



4220 WALLER DRIVE, CRYSTAL LAKE, IL 60012
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www.xcelxray.com

Operator's Manual



CAUTION: FEDERAL LAW RESTRICTS THIS DEVICE TO SALE BY OR ON THE ORDER OF A PHYSICIAN.

CAUTION: PROPER GROUNDING OF SHOCKPROOF X-RAY EQUIPMENT IS IMPORTANT. DAMAGE TO THE X-RAY TUBE MAY RESULT IF NOT PROPERLY GROUNDED. THIS UNIT, IF PROPERLY GROUNDED, IS SHOCKPROOF TO THE OPERATOR AND PATIENT.

MODEL# 715-A-BD

**Operator's Manual
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GENERAL

In order to properly protect the x-ray against damage in transit, it is necessary to disassemble the unit and package it in small, rugged packing boxes. Check shipping ticket against boxes received to determine if correct number of boxes arrived at destination. When you opened the boxes, you broke a seal that reminded you of damage in shipment.

DAMAGE IN TRANSIT

X-Cel X-Ray Corporation is not responsible for goods lost or damaged in transit. The Company's responsibility for safe delivery ceases when the carrier accepts shipment in good order. Claims for damage occurring in transit must originate and be presented by consignee. (The person receiving the goods.) All packages should be examined thoroughly at time of delivery. If damage to any box is apparent, be sure to make a notation on delivering carrier's receipt, otherwise claims may be refused (images are highly recommended).

CONCEALED DAMAGE

Notify carrier immediately regarding concealed damaged and hold entire shipment, including all boxes, intact for inspection by or instructions from carrier's agent. ICC rules require that claims for concealed damage must be made within 15 days from receipt of shipment.

PRE-ASSEMBLY

Select a room in which the working area is large enough to allow the tube head to pivot. The location selected must provide protection from radiation exposure to the operator as well as other personnel working in the area. A 12 foot exposure cord is provided to allow the operator to be outside the room or behind a shield when the exposure is made. The control cable allows remote mounting up to 5 feet away from the base. Your local inspector is a good source of current requirements.

ADDITIONAL INFORMATION AND HELP

X-Cel has additional an abundance of additional information on their website xcelxray.com. We try to provide our customers the best possible resources to allow them to have the most successful experience with their X-Cel product.

FILM ISSUES

For our customers that are using film, there are many issues that can arise preventing you from getting the best image (that you possible can). On our website, xcelxray.com, we have detailed directions to assist you in getting the best possible image from your film with the use of an X-Cel product. If after going through the recommended process does not work for you, please contact the factory at 815-455-2470, and we will do what we can to help you with your situation.

ELECTRICAL REQUIREMENTS

A grounded 120 volt (20 amp) **dedicated** outlet must be provided for this x-ray unit to operate to its intended capacity. A 20 amp GFCI outlet is recommended.

CAUTION: Allow x-ray head to warm up to room temperature before operating. When installing and checking x-ray unit for the first time, start 6/60 second, (006), 55 kVp. Operate and observe mA meter needle. As the x-ray is operated, the needle will jump a very short distance. As the exposure time is increased slowly, the mA needle will move higher in a smooth continuous motion.

NOTE

It requires one second of exposure time for the mA meter needle to register the full amount. If cassettes with screens are used, the required exposure time will be less than one second and the needle may not have time to get to the 15 mA setting. This is okay, it will not affect the film or the x-ray unit.

State radiation protection requirements vary over time and vary from state to state. Contacting your state agency for preapproval is recommended. This usually requires submitting a floor plan and specifications on the x-ray equipment. Be prepared to know the following:

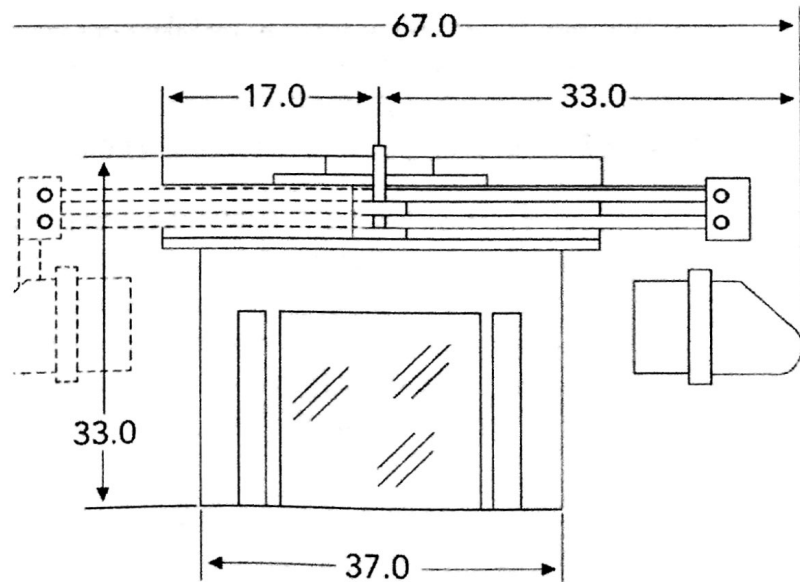
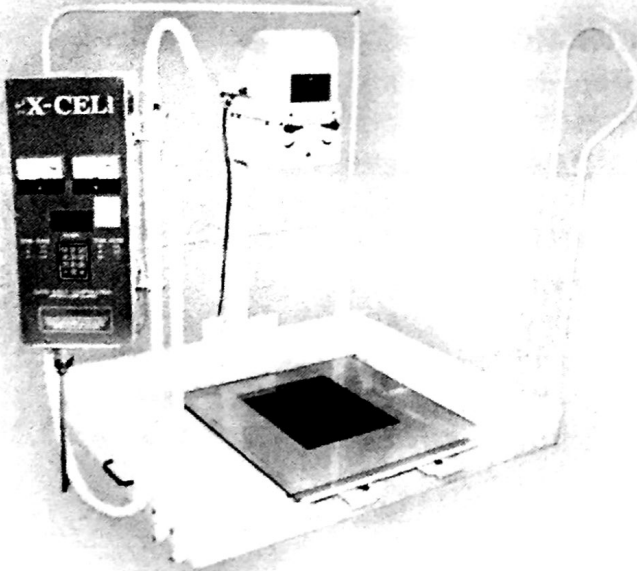
- (1) Maximum kVp (70) [90 with 90 kVp upgrade]
- (2) Maximum mA (15) [10 with 90 kVp upgrade]
- (3) Typical exposure technique (DP .5 sec. @ 55 kV/15mA) (@ 29 in SID)
- (4) Typical radiation produced (30 MR per an exposure)
- (5) Number of films (exposures to be taken per week)

CAUTION: Do not store in a damp area. Dampness may affect devices and cause rust.

