



## CORPORATION

338 DELAWANNA AVE.

CLIFTON, N.J. 07014

PHONE: 201-773-9400

TLX: 133559 XID CLIF

MS 12  
P8

February 4, 1985

Mr. John E. Glenn, Ph. D., Chief  
Nuclear Materials Section B  
Division of Engineering and Technical Programs  
Nuclear Regulatory Commission  
631 Park Avenue  
King of Prussia, PA 19406

Re: License No. 29-13064-02  
Docket No. 030-14992  
Control No. 17428

Dear Sir,

Enclosed please find the information you requested in your letter of October 29, 1984. We have attached a sketch of our calibration facility. The calibrator is kept in a lead lined box secured to the floor and locked with a Hasp lock. The calibrations are performed on off hours in the basement (calibration facility location).

Also, please find enclosed copies of our Source Identification Bulletin and Calibration Device Operation Manual and Instrument Calibration Procedures.

I hope the information enclosed is sufficient. If you have any questions, please do not hesitate to call.

Sincerely,

Joseph Dewton  
RSD Technician

JD/er

Enclosure

17428  
"OFFICIAL RECORD COPY"

8Z :Z WJ 9- 83J 5861

RECEIVED-REGION 1

ML10

8506190157 850603  
REG1 LIC30  
29-13064-02 PDR

FEB 06 1985



## CORPORATION

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### INSTRUMENT CALIBRATION

#### 1. Procedure for Calibration of Survey Instruments with Tech/Ops Model 773 Calibrator

##### 1.1 Preparation for Use

Place the source shield in a restricted area so that the directional port is aimed horizontally. To minimize the effects of scattered radiation, the unit should be 16 feet from any wall in the direction of the primary beam. Position a support horizontally from the Model 773 instrument Calibration Device. Restrict access to the area where the radiation level is in excess of 2 milliroentgens per hour.

##### 1.2 Operation

Note: To properly calibrate a survey instrument, it is necessary to check the instrument's response at two points each of the instrument's ranges. These points must be separated by at least 50% of the full scale reading. The instrument's reading should agree with the actual radiation intensity within 10% to be in proper calibration.

The following procedure is designed for a survey instrument with three scales and a range of 0-1000 mr/hr. For instruments with different ranges, the procedure will be similar, but the points will differ.

1. Turn on the survey meter and allow it to warm up for approximately 10 minutes.
2. Determine the activity of the source on the date of calibration from the decay chart provided with the source.
3. Determine the distance from the source at which the radiation intensity would be 800 mr/hr.
4. Using the tape measure attached to the Model 773, place the survey meter such that the axis of the detector is located at the proper distance from the source as determined above.



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### INSTRUMENT CALIBRATION (CONTINUED)

#### 1. Procedure for Calibration of Survey Instruments with Tech/Ops Model 773 Calibrator (continued)

##### 1.2 Operation (continued)

Note: The survey meter should be located so that the center of the detector is at the correct distance and centered on the center line of the radiation beam. The axis of the detector should be perpendicular to the center line of the radiation beam. Depending upon the physical size of your survey instrument, it may be necessary to mount it somewhat higher than the bench surface. When the proper geometry for your instrument has been established, use the same physical arrangement consistently in future calibration operations.

At short distances, using survey instruments with large detector volumes, the radiation intensity will not be uniform across the detector. Consideration should be given to this effect when determining the radiation intensities to be checked.

5. Unlock the handle of the Model 773. Remove the shipping plate. Remove all the attenuators from the radiation beam.
6. Standing away from the radiation beam, expose the source by manually raising the source rod. Note and record the survey meter reading; return the source to the stored position. The actual intensity is 800 mr/hr. If the reading is within  $\pm 10\%$  of the actual intensity, continue checking the instrument. If the instrument reading is not within  $\pm 10\%$  of the actual intensity, the instrument must be adjusted and recalibrated.

CAUTION: Do not enter the area of the radiation beam while the source is exposed.

7. Place the 0.25 attenuator in the beam. Repeat Step 6; the actual intensity is 200 mr/hr.



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### INSTRUMENT CALIBRATION (CONTINUED)

#### 1. Procedure for Calibration of Survey Instruments with Tech/Ops Model 773 Calibrator (continued)

##### 1.2 Operation (continued)

8. Remove the 0.25 attenuator from the beam and place a 0.10 attenuator in the beam. Repeat Step 6; the actual intensity is 80 mr/hr.
9. Place the 0.25 attenuator in the beam. Repeat Step 6; the actual intensity is 20 mr/hr.
10. Remove the 0.25 attenuator from the beam and place the other 0.10 attenuator in the beam. Repeat Step 6; the actual intensity is 8 mr/hr.
11. Place the 0.25 attenuator in the beam. Repeat Step 6; the actual intensity is 2 mr/hr.

