

Technical Specifications

7

7.0 Introduction

This section defines the technical performance parameters and specifications for the DM240XR Digital Modulator.

7.1 IF Specification

Tx IF:	50 to 90 MHz, 100 to 180 MHz (70/140 MHz), 950 to 2050 MHz (L-Band)
IF Step Size:	100 Hz
Frequency Stability:	3 ppm
Power Output:	0 to -25 dBm
Power Output Accuracy:	± 1.0 dB
Power Output Stability:	± 0.5 dB
Carrier Mute:	-55 dB
Spurious Emissions:	-55 dBc, 50 to 90 and 100 to 180 MHz (70/140 MHz), 950 to 2050 MHz (L-Band) -45 dBc, all other frequencies
Output Impedance:	50 Ohm (L-Band), 75 Ohm (70/140 MHz)
Return Loss:	20 dB (70/140 MHz), 14 dB (L-Band)
Phase Noise:	1 kHz -73 dBc 10 kHz -86 dBc 100 kHz -100 dBc 1 MHz -120 dBc
Output Connector:	BNC Female (70/140 MHz), SMA Female (L-Band)
Monitor Port Output Connector:	SMA Female (Based on output frequency)
External Reference:	1 to 10 MHz in 8 kHz steps, better than 10 ppm 1.5 to 5 Vp-p, 50 Ohms

7.2 Baseband Specification

7.2.1 DVB-S

Compliance	EN 300-421 and EN 301-210
Modulation Types:	BPSK, QPSK, 8PSK, 16QAM
Data Rate:	1 to 59.5 Mbps in 1 bps steps (BPSK) 1 to 119 Mbps in 1 bps steps (QPSK) 2 to 181 Mbps in 1 bps steps (8PSK) 3 to 238 Mbps in 1 bps steps (16QAM)
Symbol Rate:	1 to 68 Msps in 1 sps steps
Frame Size:	187 payload bytes, 1 sync byte, 16 parity bytes
Terrestrial Framing:	204, 188, 187 (Unframed data)
Randomization for Energy Dispersal:	Per EN 300-421
Outer Code:	Reed-Solomon (204,188,T = 8)
Interleaver:	Convolutional, I = 12
Inner Code:	(BPSK): 1/2, 2/3, 3/4, 5/6, 7/8 (QPSK): 1/2, 2/3, 3/4, 5/6, 7/8 (8PSK): 2/3, 5/6, 8/9 (16QAM): 3/4, 7/8

Baseband Roll-Off:	Viterbi K = 7, G1 = 171oct G2 = 133oct Square Root Raised Cosine 0.35 (BPSK, QPSK, 8PSK, 16QAM) 0.25 (8PSK, 16QAM) 0.20 (BPSK, QPSK)
Terrestrial Input Clock Accuracy:	400 ppm (Maximum)
Test Pattern:	Internal $2^{15}-1$ and $2^{23}-1$ Pseudo-Random Number Generators

7.2.2 DVB-S2-CCM (CCM - Normative)

Compliance	ETSI EN 302 307 v1.1.1 (normative)
Modulation Types:	QPSK, (8PSK, 16APSK & 32APSK Optional)
Transport Streams	Single MPEG Packetized Transport Streams
Data Rate:	(QPSK): 1 to 54 Mbps in 1 bps steps (8PSK): 2 to 118 Mbps in 1 bps steps (16APSK): 2.6 to 160 Mbps in 1 bps steps (32APSK): 3.5 to 200 Mbps in 1 bps steps
Symbol Rate:	1 to 45 Msps in 1 bps steps
Terrestrial Framing:	188 (1 sync byte, 187 payload bytes)
Baseband Processing:	Per ETSI EN 302 307 v1.1.1
Block Size:	64800 bits & 16200 bits
FEC Code:	BCH + LDPC
Interleaver:	Block Interleaver, per ETSI EN 302 307 v1.1.1
Inner Code Rate:	(QPSK): 1/4, 1/3, 2/5, 1/2, 2/3, 3/5, 3/4, 4/5, 5/6, 8/9, 9/10 (8PSK): 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 Optional (16APSK): 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 Optional (32APSK): 3/4, 4/5, 5/6, 8/9, 9/10 Optional
Baseband Roll-Off	Square Root Raised Cosine 0.20 0.25 0.35
Terrestrial Input Clock Accuracy:	400 ppm (max)
Test Pattern:	Internal $2^{15}-1$ and $2^{23}-1$ Pseudo-Random Number Generators



NOTE

Consult Factory on ACM & VCM, Multiple Transport Streams and Generic Transport Streams Input Stream Synchronizer & Null Packet Deletion

