

ION Digital LLP

ION 5800 MICRA

Report of Measurements

per

FCC CFR47 Part 15/C

REVISION 0.2

September 28, 2004

Approved by		
Checked by	Robert Stirling, P.Eng.	Date

Protocol Labs, Abbotsford BC, Canada
FCC Registration Number 96437
Industry Canada Registration Number IC3384

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Section I: FCC CFR47 Part 15/C Report of Measurements

Testing Details

TESTED BY: David Johanson
 TEST CONDITIONS: Temperature and Humidity: 10.5°C 67%
 TEST VOLTAGE: 3 Vdc - Lithium Battery

Test Facilities

Protocol Labs
 28945 McTavish Rd.
 Abbotsford BC, Canada, V4X 2E7
 FCC Registration Number 96437
 Industry Canada Registration Number IC3384

Test Equipment List

EMISSIONS:

Device	Model Number	Serial No.	Last Cal.	Next Cal
Antenna	EMCO 3115	9403-4251	15/10/03	15/10/04
Antenna	EMCO 3141 Bilog	1127	27/10/03	27/10/04
Spectrum Analyzer	Hewlett Packard 8566B	2241A02102	14/11/03	14/11/04
RF-Preselector	Hewlett Packard 85685A	3107A01222	10/01/04	10/01/05
Quasi-Peak Adapter	Hewlett Packard 85650A	2043A00240	10/01/04	10/01/05
Tower	Rhientech Labs	Custom	N/A	N/A
Turntable	Protocol	Custom	N/A	N/A

Company Under Test:

NAME:	ION Digital LLP <u>USA Office</u>	ION Digital LLP <u>Canada Office</u>
ADDRESS:	PO Box 3969 Blaine WA, USA 98231	#3-3033 King George Hwy. Surrey BC, Canada, V4P 1B8
CONTACT PERSON:	Mr. Dean Schebel Director – Engineering dean.schebel@ion-digital.com	
PHONE NUMBER:	800-407-4389	
FAX NUMBER:	800-407-4465	

Equipment Under Test:

THE TEST SYSTEM: EUT 1: Wireless Window Sensor

Manufacturer: Ion Digital LLP
 Model Number: ION 5800 MICRA
 Serial Number: EN6001

TEST SETUP: The EUT was setup in its normal operating mode.

MODIFICATIONS: This unit requires no modifications for it to pass.

CONCLUSION: The ION 5800 MICRA that was tested complies with the requirements of FCC CFR47 part 15/B and C.

Section Ia: FCC CFR47 Part 15/C Report of Measurements

General

Tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15/C – Intentional Radiators

The Radiated tests were performed using measurement procedure outlined in the above standard.

FCC Labeling and Marking Requirements:

Markings

According to FCC Section 15.19, a statement similar to the following must be included on an identification label, which also uniquely identifies the Manufactured date, either explicitly or through a Serial number etc.:

"This equipment complies with FCC Rules, Part 15 for an Intentional Radiator. Operation is subject to two conditions:

- 1) This device may not cause harmful interference
- 2) This device must accept any interference that may cause any undesired operation"

Labeling

According to FCC Section 15.19 labeling requirements the following statement must be included in a prominent location in your User's Manual:

This device complies with Part 15 of the FCC Rules; Operation is subject to the condition that this device not cause harmful interference

Caution: Changes or modifications to this equipment, not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Part 1 - Radiated Emission Testing

DATE: September 17, 2004

TEST STANDARD: FCC CFR47, Part 15, Subpart C 15.231

RADIATED SETUP: The equipment was set up in an open field test site. All spurious and harmonic measurements were made at a 3-meter open field test site. Peak spurious Emissions in both horizontal and vertical polarization's were measured based on continuous modulated signal while rotating the EUT on a turntable to maximize the emissions signal strength and the results recorded on the attached tables and plots. Average emissions are based on actual duty cycles pulsed and modulated signal as in Appendix C.