##### 1.3 Instrument Devices

Although the device has radiation levels which are well below the maximum radiation level permitted on storage containers, personnel should not stay close to the device any longer than necessary.

Precautions should be taken to store the instrument calibration device in an area that meets the requirements of Title 10 Code of Federal Regulations 20.202 (b) (2), 20.203(b) and 20.203(e).

It is recommended that personnel operating the equipment use a calibrated and operable survey instrument and wear appropriate personnel monitoring devices. The radiation level at the source rod when the source is in the "operate" position is approximately 50 milliroentgens per hour.

Movement of the source rod should be accomplished as expeditiously as practicable. An alternative method of raising the source rod would be the use of a string and pulley arrangement.

In no case should anyone enter the area of radiation beam or expose any part of his body to the radiation beam.



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### INSTRUMENT CALIBRATION (CONTINUED)

#### 1. Procedure for Calibration of Survey Instruments with Tech/Ops Model 773 Calibrator (continued)

##### 1.4 Leak Testing

The Tech/Ops Model 773 Meter Calibration Kit contains a Cesium 137 source which must be leak tested at intervals not to exceed six months. This may be accomplished using the Tech/Ops Model 518 Leak Test Kit.

1. Place the Model 773 calibrator in a restricted area.
2. Remove the lock and rotate the handle from the top of the source rod. Remove the shipping cover.
3. Moisten the leak test swab with EDTA solution. Blot off the excess.
4. Wipe around the top of the source rod.
5. Standing away from the beam port, raise the source rod to the open position and wipe the exposed source rod thoroughly.
6. Place the leak test swab in the plastic envelope.
7. Set the survey meter on its most sensitive range and place the meter in a low background area. Move the swab, in its plastic envelope, to the meter--not the meter to the swab.
8. If the meter indication is less than 0.2 mr/hr above background, place the plastic envelope with the swab into the mailing box and mail to Technical Operations, Burlington, Massachusetts. BE SURE TO FILL OUT AND RETURN THE IDENTIFICATION SHEET.
9. If the swab should show more than 0.2 mr/hr, DO NOT MAIL. Contact Technical Operations, Inc. for specific instructions.



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### INSTRUMENT CALIBRATION (CONTINUED)

1. Procedure for Calibration of Survey Instruments with Tech/Ops  
Model 773 Calibrator (continued)

1.4 Leak Testing (continued)

Note; The wipe test swab will be subjected to a precise radioassay when received by Tech/Ops and a leak test certificate will be mailed promptly. This certificate must be kept with your records as it is subject to NRC inspection.

The use of the calibrator is restricted to our specially trained technician.

# CALCULATION FOR CESIUM 137

- A = Decay Factor  
B = Multiplication Factor  
C = Original Source Activity  
D = Curie Activity for Current Age (Z)  
X = Half Life (30.2 years)  
Y = Decay Constant  
Z = Number of Days or Years for Current Age

## STEP

## EXAMPLE

- |                              |  |
|------------------------------|--|
| 1) $Y = \frac{.693}{X}$      | 1) $Y = \frac{.693}{30.2} = .022947$             |
| 2) $A = Y \times Z$          | 2) $A = .022947 \times 2 = .045894$              |
| 3) Change A to NEGATIVE      | 3) $-.045894$                                    |
| 4) Take exponent of $-A = B$ | 4) $B = e^{-A} = e^{-.045894} = .95514$          |
| 5) $B \times C = D$          | 5) $.95514 \times .133 = .127$ Curies at 2 Years |



CALCULATIONS FOR SET-UP FOR  
SURVEY METER CALIBRATOR

TECH OPS MODEL 773 S/N 17

USING:  $\frac{I_2}{I_1} = \frac{D_2^2}{D_1^2}$  \_\_\_\_\_ (1)

