

# OAK RIDGE NATIONAL LABORATORY

operated by

**UNION CARBIDE CORPORATION**  
**NUCLEAR DIVISION**

for the

**U.S. ATOMIC ENERGY COMMISSION**



LOCKHEED MARTIN ENERGY RESEARCH LIBRARIES



3 4456 0513443 1

ORNL - TM - 2004

104

## INFORMATION GUIDE FOR USERS OF THE OAK RIDGE ISOCRONOUS CYCLOTRON

OAK RIDGE NATIONAL LABORATORY  
CENTRAL RESEARCH LIBRARY  
DOCUMENT COLLECTION  
**LIBRARY LOAN COPY**

DO NOT TRANSFER TO ANOTHER PERSON

If you wish someone else to see this  
document, send in name with document  
and the library will arrange a loan.

LOCKHEED  
MARTIN

**NOTICE** This document contains information of a preliminary nature and was prepared primarily for internal use at the Oak Ridge National Laboratory. It is subject to revision or correction and therefore does not represent a final report.

#### LEGAL NOTICE

This report was prepared as an account of Government sponsored work. Neither the United States, nor the Commission, nor any person acting on behalf of the Commission:

- A. Makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this report, or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately owned rights; or
- B. Assumes any liabilities with respect to the use of, or for damages resulting from the use of any information, apparatus, method, or process disclosed in this report.

As used in the above, "person acting on behalf of the Commission" includes any employee or contractor of the Commission, or employee of such contractor, to the extent that such employee or contractor of the Commission, or employee of such contractor prepares, disseminates, or provides access to, any information pursuant to his employment or contract with the Commission, or his employment with such contractor.

ORNL-TM-2004

Contract No. W-7405-eng-26

ELECTRONUCLEAR DIVISION

INFORMATION GUIDE FOR USERS OF  
THE OAK RIDGE ISOCHRONOUS CYCLOTRON

NOVEMBER 1967

OAK RIDGE NATIONAL LABORATORY  
Oak Ridge, Tennessee  
operated by  
UNION CARBIDE CORPORATION  
for the  
U. S. ATOMIC ENERGY COMMISSION

LOCKHEED MARTIN ENERGY RESEARCH LIBRARIES



3 4456 0513443 1



Information Guide for Users of the  
Oak Ridge Isochronous Cyclotron

1. INTRODUCTION

This guide has been prepared to provide a statement of policy in regard to the availability of the research facilities of the Oak Ridge Isochronous Cyclotron (ORIC) and to outline the procedures developed to facilitate their use. It is assumed that the reader is generally familiar with the research capabilities and operating characteristics of ORIC.\*

2. POLICY

It is the basic policy of the Oak Ridge National Laboratory to make the ORIC research facilities available for all worthwhile research projects to which they are applicable and especially suited.

For the purpose of assigning cyclotron time and costs five categories of users are considered:

1. Electronuclear Division personnel - All the research and development programs within the Division are included.
2. Other ORNL personnel - The ORIC facility is available to all ORNL research groups.
3. Non-ORNL collaborators - University scientists and graduate students are encouraged to establish close collaborative research programs with ORNL personnel.

---

\* Nuclear Instruments and Methods, 6, 1, 105, 221, and 234 (1960).  
Nuclear Instruments and Methods 18-19, 46, 159, 170, 197, 303  
601 (1961).  
IEEE Transactions on Nuclear Science 12, 201 (1965); 13, 101 (1966);  
14, 1151 (1967).

4. Guest Scientists - Research workers from Universities may, by special arrangement, pursue relatively independent programs. These efforts are usually connected only loosely with those of ORNL staff members.
5. Off-Site Research Groups - The ORIC facilities may be made available to groups which are either from other government laboratories, or are engaged in research for government agencies.

### 3. FACILITIES AVAILABLE

To give the user some concept of the size and location of the various areas, several drawings are included, Fig. 1 ORIC First Floor Plan, Fig. 2 Ion Optics, and Fig. 3 ORIC in Section.

ORIC is designed to deliver beams of various species of ions of a wide range of energies, see Fig. 4, to target stations in two shielded experiment rooms. The beam transport ion-optics system makes it possible to deliver the beam to a target station for a wide variety of requirements. The beam size can be varied from a well-focused spot to a diffuse area, roughly 5" in diameter. The extracted beam and the target stations are 48 inches above floor level. Patch panels, noted in Fig. 2, provide for connecting experimental apparatus with recording and analyzing equipment at various locations in the counting room. The number of cables, type, maximum voltage, and connectors available at each panel are listed in Table 1. The ORIC standard flange to which experimental apparatus may be coupled is shown in Fig. 5. The safety controls systems are designed to permit the setting up of equipment in one experiment room while the other room is in use.

The installations described above are standard at ORIC and are all normally available to users. Their availability at any particular time and applicability to a particular requirement should be determined by specific inquiry well before any detailed plans are developed.

