Summary of Test Results
in accord with FCC Rules Part 15 and C63.4-1992

Equipment Model:	DNT00084
Transmitter Tested to C63.4-1992 Section:	FCC Rules 15.231
Field Strength at a distance of 3 meters:	5069 uV/Mtr (- 01.63 dB below limit) @ 318 MHz
Peak to Average Ratio:	15.6 dB - Fixed Duty Cycle
Test Conditions:	Radiated (Sections 11 & 13)
Transmitter: Transmitter Frequency:	318 MHz Nominal (Factory Tuned Only)
Bandwidth (20 dB down)	< 0.010% of Center Freq.
Frequency Tolerance:	N/A (Nominal +/- 1MHz)
Frequency Stability:	N/A (Nominal +/- 0.1 MHz)
Transmitter Spurious at 3 meters: (Worst Harmonic)	484 uV/Mtr (- 2.0 dB below limit)
Frequency:	1908 MHz
Momentary Operation (Yes/No)	Yes
Holdover time after manual release:	0 seconds (no delay on shutdown)
Duration of transmission after activation:	10 seconds maximum on any single manual activation

Attestation:

The radio apparatus identified in the application has been subject to all the applicable test conditions specified in FCC Rules Part 15 and all of the requirements of the Standard have been met.

Regulatory Compliance Engineer

REGISTERED PROFESSIONAL ENGINEER
JOHN W. KUIVINEN
No. E010909
CIVIL
STATE OF CALIFORNIA

John W. Kuivinen, P.E. John W. Kuivinen P.E. Date Aug. 10, 98

LINEAR CORPORATION
FCC ID: EF4 DNT00084

Radio Standard Specification
Low Power Communication Devices
C63.4-1992 and FCC Rules Part 15

1.0 General:

1.2, Exclusions to TV Broadcast Freq.	Complies

2.0 Related Documents:

Reference Documents for Application:	CFR 47, FCC Rules Part 15

3.0 Test Equipment:

Supply Voltage:	Fresh Duracell MN1604 9 volt alkaline battery
Test Equipment List	See Section 6
Signal Detector:	Peak with 15.6 dB peak to average conversion.

4.0 Certification and Test Results:

Summary of Results per	See Page 1 of this Report

5.0 General Technical Requirements:

5.1 Testing Methods:	Peak Signal pulse position modulated A1D signal.
5.1 Reference Standard:	C63.4-1992 (FCC Procedure)
5.2 Modulation:	Pulse Position A1D, AM Modulation
5.3 Type of Antenna:	Integral to Transmitter PCB
5.4 External Controls:	Single Push Button No user serviceable parts except for replacement of batteries
5.5 Accessories:	NONE
5.6 TX Bandwidth:	<0.010 % (See Section 8)
5.7 Equipment Labels:	See Section 2
5.8 Manual Disclaimer:	See attached draft copy of manual
5.9 Usage Restrictions:	Digital Pulse Code Only

6.0 Transmitter Characteristics and Tests:

6.1 Momentary Operated Devices:	Complies
6.1(a) Types of Signals:	Manual Push to Transmit
6.1(a) Automatic Activation:	N/A
6.1(a) Five Second Max. upon release:	Complies
6.1(b) Field Strengths:	Table 1 318 MHz = 6117 uV/Mtr at 3 meters.
6.1(c) Bandwidth (20 dB down)	<0.010 % Complies
6.1(d) Frequency Stability	N/A per regulations +/- 1 MHz Maximum Error
6.1(e) Reduced Field Strength	N/A
6.2 Non-Momentary Operated Devices:	N/A
6.2.1 Frequency Bands:	Refer to Table 1
6.3 Restricted Bands:	Complies
6.5 Pulsed Operation:	Complies (15.6 dB Peak/Average) See Section 8
6.6 Wireline Conducted Emissions:	N/A
7.0 Receivers	N/A
8.0 Self Certification:	N/A
9.0 AC Wireline Conducted Emissions:	N/A
10.0 Terminated Measurement Method:	N/A
11.0 Radiated Measurement Method:	See Section 8
11.1 Measuring Distance:	Complies
11.2 Open Field Test Site:	Complies, C63.4-1992
11.3 Equipment Test Platform:	See Section 8
11.4 Measurement Method:	Complies, See Section 8
12.0 DC Power Consumption Methods:	N/A
13.0 Near Field Measurement for < 30 MHz:	N/A
14.0 Test Report Submission:	See Attached

REPORT OF MEASUREMENTS

LINEAR CORPORATION
FCC ID: EF4 DNT00084
Model : MCT-2 Handheld Remote Control Transmitter

The enclosed documents reflect the requirements contained generally within the code of Federal Regulations, Title 47, Parts 2 and 15 as most recently published October 1, 1997 and all other applicable revisions made by the Commission since that time.

