ELECTRON BEAM SOURCE
XY SWEEP
with Memory Module

INSTRUCTION MANUAL

Part Number 132-0100-1

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www.telemark.com

WARRANTY

The Electron Beam Power Supply XY Sweep is guaranteed against faulty materials, function, and workmanship for a period of 12 months after delivery from the Telemark factory. This warranty is valid only for normal use when 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 service representative or if damage occurs through abuse, misuse, negligence, or accident. No charge will be made for repairs made under warranty at a Telemark service facility during the warranty period, simply return the malfunctioning module, freight prepaid. Telemark reserves the right for final warranty adjustment.

USER RESPONSIBILITY

The user is responsible for proper operation and ordinary maintenance of the equipment, following procedures described in this manual. If the user has a reasonable doubt about understanding the use or installation of a component, your Telemark representative or the factory should be called.

It is vitally important that the user properly installs the equipment as described in Chapter 3 (Installation) of this manual. The Warranty will be void if the equipment is improperly installed and/or improperly grounded. Alteration of the design or any function of the equipment voids the warranty and is entirely the responsibility of the user.

SAFETY WARNING

HIGH (POTENTIALLY LETHAL) VOLTAGE IS PRESENT WITHIN THIS EQUIPMENT. GREAT CARE MUST ALWAYS BE EXERCISED WHEN WORKING WITH THIS EQUIPMENT. DO NOT ATTEMPT TO REPAIR MODULE, SEND IT BACK TO THE FACTORY FOR SERVICE. THERE ARE HIGHLY SPECIALIZED COMPONENTS THAT DRIVE THE MODULE THAT MUST BE HANDLED WITH CARE.

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GENERAL DESCRIPTION

Functional Description

The Telemark electron-beam (EB) source XY Sweep with Memory Module is a four mode of operation sweeper. Front panel controls provide selection of the mode of operation of the sweeper: position only, triangular, circular, or spiraling.

Two sections of the front panel can be used as mounted, or pulled out and extended on cables for mobile use.

> Do NOT attempt to carry the sweeper by the Removable Modules' handles, as the modules will unplug and the sweeper could fall.

The sweep is used for positioning and/or sweeping, i.e. moving the e-beam around the EB source's crucible pocket in a defined pattern. The beam movement helps heat the crucible pocket's material more evenly. Also, larger pockets can be used to allow more material in the vacuum chamber per evaporation run.

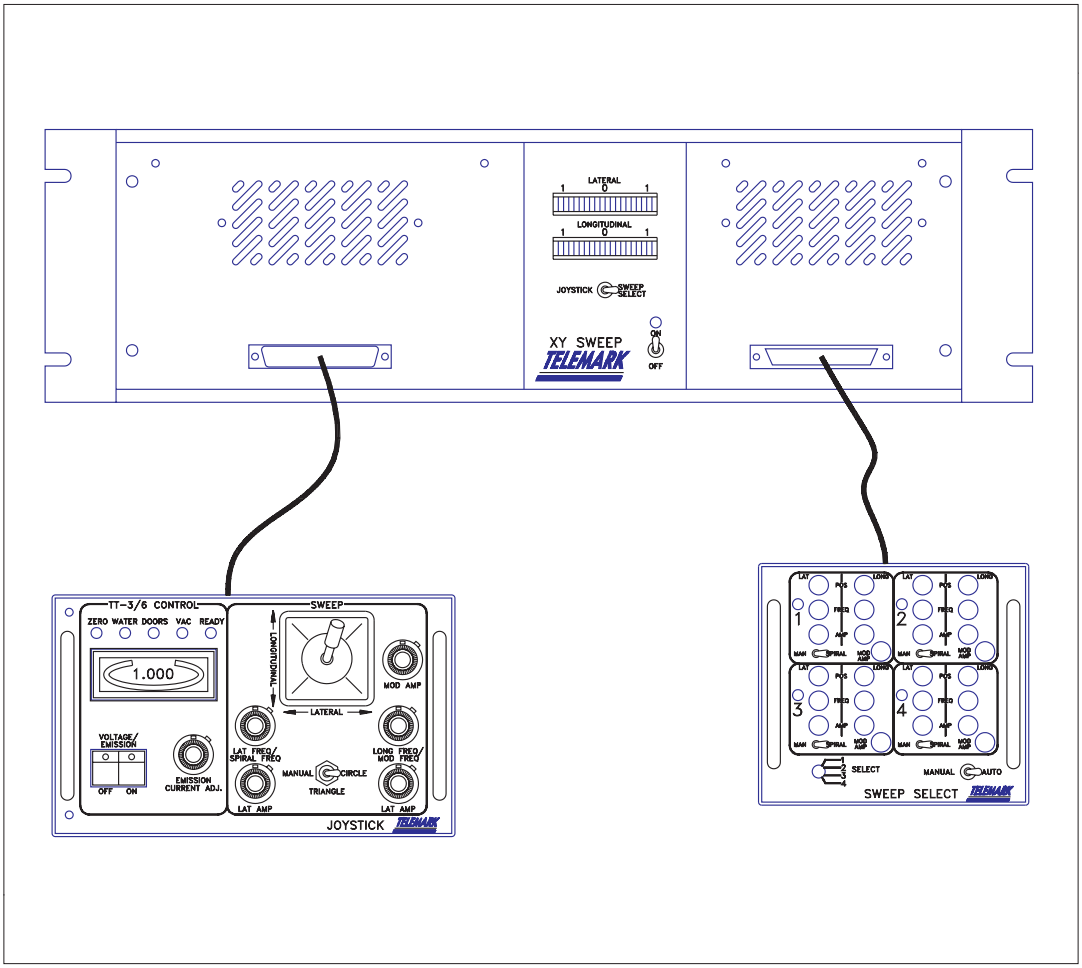
This is accomplished by running current through magnetic coils next to the crucible pocket. The magnetic field affects the position/motion of the electron beam. The mode used for a particular application is determined by the user, depending on EB source and evaporation material and rate.

