

Boulder Amateur Television Club TV Repeater's REPEATER

May, 2020
2ed edition

BATVC web site: www.kh6htv.com

ATN web site:
www.amateurtelevisionnetwork.org

Jim Andrews, KH6HTV, editor - kh6htv@arrl.net www.kh6htv.com



Micro-HAMS Digital Conference Wrap-Up: The Micro-HAMS club in the Seattle, Washington area hosted for the first time, an on-line, webinar on Saturday, May 9th. It ran all day with nine different speakers. Topics covered included: Yaesu System Fusion, Winlink, BPQ32, Nexus DR-X board, Othernet, Free-DV and VARA. At it's peak, there were about 500 on-line viewers. I (KH6HTV) gave a talk at 1 pm, on amateur, hi-def, digital TV. There were about 350 viewers for my 45 minute talk. There was also a "chat-room" after my talk. About a dozen hams were in the chat room for a question and answer session. Here in Boulder, we re-transmitted the conference over our DATV repeater and also streamed via the BATC server.

This was the Micro-Hams first ever webinar and it was plagued early on with a difficult learning curve on how to master integrating Zoom and You-Tube and many various A/V sources. Video came through fine, but there were a lot of issues getting the audio to work. They lost a whole hour plus in the morning wrestling with the audio issue and had to eventually postpone the Winlink talk to the end of the afternoon. I really felt bad for the organizers with their difficulties.

We here in Boulder have also found the audio portion to be the most difficult part of our digital television. We lose our audio much more often than our video. The issues are numerous. Especially aggravating are HDMI hick-ups. Also getting our audio signal levels proper seems to be a challenge.

All of the talks presented are now available on the Micro-Hams web site:

<https://www.microhams.com/mhdc/mhdc2020/>

From there you can then select an individual speaker and click on a link to the YouTube video of the talk.

Jim, KH6HTV

FREE DVD: Free copies are available of the DVD of my Micro-Hams talk entitled "**Amateur, High-Definition, Digital Television**". Send your requests to: kh6htv@arrl.net

Micro-Hams Feedback:

Hi Jim -- St. Louis Amateur TV Society (SLATS) enjoyed your presentation today. It was "simulcast" over our repeater with several viewing OTA. I also recorded it using the HV-110. HI-Des -110 firmware saved and divided it up into 8 .ts files.

73 de Mel, K0PRX

Thanks Jim. Your Micro-Hams program is being transmitted here on our TV repeater. You have 22 viewers from San Diego, Oceanside, Santa Catalina Island and to Laguna Beach. Thank you for sharing your program and we thank you for your work on ADTV. Your group's TV nets are always a joy to watch. One of the best in the world. Not just hello and goodbye but always a great program with content.

73, Mario, KD6ILO

N7CS - Burt - Washington:

Hi Jim! Just saw you are on the schedule for the MicroHAMS conference this Saturday. Looking forward to seeing your talk! I sent a note to the members of our local Western Washington Amateur Television Society (WWATS) club telling them about it. We're still analog, but there are a number of club members starting to get interested in digital.



By the way, I finally was able to put the 23 cm down-converter to use that I ordered from you. I did a field trip out near our ATV repeater and did a write up about it. (see below).

73, N7CS, Burt Guillot, Marysville WA

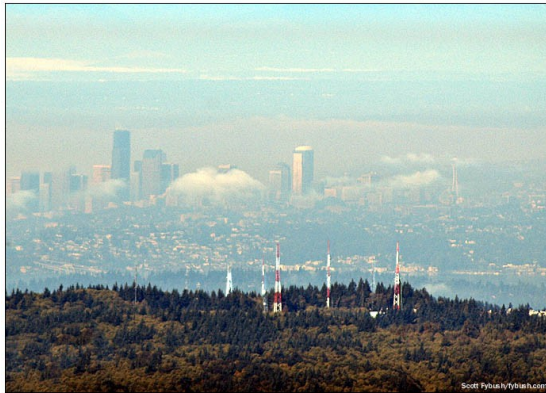
Western Washington Amateur Television Society (WW7ATS)