$I_1 = 40.64 \text{ MR/HR @ 1 METRE (39.37 ins.)}$

$I_2 = \text{Desired Intensity} = 800 \text{ MR/HR}$

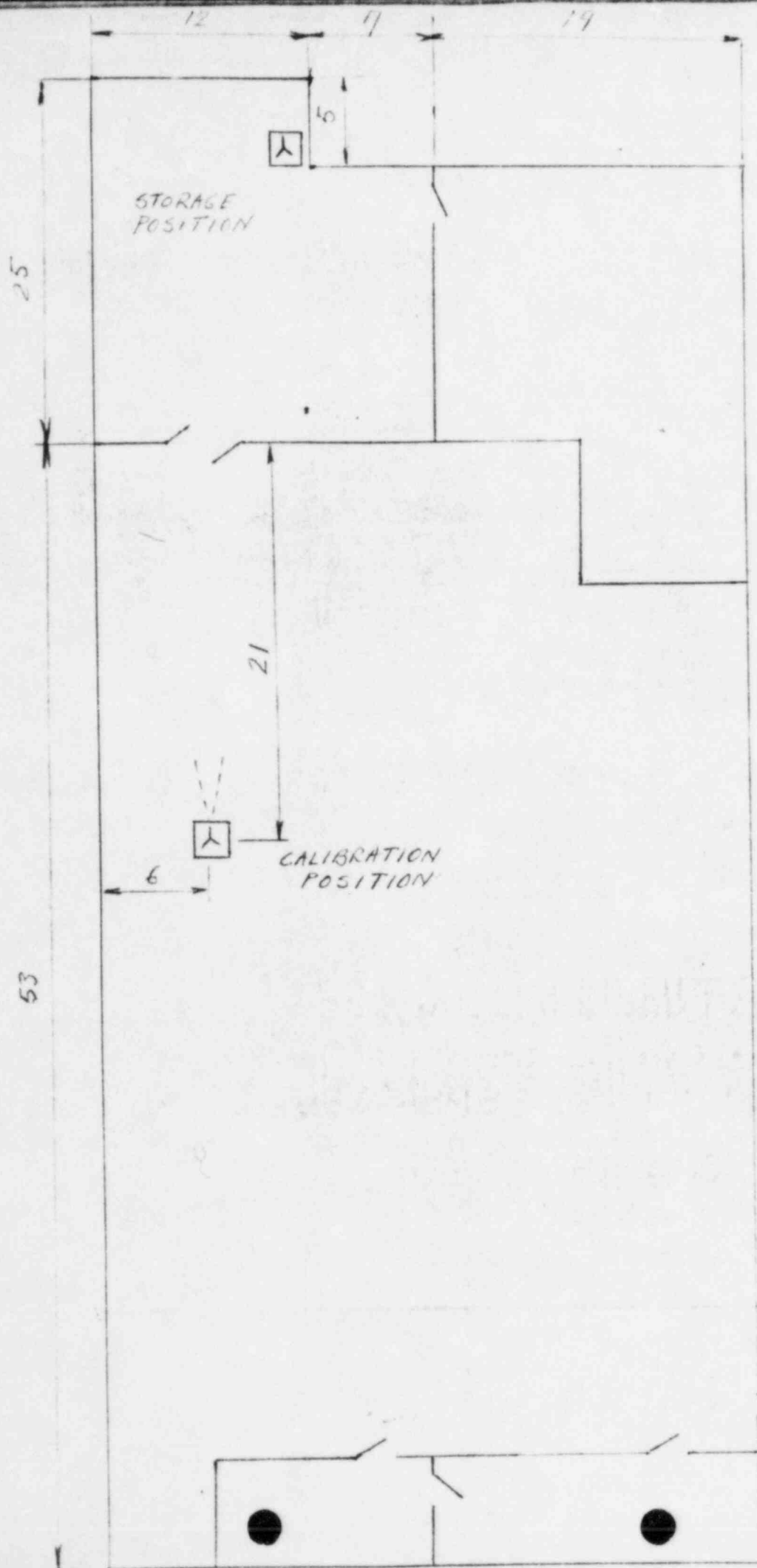
$D_1^2 = (39.37)^2 = (1549.9969) \text{ USE } 1550 \text{ for } D_1^2$

$D_2 = \text{To be Calculated using (1)}$

$$D_2 = \sqrt{\frac{I_1}{I_2} \times D_1^2} = \sqrt{\frac{40.64 \text{ (MR/HR)}}{800} \times 1550}$$

$$= \sqrt{\frac{62992}{800}} = \sqrt{78.74} = 8.873"$$





X. I. D.  
BASEMENT  
DIMENSIONS IN  
FEET

ACCESS TO  
BASEMENT

## PROCEDURE

1. Turn on the survey meter and allow it to "warm up" for approximately 10 minutes.
2. Determine the activity of the source on the date of calibration from the decay chart provided with the source.
3. Determine the distance from the source at which the radiation intensity would be 800 mr/hr (use Figure 3).
4. Using the tape measure attached to the Model 773, place the survey meter such that the axis of the detector is located at the proper distance from the source as determined above. (See Figures 1 & 2)

Note: The survey meter should be located so that the center of the detector is at the correct distance and centered on the center line of the radiation beam. The axis of the detector should be perpendicular to the centerline of the radiation beam. Depending upon the physical size of your survey instrument, it may be necessary to mount it somewhat higher than the bench surface. When the proper geometry for your instrument has been established, use the same physical arrangement consistently in future calibration operations.

At short distances, using survey instruments with large detector volumes, the radiation intensity will not be uniform across the detector. Consideration should be given to this effect when determining the radiation intensities to be checked.

5. Unlock the handle of the Model 773. Remove the shipping plate. Remove all the attenuators from the radiation beam.
6. Standing away from the radiation beam, expose the source by manually raising the source rod. Note and record the survey meter reading, return the source to the stored position. The actual intensity is 800 mr/hr. If the reading is within  $\pm 10\%$  of the actual intensity, continue checking the instrument. If the instrument reading is not within  $\pm 10\%$  of the actual intensity the instrument must be adjusted and recalibrated.