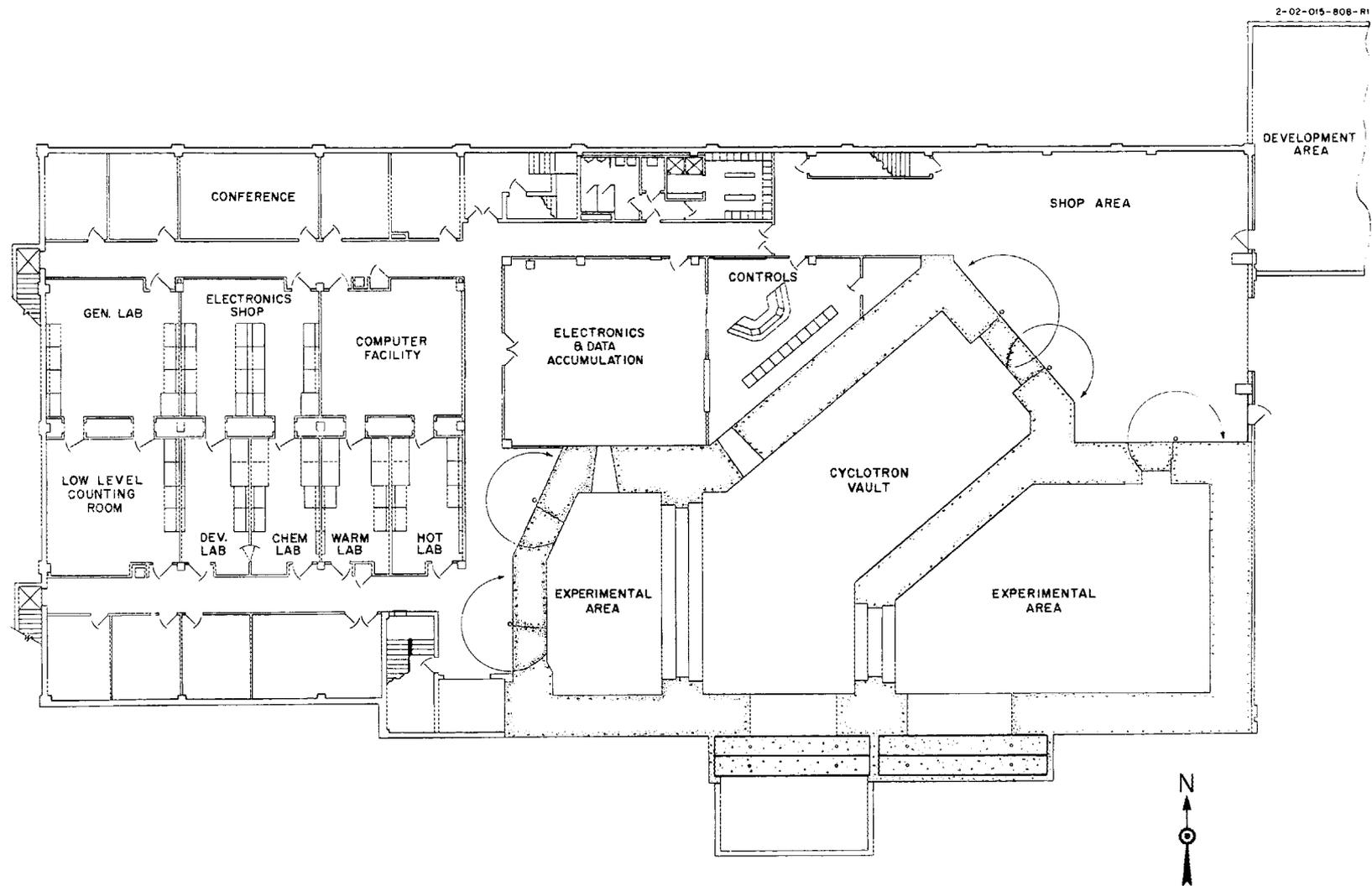


Fig. 1. First floor of ORIC building showing location of cyclotron and controls, experiment areas, counting room and laboratories. Scale:  $3/32'' = 1'$ .

