Summary of Test Results
in accord with FCC Part 15, Subpart B

Equipment Model:	GDO 98 Delta Three Receiver
Receiver Tested to 15.101(b):	Complies
Test Conditions:	Radiated Section 15.109(a)
Receiver Spurious at 3 meters: (Highest Emission)	4.5 uV/Mtr (-26.9 dB below limit)
Frequency:	52.68 MHz

Attestation:

The radio apparatus identified in the application has been subject to all the applicable test conditions specified in Parts 2 and 15 of the FCC Rules and Regulations and all of the requirements of the Rules and Regulations have been met.

Regulatory Compliance Engineer

John W. Kuivinen, P.E. _____ Date: 7/2/98

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

Radio Standard Specification
Low Power Communication Devices
FCC Rules Part 15, Subpart B

1.0 General:

1.2, Exclusions to TV Broadcast Freq.	N/A

2.0 Related Documents:

Reference Documents for Application:	CFR 47, Parts 2 & 15 ANSI/IEEE C63.4-1992

3.0 Test Equipment:

Supply Voltage:	120 VAC, Line Operated Device
Test Equipment List	See Report of Measurements
Signal Detector:	Peak Signal Reported

4.0 Certification and Test Results:

Summary of Results	See Page 1 of this section

5.0 General Technical Requirements:

5.1 Testing Methods:	Peak Signal
5.1 Reference Standard:	C63.4-1992 (IEEE Procedure)
5.3 External Controls:	No user serviceable parts
5.4 Accessories:	None Required
5.5 Detector Bandwidth:	< 1 GHz = 100 KHz (minimum) > = 1 GHz = 1 MHz (minimum)
5.6 Equipment Labels:	See Label Facsimile
5.7 Manual Disclaimer:	Complies
5.9 Usage Restrictions:	Digital Pulse Code Only

6.0 Receiver Characteristics and Tests:

7.1	Freq. of Operation:	310 MHz
7.3	Receiver Radiated Spurious:	Complies - See Report of Emissions
7.4	Conducted Emissions:	Complies - See Report of Emissions
8.0 Self Certification:		N/A
9.0 AC Wireline Conducted Emissions:		Complies - See Report of Emissions
10.0 Terminated Measurement Method:		N/A
11.0 Radiated Measurement Method:		C63.4-1992
11.1	Measuring Distance:	3 meters
11.2	Open Field Test Site:	Complies, FCC Site Acceptance dated 3/98
11.3	Equipment Test Platform:	0.8 meters, rotary turntable
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

STATEMENT OF ATTESTATION

GDO 98 Delta Three Radio Receiver

FCC ID: EF4 AAE00407

This receiver is a superregenerative radio receiver designed to be used as a remote control for a garage door residential installation. It is compatible with any of the 310 MHz Delta format transmitters.

This equipment has been tested in accordance with the requirements contained in the appropriate Commission regulations. To the best of my knowledge, these tests were performed using measurement procedures consistent with industry or commission standards and demonstrate that the equipment complies with the appropriate standards. Each unit manufactured, imported or marketed, as defined in the Commission's regulations, will conform to the sample(s) tested within the variations that can be expected due to quantity production and testing on a statistical basis.

I further certify that the necessary measurements were made by Linear Corporation, 2055 Corte Del Nogal, Carlsbad, CA., 92009.

Certified by:

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

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

Date

1.0 INTRODUCTION

This document will cover the theory of operation and specification for the XX DELTA firmware and PCB assembly. Refer to block diagram 214738 and schematic 214739 for this discussion. The functions of the operator should be the same as current XX control board with the exception of the learn mode (on board radio), the diagnostic mode and the I/R beam. The operator must be UL325 compliant and F.C.C. part 15 approved.