MINIMUM STANDARD:

Fundamental Frequency	Field Strength of Fundamental		Field Strength of Spurious Emissions Measurement Distance	
	(μV)	(dB μV)	(μV)	(dB μV)
40.66 – 40.70	2,250	67.0	225	47.0
70 -130	1,250	61.9	125	41.9
130 -174	1,250 to 3,750**	61.9 – 71.5	125 to 375**	41.9 – 51.5
174 - 260	3,750	71.5	375	51.5
260 - 470	3,750 to 12,500**	71.5 – 81.9	375 to 1,250**	51.5 – 61.9
Above 470	12,500	81.9	1,250	61.9
For this EUT 340	7294.58	77.26	729.46	57.260

**Linear interpolations

DEVICE DESCRIPTIONS: Refer to the Equipment Under Test Section, above, for EUT Descriptions.

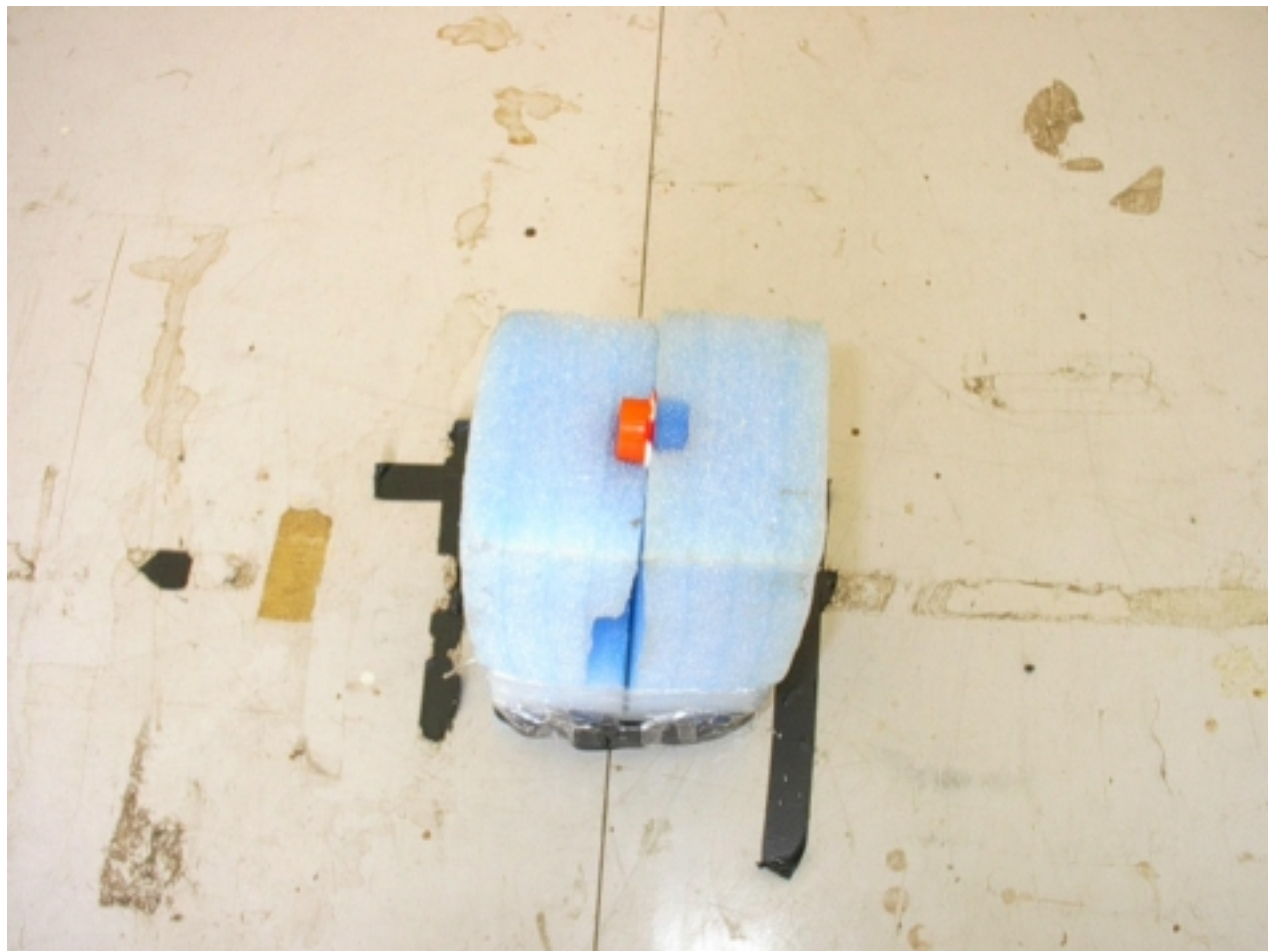
PHOTOS: See Appendix A

MEASUREMENT DATA: See Appendix B for Plot

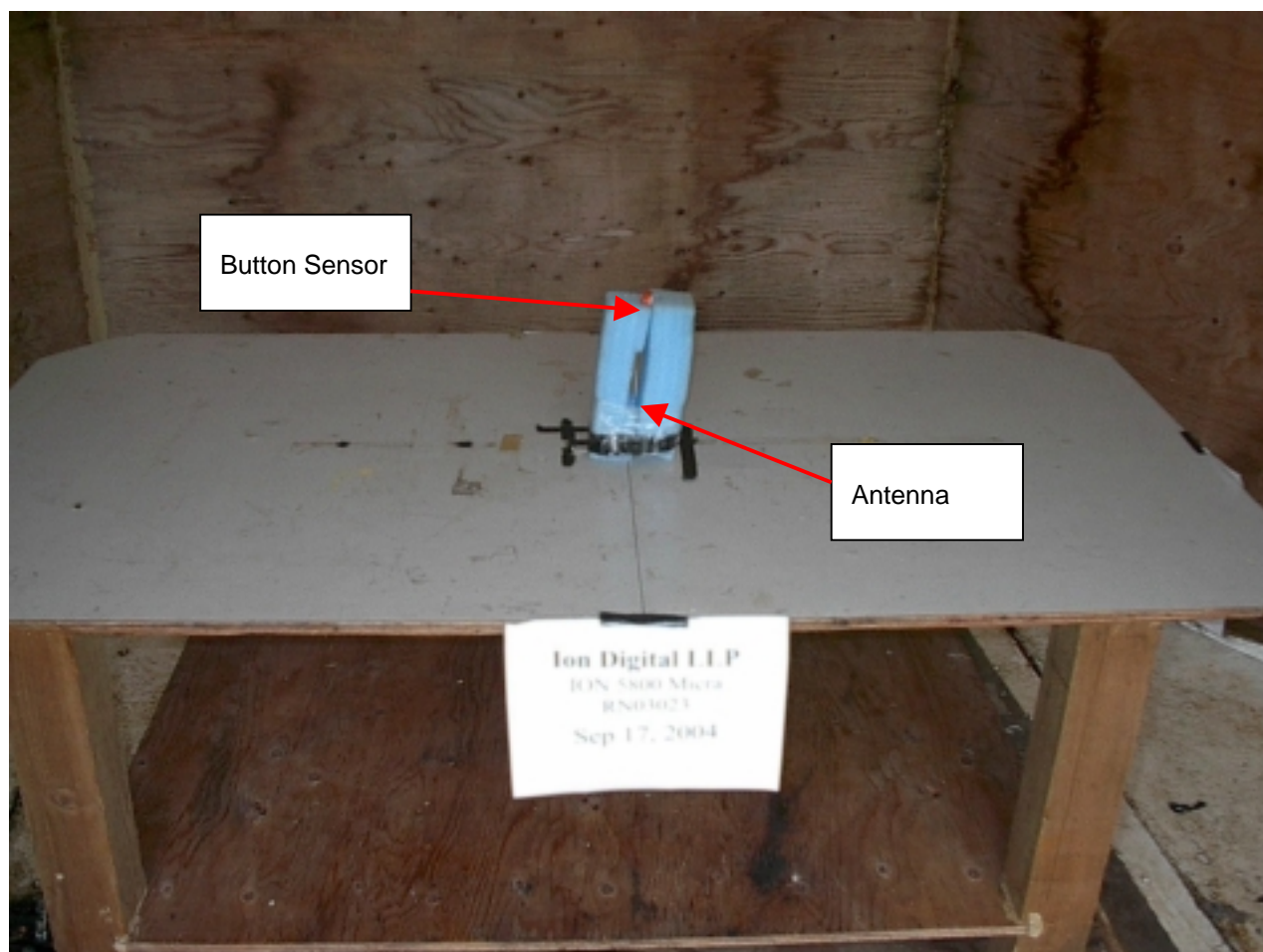
EMISSIONS DATA: See Table 1 in Appendix B for corresponding frequencies.

