6/4- Reg III & DCS

FORM NRC-313 I (1-79) 10 CFR 30

U.S. NUCLEAR REGULATORY COMMISSION

# APPLICATION FOR BYPRODUCT MATERIAL LICENSE
## INDUSTRIAL

*See attached instructions for details.*

*Completed applications are filed in duplicate with the Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety, and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555 or applications may be filed in person at the Commission's office at 1717 H Street, NW, Washington, D. C. or 7915 Eastern Avenue, Silver Spring, Maryland.*

APPLICATION FOR: *(Check and/or complete as appropriate)*

- [X] a. NEW LICENSE
- [ ] b. AMENDMENT TO: LICENSE NUMBER
- [ ] c. RENEWAL OF: LICENSE NUMBER

2. APPLICANT'S NAME *(Institution, firm, person, etc.)*
International Clinical Laboratories of Missouri, Inc.
TELEPHONE NUMBER: AREA CODE – NUMBER EXTENSION
314 968-1616

3. NAME OF PERSON TO BE CONTACTED REGARDING THIS APPLICATION
Arthur W. Perkins, Ph.D.
TELEPHONE NUMBER: AREA CODE – NUMBER EXTENSION
314 968-1616

4. APPLICANT'S MAILING ADDRESS *(Include Zip Code)*
P. O. Box 6828
St. Louis, Missouri 63144

5. STREET ADDRESS WHERE LICENSED MATERIAL WILL BE USED *(Include Zip Code)*
1243 Hanley Industrial Court
St. Louis, Missouri 63144

(IF MORE SPACE IS NEEDED FOR ANY ITEM, USE ADDITIONAL PROPERLY KEYED PAGES.)

6. INDIVIDUAL(S) WHO WILL USE OR DIRECTLY SUPERVISE THE USE OF LICENSED MATERIAL
*(See Items 16 and 17 for required training and experience of each individual named below)*

| | FULL NAME | TITLE |
|---|---|---|
| a. | Richard Muehlhauser, Ph.D. | Consultant |
| b. | Arthur W. Perkins, Ph.D. | Scientific Director |
| c. | Frank F. Hall, Ph.D. | President, Co-Director |

7. RADIATION PROTECTION OFFICER
Arthur W. Perkins, Ph.D.

*Attach a resume of person's training and experience as outlined in Items 16 and 17 and describe his responsibilities under Item 15.*

8. LICENSED MATERIAL

| LINE NO. | A ELEMENT AND MASS NUMBER | B CHEMICAL AND/OR PHYSICAL FORM | C NAME OF MANUFACTURER AND MODEL NUMBER *(If Sealed Source)* | D MAXIMUM NUMBER OF MILLICURIES AND/OR SEALED SOURCES AND MAXIMUM ACTIVITY PER SOURCE WHICH WILL BE POSSESSED AT ANY ONE TIME |
|---|---|---|---|---|
| (1) | Nickel-63 | Solid | Perkin-Elmer Part No. 009-0282 | 15 millicuries |
| (2) | | | | |
| (3) | | | | |
| (4) | | | | |

| | E DESCRIBE USE OF LICENSED MATERIAL |
|---|---|
| (1) | Electron capture detector for gas-liquid chromatographic analyses |
| (2) | |
| (3) | |
| (4) | |

I.C.L. - Missouri
Applicant....
Check No....200182
Amount/Fee Category....#110(3A)
Type of Fee....APPLICATION
Date Check Rec'd....JUN. 4....1980
Received By....Brown

DEPARTMENT OF ENERGY
Date JUN 4 1980
June PG 3 M.L.
Brown
Action Compl 6/9/80

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8004220336

## 9. STORAGE OF SEALED SOURCES

| LINE NO. | CONTAINER AND/OR DEVICE IN WHICH EACH SEALED SOURCE WILL BE STORED OR USED. A. | NAME OF MANUFACTURER B. | MODEL NUMBER C. |
|---|---|---|---|
| (1) | Gas Chromatograph | Perkin-Elmer | 3920 |
| (2) | | | |
| (3) | | | |
| (4) | | | |

## 10. RADIATION DETECTION INSTRUMENTS

| LINE NO. | TYPE OF INSTRUMENT A | MANUFACTURER'S NAME B | MODEL NUMBER C | NUMBER AVAILABLE D | RADIATION DETECTED (alpha, beta, gamma, neutron) E | SENSITIVITY RANGE (milliroentgens/hour or counts/minute) F |
|---|---|---|---|---|---|---|
| (1) | Survey meter | Picker | 2980-B | One | $\alpha, \beta, \gamma$ | 0.0-50 mr/hr |
| (2) | | | | | | |
| (3) | | | | | | |
| (4) | | | | | | |