Radiation Protection Recommendations are best made from the FDA Paragraph 1000.50 Subpart C and/or your State Inspector's office.

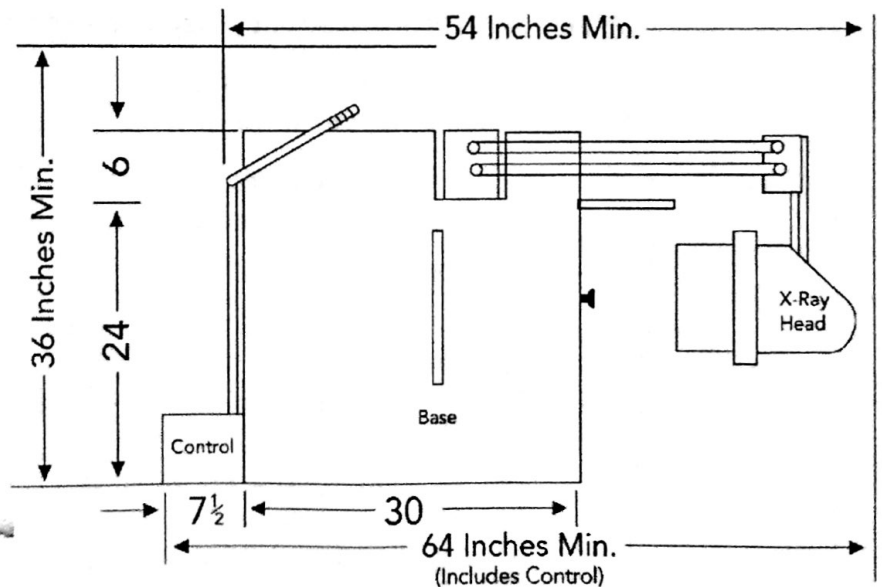
Instructions for 715-BD series assembly:

1. Start with the base and remove the right and left covers.
2. Attach the arm system to the base with hex head bolts using a ½" socket.
3. Re-install the right and left covers.
4. Connect rear hand rail to the unit.
5. Determine control placement.
 - a. Hand rail placement: you would use the left front handrail. Unscrew the 2 screws on the left front hand rail and slide the rail through the holes on the side of the control and then reattached the 2 holding screws into the front hand rail. With 2 people raise the front hand rail and attach it to the base.
 - b. Wall placement: X-Cel provides a cord allow for about 5 feet placement away from the base. DO MAKE SURE you properly install the control on the wall for the weight of the control (30 lbs.). If not done correctly, damage to the wall and unit could occur.
6. Connect the right front hand rail.
7. Remove set screw from underside of tubing at the top of the arm. Slide the x-ray head into the top of the arm system (HEAVY). Insert lubricated shaft of tubehead assembly and push until seated. Once the head is in place, ¼ turn the knob, and make sure it locks into place. **Replace set screw and lock with nut.**
8. Connect the wire cable from the tubehead to the control box (make sure it is completely together and tight).
9. Configure wire placement. There are some cable connectors provided for possible placement.



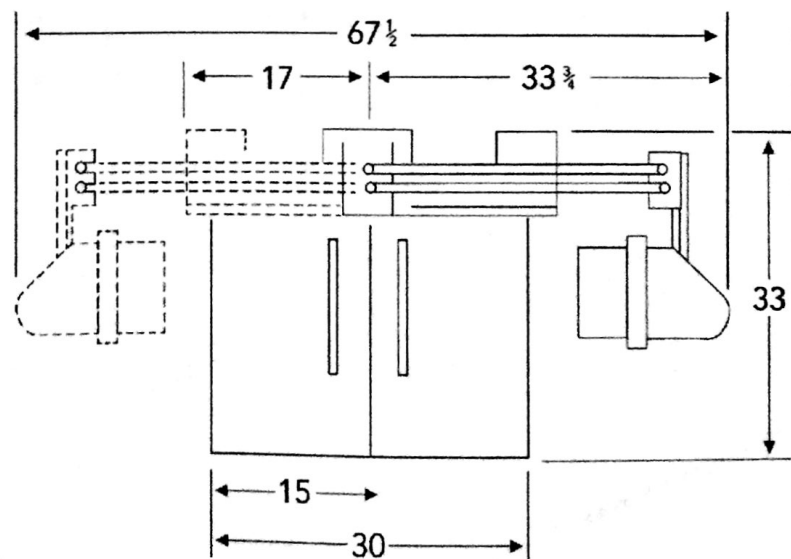
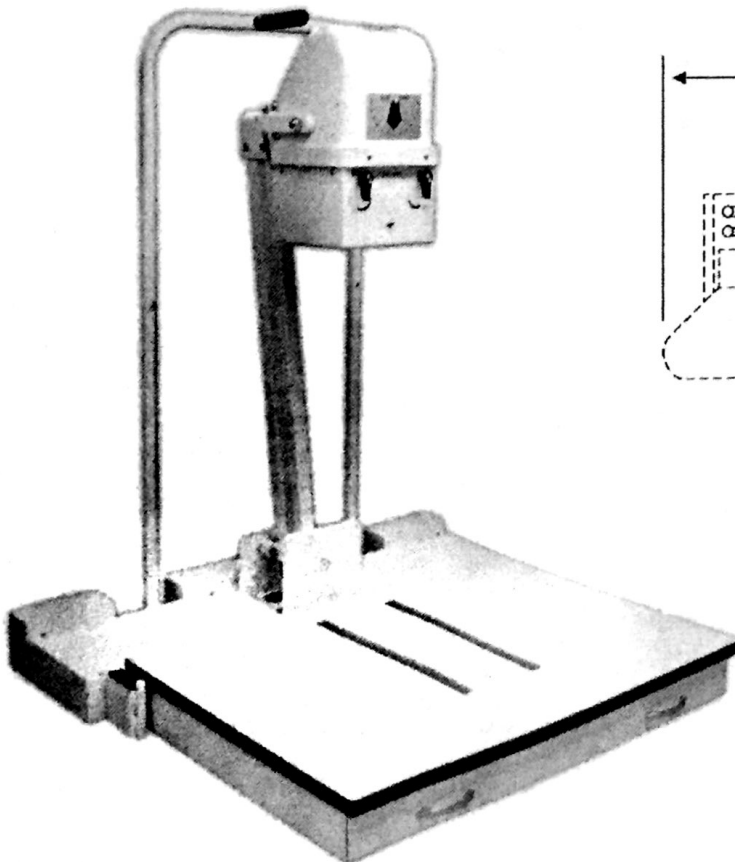
Instructions for LB and MB-715NT Assembly:

