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TX70-5 70 CM ATV TRANSMITTER

USERS MANUAL

The TX70-5 transmitter is designed to provide over 0-5 Watt continuous duty peak envelope power (sync tip) of video modulated RF in the 70 CM (420-450 MHz) amateur band. Any licensed Technician class or higher Radio Amateur may operate this transmitter in accordance with 47 CFR part 97 of the FCC Rules and Regulations. The TX70-5 accepts U.S.A. standard composite video (1 volt pk-pk) from any source such as color or black and white TV cameras or camcorders, VCRs, or computers for transmission. Audio from these sources or a low impedance dynamic mic is also transmitted on the 4.5 MHz sound subcarrier. Transmit / receive power and antenna switching is provided for the companion TVC-4S downconverter.

PLEASE read through this manual before plugging in an cables and attempting operation. Each connector and control is described here to enable your proper hookup and operation. Also the unique video practices associated with ATV and the 70 CM band are described.

REAR PANEL:

POWER INPUT JACK. A 4 pin plug and 3 ft long #18 cable is provided for connection to your source of +12 to14 Vdc. Currant draw is 500 MA in transmit. Pin 1 is ground (black) and pin 2 (red) is +. The TX70-5 works best from a well regulated voltage source with leads no longer than necessary. The transmitter is set up by us from a regulated 13.8 Vdc supply. Do not exceed 15 Vdc input. There is a 16 v zener which should blow the fuse if this voltage is exceeded or the supply leads get cross connected, but semiconductors have been known to protect fuses. If a new fuse immediately blows again, check and replace the 1N4745B 16V zener located near the fuse holder inside.

Any ripple or noise on the DC line may be seen in the transmitted video. For this reason, if a single large power supply is used to power this and other equipment, all leads must connect directly at the power supply terminals, not to an external terminal block. If a 50 or 70 watt amp is added, it is best to run it from its own separate power supply. A Radio Shack 13.8 Vdc 3A regulated power supply will run both the TX70-5 and TVC-4S.

Pin 4 has the applied + voltage when the T/R switch is in the receive position in order to power an ATV downconverter such as the TVC-4S. Pin 3 is ground. If a TVC-4S is used, the wall plug supply may be disconnected and a two wire cable made up to run from pins 3 and 4 to the 2.1mm jack. Take care to insure that the tip of the power plug is connected to the positive voltage on pin 4 of the TX70-5 power input jack, and that there are no adjacent pin shorts in the 4 pin plug with an ohm-meter before reinserting into the TX70-5.

1 AMP FUSE INSIDE. The TX70-5 itself draws about 1.5 amp in transmit, and .1 amp plus external downconverter in receive - a 2 or 3 amp 3AG fuse should handle both.

TO MONITOR. This output provides camera video during receive periods to enable you to best adjust focus and lighting, etc., rather than a distant station describing these back to you on 2 meters. Use a RCA plug shielded cable to connect to your video monitor or VCR video in. If you do not have a video monitor, the Radio Shack 15-1273 RF Modulator can take the composite video and modulate it up to channel 3 or 4 to make a second TV set into a monitor. Attempting to monitor off the air with another TV set at the same QTH most often gives false indications due to overload and reflections. Even receiving the 2nd harmonic 40 or more dB down around channel 80, or on cable channels between 57 and 60 can give an erroneous indication of transmitted picture quality.

50 OHM 70 CM ANTENNA. A UG21 type N plug is provided to attatch to low loss .5" size 50Ω coax. Losses at 70 CM are very high in transmission lines. We suggest using the foam filled types (3.5 dB/100') such as Belden 8214, or semi rigid (2.5 dB/100') Belden 9913. Put the connector together properly. See ARRL HandBook Chapter 37. The type N connector has good moisture resistance and low loss at UHF but use two layers of vinyl tape or coax seal on all outside connections to prevent moisture contamination. The antenna and feed line are the most important part of your ATV system, and therefore the last item to just try and get by with.

Take great care with preparing connectors and cable. On initial turn on, do not transmit more than 10 seconds if the reflected power is more than 10% or 2:1 VSWR. You could damage the VM-70X module. Also, VSWR or being too near your antenna can cause RF interference in your camera or buzz in the audio. With no video connected, the RF power meter should read between 4 to 5 Watts sync tip, p.e.p., power.

Use a good resonant broad bandwidth 70 CM antenna. Do not be tempted to just try it out with a rubber duckie, 2 meter antenna, or other antenna not specifically designed for the video carrier frequency. Place the antenna as high as practical, at least above the trees or roof tops. See the section on dx vs. power vs. gain on page 4.

TO DOWNCONVERTER. This BNC output jack is connected to the antenna input of your 70 CM 420-450 MHz ATV downconverter. Downconverters for other bands are not connected to the TX70-5, rather to their own antenna and left on when transmitting on 70cm for full duplex or crossband repeat. If a TVC-4S downconverter is used you will need a short 50 Ohm cable with a male BNC on one end and type N on the other. This can be made up with Radio Shack RG58/U (276-1326) plus UG88 (278-103) and N (278-151) connectors or equivalent. Keep this lead short to minimize losses in receive. The TX70-5 contains a T/R relay to switch the antenna input between the downconverter and the transmitter. See the Power Input Jack paragraphs two and three for power connections.

FRONT PANEL:

VIDEO INPUT. This input accepts any standard NTSC composite video into 75Ω from cameras, VCRs, computers, SSTV or RTTY converters, home satellite converters, etc. Use RCA phono plug and shielded cable (Radio Shack 15-1535) up to 12' or RG59 for longer runs.

