

GET THE ATV BUG!

# LOW COST GUNNPLEXER ATV

## GUNNPLEXER VIDEO MODULATOR - ONLY \$29

- \* COLOR VIDEO AND STEREO SOUND CAPABLE
- \* CAN BE REMOTED FROM THE GUNNPLEXER
- \* FINE FREQUENCY DC VARICAP BIAS CONTROL
- \* REGULATED GUNNPLEXER DC POWER



GVM-1



10 GHz Gunnplexer

Dust off those Gunnplexers on 10 and 24 GHz and make an ATV link. Link Space Shuttle or weather radar to the local ATV repeater, remote an ATV receiver or pan and tilt camera on a hill top or repeater site, or do public service events - lots of uses plus the fun of putting the system together and “seeing” it work with readily available components. You can get 1-2 miles line of sight with the simple 10 mW Gunnplexers and 17 dB horns, or farther with dishes and modified Ku band TV downconverters.

The P. C. Electronics GVM-1 is a wired and tested board which drives a 75 ohm coax and load at the Gunnplexer varicap with video and adjustable DC bias for fine frequency adjustment. It also has a regulated +10 Vdc for the Gunnplexer power - up to 1A for 100 mW Gunns. The board can be mounted in a chassis (we suggest the LMB CAB247 or Hammond 1590D die cast aluminum box) along with one or two sound subcarrier boards (go stereo sound or use one for voice and the other for control tones or digital) and the bias and power run through two 75 ohm RG6 coaxes to the Gunnplexer on the tower. The P. C. Electronics FMA5 sound subcarrier boards are \$39 each and can be specified for any specific frequency between 4.5 to 7.5 MHz - 6.2 and 6.8 MHz are standard.

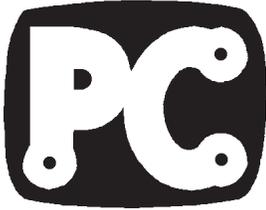
The GVM-1 video modulator board has a deviation pot to enable the standard 1Vp-p video from cameras, camcorders, and VCR’s to be set for the 4 MHz NBFM ATV or 11MHz WBFM ATV standards. The FMA5 sound subcarrier boards also have variable deviation (50 kHz is standard for FM ATV) pot as well as injection to the modulator (-10 dB is standard).

To receive you can use another Gunnplexer and off set 70 MHz and use a surplus satellite TV receiver with 70 MHz input as was used for C band TVRO systems for wideband. The 70 MHz IF systems will need a well shielded line amp to get to the noise floor - Radio Shack has some low cost in-line types. The noise figure is fairly high with Gunnplexers - 8-10 dB, so for longer distances we suggest a LNB into a 920-1600 MHz satellite TV receiver. We stock the Bensat receiver for \$130 and recommend the low noise<1 dB 10 GHz LNB from Bob Platts G8OZP 43 Ironwalls Lane, Tutbury, Burton upon Trent, England DE13 9NH Email: G8OZP@hotmail.com - for \$95. LNB’s are as low as \$40 from people like MCM Electronics, and receivers around \$150-\$200. The LNB’s that are made for 12 GHz need the DRO puck filed down to raise the LO to high side injection around 11,500 MHz. Re-invert the video polarity with the switch in the receiver.

**Call, write or email for our complete ATV Catalogue.**

Advanced Receiver Research, POB 1242, Burlington, CT 06013, tel (860) 485-0310,  
 www.advancedreceiver.com

10 GHz Web pages: <http://www.tiac.net/users/wade>



**ELECTRONICS**



# GVM-1 Gunnplexer Video Modulator

This board is designed to video modulate 5 to 100 mw Gunnplexers that have a separate varicap input. It will also supply the regulated +10 Vdc basic power up to 1 amp. Mount the board in an aluminum enclosure for both shielding and heat-sinking the regulator. The FMA5 sound subcarrier board can be mounted with the GVM-1 to add sound. The CAB247 makes a nice control box for the boards with panel room for mic and line audio gain pots, jacks, transmit switch, and the deviation and varicap bias pots - see layout page.

