ATTACHMENT A-3

RACON TEST PLAN

Tested By D. FURR Date Passed Test _____

RACON S/N 6293

Number of attempts to complete test: 1

Test Equipment (including calibrated interconnecting cable):

Item	S/N	Calibration Date
SEE TABLES IN REPORT		

1. INTRODUCTION

This test procedure is designed to produce confirmation that all RACONs meet the requirements of the United States Coast Guard. This test shall be performed on units selected by the U.S.C.G.

a. The equipment manufacturer may propose alternate test methods. The Coast Guard, however, reserves the right to reject any portion of the proposal prior testing.

b. The equipment manufacturer shall submit EMI/RFI test procedures specific to each RACON design with the first article unit.

c. The equipment manufacturer shall indicate the appropriate side lobe suppression test method in paragraph 2.7.

The following equipment will be required for testing:

a. 1035.5005.02, 2Ghz–20Ghz Rhode and Schwarz Signal Generator or equivalent
b. 1166.1660.26, 20Hz-26.5Ghz Rhode and Schwarz Spectrum Analyzer or equivalent

c. E4418B, Agilent Power Meter or equivalent
d. QHMT-2-10G, Merrimac Four-way Hybrid Splitter or equivalent
e. 2465A, Tektronix 350Mhz oscilloscope or equivalent
f. RS232C Data Terminal with keyboard
g. Variable Power Supply, 0-40 Volts DC, 0-5 Amps
h. Environmental Test Chamber: -40°C to +70°C

2. TESTING

a. The following tests shall be performed in the order indicated.
b. The RACON shall remain assembled at the highest level possible throughout each test.

2.1. SELF TEST

a. Connect power to the RACON using 12 volts DC. Allow the RACON to operate for 10 minute before testing.
b. Cause the system to do a self-test. The system should pass its own internal testing.

PASS ✓ **FAIL** ____ 4-18-05

2.2. POWER SUPPLY RANGE

a. Reverse Polarity and adjust voltage from 0 to -30 volts.
b. Reverse Polarity and adjust voltage from 0 to +30 volts.
c. Adjust voltage to +36 volts DC. Cause the system to do a self-test. The system should pass its own internal testing.
d. Adjust voltage to +10 volts DC. Cause the system to do a self-test. The system should pass its own internal testing.
e. Adjust voltage to +18 volts DC. Cause the system to do a self-test. The system should pass its own internal testing.

PASS ✓ **FAIL** ____ 4-18-05

2.3. TRANSMITTER POWER OUTPUT

a. Set the RACON response code to "T". Set the code length for 60 μs when interrogated by a 1.7 μs pulse.
b. Set the spectrum analyzer for 1 dBm per vertical division and the span for 250 MHz. Turn the "Max Hold" on. The spectrum analyzer must have been pre-calibrated by the technician for this test.
c. Slowly sweep the signal generator frequency across for S- band using a PRF of 3KHz.
d. Photograph the resultant power band pass and attach to the data sheets.
e. Write all pertinent information of the pictures on the data sheet.
f. Repeat steps (c), (d) and (e) for the X-band frequencies.
g. Measure and record the minimum power output from 2.9 to 3.1 GHz and again from 9.3 to 9.5 GHz.

METER 31.5 **dBm S >27.0 dBm Min.** **PASS** ✓ **FAIL** ____

METER 30.2 **dBm X >27.0 dBm Min.** **PASS** ✓ **FAIL** ____

2.4. POWER CONSUMPTION

a. Set the signal generator to S-band frequency to 1 KHz pulse repetition rate. Program the code length to 15 µs response length and the code to a "T".
b. The power supply should be set at 12 volts ± 0.25 volts.
c. Measure the supply current during the 3 states of the RACON.
d. Repeat steps transmit measurement for the X-band frequency.
e. Not to exceed 0.8 W in standby or quiescent and not to exceed 9.0 W when transmitting in dual band with 1% duty cycle pulses in the normal mode with enhanced SLS.

DISTRIBUTION BOX PULLS 44.6mA

Standby ≤ 41 ma METER 16.4 **ma** **PASS** ✓ **FAIL** ____

Listen ≤ 333 ma METER 140.4 **ma** **PASS** ✓ **FAIL** ____

1 KHz Transmit ≤ 500 ma S-Band METER 150.4 **ma**

1 KHz Transmit ≤ 500 ma X-Band METER 155.4 **ma**

PASS ✓ **FAIL** ____

2.5. BANDPASS TEST

a. Set the signal generator to the S-band frequency for -20 dBm. Set the pulsewidth to 1 µs ± 50 ns and the pulse repetition frequency (PRF) to 1 KHz ± 0.05 KHz.
b. Measure and record the RACON frequency response band on the spectrum analyzer.
c. Repeat steps (a) and (b) for the X-band frequency.

