TELEMARK

DIGITAL SWEEP

INSTRUCTION MANUAL

.

March, 2014

www.telemark.com

WARRANTY

This Digital Sweep for electron beam sources is guaranteed against faulty materials, function, and workmanship for a period of 12 months after delivery from Telemark.

This warranty is valid only for normal use where regular maintenance is performed as instructed. This warranty shall not apply if repair has been performed or an alteration made by anyone other than an authorized Telemark representative or if a malfunction occurs through abuse, misuse, negligence, or accident. No charge will be made for repairs made under warranty at Telemark's facilities. Defective parts will be repaired or replaced at Telemark's discretion. Customer is responsible for freight charges to Telemark's facility.

USER RESPONSIBILITY

The user is responsible for proper operation and maintenance of the equipment, following procedures described in this manual, including reference documents. Proper operation includes timely replacement of parts that are missing, broken, or plainly worn. If the user has a reasonable doubt about understanding the use or installation of a component, Telemark or your local representative should be called.

It is vitally important that the user properly installs the equipment as described in Chapter 3 (Installation) of this manual, playing particular attention to the correct grounding methods described.

The Warranty shall be void if the equipment is improperly installed and/or grounded.

TABLE OF CONTENTS

1

UNPACKING

Your Digital Sweep is packed into a specially designed double strength box and surrounded with two and a half inches of rigid foam padding. Since packaging the Digital Sweep for safe shipment is otherwise difficult, please save the box in the event that the Digital Sweep ever needs to be returned for servicing. Telemark cannot be held liable for units which are damaged in transit as a result of improper packaging.

Contents of the box are, the Sweep Module, Joystick Module and installation kit. The installation kit includes: the CD-ROM with pdf manuals, cables and two sets of fuses. Please check the packing list to make sure that no damage has occurred in transit. The sweep is ruggedly built and packaged tightly to prevent damage. In the event of any deficiencies, please report them to your vendor immediately. Also take care to read the warranty regarding the limits of Telemark's liabilities.

2

DESCRIPTION

The Digital Sweep’s most notable features:

The Telemark Sweep is a five function sweeper. It is intended for use with electron beam (EB) sources such as the Telemark line of EB sources and with other compatible EB sources that use electromagnetic deflection or combinations of electromagnetic deflection and permanent magnet focusing.

The Sweep outputs user adjustable patterns to EB sources. A Sweep is needed for positioning and moving the e-beam around the source's crucible pocket in a defined pattern. The beam movement helps heat (and evaporate) the crucible pocket’s material more evenly. Sweeping is accomplished by running current through magnetic coils next to the crucible pocket. One output runs to each of two coils (latitude and longitudinal), which are placed perpendicularly to each other. Their magnetic fields affect the position/motion of the electron beam.

A simple front panel touch screen color LCD (liquid crystal display) and handheld joystick interface is used to configure and run EB sweep patterns. The LCD display allows for easy visualization of each pattern. The LCD panel prompts the user through the various steps of a normal operation.

Specifications

Sweep Generator

Input voltage: 120/240 volts, 1-phase, 50/60 Hz.

Output current: Dual Channel (Longitudinal and Lateral): plus or minus 1.5 amps, maximum into a load with an impedance of less than 15 ohms. Rotational resolution of 360 steps (1deg. Rotational resolution)

Control

Front Panel

LCD display 320 x 240

Joystick

External Pattern Selection

3

INSTALLATION

Sweep Module

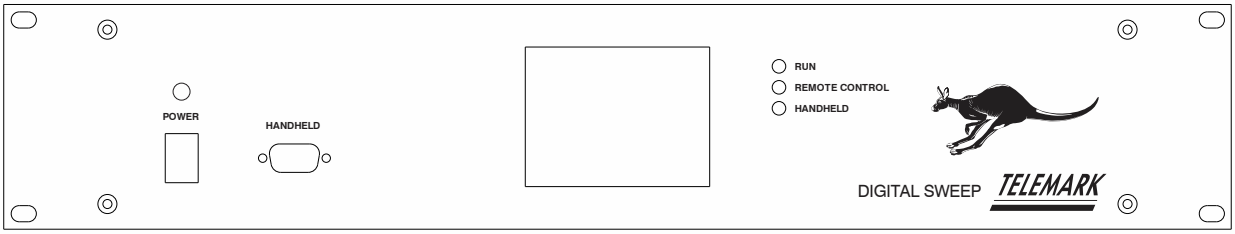


Figure 3-A, Front Panel

The Electron Beam source (EB source) Sweep is designed to be mounted in a standard 19 inch electronic instrument cabinet. Other suitable places on a vacuum system may be used. The installation procedures are described below.

Hand Held Joystick Sweep Remote Control

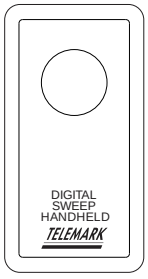


Figure 3-B, Digital Sweep Handheld

The Digital Sweep Handheld (Joystick) controls Position and some setup functions. The Digital Sweep handheld plugs into the 9 pin D connector marked **HANDHELD** on the front panel.

