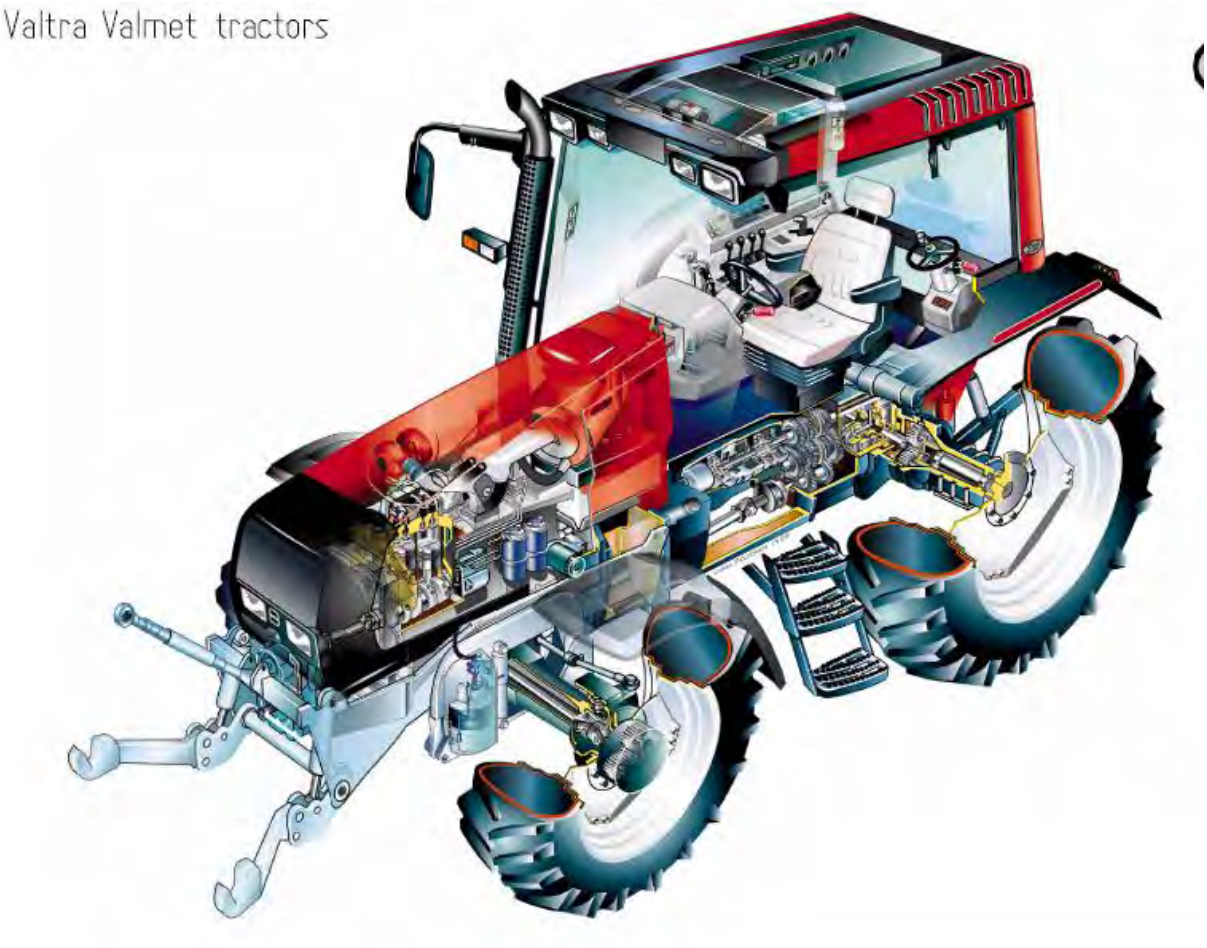
VALTRA – VALMET

MEGA MEZZO HI-TEC



WORKSHOP MANUAL

VALTRA

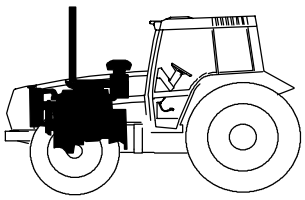
Service Manual

Tractors

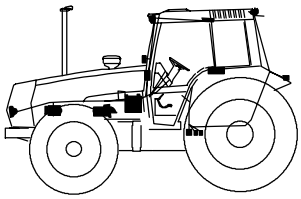
Groups 10–100

Valtra Inc.
44200 Suolahti, Finland

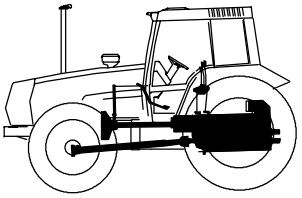
10 General



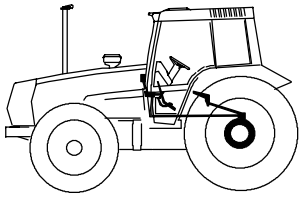
20 Engine



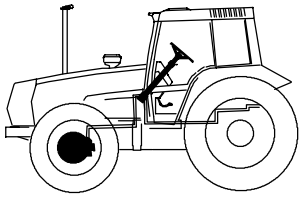
30 Electrical system



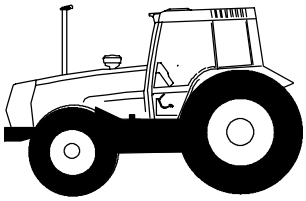
40 Power transmission



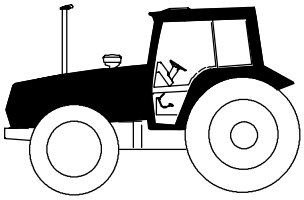
50 Brake system



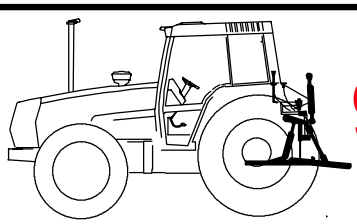
60 Steering system and Front axle



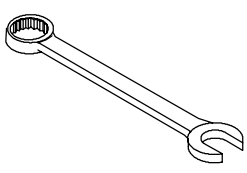
70 Frame and Wheels



80 Cab and Shields



90 Hydraulics



100 Tools

Contents

Code 370:

Code 371:

Note! Under code 371 are shown AC 5.2 system's properties, which differ from AC 5 and which cannot be shown under code 370 due to lack of space. Under code 370 are given necessary references to code 371.

