BACKHOE SPECIFICATIONS
646-B and 648
Service Manual 9-51650

J I Case
A Tenneco Company

SPECIFICATIONS

BACKHOE HYDRAULIC SYSTEM SPECIFICATIONS

PUMP SPECIFICATIONS

LOADER MODEL	GPM O PSI (0 k Pa) 3600 RPM	GPM 0 PSI (0 k Pa) 3000 RPM	GPM 1500 PSI (10 340 k Pa) 3000 RPM
644	9.5 GPM (36 1/min)	8.0 GPM (30 1/min)	7.2 GPM (27 1/min)
646 and 648	8.5 GPM (32 1/min)	7.0 GPM (26 1/min)	6.5 GPM (24 1/min)

RELIEF VALVE SPECIFICATIONS

All 644 and 646 prior to PIN 9732040 with 2 hoses to backhoe.

Main Relief Valve - 2,000 PSI (13 790 k Pa)

Circuit (Secondary) Relief Valves

Boom – Both Ports 3,000 PSI (20 684 k Pa)

Crowd – Upper Port 3,000 PSI (20 684 k Pa)
Lower Port Plugged

Swing – in cylinder end 2,000 PSI (13 790 k Pa)

All 646 Series B and 648 Loader Backhoes with 3 hoses to backhoe.

Main Relief Valve - 2,300 PSI (16 000 kPa)

Circuit (Secondary) Relief Valves -

Boom - LOWER Port 750 PSI (5 200 kPa)
(646B prior to PIN 9758399
3000 PSI (20 684 kPa))
UPPER Port 3,000 PSI (20 684 kPa)

Crowd - UPPER Port 3,000 PSI (20 684 kPa)
LOWER Port Plugged

Swing - in cylinder end 2,000 PSI (13 790 kPa)

FLOW RESTRICTORS

Boom – Upper Port .136" (3.45 mm)

Swing – Both Ports .093" (2.36 mm)

CYLINDERS

BACKHOE

Boom, dipper and bucket (1 each) . . . . . .3" dia. x 15" stroke, 1-1/2" rod
(76 mm dia. x 381 mm stroke - 38 mm rod)

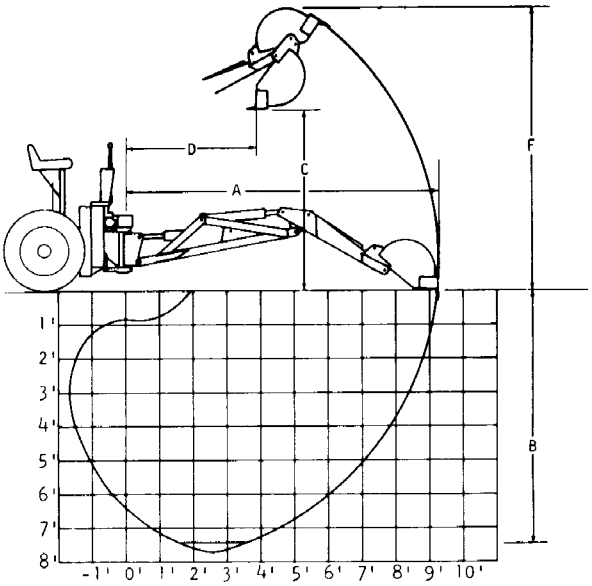
Swing - special double end . . . . . 2-3/4" dia. x 8" stroke, 2-3/4" piston
(70 mm dia. x 203 mm stroke - 70 mm piston)

Stabilizer (2) . . . . . .1-3/4" dia. x 12" stroke, 1" rod
(44 mm dia. x 305 mm stroke - 25 mm rod)

