DM240XR Digital Video Broadcast Modulator With AutoEQ™

Satellite Modems

DVB Performance

The DM240XR is DVB-S2 ready and can easily be upgraded in the field. The DM240XR provides a comprehensive set of advanced S2 features. The DM240XR extends its dominance in broadcast applications through increased data rate capability and the addition of 16APSK and 32APSK support. Proven performance operating near Shannon's limit offers results with 30% better bandwidth efficiencies and carrier to noise figures below the noise floor.

The DM240XR includes the ability to select the output frequency of 70/140 MHz or L-Band operation without any hardware modifications. The modulator offers a frequency agile IF output from 50 to 90 MHz, 100 to 180 MHz and 950 to 2050 MHz in 100 Hz steps. The DM240XR offers high data rates (up to 190 Mbps for the DVB-S2 and 238 Mbps for the DVB-S), and the most flexible modulation schemes available (QPSK, 8PSK, 16-QAM, 16APSK and 32APSK).

The DM240XR offers the flexibility to support up to three different data interfaces. The XR includes a built-in ASI interface along with the Plug-In Interface Card (PIIC) system which allows for the selection of two additional data interfaces that can be easily upgraded in the field. Supported interfaces include DVB-ASI, HSSI, RS-422, M2P/DVB, LVDS M2P/DVB and Ethernet (Pro-MPEG CoP 3 and Bridge modes).

Remote interfacing can be achieved through one of three onboard connections: Ethernet (Web or SNMP), RS-485, or RS-232. Additionally, FTP capability for firmware upgrades allows a quick, reliable method to update installed systems. The front panel offers push-button control of all features and a backlit LCD display.

DVB-CID ETSI TS 103 129 is the ETSI standard for combating satellite interference and is largely based on Comtech EF Data's award-winning MetaCarrier® technology. MetaCarrier technology embeds and detects a small message and unique ID within a video or data satellite carrier. This embedded message and ID significantly reduce the time to identify and clear interference sources. The MetaCarrier is embedded using spread spectrum techniques within the carrier itself without adding appreciable noise or power to the host carrier.

