CASE

Construction Equipment Service Training

CX SERIES EXCAVATOR

Section 1 --
GENERAL INTRODUCTION
CNH Engine
Diagnostic Class

(2004)

Training Pays

CNH America LLC
700 STATE STREET
RACINE, WI 53404 U.S.A.

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EXPLANATION OF CX SERIES

Engines				
MODEL	**CX130**	**CX160**	**CX210**	**CX240**
Make **Model**	CASE 4TA390	CASE 4TA390	CASE 6TAA590	CASE 6TAA590
HP (net)	106	106	138	163
Cold Start	Ether	Ether	Electric	Electric
Rated rpm	2200	2200	1950	2150

When programming the excavators, the manufacture model number must be used. Detailed procedures are in section 3 of this training manual.

Manufacture model number	Case model number
SHO120	CX130
SHO150	CX160
SHO200	CX210
SHO220	CX240

When programming the excavators, the following codes will be used to change the language if necessary. Detailed procedures are in section 3 of this training manual.

LANGUAGE	MODE NO.	LANGUAGE	MODE NO.	LANGUAGE	MODE NO.
Japanese	0	Italian	6	Swedish	12
English	1	Spanish	7	Finnish	13
Thai	2	Portuguese	8	Picture writing	14
Chinese	3	Dutch	9		
German	4	Danish	10		
French	5	Norwegian	11		

EXPLANATION OF CX SERIES

Reservoir

The reservoir is pressurized on all models. The air charge is provided by thermal expansion and the differential area of the cylinders as they are stroked the first time. There is a breather/pressure regulator/fill cap installed in the top cover of the excavators. A rubber-covered button on top of the breather is provided to release the air pressure in the reservoir. A sight gauge mounted to the side of the reservoir indicates the oil level. There is a 150-mesh screen at the outlet of the reservoir to the hydraulic pump.

Reservoir				
MODEL	**CX130**	**CX160**	**CX210**	**CX240**
Capacity Tank gal.	19	32	32	32
Capacity System gal.	32	38	54	59

Filters

The oil returning from the main control valve flows through the oil cooler. There is a cooler bypass valve in the circuit to protect the system during cold start conditions. As the oil returns from the oil cooler, it passes through a full flow 10-micron filter. Some of the return oil is routed through a 1-micron ultra-fine filter. Drain oil from the pilot control circuits and the case drain oil from the swing and travel motors is returned through the main return filter.

A cartridge type filter is installed in the outlet of the pilot pump to protect all pilot valves from contamination. All of these filters have filter bypass valves for cold start up protection.

Filters				
MODEL	**CX130**	**CX160**	**CX210**	**CX240**
Suction	150 mesh	150 mesh	150 mesh	150 mesh
Return	10 µ	10 µ	10 µ	10 µ
Ultra-fine	1 µ	1 µ	1 µ	1 µ
Pilot	10 µ	10 µ	10 µ	10 µ

EXPLANATION OF CX SERIES

Variable Pumps

All of the CX Series Excavators use an open center hydraulic system, in that there is always an output flow from the hydraulic pump flowing through the system. The CX Series Excavators use a variable flow piston pump system to be able to fully use the engine horsepower. As the system operating pressure increases, the flow gradually reduces, to maintain a constant horsepower load on the engine. The theory is that when very high pressures are required, speed isn't so important. The CX Series Excavators use a two-section variable displacement piston pump, to provide the flow required to operate the functions. Variable pumps allow the delivery of higher flow rates at lower working pressures, and then allow the pumps to reduce the flow at higher pressures, to keep from stalling the engine. The increased flow at lower pressures makes the cycle times faster, and increases the overall efficiency of the excavator.

The engine horsepower required to drive a hydraulic pump depends on the flow delivered by the pump, as well as the pressure at which system is operating. There is a mathematical formula to calculate the pump drive horsepower, but a rule of thumb to visualize this, is that it requires approximately 1 engine horsepower to deliver 1 gallon per minute of oil at 1500 psi. Therefore, it would require 25 HP to deliver 25 GPM at 1500 psi. If the pressure increases to 3000 psi, the requirement would be 50 HP.

The CX Series Excavators have an automatic pump de-stroke feature that reduces the pump flow to a minimum, when all control levers are in the neutral position. This is accomplished with a hydraulic pilot signal from the control valve. This system saves fuel and eliminates wasted engine and hydraulic power. The minimum flow delivery of the pumps increases with excavator size and engine horsepower. Although the pump configuration and manufacturer varies, in principal, all of the pump control systems operate the same.

