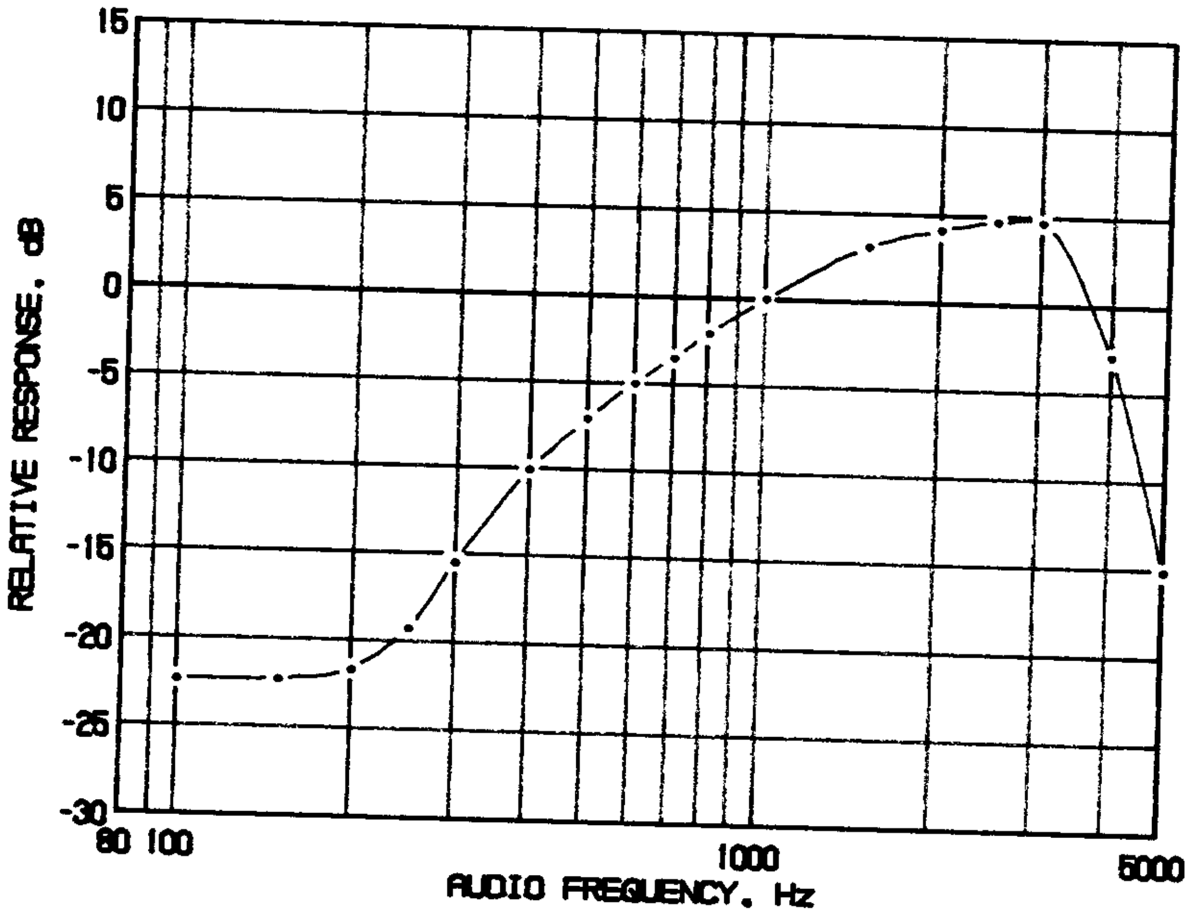
FIGURE 1

MODULATION FREQUENCY RESPONSE

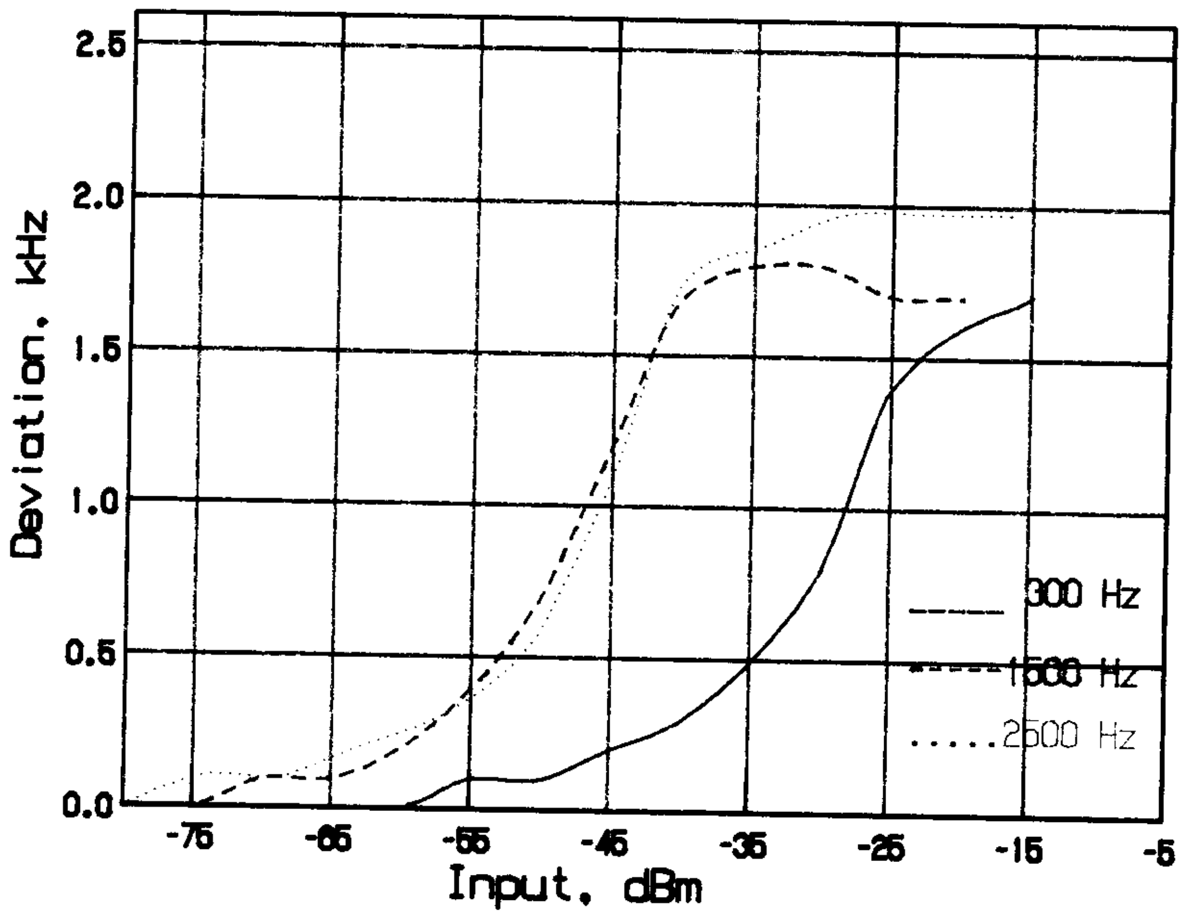


MODULATION FREQUENCY RESPONSE
FCC ID: MMA75515

FIGURE 1

FIGURE 2

AUDIO LIMITER CHARACTERISTICS

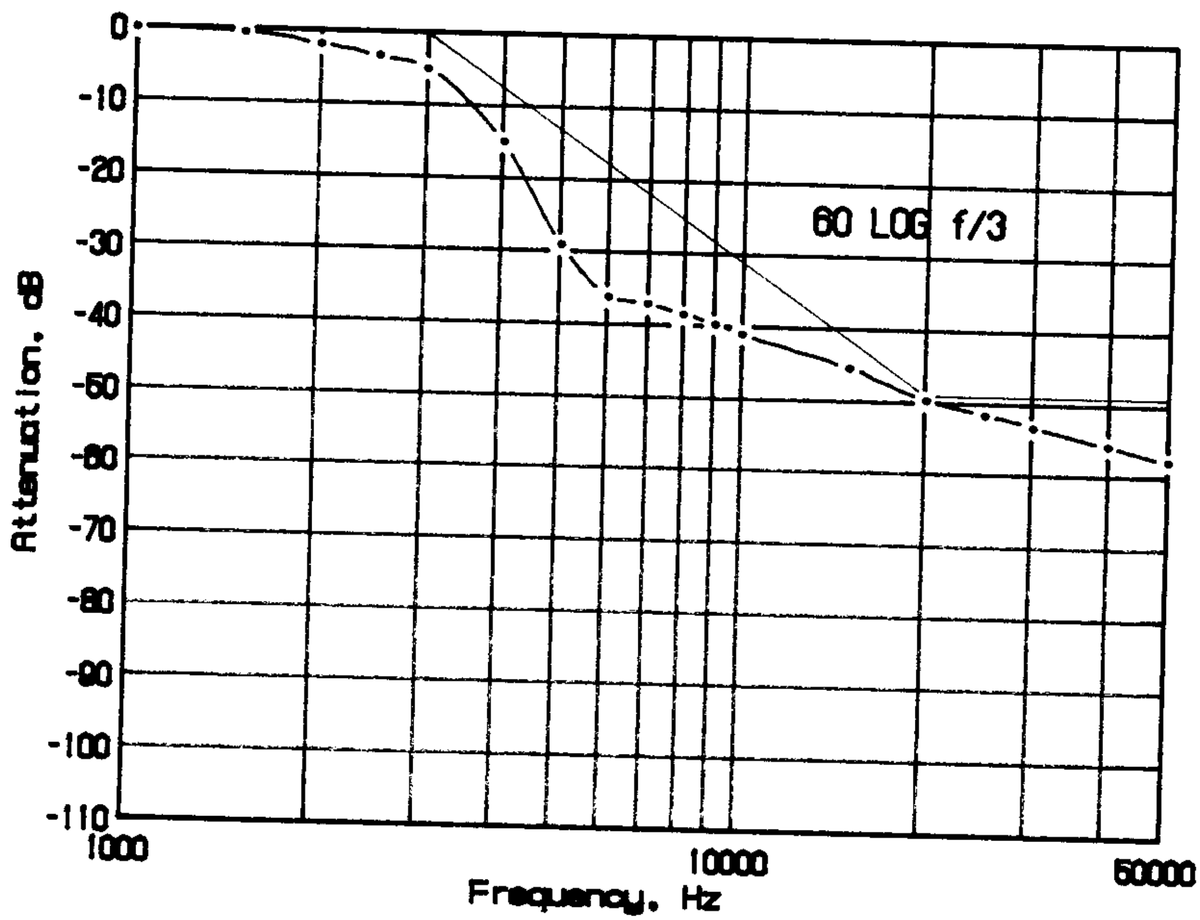


AUDIO LIMITER CHARACTERISTICS
FCC ID: MMA75515

FIGURE 2

