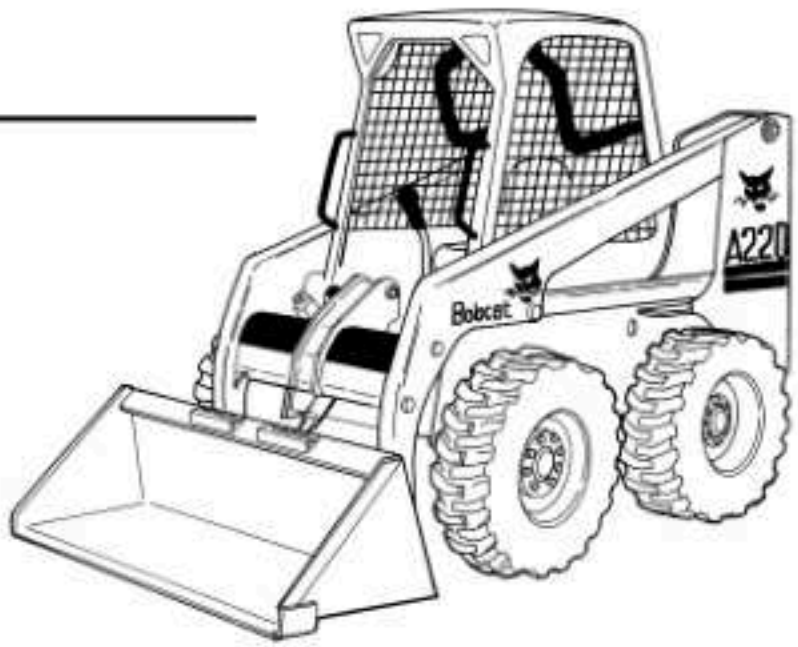
A220 TURBO

A220 TURBO HIGH FLOW

Bobcat®

Service Manual

S/N 519611001 & Above
S/N 519711001 & Above



EQUIPPED WITH BOBCAT INTERLOCK CONTROL SYSTEM (BICS™)

6901245 (3-06)

Ingersoll Rand
Compact Vehicle Technologies
Printed in U.S.A.

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A220 HYDRAULIC/HYDROSTATIC SCHEMATIC
WITH HIGH FLOW AND TWO SPEED VALVE OPTION
S/N 519611124 - 519611311
S/N 519711004 - 519711140