7.2.3 DVB-S2-ACM (Normative Features with Single Transports streams)

Compliance	ETSI EN 302 307 v1.1.1 (normative)
Modulation Types:	QPSK, (8PSK, 16APSK & 32APSK Optional)
Transport Streams	Single MPEG Packetized Transport Streams
Data Rate:	(QPSK): 1 to 54 Mbps in 1 bps steps (8PSK): 2 to 118 Mbps in 1 bps steps (16APSK): 2.6 to 160 Mbps in 1 bps steps (32APSK): 3.5 to 200 Mbps in 1 bps steps
Symbol Rate:	1 to 45 Msps in 1 sps steps
Terrestrial Framing:	188 (1 sync byte, 187 payload bytes)
Baseband Processing:	Per ETSI EN 302 307 v1.1.1
Block Size:	64 Kbits & 16Kbits
FEC Code:	BCH + LDPC
Interleaver:	Block Interleaver, per ETSI EN 302 307 v1.1.1
Inner Code Rate:	(QPSK): 1/4, 1/3, 2/5, 1/2, 2/3, 3/4, 3/5, 4/5, 5/6, 8/9, 9/10 (8PSK): 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 Optional (16APSK): 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 Optional (32APSK): 3/4, 4/5, 5/6, 8/9, 9/10 Optional
Baseband Roll-Off	Square Root Raised Cosine 0.20 0.25 0.35
Terrestrial Input Clock Accuracy:	400 ppm (max)
Test Pattern:	Internal $2^{15}-1$ and $2^{23}-1$ Pseudo-Random number Generators
Dummy Frame Insertion	Yes



NOTE

Consult Factory on ACM & VCM, Multiple Transport Streams and Generic Transport Streams Input Stream Synchronizer & Null Packet Deletion

7.3 Interface Types Available (PIIC)

ASI:	ASI, Serial, BNC (female)
ASI Out:	ASI Monitor, Serial, BNC (female)
RS-530 Serial	RS422 Serial, DB 25 (female)
RS-422 Parallel:	DVB/M2P, Parallel, RS-422, DB-25 (female)
LVDS Parallel:	DVB/M2P, Parallel, LVDS, DB-25 (female)
HSSI:	HSSI, Serial, 50 pin SCSI-2 type connector (female)
Ethernet	100/1000 Base-T, RJ45
Direct TV PECL	Positive Emitter coupled logic. DB 9 Female
G.703:	Contact factory for availability

7.4 Monitor and Control

Interface: Serial RS-485 (RLLP) and RS-232 (Terminal), Ethernet
10/100 Base-T (SNMP & Web Browser)

Parameters Controlled:

IF Frequency
IF Output Level
IF Output On/Off
Modulation Type
FEC Rate
Spectral Inversion
Data Rate
Symbol Rate
Roll-Off
Interface Type
Terrestrial Framing
Clock/Data Sources
Clock/Data Polarity
Reference Freq Source
External Reference Freq
Test Modes

Parameters Monitored:

Alarms (Major/Minor)
Stored Alarms (Major/Minor)
Faults
Stored Faults

7.5 Environmental

Prime Power 100 to 240 VAC, 50 – 60 Hz, 40 Watts Maximum

Operating Temperature: 0 to 50 °C

Humidity: Up to 95%, Non-condensing

Storage Temperature: -20 to 70 °C

Humidity: Up to 99%, Non-condensing

7.6 Physical

Weight: 7 lb. (3.2 Kg)

Size: 19" W x 17" D x 1.75" H

(48.3 x 43.2 x 4.45 cm)

7.7 Options

50 Ohm IF Output (on 70/140 MHz IF)

48 VDC Operation

7.8 DVB-S Series Configuration

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 68 Msps, QPSK/8PSK/16QAM

7.8.1 DVB-S2 Series Configuration

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/32APSK
Series 500:	1 to 45 Msps, QPSK/8PSK/16APSK/32APSK

7.9 Data Rates (DVB-S)

All Data Rates in Bps.

DVB-S Series 100					
Modulation	FEC	MPEG		Unframed	
		Minimum	Maximum	Minimum	Maximum
QPSK	1/2	1000000	9215686	1000000	10000000
QPSK	2/3	1228758	12287582	1333333	13333333
QPSK	3/4	1382353	13823529	1500000	15000000
QPSK	5/6	1535948	15359477	1666667	16666667
QPSK	7/8	1612745	16127451	1750000	17500000

DVB-S Series 200					
Modulation	FEC	MPEG		Unframed	
		Minimum	Maximum	Minimum	Maximum
QPSK	1/2	1000000	41470588	1000000	45000000
QPSK	2/3	1228758	55294118	1333333	60000000
QPSK	3/4	1382353	62205882	1500000	67500000
QPSK	5/6	1535948	69117647	1666667	75000000
QPSK	7/8	1612745	72573529	1750000	78750000

DVB-S Series 300					
Modulation	FEC	MPEG		Unframed	
		Minimum	Maximum	Minimum	Maximum
QPSK	1/2	1000000	41470588	1000000	45000000
QPSK	2/3	1228758	55294118	1333333	60000000
QPSK	3/4	1382353	62205882	1500000	67500000
QPSK	5/6	1535948	69117647	1666667	75000000
QPSK	7/8	1612745	72573529	1750000	78750000
8PSK	2/3	1843137	82941176	2000000	90000000
8PSK	5/6	2303922	103676471	2500000	112500000
8PSK	8/9	2419118	110588235	2625000	120000000

