

Analog Signal Processing

C8M

Commander™ 8 Modulator - NTSC



The Commander 8 Modulator has two frequency agile models, the C8M-L (50 to 600 MHz) and the C8M-H (550 to 1000 MHz), to cover all current and future broadband frequency requirements up to 1 GHz, with a convenient 50 MHz frequency overlap between models. Superior individual CNR performance of the C8M guarantees combined Commander 8 CNR of 65 dB for 149 channels. The C8M uses a bright, two-line vacuum fluorescent display (VFD) that provides access to all modulator controls and is accessed via a convenient menu system. Front panel RF, IF, aural subcarrier and video test points are provided. Easy rear panel fuse access is also available.

The C8M provides as a standard feature two video/audio inputs and two IF inputs for redundancy, emergency alert or programming purposes, providing operational flexibility. The input sources may be switched automatically or manually. Provisions for adjusting peak-to-average audio level in four steps is provided with the audio AGC. The video DC clamp can be referenced to sync level, burst level or both, and an adjustable video white level clip function is also provided. Video AGC is also a standard feature.

The C8M is network management ready, and is compatible with SNMP Network Management Systems via the LIFEnet™ proxy. It is also compatible with the Headend Control Software (HCS).

The Commander™ 8 Modulator (C8M) is the next generation headend television modulator that delivers superior performance in all areas with an unprecedented feature and option set.

The C8M is compatible with many commercial scrambling systems, offering a composite IF input connection to facilitate interfacing with model MVP-II in all scrambling modes, and dual IF loop-through connections for other encryption systems. The C8M also interfaces easily with the model CMTS BTSC stereo encoder; DSR-4500 DigiCipher® satellite receiver; C6BD-II television broadcast demodulator; and OAPL-* VHF off-air phaselock generator. The C8M also supports IF to RF upconversion of digital signals including 64 QAM, 256 QAM, 8-VSB and QPSK signals.

BENEFITS INCLUDE:

- Superior carrier-to-noise performance
- 1 GHz bandwidth in two models
- Frequency selection in 12.5 kHz steps
- Video/audio AGC standard feature
- Integrated DSP based BTSC stereo/SAP encoder option
- Video loop for baseband scrambling compatibility
- Network management ready
- DC power capable
- Downloadable firmware



SPECIFICATIONS

RF

Channels	Tunable by HRC, IRC, or EIA frequency plans;
Frequency Range	Frequency tunable in 12.5 kHz steps 50 to 600 MHz (C8M-L); 550 to 1000 MHz (C8M-H)
Output Level	+60 dBmV minimum
Recommended Operating Range	+57 to +61 dBmV
Spurious	<-63 dBc for intermodulation products (49 to 1000 MHz) <-72 dBc for fixed frequency products (49 to 1000 MHz) (measured relative to analog picture carrier @ +60 dBmV RF output and sound carrier @ -15 dBc) 14 dB minimum within channel
Output Return Loss	14 dB minimum within channel

C/N Ratio (normalized to 4 MHz)

In-Band	70.0 dB minimum, 72.0 dB typical
Adjacent Channels	72.0 dB minimum, 75.0 dB typical
Semi-Adjacent Channels	74.0 dB minimum, 77.0 dB typical
Other Channels	76.0 dB minimum, 79.0 dB typical

RF Carrier Phase Noise

@1 kHz offset	-71 dBc/Hz minimum
@10 kHz offset	-99 dBc/Hz minimum
@20 kHz offset	-105 dBc/Hz minimum
RF Test Point	-20 dB \pm 1 dB
Group Delay	25 ns p-p maximum within a channel
Incidental FM (\pm 120 Hz)	-30 dBc minimum

Phase-Lock Input (6.0000 or 6.0003 MHz)

Return Loss	18 dB minimum
Input Level	0 to +30 dBmV

IF

Input Frequency	41.0 to 47.0 MHz
IF Input Levels	+25 dBmV to +35 dBmV
IF Input Return Loss	20 dB minimum, 41.0 to 47.0 MHz
IF Isolation	70 dBc minimum, AUX and PGM inputs @ +30 dBmV
IF Test Point Level	-20 dB nominal \pm 1.0 dB
IF Test Point Return Loss	16 dB minimum
IF AGC Range	\pm 5 dB minimum (RF output: \pm 0.5 dB)
CW IF Output Frequency	45.75 MHz
CW IF Output Level	+53 dBmV \pm 3 dB
CW IF Phase Noise @ 1 kHz offset	-86 dBc/Hz minimum
Picture IF Output Frequency	45.75 MHz
Picture IF Output Level	+35 dBmV \pm 1.0 dB
Sound IF Output Frequency	41.25 MHz
Sound IF Output Level	+15 to +25 dBmV
Composite IF Output Level	+40 dBmV \pm 1 dB (Picture carrier)

Video

Video Inputs	Two baseband video inputs; one video loop-thru, one composite (video + audio subcarrier) input
Standard Baseband Input	0.5 to 2.0 Vp-p for 87.5% modulation
Encoded Video Input Level	1.0 Vp-p for 87.5% modulation
Video Input Impedance	75 Ohms
Video Input Return Loss	30 dB minimum
K factor	2% maximum
S/N Ratio (luminance weighted)	65 dB minimum
Chroma Delay (relative to pre-correction)	\pm 50 ns
Frequency Response	\pm 0.5 dB from 25 Hz to 4.2 MHz
Differential Gain	1.5% p-p maximum @ 87.5% modulation
Differential Phase	1.0 degree p-p maximum @ 87.5% modulation
Tilt	1% maximum

