TELEMARK

PROGRAMMABLE SWEEP

INSTRUCTION MANUAL

Manual Rev 1.1.5 March 2024

telemark.com

Current interface and software options might be different. Contact manufacturer for current manual release if the software interface or functions are different from this manual or download the current version of this manual at
https://telemark.com/e-beam-power-supplies/sweep-controllers/

TABLE OF CONTENTS

1 INTRODUCTION 8
1.1 Intended Use 8
1.2 Liabilities and Warranty 8
1.3 Safety 9
Personnel Qualifications 9
Illustration of Residual Dangers 9
1.4 General Safety Instructions 10
2 TECHNICAL DATA 12
2.1 General Data 12
Mechanical Data 12
Ambience 13
Use and Operating Modes 13
Standards 13
2.2 Mains Connection 15
2.3 Pack List 15
2.4 Specifications 16
2.5 Features 17
2.6 Interfaces 17
Input/Output Interface 17
3 INSTALLATION 18
3.1 Unpacking 18
3.2 Mechanical Installation 19
Required components 19
3.3 Installation 19
Rack Installation 19
3.4 Controller Connecting 20
Front Panel 20
Rear Panel 21
Mains Connection 22
Grounding 22

Remote Control - J2 24
Host – J1 25
Output - J3 25
3.5 List of Accessories or Supplies 27
4 USING THE PROGRAMMABLE SWEEP 28
4.1 Front Panel 28
Main Power Switch 28
Power On LED indicator 29
Handheld 29
LCD Touchscreen 29
4.2 Avatar Handheld 29
Four-way and OK Momentary switch 30
Joystick 31
5 CONFIGURATION 32
5.1 Unlocking 32
5.2 Configure System 33
Screen Saver 33
Input 33
Beam in Pocket (BIP) 34
Angle Offset 35
Lat/Long Flip 35
Factory Service 35
5.3 Pattern Pocket Setup 36
5.4 Copy Pocket Setup 38
5.5 Configure Pattern 38
5.6 Display Tail Length 39
5.7 Profile 39
5.8 Pattern Configuration Setup 41
Triangle 41
Sine 42
Figure 8 43
Line 44
Circle 44
Spiral 45
Point 45
Programmable Shape 46

5.9 Making Programmable Shapes 46
Constant Velocity/Constant Dwell 48

6 OPERATION 50

6.1 General Operation 50
Power-Up 50
Power-Down 50

6.2 Pattern Selection 51

6.3 Move Pattern 51

6.4 Run On/Off 52

6.5 Remote On/Off 53

7 SERIAL INTERFACE 55

7.1 GENERAL 55

7.2 RS-232 SERIAL INTERFACE 55

7.3 ASCII PROTOCOL 56

7.4 LIST OF COMMANDS 56

7.5 FORMAT 57

7.6 SOFTWARE FLOW CONTROL 57

7.7 ERROR CODES 58

7.8 COMMAND FORMAT 58

7.9 COMMANDS 59
Ping (!) 59
Status (?) 59
Alarm Status (a) 59
Software Version (v) 60
Remote On (R) 60
Remote Off (L) 60
Set Current Pattern In Use(P) 60
Read Current Pattern In Use Number (p) 61
Write Pattern's Shape Type (T) 61
Read Pattern's Shape Type (t) 61
Write Parameters of Pattern (U) 61
Read Parameters of Pattern (u) 62
Write one Parameter of a Pattern's Shape (F) 62
Read Parameters of a Pattern's Shape (f) 62
Write Parameters for User Shape (S) 62

Read Parameters for User Shape (s) 63
Write Pattern Name (N) 63
Read Pattern Name (n) 63
Write shape name (B) 63
Read shape name (b) 64
Set Pattern Offset (X) 64
Read Pattern Offset (x) 64
APPENDIX 1 64
APPENDIX 2 65

8 MAINTENANCE AND SERVICE 66
8.1 Maintenance 66
8.2 Cleaning 66
9 STORAGE AND DISPOSAL 67
9.1 Packaging 67
9.2 Storage 67
9.3 Disposal 67
9.4 WEEE 67
10 ERRORS AND WARNINGS 69
10.1 Error Codes 69
10.2 Interlock Fail 70
11 WARRANTY CONDITIONS 71
11.1 Limited Warranty 71

TABLE OF FIGURES

Figure 1-1, Keep Foreign Material Out of the Programmable Sweep 10
Figure 2-1, Sweep Reference Dimensions 13
Figure 3-1, Front Panel Connection 20
Figure 3-2, Avatar Sweep Handheld 21
Figure 3-3, Rear panel Programmable Sweep Controller 21
Figure 3-4, Three-conductor cable with protective ground (example) 22
Figure 3-5, Connections 23
Figure 3-6, Dsub25 pinouts 24
Figure 3-7, Host Port 25
Figure 3-8, Telemark standard Coil Wire Reference Code 25
Figure 3-9, Telemark Source Standard Direction Reference 26
Figure 3-10, Typical 8 pin Sweep/coil Installation 26
Figure 3-11, Typical 4 Pin Sweep/coil Installation 26
Figure 4-1 - Front Panel 28
Figure 4-2, Avatar Sweep Handheld 29
Figure 4-3, Four way and OK switch Operation 30
Figure 5-1, Unlocking Screen 32
Figure 5-2, Configure System 33
Figure 5-3, Beam in Pocket Setup 34
Figure 5-4, Angle Offset Setup 35
Figure 5-5, Lat/Long Flip Setup 35
Figure 5-6, Select Pattern 36
Figure 5-7, Select Pattern Pocket Setup 36
Figure 5-8, Setting the Pocket Center 37
Figure 5-9, Setting Pocket Limits 37
Figure 5-10, Copy Pocket Setup 38
Figure 5-11, Select Configure Pattern 38
Figure 5-12, Select Shape 38

Figure 5-13, Select Shift Menu 39
Figure 5-14, Positive Profile Representations 40
Figure 5-15, Setup Pattern, Triangle 41
Figure 5-16, Setup Pattern, Sine 42
Figure 5-17, Setup Pattern, Figure 8 43
Figure 5-18, Setup Pattern, Line 44
Figure 5-19, Setup Pattern, Circle 44
Figure 5-20, Setup Pattern, Spiral 45
Figure 5-21, Setup Pattern, Point 45
Figure 5-22, Select Shape 46
Figure 5-23, Setup Pattern 46
Figure 5-24, Programmable Shape Select 47
Figure 5-25, Shape Configure 47
Figure 5-26, Shape Edit 48
Figure 5-27, Constant Velocity Shown on Oscilloscope 48
Figure 5-28, Constant Dwell Shown on Oscilloscope 49
Figure 6-1, Touchscreen Display 50
Figure 6-2, Pattern Selection 51
Figure 6-3, Pattern Shift 51
Figure 6-4, Move Pattern, Joystick connected 51
Figure 6-5, Move Pattern, Joystick not Connected 52
Figure 6-6, Run On/Off 52
Figure 6-7, Run Off, Joystick 53
Figure 6-8, Remote, No Pattern 53
Figure 6-9, Remote, Pattern Selected 54
Figure 7-1, RS-232 Connection 56
Figure 9-1, WEEE Symbol 68
Figure 10-1, Interlock Fail 70

1 INTRODUCTION

Please read this manual carefully to ensure optimum operating conditions right from the start. This user manual handbook contains important information about the functionality, installation, start-up and operation of the Model Programmable Sweep.

1.1 Intended Use

The Telemark Programmable Sweep 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 output drives the latitude and longitude (X, Y) coils of an electron beam source to move the beam spot.

The device is referred to as Programmable Sweep in the remainder of this manual.

1.2 Liabilities and Warranty

Telemark is not liable for damages resulting from improper use of the device and the guarantee expires, if the user, or third party:

- ignores information contained in this manual,
- utilizes the product in a manner inconsistent with intended purpose,
- makes any modification or alteration of the product,
- unit should not be used with unauthorized accessories (compatible accessories, types and models can be found in the product documentation)

Telemark reserves the right to make changes without prior notice. Illustrations may vary depending on the version of the device.

1.3 Safety

Personnel Qualifications

All work described in this document may only be carried out by persons who have suitable technical training and the necessary experience or who have been instructed by the end user of the product.

Illustration of Residual Dangers

This Operating Manual illustrates safety notes concerning residual dangers as follows:

Information on preventing any kind of physical injury.

Information on preventing extensive equipment and environmental damage.

Information on correct handling or use. Disregarding safety notes can lead to malfunctions or equipment damage.

Note: Indicates particularly important, but not safety-relevant information.

1.4 General Safety Instructions

For all work you are going to do, adhere to the applicable safety regulations. Also observe all safety notes given in this document and forward the information to all other users of the product. Pay attention to the following safety notes:

DANGER

Mains voltage.

Contact with live parts is extremely hazardous when any objects are introduced, or any liquids penetrate the device.

Make sure that no objects enter the device. Keep the device dry.

Figure 1-1, Keep Foreign Material Out of the Programmable Sweep

WARNING

Improper use.

Improper use can damage the Programmable Sweep.

Use the Programmable Sweep only as intended by the manufacturer.

WARNING

Improper installation and operation data.

Improper installation and operation data may damage the Programmable Sweep.

Strictly adhere to the stipulated installation and operation data.

2 TECHNICAL DATA

2.1 General Data

Mechanical Data

Dimensions:	19-inch (483mm) rack 2U, 3 1/2” (89mm) high x 9 3/8” (238mm) deep, See Fig. 2-1
Net Weight:	10.6 lb. (4.8 kg)

Controller Installation: 19” Rack standard or Bench Top unit

Assembly: Connected outside of a high vacuum system to electron beam source that is inside a high vacuum system.

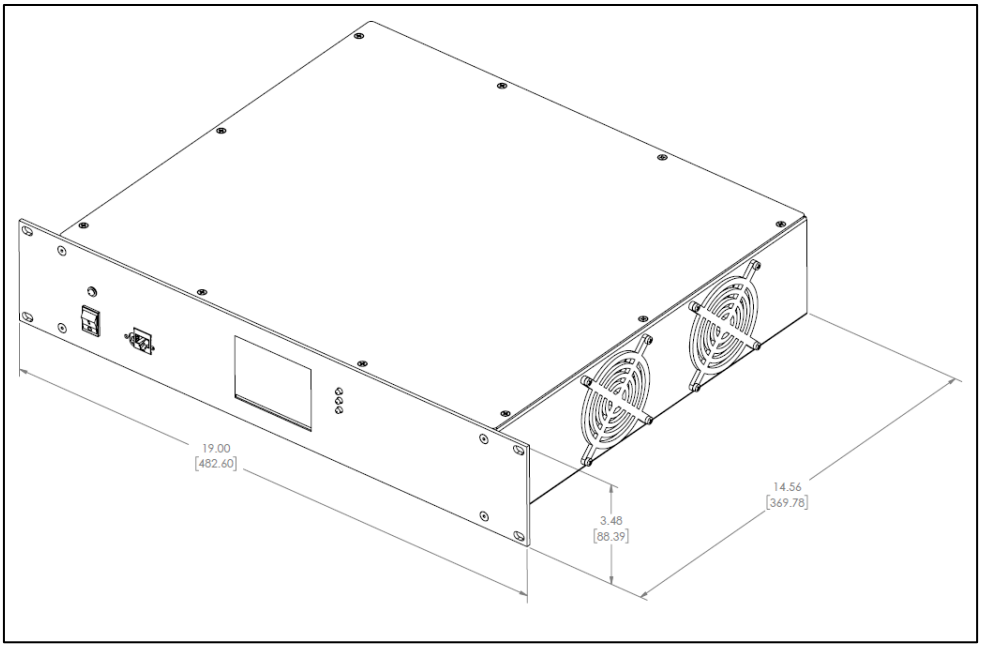


Figure 2-1, Sweep Reference Dimensions

Ambience

Temperature Storage:	-20…+60 °C
Operation Temperature:	+5…+40 °C
Relative Humidity:	Max. 80 % (up to 31 °C), decreasing to max. 50 % (above 40 °C)
Use indoor only	
Altitude:	max. 2000 m
The degree of dust standard:	II
Humidity resistance:	IP20

Use and Operating Modes

There are two common operation modes:

1. Manual control, with the touchscreen on the front panel
2. Hardware remote control with I/O interface

This mode is active by pressing the Remote button on the touchscreen. In this mode the only button available on the touchscreen is to return to manual mode.

Standards

Conformity with the Directive relating to electrical equipment designed for use within certain voltage limits 73/23/EWG

Conformity with the Directive relating to electromagnetic compatibility 89/336/EWG

Harmonized and international/national standards and specifications:

EN 61010-1 (Safety requirements for electrical equipment for measurement, control and laboratory use)

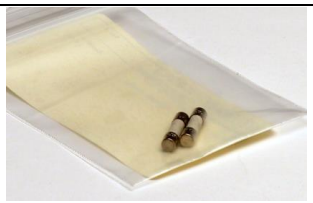
EN 61000-6-2 (Electromagnetic compatibility generic immunity standard)

EN 61000-6-3 (Electromagnetic compatibility generic emission standard)

2.2 Mains Connection

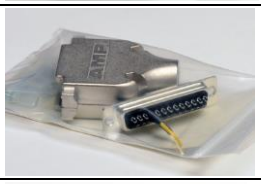
Voltage:	90 to 264 VAC, 1 phase operation
Frequency:	47 - 63 Hz
Current consumption:	Max. 2.2 A at 120V, Max. 1.1 A at 230V
Power consumption:	Max. 17 W
Overvoltage category II	
Protection class 1	
Connection US	
appliance connector	IEC 320 C14
Fuse	Slow Blow, 5 A, 250 V, 5mm x 20mm

2.3 Pack List

Part No.	Quantity	Description	
122-4003-1	1	Cable Kit, Programmable Sweep	
135-0301-2	1	Digital Sweep Ship Fuse Kit	
135-0501-1	1	Assembly, Sweep Handheld, Avatar Joystick	
135-0700-2 or 135-0700-2	1	Chassis Assembly, Programmable Sweep	

Programmable Sweep chassis is either 135-0700-1, Programmable Sweep, 1.5 Amp or 135-0700-2 Programmable Sweep, 3.0 Amp

122-4003-1, Cable Kit, Programmable Sweep

Part No.	Quantity	Description	
122-0108-1	1	Cable, Sweep (XY), 3p Philmore/Loose 25 ft.	
122-1112-1	1	Cable, Sweep Joystick 9 pin D, 10 feet	
122-3230-1	1	Cable, USB 2.0 A to B, 3 ft LP	
124-0925-7	1	Connector Kit, 25 Pin, D-Sub F, w/ Intlk loop	
376-9010-1	1	Power Cord	

2.4 Specifications

Electrical	
Input Supply Voltage	90 to 264 Vac (47 …. 63 Hz), 1 phase operation
Input Current	Max 0.4A
Mode of operation	Electron beam source pocket sweeping with one of seven predefined shapes or with a user defined shape
Methods of control	Local or remote through Communication Interface
Dimensions	Controller dimensions: 19-inch (483mm) rack 2U, 3 1/2” (89mm) high x 9 3/8” (238mm) deep
Weight	Net Weight: 10.6 lb. (4.8 kg)

I/O control	
Analog Interface	25-pin Dsub female connector, 9 Inputs: 75V reverse breakdown Passive Mode (contact closure) Outputs: 3 relay contacts NO @ max 1A, 24 DC or AC
RS-232	9-pin Dsub male connector, requires Null modem cable when connected to PC computer.

