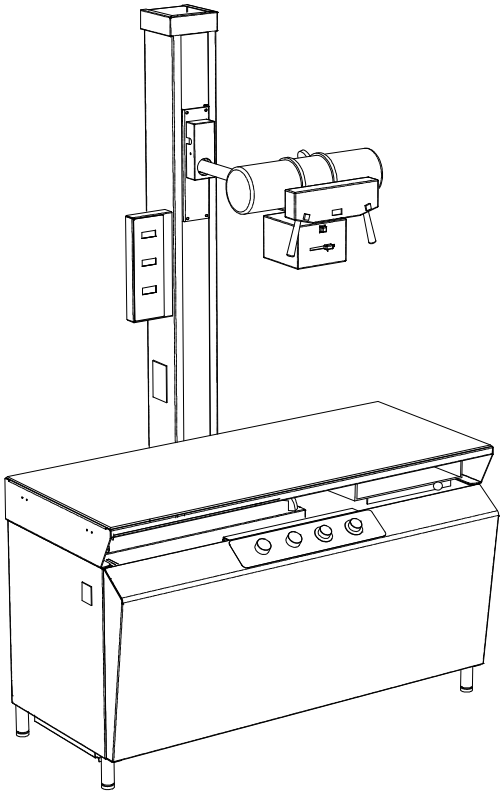
INTEGRATED VET GENERATOR

Model K200-13
INSTALLATION INSTRUCTIONS
P/N # 02157-000
Rev. B



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1. MANUAL REVISION CHART

TABLE 1

Vet System Installation and Service Manual Text Revisions			
Revision	**Date**	**Description of Revision**	**ECR No.**
A	SEPT. 2004	NEW RELEASE	4252
B	AUG. 2011	ADDED SUMMIT TUBES ON PAGE 29	7269

2.0 INTRODUCTION

The equipment, which is described in this manual, will perform reliably when installed, operated, and maintained in accordance with the instructions of this manual.

This equipment is sold with the understanding that the user assumes sole responsibility for radiation safety and that the manufacturer does not accept any responsibility for any of the following:

A. Equipment improperly installed.
B. Equipment improperly operated.
C. Equipment improperly maintained or repaired.
D. Equipment, which has been modified or altered in any way.
E. Injury or damage to patient or other personnel for any of the above causes.

We are proud of our products and are confident they will provide many years of useful and enjoyable service.

Summit Industries, Inc.

3.0 RADIATION, MECHANICAL, ELECTRICAL WARNINGS

1. RADIATION

WARNING

X-rays are dangerous to both operator and others in the vicinity unless established safe exposure procedures are strictly observed.

The useful and scattered beams can produce serious, genetic or potentially fatal bodily injuries to any persons in the surrounding area if used by an unskilled operator. Adequate precautions must always be taken to avoid exposure to the useful beam, as well as to leakage radiation from within the source housing or to scattered radiation resulting from the passage of radiation through matter.

Those authorized to operate, test, participate in or supervise the operation of the equipment must be thoroughly familiar and comply completely with the current established safe exposure factors and procedures described in publications such as Sub-Chapter J of Title 21 of the Code of Federal Regulations, "Diagnostic x-ray Systems and their Major Components," and the National Council on Radiation Protection (NCRP) No. 33, "Medical x-ray and Gamma-Ray protection for energies up to 10 MeV-Equipment Design and Use," as revised or replaced in the future.

Failure to observe these warnings may cause serious, genetic or potentially fatal bodily injuries to the operator or those in the area.

2. ELECTRICAL

WARNING

Failure to comply with the following may result in serious or potentially fatal bodily injuries to the operator or those in the area.

Only properly trained and qualified personnel should be permitted access to any internal parts. Live electrical terminals may be deadly; be sure line disconnect switches are opened and other appropriate precautions are taken before opening access doors, removing enclosure panels, or attaching accessories.

Do not remove the flexible high voltage cables from the x-ray tube housing or high voltage transformer or the access covers from the generator until the main and auxiliary power supplies have been disconnected.

When disconnecting high voltage cables, they must be grounded immediately in order to dissipate any electrical charge that may remain on the cables or the tube.

3. MECHANICAL

WARNING

All of the movable assemblies and parts of x-ray equipment should be operated with care. Only properly trained and qualified personnel should be permitted access to any internal parts.

4. SPECIFICATIONS

1. TECHNICAL RATINGS

TABLE 2 – TECHNICAL RATINGS

	300mA Station
Rated Line Voltage –	240 VAC, 60Hz., Single Phase.
Acceptable Line Voltage Regulation at Maximum Line Current	Not to exceed 5%.
Maximum Line Current (240 VAC input)	140A @ 300mA
Technique Factors that Constitute the Maximum Line Current	300 mA @ 125 kVp.
Control Rating – Output Current	100 mA and 300mA are standard.
Control Rating – Output Voltage	40 to 125kVp
Control Duty Cycle –	100 mA @125 kVp-4% 300 mA @ 125 kVp-1%

2. SPACE REQUIREMENTS

The generator is designed to fit into an enclosed space, such as within the base of a radiographic table.

3. ELECTRICAL REQUIREMENTS

TABLE 3 – ELECTRICAL POWER SUPPLY REQUIREMENTS

	300mA Station
Equipment Category	300mA @ 125 kVp, Single Phase
Nominal Line Voltage	240 VAC, 60 Hz., Single Phase
Line Voltage Range Allowed (Alternate line voltages which will provide normal operation.)	194-284 VAC.
Maximum Momentary Line Current	140 amperes (at 240 VAC)
Note: Maximum momentary line current at alternate line voltages can be determined using the formula:	$I_2 = \frac{140 \times 240}{V_2}$ V_2 = alternate line voltage I_2 = maximum line current at the alternate line voltage, "V_2."
Line Voltage Regulation under load	The line voltage drop under load is not to exceed 5% at maximum line current.

