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TEST REPORT

Project Number 12175

Report Issue Date:

03/27/2012

Applicant:

Aclara RF Systems
30400 Solon Road
Solon, Ohio 44139

Product:

Model - 2011-005 Rev C

FCC ID: LLB11005S

Gas Meter Transmitting Unit

Test dates: 03/16/2012 - 03/19/2012 Receive Date: 03/16/2012

For the purpose of demonstrating compliance with FCC Part 90

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FCC Registered Test Site Number 160606

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Test Procedures

EUT description: The Model - 2011-005 Rev C transceiver is designed to provide remote meter reading capability with the American Rockwell family of gas meters. The transceiver is mounted within the meter enclosure. The transmitter provides a very short intermittent RF transmission to provide a remote reading of the meter. A microprocessor provides timing, control and data processing functions. The built in antenna is inaccessible to the user and no provision is made for an external antenna. The receiver can be used to request a meter reading or other options available in the system.

Power Output: The EUT operates in the frequency range of (450 - 470) MHz. The first step in the measurement process was to measure the field strength of the fundamental frequency at the lowest, highest and middle operating frequency. These measurements are made in both the vertical and horizontal polarity. The maximum field strength is reported by raising and lowering the measuring antenna height between (1-4) meters and by rotating the EUT (360) degrees. The measurement distance is (3) meters.

The field strength measurements continue as described above for up to the tenth harmonic of each fundamental frequency.

Once the field strength of each signal is recorded, the EUT is replaced with a substitution antenna and signal generator. The substitution antenna is placed at the same height as the EUT had been. The combination of antenna and signal generator is then adjusted to reproduce the recorded field strength at each frequency. The ERP is then calculated by the following:

ERP = PG - CL + ANT

ERP = Effective Radiated Power (dBm)
PG = Signal Generator Output (dBm)
CL = Cable loss (dB)
ANT = antenna gain (dBd)
dBd = (antenna gain dBi) - (2.2 dB)

The measurements were made using the standard ANSI/TIA-603-C-2004.

Occupied Bandwidth: The occupied bandwidth was measured with the EUT set to low, medium and high transmit frequencies. The emissions mask used was that specified in Part 90.210 (d).

Radiated Spurious Emissions: The radiated spurious emissions measurements were measured with the EUT set to low, medium and high transmit frequencies. Based upon the low output power of this device, all spurious and harmonic signals are limited to (-20) dBm. This is based upon the calculation stated in 90.210(d)(3). The field strength of the spurious emissions were measured in the same manner as the power output measurements and then the substitution method was used to establish the power level expressed in dBm.

Frequency Stability vs. Supply Voltage: One of the internal batteries was disconnected and replaced with an external variable power supply. The frequency was measured at the normal battery voltage of (7.20) VDC and again with the external power supply adjusted to an (85%) level or (6.12) volts. This was repeated with the external DC voltage adjusted to (8.28) VDC. The maximum allowed deviation is (2.5) ppm or (1,150) Hz at (460) MHz.

Frequency Stability vs. Temperature: The fundamental frequency was measured at an ambient temperature of (20) degrees C and recorded. The transmitter was then placed in a container along with a small section of dry ice and the environment was adjusted until a low temperature of (-30) degrees C was achieved. The transmitter was allowed to stabilize for (30) minutes at this temperature and then the frequency was again measured with a spectrum analyzer. The environment was allowed to warm to (-20) degrees C and the measurement process was repeated. The environment was moved to a maximum temperature of (+80) degrees C in (10) degree increments, allowed to stabilize for (30) minutes and the frequency was re-measured.

