

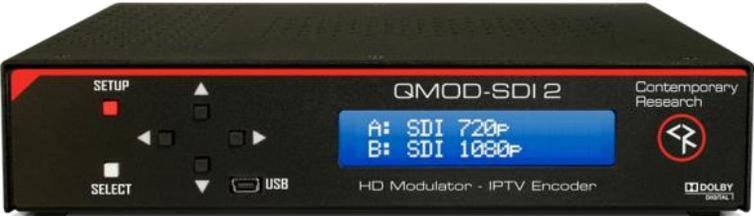
# Product Manual

## QMOD-SDI 2

### QMOD™ HD Modulator-IPTV Encoder

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January 10, 2015



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# Overview

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Employing a totally new HD encoding technology, the dual-channel QMOD-SDI 2 continues the QMODTM track record for quality and innovation, setting a new benchmark for features and performance. In addition to standard SDI resolutions, the QMOD-SDI can accept two 3G to SD SDI and 60/30 Hz feeds from prosumer SDI sources.

## Sources

- Two HD-SDI inputs, 3G 1080p and 1080i/720p 59.94/60 Hz HD-SDI, and SD-SDI 480i widescreen/4:3 video; also accepts embedded 608/708 captioning and Dolby Digital and AES audio
- Two Composite video inputs for encoding, captioning, or EAS use
- Two sets of analog Stereo and SPDIF coax audio inputs

## Encoding

- Creates a high-definition 720p/1080i MPEG-2 stream for broadcast that includes 2 HD programs
- Converts stereo and PCM to stereo Dolby Digital AC-3, can create dual-language SAP audio for each program
- Includes captioning from Line 21 data on composite video inputs
- New! Now includes full scaling that downscales 3g1080p to 1080i, compensates for 60 Hz consumer SDI, and scales all video to a set resolution

## Output

- Delivers a fully agile QAM 64/256 digital cable channel 2-135
- Up to 270 HD Programs/Channels per system
- Streams IPTV from GigE Ethernet port
- Distributes channel over an on-site broadband cable system with adjustable output level to 29 dBmV, compatible with all cable format broadband systems

## Operation

- Sets up with front-panel buttons and easy to use menus, including inputs, encoding, channel, and RF options.
- Onboard Web page for setup and monitoring, also accessible from front-panel USB port
- Control with IP Telnet commands
- Saves power and rack space using efficient design
- Includes compact switching power supply
- Mounts in optional 1RU single (RK1) or dual (RK2EZ) 19" rack kits
- Meets RoHS safety and California energy standards

# Installation - Settings

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There are 3 ways you can change the settings:

- **Front Panel.** Press the SETUP button use the Up/Down buttons to move through menus, Left/Right to change settings, then press SELECT to store the changes at each step.
  - Select a menu group (Quick, A, B, QMOD), then SELECT to view that group's menus
  - Press SETUP to move back to other menu groups
  - Pressing the left and right buttons together will reboot the unit
- **Ethernet.** Access the onboard Web pages. Helpful for remote access when system is fully integrated with site Ethernet.
- **USB-Web.** Access Web pages from front-panel USB port, simplest solution for full setup, requires no IP setup or connection, connect from the front of the equipment rack

## Front Panel Menus

There are four groups of menus you can choose from:

- **Quick Setup** supplies just the few steps needed to output the source as a channel.
- **Program A** goes deeper in to all the options for the first source
- **Program B** does the same for the second source, if that option is enabled
- **Common** menus set the core values for the entire channel, such as IP address, level, cable plan, and other options

## Quick Setup Menus

This series is designed for a quick setup for testing and integration.

Channel	Sets the physical channel, 2-135
RF Level	Sets the RF level for the channel <b>29   25   21   17   13   9</b>
Video A Input	Selects the video input for Program A <b>SDI 1   SDI 2   Video 1   Video 2</b>
Audio A Input	Selects the audio input for Program A (SDI group follows input) <b>None   SDI G1   SDI G2   SDI G3   SDI G4   Coax 1   Coax 2   Analog 1   Analog 2</b>
Video B Input	Selects the video input for Program B <b>None   SDI 1   SDI 2   Video 1   Video 2</b>
Audio B Input	Selects the audio input for Program B (SDI group follows input) <b>None   SDI G1   SDI G2   SDI G3   SDI G4   Coax 1   Coax 2   Analog 1   Analog 2</b>

At this point, you should be able to view the QMOD channels on a test TV. Note that setting Video B input to **None** will automatically put the encoder in to single-channel mode, and revert to 2-channel mode when inputs are selected for Program A and B.

