

TABLE OF CONTENTS LIST

APPLICANT: YAESU MUSEN CO., LTD.

FCC ID: K66GX2350S

TEST REPORT:

PAGE 1.....COVER SHEET - GENERAL INFORMATION & TECHNICAL DESCR.
PAGE 2.....TECHNICAL DESCRIPTION CNTD. & RF POWER OUTPUT
PAGE 3.....MODULATION CHARACTERISTICS AND OCCUPIED BANDWIDTH
PAGE 4.....SPURIOUS EMISSIONS AT ANTENNA TERMINALS
PAGE 5.....FIELD STRENGTH OF SPURIOUS EMISSIONS
PAGE 6.....METHOD OF MEASURING RADIATED SPURIOUS EMISSIONS
PAGE 7.....FREQUENCY STABILITY
PAGE 8.....CERTIFICATION OF TECHNICAL DATA AND
LIST OF TEST EQUIPMENT
PAGE 9.....LETTER EXPLAINING SCHEMATICS AND BLOCK DIAGRAMS

EXHIBIT CONTAINING:

EXHIBIT 1.....POWER OF ATTORNEY LETTER
EXHIBIT 2.....80.203 STATEMENT
EXHIBIT 3.....FCC ID LABEL SAMPLE
EXHIBIT 4.....SKETCH OF FCC ID LABEL LOCATION
EXHIBIT 5A.....EXTERNAL FRONT VIEW PHOTOGRAPH
EXHIBIT 5B.....EXTERNAL REAR VIEW PHOTOGRAPH
EXHIBIT 5C.....EXTERNAL TOP VIEW PHOTOGRAPH
EXHIBIT 5D.....EXTERNAL BOTTOM VIEW PHOTOGRAPH
EXHIBIT 5E-5F.....EXTERNAL SIDE VIEW PHOTOGRAPH
EXHIBIT 5G.....INTERNAL CHASSIS VIEW PHOTO - COMPONENT SIDE
EXHIBIT 5H.....INTERNAL COMPONENT SIDE PHOTO
EXHIBIT 5I-5J.....INTERNAL SOLDER SIDE PHOTO
EXHIBIT 6.....MAIN BLOCK DIAGRAM - 2 PAGES
EXHIBIT 7.....FRONT PART BLOCK DIAGRAM - 6 PAGES
EXHIBIT 8.....PARTS LIST (23 PAGES)
EXHIBIT 9.....SCHEMATIC - PA PCB
EXHIBIT 10.....MAIN SCHEMATIC (10 PAGES)
EXHIBIT 11.....LIST OF ACTIVE DEVICES (2 PAGES)
EXHIBIT 12.....USER'S MANUAL (25 PAGES)
EXHIBIT 13.....THEORY OF OPERATION (11 PAGES)
EXHIBIT 14.....TUNING PROCEDURE (4 PAGES)
EXHIBIT 15.....AUDIO FREQUENCY RESPONSE GRAPH
EXHIBIT 16.....AUDIO INPUT VS DEVIATION GRAPH
EXHIBIT 17.....AUDIO LOW PASS FILTER GRAPH
EXHIBIT 18.....OCCUPIED BANDWIDTH CW PLOT - HI LOWER
EXHIBIT 19.....OCCUPIED BANDWIDTH CW PLOT - LO POWER
EXHIBIT 20.....OCCUPIED BANDWIDTH PLOT - HI POWER
EXHIBIT 21.....OCCUPIED BANDWIDTH PLOT - LO POWER

APPLICANT: YAESU MUSEN CO., LTD.