Rear Panel

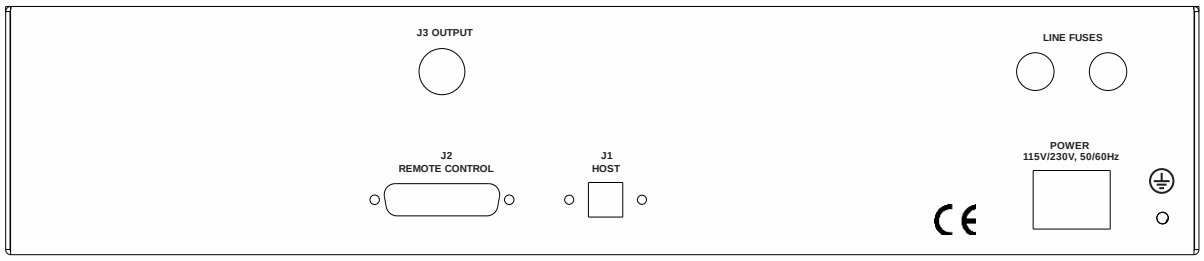


Figure 3-C, Rear Panel

1 **VAC input** - The AC voltage input can be either 115 or 230 VAC and 50/60Hz.

2 **Fuses** - For 115V usage, use a 5A Slow-blow fuse; for 230V usage, a 2.5A Slow-blow.

3 **Ground** – attach ground to the provided ground nut

4 **Host, J1** – Factory used USB port to update sweep software. **IF J1 IS CONNECTED TO A PC THE DIGITAL SWEEP WILL AUTOMATICLY GO IN TO DOWNLOAD MODE.**

5 **Remote Control, J2** - 15-pin male D-sub remote PLC port/Sweep-select jack. (see figure 3-D for connections)

Remote Control Input (5V maximum compliant)

When in Remote mode and a signal has selected a pattern that pattern will run. If no valid pattern is selected then no pattern is output. The Run LED and the Remote LED will light up when the pattern is being output to the EB Source coils.

A pattern number may be selected two different ways. When pins 17 and 5 are open the pattern is selected by a Pattern Select pin being closed (contact closed). When pins 17 and 5 are closed then a pattern is selected by Binary code input on pins 10, 11, 12, and 13. See table for binary code input (0 = open, 1 = closed).

Note: Inputs are contract closure to sweep reference. Input voltages greater than 5VDC may damage the Digital Sweep.

	Binary			
Pocket	4 (J2-10)	3 (J2-11)	2 (J2-12)	1 (J2- 13)
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0

Remote Control Output (50V maximum compliant)

Outputs are a contact closure (dry contacts) inside the Digital Sweep.

Sweep Remote – A signal is sent out when the user has put the Digital Sweep in remote mode.

Sweep Run – A signal is sent out when there is output going to the EB source coils.

Sweep Ready – A signal is sent out when the Digital Sweep is ready and operational.