Pumps				
MODEL	**CX130**	**CX160**	**CX210**	**CX240**
Max. pump flow X 2	32.4 gpm	36.2 gpm	53.1 gpm	56 gpm
Pilot pump flow	6 gpm	5.8 gpm	5.3 gpm	5.3 gpm
Manufacture	Uchida/ Kawasaki	Uchida/ Kawasaki	Kawasaki	Kawasaki
Configuration	Tandem	Tandem	Tandem	Tandem

EXPLANATION OF CX SERIES

Pilot Controls

The attachment controls are pilot operated by hand actuated controllers on all models. The pilot hand controls are mounted to tilting armrests that can be positioned to provide for maximum operator comfort. The standard control pattern is the SAE pattern. The controls can be changed to other configurations by changing the pilot hose connections at the pilot manifold, located behind the cab (see Section 8001 of the Service Manual for instructions).

There is a pattern change kit available as an option which allows pattern changes without moving hoses.

When the left arm is tilted up or the gate lever is up, all pilot operated control functions are inactive.

On all models, the travel system is actuated by foot pedals that also have hand control levers attached. The travel controls are pilot pressure operated on all models. The CX240 – CX800 have a single pedal feature. By actuating a single control pedal, both travel motors will travel at the same speed and direction. This feature gives the operator straight-line travel in either forward or reverse.

Pilot Controls				
MODEL	**CX130**	**CX160**	**CX210**	**CX240**
Pilot operated hand and foot controls	yes	yes	yes	yes
Single pedal travel	no	no	no	yes

EXPLANATION OF CX SERIES

Hydraulic System Overview

All models use a triple hydraulic pump assembly that is located on the same side of the excavator as the reservoir. All of the excavators use two variable displacement piston pumps for the excavator functions. A fixed displacement gear pump used to supply pilot control oil for the system. The original CX130 and CX160 excavators used a tandem mounted pump supplied by Uchida. All later excavators use a tandem mounted pump supplied by Kawasaki. All of the pumps have a system to limit the horsepower load on the engine. This system allows the excavator to fully utilize the power available without overloading the engine. The CX Series Excavators have an electrically controlled feature that allows the hydraulic system to operate at less than full load to increase fuel economy or fine touch controllability.

This feature allows for four digging modes:

“Auto” -Variable- 90-85% engine speed- 93-90% hydraulic pump torque.

"H" -Heavy Duty - 100% of engine speed - 100% hydraulic pump torque.

"S" -Standard Duty - 95% of engine speed - 90% hydraulic pump torque.

"L" -Light - 85% of engine speed - 70% hydraulic pump torque.

The original excavators were in the **“Auto”** mode each time they were started, newer models default to the **“H”** mode.

All models have Power Boost.

CX130/CX160 excavators have One-Touch Power Boost.

CX210/CX800 excavators have automatic Power Boost.

EXPLANATION OF CX SERIES

The CX Series Hydraulic System

There is a single main relief with a second (power boost) setting. Boom and arm anti-drift valves are built into the main control valve. An auxiliary control valve is standard and a factory installed or field installed kit with plumbing to the end of the arm is available. Other features that are built into the main control valve are:

Dual pump flow boom up

Boom down regeneration

Boom down anti-drift

Dual pump flow arm in and out

Arm in regeneration

Arm in anti-drift

Travel priority

Swing priority

Neutral pump de-stroke

Two electrical pressure switches are installed on the main control valve, and one in the swing pilot shuttle valve. These switches are used to tell the controller what hydraulic functions are being operated.

Cushion Control System

The CX Series excavators have an attachment control cushion system to allow the boom and arm cylinder control spools to gradually return to neutral, for shock-free operation. This feature allows a lesser skilled operator to work more smoothly. With the control cushion system active, the pilot oil from the hand control flows to the arm or boom control spool unrestricted. When the hand control is returned to neutral, the pilot oil is restricted as it leaves the control spool. This slow return of the spool accounts for the smooth operation. The system can be overridden with an electrical control switch on the monitor/switch panel.

Swing

The CX Series Excavators do not have a mechanical house lock. The house lock is accomplished with the swing brake. The swing brake is applied when the switch on the left console is activated or the engine is shut off. The swing brake is also applied 5 seconds after the hand control is returned to neutral unless “Free-Swing” is turned on.