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BCU 001893.07- Front PTO, Switch Error

06

Diagnostic code BCU 001893.07 is saved when the basic control unit receives the two output signals of the front PTO switch (front PTO ON or OFF) simultaneously or not at all. This indicates that the switch circuit is open or shorted to power supply (battery voltage). The diagnostic trouble code triggers the alarm level "Information".

Diagnostics

→NOTE:

The following are possible causes:

- **Defective fuse F03/02.**
- **Defective front PTO switch S06.**
- **Defective positive lead (cable 973).**
- **Defective signal lead (cable 901 or 904).**

Additional references:

• Electrical information: Reference 210-15-001 , General References - Summary.

• Reference 245-BCU-200 , Operation of the Basic Control Unit (Basic Functions).

• “Replacing the PTO Switch” (Section 40, Group 25 in the Repair manual).

(1) Preliminary test

Action:

→NOTE:

Take note of the processing procedures of Diagnostic Trouble Codes before starting the diagnosis, see Reference 245-05-002 , Accessing Addresses and Diagnostic Trouble Codes.

Result:

YES: Diagnostic trouble code is not active: Diagnosis completed.

NO: Diagnostic trouble code is active: GO TO 2 .

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(2) Check rate-of-drop potentiometer

Action:

Access address BCU 110 :

Item	Measurement	Specification
BCU 110 -- Voltage, rate-of-drop potentiometer (B27)		
Potentiometer turned fully counterclockwise:	Voltage	between 0.25 and 1.5 volts
Potentiometer turned fully clockwise:	Voltage	between 3.5 and 4.75 volts

→NOTE:

Potentiometer full clockwise voltage must be at least 2 volts more than the full counterclockwise voltage. There should be no beep or sudden change in voltage while the control is being moved.

Result:

YES:• Diagnosis completed.• Type of error indicates a loose contact. GO TO 4

NO: GO TO 3 .

(3) Check voltage supply of rate-of-drop potentiometer

Action:

Access address BCU 116 :

Item	Measurement	Specification
BCU 116 -- Voltage, 5-volt power supply for hitch control components		
5-volt power supply:	Voltage	4.75 - 5.25 volts

Result:

YES: GO TO 4 .

NO: Refer to diagnostics for faulty 5-volt power supply (diagnostic trouble code BCU 303037.03, Section 211, Group BCU).

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(9) Checking the turn-signal indicator lights

Action:

• Disconnect the 26-pin yellow plug (X617) from the instrument unit.

• Use the JT05791A multimeter to measure voltage between pins 19 (lead 813), 18 (lead 814) and 17 (lead 815) on plug X617 and any suitable ground point:

Item	Measurement	Specification
Turn signal indicators		
Tractor without trailer : Pin 19 (lead 813)	Voltage	12 volts in time with flashing signal
Tractor with one trailer : Pin 18 (lead 814)	Voltage	12 volts in time with flashing signal
Tractor with two trailers : Pin 17 (lead 815)	Voltage	12 volts in time with flashing signal

Result:

YES: Check the instrument unit and turn-signal indicator lights, repair as needed and carry out an operational test. GO TO 10 .

NO: Check the relevant lead, repair as needed and carry out an operational test.

(10) Instrument back-lighting not working

Action:

• Disconnect the 26-pin yellow plug (X617) from the instrument unit.

• Use the JT05791A multimeter to measure voltage between pin 2 (lead 138) on plug X617 and any suitable ground point:

Item	Measurement	Specification
Back-lighting		
Switch tractor's park lights **ON** :	Voltage	12 volts

Result:

YES: Check the instrument unit and back-lights, repair as needed and carry out an operational test. GO TO 11 .

NO: Check lead 138, repair as needed and carry out an operational test.

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2. Access address ECU020 and run the engine until its temperature reaches 92°C (198°F). See Reference 245-05-001 , ”General Operation and Entering the Program Mode” in the Technical manual.

CAUTION:

Wear suitable protective clothing (goggles, gloves etc.) when performing this test.