A QMOD Channel, or any QAM Channel, can include two video streams, called Programs. It's really one stream that contains both videos. The TV figures out which to play using the channel ID, typically something like channel IDs 2.1 and 2.2, 3.1 and 3.2 and so on. For marketing purposes we use the popular term "2-Channel" the general public understands, for integrators we use the more correct term "2 Programs".

## Program A and Program B

This series of menus lets you drill down to all the possible options for either Program.

Video Input	Selects the video input for Program A <b>SDI 1   SDI 2   Video 1   Video 2</b>
Output Res	When the scaling option is active, you can specify the output resolution. When it's not, the output will be set by the input. <b>1080i   720p   480i</b>
Auto Out Res	When set to <b>On</b> , the QMOD will automatically output the program as the same resolution as the source. Default is On. <b>On   Off</b>
Vid Bitrate	Bitrate is adjustable in half steps from 10-25 Mbps (5-8 for composite video). Default rate will be 18 Mbps, set to 18 or below for dual-channel operation.
Bitrate Mode	Only visible when QMOD outputs on Ethernet only. Selects Constant or Variable rate
Aud 1 Input	Sets audio for the currently selected source. If you plan on switching sources in your application, select each video input, then select the associated audio. The audio will then automatically follow the selected video input. SDI group follows SDI video input. <b>None   SDI G1   SDI G2   SDI G3   SDI G4   Coax 1   Coax 2   Analog 1   Analog 2</b>
Aud 1 Format	Selects audio format for stereo PCM or analog audio. Incoming AC3 audio encoding will be passed through. <b>AC3   MP12</b>
Aud 1 Lang	Displays metatext for audio channel language. <b>English   Spanish   Portuguese   French   German</b>
Aud 2 Input	Sets the source for the second SAP audio track for the selected video input. Audio will be in MPEG 1 Layer 2 format. <b>None   SDI G1   SDI G2   SDI G3   SDI G4   Coax 1   Coax 2   Analog 1   Analog 2</b>
Aud 2 Lang	Displays metatext for SAP audio channel language. <b>English   Spanish   Portuguese   French   German</b>
Major Chan	Major virtual channel ID for program. Default is 000, will automatically insert the physical channel number as the Major ID.
Minor Chan	Minor virtual channel ID. Default is 1, if set to 000, channel ID will only use the Major channel ID
Chan Name	Enters channel short name, up to 7 characters. QMOD A or QMOD B is default text. Press right or left arrow to start editing, use Up and Down arrows to select character.
No Vid Color	Sets background color displayed when no video is present <b>Orange   Purple (default)   Green</b>
Sync TrigLev	May help how fine details are displayed <b>1-4</b>
Clock Phase	Not applicable, RGB/Component inputs only
CC Source	Selects source for captioning. Video 1 and 2 provide Line 21 captioning data <b>None   SDI 1   SDI 2   Video 1   Video 2</b>
Horiz Freq	Shows horizontal frequency of source
Vert Freq	Shows vertical frequency of source
Lines	Shows number of lines in source video
Horiz Adjust	At the Horizontal menu, press the SELECT button to start the process – you will see a white bar in the middle of the QMOD display. - Up zooms the video horizontally, while Down scales the video down - Left moves the video left, Right moves the image right - The solution is automatically saved for that resolution. Repeat for other resolutions, if needed
Vert Adjust	At the Vertical menu, press the SELECT button to start the process – you will see a white bar in the middle of the QMOD display. - Up moves the video up, while Down moves the video down - Left zooms the video out vertically, Right scales the video down - The solution is automatically saved for that resolution. Repeat for other resolutions, if needed
Enable Logo	Inserts custom logo image into video – On, Off - preview – in development

