

SECTION 10 - ENGINE

BOOK 1 - 87342122

Chapter 2 - IVECO Engine - F3A

Model

IVECO Engine

FX 30

F3AE0684D*B001

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SECTION 10 - ENGINE

Chapter 1 - IVECO Engine F3A - General

Model	IVECO Engine
FX 30	F3AE0684D*B001

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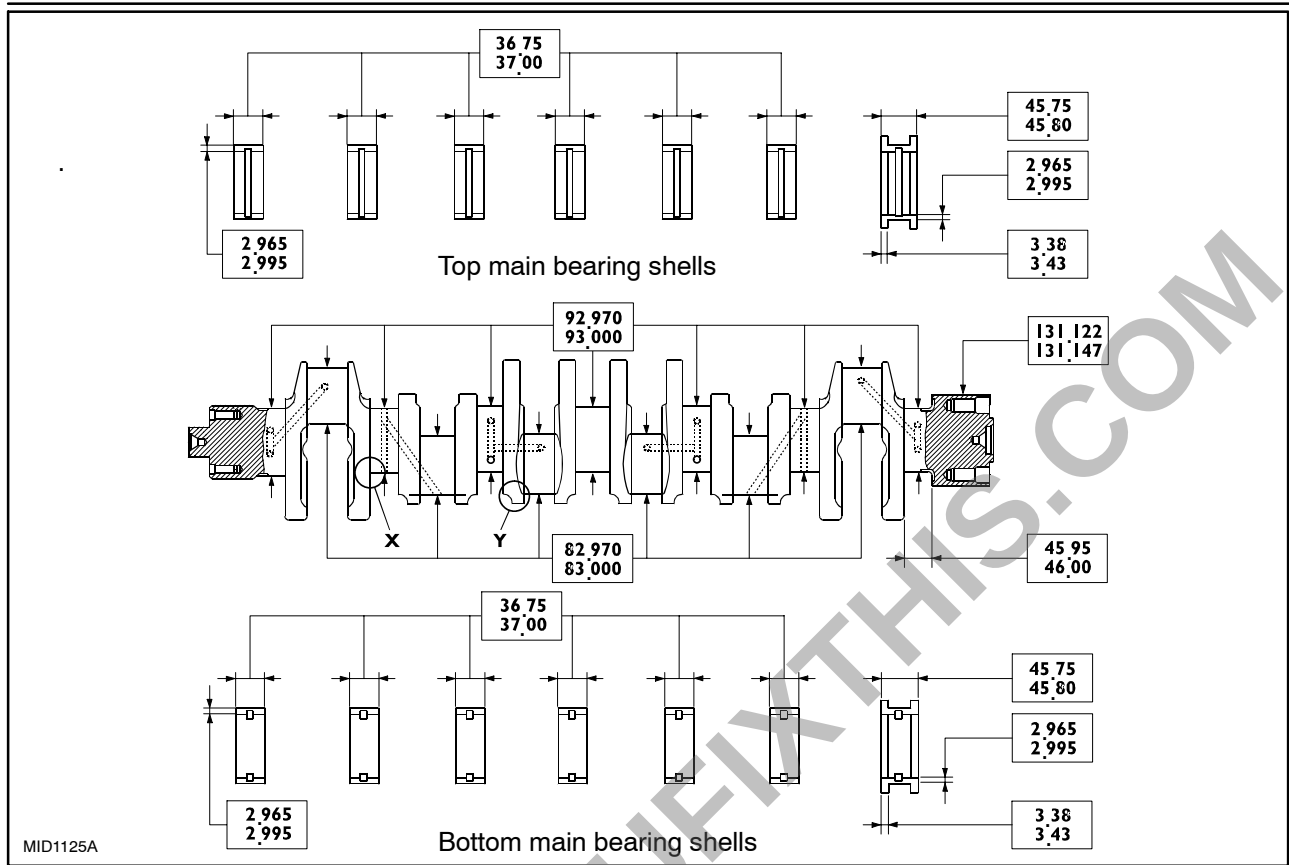
TOOLS

**CAUTION**

The operations described in this section can only be carried out with the ESSENTIAL tools indicated by an (X).

To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools, which are to be made according to the drawings included in this manual.

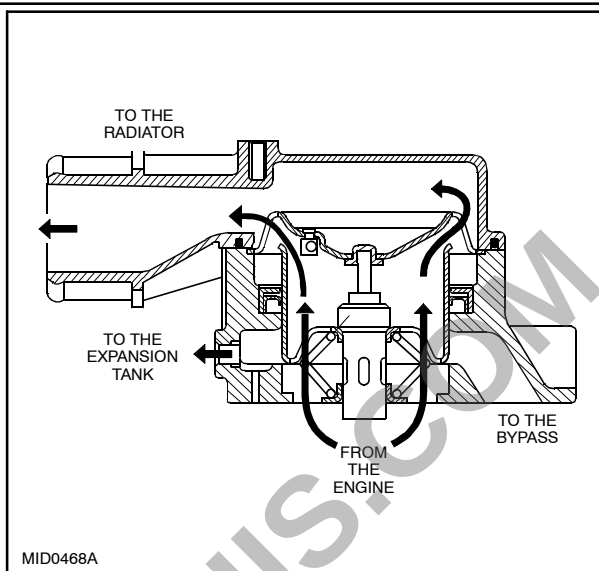
PART	DESCRIPTION
290884	Valve guide reamer
291048	Clamp to insert piston in cylinder liner (60-125 mm)
291980	Tool to remove oil filter
292045	Tool to retain cylinder liners
292243	Tool to remove remains of injector sheath
292248	Pair of gauges for angular torque with 1/2" and 3/4" square connection
292927	Percussion extractor
293273	Crankshaft lifting tool
293296	Revolving telescopic service stand (capacity 2000 daN, torque 375 daN/m)
296011	Engine removal and installation tool
296028	Pliers for piston ring disassembly and reassembly (105-160 mm)
296151	Tool for measuring cylinder liner protrusion (use with 296209)
296153	Drift to remove valve guide
296154	Tool to remove cylinder liners (use with specific rings)
296162	Tool to remove crankshaft front gasket
296163	Tool to remove crankshaft rear gasket
296165	Extractor for injector sheath
296168	Key for fitting crankshaft front gasket
296169	Key for fitting crankshaft rear gasket
296170	Tools (12+6) to retain rocker arm adjustment screw sliding blocks when disassembling and reassembling the rocker arm shaft
296172	Caps (6) protecting injector seats
296173	Tool to disassemble and reassemble engine valves (use with specific plates)



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Engine F3A - Main data of crankshaft and main bearing shells

Water leaving the thermostat



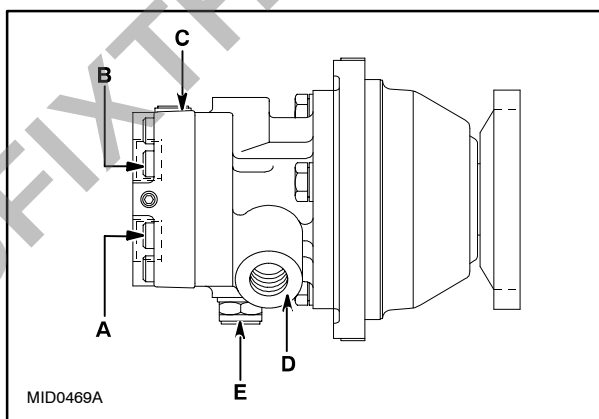
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FUEL SUPPLY

Fuel is supplied via a fuel pump, fuel filter and pre-filter, 6 pump-injectors governed by the camshaft by means of rocker arms and by the electronic control unit.

