TWS AUTOMATION

USER'S MANUAL

[ORIGINAL INSTRUCTION]

PICK AND PLACE

QUADRA DVC EVO

Rev. 1.4

Issued on 15/07/2015

WARNINGS

TWS Automation srl declines any responsibility due to any damage and injuries to persons and properties derived either by an improper use of the machine or not in accordance with the user's manual.

TWS Automation srl is entitled to change parts of the machine, of the software or pages of this manual without notice.

SAFETY

Safety precautions are provided for your protection and to prevent damage to machine. This safely information applies to all operators and service personnel. Read and observe these instructions before using the machine and its tools and accessories.

The Pick & Place Quadra DVC meets applicable safety standards. The reference regulations for designing and manufacturing the machine are UNI, ISO e CEI

General safety precautions

- Read this manual before putting the machine into operation.
- Operation, adjustment and maintenance of the machine may only be carried out by **qualified and trained** personnel who are aware of the hazards involved.
- Never let the machine operate without operator supervision.
- Only use a well-earthed wall outlet for power supply.
- Do not use the machine in damp or wet environment or in proximity of combustible fluids or gases.
- Do not execute any activities or procedures that are not described in this manual.

Avvertenze:

Before using the machine be sure that all the feeder safety panels are rightly installed and locked, so that the working area cannot be reached

It is never allowed to overrule or disconnect any safety or emergency switch or any other provision made in machine which is part of the safety circuit.

Don’t allow repair by unauthorized personnel.

Safety equipment:

Emergency switch:
Emergency switch is installed on the front of the machine. When an emergency occurs, press the switch immediately. The machine switches off immediately. At the restart of the machine, the emergency switch should be unlocked.

Symbols:

These symbols are placed on the machine:

WARNING:
ELECTRIC SHOCK DANGER
There is high voltage which can cause even lethal injuries. Do not remove protective lids and do not disable the protective devices.

WARNING:
HAND CRUSHING DANGER
There are moving parts which may cause serious injuries. Do not put your hands close to any moving part.

If any symbol is not present on the machine or if you have any questions, do not use the machine and please contact your supplier. If the name or the address of your supplier is unknown, please contact:

TWS Automation S.r.l.
Viale Zaccagna 6
54033 Avenza – Carrara (MS)
Italy
tel. 0585 - 634758
fax 0585 - 649967
e-mail: info@tws-automation.com
http://www.tws-automation.com

Liability:

TWS Automation and its distributors shall not be liable for any costs, damages or personal injuries if the machine is not used according to the safety rules given in this manual.

PREFACE

The present manual is a part of this Pick & Place Quadra DVC EVO and it contains all the information you need for a correct and safe use of the machine, together with all the instructions for right maintenance operations.
Take care of the manual and store it in a easy-to-be-reached place. It should be read by all the people in charge of handling and using the machine, a special attention should be paid by:

- owner of the company
- emergency and safety workers
- operators

The manual is valid throughout the machine's lifespan and it is strictly related to its technical conditions.

This manual should be kept close to the machine, ready to be consulted. Customer should make a copy of this manual and store it in a dedicated file.

If the machine is resold, the customer must inform the manufacturer, who will inform the new owner of any changes and improvements which should be applied to the machine to grant a correct use.

It is better to read the whole manual first fairly quickly, so you start to learn the machine controls and menu items, having a general idea of the operation and maintenance.
Then you should become familiar with the operation of the machine, changing one of the test programs which are already loaded in the Quadra at the time of purchase, running again the teaching of the placing position of the components, by varying the parameters of the assembly chart and exploring the menu items.

WARRANTY CONDITIONS

This product is guaranteed from TWS Automation s.r.l. to be free from defects in workmanship, design and parts at the moment of its purchase and for the following twelve (12) months.

Manufacturing and material defects that should occur to the product within this warranty period, under normal use and care, will be repaired or replaced by TWS Automation s.r.l at its own discretion, according to the following conditions.

This warranty does not cover any defects others than material, design and manufacturing ones. This warranty will not apply in case of:

- Periodic checking, service, repairing and replacing of the parts worn by use, software upgrade.
- Damages caused by:
    - Improper use, which is an use different from what recommended in this user's manual
    - Installation or use wich is not complying to the safety rules.
    - Tampering or attempted repair made by not authorized assistance services.
    - Accidents and force majeure events such as: thunderstorms, floods, fire, riots, not sufficient air or other problems not depending on TWS Automation s.r.l.
    - Damages caused by malfunctioning devices connected to the machine, as compressors or generators.

The product will not be defective if one needs to change or adapt it to make it complying to the safety rules of a Country different from the one the product had been originally manufactured for.

This warranty will not apply to changes, settings or damages caused by these operations, nor to arrangements, changes or settings made to upgrade the product without TWS Automation s.r.l written approval.

The warranty replacement or repair does not restart or extend the warranty period. The warranty replacement or repair might be made using refurbished units. Where a replacement is provided the product or part replaced becomes the property of TWS Automation s.r.l.

Defective replaced parts or components must always be returned to TWS Automation s.r.l. after an under warranty replacement

TWS Automation s.r.l. reminds that this warranty will not apply to the shipping charges for the replacement of defective parts, the machine (either when sending or receiving) and the assistance service paid by our operator.

MANUFACTURER LIMITED LIABILITY

The manufacturer declines any responsibility due to an improper use of the machine such as:

- Non-observance of the instructions contained in this manual
- Non-compliance with the safety rules
- Incorrect installation of the machine
- Defected external power supply
- Lack of maintenance
- Alteration of the equipment without authorisation from the manufacturer
- Use of non-original spare parts
- Allowing untrained personnel to operate the machine
- Exposing the appliance directly to atmospheric agents such as rain, sun, humidity etc.
- Making faulty or temporary electrical and/or pneumatic connections to the machine
- Unauthorized personnel using the machine

DISPOSAL

This symbol means that machine (and parts of it) must be disposed according to a specific system of separate collection of rubbish.

CE Countries

Warning: when the lifespan of the machine is over you should dismantle it in order to dispose the different components according to the existing directives: iron units must be always separated from electric and electronic ones.

Electric and electronic equipments must be disposed in accordance with in force directives about the refurbishing and recycling of this type of waste as well as batteries and accumulators.

In accordance with the requirements carried out by the CE member states, the CE users can take their electrical and electronic waste to dedicated collection centers, free of charge.
In a few countries the these products can be returned to the retailer who will take them back if the owner will purchase a new and similar product.

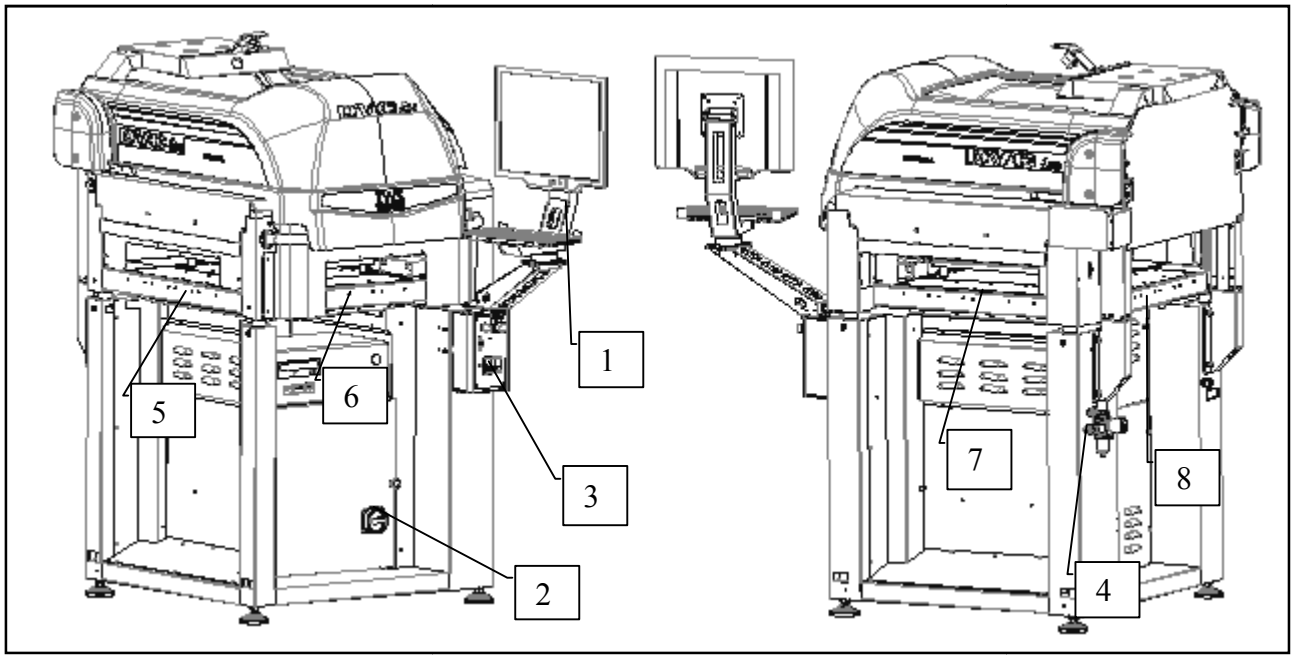
To get all the information about separate collection and recycling for this type of products, users are invited to contact the retailer or the local office in charge.

The right disposal of electric and electronic units and their recycling and refurbishing help protect the environments which surrounds us, avoiding bad effects on our health.

Other Countries

Please contact the local authorities for information about the correct way to dispose products.

1 DESCRIPTION



1	Keyboard bracket
2	Main Power Switch
3	Magnetothermic switch (ON/OFF)
4	Main air connection
5	Feeder banks position
6	Feeder banks position
7	Feeder banks position
8	Feeder banks position

1.1 TECHNICAL SPECIFICATIONS

1.1.1 Components Range

- Chip components starting from size 0201
- Cylindrical components like MELF and MINI-MELF
- SOT diodes and transistors
- Integrated circuits up to 40 mm side
- Integrated circuits with 0.5 mm pitch
- Trimmer, inductors and aluminum electrolytic capacitors

1.1.2 Feeders

8mm Tapes

Quantity: 120
Pocket max depth: 6.5mm
Max reels size: 13”

12,16,24,32,44 mm Tapes

Quantity: up to allocate the available space for tapes (120 x 8 = 960mm)
Pocket max depth: 10.5mm

Feeder for components in stick
Format: all formats
Quantity: to allocate available space (max quantity: 90 units with 15mm size)

Feeder for LED through hole
Specifications: please contact distributor or TWS Automation

Trays
Quantity: dependent on the available space on the worktop

1.1.3 Placement Head

The unit is supplied with a two-nozzle optical centring head which can handle components with a max size of approx 13mm (on-fly centering system). Bigger components are handled by the external centering camera.

1.1.4 Working Area

The normal working area is 440 x 360 mm that can be expanded up to 550 x 420mm not fitting out the feeder banks on three sides. The size of 550 mm is obtained not mounting the feeder banks placed on the operator side and on the opposite side.

1.1.5 Resolution, Repeatibility and Accuracy

	Axes XY (mm)	Theta Rotation (°)
Resolution	0.01	0.09
Repeatibility	± 0.06 @ 3 σ	± 0.18
Accuracy	± 0.10 @ 3 σ	± 0.18

1.1.6 Productivity

Max: approx 4400 cph
Average: approx 3500 cph

1.1.7 Noise

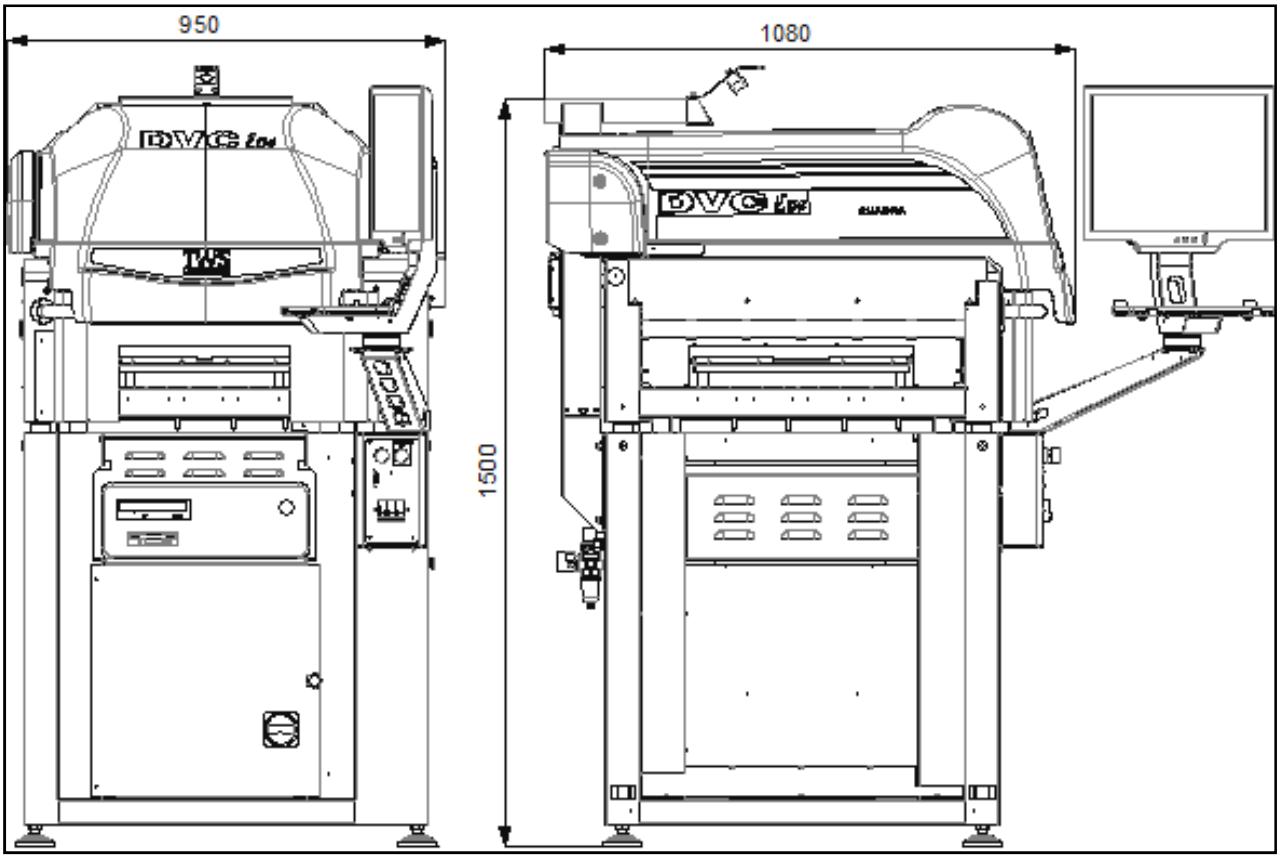
Average value: 65 dBA
Peak value: 90 dBA
Measuring position: 1 meter from Quadra and 1,6 meter from the ground.

1.1.8 Power supply

The unit works with AC 220 Volts ± 10%, 50/60 Hz. Power consumption is less than 1 kW.
Air: 8 – 10 bar “cleaned”, 60 liter/min.

1.1.9 Dimension and weight

Width x Length x Height: 950 x 1080 x 1500 mm
Weight: 215 kg


950
1080
1500

2 INSTALLATION

2.1 Transport

The machine is packed on a pallet and has four threaded inserts on the chassis, where can be fixed two bars for hand-carrying (Fig. 1).

Fig. 1 – Quadra with bars for hand-carrying

Remove the protective packing of axes only after positioning the machine.

2.2 Computer, Monitor and keyboard

Remove the packaging that locks the computer for transport, without moving it in order to not damage the rear wiring harness.
The monitor stand is located in the carton box above the work surface. Fix it to the arm already anchored to the main-switch box using the 4 screws being careful to pass the cables through the arm itself. Then mount the monitor.
The keyboard should be placed in his support and plugged into the back of the pc.

2.3 Connecting the electrical and pneumatic

The machine is supplied with IEC plugs and must be connected to an AC 220Volt 50/60Hz 16A.

The machine is equipped with an outlet quick coupling for a pipe of external diameter of 10 mm for the compressed air (8-10 bar). It is not advisable to reduce the diameter of the main air tube, to prevent momentary pressure drop when the load varies

2.4 Set-Up

- Switch on the compressed air. On the pressure gauge, check that pressure is 6 bar.
- Release the emergency switch.
- Turn on main switch, pc and monitor.
- Wait until the OS and drivers are completely loaded. Loading is compelte when prompt of commands appears.
- Run the software, writing "./qdvc" from commands prompt. Press ENTER key.
- Wait until software is fully loaded. The loading includes checks of correct communication between control boards and zero of the motorized axis (for some axis the zero is done without prior notification to the operator, for others, i.e. head X and Y axis, system -if activated- ask you you want automatic or manual zero search).

WARNING **Install feeder safety panels where there are no feeder banks in order to block any entry to the working area.**

WARNING **Feeder banks and feeder safety panels must be well tightened by screws in order to prevent any undesired movement which might damage the machine while assembling**

3 SOFTWARE DESCRIPTION

Once axis zero search are done, the software starts, showing to the operator the main window (Pic.2).

NOTE Screenshots showed in this manual may be a bit different from the real ones since they depend on the software release and on the language. Therefore, should be considered only as indicative and not necessarily correspond to the version of software installed in your machine!

To select menu items, use the arrow keys and press ENTER (or press Alt and the underlined letter in the text. For example, pressing ALT + U we enter the Utilities menu). To close the menu and submenu press the ESC key.

Apart from the function key combinations active at any point in the software (see section 3.7), from the main screen are in use the following key combinations:

- ***Shift+F2***: Check the machine zero positions
- ***F12***: Displays window of "Quick load" (see section 3.2.5).
- ***F1 - F8***: Quick loading of programs, feeders configurations and packages libraries previously introduced with "Quick Load" window.

Pic. 2 – Main window

3.1 Menu “PRODUCTION”

View “Master Program” table (Pic.3).

NOTE Pag↑ and Pag↓ keys allow you to scroll the table faster, while Ctrl+Pag↑ and Ctrl+Pag↓ allow you to go directly to the end or beginning of the table

“Master Program” and “Assembling Program”

The "Master Program" lists the assembling data reported to the Master board as well as loaded from CAD or entered by the user.

The "Assembling Program" shows instead the list of components as they will be used during the actual assembly cycle of the machine, or rather there will be several copies of the Master program if in the presence of a panel of boards and the order of the components will be exactly the one followed by the machine for their centering and placing.

The " Assembling Program " is generated automatically by the software once ended correctly the assembly data entry and once created the assembly panel using the function "*Composition panel*”.

NOTE Press F12 to switch from Master program to Assembling program (and vice-versa).

The changes made to the "Master Program" are automatically shown on the "Assembling Program" with one exception: if the data has been previously modified in the "Assembling Program" the changes must be confirmed.

To add a new row to the table, place the cursor on the last row and press the arrow key↓.

To delete a line, place the cursor on it and press the Del key.

To clear blocks instead of rows, highlight them with Enter and delete with Ctrl + Del.

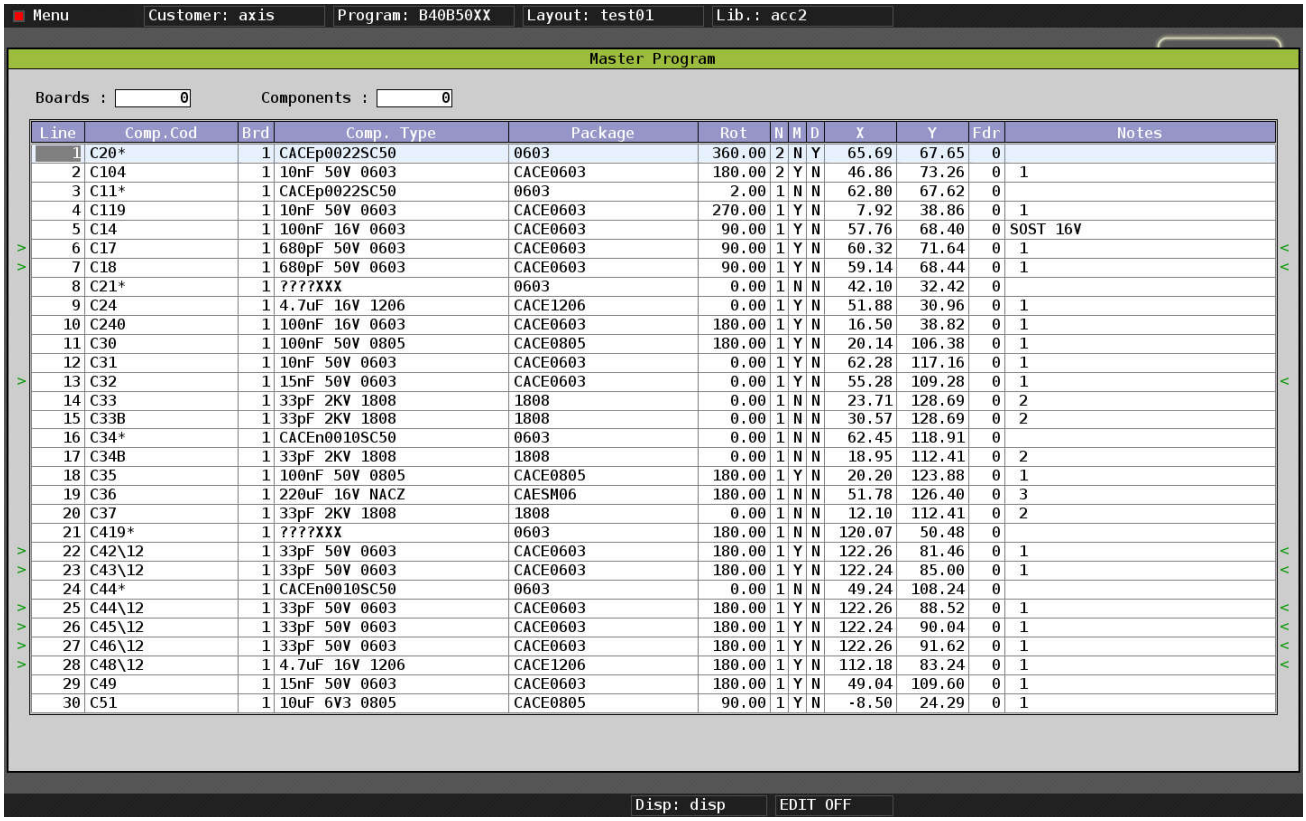
NOTE editing operations are possible only after enabling (F2) “edit data” (Edit ON).

The columns of the table "Master Program" are (In parentheses the abbreviation in the table):

- **Line number (Line)**
  The numbering of the rows in the table is progressive.
- **Component code (Cod. Comp)**
  Uniquely identifies the component within the "Master Program".
- **Board (Brd)**
- **Component Type (Comp. Type)**
  Component type or its value in alphanumeric characters.
- **Component Package (Package)**
  Package associated with the component type. It is recommended to use standardized names.
- **Rotation Angle (Rot) 0-360 deg CCW**
  The value of the angle of which the head assembly must rotate the component prior to the deposit on the board. *This value refers to the position of picking from feeder 1*. The program automatically adjusts the correction to the picking from the other 3 sides. The rotations are always counterclockwise.
- **Head (N) 1/2**
  Number of the head to be used for picking.
- **Component placing (M) Yes/No**
- **Component dispensing (D)** Yes/No
- **X and Y assembly coordinates (X – Y)**

X and Y coordinates of component assembly, expressed in millimeters and referred to zero board. The maximum value is that of the working area.

