General Information on Troubleshooting

Edition 1

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SAFETY INSTRUCTIONS

WARNING

AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments repairs or service. Untrained operators and failure to follow instructions can cause death or serious injury.

POINTS TO REMEMBER WHEN TROUBLESHOOTING

WARNING

AVOID DEATH OR SERIOUS INJURY

Stop the machine in a level place, and check that the safety pin, blocks, and parking brake are securely fitted.

WARNING

AVOID DEATH OR SERIOUS INJURY

When performing the operation with two or more workers, keep strictly to the agreed signals, and do not allow any unauthorized person to come near.

WARNING

AVOID DEATH OR SERIOUS INJURY

If the radiator cap is removed when the engine is hot, hot coolant may spurt out and cause burns, so wait for the engine to cool down before starting troubleshooting.

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SYMPTOM OF PROBABLE FAILURE AND TROUBLESHOOTING NO.

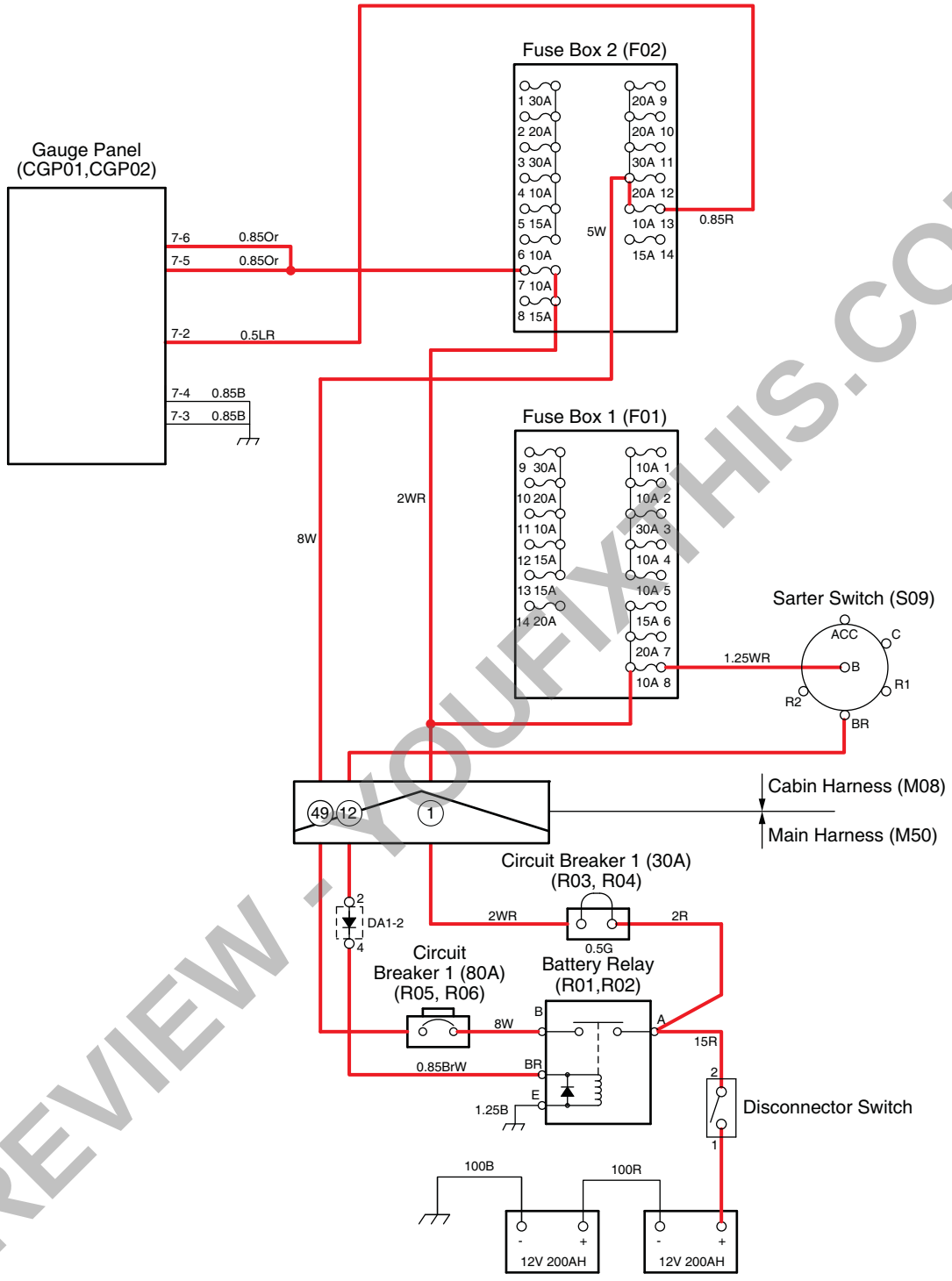
Electrical System

No.	Problem
E01	When starter switch is turn ON, Monitor Panel Display does not appear
E02	Inspection instruction for emergency engine start failure in case of EPOS controller fault.