Fuel pump

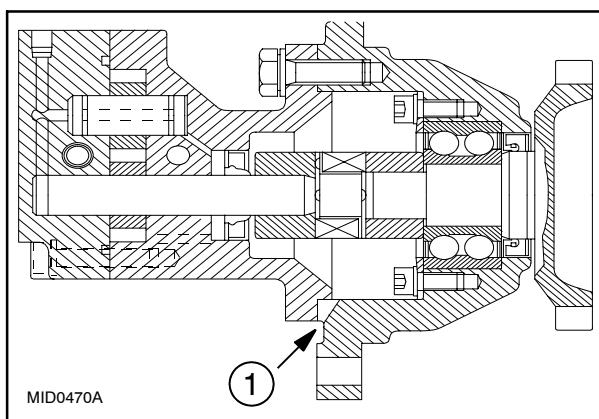
- A. Fuel inlet
 - B. Fuel delivery
 - C. Bypass nut
 - D. Fuel return from the pump-injectors
 - E. Pressure relief valve
- Opening pressure: 5-8 bars (72.5-116 psi)



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Section of the fuel pump

1. Oil or fuel leakage gauge



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MAIN DATA

(cont.)

CRANK GEAR AND CYLINDER DATA	F3B
	mm
Diameter of cylinder liner bores on block:	
- upper	153.000 ÷ 153.525
- lower	152.000 ÷ 152.025
Cylinder liners – external diameter:	
- upper	153.461 ÷ 153.486
- lower	151.890 ÷ 151.915
Cylinder liner interference – bores on block:	
- upper	0.014 ÷ 0.039
- lower	0.085 ÷ 0.135
Cylinder liner external diameter oversizes	-
Cylinder liners – internal diameter driven in and machined:	
- class A	135.000 ÷ 135.013
- class B	135.011 ÷ 135.024
- Cylinder liner protrusion from engine block under a load of 8,000 kg.	0.045 ÷ 0.075
Pistons:	
Standard piston diameter measured from skirt base:	20
- class A*	134.881 ÷ 134.893
- class B**	134.892 ÷ 124.894
Pin seat diameter	54.010 ÷ 54.018
Piston assembly clearance – cylinder liners	0.107 ÷ 0.132
Piston diameter oversizes	-
Piston pin diameter	53.994 ÷ 54.000
Piston pin – pin seat clearance	0.010 ÷ 0.024

(cont.)

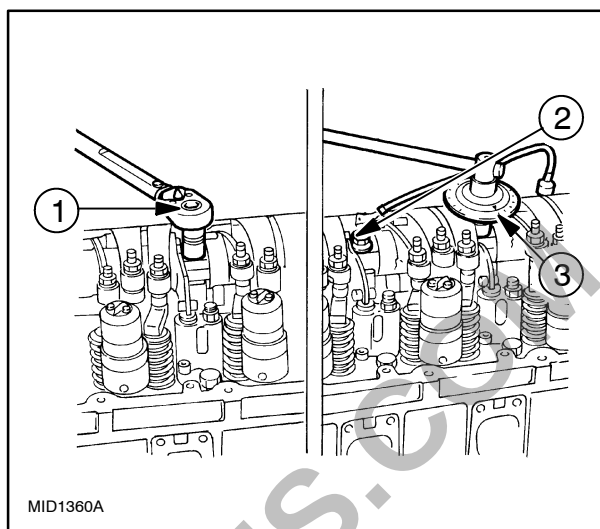
* Pistons supplied as spare parts.

** Class B pistons are assembled solely in production and are not supplied as spares.

Use engine oil to lubricate threads of screw (2) fixing rocker shaft and tighten them in two stages:

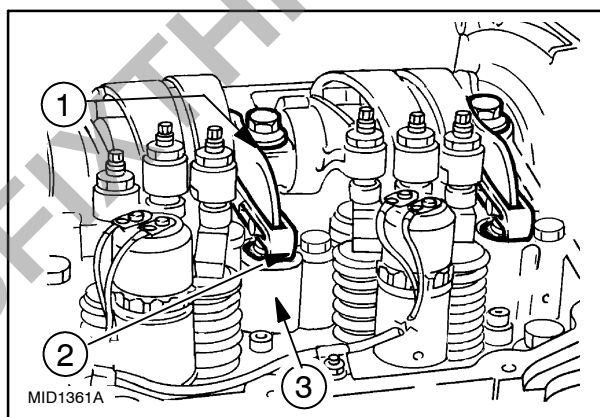
1st stage: use a torque wrench (1) to tighten to a torque of 100 Nm (10 kgm).

2nd stage: use tool **292248** to tighten to an angle of 60°



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Use springs (2) to link levers (1) to spacer (3).

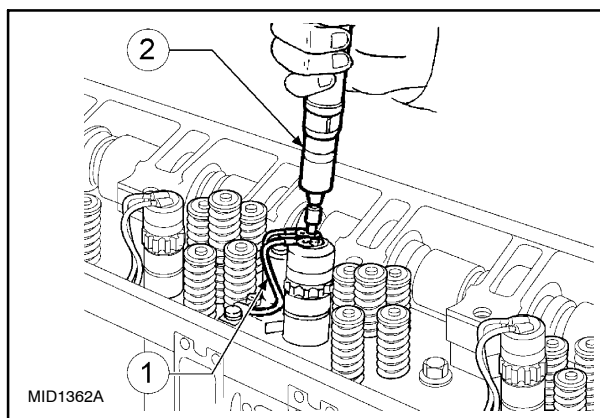


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Assemble electric wiring on pump-injectors and tighten.

Tighten fixing nuts to a torque of 1.36 to 1.92 Nm (0.13 to 0.19 kgm).

Tighten screws fixing cabling retaining clamps to cylinder heads to the set torque.