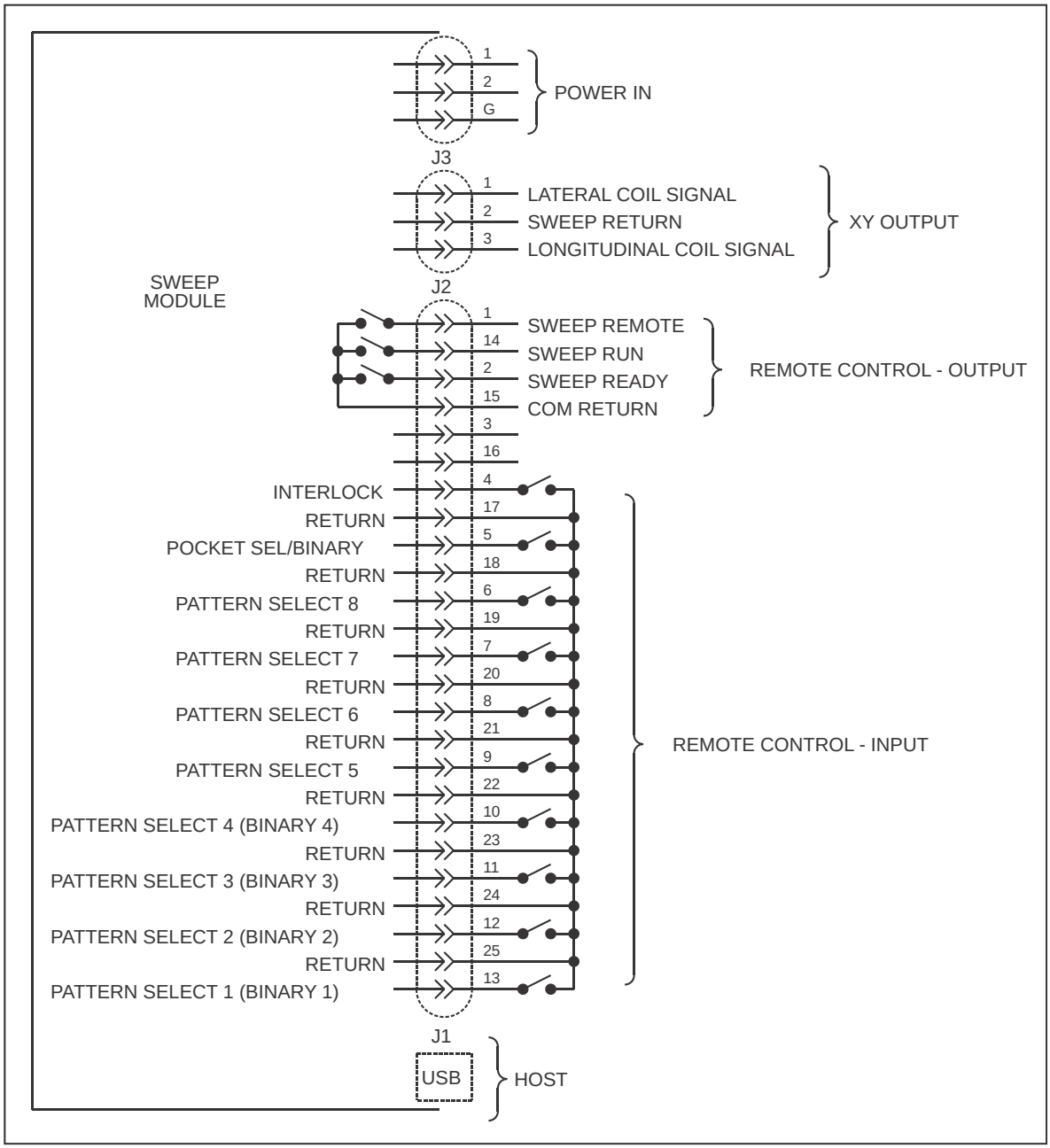


Figure 3-D, Connections

6 **Output, J3** - Connection of the sweep generator to the EB Source is shown in Figure 3-D, 3-E, 3-F or 3-G. The horizontal and lateral coils should be brought out of the tank by way of a feedthrough and connected to pins 1, 2, 3 of J3 on the Sweep Module as shown. The interconnecting wire must be capable of passing a minimum of two amperes. The return wire is shared by both longitudinal and lateral coils. The sweep voltage is grounded inside the sweeper. However, you should connect the return wire to ground at the EB source end. To leave the return wire ungrounded could damage the sweeper. Normally one side of each coil is connected to ground at the electron beam source. The return wire is connected to the same spot inside the tank.

