



SERVXXX

February 2006

GLOBAL SERVICE LEARNING

TECHNICAL PRESENTATION



"E" SERIES BACKHOE LOADERS INTRODUCTION

PRELIMINARY

**Service Training Meeting Guide
(STMG)**

"E" SERIES BACKHOE LOADERS

INTRODUCTION

AUDIENCE

Level II - Service personnel who understand the principles of machine system operation, diagnostic equipment, and procedures for testing and adjusting.

CONTENT

This presentation provides an introduction and describes the components and systems operation of the electrical system, power train, and implement and steering systems for the "E" Series Backhoe Loader. This presentation may also be used for self-paced and self-directed learning.

OBJECTIVES

After learning the information in this presentation, the technician will be able to:

1. identify the correct operation of the "E" Series Backhoe Loader electrical system, power train, implement and steering systems; and,
2. diagnose problems in the "E" Series Backhoe Loader electrical system, power train, and implement and steering systems.

REFERENCES

STMG "Distributor-type Mechanical Fuel Pump - 3044C/3046
Tier II Engines"

SERV1777

PREREQUISITES

"Fundamentals of Engines Self Study Course"

TEMV3001

"Fundamentals of Mobile Hydraulics Self Study Course"

TEMV3002

"Fundamentals of Power Train Self Study Course"

TEMV3003

"Fundamentals of Electrical Systems Self Study Course"

TEMV3004

Estimated Time: 16 Hours

Illustrations: XX

Handouts: XX

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NOTES



1

INTRODUCTION

The "E" Series Backhoe Loader family is the latest generation of Caterpillar Backhoe Loaders retaining many of the features proven on the "D" Series machines along with additional performance and design improvements.

This presentation discusses the components and system operation of the "E" Series Backhoe Loaders.

The hydraulic system has been changed from a Load Sensing/Pressure Compensated LS/PC system to a Proportional Priority, Pressure Compensated PPC system. Two types of PPC systems are used. The 416E/422E/428E machines with mechanically controlled implement hydraulic valves use one type of PPC system. The 420E/430E/432E/434E/442E/444E machines use another type of PPC system.

The "E" Series BHL product line is the first new complete redesign since the "C" Series, and brings significant improvements in performance, operator comfort, controllability, versatility, and styling.

"E" SERIES BACKHOE LOADER MACHINE SYSTEMS

MODEL	LOADER LINKAGE	BACKHOE LINKAGE	BACKHOE HYDRAULICS	LOADER HYDRAULICS	POWER TRAIN	STEERING	ENGINE	BRAKES
416E	Single Tilt	Center Pivot	Mechanical	Mechanical	2WD AWD	2WS	3054C NA	No Boost
							3054C Turbo	
420E	Single Tilt	Center Pivot	Pilot	Mechanical	2WD AWD	2WS	3054C Turbo	Boosted
	Parallel Lift			Pilot				
422E	Single Tilt	Side Shift	Mechanical	Mechanical	2WD or AWD	2WS	3054C NA	No Boost
							3054C Turbo	
428E	Parallel Lift	Side Shift	Mechanical	Mechanical	AWD	2WS	3054C Turbo	No Boost
430E	Single Tilt	Center Pivot	Pilot	Mechanical	AWD	2WS	3054C Turbo	Boosted
	Parallel Lift			Pilot				
432E	Parallel Lift	Side Shift	Pilot	Pilot	AWD	2WS / AWS	3054C Turbo	Boosted
434E	Parallel Lift	Side Shift	Pilot	Pilot	AWD	AWS	3054C Turbo	Boosted
442E	Parallel Lift	Side Shift	Pilot	Pilot	AWD	2WS/AWS	3054C Turbo	Boosted
444E	Parallel Lift	Side Shift	Pilot	Pilot	AWD	AWS	3054C Turbo	Boosted

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The "E" Series machines include models that are equipped with the center pivot backhoe and the sideshift backhoe. The sideshift models 434E and 444E are equipped with Equal Size Tires (ETS). The last digit ("4") in the model number designates the ETS option.

The 416E and 422E models are equipped with a single tilt loader and the 420E and 430E models can be equipped with a single tilt or parallel lift loader. The 428E and the 432E through 444E models come standard with the parallel lift loader.