E03	The engine will be delayed or no started in the winter season since no preheating operation.
E04	Battery charging warning light lights, when engine is started.
E05	When coolant overheat warning light lights, when engine is started.
E06	Communication Error Flashes on the Panel
E07	When engine oil pressure warning light lights, when engine is started.
E08	When WIF (Water In Fuel) warning light lights, when engine is started.
E09	Does not control the engine control dial.
E10	Does not control the engine auto idle.
E11	When pilot cutoff solenoid does not operate.
E12	When does not operate auto travel speed.
E13	Does not operation wiper motor, when starting switch is turned "ON".
E14	All Actuators Speed are Slow (EPPR Valve)
E15	Defective Oil Temperature Sensor
E16	Hydraulic oil temperature gauge indicate either min or max and does not move.
E17	Horn Does Not Sound
E18	SPC (Smart Power Control) Function Disabled
E19	Defective Pressure Control Proportional Valve
E20	Hydraulic Oil Temperature Gauge Differs from Actual Oil Temperature
E21	Check Terminal Condition Using TMS LED

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Circuit Diagram



EX1503983

Figure 1

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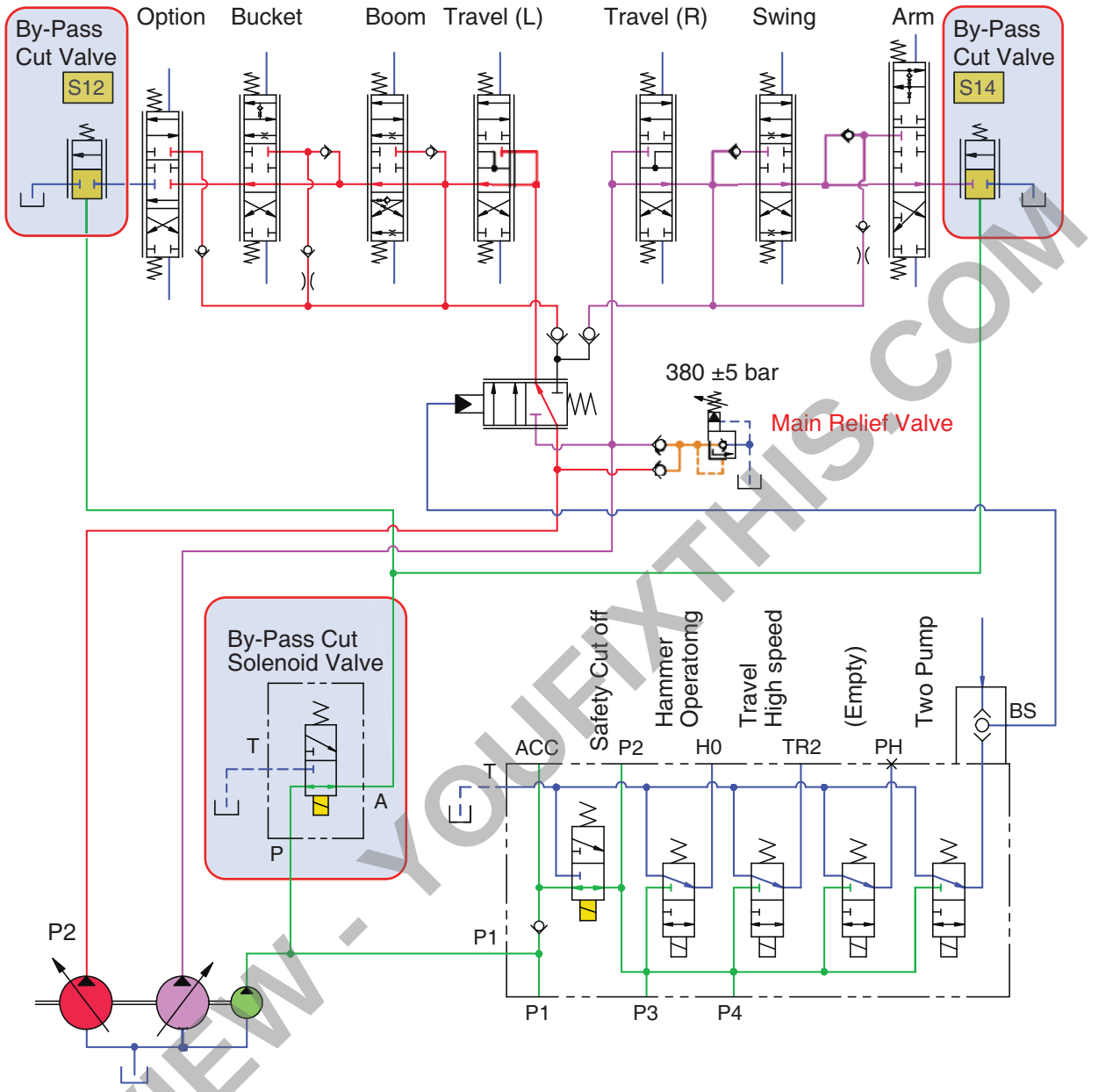


