CRC®-77tHR

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OWNER'S MANUAL

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An Eczacıbaşı-Monrol company

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PREFACE

GENERAL

Thank you for purchasing the Capintec, Inc. CRC®-77tHR Radioisotope Dose Calibrator. Every effort has been made to insure that the information in this document is complete, accurate, and up-to-date. Capintec, Inc. assumes no responsibility for the results of errors beyond its control. Mention of products manufactured by other companies does not necessarily constitute endorsement by Capintec, Inc.

Please address any comments pertaining to this manual to:

CAPINTEC, Inc.
7 Vreeland Road
Florham Park, NJ 07932
Phone (800) ASK-4CRC
Fax (201) 825-1336

Note: Federal Law restricts this device to sale by or on the order of a physician, pharmacist or other licensed professional.

SYSTEM DESCRIPTION

The CRC®-77tHR Radioisotope Dose Calibrator consists of the following:

- Display Unit (Readout)
- Chamber
- Power Cord
- Printer (optional)

The CRC®-77tHR has the following capabilities:

- Perform activity measurements
- Dose Table
- Geometry Test
- Linearity Tests
    - o AutoLinearity
    - o Standard Test
    - o Lineator
    - o Calicheck
- Half-life Calculator

YEAR 2000 COMPLIANCE

The CRC®-77tHR measurement system contains information technology that accurately processes date and time data between the years 1999 and 2000. These products, when used in combination with products purchased from other manufacturers, whose products properly exchange date and time information, will accurately process the date and time. All future products are committed to meeting the same Year 2000 compliance.

MEDICAL EQUIPMENT SAFETY CLASSIFICATION

- CLASS I EQUIPMENT energized from an external power source.
- TYPE B EQUIPMENT with no applied parts to the patient.
- Ordinary EQUIPMENT without protection against the ingress of water or particulates (IP00).
- Suitable for CONTINUOUS OPERATION.
- NOT suitable for use in an OXYGEN or a FLAMMABLE ENVIRONMENT.

ELECTROMAGNETIC INTERFERENCE POTENTIAL

This equipment complies fully with interference immunity requirements of the standard IEC 60601-1-2 (2007): Medical Electrical Equipment – Part 1-2: General Requirements for Safety – Collateral Standard: Electromagnetic Compatibility – Requirements and Tests.

This equipment generates radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to nearby devices. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference, the user is encouraged to try to correct the interference by one of the following measures:

- Increase the separation between the equipment and the affected device.
- Plug the unit into an outlet on a circuit different from that which the affected device is connected.

If this fails to correct the problem, please contact Capintec's only Authorized Service Center.

IMPORTANT SAFETY INFORMATION

The CRC®-77tHR measurement system has been carefully designed to provide years of safe and reliable performance. As with all electrical equipment, however, there are basic precautions that must be observed to avoid injuring yourself, the patient or damaging the equipment.

- ***Follow*** the unpacking and assembly instructions as explained in CHAPTER 4: SYSTEM SETUP, and ***read*** this manual carefully before using this equipment. Be sure to save all provided documents for future reference.
- ***Understand all*** warning and caution labels as explained in CHAPTER 1: SAFETY before operating this equipment.

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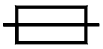
CHAPTER 1

SAFETY

GENERAL

These warnings and instructions for use form an integral part of the CRC®-77tHR and must therefore be kept available for consultation at all times. Precise compliance with the instructions is an essential condition for normal use, correct application and thus safety of the user.

SYMBOL DEFINITIONS

	Dangerous Voltage Present
	Functional Earth Ground
	Caution
	Operator should consult accompanying documents
	Operator must refer to instruction manual before use
	Fuse
	AC Voltage
	“ON” (power)
	“OFF” (power)

	Date of manufacture
	CE Mark
	Waste in Electrical and Electronic Equipment (WEEE) – This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately.
	Environmentally Friendly Use Period (EFUP) – 20 years from the date of manufacture – Toxic or hazardous substances or elements contained in the unit will not leak or mutate under normal operating conditions resulting in any environmental pollution, bodily injury or damage to assets.

WARNING AND CAUTION LABELS

The system power requirements and the replacement fuse values for power line voltages are located on the back of the Readout Unit (Figure 1-1).

CAUTION: Please reference CHAPTER 15: CLEANING AND MAINTENANCE, SECTION: FUSE SERVICING for instructions on how to change the fuses of the CRC®-77tHR.

CAUTION: A fire hazard may exist if the wrong size of fuse is installed.

Figure 1-1

The bottom of the Chamber contains the following labels:

- Figure 1-2 contains statements denoting not to remove the cover because there are no adjustments that the user can perform in the Chamber.

Figure 1-2

- Figure 1-3 pertains to the electrical safety of the Chamber. It is necessary because of the high voltage present (up to 180 Volts DC) in the Chamber. A screwdriver is necessary to remove the cover.

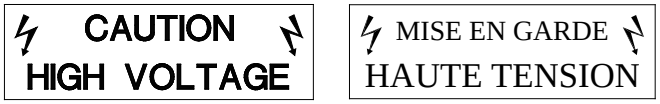


Figure 1-3

CAUTIONS AND NOTES

CAUTION: Only qualified/trained personnel should operate or service this unit.

CAUTION: If the equipment is used in a manner not specified in this manual, the protection provided by the equipment may be impaired.

CAUTION: Do not store high activity radioactive samples in the CRC®-77tHR Chamber(s). The Chamber is carefully designed for accurate and precise measurements of high activity radioactive materials. It was not designed to function as a long term storage vessel. Prolonged storage of high activity radioactive samples in the Chamber may cause premature failure of the unit.

CAUTION: In order to obtain a correct reading for a Test Source (Standard Source) Vial, the supplied liner and dipper must be used to achieve the correct geometry. The CRC®-77tHR is not designed to use syringe Test Sources in any application.

CAUTION: No internal adjustments inside the Readout or Chamber(s) may be performed by the user within the conditions of the warranty, except for changing the fuse. Due to the presence of high voltages, opening the cover with the system plugged in may be hazardous. Refer all servicing to qualified personnel.

CAUTION: Never use the calibrator without the Chamber liner(s) in place. Liners are inexpensive and easy to replace. A contaminated Chamber is a very costly mistake. If the unit becomes contaminated, remove the liner and clean the unit as stated in CHAPTER 15: CLEANING AND MAINTENANCE, SECTION: CLEANING and DISINFECTING before operating.

CAUTION: Care must be exercised when moving the instrument or when maintenance is performed. The shielded cylinder is heavy (12.7 kg or 28 lb). In order to provide the required sensitivity, the wall of the ionization chamber is extremely thin and the chamber is filled with pressurized gas. It is therefore, essential to avoid mechanical shock or vibration of any kind.

CAUTION: When working with a heavy sample, always lower it gently into the Chamber. Dropping any heavy object into the Chamber can cause permanent, expensive damage.

CAUTION: The use of multiplication and division factors in Calibration Numbers is only to maintain a degree of consistency with other Capintec Dose Calibrators. The CRC®-77tHR is a direct reading instrument. If multiplication or division is required, the arithmetic will be done by the system. The actual activity is displayed. DO NOT apply these factors to the displayed activity yourself.

CAUTION: It is desirable to leave the unit powered at all times in order to prevent moisture absorption and to maintain the stability of the instrument (especially if the instrument is subjected to high humidity or low temperature).

CAUTION: The CRC®-77tHR was designed for use in isotope production sites. Use in any other environment could cause Electromagnetic Interference (EMI) to be introduced into other devices located in the same general area as the CRC®-77tHR or the CRC®-77tHR may become susceptible to EMI.

CAUTION: The CRC®-77tHR essential performance of radiation measurement relies on the ability of the device to correctly measure the current produced by the radiation detector, which is the chamber. Electromagnetic Interference (EMI) due to nearby devices should not affect the current reading significantly. In the worst case the background noise would increase slightly. This would reduce the minimum activity level the unit can measure. This loss of sensitivity would not affect the essential performance of the unit due to the high levels of activity measured by the unit.

CAUTION: This equipment generates radio frequency energy and is susceptible to radio frequency energy (such as from other equipment and portable and mobile RF communications equipment). The equipment needs to be installed no close than 12 inches (30 cm) to any part of the CRC®-77tHR; otherwise the equipment may not function properly or may cause harmful Electromagnetic Interference (EMI) to nearby devices. There is, however, no guarantee that interference will not occur in a particular installation/location.

CAUTION: If any customer supplied printer is attached to the CRC®-77tHR, the safety of the unit may be compromised or Electromagnetic Interference (EMI) may be introduced into other devices located in the same general area as the CRC®-77tHR or the CRC®-77tHR may become susceptible to EMI. The user might need to take mitigation measures, such as relocating or re-orienting the equipment.

CAUTION: Only the 12 ft (3.7 m) Chamber cable (8400-20507) and the 6 ft (1.8 m) power cord (8125-0011) shipped with the unit may be used failure to do so may cause the safety may be compromised or Electromagnetic Interference (EMI) may be introduced into other devices located in the same general area as the CRC®-77tHR or the CRC®-77tHR may become susceptible to EMI.

CAUTION: Only the Chamber (5130-20260) supplied with this unit may be used. Failure to do so may cause the safety may be compromised or Electromagnetic Interference (EMI) may be introduced into other devices located in the same general area as the CRC®-77tHR or the CRC®-77tHR may become susceptible to EMI.

CAUTION: The emissions characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required) this equipment might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment.

CAUTION: The unit contains lead. Appropriate caution should be taken if the interior of the unit is exposed. The unit should be disposed of in accordance with local and national regulations.

CAUTION: The unit contains a Lithium Battery. This should be disposed of in accordance with local and national regulations.

CAUTION: The user should always verify the validity of any measurement or test result in order to minimize measurement errors.

WARNING: The CRC®-77tHR must be connected a supply mains with protective earth.

WARNING: No modification of this equipment is allowed.

Note: *It is recommended that periodic (every five years) re-calibration of the unit be performed only by Capintec's <u>only</u> Authorized Service Center (reference CHAPTER 15: CLEANING AND MAINTENANCE) to guarantee that the instrument's high reliability is maintained).*

GENERAL SAFETY TIPS

- Unplug the equipment before cleaning it. Use only a damp cloth; do not use solvents or aerosol cleaners.
- To protect the equipment from overheating, do not use the equipment directly in front of a radiator or heat register.
- Do not use the equipment near water, or spill liquids of any kind into the equipment.
- Be sure that your power source matches the rating listed on the CRC®-77tHR Calibrator.
- The CRC®-77tHR power cord has a grounded, 3-prong plug as a safety feature, and it will only fit into a grounded outlet. Do not use an adapter to defeat the grounding.
- Do not position the CRC®-77tHR such that the mains power on/off switch at the base of the unit cannot be accessed.
- To avoid damaging the power cord, do not place anything on it or place it where it will be stepped on. If the cord becomes damaged, replace it immediately.
- Aside from the routine maintenance described in this manual, do not try to service this equipment yourself. Do not make any adjustments other than those outlined in this manual, as you may in-validate the calibration or cause damage requiring extensive repair work. Refer servicing to qualified service personnel.

CHAPTER 2

FUNCTIONAL & TECHNICAL DESCRIPTION

INTENDED USE

The CRC®-77tHR is intended to be used by a radiochemist, radiopharmacist, health physicist, or other trained professional.

The CRC®-77tHR is designed to measure high levels of radioactive materials, usually associated with isotope production. It may be used in radiopharmaceutical production, isotope or source production, or research applications

OPERATOR PROFILE

The operator profile for the radiochemist, radiopharmacist, health physicist, or other trained professional is as follows:

- **Education:**
  - Minimum: at least an Associate Degree
  - No maximum
- **Knowledge:**
  - Minimum: Understands the basic concepts of nuclear medicine.
  - No maximum

- **Language Understanding:**
  - English
  - Other languages are available for instructions for use

- **Experience:**
  - Minimum: Has minimum training or is under surveillance by a trained user.
  - No maximum

OPERATOR TRAINING

This Owner's Manual contains all of the information required to operate the CRC®-77tHR.

FUNCTIONAL DESCRIPTION

The CRC®-77tHRR includes a Chamber that provides a precise, accurate, fast and very convenient method of measuring the activity of a radioisotope sample for Nuclear Medicine.

The activity of the sample will be displayed with a proper unit when a sample of unknown strength (activity) of a known radioisotope is placed in one of the detectors (ionization chamber or counter) and the correct calibration number is selected.

The sample must be placed in the same geometry as the reference source used to determine the calibration number by using the appropriate source holder.

Note: *For a detailed description of the basic principles of the calibrator, reference APPENDIX I: PRINCIPLE OF THE CALIBRATOR.*

Most radioisotopes can be measured in the Chamber.

Eight preset nuclide keys (Chamber Hotkeys) are provided on the Measurement screen for the most often used radioisotopes.

Twenty user assignable nuclide keys (Nuclide Screen Hotkeys) are provided for commonly used radioisotopes that do not have a preset nuclide key.

Measurements may be made reliably from as low as 1 millicurie (37 mega (10^6) Becquerel) for most radioisotopes to as high as 400 curies [14,800 giga (10^9) Becquerel] of Tc99m.

The 6cm diameter and 25cm deep ionization chamber well allows convenient measurements of virtually any radioisotope geometry in clinical use including whole generators, syringes and seed trains.

The external shield of the ionization chamber protects users from exposure to intensive radiation and reduces the effects from background radiation on low-level measurements.

FUNCTIONS

When the instrument is first powered up, Figure 2-1 Startup Screen will appear.

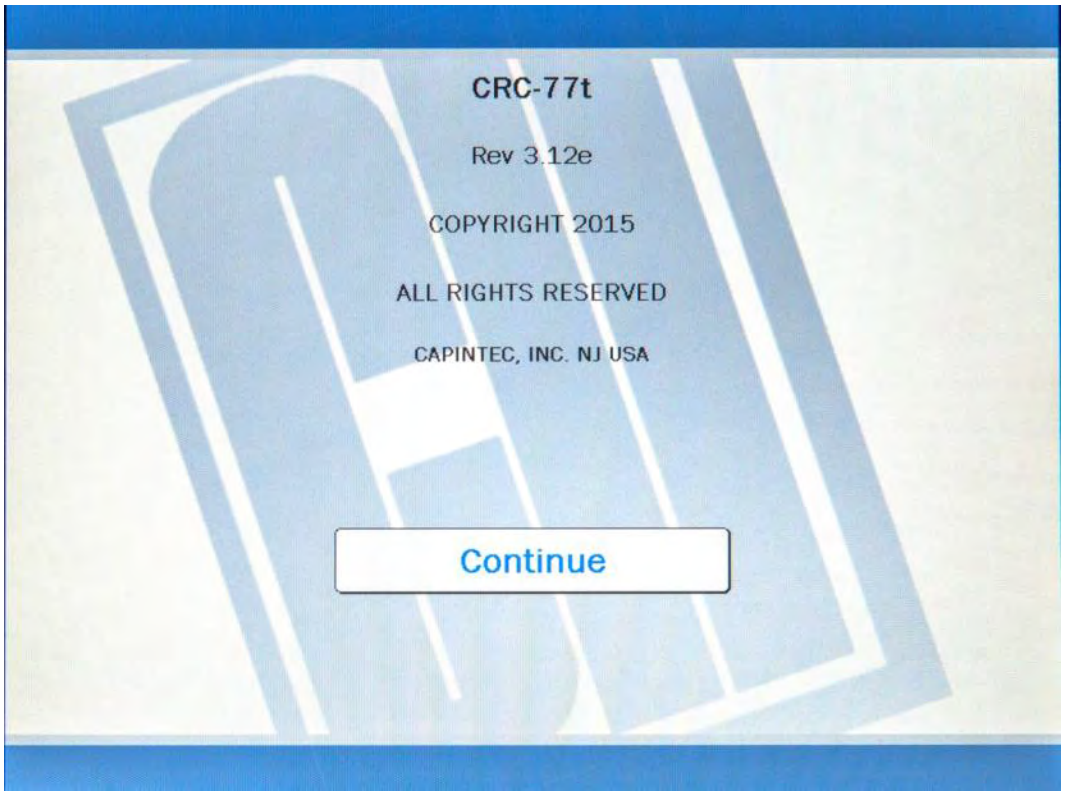


Figure 2-1 Startup Screen

Note: *The screen will display the revision level of the installed software.*

When the **CONTINUE** button is touched, Figure 2-2 Measurement Screen will appear and the system is ready to perform measurements.

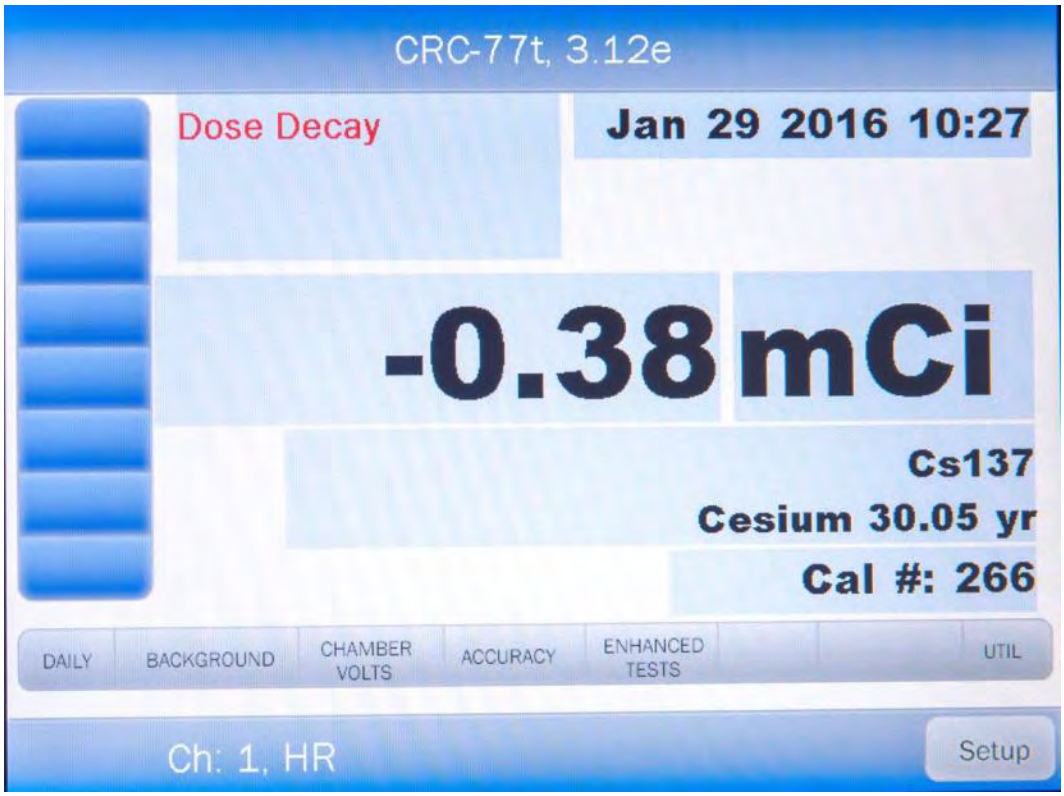


Figure 2-2 Measurement Screen

Overall Program Flow

When the power is turned on, the Startup Screen appears. When the **CONTINUE** button is pressed, the Measurement Screen is displayed and the CRC®-77tHR begins measuring the activity in the Chamber. All measurements and system functions are accessed from this screen.

The main system functions pertaining to the Chamber consist of setting date and time, choosing Curie or Becquerel operation, printing, screen setup, Curie-Becquerel calculations, Decay calculations and Diagnostics.

The functions for the Chamber are accessed from the Measurement Screen. These consist of Nuclide Key (Chamber Hotkey) assignment, Test Source information, Linearity testing, Chamber testing and Geometry testing.

TECHNICAL DESCRIPTION

On / Off Switch

The on/off switch (I = on; ○ = off) is located on the back of the instrument.

Warm Up Period

Approximately 30 minutes should be allowed for the instrument to stabilize. While the instrument is warming up, it is strongly recommended that you become familiar with the CRC®-77tHR.

Environment Requirements

Indoor use only. Pollution Degree 2, Altitude, and Installation Cat. II.

Operational

The instrument should be located where the level of the background radiation is as low and as constant as possible.

The instrument should be located where the temperature is stable within a range of +50°F to +85°F (+10°C to +30°C) and the maximum relative humidity is 90% non-condensing to warrant maximum reliability and accuracy.

The instrument should be located where the barometric pressure is within a range of 27 – 31 inches of mercury (91 – 105 kilopascals).

Storage

The instrument should be stored where the temperature is stable and the range is from +39°F to +110°F (+4°C to +43°C) and the maximum relative humidity is 90% non-condensing to warrant maximum reliability.

The instrument should be stored where the barometric pressure is within a range of 15 – 33 inches of mercury (51 – 112 kilopascals).

⚠ **CAUTION:** If these environmental requirements are not followed, the instrument may display erroneous readings

Power Requirements

CAUTION: If the input voltage to the following items is not within the stated limits, the unit may not function correctly or may be damaged

Line Voltage

Readout

100Vac, 50/60Hz, 300mA
240Vac, 50/60Hz, 1A

Printer (Optional)

HP DeskJet 6000/8000 Series Inkjet (or equivalent) Printer
100-240Vac, 50/60Hz, 1.5A

Line Filter

Line filter is provided internally.
Use of a filtered line is recommended if excessive line noise is anticipated.

Ground Current

Less than .5mA

Power Connector and Cable

A grounded 3-prong plug cord for the instrument that is approved for use at the user's site must be used.
Interconnection of devices must be made using the cables supplied with the instrument.

Dimensions

Console

Height	28.0cm	(11.0in)
Width	22.9cm	(9.0in)
Depth	31.0cm	(12.2in)
Weight	3.5kg	(7.7lb)

Chamber

Height	43.8cm	(17.25in)
Diameter	17.2cm	(6.76in)
Weight	12.7kg	(28lb)
Well Diameter	6.1cm	(2.4in)
Well Depth	25.4cm	(10.0in)
Cable Length[1]	3.7m	(12ft)
Lead Shielding	3.2mm	(1/8”)

[1] Longer cables are available. Consult factory.

Cables

Power ..... 1.8m..... (6ft)
Printer[2]..... 1.8m..... (6ft)

Performance

Measurement Range:
- Maximum Activity (F18).....4,810 GBq (130 Ci)
- Maximum Activity (I 131) .....11,100 GBq (300 Ci)

Resolution.....37.0 MBq (1.00 mCi)
Electrometer Accuracy[3] .....better than ±2%
System Precision .....better than ± 0.1% of FSD
System Linearity .....within ±2%
Response Time
- Below 20mCi .....within 25 seconds
- Above 20mCi.....within 4 seconds

Regulatory Listings

The CRC®-77tHR has been independently tested and is manufactured in compliance with the following Standards:

EMC

- IEC 60601-1-2 (2007): Medical Electrical Equipment – Part 1-2: General Requirements for Safety – Collateral Standard: Electromagnetic Compatibility – Requirements and Tests
- This unit complies, without any deviations with the following emissions and immunity standards:
  - Radiated Emissions CISPR11 ed5.0 (with A1:2010); AC Mains Conducted Emissions class A, CISPR11 ed5.0 (with A1:2010) class A
  - Harmonics IEC 61000-3-2 ed4.0 (2014-05)
  - Flicker IEC 61000-3-3 ed3.0 (2013-05)
  - Electro-Static Discharge Immunity Test IEC 61000-4-2 ed2.0 (2008-12)
  - Radiated, Radio-Frequency, Electromagnetic Immunity IEC 61000-4-3 ed3.0 (with A1:2007+A2:2010)
  - Immunity to proximity fields from RF wireless communications equipment
  - Electrical Fast Transient/Burst Immunity Test IEC 61000-4-4 ed3.0 (2012-04)
  - Immunity to Surges IEC 61000-4-5 ed3.0 (2014-05)
  - Conducted, Radio-Frequency, Electromagnetic Immunity Test IEC 61000-4-6 ed2.0 (with A1:2004+A2:2006)
  - Power Frequency Magnetic Field Immunity Test IEC 61000-4-8 ed2.0 (2009-09)
  - Voltage Dips/Interruptions Immunity Test

[2] Optional
[3] Overall accuracy is determined by the calibration for the specific nuclide and the sample configuration and the accuracies of the standard sources used for calibration of the electrometer.

- No special instructions are required to maintain compliance with these standards beyond those noted in CHAPTER 1: SECTION Cautions and Notes on how to maintain the unit's performance in regards to electromagnetic disturbances.

Safety

- EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use Part 1: general requirements
- AAMI ES60601-1: Issued: 2012/08/20 Medical Electrical Equipment – Part 1: General Requirements for Basic Safety and Essential Performance, Amendment 1. Product safety evaluation to AAMI 60601-1 3rd Edition, Amendment 1
- IEC 60601-1: Issued: 2005/12/15 Ed. 3 Medical Electrical Equipment – Part 1: General Requirements for Basic Safety & Essential Performance; Corr. 1: 2006, Corr. 2: 2007, Amd. 1: 2012
- CSA C22.2#60601-1: Issued: 2014/03/01 Ed: 3 Medical Electrical Equipment – Part 1: General Requirements for Basic Safety and Essential Performance
- IEC 60601-1-6: Issue:2010/01/27 Ed:3 Medical electrical equipment – Part 1-6: General requirements for safety – Collateral Standard: Usability Review of usability per 60601-1 3rd Edition
- IEC 62366: Issued:2007/10/18 Ed:1 Medical Devices – Application of Usability Engineering to Medical Devices
- IEC 62304: Issue:2006/05/09 Ed:1 Medical Device Software – Software Life Cycle Processes

CHAPTER 3

GENERAL OPERATING INSTRUCTIONS

GENERAL

This section describes general operating procedures, the touch screen, and how to access all other tests and screens

MEASUREMENT SCREEN

The CRC®-77tHR Measurement screen is shown below.

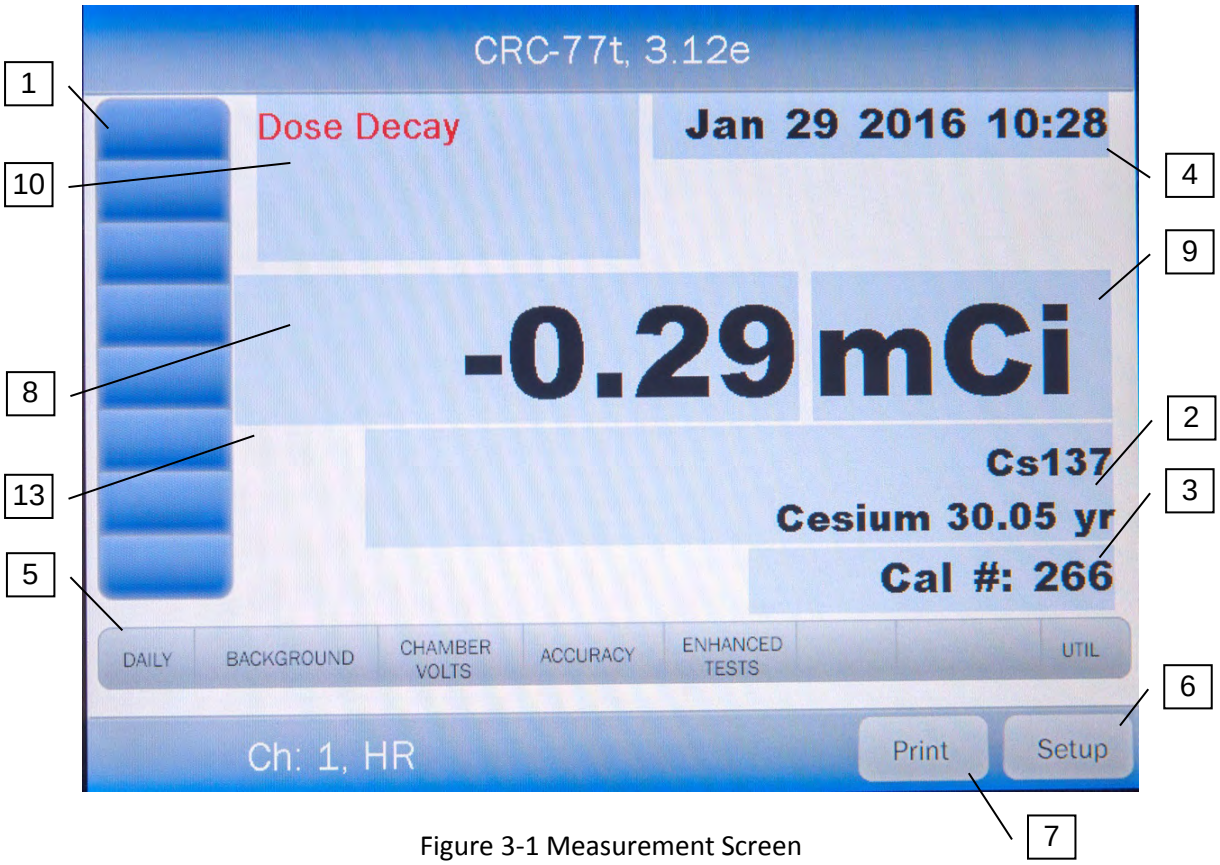


Figure 3-1 Measurement Screen

General usage of touchable buttons is briefly described. Specific button usage will be given in the appropriate sections.

Home Screen Hotkeys 1

These are the eight user-definable buttons located at the left edge of the screen. Touching one of the Hotkeys selects the programmed nuclide for measurement.

Nuclide Button 2

This button is located below the measurement and displays the currently selected nuclide, nuclide name and half-life. Touching this button allows the user to select any nuclide in memory (including nuclides added by the user).

CAL # Button 3

This is the Calibration Number button and is located below the Nuclide button and displays the currently selected nuclide's Calibration Number or the currently selected Calibration Number. Touching this button allows the user to input a Calibration Number to be used for the current measurement.

Date/Time Button 4

Touching the date/time will display a screen allowing the setting of the current date/time. A password is required to change the date and/or time.

Test Buttons 5

The bottom of the screen holds 8 buttons that are composed of **DAILY**, **BACKGROUND**, **CHAMBER VOLTS**, **ACCURACY**, **ENHANCED TESTS**, **MOLY ASSAY**, **INVENTORY**, and **UTIL**. Each of these buttons is addressed throughout the manual.

SETUP Button 6

The lower right part of the screen contains the **SETUP** button. This button allows for setting up the system for activity units, date format, type of printer, display adjustments, Staff Member setup and printers as explained in later chapters.

PRINT Button 7

Note: *If the system is not set up for use with the optional Printer, this button will not be displayed.*

The **PRINT** button will be displayed in the lower right part of the screen. It allows printing of data displayed on the screen.

Measurement Button 8

The central part of the screen contains the measurement. Touching the measurement (x.xx) allows the user to change the precision of the measurement.

Units Button 9

The central part of the screen contains the measurement unit. Touching the unit (Ci/Bq) allows the user to toggle between Curies and Becquerel if so chosen in Setup.

Dose Decay Button 10

This button is located to the right of the preset nuclide keys (Chamber Hotkeys) in the upper portion of the Measurement screen.

This button allows the entry of a future date and time for the current sample being measured. After the date and time are input, the Dose Decay button will display the activity of the current sample at the specified time in red.

ENTERING DATA

Numeric Keypad Screen

When a numeric only data entry is required, Figure 3-2 Numeric Keypad Screen will appear as shown below. This keypad is touchable for entering the data.

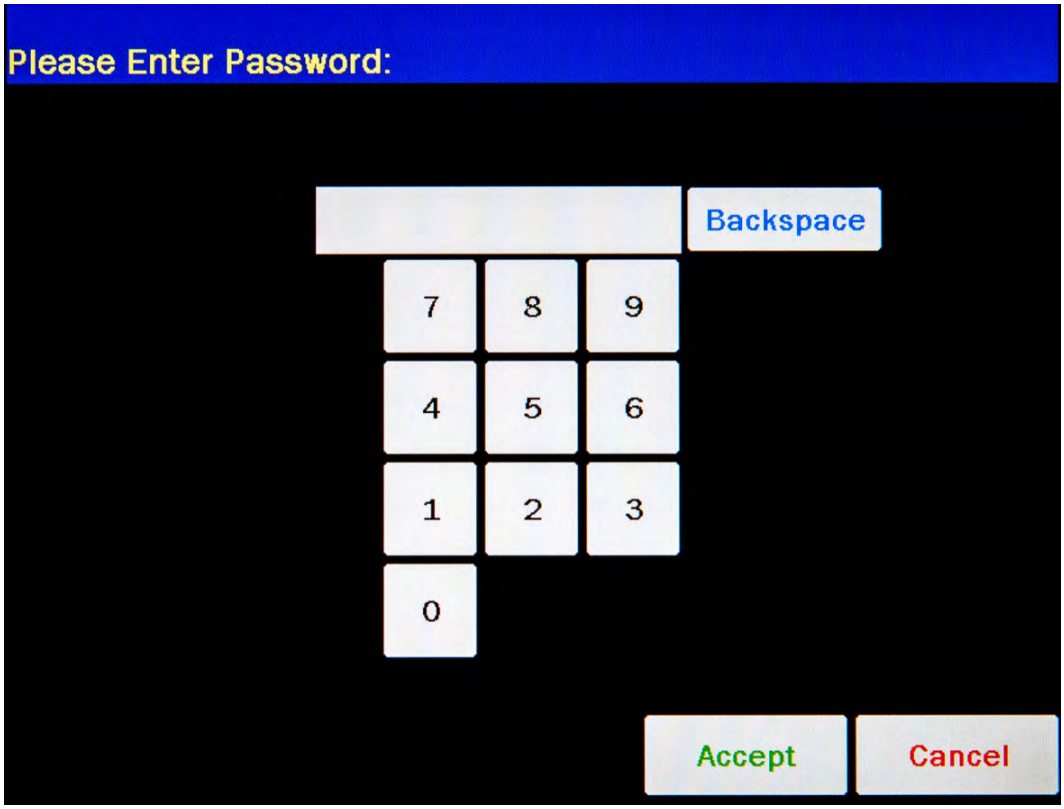


Figure 3-2 Numeric Keypad Screen

If units of measure are also required, such as Ci, mCi, µCi, GBq, MBq, kBq for activity or Yr, Hr, Day, Min, Sec for half-life, they will appear on the keypad between the number pad and the data entry box.

Alphanumeric Keypad Screen

When an alphanumeric data entry is required, Figure 3-3 Alphanumeric Keypad Screen will appear as shown below. This keypad is also touchable for entering the data.

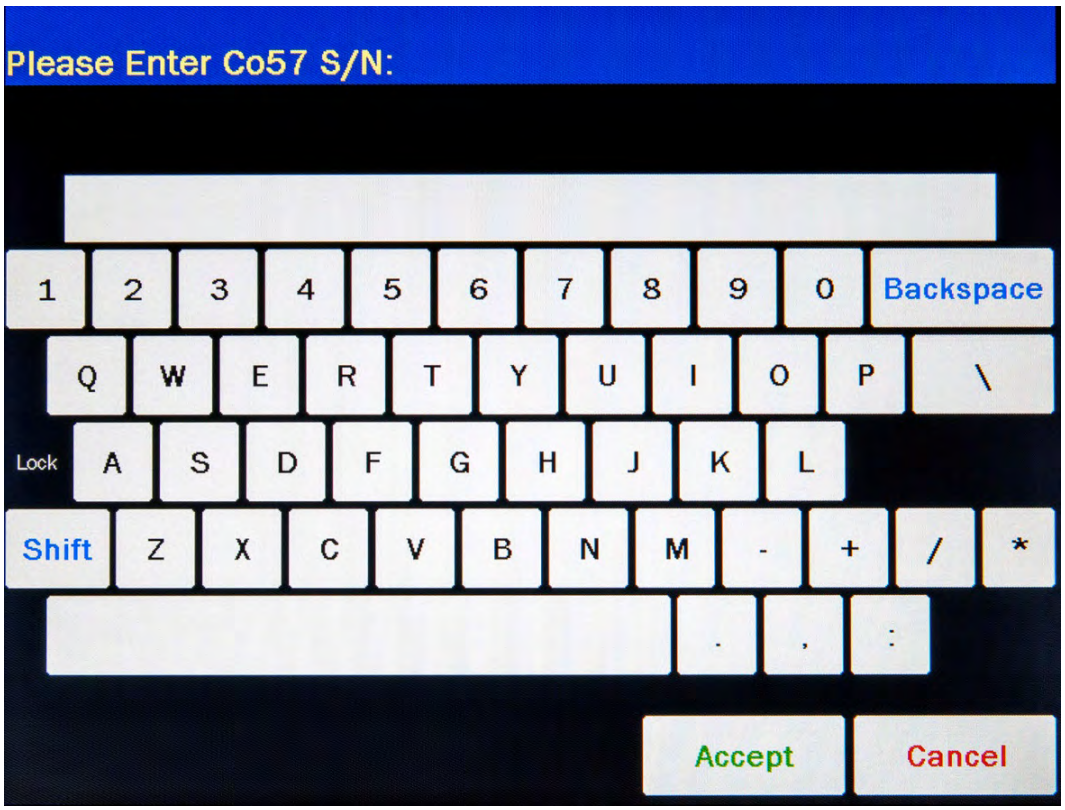


Figure 3-3 Alphanumeric Keypad Screen

Pressing the **SHIFT** key on the alphanumeric keyboard will cycle between 4 modes:

- Lock/Upper Case – If “Lock” is displayed above the **SHIFT** key and upper case letters are displayed on the keys, the keyboard is locked in upper case letters. All selected letters will be in upper case.
- 1Chr/Lower Case – If “1Chr” is displayed above the **SHIFT** key and lower case letters are displayed on the keys, the first letter selected will be in lower case and the keyboard will change to Lock/Upper case mode.
- Lock/Lower Case – If “Lock” is displayed above the **SHIFT** key and lower case letters are displayed on the keys, the keyboard is locked in lower case letters. All selected letters will be in lower case.
- 1Chr/Upper Case – If “1Chr” is displayed above the **SHIFT** key and upper case letters are displayed on the keys, the first letter selected will be in upper case and the keyboard will change to Lock/Lower case mode.

List Screen

When an item is to be selected from a group, a list appears showing the available selections. Figure 3-4 List Screen is an example of a List Screen.

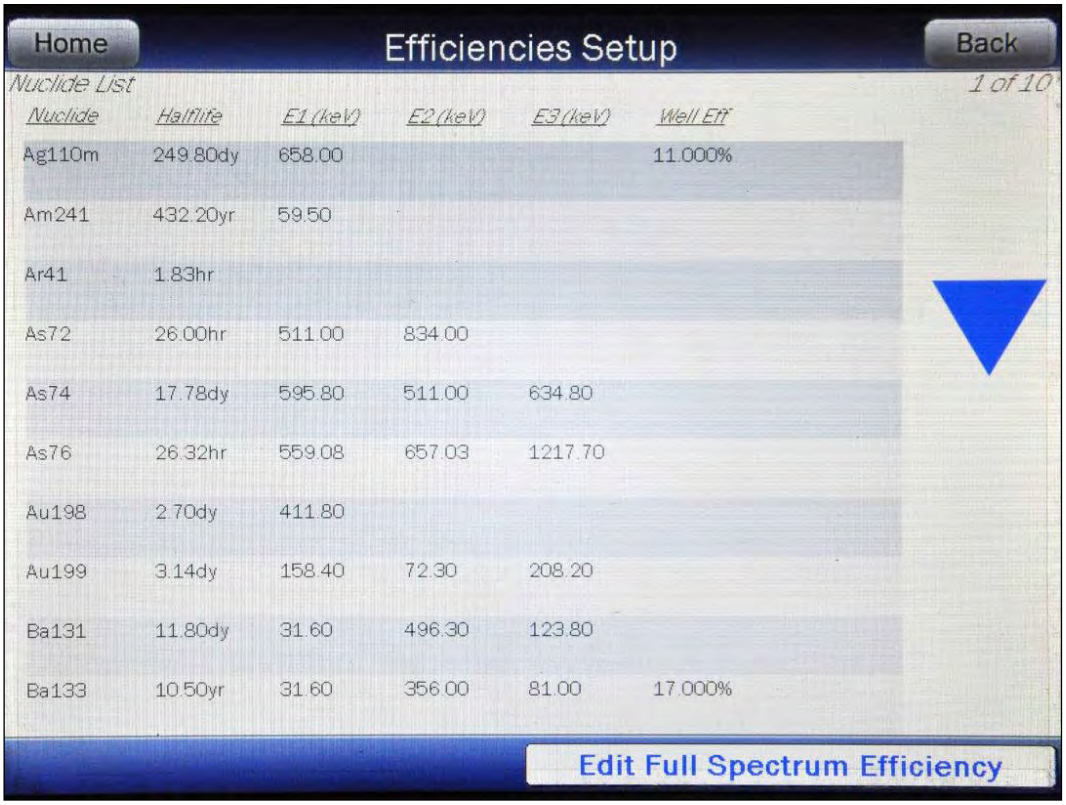


Figure 3-4 List Screen

If there are more items on the list than can fit on one page, a **DOWN ARROW** (▼) button will appear on the first page. Touching the **DOWN ARROW** (▼) button will display the next page. If there is a previous page of the list, an **UP ARROW** (▲) button will appear. Touching the **UP ARROW** (▲) button will display the previous page. The number of pages (or screens) will be shown in the upper right corner of the screen indicating the length of the list.

Quickly touching any line will highlight that line, selecting the information on that line.

Note: *When touching the screen on a list, you should withdraw your finger quickly. If you hold your finger down too long, the touched line will be blanked until your finger is removed. Moving your finger down the list will make it appear that the line has vanished. To restore the data to the screen, simply touch the line quickly again.*

Date/Time Screen

When a Date and/or Time entry is required, Figure 3-5 Date/Time Screen will appear as shown below.

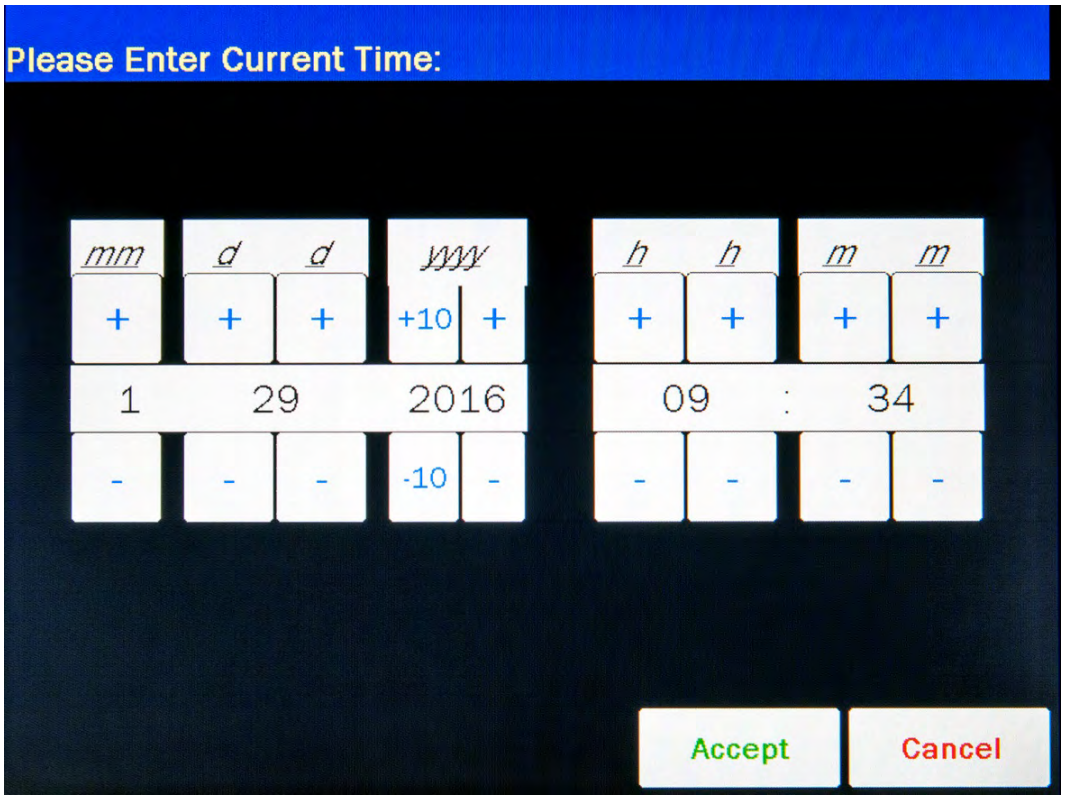


Figure 3-5 Date/Time Screen

The screen displays the currently set date and time. The date and time are divided into the following fields:

- ***mm*** ..... Month (1-12)
- ***d*** ..... first digit of the Day (0-3)
- ***d*** ..... second digit of the Day (0-9)
- ***yyyy*** ..... Year (1970-2030)
- ***h*** ..... first digit of the Hour (0-2)
- ***h*** ..... second digit of the Hour (0-9)
- ***m*** ..... first digit of the Minute (0-5)
- ***m*** ..... second digit of the Minute (0-9)

Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

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CHAPTER 4

SYSTEM SETUP

GENERAL

Initial installation and checkout procedures are described in this section.

RECEIVING CONDITION EXAMINATION

Be sure to verify that the shipping carton(s) is received in good condition, i.e., no damage should be visible and the box(es) should be dry and clean.

Should the instrument be received in a damaged condition, save the shipping container(s) and the packing materials and request an immediate inspection by the carrier.

Capintec, Inc. is not responsible for the damage, which occurs during shipment but will make every effort to help obtain restitution from the carrier.

UNPACKING AND INSTALLATION

The instrument is packed and shipped as a complete unit. All the accessories are contained in the cartons.

The instrument is shipped in a plastic bag in order to provide a dry and clean environment during shipment.

⚠ **CAUTION:** Be sure the instrument has reached room temperature prior to opening the bag. (Leave the box in the room 24 hours before opening it.)

1. Remove all outer packing materials and tapes. The shipping and packing materials should be saved for future use.
2. The following equipment should be found upon unpacking:
   - Readout Unit with Stand Base
   - Chamber and Liner/Dipper
   - Power Cord
   - Printer (optional)
     - HP DeskJet 6000/8000 Series Inkjet (or equivalent) printer

   Note: *If Test Sources are ordered, they will be shipped separately.*
3. Be sure to remove all tape and protective materials from the instrument prior to connecting to the power line.

ASSEMBLY

Readout/Stand Base

Attach the Readout to the Stand Base using the following instructions. Reference Figure 4-1 Readout/Stand Base Assembly for assembly details.

1. On the sides of Readout (A), remove both of the knobs and all (4) of the washers.
2. Place Stand Base (B) on a flat, sturdy surface.
3. Slide washer (C) over the shaft of knob (D).
4. Insert knob (D) through one side of the Stand Base (B) and place another washer (E) over the shaft of knob (D) (on the inside of the Stand Base).
5. With the front of Readout (A) facing the same direction as the front of Stand Base (B), place the Readout onto the Stand Base.
6. Insert the shaft of knob (D) into mounting hole (F) located on the side of Readout (A). Loosely tighten the knob.
7. Slide washer (G) over the shaft of knob (H).
8. Insert knob (H) through the other side of the Stand Base (B) and place another washer (J) over the shaft of knob (H) (on the inside of the Stand Base).
9. Insert the shaft of knob (H) into the mounting hole located on the other side of Readout (A). ***Note:*** *The sides of the Stand Base (B) may need to be spread apart a small amount to get the second knob to insert into the mounting hole.*

10. Verify on each side that there is a washer located between the knob and the Stand Base (on the outside of the Stand Base), and the Stand Base and the Readout (on the inside of the Stand Base).
11. The knobs can now be fully tightened.

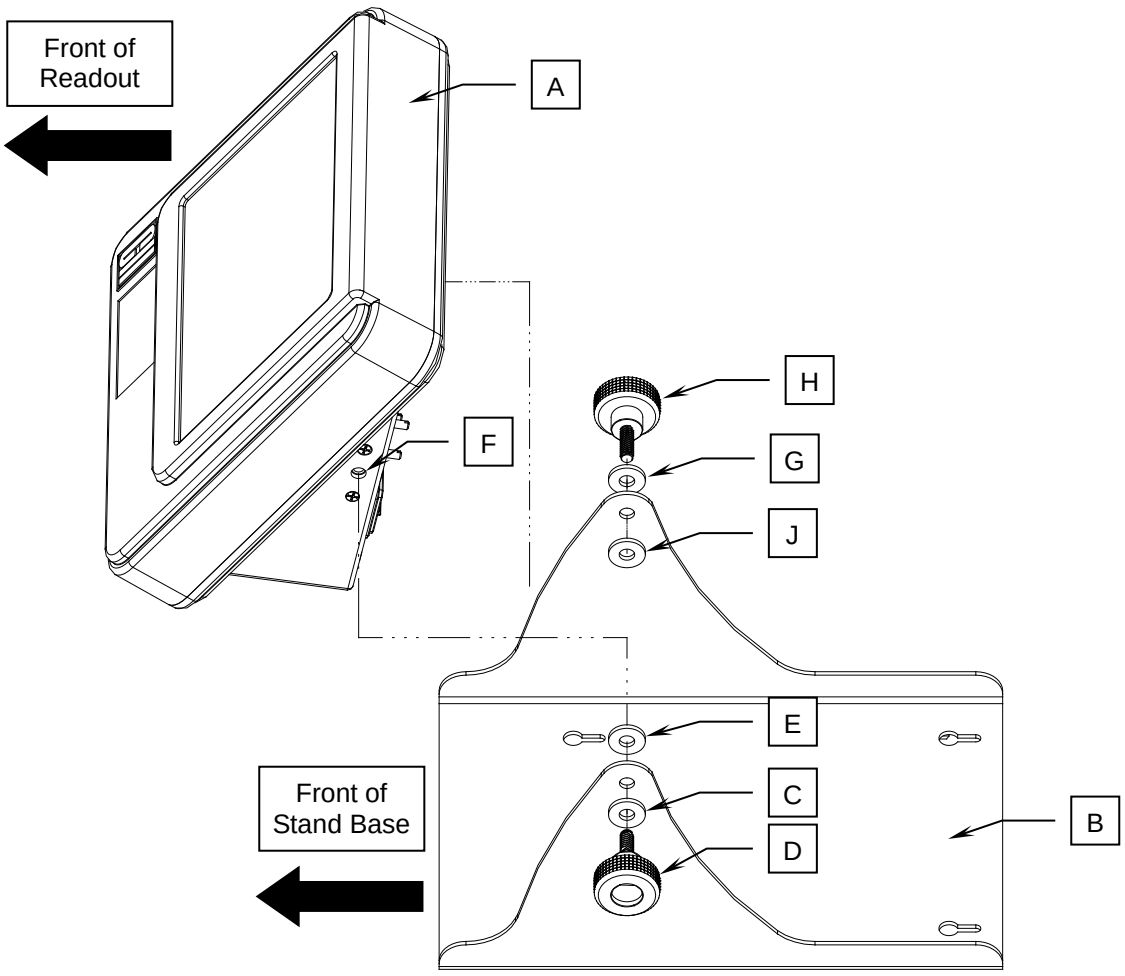

Figure 4-1 Readout/Stand Base Assembly

System Assembly

Reference Figure 4-2 Complete System and Figure 4-3 Readout Back Panel for assembly details.

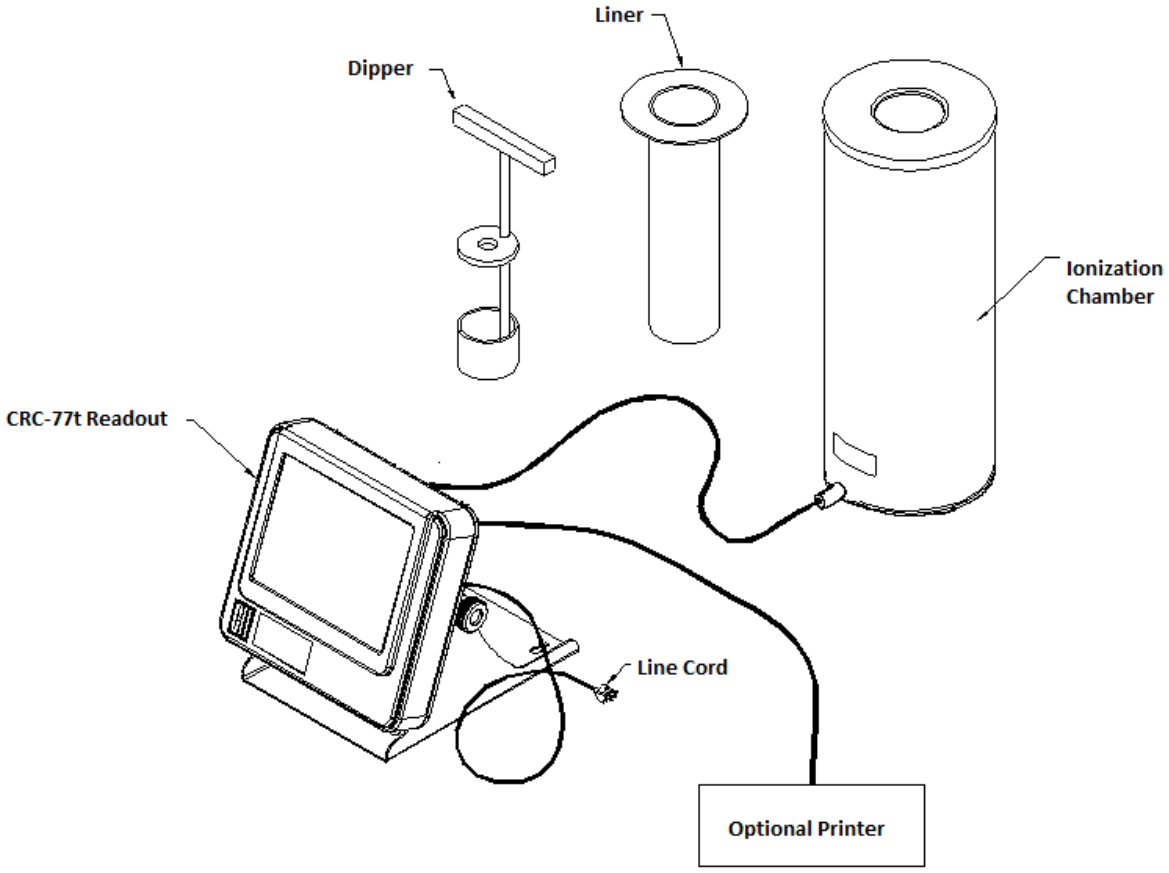

Figure 4-2 Complete System

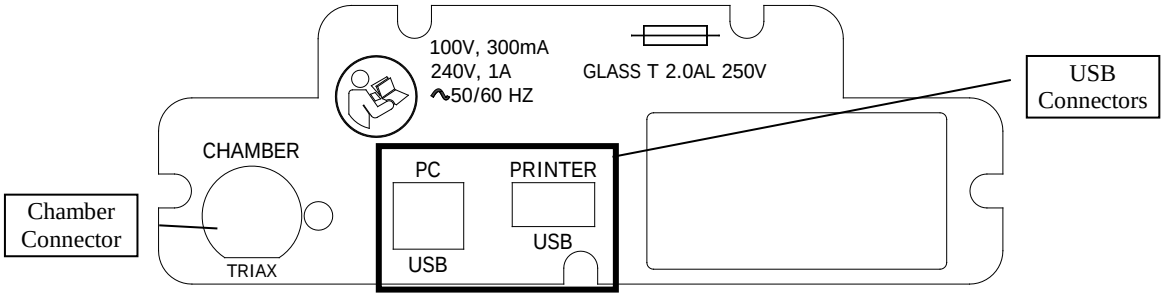

Figure 4-3 Readout Back Panel

1. Verify that all power switches (Readout and Printer) are in the “OFF” or “0” position.
2. Using a Philips head screwdriver, remove the Connector Cover from the connector labeled “Chamber”. Slide the Chamber Cable through the Connector Cover.
3. Connect the Chamber Cable to the connector on the rear of the CRC®-77tHR Readout labeled “CHAMBER”.
4. Using a Philips head screwdriver, reattach the Connector Cover to the rear of the CRC®-77tHR.
5. Attach the Power Cable to the receptacle on the Power Module located on the back of the Readout Unit.

   Note: *Do not place the Readout unit against a wall or other object so that the power cord can be detached from the back of the Readout unit.*
6. If the optional printer is used, attach the printer cable to the USB connector on the rear of the CRC®-77tHR Readout marked “PRINTER”. Attach the other end to the printer. Verify that the paper is installed.
7. The system can be connected to a computer or Nuclear Management software system via a USB interface.

   Connect the cable to the USB connector at the rear of the CRC®-77tHR Readout marked “PC”. Attach the other end to the computer or Nuclear Management software system.

Liner and Dipper

The supplied Chamber Liner and Dipper are shown below.

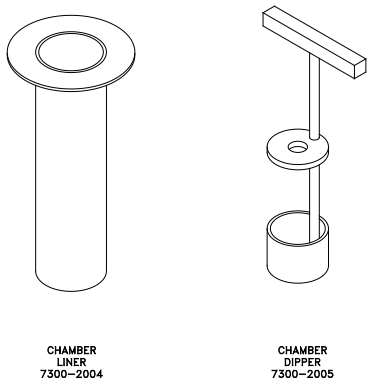

Figure 4-4 Liner and Dipper

The Chamber Liner provides protection against spills. It is made of clear, tough Plexiglass for improved durability. It is recommended that the Liner be installed inside the Chamber at all times.

⚠ **CAUTION:** Never use the calibrator without the Chamber Liner in place. Liners are inexpensive and easy to replace. A contaminated Chamber is a very costly mistake.

The Dipper (Vial/Syringe sample holder) is specially designed to hold syringes and vials of various sizes. It provides a safe, convenient way to hold a vial or syringe during activity measurement. Proper placement in the Chamber is assured every time. The cup portion will accommodate up to a 30ml vial. The Syringe Guide will accommodate 3, 5 and 10cc syringes. An adapter (7310-1109) is available to accommodate a tuberculin syringe (1cc).

ENVIRONMENT REQUIREMENTS

Indoor use only. Pollution Degree 2, Altitude, and Installation Cat. II.

The instrument should be located where the level of the background radiation is as low and as constant as possible.

The instrument should be located where the temperature is stable within a range of +50°F to +85°F (+10°C to +30°C) and the maximum relative humidity is 90% non-condensing to warrant maximum reliability and accuracy.

The instrument should be located where the barometric pressure is within a range of 27 – 31 inches of mercury (91 – 105 kilopascals).

⚠ **CAUTION:** If these environmental requirements are not followed, the instrument may display erroneous readings.

POWER REQUIREMENTS

CAUTION: If the input voltage to the following items is not within the stated limits, the unit may not function correctly or may be damaged.

Readout

100Vac, 50/60Hz, 300mA
240Vac, 50/60Hz, 1A

Printer (optional)

HP DeskJet 6000/8000 Series Inkjet (or equivalent) printer
100-240Vac, 50/60Hz, 1.5A

TURN ON PROCEDURES

1. Be sure the interconnecting cable from the Chamber is properly plugged into the back of the Readout unit.
2. Confirm the power requirements of the instrument.
3. Be sure the power switch is off. (Push lower part of the rocker switch next to the power receptor located on the rear of the main unit.)
4. Plug the power plug into a grounded three-wire outlet of the specified power line.
5. Turn on the Readout Unit using the power switch located at the rear of the unit.
6. After a few seconds, Figure 4-5 Startup Screen will appear.

Note: *After powering up, the screen may be white or have colored lines for up to 30 seconds before Figure 4-5 Startup Screen appears.*

CAUTION: Accidental connection of the power plug into a DC line or to an AC line which exceeds the specified voltage may result in catastrophic damage to the instrument's circuits.

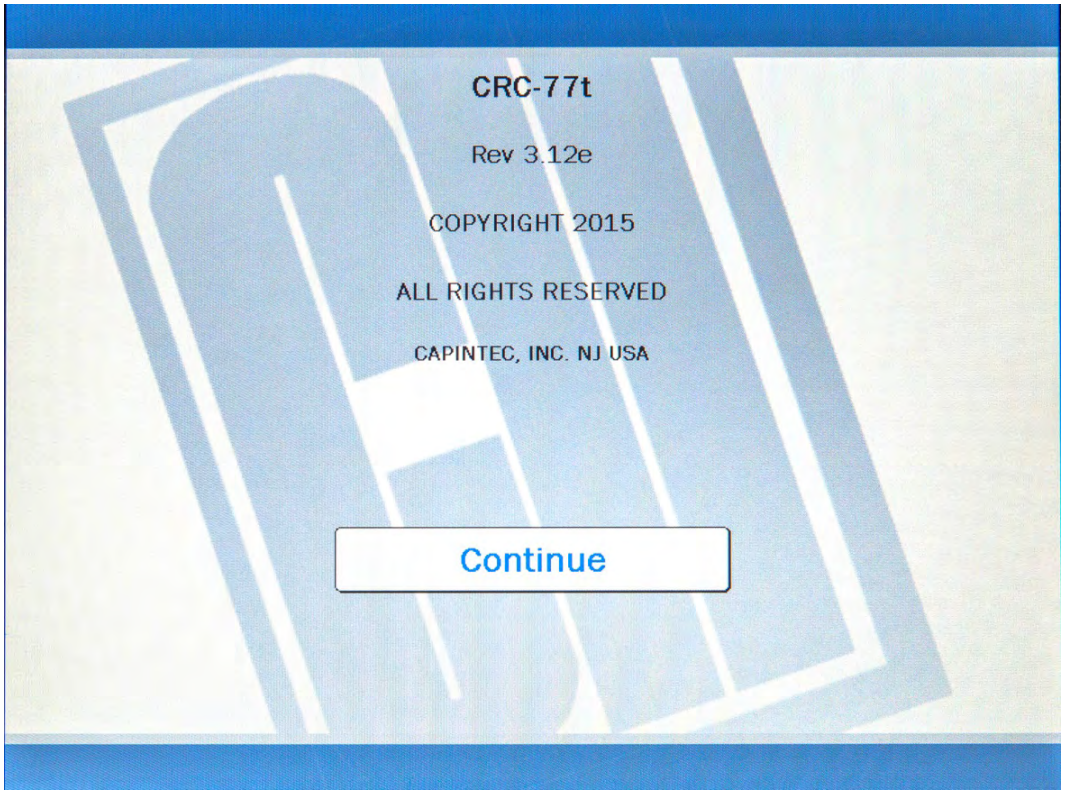

Figure 4-5 Startup Screen

Note: *The screen will display the revision level of the installed software.*

7. Press the “Continue” button.
8. If the optional printer is included, press the power button on the printer. During the powering on of the printer, it may move the printer head back and forth and make some noise while doing so. This is normal as the printer is calibrating the print head.

GENERAL OPERATIONAL SETUP

There are several things that **must** be done before using the CRC®-77tHR Radioisotope Dose Calibrator for the first time. The following briefly describes these steps:

- Verify or set the date/time: Although the date and time are set at the factory, you should verify that the date and time are correct for your location. Reference CHAPTER 5: SYSTEM INITIALIZATION, SECTION: SET DATE AND TIME.
- Select proper units: Ci or Bq. Although the system can be changed at any time, it is recommended that the proper units be set prior to using the unit to prevent confusion. Reference CHAPTER 5: SYSTEM INITIALIZATION, SECTION: CHOOSING Ci or Bq.
- Input Test Source Data: Test Sources (Standard Sources) are used for the Accuracy and Constancy tests. The Accuracy may be tested using Co57, Co60, Ba133, Cs137 or Na22. There can be a Test Source for each of these nuclides. One or more of the Test Sources must be designated as the source(s) to be used in the Daily Test. Reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: TEST SOURCE SETUP.
- Input Constancy Test Source: The base source for the Constancy Test is chosen from the sources designated as Daily Sources. Reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: TEST SOURCE SETUP.
- Verify correct printer setting: The CRC®-77tHR may be used with a USB HP Inkjet printer. Reference CHAPTER 5: SYSTEM INITIALIZATION, SECTION: PRINTING.
- Adding a Nuclide: The CRC®-77tHR contains nuclide data (name, half-life) for 84 nuclides. Up to 10 nuclides may be added: the name, half-life and calibration number will be added for each one. Reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: NUCLIDES.
- Changing Calibration Numbers: The Calibration Number of up to 10 built-in nuclides can be changed. Reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: CALIBRATION NUMBERS.

ACCEPTANCE TESTING

The following tests should be performed prior to operational use of the unit.

Diagnostics Test

Reference CHAPTER 9: DIAGNOSTICS for instructions on how to perform this test.

Daily Test

Reference CHAPTER 8: TESTS, SECTION: DAILY TEST for instructions on how to perform this test.

Accuracy Test

Reference CHAPTER 8: TESTS, SECTION: ACCURACY TEST for instructions on how to perform this test.

TURN OFF PROCEDURES

Push lower part of the rocker switch next to the power receptor located on the rear of the main unit.

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CHAPTER 5

SYSTEM INITIALIZATION

GENERAL

This section describes system initialization and parameter setup.

All of these functions are accessed via the Measurement screen.

SET DATE AND TIME

The system date and/or time can be set from the Measurement screen.

To change the date and/or time, touch the displayed date/time in the upper-right part of the screen. A numeric keypad will appear to allowing the user to input a 3-digit password as shown in Figure 5-1 Enter Password: Screen.

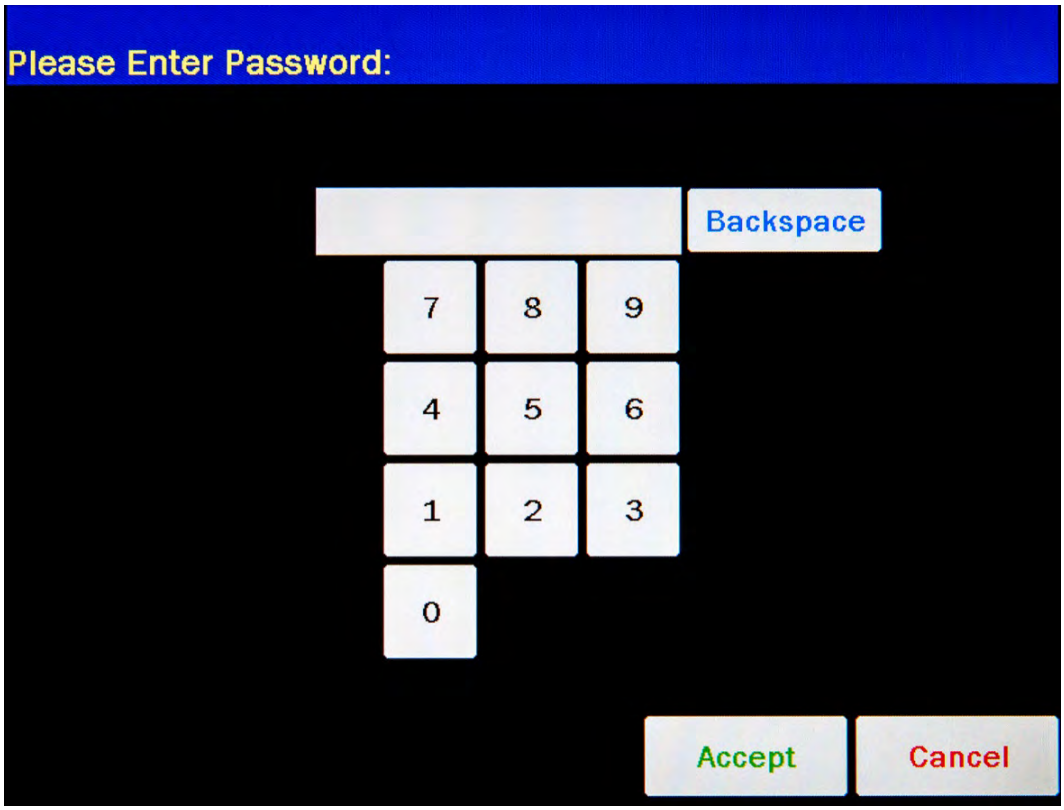

Figure 5-1 Enter Password: Screen

Input the password (last 3 digits of Readout serial number) by touching the appropriate numbers on the keypad. Touch the **ACCEPT** button to accept the password. Figure 5-2 Enter Current Time Screen will appear.

Note: *The Readout serial number is located on the rear of the readout.*

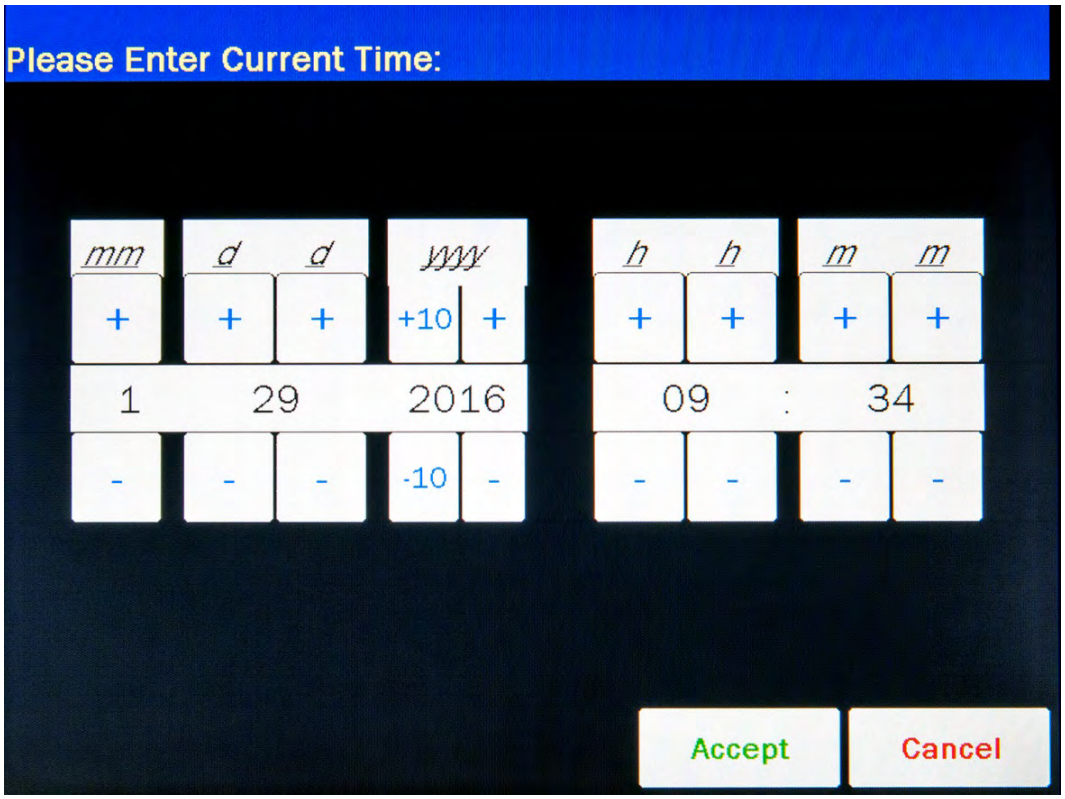

Figure 5-2 Enter Current Time Screen

The screen displays the currently set date and time. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

Touch the **ACCEPT** button to accept the new date/time or the **CANCEL** button to cancel any changes. The Measurement screen will re-appear.

CHOOSING CI OR BQ

Measurements can be displayed in Curies or Becquerels. When the system arrives, it is set up to display in Ci and Bq. Touching the measurement unit on the Measurement screen will switch the measurement result between Ci and Bq.

In some facilities, it may be decided to disable this feature and allow measurements to be displayed only in Curies or only in Becquerels.

To enable or disable Ci/Bq switching, touch the **SETUP** button located on the Measurement screen. Figure 5-3 Setup Screen will appear.

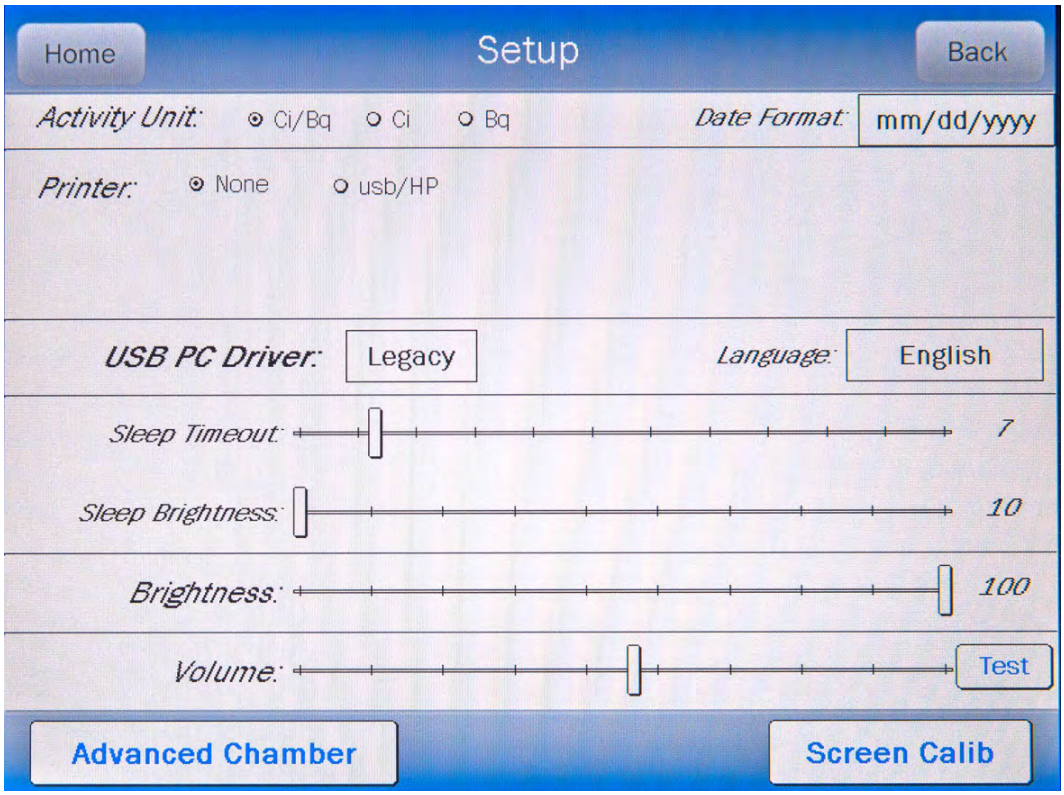

Figure 5-3 Setup Screen

In the ***Activity Unit:*** section at the top of the Setup Screen, touch the radio button next to the preferred unit for measurements:

- *Ci/Bq* ..... allows the user to switch between Curies and Becquerels,
- *Ci Only* ..... the system will be set to display measurements in Curies only,
- *Bq Only* ..... the system will be set to display measurements in Becquerels only.

Verify that the desired radio button is selected.

Press the **HOME** or **BACK** button to save the changes and return to the Measurement screen.

CHOOSING DATE FORMAT

The date can be entered, displayed and printed in 3 formats:

- Month Day Year (mm/dd/yyyy)
- Day Month Year (dd/mm/yyyy)
- Year Month Day (yyyy/mm/dd)

In the ***Activity Unit:*** section at the top of Figure 5-3 Setup Screen, the current date format is displayed in the upper right hand corner. The default date format is Month Day Year. This format will be shown throughout the manual.

To change the date format, touch the ***Date Format:*** field box. Figure 5-4 Date Format Selection Screen will appear.

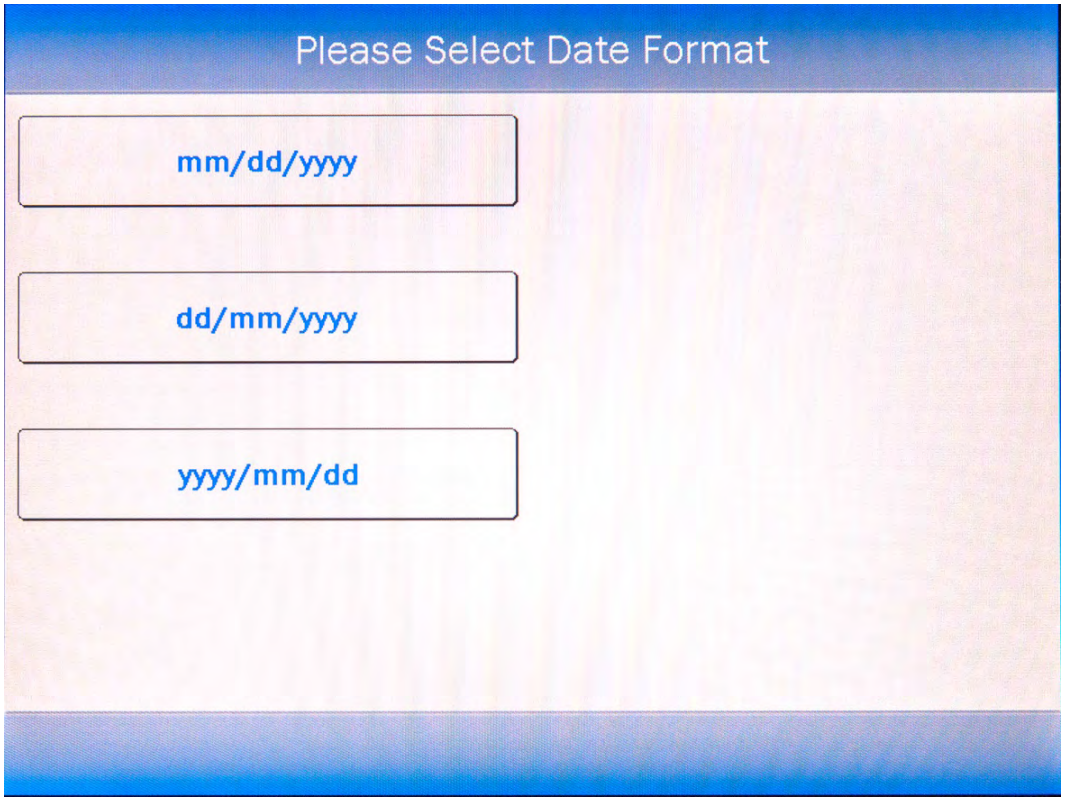

Figure 5-4 Date Format Selection Screen

Touch the desired date format button. The Setup Screen will re-appear showing the selected date format. If Day Month Year has been selected, Figure 5-5 Setup Screen after Day Month Year Selected will be displayed. If Year Month Day has been selected, Figure 5-6 Setup Screen after Year Month Day Selected will be displayed.

