

TIMCO ENGINEERING INC.

849 NW State Road 45

Newberry, Florida 32669

<http://www.timcoengr.com>

888.472.2424 F 352.472.2030 email: sid@timcoengr.com



Test Report

Product Name: 14 CH FRS TRANSCEIVER

FCC ID: KLLTP-329

Applicant:

**TEKCOM INDUSTRIES LTD.
BLOCK C, 9/F., KAISER ESTATE, PHASE 1
41 MAN YUE STREET
HUNGOM, KOWLOON FO TAN, N.T.
HONG KONG**

Date Receipt: MARCH 8, 2004

Date Tested: MARCH 23, 2004

APPLICANT: TEKCOM INDUSTRIES LTD.

FCC ID: KLLTP-329

REPORT #: T\TEKCOM_KLL\297AUT4\297AUT4TestReport.doc

COVER SHEET

TIMCO ENGINEERING INC.

849 NW State Road 45

Newberry, Florida 32669

<http://www.timcoengr.com>

888.472.2424 F 352.472.2030 email: sid@timcoengr.com

TABLE OF CONTENTS LIST

TEST REPORT:

PAGE 1.....	GENERAL INFORMATION & TECHNICAL DESCRIPTION
PAGE 2.....	TECHNICAL DESCRIPTION CONTINUED
	RF POWER OUTPUT
PAGE 3.....	MODULATION CHARACTERISTICS
	AUDIO FREQUENCY RESPONSE GRAPH
PAGE 4.....	MODULATION LIMITING GRAPH
PAGE 5.....	AUDIO LOW PASS FILTER GRAPH
PAGE 6.....	OCCUPIED BANDWIDTH
PAGE 7.....	OCCUPIED BANDWIDTH PLOT
PAGE 8.....	SPURIOUS EMISSIONS AT ANTENNA TERMINALS
PAGE 8-9.....	UNWANTED RADIATION
PAGE 10.....	METHOD OF MEASURING RADIATED SPURIOUS EMISSIONS
PAGE 11.....	FREQUENCY STABILITY
PAGE 12.....	LIST OF TEST EQUIPMENT

EXHIBITS INCLUDED:

BLOCK DIAGRAM
SCHEMATICS
PARTS LIST
USERS MANUAL
LABEL SAMPLE
LABEL LOCATION
EXTERNAL PHOTOGRAPHS
INTERNAL PHOTOGRAPHS
ALIGNMENT PROCEDURE
OPERATIONAL DESCRIPTION
TEST SET UP PHOTOGRAPHS

APPLICANT: TEKCOM INDUSTRIES LTD.

FCC ID: KLLTP-329

REPORT #: T\TEKCOM_KLL\297AUT4\297AUT4TestReport.doc

TABLE OF CONTENTS

TIMCO ENGINEERING INC.

849 NW State Road 45

Newberry, Florida 32669

<http://www.timcoengr.com>

888.472.2424 F 352.472.2030 email: sid@timcoengr.com

GENERAL INFORMATION REQUIRED FOR CERTIFICATION

2.1033(c)(1)(2) TEKCOM INDUSTRIES LTD. will manufacture the
FCCID: KLLTP-329 GMRS/FRS COMBINATION TRANSCEIVER
in quantity, for use under FCC RULES PART 95.

TEKCOM INDUSTRIES LTD.
BLOCK C, 9/F., KAISER ESTATE, PHASE 1
41 MAN YUE STREET
HUNG HOM, KOWLOON FO TAN,
N.T. HONG KONG

2.1033 (c) **TECHNICAL DESCRIPTION**

2.1033(c)(3) Instruction book. A draft copy of the instruction
manual is included in the exhibits.

2.1033(c) (4) Type of Emission: 11K0F3E
95.631

$B_n = 2M + 2DK$
 $M = 3000$
 $D = 2.5K$
 $B_n = 2(3000) + 2(2500) = 11K$

FRS Authorized Bandwidth 12.5KHz

2.1033(c)(5) FRS Frequency Range: 1. 462.5625 8. 467.5625
95.627 2. 462.5875 9. 467.5875
3. 462.6125 10. 467.6125
4. 462.6375 11. 467.6375
5. 462.6625 12. 467.6625
6. 462.6875 13. 467.6875
7. 462.7125 14. 467.7125 MHz

2.1033(c)(6)(7) Power Output shall not exceed 0.50 Watts effective
95.639 radiated power. There can be no provisions for
95.649 increasing the power or varying the power.

