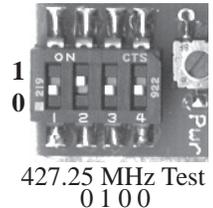


## Videolynx VM-70X Transmitter Quick Start

Your transmitter comes set for around 1/2 Watt pep output which allows you to connect up DC power and RF Out to almost immediately put a signal out on the air. Connect a red insulated #18-22 wire (Radio Shack 278-567) to the 12V solder pad and a black one to the adjacent Gnd solder pad. Always double check that red is connected to the positive output of the 11 to 13.8Vdc power source, you can damage the module if reversed.

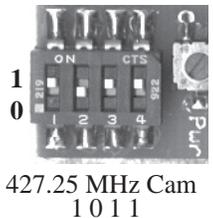
You can use batteries, but a regulated 13.8 Vdc power supply works best. Connect a 50 Ohm dummy load to the RF Out SMA jack or 70cm whip antenna that has a SMA plug on it. Set the frequency digiswitch to 427.25 MHz and internal video: 2 is ON (1) all others OFF (0). Connect an external 70cm antenna to a TV set to cable channel 58 or downconverter to 427.25 MHz.



We stock a F male to N jack adapter to connect your TV directly to low loss 1/2" size 50 Ohm coax with N plugs - 50/75 Ohm mismatch is negligible. We also stock a SMA male to N jack adapter to connect the 50 Ohm 70cm antenna coax to the VM-70X.



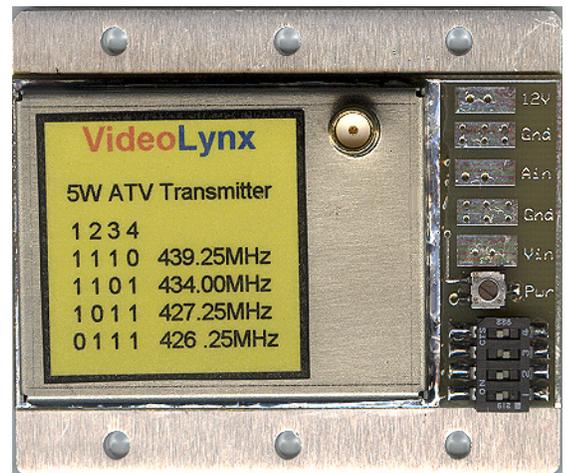
In order to connect up your camera and line audio, you can get BNC and RCA jacks from Radio Shack or Mouser and run a shielded cable from each to the Vin video and Ain audio input solder pads on the VM-70X. It is easiest is to just cut off one end of a existing BNC and/or RCA shielded cable that mates with your camera jacks. Strip the cut end about a half inch and solder the centers and Gnd shields to the solder pads. To transmit the video from the camera instead of the internal test video pattern, reverse the 4 digiswitch settings with 2 off and the others on.

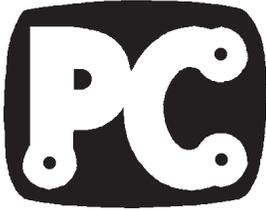


Turn on the DC power and look for the two white vertical bar test pattern and tone on the TV for no more than 5 minutes unless you have mounted a sufficient heat sink to the bottom plate - see the other application note pages. A one to two second delay for the RF to come up is normal. With inside antennas, you may also note some picture instability in the picture due to TV overload and/or multipath. If you are receiving the test pattern and audio, turn off the DC power and reset the frequency digiswitches for transmitting video from your camera. Cameras and mics can be RF susceptible so experiment with keeping the camera far enough away from the transmitting antenna.

Before connecting to a good outside 70cm antenna with a SWR of no more than 2:1, find out on your local two meter ATV talk back frequency what ATV antenna polarity is being used and which of the 4 ATV frequencies is used in your area - 144.34 and 146.430 MHz simplex are common. Only two 70cm ATV frequencies are useable at any given time and must be separated by at least 6 MHz to prevent interference. Also if FM voice repeaters use a frequency below 444 MHz for input or output, they can interfere with reception on 439.25 MHz ATV.