## 11. CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10

☒ a. CALIBRATED BY SERVICE COMPANY

NAME, ADDRESS, AND FREQUENCY

Certified Testing Laboratories
2623 Roberts Avenue
Bronx, NY 10461 Annual

☐ b. CALIBRATED BY APPLICANT

*Attach a separate sheet describing method, frequency and standards used for calibrating instruments.*

## 12. PERSONNEL MONITORING DEVICES

| TYPE (Check and/or complete as appropriate.) A | SUPPLIER (Service Company) B | EXCHANGE FREQUENCY C |
|---|---|---|
| ☒ (1) FILM BADGE | R. S. Landauer, Jr. & Co.<br>Glenwood Science Park<br>Glenwood, IL 60425 | ☒ MONTHLY |
| ☐ (2) THERMOLUMINESCENCE DOSIMETER (TLD) | | ☐ QUARTERLY |
| ☐ (3) OTHER (Specify): _____ | | ☐ OTHER (Specify): _____ |

## 13. FACILITIES AND EQUIPMENT (Check were appropriate and attach annotated sketch(es) and description(s).

☒ a. LABORATORY FACILITIES, PLANT FACILITIES, FUME HOODS (Include filtration, if any), ETC.
☐ b. STORAGE FACILITIES, CONTAINERS, SPECIAL SHIELDING (fixed and/or temporary), ETC.
☐ c. REMOTE HANDLING TOOLS OR EQUIPMENT, ETC.
☐ d. RESPIRATORY PROTECTIVE EQUIPMENT, ETC.

## 14. WASTE DISPOSAL

a. NAME OF COMMERCIAL WASTE DISPOSAL SERVICE EMPLOYED
N/A

b. IF COMMERCIAL WASTE DISPOSAL SERVICE IS NOT EMPLOYED, SUBMIT A DETAILED DESCRIPTION OF METHODS WHICH WILL BE USED FOR DISPOSING OF RADIOACTIVE WASTES AND ESTIMATES OF THE TYPE AND AMOUNT OF ACTIVITY INVOLVED. IF THE APPLICATION IS FOR SEALED SOURCES AND DEVICES AND THEY WILL BE RETURNED TO THE MANUFACTURER, SO STATE

Detector will be returned to: Nuclear Sources & Services
5711 Etheridge
Houston, TX 77017

## INFOR[illegible]ON REQUIRED FOR ITEMS 15, 16 AN[illegible]

Describe in detail the information required for Items 15, 16 and 17. Begin each item on a separate page and key to the application as follows:

15. RADIATION PROTECTION PROGRAM. Describe the radiation protection program as appropriate for the material to be used including the duties and responsibilities of the Radiation Protection Officer, control measures, bioassay procedures *(if needed)*, day-to-day general safety instruction to be followed, etc. If the application is for sealed source's also submit leak testing procedures, or if leak testing will be performed using a leak test kit, specify manufacturer and model number of the leak test kit.

16. FORMAL TRAINING IN RADIATION SAFETY. Attach a resume for each individual named in Items 6 and 7. Describe individual's formal training in the following areas where applicable. Include the name of person or institution providing the training, duration of training, when training was received, etc.

    a. Principles and practices of radiation protection.

    b. Radioactivity measurement standardization and monitoring techniques and instruments.

    c. Mathematics and calculations basic to the use and measurement of radioactivity.

    d. Biological effects of radiation.

17. EXPERIENCE. Attach a resume for each individual named in Items 6 and 7. Describe individual's work experience with radiation, including where experience was obtained. Work experience or on-the-job training should be commensurate with the proposed use. Include list of radioisotopes and maximum activity of each used.

### 18. CERTIFICATE

*(This item must be completed by applicant)*

*The applicant and any official executing this certificate on behalf of the applicant named in Item 2, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Part 30, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.*

