

# Clever Cleaner

by *Enviologic*

## User manual



©Copyright: This manual may not be circulated to third parties, nor be copied or quoted without authorisation from


*Enviologic*


# Contents

<b>1. IMPORTANT INFORMATION .....</b>	<b>1</b>
<b>2. SAFETY .....</b>	<b>1</b>
Safety instructions .....	1
Warnings .....	1
Built-in safety devices .....	2
<b>3. TECHNICAL SPECIFICATIONS .....</b>	<b>3</b>
Technical data, Clever Cleaner.....	3
Accessories .....	3
<b>4. GENERAL INFORMATION .....</b>	<b>4</b>
<b>5. STARTING THE ROBOT.....</b>	<b>4</b>
<b>6. STEERING THE ROBOT.....</b>	<b>5</b>
Operator panel .....	5
Joystick .....	6
<b>7. MOVING THE ROBOT .....</b>	<b>6</b>
Manual mode .....	6
Transport wheel .....	6
Parking position.....	6
<b>8. TEACHING .....</b>	<b>7</b>
Starting the teaching process .....	7
Menus on the operator panel during teaching .....	8
<b>9. RECIPE .....</b>	<b>9</b>
Example of recipe.....	10
Menus on the operator panel during recipe management .....	11
Explanation of specific menus.....	12
Reading run time, memory usage etc. ....	12
<b>10. THE CLEANING PROCESS.....</b>	<b>13</b>
Put the robot into the starting position for the cleaning process.....	14
Starting the cleaning process .....	14
Using a working scheme .....	14
Menus on the operator panel during cleaning .....	16
Explanation of specific menus.....	17
After cleaning .....	18
<b>11. TEACHING HINTS .....</b>	<b>18</b>
<b>12. ALARMS .....</b>	<b>20</b>
<b>13. SERVICE AND SUPPORT .....</b>	<b>22</b>

# 1. Important information

## Signs that are used in the manual

 Safety-related information is shown in a grey box marked with a red triangle

 Important information is shown in a grey box marked with an information symbol

### Intended use

The robot is designed to be safe to use provided that it is operated in accordance with the user manual. Clever Cleaner is an automatic cleaning robot that is intended to replace manual high-pressure cleaning, for example cleaning of pens.

Any other use of the robot is inappropriate. If the instructions in this manual are ignored, this could lead to accidents and harm to people, the environment or animals.

### Robot Type

Information in this manual applies to the robot type referred to as Clever Cleaner. A machine plate is attached to the robot showing the CE mark, robot type, serial number, year of manufacture and other important information, as shown in Picture 1.



RamstaRobotics AB Fyrisvallsg. 28 SE-752 28 Uppsala Sweden				CE	
Type	Clever Cleaner				
S/N	XXXXXXXXXX				
Manufact. year	XXXX				
Max IN pressure	210 bar	Ambient temp.	+1°C - +55°C		
DC-power	24 V	Weight	270 kg		

Picture 1, machine plate

### Restrictions on use

- Clever Cleaner must only be used by trained staff.
- Clever Cleaner must only be used in accordance with the instructions in this manual.

## 2. Safety


  It is important that the use of the robot complies with the safety instructions and warnings in this chapter. Read this even if you are already familiar with the use of the robot.



### Safety instructions

In this manual important information is provided regarding safe use and maintenance of the robot.

The user manual should be regarded as part of the product and should be kept accessible.

The robot is designed in conformity with applicable standards and directives. Up-to-date information on these will be found in the declaration of conformity (CE document). The instructions in this manual must be followed to ensure that the safety and performance of the robot will be maintained.

 If there are other health and safety requirements in the country of use, an appropriate supplement to this manual will be created to meet these requirements.

  It is not permissible to remove or modify the design of safety devices on the robot and accessories.

### Warnings

The safety devices and warning labels on the robot are designed to prevent accidents. The main responsibility for safe use lies with the persons that are using, maintaining or carrying out repairs on the robot.

To ensure safe use, instructions and warnings should be followed and respected.

### Emergency stop switch

As an additional precaution an emergency stop switch is installed, within easy reach on the side of the operator panel. If the switch is pressed the robot and the water jet will immediately stop.

## Transportation of the robot with a vehicle (for example with a truck or a trailer)



- The robot **must** only be transported in an upright position, safely fixed so that the robot cannot overturn or suffer any other form of mechanical damage.
- If a malfunction is suspected due to a mishap while undergoing transport the robot **must** be functionally checked before it is put into use.

## Moving the robot.



- The robot **must only** be moved with the boom, tower, telescope, arm and nozzle in the parked position.
- The robot **must only** be moved with both hands on the handle when the clutch is used.
- Methods for moving the robot **must** be adapted to the ground and personal capabilities.
- If the ground is steeply inclined (upwards or downwards) the motor **must** be used, **do not use the clutch or the pivot wheel!**

## Recording (programming) and starting a robot program



- Before cleaning, the section **must** be cleared of humans (except for the person carrying out the recording) and animals; aisles and pens **must** be clear of obstacles and doors and gates **must** be closed.
- Warning signs **must** be placed by the entrance of the section during cleaning.
- The person carrying out the recording **must** use ear defenders and safety goggles. Other recommended equipment is protective clothing, boots, gloves and a mask.
- During recording the operator **must** keep a safe distance from the moving parts of the robot and the high pressure water jet.
- During recording the robot **must** be steered in such a way that the water jet or the moving parts of the robot are **not** in contact with sensitive electronics or other sensitive equipment.
- When using markers these **must** be firmly fixed and be capable of remaining in the same position throughout the cleaning process.

## Cleaning and maintenance



- Rinse the robot thoroughly after use. **Do not use a high water pressure.**
- The batteries **must** be recharged in a well ventilated area free of flammable materials.
- During maintenance the robot **must** be switched off.
- Only qualified personnel are allowed to carry out repairs on the robot.

## Risk of overturning



- Do not transport the robot in the parking position if the ground leans more than 20 degrees sideways.
- If the tower is turned 90 degrees from the centre position and the telescope + arm are in their most extended positions, the ground should not lean more than 5 degrees (depending also on whether the water jet is directed up or down).
- During cleaning behind the robot in the marked area in picture 3, there is a risk of overturning that is dependent on the ground and the position of the boom, telescope and arm. If working in this area the recommendation is to have the telescope in its most retracted position.

## Built-in safety devices

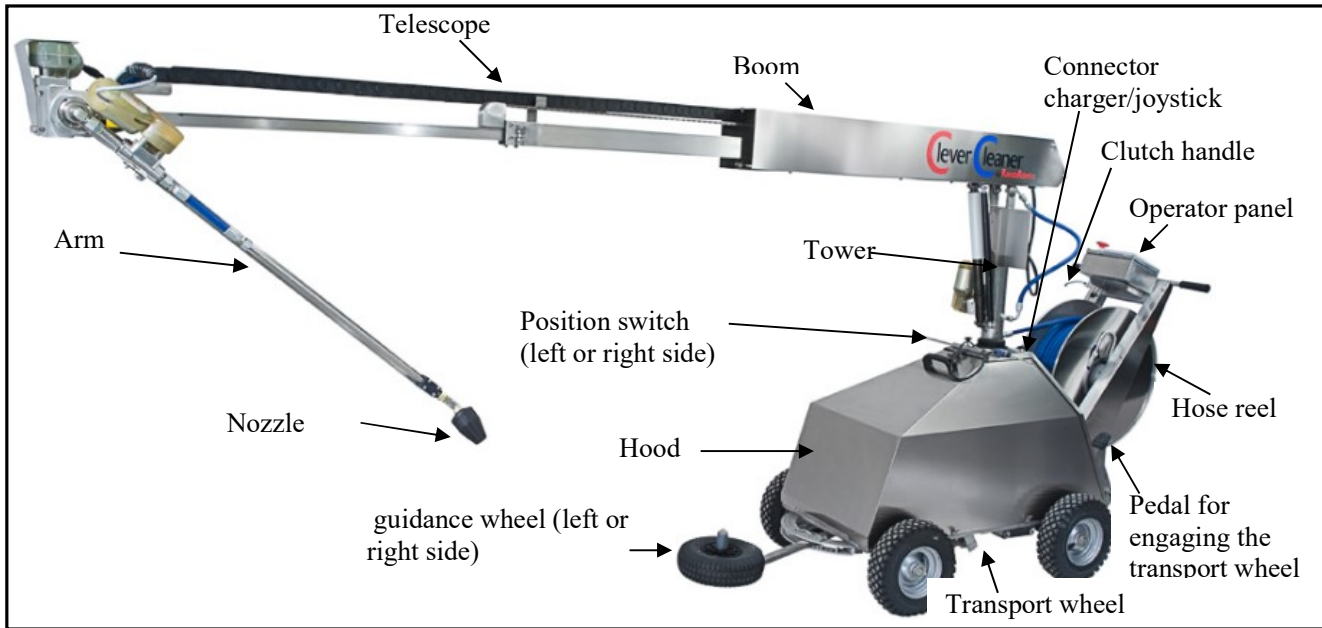
The robot has a built-in safety system with several different alarms. If an alarm occurs, the robot will immediately stop the operation, shut off the water jet, turn on the alarm LED and display an alarm text in the operator panel. The alarm has to be acknowledged before the operation can ultimately be restarted.

