

FCC Part 15 Sub-Part B & C EMI Test Report

on
Condor/Raven Meter
[FCC ID: PDVCONRAV]

models
AD16-H13S/NT3/L (Condor) &
AD20-H13S/NT3 (Raven)

applicant
Metering Technology Corporation
360 El Pueblo Drive
Scotts Valley, California 95066 USA

evaluated and prepared by
International Technology Company (ITC)
9959 Calaveras Road, Box 543
Sunol, California 94586-0543
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web Site: www.itcemc.com



EN45001 Accredited Compliance Laboratory (RES-GmbH)
Registration number: TTI-P-G 159/98-00 (RES-GmbH)

Part 1

General Information

Product Name	Condor/Raven Meter
FCC ID	PDVCONRAV
Model(s)	AD16-H13S/NT3/L (Condor) & AD20-H13S/NT3 (Raven)
Manufacturer's Name: Manufacturer's Address	Metering Technology Corporation 360 El Pueblo Drive Scotts Valley, California 95066 USA
Contact:	Tel: 831-438-9999 Mr. Vijay Dhingra Fax: 831-440-9988 vdhingra@metertech.com
Test Laboratory	International Technology Company (ITC) 9959 Calaveras Road, PO Box 543 Sunol, CA 94586-0543 Tel: (925) 862-2944 Email: itcemc@aol.com Fax: (925) 862-9013 Web Site: www.itcemc.com
Test & Report Numbers	20010410-1
Test Date & Issue Date	April 10 – 16, 2001
Total No. of Pages	21
Project Technician	Elijah Garcia & O'Lanre Owoborode

According to testing performed at International Technology Company (ITC); the above-mentioned unit is in compliance with the emissions requirements defined in FCC Part 15 B and C. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

Emissions Requirements

1. Powerline Conducted Emissions in a shielded room utilizing two LISN's per 47 CFR §15.207.
2. Radiated Emissions in a 3-meter open area site per 47 CFR §15.209 and §15.31(m).
3. Harmonics and Spurious Emissions Test in accordance with the FCC test procedure 47 CFR §2.1053 and §15.233.
4. Maximum Peak Output Power Test Requirement in accordance with 47 CFR §15.233.
5. DSS Processing Gain Calculation of NCI Module
6. ERP Calculation per EIA/IS-19-B-1988 & TIA/EIA/IS-137-A-1996
7. MPE Calculation

The results show that the sample equipment tested as described in this report is in compliance with the FCC Rules Part 15, SubPart B: Powerline Conducted Emissions, Open Field Radiated Emissions. Occupied Bandwidth, Harmonics and Spurious Emissions and Maximum Peak Output Power test requirement limits of, SubPart C.

Michael Gbadebo, PE
Engineering Manager

Applicant: Metering Technology Corporation

Report No: 0104FRS110-1

Rev. 1.1 (05/24/2001)

Prepared By: International Technology Company (ITC)
9959 Calaveras Road, PO Box 543
Sunol, CA 94586-0543 USA
Tel: (925) 862-2944 Fax: (925) 862-9013
Email: itcemc@aol.com Web: www.itcemc.com

Condor/Raven Meters
Models: AD16-H13S/NT3/L (Condor) &
AD20-H13S/NT3 (Raven)
FCC ID: PDVCONRAV

FCC Part 15 SubPart B & C

Declaration/Disclaimer

International Technology Company (ITC) reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. International Technology Company (ITC) shall have no liability for any deductions, inferences or generalizations drawn by the client or others from International Technology Company (ITC) issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval. The client/applicant/manufacturer may not use this report to claim product endorsement by NVLAP or any US Government agency.

International Technology Company (ITC) is:

Accepted by the Federal Communications Commission (FCC) for FCC Methods, CISPR Methods and AUSTEL Technical Standards (Ref. NVLAP Lab Code 200172-0)

Approved by the Industry Canada for Telecom Testing

Certified by Rockford Engineering Services GmbH for EMC Testing according to the European EMC Directive 89/336/EEC per EN45001

Certified by Reg. TP for EMC Testing according to the European EMC Directive 89/336/EEC per EN45001 for RES GmbH (DAR-Registration number: TTI-P-G159/98-00)

Certified by the Voluntary Control Council for Interference by Information Technology Equipment (VCCI) for EMC testing in accordance with the Regulations for Voluntary Control Measures, Article 8, Registration Numbers - Site 1: C-714 and R-696; Site 2: C-715 and R-697

Applicant: Metering Technology Corporation

Report No: 0104FRS110-1

Rev. 1.1 (05/24/2001)

Prepared By: International Technology Company (ITC)
9959 Calaveras Road, PO Box 543
Sunol, CA 94586-0543 USA
Tel: (925) 862-2944 Fax: (925) 862-9013
Email: itcemc@aol.com Web: www.itcemc.com

Condor/Raven Meters
Models: AD16-H13S/NT3/L (Condor) &
AD20-H13S/NT3 (Raven)
FCC ID: PDVCONRAV

FCC Part 15 SubPart B & C

Engineering Services Offered by ITC

1) Reliability / Environmental Consulting And Services

- Reliability Svcs. for Systems & Components
- MTBF Calculations
- MTTF Calculations
- Temperature Cycling Testing
- Thermal Shock Testing
- Vibration Shock Testing

2) Engineering Evaluation & Testing

- OSHA Third Party Evaluations
- SEMI S2 Reviews, 1993
- USB Specification Evaluations/Testing
- SAE Specification Evaluations/Testing
- EIA/TIA Specifications i.e. 571-A and 631
- MIL-STD i.e. 461,462,1541/EMC, 883/ESD

3) Compliance Design Consultation and Regulatory Testing Services

US: EMI/Telecom (FCC)

- FCC15 /Class A
- FCC15 /Class B and DoC
- FCC15 /SubPart C
- FCC 24
- FCC 68 (Analog and Digital)
- FCC 90
- FCC 95

Product Safety (UL/NRTL)

- All UL Standards, Including:**
- UL1950 /ITE
- UL 2601 /Medical
- UL1459 /Telecom
- UL1411 /Audio, Radio, TV
- UL 813 /Commercial Audio
- UL1604 /Hazard. Location
- UL 508 /Energy Mgmt. Equip.

