

MATERIALS LICENSE

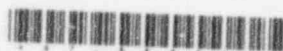
Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

OFFICIAL RECORD COPY

Licensee			
1. American Video Glass Company	3. License Number	37-30348-01	
2. 777 Technology Drive Mount Pleasant, Pennsylvania 15666-2717	4. Expiration Date	March 31, 2007	
	5. Docket or Reference No.	030-34274	
6. Byproduct, Source, and/or Special Nuclear Material	7. Chemical and/or Physical Form	8. Maximum Amount that Licensee May Possess at Any One Time Under This License	
A. Cobalt 60	A. Sealed sources (Nordion Model C-163)	A. Not to exceed 2.5 curies per source and 10 curies total	
9. Authorized use			
A. In Level Link, Inc. Model 770-A5 gauges.			

CONDITIONS

10. A. Licensed material may be used only at the licensee's facilities located at 777 Technology Drive, Mount Pleasant, Pennsylvania.
- B. The licensee may not possess and use materials authorized in Items 6, 7, and 8, until: (1) the licensee has constructed the facilities and obtained the equipment described in the application and supporting documentation; and (2) the U.S. Nuclear Regulatory Commission, Region I, ATTN: Chief, Nuclear Materials Safety Branch, 475 Allendale Road, King of Prussia, Pennsylvania 19406 has been notified in writing that activities authorized by the license will be initiated.
- In accordance with the requirements set forth in 10 CFR 30.36(b), 40.42(b), and 70.38(b), the licensee shall promptly notify the Nuclear Regulatory Commission, in writing, of a decision not to complete the facility, acquire equipment, or possess and use authorized material.
11. A. Licensed material shall only be used by, or under the supervision and in the physical presence of, Todd Cable, Tom Mastalski, or individuals who have received the training described in application dated December 2, 1996 and have been designated in writing by the Radiation Safety Officer.
- B. The Radiation Safety Officer for this license is Todd Cable.



**MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License Number

37-30348-01

Docket or Reference Number

030-34274

12. A. Sealed sources and detector cells containing licensed material shall be tested for leakage and/or contamination at intervals not to exceed six months or at such other intervals as are specified by the certificate of registration referred to in 10 CFR 32.210, not to exceed three years.
- B. Notwithstanding Paragraph A of this Condition, sealed sources designed to emit alpha particles shall be tested for leakage and/or contamination at intervals not to exceed three months.
- C. In the absence of a certificate from a transferor indicating that a leak test has been made within six months prior to the transfer, a sealed source or detector cell received from another person shall not be put into use until tested.
- D. Each sealed source fabricated by the licensee shall be inspected and tested for construction defects, leakage, and contamination prior to any use or transfer as a sealed source.
- E. Sealed sources and detector cells need not be leak tested if:
- (i) they contain only hydrogen-3; or
 - (ii) they contain only a radioactive gas; or
 - (iii) the half-life of the isotope is 30 days or less; or
 - (iv) they contain not more than 100 microcuries of beta and/or gamma emitting material or not more than 10 microcuries of alpha emitting material; or
 - (v) they are not designed to emit alpha particles, are in storage, and are not being used. However, when they are removed from storage for use or transfer to another person, and have not been tested within the required leak test interval, they shall be tested before use or transfer. No sealed source or detector cell shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.
- F. The test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. If the test reveals the presence of 0.005 microcurie or more of removable contamination, a report shall be filed with the U.S. Nuclear Regulatory Commission and the source or detector cell shall be removed immediately from service and decontaminated, repaired, or disposed of in accordance with Commission regulations. The report shall be filed within five days of the date the leak test result is known with the U.S. Nuclear Regulatory Commission, Region I, ATTN: Chief, Nuclear Materials Safety Branch, 475 Allendale Road, King of Prussia, Pennsylvania 19406. The report shall specify the source or detector cell involved, the test results, and corrective action taken.
- G. The licensee is authorized to collect leak test samples for analysis by T.N. Technologies. Alternatively, tests for leakage and/or contamination may be performed by persons specifically licensed by the Commission or an Agreement State to perform such services.

**MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License Number

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13. Sealed sources or detector cells containing licensed material shall not be opened or sources removed from source holders by the licensee.
14. The licensee shall conduct a physical inventory every six months to account for all sealed sources and devices containing licensed material received and possessed under the license.
15. The licensee shall not acquire licensed material in a sealed source or device unless the source or device has been registered with the U.S. Nuclear Regulatory Commission pursuant to 10 CFR 32.210 or equivalent regulations of an Agreement State.
16. Each gauge shall be tested for the proper operation of the on-off mechanism and indicator, if any, at no longer than six-month interval or at such longer intervals as specified by the manufacturer and approved by the Commission or an Agreement State in a registration certificate referred to in 10 CFR 32.210.
17. Installation, initial radiation survey, relocation, removal from service, maintenance, and repair of devices containing sealed sources shall be performed by persons specifically licensed by the Commission or an Agreement State to perform such services. Installation, replacement, and disposal of sealed sources shall be performed only by persons specifically licensed by the Commission or an Agreement State to perform such services.
18. Prior to initial use and after installation, relocation, dismantling, alignment, or any other activity involving the source or removal of the shielding, the licensee shall assure that a radiological survey is performed to determine radiation levels in accessible areas around, above, and below the device with the shutter open. This survey shall be performed only by persons authorized to perform such services by the Commission or an Agreement State.
19. The licensee shall operate each device containing licensed material within the manufacturer's specified temperature and environmental limits such that the shielding and shutter mechanism of the source holder are not compromised.
20. The licensee shall assure that the shutter mechanism of each device is locked in the closed position during periods when a portion of an individual's body may be subject to the direct radiation beam. The licensee shall review and modify as appropriate its "lock-out" procedures whenever a new device is obtained to incorporate the device manufacturer's recommendations.
21. The licensee is authorized to transport licensed material in accordance with the provisions of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."

**MATERIALS LICENSE
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License Number

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22. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The Nuclear Regulatory Commission's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.

- A. Application dated October 24, 1996
- B. Letter dated December 2, 1996
- C. Letter dated March 6, 1997

MAR 10 1997

Date _____

For the U.S. Nuclear Regulatory Commission

ORIGINAL SIGNED BY:

JUDITH A. JOUSTRA

By

Division of Nuclear Materials Safety
Region I

King of Prussia, Pennsylvania 19406

License No. 37-30348-01
Docket No. 030-34274
Control No. 123859

Donald R. Dicken, President
American Video Glass Company
777 Technology Drive
Mount Pleasant, Pennsylvania 15666-2717

Dear Mr. Dicken:

Please review the enclosed document carefully and be sure that you understand all conditions. If there are any errors or questions, please notify the U.S. Nuclear Regulatory Commission, Region I Office, Licensing Assistance Team, (610) 337-5093 or 5239, so that we can provide appropriate corrections and answers.

Please be advised that your license expires at the end of the day, in the month, and year stated in the license. Until your license is terminated, you must conduct your program involving byproduct materials in accordance with the conditions of your NRC license, representations made in your license application, and NRC regulations. In particular, note that you must:

1. Operate in accordance with NRC regulations 10 CFR Part 19, "Notices, Instructions and Reports to Workers; Inspections," 10 CFR Part 20, "Standards for Protection Against Radiation," and other applicable regulations.
2. Not possess and use materials authorized in Items 6, 7, and 8, on the license until:
 - a. you have constructed the facilities and obtained the equipment described in the license application and supporting documentation; and
 - b. you have notified the U.S. Nuclear Regulatory Commission, Region I, ATTN: Chief, Nuclear Materials Safety Branch, 475 Allendale Road, King of Prussia, Pennsylvania 19406 in writing, that activities authorized by the license will be initiated.
3. Notify NRC, in writing, within 30 days:
 - a. when an authorized user or Radiation Safety Officer, permanently discontinues performance of duties under the license or has a name change; or
 - b. when the mailing address on the license changes (no fee is required if the location of byproduct material remains the same).

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4. In accordance with 10 CFR 30.36(b) and/or license condition, notify NRC, promptly, in writing, and request termination of the license:
 - a. when you decide to terminate all activities involving materials authorized under the license; or
 - b. if you decide not to complete the facility, acquire equipment, or possess and use authorized material.
5. Request and obtain a license amendment before you:
 - a. permit anyone to work as an authorized user under the license;
 - b. change Radiation Safety Officer;
 - c. order byproduct material in excess of the amount, or radionuclide, or form different than authorized on the license;
 - d. add or change the areas of use, or address or addresses of use identified in the license application or on the license; or
 - e. change ownership of your organization.
6. Submit a complete renewal application with proper fee or termination request at least 30 days before the expiration date of your license. You will receive a reminder notice approximately 90 days before the expiration date. Possession of byproduct material after your license expires is a violation of NRC regulations. A license will not normally be renewed, except on a case-by-case basis, in instances where licensed material has never been possessed or used.

In addition, please note that NRC Form 313 requires the applicant, by his/her signature, to verify that the applicant understands that all statements contained in the application are true and correct to the best of the applicant's knowledge. The signatory for the application should be the licensee or a certifying official of the licensee rather than the Radiation Safety Officer or a consultant.

You will be periodically inspected by the NRC. Failure to conduct your program in accordance with NRC regulations, license conditions, and representations made in your license application and supplemental correspondence with NRC will result in enforcement action against you. This could include issuance of a notice of violation, or imposition of a civil penalty, or an order suspending, modifying or revoking your license as specified in the "General Statement of Policy and Procedure for NRC Enforcement Actions," (Enforcement Policy), NUREG 1600.

D. R. Dicken
American Video Cass Company

-3-

Since serious consequences to employees and the public can result from failure to comply with NRC requirements, prompt and vigorous enforcement action will be taken when dealing with licensees who do not achieve the necessary meticulous attention to detail and the high standard of compliance which NRC expects of its licensees.

Thank you for your cooperation.

Sincerely,

**ORIGINAL SIGNED BY:
JUDITH A. JOUSTRA**



Kathleen Dolce
Division of Nuclear Materials Safety

License No. 37-30348-01
Docket No. 030-34274
Control No. 123859

Enclosures:

1. License No. 37-30348-01
2. 10 CFR Parts 2, 19, 20, 21, 30, 71 and 170
3. NRC Form 3 and 313

cc:
State of California

DOCUMENT NAME: R:\WPS\MLTR\L3730348.01

To receive a copy of this document, indicate in the box: "C" = Copy w/o attach/encl "E" = Copy w/ attach/encl "N" = No copy

OFFICE	DNMS/RI <i>for</i>	N	DNMS/RI				
NAME	Dolce\kd1 <i>JD</i>						
DATE	03/10/97	03/ /97	03/ /97	03/ /97			

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MAR 06 '97 05:05PM CS HEALTH SERVICES

#.2/2

STATE OF CALIFORNIA—HEALTH AND WELFARE AGENCY

PETE WILSON, Governor

DEPARTMENT OF HEALTH SERVICES

714/744-P STREET

P.O. BOX 942732

SACRAMENTO, CA 94234-7320

(916) 445-1884

March 6, 1997



030-34274

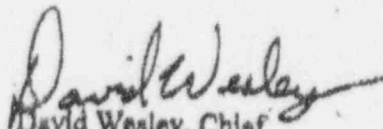
U.S. Nuclear Regulatory Commission
ATTN: John Lubinski
Mailstop T:EF3
Washington, DC 20555

Dear Mr. Lubinski:

The California Department of Health Services, Radiologic Health Branch, has reviewed the request from Level Link, Inc. to distribute the Nordion Model C-163 sealed source. Based on this review, its ANSI classification, and the information submitted, we conclude that the source is acceptable for licensing purposes. A Sealed Source and Device Certificate will be mailed to appropriate parties within one week.

If you have any questions, please call me at (916) 445-1884.

Sincerely,


David Wesley, Chief
Industrial Licensing
Radiologic Health Branch

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ML 10

123859
MAR -7 1997

FAX REC'D

American Video Glass Company
777 Technology Drive
Mt. Pleasant, Pa. 15666

MS6
P-8

March 6, 1996

Ms. Judy Joustra
Licensing Assistant Section
Nuclear Materials Safety Branch
U.S. Nuclear Regulatory Commission, Region #1
475 Allendale Road
King Of Prussia, Pa 19406-1415

Dear Ms. Joustra

In reference to American Video's Glass Company Application For Material License, "mail control Number" 123859, please find the answer to your question concerning the company that will perform our leak tests. That will be

T.N. Technologies
P.O. Box 800
2555 North IH-35
Round Rock, Texas 78680

Contact Person: Ms. Sharon Alexander

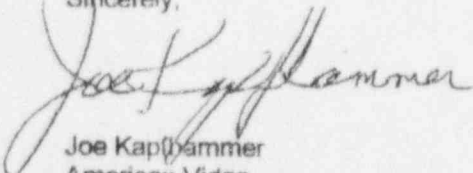
Phone No.s 512-388-9100
800-736-0801 Ext. 303
512-388-9303

Please, note that in section #10 of American Video's application it references Level Link Inc. to perform the leak test, it should be replaced by T.N. Technologies.

If you have any questions concerning the attached please feel free to contact me that the following number.

Joe Kapfhammer, 412-696-6278

Sincerely,



Joe Kapfhammer
American Video
Controls Project Engineer

attached

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ML 10

FAX REC'D

123 859

MAR - 6 1997

TELEPHONE CONVERSATION RECORD	Date: 12/24/96	Time: 12:30 PM
Mail Control No.: 123859	License No.: 37-30348-01	Docket No.: 030-14274
Person Called: Tom Gray of Level Link	Licensee: American Video	Telephone No.: (714) 997-2140
Person Calling: Kathleen Dolce / (610) 337-5251		
Subject: TELEPHONE DEFICIENCY		
Summary: 1. Facsimile received December 11, 1996, but letter was dated November 11, 1996. Please use correct month. 2. Concerning the "lapse" of Nordion's registration: there is no lapse. Nordion is no longer manufacturing and distributing the C-163 cobalt-60 sealed sources in the U.S.. The registration for the C-163 is INACTIVE (i.e., no new capsules on the market). So where is level Link acquiring these sources? With such a short half-life (5 years), how will American Video handle source replacement?		
Action Required/Taken: 1. Obtain assistance from SSS: Lubinski, John 2. cc State of California on letter		
Signature: K. Wolfe	Date: 12/24/96	

*Spoke to
secretary @
NOR.*

*Nordion still
manufacturing.*

TELEPHONE CONVERSATION RECORD	Date: 12/24/96	Time: 9:45 AM
Mail Control No.: 123859	License No.: 37-30348-01	Docket No.: 030-34274
Person Called: Joe Katfhammer, project engineer	Licensee: American Video	Telephone No.: (607) 974-6279
Person Calling: Kathleen Dolce / (610) 337-5251		
Subject: TELEPHONE DEFICIENCY		
<p>Summary: I left the following on Mr. Katfhammer's voice mail:</p> <ol style="list-style-type: none"> 1. Received your response and 11 of 12 items are complete. 2. Need to know the name of the company or companies that will analyze leak tests. Application indicates a licensed company...need name. 3. Co-60 (half-life = 5 years) sealed source is no longer being manufactured by Nordion. This means that Level Link will send/sell American Video used sources. Is this acceptable with American Video and what about replacement sources? Options change to cesium-137 (more registered sources still being manufactured) or switch type of fixed gauge. 		
Action Required/Taken: Wait for licensee's response. cc State of California on letter		
Signature: <i>Kathy Dolce</i>	Date: 12/24/96	

11:00 AM We called me
Joe was informed ~~that~~ by Tom Gray
of Level Link that Nordion is
still manufacturing C-143 &
is planning to ship Level Link
C-143 + then forward to American
Video.

Left voice mail w/ John Lubinski
56 SSSS. OFFICIAL RECORD COPY ML 10

CORNING

December 2, 1996

030-34274

Ms. Kathy Dolce
Licensing Assistant Section
Nuclear Materials Safety Branch
U.S. Nuclear Regulatory Commission, Region #1
475 Allendale Road
King Of Prussia, Pa 19406-1415

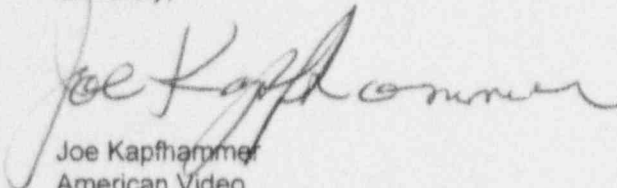
Dear Ms. Dolce

In reference to American Video's Glass Company Application For Material License, docket Number 123859, please find attached to this cover letter two copies of corrections that we reviewed about two weeks ago. I must apologize for being late with my response I hope that this does not effect our end date of Jan. 5th.

If you have any questions concerning the attached please feel free to contact me that the following numbers

Joe Kapfhammer, 607-974-6279

Sincerely,



Joe Kapfhammer
American Video
Controls Project Engineer

enclosure

OFFICIAL RECORD COPY

ML 10

DEC 23 1996

123859

Summary Sheet Of
Radiation License corrections

1.0 Section 9 vendor source assemblies literature:

Ms. Dolce's comment: Must be able to close radioactive source quickly during an emergency in the event of an accident, fire or explosion. Please remove instruction on locking the source in the open position.

Correction:

- A. Removed comment from vendor's literature about locking the source in the open position.
- B. The procedure change was reviewed with our process supervisor, both panel and funnel melting supervisors and radioactive safety officer, they all agreed.
- C. The following paragraph was added to section 9's written description.
 - * To facilitate quick closure of the source in the event of an accident, fire and explosion the source's shutter will be pined in the open position not locked. In case of an event the furnace operator or authorized personnel will be able to close the source immediately.

2. Section 10.2 "Radiation Dose Estimate" written description

Ms. Dolce's comment: Why does the melting operator need to be in the area of the radioactive source.

Correction: rephrased second paragraph to read as follows:

The tank operator is the only non-user who will come within one meter of the device except during non-routine maintenance. The tank operator is required to manually measure the molten glass level at least once a shift(every 8 hours) to verify the automatic level control system and take a temperature reading. His duration of time is about 5 to 10 seconds which should maintain a maximum exposure at less then five mR/year.

3. Section 10.3 Survey Meter

Ms. Dolce's comment: The survey meter's units of measurement are wrong they must be in mR/min. instead of counts per minute.

Corrective Action: A. To eliminate this problem I have switched to another unit that has the correct units of measurement. The unit is a Ludlum Model 3 survey meter and a model 44-2 gamma scintillator.

B. The following written description was change to the following:

Meter Ludlum Measurement, Inc. model 3 survey meter. Operating Range 0-200mr/hr and 0 to 4K counts per minute. Measures X and gamma radiation. For radiation survey and profile of tank level device.

Probe Ludlum Measurement, Inc., Model # 44-2. Measures alpha, beta, and gamma radiation. Use will be for radiation survey and profile of tank level device.

Calibration The meter and probe will be calibrated by the Ludlum Measurement Inc. at a minimum frequency of once every year. A current copy of the license, and a certificate of calibration will be kept on file. A sticker with the date of calibration, the next due date, and the calibration technician's initials, will be on the meter.

4. Section #10.4 Leak/Wipe Test

Ms. Dolce's comment: Need to specify the organization that will do the repair work on the radioactive device.

Corrective Action: The paragraph on the second page of section 10.4 was changed as follows:

If the shutter is found to be in-operative or sticking, an immediate repair will be made by the manufacturer(Level Link Inc.) or someone license to do repair work on this device.

5. Section #10.5 Maintenance and Lockout Procedures

Ms. Dolce's comment: Please change the wording of item 2,c. to include permitting workmen into and around the vessel(furnace).

Corrective Action: Item 2,c. was change to the following:

The RSO will lock the source in the "OFF" position before permitting access into and/or around the vessel(furnace) by working personnel.

6. Section # 7 Individual(s) responsible for radioactive safety program and their training experience.

Ms. Dolce's comment: Please add a second person that will be responsible if the radioactive safety office is not on site.

- Corrective Actions:
- A. The second person responsible for the radioactive safety officer's duties will be Mr. Tom Mastalski. He has just completed the course from Radiation Safety & Control Services, Inc. entitled "Radiation Safety Officer" from Nov. 18th to 22nd of this year.
 - B. Mr. Tom Mastalski's radiation safety officer training course certificate has been added to our license application.

7. Section #8 Operator Training

- Ms. Dolce's comment:
- A. Please be more specific on what type of operator needs radioactive training.
 - B. Please add annual refresher course for all personnel

- Corrective Actions:
- A. In first line of paragraph changed to the following:
All tank operators and other personnel.....
 - B. Must add the following:
 - 8. To ensure that personnel will stay abreast with current radioactive developments there will be an annual radiation safety refresher course annually given by the radiation safety office or his assistant.

8. Section #10.2 Radiation Dose Estimate (second correction on this page)

Ms. Dolce's comment: Please indicate specific period for film Badge reporting.

Corrective Action: Add the following statement to section 10.2 :
All employee film badges will be examined and recorded each month.

9 Section # 9.1,A Facilities and Equipment

Ms. Dolce's comment: Please comment on the environment that the radioactive source will be exposed to.

Corrective Action: Add special environmental written description as follows:

C.) The source is located next to the tank refiner area where internal temperatures will reach 1,300 degrees C with high density refractories in the refine wall will reduce the exposure temperature down to a range of 200 to 400 degrees F in the area of the source. The source is indirectly exposed to the outside environment due to the roof construction of Robertson ventilators to aid in heat removal from the production line. On certain occurrence high humidity will be present during glass drains that will occur under the furnace. To combat the above harsh environment the radioactive source is constructed from stainless steel and will be surround with a front cooling plate and body cooling collar that will keep the device at a temperature of 80 F during normal operations. In addition a thermocouple alarm system with red beacon light will be employed on the front cooling plate to alarm if the temperature does increase above 80F. In addition, cooling wind ducts with ambient temperature air will be blown down and around the device to reduce temperature and high humidity.

Section #7 Individual(s) responsible for radioactive safety program and their training experience.

The New Stanton plant radioactive safety officer is:

A. Mr. Todd Cable will be the radioactive safety officer of the new facility. He will complete his 40 hours of radiation safety education(NRC approved) in November of this year.

A.1 Mr. Todd Cable has attended Engelhart & Associates, Inc. course entitled " A Radiation Safety Seminar" in July of this year. Please reference his certificate and course outline that is attached.

Since 40 hours of radiation safety education(NRC approved) is required.

A.2 Mr. Todd Cable will attend an additional course from Radiation Safety & Control Services, Inc. entitled "Radiation Safety Officer" from Nov. 18th to the 22nd of this year. A course outline is attached.

A.3 Mr. Tom Masutalski will be the second person responsible for the radioactive safety officer's duties. He has just completed the course from Radiation Safety & Control Services, Inc. entitled "Radiation Safety Officer" from Nov. 18th to 22nd of this year.

B. Installation, maintenance, initial radiation survey and leak testing will be performed by Level Link engineer or other person specifically licensed by the NRC or agreement state to perform such services.

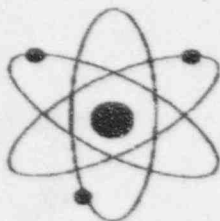
Radiation Safety & Control Services, Inc.

Awards this certificate to

Tom Mastalski

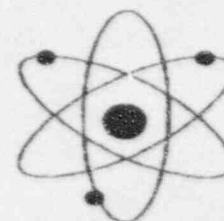
in recognition of satisfactory completion of

**RADIATION SAFETY OFFICER
TRAINING COURSE**

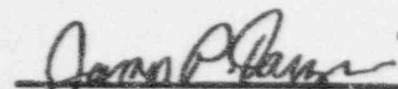


Portsmouth, New Hampshire

November 18 - 22, 1996




Frederick P. Straccia


James P. Tarzia


Eric L. Darois

Section # 8.0

Operator Training

All tank operators and other personnel (i.e. control room personnel) who may need to be near the device will receive formal training conducted by Level Link, Inc. the training will include properties of radiation, detection, sources, basic radiation safety, lock out procedures, emergency procedures and specific information concerning the radioactive tank level device.

The Radiation Safety Officer (RSO), Mr. Todd Cable has read and understands the NRC industrial Code Rule Book.

Any other individuals who will use the gauge in the near future will also be trained and certified by Level Link, Inc.

The Radiation Safety Officer will assume the following duties and responsibilities:

1. All terms and conditions of the radioactive Material License are being satisfied.
2. The equipment is Leak Tested at the six-month intervals.
3. To ensure the equipment is used by a certified operator authorized by the RSO., and that Radiation Monitoring Badges will be worn.
4. To maintain all records required by the NRC, and have them readily available for inspection.
5. To ensure the equipment is properly secured against unauthorized removal or use.
6. To serve as a point of contact and give assistance in case of emergencies.
7. Require that all the operators have read and understand the radiation safety operating and emergency procedures.
8. To ensure that personnel will stay abreast with current radioactive developments there will be an annual radiation safety refresher course given by the radiation safety office or his assistant.

1.) Panel Furnace:

- A.) As per shown in figure #1(Plant Layout)and figure #2 (Panel Furnace Detail) the radioactive source that will contain the Cobalt 60 isotope will be located on the right side of the panel furnace refiner well away from any employee walk area. The source in it's present location will be exposed to elevated temperatures and we will employ a front water cooling plate and water cooling jacket for it's body. There will be installed a temperature sensor on the front cooling plate to sense over temperature condition. If a high temperature condition is realized an alarm will sound near the source with red beacon light and in the furnace control room to alarm operation personnel. Please reference item "c" below for environment conditions.
- B.) User shall conduct, at intervals not to exceed six months, a program of visual inspections and maintenance of all source holders. This inspection shall include, but not be limited to proper labeling of the source holder, proper functioning of On-Off mechanism, adequate shielding of the radioactive material and integrity of the source mounting mechanism.
- C.)The source is located next to the tank refiner area where internal temperatures will reach 1,300 degrees C with high density refractories in the refine wall will reduce the exposure temperature down to a range of 200 to 400 degrees F in the area of the source. The source is indirectly exposed to the outside environment due to the roof construction of Robertson ventilators to aid in heat removal from the production line. On certain occurrence high humidity will be present during glass drains that will occur under the furnace.
- To combat the above harsh environment the radioactive source is constructed from stainless steel and will be surround with a front cooling plate and body cooling collar that will keep the device at a temperature of 80 F during normal operations. In addition a thermocouple alarm system with red beacon light will be employed on the front cooling plate to alarm if the temperature does increase above 80F. In addition, cooling wind ducts with ambient temperature air will be blown down and around the device to reduce temperature and high humidity.

2.) Funnel Furnace:

- A.) As per shown in figure #1(Plant Layout)and figure #3 (Funnel Furnace Detail) the radioactive source that will contain the Cobalt 60 isotope will be located on the right side of the funnel furnace refiner well away from any employee walk area. The source in it's present location will be exposed to elevated temperatures and we will employ a front water cooling plate and water cooling jacket for it's body. There will be installed a temperature sensor on the front cooling plate to sense over temperature condition. If a high temperature condition is realized an alarm will sound near the source with red beacon light and in the furnace control room to alarm operation personnel. Please reference item "c" below for environment conditions.
- B.) User shall conduct, at intervals not to exceed six months, a program of visual inspections and maintenance of all source holders. This inspection shall include, but not be limited to proper labeling of the source holder, proper functioning of On-Off mechanism, adequate shielding of the radioactive material and integrity of the source mounting mechanism.
- C.)The source is located next to the tank refiner area where internal temperatures will reach 1,300 degrees C with high density refractories in the refine wall will reduce the exposure temperature down to a range of 200 to 400 degrees F in the area of the source. The source is indirectly exposed to the outside environment due to the roof construction of Robertson ventilators to aid in heat removal from the production line. On certain occurrence high humidity will be present during glass drains that will occur under the furnace.
- To combat the above harsh environment the radioactive source is constructed from stainless steel and will be surround with a front cooling plate and body cooling collar that will keep the device at a temperature of 80 F during normal operations. In addition a thermocouple alarm system with red beacon light will be employed on the front cooling plate to alarm if the temperature does increase above 80F. In addition, cooling wind ducts with ambient temperature air will be blown down and around the device to reduce temperature and high humidity.

3.0 Emergency Procedures:

The primary effort in a fire, explosion or other emergency situation is to limit personal exposure to radiation. To prepare for a fire emergency the local fire department has reviewed the entire facility. This review included identifying the location of the radioactive tank level device. The potential dangers and protection options were discussed.

* Emergency contracts are as follows:

- Security
- Radiation Safety Officer (RSO)
- Assistant Melting Supervisor
- Melting Supervisor
- NRC
- Level Link, Inc.

* To facilitate quick closure of the source in the event of an accident, fire and explosion the source's shutter will be pined in the open position not locked. In case of an event the furnace operator or authorized personnel will be able to close the source immediately.

* If physical damage to the device from fire or other source threatens, evacuate the immediate area while simultaneously ensuring that all possible measures are being taken to protect the device from damage. In the event of a fire, fire-fighting personnel should be instructed to direct water on the gauge to keep it cool. After the fire, a complete survey should be performed to insure no contamination occurred.

* In the event of an accident, fire, and explosion that may have damaged the source encapsulation or shutter mechanism, the gauge manufacturer will be contacted immediately to provide instructions in the handling of the gauge. The regulatory agency will be notified next. Personnel will be kept away from the gauge by roping off the area until it has been determined by a survey meter that the area is safe.

* An outer boundary of less than 2 mR/hr should exist. If the contamination threatens to leave the facility proper, contact the appropriate agencies to arrange evacuation of the public. Also contact the manufacturer (Level Link Inc.).

Section #9

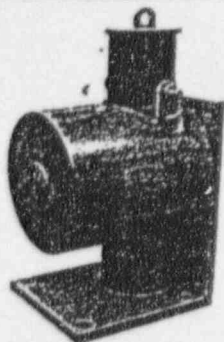
Facilities and Equipment:

- * Identify and immediately isolate all persons who might have received high exposures or who could have been contaminated. In such cases arrange for the immediate evaluation of the personal monitoring devices worn by these persons and also collect samples of body fluids such as blood, urine, etc. for further analysis.
- * If personnel have become contaminated arrange for decontamination.
- * Regulate entry to the scene of the accident to minimize exposures and contamination.
- * Notify promptly the NRC and seek advice for further action, Arrange for immediate availability of experts.
- * Maintain complete records of the accident and follow-up procedures.
- * The procedures are the responsibility of the RSO.
- * If the source housing containing radioactive material is lost or stolen, the gauge manufacturer and the regulatory authorities listed on the license will be notified.

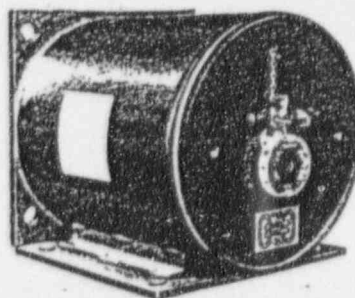


SOURCE ASSEMBLIES, SERIES TGSA 770 AND TGSA 7116

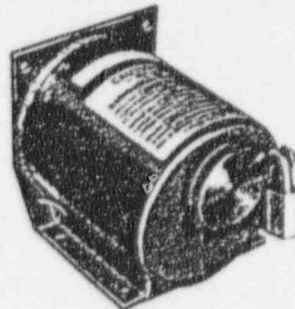
SOURCE HOLDER
MODEL TGSA 7116 —
SHUTTER OPEN



SOURCE HOLDER
MODEL TGSA 7116 —
SHUTTER CLOSED



SOURCE HOLDER
SERIES 770.
AVAILABLE IN
FIVE SIZES



SOURCE HOLDER
MODEL TGSA 770-D1
USED SPECIFICALLY FOR
BACKSCATTER
APPLICATIONS.

DESCRIPTION

The Model 770 series of source assemblies is intended for general usage with industrial nuclear instrumentation. They are designed to utilize gamma emitting nuclides, principally Cesium 137 or Cobalt 60. These holders are available in five sizes to accommodate up to 5.0 Curies of Cesium 137, or 2.5 Curies of Cobalt 60. Due to the unique design of the unit, it provides a highly collimated beam of radiation with minimal side bands, and is intended for use primarily on on-off, point level applications. It may also be utilized on varying level applications where very narrow level spans are required.

