Tranzeo
WiMAX

Pico Base Station and Subscriber Unit Quick Configuration Guide

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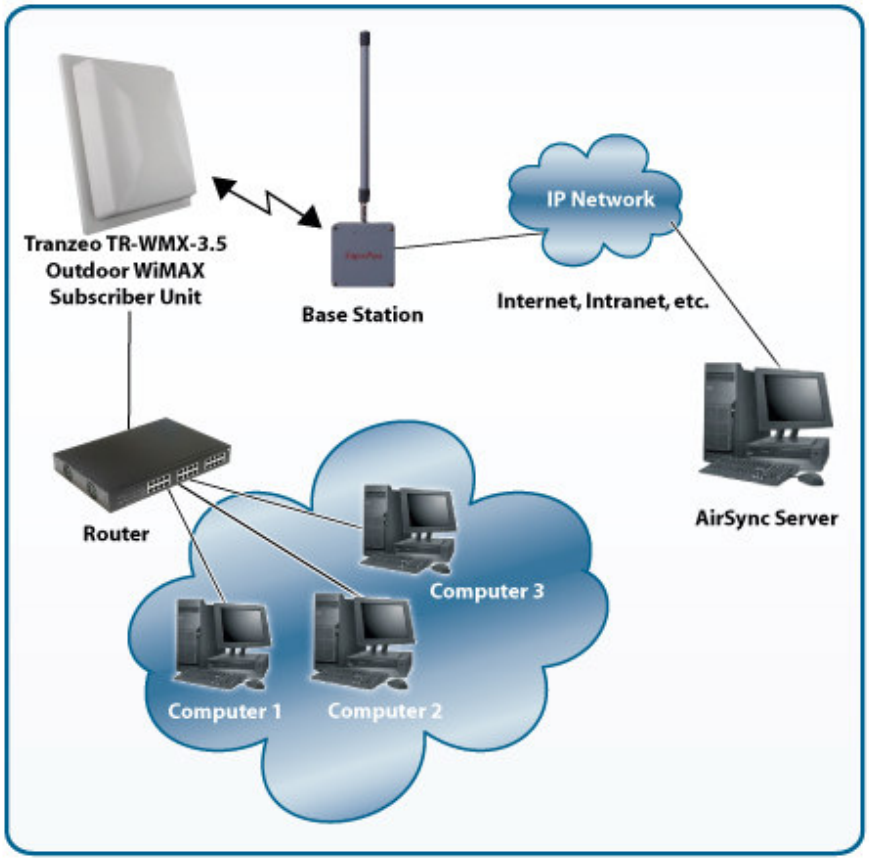
Preface

This guide provides all the information you need to configure the Tranzeo Pico Base Station (pBS) and TR-WMX WiMAX Subscriber Unit to enable end-to-end WiMAX connectivity using AirSync. If you prefer detailed instructions, please refer to the P*roximetry AirSync Practical User's Guide*.

The following figure shows an example of a configuration where the Subscriber Unit is connected to the uplink (WAN) interface on an Ethernet router, hub, or switch. In this configuration, the Subscriber Unit communicates wirelessly with a Base Station using its WiMAX interface, while communicating at 10/100 Mbps with the attached Ethernet device. The Subscriber Unit also receives its power from the Ethernet connection, eliminating the need to run a power cable to the Subscriber Unit. In this way, the Ethernet device serves as the bridge between the attached computers and the Subscriber Unit.

This device has been designed to operate with the antennas listed below, and having a maximum gain of 32 dBi. Antennas not included in this list or having a gain greater than 32 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.



This device has been designed to operate with the antennas listed below, and having a maximum gain of 32 dBi. Antennas not included in this list or having a gain greater than 32 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

Model Number	Included Antennas
TR-HTQ-5.8-12	Vertical Omni, 5.8 Ghz, 12 dBi
TR-58V-60-17	Vertical Sector, 5.8 Ghz, 60 degree, 17 dBi
TDJ-5800SPL9	Grid Antenna, 30 dBi
TR-5X-Ant-24	Panel, 5.8 Ghz, 24 dBi

Table 2 Supported Accessory antennas

Document Revision Level

Revision	Date	Description
Version 1.0.0	October 2008	Preliminary Release
Version 1.0.5	Dec. 2008	Updated, added compliance, 3.65GHz, & max RSSI

Document Conventions

This guide uses the following typographic conventions:

Convention	Description
Bold	Text on a window, other than the window title, including menus, menu options, buttons, and labels.
Italic	Variable.
`screen/code`	Text displayed or entered on screen or at the command prompt.
boldface screen font	Information you must enter is in boldface screen font.
< italic screen >	Variables appear in italic screen font between angle brackets.
[ ]	Default responses to system prompts are in square brackets.

This guide uses icons to draw your attention to certain information. Warnings are the most critical.

Icon	Meaning	Description
	Note	Notes call attention to important and/or additional information.
	Tip	Tips provide helpful information, guidelines, or suggestions for performing tasks more effectively.
	Caution	Cautions notify the user of adverse conditions and/or consequences (e.g., disruptive operations).
	WARNING	Warnings notify the user of severe conditions and/or consequences (e.g., destructive operations).

Quick Configuration

1.1 Configuration Checklist

The following checklist identifies the steps for configuring your WiMAX network. Please check each step as you complete it.

Step 1: Configure the Pico Base Station.

Step 2: Configure the Subscriber Unit.

Step 3: Configure the Subscriber Unit in AirConsole.

Step 4: Test the Subscriber Unit Connectivity.

Step 5: Monitor the Network.

1.2 Step 1: Configure the Pico Base Station

Before installing the Pico Base Station, use the following procedure to configure it.

To configure the Pico Base Station, your PC's IP address must be on the same subnet (192.168.0.xxx, where xxx is a number from 1 to 253) as the Pico Base Station, and the PC's netmask must be set to 255.255.255.0.

The Pico Base Station is configured with a default 192.168.0.254 IP address common to all Pico Base Stations. Therefore, do not simultaneously connect multiple un-configured Pico Base Stations to a common Local Area Network (LAN) and try to access them using the 192.168.0.254 IP address. Prior to installing AirSync the "Bridge IP Address" of the Pico Base Station must be changed from 192.168.0.254 to an alternate value that matches the IP schema of your network if multiple Pico Base Stations will be managed by a single AirSync installation.

1. Use an Ethernet cable to connect the Ethernet port labeled **PC** on the PoE adapter to a network-interface card (NIC) in a PC or network hub. Then connect the other Ethernet port on the PoE adapter to the Pico Base Station.

2. Launch a Web browser on a computer that is on the same subnet (192.168.0.*nnn*) as the Pico Base Station.
3. In the address bar, type **http://192.168.0.254** and click the **Go** button in your browser. The default username is **admin** and the default password is **default**. After you login, the Base Station Information Page appears.