The 416E, 422E, and 428E include mechanically controlled loader and backhoe implement hydraulic valves. The 420E and 430E models can be equipped with mechanically controlled or pilot controlled loader valves. The backhoe valves on the 420E and 430E are pilot controlled. The loader and backhoe valves on the 432E-444E are pilot controlled hydraulic valves.

The "E" Series machines are equipped with either a two wheel drive or All Wheel Drive (AWD) power train and a standard or autoshift transmission.

NOTE: The standard countershaft transmission is available in all "E" Series models. The autoshift transmission is also available on the 420E/430E/432E/434E/442E/444E models.

The standard and autoshift transmissions feature new control solenoids which provide improved clutch pressure modulation for smoother clutch engagement and longer life.



An All Wheel Steer (AWS) system is available on the 432E and 442E models and standard on the 434E and 444E models.

The "E" Series backhoe loaders are powered by direct injection, four cylinder Caterpillar 3054C diesel engines. Turbocharged engines are optional on the 416E and 422E models and standard on all other models.

The 420E/430E/432E/434E/442E/444E machines are equipped with hydraulically assisted master cylinders to reduce the amount of pedal effort. An external brake boost valve uses oil from the pilot accumulator to add boost to the master cylinder. The hydraulic force multiplies the pedal effort so the operator can get more braking force with less effort.

SIMILARITIES WITH FORMER MACHINES

- **Engine**
- **Steering System**
- **Ride Control**
- **Maintenance**

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The "E" Series machines have many similarities to the machines they are replacing.

The basic engine and fuel system are the same as the updated "D" Series Tier II machines. Glow plugs have replaced the thermal starting aid and a start aid relay has been added.

The two wheel steering system is the same except two crossover relief valves have been added. The All Wheel Steer system is the same as the updated "D" Series machines.

The ride control system is similar except for a second solenoid that has been added, which combines the check valve and shutoff valve.

Most of the daily service fill and check points are the same and can be accessed through the hinged engine hood.

DIFFERENCES FROM FORMER MACHINES

- **Operator's Station**
- **E-Stick**
- **Electrical System**
- **Transmission**
- **Rear Axle**
- **Joysticks**
- **Pattern Switching Valve**
- **Brake Master Cylinders**
- **Steering and Implement Pump**
- **PPPC Implement Hydraulic System**
- **Powered Sideshift Option**

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The "E" Series machines feature several changes over the previous models to improve operator comfort and machine performance.

The operator compartment features new console layouts. The heating, ventilation, and air conditioning includes 15 louvers and air towers, which provide significant improvements to air circulation.

The E-Stick uses an extendible slider with a new wear pad design.

The electrical system has changed significantly from the previous models. One fuse and relay block replaces the two fuse and relay blocks on the previous machine. The Cat ET connector is also located below the fuse panel and is now accessible without removing the fuse block access panel. The Machine ECM replaces the Auxiliary ECM and Autoshift ECM.

Modulation valves have been added to the standard and autoshift transmissions to improve clutch modulation, which results in smoother transmission shifting. A forward drive gear has been added to the countershaft in the standard transmission. The forward drive gear increases the machine top speed to 40 km/h (25 mph) the same as the autoshift transmission.

The rear final drive planetary gears have been moved outboard of the differential. Brake inspection ports have been added to the axle.

The pilot loader joysticks and pilot backhoe joysticks have been redesigned.



The pattern switching valve is controlled by a switch and two solenoids rather than mechanically as on the "D" Series.

The 420E/430E/432E/434E/442E/444E machines are now equipped with hydraulically assisted master cylinders, which decreases pedal effort when braking.

A torque selector solenoid has been added to the steering and implement pump on the 420E/430E/432E/434E/442E and 444E machines, which provides a higher pump setting.

The implement hydraulic system has changed from a LS/PC system to a PPC system, which provides better performance when using multiple functions.

The sideshift machines can be equipped with an optional powered sideshift, which allows the backhoe to be hydraulically shifted across the slider.



