



**Certelec Laboratories Inc.**

*Safety - EMI - Telecom - ISO Guide 25*

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**ENGINEERING TEST REPORT**

**ON:  
THE VTECH ENGINEERING LTD.  
"VT9111 ANALOG 900 MHz CORDLESS TELEPHONE"**

**FCC ID: EW780-4177-B5**

**IN ACCORDANCE WITH:  
FCC PART 15, SUBPART C  
PARAGRAPH 15.249  
900 MHz CORDLESS TELEPHONES**

**PROJECT NO.: 8R00165.1**

**TESTED FOR:**

VTECH ENGINEERING LTD.  
200-761 ALDERBRIDGE WAY  
RICHMOND, BC  
V6X 1Z9

**TESTED BY:**

CERTELECOM LABORATORIES INC.  
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APRIL 1998

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This report applies only to the items tested.

EQUIPMENT: VT9111 Analog 900 MHz Cordless Telephone  
FCC ID: EW780-4177-B5

DESCRIPTION OF EQUIPMENT: Analog 900 MHz Cordless Telephone

MODEL NO.: VT9111

SERIAL NO.: None

**GENERAL:**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15 Subpart C, Paragraph 15.249.

**ABSTRACT:**

NAME OF TEST	PARA. NO.	RESULTS
<b>HANDSET</b>		
Radiated Emissions	15.249	Complies
<b>BASE</b>		
Radiated Emissions	15.249	Complies
Powerline Conducted Emissions		Complies

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE. None

TESTED BY: Kevin Carr  
Kevin Carr, Technologist

DATE: 29 May 98

TECHNICAL REVIEW: Tom Tidwell  
Tom Tidwell, Senior Technologist

DATE: 27 May 1998

APPROVED BY: W. Waterhouse  
W. Waterhouse, RF Engineering Lab Manager

DATE: 29+ May 1998

*EQUIPMENT: VT9111 Analog 900 MHz Cordless Telephone*  
*FCC ID: EW780-4177-B5*

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**General Equipment Information (HANDSET)**

**TRANSMITTER**

Frequency Range:	925.00 MHz to 927.75 MHz, 927.75 MHz
Frequency of Sample Tested:	925.00 MHz
Tunable Bands:	1
Number of Channels:	10
Channel Spacing:	300 kHz
Emission Designator:	F3E
Crystal Frequencies:	4 MHz
User Frequency Adjustment:	Handset Channel. Selection

**RECEIVER**

Type of Receiver:	Superheterodyne
Intermediate Frequencies:	10.7 MHz
Primary Power Requirement:	Battery
Frequency Range:	902.30 MHz to 905.00 MHz
Tunable Bands:	1
Designated Reception Mode:	F3E
Operating Frequency of Sample Tested:	902.30 MHz
User Frequency Adjustment:	Handset Channel Selection

*EQUIPMENT: VT9111 Analog 900 MHz Cordless Telephone*  
*FCC ID: EW780-4177-B5*

NAME OF TEST: Radiated Emissions (HANDSET)	PARA. NO.: 15.249(a) & (c)
TESTED BY: Kevin Carr	DATE: May 4, 1998

TEST CONDITIONS: Standard Temperature and Humidity  
Standard Test Voltage

MINIMUM STANDARD:

Fundamental Frequency (MHz)	Field Strength of Fundamental (mV/m @ 3m)	Field Strength of Fundamental (dBμV/m @ 3m)	Field Strength of Spurious (μV/m @ 3m)	Field Strength of Spurious (dBμV/m @ 3m)
902 - 928	50	94	500	54

The fundamental was searched up to the 10th harmonic with all relevant emissions being noted.

Any emissions radiated outside the specified frequency band, except for harmonics shall be attenuated by at least 50 dB below the level of the fundamental emission or meet the following limits, whichever is the lesser attenuation.

Frequency (MHz)	Field Strength (μV/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

TEST RESULTS: Complies. The worst-case emission level is 36.1 dBμV/m @ 3m at 2775.1 MHz. This is 17.9 dB below the specification limit.

MEASUREMENT DATA: See attached table.

EQUIPMENT: VT9111 Analog 900 MHz Cordless Telephone  
FCC ID: EW780-4177-B5

Test Data - Radiated Emissions (Handset)

Test Distance (meters) : 3		Range: A Tower		Receiver: HP8565E Spec A		RBW 1MHz VBW: 1 MHz		Detector: Other			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Table (deg.)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Dist. Corr. (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1850.1	Hrn2	V			41.5	31.3	-45.9		26.9	54.0	27.1
1850.1	Hrn2	H			48.0	31.3	-45.9		33.4	54.0	20.6
2775.2	Hrn2	V			44.7	34.2	-45.8		33.1	54.0	20.9
2775.1	Hrn2	H			44.7	34.2	-45.8		36.5	54.0	17.9
3700.2	Hrn2	V			N.D.	40.2	-45.3			54.0	
3700.2	Hrn2	H			N.D.	40.2	-45.3			54.0	
4625.3	Hrn2	V			N.D.	40.2	-45.7			54.0	
4625.3	Hrn2	H			N.D.	40.2	-45.7			54.0	
5550.3	Hrn2	V			N.D.	42.7	-45.6			54.0	
5550.3	Hrn2	H			N.D.	42.7	-45.6			54.0	
6475.3	Hrn2	V			N.D.	45.0	-45.2			54.0	
6475.3	Hrn2	H			N.D.	45.0	-45.2			54.0	
7400.4	Hrn2	V			N.D.	46.5	-45.6			54.0	
7400.4	Hrn2	H			N.D.	46.5	-45.6			54.0	
8325.4	Hrn2	V			N.D.	49.1	-44.0			54.0	
8325.4	Hrn2	H			N.D.	49.1	-44.0			54.0	
9250.5	Hrn2	V			N.D.	50.6	-43.4			54.0	
9250.5	Hrn2	H			N.D.	50.6	-43.4			54.0	
925.1	L.P	V			54.0	30.4			84.4	94.0	9.6
925.1	L.P	H			49.0	30.4			79.4	94.0	14.6

Notes:  
 B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole  
 \* Re-measured using dipole antenna.  
 \*\* Includes cable loss when amplifier is not used.  
 \*\*\* Includes cable loss.  
 ( ) Denotes failing emission level.  
 N.D. Not Detected  
 Worst Case Noise Floor = 43 dBµV  
 Note: The E.U.T. was tested at both ends of the tunable band. Worst case results are reported.

*EQUIPMENT: VT9111 Analog 900 MHz Cordless Telephone  
FCC ID: EW780-4177-B5*

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**General Equipment Information (BASE)**

**TRANSMITTER**

Frequency Range: 902.30 MHz to 905.00 MHz  
Frequency of Sample Tested: 902.30 MHz, 905 MHz  
Tunable Bands: 1  
Number of Channels: 10  
Channel Spacing: 300 kHz  
Emission Designator: F3E  
Crystal Frequencies: 4 MHz  
User Frequency Adjustment: Handset Channel Selection

**RECEIVER**

Type of Receiver:  
Intermediate Frequencies: 10.70 kHz  
Primary Power Requirement: 12 Vdc Via Power Adaptor  
Frequency Range: 925.00 MHz to 927.75 MHz  
Tunable Bands: 1  
Designated Reception Mode: F3E  
Operating Frequency of Sample Tested: 925.00 MHz  
User Frequency Adjustment: Handset Channel Selection

EQUIPMENT: VT9111 Analog 900 MHz Cordless Telephone  
FCC ID: EW780-4177-B5

NAME OF TEST: Radiated Emissions (BASE)	PARA. NO.: 15.249(a) & (c)
TESTED BY: Kevin Carr	DATE: May 1, 1998

TEST CONDITIONS: Standard Temperature and Humidity  
Standard Test Voltage

MINIMUM STANDARD:

Fundamental Frequency (MHz)	Field Strength of Fundamental (mV/m @ 3m)	Field Strength of Fundamental (dBµV/m @ 3m)	Field Strength of Spurious (µV/m @ 3m)	Field Strength of Spurious (dBµV/m @ 3m)
902 - 928	50	94	500	54

The fundamental was searched up to the 10th harmonic with all relevant emissions being noted.

Any emissions radiated outside the specified frequency band, except for harmonics shall be attenuated by at least 50 dB below the level of the fundamental emission or meet the following limits, whichever is the lesser attenuation.

Frequency (MHz)	Field Strength (µV/m @ 3m)	Field Strength (db @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

TEST RESULTS: Complies. The worst-case emission level is 28.9 dBµV/m @ 3m at 3608.9 MHz. This is 25.1 dB below the specification limit.

MEASUREMENT DATA: See attached table.