2.1033(c)(8) DC Voltages and Current into Final Amplifier:

FINAL AMPLIFIER ONLY

INPUT POWER: $(4.5V)(0.36A) = 1.62$ Watts

2.1033(c)(9) Tune-up procedure. The tune-up procedure is included
in the exhibits.

2.1033(c)(10) Complete Circuit Diagrams: The circuit diagram and
block diagram are included in the exhibits.

APPLICANT: TEKCOM INDUSTRIES LTD.

FCC ID: KLLTP-329

REPORT #: T\TEKCOM_KLL\297AUT4\297AUT4TestReport.doc

TIMCO ENGINEERING INC.

849 NW State Road 45

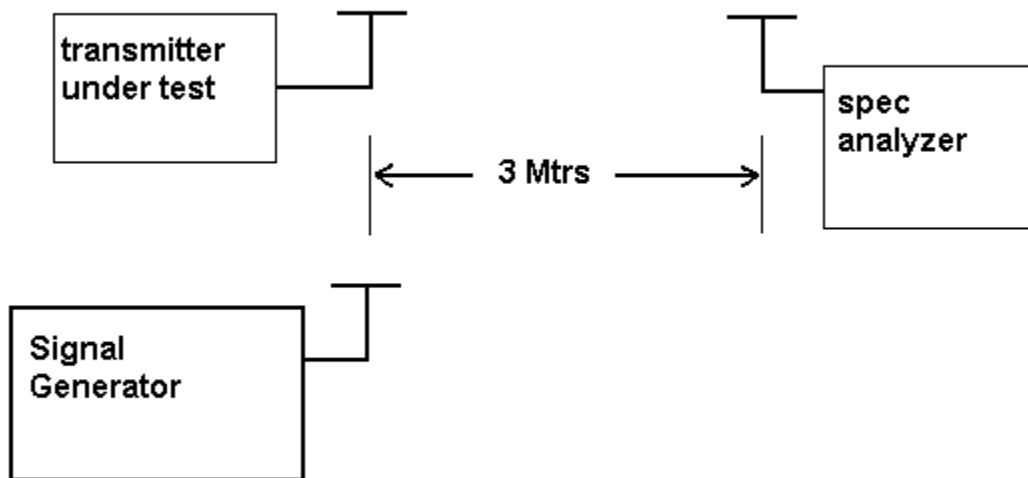
Newberry, Florida 32669

<http://www.timcoengr.com>

888.472.2424 F 352.472.2030 email: sid@timcoengr.com

- 2.1033(c)(11) A photograph or a drawing of the equipment identification label is included in the exhibits.
- 2.1033(c)(12) Photographs(8"X10") of the equipment of sufficient clarity to reveal equipment construction and layout, including meters, labels for controls, including any view under shields.
- 2.1033(c)(13) Digital modulation is not allowed.
- 2.1033(c)(14) The data required by 2.1046 through 2.1057 is submitted below.
- 2.10311c)(6)(7) RF power is measured by the substitution method as outlined in TIA/EIA - 603. With a nominal battery voltage of 4.5 V, and the transmitter properly adjusted the RF output measures:
- 2.1046(a)

FRS - .4 Watts ERP



APPLICANT: TEKCOM INDUSTRIES LTD.

FCC ID: KLLTP-329

REPORT #: T\TEKCOM_KLL\297AUT4\297AUT4TestReport.doc

TIMCO ENGINEERING INC.

