

IONIZING AND MICROWAVE RADIATION

GENERAL EDUCATION INFORMATION

1. GENERAL

1.001 This addendum supplements Section 010-150-001, Issue 2.

1.002 It is reissued to:

- Make minor text changes.
- Include the appropriate legend on Page 1 in accordance with AT&T's "Guidelines and Procedures for Safeguarding Information" and Pacific Company's System Instruction (SI) 178.

Note: Marginal arrows used to denote changes are omitted.

1.003 Price and ordering information provided in the previous addendum is retained.

The following changes apply to Part 1 of the section:

- 1.02 — omitted
- 1.04 and 1.05 — revised

1.04 Certain telephone equipment now in use in the Bell System could present an appreciable microwave radiation exposure problem. For instance, power density in the radiation field of a transmitting antenna in a land mobile base transmitter system may exceed the Bell System radiation exposure limits. Likewise, fully equipped TD and TH Microwave Systems operating at present nominal output powers of 1 watt, 2 watts and 5 watts can produce 52 watts in the circular waveguide. The current trend is toward increased transmitter output power. Under these circumstances, the total power in the circular waveguide can reach 160 watts for these fully equipped systems. Special precautions required when working with this amount of power are covered in 6.16(d).

1.05 Areas in certain customer locations may make significant exposure possible. These areas are clearly designated with radiation signs and markings under strict Nuclear Regulatory Commission (NRC), State of California, or Nevada State requirements and are subject to stringent control. Telephone supervision must cooperate with such customers to ensure that all possible safeguards are observed.

3. SOURCES OF RADIATION

The following changes apply to Part 3 of the section:

- 3.03, 3.04, and 3.09 — revised

3.03 *Naturally occurring radioactive materials:* The most widely used naturally occurring radioactive material is radium. In medicine, it is used for certain therapeutic treatments on patients. In industry, radium is used principally for radiography, and also in some luminous compounds. The textile, paper, and printing industries employ polonium or radium as static eliminators. Keep in mind that in NRC-controlled states, naturally occurring radioactive materials can be purchased on the open market without an application. However, in agreement states (with which the NRC has entered into an effective agreement under the Atomic Energy Act of 1954) such as California, and Nevada registration or licensing of these materials is required.

3.04 *Artificially produced radioactive materials:* The NRC is continually producing artificial reactor-produced radionuclides for use by several thousand universities, hospitals, and research laboratories in the United States. The use of these materials, however, is covered by NRC or state licensing. Accelerator-produced radioisotopes, which are not subject to NRC licensing, are distributed by commercial suppliers.

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

Microwave Radiation in Bell System Operations

3.09 The majority of Bell System microwave transmitters, such as the TD, TE, TH, TJ, TL and TM equipment, use low power, 0.1 to 12.5 watts per transmitter; however, the practice of utilizing a single transmitting antenna for several radio transmitters results in some cases in a potentially hazardous power density being present directly in front of these antennas. For this reason, employees are cautioned never to look into an open waveguide which is connected to these transmitters when they are energized. Bell System tropospheric scatter transmitters have a high power output and restricted area precautions have been taken to protect employees from those areas of field intensity which exceed recommended limits as covered in 5.08. Many Bell System land mobile base transmitters operating on multiple channels in the 35, 150, and 450 MHz bands may also cause power densities in excess of these recommended limits to be encountered near the transmitting antennas. When maintenance of or adjustment to a system is required, the system must be turned down before commencing work on the equipment. In this particular case, no attempt should be made to rely upon the protection suit described in Part 6 of this section since the performance of that suit has only been characterized in the microwave region. Military radar installations are the most common source of high-level microwave energy to Bell System personnel. The power output of these systems will continue to increase in the future and, accordingly, so will the hazards due to microwave and ionizing radiation. In general, military authorities operating these systems have established radiation safety programs which Bell System personnel will be required to follow. Nonetheless, specific precautions listed in 6.16 should be observed.

