



**CDMA2000 1xRTT
IP Radio Access Network (IP-RAN)**

**OneRAN Pilot Station
Installation & Maintenance Manual**

Version # 1.6

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Revision History

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Revision Numbering Key

0.x	Work in Progress
1.0	Initial Document Approval
1.x	Revisions Following Initial Document Approval
2.0	Revisions Approval

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1 INTRODUCTION

1.1 Proprietary Information Notice

THIS DOCUMENT IS THE PROPERTY OF AIRWALK COMMUNICATIONS, INC. THE RECIPIENT MAY USE IT ONLY FOR THE PURPOSE FOR WHICH IT WAS TRANSMITTED AND WILL BE RETURNED UPON REQUEST OR WHEN NO LONGER NEEDED BY RECIPIENT. IT MAY NOT BE COPIED OR COMMUNICATED WITHOUT THE WRITTEN CONSENT OF AIRWALK COMMUNICATIONS, INC.

1.2 Purpose of Document

The purpose of this document is to define the Installation, Maintenance and Safety Compliance of AirWalk Communication's, Inc. unique CDMA Radio Access Network (RAN) system. The AirWalk RAN is a market ready, standards compliant, high channel capacity, cost effective, modular and expandable wireless radio access network system. Designed specifically for CDMA2000 networks, the Base Station Transceiver (BTS) and Base Station Controller (BSC) are integrated into a single compact platform.

The target market and applications are corporations, corporate campuses, enterprises, university campuses, large industrial plants, stadiums, airports, shopping malls, blind spots, hot spots, rural areas, neighborhoods, and highways.

1.3 Scope

The scope of this document covers the description, environmental specifications, equipment location, cabling, system installation and maintenance of the AirWalk RAN. The information contained in this manual was previously included in the combined Installation & Maintenance Manual for the MiniCell and Pilot Beacon products.

1.4 Order of Precedence

This System Installation Manual will take precedence over any previous AirWalk System Installation Manual or Document.

1.5 Terminology

See the section entitled: Appendix A - Acronyms

1.6 Applicable Documents

The following documents are applicable to the extent specified in this System Installation Manual.

1.6.1 AirWalk Documents

- IP- Base Station (BS) System Description.
- IP- Base Station (BS) CPIB Block Diagram.
- IP- Base Station (BS) GPSR Block Diagram.
- IP- Base Station (BS) PCPM Block Diagram.
- IP- Base Station (BS) XCVB Block Diagram.

1.6.2 Telecom Standards

- (1) TIA/EIA/IS-2000 Series Revision: C - Introduction to CDMA2000 Spread Spectrum Systems, 05/00/02
- (2) Personal Station – Base Station Compatibility Requirements for 1.8 to 2.0 GHz CDMA PCS.
- (3) TIA/EIA-664 - Wireless Features Description, 12/00/00
- (4) TIA/EIA Interim Standard 95 Revision A - Mobile Station –Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular Systems, May 1995
- (5) TIA/EIA-95-B - Mobile Station-Base Station Compatibility Standard for Dual-Mode Spread Spectrum Systems, October 31, 1998
- (6) MSC to BS Interface Inter-Operability Specification (IOS) IOS-4.2
- (7) IMT-2000 Specification, (indoor wireless propagation)

1.6.3 Other Documents

None Identified

2 OneRAN Pilot Station Safety and Compliance Information

2.1 Statement of Intent

The AirWalk OneRAN Pilot Station is intended for use in a CDMA cellular infrastructure radio access network. The responsible body shall be made aware that, if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

2.2 Safety Precautions



1) Power Sources

Use only power sources that are within the specified limits as designated on the equipment labels. Use of power sources outside the specified limits is hazardous and may cause personal injury or property damage.

2) Equipment Location

Equipment should be located indoors or in a suitable protected environment such as an equipment enclosure. Use of unprotected equipment outdoors is hazardous and may cause personal injury or property damage.

3) Grounding and Electrical Connections

Electrical connections including equipment grounding should be made in accordance with the National Electric Code and any local regulations. Improper electrical connections are hazardous and may cause personal injury or property damage. Consult a licensed electrical installer if in doubt.

4) Hazardous Voltages

Equipment may contain hazardous voltages. Only qualified service personnel should open the equipment for adjustments, repairs or replacements.

5) Replacement Parts

Damaged parts and protective devices such as fuses should only be replaced by components approved or recommended by AirWalk Communications. Replacement fuses must be of the same rating and type as the original for continued protection.

2.3 Maintenance Information

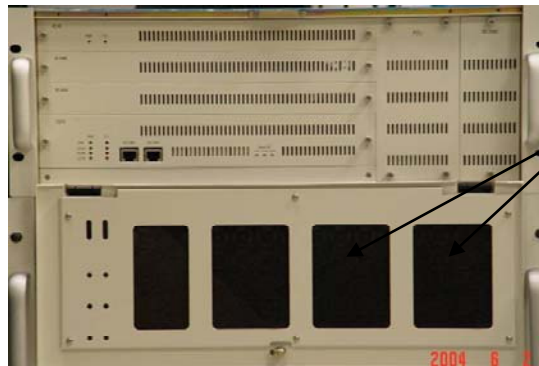
2.3.1 Cleaning

The AirWalk OneRAN Pilot Station units are protected by a high performance paint which does not require normal maintenance. If paintwork is soiled, it can be cleaned using a damp cloth after AC power has been disconnected. Do not use liquids or spray cleaning substances on the unit since property damage or personal injury may result.

2.3.2 Filter Maintenance

The OneRAN Pilot Station Unit is equipped with a washable air filter located in a front mounted drop down door.

This filter should be checked annually for dirt build-up and cleaned if required. Note more frequent inspections may be needed in dusty environments.



Air Filter Located In
Drop Down Front Door

2.3.3 Fuse Replacement

The OneRAN Pilot Station contains a 250 V 5A fuse located behind the AC connector cap as shown in the diagram. Replace the fuse with the same type and ratings.



2.3.4 Other Maintenance

Any other required maintenance must be performed by suitable trained service personnel. Do not open covers or attempt to repair unit if not suitably trained.

2.4 Labeling

2.4.1 Grounding

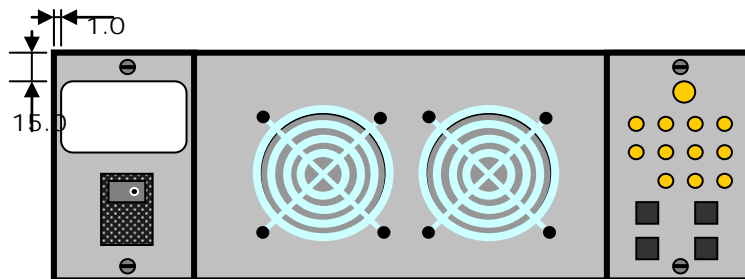
Proper grounding is recommended to ensure good RF performance in addition to personnel safety. Antenna systems should also be suitably grounded for good RF performance.

Grounding connection points on the chassis are identified by this symbol:



2.4.2 Label: Model Identification, FCC Identification, Power

The following diagram illustrates the location of the FCC label that will be applied to the OneRAN Pilot Station unit to provide model identification, FCC identification and rated power supply information.



2.5 Regulatory Compliance Information

The FCC regulatory compliance information provided in this section is applicable only to models equipped with an FCC identification number (FCC ID).

2.5.1 Radio Interference (FCC 15.19 Statement)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.5.2 Unauthorized Modifications (FCC 15.21 Statement)

Persons or parties responsible for operation of this equipment are cautioned that any changes or modifications not expressly approved by AirWalk Communications Incorporated could void the user's authority to operate this equipment.

