control Line
- Functional Description
  - List of Functions
  - Control Valve Configuration Table
    - Overview
- Travel Circuits
  - High Speed Travel Circuit
  - Low Speed Travel Circuit
  - Straight Travel Circuit (simultaneous operation of travel forward and boom-up)
- Swing Circuits
  - Swing Parking Circuit (independent operation of swing)
  - Swing Priority Variable Throttle Circuit
- Arm Circuits
  - Arm-in / Arm-out 2-speed Circuit
  - Arm-in Load Holding Valve Circuit
  - Arm-in Forced Regenerative Circuit
- Boom Circuits
  - Boom-up 2-speed Circuit
  - Boom-down Load Holding Valve Circuit
  - Boom-down Regenerative Circuit
  - Boom-down Windage Prevention Circuit
- Option Circuits
  - Breaker and Crusher Circuit (2-speed confluence crusher circuit)
  - Breaker and Crusher Circuit (option line holding valve)
  - Breaker and Crusher Circuit (breaker circuit)
  - Secondary Option Shuttle Circuit

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5. Recoil Spring

Item	135 (MONO BOOM SPEC.)	135 (MONO BOOM SPEC. WITH DOZER BLADE)
	Part No.	Weight (lb)
Yoke	KMA1299	33.3
Sems B M16 x 50	105R016Y050R	1.8
Threaded rod	KMA1300	30
Groove height N M30 x 2	165R056HSN	1.3
SP pin 6 x 56	338W080Z080B	-
Recoil spring	KNA10530	72.1
Grease cylinder assembly	KNA0338	31.7
Assembly	Total	170.1
	Mounting length of spring	16.5 in

6. Shoes

	135 (MONO BOOM SPEC.)	135 (MONO BOOM SPEC. WITH DOZER BLADE)
	Part No.	Weight or Quantity
500 grouser	KNA10590	1567 lb
Link	KNA10690	1 set
Shoes	KNA0632	43
Bolt	KNA0396	172
Nut	KNA0397	172
600 grouser	KNA10660	1747 lb
Link	KNA10690	1 set
Shoes	KNA0775	43
Bolt	KNA0396	172
Nut	KNA0397	172
700 grouser	KNA10670	2080 lb
Link	KNA10690	1 set
Shoes	KNA0776	43
Bolt	KNA0396	172
Nut	KNA0397	172
500 geo grip	KNA10610	1652 lb
Link	KNA10690	1 set
Shoes	KNA1283	43
Bolt	KNA0396	172
Nut	KNA0397	172

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NOTES:

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Travel Circuits

High Speed Travel Circuit

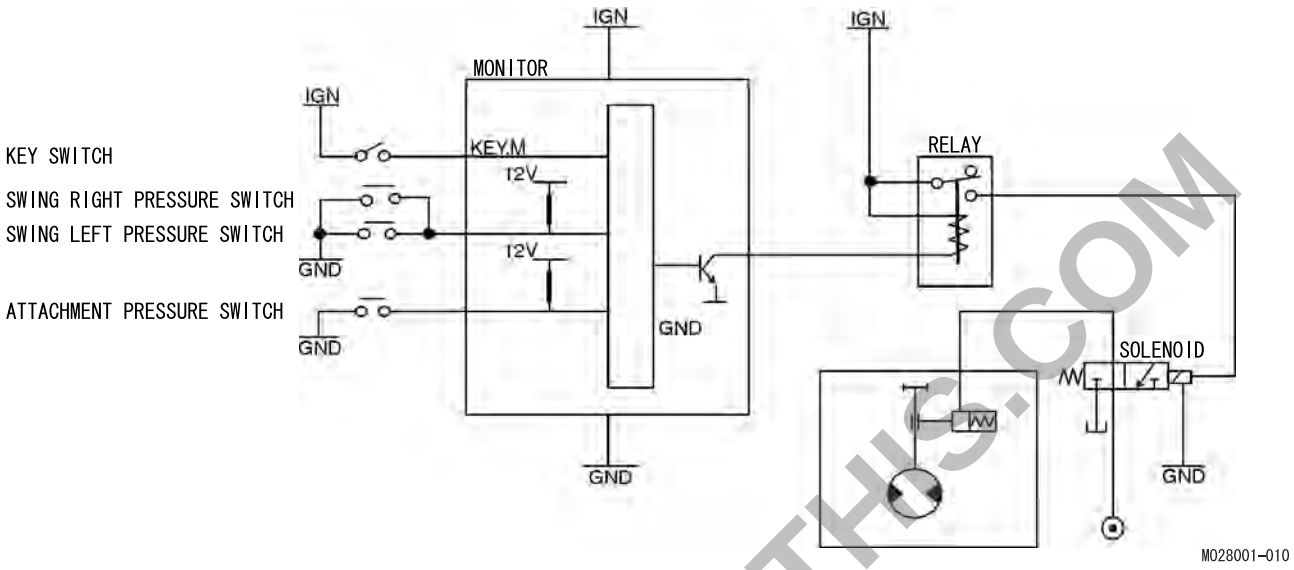
With High Speed Travel, high speeds can be achieved by setting the two-stage incline angle of the travel motor to the smaller angle. The circuit has a travel motor, which switches over to lower speeds by utilizing load pressure on the travel motor while traveling at high speeds.

Discharged oil from A1 enters port P2 at the control valve entry, while discharged oil from A2 enters port P1 at the control valve entry. Each flow goes into the travel motor through the switch-over of the left and right travel spools to obtain forward/backward travel of the machine. To obtain high speeds, electronic signals are sent to the switch panel through the travel change-over switch. Then electronic signals are sent to the solenoid valve for 2-speed travel in the assembly valves to switch the solenoid valves. This enables the original pilot pressure (3.9 MPa {570psi}) from port C1 of the assembly valves to be connected with port P of the left and right travel motors through the central joint. The original pressure (3.9 MPa {570psi}) that entered port P of the left and right travel motors positions the incline angle of the travel motor to the smaller angle, enabling faster speeds.

