Digital Receiver Technology, Inc.

DRT4300B System Software Manual

For DRT4300B System Software R01.10.00 & greater

(DRT Part No. 434-00191)

Rev. 4.1, 19 May 2015

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ECCN 7E994

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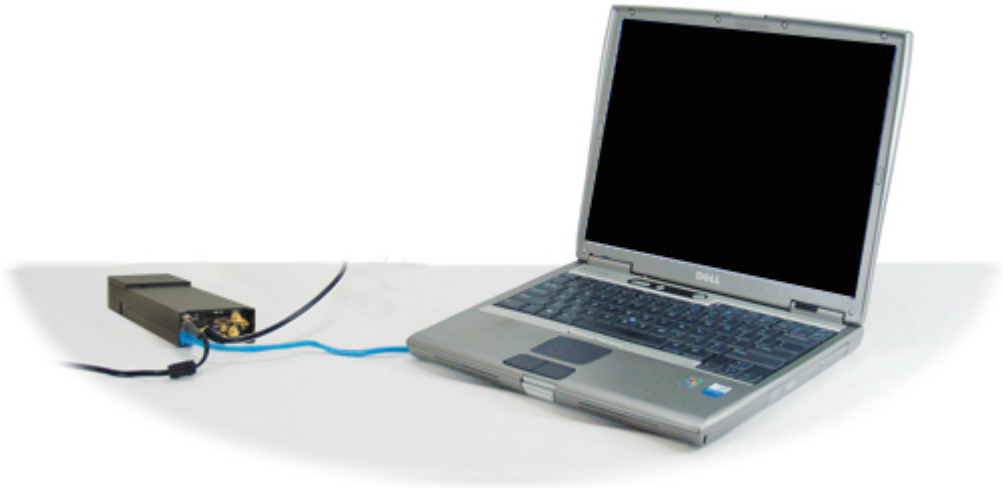
1. Introduction

These instructions describe *Galena* and the Android GUI that are used to control the DRT4311B Wideband Test Receiver.



2. PC Requirements

The *Galena* GUI is loaded onto a PC meeting the following minimum requirements:

- 1.2 gigahertz (GHz) or faster 32-bit (x86) processor or 64-bit (x64) processor.
- *Windows XP* Professional or *Windows 7* (contact DRT for the latest versions of *Windows 7* that have been tested).
- 2 gigabytes (GB) RAM.
- 50 megabytes (MB) of available hard disk space.
- Super VGA (800 x 600) or higher resolution monitor.
- Keyboard and Mouse or compatible pointing device.
- CD-ROM or DVD drive required for local software updates.
- To communicate with DRT system: Network adapter card supporting TCP required; 10/100 Ethernet LAN adapter recommended; USB is also supported.

3. System Software - Connect, Install

3.1. System Software CD

The *DRT4300B System Software* CD contains the files necessary to install:

- Embedded (system) files on the DRT4311B
- Non-disclosure Agreement (NDA) required to receive API/SDK.
- *Galena* GUI on the controller PC

3.2. Connecting to a Unit

NOTE: These instructions apply to Ethernet connections only. USB connections are described in the section ***PC Control over USB***.

Your unit is supplied with the current version of software installed and if a PC was also supplied, it should also be configured correctly for your unit. If software does need to be installed on the unit or the controller PC, refer to the ***Install Software: DRT4300B System Software CD*** section.

3.2.1. Network Mode Selection

The DRT4311B is capable of operating using:

- Wired Ethernet

3.2.2. Unit Name and Default IP Address

3.2.2.1. DRT4311B

The unit's default network name is DRT4311BsnXXXX where XXXX represents the unit's serial number. For example, a unit with serial number 2302 would have the name DRT4311BSN2302.

The factory default IP addresses are:

- Wired Ethernet: 192.168.1.100
- Factory Default USB IP: 192.168.2.100

3.2.2.2. Controller PC

The default IP address for the controller PC, if supplied by DRT, is: 192.168.1.200.

3.2.3. Routers

If the DRT system is connected to a router, ensure the router is configured to forward UDP multicast traffic. To prevent "broadcasting to the internet," the DRT software will allow two router transitions.

NOTE: When performing unit discovery, *Galena* uses port 5602/UDP and *Yukon4k* uses port 5601 for DRT unit network configuration. These ports should not be blocked. If the controller PC and the unit are not on the same subnet, the PC will not find the unit during unit discovery, although the unit will respond if the correct unit name or IP address is used to connect with the unit.

3.2.4. DRT4311B System Power Control

The DRT4311B has two power modes, Standby and On. When power is applied to the unit (either by connecting a power cable to the DC IN connector on the front panel or by connecting an optional battery at the rear on the system) the system is On. To set the system to Standby, press and release the power control button.

To reboot the system, from an On state, return the system to Standby, remove power from the unit, reapply power to the unit, and turn ON the unit. From a Standby state, remove power from the unit, reapply power to the unit, and turn ON the unit.

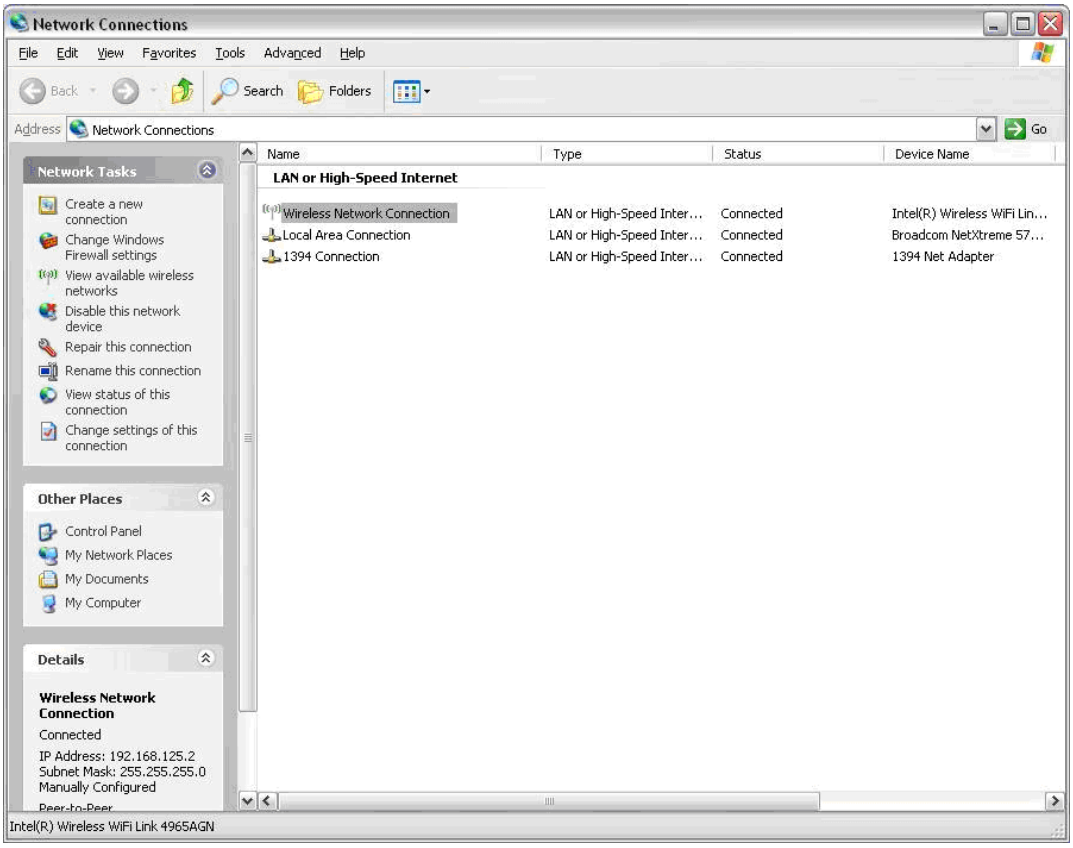
3.2.5. Configuring the Controller PC

Your controller PC may be operating *Windows XP* or *Windows 7* as the operating system (OS). Follow the instructions, below, for your PC's OS.

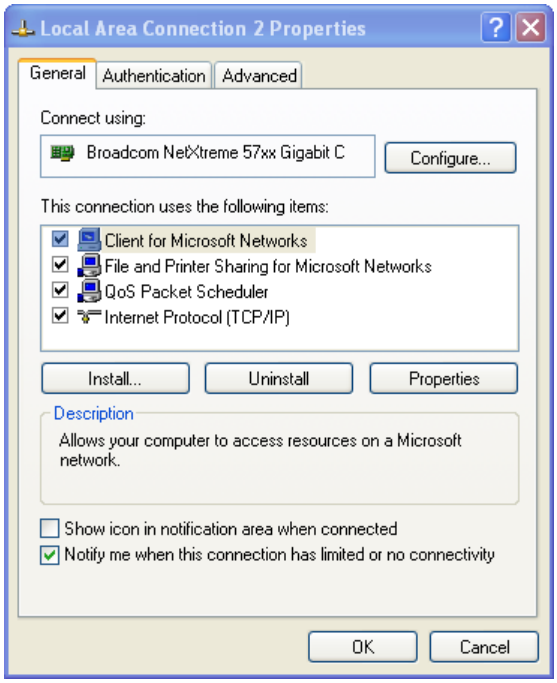
3.2.5.1. Controller PC - Windows XP

If not supplied, the Controller PC with Windows XP as the installed operating system must be configured before configuring the system. The system may be controlled over a network from a fixed location PC or from a direct connection to a PC. NOTE: These directions should be used when making Ethernet connections not USB connections. In any case, it is necessary to configure the Controller PC for communications with the unit. To configure the PC:

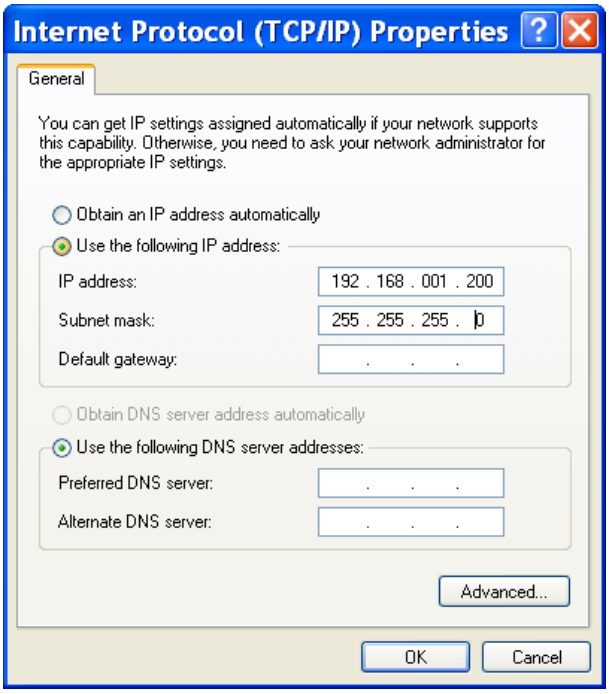
- Click the **START** button on the *Windows* Desktop, then click the **Control Panel**.
- Double-click **Network Connections**. A window similar to that shown below will appear. The actual window will depend on the configuration of the PC being used.



- Right-click **Local Area Connection** to set up a wired connection. When you right-click your selection, a popup menu will appear. Click **Properties**. The **Local Area Connection Properties** dialog will appear:



- Select the entry **Internet Protocol (TCP/IP)** and then click the **Properties** button below and to the right of the list. This will bring up the **Internet Protocol (TCP/IP) Properties** dialog.



- If the PC is to be configured for DHCP (wired Ethernet only), select **Obtain an IP address automatically** and exit the setup.
- If the PC is to be configured for static IP, select **Use the following IP address** then enter the desired IP address (for example **192.168.1.200)** in the **IP address** field.
- Next, press the TAB key to move the cursor to the **Subnet mask** field. If the IP address has been entered properly, the subnet mask should automatically have the entry **255.255.255.0** entered in the field. If the IP address is correct and the subnet mask entry is incorrect, change the subnet mask to the correct entry.

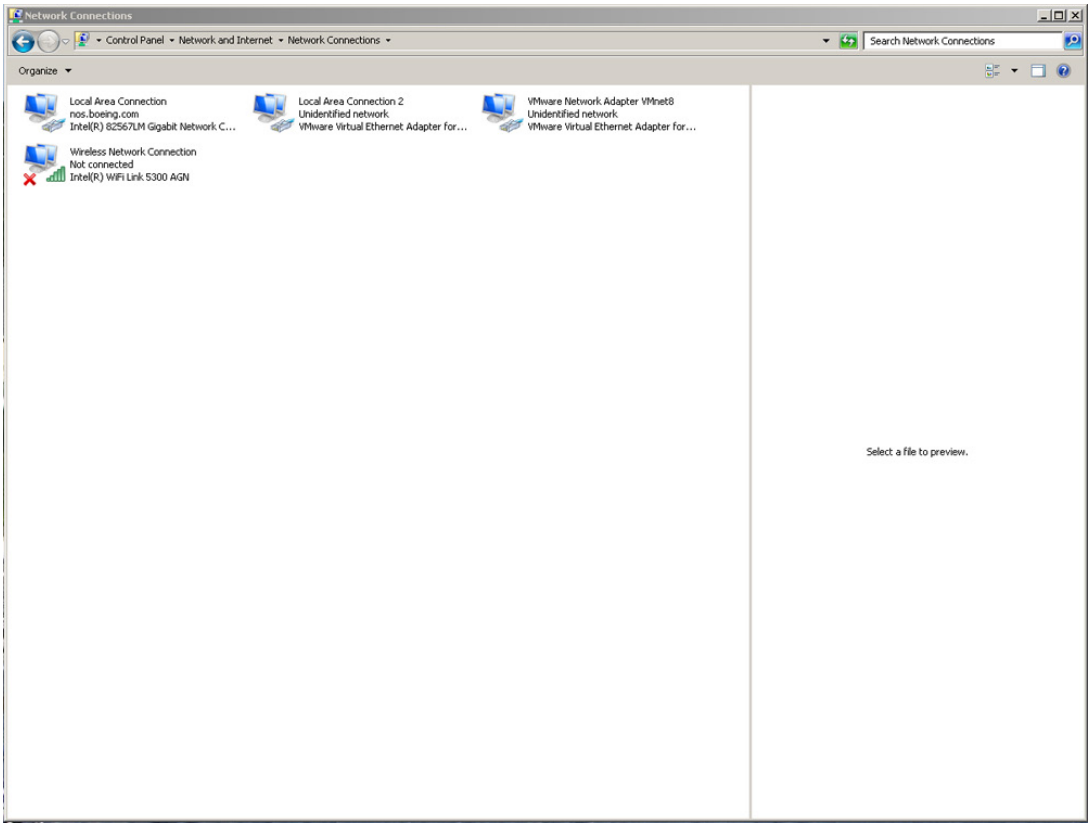
Exit the setup by clicking **OK** to close the **Internet Protocol (TCP/IP) Properties** window, then click the **Close** button on the **Local Area Connection Properties** window. Finally, click the "X" box in the upper right corner of the **Network Connections** window to exit that window.

The PC is now configured for operation with the system.

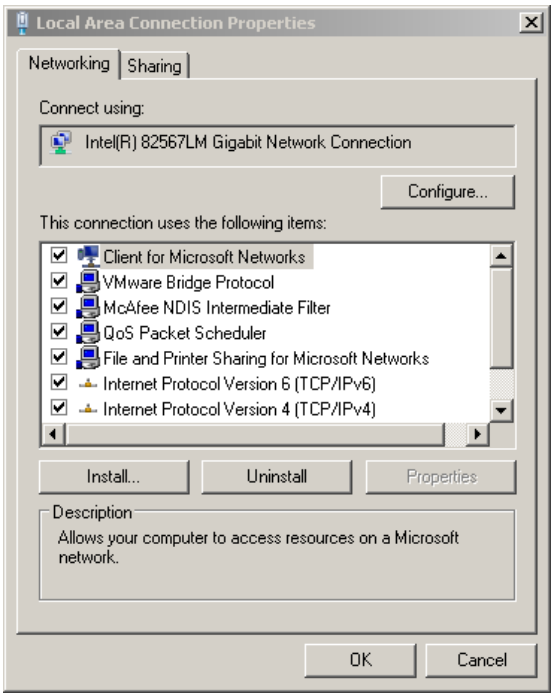
3.2.5.2. Controller PC - Windows 7

If not supplied, the Controller PC with Windows 7 as the installed operating system must be configured before configuring the system. The system may be controlled over a network from a fixed location PC or from a direct connection to a PC. In any case, it is necessary to configure the Controller PC for communications with the unit. To configure the PC:

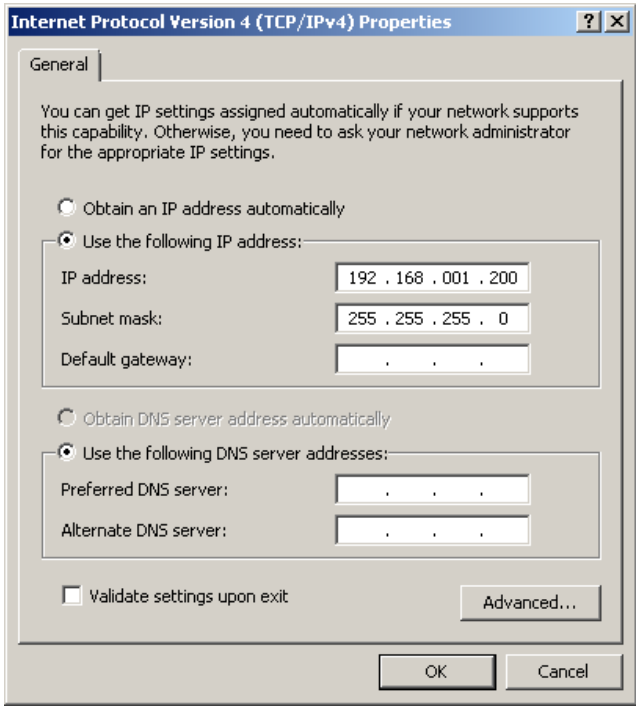
- Click the **START** button on the *Windows* Desktop, then click the **Control Panel**.
- Click **Network and Sharing Center** and then **click Change adapter settings**. A window similar to that shown below will appear. The actual window will depend on the configuration of the PC being used.



- Right-click **Local Area Connection** to set up a wired connection. When you right-click your selection, a popup menu will appear. Click **Properties**. The **Local Area Connection Properties** dialog will appear:



- Select the entry **Internet Protocol Version 4 (TCP/IPv4)** and then click the **Properties** button below and to the right of the list. This will bring up the **Internet Protocol Version 4 (TCP/IPv4)** dialog.



- If the PC is to be configured for DHCP (wired Ethernet only), select **Obtain an IP address automatically** and exit the setup.
- If the PC is to be configured for static IP, select **Use the following IP address** then enter the desired IP address (for example **192.168.1.200)** in the **IP address** field. Next, press the TAB key to move the cursor to the **Subnet mask** field. If the IP address has been entered properly, the subnet mask should automatically have the entry **255.255.255.0** entered in the field. If the IP address is correct and the subnet mask entry is incorrect, change the subnet mask to the correct entry.
- Exit the setup by clicking **OK** to close the **Internet Protocol (TCP/IP) Properties** window, then click the **OK** button on the **Local Area Connection Properties** window. Finally, click the "X" box in the upper right corner of the **Network Connections** window to exit that window.

The PC is now configured for operation with the system.

3.2.6. Network Configuration Using Yukon4K

3.2.6.1. DRT4300 System Configuration

The Controller PC must be configured before configuring the DRT43XX System.

Configuration of the unit's IP address is managed through *Yukon4k*. On the controlling PC, start *Yukon4k*. When *Yukon4k* starts, the window should list a system in the **Unit Name** field in the **Connection** box. If the PC and multiple DRT43XX Systems are on the network, multiple units may be in the drop down list. Use the arrow key to display the list of available units.

If the desired unit is not listed, click **Refresh** to re-query the network for the availability of the unit.

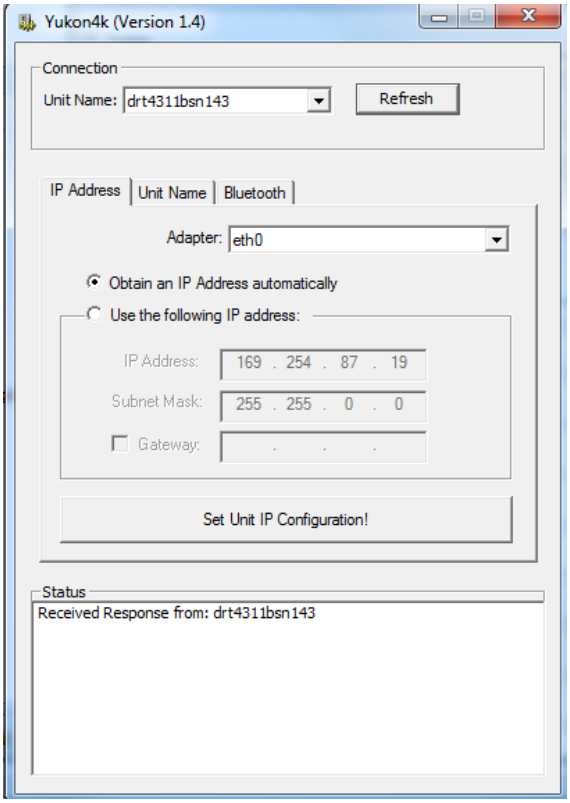
3.2.6.2. Wired Ethernet Configuration

If you are using a wired Ethernet connection, you will only need to set the fields on the **IP Address** page.

- Set the **Adapter** field to **eth0**. If you wish to use DHCP to obtain an IP address from the network, click the **Obtain an IP Address automatically** option then click the **Set Unit IP Configuration!** button.
- The **Status** area will acknowledge that the setting of the IP Address is in process and then will indicate that the setting was successful. The automatic configuration is complete. Close the *Yukon4k* software and reboot the unit.

If you wish to manually enter the IP address information:

- Click the **Use the following IP Address** option and set the **IP Address** field to an approved IP Address.
- Typically, the **Subnet Mask** field is set to 255.255.255.0, but change that address as necessary.
- If your network configuration requires a Gateway address, click the **Gateway** box and enter an approved Gateway Address in the **Gateway** field.
- Click the **Set Unit IP Configuration!** button.
- The **Status** area will acknowledge that the setting of the IP Address is in process and will indicate when the setting was successful. An error is indicated with a popup message box. The manual configuration is complete. Close the *Yukon4k* software and reboot the unit.



3.2.6.3. USB Ethernet Configuration

See the section ***PC Control over USB*** for instructions on creating a USB Ethernet configuration.

3.2.7. Determine the Static IP Address of a Unit

The situation may occur when the static IP address of a unit is not known. The following steps will allow you to determine the static IP address:

1. Connect the controller PC to the DRT System using an Ethernet LAN crossover cable.
2. Configure the PC for static IP. Refer to the ***Configuring the Controller PC*** section, above.
3. Run *Yukon4K*. Refer to Network Configuration, above. *Yukon4K* will report the DRT System's static Ethernet and USB IP addresses.

3.2.8. User Accounts and Logon Credentials

The DRT4000 systems have two independent processing units, both of which run an instance of the *Linux* Operating System (OS). Administering user accounts and logon credentials for each of these *Linux* processors requires a remote connection from a PC to the DRT4000 unit using the *PuTTY* utility. *PuTTY* provides a Secure Shell (SSH) connection between the DRT4000 system and your PC. The *PuTTY* SSH utility also allows you to enter *Linux* commands on the PC to make the necessary changes to the DRT4000 system user accounts discussed below.

