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**Internal Product Specification for the  
VT 9117 ADL MK4 BLK  
Turfone**

**Revision History:**

Revision	Description	Page	Effective Date
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## 1. Overview

This specification defines the functional and electrical performance requirements of the VT 9117 900MHz analog cordless telephone. The VT 9117 is intended to be compatible with most type of central office equipment in use in Canada, the United States and South America.

### 1.1. General Description

The VT 9117 MK4 is a basic analog cordless telephone similar our VT 9108 MK4 model in electronic platform and operation. The main different between VT 9117 MK4 with VT 9108 MK4 is on the mechanical design and cosmetic appearance. Water proof design concept is adopted in this model to provide a brand new feature for our customer. Also, in electronic part, a 3\_step electrical volume controller is developed to replace the current volume switch.

As a new generation comes from ADL MK2C, Philips RF combo chip will be used in MK4 instead of discrete components RF module used on MK2c. In addition, some of base band circuits are included inside the chip, those base band IC will not be used and reduce the total components count. New Toshiba MCU will be used to reduce the cost and better ESD performance will be expected.

### 1.2. Regulatory Standards

As a requirement for sale in the United States, the VT 9117 MK4 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 1950 Safety Requirements

As a requirement for sale in Canada, the VT 9117 MK4 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

By adopting the water proof design, VT 9117 MK4 provide a splash resistance feature on handset and base unit cradle. Below documents will be used as a standard in the design stage and products test:

- IEC 68-2-18 Part 2 ENVIRONMENTAL TESTING Part 2: Tests – Test R and guidance: Water

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

### 1.3. Preliminary Feature List

The VT 9117 MK4 will offer many of the same features as the VT 9108 MK4.

#### 1.3.1. Basic Features

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

- 30 channel, 900 MHz operation
- Automatic search for available channel
- Manual channel change when handset in PHONE mode
- 16 bit digital security code (factory default)
- Pulse, DTMF dialling (select by H/S programming), and temporary DTMF dialling
- 10 number speed dial memory; each number can be up to 16 digits

- Redial memory (16 digits)
- Low battery detection and warning indicator
- Battery charge interval: 6 days in STANDBY mode, 4.5 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 VT 9117 MK4, 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 and handset unit protects against power failure
- In-the-dark answering of incoming calls
- Compact Plug type removable battery pack
- Compatibility with remote charger system
- Power LED on base
- Separate HS In\_use LED on base
- Splash resistance design in handset unit & base charge cradle
- Wall mountable in base
- Headset jack & belt clip available in handset unit
- Electronic volume control keys instead of switch in handset
- Splash resistance on handset unit & Base unit cradle

### 1.3.3. Features Not Provided

The following features will not be offered in the VT 9117 MK4. These are explicitly listed below to ensure there are no misunderstandings on the intended operation of the product.

- Separate low battery LED on handset
- Separate <Flash> key
- Spare battery charger in base unit (optional spare battery purchased separately)
- Battery back-up in case of power failure (optional spare battery purchased separately)
- Ringer volume adjustment on base unit
- Bottom-mounted tone/pulse switch on base unit (Program on headset)

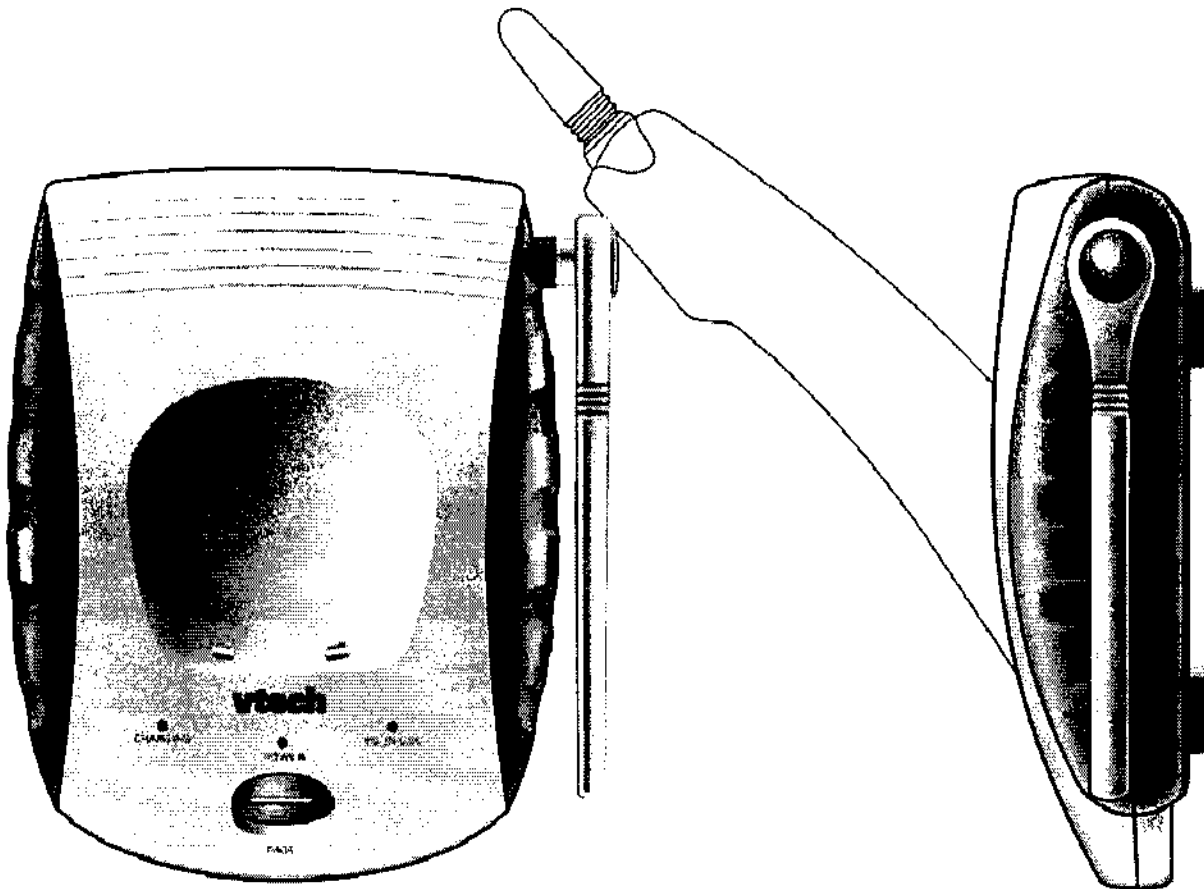
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#### 1.4. *Cosmetic Styling*

Line drawings for the VT 9117 MK4 base unit and handset are in the following sections.

