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FCC ID: MQXA440

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GENERAL INFORMATION REQUIRED
FOR TYPE ACCEPTANCE

2.1033 (c)(1)(2) ADCON TELEMETRY INC. will sell the MODEL NO. MQXA440 VHF transceiver in quantity, for use under FCC RULES PART 22 & 90.

2.1033 (c) TECHNICAL DESCRIPTION
2.1033 (3) User Manual See Exhibit 14

2.1033 (4) Type of Emission: 7K3F2D For 25KHz
7K3F2D For 12.5KHz

For 25KHz & 12kHz

Bn = 2M + 2DK

M = 4,000 Bits per second

D = 1.65KHz (Peak Deviation)

K = 1

Bn = $2(4000/2) + 2(1.65K)(1) = 4.0K + 3.3K = 7.3k$

ALLOWED AUTHORIZED BANDWIDTH = 20.00KHz.

For 12.5KHz

ALLOWED AUTHORIZED BANDWIDTH = 11.25KHz.

90.209(b)(5)

2.1033 (5) Frequency Range: 430-470 MHz

(6) Power Range and Controls: There are NO user Power controls.

(7) Maximum Output Power Rating:
0.5 Watts,
into a 50 ohm resistive load.

(8) DC Voltages and Current into Final Amplifier:

POWER INPUT

FINAL AMPLIFIER ONLY

Vce = 7.8 Volts

IC = .55 A

(9) Tune-up procedure. The tune-up procedure is given in EXHIBIT 8.

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2.1033 (10) Complete Circuit Diagrams: The circuit diagram is included as EXHIBIT 2. The block diagram is included as EXHIBIT 3.

(11) Function of each electron tube or semiconductor device or other active circuit device:
-SEE EXHIBIT 14.

(8) Instruction book. The instruction manual is included as EXHIBIT 14.

(10) Description of all circuitry and devices provided for determining and stabilizing frequency is included in the circuit description in the instruction manual.

2.1033(c)(11) A photograph or drawing of the equipment identification label is shown in Exhibit 1.

2.1033(c)(12) Photographs of the equipment of sufficient clarity to reveal equipment construction and layout and label location are shown in Exhibit 6-7.

2.1033(c)(13) For equipment employing digital modulation, a detail description of the modulation technique. This UUT uses FSK to modulate the transmitter.

2.1033(c)(14) data required for 2.1046 to 2.1057 SEE Below

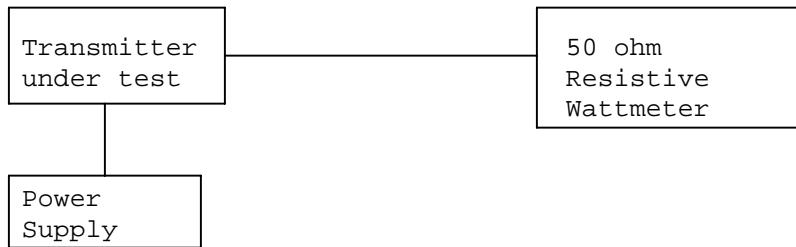
2.1046(a) RF power output.
RF power is measured by connecting a 50 ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage of 7.8 VDC, and the transmitter properly adjusted the RF output measures:

POWER OUTPUT
INPUT POWER - HIGH: $(7.8V)(0.550A) = 1.7$ Watts
INPUT POWER - LOW: $(7.8V)(0.2A) = 1.56$ Watts

OUTPUT POWER: HIGH - .5 Watts
LOW - .038 Watts

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METHOD OF MEASURING RF POWER OUTPUT



2.1047(a) Voice Modulation characteristics:
NOT APPLICABLE, F2 type of emission.

2.1049 Audio Low Pass Filter
This UUT does not have a low pass filter.

2.1049 Occupied bandwidth:
90.210(c,)
For transmitters that are not equipped with an audio low pass filter pursuant to S90.211(b), the power of any emission must be attenuated below the unmodulated carrier output power as follows: (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency(fd in kHz) of more than 5kHz but not more than 10 kHz: At least $83 \log(fd/5)$ dB; (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency(fd in kHz) of more than 10kHz, but not more than 250% of the authorized bandwidth: At least $29 \log(fd^2/11)$ dB or 50dB, whichever is the lesser attenuation; (3) On any frequency removed from the center of the authorized bandwidth by more than 250% of the authorized bandwidth: At least $43 + 10 \log(Po)$ dB.

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90.210(d) Emission Mask D - 12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 : Zero dB.

(2) On any frequency from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27(f_d - 2.88)$ dB.

