ENGINEERING STATEMENT

For Type Acceptance of

Cobra Electronics Corporation

Model No: 75WXST

FCC ID: BBO75WXSTA

I am an Electronics Engineer, a principal in the firm of Hyak Laboratories, Inc., Springfield, Virginia. My education and experience are a matter of record with the Federal Communications Commission.

Hyak Laboratories, Inc. has been authorized by Cobra Electronics Corporation to make type acceptance measurements on the 75WXST transceiver. These tests were made by me or under my supervision in our Springfield laboratory.

Test data and documentation required by the FCC for type acceptance are included in this report. It is submitted that the above-mentioned transceiver meets all applicable FCC requirements.

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Rowland S. Johnson

Dated: March 21, 2001

A. INTRODUCTION

The following data are submitted in connection with this request for type acceptance of the 75WXST transceiver in accordance with Part 2, Subpart J of the FCC Rules.

The 75WXST is a double sideband, amplitude modulated, transmitter/receiver combination intended for mobile operation in the citizens radio service. The transmitter has 40-channel capability in the 26.965 - 27.405 MHz band utilizing phase locked loop (PLL) technology. It includes weather band channels.

B. GENERAL INFORMATION REQUIRED FOR TYPE ACCEPTANCE
(Paragraph 2.983 of the Rules)

1. Name of applicant: Cobra Electronics Corporation

2. Identification of equipment: FCC ID: BBO75WXSTA

a. The equipment identification included as a separate exhibit.
b. Photographs of the equipment are included as a separate exhibit.

3. Quantity production is planned.

4. Technical description:

a. 6k00A3E emission
b. Frequency range: 26.965 - 27.406 MHz
c. Operating power of transmitter is fixed at the factory at less than 4 watts.
d. Maximum power rating under 95.635(c) of the Rules is 4 watts.
e. The dc voltage and dc currents at final amplifier:

Collector voltage: 13.6 V
Collector current: 569 mA @ 13.8 Vdc input.

f. Function of each active semiconductor device: See Appendix 1.
g. Complete circuit diagram is included as a separate exhibit
h. A draft instruction book is included as a separate exhibit.
i. The transmitter tune-up procedure is included as a separate exhibit.

B. GENERAL INFORMATION (Continued)

j. A description of circuits for stabilizing frequency is included in Appendix 2.
k. A description of circuits and devices employed for suppression of spurious radiation and for limiting modulation is included in Appendix 3.
l. Not applicable.

5. Data for 2.985 through 2.997 follow this section.

6. RF_Power_Output (Paragraph 2.985(a),(b)(1) of the Rules)

RF power output in the AM mode was measured with a Bird 4421 RF power meter and a Narda 765-20 50 ohm dummy load. (The transmitter was tuned by the factory.) Power was measured with a supply voltage of 13.8 volts, and indicated:

Channel	Power, watts
1	3.9
21	3.6
40	3.4

C. MODULATION CHARACTERISTICS

1. AF_Frequency_Response

A curve showing frequency response of the transmitter is shown in Figure 1. Reference level was taken as a 1 kHz tone with 50% modulation, as measured on a Data Tech 209 modulation meter, using a Audio Precision TRMS voltmeter and tracking generator.

2. Modulation_Limiting

Curves of AM modulation limiting for both positive and negative peaks are shown in Figures 2a and 2b, respectively. Characteristics at 300, 960, and 2500 Hz are shown using a Data Tech 209 modulation meter. Signal level was established with a Audio Precision TRMS