DVB-S Series 400					
Modulation	FEC	MPEG		Unframed	
		Minimum	Maximum	Minimum	Maximum
QPSK	1/2	1000000	62666667	1000000	68000000
QPSK	2/3	1228758	83555556	1333333	90666667
QPSK	3/4	1382353	94000000	1500000	102000000
QPSK	5/6	1535948	104444444	1666667	113333333
QPSK	7/8	1612745	109666667	1750000	119000000
8PSK	2/3	1843137	125333333	2000000	136000000
8PSK	5/6	2303922	156666667	2500000	170000000
8PSK	8/9	2419118	167111111	2625000	181333333
16QAM	3/4	2764706	188000000	3000000	204000000
16QAM	7/8	3225490	219333333	3500000	238000000

7.9.1 Data Rates (DVB-S2)

All Data Rates in Bps.

DVB-S2 Series 100			
Modulation	FEC	MPEG	
		Minimum	Maximum
QPSK	1/3	1000000	6564481
QPSK	2/5	1000000	7894121
QPSK	1/2	1000000	9888581
QPSK	3/5	1188304	11883041
QPSK	2/3	1322253	13222530
QPSK	3/4	1487473	14874731
QPSK	4/5	1587196	15871961
QPSK	5/6	1654663	16546630
QPSK	8/9	1766451	17664512
QPSK	9/10	1788612	17886119

*Normal Frame size (64800) no pilot insertion

DVB-S2 Series 200			
Modulation	FEC	MPEG	
		Minimum	Maximum
QPSK	1/3	1000000	29540166
QPSK	2/5	1000000	35523546
QPSK	1/2	1000000	44498615
QPSK	3/5	1188304	53473684
QPSK	2/3	1322253	59501385
QPSK	3/4	1487473	66936288
QPSK	4/5	1587196	71423823
QPSK	5/6	1654663	74459834
QPSK	8/9	1766451	79490305
QPSK	9/10	1788612	80487535

*Normal Frame size (64800) no pilot insertion

DVB-S2 Series 300			
Modulation	FEC	MPEG	
		Minimum	Maximum
QPSK	1/2	1000000	44498615
QPSK	3/5	1188304	53473684
QPSK	2/3	1322253	59501385
QPSK	3/4	1487473	66936288
QPSK	4/5	1587196	71423823
QPSK	5/6	1654663	74459834
QPSK	8/9	1766451	79490305
QPSK	9/10	1788612	80487535
8PSK	3/5	1779991	80099585
8PSK	2/3	1980636	89128631
8PSK	3/4	2228124	100265560
8PSK	5/6	2478562	111535270
8PSK	8/9	2646012	119070539
8PSK	9/10	2679207	120564315

*Normal Frame size (64800) no pilot insertion

DVB-S2 Series 400			
Modulation	FEC	MPEG	
		Minimum	Maximum
QPSK	1/2	1000000	44498615
QPSK	3/5	1188304	53473684
QPSK	2/3	1322253	59501385
QPSK	3/4	1487473	66936288
QPSK	4/5	1587196	71423823
QPSK	5/6	1654663	74459834
QPSK	8/9	1766451	79490305
QPSK	9/10	1788612	80487535
8PSK	3/5	1779991	80099585
8PSK	2/3	1980636	89128631
8PSK	3/4	2228124	100265560
8PSK	5/6	2478562	111535270
8PSK	8/9	2646012	119070539
8PSK	9/10	2679207	120564315

16APSK	2/3	2637201	118674033
16APSK	3/4	2966728	133502762
16APSK	4/5	3165623	142453039
16APSK	5/6	3300184	148508287
16APSK	8/9	3523143	158541436
16APSK	9/10	3567342	160530387

*Normal Frame size (64800) no pilot insertion

DVB-S2 Series 500			
Modulation	FEC	MPEG	
		Minimum	Maximum
QPSK	1/2	1000000	44498615
QPSK	3/5	1188304	53473684
QPSK	2/3	1322253	59501385
QPSK	3/4	1487473	66936288
QPSK	4/5	1587196	71423823
QPSK	5/6	1654663	74459834
QPSK	8/9	1766451	79490305
QPSK	9/10	1788612	80487535
8PSK	3/5	1779991	80099585
8PSK	2/3	1980636	89128631
8PSK	3/4	2228124	100265560
8PSK	5/6	2478562	111535270
8PSK	8/9	2646012	119070539
8PSK	9/10	2679207	120564315
16APSK	2/3	2637201	118674033
16APSK	3/4	2966728	133502762
16APSK	4/5	3165623	142453039
16APSK	5/6	3300184	148508287
16APSK	8/9	3523143	158541436
16APSK	9/10	3567342	160530387
32APSK	3/4	3703295	166648276
32APSK	4/5	3951571	177820690
32APSK	5/6	4119540	185379310
32APSK	8/9	4397854	197903448
32APSK	9/10	4453027	200386207