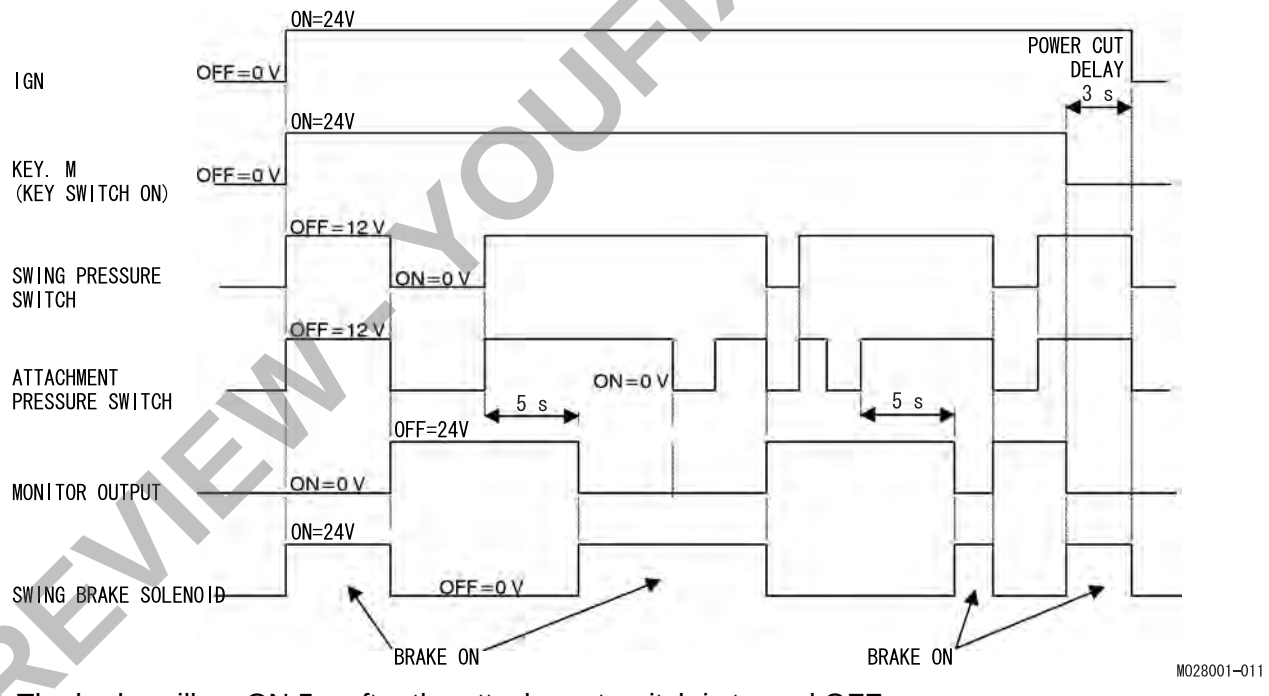
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2. Swing Brake

[1] Configuration



[2] Operation

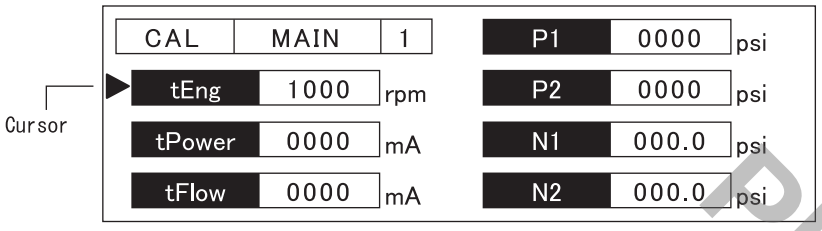


- The brake will go ON 5 s after the attachment switch is turned OFF.
- The brake will go ON 3 s after the power cut delay.

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5. CAL (troubleshooting support) Screen

(1) Operation



[1] View mode (screen switching operation)

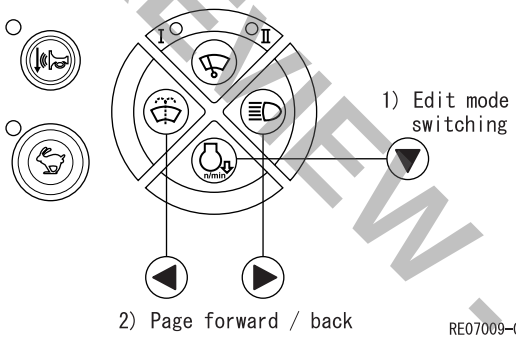
1) Switching to edit mode

Hold down the auto idle switch for 1s. The mode switches to edit mode and the cursor is displayed.

2) Page forward / back

Forward operation . light switch

Back operation..... washer switch



[2] Edit mode (setting change operation)

1) Cursor up / down

Up operation..... wiper switch

Down operation ..... auto idle switch

2) Numeric value increase / decrease

Increase value ..... light switch

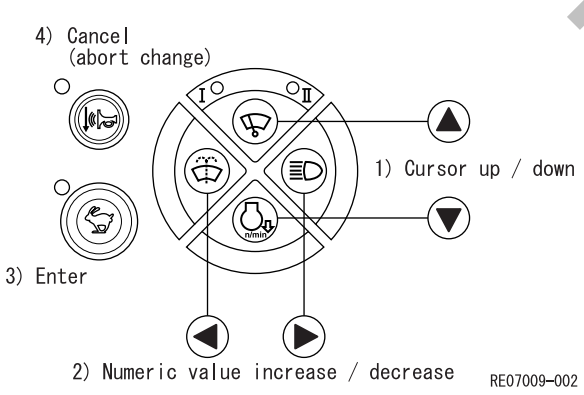
Decrease value..... washer switch

3) Enter

Enters the set contents.

4) Cancel

Use the travel high-speed select switch or the horn volume select switch to cancel. Exits edit mode and shifts to view mode. (The cursor disappears.)