System Components

The Electron Beam Power Supply XY Sweep consists of the following:

- Sweep Module - Sweep generator.
- Joystick Module - Sweep control and optional TT-3/6 control
- Sweep Select Module - Four sweep selections
- Cabling.

Figure 1-A
General View



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SPECIFICATIONS

XY Sweep with Memory Module

- Input Power

  switchable ranges of 110—120VAC @ 2A, or 208—240V @ 1A; single-phase, 50/60Hz.

- Output power

  Dual Channel (longitudinal and lateral): plus or minus 1.5 amps. (mfg. adjustable) maximum, into a load with impedance of less than 15 ohms.

- Frequency range

  Triangle Pattern mode: 6 to 50Hz;
  Circle/Spiral mode: circling at 5Hz, but can collapse into spiral at rates of 0.5 to 6Hz.

- LED Bargraphs

  Lateral and Longitudinal LED bargraphs indicating amplitude/position changes

SWEEP SELECT MODULE (Memory Module)

- Four (identical) Output Module pattern-bank selections
- Pattern Banks are selectable manually or remotely

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INSTALLATION

Introduction

The Electron Beam Source XY 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.

Please see Fig. 3-A and 3-B

Sweep Module -Rear Panel

See Figure 3-A

INPUT V.A.C. CONNECTION - Power

The VAC input connector (on the back panel) is a standard 3-pin plastic domestic male computer-style (there is a choice of input cable for either standard domestic outlet use, or the 208V single-phase jack on the back of a TT power supply).

This Sweep allows the customer to select the input-voltage range, with a switch (on the back panel) for running on either 105—120 VAC or 208—240VAC. Switched to the lower range, it can plug into domestic wall outlets, ~115VAC.

> WARNING: Care should be used to set the switch to a range appropriate for the available line power. Note if the switch is set at 230 but powered by 115, no damage results, but full power cannot be achieved. Conversely, if the switch is set at 115 but powered by 230, damage will likely result.

SWEEP OUTPUT CONNECTION - J3

Connection of the Sweep generator to the EB gun coils is accomplished by bringing the Longitudinal and Lateral coil leads out of the vacuum tank by way of a feed-through. In the vacuum tank, take care to dress these leads away from the

EB gun filament assembly and filament conductors. (This is further discussed in EB gun manuals.)