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10 \log(P)$ dB or 70 dB, whichever is the lesser attenuation.

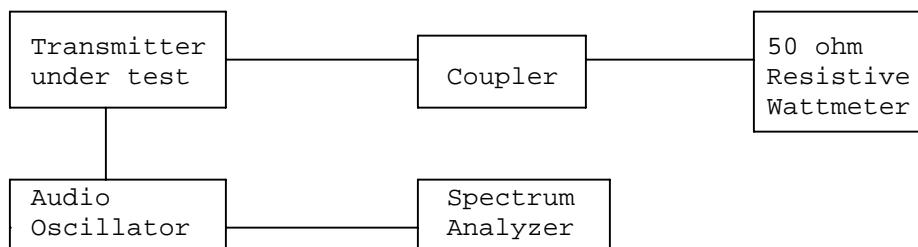
Data in the plots shows that on any frequency removed from the assigned frequency by more than 50%, but not more than 100%: At least 25dB. On any frequency removed from the assigned frequency by more than 100%, but not more than 250%: At least 35dB. On any frequency removed from the assigned frequency 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



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2.1051 Spurious emissions at antenna terminals (conducted):
 2.1052 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.

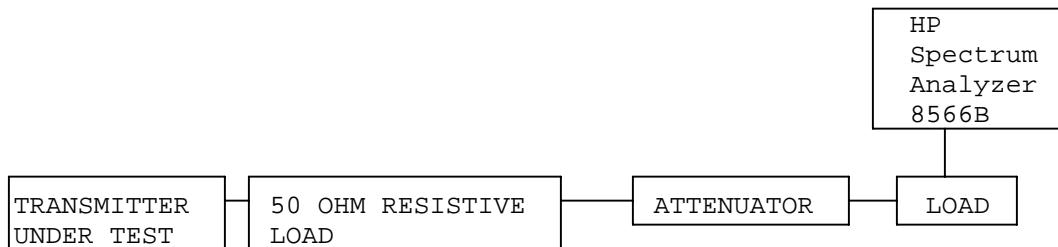
REQUIREMENTS: Emissions must be $43 + 10\log(P_o)$ dB below the mean power output of the transmitter.

For 25KHz $43 + 10\log(0.5) = 43 - 3.0 = 40.0\text{dB}$
 For 12.5KHz $50 + 10\log(0.5) = 50 - 3.0 = 47.00$

EMISSION	DB BELOW	DB BELOW
FREQUENCY MHz	CARRIER	CARRIER
	LOW POWER	HIGH POWER
461.00	00.0	00.0
922.00	-76.7	-78.2
1383.00	-69.3	-66.2
1844.00	-69.1	-78.4
2305.00	-85.2	-96.1
2766.00	-87.7	-97.8
3227.00	-74.8	-84.9
3688.00	-69.5	-81.1
4149.00	-82.5	-89.6
4610.00	-69.0	-87.8
469.00	00.0	00.0
938.00	-78.1	-77.3
1407.00	-65.9	-64.1
1876.00	-66.0	-74.9
2345.00	-82.5	-96.9
2814.00	-81.7	-90.1
3283.00	-79.7	-83.2
3752.00	-68.5	-76.4
4221.00	-79.5	-88.8
4690.00	-81.1	-88.2

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Method of Measuring Conducted Spurious Emissions



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 N.W. State Road 45, Newberry, Florida 32669.

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2.1053 Field strength of spurious emissions:

NAME OF TEST: RADIATED SPURIOUS EMISSIONS

REQUIREMENTS: Emissions must be $50 + 10\log(P_0)$ dB below the mean power output of the transmitter.

$$50 + 10\log(0.50) = 46.99 \text{ dB}$$
$$50 + 10\log(0.038) = 35.80 \text{ dB}$$

TEST DATA:

EMISSION FREQUENCY MHz	ATTN dBuV	MARGIN dB
------------------------------	--------------	--------------

HIGH POWER

461.00	0.00	0.00	H
922.00	68.69	21.70	V
1383.00	63.37	16.38	V
1844.00	77.62	30.63	H
2305.00	79.96	32.97	V
2766.00	80.54	33.55	V
3227.00	90.42	43.43	V
3688.00	90.90	43.91	H

LOW POWER

469.00	0.00	0.00	H
938.00	70.28	41.48	H
1407.00	68.76	39.96	V
1876.00	64.67	35.87	H
2345.00	72.54	43.74	V
2814.00	78.70	49.90	V
3283.00	81.96	53.16	H

