

Telephone

+1 925 837 2243

Facsimile

+1 925 837 2298

Peninsula Engineering Solutions, inc. may change specifications as necessary to meet industry requirements.

## RF-8000E Repeater

### Microwave RF Repeater Systems

### Applications

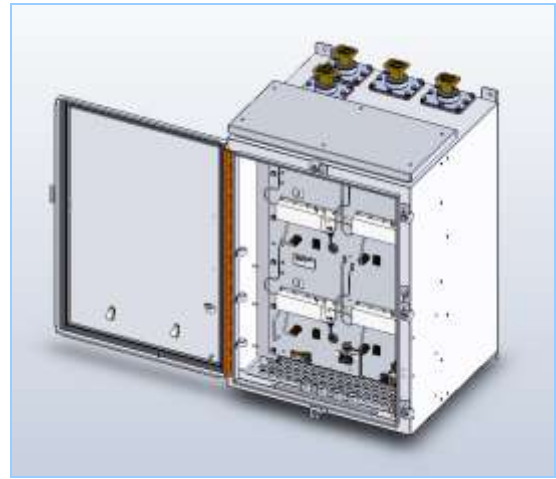
- Low-cost, highly reliable 8-GHz microwave through repeater for extending range of or clearing obstructed microwave radio paths.
- Excellent performance with digital, or video microwave radios; channel capacity to 2688 PCM (4 DS3 or 180 Mb/s), OC-3, STS-3, STM-1 (155.52 Mb/s), Internet Protocol (200 Mb/s), multiple video or mixed traffic.
- Compatible with any manufacturer's 8-GHz radio terminal.
- Solar and wind power compatible -- economical in light to heavy routes and remote locations.

### Features

- Power Amplifier RF output power up to +30 dBm, 1.0 Watt.
- Power consumption only 30 Watts, solar rated, at +12 VDC for 2-amplifier, standard-power, duplex operation.
- Solar powered, hybrid solar and wind powered, ac powered, or other alternative energy electrical power sources.
- Compact and lightweight -- ideally suited for remote sites that do not have access roads or commercial power.
- Environmentally protected aluminum, weathertight, lockable cabinet. No extra environmental shelter required in most installations. Suitable for use at unimproved sites anywhere in the world -- Alaska to Saudi Arabia.
- Internally protected duplex (FDD), frequency diversity, space diversity and three-way or "Y junction" system configurations are available.
- Only one active element per channel, the internally redundant linear amplifier.
- AGC/ALC provided to correct input fades, regulate output power and reduce overload.
- Adaptable to new radio modulations and capacities as technology advances.
- RMAS-120 Alarm system (optional) can remotely monitor repeater.
- Equipped with directional couplers for in-service RF output power measurements.
- No frequency conversion -- received signal is filtered, amplified, and re-radiated.
- Very reliable, greater than 85,000 hours MTBF for 1+0 duplex.
- Available as a self-contained RF repeater for use with customer-furnished antenna and power equipment or as a complete package including repeater, antenna, photovoltaic modules, battery charger and batteries.