EQUIPMENT: VT9111 Analog 900 MHz Cordless Telephone  
FCC ID: EW780-4177-B5

Test Data - Radiated Emissions (Base)

Test Distance (meters) : 3		Range: A Tower		Receiver: HP8565E Spec A		RBW 1MHz VBW: 1 MHz		Detector: Other			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Table (deg.)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Dist. Corr. (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1804.5	Hrn2	V			42.8	30.9	-45.8		27.9	54.0	26.1
1804.5	Hrn2	H			37.8	30.9	-45.8		22.9	54.0	31.1
2707.0	Hrn2	V			39.3	33.9	-46.0		27.2	54.0	26.8
2707.0	Hrn2	H			38.3	33.9	-46.0		26.2	54.0	27.8
3608.9	Hrn2	V			34.0	40.1	-45.2		28.9	54.0	25.1
3608.9	Hrn2	H			31.0	40.1	-45.2		25.9	54.0	28.1
4511.0	Hrn2	V			N.D.	39.8	-45.5			54.0	
4511.0	Hrn2	H			N.D.	39.8	-45.5			54.0	
4513.2	Hrn2	V			N.D.	42.5	-45.7			54.0	
4513.2	Hrn2	H			N.D.	42.5	-45.7			54.0	
6315.4	Hrn2	V			N.D.	44.4	-45.3			54.0	
6315.4	Hrn2	H			N.D.	44.4	-45.3			54.0	
7218.6	Hrn2	V			N.D.	46.2	-45.8			54.0	
7218.6	Hrn2	H			N.D.	46.2	-45.8			54.0	
8120.7	Hrn2	V			N.D.	47.8	-43.6			54.0	
8120.7	Hrn2	H			N.D.	47.8	-43.6			54.0	
9023.0	Hrn2	V			N.D.	50.5	-43.4			54.0	
9023.0	Hrn2	H			N.D.	50.5	-43.4			54.0	
-											
902.3	L/P	V			58.5	30.1			88.6	94.0	5.4
902.3	L/P	H			56.7	30.1			86.8	94.0	7.2

Notes:

B/C = Biconical. B/L = Biconilog, L/P = Log-Periodic. H = Horn. D/P = Dipole

\* Re-measured using dipole antenna.

\*\* Includes cable loss when amplifier is not used.

\*\*\* Includes cable loss.

( ) Denotes failing emission level.

N.D. Not Detected

Worst Case Noise Floor = 30 dBµV.

Note: The E.U.T. was tested at both ends of the tunable band. Worst case results are reported.

*EQUIPMENT: VT9111 Analog 900 MHz Cordless Telephone*  
*FCC ID: EW780-4177-B5*

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NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY: Kevin Carr	DATE: April 27, 1998

TEST CONDITIONS: Standard Temperature and Humidity  
Standard Test Voltage

MINIMUM STANDARD: The R.F. that is conducted back onto the AC power line on any frequency within the band 0.45 to 30 MHz shall not exceed 250 $\mu$ V (48 dB $\mu$ V) across 50 ohms.

TEST RESULTS: Complies. See attached graphs.

MEASUREMENT DATA: See attached graphs.

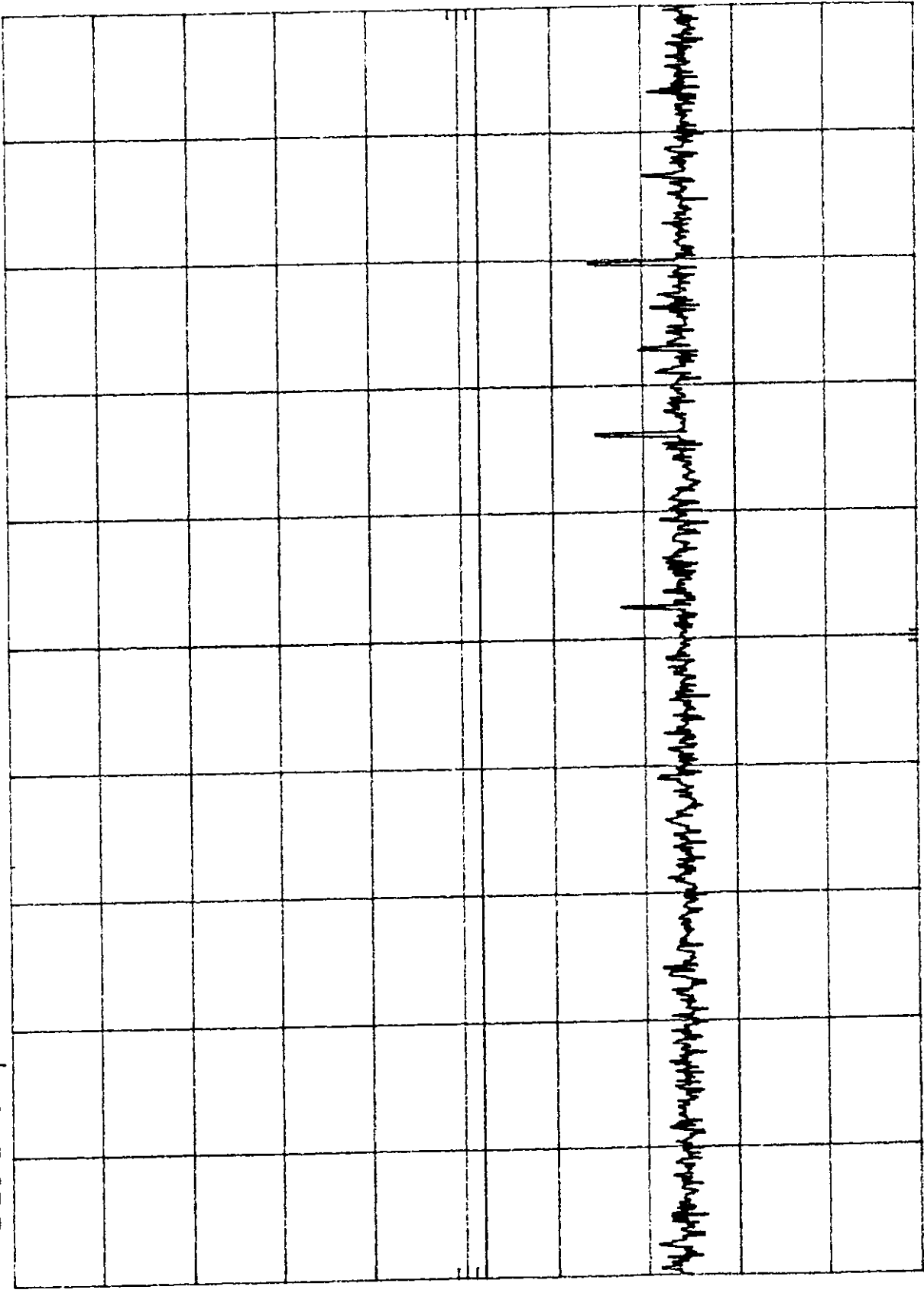
8r00165 10dB Limiter used April 27, 1998 Phase

REF 90.0 dBμV ATTEN 10 dB

hp

10 dB/

DL  
38.0  
dBμV



Project No.: 8R00165.1  
Conducted Emissions  
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STARI 450 KHZ RES BW 10 KHZ VBW 30 KHZ STOP 30.0 MHZ SWP 887 msec

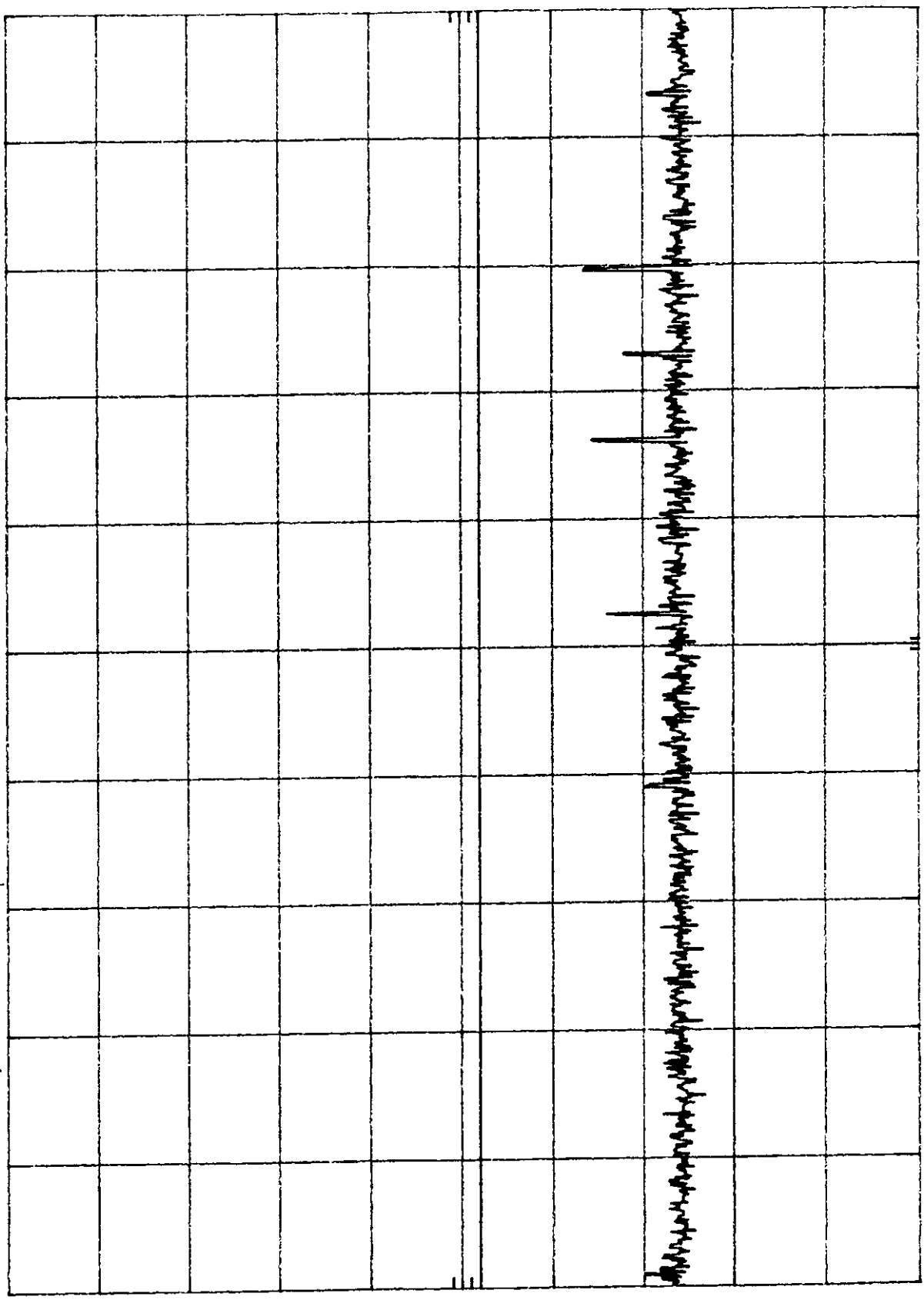
8r00165 10dB Limiter used April 27, 1998 Neutral