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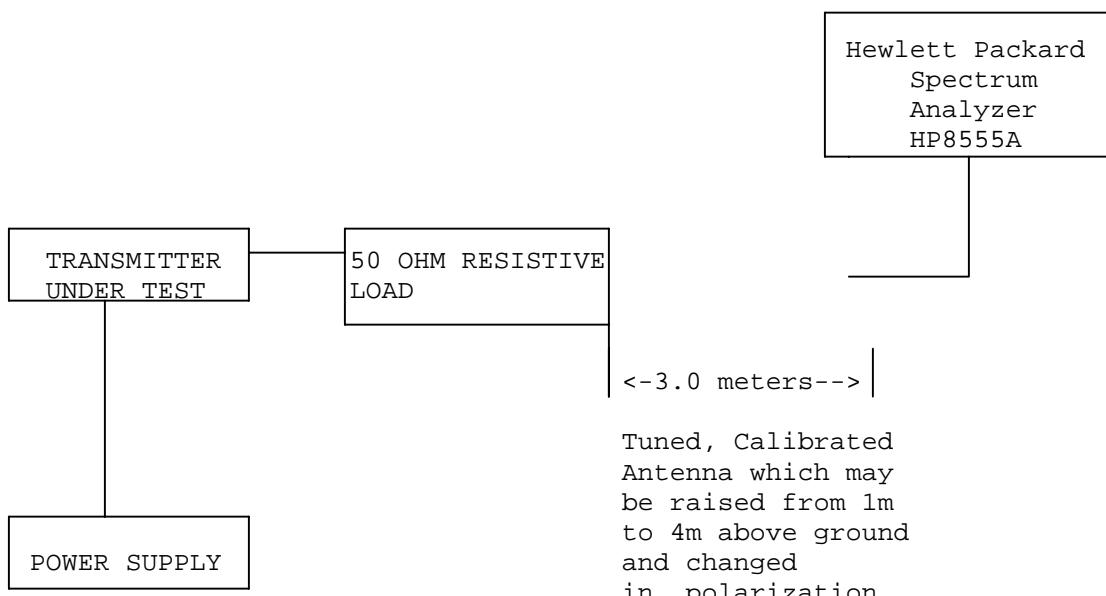
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METHOD OF MEASUREMENT: The tabulated Data shows the results of the radiated field strength emissions and attenuation calculated per TIA/EIA 603. The spectrum was scanned from 30 to at least the tenth harmonic of the fundamental. This test was conducted per TIA/EIA 603. Measurements were made at the open field test site of TIMCO ENGINEERING INC. located at 849 N.W. STATE ROAD 45, NEWBERRY, FL 32669.

Method of Measuring Radiated Spurious Emissions



Equipment placed 80 cm above ground
on a rotatable platform.

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2.1055 Frequency stability:

90.213(a)(1)

Temperature and voltage tests were performed to verify that the frequency remains within the .00015%, 1.5 ppm specification limit, for 25KHz spacing & 0.00025% for 12.5KHz spacing and 0.0001% for 6.25KHz 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 -30 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): 465.000 000 MHz

TEMPERATURE_°C	FREQUENCY_MHz	PPM
REFERENCE	465.000 000	00.0
-30	465.000 205	+00.44
-20	465.000 079	+00.17
-10	465.000 109	+00.23
0	465.000 144	+00.31
+10	465.000 210	+00.45
+20	465.000 221	+00.48
+30	465.000 175	+00.38
+40	465.000 096	+00.21
+50	465.000 071	+00.15
-15% Battery End-Point VDC		+00.46
+15% Battery End-Point VDC		+00.46

RESULTS OF MEASUREMENTS: The maximum frequency variation over the temperature range was +0.48 ppm.

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2.1055(a)(1) Frequency stability:
90.214 Transient Frequency Behavior

REQUIREMENTS: In the 450-500MHz frequency band, transient frequencies must be within the maximum frequency difference limits during the time interval indicated below for 12.5kHz Channels:

Time Interval	Maximum Frequency	Portable Radios 450-500Mhz
t1	+12.5kHz	10.0ms
t2	+6.25kHz	25.0ms
t3,t4	+12.5kHz	10.0ms

TEST PROCEEDURE: TIA/EIA TS603 PARA 2.2.19, the levels were set as follows;

1. Using the varible attenuator the transmitter level was set to 40dB below the test recievers maximum input level, then the transmitter was turned off.
2. With the Transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained with the signal generator through-out the test.
3. Reduce the attenuation between the transmitter and the RF detector by 30dB.
4. With the levels set as above the transient frequency behavior was observed & recorded.