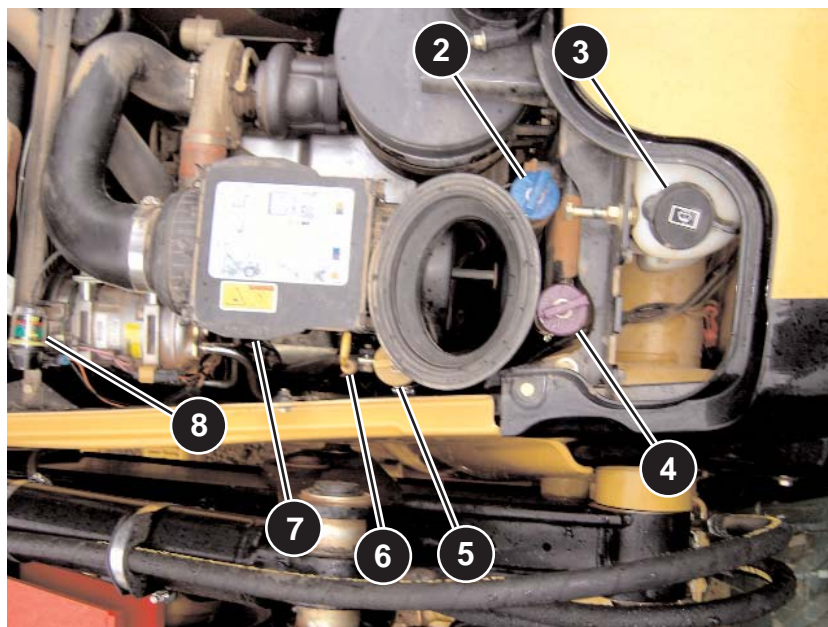
5

The new "E" Series cab with curved glass and contoured fenders gives the machine a distinct new look, improves serviceability, and provides superior visibility. The sleek hood is lowered for visibility and tilts forward for easy access.

A new mainframe provides a longer wheelbase for improved balance and is designed to provide durability for improved performance. The swing casting has an improved geometry for hose routing clearance and increased durability. With replaceable bushings in the swing casting, adjustable shim packs in the E-Stick and sideshift stabilizer legs, and a Diagonal Retention System for bucket tooth tips, the "E" Series is easier to maintain.



6



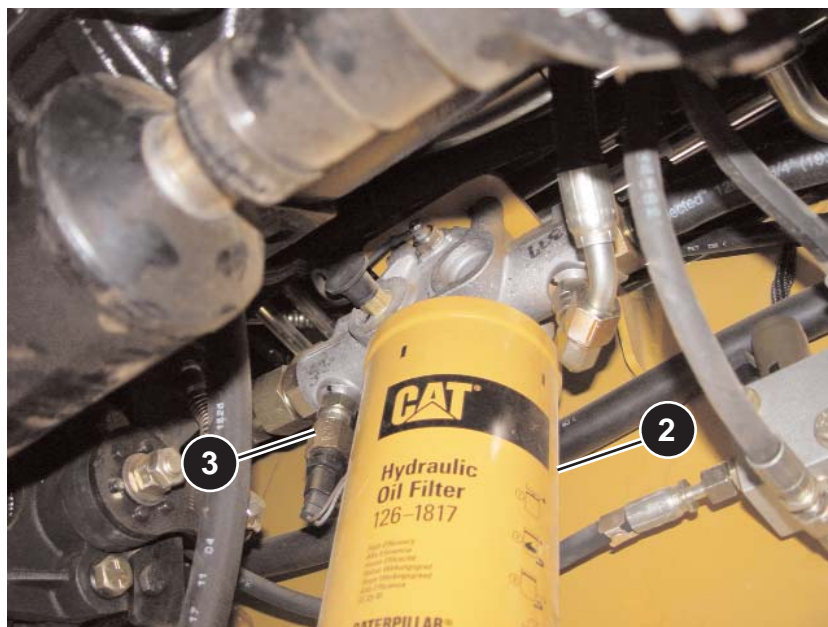
7

Access to the top of the engine and several maintenance items is obtained by opening the hood (1). Service points accessible when the hood is opened are:

- Hydraulic tank fill tube (2)
- Washer fill bottle (3)
- Transmission oil fill tube (4)
- Engine oil fill tube (5)
- Engine oil dipstick (6)
- Air filter housing (7)
- Air filter indicator (8)



