TYPE OF EXHIBIT:	TEST REPORT
FCC PART:	2.1033 (c)(14)
MANUFACTURER:	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
MODEL:	SST-144
TYPE OF UNIT:	VHF-FM Handheld Transceiver
FCC ID:	AIERIT13-144
DATE:	April 23, 2001

The following is a list of attached exhibits required by the Federal Communications Commission for the application to and grant of FCC Certification.

TYPE OF EXHIBIT:	STATEMENT OF CERTIFYING ENGINEER
FCC PART:	2.947
MANUFACTURER:	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
MODEL:	SST-144
TYPE OF UNIT:	VHF-FM Handheld Transceiver
FCC ID:	AIERIT13-144
DATE:	April 23, 2001

I, Kevin G. Matson, have been employed by RITRON, Inc. since May 1980, working in the Engineering Department since November 1980 as a radio frequency Project Engineer.

I received an Associates degree in Electrical Engineering Technology from Purdue University at Indianapolis in 1980. I received a Bachelor of Science Degree in Electrical Engineering Technology from Purdue University at Indianapolis in 1982.

I hereby certify that all measurements and date herein were taken by me, that they were obtained using sound and accepted engineering principles, and that they accurately reflect the performance and characteristics of the units tested.

Signed: 

Kevin G. Matson - Project Engineer

TYPE OF EXHIBIT: TEST EQUIPMENT LIST

FCC PART: 2.947 (d)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 23, 2001

The measured data in this report was obtained using one or more of the following pieces of equipment. The particular equipment used in any one test is detailed in the procedure for that test.

ITEM	MANUFACTURER	MODEL NO.	SERIAL NO.
Communications Test Set	IFR	COM-120B	500007144
Spectrum Analyzer	Hewlett-Packard	8590A	2618A00355
Spectrum Analyzer	Hewlett-Packard	8559A	2010A 06979
Audio Sweep Generator	B & K Precision	4010	275-00893
Power Supply	VIZ	WP706A	2773B10
Power Supply	Astron	VS-20M	9608032
Digital Oscilloscope	Philips	PM-3335	DM630005
Dual Display Multimeter	Fluke	45	6723040
Digital VOM	B & K Precision	2704A	234-008459
RF Wattmeter	Bird	6154	8652
Dipole Antenna	Electro-Metrics	EM-6924	241
Dipole Antenna	Electro-Metrics	BDA-25	8-101
Log Periodic Antenna	Electro-Metrics	LP-25	8-102
Microwave Test Antenna	Polarad	CA-B	11-3
Temperature Chamber	Associated Laboratories	ELH-0.5-LC	N/A
Thermocouple	Omega	7035-J-225	8504
30dB Power Attenuator	Bird	8306-300-N	N/A
10dB Attenuator	ELCOM	AT-51-10	N/A
20dB Attenuator	Tenuline	8340-200	1544
RF Detector	Microlabs/FXR	XA-1040	N/A

TYPE OF EXHIBIT:	DESCRIPTION OF MEASUREMENT FACILITY
FCC PART:	2.948
MANUFACTURER:	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
MODEL:	SST-144
TYPE OF UNIT:	VHF-FM Handheld Transceiver
FCC ID:	AIERIT13-144
DATE:	April 23, 2001

The Field Strength measurements filed with this application were made on a site certified by RITRON, Inc. Data pertaining to this site is on file with the FCC and is current.

This site is used exclusively by RITRON, Inc. and is utilized only for the RF Field Strength Measurements of equipment designed and manufactured by RITRON, Inc. It is NOT used for measurements by or for any other party on a contract basis or otherwise.

Signed: Kevin G. Matson

Kevin G. Matson - Project Engineer

TYPE OF TEST: RADIO FREQUENCY POWER OUTPUT

FCC PART: 2.1046

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 24, 2001

PROCEDURE:

1. The SST-144 was aligned for transmitter operation on 150.100, 156.100 and 161.900 MHz (Fo) at full rated power per the tune-up procedure outlined in the Preliminary Maintenance Manual. This represents frequencies at the low, middle and high end of the SST-144 operating frequency band.

2. Power was supplied to the SST-144 via P302 by a VIZ Model WP706A power supply.

3. The SST-144 was connected at antenna terminal P201 to the input of a Bird 6154 Thermaline Wattmeter, used to measure RF power of the carrier.

4. A Fluke Model 45 Digital Multimeter was connected in series with Pin 3 of Q203 to measure the Drain current of Q203, the final RF amplifier device.

5. A BK Model 2704A Digital Multimeter was used to measure Q203 Drain supply voltage at L208, as well as Gate bias voltage at Pin 2 of Q203.

6. The SST-144 is equipped with a 6-cell AA NiCd battery pack that has a nominal voltage of 7.2 VDC and a maximum voltage of 8.4 VDC. Measurements were taken with the power supply set to 7.2 and 8.4 VDC.

7. The SST-144 transmitter was then set to operate in low power mode, with test measurements made as described above with the power supply set to 7.2 VDC.

TYPE OF TEST: RADIO FREQUENCY POWER OUTPUT

FCC PART: 2.1046

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

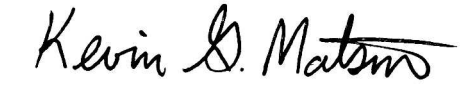
TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 24, 2001

TEST RESULTS:

Frequency (MHz)	TX Mode	Drain Voltage (VDC)	Gate Voltage (VDC)	Drain Current (Amps)	Input Power (Watts)	Output Power (Watts)	Efficiency
460.0125	Low	7.2	2.31	0.72	5.18	1.03	19.9%
	High	7.2	2.81	1.51	10.57	4.01	36.9%
	High	8.4	2.81	1.64	13.78	4.76	34.5%
465.0125	Low	7.2	2.29	0.81	5.83	1.13	19.4%
	High	7.2	2.97	1.57	11.30	4.20	37.0%
	High	8.4	3.00	1.71	14.36	5.02	35.0%
470.0125	Low	7.2	2.41	0.97	6.98	1.39	19.9%
	High	7.2	3.19	1.68	12.10	4.14	34.2%
	High	8.4	3.22	1.80	15.12	4.90	32.4%

Certifying Engineer: 

Kevin G. Matson - Project Engineer

TYPE OF TEST: MODULATOR RESPONSE

FCC PART: 2.1047 (a)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 24, 2001

PROCEDURE:

1. The SST-144 was aligned for transmitter operation on 156.100 MHz (Fo) at full rated power per the tune-up procedure outlined in the Preliminary Maintenance Manual.

2. The SST-144 speech amplifier was disconnected from the modulator at R349. The output from the Audio Signal Generator of the IFR COM120B was connected to R349 through a 100μF capacitor.

3. The SST-144 was connected at antenna terminal P201 to the 50Ω RF input of the IFR COM-120B, which was used to measure FM deviation.

4. The audio signal generator was set to a frequency of 1000 Hz and the output was adjusted to provide +/- 1.5 KHz deviation (60% rated system deviation) as indicated by the IFR COM-120B. This output level was 172 mVAC.

5. With the audio generator output level fixed at 172 mVAC, the frequency was varied from 100 - 5000 Hz. Deviation was measured at various frequencies within this range and recorded on the accompanying chart.

6. A separate measurement was made for sub-audible tones. The audio signal generator was set for various sub-audible tones between 67 - 250 Hz at an output level of 41 mVAC, the level required to produce 500 Hz deviation at 67 Hz. There was no variation in resulting deviation across the sub-audible frequency range.

TYPE OF TEST: MODULATOR RESPONSE

FCC PART: 2.1047 (a)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 24, 2001

TEST RESULTS:

Test Frequency: 156.100 MHz
Input Voltage required for 60% deviation at 1000 Hz: 172 mVAC

Modulation Frequency (Hz)	Frequency Deviation (+/- KHz)	Percent System Deviation
100	1.38	55.2%
200	1.38	55.2%
400	1.54	61.6%
800	1.56	62.4%
1000	1.54	61.6%
2000	1.54	61.6%
3000	1.52	60.8%
4000	1.41	56.4%
5000	1.44	57.6%

Certifying Engineer: Kevin G. Matson

Kevin G. Matson - Project Engineer

TYPE OF TEST: SPEECH AMPLIFIER LOW-PASS FILTER RESPONSE

FCC PART: 2.1047 (a)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 24, 2001

PROCEDURE:

1. The stages of the SST-144 speech amplifier prior to the low-pass filter were removed by disconnecting R344 from the output of limiting amplifier IC305B.

2. The output of the IFR COM120B Audio Signal Generator was applied to R344.

3. A Fluke Model 45 Dual Display Multimeter was used to measure the low-pass filter output at Pin 14 of IC303D.

4. The audio signal generator was set for a 1000 Hz sine wave at an output level of 1.78 VAC to produce 0.0 dB at the output of the low-pass filter. This level was selected to prevent limiting or distortion at any frequency. The Fluke Model 45 Dual Display Multimeter was set to make all measurements relative to this reference level.

5. The frequency of the audio signal generator was varied from 100 to 100 KHz with the output level constant. Measurements were recorded on the accompanying chart.