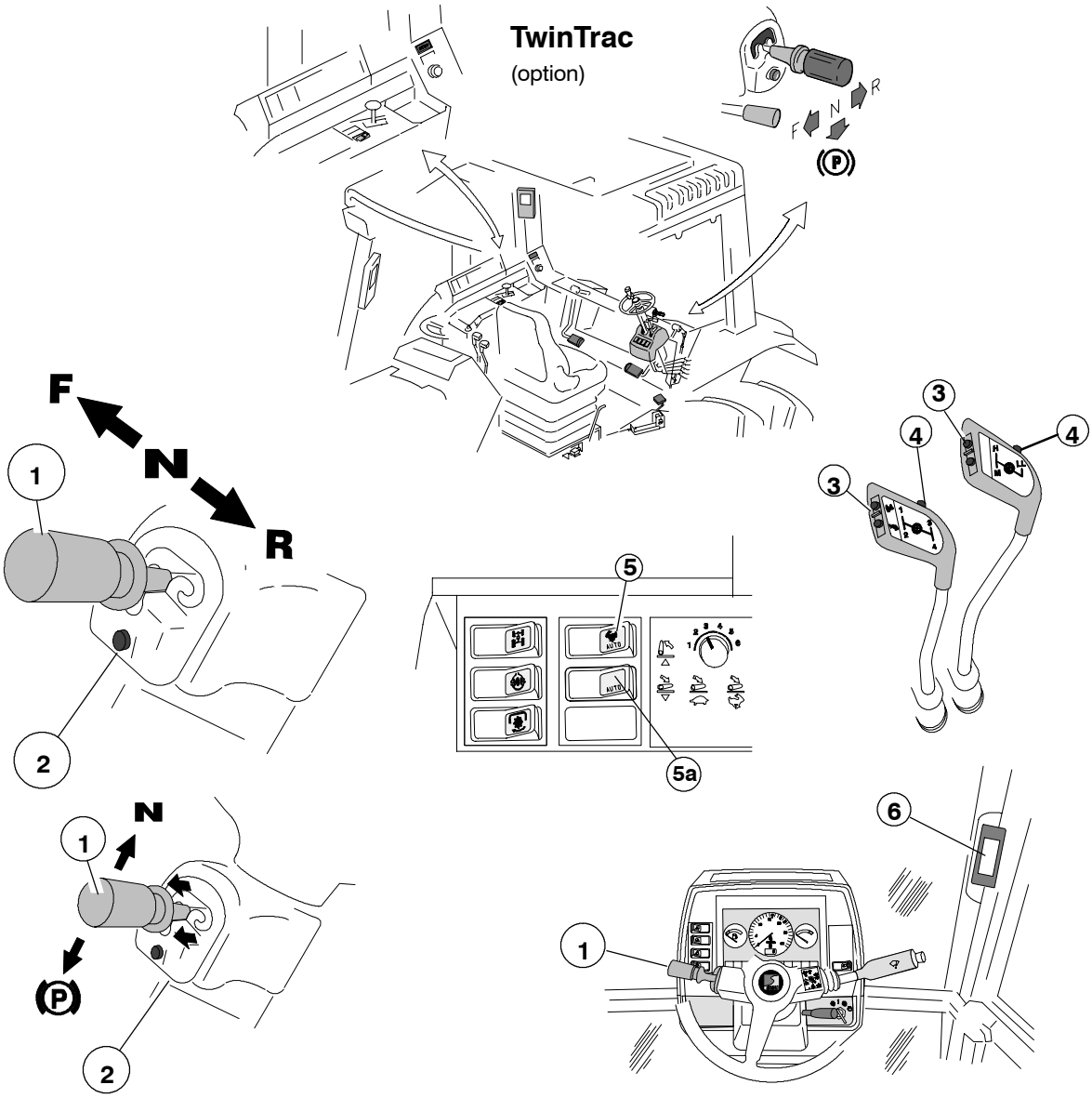
1. AC 5 and 5.2, description

Autocontrol 5 (–K41106) or 5.2 (K41107–) includes:
– Electric engagement control of HiTech shuttle
– Engagement control of DPS and PTO with electro–proportional valves
– Automatic speed change of DPS. AC 5.2: Additionally AutoTraction and Speed Matching functions of DPS.
– Autocontrol 5/5.2 display unit
– AC 5/5.2 control unit (in the lever console) and required sensors and wires.
– Fault diagnostic functions and setting procedures.

Autocontrol 5/5.2 can be fitted on 6250–8950 HiTech tractors. In these tractors the separate circuit card A10 for the DPS is removed (see Autocontrol 2.1 and 2.2).

Autocontrol 5/5.2 system includes a display unit which shows functions of transmission, helps with manual gear change and shows a fault code if the system has malfunctions. The display is also used, when testings and settings are carried out.

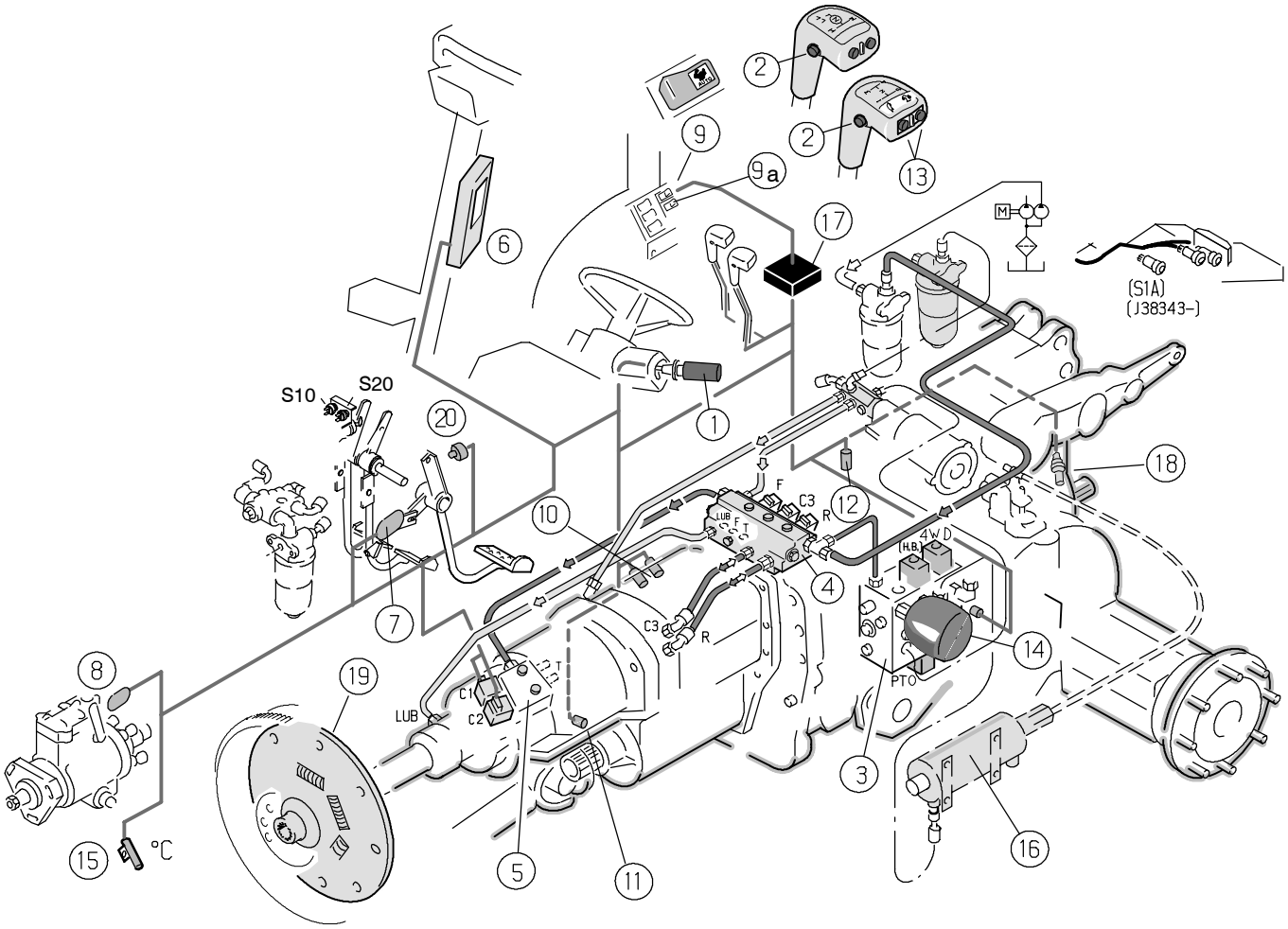
A. AC 5 / 5.2 control buttons and levers



1. Reverse shuttle lever/hand brake lever on the LH side of the steering wheel (or alternatively on the RH side). The parking brake must always be engaged, when the tractor is parked.
2. The button for pre–programming the DPS speed when the tractor driving direction is changed (this button is also used when testing AC 5 or when carrying out settings).
3. Push buttons for the manual control of DPS (as earlier) (these buttons are also used in the test mode and setting mode).
4. Push buttons for disengaging the reverse shuttle (function as in HiShift, but the clutch pedal is not depressed). The tractor has also the clutch pedal for the electrical disengagement of the HiTech shuttle and for normal driving with the pedal.
5. Three–position rocker switch for selecting manual or automatical speed change of the DPS (man/auto1/auto2) (as on AC III).

5a. Switch for AutoTraction function, AC 5.2 only.

6. AC 5/5.2 display unit, see page 4.



Picture 1. *Autocontrol 5 / 5.2 components*

1. Reverse shuttle lever/parking brake lever
2. Push buttons in the gear lever knobs for disengaging the Shuttle electrically (like HiShift. When the buttons are pressed, the clutch pedal does not move down)
*3. Servo valve block of the low pressure circuit. On the block there are gearbox oil temperature sensor, pressure accumulator, electro–proportional valve for the PTO, solenoid valves for the hand brake, 4WD and the diff. lock. The block is presented on pages **420**/**20C** and on page **440**/**24.***
*4. Valve block on which there are electro–proportional valves for the forward drive (F), reverse drive (R) and for the DPS rearmost clutch C3. The valve block is presented on page **440**/**25**.*
*5. Valve block on which there are electro–proportional valves for foremost (C1) and middle (C2) clutches of the DPS, see also page **440**/**25**.*
6. Display unit
7. Position sensor on the clutch pedal
8. Position sensor on the fuel injection pump
9. Auto1/Auto2/Man–switch for the DPS
9a. Switch for AutoTraction function (AC 5.2 only)
10. Two rpm sensors on the Shuttle
11. Gearbox speed sensor (driving speed)
12. Engine speed sensor
13. Push button for the manual control of the DPS (as AC 2.1)
14. Pressure accumulator
15. Outdoor temperature sensor
16. Hydraulic ram of the parking brake
17. Control unit of AC 5 / 5.2.
18. PTO shaft speed sensor
*19. Drive disc on the flywheel (see page **410**/**4A**)*
20. Limit switch

IMPORTANT! In the reverse drive controls (TwinTrac) there is a shuttle/parking brake lever, clutch and gas pedal (and steering wheel). In AC 5.2 the rear switches have own digital inputs in the control unit and also clutch pedal sensor inputs (the rear gas pedal has been connected to the front pedal with a cable).