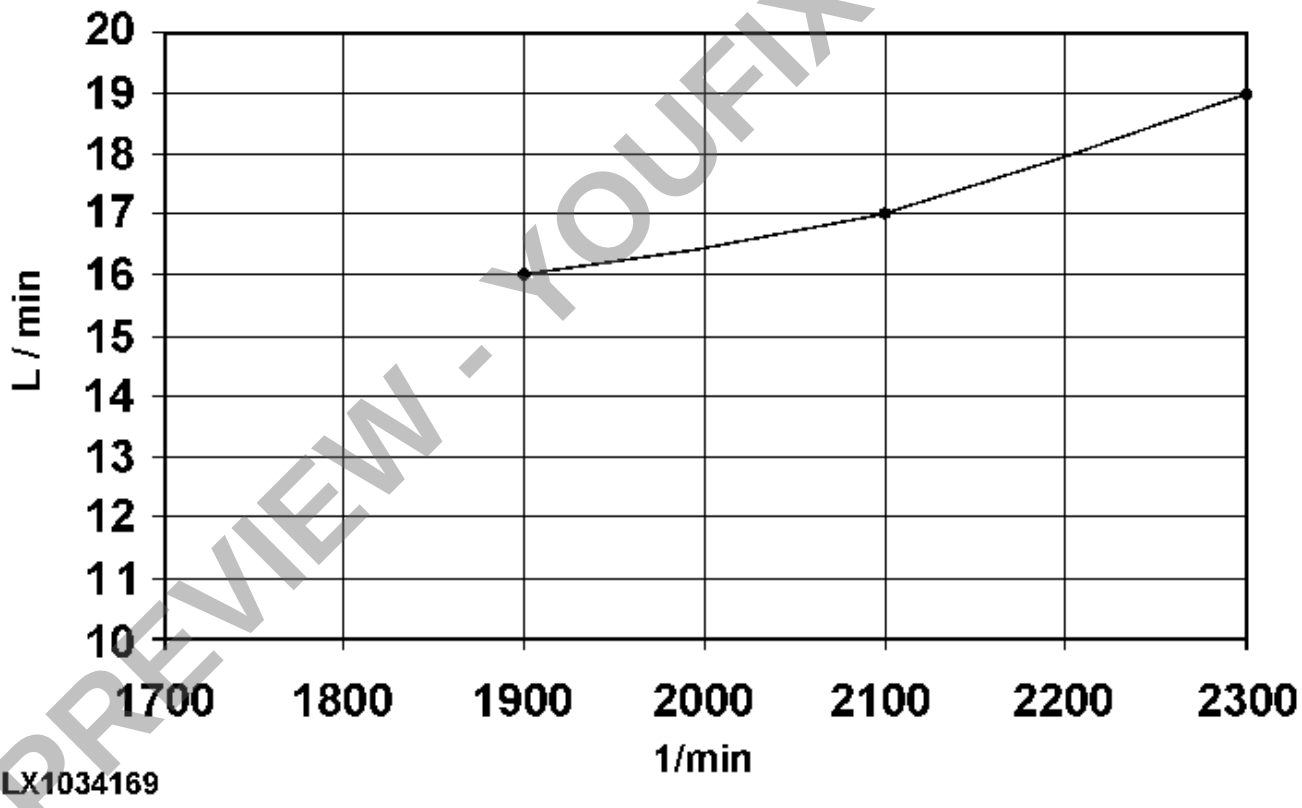
3. Read the value on flow tester

   Flow tester

   KJD10431

   Testing the rate of flow in the low-temperature circuit

   KJD10431 and compare it with the table below.

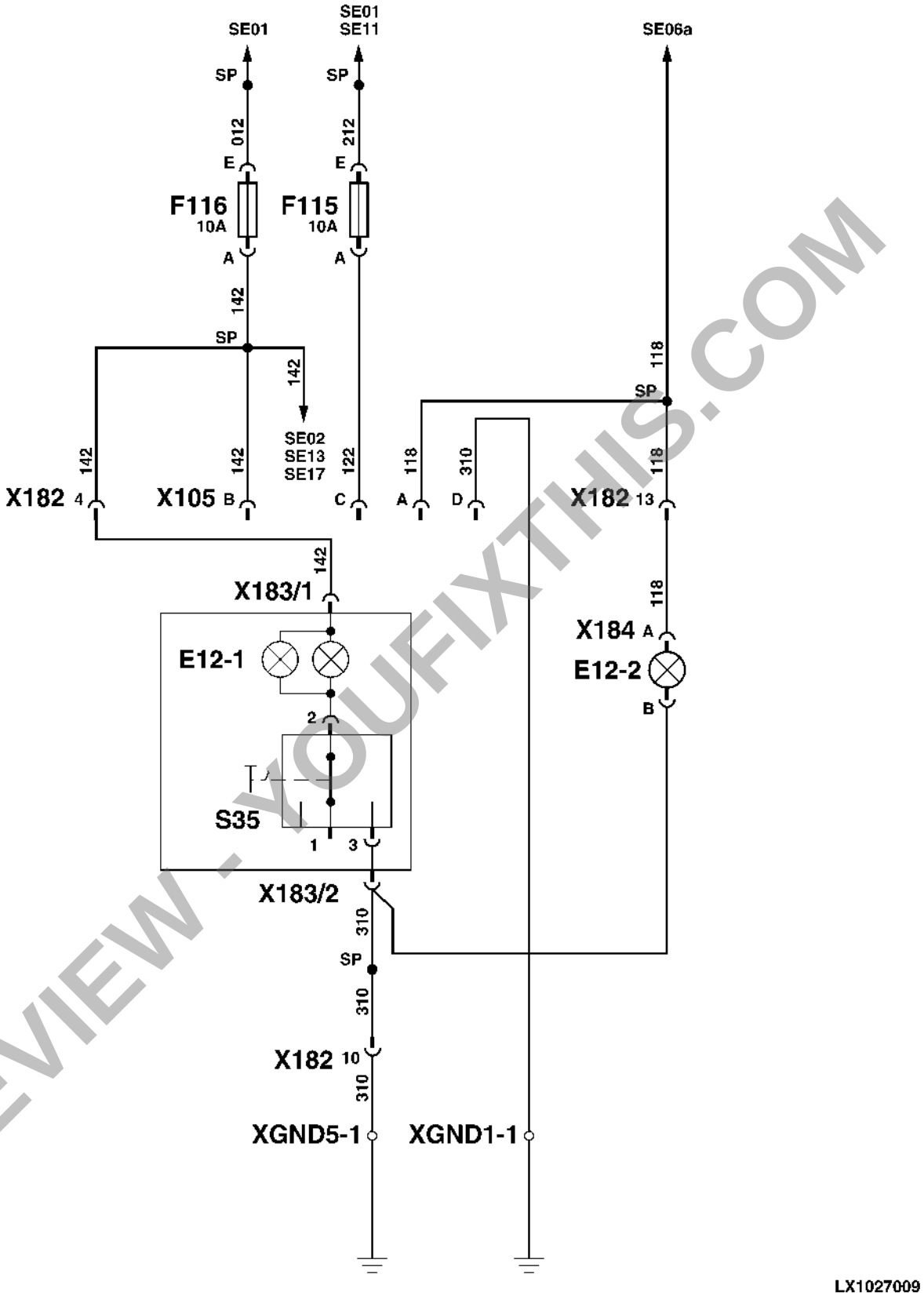


Flow rates on 6215, 6415, 6615 and 6715

Do this test at all the speeds listed in the table.