PERFORMANCE: Complies.

Appendix A: Photos



Emissions Test Setup for EUT Close up



Emissions Test Setup for EUT Holder

Appendix B: Measurement Data and Plots

Measurement Data - ION Digital LLP – ION 5800 MICRA

Conducted Emissions Data not required

Table 1: Radiated Emissions Data

Harmonic	Frequency (MHz) +/- 0.005	Pol	Uncor Pk (dBμV) +/- 0.05	Tot Corr (dB) +/- 0.05	Peak (dBμV/m) +/- 0.05	Average (dBμV/m) +/- 0.05	Limit (dBμV/m) +/- 0.05	Average (μV/m) +/- 0.05	Limit (μV/m) +/- 0.05	Delta Lim (dB) +/- 0.05
1st	345.000	V	64.80	18.0	82.8	61.50	77.26	1188.50	7294.58	-15.7
2nd	690.000	V	14.9	25.6	40.5	19.20	57.260	19.20	729.46	-38.1
3rd	1035.000	V	12.6	29.4	42.0	20.70	53.980(1)	9.12	500.03(1)	-33.2
4th	1380.000	V	21.5	32.0	53.5	32.20	53.980(1)	40.74	500.03(1)	-21.8
5th	1725.000	V	12.8	35.1	47.9	26.60	57.260	21.38	729.46	-30.7
6th	2070.000	V	38.4	2.3	40.7	19.40	57.260	9.33	729.46	-37.9
7th	2415.000	V	34.5	4.7	39.2	17.90	57.260	7.85	729.46	-39.4
8th	2760.000	V	34.9	7.6	42.5	21.20	53.980(1)	11.48	500.03(1)	-32.8
9th	3105.000	V	33.7	10.7	44.4	23.10	57.260	14.29	729.46	-34.2
10th	3450.000	V	29.9	13.4	43.3	22.00	57.260	12.59	729.46	-35.26