The specific rule sections for which the enclosed documents demonstrate compliance or rely upon to demonstrate compliance with the Commission's application and technical standards are as follows:

15.201-15.207, 15.231, Subpart C, Intentional Radiators.

Test Procedure C63.4-1992, Section 13, Measurement of Intentional Radiators was used for the testing of this device.

In accord with Section 2.948 of the Commission's Rules, a Test Site submittal dated January 27, 1998 is on file with the commission and a Letter of Acceptance dated March 13, 1998 (File 31040/SIT) is a portion of the Commission's records.

All of the information contained within this documentation is true, correct, and complete to the best of my knowledge.

John W. Kuivinen, P.E.
Regulatory Compliance Engineer

Aug. 10, 98
Date

REGISTERED PROFESSIONAL ENGINEER
JOHN W. KUIVINEN
No. E013909
Exp. 6/00
ELECTRICAL
STATE OF CALIFORNIA

TESTING INSTRUMENTATION AND EQUIPMENT LIST

SPECTRUM ANALYZERS:

H.P.	HP8562A	1KHz to 22GHz		
	S/N 2913A03742		Calibrated	1/98
			Due	1/99

ANTENNAS:

(2)	Ailtech DM105A T1	20-200 MHz		Tuned Dipole
	S/N 93412-105 and 93412-114	Calibrated 1/98	Due:	1/99
(2)	Ailtech DM105A T2	140-400 MHz	Tuned Dipole	
	S/N 93413-113 and 93413-117	Calibrated 1/98	Due:	1/99
(2)	Ailtech DM105A T3	400-1000 MHz	Tuned Dipole	
	S/N 93413-105 and 93414-111	Calibrated 1/98	Due	1/99
(2)	AH Systems SAS-200/511	1-12.4 GHz		Log Periodic
	S/N 118 and 124, P/Ns 2069			
(1)	AH Systems SAS-200/540	20-330 MHz		Biconical
	S/N 367 P/N 2052			

INSTRUMENTATION:

H.P.	HP8656B RF Generator	100 KHz - 99O MHz	
	S/N A4229590	Calibrated	1/98
		Due	1/99
Solar Electronics Line Impedance Stabilization Network, Type			
	8012-50-R-24-BNC	Calibrated:	1/98
	S/N 8379585	Due:	1/99
HP 8447D	Broadband preamplifier, 0.1-1300 MHz		
	S/N 2443A03660	Calibrated: 4/97	
		Due: 4/98	
Mini-Circuits	ZFL-2000 broadband preamplifier, 10-3000 MHz		
	S/N Lin 001	Calibrated: 4/97	
		Due: 4/98	

ACCESSORIES:

(2) Ailtech Rulers calibrated in MHz
4 Meter ABS Antenna Mast and Trolley
Tektronix C5C Scope Camera
Eighty Centimeter Tall, Motorized Wooden Turntable
BNC to BNC Cables - as-required

(2) 25' RG-214/U Low-loss Coaxial Cable
S/N- LIN001 & LIN002 Calibrated: 1/98
Due: 1/99

(2) 3' RG-55/U Low-loss Coaxial Cable, calibarated as part of the preamplifiers. Automatically taken into account when used with the above itemized range preamplifiers.

LINEAR CORPORATION
FCC ID: EF4 DNT00084

MEASUREMENT OF RADIO FREQUENCY EMISSION OF CONTROL AND SECURITY ALARM DEVICES FCC RULES PART 15, C63.4-1992 TEST PROCEDURE

I. INTRODUCTION

As part of a continuing series of quality control tests to ensure compliance with all applicable Rules and Regulations, this enclosure details the test procedures for certain radio control devices. Testing was performed at a test site located on the property of Linear Corporation, 2055 Corte del Nogal, Carlsbad, California 92009.