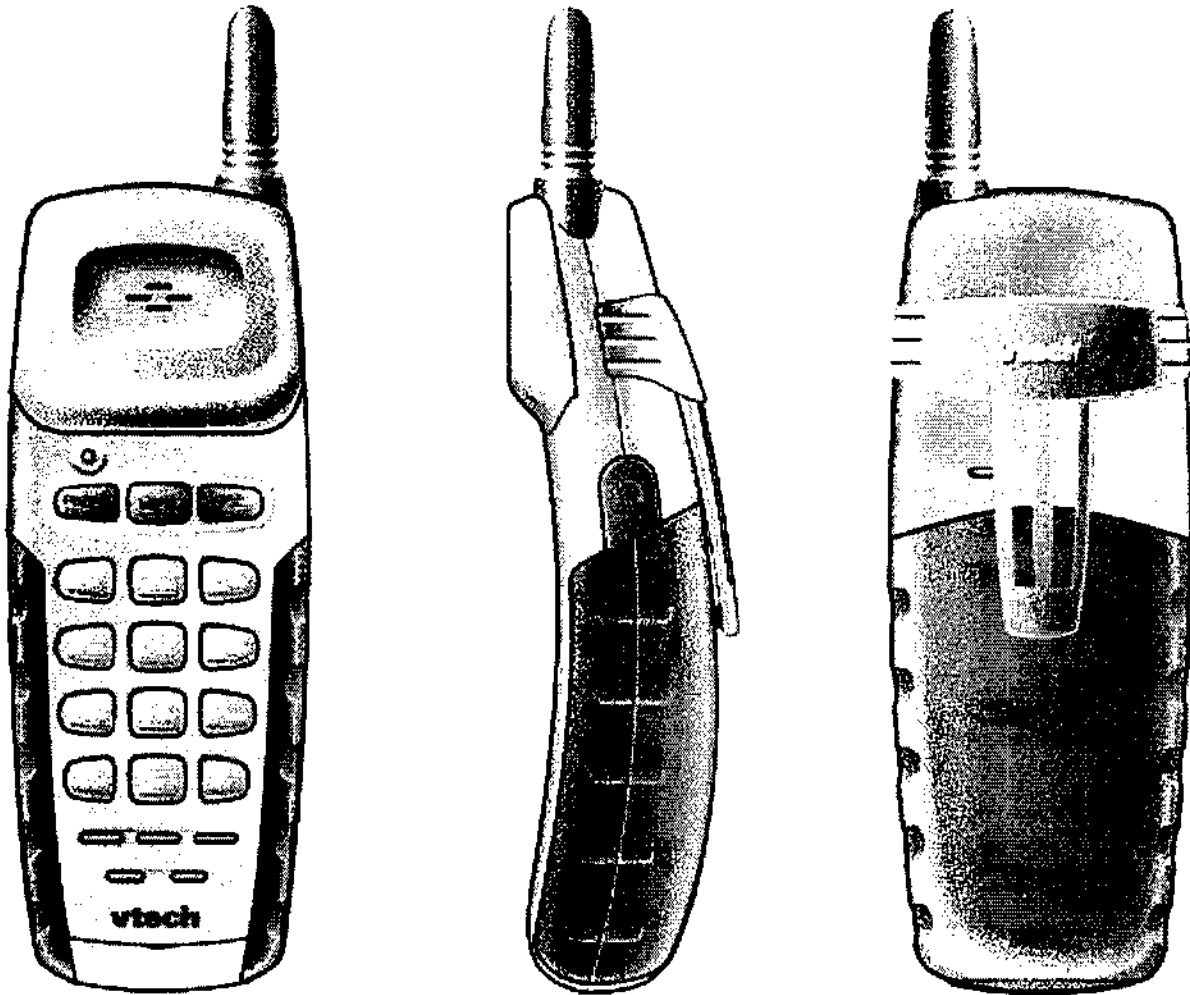
##### 1.4.1. Base Unit Line Drawing



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## 1.4.2. Handset Line Drawing

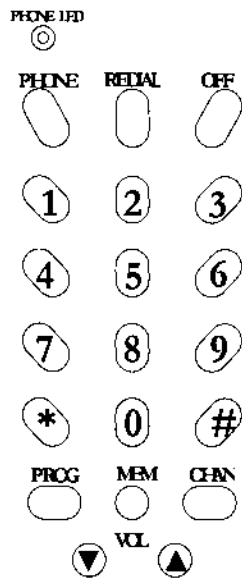


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## 2. Functional Layout

### 2.1. Handset Functional Layout



Handset Keypad Layout

#### 2.1.1. Handset LED Indicators

**Phone LED** - this LED illuminates steadily when the handset is in the PHONE mode. It will flash in cadence with an incoming ring from the PSTN line. It will flash quickly when the handset is in the PROGRAM mode. It will flash slowly when a low battery condition in the handset is detected.

#### 2.1.2. Handset Key Descriptions

**<PHONE> key** - this key is used to enter the PHONE mode. If the handset is already in the PHONE mode, pressing this key will generate a hook-flash on 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.

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

**<CHAN> 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.

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

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

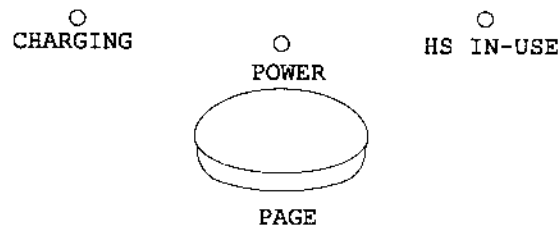
<**REDIAL/PAUSE**> key - this key is used to dial the contents of the redial buffer and active in the PHONE mode if no other dialling keys have been pressed. This key is also active in the PROGRAM mode for storing the redial buffer into a memory location. Pause can also be added into the memory by pressed this key after any number entry in PROGRAM mode.

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

<**#**> key - this key is used to select Pulse dialling in Program mode.

<**VOL ▼**> & <**VOL ▲**> keys - these two keys are used to adjust the handset unit receiver volume within the 3 preset levels: High, Middle, Low. This function is only active in the PHONE mode.

## 2.2. Base Unit Functional Layout



Base Unit Layout

### 2.2.1. Base Unit LED Indicators

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

**POWER LED** - this LED illuminates steadily when the base power adapter is plugged in and power is applied to the base unit.

**HS IN\_USE LED** - this LED illuminates steadily when the phone is in the PHONE mode. It will flash in cadence with an incoming ring.

### 2.2.2. Base Unit Key Descriptions

<**PAGE**> key - this key is used to enter the PAGE mode. In the PAGE mode, the handset will emit a series of rings. Pressing the <PAGE> key a second time (while in the PAGE mode) will terminate PAGE mode, stopping the handset rings. The PAGE mode will also be terminated automatically after 60 seconds (the STANDBY mode) or one page tone (the PHONE mode) is heard at the handset. This key is inactive if the handset is resting in the base unit cradle.