The unit is constructed of stainless steel, and is lead filled. The holder utilizes a method of collimation which provides five individual levels of radiation, selected by rotation of a shutter handwheel in 60 degree increments. The shutter may be operated manually or automatically. The hand wheel is marked so that the opening to which the unit has been set is readily determined by looking at the hand wheel. This provides a flexibility of application and can effectively increase the useful life of the source capsule. The source may be locked in either the open or closed position. It may be mounted flat on its base, or it may be hung on the side of a vessel. Where applications involving extreme heat are expected, water jackets may be provided for either the front or the top of the unit (or both). The unit is provided in five sizes, depending upon activity of source required.

For varying level, or continuous level, application, we offer the Model TGSA-7116. This source assembly provides a fan shape beam with narrow side bands. The maximum vertical range of measurement would be approximately one half the distance across the vessel, or approximately 10 feet maximum detector length. The source shutter may be opened or closed automatically, although the manual mode is more common. The unit is fabricated with stainless steel internal machine parts and a carbon steel cladding. The unit is lead filled.

For certain backscatter applications, the Model TGSA-770-D1 is utilized. It is specially constructed to permit an angular beam to be directed into the vessel for maximum backscatter generation. This unit is machined internally, stainless steel clad, and filled with lead.

Elements capable of emitting gamma radiation must be safely housed in order to be suitable for industrial applications. The Federal and State governments have established rigid safety specifications postulating requirements for industrially acceptable source holders. All Level Link source holders more than meet both state and federal specifications, assuring complete safety to personnel in the area, providing common sense precautions are observed. All holders are delivered with padlocks, and may be locked in source closed position. All source assemblies are delivered with identification labels which indicate type of nuclide contained therein, the activity, the date of loading, the model and serial number of the unit, and other information. A "Caution—Radioactive Material"

Section # 10

Radiation Safety Program

10.2

Radiation Dose Estimates

The radiation dose received from the shielded sides of the device, at one foot is 5mR/hr according to manufacturer. At this rate maximum total yearly dose, (is calculated below). The maximum exposure rate should not exceed 5 mR/hr.

The tank operator is the only non-user who will come within one meter of the device except during non-routine maintenance. The tank operator is required to manually measure the molten glass level at least once a shift(every 8 hours) to verify the automatic level control system and take a temperature reading. The site to do his work is approximitaly one meter from the device. His duration of time is about 5 to 10 seconds which should maintain a maximum exposure at less then five mR/year.

Other employees are only required to be within a meter of the device when leak testing, performing radiation profiles, non-routing maintenance and during shutdown and start-up procedures (once every two (2) years).

No one person would be within one meter greater than 10 hours per year routinely, 20 hours maximum.

As per Manufacturer, exposures to radiation levels 12 inches from the gauge surfaces with maximum loading will not exceed 5mR/hr(see below). We double this exposure rate.

Exposure 220 days/year

10 minutes per day at a maximum of 10mR/hr exposure rate

1/6 hour = 10 minutes

$220 \text{ days} \times 10 \text{ minutes/day} \times 1 \text{ hour/60min.s} = 36.67 \text{ hours of exposure / year}$

$36.67 \text{ hours/ year} \times 10 \text{ mR/hour} = 366.7 \text{ mR/ year}$

$366.7 \text{ mR/ year} \times \text{Quality factor of } 1.0 = 366.7 \text{ millirem/ year}$

All employee film badges will be examined and recorded each month.

INSTRUCTION MANUAL

LUDLUM MODEL 3 SURVEY METER

Revised June 1995
Serial No. 93535 and succeeding
Serial Numbers



LUDLUM MEASUREMENTS, INC.

P.O. Box 810 / 501 Oak Street
SWEETWATER, TEXAS 79556
Phone: 800-622-0828(USA), 915-235-5494
Fax: 915-235-4672

Serving The Nuclear Industry Since 1962

RECEIVING CONDITION EXAMINATION

Be sure to verify that the shipping carton is received in good condition with no visible damage. Should the instrument be received in a damaged condition, save the shipping container and the packing material and request an immediate inspection by the carrier.

RETURN OF GOODS TO MANUFACTURER

If equipment needs to be returned to Ludlum Measurements, Inc. for repair or calibration, please send to the address below. All shipments should include documentation containing return shipping address, customer name, telephone number, description of service requested, and all other necessary information. Your cooperation will expedite the return of your equipment.

LUDLUM MEASUREMENTS, INC.
ATTN: REPAIR DEPARTMENT
501 OAK STREET
SWEETWATER, TX. 79556
800-622-0828 (USA) 915-235-5494
FAX: 915-235-4672

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1. GENERAL

The Model 3 is a portable radiation survey instrument with four linear ranges used in combination with exposure rate or cpm meter dials. The instrument features a regulated high-voltage power supply, unimorph speaker with audio ON-OFF capability, fast-slow meter response, meter reset button and a six-position switch for selecting battery check or scale multiples of X0.1, X1, X10 and X100. Each range multiplier has its own calibration potentiometer. The unit body and meter housing are made of cast aluminum and the can is 0.090" aluminum.

Any G-M probe offered by Ludlum Measurements will operate on this unit as well as many scintillation type detectors. The instrument is typically set at 900 volts for G-M tube operation. For special requirements, it may be adjusted for operation with G-M or scintillation detectors that operate from 200 - 1500 volts.

The unit is operated with two "D" cell flashlight batteries for operation from 5°F - 122°F. For temperature operation below 32°F either very fresh alkaline or rechargeable NiCd batteries should be used. Typical battery drain averages 17 milliamperes.

2. SPECIFICATIONS

MULTIPLIERS: X0.1, X1, X10, X100

LINEARITY: Reading within $\pm 10\%$ of true value with detector connected

CONNECTOR: Series "C" (*others available*)

AUDIO: Built in unimorph speaker with ON/OFF switch (*greater than 60 dB at 2 feet*)

CALIBRATION CONTROLS: Accessible from front of instrument (*protective cover provided*)

HIGH VOLTAGE: Adjustable from 200 - 1500 volts

THRESHOLD: Fixed at 30 mV \pm 10 mV

RESPONSE: Toggle switch for FAST (4 seconds) or SLOW (22 seconds) from 10% to 90% of final reading

RESET: Pushbutton to zero meter

POWER: 2 each "D" cell batteries (*housed in sealed compartment that is externally accessible*)

BATTERY LIFE: Typically 600 hours with alkaline batteries

BATTERY DEPENDANCE: Less than 3% change in readings to battery failure indication

2. SPECIFICATIONS (cont.)

METER: 2.5" (6.4 cm) arc, 1 mA analog type

CONSTRUCTION: Cast and drawn aluminum with beige polyurethane enamel paint

TEMPERATURE RANGE: 5°F (-15°C) to 122°F (50°C) May be certified for operation from -40°F (-40°C) to 150°F (65°C)

SIZE: 6.5" (16.5 cm) H X 3.5" (8.9 cm) W X 8.5" (21.6 cm) L

WEIGHT: 3.5 lbs (1.6 kg) including batteries

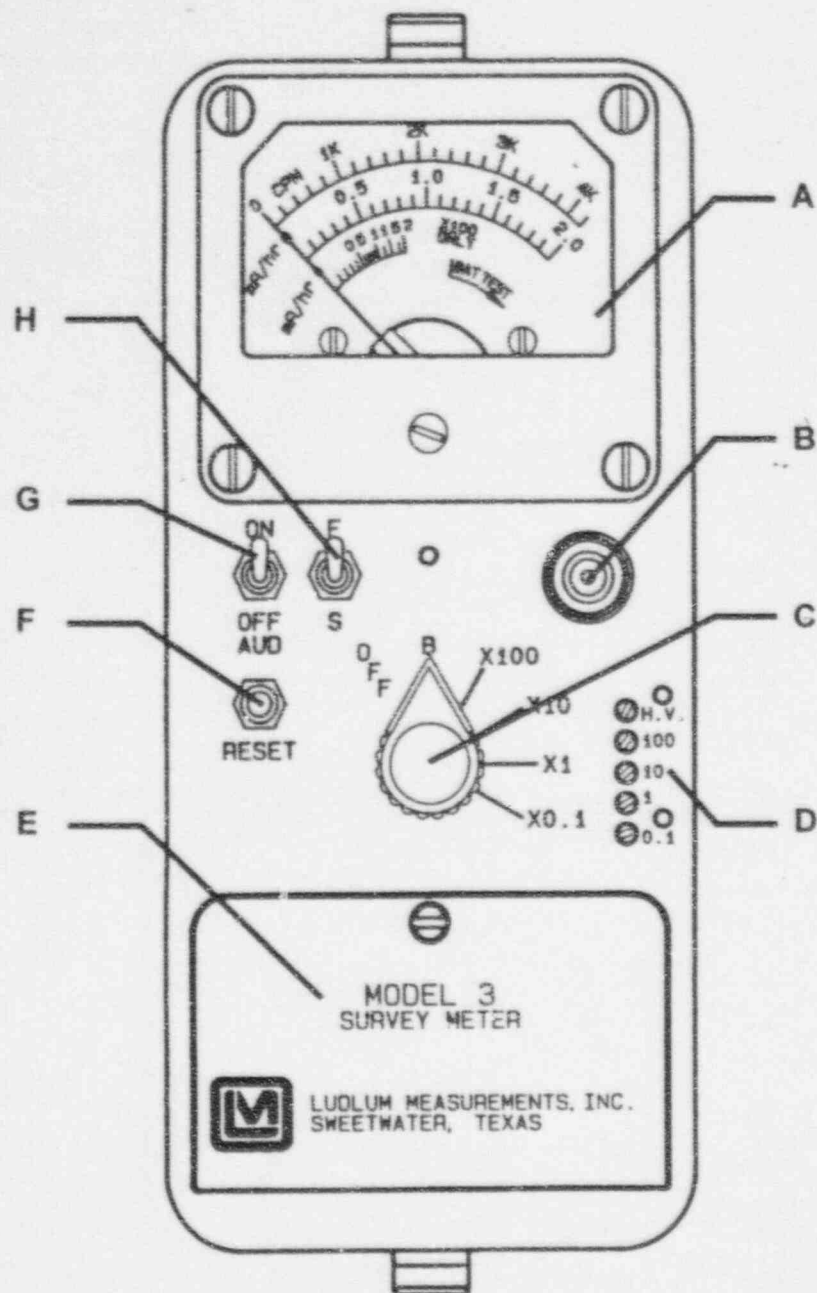
3. PRELIMINARY INSTRUCTIONS**UNPACKING AND REPACKING**

Remove calibration certificate and place in secure location. Remove instrument and accessories (batteries, cable, etc.) and ensure that all of the items listed on the packing list are in the carton. If more than one instrument (*M3 and detector(s)*) is in carton refer to the calibration certificate(s) for serial number(S/N) match. The M3 S/N is located on the front panel below the battery compartment. Most LMI detectors have a label on the base or body of the detector for the Model and S/N identification.

To return the instrument for repair or calibration provide sufficient packing material to prevent damage during shipment and appropriate warning labels to ensure careful handling. The following items and information should also be included to insure a quick turnaround time on your repair calibration:

- detector(s) and related cable(s)
- brief information as to the reason for return
- description of service requested
- return shipping address
- customer name and telephone number

4. INSTRUMENT CONTROLS AND FUNCTIONS

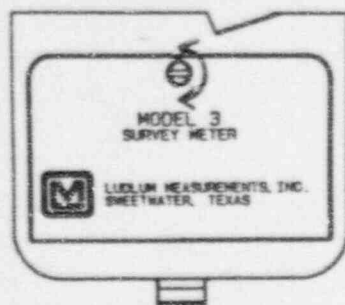


DRAWING NOT TO SCALE

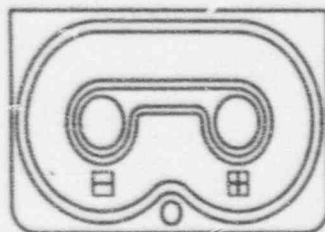
4. INSTRUMENT CONTROLS AND FUNCTIONS (cont.)

- A. Meter:** 2.5" (6.4cm) arc, 1 mA analog type with pivot-and-jewel suspension. Typical meter dials are 0 - 2 mR/hr, 0 - 5k cpm, or combination 0 - 2 mR/hr and cpm and BAT TEST.
- B. Connector:** Used to connect the detector to the instrument. Typically series "C" but can be "BNC", "MHV", "UHF", or others.
- C. Instrument Selector Switch:** A six position switch marked OFF, BAT, X100, X10, X1, X0.1. This switch is used to test the battery condition as well as set the range that the instrument will operate on.
- D. Calibration Controls:** Recessed potentiometers which are used to calibrate the individual range selections and allow for high voltage adjustment from 200 - 1500 volts. (a protective cover is provided to prevent tampering)
- E. Battery Compartment:** Sealed compartment to house two "D" cell batteries.
- F. RESET Button:** When depressed this button provides a rapid means to drive the meter back to zero.
- G. AUD ON-OFF Switch:** This toggle switch allows the operator to turn the instrument audio on or off. When ON, the switch energizes the unimorph speaker of the left side of the instrument with a click-per-event audible signal (as the count rate increases the number of clicks will increase). The audio should be turned off (when not needed) in order to reduce battery drain.
- H. F-S Switch:** This toggle switch changes the response time of the instrument from fast to slow. In the "F" position there is a fast meter response and large meter deviation. In the "S" position there is a slow response and less meter deviation.

5. OPERATING PROCEDURES



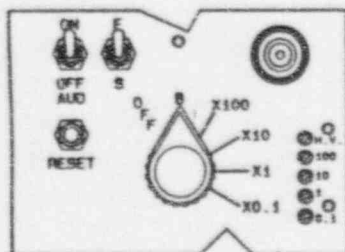
PORTABLE BATTERY
COMPARTMENT



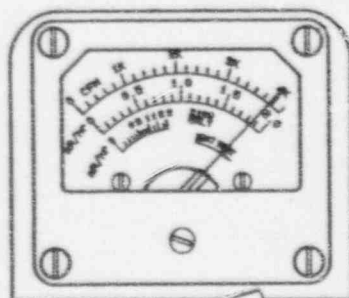
INSIDE VIEW OF
BATTERY LID

BATTERY INSTALLATION

Open the Battery Lid by twisting the latch counter clockwise 1/4 turn and install two "D" size batteries. Note (-) (+) marks on the inside of the lid. Match the battery polarity to these marks. Close the battery compartment lid by pressing down and turning the latch 1/4 turn clockwise until it latches.
(NOTE: Center post of flashlight battery is positive.)



MODEL 3
RANGE SWITCH



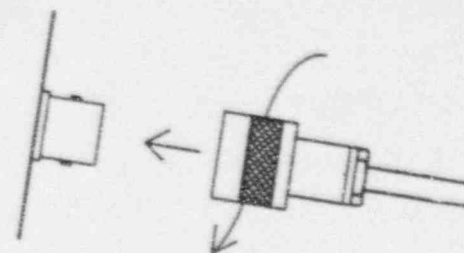
MODEL 3
METER DISPLAY

BATTERY TEST

Move the range switch to the BAT position. The meter should deflect to the battery check portion of the meter scale. If the meter does not respond, recheck that the batteries have been installed properly.

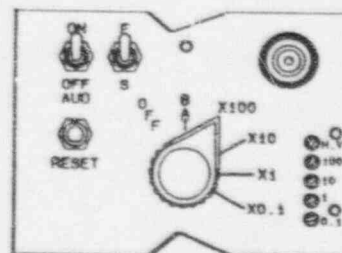
(Note: The meter face depicted above may not be the face your unit has. It is simply provided to show the meter in the BAT TEST position.)

5. OPERATING PROCEDURES



CONNECTING THE DETECTOR TO THE INSTRUMENT

Connect one end of the cable provided to the detector by firmly pushing the connectors together while twisting clockwise 1/4 turn until it latches. Repeat the process in the same manner with the other end of the cable and the instrument.



MODEL 3 CONTROLS

Turn the instrument range switch to the X100 position. Expose the detector to a check source. The speaker should click with the AUDIO ON-OFF switch turned ON. Move the range switch through the lower scales until a meter reading is indicated. The toggle switch labeled F-S should have fast response in "F" and slow response in "S". Depress the RESET switch. The meter should zero. Once this procedure has been completed successfully, the instrument is ready for use.

NOTE: To assure proper operation of the instrument between calibrations, an instrument operational check should be performed prior to use. A reference reading with a check source should be obtained at the time of initial calibration or as soon as possible afterwards, for confirming correct operation. Confirm the proper reading on each scale. If the instrument fails to fall within $\pm 20\%$ of proper reading, it should be sent to a calibration facility for recalibration.

6. CALIBRATION

6.1 DETECTOR OPERATING VOLTAGE

The operating point for the instrument and detector is established by setting the instrument high voltage. The proper selection of this point is the key to instrument performance. Efficiency, background sensitivity, and noise are fixed by the physical makeup of a given detector. However, the selection of the operating point makes a marked difference in the apparent contribution of these three sources of count. In setting the operating voltage, the final result of the adjustment is to establish the system gain so that the desirable signal pulses are above the discrimination level and the unwanted pulses from background radiation and noise are below the discrimination level and thus are not counted. The system gain is controlled by adjusting the high voltage.

NOTE: Measure the high voltage with a Ludlum Model 500 Pulser. If the pulser does not have a high voltage readout, use a high impedance voltmeter with at least 1000 megohm input resistance to measure the detector voltage.

Calibration shall include response evaluations and adjustment for two points of each scale of the instrument. The points should be separated by at least 40% of the full scale value and should be represented by points approximately equidistant from the mid-point of the scale. For example, 25% and 75%, 33% and 66%, or 20% and 80% could be appropriate for the meter scale.

6.1.1 G-M DETECTORS

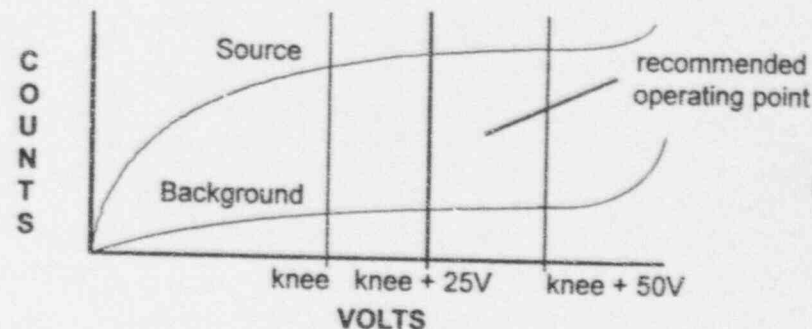
A minimum voltage must be applied to establish the Geiger-Mueller characteristic. The output pulse height of the G-M Detector is not proportional to the energy of the detected radiation. Most G-M detectors operate at 900 volts, although some miniature detectors operate at 450-550 volts. Refer to the detector operating manual for specific recommendations. If a recommended setting is unavailable, plot an operating

6. CALIBRATION (cont.)

voltage versus count rate curve to produce a plateau graph similar to the one below. Adjust the HV for 25-50 volts above the knee or start of the plateau. For mixed detector use, high voltage may be "tailored" for other detectors as long as the G-M detector is operated within the recommended voltage range.

6.1.2 SCINTILLATION TYPE DETECTORS

Scintillation type detectors have a wide gain spectrum, typically 1000:1 at a single operating point. An operating voltage versus count rate curve (plateau) must be established to determine the proper operating voltage. The operating voltage is typically set just above the "knee" of the plateau. Plot the HV versus background and source count to produce a plateau graph similar to the one in the figure below. Adjust the HV to 25-50 volts above the knee or start of the plateau. This provides the most stable operating point for the detector.



NOTE: If more than one detector is to be used with the instrument and the operating voltages are different, the HV will have to be readjusted for each detector substitution.

6. CALIBRATION (cont.)**6.2 EXPOSURE RATE CALIBRATION**

1. Adjust the HV control for the proper operating voltage of the detector.
2. Connect the detector to the instrument.
3. Turn the range switch to the X100 position.
4. Expose the detector to a calibrated gamma field which corresponds to approximately 80% of full scale meter deflection.
5. Adjust the X100 calibration control for the proper reading.
6. Reposition the detector so the field corresponds to approximately 20% of full scale meter deflection.
7. Confirm that the meter reading is within $\pm 10\%$ of the field.
8. Repeat this process for the X10, X1 and X0.1 ranges.

6.3 CPM CALIBRATION

1. Adjust the HV control for the proper operating voltage of the detector.
2. To calibrate the CPM scale, a Ludlum Model 500 pulser is required.
3. Connect the pulser to the instrument and adjust the pulse frequency to provide a deflection of approximately 80% of full scale on the X100 range.
4. Adjust the X100 calibration potentiometer for proper reading.
5. Check the 20% scale indication of the Model 3 by reducing the pulser count rate by a factor of 4. The Model 3 should read within $\pm 10\%$ of the actual pulse rate.
6. Decrease the pulse rate of the Model 500 by a decade and turn the Model 3 range switch to the next lower range.
7. Repeat the above steps for the lower ranges.

NOTE: In the event that any reading is not within $\pm 10\%$ of the true value on any scale after any of the above calibration methods, a reading within $\pm 20\%$ of the true value is acceptable if a calibration graph or chart is provided with the instrument. Instruments that can not meet these criteria are defective and require repair.

7. MAINTENANCE

Instrument maintenance consists of keeping the instrument clean and periodically checking the batteries and the calibration. An instrument operational check should be performed prior to each use by exposing the detector to a known source and confirming the proper reading on each scale.

Recalibration should be accomplished after any maintenance or adjustment of any kind has been performed on the instrument. Battery replacements are not considered to be maintenance and do not normally require the instrument to be recalibrated. Ludlum Measurements recommends recalibration at intervals no greater than one year. Check the appropriate regulatory agency regulations to determine required recalibration intervals.

The batteries should be removed and the battery contacts cleaned of any corrosion at least every three months. If the instrument has been exposed to a very dusty or corrosive atmosphere, more frequent battery servicing should be used. Use a spanner wrench to unscrew the battery contact insulators, exposing the internal contacts and battery springs. Removing the handle will facilitate access to these contacts.

NOTE

NEVER STORE THE INSTRUMENT OVER 30 DAYS WITHOUT REMOVING THE BATTERIES. ALTHOUGH THE INSTRUMENT WILL OPERATE AT VERY HIGH AMBIENT TEMPERATURES, BATTERY SEAL FAILURE CAN OCCUR AT TEMPERATURES AS LOW AS 100 DEGREES FAHRENHEIT.

8. THEORY OF OPERATION**8.1 INPUT**

Detector pulses are coupled from the detector through C57 to emitter follower Q96. R83 and R89 provide bias. R137 protects Q96 from input shorts. R27 couples the detector to the high voltage supply.

8.2 AMPLIFIER

A self-biased amplifier provides gain in proportion to R63 divided by R70. A Transistor (pin 6 of U1) provides amplification. Pins 10 thru 15 of U1 are configured as a constant current source to pin 6 of U1. The output self-biases to $2 V_{be}$ (approximately 1.4 volts) at pin 7 of U1. This provides just enough bias current through pin 6 of U1 to conduct all of the current from the current source. Positive pulses from pin 7 of U1 are coupled to the discriminator.

8.3 DISCRIMINATOR

Comparator U2 provides discrimination. The discriminator is set by the voltage divider, R75 and R196, coupled to pin 3 of U2. As the amplified pulses at pin 2 of U2 increase above the discriminator voltage, 5 volt negative pulses are produced at pin 1 of U2. These pulses are coupled to pin 5 of U3 for meter drive and pin 12 of U3 for audio.

8.4 AUDIO

Discriminator pulses are coupled to univibrator pin 12 of U3. The front panel audio ON-OFF selector controls the reset at pin 13 of U3. When ON, pulses from pin 10 of U3 turn on oscillator U5, which drives the housing mounted unimorph speaker. Speaker tone is set by R84 and C112. Tone duration is controlled by R86 and C113.

8.5 DIGITAL ANALOG CONVERTOR

Pins 10 thru 15 of U4 are coupled as a current mirror. For each pulse of current through R72 an equal current is delivered to C105. This charge is drained off by R74. The voltage across C105 is proportional to the incoming count rate.

8. THEORY OF OPERATION (cont.)**8.6 SCALE RANGING**

Detector pulses from the discriminator are coupled to univibrator pin 5 of U3. For each scale, the pulse width of pin 6 of U3 is increased by a factor of 10 with the actual pulse width being controlled by the front panel calibration controls and their related capacitors. This arrangement allows the same current to be delivered to C105 by one-tenth of a count on the X0.1 range as 100 counts on the X100 range.

8.7 METER DRIVE

The meter is driven by the emitter of Q6, coupled as a voltage follower in conjunction with pin 1 of U6. For ratemeter drive, the meter is coupled thru thermistor network R171, R181, and R190 to the emitter of Q6. For Battery Test, the voltage follower is bypassed and the meter movement is directly coupled to the battery through R150.

8.8 METER RESET

Ratemeter reset is initiated by shunting the integrated voltage at C105 to ground when the RESET button is depressed.

8.9 FAST/SLOW TIME CONSTANT

For the slow time constant, C104 is switched from the output of the meter drive to parallel C105.

8.10 LOW VOLTAGE SUPPLY

Battery voltage is coupled to U7 and associated components (a switching regulator) to provide 5 volts at pin 5 to power all logic circuits. Unregulated battery voltage is used to power the meter drive (Q6) and the high voltage blocking oscillator (Q145).

8.11 LOW VOLTAGE REFERENCE

U101 provides a 1.22 volt precision reference for the HV supply. This component also biases Q96.

High voltage is developed by blocking oscillator Q145-T165 and rectified by voltage multiplier CR166,167,169 and 175. Output voltage increases as current through Q44 increases, with maximum output voltage with Q44 saturated. High voltage is coupled back through R47. to opamp pin 6 of U6. R147 completes the high voltage circuit to ground. High voltage output is set by front panel control HV, which sets bias at pin 5 of U6. During stable operation, the voltage at pin 6 of U6 will equal the voltage at pin 5 of U6. Pin 7 of U6 will cause conduction of Q44 to increase or decrease until the high voltage seeks a level of stability.

UNIT

Completely Assembled
Model 3 Survey Meter

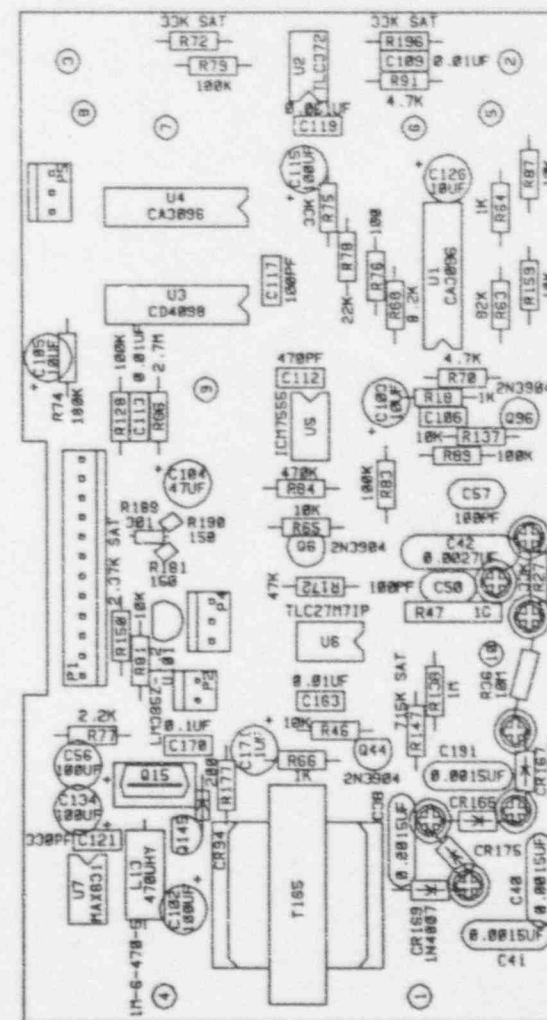
48-1605

Circuit Board, Drawing 363 X 535

BOARD

Assembled Circuit Board

5363-678



9. PARTS LIST; DRAWINGS; DIAGRAMS

MAIN BOARD COMPONENTS

Ref. No.	Description	Part No.
CAPACITORS		
C38	0.0015 μ F, 3kV, C	04-5518
C40-C41	0.0015 μ F, 3kV, C	04-5518
C42	0.0027 μ F, 3kV, C	04-5520
C50	100pF, 3kV, C	04-5532
C56	100 μ F, 10V, DT	04-5576
C57	100pF, 3kV, C	04-5532
C102	100 μ F, 10V, DT	04-5576
C103	10 μ F, 20V, DT	04-5592
C104	47 μ F, 16V, DT	04-5550
C105	10 μ F, 20V, DT	04-5592
C106	0.001 μ F, 100V, C	04-5519
C109	0.01 μ F, 100V, C	04-5523
C112	470pF, 100V, C	04-5555
C113	0.01 μ F, 100V, C	04-5523
C115	100 μ F, 10V, DT	04-5576
C117	100pF, 100V, C	04-5527
C119	0.001 μ F, 100V, C	04-5519
C121	330pF, 100V, C	04-5531
C126	10 μ F, 20V, DT	04-5592
C134	100 μ F, 10V, DT	04-5576
C163	0.01 μ F, 100V, C	04-5523
C170	0.1 μ F, 100V, C	04-5521
C171	1 μ F, 35V, DT	04-5575
C191	0.0015 μ F, 3kV, C	04-5518
TRANSISTORS		
Q6	2N3904	05-5755
Q15	MPSU51	05-5765
Q44	2N3904	05-5755
Q96	2N3904	05-5755
Q145	MPS6534	05-5763
INTEGRATED CIRCUITS		
U1	CA3096	06-6023
U2	TLC372	06-6265
U3	CD4098	06-6066
U4	CA3096	06-6023

9. PARTS LIST; DRAWINGS; DIAGRAMS

MAIN BOARD COMPONENTS (cont.)