Flow rates on 6215, 6415, 6615 and 6715	
Speed (rpm)	Flow rate (litres per minute)
2300	19,0
2100	17,0

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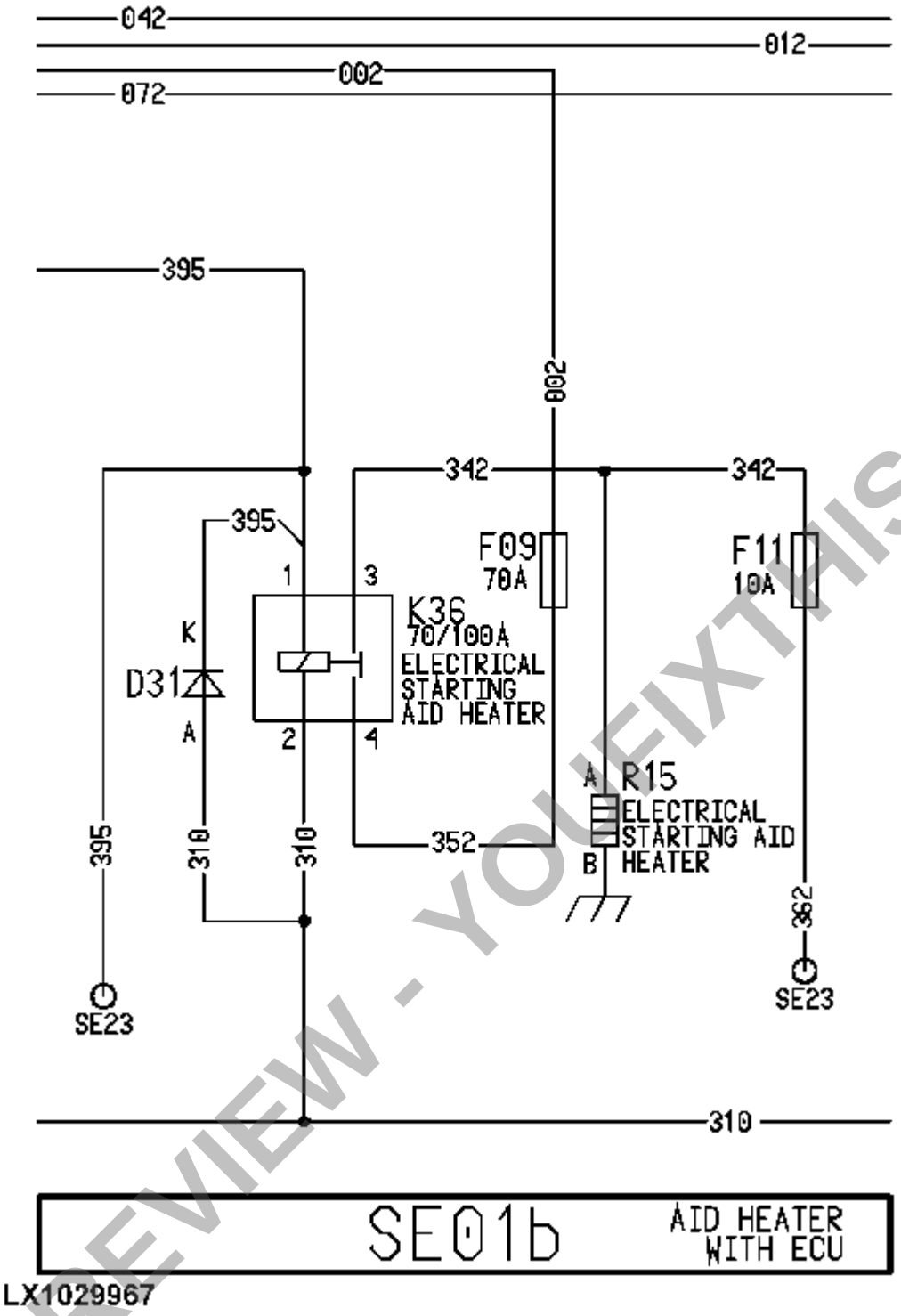


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LEGEND:

E12/1	Dome light (W26)
E12/2	Console light (W26)
F115	Fuse (W08)
F116	Fuse (W08)
X182	20-pin plug (connecting point between cab harness (W08) and fan and air-conditioning harness (W26))

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LEGEND:

D31	Diode for electrical starting aid (W03)
F09	Fuse (W03)
F11	Fuse (W03)
K36	Relay for electric starting aid (W03)
R15	Heater element for electric starting aid (W03)