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List of Common Features and Compatibility of Major Parts

Common features ○: Common parts △: Partially different ×: Different

Compatibility ←○→: Compatible in both directions —○→, —×→, ←○—, ←×—: Compatible in one direction ←×→: Not compatible in either direction

Part Name	Model 3 (MONO BOOM)	Compatibility	Model 3B (MONO BOOM)	Compatibility	Model 5	Common Features	Remarks
Travel motor	KNA10460	←×→	KNA10520	←○→	KNA10520	○	
Shoe / link (iron) ASSY	KNA10590	←○→	KNA10590	←○→	KNA10590	○	
Shoe alone	KNA0632	←○→	KNA0632	←○→	KNA0632	○	
Link ASSY	KNA10690	←○→	KNA10690	←○→	KNA10690	○	
Shoe / link (link chain) ASSY	KNA10610	←○→	KNA10610	←○→	KNA10610	○	
Shoe alone	KMA1283	←○→	KMA1283	←○→	KMA1283	○	
Link ASSY	KNA10690	←○→	KNA10690	←○→	KNA10690	○	
Lower roller	KNA0693	←○→	KNA10600	←○→	KNA10600	○	
Upper roller	KMA1275	←○→	KMA1275	←○→	KMA1275	○	
Take-up roller	KMA1265	←○→	KNA11040	←○→	KMA11040	○	
Drive sprocket	KNA0826	←○→	KNA0826	←○→	KNA0826	○	
Center joint	KRA1875	←×→	KRA11190	←○→	KRA11190	○	
Counterweight	KMB0531	←×→	KMB10790	←×→	KNB10810	×	
Turntable bearing	KMB10350	←×→	KMB10410	←○→	KMB10410	○	
Swing motor	KMC0093	←○→	KMC10010	←○→	KMC10010	○	Only the level gauge position differs (model 3 VS3B)
Engine	KMH0863	←×→	KNH10510	←○→	KNH10510	○	
Radiator / oil cooler / inter cooler	KMH0831	←×→	KMH10810	←×→	KNH10570	×	
Air cleaner ASSY	KMH0775	←×→	KMH10070	←×→	KLH10150	×	
Muffler	KNH0761	←×→	KMH10680	←×→	KLH10140	×	
Fuel tank	KMH0777	←×→	KMH10650	←×→	KNH10480	×	
Hydraulic pump	KMJ2937	←×→	KMJ119200	←×→	KNJ11860	×	
Control valve	KMJ10660	← ○ →	KMJ10660	←×→	KNJ14660	×	
Remote control valve (operation)	KHJ2911	← ○ →	KHJ2911	←×→	KHJ13290	×	Secondary pressure setting differs
Remote control valve (travel)	KHJ1969	←○→	KHJ1969	←×→	KRJ5803	×	
Hydraulic oil tank	KHJ2948	←×→	KMJ11820	←×→	KNJ14110	×	
Operator's cab	KHN18490	←×→	KHN19160	←×→	KHN16482	×	
Operator's seat	KHN3245	←○→	KHN3245	←×→	KHN11470	×	
Monitor	KHR4104	←○→	KHR4104	←×→	KHR10051	×	
Air conditioner Unit G	KHR3926	←○→	KHR20020	←×→	KHR13320	×	
Boom	KMV11710	←○→	KMV11790	←×→	KNV16450	×	
Arm	KMV2722	←○→	KMV2722	←×→	KNV16530	×	
Boom cylinder (R.H)	KMV2542	←○→	KMV13960	←×→	KNV14330	×	
(L.H)	KMV13210	←○→	KMV13970	←×→	KNV14340	×	
Arm cylinder	KNV1617	←○→	KNV1617	←×→	KNV14350	×	
Bucket cylinder	KMV2545	←○→	KMV2545	←×→	KNV12540	×	

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Major Equipment Table

5. Recoil Spring

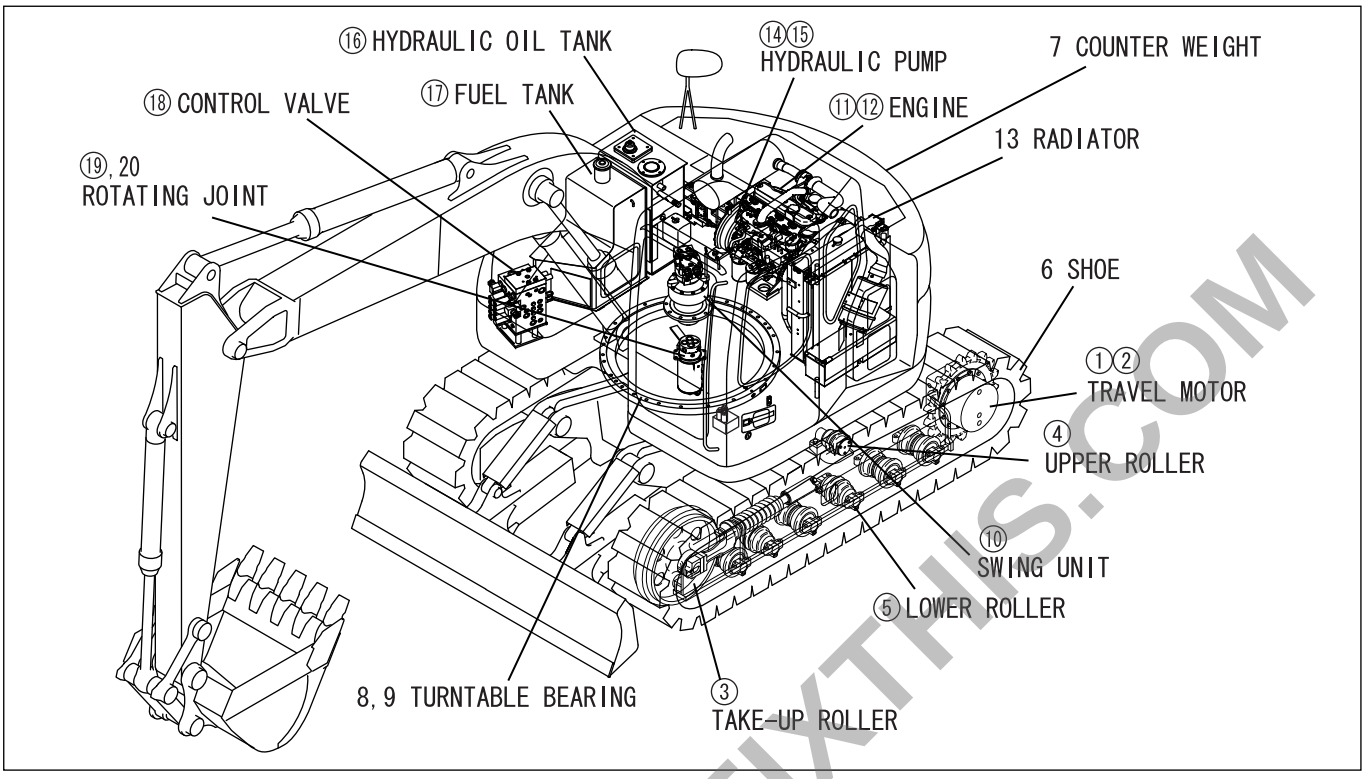
Item	135 (MONO BOOM SPEC.)	135 (MONO BOOM SPEC. WITH DOZER BLADE)
	Part No.	Weight (lb)
Yoke	KMA1299	33.3
Sems B M16 x 50	105R016Y050R	1.8
Threaded rod	KMA1300	30
Groove height N M30 x 2	165R056HSN	1.3
SP pin 6 x 56	338W080Z080B	-
Recoil spring	KNA10530	72.1
Grease cylinder assembly	KNA0338	31.7
Assembly	Total	170.1
	Mounting length of spring	16.5 in

