

INTERACTIVE TECHNOLOGIES INCORPORATED
DESCRIPTION OF MEASUREMENT FACILITIES

Measurements were performed at TUV Testing Services Open Test Site. A full description of the measurement facilities are kept on file by the FCC. TUV's acceptance and approval is dated as June 5th, 1996 in a letter received from the FCC.

TUV PRODUCT TESTING SERVICE
19035 WILD MOUNTAIN ROAD
TAYLORS FALLS, MN. 55084-1758

INTERACTIVE TECHNOLOGIES INCORPORATED

LABORATORY MEASUREMENTS

PART B

PREFACE

This device is a security transmitter. The device was placed on a .8 meter high platform, three meters from the receiving antenna. Peak emissions were found by varying the antenna height from one to four meters and rotating the device 360 degrees. Emissions were taken with both vertical and horizontal polarization's.

TEST NOTES

- 1) Bandwidth measurements were made in the peak mode, using a Hewlett Packard Spectrum Analyzer Model Number (70000).
- 2) Duty Cycle Correction Factors = $20 \log (t/T)$ Where t = Maximum time during any .1 second interval. T = .1 second
- 3) All emissions from 25 MHz were measured to the tenth harmonic were measured with an Hewlett Packard model 8566B Spectrum Analyzer.
- 4) Emissions below 1000MHz were measured with a 100 kHz bandwidth. Emissions above 1000MHz were measured with a 1MHz bandwidth.
- 5) Forbidden bands measurements were made at 1 meter distance.
- 6) Noise floor measurements. See AMBIENT LEVEL IN THE FORBIDDEN BANDS.

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BANDWIDTH MEASUREMENT

15.205 (d) Bandwidth (see Test Notes). (.25% of Fundamental)

Spectrum Analyzer used: HP 70000

Spectrum analyzer skirt bandwidth (-20 dBm) 1KHz

FREQUENCY (MHz)	MEASURED BANDWIDTH @ -20dBm (KHz)	*ESTIMATED SIGNAL BANDWIDTH (KHz)	FCC BANDWIDTH LIMIT (KHz)
319.5	41.3	40.3	792

