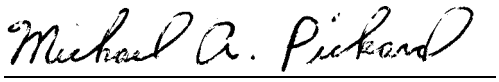
TYPE OF EXHIBIT:	TEST REPORT
FCC PART:	2.1033 (c)(14)
MANUFACTURER:	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	February 16, 2004

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
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	February 16, 2004

I, Michael A. Pickard, have been employed by RITRON, Inc. since November 1979, working in the Engineering Department since June 1981 as a radio frequency Project Engineer.

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: 

Michael A. Pickard - Project Engineer

TYPE OF EXHIBIT:	TEST EQUIPMENT LIST
FCC PART:	2.947 (d)
MANUFACTURER:	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	February 16, 2004

IC STANDARDS:	RSS-119, Issue 6, Section 4
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

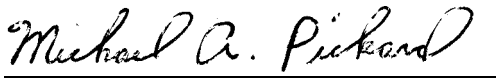
The measured data in this report was obtained using one or more of the following pieces of equipment. The particular equipment used in any one test is detailed in the procedure for that test.

ITEM	**MANUFACTURER**	**MODEL NO.**	**SERIAL NO.**
Communications Test Set	IFR	COM-120B	500008863
RF Signal Generator	Marconi Instruments	2022	119019/120
Spectrum Analyzer	Hewlett-Packard	8560E	3720A02980
Audio Sweep Generator	B & K Precision	4010	275-00893
Power Supply	BK/Precision	1630	146-03508
Digital Oscilloscope	Philips	PM-3335	DM648004
Dual Display Multimeter	Fluke	45	6723040
Digital VOM	Micronta	22-191	N/A
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
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
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	February 16, 2004

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: 

Michael A. Pickard - Project Engineer

TYPE OF TEST:	RADIO FREQUENCY POWER OUTPUT
FCC PART:	2.1046
MANUFACTURER:	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 27, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.2
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

PROCEDURE:

1. The RQX-456 was aligned for transmitter operation on 450.050, 460.050 and 470.050 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 RQX-456 operating frequency band.

2. Power was supplied to the RQX-456 via P501 by a BK Precision Model 1630 power supply. P501 is used for internal battery powered operation with an input voltage range of 6–9.6 VDC. The RQX-456 was connected at antenna terminal J201 to the input of a Bird 6154 Thermaline Wattmeter, used to measure RF power of the carrier.

3. A BK Model 2704A Digital Multimeter was connected in series with L202 to measure the collector current of Q205, the final RF amplifier device. A Micronta Model 22-191 Digital Multimeter was used to measure Q205 collector supply voltage at L202.

4. Q201, Q202, Q207 and digital pot U305B set the supply voltage to the transmitter. Measurements were taken with the transmitter set for low and high power operation at each frequency with the power supply set to the maximum and minimum input voltages.

5. Power was then supplied to the RQX-456 via J501 and J502 by a BK Precision Model 1630 power supply. J501 and J502 are used for external 12 VDC operation. The RQX-456 was connected at antenna terminal J201 to the input of a Bird 6154 Thermaline Wattmeter, used to measure RF power of the carrier.

6. A BK Model 2704A Digital Multimeter was connected in series with L202 to measure the collector current of Q205, the final RF amplifier device. A Micronta Model 22-191 Digital Multimeter was used to measure Q205 collector supply voltage at L202.

7. Q201, Q202, Q207 and digital pot U305B set the supply voltage to the transmitter. Measurements were taken with the transmitter set for low and high power operation at each frequency with the power supply set to 12 VDC.

TYPE OF TEST:	RADIO FREQUENCY POWER OUTPUT
FCC PART:	2.1046
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 27, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.2
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

TEST RESULTS:

P501 Battery Input at 9.6 VDC

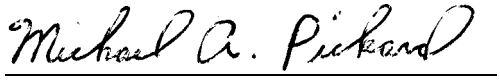
Frequency (MHz)	High/Low Power	Collector Voltage (VDC)	Collector Current (Amps)	Input Power (Watts)	Output Power (Watts)	Efficiency
450.050	Low	6.1	0.26	1.59	1.05	66.0%
	High	7.5	0.39	2.92	2.05	70.2%
460.050	Low	6.1	0.25	1.52	1.01	66.4%
	High	7.8	0.39	3.04	2.08	68.4%
470.050	Low	6.3	0.24	1.51	1.01	66.9%
	High	8.0	0.38	3.04	2.08	68.4%

P501 Battery Input at 6.0 VDC

Frequency (MHz)	High/Low Power	Collector Voltage (VDC)	Collector Current (Amps)	Input Power (Watts)	Output Power (Watts)	Efficiency
450.050	Low	5.7	0.19	1.08	0.61	56.5%
	High	5.7	0.20	1.14	0.65	57.0%
460.050	Low	5.7	0.19	1.08	0.62	57.4%
	High	5.7	0.19	1.08	0.63	58.3%
470.050	Low	5.7	0.17	0.97	0.51	52.6%
	High	5.8	0.17	0.99	0.52	52.5%

J501 and J502 External 12 VDC in

Frequency (MHz)	High/Low Power	Collector Voltage (VDC)	Collector Current (Amps)	Input Power (Watts)	Output Power (Watts)	Efficiency
450.050	Low	6.1	0.27	1.65	1.06	64.2%
	High	7.5	0.39	2.93	2.15	73.4%
460.050	Low	6.3	0.26	1.64	1.03	62.8%
	High	7.7	0.38	2.93	2.11	72.0%
470.050	Low	6.7	0.27	1.81	1.10	60.8%
	High	7.9	0.36	2.84	2.08	73.2%

Certifying Engineer: 

Michael A. Pickard - Project Engineer

TYPE OF TEST:	MODULATOR RESPONSE
FCC PART:	2.1047 (a)
MANUFACTURER:	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 27, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.6
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

PROCEDURE:

1. The RQX-456 was aligned for transmitter operation on 460.050 MHz (Fo) at full rated power per the tune-up procedure outlined in the Preliminary Maintenance Manual.

2. The RQX-456 speech amplifier was disconnected from the modulator at R345. The output of a BK Precision Model 4010 Function Generator was connected to R345 through a 100μF capacitor.

3. The RQX-456 was connected at antenna terminal J201 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 270 mVP.

5. With the audio generator output level fixed at 270 mVP, 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 80 mVP, the level required to produce 500 Hz deviation at 100 Hz. The resulting deviation varied from 500-520 Hz across the sub-audible frequency range.