1. Attach arm assembly to base frame with hex head bolts using a $\frac{1}{2}$ " socket.
2. Determine control placement.
 - a. Hand rail placement: Unscrew the 2 screws on the left of hand rail and slide the rail through the holes on the side of the control and then reattached the 2 holding screws into the hand rail. With 2 people, raise the hand rail and attach it to the base.
 - b. Wall placement: X-Cel provides a cord allow for about 5 feet placement away from the base. DO MAKE SURE you properly install the control on the wall for the weight of the control (30 lbs.). If not done correctly, damage to the wall and unit could occur.
3. Attach railing with $1\frac{1}{4}$ " fillister screws.
4. Attach the outrigger.
5. Remove set screw from underside of tubing at the top of the arm. Slide the x-ray head into the top of the arm system (HEAVY). Insert lubricated shaft of tubehead assembly and push until seated. Once the head is in place, $\frac{1}{4}$ turn the knob, and make sure it locks into place. **Replace set screw and lock with nut.**
6. Configure wire cable placement. There are some cable clamps provided for possible placement.



Instructions for Flip Base Unit Assembly:

1. Attach arm assembly to base frame with hex head bolts using a $\frac{1}{2}$ " socket.
2. Determine control placement.
 - a. Hand rail placement: Unscrew the 2 screws on the left of hand rail and slide the rail through the holes on the side of the control and then reattached the 2 holding screws into the hand rail. With 2 people, raise the hand rail and attach it to the base.
 - b. Wall placement: X-Cel provides a cord/cable allowing for about 5 feet placement away from the base. DO MAKE SURE you properly install the control on the wall for the weight of the control (30 lbs.). If not done correctly, damage to the wall and unit could occur.
3. Attach railing with 1 $\frac{1}{4}$ " fillister screws. NOTE: If right lateral only is to be used, the control may mount on the left side of the rail. If both laterals or left side lateral is to be used, the control MUST mount on the wall.
4. Carefully lay the unit on it's back and attach base with 7/16" hex head screws.
5. Pivot base supports under the base and slowly set unit upright.
6. Attach weights to base frame with $\frac{1}{2}$ " hex bolts.
7. Remove set screw from underside of tubing at the top of the arm. Slide the x-ray head into the top of the arm system (HEAVY). Insert lubricated shaft of tubehead assembly and push until seated. Once the head in place, $\frac{1}{4}$ turn the knob, and make sure it locks into place. **Replace set screw and lock with nut.**
8. Replace covers.
9. Configure wire cable placement. There are some cable clamps provided for possible placement.



FUNCTIONAL INSTALLATION CHECK

<p>(1) OPERATIONAL INDICATORS</p>	<p>1. Light on power switch will light and kVp meter will indicate a value. 2. The kVp meter will point to some kVp value between 50-70 kVp on 700 Series and 70-90 kVp on 900 Series. (Refer to check #5)</p>
<p>(2) TUBE POSITIONING A. Position arm to desired angle</p>	<p>1. The tubehead should remain in any position in which it is placed. If not, contact X-Cel for further instructions. 2. Keep tubehead in upright position after use.</p>
<p>(3) BEAM LIMITING DEVICE A. Push momentary switch.</p>	<p>1. X-ray field light will come on showing size of x-ray field selected and will remain on for a short period of time. 2. With continuous repeated use, some burning odor may be evident (this is normal and will disappear with use overtime). 3. Connector on bottom of the control must be 100% fully attached to the control box.</p>
<p>(4) EXPOSURE SWITCH A. <i>Press and Hold exposure switch.</i></p>	<p>1. Select kVp and time. Press and Hold exposure switch and after 1 second, filament pre-heat delay, x-rays will be generated con-currently with sounding of emission buzzer and mA meter will deflect. 2. NOTE: It requires approximately 1 second for the mA needle to respond. On exposure times of less than 1 second, the needle may not reach the full scale reading. This is normal. You are still getting the predetermined amount of mA.</p>
<p>B. The digital display timer requires a zero to be added before the pulses are keyed in. (example) 30/60 = 030 on keypad.</p>	<p>Add '0' (zero) to amount of exposure time in 60th's. (example) 6/60 = .1 sec. = 006</p>
<p>(5) kVp METER</p>	<p>1. Rotate black knob on the left side of the control; observe kVp needle as it moves through the full range. 2. Ranges: 700 Series = 50 - 70 (15 mA) 900 Series = 70 - 90 (10 mA) (Refer to over voltage adjustment on page C-2)</p>
<p>(6) mA METER</p>	<p>Take exposure for 1 second and read meter (wait for 1 second delay).</p>

<p>(8) LIGHT FIELD VERIFICATION "COLLIMATOR VERIFICATION"</p>	<ol style="list-style-type: none"> 1) Use a 10 x 12 image and select 8 x 10 aperture size. 2) Place imaging device in/on base. 3) Place arm in vertical position. 4) Turn on control and set for normal exposure. 5) Turn on collimating lamp and center 8 x 10 projected image in center of 10 x 12 image. 6) Place markers in 4 corners of light - use paper clips bent at right angles. Mark upper right hand quadrant with a coin, for orientation. 7) Take exposure. 8) Misalignment maybe up to 2% of the SID (for 28 inch SID that is equal to .562 inch variance).
<p>(9) SOURCE TO IMAGE DISTANCE</p>	<p>The SID on the BD series is 29 inches. The SID on the NT series is 28 inches. The SID on wall and mobile models can vary from 16 to 28 inches.</p>
<p>(10) IMAGE RECEPTOR</p>	<p>On all models, the X-ray field is perpendicular to the image receptor when arm system is brought to vertical position (0 on dial) and centering light indicates that x-ray field is centered on image receptor in lateral positions, x-ray field is perpendicular when head assembly is lowered to 90 degrees.</p>
<p>(11) ON/OFF BREAKER SWITCH</p>	<p>When switch is on, rocker should light.</p>
<p>(12) LINE REGULATION</p>	<p>Set unit to 1.0 seconds, and 70 kVp (90 kVp on 900 series). Operate unit and observe needle. Use a 150 analog VAC meter to read wall outlet voltage while operating x-ray. Use this equation for evaluation: $(V \text{ no load}) - (V \text{ full load}) / (V \text{ full load}) \times 100 = \%$ <p>Maximum is 5% for 70 kVp models. Maximum is 6% for 90 kVp models</p> </p>