2.5.3 Digital Device Interference (FCC 15.105 Statement)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

2.5.4 RF Power Requirements

The antenna(s) used for this transmitter must be fixed-mounted on outdoor permanent structures.

For systems built with additional RF amplification, power reduction is required at the band edges to comply with FCC limits.

For the 4W RCPB the maximum RF power must not exceed the following:

Channel	Maximum Power
1013 – 1014	0.109 Watts
1015 – 775	4 Watts
776 – 777	0.726 Watts

For the 20W Slim RU the maximum RF power must not exceed the following:

Channel	Maximum Power
1013 – 1015	0.140 Watts
1016 – 773	20 Watts
774 – 777	0.500 Watts

3 OneRAN Pilot Station System Introduction

3.1 Hardware Configuration

The IP-BS is a unique modular and stackable combination BSC and BTS platform that is differentiated from other systems. Other systems have separate BTS and BSC platforms which add to cost and complexity. The AirWalk OneRAN Pilot Station has a structure that combines and arranges the BSC interface with one the BTS in a single package.

The main components are:

- CDPB (Common Digital Processing Board), consisting of:
 - CPIB (Channel Processor and IF Interface Board) PB Only
 - PCPM (Primary Call Processor Module)
 - GPSR (Global Positioning System Receiver)
- XCVB-SP (RF Transceiver Board) Transmit Only configuration
- PSA (Power Supply Assembly)
- RCPB (RF Power amplifier Board) 4 Watt CDMA Power Amplifier

3.1.1 Physical Description

- AirWalk OneRAN Pilot Station
 - Dimension: Max. 482mm[19"](W) x 457mm[18"](D) x 178mm[7"](H)
 - 19" EIA Rack x 4 Rack Units
 - Weight: 15 kg [33 lbs]

3.1.2 Typical Configurations

The following shows typical component configurations for common applications. Refer to the model charts for the contents of specific model numbers.

Omni Macrocell Pilot Station System (4W PPS)

- AirWalk OneRAN Pilot Station self contained unit

Omni Multi-Carrier Macrocell Pilot Beacon System (4W PPS, 3 carrier hopping)

- AirWalk OneRAN Pilot Station self contained unit with Multi-Carrier software option

3.1.3 Installation Photographs

The following photographs show typical field installations for the AirWalk OneRAN Pilot Station systems:



Figure 3-2 – Typical OneRAN Pilot Station System



Figure 3-3 – Typical OneRAN Pilot Station Rack Mounted

3.2 Block Diagram – OneRAN Pilot Station

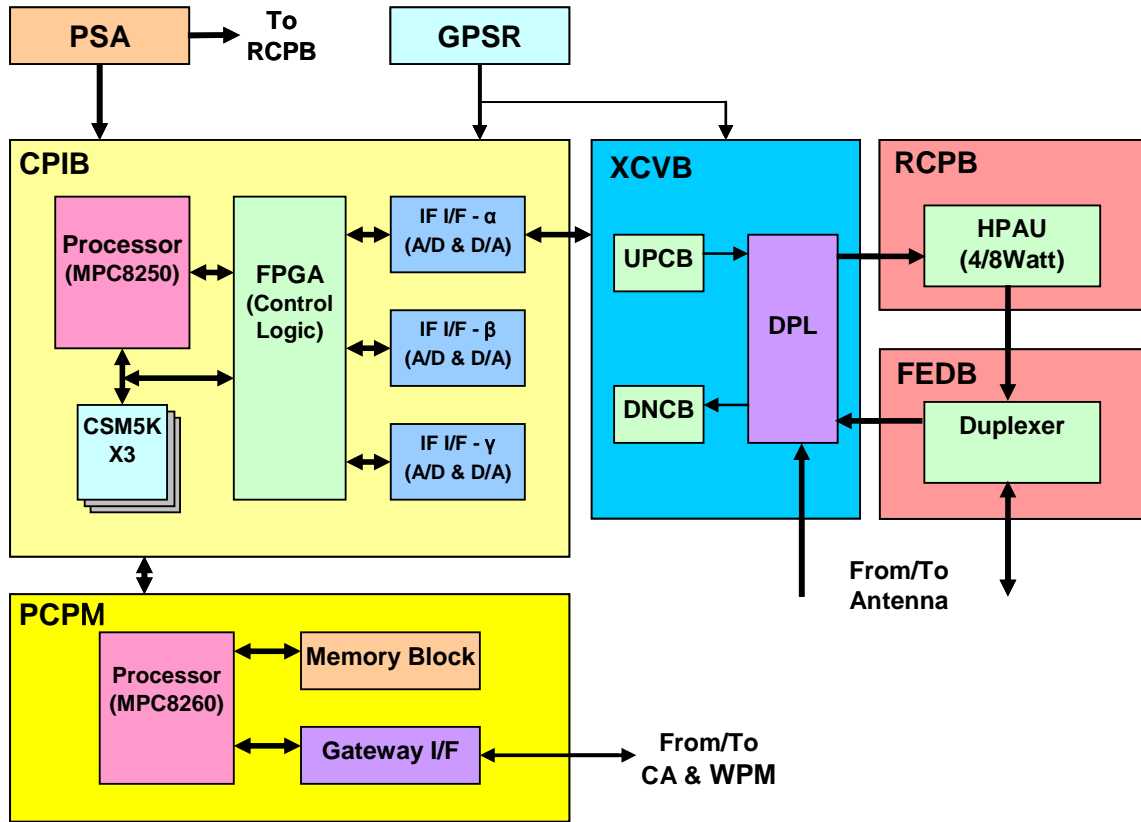


Figure 3-6 AirWalk OneRAN Pilot Station Hardware Structure

OneRAN Pilot Station Notes:

- FEDB not provided on all models
- OneRAN Pilot Station may not be equipped with diversity receiver
- OneRAN Pilot Station may not be equipped with 3 CSM-5000 or receiver A/D & IF

3.3 System Capacities and Specifications

3.3.1 OneRAN Pilot Station Technical Specification

Item	Capacity and Specification	Remarks
Frequency Band	Up-Link: 1850 ~ 1910 MHz Down-Link: 1930 ~ 1990 MHz	North American PCS Band
	Up-Link: 824 ~ 849 MHz Down-Link: 869 ~ 894 MHz	800 MHz Cellular Band
FA	1FA/Omni	Each Pilot Station Unit
Handoff	3FA Hopping Pilot Beacon	
GPS	Softer H/O, soft H/O. Hard H/O	One per Pilot Station
Installation	External GPS Antenna	4 Rack Units
Cooling	Rack Mountable	Front To Rear Flow
IP-Network Interface	Forced Air	
Transmitter output power	10/100 Base-T Ethernet	Includes duplexer
RF Interface	4W Internal RU system	CDMA 2000 1xRTT
Common Air Interface (CAI)	Antenna A (Tx/RxA) Antenna B (RxB)	
Channel bandwidth	J-STD-008/IS-95-A/IS-95B /CDMA2000-1x 1.25MHz	
Mechanical Specification		
RF Input and Output Connector	SMA Female (Input/Output)	From/To Antenna System
AC Power Connector	IEC	
Ethernet Signal Port Connectors	RJ-45	
Dimensions (WxHxD)	482mm(W) x 457mm(D) x 178mm(H) 19"(W) x 18"(D) x 7"(H)	4 Rack Units
Weight	15 kg [33 lbs]	

Table 3-1 – AirWalk OneRAN Pilot Station Specifications

3.3.2 IP-BS Power Supply & Environment Technical Specification

Input Power Supply	
Input Voltage:	AC 100Volts ~ 250Volts
Input Frequency:	50Hz ~ 60Hz
Dissipated Power	
Main Unit:	350 Watt Max (Efficiency 75%)
Environment Specification	
Operating Temperature	0° ~ +50°
Storage Temperature	-30° ~ +60°
Relative Humidity	5% ~ 95% - Non-condensing
Noise	Less than 60dBA, distance 1.5m
Airborne Particle	0 ~ 90 µg/m³