* Estimated Bandwidth = Measured bandwidth minus analyzer bandwidth

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BANDWIDTH MEASUREMENT

11:22:11 JUN 18, 1998

RL 0.00 dBm

MRK #1 FRQ 319.512 5 MHz

ATTEN 10 dB
10.00 dB/DIV

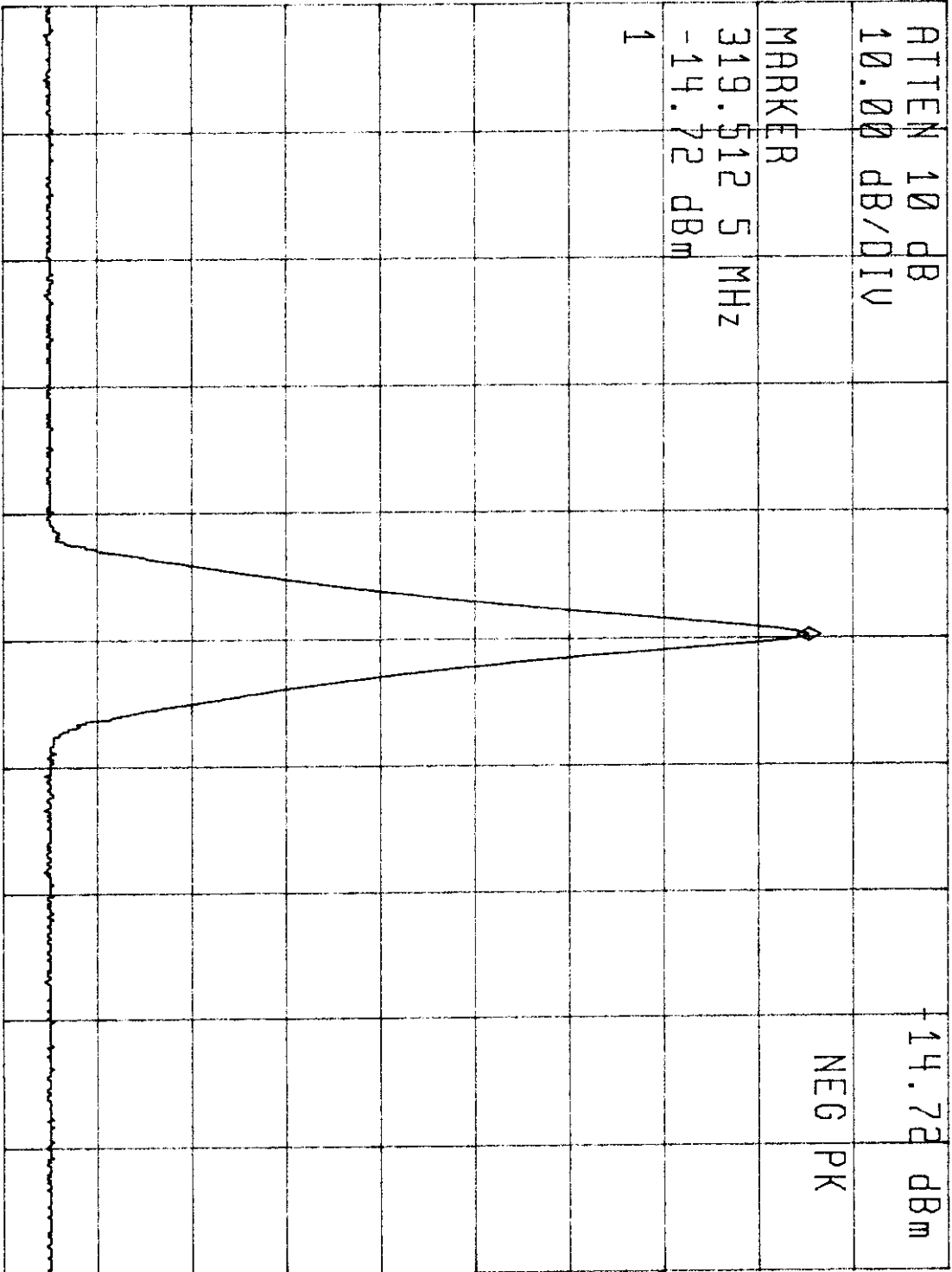
+14.72 dBm

MARKER

NEG PK

319.512 5 MHz
-14.72 dBm

1



CENTER 319.512 5 MHz
RB 1.00 kHz VB 1.00 kHz

SPAN 100.0 kHz
ST 305.0 msec

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BANDWIDTH MEASUREMENT

11:25:17 JUN 18, 1998

RL 0.00 dBm

MR #1 ΔFRQ 41.3 kHz

ATTEN 10 dB

0.09 dB

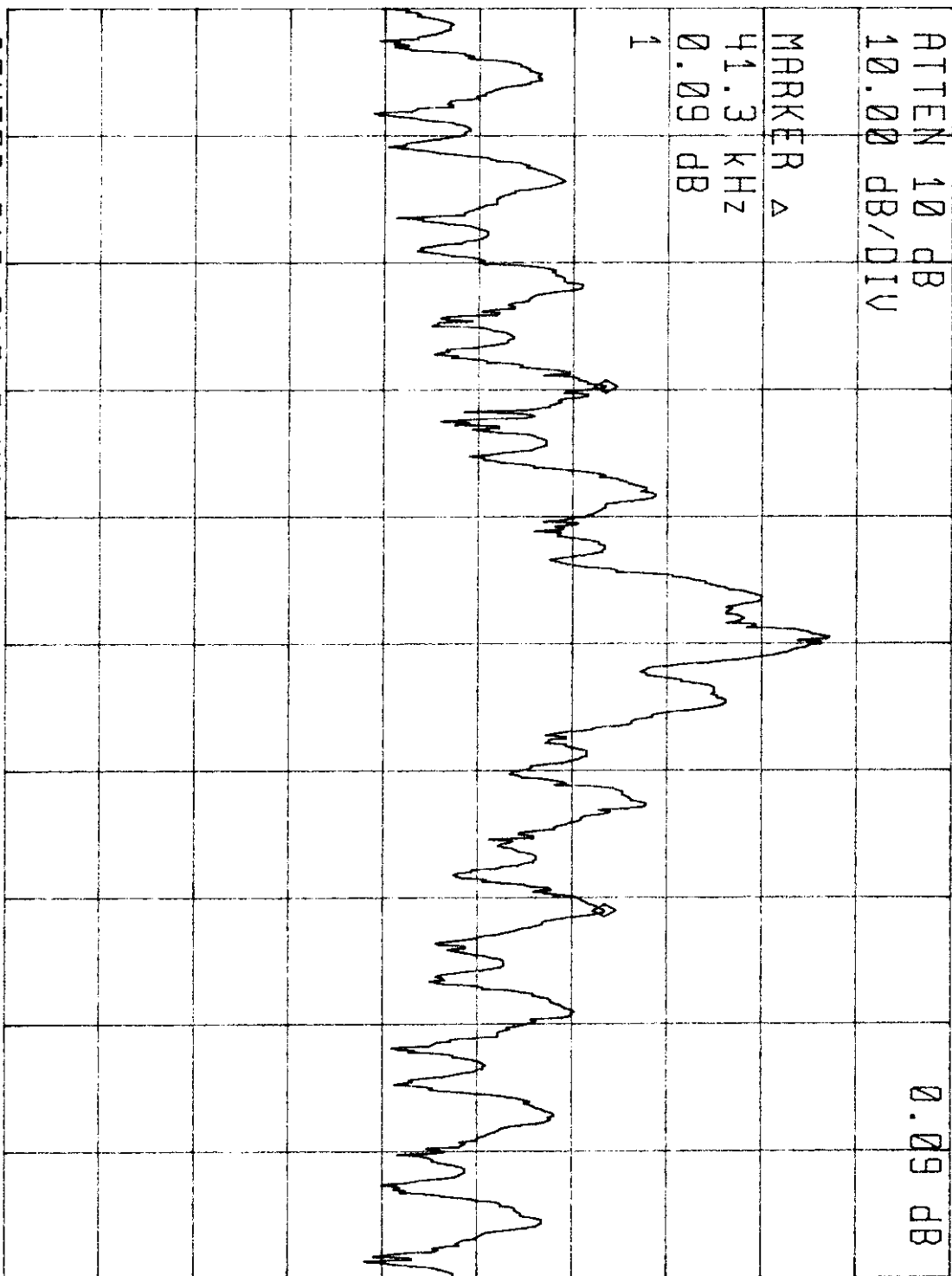
10.00 dB/DIV

MARKER Δ

41.3 kHz

0.09 dB

1



CENTER 319.512 6 MHz
RB 1.00 kHz VB 1.00 kHz

SPAN 100.0 kHz
ST 305.0 msec

INTERACTIVE TECHNOLOGIES INCORPORATED