(PRINTED APRIL 2004)
V-0268legend

LEGEND

1. RESERVOIR: Capacity . . . . . 18.8 Qts. (17.8 L)
2. FILTER - CASE DRAIN (90 Micron)
3. FILTER - HYDRAULIC (CANISTER)
4. SPRING LOADED FILTER BY-PASS VALVE: 45-55 PSI (3,1-3,8 Bar)
5. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - HYDRAULIC POWERED BOB-TACH
6. DIFFERENTIAL PRESSURE SWITCH: 36-44 PSI (2,5-3,0 Bar)
7. FLOW DIVIDER ADJUSTMENT VALVE
8. CHECK VALVE - BUCKET POSITION VALVE
9. FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR
10. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - FLOW CONTROL SPOOL
11. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - UNLOADING SPOOL
12. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - TILT CONTROL
13. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT CONTROL
14. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BICS CONTROL
15. PULL BUTTON ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT ARM BY-PASS
16. FILTER - BICS CONTROL VALVE (SCREEN)
17. ONE WAY RESTRICTOR - BOOM DOWN
18. LOAD CHECK VALVE- LIFT AND TILT
19. RELIEF VALVE - MAIN: 2950-3050 PSI (203-210 Bar) at Front Quick Couplers
20. RELIEF VALVE - PORT: 3500 PSI (241 Bar)
21. ANTICAVITATION VALVE
22. RELIEF/ANTICAVITATION VALVE - PORT (TILT BASE END) 3500 PSI (241 Bar)
23. ONE WAY RESTRICTOR VALVE
24. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - AUXILIARY
25. RELIEF VALVE - PORT: . . . . . (Optional) 3500 PSI (241 Bar)
26. RELIEF/REPLENISHING VALVE - HIGH PRESSURE: 5000 PSI (345 Bar)
27. CHARGE PRESSURE SWITCH
28. RELIEF VALVE - CHARGE: 120 degrees F. (53 degrees C.)Fluid 350 PSI (24,1 Bar) at High Engine Idle
29. CHARGE PUMP 12.0 GPM (45,4 L/min.) at High Engine Idle
30. HYDRAULIC PUMP . . . . . Gear Type 20.0 GPM (75,8 L/min.) at High Engine Idle
31. DRIVE MOTOR SHUTTLE VALVE
32. SHUTTLE RELIEF VALVE: 200 PSI (13,8 Bar)
33. REAR AUXILIARY BLEED SHUTTLE VALVE
34. LOAD CHECK VALVE - SELECT VALVE (HIGH FLOW)
35. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - HIGH FLOW
36. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - DIVERTER
37. RELIEF VALVE - MAIN (HIGH FLOW) 3000 PSI (207 Bar)
38. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (TWO COIL)
39. PILOT TO OPEN CHECK VALVE
40. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BLEED OFF
41. CHECK VALVE - BICS CONTROL VALVE
42. LIFT ARM BY-PASS RESTRICTOR
43. CHECK VALVE - AUXILIARY
44. FILTER - CASE DRAIN (Attachment)
45. VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC PUMP
46. TWO-STAGE RELIEF 1000/2000 PSI (69/138 Bar)
47. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (TWO COIL)
48. RELIEF VALVE - 1200 PSI (82,7 Bar)
49. RESTRICTOR - 0.015 inch (0,381 mm)
50. PRESSURE COMPENSATED FLOW CONTROL
51. RELIEF VALVE - PORT: 3500 PSI (241 Bar)
52. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BUCKET POSITION VALVE (ON/OFF)
53. FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR
54. HYDRAULIC BRAKE - SPRING APPLIED - PRESSURE TO RELEASE
55. PUSH BUTTON SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BRAKE
56. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - MAKE-UP
57. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - TWO SPEED
58. BRAKE DIAGNOSTIC PLUG
59. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - TWO SPEED DRIVE MOTOR
60. HYDRAULIC HIGH FLOW PUMP - Gear Type 10.0 GPM (37,9 L/min.) at High Engine Idle
61. SELECT VALVE RESTRICTOR
62. HYDRAULIC STEERING PUMP- Gear Type 13.0 GPM (49,2 L/min.) at High Engine Idle
63. FILTER - STEERING (10 MICRON)
64. SOLENOID ACTIVATED PROPORTIONAL FLOW CONTROL VALVE - STEERING
65. SOLENOID ACTIVATED PRESSURE CONTROL VALVE 0-2000 PSI (0-138 Bar)
66. STEERING CYLINDER
67. CHECK VALVE - 270 PSI (18,6 Bar)
68. PRESSURE CONTROL PILOT VALVE - 2 COILS 0 - 0.085 Ampere
69. DISPLACEMENT CONTROL SPOOL
70. PUMP SERVO
71. FRONT AUXILIARY MANUAL PRESSURE BLEED-OFF VALVE

NOTE: Unless otherwise specified springs have NO significant pressure value.

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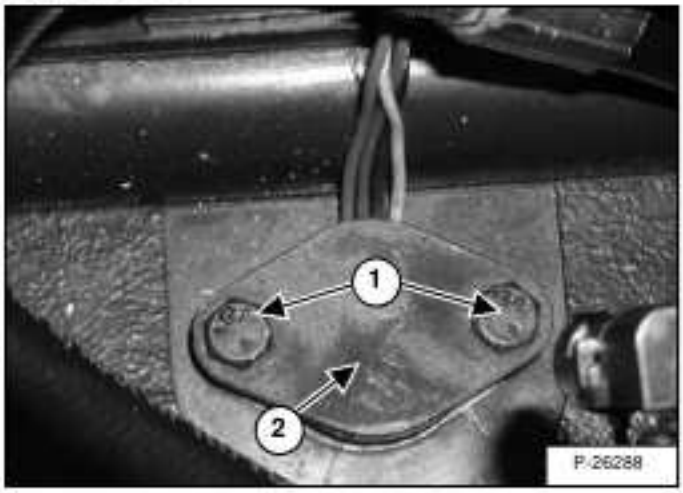
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SPEED SENSOR (CONT'D)