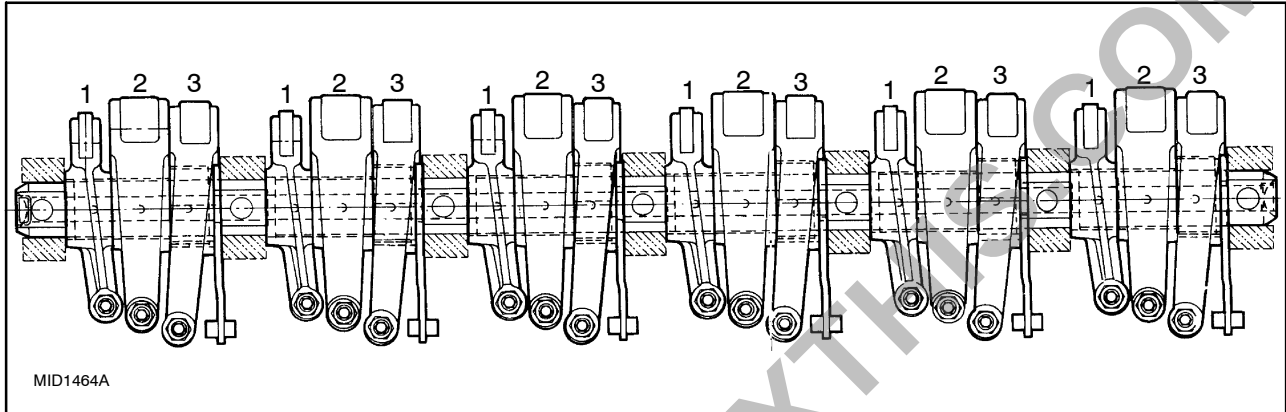


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Rocker arm shaft

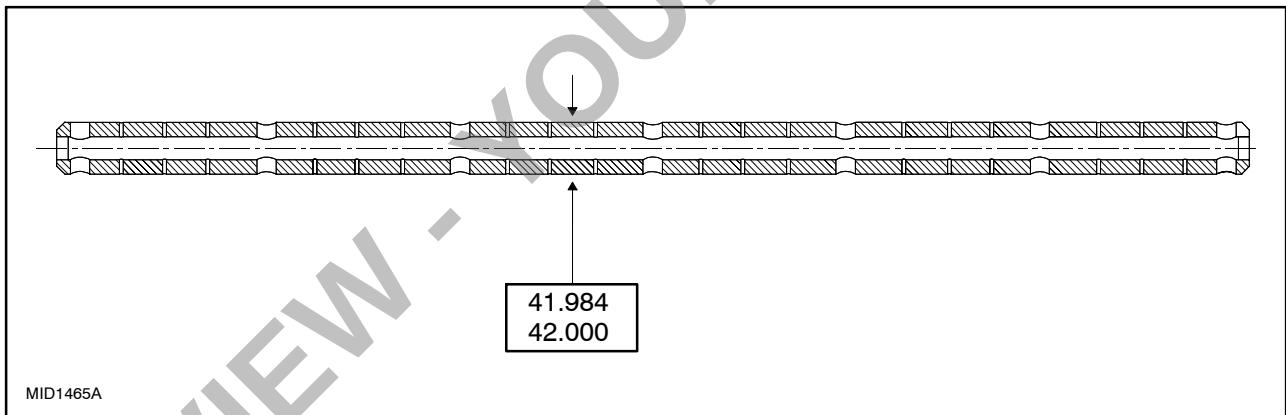
Check that the mating surfaces have no scoring or signs of seizing. If they do, replace the damaged parts.

Check the clearance between the bushings of the rocker arms and the shaft. If you find the bushings worn, replace the entire rocker arm.



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1. Intake valve rocker arm – 2. Injector rocker arm – 3. Exhaust valve rocker arm.

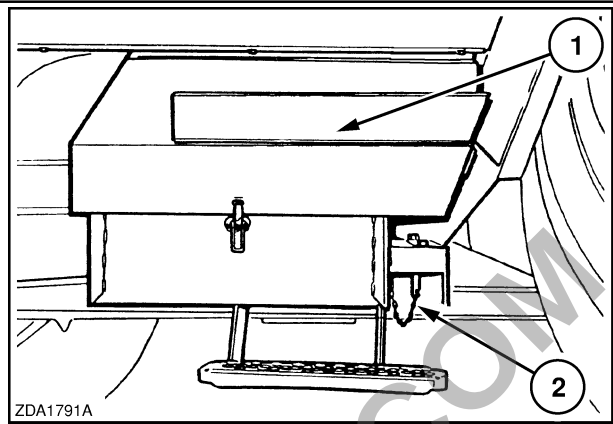


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Main data of the rocker arm shaft (Dimensions in mm)

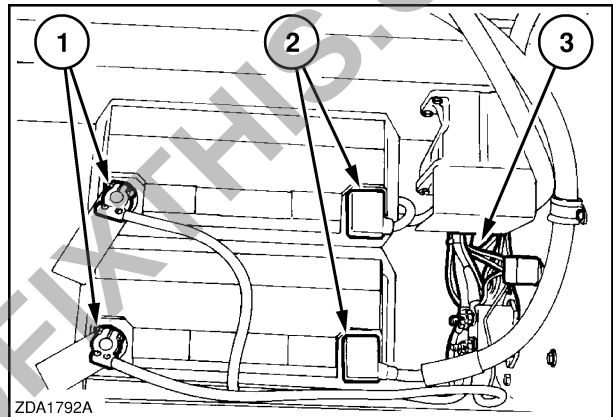
Battery box - Remove

1. Switch off the main battery switch (2).
2. Remove the cover (1) of the battery box.



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3. Mark the battery cables (1) and (2) and disconnect them.
4. Remove the batteries from the battery box.
5. Mark and disconnect all the other wires that come into the battery box at (3).



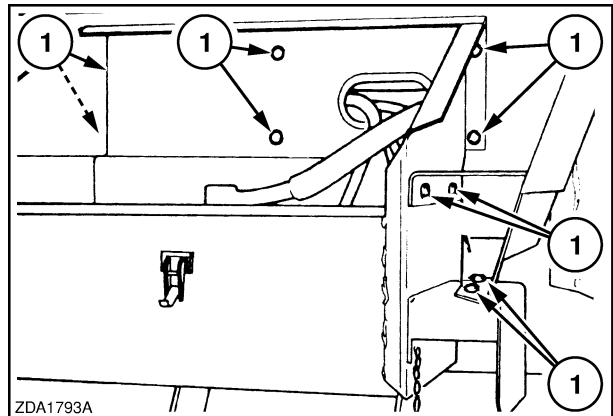
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6. Loosen the ten screws (1) that secure the battery box to the machine frame and the right-hand side platform.

**DANGER**

Be careful when loosening these screws. Even without batteries in it, the battery box is quite heavy. Two persons are needed to do this job.

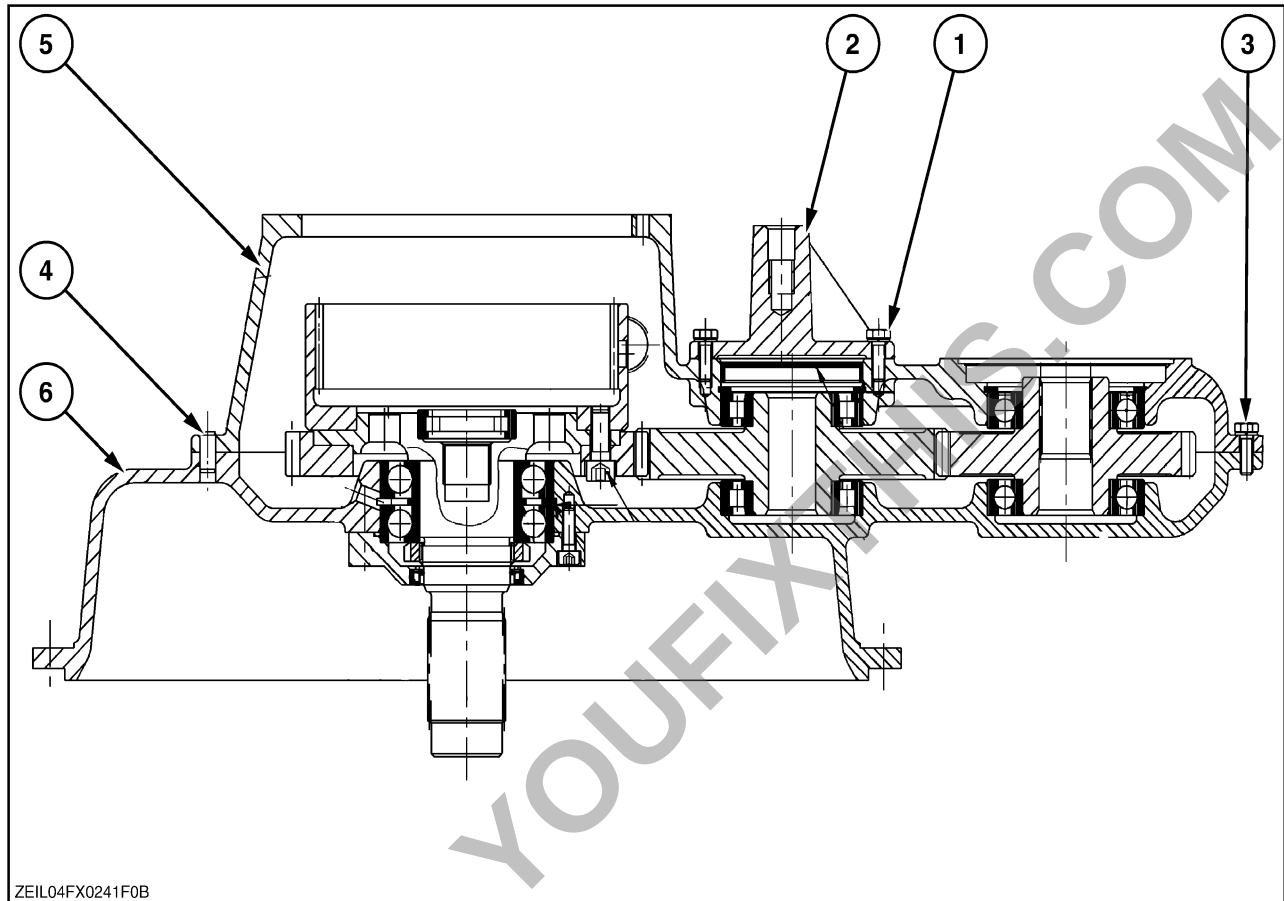
7. Pull the battery box carefully away from the forage harvester and do not damage the free wires.
8. Tie up the wires away from the working area so they do not get damaged.