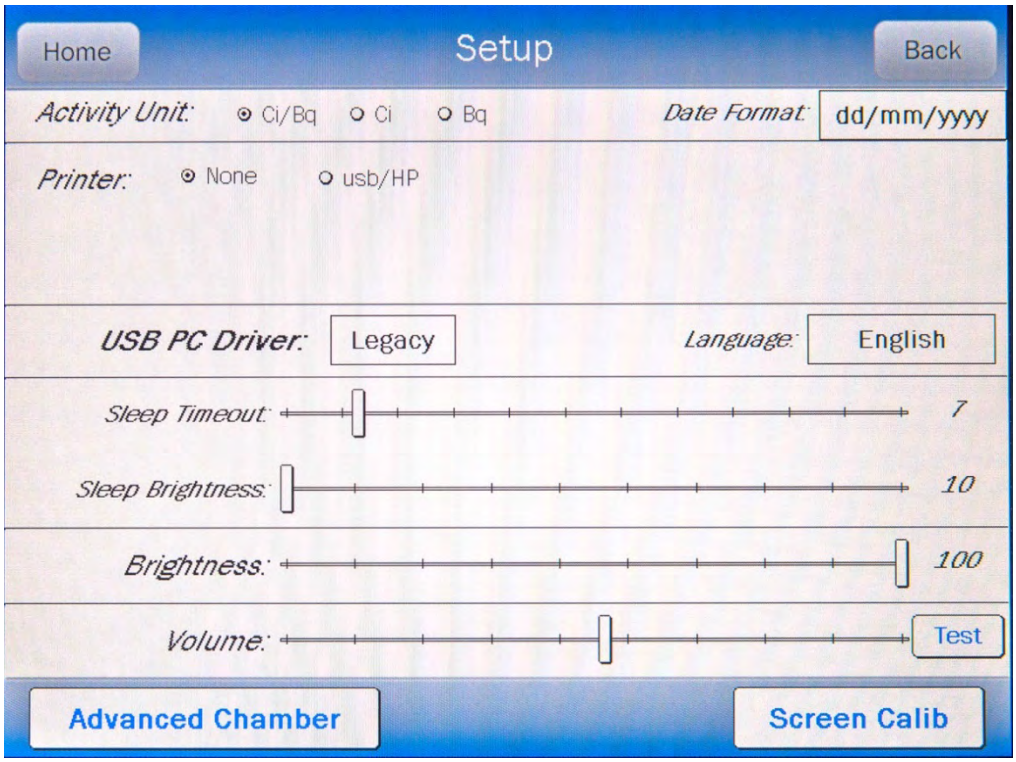

Figure 5-5 Setup Screen after Day Month Year Selected

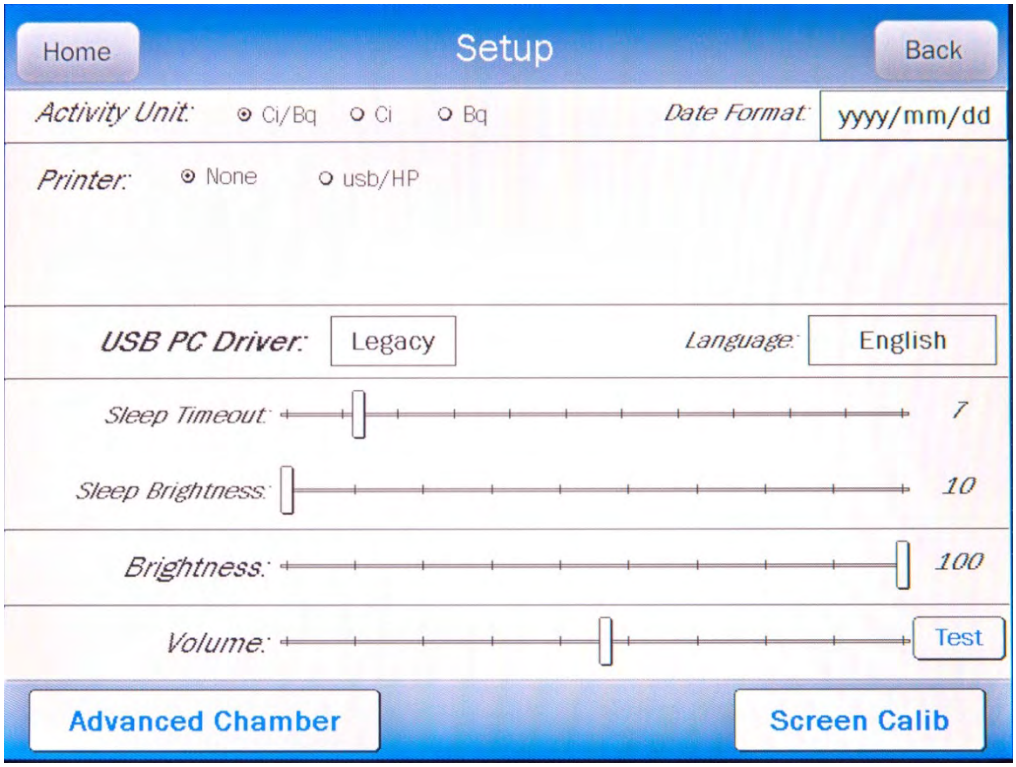

Figure 5-6 Setup Screen after Year Month Day Selected

PRINTING

⚠ **CAUTION:** If any printer other than the model supplied by Capintec is used, Electromagnetic Interference (EMI) may be introduced into other devices located in the same general area as the CRC®-77tHR.

The system does not need a printer to function properly. When a printer is set up to work with the system, a **PRINT** button will appear on all screens in which results can be printed from. If the **PRINT** button is not displayed, then the system is either not set up to work with a printer or printing is not permitted from that particular screen.

The CRC®-77tHR may be used with the following printer:

- HP DeskJet 6000/8000 Series Inkjet (or equivalent) USB printer

Other printer models may be used. Please contact the factory for information on which printers can be utilized.

Printer Power Requirements

HP DeskJet 6000/8000 Series Inkjet (or equivalent) Printer (optional)
100-240Vac, 50/60Hz, 1.5A

Printer Selection

If a printer was included with the CRC®-77tHR, the system will already be set to use the included printer. If a printer is being added or the system did not include a printer at the time of purchase, then the CRC®-77tHR must be set to use the printer in order to provide printed data.

To view and/or change the selected printer, touch the **SETUP** button located on the Measurement screen. Figure 5-3 Setup Screen will appear.

In the ***Printer*** section on the Setup Screen, the following options are available:

- *NONE* ..... if no printer is attached to the system: the calibrator will continue to function properly but without the ability to print.
- *USB/HP* ..... USB printer port, HP DeskJet 6000/8000 Series Inkjet (or equivalent) printer: prints all data on regular paper.

To select the desired printer, touch the radio button next to the preferred printer type. Verify that the desired radio button is selected.

Press the **HOME** or **BACK** button to save the changes and return to the Measurement screen.

USB PC DRIVER

This selection is provided for adjusting the USB port settings when connecting the Calibrator to a Nuclear Management software system. The USB PC Communications protocol can either be Legacy (HID (Human Interface Device)) or CDC (Communications Device Class).

By default, the USB PC Driver is set to “Legacy”. The default will work with Capintec’s Communications software. This setting may need to be changed if the Calibrator is connected to some other Nuclear Management software system.

To change the USB PC Driver protocol, from Figure 5-3 Setup Screen, touch the box containing ***LEGACY***. Figure 5-7 USB PC Driver Select Screen will appear.

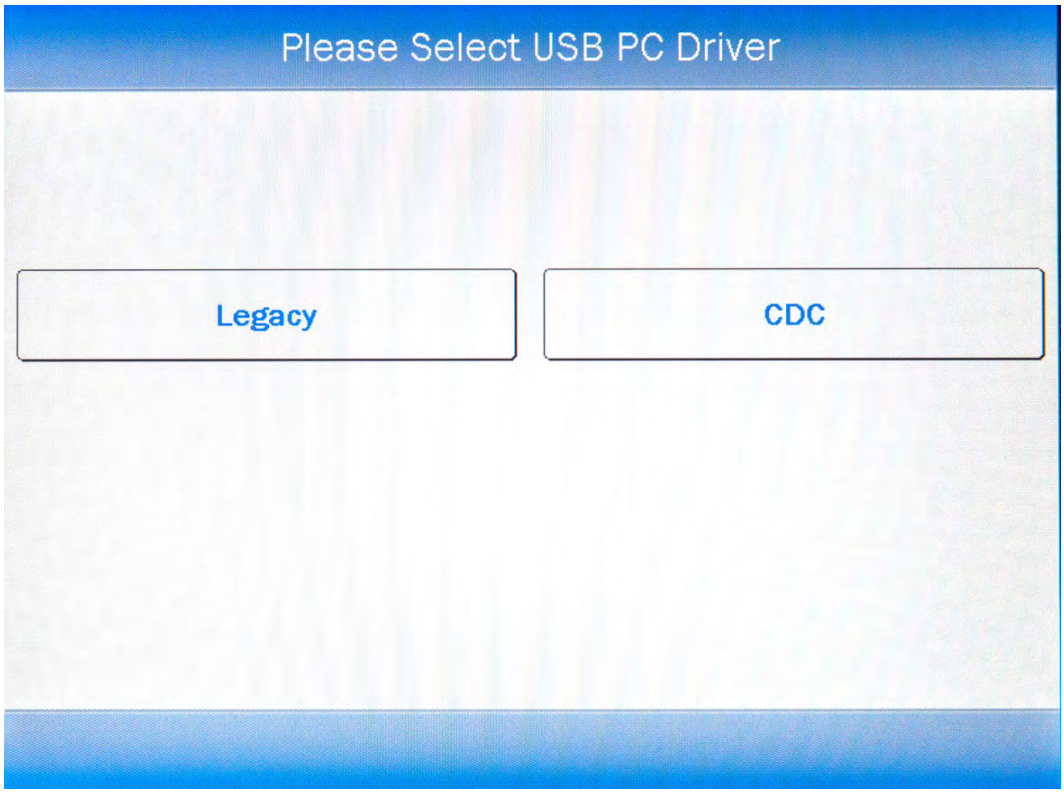

Figure 5-7 USB PC Driver Select Screen

Touch the **CDC** button to select the CDC protocol. Figure 5-3 Setup Screen will appear with ***CDC*** displayed in the USB PC Driver box.

To select Legacy, from Figure 5-3 Setup Screen, touch the box containing ***CDC*** and then touch the **LEGACY** button on Figure 5-7 USB PC Driver Select Screen.

LANGUAGE

This selection allows the screens and printouts for the CRC®-77tHR R/PET to be displayed in either English or Spanish. By default, the language is set to “English”.

To change the language, from Figure 5-3 Setup Screen, touch the box containing ***ENGLISH***. Figure 5-8 Select Language Screen will appear.

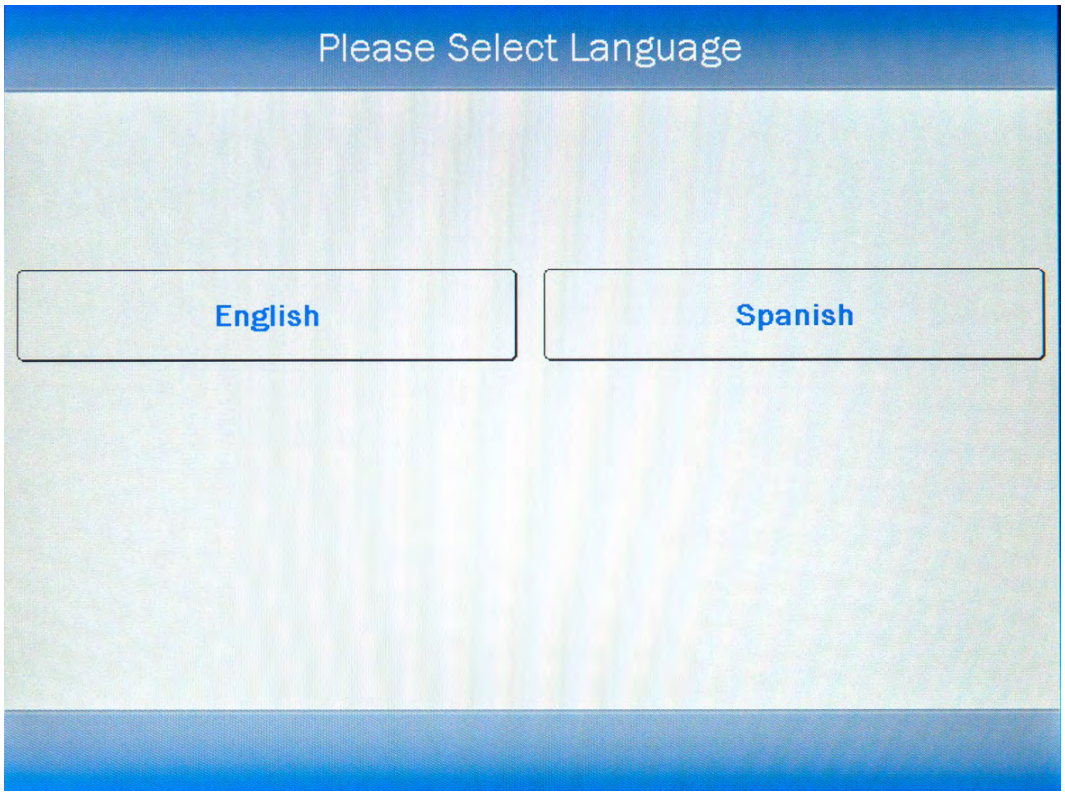

Figure 5-8 Select Language Screen

Touch the **SPANISH** button to select Spanish for the language. Figure 5-9 Setup Screen in Spanish will appear with ***Espanol*** displayed in the Language box and the system will now be set to Spanish.

To request a copy of the Owner’s Manual in Spanish, contact Capintec’s only Authorized Service Center (reference CHAPTER 15: CLEANING AND MAINTENANCE, SECTION: SERVICING).

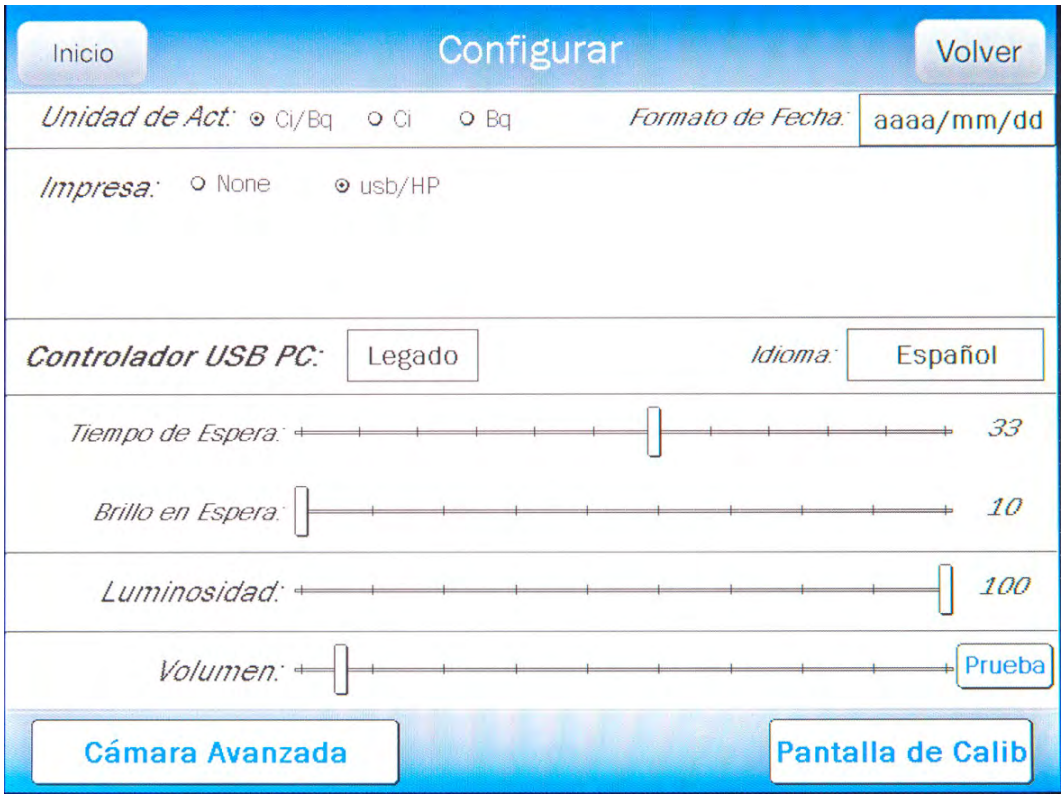

Figure 5-9 Setup Screen in Spanish

To set the system back to English, from Figure 5-9 Setup Screen in Spanish, touch the box containing ***Español***. Figure 5-10 Select Language Screen in Spanish will appear.

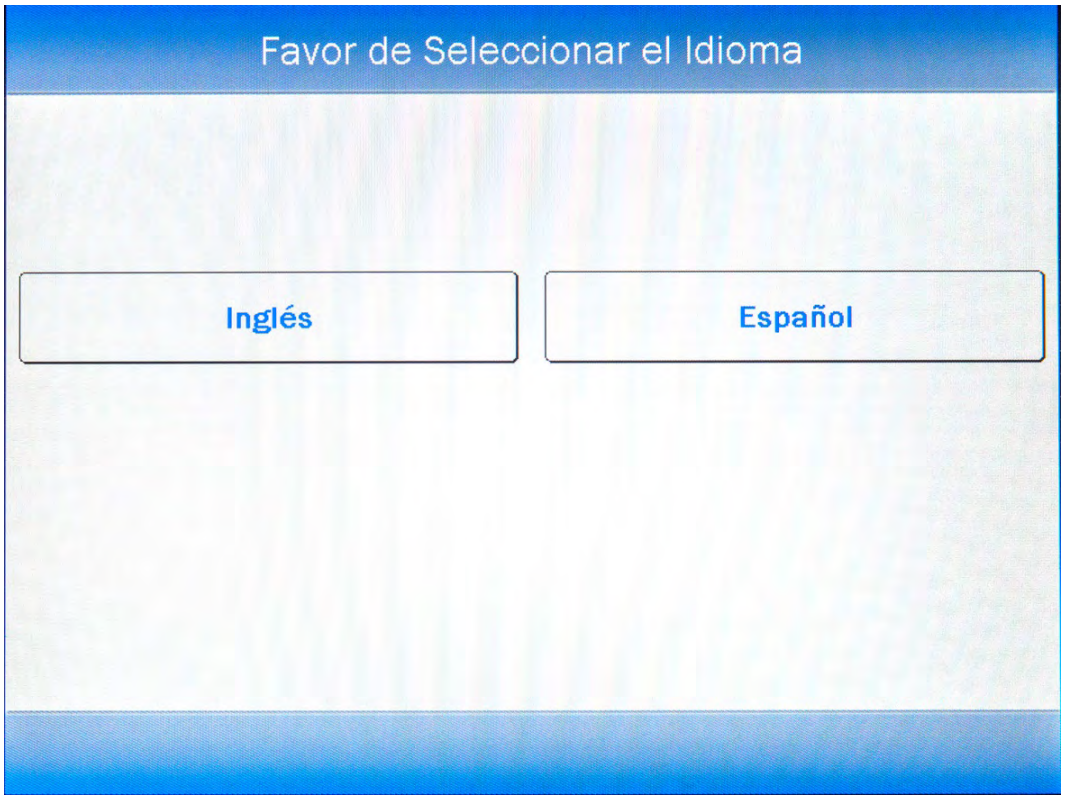

Figure 5-10 Select Language Screen in Spanish

Touch the **INGLES** button to select English for the language. Figure 5-3 Setup Screen will appear with ***English*** displayed in the Language box and the system will now be set to English.

SCREEN ADJUSTMENTS

The screen's timeout (Sleep Timeout), the screen's brightness level when it is in timeout mode (Sleep Brightness) and the screen's brightness level when it is in operational mode (Brightness) can be adjusted.

To make screen adjustments, touch the **SETUP** button located on the Measurement screen. Figure 5-11 Setup Screen will appear.

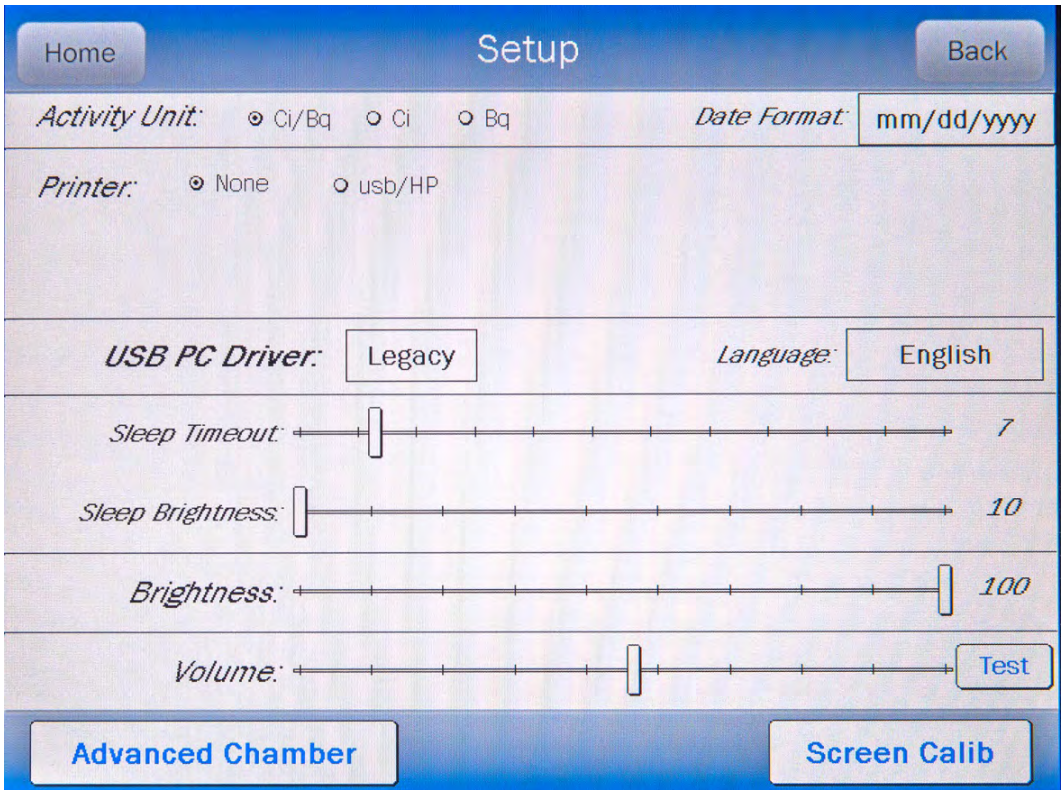

Figure 5-11 Setup Screen

Sleep Timeout

Sleep Timeout will blank the Measurement screen after the set time period. The Sleep Timeout can be set to anywhere between OFF and 60 minutes in one minute increments.

The timeout period can be adjusted using the following methods:

- Touch and hold the Sleep Timeout slider and drag it along the slider bar to the left to decrease the time it takes for the screen to blank-out. Drag the slider to the right to increase the time it takes for the screen to blank-out.
- Touch anywhere along the slider bar and the slider will move to that location.

The selected timeout period (in minutes) is displayed to the right of the slider bar.

When done making screen adjustments, press the **HOME** or **BACK** button to save the changes and return to the Measurement screen.

Sleep Brightness

Sleep Brightness adjusts the brightness (intensity) of the screen when the screen is in Sleep Timeout mode. The Sleep Brightness level can be set to anywhere between 10 and 100 in increments of 1.

The level can be adjusted using the following methods:

- Touch and hold the Sleep Brightness slider and drag it along the slider bar to the left to decrease the brightness level. Drag the slider to the right to increase the brightness level.
- Touch anywhere along the slider bar and the slider will move to that location.

The selected Sleep Brightness level is displayed to the right of the slider bar.

When done making screen adjustments, press the **HOME** or **BACK** button to save the changes and return to the Measurement screen.

Brightness

The Screen Brightness (intensity) adjusts the brightness (intensity) of the screen when in operational mode. The Brightness can be changed to conform to lighting conditions and can be set to anywhere between 10 and 100 in increments of 1.

The intensity can be adjusted using the following methods:

- Touch and hold the Brightness slider and drag it along the slider bar to the left to decrease the brightness level. Drag the slider to the right to increase the brightness level.
- Touch anywhere along the slider bar and the slider will move to that location.

The selected Screen Brightness level is displayed to the right of the slider bar.

When done making screen adjustments, press the **HOME** or **BACK** button to save the changes and return to the Measurement screen.

Screen Calibration

The touch screen was calibrated at the factory. However, over time, the calibration of the touch screen may drift slightly. In order to use the touch screen correctly, it needs to be calibrated properly. Without the right calibration, the touches will be off center and may inadvertently select the wrong button.

The CRC®-77tHR has a built-in touch screen calibration utility. To perform a screen calibration, touch the **SCREEN CALIB** button.

Figure 5-12 Touchscreen Calibration Screen will appear displaying a target in the upper left corner. Touch the center of the target. After the target is touched it will disappear and another target will appear in the lower right corner of the screen. Touch the center of this target. After this target is touched it will disappear and another target will appear in the center of the screen. Touch the center of this target. After the target is touched, Figure 5-11 Setup Screen will re-appear. The touch screen calibration procedure is complete.

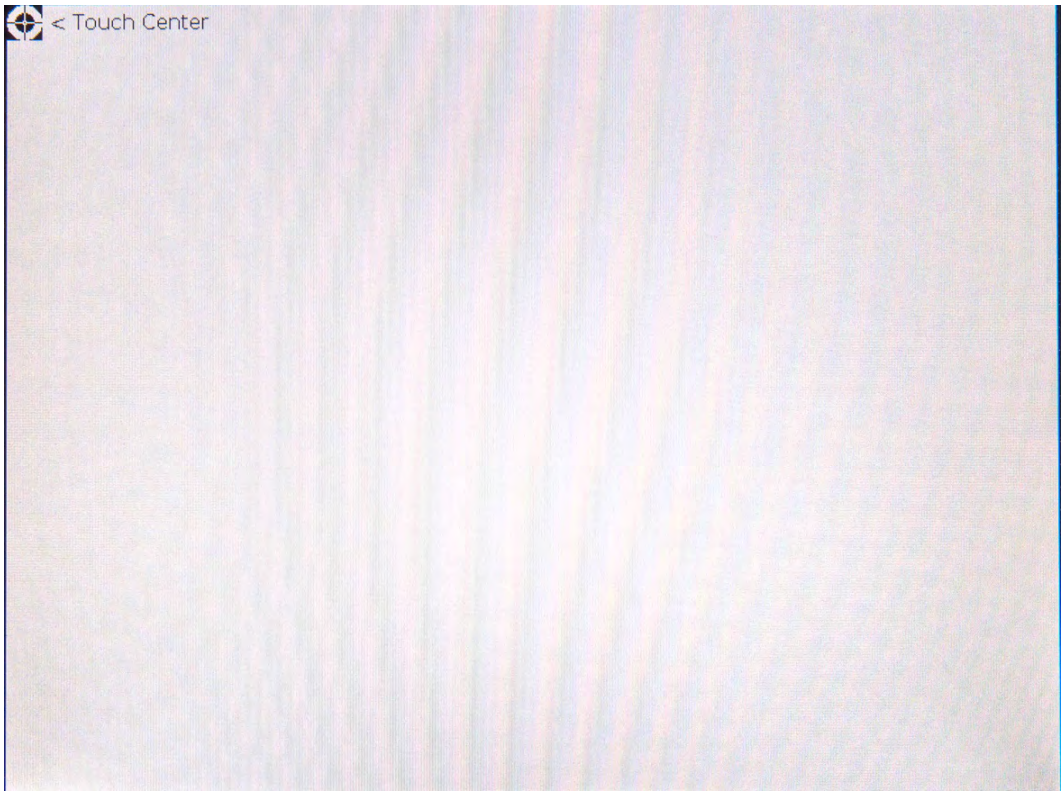

Figure 5-12 Touchscreen Calibration Screen

SPEAKER VOLUME

The volume of the system speaker can be varied. The **TEST** button located to the right of the Volume slider bar provides a continuous audible tone at the set volume level so that the volume of the speaker can be heard while adjusting the slider. Touch the **TEST** button to hear the tone. Touch the **TEST** button again to turn off the tone.

The speaker volume can be adjusted using the following methods:

- Touch and hold the Volume slider and drag it along the slider bar to the left to decrease the volume level. Drag the slider to the right to increase the volume level.
- Touch anywhere along the slider bar and the slider will move to that location.

When done making volume adjustments press the **HOME** or **BACK** button to save the changes and return to the Measurement screen.

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CHAPTER 6

CHAMBER INITIALIZATION

GENERAL

This section describes initialization and parameter setup.

All of these functions are accessed via the Measurement screen.

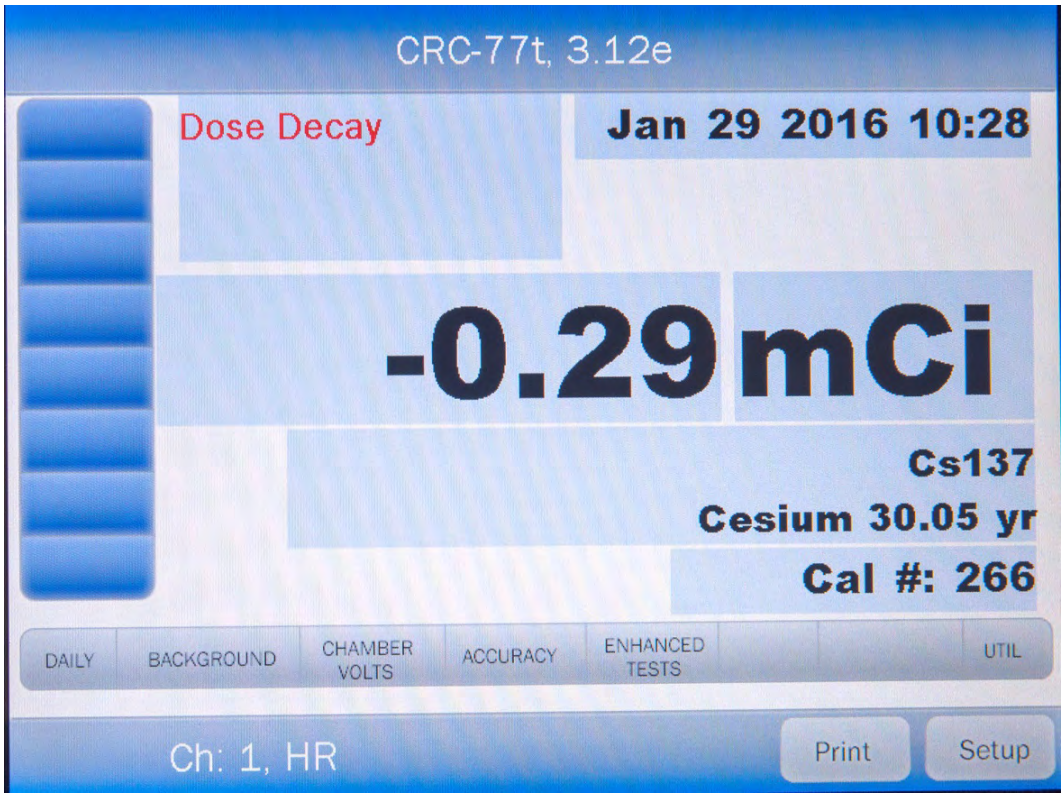

Figure 6-1 Measurement Screen

HOTKEY ASSIGNMENT

Hotkeys are nuclide shortcut keys that are preconfigured from the factory but are user definable.

There are two separate Hotkey sets:

- Home screen..... These are the eight isotope buttons located at the left edge of Figure 6-1 Measurement Screen. Touching one of these buttons selects the programmed nuclide for measurement.
- Select Nuclide screen..... These are the 20 buttons on the left half of Figure 6-6 Select Nuclide Screen. Touching one of these buttons selects the programmed nuclide.

Home Screen Hotkeys

By default, none of the Home Screen Hotkeys are assigned. These are assigned through the Setup portion of the program.

Touch the **SETUP** button located on Figure 6-1 Measurement Screen. Figure 6-2 Setup Screen will appear.

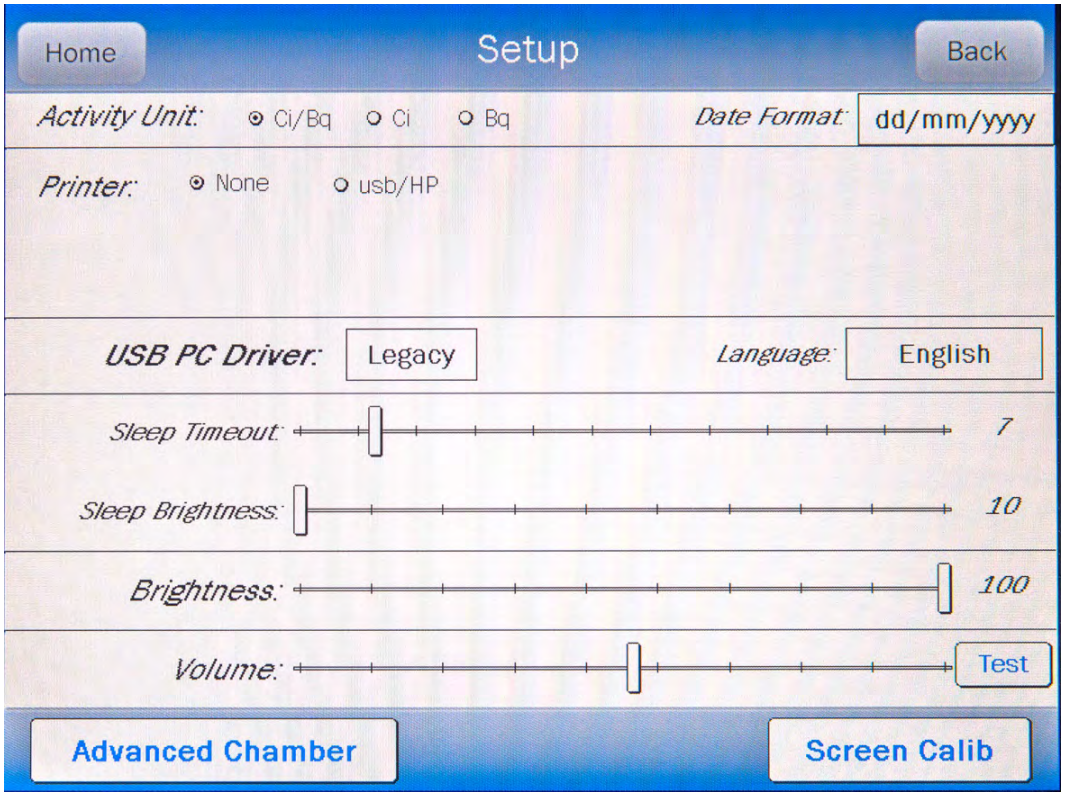

Figure 6-2 Setup Screen

From the Setup screen, touch the **ADVANCED CHAMBER** button. A numeric keypad will appear to allowing the user to input a 3-digit password as shown in Figure 6-3 Enter Password: Screen.

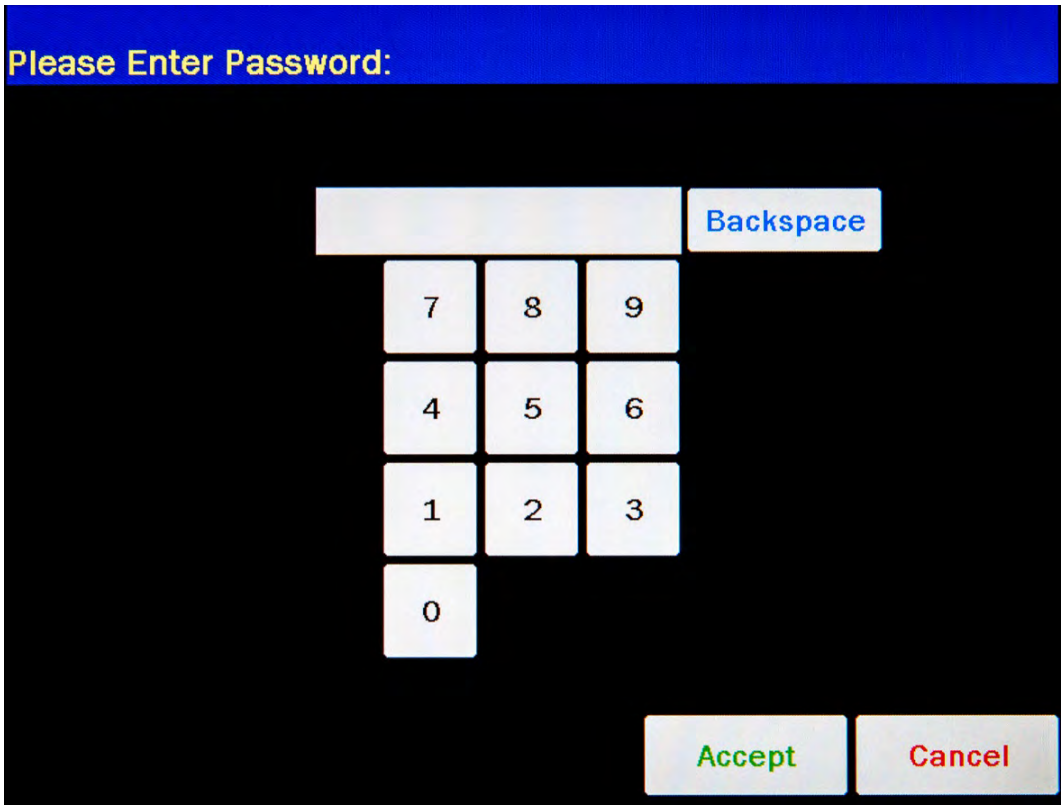

Figure 6-3 Enter Password: Screen

Input the password (the last 3 digits of the Readout serial number) by touching the appropriate numbers on the keypad. Touch the **ACCEPT** button to accept the password. Figure 6-4 Advanced Chamber Setup Screen will appear.

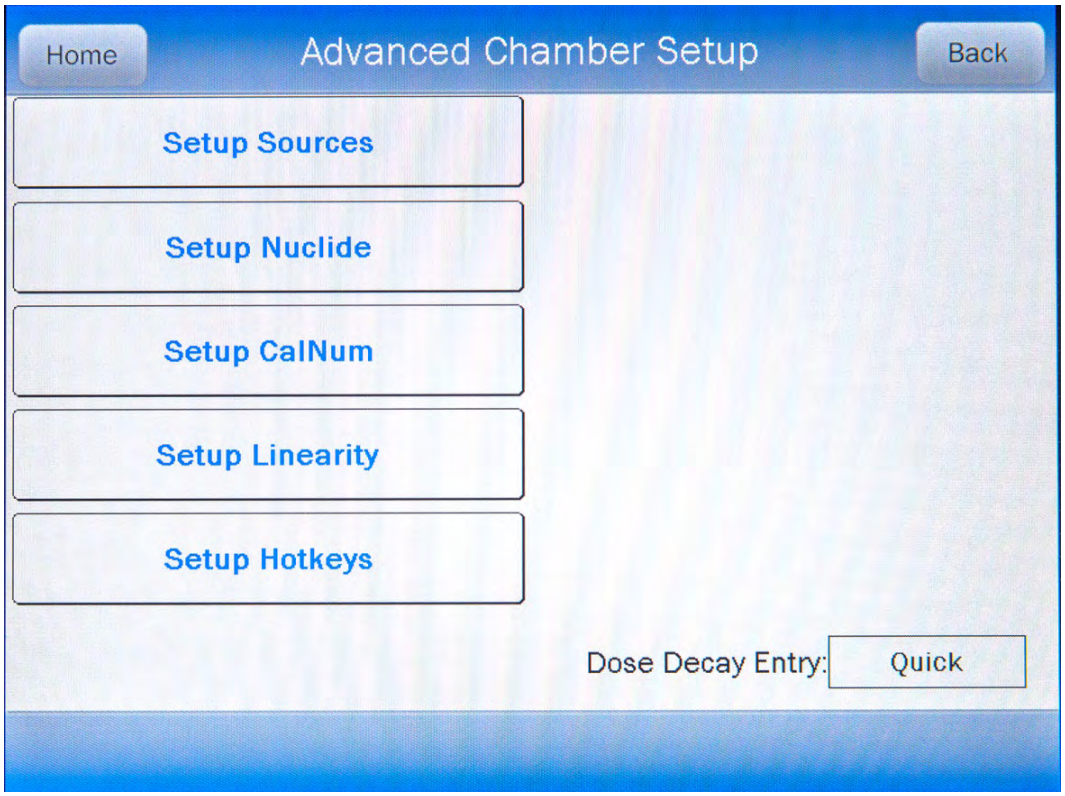

Figure 6-4 Advanced Chamber Setup Screen

To change the Hotkeys for a CRC®-77tHR System, touch the **SETUP HOTKEYS** button. Figure 6-5 Setup Hotkeys Screen will appear.

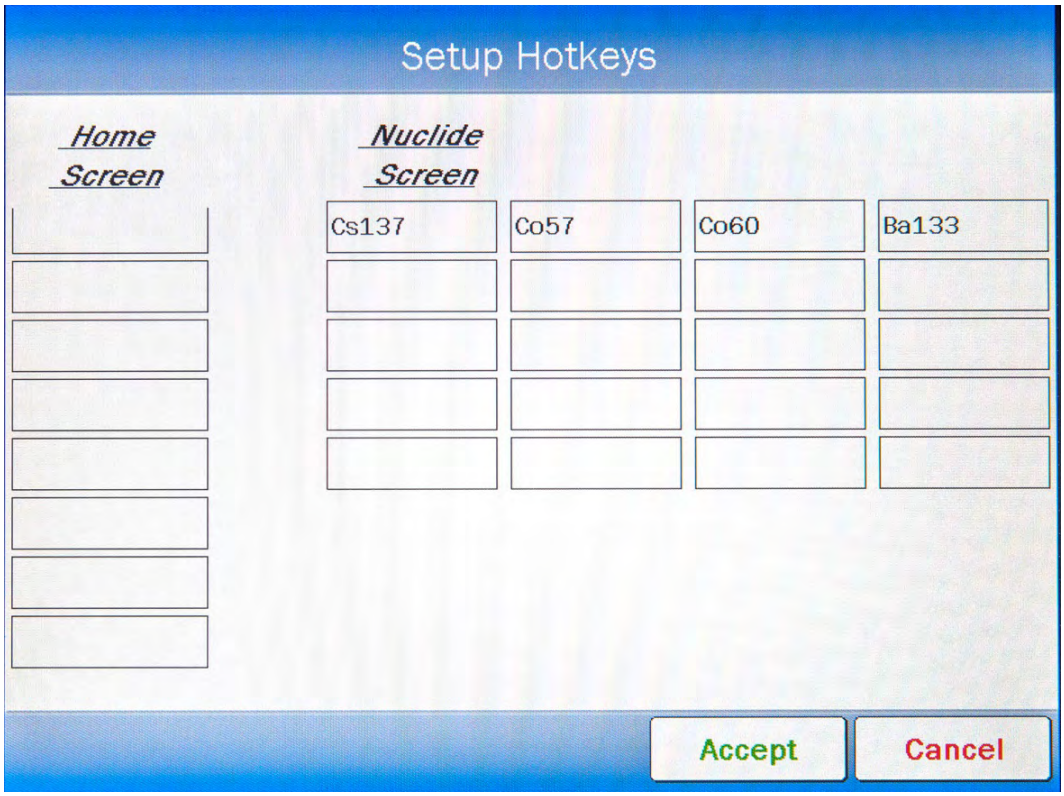

Figure 6-5 Setup Hotkeys Screen

The left side of the screen displays a list of isotopes titled “Home Screen”. These are the eight Hotkeys that are displayed on the left side of Figure 6-1 Measurement Screen. The isotopes shown under the title “Nuclide Screen” are the 20 preset **NUCLIDE** buttons that are displayed on Figure 6-6 Select Nuclide Screen.

To change the assignment of a Home Screen Hotkey, touch the desired Nuclide field box in the Home Screen column. Figure 6-6 Select Nuclide Screen will appear.

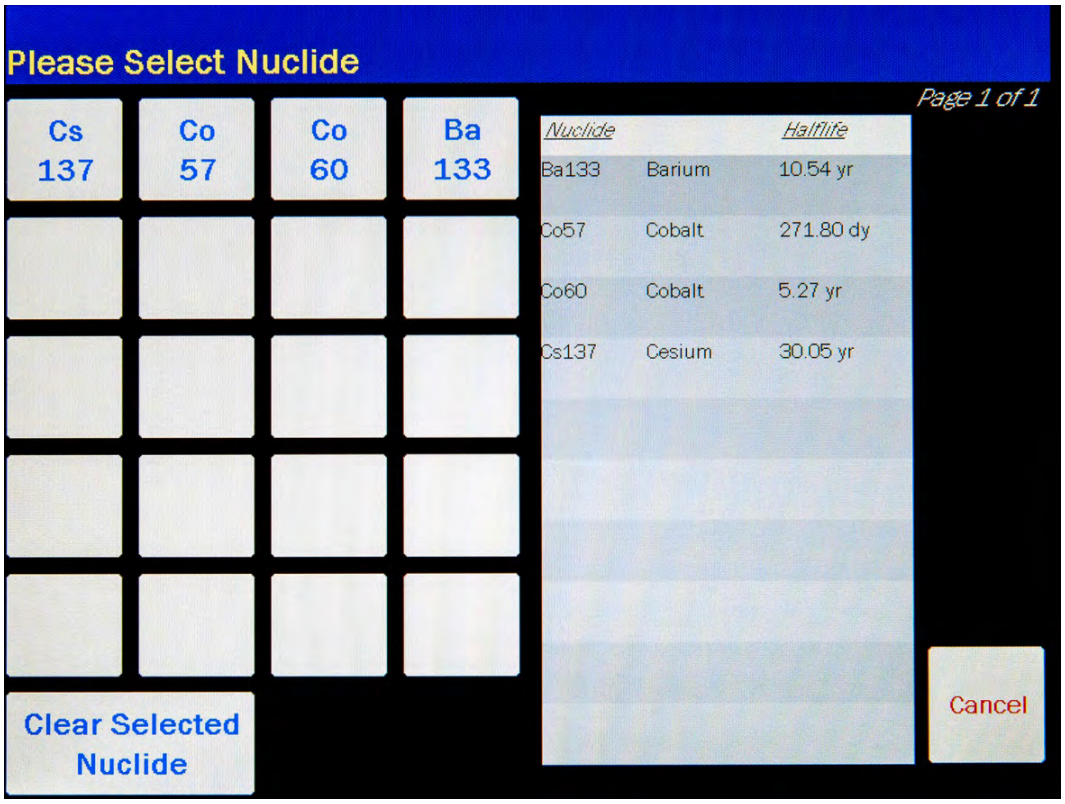

Figure 6-6 Select Nuclide Screen

The left half of the Select Nuclide screen contains 20 preset **NUCLIDE** buttons (these are the Select Nuclide Screen Hotkeys). The right half of the screen displays a listing of nuclides stored in the calibrator's memory (both default and user added nuclides) that have a Calibration Number assigned to them (Refer to the CALIBRATION NUMBERS section on page 6-24) – 10 at a time.

The nuclide list is in alphabetical order. User added nuclides are displayed at the top of the list. The length of the list will vary depending on which nuclides have a Calibration Number assigned to them (Refer to the CALIBRATION NUMBERS section on page 6-24). The number of pages shown in the upper right corner of the screen indicates the length of the list. To scroll through the list, touch the **DOWN ARROW** (▼) button. The next group of 10 nuclides will be displayed and the **UP ARROW** (▲) button will appear allowing the user to scroll up in the list.

To cancel any changes and return to Figure 6-5 Setup Hotkeys Screen, touch the **CANCEL** button.

To change the assignment of the chosen Hotkey, do one of the following:

- Touch one of the preset **NUCLIDE** keys. Figure 6-5 Setup Hotkeys Screen will re-appear with the selected Nuclide replacing the chosen Hotkey in the "Home Screen" list.

- Touch the Nuclide name on the list on the right. (If necessary, scroll the list until the desired nuclide is displayed.) Once a nuclide is selected from the list, an **ACCEPT** button will appear. Touch the **ACCEPT** button to save the change. Figure 6-5 Setup Hotkeys Screen will re-appear with the selected Nuclide replacing the chosen Hotkey in the "Home Screen" list.
- Touch the **CLEAR SELECTED NUCLIDE** button. This will cause the selected Hotkey to be blank (no nuclide assigned to the Hotkey). Figure 6-5 Setup Hotkeys Screen will re-appear with the chosen Hotkey in the "Home Screen" list blank.

Select Nuclide Screen Hotkeys

The Select Nuclide Screen Hotkeys on Figure 6-6 Select Nuclide Screen are populated by default with the following nuclides:

- Ba133, Co57, Co60 and Cs137

Any of the default Select Nuclide Screen Hotkeys can be changed.

To change the assignment of a Select Nuclide Screen Hotkey, touch the desired isotope field box in the Nuclide Screen section. Figure 6-6 Select Nuclide Screen will appear.

The left half of the Select Nuclide screen contains Select Nuclide Screen Hotkeys. The right half of the screen displays a listing of nuclides stored in the calibrator's memory (both default and user added nuclides) that have a Calibration Number assigned to them (Refer to the CALIBRATION NUMBERS section on page 6-24) – 10 at a time.

The nuclide list is in alphabetical order. User added nuclides are displayed at the top of the list. The length of the list will vary depending on which nuclides have a Calibration Number assigned to them (Refer to the CALIBRATION NUMBERS section on page 6-24). The number of pages shown in the upper right corner of the screen indicates the length of the list. To scroll through the list, touch the **DOWN ARROW** (▼) button. The next group of 10 nuclides will be displayed and the **UP ARROW** (▲) button will appear allowing the user to scroll up in the list.

To cancel any changes and return to Figure 6-5 Setup Hotkeys Screen, touch the **CANCEL** button.

To change the assignment of the chosen Hotkey, do one of the following:

- Touch one of the preset **NUCLIDE** keys. Figure 6-5 Setup Hotkeys Screen will re-appear with the selected Nuclide replacing the chosen Hotkey in the "Nuclide Screen" list.
- Touch the Nuclide name on the list on the right. (If necessary, scroll the list until the desired nuclide is displayed.) Once a nuclide is selected from the list, an **ACCEPT** button will appear. Touch the **ACCEPT** button to save the change. Figure 6-5 Setup Hotkeys Screen will re-appear with the selected Nuclide replacing the chosen Hotkey in the "Nuclide Screen" list.

- Touch the **CLEAR SELECTED NUCLIDE** button. This will cause the selected Hotkey to be blank (no nuclide assigned to the Hotkey). Figure 6-5 Setup Hotkeys Screen will re-appear with the chosen Hotkey in the "Nuclide Screen" list blank.

TEST SOURCE SETUP

Test Sources (Standard Sources) are used for the Chamber Accuracy and Constancy Tests.

The Chamber Accuracy and Constancy may be tested using Co57, Co60, Ba133, Cs137 or Na22. There can be a Test Source for each of these nuclides. One or more of the Test Sources can be designated as the source(s) to be used in the Accuracy part of the Daily Test. One of the sources designated as a Daily source can be chosen as the base source to be used for the Constancy Test.

To input Test Source data, touch the **SETUP** button located on the Measurement screen. Figure 6-7 Setup Screen will appear.

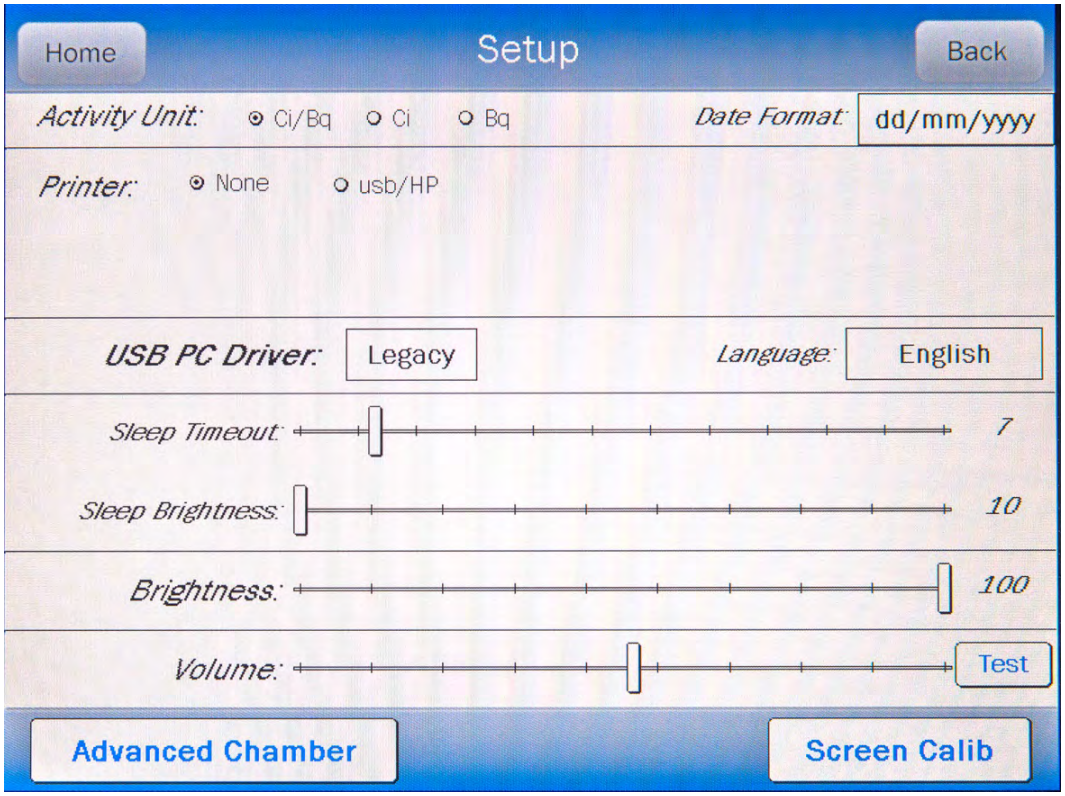

Figure 6-7 Setup Screen

Touch the **ADVANCED CHAMBER** button. A numeric keypad will appear to allowing the user to input a 3-digit password as shown in Figure 6-8 Enter Password: Screen.

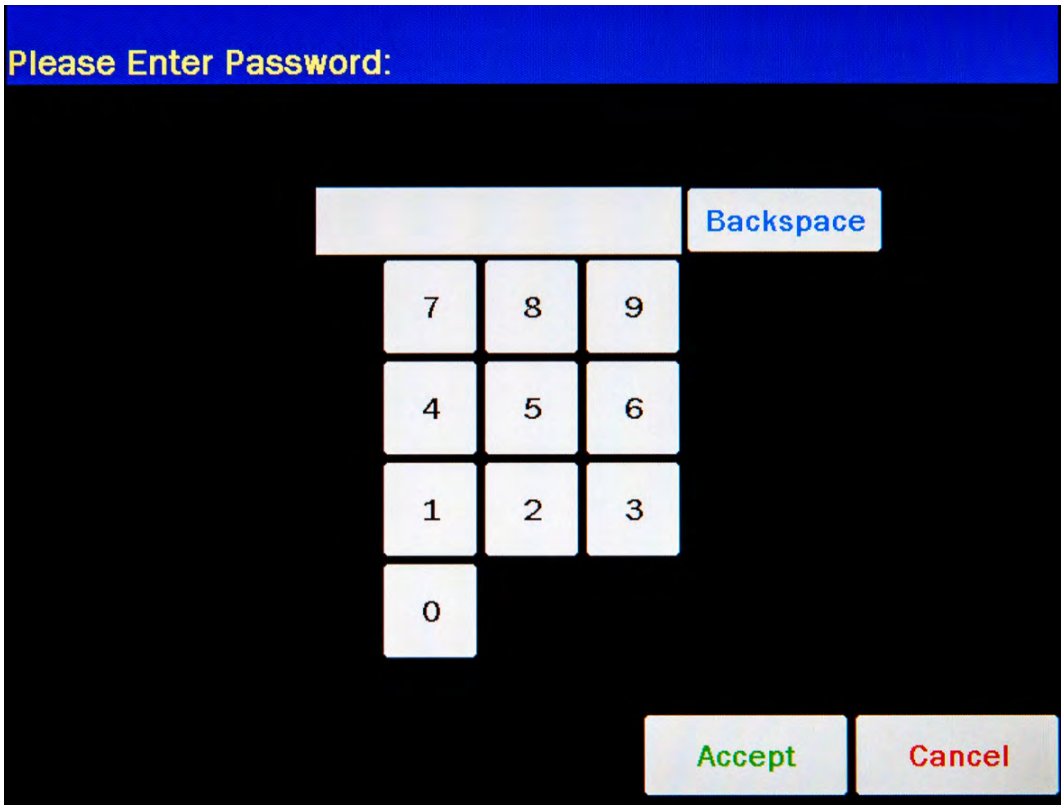

Figure 6-8 Enter Password: Screen

Input the password (the last 3 digits of the Readout serial number) by touching the appropriate numbers on the keypad. Touch the **ACCEPT** button to accept the password. Figure 6-9 Advanced Chamber Setup Screen will appear.

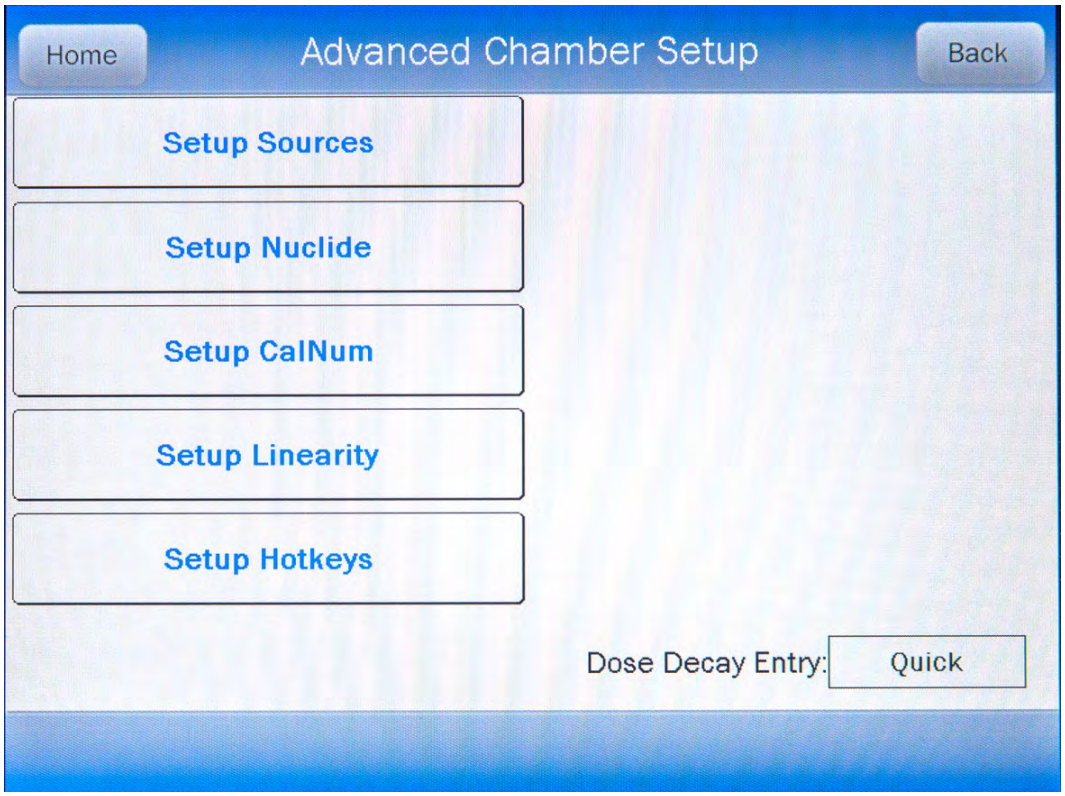

Figure 6-9 Advanced Chamber Setup Screen

Touch the **SETUP SOURCES** button. Figure 6-10 Setup Sources Screen will appear.

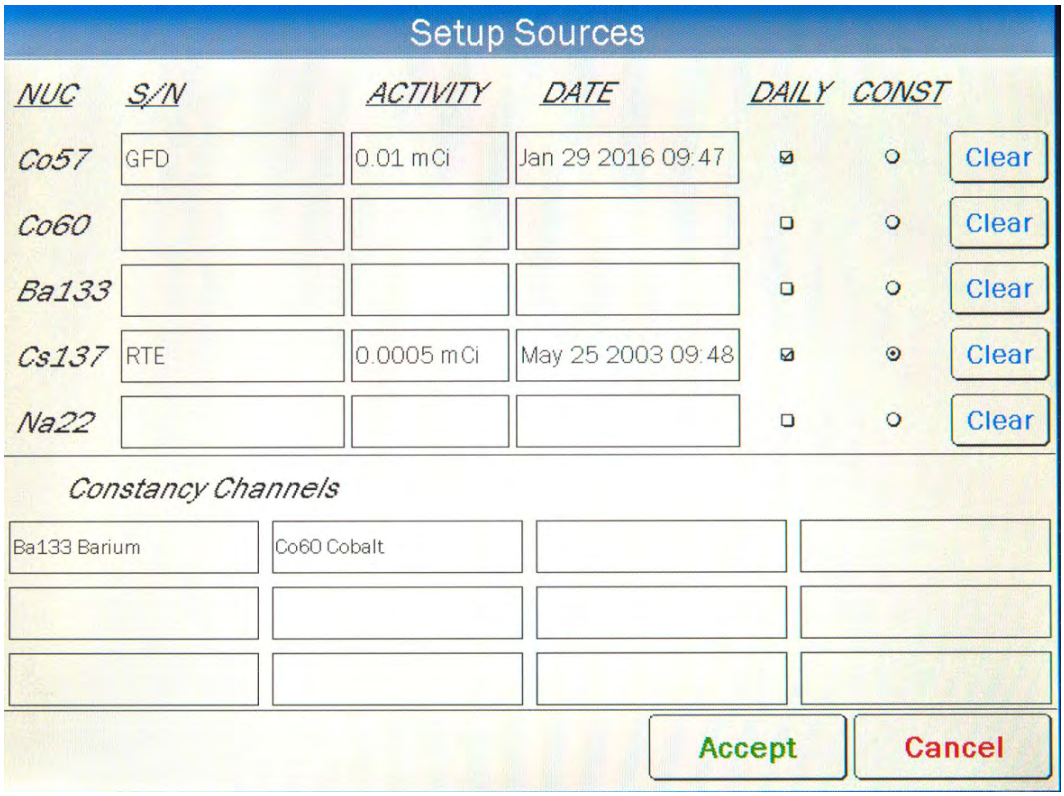

Figure 6-10 Setup Sources Screen

The Setup Sources screen allows data to be input for each Test Source and to choose which Test Source(s) will be used for the Accuracy part of the Daily Test and which source will be used as the base source for the Constancy Test. The Constancy Channels section allows nuclides to be selected for use in the Constancy Test.

Adding a Source

Note: *All fields (**S/N:**, **Activity:**, **Date:**) for the selected source must be completed before exiting the Setup Sources screen or the entered information for that source will not be saved.*

To input information for the desired Test Source, touch the field's box and input the appropriate data for that source.

Serial Number (S/N) Field

For the Test Source Serial Number (***S/N***) data, Figure 6-11 Enter Serial Number Screen will appear.

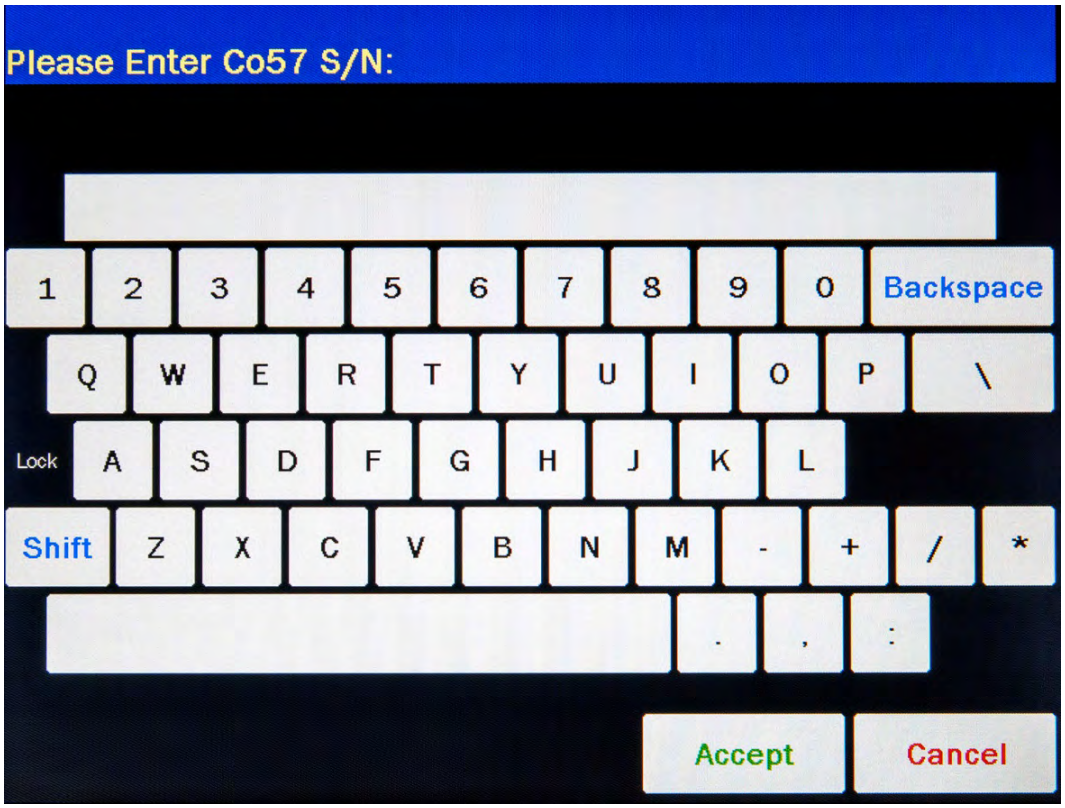

Figure 6-11 Enter Serial Number Screen

Input the serial number data of the Test Source and touch the **ACCEPT** button. The Setup Sources screen will re-appear with ***S/N*** field box populated with the entered serial number. The serial number can contain up to 10 characters

To cancel any changes and return to Figure 6-10 Setup Sources Screen, touch the **CANCEL** button.

Activity Field

For the Test Source Activity data, Figure 6-12 Enter Activity Screen will appear.

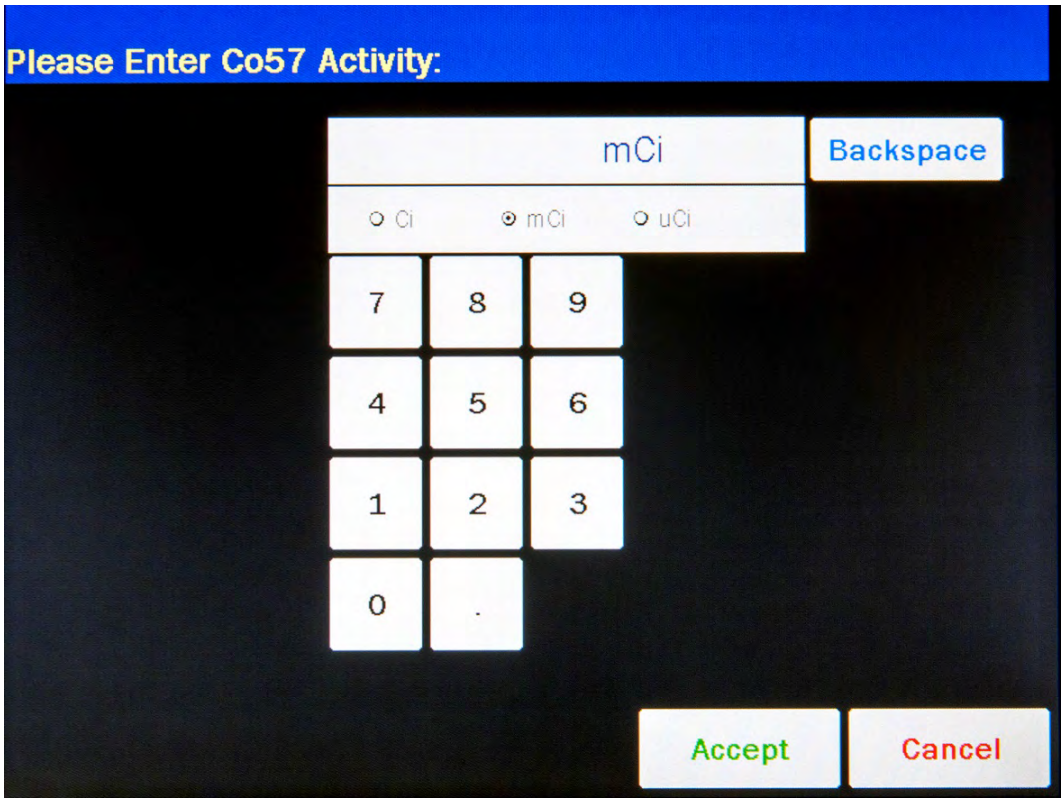

Figure 6-12 Enter Activity Screen

The Calibration activity must be less than 1 Curie. The current activity (calibration activity decayed to the present time) must be greater than the activity in the table below.

Note: *Capintec strongly recommends replacing the Test Source when the activity decays below the recommended "Minimum at Current Time" limits*

	Minimum at Current Time		Maximum	
Source	**Ci**	**Bq**	**Ci**	**Bq**
Co57	1 mCi	37 MBq	1.0 Ci	37.0 GBq
Co60	1.5 mCi	55.5 MBq	1.0 Ci	37.0 GBq

Table 6-1 Test Source Calibration Activity Limits

Input the activity value using the keypad and touch the appropriate radio button for the unit of measure of the Test Source.

Note: *The available units will change depending on which unit of measurement is in use on the Measurement screen. i.e. if set for Curies, the available units will*

be Ci, mCi and µCi; if set for Becquerels, the available units will be GBq and MBq.

Touch the **ACCEPT** button. The Setup Sources screen will re-appear with ***Activity*** field box populated with the entered activity.

To cancel any changes and return to Figure 6-10 Setup Sources Screen, touch the **CANCEL** button.

Date Field

For the Test Source calibration Date, Figure 6-13 Date/Time Screen will appear.

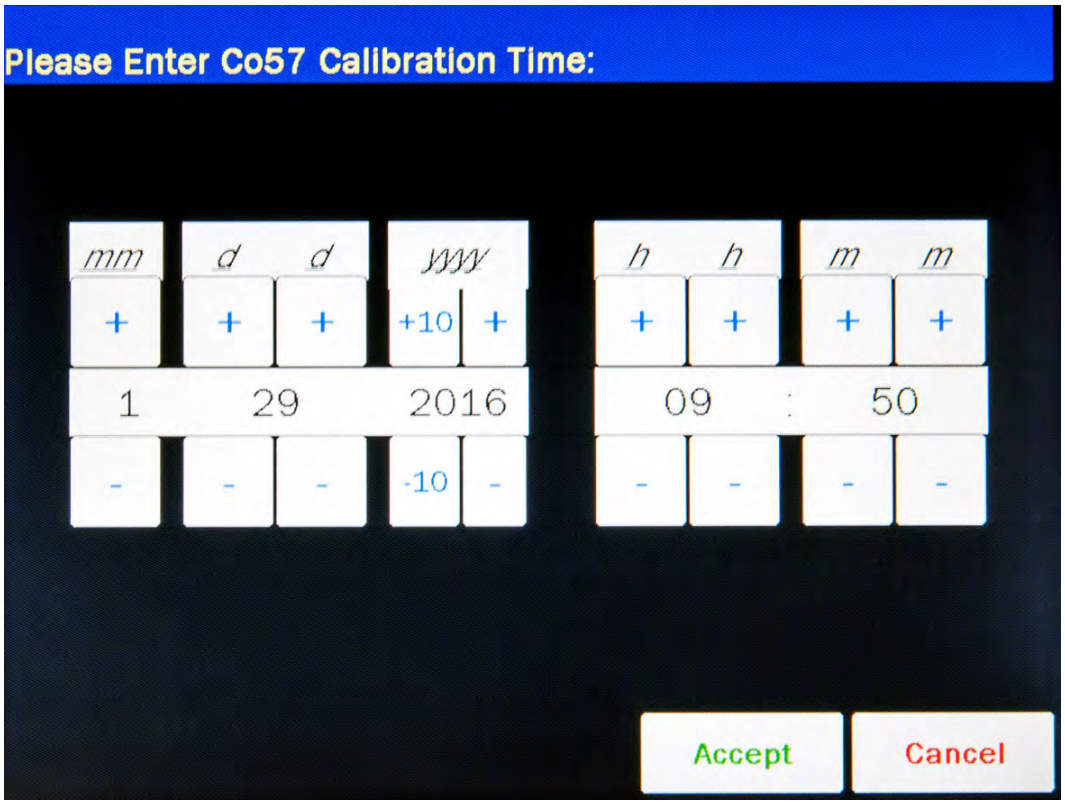

Figure 6-13 Date/Time Screen

The screen displays the currently set date and time. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

Adjust the displayed date and time to show the calibration date/time of the Test Source.

Touch the **ACCEPT** button to accept the set calibration date and time. The Setup Sources screen will re-appear with ***Date*** field box populated with the entered calibration date.

To cancel any changes and return to Figure 6-10 Setup Sources Screen, touch the **CANCEL** button.

Daily Field

By default, the ***Daily*** checkbox is checked (refer to Figure 6-10 Setup Sources Screen). At least one source must be designated as a Daily Test source for the Accuracy Test. If the selected source is not going to be used as a Daily Test source, touch the checkbox next to the selected source to remove the check from the checkbox.

Editing Source Data

Any data for any source can be edited simply by touching the desired field box and inputting the new data as described in the ***Adding a Source*** section above beginning on page 6-12.

Deleting a Source

Test Sources are removed in one of two ways: by touching the **CLEAR** button to the right of the Test Source to be deleted or by erasing the data from either the ***S/N*** field box or the ***Activity*** field box for the desired source.

To erase a selected source by erasing the data from either the ***S/N*** field box or the ***Activity*** field box,

1. Touch either the ***S/N*** or the ***Activity*** field box of the particular source.
2. When the data entry screen appears, verify that the data entry box contains no data.
3. Touch the **ACCEPT** button.
4. The Setup Sources screen will re-appear with the selected field box blank.
5. Touch the **ACCEPT** button in the lower part of the Setup Sources screen. Figure 6-9 Advanced Chamber Setup Screen will appear.
6. Touch the **SETUP SOURCES** button. Figure 6-10 Setup Sources Screen will re-appear with the particular source's information blank.

The selected Test Source is now erased from the system.

Constancy Test Source

The Constancy may be tested using Co57, Co60, Ba133, Cs137 or Na22. There can be a Test Source for each of these nuclides. One or more of the Test Sources can be designated as the source(s) to be used in the Accuracy part of the Daily Test. One of the sources designated as a Daily source must be chosen as the base source to be used for the Constancy Test.

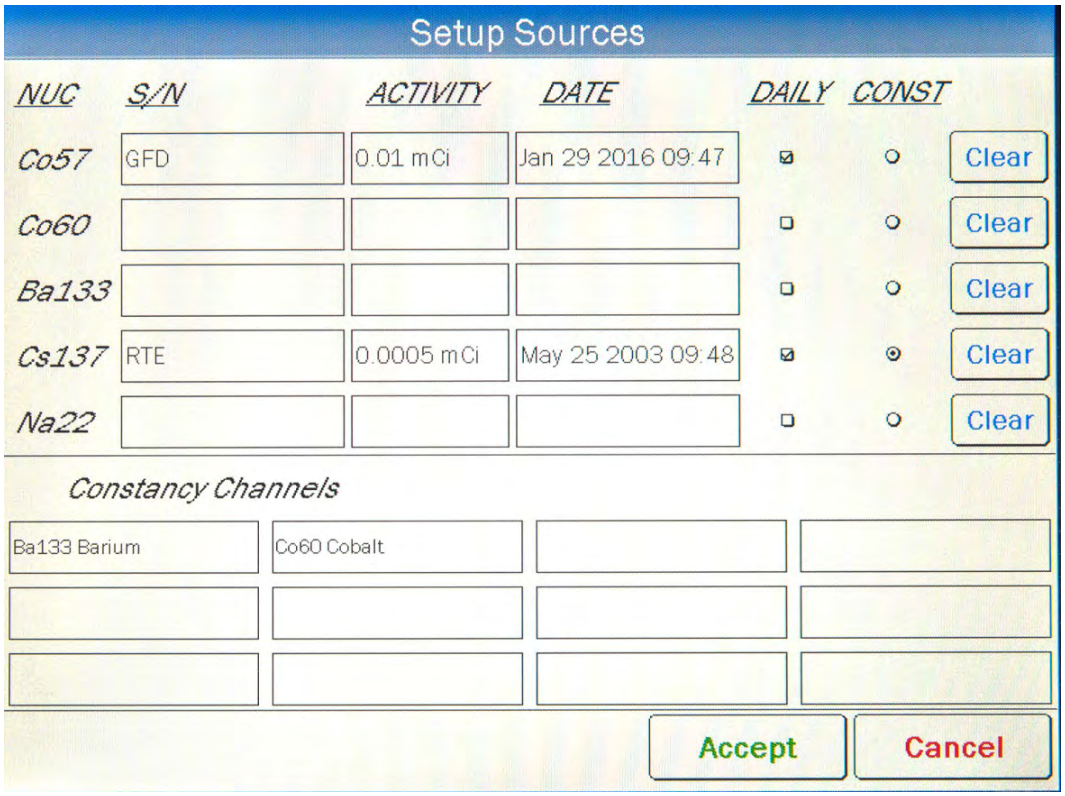

Figure 6-14 Setup Sources Screen

To select the Daily source to use as the base Constancy source, touch the associated radio button in the ***Const*** column. In the example above, Cs137 is set as the Constancy base source.

Constancy Channels

The Constancy Channels are the nuclides that will be tested during the automated Constancy Test during the Accuracy Test. Up to 12 nuclides may be selected.

When the Accuracy Test for the base Constancy source is complete, an **AUTOCONSTANCY** button will appear next to the results of the base source.

The automated Constancy Test is then performed by touching the **AUTOCONSTANCY** button. The test will automatically run and will display the results at the completion of the test.

Adding Nuclides

To select nuclides for use in the Constancy Test, touch the desired ***Constancy Channels*** field box. Figure 6-15 Select Nuclide Screen will appear.

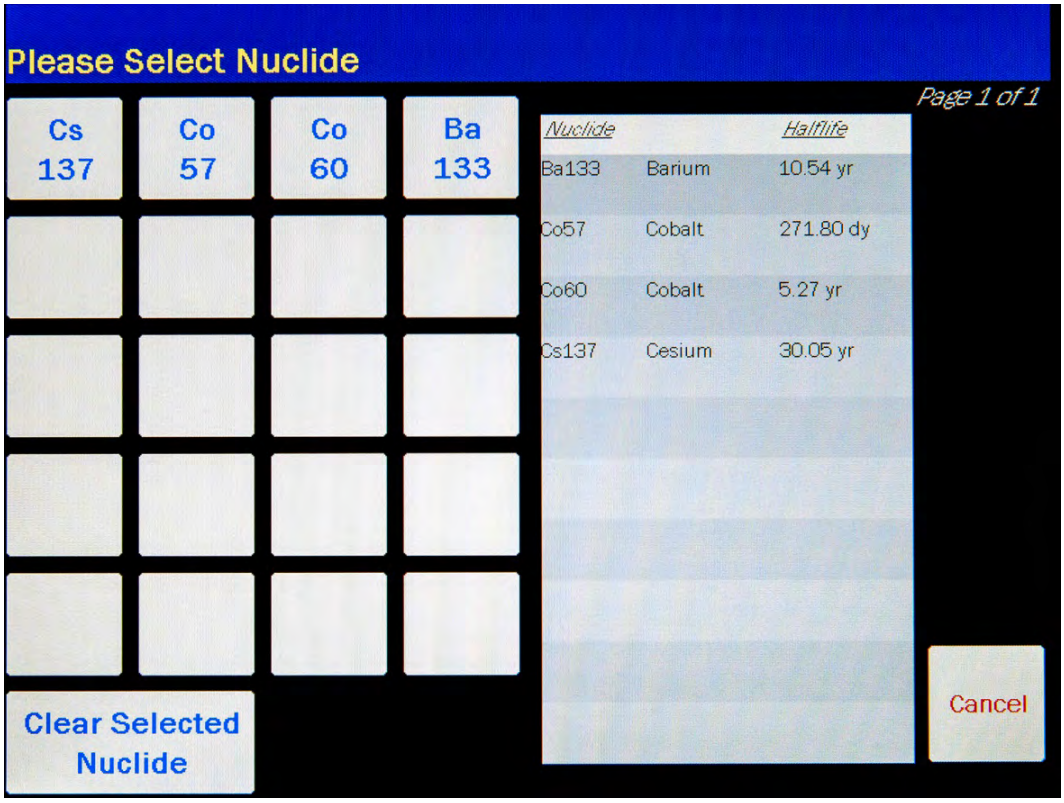

Figure 6-15 Select Nuclide Screen

The left half of the Select Nuclide screen contains the 20 preset **NUCLIDE** buttons (these are the Select Nuclide Screen Hotkeys). The right half of the screen displays a listing of nuclides stored in the calibrator's memory (both default and user added nuclides) that have a Calibration Number assigned to them (Refer to the CALIBRATION NUMBERS section on page 6-24) – 10 at a time.

The nuclide list is in alphabetical order. User added nuclides are displayed at the top of the list. The length of the list will vary depending on which nuclides have a Calibration Number assigned to them (Refer to the CALIBRATION NUMBERS section on page 6-24). The number of pages shown in the upper right corner of the screen indicates the length of the list. To scroll through the list, touch the **DOWN ARROW** (▼) button. The next group of 10 nuclides will be displayed and the **UP ARROW** (▲) button will appear allowing the user to scroll up in the list.

To cancel any changes and return to Figure 6-14 Setup Sources Screen, touch the **CANCEL** button.

To assign a nuclide for use as a Constancy Channel, do one of the following:

- Touch one of the preset **NUCLIDE** keys (Select Nuclide Screen Hotkeys). Figure 6-14 Setup Sources Screen will re-appear with the selected nuclide shown in the chosen Constancy Channel field box.
- Touch the Nuclide name on the list on the right. (If necessary, scroll the list until the desired nuclide is displayed.) Once a nuclide is selected from the list, an **ACCEPT** button will appear. Touch the **ACCEPT** button to save the selected nuclide. Figure 6-14 Setup Sources Screen will re-appear with the selected nuclide shown in the chosen Constancy Channel field box.

Removing Nuclides

To remove a nuclide from the Constancy Channels, touch the desired ***Constancy Channels*** field box to delete from the Constancy Channels. Figure 6-15 Select Nuclide Screen will appear.

Touch the **CLEAR SELECTED NUCLIDE** button. Figure 6-14 Setup Sources Screen will re-appear. The selected ***Constancy Channels*** field box will now be blank.