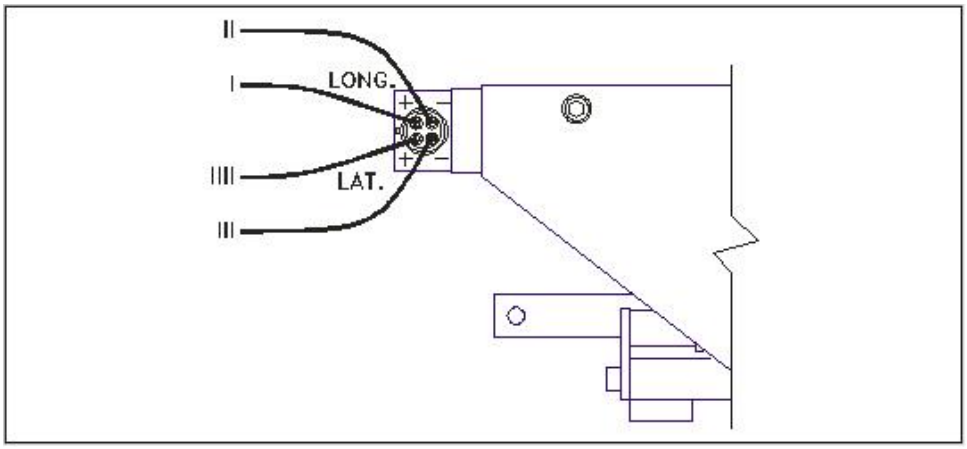


Figure 3-E, Telemark standard Coil Wire Reference Code

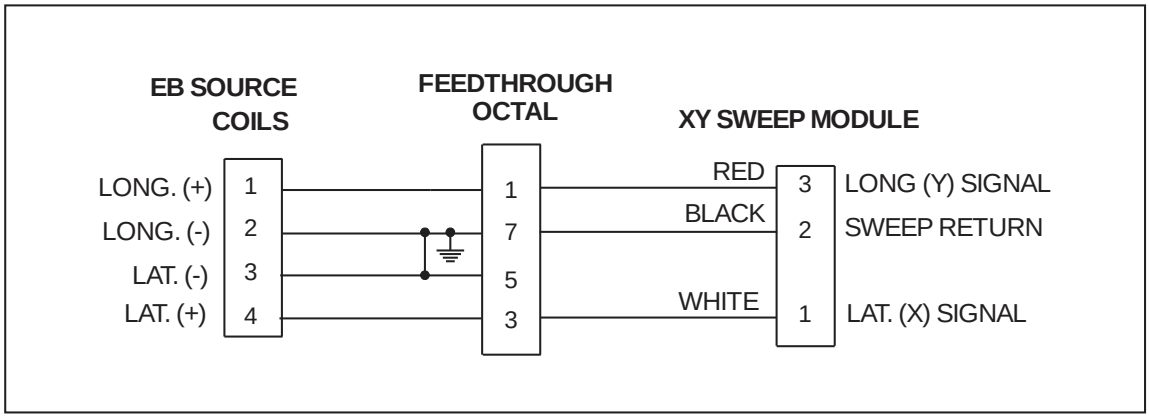


Figure 3-F, Typical 8 pin Sweep/coil Installation

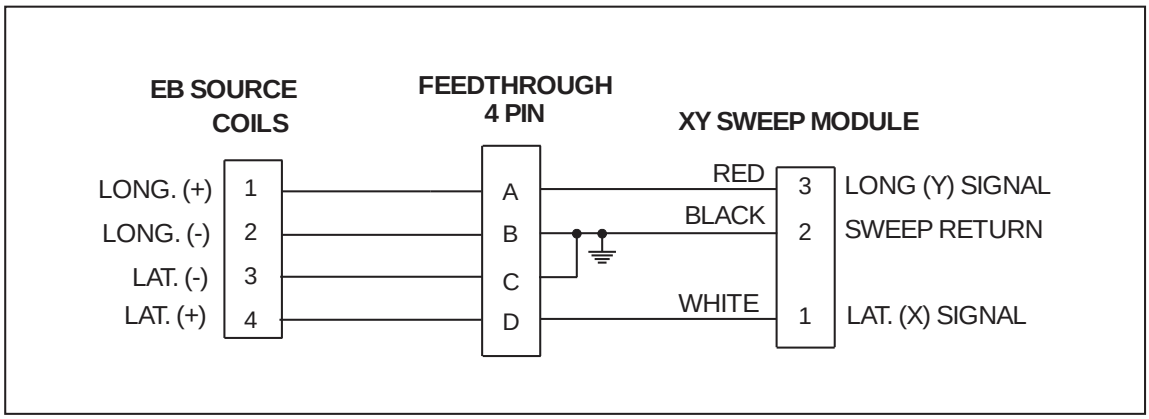


Figure 3-G, Typical 4 Pin Sweep/coil Installation

4

CONTROLS AND INDICATORS

Controller

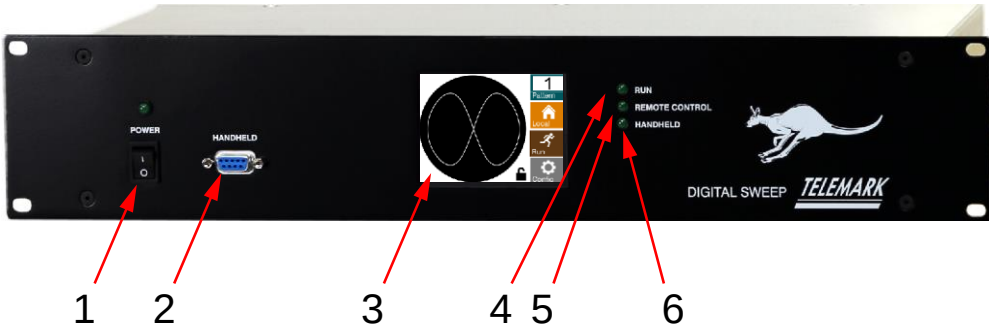


Figure 4-A, Digital Sweep

1 **POWER** - V.A.C. input power ON/OFF switch.

2 **HANDHELD** - 9-pin female D-sub port for Joystick

3 **LCD touch screen** – Human interface and displays menu choices and displays pattern identification and timings.

4 **LED, RUN** – This LED lights up if sweep output

5 **LED, REMOTE CONTROL** – This LED lights up if unit is being controlled by a remote PLC through J2 on the back panel.

6 **LED, HANDHELD** - This LED lights up if joystick is plugged in and operational.

Handheld

Figure 4-B, Handheld

The Handheld has a joystick that controls the latitudinal and longitudinal position and has an integrated momentary push-button. It is connected to the front panel of the Sweep controller via a 9-pin D-sub Male connector. The Handheld is used for the following three operations.

1. **Run Off Mode** – The joystick directly controls the e-beam output position, allowing the user to precondition the material manually. The Joystick lever controls direction of beam: left [-] & right [+] controls the lateral direction; near [-] (as seen from the EB source emitter) & far [+] controls the longitudinal direction.

2. **Pocket Location/Size Setup** – The joystick is used to set the center and diameter of the pocket, see configuration chapter for more information.

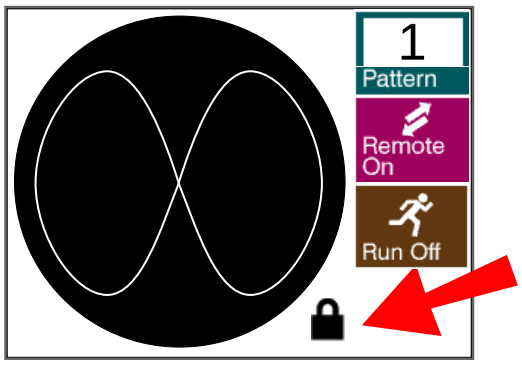
3. **Pocket Pattern Setup** – The joystick can be used to set the sweep Frequency and Amplitude for each pocket, see configuration chapter for more information.