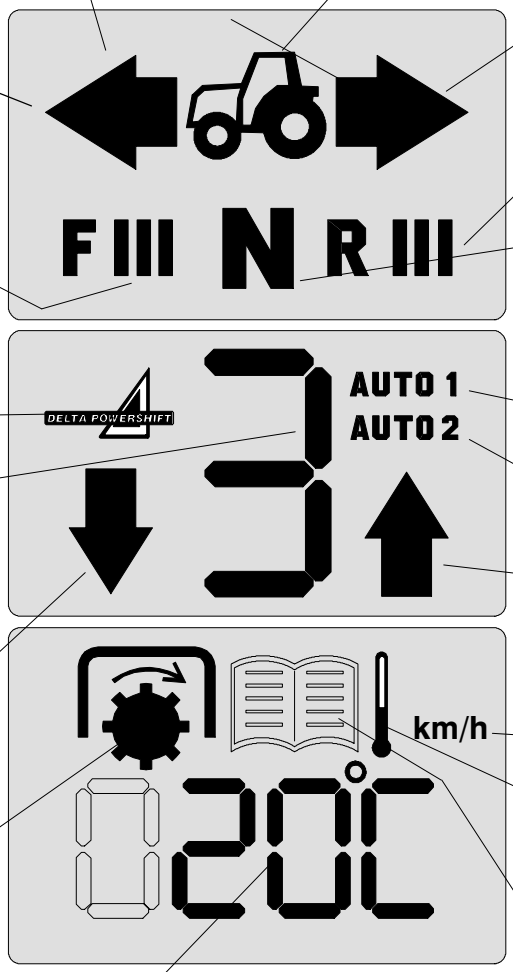
Note! On AC 5 / 5.2 there is a position sensor (8) on the fuel injection pump throttle lever and an engine speed sensor (12) on the gearbox, at which time the automatic speed change according to the engine loading is possible. The clutch pedal has a position sensor (7) and a limit switch (20) to disengage the multi–disc clutches in the shuttle.

There are two speed sensors (10), which indicate the rotation speed and direction of the shuttle output shaft. The shuttle rotation speed is compared with the engine rpm so that the AC 5/5.2 can change the driving direction safety and progressively. The AC 5 / 5.2 prevents the direction change, if the driving speed is over 10 km/h. The gearbox speed sensor (11) indicates the tractor driving speed. When the driving direction change is happening, the AC 5/5.2 pressurises the shuttle clutches progressively.

On the servo valve block (3) there is a temperature sensor, which steers the shuttle automatics so that the shuttle functions progressively regardless of the transmission oil temperature.

There is an outdoor temperature sensor (15) in the front part of the tractor. The display unit (6) is shown on the next page.

B. AC 5 / 5.2 display unit



One arrow is blinking, if a driver does not sit on the seat and driving direction (F or R) has been selected.

Tractor image is visible always, when the current is switched on

Arrow is visible when driving forwards

Arrow is visible when driving rearwards.

DRIVING MODE:
Pre–selected [1]) DPS speed in forward driving (I, II or III). If not pre–selected speeds, this symbol is invisible. Shows also main modes.
SERVICE MODE:
– FI fault code memory (AC 5.2 only)
– FII test mode
– FIII setting mode

Pre–selected [1]) DPS speed in reverse drive (I, II or III). If not pre–programmed speeds, this symbol is invisible.

N is visible when the shuttle lever is in the neutral position or in P–position. Is blinking, when automatic traction disengagement is on (AC 5.2).

DPS logo

Field driving automatics [2])
General automatics (AC 5.2)

Engaged DPS speed (1, 2 or 3). Shows also a selected module in test mode. Flashes, when automatics make speed change [3]).

Road driving automatics [2])
Adjustable automatics (AC 5.2)

Arrow upwards is blinking, if the automatics ask driver to change up [4]).

Arrow downwards is blinking, if the automatics ask driver to change down [4]).

Driving speed, when the tractor is in motion

Outdoor temperature gauge symbol is visible always, when the tractor is stationary and the current is switched on

Visible, when PTO shaft is rotating. Can be visible, altought the PTO is disengaged.

Service book is visible, when the system has found malfunctions and shows a fault code. See fault codes on page **370**/**6** (AC 5) or **371**/**5** and **6** (AC 5.2)

Outdoor temperature when the tractor is stationary. Driving speed when the tractor is in motion (accuracy one decimal □ 15 km/h. No decimal at greater speeds). Numbers show also fault codes. In the test mode is shown a point, which is tested or reset.

I = Shuttle, II = DPS, III = Diagnosis

[1]) Pre–selection means the DPS speed, which is automatically switched on when the driving direction is changed and which is pre–programmed with the button beside the shuttle lever. The pre–programming is carried out so that when one of the driving directions is engaged, driver engages the desired DPS speed and then presses the button at least 2 seconds. During the pre–programming the clutch pedal must be depressed. Thus the selected DPS speed remains in the memory of AC 5 and engages always when the driving direction in question is selected. If only one direction is pre–programmed, the pre–programming is valid only for this direction. The DPS speed remains the same in the other direction.
The pre–programmin is cancelled by pushing the button at least 2 seconds, when the shuttle is in the neutral.

[2]) The two DPS automatic modes (Auto1 and Auto2) are selected with the three–position rocker switch on the lever console. The function is the same as on AC III. The switch has also a manual position.

[3]) If a driver changes quickly from DPS speed 1 to 3, the speed 3 flashes immediately in the display (although the automatics changes the speeds also via speed 2) and speed 3 stops to flash just when the gear change is completed.

[4]) When the DPS is in the automatic mode (AUTO 1 or AUTO 2), it changes automatically down or up and informs with the flashing arrow, if the automatics cannot do more and a driver must change up or down manually.

Note! The display has a background light when the current is switched on. Tractor image, DPS–logo and outdoor temperature (stationary) or driving speed (in motion) are visible always when the current is switched on. There is a connector (RS–232) in the lever console for connecting e.g. a micro–computer for re–programming the control unit A1.

2. Fault tracing

A. General

AC 5 / 5.2 unit has an in–built function for **self–diagnosis**. If fault/faults appear in the AC 5 when working with a tractor, the fault code of the fault in question is shown in the diplay. In this instruction is shown a table in which there are listed all fault codes and corresponding faults. In this way can be localised the fault and possible repair works can be carried out.
In addition, AC 5 / 5.2 unit has an additional diagnostic mode. By pressing certain tractor switches and buttons in a correct order (instructions later), the display can be activated into the **test mode**, in which the diplay shows technical values of various electrical components when components in question are activated. Later in this instruction are shown tables which show the correct technical values of the components. These values are compared with the actual signals in the display so that possible incorrect functions can be verified.
In the same way the diplay unit can be activated into the **setting mode**, in which can be done various settings of the AC 5 components. The setting instructions are shown later in this instruction. In section 4 (components) are given instructions to measure with a multimeter. With the aid of these instructions the components can be checked and verified a faulty component.

NOTE! On page **370**/**7** there are shown working orders för the fault tracing.

B. Self–diagnosis

The self–diagnosis of AC 5 / 5.2 follow up possible faults in the system (when the current is switched on) and show a fault code, which appears in the lower display block (also a book image and the symbol of the module in the middle display block are blinking, when the fault code is shown).

FAULT GROUPS:
A: analog input (position and temp. sensors)
P: proportional output (proportional valves)
d: digital input (switches)
F: frequency input (rpm sensors)
L: logical fault (slipping clutch)

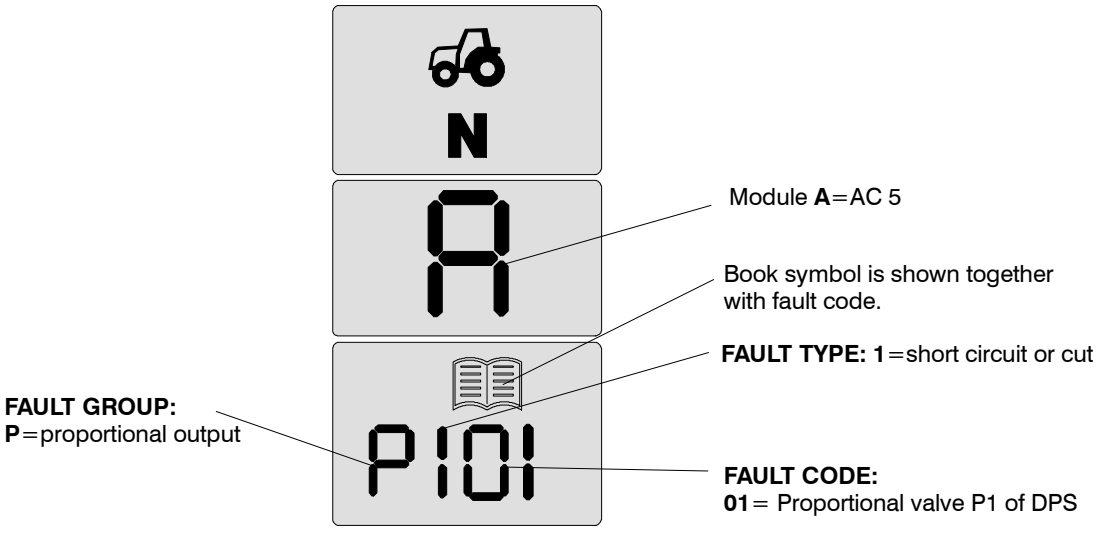
FAULT TYPES:
1=short circuit or cut
2=cut
3=value not in permissible limits
4=multi–disc clutch is slipping

All fauts are numbered with running numbers (01–99). In addition, fault type is shown with numbers (1–4).

