CUBE600N TRANSPLANTER
OPERATOR'S MANUAL

INDEX

DIMENSIONS

HEIGHT (max.)	1.990 mm
WIDTH	1.830 mm
LENGTH	2.910 mm
WEIGHT	KG. 400
VOLTAGE	220V -110V
POWER	1 Kw
AIR PRESSURE	8 BAR
NOISE LEVEL	LESS THAN 70 DECIBEL

TRANSPORT

• During transit the transplanter must be fixed onto a level surface and subsequently fastened to avoid vibration damage.

• It is good practice to tie moveable elements to avoid vibration and impact during transportation.

• Place a piece of polystyrene or sponge under the head trolley to avoid contact with the machine surface.

• Check carefully at the time of delivery that the machine is undamaged.

• To move the transplanter on level surfaces lift up the four anti-vibration feet and use the four swivel wheels.

• It's recommended to use a fork lift when loading and unloading the transplanter, taking great care to keep the feet of the machine level. Put the forks in the brackets provided.

• Before switching on the machine, remove the clamps restraining the movement of the axes.

Before starting the machine check the following:

Removal of packaging
Carefully remove all packaging and the ties that are restraining the movement of the axes.
Move all elements manually to check their smoothness.

Location of the machine
The machine must be placed indoors in a safe and sheltered place, on a level surface. Once positioned one should adjust the four anti-vibration feet so that they are completely level on the floor. Check that the machine surface is perfectly horizontal. The floor should be as clean as possible, free from grease, dust and soil.

Electrical supply
Depending upon which country the machine is sold to, the transplanter should be connected to an electrical supply of 240V or 110V.
Before connecting the machine check the tag close to the power point, which indicates the correct voltage. The power consumption is calculated as 1 Kw.
The electrical wiring needs 16A and earth connection. The electrical system must be installed and protected in accordance with current standards.
The client needs to arrange for sufficient protection of the power supply line through protection devices determined by current regulations.

Pneumatic supply
The machine requires an air supply to be connected to the inlet adapter located on the side of the electrical panel. The inlet is fitted with an anti-condensation filter. Levels should be checked periodically. The emptying of the anti-condensation filter occurs when removing the air pressure from the system. It is however possible to manually empty the bowl by operating a push button on the underside.
The minimum pressure required is 6 bars. To adjust the required pressure, operate on the knob above the pressure gauge.

4.1 GENERAL SAFETY

• For correct and safe use please read all instructions before use.

• Install and set up the machine as directed in this manual.

• Do not remove the safety guards from moving parts.

• Put back the safety guards on moving parts before restarting the machine, and ensure that these are in place before starting the machine.

• Be careful not to catch any loose clothing in moving parts.

• Electrical servicing should only be undertaken by specialist personnel.

Before switching on the machine ensure that the side panels, plastic safety guards and the doors are all closed and secure. The manufacturer or their agent cannot be responsible for the occurrence of any fault or accident if these safety precautions are not followed or the safety guards are insecure or have been tampered with.

It is furthermore recommended to carefully read the chapter regarding the use of the machine and to proceed in accordance with these instructions.

Make sure that the earth conductor is connected.

Make sure that there are no objects which can obstruct, damage or stop moving parts.

Make sure that there are no untrained personnel or children near the machine when starting up.

4.2 OPERATOR'S SAFETY

For the safety of the operator it is essential to know the machine and all its components well. To avoid inaccurate or dangerous use of the machine, proper training will be required.

Under no circumstances should an operator attempt to alter or adjust any of the operating components while the machine is working.

The machine is equipped with FIXED safety guards protecting moving parts. These are fastened to the structure and can only be loosened by use of a tool.
Only remove the safety guards after disconnecting the system from any type of energy source.

The machine is also equipped with safety guards, which can be opened. These are provided with security switches, which stops the moving parts when the guards are opened.

Only remove material from inside the machine after disconnecting the system from all energy sources.

For electrical protection, the user must make sure the machine is earthed and connected to an appropriate power supply with an automatic earth leakage circuit breaker.

Check that there is electrical continuity between metallic parts and that these are earthed to avoid accumulation of static electricity, which can be annoying for persons touching the metallic parts or cause sparks with the subsequent danger of igniting inflammable material.

5.1   Controlled Axes

The integral computer controls the movement of each axis in sequence to perform the transplanting operation.
Each axis is named alphabetically or alphanumerically to identify each axis.
The axes present on the machines of the CUBE series are as follows:
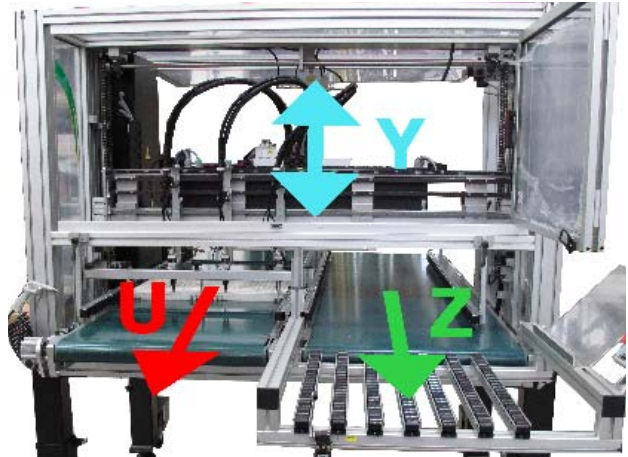
Axis X   This is the movement of the trolley, from left to right and vice versa. The movement is made by a 48V direct current motor. In some models a brushless motor (Ac 230v) is used.

Axis Y   This is the movement of the trolley, from the upper position to the lower position and vice versa. The movement allows picking up plants from one tray and placing them in another. The movement is made by a 48V direct current motor.

Axis U   This is the path normally situated on the left side of the machine. It is formed by a belt, complete with sliding wheels or a series of sliding wheels fixed to a chain. The young plant trays slide between these. The movement is made by a 48V direct current motor. The track moves forwards towards the operator.

Axis Z   This is the path where the trays or pots, containing the transplanted plants, move. This path can be a conveyor belt run by a 48v direct current motor. The conveyor moves forwards towards the operator.
In other cases this path is represented by a transport system for pots or trays on a pot filling machine.

Axis W1   This is head no. 1 complete with 24v direct current motor. The head moves linearly, on a guide from left to right and vice versa.

<u>Axis W2, W3, W4 etc.</u>   These are heads no. 2, no. 3, no. 4, etc. complete with 24v direct current motor. The heads all run linearly on the same guide from left to right and vice versa. The number of heads on the machine depends on the model.

5.2   Control Panel

The electrical control panel is normally positioned laterally, integrated in the protective framing of the machine.

All commands necessary for the functioning and programming of the machine are situated on the control panel.

Avoid getting water on the keyboard and the push buttons, and protect it from blunt instruments and naked flames. Clean with a soft damp cloth, do not use detergents or chemical products.
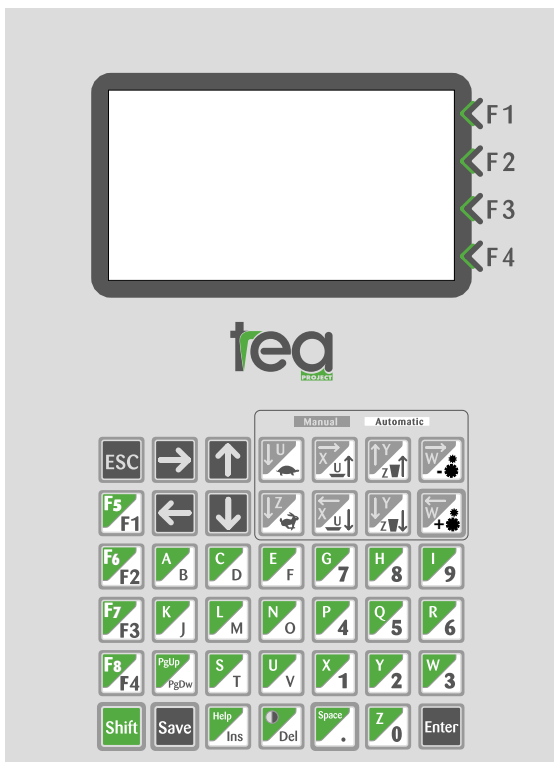
5.3   Emergency buttons

Red emergency buttons on a yellow background are located on the external panels and on the additional keyboard. The machine can be stopped by


the operator at any time by pushing one of these buttons, should people or objects be in danger.

As long as the push button remains pushed in, all other commands are deactivated and it is not possible to restart the machine from any other point.

When the emergency button is pulled back out the machine can be restarted by reactivating the Auxiliary On/Reset button and pressing the "START" button.

5.4   Safety guard

Clear plastic safety guards for the machine are provided with one or more doors, which can be opened by lifting them upwards. Opening these doors whilst the machine is operating will suspend all its functions. These can only be restored through the control panel when the door is closed, following the same procedure as with the emergency buttons. The safety guards and security switches must not be tampered with.
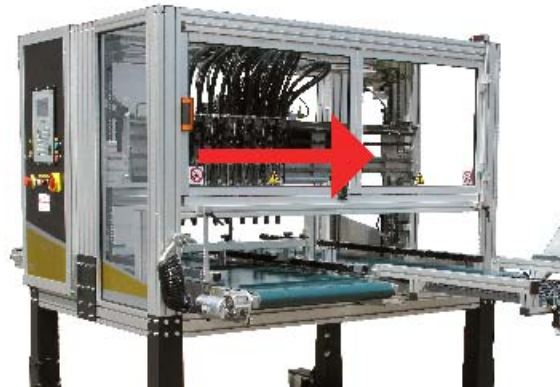

5.5   Electrical panels

The electrical panels are integrated in the structure of the machine and are suitably labelled.

In case of servicing pay attention to the instructions on the electrial scheme and use only qualified personnel.

Do no attempt to make alterations or adjustments inside the control cabinets, unless specifically instructed to do so by your authorised TEA dealer.
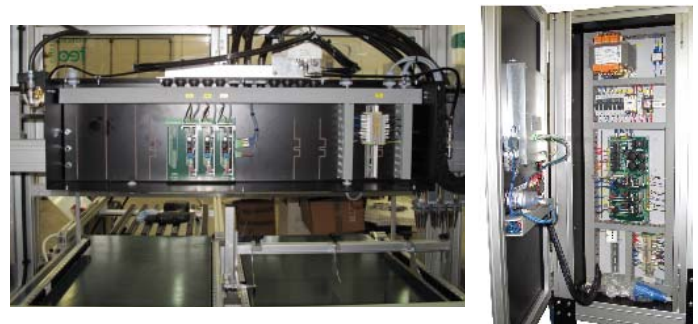
5.6   U Axis micro switch

A micro switch is positioned close to the guide on the right hand side of the plug tray path. This signals the presence of a tray to the computer. To clear trays from this area, see the procedure in the following chap-

ters.
Avoid manually removing trays as this risks damage to the micro switch.
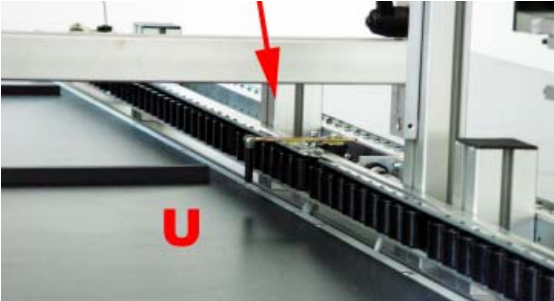
5.7   Z Axis Micro switch or Photocell

A micro switch (a photocell in some models) is situated close to the left guide of the right hand path where the conveyor belt is running.
This switch signals the presence of trays or pots to the electronic control.
To clear trays situated in the work area of the heads or close to the micro switch/photocell, see the procedure in the following chapters.
Avoid removing trays manually.
In the case of models operating directly on a filler, the micro switch is used to syncronize the two machines.

