

Product Manual

QMOD-HD

HDTV Modulator

March 8, 2010

Control Firmware Ver 2.7

Encoder Firmware 02A2

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Overview



Create your own on-site HDTV broadband distribution system using a variety HD, SD, and AV sources with the Contemporary Research QMOD-HD HDTV Modulator. No matrix routers or IP resources required, just tune in with standard displays or CR HDTV tuners.

Compact and easy to integrate, the QMOD-HD accepts AV, Component, or S-Video/Composite NTSC, converts the audio and video to a digital cable channel, and amplifies for distribution through broadband cable system. Innovative in design and value, the QMOD-HD opens the door to cost-effective distribution of digital signage and HD subscriber sources using existing broadband coax cabling in sports, retail and entertainment facilities, corporate offices, colleges, schools and worship centers. Front-panel buttons and text menu display simplify QMOD-HD setup, with options for 2-way integration with custom control systems.

Features

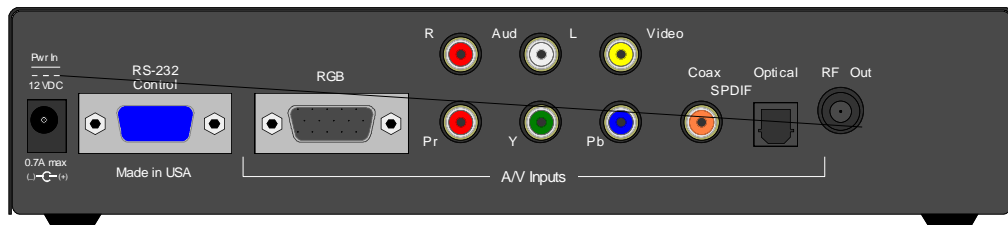
- Accepts VGA, Component, or S-Video/Composite NTSC, 720p/1080i/480/480i formats
- Presents 480p/480i video as full-screen image
- Employs pro-grade HD encoding that minimizes artifacts for motion video and signage “tickers”
- Merges audio with video from analog stereo, digital optical and coax inputs
- Creates a high-definition 720p/1080i MPEG-2 stream for broadcast
- Delivers a fully agile QAM 64/256 digital cable channel 2-135
- Amplifies for distribution over an on-site broadband cable system with adjustable output level, compatible with all cable format broadband systems
- Sets up with front-panel buttons and easy to use menus, including inputs, encoding, channel, and RF options
- Allows use of locking BNC-HD15 or HD15-HD15 cables to connect YPbPr video via the RGB input
- Integrates with RS-232 control and feedback with simple ASCII commands
- Saves power and rack space using efficient design, fan-free cooling, and compact enclosure
- Includes compact switching power supply
- Mounts in optional 1RU single (RK1) or dual (RK2) 19” rack kits
- Meets RoHS safety and California energy standards

Integration

- Connect one source to VGA, Component, or S-Video/Composite inputs
- VGA sources usually require a VGA scaler to provide 720p/1080i scan conversion and image scaling
- Connect audio to digital optical, coax, or stereo audio inputs
- Select inputs, channel, resolution, and RF output parameters from front-panel menus

Specifications

Physical	Size: 8.5" [216mm] wide x 1.73" [62mm] height (1RU) x 6.0" [153mm] deep Weight: 1.5 lbs [0.68kg] Temperature: +32° to 122° F operating temperature, convection cooled Mounting: Rack mounting for one or two units side-by-side optional (RK1, RK2)
Front Panel	Power button Setup, Select and directional buttons for front-panel setup Menu LCD, 2 lines of 20 blue characters each
Encoding	MPEG2 Profile:MP@HL for HD, MP@ML for SD 1080i, 720p, 480p, and 480i resolution, depending on input Video Encoding bitrate 18 or 25 Mbps MPEG1, Layer 2 audio
Modulation	Switchable 64/256 QAM, J83 Annex B, Interleaving Modes (128,1) MER 38 dB typical
Compliance	FCC Class B, ROHS, meets California standards
Power	2.1mm coaxial jack (inside center conductor positive) 0.7 A maximum, 11.5 to 13.5 VDC, 12 VDC typical
Real Panel	



