PENINSULA·ENGINEERING SOLUTIONS inc

no power lines | no shelters | no roads
just great microwave reliability.

World Headquarters
39 Grand Canyon Lane
San Ramon,
California 94582 USA

Telephone
+1 925 901 0103
Facsimile
+1 925 901 0403

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RF-11000 Repeater

Microwave RF Repeater Systems

Applications

- Low-cost, highly reliable 11-GHz microwave through repeater for extending range of or clearing obstructed microwave radio paths.
- Excellent performance with analog, digital, or video microwave radios; channel capacity to 2400 FDM, 2688 PCM (4 DS3 or 180 Mb/s), OC-3, STM-1 (155.52 Mb/s), Internet Protocol (200 Mb/s), multiple video or mixed traffic.
- Compatible with any manufacturer's 11-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 +32 dBm, 1.5 Watts.
- Power consumption only 65 Watts, solar rated, at +24 VDC for 2-amplifier, 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-11000 Solar Powered Repeater

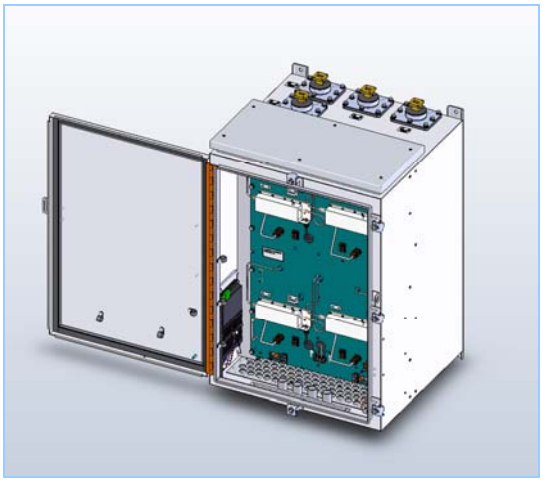

Figure 2 RF-11000 with Weathertight Enclosure

Figure 3 RF-11000 Y-Junction Repeater, 3-Hops

Two RF-11000 repeaters are 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 repeaters at this remote location. Site access is by four wheel drive vehicle.

