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□ 1.3.3A Hydraulic System (Kawasaki)

The SCC1000C crawler crane employs the full hydraulic drive. From the respect of the components contained, the hydraulic system consists of the following units: power unit, control unit, actuator, hydraulic oil tank and auxiliary components.

-- Hydraulic power unit is composed of:

1. Engine: Cummins diesel
2. Hydraulic pumps:

Main pump: swashplate variable dual pumps with two sets of axle piston rotary apparatuses and employing an open circuit, equipped with a built-in auxiliary pump to provide pressure and servo oil to each major actuator.

Rotary pump: front pump of dual gear pumps, installing at main pump power output provides high pressure oil to slewing motor.

Auxiliary pump: rear pump of dual gear pumps, provides high pressure oil to oil radiator motor and free fall clutch.

Servo pump: gear pump, provides high pressure oil to servo hydraulic system and auxiliary actuators.

--Main control valves of the hydraulic system include: three multi-way valves, three pilot control valves, and auxiliary motion control valves.

-- Actuators include motor of main hoisting winch, motor of auxiliary hoisting winch, motor of luffing winch, left and right traveling motors, slewing motor, ratchet and pawl cylinders, A-frame cylinders, slewing locking cylinders, outrigger cylinders and hydraulic brakes.

-- Hydraulic oil tank: It is equipped with components such as oil suction port, return oil filter, air filter, and sight glass. The tank is located behind the right platform and functions storing and filtering hydraulic oil and radiating heat. The hydraulic oil tank must be serviced according to the signs on the tank body on time.

-- The auxiliary hydraulic components include:

1. Oil filter: The servo oil circuit, slewing oil circuit, and hydraulic oil tank are all equipped with oil filters, so as to remove the particle pollutant in the hydraulic oil, to protect the hydraulic components, and to prolong the service life of the components. The filter core of oil filter must be serviced according to the request.
2. Hydraulic swivel joint: It is located at the center of the slewing ring and functions as a flow channel for receiving the high pressure oil from upperworks oil circuit to the lowerworks oil circuit.
3. Hydraulic oil radiator: When the oil temperature of the hydraulic oil system is high, the radiator starts to act to decrease the system temperature.
4. Accumulator: The servo system is equipped with an accumulator to maintain the pressure of servo system steadily.

In the meantime, the hydraulic system can also be divided into three major parts due to the circuits: the main circuit system, the auxiliary circuit system, and the servo circuit system.

The main circuit system includes the main hoisting oil circuit, the auxiliary hoisting oil circuit, the luffing oil circuit, left and right travel oil circuits, and the slewing oil circuit.

The auxiliary circuit system is composed of auxiliary cylinder circuits and heat radiating circuits.

The servo circuit system: include the foot pilot controlling and hand pilot controlling and pilot controlling of each control and actuator, to control each main & auxiliary oil circuit components, regulate each actuator motion and implement remote centralized control.