2.0 DOOR OPERATOR FUNCTIONS

When unit is powered up, door always goes in up direction until limit is reached.
Door goes in opposite direction each time button is pushed.
Operator only looks at beam input when door is going down.
Operator looks at motor speed (torque) whenever motor is running (after 800 msec).
When door is going down and hits an obstacle, it reverses.
When door is going up and hits an obstacle, it stops.
When push button is held down, beam is ignored.
An overall motor run time of 25 seconds will stop the door in either direction.
A maximum of 1 transmitter will be stored in EEPROM.
If door operation is stopped or not started due to an error condition,
Operator light and LED will flash out a diagnostic code.
Flash rate to be ½ sec on and ½ sec off.
Only one failure code will be flashed if multiple errors (priority to fewer flashes).

Diagnostic Conditions:

Learn in transmitter – flash 1 time.
Beam Failure (door stopped because of beam break) – flash 2 times.
Motor speed sensor failure (door stopped because of torque) – flash 3 times.
No RF due to Vacation Mode (door won't open with radio) – flash 4 times.
Pushbutton/Wall Station Wire Shorted (see definition below) – flash 5 times.
Pushbutton /Wall Station wire shorted to be determined by the following:
If operator is started by radio reception and the button measures open/close door input level, then flash diagnostic code
Operator time out failure (door stopped because of 25 second run time) – flash 6 times.

3.0 OPERATIONAL MODES

The operator shall use the following input/output assignments and timing parameters.

Radio:

Input from radio receiver
Standard Digital pulse width modulated format
4 msec frames – 8 frames in each word

256 μsec sampling rate
Pulse and gap timings per Standard Digital chart (as close as possible).
Input is on RB0 pin of microprocessor.
Data will be decoded after receipt of four valid words.
A new transmission will be assumed if there is no RF activity for 2 words.

Wall Station:
Input is from push button or wall station or external add-on radio.
Debounce for 80 msec.

I/R Beam:
Inputs a 1000 μsec positive pulse every 11 msec., if good.
If low, the beam is not connected or not aligned (bad).
If any pulse is missed, the beam is considered interrupted.
Input is on RA4 pin of microprocessor.

Tachometer Detector:
Inputs a 1 msec negative pulse approximately every 5 msec.
Indicates the motor speed.
Must let settle for 800 msec after motor is started.
Average the tachometer period over 16 measurements.
Make a reference measurement and compare to current speed.
Door is stopped if motor speed is slower than torque setting.
Use same torque curve as current unit.
Input is on RB4 pin of microprocessor.

Up Limit:
Shows when door has reached the upper limit of travel.
Input is low when at limit.
Input is on RA1/AIN1 pin of microprocessor.

Down Limit:
Shows when door has reached the lower limit of travel.
Input is low when at limit.
Input is on RA0/AIN0 pin of microprocessor.

Up and Down Torque:
Input is Up Torque adjustment when up motor relay is turned on.
Input is Down Torque adjustment when down motor relay is turned on.
Perform an A/D conversion.
Use internal reference for a "4 bit" A/D.
Allow for reference settling time.
Input is on RA3/AIN3 pin of microprocessor (comparator mode).

Learn Switch and Radio LED:

Input and Output
If an input, reads learn switch if low
If an output, lights LED if low
Switch and LED will operate as follows:
Push switch for 0 to 2 seconds – learn a transmitter
Push switch for 10 seconds – delete all transmitters
Flicker LED when RF is busy
Flash LED for diagnostics
Input/output on RB5 pin

I2C Clock:
Output to EEPROM
Output on RB7 pin

I2C Data:
Input/Output to EEPROM
Output on RB6 pin

Motor Up:
Output to activate motor in up direction
Output on RB3 pin

Motor Down:
Output activate motor in down direction
Output on RB2 pin

Light Relay:
Output to turn on light
Output on RB1 pin

4.0 CIRCUIT DESCRIPTION

Power Supply:
A.C. power is supplied to T1 through J1-9 and J1-15. RV2, RV3 and R19 provide surge protection. Output of T1 is bridge rectified, filtered by C21 and is used as the 24 V.D.C. unregulated supply. 5 volt regulator (U2) supplies regulated power to microprocessor (U3) and to radio.