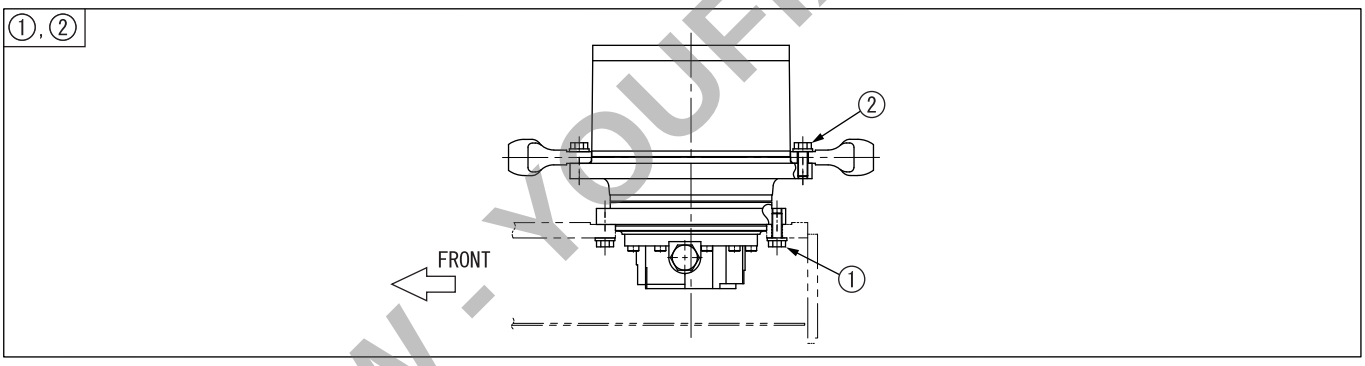
6. Shoes

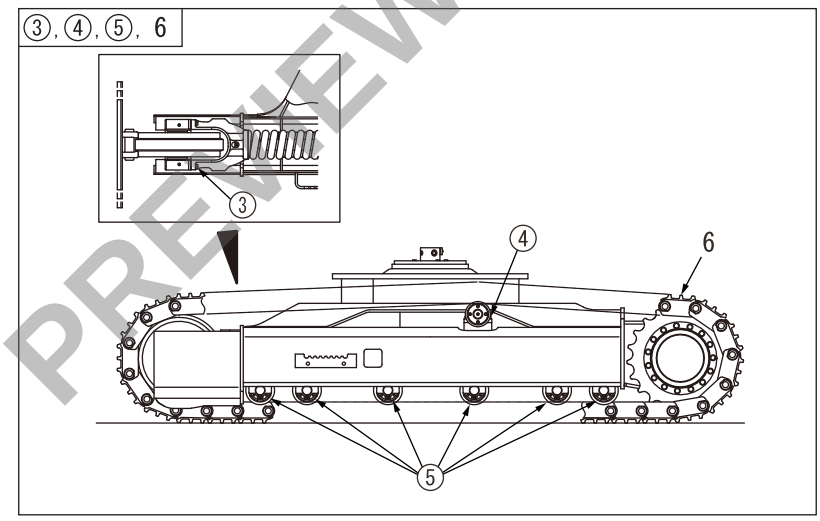
	135 (MONO BOOM SPEC.)	135 (MONO BOOM SPEC. WITH DOZER BLADE)
	Part No.	Weight or Quantity
500 grouser	KNA10590	1567 lb
Link	KNA10690	1 set
Shoes	KNA0632	43
Bolt	KNA0396	172
Nut	KNA0397	172
600 grouser	KNA10660	1747 lb
Link	KNA10690	1 set
Shoes	KNA0775	43
Bolt	KNA0396	172
Nut	KNA0397	172
700 grouser	KNA10670	2080 lb
Link	KNA10690	1 set
Shoes	KNA0776	43
Bolt	KNA0396	172
Nut	KNA0397	172
500 geo grip	KNA10610	1652 lb
Link	KNA10690	1 set
Shoes	KNA1283	43
Bolt	KNA0396	172
Nut	KNA0397	172