Table 2-12 Combination of Boom and Pendant Cable in H Operating Condition

Boom length (m)	Boom combination	Combination of pendant cable	Length of pendant cable
18 (59'1")	7.5+10.5 (24'7"+34'5")	IV	10.6 (34'9") (include connector)
21 (68'11")	7.5+3+10.5 (24'7"+9'10"+34'5")	IV+ I	13.6 (44'7") (include connector)
24 (78'9")	7.5+3+3+10.5 (24'7"+9'10"+9'10"+34'5")	IV+ I + I	16.6 (54'6") (include connector)
24★ (78'9")	7.5+6+10.5 (24'7"+19'8"+34'5")	IV+ II	16.6 (54'6") (include connector)
27 (88'7")	7.5+3+6+10.5 (24'7"+9'10"+19'8"+34'5")	IV+ II + I	19.6 (64'4") (include connector)
27★ (88'7")	7.5+9A+10.5 (24'7"+29'6"A+34'5")	IV+III	19.6 (64'4") (include connector)
30 (98'5")	7.5+3+3+6+10.5 (24'7"+9'10"+9'10"+19'8"+34'5")	IV+ II + I + I	22.6 (74'2") (include connector)
30★ (98'5")	7.5+3+9A+10.5 (24'7"+9'10"+29'6"A+34'5")	IV+III+ I	22.6 (74'2") (include connector)
33 (108'3")	7.5+3+3+9A+10.5 (24'7"+9'10"+9'10"+29'6"A+34'5")	IV+III+ I + I	25.6 (83'12") (include connector)
33★ (108'3")	7.5+6+9A+10.5 (24'7"+19'8"+29'6"A+34'5")	IV+III+ II	25.6 (83'12") (include connector)
36 (118'1")	7.5+3+6+9A+10.5 (24'7"+9'10"+19'8"+29'6"A+34'5")	IV+III+ II + I	28.6 (93'10") (include connector)
36 (118'1")	7.5+3+3+6+6+10.5 (24'7"+9'10"+9'10"+19'8"+19'8"+34'5")	IV+ II + II + I + I	28.6 (93'10") (include connector)
36★ (118'1")	7.5+9A+9A+10.5 (24'7"+29'6"A+29'6"A +34'5")	IV+III+III	28.6 (93'10") (include connector)
39 (127'11")	7.5+3+3+6+9A+10.5 (24'7"+9'10"+9'10"+19'8"+29'6"A+34'5")	IV+III+ II + I + I	31.6 (103'8") (include connector)
39 (127'11")	7.5+6+6+9A+10.5 (24'7"+19'8"+19'8"+29'6"A+34'5")	IV+III+ II + II	31.6 (103'8") (include connector)
39★ (127'11")	7.5+3+9A+9A+10.5 (24'7"+9'10"+29'6"A +29'6"A+34'5")	IV+III+III+ I	31.6 (103'8") (include connector)

1.4 Counterweight

Table 2-15 Parameters of Counterweight

Dimensions of Counterweight Blocks					
Name	Quantity	Length (m)(ft)	Width (m)(ft)	Height (m)(ft)	Unit weight (kg)(lb)
Counterweight tray	1	4.2(13'9")	1.6(5'3")	0.49(1'7")	6600(14550)
Counterweight block	6	1.6(5'3")	1.2(3'11")	0.57(1'10")	6000(13230)
Additional block	1	0.93(3'1")	0.72(2'4")	1(3'3")	3000(6610)

Additional Counterweight Using Condition			
Operating Condition	Load Chart	Boom Length Range (with Additional Counterweight)	Remark
H	Main Boom Load Chart	39m≤Main Boom Length≤72m (127'11"≤Main Boom Length≤236'3")	
HC	Main Boom Load Chart	39m≤Main Boom Length≤69m (127'11"≤Main Boom Length≤226'5")	
	Extension Jib Load Chart (Main Boom+ Extension Jib)	39m≤Main Boom Length≤69m (127'11"≤Main Boom Length≤226'5")	
FJ	Main Boom Load Chart	39m≤Main Boom Length≤63m (127'11"≤Main Boom Length≤206'8")	
	Fixed Jib Load Chart	39m≤Main Boom Length≤63m (127'11"≤Main Boom Length≤206'8")	

7. Aux. hoist

When this rotary switch is set at the “Lock” position, the auxiliary hoisting winch is locked and cannot work; when this rotary switch is set at the “Unlock” position, the auxiliary hoisting winch is unlocked and can work normally.



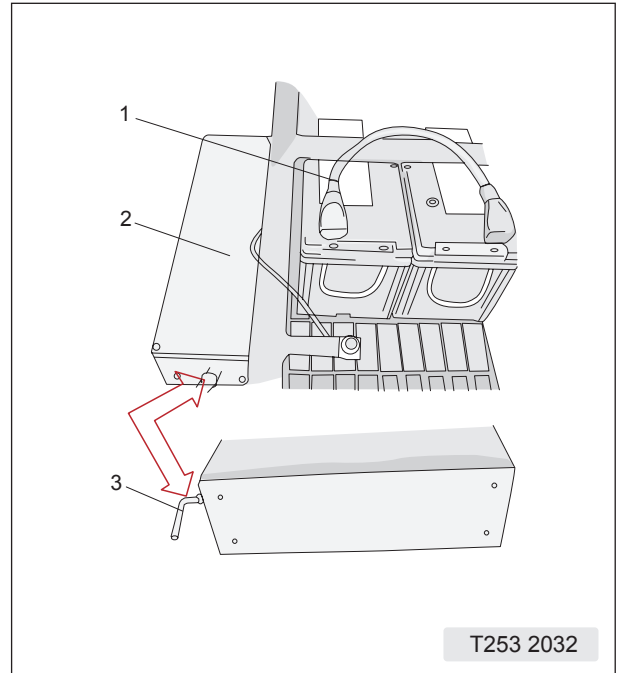
8. Main Luffing

When this rotary switch is set at the “Lock” position, the main luffing winch is locked up and can not work; when this rotary switch is set at the “Unlock” position, the main luffing winch is unlocked and can work.



