Service Manual

Fastrac

3170, 3170 Plus
3190, 3190 Plus
3200, 3200 Plus
3220, 3220 Plus
3230, 3230 Plus

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Code	Description	Possible Cause	Action and Remedy
		not touch the injector solenoids or the solenoid wires when the engine is operating. GEN1-19 **⚠ WARNING** **Do not open the high pressure fuel system with the engine running. Engine operation causes high fuel pressure. High pressure fuel spray can cause serious injury or death.** 13-3-2-16	If the symptoms then disappear and fault code Q1144 becomes inactive, a faulty injector has been diagnosed and would require replacing. Such diagnostics require specialist tools – contact JCB Landpower for advice. Be aware that if the injector is fractured or broken then damage to the piston, liner or head may have occurred and needs investigating.
Q1143	Injector cylinder number 4 - not responding properly or out of adjustment.	The Engine ECU can detect when unintended fuel injection occurs by monitoring Fuel Rail Pressure and engine speed. This fault code is logged when the ECM determines that unintended fuel injection has occurred. The fault code can become active if an injector becomes damaged and jams open, fuelling continuously. **⚠ WARNING** **The injector solenoids receive high voltage when the engine is operating. To reduce the possibility of personal injury from electrical shock, do not wear jewelry or damp clothing, and do not touch the injector solenoids or the solenoid wires when the engine is operating.** GEN1-19 **⚠ WARNING** **Do not open the high pressure fuel system with the engine running. Engine operation causes high fuel pressure. High pressure fuel spray can cause serious injury or death.** 13-3-2-16	Examine the Injector 'pass through connectors' for obvious damage or corrosion. If an injector is fuelling continuously the engine will typically die or not start. Excessive exhaust smoke and an audible engine knock is often associated with the problem. Fault code Q2115 will be active during cranking since the injector is fuelling continuously and injection rail pressure will be low. Cummins engineers use a 'fuel blocking tool' to prevent fuel reaching the suspect injector. If the symptoms then disappear and fault code Q1144 becomes inactive, a faulty injector has been diagnosed and would require replacing. Such diagnostics require specialist tools – contact JCB Landpower for advice. Be aware that if the injector is fractured or broken then damage to the piston, liner or head may have occurred and needs investigating.
Q1144	Injector cylinder number 5 - not responding properly or out of adjustment.	The Engine ECU can detect when unintended fuel injection occurs by monitoring Fuel Rail Pressure and engine speed. This fault code is logged when the ECM determines that unintended fuel injection has occurred. damage. The fault code can become active if	Examine the Injector 'Pass through connectors' for obvious damage or corrosion. If an injector is fuelling continuously the engine will typically die or not start. Excessive exhaust smoke and an audible engine knock is often associated with the problem.

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Pump

Type	Rear section (P4) of gear type double pump (triple pump on 4WS machines), driven by PTO gearbox.
Flow Rate at 13.5 bar (195 lbf/in²)	28.5 litres/min (6.3 UK gal/min; 7.6 US gal/min) at 1500 rev/min.

Control Valve

Type	Remote, chassis-mounted control valve. Incorporates pressure maintenance valve, check valve and solenoid valves.
Pressure Maintenance Valve Setting (**CT1**)	13.5 bar (195 lbf/in²)
Check Valve Cracking Pressure	
CT2	2 bar (29 lbf/in²)
CT3	5 bar (72.5 lbf/in²)
CT4	2 bar (29 lbf/in²)
CT5	12 bar (174 lbf/in²)
Solenoid Valves	12V dc, 3 position, 4-way
Low Pressure Lubrication (LPL) at 1500 rev/min.	1 - 2 bar (14.5 - 29 lbf/in²)

Differential Lock Control Valve

Type	Solenoid and pressure maintenance valve for 'soft-engage' diff. lock mounted in suspension valve block
Pressure Maintenance Valve Setting	38 bar (550 lbf/in²) at 2400 rev/min.