Caution: Do not enter the area of the radiation beam while the source is exposed.

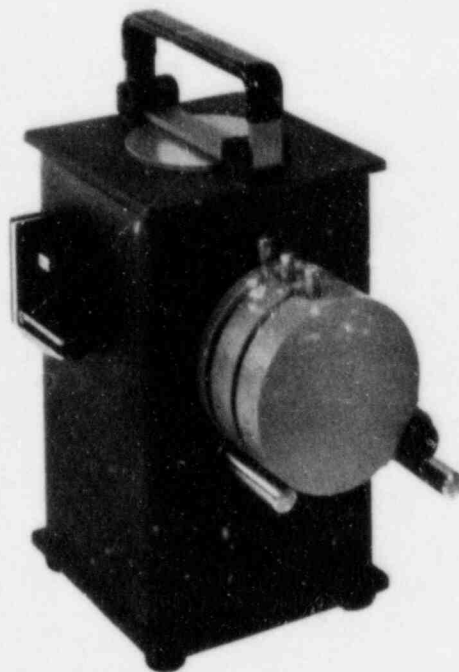
7. Place the 0.25 attenuator in the beam. Repeat step 6; the actual intensity is 200 mr/hr.
8. Remove the 0.25 attenuator from the beam and place a 0.10 attenuator in the beam. Repeat step 6; the actual intensity is 80 mr/hr.
9. Place the 0.25 attenuator in the beam. Repeat step 6; the actual intensity is 20 mr/hr.
10. Remove the 0.25 attenuator from the beam and place the other 0.10 attenuator in the beam. Repeat step 6; the actual intensity is 8 mr/hr.
11. Place the 0.25 attenuator in the beam. Repeat step 6; the actual intensity is 2 mr/hr.



# Tech/Ops Model 773 Instrument Calibration Device Operation Manual

**IMPORTANT:** The .773  
Calibrator is authorized to  
be used with 165 mci of  
Cs137. Please make cer-  
tain your license or amend-  
ment reflects this.

Tech/Ops



TECHNICAL OPERATIONS, INC.  
Radiation Products Division  
Burlington, Mass. 01803  
Phone (800) 225-1383 (toll free)  
[in Mass. call (617) 272-2000]

WARRANTY  
AND  
LIMITATION OF LIABILITY

Technical Operations, Incorporated (hereinafter referred to as *the manufacturer*) warrants its product which it manufactures and sells to be free of defects in material and workmanship for a period of 1 year from date of shipment. This warranty shall not apply to any product or parts which have been subjected to misuse, improper installation, repair, alteration, neglect, accident, abnormal conditions of operations, or use in any manner contrary to instructions.

The manufacturer's liability under such warranty shall be limited to replacing or repairing, at its option, any parts found to be defective in such respects, which are returned to it transportation prepaid; or, at its option, to returning the purchase price thereof.

The warranty on other manufacturers' components shall be that of the original manufacturer whose warranty shall be binding.

In no event shall the manufacturer be liable for any incidental or consequential damages, whether or not such damages are alleged to have resulted from the use of such product in accordance with instructions given by or referred to by the manufacturer.

Technical Operations, Incorporated assumes no liability or responsibility for the usage of any radioactive material used in connection with this product.

All other warranties, except those warranties expressly stated herein, including warranties of merchantability or otherwise, are expressly excluded.

## Technical Data

Size: 5 in (12.7 cm) wide, 5 in (12.7 cm) deep, 8.5 in (21.6 cm) high  
Weight: (with attenuators) 52 lbs. (24 kg)  
(without attenuators) 45 lbs. (20 kg)  
Source: Model 77302, <sup>137</sup>Cesium, ~~150~~ 165 millicuries  
Transport Status: DOT Specification 7A Type A Package  
Shielding Material: Lead Approx. 29 lbs. (13 kg)

## General

\* 165 The Model 773 is a small, portable radiation survey instrument calibration device. The unit consists of a ~~150~~ millicurie <sup>137</sup>Cesium source permanently attached to a movable source rod which is installed in a lead shield casting. The source is exposed by raising the source rod which positions the source in a 36° x 20° collimated beam port.

The unit is equipped with three attenuators (Transmission of 0.25, 0.10 and 0.10) to allow a survey instrument with three ranges to be calibrated at 20% and 80% of each range without changing the position of the survey instrument. The Model 773 can be used to calibrate survey instruments with ranges up to 2000 milliroentgens per hour.

The unit is equipped with a carrying handle which also serves as a source locking bar to prevent unauthorized use of the calibrator. A shipping cover is also attached to provide and additional means of securing the source.

## Receiving

Survey the device for excessive radiation levels. The device should have radiation levels less than 200 mR/hr at the surface and less than 10 mR/hr at three feet from the surface. Inspect the device for shipping damage and insure that the device is locked.