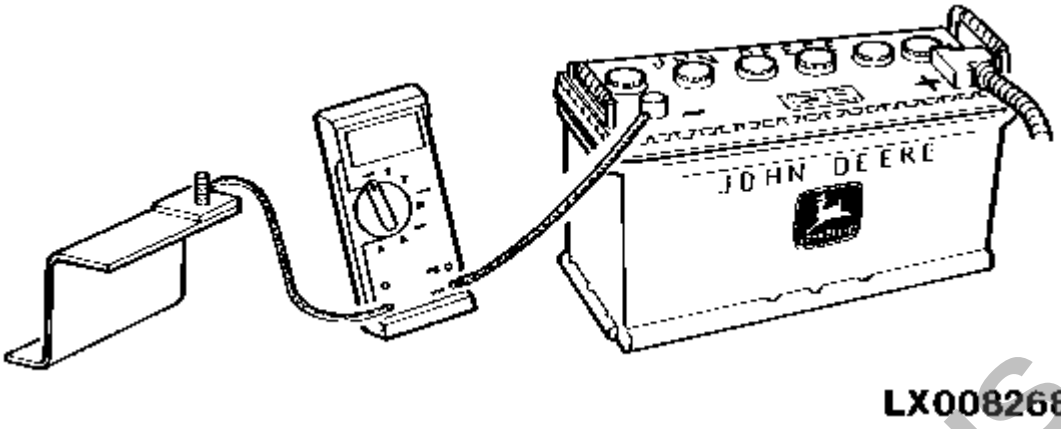
SE1B-Diagnostic Schematic - Electrical Starting Aid with TIER II Engine

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(6) Check for electrical leakage

Action:



LX008268

IMPORTANT:

All consumers must be switched off, all switches must be in the OFF position, the cab door must be closed and the engine must be shut off.

Disconnect the battery ground cable (-). All other ground leads must remain connected. Connect the digital multimeter to the tractor's frame and to the negative terminal (-) of the battery.

First select the maximum measuring range (10 amps). Select a lower measuring range if current draw is within a lower measuring range.

Electrical leakage should be less than 100 mA.

Result:

YES: GO TO 8

NO: GO TO 7

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Y01	Front PTO solenoid (SE16B; W07)
Y02	Fuel transfer pump (SE1A; W08)
Y03	Front-wheel drive solenoid valve (SE16C; W28)
Y04	Rear PTO solenoid (SE16A; W30)
Y05	Differential lock solenoid (SE16D; W30)
Y13	Injection pump solenoid valve (W03)

Reference 240-25-012, Designation of Sections Shown in Functional Schematic

DEFINITIONS:

SE1	Starter motor and charging circuit
SE2	Instrument unit
SE3	Horn
SE4	Operator′s seat
SE6	Lighting system
SE7	Worklights
SE9	Radio, dome and console lights
SE10	Fan and air-conditioning system
SE11	Windshield wiper and washer
SE13	Beacon light
SE14	3- and 7-terminal sockets
SE15	Electronic hitch control unit
SE16	Electronic control unit BCU
SE17	Signal socket
SE22	BUS terminator and terminating resistor
SE23	Electronic engine control
SE25	Back up alarm

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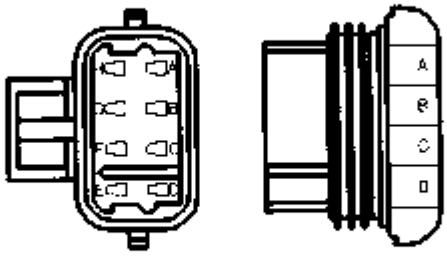
Terminal no.	Wire number and cross-section	Color of wire	To plug or component
A	vacant		
B	385C-1	dark green	X547-4
C	506C-1	light blue	X547-3
D	050C-1	black	X77-2
E	139CA-1	white	X411-D, X411-E
F	362C-1	red	X547-6
G	264CA-1.5	yellow	X79-A, K24-A
H	vacant		



LX1018500

X305 1-pin plug for voltage-to-ground on radiator

Terminal no.	Wire number and cross-section	Color of wire	To plug or component
A	310CE-2.5	black	XGND9

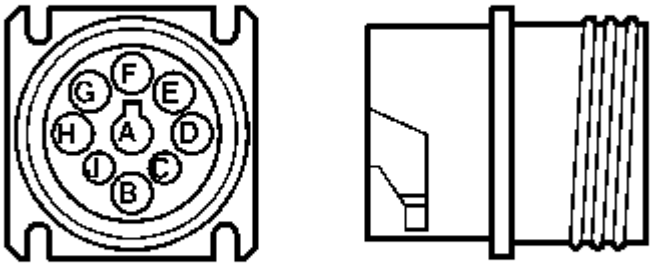


LX1017896

X411 8-pin plug - Connection point for headlight wiring harness (W04)

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LX1026522

X571 9-terminal service socket (CAN-BUS)

Terminal no.	Wire no. and cross section	Color of wire	To plug or component
A	050AG-1	black	XGND2
B	vacant		
C	934AC-1	yellow	X483/1-44, R19-A
D	935AC-1	dark green	X483/1-21, R19-B
E	vacant		
F	vacant		
G	vacant		
H	vacant		
J	142AC-1	red	F118A, X505-20