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### 3. Operating Modes

The VT 9117 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> <MEM>}
- *VOL keys* = {<▲> <▼>}

#### 3.1. STANDBY Mode

The STANDBY mode is the idle mode of the VT 9117. 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 sub-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).

When in the STANDBY mode:

- <PHONE> - causes the VT 9117 to go to the PHONE mode
- <CHAN> - this key is locked out
- <OFF> - series of on hook data send to base and maintains VT 9117 in the STANDBY mode
- Dialling Keys** - these keys are locked out
- VOL Keys** - these keys are locked out
- <REDIAL> - this key is locked out
- <PROG> - causes the VT 9117 to go to the PROGRAM mode
- Ringling** - causes the VT 9117 to go to the RINGING mode
- <PAGE> - causes the VT 9117 to go to the PAGE mode
- On Cradle** - maintains the VT 9117 in the STANDBY mode
- Off Cradle** - maintains the VT 9117 in the STANDBY mode

#### 3.2. PHONE Mode

The PHONE mode is the main operating mode of the VT 9117. 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 <CHAN> key causes the VT 9117 to seek a new RF channel for operation (refer to section 4.3 for more details).

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Pressing the VOL <▲> key will increase the handset receiver volume level step by step. When volume is turned to maximum level, the buzzer will sound two key beeps.

Pressing the VOL <▼> key will decrease the handset receiver volume level step by step. When volume is turned to minimum level, the buzzer will sound two key beeps.

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

When in the PHONE mode:

- <PHONE> - causes the base unit to generate a hook flash to the PSTN
- <CHAN> - causes the VT 9117 to change to a new RF channel
- <OFF> - causes the VT 9117 to return to the STANDBY mode
- Dialling Keys** - cause the base unit to dial the corresponding digits
- VOL Keys** - increase or decrease the handset receiver volume level accordingly
- <REDIAL> - dials the content of redial buffer
- <PROG> - this key is locked out
- Ringling** - invalid condition
- <PAGE> - causes the VT 9117 to go to the PHONE/PAGE mode
- On Cradle** - causes the VT 9117 to return to the STANDBY mode
- Off Cradle** - invalid condition

### 3.2.1. Dialling Methods

The VT 9117 supports three dialling methods: pulse, tone (DTMF), and temporary DTMF. The pulse or tone dialling mode can be set as the default dialling method by programming on the handset unit.

Temporary DTMF dialling mode is only available when the default method is set to pulse. In that case, pressing the <Tone/\*> key on the handset will initiate temporary DTMF dialling such that all subsequent digits dialled will be in DTMF (including <\*> and <#>). Temporary DTMF dialling will continue until the VT 9117 returns to the STANDBY mode, at which point the default pulse dialling resumes.

During DTMF dialling, the <Tone/\*> key will dial the DTMF <\*> digit. During Pulse dialling, 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.

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 the RAM of MCU and will be erased if MCU is reset.

### 3.2.3. Memory Dialling

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

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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/PAUSE> key, or the memory dialling feature.

### **3.3. PROGRAM Mode**

The VT 9117 supports three programming sub-modes: speed dial programming, tone/pulse select programming and ringer type programming. The speed dial programming sub-mode is used to program a number into one of the 16 speed dial memory locations; tone/pulse select programming is used to select tone dialling or pulse dialling on base; the ringer type programming sub-mode is used to select the handset ringer tone.

When in the main PROGRAM mode:

- <PHONE> - causes the VT 9117 to go to the PHONE mode (*sad tone*)
- <CHAN> - this key is locked out
- <OFF> - causes the VT 9117 to go to the STANDBY mode (*sad tone*)
- Number Keys - cause the VT 9117 to go to speed dial PROGRAM sub-mode
- <\*> Keys - cause the VT 9117 to go to the tone/pulse select PROGRAM sub-mode
- <#> Keys - cause the VT 9117 to go to the ringer type PROGRAM sub-mode
- <REDIAL>, <MEM>, <PROG> Keys - these keys are locked out
- VOL Keys - these keys are locked out
- Ringling - causes the VT 9117 to go to the PROGRAM/RINGING mode
- <PAGE> - causes the VT 9117 to go to the PROGRAM/PAGE mode
- On Cradle - causes the VT 9117 to return to the STANDBY mode (*sad tone*)
- Off Cradle - invalid condition
- 30s Timeout - returns the VT 9117 to the STANDBY mode (*sad tone*)

When in the speed dial PROGRAM sub-mode:

- <PHONE> - causes the VT 9117 to go to the PHONE mode (*sad tone*)
- <CHAN> - this key is locked out
- <OFF> - causes the VT 9117 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)
- <MEM> - number stored, return VT 9117 to the STANDBY mode (*happy tone*)
- <PROG> - this key is locked out
- VOL Keys - these keys are locked out
- Ringling - causes the VT 9117 to go to the PROGRAM/RINGING mode
- <PAGE> - causes the VT 9117 to go to the PROGRAM/PAGE mode
- On Cradle - returns VT 9117 to return to the STANDBY mode (*sad tone*)
- Off Cradle - invalid condition
- 30s Timeout - returns the VT 9117 to the STANDBY mode (*sad tone*)

When in the tone/pulse select PROGRAM sub-mode:

- <PHONE> - causes the VT 9117 to go to the PHONE mode (*sad tone*)
- <CHAN> - this key is locked out
- <OFF> - causes the VT 9117 to go to the STANDBY mode (*sad tone*)
- <\*>, <#> Keys - select tone mode or pulse mode dialling on base
- Number Keys - these keys are locked out
- <MEM> - selection stored, return VT 9117 to the STANDBY mode (*happy tone*)
- <REDIAL>, <PROG> Keys - these keys are locked out
- VOL Keys - these keys are locked out
- Ringling - causes the VT 9117 to go to the PROGRAM/RINGING mode
- <PAGE> - causes the VT 9117 to go to the PROGRAM/PAGE mode
- On Cradle - causes the VT 9117 to return to the STANDBY mode (*sad tone*)
- Off Cradle - invalid condition
- 30s Timeout - returns the VT 9117 to the STANDBY mode (*sad tone*)

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When in the ringer type PROGRAM sub-mode:

- <PHONE> - causes the VT 9117 to go to the PHONE mode (*sad tone*)
- <CHAN> - this key is locked out
- <OFF> - causes the VT 9117 to go to the STANDBY mode (*sad tone*)
- <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
- <MEM> - selection stored, return VT 9117 to the STANDBY mode (*happy tone*)
- <REDIAL>, <PROG> Keys - these keys are locked out
- VOL Keys - these keys are locked out
- Ringng - causes the VT 9117 to go to the PROGRAM/RINGING mode
- <PAGE> - causes the VT 9117 to go to the PROGRAM/PAGE mode
- On Cradle - causes the VT 9117 to return to the STANDBY mode (*sad tone*)
- Off Cradle - invalid condition
- 30s Timeout - returns the VT 9117 to the STANDBY mode (*sad tone*)

### 3.3.1. Speed Dial Programming

The VT 9117 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 <PROG> key on the handset. The PHONE LED on the handset will flash to indicate the VT 9117 is in the PROGRAM mode.
2. Enter the memory location to be used for storing the number (0 to 9).
3. Dial the number to be stored in the memory location. Numbers are stored in non-volatile memory on Handset.
4. Press the <MEM> key on the handset. The phone will store the digits in the non-volatile memory on Handset, terminate the PROGRAM mode, and 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 method. If the default dialling method is pulse when using the speed dial number, the digit <#> will be ignored and the digit <\*> will initiate temporary DTMF dialling.

