4000 Series Marking Machines
Quick Start Guide ENG124 iss 1.0 Nov 2016

EC DECLARATION OF CONFORMITY

Description of machinery:

4000 Series MARKING SYSTEM

SERIAL NUMBER :

....

THIS MACHINE COMPLIES WITH THE FOLLOWING DIRECTIVES:

» The machinery Directive 2006/42/EC
as implemented by The Supply of Machinery (Safety) Regulations 1992 (SI No. 3073)
and The Supply of Machinery (Safety) (Amendment) Regulations 1994 (SI No. 2063).

THIS MACHINERY AS DESCRIBED IN THIS DECLARATION OF CONFORMITY
CONFORMS IN ALL RESPECTS WITH THE ESSENTIAL HEALTH & SAFETY
REQUIREMENTS STATED IN THE ABOVE LISTED DIRECTIVES, STANDARDS AND
SPECIFICATIONS.

Signed: ....

Title: Managing Director

DATE: ....

EMPOWERED TO SIGN ON BEHALF OF THE RESPONSIBLE PERSON, MR N.
ANDREW, DIRECTOR OF EDWARD PRYOR AND SON LTD AT THE ABOVE ADDRESS.

Conformity 1 - Issue 5 – 07/17.

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DECLARATION OF INCORPORATION

Description of machinery:

4000 Series MARKING SYSTEM

SERIAL NUMBER :

....

THIS IS TO CERTIFY THAT THE EQUIPMENT DETAILED ABOVE COMPLIES WITH THE FOLLOWING DIRECTIVES:

» The machinery Directive 2006/42/EC
as implemented by The Supply of Machinery (Safety) Regulations 1992 (SI No. 3073) and The Supply of Machinery (Safety) (Amendment) Regulations 1994 (SI No. 2063).

THIS MACHINERY MUST NOT BE PUT INTO SERVICE UNTIL THE MACHINERY INTO WHICH IT IS TO BE INCORPORATED HAS BEEN DECLARED IN CONFORMITY WITH THE PROVISIONS OF THE EC MACHINERY DIRECTIVE.

Signed: .... ⎯⎯⎯⎯⎯⎯⎯⎯⎯   ....

Title: Managing Director

DATE: ....

EMPOWERED TO SIGN ON BEHALF OF THE RESPONSIBLE PERSON, MR N. ANDREW, DIRECTOR OF EDWARD PRYOR AND SON LTD AT THE ABOVE ADDRESS.

Incorporation 1 - Issue 5- 08/17

Health & Safety

4000 Series Marking Machine

This covers essential health and safety of the marking machine.   It is intended to supplement and support the training given by the suppliers of the equipment and the operation manuals.

Weight of Machine and Ancillary Equipment

BenchDot 300-150 EZA Marking Unit inc. Base and Column	54kg
BenchDot 150-150 EZA Marking Unit inc. Base and Column	44kg
BenchDot 100-100 EZA Marking Unit inc. Base and Column	40kg
MarkMate Marking Unit Inc. Base and Column	13kg
4000 Series Marking Controller	7kg
Circumferential Fixture	10kg
Magnetic Chuck	10kg

The weights quoted are approximate.

Handling

Care must be taken when moving or handling not to drop the equipment, causing damage to operators or other persons handling the machinery. It is advisable when lifting the machine to have two people to lift, using the base and column, it must not be lifted by the cover.

Noise Emissions

Depending on the nature of the workpiece and any support required noise emitted by the machine when marking may exceed 70dB(A)L_{eq}.   Where it is established that noise emissions may exceed current regulations, noise control methods (e.g. ear defenders/machinery guards) should be utilised.

Electrical Hazards

To prevent electrical shock do not remove the cover of the controller or marking head. There are no user serviceable parts inside. Refer servicing to qualified service personnel. Only connect the controller to the correct supply voltage. This is clearly marked on the rear of the controller.

Possible Hazards whilst Operating

The motors are low force and inertia; they therefore present a low risk when used in accordance with manufacturer's instructions. Care should be taken in the vicinity of the marking head whilst setting, operating or maintaining the machine. It is important when operating the machine that any object other than the work piece to be marked is kept away from the marking area.

Eye protection should be worn when operating the machine.

We would also remind UK employers of the general risk assessment requirement in the Management of Health and Safety at Work Regulations and in addition the requirement to ensure that work equipment is used only for the operation for which it is suitable in accordance with the Provision and Use of Work Equipment Regulations.

Users outside of the UK are reminded to ensure they are compliant with local legislation and to ensure adequate control measure are in place to reduce risk to an acceptable level.

Installing and Commissioning

It is essential to read the user manual(s) prior to use.

Disposal and Decommissioning

The LCD contains a hazardous liquid. It should be disposed of in accordance with current regulations.

The controller contains a lithium battery. It should be disposed of in accordance with current regulations.

Stability of the machine

Bench machines are provided with bolt holes in the base of the machine to fasten it down.