II. MEASUREMENT FACILITY DESCRIPTION

The test facility is a specially prepared area adequately combining the desirability of an interference free location with the convenience of nearby 120 volt power outlets, thus completely eliminating the incidence of inverter hash, so often a problem with field measurements.

III. DESCRIPTION OF SUPPORTING STRUCTURES

For Measuring Equipment - The antenna is supported on a trolley that can be raised and lowered on a mast by means of remote control to any level between 1 meter and 4 meters above the ground. For measurements at 3 meters, an antenna height (center of dipole) of about 1 meter generally yields the greatest field strength. For measurements at 1 meter, an antenna height equal to the device under test generally yields the greatest field strength. Usually, horizontal polarization yields the greatest field strength for both 1 and 3 meter measurements.

For Equipment Under Test (EUT): The equipment to be tested is supported by a wooden turntable at a height of eighty centimeters. A two axis swivel at the top of the turntable permits the unit under test to be manually oriented in the position of maximum received signal strength. The turntable can be rotated by remote control.

Test Configuration - All transmitters were located eighty centimeters above ground, at a distance of three meters from the antenna. They were each oriented for maximum radiation by rotating the turntable. The antenna was then moved vertically along the mast for optimum reception in both horizontal and vertical planes. Where no emissions were found, the antenna was also moved to one meter distance to improve system sensitivity.

All receivers were located eighty centimeters above ground, at a distance of three meters from the antenna. They were each oriented for maximum radiation by rotating the turntable. The antenna was then moved vertically along the mast for optimum reception in both horizontal and vertical planes. Generally, emissions were very close to the observed spectrum analyzer noise floor, making accurate measurement difficult because of the analyzer detector's characteristic of adding signal and noise. To better observe and measure emissions well above the noise floor, the antenna was moved in to one meter. This provides a theoretical 9.54 dB improvement in received field strength, but a possible shift from far field to near field antenna characteristics may introduce an unknown error in measurement.

All transmitters and receivers tested are typical of production units.

A Hewlett-Packard spectrum analyzer consisting of an 8562A mainframe is used for the field strength meter. A set of Ailtech DM-105 series dipoles are used for the receiving antennas up to 1 GHz. An A.H. Systems model SAS-200/511 log periodic antenna is used from 1 to 5 GHz. Since the published antenna factor includes the small amount of balun loss, this factor is not included in the equations for correcting measured values. The cable loss is added to the raw data. For measurements up to 1 GHz, a Hewlett-Packard 8447D broadband RF preamplifier is inserted between the antenna cable and spectrum analyzer input to ensure adequate system sensitivity while measuring.

From 1 GHz to 3 GHz, a Mini-Circuits ZFL-2000 broadband RF preamplifier is used instead of the HP 8447D. In many cases, the antenna is moved in to a distance of 1 meter to enhance test range sensitivity after the 3 meter data is observed. A theoretical 9.54dB improvement is realized. Please see Excel data spreadsheet for details. For a particular device and frequency, the EUT to antenna distance is specified in the Report of Measurements.

Correction of Measured Values - The spectrum analyzer calibration is in units of dBm absolute. Published antenna factor, measured cable loss and preamplifier gain are in units of dB. All equipment is referenced to a 50 ohm characteristic impedance; therefore, any impedance terms will factor out of any calculations. Also, balun loss is included in the antenna factor, so this term will not appear in any calculation.

To obtain field strength, the reference (50 ohm system) 1 uV = 0 dBuV = -107 dBm is used.

For a given frequency: antenna factor, cable loss, preamplifier gain (if used) and a 9.54 dB gain factor (3 meters to 1 meter field strength conversion) when required are factored into the spectrum analyzer reading, resulting in a field strength in units of dBm.

Field strength reading (dBm) + 107 dB = dBuV, using 0 dBuV = 1 uV/meter at a specified distance as reference.

All of the equipment was calibrated to NBS-traceable factory specifications prior to the date of measurement.