Calculating line voltage regulation	$\frac{(V_{NL} - V_L)}{V_L}$ X100 V_{NL} = line voltage under "no load" conditions V_L = line voltage under "full load" conditions
Minimum Over Current Protection Rating (Service disconnect)	50% of maximum line current rating or greater. (100 Amps is recommended.)
Distribution Transformer Requirements	Minimum 30 kVA dedicated to the x-ray control
Wire Size from Power Transformer to Disconnect Switch	for 50 feet use #2 AWG; for 100 feet use #00AWG; for 200 feet use 250 mcm

The information provided in Table 3 above and text below is taken from NEMA standards. *Minimum Power Supply Requirements for x-ray Machines,* and *National Electric Code.*

Connection to Supply Circuit (taken from N.F.P.A. 70-1984)
A disconnecting means of adequate capacity for at least 50% of the input required for the momentary rating shall be provided in the supply circuit. The disconnecting means shall be operable from a location readily accessible from the x-ray control. Underwriters Laboratories also requires that this disconnecting means to be mounted on either the wall behind the x-ray control or the wall directly adjacent to it.

5. UNPACKING and ASSEMBLY

1. The ***AV2 Integrated Vet Generator*** is delivered in three packages:

- High voltage transformer, control, x-ray tube (palletized).
- Table, collimator and accessories.
- Tubestand.

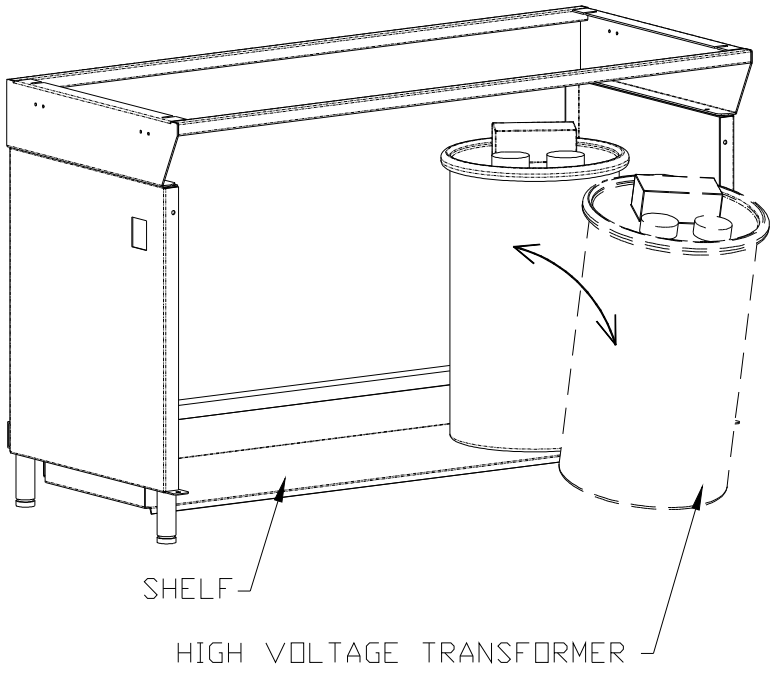
2. **It is the installer's responsibility to inspect the shipment for damage and proper count.** Upon receipt of the merchandise, any visible damage to the cartons should immediately be examined while the shipper is present. If the visible damage to the cartons also includes damage to the merchandise, the installer is responsible for making all claims with the shipping company.

If there is hidden damage to the merchandise, it is the installer's responsibility to discover that damage within a reasonable amount of time and contact the shipping company.

3. Install High Voltage Transformer.

Using a piece of cardboard to protect the floor, push the transformer onto an enclosure. (One enclosure example might be the right side of table base shelf as shown below). Once the transformer is in place, loosen the screw on the vent plug to allow for oil expansion. Cover the vent plug and flange with one of the loose fitting plastic covers provided with the HV transformer to prevent contaminants from entering the oil.

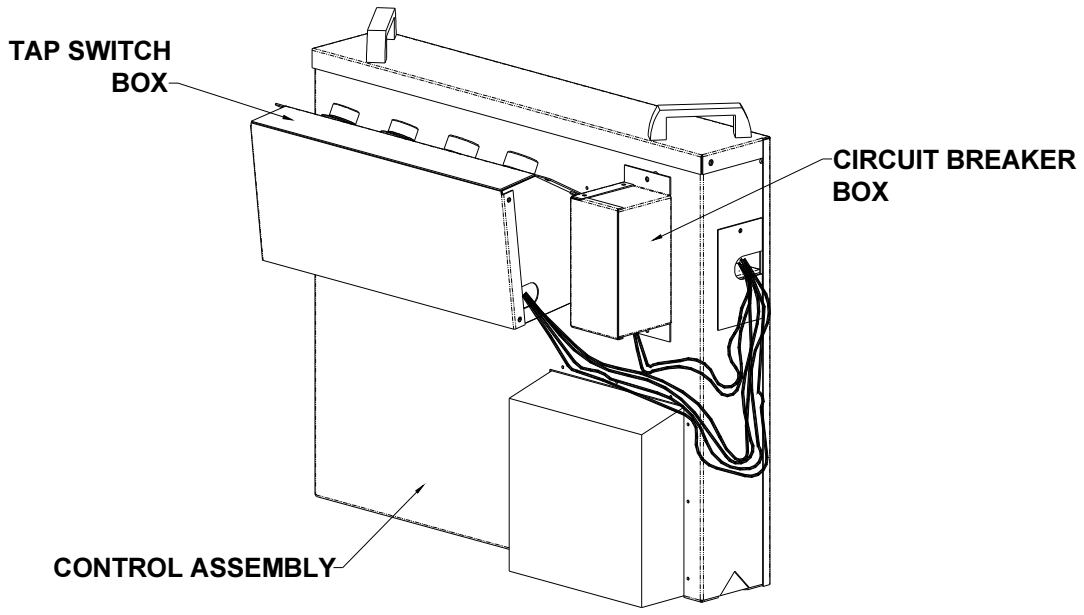
Note: It is also recommended that the transformer and control be installed before the tubestand is mounted to the table for maximum stability during installation.