- **Feeder code (Fdr)**
  Code of the feeder from which to get the component to be assembled.
- **Notes (Notes)**



Line	Comp.Cod	Brd	Comp. Type	Package	Rot	N	M	D	X	Y	Fdr	Notes
1	C20*	1	CACEp0022SC50	0603	360.00	2	N	Y	65.69	67.65	0	
2	C104	1	10nF 50V 0603	CACE0603	180.00	2	Y	N	46.86	73.26	0	1
3	C11*	1	CACEp0022SC50	0603	2.00	1	N	N	62.80	67.62	0	
4	C119	1	10nF 50V 0603	CACE0603	270.00	1	Y	N	7.92	38.86	0	1
5	C14	1	100nF 16V 0603	CACE0603	90.00	1	Y	N	57.76	68.40	0	SOST 16V
> 6	C17	1	680pF 50V 0603	CACE0603	90.00	1	Y	N	60.32	71.64	0	1 <
> 7	C18	1	680pF 50V 0603	CACE0603	90.00	1	Y	N	59.14	68.44	0	1 <
8	C21*	1	????XXX	0603	0.00	1	N	N	42.10	32.42	0	
9	C24	1	4.7uF 16V 1206	CACE1206	0.00	1	Y	N	51.88	30.96	0	1
10	C240	1	100nF 16V 0603	CACE0603	180.00	1	Y	N	16.50	38.82	0	1
11	C30	1	100nF 50V 0805	CACE0805	180.00	1	Y	N	20.14	106.38	0	1
12	C31	1	10nF 50V 0603	CACE0603	0.00	1	Y	N	62.28	117.16	0	1
> 13	C32	1	15nF 50V 0603	CACE0603	0.00	1	Y	N	55.28	109.28	0	1 <
14	C33	1	33pF 2KV 1808	1808	0.00	1	N	N	23.71	128.69	0	2
15	C33B	1	33pF 2KV 1808	1808	0.00	1	N	N	30.57	128.69	0	2
16	C34*	1	CACEn0010SC50	0603	0.00	1	N	N	62.45	118.91	0	
17	C34B	1	33pF 2KV 1808	1808	0.00	1	N	N	18.95	112.41	0	2
18	C35	1	100nF 50V 0805	CACE0805	180.00	1	Y	N	20.20	123.88	0	1
19	C36	1	220uF 16V NACZ	CAESM06	180.00	1	N	N	51.78	126.40	0	3
20	C37	1	33pF 2KV 1808	1808	0.00	1	N	N	12.10	112.41	0	2
21	C419*	1	????XXX	0603	180.00	1	N	N	120.07	50.48	0	
> 22	C42\12	1	33pF 50V 0603	CACE0603	180.00	1	Y	N	122.26	81.46	0	1 <
> 23	C43\12	1	33pF 50V 0603	CACE0603	180.00	1	Y	N	122.24	85.00	0	1 <
24	C44*	1	CACEn0010SC50	0603	0.00	1	N	N	49.24	108.24	0	
> 25	C44\12	1	33pF 50V 0603	CACE0603	180.00	1	Y	N	122.26	88.52	0	1 <
> 26	C45\12	1	33pF 50V 0603	CACE0603	180.00	1	Y	N	122.24	90.04	0	1 <
> 27	C46\12	1	33pF 50V 0603	CACE0603	180.00	1	Y	N	122.26	91.62	0	1 <
> 28	C48\12	1	4.7uF 16V 1206	CACE1206	180.00	1	Y	N	112.18	83.24	0	1 <
29	C49	1	15nF 50V 0603	CACE0603	180.00	1	Y	N	49.04	109.60	0	1
30	C51	1	10uF 6V3 0805	CACE0805	90.00	1	Y	N	-8.50	24.29	0	1

Pic. 3 - "Master Program Table"

In the upper part of the table are also two counters (they refer to the actual running program):

- **Boards**: Quantity of assembled boards in the current program
- **Components:** Quantity of placed components in the current program.

From the submenu associated with it (to open press TAB or ALT + M) you can call the following functions:

- ***Program data (F1)***: view data of the program (see section 3.1.1).
- ***Edit (F2)***: enables data edit. In the bottom right of the screen is displayed the status of the edit: "EDIT ON" (active) / "EDIT OFF" (inactive).
- ***Teaching board references (F3)***: allows to define the coordinates of the zero board, of the reference point and of the parameters relating to their image. The following submenu appears:
  - ***Manual (F3)***: is used in the preparation of the assembling program when the references have to be filed for the first time.

NOTE Before teaching fiducial parameters is necessary to create the assembly panel by specifying the appropriate search mode required

  - ***Automatic (F4)***: is used to perform automatic recognition of the references. If search fails, the software switches to the manual search.

- ***Ridefining board references (F5)***: used to manually define a zero board other than the original.
- ***Images parameters (F6)***: shows a window with the image of the zero board fiducial, the image of the area where the fiducial is searched and a series of parameters relating to the vision. These generally do not need to be changed. Pressing ESC, the dialog window with the parameters of the reference point appears.

- ***Teaching placing position (F4)***: It allows to identify the placing position of the selected component by the means of the on-fly camera. Press ESC to abort operation.

NOTE Zero board must be already defined!

- ***Feeders configuration (F5)***: displays the feeder configuration (see section 3.1.2)
- ***Panel composition (F6)***: entering data on the composition of the panel (see section 3.1.4).
- ***Assembling (F7)***: allows access to the methods of assembly:
  - **Total (F8)**: performs the assembly of all the components in the table.
  - **Step-by-step (F10)**: as above, asking for confirmation to the operator prior to each phase of the cycle. The confirmation is given by the Enter key.
  - **Restart (F11)**: resume the assembly from the point at which it was previously interrupted.
  - **Restart step-by-step (F12)**: as above, asking for confirmation to the operator prior to each phase of the cycle. The confirmation is given by the Enter key.
- ***Assembly table reorganization (F8)***: with this function you can change the order of the rows in the table and consequently the order of execution of the assembly program. The following submenu appears:
  - ***for note (F4)***
  - ***for component type (F5)***
  - ***for component code (F6)***
  - ***for feeder code (F7)***
  - ***for head (F8)***
  - ***for nozzle (F9)*** (this function is active only in the assembly program)
  - ***for board (F10)*** (this function is active only in the assembly program)
  - ***Optimize program (F11)***: (this function is active only in the assembly program) performs a rearrangement of the rows of the table, arranging them in such a way as to optimize the assembly path and avoid possible collisions. The program can be tweaked for dual head assembly (recommended) or using each head individually.
- ***Operations in the table (F9)***:
  - ***Fiducials (F3):*** Allows to identify, if already present in the imported CAD data, the coordinates of zero and board reference fiducials within program assembly data
  - ***Assemble all (F7)***: Field M (components placing) activated/not activated (YES/NO) in all the rows
  - ***Dispense all (F8)***: dispensing activated (YES) or activated (NO) in all the rows.
  - ***Duplicate field (F10)***: duplicates the contents of the selected field in the corresponding field in the row below.
  - ***Duplicate row (F11)***: creates a new row equal to that selected (except for the number and for the component code) and place it below.
  - ***Move row (F12)***: moves the selected row in the desired location. To move the row you must highlight it with Enter, navigate with the arrow keys at the point of the table where you want to move the selected row and activate the function.
- ***Dispensing (F10)***: allows access to the dispensing methods, namely:
  - **Total (F8)**: dosing the glue points of all the components in the table
  - **Step-by-step (F10)**: as above, asking for confirmation to the operator prior to each phase of the cycle. The confirmation is given by the Enter key.
  - **Restart (F11)**: resume the dispensing from the point at which it was previously

interrupted.

- **Restart step-by-step (F12)**: as above, asking for confirmation to the operator prior to each phase of the cycle. The confirmation is given by the Enter key

NOTE In the event of interruption: if it happens during a step-by-step cycle the command acts instantaneously, otherwise before the interruption it is dispensed the component for which the operation had already begun

- ***Packages libraries (F11)***: displays the table containing the package libraries (see section 3.1.3).
- ***Master/Assembly program (F12)***: switches from master program to assembly program and vice versa.
- ***Feeders/Trays Graph (Shift+F1)***: allows you to verify and optimize the feeder configuration currently installed on the machine (see section 3.1.5).
- ***Check zeros (Shift+F2)***: allows to verify and/or modify the zeros of the axes of the machine: machine zero, zero theta axis, zero Z axis.
- ***Find component (Shift+F3)***: components quick search: the search can be made in the program or in the feeder database. Selecting "search in database" you can type "*" (eg using 10* will find all the components with code that starts with 10).
- ***Teaching IC placing position (Shift+F4)***: used to teach position of components of large size which go beyond the area displayed by the camera. It is necessary to teach two points on the component: the lower left corner and the upper right corner. Before activating this function , the board zero must be defined.
- ***Feeder sequential teaching (Shift+F5)***: allows to control the sequence of the feeders used in the current program, starting from the row selected in the table.
  - ***Picking position (F5)***: the head moves in correspondence of the first feeder to learn the picking position using the camera. Press enter to move to the next feeder.
  - ***Picking Z offset (F6)***: the head moves in correspondence of the first feeder to learn Z offset. It can be done automatically or manually. Press enter to move to the next feeder.
- ***Placing position sequential teaching (Shift+F6)***: allows to quickly perform a sequential teaching of the placing position of all the components, starting from the selected row.
- ***Congruence Check (Shift+F7)***: check the congruence of data entered into the program; it also performs the automatic association between the component and the feeder code.
- ***Feeder database (Shift+F8)***: enables the easy management of feeders (see chapter 6).
- ***Select program version (Shift+F9)***: allows you to use a single program file for multiple board versions provided they comply with certain conventions in the field "Component Code" (see section 3.6.4)..
- ***Dispensation and assembling (Shift+F10)***: This function allows you to dispense and afterwards assemble boards with only one command. These functions has the same meaning to the ones referred to the assembly only.
- ***Dispensing table (Shift+F11)***: displays the dispensing program. Data in this table are not editable.

3.1.1 Program Data

Displays data of the program:
- *Thickness PCB (mm)*
- *Dispensing starting point:* coordinates to which the dispenser moves to put down some test-dots (i.e to clean the syringe) before starting the dispensing program.

- *Component maximum height*: It is the estimate of the of the maximum possible height for a component to be assembled (it is calculated on the workplate height and the PCB width).
- *Assembled components quantity*
- *Assembled boards quantity*

From the associated submenu:

- ***Dispensation starting points (F3)***: allows teaching of first dispensing points.
- ***Reset counters (F12)***: Reset board and comp. counters.

3.1.2 Feeders configuration

Shows the feeders/trays configuration and position in the current machine configuration. Such a configuration must be updated whenever you add, edit or delete one (or more) feeder/tray.

NOTE **Keeping updated the configuration of the feeders is fundamental, because it serves to properly run the automatic association between the type of component and feeder's code**

NOTE More and more feeders configurations can be created. For example for a customer or for a given assembling program, depending on what is more convenient for managing your production process

The following are the columns of the feeder configuration table.

- **Feeder code (Frd)**

This field shows the code identifying the feeder position on the machine. (see Pic.29 for further details)

- **Component type (Comp. type)**

This field shows the component type or value. The automatic association of the the feeder code to be used is based on the comparison between the information in this box and in the corresponding box of the assembling program.

- **Package component (Package)**

Identifies the format of the component to be assembled. To put a package in this field is necessary to view the table of packages and select one from the list

- **Components Note (Notes)**
- **Feeder setting time (A)**

This field specifies the time and mode of activation of the feeder. Depending upon the tape employed, a longer or shorter pulse may be needed. It is not advisable to have a longer pulse than is required as it will slow down the feeder and cause excessive wear (see below table).

- **Feeder Type (T)**

T (*Tape*)
A (*Air*)
M (*Motor*: special feeder for TH LEDs, activated by a motor)

	Setting time	Description
C	**Short**	Used for tapes with 4 mm pitch between components and small components in stick
M	**Medium**	Used for tapes with 8 or 12 mm pitch between components and big components in stick

L	**Long**	Used for tapes with 16 mm pitch between components and very big components in stick
D	**Half**	Used for tapes having 2 mm pitch between components (eg 0402 or 0201).

Auxiliary setting times (**C1, L1, M1** e **D1),** used for non-standard feeders, are available (for further info or doubts contact our service department)

Each configuration is associated with the box "Feeder Data" which contains the following data:
- *Coordinates X and Y:* coordinates of pickup in mm refer to machine zero.
- *Z picking position*: Z pickup position of the feeder in mm. It refers to the factory default Z settings. It can be both negative and positive.
- *Quantity*: number of components present in the magazine. It is decremented automatically every time a component is picked up.
- *Pitch X and Y*: distance in millimeters between two adjacent components.
- *Number of components X and Y*: amounts of components contained along the horizontal and vertical line of the tray (used only for trays)
- *Check position*: enables control function of pickup position by the camera (useful in case you are using old or not very precise feeders when picking smaller components).
- *Check for every n.*: Number of feeds of the feeder between a position check and the next one.

From the associated submenu:

- ***Feeder data (F1)***: moves the cursor to the "feeder data" window for any changes. Press ESC to return to the feeder configuration.
- ***Z-Offset teaching (F3)***: allows you to teach the right Z position that the nozzle must have to pick up the components from the current feeder bank.
- ***Picking position teaching (F4)***: allows the head to move to the position indicated by the co-ordinates in the table..
- ***Select from database (F5)***: allows you to link a feeder from the feeder table to the data contained in a feeder of the database.
- ***Remove feeder (F6)***: remove the above association.
- ***Tray pitch teaching (F7)***: (used only for trays) allows teaching of the distance (expressed in mm) between components of the tray along the X axis (**INC X)** and Y axis (**INC Y**) y. The user has to teach the following positions:

  1. Lower left pin of the lower left component; (press 'ENTER' to confirm)
  2. Upper right pin of the lower left component; (press 'ENTER' to confirm)
  3. Lower left pin of the upper right component; (press 'ENTER' to confirm)
  4. Upper right pin of the upper right component; (press 'ENTER' to confirm)
- ***Image parameters (F8)***: shows the parameters of the reference image for the control of the position of the component on the feeder.
- ***Package library (F11)***: shows the package libraries in order to select a package to associate to the selected feeder.
- ***Components feeding (Shift+F4)***: activates one feed (advancement) of the selected feeder.

3.1.3 Packages library

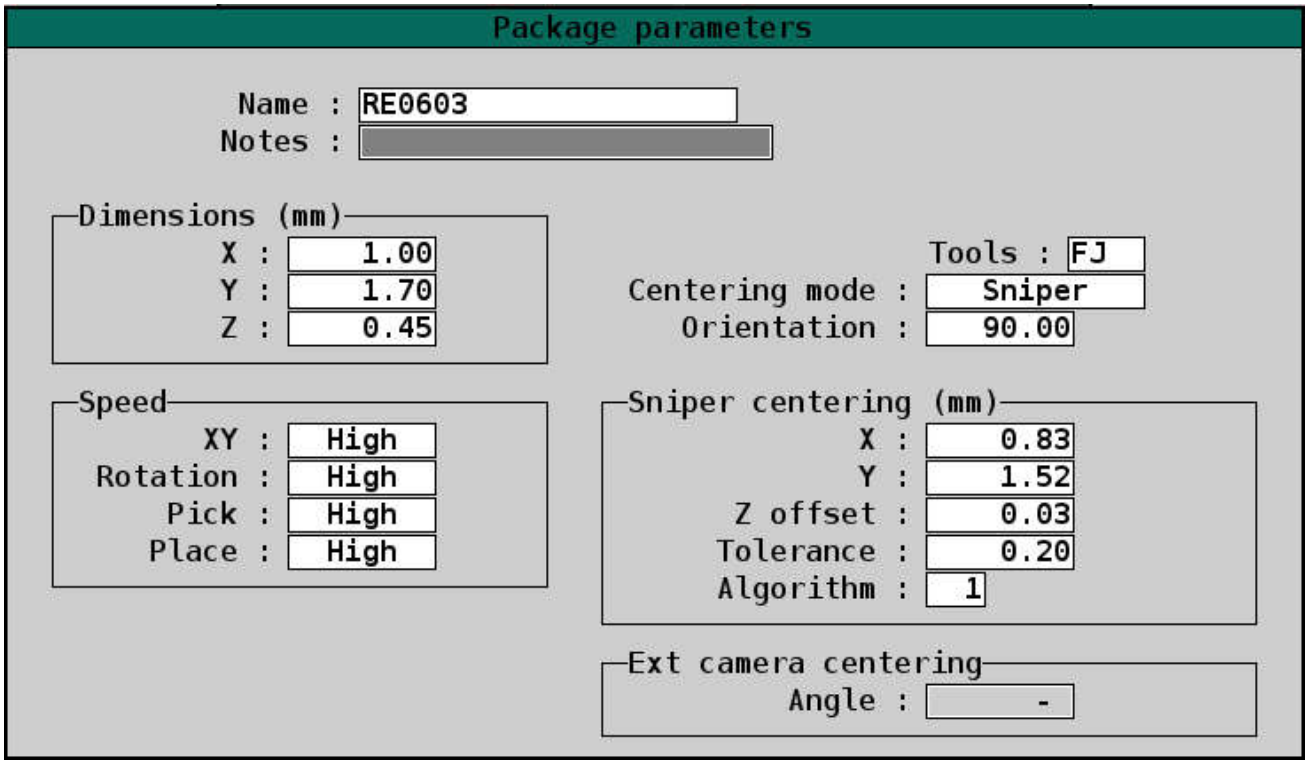
It contains the data for every component to be placed by the machine.

NOTE Since the centering parameters also depend on how a component is oriented inside the tape / stick / tray, if the same component is provided oriented differently from one supplier to another you MUST create two distinct packages or each component!

From the associated submenu you can select the following:

- ***Package parameters (F2)***: shows data of the selected package (see below).
- ***Create New (F3)***
- ***Duplicate (F4)***
- ***Rename (F5)***
- ***Delete (F6)***

NOTE The machine is supplied with a standard library packages (STDLIB) containing information relating to the most common types of components. This library is intended to be only a starting point. It is therefore necessary that each individual user integrates and sets operating parameters of the types of components used. By a correct setting of the parameters of the packages depends the goodness and the accuracy of the machine



Pic 4 – Package Parameters

3.1.3.1 Package parameters

Being possible two different centering ways (on-fly *Sniper* centering system and external camera), then exist common parameters for both systems and dedicated parameters for each system:
Common parameters are:

- ***Dimension X, Y e Z***: Physical dimensions of the component in mm. Either used by the optimizer to determine the correct assembly order and avoid collisions, both for centering with external

camera. In particular, it is conventionally requested to write as X dimension the shorter side of the component.

NOTE When you exit the parameter window package the software does a number of checks on the consistency of the data entered. In case of problems detected, you are asked if you still want to continue. It is a good rule, except in special cases, resolve issues before leaving!

- ***XY Head speed***: Speed of the axis to bring the component to the placement point.
- ***Rotation speed***.
- ***Head pickup speed***
- ***Head placing speed***

NOTE To simplify the task of the operator and prevent use of incorrect parameters, it is possible to select between 3 factory preset speeds (high, medium and low)

- ***Tools list*** (see 3.4.1.3)
- ***Centering methods***:
  "*Sniper*" (with on-fly system)
  "*Ext camera*" (with external camera)
  "*None*"
- ***Orientation*****:** angle (in degrees) that means the orientation of the component compared to the feeder (see 3.6.6).

Sniper centering system dedicated parameters are:

- ***X and Y dimension***: dimension (in mm) of the component as detected by the "sniper".

NOTE When you create a package you need to write an estimate of the values of X and Y dimensions by hand in the boxes (starting, by logic, by the physical dimensions detected with a caliper or datasheet), since during the measuring phase is also made a comparison with the sizes currently written and an error of tolerance is reported if the difference is greater than a certain threshold (see parameter "*Tolerance"* below)

- ***Z offset***: point of the component where the centering is performed. It is expressed as a deviation (mm) from the middle of the component height.
- ***Tolerance***: Tolerance (in mm) on the measurement made by the centering during assembly.
- ***Algorithm***: defines the algorithm to be used for the centering of the component. Although you can write a number between 1 and 9 (for any future developments or special cases), are currently used only the algorithms 1 and 2, and in particular:

· Algorithm 1: used for all components of dimension greater than or equal to 0603
· Algorithm 2: used for all components of smaller size to 0603 (such as 0402 and 0201)

Ext camera centering centering system dedicated parameters are

- ***Angle***: the angle (in degrees) which rotates the component before centering with the external camera (see 3.6.6).

From the associated submenu:

- ***Z offset teaching (F3)***: allows to teach level in Z of the component to be used for centering. You must choose a sample component and the angle at which the optical scan is executed. Once this operation is completed, is displayed the picture, as seen from the centering system, of the component-nozzle assy. The horizontal line identifies the level where the scan of the component will be made for the centering. Press F2 and the arrow keys to move that row vertically. Press ENTER to confirm or ESC to cancel.

NOTE The ideal level at which to execute the centering is not the same for all components! And in fact is necessary to find the point where the geometry of the component is more repeatable (eg. chip must be read in the center, the TQFP in the pin bight, the electrolytic capacitors in rectangular base ...)

- ***Comp. dimension teaching (F4)***: makes it possible to teach the dimension of the component with the selected head.

NOTE The level at which the scan is executed is the one defined by Z offset. Therefore is necessary to teach previously such parameter!

- ***Orientation (angle) teaching (F5)***: to teach the right angle the component must have to be centered.
- ***Vision parameters (F6)***: allows to teach or view the parameters of the reference image for centering the components which the external camera (when centering System is *Ext Camera*).
- ***Advanced parameters (F7)***: shows additional parameters used during component centering and, in particular:
  - **Component detection check:** Component detection control mode on the head.
    - X: no control – *default*
    - S: control with *Sniper*
    - V: control with vacuum
    - B: controls with both, first vacum and then *Sniper sensor*

NOTE Normally, except in special cases, it is recommended not to perform detection check if component is centered with the Sniper (detection check is done automatically during the centering!). On the contrary it is reccomended to use vacum check if you center the component with the external camera (being in these cases the component normally too big to be displayed with the *Sniper*). It is recommended to use *Sniper* check when assembling a small component of which you do not want, for whatever reason, to perform the centering.