Radio:
Transmitted RF signals are received through an antenna wire attached to the PCB. This signal is coupled through an RF buffer, Q1, and preamplifier, Q2, and capacitively coupled to the top of the tuning tank of the super-regenerative detector, Q3. The detector operates as a self-quenching oscillator responding logarithmically to the signal amplitude at the moment oscillation commences. To reduce radiated energy from the detector, the primary feedback path for the

oscillator is C9, which is in close proximity to Q3. In addition RF stage Q1 provides additional isolation between the antenna and the regenerative detector circuit.

The detected audio signal is low-pass filtered by R11 and C15, amplified by U1C, and detected by U1D, an input offset is created by R14 and R15. Additional low pass filtering is done with R16 and C19, and output buffering by U1F and U1E.

The output pulse train signal from U1 is distributed to the microprocessor U3 for decoding.

Wall Station:
Wall station power is supplied by constant current source Q4, Q5. Voltages developed by switches in wall station are scaled by R23 and R27 and applied to U3-1. D6, D8 and R24 provide surge protection.

I/R Beam Input:
Beam power to the emitter and detector is supplied by R39. Pulses from beam are level shifted and inverted by Q9 and applied to U3-3. D13, D14 and R42 provide surge protection.

Tachometer:
R30 supplies power to the emitter (J1-2). R29 (J1-1) is the pull up for the detector and applied to U3-10 through R31.

Up/Down Limit:
The up/down limit (J1-4, J1-5) switches supply ground to U3-18 and U3-17. R21 and R22 are the pull up resistors. R25 and R26 provide surge protection.

Up/Down Torque Adjustment:
Power is applied to up torque potentiometer when the up motor relay is energized. Resultant voltage is applied to U3-2 for A/D conversion. Down torque setting is measured in the same manner when down motor relay is energized.

Learn Switch/LED:
Learn switch and LED share the same port U3-11.

EEPROM:
EEPROM (U4) is connected to U3-12 and U3-13 using IIC interface.

Relay Control:

U3-7, U3-8 and U3-9 control the light relay (K1) the up motor relay (K2) and the down motor relay (K3). These relays distribute the A.C. to J1-12, J1-13 and J1-14.

5.0 SPECIFICATIONS

Model:	XX DELTA
Part Number:	AAE00407
RF Center Frequency:	310 MHz ± 500 KHz.
RF 3 dB Bandwidth:	6 MHz typical
Sensitivity:	-91 dBm, min., -93 dBm, typical
Emissions:	-65 dBm, at 318 MHz, typical
RF Modulation:	A1D PWM, @ 250 BITS/SECOND
Encoding Technique:	Linear Standard Digital
Number of Codes:	256 unique codes
Power Requirements:	115 vac
Operating Temp. Range:	$0^{o}C$ to $50^{o}C$.
Storage Temperature:	$-55^{o}C$ to $+85^{o}C$

ALL SPECIFICATIONS ARE NOMINAL

REPORT OF MEASUREMENTS

GDO 98 Delta Three Radio Receiver

FCC ID: EF4 AAE00407

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:

15.101-15.111 Subpart B, Unintentional Radiators.

Test Procedure C63.4-1992, Section 12: Unintentional Radiators was used for all measurement techniques.

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. Date
Regulatory Compliance Engineer

TESTING INSTRUMENTATION AND EQUIPMENT LIST

SPECTRUM ANALYZERS:

H.P.	HP8562A	1KHz to 22GHz		
	S/N 2913A03742	Calibrated	4/98	
		Due	4/99	

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: 4/98	
		Due: 4/99	
Mini-Circuits	ZFL-2000 broadband preamplifier, 10-3000 MHz		
	S/N Lin 001	Calibrated: 4/98	
		Due: 4/99	

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.

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, CA., 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

Receivers

1. Place receiver on test stand, apply power.

2. Tune the antenna to the operating frequency to be measured.

3. Tune the spectrum analyzer.

4. Cohere the Receiver (Superregenerative Receivers Only)

   Tune the RF Generator to the center frequency of the superregenerative receiver under test. Apply a signal level of -20 dBm at a distance of approximately two meters. Use an Ailtech antenna of the correct tuned frequency to radiate the cohering signal. Vary the signal frequency to insure that the maximum spurious emissions are recorded.