Ref. No.	Description	Part No.
INTEGRATED CIRCUITS (cont.)		
U5	ICM7555	06-6136
U6	TLC27M7IP	06-6248
U7	MAX631	06-6249
U101	LM385Z-1.2	05-5808
DIODES		
CR94	1N4148	07-6272
CR166-CR167	1N4007	07-6274
CR169	1N4007	07-6274
CR175	1N4007	07-6274
RESISTORS		
R18	1k	10-7009
R27	33k	10-7019
R36	10M	10-7031
R46	10k	10-7016
R47	1G	12-7686
R63	82k	10-7022
R64	1k	10-7009
R65	10k	10-7016
R66	1k	10-7009
R68	8.2k	10-7015
R70	4.7k	10-7014
R72	SAT (TYP. 33k)	10-7019
R74	180k	10-7068
R75	33k	10-7019
R76	10 OHM	10-7004
R77	2.2k	10-7012
R78	22k	10-7070
R79	100k	10-7023
R81	10k	10-7016
R83	100k	10-7023
R84	470K	10-7026
R86	2.7M	10-7029
R87	10k	10-7016
R89	100k	10-7023
R91	4.7k	10-7014

9. PARTS LIST; DRAWINGS; DIAGRAMS

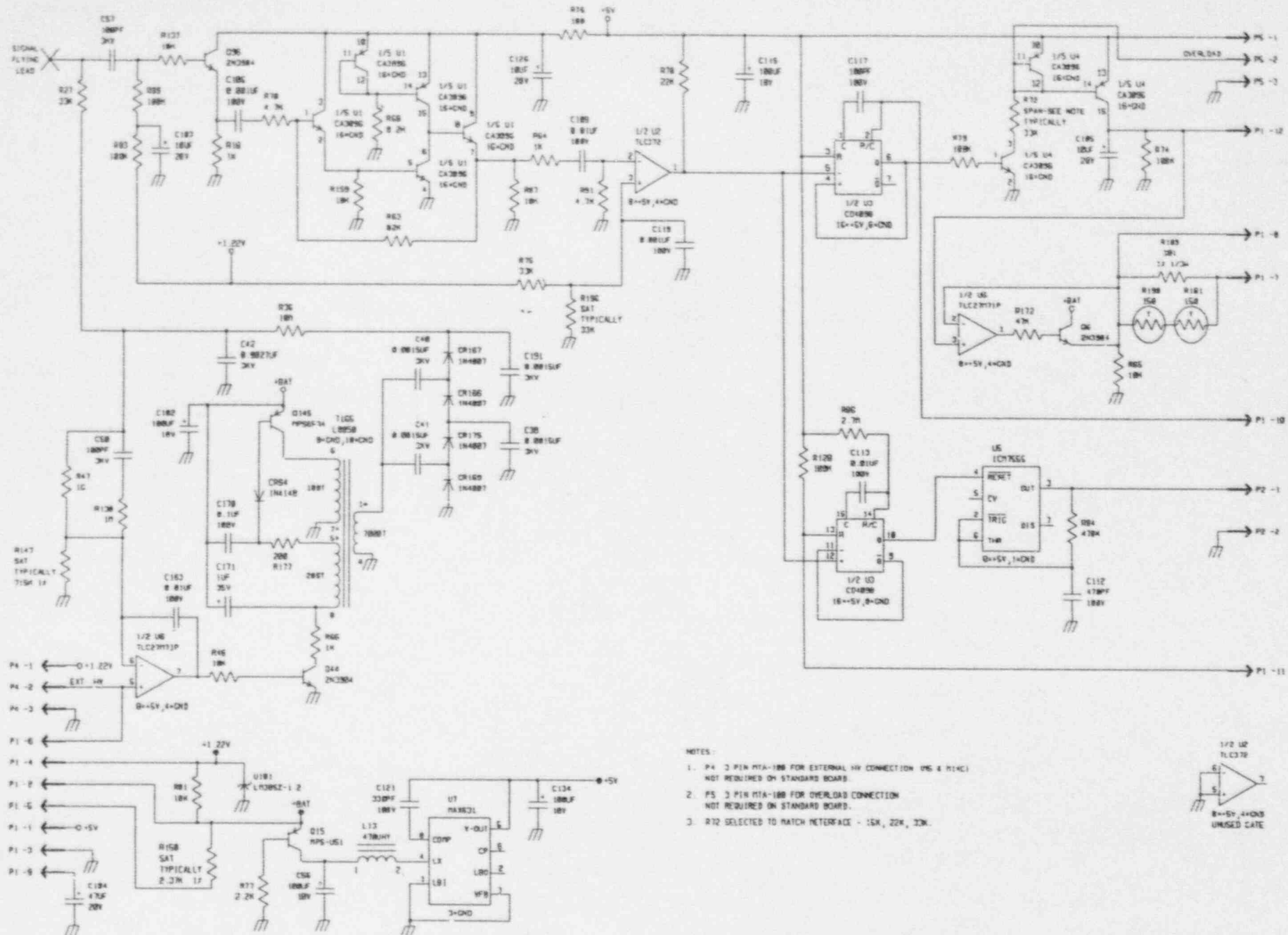
MAIN BOARD COMPONENTS (cont.)

Ref. No.	Description	Part No.
RESISTORS (cont.)		
R128	100k	10-7023
R137	10k	10-7016
R138	1M	10-7028
R147	SAT (TYP. 715k, 1%)	12-7645
R150	SAT (TYP. 2.37k, 1%)	12-7648
R159	10k	10-7016
R172	47k	10-7020
R177	200 OHM	10-7006
R189	301 OHM, 1%	12-7855
R196	SAT (TYP. 33k)	10-7019
THERMISTORS		
R181	R1006-98.4-59-D1	07-6332
R190	R1006-98.4-59-D1	07-6332
INDUCTORS		
L13	470UHY	21-9600
TRANSFORMERS		
T165	L8050	40-0902
MISCELLANEOUS		
•	RECEPTACLE (7 ea)	
	Cloverleaf 011-6809	18-8771
•	CONNECTOR (1 ea.)	
	1-640456-2 MTA100	13-8061

MODEL 3 Survey Meter

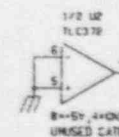
9. PARTS LIST; DRAWINGS; DIAGRAMS

MAIN CIRCUIT BOARD SCHEMATIC



NOTES:

1. P4 3 PIN MTA-100 FOR EXTERNAL HV CONNECTION (U6 & R14C) NOT REQUIRED ON STANDARD BOARDS.
2. P5 3 PIN MTA-100 FOR OVERLOAD CONNECTION NOT REQUIRED ON STANDARD BOARDS.
3. R72 SELECTED TO MATCH METERFACE - 15K, 22K, 33K.

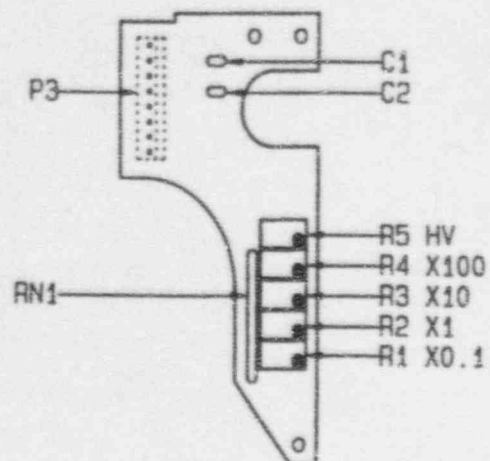


MODEL 3 Survey Meter

9. PARTS LIST; DRAWINGS; DIAGRAMS

CALIBRATION BOARD, DRAWING NO. 363 X 448

Ref. No.	Description	Part No.
BOARD	Completely Assembled Calibration Board	5363-606



CALIBRATION BOARD COMPONENTS

CAPACITORS

C1	0.0047 μ F 100V C X7R	04-5570
C2	0.047 μ F 100V C X7R	04-5565

RESISTORS

R1-R3	1 Meg Trimmer	09-6814
R4-R5	100k Trimmer	09-6813

RESISTOR NETWORK

RN1	NETWORK10k SIP 8PIN	12-7720
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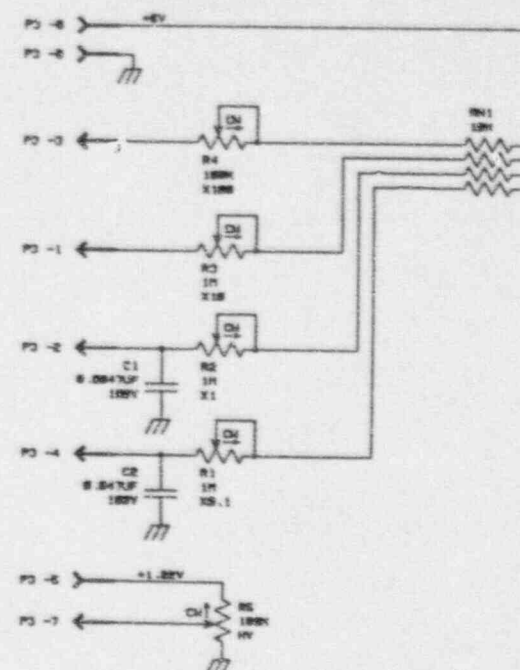
MISCELLANEOUS

P1	CONN-640456-8 MTA100	13-8039
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MODEL 3 Survey Meter

9. PARTS LIST; DRAWINGS; DIAGRAMS

CALIBRATION CIRCUIT BOARD SCHEMATIC



CHASSIS COMPONENTS

Ref. No.	Description	Part No.
AUDIO		
DS1	UNIMORPH 60690	21-9251
CONNECTOR		
P2	SERIES "C" UG 706/U	13-7751
J1	CONN-1-640442-2 MTA100	13-8407
J2	CONN-640442-2 MTA100	13-8178
J3	CONN-640442-8 MTA100	13-8184

MODEL 3 Survey Meter

9. PARTS LIST; DRAWINGS; DIAGRAMS

CHASSIS COMPONENTS (cont.)

Ref. No.	Description	Part No.
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SWITCHES

S1	Centerlab PA600-210	08-6501
S2	F/S MST 105-D	08-6511
S3	MST 105-D	08-6511
S4	30-1 P/B	08-6517

BATTERY

BT1-BT2	"D" Duracell Battery	21-9313
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MISCELLANEOUS

*	BATTERY CONTACT SET	
	Model 295	40-1707
*	CASTING Model 3	9363-195
*	MAIN HARNESS	
	Model 3	8363-607
*	PORTABLE CAN	
	ASSY (MTA)	4363-441
*	PORTABLE KNOB	08-6613
M1	PORTABLE BEZEL	
	FRONT ASSY	4363-188
*	METER BEZEL W/GLASS,	
	W/O SCREWS	4363-352
*	METER MOVEMENT	
	(1mA)	15-8030
*	PORTABLE METER	
	FACE	7363-136
*	HARNESS-PORT	
	CAN WIRES	8363-462
*	BATTERY LID	
	W/LATCHSET	
	Model 3	9363-198
*	PORT. LATCH KIT	
	W/O BATT. LID	4363-349
*	PORT. CALIB. COVER	
	W/SCREWS	9363-200
*	PORT. HANDLE (ROLLED)	
	W/SCREWS	7363-139
*	PORT HANDLE FOR CLIP	

MODEL 3 Survey Meter

9. PARTS LIST; DRAWINGS; DIAGRAMS

CHASSIS COMPONENTS (cont.)

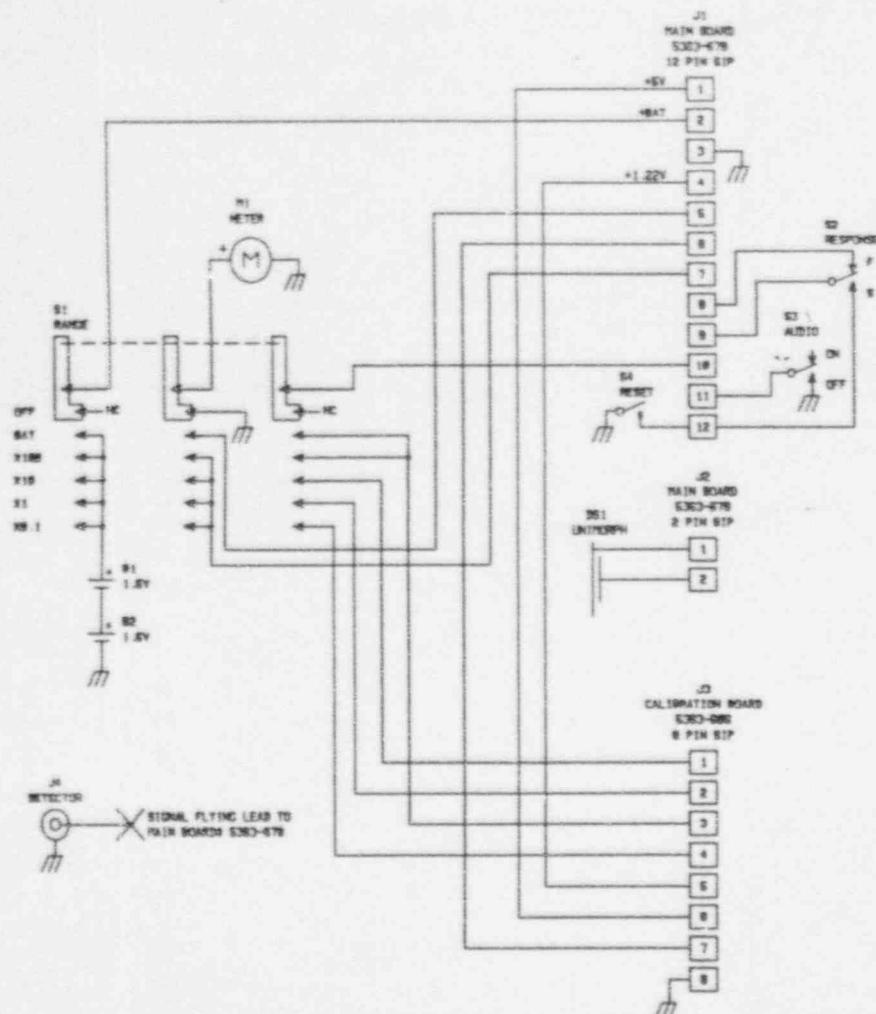
Ref. No.	Description	Part No.
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MISCELLANEOUS (cont.)

*	PORT HANDLE FOR CLIP	
	W/SCREWS	7363-203
*	REPLACEMENT CABLE	
	(STD 39")	40-1004
*	CLIP (44-3 TYPE)	
	W/SCREWS	7002-026-01
*	CLIP (44-7 TYPE)	
	W/SCREWS	7010-007-01
*	CLIP (44-6 TYPE)	
	W/SCREWS	7010-008-01

9. PARTS LIST; DRAWINGS; DIAGRAMS

CHASSIS WIRING DIAGRAM, DRAWING NO. 363 X 537



10. TROUBLESHOOTING

This section is intended to assist in isolating and identifying problems with the Ludlum Model 3 and/or its associated detector and cable. Ludlum Measurements, Inc., (LMI) provides technical support for our customers who wish to repair their instruments. If you have questions regarding instrument repairs, contact our repair department at (800) 622-0828 (USA) or (915)235-5494.

The first step in diagnosing a problem is to isolate the counting instrument from the associated detector and connecting cable. An intermittent count response, abnormally high count, or a "dead" counting system are common symptoms of a defective detector or "noisy" cable. Substituting a "known good" detector, connecting cable, or instrument is the most efficient way to isolate these types of problems. A Ludlum Model 500 series Pulse Generator may be used in place of the detector to simulate the detector response and to check detector operating voltage (HV) and instrument input sensitivity (counting threshold). Refer to the detector Instruction Manual for suggested operating voltage and counter input sensitivity.

If the problem is isolated to the instrument, a thorough understanding of the Controls and Functions, Operating Procedures, and Theory of Operation should be attained before attempting to identify problems within the instrument. The instrument housing may be removed to inspect for broken wires or defective board connections.

CAUTION: ENSURE THAT THE INSTRUMENT IS OFF WHEN TOUCHING THE CONNECTIONS TO AVOID ELECTRICAL SHOCK.

If the problem is isolated to a circuit board, complete circuit board replacement is recommended rather than component repair. (A defective circuit board can be replaced in a fraction of the time required to isolate the problem to the component level on a highly populated circuit board.)

NOTE: Recalibration is required after repair.

10. TROUBLESHOOTING (cont.)

SYMPTOM	PROBABLE CAUSE	POTENTIAL SOLUTION
Instrument will not respond in the BAT TEST position	Batteries installed incorrectly	Check that the battery polarity correlates to the + and - marks on the battery lid
	Internal battery contacts are corroded and have lost continuity between batteries and terminal	Disassemble and clean (baking soda) or replace battery contact set
Erratic response when detector connecting cable is flexed	Coaxial cable center conductor/pin connection	Replace defective cable
No response to radiation	Defective detector and/or connection cable	Substitute a "known good" detector and/or cable
	Incorrect detector operating voltage	Refer to the calibration certificate or detector instruction manual for correct operating voltage; if the instrument uses multiple detectors, confirm that the HV is matched to the detector
	Multiple detector use - incorrect operating voltage	
No audio	AUDIO ON/OFF switch is in the OFF position	Switch the AUDIO ON/OFF switch to the ON position
	Two pin connector is unplugged between the main circuit board and speaker	Remove instrument housing and check connection between circuit board and speaker

STATEMENT OF WARRANTY

Ludlum Measurements, Inc. warrants the products covered in this manual to be free of defects due to workmanship, material and design for a period of 12 months from the date of delivery. The calibration of a product as it leaves Ludlum Measurements is warranted to be within its specified accuracy limits. In the event of instrument failure, notify Ludlum Measurements for repair, recalibration, or replacement at Ludlum Measurements option.

This warranty excludes the replacement of photomultiplier tubes, G-M and proportional tubes, and scintillation crystals which are broken due to excessive physical abuse or used for purposes other than those intended.

There are no warranties, express or implied, including without limitation any implied warranty of merchantability or fitness, which extend beyond the description of the facts thereof. If the product does not perform as warranted herein, purchaser's sole remedy shall be repair or replacement, at the option of Ludlum Measurements. In no event will Ludlum Measurements be liable for damages, lost revenue, lost wages, or any other incidental or consequential damages arising from the purchase, use, or inability to use the product.

INSTRUCTION MANUAL

LUDLUM MODEL 44-2 GAMMA SCINTILLATOR

Revised June 1996



LUDLUM MEASUREMENTS, INC.

P.O. Box 810 / 501 Oak Street
SWEETWATER, TEXAS 79556

Phone: 800-622-0828(USA), 915-235-5494

Fax: 915-235-4672

Serving The Nuclear Industry Since 1962

RECEIVING CONDITION EXAMINATION

Be sure to verify that the shipping carton is received in good condition with no visible damage. Should the instrument be received in a damaged condition, save the shipping container and the packing material and request an immediate inspection by the carrier.

RETURN OF GOODS TO MANUFACTURER

If equipment needs to be returned to Ludlum Measurements, Inc. for repair or calibration, please send to the address below. All shipments should include documentation containing return shipping address, customer name, telephone number, description of service requested, and all other necessary information. Your cooperation will expedite the return of your equipment.

LUDLUM MEASUREMENTS, INC.
ATTN: REPAIR DEPARTMENT
501 OAK STREET
SWEETWATER, TX. 79556
800-622-0828 (USA) 915-235-5494
FAX: 915-235-4672

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3. PRELIMINARY INSTRUCTIONS	2
4. OPERATING PROCEDURES	2
5. PARTS LIST; DRAWINGS; DIAGRAMS	3

1. GENERAL

The Model 44-2 sodium iodide (NaI) gamma scintillator is primarily used for detecting low levels of gamma radiation in the range of 60 keV - 1.25 MeV. It consists of a 1"(2.54cm) diameter X 1"(2.54cm) thick NaI crystal coupled to a photomultiplier tube and is housed in a 0.062" thick aluminum housing. The detector is energy dependent, over responding by a factor of ten or greater in the 100 keV range and underresponding by a factor of 0.5 above 1 MeV when normalized to ^{137}Cs .

The detector operates between 500 - 1200 volts. The recommended instrument input sensitivity is approximately 2 mV or higher.

The Model 44-2 will operate with any Ludlum instruments or equivalent instruments that provide 900 VDC and an input sensitivity of approximately 2 mV or higher.

Some common applications for this detector include background radiation monitoring, low level radiation detection, and spectrum analysis when used in conjunction with a single or multi channel analyzer

2. SPECIFICATIONS

SCINTILLATOR: 1" (2.5 cm) diameter X 1" (2.5 cm) thick NaI(Tl) crystal

SENSITIVITY: Typically 175 cpm/ $\mu\text{R/hr}$ (^{137}Cs gamma)

ENERGY RESPONSE: Energy dependant

COMPATIBLE INSTRUMENTS: General purpose survey meters, ratemeters, and scalars

TUBE: 1.5" (3.8 cm) diameter magnetically shielded photomultiplier

OPERATING VOLTAGE: 500 - 1200 volts

DYNODE STRING RESISTANCE: 100 megohm

CONNECTOR: Series "C" (others available)

CONSTRUCTION: Aluminum housing with beige polyurethane enamel paint

TEMPERATURE RANGE: 5°F(-15°C) to 122°F(50°C)

May be certified to operate from -40°F(-40°C) to 150°F(65°C)

SIZE: 2" (5.1 cm) diameter X 7.3" (18.5 cm)L

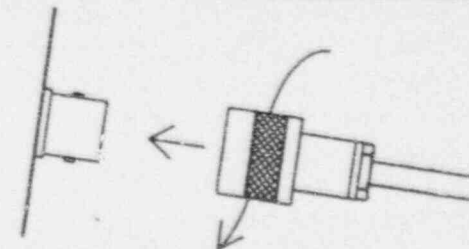
WEIGHT: 1 lb (0.5kg)

3. PRELIMINARY INSTRUCTIONS**UNPACKING AND REPACKING**

Remove the calibration certificate or detector functional check certificate and place it in a secure location. Remove the detector and accessories (cable, etc.) and ensure that all of the items listed on the packing list are in the carton. If more than one detector is in the carton refer to the calibration certificate(s) for serial number(S/N) match. The M44-2 S/N is located on the side of the detector near the connector.

To return the instrument for repair or calibration provide sufficient packing material to prevent damage during shipment and appropriate warning labels to ensure careful handling. The following items and information should also be included to insure a quick turnaround time on your repair/calibration:

- instrument(s) and related cable(s)
- brief information as to the reason for return
- description of service requested
- return shipping address
- customer name and telephone number

4. OPERATING PROCEDURES**CONNECTING DETECTOR TO INSTRUMENT**

Connect one end of the cable provided to the detector by firmly pushing the connectors together while twisting clockwise 1/4 turn until it latches. Repeat the process in the same manner with the other end of the cable and the instrument.

4. OPERATING PROCEDURES (cont.)

TESTING THE DETECTOR

1. Insure that the instrument HV is at the proper setting for the detector.
2. Connect the detector to the instrument and check for a proper background reading. (Typically 1.4 - 2.6 *kcpm* or 8 - 15 $\mu R/hr$)
3. Expose the detector to a check source and verify that the instrument indicates within $\pm 20\%$ of the check source reading obtained during the last calibration. Alternatively, expose the detector to a check source of a known value and verify that the detector gets greater than or equal to the efficiency listed in the specification section of this manual.
4. Instruments that meet these criteria are ready for use. Failure to meet these criteria may indicate a malfunction in the detector.

5. PARTS LIST; DRAWINGS; DIAGRAMS

Model 44-2 Gamma Scintillator

Ref. no,	Description	Part No.
UNIT	Completely Assembled Model 44-2 Gamma Scintillator	47-1532

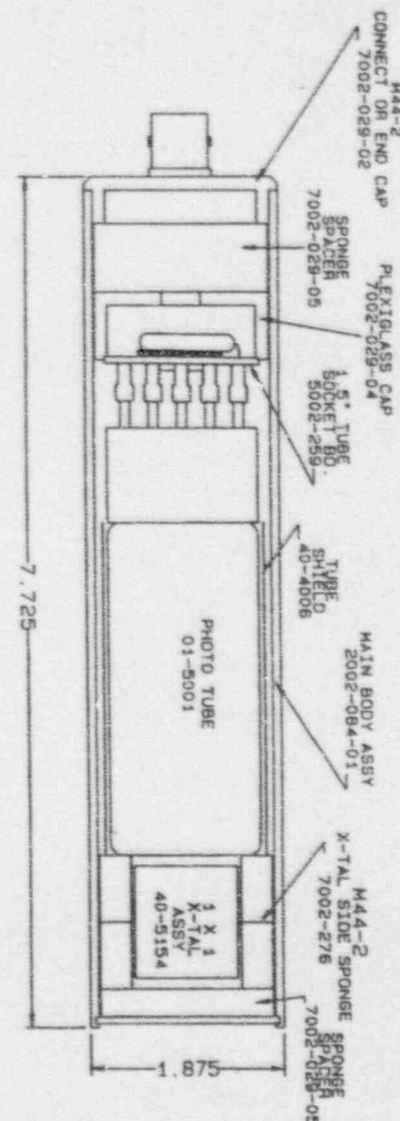
Assembly View

1 ea.	DETECTOR BODY	2002-084-01
1 ea.	END CAP	2002-029-02
1 ea.	1" x 1" NaI CRYSTAL	40-5154
1 ea.	1.5" PHOTOMULTIPLIER TUBE	01-5001
1 ea.	TUBE SHIELD	40-4006
1 ea.	1.5" TUBE SOCKET BOARD	5002-259
1 ea.	ACRYLIC CAP	7002-029-04
1 ea.	CONNECTOR, UG 706/U	13-7751
3"	TEFLON WIRE	21-9362
3"	#26 BLACK WIRE	21-9432

MODEL 44-2 Gamma Scintillator

5. PARTS LIST; DRAWINGS; DIAGRAMS

Ref. no,	Description	Part No.
1 ea.	LUG	18-8766
4 ea.	SCREWS	17-8811
3 ea.	SPOUNGE	7002-029-05
2 ea.	XTAL SIDE SPOUNGE	7002-276

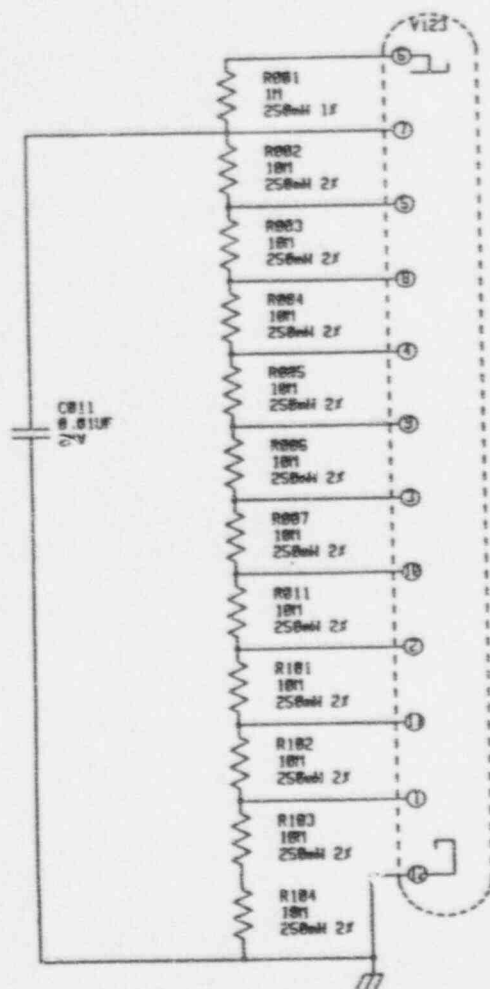


6. PARTS LIST; DRAWINGS; DIAGRAMS

Ref. no.	Description	Part No.
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1.5" Tube Socket Board

1 ea.	CIRCUIT BOARD	3002-259
12 ea.	CONTACT 003-1381-003	01-5245
1 ea.	CAP 0.01 μ F 2kv	04-5525
11 ea.	RES 10 meg 1/4 w 2%	10-7106
1 ea.	RES 1 meg 1/4 w 1% SMT	12-7964

**STATEMENT OF WARRANTY**

Ludlum Measurements, Inc. warrants the products covered in this manual to be free of defects due to workmanship, material and design for a period of 12 months from the date of delivery. The calibration of a product as it leaves Ludlum Measurements is warranted to be within its specified accuracy limits. In the event of instrument failure, notify Ludlum Measurements for repair, recalibration, or replacement at Ludlum Measurements option.

This warranty excludes the replacement of photomultiplier tubes, G-M and proportional tubes, and scintillation crystals which are broken due to excessive physical abuse or used for purposes other than those intended.

There are no warranties, express or implied, including without limitation any implied warranty of merchantability or fitness, which extend beyond the description of the face thereof. If the product does not perform as warranted herein, purchaser's sole remedy shall be repair or replacement, at the option of Ludlum Measurements. In no event will Ludlum Measurements be liable for damages, lost revenue, lost wages, or any other incidental or consequential damages arising from the purchase, use, or inability to use the product.

3. Whenever a 6 month source leak test is performed if required.
4. Prior to further use of the device if there is any suspicion of damage or malfunction.

While inspecting each device, the following test must to be performed:

1. Check by one of the following methods that the shutter fully closes.
 - a. If device is so provided, observe total cut off of radiation when shutter is closed and detector is operating.
 - b. By using the survey counter to note the decrease in radiation when the shutter is closed.

If the shutter is found to be in-operative or sticking, an immediate repair will be made by the manufacturer(Level Link Inc.) or someone license to do repair work on this device.

2. Inspect the radiation labels affixed to the gauge to ascertain that they are properly located and readable.
3. Check existence and condition of any special shielding and/or guards added to the device or surrounding equipment for purpose of protecting personnel from radiation.

10.5

Maintenance and Lock Out Procedures

- 1.) Level Link Engineering will perform any Maintenance and service to the source and the source holder.
- 2.) Lock Out Procedures:
 - a. The RSO must be notified before any maintenance work is to be done.
 - b. The sealed source is in a shielded device and can be padlocked "Closed". The only person to have a key to the lock is the RSO.
 - c. The RSO will lock the source in the "OFF" position before permitting access into and/or around the furnace(vessel) by working personnel.
 - d. After completion of maintenance, the RSO will examine the source holder and surrounding area before turning the source holder to the "ON" position.

LEVEL LINK INC.

1205 WEST BARKLEY AVENUE, ORANGE, CALIFORNIA 92668 (714) 997-2140

030-34274

MS-16

P3

November 11, 1996

USNRC
King of Prussia
Pennsylvania
ATTN: Ms. Kathy Dolce

RE: Control No. 123859

Dear Ms. Dolce:

This letter is with reference to a license application currently in your possession from American Video, New Stanton, PA.

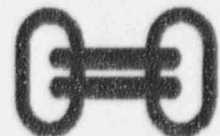
The application calls out the use of a Cobalt 60 source capsule manufactured by Nordion, Model 163. We now learn that a license to use this capsule in NRC regulated states, issued to Nordion (old AECL) has lapsed. In an effort to handle this situation, I am suggesting that Level Link, Inc. (license enclosed) acquire the capsules per the license, and transfer the completed assembly to American Video. The Level Link license, which is under timely renewal, calls out only one C-163 capsule, however I believe that the license could be amended to two capsules. The devices would then be shipped to American Video under the Level Link license. American Video would make reference to this on their license application to you. The Level Link license seems to permit this under item 9B.

Your prompt comments and response would be greatly appreciated.

Very truly yours,



Thomas A. Gray
President, Level Link, Inc.



SENT BY:

9-23-96 12:48PM :THOMAS GRAY & ASSOC.-

12184852102:# 1

STATE OF CALIFORNIA—HEALTH AND WELFARE AGENCY

PETE WILSON, Governor

DEPARTMENT OF HEALTH SERVICES

714/744 P STREET

P.O. BOX 942732

SACRAMENTO, CA 94234-7320

(916) 445-0831

SEPTEMBER 17, 1996



NOTICE OF RECEIPT OF RENEWAL APPLICATION FOR REVIEW

LEVEL LINK, INCORPORATED
1205 WEST BARKLEY AVENUE
ORANGE, CA 92868

ATTN: THOMAS A. GRAY
RADIATION SAFETY OFFICER

DOCKET NUMBER: 091796-3719

LICENSE NUMBER: 3719-30

APPLICATION DATE: SEPTEMBER 10, 1996

The above captioned renewal application has been docketed for review. Your application is deemed timely and accordingly, the license will not expire until final action has been taken by the Department. This application will be taken up in the order received.

Correspondence or other communication concerning the above referenced application must be submitted in duplicate and should make clear reference to your assigned docket number pertaining to this specific request. Future requests, not related to the above request, will be assigned a new docket number.

Thank you.

RADIOACTIVE MATERIALS LICENSING
RADIOLOGIC HEALTH BRANCH

RADIOACTIVE MATERIAL LICENSE

Pursuant to the California Code of Regulations, Division 1, Title 17, Chapter 5, Subchapter 4, Group 2, Licensing of Radioactive Material, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, use, possess, transfer, or dispose of radioactive material listed below, and to use such radioactive material for the purpose(s) and at the place(s) designated below. This license is subject to all applicable rules, regulations, and orders of the Department of Health Services now or hereafter in effect and to any standard or specific condition specified in this license.

1. Licensee	Level Link, Inc.	3. License No.	3719-30	Amendment No.	11
2. Address	1205 West Barkley Avenue Orange, CA 92668	4. Expiration date	October 28, 1996	(3)	
Attention:	Thomas A. Gray Radiation Safety Officer	a. Inspection agency	Radiologic Health Branch Los Angeles		

In response to the letter with attachments dated September 28, 1996, signed by Dan Tallman, License Number 3719-30 is hereby amended as follows:

6. Nuclide	7. Form	8. Possession Limit
A. Any except: 1. Source material; and 2. special nuclear material.	A. Sealed sources manufactured and distributed in accordance with a license issued by the U.S. Nuclear Regulatory Commission or Agreement State.	A. As per Customer's license.
B. Cobalt 60	B. Sealed source (AECL Model C-163)	B. One source not to exceed 2.5 Curies.