The handheld Joystick is required in **Run Off mode** if movement of the e-beam position is desired. It is optional to use in the **Set up mode** because values can also be adjusted via the touchscreen.

5

CONFIGURATION

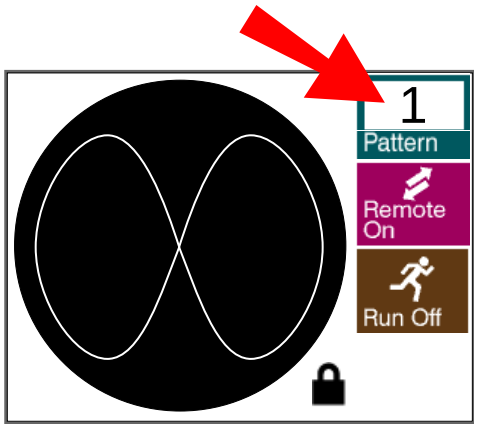
Unlocking

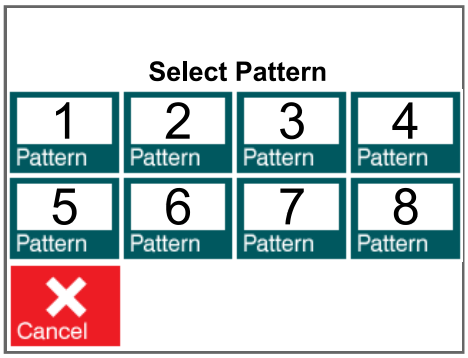


To configure the sweep first it must be unlocked. Press the lock to unlock the sweep and enter the password.

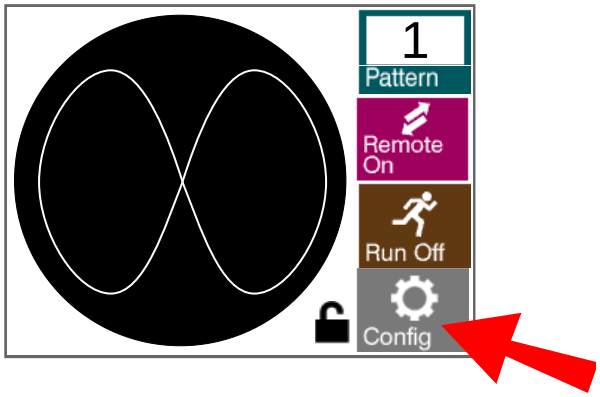
The default password is “1234”. The password can be changed at this time by pressing the **Change Password** button. Once the sweep is unlocked it will stay unlocked until it is locked by pressing the **lock** or by turning the power off.

Configure Pocket Center and Diameter

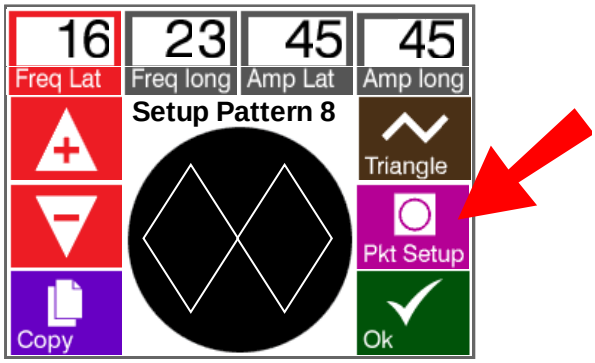




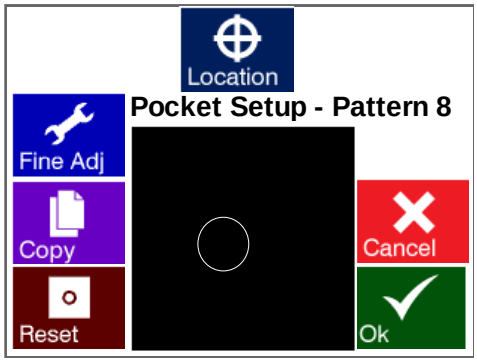
Press the **Pattern** button to select the pattern to configure.



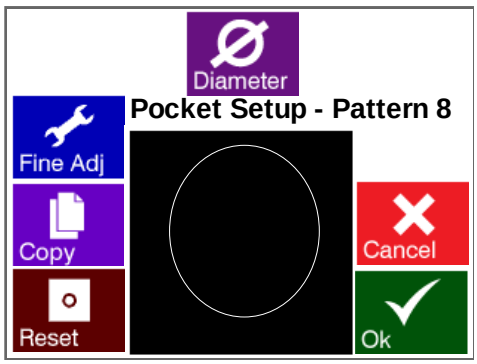
Once the sweep is unlocked then the **Config** (Configure) button can be pressed.