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MAIN DRIVE GEARBOX - DISASSEMBLE / ASSEMBLE

Splitting the main drive gearbox

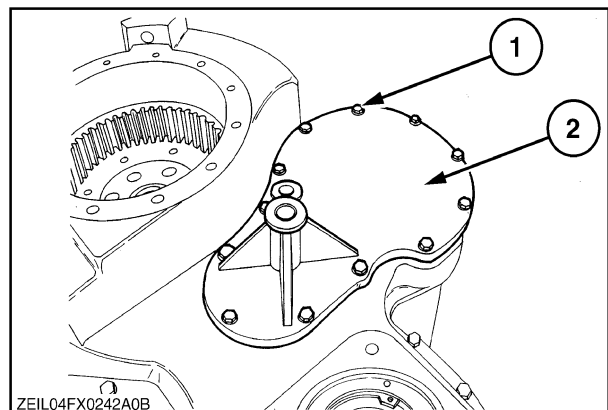


ZEIL04FX0241F0B

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- 1. Bolt
- 2. Cover
- 3. Bolt
- 4. Dowel pin
- 5. Upper gearbox half
- 6. Lower gearbox half

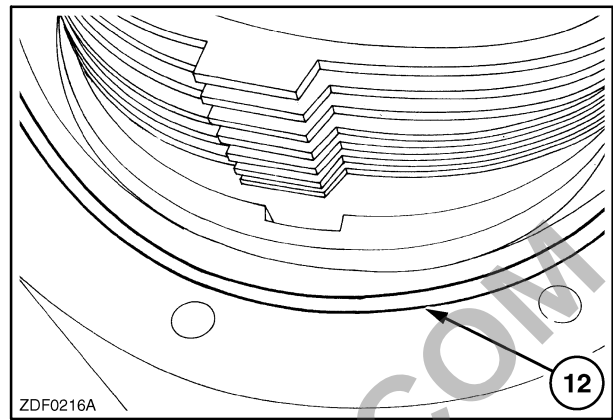
1. Remove the bolts (1) and take away the cover (2).



ZEIL04FX0242A0B

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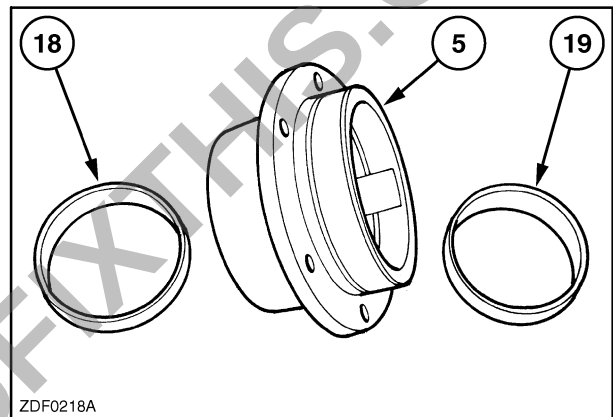
32. Install the O-ring (12).



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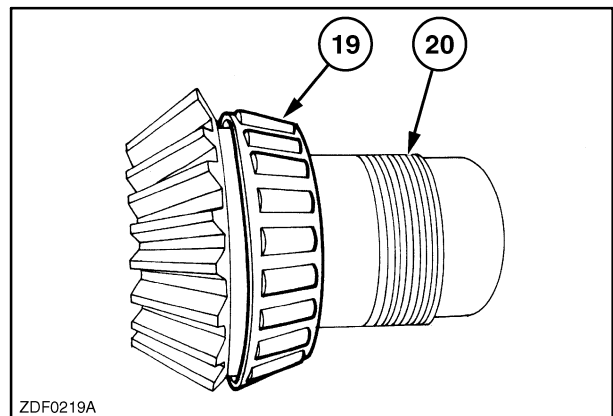
Input shaft - pre assembly

33. Install the bearing outer rings (18) and (19) into the housing (5).



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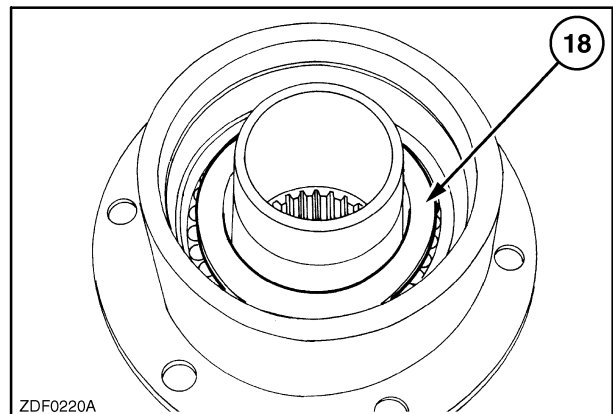
34. Heat the bearing inner ring (19) to 80°C and install it on the input gear (20).



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35. Install the bearing housing (5) on the input gear (20).

36. Install the bearing inner ring (18).



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FILLING AND BLEEDING THE HYDROSTATIC SYSTEM

After repair or replacement of a hydrostatic element a complete refill is required.

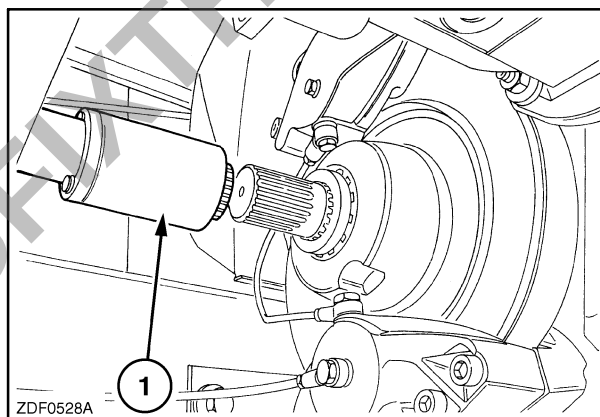
NOTE: Before mounting a new motor or a new pump, shipment oil should be drained from the new pump or motor case.

1. Place the machine on level ground.
2. Place the wheel chocks in front and behind the traction wheels to keep the machine stationary.
3. Place the ground speed control lever and the gearshift lever in the cab in neutral position.
4. Disconnect the sleeves (1) on both sides of the traction gearbox.