## Safety Precautions

The Model 773 Meter Calibration Device contains a ~~150~~ millicurie <sup>137</sup>Cesium source that

emits gamma radiation which can cause injury if improperly used. Disassembly of the device or removal of the source requires special equipment. We recommend that any service requiring disassembly of the device or removal of the source be performed by the manufacturer.

## Instrument Devices

Although the device has radiation levels which are well below the maximum radiation level permitted on storage containers, personnel should not stay close to the device any longer than necessary.

Precautions should be taken to store the instrument calibration device in an area that meets the requirements of Title 10 Code of Federal Regulations 20.202(b) (2), 20.203(b) and 20.203(e).

It is recommended that personnel operating the equipment use a calibrated and operable survey instrument and wear appropriate personnel monitoring devices. The radiation level at the source rod when the source is in the "operate" position is approximately 50 milliroentgens per hour.

Movement of the source rod should be accomplished as expeditiously as practicable. An alternative method of raising the source rod would be the use of a string and pulley arrangement.

In no case should anyone enter the area of the radiation beam or expose any part of his body to the radiation beam.

## Preparation for Use

Place the source shield in a restricted area so that the directional port is aimed horizontally. To minimize the effects of scattered radiation, the unit should be 16 feet from any wall in the direction of the primary beam.

Position a support horizontally from the Model 773 Instrument Calibration Device as shown in Figures 1 and 2.

Restrict access to the area where the radiation level is in excess of 2 milliroentgens per hour. (See Figure 4).



## Operation

**Note:** To properly calibrate a survey instrument it is necessary to check the instruments response at two points on each of the instruments ranges. These points must be separated by at least 50% of the full scale reading. The instruments reading should agree with the actual radiation intensity within 10% to be in proper calibration.

The following procedure is designed for a survey instrument with three scales and a range of 0-1000 mr/hr. For instruments with different ranges, the procedure will be similar but the points will differ.

1. Turn on the survey meter and allow it to "warm up" for approximately 10 minutes.
2. Determine the activity of the source on the date of calibration from the decay chart provided with the source.
3. Determine the distance from the source at which the radiation intensity would be 800 mr/hr (use Figure 3).
4. Using the tape measure attached to the Model 773, place the survey meter such that the axis of the detector is located at the proper distance from the source as determined above.

### Note:

The survey meter should be located so that the center of the detector is at the correct distance and centered on the center line of the radiation beam. The axis of the detector should be perpendicular to the centerline of the radiation beam. Depending upon the physical size of your survey instrument, it may be necessary to mount it somewhat higher than the bench surface. When the proper geometry for your instrument has been established, use the same physical arrangement consistently in future calibration operations.

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5. Unlock the handle of the Model 773. Re-

move the shipping plate. Remove all the attenuators from the radiation beam.

6. Standing away from the radiation beam, expose the source by manually raising the source rod. Note and record the survey meter reading, return the source to the stored position. The actual intensity is 800 mr/hr. If the reading is within  $\pm 10\%$  of the actual intensity, continue checking the instrument. If the instrument reading is not within  $\pm 10\%$  of the actual intensity, the instrument must be adjusted and recalibrated.
- CAUTION:** Do not enter the area of the radiation beam while the source is exposed.
7. Place the 0.25 attenuator in the beam. Repeat step 6; the actual intensity is 200 mr/hr.
8. Remove the 0.25 attenuator from the beam and place a 0.10 attenuator in the beam. Repeat step 6; the actual intensity is 80 mr/hr.
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11. Place the 0.25 attenuator in the beam. Repeat step 6; the actual intensity is 2 mr/hr.

## Leak Testing

The Tech/Ops Model 773 Meter Calibration Kit contains a  $^{137}\text{Cesium}$  source which must be leak tested at intervals not to exceed six months. This may be accomplished using the Tech/Ops Model 518 leak test kit.

1. Place the Model 773 calibrator in a restricted area.
2. Remove the lock and rotate the handle from the top of the source rod. Remove the shipping cover.
3. Moisten the leak test swab with EDTA solution. Blot off the excess.
4. Wipe around the top of the source rod.
5. Standing away from the beam port, raise the source rod to the open position and