EU: EMI/EMC (EN)

- EN 50081-1 /50081-2
- EN 50082-1 /50082-2
- EN 55103-1 / 55103-2
- EN 60601-1-2
- EN 55011 /55013 /55014
- EN 55015 /55020 /55022
- EN 60555-2 /60555-3
- EN 61000-3-2 /61000-3-3
- EN 61000-4-2 /61000-4-3
- EN 61000-4-4 /61000-4-5
- EN 61000-4-6 /61000-4-8 /61000-4-11

Canada: EMI, Safety, Telecom

- RSS 210 & RSS 221
- Industry Canada /IC CS-03

Asia - Australia/ International

- CISPR 11,13,14,15,16,20,22
- VCCI Class 1 & 2 /Japan

All c-UL Standards for Canada

- AS/NZ 3548: C-Tick Mark, EMC

All CSA Standards, including:

- CNS13438 - 1996 /Taiwan
- ITU Standards
- IEC /ETSI Standards
- BellCore Standards
- IEEE /ANSI Standards

EU: Safety/Machinery (EN)

- EN 60950 /61010-1
- EN 60204 /60065
- EN 60601-1-1
- TÜV

*Competent Body Representation/EU

ITC – Your One-Stop-Shop

Our comprehensive capabilities, friendly environment & fast project turn-around time makes ITC the ideal **one-stop-shop** for your engineering services needs, providing manufacturers with compliance design consultation, reliability & compliance engineering. We are committed to delivering the highest-quality engineering services & expertise you can expect at reasonable, competitive rates. We look forward to working with you on your next design, reliability compliance or engineering consultation project. For more information, contact our Business Services Department.

You can call or e-mail us at:

Toll-Free: 1-888-336-7625 – **Internet:** <http://www.itcemc.com> – **E-mail:** itcemc@aol.com

Table of Contents

	Pages
Part 1: General	
General Information.....	2
1.1 Test Methodology.....	7
1.2 Summary	7
1.3 Support Equipment.....	7
1.4 Test Diagram	7

Part 2: FCC Part 15 SubPart B, Powerline Conducted Emissions

2.1 EUT Configuration.....	8
2.2 Test Procedure.....	8
2.3 Field Strength Calculation.....	8
2.4 Spectrum Analyzer Configuration.....	8
2.5 Administrative Details.....	9
2.6 Powerline Conducted Emissions Test Results.....	9

Part 3: FCC Part 15 SubPart B, Open Field Radiated Emissions

3.1 EUT Configuration.....	10
3.2 Test Procedure.....	10
3.3 Field Strength Calculation.....	10
3.4 Spectrum Analyzer Configuration.....	10
3.5 Administrative Details	11
3.6 Open Field Radiated Emissions Test Results	11

Part 4: Fundamental Harmonic and Spurious Emissions

4.1 EUT Configuration.....	12
4.2 Test Procedure.....	12
4.3 Spectrum Analyzer Configuration.....	12
4.4 Administrative Detail	13
4.5 Fundamental Harmonic and Spurious Emissions Test Results.....	13

Part 5: FCC Part 15 SubPart C, RF Power Output

5.1.1 EUT Configuration	14
5.1.2 Test Procedure.....	14
5.2 Maximum Peak Output Power Plot.....	15

Table of Contents

	Pages
Tables	
2.6 Powerline Conducted Emissions	9
3.6 Open Field Radiated Emissions.....	11
4.5 Fundamental Harmonic and Spurious Emissions	13

Plot

5.2 Maximum Peak Output Power	15
-------------------------------------	----

Dwell Time Test.....	16
DSS Processing Gain of NCI Module.....	17
ERP & MPE Calculation	18

Appendices

A: Test Equipment	19-20
B: Modification.....	21

Applicant: Metering Technology Corporation

Report No: 0104FRS110-1

Rev. 1.1 (05/24/2001)

Prepared By: International Technology Company (ITC)
9959 Calaveras Road, PO Box 543
Sunol, CA 94586-0543 USA
Tel: (925) 862-2944 Fax: (925) 862-9013
Email: itcemc@aol.com Web: www.itcemc.com

Condor/Raven Meters
Models: AD16-H13S/NT3/L (Condor) &
AD20-H13S/NT3 (Raven)
FCC ID: PDVCONRAV

FCC Part 15 SubPart B & C

General Contd.

1.1. Test Methodology

The electromagnetic interference tests, which this report describes, were performed by an independent electromagnetic compatibility consultant, International Technology Company, in accordance with the FCC test procedure as specified in ANSI C63.4-1992.