MICROPROCESSOR CONTROLLED TIMER (MCT)

Operating Instructions

The MCT is a state-of-the-art microprocessor controlled timer coupled with digital readout and keypad entry. It reads out in 60ths of a second and allows the user to enter any time amount from 6/60ths of a second (1/10 sec.) to 180/60ths of a second (3 seconds). An abbreviated conversion chart is printed on the control case cover. We have also included in the owner's manual a blank technique chart that has a conversion chart. Federal law requires that you fill it out after refinement of your technique and hang it near your control.

Upon turning on your unit, the MCT has a memory which will display the last time correct time entered into it. Note: When entering a time setting, all three digits must be typed on the keypad. For example, when entering 30/60ths of a second ($\frac{1}{2}$ second), you must enter 030. An entry of just 30 will result in an error display. An error upon entry is displayed as UUU. When this results, simply re-enter the time desired (030). An error will result if a time is too low (less than 006) or too high (greater than 180) is entered.

When an exposure is taken, the display will blank and will not reappear until the exposure button is released. The timer will reset and remain on the last time entered.

A brief overview of the features and operating rules:

1. Digital Display and keypad entry.
2. Operates in 60ths of a second from 6/60 to 180/60.
3. All three digits must be entered (030, 049, etc...).
4. Errors display as UUU.
5. Memory retains the last time entered.
6. The timer may be reset by turning the control OFF and ON.

If you have any questions concerning this timer, please call X-CEL X-RAY at (815) 455-2470.

EXPOSURE FACTORS

EXTREMITY RADIOGRAPHIC TECHNIQUES

NOTE: Any light leaks in a Dark Room will prevent any possibility of having good results with your images.

Some film & screen combinations require more time.

The 100 speed film or Detail System are recommended.

For casts, the required exposure time may increase up to 5 times. It varies with patient and water content.

Cassettes with only one screen may require more exposure time and may never work.

MAKE FIRST EXPOSURE AT 55 kVp; .5(30/60) seconds. See procedure on previous page B-4.

For children 7 - 15 years less 1/4 of the time setting of adults.

For children 1-6 years less 1/2 of the time setting of adults.

For greater density (blackness of film) increase exposure time.

For more soft tissue exposure, reduce kVp setting.

If the flesh outline beneath the weight bearing foot is desired on the lateral projecting, have the patient stand on 1/4 inch thick hard piano felt. To make a lateral exposure, drop tubehead to 90 degrees on the dial, push light switch and position patient, film and tubehead.

PREVENTIVE MAINTENANCE

In order to keep your X-Cel X-ray podiatry unit in compliance with HEW 21 CFR 1020, the following preventive maintenance schedule is recommended:

TASK	INTERVAL
1. Rotate kVp selector knob 5 full rotations back and forth. Reset kVp at desired setting. This will insure maximum life of variac.	Weekly
2. Perform functional installation check.	Every six months
3. Tight all screws and bolts.	Once per year
4. Check wiring for proper clearance and routing.	Once per year
5. Check for any physical damage on tubehead which may impair function. (Like head square with arm)	Once per year
6. Check for oil leakage (Remove bezels on head)	Once per year
7. Check cable for cracks of wear.	Once per year
8. Check control knobs for secure attachment and proper indexing. (Feel for looseness)	Once per year
9. Ensure that nameplates are properly attached.	Once per year
10. Examine brushes on variac (kVp selector) for wear and corrosion. CLEAN WITH ALCOHOL. Replace if excessive wear is indicated.	Once per year

WARRANTY

Serial No. _____

Manufacturer, X-Cel X-Ray Corporation, warrants to Buyer, for the time period set forth below, that the new X-Cel X-Ray equipment sold under the Serial Number set forth above is of kind and quality as specified in the invoice and shall be free from defects in material and manufacturing workmanship as described below. Manufacturer further warrants that said equipment was manufactured in conformance with the Federal Performance Standard: 21CFR 1020.

TIME PERIOD

Except as limited below, defects in material and manufacturing workmanship relating to the mechanical operations of the equipment are warranted herein for a period of sixty (60) months from the date of original installation provided said equipment has been installed according to manufacturer's instructions and a completed Warranty Registration/Installation Report, as attached hereto, has been received by X-Cel X-Ray Corporation. IF SAID WARRANTY REGISTRATION/INSTALLATION REPORT IS NOT FULLY COMPLETED AND RETURNED TO X-CEL X-RAY CORPORATION UPON INSTALLATION OF SAID EQUIPMENT, THIS WARRANTY SHALL NOT APPLY AND IS VOID.

Defects in material and manufacturing workmanship relating to the X-ray tube and to the electrical operation of the equipment are warranted herein for a period of twenty-four (24) months from the date of original installation in accordance with the conditions required above as to installation and completion of the Warranty Registration/Installation Report. Upon expiration of said twenty-four (24) month period relating to the electrical operation of the equipment, the terms of the Warranty shall be limited to the following:

Time Period (from original installation):	Manufacturer's Obligation:	Buyer's Obligation:
From the 24th month to the 36th month	75% of cost of repairs or replacement	25% of cost of repairs or replacement
From the 36th month to the 48th month	50% of cost or repairs or replacement	50% of cost of repairs or replacement
From the 48th month to the 60th month	25% of cost of repairs or replacement	75% of cost of repairs or replacement

From and after the 60th month from the date of original installation, the Manufacturer shall have no obligation under this warranty.

DISCLAIMER OF UNSTATED WARRANTIES

THE WARRANTY PRINTED ABOVE IS THE ONLY WARRANTY APPLICABLE TO THIS PURCHASE. ALL OF THE OTHER WARRANTIES, EXPRESS OR IMPLIED, WRITTEN OR ORAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED.