REF 90.0 dBμV ATTEN 10 dB

hp

10 dB/

DL  
38.0  
dBμV

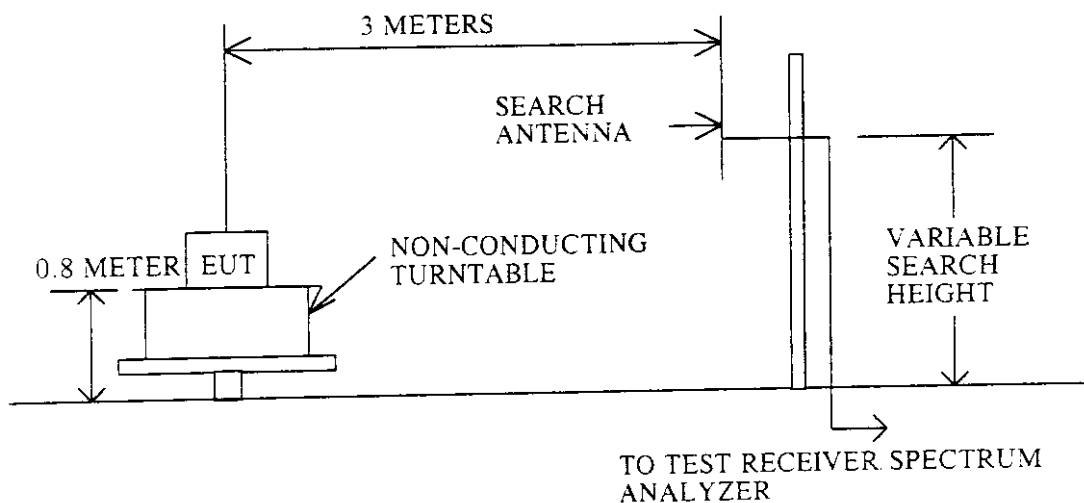


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Conducted Emissions  
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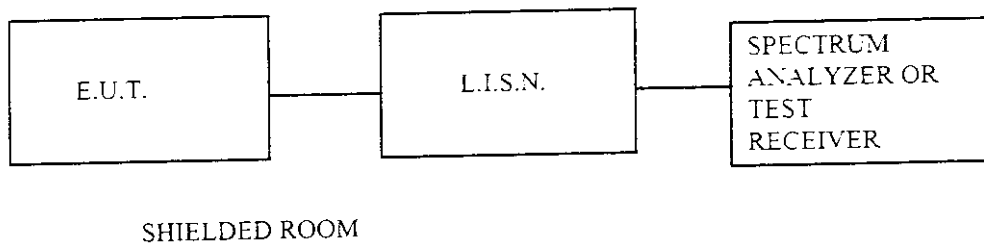
START 450 KHZ RES BW 10 KHZ VBW 30 KHZ STOP 30.0 MHz SWP 887 msec

EQUIPMENT: VT9111 Analog 900 MHz Cordless Telephone  
FCC ID: EW780-4177-B5

TEST SITE FOR RADIATED EMISSIONS



CONDUCTED EMISSIONS



EQUIPMENT: VT9111 Analog 900 MHz Cordless Telephone  
 FCC ID: EW780-4177-B5

## TEST EQUIPMENT LIST

### Equipment List - Conducted Emissions - Shielded Room #1

CAL Cycle	Equipment	Manufacturer	Model #	Serial/Asset #	Last Cal.	Next Cal.
	Plotter	Hewlett-Packard	7470A	2210A08836	N/A	N/A
1 Year	Transient Limiter	Hewlett-Packard	1194 7A	3107A01766	July 23/97	July 23 98

### Equipment List - Conducted Emissions - Shielded Room #2

CAL Cycle	Equipment	Manufacturer	Model #	Serial/Asset #	Last Cal.	Next Cal.
1 Year	LISN	Tegam	95300-50	T-128556	July 24/97	July 24 98
1 Year	Spectrum analyzer	Hewlett-Packard	8565E	FA000981	Jan. 3/97	Jan. 3/98
	Plotter	Hewlett-Packard	7470A	2210A08836	N/A	N/A

### Equipment List - Radiated Emissions

CAL Cycle	Equipment	Manufacturer	Model #	Serial/Asset #	Last Cal.	Next Cal.
1 Year	Biconical (2) Antenna	EMCO	3109	9503-2894	April 24/97	April 24 98
2 Year	Horn Antenna	EMCO	3115	4336	Oct. 30/97	Oct. 30 99
2 Year	Horn Antenna	EMCO	3115	3132	Feb. 9/98	Feb.9-00
1 Year	Log Periodic Antenna	EMCO	LPA-25	1141	July 10/97	July 10 98
1 Year	Low Noise Amplifier	Avantek	AWT-8035	1005	Oct. 24/97	Oct. 24 98
1 Year	Low Noise Amplifier	DBS Microwave	DWT-13035	9623	Oct. 24/97	Oct. 24 98
1 Year	Quasi-Peak Adaptor	Hewlett Packard	5650A	2521A00620	Aug. 19/97	Aug. 19:98
1 Year-	Spectrum Analyzer	Hewlett Packard	8566B	1950A00400	Oct. 3/97	Aug. 19 98
1 Year	Spectrum Analyzer	Hewlett Packard	8566B	1950A01177	Oct. 3/97	Aug. 19 98

Note: N/A = Not Applicable  
 NCR = No Cal Required

**VTech ENGINEERING CANADA LTD.**



<b>TITLE</b>	Internal Product Specification
<b>MODEL</b>	ADL MK2A (Low-Cost Model) - Analog 900MHz Cordless Telephone

# Internal Product Specification for the ADL MK2A (Low-Cost Model) Analog 900MHz Cordless Telephone

**Revision History:**

Revision	Description	Page	Effective Date
Draft	Draft Release.	All	Mar 27/97
0	Formal Release.	1	Mar 30/97

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Prepared By	Maria Liao	Approved By	Gary Rogalski
Title	Project Manager	Title	Engineering Manager

<b>Reference: PRC 009Z</b>	<b>Revision: 0</b>	<b>Page: 1 of 23</b>
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# VTECH ENGINEERING CANADA LTD.

<b>TITLE</b>	<b>Internal Product Specification</b>
<b>MODEL</b>	<b>ADL MK2A (Low-Cost Model) - Analog 900MHz Cordless Telephone</b>

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# VTECH ENGINEERING CANADA LTD.

<b>TITLE</b>	<b>Internal Product Specification</b>
<b>MODEL</b>	<b>ADL MK2A (Low-Cost Model) - Analog 900MHz Cordless Telephone</b>

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# VTECH ENGINEERING CANADA LTD.

<b>TITLE</b>	<b>Internal Product Specification</b>
<b>MODEL</b>	<b>ADL MK2A (Low-Cost Model) - Analog 900MHz Cordless Telephone</b>

## 1 Overview

This specification defines the functional and electrical performance requirements of the low-cost model of the ADL MK2A 900MHz Analog Cordless Telephone. The ADL MK2A is intended to be compatible with most type of central office equipment in use in Canada and the United States.

### 1.1 General Description

The VTECH 910ADL line of analog cordless telephones was first introduced to market in the fall of 1995. While the current product is based on the ADL MK2, which is a second-generation design aimed to achieve material cost reduction, the mechanical chassis has maintained the original design. The ADL MK2A is intended primarily to provide a new mechanical chassis for the analog cordless telephone product. In addition, there is a secondary focus on achieving further material cost reduction that can be realised within the target delivery schedule, to maintain the product's competitiveness within the low-end 900MHz analog cordless telephone market in the United States and Canada.