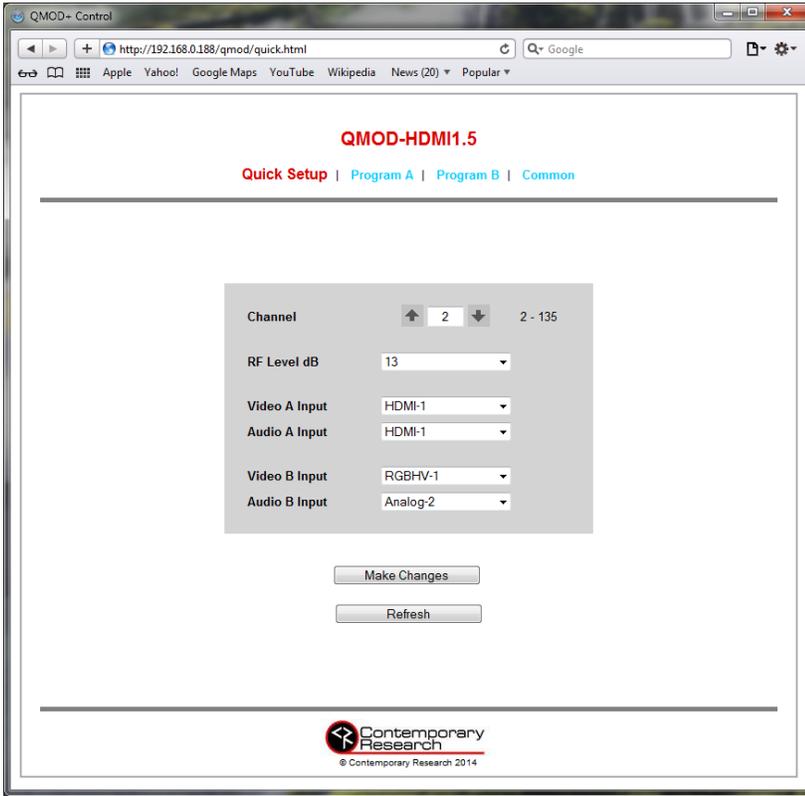
## Common

This series of menus sets global values for QMOD operation. Grayed menus cannot be changed via Web page.

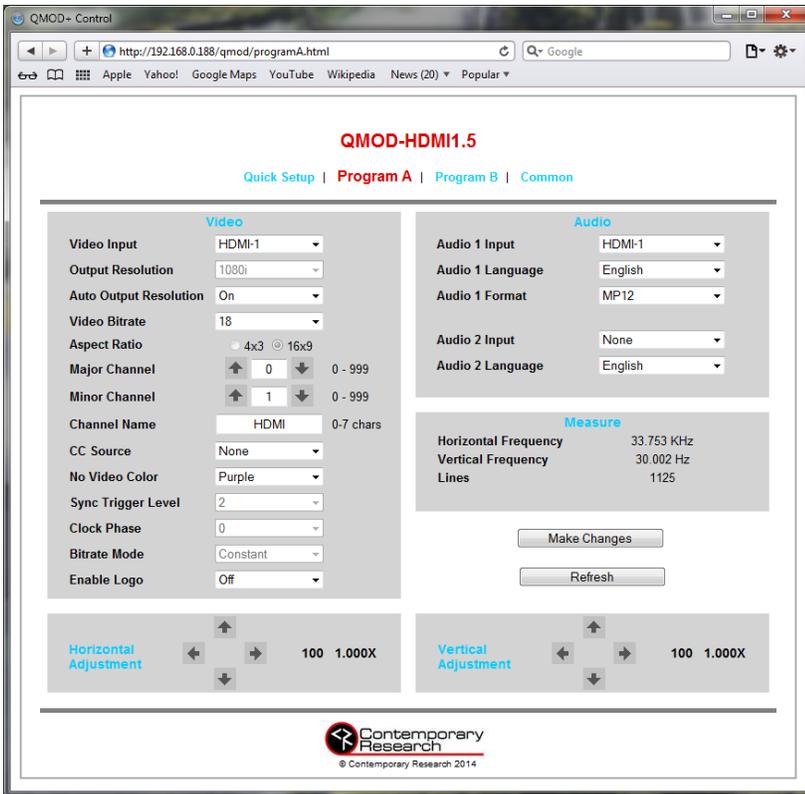
Channel	Sets the physical channel, 2-135
QAM Type	Selects QAM 64 or QAM 256 (default). Fixed at 256 when 2-channel mode is enabled. Continuous Wave is often used to test the channel with a meter. <b>256   64   CW</b>
Cable format	Standard cable frequencies (default) HRC – same as Standard, channels 5 and 6 slightly different IRC – All channel frequencies are different than the standard cable setting
RF Level dB	Sets the RF level of the channel. <b>29   25   21   17   13   9</b>
IP Mode	Selects Static (default) or DHCP IP modes <ul style="list-style-type: none"> <li>• DHCP will select new address, will switch to static if network not present</li> <li>• IP Address will show change when you select DHCP</li> <li>• If you go back to Static, the address you defined in that mode will be set</li> </ul>
IP Address	192.168.1.231 Left/Right steps through each group, click Up or Down arrow to step one at a time, hold down to move faster. Address also appears on LCD when QMOD restarts.
Gateway	255.255.255.000 Quad address – Left/Right steps through each group, click Up or Down arrow to step one at a time, hold down to move faster.
Subnet Mask	255.255.255.0 Subnet has a limited range of combinations, so this function is simplified Left/Right steps through each group, click Up or Down arrow for options
Telnet Port	2728 (default) IP port for Telnet communication – Click or hold Up or Down to set.
Output Mode	Select outputs for stream, IP menus only appear when selected. <b>RF   IP   RF+IP</b>
QMOD IP Port	Enter IP address for IPTV
UDP Mode	Selects UDP mode, sub menus change depending on mode <b>Unicast   Multicast</b>
DstMultiAddr	Enter IP address for multicast
Dest IP Addr	Enter destination IP address for unicast
Dest IP Port	Enter UDP port for unicast or multicast
MAC/SN	Shows network MAC address Ex: 00:04:9F:14:30:40 (last 2 bytes is the serial number)
LCD Contrast	Contrast 1-15
LCD Bright	Display brightness 1-16
Temperature	Internal temperature
Fan Speed	Set fan speed in percent
Backlight	Display brightness 1-10
CVCT	Activates inclusion of virtual channel ID and short Name in the video stream. <b>On (default)   Off</b>
FW version	Firmware version