Front Axle

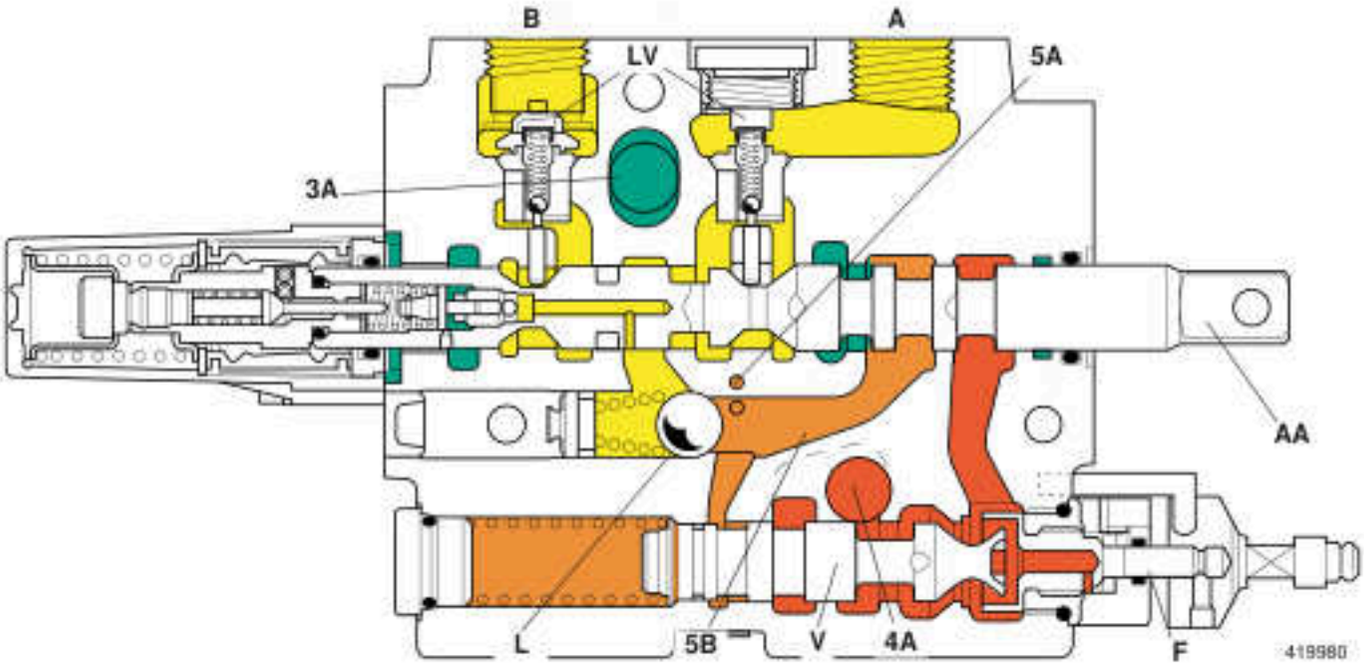
Model	SD70
Type	Crown wheel and pinion primary reduction with epicyclic hub reduction
Mounting	3 leading link control arms and Panhard rod
Differential	Soft engaged differential lock with electro - hydraulic control

Rear Axle

Model	PD90
Type	Crown wheel and pinion primary reduction with epicyclic hub reduction
Mounting	2 trailing link control arms and 'V' link
Weight (approximate)	555 kg (1224 lb)
Brakes	Single caliper solid disc on each hub
Differential	Soft-engaged differential lock with electro-hydraulic control

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Typical Manually Actuated Spool



Description

The illustration shows a typical mechanically actuated spool **AA** (see **External Hydraulics/Draft Control Valve Neutral Circuit**). The oil flow from this spool is controlled by variable flow control **F**. Load sensing diverter spool **V** diverts the flow to the next service spool in sequence or to tank if no services are selected.

Oil is fed to the spool **AA** from the inlet section of the valve block via parallel gallery **4A.**

Spool AA in neutral

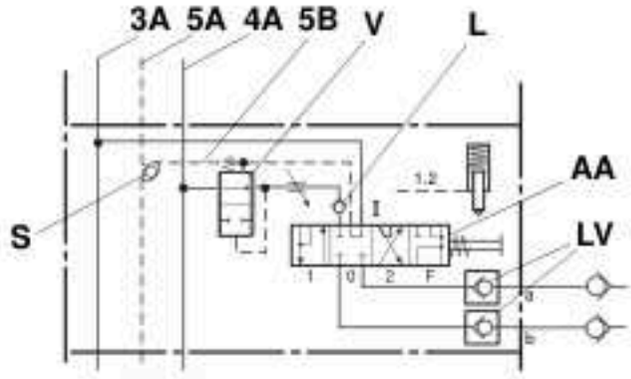
When the spool is in neutral, the pressure in parallel gallery **4A** is dead-ended by the spool and is fed to the right hand end of diverter valve **V**. This moves valve **V** to the left, closing the flow path through the diverter valve to the main spool **AA**. A restricted path past spool **V** remains to allow a bleed of pressure from **4A** up to the main spool **AA**.