SCOPE OF WARRANTY

Manufacturer's obligation under this Warranty shall be limited, at the Manufacturer's election, to either: (a) the repair of any defective part or parts or (b) making available at the place of assembly any necessary repaired or replacement part or parts of assemblies. Written notice of any defect shall be given by Buyer to Manufacturer within thirty (30) days after the defect appears.

Manufacturer's obligation herein is conditioned upon the following: (a) proper use and maintenance of the equipment and conformance with any applicable recommendations of Manufacturer and (b) Buyer making the equipment available for inspection and correction, if necessary, after written notification set forth above. Manufacturer does not warrant any products of others where Manufacturer serves solely as a distributor or reseller of such product. Manufacturer does not warrant against any mechanical or electronic modifications to the product performed by Buyer or any third party and this Warranty shall not apply to any such mechanical or electronic modifications, and the Manufacturer shall have no liability for any damages, whether consequential. Incidental, indirect, special, tort or contract damages of any kind, including but not limited to, any loss of profits or expectations, caused by or related to such modifications.

All shipping charges and rental fees are the responsibility of the Buyer. Labor charges outside of the Manufacturer's factory are the responsibility of the Buyer, unless approved in writing by Manufacturer.

LIMITATION OF LIABILITY

THE BUYER'S SOLE AND EXCLUSIVE REMEDY FOR DEFECTS IS SET FORTH IN THIS WARRANTY. THE WARRANTY SET FORTH ABOVE IS THE ONLY WARRANTY APPLICABLE TO THIS PURCHASE AND IS EXTENDED ONLY TO BUYER AND NOT TO ANY SUCCESSIVE BUYERS, USERS OR THIRD PARTIES, OR EMPLOYEES. IN NO EVENT SHALL MANUFACTURER HAVE ANY LIABILITY WHATSOEVER FOR PAYMENT OF ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT, SPECIAL, TORT OR CONTRACT DAMAGES OF ANY KIND, INCLUDING BUT NOT LIMITED TO, ANY LOSS OF PROFITS OR EXPECTATIONS.

**TECHNIQUE CHART
SUGGESTED STARTING POINTS
FOR 200 SPEED FILM**

(For CR and DR units please consult with your imaging dealer)

FOOT	EXPOSURE TIME IN SECONDS	kVp	DIAGRAM
Foot Dorsal- Plantar 0/15 degrees	.5 = 030	50-55	
Lateral 90 Degrees	.5 = 030	60-65	
Lateral Oblique 40 Degrees	.5 = 030	65	
Medial Oblique 25 Degrees	.75 = 045	65	
Raised Hallux or Digit	.5 = 030	50	
Axial Calcaneal 25 Degrees	1.0 = 060	65	
Harris & Beath 35/40 Degrees	1.25 = 075	65	
ANKLE			
Anterior - Posterior or Mortise	.75 = 045	60	
Lateral	.75 = 045	60	
Lateral Oblique	.75 = 045	60	
Medial Oblique	.75 = 045	60	
NOTE: These are suggested starting points. Adjust time and kVp as needed.			

MILLIAMPERE ADJUSTMENT

700 series (50 - 70 kVp)

1) Set at 65 kVp. Set timer to 1 SECOND (60 PULES) (060).

2) Make an exposure. If mA does not read 15, correct by use of rheostat in control. Rotate CLOCKWISE TO INCREASE and COUNTER-CLOCKWISE TO DECREASE. After resetting, make another exposure to verify setting. Use a small slotted screwdriver to make adjustments. The adjustment holes are located on the right side of the control. These adjustments will allow you a range of 5 mA

If greater adjustments are necessary, UNPLUG UNIT, remove 6 screws from front of control case and swing cover down. On bottom of control case, there is a 300 ohm variable resistor. To increase mA, move slide to right and to decrease, move to the left. The 15 mA tap is connected by a black wire.

900 Series (70 - 90 kVp)

Same as 700 series except make test at 85 kVp.

LINE REGULATION TEST

Set unit to 1.0 second and 70 kVp (90 kVp on 900 series). Operate unit and observe needle. Use a 150 VAC analog meter to read wall outlet voltage while operating x-ray (the control unit and VAC meter should be into the same outlet using the side by side plugs). Use this equation for evaluation:

$(V \text{ no load}) - (V \text{ full load}) / (V \text{ full load}) \times 100 = \%$

This will equal the percent of line regulation.

Example: $118 - 112 / 112 \times 100 = 5.33\%$

Maximum is 5% for 70 kVp models.

Maximum is 6% for 90 kVp models.

OVERVOLTAGE SAFETY STOP ADJUSTMENT

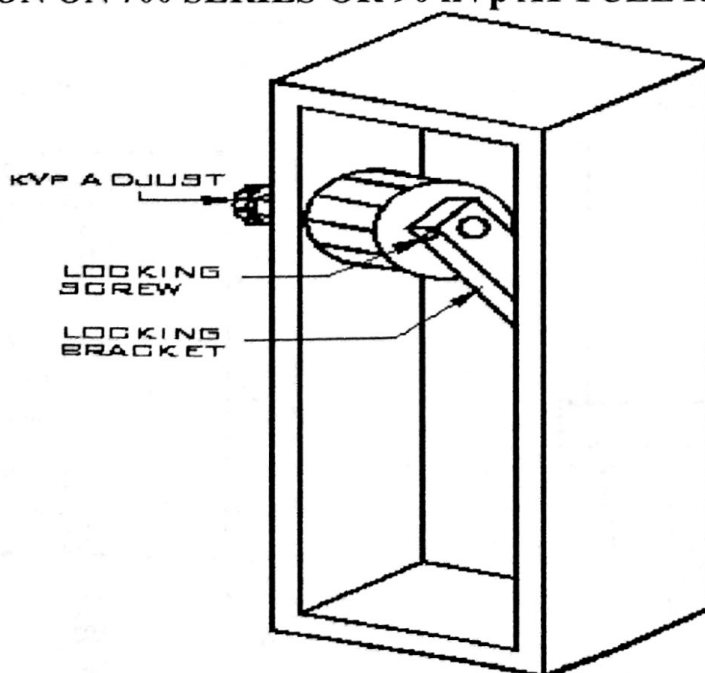
The X-Cel X-Ray has a mechanical stop to prevent accidental damage to the x-ray tube and/or transformer. This is accomplished by a stop lever attached to the voltage power control. If the line voltage to the x-ray unit (wall outlet) is low, an adjustment may be required to obtain 70 kVp or 90 kVp whichever is maximum rated output.