Establish contact with a local ATVer on 2 meter voice that has a strong simplex signal to you. This is an indication that they can receive your 70cm video. Rotate your directional antennas for best received picture coordinating on 2 meters. Don't forget to ID either by speaking into the camera mic or with a call letter card in view every 10 minutes for long transmissions and at the end of the transmissions. Once everything seems to be working well with your set up, you can consider packaging the module and heatsinking so you can crank up the power - check our Plug and Play ATV and app note web pages.





**ELECTRONICS**

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Email: ATVinfo @ hamtv.com

Web site: http://www.hamtv.com



## Videolynx VM-70X 4W+ ATV Transmitter App Note

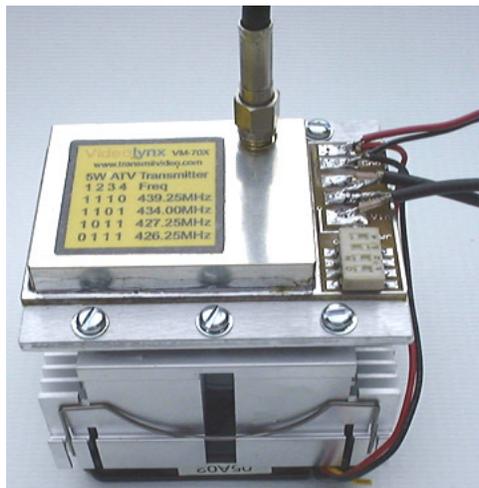
Ravi, KA3NNJ, can't resist miniaturizing ATV transmitters with the latest high tech IC's. The VM-70X is his latest which is only 2.35" x 2.8" x .75", 1.8 oz, 4 channels, sound, and puts out over 4 Watts. Some have been asking for a little more power than 50-100 mW as found in his Z70A. A pot on the board will adjust the output power anywhere from 0 to over 4 Watts. 4 channels are digiswitch selected: 426.25, 427.25, 434.0 or 439.25 MHz. The video and audio carrier are locked to the same crystal. The board accepts line level video and audio. With this unit you can run up to 1/2 Watt out without having to add a heatsink for up to 20 minutes assuming there is free air around it. This is fine for most R/C aircraft flights. The unit will work on any DC Voltage from +11 to 14.0 Vdc.

For longer time periods or restricted packaging, a heatsink needs to be bolted to the mounting plate or air blown over the unit so the maximum temperature of 149 degrees F is not exceeded. The table below shows the power, current draw at 13.8Vdc and time to reach 149 degrees from about 80 degrees with the transmitter sitting on the bench and 5 degrees per minute cooling time in-between transmissions. Obviously, for most applications, an additional heatsink and/or fan will have to be used for repetitive transmissions.

Output	Current	Time to 149F	time/deg
0.5	.35	23 min	21 sec
1.2	.48	5 min	8.5 sec
5.0	1.0	1:50 min	3 sec
0	0	5deg/min cooling	

All power is sync tip or pep.

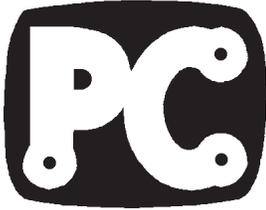
The VM-70X module comes fastened to an aluminum plate which can in-turn be bolted to a chassis or heatsink with 6 4-40 screws and the mating surfaces covered with a thin layer of heat sink compound. Under no circumstances touch the 4 screws on the bottom of the plate. As can be seen left, the heat needs to be removed for long or repetitive short key down periods so that 149 degrees is not exceeded and possible damage to the module.



An excellent solution for higher power R/C, rocket or balloon applications is to bolt a Radio Shack CPU Cooling Fan (273-153) or similar to the mounting plate. The fan draws about 200 mA at 13.8Vdc. Placing the transmitter over the heatsink, I marked the locations of the 6 holes. Then I center punched and drilled each one about 3/8 of an inch with a #43 drill. Then tapped for a 4-40 x 3/8 screw and deburred. A little fine sandpaper will remove any bumps before applying heat sink compound. Mount the transmitter as shown with the heatsink gap on the digiswitch side - hottest side is diagonally across. Connect the red fan wire to the 12V solder pad and black to ground. Cut the unused yellow wire short.

With this set up I was able to transmit 4 Watts pep ATV for 1 hour with temperature rising up to 100F.