2.4 Batteries

The overall crane voltage is DC24V, supplied by 2 batteries connected in series. They are mainly used to start the engine, supply power for the electric control cables and illuminating equipment. The generator produces electricity to charge the battery and supply power for electrical equipment. If the crane is to be out of use for a long period of time, the main switch of the batteries must be turned off. The batteries are located in the front of the left platform. Batteries and circuit are controlled to cut off or close by the main switch on the contactor junction box which is next to the batteries, see Fig. T253 2032.



No.	Name
1	Battery
2	Contactor junction box
3	Main switch

2.9.3 Precautions

1. Keep the upperworks parallel to the crawlers when parking the crane.
2. Pull out the steps at the outside of the crawler from vertical position to horizontal position (as the position shown in Fig. T253 2026).
3. Mount the crawler via the steps shown in Fig. T253 2026.
4. When standing at the catwalk outside the cab, open the sliding door of the cable shown in Fig. T253 2013.
 - Open the lock with the key;
 - Pull the handle towards outside to detach the lock cylinder;
 - Push the door backward along the sliding track to open it;
 - When the door is pushed to the terminal position, rotate the latch in the cab to lock the door manually.
 - Enter the cab via the catwalk outside the cab shown in Fig. T253 2013.
5. When carry out maintenance on the upperworks, it is required to use the handrail to ensure safety as shown in Fig. T253 2014.

6. There are two terminal positions of the cab door, i.e. when it is completely closed or opened, the door will be locked at the position automatically. Be sure that the door is locked during the operation of the crane so as to avoid crushing or impact hazard caused by the accidental movement of the door.
7. There is potential danger of crushing between the door and the cab frame.

 **WARNING**

Leave the cab in exactly the reverse order as that of entering the cab.

 **WARNING**

Crushing and impact hazard!

 **CAUTION**

Please open or close the door carefully so as to protect the hands from dangerous areas!

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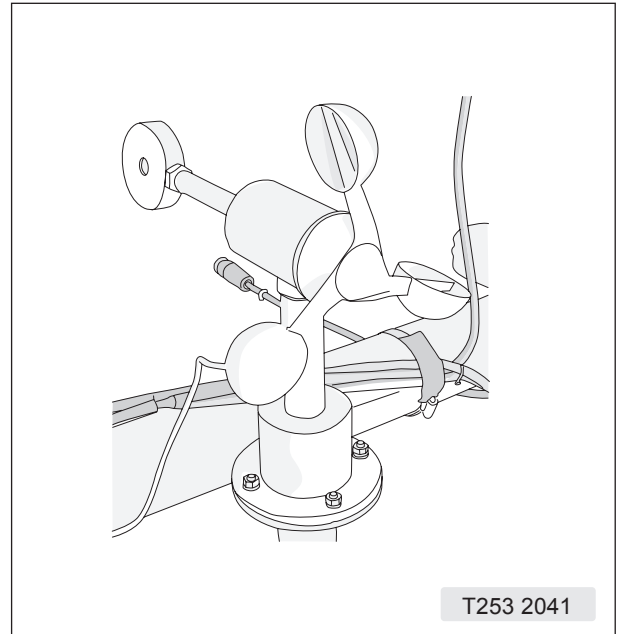
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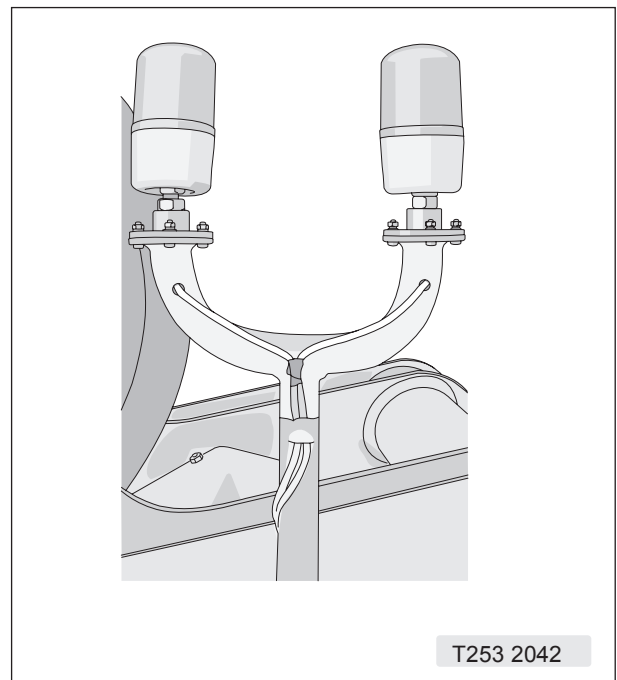
4.2.11 Anemometer