5.8 Motorized Heads

The combination of the elements picking up the plant is called a "HEAD".
Each head consists of 4 needle-holder extractors with 4 steel caps, 4 needles and a pneumatic cylinder which ejects and retracts the needles.
Each head is fixed to an electric motor which controls their positioning.

 There are different types of heads with different dimensions and functions.
The pick-up of the plant is always made from the top, with minimal damage to the foliage as it picks up the plug directly.

5.9   "U" and "Z" Axis Guides

The guides control the passage of the trays on the belt or roller transport.
They are always present on the "U" axis.
They might not be present on the "Z" axis.
The correct adjustment of these guides, especially on the "U" axis is important for a good transplanting result.
Carefully adjust the guides every time a new tray is used.

5.10 Tray restraint - "U" axis
The restraints on the "U" axis prevents the trays from moving during the phase where the plants are extracted.
The guides have to be tight to the trays, above all when handling plants with strong roots, to avoid the trays being lifted when the heads are extracted whilst picking up a plant.
The restraints should be positioned as close as possible to the trays and they should not hinder the work of the heads. Use an empty tray during the adjustment of the guides to make this positioning easier.

You will find a series of control buttons, manual switches, and lights marked with yellow labels, in addition to a computer with an alphanumeric keyboard, named TL2 positioned on the outside of the machine. A brief description of the functions of the control buttons and switches follows below.

However, in the following chapters the precise function of all the commands will be thoroughly described.

6.1 Buttons, lights and switches

Red ON-OFF switch
Positioned on the control panel of the machine near the computer. Turns the machine on and off.

POWER ON Light
Signals the presence of power

Green button/light "AUXILIARY ON/RESET"
It is necessary to press this button every time you start the machine and every time you want to exit an emergency condition.

Red EMERGENCY light
Signals the arrest of the machine caused by an emergency situation. The light switches off when the condition causing the emergency is removed and the "AUXILIARY ON/RESET" button is pressed.

Selector switch for lighting the machine
To turn the internal lights of the machine on and off.

Green START button
used when starting a run cycle or restarting a cycle which has been interrupted by an emergency situation

Red STOP button
used when interrupting (pausing) a cycle or completely stopping a run cycle (press and HOLD).

Red Emergency Switches
These have the classic "mushroom" shape.
The operator can isolate the machine, if people or objects are in danger, at any time by pushing one of these buttons.

6.2 Additional Keyboard

An additional mobile keyboard is available. It has the following buttons:
Red STOP button (will only pause cycle)
Green START button
Green "AUXILIARY ON/RESET" button/light
Red emergency switch

6.3 Keyboard TL2 computer

Alphanumeric keyboard
for entering data into the computer
The green/white keys contain numbers and letters.
Pressing the key makes the computer enters the character shown on the white background. Holding down the green "Shift" key, makes the computer enter the character shown on the green background.
for example:
to enter "4" press the 4 key
to enter the letter "P" press the same key whilst holding in the "Shift" key.

Black ESC key
Normally used to exit an entry or menu screen and return to the previous screen. Return to last step.

Black Save key
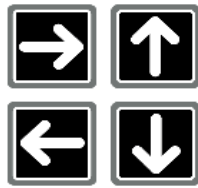Normally used to memorize a program which has just been written.

Black Enter key
Normally used to confirm the latest information entry or to pass from one line to the next.

Black Arrow keys (right, left, up, down) Normally used to move the cursor in the four directions on the display

"Function" keys (F1, F2, F3, F4)
Used individually they give access to the functions shown on the computer screen, particularly the functions F1, F2, F3 & F4.
The functions are often connected to the MENU displayed in the screen.

"Function" keys (F5, F6, F7, F8)
Used whilst pressing the green "Shift" key, to access to the functions described on the screen, particularly the functions F5, F6, F7 & F8.
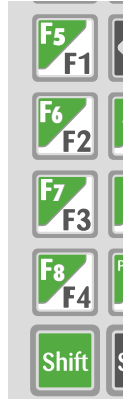
PgUp / PgDw key
Used to move to the next page when pressed by itself. Used to go to the previous page when pressed in combination with the green "Shift" key.

Help / Ins key
Inserts characters when used by itself. Used to enter on-line help when pressed in combination with the green "Shift" key.

Bright-Dark / Del key
Used to cancel characters shown on the display when used by itself. Used to change the brightness of the display when used in combination with the green "Shift" key.

Space / Dot key
Used to insert a decimal point on the display when used by itself. Used to insert a space on the display when used with the green "Shift" key.

MANUAL/ AUTOMATIC keys
In the upper right corner of the keyboard there are 8 keys in a grey and white square.
These are used for specific actions during the run cycle of the machine.
The keys have two different functions, depending on when they are used.
If the machine is executing a transplanting cycle (Automatic menu) the symbols in black on white background are active.
If, on the other hand, the machine's axes are being moved manually (Manual menu or learning cycle) the grey symbols are acttive.
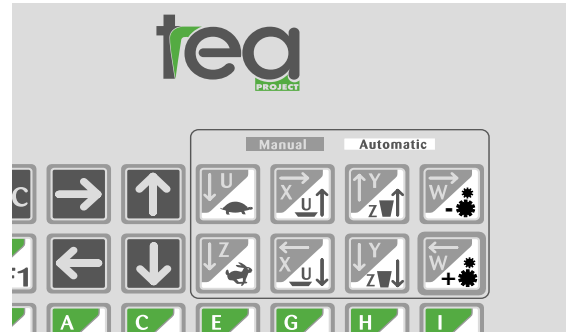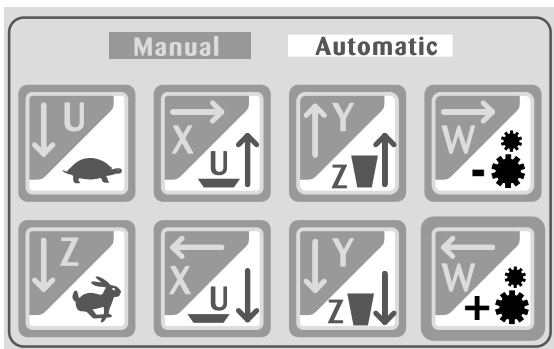
AUTOMATIC - 8 KEYS ON WHITE BACGROUND

1) TURTLE
   Reduces the run speed of the machine

2) HARE
   Increases the run speed of the machine

3) U + ARROW UP
   Raises the pick up depth of the heads when picking up plants

4) U + ARROW DOWN
   Lowers the depth of the heads when picking up plants

5) Z + ARROW UP
   Raises the planting depth of the heads in the transplanting cycle (the plants will be planted shallower)

6) Z + ARROW DOWN
   Lowers the planting depth of the heads in the transplanting cycle (the plants will be planted deeper)

7) GEAR-WHEEL WITH "-"
   Enables the potfiller and the "Z" axis movement when the transplanting cycle is not running

8) GEAR-WHEEL WITH "+"
   It sets the "U" axis transport system in automatic mode when the transplanting cycle is not running. It is also used to remove trays under the heads (moving the conveyor belt) when the transplanting cycle is not running
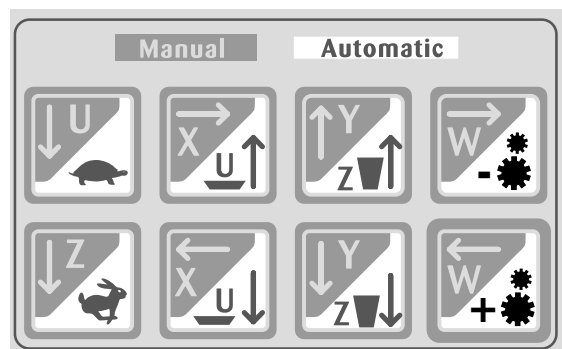
Manual - 8 keys on grey background

1) U + Arrow down
   Advances the pick up trays

2) Z + Arrow down
   Advances the placing trays or pots

3) X + Arrow to the right   NOT ACTIVE

4) X + Arrow to the left   NOT ACTIVE

5) Y + Arrow up
   Raises the trolley

6) Y + Arrow down
   Lowers the trolley

7) W + Arrow to the right
   Moves the heads towards the right

8) W + Arrow to the left
   Moves the heads towards the left

6.6   Display

Monochromatic backlit display with 420 semigraphic characters.

On the right side of the display the functions of the "F1, F2, F3 & F4" keys appear, according to the selected menu.
On all the display screens the last line of the display shows EMERGENCY messages or the state of the machine.

6.4   Serial Port

The RS232 serial port positioned on the back of the TL2 computer allows connection to a PC for exchange of data.
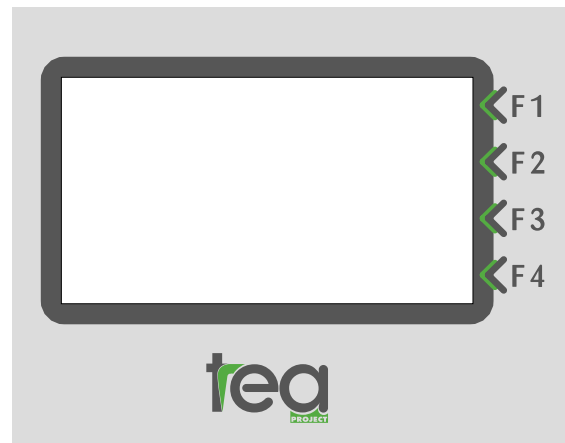
6.5   Floppy Disk / USB Key

Used to update the software of the machine and to make backup copies.

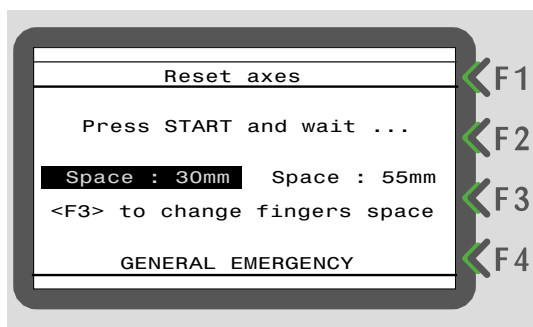## 7.1   Before switching on

Before switching on the machine check the following:
a)   The machine is connected to correct voltage.
b)   Air pressure 8 bar.
c)   The working area is cleared, ready for use.
d)   The safety guards are correctly secured.
e)   The emergency buttons are not pushed down. If they are, reset them.