BACKHOE CONTROL VALVE

Make . . . . . .Cessna
Model 30006-AC

Type . . . . . Sectional, six spool



OPERATING DATA

	*Overall reach - from Loader rear axle centerline	14'0" (4267 mm)
A	*Digging radius - from swing pivot	9'3" (2819 mm)
B	*Digging depth -	7'5" (2261 mm)
C	Loading height	5'3-3/4" (1619 mm)
D	Loading reach	51-1/2" (1308 mm)
	*Swing arc	178°
	*Bucket rotation	143°
	*Stabilizer spread - operation position	35-1/2" (902 mm)
	transport position	35-1/2" (902 mm)
	*Clearance height	5'3-3/4" (1619 mm)
	*Digging force - bucket cylinder	5295 lbs. (2402 kg)
	*Digging force - dipper cylinder	1997 lbs. (906 kg)
	*Leveling angle - maximum grade on which the backhoe will make a vertical cut	12°

DIMENSIONS

E	*Maximum transport height	68" (1727 mm)
F	Overall height maximum	8'4-1/2" (2553 mm)
	Overall length - transport	15'7" (4750 mm)
	Overall width - at loader tires (high flotation)	47" (1193 mm)
	Ground clearance - at backhoe	5" (127 mm)

OPERATING WEIGHTS

*Backhoe with 644	2400 lbs. (1087 kg)
*Backhoe with 646	2460 lbs. (1114 kg)
*Backhoe with 648	2350 lbs. (1066 kg)

BACKHOE BUCKETS (CAPACITIES)

Width Inch (mm)	Type	Heaped Cu. Ft.	Heaped (m^3)	Struck Cu. Ft.	Struck (m^3)	Weight Lbs.	Weight (kg)
12" (305)	Trenching	1.25	(0.035)	1.0	(0.028)	82	(37)
16" (406)	Trenching	2.0	(0.057)	1.625	(0.046)	90	(41)
20" (508)	Trenching	2.875	(0.081)	2.25	(0.064)	107	(49)
24" (610)	Trenching	3.5	(0.099)	2.75	(0.078)	119	(54)
12" (305)	Bellhole	1.25	(0.035)	1.0	(0.028)	80	(36)
18" (457)	Bellhole	1.75	(0.050)	1.375	(0.039)	107	(49)
22" (559)	Bellhole	2.875	(0.081)	2.25	(0.064)	120	(54)

* Specifications that conform to ICED definitions.

OPERATION OF BACKHOE CONTROL VALVE

The Backhoe Control Valve is a stack type construction valve rated at 2500 PSI (17 235 k Pa) and 15 GPM (56.7l) flow. The valve consists of a port plate (inlet plate), 6 working sections and an end plate (outlet plate). The oil passages connecting the sections are sealed between the sections with o-rings. The sections are held together with long tie bolts which run through all the sections.

NEUTRAL FLOW

When all the valve spools are in the neutral or centered position, the oil enters the inlet port in the port plate. From there it is directed to the zig-zag (open-center) passage of the valve sections. The oil from the zig-zag (open-center) passage collects in the end plate and flows out the return port to the reservoir.

The open-center passage is referred to as the zig-zag passage in this valve because of the way the oil passes through each work section. Oil enters the top half of the center passage and exits the bottom half of the center passage in each work section and thus zig-zags through each section.

PRESSURIZED FLOW

When any valve spool is in the "IN" or "OUT" position, the neutral flow through the zig-zag passage is blocked at that particular spool. The pump flow is then diverted to the deadline (parallel) passage where the oil flow is stopped by the end plate. The only path left for the oil to follow is through the lift check and then to the open work port.

LIFT CHECK

The purpose of the lift check is to prevent the oil in the work port from returning to the pressure inlet passage in the control valve.

The lift check is primarily useful when you are trying to "slow raise" a heavy load. When the spool is "cracked" the pressurized oil in the cylinder will try to backflow into the inlet passage of the control valve and drop the load.

With a lift check in the system, the oil is prevented from returning to the inlet passage of the control valve through the lift check.

When the valve spool is in neutral, the oil from the pump enters the port plate of the control valve and passes through the zig-zag (open-center) passage and on to the return port. As the spool is moved "IN" or "OUT," the oil in the zig-zag (open-center) passage is gradually cut off. As it is cut off, the inlet oil from the pump is pressurized. The pressurized oil in the deadline (parallel) passage unseats the lift check plunger and causes the load to raise.