FIGURE 3

AUDIO LOW PASS FILTER RESPONSE

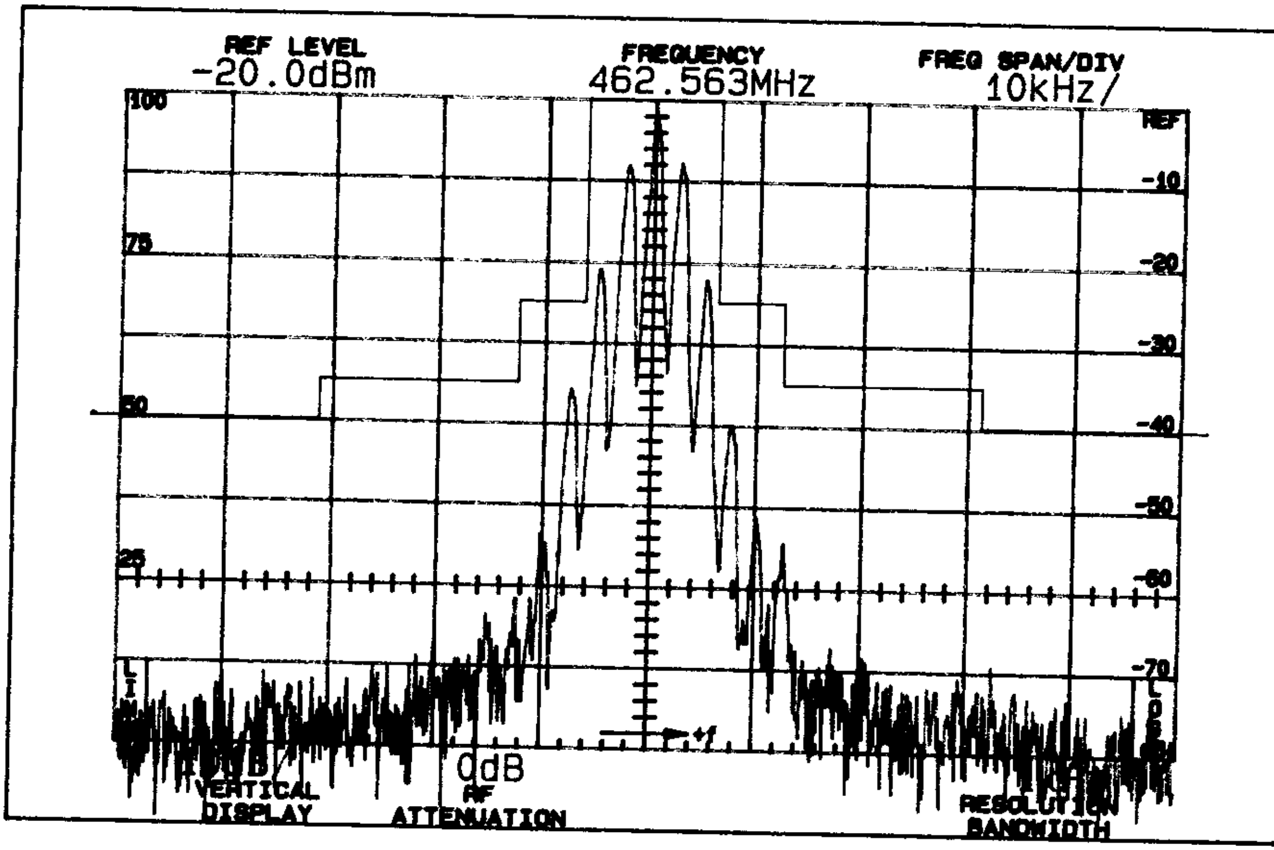


AUDIO LOW PASS FILTER RESPONSE
FCC ID: MMA75515

FIGURE 3

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, 12.5 kHz (6.25-12.5 kHz)	25
On any frequency more than 100%, up to and including 250% of the authorized bandwidth (12.5-31.25 kHz)	35
On any frequency removed from the assigned frequency by more than 250% of the authorized bandwidth (over 31.25 kHz)	43+10LogP = 40 (P = 0.495 W)

OCCUPIED BANDWIDTH
FCC ID: MMA75515

FIGURE 4

D. MODULATION CHARACTERISTICS (Continued)

The plots are within FCC limits. The horizontal scale (frequency) is 10 kHz per division and the vertical scale (amplitude) is a logarithmic presentation equal to 10 dB per division.

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

The 75-515 has a permanently attached antenna. There is no connector for an external antenna. Therefore, no antenna terminal conducted measurements were made.