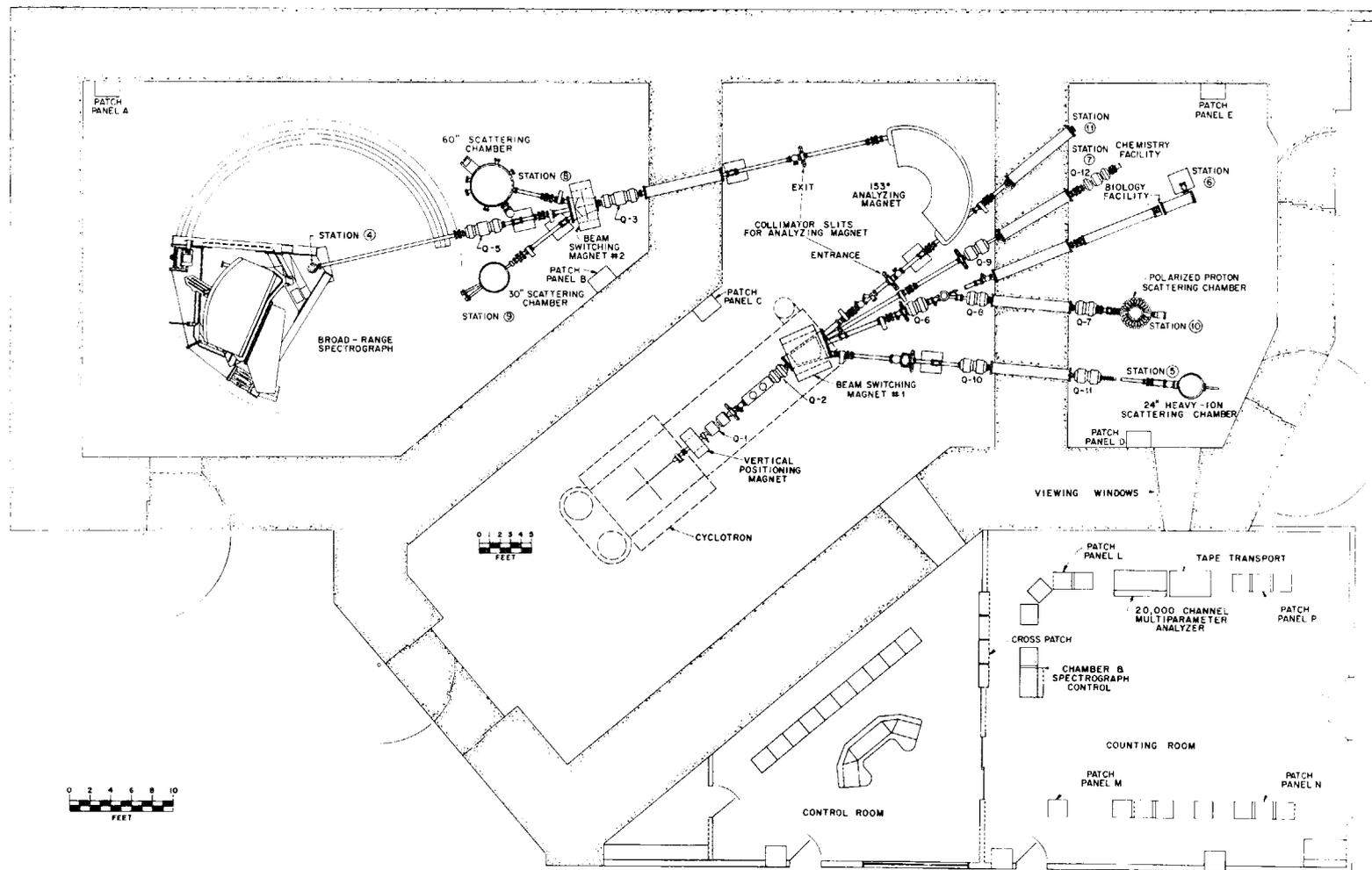
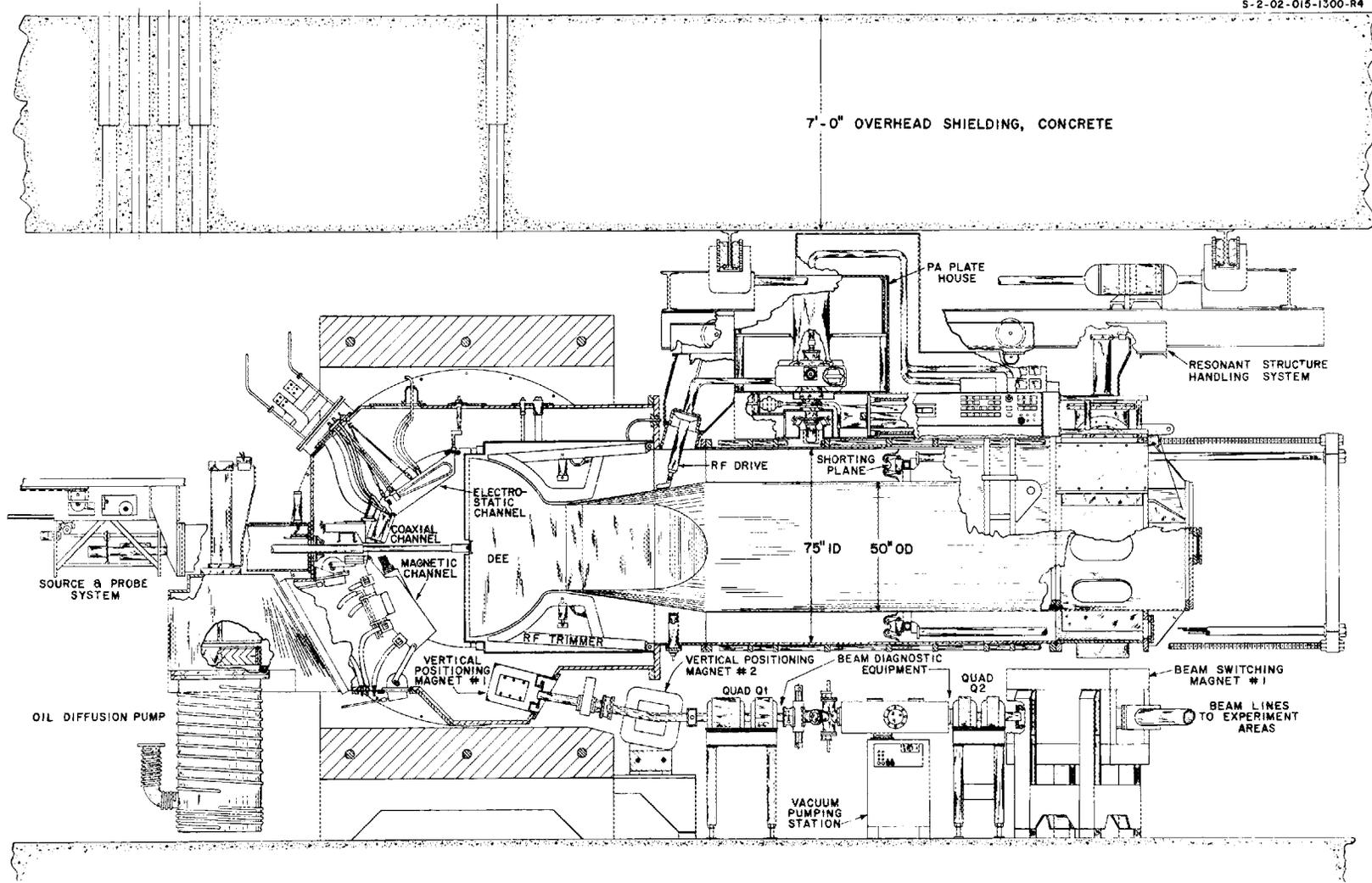


Fig. 2. Cyclotron vault and shielded experiment areas showing locations of target areas. Patch panels at each target area provide for connections with instrumentation in counting room.



5

Fig. 3. ORIC, shown in section and indicating position of external beam, 48 in. above floor level.