The pots on the boards can be removed and wires run to the same value panel type pots. For runs less than 6 inches, twisted wires can be run to the boards but if longer, shielded cable is suggested. Use an F connector for the varicap output (VC). At the Gunnplexer end, remove any other components at the varicap input and connect the 75 ohm 1W terminating resistor to that terminal and ground; run leads to another F chassis connector. Verify the 75 ohms with an ohm meter before applying voltage - any short will blow the 2N2219A. The +10 Vdc can be another coax line with connectors or a #18 red and black wire pair. Use a .1 and a 10 mF or larger cap at the Gunnplexer to filter any + lead noise. If the suggested Gunnplexer power is less than 10V drop the voltage at the Gunnplexer with series 1N4001 diodes (.7V each).

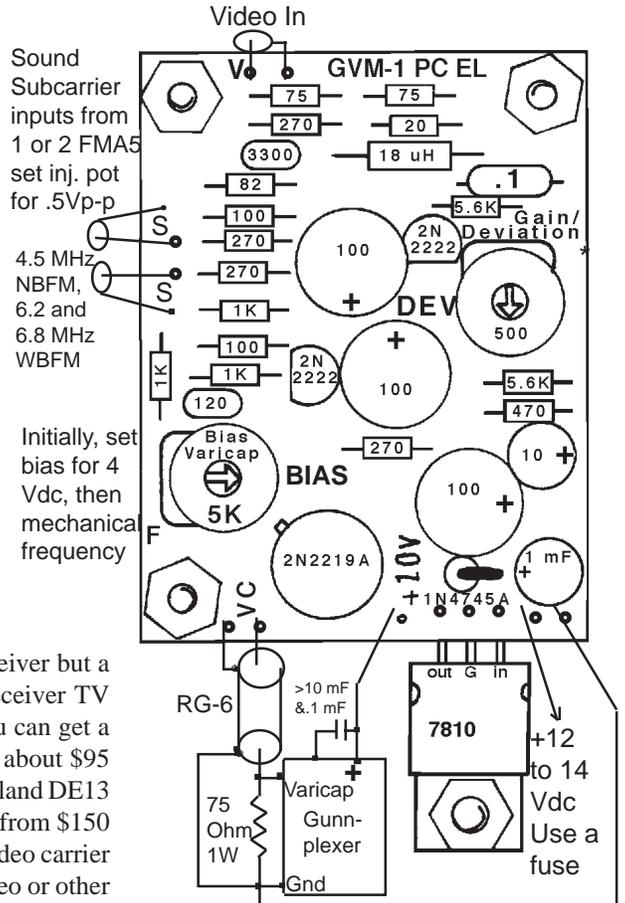
The board is designed for the standard video input of 1 volt peak to peak into 75 ohms and has a CCIR 405-1 pre-emphasis network. The 500 ohm deviation pot can be set for either the 4 MHz or 11 MHz standards. 3 to 4Vdc varicap bias generally gives the best modulation linearity. Set the 4 V bias first, then adjust the Gunnplexer mechanical frequency after 2 minutes warm-up. The bias pot can then be used for fine frequency adjustment (1 to 8.5 Vdc range- 5 to 8 MHz/V) until video limiting. SHF offers a heater kit for frequency stability in temperature varying environments.

To receive, you can use another Gunnplexer and 70 MHz satellite TV receiver but a modified low noise Ku band or DSS LNB to a 950-1450 MHz satellite receiver TV works much better. There is almost a 10 dB difference in noise figure. You can get a modified LNB with a 9 GHz LO to tune the 10.0 to 10.5 GHz ham band for about \$95 delivered in the USA from Bob Platts G8OZP 43 Ironwalls Lane, Tutbury, England DE13 9NH Email: bob\_platts@hotmail.com Satellite TV receivers are advertised from \$150 up in various magazines. We stock the Bensat receiver - \$130. 10.40 GHz video carrier with 6.8 MHz primary sound is standard in the USA for ATV and 6.2 for stereo or other function such as control, packet, ID, etc.