TYPE OF TEST: SPEECH AMPLIFER LOW-PASS FILTER RESPONSE

FCC PART: 2.1047 (a)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 24, 2001

TEST RESULTS:

Input Voltage required for 0.0 dB output at 1000 Hz: 1.78 VAC

Frequency (Hz)	Measured Amplitude (dB)
100	-0.80
200	-0.77
300	-0.72
400	-0.66
500	-0.56
600	-0.45
800	-0.22
1,000	0.00
2,000	-2.64
3,000	-10.08
4,000	-16.61
5,000	-22.05
6,000	-26.75
8,000	-34.70
10,000	-41.25
12,000	-46.81
16,000	-56.00
20,000	-63.60
24,000	-68.50
40,000	-69.40
80,000	-69.40
100,000	-69.40

Certifying Engineer: 

Kevin G. Matson - Project Engineer

TYPE OF TEST: SPEECH AMPLIFER LOW-PASS FILTER RESPONSE

FCC PART: 2.1047 (a)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

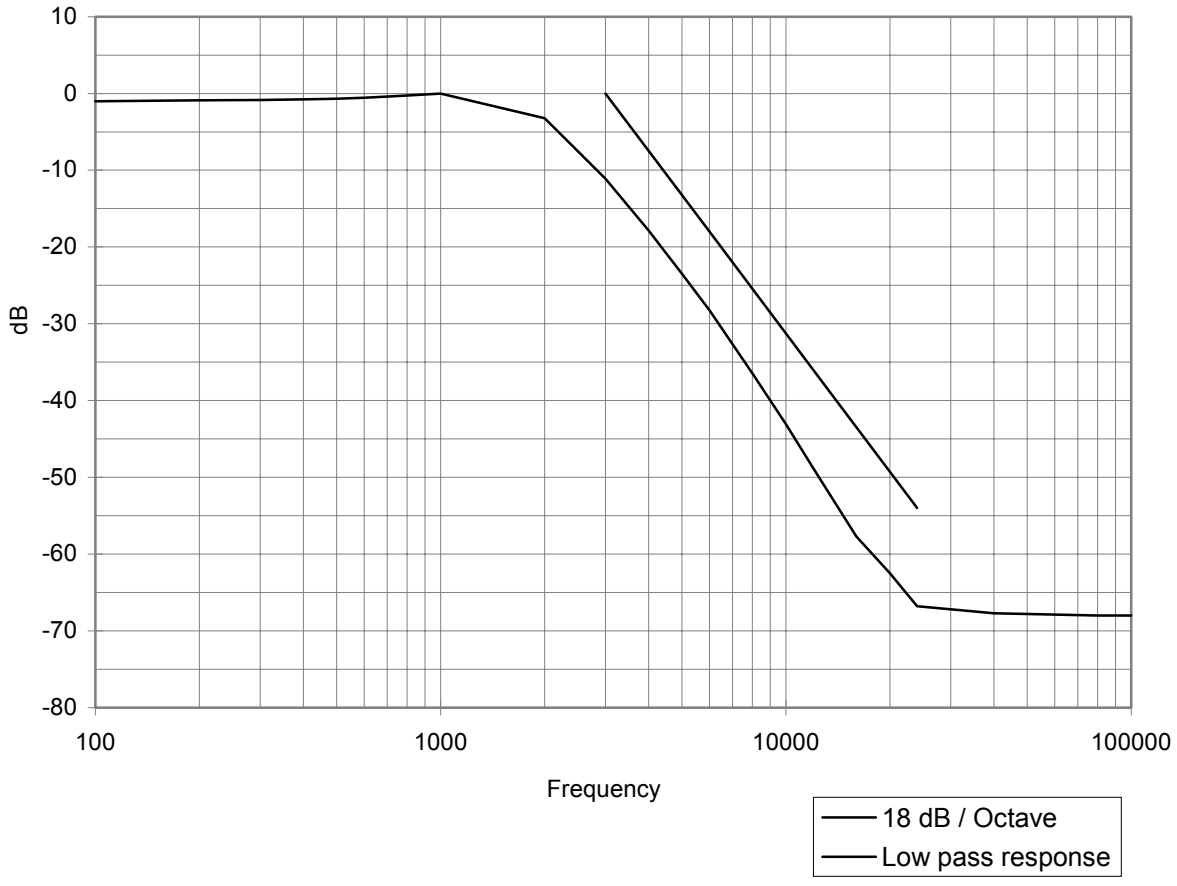
MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 24, 2001

CURVE:



TYPE OF TEST: PERCENT MODULATION VS. MODULATION INPUT VOLTAGE

FCC PART: 2.1047 (b)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 24, 2001

PROCEDURE:

1. The SST-144 was aligned for transmitter operation on 156.100 MHz (Fo) per the tune-up procedure outlined in the Preliminary Maintenance Manual.

2. The SST-144 was connected at antenna terminal P201 to the RF input of an IFR COM-120B Communications Test Set used to measure FM deviation.

3. The output of a BK Precision Model 4010 Function Generator was applied to the microphone input of the SST-144 through J301. The output of the audio generator was set to an output level of 1.0 VRMS, a level sufficient to drive the audio circuit into limiting at any frequency.

4. A Fluke Model 45 Dual Display Multimeter was used to measure the amplitude of the signal applied to the microphone input.

5. The frequency of the audio generator was adjusted to find the frequency of maximum response. The SST-144 was set for 12.5 KHz bandwidth operation and the deviation was adjusted for +/- 2.5 KHz as outlined in the Preliminary Maintenance Manual.

6. The frequency of the audio signal generator was set to 300 Hz and the output level was adjusted to produce 250 Hz deviation, which is 10% of the rated modulation. The voltage level was then adjusted for 20% of the rated modulation, and repeated for every 10% increment.

7. The input voltage was adjusted to a level 16 dB greater than that required to produce 50% modulation. The maximum deviation was noted, along with the level required to achieve it, if 100% modulation was not realized.

8. Steps 6 and 7 were repeated for frequencies of 500, 750, 1000, 2000 and 3000 Hz.

9. The SST-444 was set for 25 KHz bandwidth operation and the deviation was adjusted for +/- 5 KHz as outlined in the Preliminary Maintenance Manual.

10. Steps 6, 7 and 8 were repeated for 25 KHz bandwidth operation.

11. Results were plotted on separate graphs for 12.5 KHz and 25 KHz bandwidth operation.

TYPE OF TEST: PERCENT MODULATION VS. MODULATION INPUT VOLTAGE

FCC PART: 2.1047 (b)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 24, 2001

TEST RESULTS:

Percent	Deviation	Input level (mVRMS) - **12.5 KHz Bandwidth**					
Modulation	(KHz)	300 Hz	500 Hz	750 Hz	1000 Hz	2000 Hz	3000 Hz
10%	0.25	6.6	3.8	1.9	1.7	1.3	2.1
20%	0.50	15.4	8.9	5.7	4.3	3.0	4.8
30%	0.75	23.1	15.0	8.4	6.5	4.3	9.2*
40%	1.00	32.9	19.2	11.5	9.1	6.0	
50%	1.25	40.6	23.8	14.3	11.2	7.7	
60%	1.50	48.4	29.1	17.5	13.8	9.5	
70%	1.75	57.3	35.7	21.2	16.0	13.3	
80%	2.00	77.6	47.2	27.1	19.4		
90%	2.25	87.8	54.8	36.6	27.7		
100%	2.50	99.1	63.5				
Level at 50%	+16 dB	255.8	149.9	90.1	70.6	48.5	58.0
Max Deviation	(KHz)	2.42*	2.36*	2.25*	2.23*	1.72*	0.72*

Percent	Deviation	Input level (mVRMS) - **25 KHz Bandwidth**					
Modulation	(KHz)	300 Hz	500 Hz	750 Hz	1000 Hz	2000 Hz	3000 Hz
10%	0.50	6.0	3.2	1.8	1.7	1.2	1.7
20%	1.00	23.7	6.8	4.2	2.9	2.8	4.8
30%	1.50	41.6	12.0	7.3	5.1	4.1	12.2*
40%	2.00	62.3	17.0	10.1	7.1	5.7	
50%	2.50	79.7	22.0	13.2	9.4	7.3	
60%	3.00	96.7	26.7	16.6	12.1	8.7	
70%	3.50	126.0	32.7	19.3	14.4	9.2	
80%	4.00	165.0	42.4	23.0	16.4		
90%	4.50	183.0	51.5	33.1	24.3		
100%	5.00	238.0	69.9	39.4*	36.6*		
Level at 50%	+ 16 dB	502.1	138.6	83.2	59.2	46.0	76.9
Max Deviation	(KHz)	4.90*	4.90*	4.61*	4.60*	3.20*	1.41*

Certifying Engineer: 