Emergency Stop

An emergency stop is built into the controller. This should not be confused with the remote start/stop pendant. When pressed all mechanical movement is immediately stopped and power is disconnected from the drive circuits. Once activated the emergency stop button can be released by twisting it. Releasing the emergency stop will not reactivate the machine until appropriate commands are executed from the touchscreen.

1.   About this manual

Versions

This quick start guide provides information on the basic features of the 4000 series embedded controller. The full manual for the controller and associated range of marking machines is available to download from:
www.pryormarking.com/products/4000-controller/

Introduction

This manual is a simple introduction to the Pryor range of dot peen and scribe marking machines and also a complete reference their functions.
The various machines can be broken down into 3 categories:
- Bench Mount (BenchDot™, BenchScribe)
- Integrated (InDot™, InScribe)
- Portable (PortaDot™)

2.   System Overview

The system consists of a controller with integrated touchscreen, remote start/stop box (optional) and marking head.

The Controller and Software

The system is controlled primarily through the touch screen. The operator can navigate through menus and data forms, and also use an on-screen keyboard.

If a keyboard is connected, the controller software lets you select the option you want by highlighting it using the cursor keys and pressing the Enter key or by pressing the appropriate function key F1-F10.

You can create marks in either straight lines or arcs. Each layout may contain up to 40 lines of characters, with up to 100 characters in each line. Each line has its own character size and marking force. You may specify the horizontal and vertical position (straight lines) or the radius and start angle (arc marking) of each line.

Once a layout has been created it may be checked to see that it will fit in the available marking area. If it will fit you may then do a trial run to make sure the mark will be in the correct position, or go ahead and actually mark the layout.

The marking head

The marking head consists of 2 main parts, the base and column (for column mounted systems) and the X-Y marking head. The gap between the marking unit and the base can easily be varied to accommodate various workpieces, fixtures etc.

3.   Guide to Effective Marking

The 4000 series marking machines can mark a very wide range of work pieces using a variety of different character styles, sizes and depths.

A guide to creating an effective mark is available in the full version of this manual, available to download from www.pryormarking.com/products/4000-controller
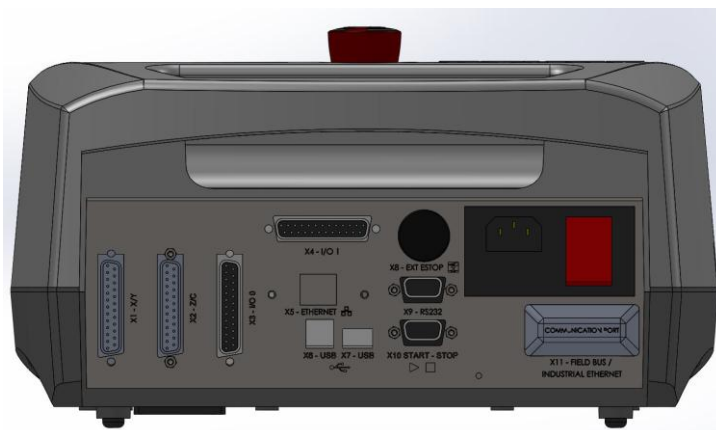
4. Getting Started

For column mounted systems it is important to use a sturdy bench and fasten the base of the machine using the 2 mounting holes on the base.

Before using the marking head for the first time fit the stylus nozzle, solenoid core (slug), stylus and spring in position and check the stylus moves freely,

The system is very easy to connect, all the connectors on the rear of the controller are labelled.

Connector Label	Function
X1 – X/Y	Connects directly to the Marking Head
X2 – Z/C	Connects directly to the Z axis. However if also using a Circumferential axis, connect it directly to the circ axis first then connect the Z axis cable to the secondary port on the circ axis. (Optional)
X3 – I/O 0	Digital I/O port, provides 8 digital inputs and 6 digital outputs for interfacing to external devices. (Optional)
X4 – I/O 1	Expansion Digital I/O port, provides an additional 8 input and 6 output signals (Optional).
X5 - Ethernet	Ethernet TCP/IP port, for connecting the controller to TCP/IP communication networks.
X6 – USB Type B	USB communication port. For connecting the controller to a windows PC. The connection will create a virtual com port on the PC.
X7 – USB Type A	USB Socket. For connecting USB flash memory or USB keyboards to the controller.
X8 – EXT ESTOP	External emergency stop connector. Replaces the built-in ESTOP to allow remote systems to interface to the controller's emergency stop functions where necessary. (Optional).
X9 – RS232	RS232 Serial Port. 9 pin connector for interfacing with PC's, PLCs, Barcode scanners and other serial communication devices.
X10 – START-STOP	Remote Start/Stop. For connection to the controllers remote start cycle and stop cycle button panel.
X11 – FIELDBUS / INDUSTRIAL ETHERNET	Anybus interface. Depending on the option purchased, the machine can be controlled by automation systems using a variety of industrial Ethernet or fieldbus interfaces such as Profibus, ProfiNet, Ethernet/IP, EtherCAT, DeviceNet, Modbus etc. (Optional)
X12 – I/O 2	Expansion Digital I/O port, provides an additional 8 input and 6 output signals (Optional on Integrated 4000 controller).
X13 – I/O 3	Expansion Digital I/O port, provides an additional 8 input and 6 output signals (Optional on Integrated 4000 controller).

