



TEST REPORT

Laboratory ID

PRODUCT SAFETY ENGINEERING, INC.
12955 Bellamy Brothers Boulevard
Dade City, Florida 33525 USA
PH (352) 588-2209 FX (352) 588-2544

Submitter ID

Midway Services
4677 118th Ave. North
Clearwater, FL 34622

Report Issue Date: _____
Sample S/N: _____
Sample Receipt Date: _____

Test Report Number: 00F246B
Model Designation: EA155
Product Description: Water Meter
Transmitter

Sample Test Date: see data sheets

Marketing Approval _____

Description of non-standard test method or test practice: **None**

Estimated Measurement Uncertainty: **Not Applicable**

Special limitations of use: **None**

Traceability: ***reference standards of measurement have been calibrated by a competent body using standards traceable to the NIST.***

According to testing performed at Product Safety Engineering, Inc., the above-mentioned unit is in compliance with the electromagnetic compatibility requirements defined in regulations indicated on page (3) of the test report. The test results contained herein relate only to the model(s) identified above. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics.

As the responsible EMC Project Engineer, I hereby declare that the equipment tested as specified above conforms to the requirements indicated on page (3) of the test report.

Signature _____

Name David Foerstner

Title Engineering Group Leader

Date _____

Reviewed by:

Approved Signatory _____ Date _____

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Product Safety Engineering, Inc 12955 Bellamy Brothers Blvd. Dade City, FL 33525
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**Product Safety Engineering, Inc 12955 Bellamy Brothers Blvd. Dade City, FL 33525
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Emissions Test Conditions: CONDUCTED EMISSIONS (Interference Voltage)

The *CONDUCTED EMISSIONS (INTERFERENCE VOLTAGE)* measurements were performed at the following test location:

☒ - Test not applicable

- ☐ - Darby Test Site (Open Area Test Site)
☐ - Darby Laboratory

Test equipment used :

Model Number	Manufacturer	Description	Serial Number
<input type="checkbox"/> - 8028-50	Solar	50 Ω LISN	829012, 829022
<input type="checkbox"/> - 3825/2	Solar	50 Ω LISN	924840
<input type="checkbox"/> - EMC-30	Electro-Metrics	EMI Receiver	191
<input type="checkbox"/> - 8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
<input type="checkbox"/> - 85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
<input type="checkbox"/> - 85662A	Hewlett Packard	Analyzer Display	2403A07352
<input type="checkbox"/> - 8028-50	Solar	50 Ω LISN	903725, 903726
<input type="checkbox"/> -			

Emissions Test Conditions: RADIATED EMISSIONS (Magnetic Field)

The *RADIATED EMISSIONS (MAGNETIC FIELD)* measurements were performed at the following test location:

- ☐ - Darby Test Site (Open Area Test Site)
☐ -
☐ -

at a test distance of :

- ☐ - 3 meters
☐ - 30 meters

☒ - Test not applicable

Test equipment used :

Model Number	Manufacturer	Description	Serial Number
<input type="checkbox"/> - 96005	Eaton	Log Periodic Antenna	1099
<input type="checkbox"/> - BIA-25	Electro-Metrics	Biconical Antenna	4283
<input type="checkbox"/> - 8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
<input type="checkbox"/> - 85662A	Hewlett-Packard	Analyzer Display	2403A07352
<input type="checkbox"/> - 85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
<input type="checkbox"/> - ALR-30M	Electro-Metrics	Loop Antenna	824
<input type="checkbox"/> - 8447D	Hewlett Packard	Preamplifier	2944A06832
<input type="checkbox"/> - EMC-30	Electro-Metrics	EMI Receiver	191

Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

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The **RADIATED EMISSIONS (ELECTRIC FIELD)** measurements, in the frequency range of 30 MHz-1000 MHz, were tested in a horizontal and vertical polarization at the following test location :

☐ - Test not applicable

☒ - Darby Site (Open Area Test Site)

☐ - Darby Lab

☐ -

at a test distance of :

☒ - 3 meters

☐ - 10 meters

☐ - 30 meters

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number
<input checked="" type="checkbox"/>	96005	Eaton	Log Periodic Antenna	1099
<input checked="" type="checkbox"/>	BIA-25	Electro-Metrics	Biconical Antenna	4283
<input checked="" type="checkbox"/>	8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
<input checked="" type="checkbox"/>	85662A	Hewlett-Packard	Analyzer Display	2403A07352
<input checked="" type="checkbox"/>	85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
<input checked="" type="checkbox"/>	8447D	Hewlett-Packard	Preamplifier (26dB)	2944A06832
<input type="checkbox"/>	EMC-30	Electro-Metrics	EMI Receiver	191
<input type="checkbox"/>	8568B	Hewlett Packard	Spectrum Analyzer	2407A03213
<input type="checkbox"/>	85650A	Hewlett Packard	Quasi-Peak Adapter	2043A00358
<input type="checkbox"/>	85662A	Hewlett Packard	Analyzer Display	2340A05806
<input type="checkbox"/>	LPA30	EM LPA	Log Periodic	2280