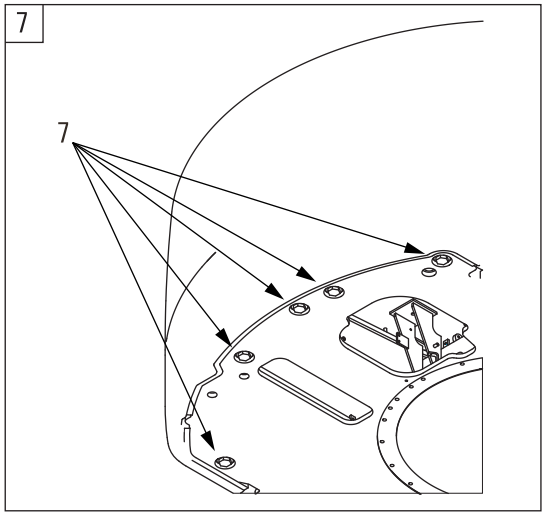
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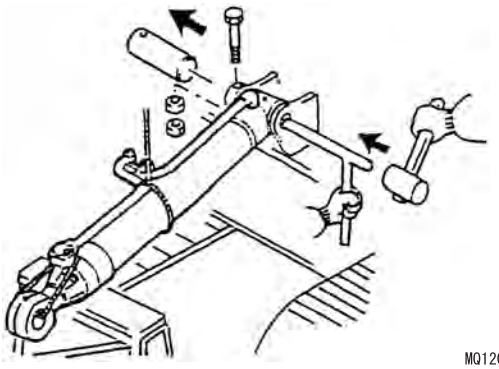
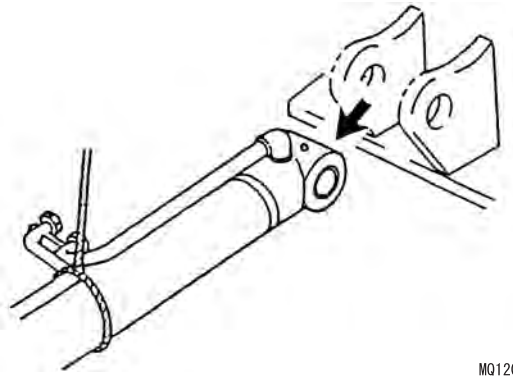




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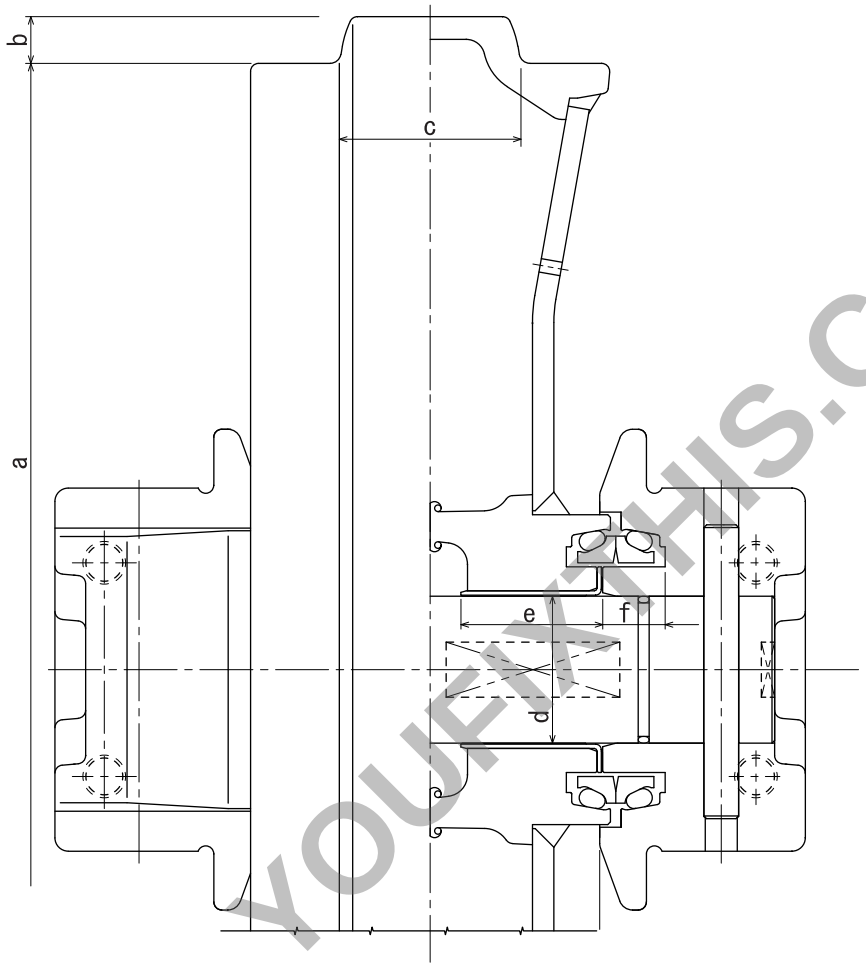
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9	 MQ12001-022	Remove the nuts and bolt and drive out the pin with a steel bar and hammer.
10	 MQ12001-023	Remove the boom cylinder.

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2. Take-up Roller



* See the gauge list for measurement gauges.

Part name	Code	Measured dimensions (mm)	Standard value (mm)	Usage limit (mm)	Judgment	Action
Take-up roller	a	ϕ	ϕ510	ϕ506	Acceptable / Unacceptable	Cladding by welding or replacement
	b		17.5	—	Acceptable / Unacceptable	
	c		68	64	Acceptable / Unacceptable	
Shaft	d	ϕ	ϕ55	ϕ54.5	Acceptable / Unacceptable	Replacement
Bushing	d	ϕ	ϕ55	ϕ55.8	Acceptable / Unacceptable	Replacement
	e		55	54.6	Acceptable / Unacceptable	
Hub	f		19.9	20.4	Acceptable / Unacceptable	Replacement

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3. Troubleshooting

(1) General precautions

Following are countermeasures if you find abnormality during the operation of Kawasaki swash plate type axial piston pump and motor.
General precautions are :

[1] Considerations before starting repair.
Determine the characteristics of the abnormality before starting repair. Consider if the cause is originated from the wrong circuit, failure of regulator, or attached valve. Double check that the problem involves the pump motor.