### 10 and 24 GHz Gunnplexer sources:

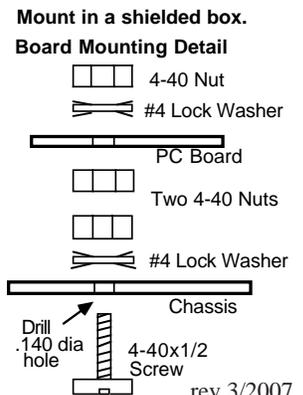
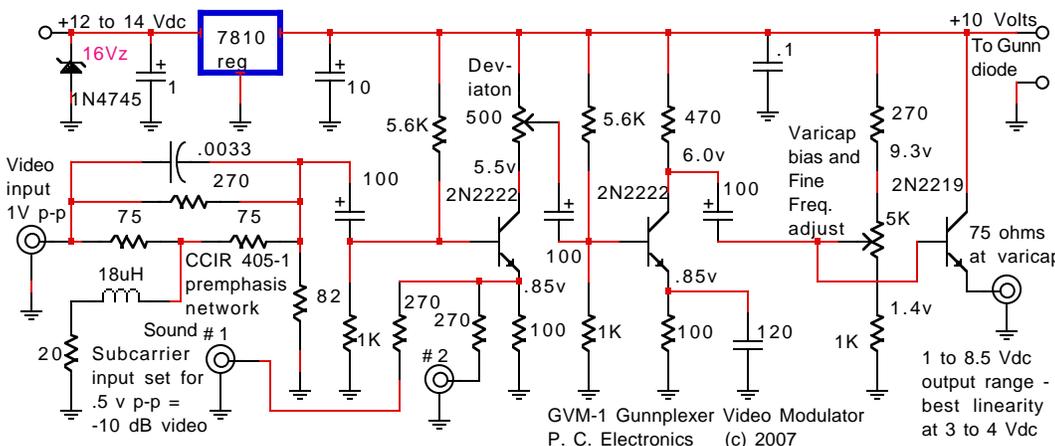
Advanced Receiver Research, POB 1242, Burlington, CT 06013 tel (860) 485-0310 www.advancedreceiver.com

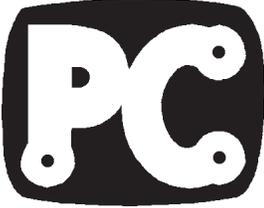
10 GHz Web pages: <http://www.tiac.net/users/wade>



\*Set deviation for 1V p-p video out of a FM TV receiver.

70 MHz satellite TV receivers require 20 dB more gain to reach the noise floor. Use 75 Ohm TV inline amp or build MMIC amp and connect to Gunnplexer detector output..





# GUNNPLEXER CONTROL BOX

## ELECTRONICS

The GVM-1 Gunnplexer modulator board needs to be put in a shielded box along with the 1 or 2 sound subcarrier boards. Some of the board trim pots can be replaced with panel equivalents and wires run to them from the boards. Shown is an example where the video gain/deviation, frequency/varicap bias, mike and line audio pots are placed on the front panel for easy operational adjustment. Below them are jacks for video, mike and line audio inputs. On the rear panel are two F61 F connectors for running the +10 Vdc Gunnplexer diode power and the varicap modulated bias. Mark the cables so that they do not get accidentally switched.

Purchase all the parts and the box before using the drill layout. The parts list and drill diameters are for the Radio Shack and Mouser part numbers but you may want to substitute other parts and sources. It is easier if you interconnect and solder all the wires between the boards and the panel pots and jacks that mount from the inside before mounting in the box. Then mount the outside mounted jacks and attach their wires. Mount, wire and solder the fuse holder, 1N4744 15 Volt protection zener, power jack and on/off switch. Mount the boards and attach and solder the leads from the jacks, then mount the pots.

Check for shorts with an ohmmeter. On turn on, verify the +10 volts gunnplexer power and variable varicap bias on the F jacks. If you have an oscilloscope, turn on the sound subcarrier boards (10K line audio gain switch) one at a time and set the injection pot for 1/2 volt p-p at the bias output. Turn off sound subcarrier, plug in video and set deviation for 2 Vp-p to start and fine adjust for 1Vp-p out of a receiver. (c)3/2007

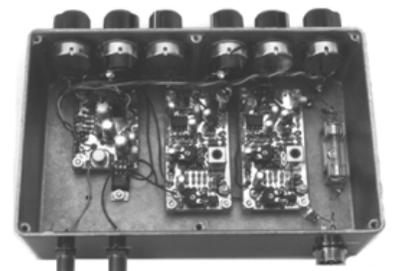
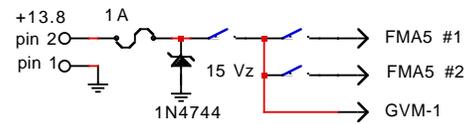
### Parts list

