X-RAY

18-20V X-RAY GENERATORS

OPERATOR'S MANUAL

XRS4RA

XRS3RA

NOVEMBER 2021

ORIGINAL INSTRUCTIONS

Golden Engineering

Portable X-ray Technology

CONTENTS

RADIATION WARNING

The X-ray generator produces high levels of radiation and must be operated by qualified personnel who have read the WARNINGS and OPERATING INSTRUCTIONS sections of the manual before operating the device.

X-ray generators from Golden Engineering are industrial type open beam X-ray generators intended to radiograph inanimate objects. The devices are a pulsed X-ray device that produces X-ray pulses of very short duration (10-50 nanoseconds). The energy produced by the X-ray generator varies from model to model, and can be up to 370kVp, which makes it possible to radiograph up to one (1) inch (2.54 cm) of steel.

Each X-ray generator ships with two keys. Various kits are available with accessories such as battery packs, battery charger, remote cable or carrying case. Refer to the Spare Parts and Accessories section or contact your sales representative for more details.

WARNINGS

The X-ray generators from Golden Engineering are pulsed X-ray generators that emit hazardous ionizing radiation when pulsing. The unit should only be operated by **authorized personnel** who are properly trained to safely operate the X-ray generator. The X-ray generator must be **registered** with proper authorities prior to use and should not be used to intentionally expose humans.

Develop and closely follow a safe operating system for using the X-ray generator. The safe operating system must ensure that no one is exposed to radiation above the permissible limits which are 2 mR (0.02 mSv) per hour for a member of the public. The safe operating system must ensure the X-ray generator is used within federal and state guidelines.

All operators and users of the X-ray generator must wear a personal radiation monitoring device, such as a TLD (thermoluminescent dosimeter), film badge, and/or a pocket dosimeter consistent with the appropriate federal, territorial or provincial standards. If an operator or bystander is exposed to an unacceptable level of radiation contact your Radiation Safety Officer and/or appropriate health care provider.

NOTE: Electronic dosimeters and survey meters of the Geiger-Mueller and scintillator types may not detect the X-ray Generator's radiation pulses.

Due to the short pulse width of the pulsed X-ray, survey meters of the Geiger-Mueller and scintillator type do not accurately detect the radiation emitted from pulsed X-ray generators.

Survey meters should be of the ionization chamber (ion chamber) type and should be used in the integration mode. Survey meters must **not** be used in the rate mode because the pulsed X-ray generator does not produce constant radiation. Pulsed X-ray generators produce very high rates of radiation for very short periods of time resulting in either unrealistically high readings or no readings for a survey meter in rate mode.

Do not operate X-ray generators in explosive atmospheres, such as in the presence of flammable liquids, gases, or dust. The internal spark gap creates sparks which may ignite the dust or fumes.

PHYSICAL DESCRIPTION

XRS3RA

CONTROL MODULE

The main user interface for the X-ray generator located on top of the unit.

HIGH VOLTAGE PULSER/TUBEHEAD

The main body of the X-ray Generator is the tube head. The head contains the tube cavity, cold cathode type X-ray tube, spark gap, high voltage capacitor, and transformer.

HANDLE

The handle of the XRS3RA is attached to the front and back of the Control Module.
The handle of the XRS4RA is integral to the body.

PICATINNY RAIL

The X-ray generator is equipped a 21 mm picatinny rail located on each side of the housing and the top/bottom of the nose.

BEAM ANGLE LABEL

BATTERY

BATTERY PACK. The standard battery pack is a DeWalt® 20V 2 amp hour Li Ion battery (DCB203).

XRS4RA

RADIATION WARNING LABEL

BASE

The base of the unit contains an identification label and a ¼-20 brass insert compatible with standard camera tripods. The base also accommodates a quick release external tripod mount. The identification label located on the bottom of the generator lists the manufacturer's name and address, model number, serial number, weight, volt, amp, and production date.

CONTROL MODULE

BEAM ORIENTATION HANDLE

The X-ray beam is emitted from the head opposite the handle, perpendicular to the head. Use the handle to rotate the beam 360° so the aperture faces the intended direction.

LIQUID CRYSTAL DISPLAY (LCD)

The 80 character LCD is the main interface with the unit. See the Operating Instructions for more details on the various control screens.

BEAM DIRECTION LABEL

Indicates the direction of the X-ray beam.

X-RAY PULSING LIGHT

Blinks once per second after time delay button or remote cable button is pressed to warn that the X-ray Generator is going to pulse. The light stays on continuously while the unit is pulsing.

This is a failsafe warning light. If the light does not work the X-ray unit will not pulse. See settings menu for fail-safe override in emergency situations.

MODEL IDENTIFICATION

POWER ON LIGHT

Illuminates when battery voltage is applied to control module.

Top View
Control Module

DELAY SWITCH

Pressing both Left and Right arrow buttons simultaneously initiates the delay mode, allowing the operator to use the unit without the remote cable.

ENTER / EMERGENCY STOP

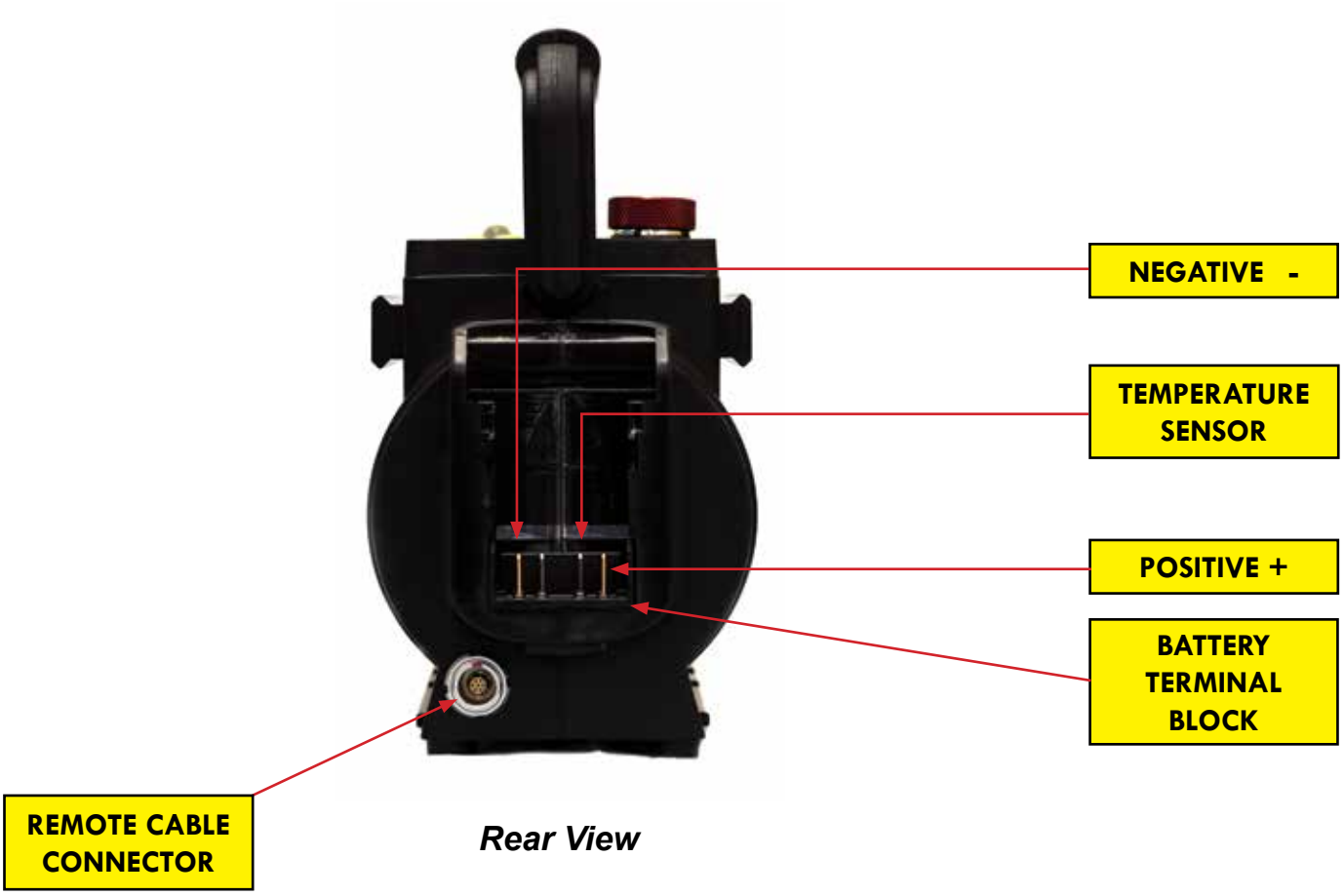
Stops the unit before it begins pulsing or stops the unit in the middle of a pulse train.
Also used as the enter button to select desired option.

