

APPLICATION FOR FCC CERTIFICATION

BZ5MX1U MODULATOR INPUT 1 WATT UHF TRANSLATOR

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This application requests authorization for video/audio input to our 1 Watt UHF Translator, BZ5MX1U (Certification applied for). The amplifier will be driven directly by a color television modulator.

The intended use of the BZ5MX1U is to rebroadcast a television translator relay station or other legal source of video and audio.

A paragraph by paragraph reference is given herein, presenting the required additional data to that called for on FCC Form 731 for FCC Certification of BZ5MX1U 1 Watt UHF Translator. Exhibits are attached to authenticate this application. If further data is required, it will be furnished on request.

The unit tested specifically for this application was operated on Channel 50. This channel was chosen to provide protection to and from existing radio services, and to facilitate the measurement of possible spurious products conducted or radiated from the 1 Watt UHF Translator.

The results noted here are "worse case" unless otherwise noted. The input signals used in the tests were generated by a color bar generator driving a Cadco Modulator which is typically the modulator used. However, due to varying customer requirements, other modulators are available on customer request. The published specifications on any modulator used in this equipment will meet or exceed FCC specifications. The output of the 1 Watt UHF Translator was properly terminated with a resistive type RF load.

- 2.1033(b)(1): Applicant is the manufacturer of the equipment. See FCC Form 731
- 2.1033(b)(2): See FCC Form 731
- 2.1033(b)(3): Exhibit 2 (1W UHF Instruction Manual, Cadco M369 Operating Manual)
- 2.1033(b)(4): Exhibit 6 (Active Devices and Function List)
- 2.1033(b)(5,6,7): See also, the paragraph by paragraph summary of compliance with Part 74, Sub-part G of the FCC Commission Rules that follow.

PART 74.750(c)(1):

The frequency stability of this equipment as measured per Part 2.1055 of the rules is much better than required over the specified range of the input voltage and temperature.

PART 74.761(a):

The frequency stability of the visual carrier is totally dependent upon the modulator. Exhibits 4a and 4b document the measurements made, including method and equipment. Modulator output frequency can be, and is normally set to zero deviation at the output channel. As shown in Exhibit 4a, the typical characteristic variation due to temperature is less than $\pm 0.02\%$. This is true for all modulator channels.

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PART 74.750(c)(2):

Observations were made on a properly operating translator video to Channel 50 using a Hewlett-Packard 8591E Spectrum Analyzer with a cut to frequency dipole antenna at 10 meters from the translator and rotated to detect maximum radiation. The following signals were present:

FREQUENCY(MHz)	SOURCE	SPECIFICATION	
		LIMIT μ V	MEASURED μ V
1374.50	2 nd Harmonic	700	50
733.00	LO	238133	10

Radiation from the modulator was nil. No spurious products could be detected at 10 meters that were less than 90dB down.

Antenna terminal measurements with the 8591E Spectrum Analyzer showed no change due to the modulator since the power amplifier stages are not affected by this modulation.

The above tests were performed using the same equipment hook up and methods described in Exhibit 3a. The translator test data compiled for this application was video to Channel 50. Translator operating with a standard video test signal input (modulated stair step and color burst) and a modulated audio carrier at -10dB of peak visual. Results are typical of performance on all channels.

PART 74.750(c)(3)(ii):

Variations of input voltage $\pm 15\%$ (reference +24VDC or 120VAC) during the temperature tests resulted in no discernible frequency variation traceable to the power supply. This is reasonable due to the modulator's internal regulation.

PART 74.750(c)(4):

The stability of the modulator's self-generated RF carrier must be considered to determine the overall 1 Watt UHF Translator's frequency stability. Exhibits 4a and 4b document the performance measurements made including methods and equipment.

PART 74.750(c)(5):

This equipment meets all the requirements for unattended operation. A description of the automatic control circuitry can be found in Exhibit 2a.

PART 74.750(c)(6):

Measurements can be taken while the equipment is in operation. Normal operating constants of the power output stage average +24 volts at 0.85amps.