2.5 Features

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.

2.6 Interfaces

Input/Output Interface

Connector: D-Sub 25 male connector

Refer to chapter 3.6.5 for details.

No of Digital Inputs: 9 – Inputs are contact closure to sweep reference.

Response time: 50mS max

No of Digital Outputs: 3 – Relay; 50V maximum compliant

3 INSTALLATION

3.1 Unpacking

1. Visually inspect the transport packaging for signs of external damage
2. Unpack the Programmable Sweep and put the packaging material aside

Note: Keep the packaging material for later use. The Programmable Sweep must be stored

and transported in the original packaging material only.

3. Examine the Programmable Sweep for completeness
4. Visually inspect the Programmable Sweep for signs of damage

Damaged product.

Putting a damaged product into operation can be extremely dangerous.

Never attempt to put a damaged product into operation. Secure the damaged product from unintended operation. Send a damage report to the haulage company or the insurer.

3.2 Mechanical Installation

Programmable Sweep can be used in the following ways: as a bench top device, mounted in a control panel or mounted in a 19 "rack. In each case, consider the following important safety information:

WARNING

The temperature of the environment.
Exceeding the allowable temperature of the device may damage the unit.

Make sure that the maximum permissible ambient temperature is not exceeded, and the air can circulate freely through the ventilation slots. Do not expose the device to direct sunlight.

Required components

The following is the minimum list of components required for setting up the sweep for safe operation.

- Electron beam source with an electromagnetic coil in working order.
- Vacuum system.
- 19-inch rack with 115/230VAC, 50/60 Hz power to house the controller.
- Cable from ground on chamber to ground stud on sweep controller.

3.3 Installation

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.

Rack Installation

The Programmable Sweep is designed for installation into a rack according to DIN 41 494 (19", 2 HU).

WARNING

Ambient temperature.

Exceeding the maximum permitted ambient temperature may damage the device.

Make sure that the maximum permitted ambient temperature is not exceeded. Do not expose the device to direct sunlight.

DANGER

Protection class of the rack.

If the product is installed in a rack, it is likely to lower the protection class of the rack (protection from foreign bodies and water) e.g. according to the EN 60204-1 regulations for switching cabinets.

Take appropriate measures to restore the required protection class of the rack.

3.4 Controller Connecting

Figure 3-1, Front Panel Connection

Front Panel

A – Handheld, Avatar Joystick Sweep Remote Control Connection

The Handheld can be used when needed and removed when not needed.

Figure 3-2, Avatar Sweep Handheld

Rear Panel

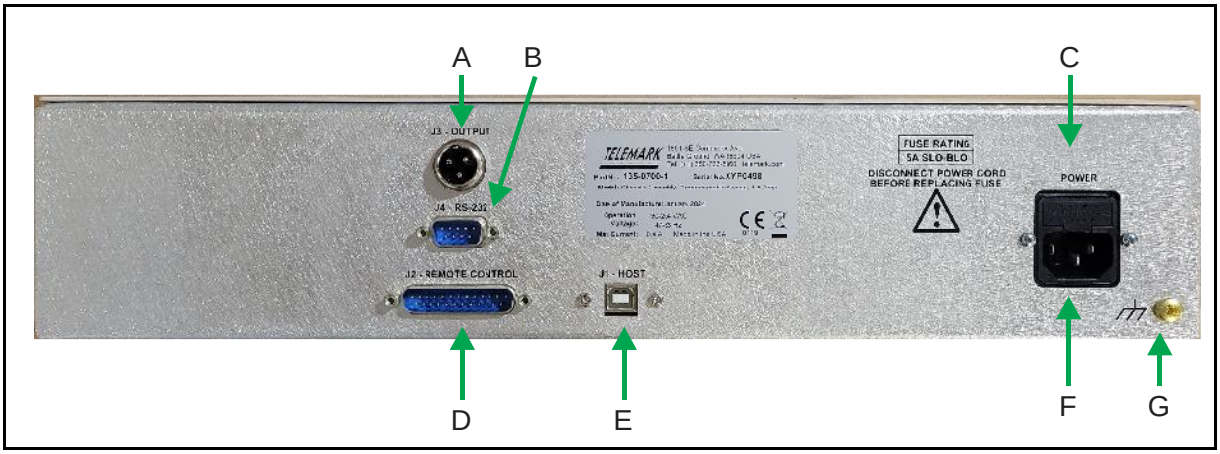


Figure 3-3, Rear panel Programmable Sweep Controller

A – **Sweep Output**

B – **RS-232**

C – **Main power socket** IEC C13

D – **Remote Control**, Input/Output interface connector Dsub 25 female

E – **USB connector**, Type B

F – **Fuses**

G – **Grounding screw**

The configuration of the available connections and photographs of cables is described in the following sections.

Mains Connection

The mains connection is designed for a mains cable which contains IEC 320 connector on the device side. A mains cable is supplied with the device. If the plug is not compatible with your wall socket, you should replace it with a suitable mains cable:

Three-conductor cable with protective ground

Conductor cross-section 3x1.5 mm^2 or larger

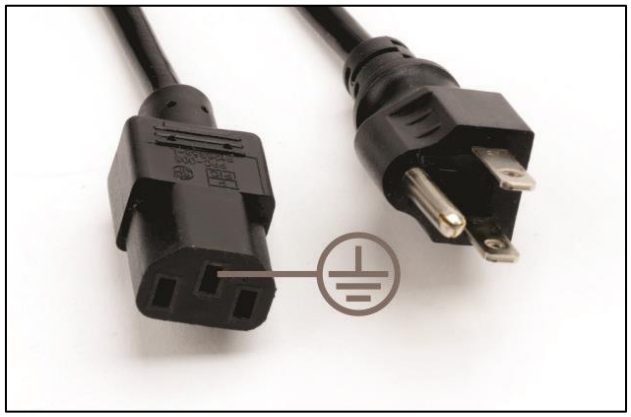


Figure 3-4, Three-conductor cable with protective ground (example)

DANGER

Mains power.

Improperly grounded devices can be extremely dangerous in the event of a fault. Use three-wire mains or extension cables with protective ground only. Plug the mains cable into wall sockets with protective ground only.

1. Connect the appliance connector of the mains cord with the mains connection of the device

2. Connect the plug of the mains cable with the wall socket

Note:

If the device is installed in a switching cabinet, the mains power can be supplied via a switchable central power distributor.

Grounding

Grounding screw (Fig. 3-3, the reference F) should be used to connect the Programmable Sweep with the main grounding system in which it operates. It is recommended to use a cable with a minimum section of 2.5 mm^2

If required, connect the vacuum system ground from the earthing screw using the protective conductor.

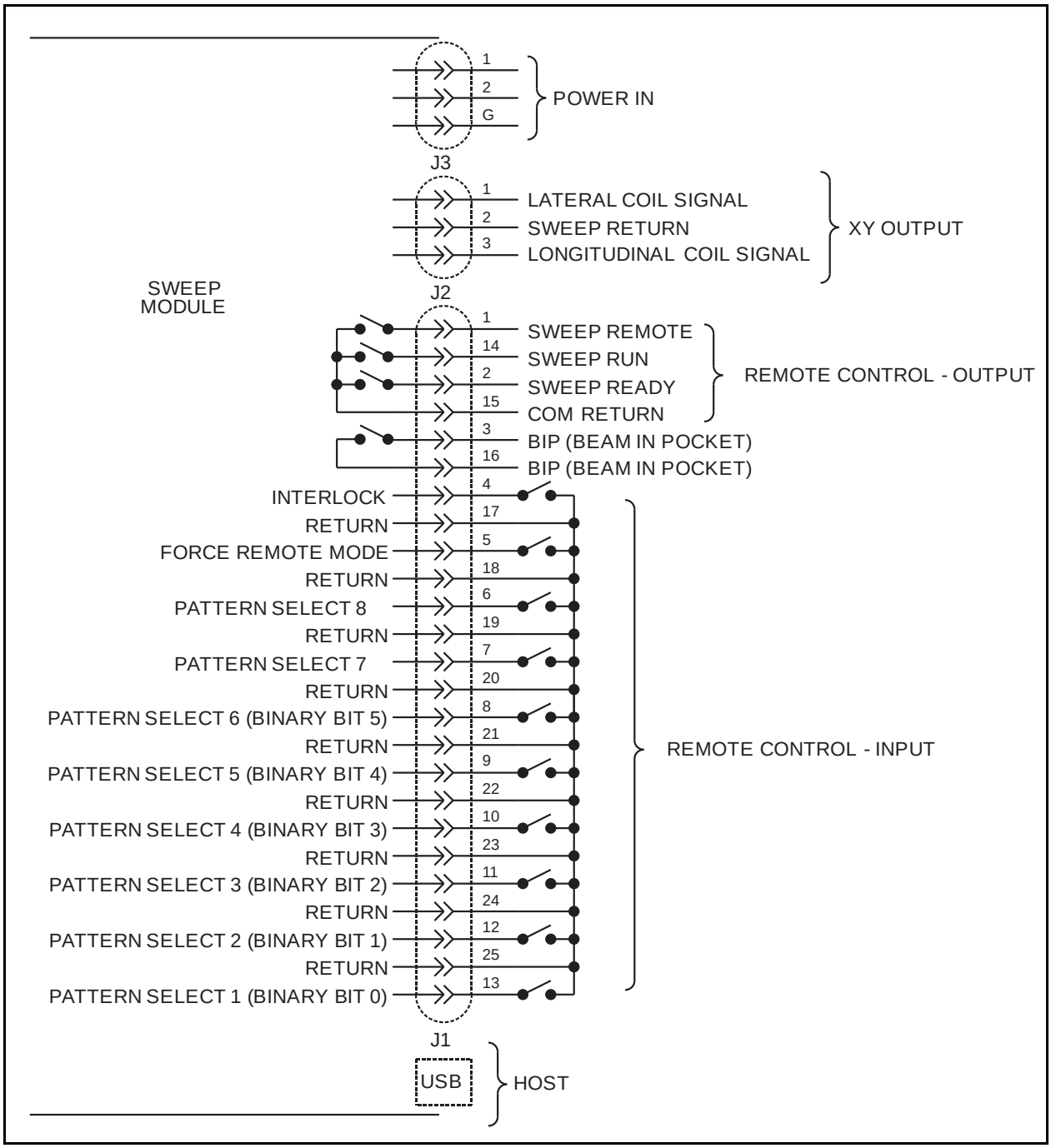


Figure 3-5, Connections

Remote Control - J2

The outputs are on a 25-pin male connector on the back of the controller, isolated SPST relays, 50VDC max, 2A max.

Pin outs and functions description:

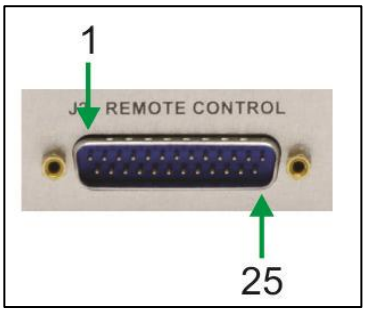


Figure 3-6, Dsub25 pinouts

Remote Control Input

Force Remote – When pins 5 and 18 are closed the sweep will be forced in to Remote mode and touchscreen is disabled.

Interlock – Pins 4 and 17 need to be closed for the sweep output to operate. If these are not close a red INT will show in the upper left of the screen

Pattern Select – 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” and the “Remote” will light up when the pattern is being output to the EB Source coils.

A pattern number may be selected three different ways:

Binary 1=00000, up to 32 patterns

Binary 1=00001, up to 32 patterns

Input Individual, up to 8 patterns directly

See section 5.2 Configure System on how to setup up selection input.

Remote Control Output (50V maximum compliant)

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

Sweep Remote – A signal is sent out when the user has put the Programmable 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 Programmable Sweep is ready and operational.

BIP – Beam in pocket signal can be off or lateral or longitudinal. If lateral or longitudinal it can be used as a bias current status relay (for instance for SLOAN

sources, AP&T sources, and some JEOL sources). BIP relay is activated when BIP is enabled and the current on the BIP axis greater than + or - 500 mA.

Host – J1

The host port is for upgrading the sweep software. **IF J1 IS CONNECTED TO A PC THE PROGRAMMABLE SWEEP WILL AUTOMATICLY GO IN TO DOWNLOAD MODE.**

Figure 3-7, Host Port

Output - J3

Connection of the sweep generator to the EB Source is shown in Figure 3-8, 3-9, 3-10, 3-11. 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. The Lat and Long direction can be change in the **Config System** menu by pressing **Lat Flip** and or **Long Flip**.

