

U.S. ATOMIC ENERGY COMMISSION

June 1974

REGULATORY GUIDE

DIRECTORATE OF REGULATORY STANDARDS

REGULATORY GUIDE 5.32

COMMUNICATION WITH TRANSPORT VEHICLES

A. INTRODUCTION

Paragraphs 73.31(b) and 73.33(a) of 10 CFR Part 73, "Physical Protection of Plants and Materials," require that road or rail vehicles transporting special nuclear material in quantities identified in §73.1(b)(2) be equipped with a radiotelephone in order that communication between the transport vehicle and a responsible licensee can be maintained. Paragraph 73.70(g) of 10 CFR Part 73 requires that certain information with regard to the shipment be recorded prior to the shipment. This includes the name of the carriers, major roads to be used, verification of communication equipment on board the transfer vehicle, names of individuals who are to communicate with the transport vehicle, and other information needed to comply with §§73.30 through 73.36 of 10 CFR Part 73. This guide describes radiotelephone equipment and systems, and procedures for their use, that are acceptable to the Regulatory staff for complying with the Commission's regulations regarding radiotelephone communication in connection with road or rail shipments of special nuclear material.

B. DISCUSSION

AVAILABLE SYSTEMS

There are two radiotelephone systems that have a sufficient number of transmitter/receiver stations throughout the country to allow the placement of long distance calls. These are the Bell System Mobile Telephone system and the Radio Common Carrier system (RCC). The Bell system uses three different carrier frequencies [(35, 43), (152, 158), and (454, 459) MHz], and the RCC uses two different carriers [(152, 158) and (454, 459) MHz]. The vehicle receives long distance calls on the lower carrier frequency in each group, i.e., 35, 152, and 454 MHz, and transmits on the higher frequencies, i.e., 43, 158, and 459 MHz. The available

channels, which are individual circuits around a particular carrier frequency, for each system are shown in Table I.

TABLE I
NUMBER OF CHANNELS PER CARRIER

	(35, 43) MHz	(152, 158) MHz	(454, 459) MHz
Bell	10	13 ^a	12
RCC	None	7	7

^a11 in U.S., 2 in Canada

The (152, 158) MHz carrier is the most popular throughout the country for both Bell and RCC; the approximate number of cities served by each carrier is shown in Table II.

TABLE II
NUMBER OF CITIES PER CARRIER

	(35, 43) MHz	(152, 158) MHz	(454, 459) MHz
Bell	70	1260	54 ^a
RCC	211 ^b	625	137

^aIn five of these - Chicago, St. Louis, Dallas, Ft. Worth, and Houston - only local subscribers are served.

^bPaging service.

USAEC REGULATORY GUIDES

Regulatory Guides are issued to describe and make available to the public methods acceptable to the AEC Regulatory staff of implementing specific parts of the Commission's regulations, to delineate techniques used by the staff in evaluating specific problems or postulated accidents, or to provide guidance to applicants. Regulatory Guides are not substitutes for regulations and compliance with them is not required. Methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the findings required to the issuance or continuance of a permit or license by the Commission.

Published guides will be revised periodically, as appropriate, to accommodate comments and to reflect new information or experience.

Copies of published guides may be obtained by request indicating the division desired to the U.S. Atomic Energy Commission, Washington, D.C. 20545. Attention: Director of Regulatory Standards. Comments and suggestions for improvements in these guides are encouraged and should be sent to the Secretary of the Commission, U.S. Atomic Energy Commission, Washington, D.C. 20545. Attention: Chief, Public Proceedings Staff.

The guides are issued in the following ten broad divisions:

1. Power Reactors
2. Research and Test Reactors
3. Fuel and Materials Facilities
4. Environmental and Siting
5. Materials and Plant Protection
6. Products
7. Transportation
8. Occupational Health
9. Accident Review
10. General

METHODS OF OBTAINING SERVICE

There are two ways to obtain radiotelephone service. One is to rent the mobile equipment from the Bell System or the Radio Common Carrier (rental will include telephone service and repairs), and the other is to buy the mobile equipment directly from manufacturers and then rent telephone service from either of these systems. Application for equipment rental or telephone service could be made to a local Bell or RCC system company where a licensee or carrier would have most need of the service.