4. Place generator in enclosure.

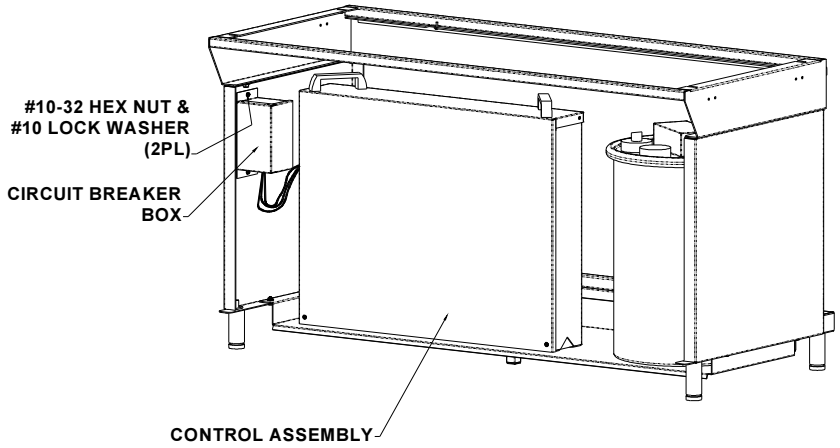
During shipment the tap switch box, circuit breaker box, and control are banded together. Together these three items comprise the generator assembly as shown below. (A fourth component of the generator assembly is the display box, which ships in the accessory carton and will mount to the tubestand column.)

Using the handles provided move the generator assembly to the enclosure. (An example would be a table base as shown below). Cut loose the banding. Remove the hardware necessary to separate the three items. Place the generator assembly into the enclosure.

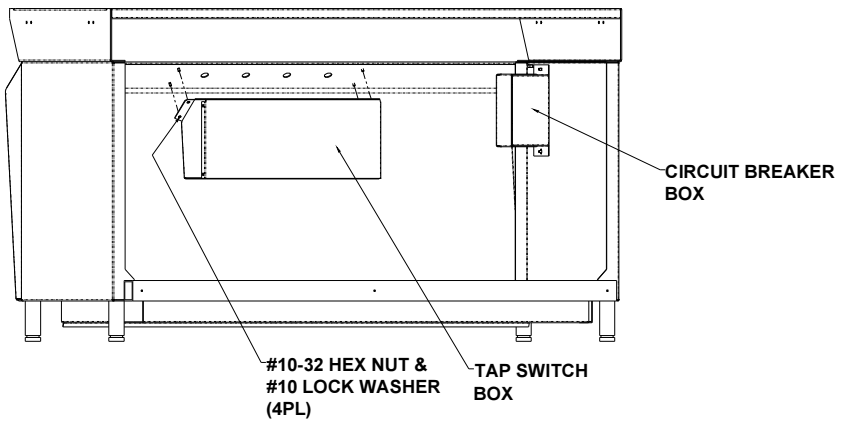


6. GENERATOR INSTALLATION

1. If not done so previously, cut loose the banding materials and move the generator assembly to the front of the enclosure. A table base is shown below as an example of an enclosure. Remove the hardware necessary to separate the three items. Place the generator assembly close to the front of the enclosure so cable routing can be laid out, yet not inside the enclosure so access is easy. Mount the circuit breaker box for easy user access.

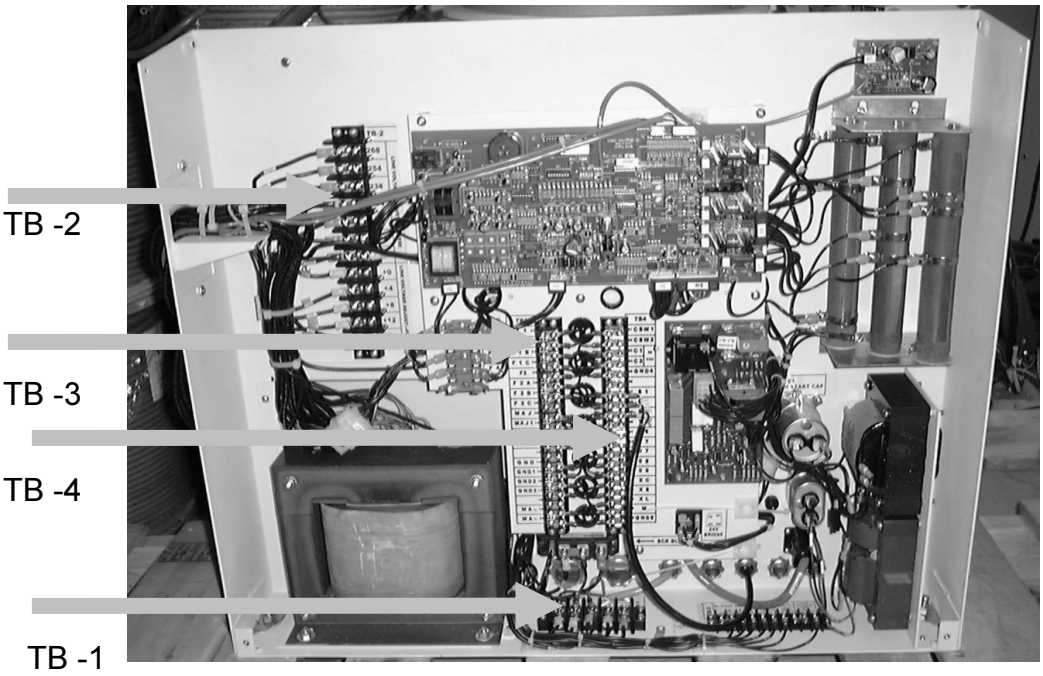


2. Mount the tap switch box to the front panel of the table, by removing the knobs and securing the box as shown. The front panel can be placed to the left side of the table base.