7.2   Starting the transplanter

After connecting the transplanter to the power source and the compressed air system, start the machine by rotating the red switch on the control panel.
At the same time the display will illuminate, and after displaying the program version for a couple of seconds the following will be shown in the display: (Note that it may take a while for the display to reach full brightness)

```
          Reset axes                    <F1

    Press START and wait ...            <F2

  Space : 30mm     Space : 55mm         <F3
 <F3> to change fingers space

       GENERAL EMERGENCY                <F4
```

The white 'Power On' and the red 'Emergency' lights will then be illuminated.
Push the green "Auxiliary On / Reset" button which will illuminate and the red "Emergency" light will turn off.
The upper part of the display will normally display the current status of the machine. In this case the display tells us that the machine is waiting to reset the axes.
The central part of the display will show the instructions awaiting action. In this case the computer tells us to press the START button to start working, and wait for further instructions.

Machines can mount different models of finger with different dimensions. In order to make the best use of the machine potential, the software can close up the fingers as much as possible according to the model of finger.
This feature allows the use of the same program even with fingers of different dimensions.
This feature must be used carefully in order to avoid that a value erroneously choosen would damage the fingers.
Should you have any doubt when replacing fingers of different models, call the technical assistance.

Pay attention to the kind of finger fitted.
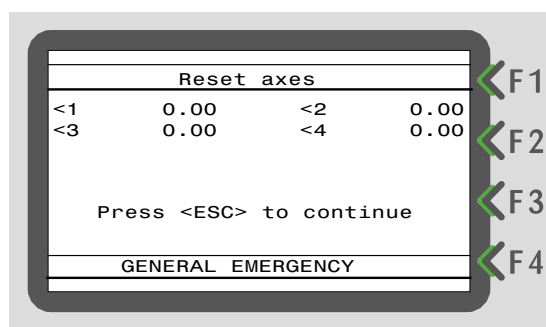The value loaded from the machine is the white text on black backgound.
To choose a different value, press <F3> button.
Every time you turn on the machine, the display will select the value set the last time the machine was run.
If the fingers have not been replaced with other of different model, the value must not be changed.
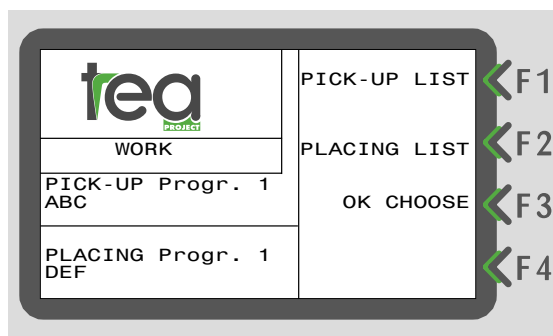
In the lower part of the display possible error messages will appear. In this case the computer signals a general state of emergency. This message disappears as soon as you push the "Auxiliary On / Reset" button.

When the "START" button is pressed the machine moves all axes to their start positions and the following is shown in the display:

```
          Reset axes                    <F1
<1      0.00     <2      0.00
<3      0.00     <4      0.00           <F2

                                        <F3
     Press <ESC> to continue

       GENERAL EMERGENCY                <F4
```

This screen enables technicians to find the correct position of the encoders on the motors.

Push "ESC" and the following screen will appear:

```
  tea
  PROJECT        PICK-UP LIST           <F1

    WORK         PLACING LIST           <F2
 PICK-UP Progr. 1
 ABC              OK CHOOSE             <F3

 PLACING Progr. 1
 DEF                                    <F4
```

The display shows the "WORK" screen.
Later on we will see how it is possible to reach this screen directly from the main menu.

On the left side, under the TEA logo, "WORK" is displayed, which indicates in which position you are.
Always on the same side, we find the programs information (the Pick-Up and the Placing program) which are on memory and are ready to be run. In particular, we can see the kind of program (Pick-Up or Placing), the position number in the respective list, and the name given to the program.

On the right side of the display there are 3 menu entries:
F1: PICK-UP LIST (go to the pick-up programs list)
F2: PLACING LIST (go to the placing programs list)
F3: OK CHOOSE (start working with the pick-up and placing programs reported on the left side of the display).

If the Pick-Up and Placing programs reported on the left side of the display are the ones you want to use, it is possible to start working pressing F3 button. (go to the next paragraph).
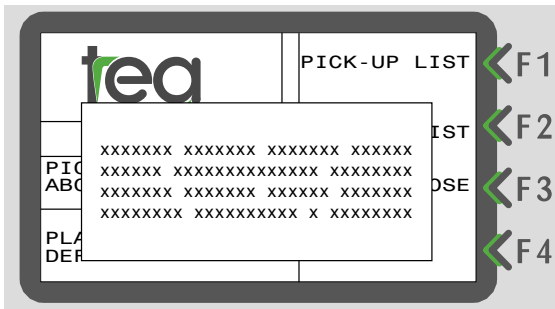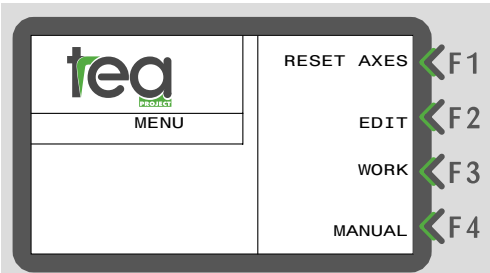
7.3   On-line help

If, during use of the computer, you find yourself in doubt about a situation, it is always possible to activate the context sensitive on-line help.
Push the "HELP" key and a note, related to the current display will appear on the screen.
Remember that to activate instructions or characters written on the green part of the key, you need to simultaneously push the green "Shift" key.
After the on-line help screen appears, pressing any key will terminate this function.
ex.
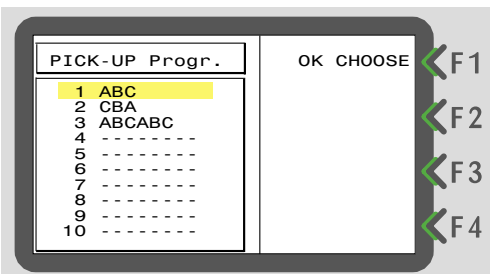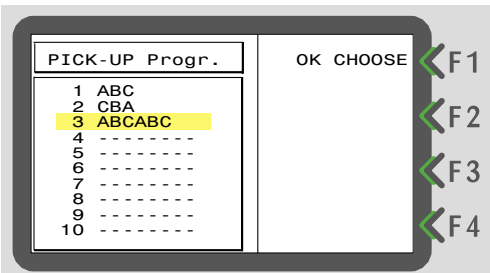*If pressing "HELP" when on the previous screen, the following help will appear.*

```
tea
PROJECT
MENU                 RESET AXES  ◀F1

                          EDIT  ◀F2

                          WORK  ◀F3

                        MANUAL  ◀F4
```

Press F3 to go to the WORK menu

F7 / F3

```
tea
PROJECT
WORK              PICK-UP LIST  ◀F1

                 PLACING LIST  ◀F2
PICK-UP Progr. 1
ABC                 OK CHOOSE  ◀F3

PLACING Progr. 1
DEF                            ◀F4
```
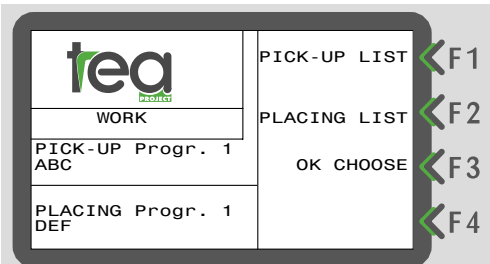
Press F1 to show the list of Pick-Up programs

F5 / F1

```
PICK-UP Progr.      OK CHOOSE  ◀F1

 1 ABC
 2 CBA
 3 ABCABC                      ◀F2
 4 --------
 5 --------
 6 --------                    ◀F3
 7 --------
 8 --------
 9 --------
10 --------                    ◀F4
```

Highlight the wanted program with the arrows

→ ↑
← ↓

```
PICK-UP Progr.      OK CHOOSE  ◀F1

 1 ABC
 2 CBA
 3 ABCABC                      ◀F2
 4 --------
 5 --------
 6 --------                    ◀F3
 7 --------
 8 --------
 9 --------
10 --------                    ◀F4
```

Confirm the selection pressing F1

F5 / F1

```
tea
PROJECT
WORK              PICK-UP LIST  ◀F1

                 PLACING LIST  ◀F2
PICK-UP Progr. 3
ABCABC              OK CHOOSE  ◀F3

PLACING Progr. 1
DEF                            ◀F4
```
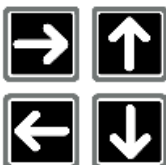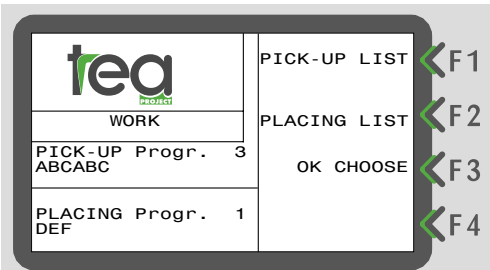
Press F2 to show the list of Placing programs

F6 / F2

```
PLACING Progr.      OK CHOOSE  ◀F1

 1 DEF
 2 FED
 3 DEFDEF                      ◀F2
 4 --------
 5 --------
 6 --------                    ◀F3
 7
```
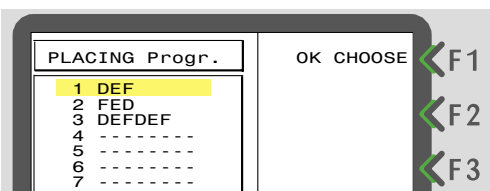
Highlight the required program with the arrows

```
PLACING Progr.      OK CHOOSE  ◀F1

 1 DEF
 2 FED
 3 DEFDEF                      ◀F2
 4 --------
 5 --------
 6 --------                    ◀F3
 7 --------
 8 --------
 9 --------
10 --------                    ◀F4
```

Confirm the selection pressing F1

F5 / F1

```
tea
PROJECT
WORK              PICK-UP LIST  ◀F1

                 PLACING LIST  ◀F2
PICK-UP Progr.  3
ABCABC              OK CHOOSE  ◀F3

PLACING Progr.  2
FED                            ◀F4
```
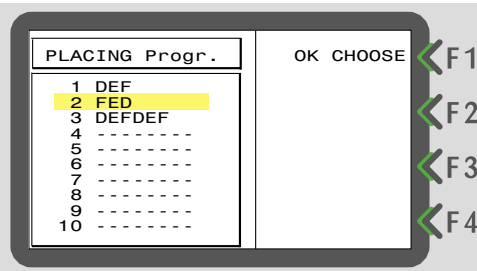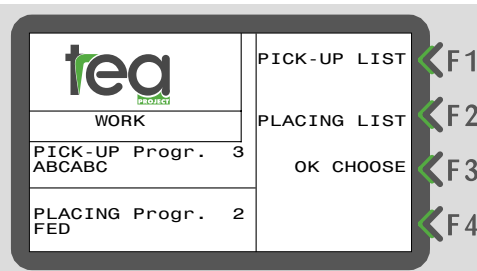
Confirm the combination of Pick-Up and Placing program by pressing F3

F7 / F3

```
                               ◀F1
      Loading: WAIT !
                               ◀F2

                               ◀F3

                               ◀F4
```
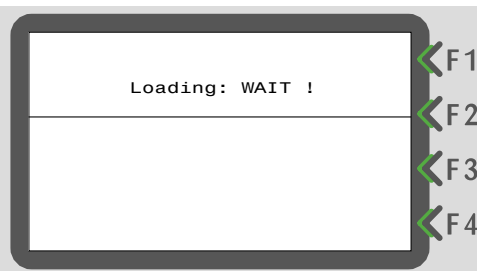
The computer is loading the programs
- wait -

```
                               ◀F1
     fingers Excluded
   rows left in picking-up      ◀F2

                               ◀F3

                               ◀F4
```
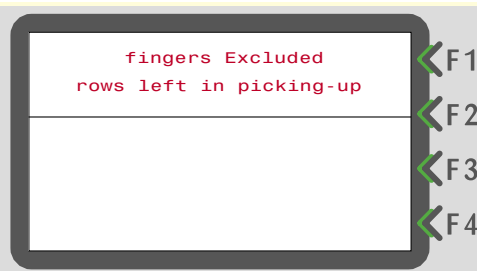
When this screen will appear, it means that the computer is excluding some fingers or some plants will remain in the tray.
Press ENTER to continue.