KEY

Main power switch to turn the unit on and off.

DIRECTIONAL BUTTONS

Left, Right, Up and Down buttons used to navigate through the menu.



Rear View

BATTERY PACK

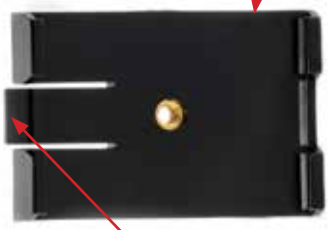
The standard battery pack is a DeWalt® 20V 2 amp-hour Li Ion battery (DCB203). The units are compatible with batteries up to 12 amp-hours.

BATTERY CHARGER

The standard battery charger is the DeWalt® DCB115 charger for both 110V and 220V. (Note: DeWalt model numbers may change). Battery charge time is typically less than one hour.
See battery charger manual for additional instructions and warnings.

PHYSICAL DESCRIPTION

XRS3RA - bottom



QUICK RELEASE TRIPOD MOUNT

TRIPOD MOUNT RELEASE TAB

NAMEPLATE LABEL

The nameplate identification label located on the bottom of the generator lists the manufacturer's name, model number, serial number, weight, volt, amp, and production date.

BASE

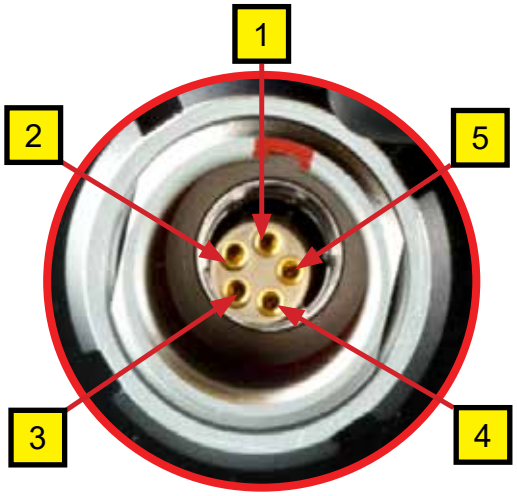
The base of the unit contains an identification label and a ¼-20 brass insert compatible with standard camera tripods. The bases also accommodate a quick release external tripod mount.
All units feature rubberized non-skid feet for stability when not using a tripod.

XRS4RA - bottom

REMOTE CABLE CONNECTOR

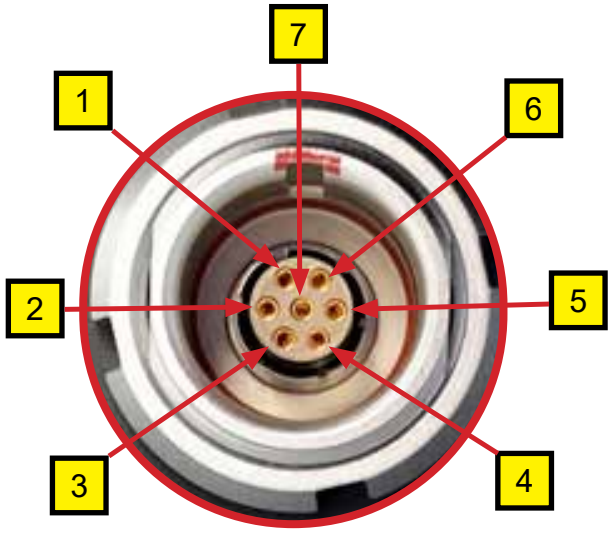
The X-ray Generator is equipped with Lemo "K" series connector located on the lower left corner of the back of the control module. This is where the remote cable or imaging system cable is attached. Depending on the options of the unit, this may either be 5 pin or 7 pin connector.

See the diagrams and table below for the details of each configuration.



5 PIN K REMOTE CABLE CONNECTOR

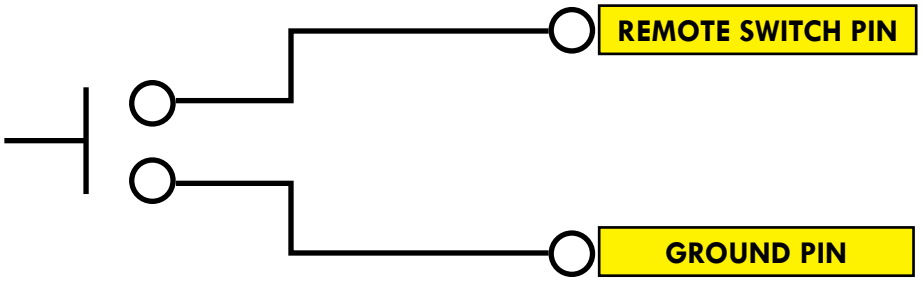
REMOTE CONNECTOR: LEMO EEG.0K.305.CLN
MATING CABLE PLUG: LEMO FGG.305.CYCC50Z



7 PIN K REMOTE CABLE CONNECTOR

REMOTE CONNECTOR: LEMO EGG.0K.307.CLN
MATING CABLE PLUG: LEMO FGG.0K.307.CYCC50Z

PIN #	5 PIN K CONNECTOR	7 PIN K CONNECTOR
1	+5 VOLTS 100 mA MAXIMUM	+5 VOLTS 1 A MAXIMUM
2	REMOTE SWITCH (5 sec delay)	REMOTE SWITCH (5 sec delay) (+3V)
3	REMOTE SWITCH – NO DELAY	REMOTE SWITCH – NO DELAY (+3V)
4	X-RAY ON / FEEDBACK SIGNAL	X-RAY ON / FEEDBACK SIGNAL (+5V)
5	GROUND (COMMON 0 VOLTS)	RS232-RX
6		RS232-TX
7		GROUND (COMMON 0 VOLTS)



Remote switch inputs are activated when connected to ground pin.

SERIAL INFORMATION
Baud Rate: 57600
8 – bit data
1 stop bit
Hardware flow control: None
Parity: none
Voltage Input: +/- 25V
Voltage Output: +/- 6V

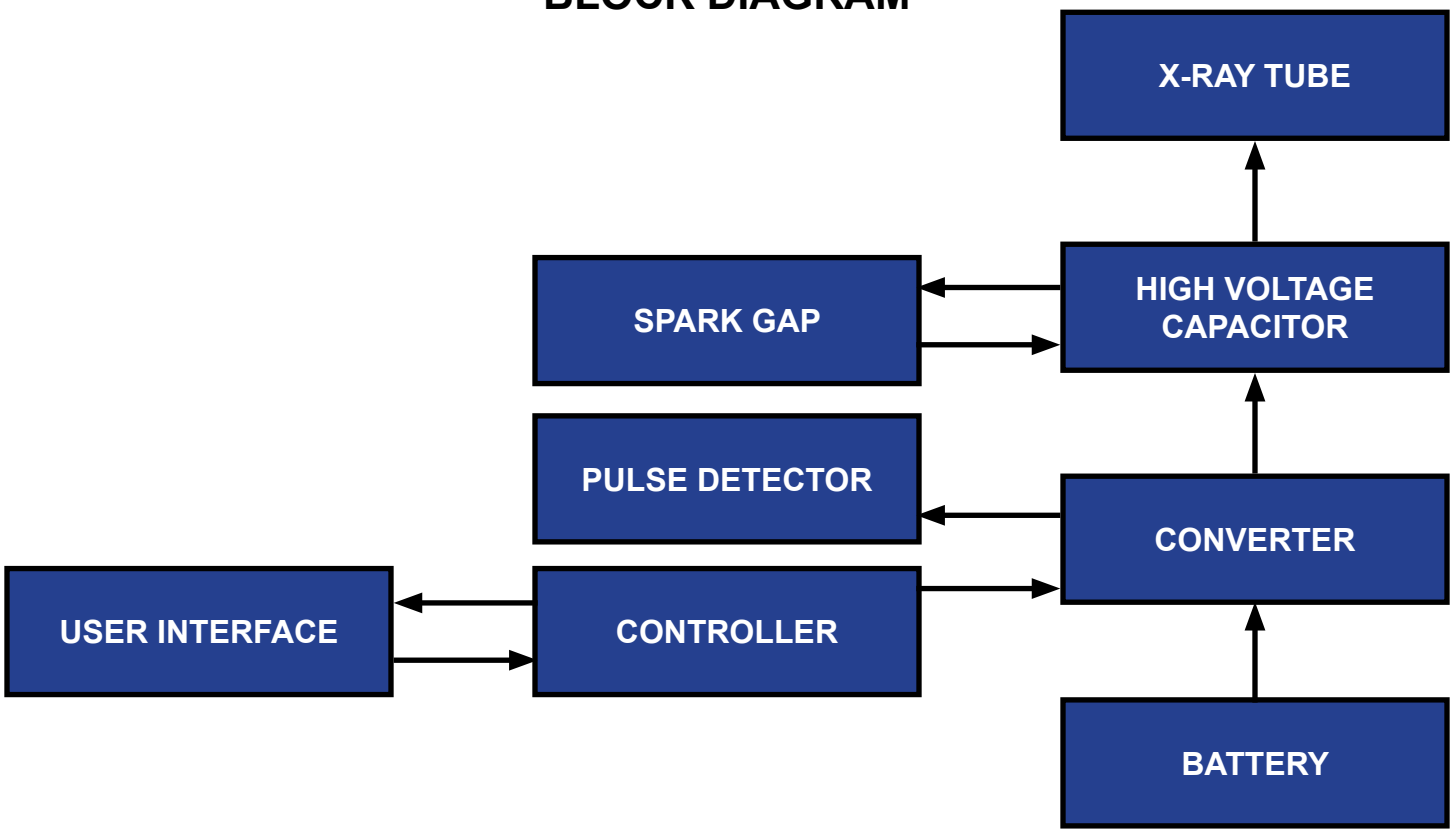
The block diagram below illustrates how the X-ray generator functions. The following sequence of events takes place each time the unit is fired:

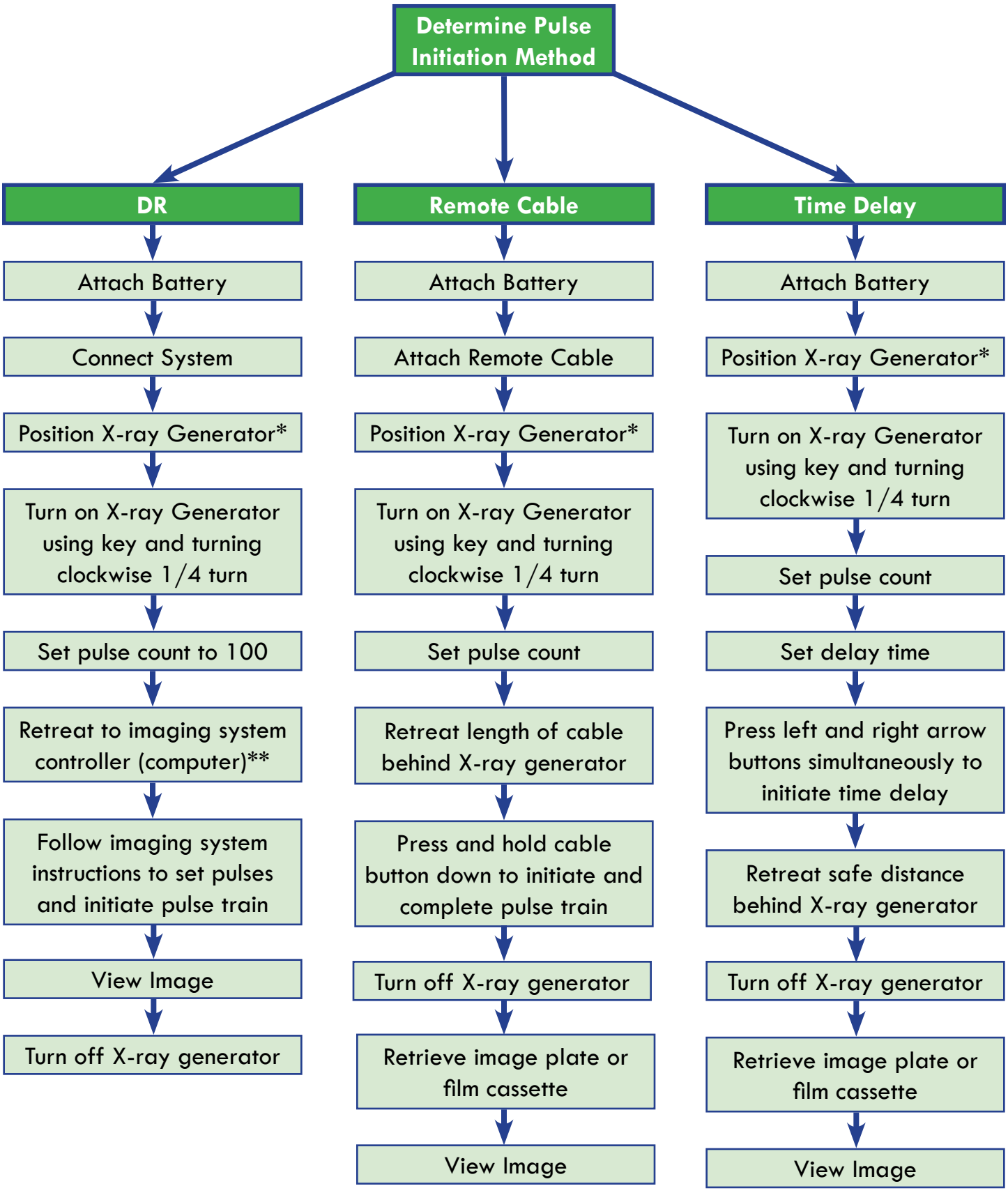
1. User initiates operation of the machine.
2. The controller sends a signal to the converter to begin oscillating.
3. Once oscillating, the converter section changes the DC battery voltage to 22Khz AC.
4. The transformer charges the High Voltage Capacitor to about 9000 volts.
5. The spark gap arcs after the High Voltage Capacitor reaches peak voltage.
6. The pulse detector signals the control block that the unit has pulsed.
7. As the High Voltage Switch is closed, a high voltage transient of between 150,000 and 370,000 volts (depending on the model and 10-30 nanoseconds in duration is applied across the X-ray tube generating X-rays.

The closing of the High Voltage Switch produces an audible pulsing sound. The X-ray generator cannot produce X-rays without the pulsing sound so it serves as an additional warning the unit is functioning.

This unit generates X-rays through high voltage bombardment of a tungsten target.
The X-ray generator **does not contain radioactive materials**.
All the high voltage is contained within the aluminum canister and as long as the canister is not punctured the operator is not exposed to dangerous voltages.