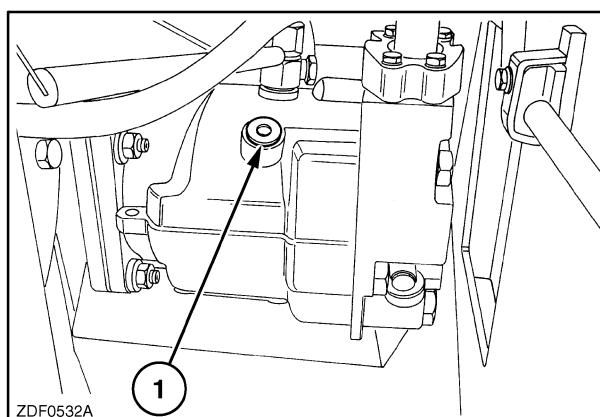
CAUTION

Before disconnecting the sleeves, secure the machine safely in place by placing adequate wheel chocks against the front and the rear of both traction wheels and steering wheels.



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5. Fill the hydraulic/hydrostatic oil reservoir with hydrostatic oil.
6. Loosen the traction hydrostatic motor drain plug (1) and bleed the charge line and motor housing until oil comes through the drain plug.
7. Tighten the drain plug (1).



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PREVIEW - YOUFIXTHIS.COM

Valve a - main drive clutch and main drive belts cylinder

- Start the forage harvester

The valve a is automatically activated into position 1.

The low pressure pump F pumps oil via port P.

This oil flow is divided in an oil flow straight to the oil reservoir R3 (hydraulic line n) and an oil flow to the main drive transfer gearbox (hydraulic line q).

NOTE: The main drive clutch H is part of the main drive transfer gearbox.

This oil flow is meant to cool and lubricate the rotating parts inside the main drive transfer gearbox and flows via the overflow line r to the oil reservoir R3.

The pressure at port B (the hydraulic cylinder) is not high enough to stretch the main drive belts.

- Switch ON the Harvest switch,

The valve a is not activated.

The valve moves back to neutral position. The pressure is now completely on the hydraulic cylinder, which stretches the main drive belts.

- Switch ON the cutterhead drive switch,

The valve a is activated into position 2.

NOTE: To achieve this step, the Harvest switch must be switched ON.

The low pressure pump will pump oil via port A to the main hydraulic clutch H (hydraulic line s).

The flow resistance of the clutch is such that the pressure on port B is still high enough to keep the main drive belts tensioned.

The oil flow through the main hydraulic clutch H arrives at reservoir R3 via hydraulic line r.

The pressure in this system is maximum 30 bar (435 psi), due to the pressure relief valve k.

The pressure contact at port MP warns the operator through the "main drive clutch oil pressure" warning light that the pressure has dropped below 24 bar (348 psi).

This is to protect the main clutch from slipping.

**CAUTION**

Never put 12V continuously to a solenoid as this will cause the solenoid to burn.

It is allowed to put 12V on a solenoid as a pulse or maximum 7V continuously!

The warning will only be activated in following conditions:

- When the cutterhead is engaged
- When the engine speed is at least 1700 rpm

Valve b - 4WD clutch

The valve b is activated when:

- The Harvest switch is switched ON
- The 4-wheel drive switch is switched ON

The pressure contact at port MP 1 switches off when the pressure, delivered by the charge pump of the hydrostatic pump C, drops below 5 bar (73 psi). In that case, the feed rolls will stop immediately.

After 5 seconds the main clutch will be disengaged giving the cutterhead, blower and spout time to clear.

The engine slows down to low idle.

Another 5 seconds later the engine will stop.

Check the hydrostatic system.

Valve c

Valve C controls the hydraulic spout deflector cylinder.

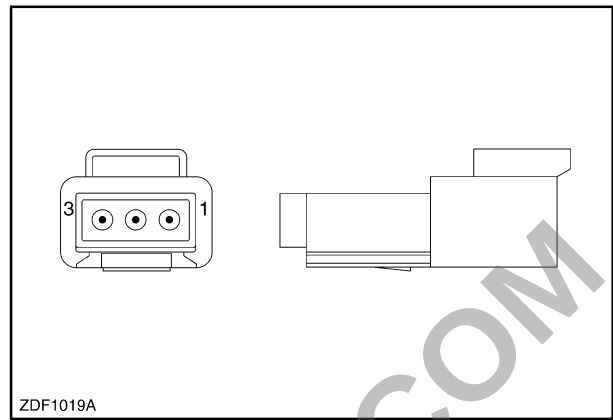
The valve is activated when:

- The harvest switch is switched on.
- Spout deflector rocker switch is activated (up or down).

Valve d

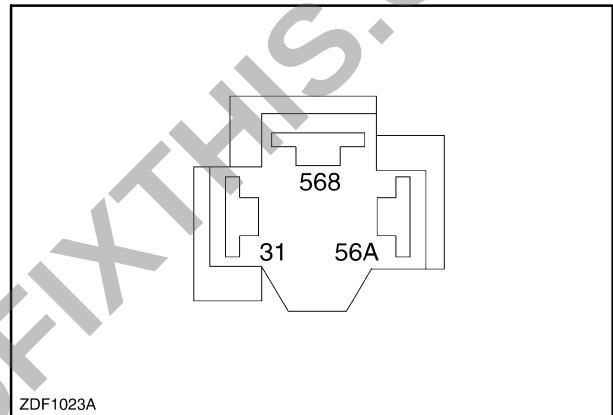
Valve d is not used.

X672



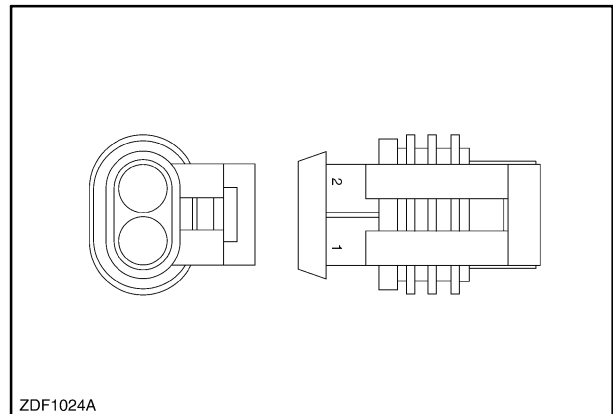
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E16