Kevin G. Matson - Project Engineer

TYPE OF TEST: PERCENT MODULATION VS. MODULATION INPUT VOLTAGE

FCC PART: 2.1047 (b)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

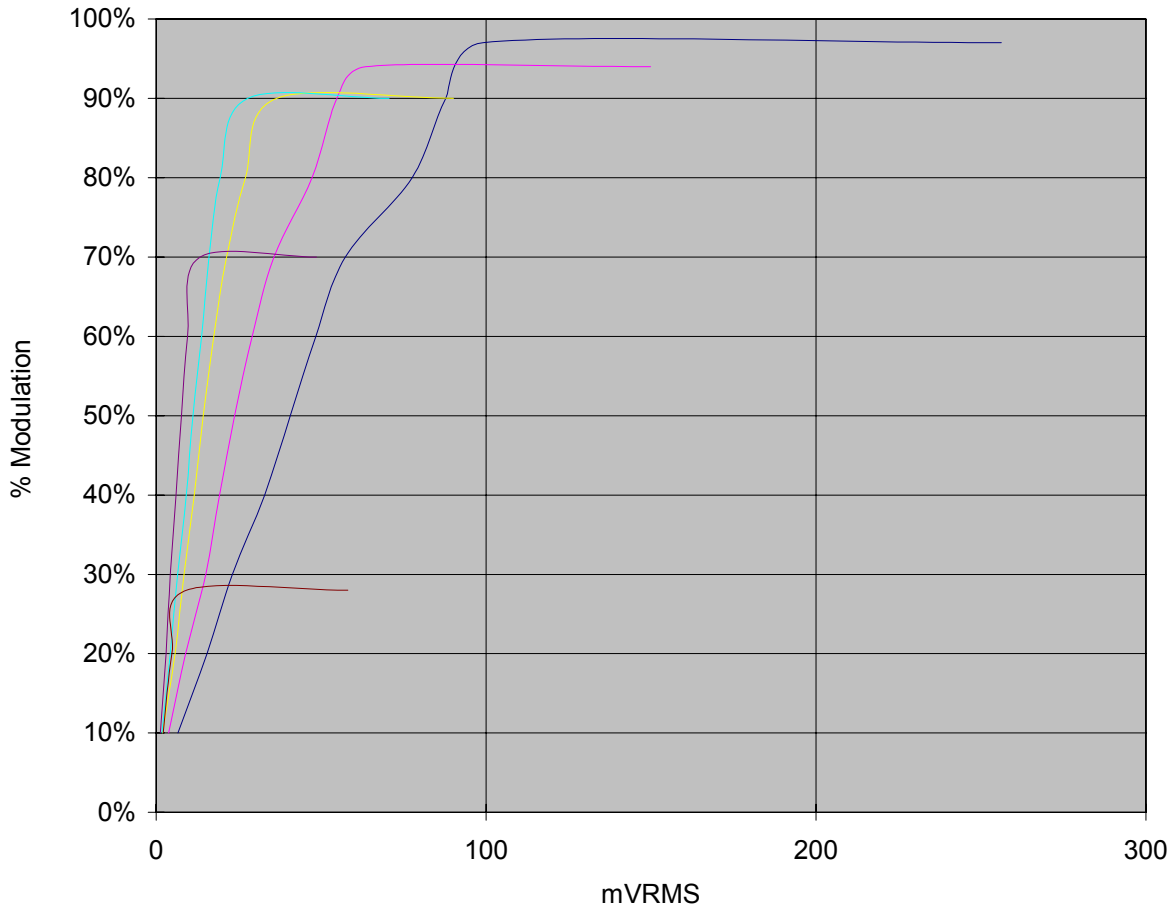
MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 25, 2001

CURVE:



Channel Bandwidth: 12.5 KHz
100% Modulation: 2.5 KHz

TYPE OF TEST: PERCENT MODULATION VS. MODULATION INPUT VOLTAGE

FCC PART: 2.1047 (b)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

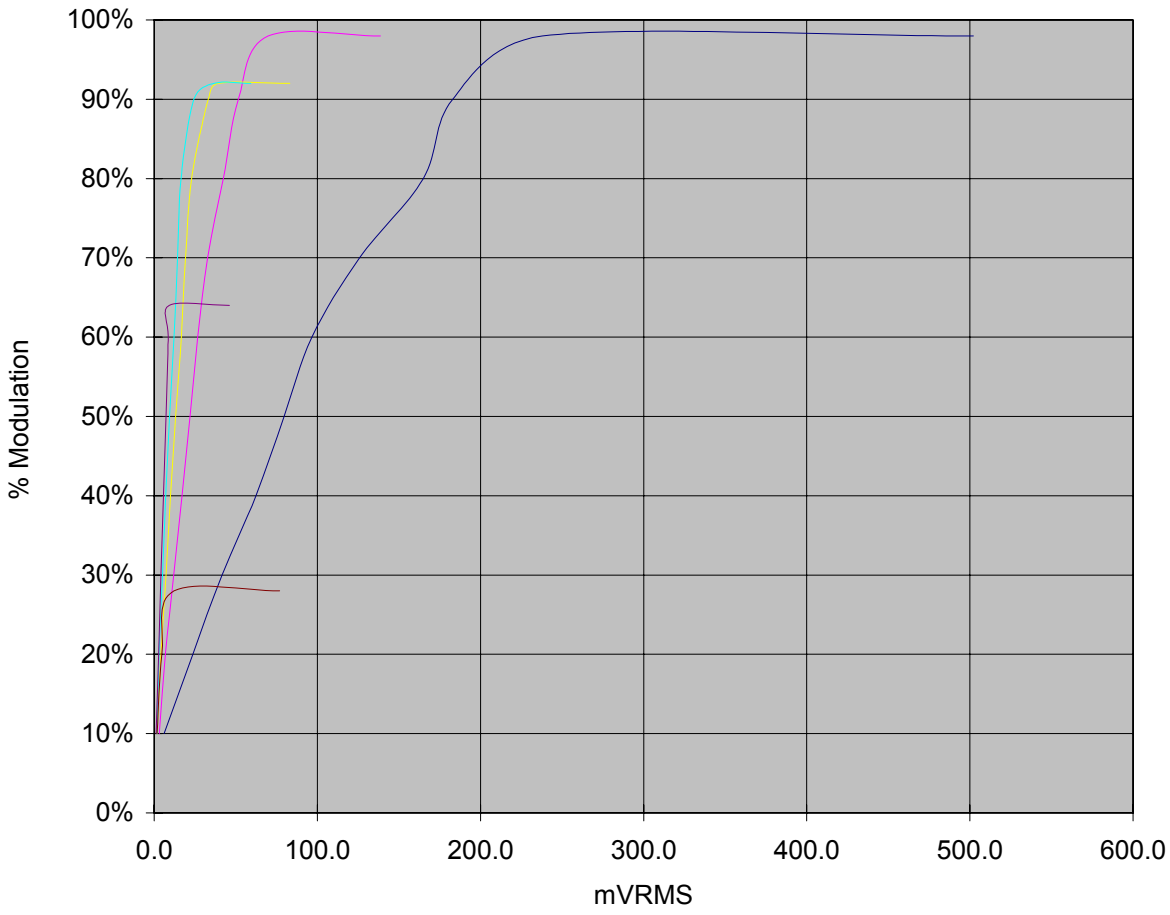
MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 25, 2001

CURVE:



Channel Bandwidth: 25.0 KHz
100% Modulation: 5.0 KHz

TYPE OF TEST: OCCUPIED BANDWIDTH

FCC PART: 2.1049 (c)(1) per 90.210 (b)(d)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 27, 2001

PROCEDURE:

1. The SST-144 was aligned for transmitter operation on 156.100 MHz (Fo) at full rated power, was set for 12.5 KHz bandwidth operation, and the deviation was adjusted for +/- 2.5 KHz as outlined in the Preliminary Maintenance Manual.

2. The RF output of the SST-144 was measured with a Bird Model 6154 Thermaline Wattmeter. This value was recorded as POWER OUTPUT. Power was supplied to the SST-144 via P302 by an VIZ Model WP706A Power Supply set at +8.4 VDC to produce the maximum rated transmitter power output.

3. The antenna terminal P201 was connected to the input of a Bird Model 8306-300-N 30 DB power attenuator. The output of the attenuator was connected to the input of a Hewlett Packard Model 8554B Spectrum Analyzer. The spectrum analyzer was set to:

   - 100 Hz Resolution
   - 5 KHz per Horizontal Division
   - 0 dBm Reference
   - 10 dB per Vertical Division

4. The center frequency of the spectrum analyzer was set to the SST-144 carrier frequency and the full scale reference line was set to the level of the unmodulated carrier.

5. The output of a BK Precision Model 4010 Function Generator was applied to the microphone input of the SST-144 through J301. The frequency of the audio signal generator was set to 2500 Hz and the output adjusted to a level 16 dB greater than that necessary to produce 50% of the rated system deviation at the frequency of maximum response.

6. The spectrum analyzer readings of the sideband levels in dBm were recorded and a graph of the spectrum analyzer output was plotted. All readings were rounded up to the nearest dB.

7. Steps 3 - 6 were repeated with the radio set for low power operation.

8. The SST-144 was set for 25 KHz bandwidth operation, and the deviation was adjusted for +/- 5 KHz as outlined in the Preliminary Maintenance Manual. Steps 3 - 7 were repeated for 25 KHz bandwidth operation.

TYPE OF TEST: OCCUPIED BANDWIDTH

FCC PART: 2.1049 (c)(1) per 90.210 (b)(d)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 27, 2001

EQUATIONS:

The analyzer readings in dBm were converted to power using the following formula:

Power = .001 (antilog F(dBm, 10))

The power readings were summed to provide a reference power level. The total was converted back to dBm with the following formula and recorded as MEAN REFERENCE POWER OUTPUT:

dBm = 10 (log Fc (Power,.001))

The sideband powers on each side of the carrier were reduced to a percentage of the MEAN REFERENCE POWER OUTPUT. The percentages were added together starting with the carrier and expanding out equally in +/- 2.5 KHz increments until greater than 99.5% of the total MEAN REFERENCE POWER was reached.