Note: Ensure the Marking Head and C / Z Motor connectors are firmly connected to the controller and screwed in place. Never attach or remove the connectors when

the controller is powered up and operating. This may damage the motor driving electronics.

Switch the system on using the switch on the rear of the controller. The machine will not operate unless the emergency stop button is untwisted and released.

The Main menu should be displayed when power is switched on:
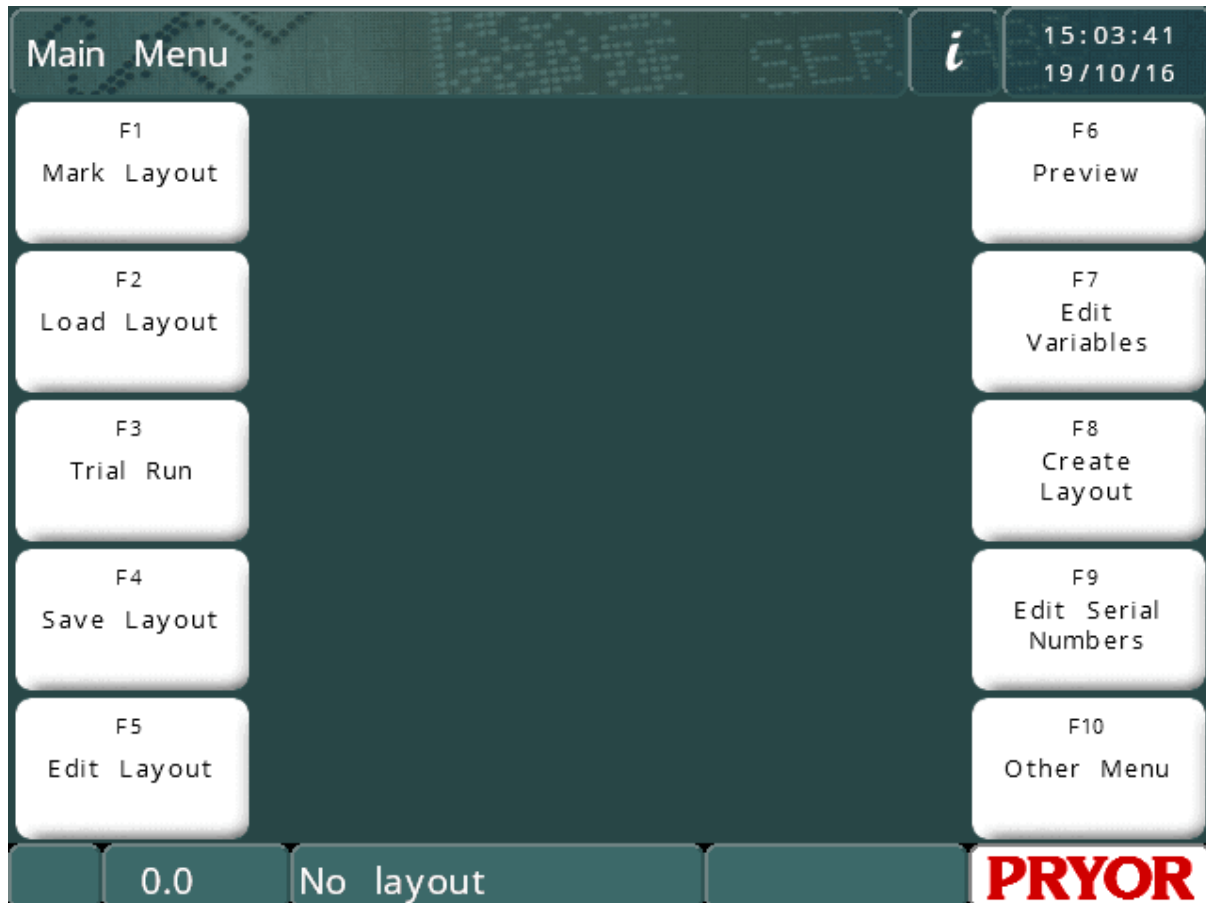
Menu options can be chosen by pressing on the menu buttons on the touch screen. If a keyboard is connected, options can be selected from a menu by using the cursor up/down keys to highlight the required option and then pressing ENTER or by pressing the appropriate function key shown screen.

Animated Help Topics

The controller has a built in animated help topic feature. On the main menu click the information button to list a series of getting started help topics.

The help topics simulate marking and trial running of the machine. All marking head movements are disabled when running help topics.

Layouts

To produce any kind of mark a layout must be created. A layout contains information about the *Text* to be marked, its *Size*, *Force* and *XY* position. The controller can save many layouts in memory.

Creating a layout

Select "F8) Create layout" from the Main menu on the touch screen. The display will then show the layout edit screen.

Type some text and then press the ENTER key . The cursor will then move on to the Size column. Enter a size of 3.0 mm (0.12").

Leave the *Force* unchanged for now.