## Web Pages

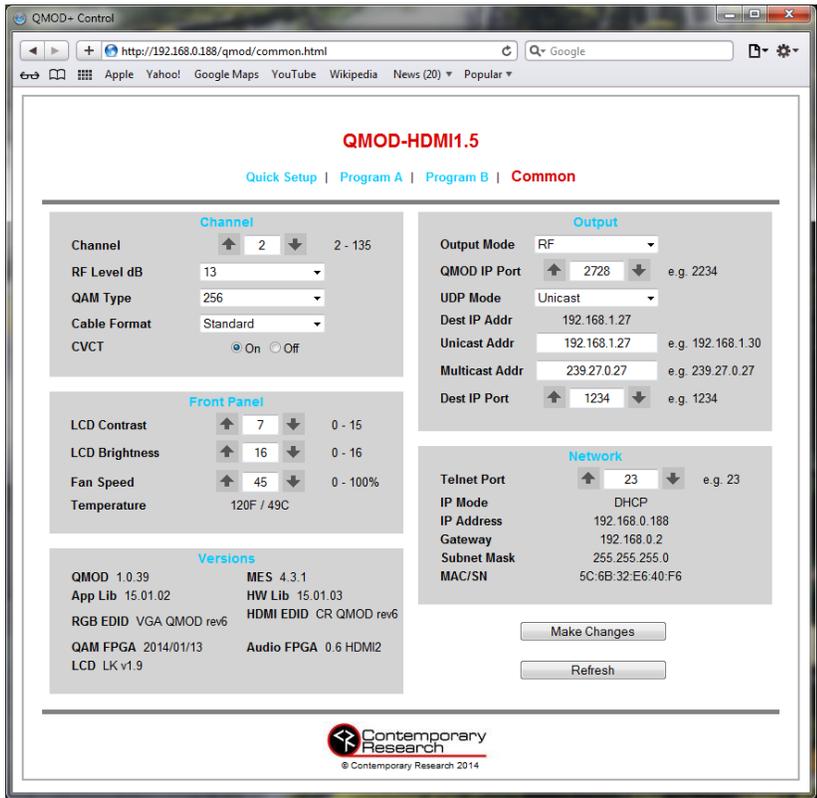
The Web pages provide the same settings as the front-panel menus in simple Web forms (QMOD-HDMI1.5 pages shown as an example).



**Quick Setup** shows the basic setup options.



The **Program A** and **Program B** pages offer a full range of setup features for each program.



The **Common** pages change global values for the QMOD.