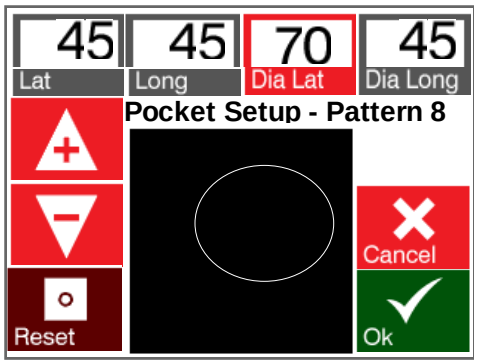
Select the **Pocket Setup**



The sweep makes a small circular pattern in this mode. With the e-beam source running at low power and looking at the pocket, observe the beam and position the beam in the center of the pocket using the handheld joystick to control the latitudinal/ longitudinal position. Click down on the switch on the joystick to make your section. When you click on the joystick button to select, the sweep will automatically switch to **Diameter** mode.

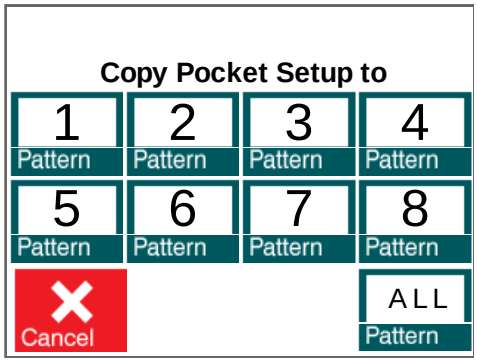


Next set the limits of the pocket with the **Diameter**. You can toggle between **Location** and **Diameter** mode each time you click on the joystick button till you are satisfied then push the **Ok** button. The center of the circle represents the center of the pocket and the circle represents the limits relative to the maximum sweep output power.



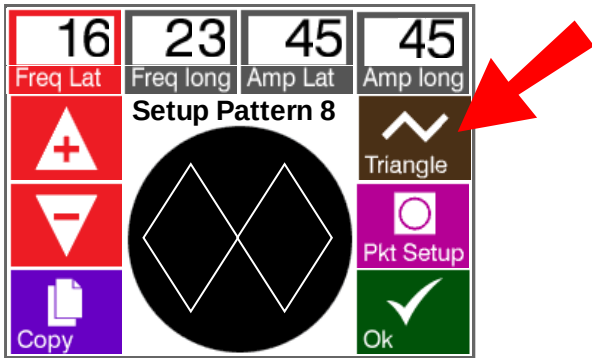
For further control the **Fine Adj** (Fine Adjustment) button brings up numeric control. Once the center and limits have been set it is a good idea to make a note of the setting.

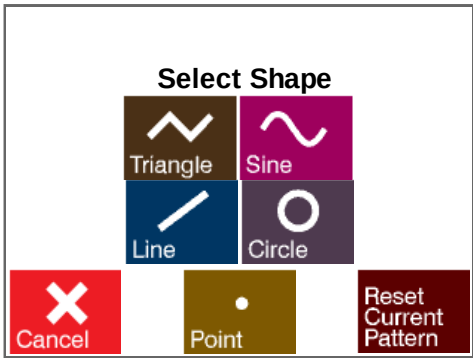
The **Reset** button will reset all values of the current pattern to their minimums. There is a conformation screen to prevent accidental resetting.



The pocket setup can be copied to other patterns. Normally coping to ALL patterns would be desirable if the pockets in the e-beam source are the same size.

Configure Pattern

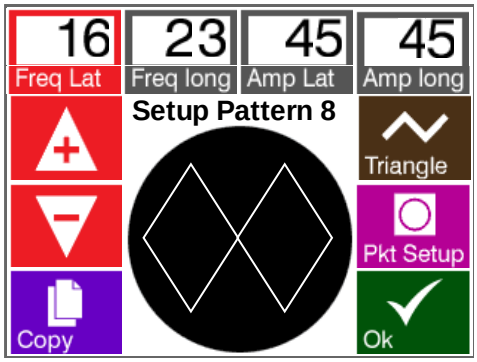




First, select the shape type, **Triangle**, **Line**, **Circle**, **Sine** or **Point** by touching the Shape button. The **Reset Current Pattern** button will reset the current pattern settings for all shapes to factory defaults.

Adjust the Frequencies and Amplitudes using the **+** and **–** arrows on the touch screen or use the joystick remote, up is **+** and down is **–**. Red highlight indicates the box with the parameter to be adjusted. Click on the remote to switch to adjust the other values or touch on the touchscreen. Latitudinal and longitudinal frequencies are adjustable from 0.5Hz to 100Hz and Collapse and Rotate frequencies are adjustable from 0 to 5Hz.