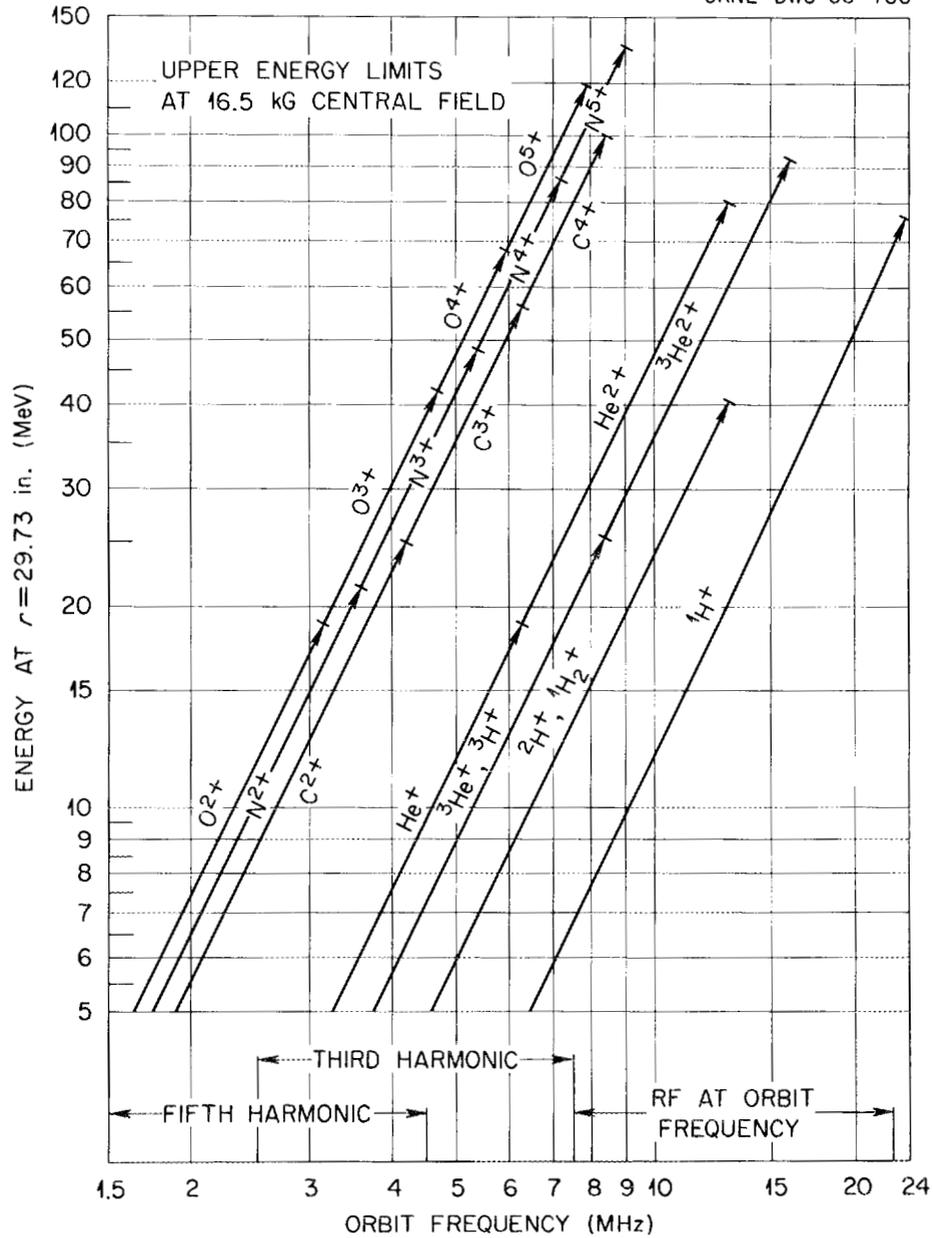


Fig. 4. Particles and energies for which ORIC is designed.

Table I  
Existing Female Connectors on the Patch Panels

<u>Cable</u>	<u>Maximum Voltage</u>	<u>Connector</u>	<u>Number of Connectors per panel</u>
RG 62 B/U	750 V	UHF	9
RG 114/U	1000 V	UHF	9
RG 108/U	1000 V	UG 103/U	4
RG 8/U	4000 V	UG 560/U	8
6 wire AWG #20	400 V	shell 14 Insert 14S-6S	8
#12 AWG	600 V	5-way Binding Post	32

EIGHT  $1\frac{3}{32}$ -in. DIAM HOLES  
EQUALLY SPACED ON  
6  $\frac{1}{4}$ -in. BOLT CIRCLE

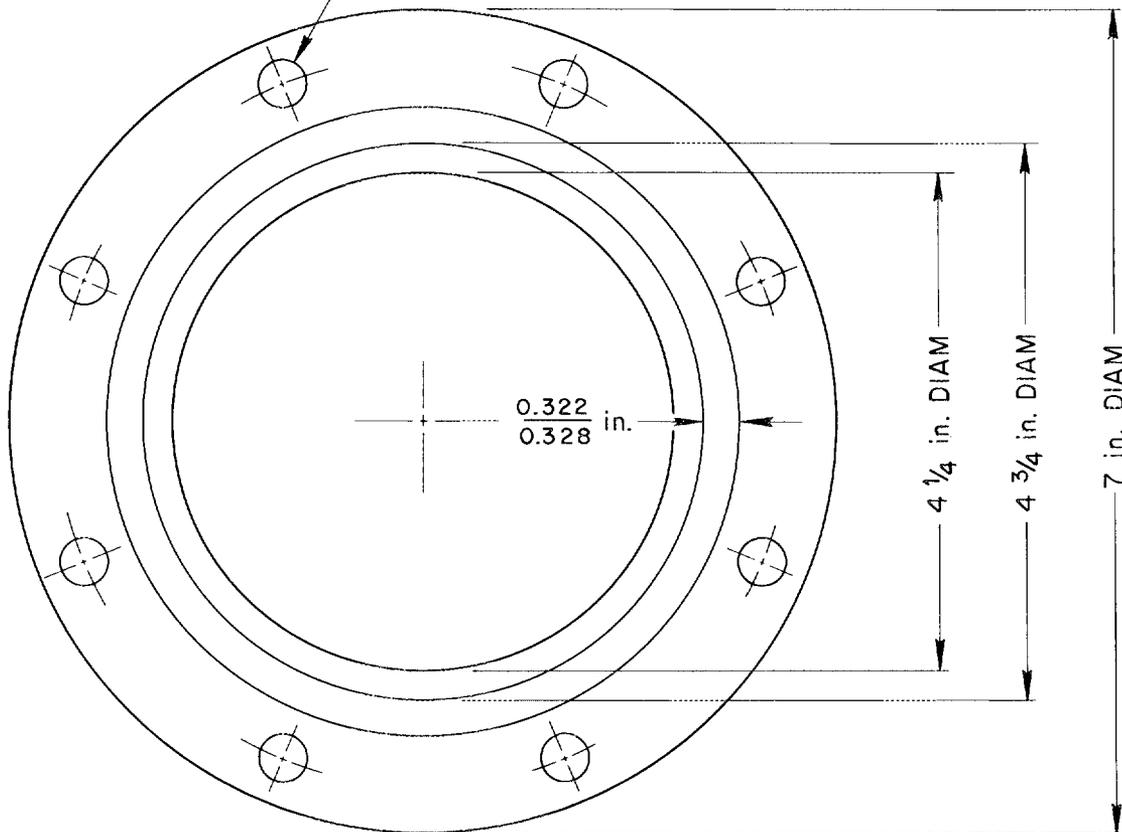


Fig. 5. ORIC standard flange. Experimental apparatus may be coupled to this existing flange.