The ADL MK2A aims to offer essentially the same functionality as the current ADL MK2. However, the ADL MK2A will include a low-cost and an up-market model. The low-cost model, which is the subject of this specification, targets to provide just a minimally acceptable set of functions for an analog cordless telephone. Hence, a number of non-essential features from the ADL MK2A will not be included for this model. The up-market model, while still targeting the low-end 900 MHz cordless telephone market, provides slightly more functionality and even includes some enhanced features not currently provided in the basic ADL MK2. Unless explicitly specified, all references to the ADL MK2A in the remainder of this specification refers to the low-cost model.

### 1.2 Regulatory Standards

As a requirement for sale in the United States, the ADL MK2A will comply with the electrical specifications defined in the following documents:

- FCC Part 15                      Radio Emissions Requirements
- FCC Part 68                     Telephone Line Interface Requirements
- UL 1459                         Safety Requirements

As a requirement for sale in Canada, the ADL MK2A will comply with the electrical specifications defined in the following documents:

- IC RSS-210                     Radio Emissions Requirements
- IC CS-03                        Telephone Line Interface Requirements
- CSA 225                         Safety Requirements

In addition to the above mandatory regulations, the recommendations provided in EIA-470-A will be used as a guideline.

### 1.3 Preliminary Feature List

The low-cost version of the ADL MK2A will offer essentially the same features as the current ADL MK2. However, there are a few ADL MK2 features that will only be available in the "up-market" model of the ADL MK2A, but not in the "low-cost" model. They are included within the list in section 1.3.3.

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# VTECH ENGINEERING CANADA LTD.

<b>TITLE</b>	<b>Internal Product Specification</b>
<b>MODEL</b>	<b>ADL MK2A (Low-Cost Model) - Analog 900MHz Cordless Telephone</b>

## 1.3.1 Basic Features

The following basic features should be considered as standard features for a quality 900MHz cordless phone:

- 10 channel, 900MHz operation
- Automatic search for available channel (when handset on cradle)
- Manual channel change when handset in PHONE mode
- 16 bit digital security code
- Pulse, DTMF, and temporary DTMF dialling modes
- 10 number speed dial memory; each number can be up to 16 digits
- Redial memory (16 digits)
- Low battery detection and warning indicator (audible only)
- Battery charge interval: 6 days in STANDBY mode, 7 hours in PHONE mode
- One-way page function from base unit to handset
- Hearing aid compatible receiver
- Three-level receiver volume control on handset

## 1.3.2 Unique Features

The following features will be offered on the ADL MK2A, but are not considered as standard for this type of product. These features help define a marketing advantage for this product.

- Non-volatile storage of speed dial numbers
- Non-volatile storage of security code at base unit protects against power failure
- In-the-dark answering of incoming calls
- Compact 'connectorless' removable battery pack
- Compatibility with remote charger system

## 1.3.3 Features Not Provided

The following features will not be offered in the ADL MK2A. These are explicitly listed below to ensure there are no misunderstandings on the intended operation of the product.

- MUTE function for handset microphone
- HOLD function for telephone line
- LCD on handset
- Non-volatile storage of security code on handset - power loss will require re-initialisation
- Non-volatile storage for the redial memory
- DTMF tone generation for duration of key-press
- DTMF feedback to user during key-press (the user will hear a simple beep for confirmation of key-press)
- Automatic channel change when handset away from base unit
- Out-of-range detection / indication on handset
- Automatic termination of RF link & PSTN connection if handset out-of-range
- Low battery visual indicator (LED)
- Spare battery charger in base unit\*
- Backlight on <Phone> key\*
- Headset jack and belt clip\*

\* These features are available in the "up-market" model of the ADL MK2A, but not in the "low-cost" model.



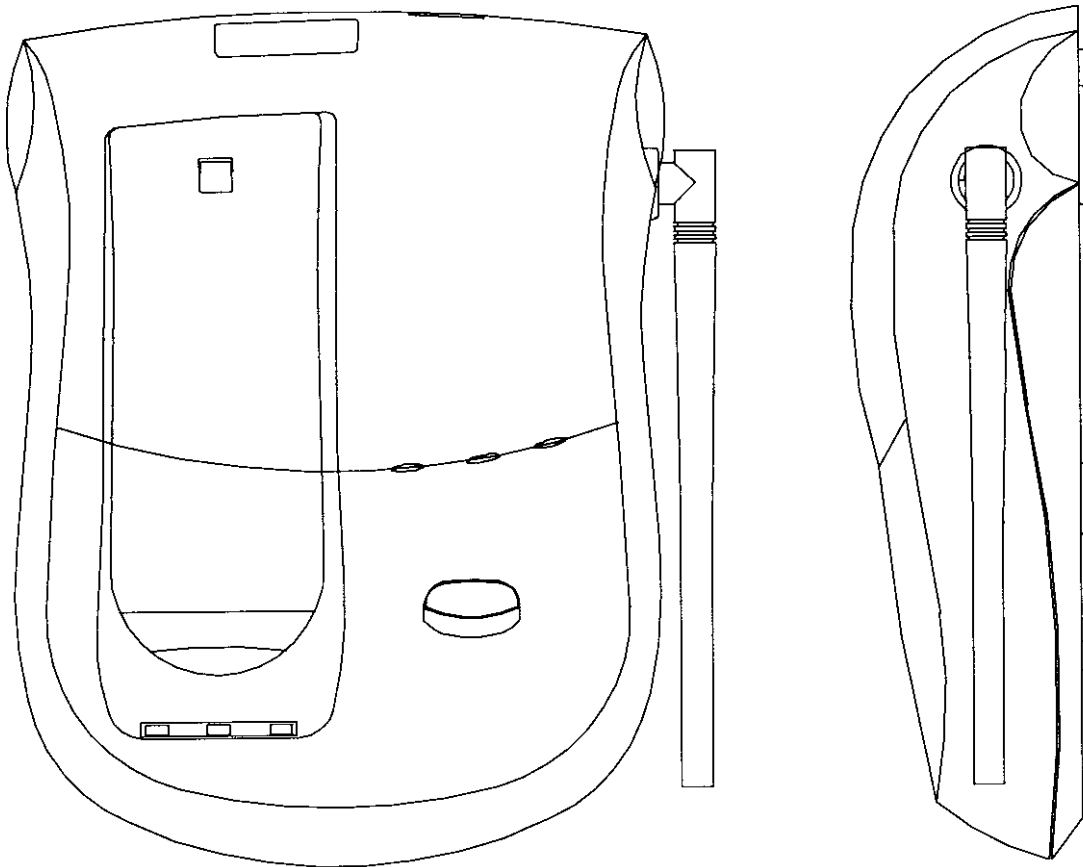
# VTECH ENGINEERING CANADA LTD.

<b>TITLE</b>	<b>Internal Product Specification</b>
<b>MODEL</b>	<b>ADL MK2A (Low-Cost Model) - Analog 900MHz Cordless Telephone</b>

## 1.4 Cosmetic Styling

The cosmetic design of the ADL MK2A will conform to the general look of the VTECH VT (*new tool*) family of cordless telephones. Line drawings for the low-cost version of the ADL MK2 base unit and handset are in the following sections.

### 1.4.1 Base Unit Line Drawing

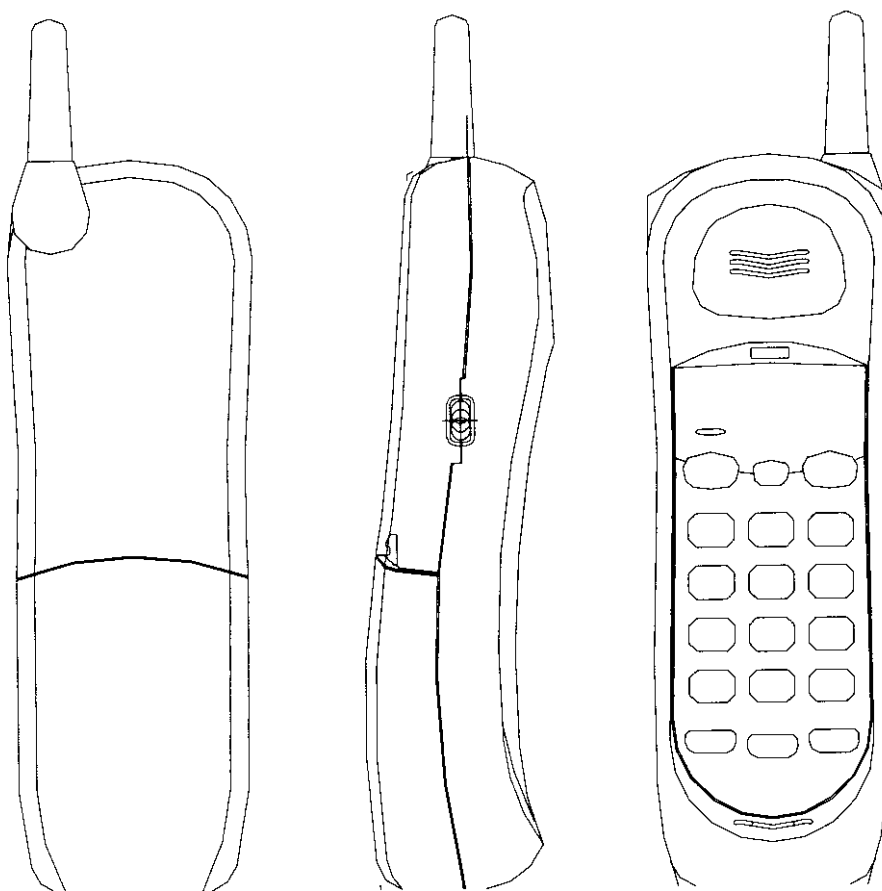




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## 1.4.2 Handset Line Drawing