   While radiating a signal, monitor the output levels at the analyzer looking for the largest peak from the unintentional radiator's spurious output.

   Record the highest levels near the center frequency but be careful not to record the signal generator as an emission from the receiver.

5. Record the Emission Levels

   Retune the antenna to the exact frequency of measurement. Adjust the antenna height and polarization for peak field strength. Rotate the turntable to orient the receiver for maximum emissions and record the frequency and level on the Report of Measurements.

   Record an image of spectrum analyzer display for the Report of Measurements, if required.

Spectrum Analyzer Control Settings:

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

FIELD STRENGTH CALCULATIONS (FCC)

DESCRIPTION: Receivers 295-320 MHz

ITEM TESTED: GDO 98, Superregenerative Receiver, No. 2
MANUFACTURER: LINEAR CORP.
TRADE NAME: N/A
PRODUCT ID: EF4 AAE00407

DATE: 06/30/98

REFERENCE DOCUMENT: SECTION 15.109(a)

1 uV/M at 3 meters = 0 dBuV = -107 dBm (reference level).
Field Strength in dBm = dBuV - 107 dBm.
Field Strength in dBuV = dBm + 107 dBm.

Please refer to tables for Antenna Factors not already listed
Preamp gain (.1 to 1300 MHz) = 26dB and (1300-2000 MHz) = 21 dB.

For 1 meter to 3 meter conversion use 9.54dB.

Since dBuV = 20 Log (uV/M), uV/M = Antilog (dBuV/20).

Calculation from measurement data:
Field Strength (dBuV) = meter reading (dBm) + Antenna and Loss factor - Preamp gain (26 or 21dB) - 1 meter to 3 meter factor (9.54dB) if needed + 107 dBm.

DISTANCE AT WHICH MEASURED: 3 Meters, 0.8 Meter above ground

A	B	C	D	E	F	G	H	I	K	L	G	H	O	P
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	Field Strength dBm/mtr	Field Strength dBuV/mtr	Field Strength uV/mtr	FCC Limit uV/M	dB:FCC dB	FREQ. MHz
	317.38	-109.04	-42.94	-75.00	17.5	1.2	27.2	9.54	-93.04	13.96	4.99	200.00	-32.06	317.38
310.00	310.00	-108.34	-43.64	#N/A	18.2	1.2	27.2	9.54	#N/A	#N/A	#N/A	200.00	#N/A	310.00
	318.68	-107.84	-44.14	-74.00	18.7	1.2	27.2	9.54	-90.84	16.16	6.43	200.00	-29.86	318.68
	620.00	-99.74	-52.24	#N/A	26.6	1.7	26.5	9.54	#N/A	#N/A	#N/A	200.00	#N/A	620.00
	930.00	-95.74	-56.24	#N/A	29.1	2.2	26.5	9.54	#N/A	#N/A	#N/A	200.00	#N/A	930.00
	1240.00	-91.94	-52.06	#N/A	26.4	2.6	20.4	9.54	#N/A	#N/A	#N/A	500.00	#N/A	1240.00
	1550.00	-91.54	-52.48	#N/A	28.2	3.0	22.2	9.54	#N/A	#N/A	#N/A	500.00	#N/A	1550.00
	1860.00	-88.14	-55.88	#N/A	29.7	3.3	20.6	9.54	#N/A	#N/A	#N/A	500.00	#N/A	1860.00

The spectrum was searched from 25 to 2000 MHz per 15.33(b)
No other emissions were observed except those shown on this page.

TESTED BY

DATE 7/2/98

ENGINEER

DATE

FILE NAME: AAE407_2.XLS DISK NAME: FCC DATA

p 10/23 JWK

FIELD STRENGTH CALCULATIONS (FCC)

DESCRIPTION: Class B Digital Device - FCC Limits

ITEM TESTED: GDO 98, Test Sample No. 2
MANUFACTURER: Linear Corp.
TRADE NAME: N/A
PRODUCT ID: EF4 AAE00407

DATE: 30 JUNE 1998

REFERENCE DOCUMENT: SECTION 15.109 (a)

1 uV/M at 3 meters = 0 dBuV = -107 dBm (reference level).
Field Strength in dBm = dBuV - 107 dBm.
Field Strength in dBuV = dBm + 107 dBm.