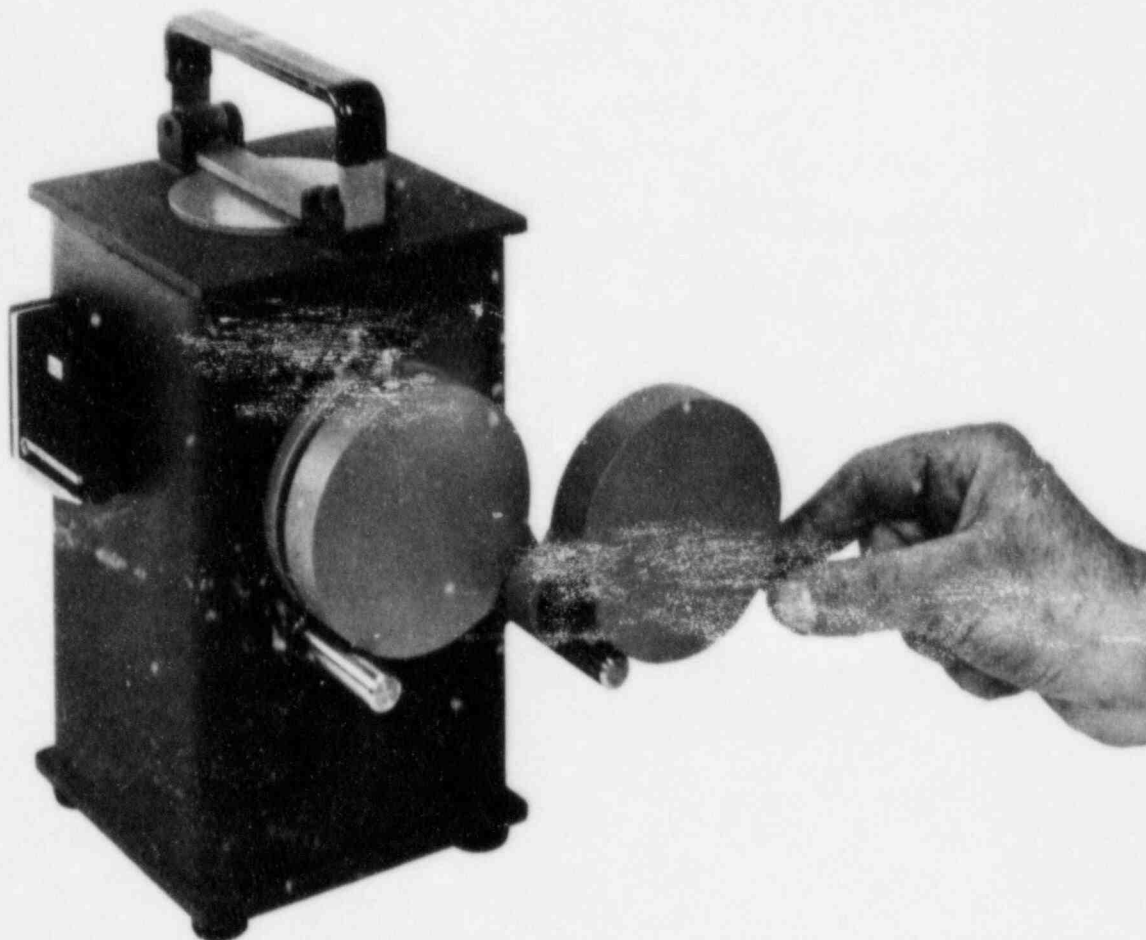
- wipe the exposed source rod thoroughly.
6. Place the leak test swab in the plastic envelope.
  7. Set the survey meter on its most sensitive range and place the meter in a low background area. Move the swab, in its plastic envelope, to the meter, not the meter to the swab.
  8. If the meter indication is less than 0.2 mr/hr above background, place the plastic envelope with the swab into the mailing box and mail to Technical Operations, Inc., Burlington, Massachusetts. BE SURE TO FILL OUT AND RETURN

#### THE IDENTIFICATION SHEET.

9. If the swab should show more than 0.2 mr/hr. DO NOT MAIL. Contact Technical Operations, Inc. for specific instructions.

#### Note:

The wipe test swab will be subjected to a precise radioassay when received by Tech/Ops and a leak test certificate will be mailed promptly. This certificate must be kept with your records as it is subject to N.R.C. inspection.