[2] Before disassembling a system, make sure to read through the service manual. Conduct the disassembly in a correct manner.

[3] When disassembling a system, be careful not to allow dust to enter.

[4] Parts are finished precisely. Be careful not to damage them when handling.

(2) Troubleshooting for the pump main body

Pumps are often attached to a regulator, attached valves and attached pumps. It can be difficult to find the cause of the problem. Checking the following points is useful to identify the problem area.

[1] Filter check and drain oil check
Check the filter element. Check if a considerable amount of contamination is found.
It is normal that a little amount of metal dust originated from abrasion of the shoe or cylinders is seen. However, if the amount of metal dust is extremely high in the filter, the shoe might be damaged. Check drain oil of inside the pump casing, as well.

[2] Abnormal noise/abnormal vibration
Check for abnormal noise or abnormal vibration in the main pump. Examine if the sound repeats with regular frequency such as, a hunching sound in the regulator or hunching sound of the valve relief.
If there is an abnormal vibration or sound, cavitation or damage inside the pump should be considered.

[3] When using two pumps.
If piping uses two single pumps or two motors, change the pipe of each pump.
By changing the pipe, the problem can be identified whether it is caused by a pump failure or a piping failure after the pump.

[4] Perform pressure measurement.
If the problem is related to the controlling function, examine the problem areas using pressure measurement tools instead of performing overhaul inspection.

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(3) Lubricating oil extraction

[1] Turn GM motor horizontally.
Please be sure drain port comes lower position.

[2] Loosen plug [30] for depressor and tighten plug [30] again loosely.
NOTE :
In the case that the inside of reduction gear is pressurized, the lubrication oil may come out and be sprayed when the plug [30] is loosened.

[3] Place a container under the workbench.
Loosen the plug [30] of drain port slowly.
Drain the lubricating oil from drain port.
NOTE :
Prepare the container, which can collect 2.1 litters of lubricating oil in the reduction gear.

[4] When the lubricating oil is not drained smoothly, loosen the plug [30] of the filling port slowly and remove the plug [30].

[5] Remove O-ring [31] from the plug [30].
NOTE :
Do not reuse O-rings [31].

(4) Removing cover

[1] Turn GM motor. (Turn up side of reduction gear.)

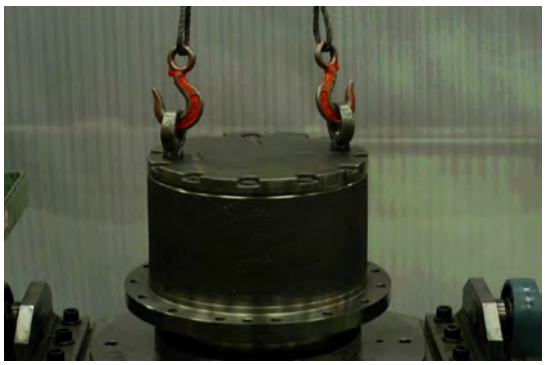
[2] Loosen Hexagon socket bolts [35] and remove the bolts.

[3] Place banging media to the offset of the cover, and hit the media upward by a hammer or steel bar to remove cover [14] from hub [1].


MQ21001-014

⚠ Caution	The cover [14] could remove suddenly after hitting. Be careful not to fall on the worker.

[4] Fasten two eyebolts on the cover [14] and use hoisting equipment for lifting up.


MQ21001-015

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(3) Disassembling instructions

When disassembling motors, follow the order described below.

The number in the parentheses following the part name is the code shown in the structural drawing.

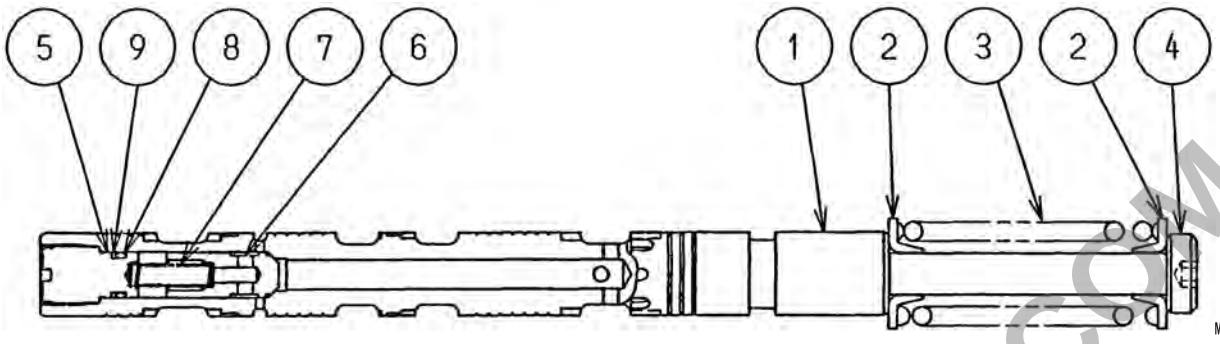
	Disassembling Procedure	Precautions
1	Wind a wire rope around the outer circumference of the motor to lift it with crane, then clean it with white kerosene. Dry it using compressed air after cleaning.	After applying masking tape or equivalent to the ports to prevent foreign substances from entering the motor, wash off mud and dust.
2	Drain oil from casing (301) through the drain plug.	
3	Secure the motor on a bench designed for easy assembly with the shaft end of drive shaft (101) down. At this time, put marks on the mating faces of casing (301) with valve casing (303).	Choose a clean place. Place a rubber plate or cloth on the bench for disassembly to avoid dents and scratches to the parts. Handle the parts carefully.
4	Remove switch-over plug for brake (031).	* Switch-over plug for brake is optional.
5	Loosen and remove relief valve (051) from valve casing (303).	
6	Loosen hexagonal socket head cap screws (V171) to remove anti-reverse valve sub-assembly (052) from valve casing (303).	
7	Loosen and remove RO plug (469) from valve casing (303) to remove springs (355) and plunger (351).	Be careful not to damage the plunger seats.
8	Loosen hexagonal socket head cap screws (401) to remove valve casing (303) from casing (301). (When the bolts are removed by the force of brake spring (712), the valve casing rises over the casing.) Remove valve plate (131) from casing (303).	Work carefully to prevent the valve plate from dropping from the valve casing. (The valve seat may be attached to the cylinder side.) When prying the mating faces with a screwdriver, be careful not to damage the mating faces.
9	Remove brake spring (712) from brake piston (702).	
10	Pull brake piston (702) from casing (301) using jig.	Use bolt holes on the brake piston to pull it straight upward.
11	Place the motor horizontally once again and pull drive shaft (101) from cylinder (111). Pull out piston (121), pressure bar (123), spherical bushing (113), spacer (117) and shoe plate (124).	Be especially careful when pulling out the cylinder because the push rod (116) comes off easily. Handle carefully so as not to damage the sliding faces of cylinder, spherical bushing, shoe and others. If the shoe plate cannot be removed, follow step 13.
12	Pull out friction plate (742) and separator plate (743) from casing (301).	
13	Remove locking ring (437) with pliers and pull out front cover (304) from casing (301).	Be especially careful when pulling out the front cover not to damage the sliding faces of oil seal. (Front cover may be removed with driving shaft altogether.)
14	Pull out drive shaft (101) from casing (301) by lightly hitting the end of the valve casing side of the drive shaft with a plastic hammer or the like.	Be careful not to damage the sliding faces with oil seal.
15	Pull out shoe plate (124) from the casing (301) by lightly hitting it from cylindrical roller bearing (443) housing side of the casing via a steel bar.	