IV MEASUREMENT PROCEDURE

Transmitters

1. Set the DIP-switch rockers of the transmitter (if needed) to all ON, jam the button in the ON position, and place the transmitter on the test stand.
2. Tune the antenna (if required).
3. Tune the spectrum analyzer.
4. Adjust the antenna height and polarization for peak field strength.
5. Rotate the turntable to orient the transmitter for the highest reading.
6. Record the observed peak emission.
7. Record the screen image (if required).

Spectrum Analyzer Control Settings:

Tuning:	As required
Bandwidth	100 KHz for Field Strength,
Scan Width:	100 KHz/div (may be different when tuning or adjusting display for photographs)
Input Attenuator:	10 dB
Scan Time:	50 mSec. sweep
Reference Level:	0 dBm
Display Mode:	Log 10 dB/division
Video Filter:	OFF
Scan Mode:	Internal
Scan Trigger:	Auto

REPORT OF MEASUREMENTS

Applications for control,security alarm,door opener or remote switch

Description: 318.000 MHz transmitter 200 BPS MegaCode

DATE: August 5, 1998

ITEM TESTED: MCT-2 Handheld Transmitter, Unit No. 1
MANUFACTURER: Linear Corp.
TRADE NAME: N/A
PRODUCT ID: EF4 DNT00084

DISTANCE AT WHICH MEASURED: 3 meters, DUT 0.8 meter above ground
REFERENCE: 15.231(a,b,c)
MEASUREMENT PROCEDURE: C63.4-1992 INTENTIONAL RADIATORS

RADIATION: per 15.205

A	B	C		D		E	G	H	I	J	K	L	M	N	O	P	Q
Tuned Frequency MHz	Emission Frequency MHz	Ambient Level dBm		FCC Limit dBm		Meter Reading dBm	Antenna Factor dB	Cable Loss dB	Amp Gain dB	Dist Fac dB	Duty Cycle dB	Field Strength dBm/mtr	dBuV/mtr	uV/M	FCC Limit uV/M	dB:FCC	FREQ. MHz
318.00	318.00	-98.40		-8.27		-9.9	18.6	1.2	27.2	0.00	15.6	-32.90	74.10	5069.91	6117.00	-1.63	318.00
	636.00	-89.80		-36.87		-52.8	26.0	1.7	26.5	0.00	15.6	-67.20	39.80	97.72	611.70	-15.93	636.00
	954.00	-85.90		-40.77		-56.2	29.4	2.2	26.5	0.00	15.6	-66.70	40.30	103.51	611.70	-15.43	954.00
	1272.00	-88.70		-37.97		-47.0	26.8	2.6	27.1	0.00	15.6	-60.30	46.70	216.27	611.70	-9.03	1272.00
	1590.00	-79.10		-47.57		-56.4	28.7	3.0	19.8	0.00	15.6	-60.10	46.90	221.31	611.70	-8.83	1590.00
	1908.00	-77.40		-49.27		-51.3	30.0	3.3	19.7	0.00	15.6	-53.30	53.70	484.17	611.70	-2.03	1908.00
	2226.00	-85.14		-42.23		-56.2	30.8	3.6	18.3	9.54	15.6	-65.24	41.76	122.46	611.70	-13.97	2226.00
	2544.00	-84.04	*	-61.63	*	#N/A	31.7	3.8	0.0	9.54	15.6	#N/A	#N/A	#N/A	611.70	#N/A	2544.00
	2862.00	-82.94	*	-62.73	*	#N/A	32.4	4.2	0.0	9.54	15.6	#N/A	#N/A	#N/A	611.70	#N/A	2862.00
	3180.00	-82.04	*	-63.63	*	#N/A	33.1	4.4	0.0	9.54	15.6	#N/A	#N/A	#N/A	611.70	#N/A	3180.00

The spectrum was searched from 25 to 3500 MHz
No other emissions were observed except those shown on this page.