Enter

```
   AUTOMATIC                    ◀F1
 PICK-UP Progr.  PLACING Progr.
 P:03   ABCABC   P:02     FED
 Pick-up    1.2  Placing   9.9  ◀F2

 Trays no.    0  Trays no.   0
                               ◀F3
 Speed%  91       -FILLER READY

 SIDE PICK-UP:F1          20.0  ◀F4
```
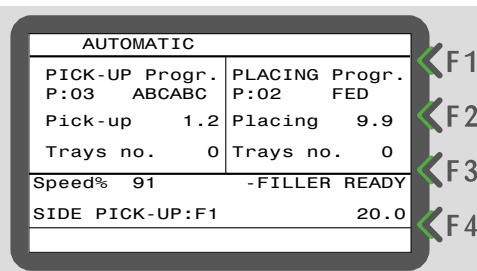
Press START to work

START

DURING AN AUTOMATIC CYCLE (while the machine is working) it is possible to perform different operations without stopping the machine.

```
      AUTOMATIC
 PICK-UP Progr.  PLACING Progr.
 P:03   ABCABC   P:02      FED
 Pick-up    1.2 Placing   9.9
 Trays no.    0 Trays no.   0
 Speed%  91       -FILLER READY
 SIDE PICK-UP:F1          20.0
```
⟨F1 ⟨F2 ⟨F3 ⟨F4

The buttons which allow you to do those modifications are almost all in the upper corner of the keyboard and, in particular, the operative ones are the black icons on white background.

Manual   Automatic

CHANGE the WORK SPEED

Press the TURTLE button to DECREASE the work speed.

Press the HARE button to INCREASE the work speed.

The value is expressed in % from 1 (lowest speed) to 100 (maximum speed).

```
 Pick-up    1.2 Placing   9.9
 Trays no.    0 Trays no.   0
 Speed%  91       -FILLER READY
 SIDE PICK-UP:F1          20.0
```
⟨F2 ⟨F3 ⟨F4

CHANGE the PLACING DEPTH

To DECREASE the placing depth, keep the "Shift" button pressed and in the meantime press "Z arrow UP" button.
The value shown on the display will increase (it is increasing the distance between the fingers and the work surface) therefore the plant will be placed higher.

Shift

To INCREASE the placing depth, keep the "Shift" button pressed and in the meantime press "Z arrow DOWN" button.
The value shown on the display will decrease (it is decreasing the distance between the

Shift

fingers and the work surface) therefore the plant will be placed deeper.

```
      AUTOMATIC
 PICK-UP Progr.  PLACING Progr.
 P:03   ABCABC   P:02      FED
 Pick-up    1.2 Placing   9.9
 Trays no.    0 Trays no.   0
 Speed%  91       -FILLER READY
 SIDE PICK-UP:F1          20.0
```
⟨F1 ⟨F2 ⟨F3 ⟨F4

Distance between the working surface and the needles end while placing; value expressed in millimitres.

CHANGE the PICK-UP DEPTH

To DECREASE the picking-up depth, keep the "Shift" button pressed and in the meantime press "U arrow UP" button.
The value shown on the display will increase (it is increasing the distance between the fingers and the work surface) therefore the plant will be picked-up higher.

Shift

To INCREASE the picking-up depth, keep the "Shift" button pressed and in the meantime press "U arrow DOWN" button.
The value shown on the display will decrease (it is decreasing the distance between the fingers and the work surface) therefore the plant will be picked-up deeper.

Shift

```
      AUTOMATIC
 PICK-UP Progr.  PLACING Progr.
 P:03   ABCABC   P:02      FED
 Pick-up    1.2 Placing   9.9
 Trays no.    0 Trays no.   0
 Speed%  91       -FILLER READY
 SIDE PICK-UP:F1          20.0
```
⟨F1 ⟨F2 ⟨F3 ⟨F4

ACTIVATE SIDE PICK-UP

Press "F1" button to Activate SIDE PICK-UP option.
When this option is ACTIVE the last line of the display will be WHITE written on BLACK background.

Press "F1" button again to Deactivate SIDE PICK-UP option.
When this option is NOT ACTIVE the last line of the display will be BLACK written on WHITE background.

```
      AUTOMATIC
 PICK-UP Progr.  PLACING Progr.
 P:03   ABCABC   P:02      FED
 Pick-up    1.2 Placing   9.9
 Trays no.    0 Trays no.   0
 Speed%  91       -FILLER READY
 SIDE PICK-UP:F1          20.0
```
⟨F1 ⟨F2 ⟨F3 ⟨F4

SIDE PICK-UP active

CHANGE the SIDE PICK-UP DEPTH

To DECREASE the placing depth during a SIDE PICK-UP, keep the "Shift" button pressed and in the meantime press the "Arrow UP" button.
The value shown on the display will increase (it is increasing the distance between the fingers and the tray).

Shift **↑**

To INCREASE the placing depth during a SIDE PICK-UP, keep the "Shift" button pressed and in the meantime press the "Arrow DOWN" button.
The value shown on the display will decrease (it is decreasing the distance between the fingers and the tray).

Shift **↓**

```
   AUTOMATIC                    ◄F1
 PICK-UP Progr. PLACING Progr.
 P:03  ABCABC  P:02    FED
 Pick-up    1.2 Placing   9.9   ◄F2
 Trays no.    0 Trays no.   0
                                ◄F3
 Speed%  91        -FILLER READY
 SIDE PICK-UP:F1          20.0  ◄F4
```

Distance from the tray to the fingers during side pick-up; value exspressed in millimitres.

RESET THE PICK-UP AND PLACING COUNTER

Press the "F2" black button to RESET the PICK-UP COUNTER. After this, a request of confirmation will appear on the display; confirm pressing the "Y" button.

F6/F2

Shift **Y/2**

Press the "F4" black button to RESET the PLACING COUNTER. After this, a request of confirmation will appear on the display; confirm pressing the "Y" button.

F8/F4

Shift **Y/2**

```
   AUTOMATIC                    ◄F1
 PICK-UP Progr. PLACING Progr.
 P:03  ABCABC  P:02    FED
 Pick-up    1.2 Placing   9.9   ◄F2
 Trays no.    0 Trays no.   0
                                ◄F3
 Speed%  91        -FILLER READY
 SIDE PICK-UP:F1          20.0  ◄F4
```

Number of pick-up trays emptied.

```
 Pick-up    1.2 Placing   9.9   ◄F2
 Trays no.    0 Trays no.   0
                                ◄F3
 Speed%  91        -FILLER READY
 SIDE PICK-UP:F1          20.0  ◄F4
```

Number of trays transplanted

10.1   Definition of "Program"

A programme is a sequence of instructions to position the heads either in the tray where the plants are picked up, or in the tray/pot where the plants are being transplanted.

The set of instructions related to picking-up the plants is called : PICK-UP PROGRAM.

The set of instructions related to the deposit of the plants is called: PLACING PROGRAM.

The PICK-UP and PLACING programs are clearly distinct and separate from each other.

Carrying out a transplant operation means combining a PICK-UP and a PLACING program.
The combination of the two programs is automatically done by the machine.

The transplanter carries out the two programs simultaneously: when it is picking-up a plant it carries out the instructions written in the PICK-UP program; when it is depositing a plant, it carries out the instructions written in the PLACING program.

10.2   Stored programs

The programs are written directly on the keyboard of the TL2 computer and memorized giving a name of maximum 8 characters.
It is possible to memorize 99 PICK-UP and 99 PLACING programs.
To start working it is necessary to choose the appropriate PICK-UP and PLACING programs; there is always the possibility of deleting programs which are no longer used and writing new ones.
The selection of the programs to use is made from the display.

Some instructions on how to carry out, register and modify programs will follow. It is recommended to do periodically a back-up copy of the programs; this will avoid to rewrite them in the unlikely event of failure of the computer.

11.1   Starting - Work Menu

As seen in the previous chapters, the display will show the "WORK" screen when starting the machine; from this screen it is easy to choose stored programs to start an AUTOMATIC work cycle.
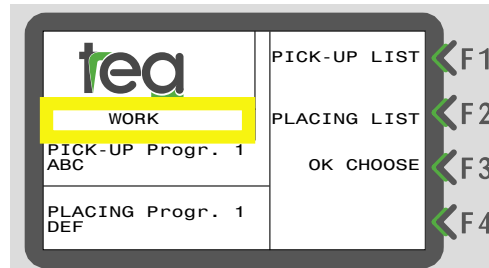
11.2   Main MENU

From the WORK menu it is possible to go to the MAIN menu pressing the "ESC" button.
From the MAIN menu you have access to 4 different functions pressing F1, F2, F3 or F4 buttons.
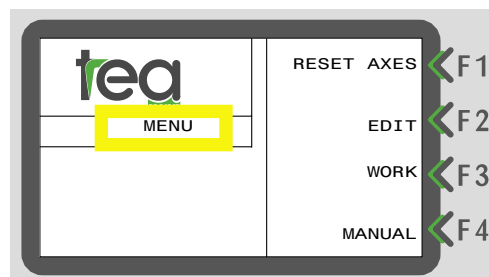
11.3   F1 - RESET AXES

Useful function for resetting the machine without having to turn it off and on again. Normally this function is only required when general parameters of the machine are being changed. Such operation is usually done by qualified personnel or after explicit instructions during maintenance.
The reset axes sequence is described in chapter 7 "Startup Procedure".
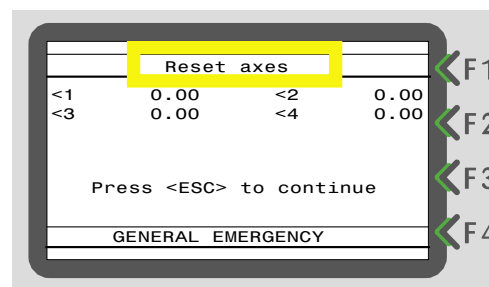
11.4   F2 - EDIT

This function allows writing, modifying or deleting programs.

It has to be used every time a new programme has to be written.

At this point the display gives the option to choose between the PICK-UP and the PLACING programs.

PICK-UP ◄F1

EDIT   PLACING ◄F2

◄F3

◄F4
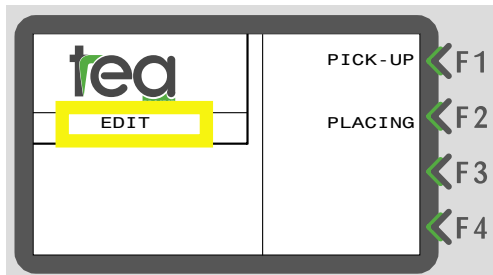
Choosing "PICK-UP" the display will show the list of "PICK-UP" programs and 4 options:
• EDIT to write a new program
• DELETE to delete one or more existing programs
• SAVE FD to save the program on Floppy disk / USB Key
• LOAD FD to load a program from Floppy disk / USB key.