S-Band ± 5MHz 2905 MHz METER 2903.98 **MHz** **PASS** ✓ **FAIL** ____

S-Band ± 5MHz 3095 MHz METER 3093.98 **MHz** **PASS** ✓ **FAIL** ____

X-Band ± 5MHz 9305 MHz METER 9306.7 **MHz** **PASS** ✓ **FAIL** ____

X-Band ± 5MHz 9495 MHz METER 9492.7 **MHz** **PASS** ✓ **FAIL** ____

2.6. FREQUENCY TRACKING ACCURACY

a. Set the signal generator to the indicated frequency ± 0.1MHz, the PRF to 1 KHz ± 50 Hz, the amplitude to -20 dBm and the indicated pulsewidth at the antenna connector.
b. Measure and record response. The maximum tracking error is ± 10 MHz for PW < 200 ns and ± 2 MHz for > 200 ns.

2925MHz 1.7 µs METER 2924.74 **MHz** **PASS** ✓ **FAIL** ____

2925MHz 150 ns METER 2924.74 **MHz** **PASS** ✓ **FAIL** ____

3000MHz 1.7 µs METER 3000.0 **MHz** **PASS** ✓ **FAIL** ____

3000MHz 150 ns METER 3000.0 **MHz** **PASS** ✓ **FAIL** ____

3075MHz 1.7 µs METER 3073.46 **MHz** **PASS** ✓ **FAIL** ____

3075MHz 150 ns METER 3074.02 **MHz** **PASS** ✓ **FAIL** ____

9325MHz	**1.7 µs**	**METER** 9326.06 **MHz**	**PASS** ✓	**FAIL** ____
9325MHz	**150 ns**	**METER** 9326.06 **MHz**	**PASS** ✓	**FAIL** ____
9400MHz	**1.7 µs**	**METER** 9399.74 **MHz**	**PASS** ✓	**FAIL** ____
9400MHz	**150 ns**	**METER** 9399.66 **MHz**	**PASS** ✓	**FAIL** ____
9475MHz	**1.7 µs**	**METER** 9474.16 **MHz**	**PASS** ✓	**FAIL** ____
9475MHz	**150 ns**	**METER** 9474.82 **MHz**	**PASS** ✓	**FAIL** ____

2.7. SIDE LOBE SUPPRESSION

This test shall be performed in the order listed in paragraph 2.7.1 (a) through (i) below unless otherwise noted in paragraph 1.c. The alternate test, paragraph 2.7.2, allows the RF signal to be turned off prior to adjusting the pulse width and frequency in steps (d) and (e).

2.7.1 SIDE LOBE SUPPRESSION TEST

a. Set the signal generator to a 2925 MHz ± 1 MHz, the PRF to 1 KHz ± 50 Hz, the amplitude to - 5 dBm ± 3 dBm and the pulsewidth to 500 ns ± 100 ns at the antenna connector. Monitor the output with a spectrum analyzer.
b. Watch the spectrum analyzer. At the beginning of the active period reduce the amplitude of the signal generator by 20dBm
c. The transmitter response on the spectrum analyzer and the scope should cease.
d. Rock the pulsewidth back and forth. The transmitter should come back on when the pulsewidth is not the same as the original setting.
e. Rock the frequency back and forth. The transmitter should come back on when the frequency is not the same as the original setting.
f. When both the frequency and pulsewidth are the same as the original setting the transmitter should again turn off.
g. Increase the amplitude of the interrogating signal generator to its original setting. The transmitter should turn back on.
h. Repeat the above test on the X-band frequency of 9475 MHz.
i. Record the result below.

S-Band ± 1 MHz 2925MHz	**PASS** ✓	**FAIL** ____
X-Band ± 1 MHz 9475MHz	**PASS** ✓	**FAIL** ____

2.7.2 ALTERNATE SIDE LOBE SUPPRESSION TEST

a. Set the signal generator to a 2925 MHz ± 1 MHz, the PRF to 1 KHz ± 50 Hz, the amplitude to - 5 dBm ± 3 dBm and the pulse width to 500 ns ± 100 ns at the antenna connector. Monitor the output with a spectrum analyzer.
b. Watch the spectrum analyzer. At the beginning of the active period reduce the amplitude of the signal generator by 20dBm
c. The transmitter response on the spectrum analyzer and the scope should cease.

d. Switch the RF Signal OFF. Change the Pulse Width and turn RF Signal back ON. The transmitter should come back on when the pulse width is not the same as the original setting. The pulse width should now be returned to the original setting with RF ON.
e. Switch the RF Signal OFF. Change the Pulse Frequency and turn RF Signal back ON. The transmitter should come back on when the frequency is not the same as the original setting. The frequency should now be returned to the original setting with RF ON.
f. When both the frequency and pulse width are the same, as the original setting the transmitter should again turn off.
g. Increase the amplitude of the interrogating signal generator to its original setting. The transmitter should turn back on.
h. If it is necessary to repeat this test, wait 10 duty cycles for the RACON to clear its SLS memory or switch off the RF and move to a new frequency.
i. Repeat the above test on the X-band frequency of 9475 MHz.