9. Authorized Use

- A. To be used incidental to installation, removal, maintenance and servicing of Ohmart, Robert Shaw Control K-ray, Texas Nuclear, Industrial, Nucleonics, Ronan Equipment gauging systems and maintenance and servicing of gauging systems authorized under a license issued by the USNRC or Agreement States. This subitem does not authorize installation or removal of devices possessed under a general license except where installation or removal is for the purpose of transfer to a person holding a specific license authorizing possession of the device.
- B. To be used as components in the manufacture, installation, removal, maintenance demonstration and source removal involving Level Link Model gauging systems and distribution of such devices to specific licensees of the USNRC or Agreement States.

LICENSE CONDITIONS

10. Radioactive material shall be used only at the following locations:

- (a) 1205 West Barkley Avenue, Orange, CA
- (b) Temporary job sites of the licensee in areas not under exclusive federal jurisdiction throughout the State of California.

Page 2 of 3 pages

RADIOACTIVE MATERIAL LICENSE

License Number: 3719-30

Supplementary Sheet

Amendment Number: 11

11. This license is subject to an annual fee for sources of radioactive material authorized to be possessed at any one time as specified in Item 6, 7, 8 and 9 of this license. The annual fee for this license is required by and computed in accordance with Title 17, California Code of Regulations, Sections 30230-30232 and is also subject to an annual cost-of-living adjustment pursuant to Section 113 of the California Health and Safety Code.
12. Radioactive material shall be used by, or under the supervision and in the physical presence of, the following individuals:
 - (a) Thomas A. Gray
 - (b) Dan A. Tallman
13. Except as specifically provided otherwise by this license, the licensee shall possess and use radioactive material described in Items 6, 7, 8 and 9 of this license in accordance with statements, representations, and procedures contained in the documents listed below. The Department's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.
 - (a) The application with attachments dated September 22, 1987 and later modified with letters dated January 3, 1990, January 29, 1990 and June 8, 1990, all signed by Thomas A. Gray, President.
14.
 - (a) The Radiation Safety Officer in this program shall be Thomas A. Gray.
 - (b) The Alternate Radiation Safety Officer in this program shall be Richard E. Gallego.
15. Sealed sources possessed under this license shall be tested for leakage and/or contamination as required by Title 17, California Radiation Control Regulations, Section 30275 (c).
16. Sealed sources described in subitem B of this license shall be tested for leakage and/or contamination at intervals not to exceed 6 months, following the test method described in the letter dated January 3, 1990, signed by Thomas Gray.
17. The following individuals are authorized to collect wipe test samples of sealed sources possessed under this license using leak test kits acceptable to the California Department of Health Services:
 - (a) The Radiation Safety Officer
 - (b) Qualified individuals designated in writing by the Radiation Safety Officer
18. Any licensed sealed source is exempt from such leak tests when the source contains 100 microcuries or less of beta and/or gamma emitting material or 10 microcuries or less of alpha emitting material.
19. The licensee shall comply with all requirements of Title 17, California Code of Regulations, Section 30373 when transporting or delivering radioactive materials to a carrier for shipment. These requirements include; (packaging, marking, labeling, loading, storage, placarding, monitoring, and accident reporting). Shipping papers shall be maintained for inspection pursuant to the U.S. Department of Transportation requirements (Title 49, Code of Federal Regulations, Part 172, Sections 172.200 through 172.204).

Page 3 of 3 pages

RADIOACTIVE MATERIAL LICENSE

License Number: 3719-30

Supplementary Sheet

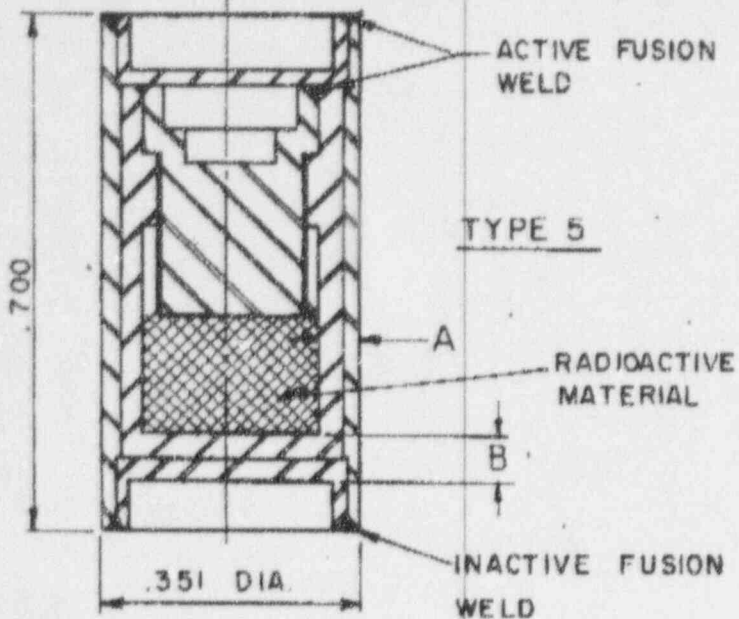
Amendment Number: 11

20. This license does not authorize distribution of radioactive material pursuant to Title 17, California Code of Regulations, Sections 30180 and 30192 through 30192.6 or equivalent provisions of the U.S. Nuclear Regulatory Commission or Agreement States.
21. The licensee shall distribute only sealed sources and/or devices for which a Sealed Source and Device Registry Document has been issued or otherwise approved by the California Department of Health Services, the U.S. Nuclear Regulatory Commission, or other Agreement State. Sealed sources and/or devices distributed must adhere to the design specifications described in the Sealed Source and Device Registry Document. Any changes in the design or specifications of these sealed sources and/or devices require the manufacturer to apply for and receive an amendment to the Sealed Source and Device Registry Document prior to distribution.
22. The licensee shall not undertake maintenance of any gauge system involving modification of the system which will affect the radioactive material, its containment or shielding except as specifically authorized by this and the customer's license. Each time the licensee modifies a gauge system in a manner which affects the containment or shielding of a sealed source of radioactive material, he shall perform the following items:
- (a) Affix a durable, clearly visible label of metal foil to the gauge system stating that: (1) the configuration of the gauge system has been modified from that of its original design; and (2) information and drawings on the modification can be obtained from Thomas Gray and Associates, Inc. or Level Link, Inc.
 - (b) Furnish a drawing of the modification to the customer for his retention.
23. At any time the licensee is engaged in making measurements by authority of this license at either a permanent or a temporary job site, the licensee shall have a current copy of each of the following documents available for inspection at the job site:
- (a) A statement authorizing each qualified individual to use radioactive material (See Condition 12).
 - (b) This License.
 - (c) The manufacturer's instruction manual with appropriate emergency procedures.

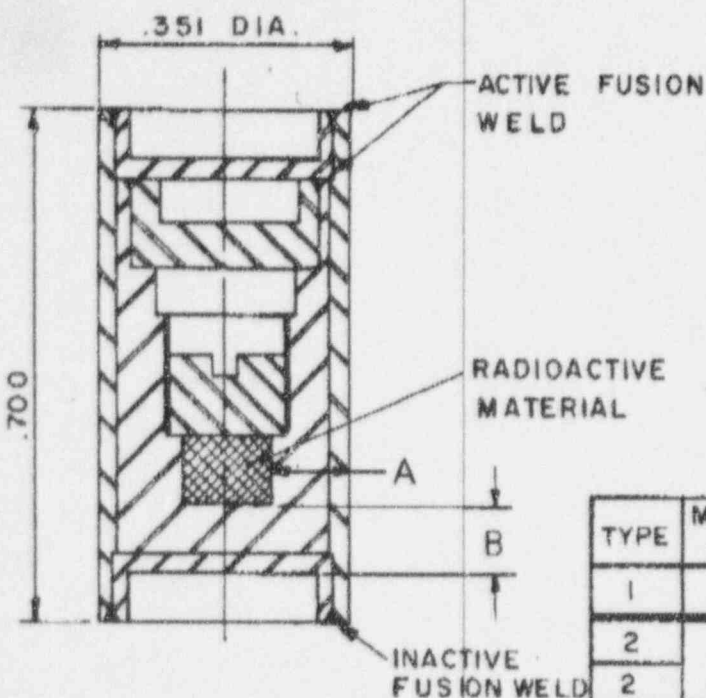
Date October 3, 1996

For the State Department of Health Services

By: David WesleyRadiologic Health Branch
P.O. Box 942732, Sacramento, CA 94234-7320



SCALE 2/1



TYPE 1, 2, 3, & 4

NOTE:

MATERIAL - RADIOGRAPHY CAPSULE[®] 304
STAINLESS STEEL

OUTER CAPSULE[®] 316 L
STAINLESS STEEL

DIMENSIONS IN INCHES EXCEPT WHERE
NOTED

TYPE	MAX. GRAM CAPACITY	ACT. DIM. (MM) DIA X HT.	A	B
1	.015	1 X 2	.139	.155
2	.04	2 X 2	.118	.092
2		2 X 3		
3	.173	3 X 3	.108	.092
3		3 X 4		
4	.266	4 X 4	.085	.092
4		4 X 5		
5	.566	5 X 4	.064	.062
5		5 X 5		
5		5 X 6		

COMMERCIAL PRODUCTS DIVISION

ATOMIC ENERGY OF CANADA LIMITED

P. O. BOX 93 • OTTAWA, CANADA

COBALT 60 RADIOGRAPY CAPSULE
TYPE C-140 IN CAPSULE TYPE C-133

ENG.
REF A05663

CODE REV A

APR 42 ER

MO.

C-163

OFFICIAL USE ONLY

DEVICE

MANUFACTURER & DISTRIBUTOR:

Thomas Gray and Associates
Orange, California

USE:

Gauging devices

GAUGE MODEL	ISOTOPE & MAXIMUM ACTIVITY		SOURCE MANUFACTURER & MODEL	
770-A1	Cs-137	500 mCi	3M Co.	4P6M
770-A1	Co-60	5 mCi	AECL	C-163
770-A2	Cs-137	1500 mCi	3M Co.	4P6E
770-A2	Co-60	50 mCi	AECL	C-163
770-A3	Co-60	300 mCi	AECL	C-163
770-A4	Co-60	1000 mCi	AECL	C-163
770-A5	Co-60	2500 mCi	AECL	C-163

DESCRIPTION:

The gauges manufactured by Thomas Gray and Associates are the same as the gauges manufactured by Robertshaw Control Company having the same model designations. Please refer to California Sheet No. 76-25 dated October 6, 1976 on the Robertshaw Control Company gauges for details.

RADIATION LEVELS:

The manufacturer states that the radiation levels 12" from the gauge surfaces with maximum loading will not exceed 5 mR/hr.

INSTRUCTION MANUAL:

A manual describing the safety precautions and operating procedure for each device is provided by the manufacturer.

SERVICING:

The manufacturer will service and/or repair the gauges if required.

OFFICIAL

OFFICIAL
USE ONLY

Thomas Gray and Associates
Orange, California

-2-

LICENSING:

A specific license is required to possess and operate the devices. Normal leak test intervals (six months) are recommended.

Level Link, Inc. is an affiliated company with Thomas Gray & Associates, Inc.

SHEET NO: 78-1

California Department of Health

ISSUE DATE: March 13, 1978

OFFICIAL
USE ONLY

123859

***** -JOURNAL- ***** DATE DEC-24-1996 ***** TIME 08:29 *****

DATE/TIME = DEC-24 08:25

JOURNAL NO. = 06

COMM.RESULT = OK

PAGES = 09

DURATION = 00:04'28

MODE = XMT

STATION NAME =

TELEPHONE NO. = T 83014155369

RECEIVED ID = 301 415 5369

RESOLUTION = STANDARD

-USNRC R1 LAS

610 337 5393- *****

TELEPHONE CONVERSATION RECORD	Date: 12/3/96	Time: 9:45 AM
Mail Control No.: 123859	License No.: 37-30348-01	Docket No.: 030-34274
Person Called: Joe Katfhammer, project engineer	Licensee: American Video	Telephone No.: (607) 974-6279
Person Calling: Kathleen Dolce / (610) 337-5251		
Subject: TELEPHONE DEFICIENCY		

OFFICIAL RECORD COPY

ML 10

Summary: Mr. Katfhammer left a voice mail message for me on December 2, 1996. I returned his phone call.

Mr. Katfhammer will:

1. provide the name of the manufacturer and model number of replacement sealed source since AECL source is no longer being manufactured;
2. provide the name of individual users who will be trained by Level Link, manufacturer of device;
3. confirm that the film badges will be exchanged monthly;
4. change the calibration frequency for meters from six months to annual;
5. provide justification for locking the devices in the open position (includes how to close device during an emergency and prevents anyone from being exposed to radiation) because Section 9 includes a description from Level-Link explaining that the gauges can be locked in either position;
6. clarify operators in Section 8 to be both control room and tank operators;
7. provide a statement in Section 8 that refresher training will be conducted annually for everyone (device users and ancillary personnel);
8. clarify the term tank operator as specified in section 10.2;
9. provide which survey instrument they will use and this instrument will readout in mR/hr or mrem/hr (picture of survey meter in Section 10 reads out in cpm);
10. clarify that any maintenance or repair will be conducted by the manufacturer or someone specifically licensed to make repairs; and
11. add "access into or around the vessel" in section 1C 5 sub-section 2(c).

Action Required/Taken: Wait for licensee's response

Signature: *K. D. Lee*

Date: 12/3/96

12. describe environmental conditions in which gauges will be exposed.

KD
12/3/96
1 PM

CORNING

December 2, 1996

Ms. Kathy Dolce
Licensing Assistant Section
Nuclear Materials Safety Branch
U.S. Nuclear Regulatory Commission, Region #1
475 Allendale Road
King Of Prussia, Pa 19406-1415

Dear Ms. Dolce

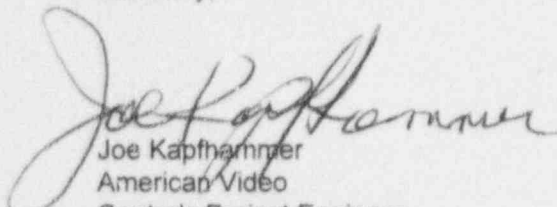
In reference to American Video's Glass Company Application For Material License, docket Number 123859, please find attached to this cover letter two copies of Mr. Todd Cable's Radiation Safety Officer Training Course certificate of completion. Could you please attach them, one each to our applications.

If you have any questions concerning the attached please feel free to contact me or Todd that the following numbers

Joe Kapfhammer, 607-974-6279

Todd Cable, 814-231-6302

Sincerely,


Joe Kapfhammer
American Video
Controls Project Engineer

enclosure

OFFICIAL RECORD COPY ML 10

123859
DEC - 3 1996

Radiation Safety & Control Services, Inc.

Awards this certificate to

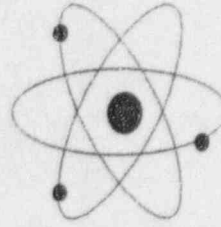
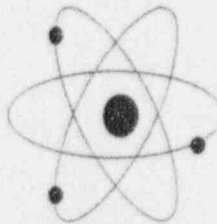
Todd Cable

in recognition of satisfactory completion of

RADIATION SAFETY OFFICER TRAINING COURSE

Portsmouth, New Hampshire

November 18 - 22, 1996




Frederick P. Straccia


James P. Tarzia

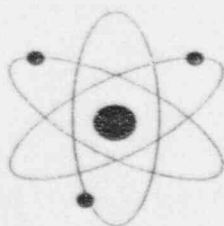

Eric L. Darois

Radiation Safety & Control Services, Inc.

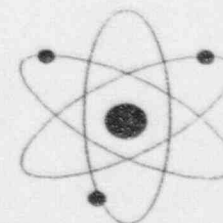
Awards this certificate to
Todd Cable

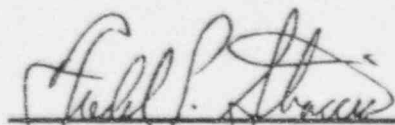
in recognition of satisfactory completion of

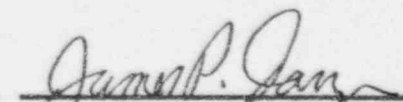
**RADIATION SAFETY OFFICER
TRAINING COURSE**




Portsmouth, New Hampshire
November 18 - 22, 1996




Frederick P. Straccia


James P. Tarzia


Eric L. Darois

LL 30348
030-34274
03/20

CORNING

October 30, 1996

Mr. F. M. Costello
Licensing Assistant Section
Nuclear Materials Safety Branch
U.S. Nuclear Regulatory Commission, Region #1

Dear Mr. Costello

Per our telephone conversation of October 15, 1996 please find enclosed two (2) copies of our Application For Material License for our American Video facility located in Mount Pleasant, Pennsylvania. The application is for two(2) cobalt 60 sources that will be used in our production of glass television tubes.

Also, enclosed is a check for \$550.00 for the application fee. Could you please send the receipt to the following address:

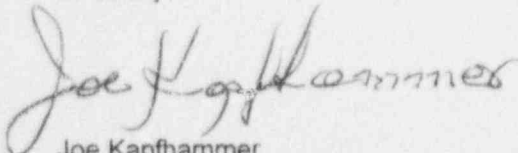
Joe Kapfhammer
HP-ME-03-081-D6
Corning Incorporated
Corning, New York 14831

If possible, could you expedite the process in issuing our license since we will begin production in the first quarter of next year. If you have any questions concerning the attached application information please feel free to contact me or Mr. Todd Cable at the following telephone numbers.

Joe Kapfhammer, 607-974-6279

Todd Cable, 814-231-6302

Sincerely,



Joe Kapfhammer
American Video
Controls Project Engineer

123859
OCT 31 1996

OFFICIAL RECORD COPY ML 10

APPLICATION FOR MATERIAL LICENSE

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 8 HOURS. SUBMITTAL OF THE APPLICATION IS NECESSARY TO DETERMINE THAT THE APPLICANT IS QUALIFIED AND THAT ADEQUATE PROCEDURES EXIST TO PROTECT THE PUBLIC HEALTH AND SAFETY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0120), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW. **LL 30348**

APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

DIVISION OF INDUSTRIAL AND MEDICAL NUCLEAR SAFETY
OFFICE OF NUCLEAR MATERIALS SAFETY AND SAFEGUARDS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

IF YOU ARE LOCATED IN:

CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLAND,
MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, PENNSYLVANIA,
RHODE ISLAND, OR VERMONT, SEND APPLICATIONS TO:

LICENSING ASSISTANT SECTION
NUCLEAR MATERIALS SAFETY BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

ALABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSISSIPPI, NORTH CAROLINA, PUERTO
RICO, SOUTH CAROLINA, TENNESSEE, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA,
SEND APPLICATIONS TO:

NUCLEAR MATERIALS LICENSING SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION II
101 MARJETTA STREET, NW, SUITE 2900
ATLANTA, GA 30323-0199

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN,
SEND APPLICATIONS TO:

MATERIALS LICENSING SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION II
801 WARRENVILLE RD.
LISLE, IL 60532-4351

ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS,
LOUISIANA, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA,
OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH,
WASHINGTON, OR WYOMING, SEND APPLICATIONS TO:

NUCLEAR MATERIALS LICENSING SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
811 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TX 76011-8084

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTIONS.

1. THIS IS AN APPLICATION FOR (Check appropriate item)

- ☒ A. NEW LICENSE
☐ B. AMENDMENT TO LICENSE NUMBER _____
☐ C. RENEWAL OF LICENSE NUMBER _____

2. NAME AND MAILING ADDRESS OF APPLICANT (Include Zip code)

Mr. Todd Cable
American Video Glass Company
777 Technology Drive
Mount Pleasant, PA

3. ADDRESS(ES) WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

American Video Glass Company
777 Technology Drive
Mount Pleasant, PA 15666-2717

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Mr. Todd Cable

TELEPHONE NUMBER

814/231-6302

SUBMIT ITEMS 5 THROUGH 11 ON 8-1/2 X 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL

- a. Form and mass number; b. chemical and/or physical form; and c. maximum amount which will be possessed at any one time

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS

9. FACILITIES AND EQUIPMENT

10. RADIATION SAFETY PROGRAM

11. WASTE MANAGEMENT

12. LICENSE FEES (See 10 CFR 170 and Section 170.31)

FEE CATEGORY

3P

AMOUNT

ENCLOSED

550.00

13. CERTIFICATION. (Must be completed by applicant) THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, 36, 38 AND 40, AND THAT ALL INFORMATION CONTAINED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

CERTIFYING OFFICER - TYPED/PRINTED NAME AND TITLE

Donald R. Dicken, President

SIGNATURE

DATE

24 October 1996

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	AMOUNT RECEIVED	CHECK NUMBER	COMMENTS
APPROVED BY			\$	DATE	

Section 5

Element and Mass No. - Cobalt 60

Chemical-Physical Form - Sealed Source. Capsule Model No. C-163

Maximum Amount Possessed - 2500 mCi per source. Two sources.

The source is manufactured by N

Nordion International Inc.

447 March Road/chemin

PO Box 13500 Kanata, Ontario, Canada K2K 1X8

The device is manufactured by:

Level Link, Inc.

1205 W. Barkley Ave.

Orange, California 92668

Device Model No.- 770-A5

OFFICIAL
USE ONLY

DEVICE

MANUFACTURER & DISTRIBUTOR:

Thomas Gray and Associates
Orange, California

USE:

Gauging devices

GAUGE MODEL	ISOTOPE & MAXIMUM ACTIVITY		SOURCE MANUFACTURER & MODEL	
770-A1	Cs-137	500 mCi	3M Co.	4P6M
770-A1	Co-60	5 mCi	AECL	C-163
770-A2	Cs-137	1500 mCi	3M Co.	4P6E
770-A2	Co-60	50 mCi	AECL	C-163
770-A3	Co-60	300 mCi	AECL	C-163
770-A4	Co-60	1000 mCi	AECL	C-163
770-A5	Co-60	2500 mCi	AECL	C-163

DESCRIPTION:

The gauges manufactured by Thomas Gray and Associates are the same as the gauges manufactured by Robertshaw Control Company having the same model designations. Please refer to California Sheet No. 76-25 dated October 6, 1976 on the Robertshaw Control Company gauges for details.

RADIATION LEVELS:

The manufacturer states that the radiation levels 12" from the gauge surfaces with maximum loading will not exceed 5 mR/hr.

INSTRUCTION MANUAL:

A manual describing the safety precautions and operating procedure for each device is provided by the manufacturer.

SERVICING:

The manufacturer will service and/or repair the gauges if required.

OFFICIAL

OFFICIAL
USE ONLY

Thomas Gray and Associates
Orange, California

-2-

LICENSING:

A specific license is required to possess and operate the devices. Normal leak test intervals (six months) are recommended.

(Source)

SHEET NO: 78-1

ISSUE DATE: March 13, 1978

California Department of Health

OFFICIAL
USE ONLY

Section #6

Purpose(s) for which licensed material will be used.

The radioactive source is part of our glass level control system that is used to monitor and control furnace glass level. The layout of a typical system is shown in figure 11.1. The radioactive source (Model 770-A5) is a stainless steel sealed unit with a specified quantity of Cobalt 60 isotope in the center. Gamma radiation is produced in a beam which is aimed slightly downward from above the glass line at an angle from the horizontal of approximately 2 degrees toward the detector. The glass attenuates (reduces) the intensity of the radiation beam on the detector. In figure 11.3. Since the tip of the radiation detector is positioned vertically at the "OK Level" as specified by plant melting personnel, a lowering of the level allows more gamma radiation to reach the detector. This gives an increased signal to the detector that is routed to the glass level control where the signal is compared to setpoint and a corrective signal is transmitted to the batch charges to speed up to maintain OK level. The reverse is true for an increase in level. Both source and detector are mounted on Gilmore slides for ease in adjustment.

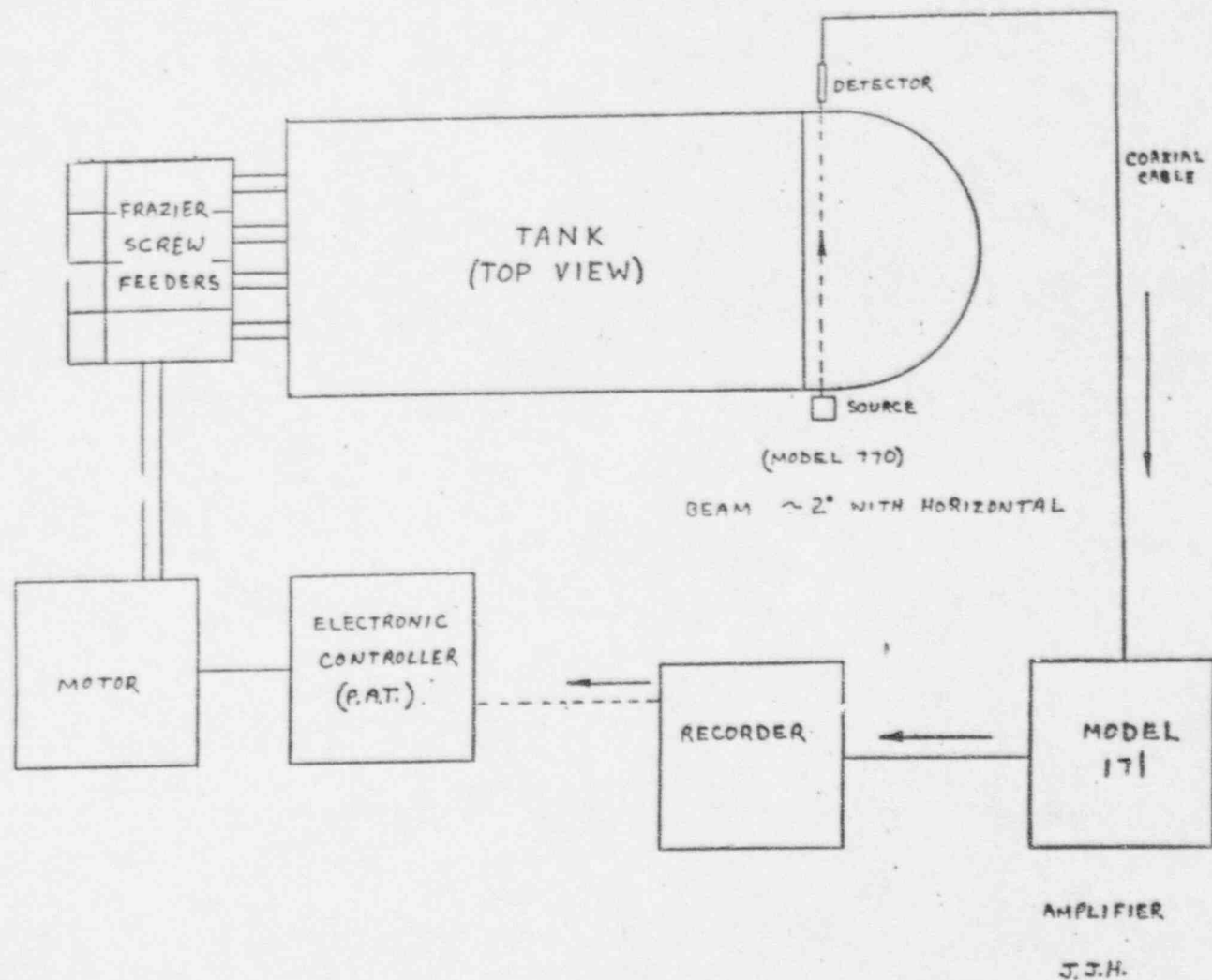
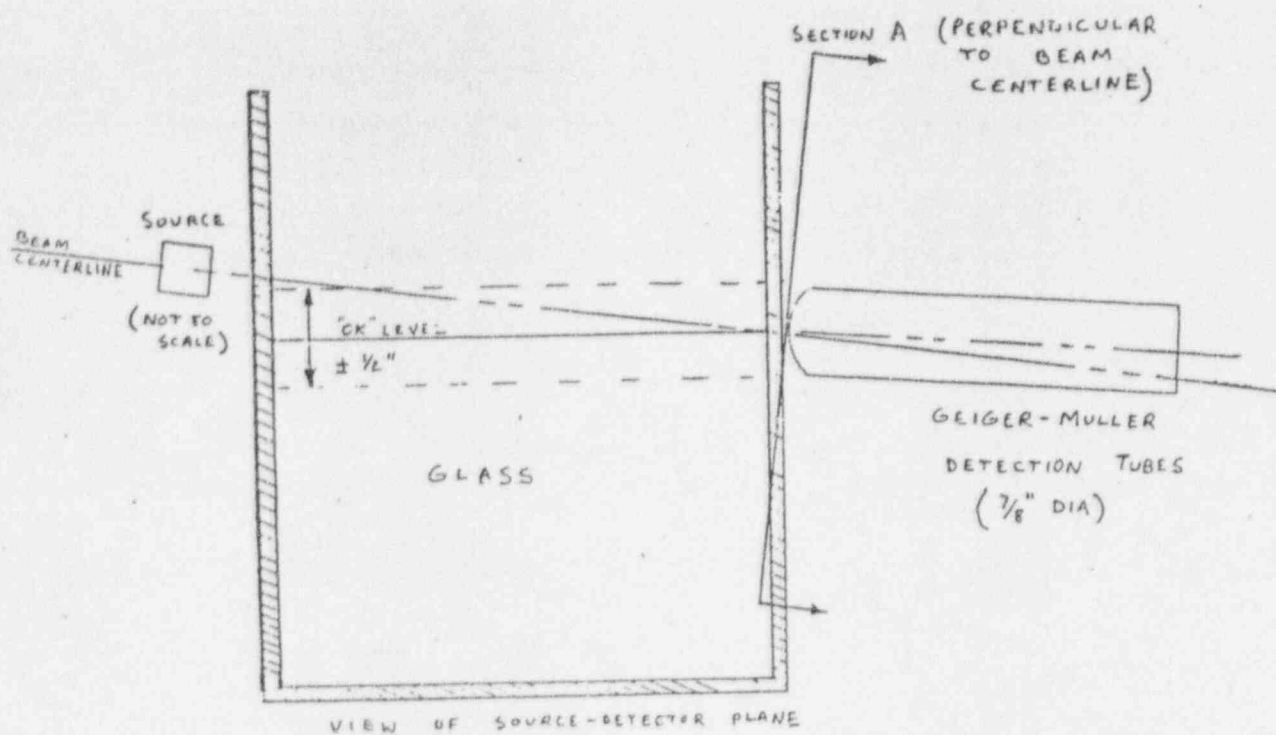


FIGURE 11.1 TYPICAL RADIATION LEVEL CONTROL SYSTEM



SECTION A VIEW

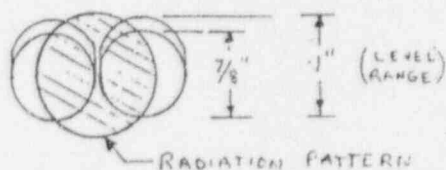


FIGURE 11.3 RADIATION LEVEL PRINCIPLE OF MEASUREMENT
(ALL BUT GM METER APPLICATIONS)

Section #7 Individual(s) responsible for radioactive safety program and their training experience.

The New Stanton plant radioactive safety officer is:

A. Mr. Todd Cable will be the radioactive safety officer of the new facility. He will complete his 40 hours of radiation safety education(NRC approved) in November of this year.

A.1 Mr. Todd Cable has attended Engelhart & Associates, Inc. course entitled " A Radiation Safety Seminar" in July of this year. Please reference his certificate and course outline that is attached.

Since 40 hours of radiation safety education(NRC approved) is required.

A.2 Mr. Todd Cable will attend an additional course from Radiation Safety & Control Services, Inc. entitled "Radiation Safety Officer" from Nov. 18th to the 22nd of this year. A course outline is attached.

B. Installation, maintenance, initial radiation survey and leak testing will be performed by Level Link engineer or other person specifically licensed by the NRC or agreement state to perform such services.

Certificate of Completion

awarded to

Todd Cable

for participation in a radiation safety training course

Given by Engelhardt & Associates, Inc.