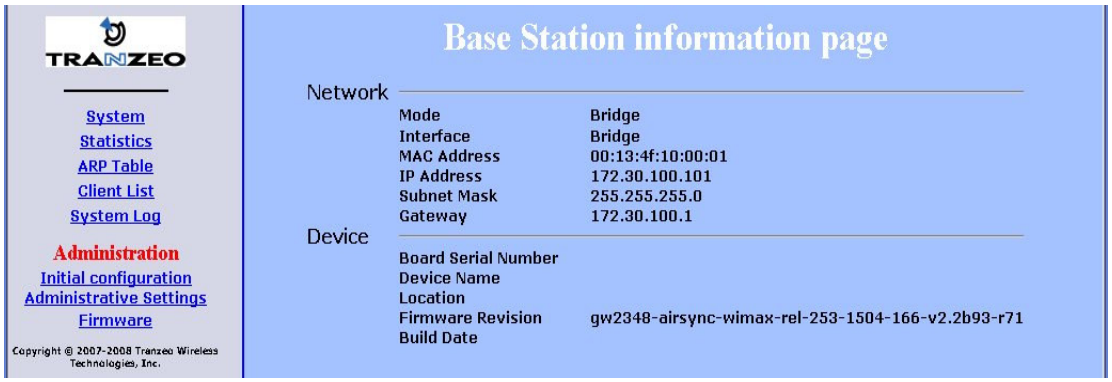


Figure 1. Base Station information page.

4. In the left pane, under **Administration**, click **Initial configuration**. The Initial Base Station Configuration page appears.

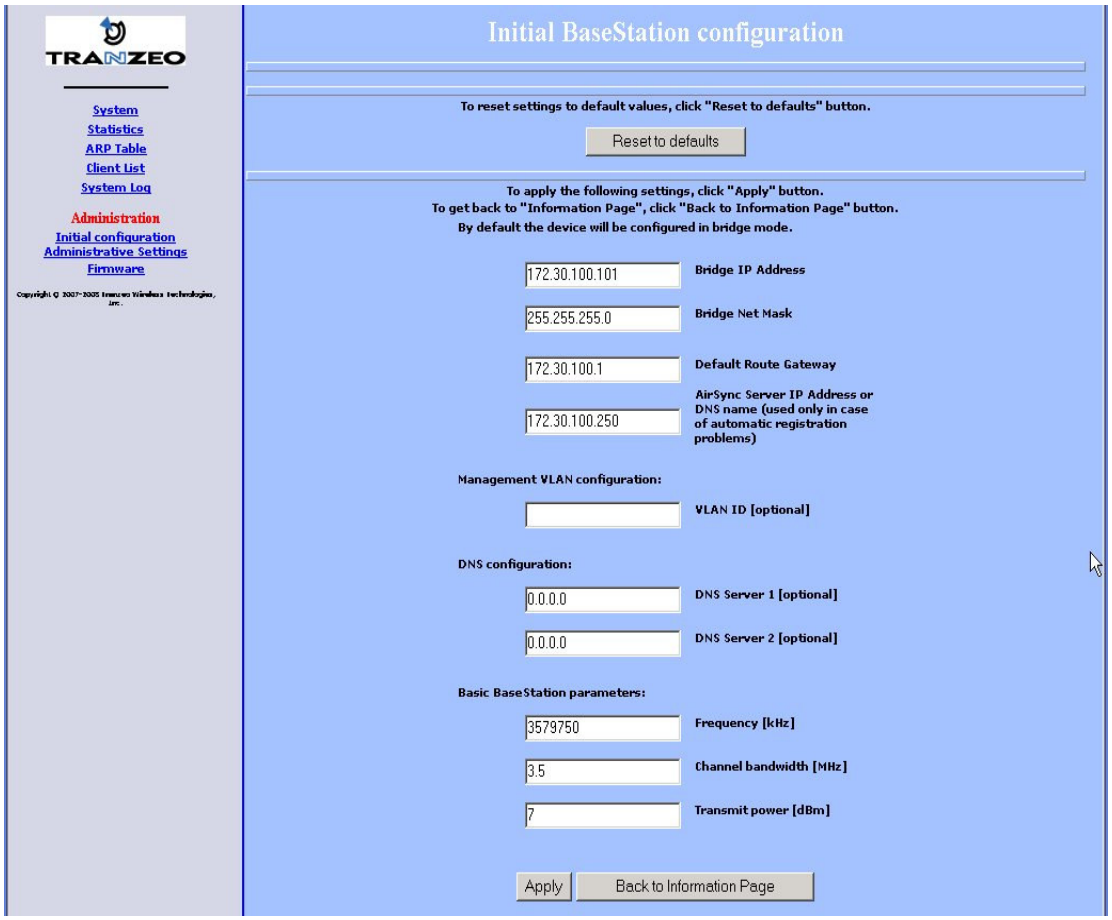


Figure 2. Initial Base Station configuration page.

5. Change the **Bridge IP Address** to match the IP address schema of your network. The IP address must be on the same subnet as the AirSync server.
6. Complete the remaining fields on the screen.

The **Frequency [khz]** and **Channel bandwidth [MHz]** settings must match the settings that you will configure later for the Subscriber Unit.

7. When finished, click **Apply** to save your settings. The Saving Settings screen appears, with a **Reboot** button for rebooting the Pico Base Station. You must reboot to apply your settings.

1.3 Step 2: Configure the Subscriber Unit

After configuring the Pico Base Station, use the procedures in the following sections to configure the Subscriber Unit.

1.3.1 Log in to the Configurator

Your Subscriber Unit provides a Web-based Configurator for performing advanced configuration activities. After you install your Subscriber Unit, use the following procedure to launch the Configurator.

1. Use an Ethernet cable to connect the Ethernet port labeled **PC** on the PoE adapter to a network-interface card (NIC) in a PC or network hub. Then connect the other Ethernet port on the PoE adapter to the Subscriber Unit.

The Subscriber Unit's Ethernet port is equipped with an auto-sensing Ethernet port that allows both regular and cross-over cables to be used.

2. Start your Web browser and point it to one of the following default IP addresses: **`http://192.168.101.151`** or **`http://192.168.0.1`**. The Login page in Figure 3 appears, with your cursor in the **User name** field.

The default IP address is the same for all TR-WMX subscriber units. Therefore, do not simultaneously connect multiple unconfigured TR-WMX subscriber units to a common Local Area Network (LAN) and try to access them using the default IP address.

To connect to the Configurator, your PC's IP address must be on the same subnet (192.168.101.xxx, where xxx is a number from 1 to 253) as the Subscriber Unit, and the PC's netmask must be set to 255.255.255.0.

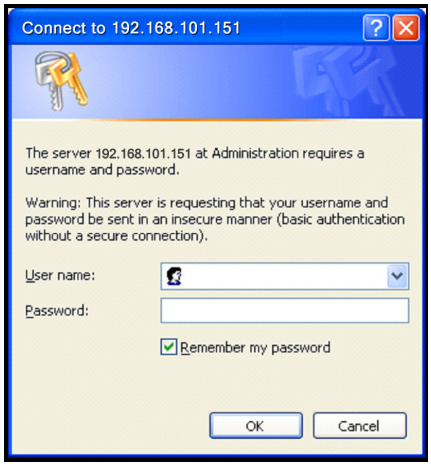


Figure 3. Login page.

3. Enter the default username **admin** and default case-sensitive password **default** in the appropriate fields.

For security, every typed password character appears as a bullet (•). For additional security, we recommend you change the default password in the Administrative Settings screen.

4. Click the **OK** button to log in. The Information Page appears (see Figure 4). This read-only page displays network, wireless and device information about your installation.