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7. Reference No. 8: Spool Assembly

BOOM 1

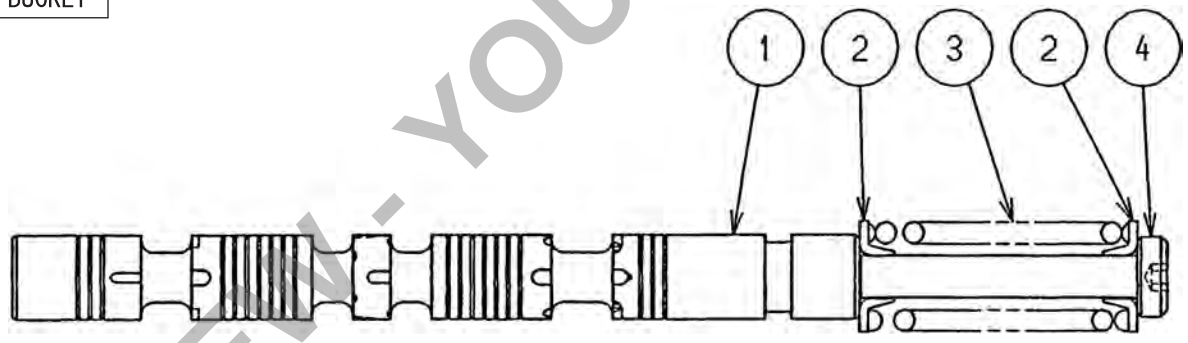


MQ23001-011

ITEM NO.	PART NAME	QTY.
1	SPOOL	1
2	SPRING SEAT	2
3	SPRING	1
4	SPOOL END	1
5	PLUG	1
6	POPPET	1
7	SPRING	1
8	O-RING	1
9	BACKUP RING	1

