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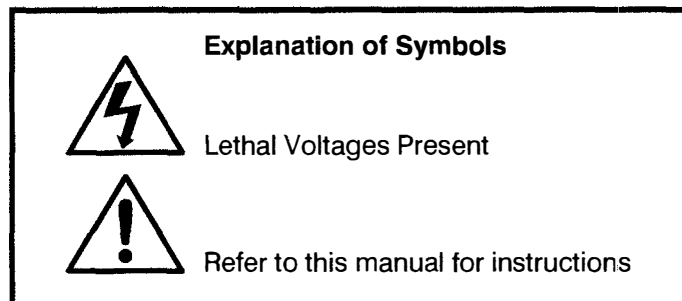
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MODEL TT-6

**E-BEAM SOURCE POWER SUPPLY &
XY SWEEP with Memory Module**

INSTRUCTION MANUAL



Part Number 109-0101-2

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December, 1999

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SAFETY WARNING

HIGH (POTENTIALLY LETHAL) VOLTAGES ARE PRESENT WITHIN THESE MODULES. GREAT CARE MUST BE EXERCISED WHEN PERFORMING MAINTENANCE. **HUMAN CONTACT WITH THE VOLTAGES CAN BE FATAL.**

Make sure that the input power is turned off before removing covers. Short all capacitors with a grounding hook. Do not test live circuits unless absolutely necessary.

If it becomes necessary to test live circuits, all test meter connections must be made with the power OFF. Test leads should be in good repair and have sufficient insulation for a test voltage of at least twice that to be measured. The test meters should be securely mounted and should not be touched after power is turned on. Do not work in cramped spaces or cluttered areas.

TROUBLESHOOTING OF THIS NATURE SHOULD BE CARRIED OUT ONLY BY QUALIFIED PERSONNEL UTILIZING STANDARD SAFETY PROCEDURES.



DANGER - HIGH VOLTAGE

WARRANTY

The TT Electron Beam Power Supplies are guaranteed against faulty materials, function, and workmanship for a period of 12 months after shipment 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 repairs have been performed or alterations made by anyone other than an authorized Telemark representative, or if damage occurs through abuse, misuse, negligence, or accident. No charge will be made for repairs made at a Telemark service facility during the warranty period. Simply return the malfunctioning module, freight prepaid. Telemark reserves the right to determine the appropriate warranty adjustment.



USER RESPONSIBILITY

The user is responsible for proper installation, operation and ordinary maintenance of the equipment, following procedures described in this manual. If the user has a doubt about 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, with particular attention to correct grounding methods, 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.

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GENERAL DESCRIPTION

Functional Description

The Telemark Model TT-6 Power supply is a direct current, regulated constant high voltage power supply. It is intended for use in the optical coating field as well as for research applications. The TT-6 is operated from the control module.

The TT-6 is compatible with EB sources that use electromagnetic deflection or combinations of electromagnetic deflection and permanent magnet focusing. Emission current regulated filament power is supplied to the EB sources.

A system of safety interlocks with the vacuum system is provided to protect both the operator and the equipment.

The Telemark electron-beam (EB) source power supply with XY Sweep with Memory Modules 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't be sweep control with module and/or sweep select module) can be used as mounted, or pulled out and used with extension 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 needed 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.

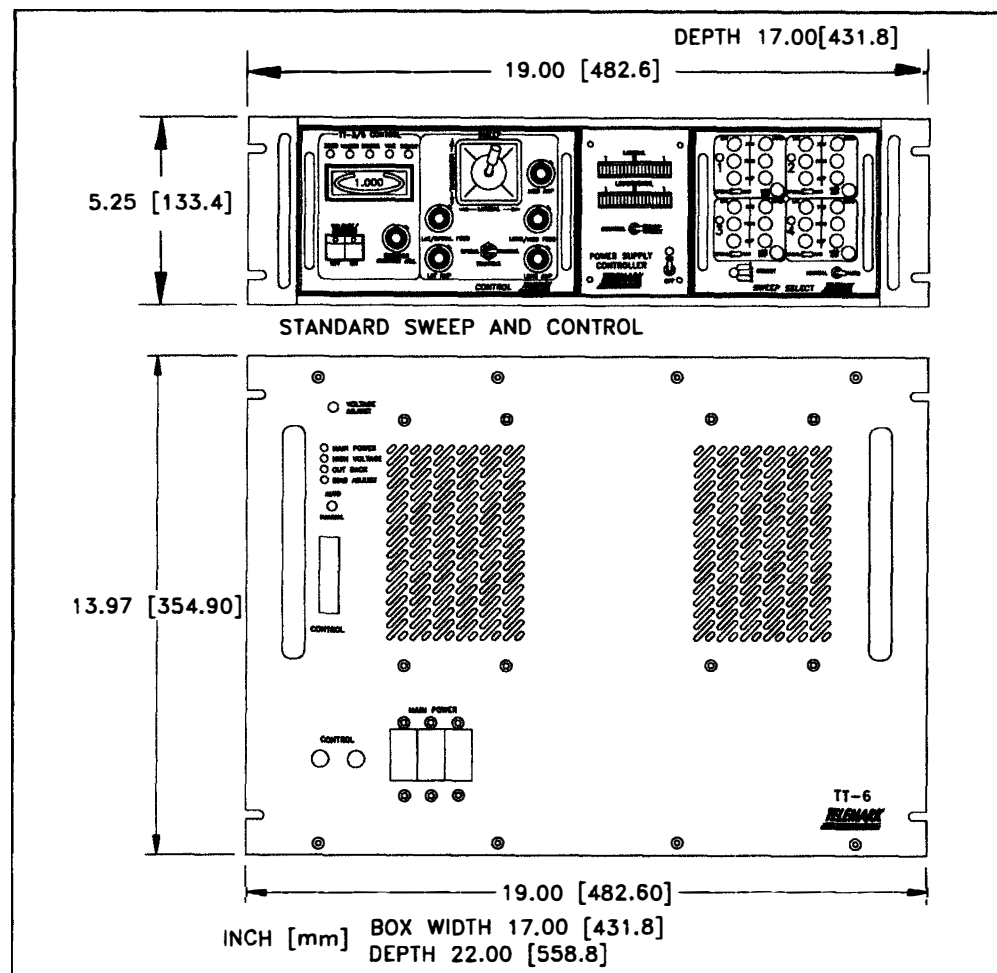
Beam deflection is accomplished by applying current through magnetic coils located next to the crucible pocket within the source. Changing the magnetic field affects the position/motion of the electron beam. The mode used for a particular application is determined by the user, after evaluating the interdependencies on the EB source, of evaporation rate, flux pattern and material.

System Components

The **TT-6 Electron Beam Power Supply** consists one each of the following:

- 1 Main Cabinet (figure 1-A)
- 2 Control Module/Sweep Module (figure 1-A or 1-B)
- 3 Filament Transformer (figure 1-C)