RS-232

DB-9 male, RS-232 data link to control system
300 to 19,200 baud (9600 default), 8 data bits, no parity, 1 stop bit

Video Inputs

RGB: RGBHV DB-15 female (1080i/720p/480p), 59.94/29.97 Hz
Component: RCA Y, Pb, Pr (1080i/720p/480p/480i) , 59.94/29.97 Hz
Note: If source outputs Component on a DB-15, use VGA cable to wire to QMOD, set QMOD to Component
S-Video: Y(Composite), C (Blue Pb) 480i, 29.97 Hz
Composite: RCA female (480i), 29.97 Hz

Audio Inputs

Digital SPDIF: Coax and Toslink optical output, PCM 48K sample rate
Analog L and R: 2 stereo RCA female jacks

RF Out

Inputs assignable to video inputs
'F', female, 75 ohm impedance
Agile, channels 2-135 (48-860 MHz), standard, HRC, or IRC spacing
6 MHz bandwidth fits any open channel without interference to adjacent channels
1 KHz resolution, +/- 30 ppm accuracy, +/- 35 ppm stability
29 dB typical output power, attenuated in 5 steps, approx 4 dB

Includes Options

PS12-1 Switching power supply, 1A 12 VDC, fits in typical AC power strips
RK1 Single Rack Kit
RK2 Dual Rack Kit
CC-232 RS-232 Cable

Firmware

2.7 Responds to new error code in 02A2
2.5 Corrects PMT counter operation
2.4 links with encoder firmware 0A02, improves 1080i performance
Encoder 02A2 fixes occasional disruption of lower half of video
2.3 Adds firmware update to QAM processor
2.2 Improves upper-channel tuning performance
2.1 Enables ASI compatibility with Motorola and other commercial cable systems
2.0 Adds 480i Component and 18/25 mbps encoding options

Front Panel Setup

There are a number of parameters that can be set by front-panel Setup commands. In normal operation the Up/Down arrows select channels, and the Left/Right arrows adjust volume.

- Pressing **Setup** enters the setup menus, shows last menu accessed (The Menu button accesses on-screen menus)
- Pressing **Up** and **Down** arrow keys steps through the QMOD-HD options (Tip: Press Up to access output, Down to jump to IP menus)
- Pressing **Left** and **Right** keys steps through options for each front-panel menu
- Press **Select** to save desired option
- Pressing **Setup** ends menu item editing or exits the front-panel setup mode

Front Panel Menus

Video Input	RGBHV (formats include 1080i, 720p, 480p) YPbPr (default, formats include 1080i, 720p, 480p, 480i) Video (automatically uses 480i) S-Vid (S-Video, automatically uses 480i)
Video Format	Format available depends on input 1080i 720p (default) 480p 480i
Channel	XXX Left/Right steps through channel numbers (use Left to access high channels)
Cable Format	Standard (default) HRC IRC
RF Level dB	29 (default dBmV) 25 21 17 13 9
Audio Input	Digi Optical Digi Coax Analog (default)
No Vid Color	Orange Purple (default) Green Displays color background with loss of video
QAM Type	64 256 (default) CW (Continuous Wave)
Trig Lev	Trigger Level – adjusts quality of encoding – best used with very detailed graphics or test screen. 1-4
Vid Bid Rate	Video Bit Rate, in mbps 18 (default) 25
Firmware	Shows version QMOD-HD VX.X NNNN VX.X = Control Firmware NNNN = Encoder Firmware