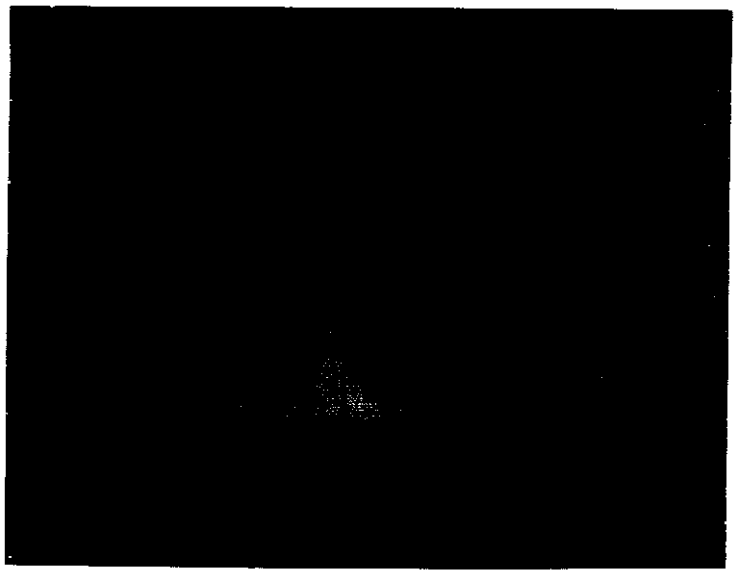
* NOTE: 1 meter measurement corrected to 3 meters

15.107(d) Conducted Emissions Not Applicable- Battery Powered

TESTED BY _____ DATE _____

ENGINEER John W. Kuwzwa DATE Aug. 10, 98

FILE NAME: DNT00084_1.XLS DISK NAME: FCC DATA



DEVICE: MCT-2 Handheld Alarm Transmitter

PHOTOGRAPH: Transmitter Spurious Emissions +/- 25 MHz of the tuned center freq.

CONDITIONS: Transmitter Fundamental. A1D Modulation, L/C Tuned Frequency Determining Element.

SPECTRUM ANALYZER CONTROL SETTINGS

CENTER FREQUENCY:	318 MHz	INPUT ATTENUATION:	-10 dB
SCAN WIDTH:	5.0 MHz/ DIV.	PREAMPLIFIER GAIN:	0 dB
SCAN TIME:	100 mSec./DIV.	LOG REF. LEVEL:	-20 dBm
RF BANDWIDTH:	30 KHz		
ANTENNA:	9" Whip on Analyzer Input	TUNED TO:	N/A MHz
ANTENNA DISTANCE:	0.25 Meters	ANTENNA HEIGHT:	N/A
SYSTEM NOISE FLOOR:	N/A		

No emissions occur outside of the of the rated center freq. except for harmonic spurious signals.

LINEAR CORPORATION
FCC ID: EF4 DNT00084

Megacode Timing Diagram and Duty Cycle Calculations

Duty Cycle is fixed because binary-coded, pulse-position type A1D modulation is used. Modulation rate is fixed at 167 bits per second. Therefore, each bit frame occupies 6 ms.

During transmission, the transmitter sequentially emits a group of 25 pulses in the form of a pulse-keyed carrier. Each pulse (transmitter ON time) has a duration of one millisecond (ms).

REAL TIME ANALYSIS: Refer to Page 2 for timing diagram. From time zero, one synchronization pulse of 1 ms duration occurs within a 6 ms "bitframe." Elapsed time: 6 ms.

Each of the remaining 24 information pulses occupy a 1 ms duration position within a 6 ms wide "bit frame" (24 frames). Total elapsed time: 144 ms.

DUTY CYCLE FACTOR:

$\frac{25 \text{ pulses (1ms)}}{150 \text{ ms}} = .1\overline{6}(20_{\log} \text{ voltage}) - -15.56\text{dB}$ (-16 practical)