Figure 1-A
Standard
TT-6



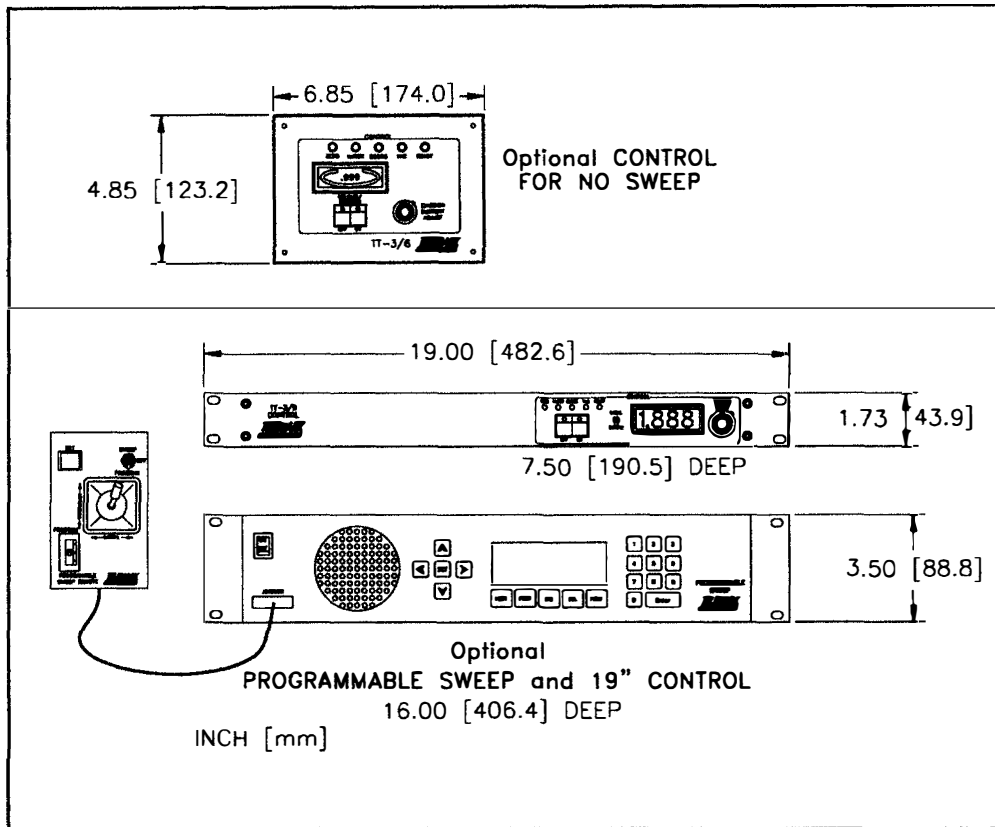


Figure 1-C
Optional
Controls

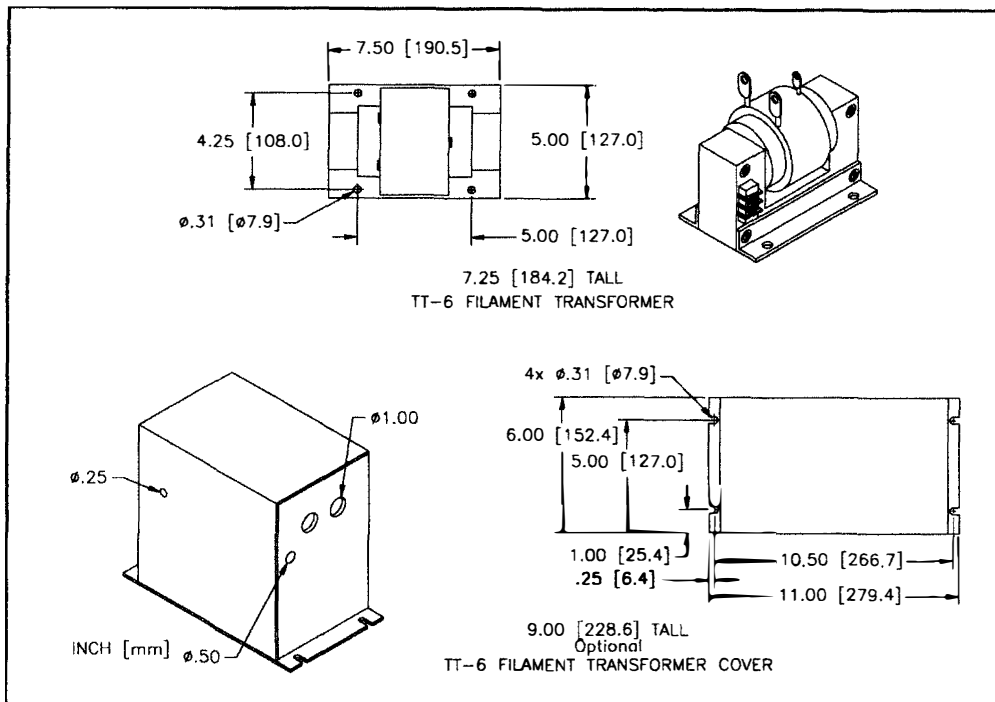


Figure 1-C
Filament
Transformer

SPECIFICATIONS

Main Cabinet

- *Input Power*
 - 208/240 volts, 3-phase, 60 Hz.
 - 380/415 volts, 3-phase, 50 Hz.
- *Constant AC Power at full load AC current*
 - TT-6: 21.8A
 - TT-6E: 10.8A
 - TT-6J: 20.3
- *Regulation*
 - Less than 2% of max.
- *Ripple*
 - Less than 100 volts pk-pk
- *Factory set current cutback level*
 - 800 ma. @ 7kV
- *Current cutback response*
 - Less than 100 microseconds
- *Output voltage range*
 - 6.5 to 7.5 kilovolts DC (negative)
- *Output current (maximum)*
 - 750 ma. @ 7kV

Source Filament Transformer

- *Primary voltage*
0 to 220 volts, 1-phase, 50/60 Hz
- *Secondary Power*
0 to 8 volts, 50 amps. max.

Optional 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 Ω .
- *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*

INSTALLATION

Introduction

Please see Figure 1-A, Main Cabinet

The TT Electron Beam Power Supply Main Cabinet and Sweep are designed to be mounted in a standard 19 inch electronic instrument cabinet. Any suitable place on a vacuum system that has a standard 19 inch wide opening may be used. There should be minimum 6" (152mm) clearance at the back to allow proper air flow. All modules must be secured in the cabinet before electrical connections are made. The installation procedures are described below.



THE MAIN CABINET WEIGHS OVER 150 LBS.
IT MUST BE SET ON RAILS IN A 19" CABINET.
IT IS VERY HEAVY! HANDLE WITH CARE!

System Grounding Practice

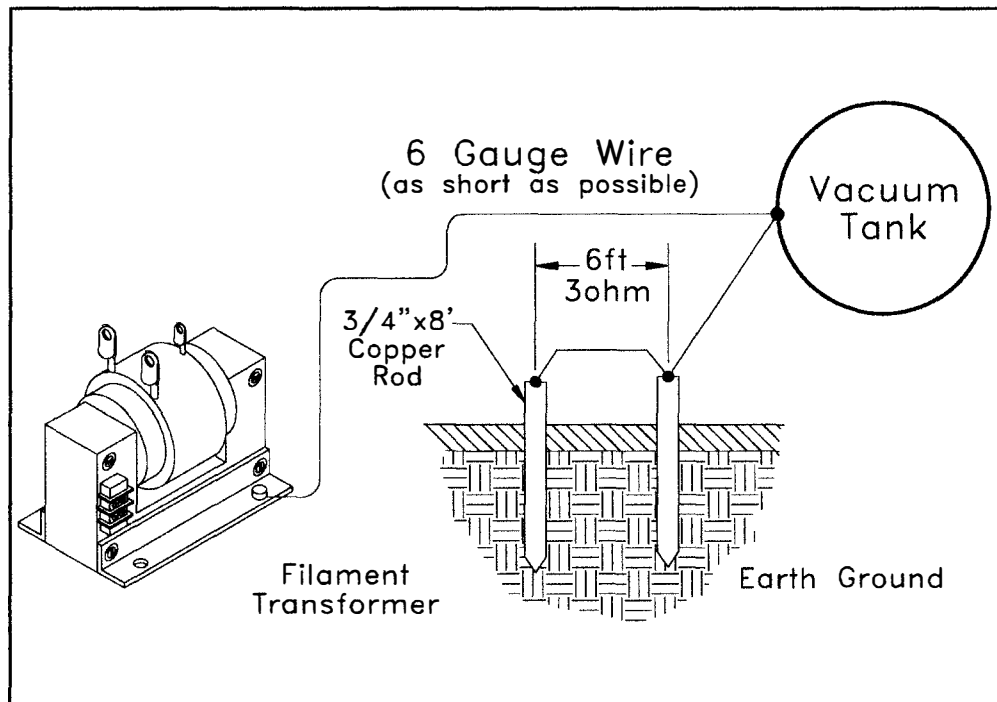
See Figure 3-A and 3-B , Vacuum Tank Grounding Installation

A good ground is necessary to assure safe and proper operation of the power supply. The following practices are recommended to assure a good ground.



NOTE - THE POWER SUPPLY MUST BE CONNECTED TO AN ISOLATED EARTH GROUND AS SHOWN IN FIG. 3-A, 3-B or 3-C, FAILURE TO CONNECT THE POWER SUPPLY TO AN ISOLATED EARTH GROUND COULD CAUSE SEVERE DAMAGE TO THE POWER SUPPLY AND/OR AUXILIARY ELECTRONIC CONTROL EQUIPMENT AND WILL VOID THE WARRANTY.