July 29-31, 1996

Orlando, FL

Susan J. Engelhardt

Susan J. Engelhardt, M.S.

Ralph Grunewald

Ralph Grunewald, Ph.D.

Dee Kaiser

Dee Ann Kaiser, M.S.

Judith Grunewald

Judith Grunewald, R.N., M.S.

ENGELHARDT & ASSOCIATES, INC.

Presents...

A Radiation Safety Seminar

September 9-11, 1996

Hilton Riverside in New Orleans

Who Should Attend:

People in industry, government, hospitals and universities who are responsible for the safe use of radiation sources and radioactivity, or need to understand the principles of radiation safety.

This seminar meets regulatory requirements for RSO training for fixed gauge users.

- Radiation and Radioactive Decay
- Radiation Quantities and Units
- Biological Effects of Radiations
- New 10CFR Part 20
- 10CFR 19, 30, 33, 34 and 35 Requirements
- Radiation Risks
- Radioactive Waste Disposal
- Radiation Measurements
- Personal Dosimetry
- Licensing Requirements
- Records Management
- Preparing for Radiation Safety Inspections
- Emergency Response

This course provides comprehensive training for industry, medicine, academic, and biotechnology/R&D personnel. The course uses a "nuts and bolts" approach to radiation safety, so each attendee receives information pertinent to them. All persons attend "core" lectures, and then the class is split into separate groups for gauge, medical and academic/biotechnology users. Each group receives specific instruction as well as hands-on for specific needs and regulatory requirements.

Evaluation Comments from Past Attendees...

"Excellent Value- best course I've attended."

"Exceed expectations. Material was right on target."

"Excellent course! Far above my expectations!! Look forward to coming again."

"I was very satisfied with the course. There was not excessive theory in the lectures, which would have probably confused me."

"I've had training under 3 other organizations. This one covered the areas better. Others focused on one or two aspects, you covered more aspects. The text is EXCELLENT. It will serve well as a reference."

Seminar Coordinator

Sue Engelhardt has over 22 years experience in Health Physics. After receiving her M.S. she worked as a Health Physicist in the uranium fuel cycle, and then as the RSO at the University of Wisconsin for 10 years. At the University Susan had experience with multi-curie quantities of radioactive material. She also taught on a consulting basis several RSO courses in heavy industry settings. As President of Engelhardt & Associates, Inc. she organizes and presents a wide spectrum of training courses, as well as preparing many different types of licenses.

Our seminar speakers have been selected, based on their individual expertise to best address your needs.

Location

Hilton Riverside in New Orleans

There is no better place to take in the action than the New Orleans Hilton Riverside, right in the middle of it all. Restaurants, shopping, casino gaming and night life are all at your doorstep. Located on the banks of the Mississippi River the Hilton Riverside gives you the best New Orleans has to offer - all within easy walking distance. Three blocks away, the historic French Quarter beckons you to explore, and the fabulous Aquarium of the Americas is just one block away.

Continental Breakfast begins at 7:30 a.m. with class starting at 8:00 a.m. each day. We will wrap-up by 4:00 p.m. Monday and Tuesday, and by 2 p.m. on Wednesday.

Day One

How Radiation is Used

- Medical
- Industrial
- Academic

Regulatory Agencies

- Who regulates what
- Where regulatory standards come from

Basic Terminology and Basic Physics

- Quantities and units of radiation
- Types of radiation; interaction of radiation and matter; how radiation is produced
- Half-life; shielding; half-value layers

Radiation Protection

- Dosimetry: Types of dosimeters and how they work
- Time, distance, shielding; inverse square
- Allowable limits of exposure; how conservative are these limits?
- Rules of thumb to protect yourself from radiation
- ALARA

Sources of Radiation Exposure

- Natural occurring, medical, work, life-style, nuclear power

Day Two

Radiation Detection Equipment

- Types of equipment and what it can be used for
- Demonstration of equipment uses
- Appropriate methods of use

Radiation Biology

- Radiation biology at the cellular level
- Early somatic effects, acute effects, delayed effects
- Radiation Risk

Radiation Safety Procedures

- Leak test: description and purpose with hands on experience
- Radiation safety surveys
- Instrument calibrations; why?
- Instrument checks; why?
- Hands on use of meters

Radiation Emergencies

- Source leakage, spills, loss of sources, injuries involving radioactive materials
- Licensee perspective

- Emergency room personnel as responders to incidents
- Emergency personnel as responders (ambulance, fire, police)

Radioactive Waste Management/Minimization

- Status of radioactive waste processing in the U.S.

Transportation

- Regulatory requirements
- Shippers responsibility

Day Three

License Writing

- How to prepare an NRC/State license; what will be approved and what will not

NRC/State Inspections

- How to deal with an NRC/State inspector
- What to do if the inspection appears to be going badly
- What to do if you are called in for an enforcement conference; can you prepare for it; can you plan for it?

Reportable Incidents

- Determination of reportable incidents
- Reporting requirements

Radiation Licensing and Regulations

- Revised 10CFR Part 20
- 10CFR 30-34, and 10CFR 35
- Gauges, specific licenses, general licenses, special requirements
- Agreement vs non-agreement states

We will break into three separate groups (i.e. medical, biotech, research, industrial/gauge) twice a day. This will assure that specific questions and problems are addressed. Bring a copy of your license or device registration and operations manual for reference.

Your Registration Fee Includes:

Continental Breakfasts
Comprehensive Radiation Safety Manual
Radiation Training Materials
Licensing Sessions

Send or Fax To: Engelhardt & Associates

2800 S. Fish Hatchery Road
Madison, WI 53711

Phone: (608) 274-4227

(800) 525-3078

Fax: (608) 273-6989

Please send payment prior to the conference.

Feel free to let us know if this is a problem. Thank You!

Continuing education credits are available for: Society for Nuclear Medicine, ARRT and the American Board of Industrial Hygiene. Approved by Agreement States for Fixed Gauge users - NRC approval assistance available.

If you are unable to attend, please pass this on to someone who may be interested.

Registration Fee: \$675.00 per person

Number of People Attending _____

REGISTRATION MUST BE RECEIVED BY AUGUST 16, 1996; PLEASE CALL IF THIS IS A PROBLEM

Name: _____

Position: _____

Organization: _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone: _____ Fax: _____

☐ Check enclosed ☐ Check, Purchase Order To Follow

Hotel Reservations: Please contact the Riverside Hilton • (504) 561-0500

Poydras at the Mississippi River • New Orleans, LA 70140

(Space Is Limited, Make Your Reservation Early)

Single/Double: \$120.00

(Please state that you are attending the Engelhardt & Associates Radiation Safety Seminar in order to receive this discounted room rate.)

Mon. 7/29/96	Description	Objectives	Trainer(s)
07:30 - 08:00 am	Continental Breakfast	Not Applicable (NA)	
08:00 - 08:10	Seminar Objectives/Overview	Understand seminar objectives. Meet trainers.	Bob Kaiser
08:10 - 08:30	How Radiation is Used <ul style="list-style-type: none"> • Medical uses • Industrial uses • Academic uses 	Know common uses of radiation in industry, research & medicine.	Sue Engelhardt
08:30 - 08:50	Regulatory Agencies <ul style="list-style-type: none"> • Who regulates what • Where regulatory standards come from • NRC vs. Agreement States • Other agencies (e.g., OSHA, FDA, EPA, DOT) 	Understand how the regulations are developed. Know the difference between Agreement vs. Non-Agreement states. Know the relationship between the NRC and other agencies.	Sue
08:50 - 09:00	Break	NA	
09:00 - 10:30 (10 min break)	Radiation Physics <ul style="list-style-type: none"> • Types of radiation • Interactions with matter • Half-life • Radioactivity units 	Know the various types and characteristics of radiation (e.g., alpha, beta, gamma) and their interactions in matter. Understand half-life, Ci, & Bq.	Ralph Grunewald
10:30 - 11:30	Group Sessions	See handouts	All
11:30 - 12:30 pm	Lunch	NA	
12:30 - 01:20	Radiation Dosimetry <ul style="list-style-type: none"> • Exposure and dose units • Types of dosimeters; how they work • NRC dose limits • Dose Calculations 	Understand radiation exposure and dose units (e.g., rad, rem, R, RBE, LET, QF). Know NRC dose limits. Know how to calculate dose from a point source.	Sue
01:20 - 01:30	Break	NA	
01:30 - 02:20	Radiation Protection <ul style="list-style-type: none"> • Time, distance, shielding • Rules for protection from radiation • Posting requirements • ALARA 	Know methods used for radiation protection (e.g., time, distance, shielding, contamination control). Know how to apply inverse square law. Know what ALARA is and how to implement.	Dee Kaiser

Mon. 7/29/96
(continued)

Description

Objectives

Trainer(s)

02:20 - 02:50 pm

Types of Licenses/Regulatory Issues

- General vs. Specific licenses
- Device registrations
- Gauge, medical, academic, biotechnology requirements

Know common types of NRC licenses and scope of each.

Sue

02:50 - 03:00

Break

NA

03:00 - 04:00

Group Sessions

See handouts

All

Tues. 7/30/96

Description

Objectives

Trainer(s)

07:30 - 08:00 am

Continental Breakfast

NA

08:00 - 09:30

Radiation Detection Equipment

(10 min break)

- Types of equipment
- Appropriate uses
- Demonstration of equipment
- Self-reading dosimeters

Understand how to select and operate equipment for the different types of radiation. Understand the basic design principles of various detectors.

Ralph

09:30 - 09:50

Sources of Radiation Exposure

- Naturally occurring, medical, occupational, life style
- Risk vs. benefit

Understand typical levels of radiation exposure from common sources. Understand perceived vs. real risk

Sue

09:50 - 10:00

Break

NA

10:00 - 10:30

Radiation Biology

- Cellular effects, tissue effects, systematic effects
- Delayed effects, early somatic effects
- Acute radiation syndrome
- Radiation hormesis, threshold vs. non-threshold

Understand the biological effects of radiation and the dose levels where these effects occur.

Sue

10:30 - 11:30

Group Sessions

See handouts

All

11:30 - 12:30 pm

Lunch

NA

Tues. 7/30/96
(continued)

	Description	Objectives	Trainer(s)
12:30 - 01:15 pm	Radiation Safety Programs <ul style="list-style-type: none">• Written programs• Key elements (e.g., RSO/RSC, facility design, PPE, procedures, records, audits)• Recordkeeping requirements• Annual reviews	Know key elements of a radiation safety program. Know how to develop an effective program.	Dee
01:15 - 01:30	Responsibilities for Radiation Safety <ul style="list-style-type: none">• Who is responsible• Legal issues	Understand the various responsibilities for radiation safety.	Sue
01:30 - 01:40	Break	NA	
01:40 - 02:30	Emergencies <ul style="list-style-type: none">• Types of emergencies (gauge, medical, academic)• Procedures• Source leakage, loss• Emergency personnel as responders• Performance based training• Interactions with the public, media, and employees	Understand the RSO's role in planning for and preventing accidents. Know how to develop an emergency plan.	Judy Grunewald
02:30 - 02:50	Transportation <ul style="list-style-type: none">• Regulatory requirements (NRC, DOT, IATA)• Shipper's responsibilities	Know regulatory requirements for transporting radioactive materials. Know shipper's responsibilities.	Dee
02:50 - 03:00	Break	NA	
03:00 - 04:00	Group Sessions	See handouts	All

Wed. 7/31/96	Description	Objectives	Trainer(s)
07:30 - 08:00 am	Continental Breakfast	NA	
08:00 - 08:30	NRC Regulations <ul style="list-style-type: none"> • Parts 30 - 35 (types of licenses) • Special requirements (gauges and licenses) 	Understand general vs. specific license. Know which NRC regulations pertain to the different licenses (gauge, medical, etc.).	Sue
08:30 - 09:00	NRC Regulations (continued) <ul style="list-style-type: none"> • Parts 19 and 20 	Know critical provisions of these worker information and protection standards.	Sue
09:00 - 09:10	Break	NA	
09:10 - 09:40	Writing a License <ul style="list-style-type: none"> • New, renewal, & amendment applications • NRC Form 313 or equivalent for Agreement states • Content • Fees 	Understand the do's and don'ts when writing a license. Know what references are available for assistance (e.g., NRC Regulatory Guides).	Sue
09:40 - 10:30	Reportable Incidents <ul style="list-style-type: none"> • When to/not to report an incident • Interactions with the public and media 	Know NRC requirements for reporting incidents and misadministrations (medical). Understand the NRC's media notification criteria. Know key aspects of communicating with the public & media.	All
10:30 - 10:40	Break	NA	
10:40 - 11:30	NRC/State Inspections <ul style="list-style-type: none"> • How to prepare • How to deal with inspectors • What to do if your inspection is going badly • What to do if called for an enforcement conference 	Understand the inspection process. Know how to prepare for and respond to enforcement activities.	All
11:30 - 12:30	Examination	Complete exam and score 85% or better.	All
12:30 - 01:00	Wrap-up		

RADIATION SAFETY OFFICER TRAINING COURSE



1996 SCHEDULE

April 15-19

June 10-14

August 26-30

November 18-22

**Radiation Safety &
Control Services, Inc.**

91 Portsmouth Avenue
Stratham, NH 03885

800-525-8339

RADIATION SAFETY OFFICER COURSE OUTLINE

MATH AND PHYSICS REVIEW

- Scientific Notation
- Algebra Review
- Basic Calculator Operation
- Nuclear Structure
- Forces in Nature
- Fundamental Properties

RADIATION & RADIOACTIVITY

- Definitions and Units
- Half-Life and Decay
- Interaction of Radiation with Matter
- Radiation Dose
- Background Radiation Exposure

BIOLOGICAL EFFECTS

- Cellular Effects
- Short-Term Effects
- Long-Term Effects

RADIOLOGICAL HAZARDS

- External Radiation
- Protection Methods - Time, Distance, and Shielding
- Contamination
- Protection Methods - Protective Clothing, Respirators, Ventillation

DETECTION AND MEASUREMENT

- Basic Principles
- Detection Efficiency
- Counting Statistics
- Dose/Dose Rate Measurements
- Contamination Measurements
- Fixed Laboratory Instruments

OPERATIONAL PROGRAM

ALARA

Radiation Safety Program Goals & Requirements

- Procedures
- Training
- Surveys
- Posting and Labeling
- Dosimetry
- Leak Testing
- Instrument Calibration
- Record Keeping
- Waste Disposal
- "Declared Pregnant Woman" Requirements

REGULATORY AGENCIES

- NRC/Agreement States - License Conditions, Revised 10 CFR 20
- DOT - Transportation Requirements
- EPA - Environmental/Effluent Considerations

COURSE DESCRIPTION

This comprehensive course provides students with a balance of technical theoretical information and practical applications of radiation safety. Fundamental concepts are presented in a logical progression, providing a sound basis for understanding the day-to-day requirements of the Radiation Safety Officer. An optional exam for RSO's whose programs require testing is also provided. Applications will be made for continuing education credits for ABHP and ABIH.

WHO SHOULD ATTEND

This course was developed for Radiation Safety Officers and other personnel responsible for radiation safety within their facility. Particular emphasis will be placed on research and development facilities, industrial licensees, and educational facilities. (NOTE: References from past students available upon request.)

HANDOUT MATERIAL

All students will be provided with a copy of the instructor notes. Also, the document "Radiological Health Handbook", will be provided to all class participants. In addition to being used throughout the class, this reference will be a valuable source of information long after the class is complete. In addition, each student will receive a scientific calculator, necessary for the practical problem-solving sessions.

COURSE SCHEDULE

Course registration will be held Monday from 8:00 to 8:30 a.m. Classes will begin at 8:30 and end at 4:30 on Monday through Thursday, and at noon on Friday. An optional exam will be offered Friday afternoon. Optional evening sessions

ABOUT THE INSTRUCTORS

FREDERICK P. STRACCIA has over twenty years of practical health physics experience. He holds a B.S. Degree in Radiological Health Physics from the University of Lowell. Mr. Straccia has been responsible for training Radiation Protection Technicians in commercial nuclear power plants. He has also worked at a large industrial Technical Center, and was responsible for all aspects of their broad scope NRC license, including RSO training course development and instruction.

ERIC L. DAROIS holds an M.S. Degree in Radiological Sciences and Protection from the University of Lowell with over twenty years of experience. He has held various health physics positions including Health Physics Supervisor at a commercial nuclear power plant and Senior Scientist at a major environmental laboratory. Mr. Darois has provided training for health physics technicians at commercial nuclear power plants and short courses in instrument calibration. He has extensive experience in instrument design and applications.

JAMES P. TARZIA holds an M.S. degree in Radiological Sciences and Protection from the University of Lowell. He has over sixteen years of experience in both research and commercial reactor facilities and has worked on DOE contracts. His areas of concentration include internal and external dosimetry, instrumentation, and health physics computer applications. Mr. Tarzia has provided health physics instruction for health physics technicians, undergraduate-level college classes and radiation safety officers.

All three instructors are Comprehensive Certified Health Physicists. As RSCS principals, they operate a nuclear instrumentation calibration facility and analytical measurement laboratory.

REGISTRATION AND FEES

Since enrollment is limited, early registration is advised. Course registration is confirmed only upon receipt of fees or a company purchase order.

The fee of \$945 includes morning and afternoon coffee breaks, a luncheon on Monday, and a social hour on Monday after class. A discount of \$100 will apply for each additional individual from the same facility.

Cancellations received within 10 business days of the start date are subject to a \$200 cancellation fee. No-shows must pay the entire fee.

FACILITIES

The course will be held at the Sheraton Portsmouth Hotel in Portsmouth, New Hampshire, (603) 431-2300. Course participants are responsible for their hotel accommodations.

Class Dates	Rate	If Reserved By:
Apr 15-19	\$ 99	March 25
Jun 10-14	\$111	May 16
Aug 26-30	\$115	July 25
Nov 18-22	\$ 93	Oct 25

(NOTE: A listing of other nearby facilities may be obtained from RSCS upon request.)

PORTSMOUTH, NH

Located just 55 miles north of Boston, Portsmouth is easily accessible by car or plane. Originally settled in 1623, this working port town is renowned for its beautifully preserved historic buildings and landmarks. Portsmouth has also been recognized for its many wonderful restaurants and unique boutiques and galleries. Across from the hotel, cruises depart daily for whale watching expeditions or scenic cruises to the historic Isles of Shoals. Whatever your interests, Portsmouth is sure to have something special to offer.

Section # 8.0

Operator Training

All operators and other personnel (i.e. control room personnel) who may need to be near the device will receive formal training conducted by Level Link, Inc. the training will include properties of radiation, detection, sources, basic radiation safety, lock out procedures, emergency procedures and specific information concerning the radioactive tank level device.

The Radiation Safety Officer (RSO), Mr. Todd Cable has read and understands the NRC industrial Code Rule Book.

Any other individuals who will use the gauge in the near future will also be trained and certified by Level Link, Inc.

The Radiation Safety Officer will assume the following duties and responsibilities:

1. All terms and conditions of the radioactive Material License are being satisfied.
2. The equipment is Leak Tested at the six-month intervals.
3. To ensure the equipment is used by a certified operator authorized by the RSO., and that Radiation Monitoring Badges will be worn.
4. To maintain all records required by the NRC, and have them readily available for inspection.
5. To ensure the equipment is properly secured against unauthorized removal or use.
6. To serve as a point of contact and give assistance in case of emergencies.
7. Require that all the operators have read and understand the radiation safety operating and emergency procedures.

Section #9

Facilities and Equipment:

1.) Panel Furnace:

- A.) As per shown in figure #1(Plant Layout)and figure #2 (Panel Furnace Detail) the radioactive source that will contain the Cobalt 60 isotope will be located on the right side of the panel furnace refiner well away from any employee walk area. The source in it's present location will be exposed to elevated temperatures and we will employ a front water cooling plate and water cooling jacket for it's body. There will be installed a temperature sensor on the front cooling plate to sense over temperature condition. If a high temperature condition is realized an alarm will sound near the source with red beacon light and in the furnace control room to alarm operation personnel.
- B.) User shall conduct, at intervals not to exceed six months, a program of visual inspections and maintenance of all source holders. This inspection shall include, but not be limited to proper labeling of the source holder, proper functioning of On-Off mechanism, adequate shielding of the radioactive material and integrity of the source mounting mechanism.

2.)Funnel Furnace:

- A.) As per shown in figure #1(Plant Layout)and figure #3 (Funnel Furnace Detail) the radioactive source that will contain the Cobalt 60 isotope will be located on the right side of the panel furnace refiner well away from any employee walk area. The source in it's present location will be exposed to elevated temperatures and we will employ a front water cooling plate and water cooling jacket for it's body. There will be installed a temperature sensor on the front cooling plate to sense over temperature condition. If a high temperature condition is realized an alarm will sound near the source with red beacon light and in the furnace control room to alarm operation personnel.
- B.) User shall conduct, at intervals not to exceed six months, a program of visual inspections and maintenance of all source holders. This inspection shall include, but not be limited to proper labeling of the source holder, proper functioning of On-Off mechanism, adequate shielding of the radioactive material and integrity of the source mounting mechanism.

3.0 Emergency Procedures:

The primary effort in a fire, explosion or other emergency situation is to limit personal exposure to radiation. To prepare for a fire emergency the local fire department has reviewed the entire facility. This review included identifying the location of the radioactive tank level device. The potential dangers and protection options were discussed.

* Emergency contracts are as follows:

- Security
- Radiation Safety Officer (RSO)
- Assistant Melting Supervisor
- Melting Supervisor
- NRC
- Level Link, Inc.

- * If physical damage to the device from fire or other source threatens, evacuate the immediate area while simultaneously ensuring that all possible measures are being taken to protect the device from damage. In the event of a fire, fire-fighting personnel should be instructed to direct water on the gauge to keep it cool. After the fire, a complete survey should be performed to insure no contamination occurred.
- * In the event of an accident, fire, and explosion that may have damaged the source encapsulation or shutter mechanism, the gauge manufacturer will be contacted immediately to provide instructions in the handling of the gauge. The regulatory agency will be notified next. Personnel will be kept away from the gauge by roping off the area until it has been determined by a survey meter that the area is safe.
- * An outer boundary of less than 2 mR/hr should exist. If the contamination threatens to leave the facility proper, contact the appropriate agencies to arrange evacuation of the public. Also contact the manufacturer (Level Link Inc.).
- * Identify and immediately isolate all persons who might have received high exposures or who could have been contaminated. In such cases arrange for the immediate evaluation of the personal monitoring devices worn by these persons and also collect samples of body fluids such as blood, urine, etc. for further analysis.
- * If personnel have become contaminated arrange for decontamination.

Section #9

Facilities and Equipment:

- * Regulate entry to the scene of the accident to minimize exposures and contamination.
- * Notify promptly the NRC and seek advice for further action, Arrange for immediate availability of experts.
- * Maintain complete records of the accident and follow-up procedures.
- * The procedures are the responsibility of the RSO.
- * If the source housing containing radioactive material is lost or stolen, the gauge manufacturer and the regulatory authorities listed on the license will be notified.

NOTES:

1. TO BUS DUCT B03-2 AT COLUMN 13 - ROW 15 ELEV. 107'-0" CONDUITS AS DEPICTED ON THIS DRAWING ARE FOR GRAPHICAL PURPOSES ONLY. ACTUAL INSTALLATION LOCATIONS WILL VARY.
2. THE CONTRACTOR SHALL VERIFY ALL LOCATIONS OF ELECTRICAL EQUIPMENT WITH MECHANICAL EQUIPMENT & PIPING PLANS TO INSURE PROPER PLACEMENT & CLEARANCE OF ELECTRICAL ITS.
3. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO INSTALL CONDUIT & WIRE AVOIDING THE BLOCKING OF EQUIPMENT ACCESS LOCATIONS, AISLES, ETC.
4. ALL WIRE, CABLE, CONDUIT, WIREWAY, AND FITTINGS SHALL BE FURNISHED BY THE CONTRACTOR.



FOR CONSTRUCTION

123850

FIGURE #2

DESIGN	REVISION
WEL CONDUIT LAYOUT	
AT PANEL SHED 20-2	
DATE	BY
10/10/60	WEL
DRAWN BY: WEL	
CHECKED BY: WEL	
DATE: 10/10/60	
SCALE: AS SHOWN	

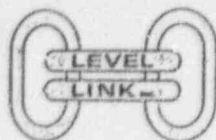
FOR CONSTRUCTION

WIRE SCHEDULES									
C. (2, 3)	CONDUIT NUMBER	FALL NUMBER	WIRE			CONDUIT & WIRE FROM	CONDUIT TO	WIRE FALL TO	
			WIRE SIZE	WIRE TYPE	CONDUIT SCHEDULE				
11, 12, 13	1000-1	P-1000	3	4	4-10	CONDUIT STRONG RAIL ELECTRICAL ENCLOSURE	RAIL SACK NO-1	RAIL SACK NO-1	
11, 12, 13	1001-1	P-1001	3	4	4-10	CONDUIT STRONG RAIL ELECTRICAL ENCLOSURE	RAIL SACK NO-1	RAIL SACK NO-1	
11, 12, 13	1002-1	P-1002	3	4	4-10	CONDUIT STRONG RAIL ELECTRICAL ENCLOSURE	CONDUIT STRONG RAIL	CONDUIT STRONG RAIL	
11, 12, 13	1003-1	P-1003	3	4	4-10	CONDUIT STRONG RAIL ELECTRICAL ENCLOSURE	CONDUIT STRONG RAIL	CONDUIT STRONG RAIL	
11, 12, 13	1004-1	P-1004	3	4	4-10	CONDUIT STRONG RAIL ELECTRICAL ENCLOSURE	CONDUIT STRONG RAIL	CONDUIT STRONG RAIL	
11, 12, 13	1005-1	P-1005	3	4	4-10	CONDUIT STRONG RAIL ELECTRICAL ENCLOSURE	CONDUIT STRONG RAIL	CONDUIT STRONG RAIL	
11, 12, 13	1006-1	P-1006	3	4	4-10	CONDUIT STRONG RAIL ELECTRICAL ENCLOSURE	CONDUIT STRONG RAIL	CONDUIT STRONG RAIL	
11, 12, 13	1007-1	P-1007	3	4	4-10	CONDUIT STRONG RAIL ELECTRICAL ENCLOSURE	CONDUIT STRONG RAIL	CONDUIT STRONG RAIL	
11, 12, 13	1008-1	P-1008	3	4	4-10	CONDUIT STRONG RAIL ELECTRICAL ENCLOSURE	CONDUIT STRONG RAIL	CONDUIT STRONG RAIL	
11, 12, 13	1009-1	P-1009	3	4	4-10	CONDUIT STRONG RAIL ELECTRICAL ENCLOSURE	CONDUIT STRONG RAIL	CONDUIT STRONG RAIL	
11, 12, 13	1010-1	P-1010	3	4	4-10	CONDUIT STRONG RAIL ELECTRICAL ENCLOSURE	CONDUIT STRONG RAIL	CONDUIT STRONG RAIL	

[illegible]

NAME: [REDACTED]
 DOB: [REDACTED]
 SEX: [REDACTED]
 RACE: [REDACTED]
 ETHNIC: [REDACTED]
 RELIGION: [REDACTED]
 MARITAL STATUS: [REDACTED]
 OCCUPATION: [REDACTED]
 ADDRESS: [REDACTED]
 CITY: [REDACTED] STATE: [REDACTED] ZIP: [REDACTED]
 PHONE: [REDACTED]
 FAX: [REDACTED]
 EMAIL: [REDACTED]
 SIGNATURE: [REDACTED]
 DATE: [REDACTED]

Figure # 3

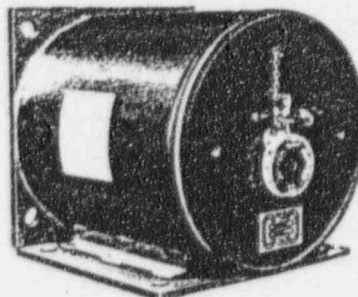


SOURCE ASSEMBLIES, SERIES TGSA 770 AND TGSA 7116

SOURCE HOLDER
MODEL TGSA 7116—
SHUTTER OPEN



SOURCE HOLDER
SERIES 770.
AVAILABLE IN
FIVE SIZES



SOURCE HOLDER
MODEL TGSA 7116—
SHUTTER CLOSED



SOURCE HOLDER
MODEL TGSA 770-D1
USED SPECIFICALLY FOR
BACKSCATTER
APPLICATIONS.



DESCRIPTION

The Model 770 series of source assemblies is intended for general usage with industrial nuclear instrumentation. They are designed to utilize gamma emitting nuclides, principally Cesium 137 or Cobalt 60. These holders are available in five sizes to accommodate up to 5.0 Curies of Cesium 137, or 2.5 Curies of Cobalt 60. Due to the unique design of the unit, it provides a highly collimated beam of radiation with minimal side bands, and is intended for use primarily on on-off, point level applications. It may also be utilized on varying level applications where very narrow level spans are required.

The unit is constructed of stainless steel, and is lead filled. The holder utilizes a method of collimation which provides five individual levels of radiation, selected by rotation of a shutter handwheel in 60 degree increments. The shutter may be operated manually or automatically. The hand wheel is marked so that the opening to which the unit has been set is readily determined by looking at the hand wheel. This provides a flexibility of application and can effectively increase the useful life of the source capsule. The source may be locked in either the open or closed position. It may be mounted flat on its base, or it may be hung on the side of a vessel. Where applications involving extreme heat are expected, water jackets may be provided for either the front or the top of the unit (or both). The unit is provided in five sizes, depending upon activity of source required.

For varying level, or continuous level, application, we offer the Model TGSA-7116. This source assembly provides a fan shape beam with narrow side bands. The maximum vertical range of measurement would be approximately one half the distance across the vessel, or approximately 10 feet maximum detector length. The source shutter may be opened or closed automatically, although the manual mode is more common. The unit is fabricated with stainless steel internal machine parts and a carbon steel cladding. The unit is lead filled.

For certain backscatter applications, the Model TGSA-770-D1 is utilized. It is specially constructed to permit an angular beam to be directed into the vessel for maximum backscatter generation. This unit is machined internally, stainless steel clad, and filled with lead.

Elements capable of emitting gamma radiation must be safely housed in order to be suitable for industrial applications. The Federal and State governments have established rigid safety specifications postulating requirements for industrially acceptable source holders. All Level Link source holders more than meet both state and federal specifications, assuring complete safety to personnel in the area, providing common sense precautions are observed. All holders are delivered with padlocks, and may be locked in either source open or source closed positions. All source assemblies are delivered with identification labels which indicate type of nuclide contained therein, the activity, the date of loading, the model and serial number of the unit, and other information. A "Caution— Radioactive Material"

warning also appears on all labels. All source holders are selected for specific applications so that the radiation levels present around all surfaces, other than the face of the unit when the shutter is open, are well below those stipulated by the Nuclear Regulatory Commission as being safe.

The 770 series of source holders are fabricated to permit the exchange of depleted source capsules. This allows the source holder to be re-used. Since the source holder portion of the source assembly is the major expense of the two components involved, re-use of the holder provides substantial economic benefit to the user. Frequently, cobalt 60 is not used on a given application because of its short half life. Through use of a 770 series holder, the cobalt source capsule can be exchanged at the expiration of its half life at a nominal cost, bringing the source assembly back to full strength.

A by-product materials license must be obtained by any organization that will utilize the source assembly. The required forms and necessary product information are provided by Level Link, as well as assistance in completing the forms. A license to a prospective user is usually issued within six weeks from the time of submittal of the license form. Although training in basic nuclear technology is very helpful, it is not a basic requirement for obtaining a license. Willingness to accept responsibility for possessing and maintaining a radioactive source is more fundamental criteria in judging the merits of an applicant. Although a certain amount of difficulty is involved in obtaining a byproducts license, our experience and available assistance will enable a prospective licensee to become licensed with a minimum of inconvenience.