TYPE OF TEST:	MODULATOR RESPONSE
FCC PART:	2.1047 (a)
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 27, 2003

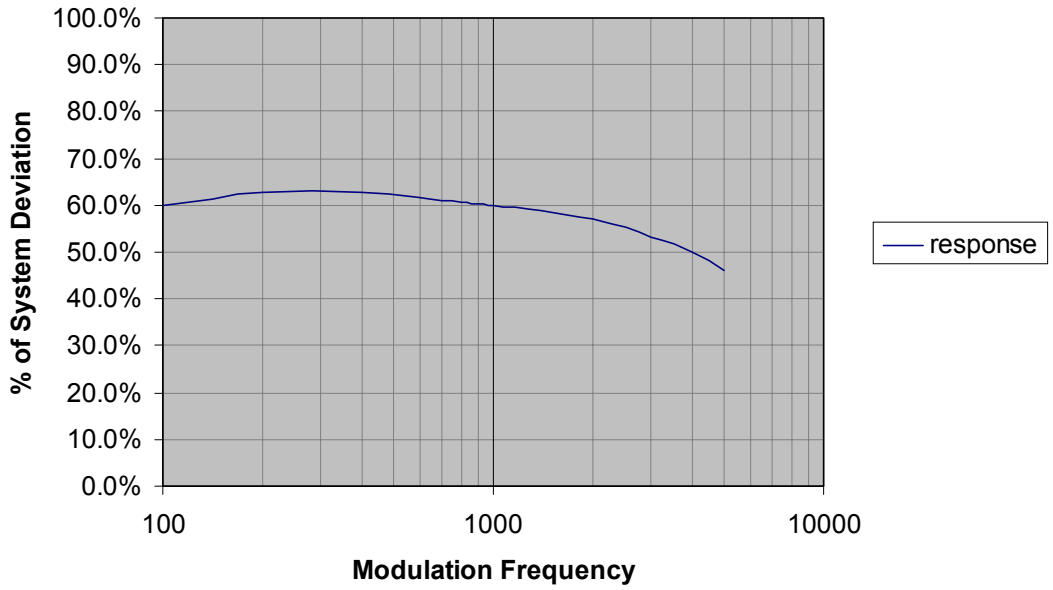
IC STANDARDS:	RSS-119, Issue 6, Section 6.6
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

TEST RESULTS:

Modulation Frequency (Hz)	Frequency Deviation (+/- kHz)	Percent System Deviation
100	1.50	60.0%
200	1.57	62.8%
400	1.57	62.8%
800	1.52	60.8%
1000	1.50	60.0%
2000	1.43	57.2%
3000	1.33	53.2%
4000	1.25	50.0%
5000	1.15	46.0%

Test Frequency: 460.050 MHz

Input Voltage required
for 60% deviation at 1000 Hz: 270 mVP



Certifying Engineer: Michael A. Pickard

Michael A. Pickard - 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
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 28, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.6
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

PROCEDURE:

1. The stages of the RQX-456 speech amplifier prior to the low-pass filter were removed by disconnecting R331 from the output of limiting amplifier U302B.

2. The output of a BK Precision Model 4010 Function Generator was applied to R331.

3. A Fluke Model 45 Dual Display Multimeter was used to measure the low-pass filter output at Pin 14 of U302D.

4. The audio signal generator was set for a 1000 Hz sine wave at an output level of 2.5 VP to produce –1.27 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. All measurements were +/- relative to the –1.27 dB measured at 1000 Hz.

TYPE OF TEST:	SPEECH AMPLIFIER LOW-PASS FILTER RESPONSE
FCC PART:	2.1047 (a)
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 28, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.6
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

TEST RESULTS:

Input Voltage required for –1.27 dB output at 1000 Hz: 2.5 VP

Frequency (Hz)	Measured Amplitude (dB)	Relative Amplitude (dB)
100	-2.14	-0.87
200	-2.11	-0.84
300	-2.07	-0.80
400	-2.01	-0.74
500	-1.94	-0.67
600	-1.84	-0.57
800	-1.59	-0.32
1,000	-1.27	0.00
2,000	0.25	1.52
3,000	-3.93	-2.66
4,000	-10.36	-9.09
5,000	-15.77	-14.50
6,000	-20.26	-18.99
8,000	-27.68	-26.41
10,000	-33.81	-32.54
12,000	-39.07	-37.80
16,000	-47.81	-46.54
20,000	-55.03	-53.76
24,000	-60.00	-58.73
40,000	-65.00	-63.73
80,000	-65.00	-63.73
100,000	-65.00	-63.73

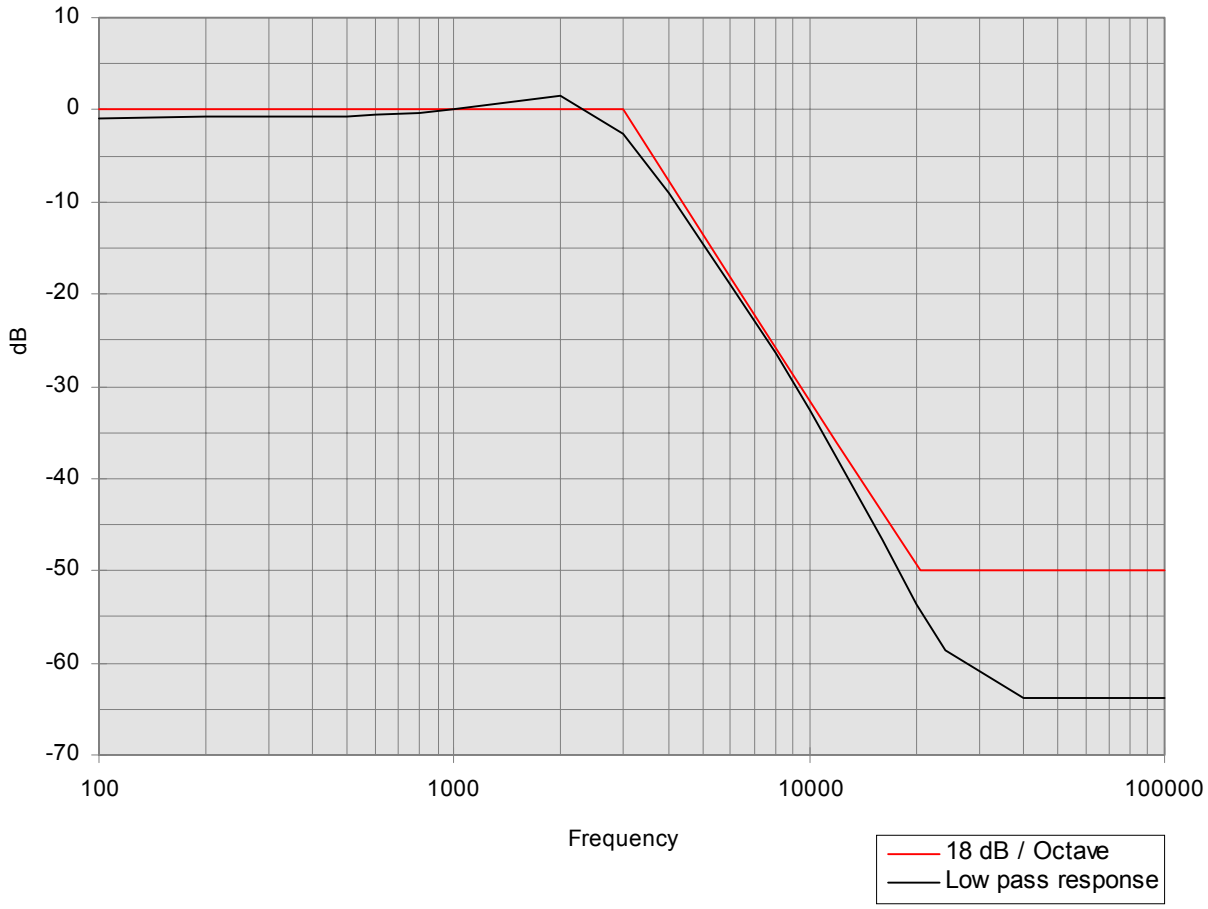
Certifying Engineer: Michael A. Pickard

Michael A. Pickard - Project Engineer

TYPE OF TEST:	SPEECH AMPLIFIER LOW-PASS FILTER RESPONSE
FCC PART:	2.1047 (a)
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 28, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.6
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

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
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 28, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.6
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

PROCEDURE:

1. The RQX-456 was aligned for transmitter operation on 460.050 MHz (Fo) per the tune-up procedure outlined in the Preliminary Maintenance Manual.