TO ADJUST THIS STOP:

1. Unplug the unit from the wall
2. Open the front cover by removing the six Philips screws and swing the hinged cover down to open.
3. Loosen the locking screw. See figure A.
4. Plug unit in and turn on.
5. While observing the kVp meter, turn the kVp adjustment knob (on outside of control, upper left hand side) to obtain 70 kVp.
6. Turn unit off and unplug.
7. Hold kVp adjustment knob and verify that safety stop is hitting the back of the control case.
8. Tighten safety stop lock screw.
9. Close front cover with one screw and turn unit on.
10. Verify unit will yield 70 or 90 kVp at full rotation of kVp adjustment knob.
11. If unit does yield maximum, replace remaining cover screws.
12. If unit does not yield maximum, repeat steps 1-10.

CAUTION! - DO NOT ADJUST UNIT TO ALLOW MORE THAN 70 kVp AT FULL ROTATION ON 700 SERIES OR 90 kVp AT FULL ROTATION ON 900 SERIES.

Figure A



BEAM LIMITING DEVICE [BLD] (ADJUSTABLE BLADES)

The front panel of the adjustable collimator includes graduation to allow pre-determining the x-ray field size for the SID indicated. To use BLD, rotate the knobs on the front panel to the desired film size and SID (Distance) Pointer (knobs) should point to small punch mark when blades are closed completely.

Depress the light switch, (front center) and the light will operate for a short period of time. The lighted area represents the radiation field within 2% of the SID

LAMP CHANGING INSTRUCTIONS – Fig 2

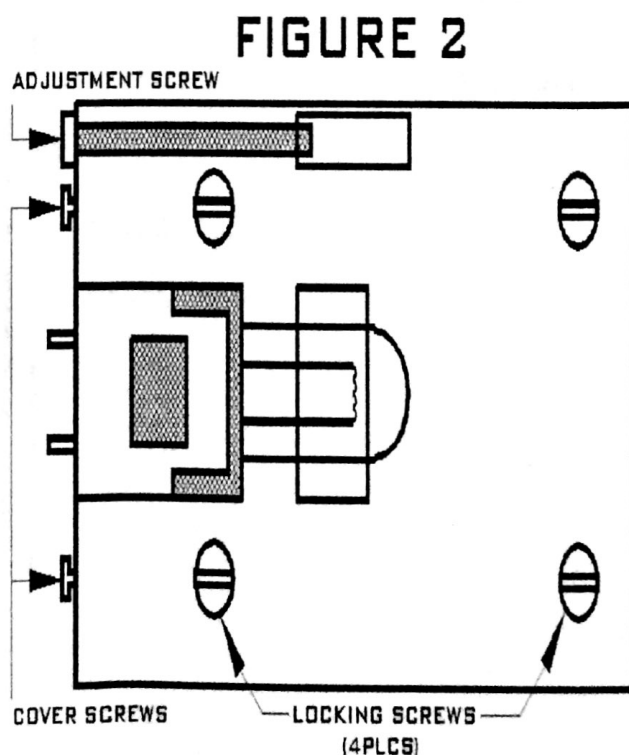
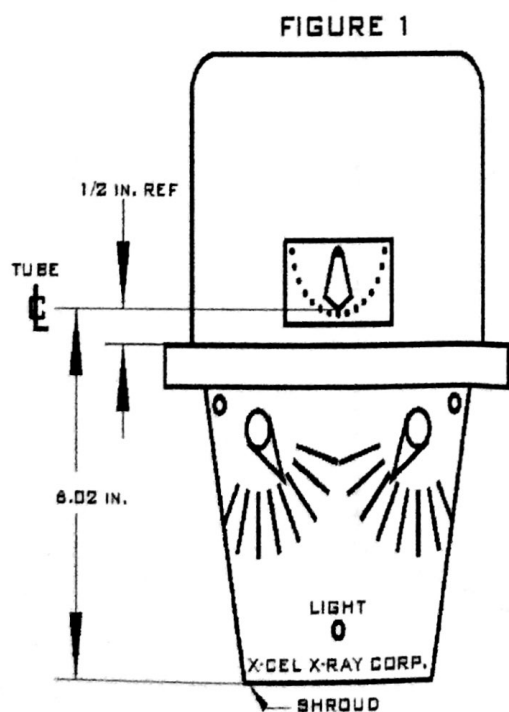
Unplug x-ray unit from wall outlet. To remove the shroud (fig 1), rotate x-ray head toward ceiling, loosen screws on the right and left sides of the collimator, and remove housing cover (rear). Remove bulb by using the tip of a small screwdriver to lift bulb out. Use X-Cel part number #805086. CAUTION: Do Not Touch Glass With Your Fingers.

To Adjust Lamp (only if necessary) - Fig 2

Lamp has a pre-focused filament. To align the light field, loosen the 4 Locking Screws. To move field sideways, rotate the Adjustment Screw. When adjustment is finished, tighten Locking Screws.

Light field and radiation field size will be correct when the lamp filament is centered over the collimator box frame.

DO NOT ATTEMPT TO ADJUST THE MIRROR. IT IS FACTORY SET



REPAIR AND TROUBLE SHOOTING

SYMPTOM	REPAIR PROCEDURE
A. No buzz.	1. Push button.
	2. If buzzer does not sound and mA meter deflects, buzzer may be bad. Clean under spring - a small dirt or metal particle will stop buzz.
B. Exposure begins immediately when pressing main power ON/OFF switch to ON position	1. The exposure timer card failed. Replace.
C. X-rays not being produced	1. Turn on unit and see if main power switch comes on. If it does not come on, see if building circuit breaker is on and the unit is plugged in.
	2. If the on-off switch lights up then proceed. Using an AC voltmeter set to read 120 volts ac, connect between the white wire (term#3 of the timer terminal strip, and the other meter lead to terminal #2 (brown wires) of the terminal strip. The meter should read 0 (zero) volts. Press and hold the exposure switch. The meter should read 120-130 volts AC. If the meter reads (0) zero, the stabilizer (CVT) is defective and needs replacement.
	3. If voltage above is satisfactory, connect voltmeter to white wire of the kVp meter and the other lead to the far right hand (nearest case) of the large brown resistor in the lower right hand side of the control. The reading should be zero. Now press and hold the exposure switch down, the reading should go to between 70 and 80 +/- . If the reading goes over 100 volts, it means the tube head or interconnecting cable is defective and needs to be repaired.
	4. Check voltage across #6 & #3 on timer. It should be 120 VAC or the line voltage. Check voltage across #5 & #3 it should be zero before depressing pushbutton and 120 VAC or line voltage after depressing. If any of these fail to check out, check pushbutton for continuity.
	5. If voltage between L2 (#3) & T2 (#4) on timer does not appear 1 second after depressing pushbutton, timer failed (open circuit). If voltage appears across L2 & T2 in control, measure across terminals #3 & #4 at head. If no voltage, there is a bad connection to head.
	6. Sporadic voltage between L2 & T2 may indicate bad brush connection or timer card failure.

