



# TwinStream



## Dual Carrier Analog/Digital Microwave System

### Overview

TwinStream was first introduced in 1998 as the dual carrier solution for transporting legacy NTSC format combined with digital ATSC for DTV. Since then, it's the overwhelming choice of broadcasters with over 1000 installations worldwide.

The analog side of the radio is NTSC and PAL compatible with four audio subcarriers available. Each audio subcarrier is a fully synthesized frequency agile channel allowing for future re-tuning of the audio frequencies.

Several modem options are available:

- MRC QV2 19.39 Mbps SMPTE 310M ] or fixed data rate ASI PLug-in Modem Module.
- SCM4000 Single Carrier Modem
- SCM5000 Single Carrier Modem
- VRM Variable Rate Modem

The TwinStream supports non-protected, hot standby, or receive diversity configurations. The MRC Hot Standby Shelf is used for standard hot standby for analog and digital configurations. For "errorless" switching on the digital side, order the MRC Hot Standby Diversity Shelf.

To maximize your investment, TwinStream offers several upgrade paths. The analog side of the shelf can be upgraded to a digital carrier, or convert the radio into single carrier. In the single carrier configuration, MRC's Variable Rate Modem offers a diverse choice of transport options.

### Features

- Dual-carrier: NTSC analog plus ATSC digital
- Support of channel plans from 10 to 28 MHz
- Architecture supports FCC and ITU channel plans from 1.9 to 15.4 GHz
- Proprietary implementation of MRC's extremely stable, low-noise YiG oscillator technology
- RF amplifiers and power supplies for each RF carrier
- Built-in diagnostics through front panel controls and display
- Choice of single-oscillator (Series 1) or dual-oscillator (Series 2) versions

### Applications

- Single and Dual-Carrier Applications, including Analog and Digital Modems
- Studio-to-Transmitter Links and Transmitter-to-Studio Links
- Satellite Backhauls
- Analog plus Digital News Gathering Backhauls
- Cable Headend Feeds

# Specifications

## General

Standard Frequency Bands:

TwinStream 68: ..... 6.8 to 7.1 GHz  
 TwinStream 127: ..... 12.7 to 13.2 GHz  
 RF Carriers,  
 One analog: ..... approximately 15 MHz wide  
 One digital: ..... approximately 7.5 MHz wide

## Transport Capacity

Carrier #1, Analog: .....  
 525 line video (NTSC) or 625 line video (PAL)  
 4 FM subcarriers (normally, audio)  
 Optional Carrier #1: Analog IF input containing  
 525 line video, Plus 2 FM subcarriers,  
 not to exceed 6.8 MHz bandwidth  
 with input return loss of 26 dB min

## Carrier #2, Digital:

- 19.39 Mbps ATSC transport stream
- 1.544 Mbps DSI data channel 9.6 kbps

Asynchronous service channel (plus three alarm inputs for the transmitter and four NC/NO relay contact closures for the receiver)  
 Note: The above is one example of many available system configurations.

## Transmitter

Type:  
 . Single conversion at microwave, both carriers  
 IF upconversion, proprietary  
 Local Oscillators: ..... Ultra-low phase noise,  
 phase-locked sources  
 Frequency Stability: ... ±0.0005%, both carriers  
 Power Output: ... See Operating Specifications

## Receiver

Type:  
 . Single conversion at microwave, both carriers  
 IF downconversion, proprietary  
 Local Oscillators: ..... Ultra-low phase noise,  
 phase-locked sources  
 Noise Figure: ..... 3.5 dB max  
 IF Bandwidth: ... 15 MHz Analog, 10 MHz Digital  
 Threshold: ..... See Operating Specifications  
 Summary

## Analog Channel, Video Performance

(Internal FM modulator and demodulator)  
 Deviation: ..... 8 MHz P-P  
 Video Signal/Noise: ..... 67 dB min  
 Video Signal/Hum: ..... 60 dB min  
 Frequency Response:  
 ±0.25 dB, 10 kHz to 4.5 MHz  
 ±0.75 dB, 4.5 to 7.5 MHz  
 Field Tilt: ..... 3 IRE max  
 Line Tilt: ..... 0.5 IRE max  
 Differential Phase: ..... ±0.75° max  
 Differential Gain: ..... 3% max