Emissions Test Conditions): INTERFERENCE POWER

The **INTERFERENCE POWER** measurements were performed by using the absorbing clamp on the mains and interface cables in the frequency range 30 MHz - 300 MHz at the following test location :

☒ - Test not applicable

☐ - Darby Lab

☐ -

☐ -

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Test equipment used :

	Model Number	Manufacturer	Description	Serial Number
<input type="checkbox"/>	MDS-21	Rhode&Schwarz	Absorbing Clamp	8608447020
<input type="checkbox"/>	8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
<input type="checkbox"/>	85662A	Hewlett-Packard	Analyzer Display	2403A07352
<input type="checkbox"/>	85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
<input type="checkbox"/>	8447D	Hewlett-Packard	Amplifier (26 dB)	2944A06832

The **EQUIVALENT RADIATED EMISSIONS** measurements in the frequency range **1 GHz - 5 GHz** were performed in a horizontal and vertical polarization at the following test location :

☒ - Darby Test Site (Open Area Test Site)

☐ -

☐ -

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at a test distance of:

☐ - 1 meters

☒ - 3 meters

☐ - 10 meters

☐ - Test not applicable

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number
<input checked="" type="checkbox"/> -	8566B	Hewlett-Packard	Spectrum Analyzer	2618A02898
<input checked="" type="checkbox"/> -	85662A	Hewlett-Packard	Analyzer Display	2542A11984
<input checked="" type="checkbox"/> -	85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
<input checked="" type="checkbox"/> -	8449B	Hewlett-Packard	Preamplifier	3008A00320
<input checked="" type="checkbox"/> -	3115	Electro-Mechanics	Double Ridge Guide Horn	3810

Equipment Under Test (EUT) Test Operation Mode - Emission tests :

The device under test was operated under the following conditions during emissions testing:

- ☐ - Standby
- ☐ - Test program (H - Pattern)
- ☐ - Test program (color bar)
- ☐ - Test program (customer specific)
- ☒ - Practice operation
- ☐ - Normal Operating Mode
- ☐ -

Configuration of the device under test:

- ☐ - See System Under Test Information in Appendix B

Rationale for EUT setup / configuration:

The EUT was transmitting data continuously, which is not a normal mode of operation. The rationale for continuous operation was so that any emission points could be observed and that the duty cycle could be easily measured.

Emission Test Results:

Conducted emissions 10/150/450 kHz - 30 MHz			
The requirements are		<input type="checkbox"/> - MET	<input type="checkbox"/> - NOT MET
Minimum limit margin	dB	at	MHz
Maximum limit exceeding	dB	at	MHz
Remarks:			

Radiated emissions (magnetic field) 10 kHz - 30 MHz			
The requirements are		<input type="checkbox"/> - MET	<input type="checkbox"/> - NOT MET
Minimum limit margin	dB	at	MHz
Maximum limit exceeding	dB	at	MHz
Remarks:			

Radiated emissions (electric field) 30 MHz - 1000 MHz			
The requirements are		<input checked="" type="checkbox"/> - MET	<input type="checkbox"/> - NOT MET
Minimum limit margin	4.9 dB	at	418 MHz
Maximum limit exceeding	dB	at	MHz
Remarks:			

The limits were calculated per 15.231(e) and determined to be (72.3) dBuV/m for the fundamental and (52.3) dBuV/m for spurious. Based on measured duty cycle (see notes under General Remarks), the limit is further relaxed by (20) dB to (92.3) dBuV/m & (72.3) dBuV/m respectively.

Interference Power at the mains and interface cables 30 MHz - 300 MHz			
The requirements are		<input type="checkbox"/> - MET	<input type="checkbox"/> - NOT MET
Minimum limit margin	dB	at	MHz
Maximum limit exceeding	dB	at	MHz
Remarks:			

Radiated emissions		1 GHz -	5 GHz
The requirements are		<input checked="" type="checkbox"/> - MET	<input type="checkbox"/> - NOT MET
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Tel (352) 588-2209 Fax (352) 588-2544			

Minimum limit margin	6.0 dB	at	2.926 GHz
Maximum limit exceeding	dB	at	GHz

Remarks:

GENERAL REMARKS:

Duty Cycle calculation:

The duty cycle is exactly the same as the original equipment and is always less than (10%) during any (100) mS period of time. The total duration of the transmission is less than (1) second and repeats at intervals no less than once each (5) hours. Plots of the data stream are included in Appendix B.

Bandwidth is less than (0.25%) of center frequency, (1,045,000) Hz.
A bandwidth plot is included in Appendix B.

SUMMARY:

The requirements according to the technical regulations are

☒ - met

☐ - **not** met.

The device under test does

☒ - fulfill the general approval requirements mentioned on page 3.

☐ - **not** fulfill the general approval requirements mentioned on page 3.