Typical Users

- Broadcasters
- Internet Service Providers
- Enterprise

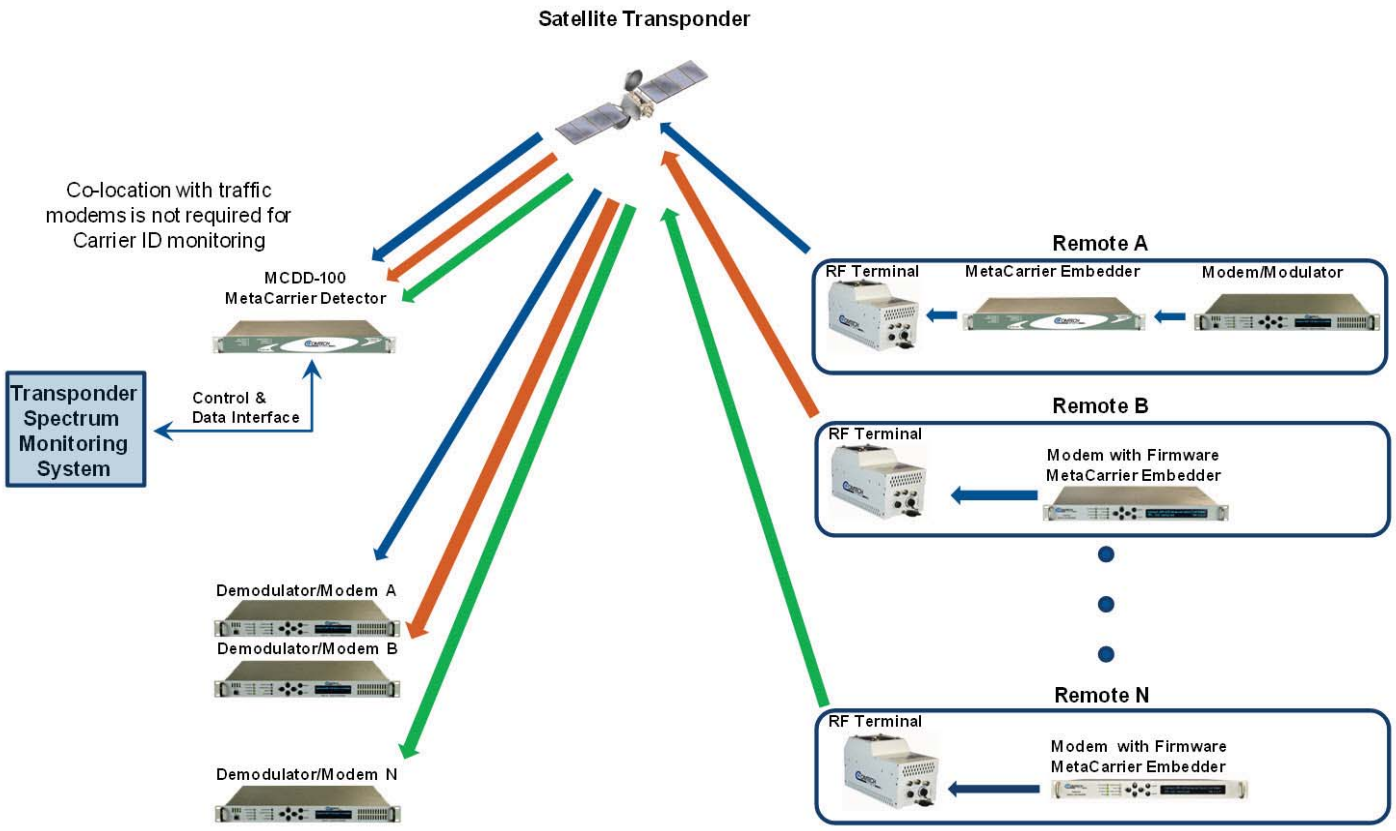
Common Applications

- Direct To Home
- Broadcast Contribution and Distribution
- Satellite News Gathering
- Broadband Interactive Services
- Digital Cinema
- Enterprise
- High Speed Content Delivery
- IPTV / Business Television

The DM240XR AutoEQ™ feature supports amplitude and group delay equalization over the satellite system. When installed, AutoEQ offers the ability to compensate the overall system group delay and amplitude flatness by pre-correcting the uplink carrier. This eliminates the need for external group delay/amplitude equalizers and makes possible equalization at L-Band. The AutoEQ will operate over the full transponder from a symbol rate of 0.1 Msps to 45 Msps.

Features

- DVB-S and DVB-S2 ready
- DVB-S2 data rates up to 190 Mbps
- DVB-S2 CM, VCM & ACM support
- DVB-S data rates up to 238 Mbps
- QPSK, 8PSK, 16-QAM, 16APSK, 32APSK
- Embedded MetaCarrier DVB-CID ETSI TS 103 129
- Powerful LDPC with BCH coding
- AutoEQ group delay and amplitude equalization
- Frequency-agile 50 to 90, 100 to 180, and 950 to 2050 MHz
- ETSI EN 302 307 (DVB-S2), ETSI EN 301 210 (DVB-S)
- ETSI EN 300 421 and ITU-1294 System B (DSS)
- Built-in ASI data interface
- Monitor port available
- Web browser user interface
- Multiple 1:1 and 1:N redundancy options available

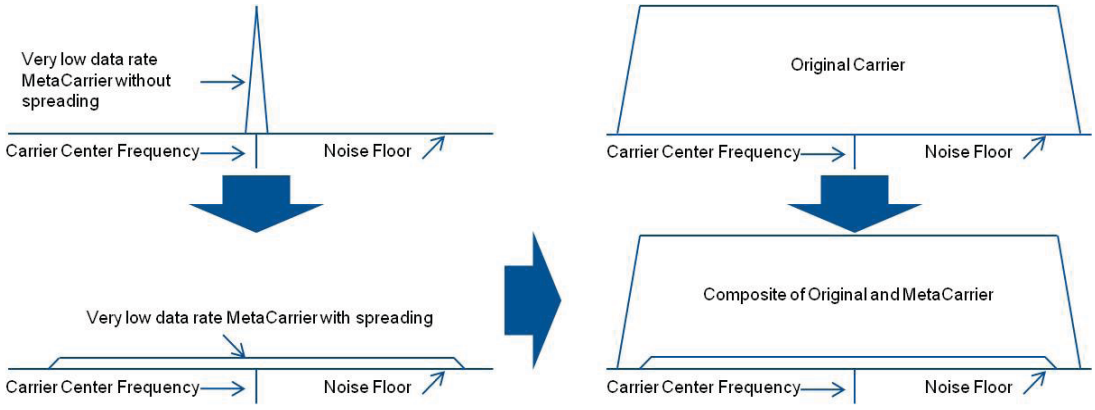


MetaCarrier Technology

Comtech EF Data developed the MetaCarrier technology, which is used to embed and detect Carrier ID on video and data satellite carriers. The MetaCarrier name is derived from the method of providing transmission information via metadata. This is accomplished by spread spectrum modulation of a very low data rate carrier (containing metadata information about the referenced carrier) over a portion of the referenced carrier. A large spreading factor is used that results in spreading the meta-carrier's energy over a significantly large amount of bandwidth – many orders of magnitude of the original metadata rate. The resulting energy becomes a nearly undetectable amount of noise being added to the referenced carrier spectrum. De-Spreading results in a coding gain that is used to extract and separate the MetaCarrier from its reference carrier.