NUCLIDES

Adding a Nuclide

The CRC®-77tHR contains nuclide data (name, half-life) for over 80 nuclides. Up to 10 nuclides can be added to the system.

To add a nuclide, touch the **SETUP** button located on the Measurement screen. Figure 6-7 Setup Screen will appear.

Touch the **ADVANCED CHAMBER** button. A numeric keypad will appear to allowing the user to input a 3-digit password as shown in Figure 6-8 Enter Password: Screen.

Input the password (the last 3 digits of the Readout serial number) by touching the appropriate numbers on the keypad. Touch the **ACCEPT** button to accept the password. Figure 6-9 Advanced Chamber Setup Screen will appear.

Touch the **SETUP NUCLIDE** button. Figure 6-16 Setup Nuclide Screen will appear.

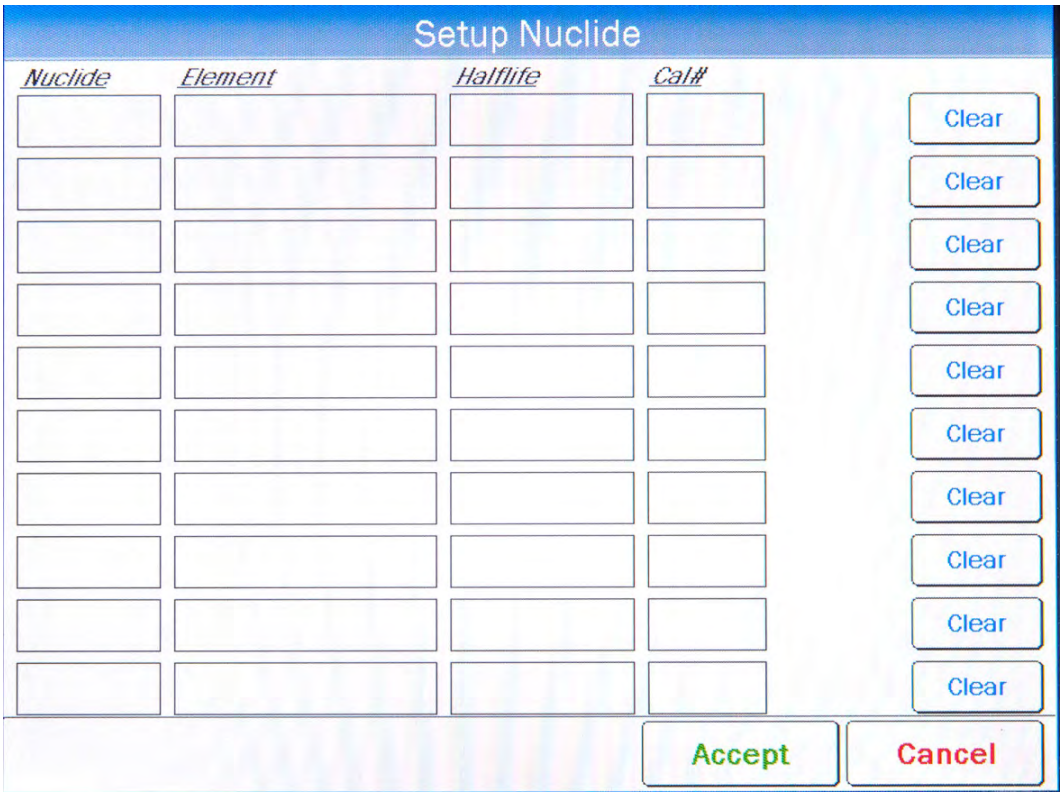

Figure 6-16 Setup Nuclide Screen

The following parameters are input for each of the added nuclides: ***Nuclide***, ***Element***, ***Half-life***, ***Cal#***. Each of these parameters is described in the sections below.

To input information for the desired nuclide, touch the desired field box and input the appropriate data for the nuclide.

All field boxes (***Nuclide***, ***Element***, ***Half-life*** and ***Cal#***) for the nuclide being added must be completed before touching the **ACCEPT** button to exit the Setup Nuclide screen or the message "**Setup Nuclide Error** Please complete partial Nuclide entry. Row(s): X" will appear. Touch the **OK** button to dismiss the message and input the missing Nuclide information.

After all necessary Nuclide information is input for all added nuclides, touch the **ACCEPT** button on Figure 6-16 Setup Nuclide Screen. The added nuclide(s) is/are now saved in the system.

To cancel adding Nuclides, touch the **CANCEL** button.

Nuclide Field

This field is the nuclide designation (i.e. Tc99m, Cs137) and consists of up to 6 alphanumeric characters.

For the ***Nuclide*** data, the alphanumeric keyboard will appear. Input the data and touch the **ACCEPT** button.

To cancel any changes and return to Figure 6-16 Setup Nuclide Screen, touch the **CANCEL** button.

Element Field

This field is the nuclide element name (i.e. Technetium, Cesium) and consists of up to 14 alphanumeric characters.

For the ***Element*** data, the alphanumeric keyboard will appear. Input the data and touch the **ACCEPT** button.

To cancel any changes and return to Figure 6-16 Setup Nuclide Screen, touch the **CANCEL** button.

Half-life Field

This field is the half-life of the nuclide (i.e. 6.01 hr, 30.00 yr) and consists of up to 6 characters (5 digits and a decimal).

For the ***Half-life*** data, the numeric keypad will appear. Input the value using the keypad and touch the appropriate radio button for the time unit of the nuclide. The available time units for half-life are: Yr (year), Hr (hour), Day, Min (minute) and Sec (second).

Touch the **ACCEPT** button when the value and time unit are correctly set.

To cancel any changes and return to Figure 6-16 Setup Nuclide Screen, touch the **CANCEL** button.

Cal# Field

This field is the Calibration Number for the nuclide (i.e. 080, 220). This field must contain a Calibration Number.

For the Calibration Number data, the numeric keypad will appear as shown in Figure 6-17 Enter Cal# Screen.

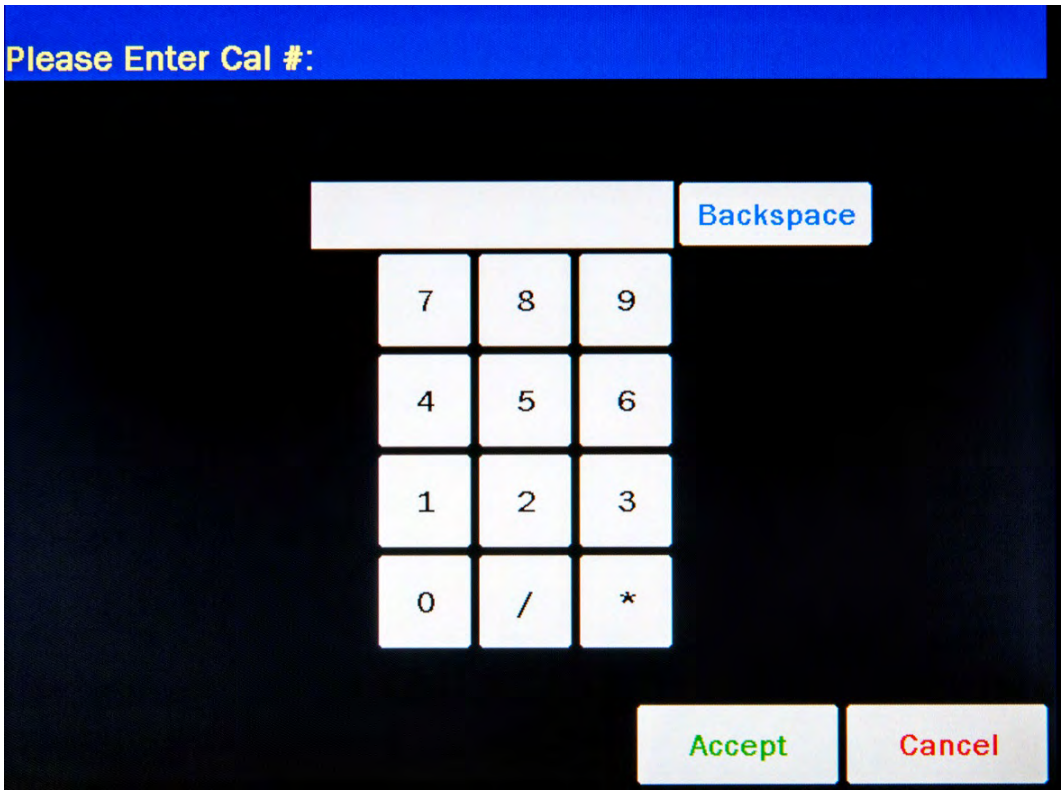

Figure 6-17 Enter Cal# Screen

A calibration number may include a multiplication sign (* on the keypad) or a division sign (/ on the keypad). However, the Chamber is always direct reading and the multiplication or division sign is only used to be consistent with existing Calibration Numbers.

For multiplication, the number can only be multiplied by 10 or 100. For division, the number can only be divided by 2. Refer to Table 6-2 Calibration Number Limits Table.

	Minimum Calibration # (*a*)	**Maximum Calibration # (*a*)**
Direct Entry (*a*)	10	1200
Multiplication (*a* × 10)	10	1200
Multiplication (*a* × 100)	10	999
Division (*a* ÷ 2)	400	1200

Table 6-2 Calibration Number Limits Table

If the Calibration Number is known for the nuclide, input the number and touch the **ACCEPT** button. If the Calibration Number is not known, input 450 and the **ACCEPT** button. The Calibration Number can then be determined using the following procedure.

To cancel any changes and return to Figure 6-16 Setup Nuclide Screen, touch the **CANCEL** button.

Determining Calibration Numbers

An initial Calibration Number (as an initial starting point, choose 450) must be input into the CRC®-77tHR for the nuclide.

Note: *In order to obtain a correct reading for a Vial or Syringe, the supplied liner and dipper must be used to achieve the correct geometry. If the source is contained in a different type of container, then contact Capintec, Inc. for further assistance.*

1. Place the standard source of the nuclide in the chamber and record the displayed activity.
2. If the displayed activity is **higher** than the measured/calculated activity of the standard source, ***increase*** the Calibration Number. If the displayed activity is **lower** than the measured/calculated activity of the standard source, ***decrease*** the Calibration Number.
3. Re-measure the activity of the standard source.
4. Continue to increase or decrease the Calibration Number (e.g. repeat steps 2 and 3) until the displayed activity matches the measured/calculated activity of the standard source.
5. Record the Calibration Number of the nuclide for future reference.
6. Input the Calibration Number following the instructions in section CALIBRATION NUMBERS on page 6-24.

Deleting a Nuclide

Any nuclide added by the user may be deleted.

Nuclides are removed by touching the **CLEAR** button to the right of the Nuclide to be deleted.

Touch the **ACCEPT** button on Figure 6-16 Setup Nuclide Screen. The selected nuclide is now erased from the system.

CALIBRATION NUMBERS

Calibration Numbers may be added or changed for up to 40 nuclides.

To add a calibration number to a nuclide that does not have a calibration number, change an existing calibration number or restore the original calibration number, touch the **SETUP** button located on the Measurement screen. Figure 6-7 Setup Screen will appear.

Touch the **ADVANCED CHAMBER** button. A numeric keypad will appear to allowing the user to input a 3-digit password as shown in Figure 6-8 Enter Password: Screen.

Input the password (the last 3 digits of the Readout serial number) by touching the appropriate numbers on the keypad. Touch the **ACCEPT** button to accept the password. Figure 6-9 Advanced Chamber Setup Screen will appear.

Touch the **SETUP CALNUM** button. Figure 6-18 Setup CalNum Screen will appear.

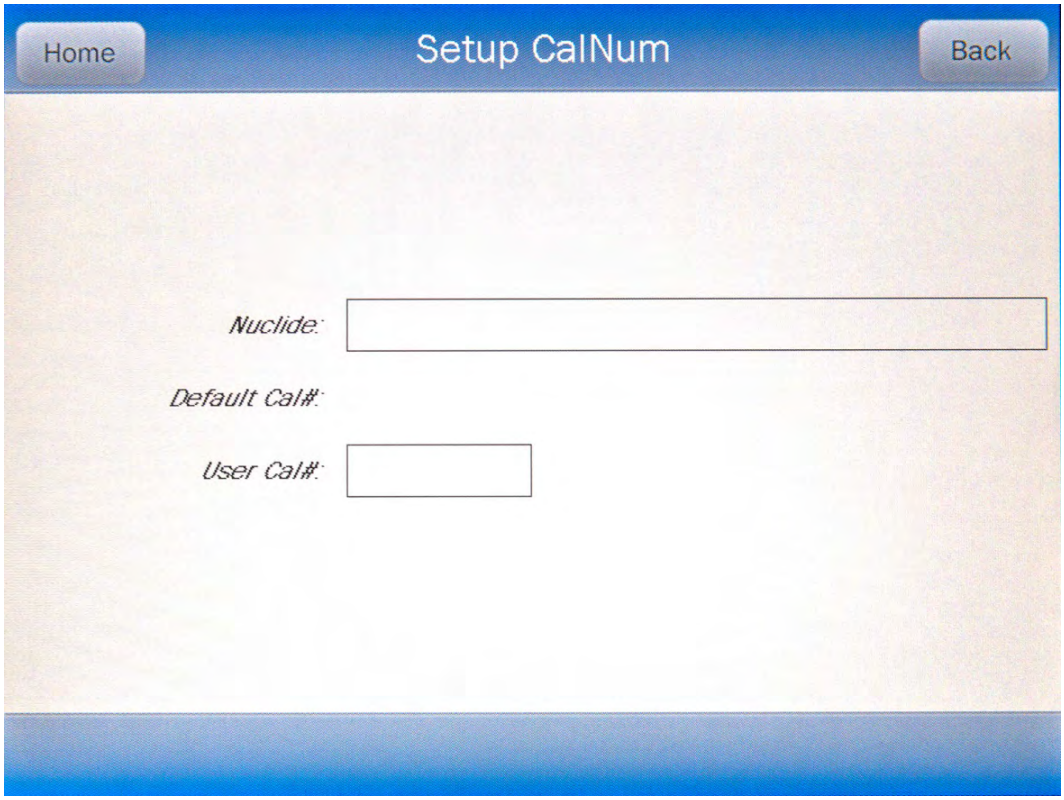

Figure 6-18 Setup CalNum Screen

Select a nuclide by touching the ***Nuclide:*** field box. Figure 6-15 Select Nuclide Screen will appear.

The left half of the Select Nuclide screen contains the 20 programmable **NUCLIDE** Hotkeys. To use one these nuclides, touch the desired key. Figure 6-18 Setup CalNum Screen will re-

appear with the chosen nuclide displayed in the ***Nuclide:*** field box along with the Default Calibration Number.

The right half of the screen displays a listing of nuclides stored in the calibrator's memory – 10 at a time. The nuclide list is in alphabetical order. The number of pages shown in the upper right corner of the screen indicates the length of the list. To scroll through the list, touch the **DOWN ARROW** (▼) button. The next group of 10 nuclides will be displayed and the **UP ARROW** (▲) button will appear to allow scrolling up in the list.

To select a nuclide in the list, touch the desired nuclide and the entire line for the selected nuclide will become highlighted and an **ACCEPT** button will appear. Touch the **ACCEPT** button to select the highlighted nuclide. Figure 6-18 Setup CalNum Screen will re-appear with the chosen nuclide displayed in the ***Nuclide:*** field along with the Default Calibration Number.

To abort selecting a nuclide and return to Figure 6-18 Setup CalNum Screen, touch the **CANCEL** button.

To input a new calibration number, touch the ***Cal#:*** field box. The numeric keypad will appear. Input the new calibration number by touching the appropriate numbers on the keypad. Touch the **ACCEPT** button to accept the Cal#. Touch the **CANCEL** button to abort any changes.

A calibration number may include a multiplication sign (* on the keypad) or a division sign (/ on the keypad). However, the Chamber is always direct reading and the multiplication or division sign is only used to be consistent with existing Calibration Numbers.

For multiplication, the number can only be multiplied by 10 or 100. For division, the number can only be divided by 2. Refer to Table 6-2 Calibration Number Limits Table on page 6-22.

If the Calibration Number change is accepted, in the Nuclide database list, the Nuclide will now appear with an * (asterisk) in front of the nuclide name indicating that the Cal # has been changed from the default value.

Restoring Original Calibration Numbers

To restore the default calibration number for a nuclide that had its number changed, touch the ***Nuclide:*** field box. From the Select Nuclide screen, choose the desired nuclide by touching one of the preset nuclide buttons or selecting the nuclide from the list.

When the Setup CalNum screen re-appears, touch the ***Cal#:*** field box. The numeric keypad will appear. Verify that the data entry box is blank and touch the **ACCEPT** button.

The Setup CalNum screen will re-appear with the ***Cal#:*** field box blank.

The selected nuclide will now use the original (default) calibration number(s).

To exit the Setup CalNum screen, touch the **BACK** button at the top of the screen and Figure 6-9 Advanced Chamber Setup Screen will appear or touch the **HOME** button at the top of the screen and Figure 6-1 Measurement Screen will appear.

LINEARITY TEST DEFINITION

Four methods of performing Linearity Tests are available: AutoLinearity, Standard (Decay), Lineator and Calicheck. This section describes the setup of the Standard, Lineator and Calicheck tests. How to perform the Linearity Tests is described in CHAPTER 11: ENHANCED TESTS, SECTION: PERFORMING LINEARITY TEST.

In order to perform a Linearity Test, at least one Linearity Test Method must be defined. All three test methods can be defined. If a Linearity Test Method is not defined when attempting to perform a Linearity Test, Figure 6-19 Linearity Test Message Screen will appear.

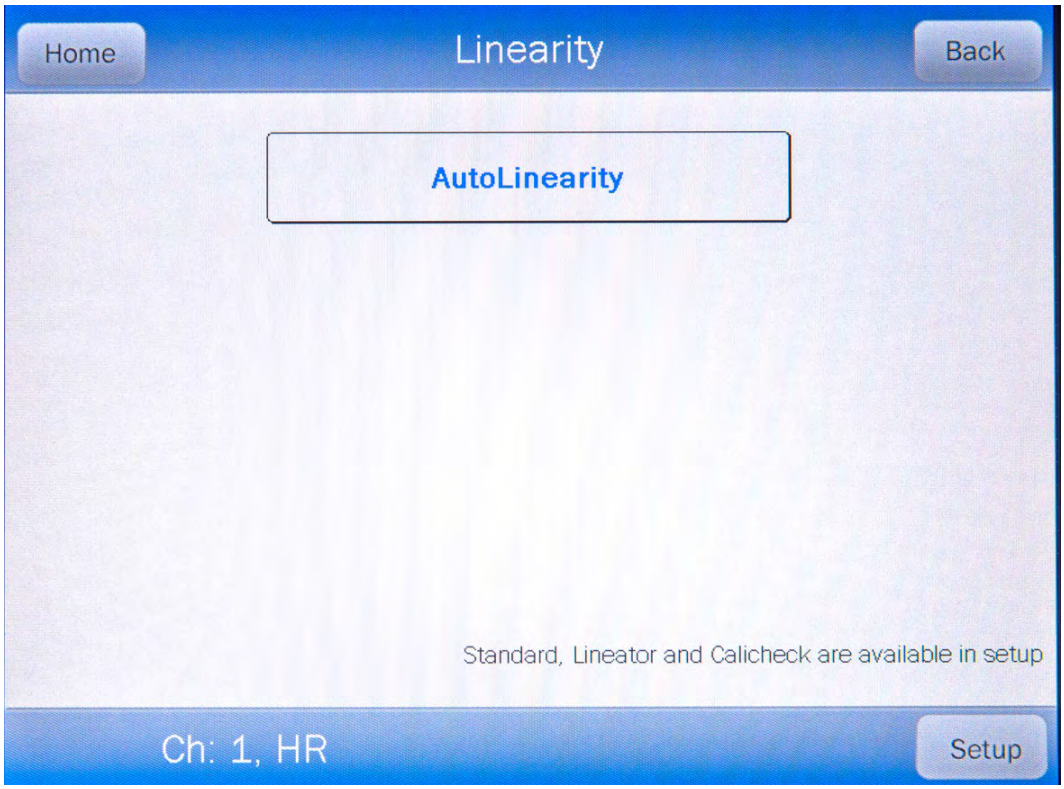

Figure 6-19 Linearity Test Message Screen

To define the Linearity Test Method from Figure 6-19, touch the **SETUP**. Figure 6-21 Enter Password: Screen will appear.

To define the Linearity Test Method from the Measurement screen, touch the **SETUP** button. Figure 6-20 Setup Screen will appear.

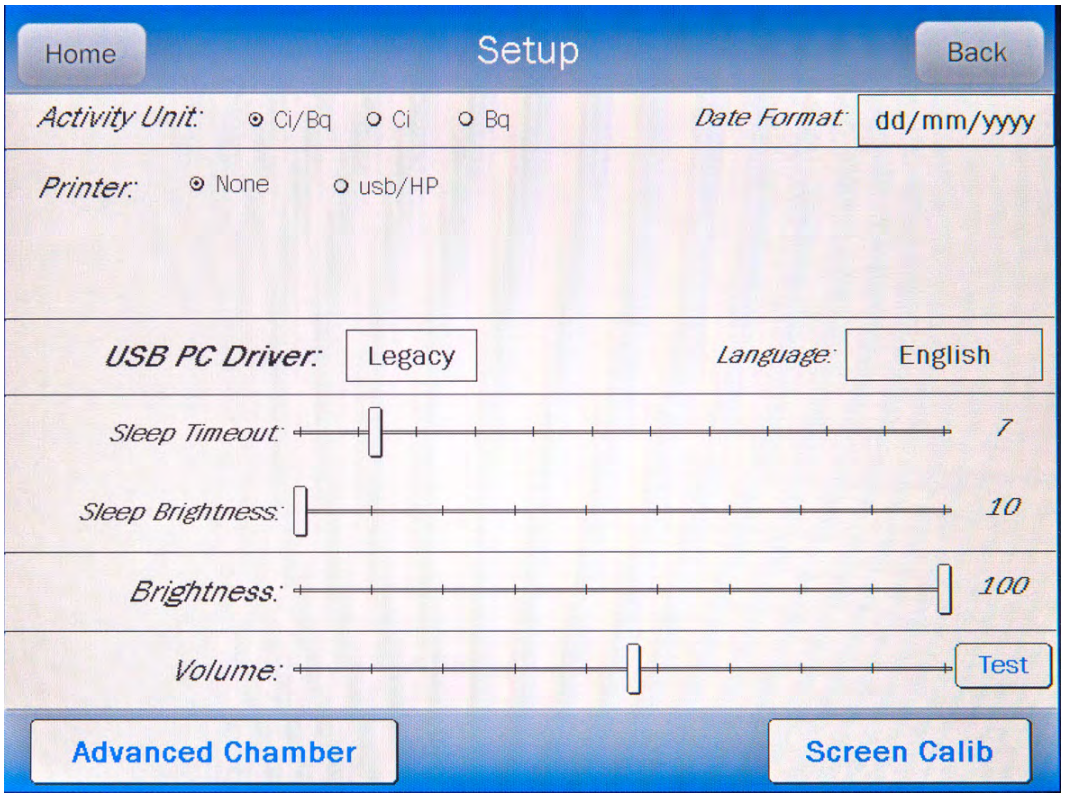

Figure 6-20 Setup Screen

Touch the **ADVANCED CHAMBER** button. A numeric keypad will appear to allowing the user to input a 3-digit password as shown in Figure 6-21 Enter Password: Screen.

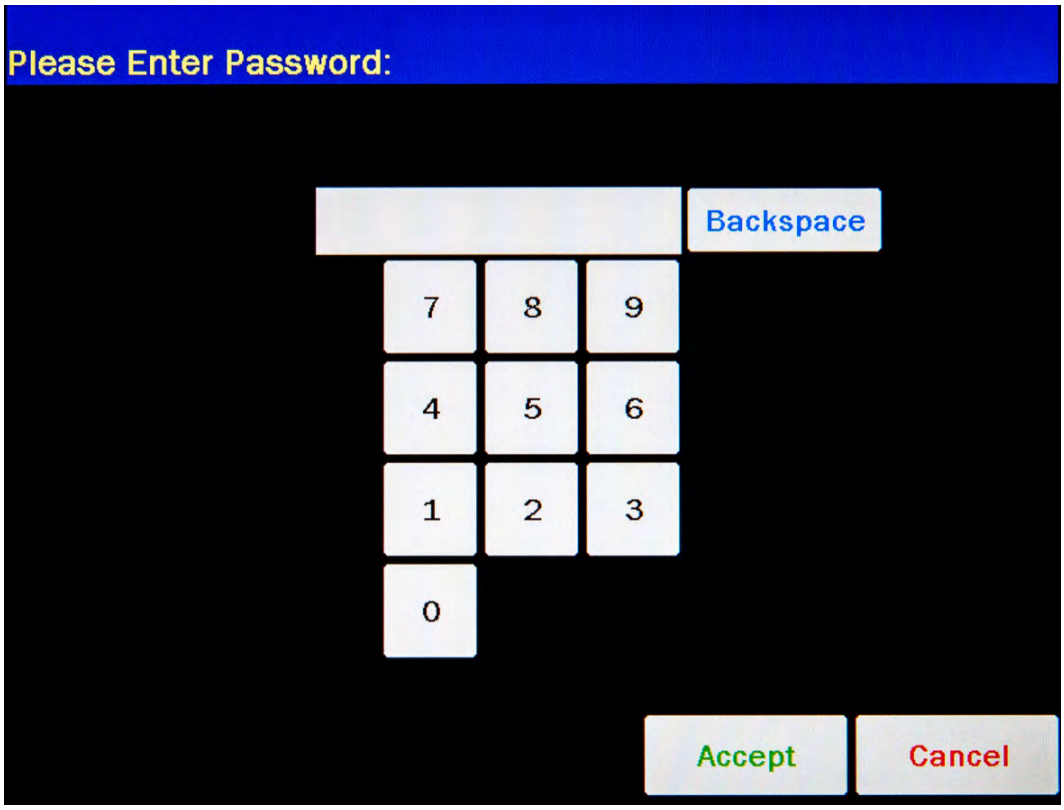

Figure 6-21 Enter Password: Screen

Input the password (the last 3 digits of the Readout serial number) by touching the appropriate numbers on the keypad. Touch the **ACCEPT** button to accept the password. Figure 6-22 Advanced Chamber Setup Screen will appear.

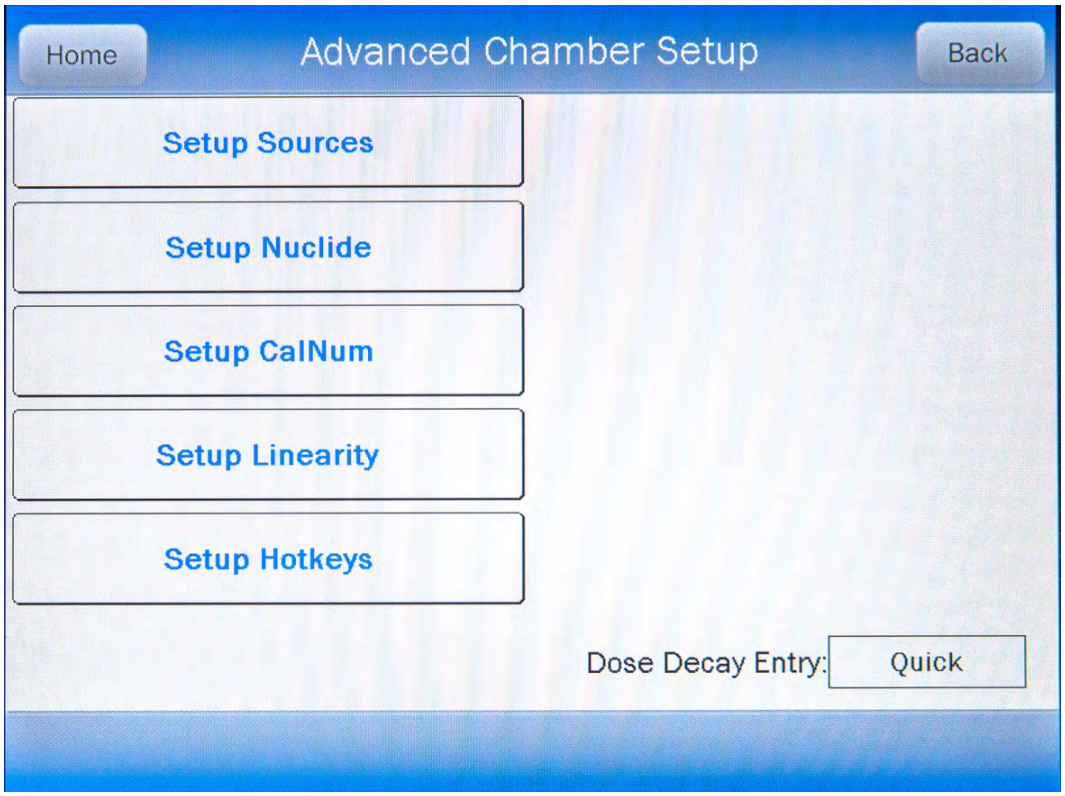

Figure 6-22 Advanced Chamber Setup Screen

Touch the **SETUP LINEARITY** button. Figure 6-23 Setup Linearity Screen will appear.

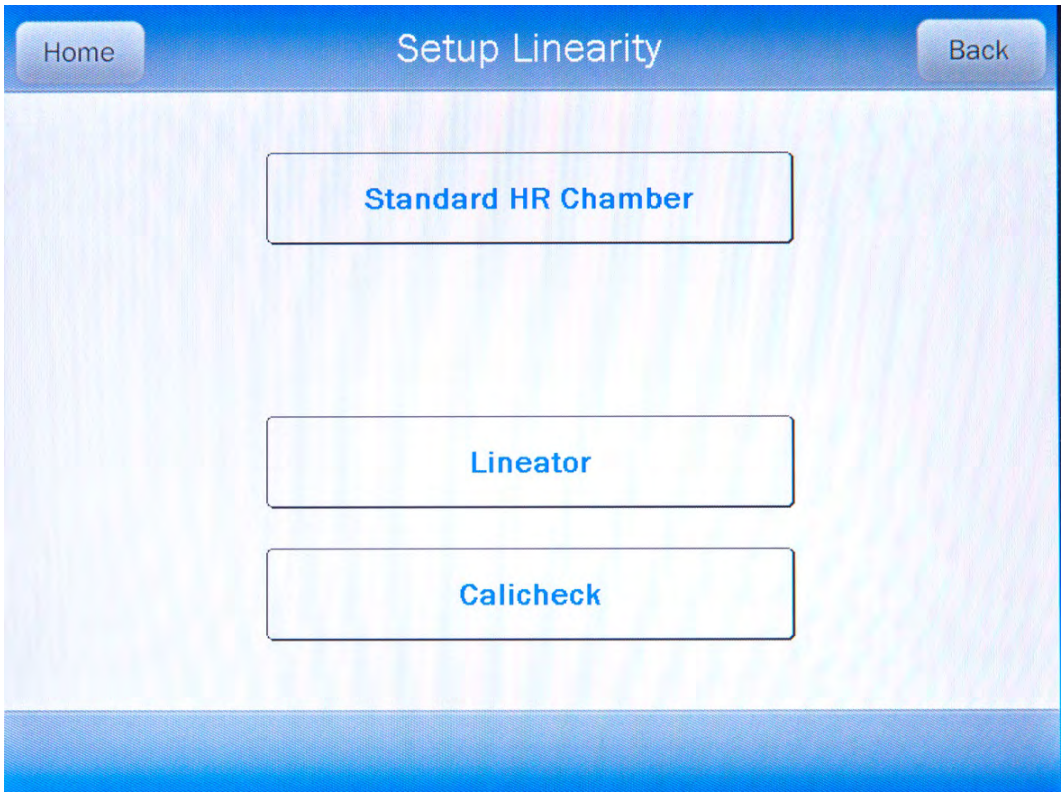

Figure 6-23 Setup Linearity Screen

Refer to the following sections for instructions for defining the desired Linearity Test.

Standard Linearity Test

Defining a Standard Linearity Test

For the Standard Test is normally performed by tracking the decay of a strong Tc99m source. However, any nuclide can be selected.

Note: *The selected nuclide must have a Calibration Number assigned to it. (Reference **CALIBRATION NUMBERS** on page 6-24) If the desired nuclide does not have a Calibration Number, it will not be displayed in the Select Nuclide list.*

The Standard Test measures the activity of the selected nuclide over a defined period of time. When the defined number of measurements have been made, a least-squares fit is performed and the deviation of the results from this fit are reported.

To set up a Standard Linearity Test, touch the **STANDARD HR CHAMBER** button Figure 6-24 Setup Linearity Standard Screen will appear.

Note: *The example shown is for using 6 measurements of Tc99m.*

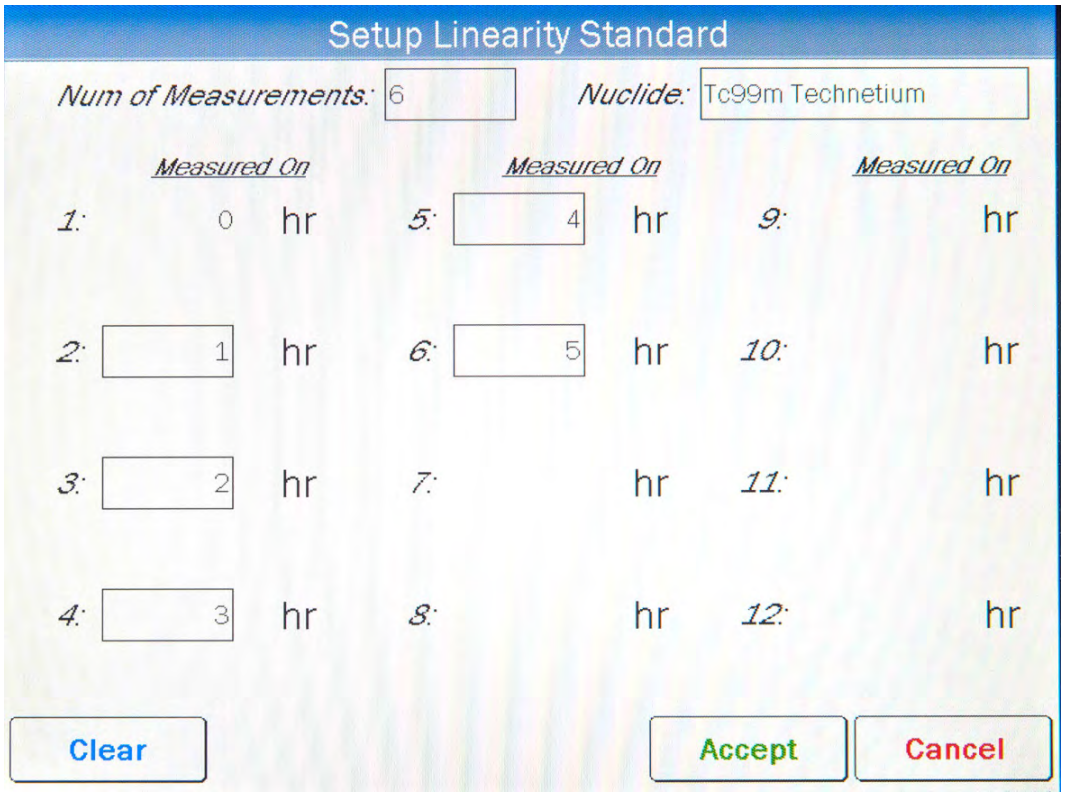

Figure 6-24 Setup Linearity Standard Screen

Select Nuclide

Tc99m is set as the default nuclide. To select a different nuclide, touch the ***Nuclide:*** field box. Figure 6-15 Select Nuclide Screen will appear.

The left half of the Select Nuclide screen contains the preset **NUCLIDE** Hotkeys. To use one these nuclides, touch the desired key. Figure 6-24 Setup Linearity Standard Screen will re-appear with the chosen nuclide displayed in the ***Nuclide:*** field box.

The right half of the screen displays a listing of nuclides stored in the calibrator's memory that have a Calibration Number assigned – 10 at a time. The nuclide list is in alphabetical order with user added nuclides at the top of the list. The number of pages shown in the upper right corner of the screen indicates the length of the list. To scroll through the list, touch the **DOWN ARROW** (▼) button. The next group of 10 nuclides will be displayed and the **UP ARROW** (▲) button will appear to allow scrolling up in the list.

To select a nuclide in the list, touch the desired nuclide and the entire line for the selected nuclide will become highlighted and an **ACCEPT** button will appear. Touch the **ACCEPT** button to select the highlighted nuclide. Figure 6-24 Setup Linearity Standard Screen will re-appear with the chosen nuclide displayed in the ***Nuclide:*** field box.

To abort selecting a nuclide and return to Figure 6-24 Setup Linearity Standard Screen, touch the **CANCEL** button.

Number of Measurements

The Standard Test can be performed with a minimum of 5 to a maximum of 12 measurements.

Touch the ***Num of Measurements:*** field box. A numeric keypad will appear allowing for the entry of the total number of measurements to be performed.

Input the number of measurements using the keypad and touch the **ACCEPT** button. Figure 6-24 Setup Linearity Standard Screen will re-appear with an empty field box beside the second measurement through the total number of measurements input.

Time Interval

For each measurement (starting with the measurement 2), the nominal time (in hours) with respect to the first measurement that the measurement will be performed is input. The minimum time (in hours) is 1 and the maximum time (in hours) is 999. The example shown in Figure 6-24 Setup Linearity Standard Screen represents 6 measurements.

The first measurement is 0 hours and is the base time of when the first measurement is made. Measurements 2 through 6 are the times from the first measurement that the next measurement is scheduled.

Once all 6 measurement times are input, touch the **ACCEPT** button. The Standard Test definition will be saved. Figure 6-23 Setup Linearity Screen will re-appear. If the set times are not in ascending order, the message "**Setup Linearity Error** Please enter hours in ascending order" will appear. Touch the **OK** button to correct the error.

To abort setting up the Standard Test, touch the **CANCEL** button. Figure 6-23 Setup Linearity Screen will re-appear.

To exit the Setup Linearity screen, press the **BACK** button on the top of the screen and return to Figure 6-22 Advanced Chamber Setup Screen or touch the **HOME** button to return to Figure 6-1 Measurement Screen.

Deleting a Standard Linearity Test Definition

The Standard Linearity Test definition may be deleted.

The definition is removed by touching the **CLEAR** button on Figure 6-24 Setup Linearity Standard Screen.

Next, touch the **ACCEPT** button. Figure 6-24 Setup Linearity Standard Screen will re-appear and the definition is now erased from the system.

Lineator Test

Defining a Lineator Test

The Lineator Test requires 8 measurements using a strong Tc99m source along with a Lineator Test tube set. A Lineator Calibration procedure must be performed before any Lineator tests.

The purpose of this test is to perform linearity quickly and not have to wait the time required to perform the Standard Linearity test. This is accomplished by measuring the attenuation of the tubes surrounding the source and storing the results. At any later time, the tubes are used to confirm that the attenuation has not changed.

To set up for a Lineator linearity test, from Figure 6-23 Setup Linearity Screen, touch the **LINEATOR** button. Figure 6-25 Setup Linearity Lineator Screen will appear.

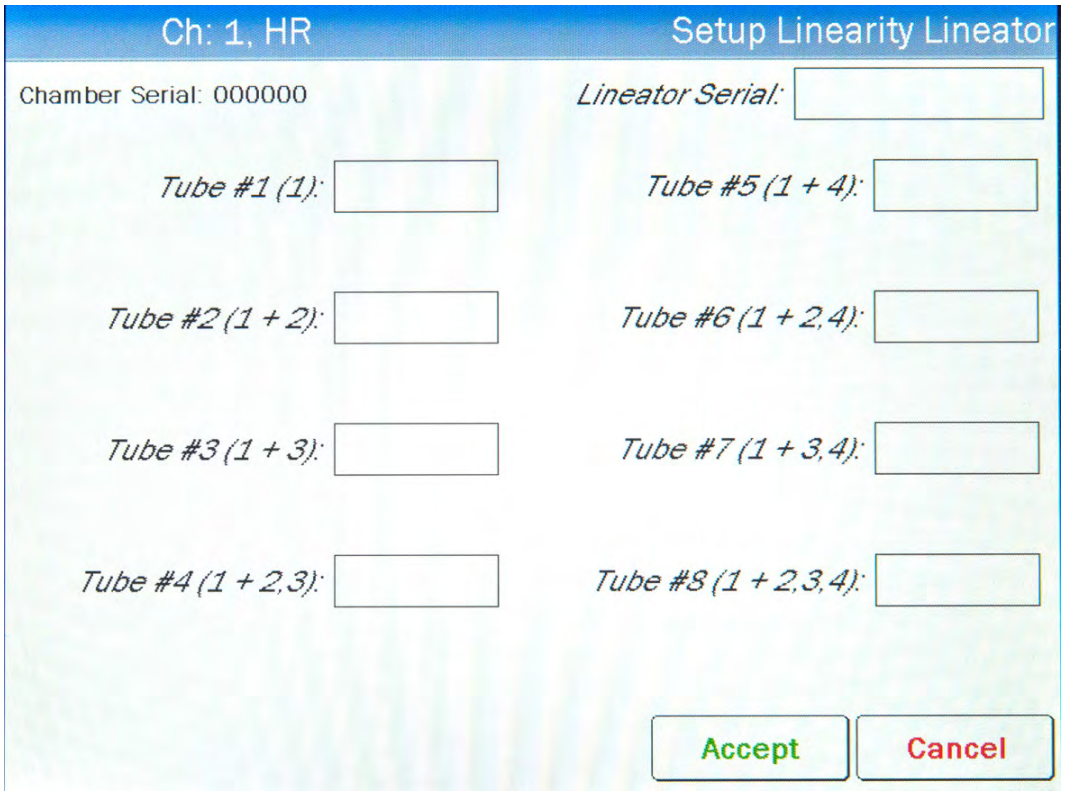

Figure 6-25 Setup Linearity Lineator Screen

Lineator Serial Number

The Lineator Serial Number must be input. To input the serial number, touch the ***Lineator Serial:*** field box. The alphanumeric keyboard will appear. Input the serial number and touch the **ACCEPT** button. Figure 6-25 Setup Linearity Lineator Screen

will re-appear with ***Lineator Serial:*** field box populated with the entered serial number. The serial number can contain up to 10 characters

To cancel any changes and return to Figure 6-25 Setup Linearity Lineator Screen, touch the **CANCEL** button.

Calibration Procedure

The Tubes must be inserted in the order indicated, i.e. Tube #1 first, then Tube #2, etc…

Remove the Dipper from the Chamber (leaving the Liner in place) and place the Tc99m test source into Tube 1 and then place Tube 1 into the Chamber. Touch the ***Tube #1 (1):*** field box to perform a measurement. A measurement window will appear as shown in Figure 6-26 Lineator Test Measurement Screen.

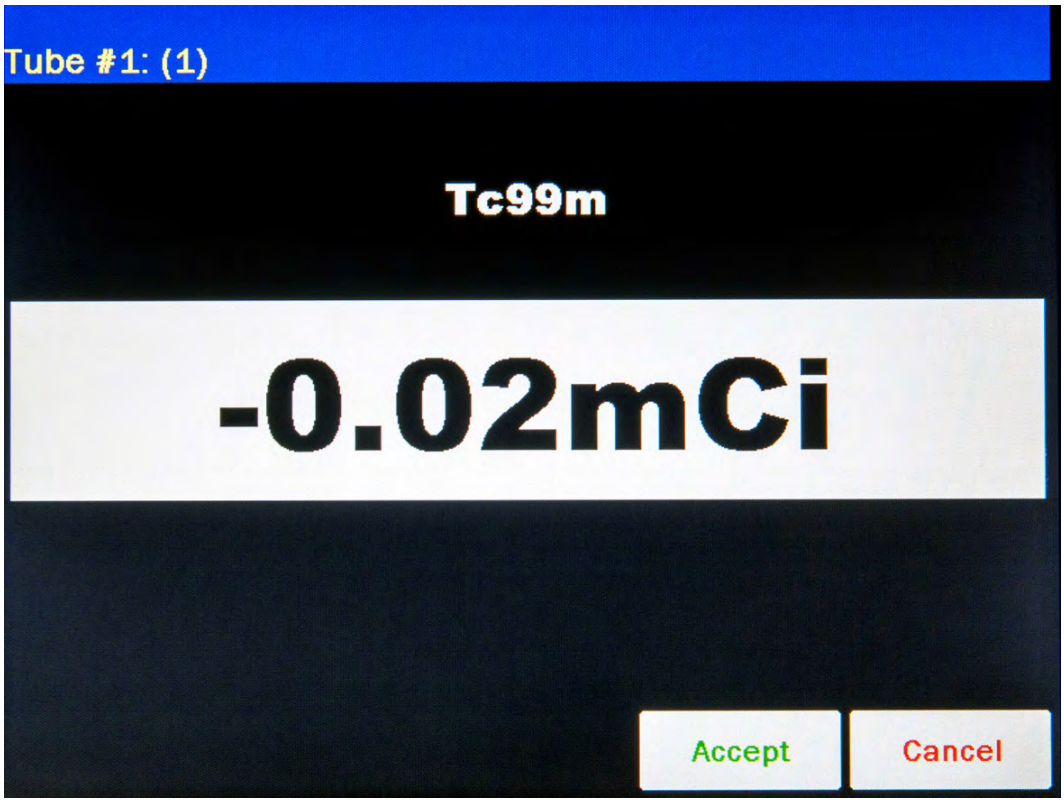

Figure 6-26 Lineator Test Measurement Screen

To abort the measurement, touch the **CANCEL** button. Figure 6-25 Setup Linearity Lineator Screen will re-appear without saving the measurement.

To save the measurement, touch the **ACCEPT** button. Figure 6-25 Setup Linearity Lineator Screen will re-appear with the ***Tube #: (1):*** field box populated with the accepted measurement.

Repeat the above steps for the remaining combination of tubes as indicated by touching the appropriate measurement field box.

Once all 8 tubes are measured, Figure 6-27 Setup Linearity Lineator Results Screen will appear.

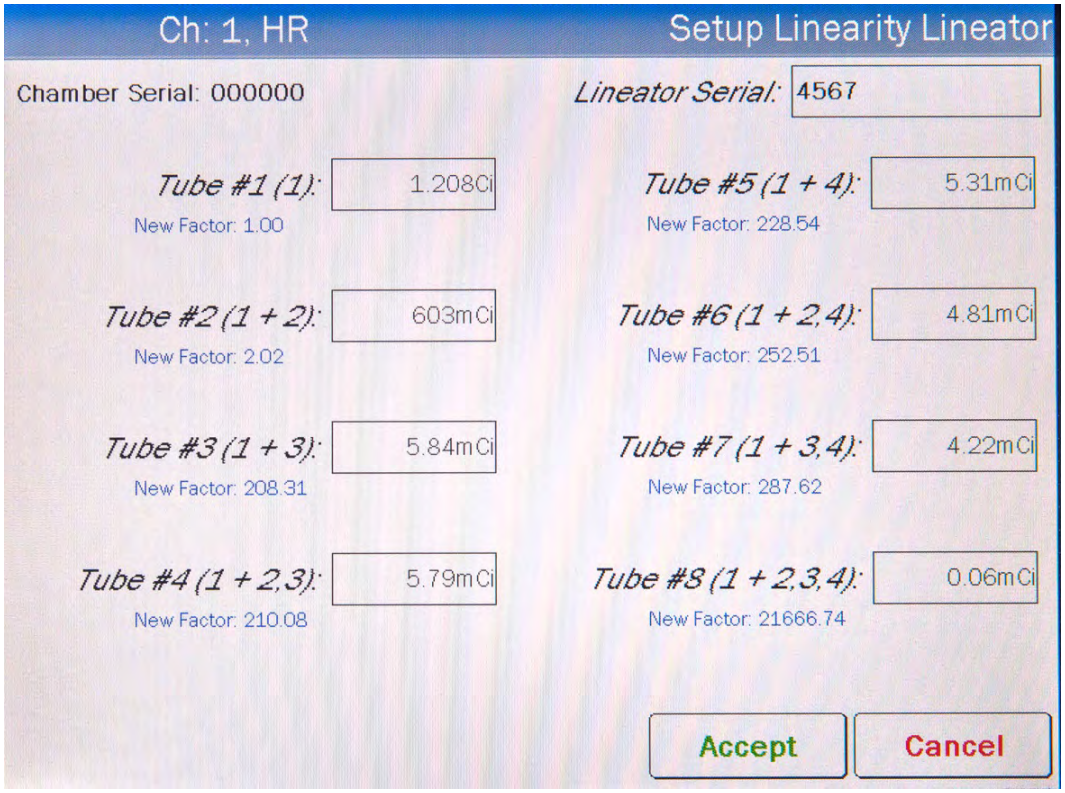

Figure 6-27 Setup Linearity Lineator Results Screen

If a printer is attached to the system, a **PRINT** button will appear on the screen. Touch the **PRINT** button to print the Lineator Calibration results.

To save the Lineator Calibration results, touch the **ACCEPT** button. Figure 6-23 Setup Linearity Screen will re-appear. The results will be stored and used as the reference when performing the Lineator test.

Note: *If all measurements have not been performed when the **ACCEPT** button is touched, the message "**Setup Lineator Error** Please fill in all measurements" will appear. Touch the **OK** button to return to Figure 6-25 Setup Linearity Lineator Screen and continue the calibration procedure.*

To exit the Lineator Calibration without saving the results, touch the **CANCEL** button. Figure 6-23 Setup Linearity Screen will re-appear without saving the results.

Deleting a Lineator Definition

The Lineator Test definition may be deleted.

From Figure 6-23 Setup Linearity Screen, touch the **LINEATOR** button. Figure 6-28 Setup Linearity Lineator View Results Screen will appear showing the current factor under each Tube #. There will also be a **DELETE CURRENT SETTINGS** button in the lower left of the screen.

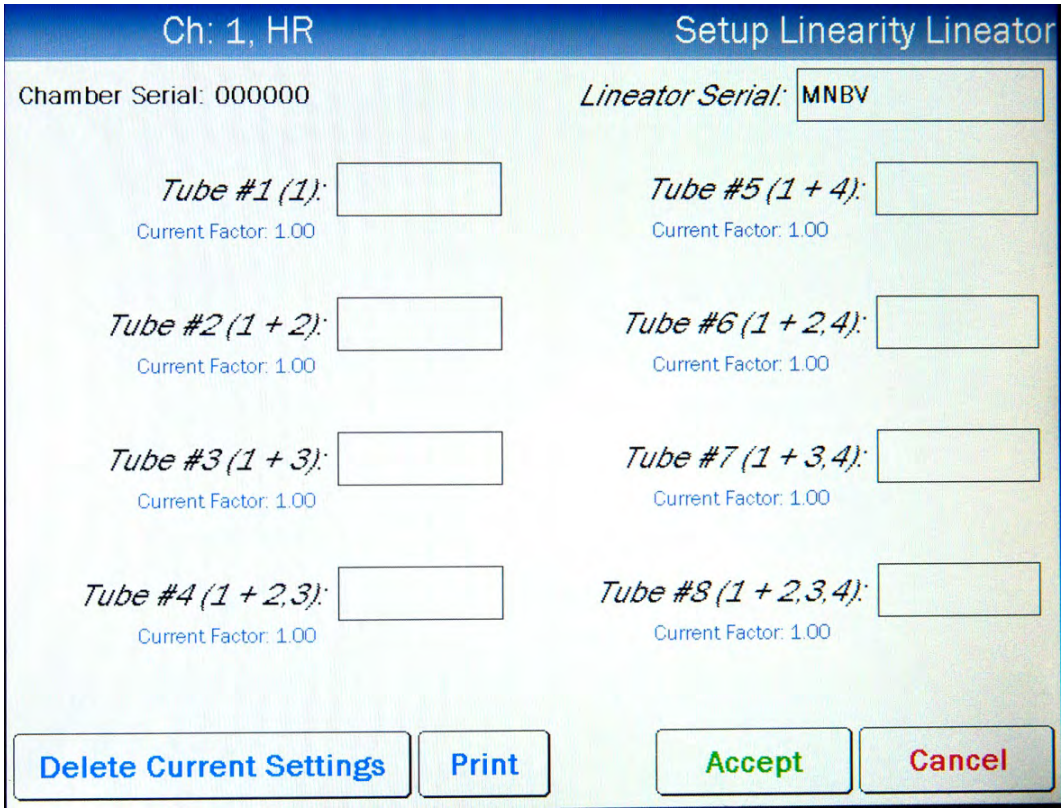

Figure 6-28 Setup Linearity Lineator View Results Screen

The definition is removed by touching the **DELETE CURRENT SETTINGS** button. Figure 6-29 Delete Lineator Settings Screen will appear.

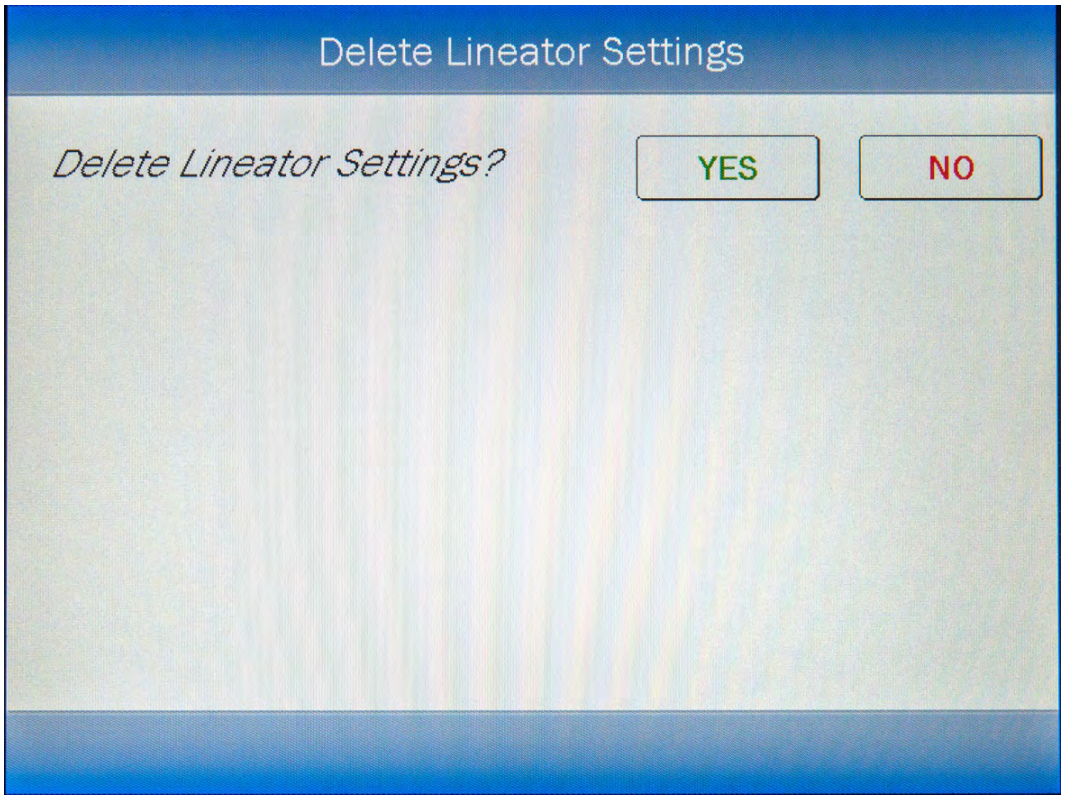

Figure 6-29 Delete Lineator Settings Screen

To abort deleting the Lineator Calibration, touch the **NO** button. Figure 6-28 Setup Linearity Lineator View Results Screen will re-appear.

To delete the Lineator Calibration, touch the **YES** button. Figure 6-25 Setup Linearity Lineator Screen will re-appear and the definition is now erased from the system.

Touch the **CANCEL** button. Figure 6-23 Setup Linearity Screen will re-appear.

Calicheck Test

Defining a Calicheck Test

The Calicheck test requires 5 to 12 measurements. A Calicheck calibration procedure must be performed before any Calicheck tests.

The purpose of this test is to perform linearity quickly and not have to wait the time required to perform the Standard Linearity test. This is accomplished by measuring the attenuation of the tubes surrounding the source and storing the results. At any later time, the tubes are used to confirm that the attenuation has not changed.

To set up for Calicheck linearity, from Figure 6-23 Setup Linearity Screen, touch the **CALICHECK** button. Figure 6-30 Setup Linearity Calicheck Screen will appear.

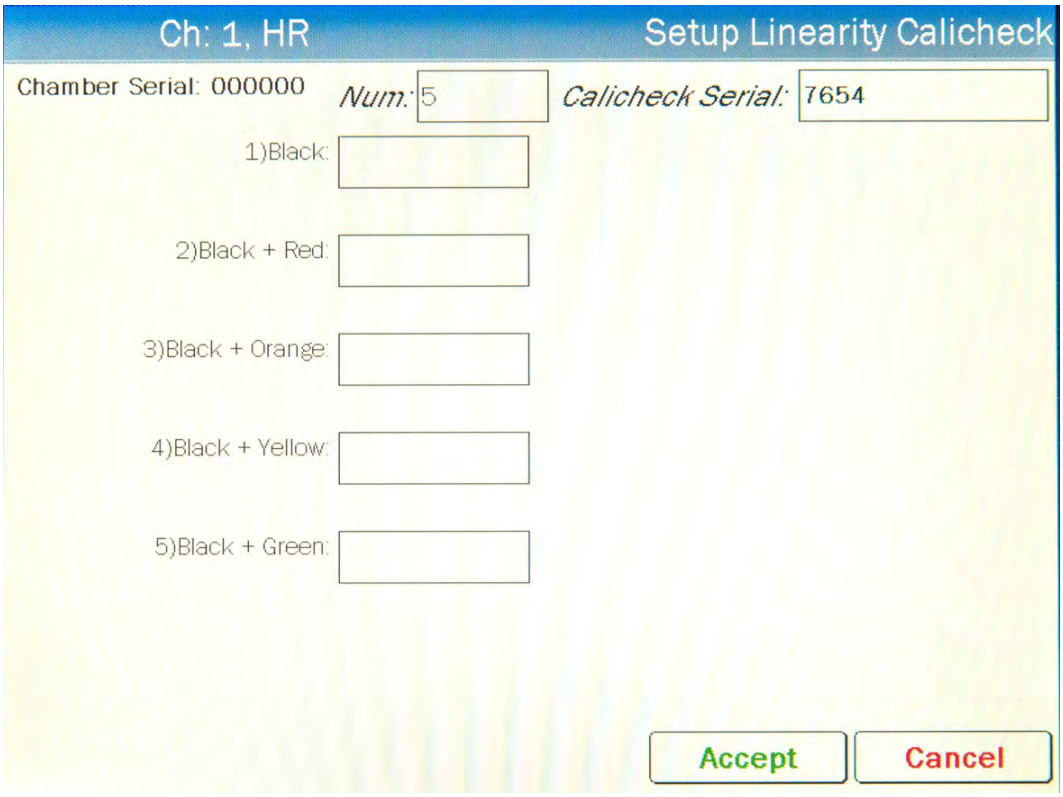

Figure 6-30 Setup Linearity Calicheck Screen

Calicheck Serial Number

The Calicheck Serial Number must be input. To input the serial number, touch the ***Calicheck Serial:*** field box. The alphanumeric keyboard will appear. Input the serial number and touch the **ACCEPT** button. Figure 6-30 Setup Linearity Calicheck Screen will re-appear with ***Calicheck Serial:*** field box populated with the entered serial number. The serial number can contain up to 10 characters

To cancel any changes and return to Figure 6-30 Setup Linearity Calicheck Screen, touch the **CANCEL** button.

Number of Measurements

The Calicheck Test can be performed with a minimum of 5 to a maximum of 12 measurements.

Touch the ***Num:*** field box. A numeric keypad will appear allowing for the entry of the total number of measurements to be performed.

Input the number of measurements using the keypad and touch the **ACCEPT** button. Figure 6-30 Setup Linearity Calicheck Screen will re-appear with an empty field box beside the number of measurements input.

Calibration Procedure

The Tubes must be inserted in the order indicated, i.e. 1) Black: first, then 2) Black + Red:, etc…

Place the Linearity Test Source in the calibrator with Black Tube. Touch the ***1) Black:*** field box to perform a measurement. A measurement window will appear as shown in Figure 6-31 Calicheck Test Measurement Screen.

Figure 6-31 Calicheck Test Measurement Screen

To abort the measurement, touch the **CANCEL** button. Figure 6-30 Setup Linearity Calicheck Screen will re-appear without saving the measurement.

To save the measurement, touch the **ACCEPT** button. Figure 6-30 Setup Linearity Calicheck Screen will re-appear with the selected measurement's field box populated with the accepted measurement.

Repeat the above steps for the remaining combination of tubes as indicated by touching the appropriate measurement field box.

Once all tubes are measured, Figure 6-32 Setup Linearity Calicheck Results Screen will appear.

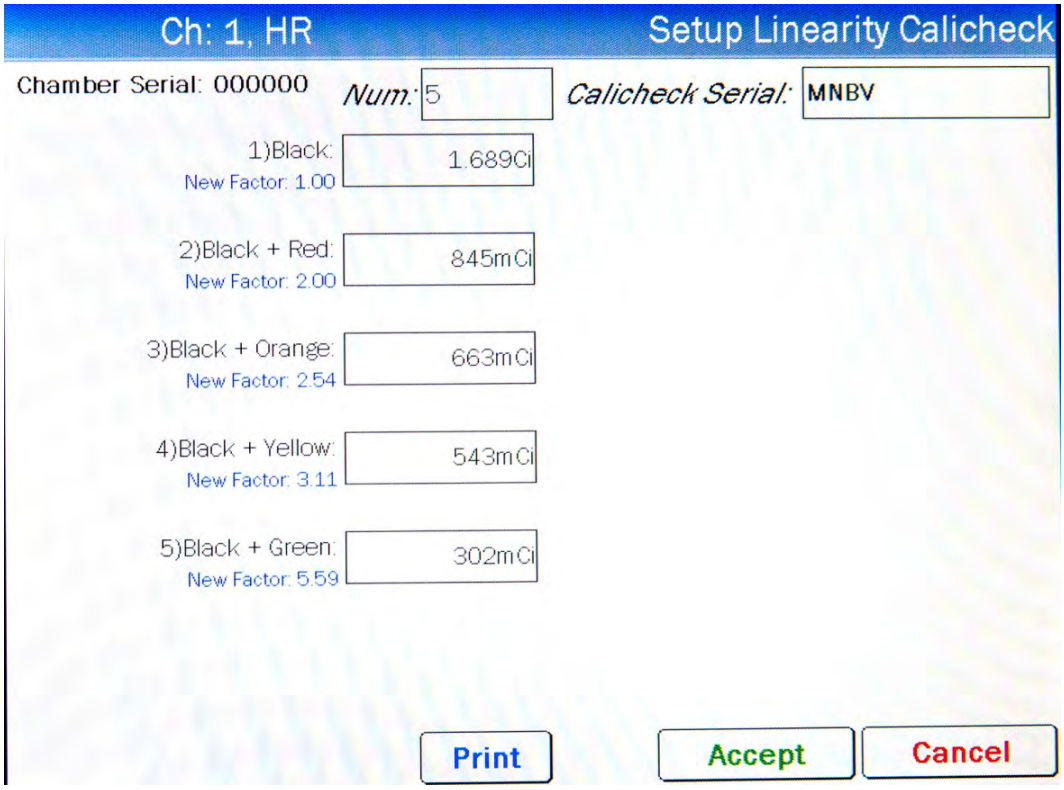

Figure 6-32 Setup Linearity Calicheck Results Screen

If a printer is attached to the system, a **PRINT** button will appear on the screen. Touch the **PRINT** button to print the Calicheck Calibration results.

To save the Calicheck Calibration results, touch the **ACCEPT** button. Figure 6-23 Setup Linearity Screen will re-appear. The results will be stored and used as the reference when performing the Calicheck test.

Note: *If all measurements have not been performed when the **ACCEPT** button is touched, the message "**Setup Calicheck Error** Please fill in all measurements" will appear. Touch the **OK** button to return to Figure 6-30 Setup Linearity Calicheck Screen and continue the calibration procedure.*

*Also, if the Calicheck Serial has not been entered when the **ACCEPT** button is touched, the message "**Setup Calicheck Error** Please fill in Calicheck Serial Number" will appear. Touch the **OK** button to return to Figure 6-30 Setup Linearity Calicheck Screen and input the Calicheck Serial number.*

To exit the Calicheck Calibration without saving the results, touch the **CANCEL** button. Figure 6-23 Setup Linearity Screen will re-appear without saving the results.

Deleting a Calicheck Definition

The Calicheck Test definition may be deleted.

From Figure 6-23 Setup Linearity Screen, touch the **CALICHECK** button. Figure 6-33 Setup Linearity Calicheck View Results Screen will appear showing the current factor under each Tube #. There will also be a **DELETE CURRENT SETTINGS** button in the lower left of the screen.

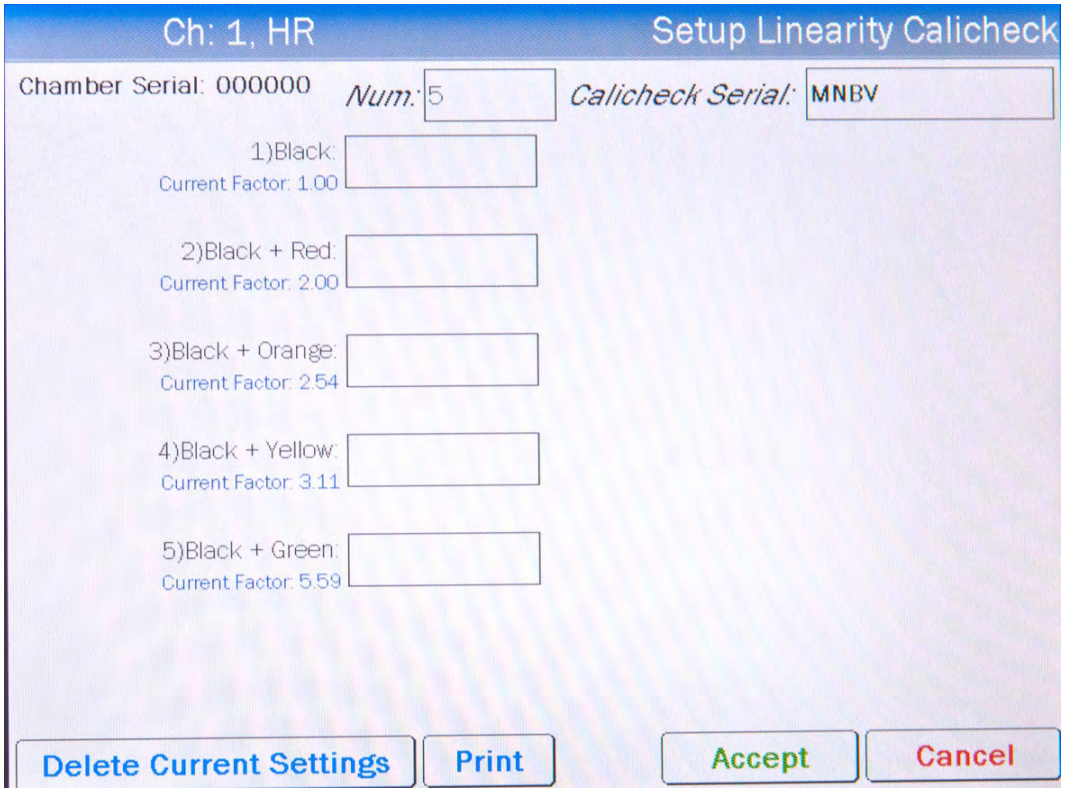

Figure 6-33 Setup Linearity Calicheck View Results Screen

The definition is removed by touching the **DELETE CURRENT SETTINGS** button. Figure 6-34 Delete Calicheck Settings Screen will appear.

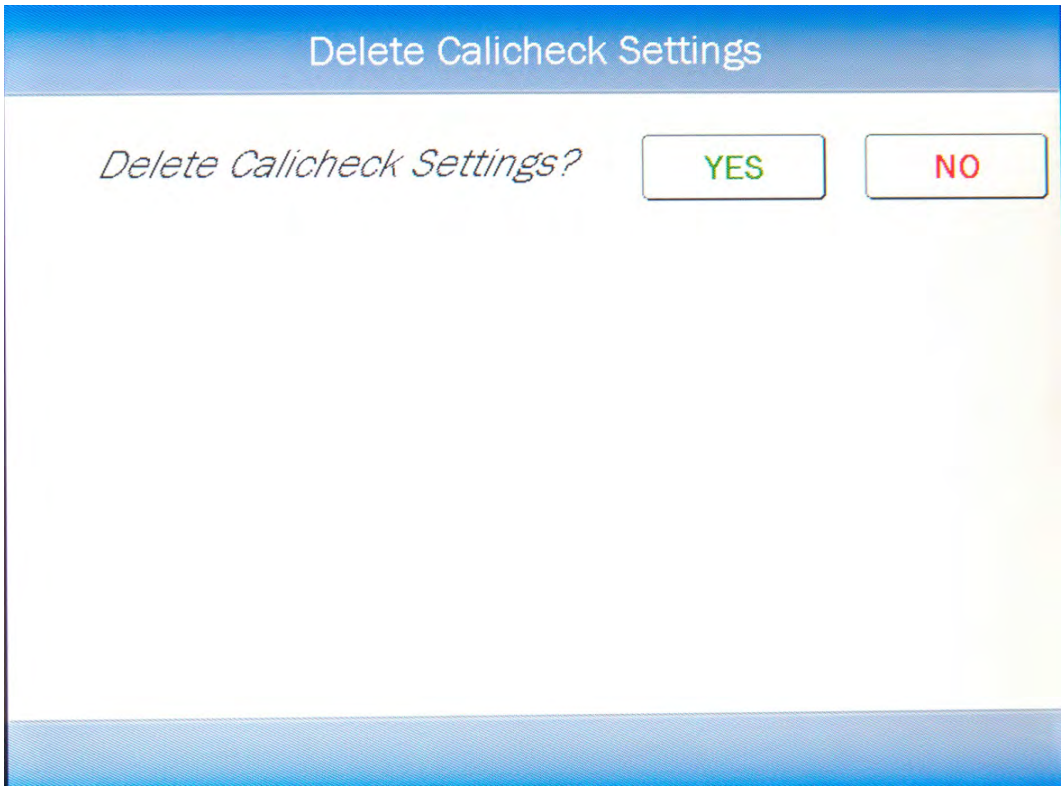

Figure 6-34 Delete Calicheck Settings Screen

To abort deleting the Calicheck Calibration, touch the **NO** button. Figure 6-33 Setup Linearity Calicheck View Results Screen will re-appear.

To delete the Calicheck Calibration, touch the **YES** button. Figure 6-30 Setup Linearity Calicheck Screen will re-appear and the definition is now erased from the system.

Touch the **CANCEL** button. Figure 6-23 Setup Linearity Screen will re-appear.

CHAPTER 7

ACCEPTANCE & QUALITY ASSURANCE TESTS

GENERAL

To insure proper operation of the CRC®-77tHR, the following tests should be performed at the indicated intervals.

ACCEPTANCE TESTS

The following tests must be performed in the following order before the initial use of the CRC®-77tHR:

- Diagnostics – reference CHAPTER 9: DIAGNOSTICS.
- Chamber Daily Test – reference CHAPTER 8: TESTS.
- Accuracy (for those nuclides that are not used in the Daily Test) – reference CHAPTER 8: TESTS.
- Linearity – The linearity should be checked over the entire range of activities which are reasonably anticipated to be used.
- Geometry – A geometry test should be performed to determine the effect of volume changes or container variation for isotopes of interest.

Diagnostic Test

When Diagnostics is selected, the instrument's memories and the programs are checked and the results are displayed. If a printer is attached to the system, the results will also be printed. If any of the tests fail, contact Capintec's only Authorized Service Center at 1-800-227-6832. (Reference CHAPTER 9: DIAGNOSTICS)

Daily Test

The Daily Test should be conducted at the beginning of each working day, prior to measuring any samples which will be administered to patients. These tests consist of an Auto Zero operation, a Background adjustment, a Chamber Voltage test, a Data Check, an Accuracy Test, and a Constancy Test. (reference CHAPTER 8: TESTS)

When the test is complete, if a printer is attached to the system, a report can be printed. The results of the Daily Test (Auto Zero, Background, Chamber Voltage and Accuracy/Constancy tests) are automatically saved to the database.

Accuracy Test

If your Accuracy Test setup includes nuclides that are not used in the Daily Tests, the Accuracy Test should be performed with those nuclides. It will not be necessary to repeat the test for those nuclides that were included in the Daily Test. (reference CHAPTER 8: TESTS)

If a printer is attached to the system, the test results can be printed at the end of all source measurements.

The results of the Accuracy test are automatically saved to the database.

Linearity Test

The linearity of the CRC®-77tHR should be checked over the entire range of activities which are reasonably anticipated to be used. The initial linearity should be performed using decay method of measuring a short lived isotope over time. Thereafter, use of calibrated sleeves is acceptable.

DAILY QUALITY ASSURANCE TESTS

Daily Tests

The Daily Test should be conducted at the beginning of each working day, prior to measuring any samples, which will be administered to patients. These tests consist of an Auto Zero operation, a Background adjustment, a Chamber Voltage test, a Data Check, an Accuracy Test, and a Constancy Test. (reference CHAPTER 8: TESTS)

Accuracy Test

If your Accuracy Test includes nuclides that are not used in the Daily Tests, the Accuracy Test should be performed with those nuclides as a part of the Daily Test.

This test is the same as the Accuracy Test described in CHAPTER 8: TESTS, SECTION: ACCURACY and CONSTANCY TEST IN DAILY TEST. This test is performed independently from the other portions of the Daily Test sequence.

The Accuracy Tests cannot be conducted until the Test Source data has been entered (reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: TEST SOURCE SETUP).

If a printer is attached to the system, the test results will automatically be printed at the end of all source measurements.

Note: *Accuracy test requires a dedicated check source of known activity which is measured on a daily basis. This test provides both an accuracy value as well as a long term reproducibility check of the instrument.*

Note: *There is no need to perform a Constancy test on alternate calibration (nuclide) settings. This provides no value in terms of instrument operation. However, due to numerous procedures which reference this test, operators who prefer to include this test should refer to CHAPTER 8: TESTS.*

Contamination Test

This tests the Dipper(s) and/or Liner(s) for contamination and is normally performed at the end of each workday. At the very least, it should be performed once per week. To perform a contamination test:

1. Make sure that the Dipper is in the Chamber and there is no source in the Dipper.
2. From the Chamber Measurement screen, select Co57 as the nuclide. This is done by touching the **NUCLIDE** button located below the measurement and selecting Co57 from the Nuclide List.
3. Record the displayed activity.
4. Remove the Dipper from the Chamber and record the displayed activity.
5. Subtract the activity in step 4 from the activity in step 3. This is the amount of contamination of the Dipper.
6. Remove the Liner from the Chamber and record the displayed activity.
7. Subtract the activity in step 6 from the activity in step 4. This is the amount of contamination of the Liner.
8. Should either the Dipper or the Liner exhibit contamination greater than 1 mCi or 37 MBq, they should be decontaminated or replaced.
9. Return the Liner to the Chamber.

⚠ **CAUTION:** Never use the calibrator without the Chamber liner in place. Liners are inexpensive and easy to replace. A contaminated Chamber is a very costly mistake.

QUARTERLY TESTS

Diagnostic Test

The Diagnostics Test should be performed as a part of the Quarterly Tests. When *DIAGNOSTICS* is selected, the instrument's memories and the programs are checked and the results are displayed. If a printer is attached to the system, the results can be printed. If any of the tests fail, contact Capintec's only Authorized Service Center at 1-800-227-6832. (Reference CHAPTER 9: DIAGNOSTICS)

YEARLY TESTS

Linearity Test

The linearity of the CRC®-77tHR should be checked over the entire range of activities which are reasonably anticipated to be used. The initial linearity should be performed using decay method of measuring a short lived isotope over time. Thereafter, use of calibrated sleeves is acceptable.

This can be done by any of several methods. The three most common methods are described in CHAPTER 6: CHAMBER INITIALIZATION, SECTION: LINEARITY TEST DEFINITION and CHAPTER 11: ENHANCED TESTS, SECTION: PERFORMING LINEARITY TEST.

CHAPTER 8

TESTS

GENERAL

This section describes the tests of the Chamber.

The results of the Daily Test (Auto Zero, Background, Chamber Voltage and Accuracy/Constancy tests) and each test performed individually are automatically saved to the database.

The Enhanced Tests are described in CHAPTER 11: ENHANCED TESTS.

BACKGROUND

Background measurements are performed by touching the **BACKGROUND** button from Figure 8-1 Measurement Screen (Background measurement is also part of the Daily Test – reference the Background section on page 8-7). Figure 8-2 Background Remove Sources Screen will appear.

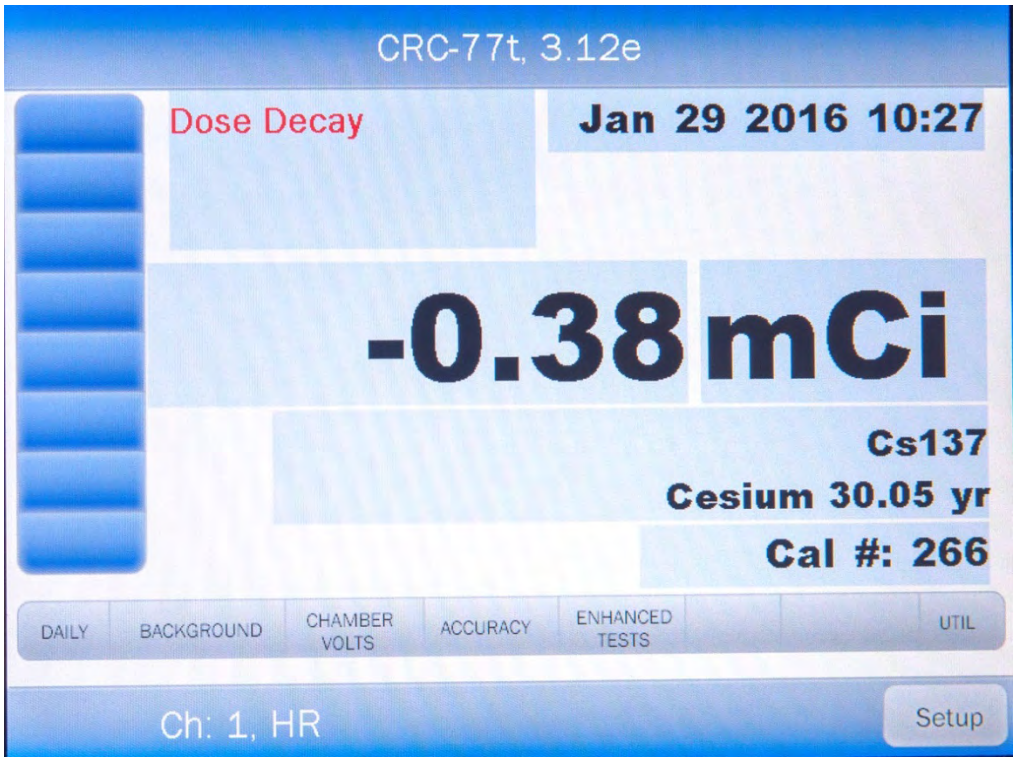

Figure 8-1 Measurement Screen

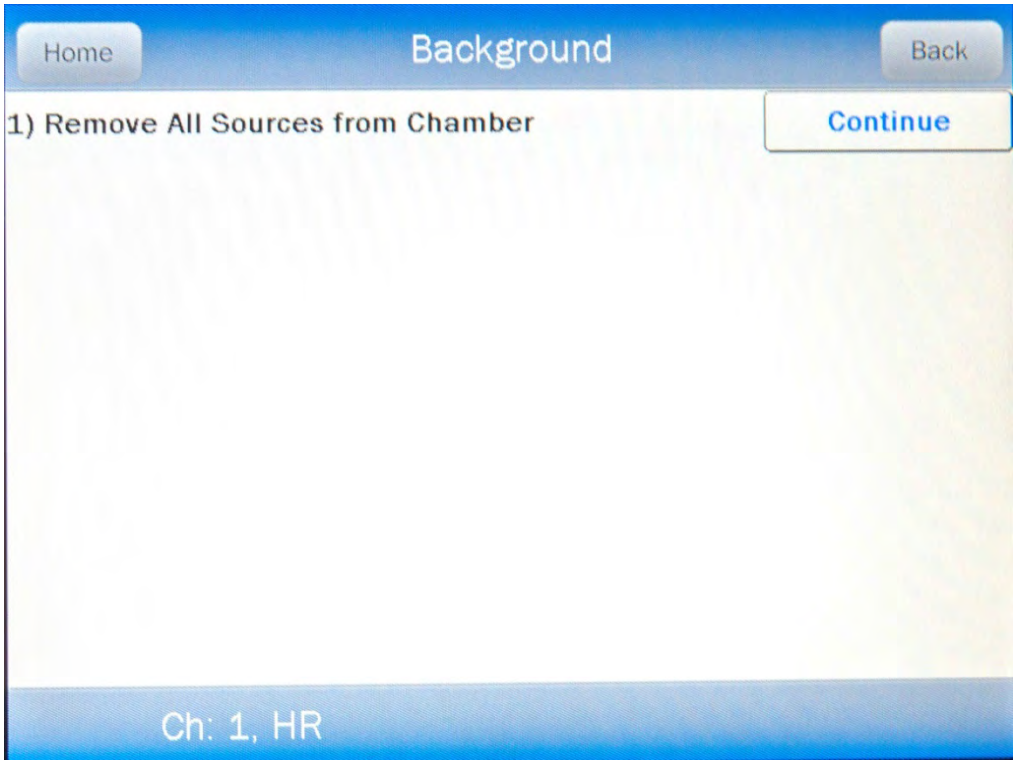

Figure 8-2 Background Remove Sources Screen

Remove all sources from the vicinity of the Chamber and touch the **CONTINUE** button. A progress bar will appear until a measurement is available.