Qty	Description	Source			
1	GVM-1 board	P. C. Electronics	1	3AG fuse holder	RS 270-739
2	FMA5 board	P. C. Electronics	1	1 Amp 3AG fuse	RS 270-1005
1	Hammond 1590D Box	Mouser Electronics	1	1N4744 15V 1W zener	RS 276-564
1	4 pin power jack	RS 274-002	6	Knob	builders choice
1	4 pin power plug	RS 274-001	4	Rubber feet	RS 64-2346 or 517-SJ5012
2	F61 coax jack	RS 278-212 or 16SF061	1	4-40x5/16 pan head screw	
1	SPST Toggle switch	RS 275-612 or ME108-MS550K	12	4-40x1/2 pan head screw	
2	Mini mic jack	RS 274-292 or 16PJ012	35	#4 nut	
3	RCA phono jack	RS 274-346 or 161-1052	22	#4 internal tooth lock washer	
1	500 ohm panel pot	31VA205	2	#4 solder lug	
1	5K panel pot	RS 271-1714 or 31VA305	62"	#22 wire hookup wire	
2	10K panel pot w/switch	RS 271-215 or 31XP401			
2	50K panel pot	RS 271-1716 or 31VJ405			

RS=Radio Shack, Mouser 1-800-346-6873

### Wire list

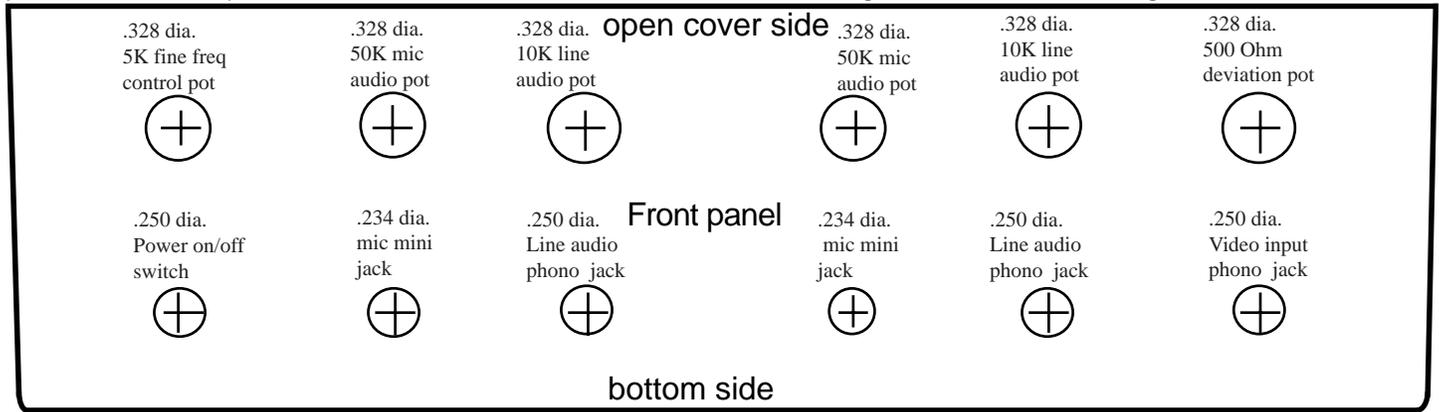
length	From	To
1"	Power jack pin 1	Ground lug under FMA5 #2 rear side mounting nut
1.5"	Power jack pin 2	Fuse holder
1"	On/off switch bottom lug	Fuse holder - Zener to ground lug under FMA5 #2 front side mounting nut.
4.5"	On/off switch middle lug	line audio #2 10K pot switch hot side lug
4"	line audio #2 10K pot switch hot side lug	line audio #1 10K pot switch hot side lug
1"	Line audio #1 jack	line audio #1 10K pot CW lug
1"	line audio #1 jack ground lug	line audio #1 10K pot CCW lug
1"	Line audio #2 jack	line audio #2 10K pot CW lug
1"	line audio #2 jack ground lug	line audio #2 10K pot CCW lug
2"	FMA5 #2 M pad	Mic jack #2
2"	Twisted pair FMA5 #2 mic pot pads	50K mic #2 pot center and CCW lugs
2"	FMA5 #2 line audio center pot pad	10K line audio #2 center lug
6"	FMA5 #2 output pad	GVM-1 S solder pad #2
3.5"	FMA5 #2 + input pad	10K line audio #2 switched side lug
2"	FMA5 #1 M pad	Mic jack #1
2"	Twisted pair FMA5 #1 mic pot pads	50K mic #1 pot center and CCW lugs
3"	FMA5 #1 line audio center pot pad	10K line audio #1 center lug
4"	FMA5 #1 output pad	GVM-1 S solder pad #1
4"	FMA5 #1 + input pad	10K line audio #1 switched side lug
2"	GVM-1 +10 pad	+10V Gunnplexer power F jack
2"	GVM-1 VC pad	Varicap bias F jack
4"	GVM-1 + input pad	line audio #1 10K pot switch hot side lug
2"	GVM-1 V video in pad	Camera video input jack
8"	3 wires 500 ohm deviation pot	GVM-1 500 ohm deviation pot pads
3"	3 wires 5K video deviation pot	GVM-1 5K deviation pot pads - put 22 ohm resistor in series with center lead.



