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* Final version of Instruction Manual will be forwared as soon as possible.

I. Technical Report Pursuant to 15.44

A. Name and Address of Manufacturer

Racon, Inc.
12628 Interurban Avenue South
Seattle, WA 98168

B Trade Name and Marketing Company

Trade Name: Racon 16000
Company: Racon, Inc.
12628 Interurban Avenue South
Seattle, WA 98168

C. Model Number

Model No. 16000

D. List of Additional Model Numbers and/or Trade Names:

None

E. Draft Instructions to be Supplied to User:

See Exhibit A.

II. Expository Statement Pursuant to 15.45

A. Block Diagram of Model 16000

See Exhibit B and C.

B. Statement of System Operation and Specifications

The Model No. 16000 Field Disturbance Sensor Transmitter is designed to provide a microwave source pattern of energy. When received by an associated receiver, this pattern provides an invisible zone of intruder detection

Typical system application would provide a perimeter protection zone around high risk or theft areas. Principle of detection depends on observing the received changes in subcarrier amplitude caused by slight changes in signal strength (a dynamic multipath environment caused by a moving target), a momentary or fixed blockage, attempted signal jamming by a foreign transmitter, or by tampering with the system.

The Model No. 16000 is housed in a metal enclosure designed to provide RFI and weather protection. The design incorporates a GaAs F.E.T. dielectric resonator oscillator coupled through the Racon waveguide bandpass filter to generate microwave energy.

No user adjustments are provided for critical parameters of radiation such as power out, frequency or antenna configuration.

SPECIFICATIONS

MICROWAVE FREQUENCY: 10.525 GHz ± 0.025 GHz

MICROWAVE OUTPUT: Less than 0.25 volt/meter @ 30 meters

ANTENNA PATTERN: Approximately 8.5 degrees horizontal and vertical beam width at -3dB points.

ANTENNA POLARIZATION: E-Plane Vertical

MODULATION: Class A2

MODULATION FREQUENCIES: 6 FIELD SELECTABLE CRYSTAL CONTROLLED CHANNELS

OPERATING TEMPERATURES: -30 degrees C to +60 degrees C

POWER ON INDICATOR: LED

POWER INPUT: 12 VDC (less than 360 M.W. continuous power dissipation per half system)

TAMPER CIRCUIT: Normally closed and open. (Contact ratings: 28 VDC @ 1 amp, 110 VAC @ 3 amps).

SIZE: 17 x 17 x 11/4 ~~12 1/4 x 12 1/4 x 11 1/4~~

WEIGHT: 7 pounds

MOUNTING: Designed for attaching to 3 1/2" O.D. pipe

RACON PART NO: 10053-001-01

C. Circuit Diagram

See Exhibit D and E

D. Description of Circuit Operation

See Exhibit F

E. Description of R.F. Source, Filter and Antenna

Shown from left to right are feed horn, waveguide filter, and D.R.O. RF source.

The D.R.O. source is a highly frequency stabilized GaAs F.E.T. device capable of producing in excess of 2 milliwatts of RF energy with 4 volts D.C. applied.

The filter Racon P/N 10002-001-02, has also been used in the Racon Model 13000, 14000, and 17000 FCC certified systems. The filter has been tested by the Hewlett-Packard Company with the following results: "At 15 GHZ the isolation reached 85 dB. At 21 GHz the signal through the filter was below the noise. Isolation exceeds 85 dB." In addition, absorbent material is inserted at the filters input.

The antenna, Racon P/N 10038-104-01 is a Racon designed SPLASH PLATE FEED used as the primary feed for a 12" diamter parabolic reflector. 3 dB beam width for this vertically polarized system is less than 8.5 degrees vertically and

horizontally. Please see photos for mechanical orientation of antenna system.

III. Photographs Pursuant to F.C.C. 15.46

A. Exterior Appearance

Model 16000 mounted on 3 1/2" O.D. Pipe

B. Construction

Model 16000 showing two major mechanical components. (Parabolic Reflector and Electronics Enclosure.)

A >

The Racon 16000 parabolic and enclosure are constructed from [illegible] aluminum. All external fasteners are of stainless steel including two 3 1/2" pipe clamps used to attach each unit to a fixed position mounting pole. The primary feed for the antenna is brass, the waveguide filter zinc, and the Radome is plexiglas.

C. Component Placement and Controls

B >

The user has access to the printed circuit board through the hinged door in the electronics enclosure. User controls include a code programming plug used to select a psuedorandom code sequence and a channel select rotary switch to determine the clock frequency. Other transmitter controls are: two inputs to control test signal and one pot (R10) to control the amplitude of the test signal. Other receiver controls are alarm

duration (R80), multipath sensitivity (R40), and a jumper (5-3) which will determine if the alarm operates in a timed or latched mode. Also both units have outputs from a tamper circuit used to notify of unauthorized entry into the electronics enclosure.

See next two pages for component placement.

D. Label Context and Location Information

The Identifier label for both the transmit and receive half are located on the inside surface of the electronic enclosure access door of each associated unit. In addition, a silkscreen is used to apply the text

Racon, Inc.
Seattle, Washington
98168
Model 16000

FCC ID B2N 9CL 16000

to the BACK UPPER CORNER - of the outside of the ELECTRONIC ENCLOSURE. For context of identifier label see next two pages.