Tips & Troubleshooting

Symptoms	Solutions
Green screen	Encoder displays color background (green, purple or blue) if there is no video or resolution or vertical frequency does not match. If you've been using many different settings in setup, press left and right panel buttons to reset QMOD.
Component	No video – check input wiring and settings Tip – you can use RCA to HD15 cable to connect YPbPr Wrong resolution – set both to match each other Wrong vertical frequency, source must output 59.94 Hz Press left and right panel buttons together to reset encoding
PC VGA	PC graphic cards rarely output video-standard HDTV at 702/1080i, 59.94 Hz – use VGA scaler <ul style="list-style-type: none"> • TV One iT-C2-400 • Extron DVS-340 (with recent firmware) • Calrad 40-888 Set scaler Hz to 59.94 (some units like Calrad state 60Hz but do 59.94 on YPbPr outputs)
DVD	Check cables and input setting Some players only output 480p/480i on Component Try changing Resolution
Tuning Issues	Displays not finding channel in scanning, or have problems locking on to channel.
Channel appears for a second or two, then image appears streaky or blocky	Set QMOD Video Bitrate to 18 mbps. Some sets cannot accept a video stream about 19.4 mbps (video + audio)
Can't tune channel	For testing to a single display, set RF output down a bit Some older sets can't tune 256 QAM, change to 64. Check reception in other sets, a few can only tune 256. Check how channel is inserted into RF and amplified – could be too weak Noise or other channel exist on same frequency If RF system is IRC, channel 5 and 6 are different, if system is HRC, all channel frequencies are different
No audio	Check audio inputs and wiring. Set source digital output to PCM 18/25 encoding issues can also appear as audio loss
Signage Formatting	Digital signage presentation almost always require a scaler to format the output for HDTV displays
Green Screen	Use VGA scaler, set to 720p/1080i, 59.95 Hz
Edges cut off	Most HDTV displays overscan video, underscan video to fit to displays Design signage with safe area
Positioning	Use Up, down, left, right scaler adjustments to fit
Improve thin lines, small text quality	Using a signal generator or test graphic, adjust quality with Sync TrigLev setting 1-4. The cable can make a difference at this setting, so use the same cable for testing as you use for the install.
DirectTV	The DirectTV HD receiver default settings can shift resolutions between 1080i, 720p, and 480p, depending on programming.
HDTV setup	Go to HDTV menu Select Video and turn Native Mode off Select Resolution and turn all modes off but 720p Go to Audio, and turn Dolby Digital off

RS-232 Control Protocol

Overview

The QMOD-HD full duplex RS-232 enables a system programmer to control all functions as well as monitor status. All commands are sent as ASCII strings. No delays between characters or commands are required, as data is interrupt driven and buffered.

There are four status strings for the QMOD-HD, three for each input channel and one for general Amp status.

One QMOD-HD may be daisy-chained together with a CR 232-series tuner from a single RS-232 port. The QMOD-HD is pre-set to Unit 1, and the tuner would be set to Unit 2.

Communications parameters (Front Panel Mode 1) are 300 to 19200 baud, 8 data bits, No parity, and 1 stop bit. Factory default is 9600 baud, Unit#1.

All settings are saved to NVRAM in the QMOD-HD.

The QMOD will accept non-standard RS-232 control such as voltage that swings from 0 to +5 VDC, commonly found when IR ports are used to send RS-232 commands.

General protocol specifications

Characters in command strings to the QMOD-HD are common ASCII keyboard characters.

Command strings sent to the QMOD-HD begin with the ASCII > (greater than symbol) as an 'Attention' character and end with carriage return - ASCII CR, Hex \$0D, or keyboard Enter - as an 'End-of-command' character.

Responses from the QMOD-HD begin with the ASCII < (less than symbol) as an 'Attention' character and end with a carriage return followed by line feed an ASCII LF or Hex \$0A as 'End-of-command' characters.

A carriage return is required at the end of each command and is assumed in all examples.