MetaCarrier Carrier Identification has a minimal effect on the carrier quality and the quality of the carrier's content. It can be read in the clear, by an MCDD, even if the referenced carrier is transmitted with conditional access or is otherwise encrypted. The MetaCarrier embedding can be used on any static carrier, SCPC, video or other.

The MetaCarrier technology overlays the very low data rate Carrier ID data in a spread spectrum carrier, onto the host carrier that it is referencing. In the below depiction, the MetaCarrier is placed 22 dB below the peak of the carrier it is identifying, at roughly the center frequency of the carrier.



AutoEQ Automatic Uplink Equalization System

The AutoEQ Automatic Uplink Equalization System is the most user friendly satellite communication system equalizer available. Unlike legacy analog equalizers which are difficult to adjust, the AutoEQ system is extremely easy to use. Transponder equalization is done in the digital domain; it is very accurate and can compensate for amplitude and group delay variations that are nearly impossible to compensate for with an analog equalizer.

The AutoEQ consists of special software built into the DM240XR coupled with a special digital receiver on a PIIC card. The receiver analyzes the signal path while the software computes the compensating equalizer values. Equalizing the link typically takes less than 2 minutes and can be done at the front panel or remotely.

A remote receiver capability is also supported for those systems where the DM240XR hub cannot see the return path from the distant end. Remote calibration is done by simply connecting and configuring the Ethernet control ports of the modulator and remote receiver to a network with internet access. The DM240XR takes care of the rest.

The AutoEQ Automatic Uplink Equalization System supports single channel per carrier (SCPC) equalization of group delay and amplitude over the entire satellite frequency range.

AutoEQ works with all modulation and coding types supported by the DM240XR (i.e. QPSK, 8PSK, 16-QAM for DVB-S and QPSK, 8PSK, 16APSK, and 32APSK for DVB-S2). The BER/bandwidth improvement is greater as the level of modulation increases.

The equalization process is nearly independent of receive signal to noise ratio. Accurate automatic equalization is possible down to the lowest specified levels of Eb/No associated with each modulation and coding type supported by the DM240XR.

The equalizer is based on the generation of complex coefficients. What this means is that it can even compensate for amplitude or group delay that is not symmetric over the carrier frequency spectrum, as would be the case if two independent carriers were placed on one transponder.

Up to 32 sets of equalization parameters can be stored within the DM240XR. This allows a DM240XR to be preconfigured for multiple carriers and multiple transponders.

Should the satellite uplink parameters change, recalibration of the AutoEQ can be easily initialized at any time, allowing for maximum flexibility for the uplink earth station.

The end result is greatly improved bandwidth and power utilization of your satellite transponder.

Features

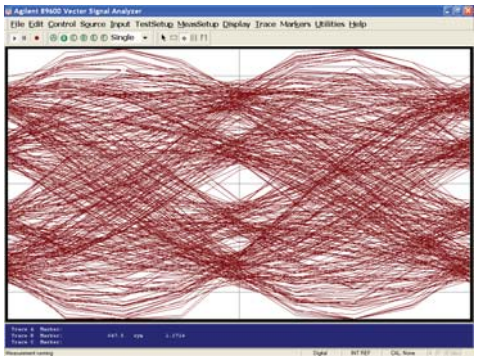
- Full or partial transponder (complex) equalization
- Digitized transponder characterization, plug and play
- No external adjustments required
- Easily upgradable into existing DMD240XRs
- Closed loop equalization using a plug-In PIIC receiver
- Supports all DM240XR modulation and frequency parameters up to 45 Msps
- Capable of multiplexing LNB power

Physical

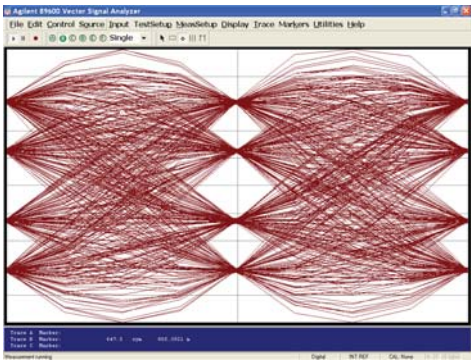
Standard Plug-In-Interface Card (PIIC)