- **Protection against current faults** is provided by separate fuses for charging and for the computer card.
- **Protection against low battery voltage** is controlled by the computer and generates an alarm if this occurs
- **Protection against collision during operation** is detected by each individual motor and generates an alarm if the current consumption becomes higher than expected.
- **Protection against water leakage** is provided partly by the alarm function.



For detailed descriptions of the alarm texts and likely reasons for each alarm see **section 12, Alarm** in this manual.

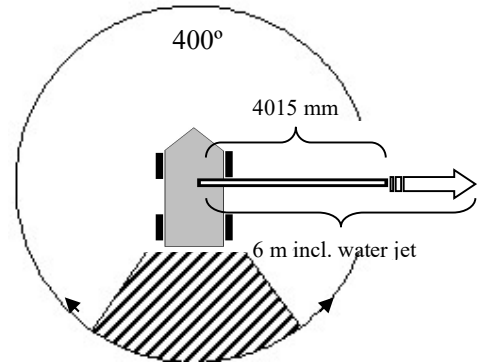
### 3. Technical specifications



Picture 2, parts of the robot

#### Technical data, Clever Cleaner

Total width:	730 mm (with special wheels, 630 mm)
Total length:	2100 mm (incl. guidance wheel)
Total height when retracted:	1610 mm
Max reach of arm:	4015 mm
Effective working range:	up to 6000 mm from centre of unit
Weight:	270 kg
Power supply:	24 V DC (2 lead acid batteries at 12 V)
Electric motors:	24 V DC (7 in total)
Ambient temp:	1°C to 55°C (33.8°F - 131°F)
Storing temp.:	Empty of water, -10°C to +75C (14°F - 167°F)
Control system:	Hitachi PLC
Alarm:	Alarm device from the system in the event of operational breakdown.
Water supply:	From external high pressure cleaning unit
Nozzle:	Rotor jet 0.55
Hose reel:	50 m high pressure hose (operated separately from the robot). Connected to a normal cleaning unit (preferably via the flow monitor).
Recommended water pressure:	180-210 bar (18-21MPa)
Recommended water flow:	15-18 l/min



Picture 3, the reach of the arm

#### Accessories

Charger:	see separate specifications supplied with the charger
GSM-alarm caller:	see separate specifications supplied with the GSM-alarm caller
Markers:	design and quantity are dependent on the installation
Nozzle:	alternative nozzles may be available depending on the working area.

## 4. General information

Instructions and documents that are included with the cleaning robot: **user manual, short user manual, two warning signs and three useful forms, “Stored pen types”, “Recipe management” and “Recipe template”**. The **user manual** includes all the information needed for preparing, making recordings (teaching), managing pen types and recipes, performing and ending a cleaning process. It also includes necessary information on how to use the robot in the best and safest way.

The **short user manual** includes concise information on how to perform and end a cleaning process.

### Short functional description

The cleaning robot obtains its 24 voltage power from two 12 volt lead acid batteries. The robot cleans with high-pressure water (warm or cold) with or without additives. The water is supplied from an external high pressure water supply via a 50 m hose mounted on a hose reel that is operated separately by the robot according to how the robot moves. The cleaning is carried out by a telescopic arm, moveable in all directions, with a maximum reach of 4015 mm (effective working range including the water jet = 6000 mm). By using the joystick you can teach the robot to move and clean in a satisfactory way. After this learning operation the robot will be able to carry out the moves on its own as many times as are necessary to achieve satisfactory cleaning.

## 5. Starting the robot

The red main switch is found on the right side of the operatorspanel, see picture on the right. For normal usage, press the main switch to start the robot. To charge the batteries, the cleaning robot must be switched off.

**The batteries cannot be charged when the robot is on.**

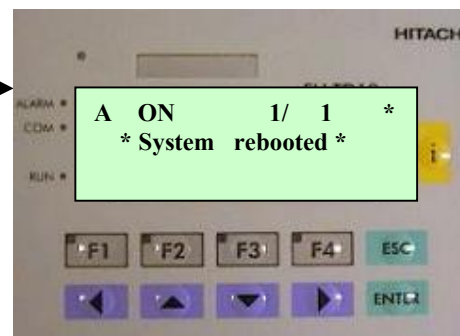


*On/off switch*

### Restarting the system

When the robot is switched on, the system is rebooted. After a few seconds the message “system rebooted” will appear in the operator panel. The alarm lamp lights up and the alarm signals are acknowledged with the **ESC** key.

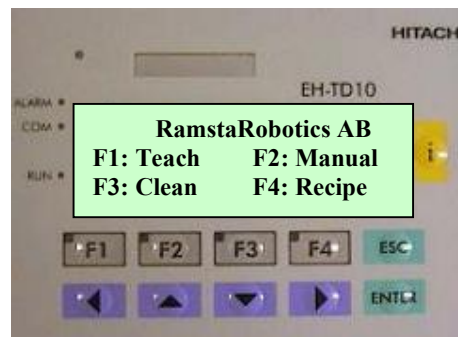
Alarm-light →



*Picture 4, rebooted system*

### Main system menu

The main menu will appear in the operator panel.



*Picture 5, main menu*

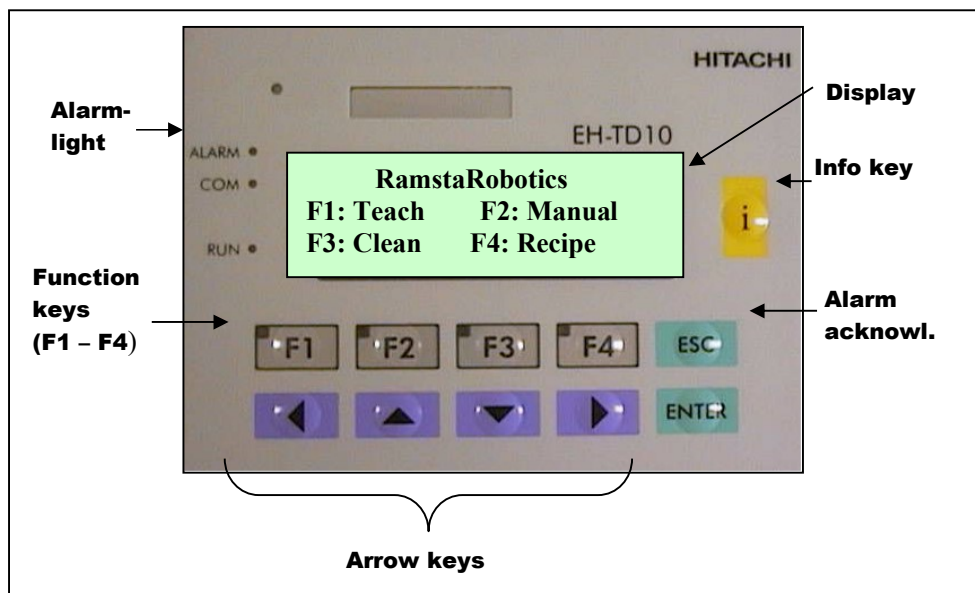
## 6. Steering the robot

The cleaning robot can be controlled from either the operator panel or the joystick.

**i** We recommend that you use the joystick during the teaching process. The joystick is connected to the cleaning robot via a six-metre cord, which facilitates the teaching process and unwanted contamination by manure or collision with the robot's telescopic arm is avoided.

### Operator panel

The operator panel is mounted on the back of the robot, see Picture 2. In addition to steering the robot the panel is used to acknowledge the alarm signals and to program the movements (make recipes).