Several items of specialized apparatus, such as scattering chambers, magnetic spectrograph, multi-channel analyzers, data acquisition computer, and special purpose electronics are available for limited use. The builder or person responsible for this equipment generally has primary call on it. The use of this type of apparatus is essentially restricted to the resident staff and to scientists working in close collaboration with them.

Office and laboratory space in the ORIC building is, unfortunately, very limited; assignments will be made by the Director of the Electronuclear Division. The approval of the Research Policy Committee is required for the introduction of extensive specialized equipment, or for any changes in the experiment areas and laboratories in the ORIC building.

#### 4. PROCEDURES FOR REQUESTING CYCLOTRON TIME

All research groups in the Electronuclear or from other ORNL divisions desiring research time on ORIC should submit their requests at least six weeks in advance of the experiment. The requests must be in writing on a form similar to that shown on page 10. The request is to be directed to A. W. Riikola, ORIC Operations, Bldg. 6000. Requests for time for experiments to be conducted in collaboration with non-ORNL personnel will be made by the ORNL collaborator as outlined above.

Requests for cyclotron time by non-ORNL scientists from laboratories doing government sponsored research, or from Universities should be made as follows. A detailed description of the proposed experiment should be sent to E. Newman, Electronuclear Division, Bldg. 6000, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830. Phone 615-483-8611, ext. 3-1486. The request should include a scientific justification for the research, complete experimental details, breakdown of time requirements, and an assessment of any possible radiation hazards

**REQUEST FOR ORIC BOMBARDMENT  
OAK RIDGE ISOCRONOUS CYCLOTRON**

DATE \_\_\_\_\_

**REQUEST BY**

NAME \_\_\_\_\_

AFFILIATION \_\_\_\_\_

ADDRESS \_\_\_\_\_ PHONE \_\_\_\_\_

**CYCLOTRON DATA**

PARTICLE	ENERGY		RESOLUTION	± MeV
	MINIMUM	MeV		
CURRENT		μA	MAXIMUM	μA
TOTAL TIME	HRS		HRS	μA

TIME DISTRIBUTION \_\_\_\_\_

DATES DESIRED \_\_\_\_\_

**EXPERIMENT INFORMATION**

DESCRIPTION OF EXPERIMENT \_\_\_\_\_

TARGET STATION TO BE USED \_\_\_\_\_ TARGET MATERIAL \_\_\_\_\_

COMMENTS \_\_\_\_\_

DO NOT WRITE IN THIS SPACE

involved. This proposal is then reviewed by the ORIC Research Policy Committee, which decides whether the experiment will be scheduled. If the recommendation of the committee is favorable, the requested time is fitted into the schedule in such a way as to permit the most efficient use of the facility.

## 5. SCHEDULING

The allocation of time on ORIC will be made by the ORIC Research Policy Committee, appointed by the Director of the Electronuclear Division. This committee sets policy, reviews requests, and allots time to the various projects. The Operations Supervisor administers the scheduling, evaluates requests for changes in the schedule, and negotiates adjustments. He is responsible to the Research Policy Committee, but does not set policy. Except for observing ORNL holidays\* the cyclotron is operated on a fixed schedule 24 hours per day, 7 days per week. A typical turn-around period is 9 weeks. Attempts will be made to accommodate specific dates requested by a user during a schedule cycle, but the primary responsibility of the Operations supervisor is to insure the most efficient use of the facility. During the summer months, from the beginning of June until the end of September, there is a very heavy commitment of cyclotron time to the resident research personnel and additional scientists from the ORAU summer research participant program. Programs by outside users must, therefore, be curtailed during this period.

---

\*ORNL Holidays:  
New Year's Day  
Washington's Birthday  
Good Friday  
Memorial Day  
Independence Day  
Labor Day  
Thanksgiving Day  
Christmas Day

## 6. ADMINISTRATION OF OPERATING COSTS

The basic cost of operating ORIC is included in the budget of the Electronuclear Division. Operating costs for various programs in the Electronuclear and other ORNL divisions and for collaborative efforts with university scientists are normally covered by the ORIC operations budget. When the cyclotron is operated to accommodate non-ORNL personnel doing government-sponsored research such operation is on a cost-recovery basis. The cost of short programs by guest scientists will normally be borne by the Electronuclear Division, but extended programs may require other financial arrangements.

The schedule is arranged in blocks of 8-hour shifts and the current charge is \$750 per shift (8 hours). Beam time is defined as the period during which the cyclotron is being tuned to deliver, is delivering, or is capable of delivering the specified beam on the user's target. This charge also covers the cost of small items from stores, and such machine shop, electronics shop, and other minor service charges as may be incurred in the course of normal cyclotron runs. Additional charges will be made for services or items which, in the estimation of the Policy Committee, are considered excessive. Three copies of AEC Form 375, through which the budget office bills the user, must be completed prior to the bombardment. An example of this form is shown on page 13.

## 7. USER RESPONSIBILITIES

It is the responsibility of the experimentalist to design apparatus and perform the experiment in the most efficient way commensurate with achieving the desired scientific objective. Experiments shall be performed in a manner that does not endanger any personnel, and all reasonable precautions shall be incorporated into the design of experiments to avoid the possibility of the release of radioactive, toxic,

Form AEC-375  
(8-64)  
AECM 7501

UNITED STATES ATOMIC ENERGY COMMISSION  
ISOTOPE ORDER BLANK

FOR USE BY FEDERAL AGENCIES ONLY—SUBMIT IN DUPLICATE

<b>1. FROM: Name and address of requisitioning agency</b>  National Aeronautics & Space Administration Goddard Space Flight Center Glendale Road Greenbelt, Md. 20771	<b>2. Requisitioning Agency Order No.:</b>  Government Order S-1234
	<b>3. Date</b>  July 1, 1967

<b>4. SHIP TO:</b>  Building 16 Glendale Road Greenbelt, Md. 20771	<b>5. BILL TO:</b>
<b>6. VIA:</b>	<b>7. G/BL No.:</b>

**8. TO:** Insert name of the AEC facility from which materials or services will be obtained. (Names and addresses of AEC facilities are listed on reverse side.)