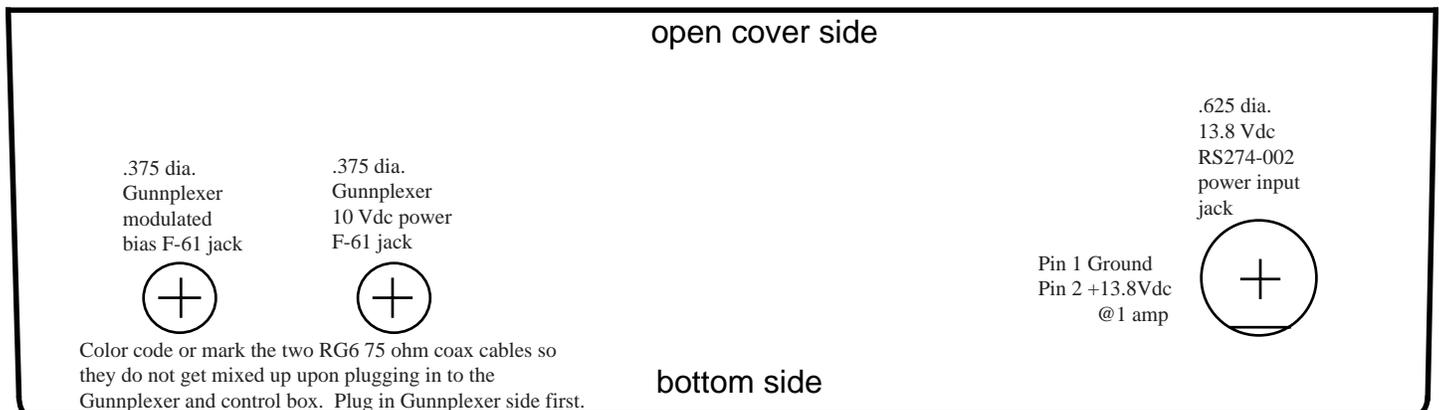
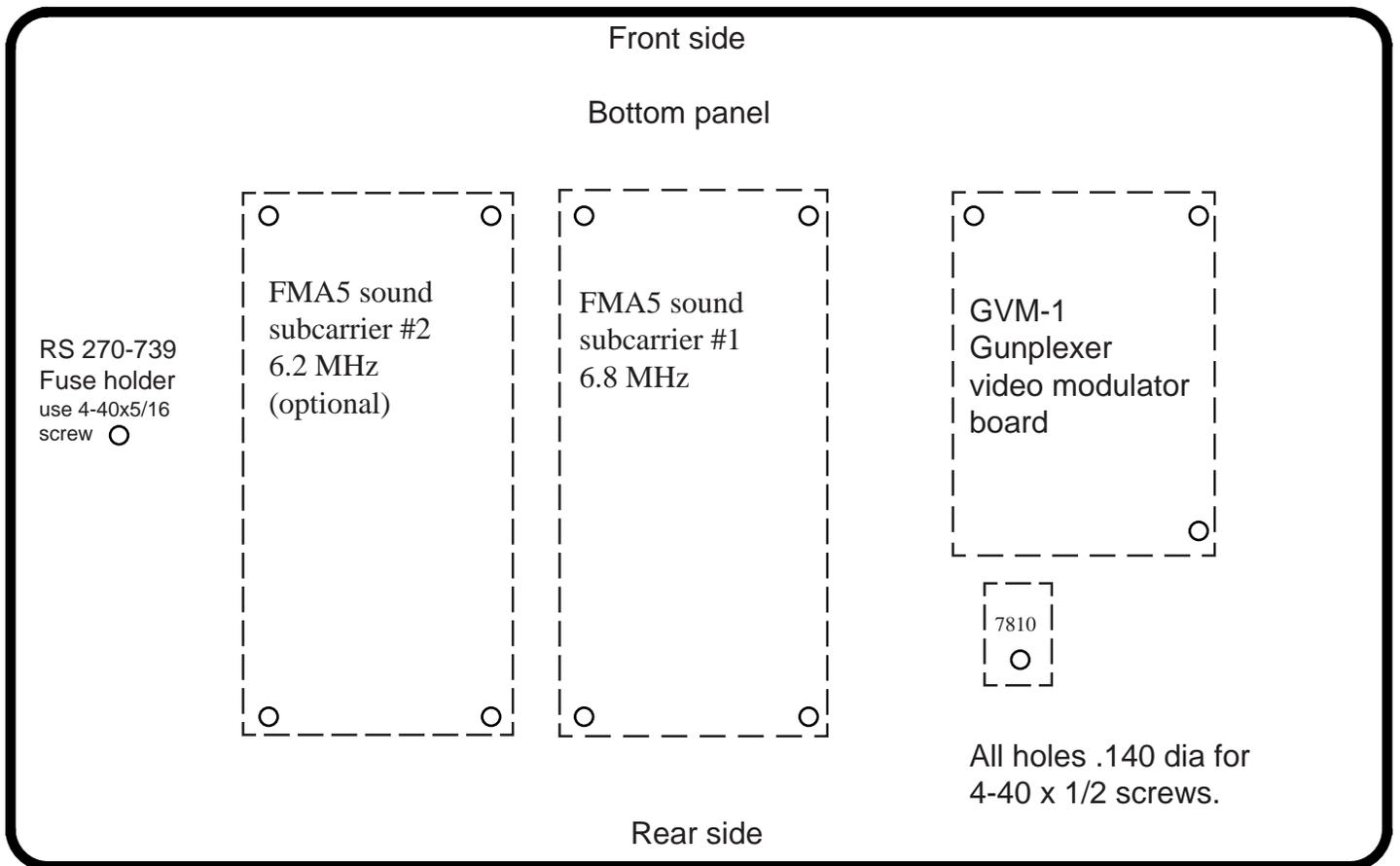
# Gunnplexer Control Box Layout and Drill Template