F. DESCRIPTION OF RADIATED SPURIOUS MEASUREMENT FACILITIES

A description of the Hyak Laboratories' radiation test facility is a matter of record with the FCC. The facility was accepted for radiation measurements from 25 to 1000 MHz on October 1, 1976 and is currently listed as an accepted site.

G. FIELD STRENGTH MEASUREMENTS OF SPURIOUS RADIATION

Field intensity measurements of radiated spurious emissions from the 75-515 were made with a Tektronix 494P spectrum analyzer using Singer DM-105 for the measurements to 1 GHz, and EMCO 3115 horn to 4.8 GHz.

The transmitter was located in an open field 3 meters from the test antenna. Supply voltage was a power supply with a terminal voltage under load of 4.5 Vdc.

The transmitter and test antennae were arranged to maximize pickup. Both vertical and horizontal test antenna polarization were employed.

The measurement system was capable of detecting signals 100 dB or more below the reference level. Measurements were made from the lowest frequency generated within the unit (12 MHz), to 10 times operating frequency. Data after application of antenna factors and line loss corrections are shown in Table 2.

TABLE 2

TRANSMITTER CABINET RADIATED SPURIOUS

462.5625 MHz, 4.5 Vdc, 0.495 watts

Spurious Frequency MHz	Radiated Field uV/m @ 3M	dB Below Carrier Reference[1]
462.563	1644864.0	0.0
925.123	3535.0	53.4V
1387.685	233.5	77.0V*
1850.246	1180.5	62.9H*
2312.808	2002.6	58.3H
2775.370	478.9	70.7V*
3237.931	255.5	76.2V*
3700.493	227.2	77.2V*
4163.054	2127.7	57.8H
4625.616	741.6	66.9V*

Required: 43+10 Log(P) = 40

[1]Worst-case polarization, H-Horizontal, V-Vertical.

*Reference data only, more than 20 dB below FCC limit.

All other spurious from 12 MHz to the tenth harmonic were 20 dB or more below FCC limit.

Power Calculation:

$$P = (FI*3)^2/49.2$$

$$= (1.644864)^2/49.2$$

$$= 0.495\ W$$

H. FREQUENCY STABILITY
(Paragraph 2.995(a)(2))

Measurement of frequency stability versus temperature was made at temperatures from -20°C to +50°C. At each temperature, the unit was exposed to test chamber ambient a minimum of 60 minutes after indicated chamber temperature ambient had stabilized to within ±2° of the desired test temperature. Following the 1 hour 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 -20°C.

A Thermotron S1.2 temperature chamber was used. Temperature was monitored with a Keithley 871 digital thermometer. The transmitter output stage was terminated in a dummy load. Primary supply was 4.5 volts. Frequency was measured with a HP 5385A frequency counter connected to the transmitter through a power attenuator. Measurements were made at 462.5625 MHz. No transient keying effects were observed.

TABLE 3

FREQUENCY STABILITY AS A FUNCTION OF TEMPERATURE

462.5625 MHz, 4.5 Vdc, 0.495W

Temperature, °C	Output Frequency, MHz	P.P.M.
-19.0	462.562215	-0.6
- 9.9	462.562388	-0.2
0.2	462.562735	0.5
10.3	462.562980	1.0
19.7	462.562613	0.2
30.7	462.562110	-0.8
40.5	462.561695	-1.7
50.2	462.561469	-2.2

Maximum frequency error: 462.561469
462.562500

\- .001031 MHz

FCC Rule 95.627(b) specifies .00025% (2.5 ppm) or a maximum of ± 0.001156 MHz, which corresponds to:

High Limit	462.563656 MHz
Low Limit	462.561344 MHz

I. 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 frequency counter as supply voltage provided by an HP 6264B variable dc power supply was varied from ±15% above the nominal 4.5 volt rating to below the battery end point. A Fluke 197 digital voltmeter was used to measure supply voltage at transmitter primary input terminals. Measurements were made at 20°C ambient.