Command String Structure

[Attention] (Unit#) [Command] (Parameters) [Return]

Attention	Single character (>) starts the string
Unit#	The Unit# is expressed as an ASCII 0-9 when used in multiple tuner applications. To address all units, use a Unit # of 0 (Zero) No unit number will default to Unit#1
Command	A two-character command
Parameters	Added attributes to some commands
Return	A carriage return ends the command string, you may use ASCII CR, Hex \$0D, or keyboard 'Enter' in programming. For simplicity, the programming examples in the manual will not show the 'CR' - so remember, you'll need to add it in your control code.

Command and Status Response

Commands can be sent back to back at any time without any delay. To allow for rapid, multiple commands, status responses are intentionally delayed by about 125mS, sending the most current status in response to control commands or user actions.

RS-232 Commands

Control Commands

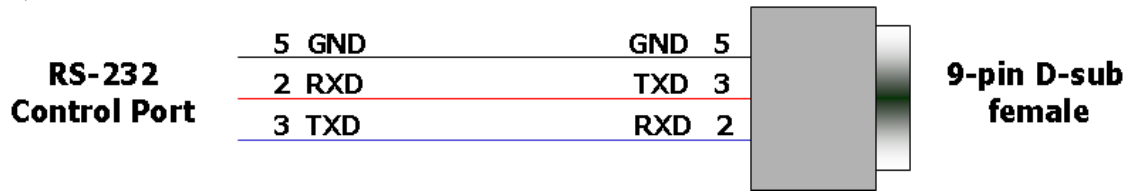
Code	Function	Operation
X9=	Video Input	0= VGA 2= YPbPr 3= Composite Video 4= S-Video
X8=	Video Format	0=1080i 1=720p 2= 480p 3= 480i
F8=	Audio Input for Video S-Video	0= Analog Stereo 1= Digital Coax 2= Digital Optical
F9=	Audio Input for VGA/ YPbPr	0= Analog Stereo 1= Digital Coax 2= Digital Optical
TC=	Channel	XXX
S0=	Cable Format	0= Standard 1= HRC 2= IRC
X2=	No Video Background	0= Purple 1= Green 3= Orange
F5=	Trigger Level	1-4
F2=	QAM Type	0= 64 1= 256 2= CW (Continuous Wave)
F0=	DB Level level from 1..7 (6, 9, 13, 17, 21, 25, 29dBmV)	1= 6 2= 9 3= 13 4= 17 5= 21 6= 25 7= 29

Terminal Communication Commands

EF	Echo Off	Characters received will not be re-transmitted (power up default).
EN	Echo On	Characters received will be re-transmitted. Example: >EN' Characters received will be re-transmitted.
ID	Product ID	Returns the product model number and software version.
Z!	Zap	Reconfigures unit to factory default settings