## Web Pages via USB

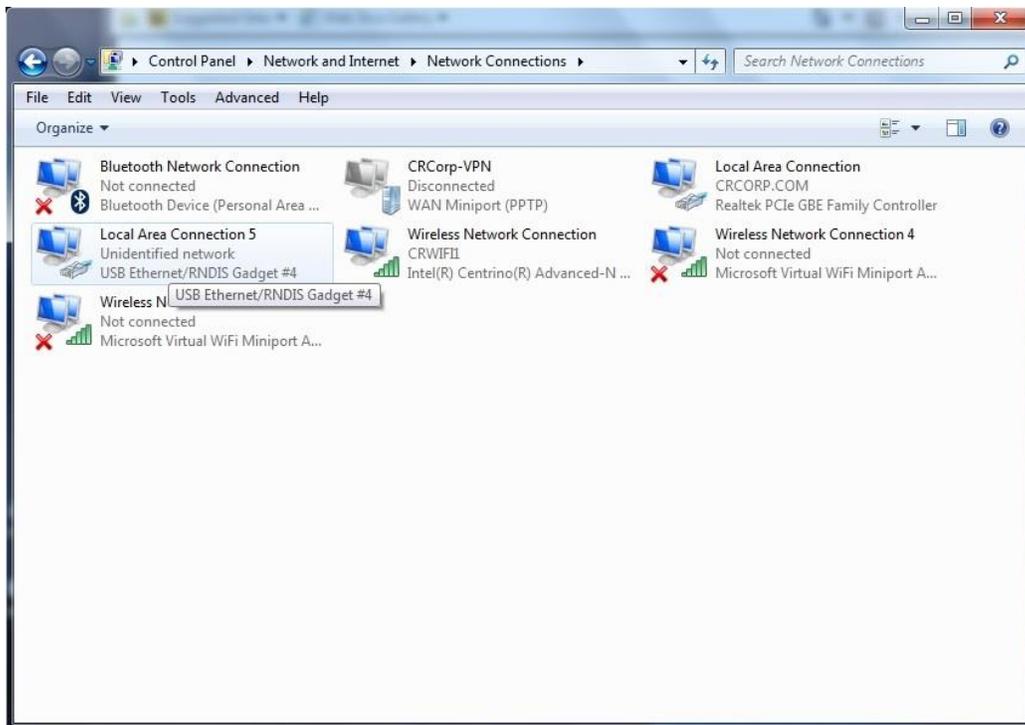
When you don't have an Ethernet connection, you can view the pages through the front USB port. The IP address of the USB port on the QMOD is 192.168.227.227.

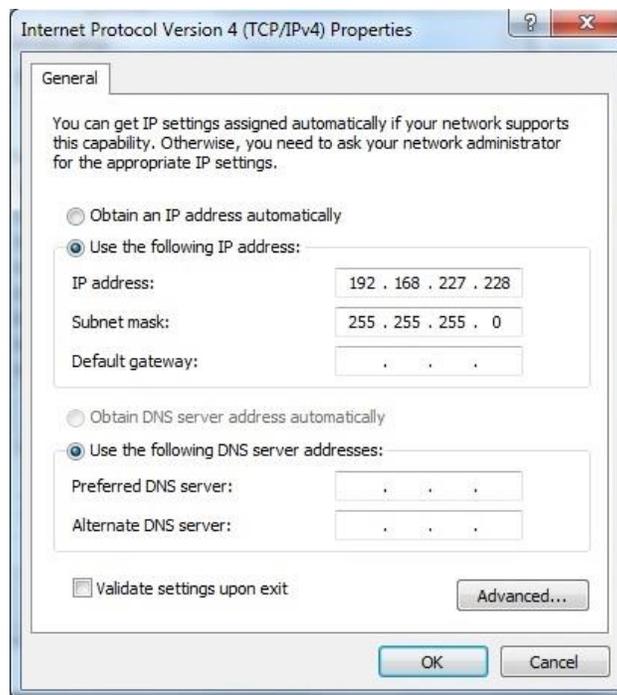
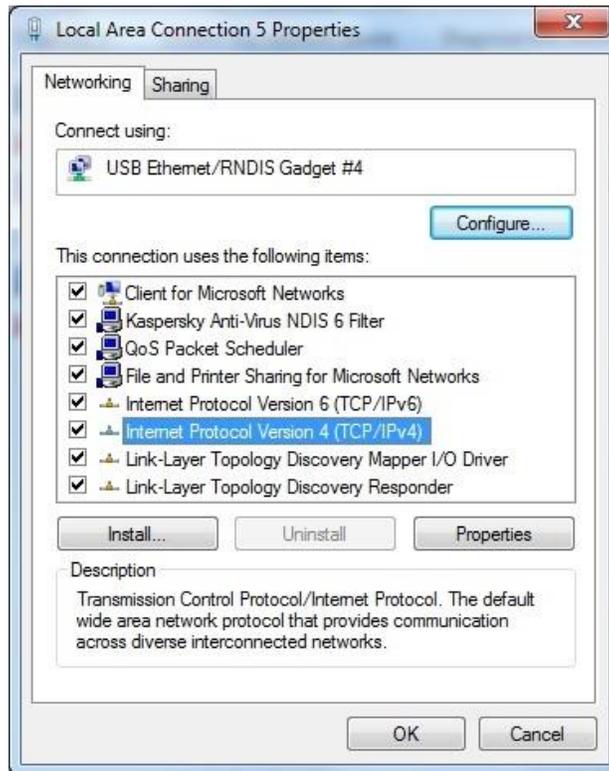
The **first time**, you will need to set the IP address of your USB port to some other address on that mini network using the following instructions:

- Connect a USB cable from the QMOD to your Windows PC. The unit will auto-install.
- Go to Control Panel —Network and Sharing Center—Change Adapter Settings
- Right-click on the **USB Ethernet/RNDIS Gadget**, select **Properties**
- Select **Internet Protocol Version 4**, select **Properties** and enter the following:
  - IP Address: 192.168.227.228
  - Subnet mask: 255.255.255.0
  - Leave all other fields blank

Enter 192.168.227.227 in your browser to see the QMOD web pages.

See the following screen shots for details...





# Firmware Update

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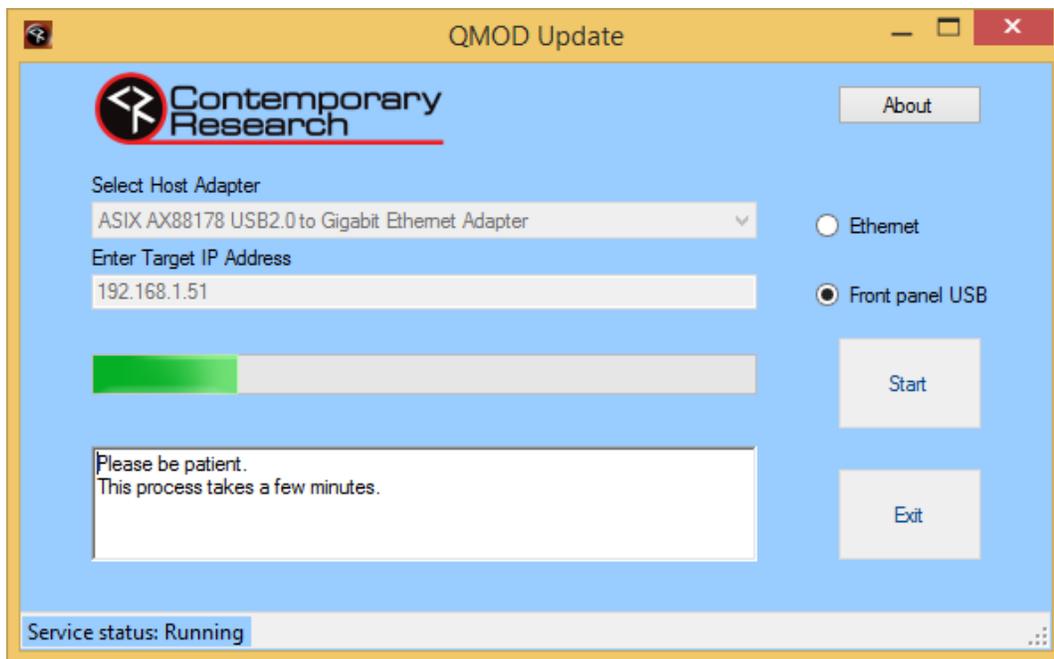
There's a whole new firmware process for the new series of QMODs. The installer you download from our website will create a standard Windows application that you will use for all new-gen QMODs. The software will select the correct firmware for each QMOD model.

There are two ways to access the download:

- Go to our site and select **Support**, then **Software Updates** and look in the **HDTV Origination** section
- Select **Products**, your QMOD and click the link in **Downloads**

After downloading, run the QMOD Update Vxxx.exe file, as you would for any new software app. Later updates will follow the same process; the installer will add the latest firmware.

After you run the installer, look in **All Programs** and run the program.