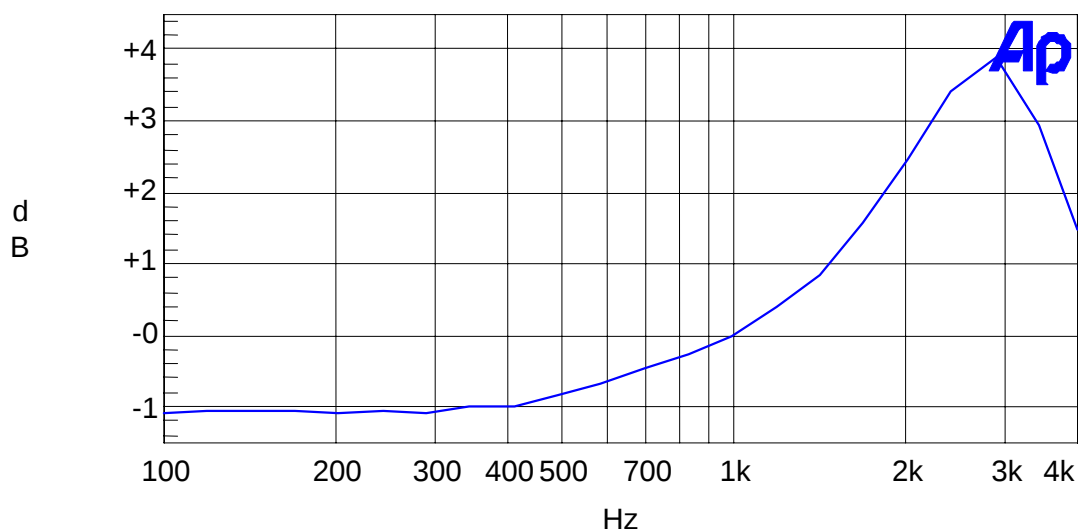
849 NW State Road 45
Newberry, Florida 32669
<http://www.timcoengr.com>
888.472.2424 F 352.472.2030 email: sid@timcoengr.com

2.1047(a)(b) Modulation characteristics:

AUDIO FREQUENCY RESPONSE

The audio frequency response was measured in accordance with TIA/EIA Specification 603. The audio frequency response curve is shown on the next page. The audio signal was fed into a dummy microphone circuit and into the microphone connector. The input required to produce 30 percent modulation level was measured. See plot below.

Audio Frequency Response Plot



APPLICANT: TEKCOM INDUSTRIES LTD.

FCC ID: KLLTP-329

REPORT #: T\TEKCOM_KLL\297AUT4\297AUT4TestReport.doc

TIMCO ENGINEERING INC.

849 NW State Road 45

Newberry, Florida 32669

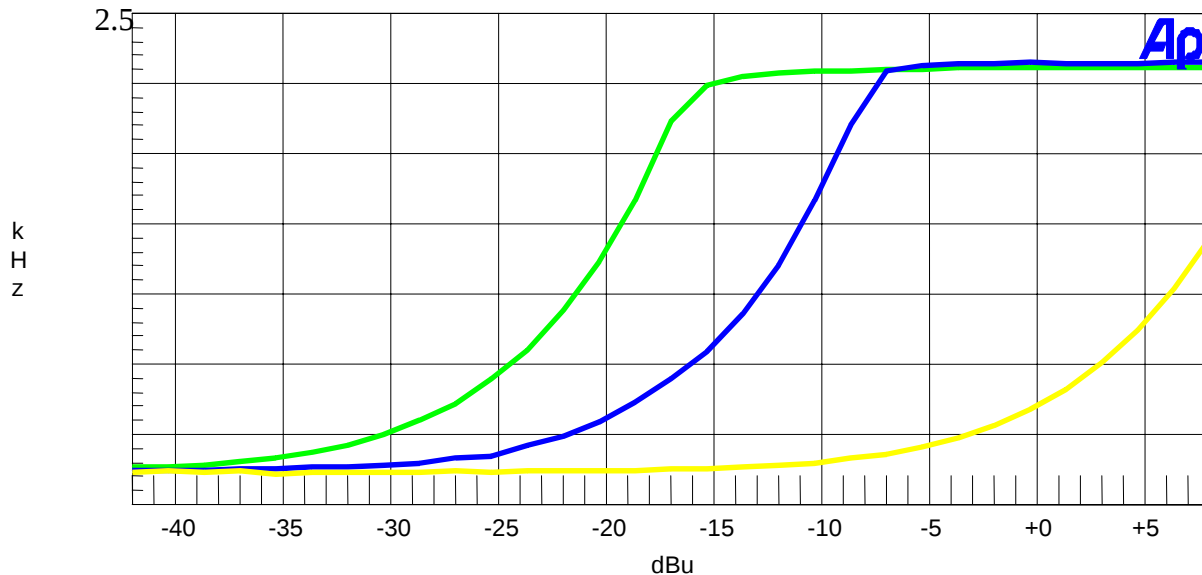
<http://www.timcoengr.com>

888.472.2424 F 352.472.2030 email: sid@timcoengr.com

2.1047(b) Audio input versus modulation

The audio input level needed for a particular percentage of modulation was measured in accordance with TIA/EIA Specification 603. The audio input curves versus modulation are on the following pages. Curves are provided for audio input frequencies of 300, 1000, and 2500 Hz. See the plot below.