WWATS holds nets every Wednesday and Saturday night at 8 pm local time. The WW7ATS repeater uses Analog NTSC video that is compatible with older televisions. The video repeater is located on Cougar Mountain and has an input of 434 MHz (horizontal polarization) with output at 1253.25 MHz (vertical polarization). Rather than using the audio component of the NTSC signal, the club uses a traditional FM repeater for audio (W7WWI; 147.08 MHz; +0.6 MHz offset; PL tone 110.9 Hz; EchoLink enabled). This allows the ATV-curious to participate in the nets, and see the video from their YouTube live stream. <https://www.qsl.net/ww7ats/stream.html>

The WW7ATS repeater has a control channel that lets the control operator switch its input between RF and Grandstream. There is a separate Internet page in which

Grandstream users can log into and switch the video feed between any of these Internet transmitters. A low-cost device called a Grandstream GS-GXV3500 can encode a standard definition analog composite video signal into RTSP (real-time streaming protocol) that can be fed over the Internet. There are a variety of reasons for this, including being too far from the repeater, having line-of-sight severely obstructed, or simply not having all the needed equipment yet to transmit from home.

Editor's Note: For more info on WW7ATS, check out their web site: www.qsl.nt/ww7ats plus www.qrz.com (WW7ATS) has a lot of details about their repeater.



WW7ATS on Cougar Mtn - Seattle



Bert's mobile ATV setup

On Saturday April 18, 2020, I drove to a spot that had line-of-sight visibility to the radio tower on Cougar Mountain and setup my equipment in my car so I could participate in the Saturday Evening set. I plugged everything in and could easily see crystal clear color bars on my portable TV

Receive Equipment:

1. Comet SBB-123 1200 MHZ Band High-Gain Mobile Antenna with N male connector
2. Comet MG-4N Mobile Magnetic Antenna Mount for use with N male antennas
3. KH6HTV Model 23-7 23 cm Down-Converter: I had mine built using an N connector for input and an F connector for output, and selected a LO frequency of 1066 MHz. That means the 1252-1258 MHz signal from WW7ATS gets shifted -1066 MHz to 186-192 MHz which lines up NTSC Over-the-Air TV Channel 9.
4. Tyler model TTV707-13 13.3" Portable Battery Powered TV: Unfortunately, Amazon is showing this TV is currently unavailable, but it has come in very handy since it can tune old-style NTSC cable and over-the-air channels without reverting to blue-screen on low-power signals. The seller told me they are working to produce more in the future.

All of the above equipment would be useful for either analog or digital ATV/DTV. The mobile antenna and mount would be useful for mobile operations, but you would want better receive antennas for base station use. You might also want to consider a mast-mounted pre-amp for your base station. Because the WW7ATS repeater is 33 miles from my home, I can't receive it with the mobile setup. (For Digital, you would need additional equipment on top of what's listed above.)

Transmitting equipment:

1. HLLY model TVX-50M Transmitter: eBay listing says this is 500 mW RF output, but I think it's really 50 mW based the picture of the circuit board. It can transmit NTSC video and audio on frequencies between 76-780 MHz in steps of 0.1 MHz, so it meets my needs for 434.0 MHz for the ATV experiments. There is no PTT input, so you have to manually flip the power switch when you are ready to transmit. I did find references that said HLLY's FM radio transmitters have out of band spurious emissions, but do not know if this applies to their TV transmitters. It is difficult to find analog NTSC modulators, so I was happy to finally find a source. They also make a 2 Watt model (not tested), and a 100 Watt model (but the 100W model does not handle amateur TV frequencies).



Burt has discovered a new source of an analog TV transmitter. HLLY brand, from China. Listed on E-Bay for about \$100. Hope to find out more about it from him soon !