TEST EQUIPMENT CALIBRATION INFORMATION

Manufacturer	Model	Description	Serial Number	Cal Due Date
Hewlett Packard	8566B	Spectrum Analyzer	2421A00526	10/13/12
Hewlett Packard	85662A	Display	2403A07352	10/13/12
Hewlett Packard	85650A	Quasi-Peak Adapter	2043A00209	10/13/12
Hewlett Packard	8447D	Preamp	1937A03247	09/06/12
Hewlett Packard	8449B	Preamp	3008A00320	04/11/12
Hewlett Packard	8648B	Signal Generator	3443U00312	09/08/12
Hewlett Packard	8672A	Signal Generator	2211A02426	03/21/12
Electro-Metrics	BIA-30	Biconical Antenna	3852	04/01/12
EMCO	3148	Log Periodic Antenna	00075741	01/17/13
Electro-Metrics	3115	Double Ridge Guide Antenna	3810	05/25/13
Schwarzbeck	UHAP-10db	Dipole antenna set	175	12/22/12
ETS Lindgren	3117	Double Ridge Guide Antenna	00109296	01/12/13
Agilent	7402A	Spectrum Analyzer	US39150137	07/18/12
Fluke	52	Digital Thermometer	447533	02/17/13
Hewlett Packard		DC Power Supply		N/A
Fluke	87V	DVM	95570315	03/02/13

Power Output and Spurious Emissions

Model 2011-005 Rev C March 16 – 19, 2012

Freq	Generator	Equivalent	Antenna	Limit	Margin
MHz	Level	Power	Polarity		
	dBm	dBm	V/H	dBm	dB
450	31.3	20.8	V		
900	-25.8	-36.6	V	-20	-16.6
1350	-43.0	-41.9	V	-20	-21.9
1800	-46.7	-49.7	H	-20	-29.7
2250	-42.5	-55.9	H	-20	-35.9
2700	-61.5	-58.0	V	-20	-38.0
3150	-60.4	-56.4	V	-20	-36.4
3600	-59.1	-53.9	V	-20	-33.9
4050	-56.8	-51.0	V	-20	-31.0
4500	-56.0	-49.7	V	-20	-29.7
460	32.0	21.5	V		
920	-28.3	-39.1	V	-20	-19.1
1380	-39.3	-38.2	V	-20	-18.2
1840	-48.6	-46.3	V	-20	-26.3
2300	-52.2	-49.6	V	-20	-29.6
2760	-59.7	-56.2	V	-20	-36.2
3220	-61.6	-57.6	V	-20	-37.6
3680	-58.8	-53.6	V	-20	-33.6
4140	-58.6	-52.8	V	-20	-32.8
4600	-55.2	-48.9	V	-20	-28.9
470	34.0	23.5	V		
940	-28.4	-28.4	H	-20	-8.4
1410	-49.6	-48.5	V	-20	-28.5
1880	-51.9	-49.6	V	-20	-29.6
2350	-55.4	-52.8	V	-20	-32.8
2820	-61.3	-57.8	V	-20	-37.8
3290	-62.3	-58.3	V	-20	-38.3
3760	-58.7	-53.5	V	-20	-33.5
4230	-57.9	-52.1	V	-20	-32.1
4700	-50.9	-57.2	H	-20	-37.2

The spurious emissions shown above meet the requirements of Part 90.120 (d) (3) defined as: On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

OCCUPIED BANDWIDTH

(Under separate test report)

FREQUENCY STABILITY VS TEMPERATURE

Temperature (Deg C)	Measured Freq (MHz)	Deviation Hz	Deviation ppm
-30	459.99971	290	0.63
-20	459.999728	272	0.59
-10	459.999817	183	0.40
0	459.999711	289	0.63
10	459.999717	283	0.62
20	459.999725	275	0.60
30	459.99973	270	0.59
40	459.999745	255	0.55
50	459.999768	232	0.50
60	459.999756	244	0.53
70	459.999785	215	0.47
80	459.999801	199	0.43

Assigned Frequency = 460.000000 MHz

FREQUENCY STABILITY VS VOLTAGE

Input Voltage	Measured Freq. (MHz)	Deviation (Hz)	Deviation (ppm)
6.12 VDC	459.999669	331	0.719
7.20 VDC	459.999669	331	0.719
8.28 VDC	459.999664	336	0.730

TRANSIENT FREQUENCY BEHAVIOR

(Under separate test report)

OUTPUT POWER AND SPURIOUS EMISSIONS
SETUP PHOTOGRAPHS