LX013685

XGND1 Ground point

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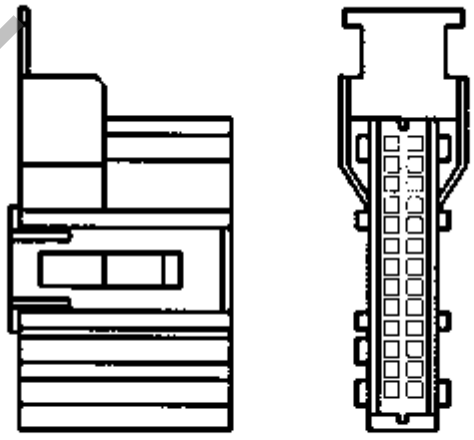
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Terminal no.	Wire no. and cross section	Color of wire	To plug or component
41	557A-1	pale purple	X245-A
42	244A-1	yellow	X324-C
42	vacant		
44	934AA-0.5	yellow	X450-41, R19-A, X571-C
45	245A-1	dark green	X324-D
46	834A-1	yellow	X14/1-F
47	838A-1	grey	X14/1-D
48	839A-1	white	X14/1-G
49	vacant		
50	vacant		
51	885A-0.5	dark green	X430-13
52	884A-0.5	yellow	X430-11
53	869A-1	white	X14/2-B
54	875A-1	dark green	X14/1-C
55	876A-1	light blue	X14/1-H
56	877A-1	pale purple	X14/1-E
57	878A-0.5	grey	X430-18
58	vacant		
59	325A-0.5	dark green	X450-9
60	341A-0.5	brown	X504-21
61	574A-0.5	yellow	X430-32
62	vacant		
63	502A-0.5	red	X430-40
64	501A-0.5	brown	X505-25
65	301A-0.5	brown	X450-34
66	vacant		
67	873AC-1	orange	X14/2-C, X14/1-B, X430-9, X430-12
68	vacant		

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Terminal no.	Wire no. and cross section	Color of wire	To plug or component
1	310BY-0.5	black	X504-17, X516-E, X26-12, X25-14, S01/1-A
2	158BB-0.5	grey	X505-6, X406-C
3	050B-0.5	black	X504-19
4	329B-0.5	white	X504-20
5	vacant		
6	vacant		
7	vacant		
8	vacant		
9	vacant		
10	vacant		
11	341B-0.5	brown	X504-21
12	149B-0.5	white	X504-22
13	320B-0.5	black	S01-GND
14	310BX-0.5	black	X504-17, X516-E, X26-12, S01/1-A, X25-1
15	vacant		
16	vacant		
17	134B-0.5	yellow	X504-23
18	146B-0.5	light blue	X504-24
19	188B-0.5	grey	X504-25
20	107B-0.5	pale purple	X504-26
21	145BC-0.5	dark green	X505-7, X406-H
22	606B-0.5	light blue	X504-27
23	906BB-0.5	light blue	X504-28, X26-11
24	351B-0.5	brown	X504-29
25	306B-0.5	light blue	X504-30
26	565B-0.5	dark green	X504-31



LX1017998

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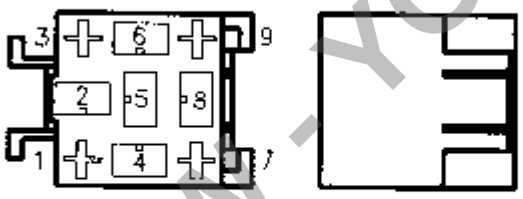
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LX013178

X186/3 1-pin plug for back-up alarm switch

Terminal no.	Wire no. and cross section	Color of wire	To plug or component
3	937YC-1	purple	X178/1B-A, X178/1A-A



LX1017994

X280 9-pin plug for backup alarm relay

Terminal no.	Wire no. and cross section	Color of wire	To plug or component
1	vacant		
2 (30)	256YD-1	light blue	X37/2-A, X37/1-A, X186-2
3	vacant		
4 (86)	956YC-1	light blue	X178/1B-B, X178/1A-B
5 (87A)	vacant		
6 (85)	310YC-1	black	X185-B, X186-1, X37/2-B, X37/1-B
7	vacant		
8 (87)	966Y-1	light blue	X185-A
9	vacant		

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- W08/3 - X113/1 - 2-pin plug (not used)
- W08/3 - X113/2 - 2-pin plug (not used)
- W08/3 - X120/1 - 1-pin plug (not used)
- W08/3 - X120/2 - 1-pin plug (not used)
- W08/3 - X122 - 2-pin plug for differential lock switch
- W08/3 - X125 - 3-pin plug for rear PTO switch
- W08/3 - X127 - 3-pin plug for front PTO switch
- W08/3 - X158 - 1-pin plug for radio antenna
- W08/3 - X182 - 20-pin plug - Connection point for fan and air-conditioning harness (W26)
- W08/3 - X188 - Prewiring for right external control of hitch
- W08/3 - X230 - 2-pin plug for seat switch
- W08/3 - X236 - 4-pin plug for cruise control potentiometer
- W08/3 - X238 - 6-pin plug for accelerator pedal potentiometer
- W08/3 - X239 - 3-pin plug - Connection point of harness for 3-terminal power outlet socket (W14)
- W08/3 - X245 - 3-pin plug for front-wheel drive switch
- W08/3 - X269F - 6-pin plug with wiring bridges for light selector
- W08/3 - X269M - 6-pin plug for light selector
- W08/3 - X311 - 2-pin plug for front PTO indicator light
- W08/3 - X315 - 2-pin plug (not used)
- W08/3 - X321 - 3-pin plug for hand throttle potentiometer
- W08/3 - X324 - 8-pin plug for brake switch
- W08/3 - X400 - 42-pin plug - Connection point for cab roof wiring harness (W19)
- W08/3 - X406/1F - 1-pin plug - Connection point for light selector
- W08/3 - X406/1M - 1-pin plug - Connection point for light selector
- W08/3 - X430 - 42-pin plug - Connection point for harness at rear of transmission (W30)
- W08/3 - X431 - 42-pin plug - Connection point for harness at front of transmission (W30)
- W08/3 - X450 - 42-pin plug - Connection point for engine wiring harness (W02)
- W08/3 - X473 - 2-pin plug, Connecting point for power supply wiring harness (W01)
- W08/3 - X504 - 42-pin plug, Connecting point for cowl wiring harness (W09)
- W08/3 - X505 - 42-pin plug - Connecting point for cowl wiring harness (W09)
- W08/3 - X515 - 8-pin plug for worklights on cab frame
- W08/3 - X544 - 2-pin plug, Connecting point for battery cut-off switch harness (W35)
- W08/3 - X560F - 2-pin plug for light selector
- W08/3 - X560M - 2-pin plug with wiring bridges for light selector
- W08/3 - X570/1 - 30-pin plug for engine control unit (ECU)
- W08/3 - X571 - 9-terminal service socket (CAN-BUS)
- W08/3 - X587F - 3-pin plug - Connection point for light that indicates electric starting aid (with ECU)
- W08/3 - X587M - 3-pin plug - Connection point for light that indicates electric starting aid
- W08/3 - X588 - 3-pin plug - Connection point for light that indicates electric starting aid (without ECU)
- W08/3 - X613 - 8-pin plug for radio
- W08/3 - X614 - 6-pin plug for CAN-BUS terminator (29-bit)