For balloons and rockets where weight and battery drain is a primary consideration, instead of a heatsink/fan, a 50K thermistor - Mouser 71-07C5002JP - can be soldered in parallel with the 5K RF power pot at the trace leading from the pot and adjacent shield cover ground. As the heat increases, the thermistor will reduce the power. With module at ambient temperature, turn on the transmitter and quickly set the maximum desired output power. I set the module without heatsink for 3W at 84F and it dropped to .9W at 125F after 10 minutes. Bolting on sheet aluminum or copper will extend the time to minimum power.



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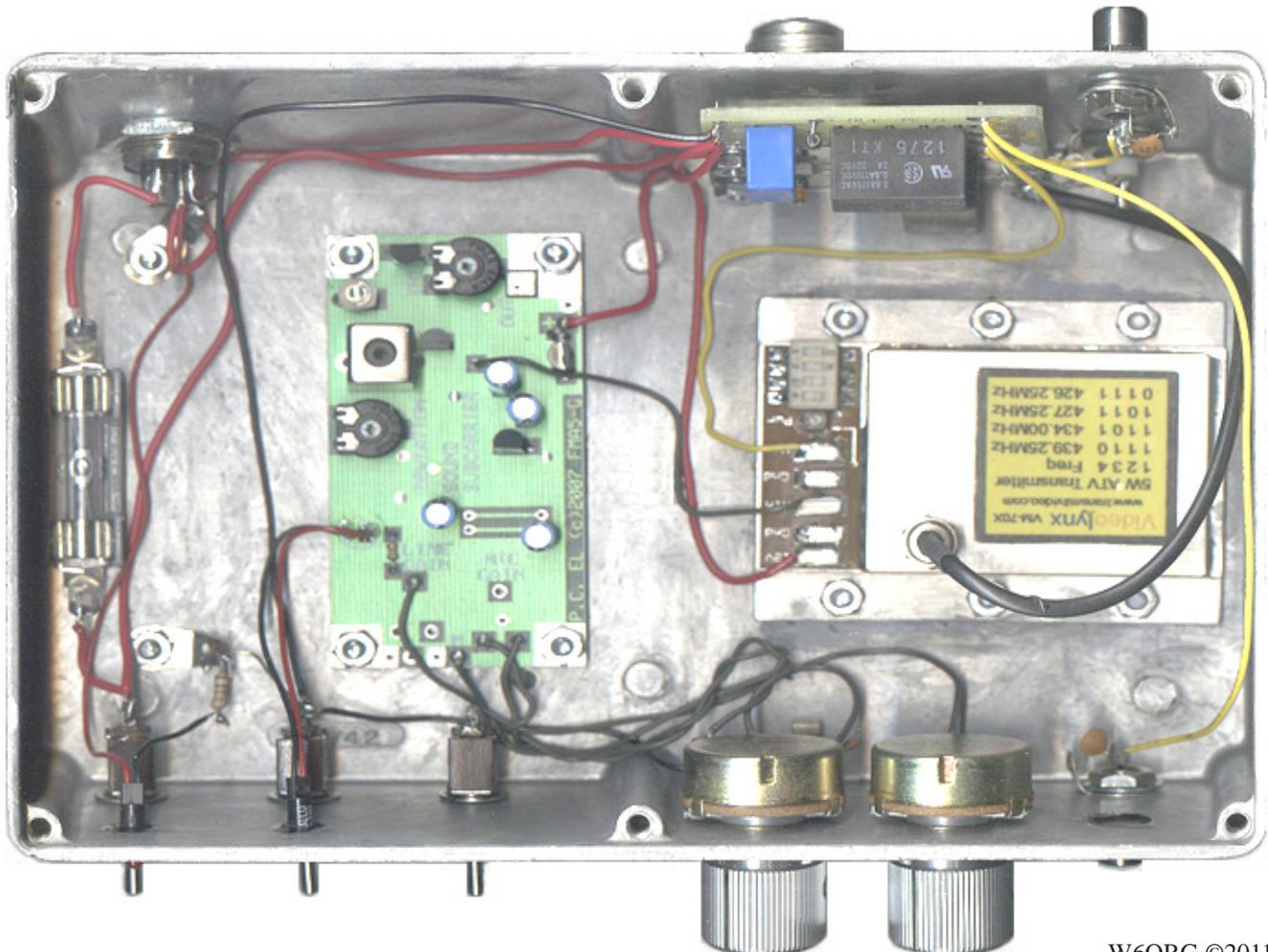
## Packaging the Videolynx VM-70X ATV Transmitter