Table 3-3 - Power Supply & Environment Specifications

4 OneRAN Pilot Station Components

4.1 OneRAN Pilot Station



Figure 4-1 OneRAN Pilot Station Photo (Front View)

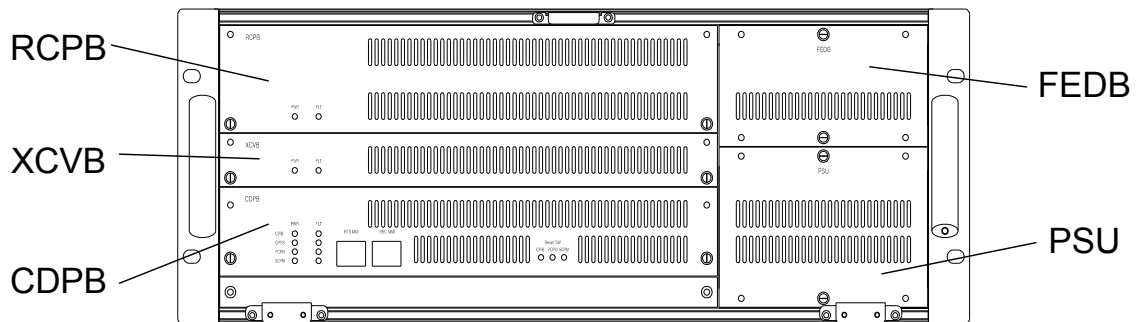


Figure 4-2 OneRAN Pilot Station Line Diagram (Front View)

FEDB: not used with OneRAN Pilot Station



Figure 4-3 OneRAN Pilot Station Photo (Back View)

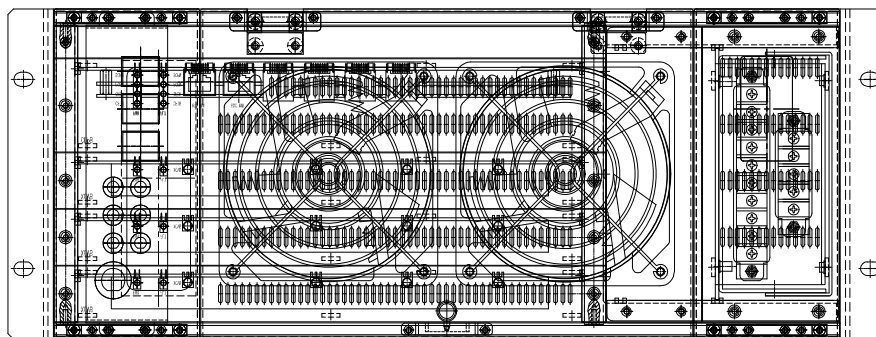


Figure 4-4 OneRAN Pilot Station – Line Diagram (Back View)

4.2 RF Power amplifier Board (RCPB – 4 Watt)

RCPB (RF Power amplifier Board) is an integrated 4 Watt CDMA Power Amplifier. Integrated meaning that this unit is one of the modules installed into the OneRAN chassis. This unit is provided for use in the mini macro cell and Pilot Station systems with medium sized geographic coverage areas.

The RCPB contains a High Power RF amplifier to increase the downlink signal strength from the RF Transceiver Board (XCVB) to the broadcast antenna. The RCPB is used predominately in an omni cell site configuration.

4.3 Component LED Configuration

CDPB: LED status indicators are provided on the OneRAN Pilot Station CDPB module. LED functions are described in the following pictures and tables.

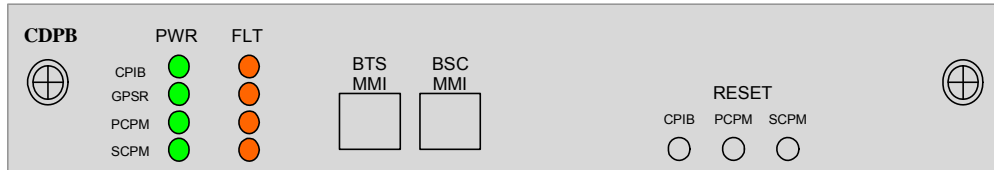


Figure 4-9 CDPB Panel Diagram



Figure 4-10 - CDPB Panel Photo

	Name	Color	On	Off	Note
1	CPIX	Green	Normal	Abnormal	CPIX power on/off indicator
2	GPSR	Green	Normal	Abnormal	GPSR power on/off indicator
3	PCPM	Green	Normal	Abnormal	PCPM power on/off indicator
4	SCPM	Green	Normal	Abnormal	SCPM power on/off indicator
5	CPIX	Orange	Abnormal	Normal	Check function of CPU in CPIX Board and ALARM
6	GPSR	Orange	Abnormal	Normal	GPSR alarm on/off indicator
7	PCPM	Orange	Abnormal	Normal	Check function of CPU in PCPM Board and ALARM
8	SCPM	Orange	Abnormal	Normal	Check function of CPU in SCPM Board and ALARM

Table 4-1 – CDPB Indicator Codes

NOTE: OneRAN Pilot Station units are NOT normally equipped with an SCPM (Secondary Call Processor Module), therefore these indicators are not used in most system applications.

XCVB: The XCVB module is equipped with 2 indicators. LED functions are described in the following pictures and tables.



Figure 4-11 - XCVB Panel Diagram



Figure 4-12 XCVB Panel Photo

	Name	Color	On	Off	Note
1	PWR	Green	Normal	Abnormal	XCVB power on/off indicator
2	FLT	Orange	Abnormal	Normal	XCVB alarm on/off indicator

Table 4-2 - XCVB Indicator Code Key

RCPB: The RCPB module is equipped with 2 indicators. LED functions are described in the following pictures and tables.



Figure 4-13 - RCPB Panel Diagram



Figure 4-14 RCPB Panel Photo

	Name	Color	On	Off	Note
1	PWR	Green	Normal	Abnormal	RCPB power on/off indicator
2	ACT/FLT	Green	Normal	(power off)	RCPB alarms are clear
2	ACT/FLT	Orange	Abnormal	(power off)	RCPB alarm/fault

Table 4-3 - RCPB Indicator Code Key

5 OneRAN Pilot Station Interface Cabling

5.1 RF Cabling

The OneRAN Pilot Station Antenna port is connected to the external antenna system as shown in Figure 6.2 (cables not included). External connector is SMA type.

The OneRAN Pilot Station is not equipped with any receivers, therefore there is no duplexer requirement for normal operation. Note the main antenna port may be marked Txα on some enclosures.

Antenna systems must include suitable protection against lightning and other hazards in accordance with conventional cell site installation practices.

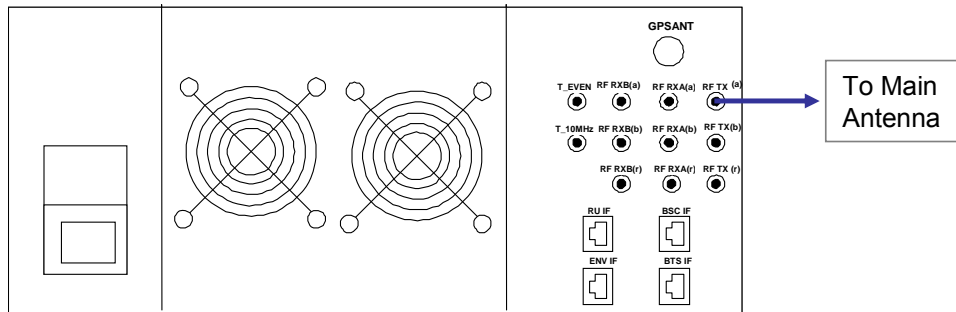


Figure 6-2 RF Cabling Diagram

5.2 Ethernet/Serial Cable Wiring

Connect the external Ethernet connections (cable not supplied) from the local Ethernet switch or hub at the cell site to the BTS and BSC Ethernet ports on the OneRAN Pilot Station as shown in Figure 6.3. Use category 5 Ethernet cable (or better) for best performance.