The <REDIAL/PAUSE> 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 the <REDIAL/PAUSE> digit after the pause is required for two (2) seconds. A key-beep will be heard with the <REDIAL/PAUSE> key-press, and then again after two (2) seconds; the second key-beep indicates that a pause has been programmed.

### 3.3.2. Tone/Pulse Select Programming

The VT 9117 supports tone mode dialling and pulse mode dialling on base unit. The tone/pulse select is programmed as follows:

1. Press the <PROG> key on the handset. The PHONE LED on the handset will flash to indicate the VT 9117 is in the PROGRAM mode.
2. Press either the <\*> keys to go to the tone/pulse select PROGRAM sub-mode.
3. Press <\*> key to select tone mode dialling or press <#> key to select pulse mode dialling. These two keys can be continuously pressed indefinitely and the latest entry will select .

4. Press the <MEM> key on the handset. The phone will store the selection in the non-volatile memory on Handset, terminate the PROGRAM mode, and return to the STANDBY mode. A *happy tone* will be emitted from the handset to indicate successful programming of the selection.

### 3.3.3. Ringer Type Programming

The VT 9117 supports four different ringer types and a ringer off state. The ringer type is programmed as follows:

1. Press the <PROG> key on the handset. The PHONE LED on the handset will flash to indicate the VT 9117 is in the PROGRAM mode.
2. Press either the <#> keys to go to the ringer type PROGRAM sub-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 VT 9117 to the STANDBY mode. (*sad tone*)
5. Press the <MEM> key on the handset. The phone will store the selection in the non-volatile memory on Handset, terminate the PROGRAM mode, and return to the STANDBY mode. A *happy tone* will be emitted from the handset to indicate successful programming of the selection.

### 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 VT 9117 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 VT 9117 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 VT 9117 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 VT 9117 to go to the PHONE mode
- <CHAN> - causes the VT 9117 to go to the PHONE mode
- <OFF> - this key is locked out
- Dialling Keys** - causes the VT 9117 to go to the PHONE mode
- VOL Keys** - causes the VT 9117 to go to the PHONE mode
- <PROG> - causes the VT 9117 to go to the PHONE mode
- Ringing** - causes the VT 9117 to remain in the RINGING mode
- <PAGE> - this key is locked out
- On Cradle** - causes the VT 9117 to remain in the RINGING mode
- Off Cradle** - causes the VT 9117 to go to the PHONE mode
- 5s Ringing Timeout** - returns the VT 9117 to the STANDBY mode

### 3.5. PAGE Mode

The PAGE mode only occurs if the handset is in the 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 page tones for 60 seconds; 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 VT 9117 to go to the PHONE mode
- <CHAN> - this key is locked out
- <OFF> - causes the VT 9117 to return to the STANDBY mode
- Dialling Keys** - these keys are locked out
- VOL Keys** - these keys are locked out
- <PROG> - this key is locked out
- Ringling** - causes the VT 9117 to go to the RINGING mode
- <PAGE> - causes the VT 9117 to return to the STANDBY mode
- On Cradle** - causes the VT 9117 to return to the STANDBY mode
- Off Cradle** - invalid condition
- 60s Page Timeout** - returns the VT 9117 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 VT 9117 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 the PHONE mode). There is only one page tone (as opposed to a series that occur in the PAGE mode).

If the user presses the <OFF> key, the PAGE is terminated, and the VT 9117 returns to the PHONE mode.

When in the PHONE/PAGE mode:

- <PHONE> - causes the base unit to generate a hook flash to the PSTN
- <CHAN> - causes the VT 9117 to change to a new RF channel
- <OFF> - causes the VT 9117 to return to the PHONE mode
- Dialling Keys** - cause the base unit to dial the corresponding digits
- VOL Keys** - increase or decrease the handset receiver volume level accordingly
- <PROG> - this key is locked out
- Ringling** - invalid condition
- <PAGE> - causes the VT 9117 to return to the PHONE mode
- On Cradle** - causes the VT 9117 to return to the STANDBY mode
- Off Cradle** - invalid condition
- 1-ring Page Timeout** - returns the VT 9117 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 the 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 VT 9117 to go to the PHONE mode (*sad tone*)
- <CHAN> - this key is locked out
- <OFF> - causes the VT 9117 to go to the PROGRAM mode
- Number Keys** - goes to the speed dial PROGRAM mode
- <\*> Keys** - puts the VT 9117 in the tone/pulse select PROGRAM mode
- <#> Keys** - puts the VT 9117 in the ringer type PROGRAM mode
- VOL Keys** - these keys are locked out
- <REDIAL>, <MEM>, <PROG> Keys** - these keys are locked out
- Ringling** - causes the VT 9117 to go to the PROGRAM/RINGING mode
- <PAGE> - returns the phone to the PROGRAM mode
- On Cradle** - returns the phone to the STANDBY mode (*sad tone*)
- Off Cradle** - invalid condition

**30s Keypad Timeout** - puts the VT 9117 in the PAGE mode (*sad tone*)

**60s Page Timeout** - returns the VT 9117 to the PROGRAM mode

When in the speed dial PROGRAM/PAGE sub-mode:

<PHONE> - causes the VT 9117 to go to the PHONE mode (*sad tone*)

<CHAN> - this key is locked out

<OFF> - causes the VT 9117 to go to the PROGRAM mode

**DTMF Keys** - enter the number to be stored

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

<REDIAL> - access contents of redial buffer (if pressed first, otherwise locked out)

<MEM> - number stored, puts VT 9117 in the STANDBY mode (*happy tone*)

<PROG> - this key is locked out

**Ringling** - causes the VT 9117 to go to the PROGRAM/RINGING mode

<PAGE> - returns the phone to the PROGRAM mode

**On Cradle** - puts the VT 9117 in the STANDBY mode (*sad tone*)

**Off Cradle** - invalid condition

**30s Keypad Timeout** - puts the VT 9117 in the PAGE mode (*sad tone*)

**60s Page Timeout** - returns the VT 9117 to the PROGRAM mode

When in the tone/pulse select PROGRAM/PAGE sub-mode:

<PHONE> - causes the VT 9117 to go to the PHONE mode (*sad tone*)

<CHAN> - this key is locked out

<OFF> - causes the VT 9117 to go to the PROGRAM mode

<\*, <#>Keys - cause the dialling mode on base to be changed accordingly

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

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

<MEM> - selection stored, puts VT 9117 to the STANDBY mode (*happy tone*)

<REDIAL>, <PROG> Keys - these keys are locked out

**Ringling** - causes the VT 9117 to go to the PROGRAM/RINGING mode

<PAGE> - returns the phone to the PROGRAM mode

**On Cradle** - puts the VT 9117 in the STANDBY mode (*sad tone*)

**Off Cradle** - invalid condition

**30s Keypad Timeout** - puts the VT 9117 in the PAGE mode (*sad tone*)

**60s Page Timeout** - returns the VT 9117 to the PROGRAM mode

When in the ringer type PROGRAM/PAGE sub-mode:

<PHONE> - causes the VT 9117 to go to the PHONE mode (*sad tone*)

<CHAN> - this key is locked out

<OFF> - causes the VT 9117 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

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

<MEM> - selection stored, puts VT 9117 in the STANDBY mode (*happy tone*)

<REDIAL>, <PROG> Keys - these keys are locked out

**Ringling** - causes the VT 9117 to go to the PROGRAM/RINGING mode

<PAGE> - returns the phone to the PROGRAM mode

**On Cradle** - puts the VT 9117 in the STANDBY mode (*sad tone*)

**Off Cradle** - invalid condition

**30s Keypad Timeout** - puts the VT 9117 in the PAGE mode (*sad tone*)

**60s Page Timeout** - returns the VT 9117 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 the 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 the PROGRAM mode and enters the PHONE mode.

When in the main PROGRAM/RINGING mode:

- <PHONE> - causes the VT 9117 to go to the PHONE mode (*sad tone*)
- <CHAN> - this key is locked out
- <OFF> - causes the VT 9117 to go to the RINGING mode (*sad tone*)
- Number Keys - goes to the speed dial PROGRAM/RINGING sub-mode
- <\*> Keys - puts the VT 9117 in the tone/pulse select PROGRAM/RINGING sub-mode
- <#> Keys - puts the VT 9117 in the ringer type PROGRAM/RINGING sub-mode
- VOL Keys - these keys are locked out
- <REDIAL>, <MEM>, <PROG> Keys - these keys are locked out
- Ring - causes the VT 9117 to remain in the PROGRAM/RINGING mode
- <PAGE> - this key is locked out
- On Cradle - causes the VT 9117 to go to the RINGING mode (*sad tone*)
- Off Cradle - invalid condition
- 30s Keypad Timeout - puts the VT 9117 in the RINGING mode (*sad tone*)
- 5s Ringing Timeout - returns the VT 9117 to the PROGRAM mode

When in the speed dial PROGRAM/RINGING sub-mode:

- <PHONE> - causes the VT 9117 to go to the PHONE mode (*sad tone*)
- <CHAN> - this key is locked out
- <OFF> - causes the VT 9117 to go to the RINGING mode (*sad tone*)
- DTMF Keys - enter the number to be stored
- VOL Keys - these keys are locked out
- <REDIAL> - access contents of redial buffer (if pressed first, otherwise locked out)
- <MEM> - number stored, puts VT 9117 in RINGING mode (*happy tone*)
- <PROG> - this key is locked out
- Ring - causes the VT 9117 to remain in the PROGRAM/RINGING mode
- <PAGE> - this key is locked out
- On Cradle - puts the VT 9117 in the RINGING mode (*sad tone*)
- Off Cradle - invalid condition
- 30s Keypad Timeout - puts the VT 9117 in the RINGING mode (*sad tone*)
- 5s Ringing Timeout - returns the VT 9117 to the PROGRAM mode

When in the tone/pulse select PROGRAM/RINGING sub-mode:

- <PHONE> - causes the VT 9117 to go to the PHONE mode (*sad tone*)
- <CHAN> - this key is locked out
- <OFF> - causes the VT 9117 to go to the RINGING mode (*sad tone*)
- <\*>, <#> Keys - cause the dialling mode on base to be changed accordingly
- Number Keys - these keys are locked out
- VOL Keys - these keys are locked out
- <MEM> - selection stored, return VT 9117 to the STANDBY mode (*happy tone*)
- <REDIAL>, <PROG> Keys - these keys are locked out
- Ring - causes the VT 9117 to remain in the PROGRAM/RINGING mode
- <PAGE> - this key is locked out
- On Cradle - puts the VT 9117 in the RINGING mode (*sad tone*)
- Off Cradle - invalid condition
- 30s Keypad Timeout - puts the VT 9117 in the RINGING mode (*sad tone*)
- 5s Ringing Timeout - returns the VT 9117 to the PROGRAM mode

When in the ringer type PROGRAM/RINGING sub-mode:

- <PHONE> - causes the VT 9117 to go to the PHONE mode (*sad tone*)
- <CHAN> - this key is locked out
- <OFF> - causes the VT 9117 to go to the RINGING mode (*sad tone*)
- <1>, <2>, <3>, <4>, <5>, <0> Keys - cause the ringer type to be changed accordingly

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- <6>, <7>, <8>, <9>, <\*>, <#> Keys - these keys are locked out
- VOL Keys - these keys are locked out
- <MEM> - selection stored, return VT 9117 to the STANDBY mode (*happy tone*)
- <REDIAL>, <PROG> Keys - these keys are locked out
- Ringling - causes the VT 9117 to remain in the PROGRAM/RINGING mode
- <PAGE> - this key is locked out
- On Cradle - puts the VT 9117 in the RINGING mode (*sad tone*)
- Off Cradle - invalid condition
- 30s Keypad Timeout - puts the VT 9117 in the RINGING mode (*sad tone*)
- 5s Ringing Timeout - returns the VT 9117 to the PROGRAM mode

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## 4. RF Link Operation

The radio frequency (RF) link is a full-duplex communication path between the VT 9117 base and the handset units. It is used to transfer both audio (voice) and data between the base and handset units. There are a total of 30 RF channels available for communication. Only one channel may be selected as the active channel at any instant, though there are provisions to select to a different active channel when there are perceived interference on the current channel.

### 4.1. RF Link Data

Data transmitted over the RF link are generally operational commands from the base to handset and vice-versa. When the VT 9117 is in the PHONE or PHONE/PAGE mode, both audio and data will be transmitted over the RF link. To minimise any perceptible impact on audio quality when data is interspersed within the voice transmission, receiver audio at the handset will be muted within twenty (20) ms of start of data transfer. Furthermore, normal data transfers will be limited to no more than 150 ms in duration. There will be no periodic muting during audio speech.