Please refer to tables for Antenna Factors not already listed
Preamp gain (.1 to 1300 MHz) = 26dB and (1300-2000 MHz) =21 dB.

For 1 meter to 3 meter conversion use 9.54dB.

Since dBuV = 20 Log (uV/M), uV/M = Antilog (dBuV/20).

Calculation from measurement data:
Field Strength (dBuV) = meter reading (dBm) + Antenna and Loss factor - Preamp gain (26 or 21dB) - 1 meter to 3 meter factor (9.54dB) if needed + 107 dBm.

DISTANCE AT WHICH MEASURED: 3 Meters, 0.8 Meter above ground

A	B		C	D	E	F	G	H	I	K	L	G	H	O	P
Tuned Frequency MHz	Emission Frequency MHz	Ant. Type	Ambient Level dBm	FCC Limit dBm	Meter Reading dBm	Antenna Factor dB	Cable Loss dB	Amp Gain dB	Dist Fac dB	Field Strength dBm/mtr	Field Strength dBuV/mtr	uV/mtr	FCC Limit uV/M	dB:FCC dB	FREQ. MHz
	30.00	BI.CON.	-110.34	-47.66	#N/A	15.90	0.30	26.00	9.54	#N/A	#N/A	#N/A	100.00	#N/A	30.00
	40.00	BI.CON.	-112.84	-45.16	#N/A	13.30	0.40	26.00	9.54	#N/A	#N/A	#N/A	100.00	#N/A	40.00
	50.65	BI.CON.	-117.44	-40.56	-70.50	8.70	0.40	26.00	9.54	-96.94	10.06	3.18	100.00	-29.94	50.65
	52.68	BI.CON.	-117.44	-40.56	-67.50	8.70	0.40	26.00	9.54	-93.94	13.06	4.50	100.00	-26.94	52.68
	54.73	BI.CON.	-117.44	-40.56	-71.50	8.70	0.40	26.00	9.54	-97.94	9.06	2.84	100.00	-30.94	54.73
	56.82	BI.CON.	-117.44	-40.56	-72.00	8.70	0.40	26.00	9.54	-98.44	8.56	2.68	100.00	-31.44	56.82
	57.87	BI.CON.	-117.44	-40.56	-76.50	8.70	0.40	26.00	9.54	-102.94	4.06	1.60	100.00	-35.94	57.87
	58.00	BI.CON.	-117.44	-40.56	#N/A	8.70	0.40	26.00	9.54	#N/A	#N/A	#N/A	100.00	#N/A	58.00
	60.00	BI.CON.	-117.54	-40.46	#N/A	8.50	0.50	26.00	9.54	#N/A	#N/A	#N/A	100.00	#N/A	60.00
	78.07	BI.CON.	-117.54	-40.46	-72.50	8.50	0.50	26.00	9.54	-99.04	7.96	2.50	100.00	-32.04	78.07
	85.15	BI.CON.	-117.54	-40.46	-73.00	8.50	0.50	26.00	9.54	-99.54	7.46	2.36	100.00	-32.54	85.15
	86.20	BI.CON.	-117.54	-40.46	-72.00	8.50	0.50	26.00	9.54	-98.54	8.46	2.65	100.00	-31.54	86.20
	90.00	BI.CON.	-117.04	-40.96	#N/A	8.90	0.60	26.00	9.54	#N/A	#N/A	#N/A	100.00	#N/A	90.00
	100.00	BI.CON.	-115.84	-42.16	#N/A	10.10	0.60	26.00	9.54	#N/A	#N/A	#N/A	100.00	#N/A	100.00
	110.00	BI.CON.	-114.24	-40.24	#N/A	11.70	0.60	26.00	9.54	#N/A	#N/A	#N/A	150.00	#N/A	110.00
	120.00	BI.CON.	-112.24	-42.24	#N/A	13.60	0.70	26.00	9.54	#N/A	#N/A	#N/A	150.00	#N/A	120.00
	130.00	BI.CON.	-111.44	-43.04	#N/A	14.40	0.70	26.00	9.54	#N/A	#N/A	#N/A	150.00	#N/A	130.00
	140.00	BI.CON.	-111.34	-43.14	#N/A	14.40	0.80	26.00	9.54	#N/A	#N/A	#N/A	150.00	#N/A	140.00
	150.00	BI.CON.	-110.84	-43.64	#N/A	14.90	0.80	26.00	9.54	#N/A	#N/A	#N/A	150.00	#N/A	150.00