Press the ESC key to go back to the Main menu. A preview of the layout will be shown in the centre window.
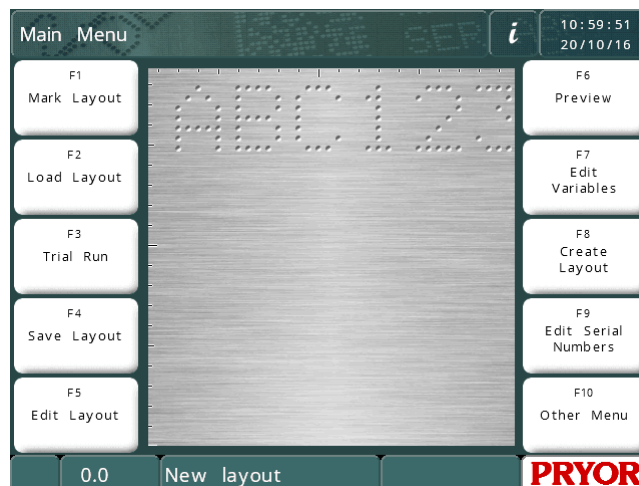
NB The display will vary depending on your machine's steps/mm and marking area.

Preview

Select "F6) Preview" from the main menu. The entire marking area is displayed and in the top left corner, the text you have entered.
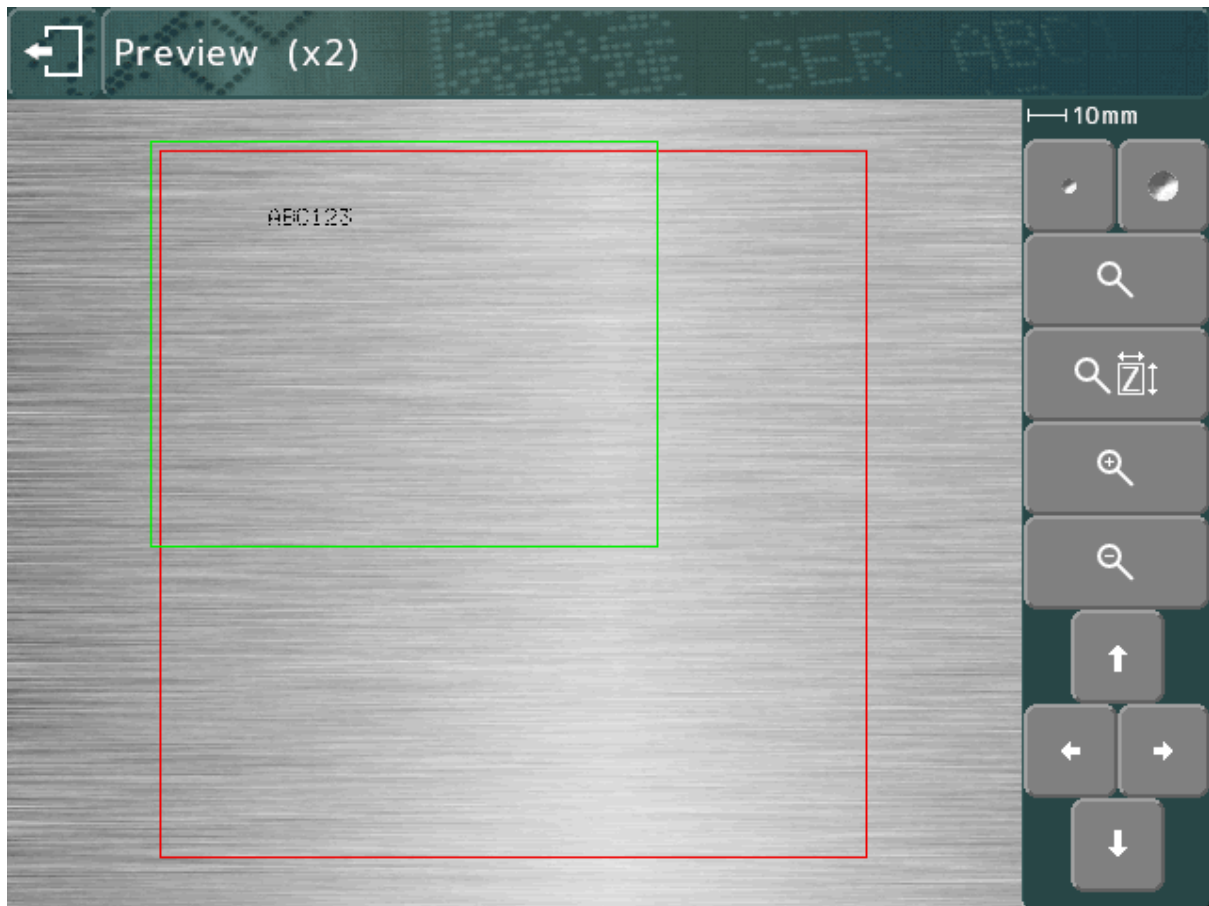
The mark may be very small. To zoom in use the cursor keys to move the green box over the text and press the 🔍 button. Press ESC ⏎ to go back to the zoomed out view.