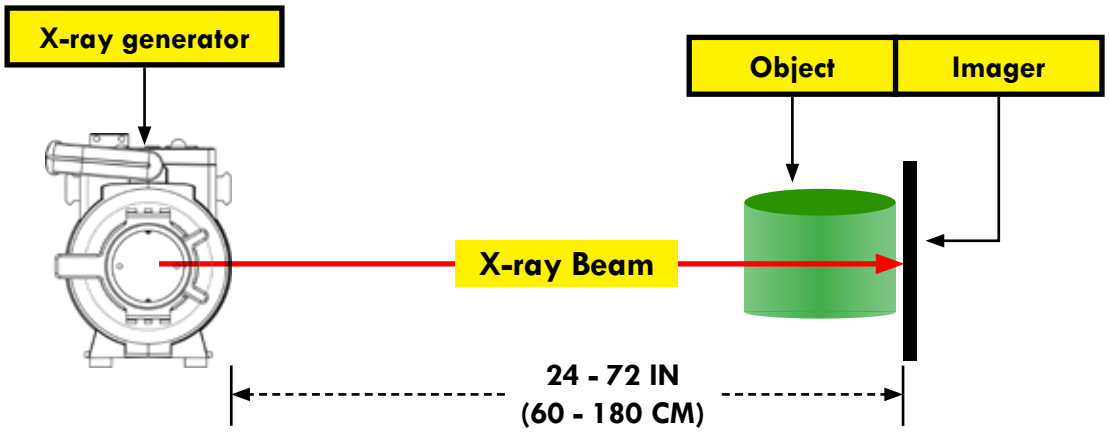
BLOCK DIAGRAM



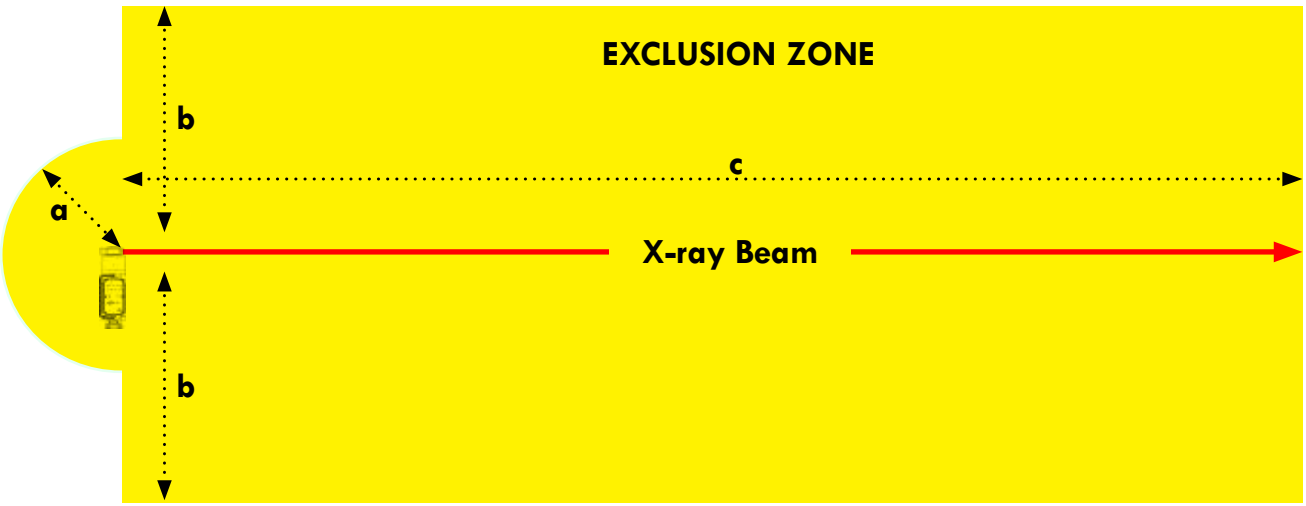

Determine Pulse Initiation Method
DR
Attach Battery
Connect System
Position X-ray Generator*
Turn on X-ray Generator using key and turning clockwise 1/4 turn
Set pulse count to 100
Retreat to imaging system controller (computer)**
Follow imaging system instructions to set pulses and initiate pulse train
View Image
Turn off X-ray generator
Remote Cable
Attach Battery
Attach Remote Cable
Position X-ray Generator*
Turn on X-ray Generator using key and turning clockwise 1/4 turn
Set pulse count
Retreat length of cable behind X-ray generator
Press and hold cable button down to initiate and complete pulse train
Turn off X-ray generator
Retrieve image plate or film cassette
View Image
Time Delay
Attach Battery
Position X-ray Generator*
Turn on X-ray Generator using key and turning clockwise 1/4 turn
Set pulse count
Set delay time
Press left and right arrow buttons simultaneously to initiate time delay
Retreat safe distance behind X-ray generator
Turn off X-ray generator
Retrieve image plate or film cassette
View Image

The following are basic operation instructions to take an X-ray image using the X-ray generator. Certain applications may require modifications to these basic procedures.

* The X-ray generator should be positioned directly in front of the object to be X-rayed and the imager placed directly behind the object to be X-rayed. Imager should be placed as close to the object as possible. Distance between X-ray generator and imager is usually 24 to 72 inches (60 to 180 cm). During operation the unit should be stabilized on a flat surface, a tripod, or a custom fixture suitable for holding the weight of the device. Refer to the Specifications table for details.



** *The operator should always stand outside of the exclusion zone. The exclusion zone (below) should be a controlled area free of all personnel while X-ray pulses.*



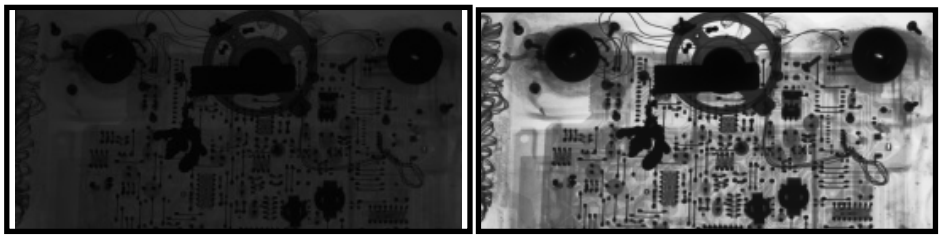
	XRS3RA	XRS4RA
a	10' (3 m)	20' (6 m)
b	25' (7.6 m)	36' (11 m)
c	100' (30 m)	113' (35 m)

RECOMMENDED PULSE SETTINGS

The chart below lists **approximate** pulses necessary to penetrate various materials. **Settings vary depending on imaging system used.** Refer to imaging system instructions for more information.

MATERIAL	PULSE SETTING	
	XRS3RA	XRS4RA
Cardboard, light wood, plastic	2-5	1-2
Light metal	10	5-10
Steel ¼" (6 mm)	25	25
Steel ½" (13 mm)	50	35-40
Steel 1" (25 mm)	99	50
Steel 1½" (25 mm)	-	99
Brass ⅛" to ¼" (3-6 mm)	99	50-99

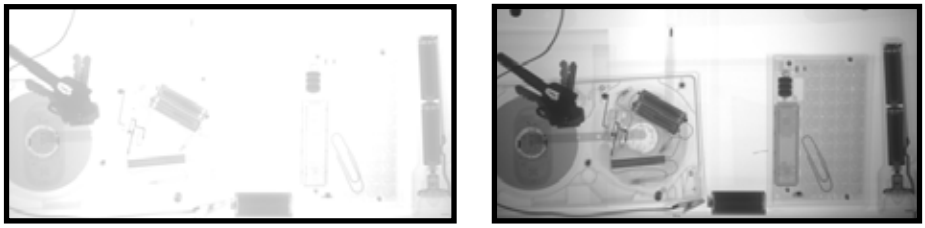
If the radiograph is too dark, the film is **underexposed**.



Underexposed *Correct Exposure*

Underexposure can be corrected by increasing the number of pulses and/or decreasing the distance between the imaging medium and the X-ray generator.

If the radiograph is too light the film is **overexposed**.



Overexposed *Correct Exposure*

Overexposure can be corrected by reducing the number of pulses and/or increasing the distance between the imaging medium and X-ray generator.

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HOME SCREEN - PULSES, DELAY, TRAINS

This is the HOME screen. From here you can set the number of pulses, delay in seconds, and adjust the trains settings. See MANUALLY ENTERING PULSE TRAINS.

Pulses:	Number of consecutive pulses that will be sent when the unit is fired.
Delay:	Number of seconds after the Delay sequence is activated by pressing BOTH the left and right arrows simultaneously
Trains:	Number of GROUPS of Pulses that will be sent when the unit is fired
BTWN:	Number of seconds between TRAINS

BASIC NAVIGATION

Press LEFT or RIGHT to change position.
The underlined character has the focus.
Press ENTER to select - cursor will blink between current setting and all segments on (black cursor).
Press UP or DOWN to change value of the selected character.
Press ENTER to accept.

Use directional buttons to navigate to all settings on the HOME screen. See below changing the Delay setting.

Press the DOWN arrow to navigate to the PULSES settings.