Pilot pressure in gallery **5A** is vented to tank gallery **3A** via the main spool. The leak free check valves **LV** are held closed by spring pressure and oil pressure at port **A** or **B**.

Spool AA selected

When the spool is actuated, the spool land seals the cavity between the pilot feed **5B** and tank gallery **3A**. Pressure is fed from the main pressure gallery **4A** past the land of spool **AA** into the pilot gallery **5B**. This pressure is fed to the left hand end of diverter spool **V** and assisted by spring force, moves the spool **V** to the right. A flow path is then open for oil from gallery **4A**, past spool **AA** to the load hold check valve **L**.

* **Note:** The load hold check valve design is changed on later production valve slices. The spherical ball **L** with conical spring is replaced by a conical seat valve with cylindrical spring.



Pressure in **5B** enters gallery **5A** via shuttle valve **S**. The pressure from **4A** opens the load hold check valve **L** and is fed via the main spool cavity out to the service via port **A** or **B** (depending on direction of spool movement). Spool **AA** raises the plunger of the appropriate leak free check valve **LV** to allow oil to return from the service via the opposite service port to that being fed by the spool.

The remotely controlled position of flow control **F** governs the amount of oil that is allowed to flow through to the service.

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Battery Warning Symbols

The following warning symbols may be found on the battery.

Symbol	Meaning
	Keep away from children.
	Shield eyes.
	No smoking, no naked flames, no sparks
	Explosive Gas.
	Battery acid.
	Note operating instructions.

⚠ CAUTION

Damaged or spent batteries and any residue from fires or spillage should be put in a closed acid proof receptacle and must be disposed of in accordance with local environmental waste regulations.

INT-3-1-12

⚠ WARNING

Batteries give off an explosive gas. Do not smoke when handling or working on the battery. Keep the battery away from sparks and flames.

Battery electrolyte contains sulphuric acid. It can burn you if it touches your skin or eyes. Wear goggles. Handle the battery carefully to prevent spillage. Keep metallic items (watches, rings, zips etc) away from the battery terminals. Such items could short the terminals and burn you.

Set all switches in the cab to OFF before disconnecting and connecting the battery. When disconnecting the battery, take off the earth (-) lead first.

When reconnecting, fit the positive (+) lead first.

Re-charge the battery away from the machine, in a well ventilated area. Switch the charging circuit off before connecting or disconnecting the battery. When you have installed the battery in the machine, wait five minutes before connecting it up.

First Aid - Electrolyte

Do the following if electrolyte:

GETS INTO YOUR EYES

Immediately flush with water for 15 minutes, always get medical help.

IS SWALLOWED

Do not induce vomiting. Drink large quantities of water or milk. Then drink milk of magnesia, beaten egg or vegetable oil. Get medical help.

GETS ONTO YOUR SKIN

Flush with water, remove affected clothing. Cover burns with a sterile dressing then get medical help.

5-3-4-3/1

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Sectional Diagrams Component Key