Figure 55

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GENERAL SPECIFICATIONS

Shipping Weight	34.9 tons (76,941 lb)	
	Includes 10% fuel, 6,500 mm (21' 3") boom, 3,200 mm (10' 5") arm, 1,410 mm (4' 6") backhoe bucket and standard shoes	
Operating Weight	Add weight of full fuel tank and operator.	
Shipping Weights With Optional Track Shoes	Add 380 kg (838 lb) for 700 mm (28") shoes	
	Add 760 kg (1,676 lb) for 800 mm (32") shoes	
	Add 945 kg (2,083 lb) for 850 mm (33.5") shoes	
	Add 1,140 kg (2,513 lb) for 900 mm (36") shoes	
	Add 526 kg (1,160 lb) for 600 mm (24") double grouser shoes	
Major Component Weights	Standard Boom 2,697 kg (5,946 lb)	
	2,600 mm (8' 5") Arm 1,121 kg (2,471 lb)	
	3,200 mm (10' 5") Arm 1,251 kg (2,758 lb)	
	3,950 mm (13' 0") Arm 1,470 kg (3,241 lb)	
	Boom Cylinders 290 kg (639 lb) each	
	Arm Cylinder 435 kg (959 lb)	
	Bucket Cylinder 260 kg (573 lb)	
	Counterweight 7,100 kg (15,700 lb)	
	Upper Structure 8,753 kg (19,297 lb)	
	Lower - below Swing Bearing 11,760 kg (25,926 lb)	
Digging Forces (At Power Boost, ISO)		
Bucket Cylinder	254 KN or 25,900 kg (57,100 lb) with Mono Boom/Articulated Boom + GP Bucket	
Arm Cylinder	185 KN or 18,865 kg (41,590 lb) with 3,200 mm (10' 5") Standard Arm	
Fuel Tank Capacity	600 liters (158.5 U.S. gal)	
Hydraulic System Capacity	450 liters (118.8 U.S. gal)	
Hydraulic Reservoir Capacity	240 liters (63.4 U.S. gal)	
Bucket Heaped Capacity Range	SAE 1.25 - 2.01 m^3 (1.63 - 2.63 yd^3) Mono Boom/Articulated Boom	
	NOTE: Refer to the Load Weight, Bucket and Arm Length Compatibility Table for information on which bucket sizes are approved with which arm length and work load material weights.	
Shoe Type	Triple Grouser	Double Grouser
Shoe Width and Optional Sizes	600 mm (24") - standard	600 mm (24") - optional
	700 mm (28") - optional	
	800 mm (32") - optional	
	850 mm (33.5") - optional	
	900 mm (36") - optional	
Ground Pressure Ratings:		
Standard 600 mm (24") shoe	0.69 bar (0.69 kg/cm^2, 9.85 psi)	
Optional 700 mm (28") shoe	0.60 bar(0.60 kg/cm^2, 8.57 psi)	
Optional 800 mm (32") shoe	0.53 bar(0.53 kg/cm^2, 7.58 psi)	
Optional 850 mm (33.5") shoe	0.50 bar(0.50 kg/cm^2, 7.17 psi)	
Optional 900 mm (36") shoe	0.48 bar(0.48 kg/cm^2, 6.77 psi)	
Optional 600 mm (24") double grouser shoe	0.71 bar(0.71 kg/cm^2, 10.04 psi)	

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OPERATIONAL PERFORMANCE TEST

Hydraulic Cylinder Cycle Time

Summary

1. Check the overall operational performance of the front attachment hydraulic system (between the hydraulic pumps and each cylinder) by measuring the cycle time of the boom, arm, bucket, and bucket dump (open/close) cylinders with the empty bucket.
2. Bucket must be empty.

Preparation

1. Maintain the hydraulic oil temperature at 50 ±5 °C (122 ±41 °F).

Engine Control Dial	Power Mode Switch	Work Mode	Auto-idle Switch
High Idle	Power Plus Mode	Digging Mode	OFF

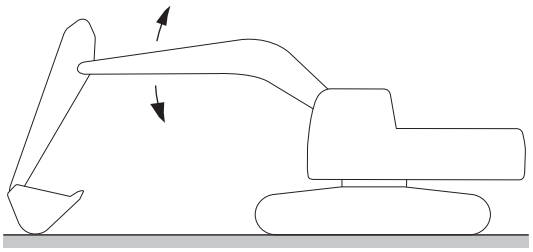
2. Position the front attachment as described in the following. Then, measure the operating time until cylinder reaches the stroke end by fully moving the control lever.
   A. Boom cylinder
      1) Boom up speed

         Rapidly operate the bucket from the ground, and measure the time it takes for the boom to reach the end point.

      2) Boom down speed

         Rapidly operate the bucket with the boom reached the end point, and measure the time it takes for the bucket to reach the ground.

      3) Measuring available displacement of the cylinder: Measure and record the extension of the cylinder rod from when the bucket is resting on the ground to when the boom cylinder is extended to its maximum length.