2. KH6HTV Model 70-9B Linear Amplifier: depending upon how far you live from the repeater, this model may be overkill. There is a less expensive, less power 70-7B model that may work for you instead. I used the "Low" power setting for my test. A 20 dB attenuator was needed to place this inline between the HLLY and Amp to keep transmitting picture stable
3. CrazyFire HD-SDI Camera: may also be overkill for your application. Any camera that can output a NTSC composite video signal can be feed into the HLLY. I got this camera specifically because it has two outputs that can be used simultaneously--a composite SDI and HD-SDI signal that I can feed into a HD-SDI HDMI converter allowing me to see what I'm transmitting on a separate, modern computer monitor.
4. Tram model 1185 Dual-Band Magnet Antenna: probably need to go back and measure SWR on this between 432.75-438.25.

With the exception of the HLLY TV transmitter that is analog-only, all of this equipment can be repurposed for digital in the future.

73 de Bert, N7CS

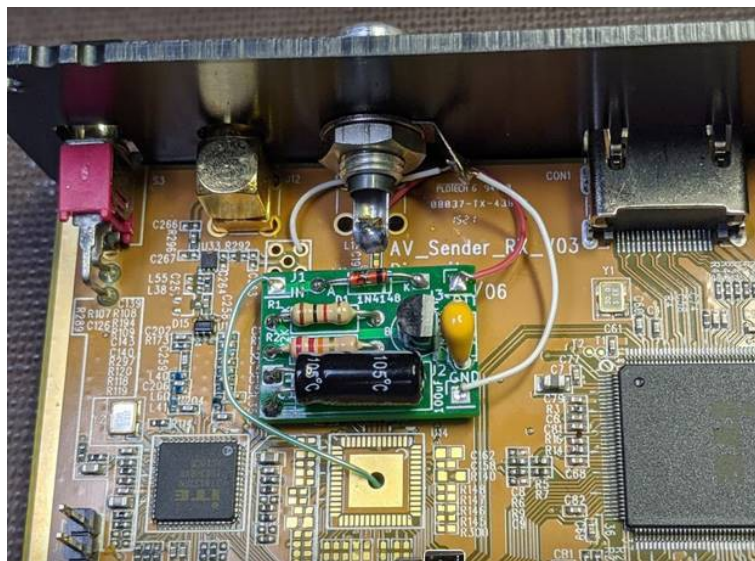
FEED-BACK on HDMI Audio Insertion:

from Mel, K0PRX, St. Louis

Thanks Jim... FB on the Win10 sound. Yes, our group has been doing the same since we started (Win 7, 8 and now 10). When Mike, WA6SVT, was here, he commented on what great "sound" one of members demonstrated using a high end stereo mic. Also, I have used HDMI audio inserters/extractors which generally work OK. HDMI has it "flukes" as you know so sometimes signals won't sync and require toggling power. Dividers will do the same (a monitor syncs but not the TV set) and even HDMI switches can cause fail-to-sync both audio and video requiring power toggle or just disconnect, re-connect the HDMI cable. I recommend a 1080p minimum "TV" set with a sound bar over a PC monitor for much better sound and picture quality. And, of course, the bigger the better but that is my personal taste. A bigger screen brings "presence" of the station your working right into the ham shack that a small monitor just can't do. ATV Hams are way ahead of these covid-19 "virtual" skype folks. Especially when it comes to lighting and sound.

**CUTE PC BOARD contd:**

In our May issue #42, p. 12, we showed Mel, K0PRX's pc board for picking off HV-110, DVB-T receiver's green LED, "Valid Signal" to key a PTT, alarm, etc. Mel now has revision #2 to also work with the HV-120. The photo below shows where Mel placed the pc board in his receiver. He mounted it using double-sided tape. Wire-wrap wire is ideal for the soldered connections to the main board.



ATV IN NEW ENGLAND: I've moved about 20 miles south and have re-set up here in Marlborough MA, so Fred, AB1OC, and I are not doing DATV together any more. I've got a couple of locals interested, though. I'm still following the "TV Rptrs Rptr-xx" series closely. Good stuff.

Your new 70-9B power amplifier, which I just purchased, will give me two complete ten-watt stations. HV-110, HV-100, 70-4B/70-8B on one; HV-120, HV-310, 70-9B on the other. Plus an HV-110 monitor receiver.

Activity has been solo since Fred got even more involved in the Nashua club, taking it to national prominence. I've mostly been just experimenting and "talking to myself." I know of no other DATVers anywhere up here in New England.