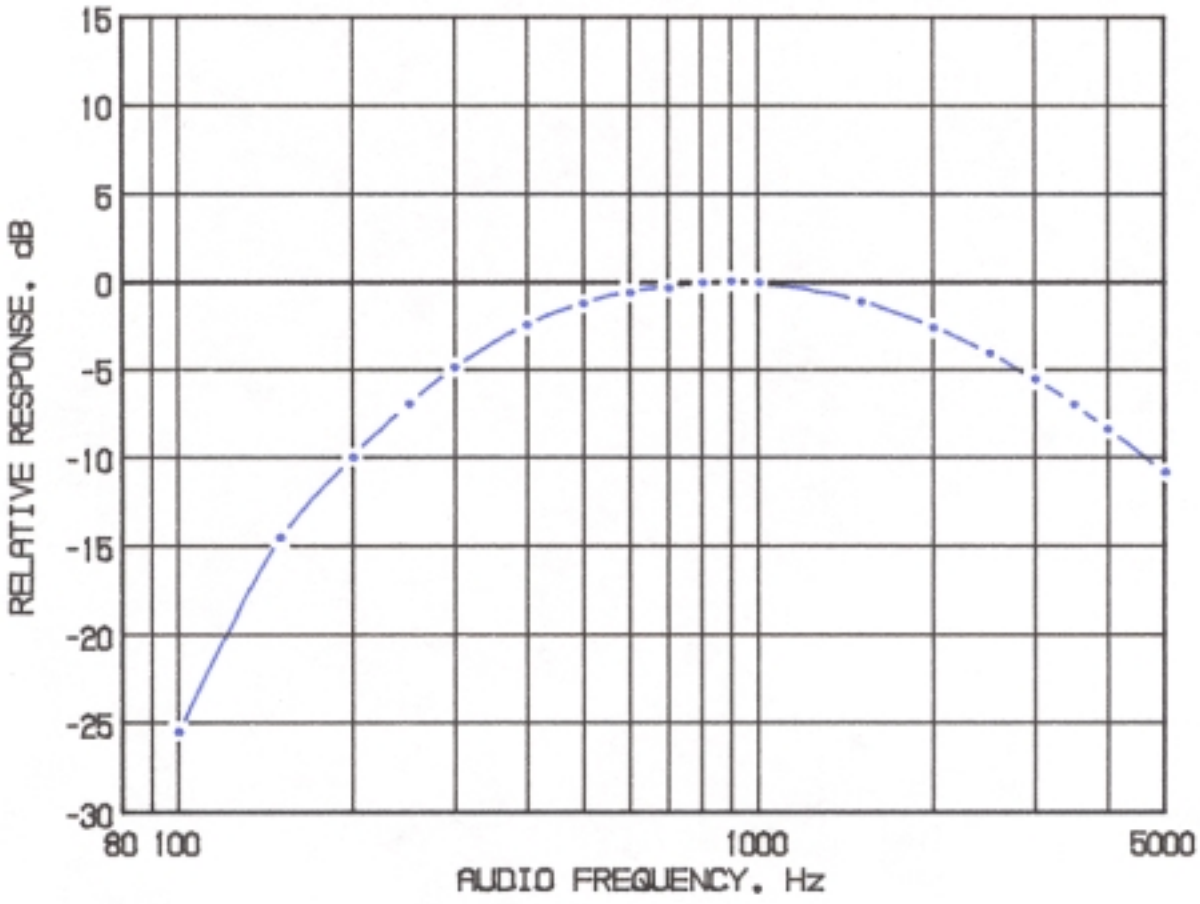
voltmeter and tracking generator. The curves show compliance with Paragraph 95.633(d) of the Rules.

3. Modulation_Limiter_Attack_Time

Modulation limiter attack time was measured by applying to the microphone input terminals a pulsed tone at 2500 Hz, 16 dB above the level required for 50% modulation at the frequency of maximum response, 960 Hz. The spectrum analyzer was tuned to upper and lower fourth-order sidebands in the time domain. Horizontal sweep of the analyzer was triggered in synchronism with the tone turn-on. Sweep speed was 100 milliseconds per division. Plots are included as Figures 3a and 3b. Any transients observed in excess of 33 dB attenuation as referenced to the carrier were less than 20 ms in duration.

