

Converting a Komatsu PC128US Excavator from Caterpillar to Deere Controls

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Brian Rasnow

brian@rasnowpeak.com



Figure 1. Komatsu PC128US S/N ~6500 (~1998 vintage), side view (left) and front view (right), with side panels removed to access the hydraulic control valves.

Introduction: Excavators have two control conventions, typified by Caterpillar and John Deere. Many modern machines have a valve enabling simple switching between these two conventions, but the Komatsu PC128US does not. If you're used to one style, then switching to the other can be a major challenge and require substantial learning curve until intuitive and automatic responses become appropriate and safe. This paper describes how to convert a Komatsu PC128US from its default Cat controls to Deere convention. The conversion involves the swapping of 4 low-pressure (~300 psi) pilot hydraulic lines leading to the main hydraulic

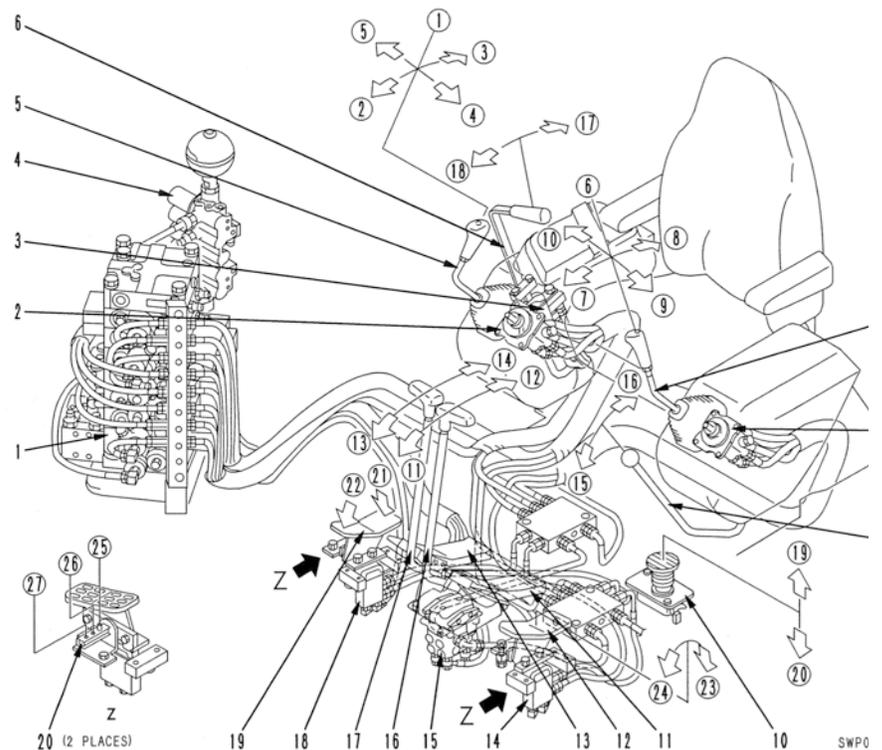


Figure 2. Pg. 10-12 (93) of the Service Manual. The right joystick (1) controls: (2) Boom RAISE; (3) Boom LOWER; (4) Bucket CURL; (5) Bucket DUMP. The left stick (6) controls: (7) Arm OUT; (8) Arm IN; (9) Swing LEFT; (10) Swing RIGHT. *The goal is to swap the Boom and Arm controls.*

control valve. Komatsu does not acknowledge this conversion is possible, and I've found no prior reports of such a conversion, although there are inquiries about it on the net. I also offer no guarantees, implied or otherwise.

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The Boom is controlled by two hydraulic cylinders located over the right track in Fig. 1a and right side Fig. 1b. The Arm is controlled by a single cylinder mounted on top of the boom, at the top of Fig. 1a. Located on the Arm is the Bucket cylinder, on the right side of Fig. 1a). Interestingly, this machine is fully hydraulic powered. On the inside of the Arm is another cylinder controlling the “thumb” that closes over the bucket. The machine can Swing right and left, and the two tracks can drive forward and backward, all powered by hydraulics. This excavator weights 29000 lbs (13,000 kg), powered by a 4-cylinder turbocharged diesel engine producing 86 Hp (64kW) at 2200 rpm, 329 N-m of torque at 1300 rpm. The hydraulic pump operates at 32-34MPa (4600-5000 psi) at flow of 226 l/min.