S-Band ± 1 MHz 2925MHz **PASS** ~~**FAIL**~~ ____

X-Band ± 1 MHz 9475MHz ~~**PASS**~~ ____ ~~**FAIL**~~ ____

2.8. RECEIVER THRESHOLD TEST

a. Set the signal generator to 3000 MHz ± 1 MHz, the PRF to 1 KHz ± 50 Hz, the amplitude to - 70 dBm ± 2 dBm and the pulse width to 50 ns at the antenna connector. Monitor the output with a spectrum analyzer.
b. Increase the amplitude of the signal generator pulse output until the RACON just starts to respond.
c. Record the minimum signal level needed to cause the RACON to continuously respond.
d. Set the signal generator to 3000 MHz ± 1 MHz, the PRF to 1 KHz ± 50 Hz, the amplitude to - 70 dBm ± 2 dBm and the pulsewidth to 300 ns ± 10 ns at the antenna connector. Monitor the output with a spectrum analyzer.
e. Record the minimum signal level needed to cause the RACON to continuously respond.
f. Set the signal generator to a frequency of 9400 MHz ± 1 MHz, the PRF to 1 KHz ± 50 Hz, the amplitude to - 70 dBm ± 2 dBm and the pulse width to 50 ns at the antenna connector. Monitor the output with a spectrum analyzer.
g. Increase the amplitude of the signal generator pulse output until the RACON just starts to respond.
h. Record the minimum signal level needed to cause the RACON to continuously respond.
i. Set the signal generator to a frequency of 9400 MHz ± 1 MHz, the PRF to 1 KHz ± 50 Hz, the amplitude to - 70 dBm ± 2 dBm and the pulsewidth to 300 ns ± 10 ns at the antenna connector. Monitor the output with a spectrum analyzer.
j. Record the minimum signal level needed to cause the RACON to continuously respond.

3000MHz ≤ -33 dBm at 300 ns	**METER** ~~136~~ -37 **dBm**	**PASS** ~~X~~	**FAIL** ____
3000MHz ≤ -33 dBm at 50 ns	**METER** ~~136~~ -36 **dBm**	**PASS** ~~X~~	**FAIL** ____
9400MHz ≤ -35 dBm at 50 ns	**METER** ~~136~~ -46 **dBm**	**PASS** ~~X~~	**FAIL** ____
9400MHz ≤ -40 dBm at 300 ns	**METER** ~~135~~ -44 **dBm**	**PASS** ~~X~~	**FAIL** ____

2.9. MORSE CODE RESPONSE

a. Set the signal generator to 3000 MHz ± 50 MHz, the PRF to 1 KHz, the amplitude to -20 dBm ± 2 dBm and the pulsewidth to 1.5 µs ± 50 ns at the antenna connector.
b. Monitor the output with a scope and a crystal detector.
c. Use the keypad to make the Morse code responses as per the following table:

B -... ✓ C -.-. ✓ D -.. ✓ G --. ✓ K -.- ✓ M -- ✓

N -. ✓ O --- ✓ Q --.- ✓ T - ✓ X -..- ✓ Y -.-- ✓

Z --.. ✓

PASS ✓ **FAIL** ____

2.10. RESPONSE CODE LENGTH

a. Set the RACON response code length to 5 µs using. Set the Morse code to a "Q".
b. Set the signal generator to 3000 MHz ± 50 MHz, the PRF to 1 KHz, the amplitude to -20 dBm ± 2 dBm and the pulsewidth to 1.7 µs ± 100 ns at the antenna connector. Monitor the output with a scope and a crystal detector. Repeat the same test at 9400 MHz.
c. Measure the response code length on the oscilloscope and record on the data sheet.
d. Repeat (a), (b) and (c) setting the response code length to 45 µs.

METER X 5.16 ~~5.1867~~ **µs 5 ± 0.5 µs** **PASS** ✓ **FAIL** ____

METER S 5.146 **µs 5 ± 0.5 µs** **PASS** ✓ **FAIL** ____

METER X 45.56 **µs 45 ± 1 µs** **PASS** ✓ **FAIL** ____

METER S 45.2 **µs 45 ± 1 µs** **PASS** ✓ **FAIL** ____

2.11. RESPONSE DELAY

a. Set the signal generator to S-band frequency and the pulsewidth to 1.0 µs. Set the RACON response code length to 45 µs. Set the Morse code to a "Q".
b. Measure the time between the falling edge of the interrogation pulse and the leading edge of the response code on the oscilloscope. Take your measurements at the 50% fall of the interrogation pulse to the 50% rise of the code response.
c. Repeat the (a) and (b) using X-band frequency.