Modulation Limiting Plots:
2.5 KHz (Green), 1.0 KHz (Blue), and 300 Hz.



APPLICANT: TEKCOM INDUSTRIES LTD.

FCC ID: KLLTP-329

REPORT #: T\TEKCOM_KLL\297AUT4\297AUT4TestReport.doc

TIMCO ENGINEERING INC.

849 NW State Road 45

Newberry, Florida 32669

<http://www.timcoengr.com>

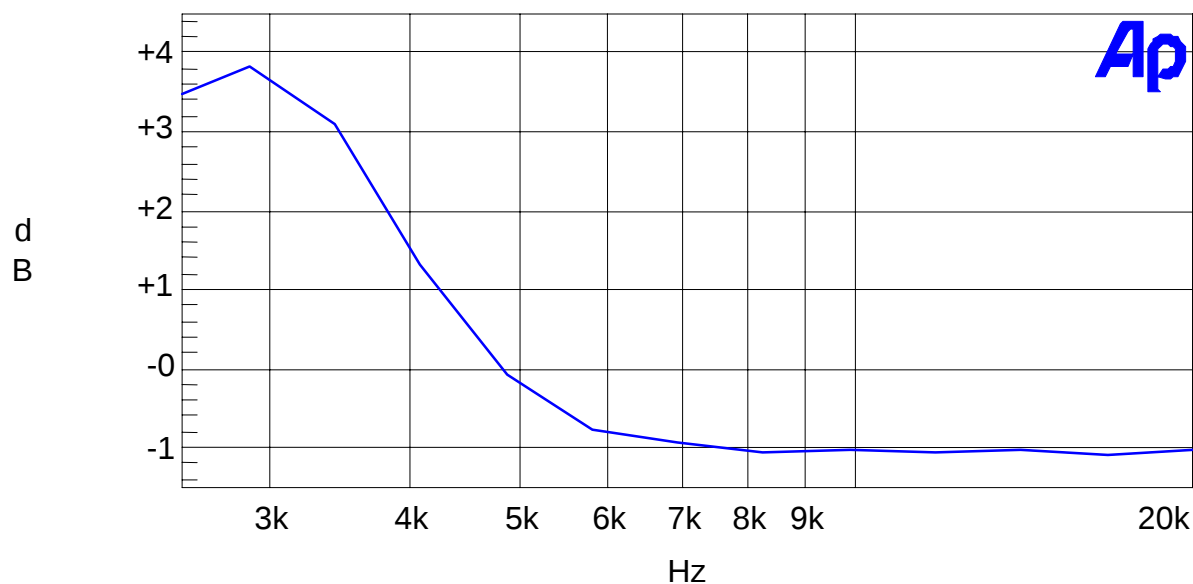
888.472.2424 F 352.472.2030 email: sid@timcoengr.com

95.637

Post Limiter Filter

Each FRS transmitter, except a mobile station transmitter with a power of 2.5Watts or less, must be equipped with an audio low pass filter. At any frequency between 3 & 20 kHz the filter must have an attenuation of $60\log(f/3)$ greater than the attenuation at 1KHz. See below.

Audio Low Pass Filter



APPLICANT: TEKCOM INDUSTRIES LTD.

FCC ID: KLLTP-329

REPORT #: T\TEKCOM_KLL\297AUT4\297AUT4TestReport.doc

TIMCO ENGINEERING INC.

849 NW State Road 45

Newberry, Florida 32669

<http://www.timcoengr.com>

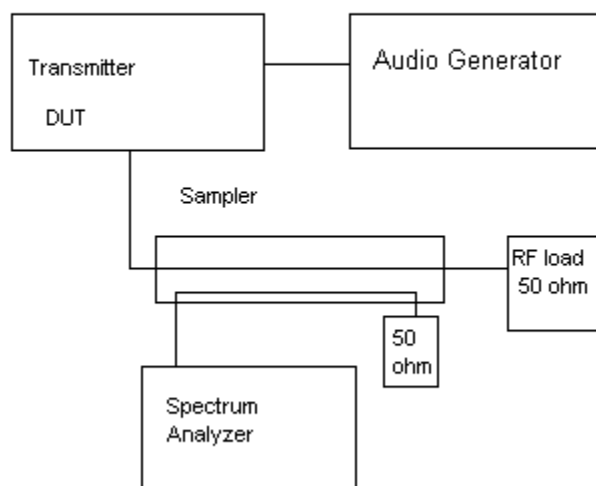
888.472.2424 F 352.472.2030 email: sid@timcoengr.com