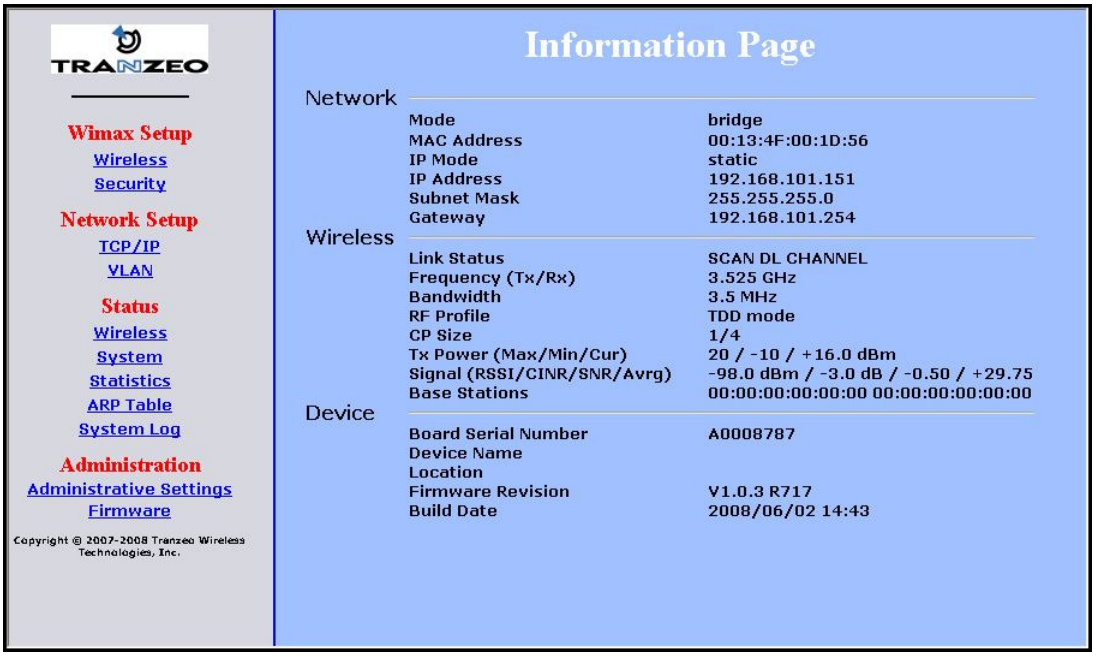


Figure 4. Information page.

1.3.2 Specify Wireless Settings

After logging in to the Configurator, use the following procedure to set the Subscriber Unit's wireless settings.

The default configuration settings for most parameters should work well for the majority of installations. Only those settings that should be confirmed or adjusted as part of the quick-configuration instructions are described in this section.

1. In the left pane, under **WiMAX Setup**, click **Wireless**. The Wireless Settings page appears (see Figure 5).
2. Set the three groups of parameters as indicated in Figure 5.
3.
4. Table 1 and Figure 5. These values must match the ones you entered for the Pico Base Station.

5. Click the **Apply** button. A page tells you that your configuration changes have been saved, but will not be applied until you reboot the Subscriber Unit.
6. Do not reboot the Subscriber Unit at this time. Instead, proceed to "Specify Network Setup Settings" on page 14.

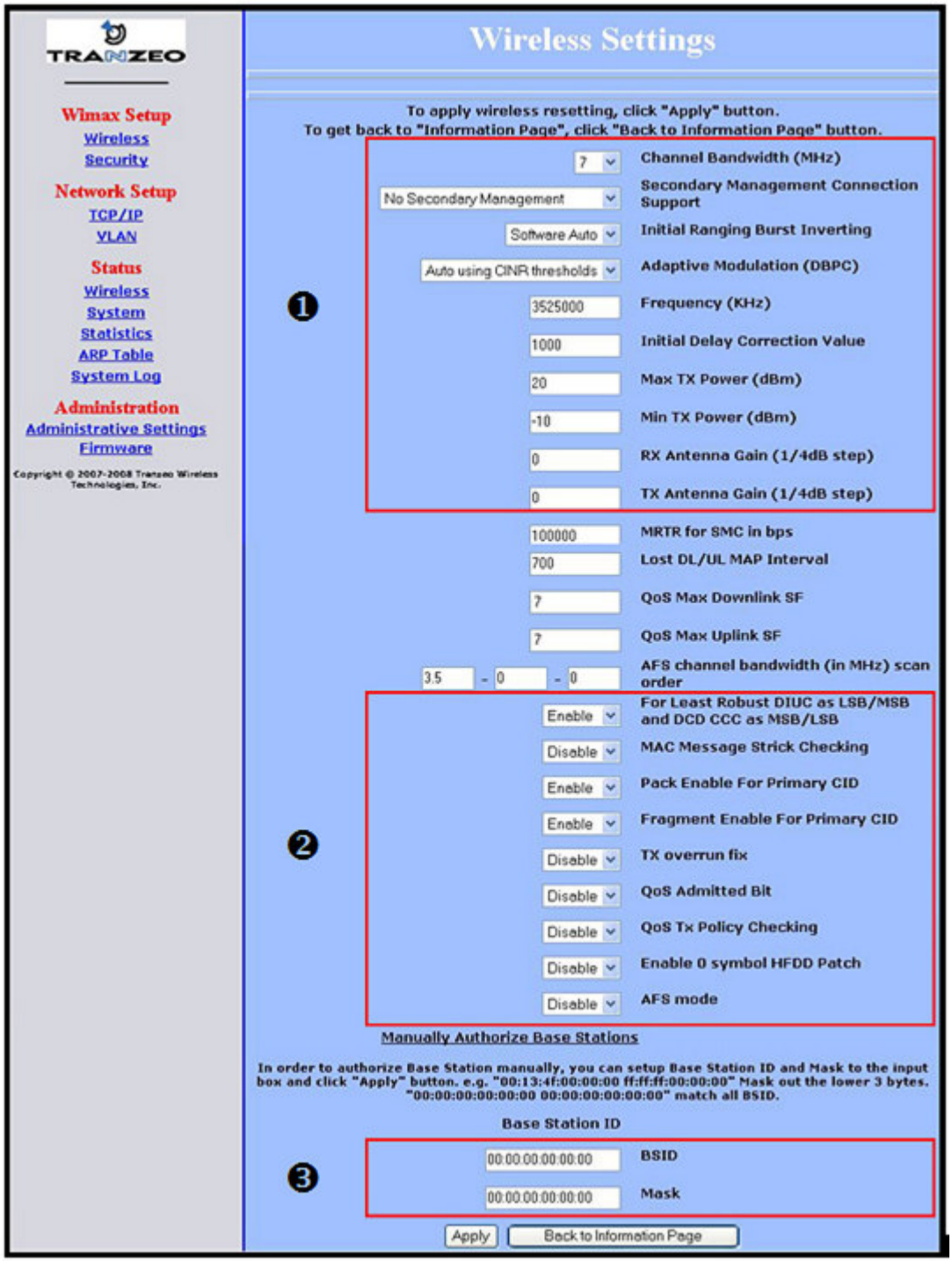


Figure 5. Wireless Settings page.