1.2. Test Facility

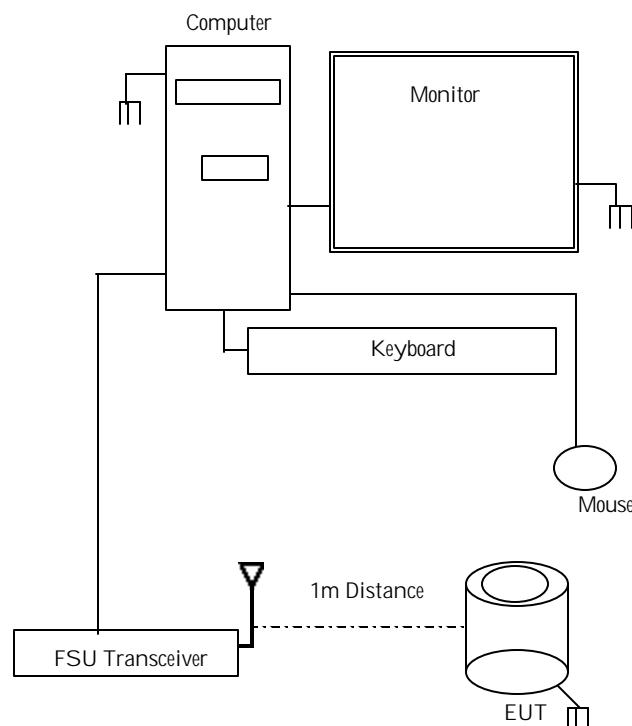
The open area test site, the conducted measurement facility, and the test equipment used to collect the emissions data is located in Sunol, California, and is fully described in site attenuation report. The approved site attenuation description is on file at the Federal Communications Commission.

1.3. Support Equipment included in the Tests:

The Condor/Raven Meter was supported with the following peripherals

No.	Description	Manufacturer	Model	Serial Number	FCC ID
1	Computer	Compaq	Presario	Not Provided	DoC Approved
2	Monitor	Viewsonic	VCDTS21442-1M	ME90702466-1M	DoC Approved
3	Mouse	Compaq	M-S489	Not Provided	JNZ201213
4	Keyboard	Compaq	SK-2800	Not Provided	GYUR66SK
5	Transceiver	Innovatec	922	070	OWS-922

1.4. Tests Setup Diagram



Applicant: Metering Technology Corporation

Report No: 0104FRS110-1

Rev. 1.1 (05/24/2001)

Prepared By: International Technology Company (ITC)
9959 Calaveras Road, PO Box 543
Sunol, CA 94586-0543 USA
Tel: (925) 862-2944 Fax: (925) 862-9013
Email: itcmc@aol.com Web: www.itceme.com

Condor/Raven Meters
Models: AD16-H13S/NT3/L (Condor) &
AD20-H13S/NT3 (Raven)
FCC ID: PDVCONRAV

FCC Part 15 SubPart B & C

Part 2

Powerline Conducted Emissions

Per FCC Part 15 Subpart B

2.1. EUT Configuration

Pre-scan measurements are first performed by collecting data with a spectrum analyzer. Significant peaks are marked and then quasi-peaked. Measurement range investigated was from 450KHz to 30MHz. The Condor/Raven Meter was set up in accordance with the suggested configuration given in FCC Measurement Procedure ANSI C63.4-1992. The measurement instrumentation used was a receiver with bandwidth parameters as stipulated in ANSI C63.4-1992. The EUT was set up on a wooden non-conductive tabletop, 80 cm above the ground reference plane, in a shielded room. It was connected to peripherals as listed and sketched in the previous page, to transmit in a continuous mode. Excess cords of the equipment were left to dangle towards the LISN. Grounding was through the power cord and voltage was 120Vac.

2.2 . Test Procedure

The NCI was transmitting continuously with modulation turned on. The Condor/Raven Meter was operated in a worst-case condition of orientation. The power line conducted EMI tests were run on the current carrying conductor of the power cords of the EUT. The highest line conducted emissions were also analyzed in detail by operating the spectrum analyzer in fixed tuned mode to determine the precise amplitude of the emissions.

2.3 . Data Table Legend and Field Strength Calculation

'Margin' indicates the degree of compliance with the applicable limit. For example, a margin of -8 dB means that the emission is 8 dB below the limit (in compliance). A margin of +4 dB means that the emission is 4 dB over the limit (out of compliance). The margin is calculated as follows:

Margin = Corrected Amplitude - Limit; where Corrected Amplitude = Amplitude + Cable Loss - Distance Factor.
the amplitude measured in a quasi peak mode.

2.4 . Spectrum Analyzer Configuration (during swept frequency scans)

Start Frequency.....	450 KHz
Stop Frequency	30MHz
Sweep Speed	Manual
Resolution Bandwidth.....	10KHz
Video Bandwidth	10KHz
Quasi Peak Adapter Bandwidth	9KHz
Quasi Peak Adapter Mode.....	Normal

Powerline Conducted Emissions Per FCC Part 15 SubPart B

2.5. Administrative Details

Test Date(s)	April 10, 2001
Emission Limits	Class B
Temperature/Humidity	29.5°C / 62%
Test Technician(s)	Elijah Garcia

2.6. Test Results

The table below shows a summary of the highest conducted emissions on all current carrying conductors of the EUT power cord compared to the FCC Class B limit.

EUT in Transmitting and Receiving Mode

Indicated Frequency MHz	Amplitude dBuV	Cable Loss dB	Corrected Amplitude dBuV	Condition	Ground	FCC 15 Limit dBuV	Class A Margin dB	FCC 15 Limit dBuV	Class B Margin dB
.480	38.8	1.0	39.8	Neutral	Connected	60.0	-20.2	48.0	-8.2
.510	40.4	1.0	41.4	Hot	Connected	60.0	-18.6	48.0	-6.6
15.230	42.0	1.0	43.0	Hot	Connected	69.5	-26.5	48.0	-5.0
15.550	39.5	1.0	40.5	Neutral	Connected	69.5	-29.0	48.0	-7.5
26.570	28.5	1.0	29.5	Neutral	Connected	69.5	-40.0	48.0	-18.5
27.050	34.2	1.0	35.2	Neutral	Connected	69.5	-34.3	48.0	-12.8
27.400	18.6	1.0	19.6	Hot	Connected	69.5	-49.9	48.0	-28.4

No emissions of significant levels were observed between 450 KHz and 30 MHz.