2.1049 Occupied bandwidth:

95.635(b)(1)(3)(7)

At least 25dB on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth. At least 35 dB on any frequency removed from the center of the authorized BW by more than 100% up to and including 250% of the authorized BW. At least $43 + \log_{10}(TP)$ dB on any frequency removed from the center of the authorized bandwidth by more than 250%. See plot on the next page.

Occupied BW Test Equipment Setup



APPLICANT: TEKCOM INDUSTRIES LTD.

FCC ID: KLLTP-329

REPORT #: T\TEKCOM_KLL\297AUT4\297AUT4TestReport.doc

TIMCO ENGINEERING INC.

849 NW State Road 45

Newberry, Florida 32669

<http://www.timcoengr.com>

888.472.2424 F 352.472.2030 email: sid@timcoengr.com

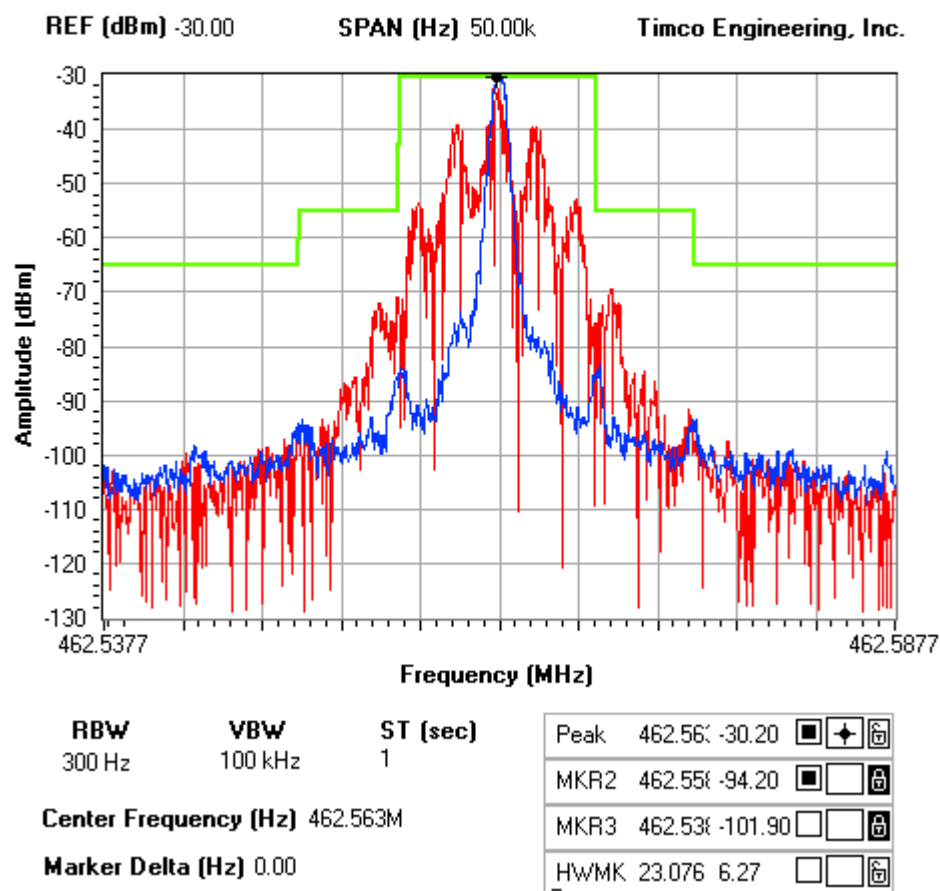
OCCUPIED BANDWIDTH PLOT

NOTES:

TEKCOM INDUSTRIES LTD. - FCC ID: KLLTP-329

OCCUPIED BANDWIDTH PLOT

FCC 95.635 Mask (1) (3) (7)



APPLICANT: TEKCOM INDUSTRIES LTD.

FCC ID: KLLTP-329

REPORT #: T\TEKCOM_KLL\297AUT4\297AUT4TestReport.doc

TIMCO ENGINEERING INC.