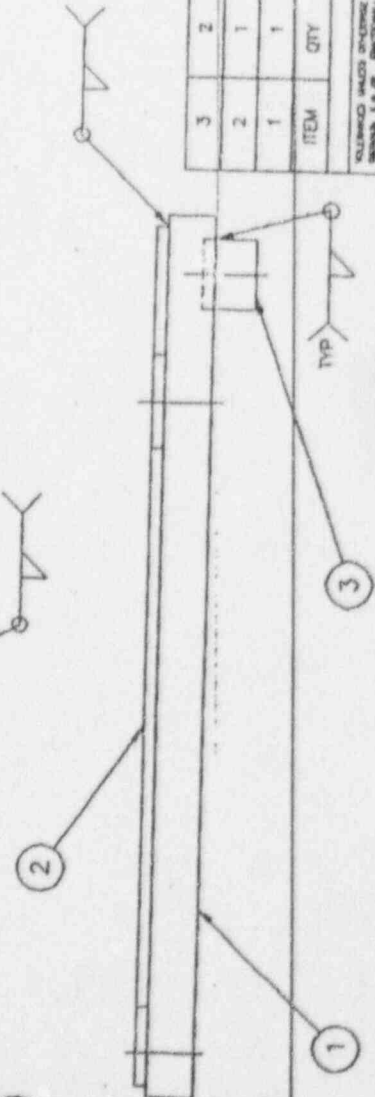
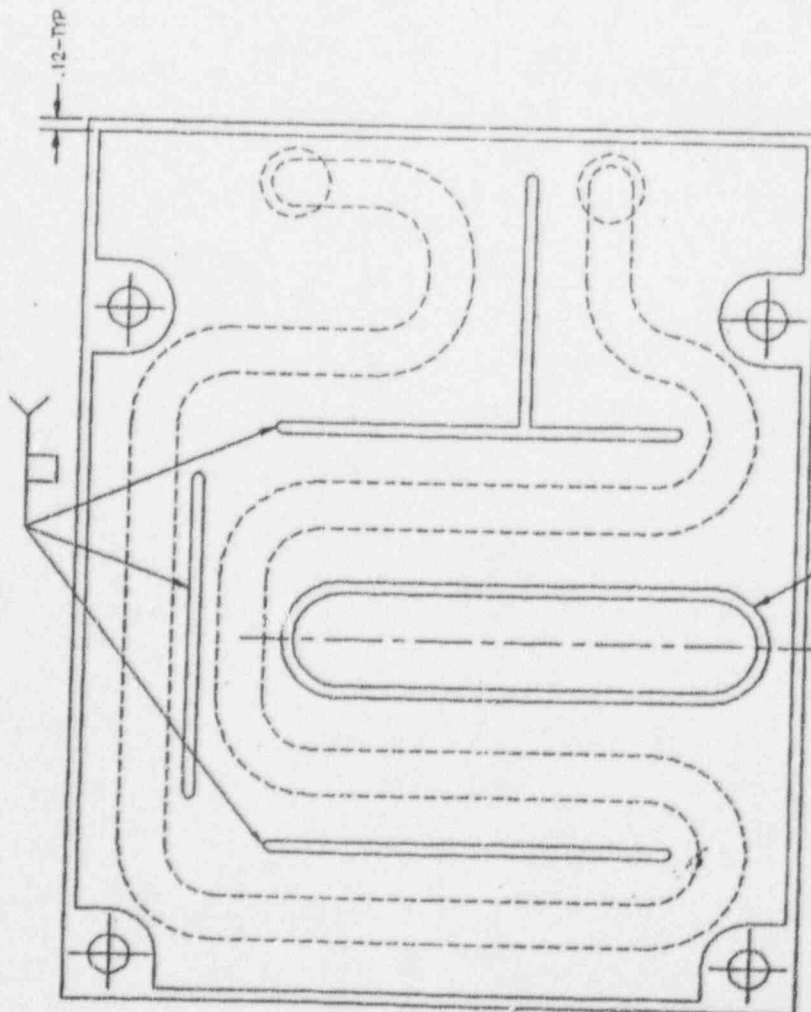
LEVEL LINK INC.
1205 West Barkley Avenue
Orange, California 92668
(714) 997-2140



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REV	DATE	BY	CHK
0	12/15/94	12P	1007

NOTE:
ALL WELDS MUST BE WATER
TIGHT TO 100PSI.



3	2	STEEL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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STD 1/4" PIPE NIPPLE
X 1' LG, SCH 40,
W/LAP FOR AIR BLEED,
304 SS, ONE REQ'D

1/4" DIA HOLE
1 RATE

1 1/2" Baffle R

FRONT

Source

STRIP 1/8" X 1 1/4" X 14 1/4"
304 SS, 2 REQ'D



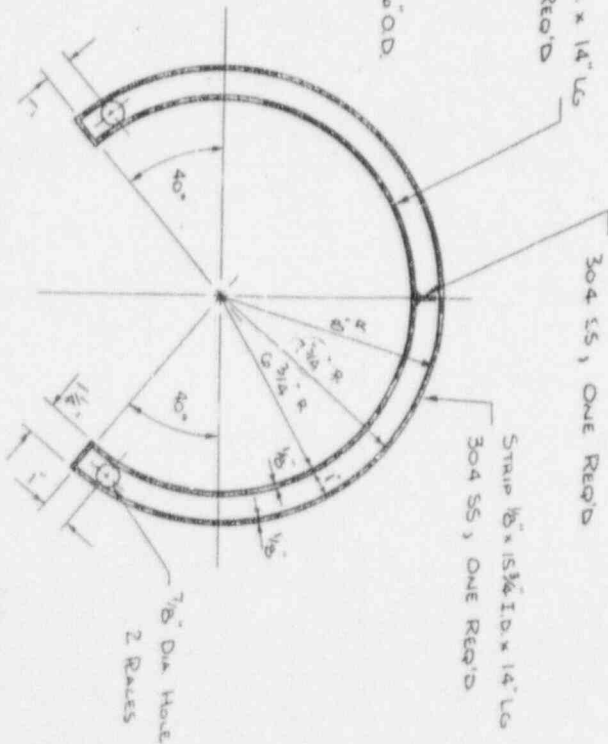
STRIP 1/8" X 13 1/2" I.D. X 14" LG
304 SS, ONE REQ'D

STRIP 1/8" X 13 1/2" I.D. X 16" O.D.
304 SS, 2 REQ'D

STD 3/4" PIPE NIPPLE
X 2" LG, SCH 40
304 SS, 2 REQ'D

SM. 1/8" X 7/8" X 1 1/2"
304 SS, ONE REQ'D

STRIP 1/8" X 15 1/2" I.D. X 14" LG
304 SS, ONE REQ'D



SECTION A-A

NOTES:

1. FOR SH-S SOURCE
2. WELDED CONSTRUCTION

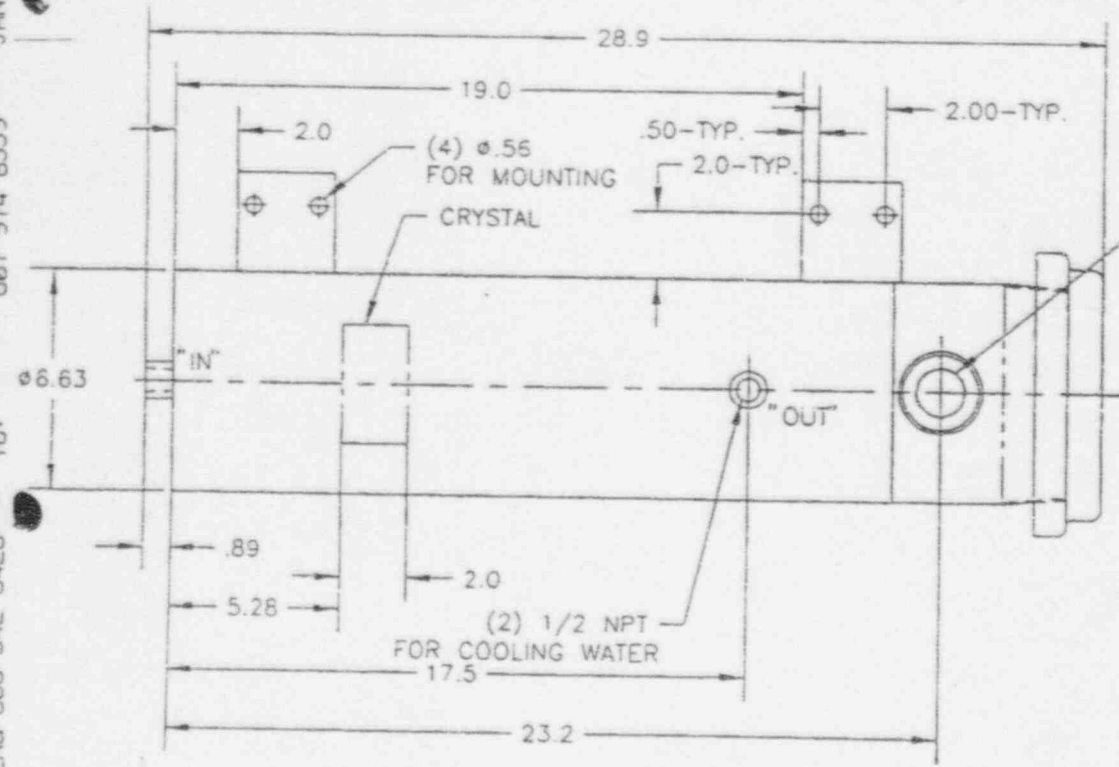
DATE	3-1-0
BY	RD
CHECK	RD
APP'D.	

LEVEL SOURCE WATER COOLER
CORNING GLASS WORKS

DATE 24038-64
EXACT PART NO. 2041

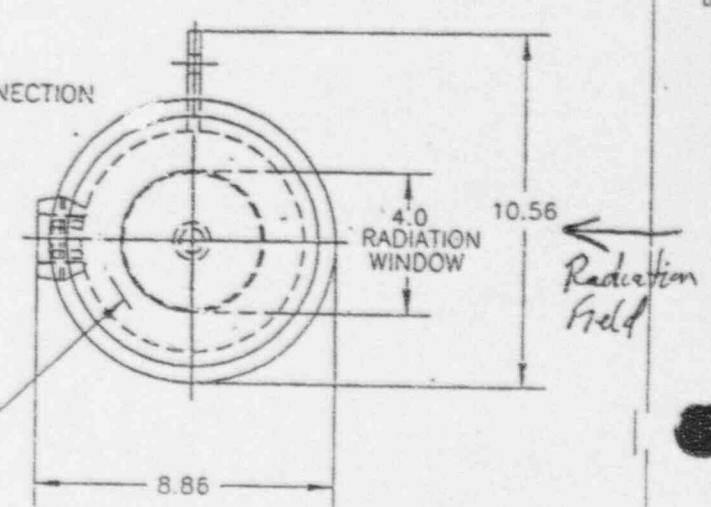
24038-313

FROM: RONAN ENG 606 342 6426 TO: 607 974 6559 JAN 15, 1996 1:57PM H371 P.05



1.25 NPT
ELEC. CONNECTION

LEAD SHIELD



ESTIMATED WEIGHT IS 100 LBS

DATE	SYM	REVISION	PT. NO.	DR	CK
8/30/94	0	ECR 40481		YSP	

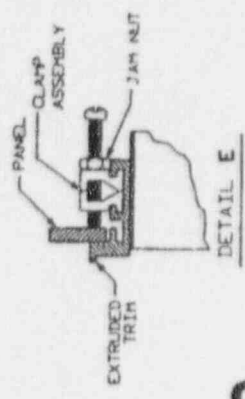
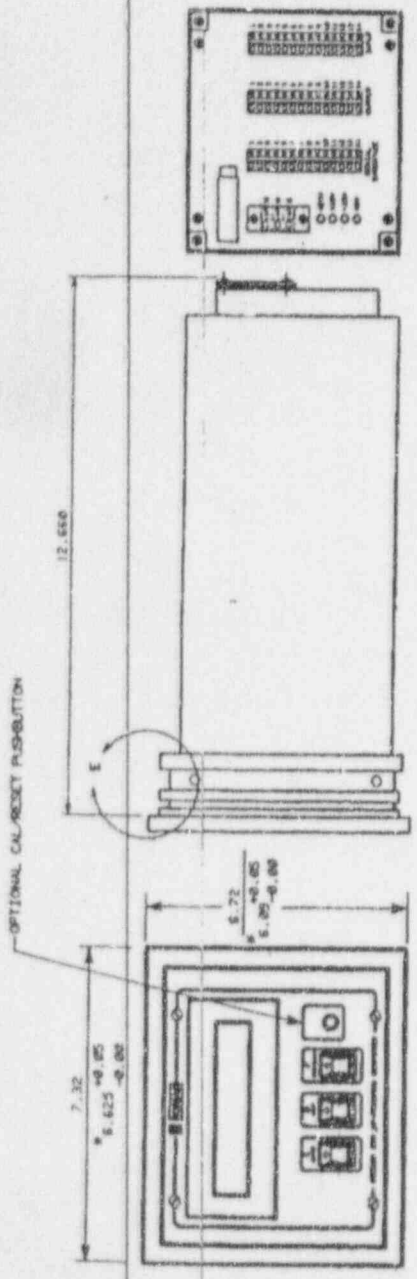
RONAN MEASUREMENTS DIVISION			
CUSTOMER: CORNING		SCALE 1-4	DR. BY YSP APPR. BY
TITLE OUTLINE: DETECTOR HOUSING W.C. WITH LEAD SHIELD			
DATE 8/30/94	DRAWING NUMBER B-10321-K		REV. 0

JAN 15 '96 13:41

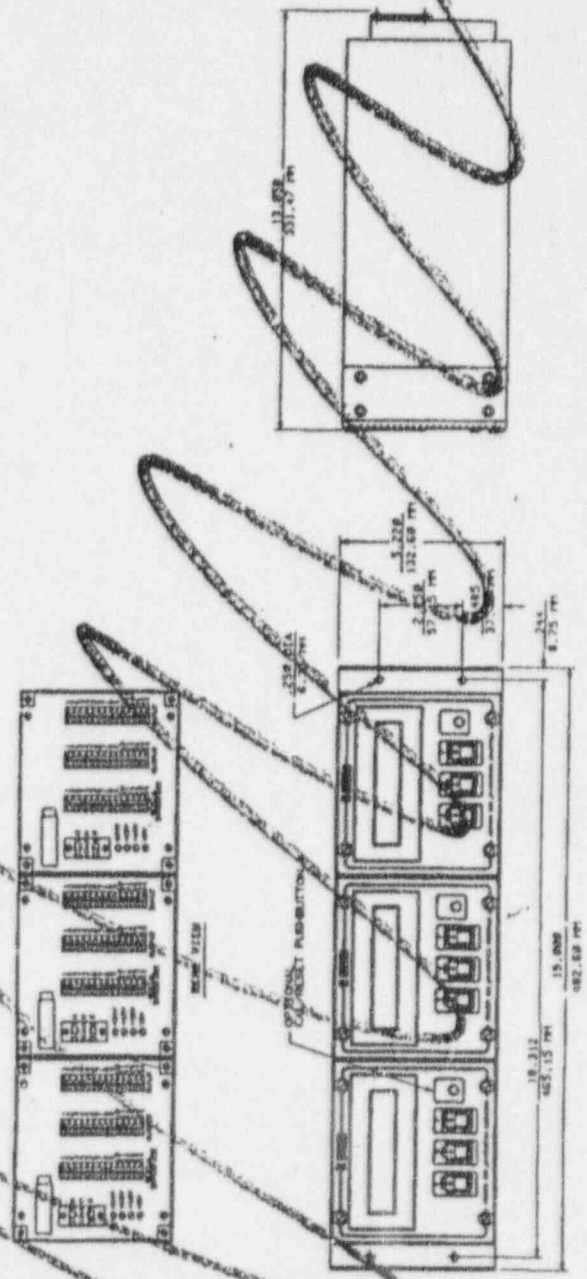
RONAN 606 342 64

PAGE.05

X96N PANEL MOUNT



X96N RACK MOUNT



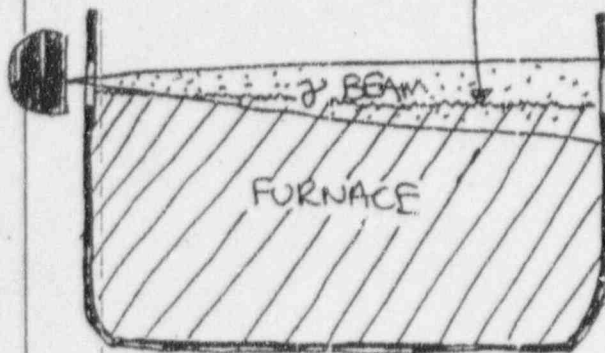
SIDE VIEW OF
FURNACE

ZERO LEVEL (0.0000 RONAN)

CORNING CONSIDERS
ZERO ON RONAN
"FULL" LEVEL

ANY DEVIATION OF LEVEL
FROM "FULL" IS $\pm .7500$ "
ON RONAN SYSTEM

SOURCE

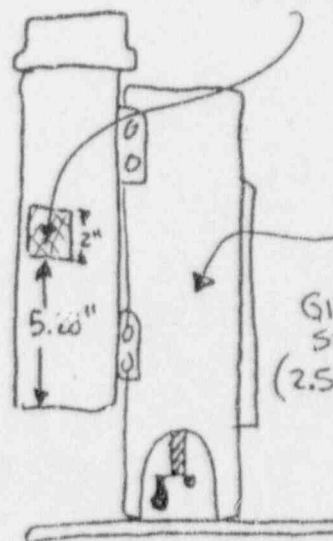


OPTIMUM
LEVEL
("FULL")

NAT CRYSTAL

PROVIDED BY
CORNING

GILMAN
SLIDE
(2.5" SPAN)



Section # 10

Radiation Safety Program

10.1 Methods and Occasions for Conducting Radiation Surveys

The following are examples of surveys to make during associated operations:

1. Determining the boundary of the restricted area.
2. Determine the radiation level at the external surfaces.
3. Determining that radiation levels around containers prepared for shipment comply with Department of Transportation regulations.

The following (attached) form is used to record data for the semiannual survey.

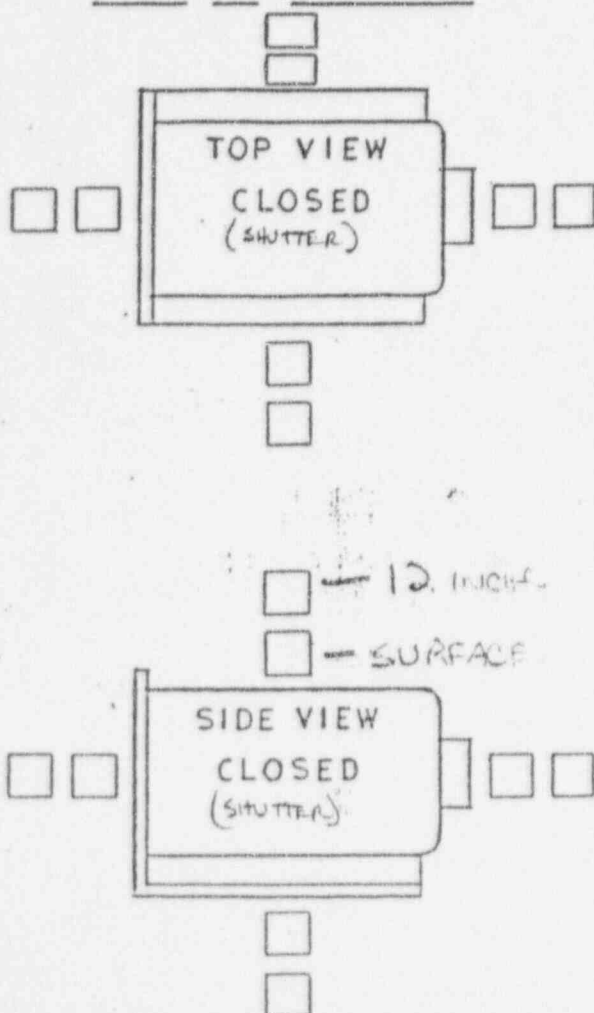
- * Determining that source is in a safe storage position with shutter closed or in its operating position when shutter is open.
- * Determining radiation levels of incoming packages.

These surveys will be discussed further under the appropriate topics. In general, survey(s) need to be made whenever a source is manipulated or moved and every six months while in operation!

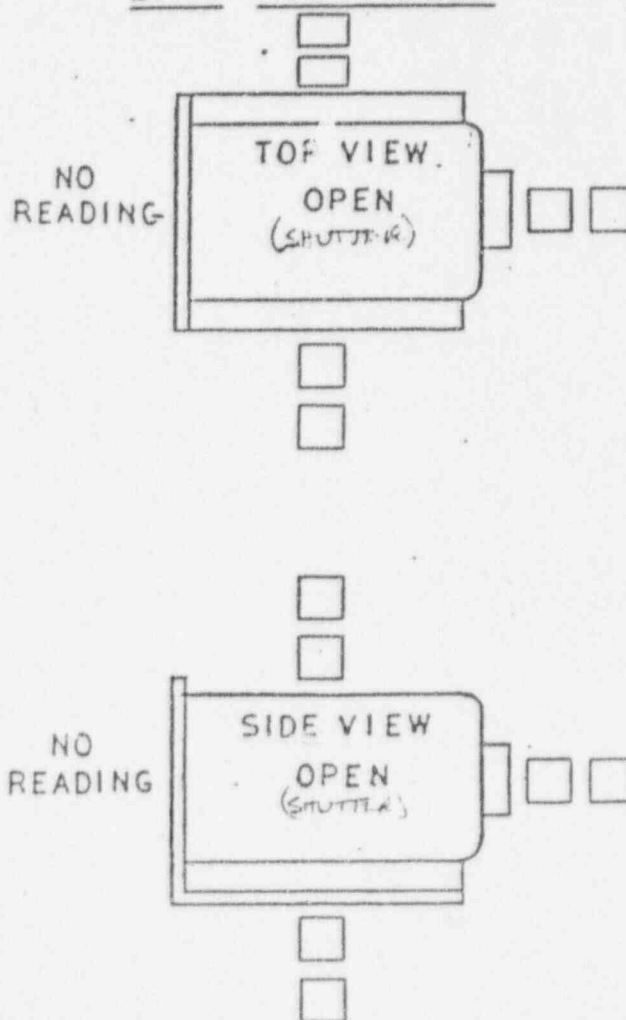
RADIATION SOURCE PROFILE FORM

DATE _____
LOCATION _____
SERIAL NO. _____
ISOTOPE _____
QUANTITY _____
MODEL _____
LOCK NO. _____
WIPE TEST KIT NO. _____
TAKEN BY _____

UNIT IN STORAGE



UNIT INSTALLED



123859

Section # 10

Radiation Safety Program

10.2

Radiation Dose Estimates

The radiation dose received from the shielded sides of the device, at one foot is 5mR/hr according to manufacturer. At this rate maximum total yearly dose, (is calculated below). The maximum exposure rate should not exceed 5 mR/hr.

The tank operator is the only non-user who will come within one meter of the device except during non-routine maintenance. The tank operator is required to enter the steel enclosure for 5-10 seconds to take a tank temperature reading. This is done 1-2 times per shift which should maintain a maximum exposure at less than five mR/year.

Other employees are only required to be within a meter of the device when leak testing, performing radiation profiles, non-routing maintenance and during shutdown and start-up procedures (once every two (2) years).

No one person would be within one meter greater than 10 hours per year routinely, 20 hours maximum.

As per Manufacturer, exposures to radiation levels 12 inches from the gauge surfaces with maximum loading will not exceed 5mR/hr(see below). We double this exposure rate.

Exposure 220 days/year

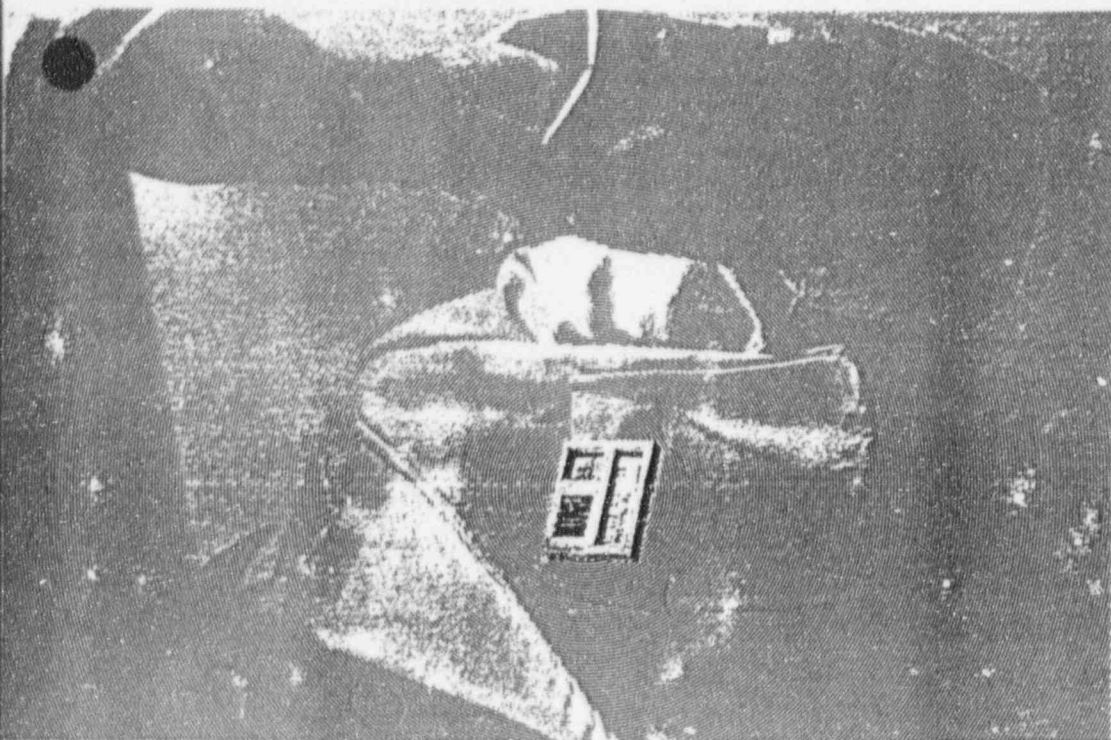
10 minutes per day at a maximum of 10mR/hr exposure rate

1/6 hour = 10 minutes

$220 \text{ days} \times 10 \text{ minutes/day} \times 1 \text{ hour/60min.s} = 36.67 \text{ hours of exposure / year}$

$36.67 \text{ hours/ year} \times 10 \text{ mR/hour} = 366.7 \text{ mR/ year}$

$366.7 \text{ mR/ year} \times \text{Quality factor of } 1.0 = 366.7 \text{ millirem/ year}$



ICN Dosimetry Service

Film Badge Manual

ICN ICN Dosimetry Service
26201 Miles Road
Cleveland, Ohio 44128
(216) 831-3000

Introduction

X-rays are invisible "bundles of energy" produced from the impact of high speed electrons on a particular target metal (usually tungsten). The energy of the x-rays varies with the amount of voltage used to accelerate the electron beam. X-rays differ from light or radiowaves in that they have a significantly higher vibration frequency, i.e. a much shorter wave length. As the wavelength is shortened, the energy of the x-ray is increased. X-rays have an extremely high penetration capacity. Protection from the harmful effects of these rays requires shielding by a dense material like lead or iron. Although the main area of concern is the primary x-ray beam, x-rays, like light do reflect from solid surfaces and attention

should be given to this scattered but weaker radiation. The unit to measure absorbed dose is called the rad. One rad is the absorbed dose of 100 ergs per gram of any matter and can be used for any type of radiation. (1 erg is the energy required to move one gram one cm.) The rad is a physical measurement, but dose in rads does not measure biological effect. The rad (measurable) corrected by a factor for the biological effect (RBE) yields the rem. This correction factor for x-rays is one, thus for x-rays, 1 rad equals 1 rem.

As the use of radiation producing equipment continues to increase, government regulations intended to assure the safe use of these machines are becoming more rigorous. In particular, these regulations require documentation that neither workers nor the general public are subjected to excessive exposure to radiation. The device most widely used to measure the quantity and quality of exposure to radiation is the film badge. The ICN Film Badge Service provides an accurate measurement and permanent record of the level of x-ray exposure.

The Film Badge

Accurate, sensitive and wide range monitoring of exposure to x-rays, has made the film badge the most widely used radiation monitoring device. The film badge consists of a radiation sensitive film packet and film holder which is capable of measuring the quantity and quality of radiation received by the film packet through the use of a radiation filtering system within the holder.

The Film

The ICN Dosimetry Service uses film packets of Kodak Type 2 Personal Monitoring Film. Type 2 film consists of a single film base with a fast (sensitive) emulsion on one side and a slow (insensitive) emulsion on the other side. Thus, a single film in a convenient-to-use packet is capable of recording exposure over the range of practical occupational exposures.

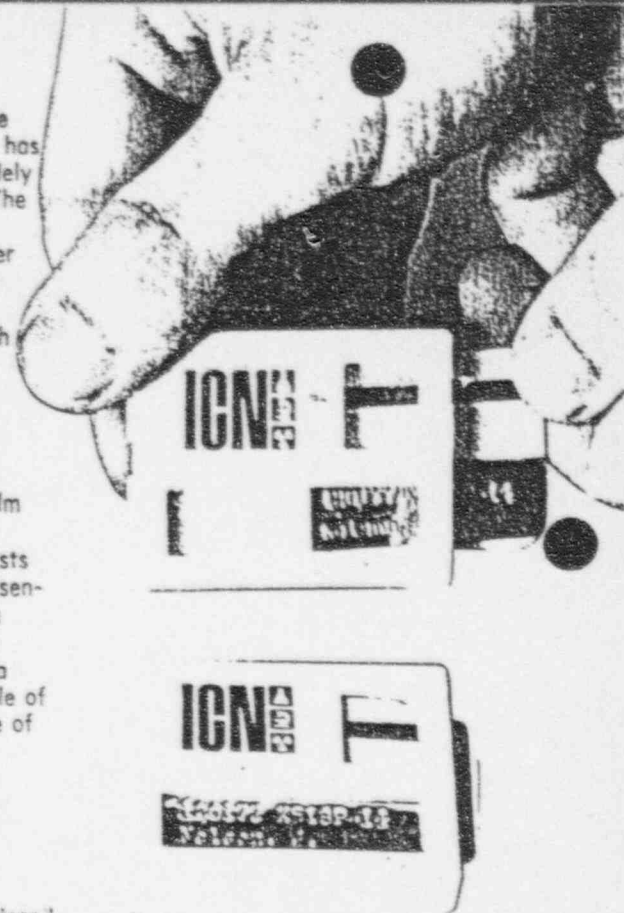
The Film Holder

The ICN multi-filter system is designed so that one quadrant of the exposed film corresponds to each filter system component—plastic, copper, cadmium. The fourth quadrant of this system is an open window. The cadmium filter will absorb all particles with energies less than 2 Mev and all photons with energies less than 150 Kev. Exposure to photons with energies more than 150 Kev is determined by comparing film darkening under the cadmium filter with the equivalent darkening on a calibration curve, using a ^{137}Cs source.

The film darkening under the copper and plastic filters are used to determine exposure to photons less than 150 Kev. Exposure to beta particles is determined from film darkening in the open window area (after correcting for darkening from other radiations, as measured under the filters) using appropriate calibration curves.

All of these calculations are handled by our computer, using data from calibration curves and related film darkening measurements for each film. (Film darkening measurements are made on each film for each of the 3 filter quadrants and the open window.) For this reason, all film packets must be exposed inside the ICN film holder. Film exposed outside of these holders cannot be accurately evaluated, and ICN will not routinely report results for such film packets.

ICN's all purpose film packet holder is constructed of impact resistant plastic and features easy replacement of film packets. For whole body-exposure monitoring, the holder is equipped with a sturdy metal clip. It is also available with a wrist band for hand and forearm monitoring.