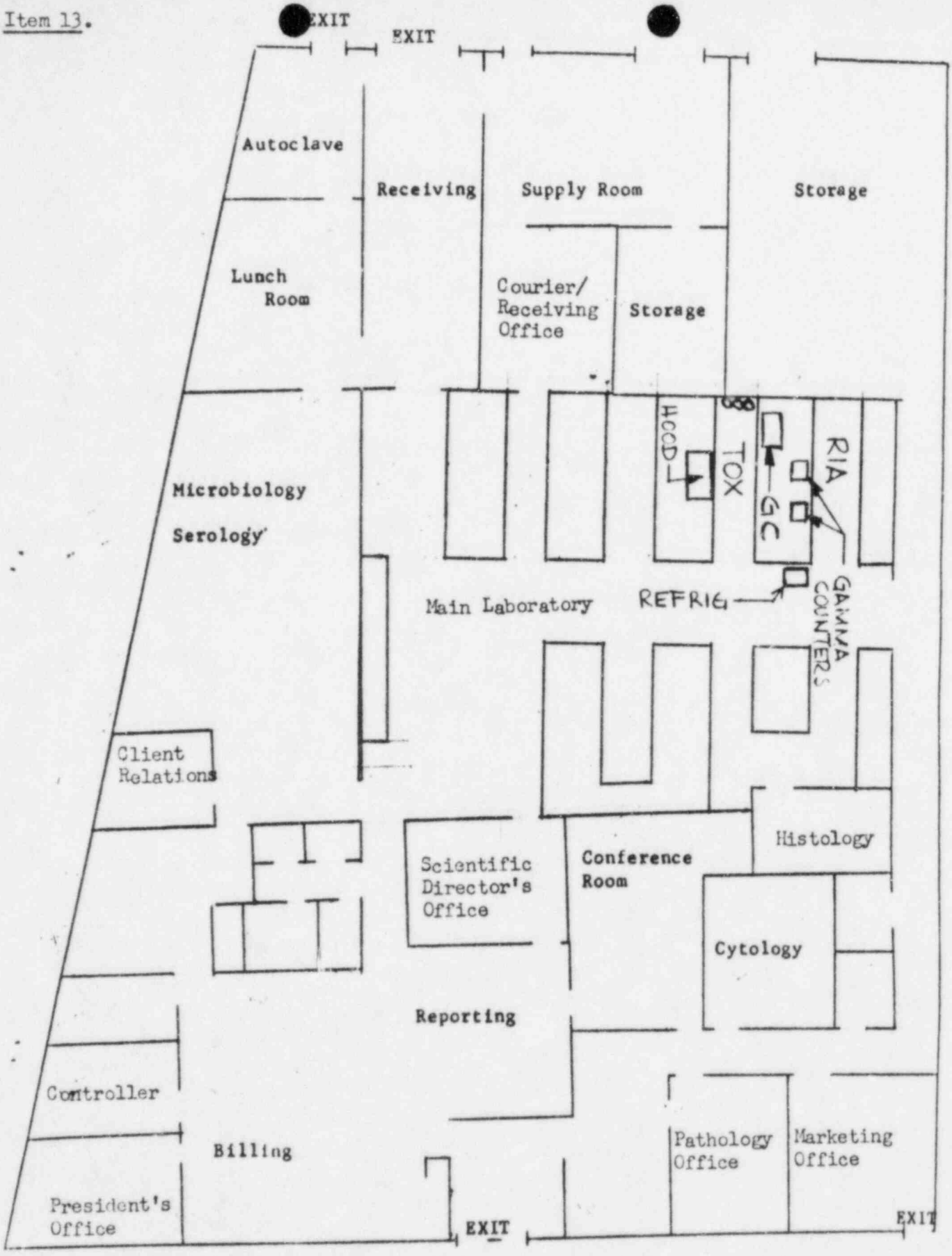
**WARNING.–18 U.S.C., Section 1001: Act of June 25, 1948; 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.**

| | |
|---|---|
| a. LICENSE FEE REQUIRED *(See Section 170.31, 10 CFR 170)* Section 170.31.3.L, $110.00 | b. CERTIFYING OFFICIAL *(Signature)* Arthur W Perkins |
| | c. NAME *(Type or print)* Arthur W. Perkins |
| (1) LICENSE FEE CATEGORY: Byproduct Material | d. TITLE Scientific Director |
| (2) LICENSE FEE ENCLOSED: $ 110.00 | e. DATE 5-28-80 |

RECEIVED

FORM NRC-313 I (1-79)

Item 13.




International Clinical Laboratories
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Item 15. Radiation Protection Program

This application is for a sealed source (electron capture detector for gas-liquid chromatography).

The leak testing procedure, radiation protection protocols, and the Perkin-Elmer wipe test kit are described in the attached "Cleaning and Maintenance Procedures" for the electron capture detector. This document shall become a part of the procedure manuals of the laboratory.

ELECTRON CAPTURE DETECTOR

Part No. Perkin-Elmer 009-0282 Ser. No. _____

CLEANING AND MAINTENANCE PROCEDURES

1. Cleaning the Electron Capture Detector by Baking Out

It is often possible to decontaminate the electron capture detector without dissassembling it by purging it with carrier gas at a flow rate between 50 and 100 ml/min. and raising its temperature. The temperature of the detector should be raised to 350°C.

Caution: When the detector is operated at a temperature near its upper limit (350°C), the detector temperature should be monitored initially to insure that the high temperature safety switch prevents a temperature in excess of 350°C.

Allow the detector to purge and periodically obtain curves of standing current vs. frequency (see Sec. 8D,2). The curves will improve as the detector cleans up. Completing clean-up may require baking for periods of several hours up to several days, depending on the type of contamination and its extent.

Important: Never attempt to flush the detector cell assembly with acidic solvents as this will result in removal of radioactive material from the foil.

2. Wipe Test

The electron capture detector must be wipe tested at least once every six months.

A record of the results of the wipe tests must be maintained in the laboratory.