Oak Ridge National Laboratory  
 Electronuclear Division  
 Oak Ridge, Tenn. 37831  
 Attn. R. F. Pruett

**9. The undersigned certifies that he (it) is authorized by**

(a) AEC License No. \_\_\_\_\_, or

(b) General License in Section 30.21, Part 30, Title 10, Code of Federal Regulations to receive the following described byproduct material:

NOTICE: Disregard Item 9 if order is for stable isotopes, irradiation service not inducing radioactivity, or for cyclotron-produced radioisotopes.

MATERIAL OR SERVICE

10. Catalog Item No. (If any)	BYPRODUCT MATERIAL OR OTHER RADIOISOTOPE: State isotope, chemical form, desired total activity, specific activity.  SERVICE IRRADIATION: State material, quantity, by whom furnished, desired activity and flux.  STABLE ISOTOPE: State isotope, chemical form, quantity, isotope concentration (specifying desired enrichment, minimum enrichment). (Use continuation sheet if required)	PURCHASE PRICE	RENTAL FEE
			Use of the Oak Ridge Isochronous Cyclotron for calibration of the dE/dx vs E detector. 24 hours of machine time required
<b>SHIPPING SCHEDULE</b>			
		SPECIAL SERVICE CHARGE (if any) HANDLING CHARGE (if any) CONTAINER DEPOSIT	
		<b>TOTAL</b>	\$2,250.00

THIS ORDER IS SUBJECT TO THE TERMS AND CONDITIONS ON REVERSE SIDE

ACCEPTED FOR THE UNITED STATES ATOMIC ENERGY COMMISSION	REQUISITIONING AGENCY
By _____	By <u>J. Smith</u>
	Title <u>Research Scientist</u>

## TERMS AND CONDITIONS

1. This order is placed in accordance with and subject to the Code of Federal Regulations, Title 10, Atomic Energy, Part 30, issued under Authority of the Atomic Energy Act of 1954, as amended.
2. Byproduct material, irradiation services, or other isotopic materials (other than source and special nuclear material) acquired from the AEC are furnished at prices and service fees as fixed by the AEC. All transportation costs will be paid by the requisitioning agency, and materials will be shipped F. O. B. the AEC facility handling the transaction. When shipment of material pursuant to this order requires the use of returnable Government-owned containers, title to such containers shall remain in the Government. If requested by the Commission the buyer will make a deposit to ensure return of the containers. The buyer will keep the containers in good condition, will not use them for any materials other than the materials shipped therein, and will deliver them to a carrier for return to the point of shipment, transportation prepaid, within thirty days from the date of receipt by the buyer of the shipment. *The buyer agrees to pay to the Commission a rental charge on each returnable Government-owned container for that period of retention which is in excess of the said 30-day period.*
3. The right to revoke or cancel this order is reserved to the AEC.
4. Material ordered from an AEC facility will be shipped as nearly approximating the activity specified in the order as is possible, but no representation is made that radioisotopes will be of a particular quality, quantity, or activity, or will be delivered at specified times. The requisitioning agency agrees to report promptly any discrepancies between the material supplied and that ordered so that replacement or other appropriate adjustment may be made.
5. Payment will be made direct to the operator of the AEC facility from which the materials or services are obtained.

## INSTRUCTIONS

1. This isotope order blank has been prepared for use by all Federal agencies ordering byproduct material, irradiation services, or other isotopic materials (other than source and special nuclear material) from AEC or AEC facilities owned by the United States Atomic Energy Commission and operated for the AEC by contractors. No other type of order blank, purchase order, or contract will be accepted by AEC or AEC facilities.
2. When submitting this order form the requisitioning agency should furnish a prepared bill of lading on which shipment will be made. If such bill of lading is not furnished, shipment will be made collect on a commercial bill of lading to be converted at destination.
3. The AEC utilizes the services of contractors operating its facilities to perform distribution functions for the AEC under cost-type contractual arrangements whereby expenses of the facilities are borne by the AEC and revenue from distribution of byproduct materials, special irradiation services, and other isotopic materials is deposited for the account of the Government, used to reduce costs of operation, or paid over as directed by AEC in accordance with applicable contract provisions. Service fees are set by AEC.
4. The contractor or AEC office accepting the order for AEC will retain the original and return an accepted copy of the order to the requisitioning agency.

## AEC FACILITIES

**OAK RIDGE NATIONAL  
LABORATORY**

*Operated by*  
Union Carbide Nuclear Company  
Post Office Box X  
Oak Ridge, Tennessee 37831

**ARGONNE NATIONAL  
LABORATORY**

*Operated by*  
University of Chicago  
9700 South Cass Avenue  
Argonne, Illinois 60440

**MOUND LABORATORY**

*Operated by*  
Monsanto Chemical Co.  
Miamisburg, Ohio 45342

**BROOKHAVEN NATIONAL  
LABORATORY**

*Operated by*  
Associated Universities, Inc.  
Upton, Long Island, N. Y. 11973

**MATERIALS TESTING  
LABORATORY**

*Operated by*  
Phillips Petroleum Company  
Post Office Box 1221  
Idaho Falls, Idaho 83401

FOR INFORMATION ON HOW TO APPLY FOR A "BYPRODUCT MATERIAL LICENSE," FORM AEC-374, OR TO OBTAIN ADDITIONAL COPIES OF THIS ORDER BLANK WRITE TO:

ISOTOPES BRANCH, DIVISION OF MATERIALS LICENSING  
U.S. ATOMIC ENERGY COMMISSION  
WASHINGTON, D.C. 20545

corrosive, or otherwise hazardous materials. The safety procedures to be adhered to are outlined in ORNL-TM-1492 which is made an addendum to this guide. The sponsor of each experiment shall provide suitable, shielded containers for transporting bombarded targets and equipment from the cyclotron. Upon completion of an experiment the sponsor shall be responsible for clearing the area used by him.