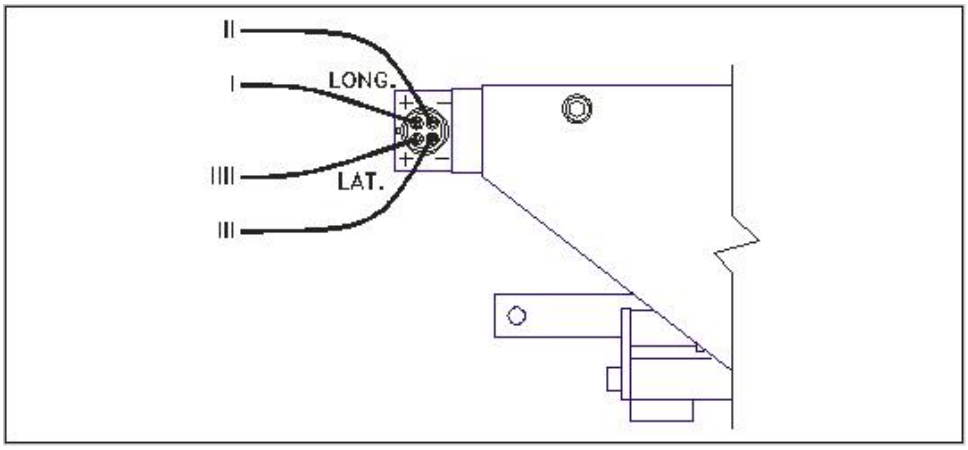


Figure 3-8, Telemark standard Coil Wire Reference Code

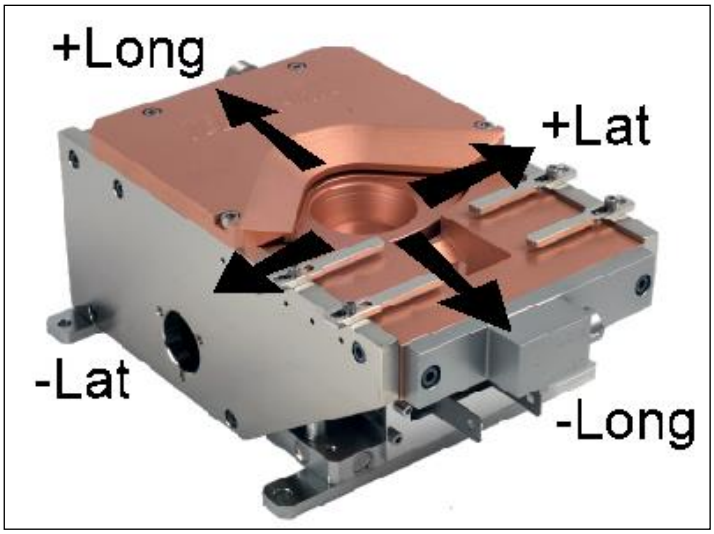


Figure 3-9, Telemark Source Standard Direction Reference

Note: the EB source Latitude and longitude coils can be connected in any manner needed to change the preferred viewing orientation as long as the Sweep Return is connected to ground.

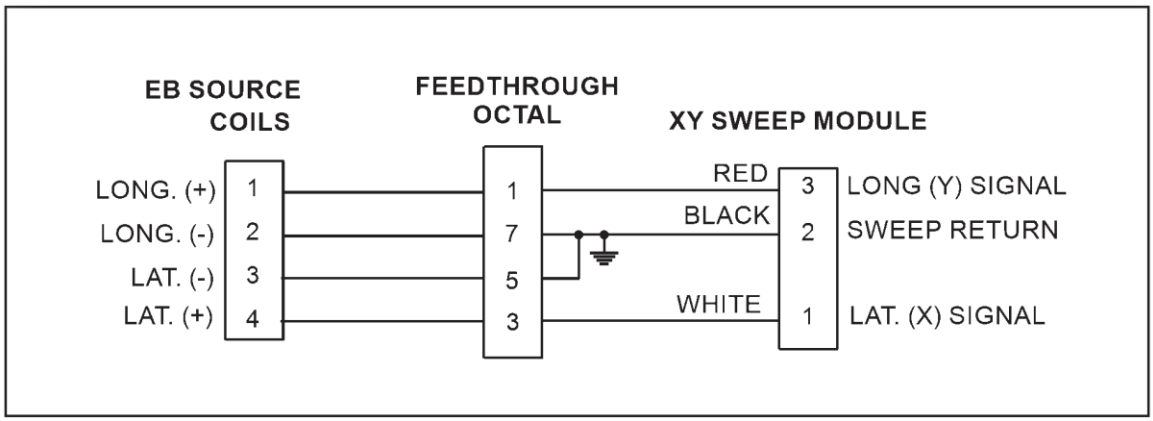


Figure 3-10, Typical 8 pin Sweep/coil Installation

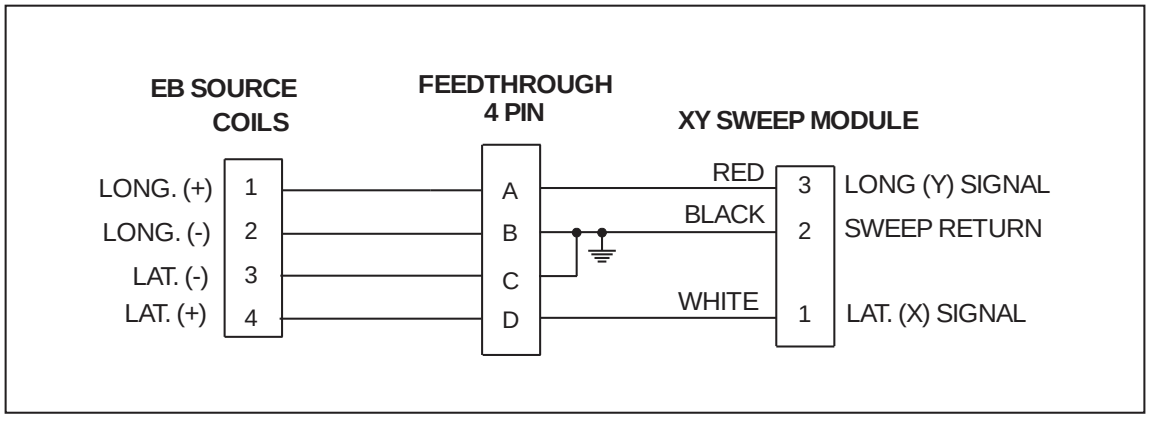


Figure 3-11, Typical 4 Pin Sweep/coil Installation

CAUTION

Improper connection.

In the case of incorrect connection - in accordance with Figure 3-8, 3-10, and 3-11 there is a danger of damage to the controller

RS-232 – J4

Connection of RS- 232. See chapter 7 for details and protocol.

3.5 List of Accessories or Supplies

Recommended parts:

8 pin feedthrough or 4 pin feedthrough

4 USING THE PROGRAMMABLE SWEEP

4.1 Front Panel

Please refer to Fig. 4-1 for front panel details

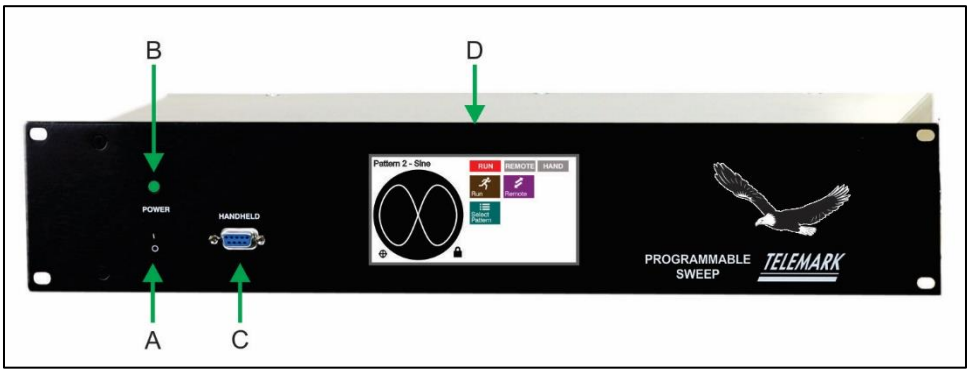


Figure 4-1 - Front Panel

A – **POWER SWITCH** (see chapter 4.1.1 for details)

B - **Power On LED** indicator (see chapter 4.1.2 for details)

C - **HANDHELD** (see chapter 4.1.3 for details)

D - **LCD touch screen** (see chapter 4.1.4 for details)

Main Power Switch

Switching On the power button (position 'I') activates the main power circuit of the device. Switching off the unit (position 'O' switch) completely cuts the power to the internal circuits - controller is safe to make rear panel connections.

DANGER

Risk of the electric shock!

All connection to the devices may only be carried out with the unit is turned off - the main power switch in 'O' position.

Failure to do so may cause electric shock

Power On LED indicator

Green LED indicates the unit power is on.

Handheld

The handheld Joystick can be plugged in or unplug at any time.

LCD Touchscreen

Interaction with the user takes place by means of a graphical LCD Touchscreen display. The screen can be set to turn off using the screen saver setting, The Sweep is always operational if the power is on even if the screen is off. Touch the screen to wake screen up.

4.2 Avatar Handheld

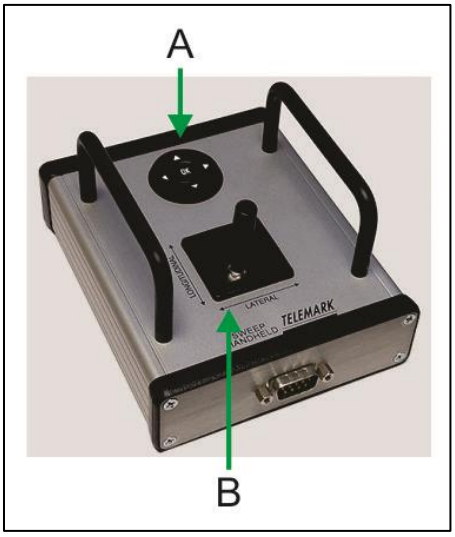


Figure 4-2, Avatar Sweep Handheld

A – **FOUR-WAY and OK SWITCH** (see chapter 4.2.1 for details)

B – **JOYSTICK** (see chapter 4.2.2 for details)

Four-way and OK Momentary switch

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

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

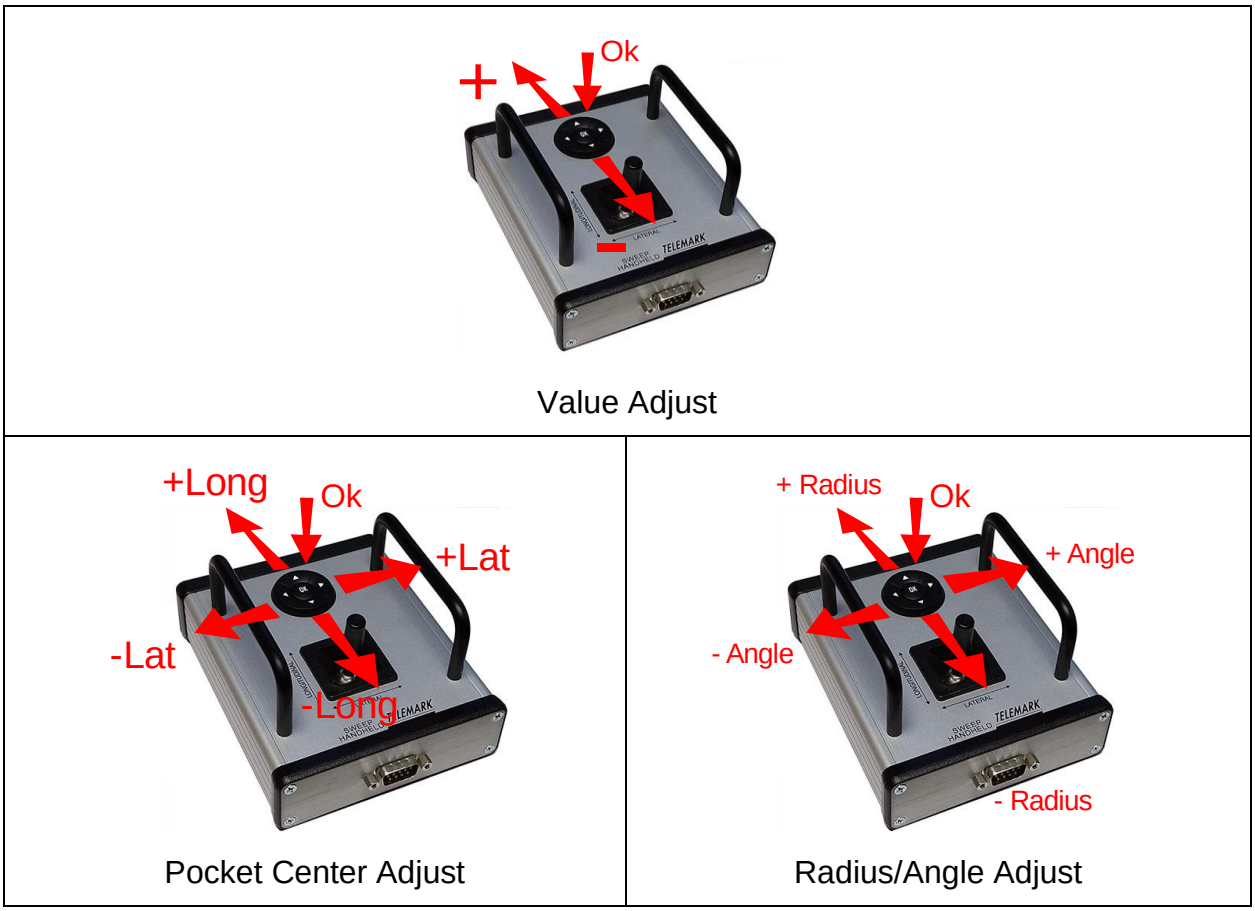


Figure 4-3, Four way and OK switch Operation

When the remote is plugged in it can function in three ways depending on the state of the screen.

Value Adjust –The Ok button switches the between variables. The Red button is the active variable. Up increases the value and down decrease the value of the button indicated in red.

Pocket Center Adjust – moves the center position in lateral and longitudinal directions. The Ok button cycles between pocket center and the eight radial adjustment points.

Radius/Angle Adjust – changes pocket point radius and deviation angle +/-22 degrees. The Ok button cycles between pocket center and the eight radial adjustment points.

Joystick

The joystick controls the latitudinal and longitudinal beam position.

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. **Pattern Shift** – The joystick is used to move the center of the pattern in run mode, see operation chapter for more information.

5 CONFIGURATION

5.1 Unlocking

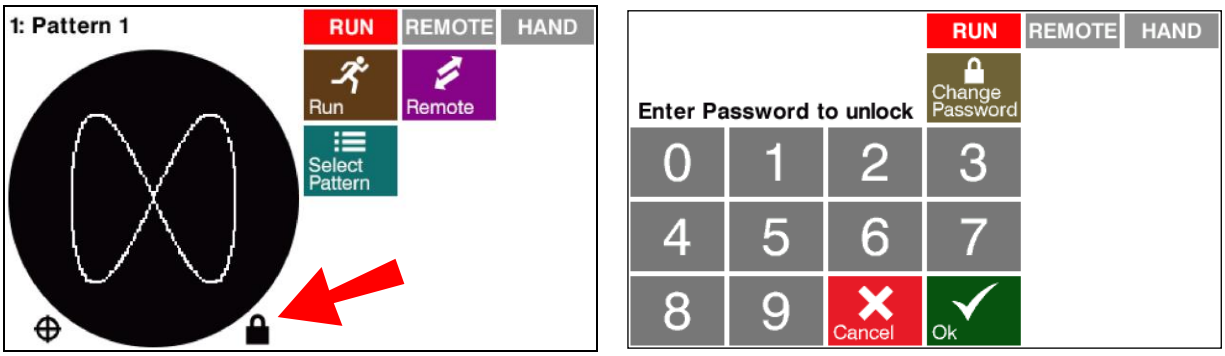


Figure 5-1, Unlocking Screen

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.