2. The RQX-456 was connected at antenna terminal J201 to the RF input of an IFR COM-120B Communications Test Set used to measure FM deviation.

3. The microphone AGC circuit was removed by disconnecting C310 from the output at R315/R316. This was to minimize noise with low input signals. The output of a BK Precision Model 4010 Function Generator was applied to the RQX-456 through C310. The output of the audio generator was set to an output level of 0.4 VP, 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 RQX-456 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 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 RQX-456 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)
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 28, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.6
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

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	5.6	1.4	1.2	0.7	0.5	0.6
20%	0.50	14.8	4.5	3.5	2.4	1.1	1.8
30%	0.75	24.0	7.3	5.8	4.2	2.1	3.1
40%	1.00	33.2	10.3	7.9	5.7	2.9	4.2
50%	1.25	42.4	12.9	9.9	7.2	4.2	5.7
60%	1.50	48.7	14.7	12.0	8.5	4.9	16.2*
70%	1.75	59.3	17.6	14.8	10.6	5.7	
80%	2.00	94.0	26.7	17.6	13.4	6.7	
90%	2.25	103.9	34.6	22.6	20.5	8.3	
100%	2.50	129.4*	62.9*	35.3*		22.6*	
Level at 50%	+16 dB	267.5	81.4	62.5	45.4	26.5	36.0
Max Deviation	(kHz)	2.35*	2.30*	2.33*	2.25	2.43*	1.40*

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	7.0	2.1	1.4	1.0	0.6	0.7
20%	1.00	16.2	4.9	3.5	2.8	1.4	2.1
30%	1.50	25.4	7.7	5.6	4.3	2.2	3.3
40%	2.00	34.6	10.6	7.4	5.9	3.1	4.2
50%	2.50	43.8	13.0	9.3	7.3	4.2	7.0
60%	3.00	51.6	14.8	10.9	9.1	5.1	25.4*
70%	3.50	61.5	17.6	13.4	11.0	6.1	
80%	4.00	103.2	26.8	18.3	14.1	7.0	
90%	4.50	123.7	34.6	26.1	23.3	8.4	
100%	5.00	282.0*	63.3*	35.3*		25.4	
Level at 50%	+ 16 dB	276.4	82.0	58.7	46.1	26.5	44.2
Max Deviation	(kHz)	4.75*	4.65*	4.60*	4.50	5.00	2.70*

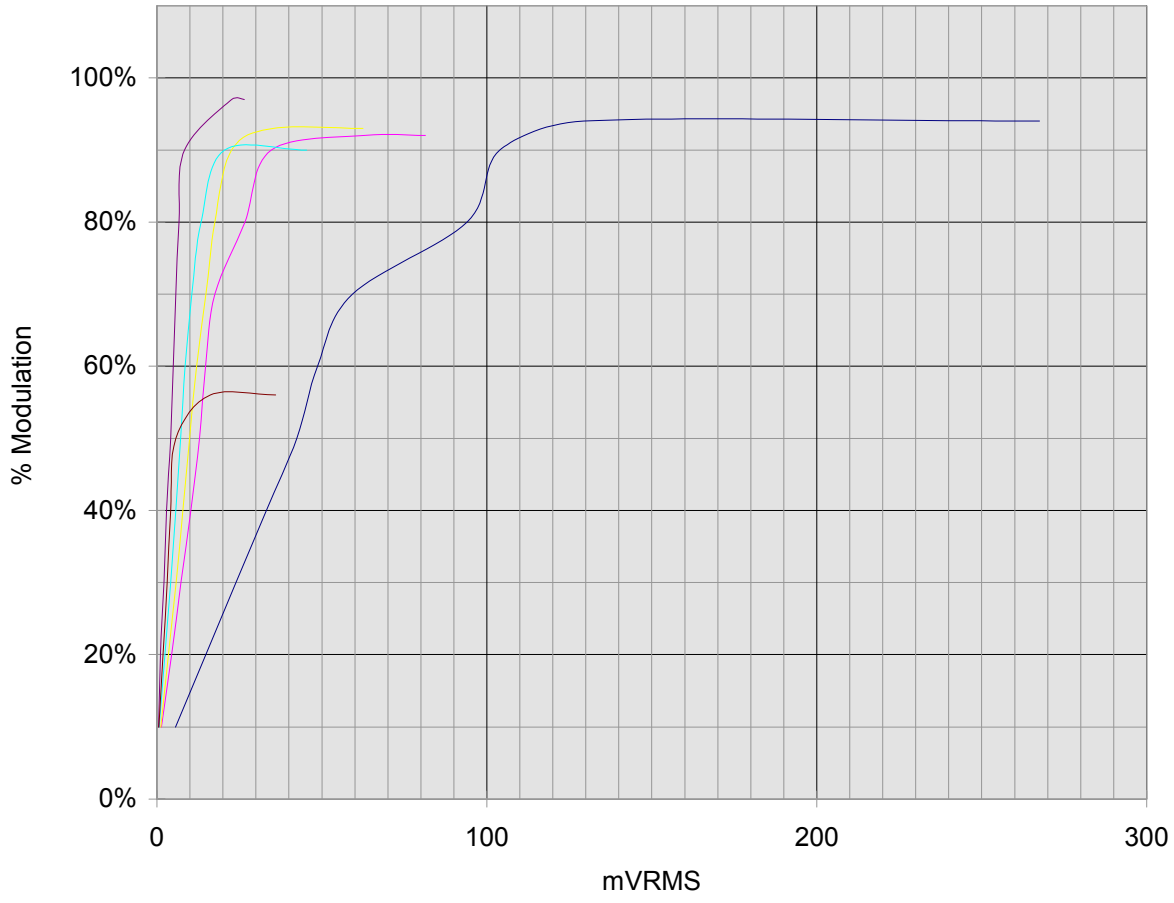
Certifying Engineer: Michael A. Pickard

Michael A. Pickard - Project Engineer

TYPE OF TEST:	PERCENT MODULATION VS. MODULATION INPUT VOLTAGE
FCC PART:	2.1047 (b)
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 28, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.6
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

CURVE:

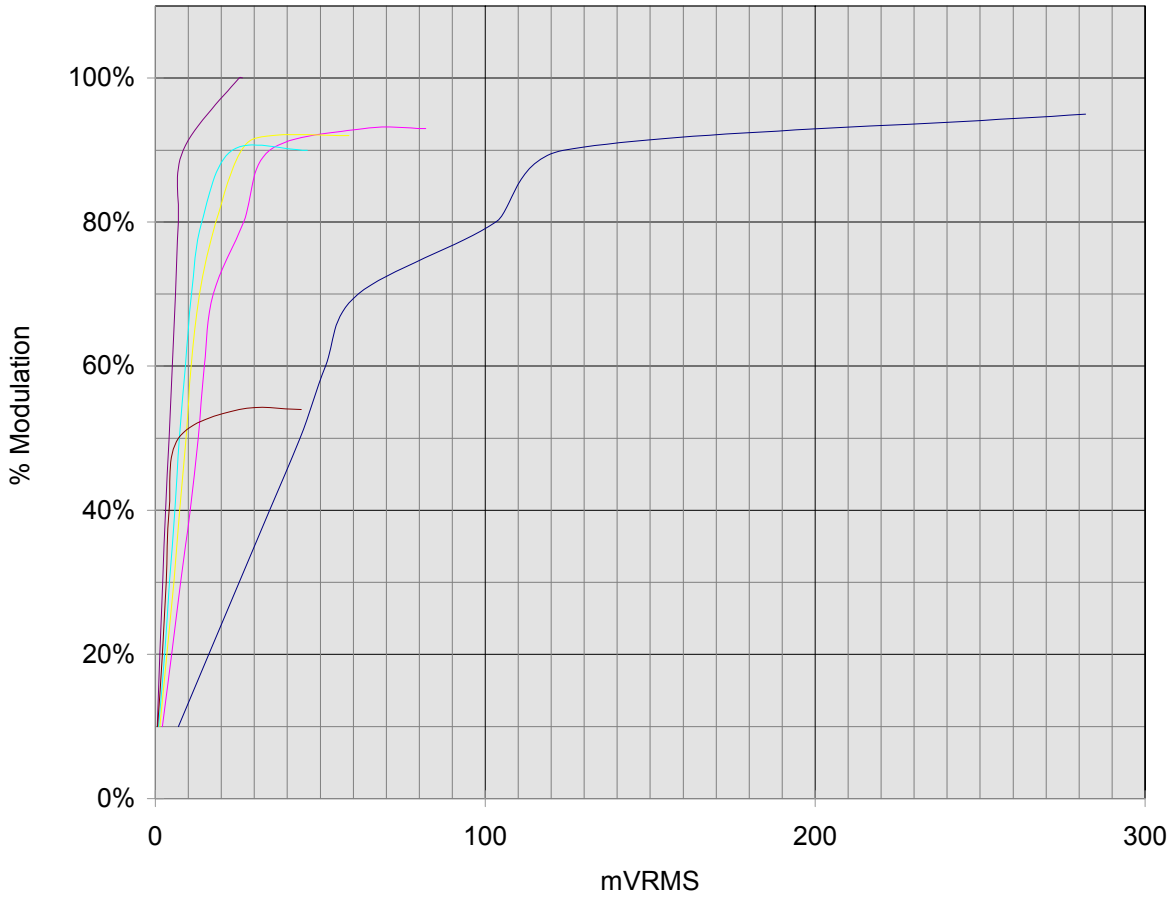


Channel Bandwidth: 12.5 kHz
100% Modulation: 2.5 kHz

TYPE OF TEST:	PERCENT MODULATION VS. MODULATION INPUT VOLTAGE
FCC PART:	2.1047 (b)
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 28, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.6
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

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
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 29, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.4
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

PROCEDURE:

1. The RQX-456 was aligned for transmitter operation on 460.050 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 RQX-456 was measured with a Bird Model 6154 Thermaline Wattmeter. This value was recorded as POWER OUTPUT. Power was supplied to the RQX-456 through P501. The transmitter supply voltage was set at +7.75 VDC to produce the maximum rated transmitter power output.

3. The antenna terminal J201 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 8560E Spectrum Analyzer. The spectrum analyzer was set to:

   - 100 Hz Resolution Bandwidth
   - 100 Hz Video Bandwidth
   - 5 kHz per Horizontal Division
   - 10 dB per Vertical Division

4. The center frequency of the spectrum analyzer was set to the RQX-456 carrier frequency and the full scale reference line was set to the level of the unmodulated carrier.

5. The microphone AGC circuit was removed by disconnecting C310 from the output at R315/R316. This was to minimize noise with low input signals. The output of a BK Precision Model 4010 Function Generator was applied to the RQX-456 through C310. 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 the spectrum analyzer output was plotted with FCC limits.

7. The RQX-456 was set for 25 kHz bandwidth operation, and the deviation was adjusted for +/- 5 kHz as outlined in the Preliminary Maintenance Manual. Steps 3 - 6 were repeated for 25 kHz bandwidth operation.

TYPE OF TEST:	OCCUPIED BANDWIDTH
FCC PART:	2.1049 (c)(1) per 90.210 (b)(d)
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 29, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.4
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

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.

The following chart shows that 99.9% of the power is contained within ± 5.5 kHz of the carrier for narrowband operation. The occupied bandwidth is therefore 11 kHz. The necessary bandwidth as determined by Carson's rule is:

Maximum modulation frequency (M) in kHz	=	3	
Maximum deviation (D) in kHz	=	2.5	
Constant K	=	1	
Necessary bandwidth for **narrowband** in kHz	=	(2xM) + (2xDxK)	= 11

An additional chart shows that 99.9% of the power is contained within ± 8 kHz of the carrier for wideband operation. The occupied bandwidth is therefore 16 kHz. The necessary bandwidth as determined by Carson's rule is:

Maximum modulation frequency (M) in kHz	=	3	
Maximum deviation (D) in kHz	=	5	
Constant K	=	1	
Necessary bandwidth for **wideband** in kHz	=	(2xM) + (2xDxK)	= 16

Certifying Engineer: Michael A. Pickard

Michael A. Pickard - Project Engineer

TYPE OF TEST:	OCCUPIED BANDWIDTH
FCC PART:	2.1049 (c)(1) per 90.210 (b)(d)
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 29, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.4
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

DATA:

Carrier Frequency:	460.05 MHz
Power Output:	2.00 Watts
Attenuation:	30.00 dB
Reference Power:	2.50 dBm
Mean Reference Power:	32.73 dBm
Channel Bandwidth:	12.50 kHz
Occupied Bandwidth:	10.00 kHz

Emission Frequency Offset (kHz)	Measured Amplitude (dBm)	Relative Amplitude (dBm)	FCC Limit (dBm)	Power (Watts)	Percent MRP (%)	Occupied Bandwidth (%)
-25.0	-97.50	-100.00	-53.01	177.8E-12	0.00%	
-22.5	-80.83	-83.33	-53.01	8.3E-9	0.00%	
-20.0	-79.00	-81.50	-53.01	12.6E-9	0.00%	
-17.5	-81.50	-84.00	-53.01	7.1E-9	0.00%	
-15.0	-77.17	-79.67	-53.01	19.2E-9	0.00%	
-12.5	-71.00	-73.50	-69.94	79.4E-9	0.00%	
-10.0	-52.17	-54.67	-51.76	6.1E-6	0.00%	
-7.5	-35.17	-37.67	-33.59	304.1E-6	0.02%	
-5.0	-19.33	-21.83	0.00	11.7E-3	0.62%	
-2.5	-5.67	-8.17	0.00	271.0E-3	14.46%	
0.0	1.17	-1.33	0.00	1.3E+0	69.84%	99.97%
2.5	-5.67	-8.17	0.00	271.0E-3	14.46%	
5.0	-19.50	-22.00	0.00	11.2E-3	0.60%	
7.5	-36.00	-38.50	-33.59	251.2E-6	0.01%	
10.0	-53.83	-56.33	-51.76	4.1E-6	0.00%	
12.5	-71.17	-73.67	-69.94	76.4E-9	0.00%	
15.0	-83.83	-86.33	-53.01	4.1E-9	0.00%	
17.5	-84.50	-87.00	-53.01	3.5E-9	0.00%	
20.0	-84.33	-86.83	-53.01	3.7E-9	0.00%	
22.5	-81.67	-84.17	-53.01	6.8E-9	0.00%	
25.0	-92.67	-95.17	-53.01	540.8E-12	0.00%	