FAULT CODES: (e.g. P101)
The fault code is shown in the display diagnosis block (lower) in four display segments as follows:
– The first segment from the left shows the fault group (**A, P, d, F or L**).
– The second segment from the left shows the fault type (**1–4**)
– The two RH side segments show the order number of the fault (**01–99**).

Note! When the fault code is shown, the symbol of the module is shown in the middle block (A=AC 5 / 5.2)**,** which the fault has been found.

When the self–diagnosis shows the fault code, the book image is flashing in frequency of **2 Hz**. If two or more faults are found simultaneously, the codes of different faults are shown three seconds by turns. When the current is switched off, the fault code memory is erased. If a fault code has been found, the driving speed or outdoor temperature cannot be seen in the lower display block. Also number of the quick–shift gear cannot be seen.



IMPORTANT! Escaping from the fault code mode is done by switching off current with the starter switch, when the fault codes exit from the display block.
AC 5.2 has a fault code memory, in which there are stored 3 latest fault codes with running hours, see page **371**/**6**.

Fault codes in AC 5.

Note! Fault codes in AC 5.2, see pages **371/5** and **6**.

Fault code	Pins	Fault identification	Fault funktion level	Tests	Repairs, settings
P101	A1A2/12	Proportional valve P1 of DPS takes current which exceeds or goes below the given limits. Short circuit or wire damage (C1).	3	See table **d)** on page **370/13**	See instr. **C** on page **370/21.**
P103	A1A2/10	Proportional valve P2 of DPS takes current which exceeds or goes below the given limits. Short circuit or wire damage (C2).	3		
P105	A1A2/8	Proportional valve P3 of DPS takes current which exceeds or goes below the given limits. Short circuit or wire damage (C3).	3		
P107	A1A2/6	Forward drive proportional valve P4 takes current which exceeds or goes below the given limits. Short circuit or wire damage (F).	3		
P109	A1A2/4	Reverse drive proportional valve P5 takes current which exceeds or goes below the given limits. Short circuit or wire damage (R).	3		
A311	A1A3/2	Gearbox oil temperature value (sensor B14) impossible (over +150˚C). Faulty sensor or its wiring	3	See table **b)** on page **370/11**	See instr. **E** on page **370/23**.
A312	A1A3/2	Gearbox oil temperature value (sensor B14) impossible (below −50˚C). Faulty sensor or its wiring	3		
A313	A1A3/4	Signal from gas pedal position sensor B15 below 1 V (DC) or over 7 V (DC). Sensor wrongly fitted or sensor/wires damaged. If fault code A313 is visible together with fault code A314, there can be a short circuit or earth leak in sensors B15 or B16 (same supply voltage).	3	See table **b)** on page **370/11**	See instr. **G** on page **370/24**.
A314	A1A3/7	Signal from clutch pedal position sensor B16 below 1 V (DC) or over 7 V (DC). Sensor wrongly fitted or sensor/wires damaged.	3	See table **b)** on page **370/11**	See instr. **F** on page **370/23**.
A315	A1A3/7 A1A4/4	When the clutch pedal is down (digital input d06 is active), the signal from the clutch pedal position sensor B16 is 0,5 V (DC) greater or smaller than it was in the calibrating point (voltage value must be beyond allowable limit over one second). Check the adjustment of the pedal limit switch S9 with the aid of the test mode, adjust if necessary. Measure and calibrate the position sensor B16. If the fault code appears in connection with the engine start, ensure the correct starting: depress first the clutch pedal and after that start the engine. Check the battery condition and charge (Voltage can be fall too low).	3	See table **b)** on page **370/11**	See instr. **F** on page **370/23**.
d116	A1A3/9, 10	DPS up–down push buttons (S23) are active simultaneously. Push buttons in the lever knobs may be in short circuit.	1	See table **a)** on page **370/10**	See instr. **B** on page **370/20**.
d117	A1A4/7, 8	Forward (S40) and reverse drive direction (S41) are active simultaneously. Shuttle lever switches may be in short circuit.	4		
d118	A1A4/10, 11	Both PTO speeds are engaged simultaneously. PTO lever switches (S28/S29) may be in short circuit.	2		
d123	A1A4/14, 7, 8	Hand brake and one or both shuttle directions engaged simultaneously. Shuttle lever switches may be in short circuit.	4	See table **a)** on page **370/10.**	See instr. **B** on page **370/20**.
d225	A1A3/7 A1A4/4	Clutch pedal position is below 2 % (0...1 %) and d06 is not active (d06=clutch pedal limit switch). Check the adjustment of the clutch pedal limit switch S9. Check the function of the parking brake pilot light H11 (program versions 42-).	3	See table **b)** on page **370/11**	See instr. **F** on page **370/23**.
F320	A1A1/5, 7	Shuttle speed sensors (B12/B13) give different frequency. Difference over 30 %. One of the sensor possible faulty.	3	See table **c)** on page **370/12**.	See instr **D** on page **370/22**.
F321	A1A1/13	Engine rpm lower than what the shuttle sensors (B12/B13) indicate, when one solenoid is fully active. Engine rpm sensor B11 may be faulty.	3		
F324	A1A1/5, 7	Driving speed over 10 km/h and direction information in the control unit is changing. Shuttle sensors B12 or B13 may be faulti or wire problems.	3	See table **c)** on page **370/12**.	See instr **D** on page **370/22**
L419	A1A1/3	Full pressure has been connected to the PTO clutch over 3 seconds, but the PTO shaft rotation speed is lower than it should be. PTO-clutch may slip. It is possible that the PTO rpm sensor B7 is faulty. Check in the test mode PTO lever switches S28 and S29 (check in the test mode that not connected the wrong way round). Check that there is a correct parameter file in the control unit. Ensure that the PTO speed parameters P and L are correctly set (in program version 42-).	2	See table **c)** on page **370/12**	See instr **D** on page **370/22** and pages **370/19** and **370/24B.**
L422	A1A1/13, 8, 6	One shuttle direction is engaged and full control has been active over 3 seconds. Shuttle rotation speed is lower than engine speed in relation to the DPS ratio. One multi-disc clutch in the DPS or in the Shuttle can slip or one proportional valve (Y4,Y6,Y17,Y11,Y12) can be trapped. This fault code also appears, if both shuttle sensors (B12,B13) do not give a signal, when engine revs are over 1600 rpm (1700 rpm in versions 50, 52. 60, 62). Check fuse F22.	4		

C. Working orders, AC 5 and 5.2

– If the display unit shows a fault code:

Measures:
1. Decode the fault code according to instr. **370**/**5–6** (self–diagnosis)
2. Check the function of the component in the test modet (instr. **370**/**8**).
3. Repair the fault.
4. If the control unit A1A or programs have been changed, make necessary settings according to instr. **370**/**24A**.
5. Carry out all points in the test mode (instr. **370**/**8**). This ensures, that the tractor is OK before delivery. From ser. no. **K41107–** incl**:** Check in the fault code memory F1.
6. Test–run the tractor according to instr. **370**/**24E**.

– If the display does not show the fault code:

In the table below, there are faults which have not the fault codes:

Component:	**Possible reason:**	**Measures:**
1. AC 5 display unit does not function (on the LH side pillar)	– control unit A1 supply voltage or earth has malfunctions or the display supply. – display unit P6 faulty – control unit connector A1A1 loose	– check fuse **F24** – voltage measures from control unit A1 connectors A1A1/1 – A1A1/2 (=battery voltage) – new display unit, if the system does not function – check connections
2. In the dashboard there is lit “P” , although the driving direction has been selected	– shuttle lever switch S15 (P) faulty or wrongly fitted.	– testing in the test mode, point **d16** / **d22** – 1) – check the fitting of switch S15 (page **370–20**)
3. Black arrow is blinking, although the driving direction has been selected	– driver has left the seat over 4 (6) seconds. AC 5.2: over 30 sec., when the clutch pedal is depressed. – detector switch S60 (in the seat) does not function or wire damage	– on the seat, shuttle lever to position P, shuttle lever to the driving position – testing in the test mode, point **d05,** 2)
4. Black arrow does not change, when using the shuttle lever	– shuttle lever switch S40 (F) or S41 (R) faulty or loosed in the frame.	– testing in the test mode, points **d09**, **d10** / **d18, d19**
5. Shuttle, DPS or PTO have malfunctons (e.g. function is slow)	– fault, that the control unit A1 has not identified – pressure in the low pressure circuit too low – clutch pre–fillling or initial pressure indexes are wrongly set	– carry out all procedures in the test mode (instr. **370/8**) – low hydraulics pressure measuring, see instr no. **911–1** – check indexes / in the setting mode, (instr. **370/24D**, AC5.2: instr. **371/11**.)
6. Engine does not start (starter motor does not rotate) Tractors **J38343–**.	– no supply to control unit A1. – Parking brake switch S15 or input signal A1A4/14 (AC 5) or A1A8/8 (AC 5.2) faulty – Control unit output signal A1A2/3 (AC 5) (to relay K28) or A1A3/5 (AC 5.2) faulty.	– check fuse F24 – testing in test mode, point **d16**/**d22** (if necessary, change switch or control unit) – Check whether the voltage from control unit A1 is in relay K28 (when necessary, change the control unit).