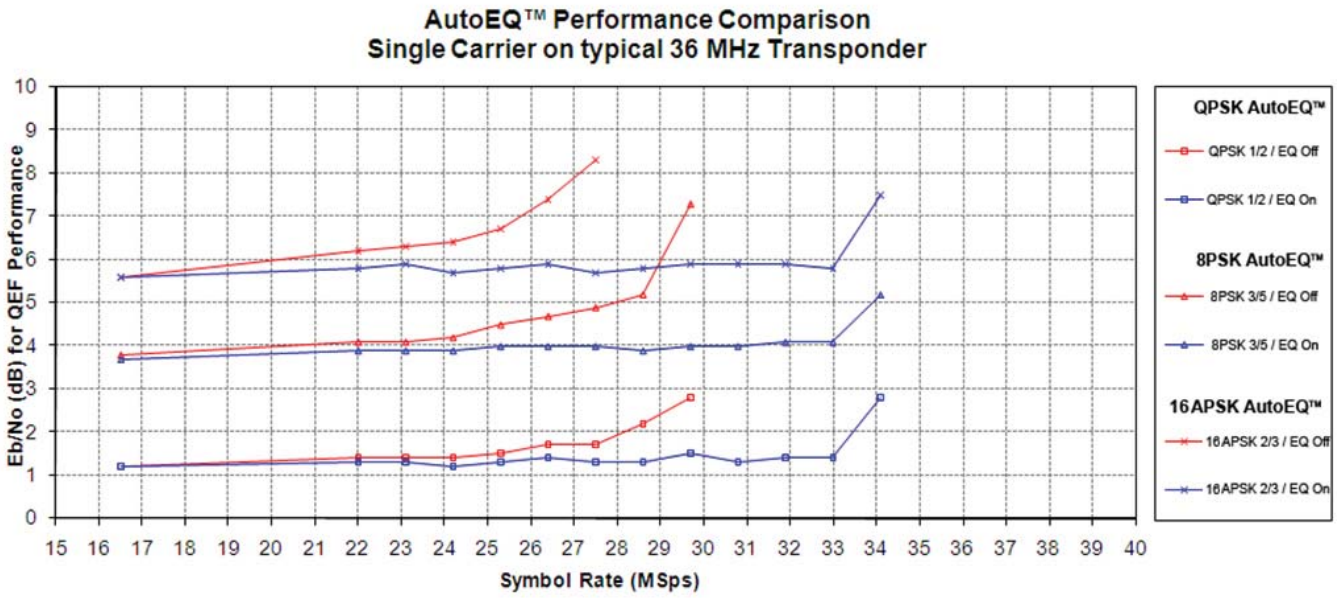
AutoEQ System Performance

Received 8PSK Over Typical Satellite **without** AutoEQ



Received 8PSK Over Typical Satellite **with** AutoEQ





Specifications

IF Interface

TX IF	50 to 180 MHz (70/140 MHz) 950 to 2050 MHz L-Band
IF Step Size	1 Hz
Frequency Stability	1 ppm
Power Output	0 to -25 dBm
Power Step Size	0.1 dB
Power Output Accuracy	± 1.0 dB
Power Output Stability	± 0.5 dB
Carrier Mute	-55 dB
Spurious:	-55 dBc, In-band -45 dBc, Out-of-band
Output Impedance	75 Ohm (70/140 MHz), 50 Ohm (L-Band)
Return Loss	20 dB (70/140 MHz) 14 dB (L-Band)
Phase Noise	1 kHz -73 dBc 10 kHz -83 dBc 100 kHz -100 dBc 1 MHz -120 dBc
Output Connector	BNC female (70/140 MHz), SMA female (L-Band)
IF Monitor	SMA female
External Reference	1, 2, 5, 10 MHz better than ±1 ppm, 1.5 to 10 Vp-p, 50 Ohms
MetaCarrier Identification	DVB-CID ETSI TS 103 129 Compliant

Baseband (DVB-S) Per ETSI EN 301 210

Data Rate	1 to 238 in 1 bps steps
Symbol Rate	1-68 Msps mMaximum
Inner FEC Code	PTCM (8PSK, 16-QAM), QPSK (Viterbi)
Code Rates	QPSK 1/2, 2/3, 3/4, 5/6, 7/8 8PSK 2/3, 5/6, 8/9 16-QAM 3/4, 7/8
Outer Code	Reed-Solomon (204, 188, T=8)
Interleaving	Convolutional, I =12
Data Scrambling	Per EN 300-421
Terrestrial Framing	204, 188, none