NOTICE

- Issuing the "wrong" *Linux* command can make the DRT4000 system inoperable. The *root* account is used during the install process, so any unintended changes to the *root* account (e.g., privileges) could affect the install process.
- Changing the *Linux root* user password and then forgetting it will prevent new software installations. The unit will have to be returned to DRT for service.

The DRT4000 systems have the following accounts and logon credentials:

Account Type	Default User Name and Password	Use
Linux Root User	Username: root Password: Contact DRT	The root user/account has access to all commands and files available on the *Linux* system. Root privileges give absolute power to the *root* account which means that the *root* user has complete access to all system files and commands. The *root* user can modify the DRT4000 system in any way desired and can grant and revoke access permissions for other users and processes, including default *root* privileges.
user	Username: drtunit Password: DrtUnit	The *drtunit* account is used by the Graphical User Interface (GUI), *Android* application, and the *Galena* control software to gain access to and control the DRT4000 system at a less privileged level than that of the *root* user account.

You may change the logon credentials for either of the accounts listed above.

DRT4000 units are normally controlled by connecting to them with a controller PC using *Galena* control software. *Galena* uses the user account credentials.

NOTICE

- When changing logon credentials, note that you MUST remember what the new credentials are because DRT will have no record of them.
- Do NOT delete the *drtunit* account. Deleting this account will disable the ability to configure the system and services. Deleting this account also will prevent access to log files and other service and scanning-related operations.

3.2.8.1. Saving Credentials

Saving credentials is not supported by DRT4000 systems. Because of this, when you use the GUI applications to connect to a DRT4000 system that is no longer using the default user account credentials, you will be prompted to enter the new credentials. When you close the GUI application and the PC you are working on does not save the DRT4000 logon credentials, you will have to enter those credentials again the next time you open the GUI application.

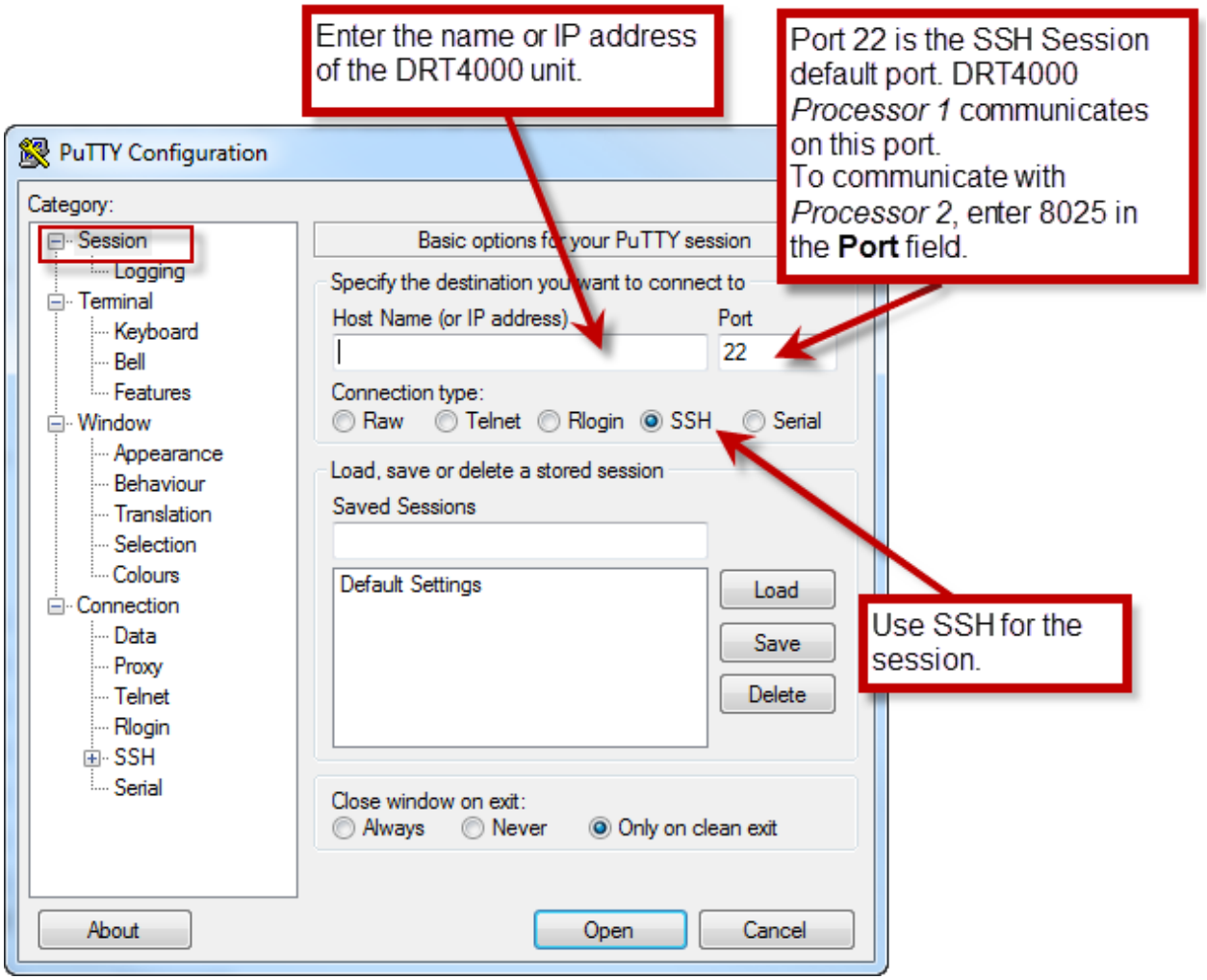
3.2.8.2. Connect to the DRT4000 System

To change user credentials you must access the DRT4000 system directly (not via *Galena*). To communicate with the DRT4000 system you will need the *PuTTY* Secure Shell utility. If this utility is not already loaded on the PC, you can download it from this Internet site: ***www.putty.org***.

Once *PuTTY* is loaded on the PC, connect to the DRT4000 system via an established Ethernet connection or with a USB cable.

NOTE: You will need to change the password twice: once for each system processor. The SSH connection uses port **22** to communicate with DRT System Processor 1 and port **8025** to communicate with DRT System Processor 2.

Once connected to the DRT unit double-click the **putty.exe** program in the directory in which it was saved on the PC to open a Secure Shell Connection. The configuration screen appears.



3.2.8.3. Change User and Administrative Logon Credentials

User (drtunit) Password Changes on Processors 1 & 2 (Ports 22 and 8025)

- Open *PuTTY* and configure the SSH session as described above for port 22. Once the session is configured click **Open**.
- You must log in as *root* user to change the *drtunit* password.

  Type *root* at the **login as** prompt and press **Enter**. Type the *root* password at the **password** prompt and press **Enter**.
- At the *root* prompt type

  /opt/ndc/change_etc.sh passwd drtunit

The following message appears confirming that the *drtunit* password was changed:

root@drt[insert the unit model number you are configuring here]snxxx:~# /opt/ndc/change_etc.sh passwd drtunit
Changing password for drtunit
New password:
Retype password:
Password for drtunit changed by root

- Close the SSH session window and open another SSH session to change the *drtunit* password on Processor 2 (port 8025). The procedure is the same as that described for Processor 1, but the connection is to port 8025.

NOTICE

You MUST enter the same password for the *root* user that you entered for Processor 1 when you change the password for Processor 2. The changed passwords for Processors 1 and 2 MUST be the same password. If the passwords do not match, *Galena* will not be able to successfully connect to the DRT unit.

Administrative (root) Password Changes on Processors 1 & 2 (Ports 22 and 8025)

- Open *PuTTY* and configure the SSH as described above for Processor 1. Once the session is configured, click **Open**.
- You must log in as *root* user to change the *root* password.

  Type *root* at the **login as** prompt and press **Enter**. Type the *root* password at the **password** prompt and press **Enter**.
- At the *root* prompt type

  /opt/ndc/change_etc.sh passwd

The following message appears confirming that the *root* password was changed:

root@drt[unit model number]snxxx:~# /opt/ndc/change_etc.sh passwd drtunit
Changing password for root
New password:
Retype password:
Password for root changed by root

- Close the SSH session window and open another SSH session to change the *root* password on Processor 2. The procedure is the same as that described for Processor 1, but the connection is to port 8025.

NOTICE

You MUST enter the same password for the *root* user that you entered for Processor 1 when you change the password for Processor 2. The changed passwords for Processors 1 and 2 MUST be the same password. If the passwords do not match, the Installer will not function.

3.2.8.4. Restore Default Passwords

To install versions of software issued before the password change option became available, you must restore the passwords to the factory issued (default) password. If this is not done, neither the Installer nor the GUI applications from earlier versions will function properly.

To restore default passwords on Processor 1 (Port 22):

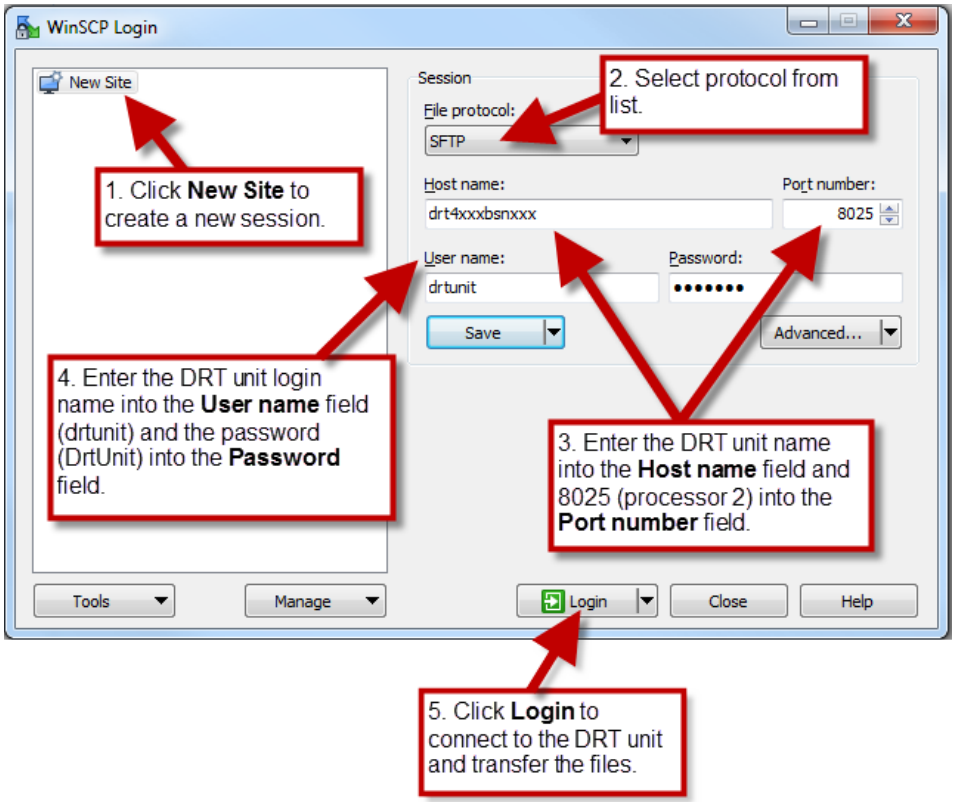
- Open PuTTY and configure the SSH as described above. Once the session is configured, click **Open**.
- You must log in as *root* user to restore default passwords.

  Type *root* at the **login as** prompt and press **Enter**. Type the *root* password at the **password** prompt and press **Enter**.
- At the *root* prompt type

  rm /mnt/data/system/etc_rw/shadow* && sync
- Close the SSH session window and open another SSH session to restore default passwords on Processor 2. The procedure is the same as that described for Processor 1, but the connection is to port 8025.
- Reboot or shut down the system to allow the changes to take place.

3.2.9. Connect to Unit for Log File Transfers

Use the following steps to connect to a DRT unit (processor 2 on port 8025) using SFTP, SCP, or FTP to download log files:



1. Open any File Transfer application. These instructions use *WinSCP* as an example.
2. Click **New Site** on the WinSCP Login screen to create a new session.
3. Select the file transfer protocol you wish to use from the **File protocol** drop-down list.
4. Enter the DRT unit name into the **Host name** field. The name of the DRT unit will vary according to what name it has been given (but will look something like this drt4xxxbsnxxx). Enter port number 8025 into the **Port number** field. This port number allows you to communicate with processor 2 where log files are stored.
5. Enter the DRT unit login name into the **User name** field (drtunit). and the password (DrtUnit) into the **Password** field.
6. Transferred files are stored in the ***sdmmc*** folder on the DRT unit.

3.3. System Software Upgrades

Initially, the DRT unit will have all software installed and no further actions are necessary. Later, you may wish to load the GUI or tools on another PC or upgrade the system software.

If your PC was supplied by DRT, it too will be fully configured with, the controlling GUI software. If your PC was not supplied by DRT, follow the instructions below to load the GUI software on it.

CAUTION

Do not attempt to load any software on the DRT system other than the *DRT4300B System Software* provided by DRT. Loading any other software (including virus protection software unless pre-approved by DRT) may render the DRT system unusable. Contact DRT for more information.

Do not attempt to load software on a DRT4311B with the LED disabled. The LED provides important information about the status of the software load that will not be available with the LED disabled. To enable the LED, refer to View System Configuration > Hardware > ***Status_LED***. The LED is enabled by default.

See the ***Network Configuration using Yukon4k*** for information on networking.

You must have administrator privileges to install on the controller PC. No special privileges are required to load / update system software on the unit. The *DRT4300B System Software* CD contains *Galena* GUI software, DRT4300B system software, and supporting tools.

NOTE: If you have changed the DRT unit user and administrative passwords and you need to install software issued before the password change option was instituted, you will have to restore default user and administrative passwords before installing the software. See the ***Restore Default Passwords*** section and follow the instructions before installing software issued before the password change option.

3.3.1. Install Software: DRT4300B System Software CD

The *DRT4300B System Software* CD can install / update the GUI on a controller PC and the embedded (system) software on aDRT4311B unit.

NOTICE

The controller PC must be connected to the DRT System when GUI software is installed/updated. During installation, the software checks the connected system to obtain information about the options available on that system. The software then installs support for those options on the controller PC so that the PC can properly control the unit. Options do not transfer between units.

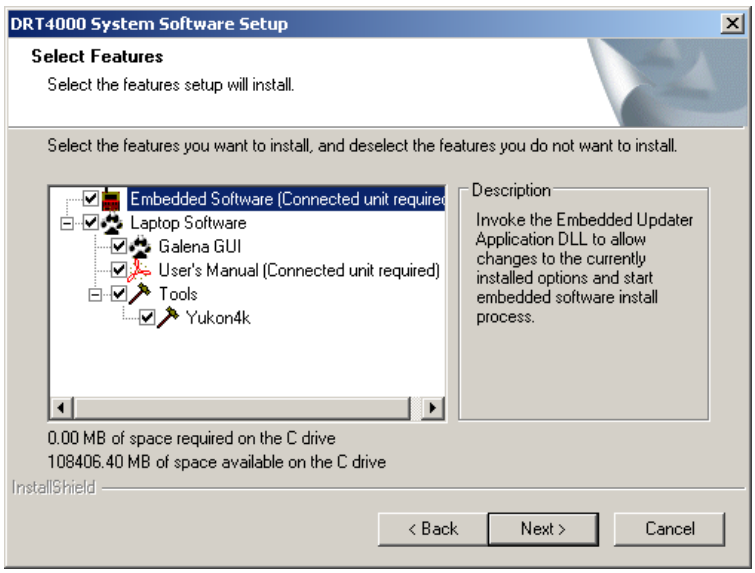
As an example, if unit 1 is configured for options 1, 2, & 3, those options will be installed on the controller PC. The PC can then control the unit in those areas. If the PC was later moved to a different unit that is configured for options 1 & 2, the software could control the unit in the areas of options 1 & 2 and the software for option 3 would be available on the PC,

but the new unit would not have this feature.

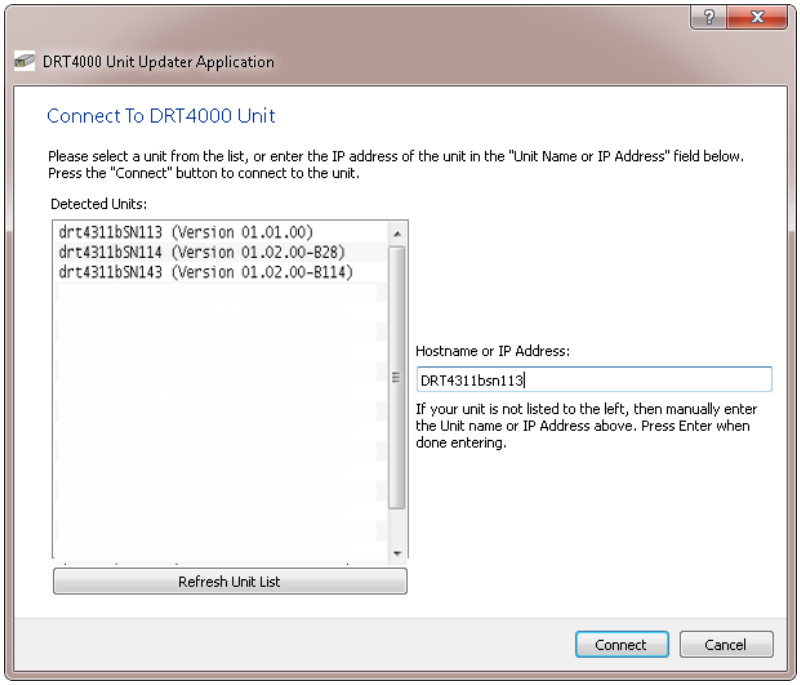
As a second example, if the controller PC, configured for a unit with options 1, 2, & 3, was connected to a unit configured for options 1, 2, 3, & 4, the PC could control the unit for options 1, 2, & 3, but option 4 would not be available.

The screenshots shown below were taken using a particular version of the Windows Operating System (OS) on a PC. If your PC has a different OS (for example, Windows XP vs. Windows 7), the screenshots may look different and have selections such as "Back" displayed in different locations; however, there should be NO difference in the available selections.

- Connect the controller PC to the unit to be used for the installation. Apply power to the PC and then to the unit.
- Insert the CD into the disk drive and the installation wizard will load automatically if autoplay is enabled. If autoplay is not available, navigate to the CD and run *Setup.exe*. The first window is a welcome window. Click **Next.** The second window is the DRT Licensing Agreement. Read carefully then select **I accept the terms of the license agreement** and click **Next**.
- On the next window, select to **Install DRT4000 System Software** (you may also select to uninstall software from this window).
- On the next window select any or all of the following:
    - **Embedded Software** – Updates the existing system software on a DRT4311B with the version contained on the *DRT4300B System Software* CD.
    - **Laptop Software** – Installs/updates the GUI-related items to the controller PC with the following options:
        - **GUI** – Installs the version of GUI on the *DRT4300B System Software* CD.
        - **User's Manual** – Installs a user manual on the PC. The manual installed reflects the options of the unit connected to the PC at the time.
    - **Tools** – Installs/updates the system tools to the controller PC with the following options:
        - **Yukon4k** – Installs *Yukon4k.exe*, a software utility for managing the unit's IP address
- Click ***Next***.

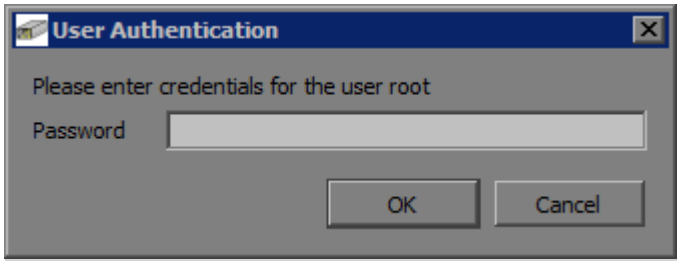


- The **Connect to DRT4000 Unit** window will display a field with a list of the units detected by the controller PC. This list may not contain all of the available units if a unit was in the process of booting up or if you are connected to a network where some units are masked by a router or other hardware.
    - If the desired unit is displayed, select that unit to automatically place the unit information in the **Hostname or IP Address** field.
    - If the unit is not displayed, click the **Refresh Unit List** button to check for any additional units that might have just come online or, if the unit's serial number or IP address is known, enter that information in the **Hostname or IP Address** field. The format is either the standard IP address format of XXX.XXX.XXX.XXX or the unit name such as drt4311bsnxxxx where xxxx is the unit serial number. Click **Connect**.



User Authentication

If you have changed the root user password, you will need to log into the unit before connecting to it using the new root user password. The following **User Authentification** dialog appears:



- **Unit Options**: The setup software will connect to the unit and obtain information about which options are enabled on that unit. (If you have elected not to load the embedded software, you will go directly to the step where the GUI is installed.) The unit's options are maintained in an Options File stored on the unit and the window displays the options currently available on the unit. At this time, you can either accept the configuration of the options currently installed or select to update the Options File on the unit.
    - To use the current options, click **Next**.
    - To change the options, contact DRT for a new Options File. More details are provided in ***Updating the Unit's Option File***, below. When the Options File is available, click **Paste**

Options File if the update information was forwarded as text in an email or click **Load New Options File** if the information was forwarded as a .KEY file.

NOTE: You must elect to load the embedded software if you are updating the Options File.

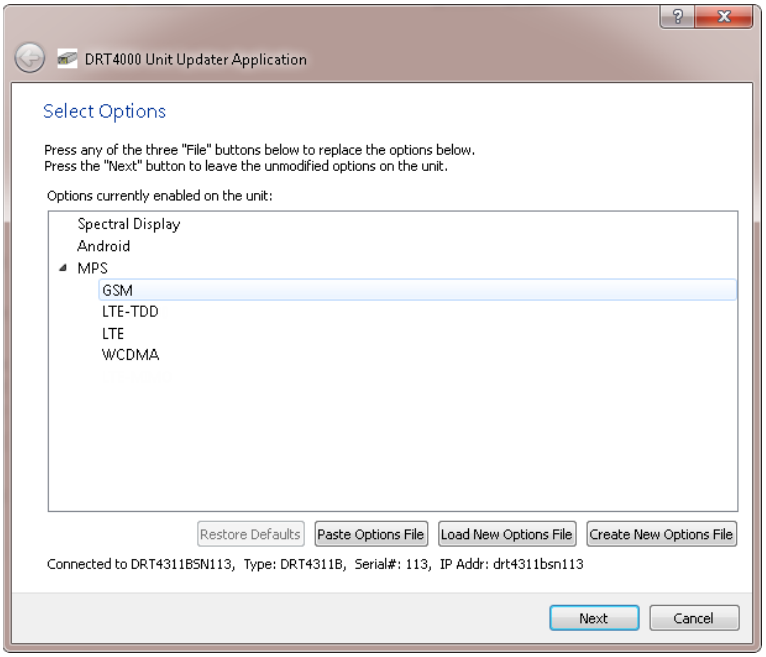
If you do not have access to email, you will need to contact DRT Customer Support and they will talk you through the update process. While on the phone with DRT Customer Support, advance to the point where you select the method of loading the update and click **Create New Options File**.

- Option Dependencies: If an option is not present on the unit, it will not be listed.

Android Option Note: If the Android option is not listed, the **Android App Publication** page discussed below will not be shown.