5.3 Electric Power Cable Wiring

Connect OneRAN Pilot Station to suitable AC power sources as shown in Figure 6-3. Use only the AC power cables provided with the unit to ensure continued safe operation.

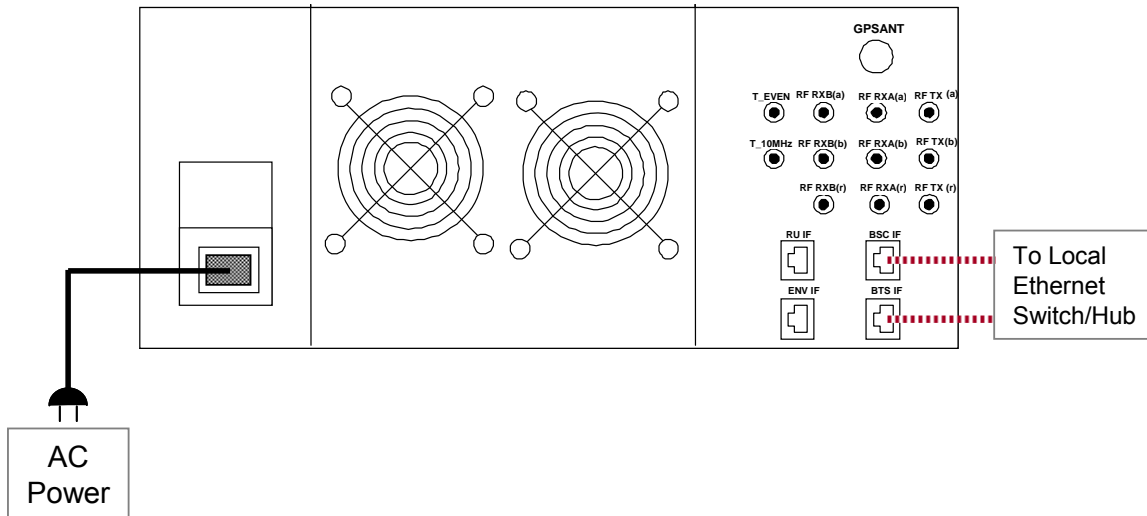


Figure 6-3 OneRAN Pilot Station Power & Ethernet Cabling

6 OneRAN Pilot Station Frequency Setting Procedures

6.1 BSM Management

The OneRAN Pilot Station base stations are normally managed by the centrally located BSM (Base Station Manager) system which communicates with the unit over an IP connection.

The BSM will download system software and configuration information which includes the physical FA (Frequency Assignment) for each base station. The base station will tune to the correct frequency as defined by the BSM configuration files.

Refer to the BSM operations manual for instructions on base station remote configuration.

6.2 Local FA Setting

It may be required to set the OneRAN Pilot Station physical FA (frequency assignment) locally for specialized test purposes or when the BSM connection is unavailable (for example during early BTS installations). This can be done using the local MMI (Man Machine Interface) port and a local PC.

The configuration data downloaded from the BSM will override local settings when BSM connections are established.

Refer to the MMI instruction manual for further information on other commands.

6.2.1 MMI Connection

Connect the serial port of the PC to the “BTS MMI” port on the OneRAN Pilot Station front panel. Use the cable described in section 7.3.1 and the following port settings:

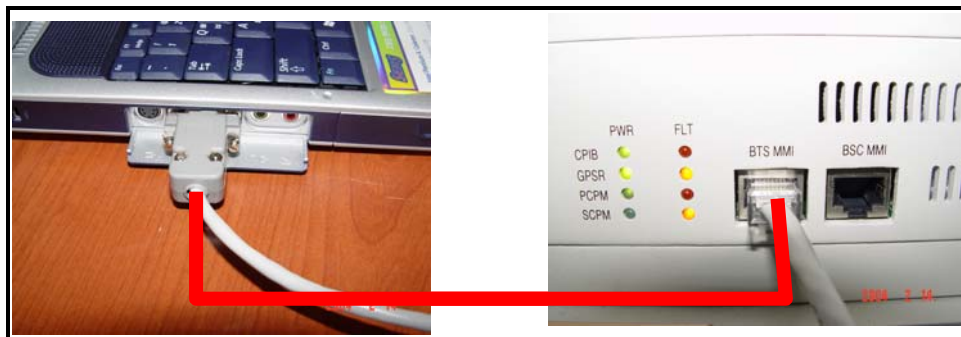
115200 baud

8 bit

No Parity

1 stop bit

No flow control



6.2.2 FA Change Procedure

The following menu driven commands will permit local change of the FA.

Step 1

At the prompt enter the following:

```
> pn3383 // this will take you to the menu screen which looks something like this:
```

```
===== PN 3383 =====
```

1. Tx Test
2. Rx Test
3. ParameterSetup
4. Rf Gain Display
5. xcvbSetup
6. ampSetup
7. Normal Gain Display
8. MakeTestCall
9. callClear
10. Overhead Calibration Control
11. Test Phone Setup (619 2221001)
12. Handoff Test
0. Exit

```
-----  
Select Number ===>
```

Step 2

Enter the following:

```
Select number => 5 // it will take you to the below menu screen.
```

```
===== Xcvb Setup =====
```

1. Change Ch
2. Tx On
3. Tx Off
4. Rx_Main_AGC ON
5. Rx_Main_AGC OFF

- 6. Rx_Sub_AGC ON
- 7. Rx_Sub_AGC OFF
- 8. Set RxMain ATT
- 9. Set RxSub ATT
- 10. Set Tx Att
- 11. Xcvb Status
- 12. showXcvrAttGain
- 0. Exit

Select Input Number =====>

Step 3

Enter the following:

Select Input Number => 1 // choosing 1 will take you to the below menu.

ALPHA : xcvrChangeCh Num [001 ~ 1500] [1175] [/0:Exit]==>

Step 4

From the above menu, type the new channel desired (CDMA channels from 1 to 1500) and 0 to exit. Note that for 3 sector base stations Step 3 must be repeated for each sector (alpha, beta, and gamma).

Note that only standard CDMA channel numbers within the designated band capability of the radio will be accepted by the base station.

7 OneRAN Pilot Station Installation Procedures

This Section gives definitions and instructions for installing the OneRAN Pilot Station and for connecting it to the wireless carrier's infrastructure. It contains detailed definitions needed for completing site Installation Checklist (Appendix B).

7.1 Installation Verification

Before installing the equipment, it is necessary to verify the following:

7.1.1 Verify Customer Contact & Equipment location

7.1.1.1 Contact Customer¹

- 1) Verify contact name check Site Preparation Planning Checklist Appendix B.
- 2) Verify contact phone number.
- 3) Introduce yourself to the Customer contact.
- 4) Introduce Installation team (if more than one person on team).
- 5) Verify that all current customer contacts are listed.
 - a) Verify that contacts can solve problems within a timely manner for:
 - i) Power Connection(s),
 - ii) T1 Connection(s),
 - iii) LAN Connection(s),
 - iv) If not, have main customer contact provide names and method of contacting.
- 6) Determine when contacts are available for help (e.g.; Time of day, day of week.).
- 7) Obtain any site access or security requirements (e.g.: ID Badges, Card-keys, Keys, Access codes) required to access installation site.
- 8) Indicate all changes on checklist.