160.00	Bl.CON.	-110.94	-43.54	#N/A		14.80	0.80	26.00	9.54	#N/A	#N/A	#N/A	150.00	#N/A	160.00
170.00	Bl.CON.	-110.94	-43.54	#N/A		14.70	0.90	26.00	9.54	#N/A	#N/A	#N/A	150.00	#N/A	170.00
180.00	Bl.CON.	-111.54	-42.94	#N/A		14.10	0.90	26.00	9.54	#N/A	#N/A	#N/A	150.00	#N/A	180.00
190.00	Bl.CON.	-111.34	-43.14	#N/A		14.30	0.90	26.00	9.54	#N/A	#N/A	#N/A	150.00	#N/A	190.00
200.00	Bl.CON.	-111.34	-43.14	#N/A		14.30	0.90	26.00	9.54	#N/A	#N/A	#N/A	150.00	#N/A	200.00
210.00	Bl.CON.	-110.74	-43.74	#N/A		14.90	0.90	26.00	9.54	#N/A	#N/A	#N/A	150.00	#N/A	210.00
220.00	Bl.CON.	-110.54	-41.44	#N/A		15.00	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	220.00
230.00	Bl.CON.	-110.94	-41.04	#N/A		14.60	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	230.00
240.00	Bl.CON.	-110.24	-41.74	#N/A		15.30	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	240.00
250.00	Bl.CON.	-109.94	-42.04	#N/A		15.60	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	250.00
260.00	Bl.CON.	-109.64	-42.34	#N/A		15.90	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	260.00
270.00	Bl.CON.	-107.84	-44.14	#N/A		17.70	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	270.00
280.00	Bl.CON.	-107.24	-44.74	#N/A		18.30	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	280.00
290.00	Bl.CON.	-107.14	-44.84	#N/A		18.40	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	290.00
300.00	Bl.CON.	-104.54	-47.44	#N/A		21.00	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	300.00
310.00	T2 ANT.	-107.14	-44.84	#N/A	*	18.40	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	310.00
320.00	T2 ANT.	-106.84	-45.14	#N/A		18.70	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	320.00
330.00	T2 ANT.	-106.54	-45.44	#N/A		19.00	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	330.00
340.00	T2 ANT.	-106.14	-45.84	#N/A		19.40	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	340.00
350.00	T2 ANT.	-105.94	-46.04	#N/A		19.60	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	350.00
360.00	T2 ANT.	-105.64	-46.34	#N/A		19.90	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	360.00
370.00	T2 ANT.	-105.34	-46.64	#N/A		20.20	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	370.00
380.00	T2 ANT.	-105.14	-46.84	#N/A		20.40	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	380.00
390.00	T2 ANT.	-104.84	-47.14	#N/A		20.70	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	390.00
400.00	T3 ANT.	-103.44	-48.54	#N/A		22.10	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	400.00
410.00	T3 ANT.	-103.24	-48.74	#N/A		22.30	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	410.00
420.00	T3 ANT.	-103.04	-48.94	#N/A		22.50	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	420.00
430.00	T3 ANT.	-102.84	-49.14	#N/A		22.70	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	430.00
440.00	T3 ANT.	-102.64	-49.34	#N/A		22.90	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	440.00
450.00	T3 ANT.	-102.44	-49.54	#N/A		23.10	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	450.00
460.00	T3 ANT.	-102.24	-49.74	#N/A		23.30	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	460.00
470.00	T3 ANT.	-102.14	-49.84	#N/A		23.40	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	470.00
480.00	T3 ANT.	-101.94	-50.04	#N/A		23.60	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	480.00
490.00	T3 ANT.	-101.74	-50.24	#N/A		23.80	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	490.00
500.00	T3 ANT.	-101.54	-50.44	#N/A		24.00	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	500.00
510.00	T3 ANT.	-101.34	-50.64	#N/A		24.20	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	510.00
520.00	T3 ANT.	-101.24	-50.74	#N/A		24.30	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	520.00
530.00	T3 ANT.	-101.04	-50.94	#N/A		24.50	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	530.00
540.00	T3 ANT.	-100.94	-51.04	#N/A		24.60	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	540.00
550.00	T3 ANT.	-100.74	-51.24	#N/A		24.80	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	550.00
560.00	T3 ANT.	-100.64	-51.34	#N/A		24.90	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	560.00
570.00	T3 ANT.	-100.44	-51.54	#N/A		25.10	1.00	26.00	9.54	#N/A	#N/A	#N/A	200.00	#N/A	570.00

