TYPE OF EXHIBIT: TRANSMITTER EFFECTIVE RADIATED POWER

FCC PART:

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: RLR-460

TYPE OF UNIT: UHF FM Repeater

FCC ID: AIERIT15-460

DATE: November 19, 2002

PROCEDURE:

1. The measurement for effective radiated power was taken at the RITRON, Inc. 3 meter test site, details of which are on file with the FCC.

2. The RLR-460 was aligned for transmitter operation on 457.1125 MHz at the 5.0 watt maximum output power rating for the unit per the tune-up procedure outlined in the Maintenance Manual. The unit was then terminated at the antenna port with the only antenna offered for sale with this product. (The user may connect other antennas, however.)

3. All field strength measurements were made with the Hewlett-Packard Model 8560E and 8559A Spectrum Analyzers and an Electro-Metrics EM-6924 adjustable dipole antenna.

4. The height and polarization of the field strength measurement antenna and orientation of the RLR-460 were varied to provide maximum field strength.

5. A substitution antenna, an Electro-Metrics EM-6924 adjustable dipole, was substituted for the RLR-460 at the RLR-460's location. An RF signal generator was set for the frequency of the RLR-460 with the level at the substitution antenna noted.

6. The polarization of the substitution antenna was adjusted for maximum signal strength at the field strength measuring antenna. The level at the field strength antenna was noted.

TYPE OF EXHIBIT: TRANSMITTER EFFECTIVE RADIATED POWER

FCC PART:

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: RLR-460

TYPE OF UNIT: UHF FM Repeater

FCC ID: AIERIT15-460

DATE: November 19, 2002

EQUATIONS:

The substitution antenna is specified from the manufacturer in terms of antenna factor rather than antenna gain. The conversion is:

Ga(dbd) = 20 log f (MHz) – AF(dB) – 31.9

The effective radiated power (ERP) is then:

ERP(dBm) = Pr(dBm) + Pgen(dBm) – Ps(dBm) – Ga(dBd)

Where:

Pr is the power level of the radio's emission at the receiving antenna output.

Pgen is the RF signal generator level at the substitution antenna input.

Ps is the power level of the substitution antenna emission at the receiving antenna output.

Ga is the gain of the substitution antenna.

The ERP is converted to watts from dBm by:

ERP(watts) = $\text{antilog}_{10}((\text{ERP(dBm)} - 30)/10)$

TYPE OF EXHIBIT: TRANSMITTER EFFECTIVE RADIATED POWER

FCC PART:

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: RLR-460

TYPE OF UNIT: UHF FM Repeater

FCC ID: AIERIT15-460

DATE: November 19, 2002

RESULTS:

Pr (dBm)	Pgen (dBm)	Ps (dBm)	Ga (dBd)	ERP (dBm)	ERP (watts)
+3.0	0.0	-26.0	0.3	+28.7	0.74

TYPE OF EXHIBIT: MAXIMUM PERMISSIBLE EXPOSURE EVALUATION

FCC PART:

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: RLR-460

TYPE OF UNIT: UHF FM Repeater

FCC ID: AIERIT15-460

DATE: February 5, 2003

PROCEDURE AND EQUATIONS:

The ERP values previously calculated will be used to determine the minimum safe distance from the antenna supplied by RITRON in order not to exceed the Occupational Limits of RF exposure.

The ERP must be converted to EIRP to simulate an isotropic radiator:

ERP = 0.74 W For this unit: EIRP = 1.22 W

Power density is related to EIRP:

$S(W/m^2) = EIRP(W)/4\pi r^2$ where r is distance from the source in meters. Rearranging for distance:

$r = SQRT (EIRP/4\pi S)$.

The MPE limit for a device operating in a General Population/Uncontrolled environment is f (MHz)/1500 mW/cm^2 which for this product at the upper band edge is 0.31 mW/cm^2.

For the equation above, mW/cm^2 must be converted to W/m^2. Since 1 mW/cm^2 = 10 W/m^2, the FCC limit is 3.1 W/m^2.

Substituting and solving for distance:

r = 0.18 meters (18 cm) or 7 in.

The MPE for General Population/Uncontrolled environment is met at a distance of 18 cm (7 in.). This is less than the 20 cm minimum distance users would be expected to be from the antenna. Therefore, since power density decreases with the square of distance, users would be exposed to less than the MPE at the 20 cm minimum distances and greater.

TYPE OF EXHIBIT: RF WARNING STATEMENT

FCC PART:

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: RLR-460

TYPE OF UNIT: UHF FM Repeater

FCC ID: AIERIT15-460

DATE: February 5, 2003

STATEMENT:

The following statement appears in the User/Maintenance Manual regarding RF safety:

This product has been evaluated for compliance with the maximum permissible exposure limits for RF energy at the maximum power rating of the unit and with the whip antenna available from RITRON. To ensure compliance with General Population/Uncontrolled maximum exposure limits, all persons must be at least 20 cm (7.9 inches) from the antenna while the unit is transmitting. Other antennas may require lesser or greater distances to meet the limits depending upon their gains relative to that tested. Higher gain antennas are capable of yielding a higher RF energy density in the strongest part of their field and would, therefore require a greater separation from the antenna.