It is installed at the top of the boom to detect the real-time wind speed and transmit the data to the display inside the operator's cab. When the detected wind speed is larger than the set value (the default value is 16m/s(35.8mph)), fault indicator is on and buzzer sounds an alarm.



4.2.12 Pharos

It is installed at the top of the boom system to send signal of height and hence allows the boom system to keep erecting at night, see Fig. T253 2042.



5 Traveling Operation

5.1 Overview

-- Action

The traveling hydraulic motors drive the crawlers through speed reducers and drive wheels and achieves straight line traveling (forward or backward) and turning .

-- Braking

The traveling brake is blade-type, normally-closed, and built-in. It can compensate automatically, requiring no adjustment. When the traveling lever/pedal in the operator's cab is pushed/pressed down, the braking is released and the crane starts to travel.

-- Automatic Direction Changing

It ensures that the ahead of the operator's cab is always the ahead of the crane and that the forward operation of the traveling lever/pedal makes the crane travel forward and vice versa, no matter what the relative position of the upperworks to the lowerworks is.

5.2 Precautions

Before Driving Operation

-- Planning the traveling route. The ground of the traveling route is required to be even, solid, and of sufficient load-bearing capacity. There shall be no obstacle in the air on the traveling route. If the obstacle in the air cannot be avoided, sufficient clearance must be ensured between the obstacle and the crane. When traveling near electric power wires, an extra clearance of 10m(32'10") must be ensured. A signalman shall be employed if necessary.

-- Check whether the crawler tension needs to be adjusted. If necessary, adjust the crawler tensioning device to maintain the appropriate tension of the crawlers. The soil on the crawler pads should also be cleared.

-- Sound the horn before operation to warn people in surrounding area to leave.

-- Know the directions of frontward and backward before traveling. If the crane travels in an opposite direction with the expected direction, an accident may happen.

-- Make sure that the crawlers are extended and the crawler traveling devices are at working station.

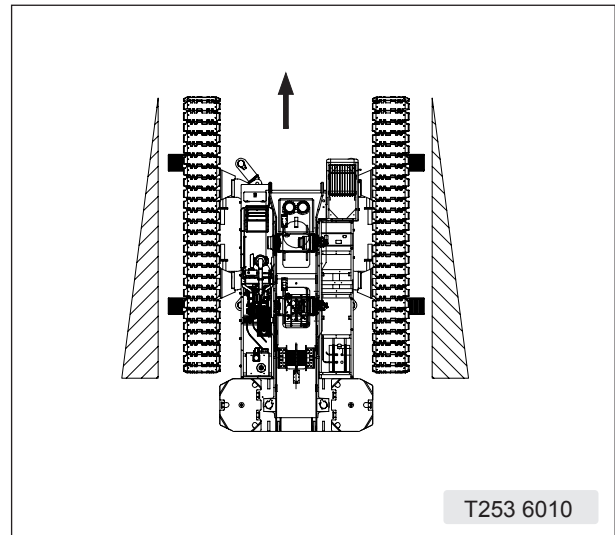
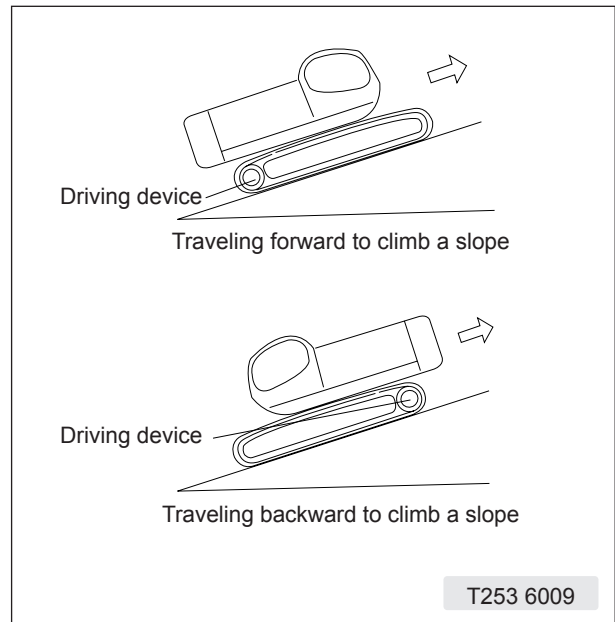
5.3.4 Traveling on Slopes without Load