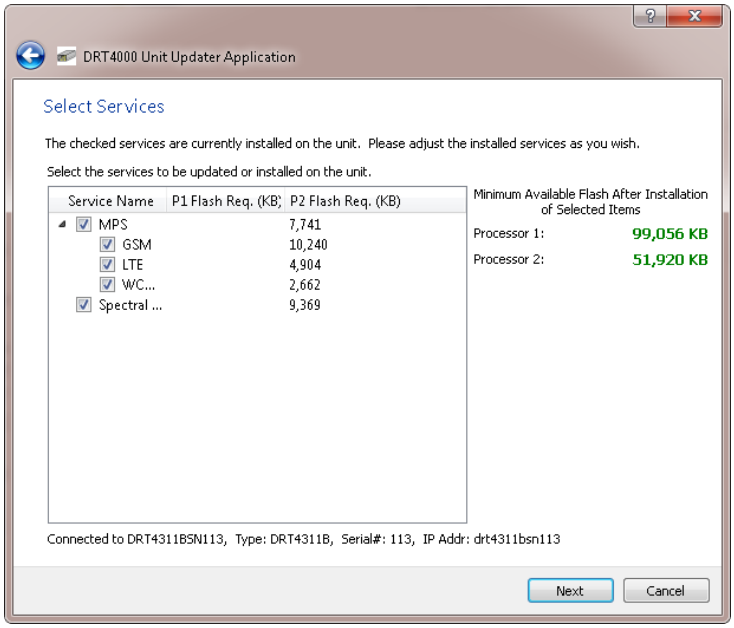
Power Spectrum Tool (PST) Option Note: Like all MPS options, if the PST option is not listed, it will not appear on the MPS Configuration Wizard Scan Configuration page if/when MPS is configured.

Click **Next** and the selected options will appear again for confirmation, this time the text for enabled options is bolded. Click **Next** again to accept these selections.



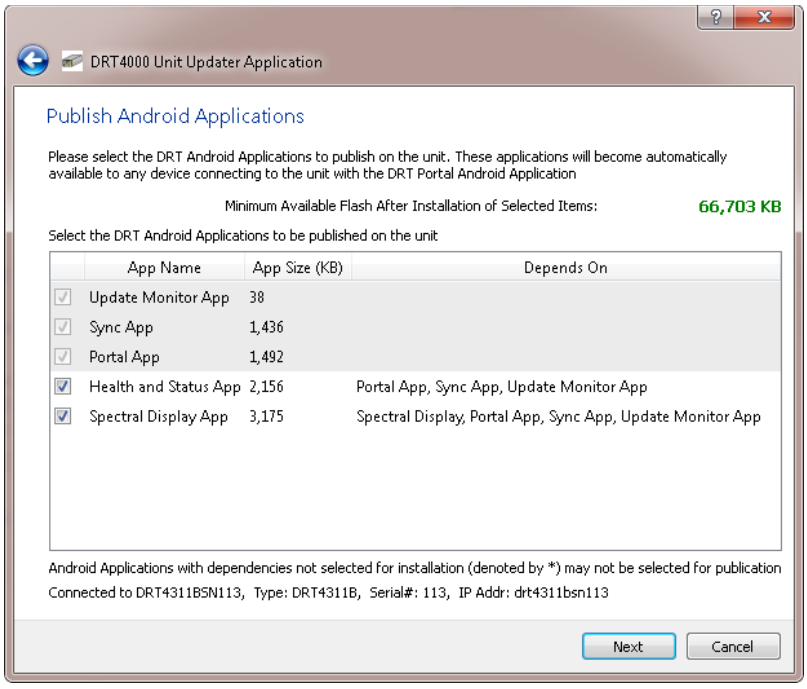
- **Select Services, Publish Android Applications, and Summary Page**

Select Services: The next window is **Select Services**. Here you may select from the services available for your unit. Check the desired service(s) and click **Next**.



Publish Android Applications: If the Android option is enabled on this unit, an additional page called **Publish Android Applications** will appear after the **Select Services** page. Which Android applications may be installed is dependent on the other options enabled and selected on previous pages.

- At this time, these are the Android applications which may be "published": Update Monitor, Sync, Portal, and SDU. Note that the SDU Android application requires that all of the other Android applications be selected, so selecting **SDU App** will automatically select all of them.
- Some Android applications require that a particular service be installed on the unit. For example, for the SDU Android application to be available, the SDU service must also have been selected on the **Select Services** page above. So if SDU was not selected, the **SDU App** option will not be available. The **Depends On** column will indicate which items an Android App requires. If a required service was not selected for installation, there will be an asterisk ***** in the **Depends On** column next to the service name.
- Applications that you may not select or deselect will have a **gray background.**
- Click **Next.**



Summary page: A summary of the options you selected above is presented. If you did not select something under a main group heading, that heading will not be shown either. For example, if no Android applications were selected, then the title line Android Apps will not be listed.

Click **Install** to begin the installation process. If selected, the installation of files on the unit and the controller PC will begin. During the software installation process, various windows will appear to let you know what the installation process is doing.

NOTE: A complete install of embedded software can take as long as fifteen minutes, depending on what files need to be updated and the connection speed.

Once the installation process has begun, do NOT turn off or disconnect the unit from the PC. However, should power be lost to the unit or the PC or should you lose the USB / Ethernet connection from the PC to the unit, you will need to repeat the installation from the beginning. If the options had been updated, they should be OK unless the loss of power / connection occurred while the options were being updated. Verify that the unit's options are correct and update if necessary.

- Following installation of the embedded files, the **Complete Software Update** dialog will give you the option of viewing and/or saving a log file of the install. You may view it now and then continue on by clicking **Cancel**, otherwise, click **Next** and then click **Finish** to continue with the installation process.
- If you selected to install the GUI, the selected documentation will now be installed on the controller PC. You will be prompted to select a **Program Folder**: Accept the default destination folder or browse to a new location then click **Next**.
- The software will be installed / updated and the selected documentation will be added / updated. When the installation is complete, click **Finish**.

3.3.2. Updating the Unit's Options File

An "Options File" defines what options this particular DRT system has. Each unit has a unique Options File identified by the unit serial number and Options File Version Number. This Options File resides on the DRT system. The unit's baseline Options File was installed prior to shipment from DRT. However, requirements can change and it may be necessary to add or remove options on a unit. If a change in options is required, contact DRT to obtain an updated file. The file can be forwarded to you as a .KEY attachment to an email (if allowed), as text in an email, or you can obtain update information during a phone call to DRT Customer Support.

If, during the ***CD Install Software: DRT4300 System Software CD***, you find that you need to change the unit's options, contact DRT Customer Support and indicate the changes in the unit's Options File that you require. DRT can email you back the file or file information or Customer Support can pass the information via a phone call and you can continue with the update.

NOTICE

The Options File includes: the Install Context version number, the unit model number, the unit serial number, and the codes to designate the available options. (To view these items, open the .KEY file using Notepad or view the contents of the email with the options file included.)

NOTE: The Options File canNOT be installed:

- On a unit with a later Install Context number. (Options File with Install Context number 3 will not load on a unit that has Install Context version 4 or greater installed on it.)
- On a unit with a different serial number. (An Options File for DRT4311B, serial number 10, will not install on DRT4311B, serial number 11.)
- If the contents of the Options File has been changed. (An Options File will not load if any of the contents within the file have been changed.)

3.3.2.1. Installing the Options File Update

To change or upgrade unit options:

1. If the updated Options File was sent as a .KEY attachment to an email, save that file on a local drive. It will be installed later.
   - or -
   If the file was sent as text as part of an email, highlight the Options File portion of the text of that email and copy it to the clipboard. It will be retrieved later. A sample Options File text portion of an email message is shown below.

Sample Options File

```
<?xml version="1.0" encoding="UTF-8"?>
<OptionsFile xmlns:xs="http://www.w3.org/2001/XMLSchema-instance">
  <SignedData>
    <OptionFileVersion>2</OptionFileVersion>
    <UnitInfo>
      <Model>DRT4311B</Model>
      <SerialNumber>8</SerialNumber>
      <InstallContext>1</InstallContext>
    </UnitInfo>
    <Options>
      <Category id="Software Options">
        <ThirdPartySigning>1</ThirdPartySigning>
        <Features>
          <EnabledFeature Id="17766BCF-D432-4EAB-ADEF-F831C78C3A3F">
            <SubFeature/>
          </EnabledFeature>
          <EnabledFeature Id="33113112-DB89-4F2A-A3A4-7BBD0202D459">
            <SubFeature>
              <EnabledFeature Id="142970C7-4894-48F4-B2E3-0DE6B01C14CE">
                <SubFeature/>
              </EnabledFeature>
              <EnabledFeature Id="BE041665-35D7-419E-A5F6-2B4465ADFBB5">
                <SubFeature/>
              </EnabledFeature>
            </SubFeature>
          </EnabledFeature>
          <EnabledFeature Id="47BD203B-32BE-4BA1-A161-43B05A0D2FF9">
            <SubFeature>
              <EnabledFeature Id="443BBAF2-416C-4334-BD49-72E44B01092F">
                <SubFeature/>
              </EnabledFeature>
              <EnabledFeature Id="CA3575F9-BBC4-44F2-84F7-041D19F637CA">
                <SubFeature/>
              </EnabledFeature>
            </SubFeature>
          </EnabledFeature>
        </Features>
      </Category>
    </Options>
  </SignedData>
  <Signature>AFJ47IED5DGH66C6UUTRDNB6O3SVFPW5</Signature>
  <ThirdPartyOptions>
    <Features>
      <EnabledFeature Id="33113112-DB89-4F2A-A3A4-7BBD0202D459">
        <SubFeature>
          <EnabledFeature Id="BE041665-35D7-419E-A5F6-2B4465ADFBB5">
            <SubFeature/>
          </EnabledFeature>
        </SubFeature>
      </EnabledFeature>
      <EnabledFeature Id="47BD203B-32BE-4BA1-A161-43B05A0D2FF9">
        <SubFeature>
          <EnabledFeature Id="CA3575F9-BBC4-44F2-84F7-041D19F637CA">
            <SubFeature/>
          </EnabledFeature>
        </SubFeature>
      </EnabledFeature>
    </Features>
  </ThirdPartyOptions>
  <ThirdPartySignature>CCHOW57X64URCIR7OJ6OG3CPWZIDFLFH</ThirdPartySignature>
</OptionsFile>
```

Unit Model Number

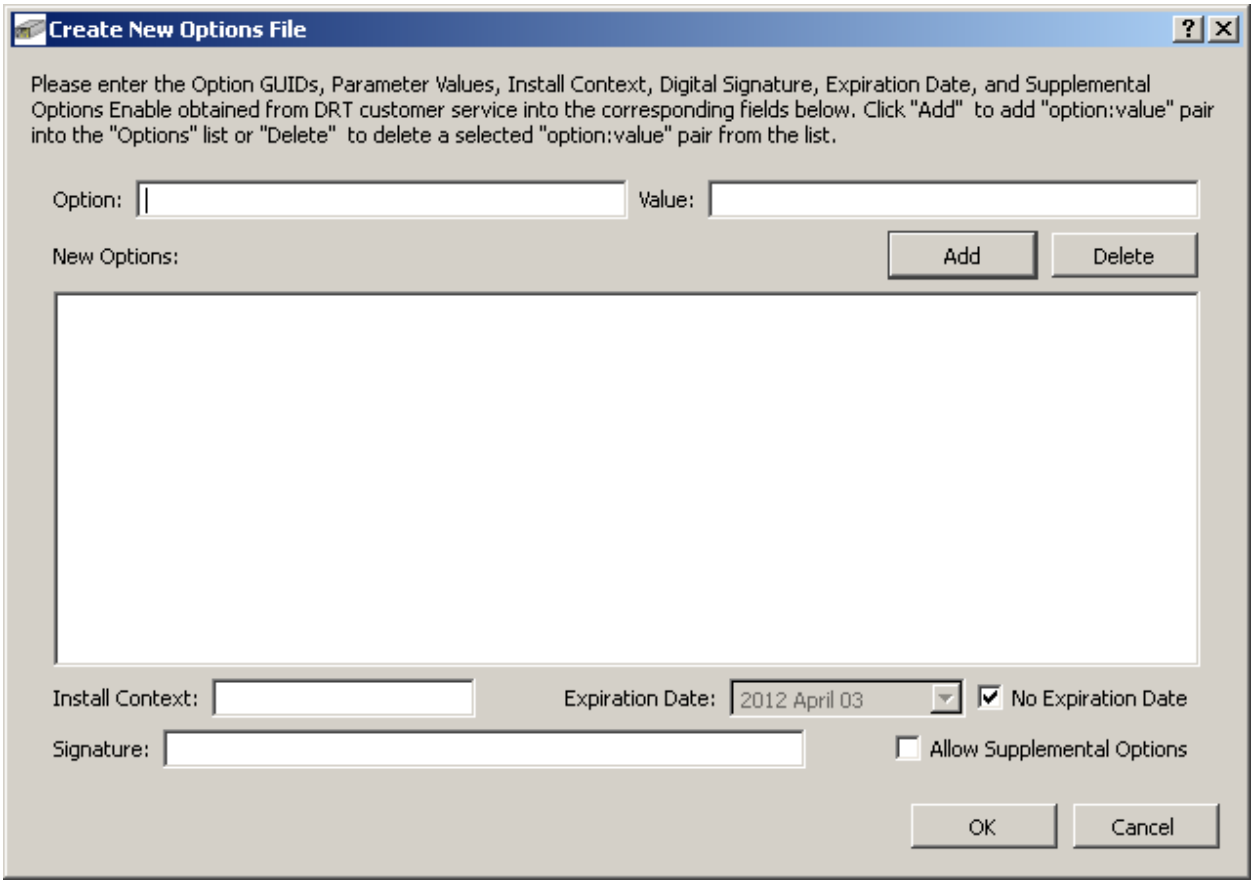
Unit Serial Number

Install Context Version Number

- or -

If an updated Options File is not available, contact DRT Customer Support at ***DRThelp@drti.com;***Toll Free 855-205-6027 (or 301-916-5554 ext. 567) to obtain the alphanumeric codes.

2. Follow Steps 1 through 5 of ***Install Software: DRT4300 System Software CD***, as shown above.
3. At **Select Options**:
   If you received a file contained in a text email, click **Paste Options File** and proceed to Step 4 or
   If you received a .KEY file, click **Load New Options File** and proceed to Step 6 or
   If you are obtaining the options information via phone call, click **Create New Options File** and proceed to step 8.
4. If you selected **Paste Options File**, the next window will be **Paste New Options**. At this time, you should have pasted the options portion from the text message to the clipboard. Click **Paste from Clipboard** at the bottom of the screen. The Options File portion of the email that you copied to the clipboard is now displayed in the **Paste New Options** window.
5. Click **OK**. The software will validate the file for use with the attached unit and will update the unit's Options File.
6. If you selected **Load New Options File**, the next window will be **Open New Options File**. Navigate to the location where you stored the options .KEY file. Highlight the new options file and click **Open**.
7. The software will validate the file for use with the attached unit and will update the unit's Options File.
8. The **Create New Options File** dialog will appear. DRT Customer Support will help you fill in the fields until all fields have been filled out and you click **OK**.



3.4. Remote Server Configuration

If you intend to save files to a remote server, you may need to configure that server.

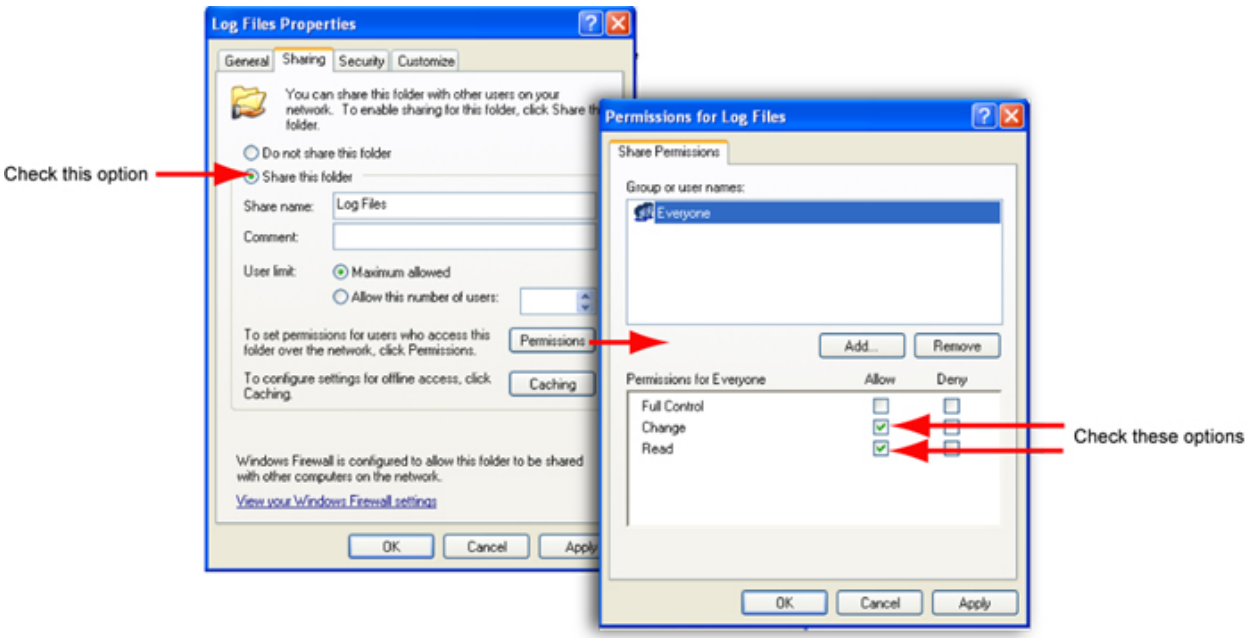
3.4.1. Set up a Windows XP Remote Server

Windows XP SP2 added security to protect a computer from unauthorized access. This security prevents the DRT unit from saving log files to that computer. The solution is to configure the *WINXP* computer so that it will allow the DRT unit to save to one of its directories. The steps are outlined below.

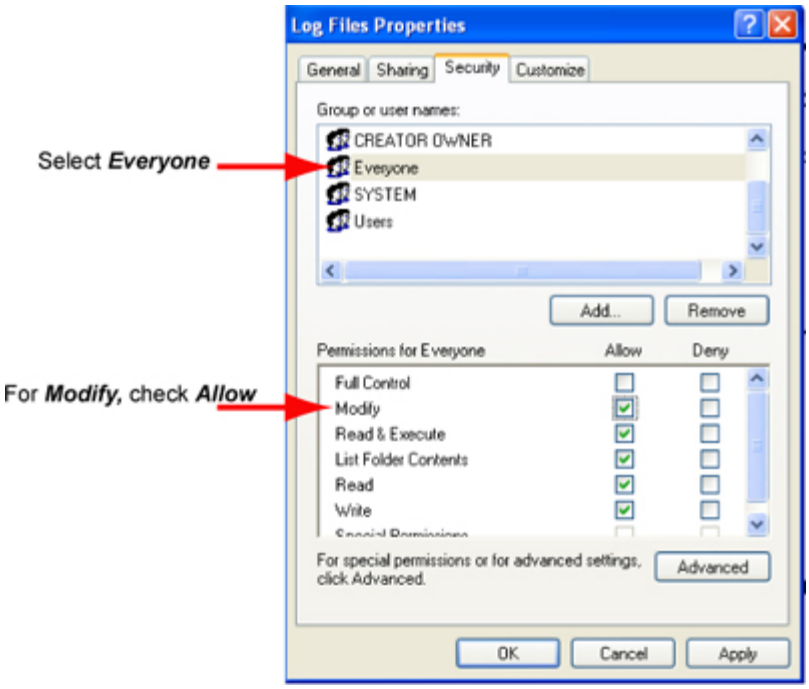
Note that these steps do not apply to a network server. To save to a network server, consult your network administrator.

Create a Shared Directory:

1. Open *Windows Explorer* and create the target directory on the local computer.
2. Right-click the directory icon and select **Properties** from the popup menu.
3. Click the **Sharing** tab.
4. Check the **Share this folder** box.
5. Click the **Permissions** button.
6. Under **Group or user names**, select **Everyone**. (If the **Everyone** user is not present click the **Add** button. In the **Enter the object names to select** box, type **Everyone** and click **OK**.)
7. With **Everyone** selected, in the **Permissions for Everyone** box, set **Change** and **Read** so that **Allow** is checked. Click **OK**.

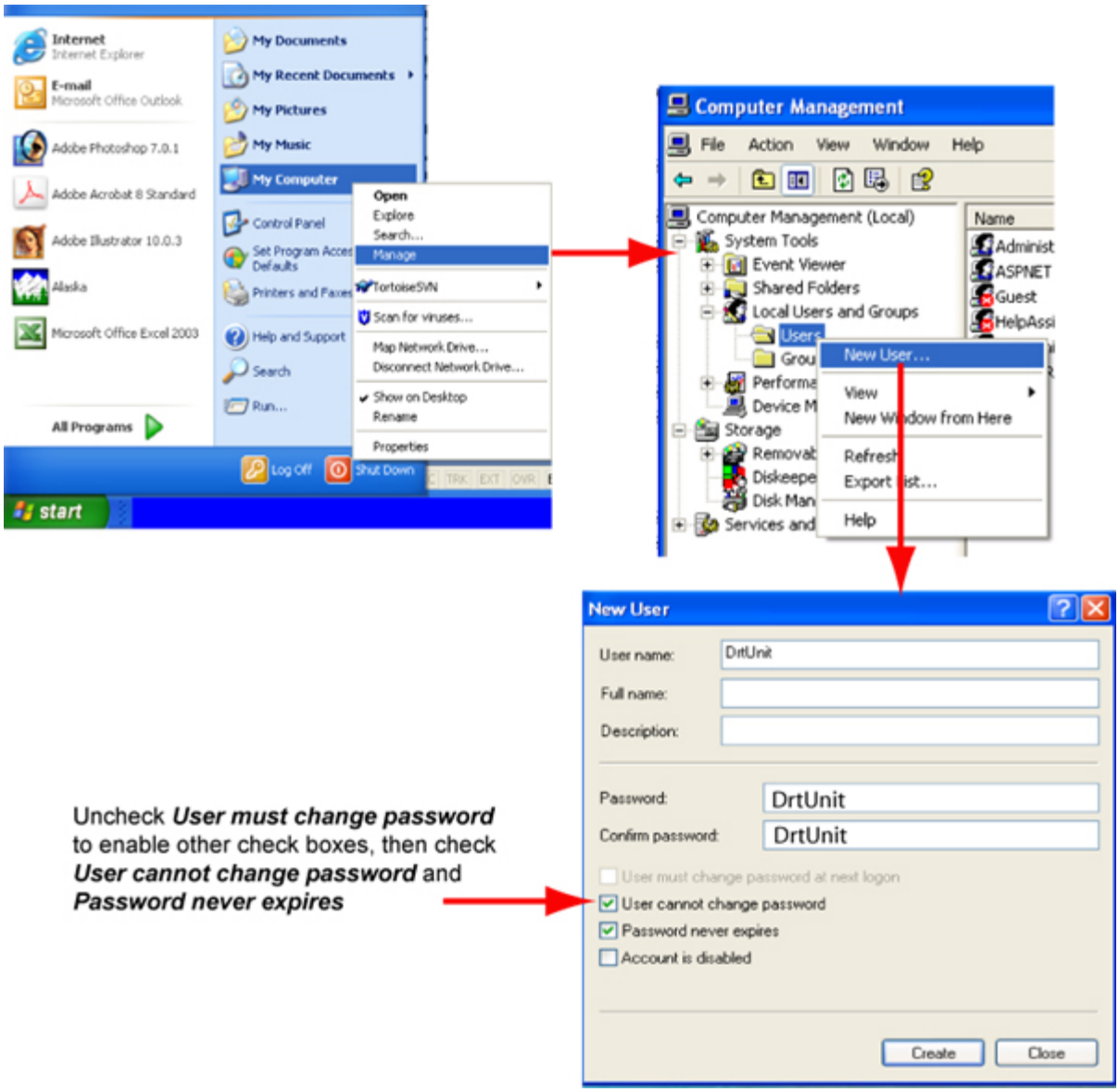


8. Click the **Security** tab and then select **Everyone**. If **Everyone** is not present, click **Add** and add **Everyone** using the same procedure as above.
9. With **Everyone** selected, in the **Permissions for Everyone** box, check **Allow** for the **Modify** box and click **OK**.