You can also drag the green box using the touch screen. Touch inside the green box, move across the screen, then let go. The box will turn orange while moving, then appear in the new location when you let go.

To zoom in (the green box will get smaller) press the ⊕🔍 button.
To zoom out (the green box will get bigger) press the 🔍 button.

You can also use the 🔍⃗Ẑ button to automatically zoom in and choose a zoom level to fit the mark to the screen.

The cursor keys may now be used to move over the enlarged image. You can also drag the viewing area using the touch screen.

The ▫ ◓ buttons may be used to modify the dot size on the preview. This will not affect the mark, but can be used to make the preview represent the actual mark more accurately for the material you are using. The system will try to replicate dot size in relation to the force used, but the actual results will depend on the material being marked.
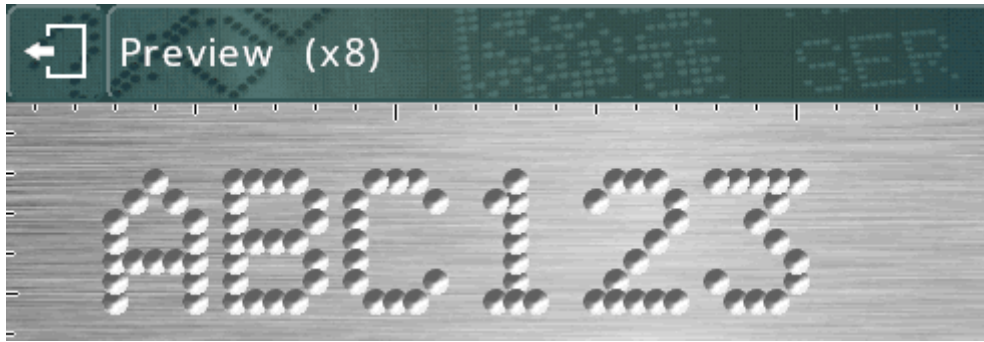
(larger dots representing overmarked characters)

Use the ⊞ button to toggle a grid overlay. This will display a grid at 1mm or 10mm intervals, depending on the zoom level.
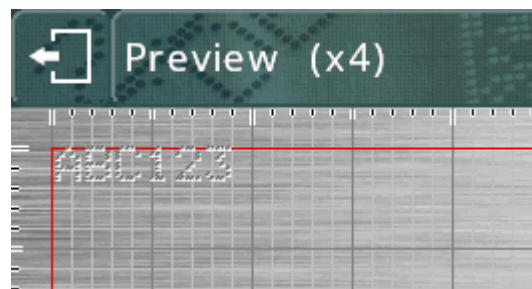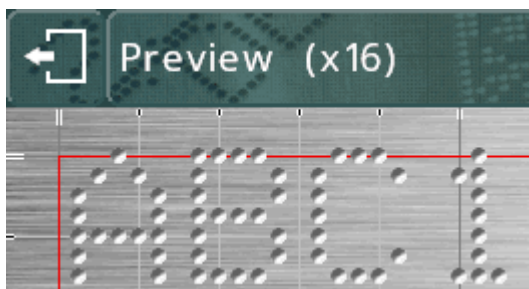
The 🔍 and 🔍 buttons may be used to increase/decrease the magnification while zoomed in.

Press the ← button to return to the previous view, then ← again to return to the Main menu.

Trial run

Trial run does not mark the work piece, it moves the marking head to where each line would be marked and then traces round the envelope of each line in the layout.

Select "F3) Trial run" from the main menu. The marking head will home and then move to the top left of the first line of the layout.

The buttons on screen can be used to modify the mark:
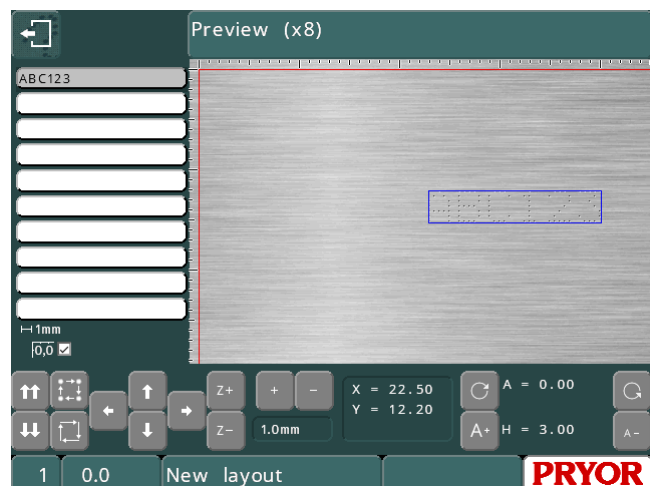
Icon	Mode Function
	Exit trial run
	Select the previous line
	Select the next line
	Trace around the line stopping on corners

	Trace around the line without stopping
	Move object one jog step up (mm)
	Move object one jog step down (mm)
	Move object one jog step left (mm)
	Move object one jog step right (mm)
Z+	Jog Z down by one jog step (mm)
Z−	Jog Z up by one jog step (mm)
+ −	Change Jog step size 0.1mm, 1mm, 10mm *
	Rotate clockwise by one jog step (degrees) *
	Rotate anticlockwise by one jog step (degrees) *
A+	Increase text size by one jog step (mm)
A−	Decrease text size by one jog step (mm)

* In Imperial mode, the steps are still 0.1mm, 1mm and 10mm, but are shown in inches. The angle will still change by 0.1, 1 or 10 degrees, even though 0.004", 0.039" and 0.394" are displayed.