  - **Vacum discharge thresold:** vacum value used as thresold when detecting component. It varies from 1 to 9 where 1 is the lowest thresold and 9 the greater.
  - **Stopped axes centering:** if enabled performs component centering only with the head not moving (valid only when centering with *Sniper*, when usually the centering is done while the head moves). Useful in case of components where the parts intended for centering are not perfectly motionless and subject to vibration during the phases of movement of the axes (as in the case of electrolytic capacitors).
  - **Placing mode:** ways to place component
    - N: normal
    - F: fine-pitch (F mode differs from N mode for the lesser impact over the plate)
    - L: LED TH (The L mode is used only for Through-Hole LED components that need the special feeder –see dedicated user manual-)
  - **Centring and Placing PID:** specifies parameters set to be used to check rotation movement of the tips during centring and palcing steps. Depending on the type of motors installed in your machine (2-pole motors or 4-pole motors, see Pic. 5 to identify them) you can use the following values (except for special cases, you use the same value for both the PID -centering or placing):

    2 Poles motors:

- 0: for small or medium to small components
- 3: for medium or medium to big components

4 Poles motors:

- 0: all the components

Pic. 5 – Different types of HeadTheta motors (4 poles to the left, 2 poles right)

- **Placing parameters:** parameters dedicated to the use of the LED TH feeder. Please refer to the dedicated user manual for more details

- ***Corrections (F8)***: Allows to add an offset to the placings of the package. From this window you can enter modifications to the angle and to the placing position of the selected package. The value in angle (in degrees) is added to the final rotation of the placement of all the components associated with the current package.
  The values entered in the table are in addition to the rotations of placement specified in the first column and are given in steps (XY: 1 step = 0.01 mm; Theta: 1 step = 0.09 °).

From the associated submenu is possible to execute the following functions:
-Perform calibration (F3): start the calibration process by using the camera. It is performed on the last assembly program.

- ***Dispenser parameters (F9)***: enables to create new configurations of glue dots for the package (see chapter 5).

3.1.4 Multiple Circuit panel

The panel identifies the actual configuration of the boards you want to assemble with a specific program.
When creating a new assembly program, we start from the concept of *Master board*. This "virtual" board represents the condition of ideal placement that, in the subsequent steps, the machine will replicate to assemble the individual boards physically placed on the machine.
If, for example, the program is generated from imported CAD data, the Master board will be represented, once identified zero and reference, from the coordinates of all the imported components.

If then the panel will be composed by a certain number of replicated boards and joined together to form an effective matrix of board, each replica will be assembled by the machine exactly as the Master board, adapting, by the learning of the fiducials, both the coordinates and the rotations.

NOTE The case of a single board is a sub-assembly of the concept of the panel that will be, in this case, composed by a single board to be assembled!

The following are the columns of the table of the composition panel.
(In parentheses item abbreviated as shown in the table)

- **Board number (BRD)**

Progressive board numbering. Starting from number "1", which identifies the board closest to the machine axes origin. The master board is identified by the word "Mast".

- **Board origin co-ordinates on the X and Y axes (X OR / Y OR)**

This is the X and Y co-ordinate of the board origin. Refers to the machine origin

- **Fiducial mark co-ordinate on the X and Y axes (X REF / Y REF)**

This is the X and Y co-ordinate of the board reference point. Refers to the machine origin

- **Board angular coefficient (THETA)**

Angle (expressed in degrees) used to re-calculate the placement position of components. **Recalculation occurs when the Theta angle of the board to be assembled differs from that of the master board.** This variation is typically due to small differences both given from inaccuracies on the edges of the panels, as well as small differences in placement of the panels on the work surface of the machine.

NOTE The angle theta is zero if the coordinates of the reference point coincide with those of the zero board

- **Board assembled (A)**
- **Note (Note)**

In the same window are then given:

- **Scale factor:** calculated, if present and identified, from the CAD data of board origin and reference.
- **Ref. Points searching mode**: Show the searching mode of the reference points (board origin and reference) currently in use.
  ◦ Board: search the references of each board of the panel.
  ◦ Panel: search only the references of the first and last board (useful when several boards are present).
- **Ref. Points Recognition mode**: Show the Recognition mode of the reference points currently in use.
  ◦ Correlation: recognition of references is based on a reference image previously learned, checking the "similarity" between that and the actual.
  ◦ Vectorial: are recognized circles of a predetermined size within the image displayed (only valid for round shape fiducials).

From the associated sub-menu is possible to execute the following functions:

- ***Master board teaching (F3)***: allows the user to teach the board origin and the reference point of the circuit (Master) taken as reference.
- ***Multiple circuit composition (F4)***: starts the function to compose a multi-panel. It asks for the board origin co-ordinates of the first circuit at lower left and of the circuit at upper right. Then the operator must specify the number of boards in the panel.

- ***Board origin sequential teaching (F5)***: allows the operator to check and modify in sequence the origin point of all boards.
- ***Board origin single teaching (F6)***: allows the operator to check or modify the board origin of the selected circuit.
- ***Ref. Points sequential teaching (F7)***: allows the operator to check and modify in sequence the reference point of all boards.
- ***Ref. Point single teaching (F8)***: allows the operator to check or modify the reference point of the circuit selected in the table.
- ***Ref***. ***Points searching mode (F9)***: to modify the searching mode (*Board* or *Panel*).
- ***Ref***. ***Points recognition mode (F10) :*** to modify the ref.points recognition mode (*Correlation* or *Vectorial*)

3.1.5 Feeders and trays usage graph

This function is used to verify and, eventually, optimize feeders configuration actually mounted on the machine.

From the associated sub-menu is possible to execute the following functions:

- ***Optimize configuration (F2)***: to create a new feeders configuration to minimize average distances between feeders pick-up positions and placing positions.

NOTE This optimization function can completely change feeders positions into the banks and into the machine's feeders slot. We recommend to use this function only when banks are still to be configured. If feeders are yet placed inside the banks, maybe it's better to use feeder banks optimization (see next).

- ***Optimize feeder banks (magazines) position (F3)***: minimizes average distances between feeder banks pick-up positions and placing down positions. The function is near the same of F2, the only difference is that the new configuration created has the same feeders configuration inside every single bank.
- ***Show feeder and tray graph (F4)***
- ***Show feeder banks (magazines) graph (F5)***
- ***Move feeder/tray (F6)***: enables the user to manually exchange a single feeder or tray position to create a new configuration. To exchange a position, place the cursor on the feeder you want to move, select it with ENTER key, place the cursor on the desired position and select the move feeder function from the associated menu or pressing F6.

3.2 Menu "MANAGEMENT"

This menu includes function to handle customers, programs, feeder configuration, packages and quick load.

3.2.1 Customers

Shows the customers list. Pressing ENTER, the selected customer is loaded.

From the associated sub-menu is possible to execute the following functions:

- ***Create New (F3)***
- ***Duplicate (F4)***
- ***Rename (F5)***

- ***Delete (F6)***
- ***Save (F7)***: save a backup copy of the selected customer on the shared network folder (if network functions are enabled and work correctly) or USB storage drive
- ***Load (F8)***: load a backup copy of a customer.

3.2.2 Programs

Shows the programs list. Pressing ENTER, the selected program is loaded.

From the associated sub-menu is possible to execute the following functions:

- ***Create New (F3)***
- ***Duplicate (F4)***
- ***Rename (F5)***
- ***Delete (F6)***
- ***Save (F7)***: save a backup copy of the selected program on the shared network folder (if network functions are enabled and work correctly) or USB storage drive
- ***Load (F8)***: load a backup copy of a program
- ***Program Notes (F9)***: allows to insert a short note to the selected program
- ***ASCII-Q file import (F11)***: import a program from ASCII-Q format from a shared network folder (if network functions are enabled and work correctly) or USB storage drive
- ***ASCII-Q file export (F12)***: export a program in ASCII-Q format to a shared network folder (if network functions are enabled and work correctly) or USB storage drive

NOTE The ASCII-Q format has been designed to create a unique interface between the CAD data generated by any software for electronic cards design and the software of the machine. TWS Automation provides a dedicated software to create files in ASCII-Q and thus greatly simplify the creation of assembly programs from CAD data. Refer directly to TWS Automation for further information.

3.2.3 Feeders configuration

Shows the feeder configuration list. Pressing ENTER, the selected configuration is loaded.

From the associated sub-menu is possible to execute the following functions:

- ***Create New (F3)***
- ***Duplicate (F4)***
- ***Rename (F5)***
- ***Delete (F6)***
- ***Save (F7)***: save a backup copy of the selected configuration on the shared network folder (if network functions are enabled and work correctly) or USB storage drive.
- ***Load (F8)***: load a backup copy of a configuration from a shared network folder (if network functions are enabled and work correctly) or USB storage drive
- ***Import from customer (F9)***: allows the user to load a feeder layout from another customer (if you are working with configurations mode not shared among all customers, eventually contact TWS Automation for additional information).
- ***Esport in CSV format (F12)***: export on shared network folder (if network functions are enabled and work correctly) or USB storage a feeder configuration in text format with defined separator (the comma in this case) so that you can import and eventually analyze it

with an external software.

3.2.4 Package library

Shows the package library list. Pressing ENTER, the selected package is loaded

From the associated sub-menu is possible to execute the following functions::

- ***Create New (F3)***
- ***Duplicate (F4)***
- ***Rename (F5)***
- ***Delete (F6)***
- ***Save (F7)***: save a backup copy of the selected package library on the shared network folder(if network functions are enabled and work correctly) or USB storage drive.
- ***Load (F8)***: load a backup copy of a package library.

3.2.5 Quick Load

From here you can configure shortcut keys F1-F8, selectable from the main menu. To edit the selected line press ENTER; press DEL to delete it.

3.3 Menu "UTILITY"

3.3.1 Hardware test

Mainly used as an aid in diagnosing malfunctions.
The parameters specified for the execution of the functions contained in this menu do not affect the operation of the machine.

3.3.1.1 Placement Heads

Verifies the operation of all devices connected to the placement head.

- *X and Y position*: Enables you to move the placement head to a specific point of the working area, by entering a co-ordinate. Press 'ENTER' again to move to the specified position.
- *Rotation*: Allows rotation (in degrees)of the head, by entering an angle. Press 'ENTER' to rotate. To exclude the correction of the calibration map of the rotation angles, enter "*NO*" in the corresponding field..
- *Nozzles*: enables Z movement of the nozzles. Type YES in the "ACTION" field and press ENTER.
- *Vacuum*: controls the solenoid valve of the vacuum generating device of the nozzles. It is activated by writing YES in the "ACTION" field and pressing ENTER. The parameter "class" allows you to set the threshold of deviation shown on the bottom. To view the threshold, move the cursor on this line and press INS (reads the vacuum value with nozzle opened), then you can activate the vacuum and check whether or not the threshold initiates.
- *Counter pressure*: Enter 'YES' in the 'ACTION' field and press 'ENTER' to command the electro-valve activating the nozzle counter pressure.

From the associated sub-menu is possible to execute the following functions:

- ***Teaching ON (F3)***: allows to perform the individual movements by pressing the arrow keys and their possible combinations with the SHIFT, ALT or CTRL keys. The movements practicable depends on the selected row during self-teaching activation. For example, if the line of the parameters of the nozzles is selected will be possible to move the nozzles along the axis Z. To exit the teaching mode, just go back to the menu and press F3.

- ***Verify rotation (F4)***: A complete set of rotations from 0° to 360° are performed by a selected nozzle. With this function can be checked if Theta brushless motors work properly.

3.3.1.2 Feeder

Check the feeders activation. Each feeder on the machine can be activated pressing 'ENTER' key.

From the associated sub-menu is possible to execute the following functions:

- ***Sequential execution (F3)***: initiates a continuous non-stop cycle of the same instruction. This sequence can be interrupted by pressing the 'ESC' key.

3.3.1.3 Tool exchange

Exchange the nozzle on the tip (head 1 or 2).

NOTE To let a tip deposit a nozzle, select the desired tip (1 or 2) and write * (symbol) in the code of the required nozzle

3.3.1.4 Axes movement

To execute a movement place the cursor over the chosen row and press ENTER.

From the associated submenu you can select the following:

- ***Sequential execution (F3)***: initiates a continuous non-stop cycle of the same instruction. This sequence can be interrupted by pressing whichever key.

3.3.1.5 Centring Test

Check and verify the "sniper" centring system

From the associated submenu you can select the following:

- ***Select feeder (F3)***
- ***Start test (F4)***
- ***Component placement position (F5)***

Once you have selected options you want, the component is picked up and centered by the Sniper. After centering, the component is brought to the coordinates of external camera teaching, in order to be displayed and make some centering checks. In particular, moving it so as to use the cross displayed on the screen as a reference and repeating several times centering, is possible to verify correct operation and repeatability. In order to correctly place the component you can move and rotate head with the following keys:
-Arrows keys to move in X and Y
-Page ↑ and Page ↓: rotate by one step (about 0.09 °)
-Ctrl + Page ↑ and Ctrl + Page ↓: rotate by one degree
-HOME and END: 90 ° rotation
Press ESC to see centering data.
Choosing not to repeat, we proceed to the analysis of the impact of the component during placement. The component is moved to the coordinates of the selected placing position and is placed. The tip remains lowered awaiting the press of a key and is performed a simple analysis of the impact of the component during placement based on the variation of the encoder of the tip. As a result is shown a graph of the variation of the rotary encoder and the test ends.

3.3.1.6 Board hardware test

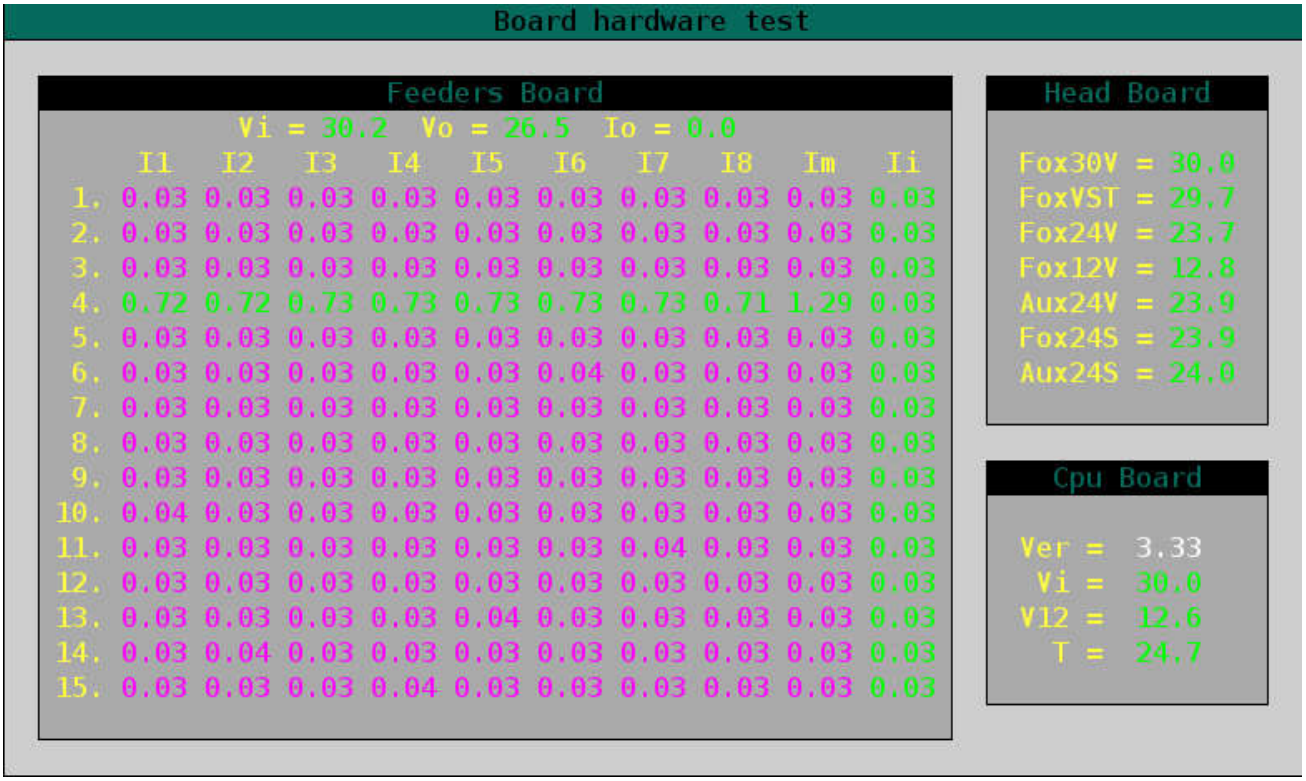
Allows an accurate test of the machine's electronics.

To access the various screens press the following function keys

F1: test currents and voltages of feeder board, head board, CPU board and feeders which are connected to the machine.
Displays currents and voltages of feeders and other cards. In green the normal values, in purple lower ones and in red the higher ones.

NOTE If in one or more places feeders are not present (or are present air-feeders), values are displayed outside the norm. However, this does not mean that there is a failure (see Pic.6 where is shown an example with just one feeder connected to the Quadra in position number 4)

- ***F2***: summary of the checks done. Allows you to have an immediate result on the actual operating status of the parts under investigation
- ***F3***: test inputs, outputs and encoders motors of rotating tips connected to the Fox (board on the head of the machine). Pressing the number / letter indicated above the name of the output it happens the activation / deactivation. The number above the input name identifies the actual value.
- ***F4***: test other inputs and outputs used by the software and connect to the various boards of the machine. Pressing the number above the name of the output it happens the activation / deactivation, the number above the input name identifies instead the present value.
- ***F5***: test feeding progress (advancements) of the feeders eventually connected to the machine. Pressing the number / letter indicated above the identifier of the feeder starts the advancement, in sequence, of individual wheels / solenoid of that feeder.
- ***F6***: test dedicated to smart feeders eventually connected to the machine to verify a correct reading of the serial number



Pic. 6 – Currents and voltages test

3.3.1.7 External camera test

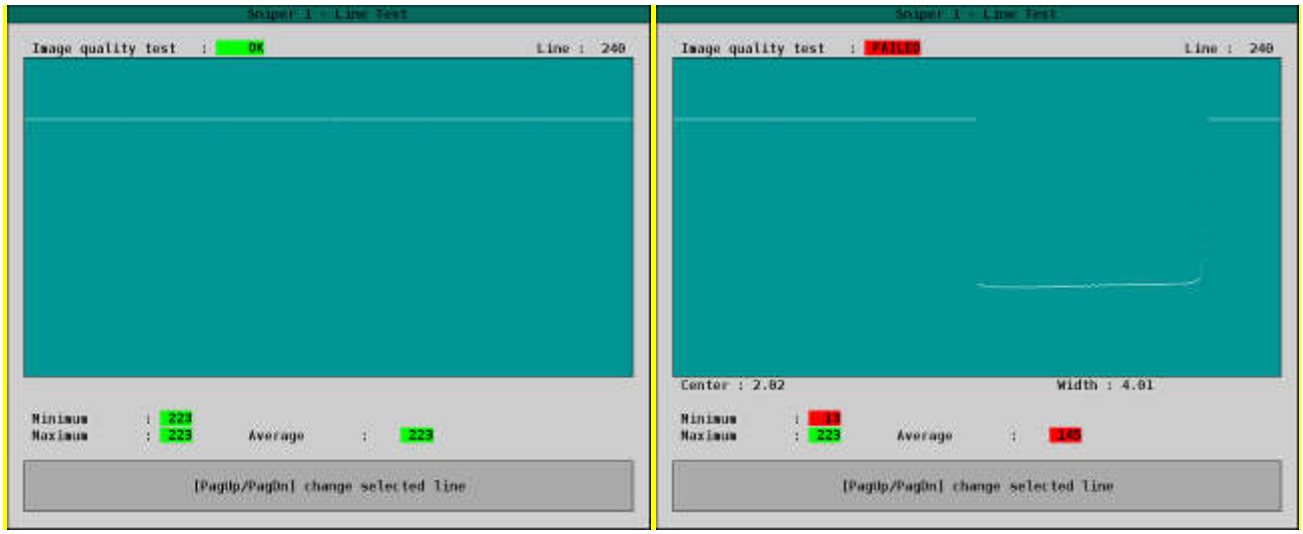
Let the user verify the proper working conditions of the external centring device.

3.3.1.8 Sniper test

Functionality tests for "Sniper" on-fly optical centering device.

- *Scan test tip 1 or 2*: performs an optical reading making the tip run along the default path (7 mm) starting from Z=0 (from –3.5 mm to +3.5 mm). Then the related graph on the screen is shown.
- *Ear-ring verify*: used to verify the slide compass on which are inserted the nozzles. The window displays the previous position where the compass was. Pressing F3 (item *Position verification (F3)* from associated submenu) a new scan is performed to check for any deviations. It is useful for verifying, in the case of malfunctions in the Z axis of one of the tips, that there are no mechanical obstructions such as not to allow the compass (and consequently the nozzle fitted on the yip) to always return in its correct working position.
- *Sensor test tip 1 or 2*: shows the scanning of a line as detected by the optical sensor. If the sensor is not obstructed the resulting figure is a horizontal line in the upper part of the graph, indicating that the sensor sees all the points of the image completely free. In the case where an object is present in the field of view of the sensor, the test shows its shape and an indication of the position and size of the same.

NOTE In this second case, test of image quality will result as failed, since the purpose of this test is to verify that, with the sensor completely free, the quality of the detected signal is higher than a certain threshold value!



Pic. 7 –Sniper sensor test with "free" window (left) and with window obstructed by a 4mm object (right)

3.3.1.9

3.3.1.10 Logger XY movements

Runs analyzes on the parameters and operation of the X&Y motor drivers.

The use of these parameters is restricted to specialized technicians of TWS Automation!

3.3.2 Backup

From the submenu you can do:

- *Parameter Backup* : allows backup of the machine working parameters on a USB device.
- *Machine data Backup*: allows backup and total restore of the machine data and parameters. In this case you can either use a USB device or a LAN network (if connected).

3.3.3 Informations

Info about the use of the machine: working time and distance traveled by the axes X and Y and statistics on the goodness of serial communications between the various boards.

3.4 Menu "CONFIGURATION"

3.4.1 Work parameters

WARNING Changing these parameters may cause malfunctions!!

3.4.1.1 Feeder position

Contains the default feeder co-ordinates, assuming that the machine is fully equipped with 8 mm wide tapes. This allows the head to quickly move to the feeder during teaching.

From the associated submenu you can select the following:

- ***Picking position teaching (F4)***
- ***Component feeding*** **(Shift+F4)**

3.4.1.2 Speed and acceleration

Display the maximum speed and acceleration of the machine axes.

3.4.1.3 Tools parameters

It contains all the parameters needed to manage and use the various nozzles (tools) installed in the appropriate holder.

The machine can be supplied with the standard nozzles holder (12 nozzles installed) or with a bigger holder (20 nozzles).