The occupied bandwidth is defined as having 99.5% of the total MEAN REFERENCE POWER existing within its limits.

Certifying Engineer: Kevin G. Matson

Kevin G. Matson - Project Engineer

TYPE OF TEST: OCCUPIED BANDWIDTH

FCC PART: 2.1049 (c)(1) per 90.210 (b)(d)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 27, 2001

DATA:

Carrier Frequency:	156.100	MHz
Power Output:	1.00	Watts
Power Output:	30.00	dBm
Mean Reference Power:	29.47	dBm
Channel Bandwidth:	12.5	KHz
Occupied Bandwidth:	10.0	KHz

Emission Frequency Offset (KHz)	Measured Relative Amplitude (dBm)	Actual Amplitude (dBm)	FCC Limit (dBm)	Power (Watts)	Percent MRP (%)	Occupied Bandwidth (%)
-25.0			-20.00			
-22.5			-20.00			
-20.0			-20.00			
-17.5			-20.00			
-15.0	-78.00	-48.00	-20.00	15.8E-9	0.00%	
-12.5	-73.00	-43.00	-39.94	50.1E-9	0.00%	
-10.0	-69.00	-39.00	-21.76	125.9E-9	0.00%	
-7.5	-51.00	-21.00	-3.59	7.9E-6	0.00%	
-5.0	-32.00	-2.00	30.00	631.0E-6	0.07%	
-2.5	-14.00	16.00	30.00	39.8E-3	4.50%	
0.0	-1.00	29.00	30.00	794.3E-3	89.71%	100.00%
2.5	-13.00	17.00	30.00	50.1E-3	5.66%	
5.0	-33.00	-3.00	30.00	501.2E-6	0.06%	
7.5	-52.00	-22.00	-3.59	6.3E-6	0.00%	
10.0	-67.00	-37.00	-21.76	199.5E-9	0.00%	
12.5	-75.00	-45.00	-39.94	31.6E-9	0.00%	
15.0	-78.00	-48.00	-20.00	15.8E-9	0.00%	
17.5			-20.00			
20.0			-20.00			
22.5			-20.00			
25.0			-20.00			

Certifying Engineer: Kevin G. Matson

Kevin G. Matson - Project Engineer

TYPE OF TEST: OCCUPIED BANDWIDTH

FCC PART: 2.1049 (c) (1) per 90.210 (d)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

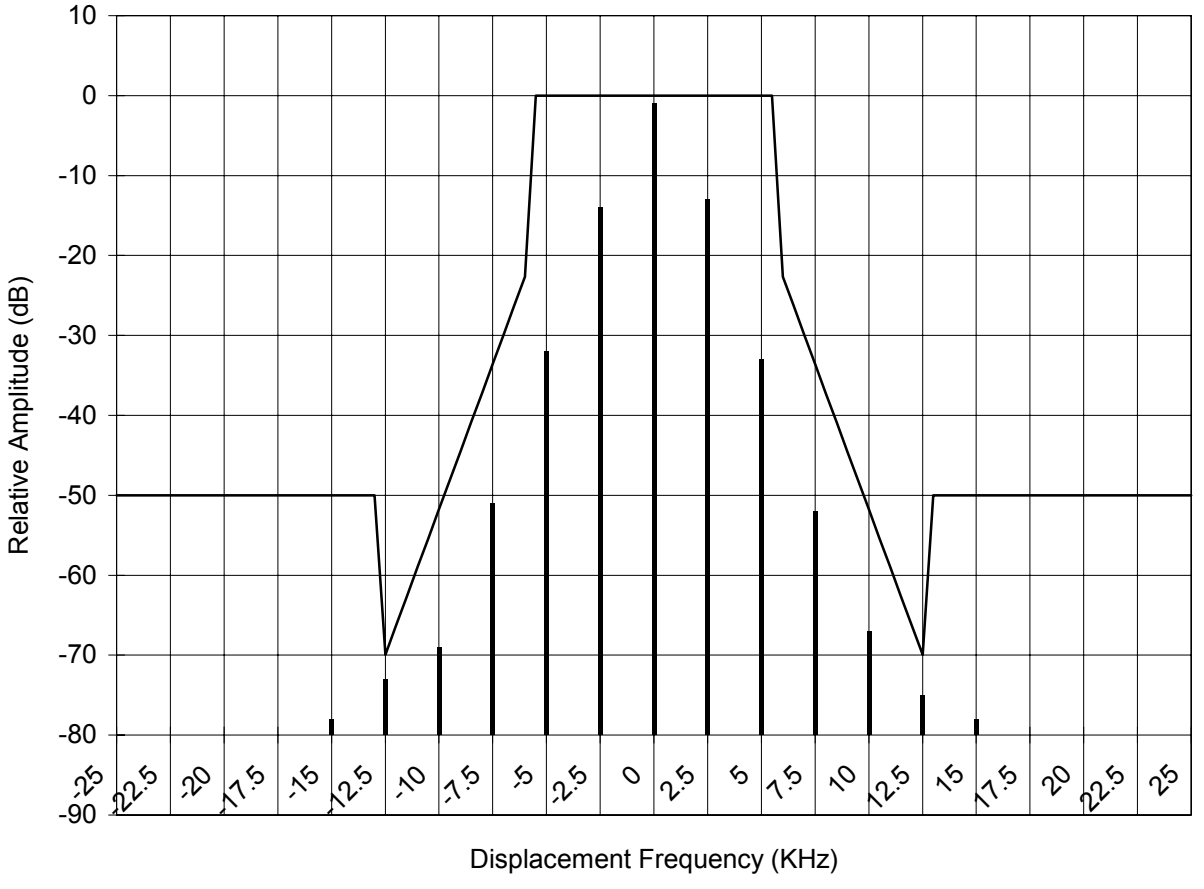
MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 27, 2001

CURVE:



Channel Bandwidth: 12.5 KHz
Power Output: 1.0 Watts

TYPE OF TEST: OCCUPIED BANDWIDTH

FCC PART: 2.1049 (c)(1) per 90.210 (b)(d)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 27, 2001

DATA:

Carrier Frequency:	156.100	MHz
Power Output:	5.00	Watts
Power Output:	36.99	dBm
Mean Reference Power:	35.41	dBm
Channel Bandwidth:	12.5	KHz
Occupied Bandwidth:	10.0	KHz

Emission Frequency Offset (KHz)	Measured Relative Amplitude (dBm)	Actual Amplitude (dBm)	FCC Limit (dBm)	Power (Watts)	Percent MRP (%)	Occupied Bandwidth (%)
-25.0			-20.00			
-22.5			-20.00			
-20.0			-20.00			
-17.5			-20.00			
-15.0	-79.00	-42.01	-20.00	62.9E-9	0.00%	
-12.5	-76.00	-39.01	-32.95	125.6E-9	0.00%	
-10.0	-68.00	-31.01	-14.77	792.4E-9	0.00%	
-7.5	-52.00	-15.01	3.40	31.5E-6	0.00%	
-5.0	-34.00	2.99	36.99	2.0E-3	0.06%	
-2.5	-15.00	21.99	36.99	158.1E-3	4.55%	
0.0	-2.00	34.99	36.99	3.2E+0	90.78%	100.00%
2.5	-15.00	21.99	36.99	158.1E-3	4.55%	
5.0	-34.00	2.99	36.99	2.0E-3	0.06%	
7.5	-53.00	-16.01	3.40	25.1E-6	0.00%	
10.0	-67.00	-30.01	-14.77	997.6E-9	0.00%	
12.5	-75.00	-38.01	-32.95	158.1E-9	0.00%	
15.0	-79.00	-42.01	-20.00	62.9E-9	0.00%	
17.5			-20.00			
20.0			-20.00			
22.5			-20.00			
25.0			-20.00			

Certifying Engineer: Kevin G. Matson

Kevin G. Matson - Project Engineer

TYPE OF TEST: OCCUPIED BANDWIDTH

FCC PART: 2.1049 (c) (1) per 90.210 (d)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