SPECIFICATIONS

Video AGC

Input Level Range	0.5 to 2.0 V p-p
AGC Accuracy	87.5% \pm 2.5%

Composite Video Input

Frequency Response	\pm 0.6 dB from 25 Hz to 4.2 MHz
Chroma Delay	\pm 65 ns
K factor	2.5% maximum

Audio

Input Level Range

Low	-10 to +10 dBm, $Z_o = 600$
High	+5 to +25 dBm, $Z_o = 600$

Input Impedance

Low	600 Ohms balanced
High	>15 k Ohms
Frequency Response	+ 1.0 dB from 30 Hz to 15 kHz
Signal to Noise Ratio	65 dB minimum
Preemphasis	75 μ s, defeatable
Harmonic Distortion	1% maximum @ 1 kHz input @ 25 kHz deviation
Hum and Noise	-60 dBc maximum @ 25 kHz deviation
Aural Subcarrier Frequency	4.5 MHz 500 Hz
Aural Subcarrier Input Level Range	+35 to +45 dBmv, $Z_o = 75$ Ohms
Aural Subcarrier Output Level	+34 \pm 3 dBmV
Aural Subcarrier Return Loss	16 dB minimum
Aural Subcarrier Test Point	+20 \pm 3 dBmV
Wideband Audio Input	\pm 1 dB, 50 Hz to 50 kHz

Audio AGC

Compression Ratio	4:1
Peak-to-Average Ratio Settings	6 dB, 9 dB, 12 dB, 15 dB (front panel adjustable)
Gain Hold Function	Activated by abrupt >15 dB decrease in input
Limiter Function	0 dBm, follows gain control
Attack and Decay Time Constants	1 s attack, 10 s decay typical
Range	-10 to +10 dBm peak

Remote Control

Input Connector	RJ-12 modular
Output (daisy chain) Connector	RJ-12 modular, daisy chain up to 256 devices maximum (C8*, C6*, Omnistar)
Communications Control	via Headend Control Software (HCS) or NETSentry network management

General

AC Voltage Requirements	100 to 240 Vrms, 47 to 63 Hz
Power Requirements	45 Watts Maximum
Operating Temperature	0° to 50° C
Weight	14.5 lbs (6.12 kgs) Maximum
Dimensions	19"W x 1.75"H x 18"D (48.2 cm x 4.4 cm x 45.7 cm)

Stereo Encoder (Order C8M with stereo encoder as C8M-*-SX) The stereo encoder option for the C8M is a high performance, digital signal processing (DSP) based unit, providing superior BTSC stereo performance per the OET-60 standard.

Stereo Encoder Specifications

Frequency Range	50 Hz to 14 kHz, + 1.0 dB
Stereo Separation	26 dB, 50 Hz to 200 Hz 30 dB, 200 Hz to 10 kHz 26 dB, 10 kHz to 14.5 kHz
Harmonic Distortion	1% maximum @ 1 kHz input
Signal to Noise Ratio	65 dB minimum
Pilot Injection	5.0 + 0.3 kHz locked to video at 1H

Stereo Encoder with SAP (Order C8M with stereo/SAP encoder as C8M-*-BX). The SAP option allows for broadcast of bilingual or other second audio programming (SAP). This option must be used in conjunction with the stereo encoder option.

SAP Encoder Specifications

Frequency Range	50 Hz to 10 kHz, + 1.0 dB
Harmonic Distortion	1% maximum @ 1 kHz input
Signal to Noise Ratio	65 dB minimum
Carrier Injection	10 kHz, locked to video at 5H

DC Power Option (DC) (Order C8M with DC option as C8M-*-XD).

The dc power option (DC) for the Commander line of headend products allows powering from a dc source instead of an ac line source.

DC Power Specifications

Input Voltage	-20 Vdc to -60 Vdc
Input Power	(-24 Vdc or -48 Vdc recommended) 45 Watts Maximum

Specifications subject to change without notice.

Model Number	Description
C8M-L-XX	NTSC Modulator, 50-600MHz
C8M-L-XD	NTSC Modulator, 50-600MHz, DC Power
C8M-L-SX	NTSC Modulator, 50-600MHz, Stereo (No SAP)
C8M-L-SD	NTSC Modulator, 50-600MHz, Stereo (No SAP), DC Power
C8M-L-BX	NTSC Modulator, 50-600MHz, Stereo & SAP
C8M-L-BD	NTSC Modulator, 50-600MHz, Stereo & SAP, DC Power
C8M-H-XX	NTSC Modulator, 550-1000MHz
C8M-H-XD	NTSC Modulator, 550-1000MHz, DC Power
C8M-H-SX	NTSC Modulator, 550-1000MHz, Stereo (No SAP)
C8M-H-SD	NTSC Modulator, 550-1000MHz, Stereo (No SAP), DC Power
C8M-H-BX	NTSC Modulator, 550-1000MHz, Stereo & SAP
C8M-H-BD	NTSC Modulator, 550-1000MHz, Stereo & SAP, DC Power