If a lift check was not used in the system, the oil from the work port would have flowed backwards, out the "cracked" spool, into the valve inlet passage and on through the zig-zag (open-center) passage to the tank. This would have happened before the zig-zag (open-center) passage was cut off and before the pump supply oil pressurized enough to equalize the backflow pressure and lift the load.

The lift check also prevents interaction between actuated spools. For example, if there were no lift checks and two loads were being raised simultaneously, the heavier of the two loads would fall and the oil from that cylinder would flow into the lighter loaded cylinder and increase its lifting speed. With lift checks in the system the oil is prevented from backflowing into the other circuit.

SYSTEM RELIEF

The purpose of the system relief valve, located in the inlet plate of the control valve, is to limit the maximum operating pressure of the control valve. The oil from the pump enters the inlet port of the control valve and if a spool is not actuated, the oil passes through the zig-zag (open-center) and on to the reservoir.

If a spool is actuated, the oil flow from the pump is diverted into a work port and on to the cylinder. If the cylinder has little or no resistance, it merely extends and requires very little oil pressure. If the cylinder meets a resistance, the cylinder will extend but requires more oil pressure to operate it. If the cylinder reaches the end of its stroke, or meets a resistance that requires more oil pressure to move it than the relief valve pressure setting, the oil will not flow into the cylinder; instead, the relief valve will open and allow the oil flow from the pump to enter the return passage and return to the reservoir. The oil flow from the pump is still pressurized to the relief valve setting until the spool is returned to neutral. The relief valve will then close and the oil will again pass through the zig-zag (open-center) passage.

VALVE WORKING SECTIONS

A four-way valve section is used to actuate a double acting cylinder in both directions.

When the spool is in the "NEUTRAL" position, the pump oil flows through the interconnecting zig-zag (open-center) passage and on to the return port. Both work ports are blocked.

When the spool is in the "IN" position, the zig-zag (open-center) passage is closed by the spool lands, therefore, the oil from the deadline (parallel) passage unseats the lift check and flows through the pressure loop to port "A" to the cylinder. Port "B" is open to tank.

When the spool is in the "OUT" position, the zig-zag (open-center) passage is closed by the spool lands, therefore, the oil from the deadline (parallel) passage unseats the lift check and flows through the pressure loop to port "B" to the cylinder. Port "A" is open to tank.

ORIFICE PLATES

Orifice plates (restrictors) are provided in both swing section work ports and in the boom section upper work port to slow the swing and boom-down action of the backhoe.

CIRCUIT RELIEF VALVES USED IN BOOM AND DIPPER SECTIONS

A circuit relief valve is used to relieve a work port of excessive pressure when the spool is in neutral and prevent damage to the cylinder or to the structure of the machine.

When an external force is applied to a cylinder, a static pressure is built up inside the cylinder. When the static pressure reaches the same pressure as the pressure setting of the circuit relief valve, the circuit relief valve will open enough to relieve the excess pressure. The oil relieved through the relief valve is dumped into the return passage in the control valve.

Similar circuit relief valves are found in one end of the swing cylinder to protect and cushion the swing circuit.

Low pressure boom down circuit (secondary) relief valve used in 646 PIN 9758399 and after and 648.

The low pressure secondary will allow the boom to drift upward while the dipper is crowded in, therefore, preventing lifting of the stabilizers from the ground.

Boom down pressure is sufficient to lift the rear of the loader for repositioning, however, when the loader bucket is raised and the dipper is positioned vertically under the boom.

This secondary relief valve is installed under the lower work port of the "Boom" valve section.

IMPORTANT: To protect the structural integrity of the front loader bucket and loader arms, THE FRONT LOADER BUCKET MUST BE POSITIONED FLAT ON THE GROUND WHEN USING THE BACKHOE.

DO NOT place the bucket on the ground in the full dump position.