Monitoring Exposure

Any employee whose work involves exposure or potential exposure to radiation from diagnostic or therapeutic x-ray or fluoroscopy should be monitored. Radiation exposure from x-ray machines is usually intermittent and the significant factor is the total exposure received during a particular time period. Regulatory limits on personnel exposure are expressed in terms of dose per quarter or dose per year. The current permissible whole body exposure is 1.25 rem per quarter or 5 rem per year. Extremity exposure (hands and forearms) is much higher—18.75 rem/quarter or 75 rem per year. The film badge is an excellent accumulator of exposure and hence is traditionally used to measure exposure received. Usually the film badge is replaced monthly but may be worn for 3 months and still yield reliable information.

Since the employer is responsible for maintaining a safe working environment, routine monitoring of work areas provide a record of the radiation environment and documents compliance with government regulations. A radiation area is defined as an area where the radiation level is more than 5 mrem/hour. The radiation level at

must be less than 2 mrem per hour or 100-mrem per week. Since x-rays are very penetrating it may be important to monitor office areas or treatment rooms to document compliance with rules for uncontrolled areas. The film badge can be used as such a monitor. The badge can be placed on an appropriate wall and allowed to remain for 1 to 3 months. Data from such films can assure the employer that his radiation environment is properly controlled.

Care in Handling

Personnel monitoring film is extremely sensitive and must be stored and handled with the same care as the most sensitive x-ray film. Irreversible damage may occur if the film is subjected to excessive heat, humidity or physical pressure. Exposure to gases such as ammonia, hydrogen sulfide, or hydrogen peroxide, will interfere with interpretation of the exposed film. All film should be stored in a cool, dry location safeguarded from stray radiation and from chemically active gases or vapors.

Some examples of "unusual" film are depicted here which demonstrate how mishandling can interfere with valid interpretation.

The Film Packet

The film is enclosed in a paper shield which must not be opened or otherwise breached or punctured. If you receive any film packets showing evidence of mechanical damage, call collect for an emergency replacement (216) 831-3000.

Information on the film packet includes the employers' code number, the wearer's badge number, the wearer's name, the initial date of scheduled use (two digits each for month, day, and year) and a radiation code indicating the type of radiations being monitored. For added convenience, successive batches of film are color coded so that an "old" film packet is readily observed and changed.

Insertion of the Film Packet

The film packet is inserted by snapping open the back of the holder and inserting it so the positive wearer identification data can be read through the holder opening.

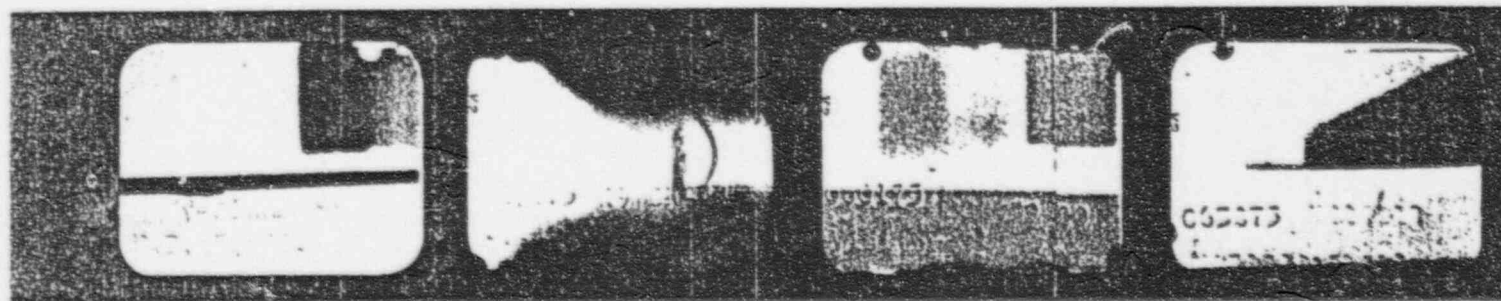
Effective and valid use of the control film packet requires that it be retained in a radiation-free location. The control packet should be inserted into a holder during the scheduled use period for the other film packets. Under no circumstance should the control film be assigned to a wearer or taken into a radiation area. The control film must be returned to ICN for processing with the other film packets.

Mailing Procedure

Film packets should be collected on the last day of the scheduled use period and packaged and mailed to ICN for processing without delay. All film packets from the same use period, including the control film, must be returned in a single shipment to assure proper processing. If this procedure is not followed, any correction for control film exposure may be compromised. Results for film received more than 90 days after the end of the scheduled use period may be invalid and ICN may withhold reporting data for these films.

We recommend that you retain the bags in which we mail film packets to you and use these bags for return mailing. In each shipment we supply a return mailing label for your added convenience.

Remember: You can help us provide you with prompt and more accurate reporting by prompt return of the film packets.



NORMAL

CHEMICAL STAIN, HEAT
OR MOISTURE

SIDE EXPOSURE

PARTIAL SHIELDING

bate, Report Issued and the number of film packets scheduled per quarter per wearer.

Inclusive dates of calendar quarters or other periods.

Initial date of current exposure period.

complete wearer identification, including wearer's name, badge number, birthdate and social security number, the type of badge and whether exposure to whole body or extremity only.

Current exposure record by radiation type and total exposure.

Cumulative exposure data for the current quarter

Number of films processed
for each wearer in the
current quarter.

**Cumulative exposure
for the current year.**

Optional report of cumulative life-time exposures. Unless the employer supplies the employee's cumulative lifetime exposure prior to initiating the ICN Service, ICN will report the cumulative exposure of the wearer while using the ICN Dosimetry Service.

date Report Issued and the number of film packets scheduled per quarter per wearer.

Inclusive dates of calendar quarters or other periods.

ION

ION RADIATION MONITORING, INC.

10000 W. 10th Avenue, Suite 1000
Denver, Colorado 80202

TEL: 303.733.1000 FAX: 303.733.1001

RADIATION EXPOSURE REPORT

Customer No. _____

From _____

Company _____

PERSONAL IDENTIFICATION

Name _____

Address _____

City _____ State _____ Zip _____

Phone _____

DATE

Start Date _____

End Date _____

EXPOSURE DATA

Exposure Type _____

Exposure Location _____

Exposure Duration _____

CUMULATIVE EXPOSURE IN REMS

From _____ To _____

Exposure Rate _____

EXPOSURE DATA

Exposure Type _____

Exposure Location _____

Exposure Duration _____

CUMULATIVE EXPOSURE IN REMS

From _____ To _____

Exposure Rate _____

Cumulative exposure data for the current quarter

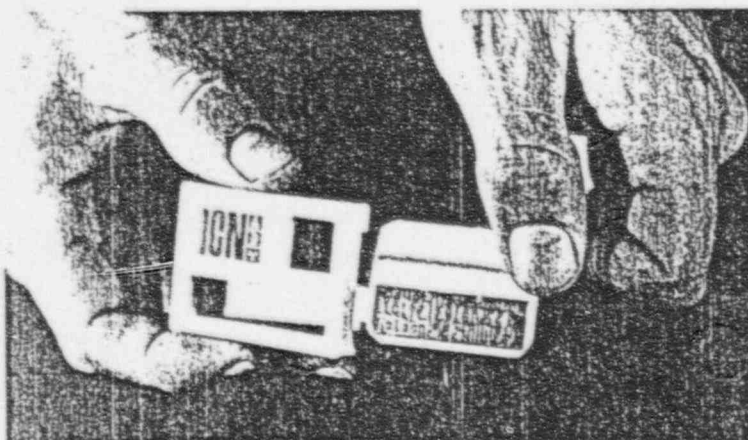
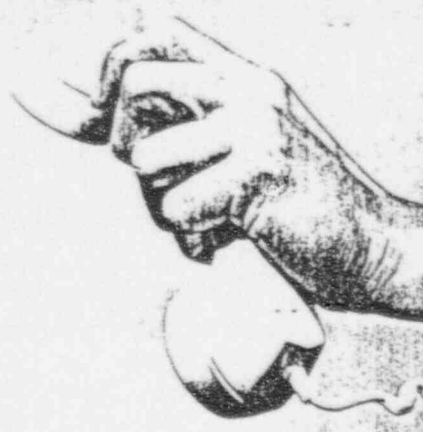
**Cumulative exposure
for the current year.**

Current exposure record by radiation type and total exposure.

**Number of films processed
for each wearer in the
current quarter.**

Optional report of cumulative life-time exposures. Unless the employer supplies the employee's cumulative lifetime exposure prior to initiating the ICN Service, ICN will report the cumulative exposure of the wearer while using the ICN Dosimetry Service.

ICN Personal Dosimetry Service



Full Compliance with Federal and state regulations governing monitoring of occupational radiation exposure.

72-Hour Service from receipt of the exposed film to mailing of reports.

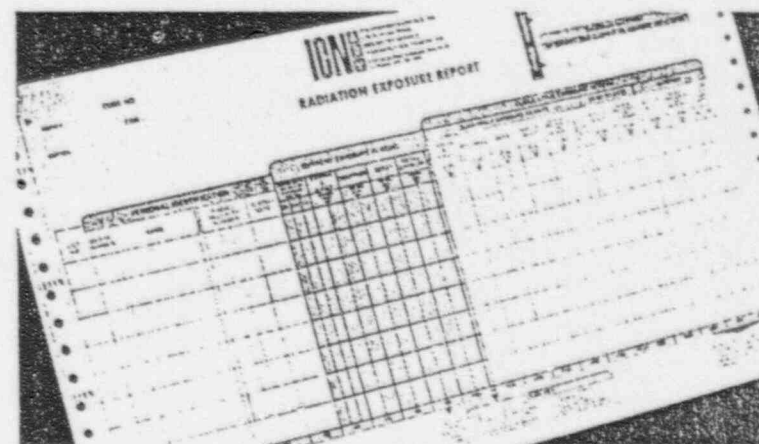
Emergency Telephone Reporting within 2-4 hours of receipt of film, with prior notification.

Convenient film changing and mailing procedures.

Positive Wearer Identification, including employer code number, employee name and badge number, and the data are permanently imprinted on both the outer cover and the exposed film for positive identification and legal documentation.

Personalized Report Form is easy to read and complies with all regulatory requirements.

Duplicate Records are maintained for 3 years for your long-term protection.



Specific Period Reporting—A monthly monitoring/reporting period for most clients is recommended. Other periods are provided to satisfy specialized requirements for unusual levels of exposure. Yearly and lifetime cumulative reports are provided.

Experience of over twenty-five continuous years assures you of the best and most comprehensive film badge service available.

Minimal Cost provides a complete dosimetry service.

Consultation from ICN's experienced staff is available at (216) 831-3000.

Film Badge Benefits

Routine use of ICN's film badge services provides a number of important benefits.

- **Personnel Safety Assurance**— Detect problems before they become serious. You gain peace of mind knowing that the radiation levels in your office are within acceptable limits.
- **Legal Protection**— Protect yourself against claims of injury by maintaining a record of personnel radiation exposure. If you can't prove that you are providing a safe working environment you may be vulnerable to expensive legal action.
- **Career-Long Service**— Monitor radiation on a cumulative basis and provide a permanent record for any future radiation control problems.
- **Economy**— Provide a powerful insurance against radiation control problems for a minimal cost. The annual cost of the service is so inexpensive that a prudent employer cannot afford to be without it.

Initiation and Change of Service

Film badge service from ICN Dosimetry can be initiated by completing an Order Form or by simply calling us collect at (216) 831-3000. We will need to know the following information:

1. Your name, address, and telephone number.
2. How many wearers.
3. The name, birthdate and social security number of each wearer.
4. X-ray machine energy (if known).
5. The reporting period. For most applications we recommend a monthly service, but this period may vary depending on the potential exposure.

Revisions

To assure the fastest response for any change of service, in particular, addition or deletion of specific personnel, we suggest that you call our Dosimetry Supervisor (216) 831-3000. As an added convenience we periodically include Revision Forms for such changes with your mailed reports.



Property of:

ICN Dosimetry Service

P.O. Box 19536

Irvine, California 92713

If Found, Please Deposit in Mail Box. Postage Guaranteed.

1.

Failure to return a control or returning a control with a different wear date than the badges returned may result in reporting of transit doses to badges.

2.

Important:

Any control used for monitoring, testing, etc., *will not* be reported and may result in reporting of transit doses to badges.

3.

TLD (including control) *not returned* at the end of the wear period or returned damaged will be assessed a charge for replacement. See terms of sale

CONTROL BADGE

S T O R E I N
R A D I A T I O N
F R E E A R E A

Do Not Open
Do Not Assign

This Control *Must* Be Returned
With All the Badges of Same

C00000E37022

0N546920301

Account Information 03/01/92 0N546

~~XXXX~~ CONTROL FILM

Section # 10

Radiation Safety Program

10.3

Survey Meter

Meter	Dosimeter Corporation, Super-Mini Survey Meter Model #3032-2. Operating Range 0-3 R. Measures X and gamma radiation. For radiation survey and profile of tank level device.
Probe	End-window probe, Model #3089. Measures alpha, beta, and gamma radiation. Use will be for radiation survey and profile of tank level device.
Calibration	The meter and probe will be calibrated by the Dosimeter Corporation at a minimum frequency of once every six months. A current copy of the license, and a certificate of calibration will be kept on file. A sticker with the date of calibration, the next due date, and the calibration technician's initials, will be on the meter.

Survey Instruments

1. Radiation levels of controlled areas, packages and devices shall be monitored using operable and calibrated survey meters.
2. The survey instruments shall be capable of detecting and measuring gamma radiation levels 0 milliroentgen per hour through one roentgen per hour.
3. The instruments shall be calibrated at intervals not to exceed three (3) months and after each servicing. The calibration and servicing shall be performed by manufacturer or licensed firms and a current copy of their license will be kept on file by the Radiation Safety Officer.
4. A copy of all calibration certifications documents shall be kept on file and made available for inspection.
5. The calibration sticker shall be maintained on each instrument showing the date of calibration, the due date of the next calibration and the initials of the calibrating technician.
6. Before using a survey meter, it shall be checked for calibration and proper battery strength.

MiniCONRAD II

INSTRUCTION MANUAL



3032-2 3034-2
PORTABLE RADIOLOGICAL
SURVEY METER


dosimeter
DOSIMETER CORPORATION
11286 Grooms Road / Cincinnati, Ohio 45242
(513) 489-8100 / Telex 214-648

MiniCONRAD II INSTRUCTION MANUAL

PORTABLE RADIOLOGICAL SURVEY METER

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1.0 GENERAL DESCRIPTION

- 1.1 General: The MiniCONRAD II's are highly reliable pocket size radiation survey meters that have an internal detector and an external probe. When they are used with their internal detector, accurate measurement of gamma and x-ray dose rates up to 5 Roentgens per hour (R/h) can be made. When

they are used with the 3089 External Probe (provided), the internal detector is automatically disconnected and the MiniCONRAD II can be used to measure alpha, beta and gamma contamination in counts per minute (cpm). See Specification 2.0.

For added reliability, a battery check function has been incorporated in the MiniCONRAD II which is easily activated by the BATT/OFF/ON switch allowing instantaneous indication of remaining battery life. In addition an internal speaker provides a convenient "clicking" type audible indication that corresponds to field intensity. The MiniCONRAD II can be clipped to the user's belt or carried in a pocket, leaving hands and eyes free for work while providing continuous monitoring capability.

- 1.2 Intended Usage: The MiniCONRAD II is intended to be used as a survey instrument itself and as a contamination meter with an external probe. It is extremely rugged and capable of optimum operation under the most extreme conditions of heavy use. Falls of up to four feet directly onto concrete have not interfered with the instrument's performance. The sturdy cast aluminum case is light weight and is built to resist dirt, dust, moisture, and other environmental contaminants which could adversely affect performance.

2.0 SPECIFICATIONS

Dimensions:	Millimeters	Inches
Width	66	2.6
Length	117	4.6
Thickness	25	.98
Weight:	Grams	Ounces
(With Battery)	404	14
Power Supply:	9-Volt transistor battery (NE 1604A or equivalent) or Line Current Adaptor Model 3034-2 (See Section 3.2).	
Battery Life:	In excess of 850 hours with earphone (speaker disabled), 250 hours with the speaker active.	
Ranges: (selected by rocker switch)		
Model 3032-2		
X1:	0-50 mR/h	
X100:	0-5 R/h	
Model 3034-2		
X1:	0-5 mR/h	
X100:	0-500 mR/h	
With 3089 Probe (both models)		
x1:	0-5,000 cpm	
x100:	0-500,000 cpm	
Operating Temperature	-10°C to +50°C	
Range:	-12°F to +122°F	
Relative Humidity:	25% to 95% over the operating temperature range.	
Accuracy:	±15% Cs-137.	

Directional Response:

The MiniCONRAD II Radiation Monitors are calibrated with the GM tube indicator target mark on the instrument case and aimed toward the calibration source. It will respond within 10% of that reported dose rate from any angle except when oriented so that the speaker or 9-volt battery is between the detector and the source of radiation. The maximum error caused by the speaker is 30% and the maximum error caused by the battery is 60% (See Figure 1).

Internal Detector:

Internally mounted, halogen quenched GM tube.

→ Model 1-5309 for Model 3032-2
Model 1-5310 for Model 3034-2

Energy Response:

Recovery Time:

≤ 2 seconds

Speaker:

The internal speaker's clicking sound rate increases with increasing radiation field intensity.

Speaker Silencer Plug:

Included. Disables speaker in quiet areas.

Belt Clip and D Ring:

Included.

Earphone (Optional):

Disables the speaker when plugged in.

Carrying Case: (Optional)

Model 1887 Carrying Case

3.0 THEORY OF OPERATION

3.1 Geiger Counter: The detector of the MiniCONRAD II is a halogen quenched Geiger-Mueller tube. Its operating voltage (550 v.d.c.) is provided by a feedback stabilized, blocking oscillator circuit. Pulses generated by the GM tube are fed into a one-shot multivibrator for signal conditioning. The output of this circuit is then integrated and displayed on the meter. Range selection is accomplished by varying the pulse width of the one-shot multivibrator. To make the MiniCONRAD II easier to read, the time constant of the integrator is different for the low and high range. The time constant is lengthened to reduce meter fluctuations on the low (x1) range where the

count rate from the tube is relatively low. On the high (x100) range, the time constant is shortened to provide quick response to sudden variations in dose rate (i.e., personnel exposure will be minimized due to instrument response).

3.2 Power Supply: The MiniCONRAD II is powered by a single 9 volt transistor type battery which provides a minimum of 850 hours of continuous use in a 10 mR/h field with the speaker disabled. The instrument's battery check function allows the user to monitor battery condition when desired. A Line Current Adapter, Model 3033, is available as an option.

3.3 Over-Range Characteristics: The unique "overflow" circuitry of the MiniCONRAD II insures that the instrument's meter will continue to read full scale in fields up to 100 times their maximum range, assuring that the user is not inadvertently exposed to high radiation levels. Downscale movement from this full scale condition typically requires less than five seconds.

4.0 OPERATION

4.1 Contents

- MiniCONRAD II (Radiation Survey Meter)
- Speaker Silencer Plug
- Manual
- Model 3089 Probe

Check the instrument for physical damage. If any items are damaged (or missing), notify DCA immediately. Do not return any instrument until authorization has been received from DCA (see Section 7 for warranty return procedures).

4.2 Description

(See Figure 1).

Power Switch: The unit's BATT/OFF/ON control is a three-position rocker switch located on the right of the front panel.

Range Switch: The range control is a two-position rocker switch located opposite the power switch and is marked "x1" and "x100".

Meter: The meter has a dual logarithmic scale and is located at the top front of the MiniCONRAD II.

Earphone Jack (optional): Connection of the earphone is accomplished through a sub-miniature phone jack located on the top of the MiniCONRAD II.

Warning: Do not push the earphone plug or speaker silencer plug into the speaker hole.

Probe Jack: Connection of the 3089 Probe is accomplished through a miniature phone jack located next to the earphone jack.

Battery Compartment: Access to the battery compartment is gained by removing the battery cover which is attached with two slotted head captive screws at the bottom of the MiniCONRAD II.

Calibration Controls: The calibration controls are located behind the two calibration covers

(plastic screws) on the left-hand edge of the MiniCONRAD II. The covers provide a splashproof seal when the instrument is in use. Refer to Section 5 for complete calibration instructions.

Belt Clip: A spring type "belt clip" located on the back of the instrument provides a secure, convenient method of carrying the MiniCONRAD II.

D Ring: A ring located on the back of the instrument provides a safe, easy method of attaching the MiniCONRAD II to a lanyard or chain.

Probe (Model 3089): The probe plug can be plugged into the probe jack. The probe can be used for contamination measurement. The probe contains a 1-6113 GM tube detector.

Speaker Silencer Plug: A molded plastic plug that is plugged into the earphone jack to silence the speaker.

Line Current Adapter (Model 3033—Optional): An alternate power supply for the MiniCONRAD II is available on request from DCA. This "Line Current Adapter" allows the instrument to be powered by 90 to 257 volts, 50 or 60 Hz.

Check Source (Model 3001—Optional): A generally licensed check source of less than 10 μ Ci of Cs-137 is available from DCA as an option. No specific NRC or State License is required by the user.

4.3 Battery: Open the battery compartment by loosening the two slotted head captive screws and removing the cover and rubber gasket. Attach a 9 volt transistor battery to the battery snap and lay flat in the battery compartment (see Figure 1). Replace the battery cover and gasket and tighten the captive screws until snug.

4.4 Battery Check: To check the battery, place the power switch in the BATT (left) position. (NOTE: THE SWITCH MUST BE HELD IN THIS POSITION SINCE IT IS SPRING LOADED AND WILL RETURN TO THE OFF POSITION WHEN RELEASED.) The meter should indicate within the BATT range on the scale. If the meter indicates below this area, the battery should be replaced as less than eight hours of battery life remain.

4.5 Radiation Measurement: After checking the battery, press the power switch to the ON (right) position. For contamination measurement, plug in the probe and read the counts per minute (cpm) scale. For survey measurements, disconnect the probe and use the internal detector. Read the milliroentgens per hour (mR/h) scale. Select the desired range x1 or x100 with the Range Switch. When measuring radiation levels, verify that you are reading correctly. In the x100 range, the value indicated on the meter must be multiplied by 100 for the correct reading. The speaker provides an audible indication of the field intensity. For noisy environments, the earphone can be used. When it is plugged into the MiniCONRAD II, the speaker is disabled. For quiet areas, the speaker silencer plug can be used in place of earphone to silence the internal speaker.

4.6 Line Current Adaptor (Optional): The "Line Current Adapter" Model #3033 provides permanent alternative power supply. It replaces the battery and battery compartment cover. Attach the adapter battery snap to the instrument battery snap and fasten the adapter battery cover to the MiniCONRAD II with the two captive screws provided. Plug the adapter into any 90 to 257 volt 50 or 60 Hz outlet and the unit is ready for operation. To return your MiniCONRAD II to battery operation, simply remove the "Line Current Adapter" and install a new 9 volt battery (per Section 4.3) and replace the original battery compartment cover and gasket.

5. CALIBRATION

5.1 Calibration Requirement: Many instruments because of their application are required by federal regulations to be calibrated at specific intervals. In the absence of regulations, it is suggested that all survey instruments, including the MiniCONRAD II, be calibrated semi-annually.

5.2 Calibration Procedure: NOTE: For calibration purposes, the "target center" is the intersection of the targets on the case.

5.2.1 Place the Range switch in the low (x1) position.

5.2.2 Remove the "x1" plastic screw that covers the low-range calibration control (see Figure 1).

5.2.3 Turn the MiniCONRAD II on and place the target center in the appropriate field of the instrument being calibrated.
Model 3032-2—30 mR/h
Model 3034-2—3 mR/h

5.2.4 Adjust the "x1" control for the proper indication on the meter scale.

5.2.5 Reduce the field by approximately 50%. The MiniCONRAD II must indicate within 15% of the field value.

5.2.6 Replace the "x1" plastic screw.

5.2.7 Place the Range switch in the high (x100) position, remove the "x100" plastic screw and place the MiniCONRAD II target center in the appropriate field.
Model 3032-2—3 R/h
Model 3034-2—300 mR/h

5.2.8 Adjust the "x100" control for the proper indication on the meter scale. The field intensity is 100 times the value indicated.

5.2.9 Reduce the field by approximately 50%. The MiniCONRAD II reading, multiplied by 100, must be within 15% of the field.

5.2.10 Replace the "x100" plastic screw and turn the MiniCONRAD II OFF.

5.3 Should an instrument, for any reason, fail to calibrate, it should be sent back to Dosimeter Corporation for corrective action.

6. MAINTENANCE

6.1 Preventive Maintenance: To insure correct operation of the MiniCONRAD II, semi-annual calibration of the instrument by DCA is suggested. When the instrument is to be stored for periods exceeding one week, the 9 volt battery should be removed. No other special maintenance is necessary.

6.2 Corrective Maintenance: In case of trouble, replace the battery before concluding that the instrument is defective.

6.3 Warranty Repair: If, while under warranty, the MiniCONRAD II is found to be defective, notify DCA immediately. Do not return the instrument until authorization has been received from the Customer Service Department. Once this is received, return the instrument with a detailed, written description of observed symptoms to DCA. Be certain that the unit is properly packaged in an appropriate shipping container. NOTE: All instruments should be returned to DCA with the freight charges prepaid.

6.4 Repair: See the P.C. Board Assembly, Fig. 2, and the appropriate schematic Figures 4, or 5 and the parts list. Also refer to the theory of operation 3.0.

6.4.1 High Voltage Circuit: The high voltage should be 550 ± 25 volts DC as measured across C5 with an electrostatic voltmeter. A lower impedance voltmeter will load down the high voltage giving inaccurate results. Adjust R3, if required, to obtain the correct voltage. If the high voltage cannot be adjusted, check transformer T1 and transistors Q1, Q2 and Q3 for proper operation.

6.4.2 Low Voltage Circuit: Measure the low voltage across C13 with an accurate voltmeter. The voltage should be $4 \pm .25$ volts DC. If the voltage is not within the specified values, adjust R24 for the proper voltage. If the voltage cannot be obtained, check U1 and Q10 with their associated circuitry.

6.4.3 Measuring Circuit: The most common cause of failure in the MiniCONRAD II is the GM tube, V1. If the high voltage is functioning and the GM tube, V1 has been replaced and it still does not function, check transistors Q6 and Q7 with their associated circuitry.

6.4.4 Speaker & Earphone: If the MiniCONRAD II indicated radiation but the speaker and the earphone do not function, check transistor Q8 and Q9 with their associated circuitry. Also check jack J1 for proper connections.

6.4.5 Overflow Circuit: If the MiniCONRAD II indicates radiation properly but falls back when it is exposed to radiation fields in

excess of full scale, check transistors Q4 and Q5 with their associated circuitry.

7. WARRANTY

7.1 Instrument Warranty: Products manufactured by Dosimeter Corporation (DCA) are hereby warranted to be free from defects in materials and workmanship for a period of two (2) years from date of delivery to DCA's customer. This warranty is contingent upon DCA being advised of any defects within this two year period. All defective products must be returned with all shipping charges prepaid only AFTER authorization by DCA. A detailed written explanation of the observed defects must accompany each unit. Returned products are subject to inspection by DCA, and DCA reserves the right to make the final decision as to responsibility.

THE LIABILITY OF DCA UNDER THIS WARRANTY IS LIMITED TO FREE REPAIR OR REPLACEMENT OF THE DEFECTIVE PRODUCT, OR DEFECTIVE COMPONENT PARTS THEREOF, AT THE SOLE OPTION OF DCA, AND DOES NOT EXTEND TO ANY CONSEQUENTIAL DAMAGES OR OTHER DAMAGES OF ANY TYPE WHATSOEVER.

DCA MAKES NO WARRANTIES OF FITNESS FOR PURPOSE OR MERCHANTABILITY AND NO OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, REGARDING THE PURCHASE AND USE OF ITS PRODUCTS AND HEREBY DENIES AND DISCLAIMS ALL LIABILITY BEYOND THE LIABILITY EXPRESSED HEREIN.

7.2 Detector Warranty: DCA warrants each tube to be free from defects in material and workmanship when used in these instruments, and no other warranty may be implied. This warranty is effective to six (6) months after delivery to the original purchaser. If failure has been caused by misuse, alteration, faulty installation, or abnormal conditions of operation, the warranty is void.