PICK-UP Progr.   EDIT ◄F1
1 ABC
2 CBA
3 ABCABC   DELETE ◄F2
4 --------
5 --------
6 --------   Save FD ◄F3
7 --------
8 --------
9 --------
10 --------   Load FD ◄F4
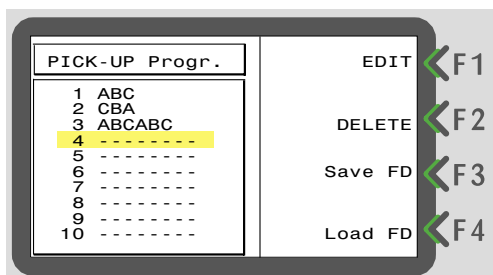
Choosing "PLACING" the display will show the list of "PLACING" programs and, as in the previous case, 4 options: EDIT, DELETE, SAVE FD and LOAD FD.

PLACING Progr.   EDIT ◄F1
1 DEF
2 FED
3 DEFDEF   DELETE ◄F2
4 --------
5 --------
6 --------   Save FD ◄F3
7 --------
8 --------
9 --------
10 --------   Load FD ◄F4
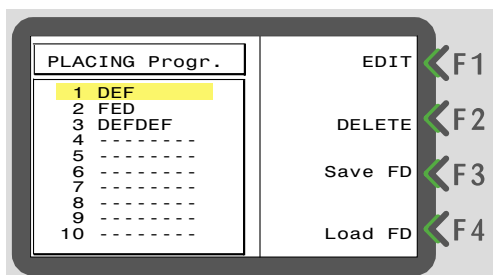
11.5   F3 - WORK

Returns to the "WORK" menu described previously.

PICK-UP LIST ◄F1
WORK   PLACING LIST ◄F2
PICK-UP Progr. 1
ABC   OK CHOOSE ◄F3
PLACING Progr. 1
DEF   ◄F4
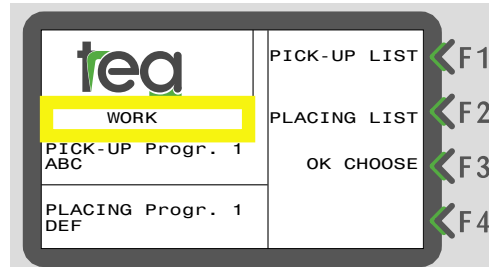
11.6   F4 - MANUAL

Function for entering into manual movement of the axes.

Press "F4" and the display will show as follows.

In the upper part of the display we can see that the computer suggests to move the axes manually at low speed.

To move the axes at a higher speed press "F1".

In the central part of the display all the axes present and their current positions are listed.

In the lower part of the display we can see the state of the machine at the moment.

PAY PARTICULAR ATTENTION WHEN MOVING THE AXES MANUALLY, AS ALL THE OVERLOAD SENSORS OF THE MOTORS ARE DEACTIVATED.

Manual slow - F1 fast ◄F1
<1   0.00   <2   0.00
<3   0.00   <4   0.00 ◄F2
◄F3
GENERAL EMERGENCY ◄F4
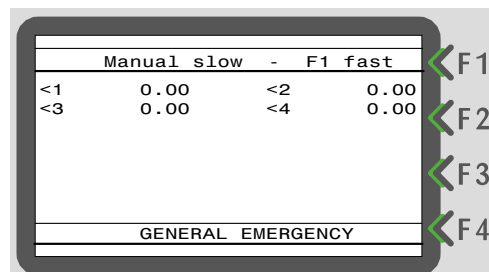
It is important to remember that when in "MANUAL" mode, the active keys are the ones with white characters on grey background.

1) U + ARROW DOWN
Advances the pick-up trays
2) Z + ARROW DOWN
Advances the placing trays or pots
3) Y + ARROW UP
Raises the trolley
4) Y + ARROW DOWN
Lowers the trolley
5) W + RIGHT ARROW
Moves the fingers towards the right
6) W + LEFT ARROW
Moves the heads towards the left
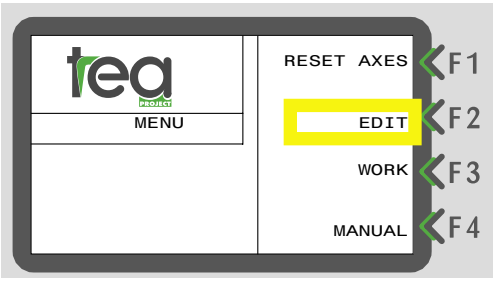
From the "RUN" menu, press ESC to go to the main menu. Press F2 to go to the "EDIT" menu.

Press F1 to go to the PICK-UP list.
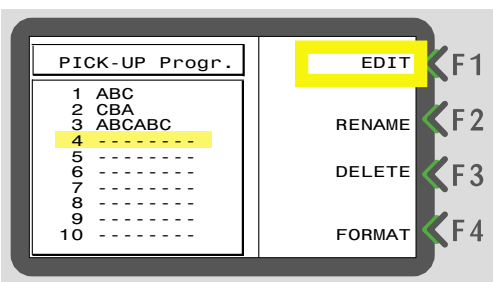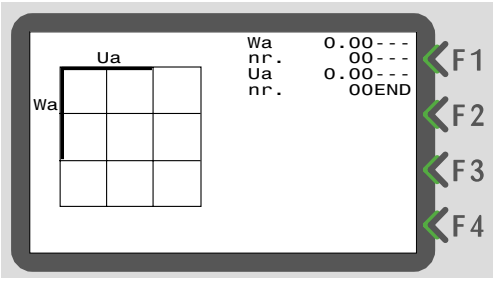
Use the ARROW DOWN button to highlight a blank program location, and press F1 to edit.

Enter the new program name (up to 8 characters), and press ENTER.

When this screen appears, press F3 to enter the grid dimensions.
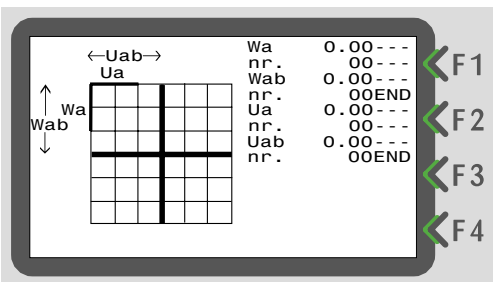
Use the Shift+PgUp keys to select the grid type. Enter the tray dimensions, pressing ENTER after each entry. When complete, press SAVE or ESC to move to the previous screen.
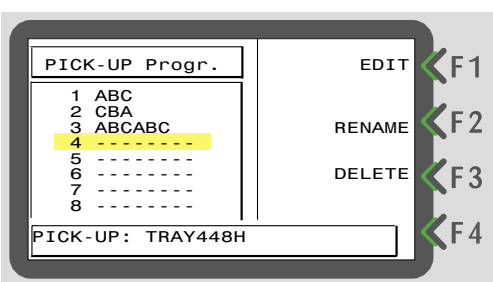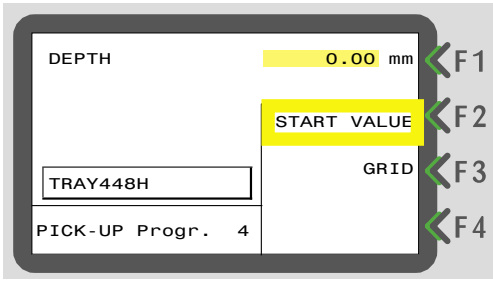
Press F2 to start the process of determining the first row position.
If a message "Pickup: rows excluded" or "Pickup: heads excluded" appears, press ENTER to continue.

```
START :  first axis value
ESC : manual movements
```
F1
F2
F3
F4
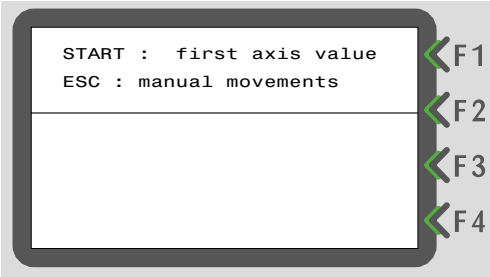
Press the green START button, and place a plug tray on the conveyor belt. The tray will advance and stop at a position just short of the correct place for the first pickup row. Depending on the software version, the next screen will appear automatically - if not, press ESC key.

START

```
Learning cycle start
U     0.00
W1    0.00
Y     0.00
X     0.00
                    MEMORIZE
PICK-UP Progr.

TRAY448H
```
F1
F2
F3
F4
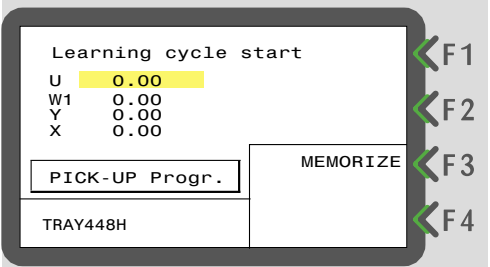
Press F4 to extend the needles, and using the grey U, W and Y keys, position head number 1 inside the centre of the plug on the left hand side of the first row of the tray (ignore other heads). When you are happy that it is correctly positioned, press the F3 key to memorize. You will be asked to confirm - press Shift+Y, and the dimensions will appear on the screen.

F8 / F4

tea
EDIT
PICK-UP
PLACING
F1
F2
F3
F4
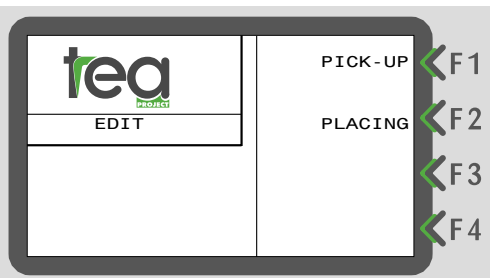
Press ESC, then ESC again, and you will be asked to Save - press Shift+Y, and the display will show:

SAVING...

ESC

tea
MENU
RESET AXES
EDIT
WORK
MANUAL
F1
F2
F3
F4
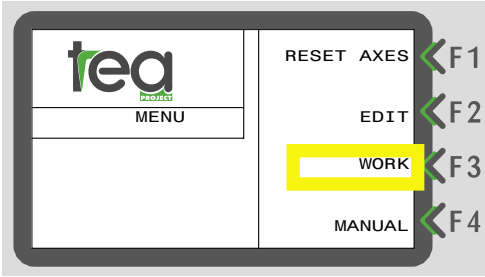
To run and test your program press ESC, then F3 to Run.

ESC

F7 / F3

tea
WORK
PICK-UP Progr. 1
ABC

PLACING Progr. 1
DEF
PICK-UP LIST
PLACING LIST
OK CHOOSE
F1
F2
F3
F4
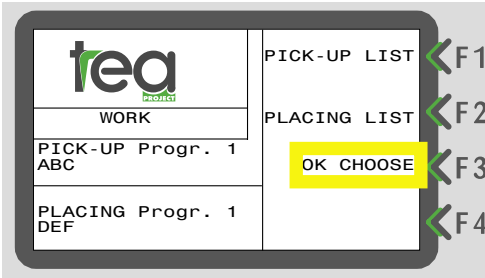
Press F3 for "Choice OK".
Note that you MUST have a placing program selected.
If a message "Pickup: rows excluded" or "Pickup: heads excluded" appears, press ENTER to continue.