5. Case cylinder (part number G100936 stamped on gland)

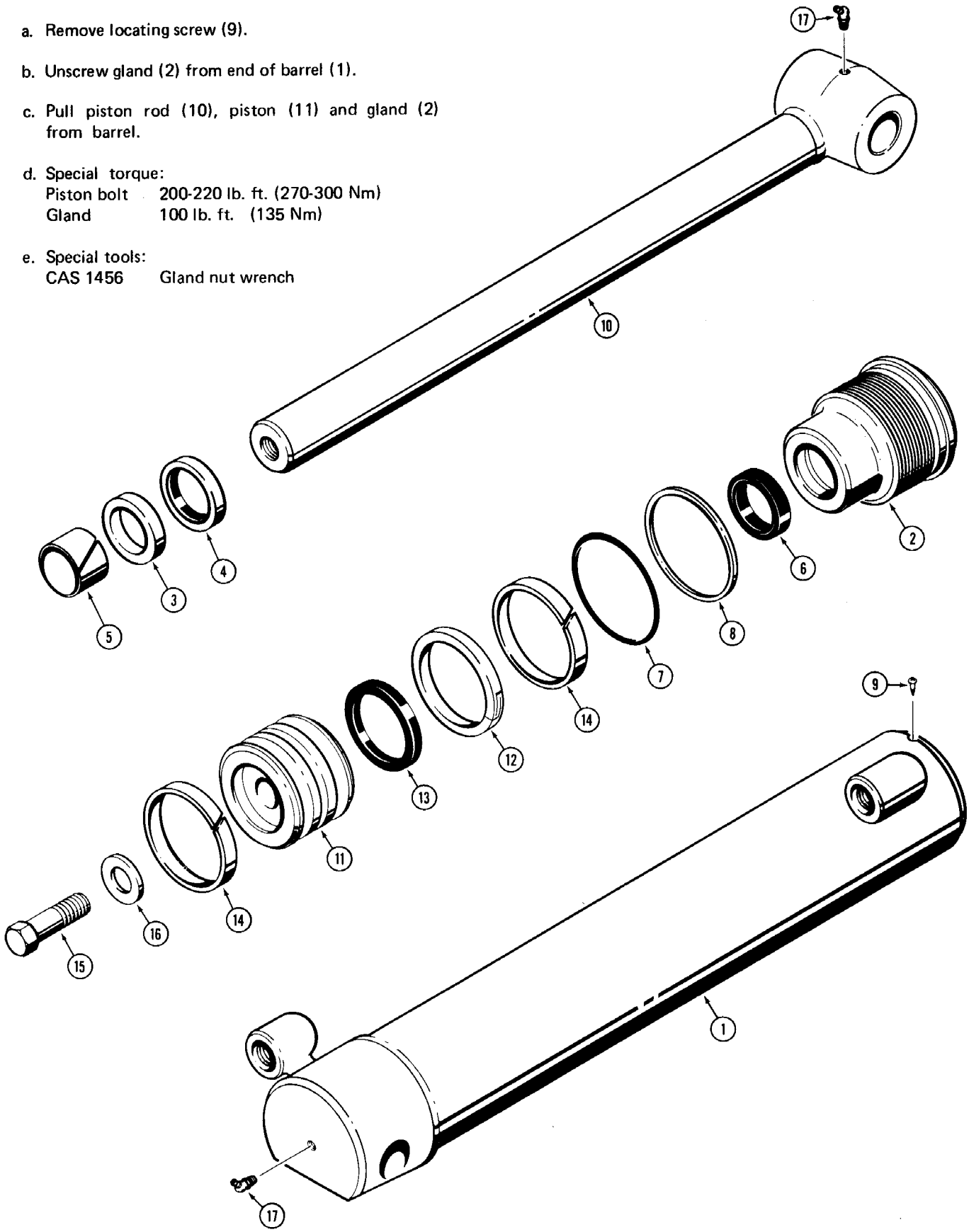
   a. Remove locating screw (9).

   b. Unscrew gland (2) from end of barrel (1).

   c. Pull piston rod (10), piston (11) and gland (2) from barrel.

   d. Special torque:
   Piston bolt 200-220 lb. ft. (270-300 Nm)
   Gland 100 lb. ft. (135 Nm)

   e. Special tools:
   CAS 1456 Gland nut wrench



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