FIGURE 1

TRANSMITTER FREQUENCY RESPONSE



TRANSMITTER FREQUENCY RESPONSE
FCC ID: BBO75WXSTA

FIGURE 1

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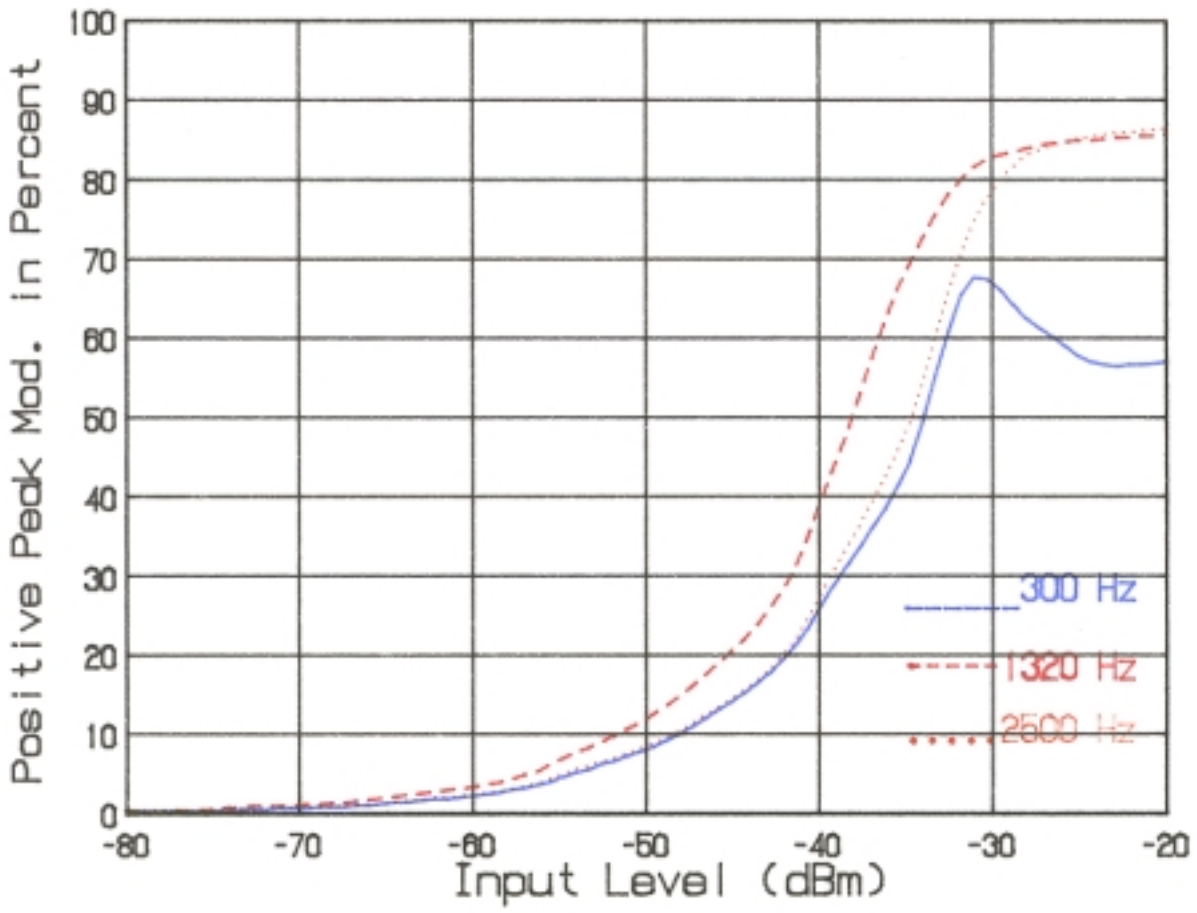
FIGURE 2a

AM MODULATION LIMITING - POSITIVE PEAKS



MODULATION LIMITING CHARACTERISTICS

Percent modulation as a function of input level at microphone jack in dBm for 300 Hz, 960 Hz, and 2500 Hz tones.

MODULATION LIMITING POSITIVE PEAKS
FCC ID: BBO75WXSTA

FIGURE 2a
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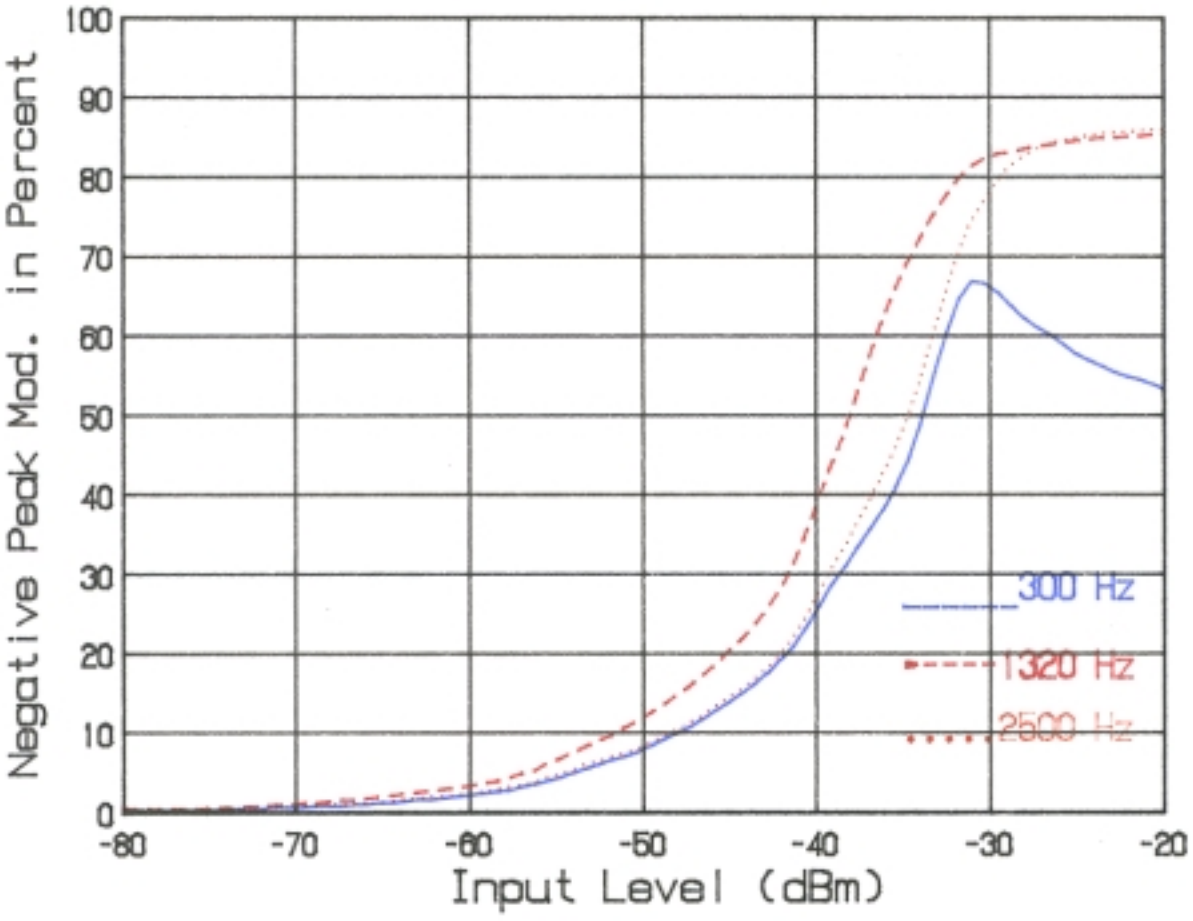
FIGURE 2b