Press START, and check the program. If there are any changes required, go back to the "EDIT Menu", select F1 (for "PICKUP"), and highlight the program with the DOWN ARROW key. Select F1 and edit the dimensions as required.

F7 / F3
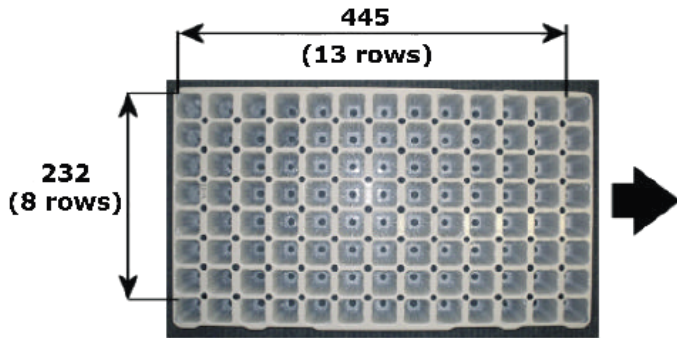
12.1   TRAY EXAMPLE 1

Grid type:
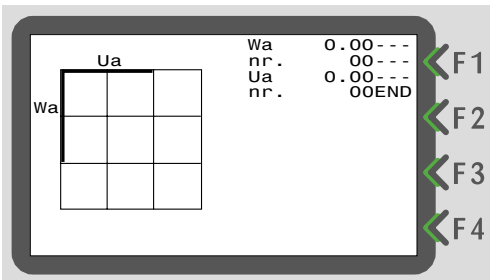
Values:

Wa = 232.00
nr. = 8
Ua = 445.00
nr. = 13

12.2   TRAY EXAMPLE 2
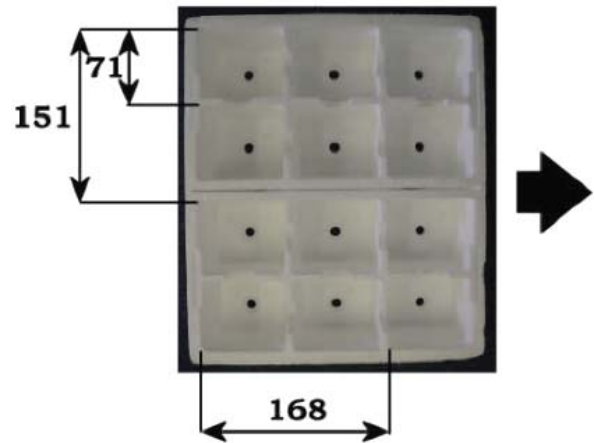
Grid type:
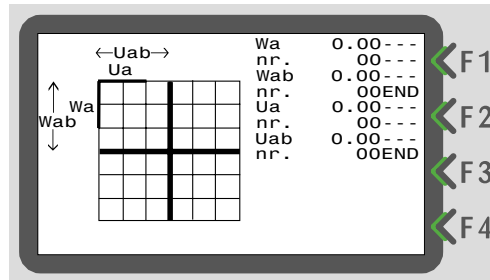
Values:

Wa = 71.00
nr. = 2
Wab = 151.00
nr. = 2
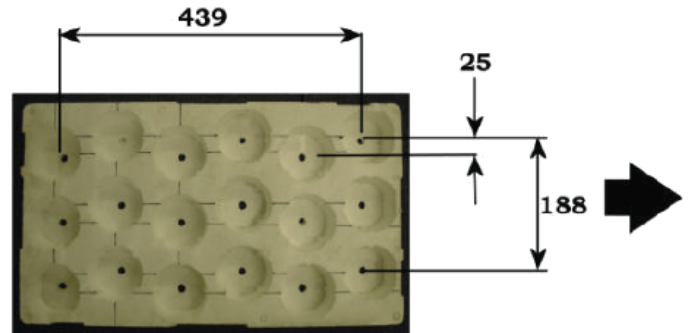Ua = 168.00
nr. = 3

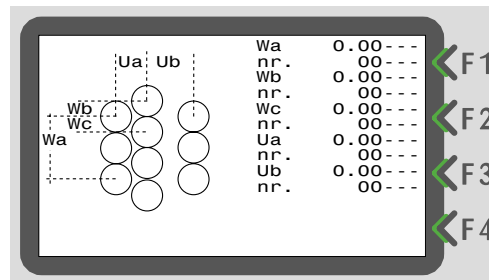## 12.3 TRAY EXAMPLE 3
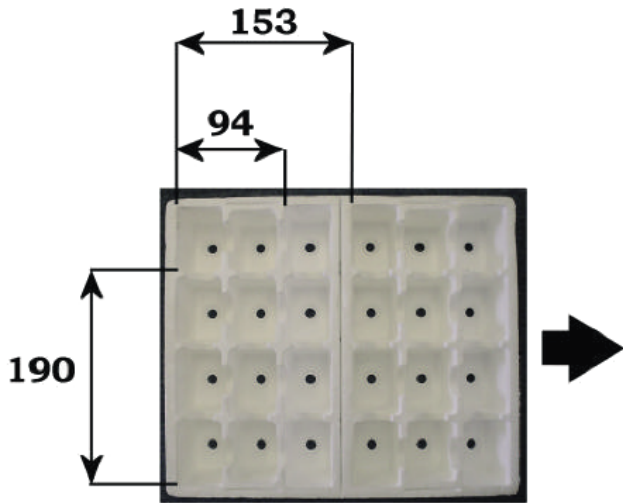
Grid type:
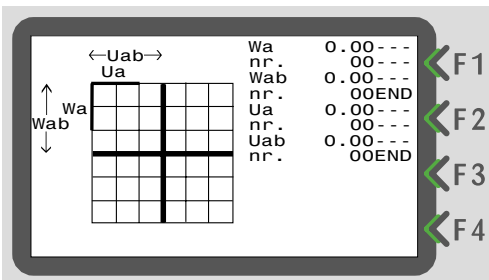
Values:

$Wa = 190.00$
$nr. = 4$
$Wab = 0.00$
$nr. = 0$
$Ua = 94.00$
$nr. = 3$
$Uab = 153.00$
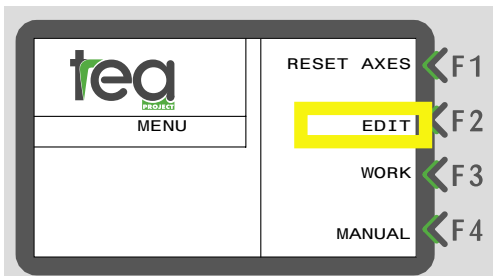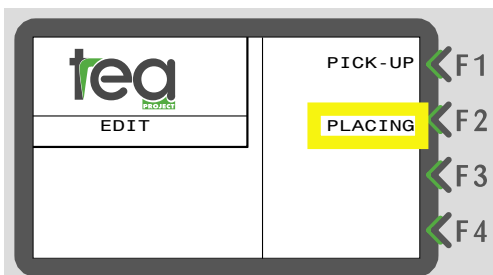$nr. = 2$

12.4 TRAY EXAMPLE 4

Grid type:

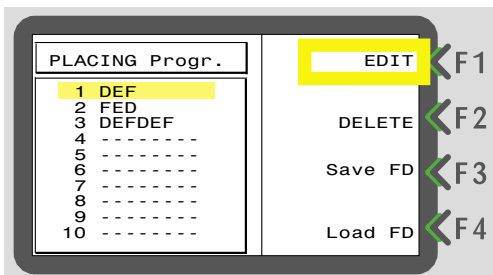
Values:

$Wa = 188.00$
$nr. = 3$
$Wb = 25.00$
$nr. = 3$
$Wc = 00.00$
$nr. = 0$
$Ua = 439.00$
$nr. = 6$
$Ub = 00.00$
$nr. = 0$

tea
PROJECT
MENU

RESET AXES ‹F1
EDIT ‹F2
WORK ‹F3
MANUAL ‹F4

ESC

F6 F2

From the "RUN" menu, press ESC to go to the main menu. Press F2 to go to the "EDIT" menu.

tea
PROJECT
EDIT

PICK-UP ‹F1
PLACING ‹F2
‹F3
‹F4

F6 F2

Press F2 to go to the PLACING list.

PLACING Progr.
1 DEF
2 FED
3 DEFDEF
4 --------
5 --------
6 --------
7 --------
8 --------
9 --------
10 --------

EDIT ‹F1
DELETE ‹F2
Save FD ‹F3
Load FD ‹F4

↓

F5 F1

Use the ARROW DOWN button to highlight a blank program location, and press F1 to edit.

PLACING Progr.
1 DEF
2 FED
3 DEFDEF
4 --------
5 --------
6 --------
7 --------
8 --------
NEW NAME ? : PAK2X3

WRITE ‹F1
RENAME ‹F2
DELETE ‹F3
‹F4

Enter

Enter the new program name (up to 8 characters), and press ENTER.

DEPTH   10.45 mm ‹F1
PLANTS PER POT   0
NR. OF FINGERS: 0
                START VALUE ‹F2
PACK2X3   GRID ‹F3
PLACING Progr. 4   POT ‹F4

F7 F3
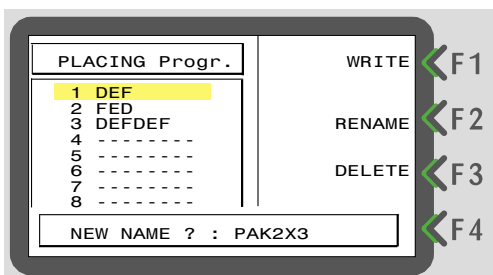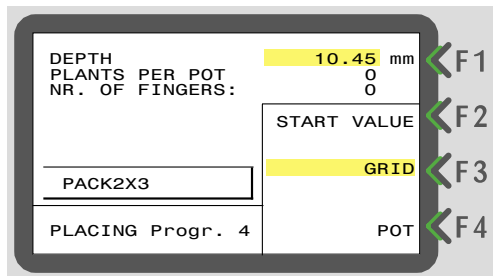
When the above screen appear, press F3 button to enter into the GRID settings.

Wa   0.00---
Za   nr.   00---
Za   0.00---
Wa   nr.   00END
‹F1
‹F2
‹F3
‹F4

←Zab→
Za
Wa
Wab

Wa   0.00---
nr.   00---
Wab   0.00---
nr.   00END
Za   0.00---
nr.   00---
Zab   0.00---
nr.   00END
‹F1
‹F2
‹F3
‹F4
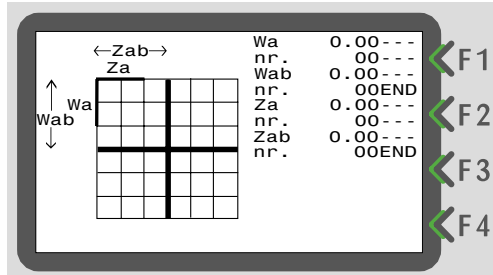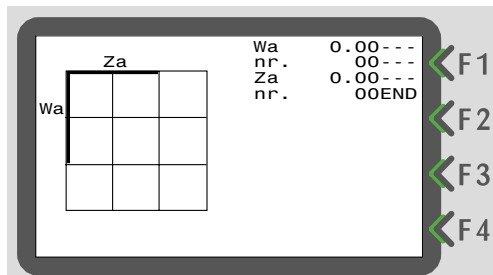
Shift **↑**

Enter

Use Shift+PgUp buttons to select the kind of grid. Enter the tray dimensions pressing ENTER after each value. Once the operation is finished, press SAVE or ESC buttons to return to the previous screen.