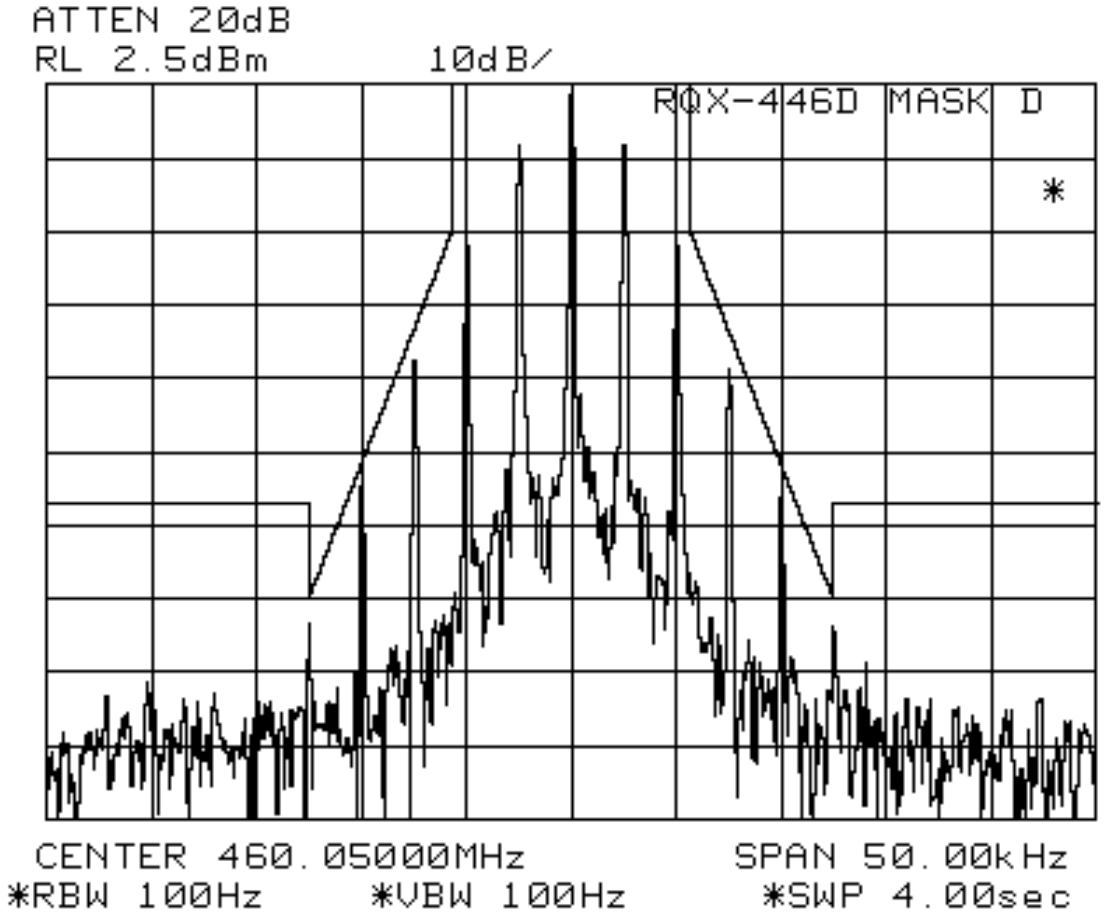
Certifying Engineer: 

Michael A. Pickard - Project Engineer

TYPE OF TEST:	OCCUPIED BANDWIDTH
FCC PART:	2.1049 (c)(1) per 90.210 (b)(d)
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 29, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.4
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

CURVE:



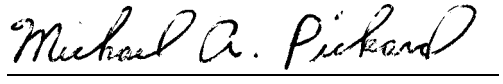
TYPE OF TEST:	OCCUPIED BANDWIDTH
FCC PART:	2.1049 (c)(1) per 90.210 (b)(d)
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 29, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.4
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

DATA:

Carrier Frequency:	460.05	MHz
Power Output:	2.00	Watts
Attenuation:	30.00	dB
Reference Power:	2.50	dBm
Mean Reference Power:	32.63	dBm
Channel Bandwidth:	25.0	kHz
Occupied Bandwidth:	15.0	kHz

Emission Frequency Offset (KHz)	Measured Amplitude (dBm)	Relative Amplitude (dBm)	FCC Limit (dBm)	Power (Watts)	Percent MRP (%)	Occupied Bandwidth (%)
-25.0	-83.67	-86.17	-35.00	4.3E-9	0.00%	
-22.5	-82.33	-84.83	-35.00	5.8E-9	0.00%	
-20.0	-83.67	-86.17	-25.00	4.3E-9	0.00%	
-17.5	-70.00	-72.50	-25.00	100.0E-9	0.00%	
-15.0	-57.17	-59.67	-25.00	1.9E-6	0.00%	
-12.5	-43.17	-45.67	-25.00	48.2E-6	0.00%	
-10.0	-29.50	-32.00	0.00	1.1E-3	0.06%	
-7.5	-17.67	-20.17	0.00	17.1E-3	0.93%	
-5.0	-8.00	-10.50	0.00	158.5E-3	8.66%	
-2.5	-2.17	-4.67	0.00	606.7E-3	33.14%	
0.0	-6.17	-8.67	0.00	241.5E-3	13.20%	99.89%
2.5	-2.00	-4.50	0.00	631.0E-3	34.47%	
5.0	-8.00	-10.50	0.00	158.5E-3	8.66%	
7.5	-18.17	-20.67	0.00	15.2E-3	0.83%	
10.0	-31.00	-33.50	0.00	794.3E-6	0.04%	
12.5	-45.17	-47.67	-25.00	30.4E-6	0.00%	
15.0	-59.00	-61.50	-25.00	1.3E-6	0.00%	
17.5	-72.17	-74.67	-25.00	60.7E-9	0.00%	
20.0	-79.33	-81.83	-25.00	11.7E-9	0.00%	
22.5	-81.00	-83.50	-35.00	7.9E-9	0.00%	
25.0	-84.00	-86.50	-35.00	4.0E-9	0.00%	