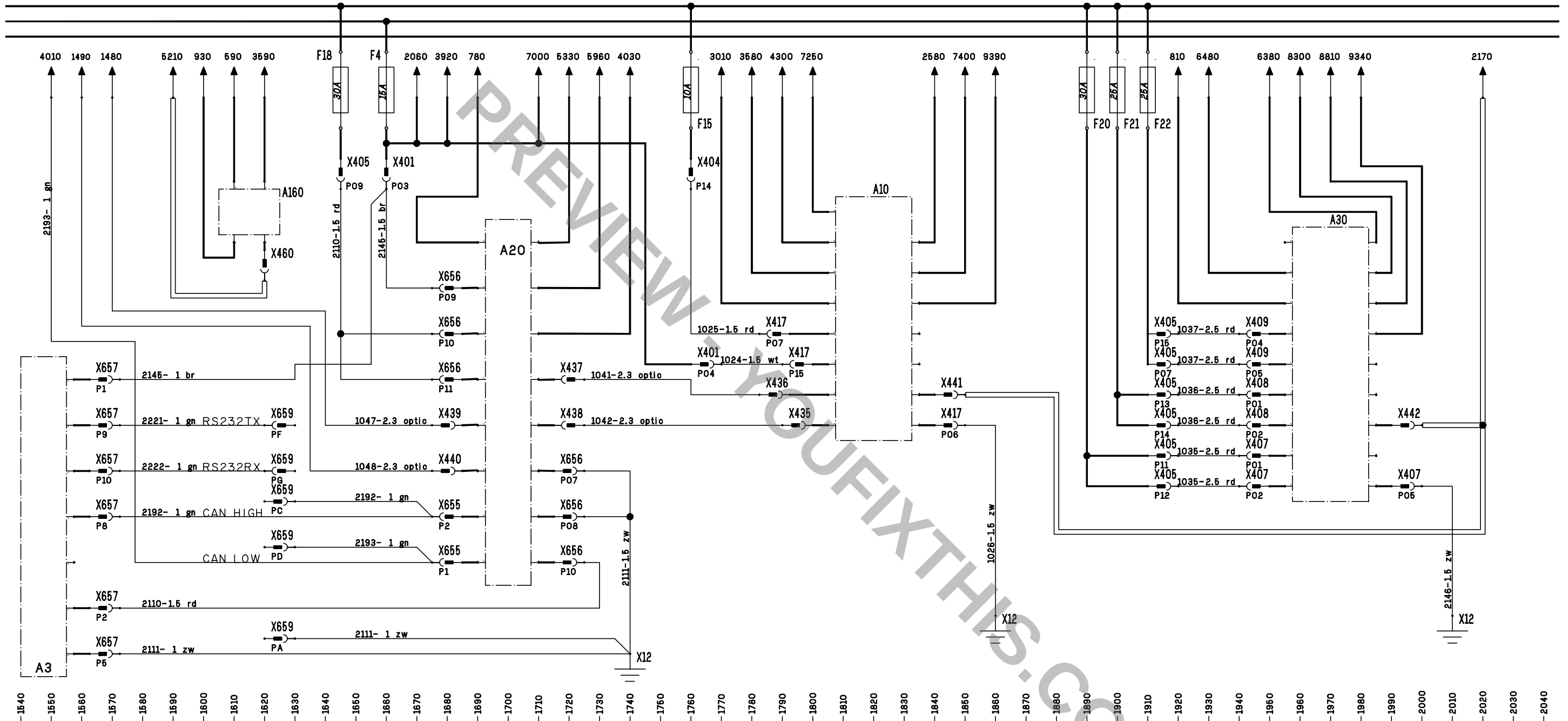
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X328



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FX30NA 5262 > 5298 FX40NA 5262 > 5298



17a SHEARBAR ADJUSTMENT

FX30NA 5262 > 5298 FX40NA 5262 > 5298 FX50NA 5262 > 5298

Code	Description	Location	Line
A24.	Shearbar adjustment control	Adjust-o-Matic print	5930
A172.	Shearbar adjustment output	Adjust-o-Matic panel	5890
B50.	Knock sensor - LH side	Shearbar - LH side	6060
B106.	Knock sensor - RH side	Shearbar - RH side	6030
H120.	Shearbar adjustment routine LED	LED # 2 in Adjust-o-Matic panel	5860
H125.	Shearbar adjustment rpm fault LED	LED # 7 in Adjust-o-Matic panel	5780
H126.	Shearbar adjustment motor fault LED	LED # 8 in Adjust-o-Matic panel	5800
H127.	Shearbar adjustment sensor fault LED	LED # 9 in Adjust-o-Matic panel	5820
H128.	Adjust cutterhead knives LED	LED # 10 in Adjust-o-Matic panel	5840
H129.	Adjust-o-Matic ready to use LED	LED # 1 in Adjust-o-Matic panel	5860
M24.	Shearbar left-hand adjuster motor	Left-hand side of chopper body	5970
M25.	Shearbar right-hand adjuster motor	Right-hand side of chopper body	6000
S120.	Shearbar adjustment switch	Switch # 2 in Adjust-o-Matic panel	5820

Line: 5780 - 6110

CAN NETWORK BASICS

The main reason for building an integrated electrical / electronic system is the increasing demand for more functions and ease of operation!

The CAN (Controller Area Network) is a communication system that links several microprocessors, using two leads to send information between them. These two leads are known as the bus.

Instead of leading wiring harnesses all over the machine, functions are grouped and collected into Input and Output stations (on electronic printed circuits). These I/O stations are linked by only a small number of wires with a serial data transmission network. The network connects all stations. As such it is merely a way of transporting information/messages from one place to another in the machine.

GENERAL LAYOUT ELECTRONIC SYSTEM

Electronic components

a Cab area

Cab sections connected to the network:

- InfoView Monitor: contains nodes A and S
 - Node A: InfoView/dashboard operation
 - Node S: Symbols and languages
- Instrument Panel
- Multifunction lever and armrest module
- Floor console module

b Electronic Box

Printed circuits located in the electronic box and connected to the network:

- CPU printed circuit: contains node B
- AOM printed circuit: contains node T
- Lights printed circuit
- Electric motor and actuator printed circuit
- Valve printed circuit
- Drive printed circuit: contains node E
- Bosch module
- Auto-Pilot module [accessory]

c Metal Detector

Contains node W.

d Electronic Engine

A communication link is established between the controller of the engine and the Electronic Box to exchange information between both systems.

The electronic control unit can only be updated and configured by an official representative.

Conclusion

The electronics on the Forage Harvester contain five memories, located on several electronic printed circuits, which are responsible for the functional operation of the machine.

They are all flash memories that can be updated by means of EST tool. This means that when a new software revision is released, no hardware changes have to be carried out and no EPROM's have to be changed.

Only a new installation disk is necessary to install the new software revision. This happens via a DIN connector underneath the dashboard.

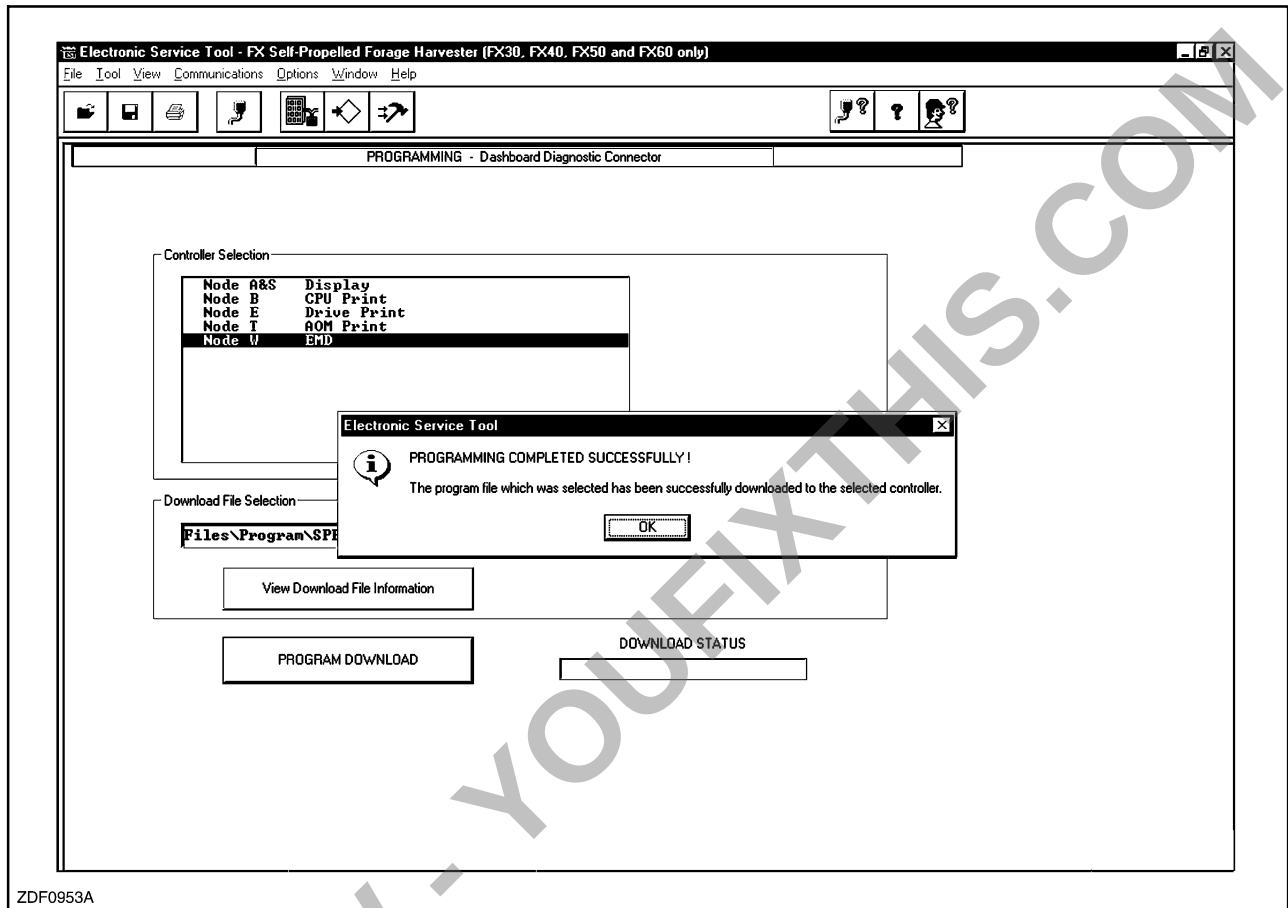
REMARK:

Module: used to indicate the hardware and printed circuit boards all over the machine.

Node: used to indicate the software that translates all input messages to output messages.

Finally the message "Programming completed successfully" will appear.

The program file which was selected has been successfully downloaded to the selected controller.



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14. Press the "OK" button.

Error Code	Description	Importance
464	FRONT HYDR. UP SOL.	Medium
Explanation :	The solenoid of the front hydraulics up valve is open or shorted.	
Action :	<p>Refer to wiring diagram : solenoid Y34, line 3840.</p> <p>Disconnect the solenoid Y34 on the stack valve.</p> <p>Check for battery voltage at Y34 while the front hydraulics up valve is activated.</p> <p>If no battery voltage:</p> <p style="padding-left: 40px;">Locate and repair the open or shorted circuit in wire 2007-wt and/or wire 2008-zw.</p> <p style="padding-left: 40px;">If no open or shorted circuit can be found, try new hydraulic printed circuit of known performance.</p> <p>If battery voltage:</p> <p style="padding-left: 40px;">Check coil resistance of the solenoid (a resistance of app. 4 ohm should be measured) or eventually power the solenoid with separate battery (insert fuse in power cable).</p> <p style="padding-left: 40px;">If the valve is not functioning, try new hydraulic valve Y34 of known performance.</p> <p style="padding-left: 40px;">If the coil resistance is correct and the hydraulic valve is functioning, connect everything and try again.</p>	

Error Code	Description	Importance
465	FRONT HYDR. DOWN SOL	Medium
Explanation :	The solenoid of the front hydraulics down valve is open or shorted.	
Action :	<p>Refer to wiring diagram : solenoid Y35, line 3860.</p> <p>Disconnect the solenoid Y35 on the stack valve.</p> <p>Check for battery voltage at Y35 while the front hydraulics down valve is activated.</p> <p>If no battery voltage:</p> <p style="padding-left: 40px;">Locate and repair the open or shorted circuit in wire 2009-gr and/or wire 2010-zw.</p> <p style="padding-left: 40px;">If no open or shorted circuit can be found, try new hydraulic printed circuit of known performance.</p> <p>If battery voltage:</p> <p style="padding-left: 40px;">Check coil resistance of the solenoid (a resistance of app. 4 ohm should be measured) or eventually power the solenoid with separate battery (insert fuse in power cable).</p> <p style="padding-left: 40px;">If the valve is not functioning, try new hydraulic valve Y35 of known performance.</p> <p style="padding-left: 40px;">If the coil resistance is correct and the hydraulic valve is functioning, connect everything and try again.</p>	

CAN ID	Data Description	word1	word2	word3	word4	Comments
1348	Spout rotation Right		=1==			=1== : activated ; =0== : not activated
1348	Feed rolls reverse engaged		=2=			=2= : engaged ; =0= : not engaged
1348	Main drive belt not tensioned		=1=			=1= : not tensioned ; =0= : tensioned
1348	Cutterhead reverse engaged		===8			===8 : engaged ; ===0 : not engaged
1348	Spout up		===4			===4 : activated ; ===0 : not activated
1348	Spout down		===2			===2 : activated ; ===0 : not activated
1348	Four-wheel drive engaged		===1			===1 : engaged ; ===0 : not engaged
1348	Front hydraulics down			=4==		=4== : activated ; =0== : not activated
1348	Front hydraulics up			=1==		=1== : activated ; =0== : not activated
1348	Spout rotation L & R pwm			==XX		Hexadecimal code
1349	Output identifiers from Node T (Adjust-O-Matic)					
1349	Sharpening routine engaged	==1				==1 activated; ==0 not activated
1349	Stop valve activated	==2				==2 activated; ==0 not activated
1349	Right AOM motor to the knives	==4				==4 activated; ==0 not activated
1349	Right AOM motor forward	==8				==8 activated; ==0 not activated
1349	Left AOM motor to the knives	=1=				=1= activated; ==0 not activated
1349	Left AOM motor forward	=2=				=2= activated; ==0= not activated
1349	Sharpener door close	=4=				=4= activated; ==0= not activated
1349	Sharpener door open	=8=				=8= activated; ==0= not activated
1349	Chopperbody not fitted	=2==				=2== not fitted; =0== fitted

REMARKS:

1. When the compressor pressure is too low or too high, the power to the electromagnetic clutch will automatically drop to 0 volt to avoid damage of the compressor.
(When the pressure is too low, there is no noise, only the led starts to blink).

NOTE: The thermo switch (B61) is controlled by the air conditioning knob and the cab temperature. When checking the air conditioning, always turn the knob completely clockwise to make sure that the thermo switch is activated.

2. The system must only be operated when the engine is warm and the interior temperature of the cab is 15 °C minimum.

**ATTENTION**

Ignoring this precaution may cause damage to the system.

Can Spy

CAN ID	DATA DESCRIPTION	word1	word2	word3	word4	COMMENTS
1283	Airco switch in cab closed	==1=				==0=: Switch open; ==1=: Switch closed
1303	Airco high pressure switch	1===				0===: Switch open; 1===: Switch closed
1303	Airco low pressure switch	2===				0===: Switch open; 2===: Switch closed
1314	Airco low pressure led		2===			0===: Extinguished
1314	Airco high pressure led		4===			0===: Extinguished
1348	Airco compressor clutch	===4				===4: Activated ===0: Not activated

Error messages

Error Code	Key words
440	Airconditiong clutch

Electrical diagrams

Group 25: Air conditioning, line 9190 – 9520.

B61: Thermostat switch

S37: Fan + air conditioning switch

Can Spy

CAN ID	DATA DESCRIPTION	word1	word2	word3	word4	COMMENTS
1283	High Flow Hydraulics open switch Pressed			2===		0=== : not pressed
1283	High Flow Hydraulics close switch Pressed			=2==		=0== : not pressed
1345	Calibrated High Flow Hydraulics	==8=				==0=: not calibrated (no); ==8=:calibrated (yes)

Error Codes

Error Code	Key words
301	Dashboard switch 1
467	High cap. hydr. up sol.
468	High cap. hydr. down sol.