DEPTH   10.45 mm ‹F1
PLANTS PER POT   0
NR. OF FINGERS: 0
                START VALUE ‹F2
PACK2X3   GRID ‹F3
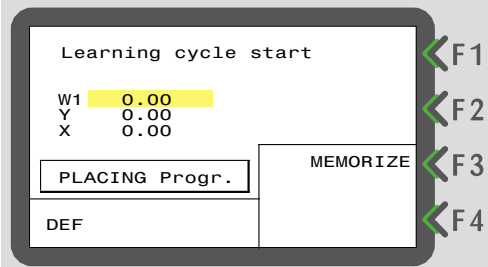PLACING Progr. 4   POT ‹F4

F6 F2
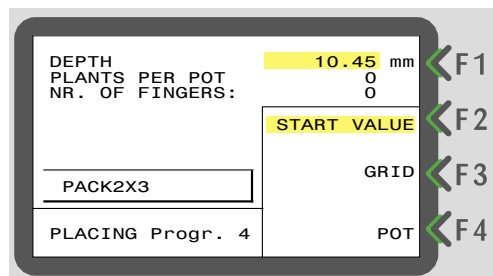
Press F2 button to start the process to set the first row position (START VALUE).
Should the message "Placing: rows excluded" or "Placing: fingers excluded" press ENTER to continue.

```
START :  first axis value
ESC : manual movements
```
F1
F2
F3
F4
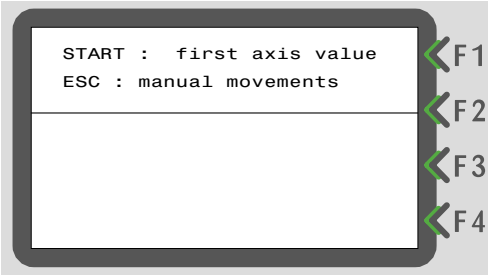
Press the green START button and put a tray on the conveyor belt. The machine will slowly position the tray and heads at a point close to the position where the first group of plants has to be planted, and then stop.
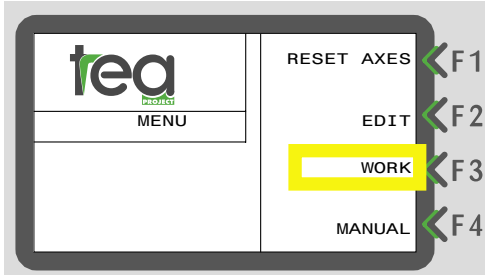
Depending on the software version, the following screen should appear automatically; if this does not happen, press ESC.
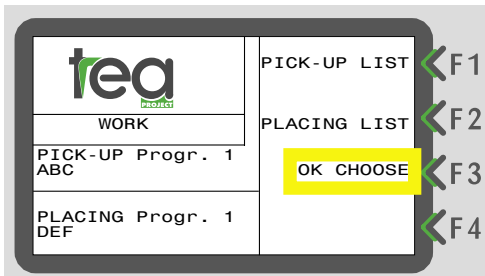
```
Learning cycle start

W1    0.00
Y     0.00
X     0.00
              MEMORIZE
PLACING Progr.

DEF
```
F1
F2
F3
F4

Press F4 to eject the needles and, using the gray buttons U, W & Y, position finger nr.1 in the middle of the first cell (on the left) in the first row of the tray (ignoring the other fingers). When finger nr.1 is in the correct position, press F3 to save. It will be asked to confirm - press Shift+Y and the values will appear on the display.

```
tea
            PICK-UP
   EDIT
            PLACING

```
F1
F2
F3
F4
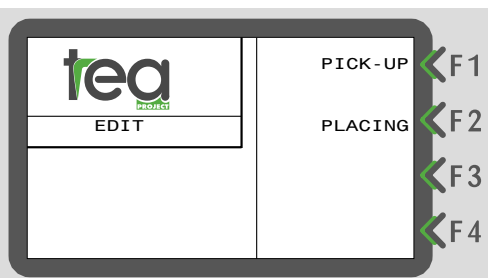
Press ESC two times and it will be asked to save - press Shift+Y and on the display will appear:

```
              SAVING...
```

To test and work with the new program, press ESC and then F3 to start working.

```
tea
            PICK-UP LIST
   WORK
            PLACING LIST
PICK-UP Progr. 1
ABC          OK CHOOSE

PLACING Progr. 1
DEF
```
F1
F2
F3
F4

```
tea
            RESET AXES
   MENU
            EDIT

            WORK

            MANUAL
```
F1
F2
F3
F4

Press F3 button for "Ok Choose".
Note that it is underlined necessary to have a program selected. Should the message "Placing: rows excluded" or "Placing: fingers excluded" appear, press ENTER to continue.
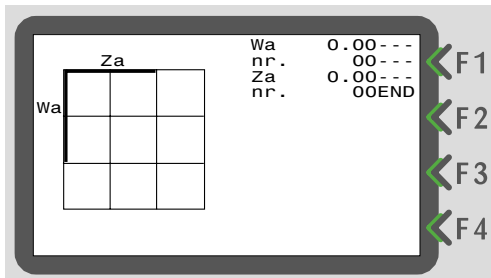
Press START and check the program. Should any modifications be necessary, go back to the "EDIT" menu, press F1 for "PLACING" and, with the Arrow Down, highlight the program you want to modify. Press F1 button and edit the dimensions as required.
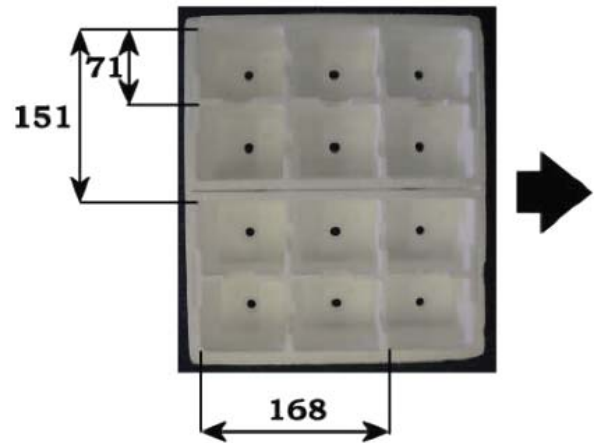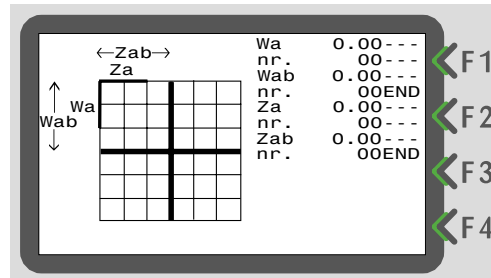
13.1   TRAY EXAMPLE 1
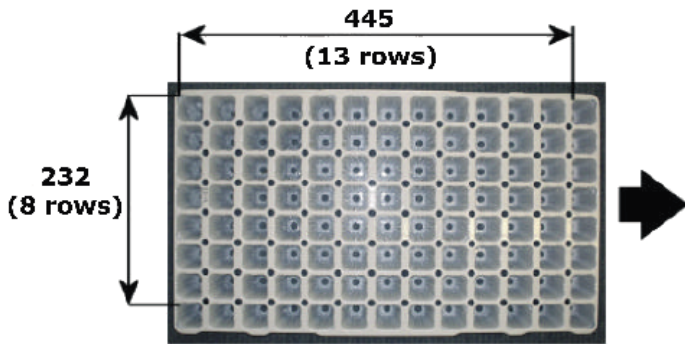
Grid type:

Values:

Wa = 232.00
nr. = 8
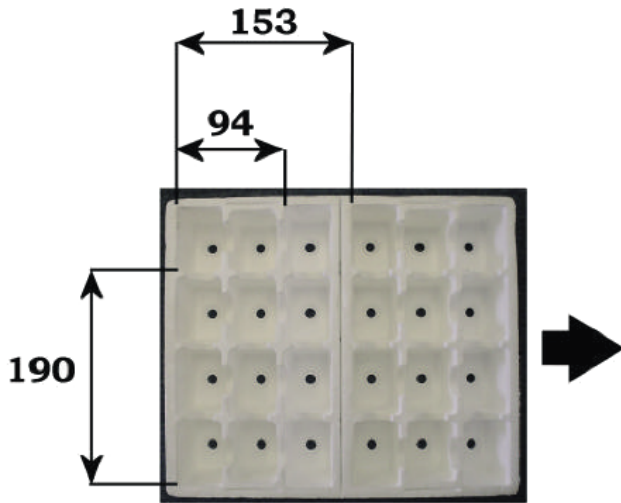*Za = 445.00*
nr. = 13

13.2   TRAY EXAMPLE 2

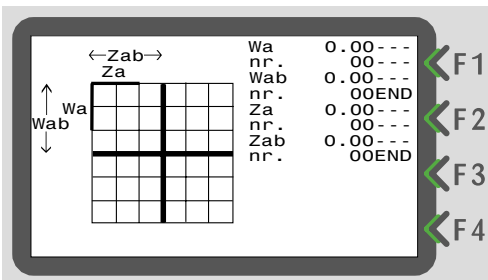Grid type:

Values:

Wa = 71.00
nr. = 2
Wab = 151.00
nr. = 2
Za   = 168.00
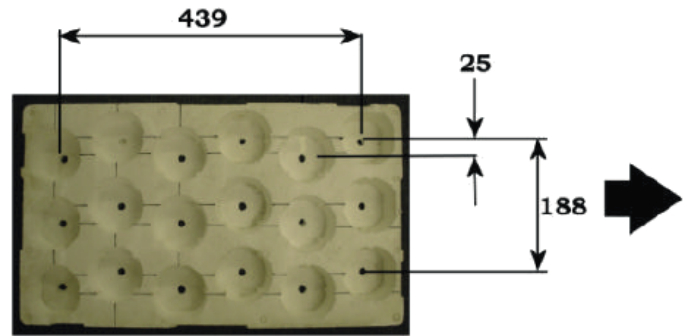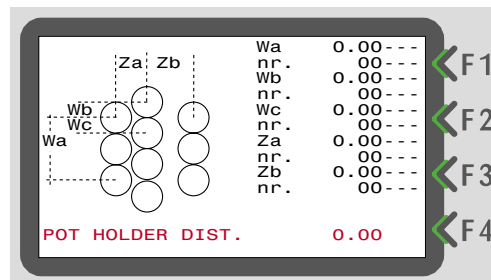*nr.   = 3*

13.3 TRAY EXAMPLE 3

Grid type:

Values:

$Wa = 190.00$
$nr. = 4$
$Wab = 0.00$
$nr. = 0$
$Za = 94.00$
$nr. = 3$
$Zab = 153.00$
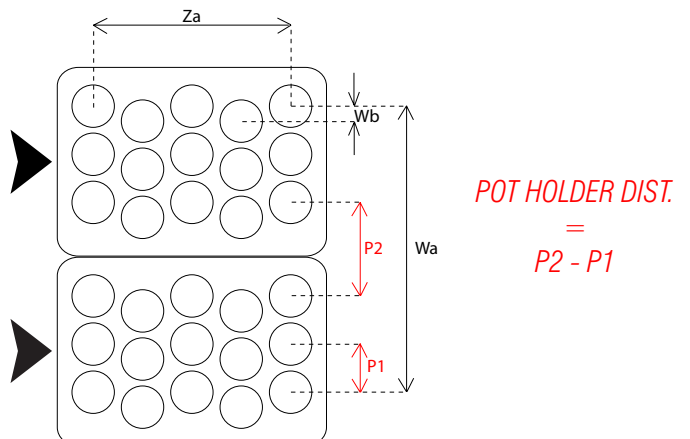$nr. = 2$

13.4 TRAY EXAMPLE 4

Grid type:

Values:

$Wa = 188.00$
$nr. = 3$
$Wb = 25.00$
$nr. = 3$
$Wc = 00.00$
$nr. = 0$
$Za = 439.00$
$nr. = 6$
$Zb = 00.00$
$nr. = 0$
$Pot\ holder\ dist. = 0.00$

<u>TO TRANSPLANT INTO 2 STAGGERED TRAYS SIDE BY SIDE:</u>
Press F4 and type the value "POT HOLDER DIST.".
This value is calculated deducting from P2 the value P1
(see drawing below).