Removal

Figure 60-80-5



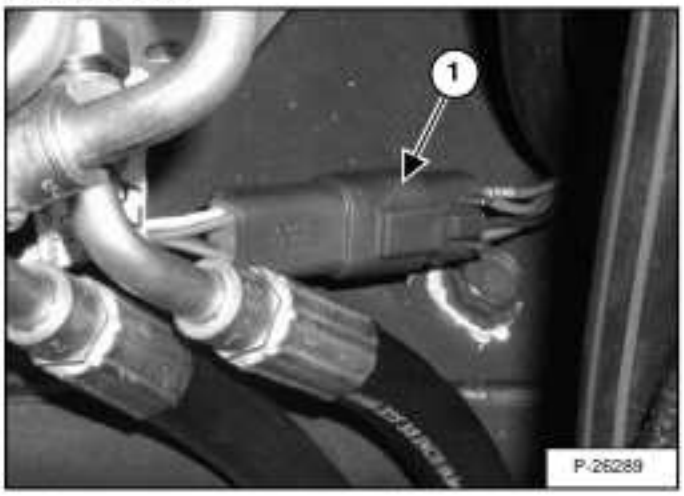
Raise the lift arms and install an approved lift arm support device. (See Engaging The Lift Arm Support Device on Page 10-20-1.)

Raise the operator cab. (See Raising The Operator Cab on Page 10-30-1.)

Remove the two, speed sensor mount bolts (Item 1) **[Figure 60-80-5]** from the top of the hydrostatic motor carrier.

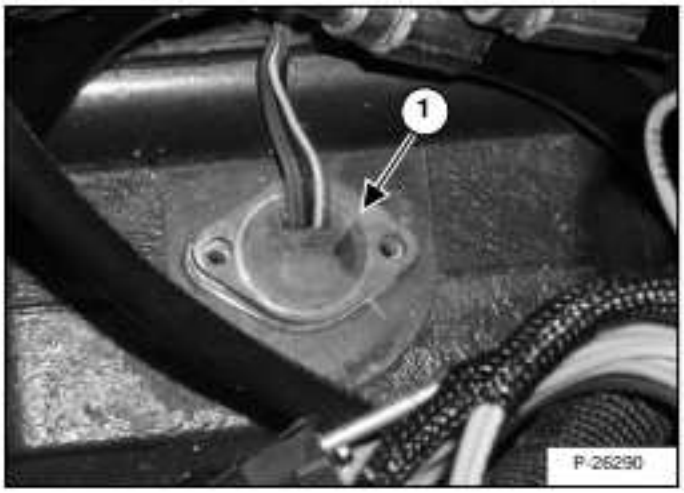
Remove the mount plate (Item 2) **[Figure 60-80-5]**.

Figure 60-80-6



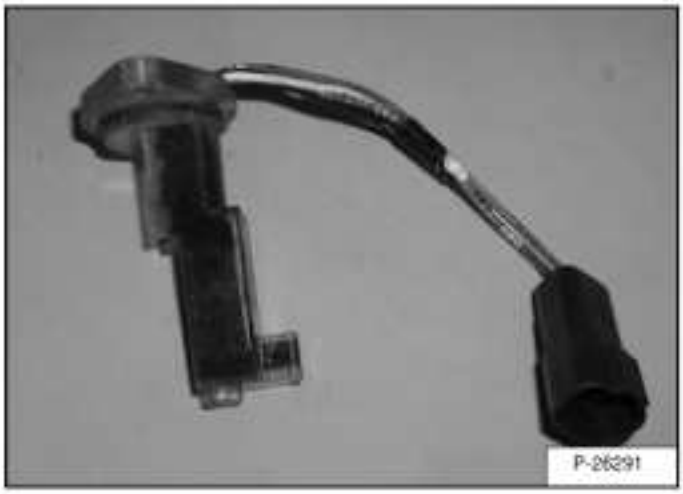
Disconnect the speed sensor electrical harness connector (Item 1) **[Figure 60-80-6]**.