5.2 Configure System

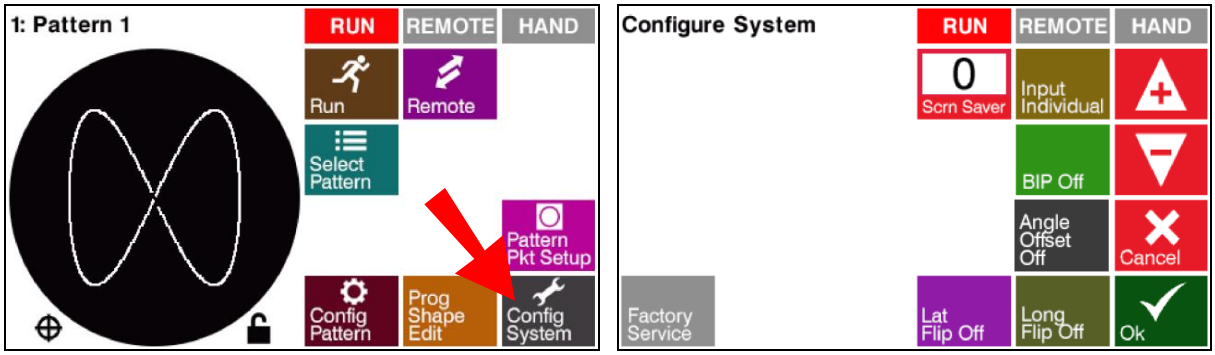


Figure 5-2, Configure System

Screen Saver

The screen saver can be set to 0 to 300 minutes in 5 minutes increments. Zero is off.

Input

Selecting a pattern from a PLC or other device can be done by one of the three following ways using the inputs on the 25 pin connector, see chapter 3 connections:

1. **Input Binary 1=00000 -** up to 32 patterns
2. **Input Binary 1=00001-** up to 32 patterns
3. **Input Individual -** up to 8 patterns directly

See table below for binary code

"Binary 1=00000" Number	"Binary 1=00001" Number	Binary Bit 5 (J2- 8)	Binary Bit 4 (J2- 9)	Binary Bit 3 (J2- 10)	Binary Bit 2 (J2- 11)	Binary Bit 1 (J2- 12)	Binary Bit 0 (J2- 13)
1	1*	0	0	0	0	0	0
2	1*	0	0	0	0	0	1
3	2	0	0	0	0	1	0
4	3	0	0	0	0	1	1
5	4	0	0	0	1	0	0
6	5	0	0	0	1	0	1
7	6	0	0	0	1	1	0
8	7	0	0	0	1	1	1
9	8	0	0	1	0	0	0
10	9	0	0	1	0	0	1
11	10	0	0	1	0	1	0
12	11	0	0	1	0	1	1
13	12	0	0	1	1	0	0
14	13	0	0	1	1	0	1
15	14	0	0	1	1	1	0
16	15	0	0	1	1	1	1
17	16	0	1	0	0	0	0
18	17	0	1	0	0	0	1
19	18	0	1	0	0	1	0

20	19	0	1	0	0	1	1
21	20	0	1	0	1	0	0
22	21	0	1	0	1	0	1
23	22	0	1	0	1	1	0
24	23	0	1	0	1	1	1
25	24	0	1	1	0	0	0
26	25	0	1	1	0	0	1
27	26	0	1	1	0	1	0
28	27	0	1	1	0	1	1
29	28	0	1	1	1	0	0
30	29	0	1	1	1	0	1
31	30	0	1	1	1	1	0
32	31	0	1	1	1	1	1
-	32	1	0	0	0	0	0

1 = CLOSED, 0 = OPEN

* Note in “Binary 1=00001” mode, 00001 and 00000 both equal one.

Beam in Pocket (BIP)

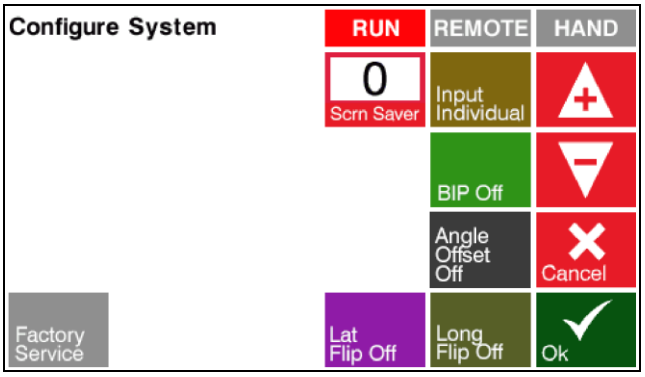


Figure 5-3, Beam in Pocket Setup

Beam in pocket is used for some non-Telemark e-beam sources that require lateral or longitudinal signal that the beam is in the pocket.

The output BIP contacts close when the current on the BIP axis coil is greater than + or - 500 mA. See chapter 3 for the 25 pin connector connections for the following three modes:

1. **BIP Off** – BIP relay not activated (Telemark E-beam Sources)
2. **BIP Lat** – BIP relay activated when current on lateral axis is greater than + or - 500 mA.
3. **BIP Long** – BIP relay activated when current on longitudinal axis is greater than + or - 500 mA.

Angle Offset

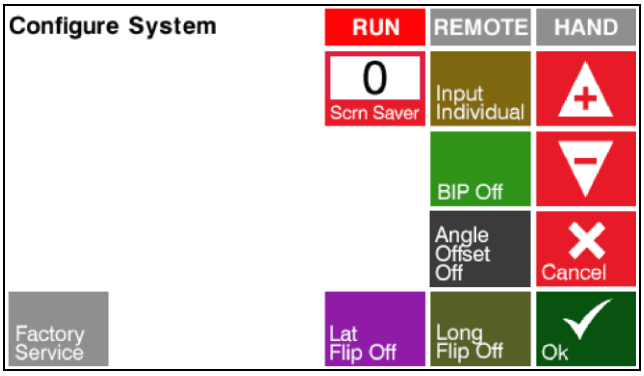


Figure 5-4, Angle Offset Setup

Beam in pocket is used for some non-Telemark e-beam sources that require a +/-45 degree rotation of the output lateral or longitudinal signals to the source.

1. **Angle Offset Off** – normal operation (Telemark E-beam Sources)
2. **+45 degree Angle Offset** – Output rotated clock wise 45 degrees.
3. **-45 degree Angle Offset** – Output rotated counter clock wise 45 degrees.

Lat/Long Flip

The + and - direction of latitude and longitude output can be changed by pressing the **Lat Flip On/Off** and/or **Long Flip On/Off** button. This is useful to get the beam movement to match the standard Lat/Long directions.

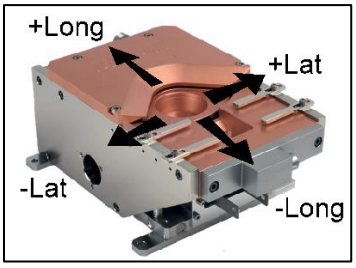


Figure 5-5, Lat/Long Flip Setup

Factory Service

Factory Service is for factory use only.

5.3 Pattern Pocket Setup

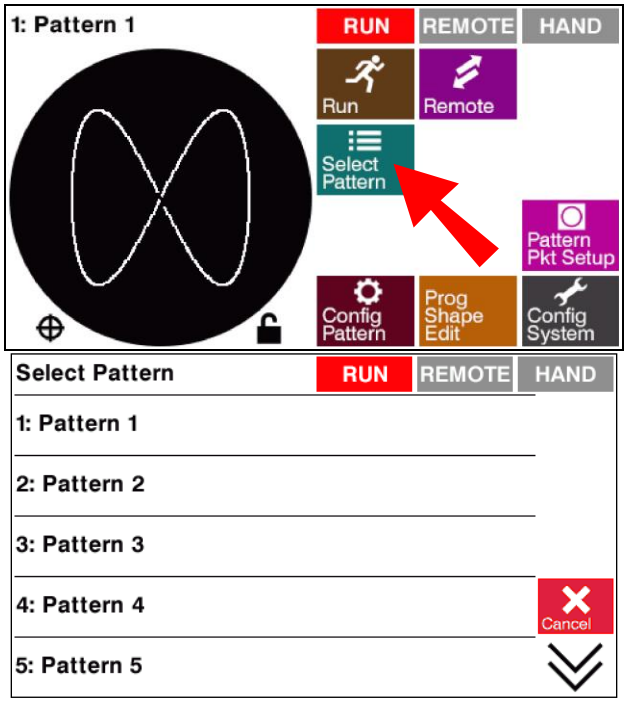


Figure 5-6, Select Pattern

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

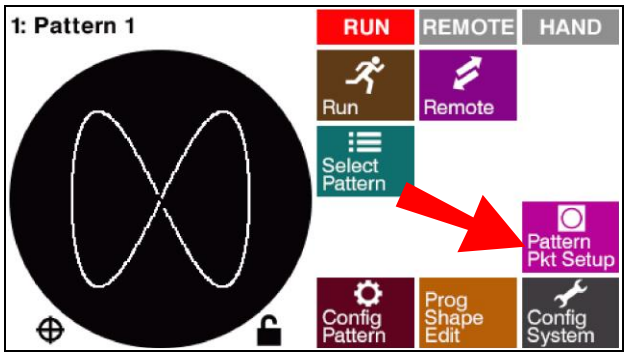


Figure 5-7, Select Pattern Pocket Setup

Select the **Pattern Pocket Setup**

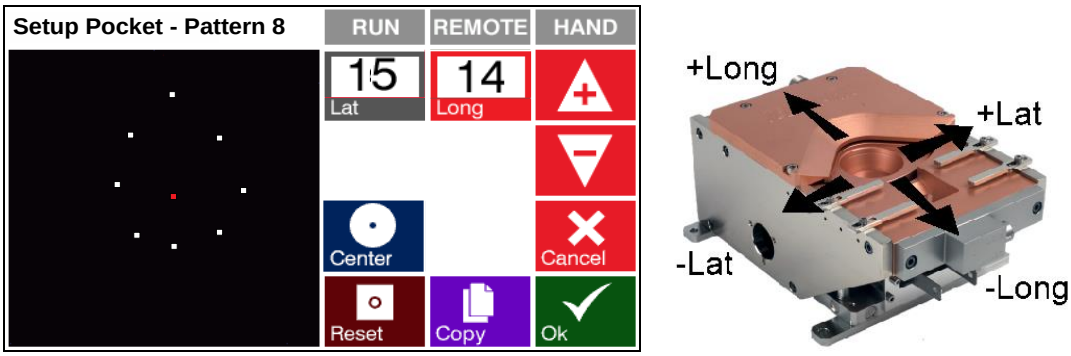


Figure 5-8, Setting the Pocket Center

First set the pocket center point. 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 or touchscreen to control the latitudinal/ longitudinal position. Moving the center point moves all 9 points.

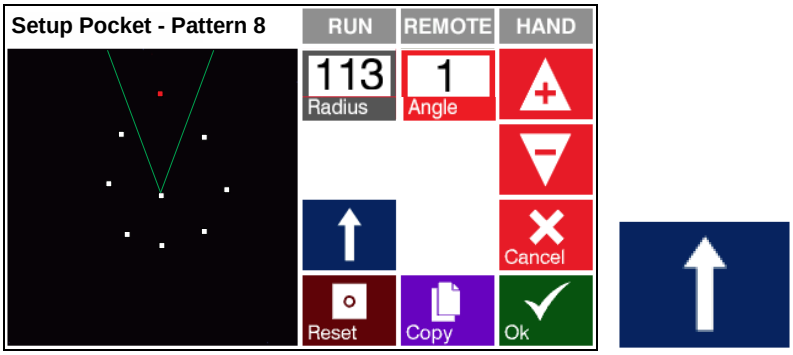


Figure 5-9, Setting Pocket Limits

Next set the limits of the pocket with the 8 limit points. The limit points can be selected by pressing the blue arrow button to cycle around the 8 directions. Each time you press the blue direction arrow the sweep will switch to the next setup point. Two green lines are drawn to show the available area. First adjust the distance from center with the radius value. If you need to make a rotational adjustment use the angle adjustment to move +/-22 degrees. When you are satisfied with all five points then push the **Ok** button (Press Cancel to not save changes to pocket setup).

Once the center and limits have been set it is a good idea to make a note of the settings. The **Reset** button will reset all values of the current pocket setup to their minimums. There is a confirmation screen to prevent accidental resetting. The black box is the usable area that defines the maximum output of 1.6 or 3.0 amps (depending on model).

5.4 Copy Pocket Setup

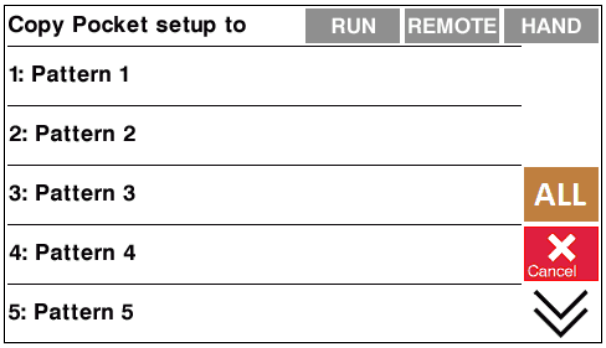


Figure 5-10, Copy Pocket Setup

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

5.5 Configure Pattern

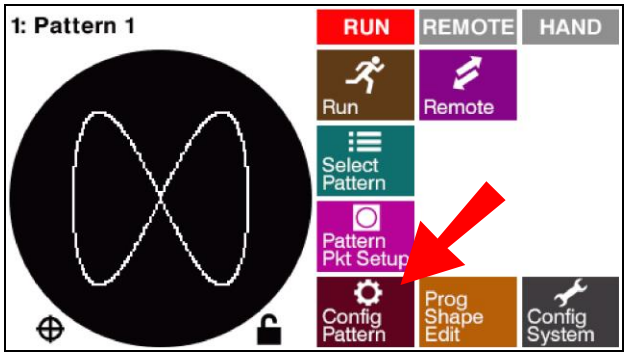


Figure 5-11, Select Configure Pattern

Press the **Config Pattern** (Configure) button.