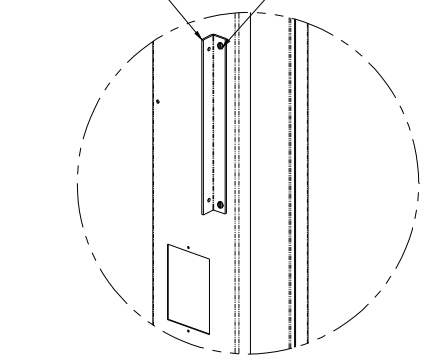
3. Remove the front cover of the control to access internal electrical connections.

Generator internal connection point locations

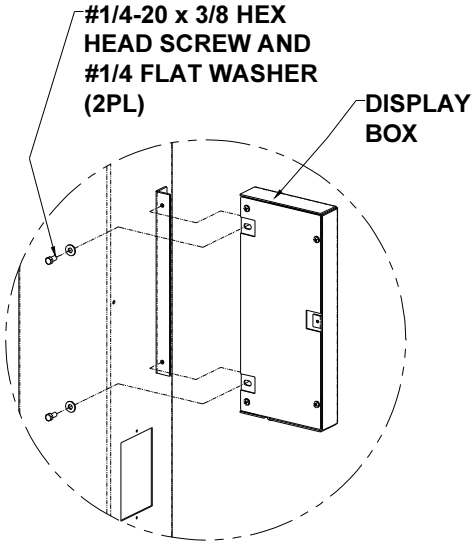


4. Once the generator and transformer are in place mount the collimator and x-ray tube to the tube mount platform of the tubestand arm. Refer to the manuals for the x-ray tube, collimator and high voltage transformer for specific information. **Typically when using a Toshiba tube and model G800 collimator two 1/8" thick spacers provide x-ray to light field size coincidence.**

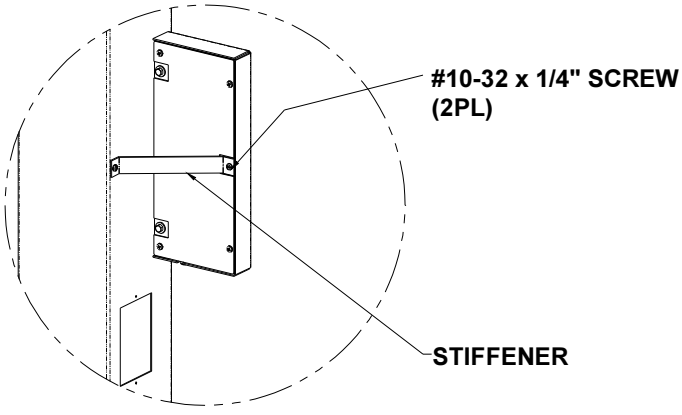
5. Secure the display mounting bracket to the column, ensuring that the mounting hardware does not interfere with motion of the counterweight assembly. Mount the generator display box and route the cable to the back of the control.



STEP 1
INSTALL MOUNTING BRACKET



STEP 2
INSTALL DISPALY BOX



STEP 3
INSTALL STIFFENER

Cable Entry Points at rear of Control

7. Generator Electrical Connections

NOTE: Whenever connecting devices to the generator it is recommended to make the connections one device at a time. This way a faulty device or field miswire can be quickly identified and corrected. Electrical connections within the generator at TB3 and TB4 are clearly marked. However, the control is positioned low on the table base shelf. As a result, field miswires due to parallax error are possible and are to be avoided. Failure to do so may cause component damage not covered under warranty.

1. Connect the Primary cable (labeled P1, P2 and GND) and the Filament cable (labeled XS, XL, XC and GND) to the High Voltage transformer terminals which carry the same markings.

2. Route the tubestand display cable from the tubestand into the black connector on the back of the generator. The connectors are keyed for proper orientation. This cable, as the stator and collimator cables, must not limit nor be strained by tubestand motion.

3. Route the x-ray tube stator cable (labeled T5, T6, 07, 08 and 09) through one of the openings in the control and connect to TB - 4 terminals 31, 32, 33, 34 and 35 respectively, which are labeled the same as the cable.

Refer to Table 4 and Figure 15 for reference. Remove jumper between terminals T5 & T6 of TB4 when connecting tube's thermal switch.

Table * – Common Stator Cable Designations

DESCRIPTION		COLOR CODE FOR STATOR CABLE		
TERMINAL TB4 MARKINGS	**CONNECTIONS**	**EUREKA TUBES**	**MACHLETT TUBES**	**SUMMIT & TOSHIBA TUBES**
T5	THERMAL CUTOUT SWITCH	ORANGE/ BROWN	---	YELLOW
T6	THERMAL CUTOUT SWITCH	BROWN/ ORANGE	---	BLUE
07	RUN WINDING OF TUBE STATOR	BLACK	BLACK	BLACK
08	START WINDING OF TUBE STATOR	RED	GREEN	RED
09	COM. LEAD OF TUBE STATOR	WHITE	WHITE	WHITE

4. From the standard two-position foot switch, route the cable (labeled S1, S2 and S3) through one of the openings in the control and connect to TB – 4 terminals 27, 28 and 29 respectively, which are labeled the same as the Foot Switch cable. (Refer to Figure *** below for reference.)

5. Connect the high voltage cables:
   A) Be careful of the three pins at each end of the cables as they can break or bend if the cable is dropped.
   B) Route the cables into the rear of the table so that they do not limit or restrict tubestand motion and they are not stressed by the tubestand motion.
   C) The HV cable terminals must be thoroughly cleaned and then coated with Vapor Proofing Compound (normally provided with x-ray tube) prior to insertion into the x-ray tube or HV transformer receptacles. It is common to use dielectric oil at the HV transformer end and vapor proofing compound at the x-ray tube end.
   D) Be sure that "Anode" of HV transformer connects to "Anode" of x-ray tube, and "Cathode" to "Cathode". Insert the HV cable terminals into the appropriate receptacle and screw the cable nut as tightly as possible by hand – Do not use tools for tightening.