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## 2 Functional Layouts

### 2.1 Handset Functional Layout

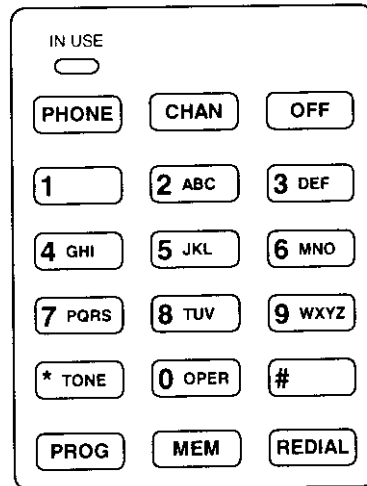


Figure 1 - Handset Keypad Layout

#### 2.1.1 Handset LED Indicators

**In Use LED** - this LED illuminates steadily when the handset is in PHONE mode. It flashes in cadence with an incoming ring from the PSTN line. It flashes quickly when the handset is in PROGRAM mode.

#### 2.1.2 Handset Key Descriptions

**<Phone> key** - this key is used to enter PHONE mode. If the handset is already in PHONE mode, pressing this key flashes the PSTN line. This key will be inactive for four seconds after the phone has auto-answered to prevent accidental flashing of the PSTN line.

**<Channel> key** - this key is used to initiate a channel change to the next available RF channel. This key is only active in the PHONE mode; it has no function in the STANDBY mode.

**<Off> key** - this key is used to exit all modes of operation and return the handset and base unit to the STANDBY mode.

**<Program> key** - this key is used to enter PROGRAM mode. This key is only active in the STANDBY mode; it has no function in the PHONE mode.

**<Memory> key** - this key is used to enter the memory dialling mode for dialling speed dial numbers. The sequence used is <Phone> <Memory> digit key, where digit key is one of 0-9.



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**<Redial> key** - this key is used to dial the contents of the redial buffer. This key is active in the PHONE mode only if no other dialling keys have been pressed. This key is also active in the PROGRAM mode for storing the redial buffer into a memory location.

**<Tone/\*> key** - this key is used to enter the temporary DTMF dialling mode. This key is only active in the PHONE mode, and only if the default dialling mode is pulse.

## 2.2 Base Unit Functional Layout

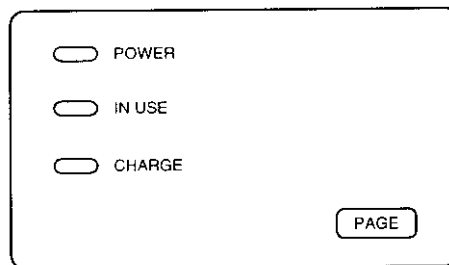


Figure 2 - Base Unit Layout

### 2.2.1 Base Unit LED Indicators

**Power LED** - this LED illuminates steadily whenever the AC power adapter is plugged in and power is applied to the base unit.

**In Use LED** - this LED illuminates steadily when the phone is in PHONE mode. It will flash in cadence with an incoming ring. This LED also flashes momentarily immediately after the handset is cradled to indicate that initialisation (assigning a new security code and RF channel) is in progress.

**Charge LED** - this LED illuminates steadily when the handset is resting in the base unit cradle and the handset battery is being charged.

### 2.2.2 Base Unit Key Descriptions

**<Page> key** - this key is used to enter PAGE mode. In PAGE mode, the handset will emit a series of rings. Pressing the <Page> key a second time (while in PAGE mode) will terminate PAGE mode, stopping the handset rings. PAGE mode will also be terminated automatically after four page tones (STANDBY mode) or one page tone (PHONE mode) is heard at the handset. This key is inactive if the handset is resting in the base unit cradle.

**Tone/Pulse switch** - this switch, located on the bottom of the base unit, is used to set the default mode of dialling to either PULSE or DTMF. The Tone/Pulse switch is read when PHONE mode is entered; it cannot be used to change the dialling mode once a call is in progress.



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## 3 Operating Modes

The ADL MK2A has a number of operating modes, including:

- STANDBY
- PHONE
- PROGRAM
- RINGING
- PAGE
- PHONE/PAGE
- PROGRAM/PAGE
- PROGRAM/RINGING

These operating modes can be triggered by any of the following events:

- pressing keys on the handset
- receiving an incoming call from the PSTN
- pressing the <Page> button on the base unit
- replacing the handset on the cradle
- removing the handset from the cradle
- a timeout (where appropriate)

For this section, the following definitions apply:

- *Number Keys* = { <1> <2> <3> <4> <5> <6> <7> <8> <9> <0> }
- *DTMF Keys* = { <1> <2> <3> <4> <5> <6> <7> <8> <9> <0> <\*> <#> }
- *Dialling Keys* = { <1> <2> <3> <4> <5> <6> <7> <8> <9> <0> <\*> <#> <Redial> <Memory> }

### 3.1 STANDBY Mode

The STANDBY mode is the idle mode of the ADL MK2A. In this mode, both the base unit and handset RF transmitters are turned off, the base unit has released the PSTN connection, and the handset goes into a sleep mode to conserve battery power. The handset 'wakes up' (turns on its receiver) periodically to check for an incoming RF link (incoming PSTN call or Page signal).

It is possible for the handset to be either in-cradle, or away from the cradle in STANDBY mode. Operation in both of these cases are essentially the same with the following exceptions:

1. The sleep cycle for the handset is slightly longer when the handset is resting in the base unit cradle to improve the cradle contact communication reliability.
2. The handset monitors both the RF link (for incoming PSTN or Page calls) and the cradle contacts (for new channel information) when resting on the base unit cradle; it monitors only the RF link when away from the cradle.
3. The base unit monitors the interference level of the default channel and has the option to select a new channel only when the handset is resting on the base unit cradle (refer to section 3.9.1 for more details).

When in the STANDBY mode:

- <Phone> - causes the ADL MK2A to go to the PHONE mode
- <Channel> - this key is locked out



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**<Off>** - this key is locked out

**Dialling Keys** - these keys are locked out

**<Program>** - causes the ADL MK2A to go to the PROGRAM mode

**Ringling** - causes the ADL MK2A to go to the RINGING mode

**<Page>** - causes the ADL MK2A to go to the PAGE mode

**On Cradle** - maintains the ADL MK2A in the STANDBY mode

**Off Cradle** - maintains the ADL MK2A in the STANDBY mode

## 3.2 PHONE Mode

The PHONE mode is the main operating mode of the ADL MK2A. In this mode, an RF link is established between the handset and the base unit; the base unit has seized the PSTN connection; and both the transmit and receive audio paths are open for voice communication. Dialling is also possible while in the PHONE mode.

Pressing the **<Channel>** key causes the ADL MK2A to seek a new RF channel for operation (refer to section 3.9.2 for more details).

Placing the handset into the base unit cradle will automatically release the PSTN connection, and return the phone to the STANDBY mode (auto-hangup).

When in the PHONE mode:

**<Phone>** - causes the base unit to generate a hook flash to the PSTN

**<Channel>** - causes the ADL MK2A to change to a new RF channel

**<Off>** - causes the ADL MK2A to return to the STANDBY mode

**Dialling Keys** - cause the base unit to dial the corresponding digits

**<Program>** - this key is locked out

**Ringling** - invalid condition

**<Page>** - causes the ADL MK2A to go to the PHONE/PAGE mode

**On Cradle** - causes the ADL MK2A to return to the STANDBY mode

**Off Cradle** - invalid condition

### 3.2.1 Dialling Modes

The ADL MK2A supports three dialling modes: Pulse, DTMF, and Temporary DTMF. The Pulse or DTMF dialling mode can be set as the default dialling mode by the switch located on the bottom of the base unit. The default dialling mode must be set before entering the PHONE mode of operation; it is not possible to change the default dialling mode while a call is in progress.

The Temporary DTMF dialling mode can only be accessed in the Pulse dialling mode. Pressing the **<Tone/\*>** key on the handset enters Temporary DTMF dialling mode, and all subsequent digits dialled will be in DTMF (including **<\*>** and **<#>**). Temporary DTMF will remain until the ADL MK2A returns to the STANDBY mode, when the default Pulse dialling mode returns. In DTMF dialling mode, the **<Tone/\*>** key will dial the DTMF **<\*>** digit.

In Pulse dialling mode, the **<#>** key has no function and will be ignored (even though a key-beep will be generated at the handset).

### 3.2.2 Redial Buffer

The redial buffer stores the first 16 digits of the number dialled during the previous call. The number may have been dialled using the DTMF keys, the **<Redial>** key, the memory dialling feature, or any allowable combination of these.



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The contents of the redial buffer can be dialled to the PSTN by pressing the <Redial> key immediately following the Phone key. The redial buffer becomes invalid as soon as any of the DTMF keys is pressed, or if the memory dialling feature is used and cannot be accessed until the phone returns to the STANDBY mode.