## Analog Channel, Audio Performance

(Internal FM modulator and demodulator)  
 Capacity: 4 FM subcarriers up to 7.5 MHz max  
 Frequency Response: ±1.0 dB, 40 Hz to 12 kHz  
 -1.5 dB, 12 to 15 kHz  
 Audio Signal/Noise: ..... 66 dB min  
 Distortion: ..... 1% max  
 Input/Output Levels: .. 0 to +9 dBm, adjustable  
 Input/Output Impedance: ..... 600 Ω

## Digital Specifications

Digital Video Channel  
 Data Rate: 19.39 Mbps (ATSC transport stream)  
 Interface: ..... SMPTE 310M, typical  
 Wayside Data Channel  
 Data Rate (DS1): ..... 1.544 Mbps  
 Interface: ..... G.703  
 Asynchronous Service Channel  
 Data Rate: ..... 9.6 kbps  
 Interface: ..... RS-232  
 Modulation: ..... 16 QAM  
 FEC: ..... Reed-Solomon (204/188)  
 and depth 12 interleaving

## Electrical

Power Consumption  
 Transmitter, unprotected terminal:  
 75 Watts typical  
 Receiver, unprotected terminal: 55 Watts typical  
 Power Supply Voltages: ..... 110/240 Vac

## Environmental

Operating Temperature Range: ... 0° to +50°C  
 Relative Humidity: . . 0 to 95%, non condensing

## Physical

Height: ..... 3 rack units: 5.25" (13.34 cm)  
 Depth: ..... 15.0" (38.1 cm)  
 Weight: ..... 22 lbs (10 kg)

## Interconnections

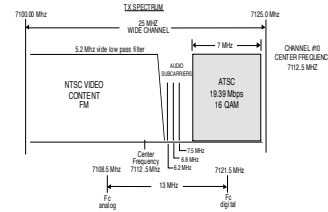
RF  
 6.8 to 7.1 GHz: ..... WRI137  
 12.7 to 13.2 GHz: ..... WR75  
 Video: ..... 75 Ω coax, female  
 Baseband: ..... 75 Ω coax, female  
 Audio: 600 Ω barrier strip with screw terminals  
 ATSC Data: ..... 75 Ω coax, female  
 Wayside DSI: ..... DB9, female  
 Service Channel: ..... DB9, female

## Transmitter & Receiver Specifications

Notes:  
 I. HP = High Power Model

## Spectrum Efficiency

The following RF spectrum diagram shows the benefits of efficiently utilizing the spectrum to best maintain the original NTSC signal content thus allowing the co-existence of both analog and digital signals.



## High Power Options

High-power amplifiers are available in many frequency bands. These amplifiers are mounted internally and powered from the standard transmitter power supply. These GaAs FET amplifiers use microstrip transmission line techniques to provide broadband high-power outputs.

## Upgrade Options

TwinStream offers the following upgrade options:

- Digital to Dual Carrier Digital/Digital: (20/20 Mbps or 20/45 Mbps or NTSC/45 Mbps or PAL/45 Mbps)
- Convert Dual Carrier to Single Carrier High Capacity (Up to 90 Mbps)
- Single Carrier to Dual Carrier

Frequency	Transmitter		Receiver	
	Analog Standard/HP (Note 1)	Digital Standard/HP (Note 1)	Analog	Digital
6.8 to 7.1 GHz	+33/+37 dBm	+27/+31 dBm	-86 dBm 37 dBm S/N	-83 dBm @ 1x10 <sup>-6</sup> BER
12.7 to 13.2 GHz	+30/+33 dBm	+24/+27 dBm	-86 dBm 37 dBm S/N	-83 dBm @ 1x10 <sup>-6</sup> BER