Note! If the fault cannot be found, try to find it by carrying out all tests in the test mode FII.

1) The parking brake can be released with a tool which incl. in the tractor tool set (after this the tractor can be towed).

2) If detector switch S60 does not function, it can temporarily be by-passed by connecting switch wires with an auxiliary wire (connector beside the seat holder). The switch must be changed and the auxiliary wire removed as soon as possible (safety).

Fault function levels, AC 5 and 5.2

In the fault function leves the different faults cause different protective functions to the tractor. For instance in the function level 2 the tractor driving is possible but the use of the PTO is prohibited. In the fault function level 4 the tractor driving is prevented until the fault has been repaired.

The number of the fault function levels is 4 pcs. Greater digit means a great priority and vice versa. The fault function level is active, until the current is switched off. If two faults with the priority of 3 have been found simultaneously, the fault function level is always 4 (for instance if two DPS proportional valves are in short circuit simultaneously).

Fault function level 1 (”fault code”)

Only a fault code in question in the display. With the tractor can be driven, but DPS can have malfunctions.

Fault function level 2 (”PTO protection”)

The fault code in the display. The PTO is disengaged immediately and a driver can activate it after the current is switched off and on. The tractor can still be driven.

Fault function level 3 (”home driving”)

The fault code in question in the display. Shuttle automatics are not in function and the PTO stops. Driving direction can be engaged only with clutch pedal depressed.
The control unit reads shuttle parameters from the table for greatest temperatures. Control unit connects all faulty solenoid outputs unenergised. DPS is locked. Before driving the tractor, the control unit clears up which one of the DPS speeds can be engaged so that the faulty solenoid output is unenergised. If the speed in question is not the speed which is now engaged, the speed is changed automatically.

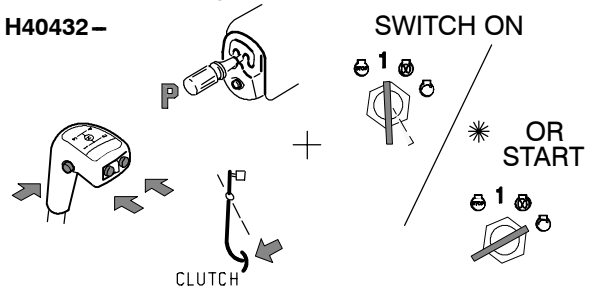
Fault function level 4 (”immediate downdrive”)

The control unit connects all proportional valves unenergised. Only a fault code in the display, not other information. The tractor cannot be driven, before the fault has been repaired. This is for protecting slipping clutches and engine overloading.

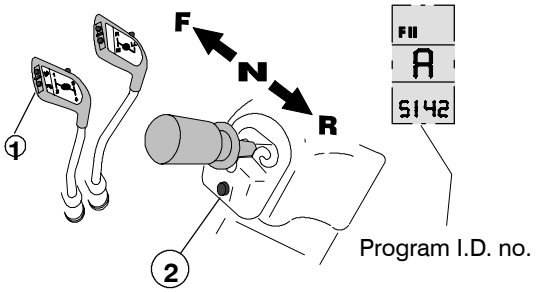
D. Fault tracing in test mode

1. Activating test mode, AC 5 and 5.2

Note! Before activating the test mode, possible pre–programming of the DPS speeds must be removed. The test mode is activated by pushing certain tractor switches in a correct order according to picture below:



Number	Funktion mode	Symbol of mode
1	Fault code memory	**F I** (AC 5.2 only)
2	Test mode	**F II**
3	Setting mode	**F III**



– step with the DPS push buttons (1) up or down and select the main mode symbol FII (test mode).
– after this confirm the selection by pushing the DPS pre–programming button (2)
– now symbol A starts to blink (2 Hz) in the middle display block.
– select module A (7 pcs modules. Only A is in use) by stepping again with the push buttons (1).
– confirm the selection by pushing the button (2) after which A remains without blinking in the display.
– the display is now in the test mode and the trouble shooting can be done

Note! When the desired module is confirmed, the parameter file identification number and the program version number start to blink in the lower block of the display (START LEVEL of **test mode F II**). The identification number can be seen in the two LH side segments and the version number in the two RH side segments.

With aid of the program identifying no. (see picture above) can be checked, which program versio or which parameter file is fitted on the tractor.

Note! In the test mode the DPS speed is always DPS1. The shuttle and PTO function normally, but the display functions are not shown. The DPS pre–programming cannot be done in the test mode. Also the DPS automatic functions are not in use.

IMPORTANT! Escaping from the test mode is done by switching off the current.

2. Fault tracing in the test mode F II.

It is possible in the test mode to check the electric function of various components (control unit input and output signals) by comparing actual values from the different components with the correct values in the tables which are shown in this instruction. Diagram below shows the test mode menu of AC 5 , in which can be stepped up or down with the DPS push buttons (1):

TEST MODE MENU IN AC 5 (AC 5.2, see page **371**/**7**):
*) Engine running

Symbol in display	Test point
F7	Direction information (rpm) *)
F6	PTO speed (rpm) *)
F5	Shuttle output speed (rpm) *)
F4	Shuttle output speed (rpm) *)
F3	Reserve
F2	Driving speed *)
F1	Engine speed *)
A4	Clutch pedal position %
A3	Gas pedal position *) %
A2	Gearbox temperature
A1	Outdoor temperature
d16	Parking brake
d15	PTO standby button
d14	Seat direction (only TwinTrac)
d13	PTO–speed 2 (lever in rear position)
d12	PTO–speed 1 (lever in front position)
d11	DPS pre–programming button (under shuttle lever)
d10	Direction R (rearwards)
d09	Direction F (forwards)
d08	DPS auto/man
d07	DPS auto1/auto 2
d06	Clutch pedal limit switch
d05	Driver detection (in seat) 1)
d04	PTO start
d03	HiShift buttons
d02	DPS push button, down
d01	DPS push button, up
e.g. 5142	**START LEVEL** **Program version nummer**
P1	DPS solenoid 1 (clutch C1) *)
P2	DPS solenoid 2 (clutch C2) *)
P3	DPS solenoid 3 (clutch C3) *)
P4	F clutch solenoidi (forwards) *)
P5	R clutch solenoid (rearwards) *)
b	Counter functions

1) See the next page.
Note! From ser. no. **J38343** incl. there are 12 pcs counter symbols in the test mode menu below symbol P5, see page **370**/**13A**.

1) If detector switch S60 does not function, it can temporarily be by–passed by connecting switch wires with an auxiliary wire (connector beside the seat holder). The switch must be changed and the auxiliary wire removed as soon as possible (safety).

Example:

If e.g. one step up is stepped from the start level by using the push buttons (1) , in the three LH side segments of the lower display symbol **d01** starts to blink with frequency of two hertz. This symbol indicates which digital input is being tested (**d01**=DPS push button up, see table **a** on the next page).

When the button in question has been selected, it can be confirmed for testing by pushing the DPS pre–programming button (2), at which time the symbol stops blinking. In the RH side segment can be seen the mode of the switch (0 or 1) depending whether the button is depressed or not.

When the button in question has been tested, move to the other point in the menu by pressing the DPS pre–programming button (2), after which the symbol starts to blink and the menu can be moved with the DPS push buttons (1). The selection is confirmed again with the pre–programming button (2) (symbol does not blink) and the switch in question can be tested.

Symbols in instruction

– **d01**...**d16**, **A1**...**A4**, **F1**...**F7** are symbols for the AC 5 control unit input signals (from switches, position sensors, temperature sensors and rotation speed sensors).

– **P1**...**P5** are symbols for the AC 5 control unit output signals (control of the proportional valves).

– **A1A1**...**A1A5** are names of the control unit connectors (on the AC 5 control unit).
For example: A1A3/2 means pin no 2 in the control unit connector A1A3 (gearbox oil temperature)

– **S28, S29**..., **B6, B**7... are symbols of the switches and sensors in the wiring diagram.

– **Y2, Y4**... are symbols of the proportional valves in the wiring diagram.

E. Checking I.D. number of AC5 programs

Programs of AC5

Note! Programming instruction of AC5 control unit, see page **370–24B**.
In the tractor production the **AC5** control unit **A1** is equipped with a program, which consists of a main program and a parameter file.
Since in the control unit A1 have been used many different main programs and parameter files, these different programs and files have I.D. numbers for identifying.
The I.D. number, which can be seen in the **AC5**–display (in test mode **FII**), shows the main program version and parameter file I.D. number. The two first digits show the parameter file I.D. number and two last digits the main program version number.