The purpose of the wipe test is to assure that removable radioactive contamination on the external portions of the cell remains at a safe level.

Caution: Until the results of the wipe test are known, assume the cell is contaminated and handle it only with suitable protection. All equipment coming into contact with the cell should be considered contaminated and handled accordingly.

. Make the wipe test

(1) Reduce the detector temperature.

(2) Reduce, but do not shut off, carrier gas pressure. This will provide a small purge of carrier gas through the instrument. Do not change settings of flow controllers or needle valves.

(3) Remove the top panel to the right of the column oven (see Fig. 1).

(4) Remove the right side panel from the instrument and slide insulation block 045-1305 out the side of the instrument.

(5) Unscrew the knurled connector on the electrode cable and carefully withdraw the cable and the attached electrode. The electrode need be withdrawn only far enough so that it is outside of the detector housing.

(6) Remove the top from the detector housing (see Fig. 2).

(7) Using the ECD wrench assembly, provided, unscrew the detector cell and remove it. Do not bend or crimp the effluent tube. DO NOT DISASSEMBLE THE CELL.

Note: While the detector cell is out of the instrument, bake out the carrier gas system to eliminate any contaminants in the system that might contribute to fouling of the detector. To do so, set a carrier gas flow of 50-100 ml/min., and raise the injector, column oven, and interface temperatures above the levels at which they have normally been run. The baking period should be 2 to 4 hours, longer if the contamination is severe.

(8) Refer to the instructions included with the wipe test kit (009-1667) supplied with the detector, and wipe the surface around the joint between the cell body and cell cap. Also wipe around the top of the effluent tube. Once the wipe test paper has been moistened and any part of the cell has been wiped, do not remoisten the paper. Also, do not allow any of the wipe test solution to enter the inlet or outlet of the cell.

(9) Put the paper in the container provided in the wipe test kit. Include a data sheet stating that the wipe test was performed on a Perkin-Elmer electron capture detector cell, part no. 009-0282, and give the date when the test was performed. Return the container to:

Nuclear Sources & Services
5711 Etheridge
Houston, Texas 77017

OR

Nuclear Radiation Dev. Corp.
2937 Alt. Blvd.
Grand Island, N.Y.

Request that a new wipe test kit be forwarded with the test results.

(10) Replace the cell assembly in the detector housing; use the ECD wrench assembly to tighten it.

(11) Carefully push the electrode and its cable back into the detector housing. The electrode assembly is aligned by a pin and slot arrangement and will slide easily into the housing when positioned correctly. Do not use excessive force. The electrode, itself, is a spring clip which attaches to the detector effluent tube.

(12) Replace the top of the detector housing and slide insulation block 045-1305 back through the side of the instrument (see Fig. 1). Replace the instrument right side panel and the top panel at the right of the column oven.

Wait for the detector to stabilize and obtain a curve of standing current vs. frequency (see Sec. 4).

3. Cleaning or Replacing the Radioactive Foil

(1) Remove the detector cell as described in Sec. 2, above.

DO NOT DISASSEMBLE THE CELL ...

(2) Put the cell in a package marked with the international radiation symbol and mail it to:

Nuclear Sources & Services
5711 Etheridge
Houston, Texas 77017

OR

Nuclear Radiation Dev. Corp.
2937 Alt. Blvd.
Grand Island, N.Y.

(3) Request that the cell be cleaned and the standing current tested. Also request that, should the foil have to be replaced, the corporation which is to replace the cell advise the customer and quote a price.

(4) Specify the Nickel 63 foil for use in Perkin-Elmer electron capture detector assembly 009-0282. Indicate that the foil must be one of the following:

Model NER-002
New England Nuclear Corp.
575 Albany
Boston, Mass.

Model N1001
Nuclear Radiation Development Corp.
2937 Alt. Blvd.
Grand Island, New York

Model NBC 7020
Amersham/Searle Corp.
2637 S. Clearbrook Drive
Arling Heights, Illinois

(5) When the cell is returned, replace it as described in Section 2.

4. Obtaining Curves of Standing Current vs Frequency

1) Set the ATTENUATION switch to the S position.

2) Zero the recorder with the recorder zero control.

3) Set the STANDING CURRENT switch to the BAL position.

4) Set the ATTENUATION switch in the X1 position.

5) Set the recorder zero position with the detector ZERO controls.

6) Set the recorder speed (e.g. 2 in./min.).

7) Set the STANDING CURRENT switch to its lowest position which drives the recorder pen upscale*.

*It is not evidence that the system is not functioning properly if the lower STANDING CURRENT switch values do not drive the pen upscale.

8) Set the ATTENUATION switch to bring the pen on scale.

9) Repeat steps 7 and 8, increasing the settings of the STANDING CURRENT control. Plot the values of the standing current control vs. the pulse frequency. (Full scale on the recorder = 100 Hz.) The frequency is to be determined from the pen position after the ATTENUATION switch setting is made:

Pulse Frequency = (Pen) Percentage of Full Scale x ATTENUATION.

