Timbermatic™ 300 Control and measuring system ver 1.32.9-

OPERATOR'S MANUAL

Timbermatic™ 300 Control and measuring system

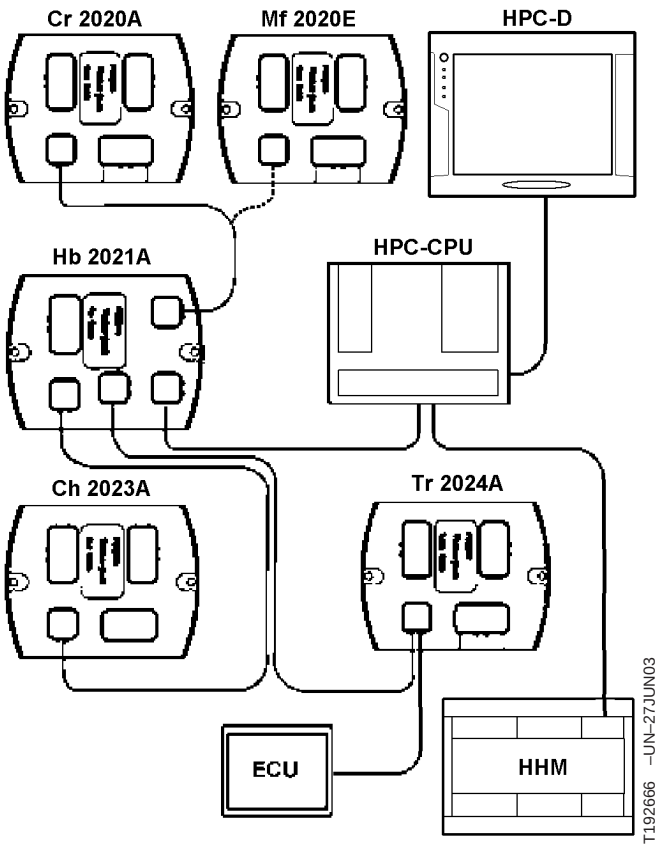
OMF0069467 Issue 06JUN05 (ENGLISH)

Worldwide Construction And Forestry Division
Litho in Finland

CAN bus modules

The system consists of six or seven modules depending on the machine type.

HPC-CPU	Harvester PC Computer Processor Unit
Hub	Hub module
HHM	Harvester Head Module
Ch	Chair module
Cr	Crane module
Tr	Transmission module
Mf	Multifunction module
ECU	Engine Control Unit

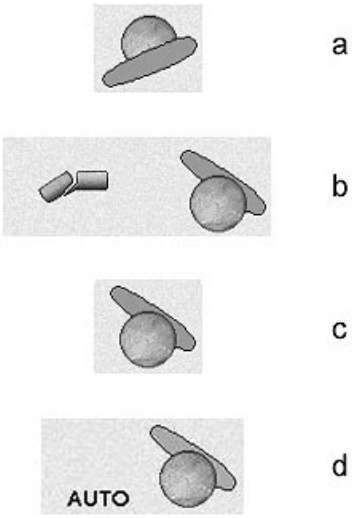


- **HPC-D**
  System display module.
- **HPC-CPU**
  Central Processing Unit of the Timbermatic™ system.
- **Hub**
  The Hub is a bus connection module. Apart from the Display and Harvester Head Module, all other modules are directly connected to it.
- **HHM**
  The Harvester Head Module processes and conveys all the control signals going to the harvester head and the measurement data coming from it. The HHM is connected directly to the Central Processing Unit (CPU).
- **Ch**
  The controls required to control the system are connected to the chair module.
- **Cr**
  The crane module controls the boom valve.
- **Tr**
  The transmission module manages the control and information flows of the base machine's diesel engine, power transmission and the associated auxiliary functions.
- **Mf**
  An additional module is connected to the Hub module in machines, where, for example, the TLC system controls the level of the cabin.
- **ECU**
  Engine Control Unit is controlling unit that guides and controls the functions of the engine.