Outside the tank, still keep the coil leads away from the high-voltage feed-throughs. These leads are then connected to pins 1, 2, & 3 of the Sweep's J3. The Sweep Output connector provided is a round metal 3-pin male Philmore. Pin 1 is the Lateral output, pin 3 the Longitudinal, and pin 2 is the common ground-return; BOTH coils return to pin 2—-the common is shared. The cable

Figure 3-A
Rear View

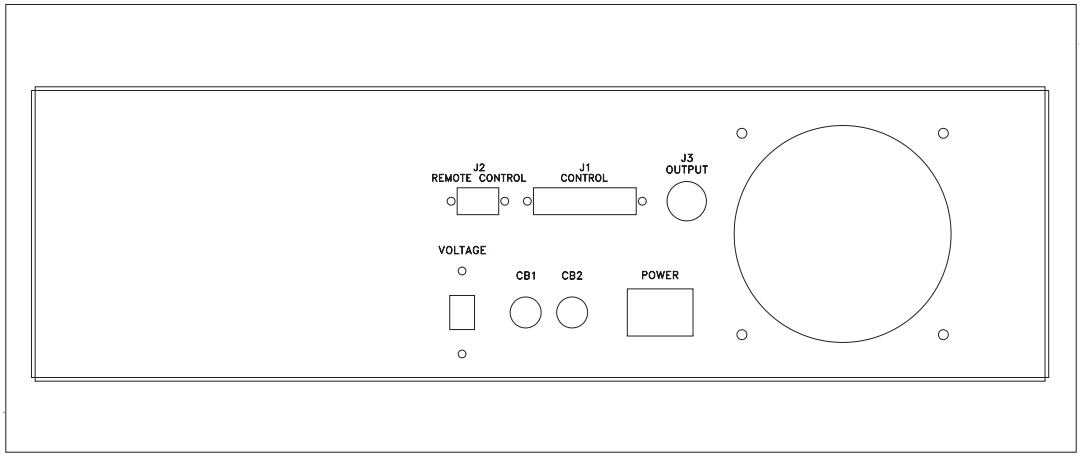
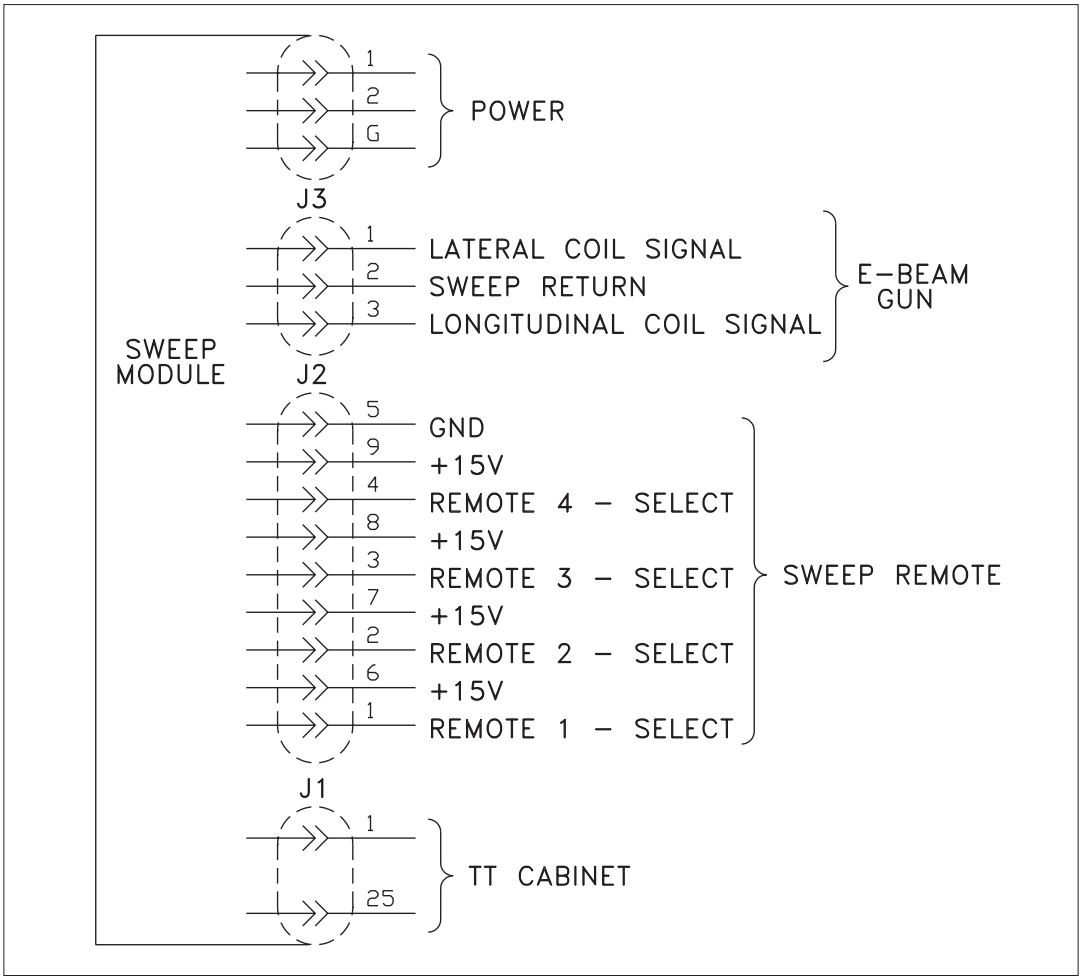