Table 1. Wireless Settings

Parameter	Choose This Setting
Group ❶ Parameters in Figure 5	
Channel Bandwidth (MHz)	For the 3.5GHz pBS operation select 3.5MHz or 7MHz (*default*), whichever best suits your application's bandwidth needs and is allowed by your license. The Pico Base Station must be set to the same bandwidth. For the 3.65GHz pBS operation select 3.5MHz or 7MHz (*default*). For the 5.8GHz pBS operation the default channel bandwidth is 10MHz.
Secondary Management Connection Support	Confirm that the default setting (Secondary Management) is disabled. If not, select No Secondary Management.
Initial Ranging Burst Inverting	Confirm that the default setting (Software Auto) is selected. If not, select it.
Adaptive Modulation (DBPC)	Confirm that the default setting (Auto using CINR thresholds) is selected. If not, select it.
Frequency (KHz)	Sets the frequency, in kHz. For 3.5GHz operation the SU range is 3300000 – 3600000 in increments of 250kHz. Default is 3525000 (3.525 GHz). Since the pBS supports frequencies from 3400000-3600000, only use frequencies in that range. For 3.65GHz operation the range is 3650000 – 3675000 in increments of 250kHz, only use frequencies in that range. For 5.8GHz operation the range is 5725000 – 5850000 in increments of 500KHz. Since the pBS supports frequencies from 5740000-5830000, only use frequencies in that range.
Initial Delay Correction Value	Confirm that a default setting of 0 is selected. If not, select it. This parameter may be adjusted over a range of 0 to 1000, and in conducted tests may need to be set to 1000 to support 7MHz channels.
Max TX Power (dBm)	The Max Tx Power value cannot exceed 20dBm. Default setting is 20. When setting the Max Tx Power value, do not exceed the max EIRP allowed by your license. When adding the values for Tx Antenna Gain and Max Tx Power, the sum of these values must equal or be less than the max EIRP that your license allows.
Min Tx Power (dBm)	Confirm that the default setting (-10) is selected. If not, select it.

Parameter	Choose This Setting
Rx Antenna Gain (1/4dB step)	Confirm that the default setting (0) is selected. If not, select it. This can be adjusted to match the gain of the antenna used, however the default setting of 0 will enable connectivity in all cases.
Tx Antenna Gain (1/4dB step)	Confirm that the default setting (0) is selected. If not, select it. This can be adjusted to match the gain of the antenna used, however the default setting of 0 will enable connectivity in all cases. The SS uses the same antenna for Tx and Rx.
Group ❷ Parameters in Figure 5	
For Least Robust DIUC as LSB/MSB and DCD CCC as MSB/LSB	Confirm that the default setting (Enable) is selected. If not, select it.
MAC Message Strict Checking	Confirm that the default setting (Disable) is selected. If not, select it.
Pack Enable for Primary CID	Confirm that the default setting (Enable) is selected. If not, select it.
Fragment Enable for Primary CID	Confirm that the default setting (Enable) is selected. If not, select it.
Tx Overrun Fix	Confirm that the default setting (Disable) is selected. If not, select it.
QoS Admitted Bit	Confirm that the default setting (Disable) is selected. If not, select it.
QoS Tx Policy Checking	Confirm that the default setting (Disable) is selected. If not, select it.
Enable 0 Symbol HDD Patch	Confirm that the default setting (Disable) is selected. If not, select it.
AFS mode	Confirm that the default setting (Disable) is selected. If not, select it.
Group ❸ Parameters in Figure 5	
BSID and Mask	Use the standard format for MAC addresses (six 2-digit hexadecimal numbers separated by colons) to enter the Pico Base Station ID. Example: "12:34:56:78:9a:bc". You can enter up to 8 Pico Base Station addresses, separating each by pressing the Enter key. To match a range of BSIDs, in the mask field use 0 to allow any or f in the digit corresponding to the BSID value to match. To match any BSID, utilize a setting of all zeros for both the BSID and Mask: "00:00:00:00:00:00 00:00:00:00:00:00".

1.3.3 Specify Network Setup Settings

After specifying wireless settings, use the following procedure to specify the network setup settings.

1. In the left pane, under **Network Setup**, click **TCP/IP**. The TCP/IP Settings page appears (see Figure 6).
2. When the Subscriber Unit is set to unmanaged mode (**No Secondary Management set on the Wireless page**) the IP Mode will be displayed as static on the TCP/IP page. Confirm IP mode is static and set the parameters in Table 2 (these parameters are highlighted in orange in Figure 6). Otherwise, skip to step 3 on the next page.

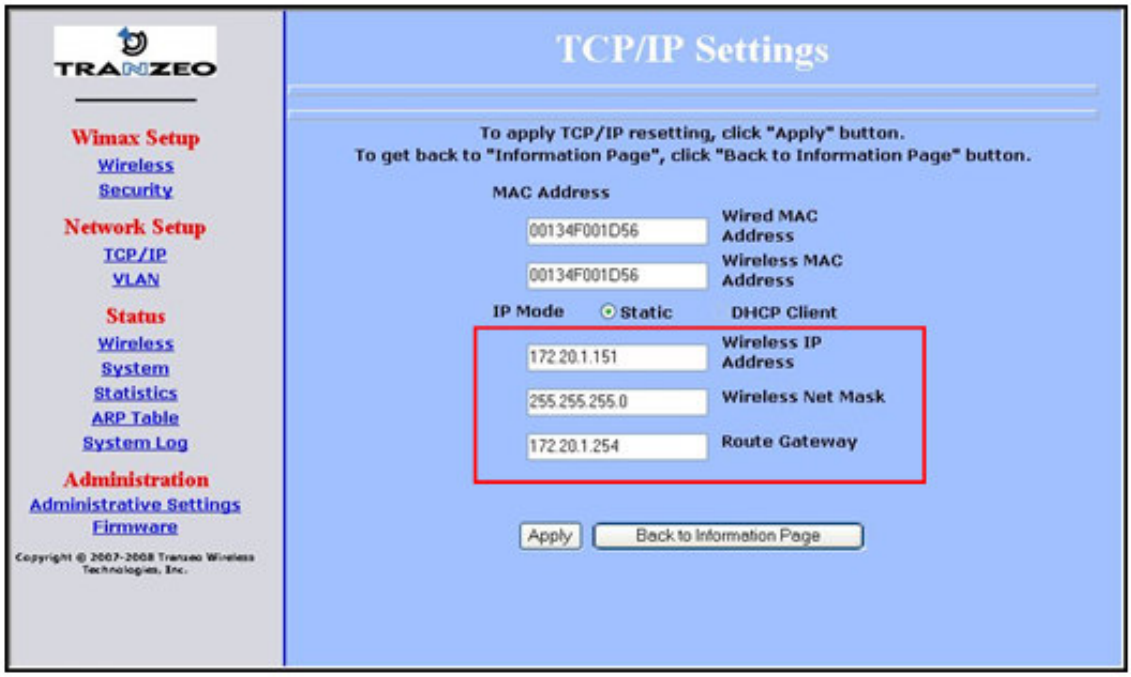


Figure 6. TCP IP Settings page.