Pic. 8 –Standard holder (left) and bigger holder (right)

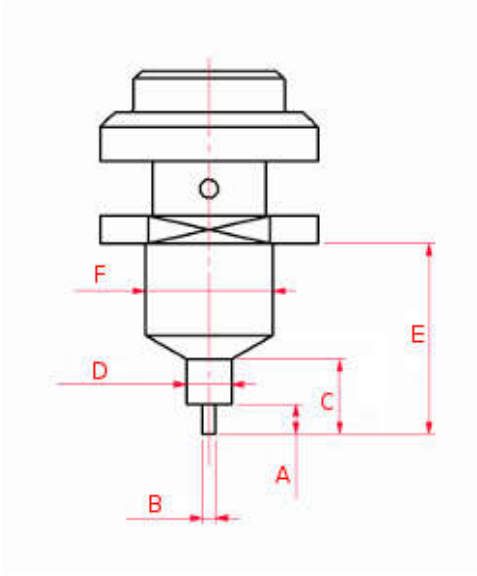
NOTE The successful acquisition of the parameters of the tools is essential for the operation of the machine! In particular, if you change the default configuration – factory settings- of the tools' holder or introducing new tools (both standard and special) is absolutely necessary to perform some calibrations properly and carefully (see 3.6.5)

Parameters associated to each tool are the following:
- *Tool code:* letter (A..Z) that uniquely identifies a nozzle inside the machine software (is used to associate the nozzles to the respective package to use them with).
- *Tool type:* Couple to each nozzle a series of data in order to give a physical description of the dimensions. This physical description is modeled on the basis of six parameters (see Pic. 9) and stored in a separate table (there can be several nozzles having the same physical model, eg. those which are duplicates ...) and is essential for the optimization function for verifying the effective dimensions of the nozzle and thus avoid possible collisions.
- *Tip allowed*: Show with which tip the tool can be picked up.
  1: only tip 1
  2: only tip 2
  B: both tips

NOTE Tip one can pick up only nozzles in the first two rows of the nozzles' holder, both in the standard and in the bigger one

- *X and Y tip 1&2*: coordinates of tools pickup position, related to machine origins.
- *Offset Z tip 1&2*: distance (gap) between the tool and the tip which fits it. Basically, allows the machine to know how has changed the Z coordinate of the end of the tip once a tool has been picked up.

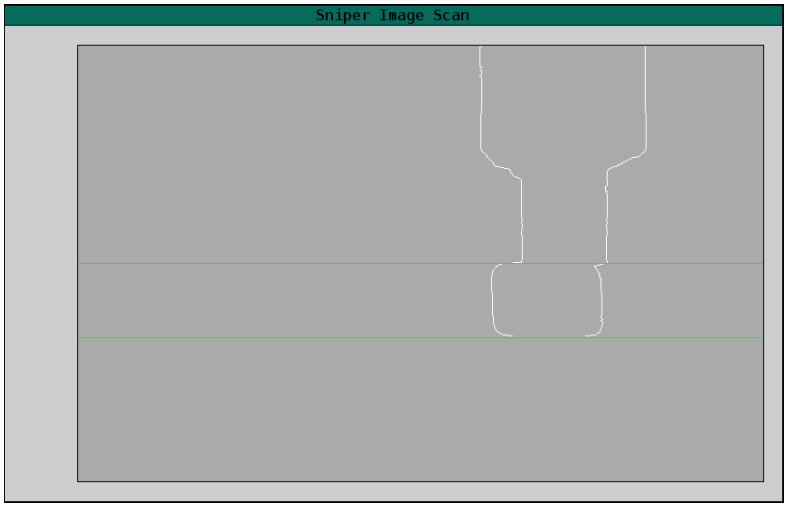
NOTE Z offset of the tools are fundamental for the correct operation of the machine, since they allow the software to know exactly how to move the tip in order to bring the components to the correct Z level both during centering and during the deposition stage. They are also essential for knowing exactly to which z level move down to pick up the components from feeders / trays. A wrong learning of these values completely inhibits the correct operation of the machine!



Pic. 9 – Modeling of the nozzle

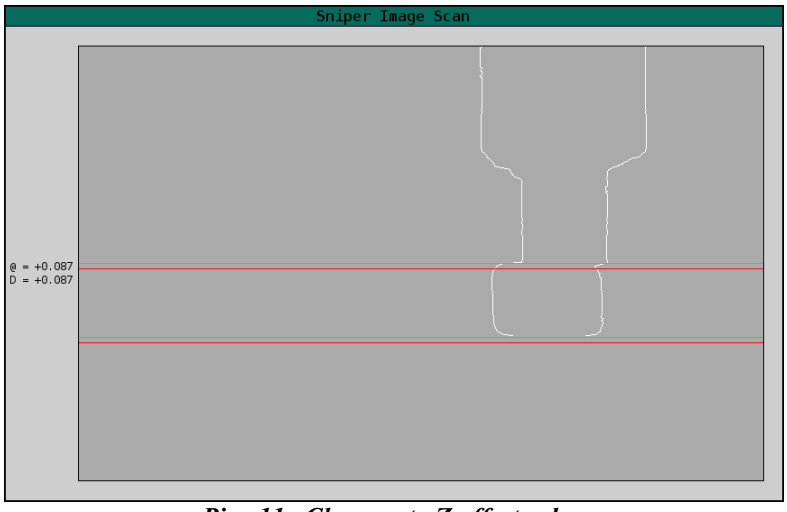
From the associated submenu you can select the following:

- ***Tool position sequential teaching (F3)***: to check and/or modify the pickup position of the tools, sequentially.
- ***Tool position individual teaching (F4)***: as above, but only for the selected tool.
- ***Z offset teaching (F5):*** activates a wizard to teach Z offset of the tool. Once you select the tip (is necessary to teach Z offset for all the tips that can use the tool), as first thing, is asked to select a component to perform the calibration (is necessary to use a component in order close the nozzle and raise it again completely through the aid of the vacuum).At this point the head is scanned by Sniper and the result of the operation is displayed:



Pic. 10 – Nozzle scan during Z offset teaching

The two horizontal green lines identify the component used as test (if everything is correctly set, in particular the height of the component in the package, the distance between the two lines must be such as to contain within it the shape of the component). To correctly set the Z offset of the tool, the upper green line should be positioned exactly between the end limit of the tool and the beginning of the component. If you need to perform an offset adjustment, pressing F2, the lines turn to red and it is possible to move them up and down using the arrow keys ↑ ↓



Pic. 11 –Changes to Z offset value

Press ENTER to confirm the new value

- ***Select tool type (F6)***: enables to specify the physical type of the tool. Selecting this function,

the tool chart is displayed. To associate a tool, move the cursor in the desidered table entry and press ENTER.

Tool types database

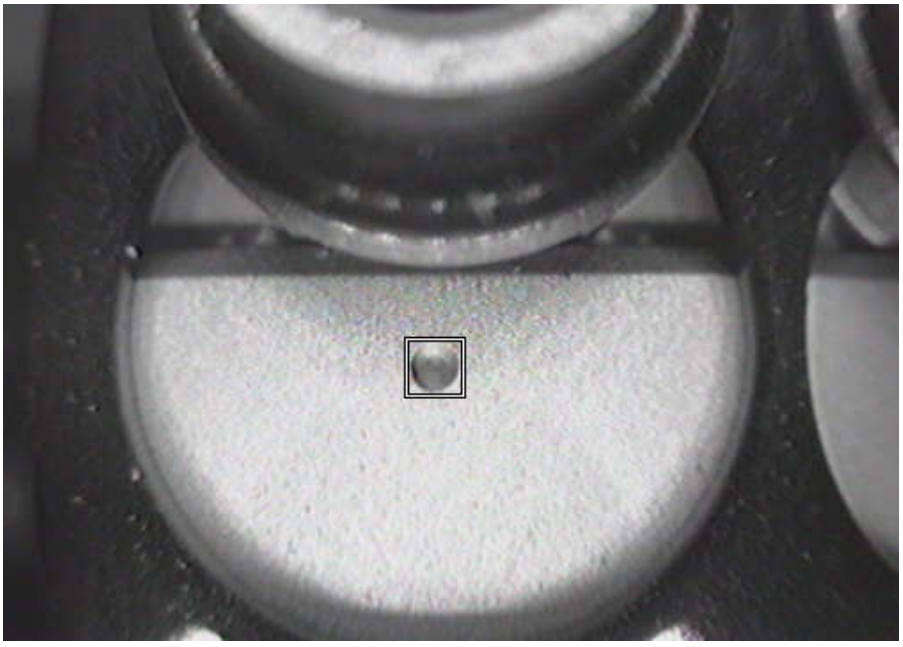
Code	Description	A	B	C	D	E	F	G
1	A/B	9.00	10.00	9.00	10.00	9.00	10.00	0.00
2	C/D	1.00	4.00	3.00	6.50	9.00	10.00	0.00
3	H/L	2.40	2.45	9.00	10.00	9.00	10.00	0.00
4	E/I	1.60	1.30	4.00	2.50	10.00	7.00	0.00
5	F/J	1.60	0.90	4.00	2.50	10.00	7.00	0.00
6	G/K/X/Y/Z	1.60	0.70	4.00	2.50	10.00	7.00	0.00
7	M	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8		0.00	0.00	0.00	0.00	0.00	0.00	0.00
9		0.00	0.00	0.00	0.00	0.00	0.00	0.00
10		0.00	0.00	0.00	0.00	0.00	0.00	0.00

[Enter] Select tool type

Pic. 12 – Tools type database

If required, for example after having inserted a new tool, it is possible enter the new physical data, and thereafter, select them

- ***Tool position teaching by fiducials (F7)***: starts the automatic teaching procedure for the pickup position of the tools through camera. In this function are associated 3 items:
  - *Teaching (F1)*: activates the sequential teaching of the fiducials marked on the tool holder. This function can be correctly activated only after teaching the reference image (see following points)
  - *Reference teaching (F2)*: enables you to teach the reference image you must use to recognise the tool position by the camera. After selecting this function you just have to move the camera onto the reference point made on the tool holder, press ENTER, select the search area and confirm pressing ENTER (Pic.13).
  - *Image parameters (F3)*: shows data of the reference image.



Pic. 13 – Reference teaching (tools position)

3.4.1.4 Camera-nozzles offset

Procedure to calibrate the distance between nozzles and camera by marking a point on the working plate by ink.

From the associated submenu you can select the following:

- ***Ink position teaching (F3)***
- ***Execute procedure (F4)***
- ***Tests with different heights (F5)***

After selecting the point of the working plate where ink is placed, by starting the procedure you have to choose the point where mark must be done (a point in the plate where, for example, you previously placed a piece of paper tape). Subsequently, the machine pick up the chosen tool to perform the calibration (a completely blind tool is supplied for this particular test), the tip is carried on the ink pad in order to dipping the tool, then the point is marked on the plate and, then, the camera is activated to match the center of the cross with the center of the sign marked.
Press ENTER to confirm

NOTE The tests at different heights is exactly analogous to the normal test with the only difference that the procedure is repeated in order to verify continuing of the offset, also on different thicknesses (the use of this procedure is reserved only on the advice of specialized personnel)

3.4.1.5 Placement mapping

Shows the adjustments used to correct possible errors of placement due to mechanical tolerances of the nozzles (see 3.6.2).

From the associated submenu you can select the following:

- ***Run mapping (F3)***
- ***Delete mapping (F4)***

3.4.1.6 Operating modes

Displays the operating parameters of the machine.

- *Output on file:* It allows you to address to a file the commands which are usually addressed to the machine boards.
- *Step mode:* Ask to press a key before executing each step of the assembly working cycle.
- *Continuous assembling.*: It runs assembly cycle in a non-stop mode, without asking for board change. Used for cycle testing, demonstration etc.
- *Sniper centering activation:* Allows you to deactivate the centering by the sniper.
- *Vacuum sensor activation.* It enables to switch off the alarm coming from the vacuum sensor in case of failed component pick-up.
- *Pressure sensor activation.* It enables you to switch off the alarm coming from the pressure sensor if the compressed air pressure is low.
- *Component pickup check with sniper:* It excludes the component pickup check with the sniper optical centering device from all the packages.
- *Automatic zero search on X, Y axes*. Activates an automatic search for the origin point.
- *Dispenser option*. Activates the menus related to use of dispenser (if fitted, select YES).
- *Automatic reference point search*. Activates an automatic search for the fiducial marks before each assembly cycle.
- *Sniper scan test on component picking*: When set to *1, 2* or *B* the optical centring device scans the component for nozzle 1, 2 or both at every pickup cycle and shows a graph..
- *Sniper scan test on error*: When set to *1, 2* or *B* the sniper optical device scans the component that

has recorded a failure error for nozzle 1, 2 or both and shows a graph.
- *Demo mode*: when set on YES disables the centering, the vacuum sensor and the pressure sensor during the assembling.
- *Z down pre-movement mode:* when set to YES enables the nozzles to execute a pre-down movement to decrease the placement time.
- *Retry number if component lost*. Specifies how many times the head must retry to pick up a component from a feeder before giving an error.
- *Auto optimization mode:* When set at 1 or 2 the program is automatically optimized for working only with nozzle one or nozzle two. When set to B the program is fully optimized for working with two nozzles.

NOTE Automatic optimization is performed whenever changes are detected on the current program

- *Enable X/Y axis mapping:* allows to disable the mapping of axes X, Y of the machine. To be used only in the case of particular requests from specialized personnel.
- *Enable optical centring device:* Enables optical centering device (external camera).
- *Logging mode:* Enables a debug operating mode. To be used only in the case of particular requests from specialized personnel.
- *Enable feeders database:* Enables feeder database functionalities (see section 6).
- *Enable LAN network operations:* Enables local area network functionalities (see section 7).
- *Use only smart feeders:* Set to *Yes* if only new feeders (508-608-808 mod. with the electronic recognition) are used.
- *Enable alarm signaller (optional):* enables operation of external alarm signal light (if electrically connected).
- *Alert on package name change:* activates a notification in case you changed the package name to a component previously included in the program.

3.4.1.7 Control Parameters

Allows you to set a number of parameters for advanced controls.
Changing these parameters is to be made only in the case of special inquiries by specialized personnel.

3.4.1.8 Axes Calibration

Allows calibration of motorized axes of the machine.
Even if a brief description of the dedicated functions is given, the use of these procedures is restricted to specialized personnel or under his direct supervision!

3.4.1.8.1 Axes X/Y

Parameters and functions to check and execute the X/Y axes calibration.

3.4.1.8.2 Z Axis

Start the procedure to determine the constant step/mm for stepper motors that move the tips vertically.

3.4.1.8.3 Theta Axis

is divided in two submenus:
- *Rotation centre*: calculates the real rotation centre for the selected nozzle.
- *Angles calibration*: allows you to make software corrections in rotation angles, in order to compensate minor errors due to mechanical inaccuracies of the parts involved in the mechanism of rotation of the tips. It is possible to discriminate between Sniper centered components and external camera centered ones. All the rotation are measured in “steps” and are always intended as counterclockwise movements.

3.4.1.9 Unit origins calibration

Allows the calibration of the distance (in X&Y) between the origin reference point and the mechanical origin of the axes (used in automatic origin search for X and Y axes)

From the associated submenu you can select the following:

- ***Unit origin calibration (F3)***: It activates teaching of the distance between unit origin and mechanical origin of the axes. Head is moved to find left and lower stroke-end of X and Y axes, then camera is activated and operator must center the image on the reference cross of unit origin. Then this reference image must be saved.
- ***Unit origin image parameters (F4)***: From the associated menu *Image teaching* (F3) you can teach the reference image used by automatic origin serach procedure

3.4.1.10 Workplate calibration

Allow to set height of the workplate.

From the associated submenu you can select the following:

- ***Plate calibration (F3):*** It activates the procedure to get height of the work plate. Head is moved to the chosen position to calibrate the plate (see next item) and vacuum is activated. Using changes in vacuum values, moving head up and down is possible to find exact point of contact with the surface of the plate.

NOTE To help the tip to make better adherence with the plate and improve the variation of the vacuum, it is recommended to put a piece of tape(paper) on the plate position chosen for the test!

- ***Calibration Position teaching (F4)***

3.4.1.11 Sniper Z Delta sensors

Detects the Z level difference between the nozzle 1 and nozzle 2 and the workplate.

WARNING use of these procedures is restricted to specialized personnel or under his direct supervision!

From the associated submenu you can select the following:

- ***Calibrate (F3)***
- ***Calibration Position teaching (F4)***

3.4.1.12 Limits and positions

Shows the co-ordinates of the limit point of the placement area related to the machine origin point, the components discharge position and the board limit.

From the associated submenu you can select the following:

- ***Component discharge position (F3)***

NOTE To avoid problems and malfunctions of the machine, you should not change, except for special cases, and always under the supervision of a specialist, the values of the limits of the machine working area!

3.4.1.13 Dispensation parameters

(see chapter 5)

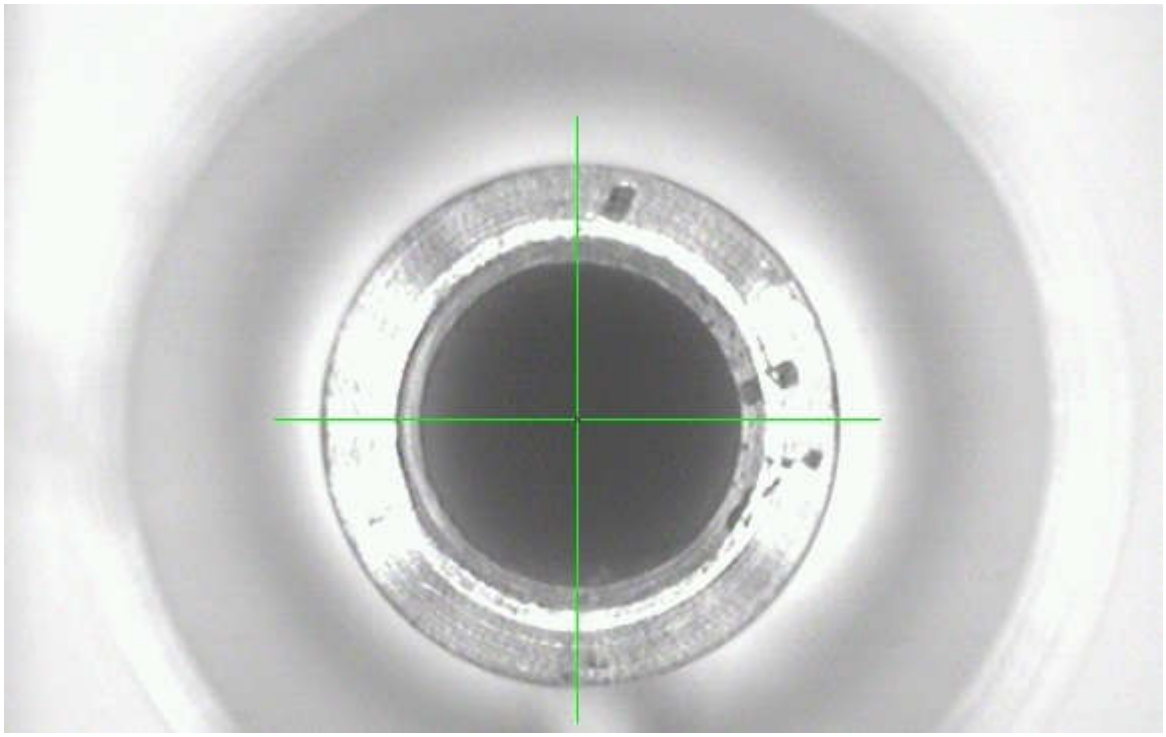
3.4.1.14 Camera-Dispenser Offset
(see chapter 5)

3.4.1.15 Centering Camera (external)
External Camera settings.

From the associated submenu you can select the following:

- ***External camera Position teaching (F3):*** To teach camera position move the cursor (cross) at the centre of the nozzle. Move nozzle up and down to get a good focus and press ENTER.

NOTE When the procedure is performed for the nozzle 1, you are asked to teach the image which is then subsequently used every time machine is switched on to control automatically the position of the optical centering ext.device



Pic. 14 – Optical External device teaching

- ***Camera Scale adjustements (F4):*** It activates automatic procedure to calculate external camera scale.
- ***Nozzle image parameters (F8)***
- ***Remove nozzle image (F9)***: remove the image and disable the automatic teaching of the optical ext.device position.

3.4.1.16 Vision parameters
Contains parameters used by the vision system to recognize images.

From the associated submenu you can select the following:

- ***Camera Scale adjustements (F3):*** It activates procedure to calculate head camera scale

3.4.1.17 Warm-up parameters
Contains parameters used to warm the machine if at start-up its temperature is under a minimum setted value:
- *Machine temperature*
- *Threshold temperature*: minimum machine temperature. If the temperature control is activated, in case machine has a temperature under this value at start-up, a warm-up cycle is automatically activated.
- *Axes acceleration*
- *Duration:* warm-up cycle duration expressed in minutes.
- *Enable warm-up control*

3.4.1.18 Machine ID
Allows to change the machine ID.

NOTE Each machineID must be different from the other ones if connected in a network

3.4.2 Reserved parameters
This menu is available only for authorized personnel by entering a psw.

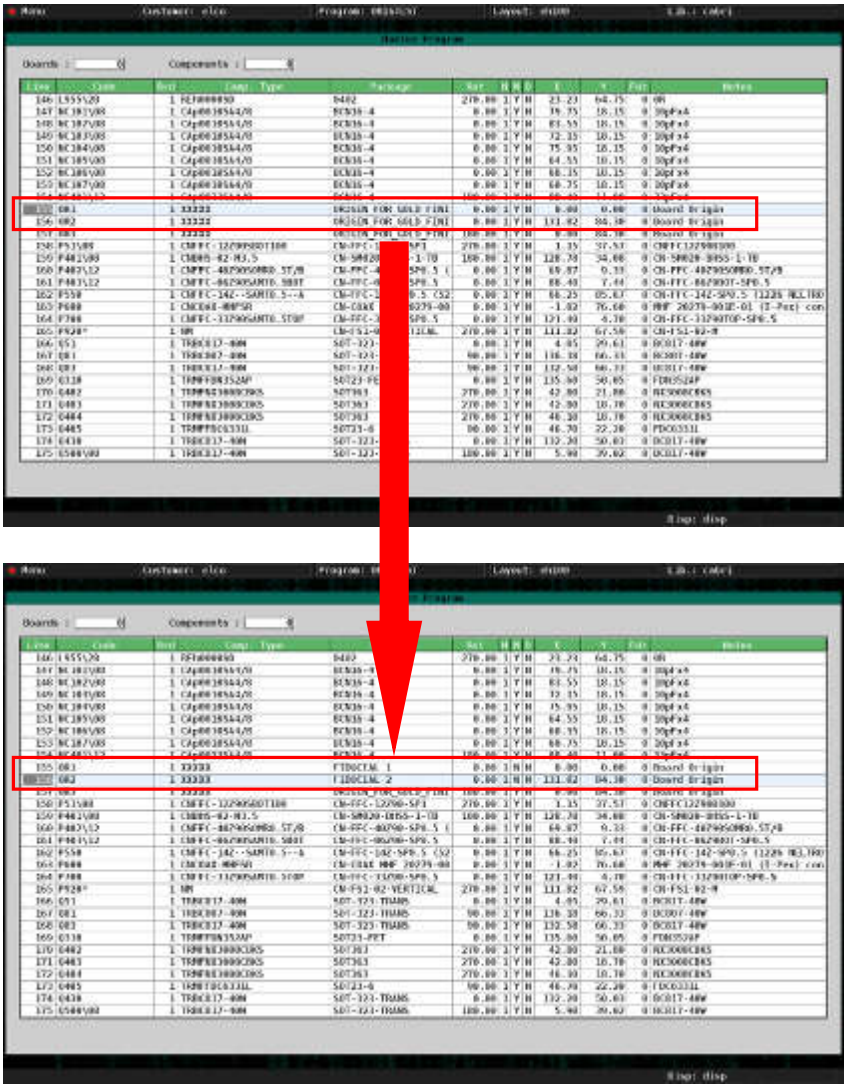
3.5 Menu "EXIT"
Allows you to exit the program before switching off the machine.