Figure 3-B
Sweep
Module
Connections



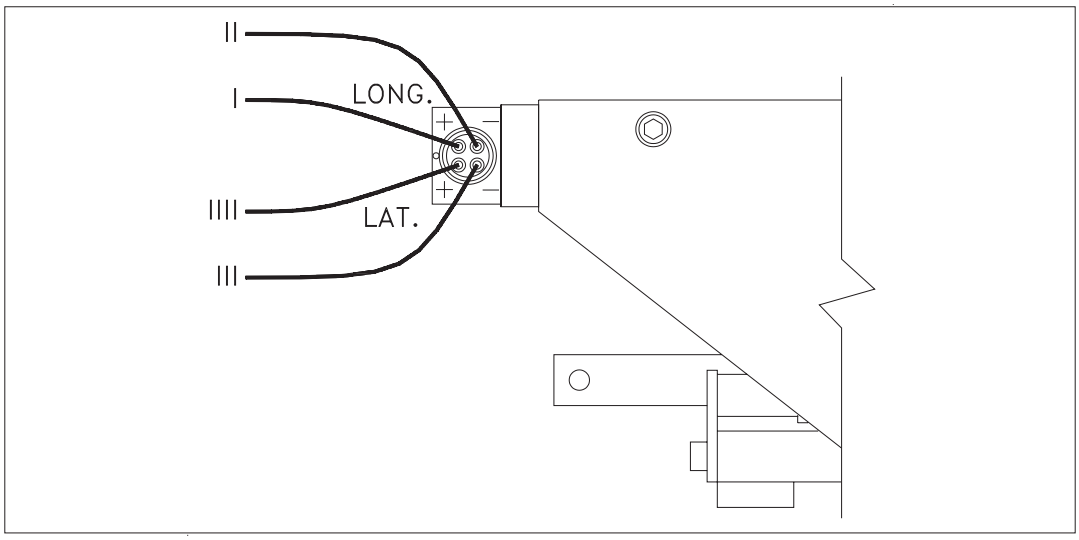


Figure 3-C Standard Telemark EB Source coil connection

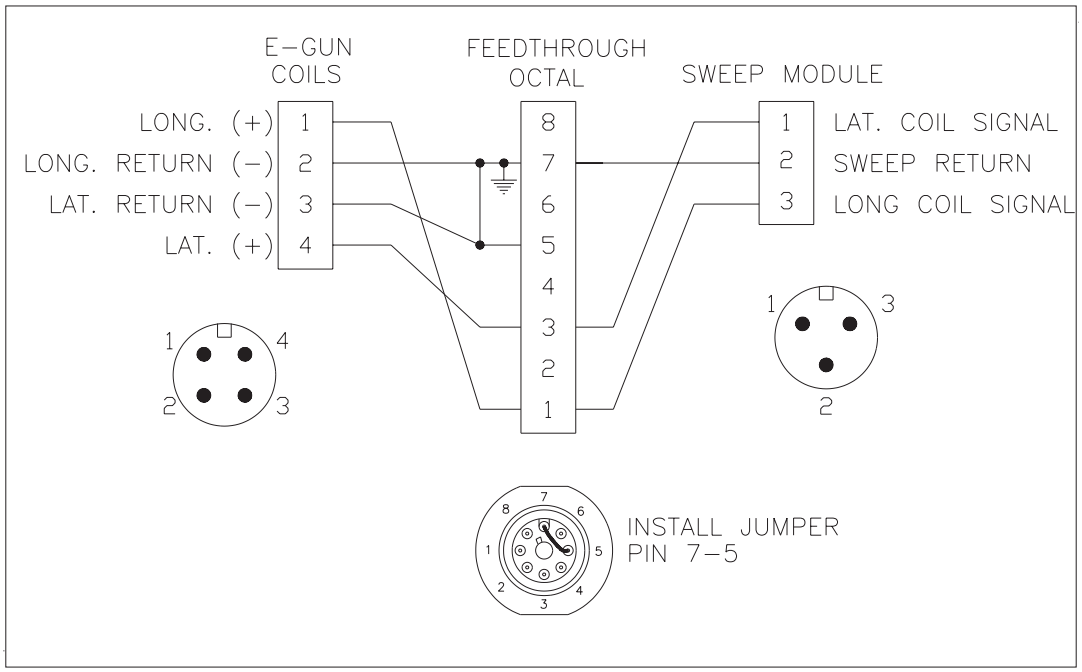


Figure 3-D Standard Telemark Sweep connections

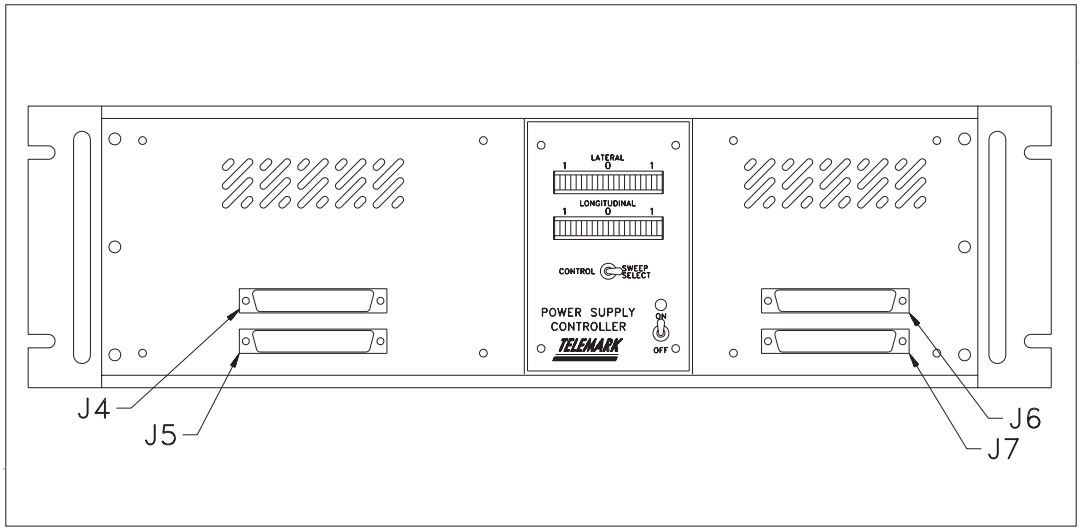
must be capable of passing a minimum of two amperes. Note the common return is not grounded inside the Sweep, but must be grounded at the EB gun tank.

> WARNING: Leaving the common ungrounded at the tank could damage the Sweep.

TT POWER SUPPLY CONNECTION - J1

The interface between the Controller and the supply is a 25-pin D-sub connector. The Controller option allows Electron-Beam Power Supply operation via the Sweeper's special Controller/Joystick Module.

Figure 3-E
Sweep
Module
Front View



REMOTE PATTERN-SELECTION CONNECTION - J2

The customer may control external selection of the Sweep Select Module's pattern banks, accomplished through a 9-pin D-sub connector. An indexer or computer may be used in conjunction with the Sweep Select Module to choose which one of its four pattern-banks is active. Connect the indexer or computer interface to J2 such that the appropriate pins of are shorted for selection of the desired bank.

Sweep Module - Front Panel

See figure 3-E

Hand-held remotes (Removable Modules) which control beam Position; and Sweep Amplitude, Frequency, and Pattern can be plugged into the 37-pin D-sub connectors on the inner-front of the Sweep.

Connection of the Sweep to its Removable Modules is shown in Fig 4-A, Sweep Chassis.

CONTROLLER/ JOYSTICK CONTROL - J4 & J5

The left module bay on the front of the chassis has 37-pin female D-sub connector for the Controller/Joystick Module. The bottom connector allows the Module to plug straight in; the top allows optional cable attachment to use the Module remotely. The connectors are electrically identical, but have different mounting hardware (jack-bolts on the upper connector).

SWEEP SELECT CONTROL - J6 & J7

The right module bay on the front of the chassis has 37-pin male D-subs for the Sweep Select Module. The bottom connector allows the Module to plug straight in; the top allows optional cable attachment to use the Module remotely. The connectors are electrically identical, but have different mounting hardware (jack-bolts on the upper connector).