EX1301781

Figure 3

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FAILURE CODE

Failure Code Table

Failure Code at Machine

GP (Graphic Panel): Code displays on Panel Gauge
FMI (Failure Mode Identifier): Code displays on DMS
DTC (Diagnostic Trouble Code): Code displays on Diagnostic tool
HEX: Hexadecimal, DEC: Decimal number

GP Display Code	SPN Name	FMI	GP Display Description	Measuring Point	Correct Value		Severity Level	Remark
					Active	Passive		
VCO001	CAN (Gauge Panel)	11	Gauge Panel Communication Error	6-12/ 6-13		R = 60 ±5 Ω	4	It is a composite resistance of CAN line. This value has to be measured by connected condition of CAN line.
VCO002	CAN (ECU)	11	E-ECU Communication Error	1-72/ 1-78			4	
VPV001	Pump P/V (A)	5	Pump P/V (A), Current Below Normal	2-119/ 2-114		R = 13.5 ±2 Ω (25°C (77°F))	3	
		6	Pump P/V (A), Current Above Normal					
VPV002	Pump P/V (B)	5	Pump P/V (B), Current Below Normal	3-16/ 3-8		R = 13.5 ±2 Ω (25°C (77°F))	3	
		6	Pump P/V (B), Current Above Normal					
VPV004	Fan Control P/V (J)	5	Fan Control P/V (J), Current Below Normal	2-116/ 2-121		R = 22.5 ±2 Ω (25°C (77°F))	3	
		6	Fan Control P/V (J), Current Above Normal					
VPV005	Press. Control 1 P/V (H)	5	Press. Control 1 P/V (H), Current Below Normal	2-111/ 2-112		R = 9.5 ±2 Ω (25°C (77°F))	3	
		6	Press. Control 1 P/V (H), Current Above Normal					
VPV006	Press. Control 2 P/V (I)	5	Press. Control 2 P/V (I), Current Below Normal	2-109/ 2-110		R = 9.5 ±2 Ω (25°C (77°F))	3	
		6	Press. Control 2 P/V (I), Current Above Normal					
VPV007	Flow Control P/V (C) 2-way RH-open	5	Flow Control P/V (C) 2-way RH-open, Current Below Normal	2-89/ 2-97		R = 18 ±2 Ω (25°C (77°F))	3	
		6	Flow Control P/V (C) 2-way RH-open, Current Above Normal					
VPV008	Flow Control P/V (D) 2-way RH-close	5	Flow Control P/V (D) 2-way RH-close, Current Below Normal	2-88/ 2-95		R = 18 ±2 Ω (25°C (77°F))	3	
		6	Flow Control P/V (D) 2-way RH-close, Current Above Normal					
VPV009	Flow Control P/V (E) Rotating CW	5	Flow Control P/V (E) Rotating CW, Current Below Normal	2-103/ 2-104		R = 18 ±2 Ω (25°C (77°F))	3	
		6	Flow Control P/V (E) Rotating CW, Current Above Normal					

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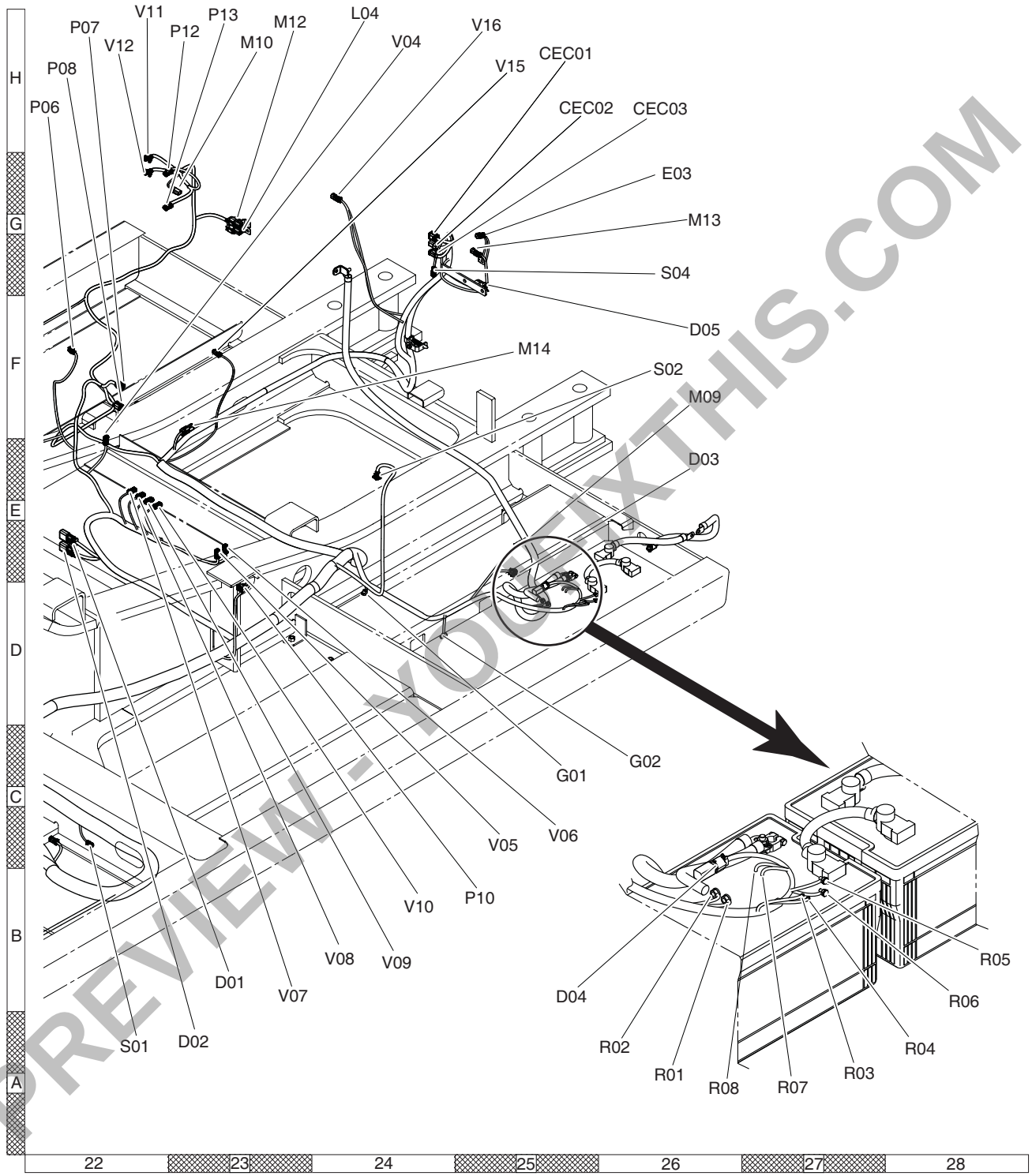
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MEMO