Figure 3-A
Vacuum
Tank
Grounding
Installation



Vacuum Tank Ground

See Fig. 3-A

The vacuum tank and E-gun must be connected to a good earth ground. Under normal conditions, a good earth ground will consist of two 3/4 inch (19mm) diameter copper clad steel rods driven through the floor and into the earth near the tank location.

The ground rods should be connected to the vacuum tank and the filament transformer by a #6 AWG or larger gauge copper cable. If the distance from the grounding rods to the tank is more than 10 feet (3 meters), but less than 20 feet, (6 meters), increase the size of the copper cable to #4 AWG. For distances of 20 to 100 feet (6 to 30.5 meters), use 2 to 4 inch (50-101.6mm) by .035-.050 inch (.089-1.27mm) copper strap. For distances over 100 feet (30.5 meters), use 4 to 6 inch (101.6-152.4mm) by .035-.050 inch (.089-1.27mm) copper strap. **Do not use braided wire.** Be sure that the connection is made to clean metal. The rods must be approximately 6 feet (1.8m) apart and the resistance between the rods (without the cable connection) should be 3 ohms or less. The resistance of the soil can be reduced by adding copper sulfate or salt water around the rods. A drip system may be required to insure maintenance of a proper ground.



NOTE - BE SURE THAT THE POWER SUPPLY CANNOT BE
TURNED ON DURING THE FOLLOWING TEST.

to the base of the transformer. Make sure connections at both ends are to clean bare metal. This insures that the transformer core does not rise above ground potential during operation.

Approximately 15 feet (3.81 meters) of high voltage coaxial cable is provided for connection of the power supply output to the source transformer. One end of this cable is permanently terminated within the power supply cabinet. The free end passes through the rear panel and goes to source filament transformer.

Approximately 5 inches (.127mm) of outer covering and shield should be removed so that the insulated center conductor is exposed. This should be connected to the center tap. The shield should be connected to the tank ground at the transformer. The same care should be taken in making these connections as that taken in connecting earth ground to the tank and transformer.

Cabinet to Control Module - J101

See Figure 1-A, 3-C, 3-D, and 4-A

There is a 25-pin D type connector located on the front panel of the HV module; it is the same as the J101 located on the back panel. The 25 wires carry many signals both for commands and feedback information in analog form. This cable connects the power supply to the Control Module. The Control Module is available in handheld or rack mounted.

Interlock Connections - J102

The external interlocks are connected to the power supply through J102, which is located on the rear of the cabinet. See Figure 3-D, Control Module Connections for details. 22 AWG (0.34mm²) ribbon cable or round cable should be used for the interlock installation that is described below.



WARNING - ALL STATEMENTS REGARDING OPERATOR AND EQUIPMENT SAFETY ARE VOID IF THE EXTERNAL INTERLOCKS ARE NOT INSTALLED AS REQUIRED.

- **WATER** - *Source Water Interlock*

Install a water flow switch in the return line of the cooling system for the electron beam source. This switch should close when there is sufficient water flow to cool the source and associated shields. Connect the switch to pins 1 and 9 of J102.

- **DOOR** - *Tank High Voltage Access*

These interlocks are to be connected to pins 2 and 10 of J102. Install series connected, normally open switches on the doors and high voltage panels so that they are closed only when the doors of the chamber and all panels are in place. This interlock should be closed only when there is no possible chance of coming into contact with high voltage.

- **VACUUM** - *High Vacuum Interlock*

This interlock insures that there is sufficient vacuum within the tank before the source can be energized. This level of vacuum normally coincides with that required for the energizing of vacuum gauge filaments and most units have auxiliary contacts for this purpose. Their connection should be such that pins 3 and 11 of J102 are shorted when the filaments of the vacuum gauge are energized.

Remote Emission Adjust - J103

The front panel mode switch must be set to **AUTO** to use the remote voltage-control input.

Remote Emission Adjust is a differential input. Install the rate signal (zero to -10 volts) pin 3 and ground to pin 4 of J103. The amplitude of this signal should increase when it is desired to increase the evaporation rate.

The power supply can also be turned on and off remotely. This is accomplished by connecting a normally-closed momentary switch across terminals 5 and 6 of J103 and a normally-open switch across terminals 1 and 2. Depressing the normally-open switch will turn the power supply on and depressing the normally closed switch will turn it off. Logic level signals are provided to indicate the operation of the power supply. A positive signal (12 or 24 volts selected by J10 on mother board) at pin 9 of J103 indicates that the power supply and filament controller is energized. A signal at pin 7 is present when the power supply is in cutback because of an arc. Pin 8 is a hard TTL low signal when HV/Emission is engaged.

If the customer needs to use the remote input, but no external switches are available or desired; move the motherboard jumper J11 to the **ON BYPASS** position and put an external jumper wire across J103 pins 5 and 6. (Note: If you have Rev.D or later mother board PCB, jumper J14 Off Bypass is provided to eliminate external jumper.) This allows on/off operation from the manual controller, while still switched to the AUTO mode, using the remote voltage-control input.

Main Cabinet

See Figure the system schematic, 3-B

Electrical, interlock and control connections are outlined in the following sections. Installation should only be performed by qualified personnel.

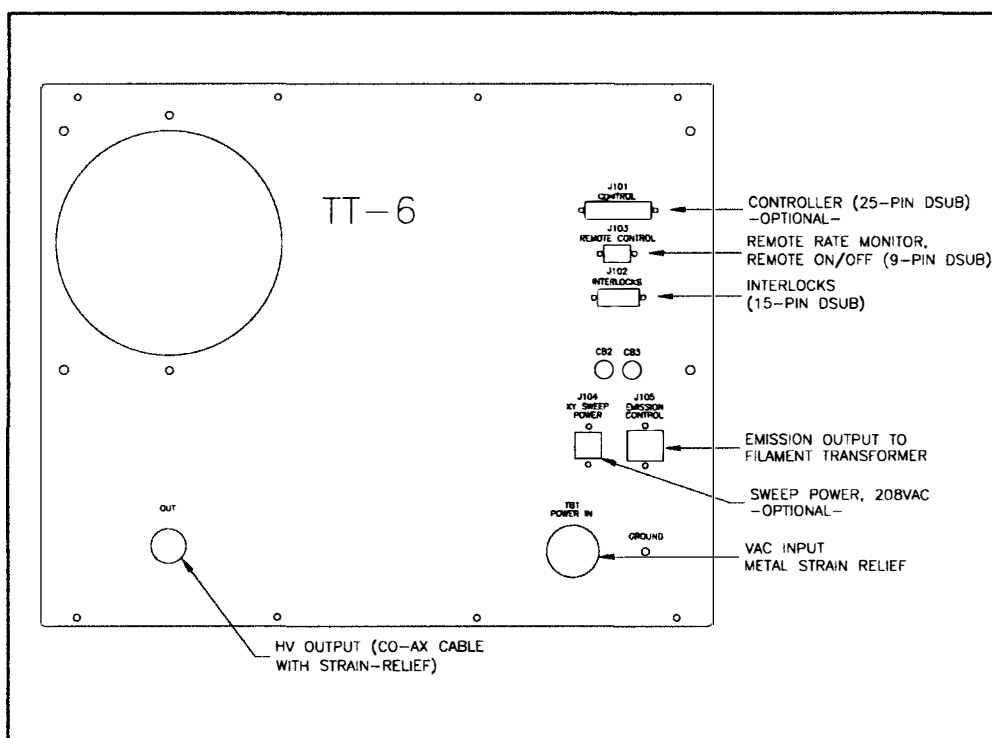
POWER IN - TB1



CAUTION - GREEN WIRE MUST BE CONNECTED TO UTILITY GROUND. IT MUST NOT BE DISCONNECTED OR BE CONNECTED TO ANY OF THE HOT LINES.

When the power supply has been installed as described in the preceding sections, the primary power should be the last connection made, with the power

Figure 3-C
Main Cabinet
Rear View



off. See Figure 3-D, Main Cabinet Connections and 3-E, VAC Input Terminal Block.

Input power is connected to the terminal board (TB1) mounted on the deck of the power supply cabinet. Input power should be connected to terminals 1 and 2, and ground to terminal 3. See the appropriate schematic for the power requirements.