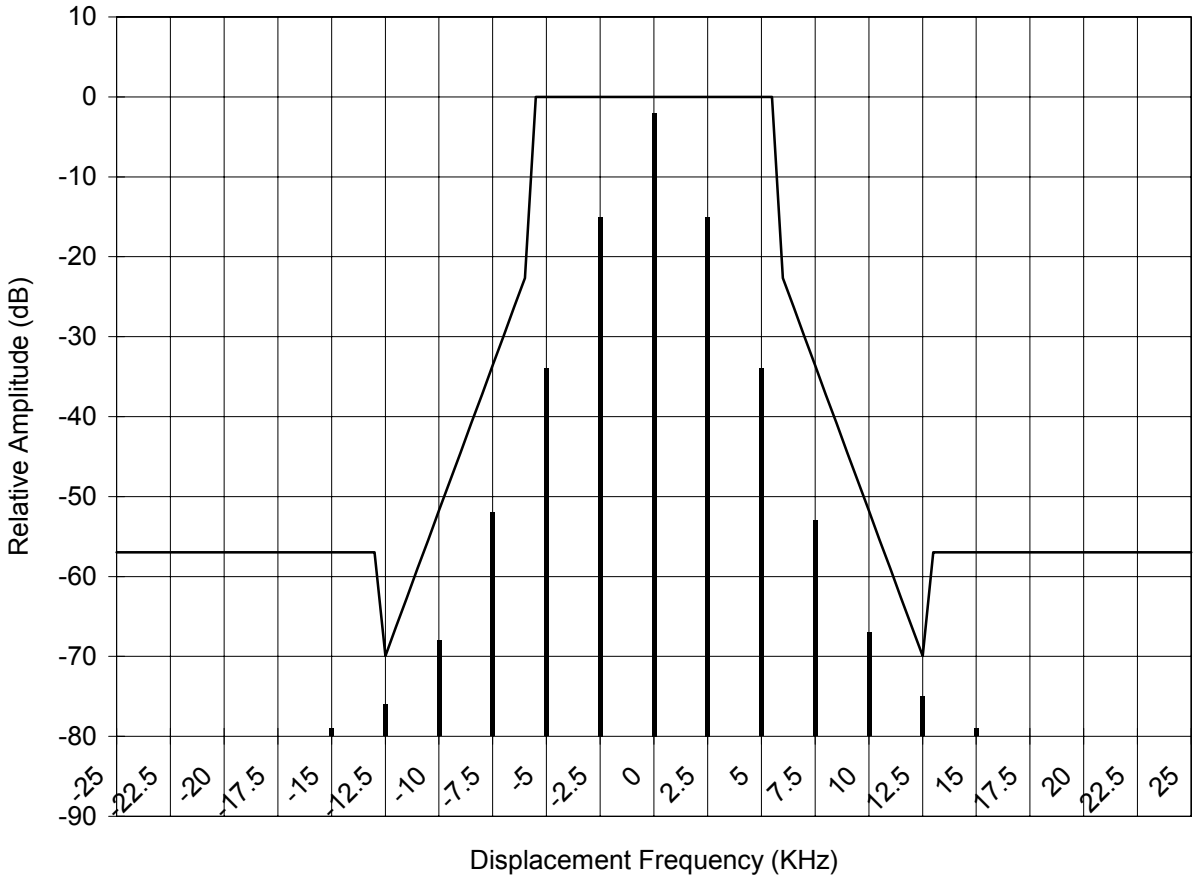
MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 27, 2001

CURVE:



Channel Bandwidth: 12.5 KHz
Power Output: 5.0 Watts

TYPE OF TEST: OCCUPIED BANDWIDTH

FCC PART: 2.1049 (c)(1) per 90.210 (b)(d)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 27, 2001

DATA:

Carrier Frequency:	156.100	MHz
Power Output:	1.00	Watts
Power Output:	30.00	dBm
Mean Reference Power:	30.22	dBm
Channel Bandwidth:	25.0	KHz
Occupied Bandwidth:	20.0	KHz

Emission Frequency Offset (KHz)	Measured Relative Amplitude (dBm)	Actual Amplitude (dBm)	FCC Limit (dBm)	Power (Watts)	Percent MRP (%)	Occupied Bandwidth (%)
-25.0			-5.00			
-22.5			-5.00			
-20.0			5.00			
-17.5			5.00	1.0E-3	0.10%	
-15.0	-72.00	-42.00	5.00	63.1E-9	0.00%	
-12.5	-69.00	-39.00	5.00	125.9E-9	0.00%	
-10.0	-53.00	-23.00	30.00	5.0E-6	0.00%	
-7.5	-36.00	-6.00	30.00	251.2E-6	0.02%	
-5.0	-20.00	10.00	30.00	10.0E-3	0.95%	
-2.5	-7.00	23.00	30.00	199.5E-3	18.96%	
0.0	-2.00	28.00	30.00	631.0E-3	59.95%	99.81%
2.5	-7.00	23.00	30.00	199.5E-3	18.96%	
5.0	-20.00	10.00	30.00	10.0E-3	0.95%	
7.5	-37.00	-7.00	30.00	199.5E-6	0.02%	
10.0	-53.00	-23.00	30.00	5.0E-6	0.00%	
12.5	-68.00	-38.00	5.00	158.5E-9	0.00%	
15.0	-71.00	-41.00	5.00	79.4E-9	0.00%	
17.5			5.00	1.0E-3	0.10%	
20.0			5.00			
22.5			-5.00			
25.0			-5.00			

Certifying Engineer: 

Kevin G. Matson - Project Engineer

TYPE OF TEST: OCCUPIED BANDWIDTH

FCC PART: 2.1049 (c) (1) per 90.210 (b)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

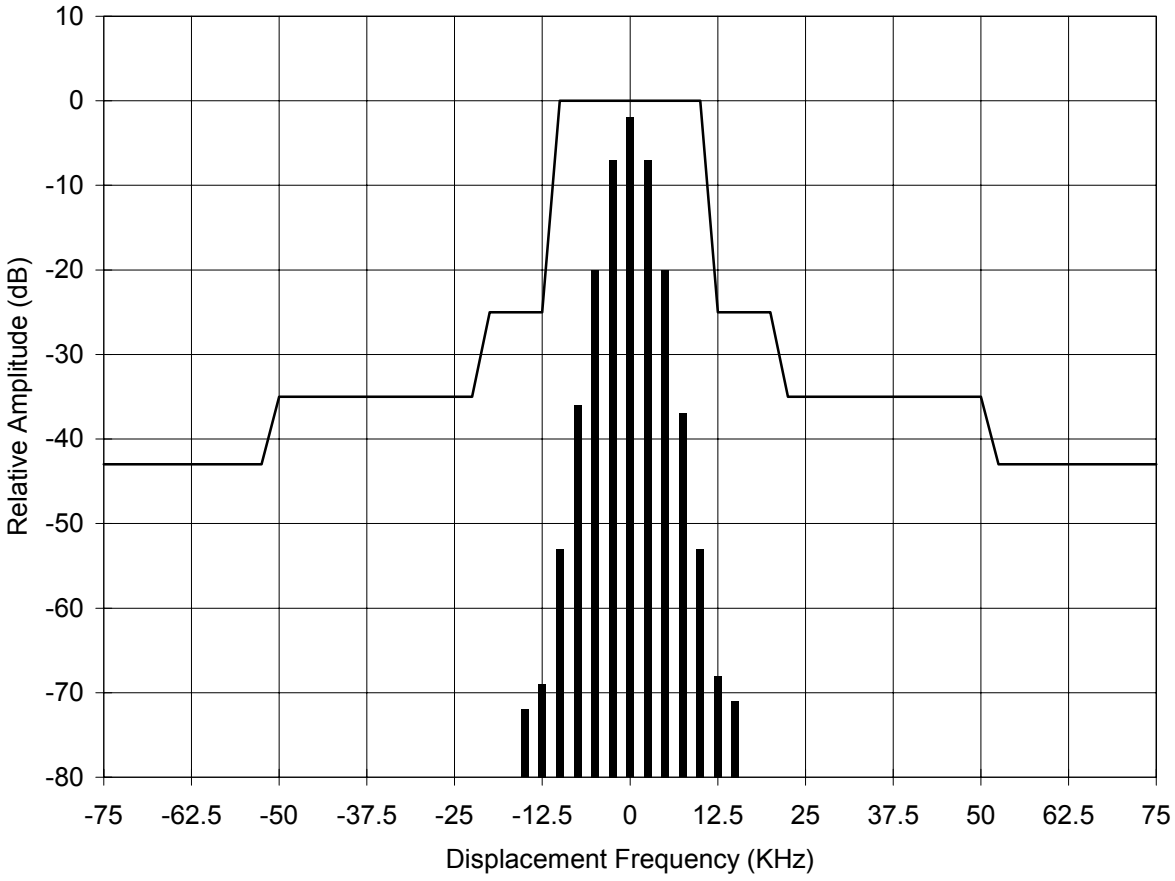
MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 27, 2001

CURVE:



Channel Bandwidth: 25 KHz
Power Output: 1.0 Watts

TYPE OF TEST: OCCUPIED BANDWIDTH

FCC PART: 2.1049 (c)(1) per 90.210 (b)(d)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 27, 2001

DATA:

Carrier Frequency:	156.100	MHz
Power Output:	5.00	Watts
Power Output:	36.99	dBm
Mean Reference Power:	35.85	dBm
Channel Bandwidth:	25.0	KHz
Occupied Bandwidth:	20.0	KHz