10) Figure 3 is a curve typical of that which should be obtained when there is little or no detector contamination and/or no column bleed. Figure 4 is a typical curve, and Figure 5 is a curve which indicates a great deal of contamination and/or excessive column bleed. If a curve similar to the one shown in Fig. 5 is obtained the detector should be cleaned (see Section 1)

11) If a curve similar to the one shown in Fig. 4 is obtained, proceed as follows:

(a) Continue the linear portion of the curve as shown in Fig. 4

(b) Draw the line AB between the extended line and the curve at 3.5. If the frequency at point B is twice or more than that at point A, the 3.5 position of the STANDING CURRENT control should not be used. Operating on the straight portion of the curve will yield the best results.

(c) If the frequency at the STANDING CURRENT cntrol position of 3.5 (point B) is greater than 10K, either the detector is contaminated and should be cleaned or there is excessive column bleed or leakage.

5. Radiation Protection (Please refer to separate "Radiation Safety Policy")

(1) Within the six-month period after a wipe test, it should be safe to handle the cell without special precautions.

(2) In the absence of the assurance that the cell is not contaminated, it should be handled only with suitable protection.

(a) No smoking, drinking, or eating shall be permitted while handling the cell.

(b) Rubber or plastic disposable gloves shall be worn while handling the cell.

(c) Laboratory coats shall be worn while handling the cell and shall be removed and left within the radioisotopes area when leaving the laboratory.

(d) Before leaving the laboratory, hands shall be washed thoroughly.

(e) The film badge dosimeter shall be worn at all times while handling the cell.

(f) All materials used to wipe the cell or to handle the cell shall be collected in a specially labeled container and disposed of through a commercial radioactive waste disposal service:

Nuclear Engineering
P. O. Box 158
Sheffield, Ill. 61631

Atomic Disposal Co., Inc.
14532 Kedzie
Midlothian, Ill.

(g) Remove the contaminated cell from the laboratory as soon as possible. Distance between the radioactive source and exposed individuals is the most readily applied radiation protection measure.

(h) Keep exposure time to the cell to a minimum.

(3) The work area around the gas chromatograph containing the electron capture detector shall be posted with the international radiation symbol.