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the “Session” menue.

[4] - Status of diagnostic trouble codes in Service ADVISOR:

- Status: "ACTIVE" (priority I):
  - Diagnostic trouble code cannot be cleared.
  - Current problem with the tractor.
- Status: "SAVED" (priority 2):
  - Diagnostic trouble code can be cleared
  - At present the problem is not recognized by the controller (example: faulty solenoid valve, switch or circuit not activated at the moment).

Accessing the diagnostic trouble codes of all control units (ALL mode)

(1) Accessing the ALL mode

Action:

Before entering the program mode, see Reference 245-05-001 , General Operation and Entering the Program Mode.

Performance monitor:

Press the “2” button or the “0” button.

Display:

- - - : ALL

Result:

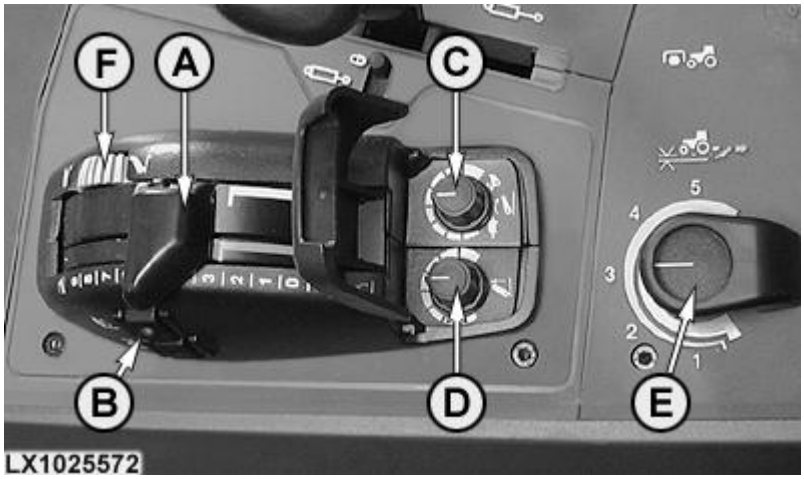
YES: Entering the ALL-mode, GO TO: 2 .

NO: Refer to the corresponding diagnostic manual.

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Key switch off.



Set rockshaft controls:

- Depth stop (F) adjusted to “9”.
- Depth control (A) to “0” (not in transport lock position).
- Raise limit control (D) fully to the right.
- Rate-of-drop control (C) fully to the right.
- Sensitivity control (E) fully to the right.
- Raise/lower control switch (B) in neutral.

Result:

YES: Go to 2

(2) Accessing the input and calibration addresses

Action:

→NOTE:

During calibration, run the engine at 1200 rpm.

Check that BCU addresses BCU 167, 174 and 185 have the correct values.

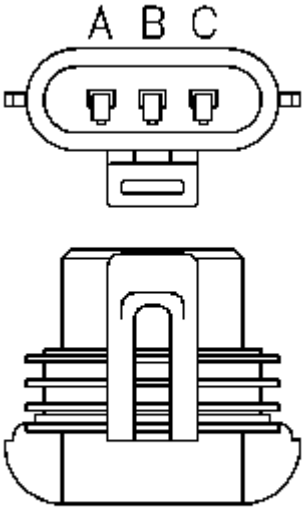
Entering program mode and accessing the relevant address, see Reference 245-05-002 , "Accessing the Addresses and Diagnostic Trouble Codes".

Result:

YES: Go to 3

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LX1025889

X89 3-pin plug for the draft sensor

1.1 - Harness test:

• Pull out the 3-pin plug (X89) for the l.h. draft sensor (B20).

• This test must be performed at plug X89 (harness W30 at rear end of transmission).

Item	Measurement	Specification
Address BCU104 - harness test for l.h. draft sensor (B20)		
Plug X89 disconnected:	Voltage	0 volts
Pin A (lead 873, positive) bypassed to pin B (lead 885; signal lead)	Voltage	4,75 - 5,25 volts

Result:

YES: Repair the position sensor as needed and carry out an operational test.

NO:GO TO 1.2.