Sweep Module - Rear Panel

See Figure 3-G

INPUT V.A.C. CONNECTION - Power

The VAC input connector (on the back panel) is a standard 115VAC 3-pin plastic domestic male computer-style (there is a choice of input cable for either standard outlet use, or the 208V single-phase jack on the back of a TT-3/6 power supply. The 208VAC cable is provided with systems units).

This Sweep allows you 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 an EB gun coil 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 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-6 POWER SUPPLY CONNECTION - J1

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

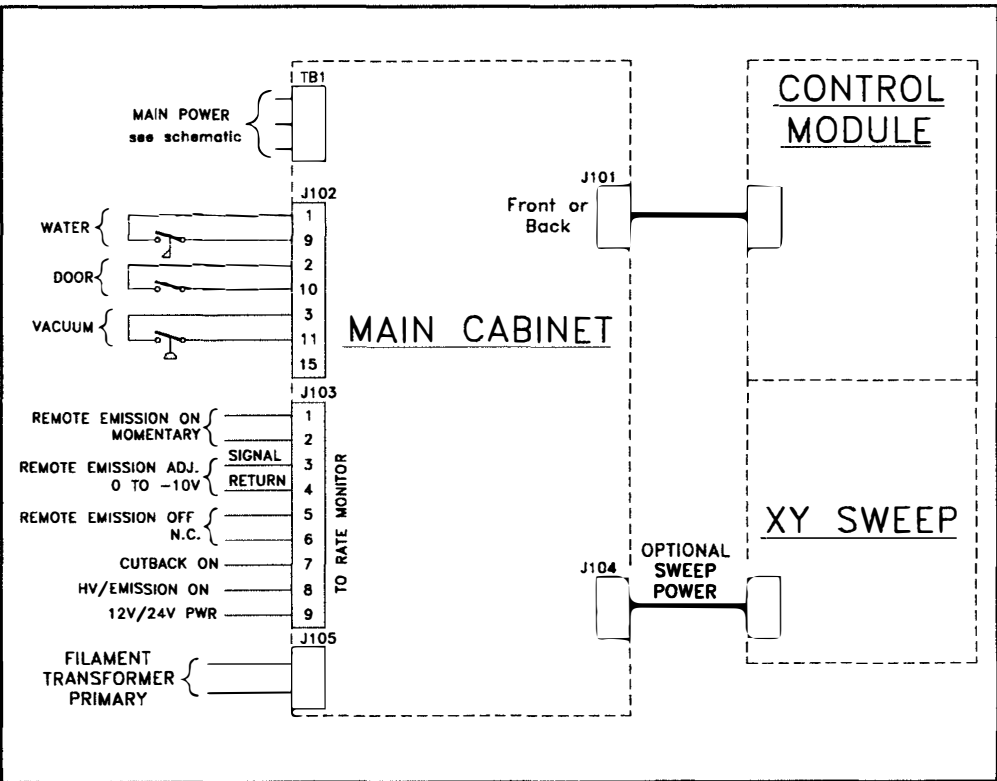


Figure 3-D
Main Cabinet
Connections

Figure 3-E
VAC Input
Terminal
Block

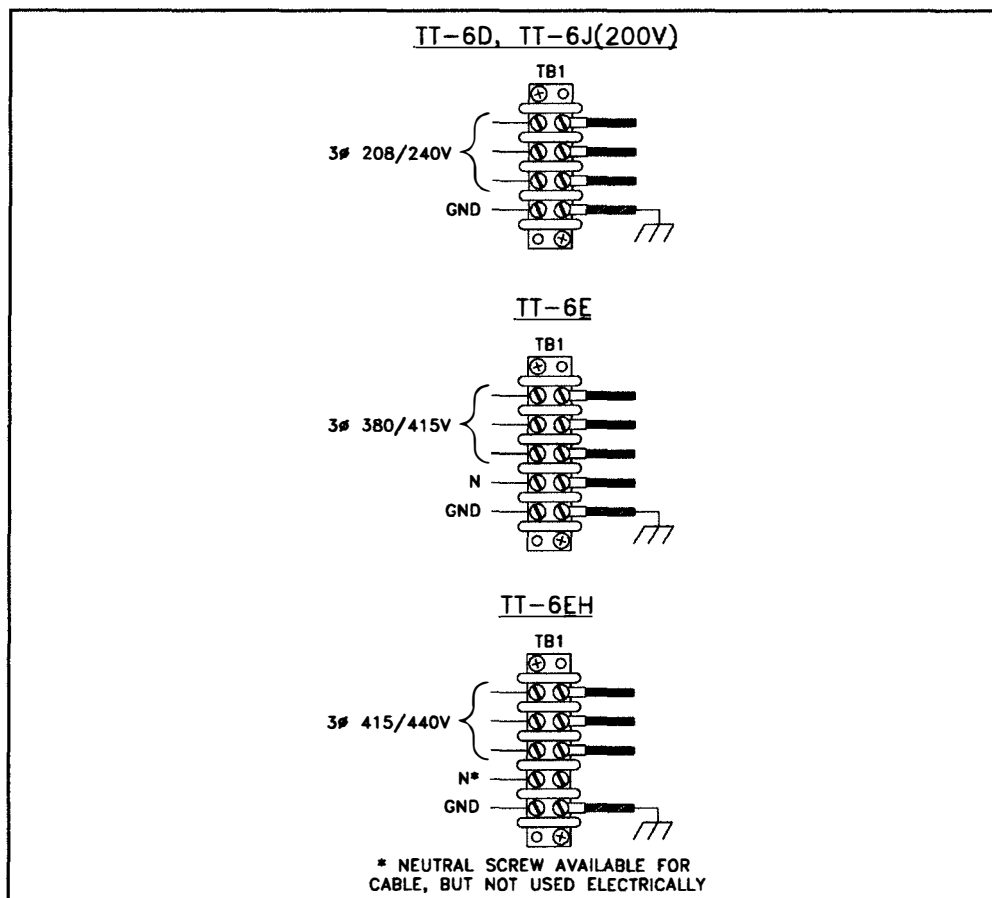
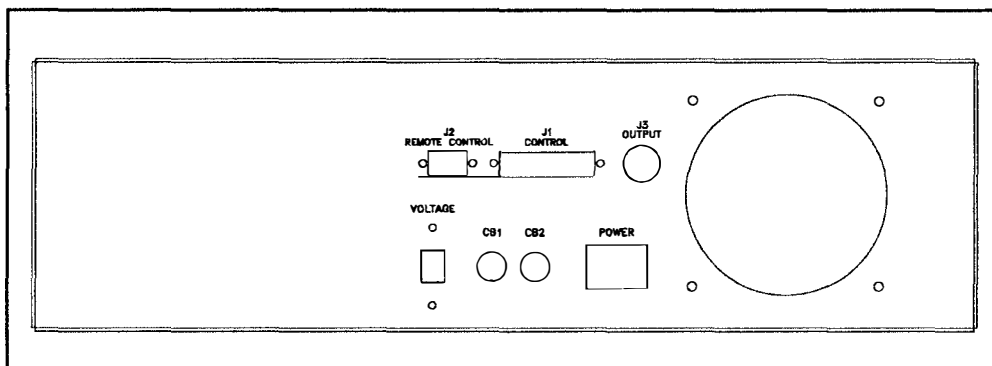


Figure 3-F
Sweep
Module
Rear View



REMOTE PATTERN-SELECTION CONNECTION - J2

You may control the external selection of the Sweep Select Module's pattern banks. This is accomplished through this male 9-pin D-sub. An indexer or computer may be used in conjunction with the Sweep Select Module to choose which 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.