3.6 Various procedures

3.6.1 Panel composition and fiducials management
The panel describes to the software the real physical composition of the boards-panel to be assembled.
In particular, the panel is identified within the working area as its position (coordinates X, Y referred to machine origin) and as a rotation with respect to the axes of the machine (in order to make the most accurate as possible the positioning of the components).
To identify even the smallest deviations that occur every time you change a panel during the production of a batch of boards and to be able to properly compensate them automatically, is introduced the concept of fiducials.
Fiducials represent one or more markers within a panel to allow a software to compensate the roto-translations at each minimum variation in the position of the PCB on the working surface. In particular, in the software of Quadra two fiducials are considered board origin and reference.
Board origin represents a first point to which all the coordinates of the components are referrred within the assembly program. The reference and is a second point which, together with the zero, allows to uniquely identify the rotation of the board inside the working area.
The software manages fiducials in two ways:
- Coordinates of fiducial imported from CAD data together with the coordinates of the components
- Fiducial identified manually teaching him directly on PCB

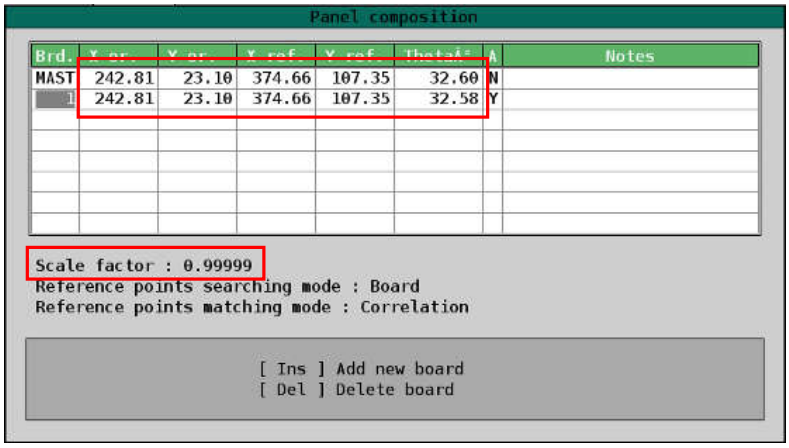
3.6.1.1 Fiducials from CAD data
It is s the ideal condition to ensure the best accuracy of the machine.
In this condition, once a program is imported from CAD data, you need to select, from the list of components, the two lines that identify the fiducials (origin and reference). To do this, simply identify the two lines (one of which, being the origin, will get, by definition, assembly coordinates

0,0), place the cursor on each ot them and, using the two functions selectable from *Operations table - fiducials - Set as fiducial 1/2,* set them in order to let the software to use them. If the operation was done correctly, the packages associated with the two lines will assume special values of FIDUCIAL 1 and FIDUCIAL 2:



Pic. 15 –Fiducials identification from program data

Then, entering the composition panel and recreating the Master, learning the board origin software will notify the fiducial 1 was set as origin, while learning the reference, the software will notify that the fiducial 2 was set as reference.
From now on, at every machine fiducials teaching, automatically the system will recalculate the roto-translation of the pcb and scale factor:



Pic. 16 – Roto-translation and scale factor calculation

3.6.1.2 Fiducials identified manually

In this case, since there are no theorical coordinates from CAD, the fiducials can only be identified by the operator selecting them directly on the PCB.
As a consequence, software will be not able to calculate the scale factor (which in this case will get the theoretical value of 1), nor automatically calculate the rotation of the pcb related to the axes X, Y.
However, during Master learning, you will be asked for learning the Theta angle via wizard. In this case, simply select two points perfectly aligned along the X axis or along the axis Y. For example, a good criterion of choice of the points for the correction of the angle Theta is to select, in the event of multipanels, the two origins (or two references) of pcbs aligned along X or along Y. In the case of individual boards, you can take the extremes of a path (choose one with a good lenght) oriented in X or Y.

Whatever is the method used to identify the fiducials is then possible to select two different modes for their automatic recognition:
- Recognition with Correlation
- Vectorial Recognition

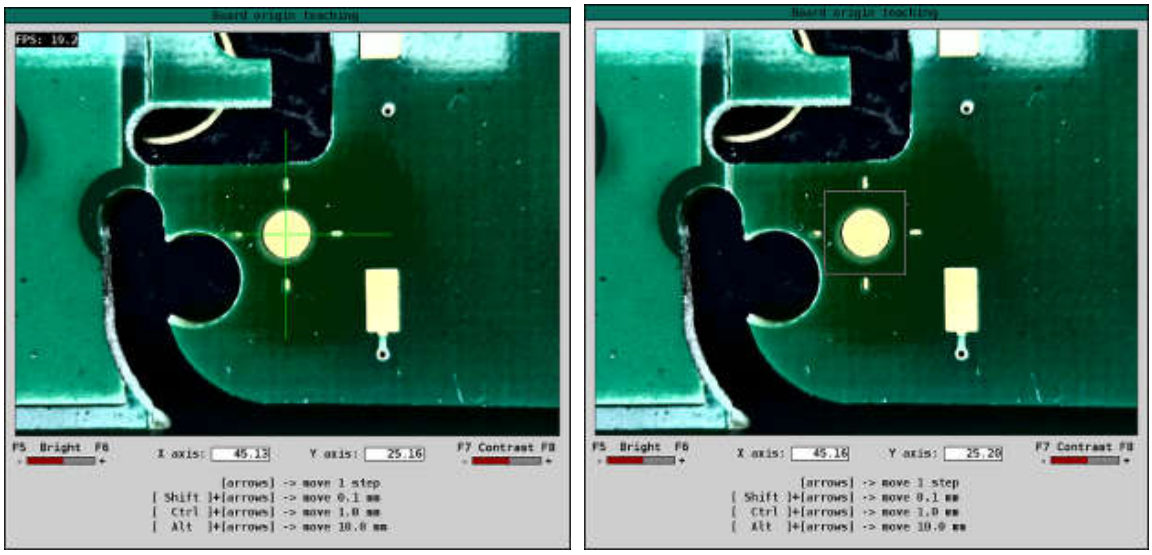
3.6.1.3 Fiducials Recognition with correlation

With this method, the software is able to recognize any type of fiducial, since the recognition takes place after you saved reference image. Consequently it is particularly suitable in cases in which you do not have fiducial "canonical" (that is identified by a symbol dedicated, such as circles, squares, or other), since, in extreme cases, they can choose as fiducial points of any circuit (provided they are not then covered by solder paste and are nevertheless very accurate and repeatable).

NOTE Pad with holes for insertion components, although usually do not cause the failure of the recognition process, may introduce considerable errors due to inaccuracies of drilling, the amount of solder on the pad, and other factors

To use the search with correlation, select the appropriate mode from the menu associated with the table of Multipanel composition (current selected mode is shown in the data of the open window).
Learning now fiducials from *Board reference teaching (F3) - Manual (F3*), selecting first the origin (zero) and then the reference you will be asked for saving the reference image. For each one, adjust brightness (F5 and F6) and contrast (F7 and F8) to obtain a clear and readily identifiable image (with F4, you set the default values).
Then define the area of recognition using the arrow keys and Pag Pag ↑ and ↓ and press ENTER to

confirm.



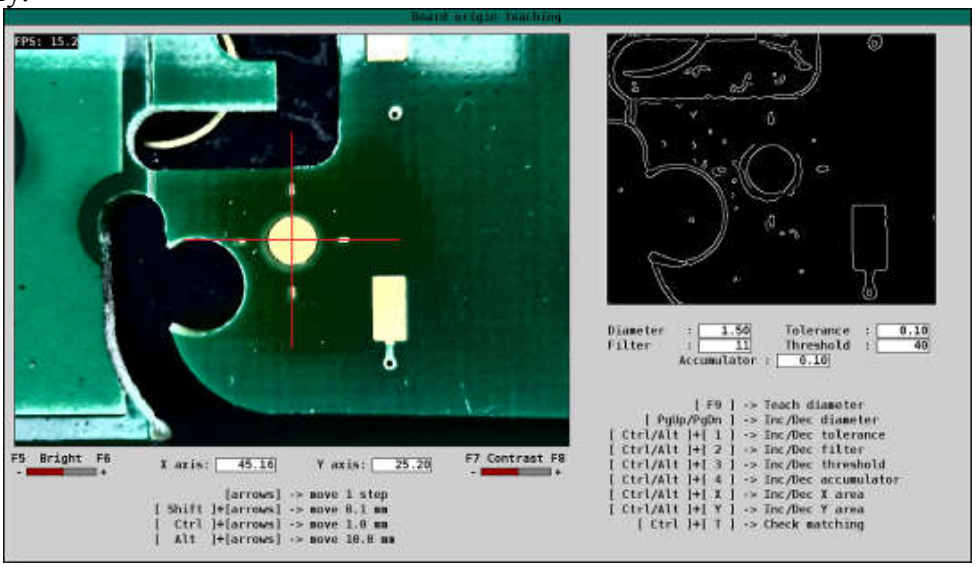
Pic. 17 –Fiducials images teaching by recognition with correlation

3.6.1.4 Fiducials Recognition with vectorial method

The vector method is dedicated solely to circular shape fiducials (they constitute the most typical and diffused case). If you are in this condition, it is recommended to use vectorial recognition being much less affected by changes of light and shade, and consequently, much more reliable and repeatable.

To use the vectorial search, select the appropriate mode from the menu associated with the table of Multipanel composition.

Learning now fiducials from *Board reference teaching (F3) - Manual (F3*), a window with two images, on the left the one captured by the camera, on the right the one created in real time by the recognition software (Pic.18), will be showed. It is now necessary to define the physical characteristics of the images to be recognized and to adjust the parameters of images and adjust filters to apply.



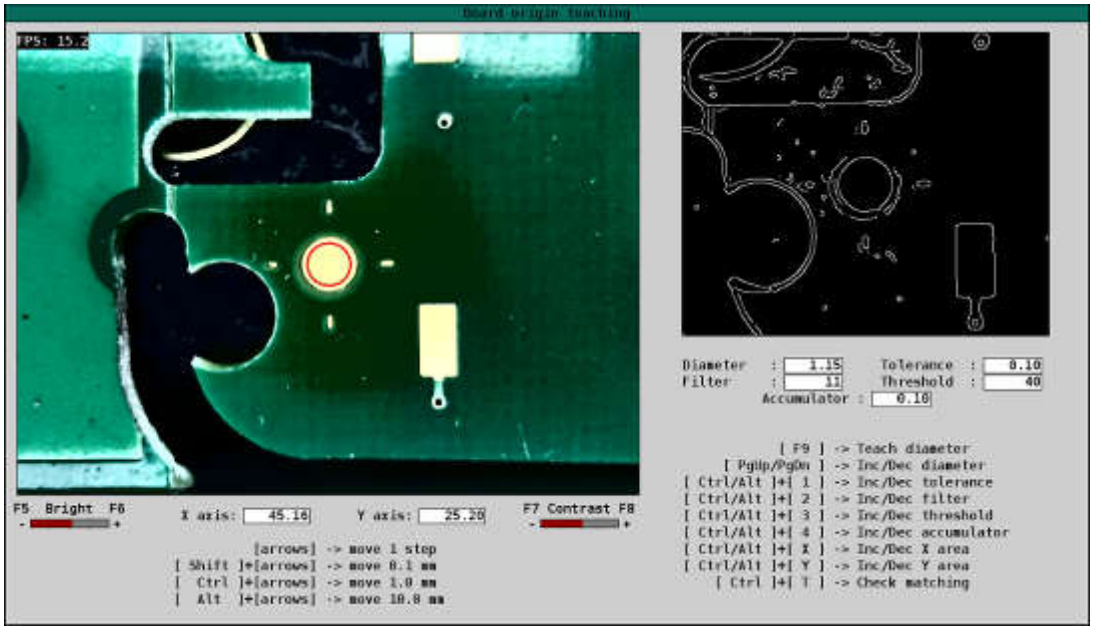
Pic. 18 – Fiducials images teaching by vectorial recognition

For a correct learning of the parameters proceed as follows:

1. Adjust brightness (F5 and F6) and contrast (F7 and F8) according to the type of PCBs used to visually recognize the circle of the fiducial in the image elaborate on the right (don't worry about

the other data displayed, the important thing is to see the circle as complete as possible)

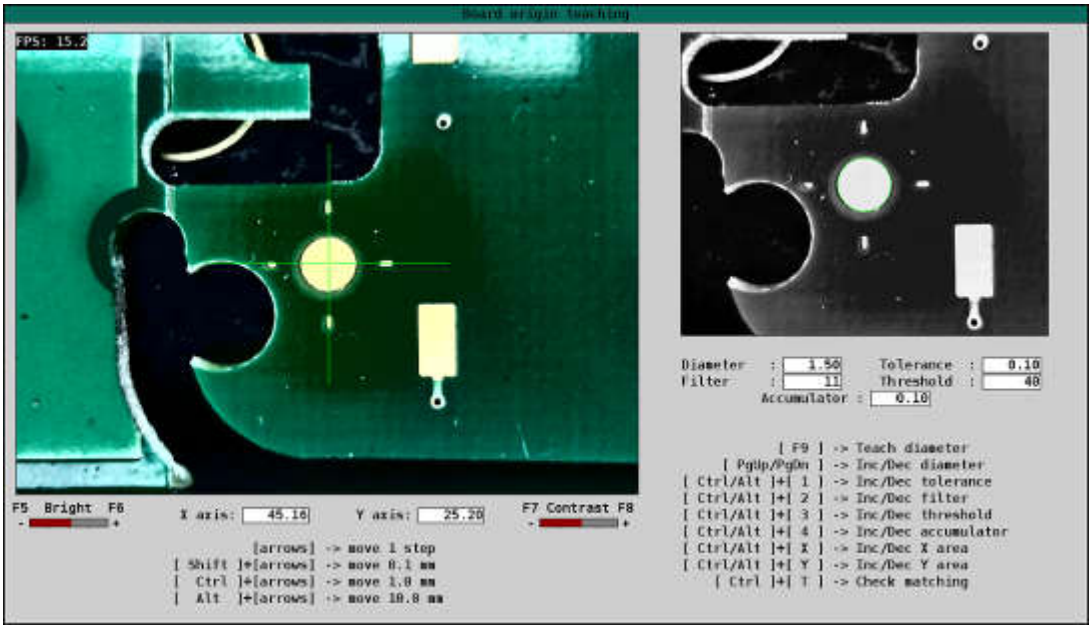
2. Learn the correct size of the fiducial entering the wizard (F9). In the left image the cross disappears and appears a circle. Move it with the arrow keys and increase / decrease its diameter with Pag↑ and Pag↓ until it coincides with the edge of the fiducial (Pic. 19). Confirm with ENTER.



Pic. 19 – Fiducials dimension teaching

3. Change the size of the search area (especially if you notice figures resembling circle of the fiducial in the part of PCB displayed, eg. holes)
4. Set a tolerance of about 0.10-0.15 and accumulator value of 0.10-0.15. The tolerance indicates how much the size of the circle can vary, the accumulator how much the searched figure is precise (the higher the set value, the better the displayed shape should be). The values shown are good in almost all cases.
5. Leaving momentarily unchanged the threshold and filter values (40 and 11 by default), try performing a recognition test (CTRL + T). The right image shows the portion of the image analyzed and, if fiducial is properly recognized, a green circle that surrounds it (Pic.20). In the case of correct recognition make the test again for 3-4 times. If the result is always positive, learning is correct and you can press ENTER to save data and switch to perform the same operations for the reference. Otherwise, try to vary the filter and threshold values to obtain the image of the circle of the fiducial as similar as possible to that of a perfect circle. If necessary, bring the value of the accumulator to a minimum (0.10).

NOTE To avoid making too many changes without understanding the real result, change one parameter at a time and run every time a recognition test (CTRL + T)



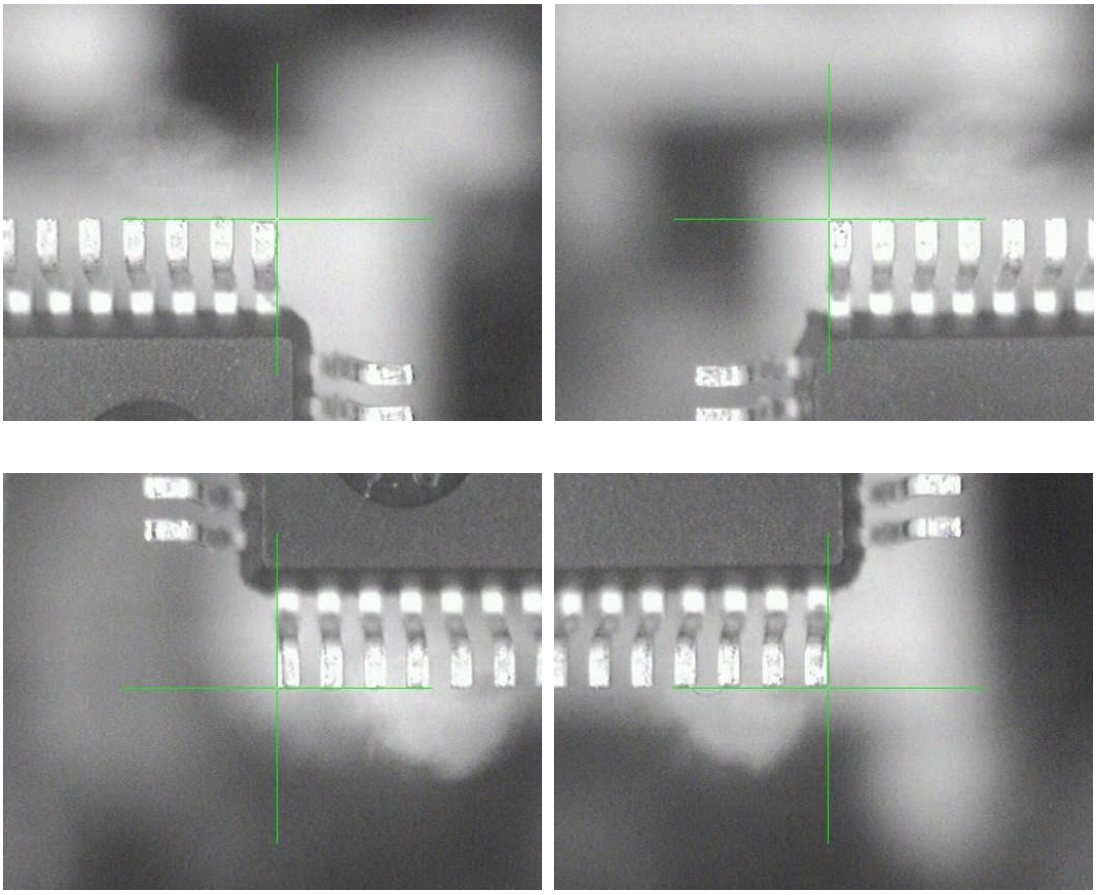
Pic. 20 – Fiducial properly recognized by the vectorial method

3.6.2 Components Placement mapping

To map the components placement, do the follows:
- Place a printed circuit board on the work surface.
- Prepare an assembling program that includes four components (for example chip 0603) mounted at 90 °, 180 °, 270 ° with the nozzle 1 and four with the nozzle 2.
- Place double-sided tape in the zone where components will be placed.
- Run the program and assemble the components in step-by-step mode.
- Activate the Placement mapping function.
- The camera is brought in correspondence of the first component. The window displays the parameters of the placing of the component (eg, nozzle 1, 0 ° rotation, correction steps 0, 0). Move the head up to position the crosshair in the center of the component and confirm with ENTER.
- Repeat the procedure for the other components.
- Remove the components from the test pcb, taking care not to move the board from its position, perform a new assembly and repeat the mapping offset.

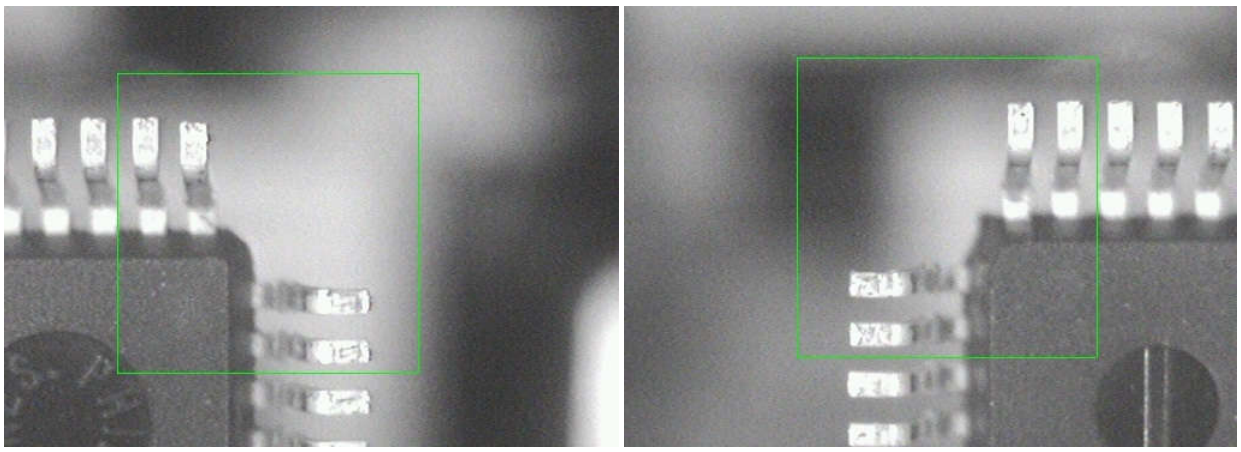
3.6.3 Package Images teaching

This is required for all packages that are centered with the external camera.
From the submenu associated with *"Parameter Package*", select "*Vision Parameters → Teaching*."
When the component is on the external camera if necessary move the nozzle up or down to bring it into focus (use the buttons Page ↑ and Page ↓) then select the four corners to correct rotation and translation (see Pic. 21).
Run again the teaching for a fine adjustement of the alignment and, in general, until when you have no doubts on the correct alignment or in the case the cursor doesn't returns exactly on the corners of the component.



Pic. 21 – Component teaching with external camera

To memorize the reference images of the two bottom corners of the component, answer "No" when asked to continue the alignment. Choose two zones at the ends of the component as a reference image



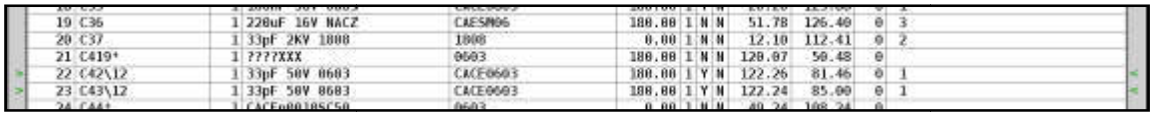
Pic. 22 – Component references image teaching

The two green boxes represent the portion of the image that will be searched during the recognition of the component. It 's necessary to select an area uniquely determinable, such as the corners. Before saving the images, you must choose appropriate values of lighting and camera shutter. such as to make the portion of the component choice clearly identifiable

3.6.4 Program versions

If the field component code ends with a backslash (\) followed by one or more digits, the system can be considered as the component to be mounted on versions identified by the number(s) indicated after the backslash character.
To activate the version control system is necessary:

1. Enter, for each component that you want versioned, at the end of the code component the special character "\" followed by one or more numbers (0 to 9). Each number corresponds to a version (eg C10 \ 0124 represents the component code C10 to be assemble in versions 0,1,2 and 4)
2. Identify as “to be versioned” the given line by positioning the cursor and pressing ALT + V. Two green identifiers (> <) appear at both ends of the line assembly



Pic. 23 – Detail of two versioned rows in theprogram table

3. Choose the version from the specific menu item. Once confirmed the choice, the versioned rows are settled as to assemble or not (based on the presence or not of the character of the version in your code component), while the other will keep their status unchanged.