7.1.1.2 Locate OneRAN Pilot Station Equipment.²

- 1) Determine where OneRAN Pilot Station is stored.
- 2) Check for any visible shipment damage.

¹ NOTE: Make sure all changes are sent to the Installation Coordinator Immediately.

² NOTE: If any visible damage contact the Installation Coordinator immediately.

7.1.1.3 Locate and verify floor space.

- 1) Determine where the OneRAN Pilot Station is to be installed (Refer to site diagram in Appendix B).
- 2) Verify that there is enough space to safely install it (Refer to site diagram in Appendix B).

7.1.2 Uncrate and arrange for packing material disposal

- 1) Carefully unpack the OneRAN Pilot Station and related components from packing material.
- 2) Check for any shipment damage.³
- 3) Be certain that all components match system order.⁴
- 4) Make arrangements with customer contact on where, when, and how to dispose of all OneRAN Pilot Station packing material.

7.1.3 Verify location of all Facility distribution points (main and intermediate)

7.1.3.1 Power Check

7.1.3.1.1 Power Location

- 1) Locate the customer provided power connection.
 - a) There should be a –48VDC connection for DC powered models (if required).
 - b) There should be a 120 or 240 VAC connection for AC powered models (if required).

7.1.3.1.2 Verify Connector.

- 1) An 8 AWG three wire stranded cable to connect to a WECO DC terminal block connector is required for –48VDC (if required).
- 2) A 6ft (1.84m) e conductor type SJT cables with standard grounded connector is required for 110VAC connection (if required).

7.1.3.1.3 Voltage

³ **NOTE: Note any damage on shipping report, and Installation Checklist. Contact the Installation Coordinator immediately**

⁴ **NOTE: If components do not match the system order, contact the Coordinator immediately.**

- 1) Using a power meter check for correct voltage.
 - a) -48VDC range is 40VDC to 57VDC (if required).
 - b) 120 VAC range is 90 VAC to 132 VAC (if required).
 - c) 240 VAC range is 180 VAC to 264 VAC (if required).

7.1.3.1.4 Amps

- 1) Check cables to determine if they will handle required Amps.
 - a) -48VDC should be able to support 27.9 Amps.
 - b) 120 VAC should support 15 Amps, 240 VAC should support 7.5 Amps

7.1.3.1.5 LAN Facilities check.

- 1) Location – Locate the customer provided LAN connections.
- 2) Verify IP Address (Site Prep Checklist Appendix B).
- 3) Verify Connector is an RJ45 (if not contact customer).
- 4) Connect Laptop and Ping IP Address.
- 5) Prepare a site IP addressable device diagram showing the IP address for each device at the base station site. This diagram is essential for any needed troubleshooting activities.
- 6) Post the diagram at the site and return a copy to the customer's maintenance center and a copy to the AirWalk customer service center:

AirWalk Customer Service Centre
1830 North Greenville Ave.,
Richardson, Texas 75081

7.2 OneRAN Pilot Station Install Procedures

7.2.1 Install OneRAN Pilot Station Cabinet

Move OneRAN Pilot Station to location.

Secure OneRAN Pilot Station in designated location
(Bolt down or Secure Wheels if provided).

7.2.2 External System Connections⁵

To install new internal connections refer to the Section and Figures in the following Table for proper cable installation.

Section	Description	Reference	✓
6.1	External Diversity Antenna System	Figure 6-2	
6.2	Electrical Power Cable	Figure 6-3 Use AC power cables supplied with unit.	
6.3	External BSC & BTS Ethernet Cable	Figure 6-4	
6.4	External GPS Antenna Cable	Figure 6-5	

Table 7-1 - External System Cable Reference

7.2.3 Connect Power to Cabinet

Connect -48VDC to DC distribution panel (if applicable).

Connect 120VAC or 240VAC to Rack AC distribution panel (if applicable).

7.2.4 Connect Communications Facilities

Connect LAN Facilities to BSC

Connect LAN Facilities to BTS.

7.2.5 Power-up procedure^{6,7}

7.2.5.1 Power-up Main cabinet

Make sure all appropriate LED's are illuminated.

7.2.5.2 Complete any Configuration options.

- a) Configure the OneRAN Pilot Station.
- i) Outgoing and incoming channels.

⁵ **WARNING: Make sure all system power supplies are turned off. All breakers/Fuses are pulled on all main and intermediate panels. Then proceed with the Installation.**

⁶ Note: Once all connections are made, make sure to: Reset/install all breakers/fuses for all main and intermediate breaker/fuse box(s). Then proceed with the Installation.

⁷ Make sure all added cabling is tie-wrapped correctly

7.3 System Test

This section contains the system tests that should be completed to determine if the OneRAN Pilot Station is operational.

7.3.1 PC to OneRAN Pilot Station cable

A special cable is required to run the required certification tests.

Connect a PC with the subject cable to run tests

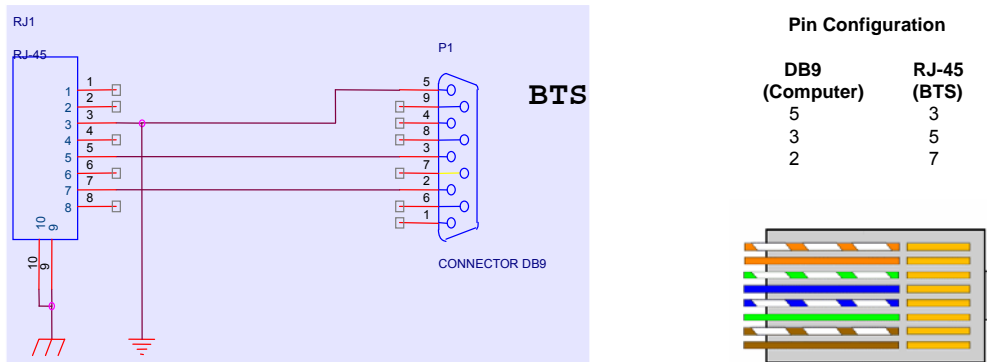


Figure 7-1 - PC to OneRAN Pilot Station Cable Specification



Figure 7-2 - PC to OneRAN Pilot Station Cable Connection Diagram

7.3.2 System Certification Tests

Start The OneRAN Pilot Station tests.

This sequence of test cases is designed to certify the OneRAN Pilot Station installation.

It is assumed the person running this checklist is familiar with the basics of configuring, running, stopping, and starting the OneRAN Pilot Station.

7.3.2.1 Test Case #1 - Image/PLD loading

7.3.2.1.1 Test Procedure #1

- Command: user: ipbs001
FTP password: ipbs001
- Command: Edit:
- P: display
- C: edit

7.3.2.1.2 Expected Result of Case #1

Screen from PC using ftp Server is shown in Figure 7-3.

```

boot device      : motfcc
unit number     : 0
processor number : 0
host name       : CPIB30a
file name       : c:/IPBS/aw_bts      ← image file name in PC
                                   (PLD : c:/IPBS/pld/bs001/file_name)
inet on ethernet (e) : 211.104.114.5:0xfffff000 ← bts IP addr./netmask
host inet (h)      : 10.0.0.12        ← PC IP addr.
gateway inet (g)   : 211.104.114.1
user (u)          : ipbs
ftp password (pw) : ipbs
flags (f)         : 0x0
target name (tn)  : cpib
other (o)         : 1                ← BTS/BSC ID
    
```