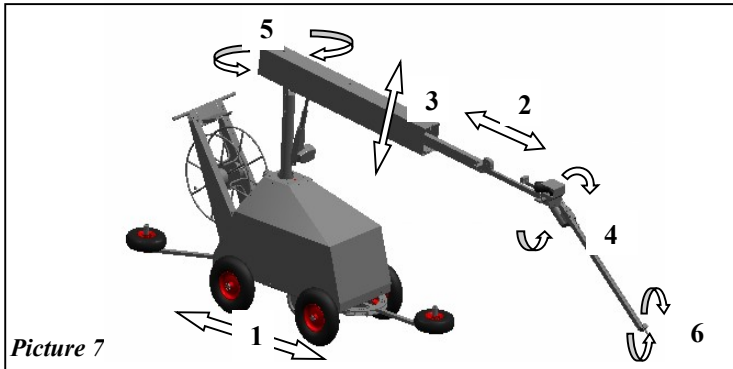
Picture 6, operator panel

**i** On some menus, an asterisk \* appears to the right. This means that more information is available behind the visible display. This information can be accessed by using the up and down arrow keys.

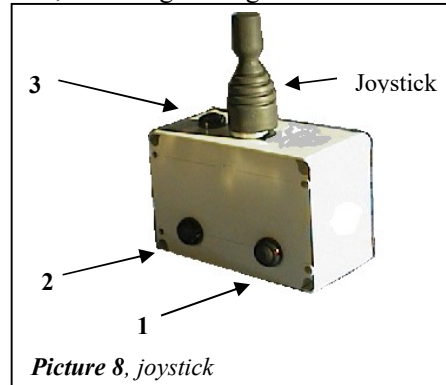
Motion selected (see picture 7)	Commands on the operator panel	
1, Drive the robot	Forwards:  +	Backwards:  +
2, Telescope	Out:  +	In:  +
3, Boom	Raise:	Lower:
4, Arm	In:  +	Out:  +
5, Tower rotation	Left:	Right:
6, Nozzle	Left:  +	Right:  +
Water	Off/On	
Hose reel	In:  +	

## Joystick

The joystick is connected to the black socket, which can be found at the rear of the cleaning robot, see Picture 2. The same socket is used for charging the batteries. The plug must be turned 90 degrees for secure tightening when connected. The joystick is used to control all motions of the cleaning robot, including turning water on and off.



Picture 7



Picture 8, joystick



The directions above are as seen from the rear of the robot

### Motion selected (see picture 7)

- 1 Robot forwards/backwards
- 2 Telescope out/in
- 3 Raise/lower boom
- 4 Arm in/out
- 5 Rotation of tower
- 6 Rotation of nozzle
- Water on/off

### Joystick commands (see Picture 8)

- Press 1 and 2, move joystick **forwards/backwards**
- Press 1, move joystick **forwards/backwards**
- Move joystick **forwards/backwards**
- Press 1, move joystick **left/right**
- Move joystick **left/right**
- Press 2, move joystick **left/right**
- Press 3

## 7. Moving the robot

### Manual mode

Manual mode means using the cleaning robot without a previous teaching process. Manual mode is used for example when the robot is moved from its storage place to the house to be cleaned. We recommend that you use manual mode to become familiar with the joystick and the different movements.

The robot can be manually moved either by manpower or by using the motors for transport. For unpowered transport, the robot is declutched using the clutch handle on the right hand side of the handlebar. The robot can also be manually operated using the transport motor from the operator panel or the joystick. The function keys on the operator panel can also be reached using the joystick. See section 6. *Steering the robot.*

### Transport wheel

Another way of moving or turning the robot is with the transport wheel, see Picture 2. To release the wheel, lift the robot by the handle at the same time as you press the pedal on the rear of the robot, see Picture 2. To park the wheel, reverse the above action, i.e. release the pedal.



- If the ground is inclined towards or away from you the motor **must** be used, **do not use the clutch or the pivot wheel!**
- Do not use your hands to release or park the transport wheel – risk of crush injuries

### Parking position

The parking position means that the boom, arm and nozzle are in the parking position. The boom must be brought down over the centre of the robot. The robot must be put in this position before starting and after finishing an operation. If the robot gives an alarm when starting cleaning the probable reason is that the robot has not been parked properly after cleaning, teaching or driving. An alarm text will then appear in the display; for more information see the section headed Alarms.



## 8. Teaching



The cleaning process requires position markers, see Picture 9. The position markers which can be S or U shaped are placed in a bracket, mounted on the house equipment before the cleaning process takes place. The cleaning robot reaches the markers during the cleaning process and position information is transferred to the computer.

Picture 9, position marker

In every section, there are several identical pens, for example a standard right pen. The teaching process relating to a standard right pen is used for all other standard right pens that are identical. If there is a difference in a standard right pen, for example a pole, there is a risk of collision and the particular pen in question must be taught separately.

### Starting the teaching process

When starting the teaching process, the system carries out an automatic check to verify the parking position of all moving parts of the cleaning robot (boom, arm, etc.). All moving parts of the cleaning robot must be in the start position. If a moveable part is not properly parked, the alarm lamp lights up, and an alarm code and alarm message are displayed. The alarm is acknowledged on the operator panel. The problem is corrected by parking the part in the “Manual” menu (see 7 Steering the robot). After that, the teaching process can be restarted.


i

- Before teaching, read “Hints for teaching”.
- The teaching should be done in a dirty pen with working water pressure.
- It is important to fill in the form “Stored pen types” during teaching and save it, *see Picture 10*.
- Any breaks during the teaching process will not appear during automatic cleaning. The actual working time clock stops during these breaks. Therefore the teaching can be carried out in a relaxed way, with no requirement for haste.

### The working order for the teaching process is as follows:

1. Have the form “Stored pen types”, see Picture 10, within reach and make notes during the teaching process.
2. Perform the teaching process pen by pen. The teaching process for each pen must begin at a marker and end at the very same marker. During the teaching process, **the actual working time** is displayed using the arrow key down (press ▼ in the “Teach” menu)
3. After successfully finishing the teaching process for a pen, the procedure is completed. The cleaning robot must be in the parking position at the time of completion of the pen concerned.
4. The next step is storing it as a new or replacing it as an old pen type.
5. When the pen type is stored the computer will automatically give you a number for that pen type. It is important that you note this number (pen type no.) in the form together with a description of the pen type, see Picture 10.

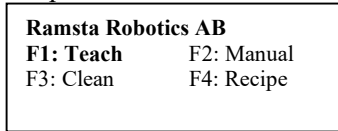
By ending the teaching process for an area, the pen types listed in the form “Stored pen types” should show all the different kinds of pen types in this particular area, including transport forwards and backwards between the position markers. Transport forwards is a unique pen type, so is transport backwards. In addition, slat cleaning is also a unique pen type.

 <b>Stored pen types</b>	
For documentation of stored pen types. Have it available when creating, editing and storing recipes!	
Pen type no	Description of the pen type (Which farm/ house/ department/ pen type/Main task for the pen type)
1	Test farm, building A1, department 12 Standard pen type, right Cleaning standard box, right
2	Test farm, building A1, department 12 Standard pen type, left Cleaning standard box, left

Picture 10, stored pen types

# Menus on the operator panel during teaching

The menus are shown in a tree structure with the main menu at the top and every submenu relating to the teaching process below.

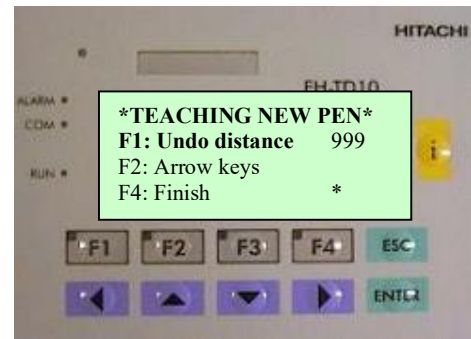


**Not. Adjust distance does not work for distance 4095 (puts the cleaning device in parking position)**

**The menu pictures shaded in grey are explained on the next page**

### Adjusting distance (Picture 11)

During the teaching process, the most recent movement can always be adjusted. By pressing **F1** again, the next most recent distance is deleted, and so on.