If purchased equipment is to be operated on the Bell System, a license will be required from the Federal Communications Commission (FCC). Purchased equipment operating on the RCC system may not require an FCC license. Maintenance of the equipment is provided when it is leased from the Bell or RCC systems. Purchased equipment must be serviced by licensed operators, as required by FCC regulation 47 CFR 21.207(e), "Transmitter Measurements".

There are several categories which define the priority for obtaining service. These are described in FCC regulation 47 CFR 21.512, "Priorities for service to subscribers."

SYSTEM ASPECTS

There are several types of service and equipment that can be obtained. The service available is dependent on the area. The equipment that can be ordered depends on whether local or nationwide service is desired. In general, the types of service available are:

1. Manual service with access to an operator.
2. Two-way dial with automatic channel selection and access to an operator (also known as Improved Mobile Telephone Service, IMTS).
3. Two-way dial service with access to an operator.
4. Two-way dial service without access to an operator.

The most inclusive service afforded is that of two-way dial with automatic channel selection and access to an operator (IMTS). This service is available on the (152, 158) MHz and (454, 459) MHz carriers only. There are at least two varieties of radiotelephone equipment that can be applied to this service. In one type of radiotelephone operating on the (152, 158) MHz carrier, all eleven channels in the United States are available through the selection of pushbuttons on the telephone. Additionally, three other pushbuttons, Home, Roam, and Manual, are available. When a vehicle is in the Home area the Home pushbutton is depressed and the Home area channels will be selected automatically. When a vehicle is outside the Home area the channels for the particular area must be selected by depressing the channel pushbuttons, as well as the Roam button. The

radiotelephone will now automatically select available channels in that area. Another type of radiotelephone operates on the (454, 459) MHz carrier and can automatically select channels in a local area only; it does not have a feature which permits selection of other channels, but could operate in another area on an IMTS mode if the channels were the same as in the Home area.

Other variations in the available equipment are nondialable phones (used only for manual service) and simplex or duplex operation. Simplex operation means that the telephone cannot transmit and receive information simultaneously. That is, while a person talks, he will not be able to hear a response from the other party. To hear the other party, he must stop talking and release a button on the telephone. Duplex operation allows the transmission and receipt of information simultaneously as in normal telephone service.

PREPLANNING

Radiotelephone call-in times can be preplanned in advance of the shipment by using a booklet issued by the American Telephone and Telegraph Co. entitled "National Mobile Telephone Service Area Listing" or a booklet issued by the Radio Common Carrier entitled "Nationwide Service Directory" in conjunction with the route maps to be used with the shipment. The area covered by each base station can be put on the route maps, and radiotelephone call-in times not to exceed 2 hours determined. When a radiotelephone call cannot be planned to occur within a 2-hour period, conventional telephone call-in location and time should be determined. This can initially be determined by locating cities, towns, or populated commercial areas along the route. The conventional call can be preplanned to occur at an approximate time (planned not to exceed 2 hours) from one of these areas. As experience is gained with particular routes, conventional telephone calls can be planned with greater precision. The drivers can note specific telephones or areas where telephones are available along the route for future conventional telephone call-in planning.

COMMUNICATION PROCEDURES

A radiotelephone conversation can be overheard by anyone having a radiotelephone set with the same carrier frequency and channels. It is therefore necessary to disguise the position of the shipment and the routes to be taken. One method for accomplishing this is the use of a transparent nonfoldable grid overlay on a standard road atlas. This grid can consist of one-half-inch squares with the horizontal axis labeled with letters and the vertical axis labeled with numbers. A typical overlay is shown in Figure 1 and is about 10.5 inches by 14 inches in overall dimensions. The road atlas chosen should have a scale of one inch equals 3 miles or less. The resolution of a one-half-inch square on the overlay would then be about 1.5 miles.