AM MODULATION LIMITING - NEGATIVE PEAKS



MODULATION LIMITING CHARACTERISTICS

Percent modulation as a function of input level at microphone jack in dBm for 300 Hz, 960 Hz, and 2500 Hz tones.

MODULATION LIMITING NEGATIVE PEAKS
FCC ID: BBO75WXSTA

FIGURE 2b
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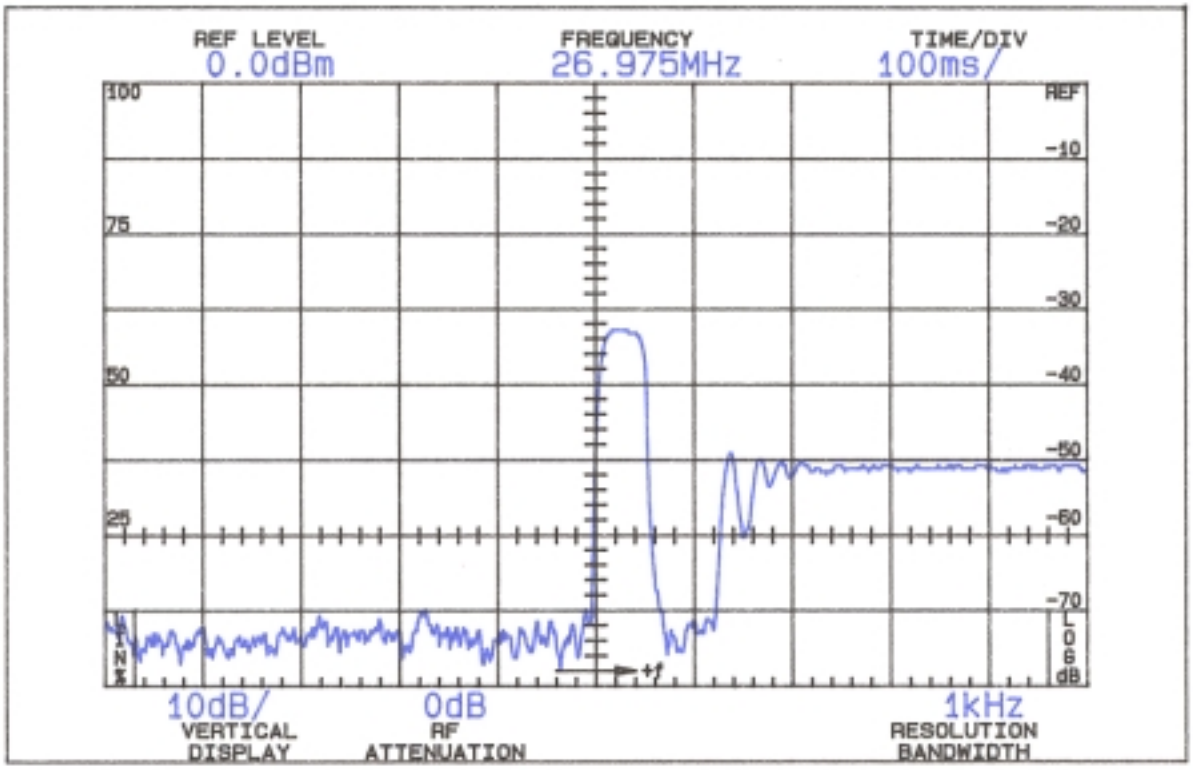
FIGURE 3a