Add the DRT Unit as a user:

10. From the *Windows* **Start** menu or on the *Windows* desktop: right-click **My Computer** and select **Manage** from the popup menu.
11. Expand **System Tools** by clicking the **+** symbol.
12. Expand **Local Users and Groups** by clicking the **+** symbol.
13. Right-click the **Users** folder and select **New User...** from the popup menu.
14. Enter *drtunit* in the **User Name** field.
15. Enter D*rtUnit* in the **Password** and **Confirm Password** fields.
16. Uncheck the **User must change password at next logon** box.
17. Check the **User cannot change password** and **Password never expires** boxes.



18. Click the **Create** button.
19. Click the **Close** button.
20. Close the **Computer Management** dialog.

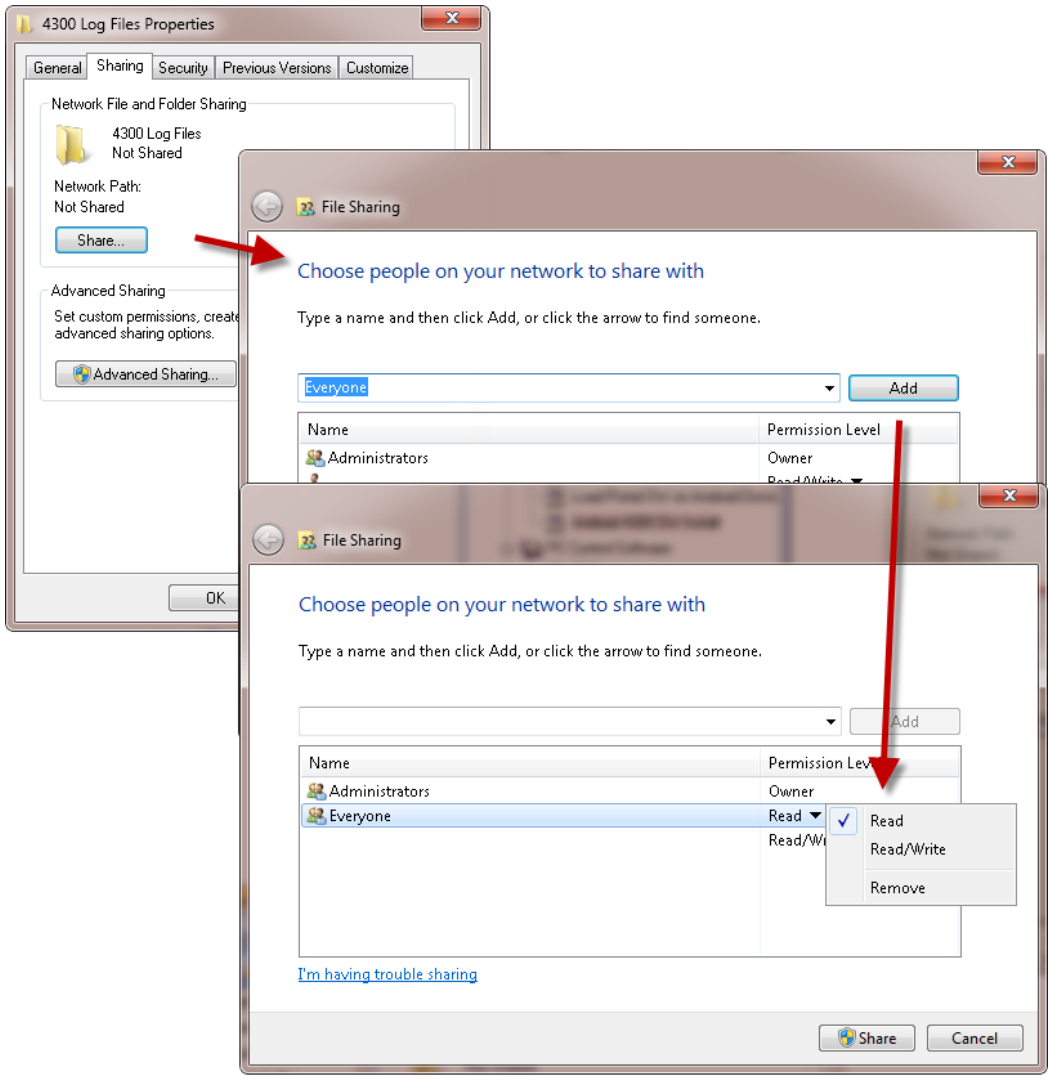
3.4.2. Set up a Windows 7 Remote Server

Windows 7 has security to protect a computer from unauthorized access. This security prevents the DRT unit from saving log files to that computer. The solution is to configure the *WIN7* computer so that it will allow the DRT unit to save to one of its directories. The steps are outlined below.

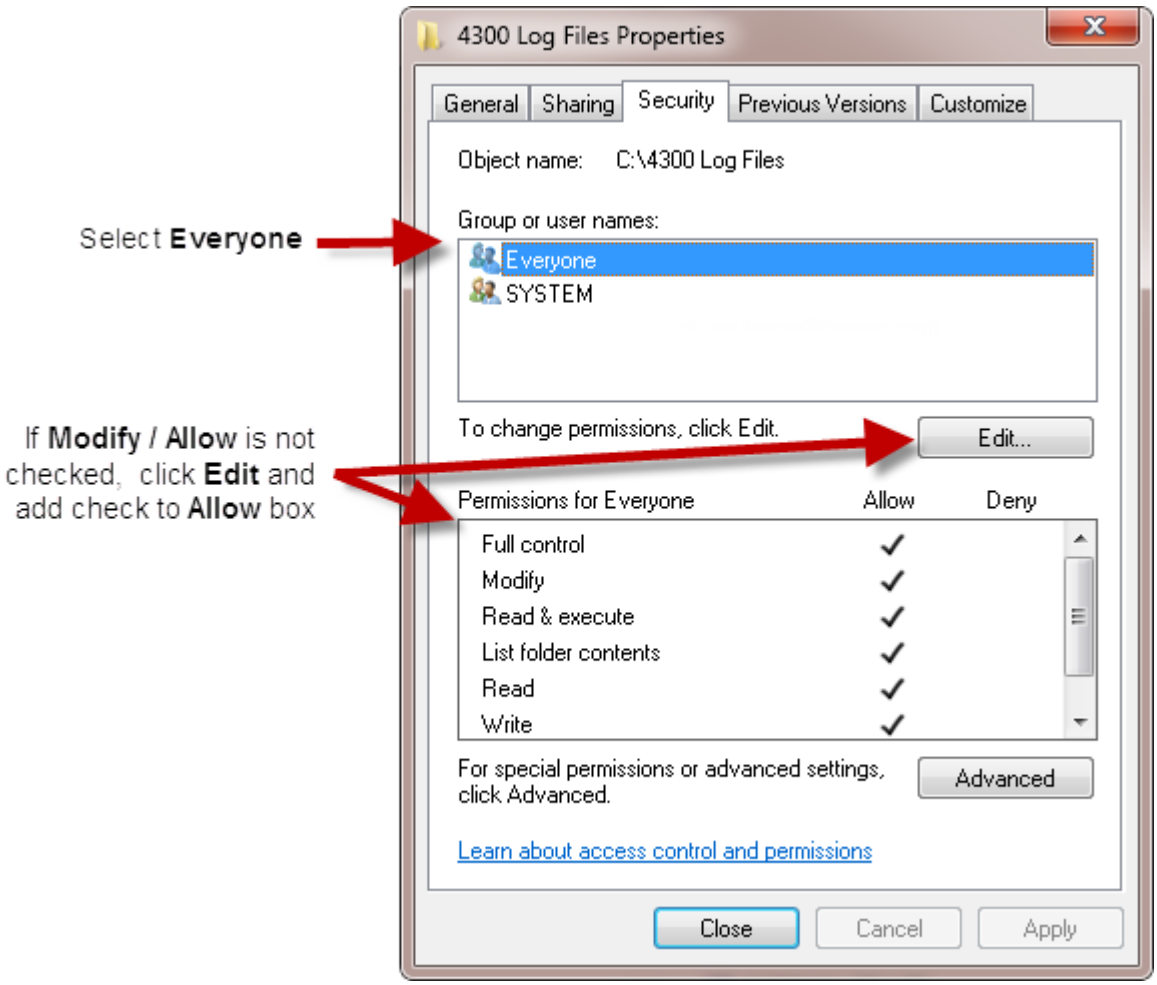
Note that these steps do not apply to a network server. To save to a network server, consult with your network administrator.

Create a Shared Directory:

1. Open *Windows Explorer* and create the target directory on the local computer.
2. Right-click the directory icon and select **Properties** from the popup menu.
3. Click the **Sharing** tab.
4. Click the **Share** button to open **File Sharing / Choose people on your network to share with.**
5. Using the pull-down arrow beside the **Add** button, open and select **Everyone**. **Everyone** will be added to the field below with a **Permission Level** of **Read**.
6. Click the **Permission Level** box and select **Read/Write**.
7. With **Everyone** selected and **Permission Level** set to **Read/Write**, click **Share**
8. The **Choose people** dialog will be replaced with **Your folder is shared**. Click **Done** to return to the **Properties** page.

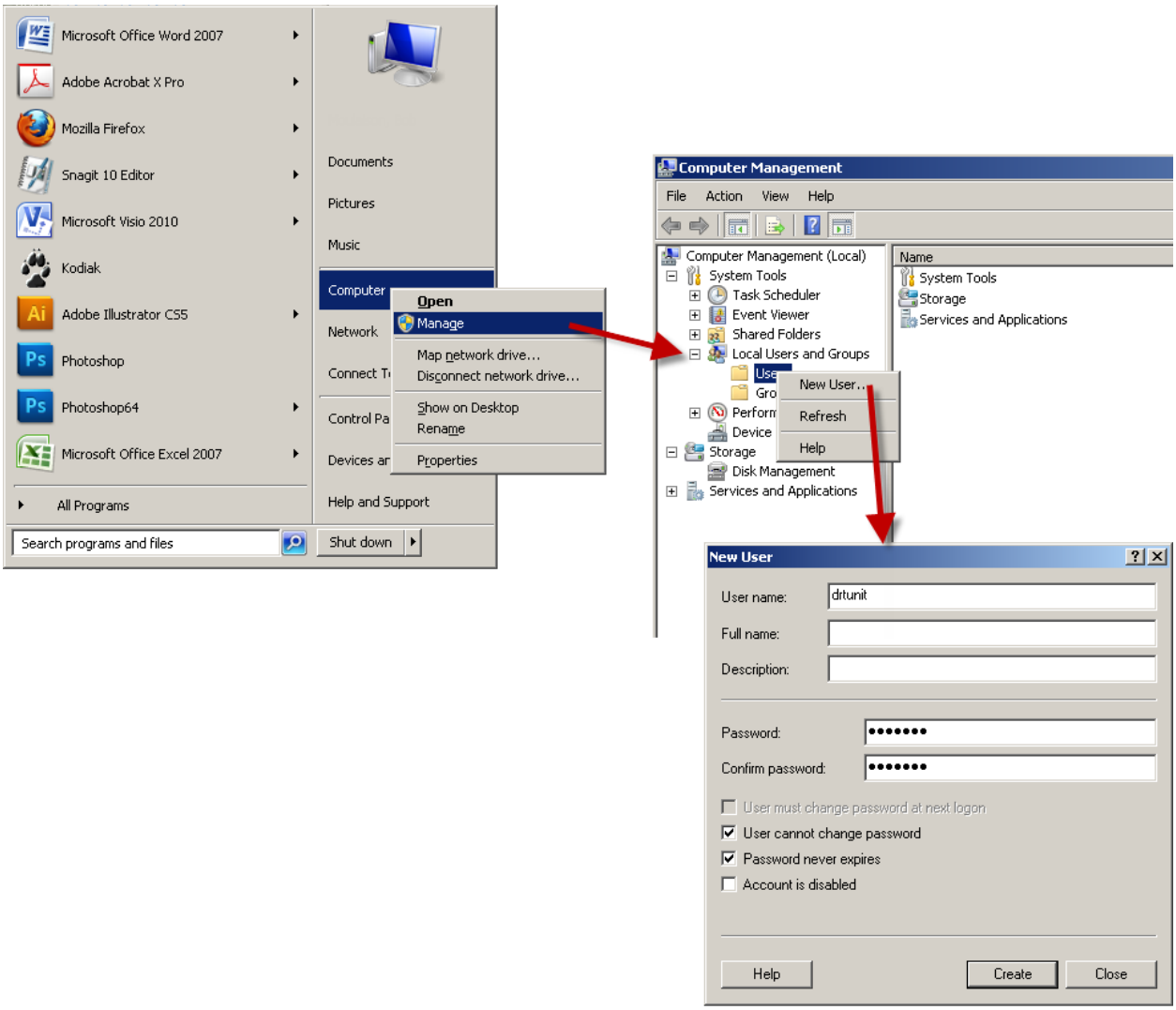


9. Click the **Security** tab and then select **Everyone**. If **Everyone** is not present, click **Add** and add **Everyone** using the same procedure as above.
10. With **Everyone** selected, in the **Permissions for Everyone** box, check **Allow** for the **Modify** box and click **OK**.



Add the DRT Unit as a user:

11. From the *Windows* **Start** menu: right-click **Computer** and select **Manage** from the popup menu.
12. Expand **System Tools** by clicking the **+** symbol.
13. Expand **Local Users and Groups** by clicking the **+** symbol.
14. Right-click the **Users** folder and select **New User...** from the popup menu.
15. Enter d*rtunit* in the **User Name** field.
16. Enter *DrtUnit* in the **Password** and **Confirm Password** fields.
17. Uncheck the **User must change password at next logon** box.
18. Check the **User cannot change password** and **Password never expires** boxes.



19. Click the **Create** button.
20. Click the **Close** button.
21. Close the **Computer Management** dialog.

3.5. PC Control Connection via USB

Instructions on connecting the PC to the DRT unit using Ethernet can be found in the section ***Connecting to a Unit***. The following procedure describes how to connect a controller PC to control a DRT4311B unit using USB. The *Windows* 7 procedure differs from the *Windows* XP procedure and each will be handled separately.

NOTE: Both the *Windows* 7 procedure and the *Windows* XP procedure configure only the controller PC's USB port to which the DRT unit is connected. If, at a later date, the DRT unit is connected to a different USB port on that PC, it will be necessary to reconfigure the PC's network connection for the new port.

Required cable: USB Type A to USB Mini-B.

NOTE: Although both a Mini-B and Mini-A cable could physically be used to connect to the DRT unit, we recommend that you use a Mini-B cable because the DRT unit is a client device in this configuration.

Windows 7 Configuration

1. Apply power to both the controller PC and the DRT unit.
2. Connect the controller PC to the DRT unit using a Type A (to controller PC) to Mini-B USB (to DRT unit) cable. Note which USB port on the PC is used for this connection.
3. After a short period, *Windows* will display that it is unable to install a driver for the device.
4. Click **Start**, right-click **Computer**, click **Manage**, and finally click **Device Manager**. The **Computer Management** window will be displayed.
5. One of the icons on the tree in the right panel has the label **Other Devices**. Under this icon will be a lower-level icon with a yellow triangle in the lower right with an exclamation mark in the center of the triangle. The icon's label will include **RNDIS/Ethernet Gadget.**
6. Right-click **RNDIS/Ethernet Gadget** and select **Update Driver Software**.
7. On the **Update Driver Software** window, select **Browse my computer for driver software**.
8. On the next window, click **Let me pick from a list of device drivers on my computer.**
9. The next window provides a field with a list of **Common hardware types**. Highlight **Network adapters** then click **Next**.
10. The next screen has two fields, **Manufacturer** (left field) and **Network Adapter** (right field).
    a. In the **Manufacturer** field, highlight **Microsoft Corporation**. (Note: this is not the same as the selection **Microsoft**.
    b. In the **Network Adapter** field, highlight **Remote NDIS based Internet Sharing Device**.
    c. Click **Next**.
11. An **Update Driver Warning** displays a warning about installing a device driver that *Windows* cannot verify that it is compatible. Click **Yes**.
12. Click **Start**, click **Control Panel**, and finally click **Network and Internet** (if configured as **View by: Category**) and then **Network and Sharing Center** or **Network and Sharing Center** (if configured as **View by: Large** or **Small icons**).
13. On the upper left side of pane, click **Change adapter settings**.
14. A **Network Connections** window will be displayed. The label for one of the displayed icons will include **RNDIS/Ethernet Gadget.** Right-click that label and select **Properties**.
15. A **Local Area Connection** window will be displayed. Double-click **Internet Protocol Version 4 (TCP/IPv4)**.

NOTE: The DRT unit factory-assigned (default) IP address is **192.168.2.100**. The PC's IP address can be between **192.168.2.1** and **192.168.2.255** with the exception that the PC's IP address canNOT be set to the DRT unit's IP address. In the next step, the IP address 192.168.2.101 is just an example.

16. Select **Use the following IP** address and, in the **IP address** field, enter **192.168.2.101**.
17. Press the TAB key to populate the **Subnet mask** field with **255.255.255.0**.
18. Click **OK**. Click **OK** again. Click **Close**. Close the **Network and Sharing Center.**
19. This completes the installation of the USB driver and the configuring of the network connection.

Windows XP Configuration

1. From the web site: ***http://code.google.com/p/beagleboard/downloads/detail?name=linux.inf***, download the file *linux.inf* to a location on the controller PC that is easily accessed.
2. Verify that the filename as stored on the PC is *linux.inf*.
3. Apply power to both the controller PC and the DRT unit.
4. Connect the controller PC to the DRT unit using a Type A (to controller PC) to Mini-B USB (to DRT unit) cable. Note which USB port on the PC is used for this connection.
5. When prompted for a driver, click **Have Disk** and direct the *Windows* search to the directory where you downloaded the *linux.inf* file.
6. Go to *Control Panel* then go to **Networking and Adapters**.
7. Right-click the connection labeled **RNDIS/Ethernet**.
8. Go into the **TCP/IPv4 properties**.

NOTE: The DRT unit factory-assigned (default) IP address is **192.168.2.100**. The PC's IP address can be between **192.168.2.1** and **192.168.2.255** with the exception that the PC's IP address can NOT be set to the DRT unit's IP address. In the next step, the IP address 192.168.2.101 is just an example.

9. Set the **IP address** to: **192.168.2.101.**
10. Press the TAB key to populate the **Subnet mask** field with **255.255.255.0**.
11. Click **OK**, then click **OK** a second time.
12. This completes the installation of the USB driver and the configuring of the network connection.

3.6. Install Software on Android Device

3.6.1. DRT43xxB System Requirements

The DRT43xxB system may be controlled using an Android device. The DRT43xxB system must be running software R01.02.xx or greater.

Diagrams showing what cables are required and how to connect the system to the Android device for operations are shown ***below***.

3.6.2. Android Device Requirements

The Android device must meet these requirements:

- Tested Models: Google Nexus 7 Tablet, Samsung Galaxy Nexus Phone, and Asus Transformer Prime Tablet.
- Android OS: 4.x. (NOTE: A problem has been identified that may prevent the use of some AT&T Smartphones.)
- Support USB connection: The USB connectivity *will NOT* work with any device that is not a Samsung, ASUS, HTC, LG, Motorola, Qualcomm, Sony, Sony Ericsson, or Google manufactured device.

Required Cables (not supplied):

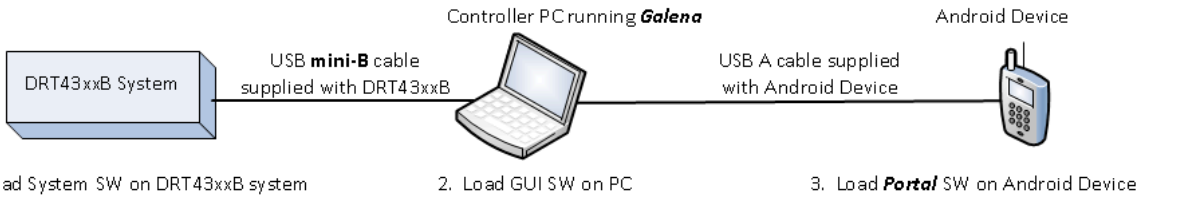
- USB A: to connect the PC to your Android device. Usually supplied with an Android device.
- USB Cable Adapter: A-to-mini-A to connect the DRT43xxB system to your Android device. The connector on the DRT43xx is a mini-A/B connector. The type of connector on the USB cable connections depends on whether the DRT43xx is acting as the host or the client. When connected to a PC, the PC is the host and a mini-B connector (supplied) is required. When connecting to an Android device, the DRT43xx is the host and a USB mini-A connection is required. Thus, you will need a USB A-to-mini-A adapter cable to connect from your Android device's USB A cable to the DRT43xxB.

3.6.2.1. PC Requirements for installing Portal

- PC must be running *Windows XP SP2* or later.
- PC must have *Windows Media Player 10 or later.* If you are running *Windows XP*, you will need to install *Windows Media Player 10* or later to enable Media Transfer Protocol (MTP). Otherwise, your Android device will be shown as unrecognized hardware by *Windows*.

3.6.3. Install Portal Application on Android Device

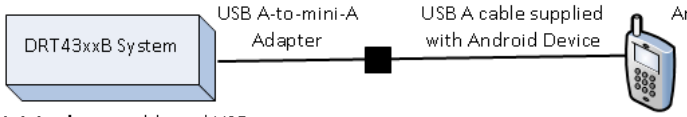
The diagram below shows the overall steps that will be required to load and use the *Portal* application. In general, it makes sense to load the system software and the GUI on the DRT43xxB system and the controller PC prior to loading the *Portal* application on the Android device.



1. Load System SW on DRT43xxB system
2. Load GUI SW on PC
3. Load **Portal** SW on Android Device

Must have **SERVICE**:
SDU

Must have **ANDROID APPS**:
Update Monitor
Sync
Portal
SDU



4. Use USB **mini-A adapter** cable and USB cable to connect DRT43xxB System to Android Device

5. ***Portal*** app on Android Device will open when the connection to the DRT43xxB is detected or open manually.

6. Select the desired Android App and begin mission configuration

3.6.3.1. Installing Portal onto on Android device for the first time

See ***above*** for the PC requirements.

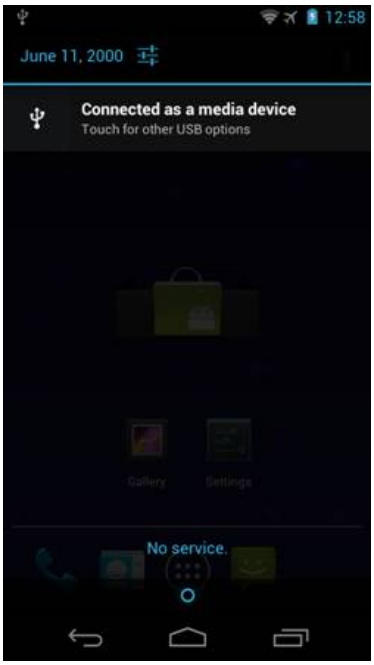
3.6.3.1.1. Hardware Connections

Using a USB cable (not supplied), connect the Android device to the PC.