Caution: Be certain to verify that the control's on/off switch is in the "OFF" position, and that the main incoming power at the service disconnect is also in the "OFF" position. It is strongly recommended that a meter be used to confirm no voltage is present before connecting the line cable to the service disconnect switch.

6. Route the line cable under the lower tubestand rail and wire it into the safety disconnect. Connect "L1" to one leg of the incoming line power, "L2" to the other incoming leg of line power, and "G" to the ground lug.

7. Line voltage adjustments:

   Terminals on TB2 are provided for coarse and fine adjustments of line voltage. Measure the line voltage at the disconnect switch and relocate wires marked "LVAC" and "LVAF" to two terminals where the sum of the two terminals markings equal the measured line voltage, ±2 VAC. For example: If line voltage is 240 VAC, connect "LVAC" to "224" and "LVAF" to "+16".

8. **It is strongly recommended that once the foot switch, stator and high voltage cables are connected a few low power exposures are taken to ensure the generator is fully operational. Once generator function is verified the collimator and other room interface connections can be made one at a time, with a verification exposure between the addition of each new device.**

9. Route the collimator cable (labeled CSW1, CSW2, C1, C2 and GND) through one of the openings in the rear of the control and connect it to TB – 4 terminals 21, 22, 23, 24 and 25 respectively, which are labeled the same as the cable. Do not connect CSW1 and CSW2 to the exposure switch locations S1 and S2! (Refer to Figure ** for reference).

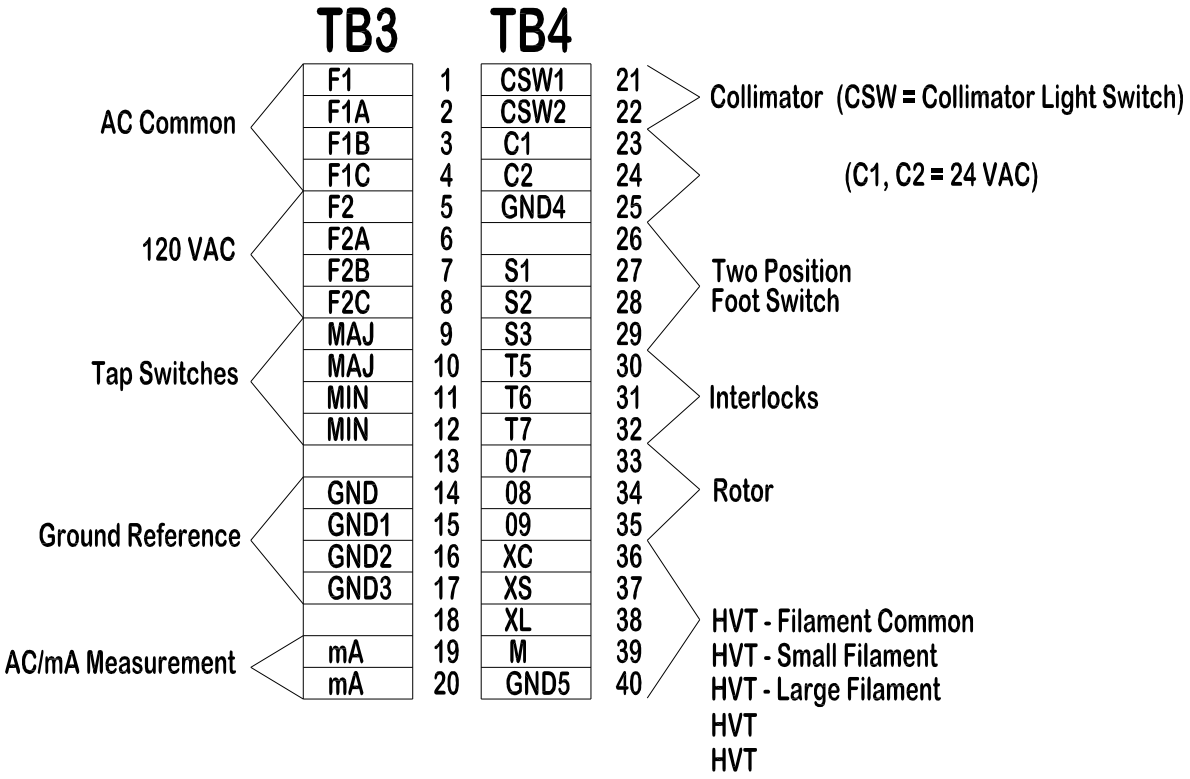


Figure 15 - TB3 and TB4 Terminal Designations

8. PRE-CALIBRATION CHECKS

1. It is recommended that the assembler read and understand the information provided with the x-ray tube prior to making any x-ray exposures. Particular attention should be given to:

   A) Initial seasoning of the x-ray tube
   B) Single exposure tube ratings
   C) Accumulated heat and anode ratings of tube

2. Line voltage adjustments:

   Terminals on TB2 are provided for coarse and fine adjustments of line voltage. Measure the line voltage at the disconnect switch and relocate wires marked “LVAC” and “LVAF” to two terminals where the sum of the two terminals markings equal the measured line voltage, ±2 VAC. For example: If line voltage is 240 VAC, connect “LVAC” to “224” and “LVAF” to “+16”.

3. Prior to turning “on” power, set each selector switch as follows:

TABLE 6 – Selector Switch Settings

Power “On-Off”	“Off”
kVp major and minor	Fully Counterclockwise
mA selector	300L
Time selector	1/120 sec.