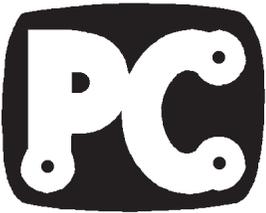
This configuration is great for making a home or portable ATV station where you need to switch the antenna and power between the transmitter and downconverter and also have mic and line audio input with low distortion deviation limiting. The Videolynx VM-70X is adjustable from 0 to more than 4 Watts pep output on 4 selectable channels in the 420-450 MHz ham band depending on applied DC



voltage from 11 to 14 Vdc. For power levels above 1/2 Watt some way to remove the heat is necessary. We have an app note that describes mounting a computer fan on the modules mounting plate, but this app note will describe packaging the VM-70X in a Hammond 1590D diecast aluminum box along with the PC Electronics TR-1b T/R relay board and using the mic and line deviation compressor section of the FMA5-G sound subcarrier board.

The die cast aluminum box with the module built in as shown below is an adequate heat sink, without a fan, to continuously run the transmitter up to 5 Watts pep with video and 13.8 Vdc applied in a 75 degree F ambient room per our tests. The VM-70X must be placed on a perfectly flat side of the box with no raised or embossed lettering or logo and a film of heat sink grease - RS 276-1372 - spread in between the box and the module.



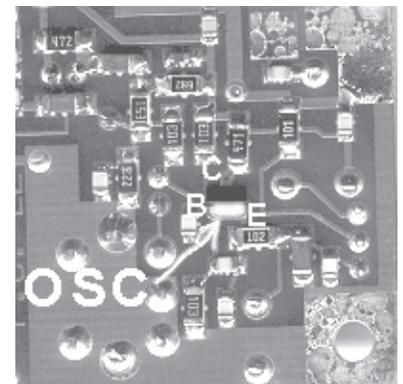


## ELECTRONICS Packaging the Videolynx VM-70X ATV Transmitter - continued

The wiring schematic on the next page has the lengths to cut the #22 insulated wires so you can solder them to the TR-1b and FMA5-G boards as well as the pots, switches, mic and PTL jacks before mounting. This makes it easier to assemble and interconnect later.

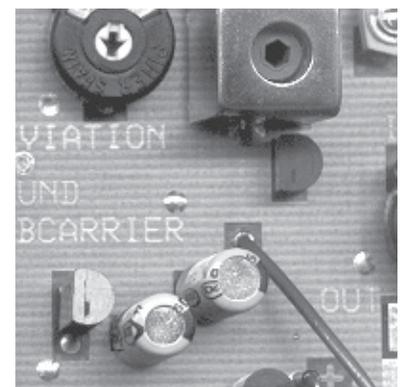
Cut out the drill templates on the edges, center on the box and then tape it down. On the bottom, make sure the 6 VM-70X mounting holes are not going to be drilled on the side that has any raised logo or lettering. The mounting surface must be perfectly flat and the holes debured for proper heat transfer and, to not stress the internal boards between hot and cold cycles. Center punch in the center of the circles and drill each one with a .125" dia drill, then redrill those with larger diameters. Check alignment with each board and the N jack. Rat tail file if necessary and debur each hole. Paint and letter the outside surfaces as desired.

**Mic and Line Audio:** The VM-70X is designed for a single line level audio input of 200-250 mV RMS and does not have an internal 25 - 40 kHz deviation limiter. Adding the P. C. Electronics FMA5-G sound subcarrier boards mic amp, line mixer and volume compressor type of deviation limiter will let you adjust proper sound levels and use a low impedance dynamic mic if desired. The transmit LED also doubles as an over deviation indicator. Before mounting the FMA5-G board, the 4.5 MHz VCO must be disabled by applying a solder short across the base to emitter solder pads of the 2N2222 surface mount oscillator transistor - see photo.