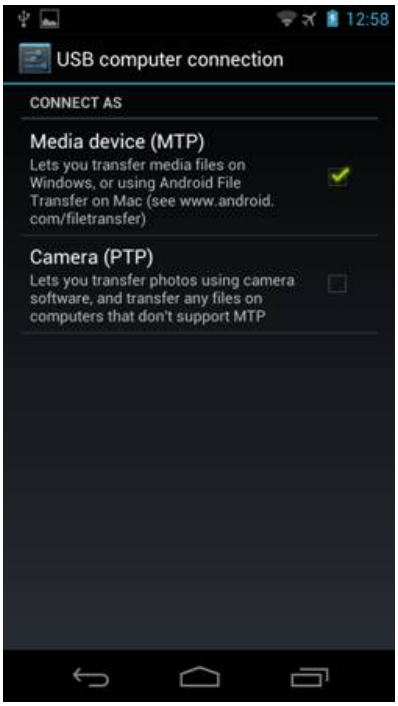
3.6.3.1.2. Install Portal

The images in this section are screenshots from a prototype GUI running on an Android device connected to a DRT4311B. Screens may look slightly different on different Android devices.

On the Android device, pull down the notification window from the top of the screen and find the USB connection.

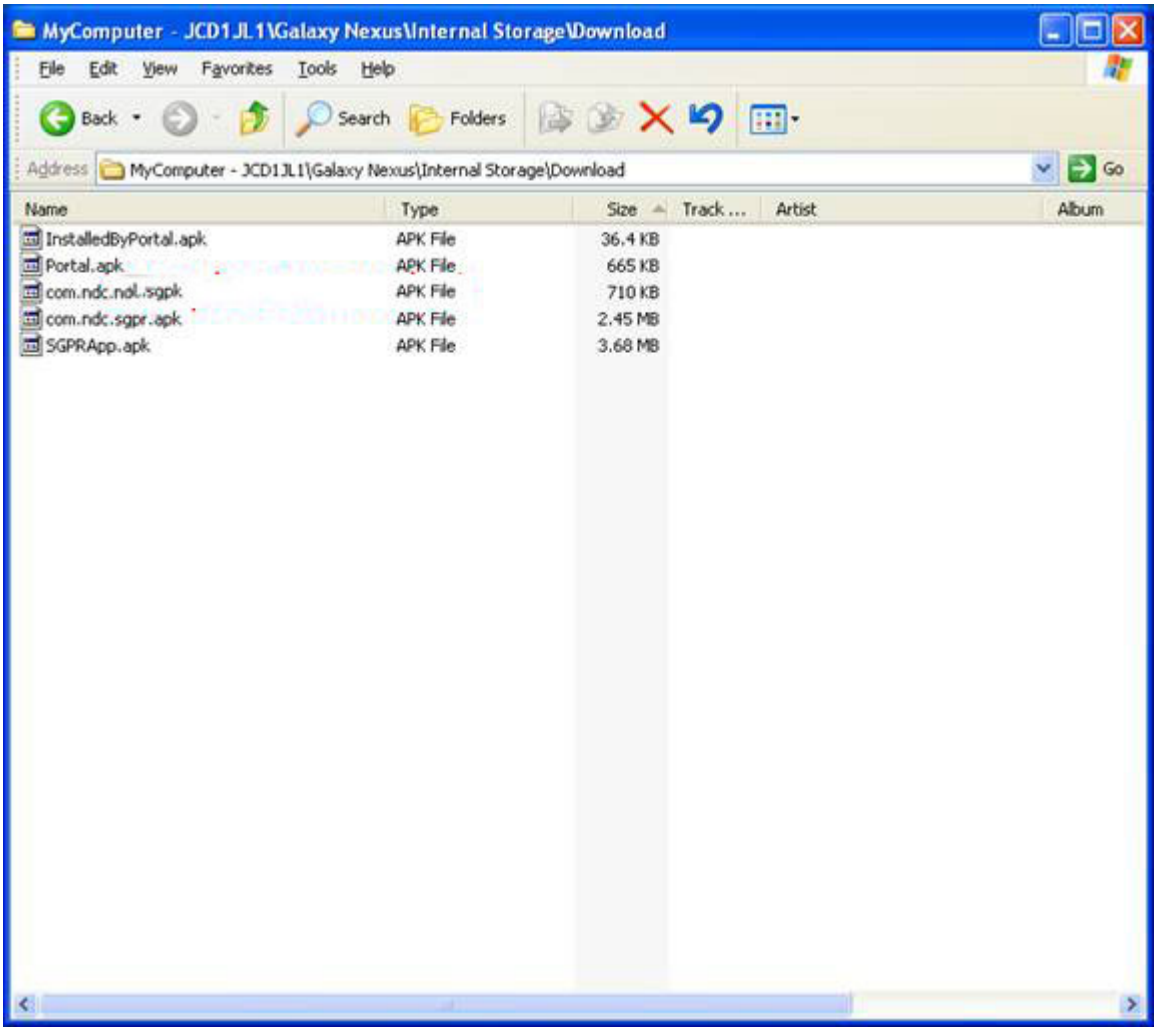


If the device is not connected as a media device, touch the connection and select **Media Device (MTP)**.



On the PC:

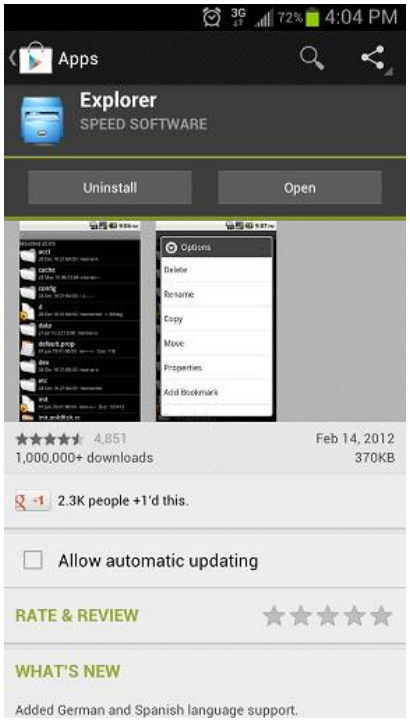
- Insert the DRT43xxB System Software CD in the CD/DVD drive. If the installation wizard starts, cancel it.
- Open My Computer or *Windows File Explorer* and find the Android device labeled as a Portable Media Player.
- Navigate to the Android device and then navigate to the Download directory (or another directory that you will remember).



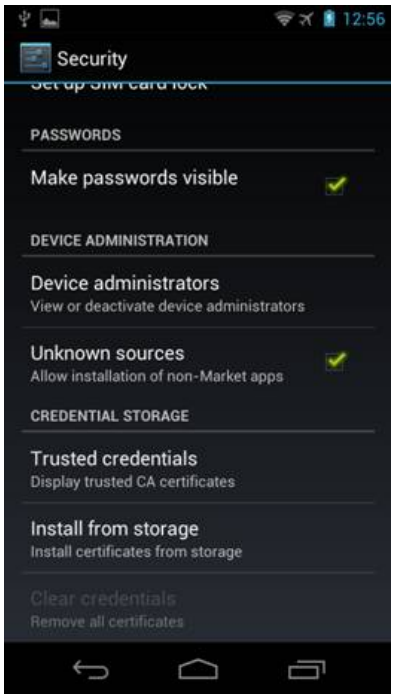
- Open another instance of *Windows File Explorer* (or My Computer):
  - Navigate to the DRT43xxB CD disk and navigate to the directory Utilities\Android.
  - Find the ***Portal apk*** file and copy it to the Android Device's Download directory you selected above.

On the Android device:

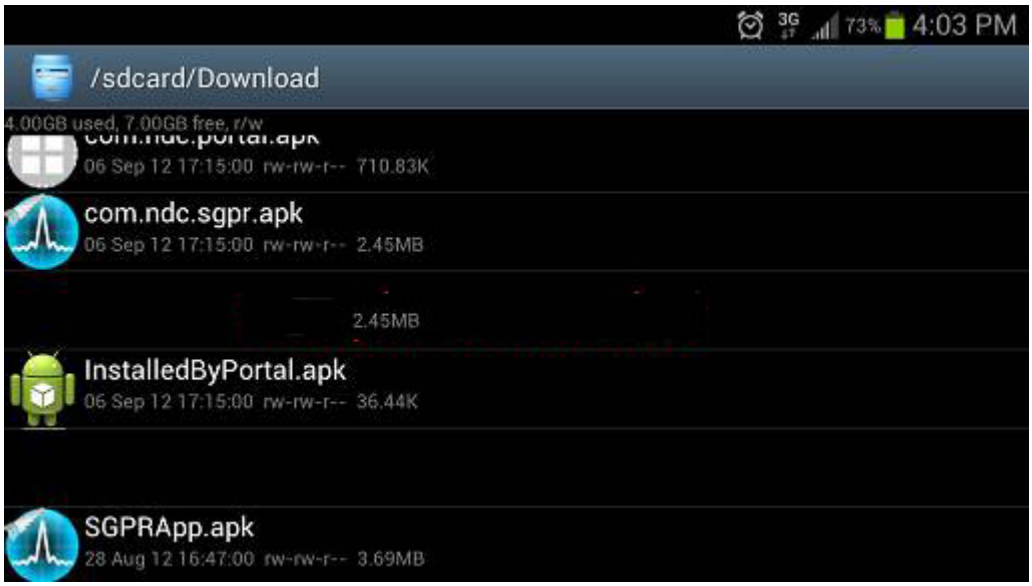
- Disconnect the USB cable from the Android device.
- On the Android device, launch the *Play Store* app and search for *Explorer* by Speed Software (https: //play.google.com/store/apps/details?id=com.speedsoftware.explorer). Obtain and install this application. (NOTE: This step requires an internet connection.)



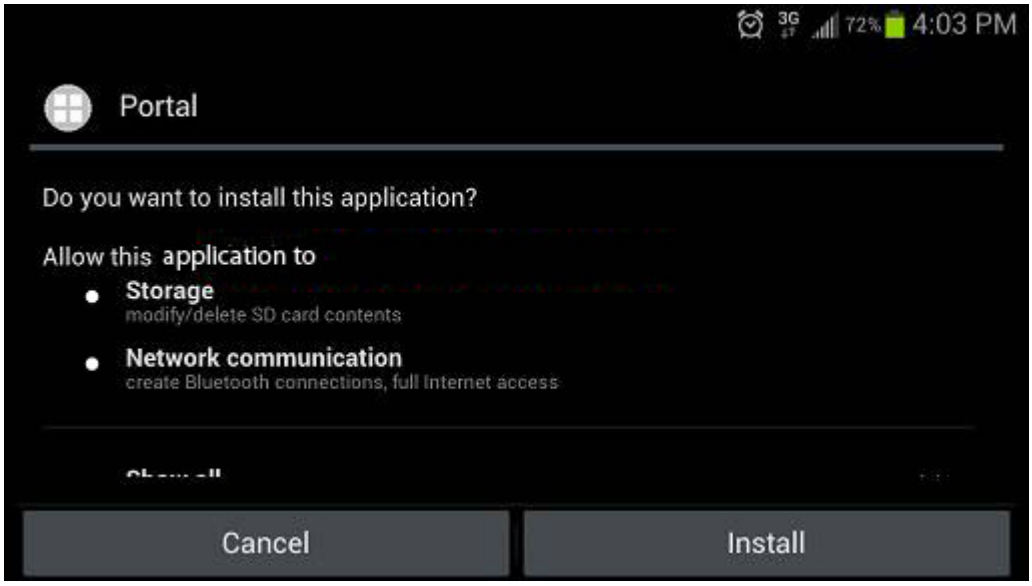
- Launch **Settings** from the app menu. Select **Security**, and check **Unknown Sources.** Confirm the selection by pressing **OK**.



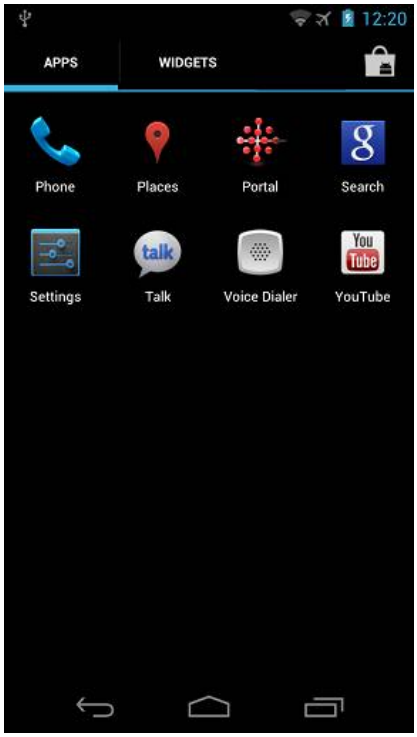
- Launch *Explorer* from the Android's app menu and navigate to the Download directory where you stored the ***Portal.apk*** file above. It may be located in “sdcard”.



- Select the ***Portal apk*** file, then select **Install** from the dialog.
- Press **Install** on the Android app install screen to install the application.



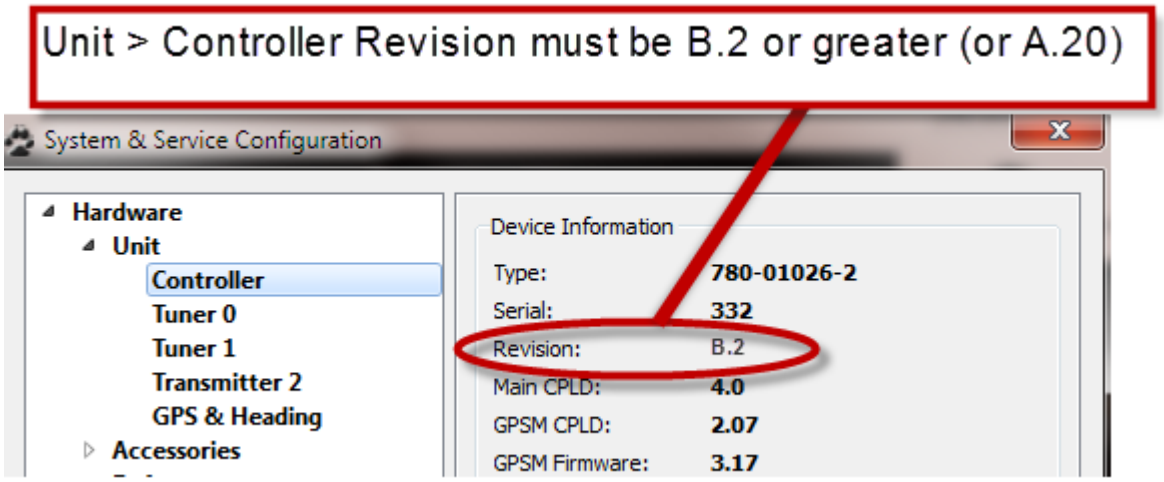
After the installation has completed, *Portal* should be an option on the Android's app menu.



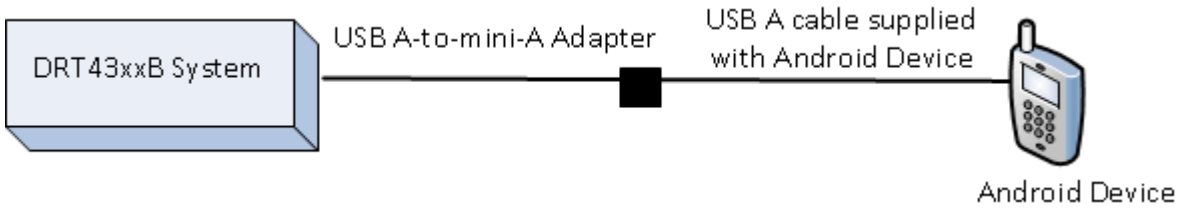
3.6.4. Connect Android for Operations

There are several methods for connecting the Android device to the DRT4300 in order to control the DRT system, but not all systems can do both.

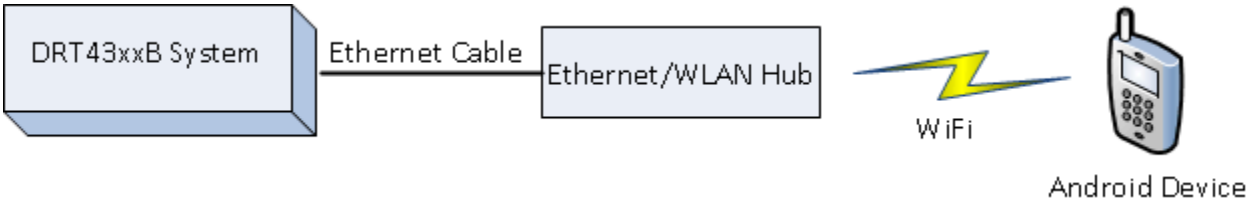
- WiFi
  - Requires the DRT43xxB system to have an Ethernet connector
  - Requires a hub that supports both Ethernet and WiFi connections
  - Requires Android device that supports WiFi
- Bluetooth - See the ***Bluetooth section*** for details. Also consult DRT for an application note on hardware configuration requirements.
- USB
  - Requires DRT43xxB system with Digital Board Rev. B.2 or greater (if it is a Rev. A board, it could be Rev. A.20) or a powered hub. To determine whether your system meets that requirement, connect to the system with *Galena* > from the main menu, select **Actions** > **View System Configuration** > on the left pane, under **Hardware** select **Unit** > **Controller**. On the right pane, the **Revision** field must say **B.2** or greater (or **A.20**).
  - Also note that a USB mini-A adapter cable is required as noted ***above*** under Android Device Requirements.



Connect to Android via USB

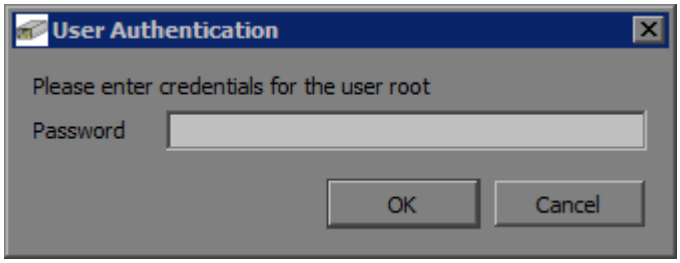


Connect to Android via WiFi



User Authentication

If you have changed the root user password, you will need to log into the unit before connecting to it using the new root user password. The following **User Authentification** dialog appears:



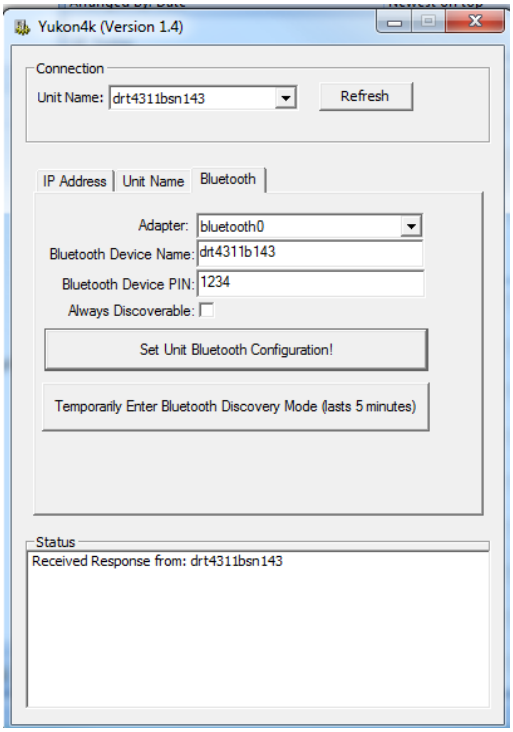
3.7. Bluetooth

3.7.1. Connect Bluetooth Adapter

A DRT system may be given Bluetooth capability using a Bluetooth adapter (sometimes called a dongle) attached to the DRT system via its USB port: most DRT4xxx systems with an exposed USB port may potentially utilize a Bluetooth adapter. Consult your DRT hardware manual or ask DRT for an application note that describes acceptable Bluetooth adapters for your DRT system and note whether your system will require a powered hub based on the revision of the system's Digital Board. The Digital Board must be Rev. B.2 or greater (if it is a Rev. A board, it could be Rev. A.20). To determine whether your system meets that requirement, connect to the system with *Galena*> from the main menu, select **Actions** > **View System Configuration** > on the left pane, under **Hardware** select **Unit** > **Controller**. On the right pane, the **Revision** field must say **B.2** or greater (or **A.20**).

3.7.2. Yukon4k Compatibility

Yukon4k R1.4 or greater is required to configure Bluetooth on the DRT unit. *Yukon4k* is provided the *DRT4000B System Software DVD*. It is installed by default on the controller PC in the same directory with *Galena*. Note:



- *Yukon4k* R1.4 is backward compatible with earlier versions of *DRT4000 System Software*, but if connected to a unit running a system software release pre-dating release of the Bluetooth feature, the **Bluetooth** tab available will be disabled
- Alternatively, if *Yukon4k* R1.3 or earlier connects to DRT units running system software that has the Bluetooth feature enabled, the Bluetooth page will not be available for configuration. But if Bluetooth was already configured on the DRT unit, the Bluetooth configuration on the unit will be unchanged (older versions of *Yukon4k* are simply unaware of Bluetooth and cannot affect it).

3.7.3. Configure DRT System Bluetooth with Yukon4k

- Connect a PC to the DRT system using an Ethernet connection.
- On the PC, open *Yukon4k* and in the **Unit Name** field, select to connect to the DRT system.
- On *Yukon4k*, click the **Bluetooth** tab.
- The **Adapter** field will show **bluetooth0** as the default.
- Enter the DRT system's name in the **Bluetooth Device Name** field. This is the name that the system will **broadcast** to be found by the Android device when the device is in **discovery mode**.
- Enter the PIN in the **Bluetooth Device PIN** field. When the DRT system is discovered, the Android device will prompt you to enter this pin so that the Android device (the client) can connect to the DRT Unit
- The DRT system needs to be "discoverable." You can make the system discoverable temporarily (for 5 minutes) or you can make the system "always discoverable." When the DRT Unit's Bluetooth is discoverable, any Bluetooth client can see the device and attempt to attach to it. When it's not discoverable, only devices that have previously paired with it may connect.
    - If the **Always Discoverable** box is checked, this will cause the unit to always be in discovery mode. Checking the **Always Discoverable** box also disables the temporary discovery mode button. If this is selected, the Bluetooth adapter may be attached/detached at any time.

- The **Temporarily Enter Bluetooth Discovery Mode** button puts the Bluetooth adapter into discovery mode for 5 minutes. After 5 minutes, the adapter will automatically return to not being in discovery mode. NOTE: The Bluetooth adapter must be attached to the DRT system prior to making this selection.

- To finish, click the **Set Unit Bluetooth Configuration!** button to send the configuration to the unit. Sending the configuration also clears out any existing pairing information on the unit and resets the Bluetooth device connected to the DRT unit.
- You can close *Yukon4k*.

Bluetooth Adapter Detection

Bluetooth adapters attached to the DRT system are detected both at start-up and dynamically during runtime. If unplugged, the adapter and cable may be simply reinserted into the DRT 4000 unit to be reinitialized using the current Bluetooth configuration. The adapter should be attached before using *Yukon4k* to put the unit into Discovery Mode.

The Bluetooth adapter will be activated using the current Bluetooth configuration (see *Yukon4k* section above). Once activated, if the adapter has an embedded indicator light, it will usually begin blinking.