When the VT 9117 is in the STANDBY mode, the base and handset will listen for data transmission from the other relating to the initiation of the PHONE, RINGER, PROGRAM or PAGE mode. If the handset is away from the cradle, the handset will be in battery-conservation mode of operation, in which the on-board electronics is essentially "asleep" but will wake up periodically to check for incoming data transmitted from the base. The handset will detect commands sent from the base within 1.4 second (so the first ring may be missed).

### 4.2. Security Code

All data communication over the RF link will include a security code as required by FCC Part 15. When a data packet is received over the RF link, the security code contained in the packet will be verified before any data is processed. This prevents the handset from receiving commands from another base unit and vice-versa.

The handset and base units will use an identical, 16-bit security code. The security code is stored in the non-volatile memory in the base and handset unit and factory defaulted in production. During production, all units will be passed through a test jig in pair. The test jig will test some parameters of the unit pair and write the security code into the memory once all test parameters passed. The test jig will count on the security code (Totally 65536 – 16bit buffer and reset after the buffer full) and write to the unit pair.

### 4.3. RF Channel Selection

In order for the handset and base unit to communicate over the RF link, the selection of the active channel must be synchronised between the two units. An active channel is initially selected during the VT 9117 initialisation process. If the RF link subsequently degrades during operation, recovery involves the selection of a new communication channel that can be manually (user) initiated.

#### 4.3.1. Background Channel Scanning

Background channel scanning is the only automatic channel selection performed on the VT 9117. Background channel scanning occurs only when the handset is resting in the base unit cradle.

After the handset had been placed on the base and channel resynchronised, handset will enter the wake and sleep mode. The clearance of the current channel will be monitored on handset every time when it wakes up. There will have a counter to check the current channel clearance. The counter will increase by one if the channel is not clear and reset to zero once clear condition detected. If the accumulated value on the counter reach 64 (means the channel are continuously occupied for around 80s), handset will scan 10 channels from the current channel by ascending order and select the most clearance channel. Once the most clear channel selected, handset will communicate with Base on the last channel and change to the new selected channel after few times of communication - 'handshake'. After successfully data transfer, base and handset will store the new channel into

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the memory as the last channel usage. If all 10 channels are occupied or clear (same RSSI), the last scanned channel will be selected and handset will try to communicate with base on this channel. However, if handset find it could not communicate with base on this channel, the last used channel will be maintained. Then, handset will enter wake and sleep cycle, reset the counter and perform the same scanning cycle on the new channels repeatedly.

During background channel scanning:

- Handset Key-presses** - invalid condition (handset in cradle)
- Ringling** - puts VT 9117 in the RINGING mode (last channel)
- <Page>** - this key is locked out (handset in cradle)
- On Cradle** - invalid condition (handset in cradle)
- Off Cradle** - puts VT 9117 in the STANDBY mode (last channel)

### 4.3.2. Manual Channel Selection

Manual channel change is available only when the VT 9117 is in the PHONE or PHONE/PAGE mode. Manual channel selection can be initiated by the user when <CHAN> key is pressed on the handset.

After pressing the <CHAN> key on the handset, Handset will scan 10 channels from the current channel by ascending order and select the most clearance channel. Then, Handset will communicate with Base on the last channel and change to the new selected channel after few times of 'handshake'. Then, they will store this new channel into the memory as the last channel usage and communicate on this new channel. If all 10 channels are occupied or clear (same RSSI), the last scanned channel will be selected and handset will try to communicate with base on this channel. However, if handset find it could not communicate with base on this channel, the last used channel will be maintained.

### 4.3.3. Channel Resynchronization

If the active channel between the base and handset becomes out of synchronisation so that further communications between the two units cannot be established, replacing the handset onto the base unit cradle will re-synchronise the channel. Handset will transmit the last channel information to the base every time it is placed on base cradle. Base will start to monitor the planned 30 channel when cradle-detect signal is detected. Once base find the handset signal on one of the 30 channels, base will communicate with handset on that channel and store this channel as the last channel usage. At that point, VT 9117 will resume operation in the STANDBY mode.

If handset place in cradle and charged from non-operational battery voltage, base will search the handset continuously. Until handset is charged up to an operational battery voltage, handset will try to communicate with the base. If handset cannot find the base, it will try again after one min. until synchronise with the base unit.

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## 5. Power Management

The VT 9117 is powered by a battery pack in the handset and by AC power in the base unit.

### 5.1. Battery

The handset of the VT 9117 operates from a three-cell, 400 mAh battery pack which is rechargeable. When fully charged, the battery will provide a minimum of four and half (4.5) hours of operation in the PHONE mode or six (6) days of operation in the STANDBY mode before requiring recharge. The battery pack will recharge automatically whenever the handset is placed in the cradle of the base unit. In addition, the battery pack can also be recharged via a compatible remote charger.

### 5.2. Low Battery Indication

The VT 9117 will provide both audible and visual warning when low battery condition in the handset detected. During the PHONE mode, the PHONE LED will be on steady. When the VT 9117 determines that the handset battery is running low, the PHONE LED will change to flash. The LED is on for 64 ms and then off for 2.95 seconds during each cycle. In addition, a beep will sound for a pattern (72ms on, 32ms off and 72ms on) when the PHONE LED is on. When the VT 9117 is in the STANDBY mode and low battery is detected, the PHONE LED will flash in a similar pattern.

If the user presses the <PHONE> key when the handset battery is low (but not completely drained), the VT 9117 will still go into the PHONE mode. In this case, a beep will sound for a pattern to alert the user and there will be no visual indication at the handset to signify the VT 9117 in the PHONE mode. Instead of steady illumination, the PHONE LED will continue to flash in the pattern that indicates a low battery condition.

### 5.3. Power Interruption

Either the handset or base unit may occasionally suffer from power interruption during operation. The handset power supply may be interrupted if the battery is physically removed from the compartment. Alternatively, the handset battery may be completely drained of its charges. In the base unit, the power supply is interrupted when AC power is available.

In either case, the VT 9117 provides the capability to recover from the power interruption. Operation in the PHONE mode will be maintained through a brief power interruption (up to 125 ms in duration) to the base unit. Also, handset will try to communicate with base after power up reset by power interruption through the last channel stored in the memory. If the base still on-line, handset can re-establish the communication link with base.

### 5.4. Charging

When the handset put on the cradle for charging, base will start up a 5s timer and monitor the receiving data pin for 500ms simultaneous and there will have two situations:

1) Base can receive the command from handset during the 500ms period.