OR

to change cursor position

to switch to edit mode. Change cursor position with left/right arrows


OR

to change value

to accept

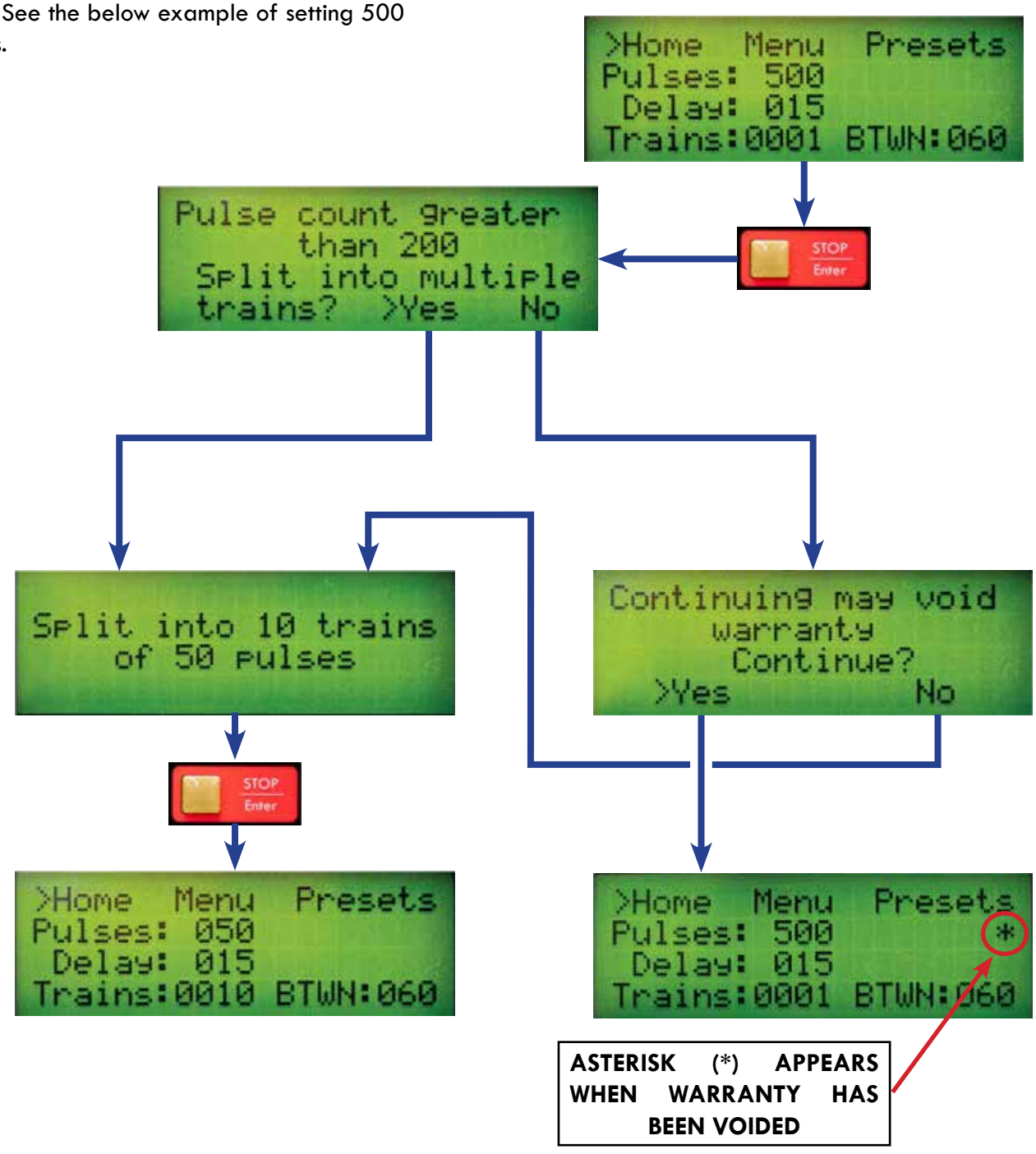
PULSE COUNT EXCEEDS DUTY CYCLE

DUTY CYCLE WARNING

The 20V family of X-ray generators are light duty machines that are not made to pulse continuously. The maximum duty cycle for the units is 200 pulses every four minutes. In temperatures above 90°F (32.22°C) or continual use situations, rest a minimum of 30 sec every 50 pulses and 4 min after every 200 pulses. Exceeding the duty cycle will shorten the life of the tube and head, and may also cause thermal damage to the circuit boards.

If the number of pulses exceeds 200, the unit will automatically attempt to split the pulses into consecutive pulse trains with a delay between them. See the below example of setting 500 pulses.

Set PULSES higher than 200, press Enter.



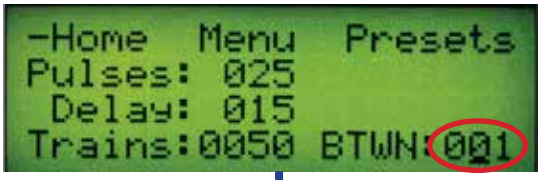
MANUALLY ENTERING PULSE TRAINS

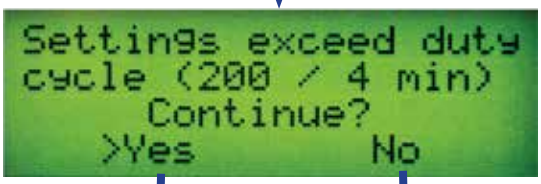
Arrow down on the HOME screen to adjust Trains and BTWN settings.
Trains indicates the number of consecutive pulse groups that will be sent.
BTWN indicates the number of seconds between pulse trains.

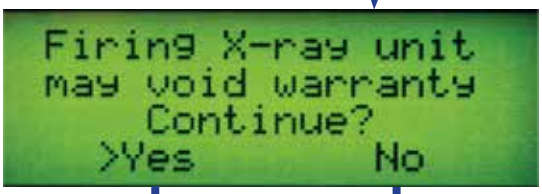
THE UNIT WILL FIRE 50 PULSE TRAINS OF 25 PULSES EACH, WITH A 4 MINUTE REST PERIOD BETWEEN TRAINS FOR A TOTAL OF 1250 PULSES

MULTIPLE PULSE TRAINS EXCEED DUTY CYCLE

Pulse train settings that exceed the duty cycle of 200 pulses in a 4 minute period will result on the following:







CANCELLING SETS
TRAINS = 1
BTWN = 240

Set PULSES and Delay, then adjust Trains and BTWN.

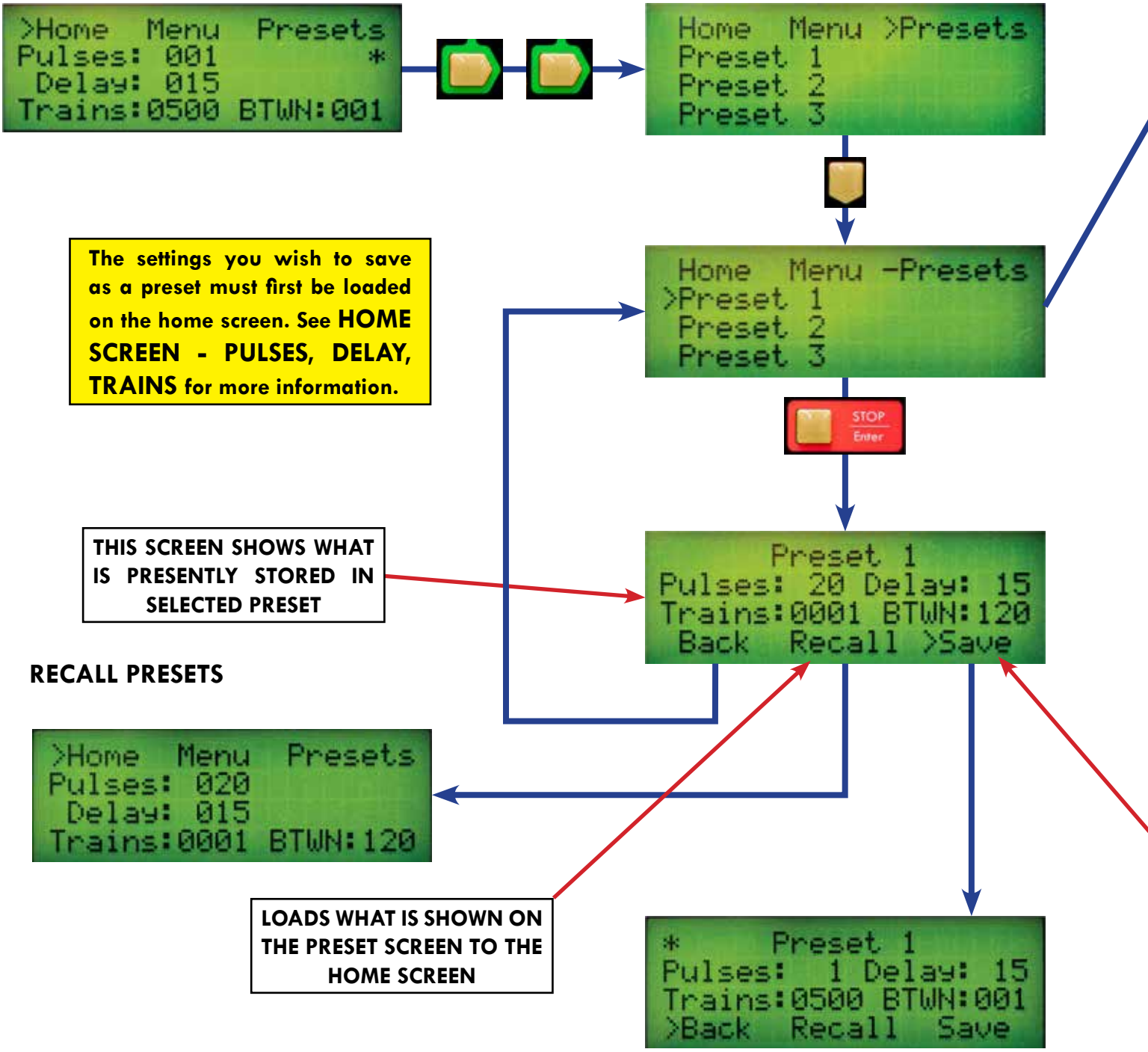
Operator may manually adjust settings and try again