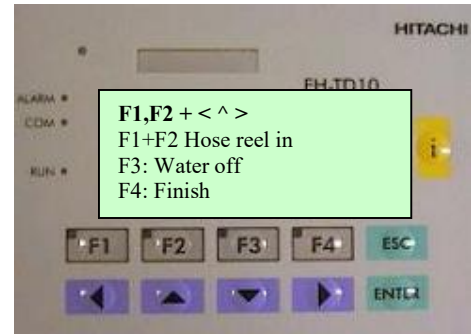
Picture 11, F1 undo distance

### Arrow keys (Picture 12)

The cleaning robot can be controlled with the joystick or from the operator panel. From the operator panel, the cleaning robot is controlled using function and arrow keys together, see the section **Steering the robot**. The operator panel can operate simultaneously with the joystick when connected to the cleaning robot.

### Water off

Function key **F3** controls water usage.

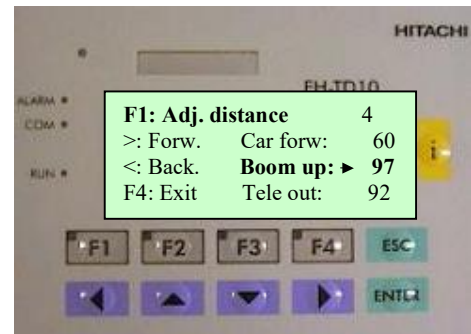


Picture 12, F1, F2 arrow keys, F3 water on/off

### Adjusting pen type/distance (Picture 13)

There are several ways of adjusting a pen type during a particular cleaning process. Different motions can be changed or erased. Every motion, for example boom up, boom down, is called a distance and is equivalent to a certain number of pulses of the motor in motion. A high number of pulses corresponds to a long distance and a low number of pulses to a short distance. If the boom uses 97 pulses (see Picture 13) and touches a pipe, the number can be reduced to a number < 97 that correspond to a non-contacting distance.

The menu in picture 13 shows the current, previous and next distance. The distance the arrow is pointing at is the **current** distance. Pressing the right **▶** or left **◀** arrow key, moves you to the previous or next distance. Only the current distance can be adjusted. Distance 4095 cannot be changed, see note. On pressing **F1**, the cursor will flash on the single digit (on the right hand side). The single digit can be changed using the up **▲** or down **▼** arrow keys. To alter the tens column, use the left **◀** arrow key. After choosing the desired number, press the **ENTER** key to accept it or the **ESC** key to redo number selection.



Picture 13, adjust distance

**i**

- Distance 4095 is not adjustable (puts the moveable part in the parking position)
- After adjusting a specific distance, subsequent distances may be affected by the adjustment. For example, imagine two consecutive motions. The first motion ends at the right side of a pen and the following motion is located at the left side of a pen. If the arm touches the side of a pen to the right and the number of pulses for this particular motion is reduced, the number of pulses for the following motion on the left side will start from a new position. The result will be that the arm touches the wall on the left side of the pen. Then you must compensate for that by reducing the “left” motion by the same number of pulses.

## 9. Recipe

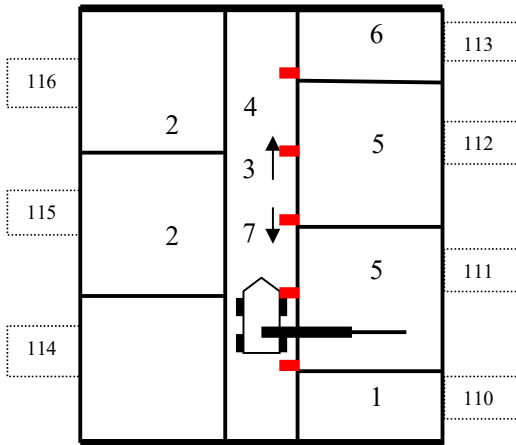
During teaching, a number of pen types have been stored, for example standard right pen, transport forwards, etc. In the recipe, pen types are put together in a sequence according to the order in which the different pens are to be cleaned. You can **create a new recipe, replace an existing recipe and change an existing recipe**

### Example of recipe

Assume that you have a section looking like the sketch in Picture 14. The section consists of three standard left pens, two standard right pens and two half pens to the right. The number next to the pens is the number of the pen, which will be used in describing the position during recipe management.

The red marks are position markers.

The different pen types are already stored and documented as shown below:



Picture 14, Example of a recipe

### Clever Cleaner Stored pen types

For documentation of stored pen types. Make it available when creating, editing and storing recipes!

Pen type No	Description of the pen type (Which farm/ house/ department/ pen type/Main task for the pen type)
1	Test farm, building A1, Department 12 Half pen, right Cleaning the first right half pen
2	Test farm, building A1, Department 12 Standard pen, left Cleaning standard pen, left
3	Test farm, building A1, Department 12 Transport Moving forward
4	Test farm, building A1, Department 12 Slats Slats cleaning
5	Test farm, building A1, Department 12 Standard pen, right Cleaning standard pen, right
6	Test farm, building A1, Department 12 Half pen, right Cleaning the last right half pen
7	Test farm, building A1, Department 12 Transport Moving backward

Picture 15, Stored pen types

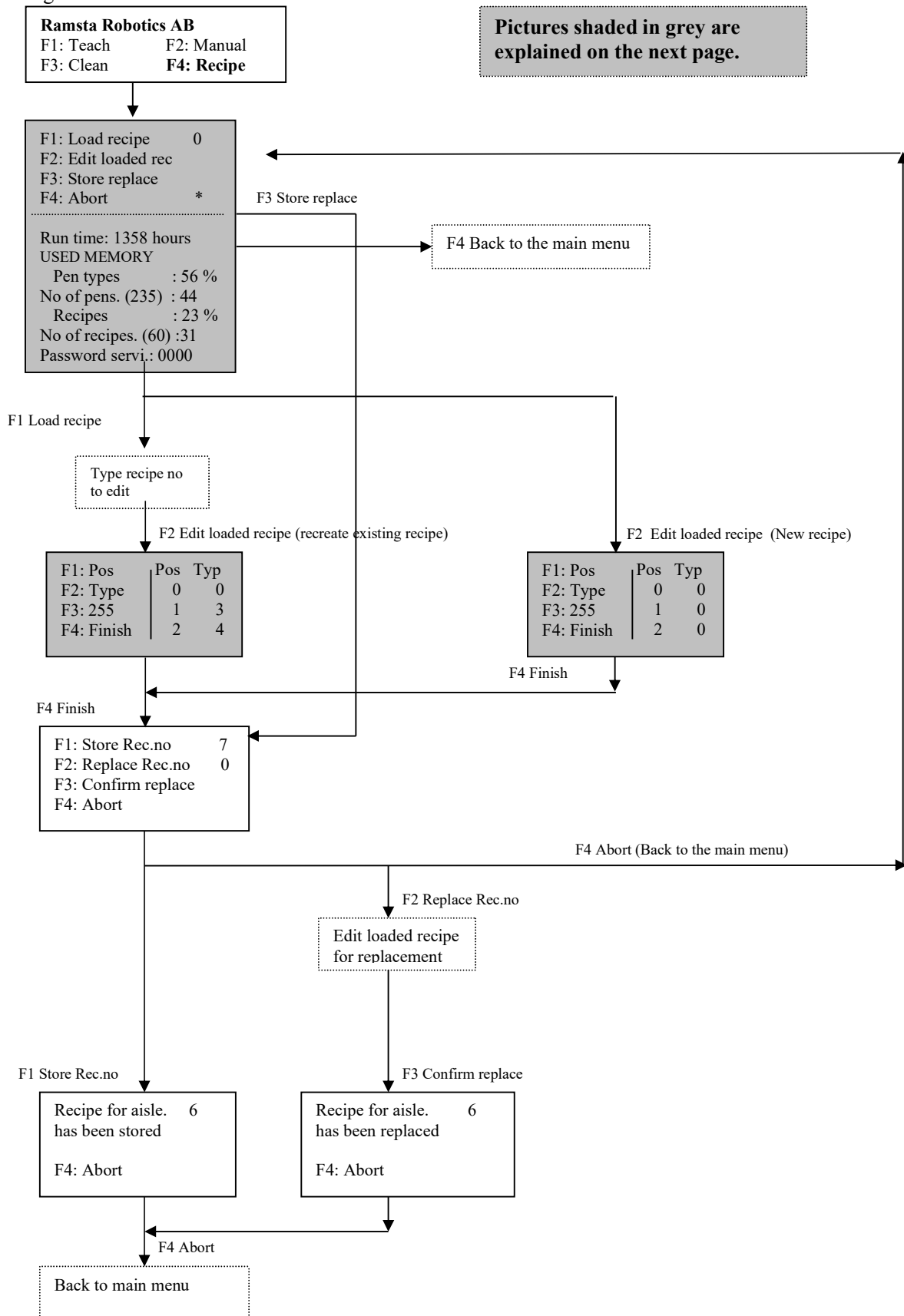
The next step is to make a recipe of the above and store it in the computer.