3.6.5 Configuration of a new tool

In order to use a new tool with the machine you must perform the following settings::

1. Check the housing of the tools holder where to place the tool.
2. Select the tool configuration window from menu *Configuration – Work Parameters – Tool Parameters*.
3. Determine the physical dimensions of the new tool (see Pic. 9) and insert them, if necessary, as a new row in the table (see Pic. 12)
4. Use the key Pag ↑ and Pag ↓ to select the tool code where it was decided to install the new tool.

NOTE If you are using temporarily special tool instead of a standard tool already configured in the machine (eg. you remove temporarily the tool F), we recommend using a tool code not yet used (eg. W), copy parameters of the tool F in the position W (ALL parameters, both positions of pickup and Z-offset), and thereafter to fine-teach the parameters for W. In any case, even if using a position never used, we reccomend to start from configuration parameters of a tool already present in the machine (in particular with regard to the Z-offset)!

5. Teach carefully manually the position of the new tool (with all the tips with which you want to use it). Check then by the specific function in hardware test the proper pick-up/placement of the new tool
6. Teach carefully the Z-offset of the new tool (for all the tips with which you want to use it).

NOTE Since the teaching function of Z-offset execute a scans of the tool around the values already written in the table, in case the new tool differs significantly in length compared to a standard one which has been copied the value from (some mm), increase manually the value of Z-offset doing ratio between new and old (eg., always referring to **Pic. 9**, if a standard tool has dimension “E”=10mm and its Z-offset 8mm and the new one has an “E” value of 13mm, increase the Z-offset of 3mm, writing

therefore about 11mm)

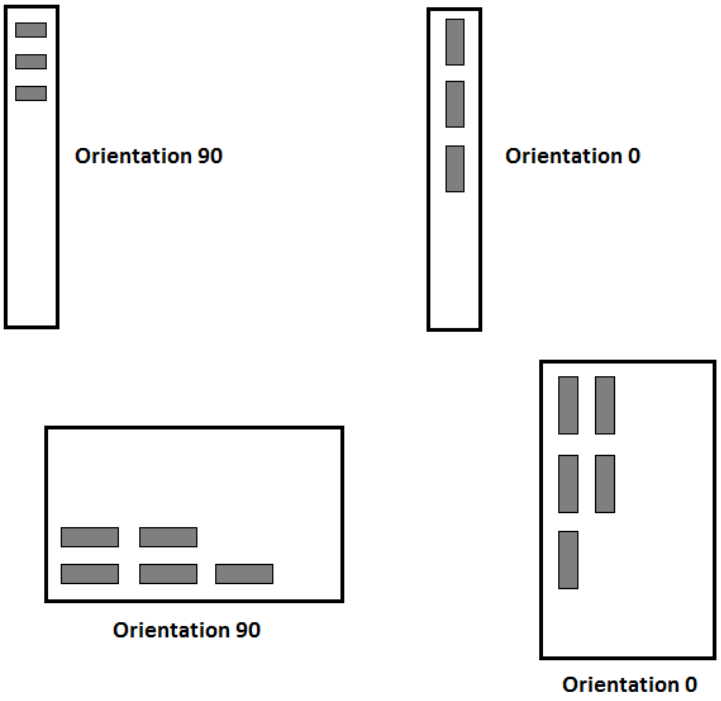
7. Write the new tool code in the parameters of packages which you want to use it with.
8. Teach the package parameters of component type which you want to use the new tool with (see section 3.1.3)

3.6.6 Camera Orientation and angle settings

The orientation indicates to the software how the component must be rotated to position the shorter side parallel to the X axis.
To make completely independent this angle from the side of the machine in which the feeder will be positioned, it is necessary to suppose to install the feeder bank containing the feeder in position 1 (see Pic. 29).
Regarding to components in tray, prevail as the tray is positioned on the plane of the machine.

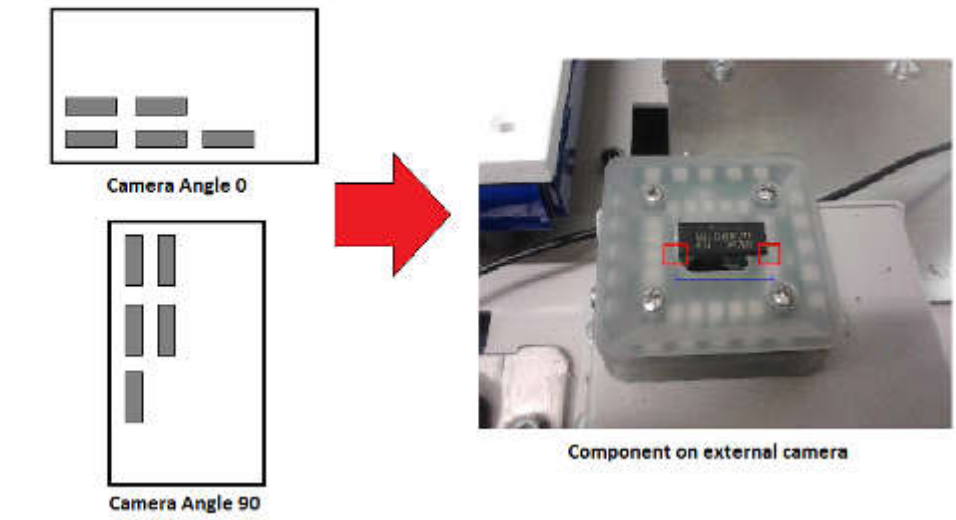
NOTE This information is ESSENTIAL for the proper functioning of the centering algorithms of the machine! You must therefore pay close attention to its correct setting!

Below are some examples of orientation for components in tape / stick and components in tray:



Pic. 24 – Examples of component orientation

Camera angle, only necessary when centering component with external camera, indicates the angle by which to rotate the component to place its longer side aligned and parallel to the X axis during the centering. Since the centering system with the external camera takes as a reference the left and right ends of the component, increasing as much as possible this distance will maximize the calculation accuracy.



Pic. 25 – Examples of Camera Angle

3.7 Functions always active

CTRL+F1
The image of scanning of the selected tip (1 or 2) centering device sensor is displayed on the screen (see section 3.3.1.8).

CTRL+F2
Displays the latest processing data performed by the centering device of the selected tip.

CTRL+F3
Displays the optical scanning of the selected nozzle (see section 3.3.1.8, "Scan tip", with the difference that the scan is not done close to origin (zero), but near the place where the tip is at the present time).

CTRL+F4
Performs check to verify step loss in Z by the safety sensor for the selected tip.

CTRL+F5
It activates ear-ring position check for the selected tip (see function *"Ear-ring verify"* section 3.3.1.8).

CTRL+F7/F8
Show data of internal logger for X and Y motor drivers (reserved for technicians)

CTRL+F9
Shows the status of the driver of the motor axes X and Y. To be used in case of movement errors in one of the two axes and then communicate the results to technicians.

CTRL+F10
Reload the parameters of the control PID for X and Y axes motor driver (reserved for specialized

technicians)

CTRL+F12
An image of the current screen-shot is saved. The images are saved in PNG format in the sub-directory "*mnt/qdata/qdvcdata/slides*".

ALT+F1
Display on the screen the image of the centering sensor of the selected tip.

NOTE You can copy and paste text from an input box or cell in a text box to another, if the data type is the same. Press CTRL + C to copy and Ctrl + V to paste

NOTE Press TAB or ALT + M to open a menu associated with a window

4 USING THE MACHINE

WARNING **Never lay anything on the placement area (tools, feeders magazines, or other). If the placement head hits obstacles during movement, severe damage is likely to occur!**

4.1 Power on

Power on the main-switch of the machine. When the operating system and all drivers are fully loaded, type *./qdvc* to start the control software.

4.2 Unit Origins

Each motorized axis of the machine needs to perform a reset initial cycle . When you start the control software that cycle is performed automatically. As for the X / Y, if enabled you are asked whether to search zeros in automatic or manual. In the second case (or in case of failure of the automatic search) is necessary to search for the zero manually centering the crosshair of the camera with the reference cross reference located at nozzle's holder (in the lower side, left of the working area of the machine).

4.3 Set Up

First it is necessary, if the machine is not ready because the production was previously started and stopped, prepare all required feeder banks.

4.3.1 Installing Feeder banks for componenents in tapes

- Plug the connector of the machine into the socket on the feeder bank (can be done with the machine switched on).
- Clip the feeder bank to the working plane of the machine by means of the hook placed on the front of the same.

WARNING **Do not execute this operation when machine's head is moving**

- Lock permanently the feeder bank with the screw inserted into the hole on the chassis of the machine.

WARNING This action (locking) is necessary to prevent accidental unhooking of the Feeder Security Panel (which could cause damage to the assembly head)

4.3.2 Installing feeder banks for components in stick

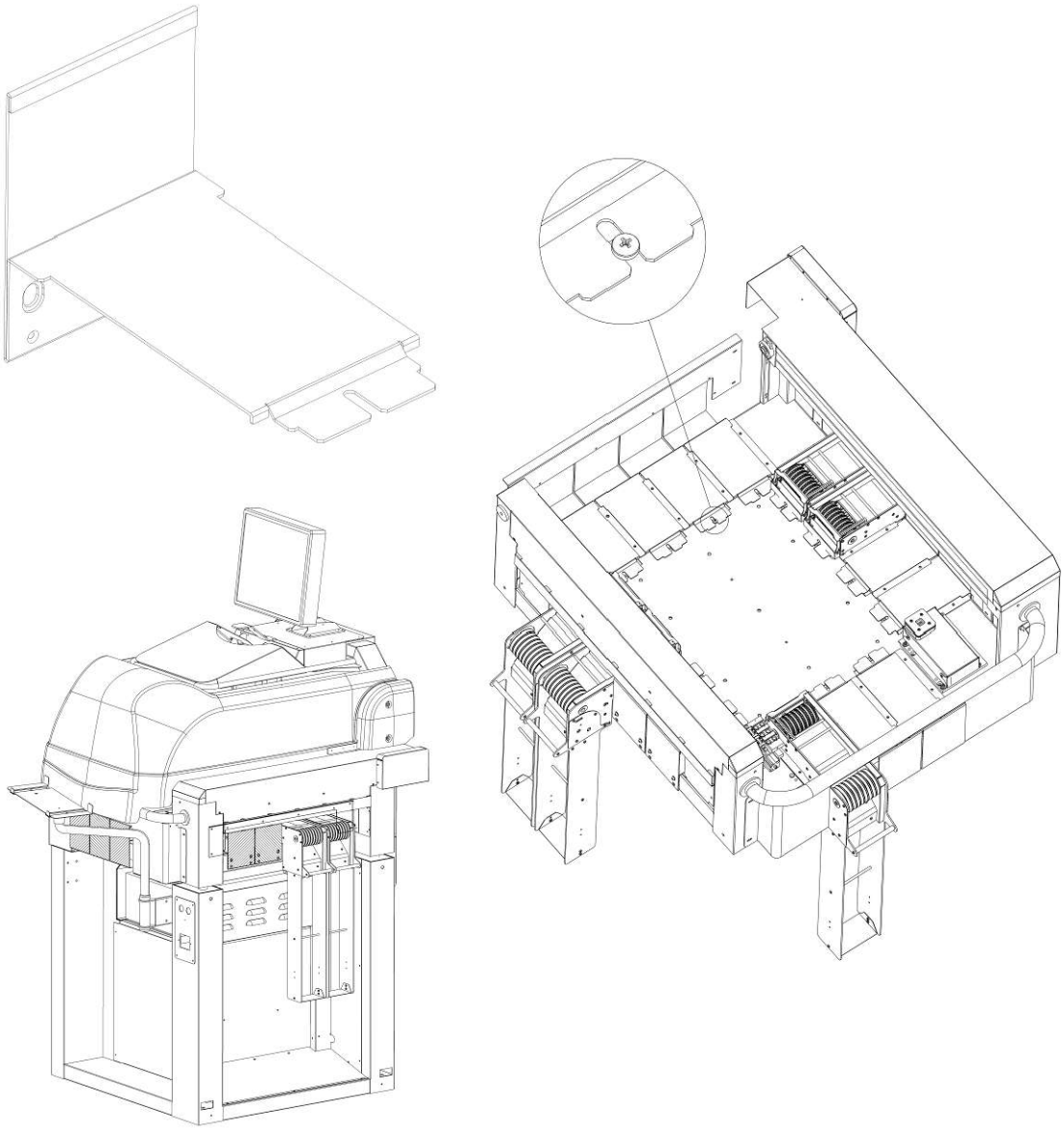
- Insert the stick in the lane through the stick-press spring.
- Insert the air nozzle by screwing it to the air pipe connector at the opposite end of the lane.

NOTE Some sticks have numerous holes which, causing the dispersion of the air blast, do not allow the feed of the components. Fill the holes with tape

NOTE To replace the lane for integrated circuits, changing feeder layout, you must remove the feeder bank from the machine, then remove the screw that secures the lane to the bank and mount a new one

4.3.3 Installing feeder safety panels

Fix the panels to the machine working plane by the hook placed in the front of the feeder.
Block the feeder safety panel by the screw which is in the hole on the machine chassis.



Pic. 26 – Fixing the feeder safety panels

WARNING **Before using the machine make sure that all safety panels are installed properly so as to disable all the access to the workspace. The feeder banks and the panels must be tightened with a screw to be inserted in the corresponding hole in the chassis so as to avoid that during the assembly can move and cause damage to the machine**

4.3.4 Trays

The machine can accommodate trays. The tray may be placed on the work plate. Be sure to place it squared to the axes of machine

4.4 Assembly program set-up and feeders configuration

The co-ordinates of the pick-up position are considered "a*bsolute*" as they are related to the machine origin. The co-ordinates of the placement position are considered "*relative*", as they are related to the board origin that, in turn, is related to the machine origin

4.4.1 Load/Create Assembling program

First you need to load a previously saved assembly program or create a new one. In both cases, refer to paragraph 3.2.2 for possible operations on programs.

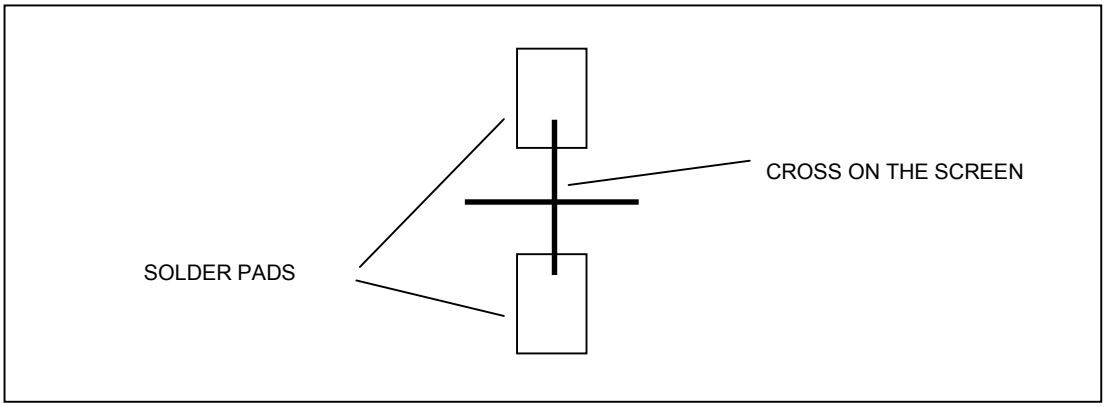
TIP ONE MANAGEMENT → CUSTOMERS → select and load the appropriate customer with ENTER key

TIP TWO MANAGEMENT → PROGRAMS → TAB key → CREATE (insert a name for the program) or LOAD → ENTER key to confirm. N.B. TO EDIT A JUST CREATED PROGRAM, IT IS NECESSARY TO LOAD AND SELECT IT.
To write/edit lines inside a program → Master Program → F2 (edit ON)

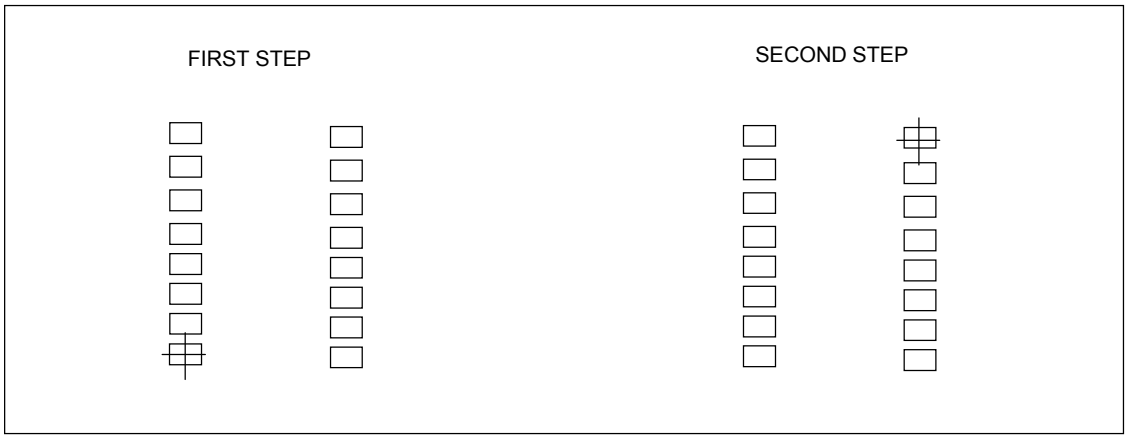
NOTE If you are importing CAD data to create a new program is necessary to convert previously the data provided by the PCB designer in ASCII-Q with a special program provided by TWS Automation. Contact TWS Automation support for more information on this program

The assembly position of a component on the board corresponds to the center of the component.
In case of component mounting positions manual teaching directly on the PCB (not having therefore CAD data) or otherwise in the event of a check of the positions of the components, you can either learn directly the placing center through the functions *Teach placing positions (F4)* or *Placing Position Sequential teaching (Shift + F6)* (typical operation eg. for small components or chip type, consisting of two/three pads, see Pic. 27), or use a wizard that allows the detection of the center of the component via two pads diametrically opposed through the function *IC Placing position teaching (Shift + F4)* (typical operation for integrated circuits, see Pic. 28)

NOTE Before being able to teach the placing positions of the components via camera, it is necessary to define the structure of the circuit (and possible multi panel) and its origins(zeros)/references, since all of the coordinates of its components will be referred to board origins



Pic. 27 – Component position teaching by camera



Pic. 28 – I.C position teaching by camera

In the case of new production is also necessary to specify the height of the PCB from the data program (Menu Program Data(F1)).

NOTE Since the variation of the height of the PCB also vary the heights of movement in Z of the tips for positioning the components, this measure is critical and essential. If you forget to set it and remains zero, launching assembly the machine warns of such forgetfulness and allows you to set it before starting the assembly of the components

4.4.2 Load/Create Feeders configuration

For assembling a program is necessary to describe in the software the actual feeders configuration installed in the Quadra. In this regard, to every program is associated a feeders configuration file. Refer to section 3.2.3 to load or create a configuration file.

TIP THREE Not necessary to create/load customer if already done when loading/creating a program.

TIP FOUR MANAGEMENT → FEEDER CONFIGURATION → choose the appropriate configuration and confirm with ENTER key OR create a new one using TAB key → CREATE.

NOTE In the case of a production already/previously used, the feeders configuration file is loaded together with the assembly program!

4.4.3 Load/Create Package libraries

The machine requires package library to center and assemble the components appropriately. Normally you use only one package library for all programs since the types of components are common to all of them. In any case, creating a new assembly program is necessary to associate that library. Refer to paragraph 3.2.4 for possible operations on the package library.

TIP FIVE MANAGEMENT → PACKAGE LIBRARIES → choose the appropriate library and confirm with ENTER key OR create a new one using TAB key → CREATE.

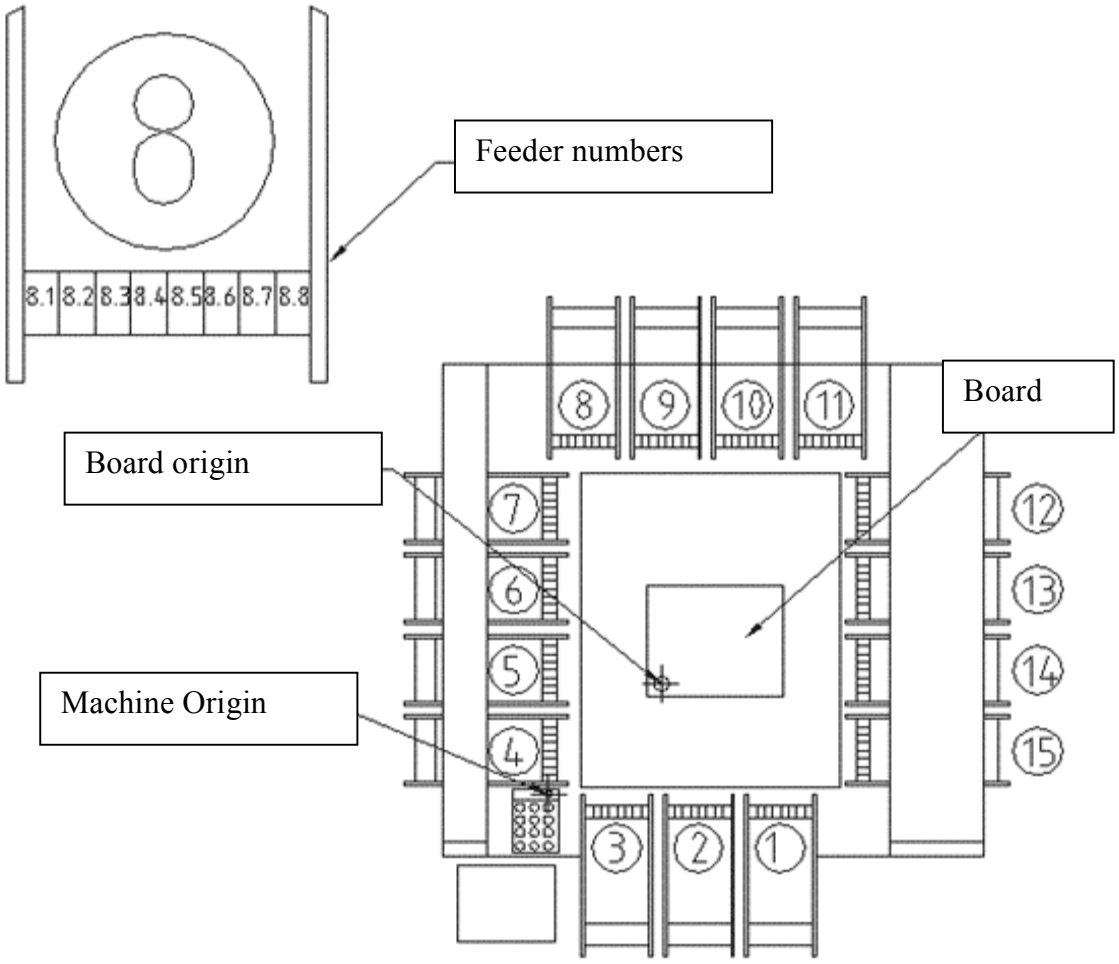
NOTE In the case of a production already/previously used, the package libray is loaded together with the assembly program!