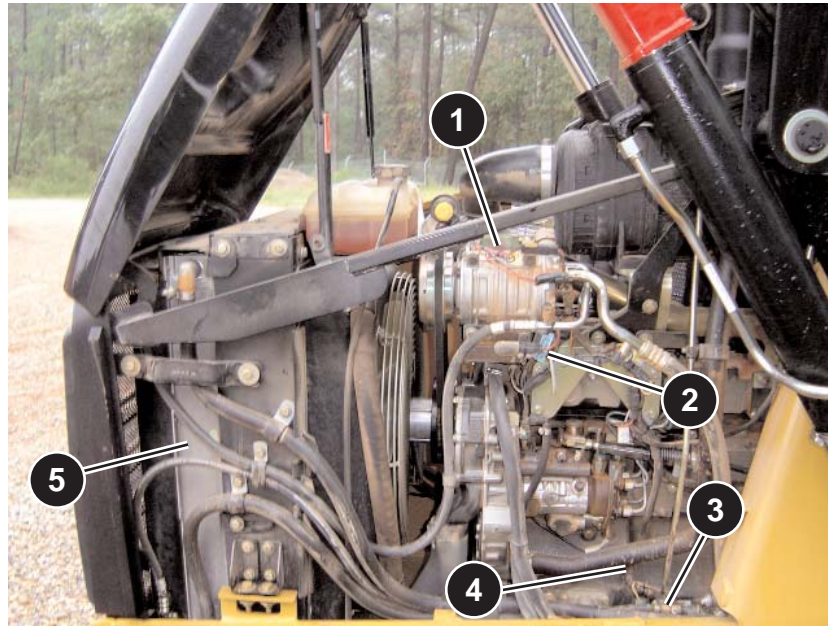
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9

The hydraulic oil sight gauge (1) is located on the left side of the machine in front of the cab.

The hydraulic oil filter (2) is located below the machine at the left frame rail. The hydraulic oil filter bypass switch (3) is mounted to the oil filter base.



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The left side of the engine (top illustration) and right side of the engine (bottom illustration) are accessed by removing the side panels. The side panels are light weight non-metallic for easy removal. The following components are visible with the side panels removed:

- Air conditioning compressor (1)
- Cold start temperature switch (2)
- Electrical fuel priming pump relay (3)
- Oil pressure switch (4)
- Hydraulic oil cooler (5)
- Coolant temperature sender (6)
- Coolant temperature switch (7)
- Transmission oil cooler (8)



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The new extendible stick (E-Stick) uses an external slider with a new wear pad design, which provides increased life and simplified serviceability. The E-Stick outer slider protects the inner slider from damage and debris and includes serrated gripping edges for improved clamping capabilities.

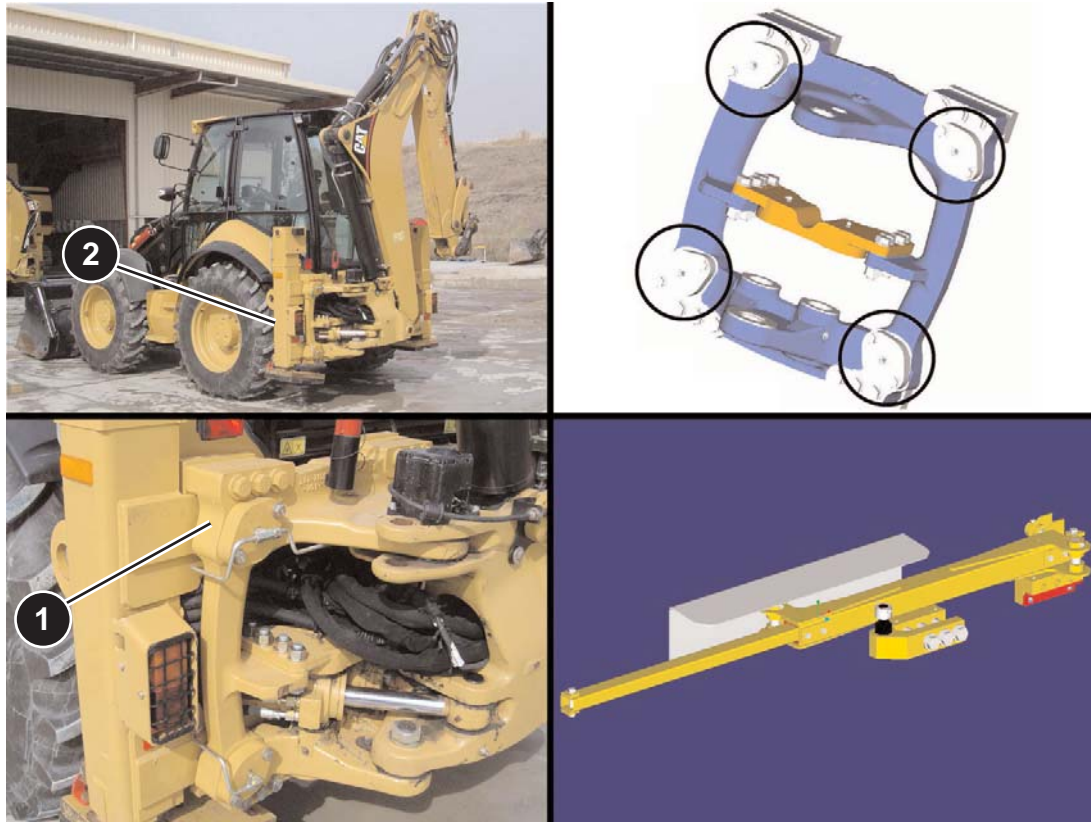
Provisions for mounting a hydraulically controlled thumb is standard equipment on some machines.