Conclusion:

The Condor/Raven Meter meets the requirements of the test reference for Powerline Conducted Emissions.

Part 3

Open Field Radiated Emissions

Per FCC Part 15 Subpart B

3.1. EUT Configuration

Similar to the test set for powerline conducted emissions, the EUT along with its associated peripherals were setup for radiated emissions scanning in an open field. Frequency measurement was taken from 30MHz to the 10thharmonic.

3.2. Test Procedure

The EUT was set up as described above, in a transmitting and receiving mode, using the FSU as the transmitting source. It was rotated 360 degrees azimuth and the search antenna height varied 1to 4 m in order to maximize the emissions from the EUT. The highest emissions were also analyzed in detail by operating the spectrum analyzer in fixed tuned mode to determine the precise amplitude of the emissions.

3.3. Data Table Legend and Field Strength Calculation

'Margin' indicates the degree of compliance with the applicable limit. For example, a margin of -8 dB means that the emissions are 8 dB below the limit (in compliance); +a margin of +4 dB means that the emission is 4 dB over the limit (out of compliance). The margin calculated as follows:

Margin = Corrected Amplitude - Limit, where Corrected Amplitude = Amplitude + Antenna Correction Factor + Cable Loss - Distance Factor, measured in quasi peak mode.

3.4. Spectrum Analyzer Configuration (during swept frequency scans)

Start Frequency 30MHz
Stop Frequency 1000MHz
Sweep Speed Manual

Measurements below 1GHz

RES Bandwidth.....100 KHz
Video Bandwidth.....100 KHz
Quasi Peak Adapter Mode.....Normal
Quasi peak Adapter Bandwidth120 KHz

Measurements above 1GHz (unless stated otherwise)

Analyzer Mode.....Video Filter
RES Bandwidth.....1MHz
Video Bandwidth.....1MHz
Freq. Span3MHz
Offset.....0dB
Quasi Peak Adapter Mode.....Disabled

Open Field Radiated Emissions Per FCC Part 15 SubPart B

3.5. Administrative Details

Test Date(s)	April 11, 2001
Emission Limits	Class B
Distance	10M Field
Test Technician(s)	O'Lanre Owoborode
Antenna Used	Biconical Antenna, model # EMCO 3104, S/N 3459 and Log Periodic Antenna, model # EMCO 3146, S/N 2075 (calibrated 01/19/2001, next calibration due date is 01/19/2002)

3.6. Test Results

The table below shows a summary of the highest amplitudes of the radiated emissions from the equipment under test at various antenna heights, antenna polarization, and EUT orientations.

Indicated Frequency MHz	Amplitude dBuV/M	Antenna dB	Cable dB	Correction Amplitude dBuV/M	T/Tab Angle Degree	Height M	Antenna Polarization	FCC15 Limit dBuV/M	Class B Margin dB
49.16	11.0	7.7	2.7	21.4	180	1.0	VB	40.0	-18.6
62.05	11.8	8.3	2.9	23.0	0	1.0	VB	40.0	-17.0
65.40	11.0	7.9	2.9	21.8	0	1.0	VB	40.0	-18.2
66.50	13.6	7.5	2.9	24.0	0	1.0	VB	40.0	-16.0
75.90	21.0	4.1	3.2	28.3	315	1.0	VB	40.0	-11.7
75.90	13.7	4.1	3.2	21.0	180	2.0	HB	40.0	-19.0
78.05	13.2	3.7	3.2	20.1	45	2.5	HB	40.0	-19.9
85.07	9.0	3.9	3.3	16.2	45	1.0	VB	40.0	-23.8
132.00	6.0	10.2	4.2	20.4	0	1.0	VB	43.0	-22.6
199.96	5.0	12.3	5.2	22.5	135	1.0	HB	43.0	-20.5
200.00	14.3	9.2	5.2	28.7	135	2.0	HL	43.0	-14.3
204.00	12.3	9.3	5.3	26.9	135	1.0	VL	43.0	-16.1
286.30	9.7	12.6	6.6	28.9	180	1.0	VL	46.0	-17.1
286.40	13.0	12.6	6.6	32.2	180	2.0	HL	46.0	-13.8
333.30	6.7	12.5	7.4	26.6	180	1.0	HL	46.0	-19.4
747.50	4.5	18.8	12.2	35.5	0	1.0	VL	46.0	-10.5

No emissions of significant levels were observed between 30 MHz and 1000MHz. There were no significant emissions above 1GHz.

Conclusion

The Condor/Raven Meter meets the requirements of the test reference for Open Field Radiated Emissions.

Applicant: Metering Technology Corporation

Report No: 0104FRS110-1

Rev. 1.1 (05/24/2001)

Prepared By: International Technology Company (ITC)
9959 Calaveras Road, PO Box 543
Sunol, CA 94586-0543 USA
Tel: (925) 862-2944 Fax: (925) 862-9013
Email: itcmc@aol.com Web: www.itcmc.com

Condor/Raven Meters
Models: AD16-H13S/NT3/L (Condor) &
AD20-H13S/NT3 (Raven)
FCC ID: PDVCONRAV

FCC Part 15 SubPart B & C

Part 4

Fundamental Harmonic & Spurious Emissions

Per FCC Part 2 Section 47 CFR §2.1053 & Part 15 Section 47 CFR §15.233

4.1. EUT Configuration

The Condor/Raven Meter was set up in accordance with the suggested configuration given in FCC Measurement Procedure ANSI C63.4-1992. The measurement instrumentation used was Hewlett Packard 8566B and 8569A Spectrum Analyzers with detector and bandwidth parameters as stipulated in C63.4-1992. At frequencies above 1GHz, average measurements, if necessary, were made using the video filter method and quasi peak detector and preselector functions were disabled.