FCC ID: K66GX2350S

DATE: JULY 23, 1999

REPORT #: F:\CUS\Y\YAE\YAE295A9.RPT

PAGE: TABLE OF CONTENTS

GENERAL INFORMATION REQUIRED
FOR TYPE ACCEPTANCE

- 2.983 (a,b,c) YAESU MUSEN CO., LTD. will sell the
MODEL NO. K66GX2350S VHF Marine transmitter in
quantity, for use under FCC RULES PART 80.
- 2.983 (d) TECHNICAL DESCRIPTION
- (1) Type of Emission: 16K0G3E/16K0F3E For 20KHz
For 25KHz
Bn = 2M + 2DK
M = 3000
D = 4.6KHz (Peak Deviation)
K = 1
Bn = 2(3.0K) + 2(4.6K)(1) = 6.0K + 10.0 = 16.0K
80.205(A) ALLOWED AUTHORIZED BANDWIDTH = 20.00KHz.
- (2) Frequency Range: 156.025-157.425 MHz
- (3) Power Range and Controls: There is a user Power switch for
High/Low Power.
- (4) Maximum Output Power Rating:
High 25.0 Watts, 1.0Watt
into a 50 ohm resistive load.
- (5) DC Voltages and Current into Final Amplifier:
- POWER INPUT
FINAL AMPLIFIER ONLY
- | High | Low |
|------------------|-----------------|
| Vce = 13.6 Volts | Vce = 13.6 VDC |
| Ice = 4.50 A. | Ice = 0.21 |
| Pin = 62.1 Watts | Pin = 2.8 Watts |
- (6) Function of each electron tube or semiconductor
device or other active circuit device: - SEE EXHIBIT
- 2.983(d) (7) Complete Circuit Diagrams: The circuit diagram is
included as EXHIBIT 9-10. The block diagram is
included as EXHIBIT 6-7.
- (8) Instruction book. The instruction manual is included
as EXHIBIT #8.

APPLICANT: YAESU MUSEN CO., LTD.
FCC ID: K66GX2350S
DATE: JULY 23, 1999
REPORT #: F:\CUS\Y\YAE\YAE295A9.RPT
PAGE #: 1

- 2.983(d) (9) Tune-up procedure. The tune-up procedure is given in EXHIBIT #8.
- (10) Description of all circuitry and devices provided for determining and stabilizing frequency is included in the circuit description in the instruction manual.
- 2.983 (11) Description of any circuits or devices employed for suppression of spurious radiation, for limiting modulation, and for limiting power.

In addition to the interstage filtering the multi-section low pass filter made up of L12, L11, C40, C47, C95, C46, C94, C45, & C26.

Limiting Modulator:

The transmitter audio limiting circuitry is contained in the loop filter IC01.

Limiting Power: There is no provision for limiting power.

- (12) Digital modulation. This unit does NOT use digital modulation.

2.983(e) The data required by 2.985 through 2.997 is submitted below.

2.985(a) RF power output.
80.215(e)(1)

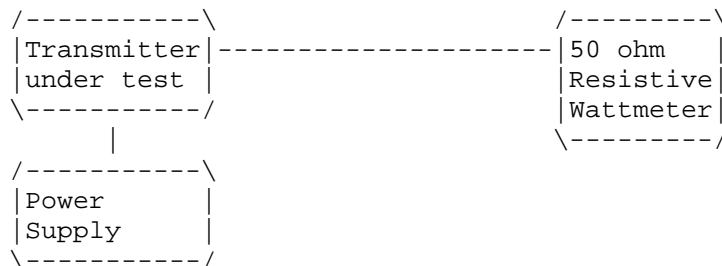
RF power is measured by connecting a 50 ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage of 13.6V, and the transmitter properly adjusted the RF output measures:

POWER OUTPUT

INPUT POWER: (13.6V)(4.5A) = 62.1 Watts

OUTPUT POWER: 25.0 Watts Efficiency: 40.3

METHOD OF MEASURING RF POWER OUTPUT



- 2.987(a) Voice Modulation characteristics:
- (a) AUDIO FREQUENCY RESPONSE See the EXHIBIT #9.
- 2.987(a) AUDIO LOW PASS FILTER
The audio low pass filter is included and the plot is shown as EXHIBIT #11. Rules 80.213(e) for ship stations with a low pass filter.
- 2.987(b) Audio input versus modulation A plot of the
80.213(d) audio input versus deviation is shown in in EXHIBIT #10.

2.989(c) Occupied bandwidth:

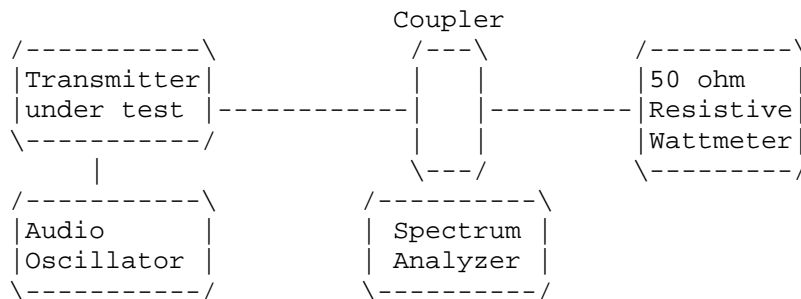
80.210(b,)
Data in the plots shows that on any frequency removed from the assigned frequency by more than 50%, but not more than 100%: At least 25dB. On any frequency removed from the assigned frequency by more than 100%, but not more than 250%: At least 35dB. On any frequency removed from the assigned frequency by more than 250%, of the authorized bandwidth: At least $43 + \log(P)$ dB.