The command will contain the information of the battery condition. If the information show that the battery condition is 'high', base will stop the 5s timer and use the normal charging current to charge the battery. If the information show that the battery condition is 'low', base will continue the timer and turn on the quick charge circuit after the 5s timer expired. Battery will charge by a high current for 90min. and back to normal charging current after the 90min. timer expired.

2) Base cannot receive the command from handset and 500ms expired.

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Base will try and start channel resynchronisation. If channel resynchronisation success, base will check the data from handset if low battery information is 'high' or 'low'. If the data show the battery condition is low, 5s timer will not be stopped and charge the battery by high current after 5s timer expired. High charging current will remain 90min. and back to normal charging current after the 90min. timer expired. If the data show the battery condition is high, base will check if the 5s timer had expired or not. If the timer still in counting, base will stop the counter and back to normal charging. However, if the 5s timer expired, base will not stop the high charging current until the 90min. timer expired.

If base cannot resynchronise with handset (e.g. battery voltage is too low and handset MCU cannot work) and cannot receive the command form handset, base will turn on the quick charge circuit after the 5s timer expired. The high charging current will remain 90min. and back to normal charging current after the 90min. timer expired.

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## 6. Data Requirements

Base and Handset unit in the VT 9117 will provide non-volatile memory for storing data and configuration information. The former is defined by the user and will be written (or re-written) into the on-board EEPROM during normal operation. The latter is pre-set during production and will not be changed during operation.

Data that will be stored in the EEPROM include:

- speed-dial numbers (10 numbers, up to 16 digits each)
- last channel information
- tone/pulse selection

When the user-defined data is changed during the PROGRAM mode, the data is immediately stored into the handset EEPROM.

Configuration information that will be stored in the EEPROM include:

- Security code
- flash time (100, 270 and 650 ms)

## 7. Electrical Specifications

### 7.1. Operating Conditions

Parameter	Min	Typ	Max	Units
Operating Temperature Range	0	25 <sup>1</sup>	50	°C
Chassis Surface Temperature <sup>2</sup>			40	°C
AC Adaptor Temperature <sup>2</sup>			45	°C
Base Unit Operating Voltage (AC Voltage, 60Hz)	99	117 <sup>1</sup>	135	Vrms
Base Unit Operating Voltage (AC Adapter Output)		9 <sup>1</sup>		Vdc
Handset Operating Voltage <sup>3</sup>	3.0	3.6 <sup>1</sup>	4.2	Vdc

- Notes:
1. Typical value represents the nominal testing value
  2. Ambient temperature = 25°C
  3. Handset operates from a 3-cell NiCd battery

### 7.2. 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>		84		mA
Base Unit Current - Talk Mode <sup>1,2</sup>		103		mA
Handset Current - Sleep Sub-mode <sup>4</sup>		1		mA
Handset Current - Wake Sub-mode		59		mA
Handset Current - Talk Mode		87		mA
Handset Charging Current (normal charge)	35	40	55	mA
Handset Charging Current (compensation charge)	85	95	105	mA
Low Battery Detection Threshold (HS)	3.3			Vdc
MCU Shutdown Threshold (HS)	2.8			Vdc
Handset Standby Time	6			Days
Handset Continuous Talk Time	4.5			Hours

- Notes:
1. DC current from 9 V power supply
  2. Cradle and spare battery charge currents = 0 mA
  3. Average current per cycle (not MCU current consumption)

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### 7.3. 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).

Parameter	Min	Typ	Max	Units
Transmit Objective Loudness Rating (TOLR) @ 0 kft <sup>1</sup>	-40	-46	-53	dB
Receive Objective Loudness Rating (ROLR) @ 0 kft <sup>1</sup>	51	46	41	dB
Sidetone Objective Loudness Rating (SOLR) @ 0 kft <sup>2</sup>	0	7	14	dB
Receive Volume Adjustment Range	12			dB
Transmit Direction Acoustic Overload (into microphone) <sup>3</sup>	103			dBspl
Receive Direction Acoustic Overload (from receiver) <sup>3</sup>	103			dBspl
Transmit Direction Noise <sup>4</sup>			20	dBmC
Receive Direction (Handset Background) Noise <sup>1,4</sup>			40	dB(A)
Peak Acoustic Pressure <sup>5</sup>			130	dBspl

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

### 7.4. 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).

Parameter	Min	Typ	Max	Units
DTMF Frequency Tolerance	-1.5		+1.5	%
DTMF Low Group Tone Level <sup>1</sup>	-7.0	-6.0	-4.5	dBm
DTMF High Group Tone Level <sup>1</sup>	-5.0	-4.0	-2.5	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
Hook Switch Flash Duration <sup>2</sup>		650		ms
Ring Detection Frequency <sup>3,4</sup>	15		68	Hz
Ring Response Voltage <sup>4</sup>	40			Vrms
Ring No-Response Voltage <sup>5</sup>			25	Vrms

- Notes:
1. Measured across a 900  $\Omega$  terminating impedance
  2. Value can be changed via EEPROM setting (650 ms is default for North America)
  3. The ringer must ring with signals within this range
  4. Measured with a frequency of 20 Hz
  5. The ringer must not ring with signals within this range

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**7.5. 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).

Parameter	Min	Typ	Max	Units
Number of RF Duplex Channels <sup>1</sup>		30		-
Duplex Frequency	18.25		17.95	MHz
RF Channel Spacing		525		kHz
RF Bandwidth <sup>2</sup>		110		kHz
IF Frequency		10.70		MHz
Base Unit Transmission Frequency	902.30		906.65	MHz
Handset Transmission Frequency	923.10		927.75	MHz
Transmitter Frequency Error (over temperature range)	-10		+10	kHz
Handset Transmit Power	-6		-2	dBm
Base Unit Transmit Power	-6		-2	dBm
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	45	50	55	kHz
Handset FSK Peak Deviation - Data	45	50	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 - 12 dB SINAD <sup>9</sup>	-110	-112		dBm
Receiver Sensitivity - 25 dB SINAD <sup>9</sup>		-108		dBm
Receiver Sensitivity - 100% Data Reception	-95	-97		dBm
Adjacent Channel Rejection (at 300 kHz offset) <sup>10</sup>	60	65		dB
Image Rejection <sup>10</sup>	60	65		dB
Clear Channel Detection Level	-100			dBm
Intermodulation <sup>10,11</sup>	55	60		dB
Co-channel Rejection	-10	-6		dB

## Notes:

1. A duplex channel includes one base-to-handset link and one handset-to-base link
2. 3 dB bandwidth of IF filter
3. Acoustic test tone: 1 kHz tone, 97 dBspl at artificial mouth output
4. Audio test tone: 1 kHz tone, -5 dBV open circuit voltage from 900  $\Omega$  source
5. Overload level corresponds to acoustic overload of 105 dBspl (transmit and receive)
6. RF test signal: 1 kHz audio signal FM modulated onto an RF carrier with  $\pm 25$  kHz deviation
7. Acoustic level into artificial ear tested at normal (low) volume level
8. Measured at telephone line interface across 900  $\Omega$  termination
9. Measured through a CCITT audio weighting filter
10. RF level of desired signal set to provide 25 dB SINAD (CCITT); rejection is relative level of interference signal above desired signal to reduce SINAD to 20 dB (CCITT)
11. Interfering carriers injected at  $\pm 600$  kHz and  $\pm 1200$  kHz offset from the desired signal.