4

CONTROLS AND INDICATORS

Control Module Chassis

See figure 4-A

1 *ON/OFF SWITCH—-Provides Sweeper power, not High Voltage Controller power.*

2 *MODE (CONTROL / SWEEP SELECT) SWITCH—-selects between Control on the left and Sweep Select on the right. Note: when no Memory Module is connected, operation defaults to the Controller (Joystick) Module.*

3 & 4 *POSITION L.E.D.s—-show the relative position of the beam (in two axis—Lateral [left & right] and Longitudinal [near & far]) in the pocket.*

5 & 6 *CONTROL CONNECTORS—-used to attach the Controller Module: the bottom one allows the module to plug on, the top is for attaching a remote cable. Note: the two connectors are electrically identical, with different hardwares.*

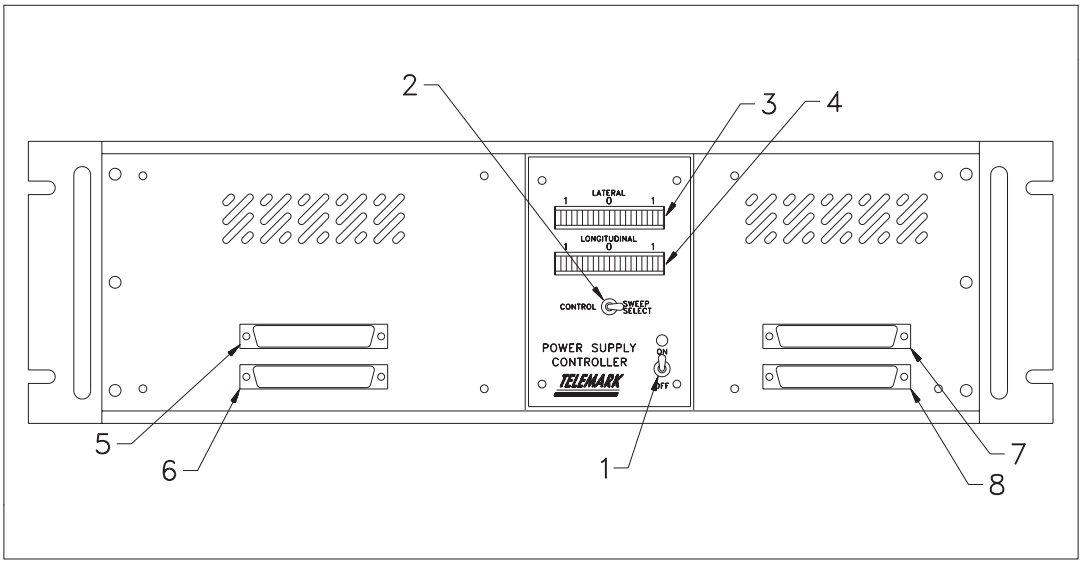
7 & 8 *SWEEP SELECT CONNECTORS—-used similarly to the Control Connectors.*

XY Sweep Controller (with Memory Module)

See figure 4-B

The Removable Module may be used plugged into the chassis, or as a Handheld Remote on an extension cable.

Figure 4-A
Sweep
Chassis,
Front View



1 *PATTERN MODE SWITCH - The three-position MODE switch is used to select between SPIRAL, MANUAL beam position, and TRIANGLE pattern.*

With the MODE switch in the SPIRALmode, the Longitudinal/Modulation Frequency knob controls the spiral-collapse frequency, while both Lateral and Longitudinal Amplitude knobs control the overall size (in two axis). The Joystick is used to position the beam. The Modulation Amp knob controls the depth of spiraling collapse (how close the beam moves towards the center of the pattern).

With the MODE switch in the MANUAL beam position setting, the Joystick is used to position the beam; there is no sweeping.

With the MODE switch in the TRIANGLE setting, the Lateral and Longitudinal Amplitudes and Frequencies of the beam are set with the corresponding knobs. The Joystick is used to position the beam. The resulting beam movement is in a diamond(s) pattern.