PY10832,0000008 –19–19MAR02–1/1

3. **Within cut window / saw bar out**
   When the feeding has reached the chosen length and the saw is in the cut window the saw symbol appears on the length display and is followed by an audible signal.
   a. When the saw bar leaves the home position and when it is out, the saw bar symbol moves to the lower position (a).
   b. Long saw time symbol
      Warns about the risk of stem's cut splits. The following saw time is expected to exceed 0,7 s. It is advisable to support the butt end of the stem to be cut lightly on a stump, for example. For activating the saw supervision, see section 102; Saw diagnostics (menu 9-4).
   c. Change saw chain symbol (orange saw bar)
      Indicates it is time to change the saw chain. The symbol appears when the saw time is 13 % longer than with a new saw chain.
      The machine asks at the start-up of the HHM whether the saw chain has been replaced with a new one. This lets it compare saw times with those for a new saw chain so that it can issue a warning when saw times get too long when the saw chain becomes blunt.
   d. Automatic cuts [Auto]
      The next crosscut happens automatically when the feeding stops in the cut window. See section 093 (menu 8-4). See section 093 (menu 8-4).

   The cut window is specified in the bucking file using the administrative program.



T203226 –UN–16SEP04

4. **Message field**
   - ID: operator, site, block
   - Start grade / pre-programmed grade limits / grade selection
   - a Message about coming scheduled maintenance appears in the message field. The message can be quitted by pressing the ESC button.

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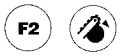
T158405 –UN–09AUG02



3. **Saw**
   See instructions for manual and automatic saw control levels, section 092 (Saw control levels).
   Sawing resets length measurement.
   Pressing (F2) and (1) at the same time resets length measurement without sawing.
   Pressing (F1) and (1) feeds the saw bar without resetting length measuring.
4. **Feed forward**
5. **Feed backward**
   These buttons start feeding forward / backward. Instructions for feed control, section 043.
   Feed forward cannot start until the saw bar has returned to the home position. Before the first cut, the felling cut, feeding takes place at reduced speed backward only (reverse creep feed). This helps you to reverse the harvester head as close to the root as possible after grabbing the tree.

NOTE: If the saw bar jams during felling you can use the reverse creep feed to help free the saw bar but be careful!

6. **Species buttons**
   Use these buttons to choose the tree species of the currently processed stem, e.g. pine, spruce, birch, mixed species. The species names and their order are determined in the administrative program.
   Pressing a species button for longer than 0,5 seconds activates “Gentle stem handling”. See section 092 (menu 7-2).
7. **Grade buttons**
   You use these buttons to assign a grade. See section 062.
8. **Length buttons**
   You can determine the length of the current log with these buttons. See section 063.
9. **Increase / decrease**
   These buttons increase or decrease the length of the log in steps, in pre-programmed lengths or control the +/- length selection.
10. **Do not count**
    This button prevents a stem being counted twice if you have to open and reposition the harvester head during processing. See section 042 (Top break or dropped stem).

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- Shift start and end.

See section 070.

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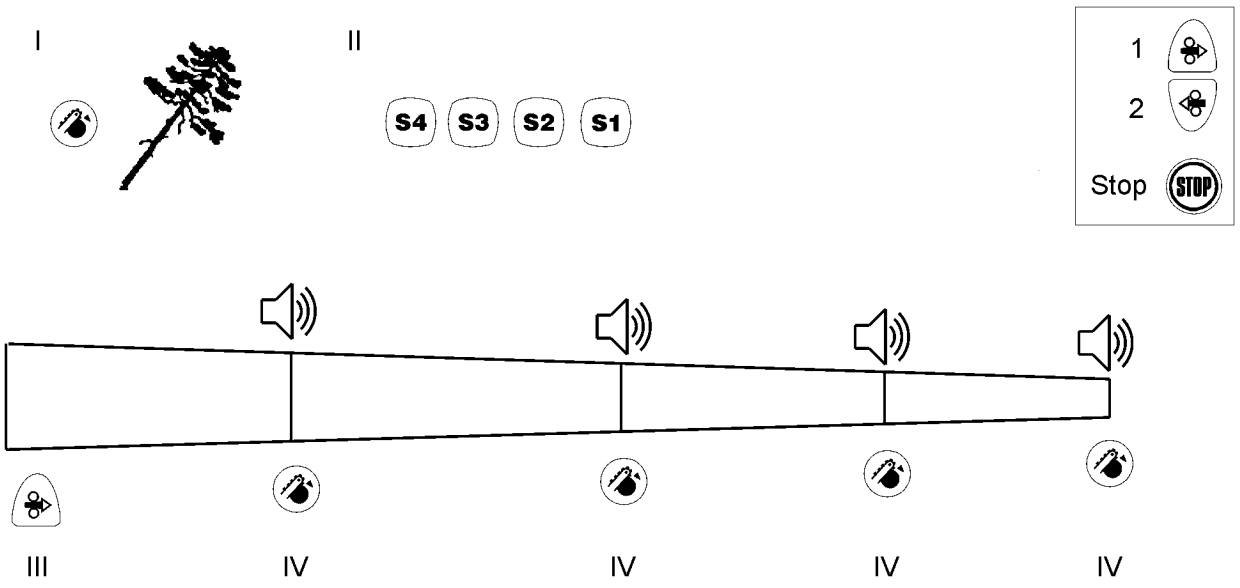