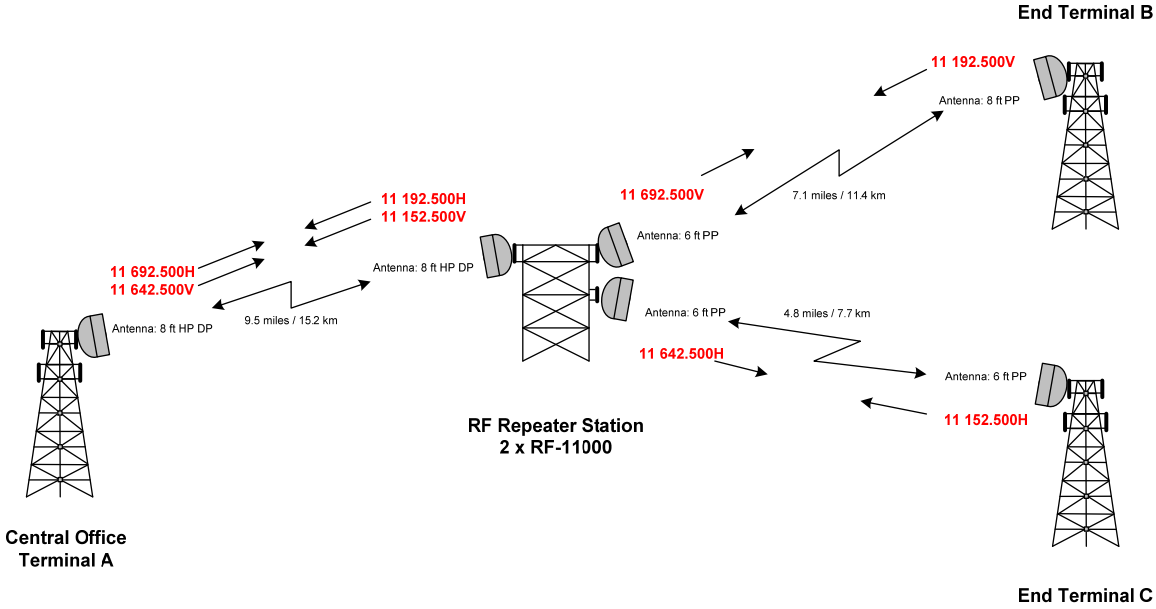

Figure 4 Y-Junction Repeater Network

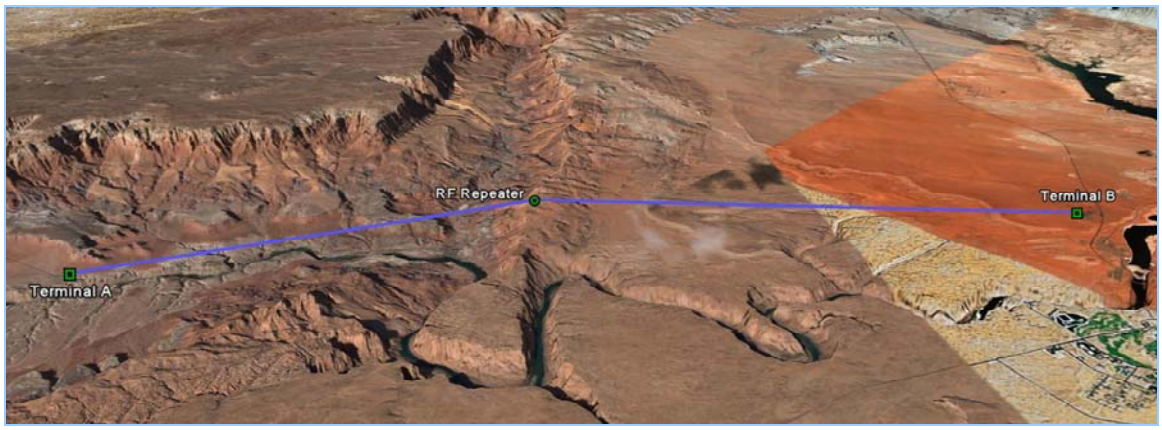

Figure 5 RF-11000 Clearing an Obstructed Path, 2-Hops

The path between Terminal A and Terminal B is obstructed by a ridge at the edge of a canyon. An RF-11000 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-11000 Repeater Installation with Solar Power

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RF-11000 Microwave RF Repeater

General

Frequency Range	10.7 ~ 11.7 GHz
Linear Amplifier Gain[1]	63 dB typ., 61 dB min.
AGC/ALC	15 dB down fade 5 dB up fade min.
Noise Figure[1]	3.5 dB at max gain
Antenna Ports	WR75 waveguide
W/G Flange	WR75, Cover
Return Loss	≥ 26 dB

Nominal Transmit Power[1, 2]

FM/FSK/MSK	32.0 dBm
4QAM/QPSK/OQPSK	30.0
16QAM	26.0
32QAM	24.0
64QAM/64TCM	22.0
128QAM/128TCM	20.0
256QAM	19.0
512QAM	18.0
32TCM	23.0
256TCM	18.0

Frequency Plan

Channel Bandwidth	40 MHz – High Capacity 20 MHz – Low ~ Medium[3]
T-R Spacing	130 MHz, min.
T-T Spacing*	80 MHz, min

* on common feeders

[1] : Not including branching losses, see Operations Manual.

[2] : See Operations Manual for more details. Modulations listed are a sample only, contact PESi for more.

[3] : RF-11000L – Low ~ Medium Capacity

Channel Response: High Capacity, Equalized

Amplitude	± 0.5 dB, f_0 ± 20 MHz
Group Delay	5 nsec P-P, f_0 ± 20 MHz

Channel Response: High Capacity, Un-Equalized

Amplitude	± 1.0 dB, f_0 ± 20 MHz
Group Delay	10 nsec P-P, f_0 ± 20 MHz

Channel Response: Low ~ Medium Capacity, Un-Equalized[3]

Amplitude	± 1.0 dB, f_0 ± 10 MHz
Group Delay	10 nsec P-P, f_0 ± 10 MHz

Power Requirements: Duplex, 2 Amplifiers

Nominal Voltage	+24 VDC
Voltage Range	+19 ~ +30 VDC
Power Consumption	65 W, Solar Rated
Polarity	Negative Ground

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

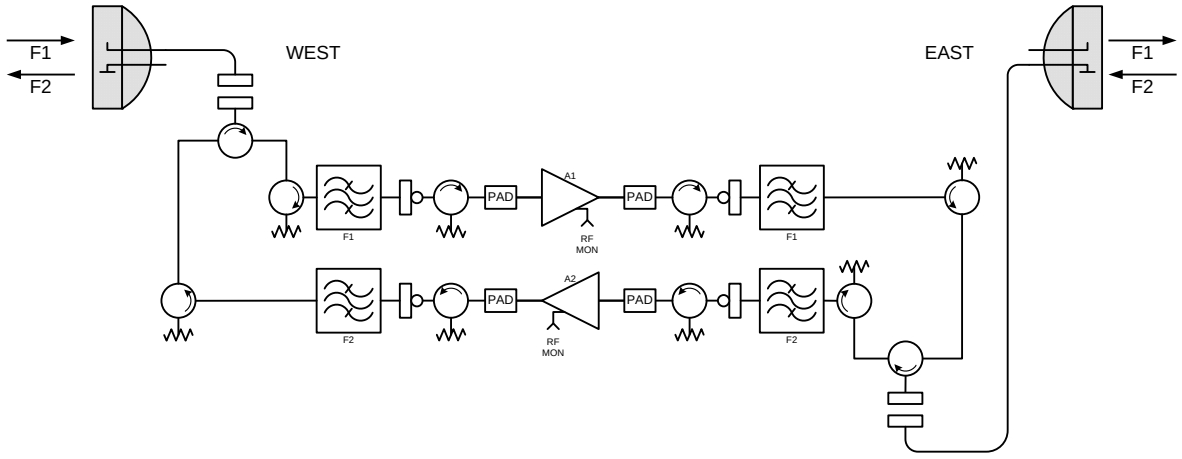
Height	36.20 in, 920 mm
Width	23.25 in, 591 mm
Depth	22.82 in, 580 mm
Weight	112 lb, 51 kg – 1+0 124 lb, 56.5 kg – 1+1, 2+0 130 lb, 59 kg – 2+0 4-Port

Reliability

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

Environmental

Ambient Temperature	-40° C ~ +60° C
Relative Humidity	90% - Housing Internal 100% - Housing External
Altitude	15,000 feet, 4600 meters
Enclosure Housing	Weathertight Aluminum



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