When the measurement is available, Figure 8-3 Background Measurement Screen will appear.

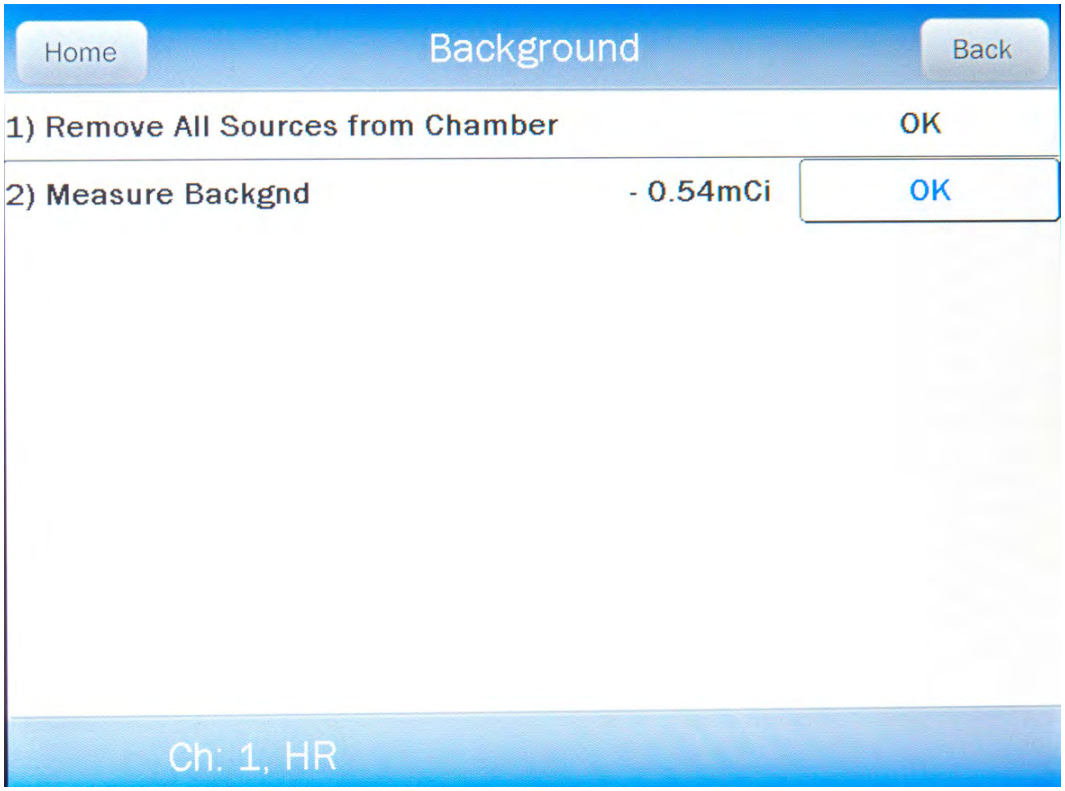

Figure 8-3 Background Measurement Screen

If the background is high but still acceptable (> 16.9µCi [0.625MBq] to < 500µCi [18.5MBq]), the message “HIGH” will appear next to the measurement. Although the value is acceptable, the reason for the high value should be investigated. If any sources are found nearby, repeat the measurement.

If the background is above the acceptable range (> 500µCi [18.5MBq]), the measurement will not be shown but Figure 8-4 Background Too High Screen will appear.

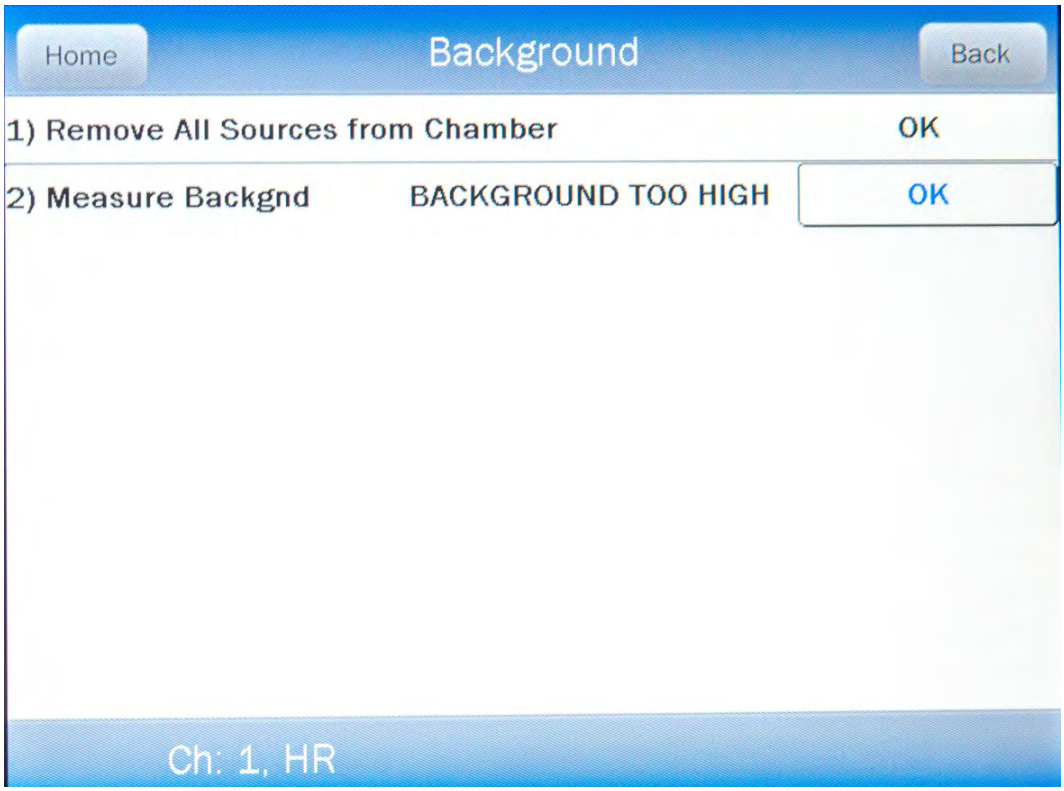

Figure 8-4 Background Too High Screen

This “TOO HIGH” background cannot be accepted by the CRC®-77tHR. Touch the **OK** button to acknowledge the message. If the cause of the high reading (nearby source, contaminated well etc.) cannot be found, contact Capintec’s only Authorized Service Center at 1-800-227-6832.

Touch the **OK** button to accept the result. Figure 8-5 Background Results Screen will appear.

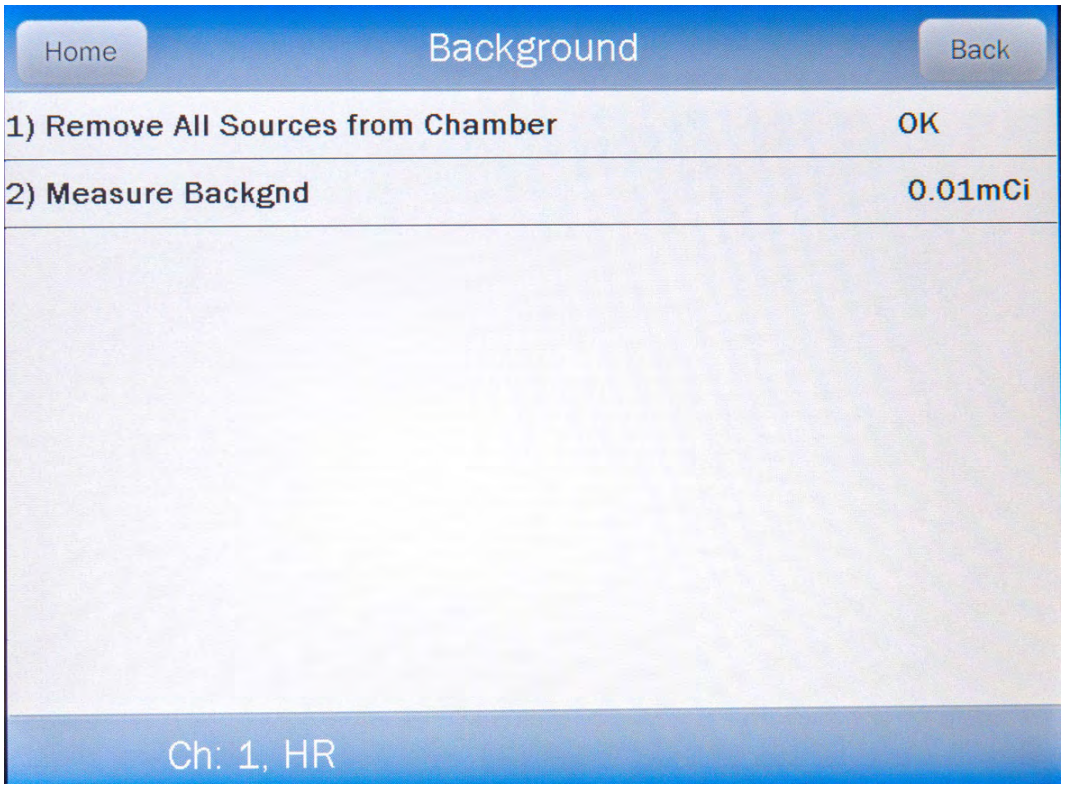

Figure 8-5 Background Results Screen

Touch the **HOME** or **BACK** button to accept the result and return to Figure 8-1 Measurement Screen.

DAILY TEST

The Daily Test consists of:

- Auto Zero
- Background
- Chamber Voltage
- Data Check
- Accuracy Test
- Constancy Test

To perform the Daily Test, touch the **DAILY** button from Figure 8-1 Measurement Screen. Figure 8-6 Daily Test Screen will appear.

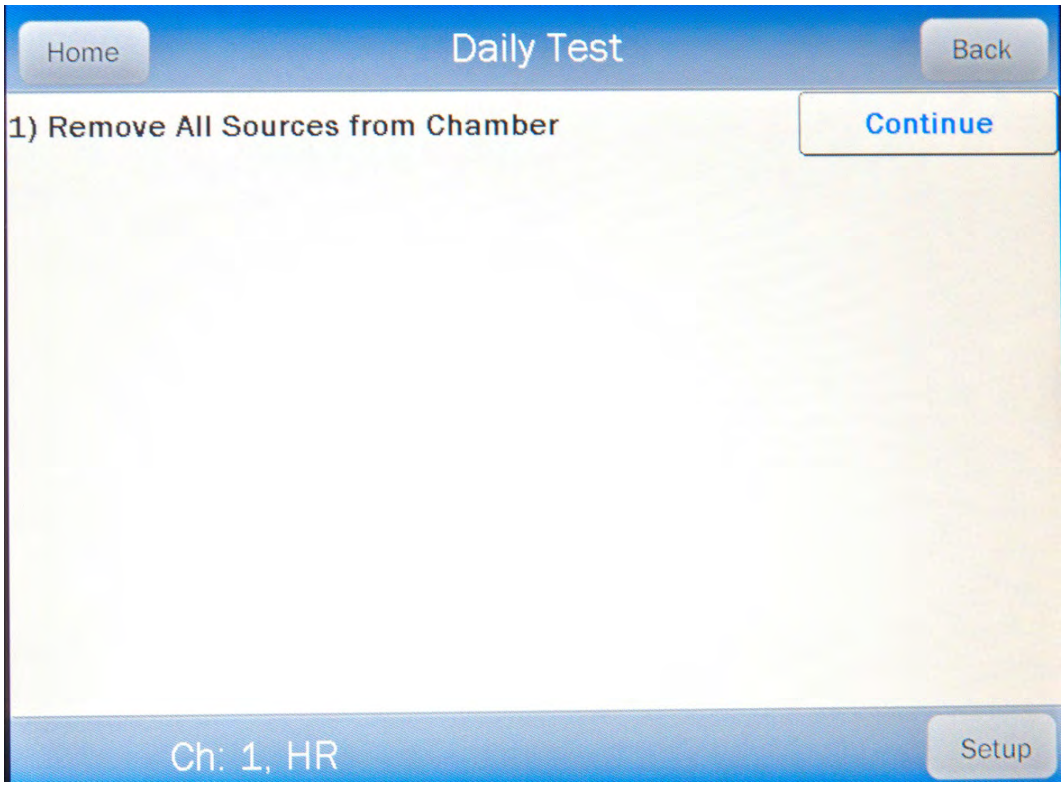

Figure 8-6 Daily Test Screen

Auto Zero

The first part of the Daily Test is the Auto Zero.

Remove all sources from the vicinity of the Chamber and touch the **CONTINUE** button. A progress bar will appear until a measurement is available.

When the measurement is available, Figure 8-7 Auto Zero Measurement Results Screen will appear.

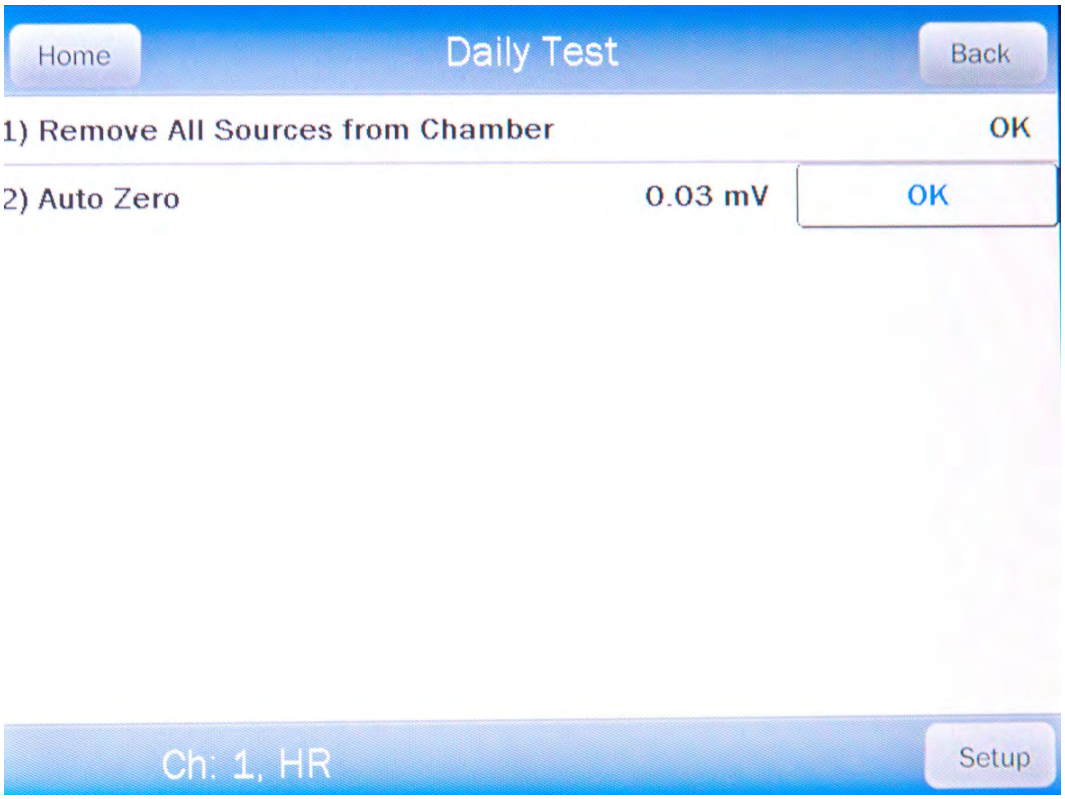

Figure 8-7 Auto Zero Measurement Results Screen

If the measured value has drifted more than ±0.30mV since the last measurement, the message “ZERO DRIFT” will be displayed. Check to make sure that no sources are in the area. If any sources are found, remove them and verify the measurement.

If the measured value is out of range (>±10mV), the message “ZERO OUT OF RANGE” will be displayed. Check to make sure that no sources are in the area. If any sources are found, remove them and verify the measurement. If no sources were found, contact Capintec’s only Authorized Service Center in Pittsburgh at 1-800-227-6832.

Background

The second part of the Daily Test is Background measurement.

Touch the **OK** button to accept the Auto Zero result and continue the Daily Test. A progress bar will appear until a measurement is available.

When the measurement is available, Figure 8-8 Background Measurement Results Screen will appear.

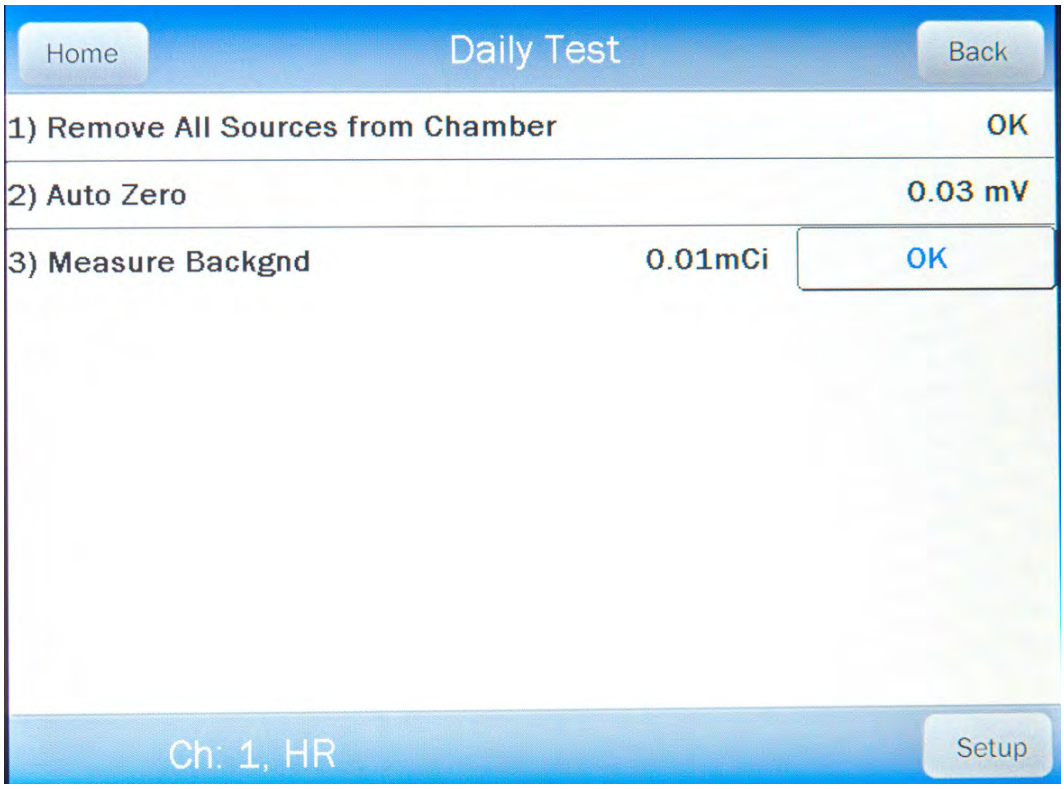

Figure 8-8 Background Measurement Results Screen

If the background is high but still acceptable (> 16.9µCi [0.625MBq] to < 500µCi [18.5MBq]), the message “HIGH” will appear next to the measurement. Although the value is acceptable, the reason for the high value should be investigated. If any sources are found nearby, repeat the measurement.

If the background is above the acceptable range (> 500µCi [18.5MBq]), the measurement will not be shown but Figure 8-4 Background Too High Screen will appear.

This “TOO HIGH” background cannot be accepted by the CRC®-77tHR. Touch the **OK** button to acknowledge the message. If the cause of the high reading (nearby source, contaminated well etc.) cannot be found, contact Capintec’s only Authorized Service Center at 1-800-227-6832.

Chamber Voltage

The third part of the Daily Test is the Chamber Voltage test.

Touch the **OK** button to accept the Background result and continue the Daily Test. A progress bar will appear until the measurement is available.

When the measurement is complete, Figure 8-9 Daily Test Results Screen will appear.

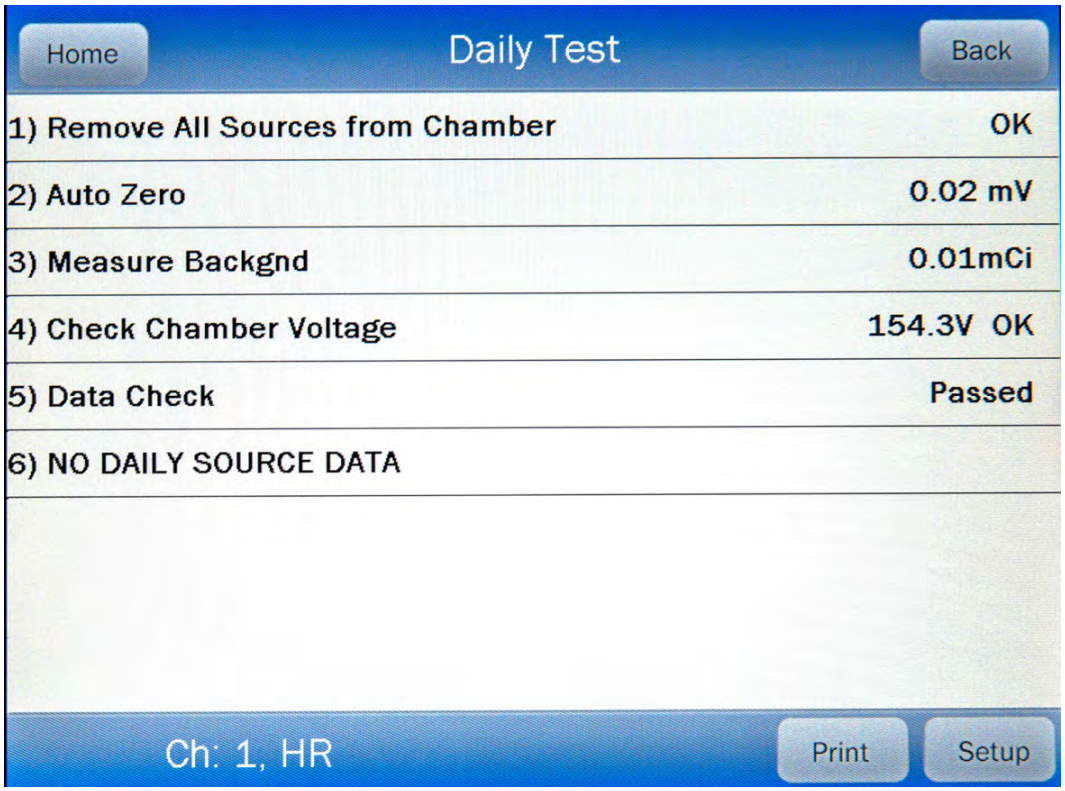

Figure 8-9 Daily Test Results Screen

The Chamber Voltage measurement is compared with the value input at the factory. If the results are out of range, the message “FAIL” appears. If this occurs, contact Capintec’s only Authorized Service Center at 1-800-227-6832.

Data Check

The next part of the Daily Test is a check of the built-in nuclide data. The results of the Data Check are indicated in Figure 8-9 Daily Test Results Screen.

If this test fails, turn the power off and then back on. This will reload the program and data into memory. Repeat the Daily Test. If the Data Check test continues to fail, contact Capintec’s only Authorized Service Center at 1-800-227-6832.

Accuracy and Constancy Test in Daily Test

The next part of the Daily Test is the Accuracy Test.

The Accuracy Test shows that the CRC-77tHR is providing correct readings over the entire energy scale. The Test Sources that were entered in Setup and chosen as a Daily Test Source (reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: TEST SOURCE SETUP), are measured. The measured activity is then compared to the calibrated activity corrected for decay.

If no sources were designated as Daily Test sources, then the message “NO DAILY SOURCE DATA” will appear and the Daily Test will be completed. The Accuracy and Constancy tests are not performed.

At this point, the following options are available:

- If a Daily Test Source(s) has been setup, the Accuracy Test can be performed by touching the **ACCURACY** button. Refer to the ACCURACY TEST section on page 8-12 for detailed information.
- If it desired to input or change Test Source information, touch the **SETUP** button to enter the Setup utility. (***Note:*** *When the* ***BACK*** *button is pressed from the Setup screen, the Daily Test must be repeated*),
- If a printer is attached to the system, the Daily Test results can be printed by touching the **PRINT** button, or
- Touch the **HOME** button to exit the Daily Test and return to Figure 8-1 Measurement Screen.

CHAMBER VOLTS

To perform the Chamber Voltage Test, touch the **CHAMBER VOLTS** button from Figure 8-1 Measurement Screen. A progress bar will appear until the measurement is available.

When the measurement is complete, Figure 8-10 Chamber Voltage Measurement Results Screen will appear.

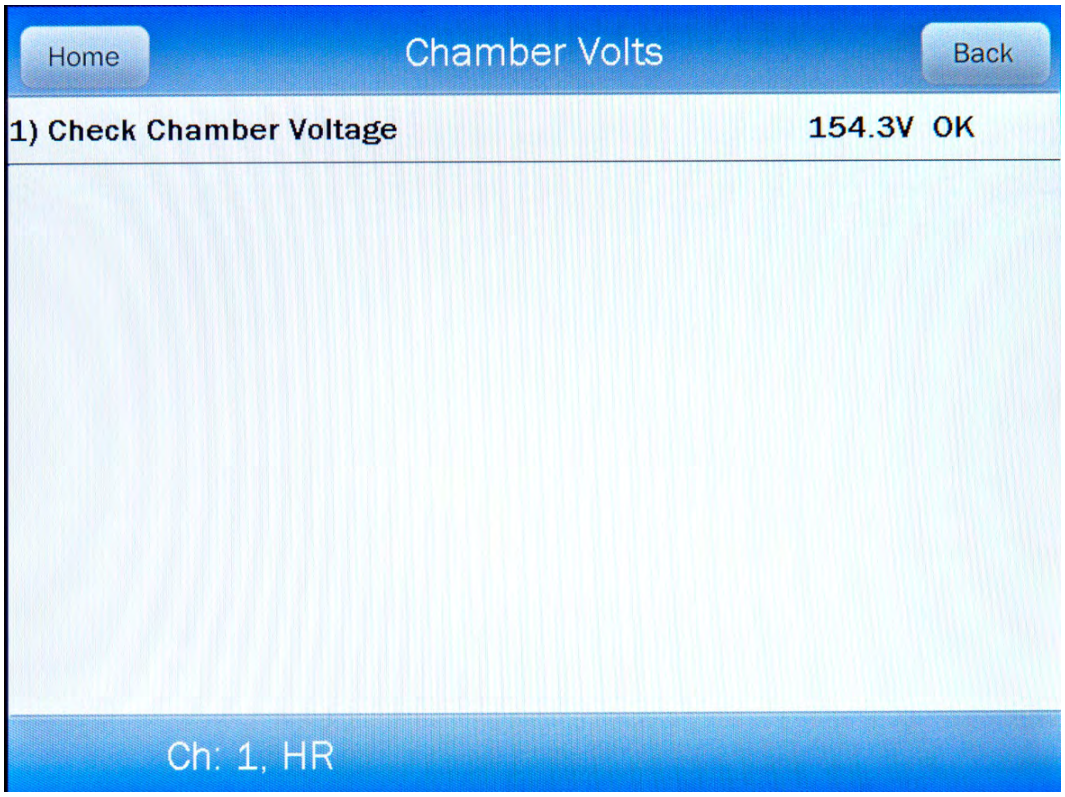

Figure 8-10 Chamber Voltage Measurement Results Screen

The Chamber Voltage measurement is compared with the value input at the factory. If the results are out of range, the message “FAIL” appears. If this occurs, contact Capintec’s only Authorized Service Center at 1-800-227-6832.

Touch the **HOME** or **BACK** button to accept the result. Figure 8-1 Measurement Screen will re-appear.

ACCURACY TEST

The Accuracy Test shows that the CRC®-77tHR is providing correct readings over the entire energy scale. All Test Sources that were entered in Setup (reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: TEST SOURCE SETUP) are measured. The measured activity is then compared to the calibrated activity corrected for decay.

Note: *The Accuracy Tests cannot be conducted until the Test Source data has been entered (reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: TEST SOURCE SETUP). If no Test Sources have been entered, Figure 8-11 Accuracy Test No Source Data Screen will appear.*

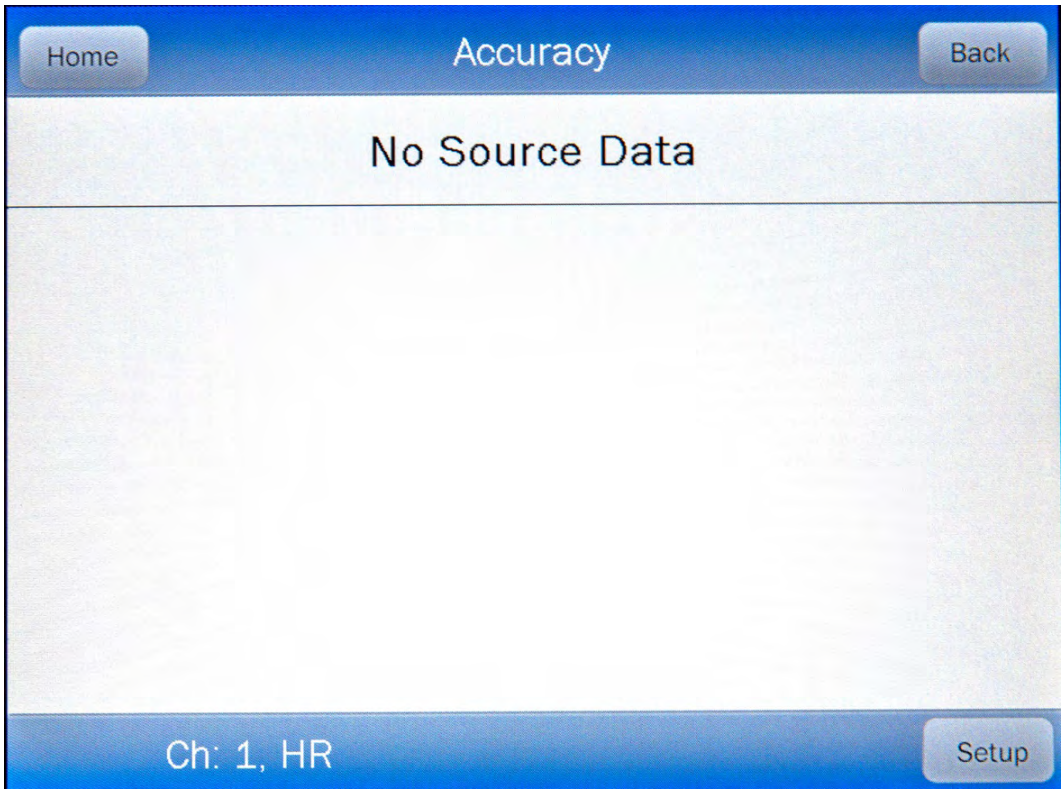

Figure 8-11 Accuracy Test No Source Data Screen

The Accuracy Test can be made directly from Figure 8-1 Measurement Screen by touching the **ACCURACY** button and duplicates the Accuracy Test performed in the Daily Test. Figure 8-12 Accuracy Test Screen will appear. The actual Test Sources and serial numbers will, of course, depend upon how the test was initially defined.

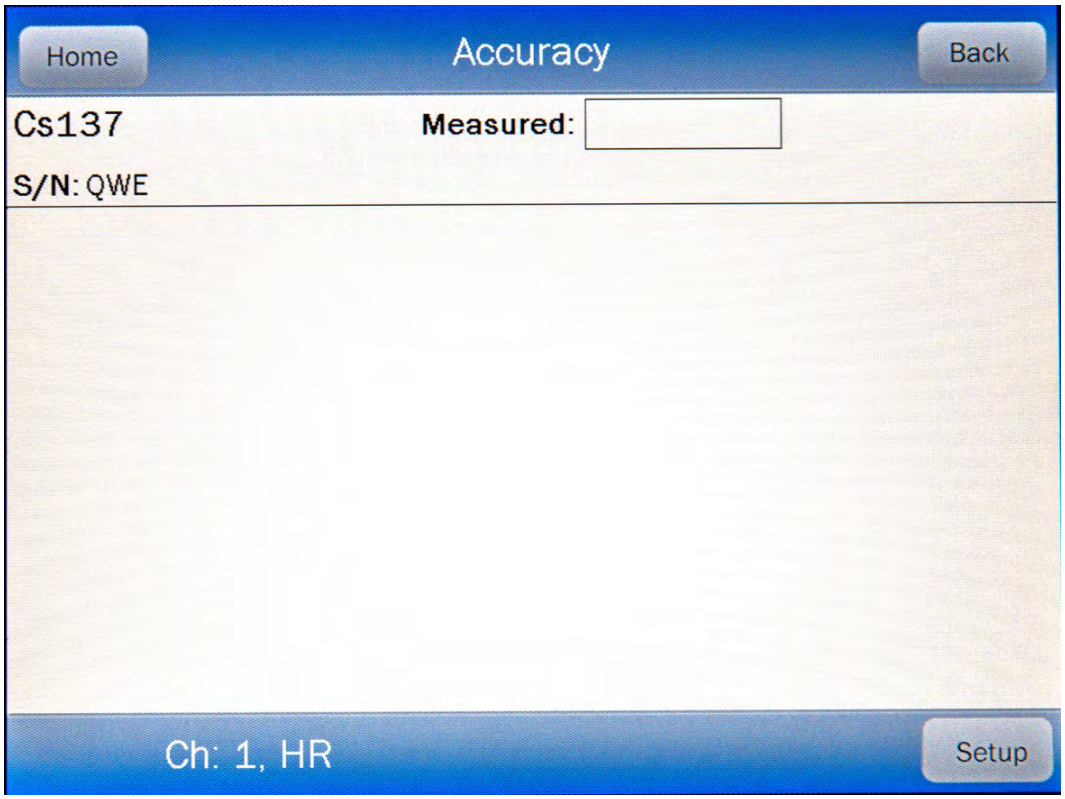

Figure 8-12 Accuracy Test Screen

Begin the test by inserting the check source into the well. Touch the ***Measured:*** field box next to the Test Source to be measured. A display similar to that illustrated in Figure 8-13 Accuracy Test Measurement Screen will appear.

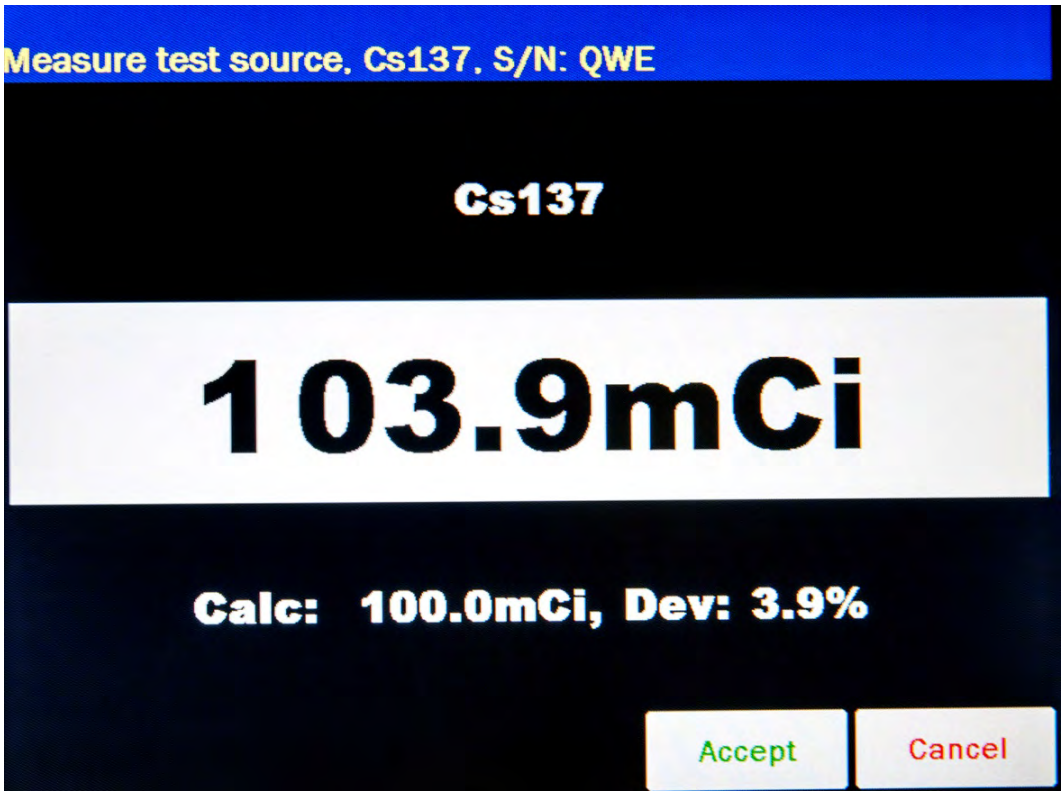

Figure 8-13 Accuracy Test Measurement Screen

The displayed measurement is the measured activity.

The “Calc:” number is the anticipated actual activity of the check source based upon the initial calibration of the source, corrected for decay.

The “Dev:” number is the percent deviation of the measured activity from the anticipated activity. If the deviation is greater than ±20%, the reading will be replaced by “ERROR” and the entire line will be displayed in red as shown in Figure 8-14 Accuracy Test Measurement Error Screen.

Deviations greater than ±5% should be investigated. If the deviation is greater than 10%, contact Capintec’s only Authorized Service Center. Note that higher than expected deviations may be within the limit of error, depending the accuracy of the check source being used.

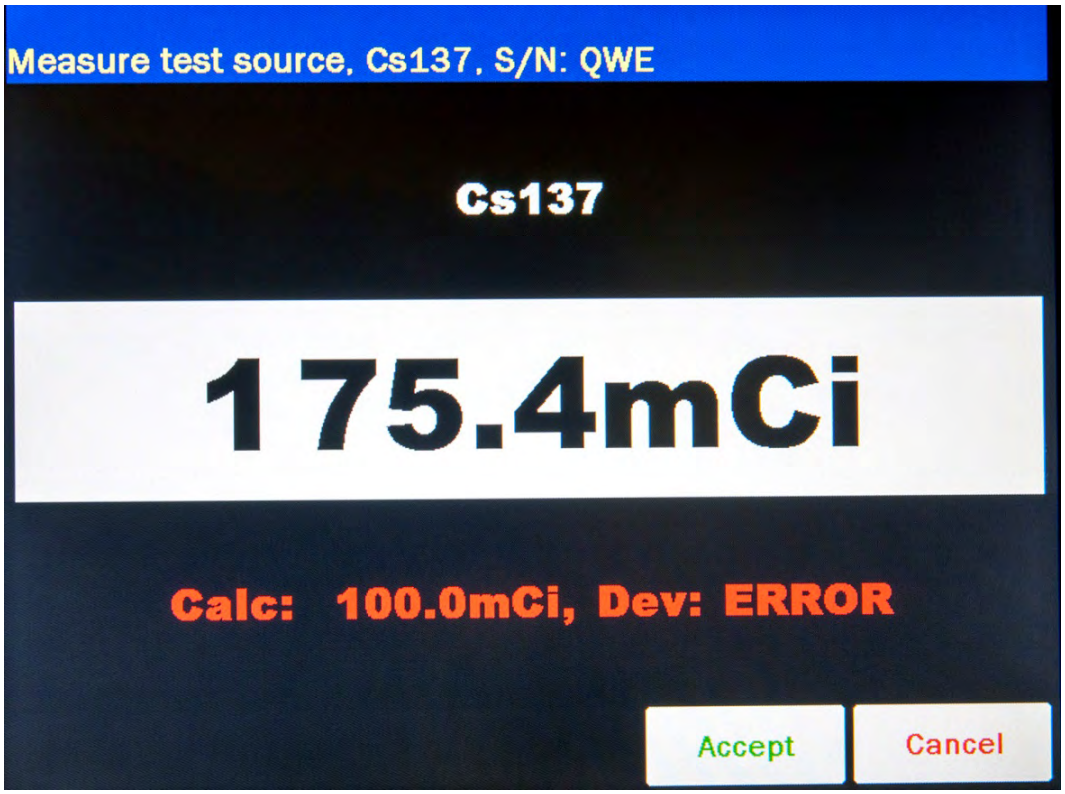

Figure 8-14 Accuracy Test Measurement Error Screen

Touch the **CANCEL** button to abort the measurement and return to Figure 8-13 Accuracy Test Measurement Screen.

Touch the **ACCEPT** button to accept the measurement. The screen will be similar to that shown in Figure 8-15 Accuracy Test Results Screen.

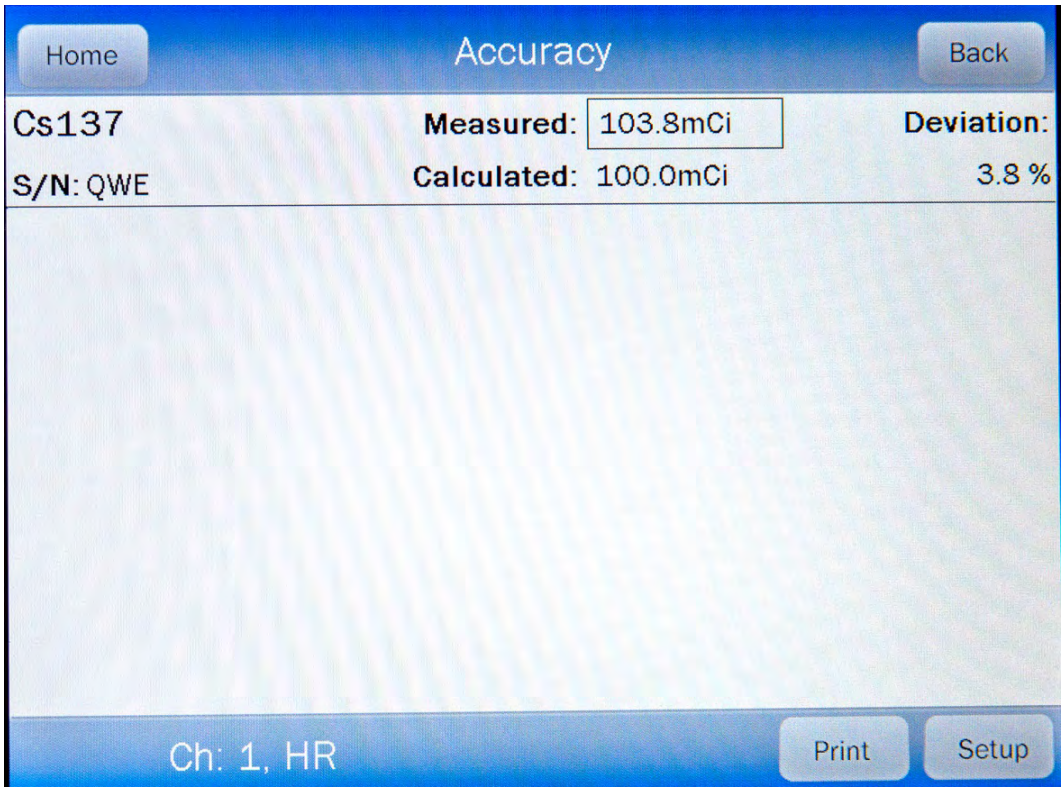

Figure 8-15 Accuracy Test Results Screen

If there is data for more than one Test Source, repeat the above the test sequence as many times as required.

When all Test Sources have been measured, the following options are available:

- If Constancy Channels have been setup (reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: TEST SOURCE SETUP), the Constancy Test can be performed by touching the **AUTOCONSTANCY** button. Refer to the **Constancy Test** section on page 8-17 for detailed information.
- If it desired to input or change Test Source information, touch the **SETUP** button to enter the Setup utility. (***Note:*** *When returning from the Setup screen, the Accuracy Test must be repeated*),
- If a printer is attached to the system, the Accuracy Test results can be printed by touching the **PRINT** button, or
- Touch the **HOME** button to exit the test and return to Figure 8-1 Measurement Screen.
- If performing the Accuracy Test from within Daily Test, touch the **BACK** button to exit the Accuracy Test and return to Figure 8-6 Daily Test Screen.

Constancy Test

The Constancy Test measures precision. This test shows that when using a source with a long half-life (the base Constancy Source (reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: TEST SOURCE SETUP)), readings are repeatable over time on any isotopes that are used on a daily basis. The Constancy Channel nuclides' activities are then calculated based on the base Constancy Source. The calculated values are compared with previously recorded values to determine if constancy is being maintained.

The Constancy Test is automated. From Figure 8-15 Accuracy Test Results Screen, touch the **AUTOCONSTANCY** button.

The CRC®-77tHR will be step through all of the Constancy Sources (channels) without user intervention. Figure 8-16 Constancy Test Results Screen will appear.

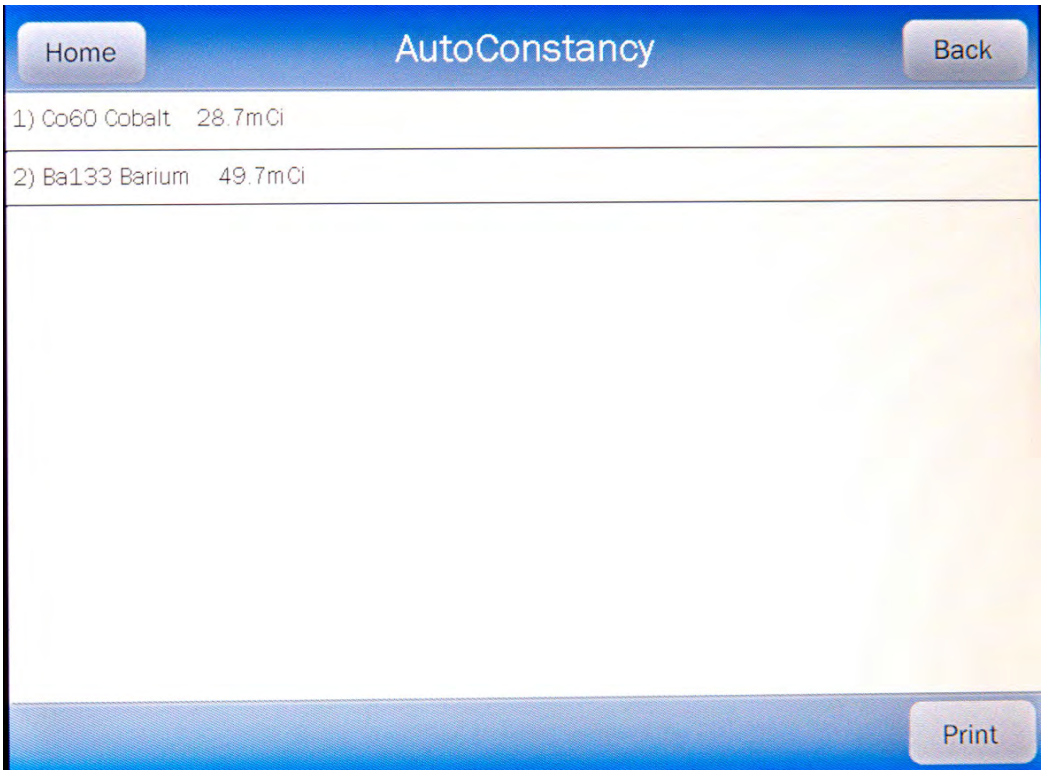

Figure 8-16 Constancy Test Results Screen

When the Constancy Test is complete, the following options are available:

- If a printer is attached to the system, the Constancy Test results can be printed by touching the **PRINT** button, or
- Touch the **HOME** button to exit the test and return to Figure 8-1 Measurement Screen.
- Touch the **BACK** button to exit the Auto Constancy Test and return to Figure 8-15 Accuracy Test Results Screen.

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CHAPTER 9

DIAGNOSTICS

GENERAL

Diagnostics performs functions to test the integrity of the system.

If a printer is attached to the system, a report will be printed containing the system configuration information.

DIAGNOSTICS

From Figure 9-1 Measurement Screen, touch the **UTIL** button. Figure 9-2 Utility Screen will appear.

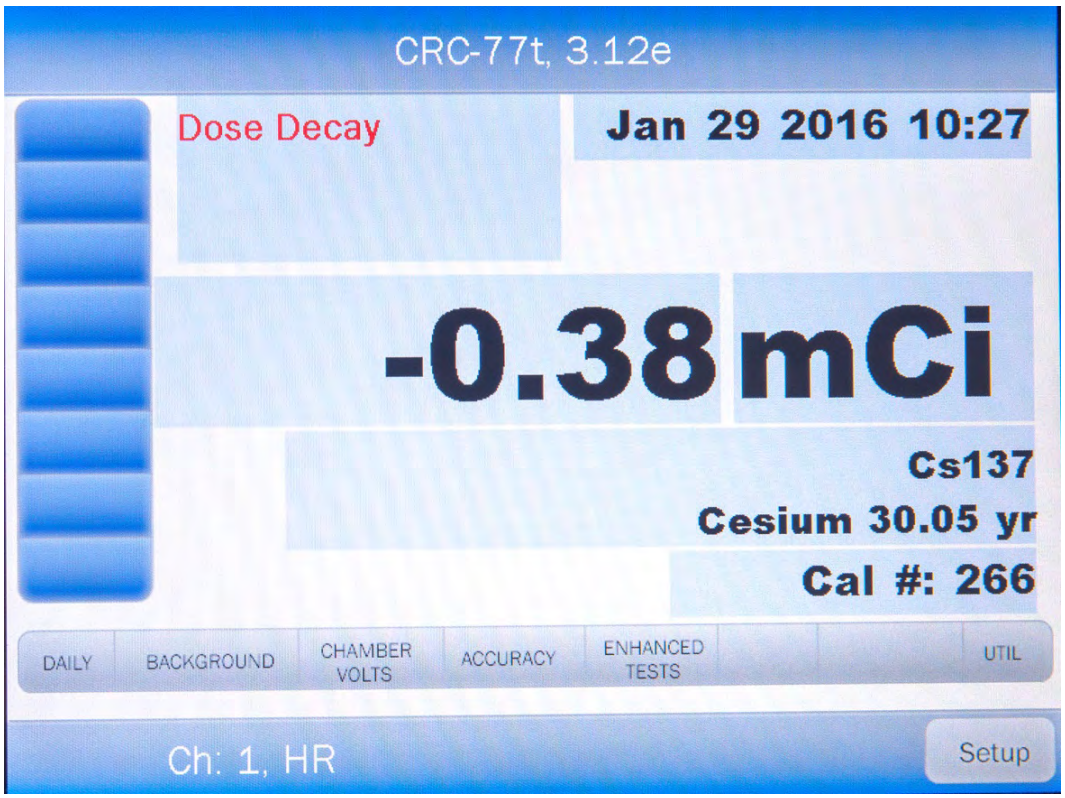

Figure 9-1 Measurement Screen

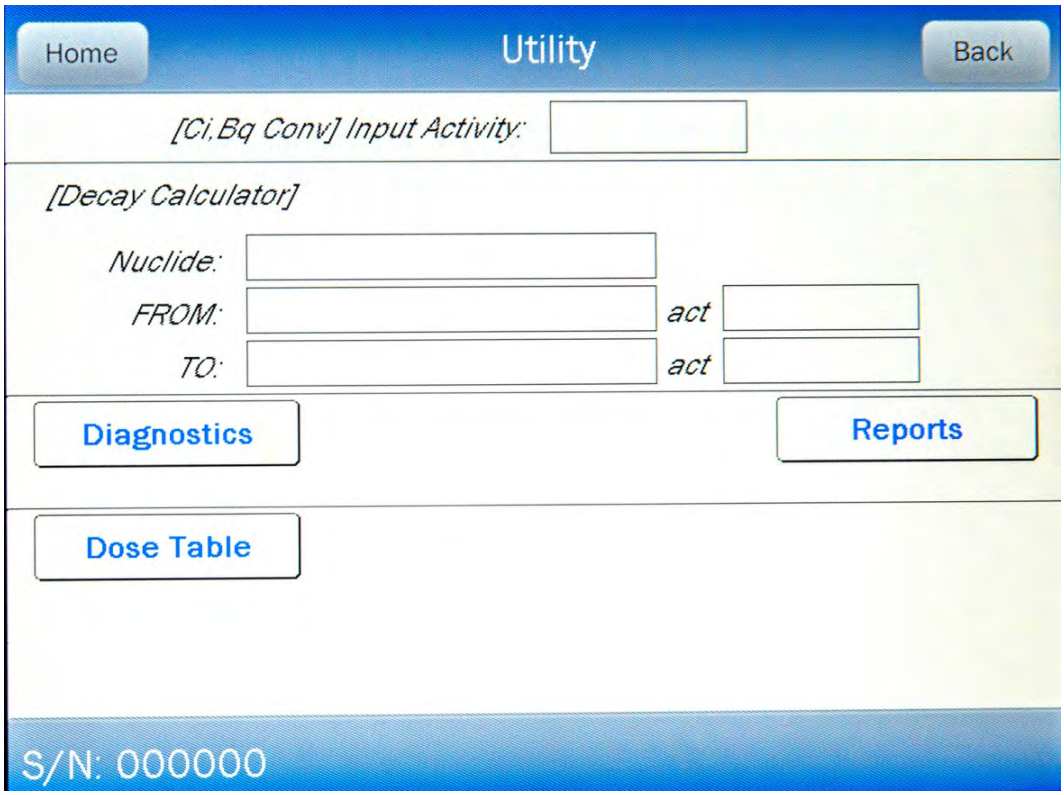

Figure 9-2 Utility Screen

Touch the **DIAGNOSTICS** button. The system diagnostic testing will begin.

The instrument's memories and the programs are checked.

If a printer is attached to the system, the results will be printed. The following data is printed on the report:

- A list of the nuclides, their half-lives and calibration numbers.
- User Added Nuclide information.
- The Test Source data.
- Chamber System Parameters.

When the test is complete, the message “PROGRAM INTEGRITY – PASS: xxxx” will be displayed as shown in Figure 9-3 Utility Screen with Diagnostics PROGRAM INTEGRITY PASS.

Note: *The value displayed after PASS is for example only and is not a real value. The value displayed will depend upon the current revision of the installed software.*

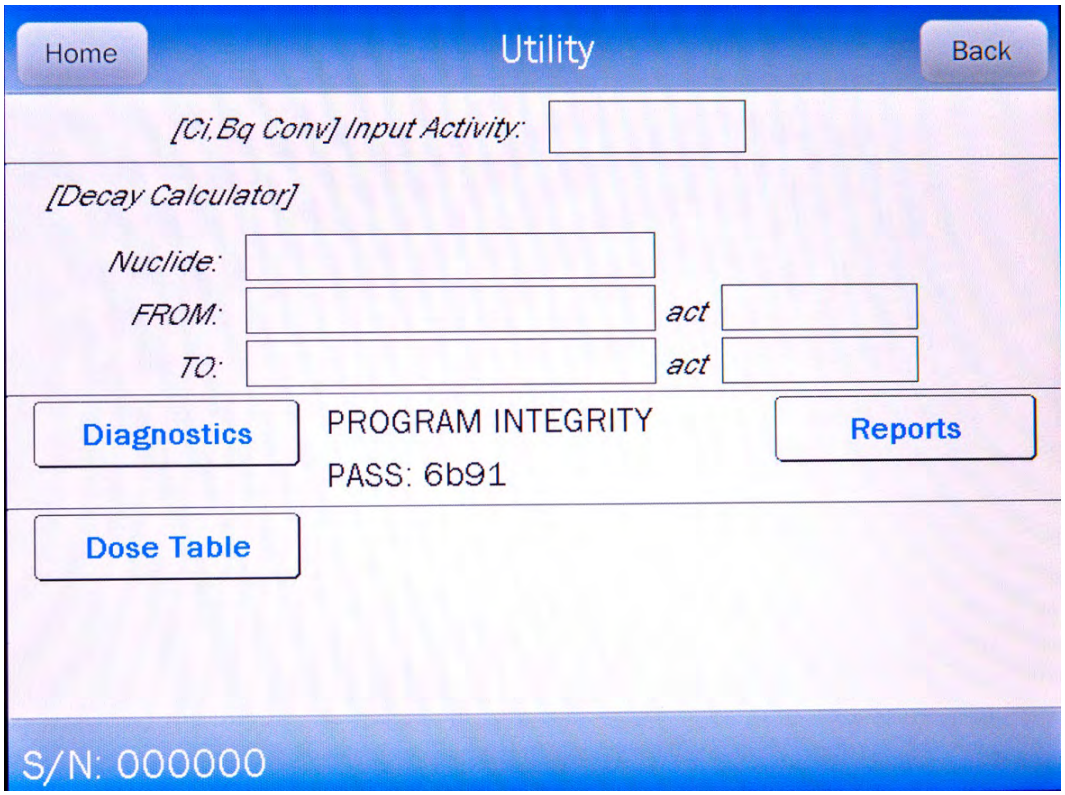

Figure 9-3 Utility Screen with Diagnostics PROGRAM INTEGRITY PASS

If the Diagnostics test fails, the message “PROGRAM INTEGRITY – FAIL: xxxx” will appear.

At power-up, the CRC®-77tHR’s program is copied from the SD card into RAM memory. If the Diagnostics fails, restart the unit and perform the test again. If it fails again, contact Capintec’s only Authorized Service Center (reference CHAPTER 15: CLEANING AND MAINTENANCE, SECTION: SERVICING) for more information, since this will indicate a SD card error or a system malfunction.

To exit the Utility screen, touch the **HOME** or **BACK** button. Figure 9-1 Measurement Screen will re-appear.

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CHAPTER 10

MEASUREMENT PROCEDURES

GENERAL

Instructions for measuring a source with the Chamber are given in this section.

The Measurement Screen is shown below along with a description of each section.

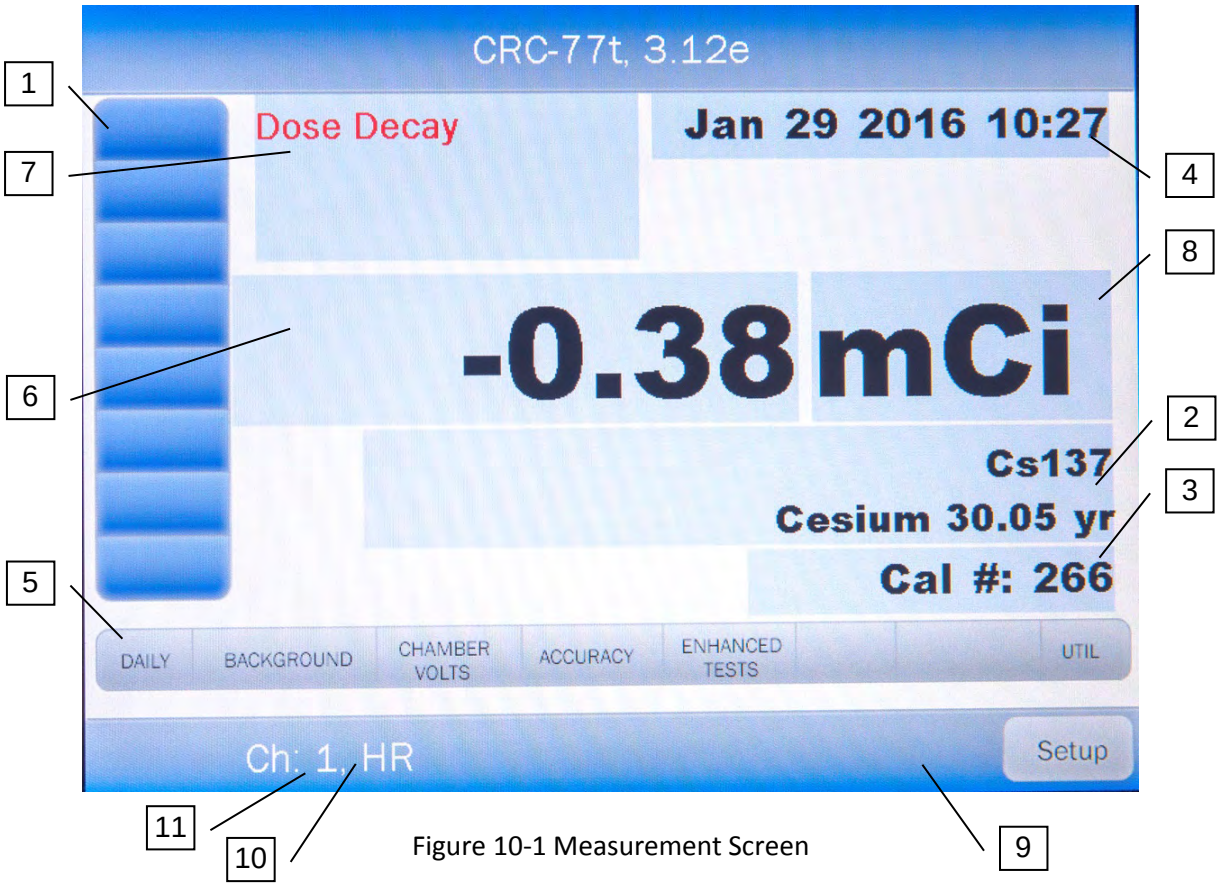

Figure 10-1 Measurement Screen

1. Home Screen Hotkeys
2. **NUCLIDE** button – displays the currently selected nuclide.
3. **CAL#** button – displays the Calibration Number of the selected nuclide.
4. **DATE/TIME** button – displays the current Date and Time.
5. **TEST** buttons – provides access to system functions.
6. **MEASUREMENT** button – displays the measured activity of the selected nuclide.
7. **DOSE DECAY** button – allows the entry of a future date and time.
8. **UNITS** button – allows toggling between Curies and Becquerels if chosen in setup.
9. **PRINT** button – displayed only if the system is set to use a printer.
10. The “HR” indicates that the Chamber is an HR Chamber.
11. The “1” indicates the number of the selected Chamber.

MEASUREMENT PROCEDURES

Note: *In order to obtain a correct reading for a Vial or Syringe, the supplied liner and dipper must be used to achieve the correct geometry. If the source is housed in a different type of container, then contact Capintec, Inc. for further assistance.*

General Activity Measurement Procedure

To measure the activity of a sample:

- Insert the sample into the Chamber.
- Specify the Nuclide via a Home Screen Hotkey, the **NUCLIDE** button or input a Calibration Number via the **CAL#** button.

To print a record of the measurement (if a printer is attached to the system):

- Touch the **PRINT** button.

To determine what the activity will be at a different time:

- Touch the **DOSE DECAY** button.

Specifying Nuclide

A nuclide may be specified via one of the Home Screen Hotkeys or via the **NUCLIDE** button.

Home Screen Hotkeys

Touch one of the 8 Home Screen Hotkeys

NUCLIDE Button

Other Nuclides can be selected by touching the **NUCLIDE** button and selecting the Nuclide from 20 **NUCLIDE** Hotkeys on the left side of the screen or from the Nuclide List on the right half of the screen as shown in Figure 10-2 Select Nuclide Screen.

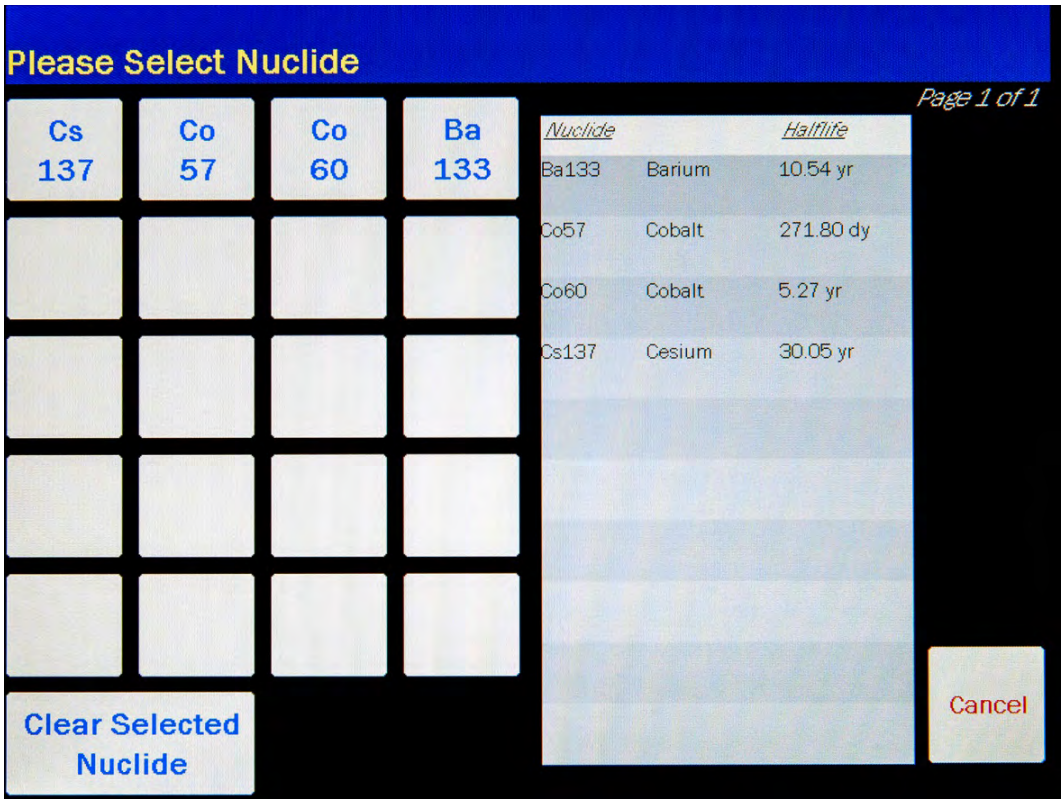

Figure 10-2 Select Nuclide Screen

Entering Calibration Number

A measurement may also be made by entering a Calibration Number instead of selecting a nuclide.

From Figure 10-1 Measurement Screen, touch the **CAL#** button. A numeric keypad will appear.

Input the desired Calibration Number by touching the appropriate numbers on the keypad. Touch the **ACCEPT** button to accept the entry. Figure 10-1 Measurement Screen will re-appear showing the new Calibration Number.

A calibration number may include a multiplication sign (* on the keypad) or a division sign (/ on the keypad). However, the Chamber is always direct reading and the multiplication or division sign is only used to be consistent with existing Calibration Numbers.

For multiplication, the number can only be multiplied by 10 or 100. For division, the number can only be divided by 2. Refer to Table 10-1 Calibration Number Limits Table.

	Minimum Calibration # (*a*)	Maximum Calibration # (*a*)
Direct Entry (*a*)	10	1200
Multiplication (*a* × 10)	10	1200
Multiplication (*a* × 100)	10	999
Division (*a* ÷ 2)	400	1200

Table 10-1 Calibration Number Limits Table

If the **CAL#** button was accidentally pressed, touch the **CANCEL** button. Figure 10-1 Measurement Screen will re-appear showing the previously entered Calibration Number.

Selecting Measurement Precision

The central part of the screen contains the measurement. Touching the **MEASUREMENT** (x.xx) button will change the precision of the measurement. The measurement can display up to 5 digits and a decimal point.

Units Button

The central part of the screen contains the measurement unit. Touching the **UNITS** (Ci/Bq) button allows the user to toggle between Curies and Becquerel if so chosen in the setup.

DOSE DECAY

Note: *This feature is only available when a nuclide is specified because the half-life of the nuclide must be known.*

It is often desirable to know the activity of the sample at another time (usually in the future).

When another date/time is chosen, the specified date and time will be displayed on the **DOSE DECAY** button along with the calculated activity at that time based on the half-life of the nuclide being measured.

Dose Decay Entry Modes

The Date/Time for the Dose Decay can be entered in one of two ways: Quick or Full. The "Quick" mode employs a numeric keypad and only the changed information needs to be entered. The "Full" mode employs the same screen used to enter the date/time in all other places. "Quick" is the default mode.

The mode is selected from Figure 10-3 Advanced Chamber Setup Screen.

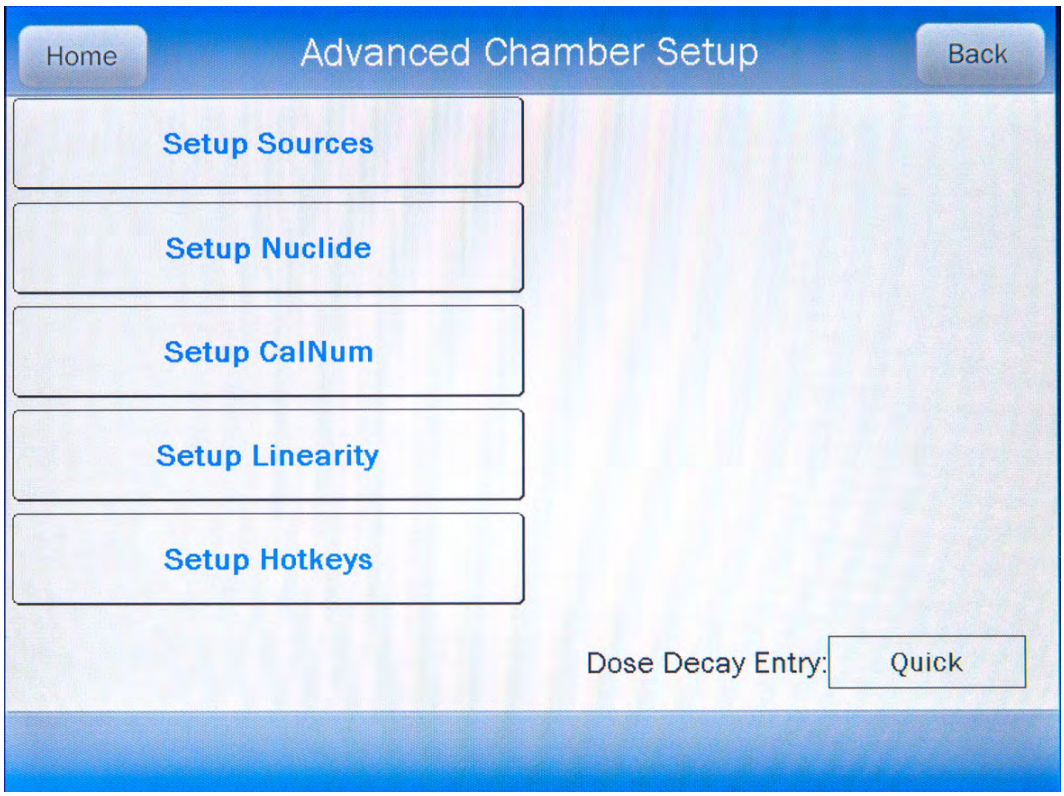

Figure 10-3 Advanced Chamber Setup Screen

To change the mode, touch the ***Dose Decay Entry:*** field box. Figure 10-4 Dose Decay Entry Mode Selection Screen will appear.

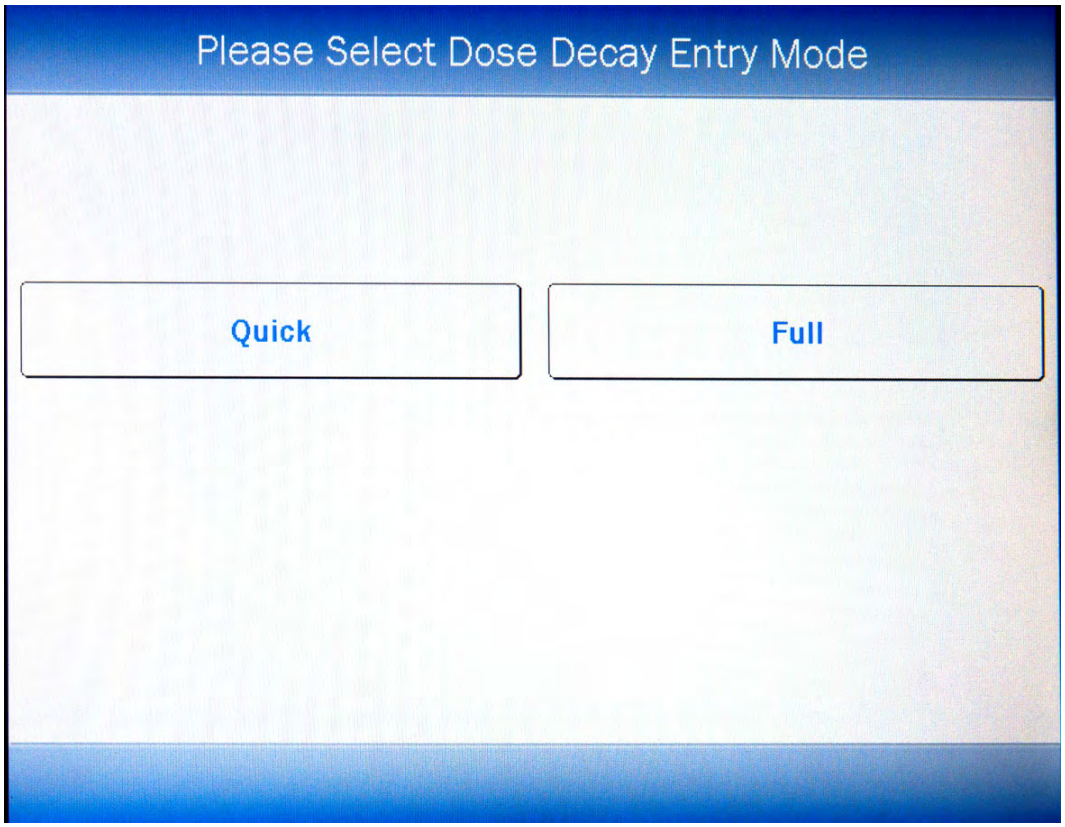

Figure 10-4 Dose Decay Entry Mode Selection Screen

Touch the **QUICK** button to select the Quick mode. Touch the **FULL** button to select the Full mode. Figure 10-3 Advanced Chamber Setup Screen will re-appear with the selected mode displayed in the ***Dose Decay Entry:*** field box..

Entering Dose Decay Date/Time

To determine the activity at a different time,

1. Insert the sample into the Chamber.
2. Specify the nuclide via a Home Screen Hotkey or the **NUCLIDE** button.
3. Touch the **DOSE DECAY** button. If the Dose Decay mode is set to “Quick”, Figure 10-5 Date/Time Screen for Quick Entry Mode will appear. If Full mode was selected, Figure 10-3 Advanced Chamber Setup Screen will appear.

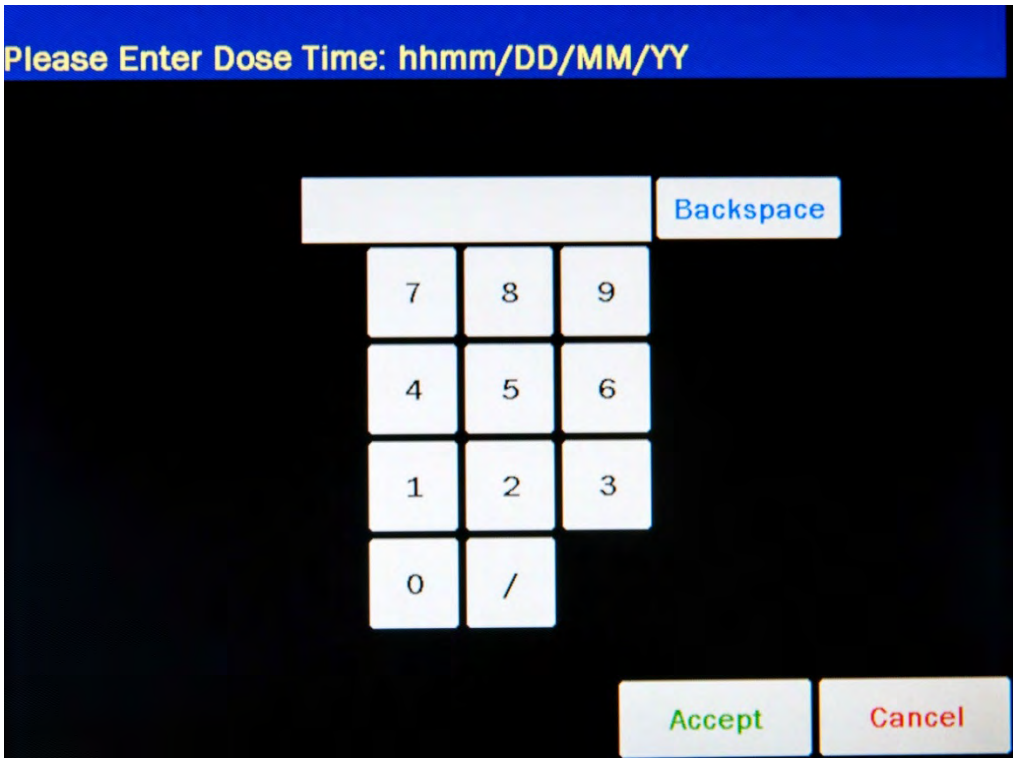

Figure 10-5 Date/Time Screen for Quick Entry Mode

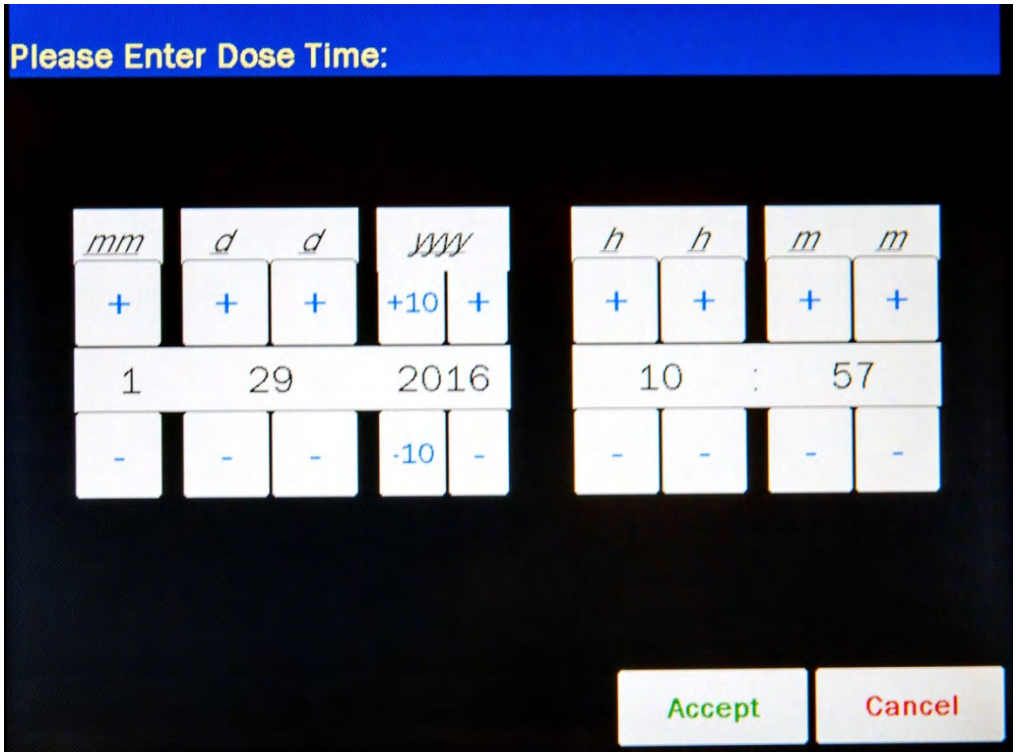

Figure 10-6 Date/Time Screen for Full Entry Mode

4. When using Quick Entry Mode, only the minimum necessary data has to be entered. If the date is the same as “today”, only hours and minutes need to be entered. If you want to add the day after an unambiguous time (e.g. 730, 1234), you do not need to enter the slash. If the time and first digit of the day are ambiguous (e.g. 1234) you must enter the slash. Similarly for the month. The year must be 2 digits. If you want the day to be the same as “today” but want to change the month or year, just enter a slash. Similarly for the month.
5. In Full Entry Mode, the screen displays the currently set date and time. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value. For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.
6. Touch the **ACCEPT** button to accept the set date and time. Figure 10-7 Measurement Screen with Dose Decay will appear with the Dose Decay button populated with the calculated future activity at the specified date and time.