Methods and Results: The service manual was the primary source of information, and was purchased from <http://www.tradebit.com>. This 1029 page tome covers various versions and the information required for this conversion is scattered in multiple sections. The hydraulic system and default controls for my serial number are shown in Fig. 2. The control joysticks pressurize pilot hydraulic lines running to the 6 spool hydraulic control valve (left side in Fig. 2), which is the natural place to swap Boom and Arm controls.

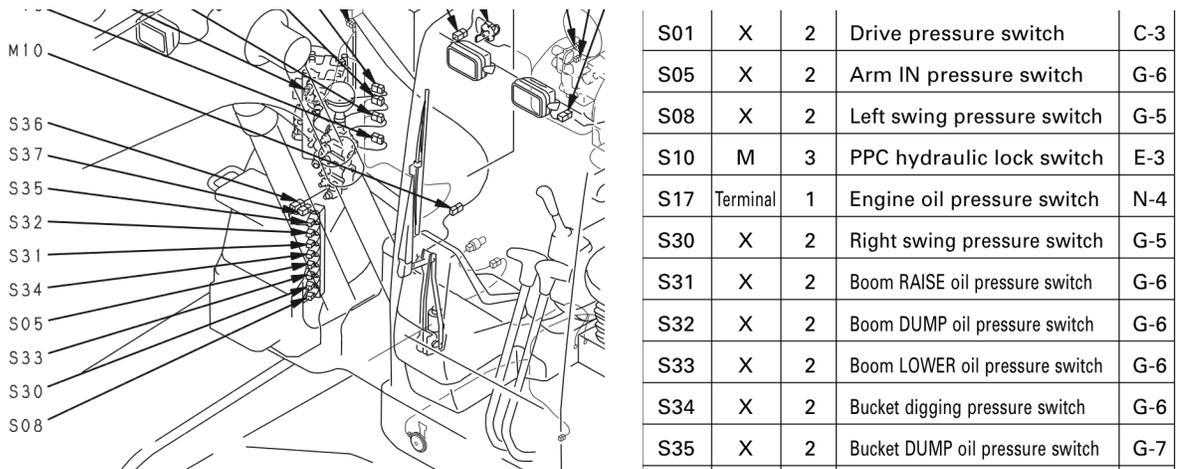


Figure 3. From Service Manual P. 427 & 9, (mis)identifying the 6-spool control valve lines. S23 (right) should read “Arm DUMP”. The electrical connections on the spool bar in are shown on p. 419, which also help identifying which line is which.

The PPC (pneumatic power clutch?) hoses on this spool are documented beginning on p. 808. P. 870-2 have photos and another list of their sequence. They have apparent “quick-release” mechanisms, which I found were neither quick nor wanted to release, even after turning both ways and breaking pressure on the distal end. The method for disconnecting “push-pull-type couplers” is documented on p. 13-14 of the Service Manual, but I only had partial success following them, perhaps due to the age of the hoses. A steel retaining ring must be spread outward uniformly before the hose can be pulled out. The sleeve is designed to do this when pushed in and then rotated counter-clockwise, but I found considerable wiggling with two pliers of the ring ends was needed. Likewise, make sure

these rings seat into grooves afterwards – the first time the machine powered up, two of the hoses blew off.

Another useful trick is to label each hose and connecting block with matching colored phone wires – which come in a wide combination of color patterns. This will facilitate verifying and undoing the conversion or attempted conversion.

Since these hoses operate at pilot pressure, it is not necessary (but a good idea anyway) depressurize the pistons before cracking hoses, nor was it necessary to purge the lines. After swapping hoses and verifying they were tight, the machine operated without issues. The dripping of fluid made little impact on the 100 liter capacity of the machine's hydraulic system.

Which hoses to swap? Initially I tried swapping S05 ↔ S33 and S31 ↔ S32 (which I did at the distal ends of these hoses, on the main control valve, avoiding the pesky push-pull couplers). The result was that both boom and arm controls operated backwards – left and right hand had been switched but forward and backwards were inverted. Undoing this and swapping S05 ↔ S31 and S33 ↔ S32 worked, but it must be done at the spool block because long hoses are switched to short hoses and visa versa. The final configuration is shown in Fig. 4b.



Figure 4. 6 spool block with two hoses removed viewed from the side (A) and with 4 hoses transposed, converting the hydraulic system to Deere convention (B).

Matching wires on the hoses and connectors indicate the original configuration.

Discussion: It isn't too difficult to convert a Komatsu PC128US and similar models from Caterpillar to Deere controls, by swapping 4 relatively low pressure hydraulic control

lines at the 6-spool block near the main Control Valve. To avoid danger from a naïve operator, make sure to indicate in obvious places that this modification has been done.