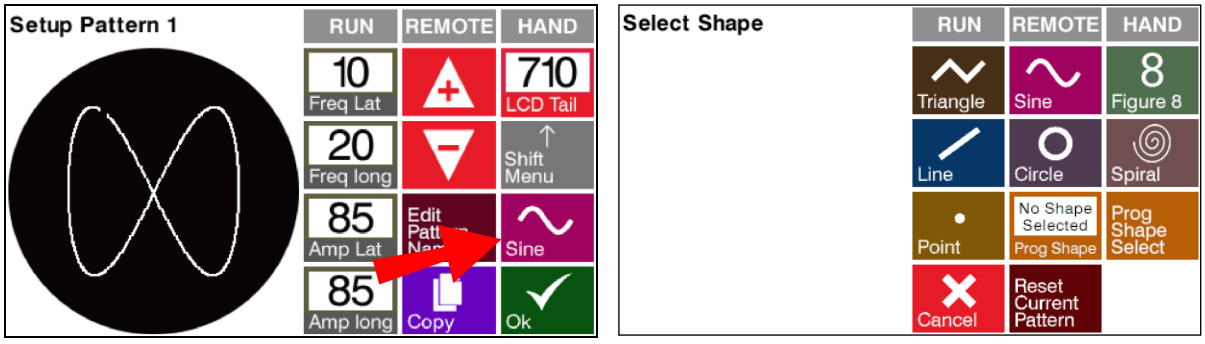


Figure 5-12, Select Shape

First, select the shape type**, Triangle, Sine, Line, Figure 8, Line, Circle, Spiral, Point or Programmable Shape** by touching the desired Shape button.

Each pattern type stores its setting separately from the other shape types. The **Reset Current Pattern** button will reset the current pattern settings for all shapes to factory defaults.

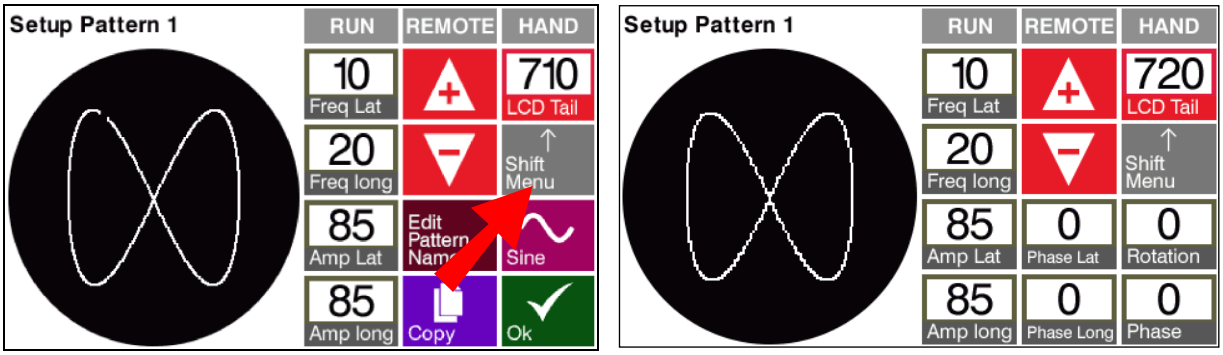


Figure 5-13, Select Shift Menu

Press the **Shift Menu** button to access the latitude & longitude amplitude, latitude & longitude phase and rotation and phase. Pressing again will return to first screen.

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 0.1Hz to 80Hz and Collapse and Rotate frequencies are adjustable from -5 to 5Hz.

5.6 Display Tail Length

The pattern on the LCD screen maybe difficult to see depending on the Shape, Frequency, and Amplitude of the pattern. Adjusting the **LCD Tail** Length can improve the visibility of the pattern. Changing the LCD Tail length (10-1000) makes the display of the pattern more or less visible. Note: the LCD Tail length has no effect on the actual output to the e-beam source.

5.7 Profile

Patterns Line, Figure 8, Spiral or Programmable Shape can have a Profile setting, -10.0 to 10.0. Positive values will spend more time on the edge of the pattern, negative values will spend more time at the center of the pattern. Some materials and patterns can benefit from power profiling by creating a more constant beam energy density as the beam sweeps across the area of the pocket. The heat maps below show the dwell time distortion of the pattern. Brighter colors indicate more time spent. A positive profile is useful for the beam to spend more time away from the center for a more even melt. A profile setting with a negative profile number over -1 is only useful for patterns that avoid the center.

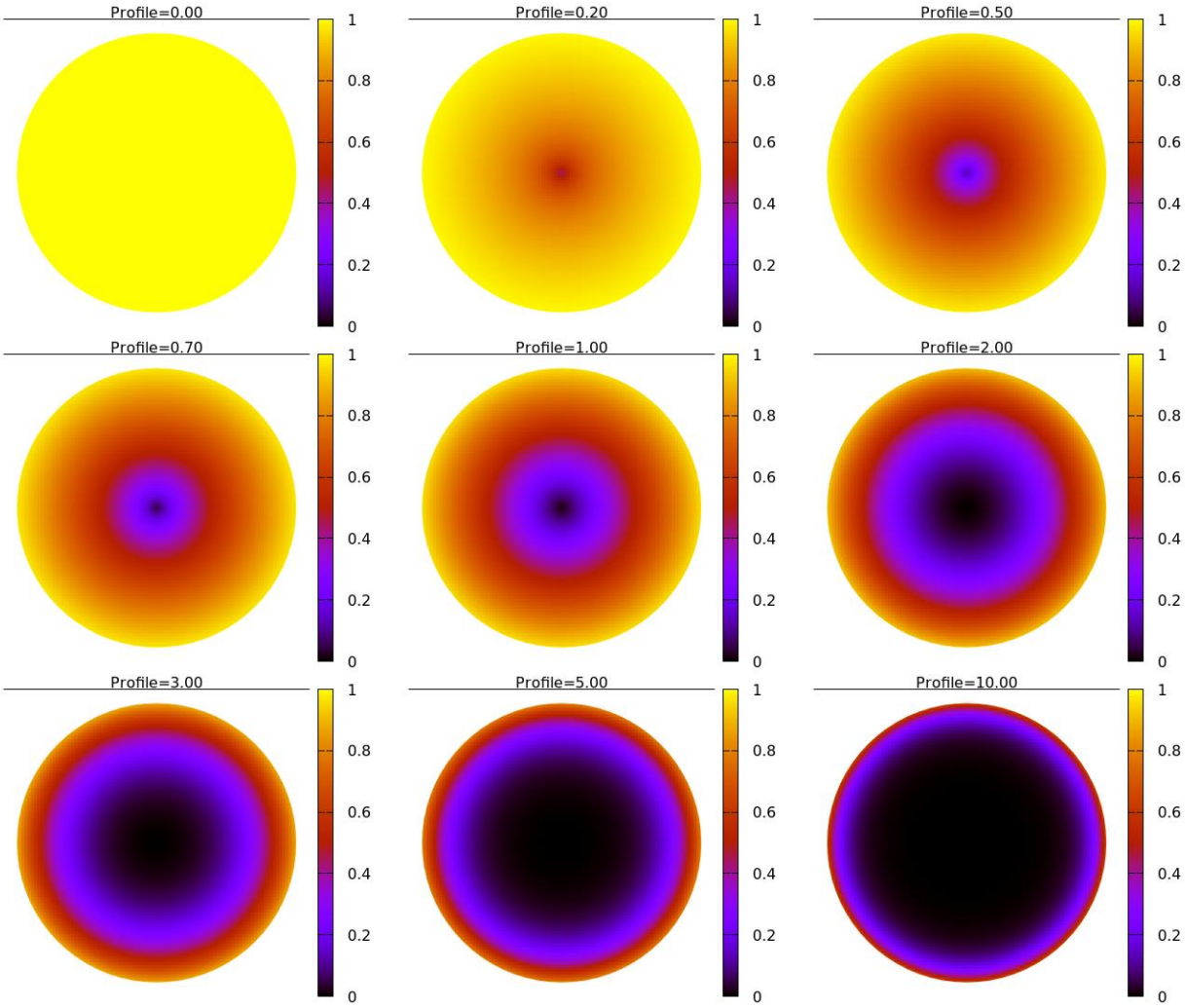


Figure 5-14, Positive Profile Representations

Figure 5-14 shows the larger the profile number the less time the beam spends in the center. Negative profile numbers cause the inverse to happen.

5.8 Pattern Configuration Setup

Triangle

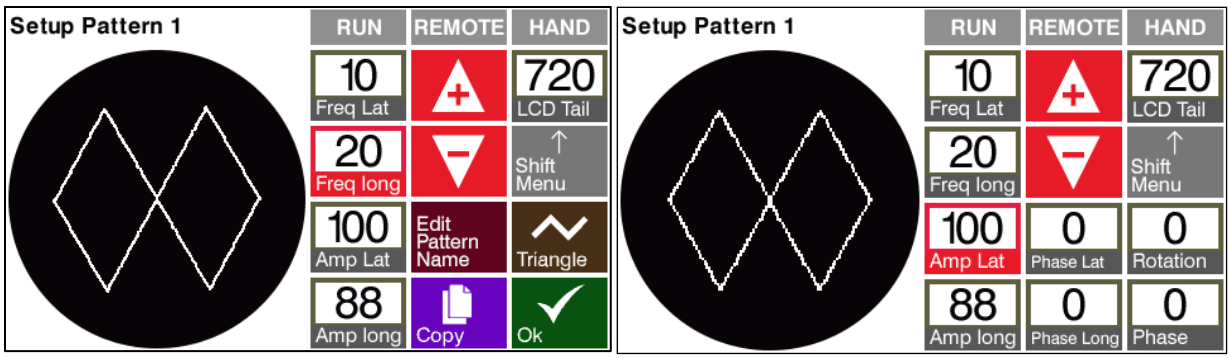


Figure 5-15, Setup Pattern, Triangle

Freq Lat – Frequency Latitudinal 0.1Hz to 80Hz

Freq Long – Frequency Longitudinal, 0.1Hz to 80Hz

Amp Lat – Amplitude Latitudinal, 20-100% of configured maximum pocket

Amp Long - Amplitude Longitudinal, 20-100% of configured maximum pocket

LDC Tail – Display of the history of the pattern, 10 to 1000

Shift Menu

Phase Lat – Relative phase shift of the latitudinal pattern, -359 degrees to 359 degrees

Phase Long – Relative phase shift of the longitudinal pattern, -359 degrees to 359 degrees

Rotation – Rotation speed of the complete pattern, -20Hz to +20Hz, positive values for CCW rotation

Phase – Relative phase rotation of the complete pattern, -359 degrees to 359 degrees

Sine

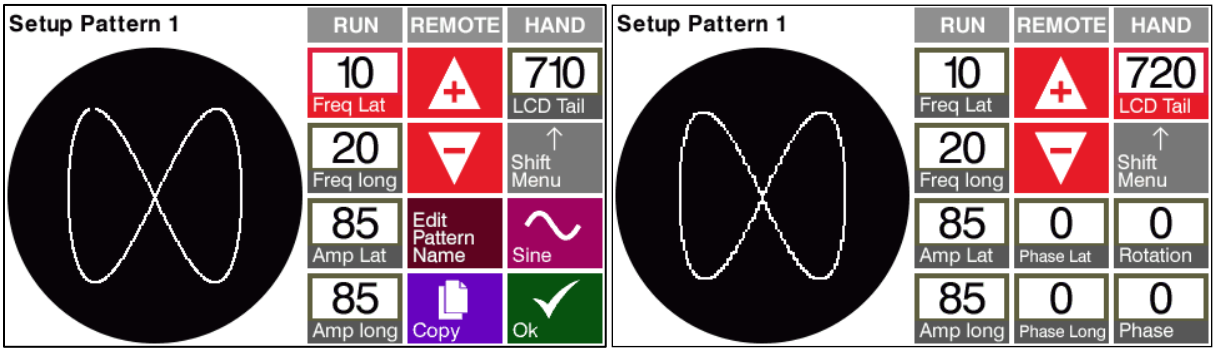


Figure 5-16, Setup Pattern, Sine

Freq Lat – Frequency Latitudinal 0.1Hz to 80Hz

Freq Long – Frequency Longitudinal, 0.1Hz to 80Hz

Amp Lat – Amplitude Latitudinal, 20-100% of configured maximum pocket

Amp Long - Amplitude Longitudinal, 20-100% of configured maximum pocket

LDC Tail – Display of the history of the pattern, 10 to 1000

Shift Menu

Phase Lat – Relative phase shift of the latitudinal pattern, -359 degrees to 359 degrees

Phase Long – Relative phase shift of the longitudinal pattern, -359 degrees to 359 degrees

Rotation – Rotation speed of the complete pattern, -20Hz to +20Hz, positive values for CCW rotation

Phase – Relative phase rotation of the complete pattern, -359 degrees to 359 degrees

Figure 8

Differs from the Sin by a fixed sine pattern with 2:1 amplitude and frequency ratio. The Figure 8 pattern amplitude can reach the outer limits of the pocket boundary.

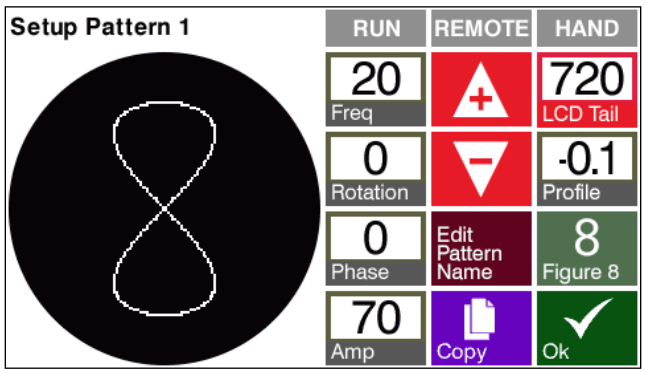


Figure 5-17, Setup Pattern, Figure 8

Freq – Frequency 0.1Hz to 80Hz

Rotation – Rotation speed of the complete pattern, -20Hz to +20Hz, positive values for CCW rotation.