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Rear of Upper Frame



EX1502990

Figure 4

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Specifications

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VPV005 Press. Control 1 Proportional Valve (H)

Failure Code	Severity Level	Failure	Press. Control 1 Proportional Valve (H)
VPV005 (V000217)	3		
Detail of Failure	This occurs only when the gauge panel's option setting is set as enabled. FMI 5: Press. Control 1 Proportional Valve (H), Current Below Normal (Open Circuit) FMI 6: Press. Control 1 Proportional Valve (H), Current Above Normal (Short Circuit)		
Action of Machine Monitor or Controller	If the pressure control proportional reducing valve (H) is malfunctioning, the corresponding malfunction details can be checked in the current malfunction check menu on the gauge panel.		
Problem on Machine	The attachment pressure set on the gauge panel is not built in the one way or two-way operation.		
Related Information	1. An error code is generated when the EPPR valve's connector is disconnected. 2. The attachment cannot be operated unless the attachment operation setting on the gauge panel is set as enabled. 3. Normal output of pressure control proportional reducing valve (H) A. DX300LC-5 ~ DX490LC-5 1) 0 bar: 650 ±15 mA 2) 100 bar: 500 ±15 mA 3) 250 bar: 240 ±15 mA 4) 350 bar: 0 mA B. DX140LC-5 ~ DX255LC-5 1) 0 bar: 480 ±15 mA 2) 250 bar: 250 ±15 mA 3) 330 bar: 144 ±15 mA 4) 350 bar: 0 mA		

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VSP010 Arm In Pressure Sensor

Failure Code	Severity Level	Failure	Arm In Pressure Sensor
VSP010 (V000247)	2		
Detail of Failure	FMI 3: Arm In Pressure Sensor, Voltage Above Normal. FMI 4: Arm In Pressure Sensor, Voltage Below Normal.		
Action of Machine Monitor or Controller	1. If the arm in pressure sensor is malfunctioning, the corresponding malfunction details can be checked in the current malfunction check menu on the gauge panel. 2. The pressure sensor malfunction symbol is illuminated on the warning section (upper section) of the gauge panel when the arm in pressure sensor is defective. 3. When malfunction of the pressure sensor is detected (for over 3 seconds), output of the proportional control valve of the pump is fixed to the maximum level.		
Problem on Machine	Abnormal arm in operation may occur when the arm in pressure sensor is defective.		
Related Information	1. The pressure sensor won't operate if it is not supplied with 24 V. 2. The pressure sensor can be severely damaged if its power line and ground line are mixed up. 3. The pressure value measured by the pressure sensor can be checked on the monitoring menu screen of the gauge panel. Features of pressure sensor: A. Operating voltage: 24 V ±10% B. Operating current: max. 20 mA C. Output voltage: 1 ~ 5 V D. Measuring pressure: 0 ~ 50 bar E. Measurement tolerance: ±3%		

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E05 When coolant overheat warning light lights, when engine is started.

Failure	When coolant overheat warning light lights, when engine is started.
Related Information	• Signal of engine coolant temperature sensor is input to engine controller and then data is transmitted to machine monitor through CAN communication system. • Engine coolant temperature can be checked with monitoring function. • The sensor measures the coolant temperature in the cylinder block after the coolant has passed the combustion chamber.