MODULATION LIMITER ATTACK TIME



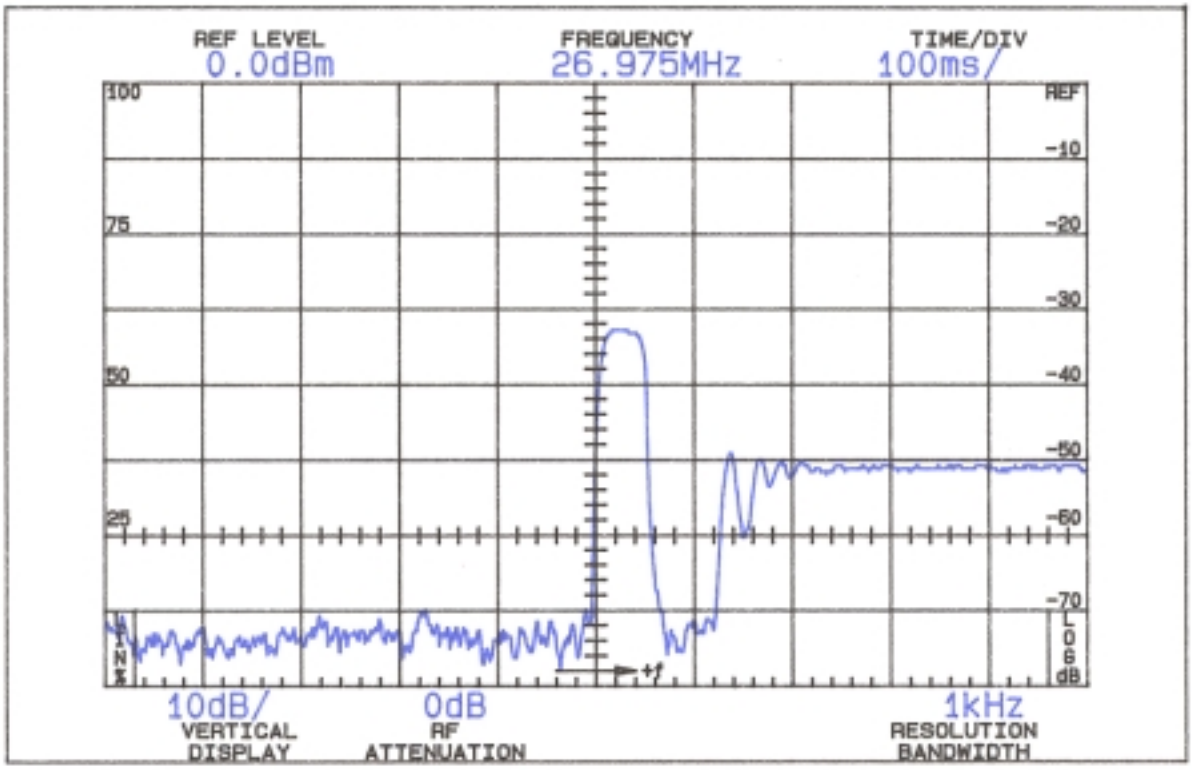
Measurement_Conditions: 16 dB over 50% modulation level at 960 Hz with 2500 Hz tone, upper fourth order sideband; horizontal scale 100 ms/div.

UPPER FOURTH-ORDER SIDEBAND
LIMITER ATTACK TIME
FCC ID: BBO75WXSTA

FIGURE 3a

FIGURE 3b

MODULATION LIMITER ATTACK TIME



Measurement_Conditions: 16 dB over 50% modulation level at 960 Hz with 2500 Hz tone, lower fourth order sideband; horizontal scale 100 ms/div.