Radiotelephone transmitter with modulation limiter.

Test procedure: TIA/EIA-603 para 2.2.11 , with the exception that various tones were used.

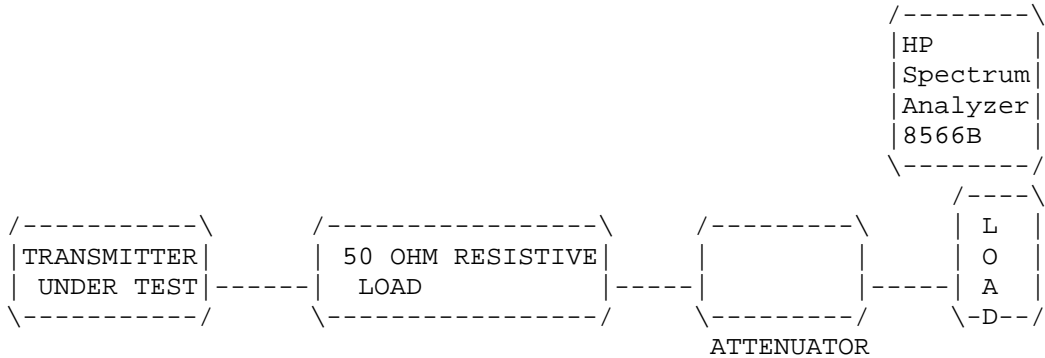
Test procedure diagram

OCCUPIED BANDWIDTH MEASUREMENT



2.991 Spurious emissions at antenna terminals(conducted):
 80.213 The data on the following page shows the level of conducted spurious responses. The carrier was modulated 100% using a 2500Hz tone. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard TIA/EIA-603.

Method of Measuring Conducted Spurious Emissions



2.991 Continued Spurious Emissions at the Antenna Terminals:

REQUIREMENTS: Emissions must be $43 + 10\log(P_o)$ dB below the mean power output of the transmitter.

For 20KHz HIGH POWER $43 + 10\log(25) = 43 + 13.98 = 57.0\text{dB}$
 LOW POWER $43 + 10\log(1) = 43 + 0 = 43\text{dB}$

HIGH POWER		LOW POWER	
EMISSION	dB BELOW	EMISSION	dB BELOW
FREQUENCY	CARRIER	FREQUENCY	CARRIER
MHz			
HIGH		LOW	
156.05	00.0	156.05	0.0
313.10	-75.00	313.10	-75.00
470.15	-63.20	470.15	-64.90
627.20	-77.80	627.20	-69.70

METHOD OF MEASUREMENT: The procedure used was TIA/EIA-603 STANDARD without any exceptions. An audio generator was connected to the UUT through a dummy microphone circuit and the output of the transmitter connected to a standard load and from the standard load through a pre-selector filter of the spectrum analyzer. The spectrum was scanned from 400KHz to at least the tenth harmonic of the fundamental using a HP model 8566B spectrum analyzer. The measurements were made using the shielded room located at TIMCO ENGINEERING INC. 849 NW STATE ROAD 45 , NEWBERRY FLORIDA 32669.

APPLICANT: YAESU MUSEN CO., LTD.
 FCC ID: K66GX2350S
 DATE: JULY 23, 1999
 REPORT #: F:\CUS\Y\YAE\YAE295A9.RPT
 PAGE #: 4

2.993(a)(b) Field strength of spurious emissions:

NAME OF TEST: RADIATED SPURIOUS EMISSIONS

REQUIREMENTS: Emissions must be $43 + 10\log(P_o)$ dB below the mean power output of the transmitter.