BANDWIDTH MEASUREMENT

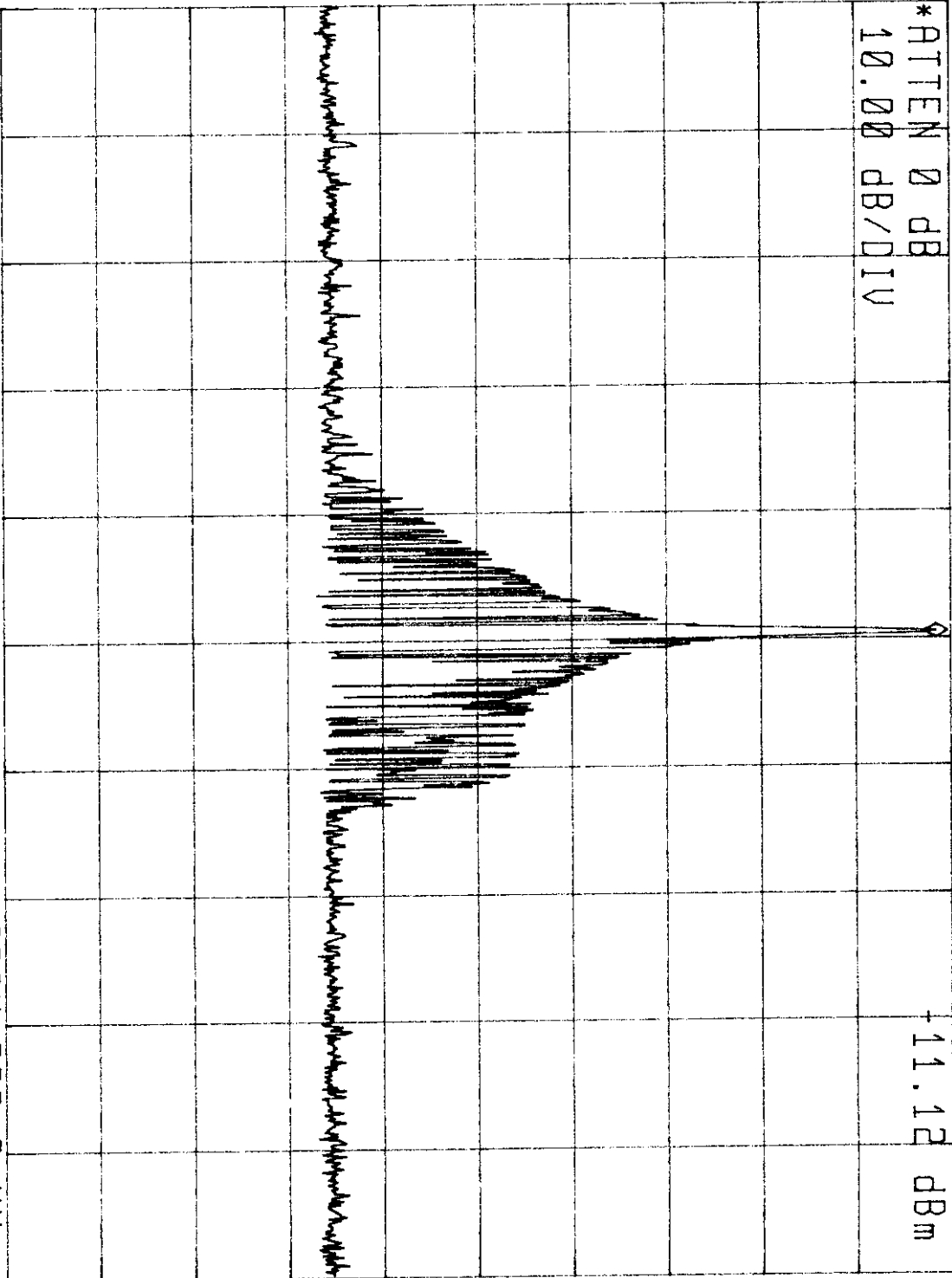
11:28:09 JUN 18, 1998

RL -10.00 dBm

MKR #1 FRQ 318.8 MHz

*ATTEN 0 dB
10.00 dB/DIV

+11.12 dBm



CENTER 319.5 MHz

RB 300 kHz

SPAN 200.0 MHz

ST 10.00 msec

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DUTY CYCLE CALCULATION

The Learnmode format transmission time varies from 19.8 milliseconds to 28.8 milliseconds. The maximum on time is 9.76 milliseconds. The interval between packets is 100 milliseconds. The maximum transmitted packets per each activation is 24, therefore the maximum transmission length is $23 \times 100 \text{ milliseconds} + 28.8 \text{ milliseconds}$ or 2.328 seconds as per FCC Rules Part 15, Paragraph 15.231 (d). This device is not supervised.