ASTERISK (*) APPEARS WHEN WARRANTY HAS BEEN VOIDED

WORKING WITH PRESETS

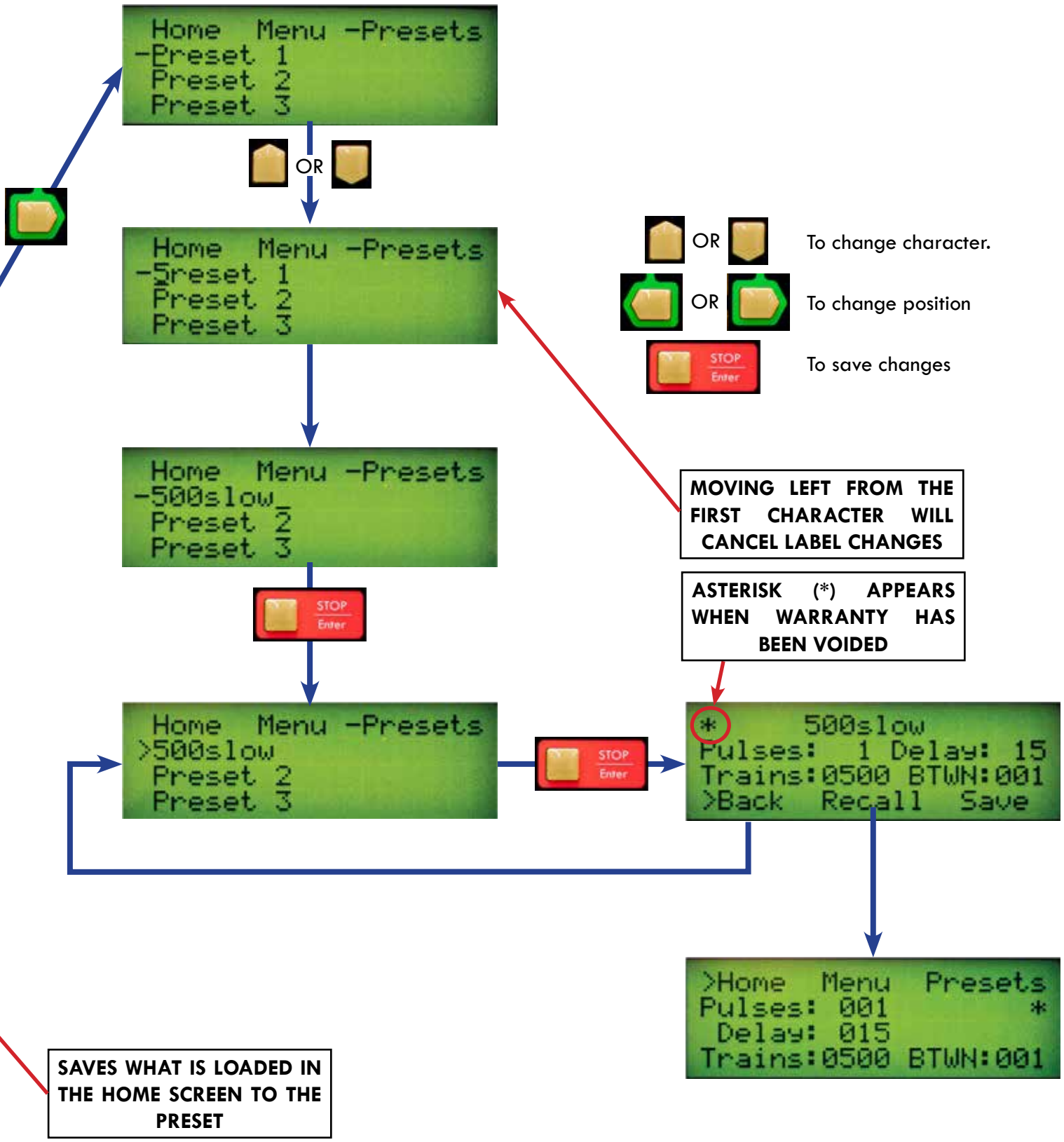
Presets allow the operator to save settings that are commonly used, so they can be recalled when needed. This is useful for changing between different pulse train setups.

DEFINE PRESETS

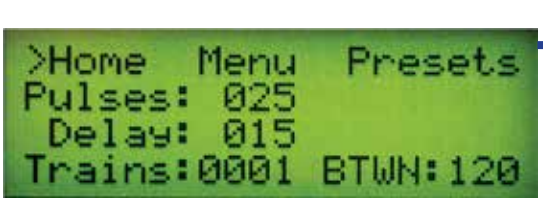


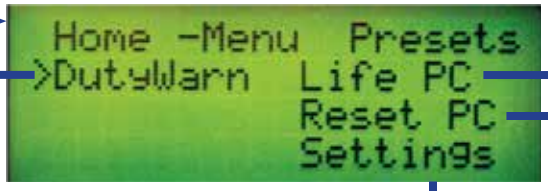
RECALL PRESETS

RENAME PRESETS



MENU SCREEN

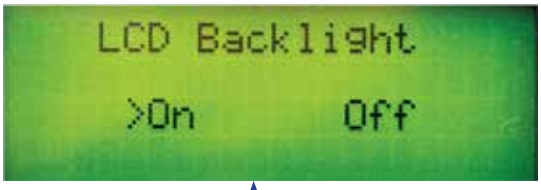


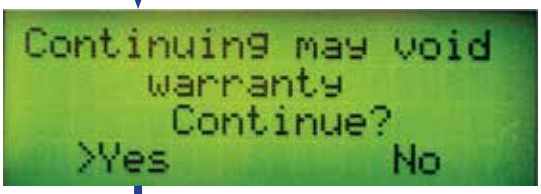


DISABLE DUTY CYCLE WARNING

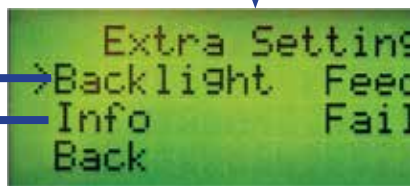
This setting allows the operator to disable the duty cycle warning. This is necessary for some DR imaging systems. Leaving the duty cycle warning enabled may interfere with normal operating parameters on these systems.

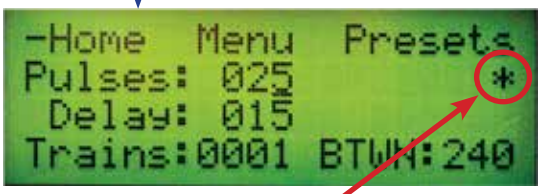
USE THE ARROW KEYS TO SELECT THE MENU, THEN PRESS ENTER TO NAVIGATE



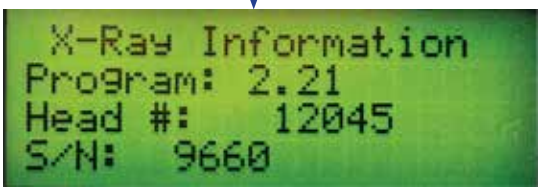


EXTRA SETTINGS





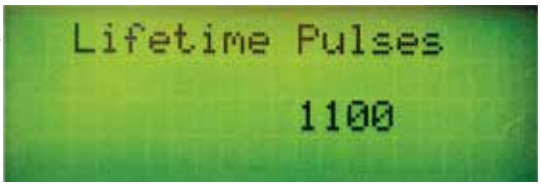
ASTERISK (*) APPEARS WHEN WARRANTY HAS BEEN VOIDED



Displays information about the software version, head number, and serial number of the unit. This is for informational purposes and cannot be edited in the field.