IV. Report of Measurement Pursuant to Sub-Part F

A. Operating Frequency. All Model 16000 R.F. sources are adjusted for fundamental frequency compliance. Each unit is set to 10.525 GHz using the test set-up as in the diagram below.

Spectral analyzes of the 16000 transmitter are shown below.

Model No. 16000 Frequency Spectrum from HP 141T
Scanwidth: 2 Mhz/Div.
Center Frequency: 10.525
Display: 10 dB Log

Test Method

1. Allow unit under test to reach normal operating temperature.

2. Adjust R.F. source to 10.525 GHz as read from HP 5343A Microwave Frequency Counter.

3. Apply pulse modulation with proposed transmitter board and photograph.

B. Permitted Band of Operation
(Frequency Stability vs. Temperature)

Instrumentation

Test Method

1. Instrumented as diagrammed unit was allowed to soak at -30 degrees C for two hours after which time frequency was recorded.

2. Thereafter the chamber was allowed to stabilize at each desired temperature and soak one hour minimum before frequencies were recorded.

3. D.C. voltage input was varied ± 15% at each temperature and recorded.

Results:

C. Emission Limitations

1. Fundamental Power Measurement.

Power output from the Model 16000 transmitter was set and measured at +2 dBm using an HP 431 Power Meter and waveguide thermistor mounted on the output of the R.F. source/filter combination. Power was then measured at 30 meters with a calibrated HP Spectrum Analyzer, coax, and coax adaptor attached to an 18 dBi gain horn.

Results:

Using the relationships

Where P = power density in watts/meter^2
P = received power in watts
A = effective area of receive antenna in meters^2
E = electric field strength in volts/meter
Z = free space intrinsic impedance = 377 ohms
= wavelength of transmitter frequency in meters = .0285
g = power ratio gain of receive antenna = 18
A = .0039 METERS^2

The electric field strength can be calculated from -46 dBm received average power then converting to watts 2.5×10^{-8} watts. Giving 2.5×10^{-8} watts times 377 ohms/.0039 effective area of 18 dBi horn = E . Or 2.5×10^{-8} times 377/.0039 = E = 49,000 microvolts/meter this falls into compliance of not exceeding 250,000 microvolts per meter.

2. Second Harmonic Measurement.

These measurements were done in essentially the same manner as fundamental field strength except a 15 dBi (Waveline type 899) K Band horn coupled to an HP Spectrum Analyzer was used. Due to extremely low signal level of the second harmonic this measurement WAS BEYOND THE CAPABILITIES OF THESE INSTRUMENTS INSURING A MINIMUM OF 25 DB SUPPRESSION OF SECOND HARMONIC.

3. Third Harmonic.

This measurement was made like second harmonic except waveline type 1099 15 dBi. A band horn was substituted. Third harmonic was below the capabilities of measurement at any range. Thus third harmonic is of very inconsequential level.

4. Spurious Emissions.

The frequency spectrum was swept from the lowest modulation frequency 19.0 KHz to 18 GHz and no spurious responses were found. This was accomplished by setting the spectrum analyzer noise floor at -60 dBm and noting any images found and comparing to any frequencies developed in the Model 14036.

5. Total RF Output Power.

Total RF power was measured by mounting a Hewlett Packard waveguide thermistor on the output side of the Bandpass Filter. Total power was set at -1 dBm average at this point.

6. Power Input - D.C. to Source.

The D.R.O. is being driven by switched 5 volts D.C. drawing nominally 30 mA while in the ON state.

V. A. Location of Test Site

The range for all measurements was an open outside area adjacent to the Racon Engineering Facility.

B. Physical Description and Characteristics of the Test Site

The test site was a level asphalt surface. There were no structures within five times the source to receiver distance on the beam centerline at the time of measurement. See diagram and photos of test site.

C. Description of Supports.

The unit under test was mounted on a 3 1/2" diameter steel post 54" above ground level. The receive horns were held in place with a panavise mounted on a tripod. This arrangement gave maximum portability with minimal field disturbance and good control of alignment.

D. List of Equipment Used and Calibration Dates.

Device	Serial Number	Last Calibrated
HP Spectrum Analyzer 8555A	1262	3-30-84
HP Thermistor X 486 A	RJH 7	2-84
HP Power Meter 432 A	1848A0749	2-28-84
HP Microwave Frequency Counter 5343 A	2148A00599	3-9-84
HP Waveguide Termination X910 B	-----	------
HP Mixer 11517 A	-----	------
HP Waveguide Adaptor 11519 A	-----	------
HP Waveguide Adaptor 11520 A	-----	------
HP Thermistor K 486 A	04084	2-84
Associated Environmental Systems Environmental Chamber BK-1108	5913	------
Racon 18 dBi Horn 10.5 GHz 10000-224-01	-----	------
Waveline K Band Horn 15 dBi 21 GHz 899	-----	------
Waveline A Band Horn 15 dBi 31.5 GHz 1099	-----	------

E. Statement of Facilities Availability

The Racon, Inc. test facility is normally available for other persons or companies at prevailing costs and terms. Racon, Inc. reserves the right to approve or disapprove such usage at any time.