Arthur W. Perkins, 5-20-80

Arthur W. Perkins, Ph.D. Date

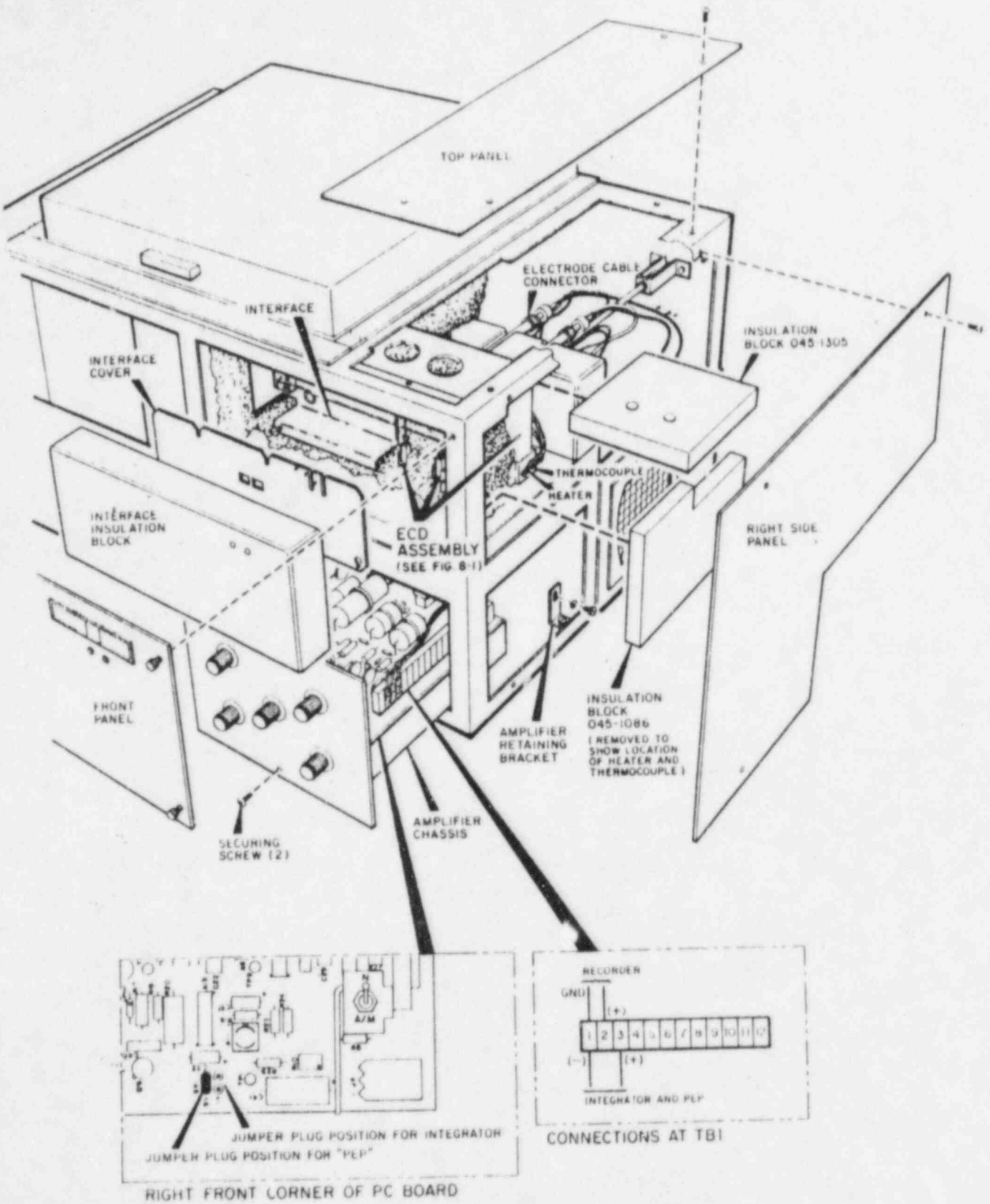
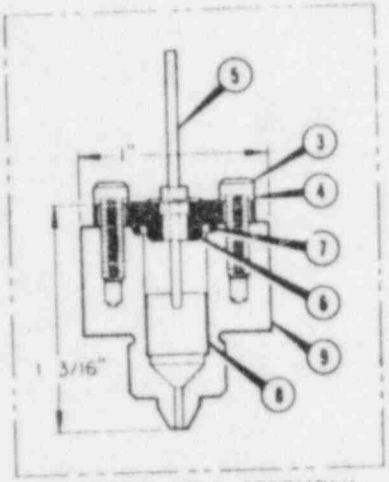
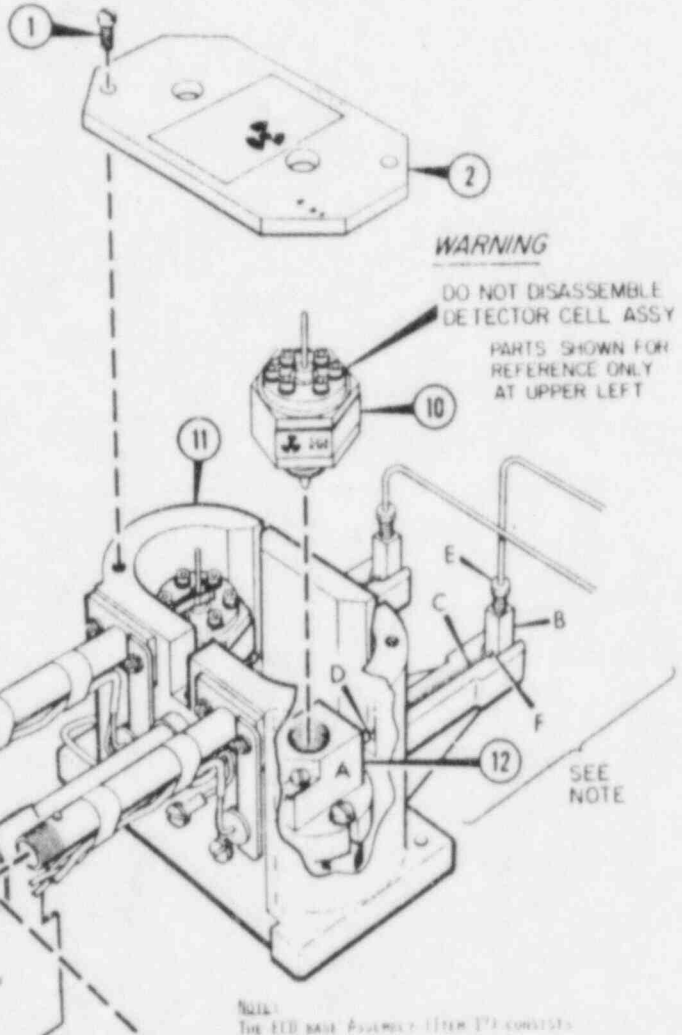



*Fig. 1 - Electron Capture Detector Assembly Installed in the Model 3920*




DETECTOR CELL ASSEMBLY
045-0282
(SEE PRECAUTION 1, UNDER "NOTE" BEFORE INSTALLING)




Numbered Components:

(1) Binding Head Screw, #6-32 x 3/8 in. long
(2) Detector Housing Cover (045-1180)
(3) Socket Head Cap Screw, 3/8 in. Long
(4) #6 Split Lockwasher
(5) Effluent Tube or Anode (009-1229)
(6) Cell Cap (009-0187)
(7) O-Ring (990-2224)
(8) Radioactive Foil
(9) Detector Cell or Cathode (009-1030)
(10) Radioactivity Label (009-1426)
(11) Dual Detector Housing (045-1275)
(12) Base Assembly (009-0172)
(13) ECD Signal Cable Assy (045-0385)
(14) Magnetic Switch (009-1654)
(15) Reset Shaft (045-1307)
(16) Reset Shaft Bracket (045-1285)

Note:
The ECD base Assembly (Item 12) consists of three parts; the Base (A), Detector Fitting (B) which is located in the interface (see Fig. 2-5), and Isolation Necting Feed Thru Tube (C) which is soldered at points (D) and (E).

It is important that the following precautions be observed:

1) While tightening interface tubing connection (E) in Detector Inlet Fitting (B), hold fitting with wrench to avoid damage at soldered connection (F).

2) When installing Cell Assembly (009-0282) in the base assembly, do not use more than 15 ft. lbs. torque, otherwise damage could result at soldered connection (D).

*Fig. 2 - Dual Electron Capture Detector Assembly Diagram*

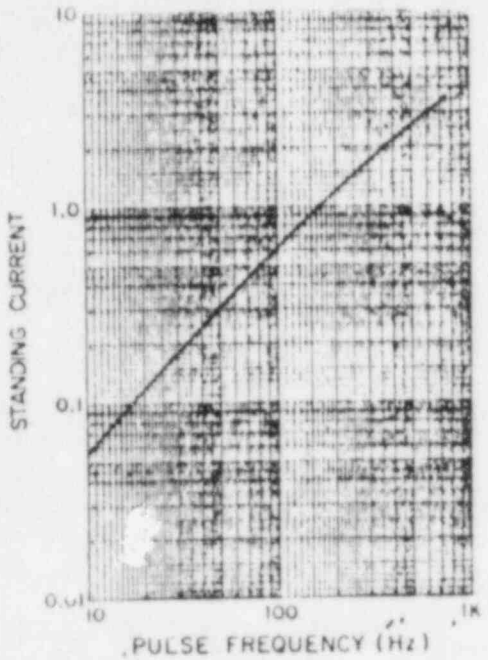



*Fig. 3 - Characteristic Curve with No Detector Contamination and No Column Bleed*