RS-232 Cable Connections

Single QMOD-HD

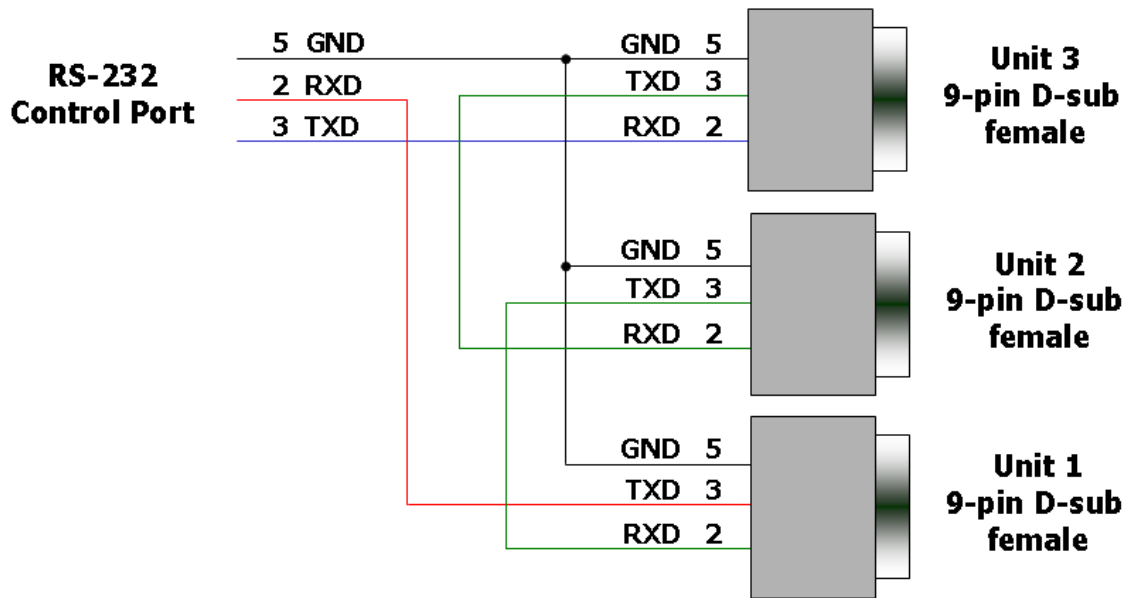


RS-232 wiring for control or programming should only use pins 2, 3, 5. Cables with all pins wired can lock out front-panel programming and data communication (Pins 4 and 9 are inputs).

QMOD-HD Daisy-Chain

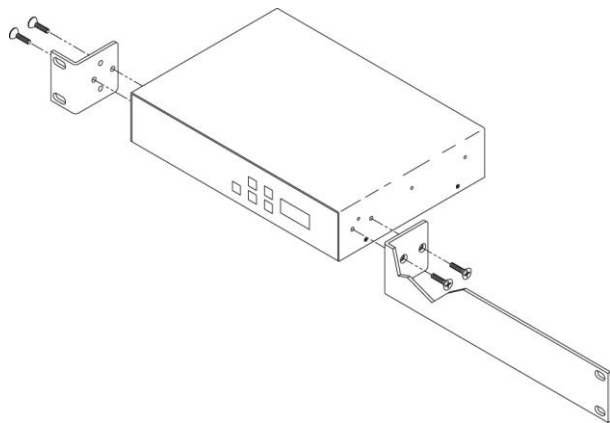
One QMOD-HD and 232-series tuner can be controlled from one RS-232 control port. The QMOD-HD will be Unit 1, and the 232-series tuner will be set to Unit 2.

The flow of information will start at the tuner, which will respond to Unit 2 commands, passing on Unit 1 commands to the QMOD-HD.

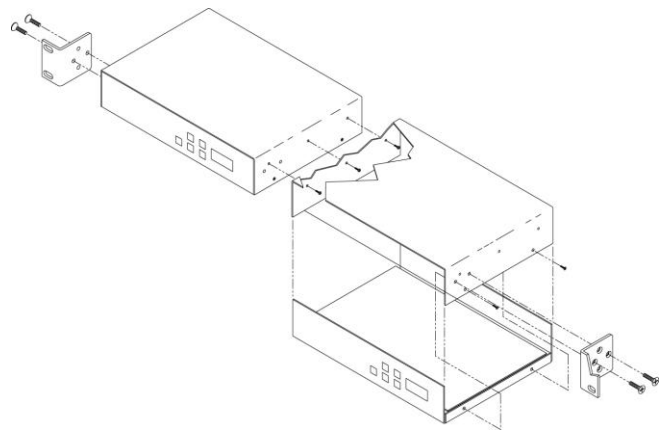


Rack Mounting

Two options are available for rack-mounting the QMOD-HD.



RK1 Rack Mount



RK2 Rack Mount

RK1 Single Unit Rack Mount

Size Long Bracket:	9.5" [206mm] wide x 1.75" [38mm] height (1RU) x 1.75" [38mm] deep
Size Short Bracket:	1.0" [22mm] wide x 1.75" [38mm] height (1RU) x 1.75" [38mm] deep
Weight:	3.25 oz [0.148kg]
Enclosure:	All aluminum with durable black powder coat paint
Hardware:	Qty 4 CS, Phillip, Flathead, 82deg, Black, 8-32 x .25"

Attach the long and short rack ears to the side and towards the front of the unit with the four (4) supplied 8-32 by 1/4" (black) countersunk screws.