POT HOLDER DIST.
=
P2 - P1

EXPLANATION OF MESSAGES AND WHAT TO DO

[E.04] GENERAL EMERGENCY:
an emergency input is not active.

> Verify all the emergency switches, buttons, the doors, etc... Look at the links of the emergency stop circuit on the electrical diagram supplied with the machine.

[E.05] LOW PRESSURE:
Air pressure is too low.

[E.06] STOP CYCLE:
the Stop Cycle Input is open.

> Verify the contacts on Stop buttons and connections.

[E.29] OFFSET MOVEMENT AXES:
one of the axes does not run to the expected speed or speed is out of the limits as from Axis Parameter nr.11.

> Check electrical supply, axis movement, encoder, wire connections.

[E.30] SAT TRANSMISSION:
there is an anomaly in data transmission between Master drive card and a Slave card.

> Check cable connections, terminal boards and clamps. Verify if the card is Ok.

[E.34] Y AXIS OVER LIMITS:
a dimension for Y Axes in a program, is over the lowest or the highest limit.

[E.35] W AXIS OVER LIMITS:
a dimension for W Axes in a program, is over the lowest or the highest limit.
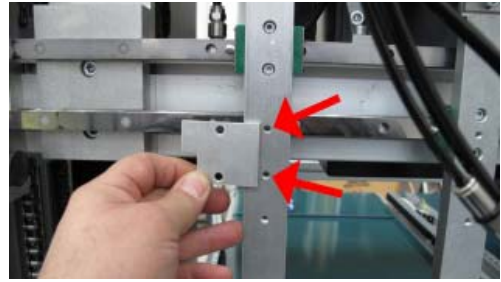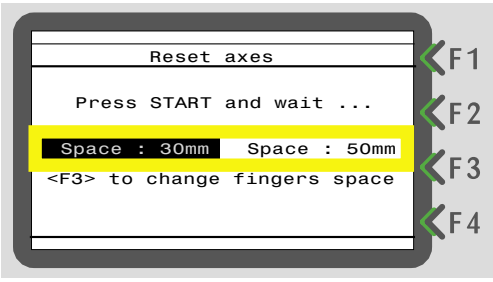
[E.36] X AXIS OVER LIMITS:
a dimension for X Axes in a program, is over the lowest or the highest limit.
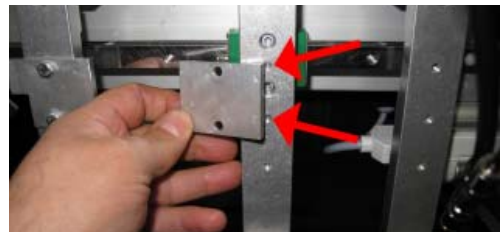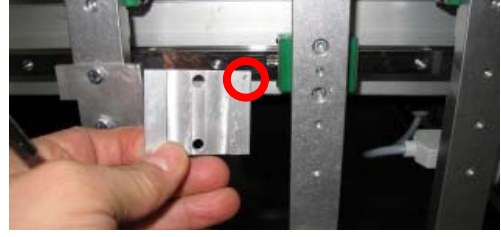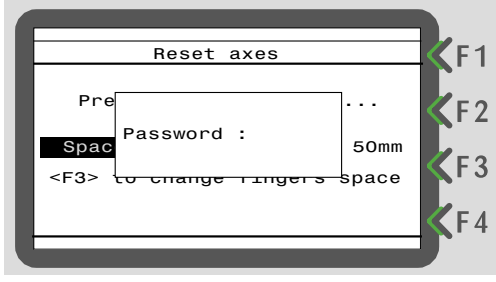
[E.41] MAX POWER MOTOR:
one motor exceeded the maximum power limit, as from Axes Parameter nr.15.

> Check if motor runs and if axes moves smoothly.

After [E.29], [E.30] and [E.41] warning messages are displayed, press the "STOP" button and another message is displayed. It shows which axes is causing the problem.
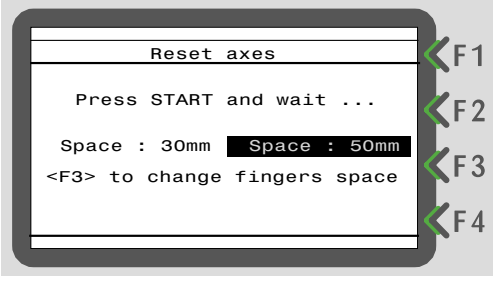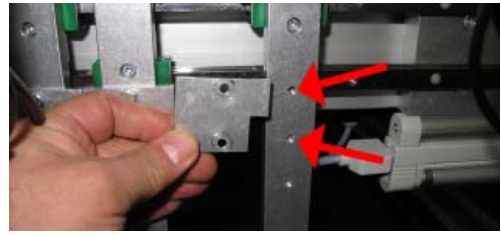
After the start of the machine press F3 to change the fingers space (from 30 to 50mm).
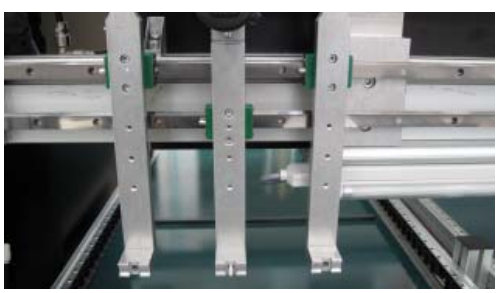

Enter the password "272727".
Press "ENTER" to confirm.

The display will show like this.
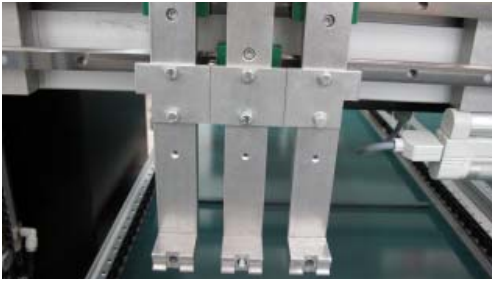

Remove the 30mm fingers.

Mount the plates and check that the reference mark on the back is always on the same side.

Fix in the marked holes.

Mount the central plate/plates as shown.

Mount the side plate as shown.

15

Result.

Check that the side plates rest against the rubber stoppers as shown.

Mount the 50mm fingers and do the zero axis.

16.1   INTRODUCTION

Careful cleaning of the machine's moving parts is fundamental for it to function correctly.
Avoid build-ups of soil and dirt.
Avoid cleaning the machine with water.
Before servicing or any other mechanical operation disconnect both the electricity and air supply.

16.2   DAILY SERVICING

Always remove dust and soil with compressed air after use.

Clean the tracks of the X and Y Axis trolley with a soft dry cloth.
Apply a thin film of air-line oil to the roller tracks.

Check that the fingers of the transplanting heads are free from soil or other materials; dip the finger in water and turn the "NEEDLES EXTEND" switch repeatedly.

Check the air filter; empty it by pushing the button under the bowl.
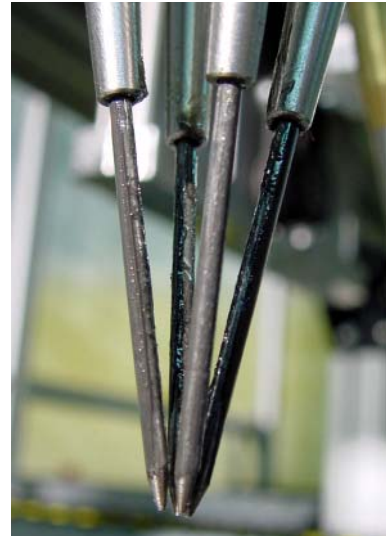

16.3   MONTHLY SERVICING

During periods of heavy use we suggest that you service weekly the machine as follows.

Check the condition of the gears.
Considerable wear can be caused by damaged pulleys. In this case contact your authorised TEA dealer.

Check the wear of the transplanting fingers.
This is usually accelerated when sandy soil is used.

Replace the needles by loosening the nuts on the top and sliding them throngh the finger plate.

Always use needles of the same length. Usually different types of fingers are equipped with needles of different length.

Check the wear of the needle-holder tips.
Check the tightness of the conveyor belts. If loose contact your authorised TEA dealer.

After disconnecting the electricity check the smoothness of the X,Y and W Axis by moving them manually.

16.4   SPECIAL SERVICING (EXTRAORDINARY)

A special service has to be made at the end of each complete working season.
We suggest you check the machine as soon as the season is finished. For more details on servicing contact your authorised TEA dealer.

Check the motor brushes.
Remove the black caps from the motor (2 or 4 per motor) and check the brushes' length.

Motor brushes shorter then 5mm could be the cause of poor performance of the motors; replace them with new brushes.

Clean the brass needle-holders from dirt and soil after removing the needles.

Check the slideway wheels and tracks of the machine. If they are damaged, or not properly adjusted, it will considerably reduce the machine's life.
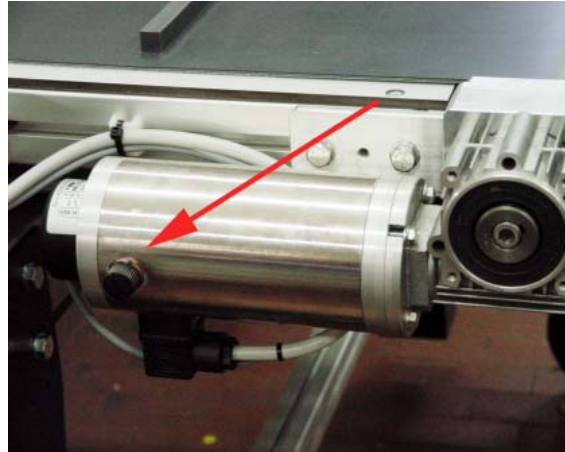
During periods when the machine is not used, cover it with a tarpaulin, and disconnect both electricity and air supplies.
The machine must be placed in a safe and sheltered place not too wet and not subjected to high changes of temperature.