The calculation for the “ Duty Cycle Correction Factor “ is as follows:

Three bit sequence defines the start of the packet. following the start sequence, all bits are either zero's or ones, with zero's being 244 microseconds high, 244 microseconds low and ones being 244 microseconds high, 488 microseconds low. High time for every bit is 244 microseconds. Total high time for 40 bit pattern is 9.76 milliseconds. Transmitting a packet every 100 milliseconds gives the maximum FCC Duty Cycle Correction Factor of 10% for our transmitter power allowance.

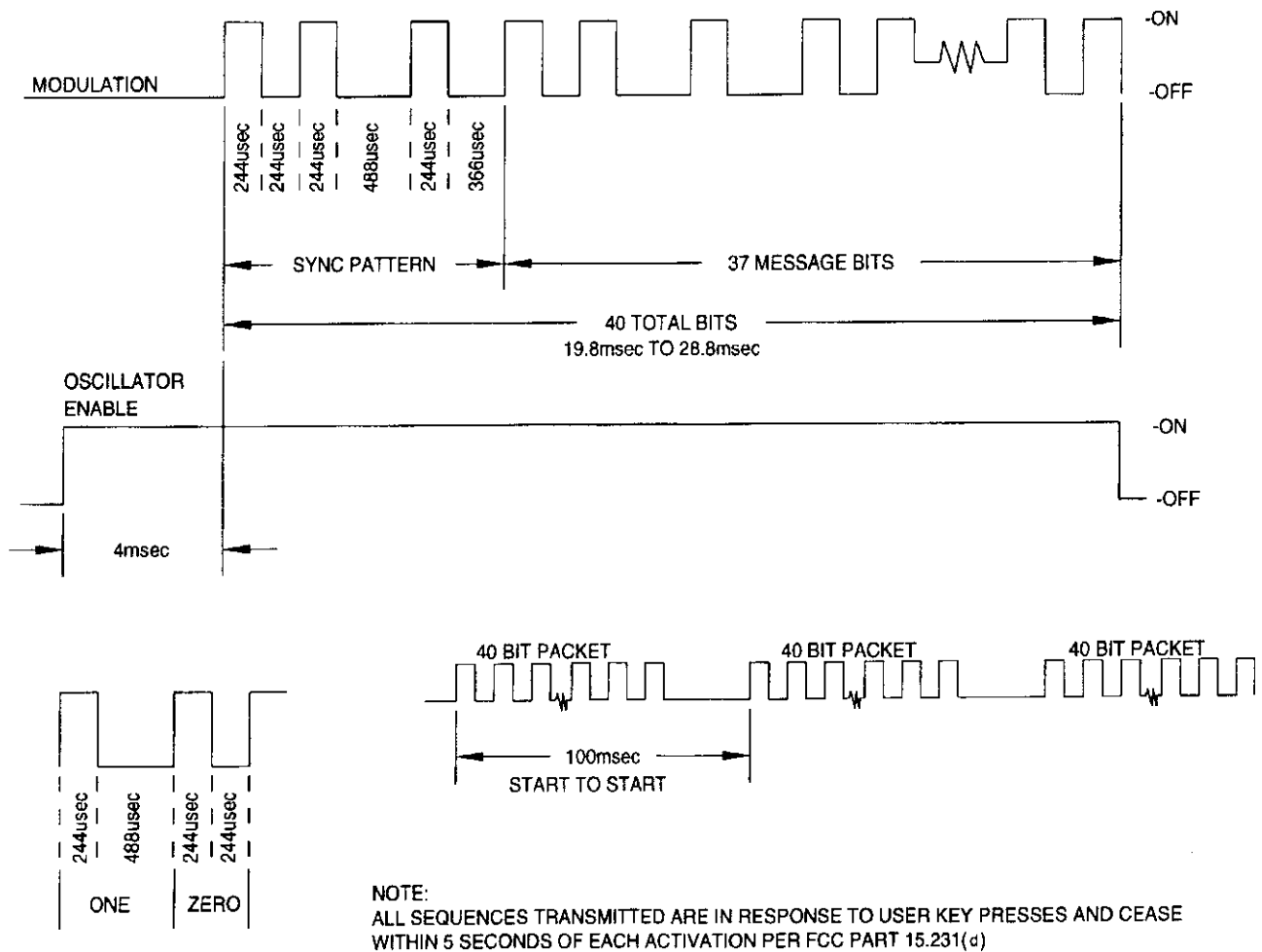
28.8 milliseconds Total Time

9.76 milliseconds Total On Time

$9.76 \text{ milliseconds TOTAL ON TIME} / 100 \text{ milliseconds} = .0976 \text{ (LOG) } \times 20 = -20.21\text{dB}$