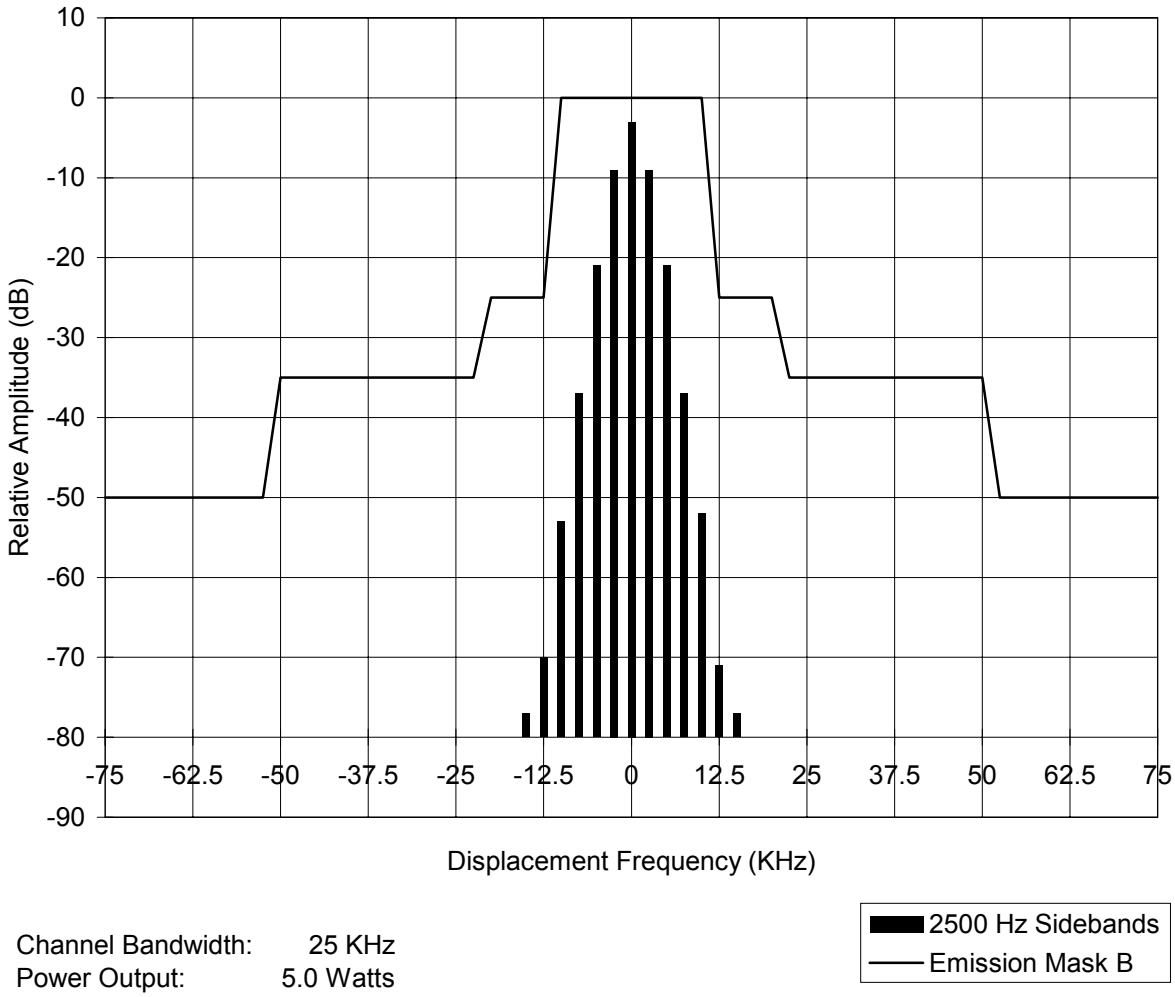
Emission Frequency Offset (KHz)	Measured Relative Amplitude (dBm)	Actual Amplitude (dBm)	FCC Limit (dBm)	Power (Watts)	Percent MRP (%)	Occupied Bandwidth (%)
-25.0			1.99			
-22.5			1.99			
-20.0			11.99			
-17.5			11.99			
-15.0	-77.00	-40.01	11.99	99.8E-9	0.00%	
-12.5	-70.00	-33.01	11.99	500.0E-9	0.00%	
-10.0	-53.00	-16.01	36.99	25.1E-6	0.00%	
-7.5	-37.00	-0.01	36.99	997.6E-6	0.03%	
-5.0	-21.00	15.99	36.99	39.7E-3	1.03%	
-2.5	-9.00	27.99	36.99	629.5E-3	16.37%	
0.0	-3.00	33.99	36.99	2.5E+0	65.15%	100.00%
2.5	-9.00	27.99	36.99	629.5E-3	16.37%	
5.0	-21.00	15.99	36.99	39.7E-3	1.03%	
7.5	-37.00	-0.01	36.99	997.6E-6	0.03%	
10.0	-52.00	-15.01	36.99	31.5E-6	0.00%	
12.5	-71.00	-34.01	11.99	397.2E-9	0.00%	
15.0	-77.00	-40.01	11.99	99.8E-9	0.00%	
17.5			11.99			
20.0			11.99			
22.5			1.99			
25.0			1.99			

Certifying Engineer: Kevin G. Matson

Kevin G. Matson - Project Engineer

TYPE OF TEST:	OCCUPIED BANDWIDTH
FCC PART:	2.1049 (c) (1) per 90.210 (b)
MANUFACTURER:	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
MODEL:	SST-144
TYPE OF UNIT:	VHF-FM Handheld Transceiver
FCC ID:	AIERIT13-144
DATE:	April 27, 2001

CURVE:



Channel Bandwidth: 25 KHz
Power Output: 5.0 Watts

TYPE OF TEST: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

FCC PART: 2.1051

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: UHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 25, 2001

PROCEDURE:

1. The SST-144 was aligned for transmitter operation on 156.100 MHz (Fo) at full rated power per the tune-up procedure outlined in the Preliminary Maintenance Manual.

2. Power was supplied to the SST-144 by a VIZ Model WP706A Power Supply. The supply voltage was set to +8.4 VDC to represent the highest possible operating voltage.

3. The transmitter was modulated by a 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation as specified in FCC Part 2.1049 (c)(1).

4. The SST-144 antenna terminal P201 was connected to the input of a Tenuline Model 8340-200, 20 dB power attenuator in series with a Mini-Circuits Model CAT-20, 20 dB attenuator. The output of the attenuators were connected to the input of a Hewlett-Packard Model 8590 Spectrum Analyzer.

5. The spectrum was searched from 8 MHz to the 10th harmonic of the operating frequency. All unreported emissions were more than 30 dB below the FCC limit of 50 + 10 log P, or -20 dBm.

6. The measured insertion loss of the attenuators and cables are listed as the “Correction Factor” on the data sheet.

7. A second test was conducted with the SST-144 transmitter set for low power operation. The supply voltage was set to +7.2 VDC to represent the nominal operating voltage. All other conditions remained the same.

TYPE OF TEST: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

FCC PART: 2.1051

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 25, 2001

TEST RESULTS:

Carrier Frequency (Fo):	156.100	MHz
Oscillator Frequency:	3.6	MHz
Output Power:	5.00	Watts
Supply Voltage:	8.4	VDC
FCC Limit:	-20	dBm

Emission Frequency (MHz)	Mulitple of Carrier	Measured Amplitude (dBm)	Correction Factor (dB)	Resultant Amplitude (dBm)
156.100	Fo	-3	39.5	36.5
312.200	2Fo	-65	39.5	-25.5
468.300	3Fo	-68	40.0	-28.0

Certifying Engineer: Kevin G. Matson

Kevin G. Matson - Project Engineer

TYPE OF TEST: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

FCC PART: 2.1051

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 25, 2001

TEST RESULTS:

Carrier Frequency (Fo):	156.100	MHz
Oscillator Frequency:	3.6	MHz
Output Power:	1.10	Watts
Supply Voltage:	7.2	VDC
FCC Limit:	-20	dBm

Emission Frequency (MHz)	Mulitple of Carrier	Measured Amplitude (dBm)	Correction Factor (dB)	Resultant Amplitude (dBm)
156.100	Fo	-9	39.5	30.5
312.200	2Fo	-66	39.5	-26.5
462.0250	3Fo	-66	40.0	-26.0

Certifying Engineer: Kevin G. Matson

Kevin G. Matson - Project Engineer

TYPE OF EXHIBIT: FIELD STRENGTH OF SPURIOUS RADIATION

FCC PART: 2.0153

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: JMX-144

TYPE OF UNIT: VHF-FM Transceiver

FCC ID: AIERIT13-144

DATE: May 2, 2001

PROCEDURE:

1. The measurement for effective radiated power was taken at the RITRON, Inc. 3 meter test site. The measurement was made in accordance with FCC Rules & Regulations Part 2.947 using the procedures of IEC Publication 106.

2. The JMX-144 was aligned for transmitter operation on 156.100 MHz at the 4.0 watt maximum obtainable from the unit per the tune-up procedure outlined in the Preliminary Maintenance Manual. The unit was then terminated at the antenna port with the two antennas sold with this product.

3. All field strength measurements were made with the Hewlett-Packard Model 8559A Spectrum Analyzer and the appropriate antenna for the frequency being measured. The antennas used were.

   - Electro-Metrics BDA-25 Dipole Antenna at 0 to 200 MHz
   - Electro-Metrics LP-25 Log Periodic Antenna at 200 to 1000 MHz
   - Polarad CA-BB Microwave Antenna at 1000 to 10,000 MHz

4. The height and polarization of the field strength measurement antenna and orientation of the JMX-144 were varied to provide maximum field strength of each spurious signal.

5. The spectrum was searched from 4 MHz to the 10^{th} harmonic of the transmit frequency. All unreported emissions were more than 20 dB below the FCC limits specified in Part 90.210(d)(3).