T155899 –UN–12AUG02

Auto mode 2

I—Felling cut
II—Select species
III—Feed forward. Press the button briefly once.
IV—Cut
-—Press (Stop) or (1) or (2) and feeding stops.
-—Press (S1)(S2)(S3)(S4) or (1) and feeding continues.

Auto mode 2

In this mode you give “permission to start” by pressing the (1) button briefly after a felling cut, after which the feeding is automatic.

Select the species and give “permission to start”. The chosen length is fed out automatically. When the cut window is reached the feeding stops and you can give the order to cut. After the saw bar returns to the home position the feeding restarts automatically and continues to the next cut window, i.e. you do not need to press a button to start feeding after a crosscut. If you want to stop the feeding in this mode, you simply press the (Stop) or (1) button.

Note that you can change the length and grade whenever you want during processing. Pressing the species button restarts the optimization after you have used manual bucking temporarily.

If the feeding slips, the system automatically reverses and then tries to feed forward again. If this is unsuccessful after two attempts then the system stops the feeding and waits for a new feed command from you. You can restart by selecting the length or by pressing the feed button.

Automatic cuts may be used on crosscuts in this automatic mode. See section 093 (Automatic cuts (menu 8-4)).

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Stem files

In the “Stem files (*.stm)” menu you can start to collect files on completed stems. The file on the collected stems stores diameter measurements every 10 cm and length, etc. Stem files have no effect on normal registration.

The stem file settings are saved in the user settings file (*.usf).

Stem files can be collected in the site’s common file, or in separate log specific files.

- Stem file name
  In this field you give the file an ID of no more than 4 characters.
- Stem file start number
  Each stem has its own file e.g. ABCD0001.stm. Here you enter the number for the first stem in the file, e.g. 1.
  E.g.
  If the “Stem file name” is ABCD and the “Stem file start number” is 1, the stem codes take the form ABCD0001....
- Stem file collect interval
  Here you state the data collection interval by tree species. If the set value is 1, data will be collected for each stem, if 2, every other stem, etc. If the “Stem file collect interval” is 0, data collection is not enabled.
- Forced cut code
  You can state whether you wish to give a reason to the file for manually grading a tree deviating from the optimization. This is done using the buttons A...E and 0...9. The meaning of the codes can be freely set e.g. E = rotten, 1 = crooked, 2 = branch, etc.
- First log min. top diameter
  Here you can limit the collection of data to stems of a desired thickness. Enter the minimum diameter for which data is to be stored. The top diameter of the first log must be greater than this for the stem’s data to be saved in the file.

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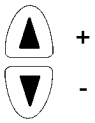


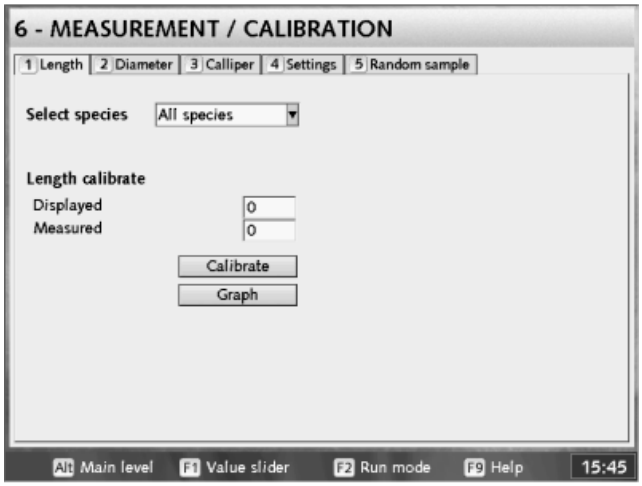
- **According to value**
  This alternative selects the most valuable longer or shorter length of the log within assortments, which are allowed for the current stem grade.
- **Optimized (3)**
  When using this alternative, the log length is determined by selecting the most valuable alternative from the three nearest length classes. The log length can be selected among assortments for which the current stem grade is allowed.
  If the (+/-) button is pressed again before the previous length is reached, the (+/-) function changes into "From assortment" function. The "Optimized (3)" function becomes active again, if the saw, feed or other bucking button is pressed.
- **From price list, include current length**
  In case several assortment alternatives are available for the same length and stem grade, this function can be used to browse through them all by pressing the (-) button. The first proposed alternative is the next most valuable one, and all of the other possible assortments are presented in the order of their value. The length does not change until all of the assortment alternatives have been browsed through.
  The (+) button is used to move to the next longer length, or to return to the most valuable assortment alternative.
- **From price list**
  If this function is selected, the log length is determined by selecting the nearest next length. The selection can be made among the assortments for which the current stem grade is allowed. If several assortment alternatives are available for the same length, the most valuable is selected.
- **From assortment**
  This alternative does not change the assortment, but selects the next length for the current assortment.