Figure 7-3 - Screen from PC Screen from WPM

```

boot device      : motfcc
unit number     : 0
processor number : 0
host name       : CPIB30a
file name       : aw_bts           ← image file name
                                   (PLD : automatic loading)
inet on ethernet (e) : 211.104.114.5:0xfffff00
                                   ← bts IP addr./netmask
host inet (h)    : 211.219.56.125 ← WPM IP addr.
gateway inet (g) : 211.104.114.1
user (u)        : ipbs
ftp password (pw) : ipbs
flags (f)       : 0x0
target name (tn) : cpib
other (o)       : 1               ← BTS/BSC ID
    
```

Figure 7-4 - Screen from PC

7.3.2.2 Test Case #2 – System Check

7.3.2.2.1 Test Procedure #2

- Command: Version

7.3.2.2.2 Expected Result of Case #2

```

-> version
VxWorks (for AirWalk8260 – XPC8260 PowerQUICC II) version 5.4.
Kernel: WIND version 2.5.
Made on Feb 10 2004, 20:07:03.
Boot line:
motfcc(0,0)CPIB30a:aw_bts e=211.104.114.5:0xfffff00
h=211.219.56.125 g=211.104.114.1 u=ipbs pw=ipbs tn=cpib o=1
value = 124 = 0x7c = ']'
    
```

Figure 7-5 - Version Command Screen

7.3.2.3 Test Case #3 – Tx check

7.3.2.3.1 Test Procedure #3

- Command: txReason
- Expected Result of Case #3

```

-> txReason

      [ TX REASON ]
=====
ALPHA : PICH OK SYCH OK PCH OK ACH OK RF OK
BETA  : PICH OK SYCH OK PCH OK ACH OK RF OK
GAMMA : PICH OK SYCH OK PCH OK ACH OK RF OK
      BSC OK
-----
ALPHA SUBCELL ..... OK
BETA  SUBCELL ..... OK
GAMMA SUBCELL .....OK
=====
value = 68 = 0x44 = 'D'
    
```

Figure 7-6 - Tx Check Screen

7.3.2.4 Test Case #4 – Output power

7.3.2.4.1 Test Procedure #4 – RF Check

- Command: showRfGain

7.3.2.4.2 Expected Result of Case #4

```

-> showRfGain

===== RF Gain Display =====
SectorGain | XCVR Gain | HPA Gain[20W]
-----
Alpha | 768(0x300) | -22dBm[0.60mW] | 32.4dBm[1.74W]
Beta  | 768(0x300) | -22dBm[0.60mW] | 32.4dBm[1.74W]
Gamma| 768(0x300) | -22dBm[0.60mW] | 32.8dBm[1.91W]
-----
value = 58 = 0x3a = ':'
    
```

Figure 7-7 - RF Check Screen

7.3.2.5 Test Case #5 – GPS Check

7.3.2.5.1 Test Procedure #5

- Command: gpsStatus

7.3.2.5.2 Expected Result of Case #5


```

-> gpsStatus
-----
GPS STATUS..... 0x2
-----
0x00 : Reserved
0x01 : Unavailable
0x02 : Available
0x04 : OCXO Warmup
0x08 : Not used
0x10 : LeapSec positive pending
0x20 : LeapSec negative pending
    
```

Figure 7-8 – GPS Status Check Screen

```

GPS ALARM..... 0x4
-----
0x01 : Antenna Power Abnormal
0x02 : HoldOver
0x04 : HoldOver Range Over
0x08 : GPS Engine Abnormal
0x10 : 10MHz Generation Abnormal
0x20 : 19.6608MHz Generation Abnormal
0x40 : Antenna Alarm
0x80 : Reserved
    
```

Figure 7-9 - GPS Alarm Check Screen

7.3.2.6 Test Case #6 – BTS Alarm Check

7.3.2.6.1 Test Procedure #6

- Command: showAlarm

7.3.2.6.2 Expected Result of Case #6

```

-> showAlarm
-----
Current Alarm Status
-----
Num Name          BS  Sec Status Time
70 BTS_COLD_START_NTF 1 255 clear THU JAN 01 00:00:00 1970
1  BTS_AMP_LINK       1 255 clear THU JAN 01 00:08:42 1970
31 BTS_FANFAIL_A      1 255 clear THU JAN 01 00:08:52 1970
41 BTS_GPS_ANT_FAIL_ALM 1 255 HAPPE THU JAN 01 00:08:42 1970
43 BTS_GPS_RANGEOVER_ALM 1 255 HAPPE THU JAN 01 00:08:42 1970
    
```

Figure 7-10 - BTS Alarm Check Screen

7.3.2.7 Test Case #7 – System Reset

7.3.2.7.1 Test Procedure #7

- Command: btsReset/bscReset/allReset

7.3.2.7.2 Expected Result of Case #7

The system is RESET

7.3.2.8 Test Case #8 – PN Check

7.3.2.8.1 Test Procedure #8

- Command: RcmCmd 1,1

7.3.2.8.2 Expected Result of Case #8

```
-> RcmCmd 1,1

Sector [0]

btsId[1]
sectorId[0]
equipStatus[3]
sectorGain[768]
pilotPn[12]
pRev[6]
pMinRev[1]
timingAdv[192]
sectionAdv[42]
```

Figure 7-11 - PN Check Screen

7.3.2.9 Test Case #9 – System Interface Check

7.3.2.9.1 Test Procedure

- Command: Ping

Send Ping Command to the Following system IP Addresses

1. WPM (Wireless PBX Manager)
2. PDSN (Packet Data Serving Node)
3. CA (Call Agent)
4. MG (Media Gateway)
5. SG (Signal Gateway)

7.3.2.9.2 Expected Result of Case #X

A successful PING command response should be received from each system.

7.3.3 Operation Tests

These test cases are designed to determine if OneRAN Pilot Station is ready for production testing.

7.3.3.1 Test Case #1 – Voice Calls

7.3.3.1.1 Test Procedure

Test Call from MS #1 to MS #2.

Test Call from MS #1 to Landline Phone #1.

7.3.3.1.2 Excepted Result of Case #1

1. 2nd MS Rings and call is answered
2. Landline phone Rings and call is answered.

7.3.3.2 Test Case #2 – Data Calls

7.3.3.2.1 Test Procedure

1. A Test Data Call from MS #1 to MS #2.
2. A Test Data Call from MS #2 to MS #1.

7.3.3.2.2 Excepted Result of Case #2

1. A Data Session is established between MS #1 and MS #2.
2. A Data Session is established between MS #2 and MS #1.

7.3.4 Operator Specific Tests

These test cases are covered in a separate test plan document and are agreed to by the operator and AirWalk Communications, Inc.

7.4 Site Clean up and Customer Signoff

7.4.1 Dispose of all packing material.

Make sure to dispose of all OneRAN Pilot Station packing material.

7.4.2 Clean-up site

Make sure not to leave anything but the installed OneRAN Pilot Station. (e.g., excess tie-wraps, bolts, etc).

7.4.3 Update Installation Checklist.

Make sure all changes are notes on Installation Checklist.

7.4.4 Customer Signoff

Get Customer Signature on Certification Document Appendix D.

7.5 Required Tools and Supplies

- 1) Hand Tools
 - a) Screwdriver set,
 - b) Pliers set,
 - c) Nut Driver set,
 - d) Cutter set,
 - e) Punch Down Tool,
 - f) Wire-wrap (Optional),
 - g) RJ-45 Crimper.
- 2) Test Equipment.
 - a) Multi-Meter & Adapter kit,
 - b) Cable Tester,
 - c) Protocol Analyzer & Adapter kit,
 - d) Telephone Test Set (Butt-set),
 - e) Set of Banjo adapters
 - f) Tone Generator & Inductive pick-up.
- 3) Supplies.
 - a) RJ-45,
 - b) Cat 5 Cable,
 - c) Tie-wraps.