Table 2. TCP/IP Settings

Parameter	Choose This Setting
Wireless Management IP Address	Secondary management mode: This value is set automatically and the field is unavailable. Unmanaged mode: Set this parameter to an unused value in the subnet to which the Pico Base Station is connected.
Wireless Management Net Mask	Secondary management mode: This value is set automatically and the field is unavailable. Unmanaged mode: Set this value to match that of the subnet to which the Pico Base Station is connected.
Management Route Gateway	Secondary managed mode: This value is set automatically and the field is unavailable.

Parameter	Choose This Setting
	Unmanaged mode: Set this value to be the router on the subnet to which the Pico Base Station is connected.

3. Click the **Apply** button. When the next page appears, click the **Reboot** button to reboot the Subscriber Unit and put your saved settings into effect.

Rebooting disconnects the Subscriber Unit and any connections currently running. It may take 60 seconds before the Subscriber Unit is running and accessible again. The **Status** LED flashes while the unit reboots and goes ON when the unit completes the reboot process.

1.4 Step 3: Configure the Subscriber Unit in AirConsole

To configure the Subscriber Unit in AirConsole:

1. Using the server where AirSync and AirConsole have been installed, click the Windows **Start** button, point to **All Programs**, point to **AirSync**, point to **AirConsole**, and click **AirConsole**.
2. Once the AirSync Management Console window appears, go to **Manage** menu and then click **Devices**. On the **Devices** tab, click **Details**, this will show the details pane on the right side of the Pico Base Station. After a few minutes, the Pico Base Station should register with AirSync automatically.
3. In the right pane, click the **Connections** tab. Connection information for the selected Pico Base Station appears. Question marks mean the detected Subscriber Unit has not been added to the AirSync server; if this happens, do not worry, as you will add the device later in this procedure.

If the Subscriber Unit does not appear in the connections tab under the Base Station after a few minutes, the link timing may require adjustment. The default settings described above enable connectivity for wireless links. However, for conducted testing two parameters may need to be adjusted. First adjust the "Magic wavesat synchronization parameter" available through Interfaces tab in AirConsole for the Base Station's bs_ofdm0 interface using the RNG_GRP sub-tab. Use values ranging from 236-690, then click Send to adjust these on the Base Station. Values of 236, 536, and 583 for this parameter are appropriate for conducted tests with respective channel bandwidths of 3.5MHz, 7MHz, and 10MHz. Keep in mind adjusting this parameter will cause the Base Station to reboot. Second, adjust the "Initial Delay Correction Value" through the Subscriber Unit Wireless Settings web page, and reboot the CPE to apply this change. Use values ranging from 0-1000, with a value of 120 for this parameter appropriate for conducted testing.

If all Subscriber Units do not appear in the connections tab under the Base Station after a few minutes, or if they are passing data with low throughput the link margin the pBS expects may need adjustment. The pBS default settings enable connectivity for many wireless links. However, for low margin links or to support

multiple CPEs the “Max. initial ranging RSSI (dBm)” setting may need to be reduced. This setting is available in the interfaces tab in AirConsole for the Base Station’s bs_ofdm0 interface using the RNG_GRP sub-tab. Using your link budget, calculate a reasonable maximum (about 5dB above your best link) and enter this value in dBm. For example for short links anticipated at the highest throughput a value of -65dBm (the default of -60dBm) may be appropriate. The Max. initial ranging RSSI (dBm)” is used by the pBS to dynamically adjust each CPE transmit power to balance the received energy in the pBS for each frame.

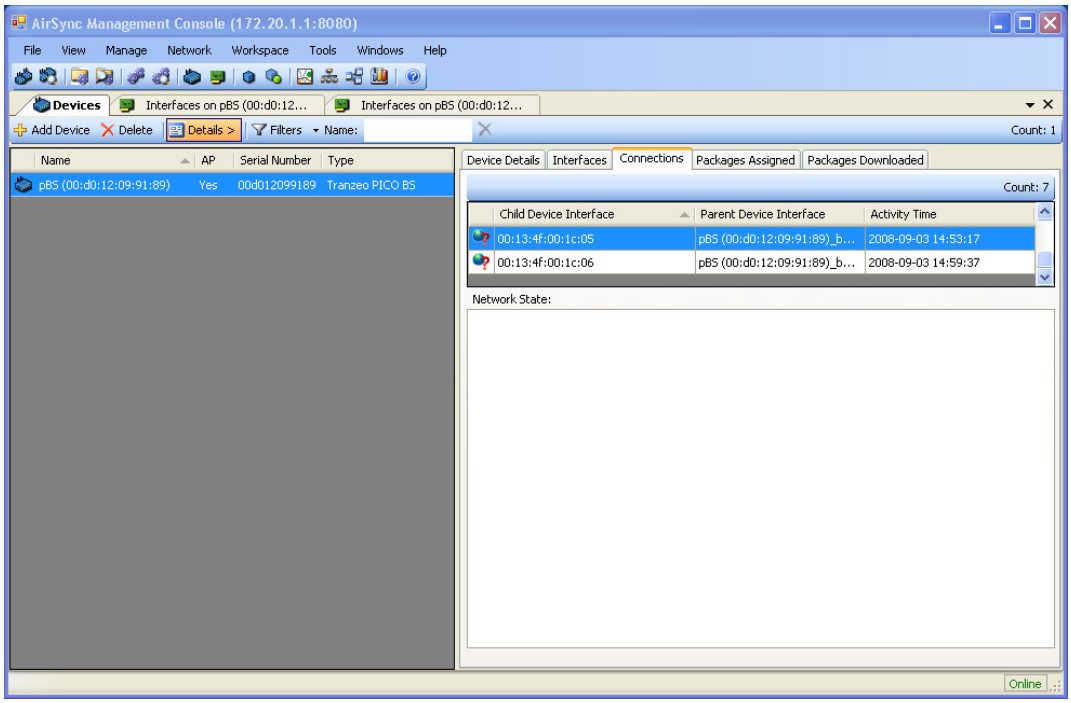


Figure 7. AirSync Management Console Window.

4. Record the Subscriber Unit’s MAC address shown and the serial number included with the Subscriber Unit. You will need them later when you configure the Subscriber Unit.

