APPLICATION FOR FCC CERTIFICATION

BZ5MX1V
MODULATOR INPUT
1 WATT VHF TRANSLATOR

resist corrosion. Circuits are properly by-passed and RF shielded as appropriate. 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 Standards 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 11a, 11b, 11c, and 11d.

The overall attenuation characteristics, as required by Part 73.687(a)(1) and Part 73.687(a)(2), are tabulated in Exhibit 9a and graphed in Exhibit 9b.

The attenuation characteristics as required by Part 73.687(a)(3) and Part 73.687(a)(4) of the translator are tabulated in Exhibit 10. The field strength of the upper and lower sidebands are well within the prescribed limits. Measurements were made in accordance with Part 73.687(a)(4). This will be measured with each unit shipped.

Exhibit 11 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 12a and graphed in Exhibit 12b.

The graphs of Exhibit 11 show linearity of the translator between reference black and white levels.

EXHIBIT 1

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 13, 14, and 15. Note that the measured curves have been drawn offset -1.5dB to show that the measured response is within the prescribed limits.

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

	MODULATION		
FREQUENCY(Hz)	25%	50%	100%
50	0	0	0
100	+0.3	+0.2	+0.2
400	+0.5	+0.5	+0.5
1000	+1.5	+1.5	+1.0
5000	+8.0	+8.5	+8.5
10000	+13.5	+13.5	+14.5
15000	+16.5	+17.5	+18.0

Tabulated below are the audio harmonic distortion measurements.

AUDIO HARMONIC DISTORTION LEVEL (%)

	MODULATION		
FREQUENCY(Hz)	25%	50%	100%
50	0.4	0.4	0.500
100	0.4	0.4	0.300
400	0.4	0.4	0.200
1000	0.4	0.3	0.200
5000	0.7	0.5	0.300
10000	*	*	0.500
15000	*	*	0.800

* Distortion measurements above 7.5kHz at 25% and 50% modulation levels are impractical.

The output noise level (FM measured as prescribed in the band of 50 to 15000Hz) was 66dB below the level representing ± 25kHz frequency swing.

The system noise output (AM) in the same band was 56dB 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.

VHF OUTPUT RF METERING BOARD

Contents:

List of Figures:

1. **RF Metering Board 20B1235G7:** Figures 1 and 2.

The function of this board is to monitor the forward & reflected power. Except for their functions and input names, metering boards have identical RF detectors. For this reason, Detector #1 for "Forward" will be described, and #2 for "Reflected" will be referenced by its component numbers inside parentheses ( ).

a) RF Detectors:

The #1 Forward (#2 Reflected) RF power sample is applied to J1 (J2) and is terminated by R2 (R4). A small amount of forward bias is applied to CR1 (CR2) via R1 and R5 (R3, R6) to overcome the threshold voltage of the diode and enhance its detection linearity at low signal levels. The opposing connection of CR1 (CR2) diode junction and Q1 (Q2) emitter-base junction provides temperature compensation.

Q1 (Q2) buffer amplifier provides a low impedance source to drive the trap C3, C4, and L1 (C5, C6, L2), through R9 (R10). This trap is broadly resonant to 4.3 MHz, and significantly attenuates 3.58 MHz NTSC color subcarrier as well as any 4.5 MHz intercarrier that may be generated in CR1 or CR2 due to the presence of visual and aural RF signals together in the system. Removal of these subcarrier components before the signal is peak detected, enables the circuit to be responsive to sync peak power only (for visual) or just CW (aural) power, and relatively immune to undesired carriers.

CR3 (CR4) is a peak detector with a time constant set by C7 and R11 (C8, R12). The signal from this peak detector is fed to op-amp U1 (U2) pin 5 and . The gain of this stage is 0.5x (0.5x), and its output on pin 7 feeds the meter which is located on the front panel of the amplifier.

U1 (U2) output pin 7 zero-offset voltage is controlled by R18 (R20). This pot should be set with no RF input, so that while you watch the voltage on TP1 (TP2) as you are setting the pot, you will observe the decrease of the voltage towards zero. When it ceases decreasing, stop adjusting. Expect about 50 mV offset voltage when the op-amp output is almost touching ground. If the pot is turned beyond this point, the output stage of the op-amp will be driven into saturation thus unable to respond to low power levels.