LOWER FOURTH-ORDER SIDEBAND
LIMITER ATTACK TIME
FCC ID: BBO75WXSTA

FIGURE 3b

C. MODULATION CHARACTERISTICS (Continued)

4. Occupied Bandwidth-AM
(Para.2.989(c) of the Rules)

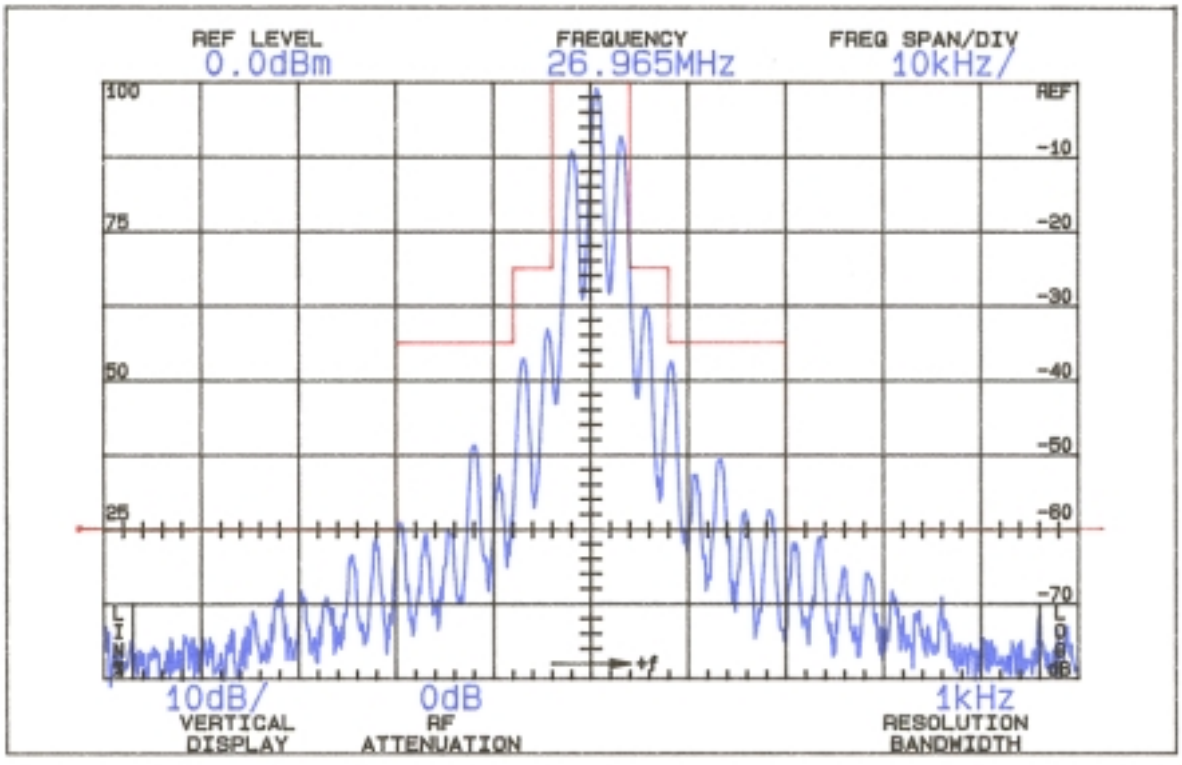
Figure 4 is a plot of the sideband envelope of the transmitter taken from a Tektronix 494P spectrum analyzer. Modulation corresponded to conditions of 2.989(a) and consisted of 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50% modulation at 960 Hz, the frequency of maximum response. Measured modulation under these conditions was 86% pos., 85% neg.

The plots are within the limits imposed by Paragraph 95.631(b)(1,3) for double sideband AM modulation. The horizontal scale, frequency, is 10 kHz per division and the vertical scale, amplitude, is a logarithmic presentation equal to 10 dB per division.

NOTE: Reference of 0 dBc is unmodulated transmitter power.

FIGURE 4

OCCUPIED BANDWIDTH



	ATTENUATION IN dB BELOW MEAN OUTPUT POWER Required
On any frequency more than 50% up to and including 100% of the authorized bandwidth, 8kHz (4-8kHz)	25
On any frequency more than 100%, up to and including 250% of the authorized bandwidth (8-20kHz)	35
On any frequency removed from the assigned frequency by more than 250% of the authorized bandwidth	60

OCCUPIED BANDWIDTH
FCC ID: BBO75WXSTA

FIGURE 4

D. SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS
(Paragraph 2.991 of the Rules)

The 75WXST transmitter was tested in the AM mode for spurious emissions at the antenna terminals while the equipment was modulated with a 2500 Hz signal, 16 dB above minimum input signal for 50% modulation at 960 Hz, the frequency of highest sensitivity.

Measurements were made with Tektronix 494P spectrum analyzer coupled to the transmitter output terminal through Narda 765-20 50 ohm power attenuator.