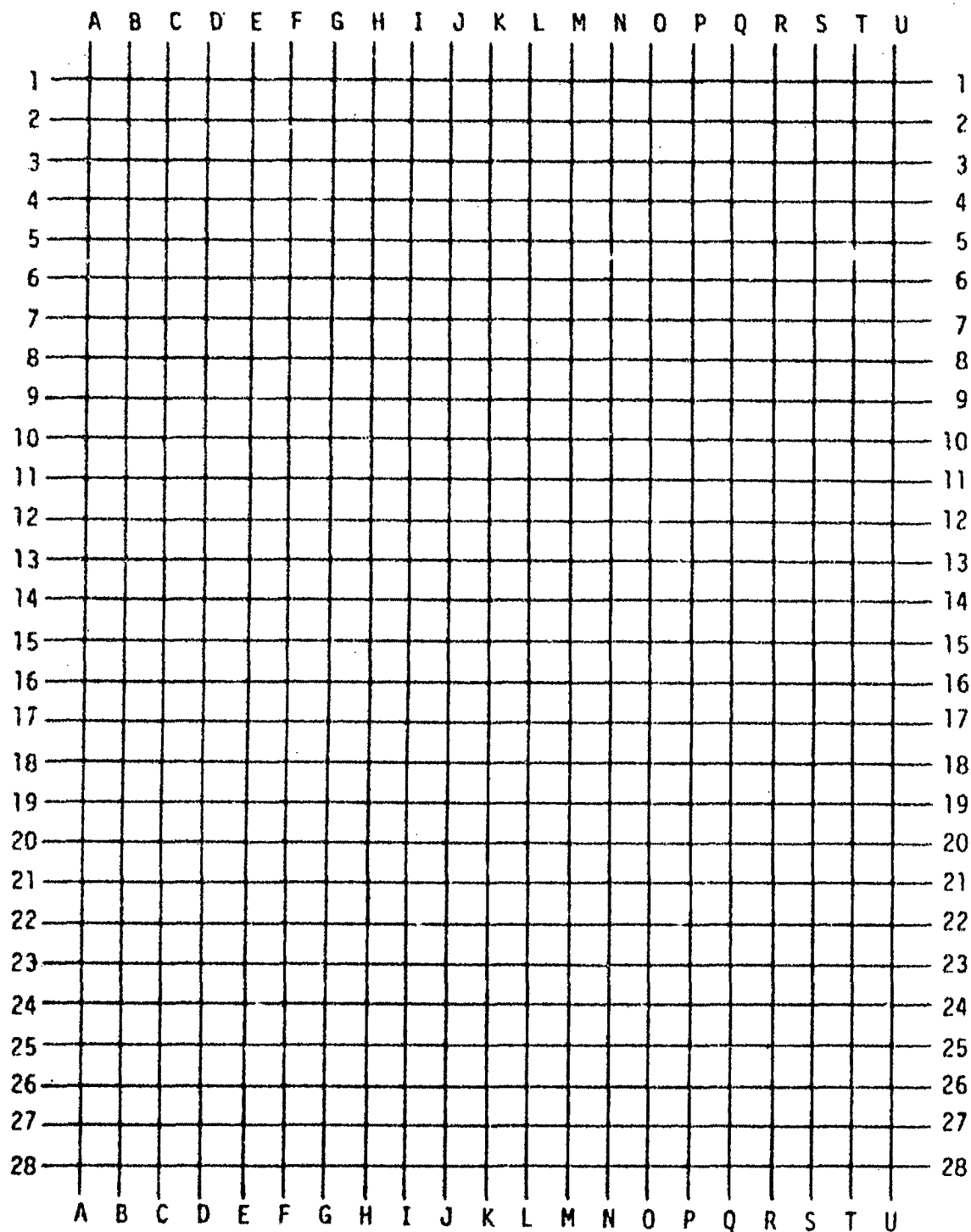


Figure 1. Overlay with 1/2-inch grid (not to scale) :alc)

With a scale of one inch equals 3 miles, it may be necessary to use several road maps to cover a shipment. A typical procedure that could be followed under these conditions is as follows:

1. Each map is assigned a number.
2. In order to position the grid with respect to the map, reference points are selected on the map. The grid is placed over the map, and distinct intersections or other identifiable landmarks are selected and given grid coordinates. These should be placed directly on the map as shown in Figure 2 with a relatively fine black marker type pen.
3. The driver could use the following procedure to telephone his position:
 - a. Select the map which includes his position.
 - b. Locate his position between two reference points on the map and place the appropriate coordinates over the reference points. Telephone the position as map number, reference points, and actual coordinates.
4. Duplicate sets of maps should be made by the licensee or his agent prior to the shipment; copies should be given only to the drivers and escorts (when they are used) and the individuals responsible for maintaining telephone communication with the shipment.