(c) P. C. Electronics 2013

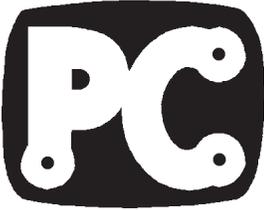
Use Hammond 1590D die cast aluminum box. Cut out template on the inside edges of each panel. Align to the top edge on the front and rear outsides. Center the bottom template taking care to align with the noted front/rear sides. Center punch thru the template into the box. Drill all holes .140 and check for alignment, then drill the larger holes.



Views are from outside



Color code or mark the two RG6 75 ohm coax cables so they do not get mixed up upon plugging in to the Gunnplexer and control box. Plug in Gunnplexer side first.



**ELECTRONICS**



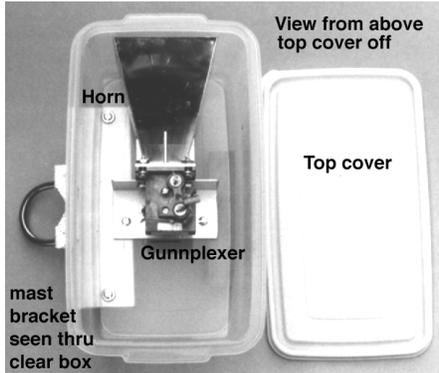
# GUNNPLEXER PACKAGING

A big problem using a 10 to 24 GHz Gunnplexer for a fixed link or alternate ATV repeater transmitter, is how to weather proof it in some kind of enclosure that will keep the moisture out of the unit and horn antenna, and not attenuate the signal. While cruising a 99 cent stores plastic wares area I got the idea that the whole assembly can fit inside a plastic resealable and Microwave friendly food container. The aluminum mounting bracket shown is fine for ATV where an SHF propotional heater board is not necessary.