**Figure 1 RF-8000E Solar Powered Repeater**

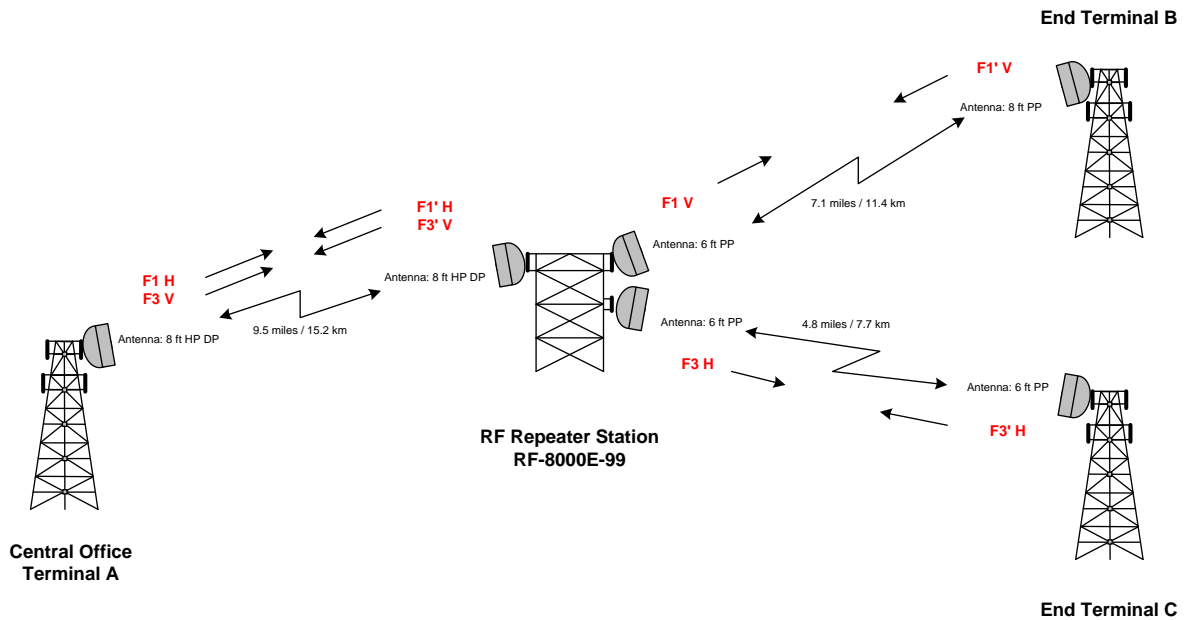


**Figure 2 RF-8000E with Weathertight Enclosure**

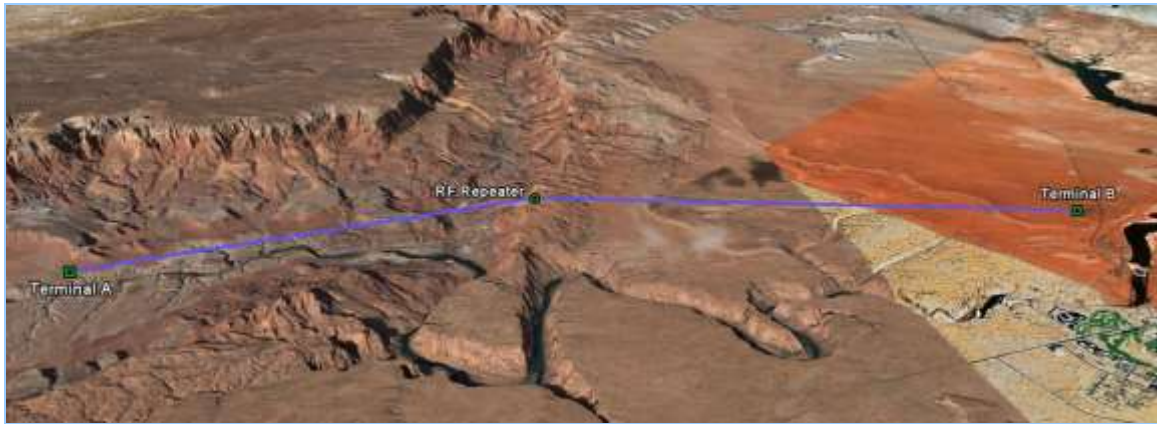


**Figure 3 RF-8000E Y-Junction Repeater, 3-Hops**

An RF-8000E-99 repeater is used to provide links to two end terminals located in a mountainous region. The repeater site's high elevation provides a vantage point where clear, line-of-sight paths to each microwave terminal exist. A photovoltaic and wind turbine power system operates the repeater at this remote location. Site access is by four wheel drive vehicle.



**Figure 4 Y-Junction Repeater Network**



**Figure 5 RF Repeater Clearing an Obstructed Path, 2-Hops**

The path between Terminal A and Terminal B is obstructed by a ridge at the edge of a canyon. An RF-8000E repeater is located on the ridge where line-of-sight paths to both terminals exist. The repeater site is isolated, requiring four wheel drive vehicles for access. Photovoltaic system provides operating power for the repeater. The repeater site in this example is shown in the figure below.