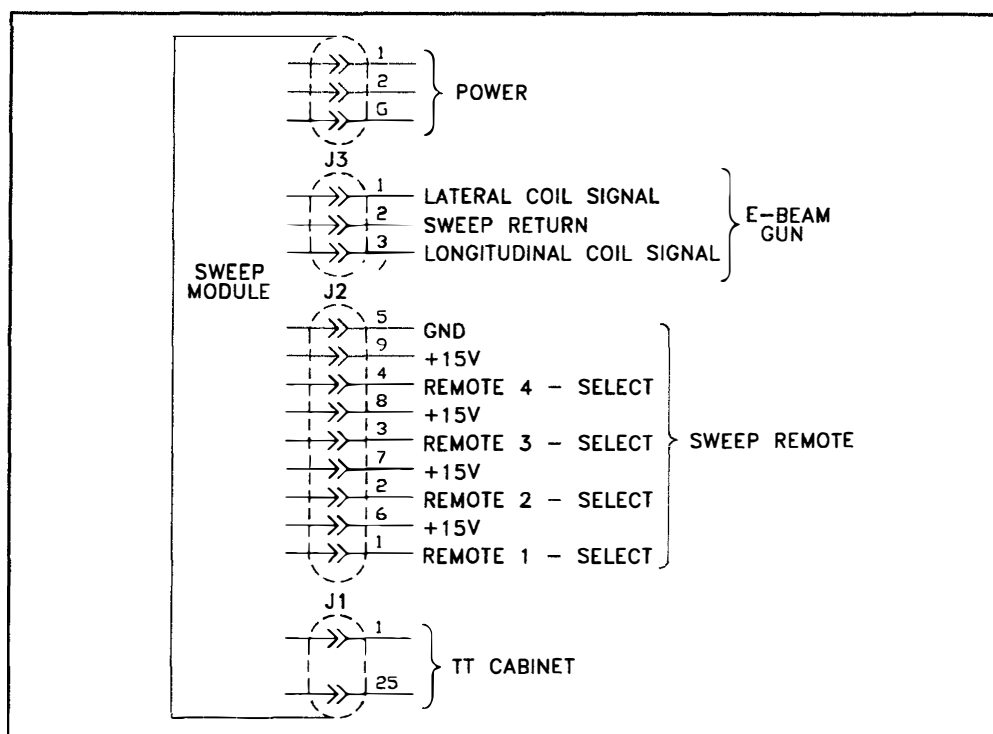


Figure 3-G
Sweep
Module
Connections

Sweep Module - Front Panel

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-B, Sweep Chassis.

CONTROLLER/ JOYSTICK CONTROL - J4 & J5

The left module bay on the front of the chassis has 37-pin female D-sub connectors 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-sub connectors 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).

CONTROLS AND INDICATORS

Control Module - Power Supply

Please refer to Fig. 4-A, Control Module Front View.

This section provides a description of the functions of the controls and indicators located on the handheld control module.

- 1** *HIGH VOLTAGE/EMISSION, OFF - The on/off function is provided by a pair of push-buttons on the panel at the lower left. The off button lights when the High Voltage and the Emission are off.*
- 2** *HIGH VOLTAGE/EMISSION, ON - The on button lights when High Voltage and the Emission are on.*

The interlocks are sequential. That is, the first open interlock in the string is indicated and when it is closed, the next open interlock is indicated. When all interlocks are closed, all of the LEDs will be energized. If Zero Start is not engaged, no interlocks can light.

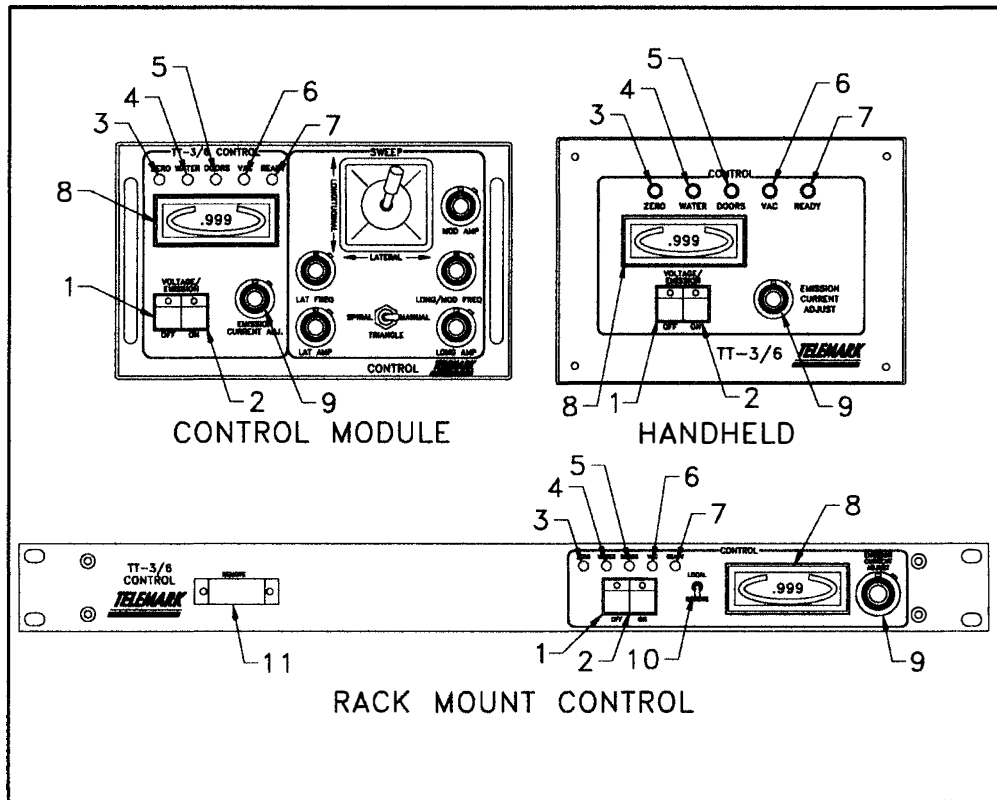


Note: There is a jumper on the motherboard for **REMOTE- ON BYPASS** that also requires a jumper at J3 pins 5-6. This 2nd jumper may be applied at J103 on the back panel.

- 3** *ZERO - This interlock insures that the emission control is at its minimum position before high voltage and filament voltage can be applied to the source. The LED will light when the emission control knob is fully counterclockwise. For "AUTO" mode, the input would need to be near 0 VDC.*

- 4 **WATER** - A water flow switch in the water return line from the source assures that there is sufficient water flow to cool the source. The LED will energize when the interlock is closed.
- 5 **DOORS** - When interlocks on all doors and panels that permit high voltage access are closed, the interlock is closed.
- 6 **VACUUM** - With a high vacuum gauge utilized in the system, the minimum vacuum level set on the gauge must be present before high voltage can be energized.
- 7 **READY** - When all of the interlocks are closed, this indicator will be energized. The **OFF** push-button LED will also energize at this time.
- 8 **VOLTAGE/CURRENT METER** - A digital bar graph displays the output voltage and a digital display shows the emission current. The voltage range of indication is 0 to -10 kV and the current is 0 to .999 ampere.
- 9 **EMISSION CURRENT** - Clockwise adjustment of this control increases the emission level of the electron beam source.
- 10 **REMOTE/LOCAL** - (Rackmount model) Switch to toggle control between panel and optional handheld control.

Figure 4-A
Control
Module -
Power
Supply, Front
View



- 11 REMOTE CONNECTOR** (Rack mount only) - A remote connection can be made from either this connector or the one on the back.

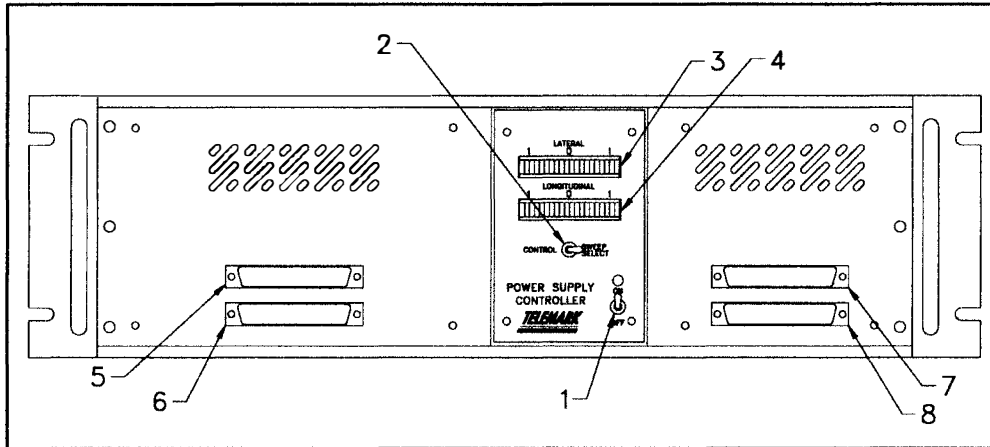


Figure 4-B
Control
Module
Chassis,
Front View

Control Module Chassis (Optional)