4.2. Test Procedure

The EUT was placed on the test table and configured for maximum response to transmit continuously. Signal strength was monitored with HP 8566B and HP8569A Spectrum Analyzers, below and above the center frequencies using an appropriate receiving antenna. Maximum emissions were obtained by varying the height of the antennas and then orienting the turntable in 360-degree turns with the analyzer in the manual mode. Unless stated otherwise, the antenna to EUT distance was 1 meter. The measurements are peak below 1GHz and average measurements above 1GHz

4.3. Spectrum Analyzer Configuration (During Swept Frequency Scans)

Start Frequency	30 MHz	→	Fundamental
Stop Frequency	1,000MHz		
Sweep Speed	Manual		
RES Bandwidth.....	100KHz		
Video Bandwidth.....	100 KHz		
Quasi Peak Adapter Mode.....	Normal		

Measurements above 1GHz (unless stated otherwise)

Analyzer Mode.....	Video Filter	→	Harmonics
RES Bandwidth.....	1MHz		
Video Bandwidth.....	1MHz		
Freq. Span	1GHz		
Offset.....	0dB		
Sweep Speed	30mSec		
Fundamental Frequency.....	792.3MHz		
Amplitude Gain.....	30dB		
Quasi Peak Adapter Mode.....	Disabled		

Applicant: Metering Technology Corporation

Report No: 0104FRS110-1

Rev. 1.1 (05/24/2001)

Prepared By: International Technology Company (ITC)
9959 Calaveras Road, PO Box 543
Sunol, CA 94586-0543 USA
Tel: (925) 862-2944 Fax: (925) 862-9013
Email: itcmc@aol.com Web: www.itcmc.com

Condor/Raven Meters
Models: AD16-H13S/NT3/L (Condor) &
AD20-H13S/NT3 (Raven)
FCC ID: PDVCONRAV

FCC Part 15 SubPart B & C

**Fundamental Harmonic & Spurious Emissions of the LAN (NCI) module
Per FCC Part 2 Section 47 CFR §2.1053 & Part 15 Section 47 CFR §15.233**

4.4. Administrative Details

Test Date(s)	April 12-13, 2001
Emission Limits	Class C
Test Technician(s)	O'Lanre Owoborode

4.5. Test Results

The table below shows a summary of the highest amplitudes of the radiated emissions from the equipment under test at various antenna heights, antenna polarizations, and EUT orientations.

Indicated Frequency MHz	Amplitude dBuV/M	Antenna dB	Cable dB	Corrected Amplitude dBuV/M	Height M	Antenna Polarization	FCC 15 Limit dBuV/M	Class C Margin dB
1.580	26.4	16.1	2.00	44.5	1.0	VB	54.0	-9.50
2.379	10.5	23.3	4.73	38.53	1.0	VB	54.0	-15.47
3.168	10.2	25.5	5.16	40.86	1.0	VL	54.0	-13.14
3.960	5.3	26.4	5.43	37.13	1.0	HL	54.0	-16.87
4.752	2.7	28.2	5.50	36.40	1.0	VL	54.0	-17.60
5.546	3.2	28.8	6.74	38.74	1.0	VH	54.0	-15.26
6.337	4.8	32.9	8.63	46.33	1.0	VH	54.0	-7.67
7.131	2.1	33.1	9.31	44.51	1.0	VH	54.0	-9.49
7.923	1.8	33.6	10.8	46.20	1.0	VH	54.0	-7.80

No emissions of significant levels were observed.

Conclusion

The Condor/Raven Meter meets the requirements of the test reference for Harmonics and Spurious Emissions.

Applicant: Metering Technology Corporation

Report No: 0104FRS110-1

Rev. 1.1 (05/24/2001)

Prepared By: International Technology Company (ITC)
9959 Calaveras Road, PO Box 543
Sunol, CA 94586-0543 USA
Tel: (925) 862-2944 Fax: (925) 862-9013
Email: itcmc@aol.com Web: www.itcmc.com

Condor/Raven Meters
Models: AD16-H13S/NT3/L (Condor) &
AD20-H13S/NT3 (Raven)
FCC ID: PDVCONRAV

FCC Part 15 SubPart B & C

Part 5

Maximum Peak Output Power

Per FCC Part 15 Section 47 CFR §15.233

5.1. EUT Configuration

The Condor/Raven Meter was set up in accordance with the suggested configuration given in FCC Measurement Procedure ANSI C63.4-1992. The measurement instrumentation used was a Hewlett Packard 8569B Spectrum Analyzer with detector and bandwidth parameters as stipulated in C63.4-1992.

5.2. Test Procedure

The Condor/Raven Meter was placed on the test table. The EUT was configured for maximum response by transmitting continuously. Signal was monitored with a HP 8566B Spectrum Analyzer, using the EMC Double-Ridged Waveguide Horn Antenna, model 3115. Unless stated otherwise, the antenna to EUT distance was 1 meter.