   MAC Address (shown in screen above): _____

   Serial Number (included in the Subscriber Unit box): _____

5. At the AirSync Management Console, click **Add Device**. The **Device Details** tab appears on the right.

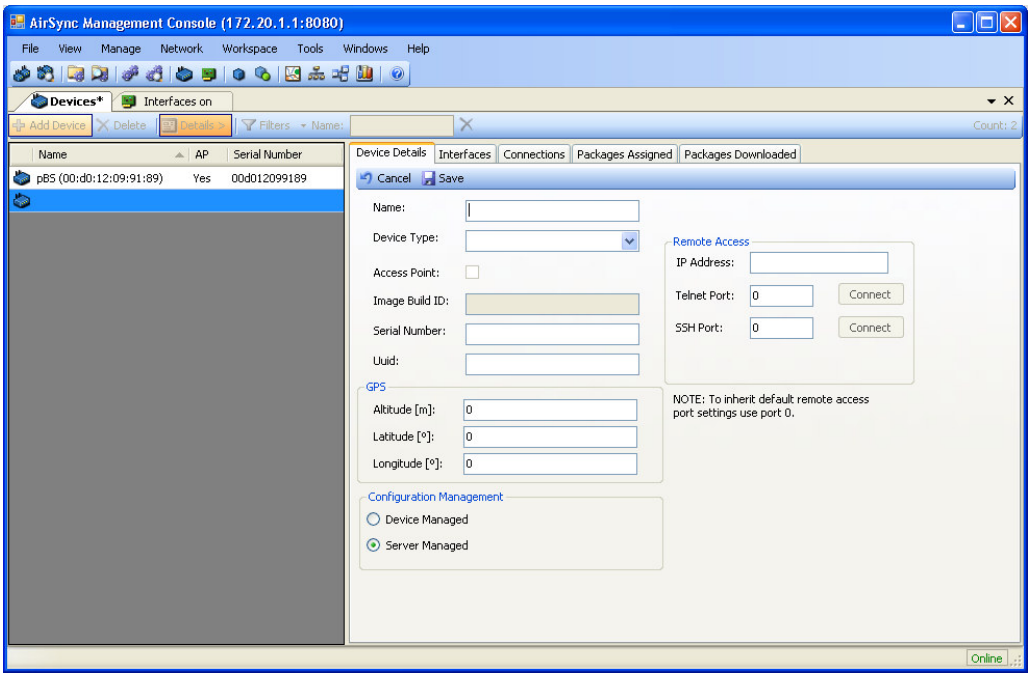


Figure 8. Device Details tab.

6. Complete the fields in the **Device Details** tab and click **Save**.

Table 3. Fields in the Device Details Tab

Parameter	Description
Name	Enter a meaningful name for the Subscriber Unit (e.g., the location where the Subscriber Unit will be installed).
Device Type	Select **Tranzeo TR-WMX** or appropriate device.
Serial Number	Enter the Subscriber Unit serial number recorded on Step 3.
Uuid	Enter a unique UUID number.
GPS	*Optional*: Enter the altitude, latitude, and longitude where the Subscriber Unit will be installed.
Configuration Management	Accept the default setting.
Remote Access	**IP Address** = enter the Subscriber Unit's IP address. A configuration graphical user interface (GUI) is available at the IP address using the default username **admin** and default password **default**. The Subscriber Unit must be set to the proper frequency and channel bandwidth to connect to the Pico Base Station using the subscriber station's Web-based GUI. The frequency and the channel bandwidth must match the values entered before for the Pico Base Station.

7. When a message prompts you to add a primary interface for this Subscriber Unit, click **OK**. The **Device Interface Details** tab appears.

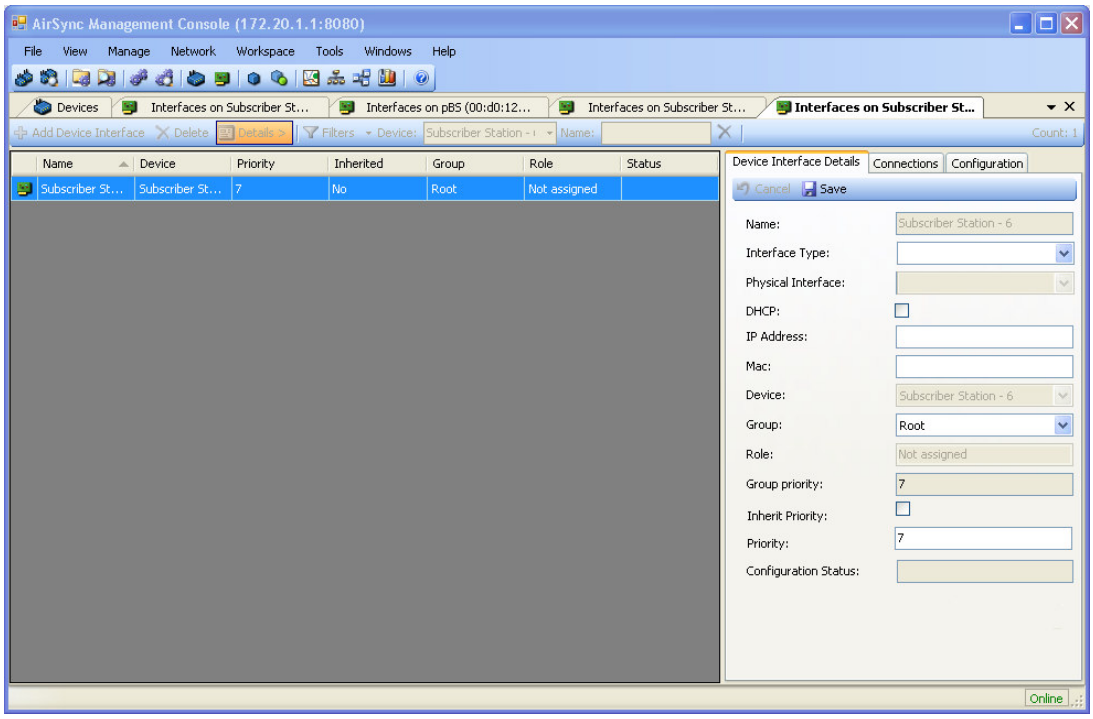


Figure 9. Device Interface Details tab.

8. Complete the fields in the **Device Interface Details** tab and click **Save**.

Table 4. Fields in the Device Interface Details Tab

Parameter	Description
Interface Type	Select **WiMax**. Once you select and Interface type the physical interface will be active. The default ofdm0 is fine.
DHCP	Check to have AirSync fill up this information automatically. This option only works if AirSync manages the device. Since the Subscriber Unit device is not managed by AirSync please do not check this box. Instead manually enter the static IP address to be used in the IP Address field.
IP Address	Enter a static IP address for the Subscriber Unit. Only available when **DHCP** is not checked.
Mac	Enter the Subscriber Unit MAC address using a : separated format (Aa:Bb:Cc:Dd:Ee:Ff:00).
Group	Add the Subscriber Unit to the group **Default**. The Subscriber Unit will inherits permissions from the group if the **Inherit Priority** checkbox is selected.

Remember that Tranzeo Subscriber Units are not managed by AirSync. Therefore, manually assigned IP Addresses must be entered in the IP Address field.

1.5 Step 4: Test the Subscriber Unit Connectivity

To test the Subscriber Unit connectivity, perform the following procedure.

1. Using the computer connected to the Subscriber Unit, confirm that the subscriber's computer can access the LAN resource and any desired destination (e.g., the Internet). The subscriber's computer must be configured with the same subnet as the Subscriber Unit and a default gateway that matches the Subscriber Unit IP address.