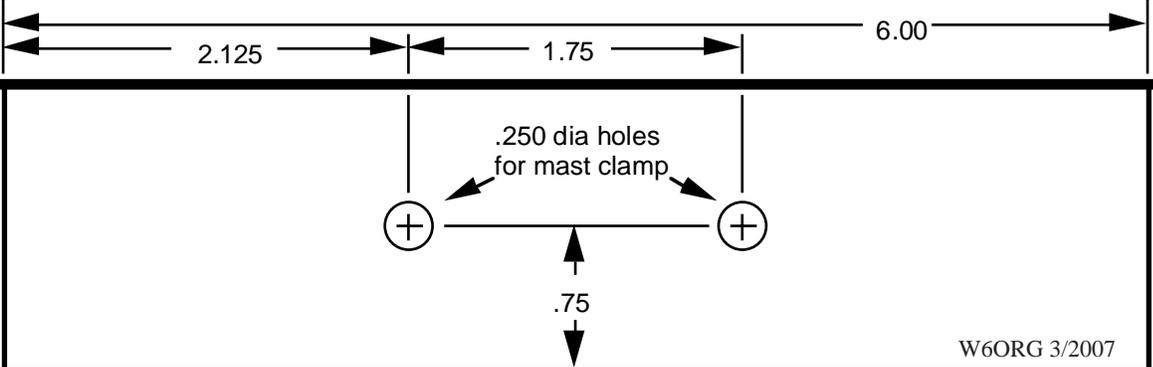
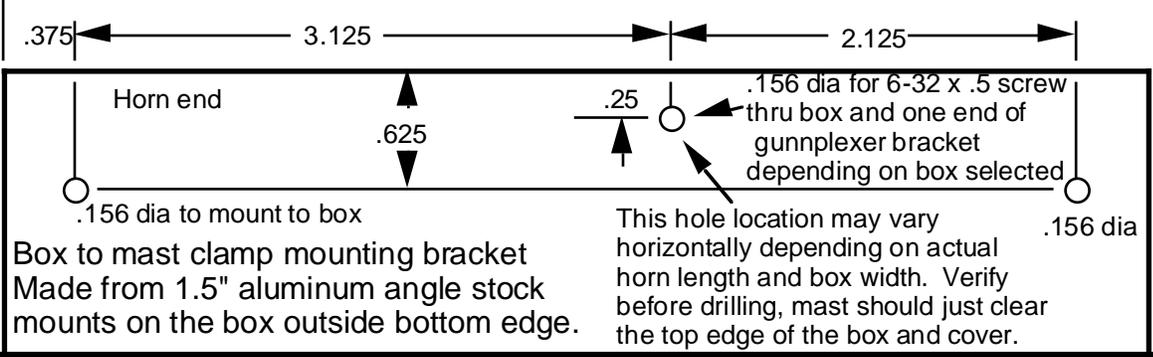
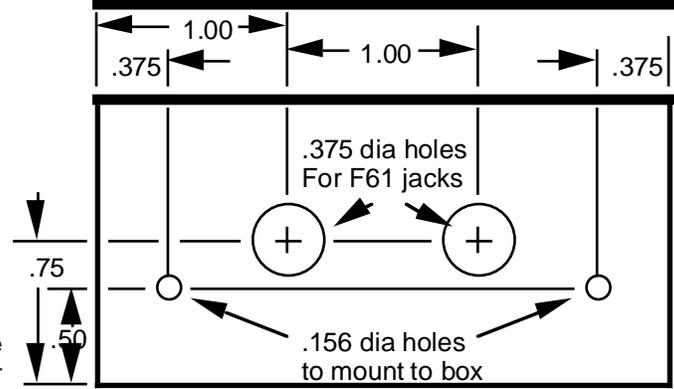
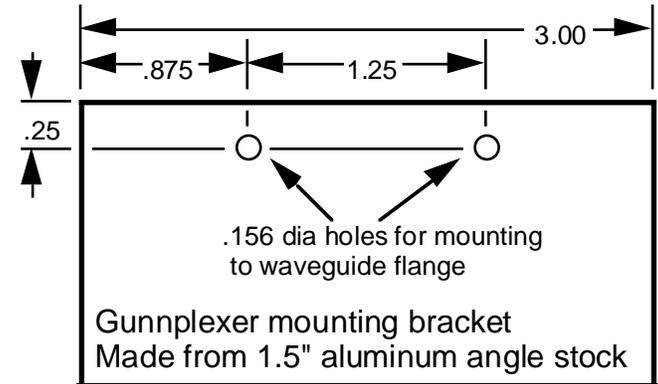
If the plastic container can be used in a Microwave oven, it should be transparent to RF which I verified. These inexpensive containers are made to be air tight to keep food fresh in the refrigerator, so they should be fine on the tower. When you shop for yours, take the gunnplexer and horn with you to make sure they fit inside and the box says it is "microwaveable". The 2 quart size is about right.