No.	Cause	Procedure, Measuring Location, Criteria and Remarks	
1	Checking ECU power status (Battery - ECU)	1. Turn starting switch to "ON" position. 2. Disconnector the ECU C40001 (CEC01) connector.	
		Check voltage between C4001-2, C4001-5 and C4001-1, C4001-4 (Ground) • Refer to Page 11-2-68 and Connector no G01	Ground Voltage: 0 V Pull-in Voltage: 28 V
		Check the wiring and fuse for an open circuit.	Fuse box 1 #14 (20 Amp)
2	Disconnected condition the ECU harness	1. Turn starting switch to "OFF" position. 2. Check the CAN communication harness between the ECU and the coolant temperature sensor.	
		Check the ECU harness resistance between A7-9 and A7-10	A7-9 (Voltage Supply): +5 V A7-10 Grounding: Ground
3	Defective Coolant Temperature Sensor(T33)	1. Turn starting switch to "OFF" position. 2. Check the coolant temperature sensor resistance	
		1. Resistance measurement by temperature 2. Measurement for open resistance coil	20°C Resistance: 2.5 kΩ 100°C Resistance: 0.186 kΩ Open resistance coil: ∞
4	Checking gauge panel power status (Battery - Gauge panel)	1. Turn starting switch to "ON" position. 2. Disconnected condition the panel resistance. 3. Disconnector the Gauge Panel CN-7 (CGP02) connector.	
		Check voltage between CN7-5, CN7-6 and CN7-3, CN7-4 (Ground) • Refer to Page 11-2-70 and Connector no G04	Ground Voltage: 0 V Pull-in Voltage: 28 V
		Check the wiring and fuse for an open circuit.	Fuse box 2 #7 (10 Amp)
5	About Coolant Temperature Sensor	The sensor is of the NTC type, which means that its resistance is temperature dependent. If the temperature increases, the resistance in the sensor drops. The engine control unit converts the sensor resistance to voltage. If the voltage is outside a certain range a fault code will be generated and the control unit will operate according to a preset temperature value.	

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Differential Pressure Change by PPR Valve Pin Adjustment

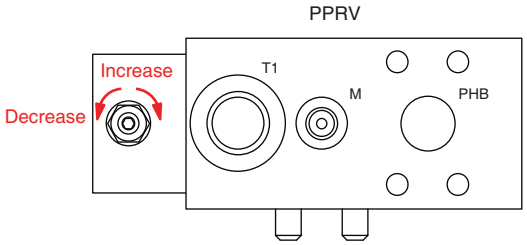


Figure 50

Calculate the Cranking Pressure

Current (mA)	Px 1	P1 (bar)	Px 2	P1 Relief (bar)	Differential Pressure (bar)
294	3.8	47	4	104	57
395	8.7	108	8.7	165	57
498	14.1	178	13.9	230	52
599	19.7	248	19.6	303	55
697	25.4	318	24.8	370	52
750	28.1	355			

The method of setting idle (front) pump P2 relief pressure.

1. The M5 and M6 are changed each other in 300 mA current of Drive (Rear) Pump EPPR Valve and then input forced operation as 400 mA current in the Idle (Front) Pump.
   → Relief boom up motion (Measure pump pressure)
2. Idle (Front) Pump pressure is cranked in the 104 bar. (Using adjust screw to set up in the 104 bar.)
3. When Drive (Rear) Pump is set, it also follow above 1 and 2 process.

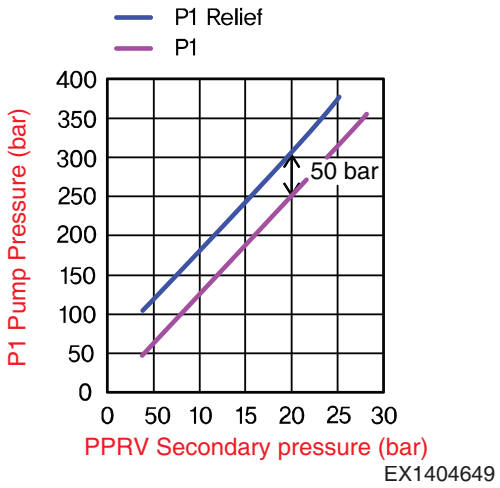


Figure 51

Angle Sensor

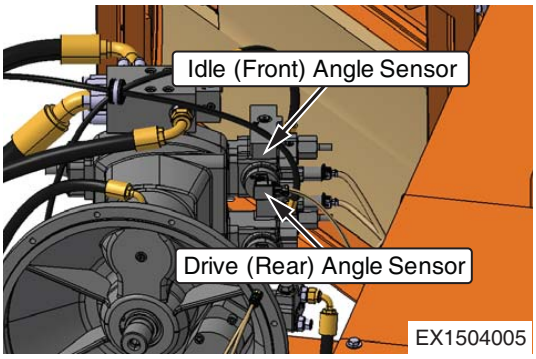


Figure 52

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Travel Pilot Pressure Sensor