Oscillator solder short

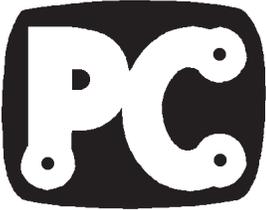
**Set Up:** The VM-70X comes preset to 1/2 Watt output. Leave it at this setting for the tune up. Check your wiring for shorts using an Ohm meter before applying DC power. Connect a 50 Ohm load or 70cm antenna of known low SWR to the RF output and through a Wattmeter. With no video plugged in, turn on the transmitter (note 1 sec delay) and quickly peak the trimmer cap on the TR-1b for maximum power out. Then you can adjust the power pot on the VM-70X for no more than 5 Watts output. You can key down for up to 5 minutes with no video connected. Plugging in video will now show about 3.5 Watts for an all black picture and 2.3 Watts for an all white picture. Do not be tempted to crank up the power pot, you are still getting 5 Watts on the sync tip. An average reading Watt meter reacts this way normally with AM video modulation. If you use this transmitter to drive a higher power amplifier, start with no video connected and the power pot turned down before connecting to the amp. Then turn both on and slowly raise the power to 1/2 therated power of the amp, or to the 1 dB compression power level, which ever is higher.



Deviation TP is the output

The sound deviation limit needs to be set for between 25 and 40 kHz. This can be done with a tone applied to the line input, line level pot raised to the point where the transmit LED is off, then setting the deviation pot in the middle of the FMA5-G board for about 35 kHz with a communications monitor. What? You don't have one of those? OK, preset the pot to about half way and you will be about 25 kHz. Note the sound level on a TV of a commercial broadcast station, then switch to the cable channel you are transmitting ATV on, and adjust the deviation pot for about the same volume - that's close enough.

If you only use one channel in your area, you need not remove the digiswitch. Most use two channels, but with this transmitter the selected channel is open, the others ground. A SPDT switch can be used per the box schematic, or you can run wires to 4 toggle switches on the front panel.



### ELECTRONICS Packaging the Videolynx VM-70X ATV Transmitter - continued

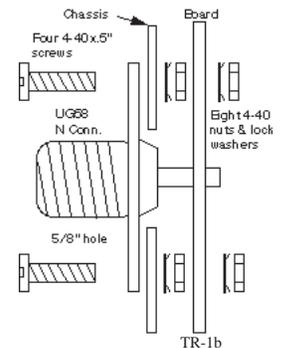
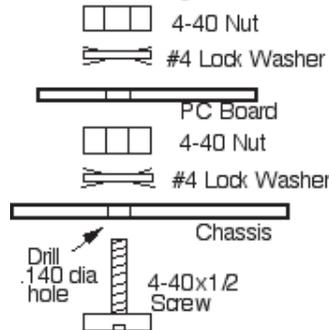
Parts list for packaging the ATV transmitter:

RS part numbers = Radio shack, the alternates after are from Mouser - call: 1-800-346-6873