F1	F2	Name (description) of the pen type	Position in stable (start position)
Pos	Pen type no		
1	1	Cleaning the first right half pen	110
2	2	Cleaning standard pen, left	114
3	4	Slats cleaning	
4	3	Moving forward	
5	5	Cleaning standard pen, right	111
6	4	Slats cleaning	
7	3	Moving forward	
8	2	Cleaning standard pen, left	115
9	4	Slats cleaning	
10	3	Moving forward	
11	5	Cleaning standard pen, right	112
12	4	Slats cleaning	
13	3	Moving forward	
14	2	Cleaning standard pen, left	116
15	6	Cleaning the last right half pen	113
16	7	Moving backward	
17	7	Moving backward	
18	7	Moving backward	
19	7	Moving backward	
20	255	End	

Picture 16, Recipe management

## Menus on the operator panel during recipe management

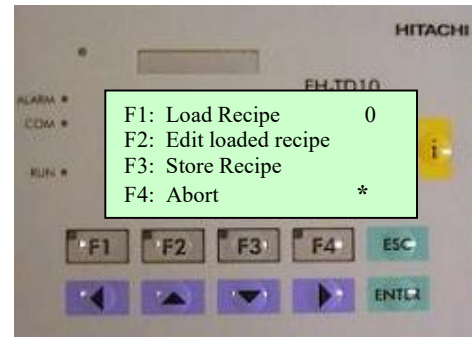
The menus are shown in a tree structure with the main menu at the top and every submenu related to the recipe management below.



### Explanation of specific menus

This menu is used to create a new recipe and change an existing recipe. Loading an existing recipe will display the different pen types in the recipe, and pen types can be changed, added or deleted. The edited recipe can be stored as a new recipe or can replace the original one.

**i** To edit a recipe, press **F1: Load recipe**, type the recipe number and then **ENTER**. Then press **F2: Edit loaded recipe**. The chosen recipe is shown on the display and can be edited.

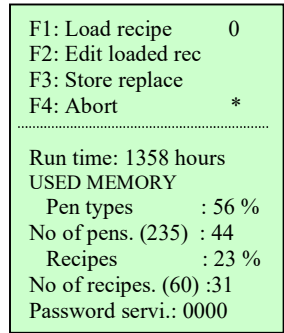


Picture 17, Load, Edit, Store a recipe

### Reading run time, memory usage etc.

To the far right of the display above, there is an asterisk on the bottom line (\*). By pressing the down ▼ arrow key, additional information is shown:

- Run time:** Displays total working time for the robot.
- Pen types:** Displays memory used in percentage for pens in memory.
- No of pens (235):** Displays the number of pen types in memory. 235 is the maximum number of pen types in the memory. **Note:** The maximum number of pen types also depends on the size of each pen type. The “pen types” value in % is therefore a more accurate indicator of the pen type memory usage.



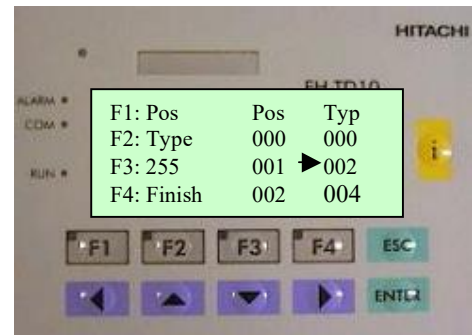
Picture 18, reading runtime memory

**Recipes:** Displays memory usage, in percentage, for recipe storage

**No of rec. (60):** Displays the number of recipes stored in the computer. The maximum number of recipes in the memory is 60.

This menu shows in which order (Pos. column) the different pen types (Type column) are to be worked on. In the example, the first pen type is 2 followed by pen type 4.

Only the row that the arrow points at can be changed. Pressing **F1 (Pos)** or **F2 (Type)**, will highlight the single digit, which can be edited using up ▲ or down ▼ arrow key. Pressing the left ◀ arrow key highlights the tens column digit. Pressing the **ENTER** key stores the chosen numbers.



Picture 19, Selection of pen types

**i** If you have a large recipe and wish to change for example pos 90 - Press **F 1**, enter 90 and press **ENTER**. You will then go directly to pos 90 instead of having to press ▼ several times.

### Adding/deleting a line (=pen type) in an existing recipe

If you have an existing recipe and would like to delete or add a line (pen type), proceed as follows:

Select the line by using the up or down arrow keys. The right arrow in the display indicates which line (Pos) is editable.

#### Deleting a line

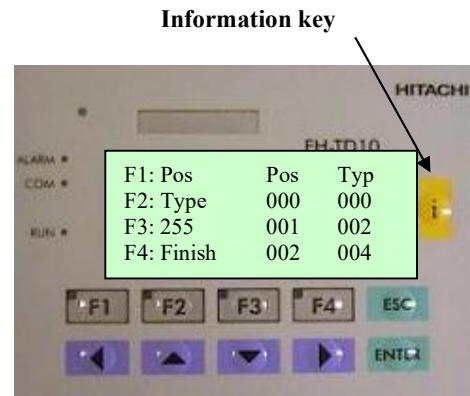
Press and hold the information key and simultaneously press ◀

In the example on the right, type 002 in position 001 will be deleted and type 004 will be moved up to position 001.

#### Inserting a line

Press and hold the information key and simultaneously press ▶

In the example on the right if you insert a line, type 004 moves down to position 002 and all following pen types will be moved down one position. At position 001, type 000 will appear and a new pen type can be entered at that position.



Picture 20, Delete or insert row



A recipe **must always be concluded with 255** by pressing F3.

## 10. The cleaning process

When starting to clean a work scheme has to be entered in the Cleaning menu. In the work scheme, you enter which recipes will be used and their individual order. Pauses (up to 999 minutes) between the recipes can also be entered here.



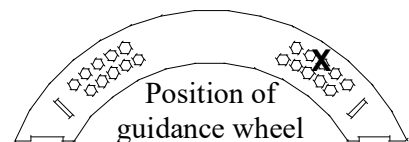
#### Before cleaning check the following:

1. That no position marker brackets have been moved or are missing
2. That each position marker is fixed in the correct bracket
3. That the position switch is set in the same position it was in during teaching, see recipe management
4. That the aisle and pens are clear of obstacles, which can interrupt the cleaning process
5. That the high-pressure cleaning unit is powered up
6. That water is connected to the high-pressure cleaner
7. That the high-pressure hose is free to move and fastened centrally behind the hose reel
8. That the charger is disconnected
9. That the recipe management list is available
10. That the pin for the guidance wheel is placed in the correct position, see recipe management list
11. That you know where to start the cleaning process, check for the first position marker

**If any position marker is missing the robot will stop and the alarm will be set where the position marker is missing.**

The recipe management sheet is used when the recipes are entered in the robot. The pin position for the guidance wheel should be shown in the top right corner, see *Picture 21*.

In the recipe the pen types are put in the correct working order. In the column on the right, the position shows where the cleaning robot is positioned when the relevant pen is being cleaned. See section “9. Recipe” for more information.



Picture 21, Mark the position of the guidance wheel

**Put the robot into the starting position for the cleaning process**

Put the robot 50 cm behind the first position marker. Make sure the guidance wheel is in contact with the wall on the side of the aisle where the markers are located.

Run the cleaning robot forwards using **F 2 + ▲**, all the way to the first position marker. It is important to press the button until the robot stops for the marker.

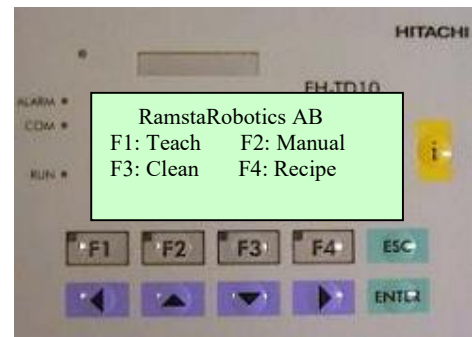
**Starting the cleaning process**

To choose an existing recipe, press “**F3: Clean**” in the main menu (see Picture 22).