As I said earlier, I moved--about a year+ ago--and have re-set up here in Marlborough. New England's topography isn't like Colorado's so a few miles over hill and dale is good DX. I farmed out my two spare receivers to Phil, W1PJE, and Eric, KV1J. We're running slowly getting up and running. In between all our other obligations we've tried the two links, but haven't succeeded yet. Mostly lousy antenna locations.

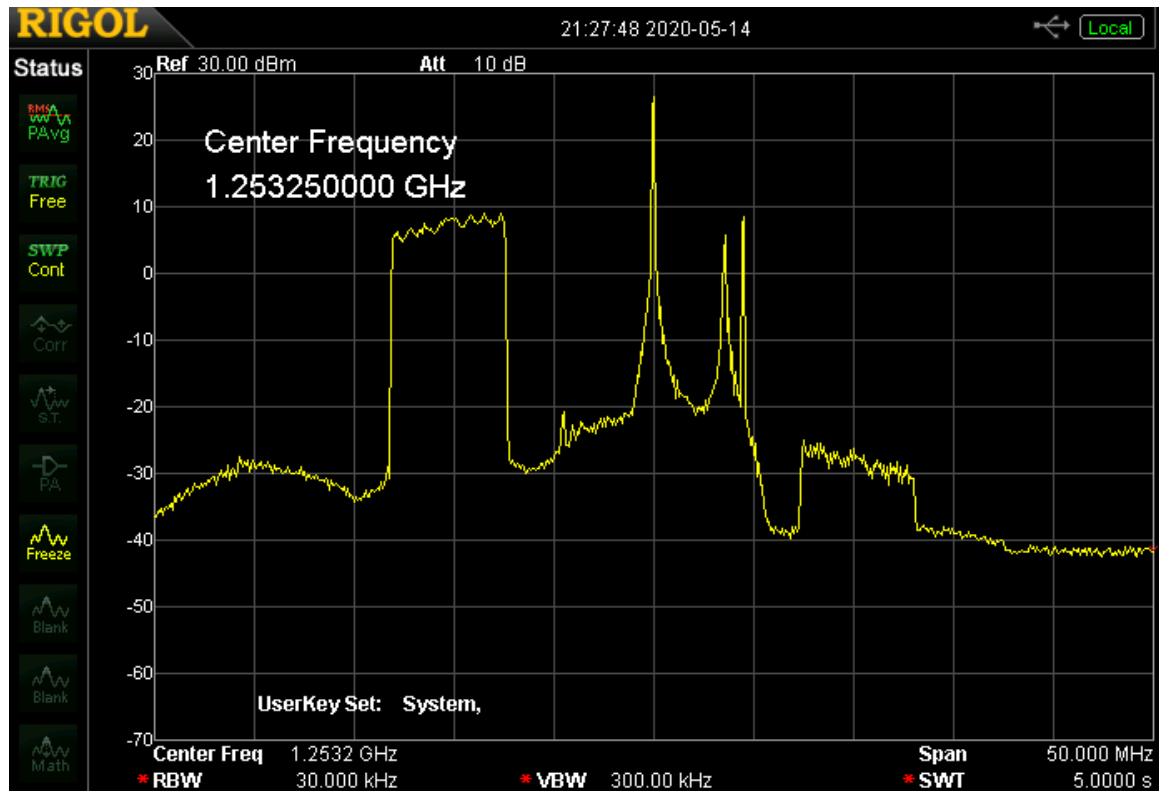
73 de Skip, K1NKR

ANTENNA TOWER VIDEOS: Gary, KB9VGD, has shared some really scary You-Tube videos of working on extremely high towers. + many others
Replacing a broadcast TV antenna on top of a 1,500 ft. tower in Florida:
<https://www.youtube.com/watch?v=pitEq8gjNj8>
2,000 ft. TV Tower in Sioux Falls, Iowa
<https://www.youtube.com/watch?v=incEjBhWcZQ>