4.4.4 Create Panel and Fiducials teaching

In the case of new production, you need to teach the data of the Master board and define the structure of the panel and fiducials (*Menu panel composition (F6)* and *Board references teaching (F3)*, refer to section 3.1.4 for more information).
If you use a program already assembled is sufficient, in the case of placing the boards to be assembled exactly in the same positions previously used, re-learn the positions of the origins (zeros) and references.

TIP SIX To insert pcb thickness and boards number →PRODUCTION → PROGRAM DATA.

NOTE The position of the board inside the working area is referred to machine origins (zeros), and in particular the coordinates of the board origins refer to machine origins (see Pic. 29). The coordinates of the components inside the board are referred, instead, to the board origins, and in particular, in the case of multiple circuit, each component of each board refers to origins of its board



Pic. 29 – Unit coordinates system and feeders numbering

TIP SEVEN To teach Multipanel (or even a single board) → F6 → Then teach Board origin (zero) and reference points moving the camera heads on the appropriate points and confirm with enter.
System asks now for Delta Theta → you need to enter (moving camera head and confirming points with enter) two points on the same line (X or Y)

TIP EIGHT Entering the placing coordinates of the components → For each row of the program you must teach the placing coordinates → move the cursor on the appropriate row then F4 (placement position teaching) or Shift+F4 (sequential position teaching) → Move the camera head on the appropriate placement position and confirm with Enter.

4.4.5 Final checks and optimization

Once the creation of the assembly program and checks on PCB positions are ended, perform a check of congruence (*Congruence Check menu (Shift + F7)*) to verify that all the information has been properly introduced and all the associations component-feeder-package are valid.
If successful, the software will complete the associations between each component and its feeder and write in all the package fields of the assembly table the correct data. You can then continue in the final steps of setup before starting assembly.
In particular, in order to create the correct assembly order and associate also the nozzles in each assembly line, perform the program optimization function (menu *Sorting table (F8) – Program Optimization (F11),* choosing, except in special cases , optimization with both nozzles).

4.4.6 Picking Positions teaching and feeder picking height

In order to pick properly the components from the feeder is necessary that picking positions of all the used feeders (and their picking heights) are fully teached.
Use the *Feeders sequential teaching (Shift + F5)* to teach both picking positions and picking heights of all the feeders used for the current program.

4.5 Assembling

Start the assembly by selecting from the menu the function *Assembly (F7) - Total (F8*).

NOTE In the case of new production, in the event of particular picking or placing problems it is recommended to start the first assembly (or partial, just for a few component) in step by step mode (menu *Assembly (F7) - Step by step (F10))*

5 USING THE DISPENSER

The DVC-Evo Quadra is fit to be equipped with either the time-pressure dispenser or the more precise volumetric one.
The Quadra dispenser has been designed to dispense adhesive, although it can also use other fluids (in case please contact TWS Automation).

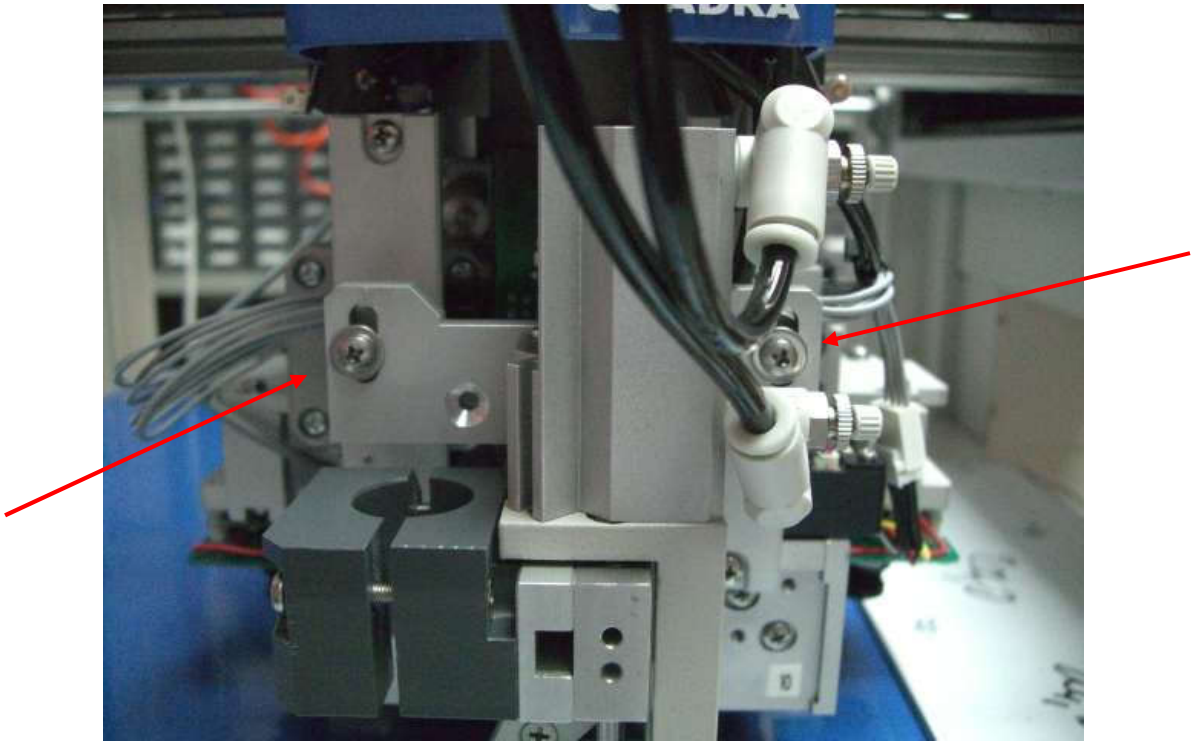
5.1 Adjusting the height of the dispensing assy and the syringe

Adjustment is done as follows:

- Remove the syringe from the dispenser.
- Slightly loosen the two M3 nuts fixing the dispenser to the mounting head; now the dispensing assembly can move freely in the two holes of the dispenser bracket **(**Pic. 30**)**
- Enter the *Utility – Work Parameters – Camera/dispenser offset* menu and press *F3 – Offset calibration.*
- Move the syringe over the board using the arrow keys, and lower the syringe using Pag↓; until the foot contacts the board surface.
- Tighten the two M3 nuts fixing the dispensing assembly to the mounting head, keeping the foot in contact with the board surface.
- Insert the syringe into its housing.
- By using a thickness gauge, place the syringe so as the distance from the tip of the needle to the board surface is approximately half of the needle's inner diameter. For example, if the needle has an inner diameter 0.4 mm, then adjust the gap to 0.2 mm.
- Raise the syringe using the Pag↑ key and exit the menu by pressing ESC.

NOTE

The height adjustment of the dispensing assy must be done every time the board thickness changes. For example, when switching from a batch of boards 1.6 mm thick to a batch of boards 1.2 mm thick, you will need to adjust the height.
The height adjustment of the syringe must be done also when needle is changed, since the new needle may be screwed to the syringe barrel to an height slightly different from that of the previous needle.



Pic. 30 - Dispenser height adjusting

5.2 Adjusting the up and down speeds of the syringe

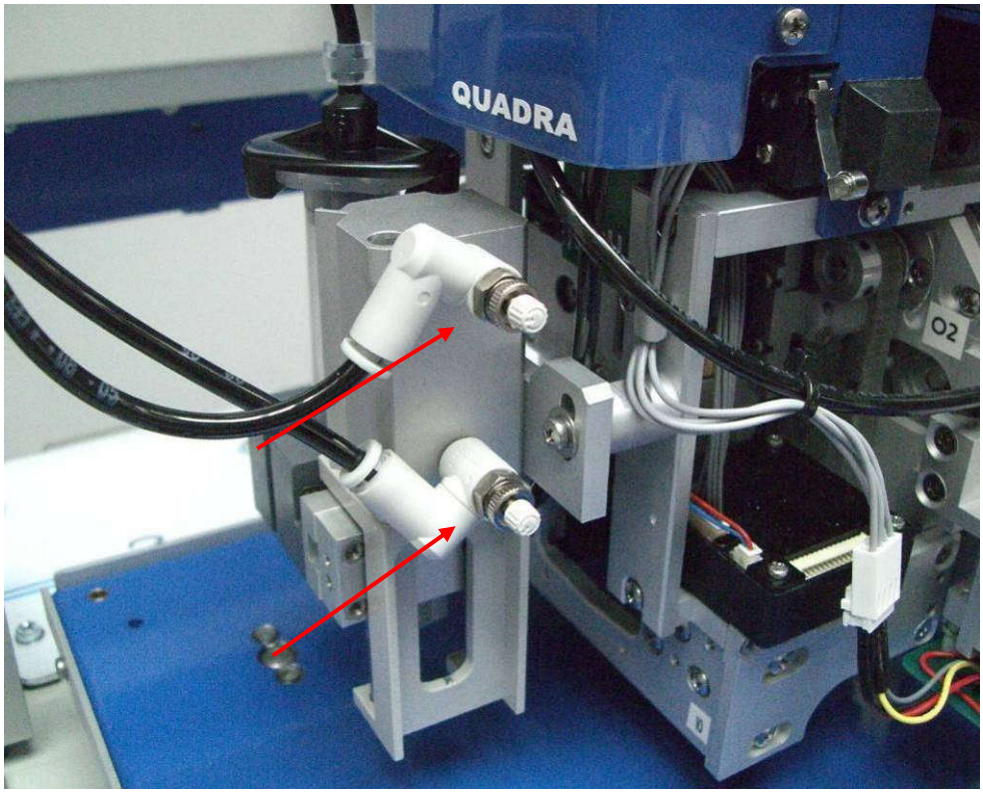
The syringe is lowered and raised by a pneumatic cylinder which has two pneumatic valves for independent adjustment of both speeds (up and down). The down speed is adjusted by the lower valve; the raising speed is adjusted by the upper valve.
To adjust the valve (Pic. 31) unscrew the locking nut, turn the small knob clockwise to lower the speed and anti clockwise to increase the speed. Then re-tighten the locking nut.

NOTE The result of the adjustment may be observed in real time by entering the *Utility – Work Parameters – Camera/dispenser offset* menu and press *F3 – Offset calibration* and lowering/raising dispenser using Pag↑ and Pag↓.

5.3 Adjusting the dispenser/camera distance

To dispense the glue dot exactly at the point programmed by the camera, you need to precisely determine the distance between the camera and the syringe needle:

- Enter the *Utility – Work Parameters – Camera/dispenser offset* menu and press *F3 – Offset calibration*
- Move the syringe over the board, using the arrow keys, and dispense a glue dot by pressing CTRL+Pag↓ (if it does not dispense the first time repeat the procedure until it does.) Once the dot has dispensed, save the position with the ENTER key.
- With the arrow keys, move the head until the camera cross-hair is centered on the glue dot, confirm with the ENTER key and save, answering *Yes* when requested.



Pic. 31 – Dispenser "down/up" speeds adjusting

This function features also other useful controls to adjust dispensing:
Pag↓ - Syringe DOWN
Pag↑ - Syringe UP
Ctrl+Pag↓ - Dispensing cycle (lower syringe, activate syringe pressure, raise syringe)
Ctrl+Pag↑ - Activate syringe pressure (the time is set in the *Dispensing Parameters* menu)

NOTE Each time you replace a syringe, the offset between the camera and needle is subject to changes. It is therefore necessary to re-run the offset setup procedure at each change!

5.4 Dispensing parameters

Menu "*Utility – Work Parameters – Dispensing Parameters*".
It is possible to create several set of parameters. You have to specify which unit must be used (time-pressure or volumetric) and set the values in a proper way. To select a different set of parameters, use the Pg↑ and Pg↓ keys. Then press Enter to confirm.

Parameters which can be changed are:
X/Y speed (High/Medium/Low)
Viscosity: allows you to change the activation time of the syringe in a comprehensive way, without having to act individually on all packages. Useful when changing the viscosity of the adhesive to be used. The parameter is expressed as a percentage: value 100 means that the syringe activation time is the same as set in the *Quantity* field of glue data package. Value 200 means that the actual activation time is twice the time set; value 50 means the time is half and so on.
Initial points: The number of adhesive test-dots dispensed before the start of the real dispensation.

Test activation time: time (in ms) during which the pressure is applied to the syringe, to dispense the adhesive during the test run.
Test points offset Y: distance (in mm) in which the dispensation is done (test-dots).
X/Y axis stop wait time : time (in ms) during which the head holds still after reaching the dispensing position.
Syringe Downstroke time: waiting time (in ms) between syringe's downstroke and activation of dispensation.
Syringe Upstroke time: time (in ms) during which the head holds still between the syringe raising command and the movement towards the next dispensing point.
Post dispensing time: time (in ms) during which the head holds still between the end of pressure application and the raising of the syringe.
Pre inversion time: time (in ms) between the raising of the syringe and the inversion of dispenser motor/counterpressure.
Inversion time: (only when using volumetric valve) it indicates the duration (in ms) of the motor dispenser inversion or counterpressure.

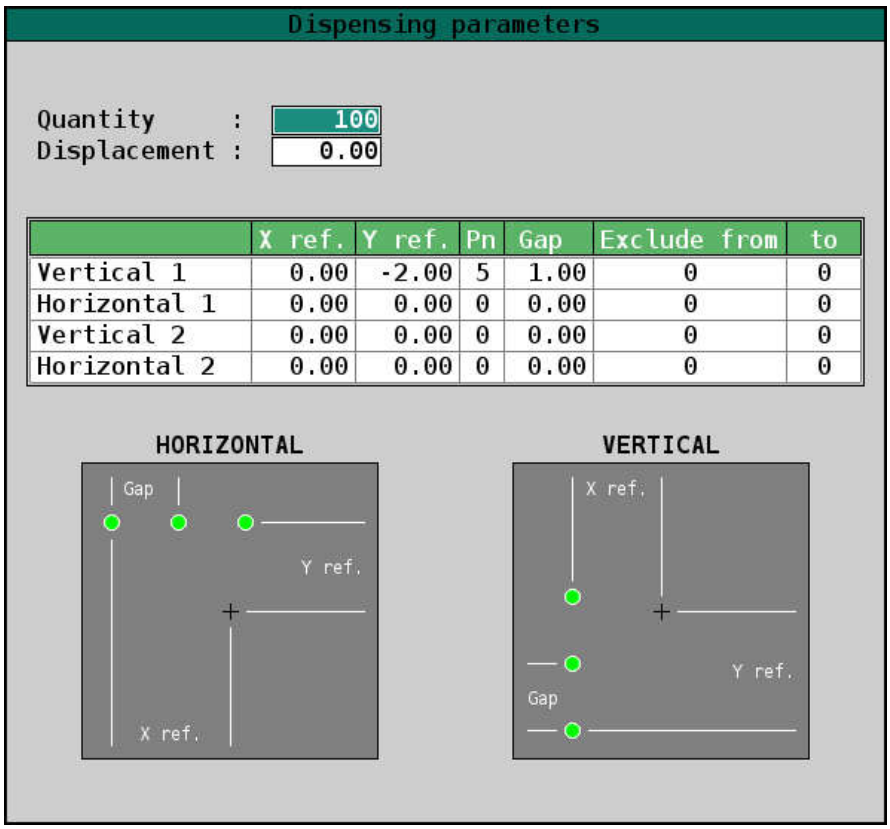
NOTE This value must be smaller than the dispensing time to be sure the dispenser is correctly working (as it is specified in package parameters, see following paragraphs)

From the associated submenu is possible to enter the following functions

- ***Glue dots position (F3):*** allows to learn the position of glue test points

5.5 Defining the package's glue-dots data

To view glue-dots for each package, select from *"Package parameters"* the item *"Dispenser parameters F3"* :



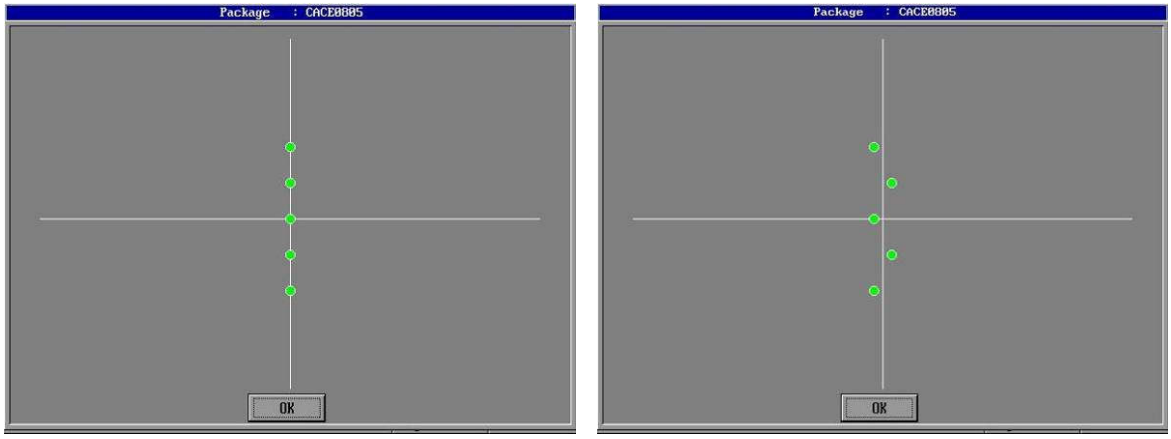
Pic. 32 - Window "Glue Data"

For each type of component you can dispense up to two lines of dots aligned horizontally and up to two lines of dots aligned vertically.
Editable parameters are:

Quantity: Amount of adhesive to be dispensed. If the parameter "viscosity" is equal to 100, this value is the time expressed in milliseconds during which the pressure is applied to the syringe.
Displacement: Let the machine to dispense some points on an alternate way along a dispensing line (see Pic.33).
X and Y reference: These are the co-ordinates of the starting point of four dot patterns (or stripes) which you can dispense. These are called *Vertical 1 & 2*, *Horizontal 1 & 2*.
Horizontal stripes have their origin in the left. Vertical stripes have their origin in the bottom.
Pn: Number of glue points per stripe. If set to zero it is not activated.
Gap: distance (in mm) between two subsequent points.
Exclusion from – to: Excludes some points of the dot stripe.

From the associated submenu is possible to enter the following functions

- ***Dispensing Preview (F3):*** Show a window with a preview of the glue dots referred to centre of component.



Pic. 33 - Displacement parameter effects on dispensing figure

5.6 Defining the test glue-dots position

At the start of each new dispensing, the machine performs one or more dispensing cycles, to discharge some adhesive contained in the needle, conditioning the adhesive state inside the barrel and to let the operator have visual confirmation that the subsequent automatic cycle will be performed properly.
To define the position where the test dots will be dispensed, select the "*Program data"* function from the assembling table.

5.7 Dispensing

To prevent that the stopping foot of the needle touches the adhesive dots already dispensed, the software organises the lines of the program according to ascending X co-ordinates.

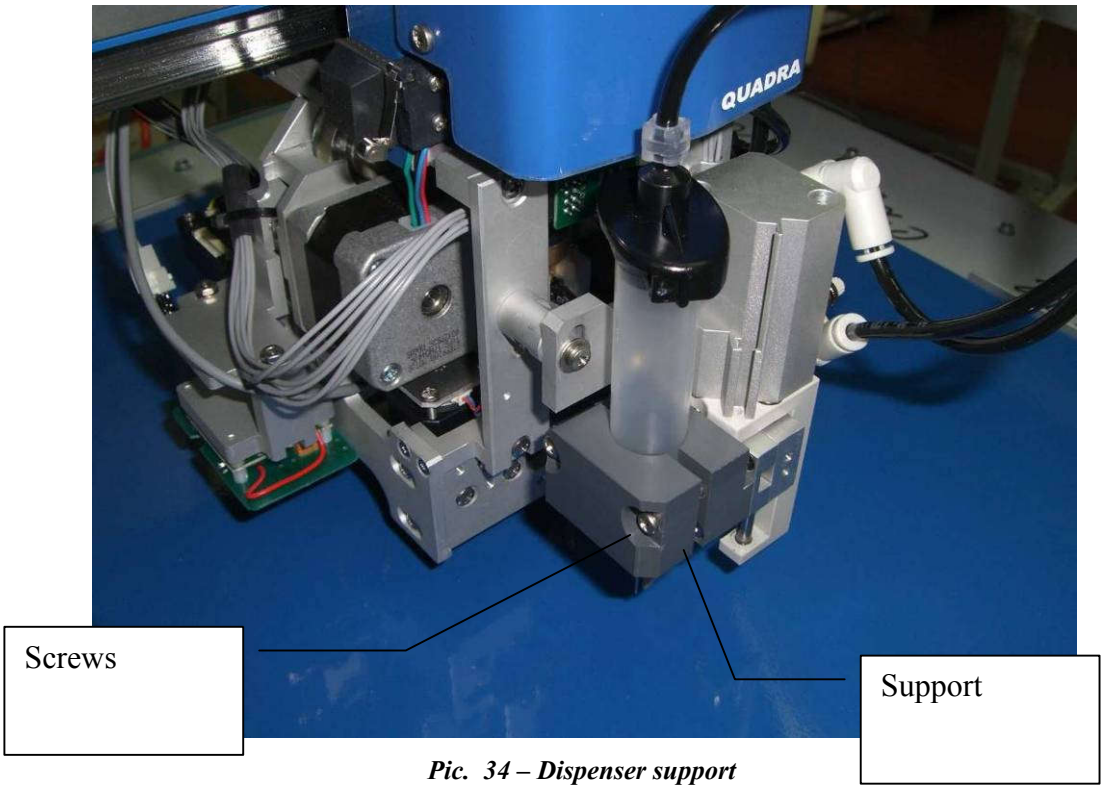
"Distribution & Assembling" function automatically performs the following sequence: dispensing and assembly of components.

5.8 Further information

When defining a package's glue data, it must be defined on the basis of a component placed (and picked from) in feeder banks # 1.
Assuming therefore this initial condition, the rotation of the glue dots is the same as the one of the component in the assembling table and, as all the rotations, is anti-clock wise.

5.9 Changing the dispensing unit

To change the dispensing unit (from T/P to Volumetric) you need to install the specific support (Pic.34):



Pic. 34 – Dispenser support

The machine is equipped only with the time-pressure dispensing support. The support for the volumetric will be fitted on the machine only per customer request. This choice was dictated by the fact that volumetric device is not directly supplied by TWS Automation.