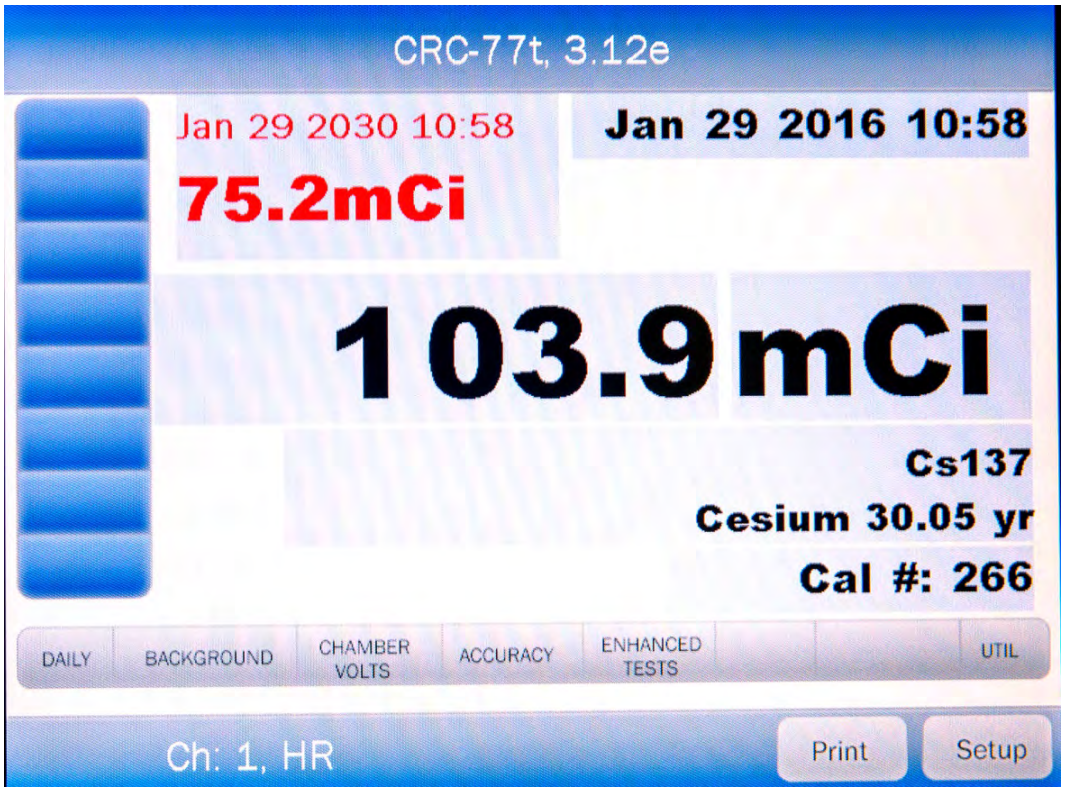

Figure 10-7 Measurement Screen with Dose Decay

If a printer is attached to the system, touch the **PRINT** button to print the Dose Decay results.

PRINTING A RECORD OF THE MEASUREMENT

To print a record of a measurement, a printer must be set up as described in CHAPTER 5: SYSTEM INITIALIZATION; SECTION: PRINTING.

Touch the **PRINT** button to print the displayed measurement.

CHAPTER 11

ENHANCED TESTS

GENERAL

This section describes the tests that are accessed via the **ENHANCED TESTS** button located on the Measurement screen.

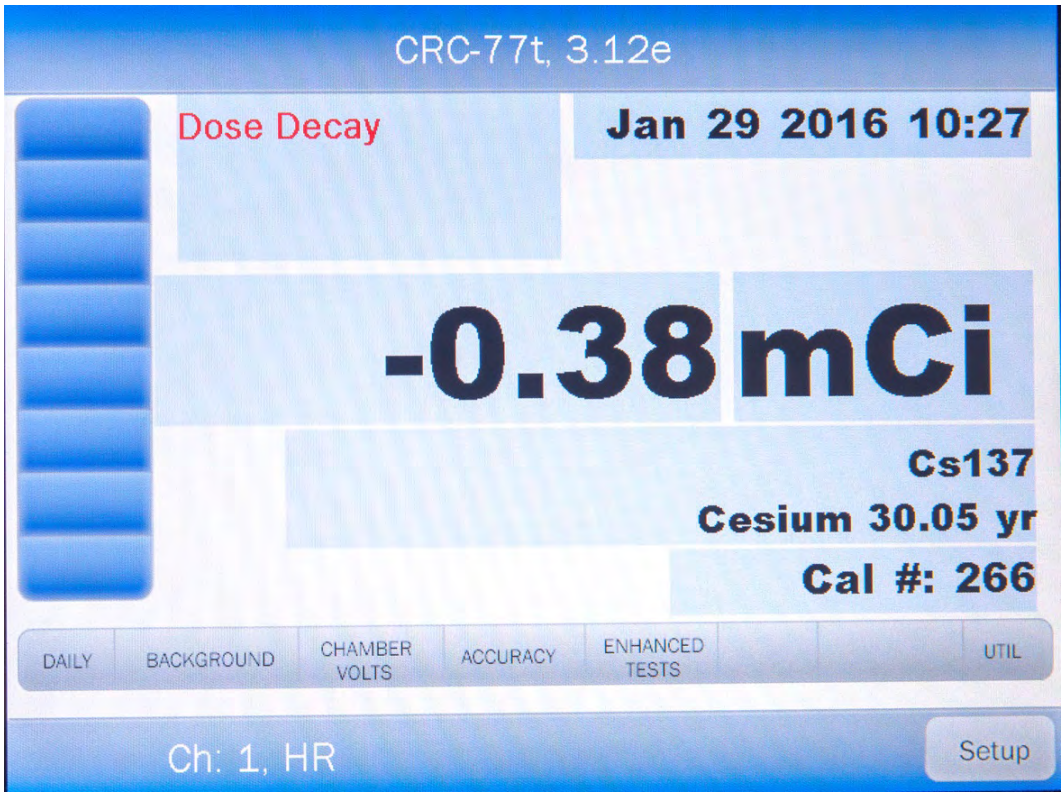

Figure 11-1 Measurement Screen

From the Measurement screen, touch the **ENHANCED TESTS** button. Figure 11-2 Enhanced Tests Screen will appear.

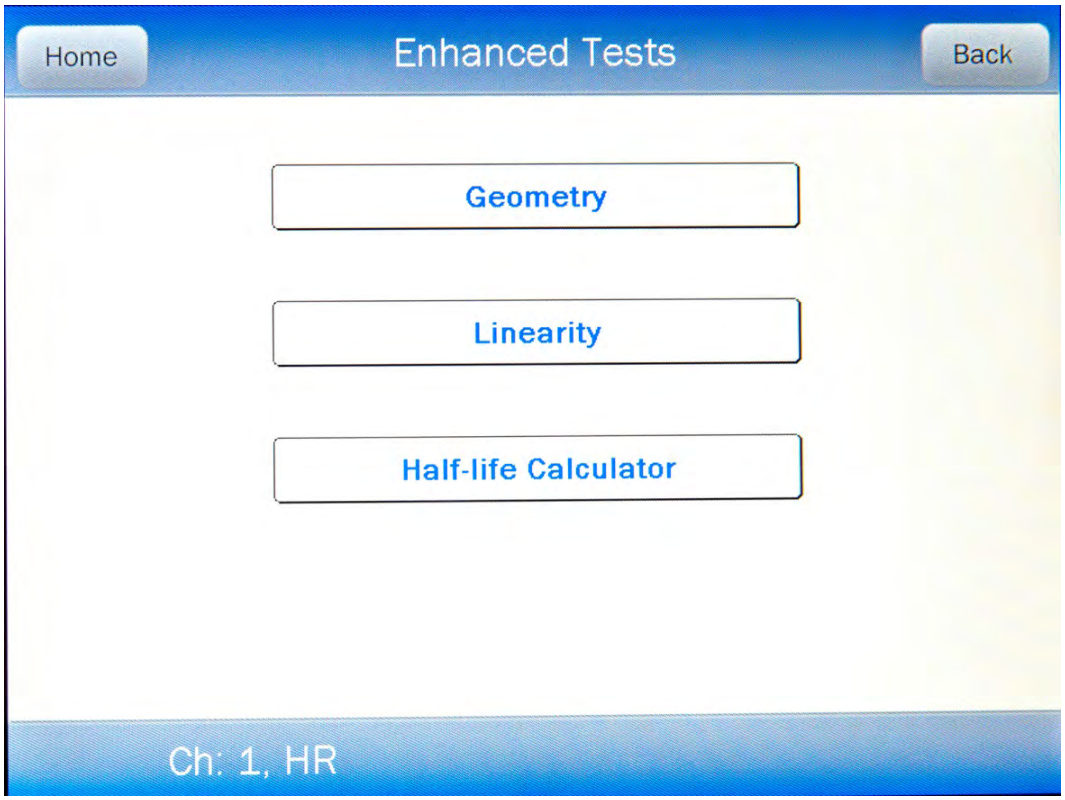

Figure 11-2 Enhanced Tests Screen

GEOMETRY TEST

The Geometry Test determines the effect of volume changes on the calibrator's accuracy. It is carried out using Tc99m and should be performed upon installation of the CRC®-77tHR.

An example Geometry Test would be to place 1ml of Tc99m (~25 mCi) in a 10 ml syringe. Place the sample in the Chamber and record the measurement. The sample is then diluted with water to 2 ml, 3 ml, 5 ml, and 10 ml. After each dilution, a measurement is performed and recorded. The data are reviewed to reveal the effect of sample geometry on the CRC®-77tHR's reading. If the Chamber is geometry-dependent, it may be necessary to routinely correct the readings.

To begin the Geometry Test, touch the **GEOMETRY** button. Figure 11-3 Geometry Test Screen will appear.

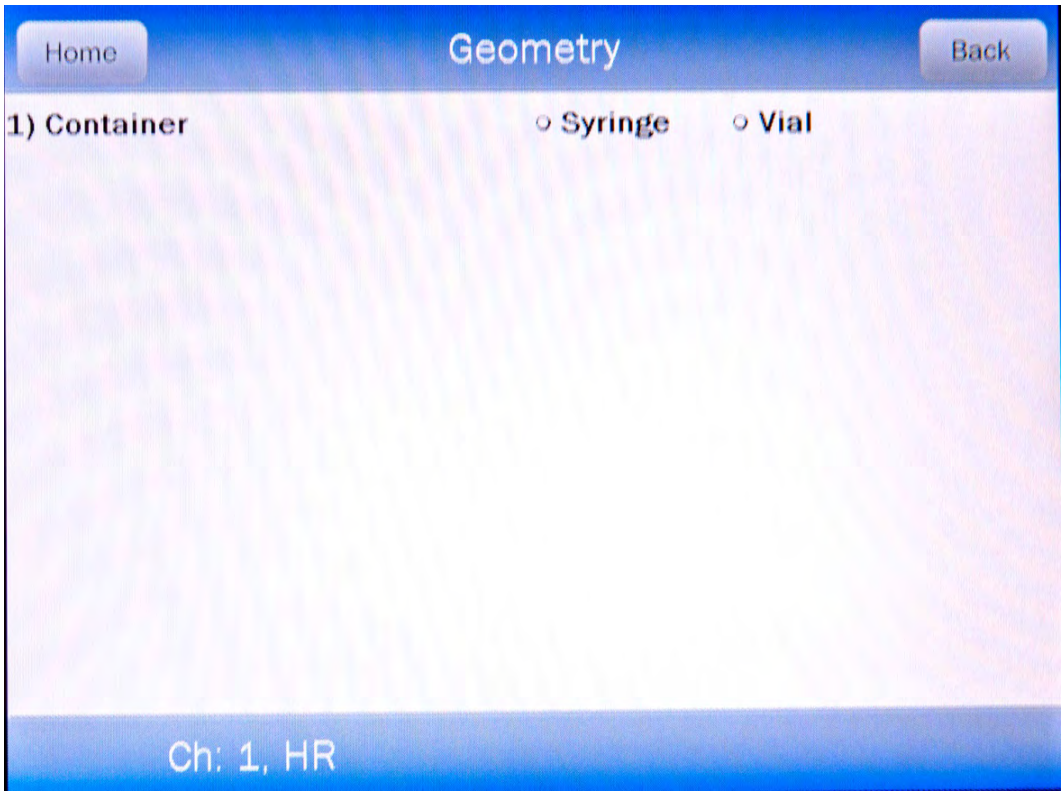

Figure 11-3 Geometry Test Screen

The test can be performed using a syringe or a vial.

A minimum of 2 samples must be measured. The maximum number of samples is 10.

From Figure 11-3 Geometry Test Screen, touch either the **Syringe** or **Vial** radio button. Figure 11-4 Geometry Test Initial Volume Entry Screen will appear. The examples shown are for testing using a Vial but are identical if using a Syringe.

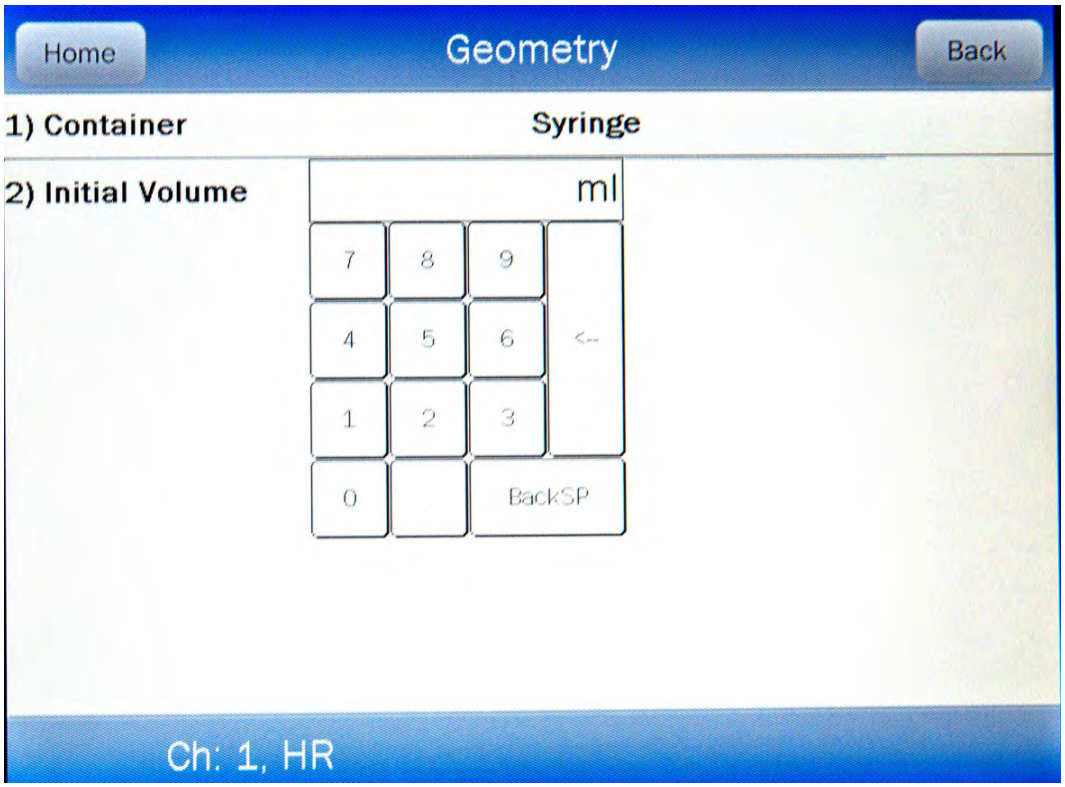

Figure 11-4 Geometry Test Initial Volume Entry Screen

Input the initial volume of the sample by touching the appropriate numbers on the keypad. Touch the **ENTER** (**<--**) key to accept the entered volume. Figure 11-5 Geometry Measurement Screen will appear for each measurement.

Note: *The minimum value that can be input is 0.1 ml. The maximum value that can be input is 98.9 ml. The overall volume of the sample cannot be greater than 98.9ml; i.e. when the Initial Volume of the sample and all Added Volumes are added together, they cannot total more than 98.9ml.*

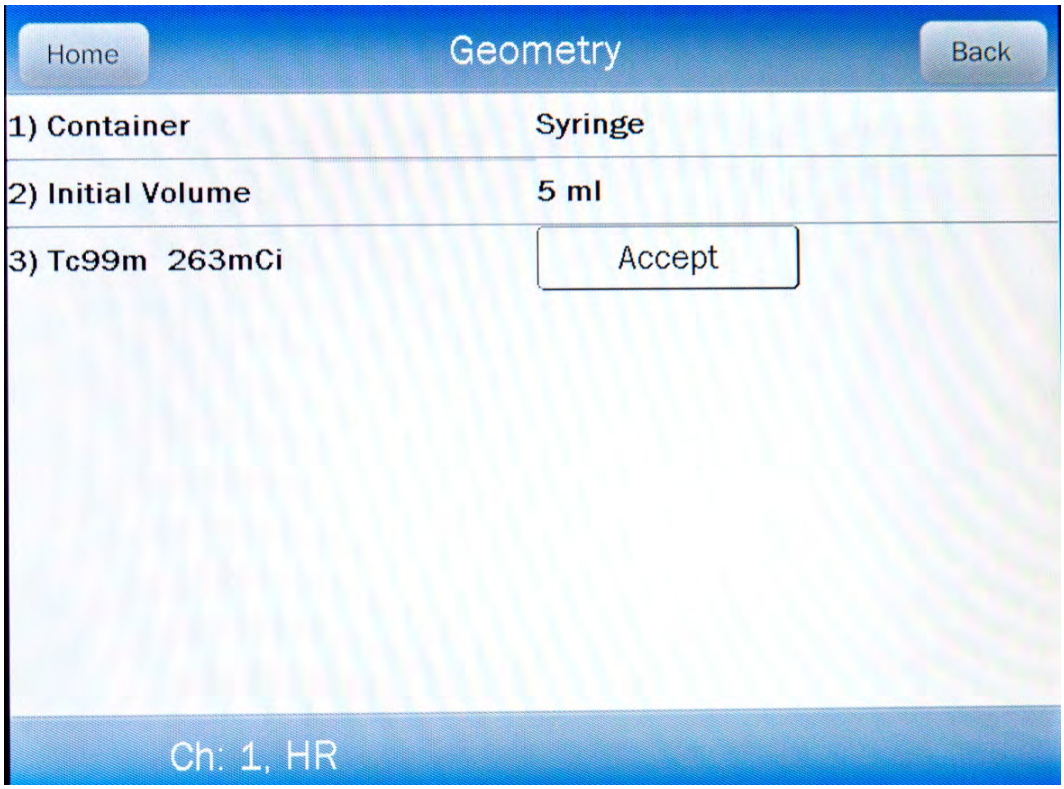

Figure 11-5 Geometry Measurement Screen

Place the sample in the Chamber. The syringe's activity will be displayed as shown in Figure 11-5 Geometry Measurement Screen.

Touch the **ACCEPT** button to accept the measurement. Figure 11-6 Geometry Test Added Volume Entry Screen will appear for the second measurement.

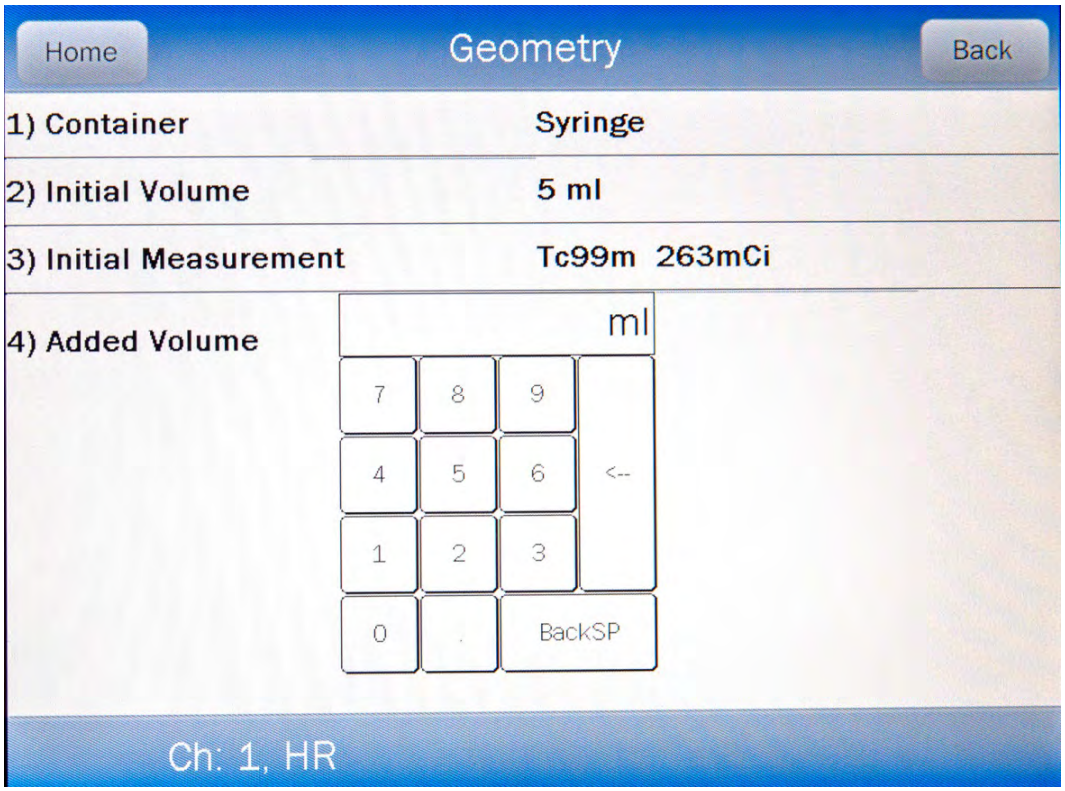

Figure 11-6 Geometry Test Added Volume Entry Screen

A minimum of 2 samples must be measured.

Input the first volume added to the sample by touching the appropriate numbers on the keypad. Touch the **ENTER** (**<--**) key to accept the entered volume. Figure 11-7 Geometry Measurement with Added Volume Screen will appear.

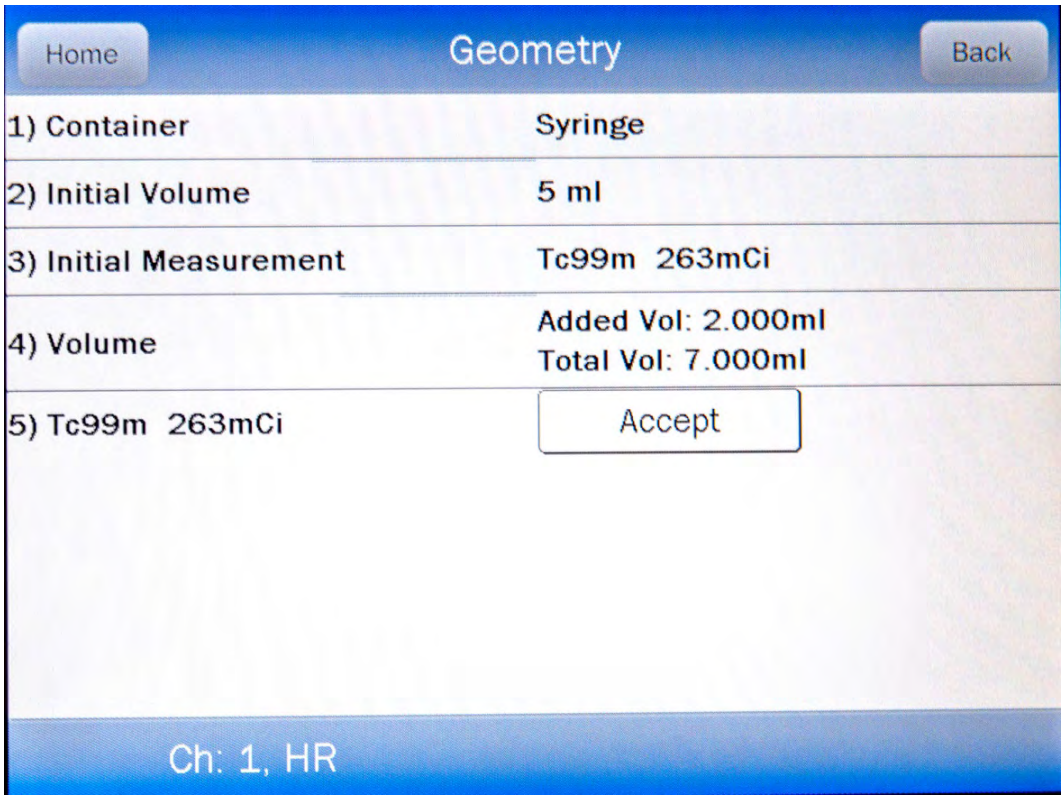

Figure 11-7 Geometry Measurement with Added Volume Screen

Touch the **ACCEPT** button to accept the measurement.

After the 2nd and subsequent measurements, Figure 11-8 Geometry Test More Measurements / Finished Screen will appear allowing more samples to be measured or finishing the test.

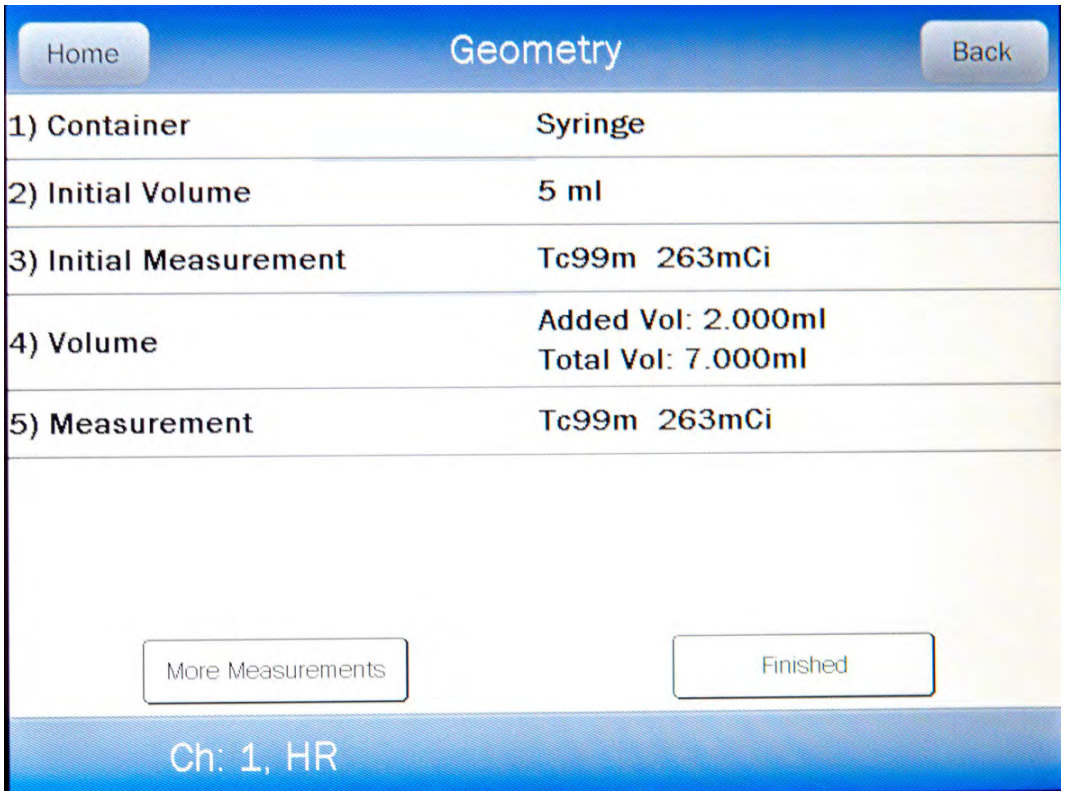

Figure 11-8 Geometry Test More Measurements / Finished Screen

If the previous sample was not the last sample to be measured, touch the **MORE MEASUREMENTS** button. Figure 11-6 Geometry Test Added Volume Entry Screen will re-appear.

Note: *The maximum number of samples is 10.*

Input the next volume added to the sample by touching the appropriate numbers on the keypad. The total volume input for all samples must be less than 99.0ml; if it is not less, the message "VALID RANGE IS XX.XXXml TO 0.1ml" will appear. (XX.XXX is the maximum volume remaining after subtracting the current total volume from the maximum of 99.0ml.)

Touch the **ENTER** (**<--**) key to accept the entered volume. Figure 11-7 Geometry Measurement with Added Volume Screen will appear.

Touch the **ACCEPT** button to accept the measurement.

If the previous sample was the last sample to measured, touch the **FINISHED** button. Figure 11-9 Geometry Report Screen will appear.

Measurement Results

After the last sample has been measured, Figure 11-9 Geometry Report Screen will appear.

The first measurement made is considered the Base Measurement. The base measurement is the measurement that all other measurements will be compared to. The variance is calculated using the base measurement.

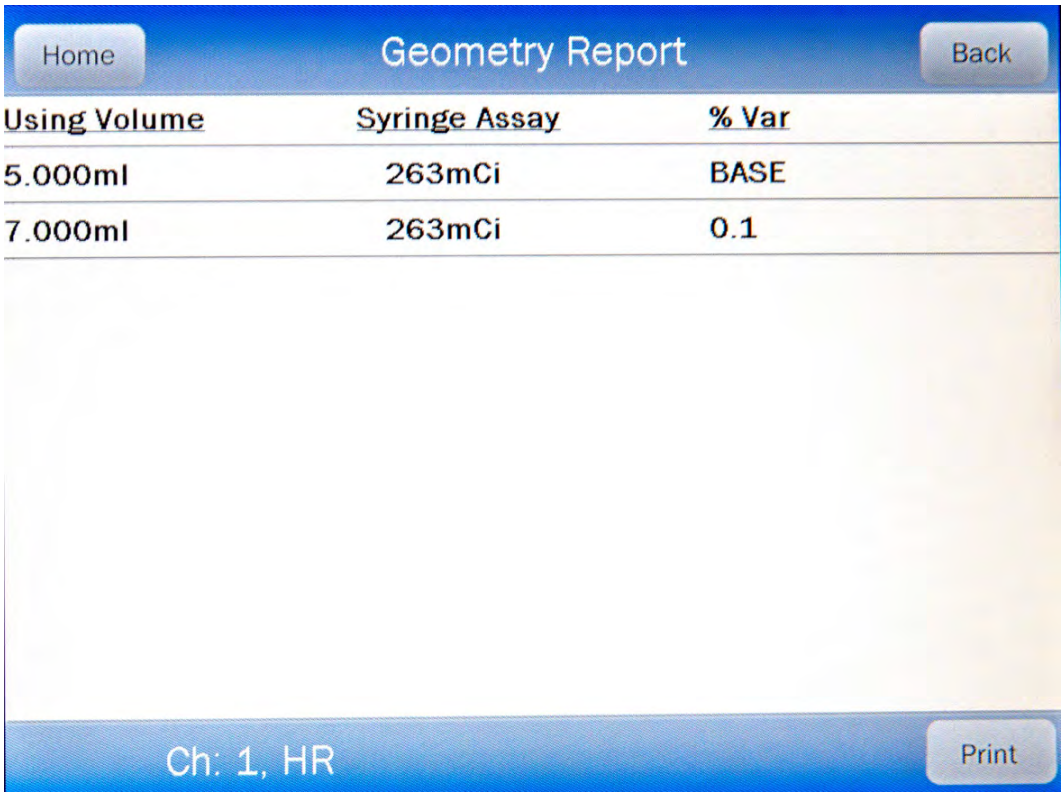

Figure 11-9 Geometry Report Screen

If a printer is attached to the system, the Geometry Report can be printed by touching the **PRINT** button

Touch the **BACK** button to exit the Geometry Report and return to Figure 11-3 Geometry Test Screen.

Touch the **HOME** button to exit the Geometry Report and return to Figure 11-1 Measurement Screen.

PERFORMING LINEARITY TEST

The available Linearity Tests are: AutoLinearity, Standard Linearity, Lineator and Calicheck. AutoLinearity does not need any previous setup.

In order to perform a Linearity Test other than AutoLinearity, at least one of the other Linearity Test Methods must be defined. All three methods can be defined.

From the Enhanced Tests screen, touch the **LINEARITY** button.

If a Linearity Test Method is not defined, Figure 11-10 Default Linearity Tests Screen will appear. Touch the **SETUP** button and reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: LINEARITY TEST DEFINITION.

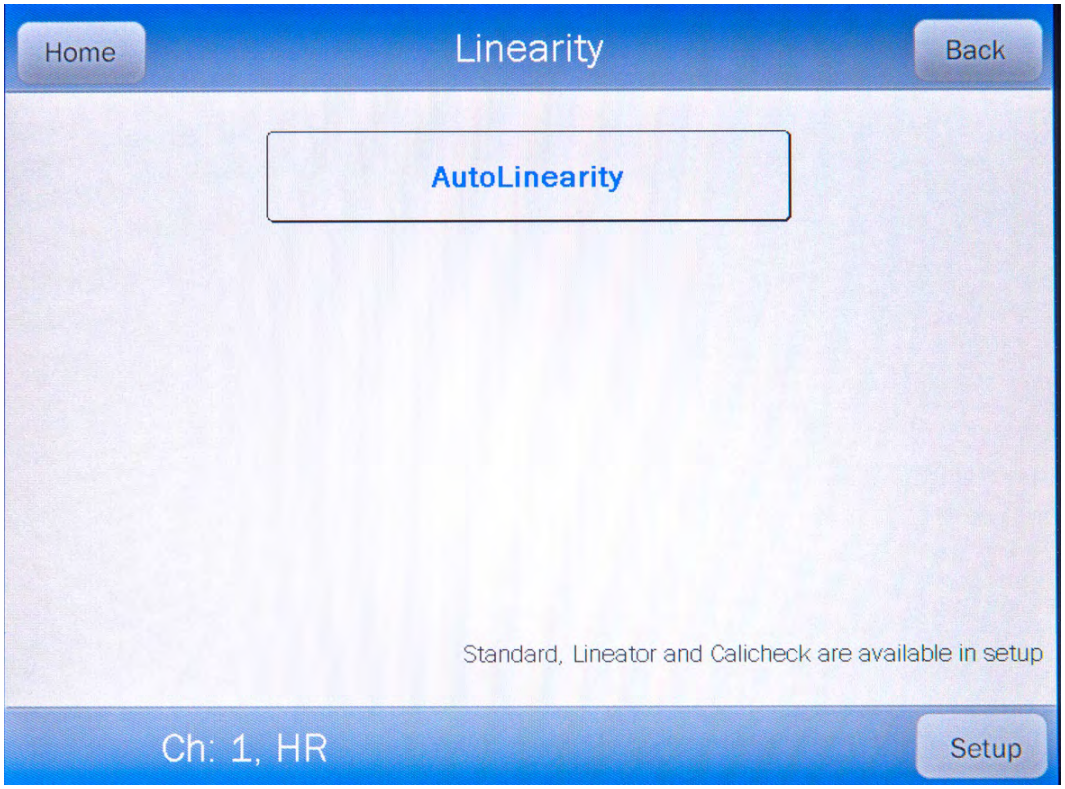

Figure 11-10 Default Linearity Tests Screen

If Linearity Test Method(s) have been defined, the Linearity screen will display the defined Linearity test(s).

AutoLinearity

AutoLinearity is an automated version of the Standard Linearity Test. The predicted activity is calculated in the same way. In addition, the results are stored in the database and reports can be printed.

This test is persistent. It can be paused and then resumed. If the power is turned off during the test, the data will not be lost.

Touch the **AUTOLINEARITY** button. Figure 11-11 Start AutoLinearity Screen will appear.

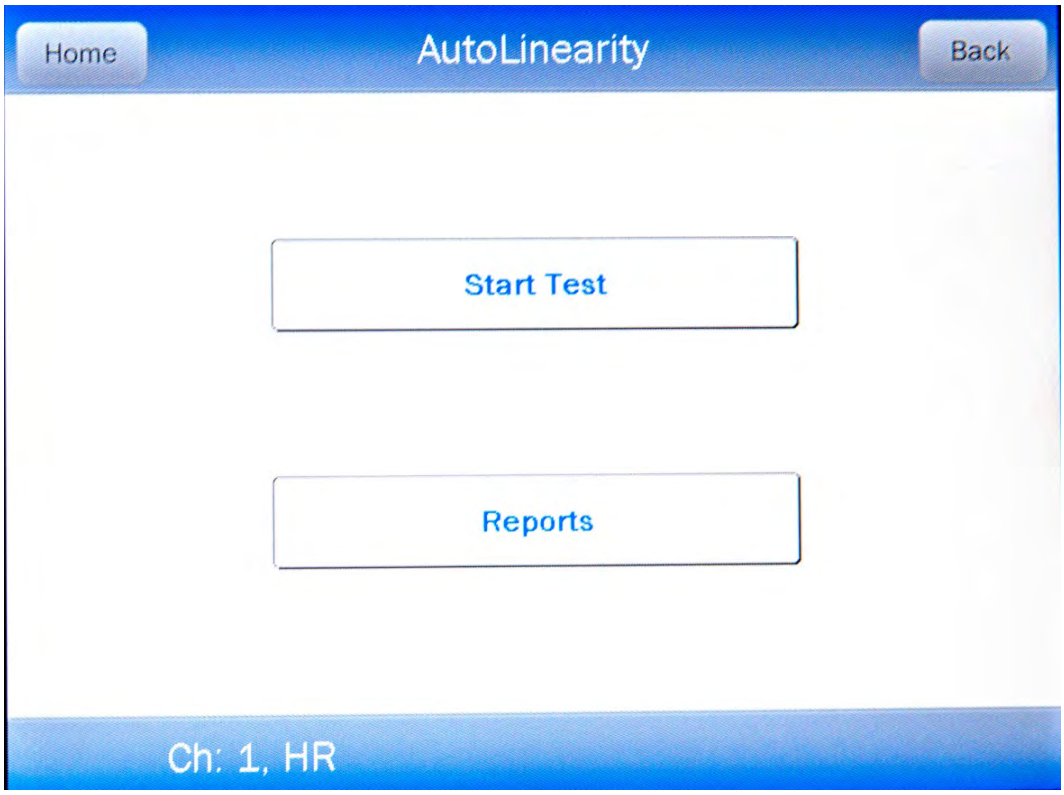

Figure 11-11 Start AutoLinearity Screen

To begin the test, touch the **START TEST** button. Figure 11-12 AutoLinearity Setup Screen will appear.

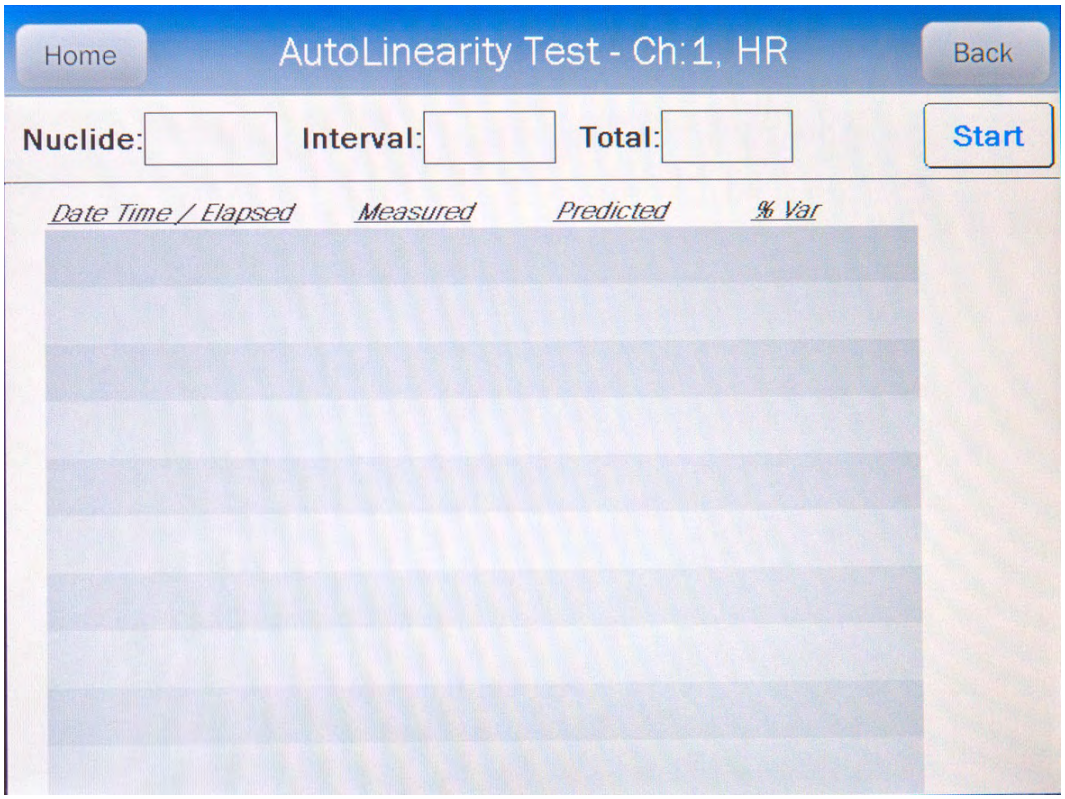

Figure 11-12 AutoLinearity Setup Screen

Selecting Nuclide

To select the nuclide to use for the Linearity Test, touch the ***Nuclide:*** field box. Figure 11-13 Select Nuclide Screen will appear.

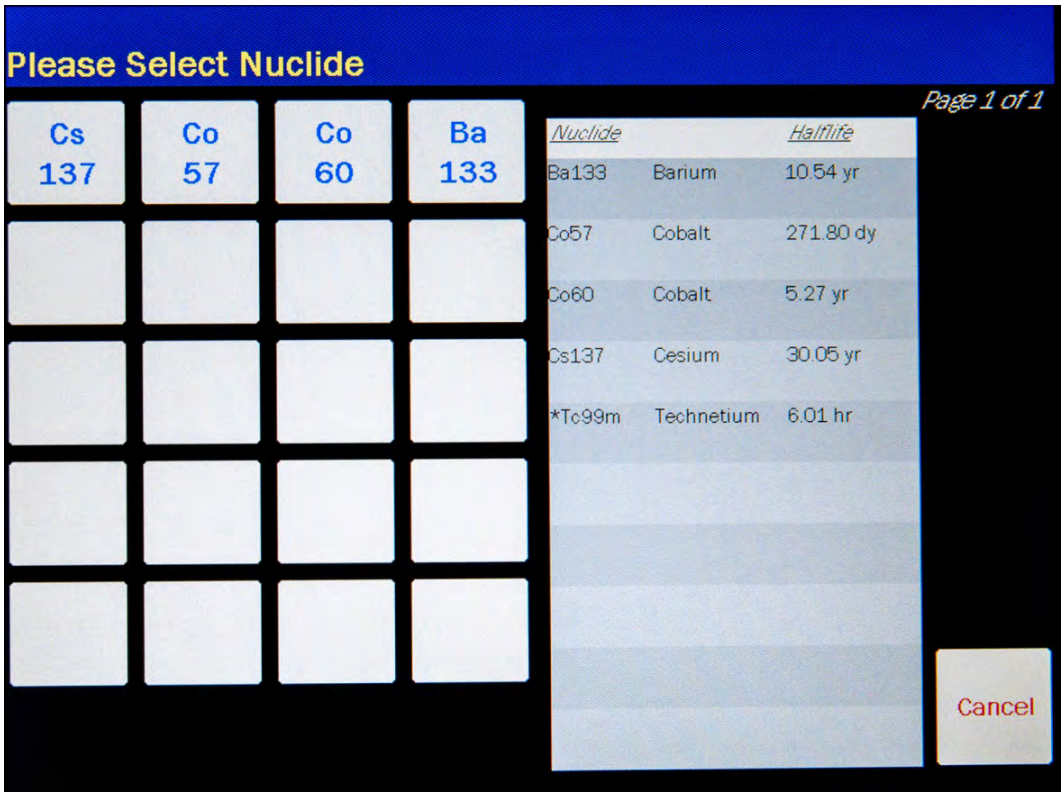

Figure 11-13 Select Nuclide Screen

The left half of the Select Nuclide screen contains the 20 preset **NUCLIDE** buttons. The right half of the screen displays a listing of nuclides stored in the calibrator's memory (both default and user added nuclides) that have a Calibration Number assigned to them (Reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: CALIBRATION NUMBERS) – 10 at a time.

The nuclide list is in alphabetical order. User added nuclides are displayed at the top of the list. The length of the list will vary depending on which nuclides have a Calibration Number assigned to them (Reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: CALIBRATION NUMBERS). The number of pages shown in the upper right corner of the screen indicates the length of the list. To scroll through the list, touch the **DOWN ARROW** (▼) button. The next group of 10 nuclides will be displayed and the **UP ARROW** (▲) button will appear allowing the user to scroll up in the list.

To cancel the nuclide selection and return to Figure 11-12 AutoLinearity Setup Screen, touch the **CANCEL** button.

To select a nuclide for measurement, do one of the following:

- Touch one of the preset **NUCLIDE** keys. Figure 11-12 AutoLinearity Setup Screen will re-appear with the selected nuclide name shown in the ***Nuclide:*** field box.

- Touch the Nuclide name on the list on the right. (If necessary, scroll the list until the desired nuclide is displayed.) Once a nuclide is selected from the list, an **ACCEPT** button will appear. Touch the **ACCEPT** button to use the selected nuclide. Figure 11-12 AutoLinearity Setup Screen will re-appear with the selected nuclide name shown in the chosen ***Nuclide:*** field box.

Setting Interval

The Interval is the time between measurements in minutes.

To set the desired Interval, touch the ***Interval:*** field box. Figure 11-14 Numeric Keypad Screen will appear.

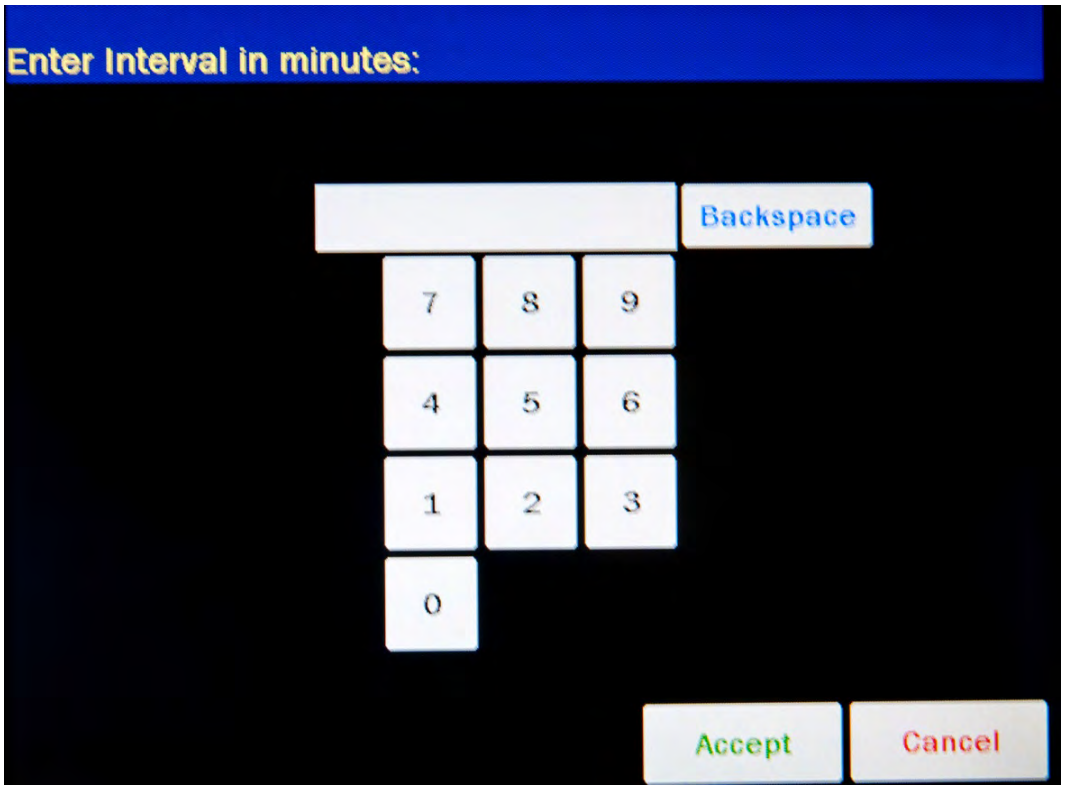

Figure 11-14 Numeric Keypad Screen

Input the desired Interval (in minutes) by touching the appropriate numbers on the keypad. Touch the **ACCEPT** button to accept the entered time. Figure 11-12 AutoLinearity Setup Screen will re-appear with the entered time shown in the Interval***:*** field box.

Note: *The minimum Interval that can be input is 5 minutes. The maximum Interval that can be input is 60 minutes.*

Setting Total

The Total is the total time for the test in hours.

To set the desired total time for the test, touch the ***Total:*** field box. Figure 11-14 Numeric Keypad Screen will appear.

Input the desired Total time (in hours) by touching the appropriate numbers on the keypad. Touch the **ACCEPT** button to accept the entered time. Figure 11-12 AutoLinearity Setup Screen will re-appear with the entered time shown in the ***Total:*** field box.

Note: *The minimum Total Time that can be input is 1 hour. The maximum Total Time that can be input is 100 hours.*

Starting the Test

Once all of the values have been entered, touch the **START** button. Figure 11-15 AutoLinearity Screen After Measurements Begin will appear.

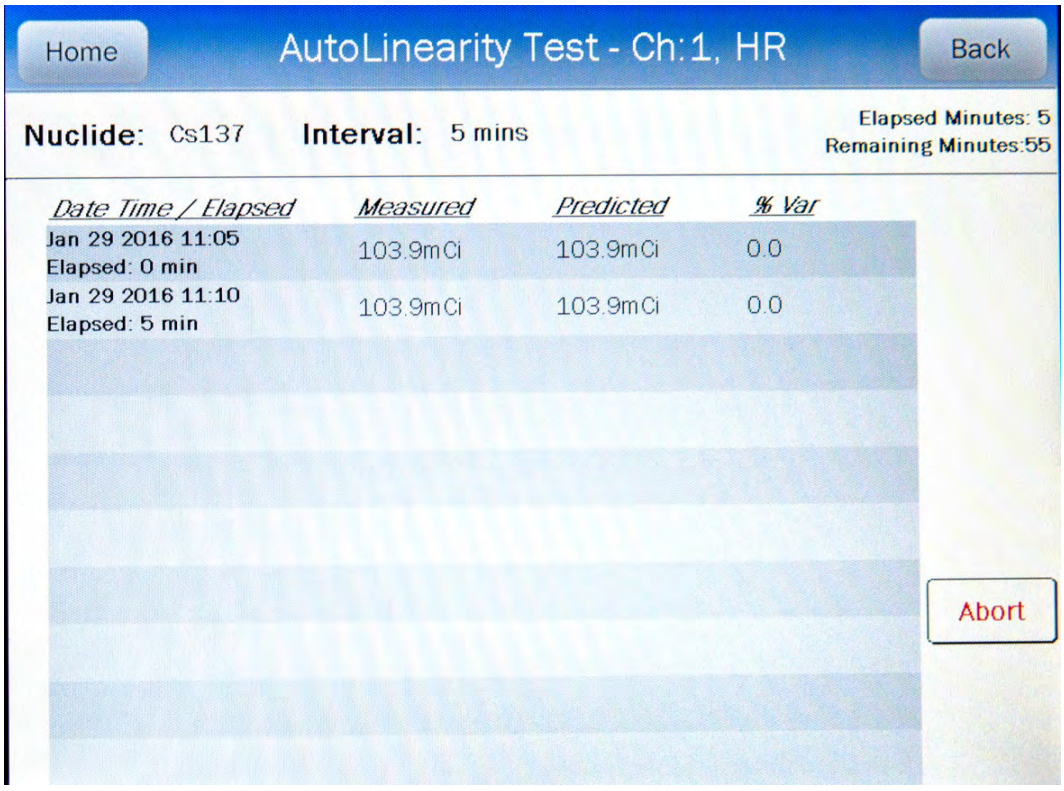

Figure 11-15 AutoLinearity Screen After Measurements Begin

The Elapsed Minutes and the Remaining Minutes are displayed at the upper right corner of the screen. There is a two minute wait to allow the measurement to stabilize before the test begins. This is indicated by the Elapsed Minutes showing -2.

After each measurement is made, the following information will be displayed:

- Date Time / Elapsed: This is the date and time of the measurement and the elapsed time since the test began.
- Measured Activity: This is the actual activity measured at the time of the measurement.
- Predicted Activity: This is the predicted decayed activity (based on the first measured value) at the time of the measurement.
- % Variation: This is the percentage variation of the measured value from the predicted value.

Pausing the Test

If it is required to use the Calibrator for other measurements while performing AutoLinearity, the test can be paused by touching the **BACK** or **HOME** button. The test data will be saved and the test can be resumed.

When the **BACK** button is touched, Figure 11-16 Pause AutoLinearity Test Screen – Back Button will appear.

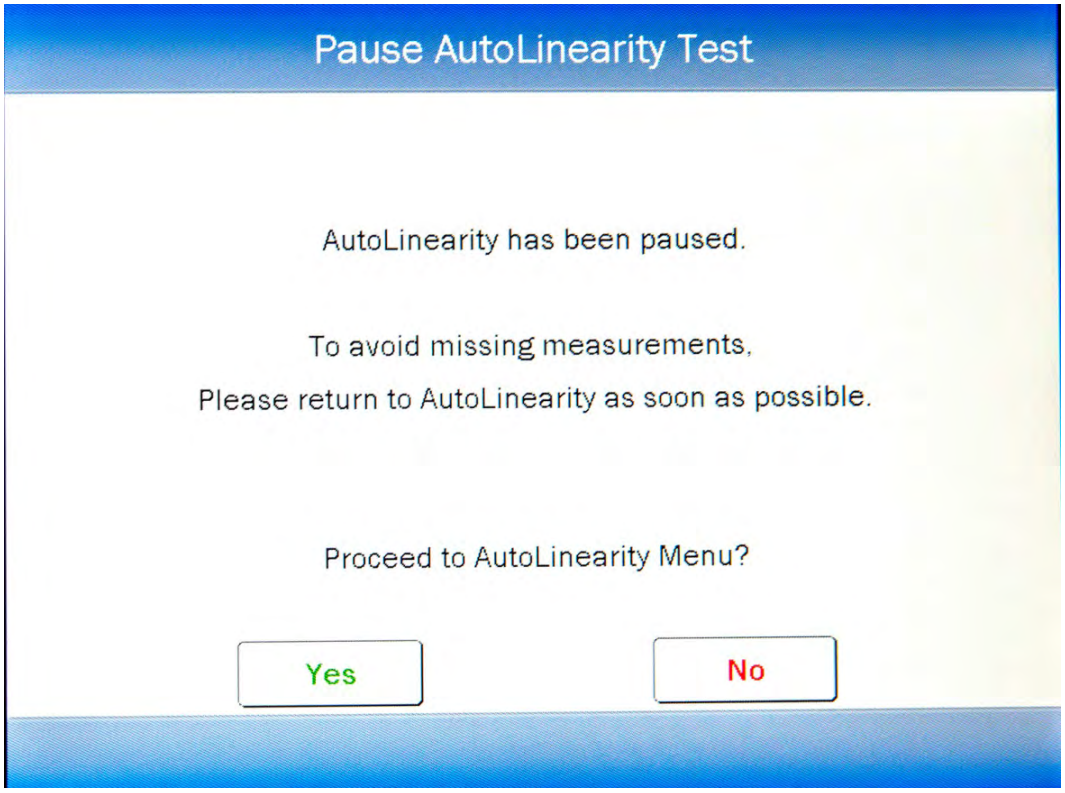

Figure 11-16 Pause AutoLinearity Test Screen – Back Button

Touch the **YES** button to proceed to Figure 11-18 AutoLinearity Menu Screen after Pause. Touch the **NO** button to return to Figure 11-15 AutoLinearity Screen After Measurements Begin.

When the **HOME** button is touched, Figure 11-17 Pause AutoLinearity Test Screen – Home Button will appear.

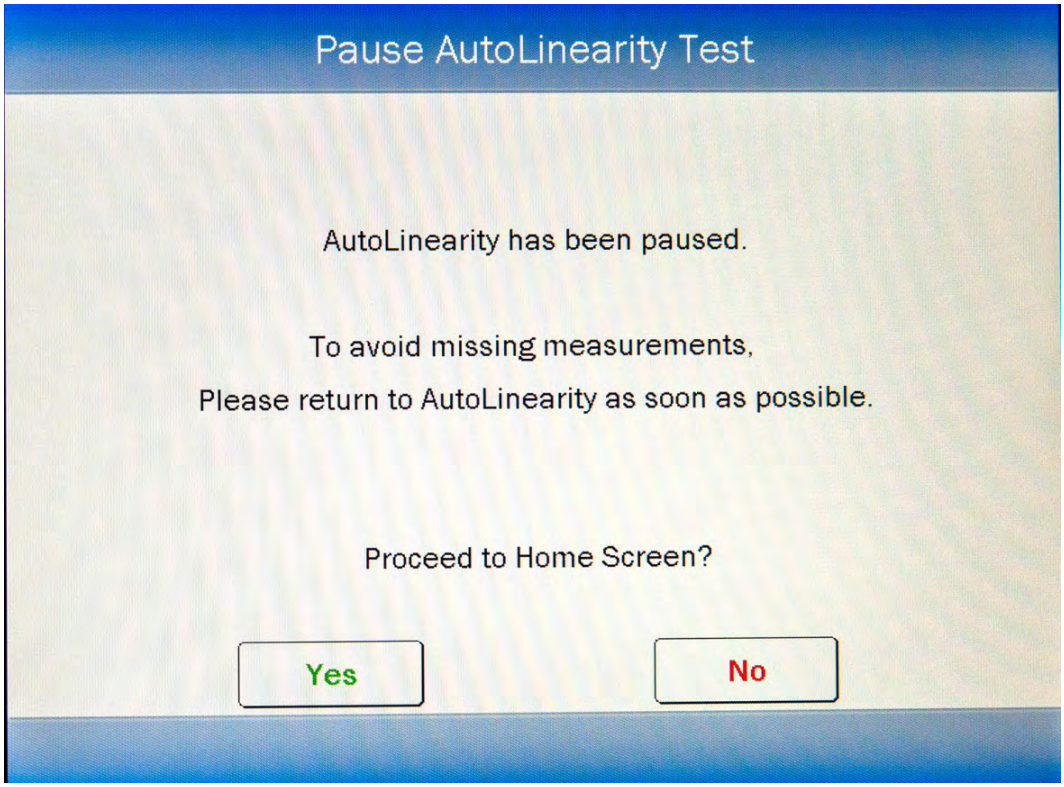

Figure 11-17 Pause AutoLinearity Test Screen – Home Button

Touch the **YES** button to proceed to the Measurement screen. Touch the **NO** button to return to Figure 11-15 AutoLinearity Screen After Measurements Begin.

After the test has been paused, the Measurement screen will display the message "**AutoLinearity Paused!!!**" on the bottom of the screen as a reminder to resume the test.

Resuming the Test

When AutoLinearity is selected after the test has been paused, Figure 11-18 AutoLinearity Menu Screen after Pause will appear.

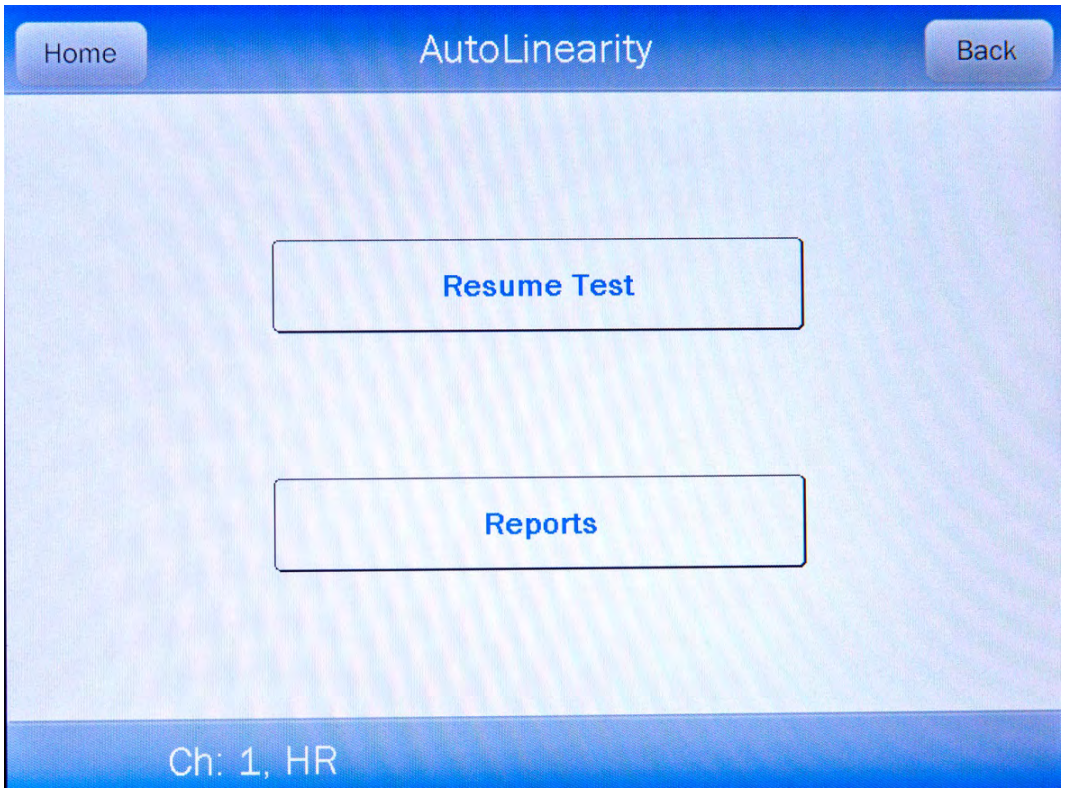

Figure 11-18 AutoLinearity Menu Screen after Pause

To continue the test, touch the **RESUME TEST** button. Figure 11-19 Resume AutoLinearity Test Screen will appear.

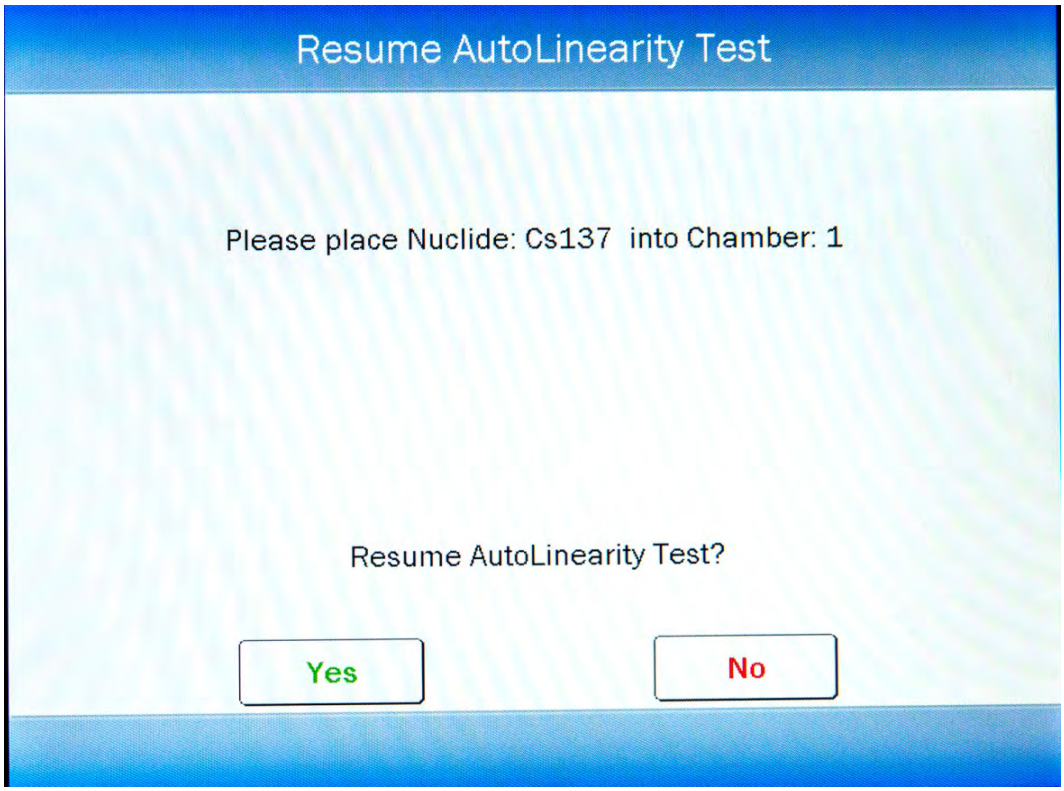

Figure 11-19 Resume AutoLinearity Test Screen

Touch the **YES** button to proceed to Figure 11-15 AutoLinearity Screen After Measurements Begin. Touch the **NO** button to return to Figure 11-18 AutoLinearity Menu Screen after Pause.

When the measurement screen reappears, any missed measurements will be marked as “Paused” in the Measured column. The measurements marked “Paused” are lost and cannot be recovered.

Aborting a Test

Aborting an In-progress Test

A test in-progress can be aborted by touching the **ABORT** button while the test is still in-progress. Figure 11-20 Abort AutoLinearity Test In-progress Screen will appear.

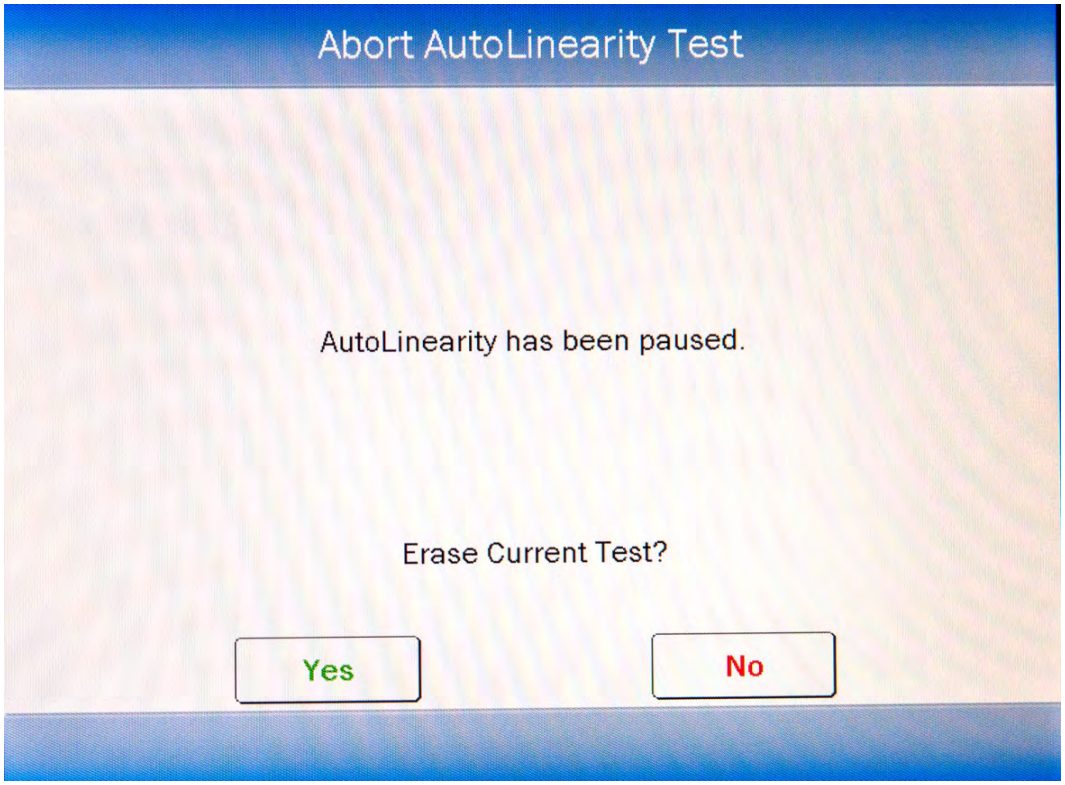

Figure 11-20 Abort AutoLinearity Test In-progress Screen

Touch the **YES** button to erase the current test data. The data will be erased and Figure 11-12 AutoLinearity Setup Screen will re-appear.

Touch the **NO** button to return to the test in-progress.

Aborting a Finished Test

A finished test can be aborted by touching the **ABORT** button after the test has finished. Figure 11-21 Abort AutoLinearity Test After Finished Screen will appear.

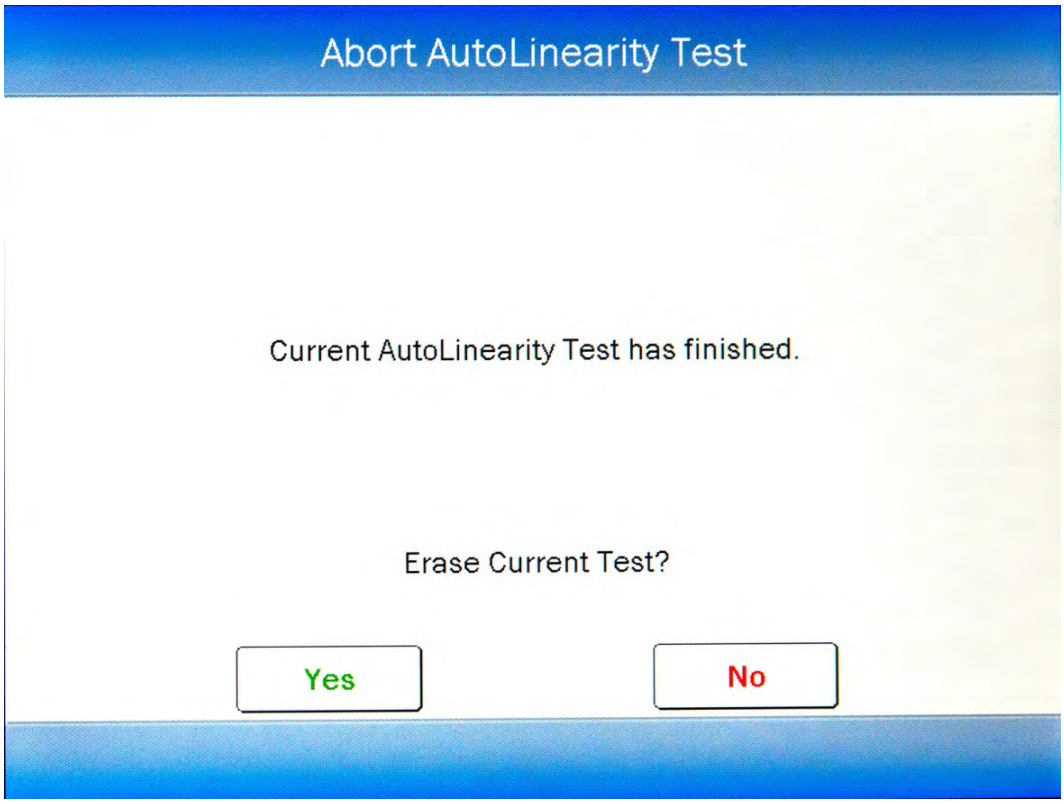

Figure 11-21 Abort AutoLinearity Test After Finished Screen

Touch the **YES** button to erase the current test data. The data will be erased and Figure 11-12 AutoLinearity Setup Screen will re-appear.

Touch the **NO** button to return to the finished test as shown in Figure 11-24 AutoLinearity Test Finished Screen.

Saving the Test

After 5 measurements have been made, a **SAVE** button will appear as shown in Figure 11-22 AutoLinearity Screen with Save Button.

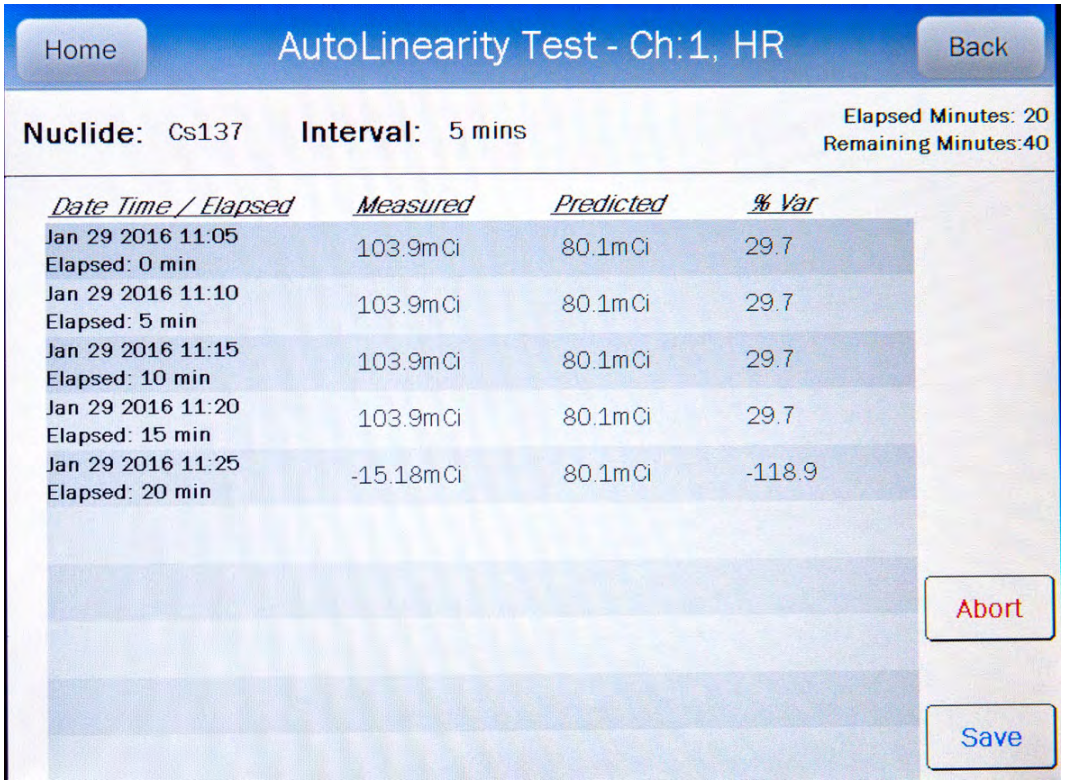

Figure 11-22 AutoLinearity Screen with Save Button

Saving an In-progress Test

A test in-progress can be saved by touching the **SAVE** button while the test is still in-progress. Figure 11-23 Save AutoLinearity Test In-progress Screen will appear.

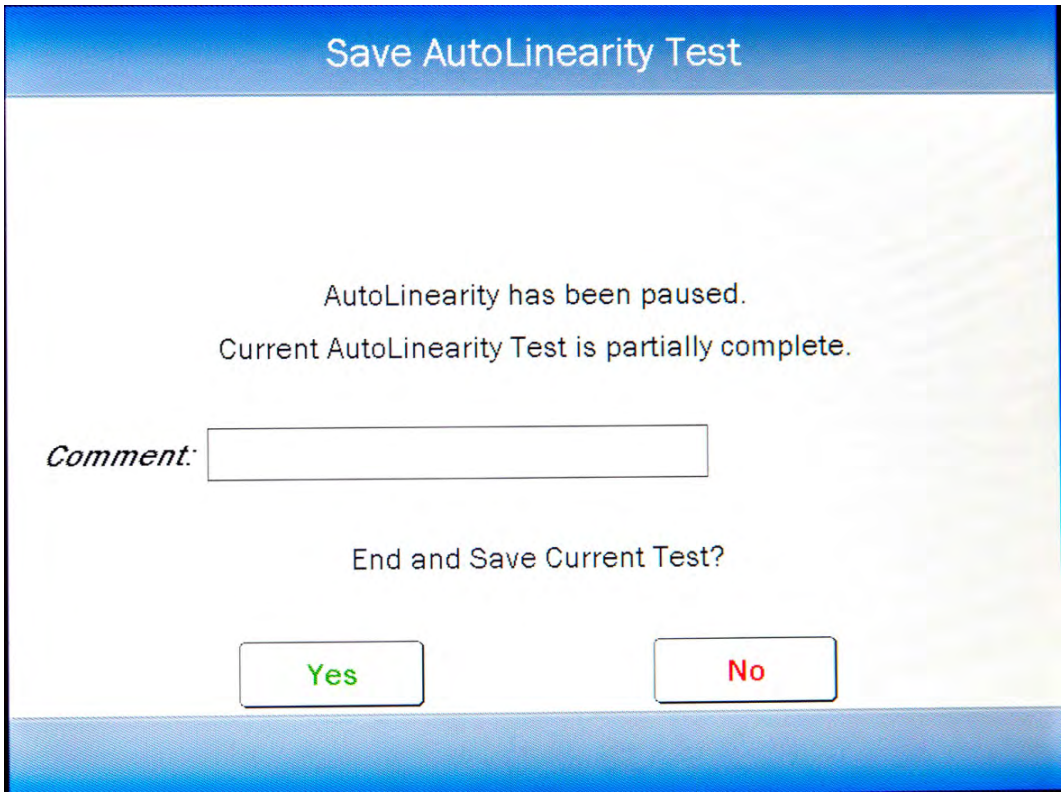

Figure 11-23 Save AutoLinearity Test In-progress Screen

If so desired, input a comment. Touch the **YES** button to save the current test data. The data will be saved and Figure 11-12 AutoLinearity Setup Screen will re-appear. The test will be finished and cannot be restarted.

Touch the **NO** button to return to Figure 11-15 AutoLinearity Screen After Measurements Begin.

Saving a Finished Test

When the test is finished, the message “Finished!!!” will appear in the upper right of the screen as shown in Figure 11-24 AutoLinearity Test Finished Screen.

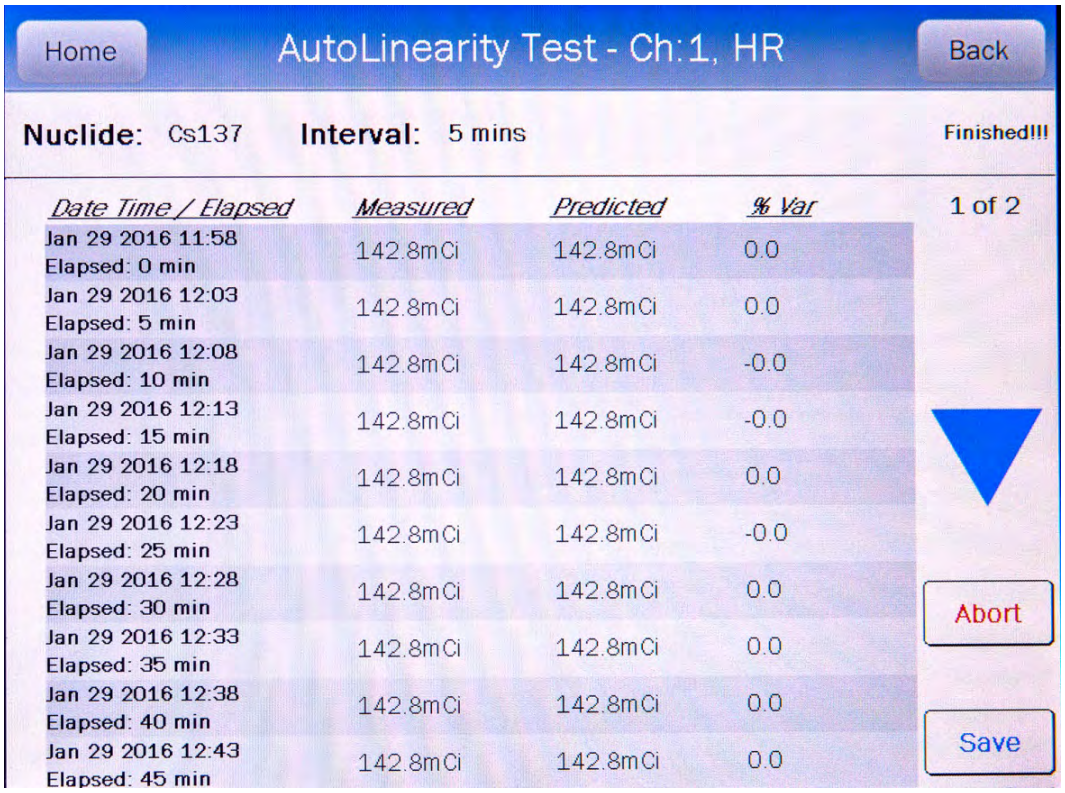

Figure 11-24 AutoLinearity Test Finished Screen

A finished test can be saved by touching the **SAVE** button after the test has finished. Figure 11-25 Save AutoLinearity Test After Finished Screen will appear.