849 NW State Road 45
Newberry, Florida 32669
<http://www.timcoengr.com>
888.472.2424 F 352.472.2030 email: sid@timcoengr.com

NAME OF TEST: **SPURIOUS EMISSIONS AT ANTENNA TERMINALS**

2.1051 Not Applicable, no antenna terminal allowed.

2.1053 **UNWANTED RADIATION (462.56 MHz):**
95.635(b)(7)

The tabulated Data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the 10th harmonic of the fundamental. This test was conducted per ANSI C63.4-1992.

REQUIREMENTS: $43 + 10\log(.4) = 39.02 \text{ dB}$

TEST DATA:

Emission Frequency MHz	Ant. Polarity	Corrected EUT Signal Reading	Coax Loss (dB)	Substitution Antenna (dBd)	dB Below Carrier (dBc)
462.56	V	11.8	0	0.00	0.00
925.12	V	-30.1	0	-0.85	42.75
1387.68	V	-34.4	1.1	4.50	42.80
1850.24	V	-46.2	1.2	5.16	54.04
2312.80	V	-51.3	1.25	6.25	58.10
2775.36	V	-54.6	1.3	7.07	60.63
3237.92	V	-44.4	1.4	7.39	50.21
3700.48	H	-50.1	1.4	7.55	55.75
4163.04	H	-40.2	1.45	7.81	45.64
4625.60	H	-48.2	1.5	8.20	53.30

APPLICANT: TEKCOM INDUSTRIES LTD.

FCC ID: KLLTP-329

REPORT #: T\TEKCOM_KLL\297AUT4\297AUT4TestReport.doc

TIMCO ENGINEERING INC.

849 NW State Road 45
Newberry, Florida 32669
<http://www.timcoengr.com>
888.472.2424 F 352.472.2030 email: sid@timcoengr.com

2.1053
95.635(b)(7)

UNWANTED RADIATION (471.71 MHz):

The tabulated Data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the 10th harmonic of the fundamental. This test was conducted per ANSI C63.4-1992.

REQUIREMENTS: $43 + 10\log(.4) = 39.02 \text{ dB}$

TEST DATA (467.71 MHz):

Emission Frequency MHz	Ant. Polarity	Corrected EUT Signal Reading	Coax Loss (dB)	Substitution Antenna (dBd)	dB Below Carrier (dBc)
467.71	V	11.80	0	0	0
935.20	V	-31.00	0	-0.97	43.77
1402.80	V	-32.90	1.1	4.56	41.24
1870.40	H	-45.70	1.2	5.17	53.53
2338.00	V	-54.50	1.25	6.33	61.22
2805.60	H	-55.80	1.3	7.09	61.81
3273.20	V	-53.00	1.4	7.41	58.79
3740.80	V	-49.30	1.4	7.55	54.95
4208.40	H	-46.10	1.45	7.88	51.47
4676.00	V	-54.70	1.5	8.14	59.86

APPLICANT: TEKCOM INDUSTRIES LTD.

FCC ID: KLLTP-329

REPORT #: T\TEKCOM_KLL\297AUT4\297AUT4TestReport.doc

TIMCO ENGINEERING INC.