Phase – Relative phase rotation of the complete pattern line (only visible when the rotation is 0), -359 degrees to 359 degrees

Amp – Amplitude, 20-100% of configured maximum pocket

LDC Tail – Display of the history of the pattern, 10 to 1000

Profile - -10.0 to 10.0

Line

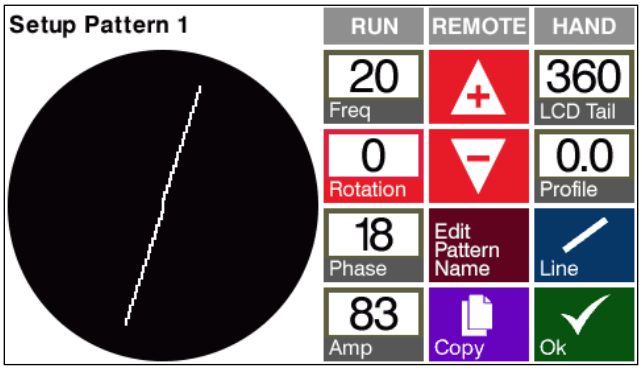


Figure 5-18, Setup Pattern, Line

Freq – Frequency, 0.1Hz to 80Hz

Rotation – Rotation speed of the complete pattern, -20Hz to +20Hz, positive values for CCW rotation

Phase – Controls the angle of the line (only visible when the rotation is 0), -359 degrees to 359 degrees

Amp – Amplitude, 20-100% of configured maximum pocket

LDC Tail – Display of the history of the pattern, 10 to 1000

Profile - -10.0 to 10.0

Circle

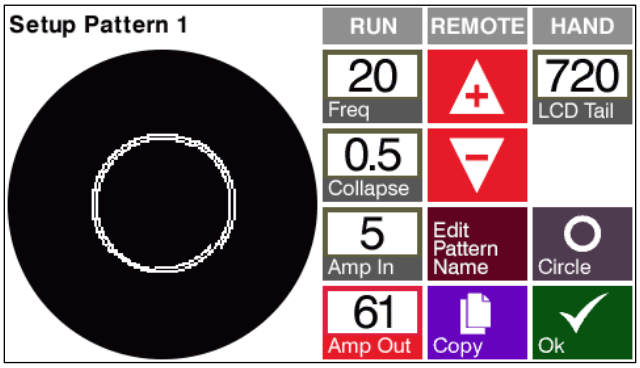


Figure 5-19, Setup Pattern, Circle

Freq – Frequency, 0.1Hz to 80Hz

Collapse - Collapse, 0 to 5Hz. (if collapse is 0 then the Amp In is not visible)

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

Amp Out – Amplitude Out, 10-100% of configured maximum pocket

LDC Tail – Display of the history of the pattern, 10 to 1000

Spiral

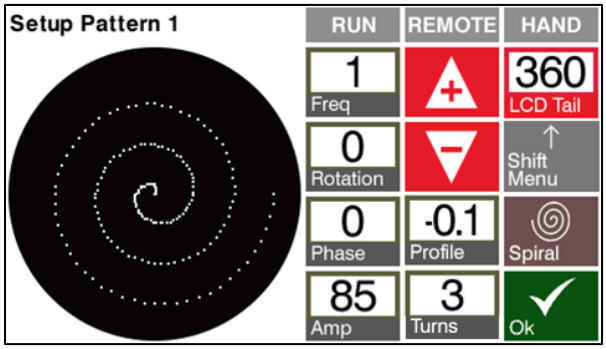


Figure 5-20, Setup Pattern, Spiral

Freq – Frequency, 0.1Hz to 80Hz

Rotation – Rotation speed of the complete pattern, -20Hz to +20Hz, positive values for CCW rotation

Phase – Controls the angle of the line (only visible when the rotation is 0), -359 degrees to 359 degrees

Amp – Amplitude, 20-100% of configured maximum pocket

LDC Tail – Display of the history of the pattern, 10 to 1000

Profile – Range -10.0 to 10.0

Turns – Number of spiral turns 1 to 9

Point

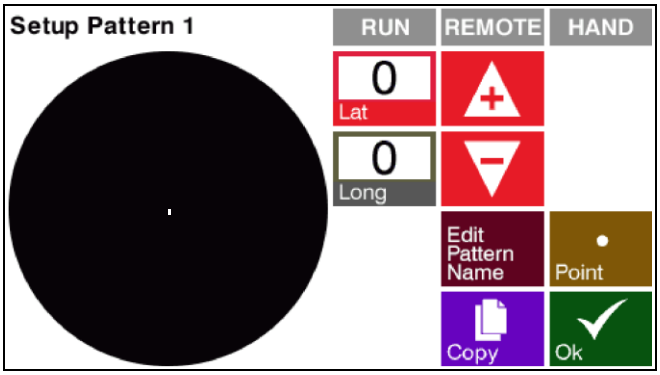


Figure 5-21, Setup Pattern, Point

The point pattern is a fixed point and location is a special case. The lat and long numbers displayed are the absolute location numbers. A maximum of 97% of configured pocket maximum in any direction is designed to prevent users from damaging the ebeam source pocket.

Lat – Latitudinal position, -511 to +511 (-97% to +97% of configured pocket maximum)

Long – Longitudinal position, -511 to +511 (-97% to +97% of configured pocket maximum)

Programmable Shape

If the **Prog Shape** button says “No Shape Selected” press the **Select Prog Shape** button to select a shape from the “Select Prog Shape” list.

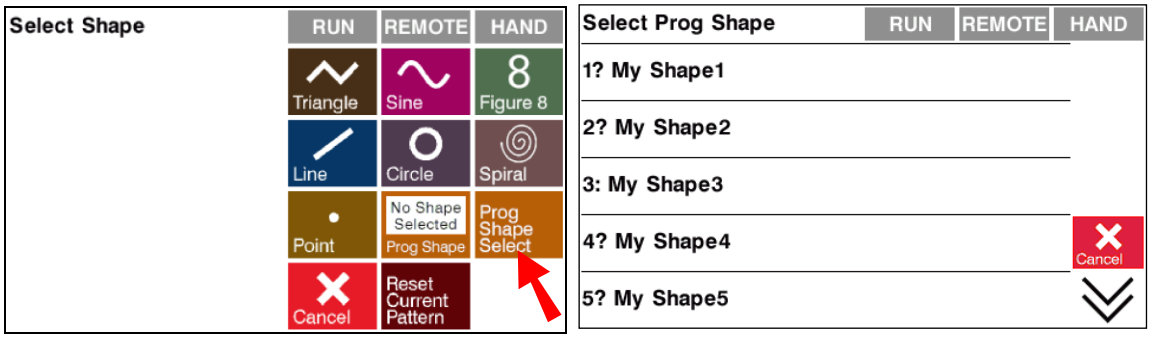


Figure 5-22, Select Shape

“?” next to the shape number means that the shape is not defined and not selectable.

Once a shape is selected and there is a number in the **Prog Shape** button then the **Prog Shape** button can be pressed.

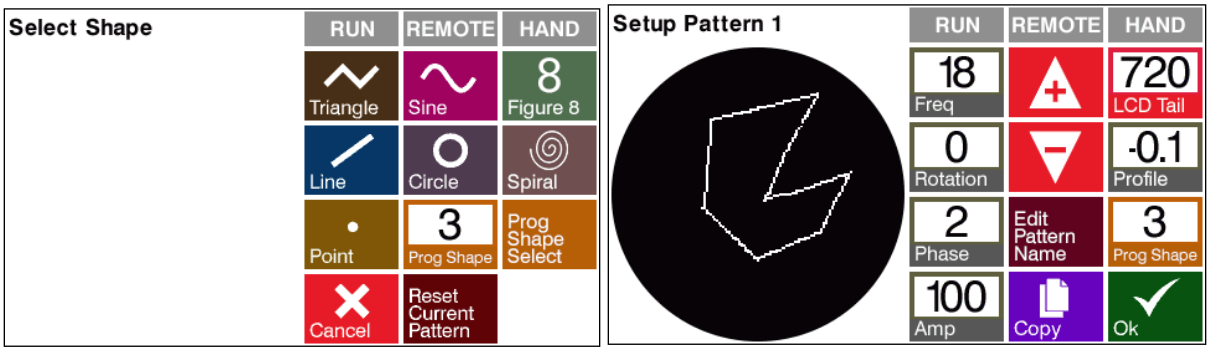


Figure 5-23, Setup Pattern

Freq – Frequency, 0.1Hz to 80Hz

Rotation – Rotation speed of the complete pattern, positive values for CCW rotation, -20 to 20Hz.

Phase – Controls the angle of the line (only visible when the rotation is 0), -359 degrees to 359 degrees

Amp – Amplitude, 25-100% of configured maximum pocket

LDC Tail – Display of the history of the pattern, 10 to 1000

Profile - -10.0 to 10.0

5.9 Making Programmable Shapes

To make a programmable shape press **Prog Shape Edit.** Select a shape to edit **Prog Shape Select**

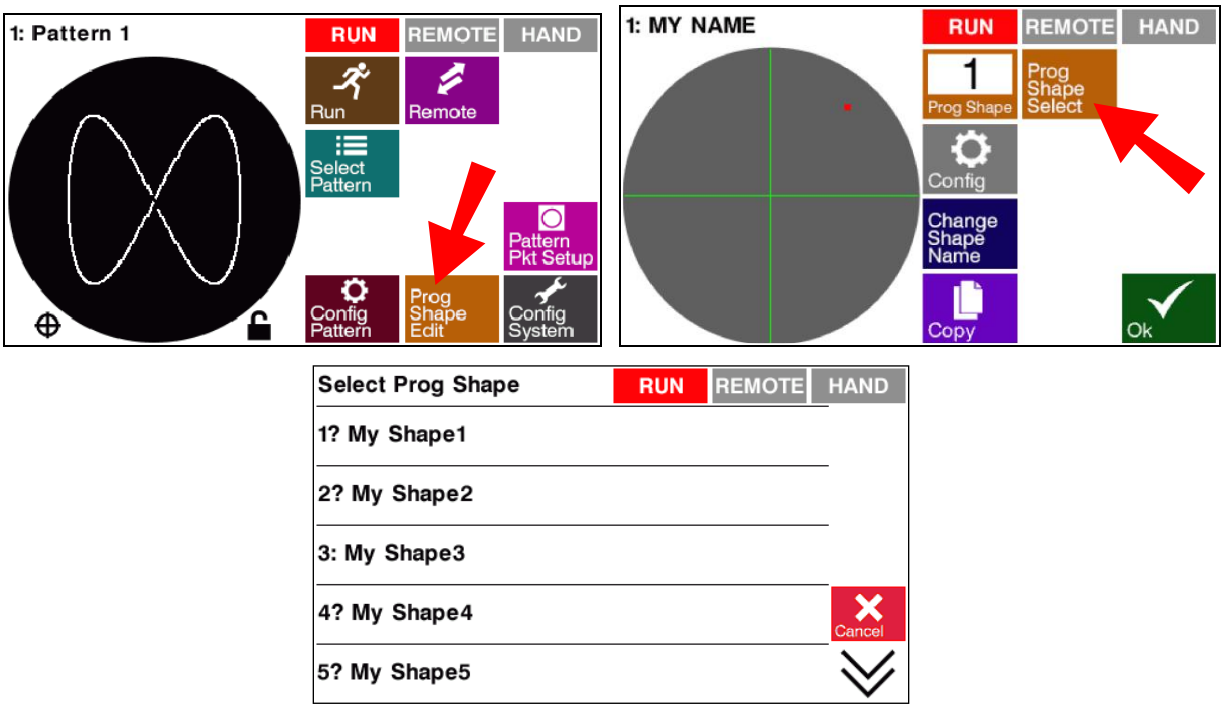


Figure 5-24, Programmable Shape Select

"?" next to the shape number means that the shape has not been defined yet.

Once a shape is selected and there is a number in the **Prog Shape** button then it can be edited by pressing Config. In the Shape edit mode the circle is gray with a green crosshair to help with designing the shape.

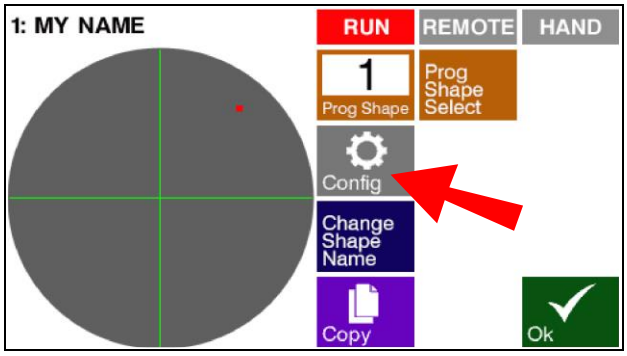


Figure 5-25, Shape Configure

Use **Change Shape Name** to change the name of the shape.

There are two ways to add programmable steps.

1. Press on the round black pocket representation with your finger or a blunt stylus the location where you want to add a step. Fine tune the location by changing the Lat and Long values use + and –.

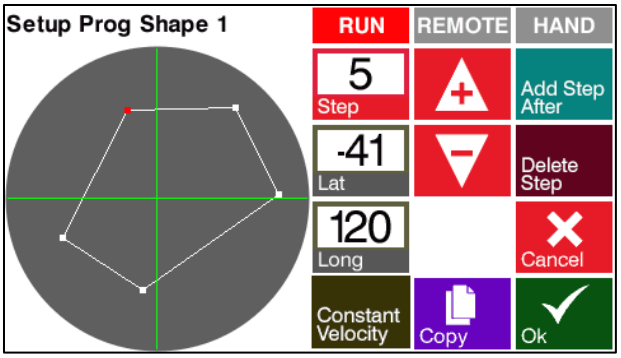


Figure 5-26, Shape Edit

2. Press **Add Step After,** this will add a step at Lat 0, Long 0. Use + and – to change Lat and Long location. When **Add Step After** pressed again it will add another step after the current step at the same location. A maximum of 360 points can be programmed.

Steps can be edited by changing the step number and then changing the Lat and Long values.

Use **Delete Step** to delete the current step.

Use **Copy** to copy shape to another numbered shape.

Constant Velocity/Constant Dwell

Constant Velocity – In this mode the sweep moves the beam at a constant velocity irrespective of how many actual points the user shape is. Note Profile is only available with Constant Velocity.

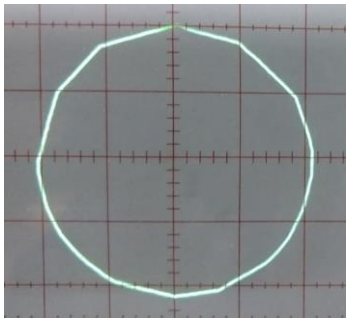


Figure 5-27, Constant Velocity Shown on Oscilloscope

Constant Dwell – In this mode the sweep will dwell on each point equally. It is recommended that more points are used to smooth out that sweep to reduce the occurrence of hot spots. Figure 5-28 shows the same pattern as figure 5-27. This pattern has fewer points on the top and this can be seen in figure 5-28.

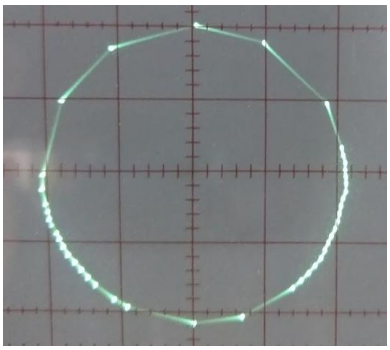


Figure 5-28, Constant Dwell Shown on Oscilloscope

6 OPERATION

6.1 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.