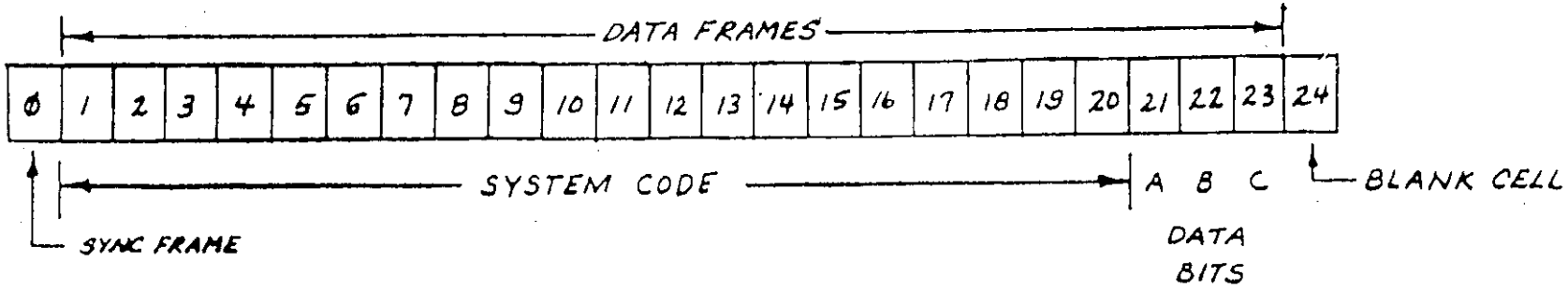
This calculation is based on a 150 ms total cycle time which is representative of actual operation.

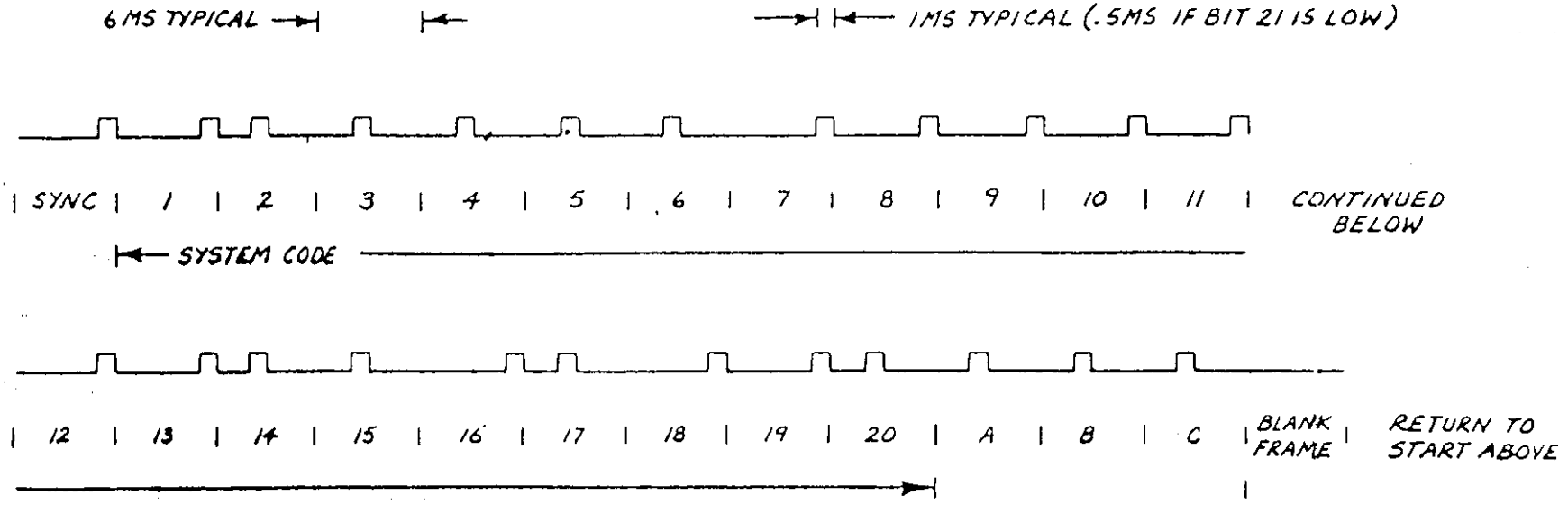
In compliance with Rule 15.205(b), the following duty cycle factor is used for all field strength calculations:
For a worst-case 100 ms interval occuring during the 144ms-long string of 24 bit frames:

$\frac{100 \text{ ms}}{6 \text{ ms}}$ interval per frame $= 16.\overline{6}$ frames average, 17 pulses possible.

$.17(20_{\log} \text{ voltage}) = -15.6$ dB

MEGACODE TIMING DIAGRAM





CODE SHOWN IS: 1 0 0 0 0 0 1 1 1 1 1 1 1 0 0 1 0 1 1 0 0 0 0