Multiplexing DVB-T on Top of an Analog, VUSB-TV Transmitter

Jim, KH6HTV

I was recently corresponding with some ATV hams that were interested in doing digital TV on their ATV repeater. However, they were encountering resistance from other hams that wanted to stay analog. I suggested that it would be possible to do both. For reception, they could add a second digital TV receiver easily and use the same input channel. After their input band-pass filter and pre-amp, simply add a 3dB power splitter and feed their original analog TV receiver and take the other splitter output and feed a digital TV receiver. For transmitting, use the same rf linear power amplifier and antenna, but add a 3dB power combiner to the input of the amplifier and feed it with two modulators, one analog and one digital. For transmitting, put the two modulators on different channels. Feed the same A/V signal to both modulators for simulcasting analog and digital. This should usually be easier to accomplish on the 23cm band, compared to 70cms because we have there 60 MHz vs. 30 MHz and also typically fewer users



Multiplexed, 23cm, ATV Transmitter: Digital, DVB-T on 1243 MHz and Analog, NTSC, VUSB-TV on 1253.25 MHz 10dB/div & 5 MHz/div. rms detector & 30kHz BW

I have setup an experiment here in the ham shack on my electronics test bench to demonstrate the principal. My 23cm experiment put a 1243 MHz, 6 MHz BW, DVB-T, signal on ATV-1 channel (1240-1246). I left ATV-2 (1246-1252) empty as a Guard channel. I then put a 1253.25 MHz, VUSB-TV signal on ATV-3 channel (1252-1258).

By carefully balancing the relative digital and analog rf power levels, the system worked well. I used analog and digital receivers to test the quality of the transmitted multiplexed TV signals. On the digital TV receiver, the s/n meter showed perfect readings both with and without the analog signal being present. For analog TV, there was a slight impairment in the transmitted signal. On the analog receiver and also using a Tektronix waveform monitor and vector scope, the presence of the digital signal was seen to add a slight amount of extra background white noise. The analog picture went from being a perfect P5 to a very acceptable, P 4.5 picture.

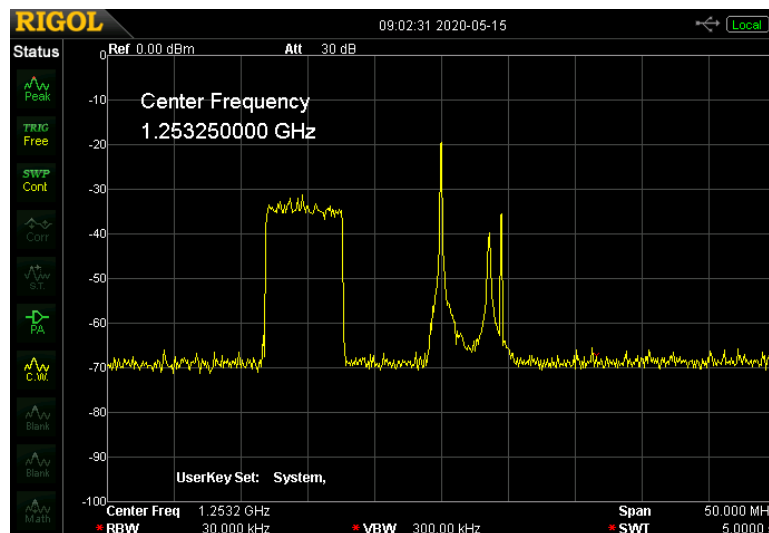
I followed this procedure to set it up the ATV transmitter for the above photo.

1. First turn on only the analog modulator. Increase the rf drive level to the final amplifier until one sees the un-wanted lower sideband, as evidenced by the sound and color sub-carriers, start to grow. Stop when they grow to be -20dB below the upper sideband sub-carriers.

2. Reduce the rf drive power -3dB. This will typically drop the undesired lower side band sub-carriers to -30dB below the upper sideband sub-carriers.
3. Next measure and record the analog rf output power of the transmitter. Measure it as the PEP on the sync tips.
4. Turn off the analog modulator and turn on the digital modulator.
5. Increase the digital rf drive level until the rms output power of the transmitter is -8dB below that of the analog PEP power level.
6. You can now turn on both modulators. The result will be similar to that shown in the above photo.