Measured at 50% to 50%. <667 ns **PASS** ✓ **FAIL** ____

2.12. RISE TIME

a. Set the signal generator S-band frequency pulsewidth to 100 ns. Set the RACON response code length to 45 µs. Set the Morse code to a "Q".
b. Measure the rise time and the fall time of the detector transmitter output and record on the data sheet. Measurements should be from the 10% to 90% of the rise/fall amplitude.
c. Repeat the (a) and (b) using X-band frequency.

RETEST FOR DATA PLOT CAPTURE 6-7-05

S BAND RISE ~~2.34~~ 51.2 ~~5.12~~ **< 100 ns FALL** ~~4.22~~ ~~1.42~~ 54.0 **< 100 ns** **PASS** ✓ **FAIL** ____

X BAND RISE ~~44.2~~ 48.0 ~~44.03~~ **< 100 ns FALL** ~~41.6~~ ~~41.67~~ 48.8 **< 100 ns** **PASS** ✓ **FAIL** ____

2.13. MODE OF OPERATION

Check the ON and OFF time program. Accuracy ± 1 second.

Time On: 10 secs	Time Off: 10	**PASS** ✓	**FAIL** ____
Time On: 60 secs	Time Off: 30	**PASS** ✓	**FAIL** ____
Time On: 10 secs	Time Off: 30	**PASS** ✓	**FAIL** ____
Time On: 30 secs	Time Off: 0	**PASS** ✓	**FAIL** ____

2.14. Min and Max RESPONSE RATE

a. Set the signal generator to S-band and the pulsewidth to 1.7 µs. Set the RACON response code length to 45 µs. Set PRT/PRF to 0.1 ms or 10 KHz.
b. Repeat (a) and (b) using X-band frequency.

The RACON should reliably respond. **PASS** ✓ **FAIL** ____

c. Set PRT/PRF to 4 ms or 250 Hz.
d. Repeat (c) using X-band frequency.

The RACON should reliably respond. **PASS** ✓ **FAIL** ____

2.15. INSTANTANEOUS EMISSION BANDWIDTH

a. Set the signal generator to 3025 MHz ± 5 MHz, the PRF to 1 KHz ± 50 Hz, the amplitude to - 20 dBm and the pulsewidth to 1.7 µs at the antenna connector. Set the Morse code response to "T" (tango) and the length to 45 µs.
b. Measure the instantaneous bandwidth. Repeat the same test at 9425 MHz.

S @ -5 dBc ≤ 2 MHz	**PASS** ✓	**FAIL** ____
S @ -20 dBc ≤ 4 MHz	**PASS** ✓	**FAIL** ____
X @ -5 dBc ≤ 2 MHz	**PASS** ✓	**FAIL** ____
X @ -20 dBc ≤ 4 MHz	**PASS** ✓	**FAIL** ____

The period of cycling shall be 24 hours, with 12 hours at high temperature and 12 hours at low temperature. These times include the time required to accomplish the temperature changes. Checkout of RACON operation shall be performed at least once each hot cycle and once each cold cycle. The RACON operation during this test pertains to TRANSMITTER POWER OUT, MORSE CODE RESPONSE and FREQUENCY TRACKING ACCURACY.

PASS ✓ **FAIL** ____

2.22. PHYSICAL CHARACTERISTICS

a. Workmanship in accordance with MIL-HDBK-454A, Guideline 9 and 69.

PASS ✓ **FAIL** ____

b. Soldering conforms to MIL-HDBK-454A, Guideline 5 and IPC J-STD-001C.

PASS ____ **FAIL** ✓

c. Terminations conform to MIL-HDBK-454A, Guideline 19 and IPC-J-STD-002B.

PASS ____ **FAIL** ____

d. Weight not to exceed 66Lbs (30Kg.) **PASS** ✓ **FAIL** ____

e. Handle equipped. **YES** ✓ **NO** ____

f. Cylindrical diameter not to exceed 23.6 inches (600mm). **PASS** ✓ **FAIL** ____

g. Height not to exceed 35.5 inches (900mm) **PASS** ✓ **FAIL** ____

h. RACON shall mate with the standard USCG RACON platform Refer to Attachment A-4 for reference.

YES ✓ **NO** ____

2.23. POST TESTING

a. Reassemble in accordance with manufactures provided specification.
b. Connect power to the RACON using 12 volts DC. Allow the RACON to operate for 10 minute before testing.
c. Cause the system to do a self-test. The system should pass its own internal testing.

YES ✓ **NO** ____