**Figure 6 RF Repeater Installation with Solar Power**

## RF-8000E Microwave RF Repeater

### General

|  |                          |
|--|--------------------------|
| Frequency Range                        | 7.7 ~ 8.5 GHz            |
| Linear Amplifier Gain, L1 <sup>1</sup> | 58 dB typ., 56 dB min.   |
| Linear Amplifier Gain, L2 <sup>1</sup> | 63 dB typ., 61 dB min.   |
| AGC/ALC                                | 15 dB down, 5 dB up fade |
| Noise Figure <sup>1</sup>              | 5 dB at max gain         |
| Antenna Ports                          | WR112 waveguide          |

|             |         |
|-------------|---------|
| W/G Flange  | CPR112G |
| Return Loss | ≥ 26 dB |

### Nominal Transmit Power<sup>1,2</sup>

| Modulation      | Level 1  | Level 2  |
|-----------------|----------|----------|
| FM/FSK/MSK      | 26.0 dBm | 30.0 dBm |
| 4QAM/QPSK/OQPSK | 24.0     | 28.0     |
| 16QAM           | 20.0     | 24.0     |
| 32QAM           | 18.0     | 22.0     |
| 64QAM/64TCM     | 16.0     | 20.0     |
| 128QAM/128TCM   | 14.0     | 18.0     |
| 256QAM          | 13.0     | 17.0     |
| 512QAM          | 12.0     | 16.0     |
| 32TCM           | 17.0     | 21.0     |
| 256TCM          | 12.0     | 16.0     |

### Frequency Plan

|                   |  |
|-------------------|--|
| Channel Bandwidth | 30 MHz – High Capacity<br>15 MHz – Low ~ Medium <sup>3</sup> |
| T-R Spacing       | 80 MHz, min.   |
| T-T Spacing*      | 56 MHz, min  |

\* on common feeders

<sup>1</sup>: Not including branching losses, see Operations Manual.

<sup>2</sup>: See Operations Manual for more details. Modulations listed are a sample only, contact PESi for more.

<sup>3</sup>: RF-8000EL – Low ~ Medium Capacity

### Channel Response: High Capacity, Equalized

|             |                              |
|-------------|------------------------------|
| Amplitude   | ± 0.5 dB, $f_0 \pm 15$ MHz   |
| Group Delay | 5 nsec P-P, $f_0 \pm 15$ MHz |

### Channel Response: High Capacity, Un-Equalized

|             |                               |
|-------------|-------------------------------|
| Amplitude   | ± 1.0 dB, $f_0 \pm 15$ MHz    |
| Group Delay | 15 nsec P-P, $f_0 \pm 15$ MHz |

### Channel Response: Low ~ Medium Capacity, Un-Equalized<sup>3</sup>

|             |                                |
|-------------|--------------------------------|
| Amplitude   | ± 1.0 dB, $f_0 \pm 7.5$ MHz    |
| Group Delay | 15 nsec P-P, $f_0 \pm 7.5$ MHz |

### Power Requirements: Duplex, 2 Amplifiers

|                            |                            |
|----------------------------|----------------------------|
| Nominal Voltage            | +12 VDC (+24 VDC Optional) |
| Voltage Range              | +11 ~ +16 VDC              |
| Power Consumption, Level 1 | 30 W, Solar Rated          |
| Power Consumption, Level 2 | 35 W, Solar Rated          |
| Polarity                   | Negative Ground            |

### Dimensions: 1+0, 1+1 and 2+0 Configurations

|        |  |
|--------|--|
| Height | 36.74 in, 933 mm   |
| Width  | 23.25 in, 591 mm   |
| Depth  | 22.82 in, 580 mm   |
| Weight | 90 lb, 41 kg – 1+0<br>111 lb, 50.5 kg – 1+1, 2+0<br>119 lb, 54 kg – 2+0 4-Port |

### Reliability

|      |                     |
|------|---------------------|
| MTBF | 85,000 hours        |
| MTTR | 30 minutes, on-site |

### Environmental

|                     |                        |
|---------------------|------------------------|
| Ambient Temperature | -40° C ~ +60° C        |
| Relative Humidity   | 90% - Housing Internal |

|                   |   |
|-------------------|---|
| Altitude          | 100% - Housing External<br>15,000 feet, 4600 meters |
| Enclosure Housing | Weathertight Aluminum                               |

Telephone  
+1 925 837 2243  
Facsimile  
+1 925 837 2298

Peninsula Engineering Solutions, inc. may change specifications as necessary to meet industry requirements.