RF power output = Measured value + antenna correction + cable correction - Amplifier Gain (if provided)

The plot in the next page shows that transmitted power 60dBuV(30mW) is lower than the specified maximum limit of 73.9dBuV (37mW)

$$39.2 - 10(\text{DF}) + 12.8(\text{CL}) + 18(\text{AF}) = 60\text{dBuV}$$

Legends

DF Distance Factor
CL Cable Loss
AF Antenna Factor

Applicant: Metering Technology Corporation

Report No: 0104FRS110-1

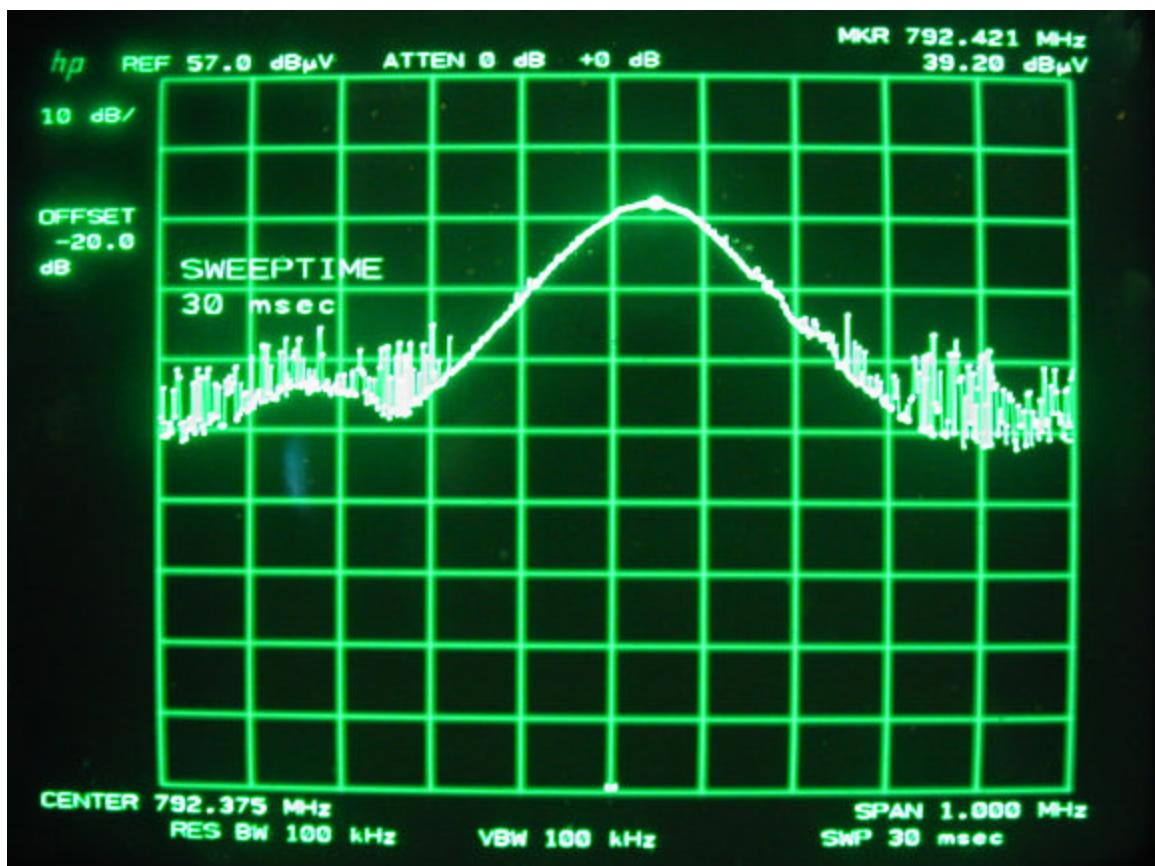
Rev. 1.1 (05/24/2001)

Prepared By: International Technology Company (ITC)
9959 Calaveras Road, PO Box 543
Sunol, CA 94586-0543 USA
Tel: (925) 862-2944 Fax: (925) 862-9013
Email: itcmc@aol.com Web: www.itcmc.com

Condor/Raven Meters
Models: AD16-H13S/NT3/L (Condor) &
AD20-H13S/NT3 (Raven)
FCC ID: PDVCONRAV

FCC Part 15 SubPart B & C

**5.3. Maximum Peak Output Power
Per FCC Part 15 Section 47 CFR §15.233**



Applicant: Metering Technology Corporation

Report No: 0104FRS110-1

Rev. 1.1 (05/24/2001)

Prepared By: International Technology Company (ITC)
9959 Calaveras Road, PO Box 543
Sunol, CA 94586-0543 USA
Tel: (925) 862-2944 Fax: (925) 862-9013
Email: itcmc@aol.com Web: www.itcmec.com

Condor/Raven Meters
Models: AD16-H13S/NT3/L (Condor) &
AD20-H13S/NT3 (Raven)
FCC ID: PDVCONRAV

FCC Part 15 SubPart B & C

6. Dwell Time Test Per FCC Part 15 Section 47 CFR §15.233

Dwell Time is 680mS
Interval between Operations is >10 sec.

NB. Plot will be provided later.

Applicant: Metering Technology Corporation

Report No: 0104FRS110-1

Rev. 1.1 (05/24/2001)

Prepared By: International Technology Company (ITC)
9959 Calaveras Road, PO Box 543
Sunol, CA 94586-0543 USA
Tel: (925) 862-2944 Fax: (925) 862-9013
Email: itcmc@aol.com Web: www.itcmc.com

Condor/Raven Meters
Models: AD16-H13S/NT3/L (Condor) &
AD20-H13S/NT3 (Raven)
FCC ID: PDVCONRAV

FCC Part 15 SubPart B & C

7. DSS Processing Gain Calculation of LAN (NCI) Module

- The Transmit module generates the spread spectrum binary sequence for output to the RF modulator (directly modulated VCO).
- The Transmitter logic encodes two consecutive bits of data into one of four possible 32-bit (chip) PN sequences. Consequently, an improvement in the signal to noise ratio is achieved since each pair of the data bit is now represented by 32 chips. The improvement, or processing gain in decibel is calculated as:

$$\text{Processing Gain} = 10 \log (32 \text{ chips} / 2 \text{ bits})$$

$$\text{Processing Gain} = 12 \text{ dB}$$

- The Transmitted PN sequence is further randomized by modulus-2 addition with a fixed 2047-bit PN sequence. This operation smoothes (spectral Whitens) the output spectrum by eliminating discrete spectral components.