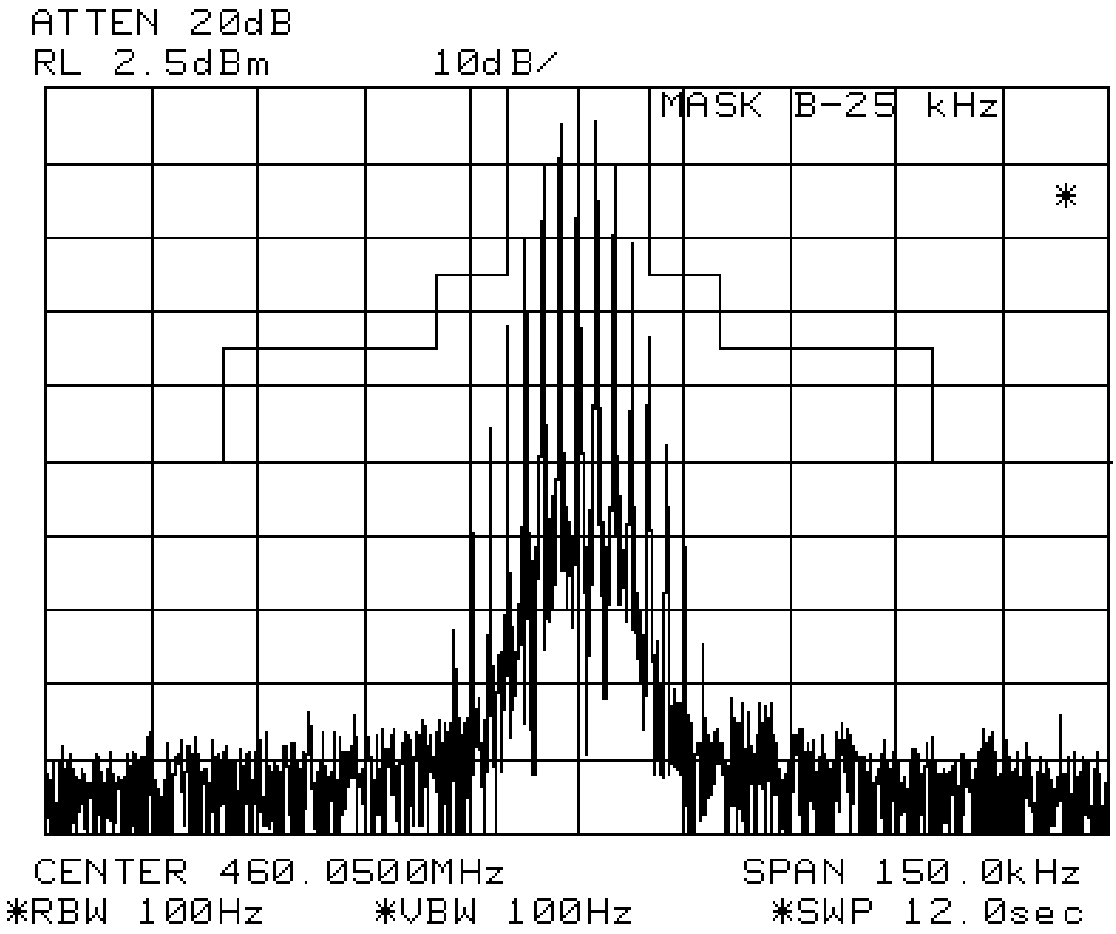
Certifying Engineer: 

Michael A. Pickard - Project Engineer

TYPE OF TEST:	OCCUPIED BANDWIDTH
FCC PART:	2.1049 (c)(1) per 90.210 (b)(d)
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 29, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.4
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

CURVE:



TYPE OF TEST:	SPURIOUS EMISSIONS AT ANTENNA TERMINALS
FCC PART:	2.1051
MANUFACTURER:	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 29, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.3
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

PROCEDURE:

1. The RQX-456 was aligned for transmitter operation on 460.050 MHz (Fo) at full rated power per the tune-up procedure outlined in the Preliminary Maintenance Manual.

2. Power was supplied to the RQX-456 through P501. The transmitter supply voltage was set at +7.75 VDC to produce the maximum rated transmitter power output.

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 RQX-456 antenna terminal J201 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 8560E Spectrum Analyzer.

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

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

7. Resultant Amplitude = Measured Amplitude + Correction Factor

TYPE OF TEST:	SPURIOUS EMISSIONS AT ANTENNA TERMINALS
FCC PART:	2.1051
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 29, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.3
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

TEST RESULTS:

Carrier Frequency (Fo):	460.050	MHz
Oscillator Frequency:	14.4	MHz
Output Power:	2.0	Watts
Transmitter Supply Voltage:	7.75	VDC
FCC Limit:	-20	dBm

Emmission Frequency (MHz)	Multiple of Carrier	Measured Amplitude (dBm)	Correction Factor (dB)	Resultant Amplitude (dBm)	FCC Limit (dBm)
402.4500	fo - (14.4 * 4)	-61.0	30	-31.0	-20.0
416.8500	fo - (14.4 * 3)	-69.5	30	-39.5	-20.0
460.0500	fo	3.0	30	33.0	None
503.2500	fo + (14.4 * 3)	-70.0	30	-40.0	-20.0
517.6500	fo + (14.4 * 4)	-62.5	30	-32.5	-20.0
920.1000	fo * 2	-55.1	30	-25.1	-20.0
2300.2500	fo * 5	-70.8	30	-40.8	-20.0
2760.3000	fo * 6	-62.5	30	-32.5	-20.0

Certifying Engineer: Michael A. Pickard

Michael A. Pickard - Project Engineer

TYPE OF EXHIBIT:	FIELD STRENGTH OF SPURIOUS RADIATION
FCC PART:	2.0153
MANUFACTURER:	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 29, 2003

PROCEDURE:

1, The measurements for effective radiated power and field strength of spurious radiation were taken at the RITRON, Inc. 3 meter test site using the substitution method. The measurements were made in accordance with FCC Rules & Regulations Part 2.947.

2. The RQX-456 was aligned for transmitter operation on 460.050 MHz at 2.0 Watts per the tune-up procedure outlined in the Preliminary Maintenance Manual. The unit was then terminated at the antenna port with the antenna sold with this product (Nearson AFB-1545). Power was supplied to the RQX-456 by 8 D-cell alkaline batteries installed in the battery holder located within the RQX-456 enclosure.

3. All field strength measurements were made with the Hewlett-Packard Model 8560E Spectrum Analyzer and the appropriate antenna for the frequency being measured. The antennas used were:

   - Calibrated ½-wave dipole tuned to desired harmonic
   - Electro-Metrics LP-25 Log Periodic Antenna at 200 to 1000 MHz

4. A tuned dipole was substituted at the radio side of the range driven by a known power to produce a known ERP at each harmonic. The receiving antenna was oriented both vertically and horizontally and reference measurements were taken at each harmonic.

5. For each emission, the height and polarization of the field strength measurement antenna and orientation of the RQX-456 were varied to provide maximum field strength.

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

7. ERP (dBm) = analyzer reading of emission (dBm) – 0dB substitution analyzer reading (dBm)

TYPE OF EXHIBIT: FIELD STRENGTH OF SPURIOUS RADIATION

FCC PART: 2.0153

FCC ID: AIERIT18-456

MODELS: RQX-456, RQX-456-XT

DATE: October 29, 2003

RESULTS:

Emission Frequency (MHz)	Mult of Carrier	Reference Antenna	Analyzer Reading (dBm)	Generator Substitution Level (dBm)	Analyzer Substitution Reading (dBm)	ERP (dBm)	FCC Limit (dBm)
460.05	1	Horz Dipole	1.0	0	-29.7	30.7	None
920.10	2	Horz Dipole	-70.5	0	-38.8	-31.7	-20
1380.15	3	Horz Dipole	-88.5	0	-53.2	-35.3	-20
1840.20	4	Horz Dipole	-105.0	0	-64.0	-41.0	-20
2300.25	5	Horz Dipole	-109.0	-20	-79.7	-29.3	-20
460.05	1	Vert Dipole	-1.5	0	-29.0	27.5	None
920.10	2	Vert Dipole	-69.5	0	-40.8	-28.7	-20
1380.15	3	Vert Dipole	-89.5	0	-53.0	-36.5	-20
1840.20	4	Vert Dipole	-103.0	0	-62.2	-40.8	-20
2300.25	5	Vert Dipole	-103.0	-20	-79.7	-23.3	-20

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

Certifying Engineer: Michael A. Pickard

Michael A. Pickard - 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
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	November 15, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 7.0
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

PROCEDURE:

1. The RQX-456 was aligned for transmitter operation on 460.050 MHz (Fo) at full rated power per the tune-up procedure outlined in the Preliminary Maintenance Manual.