PY10832,000003C –22–05APR02–2/2

Length calibration values

- **Graph**
  Length measurement in the system is based on the length sensor reporting two pulse trains. These are then processed by the system using a value which converts the pulses to a length.
  When calibrating length, the length calibration value is changed, meaning that the next time the system converts the successive pulses, it will interpret these as a different length.
  This calibration value can be measured and calibrated for each species.

NOTE: Changing length calibration values will affect volume calculation directly. The automatic calibration will make the appropriate changes so you don't usually need to adjust these values directly.



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Settings for measurement

- **Distance between saw and diameter sensor, cm**
  The distance between the saw bar and the delimbing knives, which measure the diameter, is entered in the system using this parameter.
  The value is automatically set when you choose the harvester head type and set default values. It will not need to be adjusted as long as you do not modify the harvester head diameter sensors or saw.
- **Re-measure dead zone, dm**
  When feeding backward, only to feed forward again afterwards, there is a risk that the bark will flake off or the stem will be damaged by the feed rollers. This might result in an incorrect diameter reading.
  Using this parameter, you can inform the system not to measure new diameters for the distance which you have entered here. Instead, values that were initially measured for this part of the stem.
  E.g.
  With the parameter set at 4 dm: with a measured length of 300 cm, the harvester head will reverse, e.g. 60 cm, feeding forward again afterwards. The system will get new diameter values for the distance from 280 cm.
- **Max tapering, mm/dm**
  The system will not measure stem taper greater than the value of this parameter. Instead, it uses the set value of the parameter.
  If this value is set at maximum 250, the system is able to measure tapering up to 250 mm / dm.
- **Save calibration values (*.mac)**
- **Load calibration values (*.mac)**

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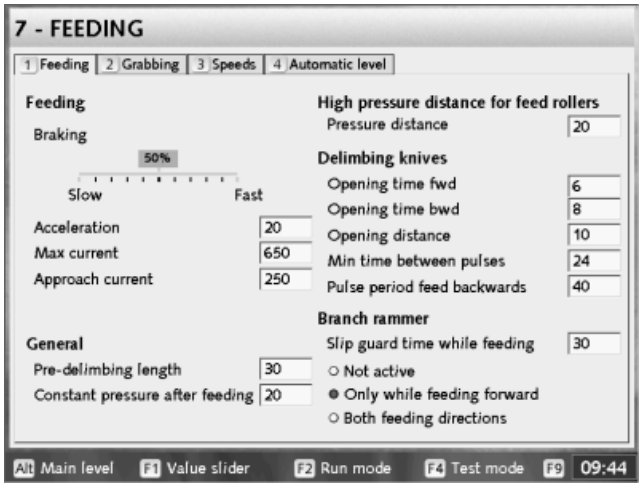
Feeding (menu 7-1)