4. In order to prevent accidental production of x-rays during initial check-out, disconnect the leads marked P1 and P2 from TB 1 and install a jumper from TP – 13 to TP – 4 of J400 board (this will hold the SCR open). Switch the power safety disconnect switch “ON” and then switch the control’s “ON-OFF” switch to “ON.” Observe the following:

TABLE 7 – Display Readings

mAs display indicates	2.5
kVp display indicates	<40

5. Rotate kVp knobs so that display indicates >40 kVp. While observing the tube filaments through the port of the x-ray tube, verify that the correct filament is lit for each mA station. The small focal spot should illuminate for 100 mA, and the large focal spot should illuminate for 300 mA.

6. Verification of Rotor circuit.

   Depress the foot switch to the 1st stage (PREP), or the "PREP" button on the optional remote switch. Verify anode rotation and filament boost. The bottom status display should show "WAIT" momentarily, then "PREP".

7. The kVp meter circuit is factory adjusted, but display accuracy should be checked prior to other calibration steps.

   1. With power "Off" connect an AC voltmeter capable of reading 0-300 VAC across the wipers (center terminals of tap switches) of the kVp selector switches (major and minor) of TB3 terminals 9 and 10. This will allow measurement of the "no-load" primary voltage.

   2. Turn on power and adjust the kVp selector switches to achieve 220 VAC on the voltmeter. Refer to Table 8 for correct kVp display values

   3. Reset the kVp tap switches to achieve 160 VAC on the meter. Refer to Table 9 for the correct kVp display values.

TABLE 8 – kVp/mA Readings @ 220 VAC

mA Station	kVp display on tubestand
100	114
300	87

TABLE 9 – kVp/mA Readings @ 160 VAC

mA Station	kVp display on tubestand
100	80
300	53

If the kVp meter varies by more than 5 kVp to the above values, proceed to the kVp calibration procedure *** before adjusting mA.

4. Switch the disconnect switch to “Off’ and reconnect the leads P1 and P2 to TB 1 on the control. **Be sure to remove the jumper between TP – 13 and TP – 4 on the J400 PCB.**

9. mA CALIBRATION

Achieving maximum accuracy of tube current (mA) involves two types of adjustments:

- Overall mA level (bands of filament resistor RX), and
- mA balance throughout the useful kVp range (bands of space charge compensating resistor RSCC).

The leads connected to the resistor bands of resistor RX (the third resistor on the right of the three at the right corner of the Control Board) are marked with letters which correspond to the mA stations (small-SM-100mA, medium-MD-300mA, large-LG-not used). Moving one of these bands upwards increases the mA for the corresponding mA station.

The leads connected to the bands of RSCC are also marked with SM (100 mA), MD (300 mA), LG (not used) which correspond to the mA stations. Moving one of these bands upwards increases the space charge compensation, which increases mA at low kVp, and reduces mA at high kVp. Moving one of these bands down reduces the space charge compensation, decreasing mA at low kVp and increasing mA at high kVp.

Normal mA tracking will result in mA values slightly high at 80 kVp and mA values roughly equal to one another but slightly low at the each end of the kVp range (50 and 125 kVp). See Figure 16 below for a visual representation of this effect.

Two terminals of TB3 are marked “mA” (terminals #19 & 20). Remove the factory installed jumper from these two terminals & connect an AC mA meter to these terminals to measure tube current. Be certain to replace the jumper when removing the meter.

NOTE: Ensure that the mAs meter is set to AC mA and that the scale factor of the meter (20, 200, 2000 for example) is set to maximum.

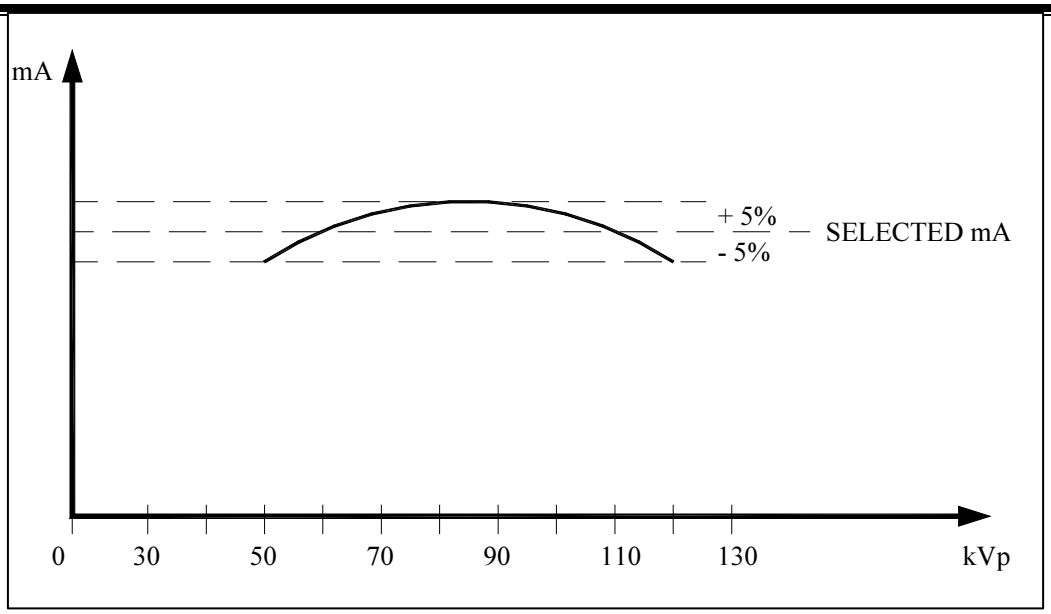


Figure 16 – mA Tracking Example

For the following steps, use mA values and band designations in the table below:

Table 10 – mA Stations/Band Labels

mA Station	100/300 Configuration
100mA	SM
300mA	MD

9. mA Calibration (continued)

In the following procedures, use the SM and MD bands to control filament voltage and mA output for 100 mA and 300 mA respectively. Calibration is typically started with the 100mA station. Note that AC mA can be measured between the mA points on TB3, or in line with the red M1 lead.