(1) – Limits for Spurious Emissions inside restricted Bands per 15.205

Spurious Emissions Plot

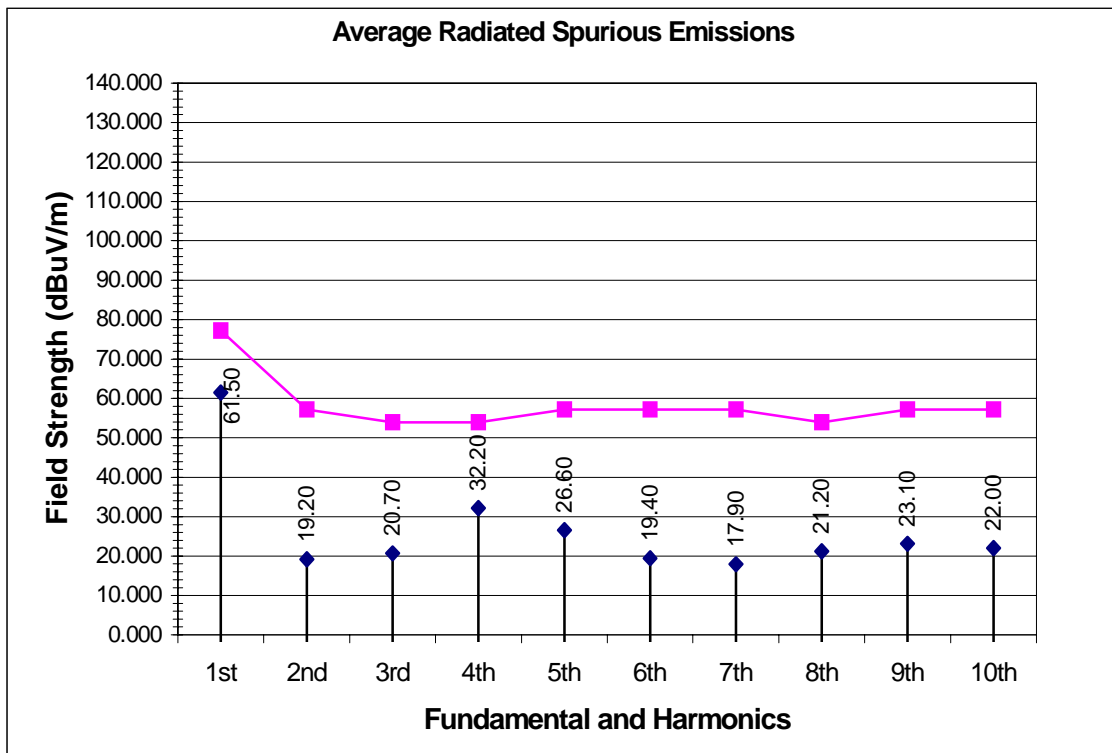


Figure 1: 345.00 MHz Harmonics

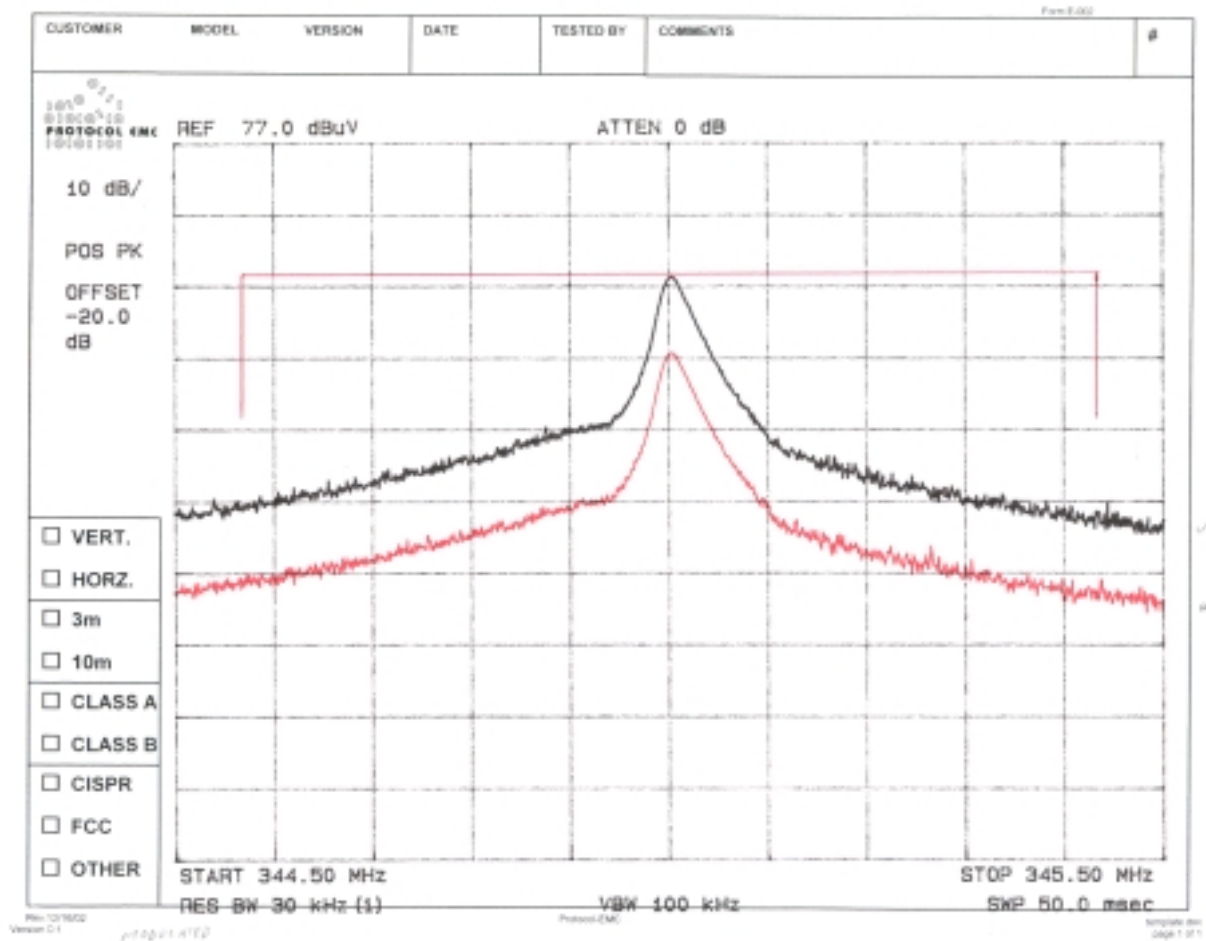


Figure 2: Occupied Bandwidth

Black – Vertical Antenna

Red – Horizontal Antenna

Appendix C: ION DIGITAL LLP 5800 MICRA

Duty Cycle Correction factor

On a change of state, 6 identical packets are transmitted at random intervals. The time interval between each packet is no less than 100mS and averages 125 mS. Each packet is 64 bits (16 bits preamble, 48 bit data) transmitted as PWM-ASK modulation.