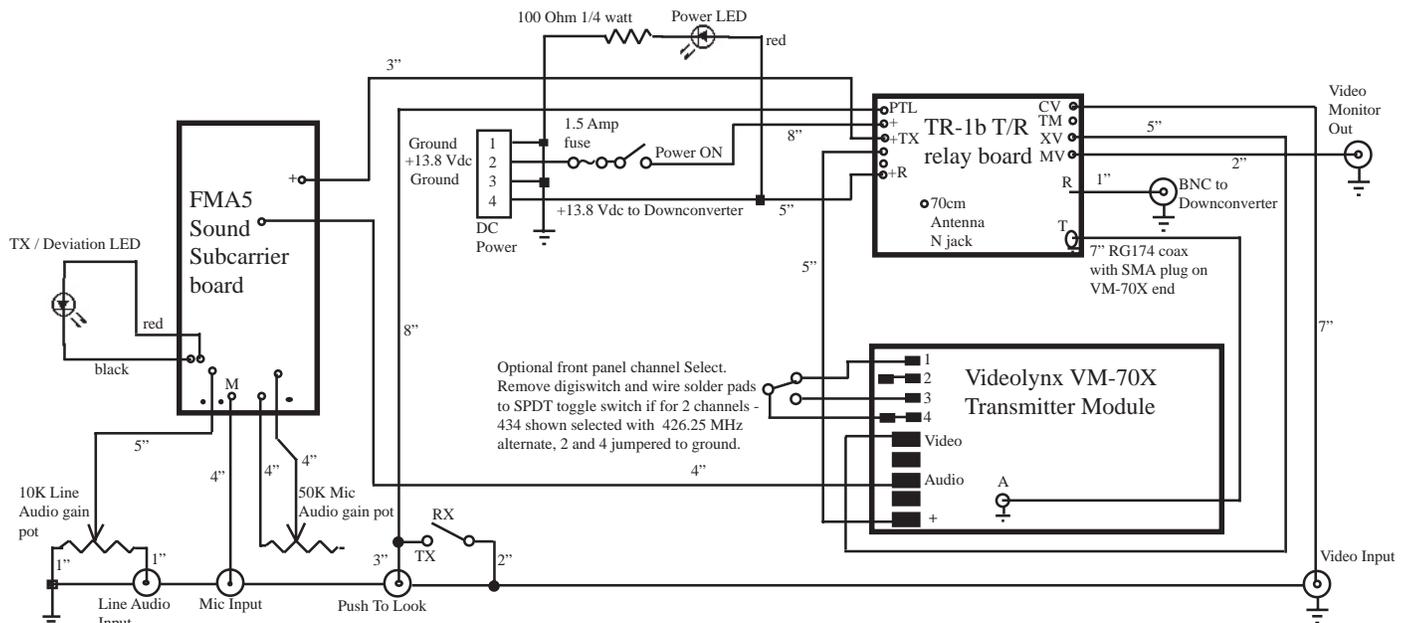
- 1 VM-70X ATV transmitter module, P. C. Electronics
- 1 FMA5-G sound subcarrier board, P. C. Electronics
- 1 TR-1b T/R relay board, P. C. Electronics
- 1 UG-58 N chassis jack, P. C. Electronics
- 1 Hammond 1590D die cast aluminum box, 546-1590D
- 1 10K line audio pot, RS 271-1715, 31VA401
- 1 50K mic gain pot, RS 271-1716, 31VA405
- 1 UG1094 BNC chassis jack, RS 278-105
- 1 4 pin chassis DC power jack, RS 274-002
- 1 4 pin DC power plug, RS 274-001
- 1 3AG fuse holder, RS 270-739
- 1 1.5 Amp 3AG fuse, RS 270-1022
- 3 RCA phone jack, 161-1052
- 1 Mini mic jack, 16PJ012
- 1 Sub-mini PTL jack, 16PJ100
- 2 Knob, builders choice, ME 450-6015
- 2 Toggle switch SPST, RS 275-612, ME 108-MS550K
- 1 Toggle switch (opt) SPDT, RS 275-613
- 2 LED, red with wires. 645-558-0101-007F
- 1 100 Ohm 1/4 watt resistor, RS 271-1311, 29SJ250-100
- 14 4-40x1/2" pan head screws, RS 64-3011, 5721-440-1/2
- 24 4-40 nuts, RS 64-3018, 5721-440
- 23 #4 internal tooth lock washers
- 2 #4 solder lug, 534-7311
- 4 Rubber bumpers, RS 64-2346, 517-SJ-5007BK
- Misc #22 hookup and buss wire, #18 for DC power leads

Check all parts for fit, then clean the box with isopropyl alcohol prior to painting. Spray paint the outside surfaces of the box and cover. After drying, rub on letters can be applied and then a coat of clear paint. After the box is completely dry, assemble all the parts and wire.

#### Board Mounting Detail



Place screw through hole in chassis, drop on lock washer or solder lug, then finger tighten the nut. Then place the PC board on the nuts and check for fit. Check the wire protrusion on the bottom of the boards and cut close so as not to short out to the chassis. Push down on the board near the mounting hole while tightening with a screwdriver to lock in the alignment. Then put on the final lock washer and nut.



# 5 Watt ATV Transmitter drill drawing using a Hammond 1590D die cast aluminum box.

Videolynx VM-70X, P.C. Electronics FMA5-G and TR-1b boards. W6ORG ©2011