Sometimes the USB connection is not detected on attach and may need to be unplugged and plugged into the unit, but this only happens occasionally. The built-in Bluetooth adapter indicator light may be used to establish whether or not it was properly initialized.

3.7.4. Load Portal Software on the Android Device

Note that *Portal* must already be loaded on the Android device in order to finish the Bluetooth connection setup. See the ***Load Portal section***.

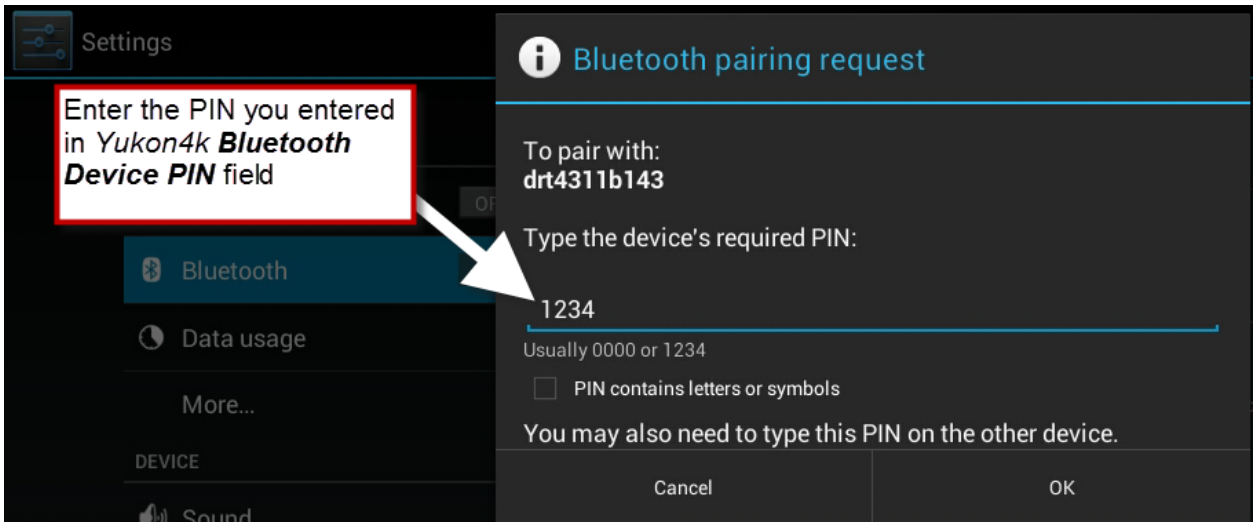
3.7.5. Pair DRT System with the Android Device

The DRT system's Bluetooth must be paired with the Android device's Bluetooth. In order to find and connect to a DRT 4000 system via Bluetooth, the DRT 4000 system (the Bluetooth host) must be in Discovery Mode. This is done using *Yukon4k* (see ***above***).

Consult your Android device instructions for details on how to pair that device with a Bluetooth device. When searching for devices, the DRT 4000 system should be visible to the Android device using the Bluetooth Device Name that was set using *Yukon4k*. The screen below shows a DRT system discovered by an Android device. Once the Android device has discovered the DRT system, on the Android device, select the DRT unit for pairing.

Android Device Screen Showing DRT System as a Discovered Device

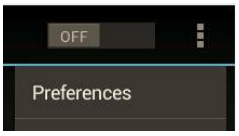
You will be prompted to enter the Bluetooth Device PIN you entered in *Yukon4k*. Click **OK** or follow the instructions for your Android device to complete the Bluetooth pairing. If you use *Yukon4k* to change any aspect of the DRT 4000 Bluetooth configuration at any point, the Android device will not recognize it unless you put the DRT4000 system back into discovery mode. Additionally, since the pairing information has been cleared from the DRT system, it may need to be re-paired with the Android device.



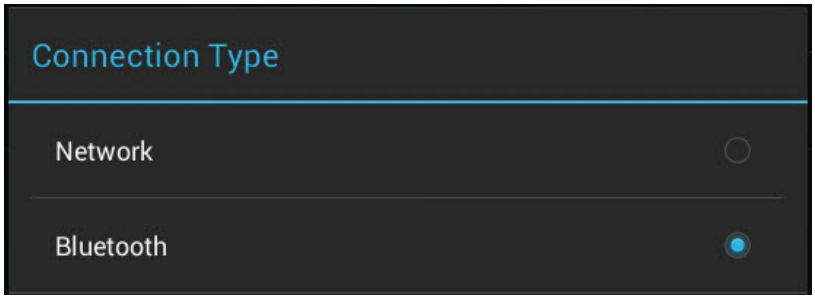
3.7.6. Connect Android Device to DRT System using Bluetooth

Once the DRT system and the Android device have been "paired" for Bluetooth, they can communicate over the Bluetooth connection; however, there is one more step to finish configuring the DRT *Portal* application running on the Android device. Once the Android device has been paired with the DRT4000 system, the Bluetooth connection must be established:

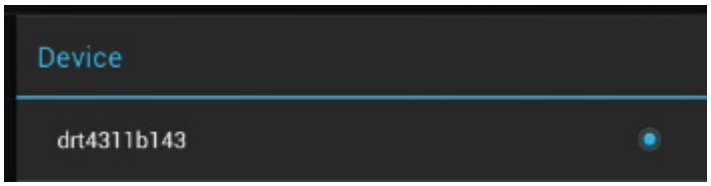
- Open *Portal* on the Android.
  - If *Portal* has been configured with this DRT system before, just set the *Portal* ON/OFF slider to ON. The Android device will connect and begin to sync up with the DRT system.
  - If this is the first time you are connecting to the DRT System:
    - Leave the *Portal* ON/OFF slider (usually located in the upper right corner of the display) in the OFF position.
    - Open the Android menu (icon and location vary) > select **Preferences.**



    - Under **Connection Type >** select **Bluetooth**.



- The devices that are currently paired with the Android are listed under **Bluetooth Settings.** Select which paired Bluetooth device *Portal* should connect to. A circle indicates the currently selected device.



- Go back to the main *Portal* window > set the *Portal* ON/OFF slider to ON.
- The Android device will begin to sync up with the DRT system.

4. Control Software

4.1. PC GUI - Galena

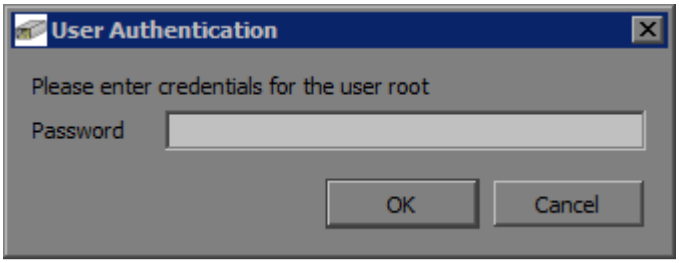
Galena is the DRT-supplied GUI that runs on a controller PC. To open *Galena*, double-click the *Galena* icon on the controller PC's *Windows* Desktop. To connect to a unit, click **File** on the main menu and select **Connect**.

4.1.1. Connect to a Unit with PC (Galena)

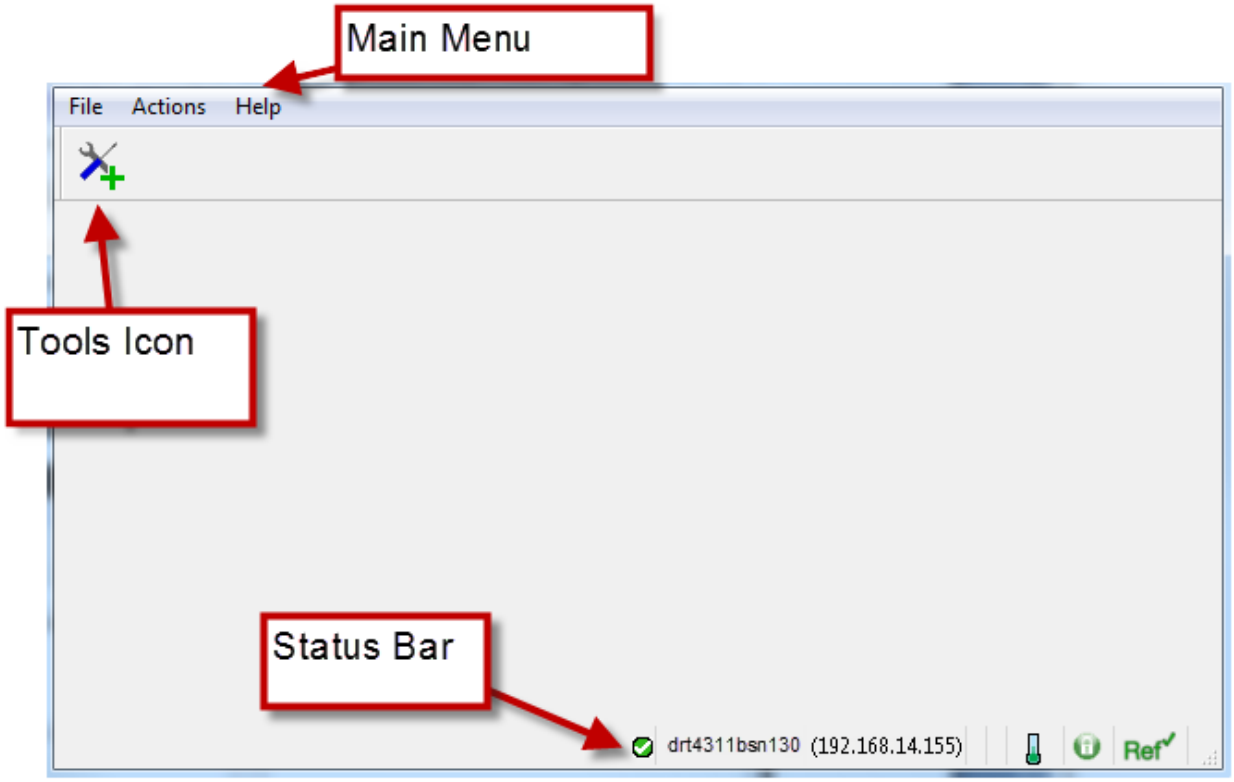
The PC must be connected to the DRT system using an Ethernet cable, either directly using a crossover cable, via a USB cable, or through a network using a LAN cable.

User Authentication

If you have changed the root user password, you will need to log into the unit before connecting to it using the new root user password. The following **User Authentification** dialog appears:



Once connected and if the unit is not running a scan, the main window will look like this:



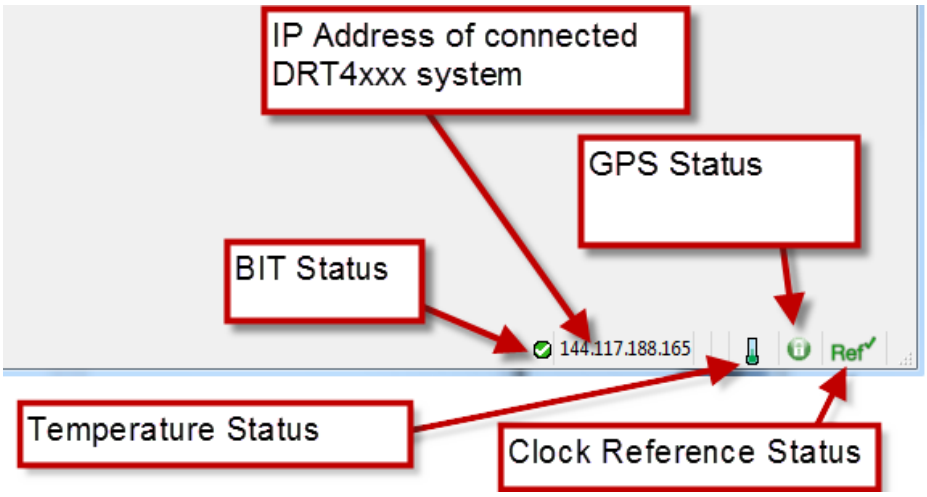
Main Menu: use selections on the Main Menu to connect to, configure, and get information on the DRT system and connected devices.

Tools: use to select services available on the DRT unit.

Status Bar: check here for information on DRT system readiness, unit temperature and electrical (battery), GPS, and Ref Clock statuses.

4.1.2. Status Bar

- Go/NoGo BIT Status: One of the first tasks that the unit performs is the Go/NoGo Built-in-Test (BIT). This BIT tests each of the main hardware groups. A green check,  , indicates successful completion of the tests and a red "X,"  , is displayed if one or more problems are detected. With a Go result, you can proceed with the operation. However, if the result is NoGo you will need to resolve the NoGo problems before proceeding. More information is available on BIT results in the **System Information/*BIT*** section. Contact DRT Customer Service for more information.
- Unit model number and serial number: The model number and serial number of the unit this GUI is connected to is displayed.
- Unit IP Address: The IP address of the unit this GUI is connected to is displayed.
- Thermometer:  A green thermometer indicates the DRT system's temperature is good. A red thermometer indicates the temperature is high with a critical severity reported by the embedded processor. A blue thermometer indicates that the DRT system's temperature is low with a critical severity reported by the embedded processor.
- GPS Status:
  -  - indicates the selected GPS receiver is locked.
  -  - indicates the selected GPS receiver is not locked.
  -  - indicates the status of the selected GPS receiver is unknown.
- Reference Clock Status:
  -  - indicates the selected clock reference is working correctly.
  -  - indicates there is a problem with the selected clock reference.
  -  - indicates an unknown state for the clock reference.
- Battery Status - If a battery is attached, another icon will display the battery's status. The battery icon is green with 10 sections. As battery capacity is depleted, the sections will disappear. When battery capacity remaining goes below 50%, the icon turns yellow. Below 30%, the icon turns red. The system will notify you when the battery life drops to 30 minutes remaining and again when there are only 5 minutes remaining.



4.1.3. Main Menu

NOTE: Many options fields with default values can be changed in more than one way. Fields with a default value can be incremented and decremented using the up and down arrows on the right side, by highlighting the value and entering a new value using the controller PC's keyboard, or by highlighting the value and using the mouse's scroll wheel. When a field has multiple divided values, it will be necessary to highlight and change each section individually.

4.1.3.1. File Menu

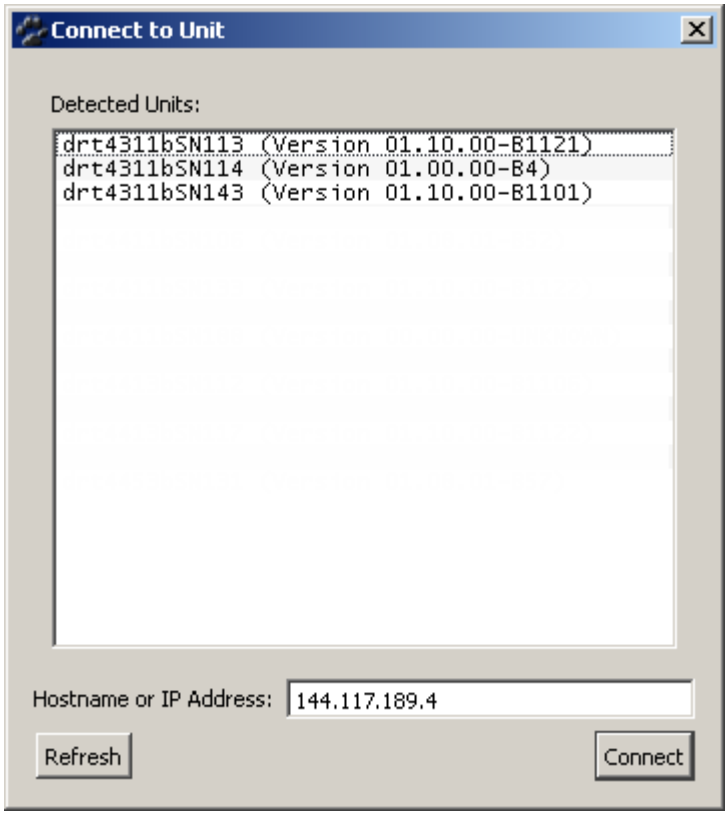
File has these options:

- **Connect** – Connects your PC to a DRT unit.
- **Disconnect** – Disconnects from the DRT unit.
- **Restore Unit Defaults** –Returns the unit to the initial startup configuration with nothing running. Default configuration files are deleted but explicitly named configuration files are retained.
- **Manage Configurations** – Loads or deletes a configuration file from the unit's SD card or from the controller PC. See below for further information.
- **Save Configuration** – Click **Save Configuration** to save a configuration file to unit memory and/or the controller PC. See below for further information.
- **Reset Unit Configuration** – Click **Reset Unit Configuration** to bypass the embedded controller and reset the unit configuration. See below for further information.
- **Shut Down Unit** – Click **Shut Down Unit** to **Shut Down** the unit or **Reboot** the unit. See below for further information.
- **Retrieve System Logs** - Generates copies of debug or configuration logs or both for viewing or to send via email to DRT Customer Support for troubleshooting. System logs contain information on system diagnostics (error logs) and system configuration (tuners, controllers, and MPS protocols). See below for further information.
- **Exit** – Click **Exit** to exit the software.

4.1.3.1.1. Connect

Use the **Connect to Unit** dialog to select which unit the GUI should connect to. This dialog will automatically open when the GUI is opened or, select **File** > **Connect**. This dialog will display the name(s) of all available units on the network or the name of the unit connected directly to the PC along with the version of embedded software that each is running. Highlight the DRT unit you want to use and click **Connect** or double click the entry in the list. Up to eight instances of *Galena* may be connected to one DRT system.

If the serial number of the desired DRT unit is not displayed, but the unit is believed to be on the network and operational, click **Refresh**. You can also enter the unit's host name or IP address in the **Hostname or IP Address** field and click **Connect**.



NOTE: When connecting to a unit, the software will examine the current GUI software version as well as the embedded, or system, software version and advise you if the versions are different. It is highly recommended that the software versions be the same because dissimilar versions can cause improper operation.

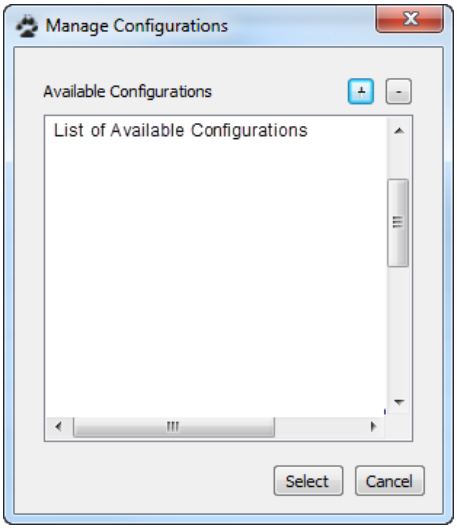
4.1.3.1.2. Disconnect

Select **File > Disconnect** to disconnect the GUI from the DRT unit.

4.1.3.1.3. Restore Unit Defaults

Select **File > Restore Unit Defaults** to return the unit to the initial startup configuration with nothing running. Stored configuration files are retained.

4.1.3.1.4. Manage Configurations



Select **File > Manage Configurations** to load a previously saved configuration for reuse. A dialog will display a list of all the configuration files stored on the unit. Select one of these files by highlighting the file and clicking **Select**. The file will load and the scan will be added to the list of available configurations.

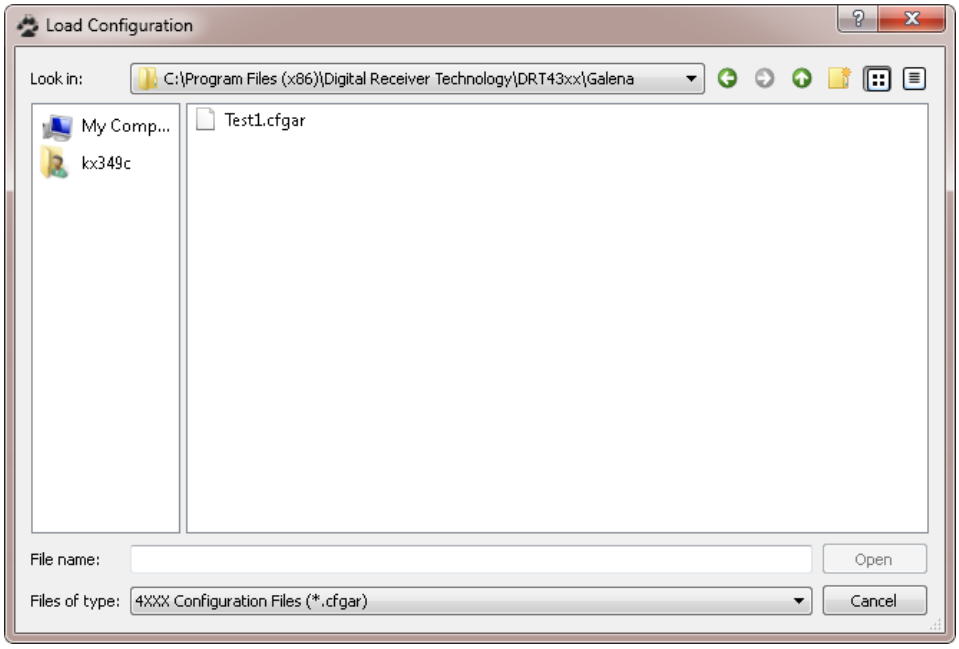
To remove a configuration file from storage, highlight the file and click the minus - button at the upper right above the field.

If the desired file is not on the unit, click the plus + button at the upper right above the field. A dialog will allow you to navigate to other configuration files stored on the controller PC. Refer to ***Load a Configuration from the Controller PC*** below.

Click **Cancel** to return to the main window without loading a file.

4.1.3.1.4.1. Load a Configuration from the Controller PC

When the desired configuration file is not available on the unit, the + button opens a dialog that will allow you to browse the PC to locate the desired file. Select the file and click **Open**. You will be asked where to save the file and the saved scan will be added to the list of available configurations. Load a configuration file by selecting the file name and clicking **Select**.



Click **Cancel** to return to the **Manage Configurations** dialog without loading a file.

4.1.3.1.5. Save Configuration

A configuration file can be saved for reuse. As an example, an MPS file could contain the protocol and scan configuration. When you select **Save Configuration,** a dialog box will be displayed with a **Filename** field for you to enter the name of the file and a **Location** field with the following location options:

- Remote – The file will be saved at a designated remote location.
- SD – The file will be saved on the unit's SD card (The card must be installed before the unit is powered on for the card to be recognized by the unit.).
- Temporary - This stores the file in the DRT system's temporary directory. The temporary directory is erased every time the unit is powered off.
- Computer – The file will be saved on the controller PC. (When this option is selected, a second **Save Configuration** dialog will appear to allow you to select a location for the file to be saved on the PC. If the initial location is not where you want the file saved, you can navigate to a different location or create a location for saving the file.)

The configuration file on the unit is available to any PC connected to the unit and the configuration file on the PC is available for use with any other unit. The file extension is .CFGAR.

NOTE: The saved file name will not contain any spaces. If a space is used when the file name is entered, an underscore will automatically replace the space. Therefore, if you enter **TEST 1** as the file name, the saved file will be named **TEST_1.**

Click **Cancel** to return to the main window without saving the file.

4.1.3.1.6. Reset Unit Configuration

When a configuration on a unit has become unresponsive and you are unable to connect to the unit, it may be necessary to reset the unit to factory defaults while bypassing the embedded controller on the unit:

1. Select **Reset Unit Configuration**.
2. At the **Connect to Unit** dialog, select the unit to be reset. If the unit name is displayed, enter the unit's host name or IP address in the **Hostname or IP Address** field.
3. Click **Connect**. A message is displayed.
4. Click **Reset Unit Configuration** to reset the unit. The unit will be reset and rebooted. Click **Close**. Allow time for the unit to reset before trying to reconnect to the unit. If you attempt to connect before the unit is ready, you will receive an error message. Acknowledge the error and wait a short time before reattempting to connect.