NOTE: 20dB is the maximum allowable DUTY CYCLE CORRECTION FACTOR

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TRANSMITTER MODULATION & TIMING

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SINGLE PACKET
100 MILLISECOND PLOT

10:23:19 JUN 22, 1998

RL -10.00 dBm

MKR #1 SMT 25.00 msec

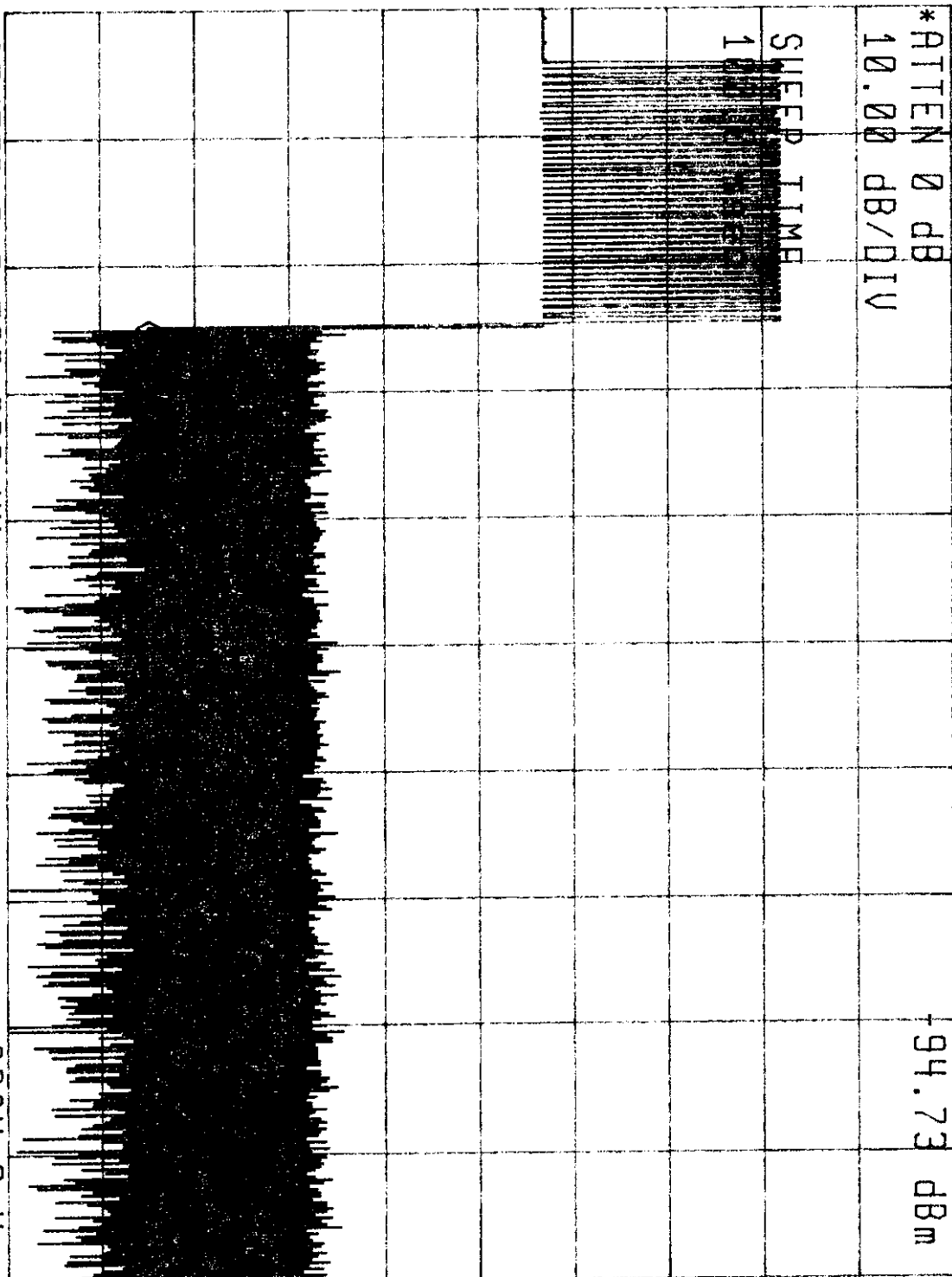
*ATTEN 0 dB

10.00 dB/DIV

+94.73 dBm

SLEEP TIME

10.00 dB/DIV



CENTER 319.508 000 MHz

*RB 300 kHz VB 300 kHz

SPAN 0 Hz

*ST 100.0 msec

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SINGLE PACKET

MAXIMUM ON TIME IS 9.76MILLISECONDS

MAXIMUM POSSIBLE PACKET DURATION IS 28.8 MILLISECONDS

10:12:56 JUN 22, 1998

RL -10.00 dBm

MKR #1 ΔSMT 20.74 msec

*ATTEN 0 dB
10.00 dB/DIV

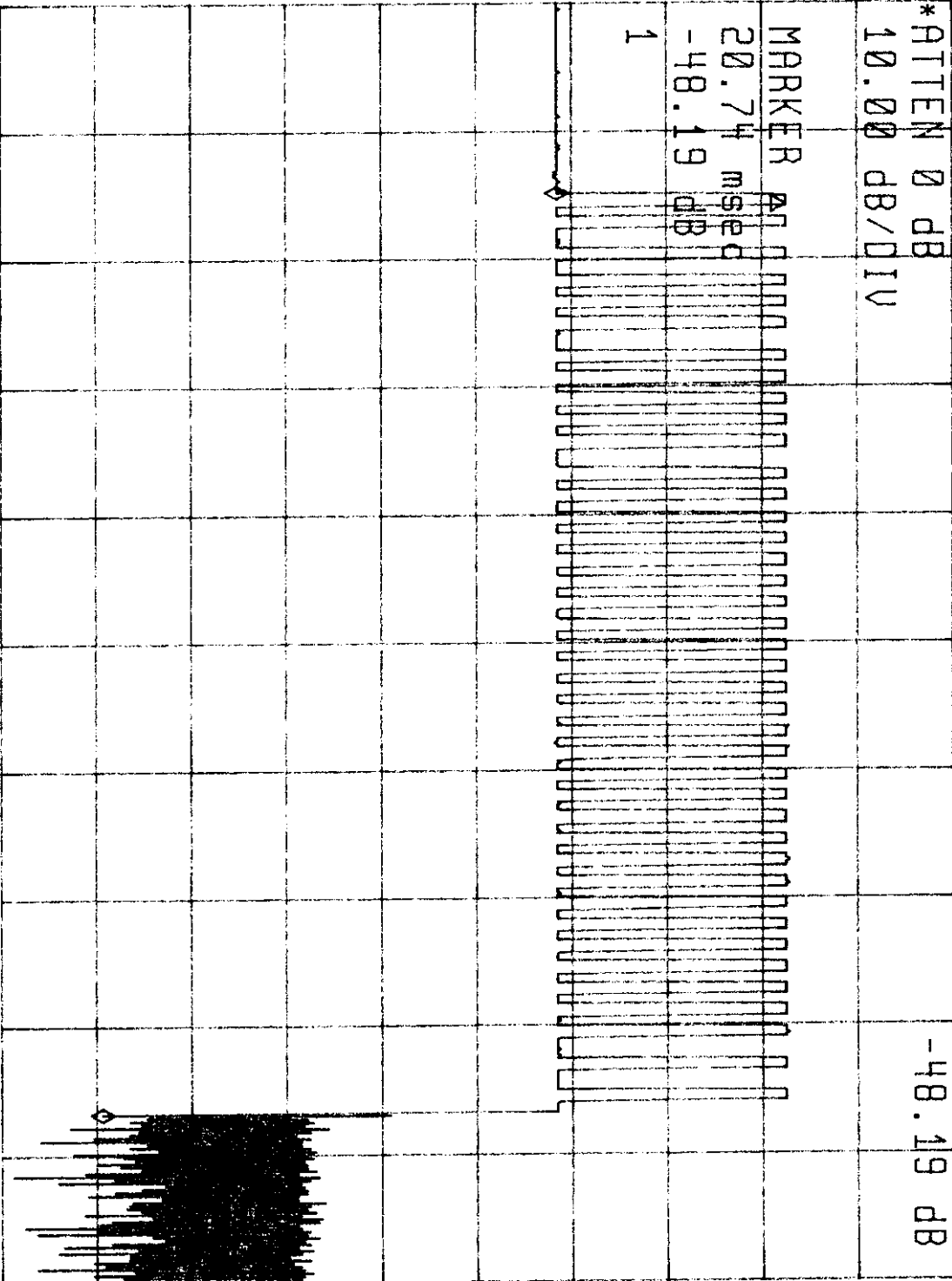
-48.19 dB

MARKER

20.74 msec

-48.19 dB

1



CENTER 319.508 000 MHz

SPAN 0 Hz

*RB 300 kHz VB 300 kHz

*ST 28.80 msec

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A COMPLETE TRANSMISSION OF 24 INDIVIDUAL ALARM PACKETS

1) **INTER MESSAGE TIME DELAY** - Measured from the leading edge of one message packet to a leading edge of the following message packet. This time will be 100 milliseconds. The transmission duration will never exceed 2.328 seconds in accordance with 15.201 (d).