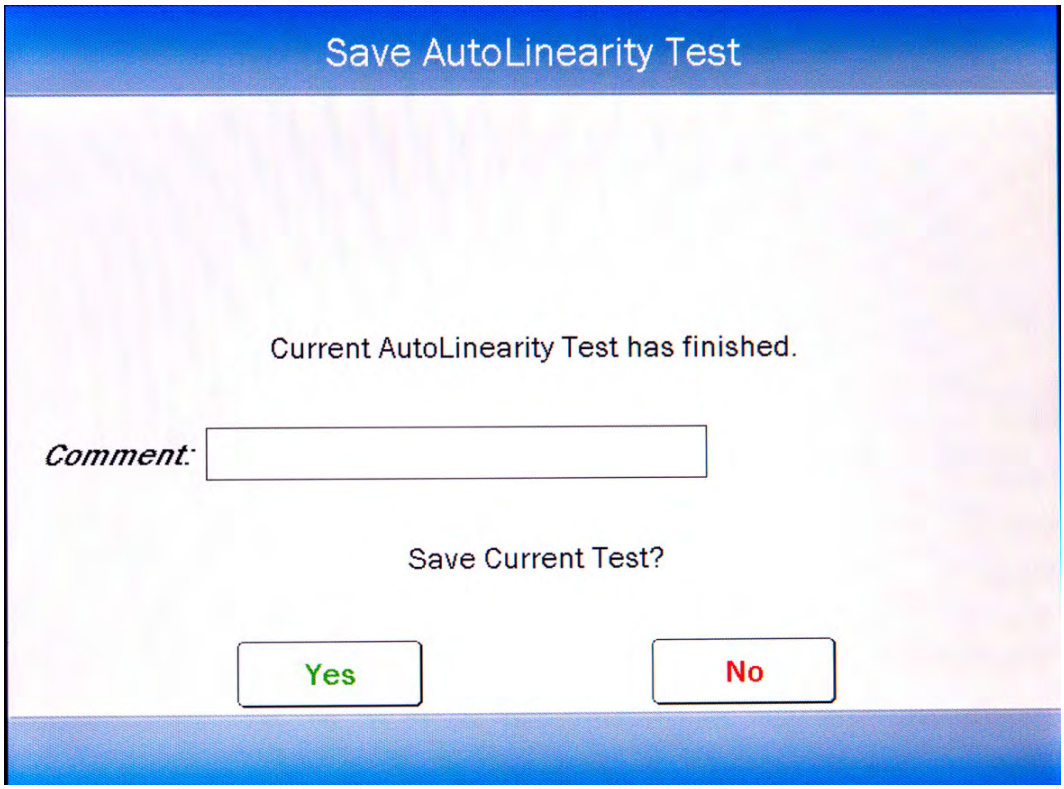

Figure 11-25 Save AutoLinearity Test After Finished Screen

If so desired, input a comment. Touch the **YES** button to save the current test data. The data will be saved and Figure 11-12 AutoLinearity Setup Screen will re-appear. The test will be finished and cannot be restarted.

Touch the **NO** button to return to Figure 11-24 AutoLinearity Test Finished Screen.

Power Failure

If the power goes off during a test, the data will not be lost. On power-up, the system will automatically return to the AutoLinearity Test that was in-progress.

Any measurements missed while the power was off will be marked as “Power Failure” in the Measured column. The measurements marked “Power Failure” are lost and cannot be recovered.

AutoLinearity Reports

To view or print a report of a desired AutoLinearity Test, touch the **REPORTS** button from Figure 11-11 Start AutoLinearity Screen or Figure 11-18 AutoLinearity Menu Screen after Pause. Figure 11-26 Search AutoLinearity Tests Screen will appear.

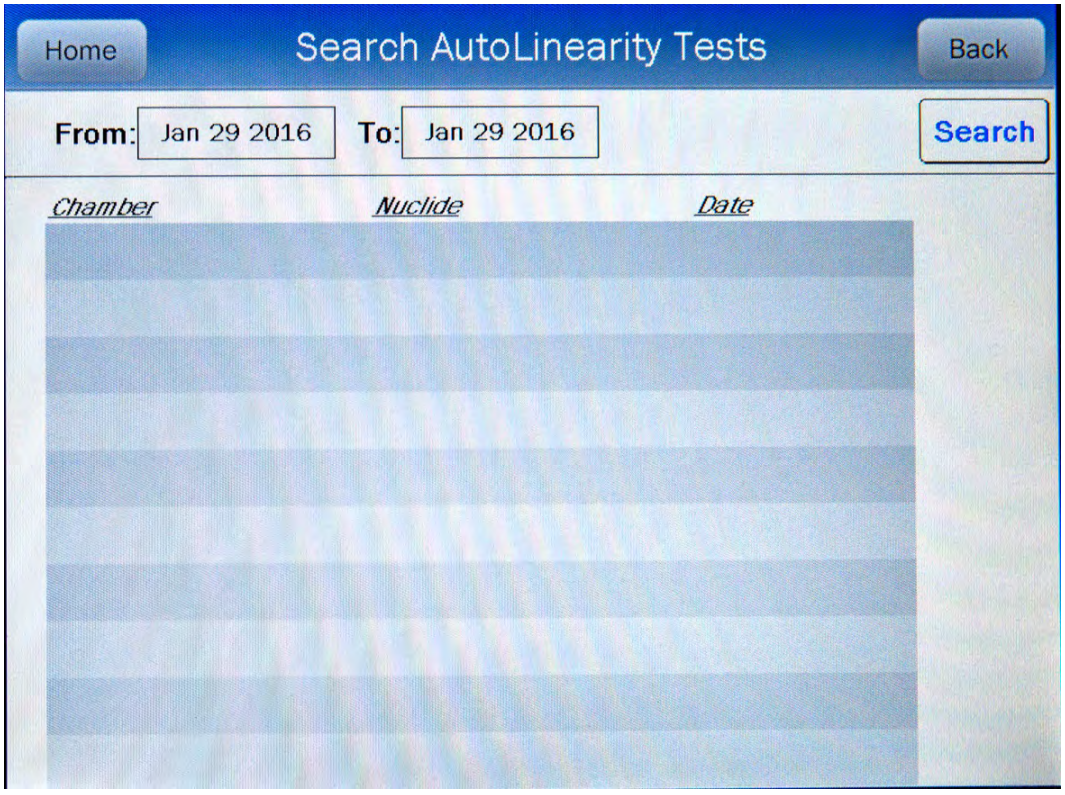

Figure 11-26 Search AutoLinearity Tests Screen

Set Date

The AutoLinearity Test results are searchable by using a date range. The default ***From:*** and ***To:*** dates are "today".

To change the From date, touch the ***From:*** field box. The Enter Start Date screen will appear.

The screen displays the currently set date. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

Touch the **ACCEPT** button to accept the set date or the **CANCEL** button to cancel any changes. Figure 11-26 Search AutoLinearity Tests Screen will re-appear showing the set ***From:*** date.

To change the To date, touch the **To:** field box. The Enter End Date screen will appear.

The screen displays the currently set date. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

Touch the **ACCEPT** button to accept the set date or the **CANCEL** button to cancel any changes. Figure 11-26 Search AutoLinearity Tests Screen will re-appear showing the set ***To:*** date.

Search

When the From and To dates are correct, touch the **SEARCH** button. The screen displays a listing of the data for the AutoLinearity Tests performed within the specified date range.

Note: *If the search results in more than 100 items, the message "**Search AutoLinearity Test Error** More than 100 items have been returned Please refine criteria" will appear. Refine the search by narrowing the date range to search for.*

To exit Figure 11-26 Search AutoLinearity Tests Screen,

- touch the **BACK** button – Figure 11-11 Start AutoLinearity Screen or Figure 11-18 AutoLinearity Menu Screen after Pause will re-appear or
- touch the **HOME** button – the Measurement screen will appear.

The listing is in reverse chronological order (newest at the top of the list). The length of the list will vary depending on how many AutoLinearity Tests have been performed between the selected dates. If there are more than 10 results, the number of pages (or screens) will be shown in the upper right corner of the screen indicating the length of the list. To scroll through the list, touch the **DOWN ARROW** (▼) button. The next group of 10 results will be displayed and the **UP ARROW** (▲) button will appear allowing the user to scroll up in the list.

View Test Details

To obtain a detailed report for a particular AutoLinearity Test result, touch the desired result on the list. The result will become highlighted and a **VIEW** button will appear on the screen similar to that shown in Figure 11-27 Search AutoLinearity Tests Screen with Test Highlighted. (If necessary, scroll the list until the desired result is displayed.)

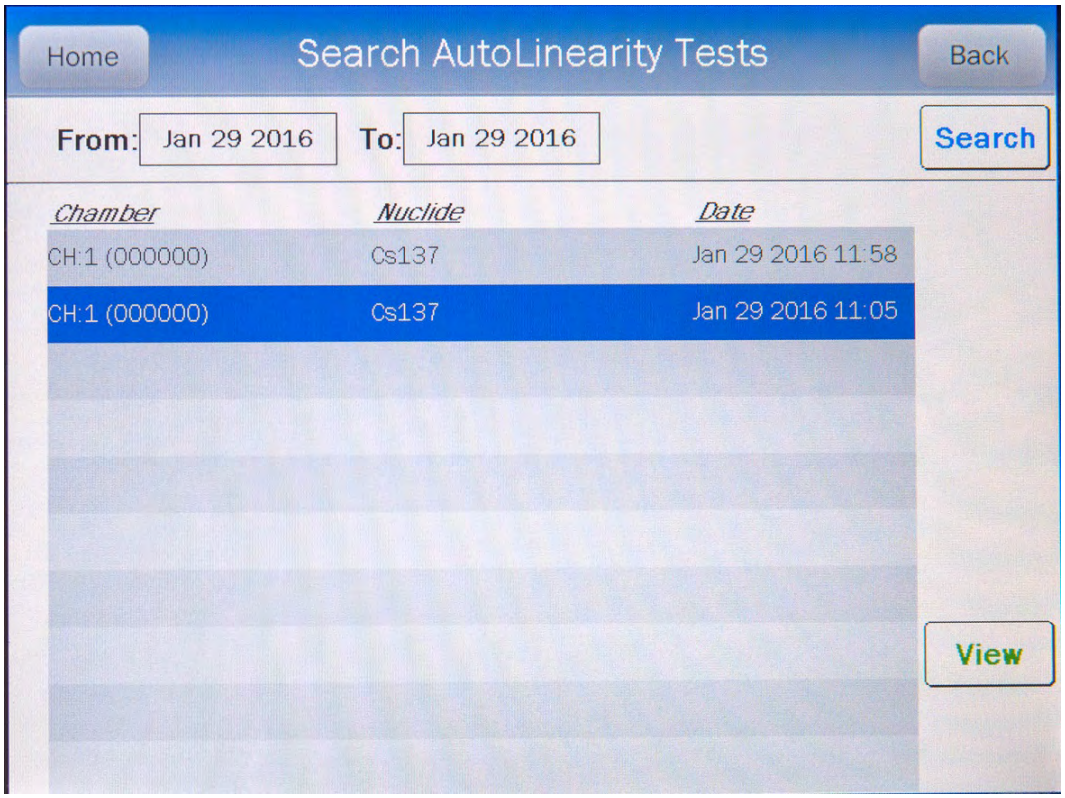

Figure 11-27 Search AutoLinearity Tests Screen with Test Highlighted

Touch the **VIEW** button. Figure 11-28 AutoLinearity Report Screen will appear displaying the detailed report for the selected AutoLinearity Test result.

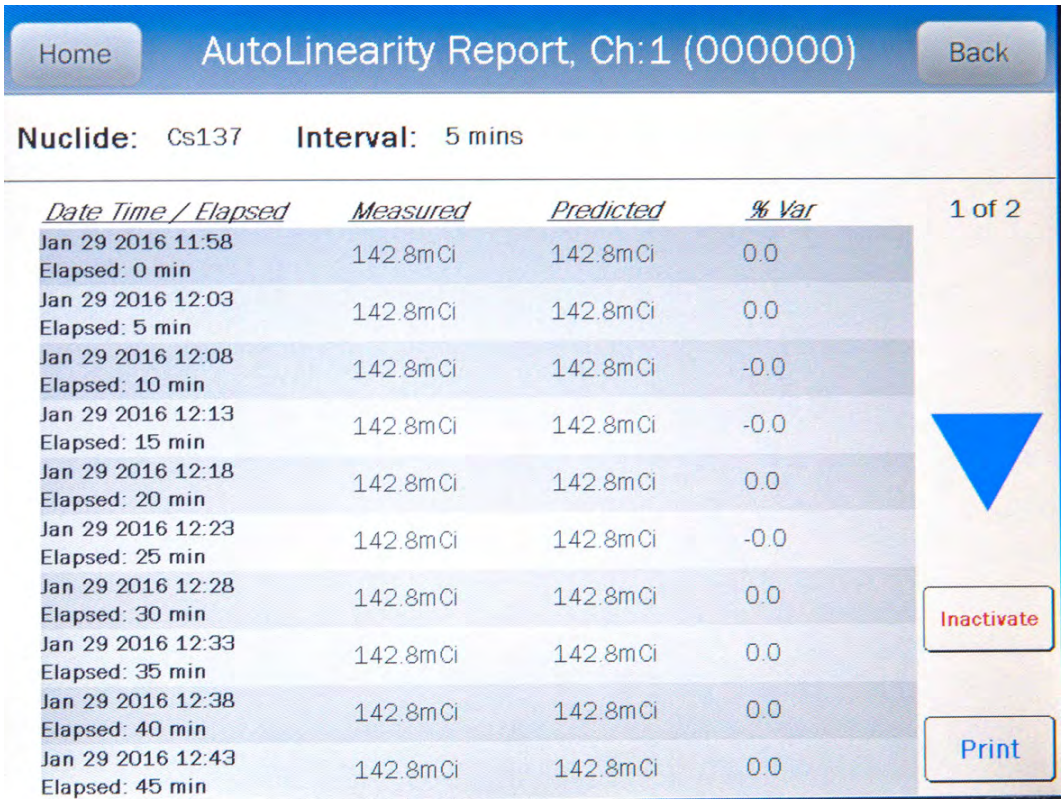

Figure 11-28 AutoLinearity Report Screen

The following sections describe the functions that are available from Figure 11-28 AutoLinearity Report Screen.

Print Results

If a printer is attached to the system, the detailed report of the selected AutoLinearity Test result can be printed by touching the **PRINT** button.

Inactivate an AutoLinearity Test

An AutoLinearity Test result can be inactivated. Reasons for doing this can be:

- the test was a simulation for training,
- a mistake was made doing the test, etc.

The AutoLinearity Test result will still be saved in the database. When the test is displayed on the list, it will be shown with a line through the characters. When the individual report is printed, “INACTIVE” and the optional comment will appear.

To inactivate the selected AutoLinearity Test, touch the **INACTIVATE** button. Figure 11-29 Inactivate Record Screen will appear.

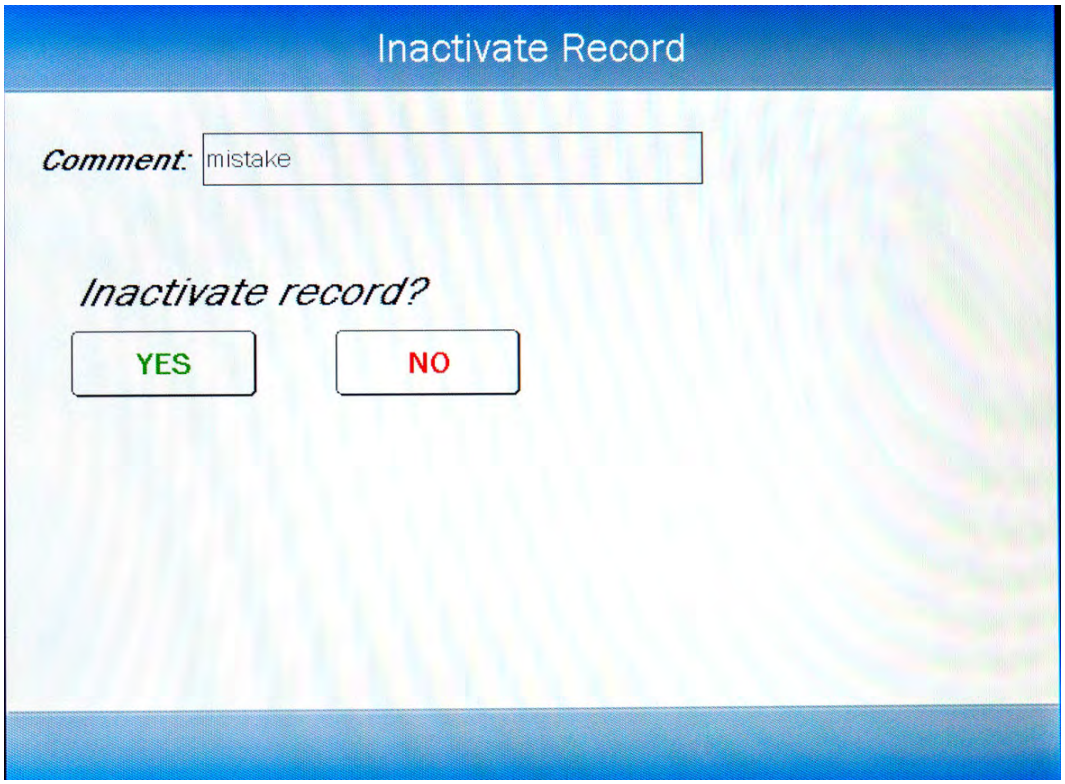

Figure 11-29 Inactivate Record Screen

To enter an optional comment (description or reason) for the selected AutoLinearity Test result inactivation, touch the ***Comment:*** field box. Figure 11-30 Alphanumeric Keypad Screen will appear.

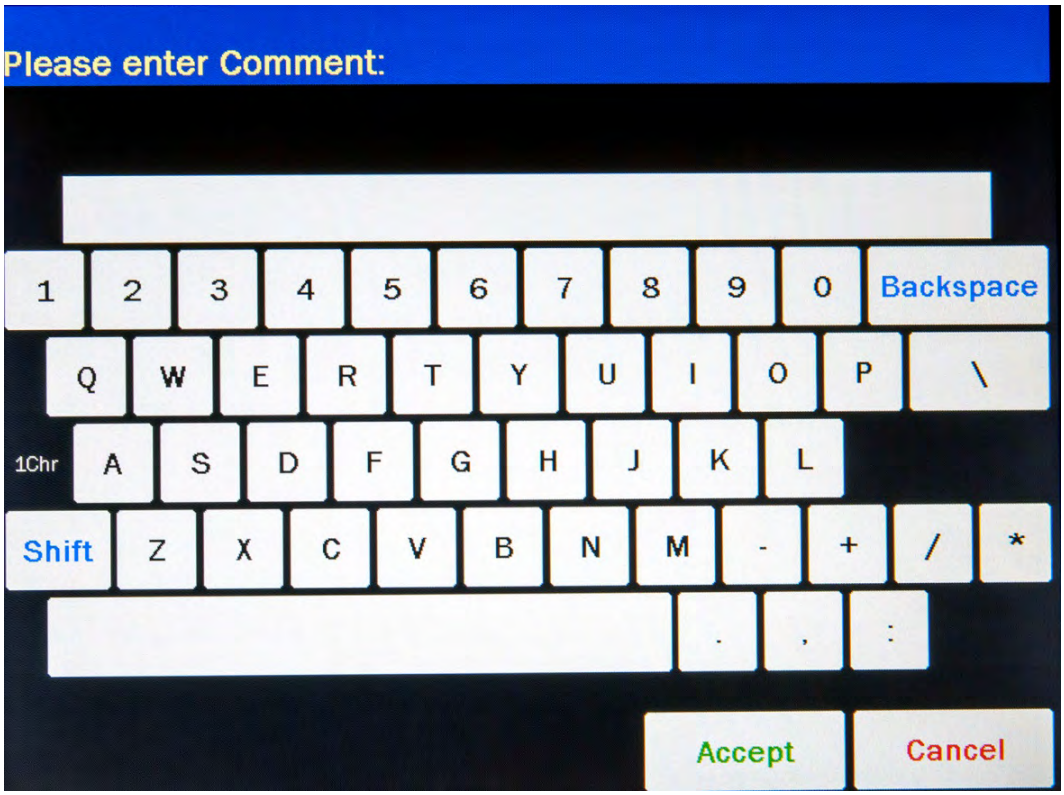

Figure 11-30 Alphanumeric Keypad Screen

Input the desired comment (description or reason) for the invalidation and touch the **ACCEPT** button. Figure 11-29 Inactivate Record Screen will re-appear with the ***Comment:*** field box populated with the entered comment. The comment can contain any combination of 22 alphanumeric characters maximum.

To cancel any changes and return to Figure 11-29 Inactivate Record Screen, touch the **CANCEL** button.

To complete the inactivation of the selected AutoLinearity Test result, touch the **YES** button.

If it is decided not to inactivate the selected AutoLinearity Test result, touch the **NO** button.

Standard Test

If the Standard Linearity Test has been defined, the **STANDARD** button will be displayed on the screen.

The Standard Test is normally performed by tracking the decay of a strong Tc99m source. However, the required nuclide was defined in the setup.

The Standard Test measures the activity of the selected nuclide over a defined period of time. When the defined number of measurements have been made, a least-squares fit is performed and the deviation of the results from this fit are reported.

First Measurement

To begin the Standard Linearity Test, touch the **STANDARD** button. Place the required linearity source in the Chamber. The activity of the source will be displayed.

Touch the **ACCEPT** button to accept the measurement. Figure 11-31 Standard Linearity Test Remaining Measurements Screen will appear showing percentage variance for the first (base) measurement and the times to perform the remaining measurements.

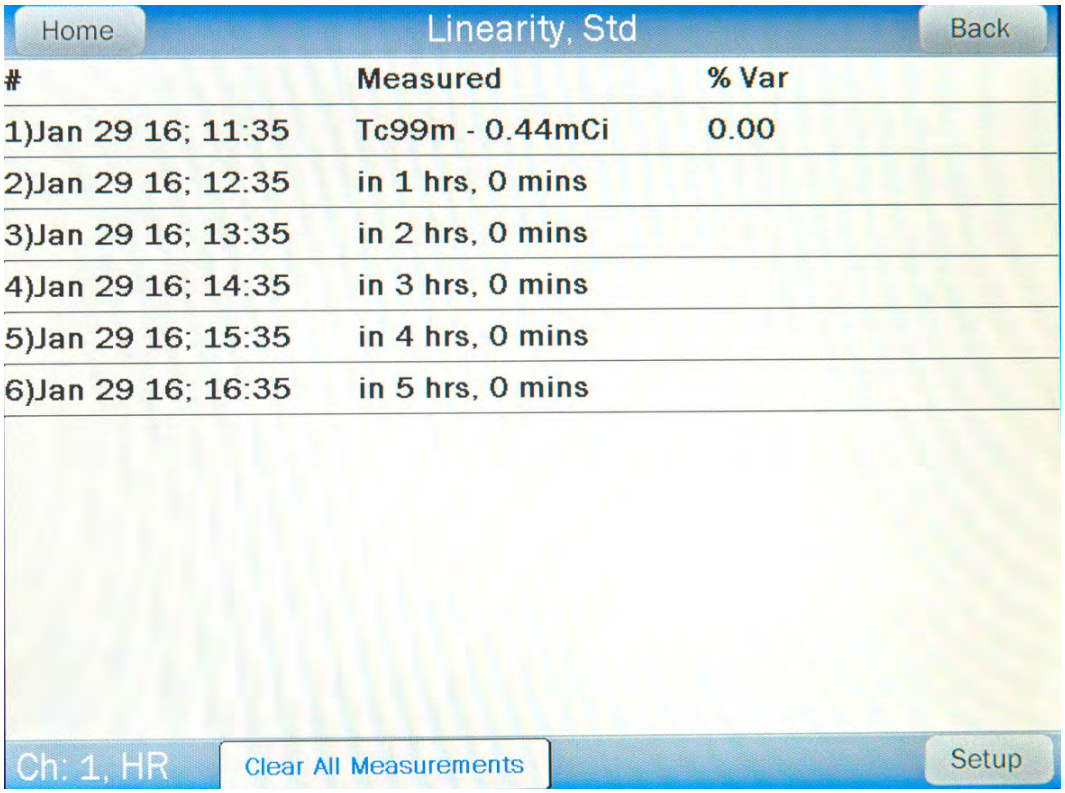

Figure 11-31 Standard Linearity Test Remaining Measurements Screen

To repeat the measurement, touch the **CLEAR ALL MEASUREMENTS** button. Touch the **ACCEPT** button to accept the measurement. Figure 11-31 Standard Linearity Test Remaining Measurements Screen will re-appear showing percentage variance for the first (base) measurement and the times to perform the remaining measurements.

At this time, note the times of the remaining measurements.

Second through Last Measurements

Perform the remaining measurements at time intervals close those entered when the test was defined. The actual elapsed time will be used in the calculations.

From Figure 11-1 Measurement Screen, touch the **ENHANCED TESTS** button. The Enhanced Tests screen will appear.

Touch the **LINEARITY** button. The Linearity screen will appear.

Touch the **STANDARD** button. Figure 11-32 Standard Linearity Test Results Screen will appear.

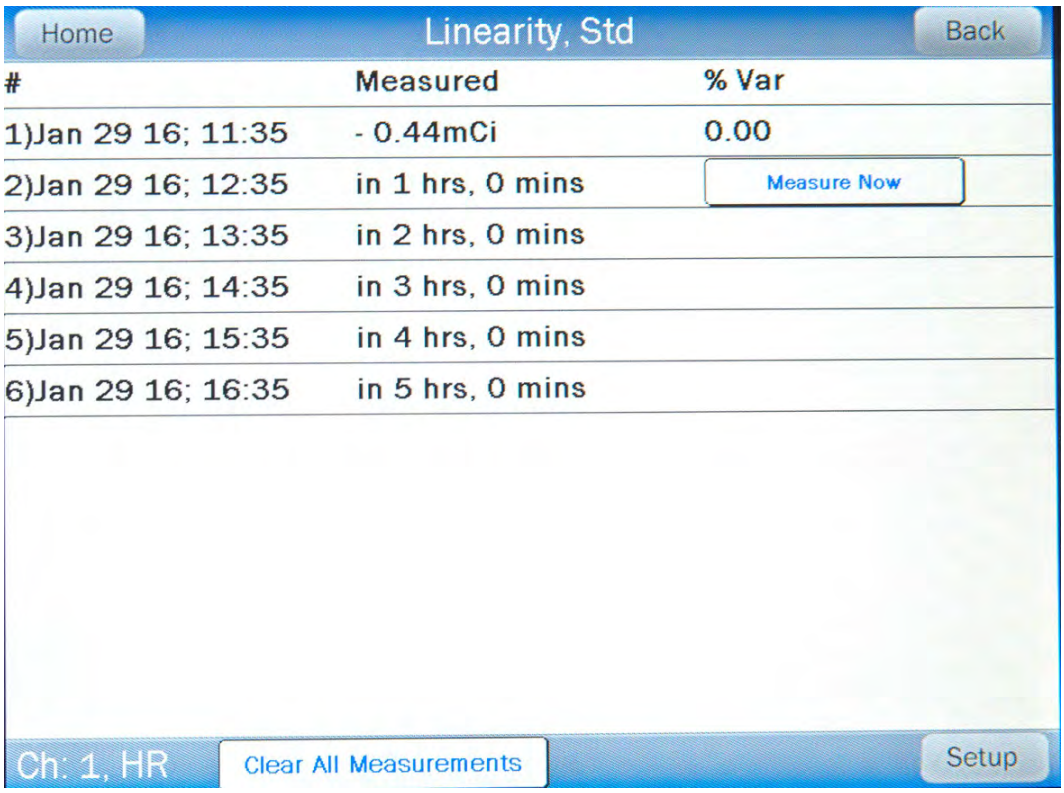

Figure 11-32 Standard Linearity Test Results Screen

The percentage variance from the base measurement is displayed after each measurement.

To repeat all measurements and start the test over, touch the **CLEAR ALL MEASUREMENTS** button. All measurements will be cleared.

If a printer is attached to the system, the Standard Linearity Test report can be printed by touching the **PRINT** button

Touch the **BACK** button to exit the Standard Linearity Test results and return to the Linearity screen.

Touch the **HOME** button to exit the Standard Linearity Test results and return to Figure 11-1 Measurement Screen.

Lineator Test

If the Lineator Linearity Test has been defined, the **LINEATOR** button will be displayed on the screen.

The Lineator Test requires 8 measurements using a strong Tc99m source along with a Lineator Test tube set.

The purpose of this test is to perform linearity quickly and not have to wait the time required to perform the Standard Linearity test. This is accomplished by measuring the attenuation of the tubes surrounding the source and storing the results. At any time, the tubes are used to confirm that the attenuation has not changed.

The Lineator Test steps the user through the measurement of each tube.

To begin the Lineator Linearity Test, touch the **LINEATOR** button. Figure 11-33 Lineator Linearity Test First Measurement Screen will appear.

Figure 11-33 Lineator Linearity Test First Measurement Screen

Remove the Dipper from the Chamber (leaving the Liner in place) and place the Tc99m test source into Tube 1 and then place Tube 1 into the Chamber. The activity of the source will be displayed as shown in Figure 11-33 Lineator Linearity Test First Measurement Screen.

Touch the **ACCEPT** button to accept the measurement. Figure 11-33 Lineator Linearity Test First Measurement Screen will now show the factor and the ratio for the first tube. The factor will be always 1.00 and the ratio will always be 100.00% since this is the first (base) measurement.

Place the requested tube(s) into the Chamber. Touch the **ACCEPT** button to accept the measurement. Figure 11-33 Lineator Linearity Test First Measurement Screen will now show the current factor and the current ratio for the measured tube(s).

Repeat the above steps for the remaining combination of tubes as indicated.

Review the ***% Ratio*** column. This is the ratio of the current factor to the initial factor determined when performing the Lineator Calibration procedure (reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: LINEARITY TEST DEFINITION, Lineator Test). Verify that each ratio is within the specified limits for the facility's license.

If a printer is attached to the system, a **PRINT** button will appear on the screen. Touch the **PRINT** button to print the Lineator Linearity Test results.

Touch the **BACK** button to exit the Lineator Linearity Test results and return to the Linearity screen.

Touch the **HOME** button to exit the Lineator Linearity Test results and return to Figure 11-1 Measurement Screen.

Calicheck Test

If the Calicheck Linearity Test has been defined, the **CALICHECK** button will be displayed on the screen.

The Calicheck Test requires between 5 and 12 measurements (as defined in the Calicheck Setup – reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: LINEARITY TEST DEFINITION, Lineator Test) using a strong Tc99m source along with a Calicheck Test tube set.

The purpose of this test is to perform linearity quickly and not have to wait the time required to perform the Standard Linearity test. This is accomplished by measuring the attenuation of the tubes surrounding the source and storing the results. At any later time, the tubes are used to confirm that the attenuation has not changed.

The Calicheck Test steps the user through the measurement of each tube.

To begin the Calicheck Linearity Test, touch the **CALICHECK** button. Figure 11-34 Calicheck Linearity Test First Measurement Screen will appear for the first measurement. The examples shown are for 5 tubes.

Figure 11-34 Calicheck Linearity Test First Measurement Screen

Remove the Dipper from the Chamber (leaving the Liner in place). Place the Tc99m test source into the Black Tube and then place the Tube into the Chamber. The activity of the source will be displayed as shown in Figure 11-34 Calicheck Linearity Test First Measurement Screen.

Touch the **ACCEPT** button to accept the measurement. Figure 11-35 Calicheck Linearity Test Next Measurement Screen will now show the measurement result and the Percent Variance from the Mean for the Black Tube. The Percent Variance will always be 0.00 since this is the first measurement.

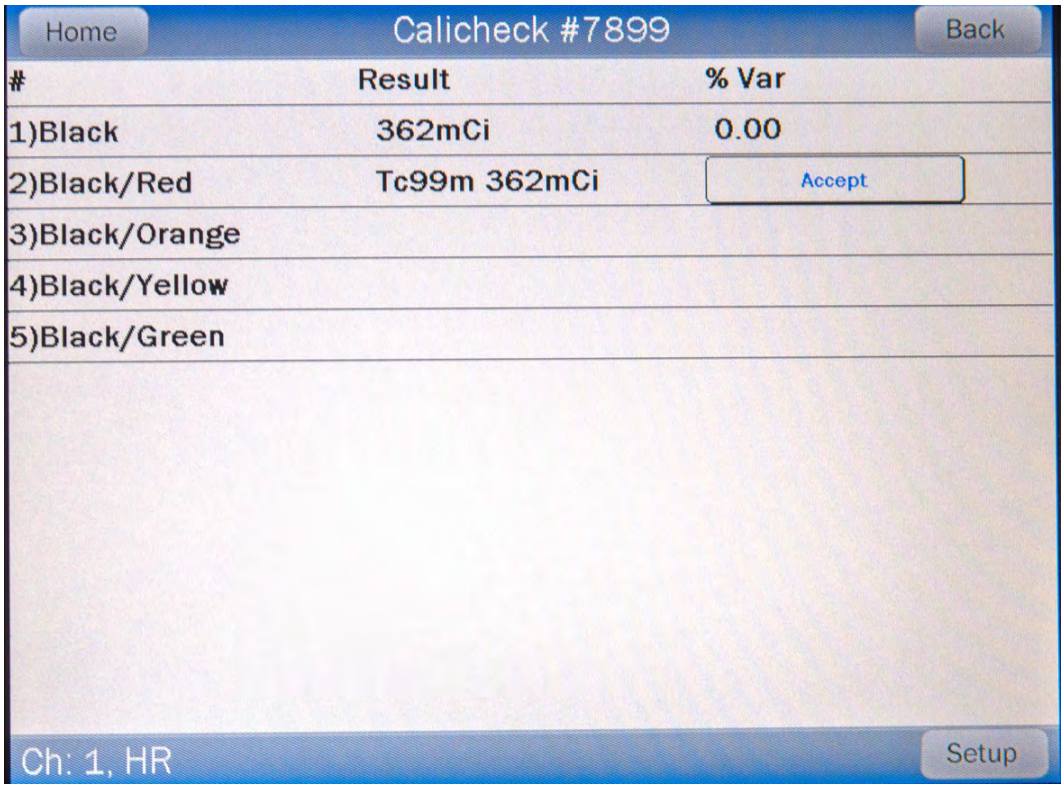

Figure 11-35 Calicheck Linearity Test Next Measurement Screen

Place the requested tube(s) into the Chamber. Touch the **ACCEPT** button to accept the measurement. Figure 11-35 Calicheck Linearity Test Next Measurement Screen will now show the measurement result and the current Percent Variance from Mean for the measured tube(s) and the adjusted Percent Variance from Mean for the previously measured tube(s).

Repeat the above steps for the remaining combination of tubes as indicated.

Review the ***Result*** and ***% Var*** columns. The screen shows the Result and the Percent Variation from Mean for each tube. The Result is the actual measurement for the selected tube multiplied by the corresponding Calibration Factor that was determined when the Calicheck Calibration procedure was performed (reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: LINEARITY TEST DEFINITION, Calicheck Test). The Mean is the sum of the Results divided by the total number of measurements performed. The Percent Variance is the ratio of the Result to the Mean.

Verify that each Percent Variance is within the specified limits for the facility's license.

If a printer is attached to the system, a **PRINT** button will appear on the screen. Touch the **PRINT** button to print the Calicheck Linearity Test results.

Touch the **BACK** button to exit the Calicheck Linearity Test results and return to the Linearity screen.

Touch the **HOME** button to exit the Calicheck Linearity Test results and return to Figure 11-1 Measurement Screen.

HALF-LIFE CALCULATOR

The Half-life Calculator calculates the half-life of a nuclide from a series of sequential measurements. The half-life is determined thru the least squares linear regression method.

To begin the Half-life Calculator, touch the **HALF-LIFE CALCULATOR** button. Figure 11-36 Half-life Calculator Screen will appear.

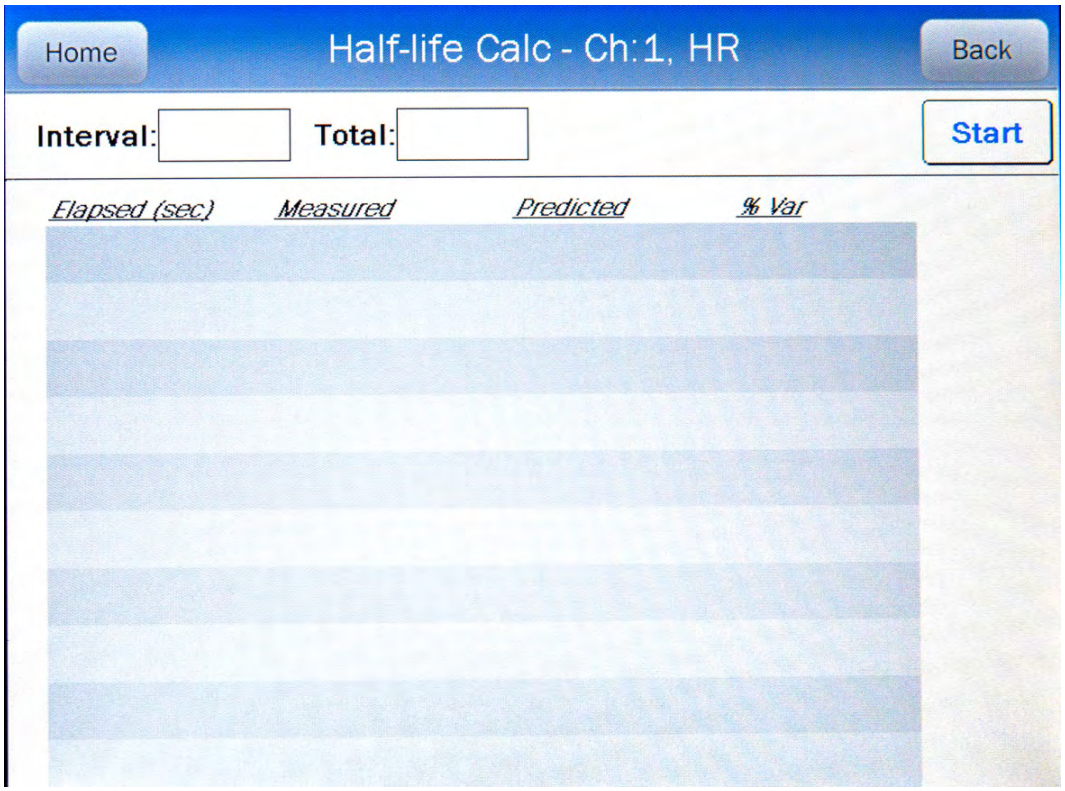

Figure 11-36 Half-life Calculator Screen

Setting Interval

The Interval is the time between measurements in seconds.

To set the desired Interval, touch the ***Interval:*** field box. Figure 11-37 Numeric Keypad Screen will appear.

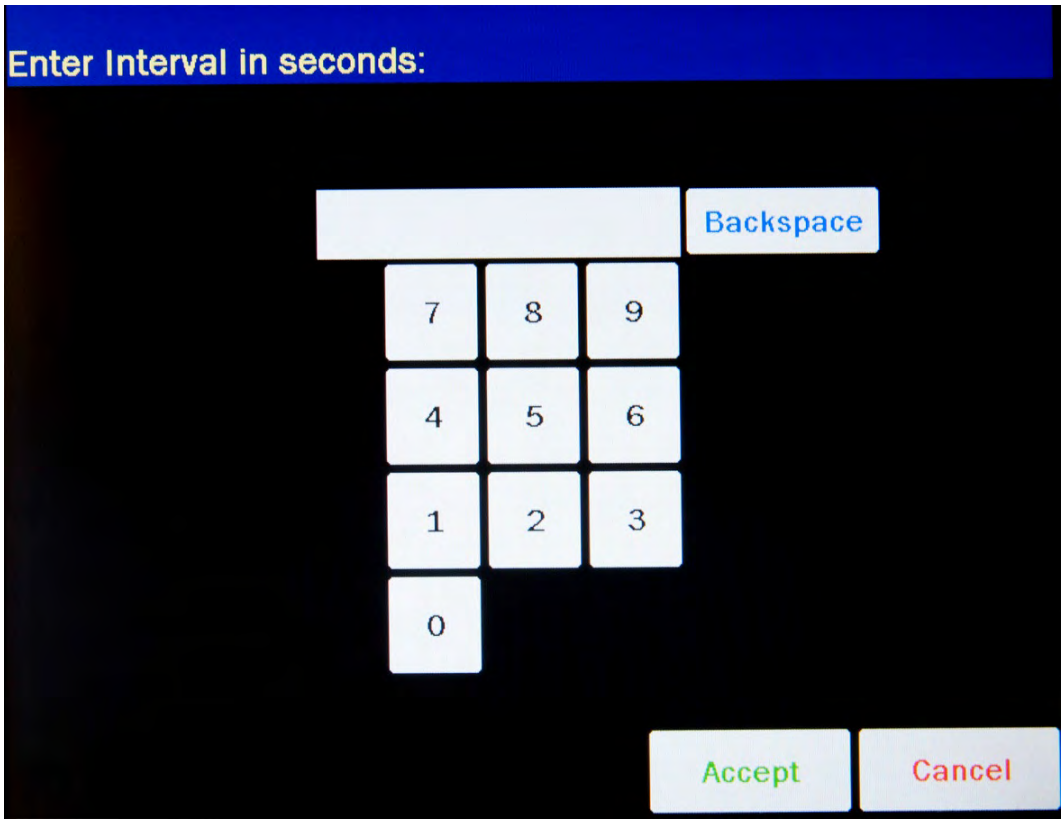

Figure 11-37 Numeric Keypad Screen

Input the desired Interval (in seconds) by touching the appropriate numbers on the keypad. Touch the **ACCEPT** button to accept the entered time. Figure 11-36 Half-life Calculator Screen will re-appear with the entered time shown in the ***Interval:*** field box.

Note: *The minimum Interval that can be input is 1 second. The maximum Interval that can be input is 300 seconds.*

Setting Total

The Total is the total time for the series of measurements in minutes.

To set the desired total time, touch the ***Total:*** field box. Figure 11-38 Numeric Keypad Screen will appear.

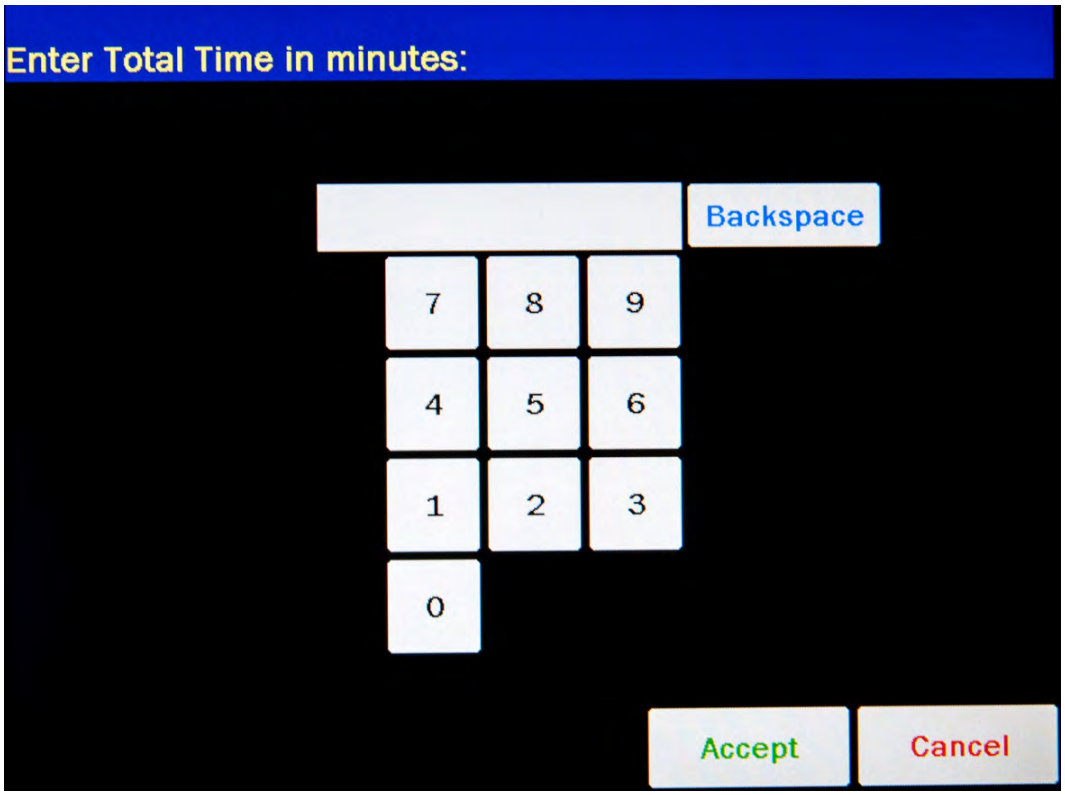

Figure 11-38 Numeric Keypad Screen

Input the desired Total time (in minutes) by touching the appropriate numbers on the keypad. Touch the **ACCEPT** button to accept the entered time. Figure 11-36 Half-life Calculator Screen will re-appear with the entered time shown in the ***Total:*** field box.

Note: *The minimum Total time that can be input is 1 minute. The maximum Total time that can be input is 6000 minutes.*

Starting the Measurements

Once all of the values have been entered, touch the **START** button. Figure 11-39 Half-life Calculator Screen After Measurements Begin will appear.

Note: *An error screen will be displayed if the number of measurements is less than 5.*

Note: *An error screen will be displayed if the number of measurements is larger than 1201. The error screen will suggest changes to Total time or Interval time, which will correct the error.*

Note: *The normal 20 seconds running average is disabled for half-life measurements. Increase the number of measurements to get a more accurate half-life result.*

Note: *If the initial measurement is too low, the measurements will automatically stop and Figure 11-40 Half-life Calculator Screen After Measurements Finished will appear. The message "Activity Too Low Error" will be displayed in the upper right corner.*

Figure 11-39 Half-life Calculator Screen After Measurements Begin

The Elapsed time and Remaining time are displayed in the upper right corner of the screen. The time format is minutes:seconds and is refreshed after each measurement.

After each measurement is made, the following information will be displayed in the grid:

- Elapsed time in seconds
- Measured voltage from Chamber

Note: ***"****Under Range" will be displayed if the voltage is zero or negative. Under Range measurements are not used in the calculation of the half-life.*

Note: *"Over Range" will be displayed if the voltage is larger than the upper range of the ADC chip. Over Range measurements are not used in the calculation of the half-life.*

Measurements will stop when the Total time has elapsed. After measurements have stopped, Figure 11-40 Half-life Calculator Screen After Measurements Finished will appear.

Stopping the Measurements Early
To stop the measurements before the total time has elapsed, press the **STOP** button. The half-life will be calculated with the measurements taken. After pressing **STOP**, Figure 11-40 Half-life Calculator Screen After Measurements Finished will appear.

Calculated Half-life
After completing the measurements, the half-life is calculated with the least squares linear regression method. Figure 11-40 Half-life Calculator Screen After Measurements Finished will appear.

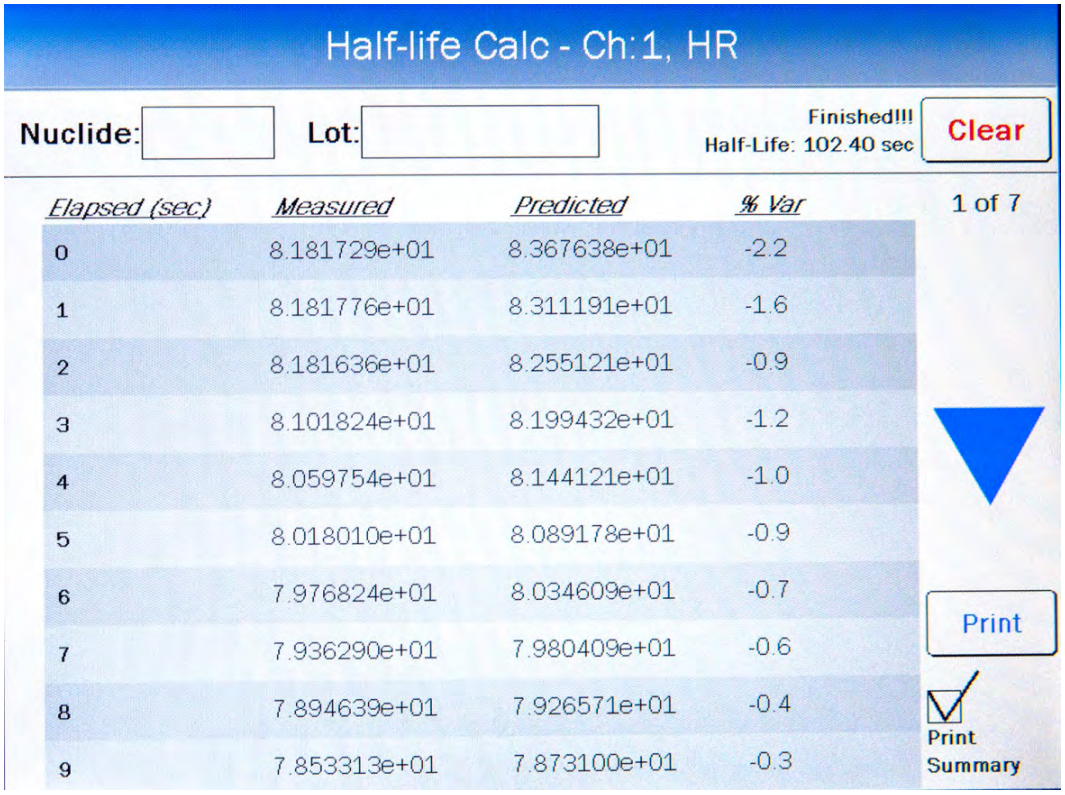

Figure 11-40 Half-life Calculator Screen After Measurements Finished

The calculated half-life value is displayed in the upper right corner.

The following measurement information will be displayed:

- Elapsed time in seconds,
- Measured voltage from Chamber,
- The predicted voltage from the linear least squares regression,
- % Variation of the Measured voltage from the Predicted voltage.

Note: *If the initial measurement is too low, then "Activity Too Low Error" will be displayed in the upper right corner.*

Note: *If the number of valid measurements is less than 5, then the "Less than 5 measurements" message will be displayed in the upper right corner.*

Note: *If the calculated half-life is negative, then the "Half-life is negative" message will be displayed in the upper right corner.*

Note: *If the calculated half-life is too small, then the "Half-life is too short" message will be displayed in the upper right corner.*

Note: *If the range of the measurements is within the noise of the instrument, then the "Half-life is too long" message will be displayed in the upper right corner.*

Printing Results

If a printer is attached to the system, the half-life results can be printed by touching the **PRINT** button.

The ***Print Summary*** checkbox can be used to exclude the measurements from the printout. This setting persists between successive half-life calculations.

The Nuclide can be included on the printout by touching the ***Nuclide:*** textbox and selecting a Nuclide. This setting persists between successive half-life calculations.

The Lot Number can be included on the printout by touching the ***Lot:*** textbox and entering the lot number using the alphanumeric keyboard screen. This setting is cleared between successive half-life calculations.

Clear Current Half-Life Result for New Half-Life Calculation

The current half-life result can be cleared by pressing the **CLEAR** button. The results will be removed from Figure 11-36 Half-life Calculator Screen. The Interval time and the Total time will be the retained from the previous calculation.

CHAPTER 12

DOSE TABLE

GENERAL

The Dose Table function is used to print a table showing the volume to be withdrawn from a measured sample to obtain a desired dose at future times for the activity that is being measured.

From Figure 12-1 Measurement Screen, touch the **UTIL** button. Figure 12-2 Utility Screen will appear.

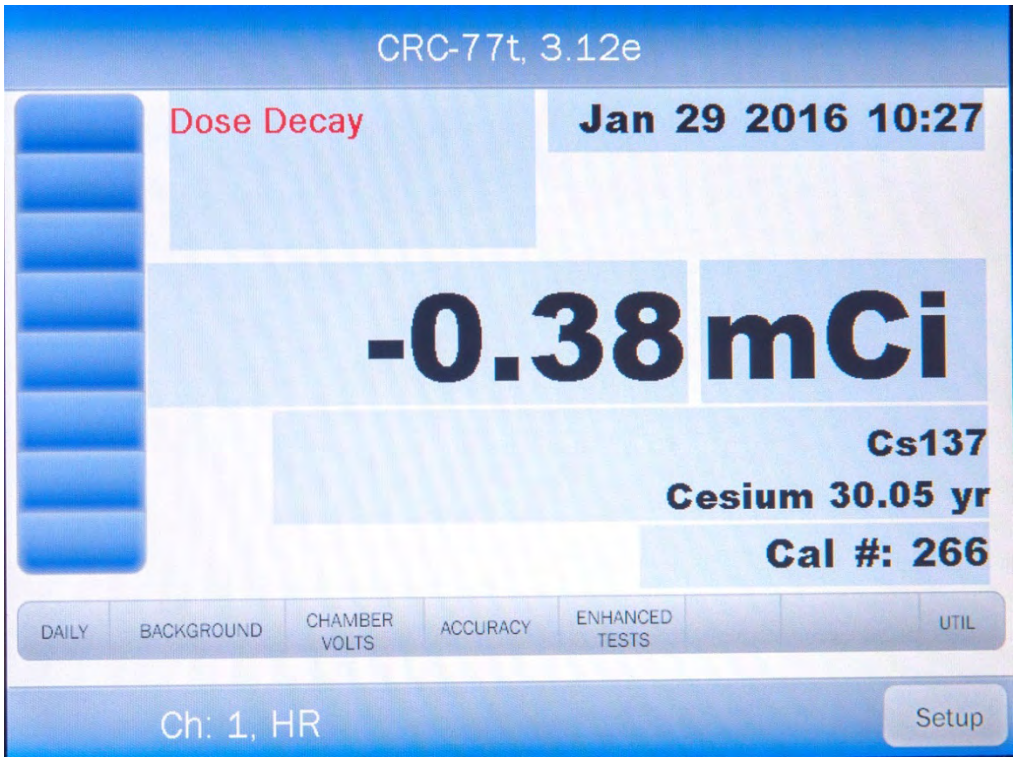

Figure 12-1 Measurement Screen

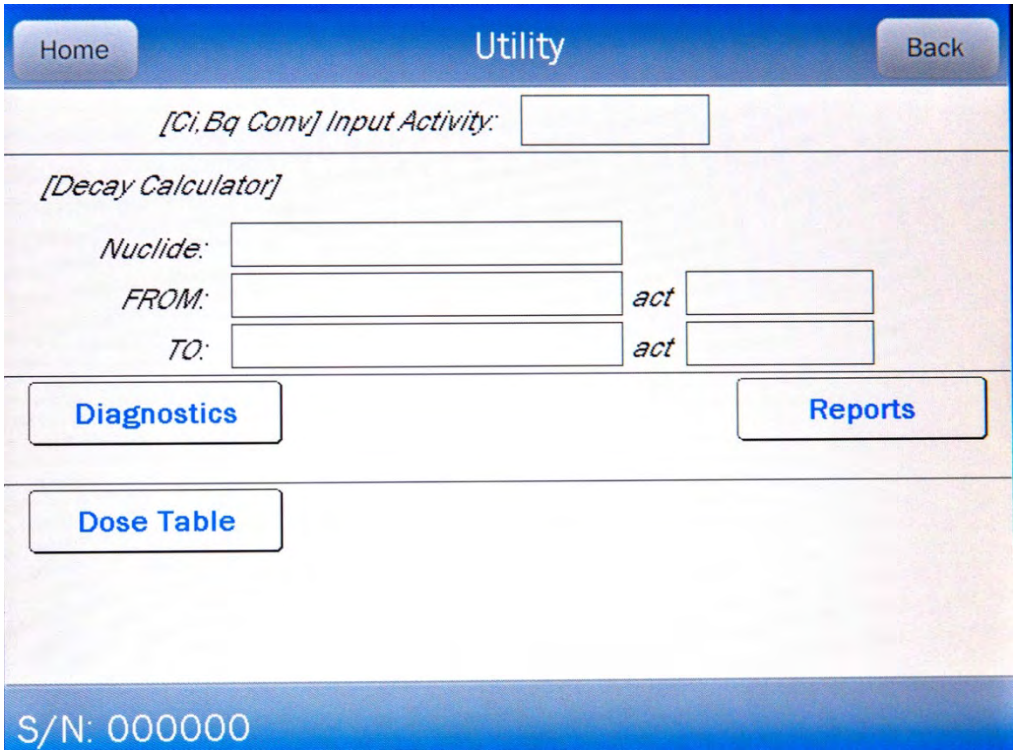

Figure 12-2 Utility Screen

Touch the **DOSE TABLE** button. Figure 12-3 Dose Table Screen will appear.

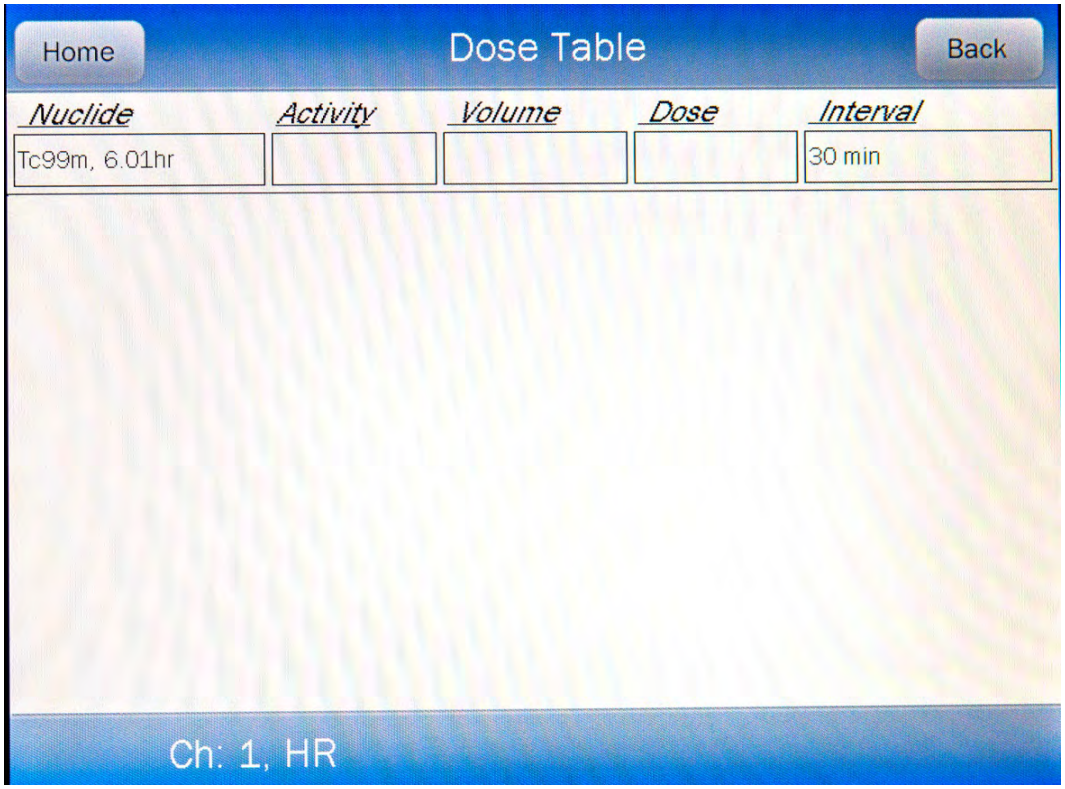

Figure 12-3 Dose Table Screen

To exit without saving any data input and return to Figure 12-2 Utility Screen, touch the **BACK** button.

To exit without saving any data input and return to Figure 12-1 Measurement Screen, touch the **HOME** button.

NUCLIDE

When entering the Dose Table function, the nuclide that was being measured on Figure 12-1 Measurement Screen will be set as the default nuclide.

To select a different nuclide, touch the ***Nuclide*** field box. Figure 12-4 Select Nuclide Screen will appear.

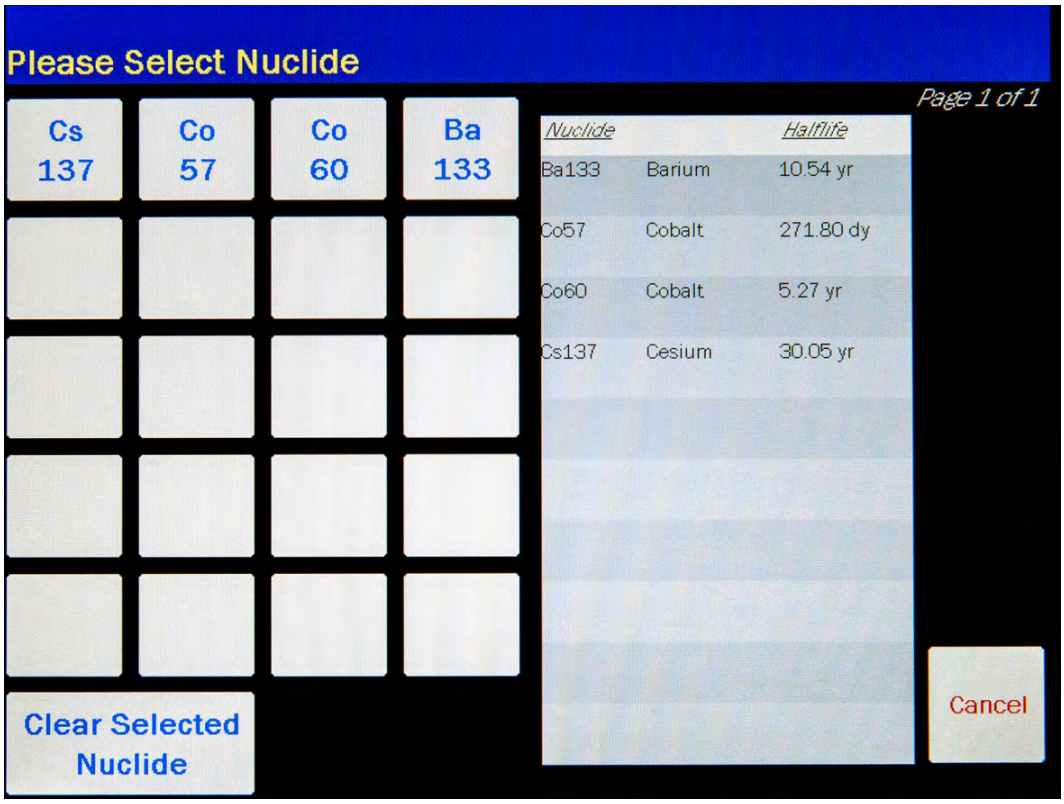

Figure 12-4 Select Nuclide Screen

The left half of the Select Nuclide screen contains the 20 preset **NUCLIDE** buttons (these are the Select Nuclide Screen Hotkeys). The right half of the screen displays a listing of nuclides stored in the calibrator's memory (both default and user added nuclides) that have a Calibration Number assigned to them (Reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: CALIBRATION NUMBERS) – 10 at a time.

The nuclide list is in alphabetical order. User added nuclides are displayed at the top of the list. The length of the list will vary depending on which nuclides have a Calibration Number assigned to them. The number of pages shown in the upper right corner of the screen indicates the length of the list. To scroll through the list, touch the **DOWN ARROW** (▼) button. The next group of 10 nuclides will be displayed and the **UP ARROW** (▲) button will appear allowing the user to scroll up in the list.

To cancel the nuclide selection, touch the **CANCEL** button.

To assign a nuclide for use for the Dose Table, do one of the following:

- Touch one of the preset **NUCLIDE** keys. Figure 12-3 Dose Table Screen will re-appear with the ***Nuclide*** field box populated with the selected nuclide and its half-life.
- Touch the Nuclide name on the list on the right. (If necessary, scroll the list until the desired nuclide is displayed.) Once a nuclide is selected from the list, an **ACCEPT** button will appear. Touch the **ACCEPT** button to select nuclide. Figure 12-3 Dose

Table Screen will re-appear with the ***Nuclide*** field box populated with the selected nuclide and its half-life.

ACTIVITY

To measure the nuclide's current activity, touch the ***Activity*** field box. Figure 12-5 Measure Activity Screen will appear.

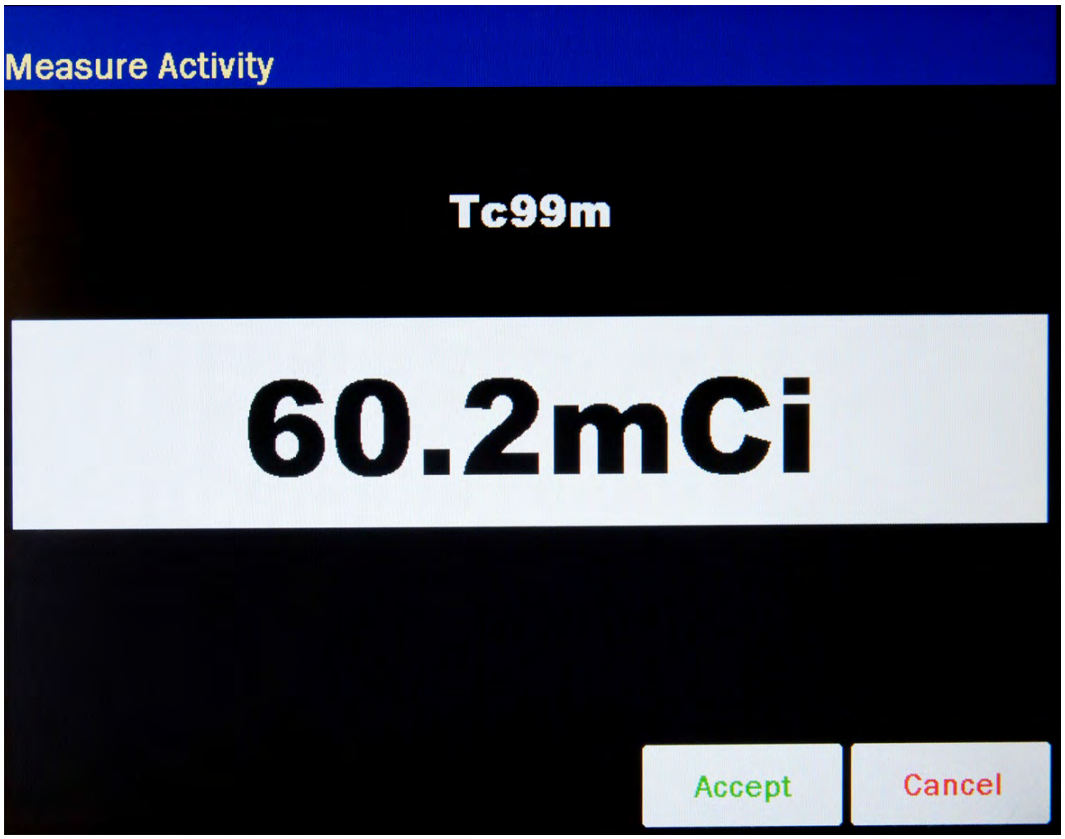

Figure 12-5 Measure Activity Screen

Place the nuclide into the Chamber.

To save the measurement, touch the **ACCEPT** button. Figure 12-3 Dose Table Screen will re-appear with the ***Activity*** field box populated with the accepted measured activity.

To abort the measurement, touch the **CANCEL** button.

VOLUME

To input the volume of the sample that the dose will be drawn from in ml, touch the ***Volume*** field box. A numeric keypad will appear. Input the volume using the keypad and touch the **ACCEPT** button. Figure 12-3 Dose Table Screen will re-appear with the ***Volume*** field box populated with the entered volume.

Note: *The minimum value that can be input is 1.00 ml. The maximum value that can be input is 1000.00 ml.*

To abort the entering the volume, touch the **CANCEL** button.

DOSE

To input the desired activity of the dose, touch the ***Dose*** field box. Figure 12-6 Enter Activity Screen will appear.

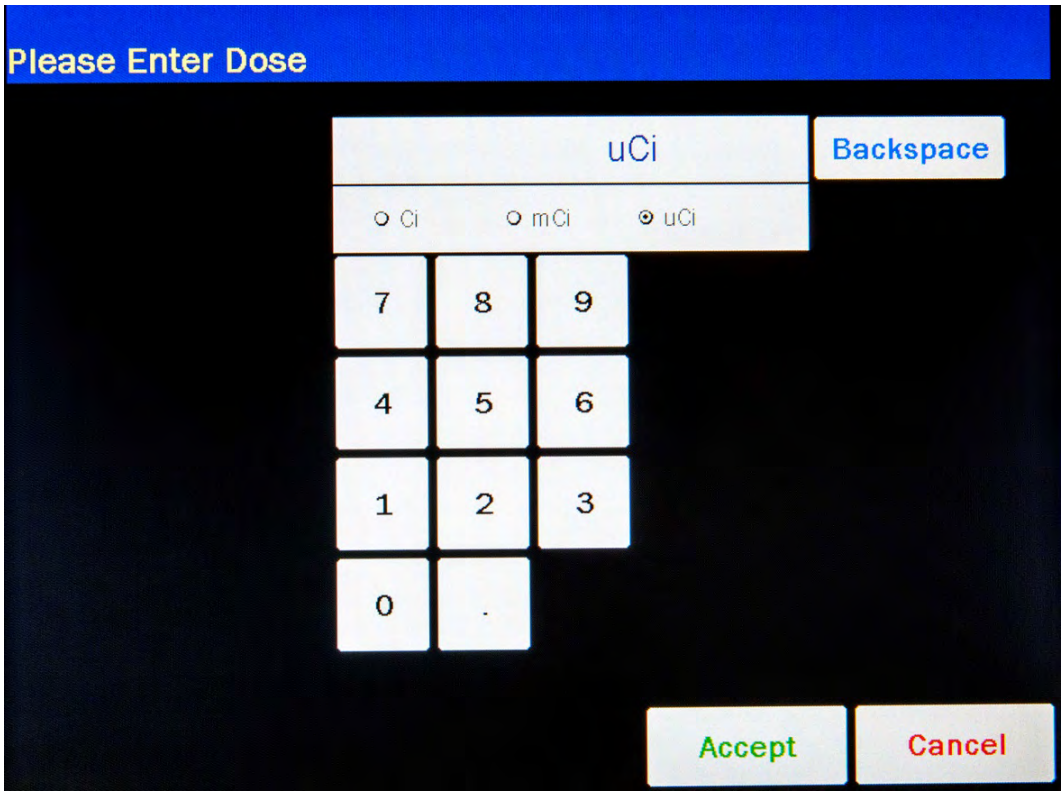

Figure 12-6 Enter Activity Screen

Input the desired activity of the dose using the keypad and touch the appropriate radio button for the unit of measure of the item.

Note: *The available units will change depending on which unit of measurement is in use on the Measurement screen. i.e. if set for Curies, the available units will be Ci, mCi and µCi; if set for Becquerels, the available units will be GBq and MBq.*

To cancel any changes, touch the **CANCEL** button.

Touch the **ACCEPT** button. Figure 12-3 Dose Table Screen will re-appear with the ***Dose*** field box populated with the entered activity.

RESULTS

After all field boxes are filled in, the calculated results will be displayed with the time and required volume for the desired dose at the specified time intervals appropriate to the nuclide (based on the half life) for up to 30 time intervals as shown in Figure 12-7 Dose Table Results Screen.

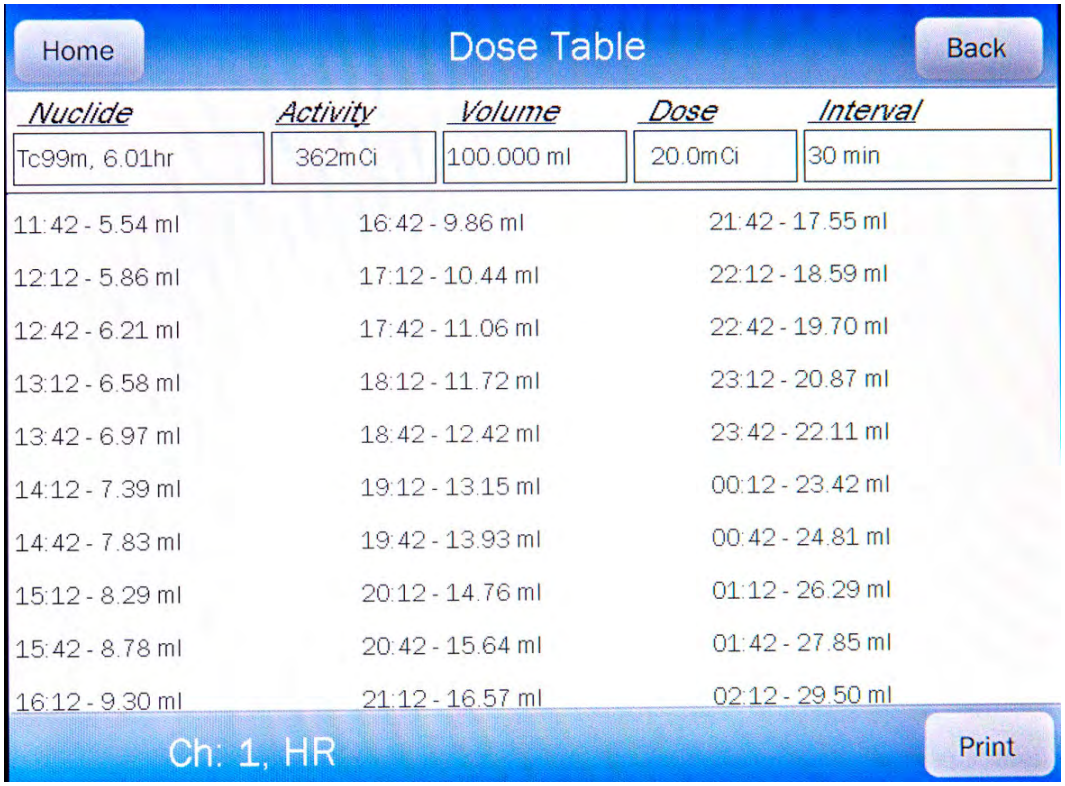

Figure 12-7 Dose Table Results Screen

If there is not enough volume for the dose, the last time will show the message “EXCEEDS INTIAL”. This indicates that the volume required for the dose at that time exceeds the sample’s initial volume that was entered.

INTERVAL

The ***Interval*** field box is the time in minutes from the current time that will be used for calculating the required volume for the dose at the times specified. The default interval is 30 minutes.

To change the default time interval, touch the ***Interval*** field box. A numeric keypad will appear. Input the time interval using the keypad and touch the **ACCEPT** button. Figure 12-7 Dose Table Results Screen will appear with the ***Interval*** field box populated with the entered time.

Note: *The minimum time interval that can be input is 1 minute. The maximum time interval that can be input is 999 minutes.*

The Interval can be changed repeatedly to obtain new results based on the entered interval.

PRINTING THE RESULTS

If a printer is attached to the system, a **PRINT** button will appear on the screen. Touch the **PRINT** button to print the results.

CHAPTER 13

REPORTS

GENERAL

When the Daily, Background, Chamber Voltage and Accuracy/AutoConstancy tests are performed, the results of the tests are saved to a database.

The Reports module is used to view and print reports of the saved tests.

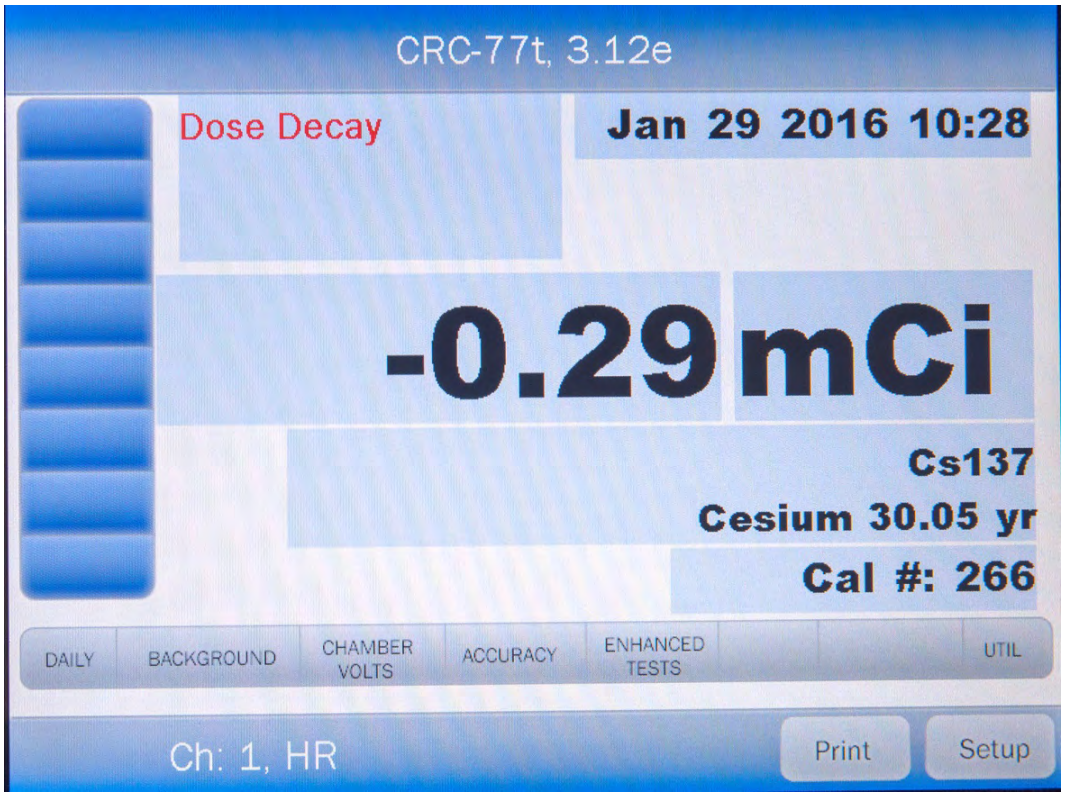

Figure 13-1 Measurement Screen

From Figure 13-1 Measurement Screen, touch the **UTIL** button. Figure 13-2 Utility Screen will appear.

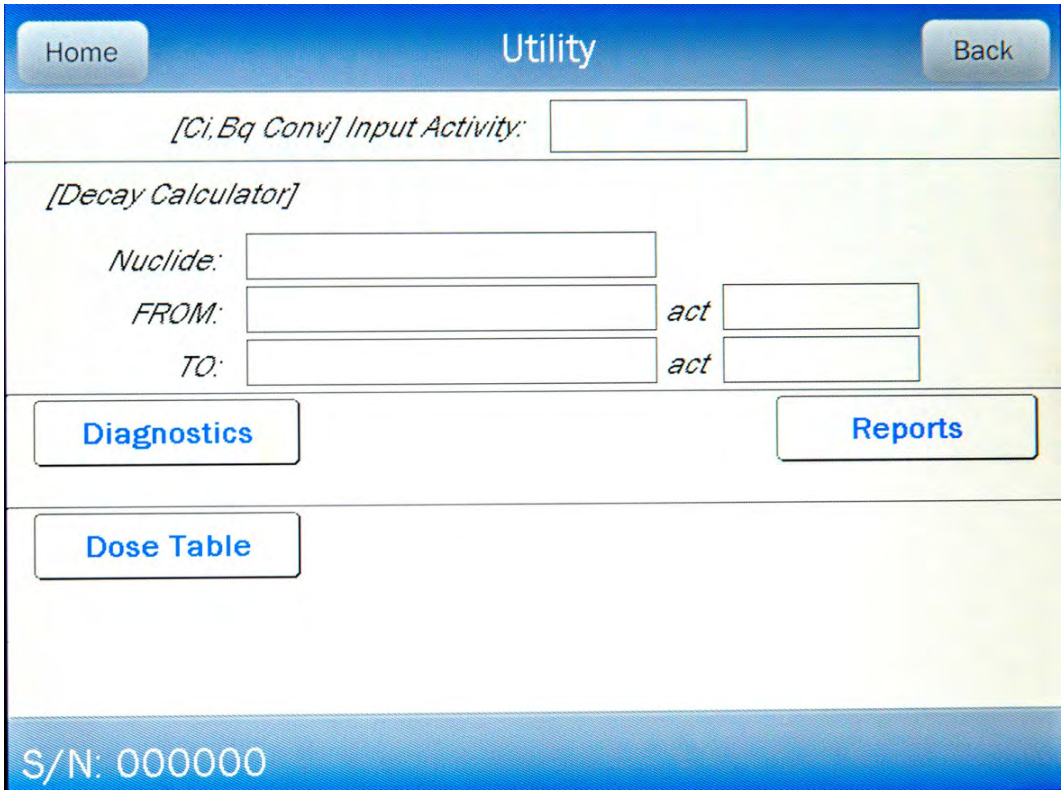

Figure 13-2 Utility Screen

To access the Reports module, touch the **REPORTS** button from Figure 13-2 Utility Screen. Figure 13-3 Reports Screen will appear.