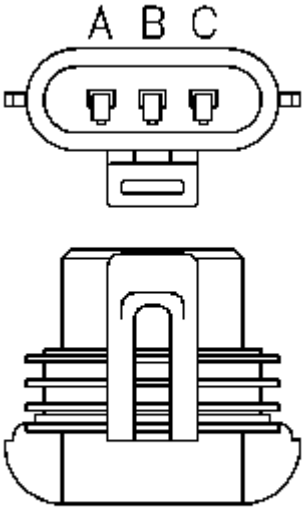
Action:

1.2 - Check supply voltage:

Use a JT05791A - Multimeter to check the power supply at plug X89 (wiring harness W30 at rear end of transmission).

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LX1025889

X89 3-pin plug for the draft sensor

1.1 - Harness test:

• Pull out the 3-pin plug (X89) for the l.h. draft sensor (B20).

• This test must be performed at plug X89 (harness W30 at rear end of transmission).

Item	Measurement	Specification
Address BCU104 - harness test for l.h. draft sensor (B20)		
Plug X89 disconnected:	Voltage	0 volts
Pin A (lead 873, positive) bypassed to pin B (lead 885; signal lead)	Voltage	5 volts

Result:

YES: Repair the position sensor as needed and carry out an operational test.

NO:GO TO 1.2.

Action:

1.2 - Check supply voltage:

Use a JT05791A - Multimeter to check the power supply at plug X89 (wiring harness W30 at rear end of transmission).

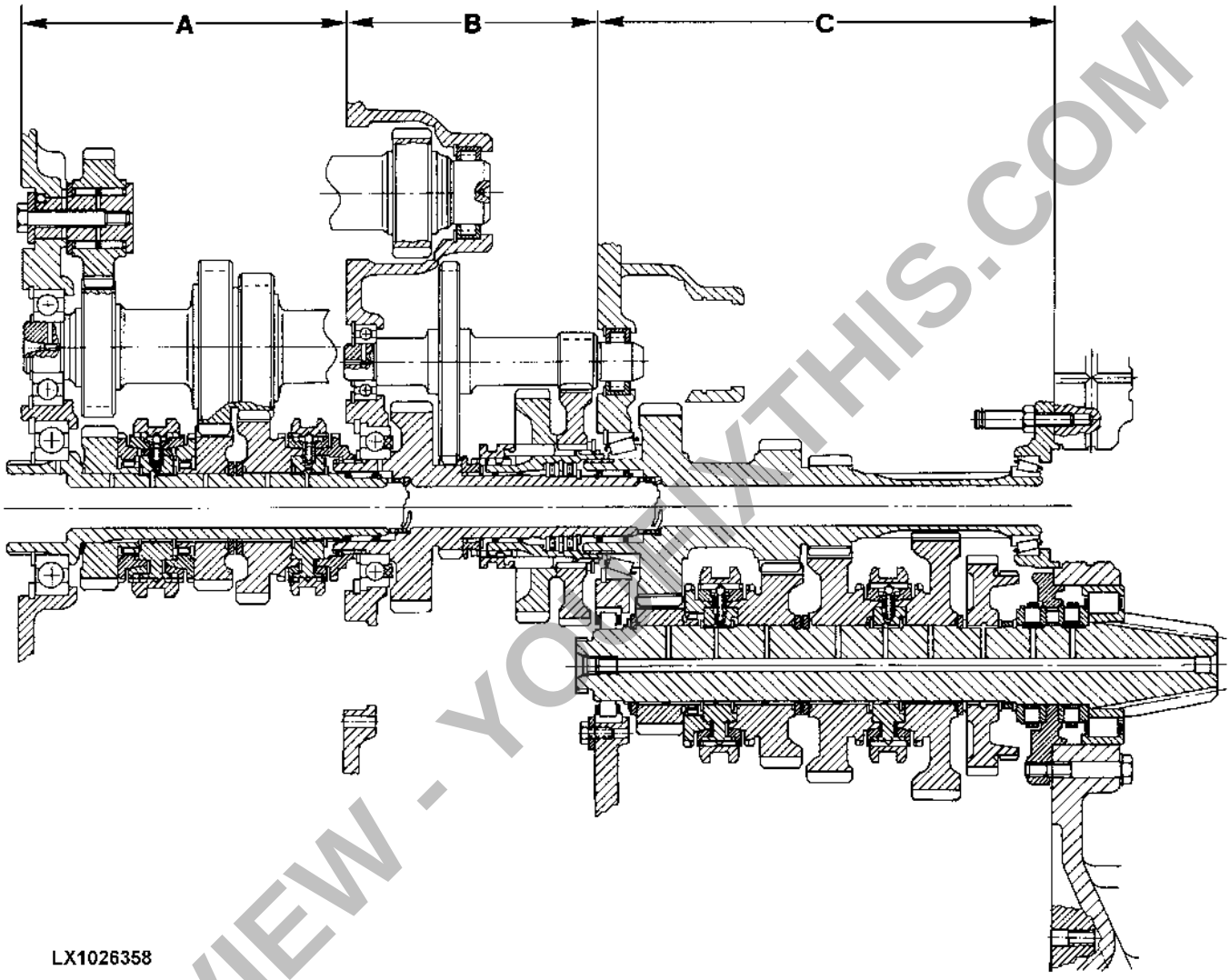
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• 12 forward speeds (3 gears x 4 ranges)

• 4 reverse speeds (1 gear x 4 ranges)

Layout of 12-speed transmission with creeper



LEGEND:

A	Gear transmission
B	Creeper transmission
C	Range transmission

This version consists of gear transmission (A), creeper transmission (B) and range transmission (C). All the gears and ranges are fully synchronized. The creeper transmission is not synchronized.