In addition, a line in the layout can be selected by pressing on the text in the list to the left, or on the mark in the preview screen. The head will move through all intervening lines in order to avoid possible collisions with the part being marked.

The marks can also be moved around by dragging on them in the preview. The mark must be already selected, then touch the mark again, move your finger on the screen, then let go of the screen.

Marking a layout

Position a workpiece under the marking head and adjust the gap between the stylus and the workpiece (for Bench machines use the handle on top of the column, for portable machines use the adjustable face mask). Use a gap of about 2 mm (0.08").

To mark the layout select "F1) Mark layout" or the green button on the remote control. The marking head will mark the work piece. If the mark is not deep enough then increase the gap or increase the force (and vice-versa).

There are two ways to stop the marker. The red button on the remote control (if used) will abort under control without losing the current layout, the emergency stop interlock on the controller will stop marking by removing all power from the motors and punch. The default E-stop configuration is to keep the rest of electronics running while power to the motors and punch is disconnected.

5.   Layouts

Introduction

A layout consists of a number of lines of information (up to 40). Each line has its own *Text*, *Size*, *Force*, *XYZ* position and many other parameters.

The *Size* of the characters (height) may be 0.15 mm to 999.90 mm (0.006" to 40") in steps of 0.15 mm (0.006") (for 5x7 dot and varidot style, dependent on machine

type).   For most character styles the width of the character (including the space between characters) is equal to the *Size*.

The *Force* may be 0 (no mark) to 14 (deep mark). Some marking heads may have some restriction on marking force.

The *X* and *Y* position may be specified to place a mark anywhere in the available marking area with 0.025 mm (0.001") resolution.

Line Parameters

Each line has an extensive set of parameters associated with it. These are very powerful, they are described briefly in the table below.

Press the ⊟↑ ⊟↓ buttons to change the line's data that is displayed. The line number is shown in the bottom left of the screen.

Press the ▤↑ ▤↓ buttons to show another page of parameters for this line. You can also drag on the parameters section of the screen to change the page of parameters.

Contents

The *Contents* parameter specifies what a line is for. A layout line normally contains the text to be marked but it may be any of the following:

Contents	Text
Text	*Text* is marked exactly as it appears.
Serial	*Text* is a serial number and is incremented after the layout is marked.
Global serial	*Text* is replaced by the global serial number when the layout is marked.
Variable	*Text* is a variable and can be modified from the Edit Variables screen or by transmitting variable data for marking via a communication port.
Global variable	*Text* is replaced by the global variable when the layout is marked.

|	
Time/date	Time/date information is inserted in the *Text* at specified places when the layout is marked.
Logo	*Text* specifies the name of a dot logo.
HPGL logo (Smooth)	*Text* specifies the name of a HPGL logo.
HPGL logo (Sharp)	*Text* specifies the name of a HPGL logo.
I/O control	*Text* contains commands to make use of programmable digital inputs and outputs.
Barcode	*Text* is replaced by text from a barcode reader.
Comms Command	*Text* is transmitted out of the RS232 port to a third party device such as a barcode printer. See serial communications section for more details.
DataMatrix	*Text* is encoded into a Data Matrix code. See Data Matrix section for further details.
Data Entry via Prompt	*Text* is replaced by variable information entered at an on-screen prompt. Also supports Barcode scanners. See Data Entry via prompt section for more details.
Obliterate Data Matrix	Allows a Data Matrix code to be rendered unreadable by crossing it out and filling in the codes timing pattern.
Serial via Prompt	When used with Data Entry via Prompt mode and MultiMark enabled, this allows a starting serial number to be entered and the value will increment for the number of cycles entered by the user.
Variable / Serial	*Text* is treated like a Serial Number but can be modified via the communication port in select layout mode. Useful for setting a starting number.
Special	Reserved for special applications.

Font

The *Font* parameter specifies the style of character. The available styles are:

Font	Description
5x7 dot	Standard 5x7 dot matrix. 0.15 mm (0.006") minimum *Size*.
5x7 varidot	Characters are formed from lines of dots, the spacing between dots can be specified. Not good for small characters.
7x9 dot	7x9 dot matrix. 0.20 mm (0.008") minimum *Size*.
5x9 OCR dot	Dot matrix characters conforming to the OCR standard. 0.20 mm (0.008") minimum *Size*.
5x9 OCR varidot	Vector characters conforming to the OCR standard. Not good for small characters.
Vector	Used for the Fast Pneumatic and Scribe Machines. This is the same as the 5x7 font but has continuous lines.
HPGL	Used on dot and scribe machines. A simple vector font that can be overridden by downloading HPGL files for each letter.

Minimum sizes stated are for 40 steps/mm. The minimum size is based on 1 step between dots.