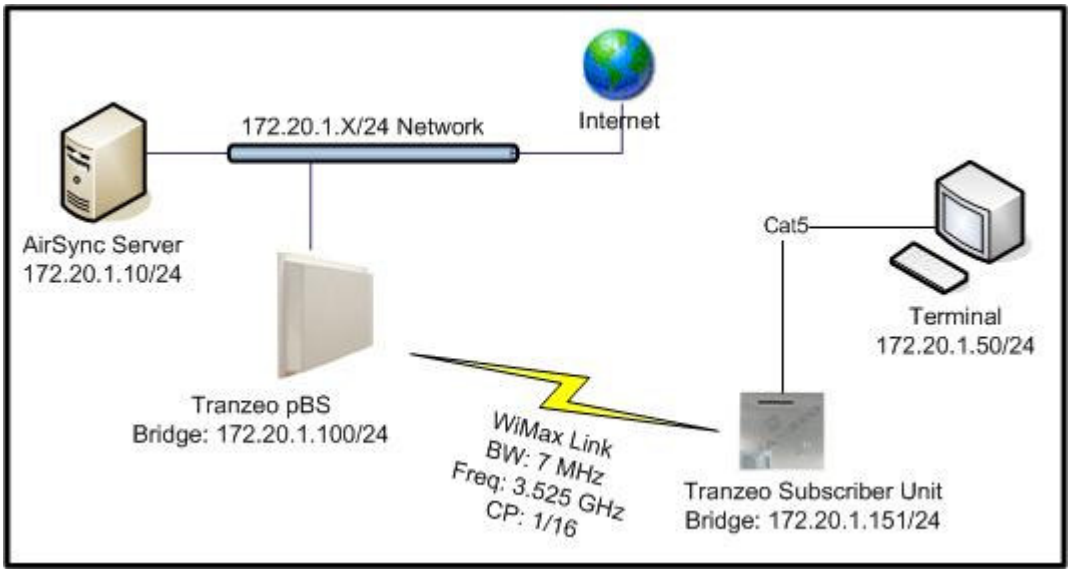


Figure 10. An example of a typical network configuration.

2. If the LAN resources cannot be accessed, click the **Devices** tab, select the Pico Base Station device, and verify that the device has no warning triangle and that all the rows appear in white in the **Interfaces** tab in the right pane. If the Subscriber Unit appears in red, the link between the Pico Base Station and Subscriber Unit is down. If this is the case then check the **Configuration** tab under **Manage**, **Device Interfaces** and select the bs_ofdm0 device interface to confirm that the frequency and bandwidth are set up properly in the Pico Base Station (RADIO_GRP sub-tab). Also confirm that the frequency and bandwidth are set up properly in the Subscriber Unit using the Subscriber Unit's Web-based GUI.

The Tranzeo pBS and SS each include a variety of configuration options that may be adjusted to enable wirless links to close. Specifically, the first parameter to check are verifying the link margin is sufficient for each SS and pBS link and adjust the "Max. initial ranging RSSI (dBm)" and the "Transmit Power (dBm)" on the pBS if needed. Second, if confident of a sufficient link margin, different channel bandwidth selections may require adjusting the

Magic Wavesat Synch parameter on the pBS and the Initial Delay Correction Value on the SS.

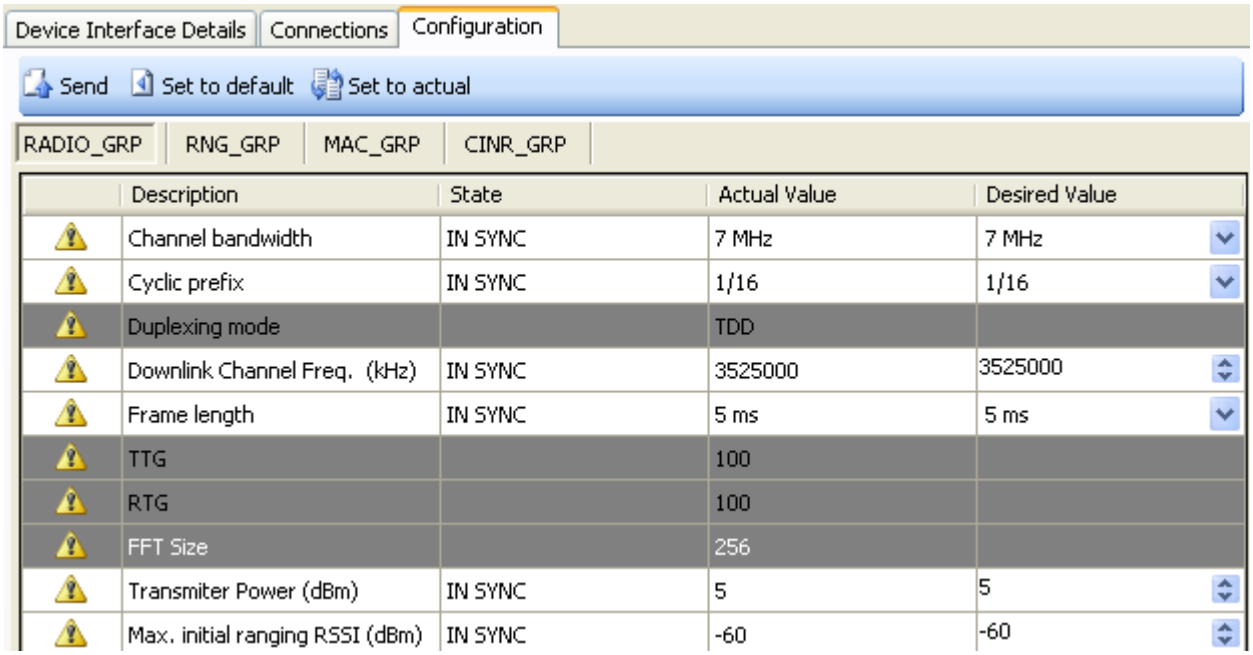


Figure 11. Configuration subtab on Device Interfaces Details tab.

The figure above shows the default values to configure the Pico Base Station to be connected to a single Subscriber Unit. If you wish to connect more than one Subscriber Unit please modify the *Frame Length* to 10 or 20 ms. 10ms is the recommended value. Although the latency will increase compared to 5ms frames, the supported throughput will increase. In addition, change the Minimum Size of First Burst value under the MAC_GRP tab. The recommended burst size values are shown below in Table 5: Minimum Size of First Burst for multiple Subscriber Units.

Table 5: Minimum Size of First Burst for multiple Subscriber Units.

Number of Subscriber Units	Minimum Size of First Burst
1	25
2	27
3	28
4	30
5	31
6	33

7	34
8	36
9	37
10	39
11	40
12	42
13	43
14	45
15	46
16	48
17	49
18	51
19	52
20	54
21	55
22	57
23	58
24	60
25	61
26	63
27	64
28	66
29	67
30	69
31	70

3. From the **Devices** tab, click the Pico Base Station row in the left pane on which the device name appears. Then, in the right pane, click the **Connections** tab.
4. In the **Connections** tab, click the Subscriber Unit. If the row appears in white, as in the following example, you will see the services flow assigned to the Subscriber Unit.