Testing Start Date 06/27/2000

Testing End Date: 06/27/2000

- PRODUCT SAFETY ENGINEERING INC -

Test-setup photo(s):

Conducted emission 450/150 kHz - 30 MHz

Test-setup photo(s):
Radiated Emissions 30 MHz 4 GHZ



APPENDIX

A

Test Equipment Calibration Information & Test Data Sheets

TEST EQUIPMENT CALIBRATION INFORMATION

Manufacturer	Model	Description	Serial Number	Cal Due
Hewlett Packard	8566B	Spectrum Analyzer	2421A00526	08/02/00
Hewlett Packard	85662A	Display	2403A07352	08/02/00
Hewlett Packard	85650A	Quasi-Peak Adapter	2043A00209	08/02/00
Hewlett Packard	8447D	Preamplifier 0.1 - 1,000 MHz	2944A06832	08/24/00
Hewlett Packard	8568B	Spectrum Analyzer	2407A03213	07/06/00
Hewlett Packard	85662A	Display	2340A05806	07/06/00
Hewlett Packard	85650A	Quasi-Peak Adapter	2043A00358	07/04/00
Hewlett Packard	8447D	Preamplifier 0.1 - 1,000 MHz	2944A06901	12/07/00
Hewlett Packard	8447D	Preamplifier 0.1 - 1,000 MHz	1937A03247	06/06/00
Hewlett Packard	8449B	Preamplifier 1 - 26.5 GHz	3008A00320	12/04/00
Hewlett Packard	8648B	Signal Generator	3443U00312	05/13/01
Hewlett Packard	8672A	Signal Generator	2211A02426	09/21/00
Eaton	96005	Log Periodic Antenna	1099	08/27/00
Electro-Metrics	LPA 30	Log Periodic Antenna	2280	08/12/00
Electro-Metrics	BIA 30	Biconical Antenna	3852	08/12/00
Electro-Metrics	BIA 25	Biconical Antenna	4283	08/27/00
Electro-Mechanics	3115	Double Ridge Guide Ant.	3810	05/27/01
Electro-Metrics	ALR30M	Magnetic Loop Antenna	824	11/08/00
Solar	8012	LISN	924840	09/22/00
Solar	8028	LISN	829012/809022	09/08/00
Solar	8028	LISN	903725/903726	08/25/00
Schwartzbeck	MDS-21	Absorbing Clamp	02581	11/24/00
Leader	LFG1310	Function Generator	8060233	01/26/00
Holaday Ind.	HI 4422	Isotropic Probe	90310	04/18/01
IFR Systems	A-8000	Spectrum Analyzer	1306	06/02/00
Fischer Custom	F-33-1	RF Current Probe	360	09/08/01
Electro-Metrics	EMC-30	EMI Receiver	191	11/01/00
Boonton	4220A	RF Power Meter	204103AA	10/28/00
Boonton	51011	RF Power Meter	28823	10/28/00

Radiated Test Data

Freq. In MHz	Amplitude (dBuV/m)	Limit (dBuV/m)	Delta
37.96	14.0	40	-26.0
49.84	13.5	40	-26.5
87.35	16	40	-24.0
200.3	17.5	43.5	-26.0
250.66	14.2	46	-31.8
418.03	87.4	92.3 (w/ relaxation)	-4.9
835.99	63.2	72.3 (w/ relaxation)	-9.1
1,254	58.8	72.3 (w/ relaxation)	-13.5
1,672	63.3	72.3 (w/ relaxation)	-9.0
2,090	52.9	72.3 (w/ relaxation)	-19.4
2,508	59.2	72.3 (w/ relaxation)	-13.1
2,926	66.3	72.3 (w/ relaxation)	-6.0
3,344	58.7	72.3 (w/ relaxation)	-13.6
3,762	52.7	72.3 (w/ relaxation)	-19.6
4,180	54.0	72.3 (w/ relaxation)	-18.3

APPENDIX

B

System Under Test Description

EUT - Midway Services Transmitter

Cable - (3) conductor (non) shielded - (1) meter in length to Meter Assembly

Peripheral - Sensus Water Meter

APPENDIX

C

Measurement Protocol

The test methodology followed during the collection of the data included within this technical report was ANSI C63.4:1992.

The EUT was powered with (120) VAC / (60) Hz during the collection of data included within.

The data is compared to the FCC Part 15 Class B limits.

The "EMI" instrumentation is capable of calculating the final emission level based on the following formula:

Level at the receiver (dBμV) + Antenna Correction Factor (dB/M) + Cable Loss (dB) - Preamp Gain (dB) = Actual Level in dBμV/M.

The sample calculation below is based on the actual test data collected:

Observed Level	53.3	dBμV	
ACF	10.5	dB/M	
Cable Loss	0.8	dB	
Preamp Gain	26.0	dB	
Actual Level	38.6	dBμV/M	@ 50.3 MHz

Please have a company official review this report and sign.