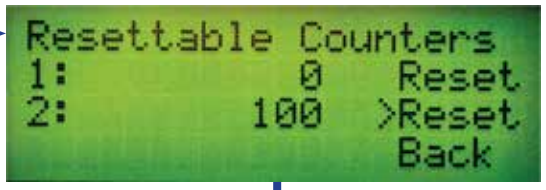
VIEW LIFETIME PULSES

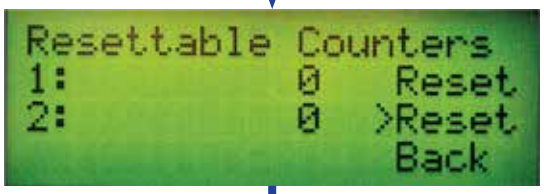
This screen displays the total number of pulses the unit has sent. This is for informational purposes and cannot be reset in the field.

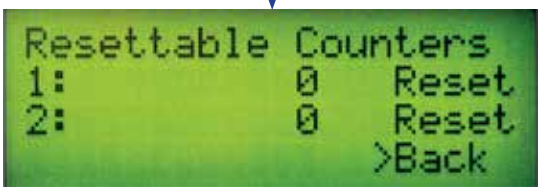


RESET PULSE COUNTERS

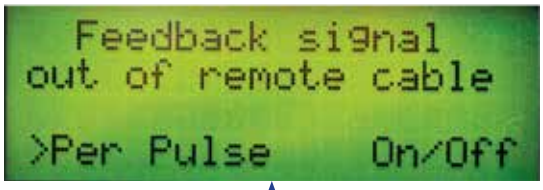
The unit has 2 resettable counters like the trip odometer in a car. Select RESET PC from the menu to view. Arrow down and press Enter to reset. Operator can use this feature to track number of pulses since the last tube replacement, number of pulses used on a specific job, or any other event the operator wants to track.

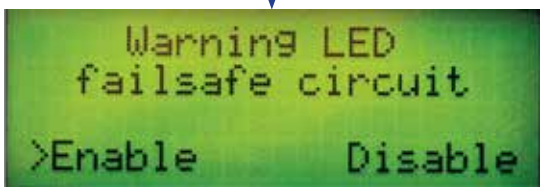






Select Per Pulse to send the feedback signal on the cable for every pulse (every pulse is counted).
Select On/Off to send a "TRUE" signal (+5V) for the duration of a pulse train.





Disabling the failsafe circuit may be necessary if the Check Warning LED error message is displayed but the LED is actually working. This will allow the unit to continue operating but service may be required. Contact Golden Engineering.

ERROR MESSAGES

The unit has reached the duty cycle of 200 pulses in less than 4 minutes and required a cool-down period of up to 4 minutes.

Battery voltage is at or below 15V. It is not recommended to leave the unit powered on once this message is displayed.

The failsafe warning LED is not lighting up. The control board may need to be replaced or the unit may need to be returned for service. Operation may continue by disabling the failsafe circuit. See Disabling Failsafe in the EXTRA SETTINGS section.

The unit has not detected a pulse within the past second. The battery may be low or there may be a problem with the oscillator circuit or another problem in the head. Try changing the battery. If the problem persists the unit should be returned for service.

The controller is not detecting the feedback signal. The unit will not pulse and must be returned for service.

The contol board is not receiving power. This may be a dead battery (try charging or replacing it).
The ribbon cable connecting the oscillator board to the control board may be disconnected. Remove the control panel and verify or correct the issue.

The unit was powered off with 5 pulse trains set. Select YES to continue with the multiple pulse trains. Select NO to set the trains back to 1 and time between to 240. The number of pulses is not reset, only the trains and time between.

SYMPTOM	TEST	ACTION
Unit makes loud popping noise while pulsing.		**Stop and return unit for repair.** Continued use in this condition will cause additional damage to the unit.
Oil visible in collimator window		Oil inside this window is normal, as long as it is not leaking to the outside of the unit.
Oil leaking from unit.	Remove oil from surface and see if it returns.	If oil returns, send unit back for repair.
No “power on” light	Check battery voltage Check bttery connection	Replace or charge battery Ensure battery is securely attached and battery clips are not bent or broken.
Power on lights, but X-ray does not pulse.	Check the battery voltage. Check the 2amp fuse.	Charge or replace the battery. Replace the fuse if necessary.
Power on lights, X-ray pulsing light does not illuminate, X-ray does not pulse	Check the battery voltage.	Go to settings menu failsafe disable To fix light replace processor board
Low Battery Please Charge	Appears if battery is below 15V	Charge the battery
X-ray pulses, but no image or black image.	Test X-ray output.	Return unit for tube replacement if no X-ray output dose.
Unit stops pulsing in the middle of a pulse train and LCD displays 00.	Check the battery voltage. Check 20 amp fuse.	Charge battery if necessary. Replace the fuse if blown.

MAINTENANCE

X-RAY DOSE MEASUREMENT

Using a dosimeter, the average X-ray dose for an X-ray generator can be established. If low output is suspected, follow this procedure to verify output dose.
The leakage sheet illustrates the X-ray dose and maximum allowable radiation leakage levels for each X-ray unit. A completed copy of this form accompanies each X-ray generator.

1. Place the dosimeter 30 cm in front of the aperture, perpendicular to the case, and in line with the center of the beam angle label.
2. Set the unit to 50 pulses and fire the X-ray generator.
3. Refer to the table at right for expected 50-pulse readings.
4. If output is too low, recommend returning the unit for repair.

Model	50 Pulse mR
XRS3RA	85-200
XRS4RA	185-425

TUBE REPLACEMENT

The **XRS3RA** and **XRS4RA** models must be returned for all service requirements. The head is filled with mineral oil, which requires special care for tube replacement and the orientation of the tube is critical to the RA unit's performance. The unit must be sent back to Golden Engineering or an Authorized Distributor for tube replacement. Tube life is approximately 100,000 pulses. Under normal conditions the tube's output will decrease slowly with use. If the tube is broken or the glass cracks the tube output will cease immediately.

BATTERY DISPOSAL

Follow all federal, state, and local laws for disposal of lithium-ion batteries. Batteries may be returned to Golden Engineering for proper disposal.

DISASSEMBLY INSTRUCTIONS

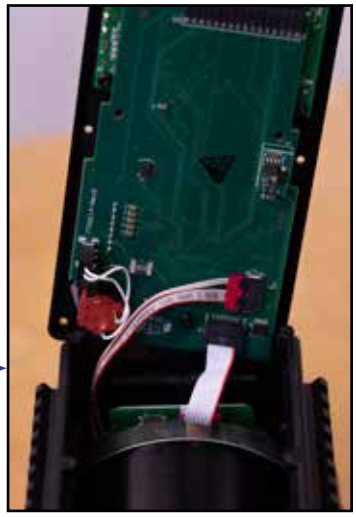
WARNING
Risk of electric shock
Remove battery before disassembling X-ray generator

In some cases it may be necessary to disassemble an X-ray generator to replace a board, or to isolate the head to return just that part for service.
Follow these instructions to complete the disassebbly process.

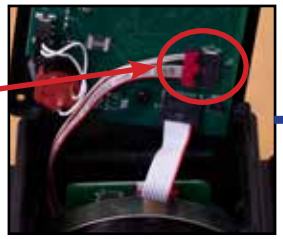
REMOVING THE CONTROL MODULE

Use T10 Torx driver to remove 6 screws holding control module in place.

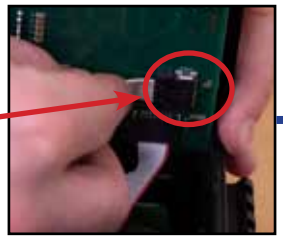
Tip the control module up to expose the connecting cables.



Units with 5-pin remote cable connectors will have a **red locking connector**. Use a small flat-head screwdriver to release the tab and gently pull the connector straight out.



Units with 7-pin remote cable connectors will have a **black friction connector**. Gently pull the connector straight out.