1 Battery (all machines)
1A Second Battery (3000 Series only)
2 Ignition Switch
3 Starter Motor
4 Alternator
5 Trailer ABS Connector
5A Tractor ABS Supply (if fitted)
5B Tractor ABS Return (if fitted)
6 Ignition Relay
7 Work lights Relay
8 Heater Unit (3000 Series)
9 Auxiliary Connector
9A Auxiliary Power Socket (if fitted)
10A Air Conditioning Connector (3000 Series)
11A Auxiliary Lights Supply Connector (3000 Series)
12 Suspension Seat/Flow Divider Connector
13 Horn Connector
14 Start Inhibit Relay 1
15 Start Inhibit Relay 2
16 Clutch Start Micro-switch
17 Diode Connector
18 Front PTO Switch
19 Rear PTO Switch
20 Brake Lights Switch
21 Brake Lights Relay
22 Rear Wiper Motor
23 Rear Wash/Wipe Switch
24A Connector - Rear Washer Pump (3000 Series)
25 Rear Intermittent Wipe Relay
26 Rear Wiper Connectors
27A Front Washer Pump Connector (3000 Series)
28 Horn
29 Washer/Horn Switch
30 Front Wiper Motor
31 Front Intermittent Wipe Relay
32 Front Wiper Switch
33 Cold Advance Switch (2000 Series only)
33A Waxstat
34 PTO Cut-out Relay
35 Jack Socket
36 EDC Connector
37 EDC Control Panel
38 Area Cut-out Switch (EDC)
39 Connector - EDC Unit
40 Pin position identification for **39**
41 Raise/Lower Switch (EDC) (In cab)
42L Draft Pin (EDC) (Left Hand)
42R Draft Pin (EDC) (Right Hand)
43 Position Sensor (EDC)
44A Raise Push-Button (EDC) (RH Fender)
44B Raise Push-Button (EDC) (LH Fender)
45A Lower Push-Button (EDC) (RH Fender)
45B Lower Push-Button (EDC) (LH Fender)
46 Raise Solenoid (EDC)
47 Lower Solenoid (EDC)
48 Gear Lever Powershift Switches
a Down
b Up
c Auto
48A Duplicate Powershift Switches (if fitted)
a Up
b Down
c Auto
49 Powershift Solenoids
a Snail
b Tortoise
c Hare
49A Splitter Dump Relay
50 Accelerator Pedal Switch
51 Column Switch
52 Powershift Range Neutral Solenoid Selector
53 Powershift Range Engaged Solenoid Connector
55 Clutch Warning/Selectronic Bleeper
56 Powershift Low/Reverse Air Ram
57 Powershift Medium/High Air Ram
58 2WD/Differential Lock Switch
59 Front PTO
60 Rear PTO
61 Differential Lock Switch
62 Differential Lock Cut-Out Relay
63 2WD Dump Relay
64 2WD Solenoid
65 Differential Lock Solenoid
66 Rear PTO Brake Solenoid
67 Front PTO Brake Solenoid
68 Rear PTO Drive Solenoid
69 Front PTO Drive Solenoid
70 Park Brake Switch
71 Rear PTO Cut-Out Connector
71a Rear PTO Termination Connector (machines without rear PTO cut-out option)
71b Rear PTO Interconnecting Connector (machines with rear PTO cut-out option)
72 Diode Connector (E21) (PTO Cut-Out)
73 PTO Cut-Out Push-Button (LH Fender)
74 PTO Cut-Out Push Button (RH Fender)
75 Air Conditioning Blower Switch (2000 Series only)
76 Air Conditioning Switch (2000 Series only)
77 Compressor Switch Earth
78 Air Conditioning Unit
79 Air Conditioning Compressor Switch
80 Air Conditioning Compressor Clutch
81 Air Conditioning Compressor Pressure Switch (High)
82 Air Conditioning Compressor Pressure Switch (Low)
83 Air Conditioning Compressor Clutch Relay
84 Radio/Cassette
85 Interior Light (RH)
86 Interior Light (LH)
87 Door Switch (LH)
88 Beacon Switch
89 Beacon Socket
90 Hazard Switch
91 Single Trailer Turn Relay
92 Second Trailer Turn Relay
93 Outer Indicator Lights (RH)
94 Outer Indicator Lights (LH)
95A Auxiliary Lights Connector (In)
95B Auxiliary Lights Connector (Out)
96 Side Repeater (LH) (3000 Series only)
97 Side Repeater (RH) (3000 Series only)
98 Trailer Socket
99 Rear Light Cluster (LH) Connector
100 Rear Light Cluster (RH) Connector
101 Front Light Cluster (RH) Connector (3000 Series only)
102 Front Light Cluster (LH) Connector (3000 Series only)
103 Front Work lights Switch
104 'A' Post Work lights Relay
105 Front Working Light (RH outer)
106 Front Working Light (RH inner)
107 Front Working Light (LH inner)
108 Front Working Light (LH outer)
109 Front Working Light (RH 'A' post)
110 Front Working Light (LH 'A' post)
111 Rear Work lights Switch
112 Rear Working Light (RH outer)