	7. Crackling or sputtering sounds in head indicate bad tubehead or an unconnected mA lead.
	8. The mA meter does not deflect when exposure button is pushed and buzz is heard - x-ray filament may be burned out.
	9. To check: Remove shroud and check voltage across 2 & 4 (expect less than 85 V) after 1 second delay. If both check ok and there's no mA, tube is bad.
D. Exposure fails to be ended by timer	1. Try a different timer setting, and make an exposure. If failure continues, replace entire timer.
	2. Triac failed in closed position. Replace entire timer.
E. Circuit breaker on control continues to blow OR Timer gives short pulses.	1. Consult X-Cel
F. Sparks from control.	1. Consult X-Cel
G. Tubehead drifts	1. Adjust spring. A. Floor model - End of cylinder on arm. 3/4" open end or ratchet wrench required. B. Wall or Mobile model - Remove end cap on each cylinder on side of arm. 9/16" socket required.
H. Centering Light	1. If no voltage to centering light, timer card may be bad or there may be a loose connections at the card. Light is run off of terminal 4 (red) & 6 (blue) of the x-ray head.

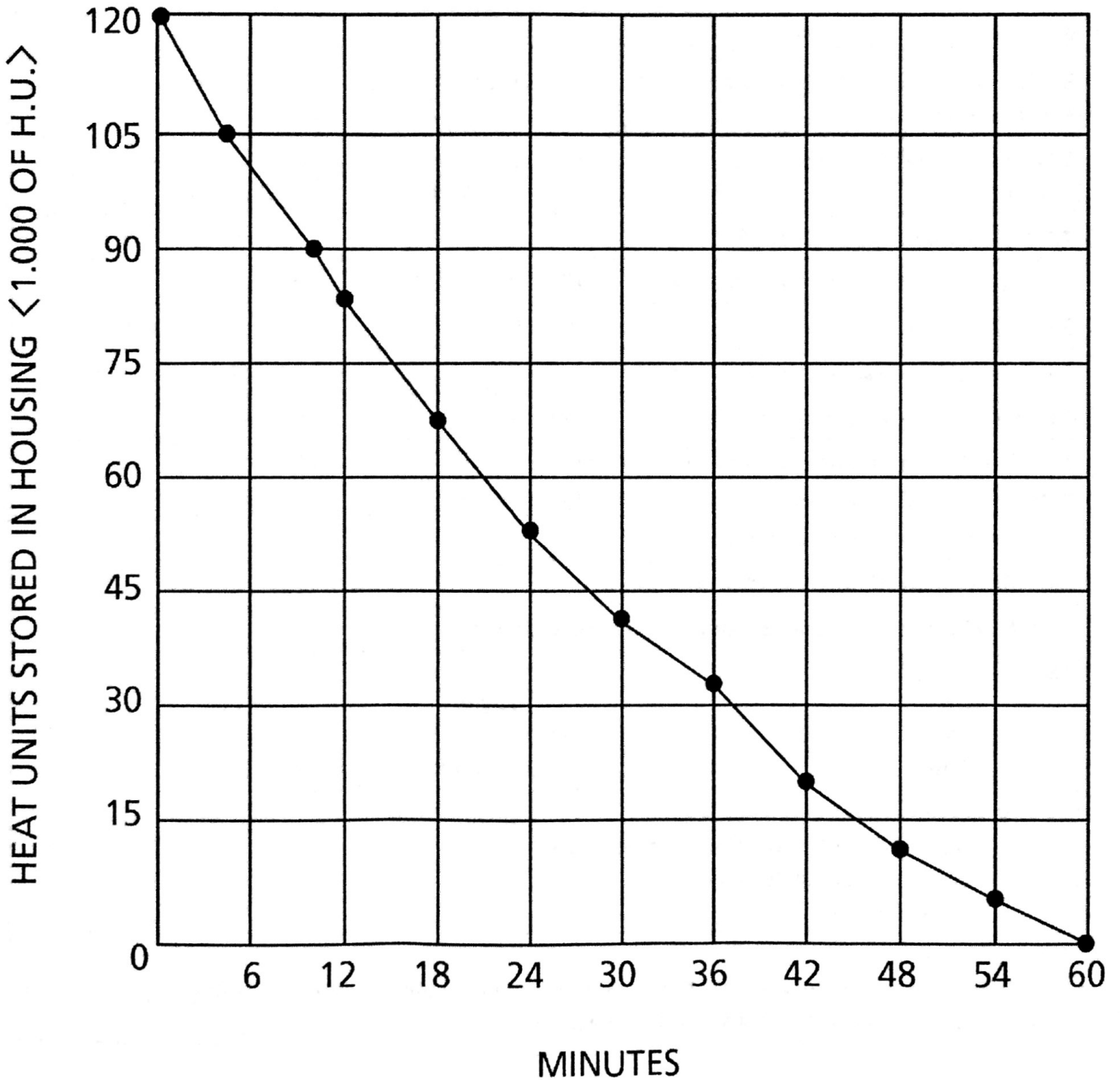
TECHNICAL DATA

1.) Rated Line Voltage = 120 volts, 60 Hz	700 Series	900 Series
2.) Maximum Current	20 amps	22 amps
3.) Line Voltage Range	110 - 130	110 - 130
4.) Line Voltage Regulation	5%	6%
5.) Technique Factors that Constitute Maximum Line Current	70 kVp 15 mA	90 kVp 10 mA
6.) Generator Rating & Duty Cycle (Full load)	70 kVp 15 mA 10% Duty Cycle	90 kVp 10 mA 6% Duty Cycle
7.) TUBE HOUSING ASSEMBLIES		
8.) Maximum rated peak tube potential	70 kVp	90 kVp
9.) Leakage Technique Factor	70 kVp @ 1.8 mA	90 kVp @ 1.33 mA
10.) Minimum Filtration (mm aluminum) *	1.8 mm	3.2 mm
11.) Focal Spot - Tube (NEMA)	1.0 mm	1.0 mm
12.) Peak tube potential at which aluminum equivalent was obtained	70 kVp	90 kVp
13.) Cooling Curves (included on page 20)		
14.) Tube Rating Charts (included on page 21)		
15.) Anode Thermal Characteristics (included on page 22)		
16.) Maximum Deviation		
kVp	+/- 10 kVp	+/- 14 kVp
mA	+/- 2.0 mA	+/- 2.0 mA
Timer	+/- 2 Pulse**	+/- 2 Pulse**
17.) Definitions of Measurement Basis		
kVp - Peak tube potential during exposure		
mA - Average anode current		
Timer - Seconds		
* as of 6/2006		
** or 10% whichever is greater. Any timer test must include monitoring the line voltage regulation in a manner similar to the instructions shown on page 14.		