10:18:15 JUN 22, 1998

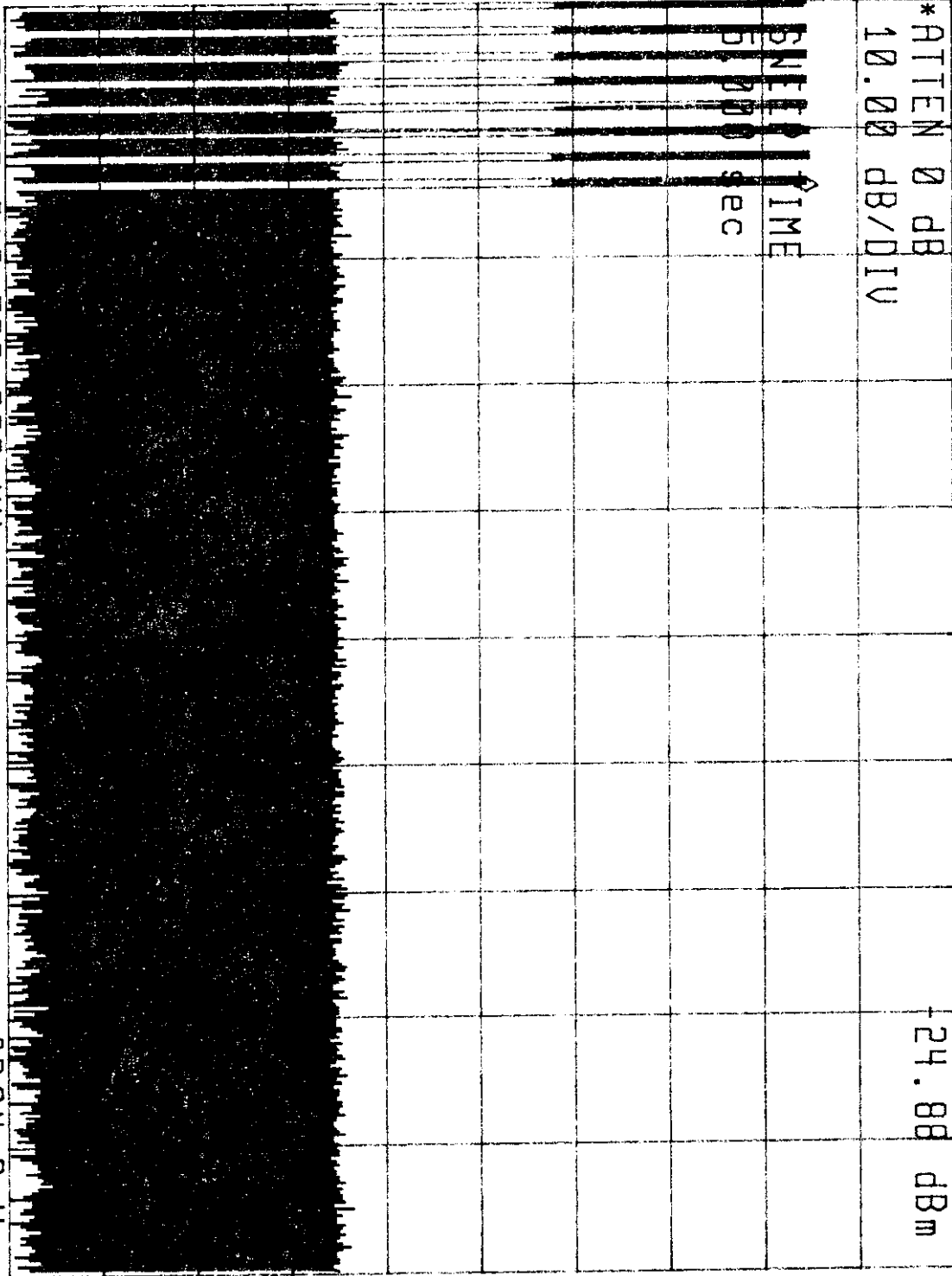
RL -10.00 dBm

MKR #1 SWT 725.0 msec

*ATTEN 0 dB
10.00 dB/DIV

+24.88 dBm

TIME
100 sec



*RB 300 kHz
CENTER 319.508 000 MHz
VB 300 kHz

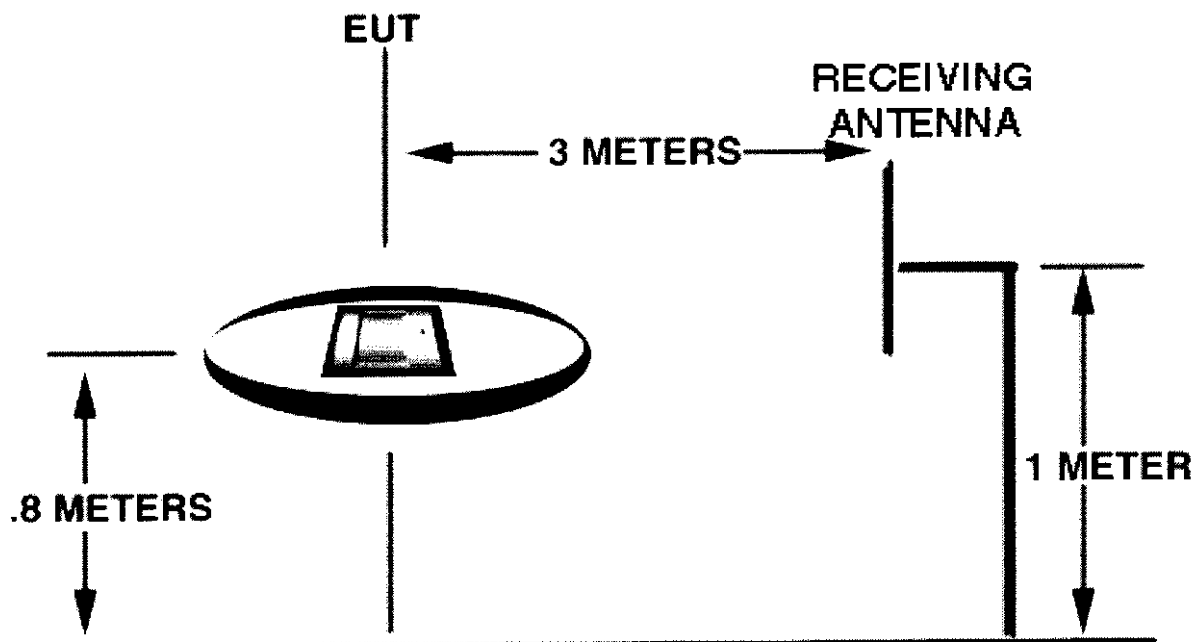
SPAN 0 Hz
*ST 5.000 sec

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EXHIBIT 4

LABORATORY MEASUREMENT SKETCHES

RADIATED EMISSIONS



INTERACTIVE TECHNOLOGIES INCORPORATED

RADIATED EMISSIONS SUMMARY

The SIMON II TRANSMITTER passes FCC Rules Part 15, Subpart C, Paragraphs 15.231 and 15.231 (e).

The highest fundamental radiated emission measurement was 1.14dB below the FCC limit at 319.5MHz. The highest spurious emission measurement was 11.94dB below the FCC limit at 639MHz. The highest forbidden band emission was 6.58dB below the FCC limit at 2236.6MHz..

The highest fundamental radiated emission measurement of 15.231 (e) was 7.29dB below the FCC limit at 319.5MHz. The highest spurious emission measurement of 15.231 (e) was 10.39 dB below the FCC limit at 639MHz. The highest forbidden band emission measurement of 15.231 (e) was 28.97dB below the FCC limit at 2236.6MHz.

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FCC EMISSIONS CALCULATION

TERMS:

ANALYZER READING (AR) (dBuV)

TOTAL LOSS FACTOR (TLF) (dB) = (ANTENNA FACTOR (AF) + CABLE LOSS (CL))

DUTY CYCLE CORRECTION (DC) (dB) = AVERAGE ON TIME OF DATA

EXAMPLE:

ANALYZER READING = 70dBuV

ANTENNA FACTOR = 18.4dB

CABLE LOSS = 4.1dB

DUTY CYCLE CORRECTION = 20dB

$(AR + TLF (AF + CL)) - DC = \text{dBuV} / M$ (70dBuV + 22.5) - 20 = 72.5dBuV / M

$\text{INVERSE LOG} (\text{dBuV}/M / 20) = \text{uV} / M$ (72.5dBuV/M /20) = 4217uV / M

INTERACTIVE TECHNOLOGIES INCORPORATED

LABORATORY MEASUREMENTS

RADIATED EMISSIONS

PRODUCT DESCRIPTION: SIMON II TRANSMITTER
MODEL NUMBER: B4Z-735-XMTR
FUNDAMENTAL 319.5MHz
POLARIZATION: HORIZONTAL & VERTICAL

The highest fundamental emission along with, the three highest spurious and restricted band emissions are listed below as per ANSI C63.4 paragraph 10.1.8.2.

Emissions from .009MHz to the tenth harmonic were measured as per FCC Rules Part 15, Subpart C, paragraph 15.33 (a).

	ANALYZER	20*LOG	ANTENNA	FIELD	FIELD	FCC
FREQUENCY	READING	DUTY CYCLE	FACTOR	STRENGTH	STRENGTH	LIMIT
MHz	dBuV	-dB	dB	dBm	uV/m	uV/M
319.5	77.35	20	17.4	74.8	5463.9	6229.5
639	41.55	20	22.4	44	157.6	623
1917	29.55	20	33.8	43.4	147.1	623
1278	32.95	20	29.3	42.3	129.6	623
2236.6	26.3	20	41.1	47.4	234.4	500
1597.5	32.75	20	31.2	44	157.6	500
1917	29.55	20	33.8	43.4	147.1	500

INTERACTIVE TECHNOLOGIES INCORPORATED

LABORATORY MEASUREMENTS

RADIATED EMISSIONS

PRODUCT DESCRIPTION: SIMON II TRANSMITTER
MODEL NUMBER: B4Z-735-XMTR
FUNDAMENTAL 319.5MHz
POLARIZATION: HORIZONTAL & VERTICAL

The highest fundamental emission along with, the three highest spurious and restricted band emissions are listed below as per ANSI C63.4 paragraph 10.1.8.2.

Emissions from .009MHz to the tenth harmonic were measured as per FCC Rules Part 15, Subpart C, paragraph 15.33 (a).

Emission limits were derived from the table in Paragraph 15.231 (e).