Bits are Phase Encoded (Manchester) at baseband, so the duty cycle is exactly 50%. Each bit cell interval is 0.27mS, so the total on time per packet is:

$$\text{On Time} = 64 \text{ bits} * 0.5 \text{ on/bit} * 0.27\text{mSec} = 8.64 \text{ mSec}$$

Thus, for every 100 ms, we are transmitting for 8.64 ms of that time period. Therefore our duty cycle correction factor (in the worst case 100mSec period) is:

$$\text{DUTY CYCLE CORRECTION FACTOR (dB)} = 20 * \text{Log}(0.0864) = -21.3 \text{ dB}$$

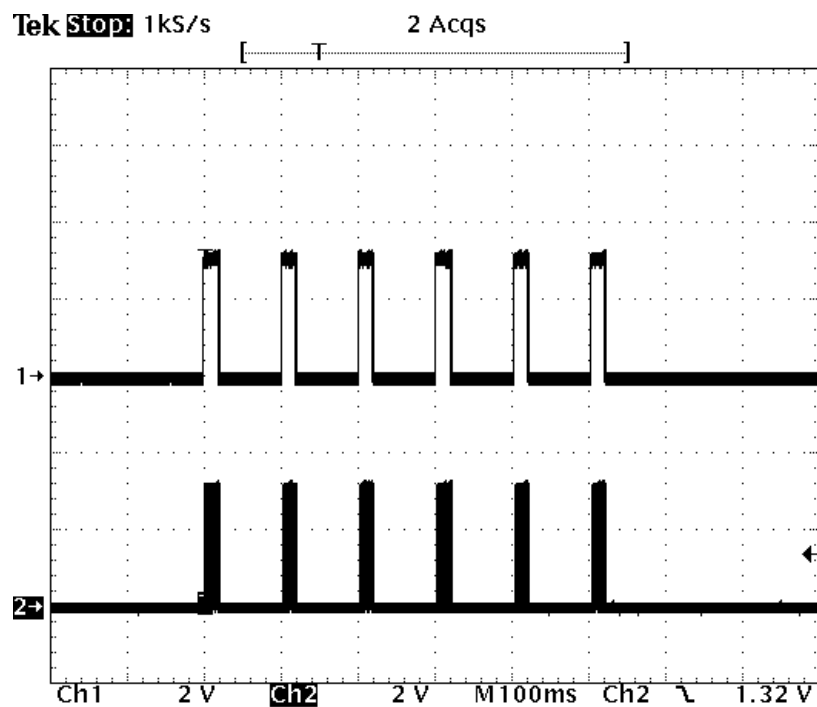
Transmission Time Duration from Trigger Point to End of Transmission