It is possible to dial further digits after the <Redial> key is pressed, either by using the DTMF keys, or the memory dialling feature. Any suffix digits (including memory dialling) will be appended to the redial buffer.

The redial buffer is stored in volatile memory — the contents of the redial buffer will be lost if a power failure occurs at the base unit.

### 3.2.3 Memory Dialling

Numbers can be dialled out from any of the 10 speed dial memories by pressing the <Memory> key, followed by the number key corresponding to the desired memory location. After the <Memory> key is pressed, only the number keys (memory locations), the PHONE key (hook flash) and the <Off> key (return to STANDBY mode) will be accepted - the remaining keys on the handset will be locked-out. There is no timeout on the memory dialling mode.

It is possible to dial digits before and after using the memory dialling feature; these digits can be dialled using the DTMF keys, the <Redial> key, or the memory dialling feature.

### 3.3 PROGRAM Mode

The ADL MK2A supports two programming modes: Speed Dial programming, and Ringer Type programming. The Speed Dial programming mode is used to program a number into one of the 16 speed dial memory locations; the Ringer Type programming mode is used to select the handset ringer tone.

When in the main PROGRAM mode:

- <Phone> - causes the ADL MK2A to go to the PHONE mode
- <Channel> - this key is locked out
- <Off> - causes the ADL MK2A to go to the STANDBY mode
- Number Keys - cause the ADL MK2A to go to speed dial PROGRAM mode
- \*, # Keys - cause the ADL MK2A to go to the ringer type PROGRAM mode
- <Redial>, <Memory>, <Program> Keys - these keys are locked out
- Ringling - causes the ADL MK2A to go to the PROGRAM/RINGING mode
- <Page> - causes the ADL MK2A to go to the PROGRAM/PAGE mode
- On Cradle - causes the ADL MK2A to return to the STANDBY mode
- Off Cradle - invalid condition
- 30s Timeout - returns the ADL MK2A to the STANDBY mode (sad tone)

When in the speed dial PROGRAM mode:

- <Phone> - causes the ADL MK2A to go to the PHONE mode (Sad Tone)
- <Channel> - this key is locked out
- <Off> - causes the ADL MK2A to go to the STANDBY mode (Sad Tone)
- DTMF Keys - enter the number to be stored
- <Redial> - access contents of redial buffer (if pressed first, otherwise locked out)
- <Memory> - number stored, return ADL MK2A to STANDBY mode (happy tone)
- <Program> - this key is locked out
- Ringling - causes the ADL MK2A to go to the PROGRAM/RINGING mode
- <Page> - causes the ADL MK2A to go to the PROGRAM/PAGE mode



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**On Cradle** - returns ADL MK2A to return to the STANDBY mode (Sad Tone)

**Off Cradle** - invalid condition

**30s Timeout** - returns the ADL MK2A to the STANDBY mode (sad tone)

When in the ringer type PROGRAM mode:

<Phone> - causes the ADL MK2A to go to the PHONE mode

<Channel> - this key is locked out

<Off> - causes the ADL MK2A to go to the STANDBY mode

<1>, <2>, <3>, <4>, <5>, <0> **Keys** - cause the ringer type to be changed accordingly

<6>, <7>, <8>, <9>, <\*>, <#> **Keys** - these keys are locked out

<Redial>, <Memory>, <Program> **Keys** - these keys are locked out

**Ringling** - causes the ADL MK2A to go to the PROGRAM/RINGING mode

<Page> - causes the ADL MK2A to go to the PROGRAM/PAGE mode

**On Cradle** - causes the ADL MK2A to return to the STANDBY mode

**Off Cradle** - invalid condition

**30s Timeout** - returns the ADL MK2A to the STANDBY mode (sad tone)

### 3.3.1 Speed Dial Programming

The ADL MK2A has 10 speed dial memory locations, accessed by the digit keys 0 to 9. Each location can hold up to 16 digits.

To program a speed dial number:

1. Press the <Program> key on the handset. The Phone LED will flash to indicate the ADL MK2A is in programming mode.
2. Enter the memory location to be used for storing the number (0 to 9). The ADL MK2A goes to speed dial PROGRAM mode and establishes an RF link.
3. Dial the number to be stored in the memory location. Numbers are transferred to the base unit for subsequent storage in non-volatile memory.
4. Press the <Memory> key on the handset. The phone will store the digits in the non-volatile memory in the base unit, shut-down the RF link, terminate PROGRAM mode, and will return to the STANDBY mode. A *happy* tone will be emitted from the handset to indicate successful programming of the number.

Any of the DTMF dialling keys can be used to store numbers in the speed dial memory independent of the default dialling mode. If the default dialling mode is Pulse when using the speed dial number, the digit <#> will be ignored and the digit <\*> will put the ADL MK2A in temporary DTMF dialling mode.

The <Redial> key can also be pressed to store the contents of the redial buffer to the memory location, but only if no other digit keys have been pressed first.

A pause can be inserted into a memory location by pressing and holding the digit after the pause is required for two (2) seconds. A key-beep will be heard with the initial key-press, and then again after two (2) seconds; the second key-beep indicates that a pause has been programmed. Further key-beeps (and additional pauses) will be inserted every two (2) seconds if the DTMF key is held continuously.



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## 3.3.2 Ringer Type Programming

The ADL MK2A supports four different ringer types and a ringer off state. The ringer type is programmed as follows:

1. Press the <Program> key on the handset. The Phone LED will flash to indicate the ADL MK2A is in programming mode.
2. Press either the <\*> or <#> keys to go to ringer type programming mode.
3. Press any of the {<1> <2> <3> <4>} keys to select a new ringer type, the <5> key to turn the ringer off, or the <0> key to maintain the current ringer selection. After one of these keys is pressed, the current ringer selection is sounded from the handset buzzer for the user's reference. These keys can be continuously pressed indefinitely.
4. Press the <Off> key to return the ADL MK2A to the STANDBY mode.

## 3.4 RINGING Mode

The RINGING mode occurs when a valid ring signal is applied to the base unit from the PSTN connection. The base unit establishes an RF link to the handset, and sends commands to the handset causing it to ring with the currently selected ring type (if the ringer is turned off, the handset will not ring). The commands are sent in cadence with the received ring signal, making the ADL MK2A virtually transparent to speciality ring types.

If the handset is away from the base unit cradle, pressing any key on the handset (except Off) will cause the ADL MK2A to go off-hook and answer the incoming call. The feature is referred to as *In the Dark Answering*.

If the handset is resting on the base unit cradle, lifting the handset from the cradle will cause the ADL MK2A to automatically answer the incoming call. In this case, the Phone key will be disabled for the first 4 seconds to prevent the user from accidentally flashing the PSTN connection.

When in the RINGING mode:

- <Phone> - causes the ADL MK2A to go to the PHONE mode
- <Channel> - causes the ADL MK2A to go to the PHONE mode
- <Off> - this key is locked out
- Dialling Keys - causes the ADL MK2A to go to the PHONE mode
- <Program> - causes the ADL MK2A to go to the PHONE mode
- Ringing - causes the ADL MK2A to remain in the RINGING mode
- <Page> - this key is locked out
- On Cradle - causes the ADL MK2A to remain in the RINGING mode
- Off Cradle - causes the ADL MK2A to go to the PHONE mode
- 5s Ringing Timeout - returns the ADL MK2A to the STANDBY mode

## 3.5 PAGE Mode

The PAGE mode only occurs if the handset is in STANDBY mode, the handset is away from the base unit cradle, and the <Page> button on the base unit is pressed. In the PAGE mode, the handset emits a series of four tones; the page tones can be turned off by either pressing the <Off> key on the handset, or the <Page> key on the base unit.

When in the PAGE mode:

- <Phone> - causes the ADL MK2A to go to the PHONE mode

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<Channel> - this key is locked out  
 <Off> - causes the ADL MK2A to return to the STANDBY mode  
**Dialling Keys** - these keys are locked out  
 <Program> - this key is locked out  
**Ringing** - causes the ADL MK2A to go to the RINGING mode  
 <Page> - causes the ADL MK2A to return to the STANDBY mode  
**On Cradle** - causes the ADL MK2A to return to the STANDBY mode  
**Off Cradle** - invalid condition  
**4-ring Page Timeout** - returns the ADL MK2A to the STANDBY mode

### 3.6 PHONE/PAGE Mode

The PHONE/PAGE mode is only entered if the <Page> key is pressed on the base unit while the ADL MK2A is in the PHONE mode. In this mode, the handset begins to ring as it does in the PAGE mode, but voice path to the PSTN is still available (as in PHONE mode). The page tone in this mode is lower frequency than standard page tone to reduce the volume level; also, there is only one page tone (as opposed to four that occur in PAGE mode).

If the user presses the <Off> key, the PAGE is terminated, and the ADL MK2A returns to the PHONE mode.