Triangle



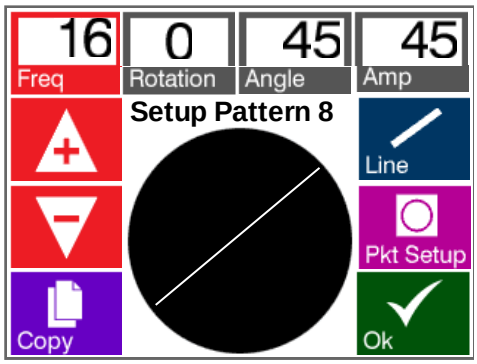
Freq Lat – Frequency Latitudinal, 0.5Hz to 100Hz

Freq Long – Frequency Longitudinal, 0.5Hz to 100Hz

Amp Lat – Amplitude Latitudinal, 5-100% of configured maxim pocket

Amp Long - Amplitude Longitudinal, 5-100% of configured maxim pocket

Line



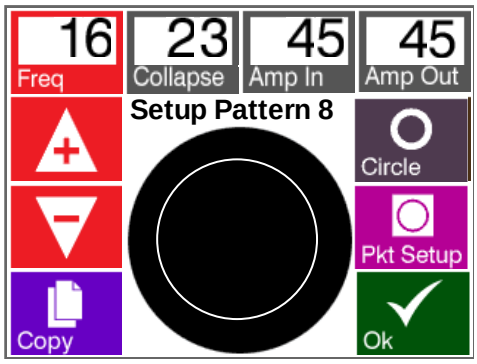
Freq – Frequency, 0.5Hz to 100Hz

Rotation – Rotation of the line, 0 to 5Hz.

Angle – Controls the angle of the line (only when the rotation is 0)

Amp – Amplitude, 5-100% of configured maxim pocket

Circle



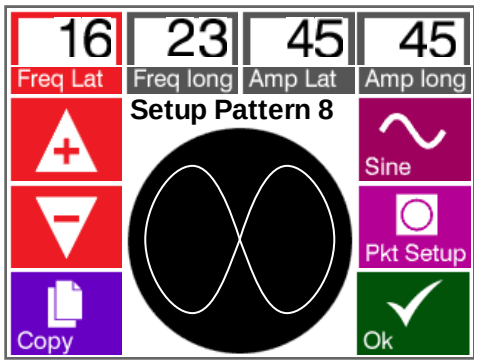
Freq – Frequency, 0.5Hz to 100Hz

Collapse - Collapse, 0 to 5Hz.

Amp In – Amplitude In, 5-100% of configured maxim pocket (only when the collapse greater than 0)

Amp Out – Amplitude Out, 5-100% of configured maxim pocket

Sine



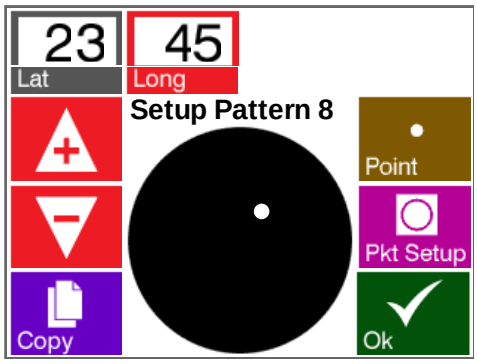
Freq Lat – Frequency Latitudinal 0.5Hz to 100Hz

Freq Long – Frequency Longitudinal, 0.5Hz to 100Hz

Amp Lat – Amplitude Latitudinal, 5-100% of configured maxim pocket

Amp Long - Amplitude Longitudinal, 5-100% of configured maxim pocket

Point



The point pattern is a fixed point

Lat – Latitudinal position, -100 to +100

Long – Longitudinal position, -100 to +100

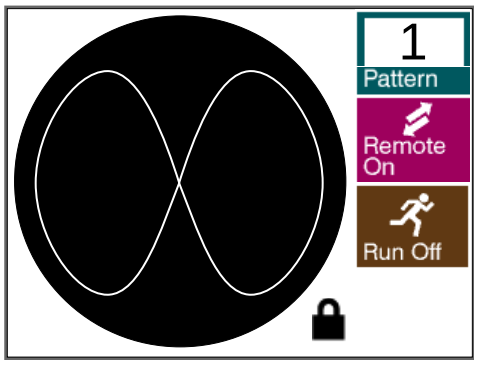
6

OPERATION

General Operation

Power-Up

When the front-panel **POWER** switch is turned on, the fans turn on and the LCD lights and displays the version of the software for 3 seconds then displays the operational screen shown below. The digital sweep will check output to see if an EB source is connected. If there is no EB source is present or there is an open on the one or both of the coils or a wiring error an error message will be displayed on the screen. Connecting the digital sweep to an operational EB will remove the error message and it will then display the screen below. See chapter 7 for error codes.

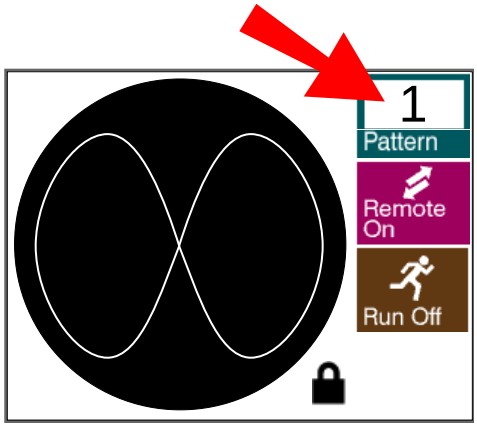


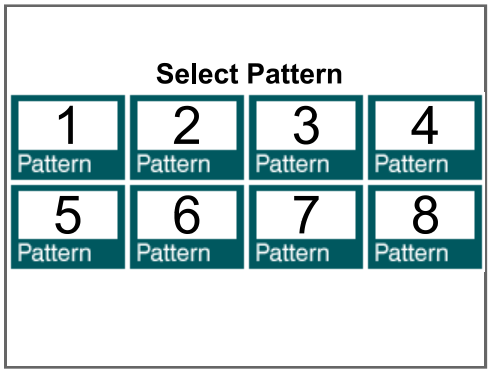
Then turn on the power supply HV & Emission. Set the Hi-Voltage at the level necessary for the material, but set the Emission very low, just enough to barely see a beam. This way the sweep pattern settings can be judged and finalized without affecting the material.