Travel speed: up to 30 km/h (18.5 mph)

The following gears are provided:

• 12 forward speeds (3 gears x 4 ranges)

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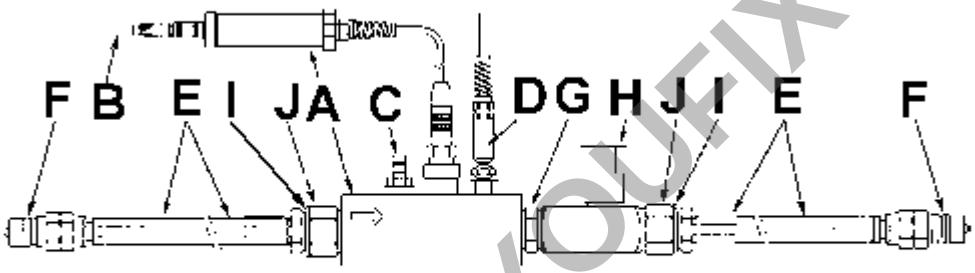


FKM10471

SensoControl© measurement unit for testing hydraulic systems

System for measuring rate of through-flow

FKM10472



FKM10472

LEGEND:

A	FKM10472-1 flow turbine
B	FKM10472-2 connecting cable
C	FKM10472-3 1/4-in. coupler
D	FKM10472-4 temperature sensor
E	FKM10472-5 hose (2 used)
F	FKM10472-6 quick coupler (2 used)
G	FKM10472-7 2-way fitting
H	FKM10472-8 restrictor
I	FKM10472-9 sealing ring (2 used)
J	FKM10472-10 restriction fitting (2 used)
	FKM10472-11 carrying case

SensoControl© measurement unit for hydraulic system flow testing, consisting of:

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(7) Check the pressure at the forward clutch

Action:

See Reference 255-15-008 , PowrQuad Transmission-Checking Pressure at Forward Clutch.

Item	Measurement	Specification
6215 tractors	Pressure (at 2300 rpm)	1200 kPa 12 bar 175 psi
6415 to 6715 tractors	Pressure (at 2300 rpm)	1400 kPa 14 bar 205 psi

Result:

YES: GO TO 8.

NO: See Reference 255-15-004 , PowrQuad Transmission-Checking System Pressure.

NO: See Reference 255-15-005 , PowrQuad Transmission-Checking Lube Oil Pressure.

(8) Check the pressure at the reverse brake

Action:

See Reference 255-15-009 , "PowrQuad Transmission-Checking Pressure at Reverse Brake".

Item	Measurement	Specification
6215 tractors	Pressure (at 2300 rpm)	1200 kPa 12 bar 175 psi
6415 to 6715 tractors	Pressure (at 2300 rpm)	1400 kPa 14 bar 205 psi

Result:

YES: GO TO 9.

NO: See Reference 255-15-004 , PowrQuad Transmission-Checking System Pressure.

NO: See Reference 255-15-005 , PowrQuad Transmission-Checking Lube Oil Pressure.

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assembled shafts are splined to each other.

The extended intermediate shaft holds the A, B, C, D, E and F range gears (M, K, J, H, E, G), the synchronizers (F, I and L) and the front-wheel drive gear (O). The range gears can turn freely on the shaft. The synchronizing units and the front-wheel drive gear are joined to the intermediate shaft.

The drive shaft gears mesh with the range gears on the countershaft (D) or intermediate shaft (P). Additionally, for range A the two double gears (C) and (N) are shifted to reduce shaft speed.

Torque is transferred from the PowrQuad module to the drive shaft (A) and from there to drive shaft (B). The drive shafts drive the individual range gears. If the synchronizers are in neutral, all range gears are free to turn on the intermediate shaft. The intermediate shaft does not turn. If a synchronizer is moved to a shift position, the associated range gear will be solidly engaged on the shaft. This allows torque to move to the intermediate shaft. From the intermediate shaft, torque is transmitted to the ring gear and to the front-wheel drive clutch

[If Equipped]

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G	Check valve
H	Metering unit
I	Return oil connection
J	Pressure oil connection
K	Pilot line
L	Low pressure oil
M	Return oil connection
N	Pilot oil

→NOTE:

Illustration shows right-hand turn.

Should the hydraulic pump fail, the steering system switches automatically to emergency steering. With emergency steering the spool turns until it turns the sleeve (after 8°) and thereby turns the rotor.

The metering unit now operates as an hydraulic pump and opens the check valve by means of its suction effect. This means return oil from the steering cylinder can flow directly to the metering unit. Moreover, further oil can be drawn from the brake valve oil reservoir. With emergency steering, steering is a little heavier due to the lack of oil pressure influencing the rotor movement.

As soon as the hydraulic pump is functioning normally, the inlet priority valve automatically supplies oil to the steering valve. Other consumers receive oil only when sufficient oil is available for the steering valve.

Various Types of Steering Valve

Depending on the type of tractor, various steering units may be fitted (see table). The type is indicated on the steering identification plate.

All steering systems essentially operate as described above.

Steering Valve Type

- OSPF 100 LS (Danfoss)
- OSPF 125 LS (Danfoss)
- OSPF 160 LS (Danfoss)

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control unit that controls the rockshaft.

The draft sensors (B) need to be in a specific position and require adjustment.

The bearing pins (H) are held in place by a pin (D).

Inside the bearing pins there is a metal rod (E) with a magnet (A) over a sensor (B). When the bearing pin (H) is flexed by lower arm draft force (F) the metal rod is displaced. The resultant magnetic field alteration (Hall effect) is received by the sensor and passed to the electronic control unit. The function is produced only in a horizontal direction.

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