E.g. I.D nummer **5142**:
51 =parameter file I.D. number, **42** =main program version number**.**

Main program version numbers:

Version	Fitted in production, ser. nos.
38	-H40431 (pre-series)
40	H40432- pre-series, (in series H49112-)
41	J01401- (about)
43	J38343-
42	J39116-
42 or 60	J45136- *
50, 52	Used in service and in spare part units (up to tractors –J38342)
53	Is used now in Service and in Spare Parts to tractors ser. no. **H49112–J38342.**
60	J47542-
62	K02116- (used also in service and in spare parts from J38343 incl.
63, 66	Is not fitted in production.
64	Is not fitted in production (fitted in Spare Parts units).
65	Is used now in Service and in Spare Parts to tractors ser. no. **J38343–K41106.**

***** The tractor has either version **42** or **60**, must be checked in tractor display in the test mode.

Parameter file I.D. numbers:

I.D.numbers	PTO speeds
10	1000
17	1000 / 540E
51	540 / 1000
57	540 / 540E
71	540E / 1000E (8350Hi)

Additionally, in service and in spare parts units the following I.D. numbers have been used with effect from program versions 42 (43) incl.. In these versions all PTO types have not an own parameter file but the PTO ratios must be installed into the control unit (see page **370–19A**). The I.D. number increases, when the parameter file is further developed.

E.g. with main program versions **53** and **65** is used a parameter file, which has I.D. numbers 23 and 33.

I.D. number	Tractor model
21...29	models 6250Hi-8150Hi, 8450Hi-8950Hi
31...39	model 8350Hi (low revs)

I.D. numbers of programs used in Production, in Spare Parts and in Service (AC 5 only):

Note! Sorted according to the main program version. Beside the I.D. numbers there is information, with which can be concluded whether the tractor has a correct program.
Tractor chassis numbers in brackets show how old tractor the program is and which program can be fitted. I.D. numbers can be seen in the tractor display. In the PC monitor the numbers change places, e.g. **5162** –> **6251**.

IMPORTANT! Only the newest programs can be used in Service and Spare Parts (versions **53** and **65**).

Note! If an I.D number of a tractor cannot be found in this list, ask Tractor Service.

Main program no. 38 (these must not be on field).
These must be replaced with program version **53.**
These must not be used in Service.

10 38	1)	PTO 1000
17 38	1)	PTO 1000/540E
51 38	1)	PTO 540/1000
57 38	1)	PTO 540/540E
71 38	1)	PTO 540E/1000E (8350Hi)

Main program no. 40 (these must not be on field).
These must be replaced with program version **53**.
These must no more be used in Service.

10 40	1)	PTO 1000
17 40	1)	PTO 1000/540E
51 40	1)	PTO 540/1000
57 40	1)	PTO 540/540E
71 40	1)	PTO 540E/1000E (8350Hi)

Main program no. 41 (H49112–J38342).
These can be replaced with program version **53**.
These must no more be used in Service.

10 41	PTO 1000
17 41	PTO 1000/540E
51 41	PTO 540/1000
57 41	PTO 540/540E
71 41	PTO 540E/1000E (8350Hi)

Main program no. 42 (J38343–J47541).
These can be replaced with program version **65**.
These must no more be used in Service.

10 42	2)	PTO 1000
17 42	2)	PTO 1000/540E
51 42	2)	PTO 540/1000
57 42	2)	PTO 540/540E
71 42	2)	PTO 540E/1000E (8350Hi)

Numbers used only by Service and Spare Parts:

21 42	2)	6250Hi–8950Hi (Ei 8350Hi)
31 42	2)	8350Hi

Main program no. 43 (J38343–J47541).
These can be replaced with program version **65**.
Thes must no more be used in Service.

10 43	2)	PTO 1000
17 43	2)	PTO 1000/540E
51 43	2)	PTO 540/1000
57 43	2)	PTO 540/540E
71 43	2)	PTO 540E/1000E (8350Hi)

Main program no. 50.
Numbers used only by Service and Spare Parts.
These can be replaced with program version **53**.
These must no more be used in Service.

22 50	1)	6250Hi–8950Hi (Ei 8350Hi)
32 50	1)	8350Hi

Main program no. 52 (–J38342).
Numbers used only by Service and Spare Parts.
Fits to tractors, if the end of the control unit ser. no. is at least 00400 or greater.
These can be replaced with program version **53**.
These must no more be used in Service

20 52	1)	6250Hi–8950Hi (Ei 8350Hi)
23 52		6250Hi–8950Hi (Ei 8350Hi)
30 52	1)	8350Hi
33 52		8350Hi

Main program no. 53 (H49112–J38342).
Numbers used only by Service and Spare Parts.
Fits to tractors, if the end of the control unit ser. no. is at least **00400** or greater.
These must be used in service
These programs are in disk 340 422 60.

23 53	6250Hi–8950Hi (Ei 8350Hi)
33 53	8350Hi

1) A new program must be input into the control unit in connection with service (main program version **53**).
2) If a tractor has the reverse drive controls, a new program must be input (main program version **65**). Affects function of the clutch pedal and AutoDPS when the seat is turned rearwards.

Note! If in the test mode **FII** the I.D. number is **9953** or **9965** after programming or after control unit change, the parameter file has not been input. Input correct parameter file according to instr. on page **370–24B**.

Note! If the clutch pedal has malfunctions or the tractor has malfunctions (e. g. fault codes P101...P109), the transmission has jammed or if tractors transmission has not disengaged complety with clutch pedal, with HiShift button or with shuttle lever, then must a new program be input (main program version **53** or **65** and parameter file). Programming instructions on page **370–24B**.

Main program no. 60 (J38343–K02115).
These can be replaced with program version **65**.
These must no more be used in Service.

10 60	PTO 1000
17 60	PTO 1000/540E
51 60	PTO 540/1000
57 60	PTO 540/540E
71 60	PTO 540E/1000E (8350Hi)

Numbers used only by Service and Spare Parts.

22 60 3)	6250Hi–8950Hi (Ei 8350Hi)
32 60 3)	8350Hi

Main program no. 62 (J38343–K41106).
These can be replaced with program version **65**.
These must no more be used in Service.

10 62	PTO 1000
17 62	PTO 1000/540E
51 62	PTO 540/1000
57 62	PTO 540/540E
71 62	PTO 540E/1000E (8350Hi)

Numbers used only by Service and Spare Parts.

20 62 3)	6250Hi–8950Hi (Ei 8350Hi)
23 62	6250Hi–8950Hi (Ei 8350Hi)
30 62 3)	8350Hi
33 62	8350Hi

Main program no. 63 (J38343–K41106).
Used only in service in some tractors.
These must be replaced with program version **65**.
These must not be used in Service .

23 63 3)	6250Hi–8950Hi (Ei 8350Hi)
33 63 3)	8350Hi

Main program no. 64 (J38343–K41106).
Numbers used only by Service and Spare Parts.
These can be replaced with program version **65**.
These must no more be used in Service.

23 64	6250Hi–8950Hi (Ei 8350Hi)
33 64	8350Hi

Main program no. 65 (J38343–K41106).
Numbers used only by Service and Spare Parts.
These must be used in service
These programs are in disk 340 422 60.

23 65	6250Hi–8950Hi (Ei 8350Hi)
33 65	8350Hi

Main program no. 66 (J38343–K41106).
Used only in service in some tractors.
These must be replaced with program version **65**.
These must not be used in Service .

23 66 3)	6250Hi–8950Hi (Ei 8350Hi)
33 66 3)	8350Hi

1) A new program must be input into the control unit in connection with service (main program version **53**).
2) If a tractor has the reverse drive controls, a new program must be input (main program version **65**). Affects function of the clutch pedal and AutoDPS when the seat is turned rearwards.
3) A new program must be input (main program version **65**).

Note! If in the test mode **FII** the I.D. number is **9953** or **9965** after programming or after control unit change, the parameter file has not been input. Input correct parameter file according to instr. on page **370–24B**.

Note! If the clutch pedal has malfunctions or the tractor has malfunctions (e. g. fault codes P101...P109), the transmission has jammed or if tractors transmission has not disengaged complety with clutch pedal, with HiShift button or with shuttle lever, then must a new program be input (main program version **53** or **65** and parameter file). Programming instructions on page **370–24B**.