HIGH POWER $43 + 10\log(25.0) = 56.98$ dB
LOW POWER $43 + 10 \text{ LOG}(1.0) = 43.00$ dB

EMISSION FREQUENCY MHz	ATT. dB	MARGIN dB	
HIGH POWER			
156.15	0.0	0.0	H
312.30	-67.00	10.0	H
468.45	-75.00	18.0	H
624.60	-78.28	21.28	H
780.75	-84.14	27.14	V
936.90	-85.62	28.62	V
1093.05	-83.55	26.55	H
1249.20	-89.80	32.80	V
1405.35	-88.80	31.80	H
1561.50	-92.27	35.27	H
LOW POWER			
156.15	0.0	0.0	H
312.12	-53.00	10.00	H
468.45	-59.45	16.45	H
624.60	-71.08	28.08	H
780.27	-89.54	46.54	H
468.45	-62.15	19.15	H
624.60	-68.08	25.08	H
780.75	-89.04	46.04	V
936.90	-79.02	36.02	H
1093.05	-80.80	37.80	H
1249.20	-70.02	27.02	V
1405.35R	-81.40	38.40	V
1561.50R	-86.47	43.47	V

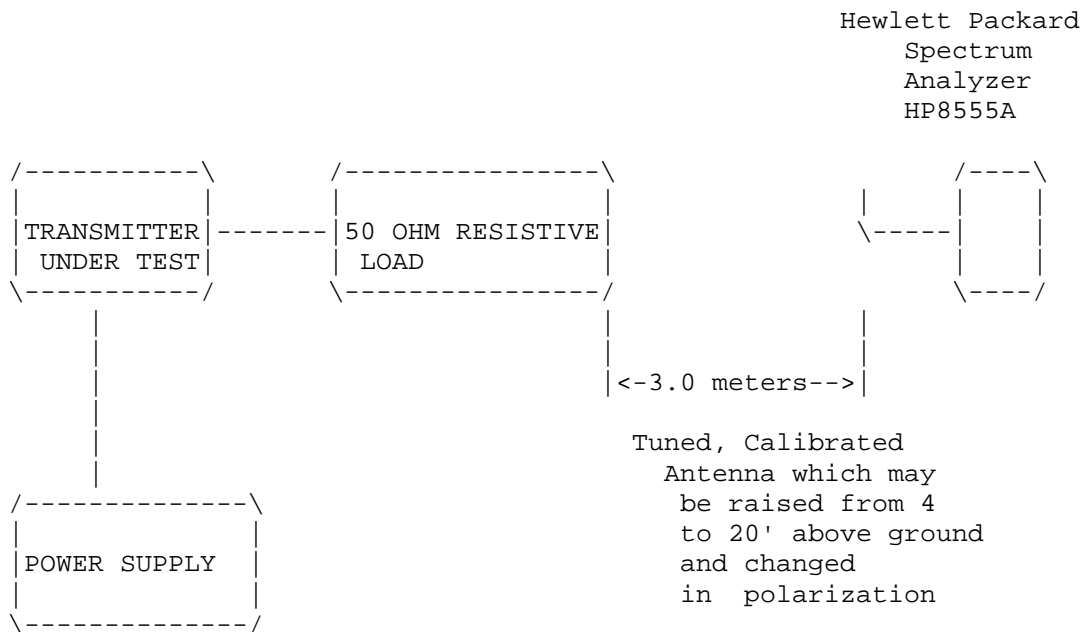
METHOD OF MEASUREMENT: The tabulated Data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 to at least the tenth harmonic of the fundamental. This test was conducted per ANSI STANDARD C63.4-1992 with the exception of briefly connecting the transmitter to a half wave dipole for the purpose of establishing a reference. Measurements were made at the open field test site of TIMCO ENGINEERING INC. located at 6051 N.W. 19th Lane Gainesville, FL 32605.

APPLICANT: YAESU MUSEN CO., LTD.
FCC ID: K66GX2350S
DATE: JULY 23, 1999
REPORT #: F:\CUS\Y\YAE\YAE295A9.RPT
PAGE #: 5

2.993(a)(b)

2.993(a)(b) Continued Field strength of spurious emissions:

Method of Measuring Radiated Spurious Emissions



Equipment placed 4' above ground
on a rotatable platform.