Descriptions of the physical arrangement and chemical compositions of all targets and apparatus, including slits, collimators, and Faraday cups, shall be provided along with requests for cyclotron time.

#### 8. CYCLOTRON OPERATION

It is the responsibility of the ORIC Operations Group to provide a specified beam to the experimenter's apparatus. The Operations Group aids the user in setting up his apparatus and assists in every way to insure the safe and successful completion of the experiment under the guide lines of ORNL-TM-1492. All activities related to cyclotron operation and to maintenance of adequate radiation safeguards are at all times under the immediate supervision of the Shift Technical Supervisor, or in his absence, the Crew Chief. The operations group sees that the experimenter is provided with any materials and craft help he may need during the course of his experiment. Prior to any series of bombardments, the ORIC Operations Office will furnish the experimenter detailed information regarding operating procedures and assist in making any special arrangements.

## ADDENDUM

ORIC OPERATION SAFETY PROCEDURES

R. S. Lord and A. W. Riikola

## ABSTRACT

The operating practices established to provide general, electrical, and radiation safety protection for personnel using the Oak Ridge Isochronous Cyclotron are outlined. Areas of responsibility are defined, both for the cyclotron operation staff and for the research users.

---

The purpose of this procedure is to outline the operating practices established to provide general, electrical, and radiation safety protection for personnel using the Oak Ridge Isochronous Cyclotron for research. To assure the most effective and efficient working relationship areas of responsibility are defined, both for the operations personnel and for the research user.

Most of the safety rules outlined herein are those commonly practiced by personnel at ORNL in working with various shop machines and electronic equipment. The rules pertaining to radiation safety are more specifically directed toward the special hazards associated with cyclotrons, but follow guidelines established by the Atomic Energy Commission and the Oak Ridge National Laboratory.<sup>1</sup> The stated policy of the Oak Ridge National Laboratory is to:

1. Conduct all activities with the lowest reasonable risk of personal injury or property loss due to preventable accidents.
2. Perform all work and maintain the working environment in accordance with Laboratory safety regulations and designated national codes and standards.

---

<sup>1</sup>General and electrical safety procedures are outlined in the Laboratory Safety Manual; these are available through the Safety and Radiation Control office; each Group Leader, Shift Technical Supervisor, and the Crew Chiefs have copies or access to same for reference.

## ADDENDUM

3. Investigate all significant accidents, determine their causes, and take steps to prevent recurrence of similar accidents.

Implementation of these policies requires the cooperation and positive effort of everyone at Oak Ridge National Laboratory. The over-all responsibility at ORIC has been delegated to the Electronuclear Division Safety Officer; on shift, the responsibility is delegated to the Shift Technical Supervisor, or in his absence, to the Crew Chief on duty.

## Special ORIC Hazards

Several areas of particular hazard at the ORIC that require special attention are:

1. In operation the cyclotron produces hazardous levels of radiation, and residual radiation is emitted from its components and targets after shutdown. The system for preventing accidental radiation exposure to personnel during cyclotron operation, as described in detail in ORNL-TM-364, has proved both reliable and operationally satisfactory. In addition, established Laboratory procedures must be followed when dealing with radioactivity.
2. The machine shop and general shop areas are outlined with yellow floor stripes. Entrance to these areas require eye protection. Protective goggles for visitors are available in wall cases near the entrances to these areas.
3. The large shield doors weigh from 30 to 65 tons each. One should not attempt to enter or leave a shielded room while the door is in motion.
4. Magnetic materials must not be in the proximity of either the main magnet or the ion optics magnets when they are energized. At full excitation the field from the main magnet is potentially hazardous 5 feet from the yoke, the field from the ion optics magnets within about 10 in. of the yoke. The operation of meters and watches can be adversely affected by the magnetic field at any point in the cyclotron vault.

## ADDENDUM

5. While in operation, the cyclotron and much of the experimental equipment use power supplies which are potentially lethal. These are marked and identified where possible. The use of photomultipliers and other electronic systems and circuitry in research activities create many potential hazards which cannot all be properly labeled. The exercise of extreme care in handling equipment which may carry hazardous electrical voltages is the only means for assuring reasonable safety. Any supply above 50 volts and capable of delivering more than 0.050 amperes is considered hazardous and must be so labeled. (Refer to Proc. 1.5 ORNL Safety Manual.)
6. Toxic or flammable gases must not be vented to the atmosphere inside the building; areas in which these gases are used must be clearly marked to indicate the hazard involved.

RESPONSIBILITIES OF SHIFT TECHNICAL SUPERVISOR  
AND CREW CHIEF

The Shift Technical Supervisor, or in his absence the Crew Chief, is in full charge of operating the cyclotron. He is responsible for delivering the desired particle type, quantity, and quality of beam to the investigator's target station. It is the Shift Technical Supervisor's or Crew Chief's prerogative to terminate any bombardment when in his judgment cyclotron equipment and/or personnel safety is endangered. Some of the pertinent duties and responsibilities of the Operations personnel are noted:

1. Check that all associated utilities, power supplies, vacuum and cooling water pumps, etc., are in proper and safe operational status prior to starting up the cyclotron.
2. Check the ORIC Target Run Sheet (TX-3286) to see that it has been properly filled out by the User. If he feels that the experiment will present unusual or potentially dangerous hazards and/or possible contamination after the bombardment,