F. Functional differences of program versions, comparison, AC 5 only

HiTech – PROGRAMS

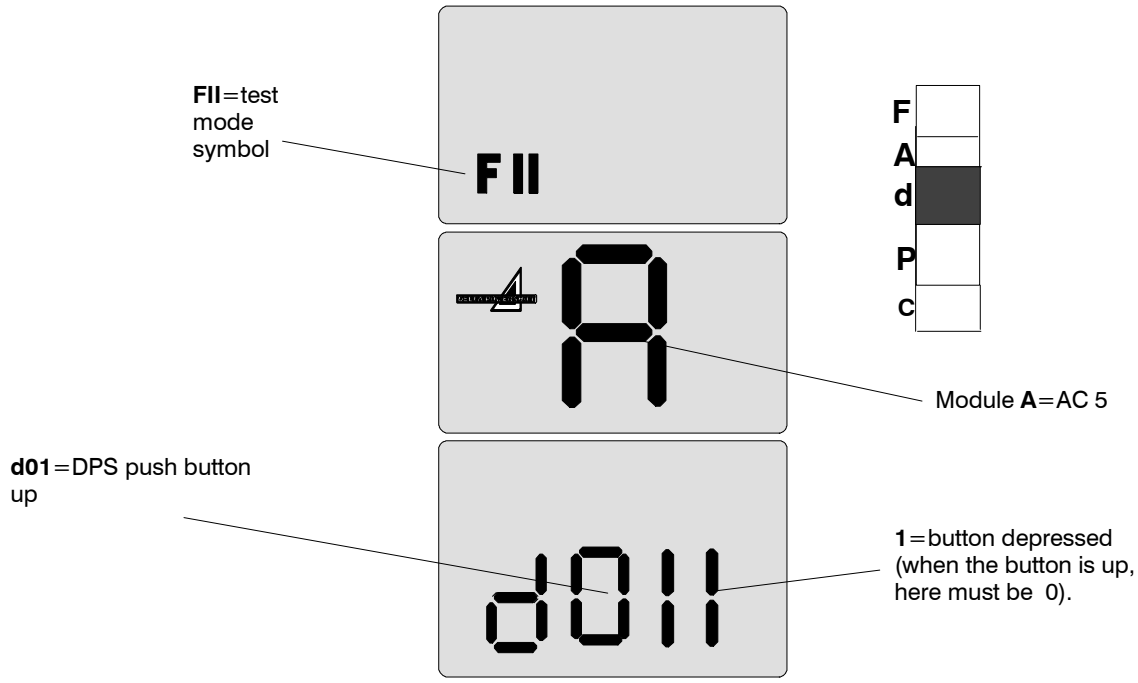
DIFFERENCES BETWEEN MAIN PROGRAM VERSIONS:

VERSION 41	VERSIONS 42, 43, 50, 52, 60, 62
** GENERAL **	
	Reverse drive controls can be fitted as an option.
	PTO start – /stop push buttons can be fitted in rear mudguards (option).
Parking brake is not connected to AC5 –control unit.	AC5 –unit controls the parking brake.
** AC5 – PROGRAMS **	
Five different parameter files for all PTO types (in production and in service).	**Five** different parameter files in tractor production. Only **two** different parameter files are needed in service (PTO ratios can be set with indexes).
** FUNCTIONS **	
PTO rocker switch in the cab.	PTO rocker switch in cab **and push button in rear mudguards** (option). Operating instructions, see Operator's Manual.
Seat indicator delay is **4 seconds**.	Seat indicator delay is **6 seconds**.
Parking brake can be applied under speed of **4 km/h** .	Parking brake can be applied under speed of **2 km/h** (4 km/h in versions 50 and 52).
VERSION 41	**VERSIONS 42, 43, 50, 52, 60, 62**
Pre – programmed DPS – speeds engages: – when driver moves shuttle lever to F – or R – position (**without** clutch pedal) – or when driver presses the HiShift – button (with or without shuttle lever)	Pre – programmed DPS – speeds engages: – when driver moves the shuttle lever to F – or R – position (**with or without the clutch pedal**) – or when driver moves the shuttle lever to F – or R – position and simultaneously presses the HiShift – button (the gear is engaged after the button is released)
The DPS – pre – programming and AutoDPS can be engaged simultaneously => unnecessary gear shifts in the driving direction change.	When AutoDPS is in function, **the DPS – pre – programmed speeds are by – passed temporarily**. The pre – programmed speeds are activated, when AutoDPS is disengaged.
When AutoDPS is in function, the use of the DPS push buttons can disturb the gear change when stopping driving.	When the tractor is stopped, AutoDPS engages **always gear no. 1** although the DPS push buttons are pressed simultaneously.
	AutoDPS gear shift delay has been shortened. Also some points in gear shift diagrams have been modified.
PTO symbol is visible in AC5 –display, when the PTO shaft rotates over **45 r/min.**	PTO symbol is visible in AC5 –display, when the PTO shaft rotates over **150 r/min.**

VERSION 41	VERSIONS 42, 43, 50, 52, 60, 62
**** TEST– AND SETTING MODE ****	
In the service mode there are **two** modes: – test mode FII (for service man) – setting mode FIII (for srvice man)	In the service mode there are **three** modes: – test mode FII (for serviceman **and driver**) – setting mode FIII (for serviceman) – **driver** setting mode FIII > three settings (A: tyre dimension, F: °C/°F, S: km/h / miles/h)
Setting of DPS initial pressures cannot be seen as a pressure change in the setting mode. However, affects the function of the DPS.	Setting of DPS initial pressures can be seen as a pressure change in the setting mode.
In the test mode the temperature sensors (A1, A2) show **"L9"** (= low), when the temperature is below –9°C.	In the test mode the temperature sensors (A1, A2) show **"LO"** (= low), when the temperature is below –9°C.
Counters are nor in use.	**12 counters**, which gather information, how many times and how many minutes certain functions have been in use:
**** FAULT CODES ****	
Fault code P101 causes fault code F321 => fault function level 4 => tractor stops.	Program has been developed. **Fault code P101** does not cause other fault codes.
	Fault code d225 appears, if the clutch pedal position is **below 2%** (0–1%) and pedal limit switch S9 is not yet switched on.
VERSION 41	**VERSIONS 42, 43, 50, 52, 60, 62**
**** INTERNAL FUNCTIONS****	
When the PTO is started, pressure rises always according to a certain curve (program).	When the PTO is started, pressure rises always according to a certain curve (program), but the PTO acceleration (sensor B7) is followed at certain intervals and when necessary pressure is raised.
	Versions 50 and 60: –Clutch pedal function precised –Function of DPS automatic gear change (AutoDPS) has been ensured when using reverse drive controls (TwinTrac)
	Versions 52 and 62: –Clutch pedal function precised

G. Testing various switches and buttons (d01–d16) in the test mode in AC 5

NOTE! In AC 5.2 there are more test points, see page **371**/**8**.



INPUT	DESCRIPTION	1 in display	0 in display
d01 (S23), (S1W) 1)	DPS–push button up	button down	button up
d02 (S23), (SiW) 1)	DPS–push button down	button down	button up
d03 (S45)	HiShift buttons (2 pcs, try both buttons)	button down	button up
d04 (S25) (S1A, S2A) 2)	PTO start switch	Start position	switch up
d05 (S60)	Detection of driver (in driver's seat)	Driver on seat	not seat signal
d06 (S9) (S2W) 1)	Clutch pedal limit switch	pedal down	pedal up
d07 (S47)	DPS automatic speed change switch	Auto–pos. 1	Auto–pos. 2
d08 (S47)	DPS auto/manual	Auto 1 or auto 2	Manual
d09 (S40) (S40) 1)	Direction F	Selected	not selected
d10 (S41), (S41) 1)	Direction R	Selected	Not selected
d11 (S51) (S51) 1)	DPS–pre–programming button (under shuttle lever)	button down	button up
d12 (S28)	PTO–lever in front position	selected	not selected
d13 (S29)	PTO–lever in rear position	selected	Not selected
d14 (–) (S3W) 1)	Driver's seat direction (TwinTrac only)	backwards	forwards
d15 (S25)	PTO rocking switch	Start position	Switch up
d16 (S15) (S15) 1)	Hand brake	applied	not applied