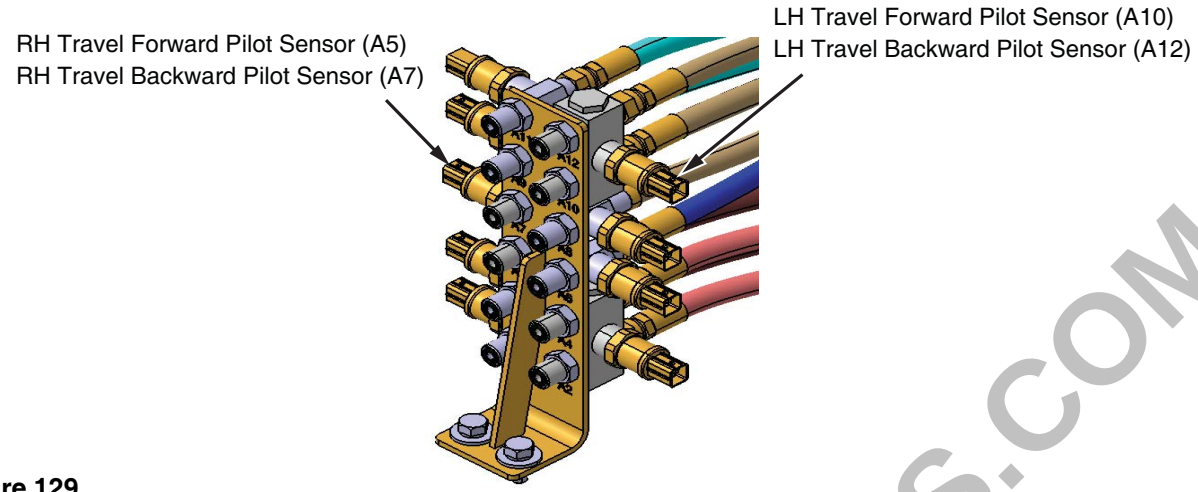


Figure 129

EX1504024

Solenoid Valve

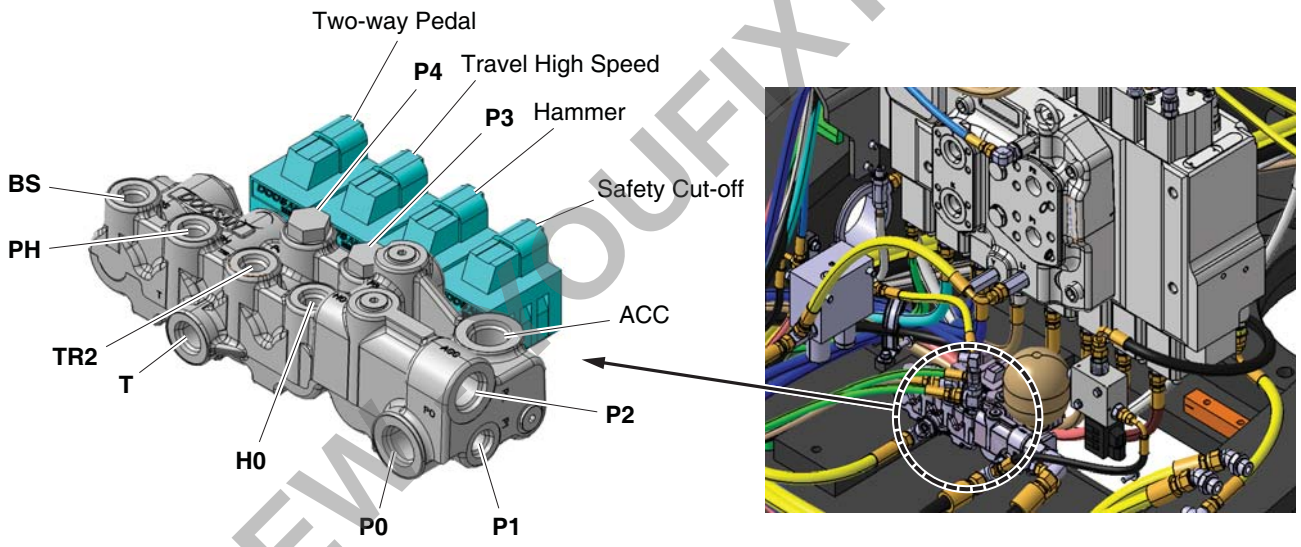


Figure 130

EX1504025

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<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, Measuring Location, Criteria and Remarks</th></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Defective EPPR Valve in Drive (Rear) Pump</td><td rowspan="2">Check electric current at EPPR Valve</td><td colspan="2">1. Check the EPPR valve for normal operation.
2. Check the current supplied to each pilot pressure sensor from the joystick in the working mode and travel mode.
3. The current level for each mode can be verified on the gauge panel as well.
4. The auxiliary mode switch is "OFF".</td></tr>
<tr><td>Idle (Front) Pump Current Boom (Up/Down), Bucket (Crowd/Dump), Travel (LH) Arm (In/Out)
[Drive (Rear) Pump Current Boom Up, Arm (In/Out), Travel (RH) Option Swing]</td><td>Check Current (at 1,800 rpm)
Stand by Pressure:
300 ±15 mA
System Pressure: 750 ±30 mA
[Check Current (at 1,800 rpm)
Stand by Pressure:
300 ±15 mA
System Pressure: 750 ±30 mA
Swing Pressure: 650 ±30 mA]</td></tr>
<tr><td rowspan="2">Check the secondary pressure EPPR valve.</td><td colspan="2">1. Check the secondary pressure change by the pilot sensor.
2. Measuring point: port X2 for idle (front) pump/
[port X1 for drive (rear) pump]</td></tr>
<tr><td>Drive (Rear) Pump Current Boom Up, Arm (In/Out), Travel (RH) Option, Swing
[Idle (Front) Pump Current Boom (Up/Down), Bucket (Crowd/Dump), Travel (LH) Arm (In/Out)]</td><td>[Check Current (at 1,800 rpm)
Stand by Pressure: 4.0 bar
System Pressure:
28.4 ±0.3 bar
Swing Pressure: 23.0 bar]
[Check Current (at 1,800 rpm)
Stand by Pressure: 4.0 bar
System Pressure:
28.4 ±0.3 bar]</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Malfunction of Arm In Control Valve</td><td colspan="3">Be ready with engine stopped, then perform troubleshooting with engine running at full speed.</td></tr>
<tr><td colspan="2">Arm relief Pressure</td><td>Arm In hydraulic relief
Pressure 387 ±5 bar
(5,612 ±72.5 Psi)</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Defective Arm Brake Valve in Main Control Valve</td><td colspan="2">Tie rods have been tightened with too great a tightening torque.</td><td>Loosen the nuts of the tie rods and tighten at the specified torque, see "Installation Drawing" of the respective product.</td></tr>
<tr><td colspan="2">Oil temperature too high and/or too great a temperature difference between the pressure fluid and the mobile control block, causing blocking because of dissimilar heat expansion of spool and mobile control block.</td><td>Check cooler function, oil supply and pump pressure in neutral position. Avoid temperature shock.</td></tr>
<tr><td colspan="2">Contamination or foreign particles introduced during the assembly of the connections leading to the actuator are jamming the spool</td><td>Visually inspect the connectors to the actuator, remove foreign particles with a magnet or tweezers. In case of jammed foreign particles, replace the control spool module with a new one.</td></tr>
</table>