Dot fonts displayed on the mark preview screen:
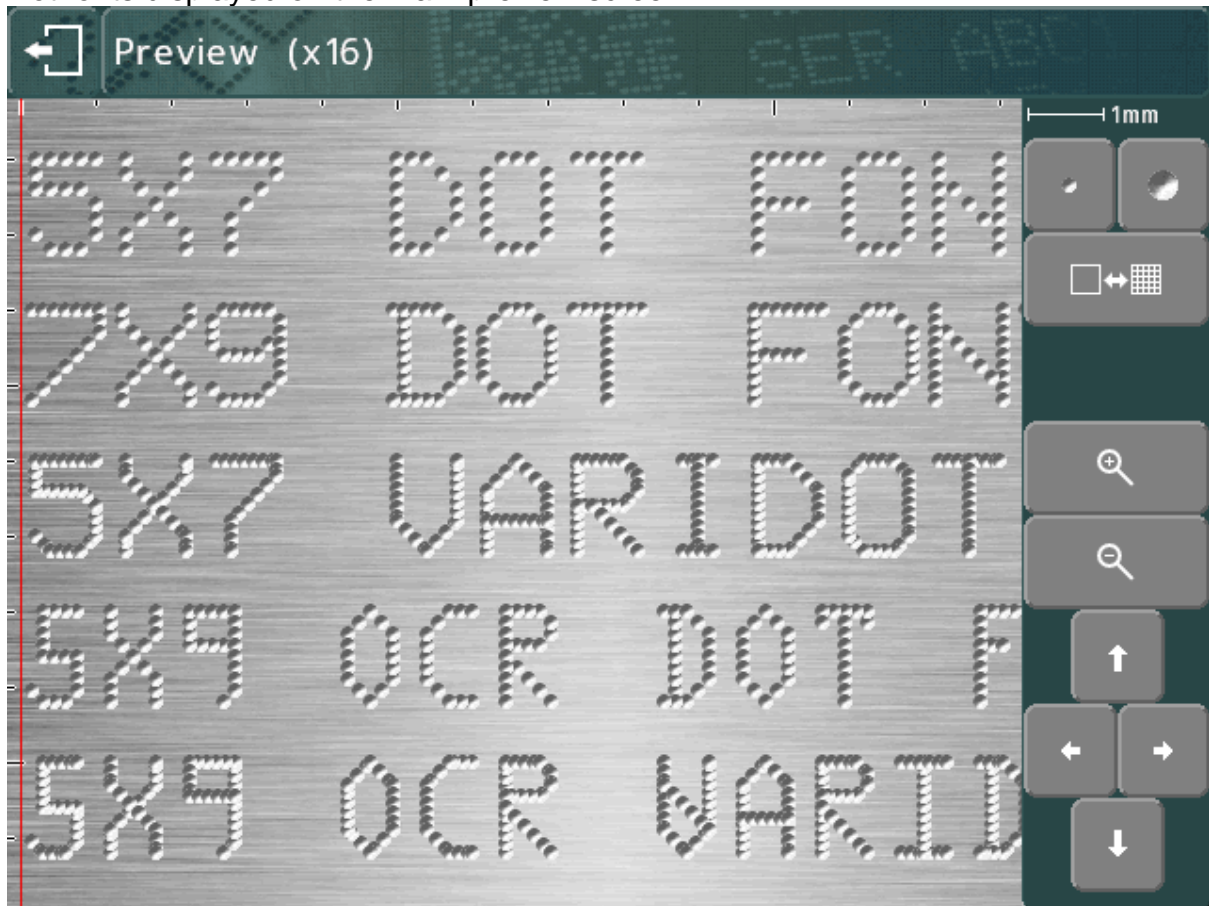
Scribe fonts displayed on the mark preview screen:

Varidot

This parameter specifies the spacing between dots. For electric solenoid dot marking the range is 5 to 255 steps. For pneumatic solenoid dot marking it is 50 to 255 steps.

Repeat dot

To obtain a deeper mark it is possible to mark each dot several (1-9) times.   This will result in slower marking speeds.

Mode

This specifies linear/arc marking for lines of text.

Width

Character width can be specified independently of the *Size* (height). The width includes the spacing between characters.   If the *Width* parameter is set to 0.0 then it will be calculated automatically. Range is 0.00 mm to 999.90 mm (40").

Angle

If the *Mode* parameter specifies a straight mark then *Angle* specifies the angle by which the mark will be rotated around its *XY* position.   If *Mode* specifies an arc mark then *Angle* specifies the start angle of the *Text*. Range is -359 to +359 degrees.

Radius

If the *Mode* parameter specifies an arc mark then *Radius* specifies the inside radius of the arc that the *Text* is marked on, if *Mode* specifies a straight mark then *Radius* is ignored.

Z

If an electric Z axis is fitted then *Z* specifies the position that the Z axis will move to before marking the line.   If a pneumatic Z axis is fitted then a value of 0.0 will retract the Z axis, a value of 1.0 will extend the Z axis.   The Z axis movement will take place after any *XY* movement for a layout line.