8. Reference No. 9: Spool Assembly

BUCKET



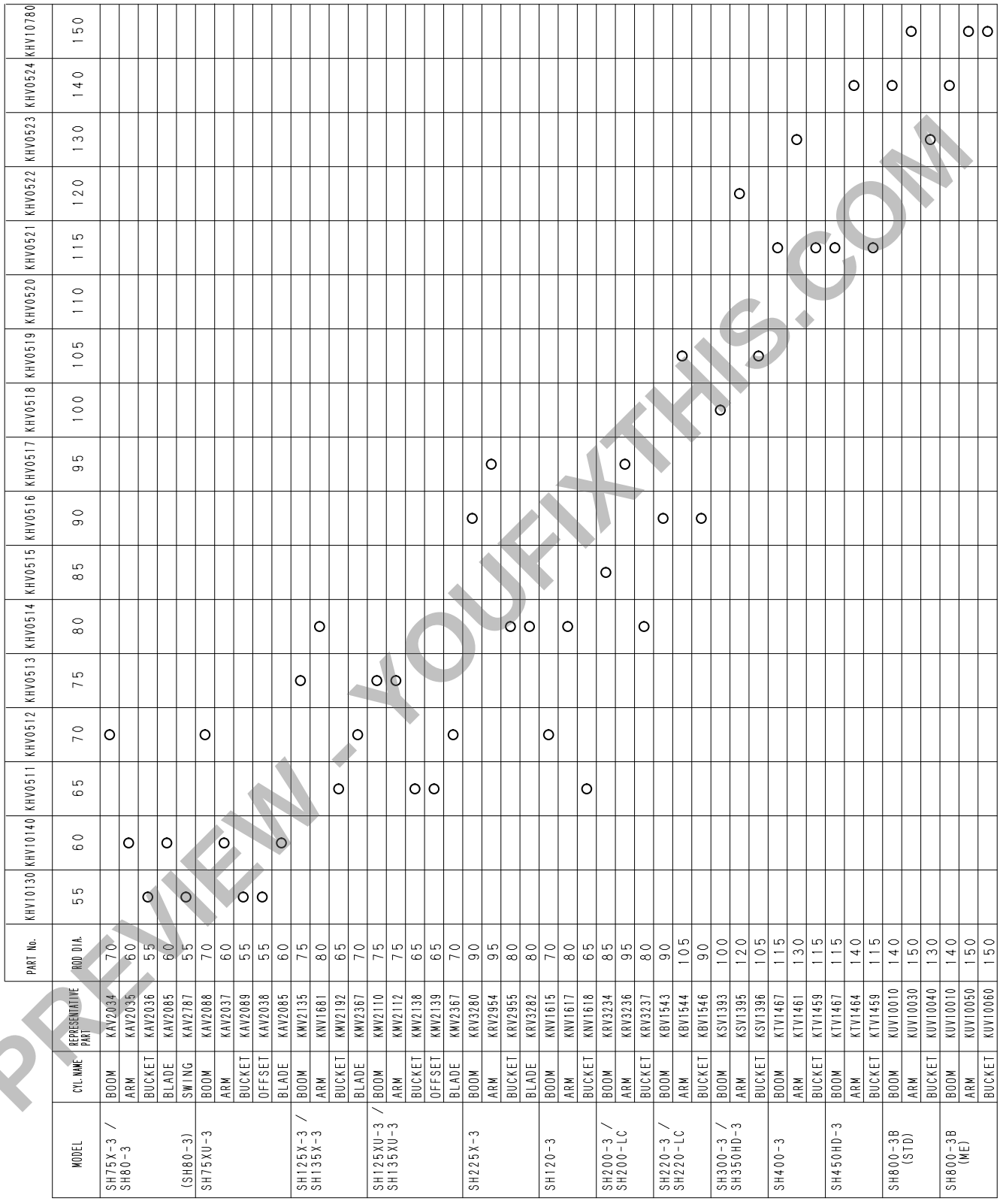
MQ23001-012

ITEM NO.	PART NAME	QTY.
1	SPOOL	1
2	SPRING SEAT	2
3	SPRING	1
4	SPOOL END	1

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2) Jigs for injection and ejection of bushings and wiper rings



MODEL	CYL.NAME	REPRESENTATIVE PART	ROD DIA.	PART No.	KHV10130	KHV10140	KHV0511	KHV0512	KHV0513	KHV0514	KHV0515	KHV0516	KHV0517	KHV0518	KHV0519	KHV0520	KHV0521	KHV0522	KHV0523	KHV0524	KHV10780
			55	60	65	70	75	80	85	90	95	100	105	110	115	120	130	140	150		
SH75X-3 / SH80-3 (SH80-3)	BOOM	KAV2034	70			○															
	ARM	KAV2035	60	○																	
	BUCKET	KAV2036	55																		
	BLADE	KAV2085	60	○																	
	SWING	KAV2787	55																		
SH75XU-3	BOOM	KAV2088	70			○															
	ARM	KAV2037	60	○																	
	BUCKET	KAV2089	55		○																
	OFFSET	KAV2038	55	○																	
	BLADE	KAV2085	60	○																	
SH125X-3 / SH135X-3	BOOM	KMV2135	75					○													
	ARM	KNV1681	80						○												
	BUCKET	KMV2192	65		○		○														
	BLADE	KMV2367	70																		
SH125XU-3 / SH135XU-3	BOOM	KMV2110	75					○													
	ARM	KMV2112	75					○													
	BUCKET	KMV2138	65		○																
	OFFSET	KMV2139	65		○																
	BLADE	KMV2367	70				○														
SH225X-3	BOOM	KRV3280	90									○									
	ARM	KRV2954	95										○								
	BUCKET	KRV2955	80							○											
	BLADE	KRV3282	80							○											
SH120-3	BOOM	KNV1615	70				○														
	ARM	KNV1617	80							○											
	BUCKET	KNV1618	65			○															
SH200-3 / SH200-LC	BOOM	KRV3234	85								○										
	ARM	KRV3236	95										○								
	BUCKET	KRV3237	80							○											
SH220-3 / SH220-LC	BOOM	KBV1543	90									○									
	ARM	KBV1544	105												○						
	BUCKET	KBV1546	90									○									
SH300-3 / SH350HD-3	BOOM	KSV1393	100											○							
	ARM	KSV1395	120													○					
	BUCKET	KSV1396	105												○						
SH400-3	BOOM	KTV1467	115														○				
	ARM	KTV1461	130															○			
	BUCKET	KTV1459	115													○					
SH450HD-3	BOOM	KTV1467	115													○					
	ARM	KTV1464	140																○		
	BUCKET	KTV1459	115													○					
SH800-3B (STD)	BOOM	KUV10010	140																○		
	ARM	KUV10030	150																	○	
	BUCKET	KUV10040	130														○				
SH800-3B (ME)	BOOM	KUV10010	140																○		
	ARM	KUV10050	150																	○	○
	BUCKET	KUV10060	150																		

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(2) Dumping mechanism of the operating part

[1] When in neutral position
The push rod is pushed up by the dumping springs (336) through the piston (224) and is in the position as shown in the *Cross-sectional View of the Assembly*.

[2] Operation from central to tilted (refer to *Explanatory Diagram of Dumping Actuation No. 1*)
Referring to the *Cross-sectional View of the Assembly*, if the cam is rotated clockwise, the push rod on port 1 side is pushed downward and the piston moves downward.
At this time, the oil inside the dumping piston is released through the restriction hole and the pressure created at that time is the dumping force.
On the other hand, the push rod on port 2 side moves upward by the dumping spring through the piston. At this time, tank oil flows through the ball check part (3 places) which is made up of the steel ball (225) located inside the dumping piston area. The oil outside the piston area flows through the passage from the upper part of the casing to port T.

[3] Operation going from full tilt to the opposite direction (refer to *Explanatory Diagram of Dumping Actuation No. 2*)
Referring to the *Cross-sectional View of the Assembly*, after the cam is tilted fully in the clockwise direction, when it is rotated counterclockwise, the push rod on port 2 side is pushed down and the piston moves downward.
At this time, the oil inside the dumping piston area is released through the restriction hole and the pressure created then is the dumping force.
On the other hand, the push rod on the port 1 side is moved upward by the reset spring (335) and dumping spring.
At this time, tank oil flows through the ball check (3 places) which is made up of the bushing and steel ball located inside the dumping piston area. The oil outside the piston area flows through the passage from the upper part of the casing to tank port.
In other words, from neutral to full tilting position or from full tilting to neutral position, the valve is constructed so that dumping force works for either tilting operation.

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