FCC CERTIFICATION REPORT

for

Capricorn Electronics Inc.

FCC ID: CNAWK700

1.0 Introduction

This report has been prepared on behalf of Capricorn Electronics Inc. to support the attached Application for Equipment Authorization. The test and application are submitted for a Periodic Intentional Radiator under Part 15.231 of the FCC Rules and Regulations. The Equipment Under Test was the Capricorn Electronics Inc. Low Power Keypad Transmitter.

All measurements herein were performed according to the 1992 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and field Strength Instrumentation. Calibration checks are made periodically to verify proper performance of the measuring instrumentation.

All measurements are performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code 200066-0) as an independent FCC test laboratory.

The results reported herein relate only to the item tested. This report shall not be used to claim product endorsement by NVLAP or any agency of the US Government.

1.1 Summary

The Capricorn Electronics Inc. Keypad Transmitter complies with the limits for a Periodic Intentional Radiator under Section 15.231.

2.0 Description of Equipment Under Test (EUT)

The Capricorn Electronics Inc. keypad transmitter is a 313.5 MHz low power transmitter that allows remote arm and disarm capabilities within a home or small business. The keypad's operation matches the setup for the system's master hardwire keypad. Disarm codes, single digit arming, etc., are identical to the master keypad.

When a key is pressed, the unit will beep and the transmitter and transmit LED will activate. The transmitter will cease operation within approximately two seconds of the key being released. The unit activates a supervisory transmission to verify system integrity once every 66 minutes (± 5 minutes). This transmission lasts for no longer than 9.12 ms, regardless of coding.

The battery powered transmitter also contains a permanently attached antenna. The transmitter is used with a receiver, FCC ID: CNAPL-1.

2.1 On-board Oscillators

The Capricorn Electronics Inc. Keypad Transmitter contains a 4.00 MHz oscillator that is used for the digital portion of the unit and a 313.5 MHz SAW resonator for the transmitter.

3.0 Test Configuration

To complete the test configuration required by the FCC, the keypad transmitter was powered-on. The transmitter was tested in all three orthogonal planes.

3.1 Testing Algorithm

The transmitter was turned on and constantly transmitting with the worst case modulation. Worst case emissions are recorded in the data tables.

3.2 Conducted Emissions Testing

Conducted emissions testing was not performed since the unit is battery powered and does not connect to the AC power mains.

3.3 Radiated Emissions Testing

The EUT was placed on an 80 cm high 1 x 1.5 meters non-conductive motorized turntable for radiated testing on a 3 meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Biconical log periodic and horn broadband antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

The output from the antenna was connected, via a preselector or preamplifier, to the input of the spectrum analyzer. The detector function was set to peak. For emissions below 1 GHz, the measurement bandwidth on the spectrum analyzer system was set to at least 120 kHz, with all post-detector filtering no less than 10 times the measurement bandwidth. For emissions above 1 GHz, the measurement bandwidth on the spectrum analyzer system was set to at least 1 MHz, with all post-detector filtering no less than 10 times the measurement bandwidth.

3.3.1 Radiated Data Reduction and Reporting

To convert the raw spectrum analyzer radiated data into a form that can be compared with the FCC limit, it is necessary to account for various calibration factors that are supplied with the antennas and other measurement accessories. These factors are grouped into a composite antenna factor (AFc) and are supplied in the AFc column of Table 1. The AFc in dB/m and AFd (duty cycle factor) in dBμV (see Exhibit 1) are algebraically added to the Spectrum Analyzer Voltage in dBμV to obtain the Radiated Electric Field in dBμV/m. This level is then compared with the FCC limit.

Example:

Spectrum Analyzer Voltage:	VdBμV
Composite Antenna Factor:	AFcdB/m
Duty Cycle Factor:	AFddBμV
Electric Field:	EdBμV/m = VdBμV + AFcdB/m + AFddBμV
To convert to linear units:	EμV/m = antilog (EdBμV/m/20)

Data is recorded in Table 1.