7.6 Troubleshooting Procedures

The OneRAN Pilot Station is designed to provide reliability and consistently high performance in all network environments. The installation procedure for the OneRAN Pilot Station is a straightforward and is discussed in these sections.

Should problems develop during installation, this section is intended to help locate, identify and correct these types of problems. Please follow the suggestions listed below prior to contacting AirWalk Communications, Inc. or Carrier contacts. If you are unsure of the procedures described in this section, contact the Installation coordinator immediately.

7.6.1 Before Calling for Assistance

- 1) If difficulty is encountered with a specific component of the OneRAN Pilot Station, refer back to the Installation Section for that component.

- 2) Check the cables and connectors to ensure that they have been properly connected and the cables/wires have not been crimped or impaired in some way during installation. (About 90% of component problems can be attributed to wiring and connector problems).
 - a) Check Cable,
 - b) Check connector,
 - c) Check for solid connection,
 - d) Check with Carrier contact.
- 3) Make sure that all power cord is properly attached to each OneRAN Pilot Station component. Be certain that all power cords are plugged into a functioning electrical outlet. Use the PWR LED's to verify each unit is receiving power.
 - a) Check intermediate breakers or fuses.
- 4) If the problem is isolated to something other than the OneRAN Pilot Station contact the appropriate Carrier contact person.
- 5) Verify whether or not the problem is corrected. If not, go to Step 6 below. If the problem is corrected, continue with installation.
- 6) If the problem continues after completing Step 4 above, contact the AirWalk Communications, Inc. Installation Project manager, to determine the next course of action.

7.6.2 When Calling for Assistance

Please be prepared to provide the following information.

- 1) A complete description of the problem, including the following points:
 - a) The nature and duration of the problem;
 - b) Situations when the problem occurs;
 - c) The components involved in the problem;
 - d) Any particular application that, when used, appears to create the problem;
- 2) A record of changes that have been made to the OneRAN Pilot Station configuration prior to the occurrence of the problem.
- 3) Any changes to system should all be noted.

8 Appendix A - Acronyms

Acronym	Description
2G	Second Generation in CDMA wireless network
3G	Third Generation in CDMA wireless network
AC	Alternating Current
Access Channel	A Reverse CDMA Channel used by mobile stations for communicating to the base station. The Access Channel is used for short signaling message exchanges, such as call originations, responses to pages and registrations. The Access Channel is a slotted random access channel.
ACH	Access Channel
AD	Analog to Digital
AFEU	Antenna Front End Unit
AGC	Automatic Gain Control
ANT	Antenna
AWGN	Additive White Gaussian Noise
Base Station (BS)	A fixed station used for communicating with mobile stations. Depending upon the context, the term base station may refer to a cell, a sector within a cell, an MSC, or other part of the wireless system.
BCCM	BTS Call Control Module
BHCA	Busy Hour Call Attempts
BLK	Blank
BS	Base Station
BSAP	Base Station Application Part
BSC	Base Station Controller
BSMAP	Base Station Management Application Part
BTS	Base station Transceiver Subsystem
CA	Call Agent
CAI	Common Air Interface
CC	Connection Confirm
CCM	Channel Control Module in BTS
CDMA	Code Division Multiple Access
CEC	Channel Elements Control Block
CED	Channel Elements Diagnostic Block
CLAP	Composite Link Analysis Platform
CPIB	BTS Channel and Call Processing Interface Board
CPU	Central Processing Unit
CR	Connection Request
CREF	Connection Refused
CSM5000	Cell Site Modulator 5000 (CDMA ASIC chip released by Qualcomm for cdma2000)
DA	Digital to Analog
DC	Direct Current
DCCH	Dedicated Control Channel
DCLI	Data Link Connection Identifier
DRS	Data Ready to Send
DT	Data Form
DTAP	Direct Transfer Application Part

Acronym	Description
EMI	Electro-Magnetic Interference
ESN	Electronic Serial Number
EVDO	Evolution Data Only
EVDV	Evolution Data and Voice
EVRC	Enhanced Variable Rate CODEC
FA	Frequency Assignment
FCC	Federal Communications Commission
F-CCH	Forward Common Control Channel
FCH	Fundamental Channel
F-DCCH	Forward Dedicated Control Channel
FDCH	Forward Dedicated Signaling Logical Channel
FER	Frame Error Rate
FM	Fault Management
FO	Frame Offset
Forward Traffic Channel	One or more code channels used to transport user and signaling traffic from the base station to the mobile station.
FSCH	Forward Common Signaling Logical Channel
GND	Ground
GPS	Global Positioning System
GRE	Generic Routing Encapsulation
HLR	Home Location Register
HO	Handoff
HPAU	High Power Amplifier Unit
IF	Intermediate Frequency
IMSI	International Mobile Subscriber Identity
ING	Inter Network Gateway
IOS	Interoperability System
IP	Internet Protocol
IPC	Inter Processor Communication
LAC	Link Access Control. Entity that provides assured mode or unassured mode delivery of information across the air interface between the mobile station and the base station.
LPA	Linear Power Amplifier
LTU	Logical Transmission Unit One or more Type 3 or Type 5 MuxPDUs with a 16bit CRC.
MAC	Medium Access Control Entity that controls the access to and from Upper Layer Signaling, Data Services and Voice Services to Physical Layer resources.
MAHHO	Mobile Assisted Hard Hand Off
MCC	Main Call Control module in IP-BSC
MG	Media Gateway
MIMO	Multi Input Multi Output
MIN	Mobile Identification Number
MMC	Man-Machine Command
MMS	Multimedia Messaging Service
MN	Mobile Node
MS	Mobile Station
MSC	Mobile Switching Center

Acronym	Description
MTBF	Mean Time between Failure
MTTR	Mean Time to Repair
NDSS	Network Directed System Selection
NGN	Next Generation Networks
NMS	Network Management System
OAM	Operation, Administration, and Maintenance
OCNS	Orthogonal channel Noise Simulator
OS	Operating System
OTD	Orthogonal Transmit Diversity
OUNS	Other User Noise Source
PACA	Priority Access Channel Assignment
Paging Channel	A code channel in a Forward CDMA Channel used for transmission of control information and pages from a base station to a mobile station
PBA	Printed Board Assembly
PBX	Private Branch Exchange
PCB	Printed Circuit Board
PCF	Packet Control Function in IP-BSC
PCH	Paging Channel
PCM	Pulse Code Modulation
PCPM	Primary BSC Call Processing Board
PDSN	Packet Data Serving Node
PDU	Protocol Data Unit. An atomic set of data, header information, and control information that are provided by a service user to a service provider.
PER	Packet Error Rate
Physical Channel	Radio transmission link
Pilot Channel	An un-modulated, direct-sequence spread spectrum signal transmitted by a CDMA base station or mobile station. A pilot channel provides a phase reference for coherent demodulation and may provide a means for signal strength comparisons between base stations for determining when to handoff.
PLD	Program Loaded Data
PN	Pseudo Noise
PSA	Power Supply Assembly
PSTN	Public Switched Telephone Network
QCELP	Qualcomm Code Excited Linear Prediction
QOF	Quasi-Orthogonal Function
QOF	Quasi Orthogonal Function
QoS	Quality of Service
RAN	Radio Access network
RC	Radio Configuration
RCC	Radio interface Call Control
RDCH	Reverse Dedicated Signaling Logical Channel
Reverse Traffic Channel	A traffic channel on which data and signaling are transmitted from a mobile station to a base station. The Reverse Traffic Channel is composed of up to one Reverse Dedicated Control Channel, up to one Reverse Fundamental Channel, zero to two Reverse Supplemental Channels, and zero to seven Reverse Supplemental Code Channels.
RF	Radio Frequency
RLC	Release Complete