6. A substitution antenna, an Electro-Metrics EM-6924 adjustable dipole, was substituted for the JMX-144 at the JMX-144's location. An RF signal generator was set for the frequency of the JMX-144's spurious signal with the level at the substitution antenna noted.

7. The polarization of the substitution antenna was adjusted for maximum signal strength at the field strength measuring antenna. The level at the field strength antenna was noted.

TYPE OF EXHIBIT: FIELD STRENGTH OF SPURIOUS RADIATION

FCC PART: 2.0153

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: JMX-144

TYPE OF UNIT: VHF-FM Transceiver

FCC ID: AIERIT13-144

DATE: May 2, 2001

EQUATIONS:

The substitution antenna is specified from the manufacturer in terms of antenna factor rather than antenna gain. The conversion is:

Ga(dbd) = 20 log f (MHz) – AF(dB) – 31.9

The effective radiated power (ERP) is then:

ERP(dBm) = Pr(dBm) + Pgen(dBm) – Ps(dBm) – Ga(dBd)

Where:

Pr is the power level of the radio's emission at the receiving antenna output.

Pgen is the RF signal generator level at the substitution antenna output.

Ps is the power level of the substitution antenna emission at the receiving antenna output.

Ga is the gain of the substitution antenna.

The ERP is converted to watts from dBm by:

ERP(watts) = $\text{antilog}_{10}((\text{ERP(dBm)} - 30)/10)$

TYPE OF EXHIBIT: FIELD STRENGTH OF SPURIOUS RADIATION

FCC PART: 2.0153

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: JMX-144

TYPE OF UNIT: VHF-FM Transceiver

FCC ID: AIERIT13-144

DATE: May 2, 2001

RESULTS:

Frequency (MHz)	Pr (dBm)	Pgen (dBm)	Ps (dBm)	Ga (dBd)	Spurious Emission (dBm)	FCC Limit (dBm)
312.200	-60.0	0.0	-30.0	-1.0	-29.0	-20.0
468.300	-62.0	0.0	-26.0	0.0	-36.0	-20.0
624.400	-63.0	0.0	-32.0	-0.3	-30.7	-20.0

All other spurious emissions were at least 20 dB below the limit.

Certifying Engineer: Kevin G. Matson

Kevin G. Matson - Project Engineer

TYPE OF TEST: FREQUENCY STABILITY VS. TEMPERATURE

FCC PART: 2.1055 (a)(1)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 26, 2001

PROCEDURE:

1. The SST-144 was aligned for transmitter operation on 156.100 MHz (Fo) at full rated power per the tune-up procedure outlined in the Preliminary Maintenance Manual.

2. Power was supplied to the SST-144 by a VIZ Model WP706A power supply set to the nominal operating voltage of +7.2 VDC. The SST-144 antenna terminal P201 was connected to the input of an IFR COM-120B RF communications test set, used to measure frequency of the carrier.

3. Temperature was measured with an Omega Model 7035-J-225 thermocouple connected directly to the case of Y302, a TCVCXO reference oscillator mounted on the SST-144 printed circuit board.

4. The SST-144 was enclosed in a plastic bag and placed into an Associated Laboratories Model ELH-0.5-LC environmental test chamber.

5. The temperature was raised to +50°C and allowed to stabilize for 30 minutes. The transmitter was activated and the frequency output recorded. The temperature was lowered in 10°C increments down to -30°C, allowing 30 minutes to stabilize at each temperature.

6. All measurements were converted to part-per-million (ppm) deviation and charted on a linear graph.

TYPE OF TEST: FREQUENCY STABILITY VS. TEMPERATURE

FCC PART: 2.1055 (a)(1)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 26, 2001

TEST RESULTS:

Frequency: 156.100 MHz
FCC Limit: +/- 2.5 ppm

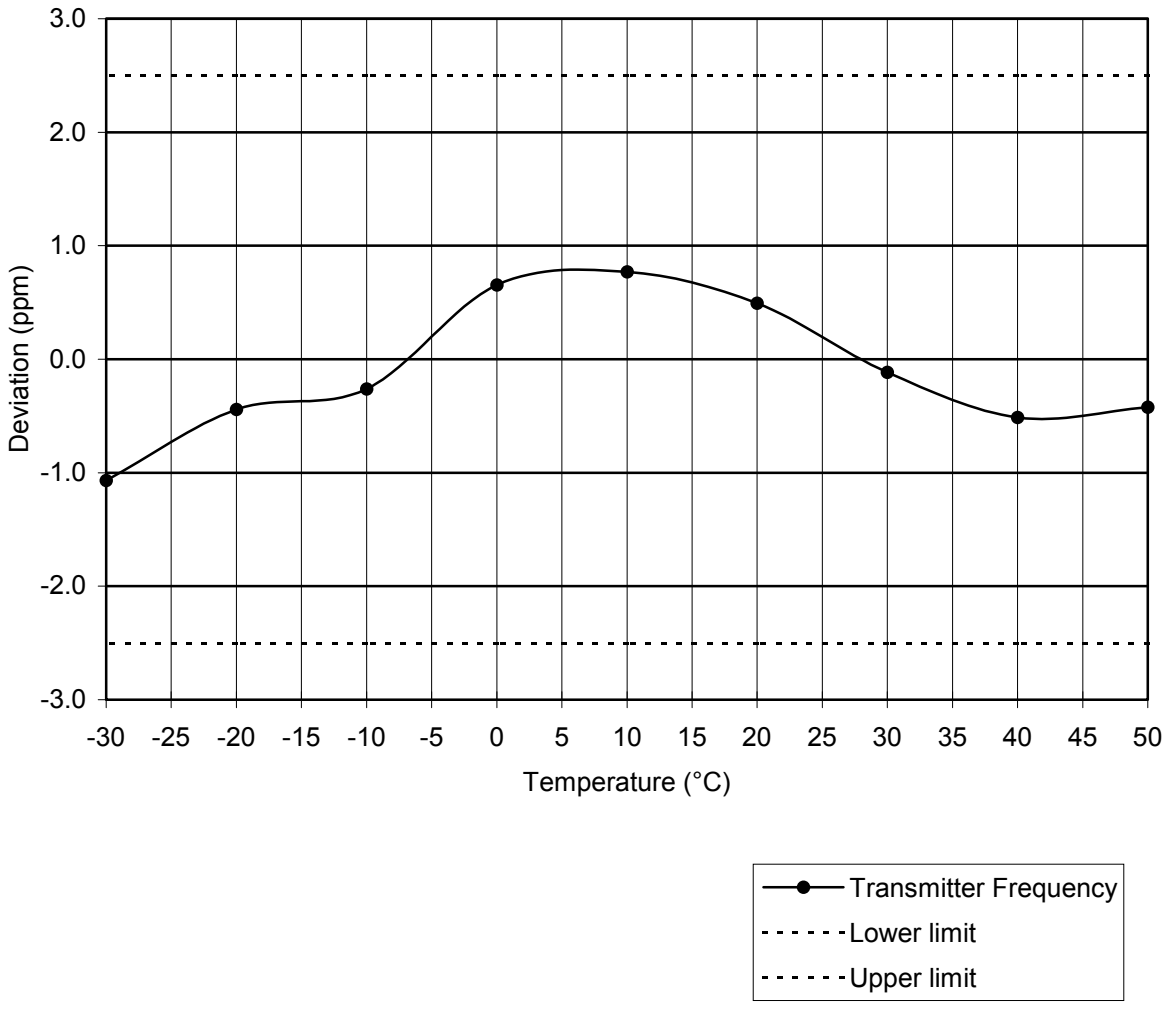
Temperature (°C)	Frequency (MHz)	Deviation (Hz)	Deviation (ppm)
50	156.099934	-66	-0.42
40	156.099920	-80	-0.51
30	156.099982	-18	-0.12
20	156.100077	77	0.49
10	156.100120	120	0.77
0	156.100102	102	0.65
-10	156.099959	-41	-0.26
-20	156.099931	-69	-0.44
-30	156.099833	-167	-1.10

Certifying Engineer: Kevin G. Matson

Kevin G. Matson - Project Engineer

TYPE OF TEST:	FREQUENCY STABILITY VS. TEMPERATURE
FCC PART:	2.1055 (a)(b)
MANUFACTURER:	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
MODEL:	SST-144
TYPE OF UNIT:	VHF-FM Handheld Transceiver
FCC ID:	AIERIT13-144
DATE:	April 26, 2001

CURVE:



TYPE OF TEST: FREQUENCY STABILITY VS. BATTERY VOLTAGE

FCC PART: 2.1055 (d)(2)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 25, 2001

PROCEDURE:

1. The SST-144 was aligned for transmitter operation on 156.100 MHz (Fo) at full rated power per the tune-up procedure outlined in the Preliminary Maintenance Manual.

2. Power was supplied to the SST-144 by a VIZ Model WP706A power supply, and supply voltage was measured at P302 battery connector with a Micronta Model 22-191 Digital Multimeter.

3. The SST-144 antenna terminal P201 was connected to the input of an IFR COM-120B RF communications test set, used to measure frequency of the carrier.