Table 1

FCC 15.231 3M Radiated Emissions Data - Site 2

CLIENT: Capricorn Electronics Inc.
FCC ID: CNAWK700
DATE: 7/16/98
CLK SPEED(S): 313.5 MHz
BY: Steve Koster
JOB #: 4639X

FREQ MHz	POL H/V	Azimuth Degree	Ant Height m	SA LEVEL PEAK dBuV	AFc dB/m	DUTY CYCLE CORR	E-FIELD dBuV/m	E-FIELD uV/m	LIMIT uV/m	MRGN dB
313.50	H	90.00	1.5	75.3	16.4	-20.8	70.9	3525.6	5979.0	-4.6
626.95	H	135.00	2.0	28.9	24.0	-20.8	32.1	40.5	597.9	-23.4
940.36	H	90.00	1.0	40.6	28.7	-20.8	48.5	267.0	597.9	-7.0
1253.44	V	225.00	1.0	55.8	-14.0	-20.8	21.0	11.3	597.9	-34.5
1567.36	V	225.00	1.0	52.5	-11.5	-20.8	20.2	10.2	500.0	-33.8
1880.65	H	225.00	1.0	38.9	-7.5	-20.8	10.6	3.4	597.9	-44.9

Table 2

System Under Test

FCC ID: CNAWK700

EUT:	Capricorn Electronics Inc. Keypad Transmitter; FCC ID: CNAWK700

Table 3

Measurement Equipment Used

The following equipment is used to perform measurements:

Hewlett-Packard Spectrum Analyzer: HP 8568B
Hewlett-Packard Spectrum Analyzer: HP 8593A
Hewlett-Packard Quasi-Peak Adapter: HP 85650A
Hewlett-Packard Preselector: HP 85685A
Hewlett-Packard Preamplifier: HP 8449B
Antenna Research Associates, Inc. Biconical Log Periodic Antenna: LPB-2520
Antenna Research Associates Horn Antenna: DRG-118/A
Solar 50 Ω/50 μH Line Impedance Stabilization Network
AH Systems, Inc. Portable Antenna Mast: AMS-4
AH Systems, Inc. Antenna Tripod: ATU-200/510
AH Systems, Inc. Motorized Turntable
RG-214 semi-rigid coaxial cable
RG-223 double-shielded coaxial cable

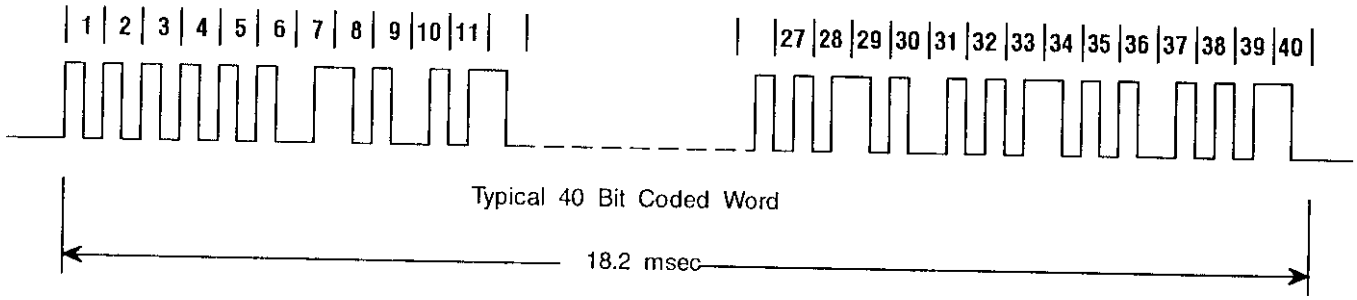
EXHIBIT 1

DUTY CYCLE CALCULATIONS

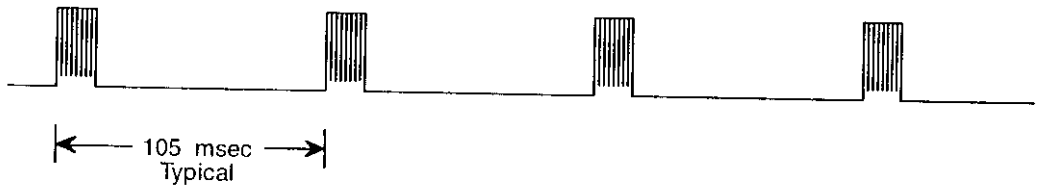
The following page shows a drawing and calculation of the duty cycle.