Length

If *Mode* specifies a straight mark then *Length* specifies the maximum length of the mark, the character width will be automatically condensed to ensure that *Length* is not exceeded.   If *Length* is set to 0 then it is ignored.
If *Mode* specifies an arc mark then *Length* specifies the maximum length in degrees.

Editing layouts

Editing keys
The following buttons can be used when editing a layout:

Icon	Action
⬆	Moves to the previous line.
⬇	Moves to the next line.
⬅	Moves left one character.
➡	Moves right one character.
⬅	Moves to the beginning of an entry.
➡	Moves to the end of an entry.
	Moves up several lines
	Moves down several lines
	Move up one line in the layout (only available when editing parameters)
	Move down one line in the layout (only available when editing parameters)

↵	Moves to the start of the next field.
⊠▷	Deletes the character under the cursor.
◁⊠	Deletes the character to the left of the cursor.
␣	Inserts a space where the cursor is.
⇄	Moves to/from line parameter screen for the current line.
←	Leave current screen / go back one menu
▤→▤	Accesses the cut/paste menu.
⚙	Edit layout parameters such as offsets, home method and autosense gap.
▦🔍	View mark preview.

The following buttons can be used when editing a text field:

Using the on-screen keyboard, the [Aa] button will toggle between upper and lower case letters.

The [£$%&] button will cycle through the special character keyboard layouts. Note that special characters cannot be used for filenames, and the special character keyboard layouts will not be available when loading and saving files.
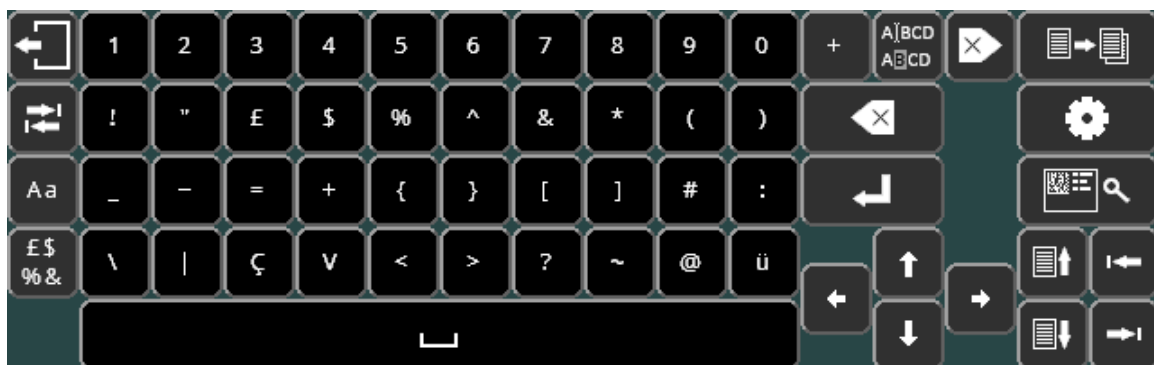
Pressing [Aa] will return to the standard alphanumeric keyboard layout.

6.   Further Information

More details about the functions described above and the many advanced functions available from the controller are given in the full version of the user guide. This will have been supplied with the machine on a USB drive, and is available to download from www.pryormarking.com/products/4000-controller
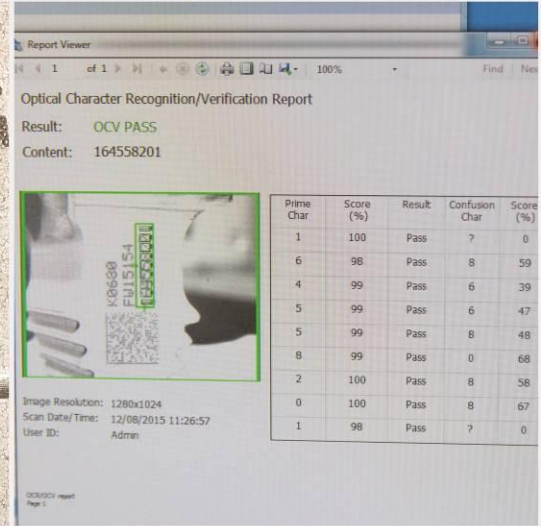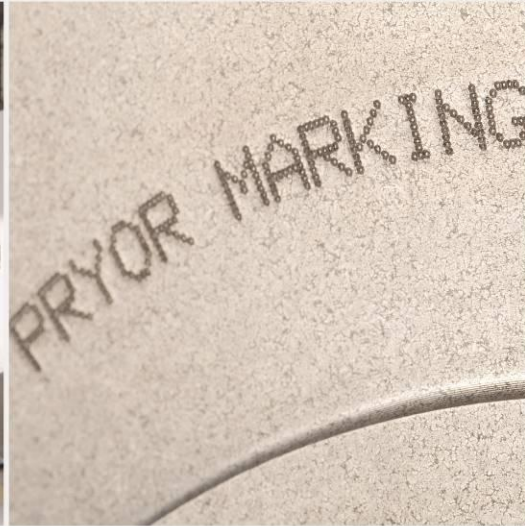
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