4. Frequency measurements were made at +25°C with supply voltage set to 6.0, 7.2 and 8.4 VDC.

5. The lowest operating voltage is determined by battery end of life voltage for each cell multiplied by the number of individual cells. The maximum cell voltage multiplied by the number of cells determines the highest operating voltage. For AA NiCd and NiMH cells the lowest operating voltage is 1 VDC and the highest operating voltage is 1.4 VDC.

Lowest operating voltage	1.0 VDC X 6 cells	6.0 VDC
Nominal operating voltage	1.2 VDC X 6 cells	7.2 VDC
Lowest operating voltage	1.4 VDC X 6 cells	8.4 VDC

6. All frequencies were referenced to the measurement made at +7.2 VDC, the nominal supply voltage for a 6-cell AA NiCd battery pack.

TYPE OF TEST: FREQUENCY STABILITY VS. BATTERY VOLTAGE

FCC PART: 2.1055 (d)(2)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 25, 2001

TEST RESULTS:

Carrier Frequency: 156.100 MHz

Battery Voltage (VDC)	Battery Condition	Transmitter Frequency (MHz)	Deviation (Hz)	Deviation (ppm)
6.0	end of life	156.100083	0	0.00
7.2	nominal	156.100083	0	0.00
8.4	high charge	156.100083	0	0.00

Certifying Engineer: Kevin G. Matson

Kevin G. Matson - Project Engineer

TYPE OF TEST: TRANSIENT FREQUENCY BEHAVIOR

FCC PART: 90.214

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: UHF-FM Handheld Transceiver

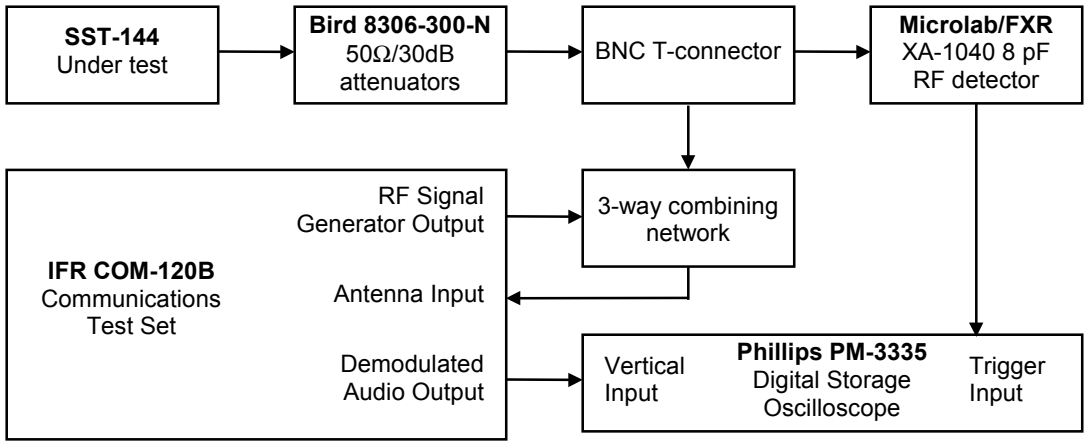
FCC ID: AIERIT13-144

DATE: April 25, 2001

PROCEDURE:

The SST-144 was aligned for transmitter operation on 156.100 at full rated power per the tune-up procedure outlined in the Preliminary Maintenance Manual. The tests were conducted per EIA-603 Part 2.2.19 as follows:

1. The test equipment was connected per the following diagram:



2. The IFR COM-120B receiver was set to measure FM deviation with the audio bandwidth set at ≤ 20 Hz to 15 KHz and the RF frequency set to 156.100 MHz.

3. The SST-144 transmitter under test was turned on and the IFR COM-120B Spectrum Analyzer was used to measure the RF power level through the test network.

4. The SST-144 transmitter was turned off.

5. The IFR COM-120B RF signal generator was set to 156.100 MHz at an RF level 20 dB below that measured in step 3, modulated with a 1 KHz tone at ± 25 KHz deviation.

6. The Phillips PM-3335 digital oscilloscope horizontal sweep rate was set to 10 mS per division. The vertical amplitude control was adjusted to display the 1000 Hz demodulated audio from the signal generator at ± 4 divisions, verically centered on the screen.

7. The Phillips PM-3335 digital oscilloscope was set to trigger at 1 division from the left side of the display when the RF detector senses RF power from the SST-144 transmitter.

8. The attenuation of the RF attenuator was reduced so the input of the RF detector and the RF combiner is increased by 30 dB when the SST-144 transmitter is turned on.

9. The SST-144 transmitter is turned on and the resulting waveform on the oscilloscope display was stored and plotted. The FCC limits per Part 90.214 were added to the plot in the same manner illustrated in EIA-603 Part 3.2.19.2 The resulting plot is labeled “switch on condition” and shows compliance with FCC Part 90.214.

10. The Phillips PM-3335 digital oscilloscope was set to trigger at 1 division from the right side of the display when the RF detector senses loss of RF power from the SST-144 transmitter.

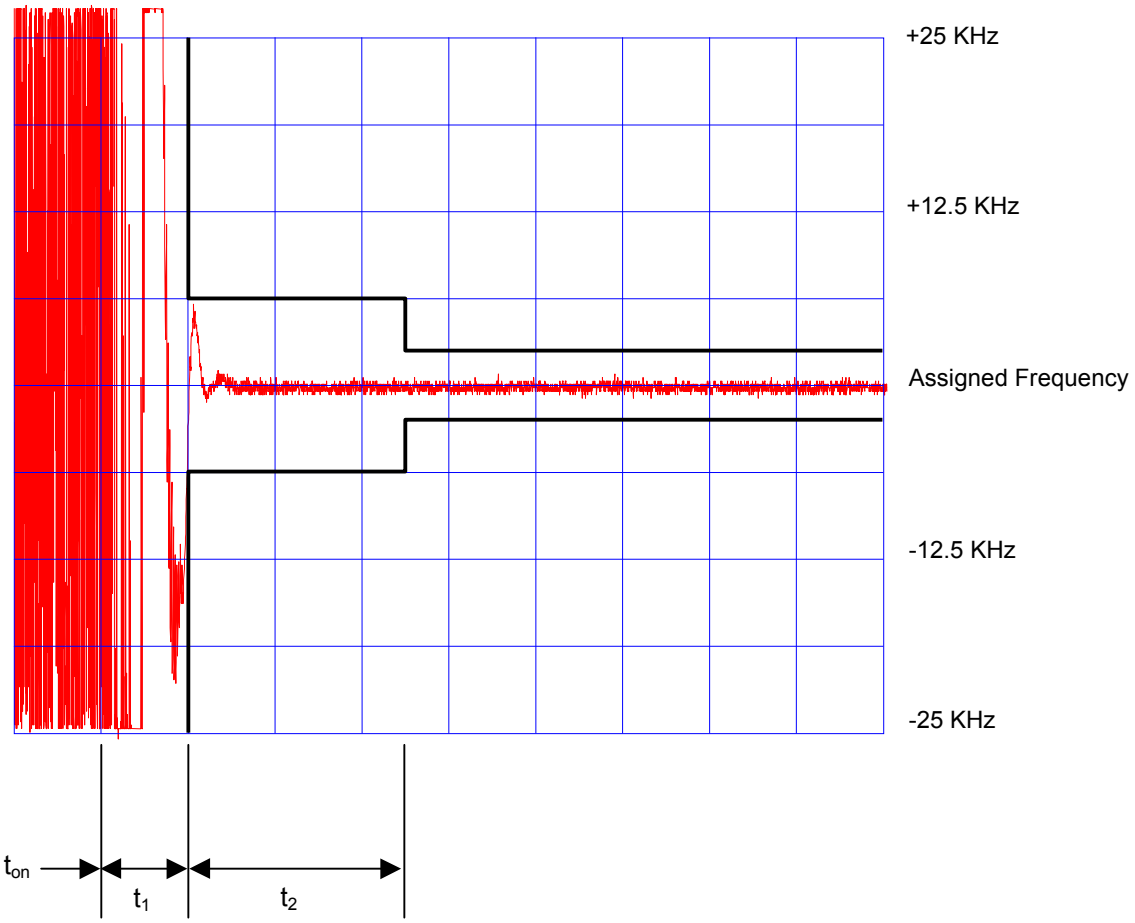
11. The SST-144 transmitter is turned off and the resulting waveform on the oscilloscope display was stored and plotted. The FCC limits per Part 90.214 were added to the plot in the same manner illustrated in EIA-603 Part 3.2.19.2 The resulting plot is labeled “switch off condition” and shows compliance with FCC Part 90.214.

Certifying Engineer: Kevin D. Matson

Kevin Matson - Project Engineer

TYPE OF TEST:	TRANSIENT FREQUENCY BEHAVIOR
FCC PART:	90.214
MANUFACTURER:	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
MODEL:	SST-144
TYPE OF UNIT:	VHF-FM Handheld Transceiver
FCC ID:	AIERIT13-144
DATE:	April 25, 2001

SWITCH ON CONDITION t_{on}, t_1, and t_2



TYPE OF TEST: TRANSIENT FREQUENCY BEHAVIOR

FCC PART: 90.214

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: SST-144

TYPE OF UNIT: VHF-FM Handheld Transceiver

FCC ID: AIERIT13-144

DATE: April 25, 2001

SWITCH OFF CONDITION t_3 and t_{OFF}