Another method that can be used to disguise the position of the shipment is known as the "check point" system. This approach, applicable to preplanned routes, uses landmarks as check points. The landmarks are typically all towns, cities, villages, state lines, and major highway intersections along the preplanned route. The landmarks are identified by a symbol (number or alphabetical character) on a single strip map carried along with the shipment. The driver, in reporting his position, relates only the symbol applicable to his position, or "x" number of miles from a landmark. Mileages between landmarks and those locations where commercial telephones are available on the strip maps may also be included. Personnel controlling the shipment should have a corresponding strip map and plot the progress and locations of the shipment.

A third method of disguising the movement of a shipment is through the use of a telephone voice scrambler. This device, when placed in front of a telephone, will "scramble" the message over the communication link and will produce unintelligible sounds at the other end of the circuit unless a companion device which is matched to the sending device is also available in front of the telephone at the other end. Telephone voice scramblers are therefore available in coded pairs and can be made available in matched sets of more than two units to handle conference calls or calls from a vehicle to different locations.

C. REGULATORY POSITION

1. SYSTEMS ASPECTS

The system that provides the most radiotelephone coverage along the route of the shipment should be selected. After a system has been selected (i.e., Bell or RCC) the radiotelephone selected should have all available channels for the carrier chosen. Further, the telephone shall be dialable and should provide for duplex operation.

2. PREPLANNING

The licensee should preplan the shipment route if he is going to make the shipment; otherwise, he should obtain a preplanned route from the carrier. Routes should be preplanned to use as much radiotelephone coverage as possible. The requirement that transit times be minimized (paragraph 73.30(b)) should be observed; however, making radiotelephone calls is the more desirable feature, and transit times could be somewhat increased to accommodate good radiotelephone coverage. Since all radiotelephone stations may not accept calls from a number which is not in the local directory, calls to each radiotelephone area selected should be made to assure that the operators will accept outside calls. Where radiotelephone coverage is not available without extensive rerouting, conventional telephone calls should be preplanned every two hours when available along the route.

The licensee(s) or agent(s) responsible for communications liaison with the shipment should be predesignated before a shipment is made. A continuously manned telephone with an unlisted number should be provided at the licensee's or agent's facility. This telephone should not be used for any other calls while a shipment is in progress.

Appropriate local law enforcement authorities (LLEA) such as the Head of the State Police, the State Safety Director, or the local State police barracks, should be contacted in advance of a shipment to assure that recovery procedures will be followed and that adequate response forces will be available along the route. Once initial contact has been made it is not necessary to reestablish contact for subsequent shipments through the same jurisdiction except that procedures should be reaffirmed at least annually. The telephone number of the LLEA along the preplanned route of the shipment who will be called in case of an emergency or failure of the transport vehicle to call in should be given to the vehicle crew and the person(s) responsible for maintaining communications with the vehicle crew.

3. COMMUNICATION PROCEDURES

The check point or voice scrambler is preferred to the grid method for concealing the position of a vehicle. The