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Feeding

- **Braking**
  The feed braking must be set according to the number of branches on the stem. The delimbing result can be improved for stems with thick branches when the braking is fast. However, this might cause stems that are easy to delimb to go past the cut window. On the other hand, if the braking is too soft, the feeding speed can decrease too much before reaching the cut window. This hampers the delimbing of thick branched stems, the feeding may stop before the cut window is reached. The feeding is normally stopped automatically at the front edge of the cut window in the direction of feed. The cut window is specified in the bucking file using the administrative program.
- **Acceleration**
  During acceleration the feeding control current increases until the maximum current is achieved. This determines how quickly the control current increases in relation to the acceleration distance. Increasing this value results in reaching the maximum current faster.
- **Max current**
  This parameter value determines the maximum control current of the feed valve spool on the forward / backward feed and is directly proportional to the feeding speed.
  Normally, the maximum current is set at its default value, in which case the feeding control valve should be able to open fully.
  If the parameter is set at a value that is too low, the feed will not be able to manage the biggest trees. If the feeding speed is restricted by means of this parameter, the valve will restrict the flow of oil. In hot conditions, this may lead to overheating of the hydraulic oil.
- **Approach current**
  The “Approach current” value is used in the final stage of feeding to compensate for the feeding speed of different sized stems before the cut window.

General

- **Pre-delimbing length**

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T158475 –UN–12AUG02

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Example: Testing and adjusting of the grabbing pressure of delimbing knives or feeding rolls in the test mode without mechanical valve adjustment. The correct pressure values can be found in the harvester head manual.

1. Maximum grabbing pressure
   a. Grabbing maximum current: 900.
      Minimum pressure: 600.
   b. Start test. The test is activated by using the feed forward button (1).
   c. Use a pressure gauge to measure the pressure at the grabbing measuring point. Stop test.
   d. If the pressure reading was not correct, adjust the minimum pressure value and repeat test.
   e. When the pressure is correct, copy the reading of the minimum pressure value to the grabbing maximum current value.

2. Minimum grabbing pressure
   a. Diameter for settings testing: 90 mm.
      Minimum pressure: 150. When testing the delimbing knives, set the pressure ratio of the knives at 100 or the default value of the head.
   b. Start test. The test is activated by using the feed forward button (1).
   c. Use a pressure gauge to measure the pressure at the grabbing measuring point. Stop test.
   d. If the pressure reading was not correct, adjust the minimum pressure value and repeat test.
      Delimbing knives: Start by measuring the pressure of the upper knives and adjust it to the correct value by adjusting the minimum pressure value. Next, measure the pressure of the lower knives and adjust it by means of the pressure ratio of the knives (“Lower DK pressure in relation to upper DK pressure”).

When you get practical settings you can save the changes before leaving the test mode.

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T158481 –UN–12AUG02

Saw control levels

Saw control includes four options which are a manual level (0) and three auto modes (1...3).

There can be used automatic cuts in crosscuts in modes 2 and 3. See section 093 (Automatic cuts (menu 8-4)).

Before automatic saw control can be used, the harvester head must be equipped with two sensors which sense the position of the saw bar. They have to be adjusted properly before using the saw control auto modes. See section 093 (Saw (menu 8-1)).

Manual saw control (mode 0)

As long as you hold down the (1) button, the harvester head will keep sawing. The saw will return when the button is released.

The automatics are completely switched off. Position sensor pulses of the saw bar are not used in this level.

The manual mode (0) of saw control uses a factory set lower control current of constant pressure.

Saw auto mode 1

You have to keep the (1) button pressed during the entire cut. When the saw bar has cut through the stem, it will return automatically to its home position.

The function is the same in both felling cut and processing mode.

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PY10832,000005C –19–09APR02–1/2

Checking and adjusting the saw depth

1. **First check and (if necessary) calibrate the diameter measurement.**

2. Set the saw and feeding auto modes to level 1.

3. First check the through-sawing on small diameters (50...100 mm). Make several cuts. The saw bar has to cut through about 2...5 cm more than the diameter (about half the saw bar width). Adjust using the “Start point” parameter. If the saw does not cut through properly, increase the value of the parameter. If it cuts too far, decrease the value.

4. Next check the through-sawing on larger diameters (20...40 cm). Now make a comparable adjustment with the “Cutting calibration” parameter. If the saw does not cut through properly , increase the value.

5. If needed, you can now fine tune the saw depth at different diameters using the “Saw depth adjustment table” parameters. E.g. if the saw cuts too far at a diameter of 240 mm, the value for this diameter range should be decreased.

6. Now you can adjust the saw depth for felling cuts using the “Buttress %” parameter. If the saw cuts too far, decrease the value. If the saw cuts too little, then increase the value.

It is better that the saw bar cuts through slightly too far than too little.