You have two options for firmware updating, Ethernet or Front panel USB. Ethernet is always the quickest; USB is handy when you don't have an IP connection. You'll find the IP address of the QMOD by pressing **Setup**, then select **Common**, and use the **Up** or **Down** arrows to find the address.

The update process via USB will take much longer than IP.

# Installation - Sources

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## Process

- Connect source(s) to appropriate inputs
- Perform Quick Setup from front panel to test operation and channel
- Use USB Web pages or front panel menus to complete the setup
- The front panel LEDs will light if 2-channel or scaling options are enabled

## SDI 1 and 2

- Source can be 1080p 60/59.94 Hz, 1080i 60/59.94 Hz, 720p 60/59.94 Hz, or 480i 29.97 Hz
- QMOD will sync to SDI resolution and display format on front panel display
- 1080p 3G SDI will be formatted as 1080i (there is no 1080p format in QAM presently)
- If the resolution is not one of the above, the display will state "Incorrect SIG"
- If the QMOD can't connect to the SDI feed, display will read "No Signal". If there is a signal, the connection can often be made using an SDI re-clocking device.

## Video/CC

- The Video/CC input can be used to create an SD digital channel, or to feed Line 21 captioning data

## Audio Inputs

- SDI audio can be assigned to four groups of embedded audio, Dolby audio is passed through, stereo AES is processed as Dolby Digital stereo in the program
- The SPDIF Coax and analog Stereo inputs can be assigned to any input
- When using 2 language tracks, the first will be Dolby Digital, the second MPEG1 Layer 2 stereo

## Ethernet

- The IP and Telnet ports are assigned via front panel or Web menus
- Streaming options can be set locally or remotely

## EAS

- EAS (Emergency Alert System) operation is triggered by a latching input on the SW and Ground pins, a 5-12 VDC level on the V+ and Ground pins
- The assigned EAS inputs, usually Video and Stereo, will broadcast on both programs when active

## Multicast

Multicasting streams require a router with Multicast capability – the router creates the copies needed for user requests. Use IP addresses 224.0.0.1 through 239.255.255.255, which are set aside for multicast streams.

# Rack Mounting

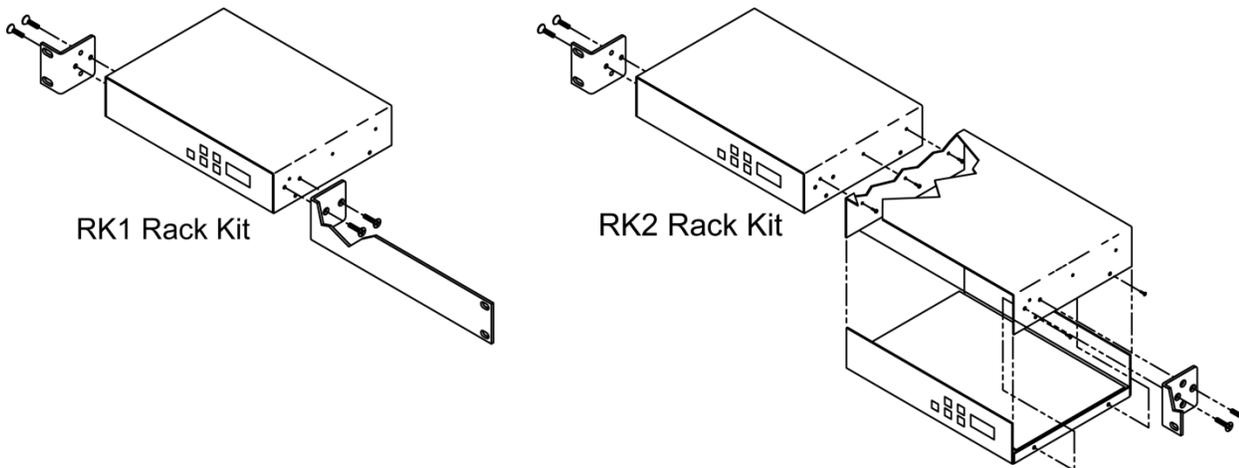
Three options are available for rack-mounting QMOD modulators.



## RK2EZ Dual Rack Kit with Tie Bar Mounting

QMOD enclosures have a slot in the bottom middle of the case. This will accept a tie bar that will lock the two enclosures together without taking the cases apart. Do not mount the QCA9-33 or QDA4-45 units next to QMODs, as the units will block flow-through fan ventilation.