RK2 Side-by-Side Rack Kit

1. Remove top cover of the first unit by removing the ten (10) black screws.
2. Attach cover of first unit to the side of the second with three (3) supplied 4-40 by 1/4" (silver colored) panhead screws and split lock washers. Note that only one side of the second unit has the (3) built in nuts to accept the screws above.
3. Reinstall the bottom/chassis of the first unit underneath its cover and attach with just eight (8) of the screws removed in step 1.
4. Attach short rack ears to the side and towards the front of each unit with the four (4) supplied 8-32 by 1/4" (black) countersunk screws.

Safety Instructions

Read before operating equipment.

1. **Cleaning** - Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
2. **Power Sources** - Use supplied or equivalent UL/CSA approved low voltage DC plug-in transformer.
3. **Outdoor Antenna Grounding** - If you connect an outside antenna or cable system to the product, be sure the antenna or cable system is grounded so as to provide some protection against voltage surges and built-up static charges. Section 810 of the National Electrical Code, ANSI/NFPA No. 70, provides information with respect to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna discharge unit, connection to grounding electrodes, and requirements for the grounding electrode.
4. **Lightning** - Avoid installation or reconfiguration of wiring during lightning activity.
5. **Power Lines** - Do not locate an outside antenna system near overhead power lines or other electric light or power circuits or where it can fall into such power lines or circuits. When installing an outside antenna system, refrain from touching such power lines or circuits, as contact with them might be fatal.
6. **Overloading** - Do not overload wall outlets and extension cords as this can result in a risk of fire or electric shock.
7. **Object and Liquid Entry** - Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short out parts, resulting in a fire or electric shock. Never spill liquid of any kind on the product.
8. **Servicing** - Do not attempt to service this product yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.
9. **Damage Requiring Service** - Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
 - When the power supply cord or plug is damaged.
 - If liquid spills or objects fall into the product.
 - If the product is exposed to rain or water.
 - If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions. An improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation.
 - If the video product is dropped or the cabinet is damaged.
 - When the video product exhibits a distinct change in performance, this indicates a need for service.

Limited Warranty and Disclaimer

Contemporary Research Corporation (CR) warrants this product to be free from defects in material and workmanship under normal use for a period of two years from the date of purchase from CR. Should such a defect occur CR will repair or replace, at their option, the defective product at no cost for parts or labor.

This warranty extends to product purchased directly from CR or an Authorized CR Dealer. Consumers should inquire from selling dealer as to the nature and extent of the dealer's warranty, if any.

All warranty claims must be shipped pre-paid to the factory. Call or fax to obtain a Return Material Authorization (RMA) number.

CR is not liable for any damages caused by any of its products or for the failure of any products to perform, including any lost profits, lost savings, incidental damages, or consequential damages. CR is not responsible for any claim made by a third party or made for you by a third party. This limitation of liability applies whether damages are sought, or a claim is made, under this warranty or as a tort claim (including negligence and strict product liability), a contract claim, or any other claim. This limitation of liability cannot be waived or amended by any person. This limitation of liability will be effective even if CR or an authorized representative of CR has been advised of the possibility of any such damages.

Some states do not allow a limitation of how long an implied warranty lasts. Some states do not allow the limitation or exclusion of incidental or consequential damages for consumer products. In such states, the limitation or exclusion of the Limited Warranty may not apply to you. This Limited Warranty gives you specific legal rights. You may also have other rights that may vary from state to state. You are advised to consult applicable state laws for a full determination of your rights.

Except as expressly set forth in this Limited Warranty, CR makes no other warranties, expressed or implied, including any implied warranties of merchantability or fitness for a particular purpose. CR expressly disclaims all warranties not stated in this Limited Warranty. Any implied warranties that may be imposed by law are limited to the terms of this Limited Warranty.