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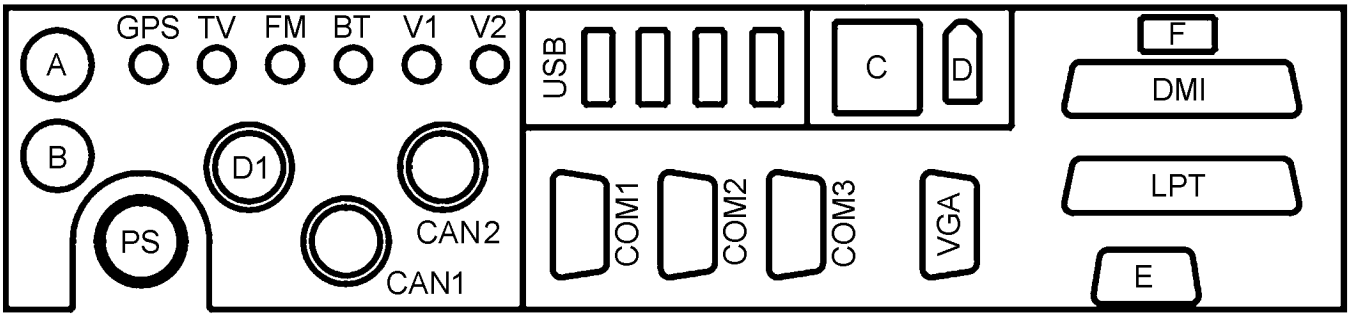
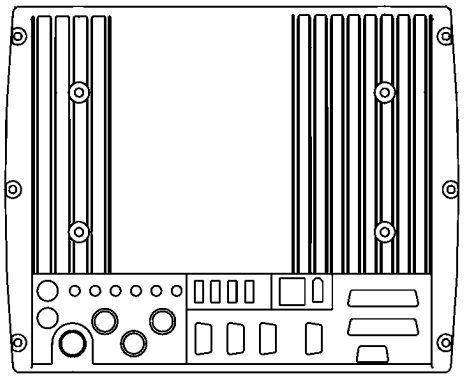


T192860 –UN–07JUL03

CPU



T192861 –UN–07JUL03

HPC-CPU connectors	
A	PS2 connector of PC keyboard
B	PS2 connector of mouse
PS	Power supply, +24 V, XC12
DMI	Display module connector
CAN2	TMC™ CAN connector to Hub module, XD1
CAN1	CAN connector to harvester head module (HHM), XC11
COM1 COM2 COM3	Three RS-232 data transfer ports - Calliper data transfer: COM1 or COM2
USB	Four USB ports (USB A type 1.1) - USB1: GPS antenna - USB2: printer (if not LPT)
LPT	Printer connector (if not USB2)
GPS	Not used
TV	Not used
FM	Not used
BT	Not used
V1	Video In1, connector of reversing camera *)
V2	Video In2, connector of camera *)
D1	Data In (not used)
VGA	Not used
C	Ethernet (not used)
D	Firewire (iLink, Lynx) (not used)
E	Audio Out (not used)
F	Not used (external cooling fan). It is forbidden to use this connector for any other purpose.
*) if equipped	

PY10832,0000065 –19–10APR02–2/2

Event log (menu 9-1)

The event log contains all the changes made to the system settings. Details of individual events in the list can be shown using the “Show details” command.

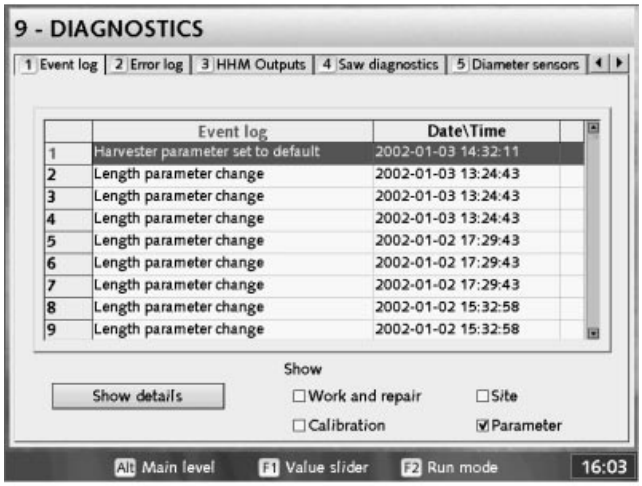
Details show for example

- the name of an edited parameter
- the old and the new value for the setting.