2. Power was supplied to the RQX-456 through P501. The transmitter supply voltage was set at +7.75 VDC to produce the maximum rated transmitter power output. The RQX-456 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 RQX-456 printed circuit board.

4. The RQX-456 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)
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	November 15, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 7.0
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

TEST RESULTS:

Frequency:	460.050 MHz
Nominal Temp:	+25 °C
FCC Limit:	+/- 1.5 ppm

Temperature (°C)	Frequency (MHz)	Deviation (Hz)	Deviation (ppm)
50	460.049650	-350	-0.76
40	460.049855	-145	-0.32
30	460.050000	0	0.00
20	460.050215	215	0.47
10	460.050365	365	0.79
0	460.050345	345	0.75
-10	460.050165	165	0.36
-20	460.050070	70	0.15
-30	460.050120	120	0.26

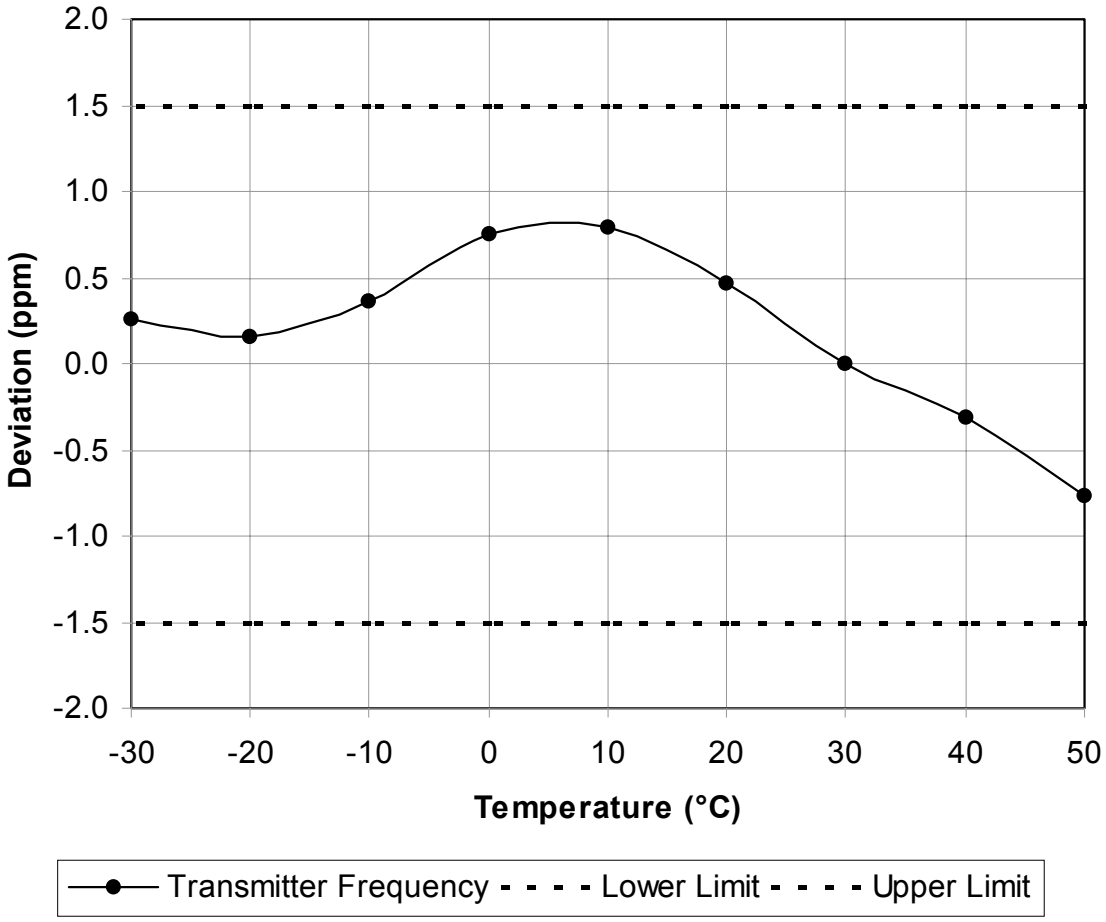
Certifying Engineer: Michael A. Pickard

Michael A. Pickard - Project Engineer

TYPE OF TEST:	FREQUENCY STABILITY VS. TEMPERATURE
FCC PART:	2.1055 (a)(1)
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	November 15, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 7.0
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

CURVE:



TYPE OF TEST:	FREQUENCY STABILITY VS. BATTERY VOLTAGE
FCC PART:	2.1055 (d)(1)
MANUFACTURER:	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	November 30, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 7.0
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

PROCEDURE:

1. The RQX-456 was aligned for transmitter operation on 460.050 MHz (Fo) at full rated power per the tune-up procedure outlined in the Preliminary Maintenance Manual.

2. Power was supplied to the P501 battery input of the RQX-456 by a BK Precision Model 1630 power supply. Supply voltage was measured at P501 with a Micronta Model 22-191 Digital Multimeter.

3. The RQX-456 antenna terminal J201 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 as follows:

Minimum operating voltage with batteries	6.0 VDC
Nominal operating voltage with batteries	9.0 VDC
Maximum operating voltage with batteries	9.6 VDC

5. Power was then supplied to the RQX-456 at the +12 VDC external supply input J501 and J502. Supply voltage was measured at J501and J502 with a Micronta Model 22-191 Digital Multimeter.

6. Frequency measurements were made at +25°C with supply voltage set as follows:

Minimum operating voltage	10.0 VDC
85% of nominal operating voltage	10.2 VDC
Nominal operating voltage	12.0 VDC
115% of nominal operating voltage	13.8 VDC
Maximum operating voltage	14.0 VDC

7. All frequencies were referenced to the measurement made at the nominal supply voltage.

TYPE OF TEST:	FREQUENCY STABILITY VS. BATTERY VOLTAGE
FCC PART:	2.1055 (d)(1)
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	November 30, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 7.0
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

TEST RESULTS:

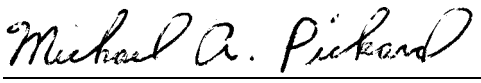
Carrier Frequency: 460.050 MHz

Power in at P501 Battery Input Connector

Supply Voltage (VDC)	Supply Condition	Transmitter Frequency (MHz)	Deviation (Hz)	Deviation (ppm)
6.0	Minimum Battery	460.049990	-10	-0.02
9.0	Nominal Battery	460.050000	0	0.00
9.6	Maximum Battery	460.050010	+10	+0.02

Power in at J501 and J502 External +12 VDC Input Connectors

Supply Voltage (VDC)	Supply Condition	Transmitter Frequency (MHz)	Deviation (Hz)	Deviation (ppm)
10.0	Minimum	460.049990	-10	-0.02
10.2	85% Nominal	460.049990	-10	-0.02
12.0	Nominal	460.050000	0	0.00
13.8	115% Nominal	460.050000	0	0.00
14.0	Maximum	460.050000	0	0.00

