

# Variable Rate Modem

Terrestrial Microwave Modem for High Speed Data



## Applications

- High capacity data carrier for Studio-to-Transmitter Links and Transmitter-to-Studio Links
- Satellite Backhauls

## Features

- Internal One to Four Channel Multiplexer
- Up to Four User-Selectable Data/Overhead Interfaces
- Data Rates from 1 to 200 Mbps
- 4, 16, 32, 64, and 128 QAM Operation
- Space Diversity Option
- Ideal for New Microwave Links, Upgrades or Retrofits
- High Resistance to Fading
- Wayside and/or Overhead Options
- Simplex or Duplex Configurations
- Bandwidth efficiency using 1 to 4 IF carriers

## OVERVIEW

This innovative and highly flexible platform can be configured for data rates between 1 and 200 Mbps. The unit allows complete control over the modulation density and channel bandwidth for efficiencies up to 6 Bps/Hz. The unique architecture of the modem's IF allows large improvements to fading and multipath via multiple digital equalizers.

The MRC Modem is an ideal solution for both new and retrofit microwave link installations. Maximum flexibility is achieved by an internal data multiplexer that combines up to four user selectable data paths into a single data stream. Interface choices for each include DS3, E3, STS-1, and DVB-ASI, SMPTE 310M, Parallel, Overhead and T1/E1(Wayside). The IF can be configured with 1 to 4 channels, each with 12 tap equalizer providing total flexibility. Each multiplexed channel can operate up to 7 Mbaud.

## System Benefits

MRC's Variable Rate Modem combined with MRC's DAR Plus Radio platform allows the user an efficient utilization of channel bandwidth with maximum overall system link budget characteristics while still maintaining application flexibility. The user can configure the application by choosing from a variety of interface cards and complex modulation schemes to match his microwave system link budget requirements. Such applications include digital electronic newsgathering back haul links and single to multiple DS3/E3/T1/E1 distribution/contribution links.

The built in packet based multiplexer of the Variable Rate Modem is ideal for applications that require drop and insert of signals within a microwave network.

As a complete system, the MRC DAR Plus Radio and MRC Variable Rate Modem can be configured for multihop, repeating, simplex, duplex and space diversity applications.

## RELIABILITY

The MRC Variable Rate Modem is rich with features designed to maximize the integrity of your data service. The Reed-Solomon decoder provides superior error correction while the adaptive equalizers provide superior protection from frequency selective fading and multipath.

Optional space diversity switching can provide higher than normal protection via the units ability to predict and switch before data errors occur.

Additional features include the choice of remotely interfacing through one of three on board connections: Ethernet (SNMP), RS485 or an externally-controlled RS232 terminal. The front panel offers push-button control of all features and a backlit LCD display. Menus are specifically designed for ease of use and quick on line operation as well as changes in configuration.

## SPECIFICATIONS

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*Front panel selectable.*

Total Data Rate: ..... Variable from 1-200 Mbps total  
in 1 bps steps\*

*Note: Interface selection may limit maximum data rate.*

Total Baud Rate: .....up to 28 Mbaud  
depending upon number of IF channels installed

IF Channels: ..... 1 to 4

IF Channel Baud Rate: .....3.5 to 7 Mbaud Per Channel

IF Channel Spacing: .....1.15 to 1.4 times channel baud rate.  
1.25 nominal\*

Mux/Demux: .....One to four\* data channel DVB compliant

Modulation: .....4, 16, 32, 64, 128 QAM\*

FEC: .....204/188 Reed Solomon

FEC/Mux Overhead: .....204/184 (204/188  
for DVB Framed Interface)

Adaptive Equalizer: .....12 tap DFE and 8 tap FFE  
(One per IF Channel)

IF Range: .....50 to 90 MHz\*

IF Return Loss: .....20 dB

Tx Output Power: .....0 to -25 dBm in 0.1 dB steps\*

Spurious Output: .....-55 dBc in band

Rx Input Power: .....0 to -25 dBm.

Frequency Stability: .....10 ppm

Carrier Acquisition: .....±400 KHz or ±10%  
of channel baud rate, whichever is less

Rx Data Buffer: .....0 to ±2 Mbits

Remote Control: .....SNMP  
RS485/232  
Modem Drives External Terminal

Chassis Size: .....2 RU (3.5")

Power: .....85-264 Vac, 50/60 Hz

Environmental: .....0 to 50 o C

Compliance: .....CE mark

### OPTIONS:

- -48 Vdc, +24 Vdc
- Simplex Configuration: Modulator Only
- Simplex Configuration: Demodulator Only
- Space Diversity: Demodulator Only
- Additional Modulator IF Channels: Up to 4 per Chassis
- Additional Demodulator IF Channels: Up to 4 per Chassis

### OPTIONAL DATA INTERFACES:

- G.703, DS3, E3 or STS-1\*
  - DVB ASI (normal or advanced)
  - RS422 Parallel, DVB-SPI Parallel, M2P\*
  - LVDS Parallel, DVB-SPI Parallel, M2P\*
  - Other interfaces available upon request
- Note: Up to 4 interfaces per chassis. Any combination can be installed and operated by front panel control. Only one interface can be configured for DVB framed data.*

### OPTIONAL WAYSIDE CHANNEL INTERFACES:

- Orderwire—can be configured for eight DS0s or seven DS0s plus one Audio\*
- T1 or E1 (Wayside)\*

### HOW TO CALCULATE 3 DB BANDWIDTH OF THE MRC VARIABLE RATE MODEM MODULATED CARRIER

1. Find combined interface data rate:  
DR C = Interface 1 Data Rate + Interface 2 Data Rate + Interface 3 Data Rate + Interface 4 Data Rate
2. Find Total Data Rate plus R/S and mux overhead: DR T = DR C x (204/184)
3. Find Channel Baud Rate: BR C = DR T / (QAM X N C)  
Where Nc = number of channels (one to four)  
And QAM = .....2 for 4 QAM  
.....4 for 16 QAM  
.....5 for 32 QAM  
.....6 for 64 QAM  
.....7 for 128 QAM
4. Select Channel Spacing: C S = from 1.15 to 1.4 times channel baud rate.  
This number is normally 1.25 but can be set to any number between 1.15 and 1.4.
5. Total 3 dB bandwidth = BR C x C S x (N C - 1) + BR C