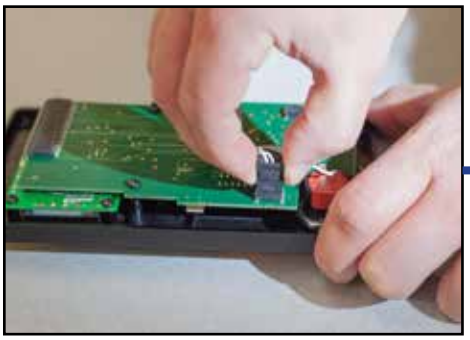


Keep track of where each of the screws came from as you disassemble the unit. They are all T10, but have different thread and length

Control Module Removed

INSTRUCTIONS FOR REPAIR

REMOVING THE MAIN CONTROL BOARD



Remove keyswitch connector

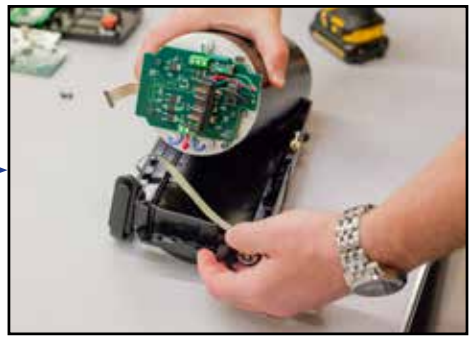
Remove 3 screws holding processor board to top

Remove processor board.

REMOVING THE HEAD

Remove the screws that hold the housing together.
XRS3RA has 8 screws;
XRS4RA has 7 in the main body, plus another 8 in the handle

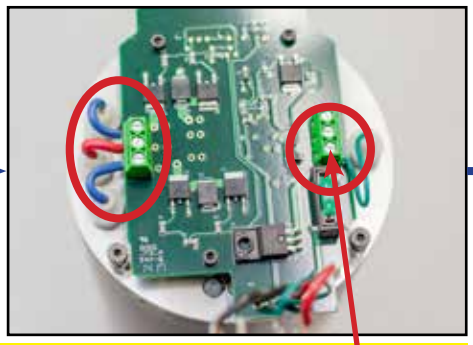
Remove one side of the housing.



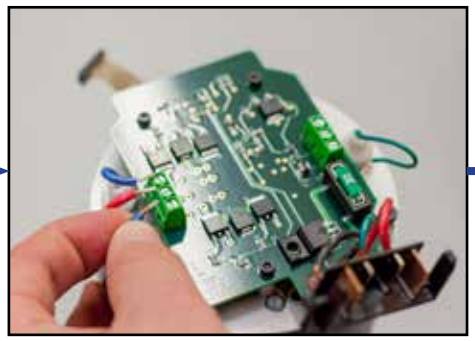
Remove the head and oscillator board.

REMOVING THE OSCILLATOR BOARD AND ISOLATING THE HEAD

Loosen the four screws that hold the feedback wires in place.



GREEN WIRE GOES ON THE BOTTOM TERMINAL



Remove feedback wires.

Disconnect ribbon cable.

Keep track of where each of the screws came from as you disassemble the unit. They are all T10, but have different thread and length

SAVE THESE 3 SPACERS. THEY WILL BE LOOSE WHEN THE BOARD IS REMOVED.

Remove the screws that connect the oscillator board to the head.

Remove the oscillator board.

Head is now isolated and can be returned for service.

SPECIFICATIONS

PHYSICAL DIMENSIONS INCLUDING BATTERY PACK		
MODEL	**XRS3RA**	**XRS4RA**
LENGTH (with battery)	15.42 in (39.17 cm)	19.26 in (48.92 cm)
WIDTH (with picatinny rails)	4.26 in (10.82 cm)	4.80 in (12.19 cm)
HEIGHT (without key)	5.83 in (14.81 cm)	7.05 in (17.91 cm)
WEIGHT (with battery)	11.80 lb (5.40 kg)	18.30 lb (8.30 kg)
X-RAY OUTPUT		
X-ray dose per pulse (12 inches in front of unit)	1.7 mR to 4.3 mR	3.7 mR to 8.5 mR
Pulses per battery charge	5500	3000
Pulses per second	21 (Nominal)	9 (Nominal)
Expected tube life (glass tube)	100,000 pulses	50,000 pulses
X-ray source size	1/8 in. (3mm)	1/8 in. (3mm)
Average X-ray Tube Current	0.25 mA	0.25 mA
Maximum Photon Energy	270 kVp	370 kVp
Output Power	67.5 W	92.5 W
X-ray pulse width (FWHM)	25 nanoseconds	10 nanoseconds
ELECTRICAL AND THERMAL CHARACTERISTICS		
Battery voltage	18-20 V	18-20 V
Battery type	Li Ion	Li Ion
Battery recharge time	1 Hour	1 Hour
Current draw	20A @ 18-20 V	13A @ 18V
Storage Temperature	0° to 120° F (-18 to 50° C)	0° to 120° F (-18 to 50° C)
Operating Temperature	0° to 120° F (-18 to 50° C)	0° to 120° F (-18 to 50° C)
Maximum duty cycle	200 pulses every 4 min (3000 pulses per hour)	200 pulses every 4 min (3000 pulses per hour)
High Temperature or High Use Duty Cycle	Rest 30 sec every 50 pulses and 4 min every 200 pulses	Rest 30 sec every 50 pulses and 4 min every 200 pulses
IP Rating	IP 54	IP 54
Minimum Standby Time	10 hours	10 hours
Warm-up	None required	None required

* output and charactersitic measurements are nominal based on fully charged battery

FWHM = Full Width Half Max value of a pulse

ITEM	PART NUMBER	
Thumbwheel Key	2002000	
Flat key	5951020	
DeWalt® Battery 20V DCB203 (2 Ah)	1800106	
DeWalt® Battery Charger (110V) DCB115	1800151	
DeWalt® Battery Charger (220V) DCB115	1800164	
5-Pin K Remote Cable	1809022	
7-Pin K Remote Cable	1809030	
ADAPTER CABLE (5 PIN K PLUG / 5 PIN B RECEPTACLE)	1809023	
ADAPTER CABLE (5 PIN K PLUG / 4 PIN B RECEPTACLE)	1809024	
ADAPTER CABLE (5 PIN K PLUG / 7 PIN K RECEPTACLE)	1809033	
ADAPTER CABLE (7 PIN K PLUG / 5 PIN B RECEPTACLE)	1809031	
ADAPTER CABLE (7 PIN K PLUG / 5 PIN K RECEPTACLE)	1809032	
ADAPTER CABLE (7 PIN K PLUG / 4 PIN B RECEPTACLE)	1809034	
	XRS3RA	**XRS4RA**
Tripod Mount	4000352	-
Carrying case (holds X-ray, 2 batteries, charger, cable)	1701520	1701682
Handle	4000153	4000035 R
		4000045 L

Golden Engineering, Inc. warrants XRS3RA, and XRS4RA X-ray units made and sold by it or its authorized representatives to be free of **defects in materials and workmanship** for a period of twelve (12) months from the date of shipment to the end user. **Warranty does not cover maintenance required due to life.** To make a claim under this limited warranty, customer must ship the entire unit (or the component believed to be defective) to Golden Engineering, post-paid. Golden Engineering, Inc. assumes no liability for units or components shipped until they are actually in the custody of Golden Engineering, Inc. Provided Golden Engineering, Inc. in its sole discretion, is satisfied that the failure is not the result of excessive use, abuse, misuse, accident, modification or improper disassembly or repair, Golden Engineering will provide parts and labor required to repair the unit. Golden Engineering reserves the right to use reconditioned and remanufactured components that meet original specifications. The unit or component will be returned and shipped to customer at customer's expense. THIS EXPRESS LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES AND GUARANTEES, EITHER EXPRESS OR IMPLIED OR CREATED BY OPERATION OF LAW.

INSTRUCTIONS FOR TRANSPORTATION, STORAGE, AND DISPOSAL

The X-ray generator is shipped in a rigid case or strong fiberboard box with custom foam insert. When transporting, remove the battery pack and transport in a rigid case or fiberboard box with sufficient cushioning. Store the X-ray generator in a dry environment within temperature ranges within in the specifications. For disposal remove the tube and follow all applicable environmental laws. Alternatively, the X-ray generator may be returned to Golden Engineering for proper disposal.

RETURNING UNIT FOR REPAIR

Complete the repair form at www.goldenengineering.com/technical.html and include a copy of the printed form with the repair. If you do not have internet access prior to sending repair then include a letter containing a brief description of the problem, contact name, phone number, and return address.

- Remove battery before shipping the unit.
- Accessories are not necessary with units shipped back for repair.
- Be sure the unit is securely packaged for shipment and seal in plastic bag if there is an oil leak.

Manufactured by:
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Web: www.goldenengineering.com
Email: service@goldenengineering.com

European Representative:
Certification Experts Europe
Nieuwstad 100
1381 CE Weesp,
The Netherlands

Country of Origin	USA	
Model	**XRS3RA**	**XRS4RA**
Serial Number		
Delivery Date		

Golden Engineering, Inc.
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