Certifying Engineer: 

Michael A. Pickard - Project Engineer

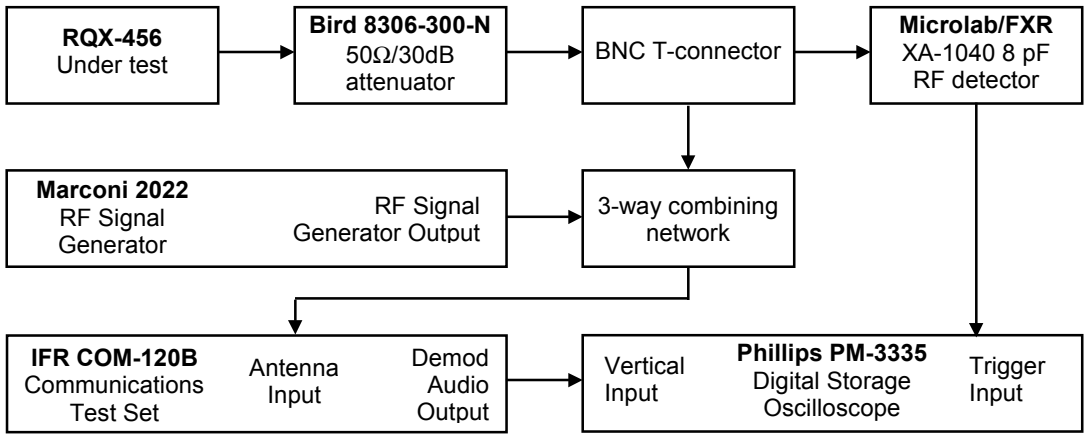
TYPE OF TEST:	TRANSIENT FREQUENCY BEHAVIOR
FCC PART:	90.214
MANUFACTURER:	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 30, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.5
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

PROCEDURE:

The RQX-456 was aligned for transmitter operation on 460.050 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 460.050 MHz.

3. The RQX-456 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 RQX-456 transmitter was turned off.

5. The Marconi Model 2022 RF signal generator was set to 460.050 MHz at an RF level 20 dB below that measured in step 3, modulated with a 1 kHz tone at ± 12.5 kHz deviation.

6. The Phillips PM-3335 digital oscilloscope's 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, vertically centered on the screen.

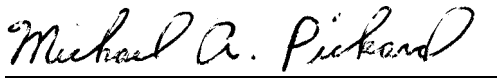
7. The Phillips PM-3335 digital oscilloscope was set to trigger at 1 division from the left side of the display when the RF detector senses RF power from the RQX-456 transmitter.

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 RQX-456 transmitter is turned on.

9. The RQX-456 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 RQX-456 transmitter.

11. The RQX-456 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.

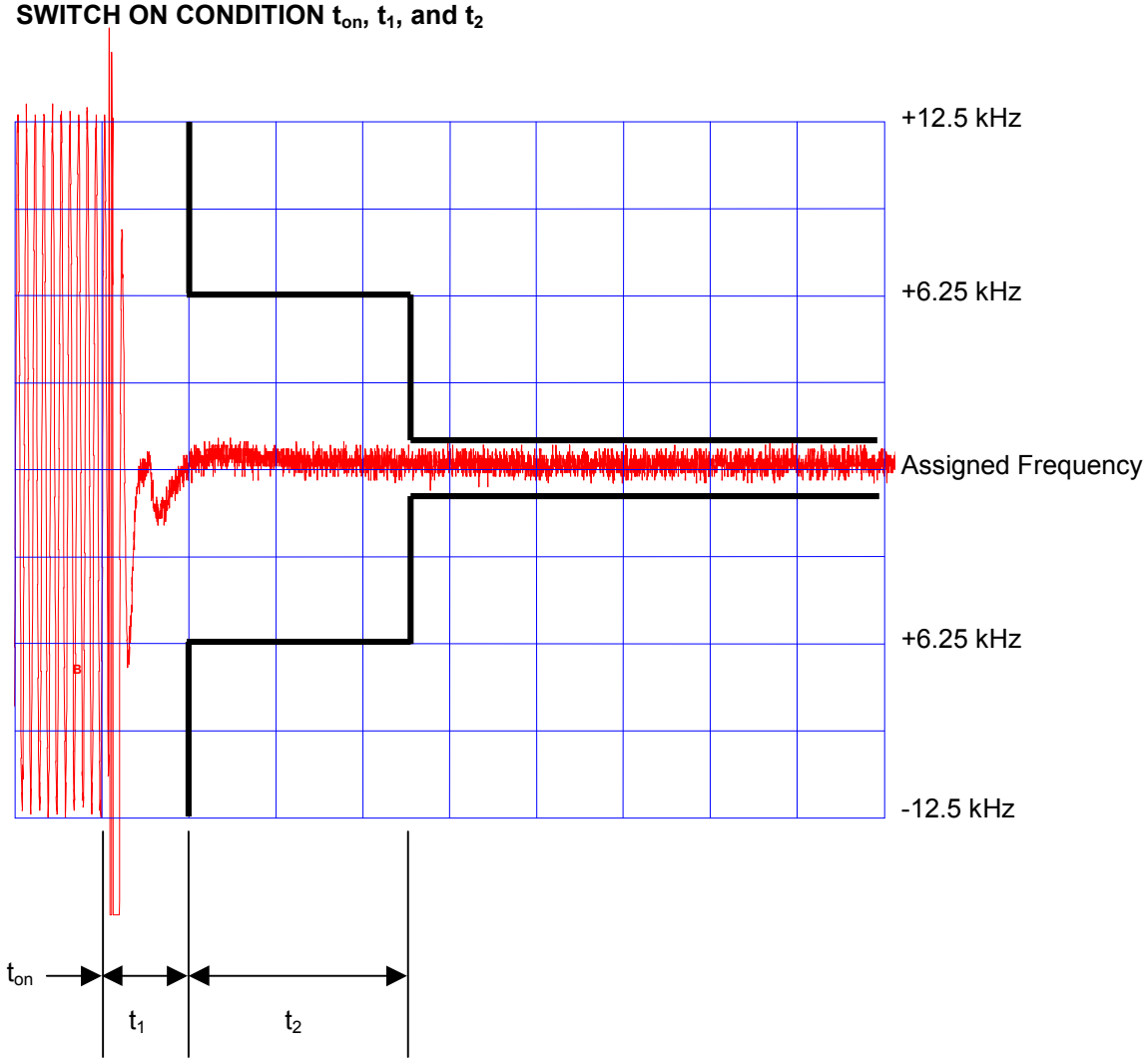
Certifying Engineer: 

Michael A. Pickard - Project Engineer

TYPE OF TEST:	TRANSIENT FREQUENCY BEHAVIOR
FCC PART:	90.214
FCC ID:	AIERIT18-456
MODELS:	RQX-456, RQX-456-XT
DATE:	October 30, 2003

IC STANDARDS:	RSS-119, Issue 6, Section 6.5
INDUSTRY CANADA:	1084A-RIT18456
MODELS:	RQX-456-CANADA, RQX-456-XT-CANADA

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



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SWITCH OFF CONDITION t_3 and t_{OFF}