The list can be made easier to read by selecting only the desired event group from the following:

- Work and repair
- Site
- Calibration
- Parameter

If all the groups are checked, the list will show all the events in chronological order.



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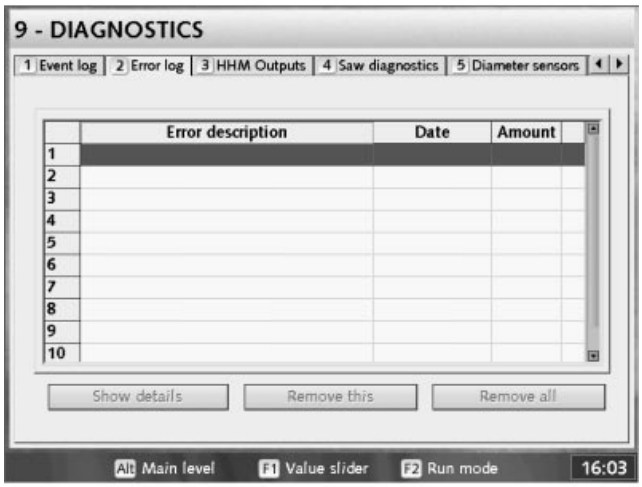
Error log (menu 9-2)

The list shows all the error functions the system has registered in the chronological order. Error descriptions can be removed separately or all at the time. “Show details” gives further information of an error description marked by the cursor. Thereafter you can ask for possible cause for the error.



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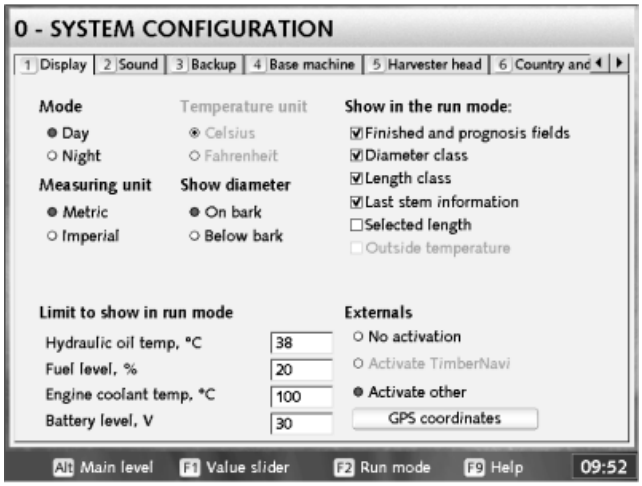
Display (menu 0-1)

Display setup



T208992 –UN–23FEB05

- Appearance of the run mode display can be selected according to visibility. You can select a light background as a day view or a dark night view.
- Selectable metric or imperialistic (US) units for measurement are shown in the run mode display.
- There can be shown diameter on or below bark on the the run mode.
- Sensor data display limits listed here can be altered. When a sensor data exceeds (or goes below) the limit set, the respective sensor symbol will be shown on the run mode display. The data is visible all the time with the following settings:
  – Hydraulic oil temperature, 0 °C
  – Fuel level, 100 %
  – Engine coolant temperature, 0 °C
  – Battery voltage level, 30 V
- “Show in the run mode” items are shown in the run mode display only if they are checked in the list. “Last stem information” appears on the display, when the stem is finished.

NOTE: The volume in the “Last stem information” window also contains the unregistered stem parts.

The “Selected length” is shown in the current log data, and it is the length suggestion made by the optimization.

- Outdoor temperature
  An outdoor temperature display and its unit may be selected if the TMC™ module has the required temperature sensor connected.
- The selection “Externals” opens the program of your choice (e.g. TimberNavi™) on the run mode display, when the stem has been finished, the harvester head is open and the drive pedal is being pressed. The display returns to the run mode, when another stem is grabbed.
- If the harvester is equipped with a GPS locator its coordinate data can be attached to PRI production files. The function is activated by checking the “GPS coordinates to PRI”.This feature is used with TimberNavi™.

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Print setup (menu 3-3)

- **Orientation**
  Printouts are available on portrait or landscape paper.
- **Type**
  When a printout covers various different topics, you can choose here whether to print each topic on a separate page, or condense the material as much as possible to fit it onto one.
- **Format**
  Paper sizes available are A4 (the European) or Letter (US).

T156710 —UN–27JUN02

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