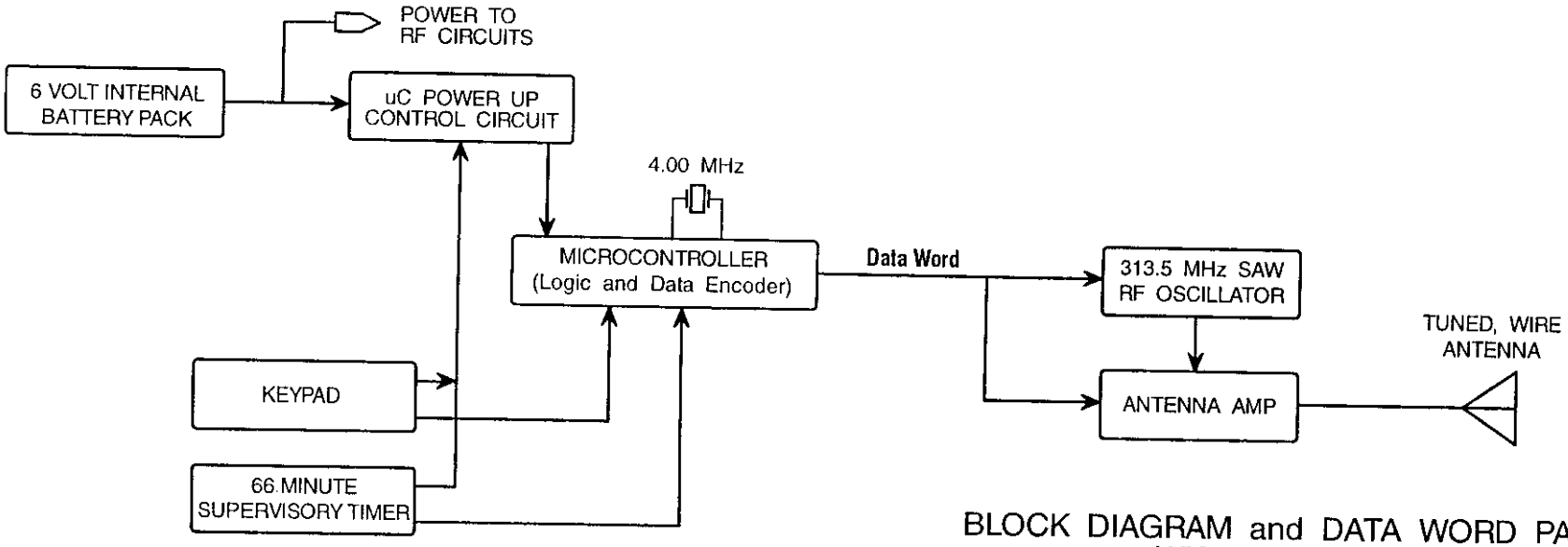
Each bit cell is 228 usec ON and 228 usec OFF. Total ON time per data word, regardless of coding, is 40 x 228 = 9.12 msec.

DATA WORD



DATA WORD REPEAT CYCLE





BLOCK DIAGRAM and DATA WORD PATTERN
WK-700 SECURITY TRANSMITTER
Capricorn Electronics, Inc.

6/98 File: 700_BD15.CDR
FCC Part 15

EXHIBIT 2

CARRIER BANDWIDTH DATA

The 20 dB modulated bandwidth shall be no wider than 0.25% of the center frequency.