There are two ways of starting a cleaning process

1. With a working scheme
2. With only one recipe.

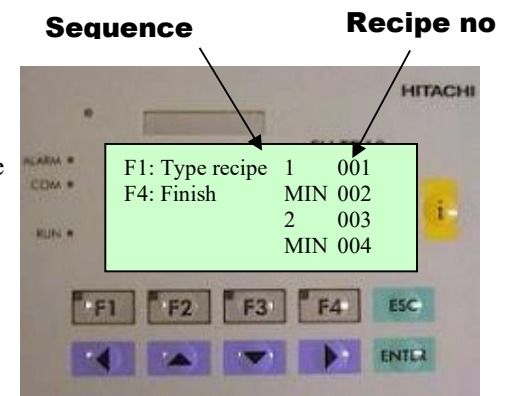
A **working scheme** comprises one or **more recipes** and if you are not using a working scheme, only one recipe at the time can be used.



Picture 22, main menu

**Using a working scheme**

In the working scheme (see Picture 23), recipe numbers are chosen in a given order. Use **F1** and the marker indicates the third position in the recipe number (to the right) on the first row. The recipe number is typed from right to left (the last digit first and so on). If you want to use recipe number 12 for example, place the marker to the right, then use the up ▲ arrow key twice to type digit 2. Then use arrow key left ◀ followed by the up ▲ arrow key once for digit 1. When the correct number is typed, confirm using the **ENTER** key. You can also put a time for pausing between the recipes if required.



Picture 23, using a working scheme

**Only the top row in the display is editable**

Use the down ▼ arrow key to reach the subsequent rows in the display. Then use **F1** and follow the instructions above. Assume the following, recipe number 001 is cleaning pens, recipe number 003 is wall cleaning and recipe number 004 is ceiling cleaning:

- Work no 1: Cleaning pens
- Pause: 30 minutes
- Work no 2: Cleaning pens (second round)
- Work no 3: Wall cleaning
- Work no 4: Ceiling cleaning

After making a working scheme, use **F4** to finish and a new menu will appear (see picture 24).

**F1: Scheme** is shown as a confirmation of a stated working scheme. In this menu, an optional starting position in the section can be chosen. For example, there might be a number of pens not requiring cleaning at this particular time. Their position is described in the recipe management sheet.

The cleaning process is started by using **F3: Confirm start**.

**Timer function**

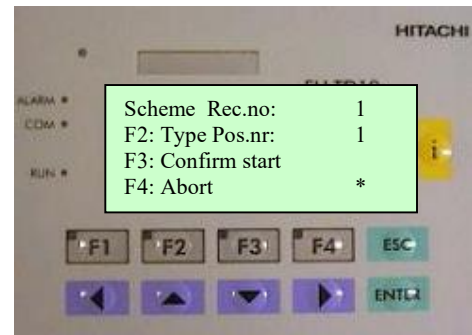
To the far right of this menu, there is an asterisk on the bottom line (\*).

By pressing the down ▼ arrow key, you can edit a timer function.

Use the left arrow to type hours and right arrow for minutes to start

(the robot starts when the timer is at zero).

Confirm the timer with **F3: Confirm start**



Picture 24, scheme

**Cleaning without a working scheme**

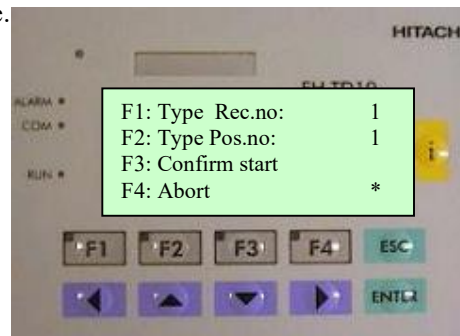
After using **F3: Clean** in the main menu, you reach the same menu under “Using a working scheme”. (see Picture 23). To close this menu, use **F4: Exit** without typing anything, i.e. zeros in right column.



Then you will reach the same picture as after making a working scheme. The only difference is the message under **F1, F1: Type Rec. no.** (see Picture 25).

Type “recipe number” using the arrow keys in the same manner as in “working with a working scheme”. At this point, you can start the cleaning process at any position in the section.

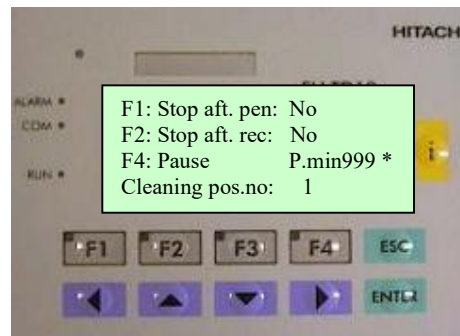
The cleaning process is started using **F3: Confirm start**



Picture 25, cleaning without a working scheme

Regardless of whether options 1 or 2 above are used, this picture will be displayed (see Picture 26). It is shown during the whole cleaning process and it is possible to interrupt the cleaning process after a particular pen or when the recipe is completed. Additional information about the position in progress is displayed

Pressing **F1** or **F2** will change the text from No to Yes

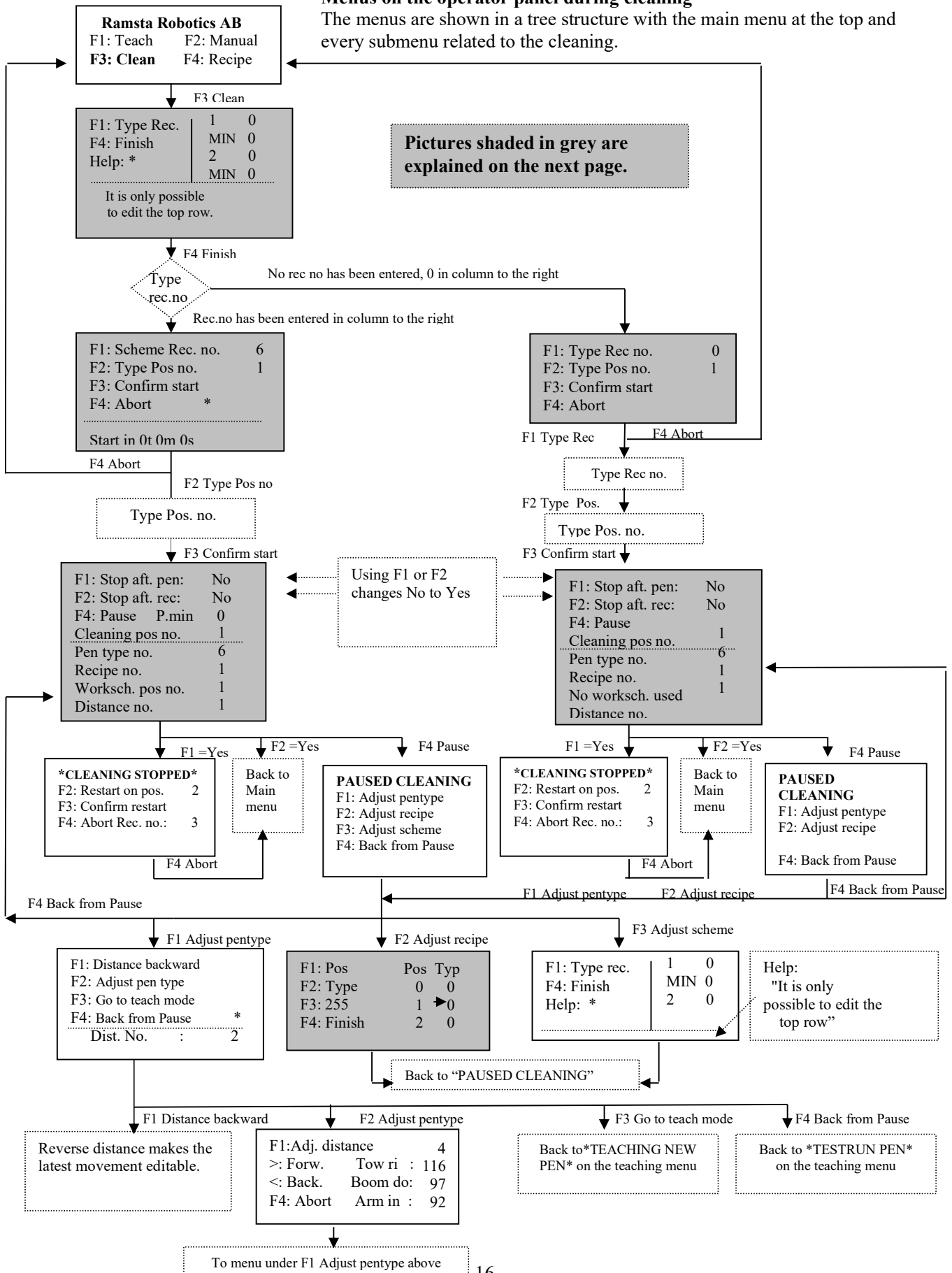


Picture 26, Cleaning position

- i**
- If running without a working scheme, the cleaning process will operate without stopping if you do not change F1 or F2 to Yes
  - If running using a working scheme, the cleaning process will end after the last recipe in the working scheme, and there is no need to change F1 and/or F2 to Yes
  - As shown in the tree menu on the next page, you also have the option during cleaning to alter pens, take over the teaching etc.