Figure 60-80-7



Lift the speed sensor (Item 1) **[Figure 60-80-7]** out from the motor carrier.

Figure 60-80-8



Remove the speed sensor **[Figure 60-80-8]**.

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SYSTEM TROUBLESHOOTING CHART

Blower motor does not operate

Possible Cause	Inspection	Solution
1. Blown fuse.	Inspect the fuse/wiring.	Replace fuse/repair wiring.
2. Broken wiring or bad connection.	Check the fan motor ground and connectors.	Repair the wiring or connector.
3. Fan motor malfunction.	Check the lead wires form the motor with a circuit tester.	Replace Motor.
4. Resistor malfunction.	Check resistor using a circuit tester.	Replace Resistor.
5. Fan motor switch malfunction.	Check power into and out of the fan switch.	Replace Fan Switch.

Blower motor operates normally, but air flow is insufficient

Possible Cause	Inspection	Solution
1. Evaporator inlet obstruction.	Check evaporator for plugging.	Remove obstruction and clean evaporator fins with air or water.
2. Air leak.	Check to make sure air hoses are properly hooked to Louvers, and air ducts.	Repair of adjust.
3. Defective thermo. switch (frozen evaporator).	Check thermostat using a circuit tester.	Replace thermostat.
4. Plugged cab filters	Check cab filter condition.	Clean or replace filters.

Insufficient cooling although air flow and compressor operation are normal

Possible Cause	Inspection	Solution
1. System low on refrigerant.	The high side pressure will be low and bubbles may be present in sight glass on receive drier.	Repair any leaks and recharge the refrigerant to the correct level.
2. Excessive refrigerant.	The high pressure side pressure will be high.	Use refrigerant recovery equipment to capture excess refrigerant. Charge to the correct refrigerant level.

The compressor does not operate at all, or operates improperly

Possible Cause	Inspection	Solution
1. Loose drive belt.	The belt is vibrating or oscillating.	Adjust tension.
2. Internal compressor malfunction.	The compressor is locked up and the belt slips.	Replace compressor.
	Magnetic clutch related	
3. Low battery voltage.	Clutch slips.	Recharge the battery.
4. Faulty coil.	Clutch slips.	Replace the magnetic clutch.
5. Oil on the clutch surface.	Clutch slips.	Replace or clean the clutch surface.
6. Open oil.	Clutch does not engage and there is no reading when a circuit tester is connected between the coil and terminals.	Replace clutch.
7. Broken wiring or poor ground.	Clutch will not engage. Inspect the ground and connections.	Repair.
8. Wiring harness components.	Test the conductance of the pressure switch, thermostat, Relay, etc.	Check operation.

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A220 HYDRAULIC/HYDROSTATIC SCHEMATIC
WITH TWO SPEED VALVE OPTION
S/N 5196111408 AND ABOVE
S/N 519711198 AND ABOVE