Applicant: Metering Technology Corporation

Report No: 0104FRS110-1

Rev. 1.1 (05/24/2001)

Prepared By: International Technology Company (ITC)
9959 Calaveras Road, PO Box 543
Sunol, CA 94586-0543 USA
Tel: (925) 862-2944 Fax: (925) 862-9013
Email: itcmc@aol.com Web: www.itcmc.com

Condor/Raven Meters
Models: AD16-H13S/NT3/L (Condor) &
AD20-H13S/NT3 (Raven)
FCC ID: PDVCONRAV

FCC Part 15 SubPart B & C

8. ERP Calculation

Test: RF Power Output Radiated
Specification: 47 CFR 2.1046(a)
Guide: EIA/IS-19-B-1988 & TIA/EIA/IS-137-A-1996

Radiated Measurement Procedure

The EUT was placed on an open-field site and its radiated field strength at a known distance was measured by means of a spectrum analyzer. Data packets were transmitted numerous times, while the receiving antenna placed 3 meters from the transmit antenna captured the signal power. Equivalent loading was calculated from the equation.

$$P_t = ((E \times R)^2 / 49.2) \text{ watts, where } R = 3\text{m.}$$

E = Signal amplitude in v/m

Measurement accuracy is $\pm 1.5\text{dB}$

Frequency MHz	dBuV/m	Corr. Factor dBuV/m	Corr. Amp. dBuV/m	V/m @ 3m	ERP Watts
792.3	29.2	18.8	12.0	1000	0.183 μ W

$$60\text{dB}\mu\text{V/M} = \text{Log}^{-1}(60/20)$$

$$60\text{dB}\mu\text{V/M} = 10^3\mu\text{V/M} = 1000\mu\text{V/M}$$

$$\begin{aligned} P &= (E \times R)^2 / 49.2 \\ &= (1000 \times 3)^2 / 49.2 \\ &= (10^{-3} \times 3)^2 = \frac{(3 \times 10^{-3}\text{V})^2}{49.2} \\ &= (9 \times 10^{-6}) / 49.2 \\ &= 0.183 \times 10^{-6} \\ &= 0.183\mu\text{Watt} = 183\text{nWatt} \end{aligned}$$

RF Safety Exposure per FCC Requirement

The Maximum Permissible Exposure (MPE) distance per ANSI C95.1 table 2 for uncontrolled environment is $f(\text{MHz})/1500 [\text{mW/cm}^2]$. The numeric value of the gain for the antenna is 2(3dBi). Therefore power density is:

$$1000\text{mW} \times 2.0 / (4\pi r^2) = 792 / 1500 [\text{mW/cm}^2]$$

$$r = [(792\text{MHz}/1500\text{mW/cm}^2) (4\pi) / 1000\text{mW}]^{1/2}$$

$$\mathbf{r = 8.1\text{cm}}$$

Therefore, the maximum calculated MPE distance r is 8.1cm. The installation instructions shall indicate that at least 10.1cm (8.1 + 2 margin) separation shall be provided between the antenna and the people.

Applicant: Metering Technology Corporation

Report No: 0104FRS110-1

Rev. 1.1 (05/24/2001)

Prepared By: International Technology Company (ITC)
9959 Calaveras Road, PO Box 543
Sunol, CA 94586-0543 USA
Tel: (925) 862-2944 Fax: (925) 862-9013
Email: itcmc@aol.com Web: www.itcmc.com

Condor/Raven Meters
Models: AD16-H13S/NT3/L (Condor) &
AD20-H13S/NT3 (Raven)
FCC ID: PDVCONRAV

FCC Part 15 SubPart B & C

Appendix A

Test Equipment

Some or all of the following test equipment is currently used to measure the conducted and/or radiated emissions from the equipment under test:

Test Equipment	Manufacturer & Model Number	Serial Number	Calibration Date	Next Calibration Due Date
Spectrum Analyzer	Hewlett Packard 8590A	2752A02715	02/19/2001	02/19/2002
Spectrum Monitor	Rhode & Schwarz EZM	881334/025	02/19/2001	02/19/2002
Test Receiver (9 KHz - 30 MHz)	Rhode & Schwarz ESH3	RES0753	02/23/2001	02/23/2002
Test Receiver (20-1300 MHz)	Rhode & Schwarz ESVP	RES0749	02/22/2001	02/22/2002
Spectrum Analyzer	Hewlett-Packard 8566B	2618A02909	02/20/2001	02/20/2002
Spectrum Analyzer	Hewlett-Packard 8567A	2602A00239	02/20/2001	02/20/2002
Spectrum Analyzer Display (Site 1)	Hewlett-Packard 8590A	2542A11954	02/21/2001	02/21/2002
Spectrum Analyzer Display (Site 2)	Hewlett-Packard 85662A	2542A12593	03/01/2001	03/01/2002
Quasi Peak Adapter (Site 1)	Hewlett-Packard 85650	2521A00871	03/01/2001	03/01/2002
Quasi Peak Adapter (Site 2)	Hewlett-Packard 85650A	2521A00737	02/21/2001	02/21/2002
Preselector (Site 1)	Hewlett-Packard 85685A	2620A00265	03/01/2001	03/01/2002
Preselector (Site 2)	Hewlett-Packard 85685A	2648A00462	02/21/2001	02/21/2002
Preamp	Hewlett-Packard 8447D	2648A04855	03/01/2001	03/01/2002
Preamp	Hewlett-Packard 8449B	3008A00101	03/01/2001	03/01/2002
Computer	HP 000/300	RES449	N/A	N/A
Absorbing Clamp	MDS21	891092/025	05/16/2000	05/16/2001
Antenna Cable (OPTK45)	RG8/u	-	N/A	N/A
Antenna System	EMCO 3230	-	N/A	N/A
Biconical Antenna (Site 1)	EMCO 3104	3459	02/25/2001	02/25/2002
Biconical Antenna (Site 2)	EMCO 3104C	9111-4463	02/23/2001	02/23/2002
Log Periodic Antenna (Site 1) (200-1000 MHz)	EMCO 3146	2075	02/25/2001	02/25/2002
Log Periodic Antenna (Site 2) (200-1000 MHz)	EMCO 3146	9510-4202	02/12/2001	02/12/2002
Adj. Element Dipole Antenna (28 MHz-1 GHz)	EMCO 3120	2632	02/19/2001	02/19/2002
Horn Antenna	Eaton 96001	2632	02/20/2001	02/20/2002
LISN (25 Amp)	EMCO 38825/2	9210-2008	02/20/2001	02/20/2002
LISN (100 Amp)	Solar 8610-50-TS-100N		02/19/2001	02/19/2002
LISN	EMCO 3825/2R	1188/1001	02/22/2001	02/22/2002