Acronym	Description
RLP	Radio Link Protocol. Connection-oriented, negative-acknowledgement-based data delivery protocol.
RLSD	Released
RP	Radio Network – PDSN
RPSU	Remote RF Power Supply Unit
RRCU	Remote RF Control Unit
RRM	Radio Resource Management Block
RRP	Registration Reply Message
RRQ	Registration Request Message
RSCH	Reverse Common Signaling Logical Channel
RSSI	Received Signal Strength Indication
RTP	Real-Time Transport Protocol
RU	Remote RF Unit
RUpd	Registration Update Message
SAP	Service Access Point Conceptual point at the interface between two adjacent layers where services are provided to the upper layer and data and protocol information is exchanged between layers.
SAR	Segmentation and Reassembly
SCCH	Supplemental Code Channel
SCCP	Signaling Connection Control Protocol
SCH	Supplemental Channel
SDU	Selection and Distribution Unit
SEU	Sector Expansion Unit
SIGTRAN	Signaling Transport processing module in IP-BSC
Slotted Mode	An operation mode of the mobile station in which the mobile station monitors only selected slots on the Paging Channel
SMS	Short Message Service
SMV	Selectable Mode VOCODER
SRBP	Signaling Radio Burst Protocol. An entity that provides connectionless protocol for Signaling messages.
SRU	Sector Reduction Unit
SS	Soft Switch
STS	Space Time Spreading
Sync Channel	A code channel in the Forward CDMA Channel which transports the synchronization message to the mobile station
TCC	Traffic Channel Control Block
TCE	Traffic Channel Element
TCM	Traffic Control Module in BTS
TCP	Transmission Control Protocol
TOD	Time of Day
TP	Traffic processing and Path Control module in IP-BSC
TPTL	Transmit Power Tracking Loop
UART	Universal Asynchronous Receiver/Transmitter
UDP	User Datagram Protocol
VSWR	Voltage Standing Wave Ratio
XCV	Base Station Transceiver Control Block
XCVR	Transceiver Board

9 Appendix B - Site preparation checklist

OneRAN Pilot Station Site Preparation Check List for:	<i>{Customer Name}</i>
---	------------------------

ITEM #	Description	Site Prep Guide Section #	Date Complete	Complete	Information
1	Customer Contact & Equipment location	1			
	a. Main Contact Customer	1.1.1			
	b. Other Customer Contacts	1.1.2			
	1. Power contact	1.1.2			
	2. Communications Facilities Contact	1.1.2			
	3. LAN Facilities Contact	1.1.2			
	4. MSC Security Contact	1.1.2			
	c. Complete Customer Questions Appendix C	App. C			
2	AirWalk Series IP-RAN Site Requirements	2.1			
	a. Space requirements	2.1.1			
	b. AirWalk Series IP-RAN placement Diagram	2.1.2			
	c. Installation Location for AirWalk Series IP-RAN Equipment	2.1.2.1			
3	Complete Site Drawings Appendix B	App. B			
	Power requirements	2.1.3			

ITEM #	Description	Site Prep Guide Section #	Date Complete	Complete	Information
a.	Location				
b.	Voltage				
c.	Amps				
d.	Connector				
	Security	2.1.3			
a.	MSC Equipment Room security				
b.	MSC Equipment room access				
	Communications Facilities	2.1.3			
a.	Number of T1 circuits				
	Connector				
	Location				
	LAN Facilities	2.1.3			
a.	Location				
b.	Connector				
c.	Carrier Network IP Address				
d.	AirWalk Series IP-RAN Component IP Addresses				
	Other Information				
a.	Heat dissipation				
b.	Environmental specifications	2.1.4			

ITEM #	Description	Site Prep Guide Section #	Date Complete	Com plete	Information
c.	Ambient temperature and humidity	2.1.4.2			
d.	Dust density	2.1.4.4			
e.	Altitude	2.1.4.5			
f.	Air conditioning	2.1.4.6			
g.	Fire protection				

10 Appendix C - Installation Checklist

OneRAN Pilot Station Site Installation Check List for:	<i>{Customer Name}</i>	
Address	Installer Name (s)	Customer Contact (s)
<i>{OneRAN Pilot Station Installation Address}</i>		

ITEM #	Description	Install Manual Section	Date Complete	Time	Customer Contact Initials	Installer Initials
1	Verify Customer Contact & Equipment location	9.1.1				
2	Contact Customer	9.1.1.1				
3	Locate OneRAN Pilot Station Equipment	9.1.1.2				
4	Locate and verify Floor Space	9.1.1.3				
5	Uncrate and arrange for packing material disposal	9.1.2				
6	Verify location of all distribution points (main and intermediate)	9.1.3				
7	Power Check	9.1.3.1				
8	Power Location	9.1.3.1.1				
9	Verify Connector	9.1.3.1.2				
10	Voltage	9.1.3.1.3				
11	Amps	9.1.3.1.4				
12	LAN Facilities check	9.1.3.1.5				
13	Location	9.1.5.1.5				
14	Verify IP Address	9.1.3.1.5				
15	Verify Connector	9.1.3.1.5				
16	Ping IP Address	9.1.3.1.5				

ITEM #	Description	Install Manual Section	Date Complete	Time	Customer Contact Initials	Installer Initials
17	Prepare IP addressable device diagram	9.1.3.1.5				
18	Post IP diagram at: i) site; ii) customer; iii) Airwalk Customer Service	9.1.3.1.5				
19	Install OneRAN Pilot Station Cabinet	9.2.1				
20	Move OneRAN Pilot Station to location	9.2.1				
21	Secure OneRAN Pilot Station in designated location	9.2.1				
22	Verify all internal System connections	9.2.2				
23	External System Connections	9.2.3				
MAKE SURE ALL SYSTEM POWER SUPPLIES ARE TURNED OFF BEFORE PROCEEDING!!!						
24	Connect Power to Cabinet	9.2.4				
25	Connect -48VDC to DC distribution panel (If applicable)	9.2.4				
26	Connect 120-240 VAC to AC distribution panel (If applicable)	9.2.4				
27	Connect Communications Facilities	9.2.5				
28	Connect LAN Facilities to BSC	9.2.5				
29	Connect LAN Facilities to BTS	9.2.5				
30	Power-up procedure	9.2.6				
31	Power-up Main cabinet/rack power, check LEDs	9.2.6.1				
32	Complete any configuration options	9.2.6.2				
	System Certification Tests	9.3.2				
33	Test Case #1 - Image/PLD loading	9.3.2.1				
34	Test Case #2 – System Check	9.3.2.2				
35	Test Case #3 – Tx check	9.3.2.3				
36	Test Case #4 – Output power	9.3.2.4				
37	Test Case #5 – GPS Check	9.3.2.5				
38	Test Case #6 – BTS Alarm Check	9.3.2.6				
39	Test Case #7 – System Reset	9.3.2.7				
40	Test Case #8 – PN Check	9.3.2.8				

ITEM #	Description	Install Manual Section	Date Complete	Time	Customer Contact Initials	Installer Initials
41	Test Case #9 – System Interface Check	9.3.2.9				
	Operation Tests	9.3.3				
42	Test Case #1 – Voice Calls	9.3.3.1				
43	Test Case #2 – Data Calls	9.3.3.2				
44	Operator Specific Tests (If Required)	7.3.4				
	Site Clean Up & Documentation					
45	Dispose of all packing material	7.4.1				
46	Clean-up site	7.4.2				
47	Update Installation Checklist	7.4.3				
48	Get Customer Signature on Certification Document	7.4.4				

11 Appendix D - Customer Certification Document

Date

Subject:

The subject OneRAN Pilot Station has been certified to be up and running today.

AirWalk Communications, Inc. (Installation Team)

Date

Authorized Carrier Representative

Date

This Page Marks End of Document