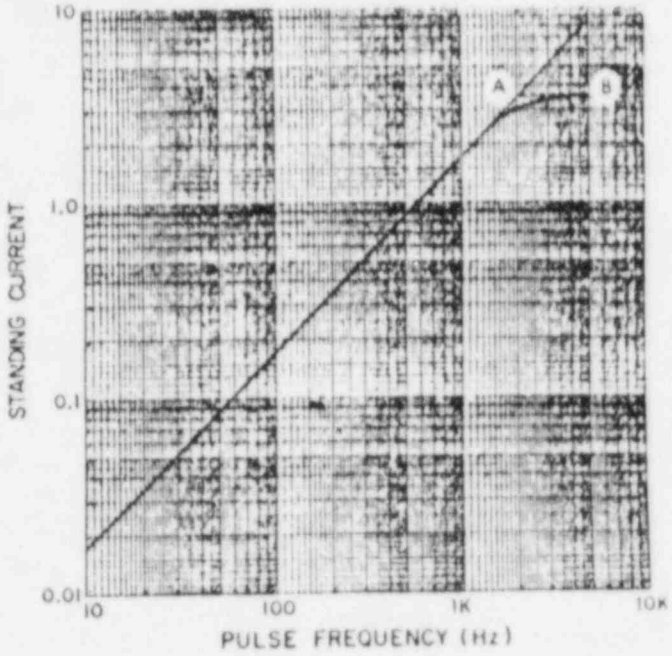



*Fig. 4 - Typical Characteristic Curve*

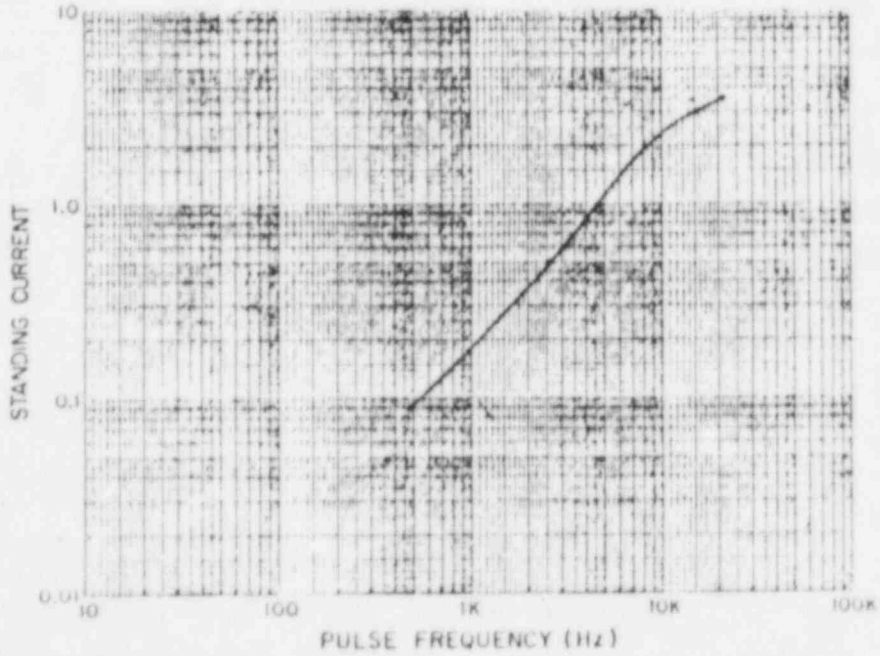



*Fig. 5 - Curve Indicative of Detector Contamination and/or Column Bleed*

International Clinical Laboratories of Missouri, Inc.
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St. Louis, Missouri 63144

Item 16. Formal Training in Radiation Safety

1. Arthur W. Perkins, Ph.D.

Course in Atomic Physics, 1949-1950 (1 semester)
The University of the South
Sewanee, TN

Course in Radiochemistry, 1962 (1 semester)
The University of New Mexico
Albuquerque, NM

2. Frank F. Hall, Ph.D.

Graduate level course in Principles of Radioisotopes, 1964
Texas A & M
College Station, TX

3. Richard Muehlhauser, Ph.D.

Course in Radiotracer Methodology and Biological Sciences, 1971
Oregon State University
Corvallis, OR

International Clinical Laboratories of Missouri, Inc.
1243 Hanley Industrial Court
St. Louis, Missouri 63144

Item 17. Experience

1. Arthur W. Perkins, Ph.D.

(a) U.S. Army, 1951. Lectures on battlefield survival in the event of nuclear war. No isotopes used.

(b) Sandia Corporation, Albuquerque, NM, 1959-1963. Availability of literature on the effects of nuclear weapons; constant safety consciousness by Sandia for radiation safety and the effects of radiation. No isotopes used.

(c) Lovelace-Bataan Medical Center, Albuquerque, NM, 1973-1974. Used iodine-131 and iodine-125 in radioassay procedures. Less than 50 microcuries of either isotope at any one time.

(d) Oak Ridge National Laboratories, Oak Ridge, TN, 1975. Constant alerting to potential hazards of radiation as part of the corporate safety program. No isotopes used.

(e) Bio-Science Laboratories, Van Nuys, CA and St. Louis, MO, 1975-1977. Used iodine-125, tritium, and cobalt-57 in radioassay procedures. Less than 500 microcuries at any one time.

(f) International Clinical Laboratories, St. Louis, MO, 1977-1980. Used iodine-125 and cobalt-57 in radioassay procedures. Less than 200 microcuries at any one time; less than 5 microcuries of cobalt-57 at any one time.

No experience with gas-liquid chromatography using electron capture detectors.

International Clinical Laboratories of Missouri, Inc.
1243 Hanley Industrial Court
St. Louis, Missouri 63144

Item 17. Experience

2. Frank F. Hall, Ph.D.

(a) Scott and White Clinic, Temple, TX, 1970-1974. Used iodine-131, iodine-125, tritium, and carbon-14 in in vitro diagnostic procedures and in research.

(b) Damon Laboratories, Boston, Mass., 1974-1975. Used iodine-125 and iodine-131 in in vitro diagnostic procedures.

International Clinical Laboratories of Missouri, Inc.
1243 Hanley Industrial Court
St. Louis, Missouri 63144

Item 17. Experience

3. Richard Muehlhauser, Ph.D.

(a) Department of Clinical Pharmacology, University of Colorado, Boulder, Colo., 1971-1973. Studies with carbon-14 labeled secobarbital.

(b) Mallinckrodt, St. Louis, MO, 1975-1980. Use of carbon-14, iodine-125, and tritium in in vitro diagnostics, including TLC radiochromatrography and liquid scintillation counting. Radioactive waste disposal training and experience provided by Mallinckrodt through the radiation safety committee. Less than 100 millicuries activity involved.

NOTE TO: License Fee Management Branch, ADM

FROM: Region III

SUBJECT: VOIDED APPLICATION

Control Number 77979

Applicant International Clinical Labs

Date Voided 9-18-85

Reason for Void License expired prior to completion of amendment action. The request will be incorporated into the new license

Signature P. Vacherlon

Attachment:
Application 1

appl fee Pd 77756

OK LHMS OCT 1985

No fee collect Court of 77598 Not attached