The gradeability of the SCC1000C crawler crane is 30%, that is, the crane can climb up to a slope of 16.7° with the 18m(59'1") basic boom and without load.

If the crane travels with the basic boom, the boom angle shall be kept smaller than 30°. When traveling forward to climb a slope, the driving wheels shall be at rear; vice versa, when traveling backward to climb a slope, the driving wheels shall be at front. The maximum slope for crane climbing is 16.7°, see Fig. T253 6009.

To prevent damage to crawler group, the following regulations must be observed when driving the crane on ramps or slopes:

-- Usually, the crane is only allowed to travel straight-line on the ramp, see Fig. T253 6010.



□ 7.1B Main Hoisting – Normal Winch

Same to the auxiliary winch device, detailed information on auxiliary winch please refer to 7.2 Auxiliary Hoisting.

8 Luffing Operation

8.1 Overview

- The boom luffing winch is directly driven by the hydraulic motor through planetary gears.
- The boom luffing winch is equipped with pawl and ratchet device to ensure the safety of boom under non-working condition.
- Normally closed, built-in, wet-type, requiring no adjustment spring-loaded, blade-type brake, spring-applied and hydraulically released.

8.2 Preparation before operation

- Check all the operation of each safety device for normal function.
- The pawl and ratchet device for boom luffing winch is electrically controlled. Set the "Luffing" switch on the right control panel at the "Unlock" position to release the pawl and ratchet locking. If the switch is set at the "Lock" position, the pawl and ratchet device is engaged. If the pawl and ratchet is stuck and cannot be released, move the control lever slightly to operate the boom luffing winch to lift, and the ratchet can be released.
- The clearance from the hook block to the boom head must keep more than 3m(9'10"). The hoisting wire rope must be unwound accordingly when lowering the boom/jib. If the hook block comes into contact with the boom head, it can cause the wire rope to break, or the boom/jib retroversion, or damage to boom head.
- Control the raising or lowering speed of boom luffing through the travel of control levers according to the operating condition on the job location.

11 Operating Instruction

11.1 Overview

The load regulated in Load Charts applies to the following situations:

- The crane is on level ground (1%) with load when not traveling.
- The ground is of sufficient load bearing capacity.
- All crane actions should be carried out slowly and steadily in line with its configuration and the load attached. Sudden acceleration is not allowed.
- Weight of the hook block, wire rope from hook block to boom/jib head, and hoisting tools are also included in the rated load, which should be deducted by value in Load Charts to get the net load capacity.

Table 2-25 Dead-weight of hook block

Nominal Load (t)(UST)	100(110)	50(55)	25(27.5)	9(10)
Dead-weight (kg)(lb)	1600(3527)	900(1984)	550(1213)	250(552)

- Be careful in slewing and engaging the slewing brake, especially when the crane is installed with a jib.
- Slewing as slow as possible. Pay special attention when engaging the brake.
- It is not allowed to use boom and jib to hoist the load at the same time (dual hook operation)!

WARNING

Dragging the load or increasing working radius is absolutely not allowed!

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