Applicant: Metering Technology Corporation

Report No: 0104FRS110-1

Rev. 1.1 (05/24/2001)

Prepared By: International Technology Company (ITC)
9959 Calaveras Road, PO Box 543
Sunol, CA 94586-0543 USA
Tel: (925) 862-2944 Fax: (925) 862-9013
Email: itcmc@aol.com Web: www.itcmec.com

Condor/Raven Meters
Models: AD16-H13S/NT3/L (Condor) &
AD20-H13S/NT3 (Raven)
FCC ID: PDVCONRAV

FCC Part 15 SubPart B & C

Test Equipment

Test Equipment	Manufacturer & Model Number	Serial Number	Calibration Date	Next Calibration Due Date
Remote Controlled 8 ft Rotating Table	RES RT1	Not Provided	N/A	N/A
Remote Controlled 25 ft Rotating Table	RES RT2	Not Provided	N/A	N/A
Remote Controlled 4 ft Rotating Table	RES RT3, RT4, RT5	Not Provided	N/A	N/A
Remote Controlled 4 m Antenna Mast	RES AM1	Not Provided	N/A	N/A
Remote Controlled 6 m Antenna Mast	RES AM2 & AM3	Not Provided	N/A	N/A
3 Phase 220 VAC/50 Hz Generator	Not Provided	DB7130B40	05/16/2000	05/16/2001
Oscilloscope (300 MHz)	Tektronix 2465	Not Provided	05/16/2000	05/16/2001
Digital Scope	Hitachi VC-6075	Not Provided	05/16/2000	05/16/2001
	Valhalla			
Power Analyzer	Scientific/2101	RES 574	05/16/2000	05/16/2001
Digital Thermometer	Omega 440	Not Provided	05/16/2000	05/16/2001
DC Computer System	Kepco JQE150-1.5m	HI77085	05/16/2000	05/16/2001

The spectrum analyzers are self-calibrated before every test and are calibrated to NIST standards annually. All of the other EMI equipment is calibrated on a monthly basis using the spectrum analyzers as standards.

Applicant: Metering Technology Corporation

Report No: 0104FRS110-1

Rev. 1.1 (05/24/2001)

Prepared By: International Technology Company (ITC)
 9959 Calaveras Road, PO Box 543
 Sunol, CA 94586-0543 USA
 Tel: (925) 862-2944 Fax: (925) 862-9013
 Email: itcmc@aol.com Web: www.itcmec.com

Condor/Raven Meters
 Models: AD16-H13S/NT3/L (Condor) &
 AD20-H13S/NT3 (Raven)
 FCC ID: PDVCONRAV

FCC Part 15 SubPart B & C

Appendix B Modification Letter

To whom it may concern:

This is to certify that **no modifications** were necessary for:

Condor/Raven Meter, model AD16-H13S/NT3/L (Condor) & AD20-H13S/NT3 (Raven)

To comply with:

1. Powerline Conducted Emissions in a shielded room utilizing two LISN's per 47 CFR §15.207.
2. Radiated Emissions in a 3-meter open area site per 47 CFR §15.209 and §15.31(m).
3. Harmonics and Spurious Emissions Test in accordance with the FCC test procedure 47 CFR §2.1053 and §15.233.
4. Maximum Peak Output Power Test Requirement in accordance with 47 CFR §15.233.
5. DSS Processing Gain Calculation of NCI Module
6. ERP Calculation per EIA/IS-19-B-1988 & TIA/EIA/IS-137-A-1996
7. MPE Calculation

The results show that the sample equipment tested as described in this report is in compliance with the FCC Rules Part 15, SubPart B: Powerline Conducted Emissions, Open Field Radiated Emissions, Harmonics and Spurious Emissions and Maximum Peak Output Power test requirement limits of SubPart C.

For further information, please contact the manufacturer at

Metering Technology Corporation
360 El Pueblo Drive
Scotts Valley, California 95066 USA
Tel: 831-438-9999
Fax: 831-440-9988
Attention: Mr. Vijay Dhingra
vdhingra@metertech.com

Applicant: Metering Technology Corporation

Report No: 0104FRS110-1

Rev. 1.1 (05/24/2001)

Prepared By: International Technology Company (ITC)
9959 Calaveras Road, PO Box 543
Sunol, CA 94586-0543 USA
Tel: (925) 862-2944 Fax: (925) 862-9013
Email: itcmc@aol.com Web: www.itcmec.com

Condor/Raven Meters
Models: AD16-H13S/NT3/L (Condor) &
AD20-H13S/NT3 (Raven)
FCC ID: PDVCONRAV

FCC Part 15 SubPart B & C