In order to improve measurement system dynamic range, a series trap tuned to the carrier frequency was used on the Narda attenuator output. The trap, which had negligible shunt attenuation at the second harmonic and high frequencies, provided 26 dB attenuation of the fundamental. The trap was not used during close-in (within 10 MHz of the carrier) spurious measurements.

During the tests, the transmitter was terminated in the Narda 765-20 dummy load. Power was monitored on a Bird 43 Thru-Line wattmeter; dc supply was 13.8 volts throughout the tests.

Spurious emission was measured on Channels 1, 21, and 40 throughout the RF spectrum from 4.5 to 300 MHz. Any emissions

that were between the 60 dB attenuation required and the 100 dB noise floor of the spectrum analyzer were recorded. Data are shown in Table 1.

E. MEASUREMENTS OF SPURIOUS RADIATION
(Paragraph 2.993(a)(b,2) of the Rules)

Measurements of radiated spurious emissions from the 75WXST transmitter were made by substitution/comparison with a Tektronix 494P spectrum analyzer and dummy load located in an open field 3 meters from the test antenna. Output power was 3.9 watts. The supply voltage was 13.8 volts. The transmitter and test antennae were arranged according to OCE 42 to maximize pickup. Measurements were made with and without accessory cable. Both vertical and horizontal test antenna polarization were employed.

Measurements were made from 4.5 MHz to 10 times the maximum operating frequency of 26.965 or 269.650 MHz

TABLE 1

TRANSMITTER CONDUCTED SPURIOUS

Channel	Spurious Frequency MHz	dB Below Unmod Carrier Ref.
1	53.930	68
1	80.895	81
1	107.860	87
1	134.825	84
1	161.790	94
1	188.755	93
1	215.720	89
1	242.685	80
1	269.650	81
21	54.430	64
21	81.645	82
21	108.860	88
21	136.075	82
21	163.290	93
21	190.505	98

21	217.720	89
21	244.935	81
21	272.150	80
40	54.810	62
40	82.215	83
40	109.620	87
40	137.025	82
40	164.430	92
40	191.835	98
40	219.240	96
40	246.645	86
40	274.050	80
	Required:	60

All other spurious were more than 20 dB below required 60 dB suppression.

E. MEASUREMENTS OF SPURIOUS RADIATION (continued)

Reference level for the spurious radiations was taken as an ideal dipole excited by 3.9 watts.

TABLE 2

TRANSMITTER CABINET RADIATED SPURIOUS

Channel 1, 26.965 MHz; 3.9 watts, 13.8 Vdc

Frequency, MHz	dB Below Carrier Reference
53.930	70H*
Required:	60

Worst-case polarization, H = Horizontal; V = Vertical.

Any unlisted spurious were more than 80 below carrier reference from 4.5 to 269.65 MHz.

F. FREQUENCY STABILITY
(Paragraph 2.995(a)(1) of the Rules)

Measurement of frequency stability versus temperature was made at temperatures from -30°C to +50°C in 10° increments. At each temperature, the unit was exposed to the test chamber ambient a minimum of 60 minutes after indicated chamber temperature ambient had stabilized to within ± 2° of the desired test temperature. Following a 30 minute soak at each temperature, the unit was turned on, keyed and frequency measured within 2 minutes. Test temperature was sequenced in the order shown in Table 3, starting with -30°C.

A Thermotron S1.2 temperature chamber was used. The transmitter output stage was terminated in a dummy load. Primary supply was 13.8 volts. Frequency was measured with a HP 5385A digital frequency counter connected to the transmitter through a power attenuator. Measurements were made on Channel 9, 27.065 MHz. No transient keying effects were observed.

G. FREQUENCY STABILITY (Continued)

TABLE 3

Temperature	Output_Frequency,_MHz
-29.2	no rf output
-19.6	27.064928
- 9.9	27.065014
0.7	27.065043
9.8	27.065035
20.2	27.065015
30.2	27.065003
40.2	27.065007
49.9	27.065053
Maximum frequency error:	27.064928
	27.065000

- .000072 MHz

FCC Rule 95.625(b) specifies .005% or a maximum of ± .001353 MHz.

G. FREQUENCY STABILITY AS A FUNCTION OF SUPPLY VOLTAGE
(Paragraph 2.995(d)(2) of the Rules)

Oscillator frequency as a function of power supply voltage was measured with a HP 5385A digital frequency counter as supply voltage provided by an HP 6264B variable dc power supply was varied ± 15% from the nominal 13.8 volt rating. A Keithley 197 digital voltmeter was used to measure supply voltage at transmitter primary input terminals. Measurements were made at 20°C ambient.