1. Check that your enclosures have the tie bar slot.
2. Slide the included tie bar into the side of one unit and attach with the included screws.
3. Slide the other unit into the tie bar, and attach the screws
4. Add the rack mounts to the sides.



## RK1 Single Unit Rack Mount

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 Style – Locking Cases together

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.

# Specifications

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<b>Physical</b>	8.5" [216mm] wide x 1.73" [62mm] height (1RU) x 6.0" [153mm] deep 1.5 lbs [0.68kg] +32° to 122° F operating temperature, convection cooled Rack mounting for one or two units side-by-side optional (RK1, RK2EZ)
<b>Front Panel</b>	Select and directional buttons for menu setup Menu LCD, Blue with 2 lines of 20 white characters each
<b>Encoding</b>	MPEG2 Profile:MP@HL for HD, MP@ML for SD 1080i, 720p, 480p, and 480i resolution Up to 2 programs in MPEG2 transport stream for QAM and IPTV Video Encoding bitrate 10-25 Mbps in half-step settings Dolby Digital stereo or MPEG1, Layer 2 audio SAP Dual-language capability, 2 <sup>nd</sup> language will be MPEG1 Full scaling for video up- and down-conversion Dual-channel operation with optional upgrade key
<b>Modulation</b>	Switchable 64/256 QAM, J83 Annex B, Interleaving Modes (128,1) MER 38 dB typical
<b>Compliance</b>	FCC Class B, ROHS, meets California standards
<b>Power</b>	2.1mm coaxial jack (inside center conductor positive) 1.1A maximum, 11.5 to 13.5 VDC, 12 VDC typical
<b>Rear Panel</b>	
EAS	3 GPI Pins for latching control, SW for closure, V+ 5-12 VDC, Ground
SDI Inputs	Two BNC Female SD-SDI @ 270Mb/s, HD-SDI @ 1.485Gb/s, 3G SDI @ 2.970Gb/s Coax cable auto-equalizer for SD up to 460m, HD up to 230m (RG6) Resolutions 1080p at 59.94Hz, 1080i/720p at 59.94/60Hz, or SD 480i at 29.97Hz Video Format YCbCr 4:2:2 Accepts SDI embedded Stereo/Dolby Digital 48KHz audio Widescreen option for 480i
Video Inputs	NTSC Video: RCA female (480i), 29.97 Hz, supplies line 21 Captioning
Audio Inputs	<b>Digital SPDIF:</b> Coax , PCM 48K sample rate <b>Analog L and R:</b> 2 stereo RCA female jacks Inputs assignable to video inputs 'F', female, 75 ohm impedance
RF Out	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 dBmV typical output power, attenuated in 5 steps, approx 4 dB
<b>Includes</b>	PS12-1 Switching power supply, 1A 12 VDC, fits in typical AC power strips PS12-4Y 4A power supply with Y cable to drive 2-4 QMODs (free at time of order)
<b>Options</b>	RK1 Single Rack Kit , RK2EZ Dual Rack Kit

## QAM Channel Chart, Center Frequency

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Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
2	57	36	297	75	531	119	765
3	63	37	303	76	537	120	771
4	69	38	309	77	543	121	777
5	75	39	315	78	549	122	783
6	81	40	321	79	555	123	789
95	93	41	327	80	561	124	795
96	99	42	333	81	567	125	801
97	105	43	339	82	573	126	807
98	111	44	345	83	579	127	813
99	117	45	351	84	585	128	819
14	123	46	357	85	591	129	825
15	129	47	363	86	597	130	831
16	135	48	369	87	603	131	837
17	141	49	375	88	609	132	843
18	147	50	381	89	615	133	849
19	153	51	387	90	621	134	855
20	159	52	393	91	627	135	861
21	165	53	399	92	633		
22	171	54	405	93	639		
7	177	55	411	94	645		
8	183	56	417	100	651		
9	189	57	423	101	657		
10	195	58	429	102	663		
11	201	59	435	103	669		
12	207	60	441	104	675		
13	213	61	447	105	681		
23	219	62	453	106	687		
24	225	63	459	107	693		
25	231	64	465	108	699		
26	237	65	471	109	705		
27	243	66	477	110	711		
28	249	67	483	111	717		
29	255	68	489	112	723		
30	261	69	495	113	729		
31	267	70	501	114	735		
32	273	71	507	115	741		
33	279	72	513	116	747		
34	285	73	519	117	753		
35	291	74	525	118	759		

# Safety Instructions

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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**

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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.