	ANALYZER	20*LOG	ANTENNA	FIELD	FIELD	FCC
FREQUENCY	READING	DUTY CYCLE	FACTOR	STRENGTH	STRENGTH	LIMIT
MHz	dBuV	-dB	dB	dBm	uV/m	uV/M
319.5	63.2	20	17.4	60.6	1071.5	2480
639	35.1	20	22.4	37.5	75	248
958.5	24.1	20	27.5	31.6	38	248
1278	15.25	20	29.3	19.6	16.9	248
2236.5	3.9	20	41.1	25	17.8	500
1597.5	8.35	20	39.6	19.6	9.5	500
2875.6	1.65	20	37.3	18.2	8.1	500

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AMBIENT LEVEL IN FORBIDDEN BANDS

Noise floor of spectrum analyzer with antenna factors and duty cycle correction converted to uV/M at approximately one meter.

15.205(a) All forbidden band information is listed below.

FREQUENCY MHz	NOISE FLOOR READING dBuV	20 LOG DUTY CYCLE dB	LOSS FACTOR dB	FIELD STRENGTH uV/M	FCC LIMIT uV/M
.09-.11	N.A.	N.A.	N.A.	N.A.	*
.49-.51	N.A.	N.A.	N.A.	N.A.	*
2.1735-2.1905	N.A.	N.A.	N.A.	N.A.	300
8.362-8.366	N.A.	N.A.	N.A.	N.A.	300
13.36-13.41	N.A.	N.A.	N.A.	N.A.	300
25.5-25.67	N.A.	N.A.	N.A.	N.A.	300
37.5-38.25	N.A.	N.A.	N.A.	N.A.	300
73-75.4	N.A.	N.A.	N.A.	N.A.	300
108-121.94	N.A.	N.A.	N.A.	N.A.	450
123-138	N.A.	N.A.	N.A.	N.A.	450
149.9-150.05	N.A.	N.A.	N.A.	N.A.	450
156.7-156.9	N.A.	N.A.	N.A.	N.A.	450
162.0125-167.17	N.A.	N.A.	N.A.	N.A.	450
167.72-173.2	N.A.	N.A.	N.A.	N.A.	450
240-285	17.45	-20	22	9.4	600
322-335.4	19.35	-20	23.8	14.4	600
399.9-410	19.35	-20	22.1	11.8	600
608-614	0.4	-20	24.6	1.8	600
960-999	0.4	-20	33.4	4.9	600
999-1240	-0.75	-20	26	1.8	1500
1300-1427	-0.75	-20	28	2.3	1500
1435-1626.5	-0.75	-20	28	2.3	1500
1660-1710	-0.75	-20	28	2.3	1500
1717.8-1722.2	-0.75	-20	28	2.3	1500
2200-2300	-1.25	-20	32	3.4	1500
2310-2390	-1.25	-20	32	3.4	1500
2483.5-2500	-1.25	-20	32	3.4	1500
2655-2900	-1.25	-20	34	4.3	1500
3260-3267	NA	NA	NA	NA	1500
3332-3339	NA	NA	NA	NA	1500
3345.8-3358	NA	NA	NA	NA	1500
3600-4400	NA	NA	NA	NA	1500

* Calculated based on $2400/F$ (kHz) x 300. (See Rule 15.209.)

All measurements were taken with an HP 8566B Spectrum Analyzer. The bandwidth was 100kHz for measurements below 100MHz. The bandwidth was 1MHz for measurements above 1000MHz. The video filter was off.

INTERACTIVE TECHNOLOGIES INCORPORATED

TEST FACILITY DATA SHEETS
NOISE FLOOR MEASUREMENTS

T U V P R O D U C T S E R V I C E
R A D I A T E D E M I S S I O N S

Large Test Site
3 Meter Antenna Distance
Equipment Under Test:
ITI
SIMON II SECURITY PANEL
Notes: WITH ON BOARD TRANSMITTER.

Report W8264 Run 5
Date 06/09/98 Page 1
Engineer _____
Tech: RMJ _____
Requester _____

Frequency MHz	Level dBuV	Factor dB	Cable dB	Final dBuV/m	Az deg	Polar\ Height	Delta	Delta
319.45	77.35	15.8	1.6	94.7	--	H --		
638.97	41.55	20.1	2.3	63.9	--	H --		
958.50	28.3	24.6	2.9	55.7	--	H --		
1278.1	32.95	25.9	3.4	62.2	--	H --		
1597.6	32.75	27.3	3.9	63.9	--	H --		
1917.1	29.55	28.9	4.9	63.4	--	H --		
2236.6	26.3	29.9	12	68.2	--	H --		
2556.2	9.2	30.7	7.5	47.4	--	V --		
2875.7	14.1	31.1	5.4	50.7	--	V --		
3195.2	15.2	31.9	5.4	52.5	--	H --		

LOW LEVEL MODE.

3195.3	2.4	31.9	5.4	39.7	--	H --		
2875.7	1.65	31.1	5.4	38.2	--	H --		
2556.2	2.6	30.7	7.5	40.8	--	V --		
2236.7	3.9	29.9	12	45.8	--	V --		
1917.1	4.1	28.9	4.9	37.9	--	H --		
1597.6	8.35	27.3	3.9	39.5	--	H --		
1278.1	15.25	25.9	3.4	44.5	--	H --		
958.51	24.1	24.6	2.9	51.5	--	H --		
638.98	35.1	20.1	2.3	57.4	--	H --		

T U V P R O D U C T S E R V I C E

RADIATED EMISSIONS

Large Test Site
 3 Meter Antenna Distance
 Equipment Under Test:
 ITI
 SIMON II SECURITY PANEL
 Notes: WITH ON BOARD TRANSMITTER.

Report W8264 Run 5
 Date 06/09/98 Page 2
 Engineer _____
 Tech: RMJ _____
 Requester _____

Frequency MHz	Level dBuV	Factor dB	Cable dB	Final dBuV/m	Az deg	Polar\ Height	Delta	Delta
319.45	63.2	15.8	1.6	80.6	--	H --		

END OF SCAN.

T.U.V. PRODUCT SERVICE

RADIATED EMISSIONS

Large Test Site
 3 Meter Antenna Distance
 Equipment Under Test:
 ITI
 CONCORD HYBRID SECURITY PANEL
 Notes: WITH ON BOARD TRANSMITTER.