The processor samples the reed switch approximately once per second. After detecting a change of state, it constructs the packet (1mS), then enables the VCO on the transmitter to power up (10mS), but does not transmit during that time. Then 4 packets (29 mS each) are sent, with a random timeout between them (100mS – 800mS). Therefore the total duration time from when the device is triggered, to when transmission is completed and turned off (worst case) is 3.527 seconds.

0.000s	Trigger Point
2.000s	Microprocessor sample time (on close of reed switch worst case)
0.002s (worst case)	Microprocessor setup time for packet construction and transmitter warmup
0.645s	Sextet Packet Transmission (1 st group of 6 packets)
1.305s	worst case delay between sextet#1 and sextet #2
0.770s	Sextet Packet Transmission (2 nd group of 6 packets)
4.722s completed/off.	Total worst case duration from when device is triggered to transmission

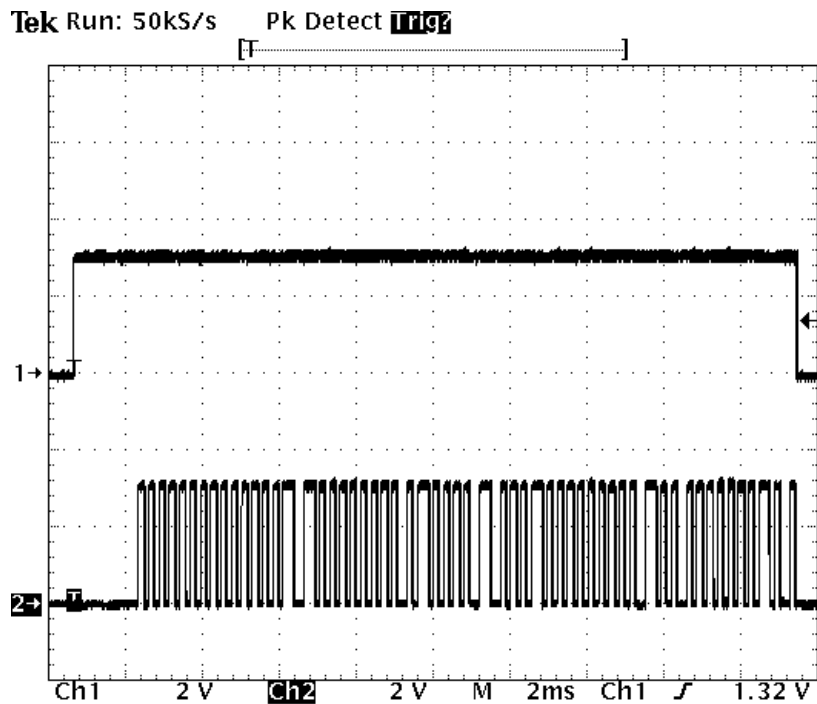
Timing Plots

Figure 1: Transmitted (1st Sextet) Data Packets, 100ms/div



5 Dec 2003
12:07:23

Figure 2: Transmitted Data Packet, 2.0 ms/div



5 Dec 2003
12:09:02

Figure 3: Transmitted Data Packet, 0.5 ms/div