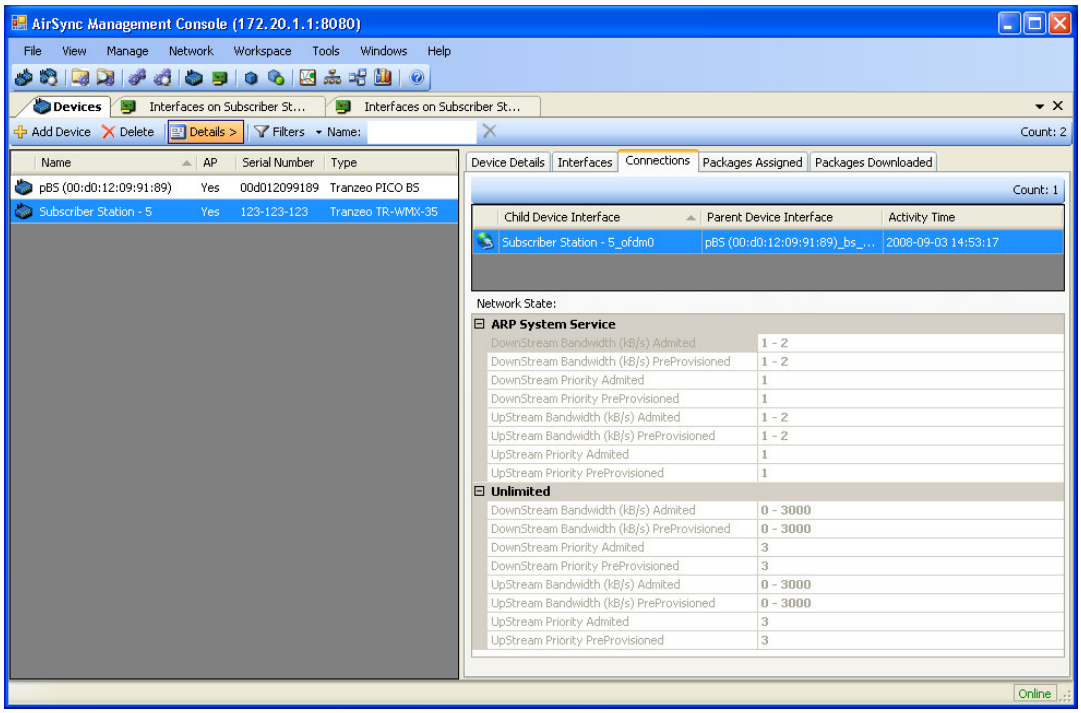


Figure 12. Connections subtab on Devices tab.

If there are no services flows, check that the Subscriber Unit is assigned properly to the group called **Default**. To do so, click the **Devices** tab in the left pane; then, in the **Devices** tab on the left, right-click the subscriber station whose group you want to confirm and select **Show Interfaces** from the shortcut menu. In the right pane, click **Edit** and use the **Group** drop-down list to select the appropriate group.

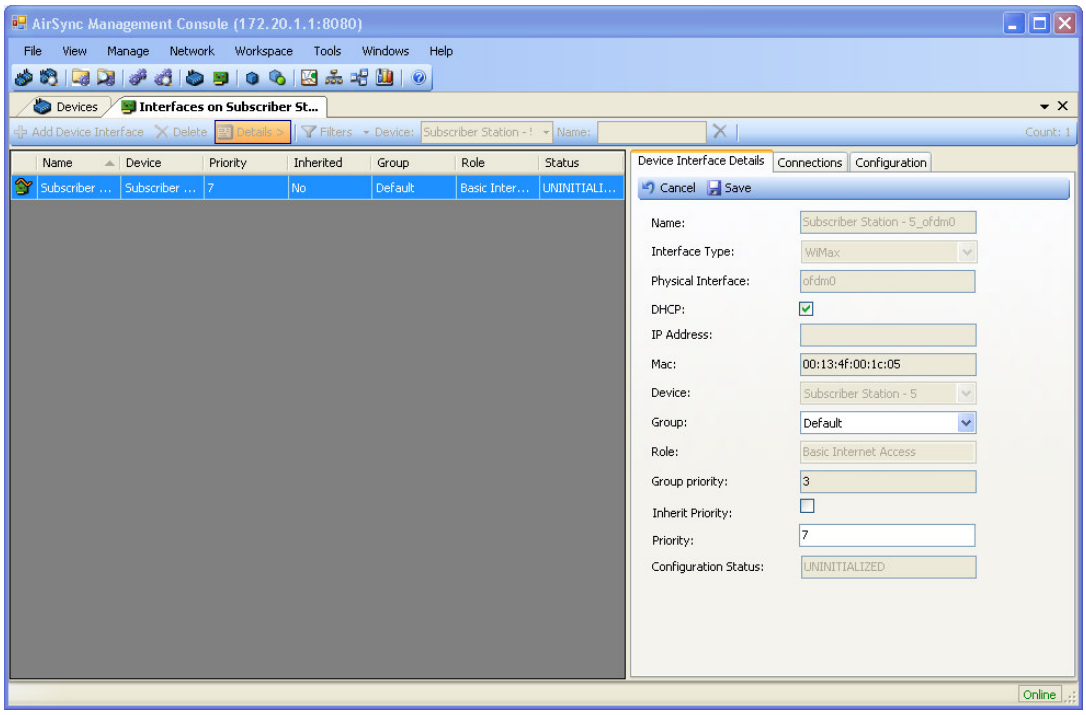


Figure 13. Device Interfaces details tab.

1.6 Step 5: Monitor the Network

After confirming that the subscriber's computer can access the LAN resources, use the following procedure to monitor the network.

1. In the **Devices** tab, right-click the Subscriber Unit and choose **Show Statistics** from the shortcut menu. A box appears with statistics for monitoring the network.

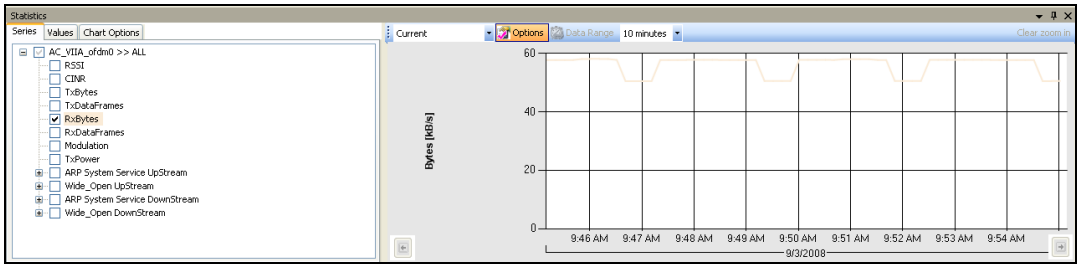


Figure 14. Statistics tab.

2. Using the statistics box, edit the parameters and see the real-time performance results of the Subscriber Unit.

The AirSync Server icons indicate the status of each device. For example:

-  = the device does not have a working agent.
-  = the device is down and the AirSync Server cannot ping it.

Congratulations! You have now completed the configuration for the Tranzeo TR-WMX WiMAX Subscriber Unit and attaching it to the Pico Base Station.

For more information, please visit www.tranzeo.com.

Compliance Information

FCC Information

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.

This equipment has been tested and found to comply with the limits for 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 and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures.

Reorient or relocate the receiving antenna

Increase the separation between the equipment and receiver

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected

Consult the dealer or an experienced radio/TV technician for help

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.

Any changes or modification to said product not expressly approved by Tranzeo Wireless Technologies Inc. could void the user's authority to operate this device.

Industry Canada Information

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

For safety reasons, people should not work in a situation where RF exposure limits could be exceeded. To prevent this situation, the users should consider the following rules:

Install the antenna so that there is a minimum of 123.6 cm (48.7 in) of distance between the antenna and people.

Do not turn on power to the device while installing the antenna.

Do not connect the antenna while the device is in operation.

Do not co-locate or operate the antenna used with the device in conjunction with any other antenna or transmitter.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

The product requires professional installation. Professional installers must ensure that the equipment is installed following local regulations and safety codes.