Electrical diagram

Group 29: High flow rear hydraulics, line 10890 - 11050.

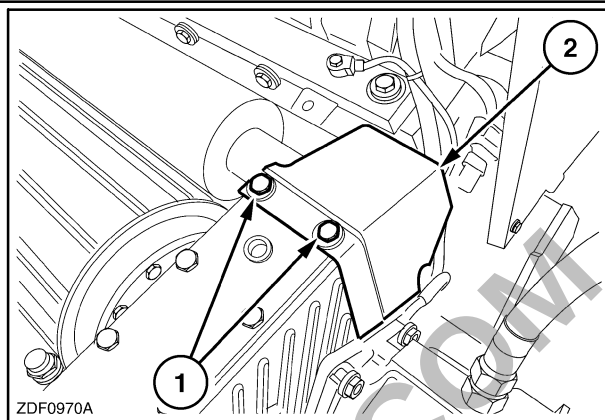
S137: High flow rear hydraulics switch

Y49: Tip trailer up valve

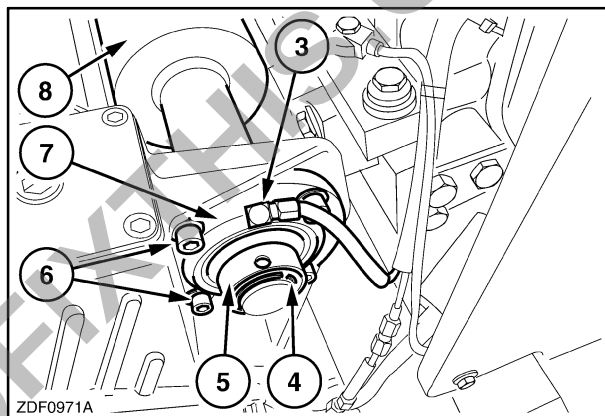
Y50: Tip trailer down valve

SMOOTH ROLL**Removal**

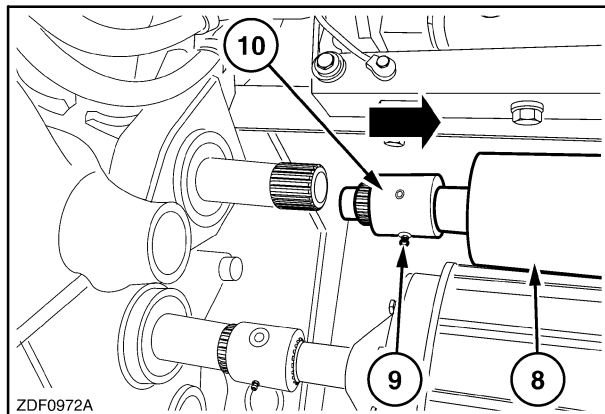
1. Remove the left-hand side shieldings of the chopperbody.
2. Remove or tilt down the upper feed roll assembly.
3. Remove the scraper. Keep all removed parts for later use.
4. Remove the bolts and washers 1 and remove the cover 2.
5. Disconnect the grease line 3.
6. Remove the circlip 4 and eventual shims behind it and keep them for later use.
7. Remove the collar 5.
8. Remove the four Allen screws and lock washers 6 and keep for later use.
9. Loosen the locking screw 9 and push the sleeve 10 in the direction of the arrow.
10. Push the smooth roll assembly in the direction of the arrow.
11. Remove the bearing housing 7 (Fig. 22) from the end of the smooth roll 8. Note down the number of shims between the smooth roll bearing and the smooth roll and keep them for later use.
12. Lift the smooth roll 8 out of the chopperbody.
13. Remove sleeve 10 from shaft 8.
14. If necessary, replace circlip 11, special bearing 12 and O-ring 13 on the shaft 8.



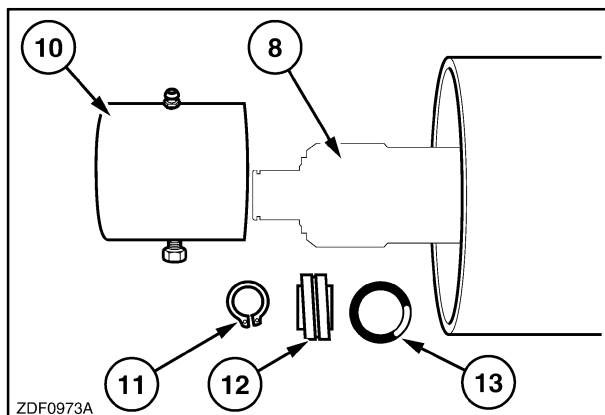
21



22



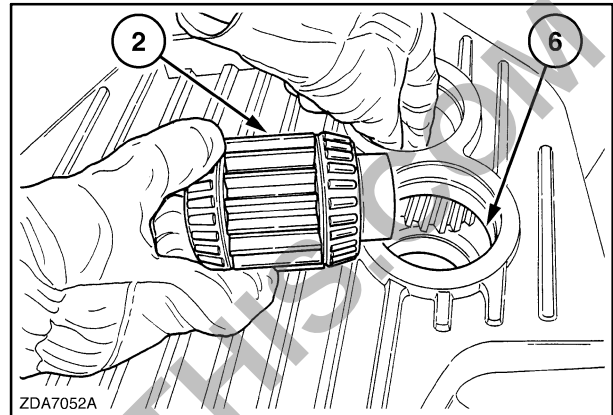
23



24

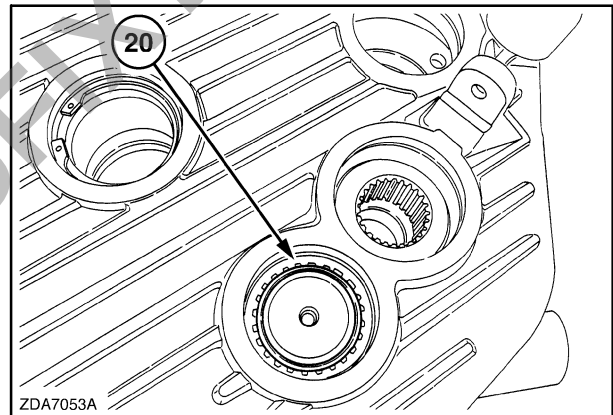
Input shaft

8. Turn the gearbox upside down.
9. Install the circlip (22) and the outer ring of bearing (21) into the casting.
10. Turn the gearbox upside down.
11. Install the inner ring of bearings (20) and (21) onto the input shaft (2).
12. Install the input shaft (2) with the bearing inner rings.



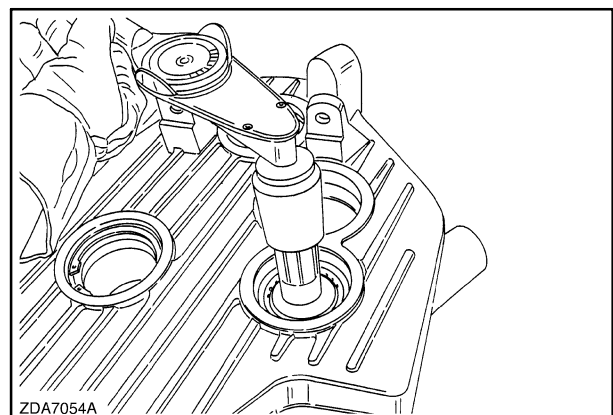
12

13. Install the outer ring of bearing (20).
14. Install the shimpac (24) and the circlip (23).



13

15. Adjust the shimpac (24) until the running torque is 0.5 – 2.0 kg.cm. Then remove 0.1 mm of the shimpac. The running torque should be less than 0.5 kg.cm.



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