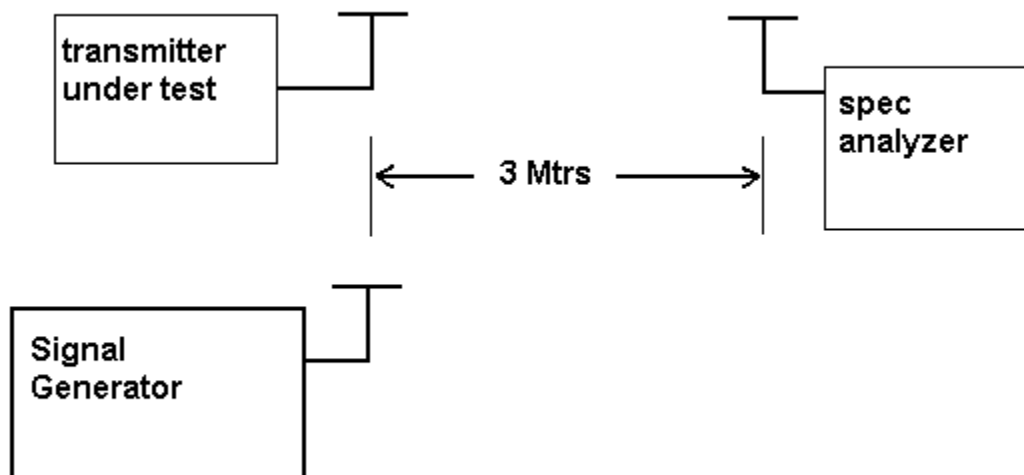
849 NW State Road 45

Newberry, Florida 32669

<http://www.timcoengr.com>

888.472.2424 F 352.472.2030 email: sid@timcoengr.com

Method of Measuring Radiated Spurious Emissions



Equipment placed 80 cm above ground
on a rotatable platform.

* Appropriate antenna raised from 1 to 4 M.

METHOD OF MEASUREMENT: The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per TIA/EIA STANDARD 603 using the substitution method. Measurements were made at the open field test site of TIMCO ENGINEERING, INC. located at 849 NW State Road 45, Newberry, FL 32669.

APPLICANT: TEKCOM INDUSTRIES LTD.

FCC ID: KLLTP-329

REPORT #: T\TEKCOM_KLL\297AUT4\297AUT4TestReport.doc

Page 10 of 12

TIMCO ENGINEERING INC.

849 NW State Road 45
Newberry, Florida 32669
<http://www.timcoengr.com>
888.472.2424 F 352.472.2030 email: sid@timcoengr.com

2.1055

Frequency stability:

95.621(b)

Temperature and voltage tests were performed to verify that the frequency remains within the 0.00025%, 2.5 ppm specification limit. The test was conducted as follows: The transmitter was placed in the temperature chamber at 25° 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° 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° C.

Readings were also taken at plus and minus 15% of the battery voltage of 4.5 VDC.

MEASUREMENT DATA:

Assigned Frequency (Ref. Frequency): 462.562 840

TEMPERATURE C	FREQUENCY MHz	PPM
REFERENCE_____	462.562 840	0.00
-30C_____	462.562 174	-1.44
-20C_____	462.562 680	-0.35
-10C_____	462.562 821	-0.04
0C_____	462.562 961	0.26
10C_____	462.563 028	0.41
20C_____	462.562 840	0.00
30C_____	462.563 123	0.61
40C_____	462.563 547	1.53
50C_____	462.563 756	1.98

BATT. %	BATT. DATA	VOLTS	BATT. PPM
-15%	462.562 761	3.83	-0.17

RESULTS OF MEASUREMENTS: The test results indicates that the EUT meets the requirements.

Note: This EUT meets the frequency stability requirement for a FRS: +/- 2.5ppm over temp range of -20 degrees C to +50 degrees C.

APPLICANT: TEKCOM INDUSTRIES LTD.

FCC ID: KLLTP-329

REPORT #: T\TEKCOM_KLL\297AUT4\297AUT4TestReport.doc

TIMCO ENGINEERING INC.

849 NW State Road 45

Newberry, Florida 32669

<http://www.timcoengr.com>

888.472.2424 F 352.472.2030 email: sid@timcoengr.com

EMC Equipment List

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/26/01	3/26/04
3-Meter OATS	TEI	N/A	N/A	Listed 1/13/03	1/13/06
Biconnical Antenna	Eaton	94455-1	1057	CAL 3/18/03	3/18/05
Biconnical Antenna	Eaton	94455-1	1096	CAL 10/1/01	10/1/03
Biconnical Antenna	Electro- Metrics	BIA-25	1171	CAL 4/26/01	4/26/03
Blue Tower Quasi-Peak Adapter	HP	85650A	2811A01279	CAL 4/15/03	4/15/05
Blue Tower RF Preselector	HP	85685A	2926A00983	CAL 4/15/03	4/15/05
Blue Tower Spectrum Analyzer	HP	8568B	2928A04729 2848A18049	CAL 4/15/03	4/15/05
LISN	Electro- Metrics	ANS-25/2	2604	CAL 10/9/01	10/9/03
LISN	Electro- Metrics	EM-7820	2682	CAL 3/12/03	3/12/05
Log-Periodic Antenna	Eaton	96005	1243	CAL 5/8/03	5/8/05

APPLICANT: TEKCOM INDUSTRIES LTD.

FCC ID: KLLTP-329

REPORT #: T\TEKCOM_KLL\297AUT4\297AUT4TestReport.doc