The example shown here uses a Rubbermaid "Servin' Saver" model 3911 1.9 qt. size which I paid \$4 for, but there are plenty of less expensive ones at discount stores. The mounting brackets are made from 1.5" aluminum angle stock available at hardware stores and will fit any of the gunnplexer units, but check the rough fit before drilling any holes. The sketches shown are full sized and can be used directly to center punch mark the holes, but verify the dimensions before drilling.

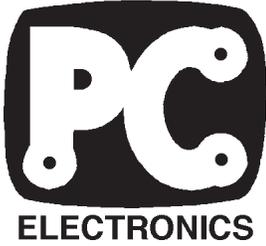
Mount the bracket to the gunnplexer and place inside the box. Mark the two 6-32 screw mounting holes and two F jack drill locations with a felt marker through the bracket. Since the plastic is transparent, you can see where to drill the box through from the outside. Use a block of wood under the box to keep from cracking the plastic. The holes for the two F jacks are 5/8" dia and do not physically touch the jacks after mounting. Drill a .156 drain and breathing hole anywhere on the bottom.



Identify the two jacks with a felt marker on the outside bottom of the box in the same manner as the control box and RG6 cables.



Two F61 jacks are bolted on to the gunnplexer bracket for the modulated varicap bias and +10Vdc. Run jumper wires from the jacks to the respective gunnplexer terminals and verify the operation before mounting in the box. The gunnplexer bracket is held to the box with two 6-32 x .5 pan head screws. Use a flat #6 washer under the screw head on the outside to give more bearing surface on the plastic. Use a #6 lock washer under the nut. The mast clamp bracket is also made from 1.5" aluminum angle and held to the box with 3 screws. Depending on placement in your box, one of the screws may also be one of the gunnplexer bracket screws.



## GVM-1 Board Applications

This board has many other uses, with only slight modification, besides video modulating a Gunnplexer.

**FM ATV Receive Video Amp** - Boost the low video output to 1V peak to peak from an analog satellite TV receiver by clipping out the input pre-emphasis 20 Ohm resistor (marked with an X) and replacing the 270 Ohm with a jumper on this board. Analog satellite TV runs 11 MHz deviation and ATV uses 4 MHz deviation on the 900 and 1200 MHz ham bands. So a gain of almost 3 is required to properly drive a video monitor for ATV. Some receivers have a video gain pot inside but still dont quite make it. This board has an adjustable gain of up to 5.

**Video Distribution Amp** - You can drive a 2nd monitor, VCR, transmitter, etc., by tapping into a video line without loading it down with this board. Clip out the input pre-emphasis 20 Ohm resistor, \* 82 Ohm input termination resistor, 270 Ohm resistor and add the jumper. In fact, you can add 2 or 3 modified GVM-1 boards in the DA configuration.

**Add Sound Subcarrier** - There are two inputs that can mix FM sound subcarriers to any video line going to an ATV transmitter that does not have sound. The FMA5-G sound subcarrier board(s) output can be connected to the solder pads on the GVM-1 board to be mixed in with the video.

**Pre-emphasis and De-emphasis** - FM satellite receivers have de-emphasis built in to the video output. However, most all FM video receivers made for wireless security camera systems do not. Pre-emphasis in the transmitter and corresponding de-emphasis in the receiver running 4 MHz deviation can gain twice the distance by lowering the noise floor. The stock GVM-1 can be used as is with the transmitter and another GVM-1 with the 5 pre-emphasis parts replaced with the de-emphasis parts and one removed as shown at the top side of the board on the right.

When not used to also bias a Gunnplexer diode, the 5K varicap bias pot should first be set to give 2.0 Vdc at the VC video output when connected to a 75 Ohm resistive load. Also, to limit the current if accidentally grounded, the 75 Ohm 1 Watt resistor is run from the VC solder pad to the video out jack or video out cable. The 5K Deviation pot becomes the video gain pot for setting the output to 1 Vp-p into the resistive 75 Ohm termination in your monitor, VCR or transmitter.

The GVM-1 board is available from P. C. Electronics for \$29 each or \$25 each in quantity.