PART 74.750(c)(7) AND PART 74.783(a)(2):

Station identification requirements will be supplied by the originating station.

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PART 74.750(c)(8):

Wiring, shielding and construction are in accordance with accepted principles of good engineering practice. Apparatus is constructed on an aluminum chassis suitably protected to resist corrosion. Power circuits are fused and overload protected by automatic shutdown.

PART 74.750(d)(1):

This equipment meets the requirements of Part 73.687(a)(1) and Part 73.687(b)(3) at the final RF output terminal.

It is anticipated that the translator will be driven directly by the demodulator output of an FM microwave repeater. No provision is made for tampering with or adjusting the composite video or audio signal, except depth of video modulation. Therefore, all aspects of the input video signal (Transmission Standard 73.682 and 73.687) are determined solely by the originating television station. This performance data has been obtained with an NTSC signal generator that produces standard video test signals. See Exhibits 10a, 10b, 10c and 10d.

The attenuation characteristics as required by Part 73.687(a)(3) and Part 73.687(a)(4) of the translator are tabulated in Exhibit 9. The field strength of the upper and lower sidebands are well within the prescribed limits. Measurements are made in accordance with Part 73.687(a)(4). This will be measured with each unit shipped.

Exhibit 10 shows photographs of various video test waveforms as seen on the translator, demonstrating that the transmitted waveform is substantially identical to the input. The typical envelope delay response of the modulator as required in Part 73.687(a)(5) will be made on each unit manufactured to ensure that readings meet the FCC specifications. The additional group delay in the translator is negligible. The test equipment and set-up used is described in Exhibit 3. Tabulated data is shown in Exhibit 11a and graphed in Exhibit 11b.

The graphs of Exhibit 10 show linearity of the translator between reference black and white levels.

The audio input to the modulator was measured in accordance with Part 73.687(b). All measurements were made with the equipment adjusted for normal program operation and included all circuits between the modulator input terminal and the antenna output. Test equipment and set-up are shown in Exhibit 5.

Tabulated below, are the frequency response measurements for various percentages of modulation in accordance with Part 73.1570(b)(3). This data is shown in graph form in Exhibits 12 and 13. Note that the measured curves have been drawn offset -1.5dB to show that the measured response is within the prescribed limits.

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AUDIO FREQUENCY RESPONSE
REFERENCE 50Hz AT 0dB INTO 600 OHMS

FREQUENCY(Hz)	MODULATION	
	50%	100%
50	0	0
100	+1.51	-1.35
400	+1.5	+1.50
1000	+1.97	+2.28
5000	+7.84	+9.80
10000	+12.79	+15.00
15000	+15.6	+17.86

Tabulated below are the audio harmonic distortion measurements.

AUDIO HARMONIC DISTORTION LEVEL (%)

FREQUENCY(Hz)	MODULATION	
	50%	100%
50	3.10	1.37
100	2.97	1.29
400	2.95	1.32
1000	3.00	1.30
5000	2.93	1.29
10000	*	1.31
15000	*	1.34

* Distortion measurements above 7.5kHz at 50% modulation levels are impractical.

The output noise level (FM measured as prescribed in the band of 50 to 15000Hz) was 55dB below the level representing ± 25 kHz frequency swing.

The system noise output (AM) in the same band was 50dB below the level representing 100% amplitude modulation.

The output noise measurement had to be performed with the visual carrier operative because of the translator's common visual/aural amplifiers.

PART 74.750(d)(2):

The modulator of this translator will accept audio from the microwave television translator relay station in one of two possible ways. First, when the microwave signal carries the audio at a separation of 4.5MHz, it will be passed through the translator's modulator multiplexed on the video. Frequency spacing, deviation, and other characteristics including distortion are therefore determined solely by the originating television station.

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The sound carrier deviation was monitored while the frequency vs. temperature measurements were taken, see Exhibit 4a. The equipment meets the ± 1 kHz requirement.