Actual frequency range of testing is from 30 to 1.0 GHz.
* = See other Excel Data Sheet for Radiated Emissions

TESTED BY

7/24/98
DATE

ENGINEER

DATE

FILE NAME: AAE00407_1.XLS DISK NAME: FCC DATA

p 3 of 3

15.107(a,c) COMPLIANCE MEASUREMENTS

Measurement procedure in accordance with C63.4-1992.

Conducted Measurements: 450 KHz to 30 MHz

Operating Frequency: 310 MHz

Instrumentation:

Spectrum Analyzer: HP8562A
Powerline Filter: Corcom 10ER3
10Amp 120/250 VAC 50/60 Hz.
Power Mains Network (LISN):
Solar 8012-50-R-24-BNC

The AAE00407 superregenerative receiver is powered from an internal class II isolation transformer.

The receiver and microcontroller combination operates on 24 VAC at an average current drain of less than 50 mA. The conducted emissions from this receiver were very low and no significant conducted emissions in the range of 450 KHz to 30 MHz were observed.

A short BNC to BNC cable connected the LISN output port to the spectrum analyzer.

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.

The tests were performed at Linear Corporation, 2055 Corte Del Nogal, Carlsbad, CA. 92009.

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

July 2, 1998
Date

CONDUCTED EMISSION DATA SHEET
FOR FCC, PART 15.107(a)

DESCRIPTION: GDO 98, SAMPLE NO. 2
Microcontroller Emission Data

ITEM TESTED: GARAGE DOOR OPERATOR
MANUFACTURER: LINEAR CORP.
TRADE NAME: N/A
PRODUCT ID: EF4 AAE00407

DATE: 30 JUNE 1998

REFERENCE DOCUMENT: C63.4-1992 Test Procedure

Technical Notes:
1. The highest emission of the high or neutral input of the power line is the only emission recorded.
2. Peak reading on max hold is recorded using the HP8562A as specified in Instrumentation and Equipment list. A minimum of 10 sweeps is stored on the CRT before data is taken.
3. Line Impedance Stabilization Network (LISN) is a Solar 8012-50-R-24-BNC.
4. Where no emissions were found, they are reported as -107 dBm

A	B	C	D	E	F	G	H	I
Frequency MHz	Level dBm	Level dBuV	Atten. dB	Cable Loss dB	Emission Level dBuV	Emission Level uV	Spec. Limit uV	dB:FCC Limit
0.45	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96
1.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96
4.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96
8.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96
10.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96
12.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96
16.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96
20.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96
21.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96
22.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96
23.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96
24.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96
25.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96
26.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96
27.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96
28.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96
29.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96

John Kuwana
TESTED BY

July 2, 1998
DATE

FILE NAME: AAE407_1.XLS

DISK NAME: FCC CONDUCTED DATA