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The E-Stick is adjustable up and down by sliding the wedges (1) located at each end of the E-Stick. The wedges can be moved by loosening the two bolts (2) on the E-Stick and adjusting the set screw (3). Slide the wedges in to tighten and out to loosen the E-Stick.

The E-Stick is adjustable back and forth by changing the amount of shims (4) located in two places along the side of the E-Stick. The shims can be accessed by removing four bolts and a plate (5) on the E-Stick.



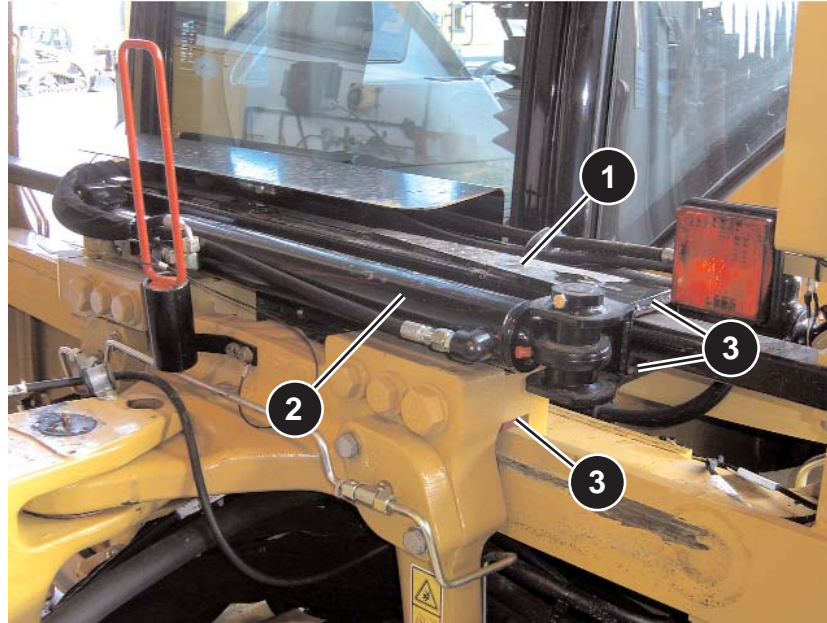
14

"E" Series sideshift machines have a new slide frame (top right illustration) with new externally serviceable slide frame lock cylinders and reversible/replaceable wear plates (1). The lock cylinders can be serviced in the field with standard tools.

The stabilizers (2) are now externally adjustable.

A powered sideshift (bottom right illustration) is available, which allows the operator to hydraulically shift the backhoe across the slider.

The 434E and 444E sideshift models are equipped with equal size tires as shown in this illustration, which provides lower ground pressure due to a larger tire footprint in contact with the ground.



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This illustration shows the optional powered sideshift (1) attachment. The powered sideshift moves the backhoe across the slider using a hydraulic cylinder (2). Wear pads (3) on the slider and powered sideshift assembly are serviceable.



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OPERATOR'S STATION

The new "E" Series cab offers an improved operator environment, with increased visibility, ergonomics, and comfort. The pod-mounted joystick controls on machines with a pilot controlled backhoe valve offer increased comfort, control, and versatility.

The air conditioning system performance has improved with 15 louvers and air towers at the rear. There is now a separate accumulator and dryer. The dryer requires replacement every 3000 hours or two years.

Other cab features include:

- Automotive style finish
- Curved glass maximizes space within the cab and provides 360° visibility
- Air Suspension seat
- Low effort machine controls
- Personal storage space



- Joystick pattern switch (pilot controlled machines)
- Continuous flow for auxiliary functions (optional)