When in the PHONE/PAGE mode:

<Phone> - causes the base unit to generate a hook flash to the PSTN  
 <Channel> - causes the ADL MK2A to change to a new RF channel  
 <Off> - causes the ADL MK2A to return to the PHONE mode  
**Dialling Keys** - cause the base unit to dial the corresponding digits  
 <Program> - this key is locked out  
**Ringing** - invalid condition  
 <Page> - causes the ADL MK2A to return to the PHONE mode  
**On Cradle** - causes the ADL MK2A to return to the STANDBY mode  
**Off Cradle** - invalid condition  
**1-ring Page Timeout** - returns the ADL MK2A to the PHONE mode

### 3.7 PROGRAM/PAGE Mode

The PROGRAM/PAGE mode is only entered if the <Page> key is pressed on the base unit while the phone is in PROGRAM mode. In this mode, the handset begins to ring as it does in the PAGE mode, but the user can complete his operation in the PROGRAM mode.

If the user presses the <Off> key, the PAGE is terminated, and the phone returns to the PROGRAM mode.

When in the main PROGRAM/PAGE mode:

<Phone> - causes the ADL MK2A to go to the PHONE mode  
 <Channel> - this key is locked out  
 <Off> - causes the ADL MK2A to go to the PROGRAM mode  
**Number Keys** - goes to the speed dial PROGRAM/PAGE mode  
 <\*, <# Keys - puts the ADL MK2A in the ringer type PROGRAM/PAGE mode  
 <Redial>, <Memory>, <Program> Keys - these keys are locked out  
**Ringing** - causes the ADL MK2A to go to the PROGRAM/RINGING mode  
 <Page> - returns the phone to the PROGRAM mode



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- On Cradle** - returns the phone to the STANDBY mode
- Off Cradle** - invalid condition
- 30s Keypad Timeout** - puts the ADL MK2A in the PAGE mode (sad tone)
- 4-ring Page Timeout** - returns the ADL MK2A to the PROGRAM mode

When in the speed dial PROGRAM/PAGE mode:

- <Phone>** - causes the ADL MK2A to go to the PHONE mode (Sad Tone)
- <Channel>** - this key is locked out
- <Off>** - causes the ADL MK2A to go to the PROGRAM mode
- DTMF Keys** - enter the number to be stored
- <Redial>** - access contents of redial buffer (if pressed first, otherwise locked out)
- <Memory>** - number stored, puts ADL MK2A in PAGE mode (happy tone)
- <Program>** - this key is locked out
- Ringin**g - causes the ADL MK2A to go to the PROGRAM/RINGING mode
- <Page>** - returns the phone to the PROGRAM mode
- On Cradle** - puts the ADL MK2A in the STANDBY mode (Sad Tone)
- Off Cradle** - invalid condition
- 30s Keypad Timeout** - puts the ADL MK2A in the PAGE mode (sad tone)
- 4-ring Page Timeout** - returns the ADL MK2A to the PROGRAM mode

When in the ringer type PROGRAM/PAGE mode:

- <Phone>** - causes the ADL MK2A to go to the PHONE mode
- <Channel>** - this key is locked out
- <Off>** - causes the ADL MK2A to go to the PROGRAM mode
- <1>, <2>, <3>, <4>, <5>, <0> Keys** - cause the ringer type to be changed accordingly
- <6>, <7>, <8>, <9>, <\*>, <#> Keys** - these keys are locked out
- <Redial>, <Memory>, <Program> Keys** - these keys are locked out
- Ringin**g - causes the ADL MK2A to go to the PROGRAM/RINGING mode
- <Page>** - returns the phone to the PROGRAM mode
- On Cradle** - puts the ADL MK2A in the STANDBY mode
- Off Cradle** - invalid condition
- 30s Keypad Timeout** - puts the ADL MK2A in the PAGE mode (sad tone)
- 4-ring Page Timeout** - returns the ADL MK2A to the PROGRAM mode

### 3.8 PROGRAM/RINGING Mode

The PROGRAM/RINGING mode is only entered if an incoming PSTN call occurs while the phone is in PROGRAM mode. In this mode, the handset begins to ring as it does in the RINGING mode, but the user can complete his operation in the PROGRAM mode.

If the user presses the <Phone> key, the PSTN call is answered, the phone leaves PROGRAM mode and enters the PHONE mode.

When in the main PROGRAM/RINGING mode:

- <Phone>** - causes the ADL MK2A to go to the PHONE mode
- <Channel>** - this key is locked out
- <Off>** - causes the ADL MK2A to go to the RINGING mode
- Number Keys** - goes to the speed dial PROGRAM/RINGING mode

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<\*, <# Keys - puts the ADL MK2A in the ringer type PROGRAM/RINGING mode  
 <Redial>, <Memory>, <Program> Keys - these keys are locked out  
 Ringing - causes the ADL MK2A to remain in the PROGRAM/RINGING mode  
 <Page> - the Page key is locked out  
 On Cradle - causes the ADL MK2A to go to the RINGING mode  
 Off Cradle - invalid condition  
 30s Keypad Timeout - puts the ADL MK2A in the RINGING mode (sad tone)  
 5s Ringing Timeout - returns the ADL MK2A to the PROGRAM mode

When in the speed dial PROGRAM/RINGING mode:

<Phone> - causes the ADL MK2A to go to the PHONE mode (Sad Tone)  
 <Channel> - this key is locked out  
 <Off> - causes the ADL MK2A to go to the RINGING mode (Sad Tone)  
 DTMF Keys - enter the number to be stored  
 <Redial> - access contents of redial buffer (if pressed first, otherwise locked out)  
 <Memory> - number stored, puts ADL MK2A in RINGING mode (happy tone)  
 <Program> - this key is locked out  
 Ringing - causes the ADL MK2A to remain in the PROGRAM/RINGING mode  
 <Page> - this key is locked out  
 On Cradle - puts the ADL MK2A in the RINGING mode (Sad Tone)  
 Off Cradle - invalid condition  
 30s Keypad Timeout - puts the ADL MK2A in the RINGING mode (sad tone)  
 5s Ringing Timeout - returns the ADL MK2A to the PROGRAM mode

When in the ringer type PROGRAM/RINGING mode:

<Phone> - causes the ADL MK2A to go to the PHONE mode  
 <Channel> - this key is locked out  
 <Off> - causes the ADL MK2A to go to the RINGING mode  
 <1>, <2>, <3>, <4>, <5>, <0> Keys - cause the ringer type to be changed accordingly  
 <6>, <7>, <8>, <9>, <\*>, <#> Keys - these keys are locked out  
 <Redial>, <Memory>, <Program> Keys - these keys are locked out  
 Ringing - causes the ADL MK2A to remain in the PROGRAM/RINGING mode  
 <Page> - this key is locked out  
 On Cradle - puts the ADL MK2A in the RINGING mode  
 Off Cradle - invalid condition  
 30s Keypad Timeout - puts the ADL MK2A in the RINGING mode (sad tone)  
 5s Ringing Timeout - returns the ADL MK2A to the PROGRAM mode

## 3.9 RF Channel Selection

### 3.9.1 Background Channel Scanning

Background channel scanning is the only automatic channel selection performed on the ADL MK2A. Background channel scanning occurs only when the handset is resting in the base unit charging cradle.

When the base unit is in STANDBY mode with the handset resting in its charging cradle, the base unit will monitor the current channel for RF activity (through the use of the RSSI logic signal). If the base unit detects activity for a continuous period exceeding 50 seconds, the base unit will initiate a channel scanning mode.



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The base unit will change its receiver to the next RF channel, and monitor that channel for RF activity - if activity is present, it continues scanning on the next RF channel; if no activity is present, that channel is selected as the new RF channel. If no available channels can be found, the base unit departs the channel scanning mode, and returns to the STANDBY mode with the same default RF channel.

If a new RF channel is found, the base unit will communicate the new RF channel and security code to the handset through the cradle contacts; the handset will respond over the RF link (on the new RF channel). Once the acknowledgement is received, the new RF channel is selected as the default channel, and the phone returns to the STANDBY mode.

Once the phone is back in STANDBY mode, the base unit begins monitoring the new channel for continuous RF activity that exceeds one (1) minute, at which point the channel scanning mode is activated again.

Only the base unit verifies the availability of the new channel; the ADL MK2A does not have the ability to monitor the availability of corresponding handset receive channels.

When in the back-ground channel scanning mode:

- Handset Key-presses** - invalid condition (handset in cradle)
- Ringling** - puts ADL MK2A in the RINGING mode (default channel)
- <Page>** - this key is locked out (handset in cradle)
- On Cradle** - invalid condition (handset in cradle)
- Off Cradle** - puts ADL MK2A in the STANDBY mode (default channel)
- New Channel Select** - puts ADL MK2A in the STANDBY mode (new channel)
- No New Channel** - puts ADL MK2A in STANDBY mode (default channel)

### 3.9.2 Manual Channel Selection

Manual channel change is possible only when the ADL MK2A is in the PHONE mode or the PHONE/PAGE mode. A manual channel change is initiated by the user pressing the <Channel> key on the handset.

Once the base unit receives the channel change command, it changes its receiver to the next RF channel and checks for RF activity, if the channel is free, it selects it as the new channel; if it is occupied, it changes its receiver to the next channel in sequence. If all channels are occupied, the new channel will be the 9th channel in the circular sequence (i.e., the old channel minus 1).

The base unit then returns to the old channel, and transmits the new channel to the handset; the handset receives the new channel and tunes its Tx/Rx accordingly.