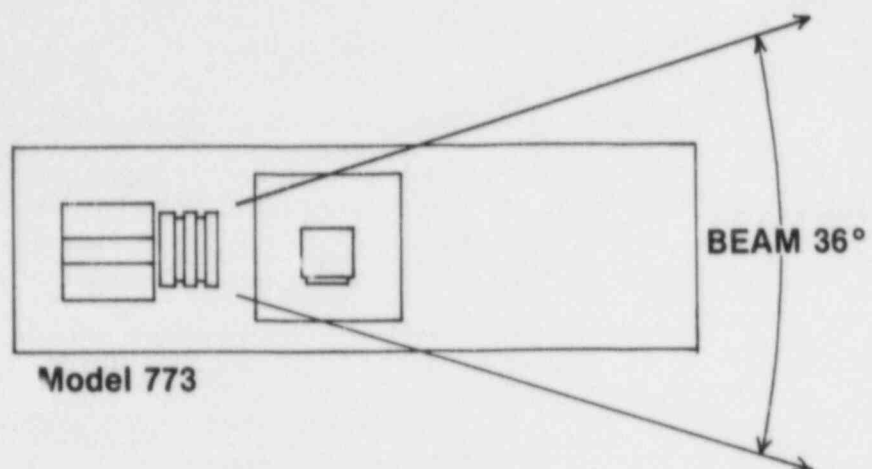


FIGURE 1

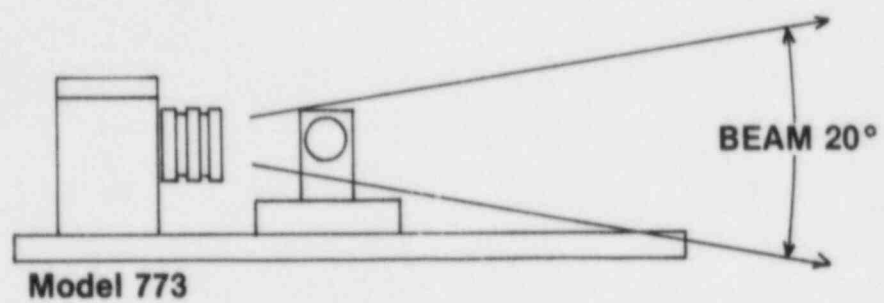
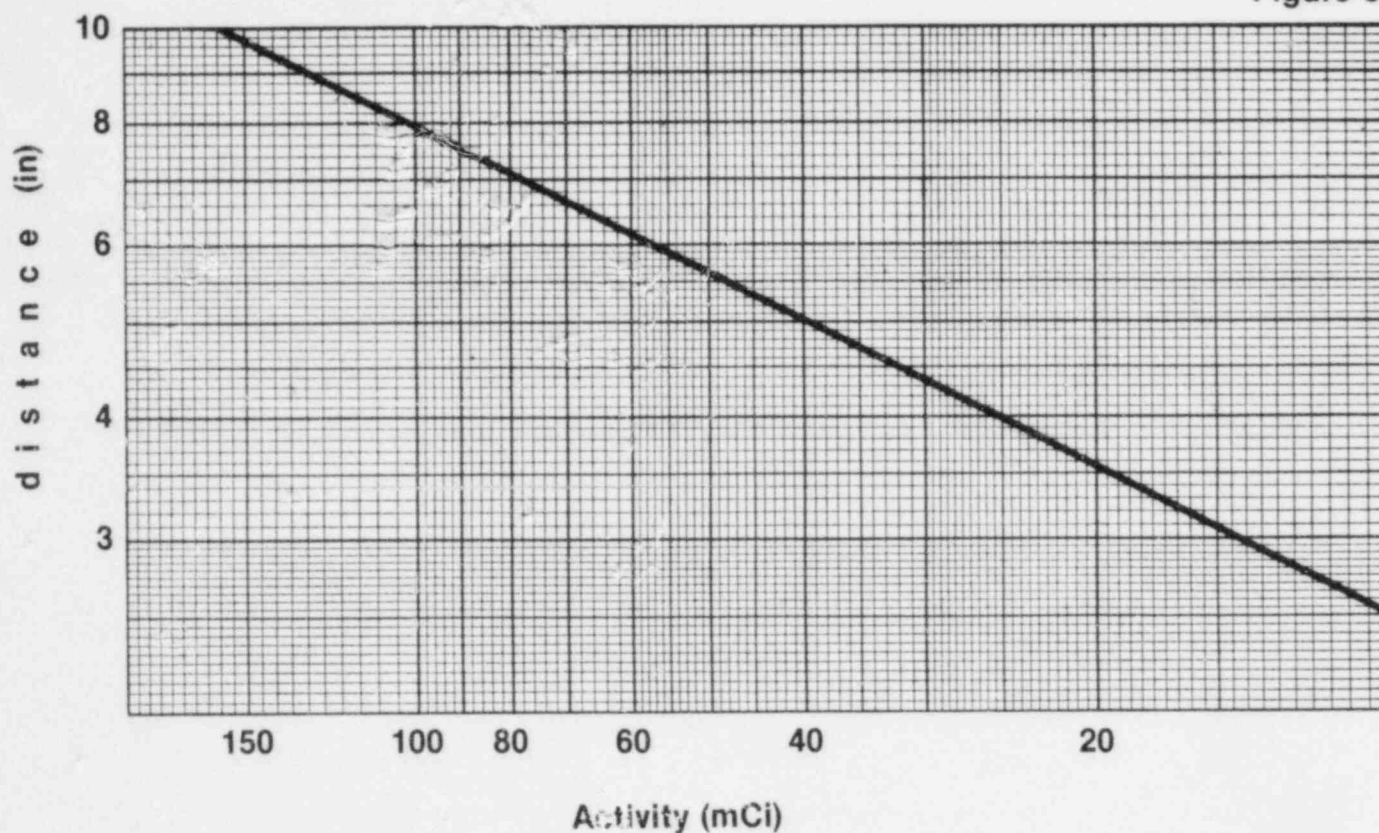