4. BIOLOGICAL EFFECTS OF RADIATION

The following change applies to Part 4 of the section:

- 4.09 — added sentences

4.09 (Add after the last sentence.) These new guidelines introduce for the first time a method of adjusting the Radiation Protection Guide, taking into consideration unusual environmental conditions. However, use of the Temperature-Humidity Index (THI) as defined here appears impractical under field conditions. For this reason,

the earlier guidelines adopted by the Bell System have been retained for the Pacific Company and Nevada Bell. These are covered in 5.08 of this addendum.

5. UNITS OF RADIATION DOSE AND PRESENT LIMITS

The following changes apply to Part 5 of the section:

- 5.08 — revised
- 5.09 — omitted

5.08 Because use of the Temperature-Humidity Index (THI) as defined in this section is impractical under field conditions, the Pacific Company and Nevada Bell have retained, until further notice, the earlier microwave radiation limits adopted by the Bell System. These are based solely on the average power density of the nonionizing radio fields. The limits are in agreement with, or more conservative than, the United States of America Standards Institute, Standard C95.1 — 1966. They are:

- (a) 0-1 mW/cm²: Safe for continuous exposure.
- (b) 1-10 mW/cm²: Safe for exposure on a casual or incidental basis only.
- (c) Above 10 mW/cm²: Areas of this field intensity are considered potentially hazardous.

6. DETECTION, CONTROL, PROTECTION, AND PRECAUTIONS

The following changes apply to Part 6 of the section:

- 6.12(a) — added sentence
- 6.12(b) — omitted
- 6.12(e) — added sentence
- 6.16(d) — revised
- 6.16(e) — omitted
- 6.18 — omit last sentence
- 6.21 — revised

6.12 (a) (Add after the last sentence.) They should be cautioned in the same way when the high voltage rectifiers and modulators are located in a room separate from the transmitting room as ionizing radiation may be present in certain transmitting tubes of high-power transmitters. It is not produced intentionally but is an effect of the very high voltages (15 kV and above) used to "excite" these powerful transmitters.

6.12 (e) (Add after the last sentence.) The decision to use plug-and-jack telephone equipment should be based on an evaluation of existing or potential radiological hazards.

6.16 (d) *Antenna work — hot patching:* The protective clothing described in 6.17 through 6.21 must be worn during all work operations (inside or outside) involving open waveguides and antennas (containing 30 watts or more of power) that are common to any or all microwave systems and are considered "hot" or in service. "Common" refers to the waveguide beyond the first channel dropping filter (toward the antenna). As mentioned in 3.09 (of this addendum), where land mobile base systems are concerned, no work operation should be attempted on these systems before all transmitters are turned down.



Caution: If there is any doubt as to the total power at the point of a "Hot Patch" or the accuracy of waveguide drawings, protective clothing must be worn.

6.18 (Delete reference to Section 010-150-003 in last sentence.)

6.21 Under no circumstances should a suit other than the specified Goodall Rubber Company Wave Guard Suit be used to perform the operations described in 6.16(d). Ordering and price information for the microwave radiation protection garment is as follows:

ORDER WORDING	APPROXIMATE PRICE EACH FOB POINT OF SUPPLY
(Quantity) Suit, Wave Guard (size as No. 1 or No. 2)* furnished by Goodall Rubber Company, New York City, NY	\$62.80

Replacement pieces may be ordered separately as follows:

ORDER WORDING	APPROXIMATE PRICE EACH FOB POINT OF SUPPLY
(Quantity) Hood, No. 5, for Goodall Rubber Company Wave Guard Suit	\$16.20
(Quantity) Coverall, No. 10, for Goodall Rubber Company (Size No. 1 or No. 2)* Wave Guard Suit	\$42.50
(Quantity) Kit, Carrying, WH for Goodall Rubber Company Wave Guard Suit	\$ 4.25

*Size No. 1 — 38 to 44, size No. 2 — 46 to 50.