APPLICANT: YAESU MUSEN CO., LTD.
FCC ID: K66GX2350S
DATE: JULY 23, 1999
REPORT #: F:\CUS\Y\YAE\YAE295A9.RPT
PAGE #: 6

Frequency stability:

2.1055(a)(2)

90.213(a)

Temperature and voltage tests were performed to verify that the frequency remains within the .0010%,10.0 ppm specification limit, for 20KHz spacing. The test was conducted as follows: The transmitter was placed in the temperature chamber at 25 degrees C and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which four frequency readings were recorded at 15 second intervals. The worse case number was taken for temperature plotting. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -20 degrees C after which the transmitter was again allowed to stabilize for one hour. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15 second intervals. The worst case number was recorded for temperature plotting. This procedure was repeated in 10 degree increments up to + 50 degrees C.

Readings were also taken at minus 25% of the battery voltage of 5.4VDC, which we estimate to be the battery endpoint.

MEASUREMENT DATA:

Assigned Frequency (Ref. Frequency): 156.800 000MHz

TEMPERATURE oC	FREQUENCY MHz	PPM
REFERENCE_____	156.800 000	00.0
-20_____	156.800 700	+4.46
-10_____	156.801 140	+7.27
0_____	156.800 760	+4.84
+10_____	156.800 410	2.61
+20_____	156.800 678	4.27
+30_____	156.799 910	-0.57
+40_____	156.799 930	-0.45
+50_____	156.800 090	+0.57
20oC 0.85% Battery Voltage	156.799 890	+0.70
1.15% Battery Voltage	156.799 890	+0.70

RESULTS OF MEASUREMENTS: The maximum frequency variation over the temperature range was -0.45 to 7.27 ppm. The maximum frequency variation over the voltage range was +0.70 ppm.

APPLICANT: YAESU MUSEN CO., LTD.

FCC ID: K66GX2350S

DATE: JULY 23, 1999

REPORT #: F:\CUS\Y\YAE\YAE295A9.RPT

PAGE #: 7

- 2.983(f) Photo or Drawing of Label:
See Page 33.
- 2.983(g) Photos of Equipment:
See Pages 5A-5J.
- 2.999 Measurement Procedures for Type Acceptance:

Measurement techniques have been in accordance with EIA specifications and the FCC requirements.
- 2.909 Certification_of_Technical_Data_by_Engineers

We, the undersigned, certify that the enclosed measurements and enclosed data are true and correct.

S. S. SANDERS
S.S. Sanders
Engineer

LIST OF TEST EQUIPMENT

1. Spectrum Analyzer: Hewlett Packard 8566B - Opt 462, w/ preselector 85685A, & Quasi-Peak Adapter HP 85650A, & HP 8449B - OPT H02 Cal. 7/6/99
2. Signal Generator, Hewlett Packard 8640B, cal. 10/1/98
3. Signal Generator, HP 8614A Serial No.2015A07428 cal. 5/27/99
3. Eaton Biconnical Antenna Model 94455-1
20-200 MHz Serial No. 0997 Cal. 10/30/98
4. Electro-Metric Dipole Kit, 20-1000 MHz, Model TDA-30 10/31/98
5. Electro-Metric Horn 1-18 GHz, Model RGA-180, Cal. 10/30/98
6. Electro-Metric Antennas Model TDA-30/1-4, Cal. 10/15/98
7. Electro-Metric Line Impedance Stabilization Network Model No. EM-7821, Serial No. 101; 100KHz-30MHz 50uH. Cal.11/19/98
8. Electro-Metric Line Impedance Stabilization Network Model No. EM-7820, Serial No. 2682; 10KHz-30MHz 50uH. Cal. 11/19/98
9. Special low loss cable was used above 1 GHz
10. Tenney Temperature Chamber

APPLICANT: YAESU MUSEN CO., LTD.
FCC ID: K66GX2350S
DATE: JULY 23, 1999
REPORT #: F:\CUS\Y\YAE\YAE295A9.RPT
PAGE #: 8

APPLICANT: YAESU MUSEN CO., LTD.
FCC ID: K66GX2350S

To Whom It May Concern:

The schematics and block diagrams provided by the applicant were very large and the print was very small. We enlarged them with our copier and have submitted them in several pieces but in PDF "book" form.

We have scanned them in from left to right - top portion and then left to right - bottom portion.

If this is not acceptable, please advise an acceptable method.

APPLICANT: YAESU MUSEN CO., LTD.
FCC ID: K66GX2350S
DATE: JULY 23, 1999
REPORT #: F:\CUS\Y\YAE\YAE295A9.RPT
PAGE #: 9