### Menus on the operator panel during cleaning

The menus are shown in a tree structure with the main menu at the top and every submenu related to the cleaning.



### Explanation of specific menus

The menu to the right is shown by pressing **F3: Clean** in the main menu (see *Picture 27*). In this menu the work scheme is set out for this particular cleaning process. The column to the left (1, Min, 2, Min) shows the recipe working order. Between the recipes there can be a pause, which is entered in minutes. The column to the right shows the recipe number. In this example the working order is recipe number 3 and 5. The work scheme is ended by pressing **F4: End**

Only the top line of the display is editable (see the help text on the display). Use the up ▲ or down ▼ arrow keys to move positions to the top line.

If a working scheme has been made (requires at least 1 recipe in the column to the right), the menu to the right (see picture 28) will appear. It is possible to select the starting position in the recipe of the cleaning process. This means the starting position can be anywhere in the section, if, for example, some of the pens have not been in use.

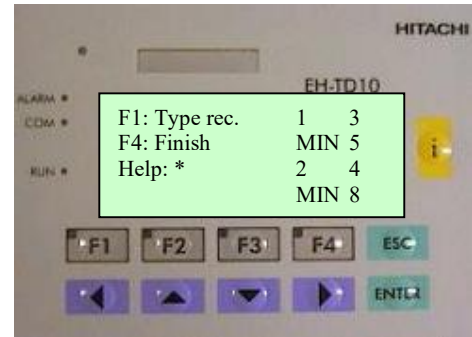
If a work scheme has not been created (only zeros in the columns on the right), this menu is shown, see *Picture 29*. At this point, a recipe number must be selected. Cleaning is started manually regardless of whether you have chosen to clean according to a work scheme or recipe. On the bottom line on the far right of this menu there is an asterisk (\*). If you press ▼ you can access a timer function where you can set the hours, (left arrow) and minutes (right arrow) to the start time. (The robot starts when the timer is at zero). Pressing **F3** confirms the set starting time: **Confirm start**

- i**

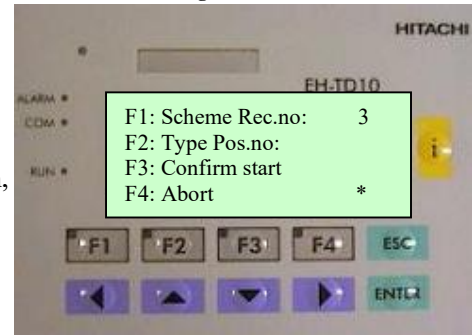
  - A cleaning process not started from within a work scheme will go on forever unless **F1** or **F2** is pressed. This changes the stop command from No to Yes (see *Picture 30*).
  - Changes to a recipe during cleaning will only remain in effect during that cleaning process.

### Excluding pens from the cleaning process

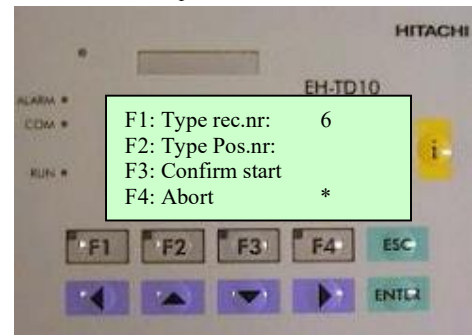
If pens are to be excluded from the cleaning process, because they are not in use, use the change recipe function. Type zero in place of the pen type to be excluded (see *Picture 31*). This modification is not stored in the computer.



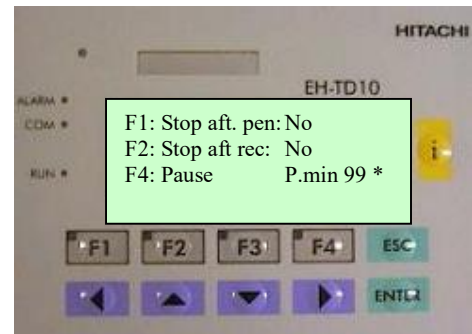
*Picture 27, cleaning*



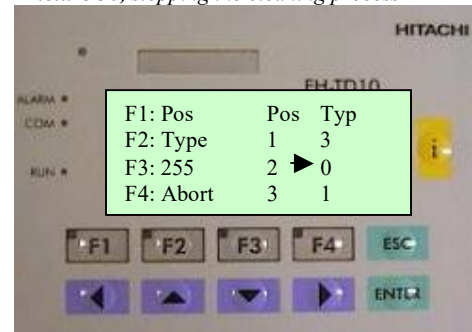
*Picture 28, Start position*



*Picture 29, Recipe no*



*Picture 30, stopping the cleaning process*



### After cleaning

After the cleaning process it is important that you follow these steps:

1. Release the pressure by extending the arm in manual mode and opening the water valve. **The water connected to the high pressure cleaner must be turned off before releasing the pressure!**
2. Disconnect the hose from the high pressure cleaner and roll it up by pressing **F1** + **F2** at the same time.
3. The robot will roll the hose up for as long as you press the keys.
4. Rinse the robot with water thoroughly. Take the hood off and rinse the parts under the hood and also inside the boom.
5. Take the robot to the parking place to be used between the cleaning sessions. Charge the batteries by connecting the charger to the rear connector. The robot charger is charge protected which means that you can leave it on charge until the next cleaning process.



**Do not use high pressure** for cleaning the robot

When the robot is not in use it must be kept in an area that is frost-free.

## 11. Teaching hints

1. The teaching process should take place using working pressure, because the arm is affected by the power from the flowing water.
2. Avoid retraction of the telescope when the boom is in its maximum elevated position, since this causes a high level of stress on the telescoping motor.
3. The teaching of pen types should be done in dirty pens in order to observe the track of the water jet.
4. Ensure that there are no local obstacles in one pen such as gas extraction equipment, posts, etc. If so, the teaching process should take place in this particular pen to avoid collisions.
5. Keep some clearance (approx. 15 cm) from house equipment during the teaching process. This is important when changing the position of the boom, to avoid collision if the cleaning robot has a slightly different position during the cleaning process. There can also be a discrepancy in the house equipment when going from one pen to another.
6. If it is not possible to take point 5 into account, because of a lack of space or similar problems, you should consider moving away from the area that could cause a collision before you change the height of the boom, for example, or retract the telescopic arm. In this way you can be sure that there will not be a production stoppage due to collisions, even if some parts of the arm touch the equipment.
7. Take care of the house equipment; keep the nozzle at the right distance.
8. Remember that the robot obtains different parking positions by driving forwards or backwards to the marker. Therefore, try to teach it in the order that it will subsequently be given in the recipe.
9. It is important that no **major** obstacles are located in a position that could interfere with the guidance wheel during movement in the cleaning process. This could cause the robot to skid and lose its exact positioning. To avoid this, extra position markers can be used.
10. When you drive forwards to a marker, the distance must be greater than 20 cm. Check it every time before you move the robot forwards and if you are standing close to a marker. Drive the robot first the other way so you obtain 30-40 cm clearance and then drive to the next marker. It is very important that you hold the joystick until the machine stops at the marker; if you release it before the machine has detected the marker, the distance will be recorded incorrectly.
11. If you are using a double nozzle, be **very** careful in turning the water on, so the correct nozzle is chosen. When you change nozzle, turn the water off, move the arm out into a horizontal position, turn the nozzle at least 180 degrees so that the nozzle you will use is pointing down, drive the tower, telescope or the machine in for at least 5 seconds and only then turn the water on.