2 *JOYSTICK - Moves the beam position (in two axis —Lateral [left & right] and Longitudinal [near & far]), or the center position of patterns.*

3 & 4 *AMPLITUDE - Adjusts the overall pattern size (in two axis).*

5 & 6 *FREQUENCY - Adjusts the sweeping speed(s). When in Triangle mode, the Lateral and Longitudinal Frequency knobs operate independently (in two axis). When in Spiral mode, only the Longitudinal/Mod.Freq. pot (6) controls the spiral-collapse frequency.*

7 *MOD AMP - The modulation amplifier knob adjusts the depth of the spiral's collapse.*

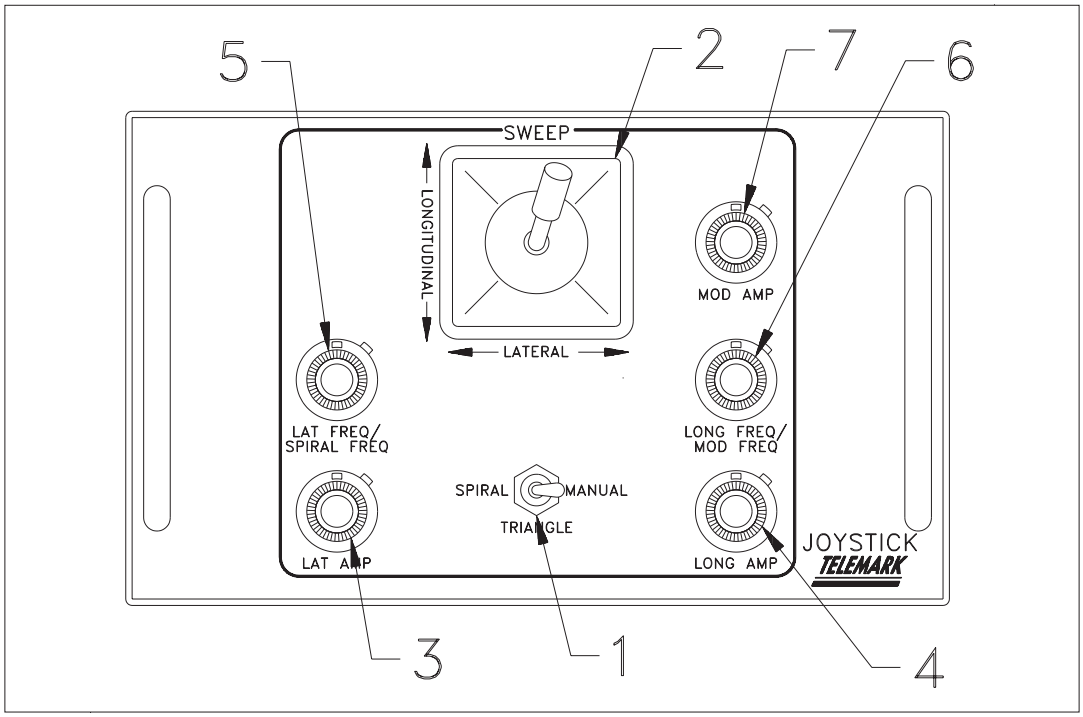


Figure 4-B
Joystick
Module

Sweep Select Module (Memory Module)

See figure 4-C

The Removable Module may be used plugged into the chassis, or as a Handheld Remote on an extension cable. Each Channel (1—4) operates similarly to the Controller (Joystick) Module.

1 *MANUAL/AUTO SWITCH - Changes the control of the Sweep Select module from the knob on the front panel (2) to the remote input from J2 on the back panel. Note: in AUTO mode, if J2 has no input, operation defaults to Sweep Select Channel 1.*

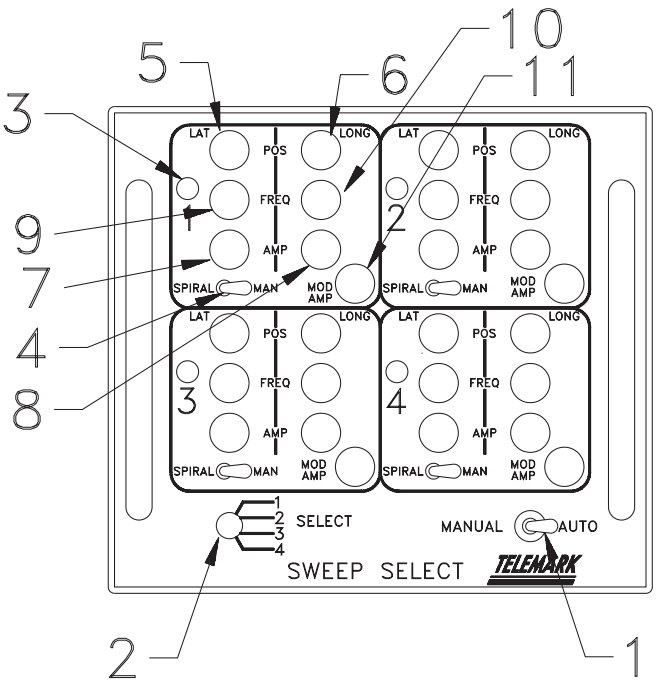
2 *SELECT PATTERN - Rotates to select the active pattern for manual mode.*