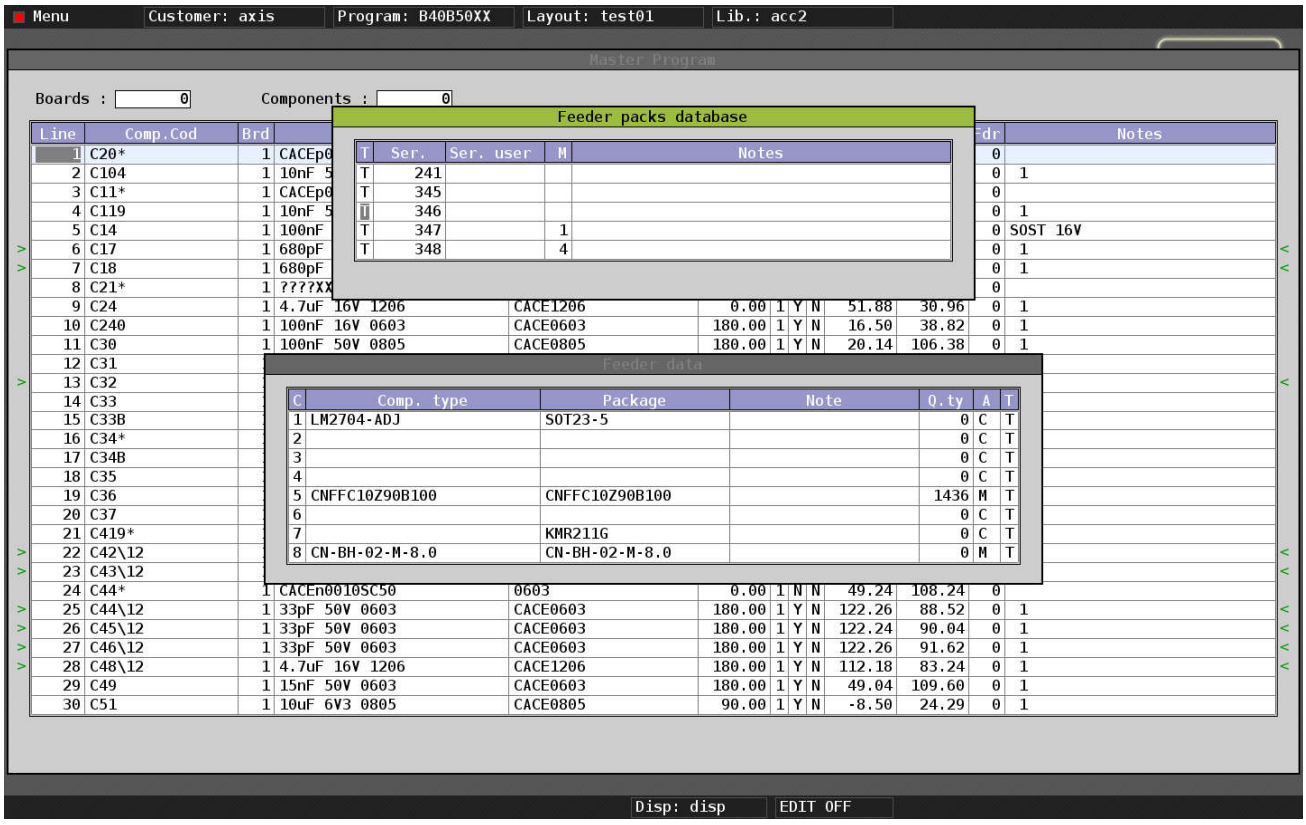
6 FEEDER BANK DATABASE

With the feeder bank database is possible to let machine recognize the feeders currently connected to the machine.

NOTE To activate the feeder banks managing system, it is necessary to set the appropriate flag "*Enable feeder database*" in the window "*Executive mode*

The window "*Feeder banks Database Shift+F8*" can be selected from the *"Production"* submenu.

The first window (at the top of the screen) contains a list of feeders in the database, while the second displays the components included in the database for the selected feeder.



Pic. 35 – Feeder bank database window

The items that make up the "Feeder database" table are:

- **Feeder type (T):** Tape ("T") Stick ("A").
- **Serial number (Ser)**
- **Position (M)**: position of the feeder on the machine.
- **Note (Note)**

The color provides the following information:

- Green: magazine mounted on the current machine

- Red: magazine mounted on another machine (only if you use the database functionality and network operation)
- Black: magazine not installed on any machine

The fields in the window of the "*Feeder data"* are the same you find in "*Feeder configuration"*

From the associated submenu you can select the following:

- ***Feeder data (F1)***: activates the window with the data of the feeders, allowing changes.
- ***Find serial number (F4)***: searches for a feeder bank having a specific serial number.
- ***Find user's serial number (F5)***: searches for a feeder with specified user's serial number.
- ***Find feeder number (F6)***: searches for a feeder bank installed in a specific position.
- ***Find notes (F7)***: searches for a feeder bank containing a specific text inside the "Notes" field. It can give multiple results.
- ***Find feeder (F8)***: searches for a component code or a part of it (e.g. 100nF 0603). It can give multiple results.
- ***Feeder recognition (F9)***: starts the automatic identification of the feeder banks installed on the machine.
- ***Feeder data import (F11)***: creates a "link" between feeder configuration and database. it allows the correct alignment between the actual feeder configuration and the database.
- ***Advanced search (Shift+F3)***
- ***Export inventory (Shift+F5)***: creates a text report file containing informations about all of the components stored on feeder database.
- ***Feeder unmounting (Shift+F6)***: force the removal of a feeder from the database, by a machine different from the one in which it is assembled.

6.1 Feeder Recognition

Feeder Recognition (F9) allows the automatic identification of the feeder banks installed on the machine, reading the electronic serial number of the feeder bank.

When recognition is completed the software check if the recognized serial numbers match expected feeders indicated by the feeder layout. If some errors are detected, software will show a report of detected errors and give the possibility of change the feeder layout according to recognized feeder banks (update feeder layout).

6.2 Feeder import data

The import function takes the current configuration as valid and overwrites the data in the database. Before running this function, be sure you have checked that the contents of the feeder configuration table is correct, by looking at the tapes and sticks physically present on the feeders.
The software searches each feeder indicated in the feeder bank configuration in the database. If configuration data does not correspond to any feeder, it is asked to the user to enter a new serial number in the database.

6.3 Using Feeder database in a LAN

It is possible to create a local network to connect one or more machines to a server. By activating the network functions, the machines can access a shared feeder database on which the following rules apply:

1. A local database upgrade/modification is always sent to the server database. By this way all the machines have always the same database.
2. If the local database is changed when network is disabled or unavailable, user is asked to report these changes in the remote database when the network connection becomes available.
3. If the local and remote databases are not aligned at database handling startup, local database is updated with remote data.

7 NETWORK

You can create a local network of machines by connecting them all to a single PC able to act as a server.
The introduction of Quadra within a local network allows you to:

- automate data backup procedures
- load / save programs and configurations on a shared folder between all machines
- share the feeders database (if used) between multiple machines of the same type

The procedure described in this manual guides you through the configuration of the PC of the machine in order to make possible the activation of the network software.

WARNING **The connection of the machine PC to the network and configuration of the server computer is not a task of this manual! In case of problems contact your network administrator. TWS Automation is not responsible for any malfunction of the machine on the network, related to configuration problems and/or inefficiencies inherent to the network!**

7.1 Server PC configuration

Before configuring the PC of the machine you need to configure in advance the PC that will be used as server.
In particular in that PC will be necessary:

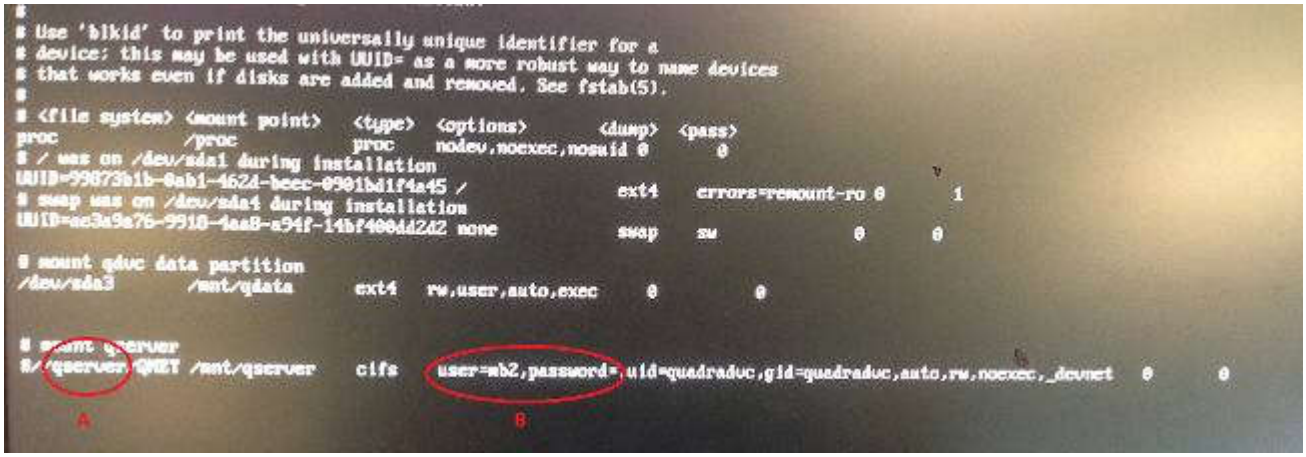
1. Create a new user with the password corresponding to the user name and password that will be settled in the PC of the machine to access the network (see next paragraph)
2. Create a shared folder called QNET and share it, giving full rights to operate to the user created in the previous step
3. Recover the network name (or IP address if static) to be used later in the configuration of the PC machine (see next paragraph).

NOTE Contact, if necessary, the network administrator to apply these settings in the computer dedicated to machines' network!

7.2 Quadra PC Configuration

Once server PC has been configured, do the following:

1. Turn on the machine and wait for the complete loading of the operating system and drivers
2. Press ALT + F2 to open a new linux terminal
3. Login using *service* both as username as password
4. Run the command
   sudo nano /etc/fstab
   press ENTER to confirm
5. Enter the password *service* when requested
6. If everything went well, you will get an editor with a text file



Pic. 36 – Config file modification to activate network in Quadra

7. In the row shown in the figure is required:
   a. Remove the # at the start line (the one before //qserver/QNET)
   b. Change the name qserver (shown in figure A) with the network name of the server PC (or its IP address if static), see section 3 of the previous paragraph
   c. In the fields *user* and *password* marked with B in the picture, write the username and password you have created in the PC server to give access to the machine (see point 1 of the previous paragraph).

NOTA In the standard file of the machine username is setted *mb2* as example and there is no password. Enter your details AFTER the comma of the keyword *user* and *password* of the configuration file!

   d. Press CTRL + X and press Y to save the file.

8. Press ALT + F1 to return to the terminal for machine use
9. Run the command *./off* to turn off the PC
10. Turn off the machine and restart it completely.

7.3 Check the network connection and the proper sharing

Once the machine is restarted after the configuration of the network, to ensure its proper functioning do as follows:

1. From Server PC create a text file (i.e. “test.txt”) writing any text string.
2. From Quadra PC, once OS has been fully loaded, type the command
   ls /mnt/qserver
   press ENTER to confirm
   Verify that the created text file “test.txt” is showed in the file list (command *ls* shows all the files included in the shared directory QNET previously created in the server PC)
3. From Quadra PC execute the command
   nano /mnt/qserver/test.txt
   press ENTER to confirm
4. Open the editor, you will see the contents of the file "test.txt" previously written from server PC. Edit content, exit with CTRL + X and confirm saving with Y
5. Now opening the file "test.txt" from the PC server you will have to see the changes made by the Quadra PC

7.4 Network Activation in the Quadra software

Start the control software and enable network operations by setting the dedicated flag to Yes (*Enables operations over LAN*) from the window of the executive mode (accessible from the *Configuration menu*).
Exit the control software and return to it to activate the network functionality.

8 MAINTEINANCE

8.1 Cleaning and lubrification of guides and bearings of X and Y axes

Clean and lubricate once per year as follows:
- Remove protective covers of the axes
- Clean the guides using a cloth dampened with solvent
- Lubricate the guides and bearings with specific oil for bearings, to ease sliding and protect from oxidation.

8.2 Cleaning and lubrification of guides and bearings of Z axis

This operation has to bve performed by a TWS Automation technician after 5.000.000 head cycles (approx every 2 years if the machine works 8 hours per day).

8.3 Tools cleaning

Monthly:
-Immerse in turpentine and blow with compressed air, repeating the operation several times.
-Verify that the suction hole is clean and has not suffered accidental deformation.

8.4 Cleaning of the Vacuum circuit

The vacuum circuit does not have filters and does not need ordinary maintenance. For any vacuum problems please contact a TWS Automation technician.

8.5 “SNIPER” sensor devices cleaning

Weekly clean the Sniper device as follows:
- Blow compressed air on both Sniper device lenses
- If they should remain dirty clean them with an alcool wet cotton bud. Always wipe in the same direction to avoid leaving lint pieces, and let them dry. Blow compressed air.

8.6 Camera module cleaning

Check periodically for external optical device lens cleaning. If some dirty particles are on camera module, remove them by compressed air or some clean clothes (the same used for glasses lens cleaning).

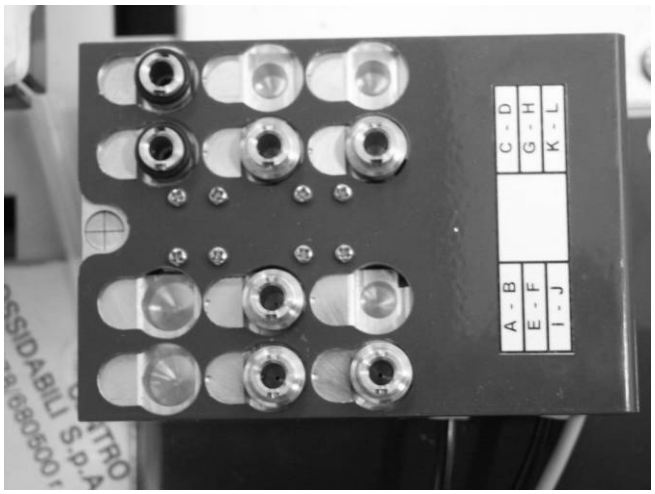
8.7 Water discharge from compressed air filter

Daily, check the water level in the filter cup and empty, if necessary, by opening the exhaust valve placed at the bottom of the water collector.

9 APPENDIX

9.1 Component/Nozzle association

COMPONENT TYPE	NOZZLE QDVCEvo	NOTE
0402 – 1 x 0,5 mm	1,3-0,4	
0603 – 1,6 x 0,8 mm	1,0-0,6	
0805 – 2,0 x 1,2 mm	1,3-0,8	
1206 – 3,2 x 1,6 mm	1,3-0,8	
1210 – 3,2 x 2,5 mm	1,3-0,8	
1812 - 4,5 x 3,2 mm	2,5-0,6	
2220 – 5,7 x 5,0 mm	2,5-0,6	
MELF 5, 0 x 2,5	2,5-0,6	
MINI-MELF 3,5 x 1,6	1,3-0,8	
MICRO-MELF 2,0 x 1,0	1,0-0,6	
SOT23 – 2,9 x 1,3	1,3-0,8	
SOT89 – 4,5 x 2,5	2,5-0,6	
D-PAK – 6,5 x 6,0	6,0-2,0	
Tantalio A - 3,2 x 1,6 mm	1,3-0,8	
Tantalio B – 3,5 x 2,8 mm	2,5-0,6	
Tantalio C – 6,0 x 3,2 mm	2,5-0,6	
Tantalio D – 7,3 x 4,3 mm	6,0-2,0	
Elettrolitici A – 7,2 x 6,5 mm H 5,4 mm	6,0-2,0	
Elettrolitici B – 7,2 x 6,5 mm H 7,8 mm	6,0-2,0	

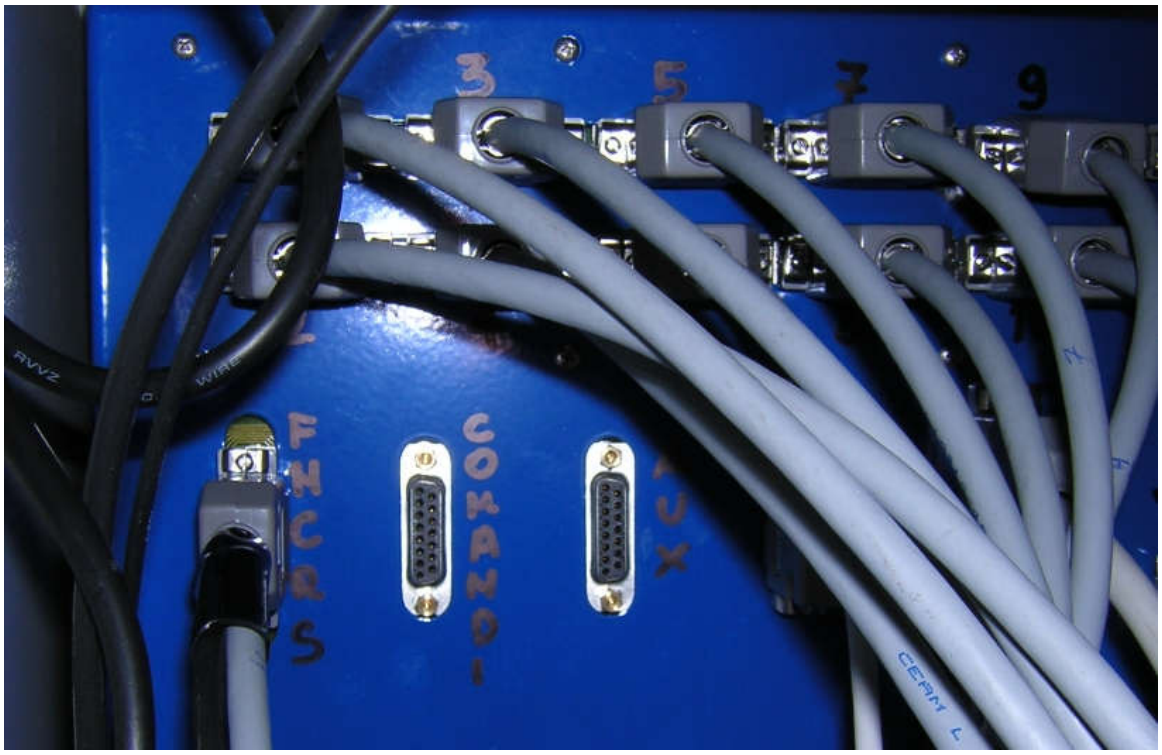


A	–	10	- 3
B	–	6	- 2
C	–	2,5	- 0,6
D	–	2,5	- 0,6
E	–	1,3	- 0,8
F	–	1	- 0,6
G	–	1,3	- 0,4
H	–	Dummy	
I	–	1,3	- 0,8
J	–	1	- 0,6
K	–	1,3	- 0,4
L	–	n.u.	-

n.u.

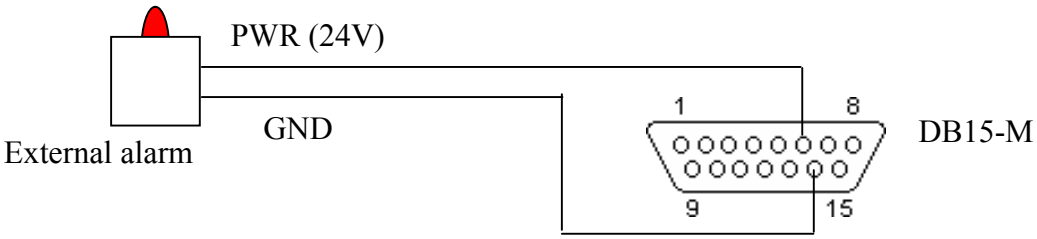
9.2 External alarm connection

It is possible to install an additional alarm. It will signal, in the event that mode *"external alarm signal"* is activated, any interruption of the assembly program. The connector "*Comandi"*, which supplies a voltage of 24V and 250mA is located in the bus (Pic. 37).



Pic. 37 – Socket "Comandi" for the external auxiliary alarm connection

The external alarm must be connected by a DB15-M connector as for the following drawing:



Pic. 38 – Alarm ad DB15-M connector connection

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9.3 Quadra with double dispenser kit

Machines equipped with double dispenser have practically the same features of regular machines with single dispenser. The only major differences (besides the bigger size of the head due to the two

dispensers and the consequent restriction of the working area) are the need to set the parameters of both dispenser (type and offset camera-dispenser) and the possibility to choose, via software, which dispenser must be used for dosing a particular component.

Quadra's software can be started in two ways:

- By starting software with command "**./disp1**": enables the machine to work with a single dispenser, exactly as a standard machine. In this condition, once made the appropriate mechanical adjustments, the mounting head can reach all of the positions of the working area.
- By starting software with command "**./disp2**": enables the machine to work with both dispensers.

NOTA By starting the software with the command DISP1, each setting and each mode is the same as the software of the standard machines. The following descriptions apply only in the case of boot with the command DISP2!

NOTA Use the specific user-guide to see what you need exactly to do to switch from double dispenser configuration to the single dispenser (and vice versa)!

9.3.1 Dispensing parameters

By selecting "*Configurations – Working parameters – Dispensing Parameters*", is then necessary select Dispenser 1 or Dispenser 2. The parameters are practically the same as described in section 5.4, with the exception of:
Pre-inversion time becomes **Anti-drops start**, and practically have the same meaning
Vacuum pulse time: time (in ms) of the first vacuum activation
Long vacuum pulse: time (in ms) of the second vacuum activation
Vacuum waiting time: time (in ms) of an additional delay everytime vacuum is activated
Similarly, you can select or change the parameters of the item *Dispensing (F10)* in the main menu of the program tables.

9.3.2 Offset Camera-dispenser

Exactly as in the case of dispensing parameters, the procedure for the offset dispenser-camera is the same as described in chapter 5.3 for standard machines, with the only difference that by selecting the menu *"Configuration – Working Parameters - Offset dispenser-camera"*you must now select the dispenser on which perform the calibration.

9.3.3 Select dispenser in the program table

In column **D** of the program table is now possible to identify the dispenser to be used for each line. In particular, instead of only one choice Yes / No to dispense or not a component as in the case of the standard machine, you can now choose 1/2 / A / N (Dispenser1 / Dispenser2 / Both dispenser / No dispensing).

9.3.4 Start dispensing

Exactly as in the standard software, selecting *Dispensing (F10)* in the main menu of the program tables you can start the cycle. The difference is that in this case we must choose the dispenser to use.
Similarly, it is possible to start the combined cycle dispensing and assembly. However, are now possible 4 different choices:

- Dispensing with dispenser 1 and then assembling components
- Dispensing with dispenser 2 and then assembling components

- Dispensing with both dispenser and then assembling components
- Dispensing with dispenser 1, assembling components and then dispensing with dispenser 2

For each of the above procedures remain valid options dispensing / assembly described in Section 3.1.

TWS AUTOMATION thanks you for your choice and wish to remind you that for any queries you are welcome to contact our customer service department or our distributors

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