Figure _____

Report W8264 Run 4
 Date 06/09/98 Page 3
 Engineer _____
 Tech: RMJ _____
 Requester _____

Measurement Summary

Frequency MHz	----- Final dBuV/m	----- uV/m	Azimuth deg	Polar\ Height	Delta	Delta
200.1	31.1	35.892	--	V --		
300	35.8	61.659	--	V --		
319.44	92.9	44157.	--	V --		
500	39.8	97.723	--	V --		
638.94	52.3	412.09	--	V --		
958.45	49.2	288.40	--	V --		
1000	27.6	23.988	--	V --		
1278.0	47.1	226.46	--	H --		
1597.5	57	707.94	--	V --		
1917.0	46.4	208.92	--	V --		
1999.9	34.1	50.699	--	V --		
2236.6	58.9	881.04	--	V --		
2556.1	45.2	181.97	--	V --		
2875.6	39	89.125	--	V --		
3195.0	37.9	78.523	--	V --		

File W8264 Run 4

INTERACTIVE TECHNOLOGIES INCORPORATED

PRODUCT DESCRIPTION

MITSUBISHI MICROCOMPUTERS

M3802x Group

SINGLE-CHIP 8-BIT CMOS MICROCOMPUTER

DESCRIPTION

The M3802x group is made up of 8-bit microcomputers based on the MELPS 740 core.

The M3802x group is designed for controlling systems that require analog signal processing and include two serial I/O functions, A-D converters, and D-A converters.

The various microcomputers in the M3802x group include variations of internal memory size and packaging. For details, see the section on part numbering.

For details on availability of microcomputers in the M3802x group, see the section on group expansion.

FEATURES

- Basic machine-language instructions 71
- Instruction execution time 0.5 μ s
(shortest instruction at 8MHz oscillation frequency)
- Memory size
 - ROM 4K to 32K bytes
 - RAM 192 to 1024 bytes
- Programmable input/output ports 56
- Interrupts 16 sources, 16 vectors
- Timers 8 bitX4
- Serial I/O1 8-bitX1 (UART or Clock-synchronized)
- Serial I/O2 8-bitX1 (Clock-synchronized)
- PWM 8-bitX1
- A-D converter 8-bitX8 channels
- D-A converter 8-bitX2 channels
- Clock generation circuit Internal feedback amplifier
(connect to external ceramic resonator or quartz crystal)
- Supply voltage 3.0 to 5.5V
- Low power dissipation 32mW
- Memory expansion possible
- Operating temperature range -20 to 85°C

APPLICATIONS

Office automation, VCRs, tuners, musical instruments, cameras, air conditioners, etc.

The microprocessor controls the RF transmitter initiation, timing and power output. As per the timing diagram on pages 23 and 24, Pin 17 of the micro puts a high on the oscillator transistor (Q4) base and turns the transmitter frequency controlling stage on. Approximately 5 milliseconds after the oscillator has been turned on, either pins 12 or 34, sends the data stream to the amplifier transistor (Q9) base. The learnmode data packet is sent on pin 12 for a full signal transmission or pin 34 for a reduced power transmission.

INTERACTIVE TECHNOLOGIES INCORPORATED

PRODUCT DESCRIPTION

MITSUBISHI MICROCOMPUTERS
M3802x Group

SINGLE-CHIP 8-BIT CMOS MICROCOMPUTER

PIN DESCRIPTION

Pin	Name	Function	Alternate Function
V _{CC} , V _{SS}	Power supply	Power supply inputs 4.0 to 5.5V to V _{CC} , and 0V to V _{SS} .	
CNV _{SS}	CNV _{SS}	This pin controls the operation mode of the chip. Normally connected to V _{SS} . If this pin is connected to V _{CC} , the internal ROM is inhibited and external memory is accessed.	
V _{REF}	Analog reference voltage	Reference voltage input pin for A-D and D-A converters.	
AV _{SS}	Analog power supply	GND input pin for A-D and D-A converter. Keep at the same potential as V _{SS} .	
RESET	Reset input	To reset the microcomputer, this pin should be kept at an "L" level for more than 2μs under normal operating conditions.	
X _{IN}	Clock input	Input and output signals for the internal clock generation circuit. Connect a ceramic resonator or quartz crystal between the X _{IN} and X _{OUT} pins to set the oscillation frequency. If an external clock is used, connect the clock source to the X _{IN} pin and leave the X _{OUT} pin open.	
X _{OUT}	Clock output		
P0 ₀ —P0 ₇	I/O port P0	An 8-bit CMOS I/O port. An I/O direction register allows each pin to be individually programmed as either input or output. At reset this port is set to input mode. In modes other than single-chip, these pins are used as address, data, and control bus I/O pins.	
P1 ₀ —P1 ₇	I/O port P1		
P2 ₀ —P2 ₇	I/O port P2		
P3 ₀ /DA ₁ , P3 ₁ /DA ₂	I/O port P3		D-A converter output pins
P3 ₂ —P3 ₇			
P4 ₀ /INT ₄ , P4 ₁ /INT ₀ , P4 ₂ /INT ₁ , P4 ₃ /INT ₂	I/O port P4	An 8-bit CMOS I/O port with the same function as port P0.	External interrupt input pin
P4 ₄ /R _X D, P4 ₅ /T _X D, P4 ₆ /SCL _{K1} , P4 ₇ /S _R DV ₁			Serial I/O1 I/O pins
P5 ₀ /S _{IN} 2, P5 ₁ /S _{OUT} 2, P5 ₂ /SCL _{K2} , P5 ₃ /S _R DV ₂	I/O port P5	An 8-bit CMOS I/O port with the same function as port P0.	Serial I/O2 I/O pins
P5 ₄ /CNTR ₀ , P5 ₅ /CNTR ₁			Timer X and Timer Y I/O pins
P5 ₆ /PWM			PWM output pin
P5 ₇ /INT ₃			External interrupt input pin
P6 ₀ /AN ₀ — P6 ₇ /AN ₇	I/O port P6	An 8-bit CMOS I/O port with the same function as port P0.	A-D converter input pins

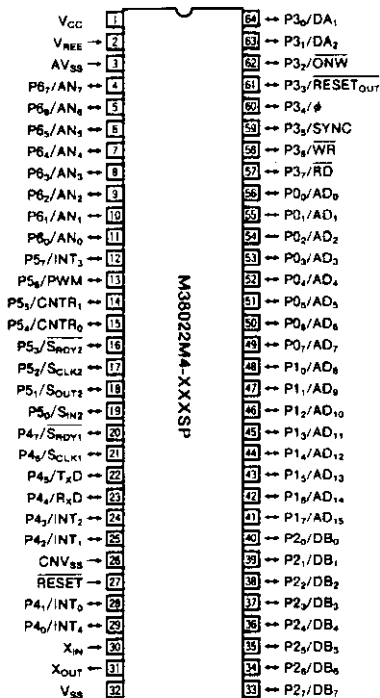
INTERACTIVE TECHNOLOGIES INCORPORATED

PRODUCT DESCRIPTION

MITSUBISHI MICROCOMPUTERS
M3802x Group

SINGLE-CHIP 8-BIT CMOS MICROCOMPUTER

PIN CONFIGURATION (TOP VIEW)



Package type : 64P4B

64-pin shrink plastic-molded DIP