For the example shown. The resultant analog TV rf power was 5.6 Watts (PEP). The resultant digital TV rf power was 850 mW (rms). The non-linearities in the amplifier were seen to generate an extra, low level digital signal in the next TV channel above the analog channel. It is measured to actually be -66dB below the analog TV signal's video carrier. In the guard channel between the digital and analog TV signal, the residual digital noise is about -60dB below the video carrier. Note: This is using the rms detector and gives to rms power in a 30kHz bandwidth.

The sacrifice in TV transmitter power made by multiplexing versus using it strictly for analog or digital, is lowering the analog PEP power by -3dB and the digital rms power by -5dB.



The input multiplexed signal. Digital, DVB-T on 1243 MHz and Analog, NTSC, VUSB-TV on 1253.25 MHz 10dB/div & 5 MHz/div. rms detector & 30kHz BW

TEST SET-UP: My multiplexing test set-up used a Blonder-Tongue ACM-806, CATV modulator and a Hi-Des HV-320E modulator to generate the analog and digital signals. The CATV modulator was set to channel 9 (187.25 MHz). I used my model

23-6 Up-Converter to put the analog signal on 1253.25 MHz. I set the HV-320E directly to 1243 MHz. I combined the two signals using a Mini-Circuits 3dB splitter/combiner. The 3dB combiner output is shown above.

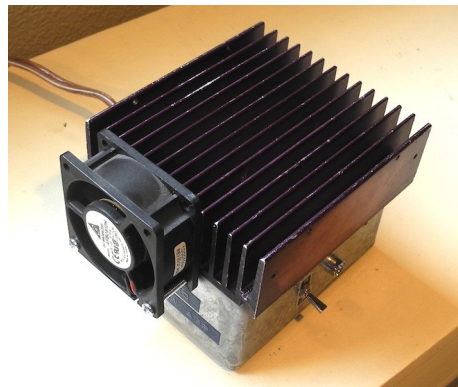
I used my model 23-11A as an example, 23cm linear rf power amplifier for this multiplexing test. To instrument the resultant, amplified 23cm multiplexed signal, I put a 50 watt, 30dB attenuator on the amplifier followed by a 20dB directional coupler and then into my Rigol spectrum analyzer to monitor the spectrum. I used the directional coupler output to a 30dB attenuator and a 3dB splitter to provide test signals for the analog and digital TV receivers. The digital receiver was a Hi-Des HV-120. To receive the analog signal, I used my model 23-7 Down-Converter to a Drake DMM806, CATV receiver tuned to channel 9. I analyzed the analog video output using Tektronix waveform monitor and vector scope, plus a JVC studio monitor.

ATV HAM ADS

Free advertising space is offered here to ATV hams, ham clubs or ARES groups. List here amateur radio & TV gear **For Sale - or - Want to Buy.**

For Sale: 20 Watt, 23cm AMPLIFIER

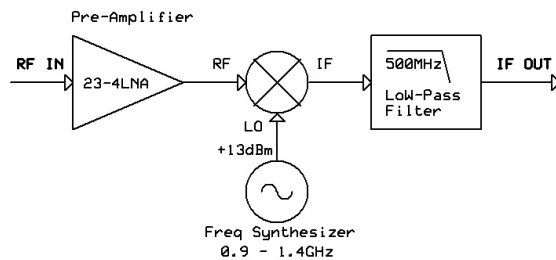
Home built, used Mitsubishi M57762, class A-B, brick amp module. For AM-TV service, for 250mW in, you get 10 Watts (pep) output. For FM-TV service, for 1 W input, you get 20 W output -- 4 Amps at 12Vdc. Not recommended for DVB-T service. I am asking \$50 plus shipping. If interested, contact, Jim, KH6HTV, e-mail = kh6htv@arrrl.net



23 cm Up & Down CONVERTERS: The KH6HTV Video models 23-6 and 23-7 are ideal for ATV hams wishing to do analog, NTSC, VUSB-TV on the 23cm band. Both the 23-6 & 23-7 have a frequency synthesized LO with three selectable frequencies. Specify your desired LO frequencies when ordering. For example, selecting an LO of 1066 MHz in the converter will allow one to easily use CATV modulators and conventional home TV receivers on the standard broadcast TV channels of 7 -13. The 23-6 will thus upconvert a CATV modulator to 23cm standard ATV channels. The 23-7 will likewise down-convert 23cm ATV signals to a home TV receiver.