1. Connect a Dynalyzer or **AC** mAs meter to perform the following procedure. An AC mAs meter can be inserted into the circuit by removing the jumper between TB3-19 “MA~” and TB3-20 “MA~” and connecting the meter to those terminals (**AC readings only**). Be certain to replace the jumper after removing meter.

2. Select 100 mA and 80 kVp.

3. Adjust the SM band of filament resistor “RX” to produce the desired mA. Moving the band upward increases mA. (Typically about 38 VAC between XC and XS measured at prep results in 100 mA at 80 kVp.)

4. Select 50 kVp and note the mA produced.

5. Select 120 kVp and note the mA produced.

6. If the mA at 120 kVp is higher than the mA at 50 kVp, move the SM band of RSCC upward. If lower, move the band downward. Achieve relative balance per Figure 16 above. The unit is capable, by fine tuning, to track within ±5% of selected value.

7. Repeat steps (3) through (6) until no further adjustments are necessary.

8. Repeats steps 2 through 7 above for the 300 mA station, using the MD resistor band. (Typically about 50 VAC between XC and XL measured at prep results in 300 mA at 80 kVp.)

9. Replace jumper after removing the AC mAs meter.

10. kVp CALIBRATION

Note: In order to make a valid comparison between the actual kVp output and the kVp meter's preread indication, the tube current must be calibrated accurately per section 9. Failure to do so will result in miscalibration of kVp.

For the following steps, use values in the table 11 below

TABLE 11 – Adjustment Pot Identification

Adjustment Pot	mA Configuration
P2	**100** mA offset
P3	**300** mA offset
P5	**100** mA slope
P6	**300** mA slope

In the following procedure, fine tuning of the kVp display calibration depends on the assumption that mA has been calibrated.

1. Offset Adjustment:

   a. Select 50 kVp and 100 mA. While monitoring mA and kVp output, compare the measured kVp to the kVp meter's readings.

   b. Adjust the kVp offset pot (from Table 11 above) that corresponds to the mA of your Station (For a 100 mA station the pot is P2) until the kVp meter's preread indication matches the actual measured kVp output.

2. Slope Adjustment:

   c. Select 110 kVp. Make an x-ray exposure and adjust the slope pot (See Table 11 above) until the kVp meter's preread indication matches the measured kVp output. Repeat steps 1 and 2 until no further adjustments are necessary.

3. Verify that the kVp display tracks well throughout the kVp range.

4. Repeat steps 1, 2 and 3 above for the 300 mA station, using Table 11 as a guide for identifying the appropriate adjustment potentiometer.

The offset and slope adjustments are interdependent; as an adjustment in the offset is made, it will affect the slope, and as an adjustment is made in the slope it will affect the offset. By anticipating the interactive response it will reduce the number of adjustments required to achieve the desired accuracy of kVp display at each end of the kVp range.

Under normal conditions the kVp meter's indication will not deviate from the measured kVp output by more than 5 kVp.

11. CALIBRATION OF kVp WITHOUT A MEANS TO MEASURE ACTUAL kVp

In the following procedures, an mA will be chosen, a kVp tap switch voltage will be set, and the kVp display will be adjusted to indicate the value shown in the column on the left side of Table 12 below.

Typically if 50 kVp and 110 kVp are set in this manner, all values in between will also be correct. The tap switch voltages for kVp outputs between 50 and 110 kVp shown below are not needed for this procedure, but are provided for reference.

TABLE 12 – TYPICAL KVP TAP SWITCH VOLTAGES

kVp	100 mA Station Unloaded Tap Switch Voltage	300 mA Station Unloaded Tap Switch Voltage
50	108	155
60	125	173
70	143	190
80	160	208
90	178	225
100	195	243
110	213	260
120	230	278

11. CALIBRATION OF kVp WITHOUT MEANS TO MEASURE ACTUAL kVp (continued)

1. Connect an AC voltmeter capable of measuring 0-300 VAC to the common terminals of the minor and major kVp tap switches, or to TB3 terminals 10 and 11.

2. Select an mA station. Adjust the kVp tap switches to achieve the voltage which should result in 50 kVp per Table 12 above. (For example, at the 100 mA station adjust the tap switches to achieve 108 VAC).

3. Adjust the kV offset pot shown in Table 11 for the mA station selected. (For 100 mA offset adjust P2), until the kVp meter reads 50 kVp

4. Readjust the kVp tap switches to achieve the voltage which should result in 110 kVp per Table 12. (For example, for the 100 mA station adjust the tap switches to achieve 213 VAC.)

5. Adjust the appropriate slope pot until the kVp meter reads 110 kVp.

6. Repeat steps 2 through 5 until no further adjustments are required.

7. Repeat these steps, adjusting tap switch voltages, then offset and slope pots, until the kVp display indicates the appropriate value across the operating range for each mA station.

12. CONTROL BOARD CONFIGURATION SETTINGS

1. The Integrated Vet System's Control board has a variety of dip switch settings to configure the control for the type of x-ray tube used in the system. These switches are typically set at the factory. Some features shown in the table below are not available on this model of x-ray control. The dip switch combinations are shown in Figure 18 below.