See figure 4-B

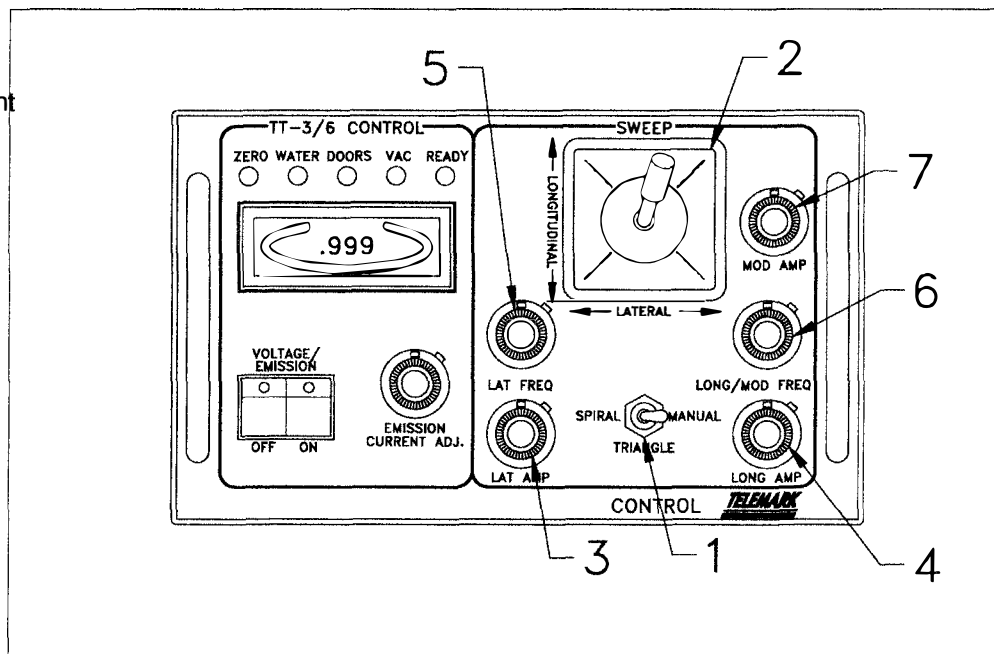
- 1 ON/OFF SWITCH**—Provides Sweeper power, not TT-3/6 Controller power.
- 2 MODE (CONTROL / SWEEP SELECT) SWITCH**—selects between Control on the left and Sweep Select on the right.
Note: when no Memory Module is connected, operation defaults to the Controller (Joystick) Module.
- 3 & 4 POSITION L.E.D.s**—show 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 hardware.
- 7 & 8 SWEEP SELECT CONNECTORS**—used similarly to the Control Connectors.

XY Sweep Controller (with Memory Module) (Optional)

See figure 4-C

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

Figure 4-C
Sweep
Module, 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 *SPIRAL* condition, 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 size (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.

Sweep Select Module (Memory Module) (Optional)

See figure 4-D

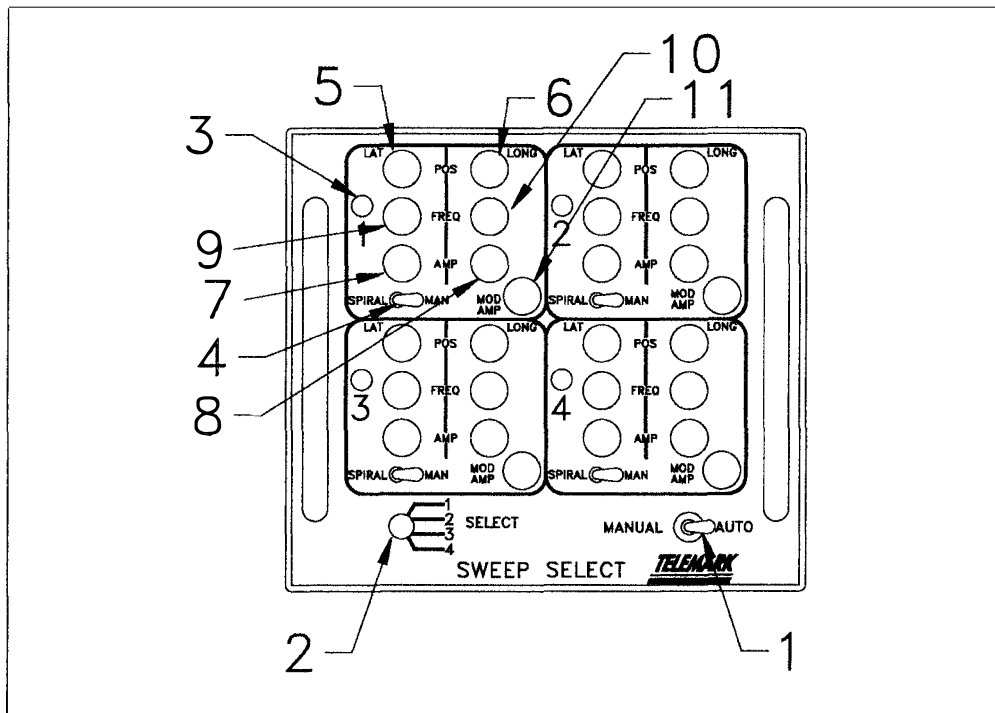


Figure 4-D
Sweep Select
Module, Front
View

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 condition, 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 (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.*

Main Cabinet

See Fig. 4-E

- 1** *MAIN CIRCUIT BREAKER - This provides primary circuit protection. When it is ON, AC power is applied to the power supply. (2-pole single phase, TT-3; and 3-pole three phase, TT-6)*
- 2** *CONTROL POWER - These (1 amp, TT-3; and 2 amp, TT-6) thermo breakers provide protection for the control circuits. If they should TRIP, their actuators must be pushed in to resume normal operation.*
- 3** *MAIN POWER INDICATOR - This LED lights when power is applied to the control circuits.*
- 4** *HIGH VOLTAGE INDICATOR - This LED lights when the high voltage is turned on.*