**7.6. Frequency Allocation Tables**

The RF channels for the VT 9117 are allocated in fixed pairs as indicated in the tables below. The duplex frequency is maintained at 22.75 MHz for 19 of the 30 channels and 17.95 MHz for the remaining 11 channels.

**7.6.1. Base Unit Frequencies**

Channel #	Transmit Frequency	Receive Frequency	Rx LO Frequency
1	902.3 MHz	925.05 MHz	935.75 MHz
2	903.35 MHz	926.1 MHz	936.8 MHz
3	904.4 MHz	927.15 MHz	937.85 MHz
4	905.45 MHz	928.2 MHz	938.9 MHz
5	906.5 MHz	929.25 MHz	940 MHz
6	903.05 MHz	925.8 MHz	936.5 MHz
7	904.1 MHz	926.85 MHz	937.55 MHz
8	905.15 MHz	927.9 MHz	938.6 MHz
9	906.2 MHz	928.95 MHz	939.65 MHz
10	902.75 MHz	925.5 MHz	936.2 MHz
11	903.8 MHz	926.55 MHz	937.25 MHz
12	904.85 MHz	927.6 MHz	938.3 MHz
13	905.9 MHz	928.65 MHz	939.35 MHz
14	902.45 MHz	925.2 MHz	935.9 MHz
15	903.5 MHz	926.25 MHz	936.95 MHz
16	904.55 MHz	927.3 MHz	938 MHz
17	905.6 MHz	928.35 MHz	939.05 MHz
18	906.65 MHz	929.4 MHz	940.1 MHz
19	903.2 MHz	925.95 MHz	936.65 MHz
20	904.25 MHz	927 MHz	937.7 MHz
21	905.3 MHz	928.05 MHz	938.75 MHz
22	906.35 MHz	929.1 MHz	939.8 MHz
23	902.9 MHz	925.65 MHz	936.35 MHz
24	903.95 MHz	926.7 MHz	937.4 MHz
25	905 MHz	927.75 MHz	938.45 MHz
26	906.05 MHz	928.8 MHz	939.5 MHz
27	902.6 MHz	925.35 MHz	936.05 MHz
28	903.65 MHz	926.4 MHz	937.1 MHz
29	904.7 MHz	927.45 MHz	938.15 MHz
30	905.75 MHz	928.5 MHz	939.2 MHz

**7.6.2. Handset Frequencies**

Channel #	Transmit Frequency	Receive Frequency	Rx LO Frequency
1	925.05 MHz	902.3 MHz	891.6 MHz
2	926.1 MHz	903.35 MHz	892.65 MHz
3	927.15 MHz	904.4 MHz	893.7 MHz
4	923.4 MHz	905.45 MHz	894.75 MHz
5	924.45 MHz	906.5 MHz	895.8 MHz
6	925.8 MHz	903.05 MHz	892.35 MHz
7	926.85 MHz	904.1 MHz	893.4 MHz
8	923.1 MHz	905.15 MHz	894.45 MHz
9	924.15 MHz	906.2 MHz	895.5 MHz
10	925.5 MHz	902.75 MHz	892.05 MHz
11	926.55 MHz	903.8 MHz	893.1 MHz
12	927.6 MHz	904.85 MHz	894.15 MHz
13	923.85 MHz	905.9 MHz	895.2 MHz
14	925.2 MHz	902.45 MHz	891.75 MHz
15	926.25 MHz	903.5 MHz	892.8 MHz
16	927.3 MHz	904.55 MHz	893.85 MHz
17	923.55 MHz	905.6 MHz	894.9 MHz
18	924.6 MHz	906.65 MHz	895.95 MHz
19	925.95 MHz	903.2 MHz	892.5 MHz
20	927 MHz	904.25 MHz	893.55 MHz
21	923.25 MHz	905.3 MHz	894.6 MHz
22	924.3 MHz	906.35 MHz	895.65 MHz
23	925.65 MHz	902.9 MHz	892.2 MHz
24	926.7 MHz	903.95 MHz	893.25 MHz
25	927.75 MHz	905 MHz	894.3 MHz
26	924 MHz	906.05 MHz	895.35 MHz
27	925.35 MHz	902.6 MHz	891.9 MHz
28	926.4 MHz	903.65 MHz	892.95 MHz
29	927.45 MHz	904.7 MHz	894 MHz
30	923.7 MHz	905.75 MHz	895.05 MHz



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**7.7. Safety Specifications**

Parameter	Min	Typ	Max	Units
HI POT current <sup>1</sup>			5	mA

Notes: 1. Current drawn when 1 kV is applied simplex on tip and ring for 60 s.

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## 8. Water proof specifications

VT 9117 ADL MK4 is designed to be water proof for the handset unit (excludes the headset) & base cradle. But the following discussing does not cover the below conditions and/or portions:

- When the handset is using with the headset connected or the headjack cover is not properly installed.
- When the handset battery door is not properly installed.
- After more than 6 times of drop test.
- In base unit, only the charge cradle is designed to be water proof, other portion is not included, such as: power jack, telephone jack, page key, LEDs, base bottom,...

### 8.1. Water proof standards

The international standard IEC 68-2-18 PART 2: " Tests – Test R and guidance: Water" will be adopted as the standard in design stage and products test.

This test is structured into three groups:

- Ra: "Falling drops" which in principle are tests with artificial rain.
- Rb: "Impacting water" where high intensity dropfields or water jets impinge upon the test specimen with a certain force and the dropfields may assume any angle towards the test specimen.
- Rc: "Immersion" where the test specimen is immersed in water to specified depths or equivalent pressures.

For the Ra test, the function of the unit is guaranteed, that means:

During transportation, storage or in service, this unit may be exposed to vertical falling drops, for example, natural rain, seepage or condensation, the unit will function normally within 60 minutes.

For the Rb test, the unit can merely survive from the impacting water condition, that means:

During transportation, storage or in service, this unit may be subjected to impacting water, such as water from cloud-bursts, heavy driving rain, sprinkler systems, spray from wheels, sluicing or breaking seas. The unit can survive from the above conditions, and after dry up, the function will recover.

For Rc test, the unit will not complied with.

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