Only the base unit verifies the availability of the new channel; the ADL MK2A does not have the ability to monitor the availability of corresponding handset receive channels.



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## 4 Electrical Specifications

### 4.1 Operating Conditions

Parameter	Min	Typ	Max	Units
Operating Temperature Range	0	25 <sup>1</sup>	50	°C
Base Unit Operating Voltage (AC Voltage, 60Hz)	96	120 <sup>1</sup>	144	Vrms
Base Unit Operating Voltage (AC Adapter Output)		9 <sup>1</sup>		Vdc
Handset Operating Voltage <sup>2</sup>	3.2	3.6 <sup>1</sup>	4.2	Vdc

- Notes:
1. Typical value represents the nominal testing value
  2. Handset operates from a 3-cell NiCd Battery

### 4.2 DC Electrical Characteristics

Specifications marked with \* are guaranteed at the nominal testing temperature and voltage on all units with the use of automated production test equipment (ATE)

Parameter	Min	Typ	Max	Units
* Base Unit Current - Standby Mode <sup>1,2</sup>	90		118	mA
* Base Unit Current - Talk Mode <sup>1,2</sup>	120		158	mA
Handset Current - Sleep Mode		1	3	mA
* Handset Current - Wake Mode	41		51	mA
* Handset Current - Talk Mode	61		86	mA
* Handset Sleep Duration - Standby Mode	750		1150	ms
Handset Wake Duration - Standby Mode		52	60	ms
* Low Battery Detection Threshold (HS)	3.4			Vdc
* MCU Shutdown Threshold (HS)	3.2			Vdc
Handset Standby Time	6			Days
Handset Continuous Talk Time	7			Hours
* Loaded Cradle Charge Contact Voltage <sup>3</sup>	3.3		4.3	V
* Loaded Spare Battery Charge Contact Voltage <sup>3</sup>	1.7		2.5	V

- Notes:
1. DC current from 9V power supply
  2. Cradle and spare battery charge currents = 0mA
  3. Voltage measured across a 50Ω charge circuit load resistor

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## 4.3 Audio Specifications

Specifications marked with \* are guaranteed at the nominal testing temperature and voltage on all units with the use of automated production test equipment (ATE).

	<b>Parameter</b>	<b>Min</b>	<b>Typ</b>	<b>Max</b>	<b>Units</b>
*	Transmit Objective Loudness Rating (TOLR) <sup>1</sup>	-40	-46	-53	dB
*	Receive Objective Loudness Rating (ROLR) <sup>1,2</sup>	51	+46	41	dB
*	Sidetone Objective Loudness Rating (SOLR) <sup>3</sup>	+3	+8	+19	dB
*	Receive volume adjustment range	6	8		dB
*	Transmit Direction Acoustic Overload (into microphone) <sup>4</sup>	105			dBspl
*	Receive Direction Acoustic Overload (from receiver) <sup>4</sup>	105			dBspl
	Transmit Direction Noise <sup>5</sup>			20	dBnC
	Receive Direction Noise <sup>2,5</sup>			35	dB(A)
	Peak Acoustic Pressure <sup>6</sup>			130	dBspl

- Notes:
1. Tested using 0kft of simulated telephone line
  2. Tested at normal (low) volume level
  3. Base unit connected to 0kft of simulated telephone line terminated with 900Ω
  4. Acoustic level that results in 5% THD, measured at 1kHz through a 5kHz lowpass filter
  5. Handset isolated from sound input and mechanical disturbances
  6. Tested at high volume level

## 4.4 Telephone Line Interface Specifications

Specifications marked with \* are guaranteed at the nominal testing temperature and voltage on all units with the use of automated production test equipment (ATE).

	<b>Parameter</b>	<b>Min</b>	<b>Typ</b>	<b>Max</b>	<b>Units</b>
*	DTMF Frequency Tolerance	-1.5		+1.5	%
*	DTMF Low Group Tone Level <sup>1</sup>	-7.5	-5.0	-4.0	dBm
*	DTMF High Group Tone Level <sup>1</sup>	-5.5	-3.0	-2.0	dBm
	DTMF Combined Tone Level <sup>1</sup>			+2.0	dBm
	DTMF High Group Pre-emphasis (Twist)		2.0	4.0	dB
	Pulse Dialling Break Duration		60		ms
	Pulse Dialling Make Duration		40		ms
	Pulse Dialling Rate		10		pps
	Ring Detection Frequency <sup>2,3</sup>	15		68	Hz
	Ring Response Voltage <sup>3</sup>	40			Vrms
	Ring No-Response Voltage <sup>4</sup>			15	Vrms



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- Notes:
1. Measured across a 900 $\Omega$  terminating impedance
  2. The ringer must ring with signals within this range
  3. Measured with a frequency of 20Hz
  4. The ringer must not ring with signals within this range



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## 4.5 Radio Specifications

Specifications marked with \* are guaranteed at the nominal testing temperature and voltage on all units with the use of automated production test equipment (ATE).

	<b>Parameter</b>	<b>Min</b>	<b>Typ</b>	<b>Max</b>	<b>Units</b>
	Number of RF Duplex Channels <sup>1</sup>		10		-
	Duplex Frequency		22.75		MHz
	RF Channel Spacing		300		kHz
	RF Bandwidth <sup>2</sup>		150		kHz
	IF Frequency		10.70		MHz
	Base Unit Transmission Frequency	902.30		905.00	MHz
	Handset Transmission Frequency	925.05		927.75	MHz
	Transmitter Frequency Stability (over temperature range)	-10		+10	kHz
*	Handset FM Peak Deviation; Acoustic Test Tone <sup>3</sup>	23	25	27	kHz
*	Base Unit FM Peak Deviation; Audio Test Tone <sup>4</sup>	24	25	26	kHz
	Base & Handset FM Peak Deviation - Overload Level <sup>5</sup>		40		kHz
*	Base FSK Peak Deviation - Data	35	40	45	kHz
*	Handset FSK Peak Deviation - Data	30	40	55	kHz
*	Handset Recovered Acoustic Level - RF Test Signal <sup>6,7</sup>	95	97	99	dBspl
*	Base Unit Recovered Audio Level - RF Test Signal <sup>6,8</sup>	-11	-10	-9	dBv
*	Receiver Sensitivity - 12dB SINAD <sup>9</sup>	-112	-115		dBm
	Receiver Sensitivity - 25dB SINAD <sup>9</sup>		-110		dBm
*	Receiver Sensitivity - 100% Data Reception	-110			dBm
	Adjacent Channel Rejection <sup>10</sup>	55			dB
	Image Rejection <sup>10</sup>	65			dB
*	Clear Channel Detection Level	-100		-80	dBm

Notes:

1. A duplex channel includes 1 base to handset link and 1 handset to base link
2. 3dB bandwidth of IF filter
3. Acoustic test tone: 1kHz tone, 97dBspl at artificial mouth output
4. Audio test tone: 1kHz tone, -5dBV open circuit voltage from 900Ω source
5. Overload level corresponds to acoustic overload of 105dBspl (transmit and receive)
6. RF test signal: 1kHz audio signal FM modulated onto an RF carrier with ±25kHz deviation
7. Acoustic level into artificial ear tested at normal (low) volume level
8. Measured at telephone line interface across 900Ω termination
9. Measured through a CCITT audio weighting filter
10. RF level of desired signal set to provide 25dB SINAD (CCITT); rejection is relative level of interference signal above desired signal to reduce SINAD to 20dB (CCITT)

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## 4.6 Frequency Allocation Tables

The RF channels for the ADL MK2A are allocated in fixed pairs as indicated in the tables below. The duplex frequency is maintained at a fixed 22.75MHz for all 10 channels.

### 4.6.1 Base Unit Frequencies

Channel #	Transmit Frequency	Receive Frequency	Rx LO Frequency
1	902.30 MHz	925.05 MHz	914.35 MHz
2	902.60 MHz	925.35 MHz	914.65 MHz
3	902.90 MHz	925.65 MHz	914.95 MHz
4	903.20 MHz	925.95 MHz	915.25 MHz
5	903.50 MHz	926.25 MHz	915.55 MHz
6	903.80 MHz	926.55 MHz	915.85 MHz
7	904.10 MHz	926.85 MHz	916.15 MHz
8	904.40 MHz	927.15 MHz	916.45 MHz
9	904.70 MHz	927.45 MHz	916.75 MHz
10	905.00 MHz	927.75 MHz	917.05 MHz

### 4.6.2 Handset Frequencies

Channel #	Transmit Frequency	Receive Frequency	Rx LO Frequency
1	925.05 MHz	902.30 MHz	913.00 MHz
2	925.35 MHz	902.60 MHz	913.30 MHz
3	925.65 MHz	902.90 MHz	913.60 MHz
4	925.95 MHz	903.20 MHz	913.90 MHz
5	926.25 MHz	903.50 MHz	914.20 MHz
6	926.55 MHz	903.80 MHz	914.50 MHz
7	926.85 MHz	904.10 MHz	914.80 MHz
8	927.15 MHz	904.40 MHz	915.10 MHz
9	927.45 MHz	904.70 MHz	915.40 MHz
10	927.75 MHz	905.00 MHz	915.70 MHz