Bandwidth Limit = Carrier Frequency x .0025

Bandwidth Limit = 313.5 MHz x .0025 = 783.75 kHz

Measured EUT Bandwidth = 200 kHz

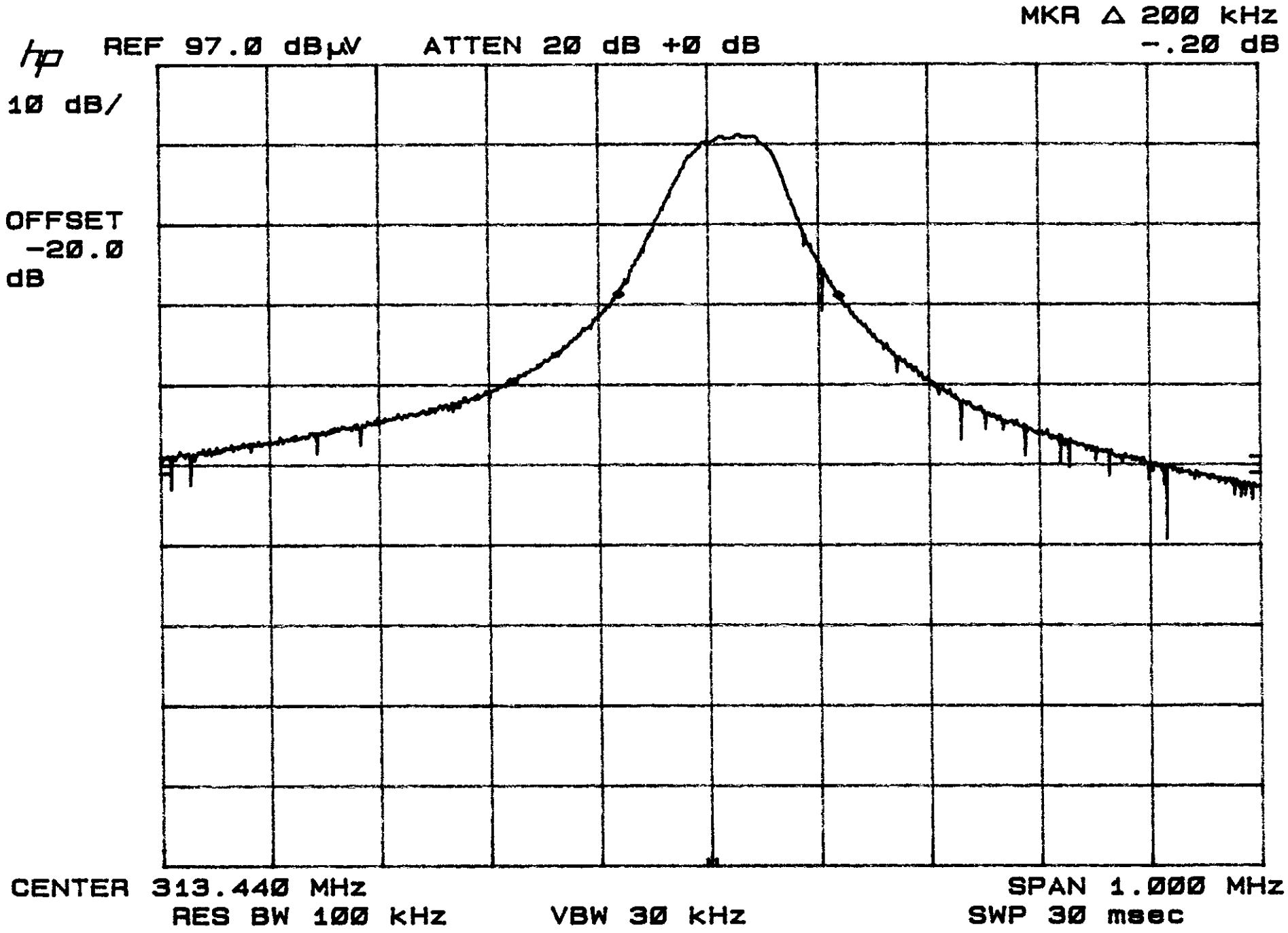

MKR Δ 200 kHz
-.20 dB
REF 97.0 dBμV
ATTEN 20 dB +0 dB
10 dB/
OFFSET
-20.0
dB
CENTER 313.440 MHz
SPAN 1.000 MHz
RES BW 100 kHz
VBW 30 kHz
SWP 30 msec

EXHIBIT 4

MAXIMUM RADIATED EMISSIONS CONFIGURATION