(PRINTED APRIL 2004)
V-0529legend

LEGEND

1. RESERVOIR: Capacity . . . . . 18.8 Qts. (17.8 L)
2. FILTER - CASE DRAIN (90 Micron)
3. FILTER - HYDRAULIC (CANISTER)
4. SPRING LOADED FILTER BY-PASS VALVE: 45-55 PSI (3,1-3,8 Bar)
5. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - HYDRAULIC POWERED BOB-TACH
6. DIFFERENTIAL PRESSURE SWITCH: 36-44 PSI (2,5-3,0 Bar)
7. FLOW DIVIDER ADJUSTMENT VALVE
8. CHECK VALVE - BUCKET POSITION VALVE
9. FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR
10. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - FLOW CONTROL SPOOL
11. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - UNLOADING SPOOL
12. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - TILT CONTROL
13. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT CONTROL
14. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BICS CONTROL
15. PULL BUTTON ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT ARM BY-PASS
16. FILTER - BICS CONTROL VALVE (SCREEN)
17. ONE WAY RESTRICTOR - BOOM DOWN
18. LOAD CHECK VALVE - LIFT AND TILT
19. RELIEF VALVE - MAIN: 2950-3050 PSI (203-210 Bar) at Front Quick Couplers
20. RELIEF VALVE - PORT: 3500 PSI (241 Bar)
21. ANTICAVITATION VALVE
22. RELIEF/ANTICAVITATION VALVE - PORT (TILT BASE END) 3500 PSI (241 Bar)
23. ONE WAY RESTRICTOR VALVE
24. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - AUXILIARY
25. RELIEF VALVE - PORT: . . . . . (Optional) 3500 PSI (241 Bar)
26. RELIEF/REPLENISHING VALVE - HIGH PRESSURE: 5000 PSI (345 Bar)
27. CHARGE PRESSURE SWITCH
28. RELIEF VALVE - CHARGE: 120 degrees F. (53 degrees C.)Fluid 350 PSI (24,1 Bara) at High Engine Idle
29. CHARGE PUMP 12.0 GPM (45,4 L/min.) at High Engine Idle
30. HYDRAULIC PUMP . . . . . Gear Type 20.0 GPM (75,8 L/min.) at High Engine Idle
31. DRIVE MOTOR SHUTTLE VALVE
32. SHUTTLE RELIEF VALVE: 200 PSI (13,8 Bar)
33. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BLEED OFF REAR AUXILIARY ("SV2")
34. LOAD SHUTTLE VALVE - BLEED OFF
35. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - FOR REAR AUXILIARY - NORMALLY CLOSED. ("P2" and "F2")
36. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - FOR REAR AUXILIARY - NORMALLY OPEN ("D1" and "P1")
37. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - FOR REAR AUXILIARY - NORMALLY OPEN ("D2" and "P2")
38. FILTER - DIVERTER VALVE (SCREEN) INTEGRATED IN SOLENOID
39. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - TO ACTIVATE REAR AUXILIARY ("SV1")
40. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - FOR REAR AUXILIARY - NORMALLY CLOSED ("P1" and "F1")
41. CHECK VALVE - BICS CONTROL VALVE
42. LIFT ARM BY-PASS RESTRICTOR
43. CHECK VALVE - AUXILIARY
44. FILTER - CASE DRAIN (Attachment)
45. VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC PUMP
46. RELIEF VALVE - 2000 PSI (138 Bar)
47. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (TWO COIL)
48. RELIEF VALVE - 1200 PSI (82,7 Bar)
49. CHECK VALVE - With 80 PSI (5,5 Bar) Spring
50. CHECK VALVE - With 300 PSI (520,7 Bar) Spring
51. RELIEF VALVE - PORT: 3500 PSI (241 Bar)
52. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BUCKET POSITION VALVE (ON/OFF)
53. FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR
54. HYDRAULIC BRAKE - SPRING APPLIED - PRESSURE TO RELEASE
55. PUSH BUTTON SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BRAKE
56. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - MAKE-UP
57. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - TWO SPEED
58. DISPLACEMENT CONTROL SPOOL
59. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - TWO SPEED DRIVE MOTOR
60. PUMP SERVO
61. HYDRAULIC STEERING PUMP - Gear Type 13.0 GPM (49,2 L/min.) at High Engine Idle
62. FILTER - STEERING (10 MICRON)
63. SOLENOID ACTIVATED PROPORTIONAL FLOW CONTROL VALVE - STEERING
64. SOLENOID ACTIVATED PRESSURE CONTROL VALVE 0-2000 PSI (0-138 Bar)
65. STEERING CYLINDER
66. CHECK VALVE - 270 PSI (18,7 Bar)
67. PRESSURE CONTROL PILOT VALVE - 2 COILS 0 - 0.085 Ampere
68. FRONT AUXILIARY MANUAL PRESSURE BLEED-OFF VALVE
69. ORIFIVE - 0.120 inch (3,0 mm) Restriction
70. ORIFIVE - 0.025 inch (0,63 mm) Restriction
71. ORIFIVE - 0.030 inch (0,76 mm) Restriction

NOTE: Unless otherwise specified springs have NO significant pressure value.

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