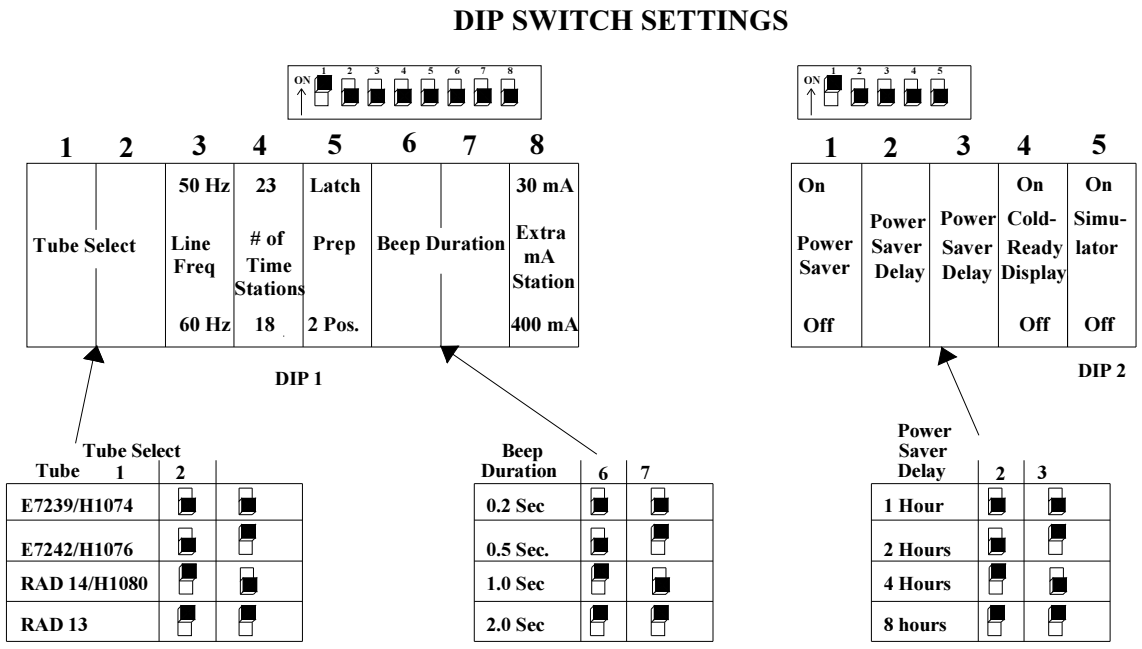


Figure 18 – DIP Switch Settings for Configuring Options and Features

2. X-RAY TERMINATION BEEPER VOLUME CONTROL

The volume of the x-ray termination beeper can be adjusted by P7, located on the control board. Turning P7 counter-clockwise increases the volume from quiet to very loud. Note: The front cover of the control will quiet the sound considerably so test the volume with the cover in place.

13. TUBESTAND DISPLAY MESSAGES

The following messages may appear on the tubestand display's lower window.

WAIT PREP has been requested but the tube is not warmed up yet. The message clears as soon as the tube is ready for an exposure. This typically takes between one and two seconds.

PREP The tube is warm and now ready for an exposure.

XRAY Exposure is occurring. Ionizing radiation is present.

GOOD JOB Exposure completed successfully. The message is cleared when the exposure switch is released.

TUBE Indicates that the singe shot tube power limits are exceeded by the selected techniques. It is accompanied by an error beep and prep is not allowed. The message clears when allowed techniques are selected.

HEAT Indicates tube heat interlock. The message is accompanied by an error beep and cleared as soon as the x-ray tube cools. PREP is locked out.

ZCO Line voltage zero crossing signal not detected. Accompanied by error beep. PREP locked out. Message clears as soon as zero crossing signal detected.

FOOT Foot switch released before exposure is finished. Accompanied by error beep. The message is cleared when any of the techniques change or PREP is requested.

ROTR Tube rotor error. Accompanied by error beep. PREP is terminated. The message is cleared when any of the techniques change or PREP is requested.

FIL1 Standby filament current too low, or not present. Accompanied by error beep. PREP locked out. Message clears when standby filament current is acceptable.

FIL2 Standby filament current too high. Accompanied by error beep. PREP locked out. Filament circuit disabled. Message will not clear without rebooting system and resolving cause of high idle current.

FIL3 Boost filament current too low. Accompanied by error beep. PREP locked out. The message is cleared when any of the techniques change, PREP is requested, or cause of low boost current is found and resolved.

FIL4 Boost filament current too high. Accompanied by error beep. PREP locked out. The message is cleared when any of the techniques change, PREP is requested, or cause of high boost current is found and resolved.

COLD The control is cold. Exposures are possible, but the outputs will not be at their maximum accuracy. "COLD" will change to "READY" once the unit is on for about ten minutes.

READY READY scrolls across the tubestand display once the unit has warmed up to a level that delivers the most accurate outputs, about ten minutes after initial turn-on.

EXPOSURE COUNT

When the kVp major, kVp minor & mA selectors are in their fully counter-clockwise positions, the lowest digital display on the front of the tubestand will indicate “EXPO” (indicating “exposure count mode”) & the kVp & mAs digital displays, also on the front of the tubestand, will indicate the total number of x-ray exposures that have been produced. To read the total exposure count, simply consider the number in the kVp display as the first 4 digits & the number in the mAs display as the last 4 digits.

Examples:

1) When the kVp display indicates 12 & the mAs display indicates 6789, the total number of x-ray exposures is 126,789.

2) When the kVp display indicates 4 & the mAs displays indicates 1000, the total number of x-ray exposures is 41,000.

3) When the kVp display is blank & the mAs display indicates 378, the total number of x-ray exposures is 378.

ZZZZ

Sleep timer is 5 minutes away from turning off system. Accompanied by error beep. Active in power saving mode only.

14. MAINTENANCE

Routine maintenance should be performed within 90 days of installation and every six months thereafter. The maintenance should include but not be limited to the following.

- Confirm accuracy of kVp, mAs and time.
- Confirm display characters illuminate properly.
- Confirm status display “TUBE” illuminates when less than 40 kVp is selected.
- Tightness of all interconnect cables.
- Check for binding or abrasion of high voltage cables and correct as needed.
- Check for tightness of high voltage cable knurl nuts.
- Confirm that the switch assembly and circuit breaker are well secured to the enclosure.
- Confirm x-ray to light field coincidence.
- Confirm x-ray centerline to image receptor coincidence.
- Where local codes require, confirm linearity and reproducibility.