End of life (EOL) 10 yrs. 5yrs on Re-Manufactured

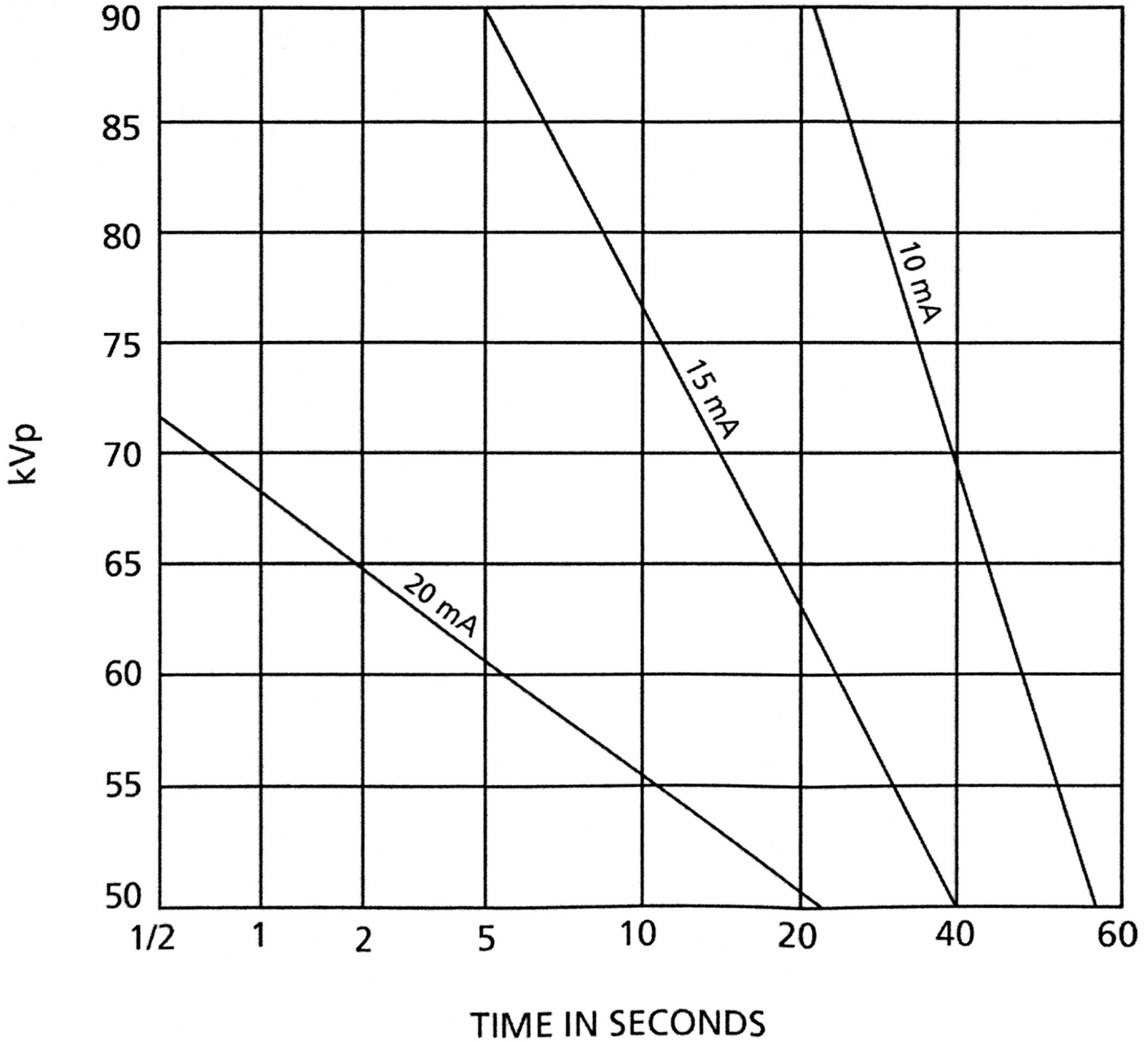
COOLING CURVES

Continuous duty ratings give the maximum duty permissible to prevent overheating of the tube housing when a continuous series of exposures are made. Continuous duty ratings are important when a series of exposures exceeds 10 minutes or if cooling time of the tube housing between each series is not adequate. See chart below.



INSTANTANEOUS TUBE RATING

Instantaneous tube rating gives the maximum exposure permissible for a single exposure to ensure that excessive heat energy does not damage and pit the tungsten anode. As shown in Chart II, at 90 kVp and 15 mA, do not exceed a 3 second exposure or damage to the tube may result.



ANODE THERMAL CHARACTERISTICS

Intermittent duty ratings give the maximum permissible duty for a series of exposures. Each exposure must not exceed the instantaneous tube ratings. See Chart III below.

The heat generated at the anode of the x-ray tube is proportional to the kVp, mA, and the time of the exposure. The heat is measured in heat units (H.U.) A heat unit is defined as $kVp \times mA \times \text{Time (seconds)}$. For example, the number of heat units developed by a 60 kVp, 15 mA, and 2 second exposure would be $60 \times 15 \times 2 = 1,800$ H.U.

The tube will operate within safe limits of the anode, if heating does not exceed the cooling rate. The maximum cooling rate of the anode is 7,200 H.U. per minute with a maximum anode storage of 25,000 H.U. For a 60 kVp, 15 mA at 2 second exposure, the number of exposures per minute should not exceed 4 ($7,200/1,800$). Chart I contains the housing cooling chart. The anode cooling curve is shown below.