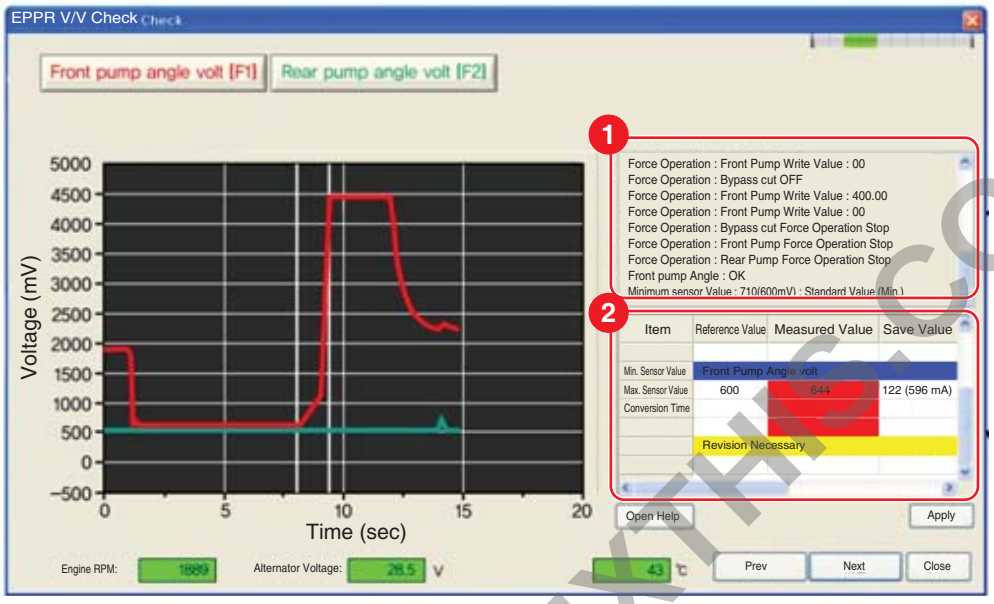
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Step 3 – The test result and status are displayed.

NOTE: *If the test result is out of the yellow specified range (displayed in red), the corresponding trouble code is generated.*

⇒ *Perform any necessary inspection and repair.*



Display the Test Progress

1
Force Operation : Front Pump Write Value : 00
Force Operation : Bypass cut OFF
Force Operation : Front Pump Write Value : 400.00
Force Operation : Front Pump Write Value : 00
Force Operation : Bypass cut Force Operation Stop
Force Operation : Front Pump Force Operation Stop
Force Operation : Rear Pump Force Operation Stop
Front pump Angle : OK
Minimum sensor Value ; 710(600mV) ; Standard Value (Min.)
Maximum Sensor Value ; 4306(4500mV) ; Standard Value(Min.)
Conversion Time ; 22.19(1.20Sec) -> Swash Plate Angle Convertor ; Standard Value(Over)

Criteria
Min Voltage : 0.43 ~ 0.7 V, Max Voltage : 4.33 ~ 4.47 V
Transition time : 1.2 sec [Force Current (400 mA) → 4.0 V]

Display the Status Test Results

2

Item	Reference Value	Measured Value	Save Value
Min. Sensor Value	Front Pump Angle volt		
Max. Sensor Value	600	644	122 (596 mA)
Conversion Time			
	Revision Necessary		

EX1404623

Figure 33

※Status (Min., Max. values - reference mark)

Reference	Green	Yellow	Red
Max. (4,450 mV)	±10 mV	+20 mV -120 mV	If the value is greater than the yellow.
Max. (600 mV)	±10 mV	+20 mV -120 mV	If the value is greater than the yellow.

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