4.1.3.1.7. Shut Down Unit

Removing power from the unit without properly shutting it down can result in the SD card being corrupted.

When the Shut Down Unit option is selected, a dialog will appear with these selections:

- **Shut Down** – Saves the current configuration and powers the unit down to Standby. You will need to press the **Power Control** button on the unit to turn the unit ON.
- **Reboot** – Saves the current configuration and reboots the unit.
- **Nothing** – Cancels the selection and returns system to the current configuration with no changes made.

4.1.3.1.8. Retrieve System Logs

The Retrieve System Logs option generates copies of debug or configuration logs or both for viewing or to send via email to DRT Customer Support for troubleshooting. System logs contain information on system diagnostics (error logs) and system configuration (tuners, controllers, and MPS protocols).

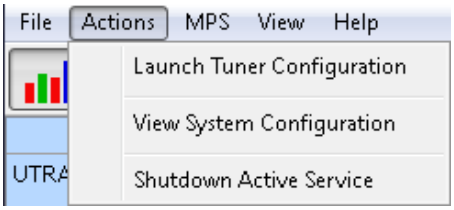
1. Select **File** > **Retrieve System Logs**.
2. When the Diagnostic Selection dialog appears, check **Debug Logs** to generate Debug Logs. Debug logs contain error information that can be used during troubleshooting. Check **Unit Configuration** to generate logs containing configuration information on tuners, controllers, and MPS protocols. You can also select both options to generate both types of logs.
3. Once generated the Diagnostics Saved dialog appears. Click **View Diagnostics** to view the logs you selected. Debug logs have a *.log* extension. Configuration logs are compressed in the *SdConfiguration.tar* file. You can open this file using *WinZip* or another compatible file compression/extraction application.
4. To email log files to DRT Customer Support, select **Email Support** from the Diagnostics Saved dialog. An email opens with the email address of the DRT Help Desk filled automatically filled out in the **To** field and the Subject Line filled out. **You must attach the files to the email before sending.**

4.1.3.1.9. Exit

Select **File > Exit** to exit. **Exit** terminates GUI, but the DRT system continues to operate.

4.1.3.2. Actions Menu

Actions has these options:



- **Launch Tuner Configuration** – Manipulates the flow of data through the tuners.
- **View System Configuration** – Part of this selection is common to all services and will be discussed below. The portion unique to MPS will be discussed in the MPS section while the portion unique to Spectral Display is discussed in that section.
- **Shutdown Active Service –** Shuts down the active service.

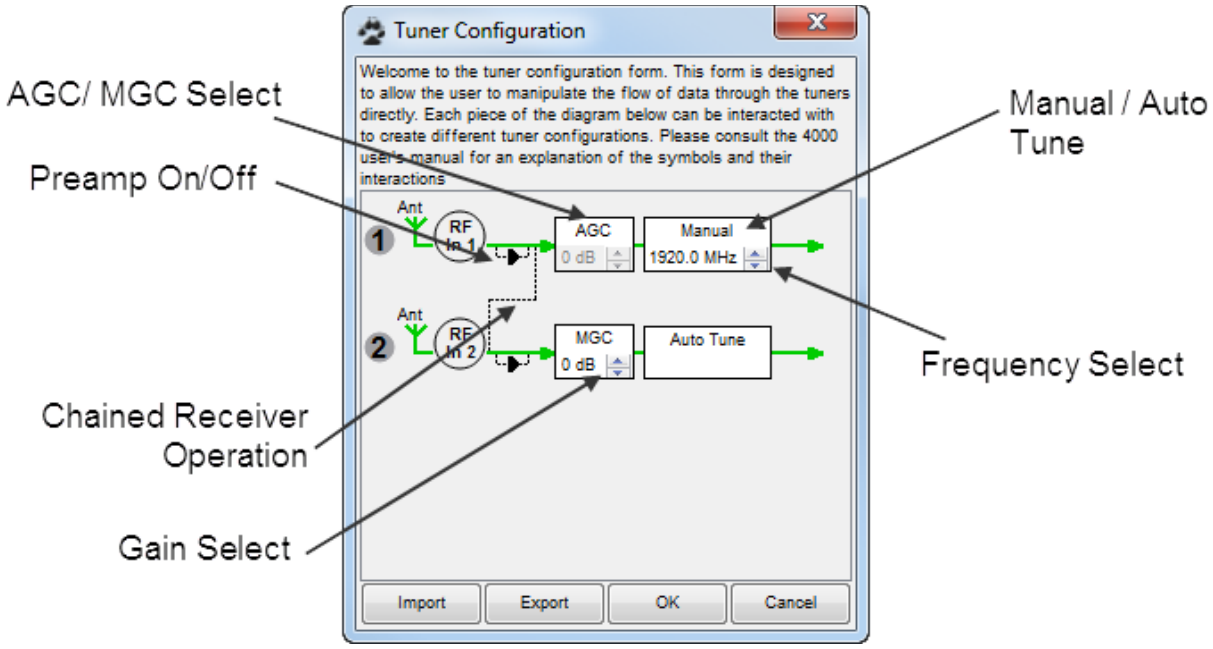
4.1.3.2.1. Launch Tuner Configuration

NOTICE

The software is written to optimize the tuner configuration for the current application. We recommend that you maintain the default settings and that you do not reconfigure the tuner(s). Changes to daisy-chain settings are the only settings changes that should be made.

The **Tuner Configuration** dialog allows you to manipulate the signal flow through the tuners. Several options are available:

NOTE: The **Tuner Configuration** dialog, shown below, depicts a unit with 2 tuners. For a system with only 1 tuner the dialog would show only the first tuner and for a system with 3 tuners, the dialog would depict 3 tuner sets with their available links.



- **Preamp On / Off** – You can add a 13 dB preamp into the input circuit. To select this option, click the triangle icon,  , located below the solid green signal path. The solid green signal path and the triangle will change to solid green,  , indicating the preamp is turned on.
- **AGC / MGC** – The default for the gain control box is Automatic Gain Control (**AGC**). In AGC, the system determines the gain requirement and sets the gain accordingly. As an option, you can select Manual Gain Control (**MGC**) to set the gain to any value between 0 dB and 52 dB. Click **AGC** in the box to select **MGC**. Then enter / set the gain to be applied to the incoming signal. The arrows increment / decrement the gain value in 1 dB steps.
- **Chained (Daisy-Chained) Receiver Operation** – To supply the received signal to both tuners, click the dashed line between the AGC / MGC inputs. The green signal path from **RF In 2** will be removed as the feed to the lower AGC / MGC input and the green signal path from the upper input will go to both inputs. Operating in this mode reduces the input signal to both inputs by approximately 4 dB.
- **Manual / Auto Tune** – The default for the tuning box is **Manual**. In **Manual**, you set the frequency of the tuner. The limits are 24.0 MHz or 40.0 MHz to 2980.0 MHz. Any entry below 40 MHz will automatically be set to 24.0 MHz. Entries between 40 MHz and 2980 MHz will be 4 MHz steps and the entered value will be rounded to the nearest 4 MHz.

NOTE: **Manual / Auto Tune** mode cannot be changed once a service is running; however, if in **Manual** mode, you can change the tune frequency while a service is running.

For frequency values entered while in **Manual** mode, the frequency is set in 4 MHz increments. A frequency entered with a value between a 4 MHz increment and 1.9 MHz above that increment will be rounded down to the 4 MHz increment and any value entered between 2.0 MHz and 3.9 MHz above the 4 MHz increment will be rounded up to the next higher 4 MHz increment.

The **RF IN 1** input, associated with tuner 1, is indicated by the 1 icon and the **RF IN 2** input, associated with tuner 2, by the 2 icon.

4.1.3.2.1.1. Antenna Inputs (V2 and V3 Scanners)

There are multiple antenna connection possibilities when configuring a scanner with more than one tuner. There are three alternatives for attaching antennas:

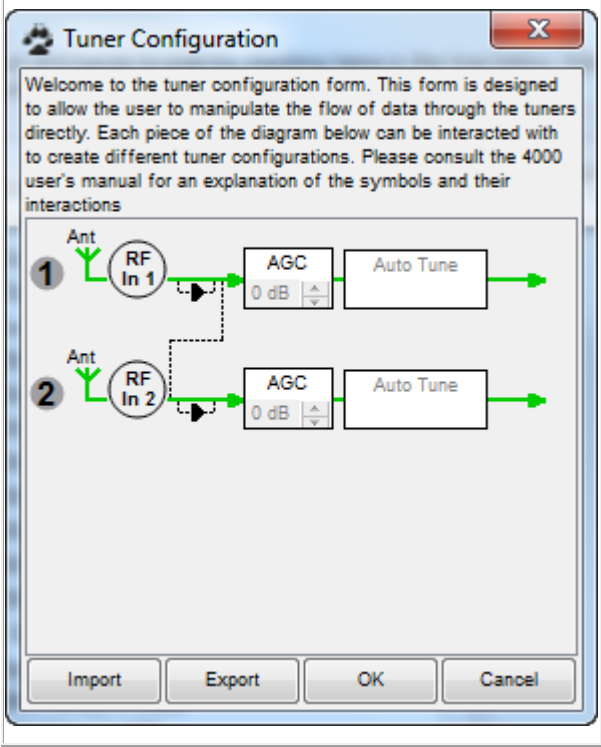
- Multiple antennas give the best performance (maximum RF sensitivity). Attach one antenna to each RF input connector.
- The output from a single antenna can be split (using a customer-supplied external splitter) and connected to multiple RF inputs (reduced performance).
- As a last resort, the output from a single antenna can be daisy-chained inside the system (**RF In 1** passes the signal **RF In 2**) (reduced performance).

NOTE: At least two antennas are required for LTE MIMO operations.

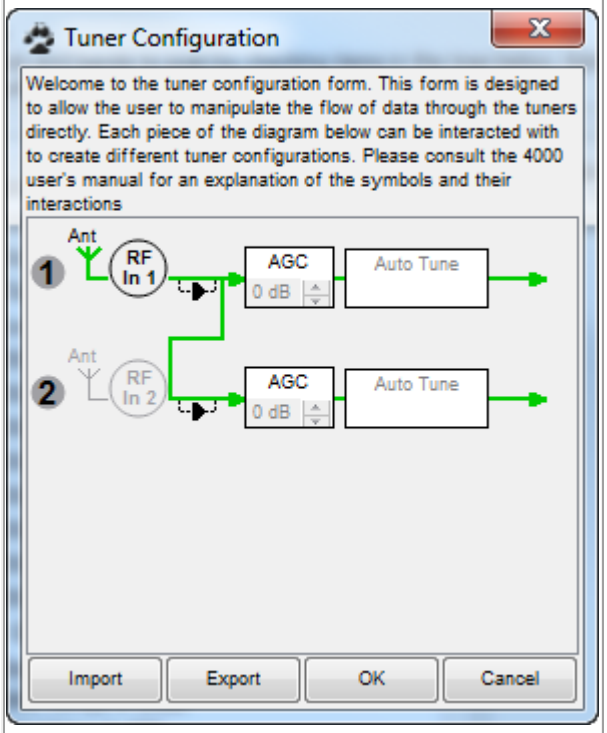
Before configuring tuners using the Tuner Configuration Wizard refer to the Hardware Manual for your system for instructions on making the hardware connections.

Configuration with either:

Two-Antennas (BEST performance) OR Single Antenna with splitter to send the signal to RF IN 1 and RF IN 2



Single antenna with daisy-chain configuration



4.1.3.2.1.2. Importing and Exporting Tuner Configuration Files

When a tuner configuration has been successfully used, it can be saved for reuse. When you select **Export,** a **Save As** *Windows* dialog will allow you to save the file to your PC. If the initial location is not where you want the file saved, you can navigate to a different location or create a location for saving the file. Enter the file name in the **File Name** field at the bottom of the screen and click **Save**. The configuration will be saved on the controller PC with that name and a .TCF.xml extension.

The configuration file on the PC is available for use with any other unit.

Once the tuner configuration file has been saved, it can be recalled by clicking **Import** and selecting the desired file.

4.1.3.2.2. View System Configuration

Selecting **View System Configuration** brings up the **System & Service Configuration** dialog.

NOTE: The **System & Service Configuration** dialogs, shown in subsequent pages, depict a unit with 2 tuners, **Tuner 0** and **Tuner 1**. For a system with only 1 tuner the dialog would show only **Tuner 0** and for a system with 3 tuners, the dialog would have **Tuner 0, Tuner 1,** and **Tuner 2**.

The **System & Service Configuration** dialog shows these main options in the left pane – **Hardware, Software,** and **BIT.**

4.1.3.2.2.1. Hardware

Unit

The **Unit** view provides a summary of the current status of the unit in the right pane.

- **Summary** – This area contains the **Unit Name**, the unit's **IP Address**, the **Model** and the unit's **Serial Number**. (The **Unit Name** includes the unit's model and serial numbers.)
- **Date and Time** – This area contains the unit's **Date** and **Time**. Time is based on a 24-hour clock and is typically based on GPS time, but can be modified.
- **Status:**

NOTE: The **GPS Locked** status is repeated in **System Information > Hardware Information > Unit > Internal GPS > Summary > Locked**.

  - **GPS Locked** has three possible states:
    - **Not Locked** – There are not sufficient usable locked satellites to obtain a fix.
    - **Locked 2D** – There are sufficient locked satellites to obtain a two-dimensional (latitude and longitude) position fix.
    - **Locked 3D** – There are sufficient locked satellites to obtain a three-dimensional (latitude, longitude, and altitude) position fix.
  - **Temperature** – **Temperature** provides the internal temperature of the unit. The internal temperature, in degrees C, and a thermometer icon are presented. The icon will be green, meaning an acceptable internal temperature, when the temperature is below 60° C. When the internal temperature reaches 60° C, the thermometer changes to red. Unless continued operation is critical, the unit should be shut down when 60° C is reached.

- **Battery:**

NOTE: If the unit is being powered from an external source and a battery is not attached, values for these three entries will not be displayed.

  - **Battery Level** – **Battery Level** indicates the amount of charge remaining in the attached battery. The **Battery Level**, when a battery is connected, is expressed as **XX%** (**YY min**) where **XX%** indicates the percentage of charge remaining in the battery and **YY min** indicates the estimated usable time, in minutes, of operation remaining with the attached battery. If the battery is being charged while attached to the unit, the display will read **Charging**.
  - **Battery Voltage** – **Battery Voltage** indicates the voltage level of the attached battery, expressed as **X.XXX** V. If the battery is being charged while attached to the unit, disregard this entry.
  - **Battery Amperage** – **Battery Amperage** indicates the amount of current being supplied by the attached battery, expressed as **X.XXX** A. If the battery is being charged while attached to the unit, disregard this entry.

- **Status LED: Front Panel**

NOTE: The LED is enabled by default. Once disabled, to re-enable the LED you must return to this dialog.

- Located on the front panel of the DRT4311B is a status LED. When lit, this LED indicates the system status. The status LED can be enabled (lit) or disabled (not lit). Powering the unit off / then on will not change the configuration of the LED. Once disabled, you must return to this dialog and enable the LED to have it lit.
  - To enable the LED, check the Enable System Status LED box. Uncheck the box to disable the LED.

CAUTION

Do not attempt to load software on a DRT4311B with the LED disabled. The LED provides important information about the status of the software load that will not be available with the LED disabled.

Click the"**+**" beside **Unit** to reveal:

- **Controller**
- **Tuner 0**
- **Tuner 1**
- **GPS & Heading**

Controller

The **Controller** view provides information about the system controller and the versions of software loaded in specific areas. The **Device Information** area provides:

- **Type** – The type of Controller
- **Serial** – The serial number of the Controller
- **Revision** – The revision of the Controller
- **Main CPLD** – The version of software being run on the Main Complex Programmable Logic Device (**CPLD**)
- **GPSM CPLD** – The version of software being run on the Gypsum (**GPSM**) **CPLD**
- **GPSM Firmware –** The version of software being run on the **GPSM Firmware**
- **GPSM GPS** – The version of software being run on the **GPSM GPS** Receiver.
- **P1 / P2 BLL** – The version of software being run on the Bootloader Loader (**BLL**) for Processor 1 (**P1**) / Processor 2 (**P2**)
- **P1 / P2 Bootloader** –The version of software being run on the **Bootloader** for Processor 1 (**P1**) / Processor 2 (**P2**)
- **P1 / P2 OS** – The version of software being run on the Operating System (**OS**) for Processor 1 (**P1**) / Processor 2 (**P2**)
- **P1 / P2 Filesystem** – The version of software being run on the File System for Processor 1 (**P1**) / Processor 2 (**P2**)

NOTE: P1 and P2 represent Processor 1 and Processor 2. It is not necessary for P1 and P2 entries to have the same software versions.

Tuner 0 / 1

The **Tuner 0 / 1** views provide information about the system tuners and the versions of software loaded. The **Device Information** area provides information on the versions of the tuners in the unit. This includes the **Type** of tuner, the **Serial** number of the tuner, and the **Revision** of the tuner. This area also includes information on the **FPGA Revision** of software being run by the Tuner as well as the status of the unit's calibration.

GPS & Heading

The **Data** area provides the following information:

- **Date** – The current date in MM/DD/YYYY format. The display format of the date can be changed. Refer to ***Display Options***, below.
- **Time** – The current GPS UTC time.
- **Locked** – The current state of the GPS is:
    - **Unlocked** – There are not sufficient usable locked satellites to obtain a fix.
    - **Locked2D** – There are sufficient locked satellites to obtain a two-dimensional (latitude and longitude) position fix. With **Locked 2D**, the **Horizontal DOP** value will be a small number and the **Vertical DOP** value will be a dash. An exception to the dash can occur for a short period of time while the system is in a transition from **Locked 3D** to **Locked 2D** or from **Unlocked** to **Locked 2D,** when the value will be very large.
    - **Locked3D** – There are sufficient locked satellites to obtain a three-dimensional (latitude, longitude, and altitude) position fix. With Locked 3D, the **Horizontal DOP** and **Vertical DOP** values will be small numbers.

NOTE:

- When position is displayed in MGRS, the **Latitude** and **Longitude** fields are replaced by a single MGRS field.
- The display format for the location (Latitude and Longitude) can be changed. Refer to ***Display Options***, below.

- **Latitude** – The current latitude in decimal degrees; degrees, minutes, & seconds; or Military Grid Reference System (MGRS).
- **Longitude** – The current longitude in decimal degrees; degrees, minutes, & seconds; or MGRS.
- **Altitude** – The current altitude of the unit in meters. Available only when **Locked 3D**.
- **Heading** – The direction of movement of the unit referenced to true north in decimal degrees.
- **Speed** – The velocity of movement of the unit in kilometers per hour (km/h)
- **Visible Satellites** – The number of satellites being used by the GPS
- **Horizontal DOP** – The current value of **Horizontal** Dilution of Precision (**DOP**). This term will have a value whenever there is a **Locked 2D** or **Locked 3D** lock status.
- **Vertical DOP** – The current value of **Vertical** Dilution of Precision (**DOP**). This term will have a value whenever there is a **Locked 3D** lock status. With a **Locked 2D** status, the entry could be a dash or a number greater than 20.

The **GPS Source** area provides the following information:

- **Source** – The current source of location information:
    - **GPSM Device** – Position information is derived from the internal GPS system
    - **Manual GPS** – Position information is entered manually based on best available information
        - **Latitude** – Manually enter the best available information on the latitude of the current position in decimal degrees.
        - **Longitude** – Manually enter the best available information on the longitude of the current position in decimal degrees.
        - **Altitude** – Manually enter the best available information on the altitude of the current position in meters.

The **Heading Source** area provides the following information:

- **Source** – The current source of location information:
    - **GPSM Device** – Position information is derived from the internal GPS system
    - **Manual Heading** – Heading information is entered manually based on best available information
        - **Heading** – Manually enter the best available information on the direction of movement in decimal degrees.
        - **Speed** – Manually enter the best available information on the speed of movement in decimal kilometers per hour (km/h).

Accessories

Click the"**+**" beside **Accessories** to reveal:

- **SD**

The **SD** view provides information about the status of the SD card.

The **Details** area provides the following information:

- **SD Card Inserted** – The status of whether an SD card is recognized as being inserted in the unit. NOTE: The SD card must be installed in the unit before power is applied to the unit for the card to be recognized.

Reference

The **System & Service Configuration > Hardware > Reference** area displays the **Reference Settings,** the **Synchronization Settings,** and the **Output Settings** of the unit.

Reference Settings

The **Reference Settings** area's **Clock Reference** field allows you to select the source of the reference. The default is **Internal GPS (Trained)** and the options are:

- **Internal GPS (Trained)** – This selection establishes a trained clock using the system's internal GPS as a reference.
- **External 1PPS (Trained)** – This selection establishes a trained clock using an external 1PPS sync signal as a reference. Although not required, it is recommended that the **External 1PPS** is selected for the **Synchronization Pulse.** The external 1PPS signal must be connected to the system. See your hardware manual for details on connecting the external 1PPS signal.
- **External 10 MHz (Trained)** – This selection establishes a trained clock using an external 10 MHz source as a reference. The external 10 MHz signal must be connected to the system. See your hardware manual for details on connecting the external 10 MHz signal.

- **External 10 MHz (Bypass)** – This allows an external source to be used as the system reference. The external 10 MHz signal must be connected to the system. See your hardware manual for details on connecting the external 10 MHz signal.

The **Reference Settings** area's **Reference Lock** field indicates whether the unit's internal oscillator is locked to the selected GPS signal or external 10 MHz input.

External 10 MHz Present – This area indicates whether an external 10 MHz signal is present.

External 1PPS Present – This area indicates whether an external 1PPS signal is present.

Synchronization Settings

The **Synchronization Pulse** options allow you to select the source for the synchronization pulse used to synchronize to other equipment. The options are:

- **Internal Generated PPS** – This selection chooses an internally-generated (based on the Reference Settings selection) 1PPS signal.
- **External 1PPS** – This selection allows you to select a 1PPS signal supplied from an external source. The external 1PPS signal must be connected to the system. See your hardware manual for details on connecting the external 1PPS signal.

Output Settings

The **Output Settings** options allow you to select to output signals for synchronizing other equipment. Check the preferred option. The options are:

- **External 10 MHz** – Output a 10 MHz reference signal to a connector. See your hardware manual for details on connecting the external 10 MHz signal.
- **External 1PPS** – Output a 1PPS signal to a connector. See your hardware manual for details on connecting the external 1PPS signal.

4.1.3.2.2.2. Software

The **Software** view displays the software on the unit. Other views under **Software** are described below.

Audible Alerts

The **System & Service Configuration > Software > Audible Alerts** area allows you to configure the software to provide an audible alert when there is a change in state of the **GPS** lock, the **Reference** loop lock, and/or the unit's temperature. The alarm will occur when there is a transition to the selected state.

- **Transition to State (GPS)** - An audible alarm can be set to occur when the GPS status changes to **Locked** and/or **Unlocked**.
- **Reference** - An audible alarm can be set to occur when the reference clock loop status changes to **Locked** and / or **Unlocked**.
- **Temperature** - An audible alarm can be set to occur when the unit temperature status changes to **Low**, **Normal**, and / or **High**.

To Configure an alarm: The software makes use of the .WAV files included with your *Windows* software.