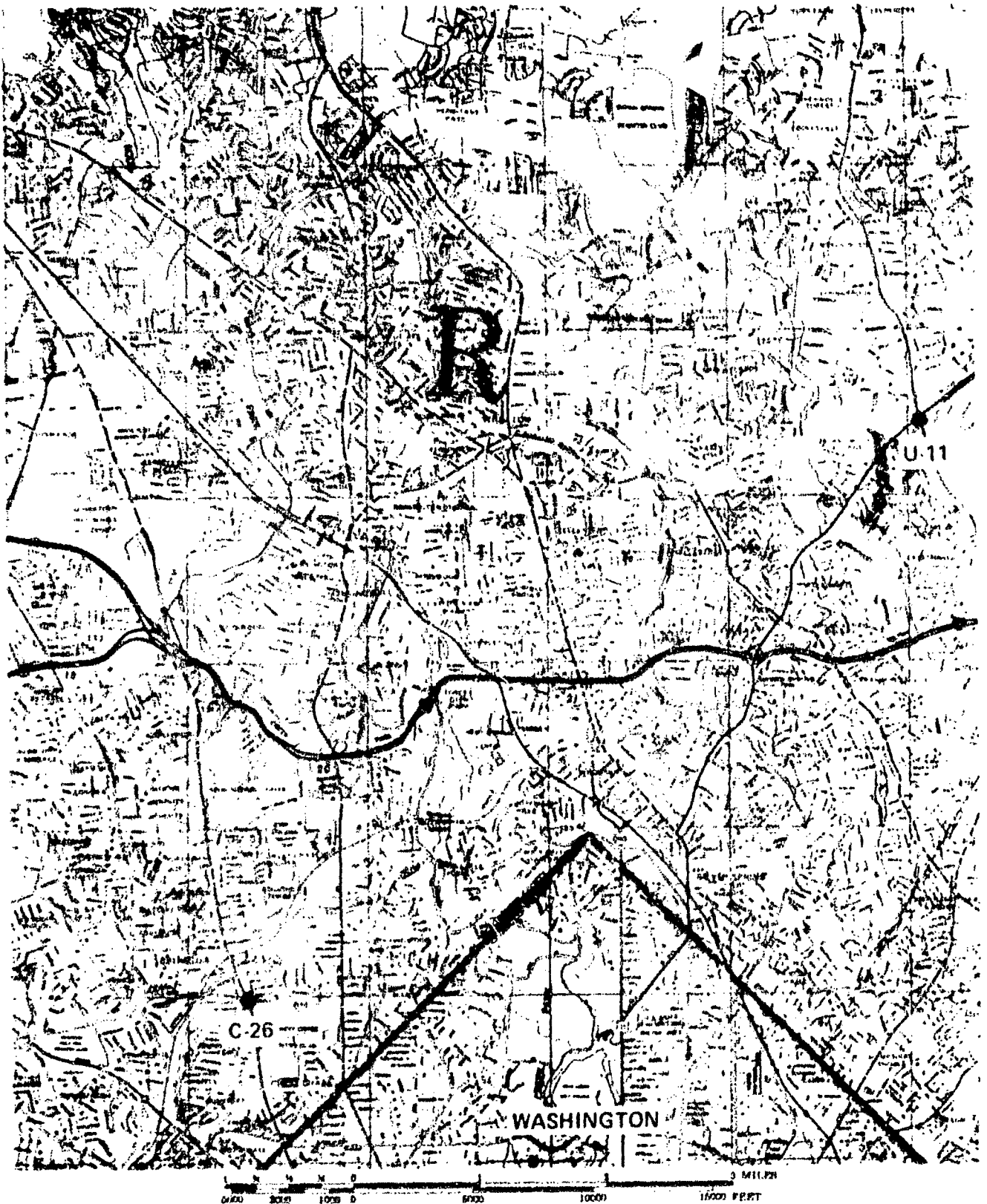


Figure 2. Typical roadmap with grid reference points

grid may offer some operational problem in a moving vehicle. All three methods, however, are considered acceptable for concealing the position of a vehicle. When a scrambler is used, some method of obtaining an accuracy equivalent to that of the grid or check point system should be developed. Maps containing the routes to be used as part of the grid or check point systems should be assembled and distributed to the vehicle crew and to individuals who will be responsible for maintaining communication with the shipment.

The vehicle crew should update their position at least every fifteen minutes so they could communicate their location in case of emergency. Procedures for obtaining telephone channels when all are busy and an emergency exists should be understood and practiced by the vehicle crew.

In cases where a radiotelephone call has been planned and cannot be made because of overcrowded channels, atmospheric interference, or other reason, the vehicle personnel should continue attempts to complete the radiotelephone call and should also plan to make a conventional telephone call as soon as possible. The licensee monitoring call-in's should contact the LLEA where the vehicle last reported, the LLEA where the vehicle is supposed to be, and all intermediate LLEA's within 30 minutes after the scheduled call-in time if communications with the vehicle have not been established. The AEC regional office of the licensee monitoring communications and the AEC regional office for the region in which the vehicle was last reported should also be notified.