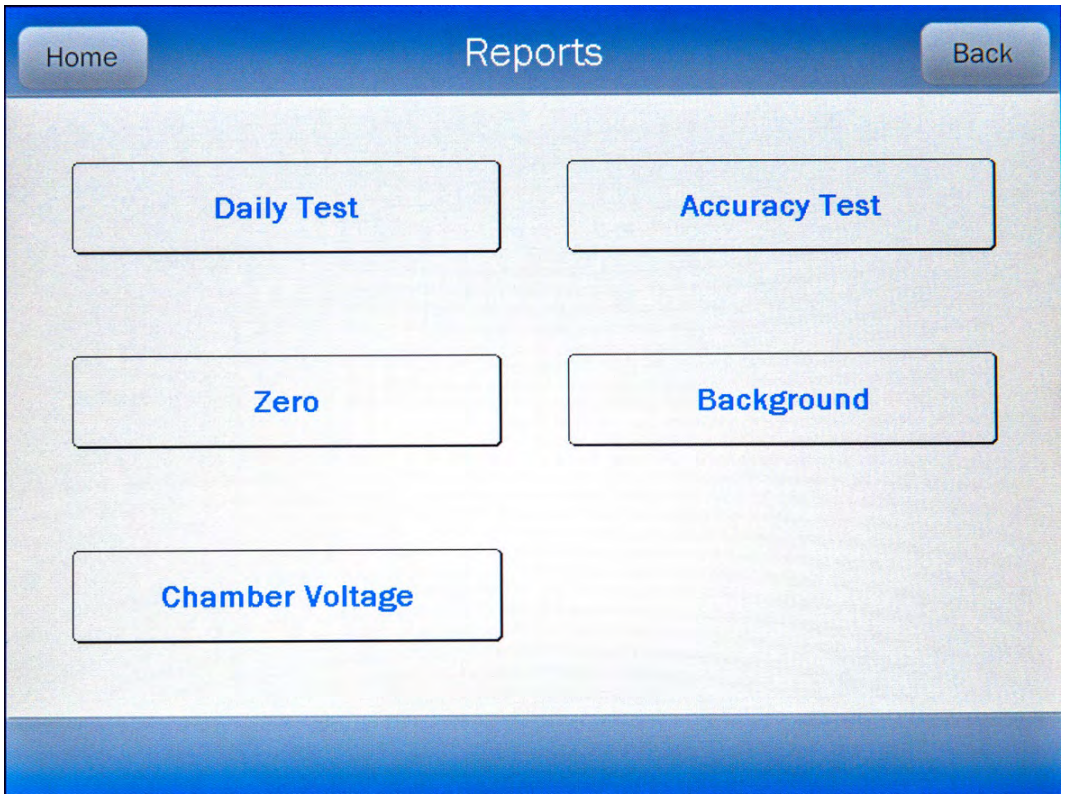

Figure 13-3 Reports Screen

To exit Figure 13-3 Reports Screen,

- touch the **BACK** button – Figure 13-2 Utility Screen will re-appear or
- touch the **HOME** button – Figure 13-1 Measurement Screen will appear.

DAILY TESTS REPORT

From Figure 13-3 Reports Screen, touch the **DAILY TEST** button. Figure 13-4 Search Daily Tests Screen will appear.

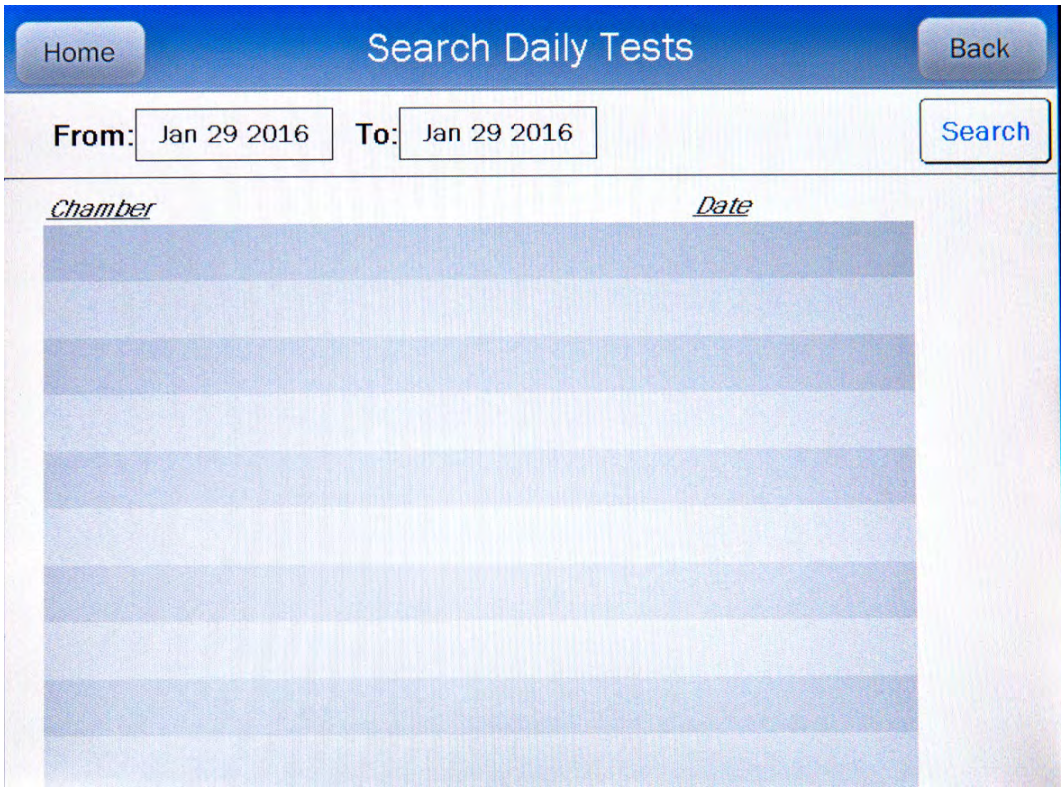

Figure 13-4 Search Daily Tests Screen

To exit Figure 13-4 Search Daily Tests Screen,

- touch the **BACK** button – Figure 13-3 Reports Screen will re-appear or
- touch the **HOME** button – Figure 13-1 Measurement Screen will appear.

Set Date

The Daily Test results are searchable by using a date range. The default ***From:*** and ***To:*** dates are “today”.

To change the From date, touch the ***From:*** field box. The Enter Start Date screen will appear.

The screen will display the currently set date. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

Touch the **ACCEPT** button to accept the set date or the **CANCEL** button to cancel any changes. Figure 13-4 Search Daily Tests Screen will re-appear showing the ***From:*** set date.

To change the To date, touch the ***To:*** field box. The Enter End Date screen will appear.

The screen will display the currently set date. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

Touch the **ACCEPT** button to accept the set date or the **CANCEL** button to cancel any changes. Figure 13-4 Search Daily Tests Screen will re-appear showing the ***To:*** set date.

Search

When the From and To dates are correct, touch the **SEARCH** button. The screen will display a listing of the Daily Tests performed within the specified date range as shown in Figure 13-5 Search Daily Tests Screen after Searching.

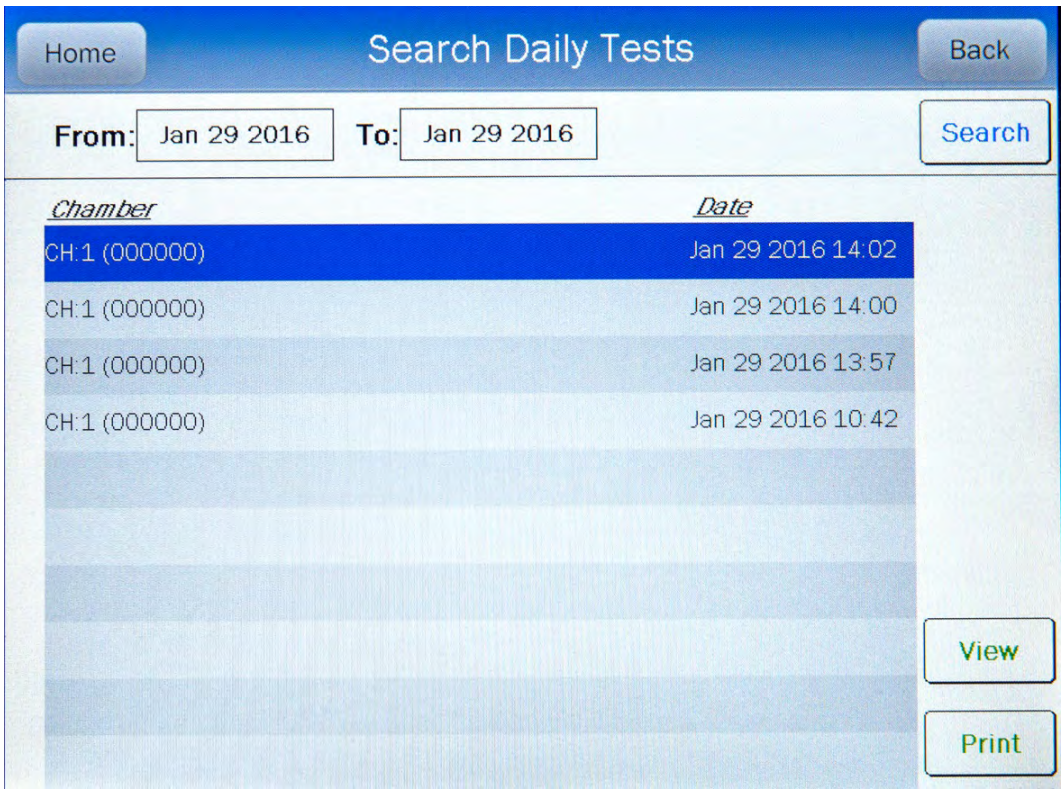

Figure 13-5 Search Daily Tests Screen after Searching

Note: *If the search results in more than 100 items, the message "**Search Daily Tests Error** More than 100 items have been returned Please refine criteria" will appear. Refine the search by narrowing the date range to search for.*

To exit Figure 13-5 Search Daily Tests Screen after Searching,

- touch the **BACK** button – Figure 13-3 Reports Screen will re-appear or
- touch the **HOME** button – Figure 13-1 Measurement Screen will appear.

The listing is in reverse chronological order (newest at the top of the list). The length of the list will vary depending on how many Daily Tests have been performed between the selected dates. If there are more than 10 results, the number of pages (or screens) will be shown in the upper right corner of the screen indicating the length of the list. To scroll through the list, touch the **DOWN ARROW** (▼) button. The next group of 10 results will be displayed and the **UP ARROW** (▲) button will appear allowing the user to scroll up in the list.

Print Search Results

If a printer is attached to the system, a report of the search results can be printed by touching the **PRINT** button. This report will contain the detailed results for all tests listed on the Search screen.

Viewing an Individual Test Report

To obtain a detailed report for an individual Daily Test result, from Figure 13-5 Search Daily Tests Screen after Searching, touch the desired result on the list. The result will become highlighted and a **VIEW** button will appear on the screen as shown in Figure 13-6 Search Daily Tests Screen with Highlighted Test Result. (If necessary, scroll the list until the desired result is displayed.)

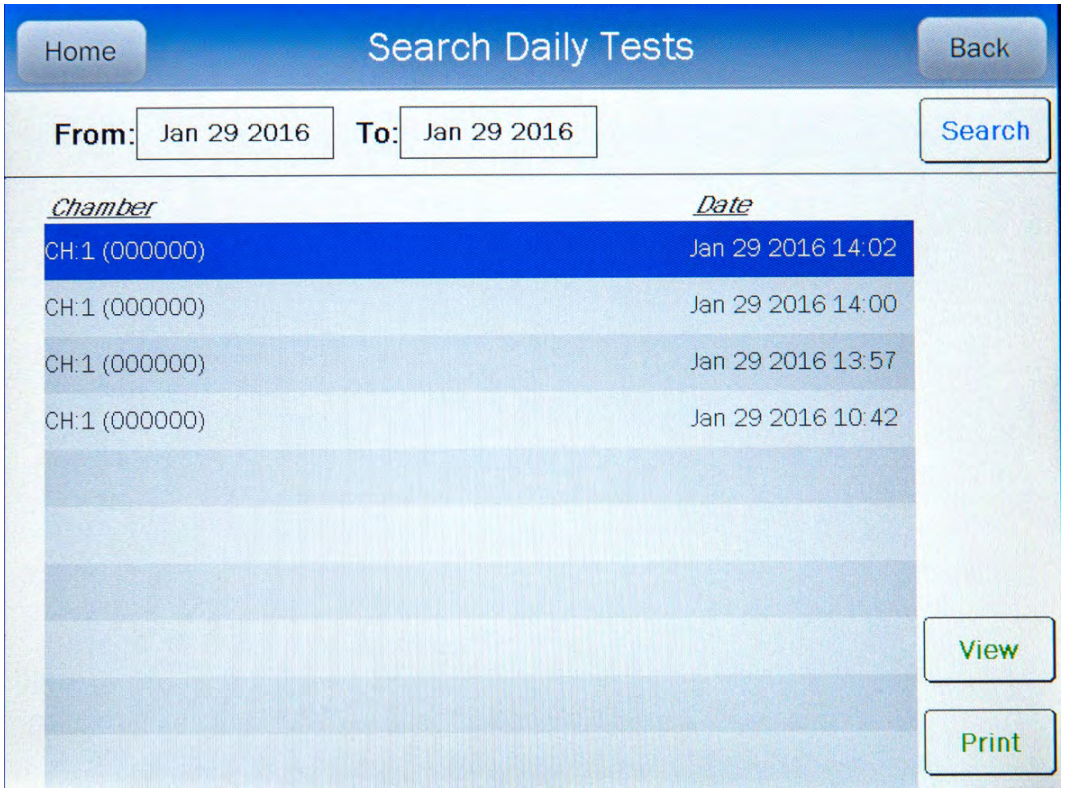

Figure 13-6 Search Daily Tests Screen with Highlighted Test Result

Touch the **VIEW** button. Figure 13-7 Daily Test Report Screen will appear displaying the detailed report for the selected Daily Test result.

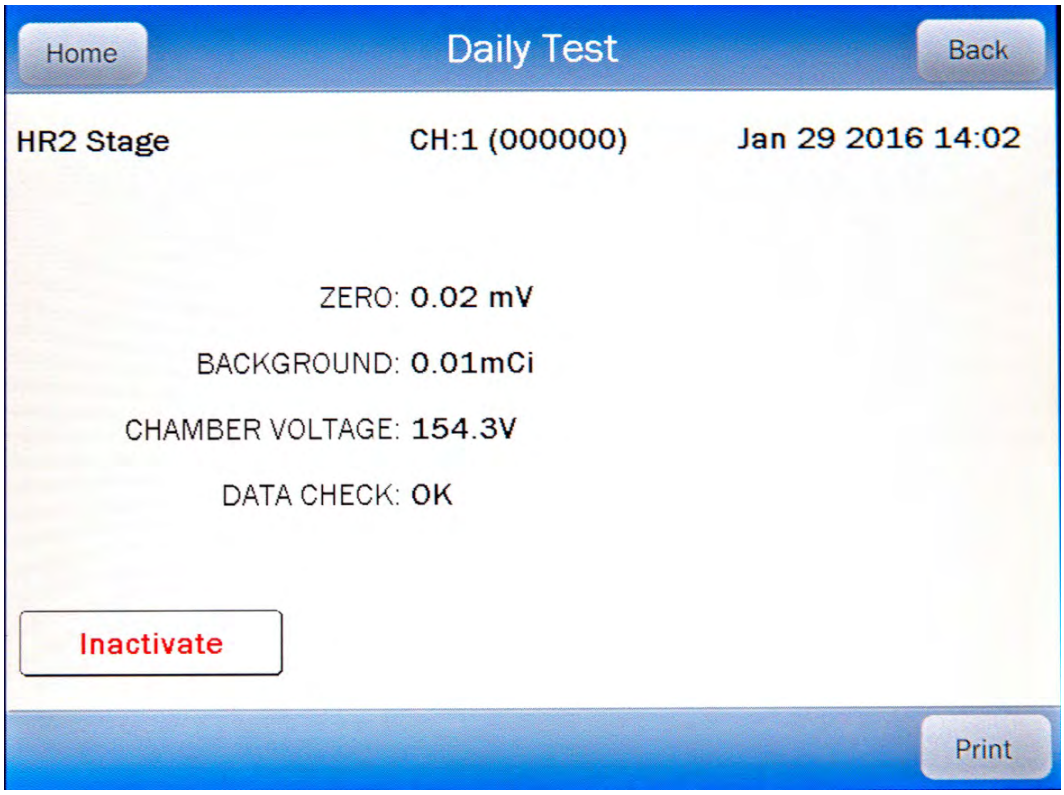

Figure 13-7 Daily Test Report Screen

To exit Figure 13-7 Daily Test Report Screen,

- touch the **BACK** button – Figure 13-5 Search Daily Tests Screen after Searching will re-appear or
- touch the **HOME** button – Figure 13-1 Measurement Screen will appear.

Accuracy Test

If an Accuracy Test was performed as part of the selected Daily Test, an **Accuracy Test** button will be displayed as shown in Figure 13-7 Daily Test Report Screen. If an Accuracy Test was not performed as part of the Daily Test, the **Accuracy Test** button will not be displayed.

To view the Accuracy Test results, touch the **ACCURACY TEST** button. A screen similar to Figure 13-20 Accuracy Test Result Screen will appear.

To exit the Accuracy Test Result screen,

- touch the **BACK** button – Figure 13-7 Daily Test Report Screen will re-appear or
- touch the **HOME** button – Figure 13-1 Measurement Screen will appear.

AutoConstancy Test

If an AutoConstancy Test was performed as part of the Accuracy Test of the selected Daily Test, an **AutoConstancy** button will be displayed on the Accuracy Test Results screen. If the AutoConstancy Test was not performed as part of the Accuracy Test of the Daily Test, the **AutoConstancy** button will not be displayed.

To view the AutoConstancy results, touch the **AUTOCONSTANCY** button. The AutoConstancy Results screen will appear.

To exit the AutoConstancy Result screen,

- touch the **BACK** button – the Accuracy Test Result screen will re-appear or
- touch the **HOME** button – Figure 13-1 Measurement Screen will appear.

Print Individual Results

If a printer is attached to the system, a detailed report of the selected Daily Test result can be printed.

Touching the **PRINT** button on any of the results screens (Daily Test, Accuracy or AutoConstancy) will print the entire Daily Test report.

Inactivate a Daily Test

A Daily Test result can be inactivated. Reasons for doing this can be:

- the test was a simulation for training,
- a mistake was made doing the test, etc.

It is important to note that once a Daily Test has been inactivated, it cannot be reactivated. The Daily Test result will still be saved in the database.

When the inactivated Daily Test is displayed on the list, it will be shown with a line through the characters. When the report is printed, the word “INACTIVE” and the optional comment will appear below the data.

When inactivating a Daily Test, all tests associated with that Daily Test will also be inactivated (Zero, Background, Chamber Voltage and Accuracy/Constancy).

To inactivate the selected Daily Test, touch the **INACTIVATE** button. Figure 13-8 Inactivate Record Screen will appear.

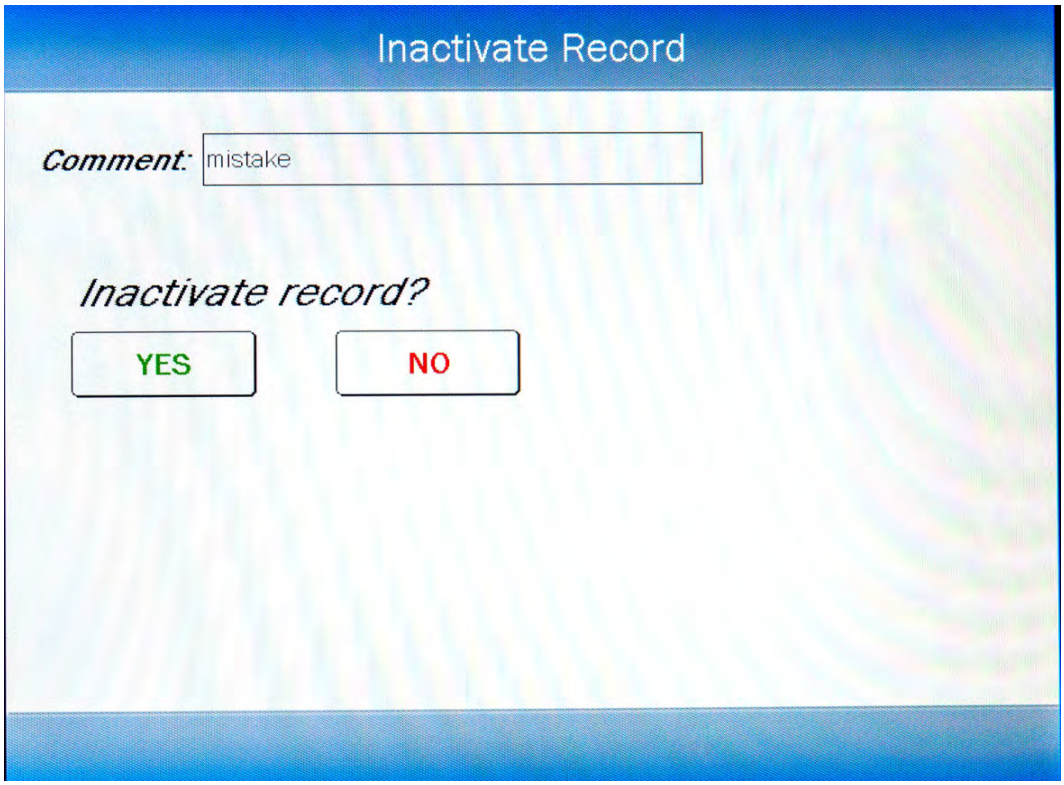

Figure 13-8 Inactivate Record Screen

To enter an optional comment (description or reason) for the selected Daily Test result inactivation, touch the ***Comment:*** field box. Figure 13-9 Alphanumeric Keypad Screen will appear.

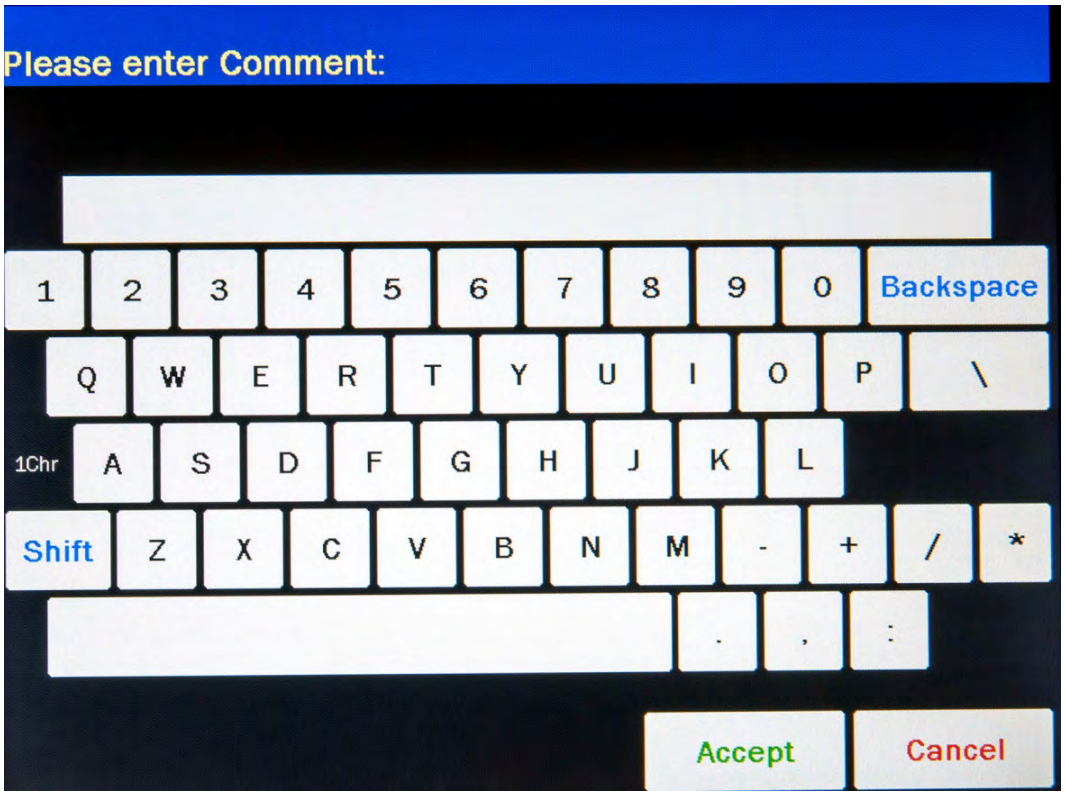

Figure 13-9 Alphanumeric Keypad Screen

Input the desired comment (description or reason) for the invalidation and touch the **ACCEPT** button. Figure 13-8 Inactivate Record Screen will re-appear with the ***Comment:*** field box populated with the entered comment. The comment can contain any combination of 22 alphanumeric characters maximum.

To cancel any comment changes and return to Figure 13-8 Inactivate Record Screen, touch the **CANCEL** button.

If it is decided not to inactivate the selected Daily Test result, touch the **NO** button. Figure 13-7 Daily Test Report Screen will re-appear.

To complete the inactivation of the selected Daily Test result, touch the **YES** button. Figure 13-5 Search Daily Tests Screen after Searching will re-appear with a line through the characters of the inactivated Daily Test.

ZERO MEASUREMENTS REPORT

From Figure 13-3 Reports Screen, touch the **ZERO** button. Figure 13-10 Search Zero Measurements Screen will appear.

Figure 13-10 Search Zero Measurements Screen

Set Date

The Zero Measurement results are searchable by using a date range. The default ***From:*** and ***To:*** dates are "today".

To change the From date, touch the ***From:*** field box. The Enter Start Date screen will appear.

The screen will display the currently set date. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

Touch the **ACCEPT** button to accept the set date or the **CANCEL** button to cancel any changes. The Search Zero Measurements Screen will re-appear showing the ***From:*** set date.

To change the To date, touch the ***To:*** field box. The Enter End Date screen will appear.

The screen will display the currently set date. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

Touch the **ACCEPT** button to accept the set date or the **CANCEL** button to cancel any changes. The Search Zero Measurements Screen will re-appear showing the ***To:*** set date.

Search

When the From and To dates are correct, touch the **SEARCH** button. The screen displays a listing of the data for the Zero Measurements performed within the specified date range as shown in Figure 13-11 Search Zero Measurements Screen after Searching.

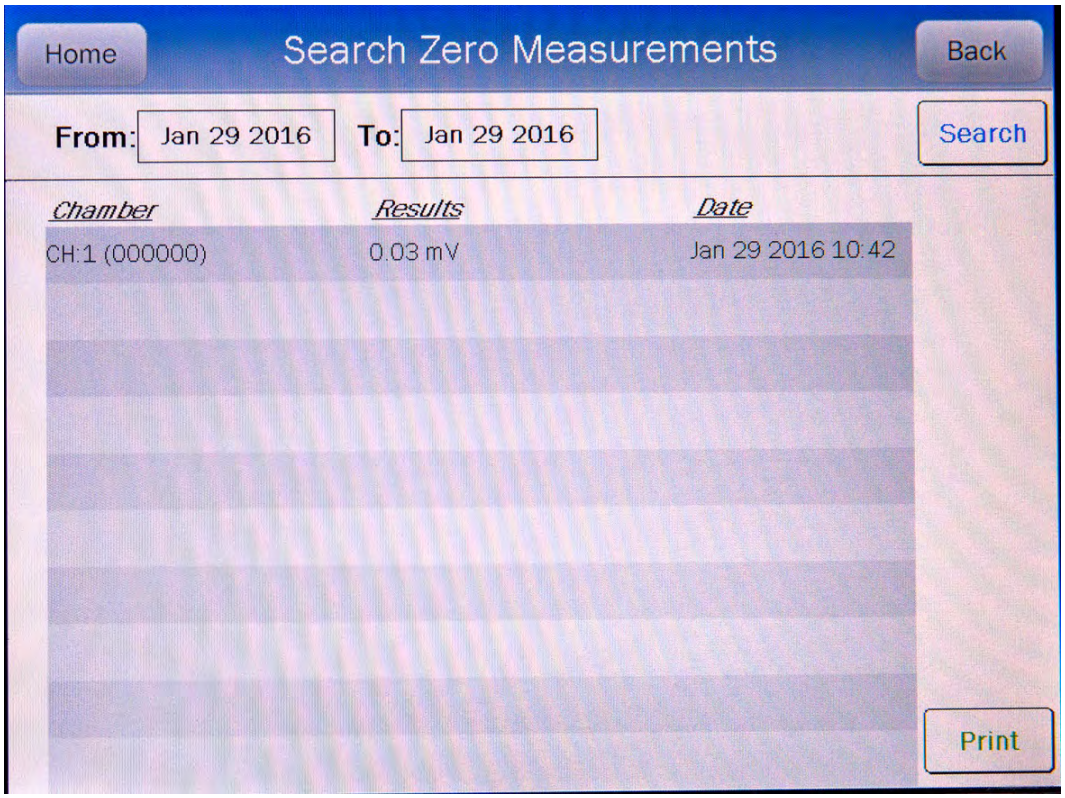

Figure 13-11 Search Zero Measurements Screen after Searching

Note: *If the search results in more than 100 items, the message "**Search Zero Measurements Error** More than 100 items have been returned Please refine criteria" will appear. Refine the search by narrowing the date range to search for.*

To exit Figure 13-11 Search Zero Measurements Screen after Searching,

- touch the **BACK** button – Figure 13-3 Reports Screen will re-appear or
- touch the **HOME** button – Figure 13-1 Measurement Screen will appear.

The listing is in reverse chronological order (newest at the top of the list). The length of the list will vary depending on how many Zero Measurements have been performed between the selected dates. If there are more than 10 results, the number of pages (or screens) will be shown in the upper right corner of the screen indicating the length of the list. To scroll through the list, touch the **DOWN ARROW** (▼) button. The next group of 10 results will be displayed and the **UP ARROW** (▲) button will appear allowing the user to scroll up in the list.

Print Search Results

If a printer is attached to the system, a report of the search results can be printed by touching the **PRINT** button. This report will contain the detailed results for all tests listed on the Search screen.

Viewing an Individual Test Report

To obtain a detailed report for a particular Zero Measurement result, from Figure 13-11 Search Zero Measurements Screen after Searching, touch the desired result on the list. The result will become highlighted and a **VIEW** button will appear on the screen similar to that shown in Figure 13-6 Search Daily Tests Screen with Highlighted Test Result. (If necessary, scroll the list until the desired result is displayed.)

Touch the **VIEW** button. Figure 13-12 Zero Measurement Result Screen will appear displaying the detailed report for the selected Zero Measurement test.

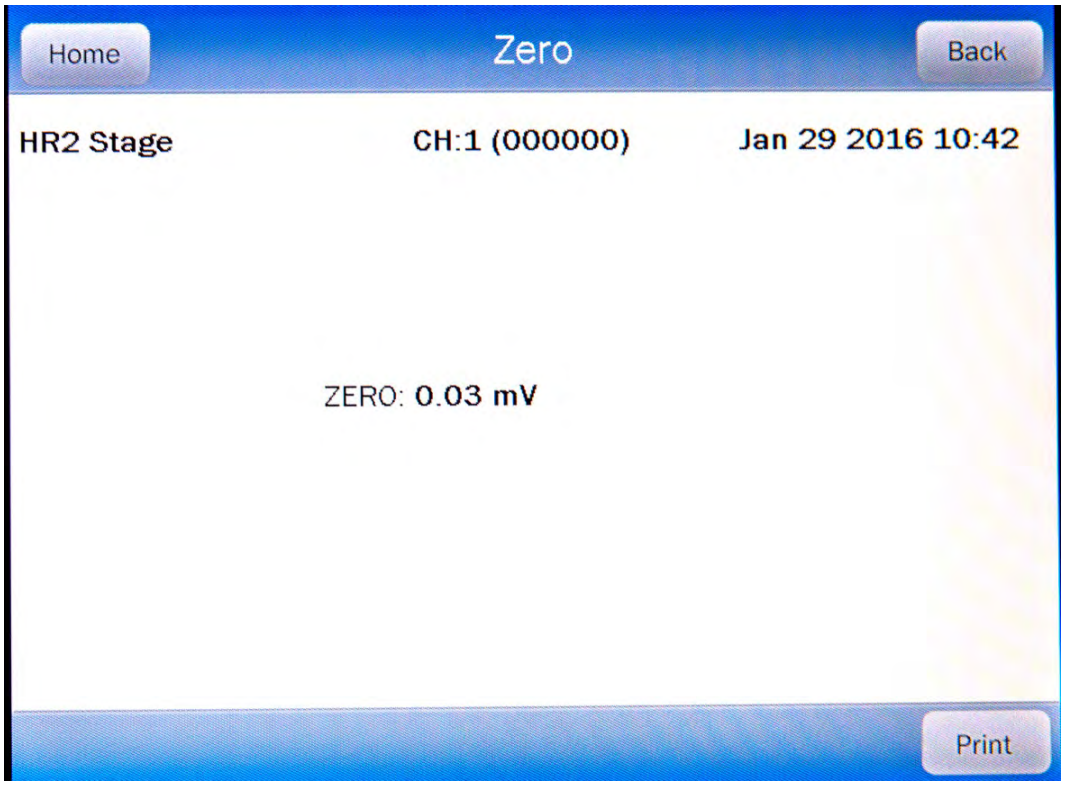

Figure 13-12 Zero Measurement Result Screen

To exit Figure 13-12 Zero Measurement Result Screen,

- touch the **BACK** button – Figure 13-11 Search Zero Measurements Screen after Searching will re-appear or
- touch the **HOME** button – Figure 13-1 Measurement Screen will appear.

Print Individual Results

If a printer is attached to the system, a detailed report of the selected Zero measurement result can be printed.

Touching the **PRINT** button on the results screen will print the selected Zero Measurement report.

Inactivate a Zero Measurement

Note: *This section is only included for legacy systems. Remote Displays are no longer available as an option.*

The **INACTIVATE** button will be displayed on Figure 13-12 Zero Measurement Result Screen only if a Zero measurement was performed using the optional legacy Remote

Display. If the selected Zero Measurement was part of a Daily Test, the **INACTIVATE** button will not be displayed.

Only a Zero measurement that was made using the optional legacy Remote Display can be inactivated. Reasons for doing this can be:

- the test was a simulation for training,
- a mistake was made doing the test, etc.

It is important to note that once a Zero measurement has been inactivated, it cannot be reactivated. The Zero measurement result will still be saved in the database.

When the inactivated Zero measurement is displayed on the list, it will be shown with a line through the characters. When the report is printed, the word “INACTIVE” and the optional comment will appear below the data.

To inactivate the selected Zero measurement, touch the **INACTIVATE** button. Figure 13-13 Inactivate Record Screen will appear.

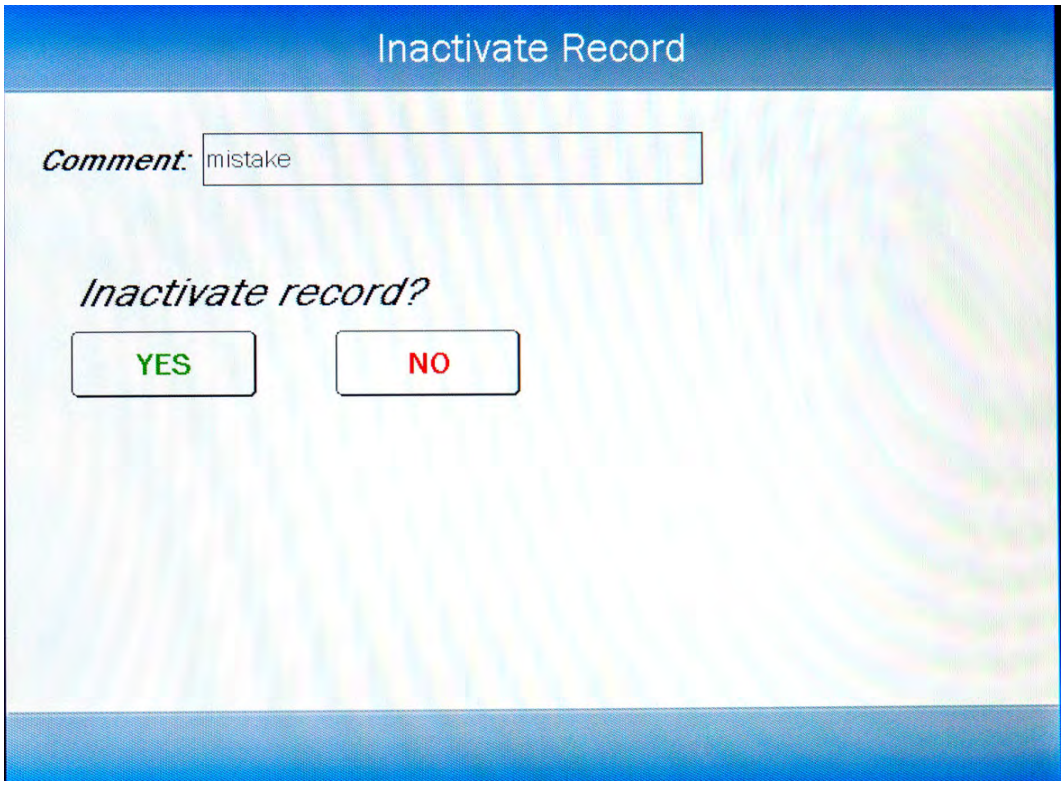

Figure 13-13 Inactivate Record Screen

To enter an optional comment (description or reason) for the selected Zero measurement result inactivation, touch the ***Comment:*** field box. Figure 13-14 Alphanumeric Keypad Screen will appear.

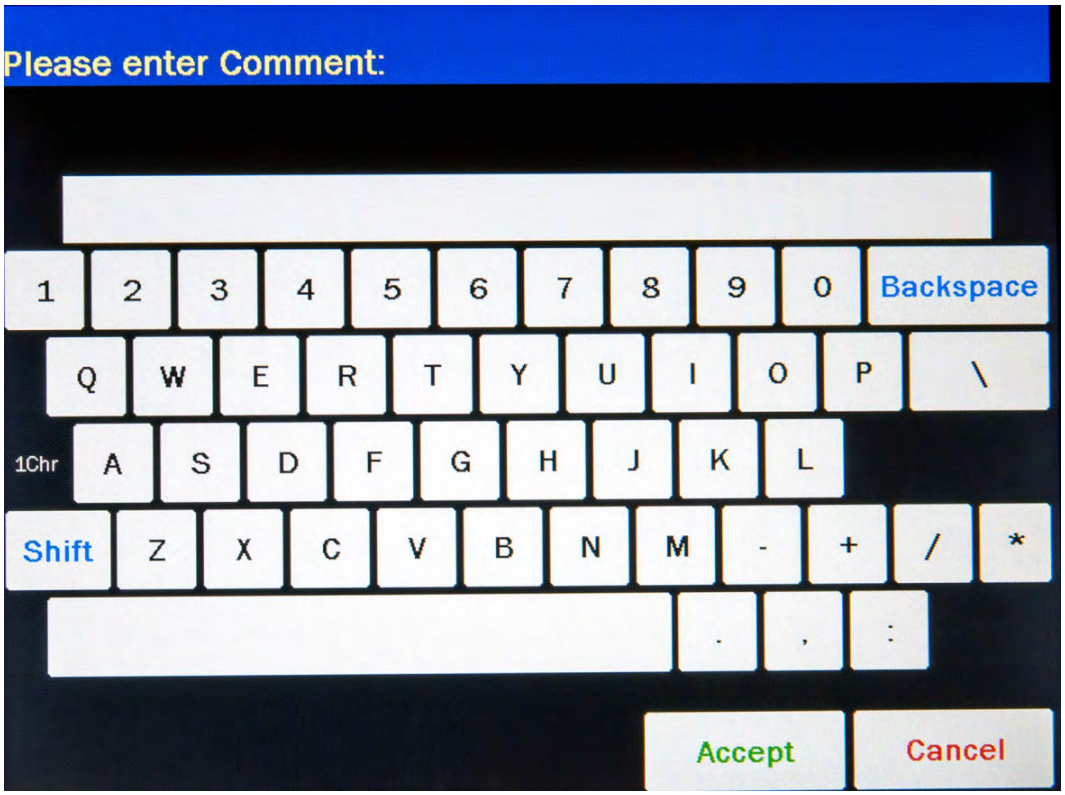

Figure 13-14 Alphanumeric Keypad Screen

Input the desired comment (description or reason) for the invalidation and touch the **ACCEPT** button. Figure 13-13 Inactivate Record Screen will re-appear with the ***Comment:*** field box populated with the entered comment. The comment can contain any combination of 22 alphanumeric characters maximum.

To cancel any comment changes and return to Figure 13-13 Inactivate Record Screen, touch the **CANCEL** button.

If it is decided not to inactivate the selected Zero Measurement result, touch the **NO** button. Figure 13-12 Zero Measurement Result Screen will re-appear.

To complete the inactivation of the selected Zero Measurement result, touch the **YES** button. Figure 13-11 Search Zero Measurements Screen after Searching will re-appear with a line through the characters of the inactivated Zero measurement.

CHAMBER VOLTAGE REPORT

From Figure 13-3 Reports Screen, touch the **CHAMBER VOLTAGE** button. The Search Chamber Voltage Tests Screen will appear and be similar to that shown in Figure 13-10 Search Zero Measurements Screen.

Set Date

The Chamber Voltage Test results are searchable by using a date range. The default ***From:*** and ***To:*** dates are "today".

To change the From date, touch the ***From:*** field box. The Enter Start Date screen will appear.

The screen will display the currently set date. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

Touch the **ACCEPT** button to accept the set date or the **CANCEL** button to cancel any changes. The Search Chamber Voltage Tests Screen will re-appear showing the ***From:*** set date.

To change the To date, touch the ***To:*** field box. The Enter End Date screen will appear.

The screen will display the currently set date. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

Touch the **ACCEPT** button to accept the set date or the **CANCEL** button to cancel any changes. The Search Chamber Voltage Tests Screen will re-appear showing the ***To:*** set date.

Search

When the From and To dates are correct, touch the **SEARCH** button. The screen displays a listing of the data for the Chamber Voltage Tests performed within the specified date range as shown in Figure 13-15 Search Chamber Voltage Tests Screen after Searching.

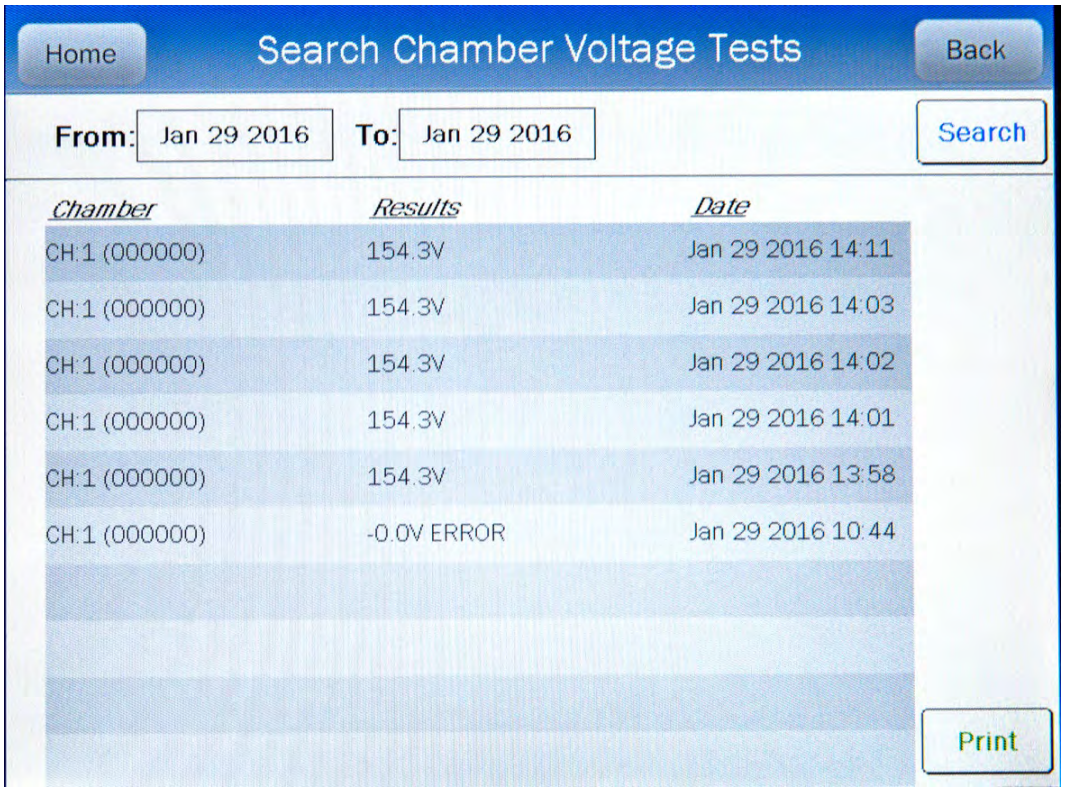

Figure 13-15 Search Chamber Voltage Tests Screen after Searching

Note: *If the search results in more than 100 items, the message "**Search Chamber Voltage Test Error** More than 100 items have been returned Please refine criteria" will appear. Refine the search by narrowing the date range to search for.*

To exit Figure 13-15 Search Chamber Voltage Tests Screen after Searching,

- touch the **BACK** button – Figure 13-3 Reports Screen will re-appear or
- touch the **HOME** button – Figure 13-1 Measurement Screen will appear.

The listing is in reverse chronological order (newest at the top of the list). The length of the list will vary depending on how many Chamber Voltage Tests have been performed between the selected dates. If there are more than 10 results, the number of pages (or screens) will be shown in the upper right corner of the screen indicating the length of the list. To scroll through the list, touch the **DOWN ARROW** (▼) button. The next group of 10 results will be displayed and the **UP ARROW** (▲) button will appear allowing the user to scroll up in the list.

Print Search Results

If a printer is attached to the system, a report of the search results can be printed by touching the **PRINT** button. This report will contain the detailed results for all tests listed on the Search screen.

Viewing an Individual Test Report

To obtain a detailed report for a particular Chamber Voltage measurement result, from Figure 13-15 Search Chamber Voltage Tests Screen after Searching, touch the desired result on the list. The result will become highlighted and a **VIEW** button will appear on the screen similar to that shown in Figure 13-6 Search Daily Tests Screen with Highlighted Test Result. (If necessary, scroll the list until the desired result is displayed.)

Touch the **VIEW** button. Figure 13-16 Chamber Voltage Test Result Screen will appear displaying the detailed report for the selected Chamber Voltage Test result.

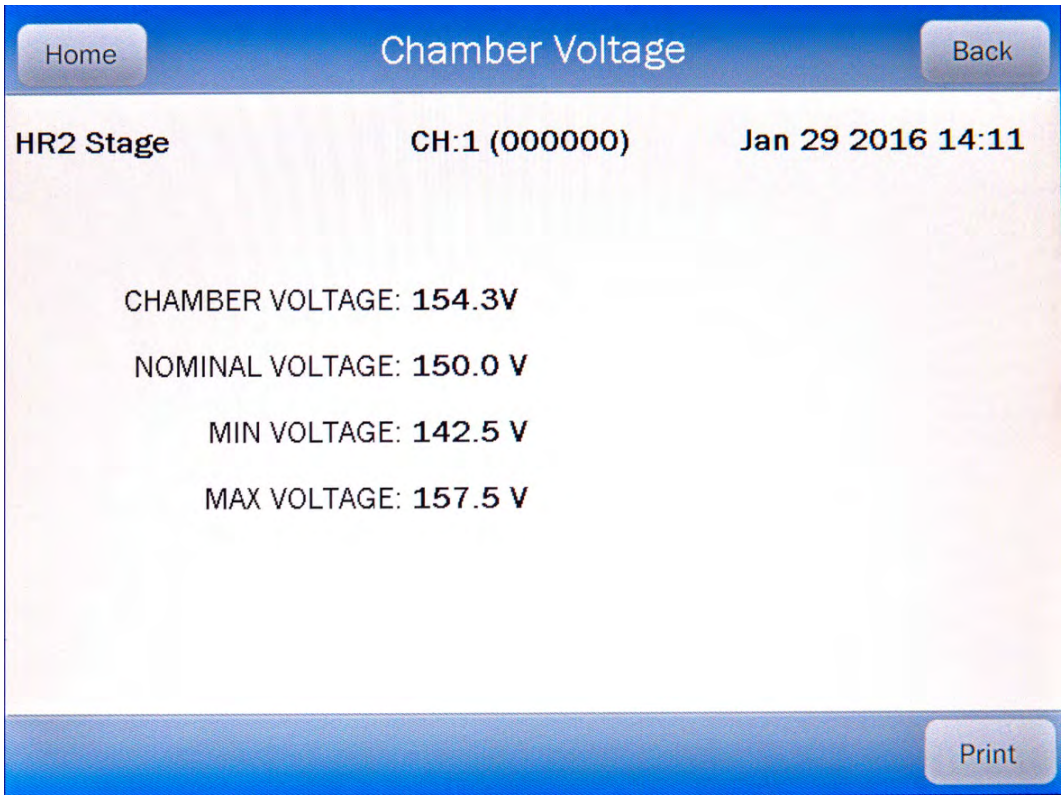

Figure 13-16 Chamber Voltage Test Result Screen

To exit Figure 13-16 Chamber Voltage Test Result Screen,

- touch the **BACK** button – Figure 13-15 Search Chamber Voltage Tests Screen after Searching will re-appear or
- touch the **HOME** button – Figure 13-1 Measurement Screen will appear.

The results screen displays the following:

- Chamber Voltage: This is the actual Chamber Voltage measurement that was recorded when the test was performed.
- Nominal Voltage: This is what the Chamber Voltage measurement was when the system was calibrated at the factory.
- Min Voltage: This is the minimum Chamber Voltage allowed before the system will indicate "FAIL" during the Chamber Voltage test. This is the Nominal Voltage minus 5%.
- Max Voltage: This is the maximum Chamber Voltage allowed before the system will indicate "FAIL" during the Chamber Voltage test. This is the Nominal Voltage plus 5%.

Print Individual Results

If a printer is attached to the system, a detailed report of the selected Chamber Voltage test result can be printed.

Touching the **PRINT** button on the results screen will print the selected Chamber Voltage report.

Inactivate a Chamber Voltage Measurement

The **INACTIVATE** button will be displayed on Figure 13-16 Chamber Voltage Test Result Screen if a Chamber Voltage test was performed using the Chamber Voltage button on Figure 13-1 Measurement Screen or by using the optional legacy Remote Display (***Note:*** *This applies only to legacy systems. Remote Displays are no longer available as an option.*). If the selected Chamber Voltage measurement was part of a Daily Test, the **INACTIVATE** button will not be displayed.

Only a Chamber Voltage measurement that was made using the Chamber Voltage button on Figure 13-1 Measurement Screen or by using the optional legacy Remote Display can be inactivated. To inactivate a Chamber Voltage measurement that was part of a Daily Test, the entire corresponding Daily Test must be inactivated. Reasons for doing this can be:

- the test was a simulation for training,
- a mistake was made doing the test, etc.

It is important to note that once a Chamber Voltage measurement has been inactivated, it cannot be reactivated. The Chamber Voltage measurement result will still be saved in the database.

When the inactivated Chamber Voltage measurement is displayed on the list, it will be shown with a line through the characters. When the report is printed, the word “INACTIVE” and the optional comment will appear below the data.

To inactivate the selected Chamber Voltage measurement, touch the **INACTIVATE** button. Figure 13-17 Inactivate Record Screen will appear.

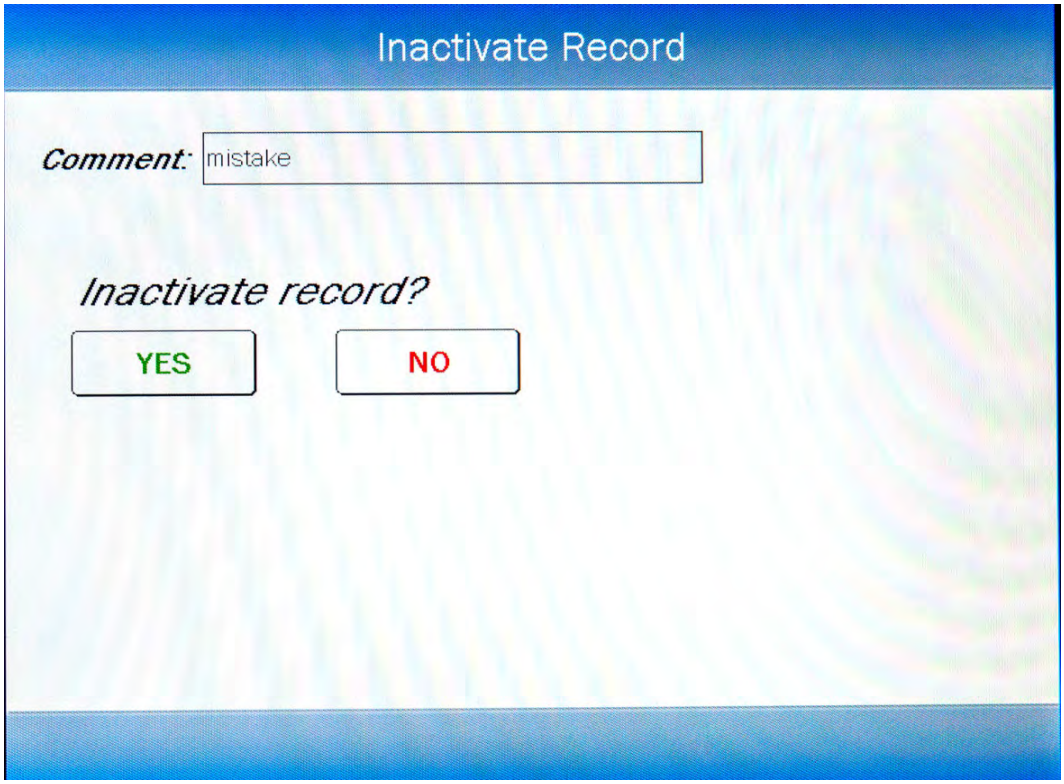

Figure 13-17 Inactivate Record Screen

To enter an optional comment (description or reason) for the selected Chamber Voltage measurement result inactivation, touch the ***Comment:*** field box. Figure 13-18 Alphanumeric Keypad Screen will appear.

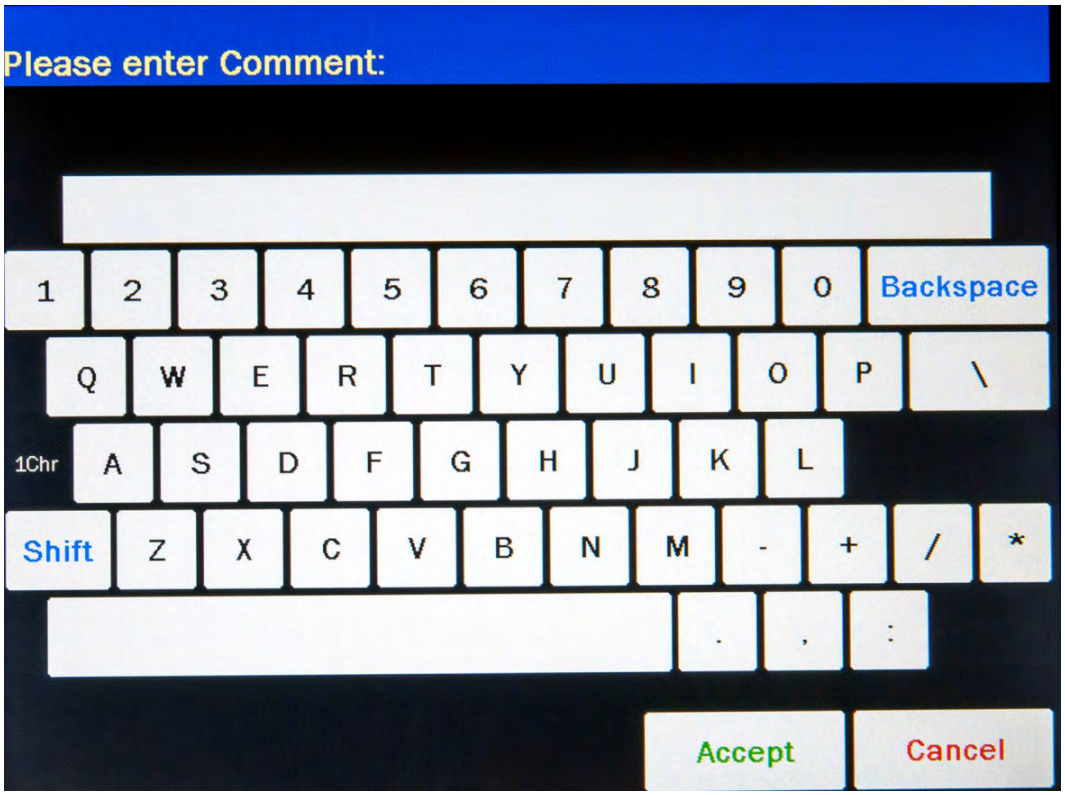

Figure 13-18 Alphanumeric Keypad Screen

Input the desired comment (description or reason) for the invalidation and touch the **ACCEPT** button. Figure 13-17 Inactivate Record Screen will re-appear with the ***Comment:*** field box populated with the entered comment. The comment can contain any combination of 22 alphanumeric characters maximum.

To cancel any comment changes and return to Figure 13-17 Inactivate Record Screen, touch the **CANCEL** button.

If it is decided not to inactivate the selected Chamber Voltage measurement result, touch the **NO** button. Figure 13-16 Chamber Voltage Test Result Screen will re-appear.

To complete the inactivation of the selected Chamber Voltage result, touch the **YES** button. Figure 13-15 Search Chamber Voltage Tests Screen after Searching will re-appear with a line through the characters of the inactivated Chamber Voltage measurement.

ACCURACY TEST REPORT

From Figure 13-3 Reports Screen, touch the **ACCURACY TEST** button. The Search Accuracy Tests Screen will appear and be similar to that shown in Figure 13-10 Search Zero Measurements Screen.

Set Date

The Accuracy Test results are searchable by using a date range. The default ***From:*** and ***To:*** dates are "today".

To change the From date, touch the ***From:*** field box. The Enter Start Date screen will appear.

The screen will display the currently set date. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

Touch the **ACCEPT** button to accept the set date or the **CANCEL** button to cancel any changes. The Search Accuracy Tests Screen will re-appear showing the ***From:*** set date.

To change the To date, touch the ***To:*** field box. The Enter End Date screen will appear.

The screen will display the currently set date. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

Touch the **ACCEPT** button to accept the set date or the **CANCEL** button to cancel any changes. The Search Accuracy Tests Screen will re-appear showing the ***To:*** set date.

Search

When the From and To dates are correct, touch the **SEARCH** button. The screen displays a listing of the data for the Accuracy Tests performed within the specified date range as shown in Figure 13-19 Search Accuracy Tests Screen after Searching.

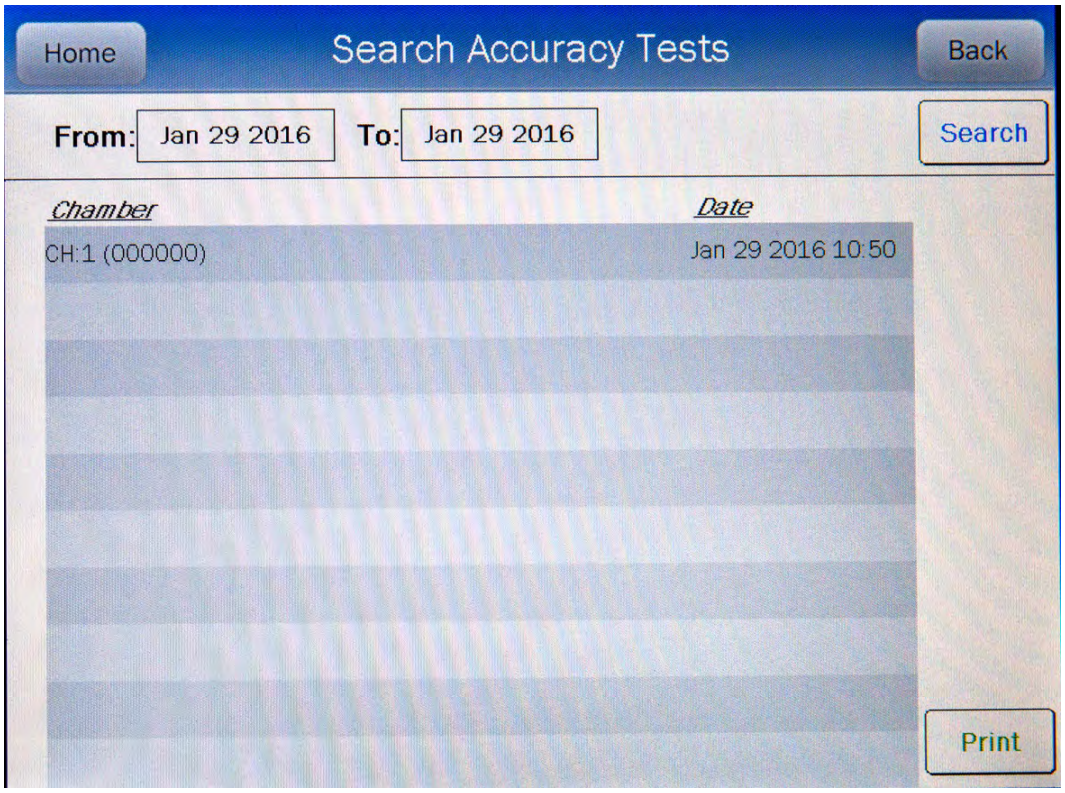

Figure 13-19 Search Accuracy Tests Screen after Searching

Note: *If the search results in more than 100 items, the message "**Search Accuracy Test Error** More than 100 items have been returned Please refine criteria" will appear. Refine the search by narrowing the date range to search for.*

To exit Figure 13-19 Search Accuracy Tests Screen after Searching,

- touch the **BACK** button – Figure 13-3 Reports Screen will re-appear or
- touch the **HOME** button – Figure 13-1 Measurement Screen will appear.

The listing is in reverse chronological order (newest at the top of the list). The length of the list will vary depending on how many Accuracy Tests have been performed between the selected dates. If there are more than 10 results, the number of pages (or screens) will be shown in the upper right corner of the screen indicating the length of the list. To scroll through the list, touch the **DOWN ARROW** (▼) button. The next group of 10 results will be displayed and the **UP ARROW** (▲) button will appear allowing the user to scroll up in the list.

Print Search Results

If a printer is attached to the system, a report of the search results can be printed by touching the **PRINT** button. This report will contain the detailed results for all tests listed on the Search screen.

Viewing an Individual Test Report

To obtain a detailed report for a particular Accuracy Test result, from Figure 13-19 Search Accuracy Tests Screen after Searching, touch the desired result on the list. The result will become highlighted and a **VIEW** button will appear on the screen similar to that shown in Figure 13-6 Search Daily Tests Screen with Highlighted Test Result. (If necessary, scroll the list until the desired result is displayed.)

Touch the **VIEW** button. Figure 13-20 Accuracy Test Result Screen will appear displaying the detailed report for the selected Accuracy Test result.

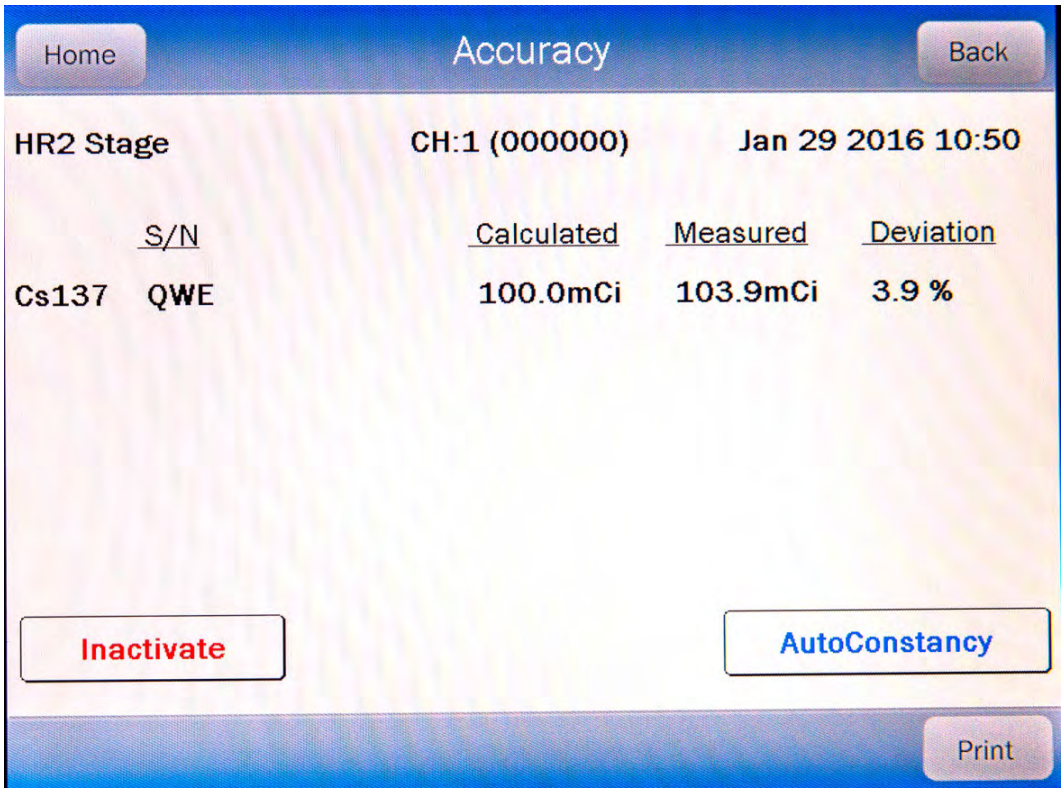

Figure 13-20 Accuracy Test Result Screen

To exit Figure 13-20 Accuracy Test Result Screen,

- touch the **BACK** button – Figure 13-19 Search Accuracy Tests Screen after Searching will re-appear or
- touch the **HOME** button – Figure 13-1 Measurement Screen will appear.

AutoConstancy Test

If an AutoConstancy Test was performed as part of the selected Accuracy Test, an **AutoConstancy** button will be displayed on the Accuracy Test Results screen. If the AutoConstancy Test was not performed as part of the Accuracy Test of the Daily Test, the **AutoConstancy** button will not be displayed.

To view the AutoConstancy results, touch the **AUTOCONSTANCY** button. The AutoConstancy Results screen will appear.

To exit the AutoConstancy Result screen,

- touch the **BACK** button – Figure 13-20 Accuracy Test Result Screen will re-appear or
- touch the **HOME** button – Figure 13-1 Measurement Screen will appear.

Print Individual Results

If a printer is attached to the system, a detailed report of the selected Accuracy test result can be printed.

Touching the **PRINT** button on either the Accuracy Test results screen or the AutoConstancy Test results screen will print the selected Accuracy Test report.

If the selected Accuracy/AutoConstancy Test is part of a Daily Test, the report will contain all of the Daily Test data.

If an AutoConstancy was performed as part of the selected Accuracy Test, the AutoConstancy results will also be included on the printout.

Inactivate an Accuracy/AutoConstancy Test

The **INACTIVATE** button will be displayed on Figure 13-20 Accuracy Test Result Screen if the selected Accuracy Test was performed using the Accuracy button on Figure 13-1 Measurement Screen. If the selected Accuracy Test was part of a Daily Test, the **INACTIVATE** button will not be displayed.

Only an Accuracy Test that was made using the Accuracy button on Figure 13-1 Measurement Screen can be inactivated. To inactivate an Accuracy Test that was part of a Daily Test, the entire corresponding Daily Test must be inactivated. Reasons for doing this can be:

- the test was a simulation for training,
- a mistake was made doing the test, etc.

It is important to note that once an Accuracy Test has been inactivated, it cannot be reactivated. The Accuracy Test result will still be saved in the database.

When the inactivated Accuracy Test is displayed on the list, it will be shown with a line through the characters. When the report is printed, the word “INACTIVE” and the optional comment will appear below the data.

To inactivate the selected Accuracy Test, touch the **INACTIVATE** button. Figure 13-21 Inactivate Record Screen will appear.

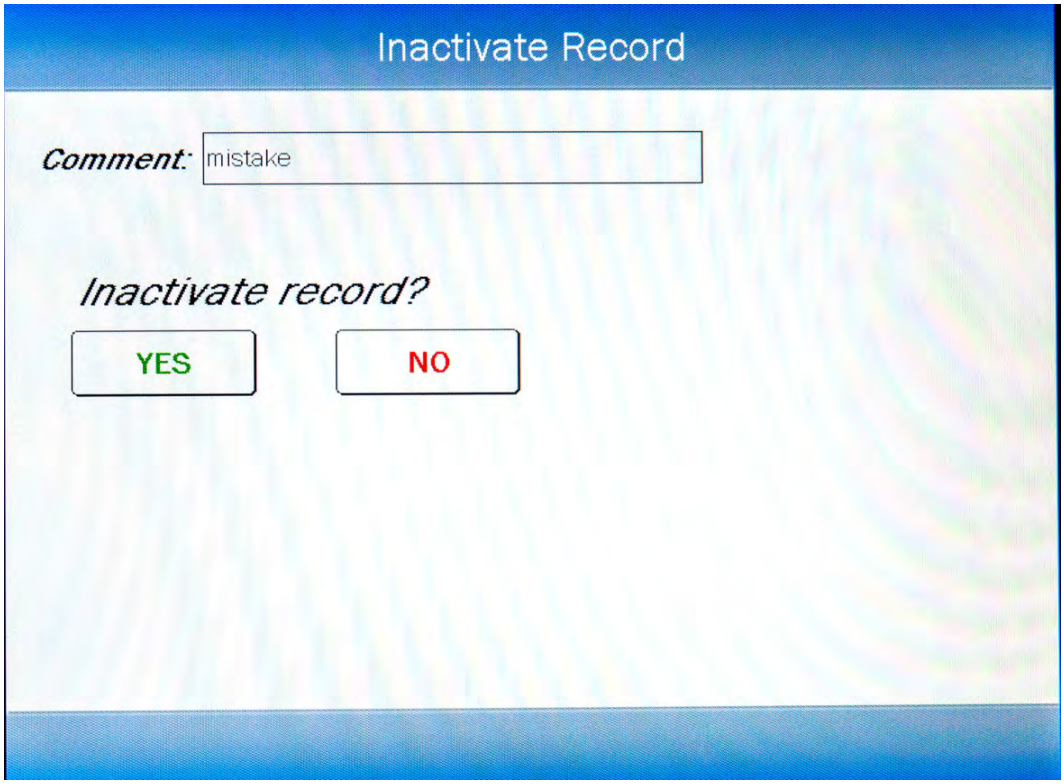

Figure 13-21 Inactivate Record Screen

To enter an optional comment (description or reason) for the selected Accuracy Test result inactivation, touch the ***Comment:*** field box. Figure 13-22 Alphanumeric Keypad Screen will appear.

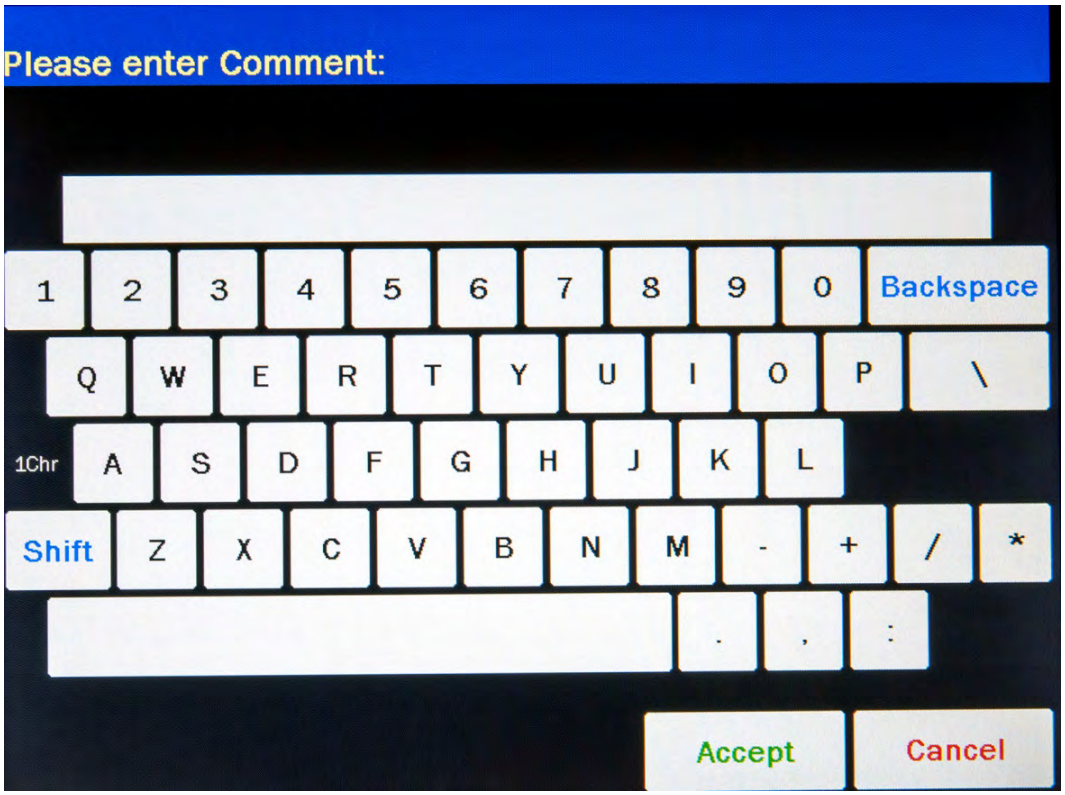

Figure 13-22 Alphanumeric Keypad Screen

Input the desired comment (description or reason) for the invalidation and touch the **ACCEPT** button. Figure 13-21 Inactivate Record Screen will re-appear with the ***Comment:*** field box populated with the entered comment. The comment can contain any combination of 22 alphanumeric characters maximum.

To cancel any comment changes and return to Figure 13-21 Inactivate Record Screen, touch the **CANCEL** button.

If it is decided not to inactivate the selected Accuracy Test result, touch the **NO** button. Figure 13-20 Accuracy Test Result Screen will re-appear.

To complete the inactivation of the selected Accuracy Test result, touch the **YES** button. Figure 13-19 Search Accuracy Tests Screen after Searching will re-appear with a line through the characters of the inactivated Accuracy Test.

BACKGROUND MEASUREMENTS REPORT

From Figure 13-3 Reports Screen, touch the **BACKGROUND** button. The Search Background Measurements Screen will appear and be similar to that shown in Figure 13-10 Search Zero Measurements Screen.

Set Date

The Background Measurement results are searchable by using a date range. The default ***From:*** and ***To:*** dates are "today".

To change the From date, touch the ***From:*** field box. The Enter Start Date screen will appear.

The screen will display the currently set date. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

Touch the **ACCEPT** button to accept the set date or the **CANCEL** button to cancel any changes. The Search Background Measurements Screen will re-appear showing the ***From:*** set date.

To change the To date, touch the ***To:*** field box. The Enter End Date screen will appear.

The screen will display the currently set date. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

Touch the **ACCEPT** button to accept the set date or the **CANCEL** button to cancel any changes. The Search Background Measurements Screen will re-appear showing the ***To:*** set date.

Search

When the From and To dates are correct, touch the **SEARCH** button. The screen displays a listing of the data for the Background Measurements performed within the specified date range as shown in Figure 13-23 Search Background Measurements Screen after Searching.

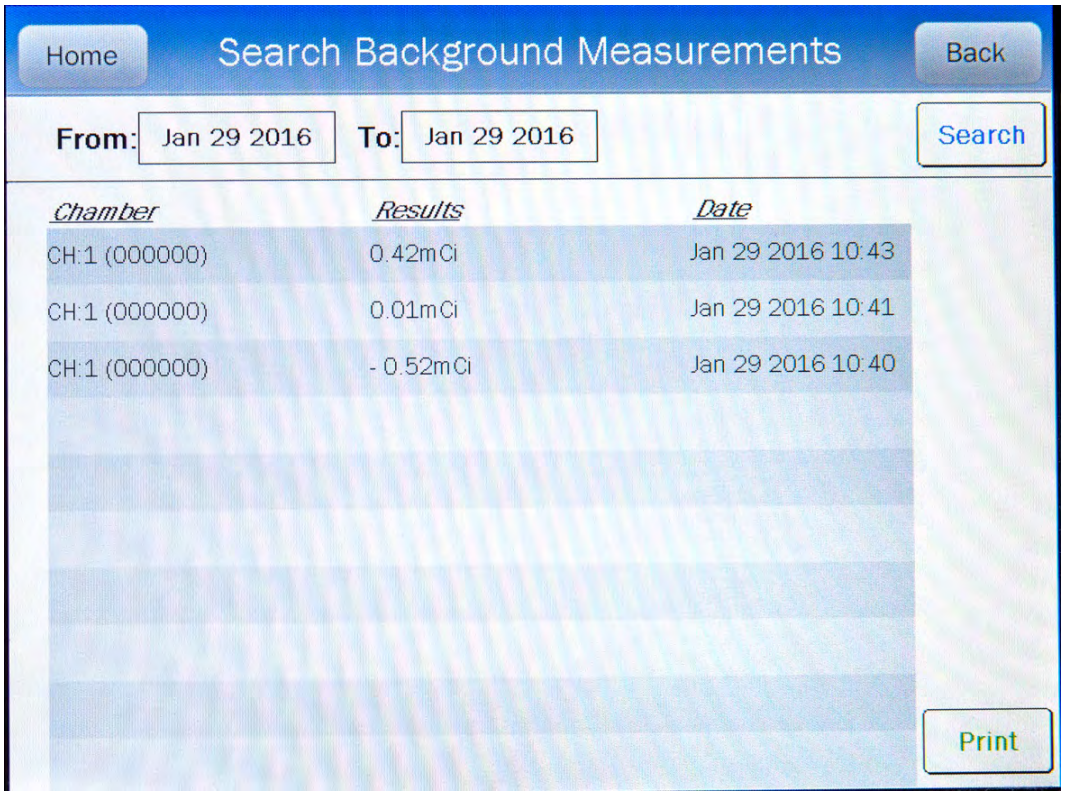

Figure 13-23 Search Background Measurements Screen after Searching

Note: *If the search results in more than 100 items, the message "**Search Background Measurements Error** More than 100 items have been returned Please refine criteria" will appear. Refine the search by narrowing the date range to search for.*

To exit Figure 13-23 Search Background Measurements Screen after Searching,

- touch the **BACK** button – Figure 13-3 Reports Screen will re-appear or
- touch the **HOME** button – Figure 13-1 Measurement Screen will appear.

The listing is in reverse chronological order (newest at the top of the list). The length of the list will vary depending on how many Background Measurements have been performed between the selected dates. If there are more than 10 results, the number of pages (or screens) will be shown in the upper right corner of the screen indicating the length of the list. To scroll through the list, touch the **DOWN ARROW** (▼) button. The next group of 10 results will be displayed and the **UP ARROW** (▲) button will appear allowing the user to scroll up in the list.

Print Search Results

If a printer is attached to the system, a report of the search results can be printed by touching the **PRINT** button. This report will contain the detailed results for all tests listed on the Search screen.

Viewing an Individual Test Report

To obtain a detailed report for a particular Background Measurement result, from Figure 13-23 Search Background Measurements Screen after Searching, touch the desired result on the list. The result will become highlighted and a **VIEW** button will appear on the screen similar to that shown in Figure 13-6 Search Daily Tests Screen with Highlighted Test Result. (If necessary, scroll the list until the desired result is displayed.)

Touch the **VIEW** button. Figure 13-24 Background Measurement Result Screen will appear displaying the detailed report for the selected Background Measurement result.