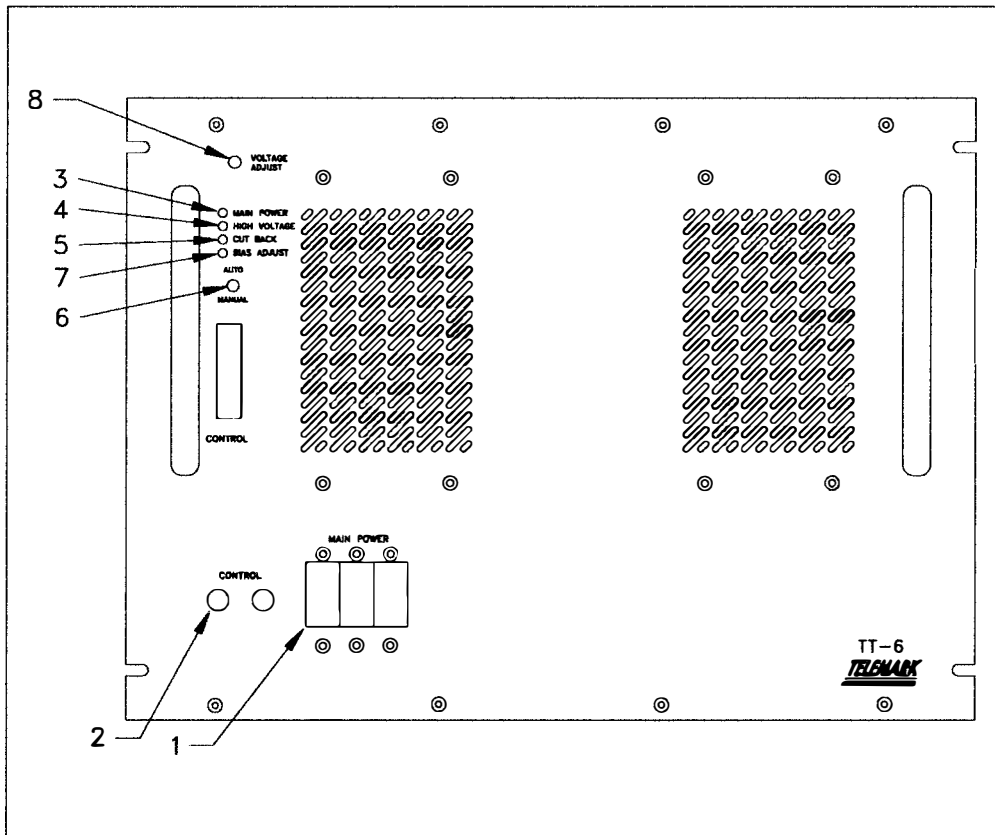


Figure 4-E
Main Cabinet
Front View

- 5 CUTBACK INDICATOR** - This LED energizes when the power supply is in a cutback condition.
- 6 MANUAL/AUTO MODE SWITCH** - This switch selects the mode of operation of the power supply. When in the **MANUAL** position, the **ON** push-button and **EMISSION** potentiometer on the handheld control module are active. When in the **AUTO** position, the control functions of J103 are active. The **OFF** switch on the control module is active at all times.
- 7 BIAS** - The Bias adjustment is located under the LEDs. The Bias trim pot is recessed and is used to adjust the "bias" set point (the minimum source current). Turning clockwise with a small flat head screwdriver increases the filament current. With the source current on and the emission current set at "0" the bias should be adjusted to the point that the beam just begins to appear. Line voltage changes may affect this set point.
- 8 VOLTAGE ADJUST** - Clockwise adjustment of the pot increases the output voltage level. On EB sources without sweep coils the beam can be centered in the pocket longitudinally with the voltage adjust.

OPERATION

Introduction

This section describes the normal operating procedures for the Telemark TT Power Supplies.

Preliminary Precautions

Before turning on the system for the first time, it is essential that the following conditions are observed:

- 1 *The ground system is correctly installed as described in detail in Chapter 3 (Installation), System Grounding Practice.*
- 2 *The external interlocks are correctly installed as described in detail in Chapter 3, Interlock Connections, page 3-5.*
- 3 *The vacuum tank is operational.*
- 4 *The filament assembly is assembled to specifications and not shorted to ground, and the E-beam gun has material in its crucible.*

Power Supply Startup

- 1 *Turn on primary **AC POWER** circuit breaker.*



Note: Allow two minutes for the unit to warm up before proceeding.

- 2 *Observe the interlock lights. All should be on. If any of these lights are not illuminated, Source Emission Adjust must*

be to zero, the corresponding open interlock must be located and the condition causing the open interlock corrected. The high voltage and source filament are then ready to be turned on.

- 3** *With the front panel switch in **MANUAL** turn on the high voltage and emission by depressing the Controller's **ON** push-button.*
- 4** *High voltage will now be applied to the electron beam source and HV level will be indicated by the **High Voltage** digital bar graph.*
- 5** *Adjust high voltage to the operating level.*
- 6** *Slowly increase the **BIAS ADJUST** trimmer until you see a small amount of emission current. Check the E-beam gun source for a beam. Decrease this setting to slightly below the point at which emission occurs. Leave the potentiometer at this setting.*
- 7** *Increase the Controller's **SOURCE EMISSION ADJUST** potentiometer to the required operating level indicated by the digital display of current.*

XY Sweep (with Memory Module) Setup

The following is the procedure to set the Sweep Module 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*
Perform steps 3 through 6 above. 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.
- 6** *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.*

- 7 Place the front-panel switch "control/sweep select" in the "sweep select" position.
- 8 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.
- 9 Switch the channel's mode switch to "man" (manual).
- 10 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.
- 11 Repeat the last three steps for each of the other pattern-bank channels.
- 12 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 The 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.

Power Supply Shutdown

- 1 Reduce the **EMISSION ADJUST** potentiometer to zero. The indicated emission current should go to zero. If it does not, the bias setting is too high and should be reduced.
- 2 Turn off the high voltage and emission by depressing the **OFF** push-button. The indicated voltage level will go to zero.

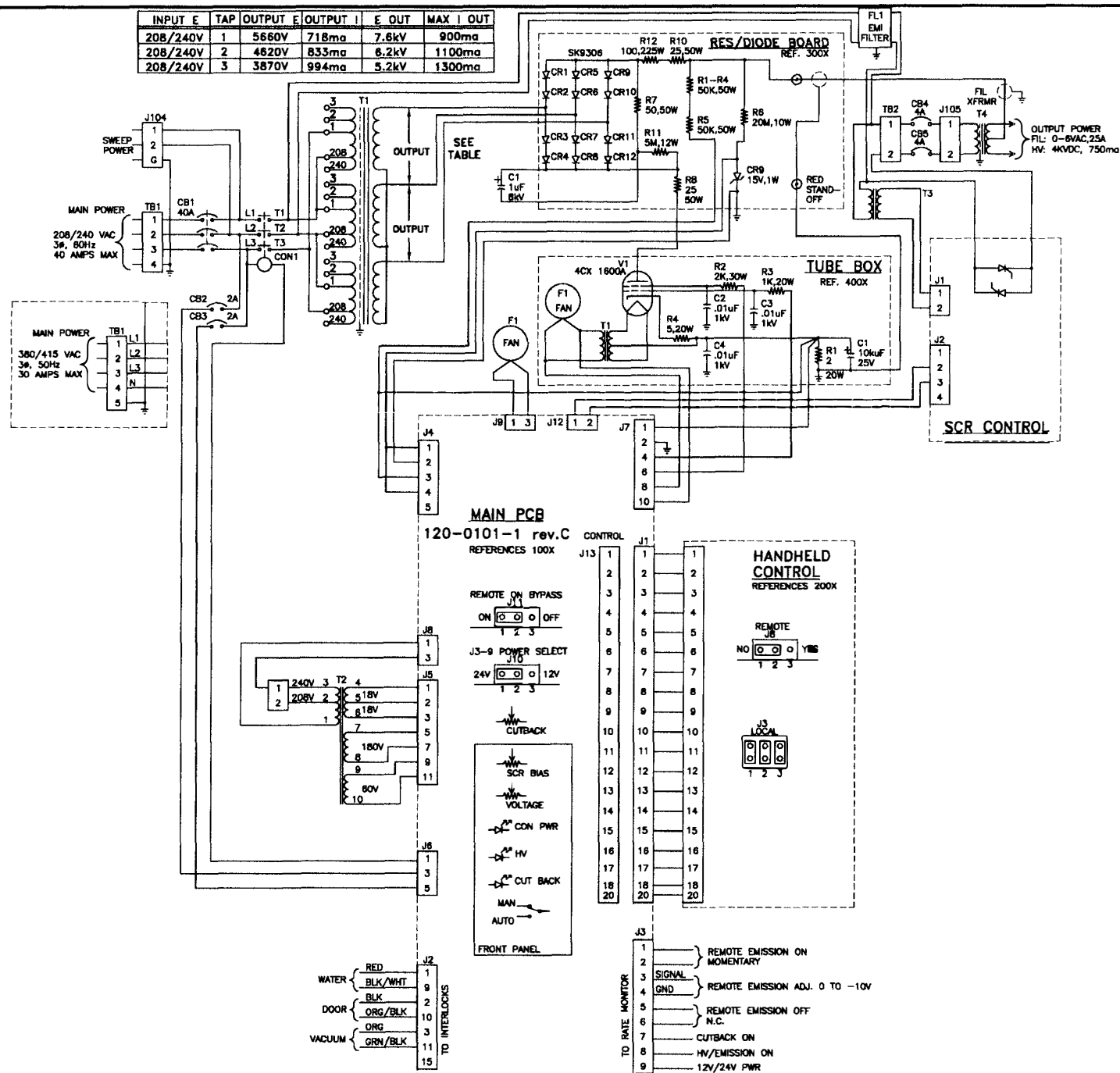


Note: Allow two minutes for the unit to cool down before proceeding.

{This may be accomplished with the optional TT-3/6 Controller section of the Controller/Joystick Module. Note also the Power Supply high-v will be deactivated if the Controller/Joystick Module is unplugged.}

- 3** Turn off the main circuit breaker.
- 4** Turn off the Sweep's **POWER** switch. The sweep outputs are deactivated.
- 5** Turn off the primary source of (208/240) VAC power to the system.
- 6** The system is now totally de-energized.

