Microwave RF Repeaters carry OC-3 Traffic

Introduction

A frequently heard question by the technical staff at Peninsula is: “Can the microwave RF Repeater handle OC-3 rates?” Peninsula Engineering Solutions is pleased to report that many of our repeaters do support OC-3 rates.

The 6, 7, 8 and 11 GHz repeaters plus certain 4 and 4.5 GHz repeaters support 155.52 Mb/s, also known as OC-3. Associated PDH and SDH traffic signals are STS-3 and STM-3.

Repeaters are a natural for higher capacity

RF repeaters are designed to support the available bandwidths and capacities in each microwave radio communications band. Repeaters with 28 ~ 30 and 40 MHz bandwidths are compatible with terminals radios that carry 155 Mb/s.

As the terminal traffic capacity increases in the same radio bandwidth channel, the repeater can most often support this higher capacity. Adjustment to the repeater transmit power setting may be required to conform to the terminal modulation.

Radio communications regulatory agencies rarely change the channel bandwidth in the microwave bands, as this would cause major disruption to existing services. The radio manufacturers are forced to devise better modulations with more complexity to pack the greater capacity into a given microwave channel. Since the channel bandwidth doesn’t change, the microwave RF repeater will support the new capacity.

Modulation and Transmit Power

As the modulations grow in complexity or number of states, the carrier power peak-to-average ratio increases. All power amplifiers must be operated to accommodate the peak-envelope-power with enough margin to keep the intermodulation products low enough to cause little harmful degradations to the signal quality. Complicating the power setting equation is that the more complex modulations require even more attenuation of these intermodulation products.

The linear amplifiers used in the microwave RF repeaters are designed to be flexible about the transmit power operating level. A simple adjustment to the ALC power set point is all that is needed to control the output power.

Higher power level amplifiers are available in the 6, 7 and 8 GHz bands specifically to support the higher capacity microwave links.

Some examples of 155 Mb/s power settings for the RF-6000E/EW, the most popular RF repeater.

Model	Modulation	Tx Power
RF-6000E-41	128 TCM	18.4 dBm
RF-6000E-41	128 QAM	17.0 dBm
RF-6000EW-51	64 QAM	18.0 dBm

Parallel and Multi-Line Links

When one OC-3 link is not enough, the radio planners often will add a second or more radios in parallel on the same hop. Microwave RF repeaters have the same capability to add radio channels in parallel. The greatest number of microwave channels in current equipment is eight. Multi-line configurations can partition the channels in a 7+1 protection arrangement.

Channel Equalization

The higher traffic capacity links are more demanding on the channel quality. To improve the performance, optional delay equalizers may be provisioned in most repeaters. The RF-6000EW and RF-11000 repeaters always use equalizers.

Multi-hop tandem repeaters should be equipped with delay equalizers.

Repeater compatibility list

Repeater models compatible with 155 Mb/s rates are:

- RF-4000 40 MHz Ch Plan
- RF-4500 40 MHz Ch Plan
- RF-6000E 30 MHz Ch Plan
- RF-6000EW 40 MHz Ch Plan
- RF-7000E 28, 30 MHz Ch Plans
- RF-8000E 28, 30 MHz Ch Plans
- RF-11000 40 MHz Ch Plan

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