Power-Down

When the front-panel **POWER** switch is turned off, all lights and outputs go off. All patterns are stored in memory; last pattern used will be the current selection when the unit is turned back on.

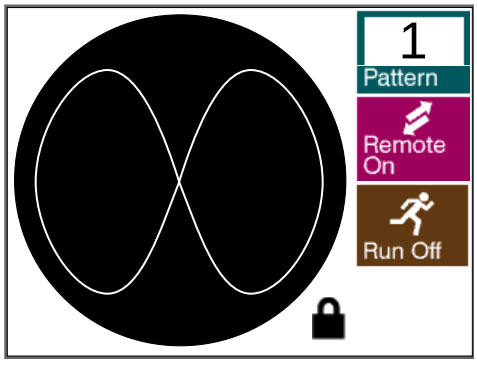
Pattern Selection



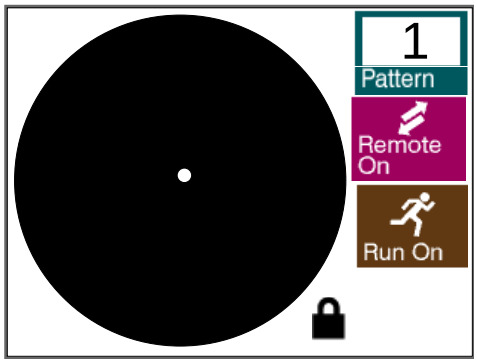


Press the **Pattern** button to get the Select Pattern menu.

Run On/Off



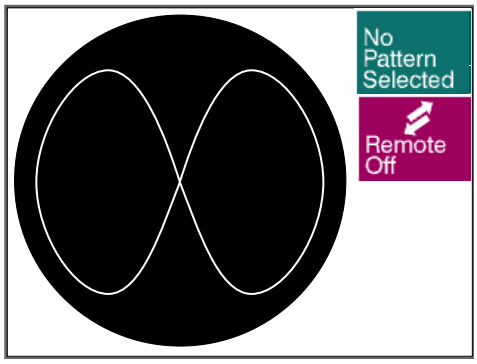
When in **Run On** mode the pattern that has been selected the Select Pattern menu is output.

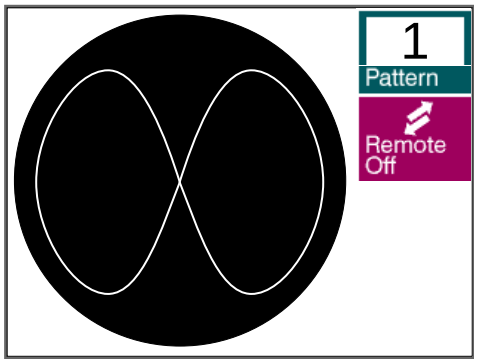


When in **Run Off** mode the joystick directly controls the e-beam output position, allowing the user to precondition the material manually. The Joystick lever controls direction of beam: left [-] & right [+] controls the lateral direction; near [-] (as seen from the EB source emitter) & far [+] controls the longitudinal direction.

Remote On/Off

Remote button toggles between on and off. Remote On allows control from a PLC using the remote control input on J2 on the back panel. When remote is **on** the operator can only turn it off, all other operations are disabled. **Remote On** gives full control to the remote. If a valid pattern is selected then that pattern and the pattern number will be displayed. If no pattern is selected then **No Pattern Selected** is shown. When the RUN control signal is active (contact closed) the selected pocket will Run the pattern currently selected. If no valid pattern is selected then no pattern is output. The Run LED and the Remote LED will light up when the pattern is being output to the coils.





7

ERROR CODES

Error Codes

The Digital Sweep checks at start up and continually when it is turn on for any errors, if an error is found the sweep output is stopped and **Remote** mode it turned off. The error conditions must be fixed before the Digital Sweep will be operational. Errors may be with the Digital Sweep, the EB source coils, or the connection between the two. The possible error codes are shown below:

+24V failure on Latitude driver

-24V failure on Latitude driver

+24V failure on Longitude driver

-24V failure on Longitude driver

EEPROM failure - no acknowledge

EEPROM failure - invalid product code

EEPROM failure - write verify

Latitude coil failure

Longitude coil failure

Warning

A red dot shown on the **Run Off** button indicates that the joystick is not calibrated. The handheld joystick must be returned to the factory for calibration.