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TT-6 MAIN CHASSIS SCHEMATIC

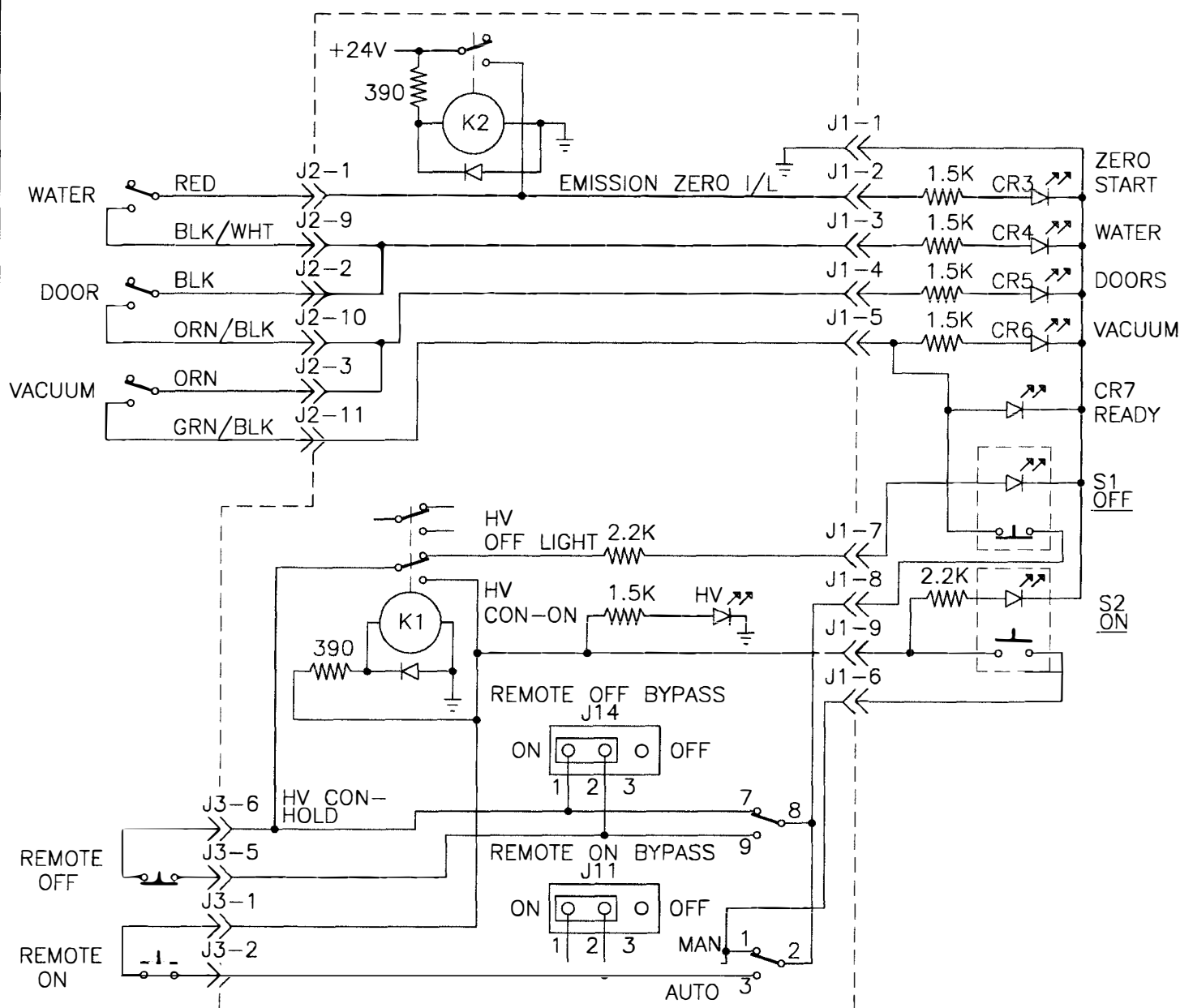
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REV G

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DATE 12/23/99

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IF USED IN THE AUTOMATIC MODE THEN THE "REMOTE OFF" SWITCH OR J14 MUST BE USED.

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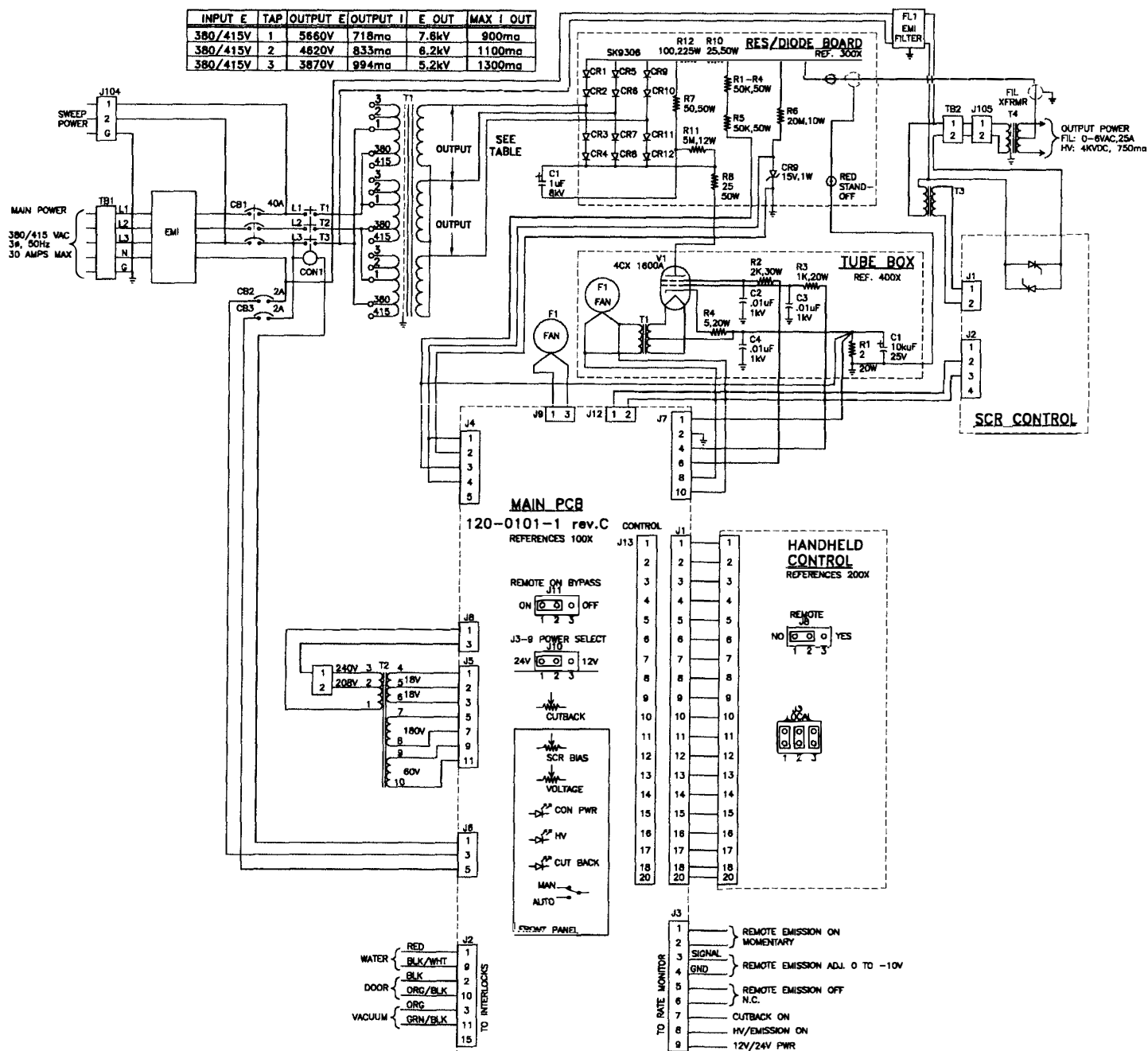
TT-3/6 SIMPLIFIED ON/OFF CONTROL

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TT-6E MAIN CHASSIS SCHEMATIC, 50Hz

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