## ADDENDUM

- he will contact the Division Radiation Control Officer and obtain his approval prior to starting the experiment.
3. Check the vault and the selected shielded experiment room to see that all personnel are out. In addition he makes the following checks within these areas:
    - (a) Checks all "Scram" buttons to see that they are in "Operate" position.
    - (b) Closes the shielded door of the selected beam path experiment room.
    - (c) Sees that shield-wall plugs, beam stops, valves, and cooling water circuits are in the "On or Open" position in the Control Room.
    - (d) Visually inspect mechanical indicators on shield-wall plugs to be sure they are closed in beam lines that are not to be used.
    - (e) Ascertains that all key interlocks are in closed position before proceedings with start-up of the cyclotron.
  4. Starts up the cyclotron and makes the bombardment per instructions from the investigator or user.
  5. At the termination of the bombardment or run:
    - (a) Stops the cyclotron and follows the routine procedures for re-entering the experiment room, i. e. , closes selected shield-wall plugs and applicable beam stops and releases appropriate key interlocks and switches.
    - (b) Ascertains the radiation level and dictates the time of entry to the target station or other adjacent areas where high radiation levels exist.
    - (c) If the possibility of contamination exists, or if the dose rate in an area easily accessible to personnel is greater than 5 rem/hr, he shall call the Health Physicist for a more detailed survey.
    - (d) Ropes off any areas in which the accumulated weekly dose may be as much as 1 rem. (Follow procedure 2.7 of the Health Physics Manual. )

## ADDENDUM

6. In the event the Senior Operations man on duty decides that entry into the cyclotron vacuum tank or into the highly activated beam optics system is necessary, he will request a Health Physicist to make radiation surveys to determine the length of time that craftsmen will be allowed to work in these areas. If the anticipated radiation exposure is to exceed 20 mrem total body, 120 mrem skin, or 300 mrem extremities, a Radiation Work Permit (UCN-2779) shall be filled out and posted in the working area.
7. Since the three exhaust fans from the shielded areas are not shut off automatically in the event of a "High Radiation Alarm" (bell alarm) as indicated by the monitors in the Control Room, the Shift Technical Supervisor or Crew Chief will ascertain whether the exhaust fans should be shut down manually. These fans should be shut down if the air monitor alarm is from particulate rather than gaseous activity. (Response of instrument after filter tape is advanced should indicate state of activity.) These switches (AJ-127 for Room C-111, AJ-128 for Room C-109, and AJ-129 for Room C-110) are located in the Relay Room C-200. (The buzzer sounding is a warning signal, whereas the bell signifies a high radiation level requiring investigation and possible fan shutdown.)
8. See that all radiation measuring instruments (both portable and stationary types) are checked periodically by Health Physics to insure that they are in good working condition.
9. Informs the user that all sources of radiation are to be handled and stored within the regulated zone on the first floor. Radioactive materials carried off site should not be transported from building through the unregulated zone. (Refer to item 8, page 7 for User's Responsibilities.) The regulated zone consists of the shielded areas, the shop, and four laboratories on the south corridor.

## ADDENDUM

10. Maintains a surveillance of all personnel within regulated areas to insure that they are wearing a pair of pocket meters and the regular ORNL or visitors badge meters. Ascertains that visitors and/or users are fully aware of the special radiation problems that exist at the ORIC.
11. To minimize radiation exposures whenever targets are removed or transferred in high radiation fields the following limits will be adhered to:
  - (a) Whenever bombarded targets are removed from radiation fields  $\geq 150$  mrem/hr remote handling equipment (tongs) must be used.
  - (b) Personnel are not permitted to expose hands to a radiation field  $>75$  rem/hr.
  - (c) Eye protection is advisable in these high radiation fields--goggles or safety glasses should be worn.
12. The Shift Technical Supervisor, or in his absence the Crew Chief, is responsible for sounding the building evacuation signal if and when evacuation is deemed necessary. (In ORIC Building this is done by verbal announcement from the Control Room PA system.) The Shift Technical Supervisor or Crew Chief on duty is in immediate charge in the event of any emergency and/or power failure during his shift. If the emergency is of a major nature, the Plant Shift Superintendent will assume responsibility upon his arrival at the building.

## RESPONSIBILITIES OF THE ORIC USER

1. Before proceeding with any experiments, it is imperative that users of the ORIC familiarize themselves with the hazards involved and with all the procedures governing the operation of the cyclotron.
2. All new experiments must be cleared with the Radiation Control Officer prior to installation and bombardment.

## ADDENDUM

3. Before starting any experiment on the ORIC outside users of the ORIC facilities must obtain the ORNL Temporary Badge-Meter, which is issued to visitors, and have it signed by the Technical Shift Supervisor or Crew Chief.

4. User must fill out the "Target Run Sheet," UCN-6218, in the Operations Control Room before start of any bombardment. All specific information pertaining to the user's experiment should be noted on this "Target Run Sheet." It would be to the user's advantage to fill out the run sheet several shifts prior to his run to allow ample time for the operations crew to make any necessary preparations to expedite the start of the experiment.

5. If the user wishes entry into the shielded area, he should contact the operating personnel who will make the necessary checks as noted in his responsibilities under 5A and 5B.

6. The user is responsible for informing operations personnel with regard to any additional interlocks and/or safety devices incorporated in this experimental equipment.

7. The user cooperates with operating personnel in minimizing radiation hazards and personnel radiation exposures during the course of his experiment.

8. The user is responsible for seeing that a Radiation Hazard Material Transfer tag (UCN-2765) is issued by Health Physics for any container being used to transfer radioactive targets or material beyond regulated zone. (See 9, page 5 above for regulated zone in Building 6000.) Radioactive materials shipped outside the Oak Ridge National Laboratory are handled by Health Physics to insure compliance with AEC and ORNL regulations.

9. Radioactive materials not actually in use should be given to the Health Physicist for disposal, or stored in lead pigs within the regulated zone.

10. At the conclusion of an experiment, the user shall be responsible for seeing that any portable equipment, leads to patch panels, power supplies, etc., associated with his experiment are de-energized, removed, and stored out of the way to permit succeeding experimenters

## ADDENDUM

access to the area. All high voltage cables must be disconnected at the power supply at the end of an experiment. Cap all exposed high voltage terminals not in use.



## Distribution

1-100	ORIC Operations Office
101-102	Accelerator Information Center
103-104	Central Research Library
105	Document Reference Section (Y-12)
106 - 183	Laboratory Records
184	LRRC
185 - 199	DTIE - ORO
200	Laboratory and University Division, AEC, ORO
201	Patent Office