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EXHIBIT 19

ENGINEER' S STATEMENT

I, John Tremblay, do hereby certify that the attached information was prepared by me or under my direction.

LICENSED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO

John E. Tremblay, P.Eng.
Vice-President Engineering

Date

APPLICATION FOR FCC CERTIFICATION
BZ5MX1V
MODULATOR INPUT
1W VHF TRANSLATOR

This application requests authorization for video/audio input to our 1 Watt VHF Translator, BZ5MX1V (Certification applied for). The amplifier will be driven directly by a color television modulator.

The intended use of the BZ5MX1V 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 BZ5MX1V 1 Watt VHF 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 8. This channel was chosen to provide protection to and from existing radio services, and to facillitate the measurement of possible spurious products conducted or radiated from the 1 Watt VHF Translator.

The results stated here are "worse case" unless otherwise noted. The input signals used in the tests were generated by a color bar generator driving a Blonder Tongue TV Modulator which is typically the modulator used. However, due to varying customer requirements, other modulators are available on customer request. The published specification on any modulator used in this equipment will meet or exceed FCC specifications. The output of the 1 Watt VHF 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 VHF Instruction Manual, CAMS-60b Instruction 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 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 $\pm$.02%. This is true for all modulator channels.

1. RF Metering Board 20B1235G7: Figures 1 and 2. (continued).

The output of U1-7 (U2-7) drives the RF power meter through R32 (R30) which set the meter deflection with a known RF signal. U1-7 (U2-7) drives. Forward calibration is done with full rated power and a forward RF sample from the directional coupler applied to J1. R32 is adjusted for a 100% reading on the forward power meter position.

For Reflected calibration, the same forward RF sample is then applied to J2, R30 is set for a 100% reading on the Reflected Power meter.

2. RF Metering Board Test and Calibration:
(Refer also to the Pin Attenuator section of this manual)

a) **Forward Power Meter Calibration - Zero Adjust**

With no RF input connected, measure the DC voltage at U1-7 (or TP1) and adjust R18 until the output voltage at U1-7 (TP1) drops to a minimum, approximately 10 to 50 mVDC. A DC coupled scope will make the adjustment easier to see; the objective is to place the U1 output as near the op-amp ground rail as possible without the op-amp going into saturation. Turning the pot farther will decrease the sensitivity of the system for small signals. Once this minimum voltage has been reached, do not re-adjust R18.

b) **Reflected Power Meter Calibration - Zero Adjust**

With no RF input connected, measure the DC voltage at U2-7 (or TP2) and adjust R20 for a minimum, which should be approximately 50 mVDC. Once this minimum voltage has been reached, do not re-adjust R20. This adjustment is done in precisely the same way as in step a) above.

c) **Forward Power calibration**

Set the exciter RF output for the transmitter to run at its operating power. Adjust R32 for a forward power meter reading of 100%.

NOTE: Before proceeding to the next step, ensure that the Pin Attenuator Board has been setup according to the procedure on the Pin Attenuator Board section of this manual (see page 34a-1).

d) **Reflected Power calibration**

1. Temporarily defeat the VSWR cutback protection (if it's been initially setup) by adjusting R36 fully clockwise (CW). With the transmitter still at "full power", disconnect the RF input cable from J1 and connect it instead to the reflected power input J2. Switch to position 'RFL' and adjust R30 so that the reflected power reads 100. This now corresponds to a reflected power of 100%.

2. Enable the VSWR cutback by turning R36 counter clockwise until the meter indicates 10% output. This means that in severe VSWR conditions such as in an open circuit, the amplifier will automatically cuts back to 10% thus protecting itself.

3. Replace the cables in their proper connections. RFL meter reading should be nill and the FWD meter reading should be back to 100%. If the FWD reading is much less than 100%, R36 was probably overadjusted.

PART 74.750(c)(2):
Observations were made on a properly operating translator video to Channel 8 using a Hewlett-Packard 8558B 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 uV	MEASURED uV
365.25	2nd Harmonic	293	100
227.00	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 modification.

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 8. 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)(i):
Variation of input voltage ± 15% (reference +24 VDC 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 VHF 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 500mA.

PART 74.750(c)(7) AND PART 74.783(a)(2):
Station identification requirements will be supplied by the originating station.

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