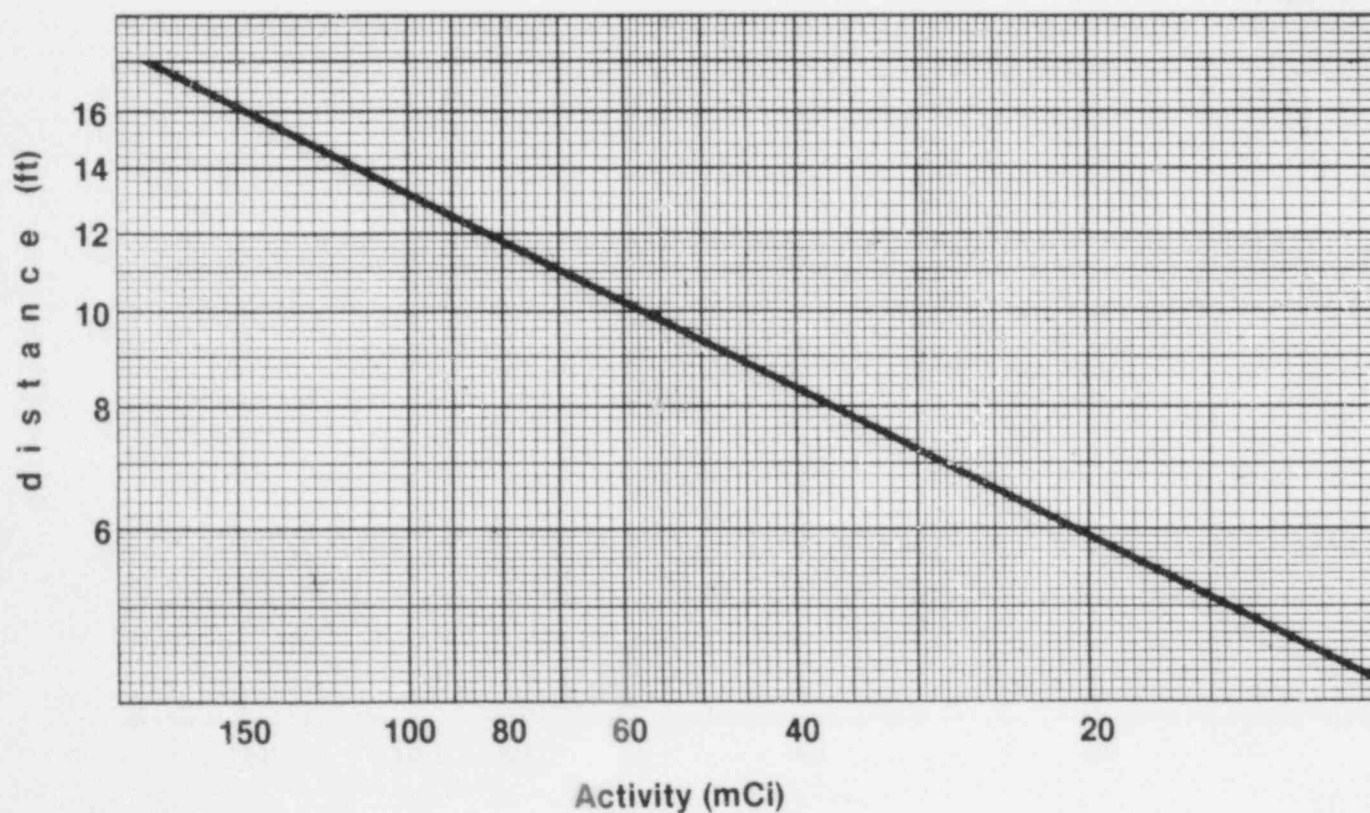
FIGURE 2

Figure 3



Distance to 800mR/hr isodose line as a Function of Activity

Figure 4



Distance to 2mR/hr isodose line as a Function of Activity



RADIATION PRODUCTS DIVISION

DATE

1/28/85

TELEPHONE OR VERBAL CONVERSATION RECORD

TIME

8 AM.  
8 PM.

☐ INCOMING CALL

☒ OUTGOING CALL

☐ VISIT

PERSON CALLING

John Glenn

OFFICE/ADDRESS

Region I

PHONE NUMBER

EXTENSION

PERSON CALLED

Marty Cogan

OFFICE/ADDRESS

X10 Corporation

PHONE NUMBER

EXTENSION

201-773-9400

SUBJECT

Abandonment Letter CN 17428

SUMMARY

Response will be sent on 2/1/85.

REFERRED TO:

ACTION REQUESTED

Hold till 2/8/85

☐ ADVISE ME OF ACTION TAKEN.

INITIALS

DATE

ACTION TAKEN

INITIALS

DATE

"OFFICIAL RECORD COPY"

ML10