Model 23-7 23 cm DOWN - CONVERTER



The KH6HTV VIDEO Model 23-7 is a high performance, 23cm Down-Converter with 22 dB of conversion gain. The front end pre-amp is the same circuit as used in the model 23-4LNA. It has a flat frequency response across the 23cm band (1240-1300MHz) with a 0.9dB noise figure. The Schotky diode mixer features a high level LO drive. The LO is provided by an easily re-programmable, frequency synthesizer. A three position, front panel toggle switch allows the selection of three pre-programmed LO frequencies.

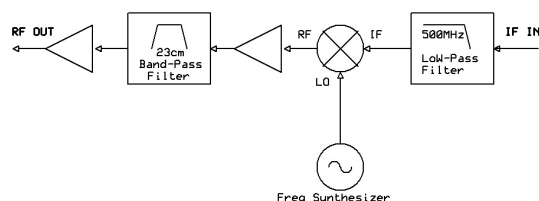
The 23-7 was designed to be a companion unit for use with the model 23-5 IF Amplifier and FM-TV Demodulator to make a complete 23cm, FM-TV Receiver. The 23-7 is ideal for down converting analog FM-TV or VUSB-TV or DTV signals.

PARAMETER	Typical Performance	Notes
RF Input Frequency Range	1240 - 1300 MHz	23cm amateur radio band
Noise Figure	0.9 dB, typical	see 23-4LNA specs.
Conversion Gain	22 dB, nominal	RF in to IF out
IF Output Bandwidth	5 to 500 MHz	-3 dB
Max. IF Output Power	0 dBm	at -1 dB gain compression
LO range	0.95 to 1.4 GHz optional: 0.65 to 1.1 GHz	frequency synthesized
LO Frequencies	3 selectable by front panel switch	Specify desired LO frequencies when ordering
DC Supply Voltage	+12 Vdc, nominal at 240 mA	+10 to +15 V range
RF & IF Connectors	SMA (f)	optional: N for RF Input BNC or F for IF Output
Dimensions & Weight	4.2" x 1.8" x 7.4" (w x h x d)	1.1 lbs

KH6HTV-VIDEO www.kh6htv.com e-mail: kh6htv@arrl.net
Boulder, Colorado & Maui, Hawaii, USA (rev. 10/20/2018)



Model 23-6 23 cm UP - CONVERTER



The Model 23-6 is an Up-Converter for the 23cm band with 15 dB of conversion gain. The Schotky diode mixer features a high level LO drive. The LO is provided by an easily re-programmable, frequency synthesizer. A three position, front panel toggle switch allows the selection of three pre-programmed LO frequencies. Specify the desired LO frequencies when ordering. For example, to transmit on the lower seven, 23 cm, 6 MHz, TV channels (23-1 thru 23-7) use a CATV, NTSC modulator use an LO of 1066 MHz and standard broadcast TV channels 7 - 13.

PARAMETER	Typical Performance	Notes
RF Output Frequency Range	1240 - 1300 MHz	23cm amateur radio band
IF Input Bandwidth	5 to 500 MHz	-3 dB
Conversion Gain	15 dB, nominal, ± 1 dB	IF in to RF out
Max. RF Output Power	+17 dBm	at -1 dB gain compression
Recommended max RF Output	+10 dBm	for ultra-linear operation
LO range	0.95 to 1.4 GHz optional: 0.65 to 1.1 GHz	frequency synthesized
LO Frequencies	3 selectable by front panel switch	Specify desired LO frequencies when ordering
DC Supply Voltage	+12 Vdc, nominal at 270 mA	+10 to +15 V range
RF & IF Connectors	SMA (f) standard	optional: N(f) for RF Output BNC(f) or F for IF Input
Dimensions	4.2" x 1.8" x 7.4" (w x h x d)	

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