TABLE 4

FREQUENCY STABILITY AS A FUNCTION OF SUPPLY VOLTAGE

462.5625 MHz, 4.5 Vdc Nominal; 0.495W

Supply Voltage		Output Frequency, MHz	P.P.M.
5.17	115%	462.562792	0.6
4.95	110%	462.562733	0.5
4.73	105%	462.562665	0.4
4.50	100%	462.562613	0.2
4.28	95%	462.562573	0.2
4.05	90%	462.562542	0.1
3.83	85%	462.562519	0.0
3.60*	80%	462.562497	-0.3

Maximum frequency error: 462.562792
462.562500

\+ .000492 MHz

FCC Rule 95.627(b) specifies .00025% (2.5 ppm) or a maximum of ± 0.001156 MHz, corresponding to:

High Limit	462.563656 MHz
Low Limit	462.561344 MHz

*Battery end point.

APPENDIX 6

ALIGNMENT PROCEDURE

ONE (1) PAGE ALIGNMENT PROCEDURE FOLLOWS THIS SHEET

8. Alignment instructions

WARNING

Any repairs or adjustments should be made under the supervision of a qualified radio-telephone technician.

TRANSMITTER

1. Power Supply Voltage

The Power supply voltage should be set for 4.5 VDC measured at the radio during transmit. Periodically check the power supply voltage during the alignment procedure.

2. Frequency Setting

A. Connect a frequency counter or Communications Service Monitor to the antenna connector through an RF power attenuator (10 watt minimum rating, 20 dB minimum attenuation).
B. Depress the PTT switch.
C. Adjust the CT2 trimmer capacitor such that the output frequency is equal to the channel frequency with a maximum error of +/- 200 Hz.
D. Release the PTT switch.

3. Output Power Alignment.

A. Set the power supply voltage for 4.5 VDC.
B. Connect a Communications Service Monitor or a wattmeter and dummy load to the antenna connector.
C. Depress the PTT switch.
D. To be convinced for 0.45 Watt output power with a maximum error of +/- 0.05 Watt.
E. Release the PTT switch.

4. Deviation Adjustment.

A. Connect an audio generator to the microphone jack JIG. The audio frequency should be set at 1 KHz.
B. Connect an FM deviation meter or Communications Service Monitor to the antenna connector through an RF power attenuator (10 watt minimum rating, 20 dB minimum attenuation). Set the monitor to read peak deviation.
C. Depress the PTT switch.
D. Adjust the audio generator level 100 mV rms.
E. Adjust VR201 for +/- 2.4 KHz maximum deviation.(with ctcss tone)
F. To be convinced +/- 1.8KHz without ctcss tone.(1.2KHz dev. 20dB up)
g. Release the ptt switch.

APPENDIX 7

CIRCUITS AND DEVICES TO STABILIZE FREQUENCY

A PLL and 12.8 MHz TCXO determine and stabilize frequency.

APPENDIX 8

CIRCUITS TO SUPPRESS SPURIOUS RADIATION AND LIMIT MODULATION

CIRCUITS TO SUPPRESS SPURIOUS EMISSIONS

The transmitted signal of approximately 7 mW combined at the driver TR is supplied to the base of the Q208 amplifier, the signal is amplified to 0.47 W and passes the TX LPF of the 2nd order L221 and L219, C611, C613. RX/TX switching takes place at D209. After this, the signal is provided to the antenna through TX LPF consisting of C616, L217, C617 and C619.

CIRCUITS TO LIMIT MODULATION

The voice signal input from the microphone is pre-emphasized at the IC707D, and at the same time, the components below 300 Hz are reduced to minimize the influence to the CTCSS tone. The signal which comes out of the IC707D is limited to a certain amplitude at the IC707C for the voice signal not to exceed the allowable bandwidth assigned for transmission.

After passing the IC308C limiter, the signal is combined with the CTCSS tone, passes the RV401 and is supplied to the 3 kHz LPF which has the 4th-order characteristics and adjusts the audio frequency band width to the allowable bandwidth.