Baseband (DVB-S2) PER ETSI EN 302 307

Modulation Types	QPSK, 8PSK, 16APSK, 32APSK
DVB Modes	CCM, ACM, VCM
Data Rate	1 to 80 Mbps in 1 bps steps (QPSK) 2 to 118 Mbps in 1 bps steps (8PSK) 2.6 to 160 Mbps in 1 bps steps (16APSK) 3.5 to 190 Mbps in 1 bps steps (32APSK)
Symbol Rate	1 to 45 Msps maximum
Terrestrial Framing	188 (1 Sync Byte, 187 payload bytes)
Block Size	64800 bits, 16200 bits
FEC Code	BCH + LDPC
Interleaver	Block Interleaver, Per ETSI EN 302 307
Code Rates	QPSK:1/4,1/3, 2/5,1/2,3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 8PSK: 2/3, 3/4, 3/5, 5/6, 8/9, 9/10 16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 32APSK: 3/4, 4/5, 5/6, 8/9, 9/10
Baseband Roll-Off	Square root raised cosine 0.20, 0.25, 0.35
Terrestrial Input Clock Accuracy	Better than 400 ppm
Test Pattern	Internal 2^{15}-1 and 2^{23}-1 Pseudo-random number generator
Internal Clock Source Stability	10 ppm

Monitor & Control

Interface	Serial RS-485 (remote) and RS-232 (germinal), Ethernet 10/100Base-T (SNMP v1/v2 and Web browser)	
Parameters Controlled	• Test modes • IF frequency • IF output level • IF output on/off • Data rate • Symbol rate • Clock polarity • Data polarity	• Inner code rate • Modulation • Rolloff • Pilot symbols • Gold code seq • Terr framing • Sat framing
Parameters Monitored	• Faults (current & latched Alarms) • Supply voltages	

Optional Interfaces

Serial	DVB-ASI, G703, HSSI
Parallel	RS-422 (M2P, DVB), LVDS (M2P, DVB), DSS
Ethernet	100/1000Base-T (PRO-MPEG COP3/R2 & BRIDGE Mode)
AutoEQ	Amplitude and group delay equalization

Physical & Environmental

Prime Power	100 - 240 VAC, 50 - 60 Hz, 40 W maximum
Operating Temperature	0 to 50°C
Operating Humidity	Up to 95%, non-condensing
Storage Temperature	-20 to 70°C
Storage Humidity	Up to 99%, non-condensing
Weight	10 lbs (4 kg)
Dimensions (1RU) (height x width x depth)	1.75” x 19” x 17” 4.45 x 48.3 x 43.2 (cm)

Configuration Series DVB-S

Series 100	1 - 10 Msps, QPSK
Series 200	1 - 45 Msps, QPSK
Series 300:	1 - 45 Msps, QPSK/8PSK
Series 400	1 - 68 Msps, QPSK/8PSK/16-QAM

Configuration Series DVB-S2

Series 100	1 to 10 Msps, QPSK
Series 200	1 to 45 Msps, QPSK
Series 300	1 to 45 Msps, QPSK/8PSK
Series 400	1 to 45 Msps, QPSK/8PSK/16APSK
Series 500	1 to 45 Msps, QPSK/8PSK/16APSK/32APSK

AutoEQ Specifications

Demodulator Input (PIIC Card Receiver)

Input Frequency	950-1750 MHz
Input Power	-45 to -20 dBm
Input Impedance	50 Ohm (optional 75 Ohm F)
Input Connector	SMA-F (optional F-type)
Es/No	0 dB min.

LNB DC Inject

Purpose	Used to diplex DC power onto RF RX connector
Input Connector	PP3-002A 5.5mm x 2.1mm x 9.5mm in-line DC power plug
Input Voltage	28 Volts max.
Input Current	0.5 Amps max.

DM240XR Monitor and Control

Equalizer	Enabled, disabled
RX IF	950-1750 MHz
EQ Calibration	Reference acquire, calibration
EQ Receiver	Local, remote
EQ Select	1-32 coefficient sets
EQ Rename	1-32 coefficient sets
EQ Delete	1-32 coefficient sets
EQ Restore	Entire AutoEQ table

Digisat International Inc.
4195 W. New Haven Ave., Suite 15
Melbourne, FL 32904
USA
+1-321-676-5250
Email: sales@digisat.org
http://www.digisat.org