12. Before parking the arm, always point the nozzle to the left. If the arm is in an incorrect position there is a risk that the nozzle will collide with the boom during parking.
13. Parking the tower must always be done by turning it from right to left. Make sure that the tower is at least 30° from the centre before turning left. This will make it easier for the robot to sense the parking position.
14. The position of the hose should be finely adjusted for every single cleaning session. Otherwise the hose could end up on one side of the reel, which could lead to an unwanted stoppage during the cleaning process.
15. Try to perform the teaching process for new pens efficiently. Time measurement for each pen is a good working tool and another way is to compare the number of distances used. It is very important to divide the pen into smaller parts. It is very easy to maintain concentration for a few minutes but after a while you lose focus and start to make mistakes.

**Always do one rough clean and one careful clean!**

In the first teaching session, the floors of the slaughter pen will be washed and saved as a pen type. Limit yourself to the standard pens i.e. whatever type you have many pens of. It is an obvious error to carry out teaching in a sick pen or a half pen for the first time when you are in a new section.

16. Be careful to document all teaching: the name of the farm, house number, path number, pen number, pen type. This appears obvious at the time of teaching, but after some more teaching it will be very hard to keep in order. Besides, it should be possible for other staff at the farm, including temporary workers, to handle the robot and its programming. It is a good idea to write some notes about the recipe template to use in the section and record it in a computer after the teaching process. If you save it as a file in the computer it is easy to print a new one when you have forgotten the recipe in the section, which you may often do.
17. Next time you clean a section which looks like the one you installed the robot in, you should redo the worst pen type. This means that it is useful for you to make some notes about how it worked out after you cleaned it again, so you will remember what you want to do. Maybe you were not satisfied with the floor in the right-hand pen, so you do it again. You can do that by starting the recipe on a position for that pen type. Now you can let the robot work until you think it is doing something wrong. Push F4 for “Pause”, the water will turn off and the arm will stop when the first distance is completed. Push F1 “Adjust pen type” and then F3 “Go to teach mode”. Now you are in the teaching position and can teach again from here to the end. When the robot is parked by the marker you complete the teaching as usual and choose Replace pen type. The type which was operational when you selected pause will be preselected so it is only necessary to “Confirm choice” then you do not have to make any changes to the recipe. Restart the robot and finish the cleaning. If you do it this way you will take 15 to 30 minutes on learning during each cleaning session for some time to come. The result will be that you will constantly reduce the cleaning time, improve the result and you will also learn how to use the robot in the most effective way. When you are completely satisfied with the standard pens it is time to carry out teaching on the rest. Take one per cleaning session and add it into the recipe with the add function.

**i**

If you obtain an alarm indicating “limit position was not reached” during transport in cleaning mode, no further attempts will be made to reach the limit position (all other limit positions must be detected before working the next distance). When a marker is missing, the device must be placed in the correct location before the alarm is acknowledged.

## 12. Alarms

The cleaning robot has a safety system with several alarm functions and corresponding alarm messages. If the robot goes into alarm mode, cleaning is immediately interrupted. The water is turned off, the alarm lamp lights up and an alarm message is shown on the display.

After the malfunction has been taken care of, it is in most cases possible to reset (acknowledge) the alarm and the cleaning robot can continue the cleaning process (see explanation of function keys on the operator panel).

**i**

If you obtain an error message, please write down the alarm code (see list below) when calling service to obtain best support.

### 1. Typed recipe don't exist

The user is trying to enter a recipe not stored in the computer.

### 2. Limit position too early

The cleaning robot has detected a limit position not being reached during the teaching process. This malfunction can occur during transport, when the limit switch touches some part of the house equipment before it reaches the marker.

### 3. Emergency stop pressed or no pulse

This alarm can appear when an engine is running and no pulses are detected from the computer. The reason can be a broken pulse indicator. It also appears when the emergency stop is pressed down.

### 4. Cannot find limit position

A limit position reached in the teaching process was not reached during the cleaning process (safety margin included). One reason can be a missing marker, giving incorrect information on transport forwards/backwards. During transport of the device, no further attempts will be made to reach the limit position. All other limit positions must be detected before working the next distance. When a marker is missing, the device must be placed in the correct location before the alarm is acknowledged. The cleaning process can then be continued. A marker must be detected +/- 90 cm from the position it was in when the learning process for that particular pen type took place. If not, the alarm will go off. We recommend that the position markers are evenly distributed along the aisle with a tolerance of +/- 5 cm.

### 5. Typed recipe don't exist

Obtained when replacing or playing recipes, because the recipe entered does not exist.

### 6. First distance already done

During the teaching process, the taught distances for the current pen type can be reversed. This type of alarm appears when the operator has reversed the cleaning robot into the parking position and there are no more distances to reverse.

### 7. Max distances stored

This type of alarm is the second step in the alarm connected to the teaching memory. The first step is reached 50 distances before (see alarm 17). After acknowledging this alarm, the operator can complete the teaching process using the last 50 distances. If not, this second step alarm appears when the memory capacity of 1020 distances has been used for this particular pen type.

**i**

The only way to escape from this situation is to reboot the system using the main switch, and the pen type will then NOT be stored

### 8. Max pen types stored

The memory capacity has been reached; no more pens can be filed. After acknowledging the alarm, choose from Replace a pen in the memory or abort the process.

### 9. Max amount of pulses stored

This alarm appears only during transport forwards/backwards. Limit switches limit other movements.

### 10. Current overload

A motor is using more current than normal; probably because the arm or the boom has encountered an

obstacle. When the cause has been corrected, the alarm can be acknowledged and the process can be continued with the remaining part of the distance.

**11. Battery power low**

The battery power has fallen below 21 volts; this means the system is not completely reliable and the voltage alarm is generated. If this alarm appears during the cleaning process, the pen is completed before the cleaning device is stopped.

At this point, the batteries must be recharged immediately.

**12. \*System rebooted\***

The system has been rebooted with the main switch and is ready for use.

**13. Dist. before parking too short**

To obtain a correct starting position for the cleaning robot, which is essential for repeatability, every parking position must be reached before ending the teaching process. Every movement is limited in the retracted position. The cause of this alarm is the parking movement of the tower, (turning). Parking the tower requires that the arm be completely retracted on parking; the boom must pass the centre line of the robot to the right. At this point, the parking movement takes place using a turn to the left. If the distance before the parking movement is too short to reach a correct position, this alarm appears. When acknowledging, the distance is reversed automatically. At this point the operator should turn the tower further to the right before attempting a new parking movement.

**14. Typed recipe don't exist**

The operator has chosen a recipe not stored in memory. After acknowledgement of the alarm, the selected aisle will be set to 0.

**15. Recipe not ended with 255**

During recipe management, pen type 255 must end a recipe. This is done by selecting **F3** from the recipe menu when the marker has reached the last position. If not, and the operator has used **F4**, this alarm appears. After acknowledgement, it is possible to end in a proper way.

**16. Memory of recipes full**

The recipe memory is full; no more recipes can be stored.

**17. Only 50 distances left**

This is a serious alarm because only 50 distances out of 1020 remain before the memory capacity for this particular pen type is reached. (See alarm 7)

**18. Pen type does not exist**

The operator is trying to use a pen type not stored in memory.

**19. Boom not parked**

The boom has not reached the parking position when completing the teaching process or after a manual run.

**20. Tower not parked**

The tower has not reached the parking position when completing the teaching process or after a manual run.

**21. Telescope not parked**

The telescopic arm has not reached parking position when completing the teaching process or after a manual run.

**22. Arm not parked**

The boom has not reached its parking position when completing the teaching process or when starting after a manual run.

**23. Nozzle not parked**

The nozzle has not reached parking position when completing the teaching process or after a manual run

**24. Recipe not correctly ended**

Pen type 255, which must always be the last pen type, is missing.

## 25. Water not turned off

The water has not been turned off when completing the teaching process or after a manual run.

# 13. Service and support

Address:  **Enviologic**  
Söderforsgatan 1  
S-752 28 Uppsala  
Sweden  
Phone: +46 (0)18 39 82 30  
Fax: +46 (0)18 60 42 82  
E-mail: [info@enviologic.se](mailto:info@enviologic.se)  
Internet: [www.enviologic.se](http://www.enviologic.se)