LINE AUDIO INPUT. High level line audio usually from the same source as plugged into the companion Video input is plugged into this jack using another RCA phono plug shielded cable. Minimum level is .1 v pk-pk into a 10K load. The level is controlled by the line audio gain knob.

LINE AUDIO GAIN control. Nominal input is .1 to 1 Vp-p into 10K. Increase the line or mic audio gain controls to the point that the green LED blinks off (indicating that the AGC limiting at 25 to 40 kHz), and then back off a little. In the off position, the whole sound subcarrier board is turned off.

MIC jack accepts any low Z dynamic or low Z Amplified electret camcorder mic in the range of 100 - 600 Ohms with a mini plug. Mic audio is active at all times and mixes with the camera or external audio inputs to enable greater pickup, commenting while running video tapes, etc. Mikes must have a shielded cable to prevent RF pickup hum and buzz. Some electret and amplified mics are very susceptible to RF pickup and may need the addition of a small 220 pF disc cap (RS 272-124) directly across the mic element. Presently Radio Shack makes 2 different replacement remote-control dynamic omnis for portable recorders (33-2001 & -1067) that work well and some provide the "push to look" plug also. The 33-2001 has a wind screen which is preferred for portable work. The unidirectional 33-3015 or 33-3021 is used for full duplex to minimize speaker feedback.

MIC GAIN control sets the level from the low impedance mic jack. This audio is mixed with the line audio and its level is varied independantly. If you connect the audio from your home VCR or camcorder, you can use the mic input to voice over comment.

PTL submini jack. Push To Look is like push to talk only with video. Grounding the tip keys the transmitter. This jack is in parallel with the front panel transmit/receive toggle switch.

XMIT/REC switch. It is in parallel with the PTL jack. The red lamp above this switch will light whenever you are in the transmit mode. In receive, the applied + voltage appears on pin 4 of the power jack to power an external 70CM ATV downconverter such as the TVC-4S.

POWER ON switch turns on the applied +12 to 14 Vdc to the TX70-5. If the green light does not come on, check the internal fuse and why it to blew before replacement.

INTERNAL ADJUSTMENTS - See the individual data sheets for the Videolynx VM-70X module, FMA5-G and TR-1b boards.. The VM-70X is best run at 4 Watts pep output if key down times exceed 5 minutes. There is a pot on the module for setting this level with a 70cm RF Wattmeter. Setting is done with no video plugged in. With video plugged in the average power will read less, but the peak envelope power (sync tip) will be the same as measured with no video connected. Make sure that sufficient convection cooling occurs by having no other objects within 3' of the unit.

OPERATING NOTES: ATV practices are somewhat different from the other bands and modes. Since we must use directional antennas to make up for the 26 dB higher noise floor difference compared to NBFM due to bandwidth (15 kHz vs. 3 MHz), the probability of someone pointing their beam at you while at the same time you at them and calling CQ is very low. This is why many ATV contacts are initiated by calling or listening on an area 2 meter FM simplex ATV coordination frequency (146.43 in 434.0 areas, and 144.34 in 439.25 transmit video areas due to the 3rd harmonic relationship).

Two meters, even for FM, has about 9 dB less path loss than 70CM so that all possible ATVers can be received on 2 meter FM using just an omni antenna. You will find with experience the correlation between 2 meter simplex and 70CM ATV. It is much easier for all local ATVers to monitor a squelched 2 meter FM simplex channel than to try tuning and swinging the 70CM beam looking for sync bars. Once another ATVer comes up on 2 meters, you can roughly swing the beams on each other before turning on the ATV transmitter. Then, if the picture is better than 20% snow, the video transmitting station can talk on the sound subcarrier, and all those receiving him can talk back at the same time on 2 meters (full duplex) to comment on picture content, etc. Others listening to the 2 meter channel are often hooked into ATV this way. You can also run full duplex audio and video with another station on 900 or 1200 MHz bands.

It is more fun as time goes on to have many hams put their families, other hobbies, and varied interests on the screen. Let others know your 2 meter ATV freq. by publishing in local radio clubs newsletters, contact your local ARRL SCM, or pick a night and time to start an ATV net. The TX70-5 is portable enough to give a little demo at your local radio club or hamFest.

ANTENNA POLARIZATION must be the same in any area or you could be losing up to 20 dB by being opposite. Polarization in any area seems to be more of an emotional rather than technical decision. If most of the ATVers come from the weak signal or 432 SSB/DX group or using 439.25, they will push for horizontal. The FMers or those using 434.0 will push for vertical. The main motivation is not to have to get separate antennas for each mode of interest. Technically there is little difference between polarization's above 300 MHz according to a US Army study. However, below 300 MHz horizontal is generally better. Vertical polarization is preferred in areas that have a repeater or want omni directional coverage for weather radar or other public service applications due to the fact that there are many manufacturers of high gain vertical omnidirectional antennas for base station as well as mobile. Horizontal omni gain takes many more elements for the same gain as vertical and few are made commercially. So this is a regional decision that should be made by the local ATV community. One alternative is for individual ATVers to use circular polarized antennas, which works great for all modes. There are many exaggerated claims for antenna gain and performance. When you select yours, it should have sufficient bandwidth, and go by the actual measured gains published from the various VHF/UHF Conference contests rather than advertisements and unsubstantiated articles.