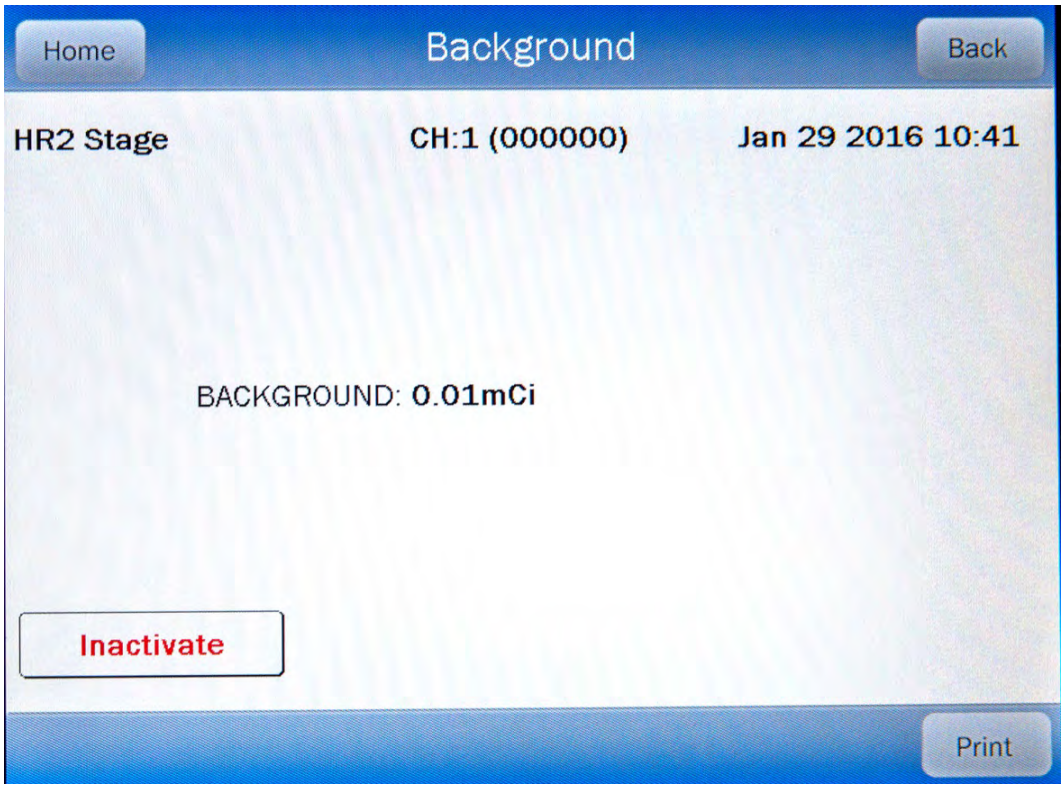

Figure 13-24 Background Measurement Result Screen

To exit Figure 13-24 Background Measurement Result Screen,

- touch the **BACK** button – the Search Background Measurements screen will re-appear or
- touch the **HOME** button – Figure 13-1 Measurement Screen will appear.

Print Individual Results

If a printer is attached to the system, a detailed report of the selected Background measurement result can be printed.

Touching the **PRINT** button on the results screen will print the selected Background Measurement report.

Inactivate a Background Measurement

The **INACTIVATE** button will be displayed on Figure 13-24 Background Measurement Result Screen if a Background measurement was performed using the Background button on Figure 13-1 Measurement Screen or by using the optional legacy Remote Display (***Note:*** *This applies only to legacy systems. Remote Displays are no longer available as an option.*). If the selected Background measurement was part of a Daily Test, the **INACTIVATE** button will not be displayed.

Only a Background measurement that was made using the Background button on Figure 13-1 Measurement Screen or by using the optional legacy Remote Display can be inactivated. To inactivate a Background measurement that was part of a Daily Test, the entire corresponding Daily Test must be inactivated. Reasons for doing this can be:

- the test was a simulation for training,
- a mistake was made doing the test, etc.

It is important to note that once a Background measurement has been inactivated, it cannot be reactivated. The Background measurement result will still be saved in the database.

When the inactivated Background measurement is displayed on the list, it will be shown with a line through the characters. When the report is printed, the word “INACTIVE” and the optional comment will appear below the data.

To inactivate the selected Background measurement, touch the **INACTIVATE** button. Figure 13-25 Inactivate Record Screen will appear.

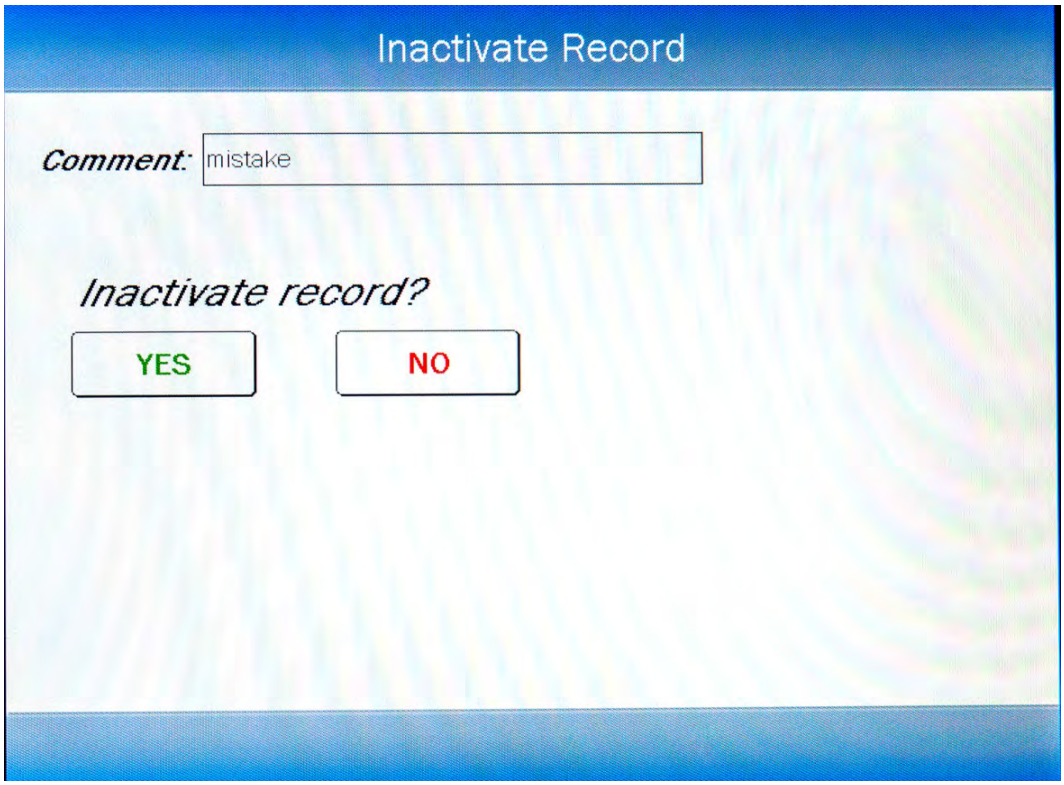

Figure 13-25 Inactivate Record Screen

To enter an optional comment (description or reason) for the selected Background measurement result inactivation, touch the ***Comment:*** field box. Figure 13-26 Alphanumeric Keypad Screen will appear.

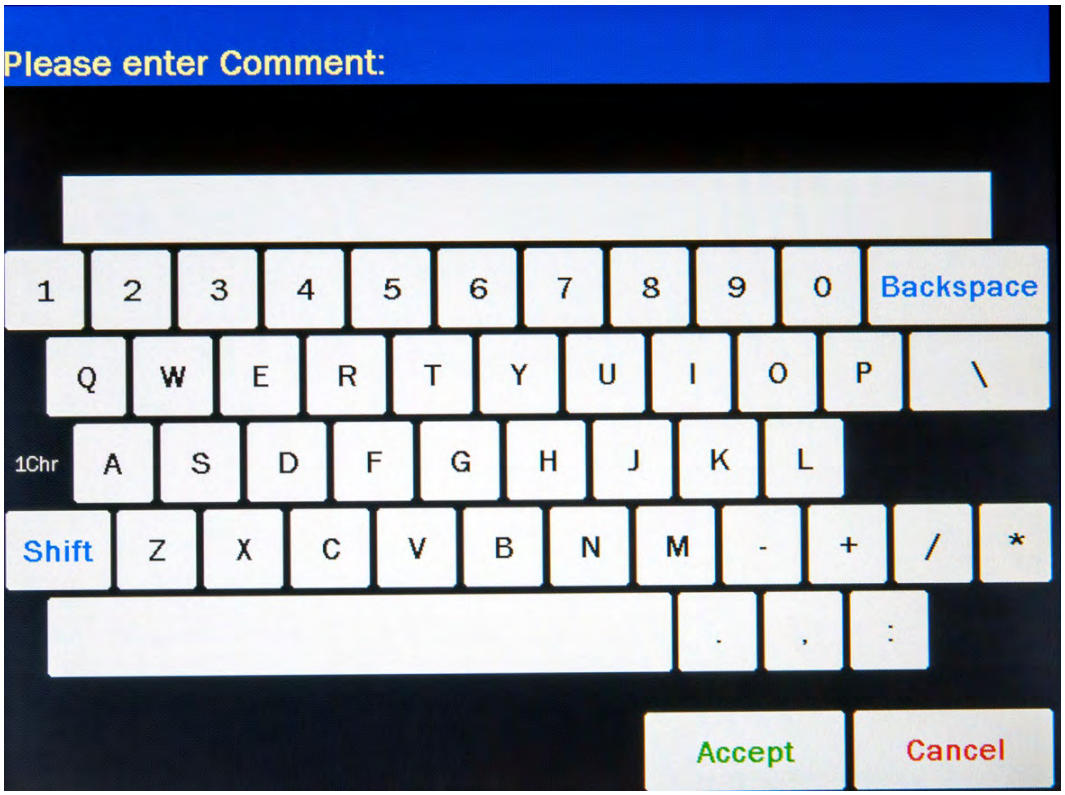

Figure 13-26 Alphanumeric Keypad Screen

Input the desired comment (description or reason) for the invalidation and touch the **ACCEPT** button. Figure 13-25 Inactivate Record Screen will re-appear with the ***Comment:*** field box populated with the entered comment. The comment can contain any combination of 22 alphanumeric characters maximum.

To cancel any comment changes and return to Figure 13-25 Inactivate Record Screen, touch the **CANCEL** button.

If it is decided not to inactivate the selected Background measurement result, touch the **NO** button. Figure 13-24 Background Measurement Result Screen will re-appear.

To complete the inactivation of the selected Background measurement result, touch the **YES** button. Figure 13-23 Search Background Measurements Screen after Searching will re-appear with a line through the characters of the inactivated Background measurement.

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CHAPTER 14

CALCULATION UTILITIES

GENERAL

Two calculation utilities are provided with the CRC®-77tHR:

- Conversion between Curie and Becquerel and
- Decay Calculation.

To access the calculation utilities, touch the **UTIL** button from Figure 14-1 Measurement Screen. Figure 14-2 Utility Screen will appear.

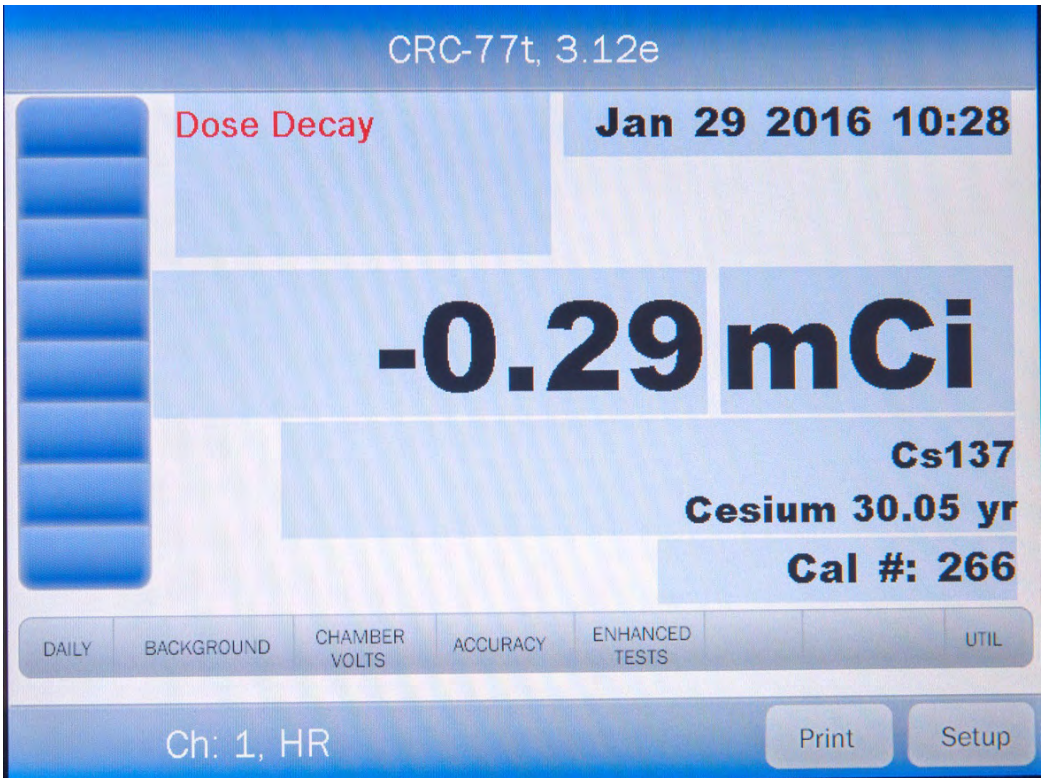

Figure 14-1 Measurement Screen

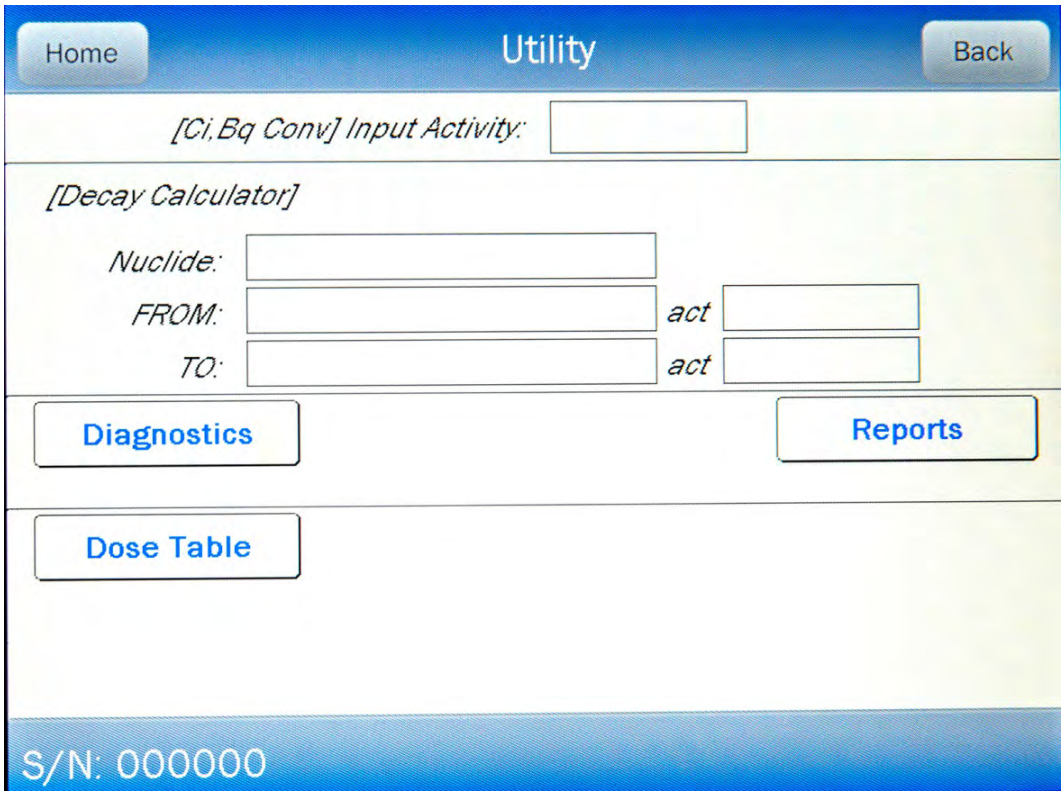

Figure 14-2 Utility Screen

CONVERSION BETWEEN CI AND BQ

Located in the top section of Figure 14-2 Utility Screen is the Curie/Becquerel converter. An activity is input in Curies and the value is displayed in Becquerels or an activity is input in Becquerels and the value is displayed in Curies.

To perform a conversion, touch the ***[Ci,Bq Conv] Input Activity:*** field box. Figure 14-3 Enter Activity Screen will appear.

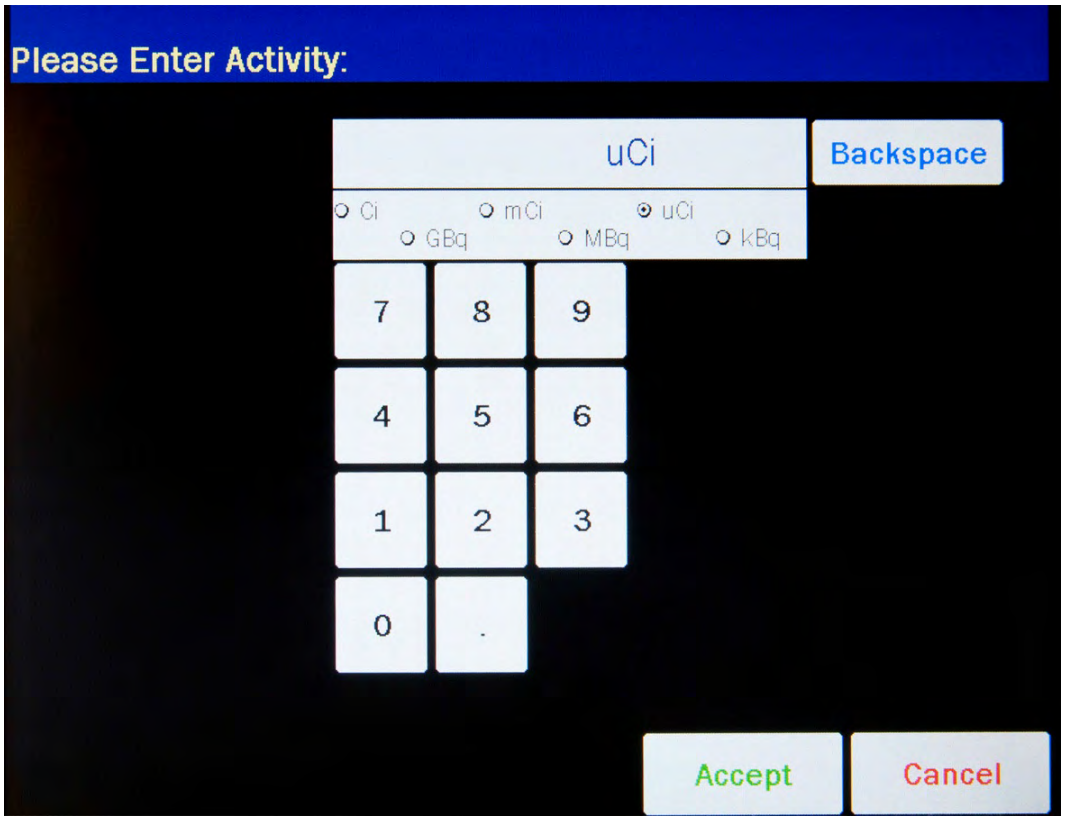

Figure 14-3 Enter Activity Screen

Input the activity to be converted using the keypad and touch the appropriate radio button for the unit of measure.

To exit the Curie/Becquerel converter and return to Figure 14-2 Utility Screen, touch the **CANCEL** button.

Once the activity and units are correct, touch the **ACCEPT** button. Figure 14-2 Utility Screen will re-appear with the ***[Ci,Bq Conv] Input Activity:*** field box populated with the entered activity. The result of the conversion is located next to the field box.

To perform another conversion, touch the ***[Ci,Bq Conv] Input Activity:*** field box. Figure 14-3 Enter Activity Screen will appear.

DECAY CALCULATOR

Located in the center section of Figure 14-2 Utility Screen is the Decay Calculator. This utility is used to calculate the activity of a source at a different time (either in the past or the future).

Select Nuclide

To select the desired nuclide, touch the ***Nuclide:*** field box. Figure 14-4 Select Nuclide Screen will appear.

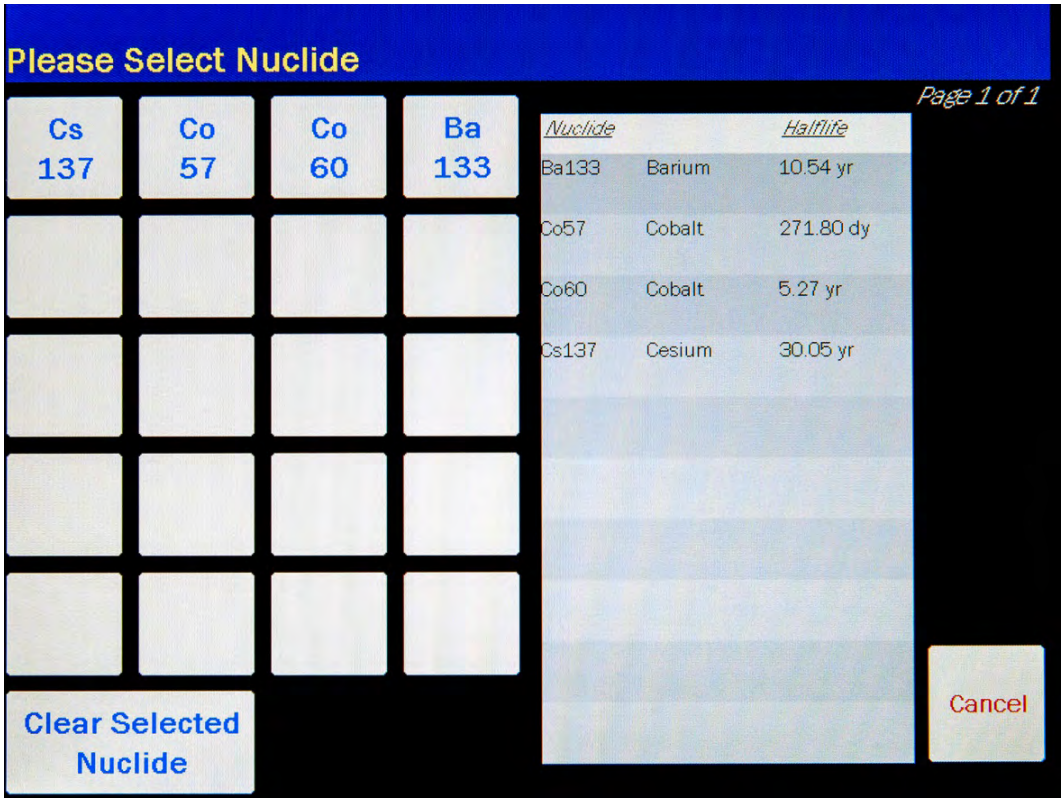

Figure 14-4 Select Nuclide Screen

The left half of the Select Nuclide screen contains the 20 preset **NUCLIDE** buttons (these are the Select Nuclide Screen Hotkeys). The right half of the screen displays a listing of nuclides stored in the calibrator's memory (both default and user added nuclides) that have a Calibration Number assigned to them (Reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: CALIBRATION NUMBERS) – 10 at a time.

The nuclide list is in alphabetical order. User added nuclides are displayed at the top of the list. The length of the list will vary depending on which nuclides have a Calibration Number assigned to them (Reference CHAPTER 6: CHAMBER INITIALIZATION, SECTION: CALIBRATION NUMBERS). The number of pages shown in the upper right corner of the screen indicates the length of the list. To scroll through the list, touch the **DOWN ARROW** (▼) button. The next group of 10 nuclides will be displayed and the **UP ARROW** (▲) button will appear allowing the user to scroll up in the list.

To cancel the nuclide selection and return to Figure 14-2 Utility Screen, touch the **CANCEL** button.

To select a nuclide for calculation, do one of the following:

- Touch one of the preset **NUCLIDE** keys (Select Nuclide Screen Hotkeys). Figure 14-2 Utility Screen will re-appear with the selected nuclide name and half-life shown in the ***Nuclide:*** field box.
- Touch the Nuclide name on the list on the right. (If necessary, scroll the list until the desired nuclide is displayed.) Once a nuclide is selected from the list, an **ACCEPT** button will appear. Touch the **ACCEPT** button to use the selected nuclide. Figure 14-2 Utility Screen will re-appear with the selected nuclide name and half-life shown in the chosen ***Nuclide:*** field box.

Date and Activity

The beginning (From) and ending (To) date, time and activity must be input to perform the calculation.

Beginning Date and Time

To input the beginning date and time for the calculation, touch the ***FROM:*** field box. Figure 14-5 Date/Time Screen will appear.

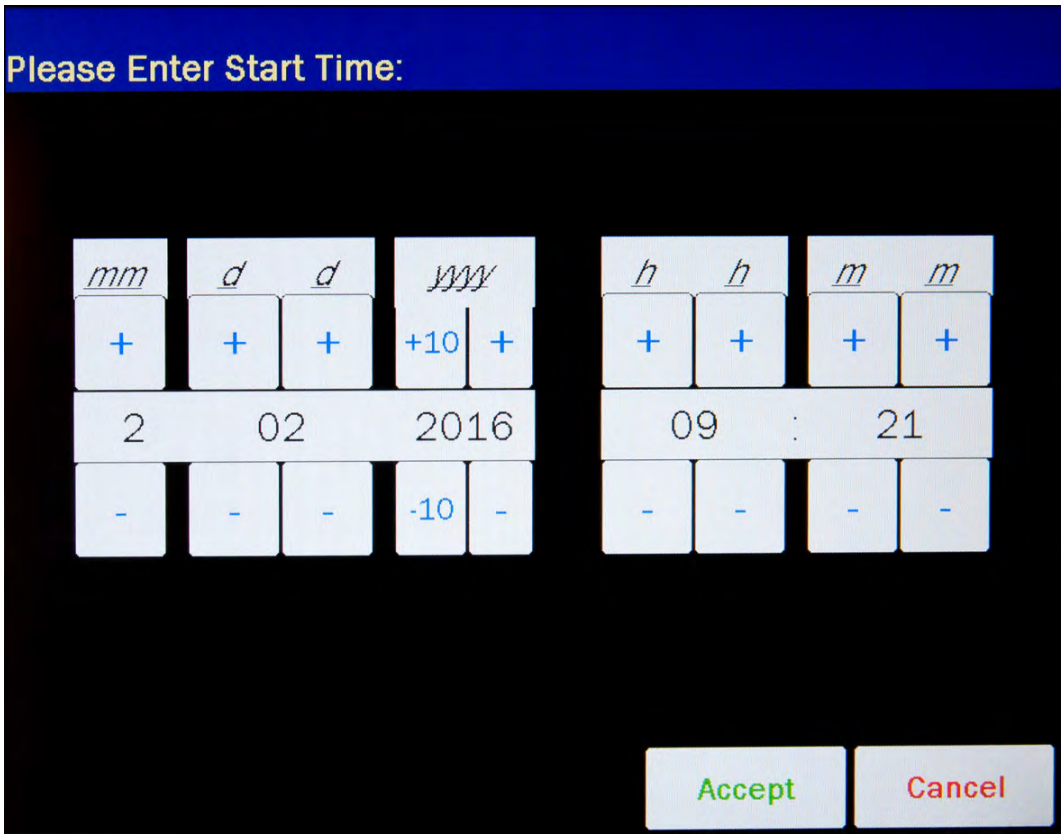

Figure 14-5 Date/Time Screen

The screen displays the currently set date and time. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

Adjust the displayed date and time as required to show the beginning date/time of the calculation.

To cancel any changes and return to the Figure 14-2 Utility Screen, touch the **CANCEL** button.

Touch the **ACCEPT** button to accept the set date and time. Figure 14-2 Utility Screen will re-appear with ***FROM:*** field box populated with the entered date and time.

Beginning Activity

To input the beginning activity for the calculation, touch the ***FROM: act*** field box. Figure 14-6 Enter Activity Screen will appear.

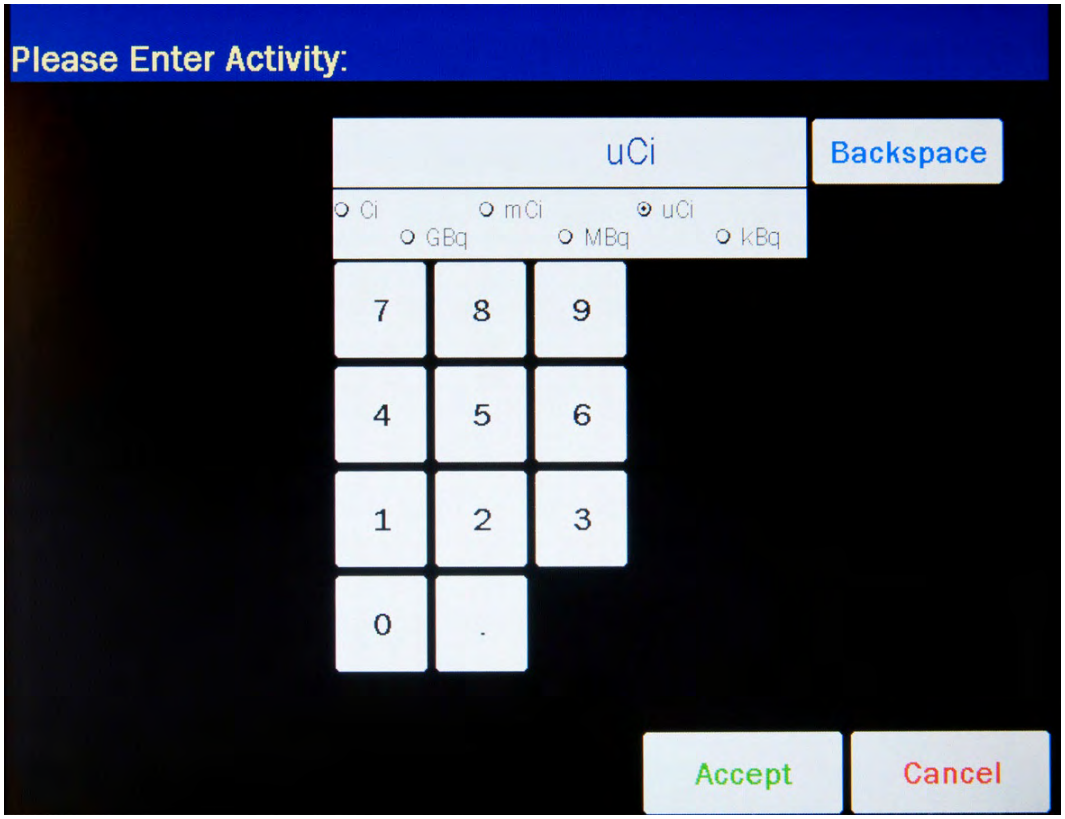

Figure 14-6 Enter Activity Screen

Input the beginning activity to be converted using the keypad and touch the appropriate radio button for the unit of measure.

To cancel any changes and return to the Figure 14-2 Utility Screen, touch the **CANCEL** button.

Touch the **ACCEPT** button to accept entered activity. Figure 14-2 Utility Screen will re-appear with ***FROM: act*** field box populated with the entered activity.

Ending Date and Time

To input the ending date and time for the calculation, touch the ***TO:*** field box. Figure 14-7 Date/Time Screen will appear.

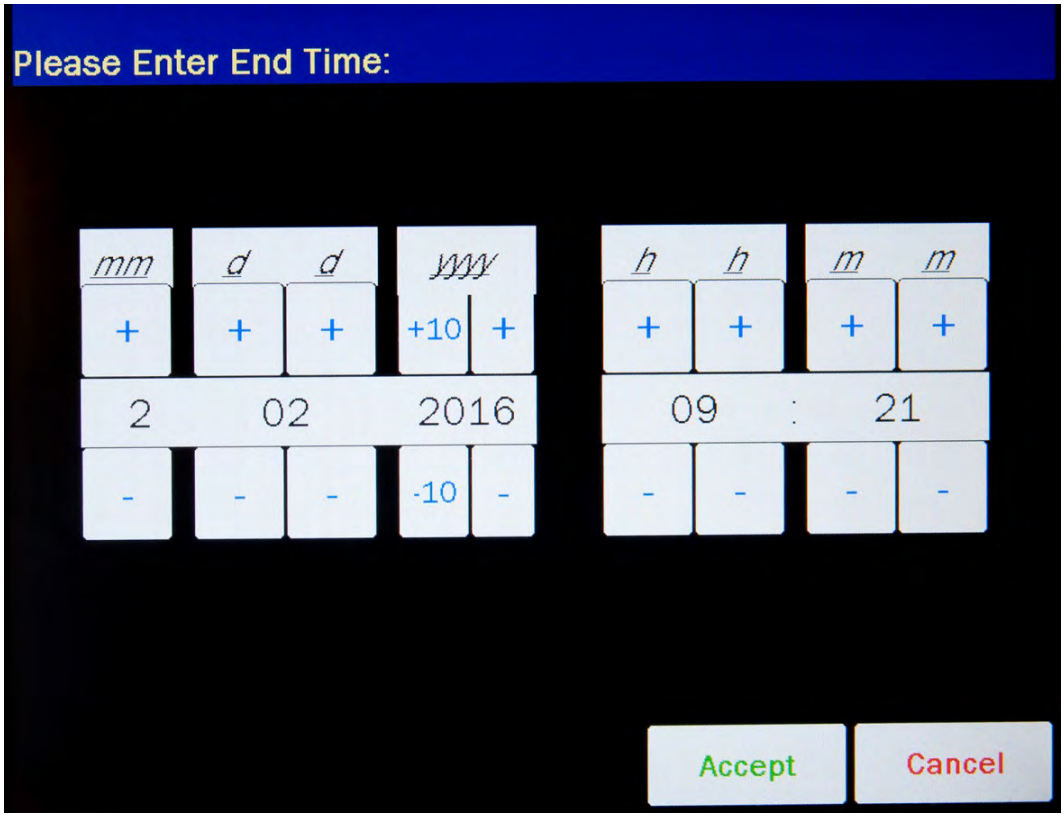

Figure 14-7 Date/Time Screen

The screen displays the currently set date and time. Above and below each of the fields are **+** and **–** buttons, respectively. To adjust the displayed value for a specific field, touch the **+** button to increase the displayed value or the **–** button to decrease the displayed value.

For the year, **+10** and **-10** buttons are provided to quickly change the tens column of the years.

Adjust the displayed date and time as required to show the ending date/time of the calculation.

To cancel any changes and return to the Figure 14-2 Utility Screen, touch the **CANCEL** button.

Touch the **ACCEPT** button to accept the set date and time. Figure 14-2 Utility Screen will re-appear with ***TO:*** field box populated with the entered date and time.

Results

After the ***FROM:***, ***FROM: act*** and ***TO:*** field boxes are filled in, the calculated ending activity results will be displayed and highlighted in green as shown in Figure 14-8 Decay Calculator Results Screen.

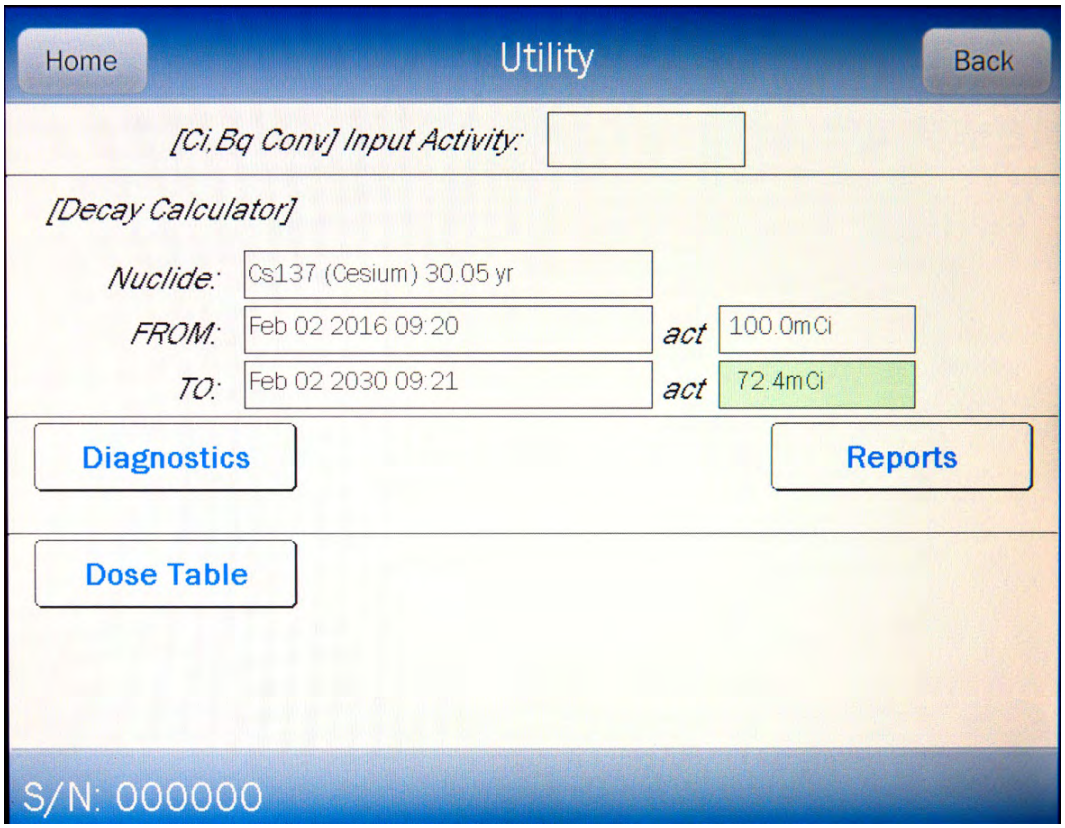

Figure 14-8 Decay Calculator Results Screen

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CHAPTER 15

CLEANING AND MAINTENANCE

GENERAL

This chapter provides the information necessary for the user to perform the basic maintenance of instrument cleaning, fuse replacement, battery replacement and general preventative maintenance. There are no internal adjustments or calibration settings that may be done by the user within the conditions of the warranty.

⚠ **CAUTION:** REFER ALL SERVICING TO A QUALIFIED SERVICE REPRESENTATIVE!

It is recommended that periodic (every five years) re-calibration of the CRC®-77tHR be performed only by Capintec's Authorized Service Center to guarantee the instrument's high reliability is maintained. Contact Capintec's only Authorized Service Center for servicing or re-calibration at (800) ASK-4CRC.

CLEANING AND DISINFECTING

CAUTION:

- DISCONNECT THE POWER BEFORE CLEANING.
- TO AVOID ELECTRICAL SHOCK OR DAMAGING OF THE CRC®-77tHR, NEVER ALLOW WATER OR LIQUIDS TO PENETRATE THE CHAMBER OR THE READOUT ENCLOSURE.
- DO NOT USE AEROSOL DISPENSERS TO SPRAY THE EQUIPMENT WITH CLEANING SOLUTIONS OR LIQUIDS.
- TO AVOID DAMAGING THE CASE OR DISPLAY SCREEN, DO NOT USE AROMATIC HYDROCARBONS, CHLORINATED SOLVENTS OR METHANOL-BASED CLEANING SOLUTIONS.
- PRIOR TO CLEANING OR DISINFECTING THE LINER AND/OR DIPPER, THEY MUST BE REMOVED FROM THE CHAMBER. CAUTION: NEVER USE THE CALIBRATOR WITHOUT THE CHAMBER LINER IN PLACE. LINERS ARE INEXPENSIVE AND EASY TO REPLACE. A CONTAMINATED CHAMBER IS A VERY COSTLY MISTAKE.

Cleaning Instructions

Readout Unit and Chamber

Wipe the surfaces clean using a damp, non-abrasive cloth or sponge and a mild detergent and water; do not use solvents or aerosol cleaners. After cleaning, wipe all surfaces dry with a soft, non-abrasive cloth. To avoid scratches, do not use abrasive pads.

Liner/Dipper

Remove the Liner and/or Dipper from the Chamber and wipe the surfaces clean using a damp, non-abrasive cloth or sponge and a mild detergent and water; do not use solvents or aerosol cleaners. After cleaning, wipe all surfaces dry with a soft, non-abrasive cloth. To avoid scratches, do not use abrasive pads.

Replace the Liner and Dipper in the Chamber.

CAUTION: Never use the calibrator without the Chamber liner in place. Liners are inexpensive and easy to replace. A contaminated Chamber is a very costly mistake.

Printer

If a printer was included with the system, refer to the printer owner's manual for proper cleaning procedures.

Disinfecting Instructions

All surfaces can be disinfected with bleach using a mixture of 1 cup of bleach per gallon of water. Wipe all surfaces using a non-abrasive cloth lightly dampened with the bleach mixture. After disinfecting, wipe dry with a soft, non-abrasive cloth.

All surfaces can also be wiped with soft cloth lightly dampened with alcohol, such as an alcohol prep pad. After wiping, the surface can be left to air dry.

Liner/Dipper

Remove the Liner and/or Dipper from the Chamber and disinfect as directed above.

Replace the Liner and Dipper in the Chamber.

⚠ **CAUTION:** Never use the calibrator without the Chamber liner in place. Liners are inexpensive and easy to replace. A contaminated Chamber is a very costly mistake.

PREVENTATIVE MAINTENANCE

The following preventative maintenance should be performed at the specified intervals. General cleaning is at the discretion of the user (see Cleaning Instructions above). It is recommended to periodically perform the Quality Assurance Tests as described in CHAPTER 7: ACCEPTANCE & QUALITY ASSURANCE TESTS.

Tests must be performed in an environment where the temperature is stable within a range of +50°F to +85°F (+10°C to +30°C) and the maximum relative humidity is 90% non-condensing. The unit should be powered-up for at least one-half hour prior to performing any measurements. No other precautions need to be observed.

⚠ **CAUTION:** If these environmental requirements are not followed, the instrument may display erroneous readings.

The Quality Assurance Tests should be immediately performed if:

- The equipment has been subjected to extreme physical stress,
- Liquids enter the readout unit, and/or chamber, or
- Any cable shows signs of damage.

DISPOSAL

The following items should be taken into consideration before disposing. These items should be disposed of in accordance with local and national regulations. Please contact Capintec, Inc. or an authorized disposal company to decommission your equipment.

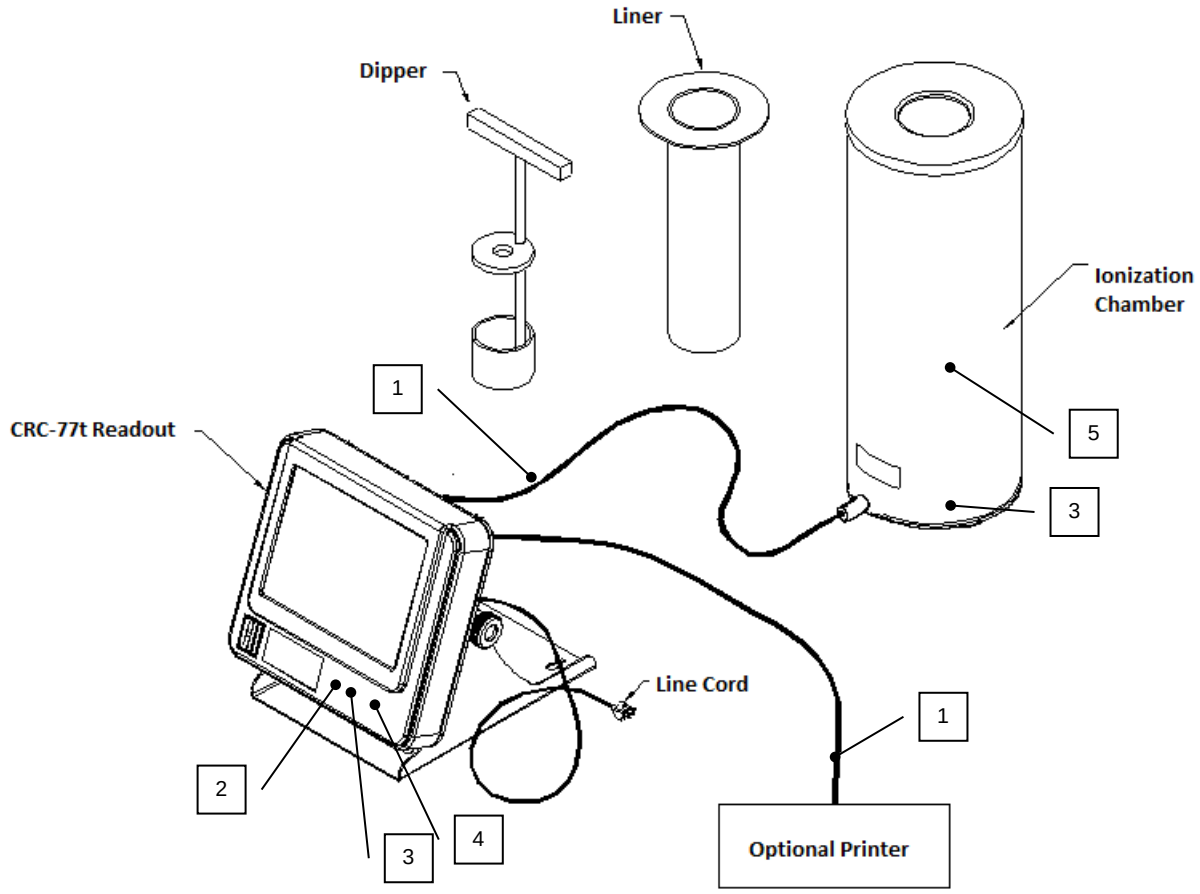

Figure 15-1

No.	Recycling/Material Code	Important Information
1	External Electrical Cables	
2	Lithium Battery	Contained on the Main printed circuit board inside of the readout unit.
3	Printed Circuit Boards	Iometer, Main, Power Supply, LCD Controller
4	Electrolytic Capacitor	Power Supply Printed Circuit Board
5	Lead	Lead Shielding around Chamber

SERVICING

The system is covered by a two year limited warranty, under normal conditions of use.

Other than the Readout Unit fuses (reference FUSE SERVICING on page 15-5) and internal Lithium Coin Battery (reference BATTERY REPLACEMENT on page 15-6), there are no user serviceable parts contained in the system.

Every five years, the system should be returned to Capintec's only Authorized Service Center for a complete verification.

CAPINTEC, Inc.
7 Vreeland Road
Florham Park, NJ 07932
Phone (800) ASK-4CRC
Fax (201) 825-1336

FUSE SERVICING

Readout Fuses

CAUTION: FOR CONTINUED PROTECTION, REPLACE ONLY WITH SAME TYPE AND RATING OF FUSE(S). A FIRE HAZARD MAY EXIST IF THE WRONG SIZE OF FUSE IS INSTALLED.

Two fuses are located in the power entry module next to the power cord connector on the back panel of the Readout Unit. These fuses are rated at 2.0A 250Vac delayed type as specified on the label located directly above the power entry module.

To change these fuses:

1. Turn off the CRC®-77tHR power switch and unplug the line cord from the power entry module.
2. Insert the tip of a small flat bladed screwdriver into the notch of the power entry module just to the left of the switch. Twist the screwdriver to open the fuse cover door. (Refer to Figure 15-2 Readout Fuse Replacement).
3. To remove the first of the two fuse carriers, insert the tip of the screwdriver behind the arrow and pull it out. Repeat this process for the second fuse.
4. Remove the blown fuse(s) from the carrier and replace it (them) with T 2.0AL 250 Volt fuse(s).
5. Re-insert the fuse carriers with the arrows pointing up.

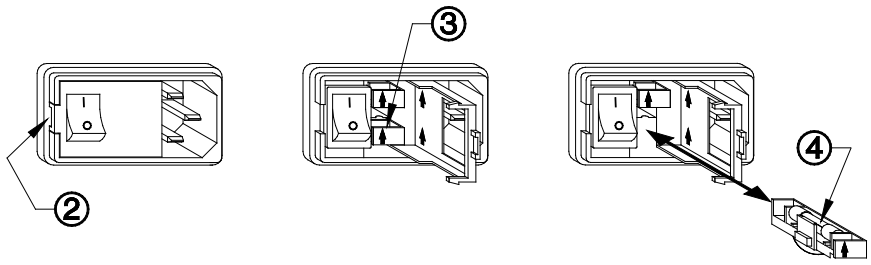

Figure 15-2 Readout Fuse Replacement

6. Close the fuse cover door and snap it into place.
7. Replace the line cord and turn on the power switch for the CRC®-77tHR.
8. Verify the CRC®-77tHR System is functioning correctly by performing the Daily Test as specified in CHAPTER 7: ACCEPTANCE & QUALITY ASSURANCE TESTS.

Printer Fuse

The printer fuse is not accessible from the outside of the printer case and must be replaced by a qualified service representative.

BATTERY REPLACEMENT

⚠ **CAUTION:** The replacement battery must be a CR2032 3 volt Lithium Coin.

When the internal 3 Volt Lithium Coin Battery falls below 2.75 Volts, the “Low Battery” message will appear on the screen as shown in Figure 15-3 Main Screen showing Low Battery. This indicates that the battery needs to be replaced.

If the battery voltage level falls low enough, the date and time will reset to January 1, 2000, 00:00 as shown in Figure 15-3 Main Screen showing Low Battery.

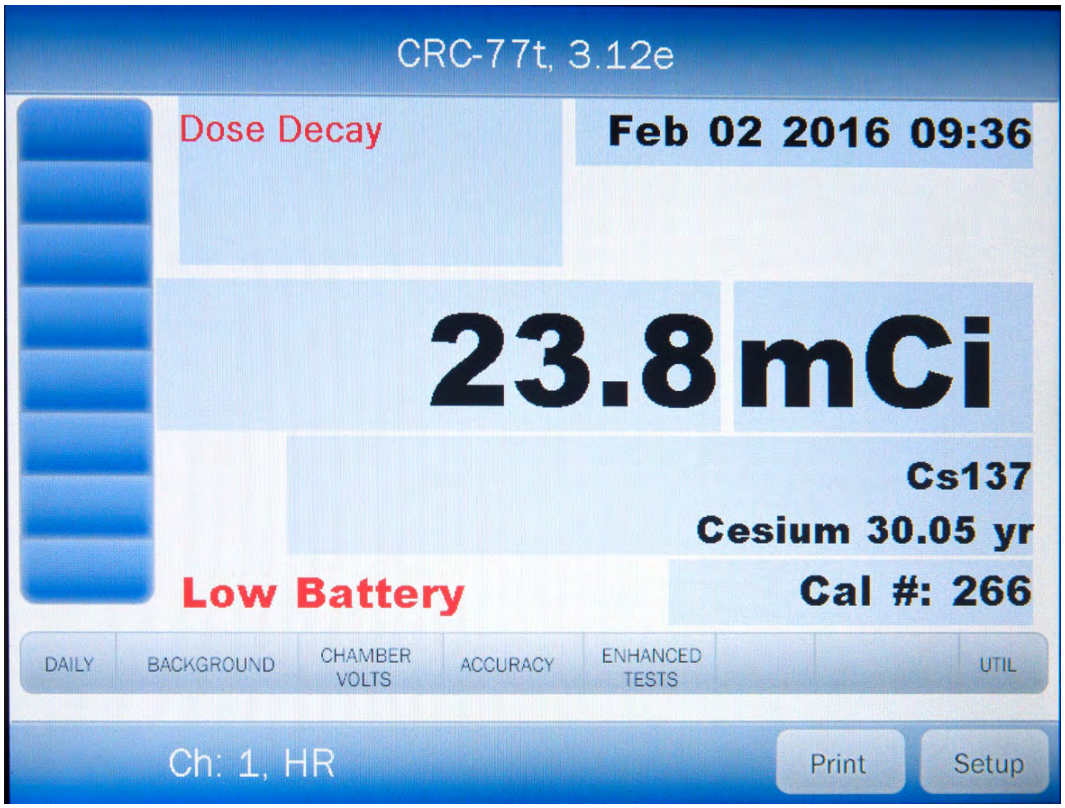

Figure 15-3 Main Screen showing Low Battery

The procedure outlined below describes how to remove and install the battery. Only qualified service personnel should perform this procedure. If there are any questions, please contact Capintec's only Authorized Service Center at (800) ASK-4CRC.

1. Remove Readout Unit From Stand Base
    a. Turn off the power switch on the back of the Readout Unit and disconnect the power cord and ALL other cables.
    b. Remove the Readout from the Stand Base by removing the two knobs located on the sides of the Stand Base. Note that there are also two washers on each knob – 1 goes between the knob and the Stand Base and the other goes between the Stand Base and the Readout Unit.
2. Battery Removal
    a. Lay the Readout Unit face-down on a flat surface. A soft cloth can be used to avoid damaging the face of the unit.
    b. Using a 3/32" Allen Wrench, remove the 4 black hex-head screws securing the Back Case to the Front Case as shown in Figure 15-4.

Figure 15-4

⚠ **CAUTION:** There are several Flat-Flex cables inside the Readout Unit that connect the Back Case to the Front Case. Exercise care while performing the following steps to avoid disconnecting any of the cables.

c. Once the 4 screws are removed, gently lift up the Back Case approximately ½" above the Front Case and carefully move the Back Case to the left approximately 3" to expose the battery as shown in Figure 15-5.

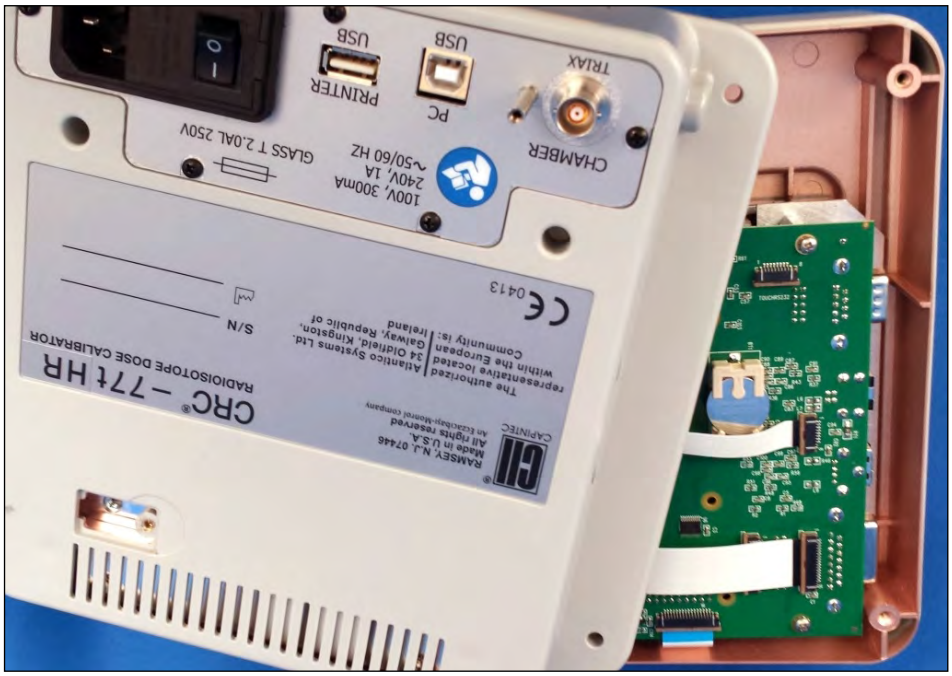

Figure 15-5

d. Gently press the battery in the direction of the arrow (toward the end of the battery holder with the three prongs) as shown in Figure 15-6.

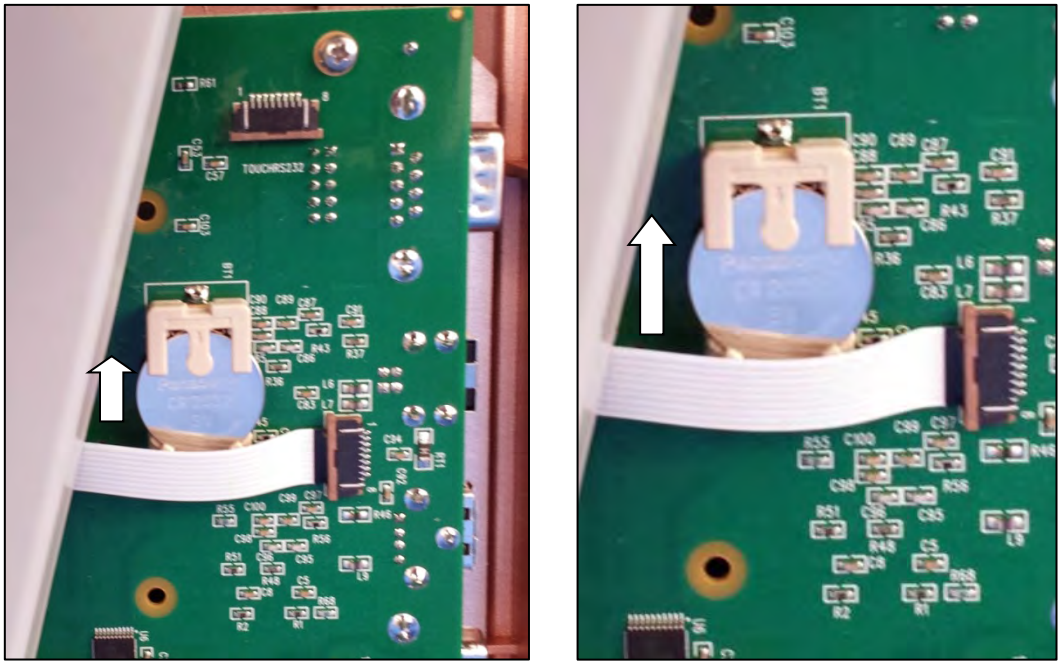

Figure 15-6

e. Lift the other end of the battery up and slide it out. The battery holder will appear as shown in Figure 15-7.

Figure 15-7

3. Battery Installation

a. Locate the new battery and verify the proper orientation as shown in Figure 15-8 – the positive (+) side of the battery must face up.

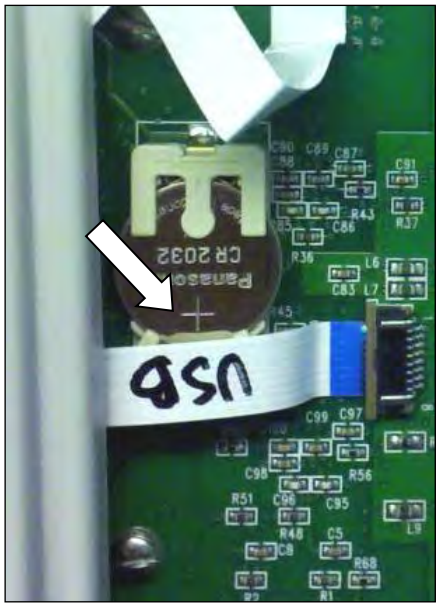

Figure 15-8

b. Slide the battery into the battery holder under the three prongs as shown in Figure 15-9.

Figure 15-9

c. Press down on the other side of the battery as shown in Figure 15-10 until a click is heard.

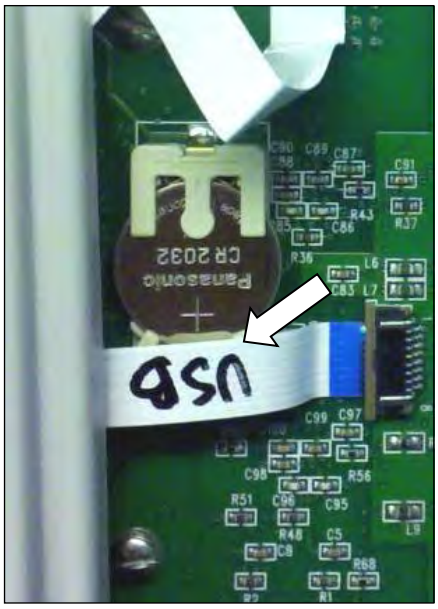

Figure 15-10

d. Verify that the battery is secure in the connector and not loose.

e. Verify that none of the Flat Flex cables are loosened from their connectors.

f. Gently lift up the Back Case approximately ½" above the Front Case and carefully move the Back Case to the right and line up the Back Case with the Front Case.

g. Replace the 4 hex-head screws.

4. Re-attach the Stand Base
   Note: *Reference CHAPTER 4:SYSTEM SETUP; SECTION:ASSEMBLY for illustration.*

   a. On the previously removed 2 knobs, verify that a washer is over the shaft of each knob.

   b. Insert one of the knobs through one side of the Stand Base and place another washer over the shaft of the knob (on the inside of the Stand Base).

   c. With the front of the Readout facing the same direction as the front of the Stand Base, place the Readout onto the Stand Base.

   d. Insert the shaft of the knob into the mounting hole located on the side of the Readout Unit. Loosely tighten the knob.

   e. Insert the other knob with washer through the other side of the Stand Base and place the other washer over the shaft of the knob (on the inside of the Stand Base).

   f. Insert the shaft of the knob into the mounting hole located on the other side of the Readout Unit. ***Note:*** *The sides of the Stand Base may need to be spread apart a small amount to get the second knob to insert into the mounting hole.*

   g. Verify on each side that there is a washer between the knob and the Stand Base (on the outside of the Stand Base), and the Stand Base and the Readout (on the inside of the Stand Base).

   h. The knobs can now be fully tightened.

5. System Power-Up

   a. Reconnect the power cord and ALL other cables.

   b. Turn on the power to the Readout Unit and verify that the "Low Battery" message does not appear on the display.

6. Set the date and time as described in CHAPTER 5: SYSTEM INITIALIZATION.

CHAMBER REPLACEMENT

1. Be sure the power switch is off. (Push lower part of the rocker switch next to the power receptor located on the rear of the main unit.)
2. Remove the power plug from the grounded three-wire outlet.
3. Disconnect the Chamber Cable from the connector on the original Chamber.
4. Set the original Chamber aside.

5. Connect the Chamber Cable to the connector on the replacement Chamber.
6. Be sure the interconnecting cable from the Chamber is properly plugged into the back of the Readout unit.
7. Be sure the power switch is off. (Push lower part of the rocker switch next to the power receptor located on the rear of the main unit.)
8. Confirm the power requirements of the instrument.
9. Plug the power plug into a grounded three-wire outlet of the specified power line.
10. Turn on the Readout Unit using the power switch located at the rear of the unit.
11. After a few seconds, The Startup screen will appear.

    Note: *After powering up, the screen may be white or have colored lines for up to 30 seconds before the Startup screen appears.*

12. Perform a Daily Test as described in CHAPTER 8: TESTS.

CHAMBER CABLE REPLACEMENT

1. Be sure the power switch is off. (Push lower part of the rocker switch next to the power receptor located on the rear of the main unit.)
2. Remove the power plug from the grounded three-wire outlet.
3. Disconnect the original Chamber Cable from the connector on the Chamber.
4. Disconnect the original Chamber Cable from the connector on the rear of the CRC®-77tHR Readout labeled “CHAMBER”.
5. Set the original Chamber Cable aside.
6. Connect the replacement Chamber Cable to the connector on the rear of the CRC®-77tHR Readout labeled “CHAMBER”.
7. Connect the replacement Chamber Cable to the connector on the Chamber.
8. Be sure the power switch is off. (Push lower part of the rocker switch next to the power receptor located on the rear of the main unit.)
9. Confirm the power requirements of the instrument.
10. Plug the power plug into a grounded three-wire outlet of the specified power line.
11. Turn on the Readout Unit using the power switch located at the rear of the unit.
12. After a few seconds, The Startup screen will appear.

    Note: *After powering up, the screen may be white or have colored lines for up to 30 seconds before the Startup screen appears.*

13. Perform a Daily Test as described in CHAPTER 8: TESTS.

TROUBLESHOOTING

Some problems may be very easy to diagnose and correct in the field with little or no equipment. If a problem should occur, check here before you call for service. You may be able to save a considerable amount of time and money.

Nothing appears on the display.

- Make sure calibrator is plugged into a live outlet and is turned on.
- Check fuse and replace if necessary. Reference the FUSE SERVICING section on page 15-5.

Buzzer buzzes continuously.

- A brief power line disruption may have caused the program to “lose its place”. Try turning the power off and then on again. If the buzzing continues, turn the power off and consult the factory. DO NOT leave the unit buzzing longer than necessary.

No Detector Found.

- Make sure the Chamber Cable is plugged into the connector labeled “CHAMBER” on the rear of the Readout unit. Reference CHAPTER 4: SYSTEM SETUP; SECTION: UNPACKING AND INSTALLATION.

High Background indication.

- Chamber Well, liner, or dipper may have become contaminated. Reference CHAPTER 7: ACCEPTANCE & QUALITY ASSURANCE TESTS, SECTION: DAILY QUALITY ASSURANCE TESTS, Contamination Test.
- Background may actually be high. Check by removing the dipper and placing a lead sheet over the top of the well.

Readings appear overly noisy for low activities.

- Make sure that the chamber is on a solid surface and is not subject to vibration.

Indication of significant negative activity.

- Background level may have changed. Re-do the Background Adjust. Reference CHAPTER 8: TESTS, SECTION: BACKGROUND.

The time is reset to 00:00.

- The internal Lithium Coin Battery may be depleted. Reference the BATTERY REPLACEMENT procedure on page 15-6.

Printer prints junk or prints with incorrect spacing.

- Make sure that the Printer Menu Setup is correct. Reference CHAPTER 5: SYSTEM INITIALIZATION, SECTION: PRINTING.

Printer will not respond.

- Make sure printer is plugged into a live outlet, turned on, and “selected”.

- Make sure that paper is in the paper path.
- Run the Diagnostic Test and make sure that the system expects to have a printer. If not, Make sure that the Printer Menu Setup is correct. Reference CHAPTER 5: SYSTEM INITIALIZATION, SECTION: PRINTING.

RELATED PRODUCTS

The following products are available from Capintec. Call Capintec's only Authorized Service Center at (800) ASK-4CRC for answers to your questions or to place an order.

- Calicheck Linearity Test Kit.....5120-2144
- Ionization Chamber Well Inserts (liners).....7300-2004
- Plastic Sample Holders (dippers).....7300-2005
- Syringe Dipper Adaptor (to 1cc).....7310-1109
- Environmental Shield.....7300-2450
- CAP-Lift remote lowering/raising of syringes or vials.....5130-30251
- Fuse: T 2 Amp. 250 Volts. (Readout Unit) 2 Req.....2110-0083
- 3V Lithium Coin Battery (CR2032).....0500-0039
- English translation of Owner's Manual.....9250-0153
- Spanish translation of Owner's Manual.....9250-0156

Note: *Circuit diagrams, component parts lists, descriptions and calibration instructions are available to appropriately qualified personnel.*

SHIPPING

If for any reason the CRC®-77tHR must be returned to Capintec, the shipping carton must contain the following or equivalent labeling as shown in Figure 15-11 and Figure 15-12. Label stipulating the maximum environmental conditions for safe storage and shipment.

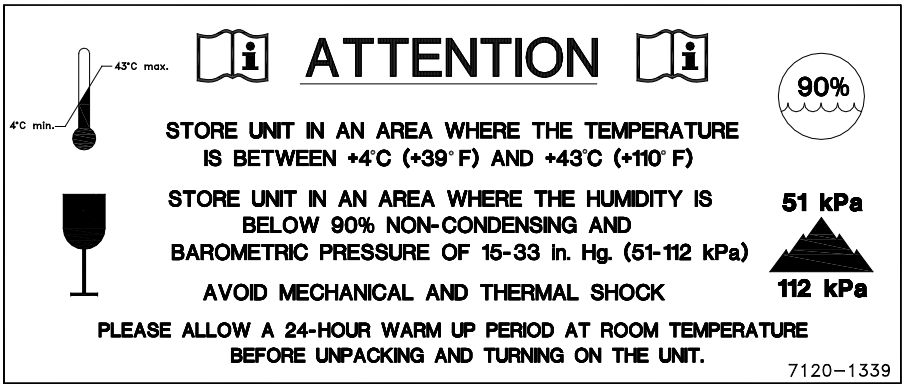

Figure 15-11


NON-FLAMMABLE GAS
2
Printed by Labelmaster, An American Labelmark Co.
Chicago, IL 60648 (800) 621-5808 HML4

Figure 15-12

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APPENDIX I

PRINCIPLE OF THE CALIBRATOR

GENERAL

The definition of activity, the basic principle of the calibrator, and the detailed discussion on the calibration are presented in this section.

DEFINITION OF ACTIVITY

Activity

Activity is defined as:

The activity, A, of a quantity of a radioactive nuclide is the quotient of dN by dt, where dN is the number of spontaneous nuclear transformations which occur in this quantity in time interval dt.

$$A = \frac{dN}{dt}$$

The special unit of activity is Curie (Ci):

$$1\ Ci = 3.7 \times 10^{10} \quad s^{-1} \text{ (exactly)}$$

Note: *The term nuclear transformation is meant to designate a change of nuclide of an isomeric transition. (ICRU REPORT 19, 1971)*

The SI (International System of Units) unit for activity is the reciprocal second, s^{-1}, and is named the Becquerel (Bq), i.e.

$$1\ Bq = 1 \text{ Nuclear Transformation per second}$$

$$1\ Ci = 3.7 \times 10^{10}\ Bq$$

Types of Transformations

α-decay

The nucleus emits a helium nucleus (α-particle).

Electron Capture (ε-decay)

The nucleus captures one of its own orbital electrons, usually from the K shell, and a neutrino is emitted.

β^- Decay

The nucleus emits an electron (β^- particle), and a neutrino.

β^+ decay

The nucleus emits a positron (β^+ particle) and a neutrino.

Nuclear Transition

A photon (electromagnetic radiation, γ-decay), electron (Internal Conversion Electron Emission, CE) or electron-positron pair (Internal-pair emission, e±) is emitted by a nucleus in a transition from a higher to lower energy state.

No nuclear transformation occurs if there is no change in the atomic number or the mass number. The de-excitation of a nucleus in its unstable state (metastable state) is, however, included in the definition of activity.

MEASUREMENT OF ACTIVITY

A Nuclear Transformation is always associated with one or more of the following types of radiation:

α, β^+, β^- and γ Photons

We can, therefore, measure activity by detecting one or more of the above radiations.

α-Particle Radiation

The most energetic α-particle emitted by a radionuclide has an energy of less than 10MeV, which corresponds to a range of about 10mg/cm^2 (8cm in air). Because of its short range, an α-particle from a radionuclide cannot penetrate to the ionization chamber's sensitive volume and therefore, cannot be detected.

All α-decays, however, are accompanied by photon radiation as the daughter nucleus decays to its ground state. The activity of a nuclide that decays through α radiation can therefore, be measured by detecting the associated photon radiation.

β^+ Radiation

β^+ particle (positron) emitted from a nucleus comes to rest in the media by losing its kinetic energy mainly by direct ionization processes and then annihilates with an electron to produce two photons of 511keV each. These photons are easily detected by the ionization chamber. De-excitation photons are also associated with β^+ decay.

β^- Radiation

The ejected electron loses kinetic energy in matter mainly by direct ionization.

The range of most emitted β's is very short. It should be noted that in β^+ and β^-emission, the emitted electron or positron has a continuous energy spectrum, which ranges from E_{max} to zero, where E_{max} is the maximum transition energy. β-rays (with the exception of a small portion of very high energy βs) will be stopped in the sample, in the chamber liner, and in the chamber wall.

As the electron decelerates, it also produces continuous low energy photon emission called Bremsstrahlung (stopping or braking radiation).

Many radionuclides that decay by β emission also emit de-excitation photons (x-rays, γ-rays), which can be detected by the ionization chamber.

Electron Capture

The actual electron capture process cannot be detected since the electron is not emitted but is captured by the nucleus. The capture of the orbital electron, however, leaves a vacancy in the atomic orbital shell, resulting in x-rays as the atom de-excites.

The energy of K x-ray is approximately

$$E_k \cong \frac{Z^2}{100} \text{ keV}$$

where Z is the atomic number of the daughter nucleus.

γ-rays are also often given off as the daughter nucleus de-excites.

Photon Radiation

Photon radiation is associated with most nuclear transformations. A high-energy photon interacts with matter very weakly. Photon intensity is therefore, not altered substantially by the surrounding media, i.e., measurement of activity can be accomplished with a minimum of disturbance from the sample configuration.

As can be seen from the above, in all cases we are detecting photons. We will therefore, discuss photons and their interactions with matter in detail.

PHOTONS

Photon is the general term for a quantum of radiation. Photons are classified according to their method of production.

γ-Rays

Photons resulting from nuclear transitions, nuclear reaction or annihilation of particles (e.g., electron-positron annihilation) are called Gamma-rays (γ-rays). Radioisotope sources (radionuclides) are the most common means of γ-ray production. Radioisotope γ-sources emit photons of one or more discrete energies.

X-Rays

X-rays are associated with the deceleration of electrons or with orbital electron transitions in atoms.

The radiation from a γ-source is often accompanied by characteristic x-rays from transitions of the orbital electrons in the daughter atom.

Bremsstrahlung

When very fast electrons are brought to rest in a medium (or pass through media) a continuous low energy photon spectrum occurs. This is called Bremsstrahlung ("stopping or braking radiation").

The intensity and the energy spectrum of Bremsstrahlung are highly dependent upon the source configuration and media surrounding the sample.

In this manual, the term photon will be used when the method of production of the radiation has no bearing on the discussion.

Interactions of Photons with Matter

There are three mechanisms by which photons can interact with matter and, thus, deposit their energy. These mechanisms are: Photoelectric effect, Compton Effect, and, pair production. The energy of the photon determines which process (or processes) is possible.

Photoelectric Effect

The photoelectric effect is an interaction between a photon and an electron that is bound to an atom. In the photoelectric process, the photon is absorbed by the atom and a bound electron is ejected. The kinetic energy of the ejected electron is equal to the photon energy minus the binding energy of the electron. The binding energy of an electron is the energy that must be supplied in order to remove the electron from the atom.

In nuclear medicine, we are interested in photon energies of 20keV or greater. At these energies, all the electrons in the materials used for the chambers are able to participate in the photoelectric process. The photoelectric effect is the most important process at low energies. However, for photon energies much greater than electron binding energies, the processes described below become more important and the number of photoelectric interactions occurring becomes small. At a given energy, the number of photoelectric interactions per unit mass varies as the 4^{th} power of the atomic number and is inversely proportional to the atomic weight of the medium (Z^4/A).

Compton Effect

The Compton Effect is a collision between a photon and an electron that can be considered unbound. An electron can be considered to be unbound (or "free") if the energy of the incident photon is much greater than the binding energy of the electron. The kinetic energy of the scattered electron is not constant, but is a function of the angle through which it is scattered. The scattered photon must interact again in order to impart all of its energy to the medium.

The Compton Effect is the dominant process for photon energies from 100keV to about 10MeV in the region of the atomic numbers for detector materials. At 100keV, the maximum kinetic energy of the scattered electron is about 30 percent of that of the incident photon; at 1MeV, it is about 80 percent; and at 10MeV, it is about 98%.

The number of Compton interactions per unit mass varies directly as the atomic number and inversely as the atomic weight of the medium (Z/A).

Pair Production

The process of pair production is difficult to comprehend because it is strictly a relativistic quantum mechanical effect. What is observed to take place is that in the presence of the electric field of a nucleus, the incident photon disappears and an electron and a positron appear. (A positron is a particle with the same properties as an electron, except that it has a positive charge.)

In order to produce an electron-positron pair, the incident photon must have an energy of at least twice the mass of an electron, i.e., 1.022MeV. This process dominates for very high energies, that is, above about 10MeV. The number of pair production interactions per unit mass is proportional to the square of the atomic number and inversely proportional to the atomic weight of the medium (Z^2/A).

IONIZATION CHAMBER MEASURING PROCESS

An ionization chamber consists of two or more electrodes. The electrodes confine a volume of gas and collect the charge (ions) produced by radiation within the volume. Thus, ionization chambers can be used to measure radiation fields if the relationship between the radiation field and the charge produced is known.

The radiation enters the chamber through the chamber wall and interacts with the gas in the chamber or with the chamber wall. It must be pointed out that photons cannot produce ionization directly, but must first interact with the chamber material (gas and wall) producing electrons. That is, through a series of interactions, the photon transfers its energy to one or more electrons.

The electron is slowed down through collisions with the chamber gas (argon). The collisions knock electrons off the molecules producing positive ions (this is the ionization process).

The collection voltage across the chamber sets up an electric field. The positive ions will drift towards the negative electrode and the electron (and negative ions if they are formed) will drift towards the positive electrode, thus producing a current. The electronic circuitry then measures either the current or the total charge produced during the period of interest.

The number of ions produced in the chamber is directly related to the energy deposited in the chamber by the radiation.

DETAILED DISCUSSIONS

Effects of the Integral Shield

The advantage of the shield is the reduction of radiation exposure to the personnel handling the radioisotopes, as well as reduction of the background effects on the activity measurements.

It is important to note, however, that if a shield is placed around or near a calibrator, the sensitivity of the ionization chamber is enhanced due to backscattering of photons by the shielding. Above about 250keV, the scattering of photons is mainly forward and at the low energy region, attenuation of photons by the outer wall of the chamber becomes significant. For a CRC® calibrator, the backscattering effects are more significant for photons of energies between 70keV and 250keV than photons in other energy regions.

Effects of the Container

The radioactive standard materials in the ampoules now being provided by NIST are a good approximation to an assay of a radiopharmaceutical in a plastic syringe or in a glass syringe (a wall thickness of about 1.2mm), even for radioisotopes that decay with a significant abundance of low-energy photons.

The user should select, whenever possible, a standardized procedure, volume, and container for all radioactivity measurements. The plastic syringe is convenient since it represents the delivery vehicle to the patient in most clinical situations.

Significant errors will occur in some instances, e.g., if the radioisotope is assayed in an appreciably different material and/or wall thickness than that of the standards.

The ampoules of recently available standards from NIST are uniform. Plastic syringes also have a rather uniform wall thickness and absorption is low. However, a random sampling of 5, 10, 25, 50, and 125ml size multi-injection dose vials from several sources indicated that the wall thickness varied randomly from 1 to 3mm quite independently of the volume of glass vial.

The assay of radioisotopes having a significant abundance of low- energy gamma-, x-, and/or high-energy beta-ray radiation may be affected by changes in the sample configuration used to assay the radio-pharmaceutical if the samples are severely different from the standard source. In such cases, an independent check or determination of a calibration appropriate to a user's needs is advised. Fortunately, most radioisotopes can be accurately assayed independently of the sample size.

Effects of Impurities

An Ionization chamber itself does not have intrinsic energy- discrimination capability. The presence of radioisotope impurities will affect the reading of the instrument unless the effect of impurities is eliminated by photon filtration as is done with Mo99 breakthrough in Tc99m. However, the presence of low-level radionuclide impurity does not negate the usefulness of a radioisotope calibrator, if the user is aware of its presence and has an independently determined calibration including photons arising from the impurities.

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INDEX

NEW PRODUCT WARRANTY

Conditions and Limitations

CAPINTEC warrants our products to be free from defects in material and workmanship for a period of 24 months after delivery to the original buyer (unless indicated otherwise). Our obligation under this warranty is limited to servicing or adjusting products returned to our factory for that purpose promptly upon any claim under this warranty, provided our examination discloses to our satisfaction that the affected parts were originally defective and have not been subjected to misuse, abuse, mishandling or improper operation. This warranty extends to every part of the product except batteries, fuses, ink, magnetic storage media, toner, transistors, tubes or any other normally consumable item. In no event shall we liable for transportation, installation, adjustment or any other expenses which may arise in connection with such products or their servicing or adjustment.

This warranty is expressly in lieu of any other express or implied warranties, and we make no warranty that the products sold herein are merchantable or are suitable for any particular purpose. The benefits of this warranty shall extend only to the buyer and to none other. We shall have no liability of any nature arising out of the use or application of the product in conformity with this warranty. If the product shall fail to perform in conformity with the warranty made herein, we shall be liable solely for the repair and replacement of the product as provided hereinabove, and shall have no other liability in respect of such failure or performance, or any consequences therefrom, including, without limitation, business impairment or loss, personal injury or property damage.

No agent, employee, or representative of ours has any authority to bind us to any representation or warranty concerning the product sold herein, and unless a representation or warranty made by an agent, employee or representative is specifically included herein, it shall not be enforceable by the buyer. No waiver, alteration or modification of the foregoing conditions shall be valid, unless made in writing and signed by an executive officer of our corporation.

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CAPINTEC, INC.

DECLARATION OF CONFORMITY
THE EC DIRECTIVE AND CE MARKING

We, Capintec, Inc.
7 Vreeland Road
Florham Park, NJ 07932
Phone (800) ASK-4CRC
Fax (201) 825-1336

declare under our sole responsibility that the product CRC®-77t RADIOISOTOPE DOSE CALIBRATOR (including use with Epson Roll and Epson Slip printers) to which this declaration relates is in conformity with the Medical Device Directive 93/42/EEC.

This product is in conformity with the following standards or other normative documents following:

1. IEC 60601-1
2. IEC 60601-1-2
3. IEC 60601-1-6
4. IEC 62304

Certified to Annex V of the Directive 93/42/EEC on Medical Devices
Dose Calibrators, Class I with measuring function
Certified through Intertek Semko AB, Notified Body MDD
CE Mark as shown denotes conformance to the above statement.

CE 0413

The Technical Construction File is maintained at:
Capintec, Inc.
7 Vreeland Road
Florham Park, NJ 07932
Phone: (800) ASK-4CRC
Fax: (201) 825-1336

The authorized representative located within the Community is:
Atlantico Systems Ltd.
34 Oldfield, Kingston, Galway, Republic of Ireland

Date of issue: 8/10/16

Place of issue:
Capintec, Inc.
7 Vreeland Road
Florham Park, NJ 07932

Mary Anne Yusko

Mary Anne Yusko
Vice President, Product Development & Regulatory Affairs