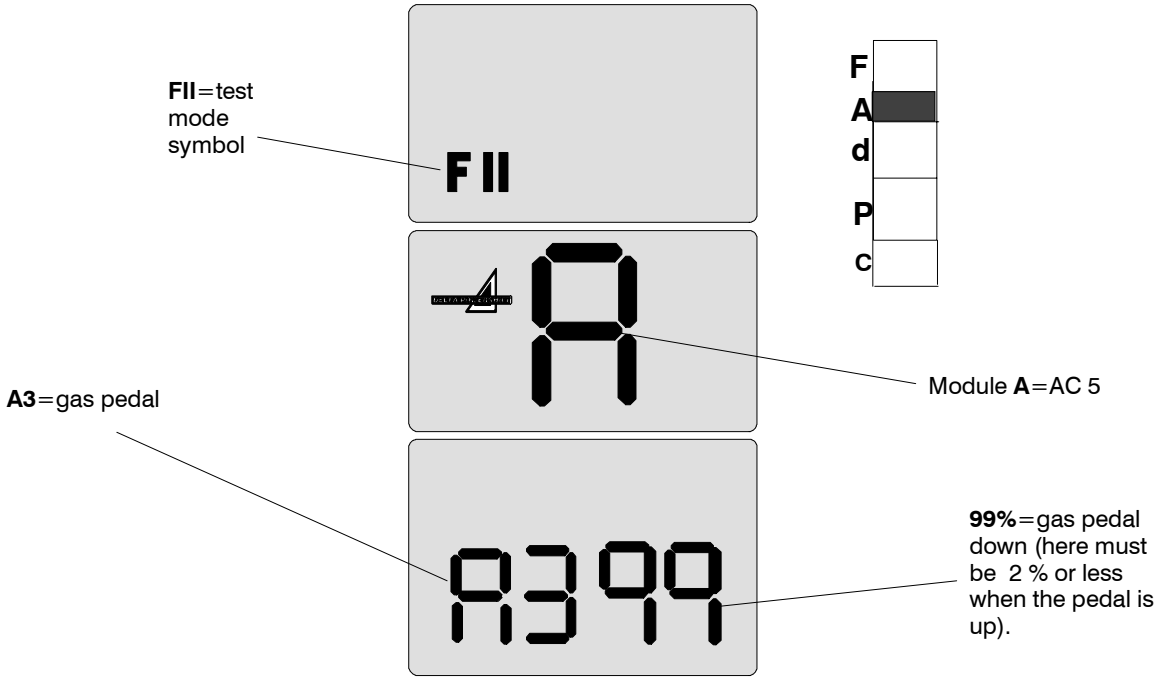
– If the value in the display is not 0, althought it should be according to the table above, the switch can be damaged or in short circuit. Check, change the switch. Check the switch wires.
– If the value in the display is not 1, althought it should be according to the table above, the switch can be damaged/wires broken/ poor contacts in connectors. Change the damaged switch. Check the switch wirings.

NOTE! If a switch (e.g. DPS push button) is damaged, it can be difficult to move into the test mode. AC 5 display shows, however, fault codes, if certain switches are out of order.

1) The latter switch is for the reverse drive controls (option) (TwinTrac). When checking these switches the seat must be turned rearwards.
2) The PTO rear push buttons S1A and S2A (option) are placed on the rear mudguards.

H. Testing temperature sensors and position sensors (A1–A4) in the test mode in AC 5

NOTE! Corresponding tests in AC 5.2, see page **371**/**9**.



SYMBOL	NAME	DESCRIPTION
A1 (B17)	Outdoor temperature (xx °C or F)	Compare the value with the ambient outdoor temperature. If the values are different or not visible, check the sensor wires and sensor itself, see instr **E** on page **370**/**23**. If the temperature is below –9° C, shows the display in place of temperature "L9" (Program versions 38, 40, 41) or "LO" (Versions 42, 43, 50..., 60...)
A2 (B14)	Gearbox oil temperaturte (xx °C)	Compare the reading with the actual gearbox temperature. If the values are different or not visible, check the wires and the sensor, see instr. **E** on page **370**/**23**. If the temperature is below –9° C, shows the display in place of temperature "L9" (Program versions 38, 40, 41) or "LO" (Versions 42, 43, 50..., 60...)
A3 (B15) 1)	Accelerator pedal position (xx %)	When the pedal is fully up, the value should be smaller than **2**. When the pedal is down, the value should be greater than **95**. Check also that the value changes evenly when the pedal is moved (in the middle of the pedal stroke, the value should be about 50). If the values deviate from corret values, see instr. **G** on page **370**/**24**.
A4 (B16), (B1W) 2)	Clutch pedal position (xx %)	When the pedal is fully up, the value should be greater than **97**. With the pedal at the bottom, the value should be smaller than **2**. Also check, that the value changes evenly when the pedal is moved (in the middle of the pedal travel, the value should be about 50). If the values deviate from the above given values, see instr. **F** on page **370**/**23**. Check that the display reading is 3...8 in point, where the pedal limit switch switches on (click).

1)The gas pedal of the reverse drive controls (TwinTrac, option) controls the same position sensor as the front gas pedal. If the rear gas pedal value is not within the given limits, the rear gas pedal cable must be adjusted so that the fuel injection pump adjusting lever can move the whole stroke.

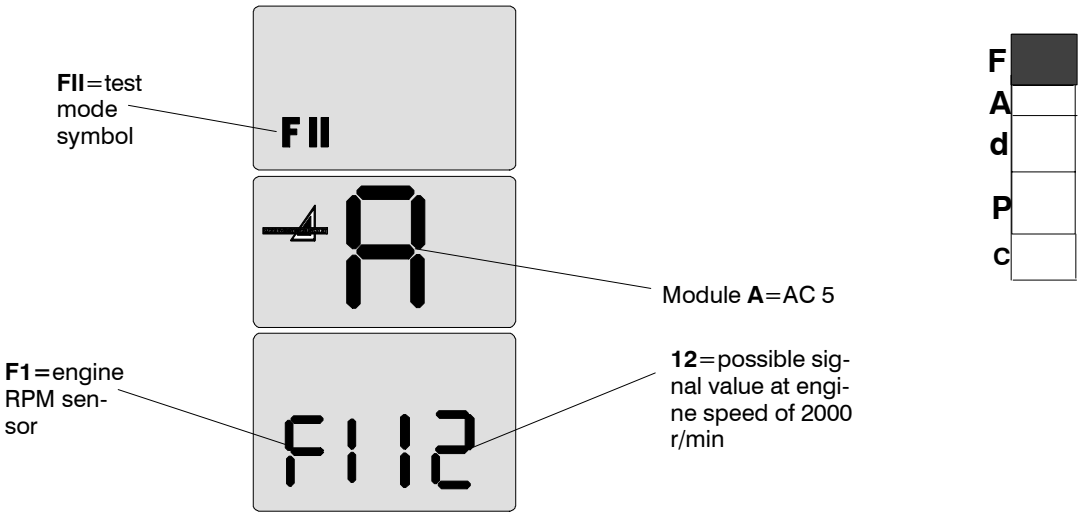
2) The latter switch is for the reverse drive controls (option) (TwinTrac). When checking these switches the seat must be turned rearwards.

I. Testing RPM–sensors (F1–F7) in the test mode in AC 5

NOTE! Corresponding tests in AC 5.2, see page **371**/**9A.**

Note! If the display shows e.g. **F1 51**, it means the engine rpm sensor frequency of 5100 Hz (value x100=Hertz number).

Example:



INPUT	NAME	VALUES	DESCRIPTION
F1 (B11)	Engine rpm sensor	1000 r/min=5,7–6,3 1500 r/min=8–10 2000 r/min=11–13	Set the engine revs to 1000 r/min and compare the value with the given values in the LH side column. Raise the revs to 1500 and 2000 r/min and compare the reading. If one of the values is not within the given limits, check the sensor, see instr. **D** on page **370**/**22**.
F2 (B6)	Gearbox speed sensor	1000 r/min=0,6–0,8 (50 km/h) 1500 r/min=1,1–1,3 (50 km/h) 2000 r/min=1,4–1,8 (50 km/h) 1000 r/min=0,5–0,7 (40 km/h) 1500 r/min=0,8–1,1 (40 km/h) 2000 r/min=1,1–1,5 (40 km/h)	Set the engine revs to 1000 r/min, engage gear M1 and drive the tractor forwards. Compare the reading with the given value. Test also at 1500 and 2000 rpm engine revs. If the values differ, see instr. **D** sivulla **370**/**22**.
F3	Reserve		
F4 (B12)	Shuttle output speed (upper sensor)	1000 r/min=1,8–2,1 (F) 1500 r/min=2,9–3,1 (F) 2000 r/min=3,8–4,2 (F)	Set the gears in neutral. Set the engine revs to 1000 r/min. Engage forward direction (F) and compare the value with the given value. Make the same check also in the reverse direction (R). Raise the engine revs to 1500 and 2000 r/min and measure again in both directions. Compare the reading with the given values. If one of the values deviates, carry out a comparing measurement, check the sensor according to instr. **D** on page **370**/**22**.
F5 (B13)	Shuttle output speed (lower sensor)	1000 r/min=1,9–2,2 (R) 1500 r/min=3,0–3,2 (R) 2000 r/min=3,9–4,3 (R)	
F6 (B7)	PTO speed sensor	540=1,7–2,0 540E=2,2–2,5 1000=3,0–3,3 540E=2,2–2,5 (8350Hi) 1000E=3,7–3,9 (8350Hi)	Engage PTO. Set the engine revs to 1000 r/min. Compare the values with the given values. If the values deviate, check the sensor acording to instr. **D** on page **370**/**22**.
F7 (B12, B13)	Direction information	F=1 R=2	Set the gears in neutral. Set the engine revs to 800 r/min. Engage the forward direction (F) and raise slowly the engine revs up to max. The reading must be 1 and must remain the same during the whole test. Engage reverse direction (R) and repeat the same measurement. The reading must be 2 during the whole measurement. If one of the direction readings does not function (value is faulty or it changes when engine revs varie), but F4 and F5 values are correct, the AC 5/5.2 control unit A1 may be damaged and should be changed.

NOTE! If the measured values deviate from the above given values, check first the driver detection switch and its wiring in the seat.