113 Rear Working Light (RH inner)
114 Rear Working Light (LH inner)
115 Rear Working Light (LH outer)
116 Main Lights Switch
117 Rear Fog Lights Switch
118 Rear Fog Lights Relay
119 Column Lights Switch (Main/Dip/Flash)
120 Headlight Connector (LH) (3000 Series)
120A Sidelight Connector (LH) (2000 Series)
121 Headlight Connector (RH) (3000 Series)
121A Sidelights Connector (RH (2000 Series)
122 Air Gauge Illumination Lamp
123 Number Plate Lamp (LH)
124 Number Plate Lamp (RH)
125 Auxiliary Lights Switch (3000 Series)
126 Auxiliary Headlights (RH)
127 Auxiliary Headlights (LH)
128A Speaker (LH)
128B Speaker (RH)
129 Auxiliary Socket
130 Cigar Lighter
131 Reverse Light Relay
133 Heater Relay 1
134 Heater Relay 2
135 Engine Grid Heater 1
136 Engine Grid Heater 2
139 Buzzer Relay
140 Clutch 'Up' Switch
141 Water Temperature Sender
142 Air Pressure Switch - Tank 1
143 Air Pressure Switch - Tank 2
144 Air Pressure Switch - Tank 3
145 Fuel Level Sender
146 Transmission Oil Filter Switch
147 Air Filter Switch
148 Front Brake Reservoir Level
149 Rear Brake Reservoir Level
149A Brake Reservoir 3 Level
150 Transmission Oil Pressure Switch
151 Speedometer Pick-up 1
151A Speedometer Pick-up 2
152 Engine Oil Pressure Switch
153 CANBUS Cable Screen
154 RF Ground
155 Diagnostic Connector
158 Fuel Flow Sensor
159 Radar Speed Sensor
160 ABS Trailer Socket
161 Suspension Seat Connector
162 Flow Divider Switch
163 Flow Divider Valve Connector
164 Rear Axle Ram Lock Switch (closed when locked)
165 Rear Axle Ram Lock Valve
166 Steer Valve (RH)
167 Steer Valve (LH)
171 Trailer Socket (U.S.A.)
172 Trailer Socket (Standard)
174 Wheel Slip Enable Switch (machines with radar only)
175 Inching Solenoid Resistor
176 Column Switch Button
177 Clutch Potentiometer
a Clutch Pedal Down
b Clutch Pedal Up
178 Transmission Oil Temperature Sensor 1
179 Transmission Oil Temperature Sensor 2
180 Clutch Lubrication Solenoid
181 Transmission Brake Solenoid
182 Inching Solenoid
183 Cab Auxiliary Supply Connector
184 Cab Auxiliary Battery Supply - Terminal Posts
185 Cab 3-pin Auxiliary Power Socket (battery and ignition supplies)
186 Cab Auxiliary Power Convenience Socket (Option)
187 Ignition Switched Relay (supplied with item **186**)
188 ABS Diagnostic Interconnect
189 Tractor Diagnostic Interconnect
190 Tractor ABS Diagnostic Relay
191 Diagnostic Switch
192 Tractor ABS Ignition Relay
193 ABS Speed Sensor (Front RH)
194 ABS Speed Sensor (Front LH)
195 ABS Speed Sensor (Rear RH)
196 ABS Speed Sensor (Rear LH)
197 ABS Pressure Modulating Valve (Front)
198 ABS Pressure Modulating Valve (Rear LH)
199 ABS Pressure Modulating Valve (Rear RH)
200 Tractor ABS ECU Connectors
201 Heated Mirror Supply
202 Interconnect
203 Rear Bulkhead Connector
204 Engine Bulkhead Connector
205 ECU 3 Connector
206 Engine Torque De-rate Resistor Connector
207 ISC (Field Speed Control) Validation
208 Hand Throttle
209 Throttle Pedal Position Sensor
210 Throttle Pedal Idle Validation Switch Connector
211 Accelerator Switch
212 Hand Throttle Connectors
213 Pedal Throttle Connectors
214 Powershift ECU 1(Black)
215 Fan Clutch
216 Front Bulkhead Connector
217 Engine ECU
218 Water in Fuel Sensor
219 Bulkhead Connector
220 Engine Speed Control Switch
221 Intermediate (or Field) Speed Control
222 Interconnect (less ECU 1)
223 Resistor
224 EPS 2 Relay
225 Megafuse
226 Upper Front Work Lights Relay (CR121)
227 Headlight Bar Work Lights Cut-out Relay
228 Rear Upper Changeover Work Lights Relay
229 Upper Front Work Lights Relay (WH3)
230 Headlight Bar Work Lights Relay
231 Work Lights Connector - 4 Front Work Lights
232 Work Lights Connector - 6 Front Work Lights
*** 233** Work Lights Connector - 8 Front Work Lights
234 Work Light - RH Rear Fender
235 Work Light - LH Rear Fender
236 Rear Fender Work Lights Cut-out Relay
237 Work Light - Rear Fender
238 CR121E Relay Base

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