TABLE 4

Supply Voltage	Output Frequency, MHz
15.87	27.065016
15.19	27.065016
14.49	27.065016
13.80	27.065015
13.11	27.065015
12.42	27.065015
11.73	27.065015
Maximum frequency error:	27.065016
	27.065000
	+ .000016 MHz

FCC Rule 95.625(b) specifies .005% or a maximum of ± .001353 MHz. No effects on frequency related to keying the unit were observed.

H. ADDITIONAL REQUIREMENTS FOR TYPE ACCEPTANCE
(Paragraph 95.665 of the Rules)

The 75WXST meets the applicable provision of 95.665(a).

External controls are limited to the following per 95.665(a):

1. Primary power connection
2. Microphone
3. RF output power connection
4. N/A
5. On-off switch (combined with receiver volume control)
6. Not applicable, AM only
7. Not applicable, AM only
8. Transmitting frequency selector

9. Transmit-receive switch
10. See #1
11. Not applicable

The serial number of each unit will be implemented in accordance with 95.667.

A copy of Part 5, Subpart D, of the FCC rules for the Citizens Band Radio Service, current at the time of packing of the transmitter, must be furnished with each CB transmitter marketed per 95.669.

I. PLL RESTRICTIONS
(Per Public Notice of April 27, 1978)

The 75WXST meets the following conditions specified in the April 27, 1978 notice:

1. All frequency-determining elements, including crystals, PLL integrated circuits and channel selector switches are permanently wired and soldered in place.

2. The PLL integrated circuit has no more than six active leads and is BCD encoded.

3. The channel selection mechanism has only 40 positions.

4. The PLL integrated circuit has no "spare" or undedicat ed leads.

5. A copy of the PLL data sheet is shown in Appendix 4.

J. FINAL AMPLIFIER DATA

1. A copy of the final RF amplifier data sheet is included in Appendix 5.

APPENDIX 1

FUNCTION OF DEVICE

LIST OF CRITICAL PARTS FOR CB 75 WX ST II

ITEM	REFERENCE	FUNCTIONAL	DESCRIPTIONS	GIANT P/N	VENDOR
1	IC5	MCU, PLL & LCD driver	Single-Chip Microcontroller with PLL and LCD driver LC72322	KEIC-LC72322	Sanyo
2	IC6	Audio power amplifier for RX	Low voltage audio power amplifier LM386-1	KEIC-LM386-1	National
3	IC2	Autio amplifier for TX mod.	10W car radio audio amplifier TDA2003	KEIC-TDA2003	SGS
4	IC1	FM IF system	Low power narrow band FM IF	KEIC-DBL5018	DAEWOO
5	IC3	Compander	Compander TA31101AF	KEIC-TA31101AF	Toshiba
6	IC4	Analog switch	Quad bilateral switch TC4066BF	KEIC-TC4066BF	Toshiba
7	Q25	TX FINAL	CB transceiver TX final amplifier application: KTC2078	KET-C2078	KEC

FUNCTION OF DEVICES
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APPENDIX 1

APPENDIX 2

CIRCUITS AND DEVICES TO STABILIZE FREQUENCY

All 40 channels of transmitting, and receiving, frequencies are provided by PLL (Phase Locked Loop) circuitry.

The purpose of the PLL is to provide a multiple number of frequencies from a VCO (Voltage Controlled Oscillator) with quartz crystal accuracy and stability locked to crystal oscillator reference frequency.

The reference crystal oscillator frequency is 4.5 MHz.

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APPENDIX 2

APPENDIX 3

1. Circuits_For_Suppression_Of_Spurious_Radiation

The tuning circuit between frequency synthesizer and final amp Q25 and 3-stage "PI" network L13, L15, L16, L17 serve to suppress spurious radiation. This network serves to impedance match Q25 to the antenna and to reduce spurious content to acceptable levels in the frequency synthesizer.

2. Circuits_For_Limiting_Modulation

Some of the modulating signal is rectified and controls Q24 and Q10 to attenuate the mic input signal. The resulting feedback loop keeps the modulation below 100 percent for the input signals approximately 40 dB greater than the signal level required to produce 50% modulation. The modulation attack time is about 20 mS and the modulation release time is about 300 mS.

3. Circuits_for_Limiting_Power

During factory alignment, L14 is adjusted to limit the available power to slightly less than 4 watts. The tuning is adjusted so that the actual power is from 3.6 to 3.9 watts. There are no other additional controls for adjusting the TX output power.

DEVICES AND CIRCUITS TO SUPPRESS SPURIOUS RADIATION AND LIMIT MODULATION

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APPENDIX 3