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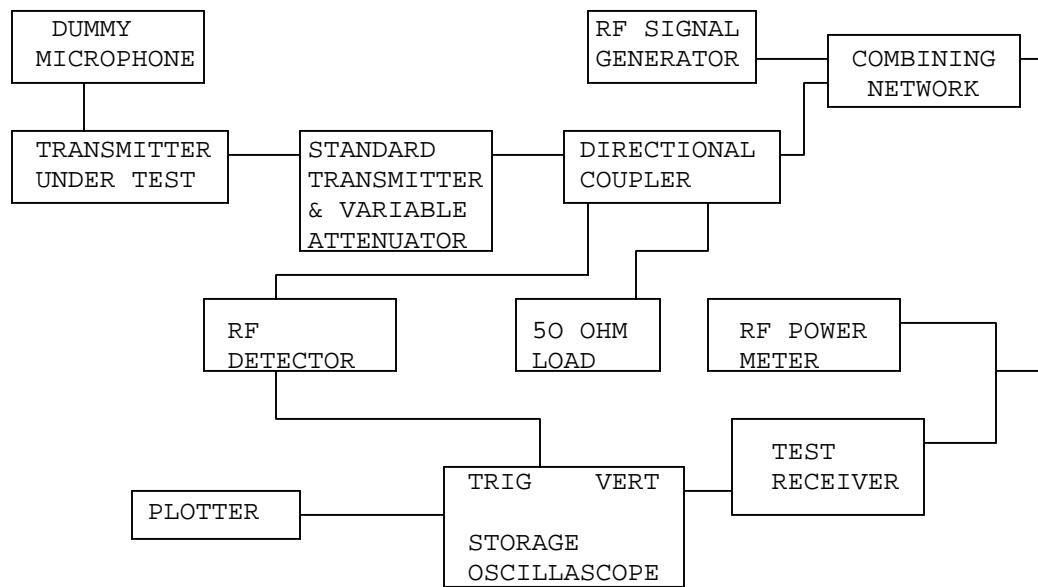
2.1055

Frequency stability:

90.214

Transient Frequency Behavior

(Continued)



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2.10

Measurement Procedures for Type Acceptance:

Measurement techniques have been in accordance with TIA/EIA STD 603-1992.

TEST EQUIPMENT LIST

1. X Spectrum Analyzer: HP 8566B-Opt 462, S/N 3138A07786, w/ preselector HP 85685A, S/N 3221A01400, Quasi-Peak Adapter HP 85650A, S/N 3303A01690 & Preamplifier HP 8449B-OPT H02, S/N 3008A00372 Cal. 1/19/01
2. X Biconnical Antenna: Eaton Model 94455-1, S/N 1057, Cal 3/15/00
3. Biconnical Antenna: Electro-Metrics Model BIA-25, S/N 1171 Cal. 3/16/01
4. X Log-Periodic Antenna: Electro-Metrics Model EM-6950, S/N 632 Cal. 3/15/00
5. Log-Periodic Antenna: Electro-Metrics Model LPA-30, S/N 409 Cal. 3/15/00
6. X Double-Ridged Horn Antenna: Electro-Metrics Model RGA-180, 1-18 GHz, S/N 2319
7. 18-26.3GHz Systron Donner Standard Gain Horn #DBE-520-20
8. Horn 40-60GHz: ATM Part #19-443-6R
9. Line Impedance Stabilization Network: Electro-Metrics Model EM-7820, w/NEMA Adapter S/N 2682 Cal. 3/16/01
10. Temperature Chamber: Tenney Engineering Model TTRC, S/N 11717-7 Cal. 1/21/01
11. Frequency Counter: HP Model 5385A, S/N 3242A07460 Cal 11/20/00
12. Peak Power Meter: HP Model 8900C, S/N 2131A00545, Cal. 1/26/01
13. X Open Area Test Site #1-3meters Cal. 12/22/99
14. Signal Generator: HP 8640B, S/N 2308A21464 Cal. 11/21/00
15. Signal Generator: HP 8614A, S/N 2015A07428
16. Passive Loop Antenna: EMCO Model 6512, 9KHz to 30MHz, S/N 9706-1211 Cal. 6/10/00
17. Dipole Antenna Kit: Electro-Metrics Model TDA-30/1-4, S/N 153 Cal. 11/24/00
18. AC Voltmeter: HP Model 400FL, S/N 2213A14499 Cal. 2/1/01
19. Digital Multimeter: Fluke Model 8012A, S/N 4810047 Cal 9/21/99
20. Digital Multimeter: Fluke Model 77, S/N 43850817 Cal 11/16/00
21. Oscilloscope: Tektronix Model 2230, S/N 300572 Cal 2/1/01

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