3 *ACTIVE PATTERN L.E.D. - Indicates which one of the four patterns is active.*

4 *PATTERN MODE SWITCH - The three-position MODE switch is used to select between SPIRAL, MANUAL beam position, and TRIANGLE pattern. Note: Triangle is not silkscreened on the panel, but it is the middle position, similar to the Joystick Controller Module.*

With the MODE switch in the SPIRAL mode, the Longitudinal/Modulation Frequency knob controls the spiral-collapse frequency, while both Lateral and Longitudinal Amplitude and Position knobs control the overall size and placement

Figure 4-C
Sweep
Select



(in two axis). The Modulation Amp knob controls the depth of spiraling collapse (how close the beam moves towards the center of the pattern).

With the MODE switch in the MANUAL beam position setting, the Lateral and Longitudinal Position knobs are used to position the beam; there is no sweeping.

With the MODE switch in the TRIANGLE setting, the Lateral and Longitudinal Positions, Amplitudes, and Frequencies of the beam are set with the corresponding knobs. The resulting beam movement is in a diamond(s) pattern.

5 & 6 *POSITION - Moves the beam (in two axis—Lateral [left & right] and Longitudinal [near & far]), or the center position of patterns.*

7 & 8 *AMPLITUDE - Adjusts the overall pattern size (in two axis).*

9 & 10 *FREQUENCY - Adjusts the sweeping speed(s). When in Triangle mode, the Lateral and Longitudinal Frequency knobs operate independently (in two axis). When in Spiral mode, only the Longitudinal/Mod.Freq. pot (10) controls the spiral-collapse frequency.*

11 *MOD AMP - The modulation amplifier knob adjusts the depth of the spiral's collapse.*

5 OPERATION

Introduction

This section describes the normal operating procedures for the Telemark E-beam XY Sweep.

XY Sweep (with Memory Module) Setup

The following is the procedure to set the Sweep Controller/Joystick Module for initializing operating levels. (This may be done with the Module plugged into the front panel or extended by cable.)

1. *With the HV/Emission off, place the front-panel switch "control/sweep select" in the "control" position.*
2. *Turn on the "power" switch.*
3. *Set the joystick to its midpoint, and switch the module's mode switch to "manual."*
4. *Note the LED bargraph displays are approximately mid-scale. Slight adjustment of the joystick may be necessary.*
5. *Turn on the E-beam Power Supply's high-voltage*
6. *Increase the Emission output adjustment slowly until there is a barely discernible beam in the EB gun's crucible pocket. The beam should have enough high-voltage to strike near the center of the crucible. Keep the emission low, around 30 milliamperes.*
7. *Slowly move the joystick and observe movement of the beam in the crucible. This ensures connection of the deflection coils*

and Sweep output. With the beam in the center of the pocket, turn Emission down.

8 *Place the front-panel switch "control/sweep select" in the "sweep select" position.*

9 *Switch the Sweep Select Module's control-select toggle-switch (labeled "manual/auto") to 'manual.' Turn the rotary switch labeled "select" to pattern-bank channel 1.*

10 *Switch the channel's mode switch to "man" (manual).*

11 *Bring the E-beam Power Supply's Emission up slowly and use the Sweep Select's channel 1 position knobs to center the beam in the crucible pocket. Turn the Emission down.*

12 *Repeat the last three steps for each of the other pattern-bank channels.*

13 *If more than one Sweep Select Module is to be used (for additional pattern storage), it is advisable to center the channels at this time.*

XY Sweep with Memory Module Operation

The system is now operational. The position of the E-beam in the crucible can be moved or swept by adjustment of the Sweeper removable module controls.

Patterns are determined using the Controller/Joystick Module while watching the E-beam in the vacuum tank's EB gun crucible. Once setup and positioned, they can be copied to Sweep Select Module pattern-bank channels even with Emission off: visually match front-panel LED bargraph-display motions controlled by the joystick system with those controlled by the Sweep Select channels. Once patterns are complete, it is best to check them with low Emission into the tank. Note E-beam shape may be affected somewhat as Emission output is later increased to high levels. If the E-beam spreads, the pattern may end up sweeping wider areas than previously calibrated.

CAUTION: always keep the E-beam in the crucible pocket.