8.0 SPARE PARTS

For those intending to perform maintenance on the Model 3032-2, 3034-2 instruments, the following parts are used on the instrument indicated:

Instrument	Ckt. No.	DCA Component Item No.	Description	Quantity
3032-2	M1	700734-3	Meter Assy.	1
3032-2		51-700700-1	Plate, Battery Cover—Wht.	1
3032-2	V1	50-700126	GM Tube Assy—5309	1
3032-2		700724-2	P.C. Board Assy	1
3032-2	R18, 20	99-418001	Resistor, Crbn 180K 1/4W 5%	2
3032-2	R8	99-568001	Resistor, Crbn 6.8M 1/4W 5%	1
3032-2	S1	76-700357	Switch, Rocker x1, x100	1
3032-2		700736-1	Jack Assy	1
3032-2	J4	80-160110	Jack, 3.5 MM	1
3032-2	J1	80-161000	Jack, Phone 2.5MM	1
3034-2	M1	700734-7	Meter Assy	1
3034-2		51-700700-4	Plate, Battery Cover—Blk.	1
3034-2	V1	50-700381	GM Tube Assy—5310	1
3034-2		700724-3	P.C. Board Assy	1
3034-2	R18, 20	99-418001	Resistor, Crbn 180K 1/4W 5%	2
3034-2	R8	99-568001	Resistor, Crbn. 6.8M 1/4W 5%	2
3034-2	S1	76-700357	Switch, Rocker x1, x100	1
3034-2		700736-1	Jack Assy.	1
3034-2		80-160110	Jack, 3.5 MM	1
3034-2	J1	80-161000	Jack, 1 Phone 2.5MM	1
		26-005211-1	Clamp, Cable	1
		59-199306	Clip, Belt	1
		59-700128	Insulator, Bottom	1
		60-005212-1	Ring, "D"	1
		67-005215-1	Screw, PN 8-32 x 3/32-In House	2
		67-8323078-04	Screw, PN 8-32 x 1/4 Nylon	2
		67-2562133-06	Screw, Oval #2-56 x 3/8	4
		67-8323030-04	Screw, PN 8-32 x 1/4	1
		68-719333	Screw, Battery Cover Captive	2
		700715-1	Case Assy	1
		55-700692-1	Case, Silkscreened	1
		66-700686-1	Pad, Foam	2
		66-700686-2	Pad, Foam 2"	1
		66-700712-1	Gasket, Speaker	1
		701083-1	Cloth, Wire	1
		51-700699-1	Panel, Front Silkscreened	1
		66-700684-1	Gasket, Front Panel	1
		66-700717-1	Pad, Switch	1
	J1	700735-1	Phone Jack Assy	1
	R8	99-568001	Resistor, Carbon 6.8M 1/4W 5%	1
		51-700700-1	Plate, Battery Cover, Wht	1
		66-700701-1	Gasket, Battery Cover	1
		80-700810-1	Plug, Speaker Silence 2.5M	1
		80-435755	Connector, GM Tube	1
	S1	76-005205-3	Switch, Rocker Blk Red	1
		700722-1	P.C. Board Sub-Assembly	1
	LS1	50-700485	Speaker Assembly	1
	S2	76-720713	Switch, 3 Position	1
	J2	80-120100	Snap, Battery	1
	U1	85-821101	I.C., Micro Power	1
	Q3	86-005267-1	Transistor, SPF 3065	1
	Q7,8	86-412603	Transistor, Silicon PNP 2N4126	2
	Q1,2,5,9	86-440104	Transistor, 2N4401 NPN Silicon	4
	Q4,6,10	86-620003	Transistor, Darlington MPS A62	3
	CR3,4	87-091400	Diode, Silicon 1N914B	2

CR1,2	97-400700	Diode, Silicon 4007	2
T1	96-787200	Transformer, High Voltage	1
C7	97-050203	Capacitor, Cer. 50pf 1000V	1
C10	97-151702	Capacitor, Mica 510pf 100V 5%	1
C2	97-175203	Capacitor, Cer. 750pf 1000V 10%	1
C3,4,5	97-256203	Capacitor, Cer. .0056μf 1KV 10%	3
C11	97-350102	Capacitor, Mylar .05μf 100V	1
C12	97-415206	Cap., Mono .15μf 50 V	1
C6	97-522503	Capacitor, Tantalum 2.2μf 25V	1
C1	97-533501	Capacitor, Tant. 3.3μf 10V 20%	1
C8	97-647304	Capacitor, Electro. 47μf 16V	1
C9, 13, 14	97-747305	Capacitor, Electro. 470μf 10V	3
R17, 19, 24	98-005175-1	Potentiometer, 500K	3
R3	98-005175-2	Potentiometer, 5M	1
R1	99-210001	Resistor, Carbon 1K 1/4W 5%	1
R14	99-220006	Resistor, Metal 2K 1/8W 1%	1
R 28	99-233001	Resistor, Carbon 3.3K 1/4W 5%	1
R2	99-310001	Resistor, Carbon 10K 1/4W 5%	1
R12,21,29,30	99-327001	Resistor, Carbon 27K 1/4W 5%	4
R6, 13,23,25	99-410001	Resistor, Carbon 100K 1/4W 5%	4
R11	99-415001	Resistor, Carbon 150K 1/4W 5%	1
R9	99-422001	Resistor, Carbon 220K 1/4W 5%	1
R26, 27	99-447001	Resistor, Carbon 470K 1/4W 5%	2
R10, 22	99-510001	Resistor, Carbon 1M 1/4W 5%	2
R7	99-522001	Resistor, Carbon 2.2M 1/4W 5%	1
R31	99-556001	Resistor, Carbon 5.6M 1/4W 5%	1
R4	99-590906	Resistor, Cermet 9.09M 1/8W 1%	1
R5	99-810003	Resistor, Metal 1KM .35W 5%	1
	50-700346	3089 Probe Assy	1
	1-6113	GM Tube 6113	1
	50-700345	Bottom Cap Assy	1
	53-31280	Bushing, Brass Strain Relief	1
	53-700599	Bottom Cap, Finished	1
	68-270371	Screw, Sckt Hd 4-40 x 3/16	2
	68-350471	Screw, Set 6-32 x 1/4	1
	80-453755	Connector, GM Tube	1
	80-780000	Plug, Miniature Phone	1
	82-844200	Cable, 2 Conductor 87m	2
	99-522001	Resistor, Carbon 2.2M 1/4W 5%	1
	53-313520	Probe Body-3089	1
	53-313600	Screen	1
	53-700361	End Cap Black Anodize	1
	64-300100	Ring, Retaining	1

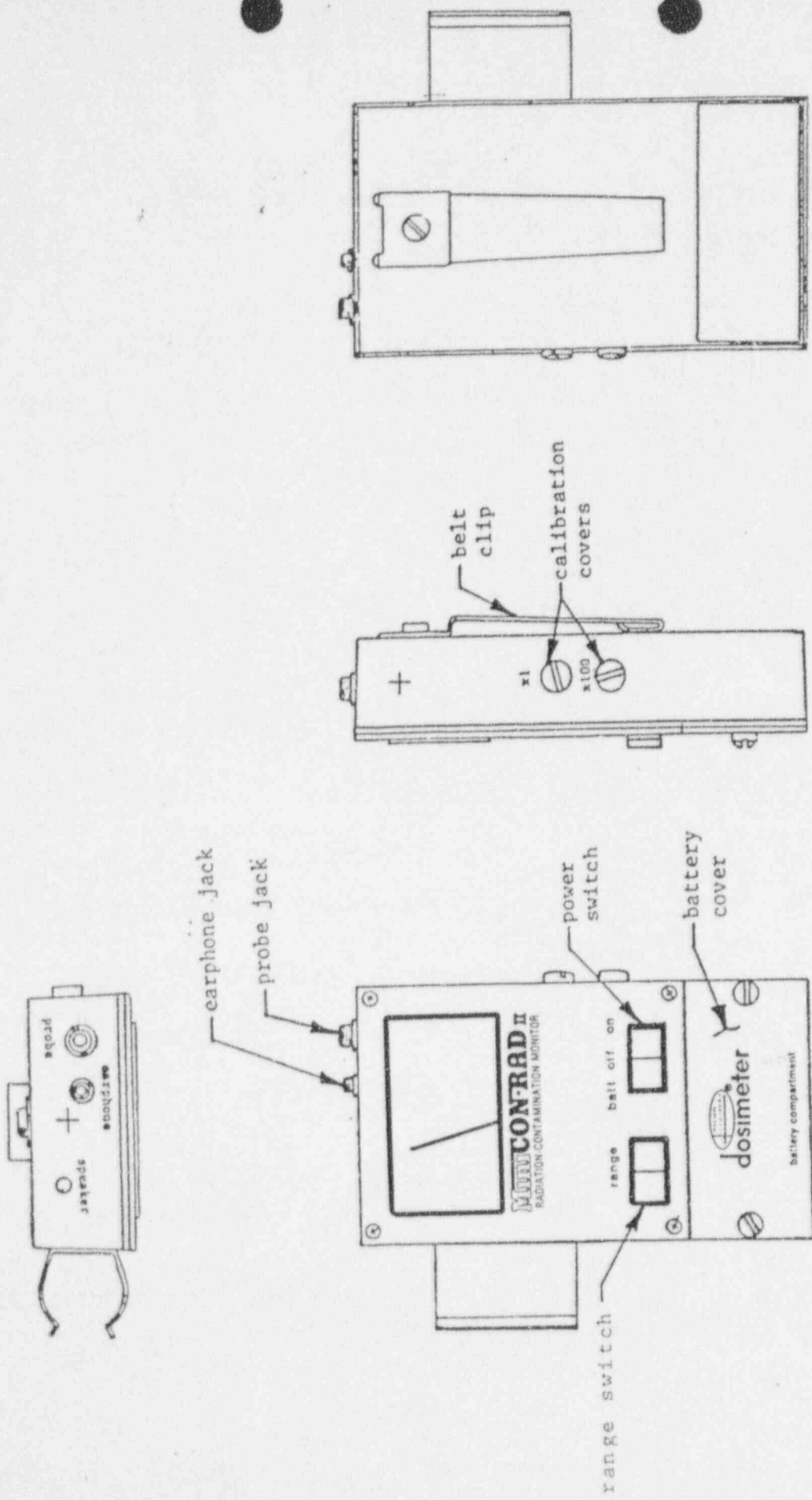


Figure 1

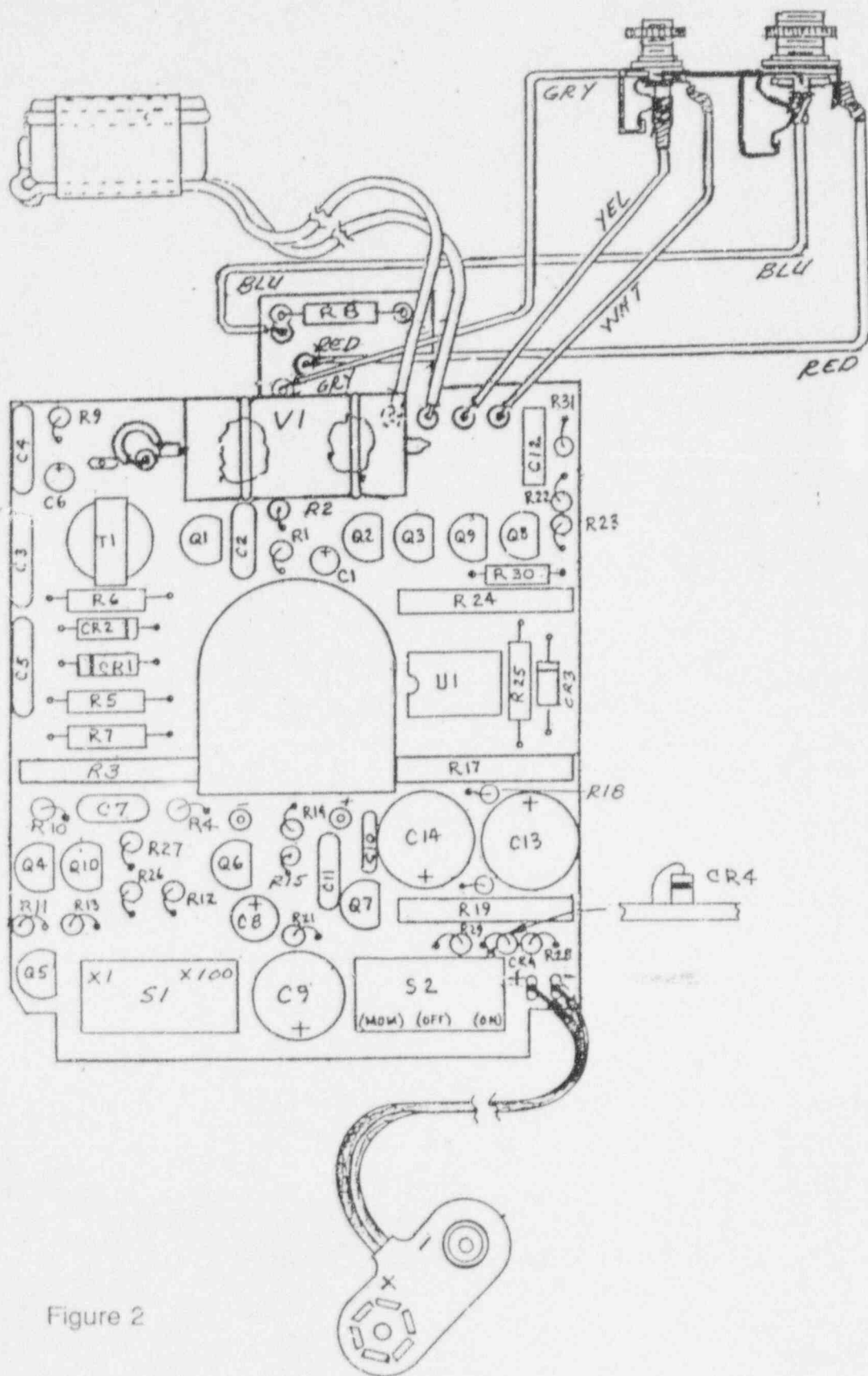


Figure 2

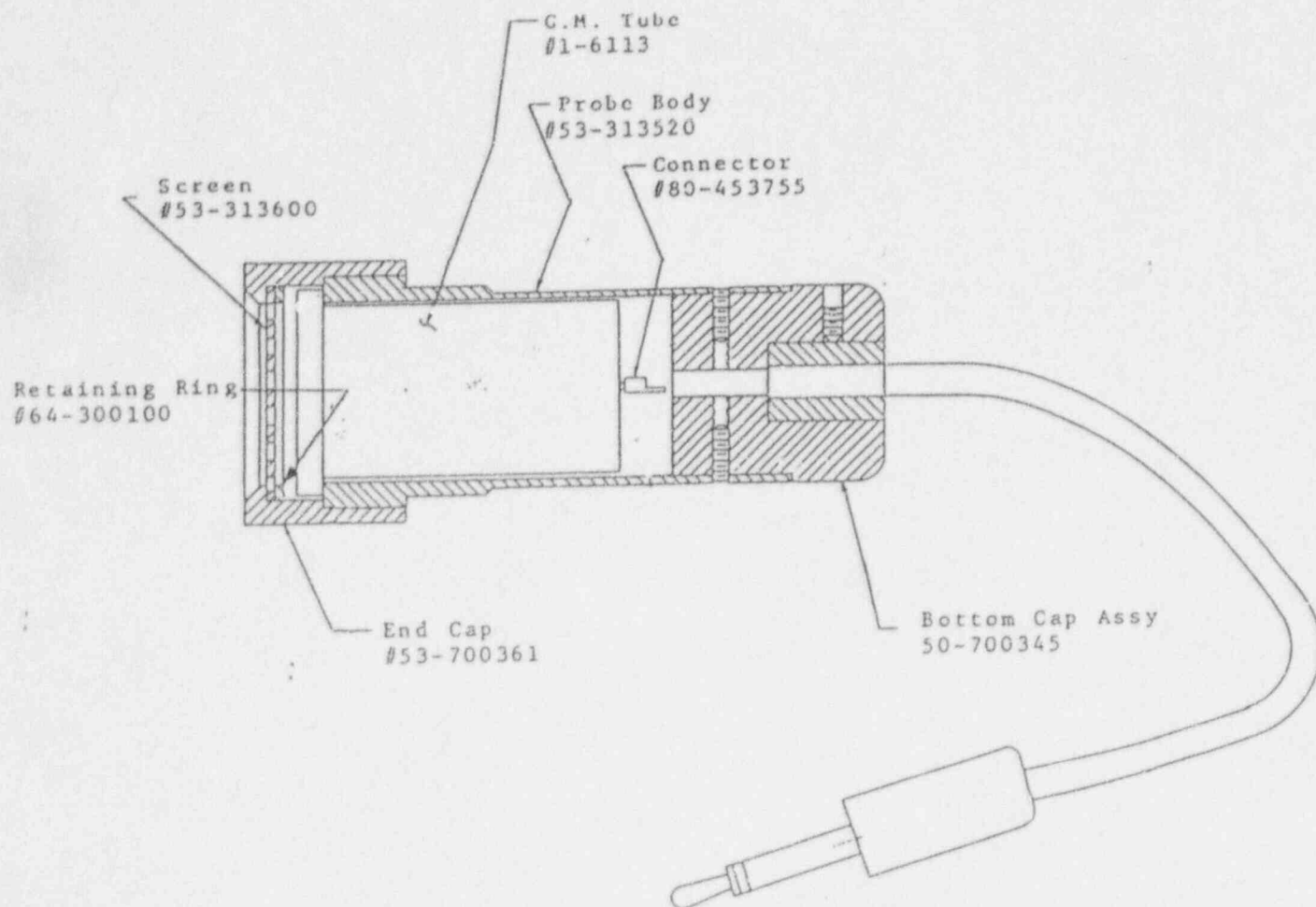
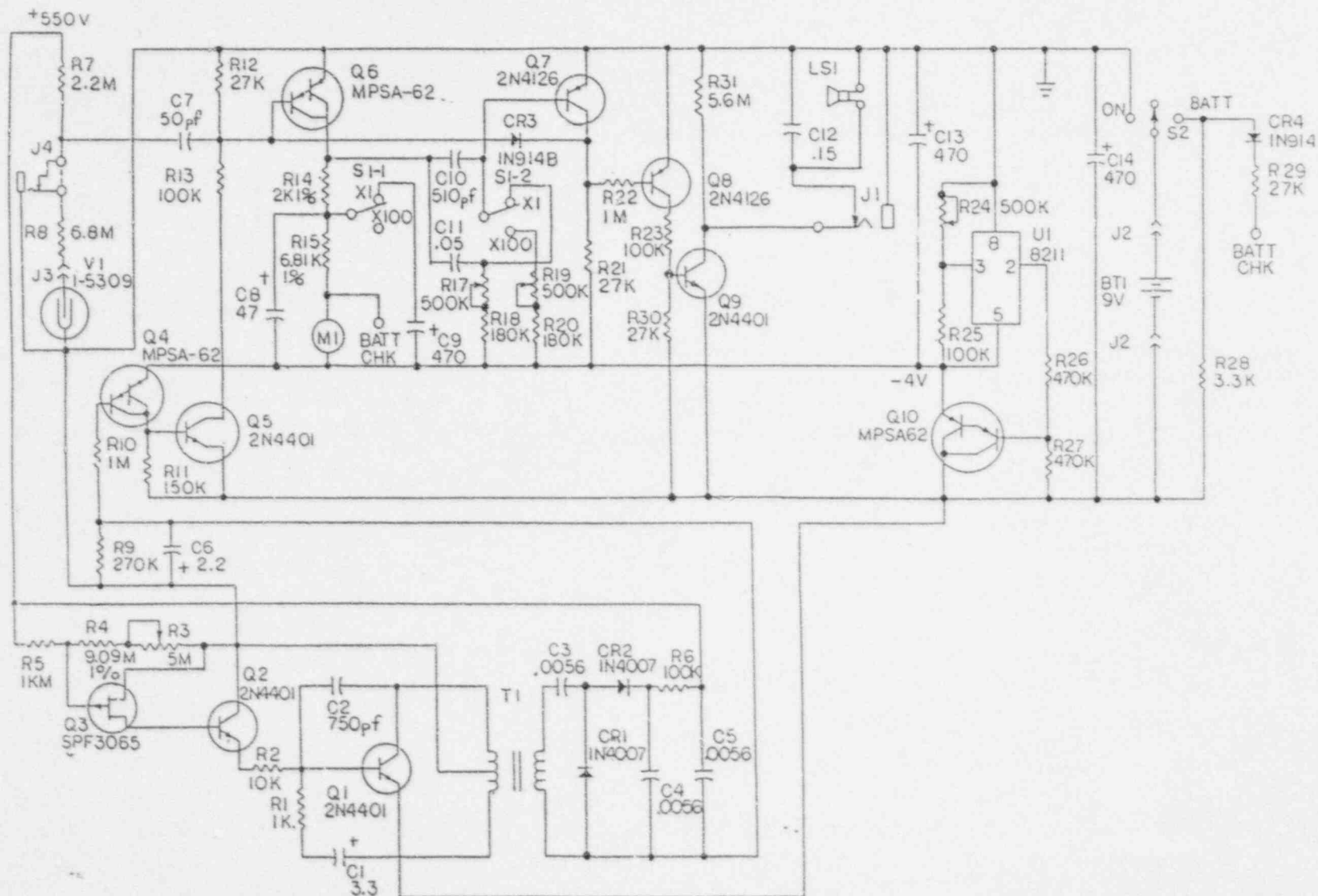


Figure 3



Notes

1. All resistors are 1/4w 5% unless otherwise specified.
2. All capacitors are in uf unless otherwise specified.

Figure 4
3032-2 Schematic

The following procedure covers leak testing of all sealed sources. These tests are required to be performed at the following times.

- 1.) Immediately upon receipt of the sealed source.
- 2.) Immediately prior to initial use if longer than 6 months after receipt.
- 3.) Every 6 months after initial installation.
- 4.) Immediately upon removal for storage or disposal.
- 5.) Prior to further use if there is any suspicion of damage.

Equipment required for field tests:

- 1.) Tongs, to hold filter paper.
- 2.) 30 mm diameter filter papers.
- 3.) 1-1/2" X 2-1/2" envelopes for filter papers.
- 4.) Calibrated approved survey meter within thin end window G-M probe.
- 5.) Radiological inspection report forms.
- 6.) Gloves
- 7.) Lab coat
- 8.) Film badge

Procedure:

Label one envelope for each device showing identification of the device by number on location in the process. Label one envelope "control", label one piece of filter paper for each device showing identification of the device or location in the process. Label one piece of filter paper "control". Insert each filter paper in its proper envelope.

Obtain and wear film badge.

Obtain operable and calibrated survey meter. Check batteries and adjust if needed.

Obtain keys from Radiation Safety Officer or Plant Manager.

Approach device/gauge with survey meter in hand while noting the readings.

Section # 10

Radiation Safety Program

10.4

Leak/Wipe Test (continued)

Obtain reading at 1 meter.

Survey the device with the shutter open and record.

Unlock and place the shutter in the off position and lock.

Survey the device with the shutter closed and record.

Set up survey counter in a location away from any radiation source. Set counter range to its lowest scale. Read the background radiation and record on the inspection report form.

Using tongs, pick up the filter paper, previously labeled for the device being tested, and wipe its unmarked side over the external window area of the source housing and along any seams or openings leading into the source housing. Any covering or window material, not a part of the original radiation producing device, must be removed for the test.

Immediately expose this filter paper to the survey counter and note the number of counts per minute over background indicated, on the inspection report form. If no increase in counts over background is noted, mark negative on the envelope and report form. Insert the filter paper into its marked envelope and seal.

After all the radiation producing devices (except Krypton 85 and Hydrogen) are tested, the envelopes containing the control filter paper and the inspection report form are to be forwarded to a person or firm licensed to perform the laboratory analysis.

In the event that any filter paper shows a reading over background, an immediate repeat of the of the leak test on that sealed source must be done. The actual counts per minute from the filter paper shall be compared with the counts obtained from a 0.005 millicurie beta standard. If the counts equal or exceed the counts from the standard sample, Emergency procedures will be followed.

The following procedures covers inspection of shutters and other protective devices and All sealed sources. These tests are to be performed at the following times:

1. Upon installation of any sealed source into the device where it is used.
2. Every 6 months after initial installation.

Section # 10

Radiation Safety Program

10.4

Leak/Wipe Test (continued)

3. Whenever a 6 month source leak test is performed if required.
4. Prior to further use of the device if there is any suspicion of damage or malfunction.

While inspecting each device, the following test must to be performed:

1. Check by one of the following methods that the shutter fully closes.
 - a. If device is so provided, observe total cut off of radiation when shutter is closed and detector is operating.
 - b. By using the survey counter to note the decrease in radiation when the shutter is closed.

If the shutter is found to be in-operative or sticking, an immediate repair will be made using the "Procedure for Installation or Removal of Source holders in Gauging Devices" detailed elsewhere in this manual.

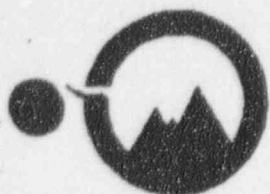
2. Inspect the radiation labels affixed to the gauge to ascertain that they are properly located and readable.
3. Check existence and condition of any special shielding and/or guards added to the device or surrounding equipment for purpose of protecting personnel from radiation.

After inspecting each device, record correct operation by marking "OK" under the shutter and lights column of the inspection report. Note under comments any repairs made.

Leak tests will be performed at least semiannually by the RSO or his/her designated individual. Level Link Inc. will provide the analysis of the wipe samples. The test will be performed using the following procedure.

Wipe test Procedure

- ☛ The user shall be trained in the proper procedures in performing a leak test.
- ☛ Gloves to prevent contamination should be worn.
- ☛ Record all appropriate information concerning source (model number, serial number, etc.)
- ☛ Survey the gauge or source holder with the radiation meter to assure levels are within limits (less than 5 mR/hr at three feet and less than 2 mR/hr at the surface of the gauge). Be sure to check the survey meter batteries prior to performing the survey. Allow the meter proper warm-up time. The source shutter should be in the off position and locked in place.
- ☛ Lightly moisten the swab per manufacturers directions.
- ☛ Wipe all accessible surface of the holder, including all flanges and openings where possible leakage could occur.
- ☛ Place the used swab in the envelope, the stick may be broken to fit.
- ☛ Monitor the package. If greater than 0.5 mR/hr, do not send. Contact the manufacturer.
- ☛ Monitor gloves for contamination.



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(209) 667-1102

Thomas
Gray and
Associates.

Incorporated

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Orange, California 92668
(714) 997-8090

Source Management

For those who utilize radioisotopes, management of proper radioisotope (or sealed source) service records, sometimes presents a problem. From the initial license application, registration, and fee payment, through the periodic tests which are required by the state, and also the annual review and reinstatement of the specific license, the detailed procedure can become confusing and bothersome. As a means of alleviating this problem as much as possible, and taking this burden off the back of the user, we have instigated a "Source Management Service" which will handle all of these matters on a timely basis and assure compliance in every respect with the state and federal regulations, keeping the client fully informed of his current position with the regulating agency. The primary services offered are:

Physical performance of source wipes (or leak tests) at the interval stipulated by the regulating agency. — A "leak test" is a means of determining that the integrity of the sealed source is sound. If a sealed source is leaking, radioactive contamination will be present in the vicinity of the sealed source. A "source wipe" is used to detect the presence of this contamination. Leak tests are to be made on a periodic basis, normally every six months, but in some instances the interval can be as long as three years. (See 30275 of California Radiation Control Regulations). The correct interval for the source in question is normally stated in the literature provided by the device manufacturer.

Provide the leak test analysis. — This consists of accurately analyzing the wipe source instrument for minute quantities of radioactivity. (0.005 microcuries of removable contamination.) The results of the analysis, as stated on a prepared form, would then be sent to the user for his file, within two weeks from the time the actual source wipe was made.

If the source holder is a shuttered device, inspect the operation of the source shutter and determine its shielding effectiveness. Such periodic inspections are required by general licensees.

Provide an isodose pattern (radiation profile) of the source bearing device, showing precise radiation levels on all surfaces of the device.

Schedule source wipes to assure that the tests are made on time and that the information is in the files on time. (Note: Users are subject to unannounced visits from state inspectors whose function is to determine that leak tests are being made at the proper intervals and that adequate records are being kept on file).

Leak Test Kits - For specific licensees, who are permitted to perform their own leak test, TGA offers a leak test kit and analysis package consisting of:

- A) Leak test information register.
- B) Leak test instruction format.
- C) Four (4) swabs on sticks in return receptacles.
- D) Two (2) Whatman's #41 paper wipes in return receptacles.
- E) Vial of appropriate detergent.
- F) Return shipping container. (Prelabeled)

Leak test analysis results will be forwarded to the tester or to other appropriate individuals within two weeks of receipt of the used leak test material. An identical permanent backup file containing all results and other appropriate data will be maintained, to be available to the customer if ever required for any purpose.

Leak Test Kit and Analysis prices quoted upon request.

Thomas Gray and Associates

LEAK TEST INFORMATION

SOURCE DATA

Source Owned by _____

Source Manufactured by _____

Holder Manufactured by _____

Source Model No. _____

Source Serial No. _____

Holder Model No. _____

Holder Serial No. _____

Isotope _____

Activity _____

NOTE: Isotope activity expressed in curies, millicuries, or microcuries

Date of Test _____

Thomas Gray and Associates

LEAK TEST INSTRUCTIONS

Any leakage from a radioactive source (other than of gaseous or volatile radioactive content) will result in deposition of a radioactive film on the surface of the source or adjacent objects. Periodic wipes of these surfaces, when properly analyzed with a sensitive instrument, can ordinarily detect traces of leakage long before significant amounts of radioactive material have been released. This leak test kit may be used by a competent person trained in radioisotope maintenance procedures to make the actual wipe. The process of actually making the wipe is usually simple, although extreme care should be taken, and instructions followed closely.

The procedure is as follows:

- 1) Select either the stick swabs or the filter paper to make the wipe. If the source being wiped is emitting high levels of radiation, or if there are irregular surfaces with hard-to-reach areas, select the stick swab. If the surfaces are flat and easy to wipe, select the filter paper.
- 2) Lightly moisten the swab or the filter paper with the detergent in the plastic vial. Moisten only one of the two swabs or filter paper.
- 3) Wipe all accessible surfaces of the radioactive source housing, or if the source is in a holder, wipe around all flanges and openings where possible leakage could occur. Where high level sources are involved, the storage container may be wiped after the source has been removed.
- 4) Place the used swab or filter paper in its plastic envelope, and fold several times. After using the swab, the stick may be broken without harm.
- 5) Repeat the process, using swab or filter paper No. 2. Do not moisten. Then return it to the plastic envelope and fold several times.
- 6) Fill out the form entitled "Leak Test Information" and return it, along with the used swabs or filter paper to Thomas Gray & Associates by means of the return, pre-labeled envelope. Results will be returned to the addressee within two weeks.

-2-

We will analyze the wipes for presence of any radioactive material. If the analysis reveals that less than 0.005 microcuries of radioactive contamination were removed from the source or device by means of the wipe, the source or device are considered to be safe. If more than 0.005 microcuries of contamination were present, it is considered contaminated and the user will be immediately notified. Normally, excessive contamination is not present. Under these circumstances, the user will receive a completed "Leak Test Certificate" indicating that the source or device is safe. This form should be retained in the source file for future reference.

IMPORTANT:

Before sending a used wipe swab or filter paper through the mail, they should be surveyed with a radiation detector to verify that radiation levels are less than 0.5 mr/hr., if a survey meter is available to you. If levels exceed 0.5 mr/hr, the wipes cannot be sent via mail and the contamination would certainly exceed 0.005 microcuries. If this occurs, a report must immediately be filed with the State Department of Radiological Health, if you reside in an agreement state, (such as California) or with the Nuclear Regulatory Commission, D.O.E. if you reside, and the sources are located, in a non-agreement state. In such an instance levels of contamination would be verified through prompt analysis of the wipes.

PROCEDURE FOR COMPLETION OF LEAK TEST INFORMATION FORM

- 1) "Source owned by" is normally the user. If the source has been leased, the true owner as well as the user, should be indicated.
- 2) "Source manufactured by" is the source manufacturer, if known. If not, the holder, instrument, or device manufacturer. List both, if possible.
- 3) "Source model and serial numbers" - List this information if it is available. If not, the model and serial numbers of the device, instrument or holder.
- 4) "Isotope" is the name of the nuclide, Cobalt 60, Cesium 137, etcetera. "Activity" is the quantity of isotope contained in the capsule.
- 5) Any additional information thought to be relevant should be added where indicated.

We will automatically notify you shortly before your next wipe is due. If you have any questions regarding procedures, please contact us for clarification. Thank you for letting us serve you.

LEAK TEST CERTIFICATE

SOURCE DATA

Source owned by: _____

Source Manufactured by: _____

Holder Manufactured by: _____

Source Model No. _____ Source Serial No. _____

Holder Model No. _____ Holder Serial No. _____

Radioisotope: _____ Activity: _____

NOTE: Isotope activity is expressed in curies, millicuries, or microcuries.

Date sample was taken: _____ Date of last test: _____

TEST DATA

The following results were obtained:

The wipes analyzed indicate the presence of approximately _____ μCi (microcuries) of contamination. This source is therefore considered to be:

☐ NOT LEAKING

☐ LEAKING

Leak test log number: _____

Licensed TGA representative

Date of measurement: _____

CONSULTING -- ENGINEERING -- SERVICES

10.5

Maintenance and Lock Out Procedures

- 1.) Level Link Engineering will perform any Maintenance and service to the source and the source holder.
- 2.) Lock Out Procedures:
 - a. The RSO must be notified before any maintenance work is to be done.
 - b. The sealed source is in a shielded device and can be padlocked "Closed". The only person to have a key to the lock is the RSO.
 - c. The RSO will lock the source in the "OFF" position before permitting access to the working personnel.
 - d. After completion of maintenance, the RSO will examine the source holder and surrounding area before turning the source holder to the "ON" position.

Section #11

Waste Management

1. Whenever the source holder is no longer needed, it will be removed and returned to the manufacturer(Level Link, Inc.) for disposal.
2. The services of the manufacturer's representative will be obtained to supervise removal, reinstallation and/or packaging for return to the manufacturer(Level Link, Inc.).

123859

BETWEEN:

LICENSE FEE MANAGEMENT BRANCH, ARM
AND
REGIONAL LICENSING SECTIONS

(FOR LFMS USE)
INFORMATION FROM LTS

PROGRAM CODE: 03120

STATUS CODE: 3

FEE CATEGORY: -----

EXP. DATE: 0

FEE COMMENTS: -----

DECOM FIN ASSUR REQD: -----

LICENSE FEE TRANSMITTAL

A. REGION

1. APPLICATION ATTACHED

AppLICANT/LiCENSEE: AMERICAN VIDED GLASS COMPANY
RECEIVED DATE: 961031
DOCKET NO: 3034274
CONTROL NO.: 123859
LICENSE NO.:
ACTION TYPE: NEW LICENSEE

2. FEE ATTACHED

AMOUNT: \$550.00
CHECK NO.: 324056

3. COMMENTS

SIGNED
DATE

R. J. Brown
11/4/96

B. LICENSE FEE MANAGEMENT BRANCH (CHECK WHEN MILESTONE 03 IS ENTERED 1/1)

1. FEE CATEGORY AND AMOUNT: 3P -----

2. CORRECT FEE PAID. APPLICATION MAY BE PROCESSED FOR:
AMENDMENT -----
RENEWAL -----
LICENSE -----

3. OTHER -----

SIGNED
DATE

Log *Dec 2*
Remitter *CORNING FEDERAL CREDIT UNION*
Check No. *324056*
Amount *\$550*
Category *3P*
Type of Fee *APP*
Check Rec'd *12/4/96*
Completed *AB*