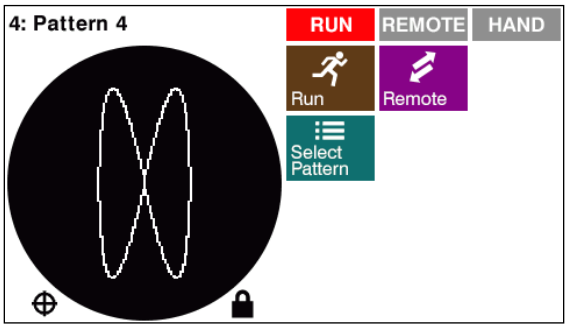


Figure 6-1, Touchscreen Display

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.

6.2 Pattern Selection

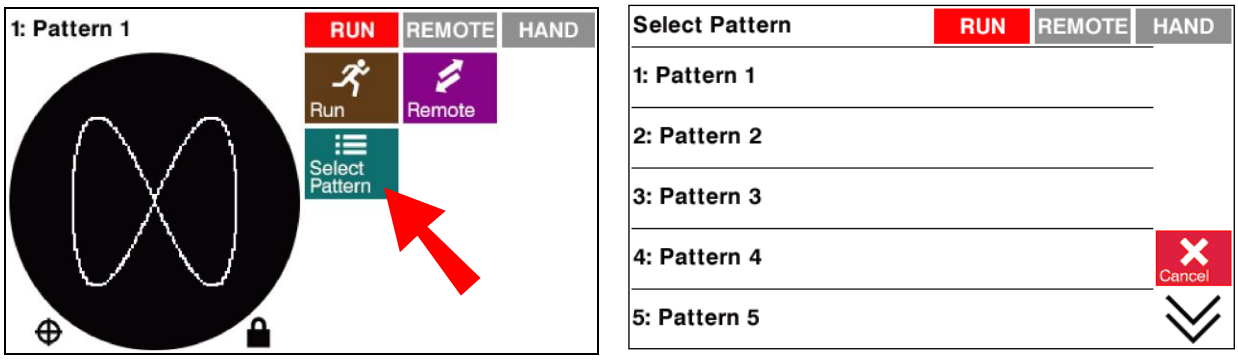


Figure 6-2, Pattern Selection

Press the **Select Pattern** button to select a pattern.

6.3 Move Pattern

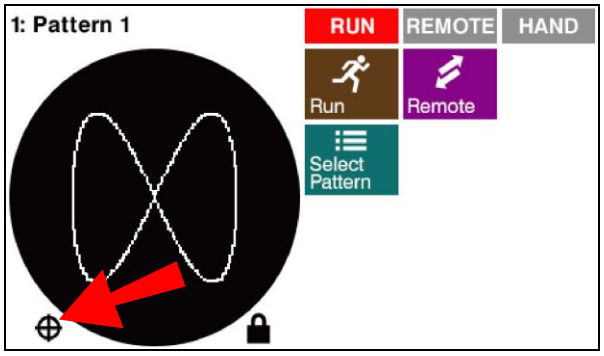


Figure 6-3, Pattern Shift

Patterns can be shifted in the pocket by pressing the Move Pattern icon

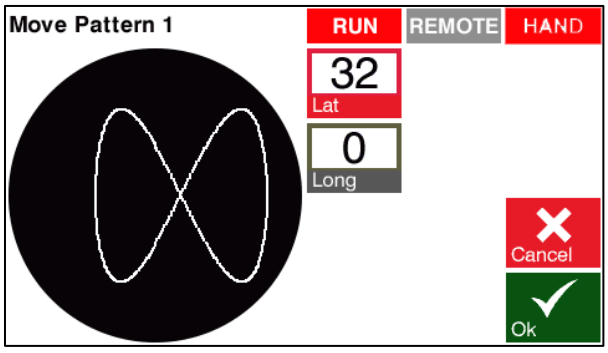


Figure 6-4, Move Pattern, Joystick connected

If the joystick handheld is plugged in Latitude and longitude can be adjusted directly by moving the joystick. Pressing ok will save the location. Moving the joystick when not in move mode moving the joystick will have no effect.

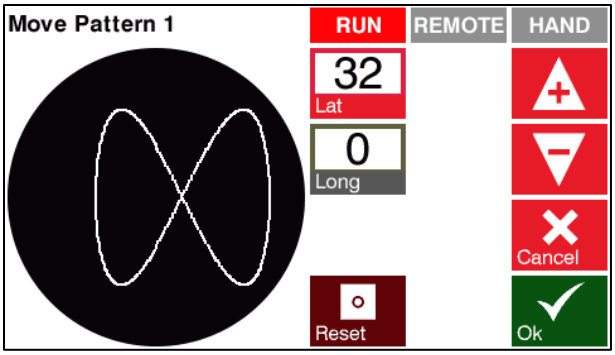


Figure 6-5, Move Pattern, Joystick not Connected

If the handheld joystick is not plug in Latitude and longitude can be adjusted with the + and – arrows on the touchscreen. The pattern can only be moved to the edge of the pocket (the smaller the pattern the more it can move). In **Locked** mode the new location will be stored until the Digital Sweep power is turned off. In **Unlocked** mode the new location will be stored in permanent memory till it is reset or changed. The Reset button will reset Latitude and longitude to 0. If the pattern is changed in configuration mode and the shape exceeds the pocket limit the pattern shift will be reset to 0. Also any changes to the pocket limit will reset the pattern shift to 0.

6.4 Run On/Off

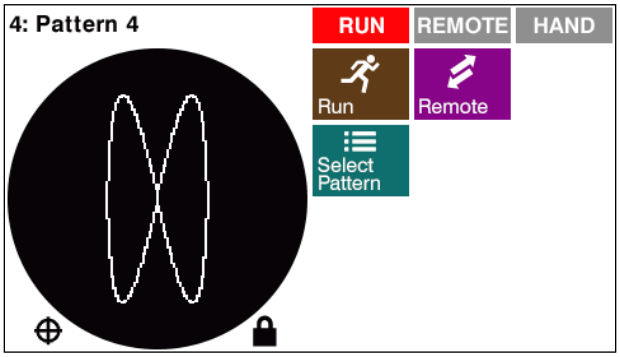


Figure 6-6, Run On/Off

When in **Run** is in the on mode the pattern that has been selected the Select Pattern menu is output to the e-beam source.

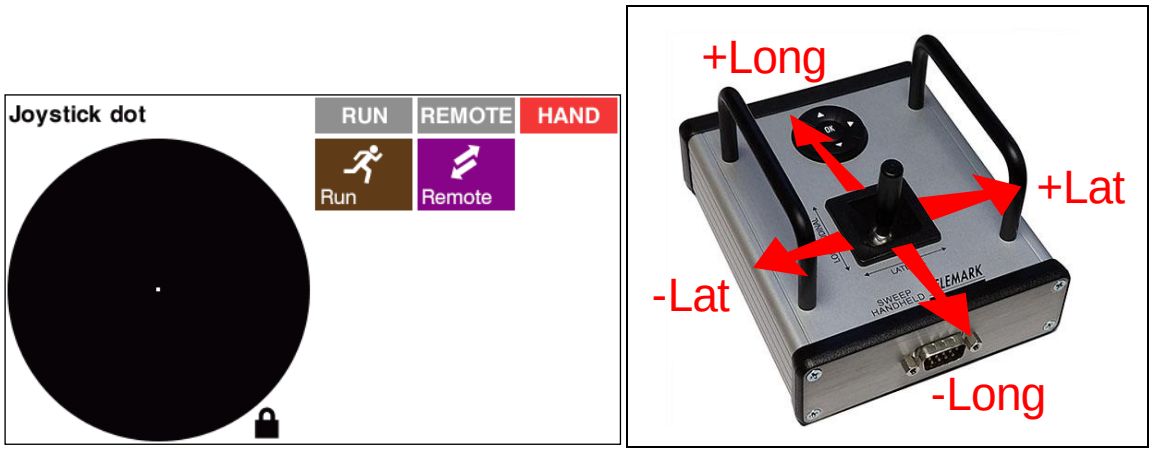


Figure 6-7, Run Off, Joystick

When in **Run** is in the 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.

6.5 Remote On/Off

See chapter 3.4.5 for information about the optional Force remote input.

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 and lights up the Remote on the LCD display on the front panel.

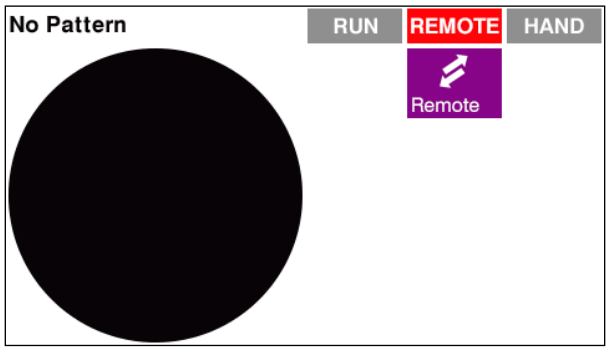


Figure 6-8, Remote, No Pattern

If no pattern is selected by the remote then **No Pattern Selected** is shown and there is no output to the coils

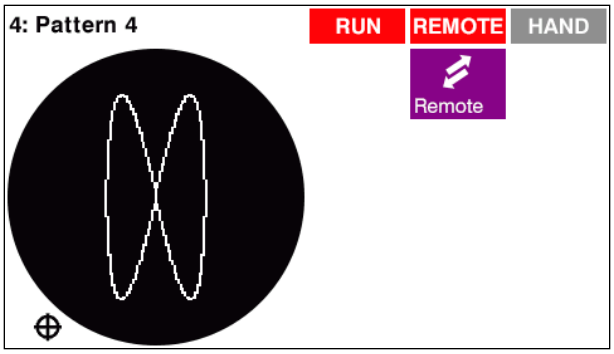


Figure 6-9, Remote, Pattern Selected

If a valid pattern is selected by the remote (contact closed, see chapter 3 for input description) then that pattern and pattern number will be displayed, the Run indication will light up and the pattern is output to the e-beam source coils.

7 SERIAL INTERFACE

7.1 GENERAL

The Programmable Sweep comes standard with an RS-232 serial interface. The serial computer interface of the Telemark Programmable Sweep permits remote control using a personal computer or process controller.

7.2 RS-232 SERIAL INTERFACE

The RS-232 serial interface of the Programmable Sweep allows one Programmable Sweep to be connected to any other device with an RS-232 serial interface. A D9P connector is provided on the rear panel for permanent connection to the host computer. See figure 7-1.

The Programmable Sweep's RS-232 port is automatically set up to operate with the following specifications:

BAUD RATE = 9600

8 DATA BITS

NO PARITY

1 STOP BIT

NO FLOW CONTROL

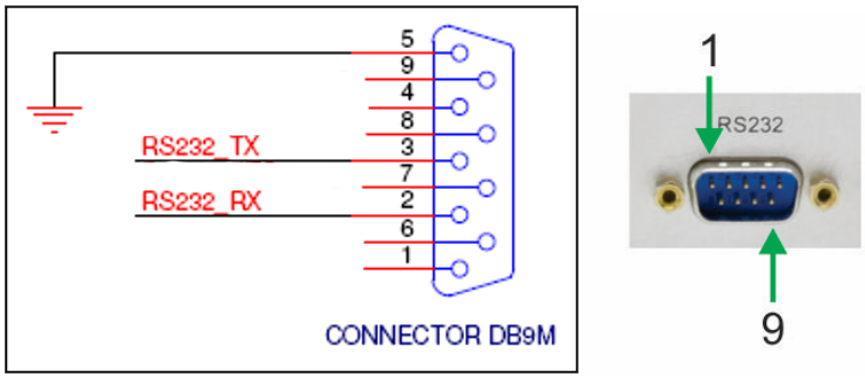


Figure 7-1, RS-232 Connection

7.3 ASCII PROTOCOL

All communications between the computer and the Programmable Sweep are in ASCII code. All numbers are transmitted as numbers in ASCII code.

7.4 LIST OF COMMANDS

ASCII code Decimal Number	ASCII code	Command
33	!	Ping
63	?	Status
97	a	Alarm Status
118	v	Software Version
82	R	Remote On
76	L	Remote Off
80	P	Set Current Pattern In Use
112	p	Read Current Pattern In Use Number
84	T	Write Pattern's Shape Type
116	t	Read Pattern's Shape Type
85	U	Write Parameters of Pattern
117	u	Read Parameters of Pattern
70	F	Write Parameters of a Pattern's Shape
102	f	Read Parameters of a Pattern's Shape

83	S	Write Parameters for User Shape
115	s	Read Parameters for User Shape
78	N	Write Pattern Name
110	n	Read Pattern Name
66	B	Write shape name
98	b	Read shape name
88	X	Set Pattern Offset
120	x	Read Pattern Offset

7.5 FORMAT

When sending commands to the Programmable Sweep, send “ACK” at the end of the message string. The Programmable Sweep returns an “NAK” at the end of a response if the command failed and an “ACK” if the command succeeded.

ASCII code Decimal Number	**ASCII code**	**Command**
6	**“ACK”**	Command Acknowledgment (Control F on PC keyboards)
21	**“NAK"**	Negative Command Acknowledgement

Send to Programmable Sweep format:

“Message string” ACK

Reply from Programmable Sweep format:

“Message string” ACK (success)

Or

“Error code” NAK (failure)

7.6 SOFTWARE FLOW CONTROL

Optional Xon(“transmit off”)/Xoff(“transmit off”) flow control is a method of software flow control.

When you want the sweep to stop transmitting, you send the sweep Xoff chr(d19). The sweep will resume transmitting when it receives Xon chr(d17). The five second command receive timeout stays in effect.

7.7 ERROR CODES

When the Programmable Sweep fails to process or preform a command, it sends one of the following codes error code followed by a “NAK” (Negative Command Acknowledgement).

ASCII code Decimal Number	ASCII code	Description
65	**A**	Illegal command
66	**B**	Illegal Value/argument
68	**D**	Illegal format. Parameter not found. Too many parameters.
69	**E**	No data
70	**F**	Cannot proceed
71	**G**	Cannot proceed due to alarm condition
84	**T**	Receive timeout. No ACK chr(d06) found

7.8 COMMAND FORMAT

“CommandCharacter”, parameter1, paramter2 … chr(d06)

“CommandCharacter” is a single ASCII printable character followed by possible command parameter values/strings. The first parameter does not necessarily need any leading white space (as indicated by commas), but any succeeding parameters do.

The valid range for each parameter is shown within curly brackets: n{min…max}. If the parameter value is out of range a “B” + NAK response is returned.

Commands that return values, return the command character followed by each value preceded by a space delimiter. Chr(d06) is the final character.

Note: read commands work at anytime but write commands only work if the programmable sweep is in “COM Remote” mode. This mode is activated by the command “Remote On” (R). See below for the “Remote On” command.

7.9 COMMANDS

Ping (!)

No functional action other than to acknowledge.

Format: !<ACK>

Response: !<ACK>

Status (?)

Use to find system status.

Format: ?<ACK>

Response: "?" + n + s1 + s2 + s3 + s4 + s5 + x' + y' + <ACK>

n{0…32}	Current pattern. Zero means no pattern is selected.
s1{0/1}	REMOTE status. '0' = not active, '1' = active.
s2{0/1}	RUN status.
s3{0/1}	READY status.
s4{0/1}	BIP status.
s5{0/1}	ALARM status. '0' = no alarm, '1' = at least one alarm is active.
x'	X offset scaled back to virtual joystick space.
y'	Y offset scaled back to virtual joystick space.

Alarm Status (a)

Use to find detail of Alarm status.

Format: a<ACK>

Response: "a" + n + <ACK>

n{0…1023}	Alarm status.
Bit9	1=Software version not compatible with PCB.
Bit8	1=WAVE SPAN EXCEEDED – user shape. Forces POINT shape output.
Bit7	1=EEPROM WRITE FAILURE
Bit6	1=EEPROM NOACK
Bit5	1=Y COIL OPEN/SHORT
Bit4	1=Y -15V FAILURE
Bit3	1=Y +15V FAILURE
Bit2	1=X COIL OPEN/SHORT

Bit1 1=X -15V FAILURE

Bit0 1=X +15V FAILURE

Software Version (v)

Transmit software version.

Format: v<ACK>

Response: “v” + chr(d34) + str + chr(d34) + n1 + n2 + n3 + chr(d06)

str	Product name
n1{0…255}	Major version.
n2{0…255}	Minor version.
n3{0…65535}	Julian Build Date. YYDDD.

Remote On (R)

Force remote on. If ‘n’ is specified that pattern will be selected. If ‘n’ equals zero, no pattern will be selected.

Format: “R”, n{0…32}<ACK>

Example: to set to remote and pattern 3 send: R 3<ACK>

If standard remote is active the response will be “F” + NACK, else;

The response will be: “R” + n + <ACK>

Remote Off (L)

Force remote off.

Format: L<ACK>

The response will be: “L” + <ACK>

Set Current Pattern In Use(P)

Format: “P”, n{0…32}

Example: to set to pattern 3 if already in remote mode send: P 3<ACK>

Select pattern = ‘n’. If ‘n’ equals zero, no pattern will be selected. **Force remote on must already be enabled otherwise the response will be “F” + NACK**, else;

The response will be: “P” + n + <ACK>

Read Current Pattern In Use Number (p)

Format: p<ACK>

Transmit currently selected pattern.

The response will be: “p” + n + <ACK>

n{0…32} Currently selected pattern. Zero means no pattern is selected.

Write Pattern’s Shape Type (T)

Format: T<ACK>

“T”, n{1…32}, s{‘T’, ‘S’, ‘F’, ‘L’, ‘C’, ‘R’, ‘P’, 1…32}

Example: to set to pattern 3 shape type line send: T 3 L<ACK>

Update (pattern ‘n’) selected shape = ‘s’.

If you update the current remote selection

The response will be: “T” + n + s + <ACK>

Note: If changing current pattern shape it will need to be reselected with command R to take effect.

Read Pattern’s Shape Type (t)

Format: “t”, n{1...32}

Example: to read pattern 3 shape type send: t 3<ACK>

Transmit the selected shape of pattern ‘n’.

The response will be: “t” + n + Shape + <ACK>

n Pattern number.

Shape Selected shape of pattern. See appendix 1.

Write Parameters of Pattern (U)

Format: “U”, n{1...32}, s{‘T’, ‘S’, ‘F’, ‘L’, ‘C’, ‘R’, ‘P’, ‘#’}, p[]

Update the parameters of shape ‘s’ in pattern ‘n’ with the values ‘p[]’. The values should be within parameter bounds; if not, selecting the pattern will force boundary limits on the internally loaded data – the EEPROM values are not altered. p[] = s[1…13] as defined in appendix 2.

The response will be: “U” + n + s + p[]+ <ACK>

Note: Commands “T” and “U” only update the EEPROM data. Each pattern has enough storage capacity for seven standard and one user defined shape. Each Shape (see appendix 1) of a pattern has a distinct set of parameters (see appendix 2).

Read Parameters of Pattern (u)

Format: “u”, n{1...32}, s{‘T’, ‘S’, ‘F’, ‘L’, ‘C’, ‘R’, ‘P’, ‘#’}

Example: to read pattern 3 shape type Line send: u 3 L<ACK>

Download the parameters of pattern ‘n’. If ‘s’ is specified, only the parameters for that shape will be returned, otherwise all shape parameters will be returned.

The response will be: “u” + n + Current Shape + Shape + s[] + <ACK>

n	Pattern number.
Current Shape	Currently selected shape of pattern. See appendix 1.
Shape	Shape is the shape desination for the following shape parameters. See appendix 1.
s[]	The shape parameters if ‘s’ is specified. See appendix 2.
s[T]…s[#]	The shape parameters for all shapes if ‘s’ is not specified. See appendix 2.

Write one Parameter of a Pattern’s Shape (F)

Format: “F”, n{1…32}, s{‘T’, ‘S’, ‘F’, ‘L’, ‘C’, ‘R’, ‘P’, ‘#’}, p{1…13}, v{-32768…+32767}

Example: to write pattern 3 shape type Line Profile frequency to 9.9Hz

send: F 3 L 3 99 <ACK>

Update parameter ‘p’ of shape ‘s’ in pattern ‘n’ with the value ‘v’. The value should be within bounds for the particular shapes’ parameter; if not, selecting the pattern will force boundary limits on the internally loaded data – the EEPROM value is not altered.

Read Parameters of a Pattern’s Shape (f)

Format: “f”, n{1…32}, s{‘T’, ‘S’, ‘F’, ‘L’, ‘C’, ‘R’, ‘P’, ‘#’}, p{1…13}

Transmit value of parameter ‘p’ of shape ‘s’ for pattern ‘n’.

The response will be: “f” + n + s + v + <ACK>

n	Pattern number.
s	Shape. See appendix 1.
p	Parameter index. See appendix 2.
v{-32768…+32767}	Parameter value.

Write Parameters for User Shape (S)

Format: “S”, n{1...32}, chr{‘V’, ‘D’}, [x{-200…+200}, y{-200…+200}]

Upload point parameters for user shape ‘n’. ‘chr’ specifies whether shape is constant Velocity or constant Dwell. [] specifies a point with Lat./Long. coordinates. If any parameter is out-of-bounds, missing, or more that 360 points specified; nothing will be saved to EEPROM and the response will be an appropriate NACK.

Read Parameters for User Shape (s)

Format: “s”, n{1...32}

Download point parameters for user shape ‘n’. If there are no points the response will be: “E” + NACK, otherwise the response will be: “s” + n + chr + [x + y] + <ACK>

n	Shape number.
chr{‘V’, ‘D’}	Shape is constant Velocity or constant Dwell.
x{-200…+200}	Next point Lat. coordinate.
y{-200…+200}	Next point Long. coordinate.

Write Pattern Name (N)

Format: “N”, n{1...32}, str{“string”}

Example: to write pattern 3 name

send: N 3 “mypattern”<ACK>

Write pattern ‘n’ name = ‘str’. The name ‘str’ must be enclosed within double quotes. The valid range of ASCII characters for ‘str’ are SPACE to “~” inclusive. Any more than 128 characters will be truncated. ASCII New Line, chr(d10) is considered a virtual end of name; any characters after will not be displayed on the LCD screen.

Read Pattern Name (n)

Format: “n”, n{1...32}

Read pattern ‘n’ name. If there is no name ‘str’ will be ‘Pattern #’, # == ‘n’.

The response will be: “n” + n + chr(d34) + str + chr(d34) + <ACK>

n	Pattern number.
str	Pattern name.

Write shape name (B)

Format: “B”, n{1...32}, str{“string”}

Example: to write pattern 3 name

send: B 3 “myshape”<ACK>

Write shape ‘n’ name = ‘str’. The name ‘str’ must be enclosed within double quotes. The valid range of ASCII characters for ‘str’ are SPACE to “~” inclusive. Any more than 128 characters will be truncated. ASCII New Line, chr(d10) is considered a virtual end of name; any characters after will not be displayed on the LCD screen.

Read shape name (b)

Format: “b”, n{1...32}

Read shape ‘n’ name.

The response will be: “B” + n + chr(d34) + str + chr(d34) + <ACK>

n Shape number.

str Shape name.

Set Pattern Offset (X)

Format: “X”, x{-500...+500}, y{-500...+500}

Set pattern center offset = virtual ‘x’,’y’. ‘x’ and ‘y’ specify the boundaries of a virtual square emulating the movement of a joystick. This ‘square’ is equivalent to 100% of the pocket setup configuration. This works the same as local MOVE in that a shape will not be allowed to move past the 97% limit. If the ‘x’,’y’ coordinates specify a location outside the limit radius, the shape will be set at the limit radius. If local joystick or shape MOVE is operating, the response will be “F” + NACK, otherwise;

The response will be: “X” + x’ + y’ + <ACK>

x’ X offset scaled back to virtual joystick space.

y’ Y offset scaled back to virtual joystick space.

Read Pattern Offset (x)

Format: “x”

Transmit the pattern center offset.

The response will be: “x” + x’ + y’ + <ACK>

x’ X offset scaled back to virtual joystick space.

y’ Y offset scaled back to virtual joystick space.

APPENDIX 1

Shape specification/meaning:

Shape. chr{‘T’, ‘S’, ‘F’, ‘L’, ‘C’, ‘R’, ‘P’} or {1…32}

Letter	Type
T	Triangle
S	Sine
F	Figure8
L	Line
C	Circle
R	Spiral
P	Point
1 to 32	Custom Shape

chr{'#'} specifies/indicates custom user shape – not the custom number.

APPENDIX 2

s[] parameter index and value specifications:

S number	Name	Range
1	Frequency Lat.	{1…700} Hertz*10. Sine and Triangle only.
2	Frequency Long.	{1…700} Hertz*10. Sine and Triangle only.
3	Frequency Common	{1…1000} Hertz*10. All other shapes.
4	Frequency Spin	{-200…+200} Hertz*10.
5	Frequency Collapse or Turns. Spiral.	{0…50} Hertz*10. Circle. or {1…9} Turns. Spiral.
6	Angle Plane	{-359…+359} Degrees.
7	Angle Phase Lat.	{-359…+359} Degrees. Sine and Triangle only.
8	Angle Phase Long.	{-359…+359} Degrees. Sine and Triangle only.
9	Amplitude Lat. or Point location Lat. or Amplitude inner	{100…1000} Percent*10. Sine and Triangle outer. or {-970…+970} Percent*10. Point location. or {50…1000} Percent*10. Circle inner collapse.
10	Amplitude Long. or Point location Long.	{100…1000} Percent*10. Sine and Triangle outer. or {-970…+970} Percent*10. Point location
11	Amplitude Outer	{100…1000} Percent*10. Other than Point, Sine or Triangle.
12	Tail length.	{10…1000} Number of display dots.
13	Profile.	{-100…+100} Profile*10.

Frequency, amplitude, percent and profile parameters are ten times required value to allow for one-tenth resolution. Negative angles/frequencies mean counter clockwise direction, positive angles/frequencies mean clockwise direction. An amplitude of 100% means the outer edge of the pocket setup.

8 MAINTENANCE AND SERVICE

8.1 Maintenance

The Sweep does not require any special maintenance.

8.2 Cleaning

For cleaning the outside of the device, a slightly moistened cloth will usually do. Do not use any aggressive or abrasive cleaning agents.

Mains voltage.

Components inside of the Sweep controller are components to mains voltage.

Protect the device from liquids.

Do not open the device.

9 STORAGE AND DISPOSAL

9.1 Packaging

Please keep the original packaging. The packaging is required for storing the Sweep and for shipping it to a Telemark service center.

9.2 Storage

The Sweep may only be stored in a dry room. The following requirements must be met:

Ambient temperature: -20….+60 °C

Humidity: as low as possible. Preferably in an air-tight plastic bag with a desiccant.

9.3 Disposal

The product must be disposed of in accordance with the relevant local regulations for the environmentally safe disposal of systems and electronic components.

9.4 WEEE

The use of the Waste Electrical and Electronic Equipment (WEEE) symbol (see Figure 8-1) indicates that this product may not be treated as household waste. By ensuring this product is disposed of correctly you will protect the environment. Recycling information of this product can be obtained at the place of sale, your household waste disposal service provider, or local authority.

Figure 9-1, WEEE Symbol

10 ERRORS AND WARNINGS

10.1 Error Codes

The Programmable 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 Programmable Sweep will be operational. Errors may be with the Programmable 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

10.2 Interlock Fail

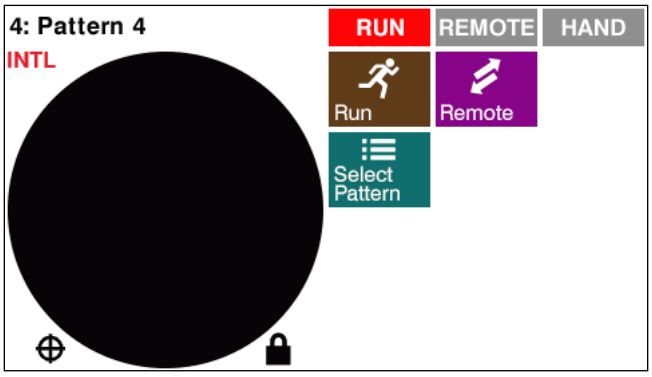


Figure 10-1, Interlock Fail

When the interlock string is broken a red “INTL” will show in the upper left corner of the screen, the pattern will stop on the screen and the output to the EB sources will stop.

11 WARRANTY CONDITIONS

11.1 Limited Warranty

Telemark products are warranted to be free of defects in materials and/or workmanship for a period of 12 months after shipment from the Telemark factory. This warranty is valid only for normal use, where regular maintenance has been performed. This warranty shall not apply if the product has been repaired or alterations made by anyone other than authorized Telemark service representatives, or if a malfunction or damage occurs through abuse, misuse, negligence, shipping damage, or other accident. No charge will be made for repairs covered by this warranty at a Telemark service facility. Telemark reserves the right to determine if the malfunction was caused by defective materials or workmanship. The customer will be responsible for freight charges to Telemark's service facility.