1. Click **Browse.** You will be directed to the .WAV files on your PC.
2. Select a .WAV file and click **Open**. This will load the available .WAV files into the software for selection.
3. Highlight a parameter that should produce an alarm when that state is achieved.
4. Using the list of available .WAV files, click the file to be associated with that status change. The file name will be placed in the **Sound** column of the selected state.
5. Check the box associated with that state to activate that alarm.
6. Repeat Steps 1 through 5 for each desired alarm.
7. To test any sound of the alarm, highlight that sound and click **Test**.

8. When all alarms have been set, click **OK**.

Applications

The **Software / Applications / Embedded Application** area provides information about the version of software and the build being run on the unit.

File Access

The **System & Service Configuration > Software > File Access** area allows you to connect to a remote server, to specify the auto-save location, and to identify the destination for output files.

1. Depending on what is desired, in the **Auto-save Configuration To** and/or the **Save Output Files To** field make a selection:

   Auto-Save options are:

   - **None** – Output files not saved.
   - **SD** – Storage on the unit's SD card (requires an SD card installed at startup).
   - **Remote** – Storage at a remote location (requires a remote server connection, see above).

   Save Output Files options are:

   - **None** – Output files not saved.
   - **SD** – Storage on the unit's SD card (requires an SD card installed at startup).
   - **Remote** – Storage at a remote location (requires a remote server connection, see above).

2. If you selected **Remote:**

   - Enter the IP address of the server in the IP field.
   - Enter the **Path** within the server to locate the files. NOTE: A leading slash is not required when entering the path, for example, drtunit/drt4311bsn100, no slash appears before *drtunit* in the path.

3. Click **Apply**.

   - **Status** - This field displays the status of the remote server's connection. Until the remote server has been enabled and configured, the status will indicate Not Configured. If an attempt was made to enable and configure the remote server, but the configuration was invalid, the status will indicate Configured and Disconnected. However, the status will change to Configured and Connected when the remote server has been selected, configured, and the configuration confirmed.

   NOTE: After changing the server IP address and path settings and clicking **Apply**, a reboot prompt appears. The unit will automatically reboot.

Date & Time

The **System & Service Configuration > Software > Date & Time** area displays the **Current Time,** allows you to **Configure Unit Time,** and allows you to select an **NTP Server**. When the changes are complete, click **Apply** to enable the changes.

Current Time

The **Current Time** area displays:

- **Windows Time** – The current date and time of the controller PC in the designated **Display Format**. Clock display is in 24-hour format.
- **Unit Time** – The Unit's current date and time in the designated **Display Format**. Clock display is in 24-hour format.

Configure Unit Time

The **Configure Unit Time** area allows you identify the source of system time and to set the date / time.

- Identify the time source:
    1. Set the **Time Source** field to **Internal Clock**, **GPS Device**, or **NTP.**

    NOTE: If NTP is selected, it is necessary to provide the IP address of the NTP server. See ***NTP Server***, below.

- To set the unit to a date / time, the time source must be set to **Internal Clock** then:
    1. The date / time field will display the current date and time of the unit in the selected format. To change the date or time, highlight the first segment of the display to be changed and use the up / down arrows to make the change or enter in the correct date / time.
    2. Repeat for each additional segment to be changed.

NTP Server

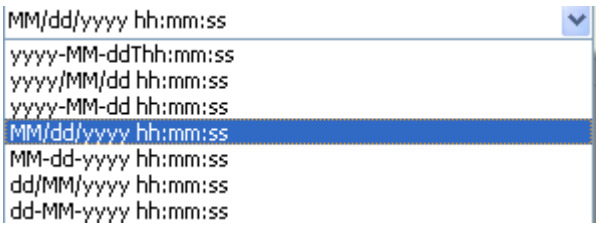
When NTP is selected in the **Time Source** field, the **NTP Server** field will accept an entry. In this field enter the IP address of the NTP server that will be the time source.

NOTE: Unless the PC's time has been recently synced to a time standard, Windows Time and Unit Time can differ by several seconds.

Display Options

The **System & Service Configuration / Display Options** area configures the **Date and Time Format** display in the GUI, the units of the **Display Compass Angle**, and the method of position display. When the changes are complete, click **Apply** to enable the changes.

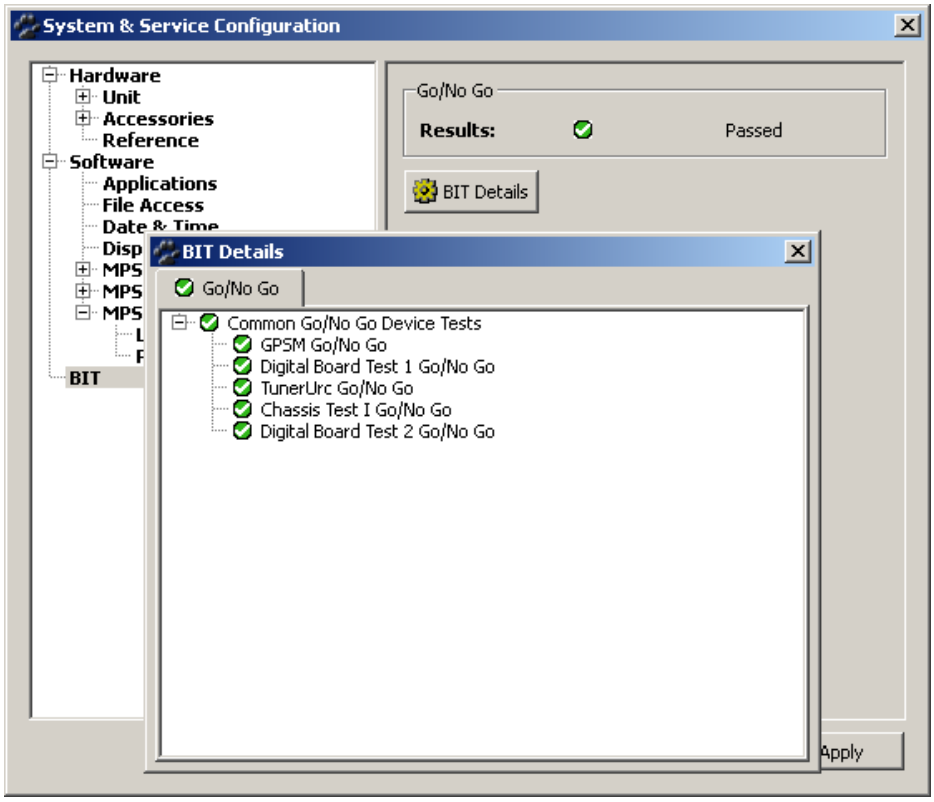
- The **Date and Time Format** area allows you to change the way the date and time are displayed by the unit. The available options are:



- The **Compass Angle** can be expressed either in **Degrees** or in **Mils**. The default is **Degrees.**
- The position as determined by GPS can be displayed in three formats:
    - **12.3456°** (Decimal degrees) – The values of latitude and longitude are displayed in decimal degrees. The default is decimal degrees.
    - **12° 34' 56"** (Degrees, Minutes, & Seconds) – The values of latitude and longitude are displayed in degrees, minutes and seconds.
    - **MGRS** – The position is given using the Military Grid Reference System (MGRS).

4.1.3.2.2.3. BIT

On startup, Go/No Go BIT is run and the results presented here. Selecting **BIT** provides a summary of the BIT results. The results, provided in the **Go/NoGo** area of the **System Information / BIT** page, will indicate that the overall system **Passed** ( ) or **Failed** ( ). Click the **BIT Details** button to display a tree which shows each of the test categories and results of each, given as a or a .Click in the upper right corner to close the **Bit Details** screen then click **OK** or **Cancel** to exit **System & Service Configuration** or select another category. The GUI's Status Bar also shows whether the system passed BIT.



4.1.3.3. Help Menu

Help has one option:

- **About** – Click **About** for information about the version of the GUI that is running on the PC.

4.1.4. User Preferences

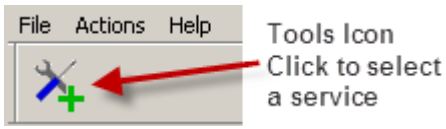
The GUI automatically saves certain user preferences. The preferences are saved when the GUI is closed. The preferences are:

- Window Size / Location – The current location of the GUI on the PC screen and size of the GUI's window will be retained.
- Connection to Unit – The last connected unit will be auto-populated into the **Connect** dialog the next time is run.
- Measurement System - Imperial or Metric
- Compass Angle - Degrees or Mils

NOTE: After making any configuration changes to the unit, allow a minimum of five seconds for the user preferences files to update before powering down the unit.

4.1.5. Select the Service

Click the **Tools** icon to select the service.

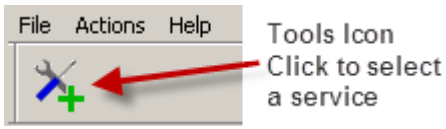


A **New Service** dialog will be displayed with the available operating mode options.

Highlight the desired service and click **Next**. A configuration wizard is launched.

4.1.6. Spectral Display

To start the Spectral Display service when another service is already running, on the main menu click **Actions** > **Shutdown Active Service**. Then click the **Tools** icon > select Spectral Display and click **Next**. The Spectral Display Service starts.



Refer to ***Manage Scanner Configuration*** to configure the initial scan.

4.1.6.1. Main Menu

Selections common to both the MPS operating mode and the Spectral Display operating mode are covered in the ***Galena GUI*** section.

4.1.6.1.1. Actions Menu

Actions has these options:

- **Launch Tuner Configuration** – this option is covered in the ***Galena GUI / Actions Menu*** section.

- **View System Configuration** – a portion of this option is covered in the ***Galena GUI / Actions Menu*** section. The portion that is Spectral Display specific is discussed in ***Spectral Display Properties*****,** below.
- **Shutdown Active Service –** this option is covered in the ***Galena GUI / Actions Menu*** section.

4.1.6.1.2. View System Configuration

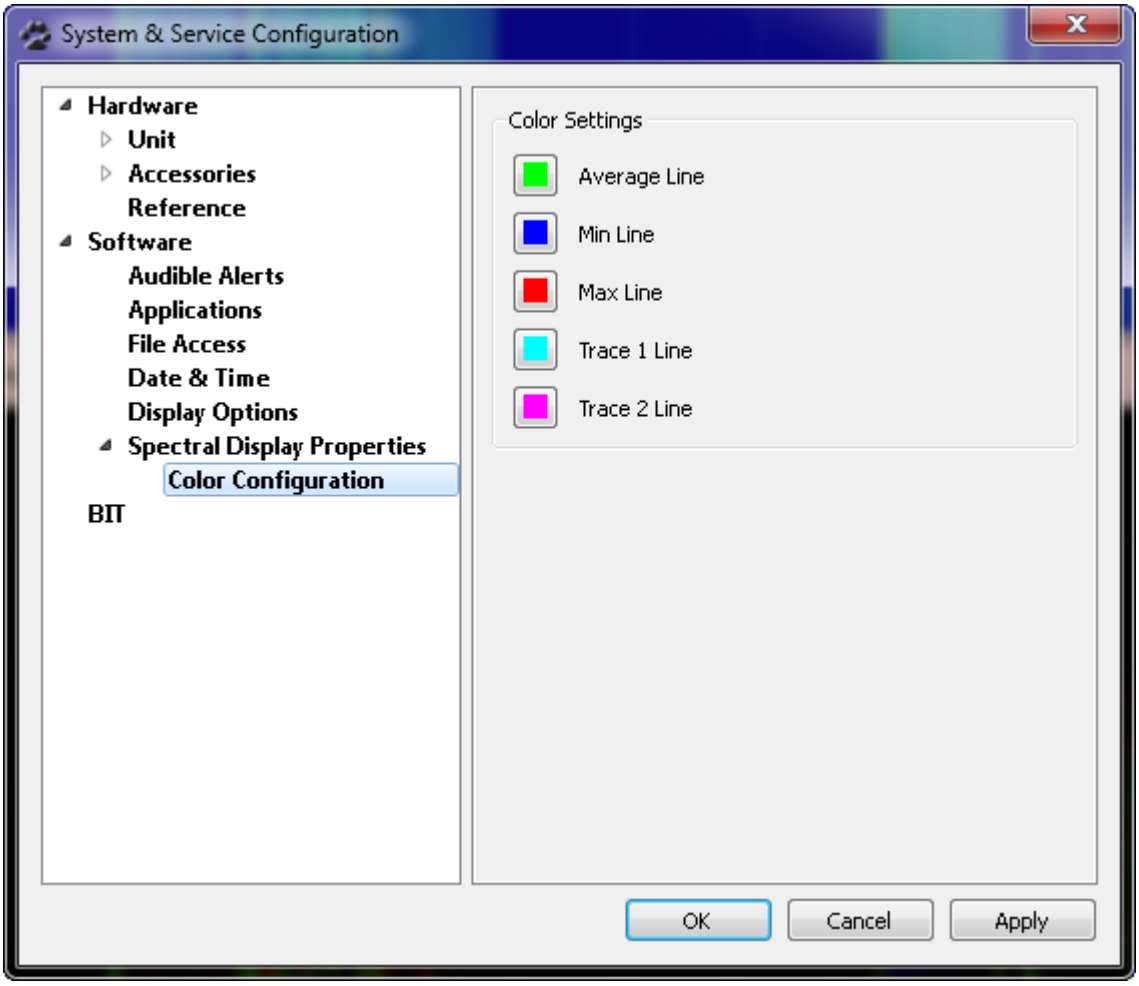
When all selections and edits on System & Service Configuration are complete, click **OK**.

4.1.6.1.2.1. Spectral Display Properties

The **System & Service Configuration** dialog has an additional section that is only available for Spectral Display, **Spectral Display Properties**. It is through this section that **Color Configuration** is selected.

Color Configuration

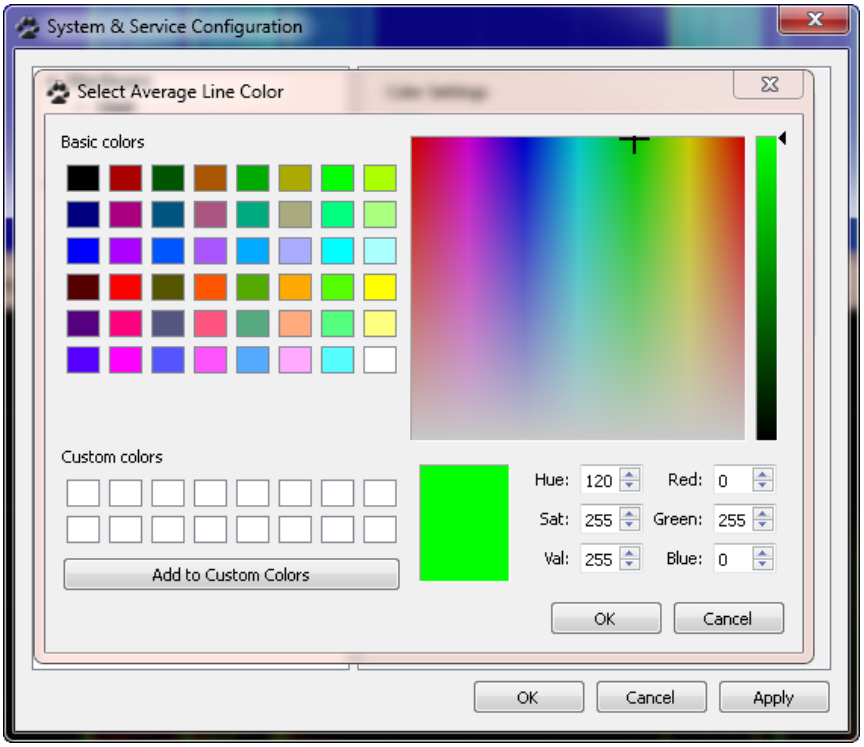
The **Color Configuration** view allows you to set the colors for spectral display's trace view lines.



There are five **Color Settings** for the spectral display lines:

- **Average Line –** The current signal level, by frequency, of the displayed signal.
- **Min Line** – The minimum signal level, by frequency, of the displayed signal while using Peak Hold.
- **Max Line** – The maximum signal level, by frequency, of the displayed signal while using Peak Hold.
- **Trace 1 Line** – The signal level, by frequency, of the displayed signal at a particular point in time.
- **Trace 2 Line** – The signal level, by frequency, of the displayed signal at a particular point in time.

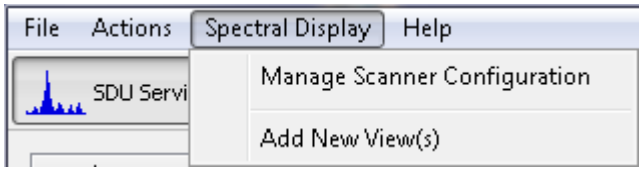
Each spectral display line can be set to any of 48 pre-configured basic colors, you can create up to sixteen custom colors using the accompanying palette, or you can select any color on the palette. To change a line's color, click on the button associated with that line. The **Select Line Color** dialog will be displayed. Click on a basic color, click on a custom color, click on any color within the palette, or enter values for **Hue**, **Sat**uration, **Val**ue, **Red**, **Green**, and **Blue** for the color to be displayed.



4.1.6.2. Spectral Display Menu

Spectral Display has these options:

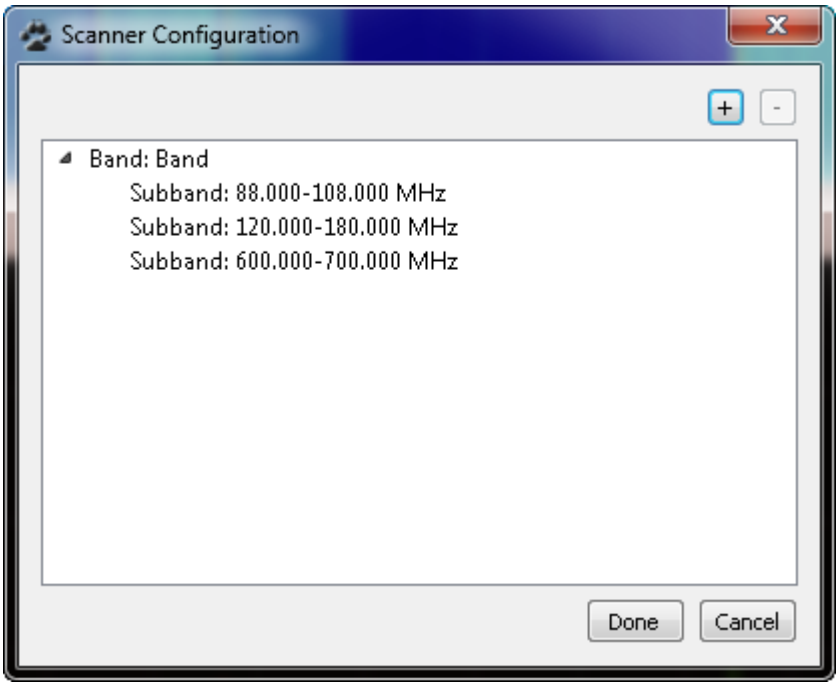
- **Manage Scanner Configuration** – create and modify scan bands.
- **Add New View(s) –** add a copy of a current scan band to the display (requires an active scan).



4.1.6.2.1. Manage Scanner Configuration

Clicking **Manage Scanner Configuration** opens the **Scanner Configuration** dialog. The **Scanner Configurations** dialog allows you to create and remove scan bands.

If the Spectral Display option has not been used before, **Manage Scanner Configuration** is the only available option under the **Spectral Display** pulldown at startup. An information box will notify you that no bands are currently configured in this scan and a subband with an initial start frequency of 2 MHz and an initial stop frequency of 3000 MHz has been loaded. Other subbands can be added as necessary. The **Band** field will list all subbands currently available.



To add a subband, click the plus button,  , in the upper right corner of the dialog. Each new subband will also have an initial start frequency of 2 MHz and an initial stop frequency of 3000 MHz. To change a start or stop frequency, first double-click on the frequency to be changed. Then:

1. For a frequency resolution to 1 kHz, enter the frequency in the format xxxx.xxx MHz using the keyboard or
2. For a frequency resolution to 1 MHz, enter the frequency in the format xxxx MHz using the keyboard or
3. Use the mouse to highlight one or more digits of the frequency and replace those digits using the keyboard or
4. Use the up and down arrows, either the keyboard's or the dialog's, to increment or decrement the frequency in 0.100 MHz steps

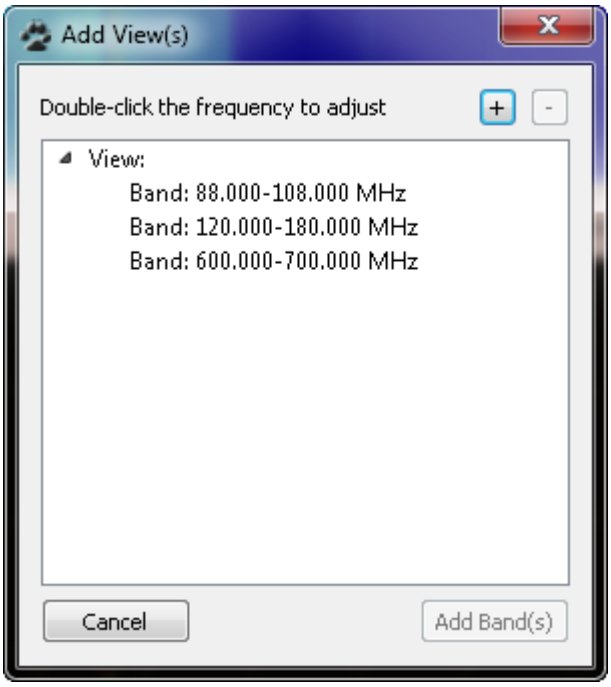
NOTE: The start frequency must be lower than the stop frequency. Should you change the start frequency or the stop frequency with the result that start frequency ends up greater than the stop frequency, the unchanged term will be reset to match the changed value which will result in a single frequency scan. For example 240 MHz - 280 MHz changed to 300 MHz - 280 MHz will become 300 MHz - 300 MHz and 240 MHz - 280 MHz changed to 240 MHz - 200 MHz will become 200 MHz - 200 MHz.

To remove a subband, highlight that subband and click the minus, -, button. A subband can also be removed by clicking the remove "X", , in that subband's tab above the display(s).

When through with the changes, click **Done** to accept the changes and exit or click **Cancel** to undo any changes and exit.

4.1.6.2.2. Add New View(s)

To add a new view, select **Add New View(s)** and click the plus button, +. If a current band had been highlighted, the new band will duplicate the start and stop frequencies of the highlighted band and if no band was highlighted, the new band will duplicate the start and stop frequencies of the first band in the current list.



For information on changing a start or stop frequency, refer to ***Manage Scanner Configuration***, above.

4.1.6.3. Spectral Display Operations

4.1.6.3.1. *Galena* Spectral Display Main Window

4.1.6.3.1.1. Spectral Display

The Spectral Display is a spectrum analyzer that provides a graphic display of detected radio-wave frequency and power activity. You control the display by setting parameters that define the frequency range(s) to be monitored. The maximum frequency range displayed is 2 MHz to 3000 MHz.

The main window can contain two spectral plot views. One is called a trace view and the other is called a waterfall or spectrogram view.

The trace view presents a point-by-point plot connected by lines. The frequency, in MHz, is displayed along the horizontal axis, with the higher frequency to the right and the amplitude (Power), in dBm, is displayed along the vertical axis with the strongest signal to the top. Moving the cursor to any location on the display area will cause the cursor to become a cross and a tool tip to appear. The box will contain the frequency in MHz and the power level in dBm at the center of the cross.

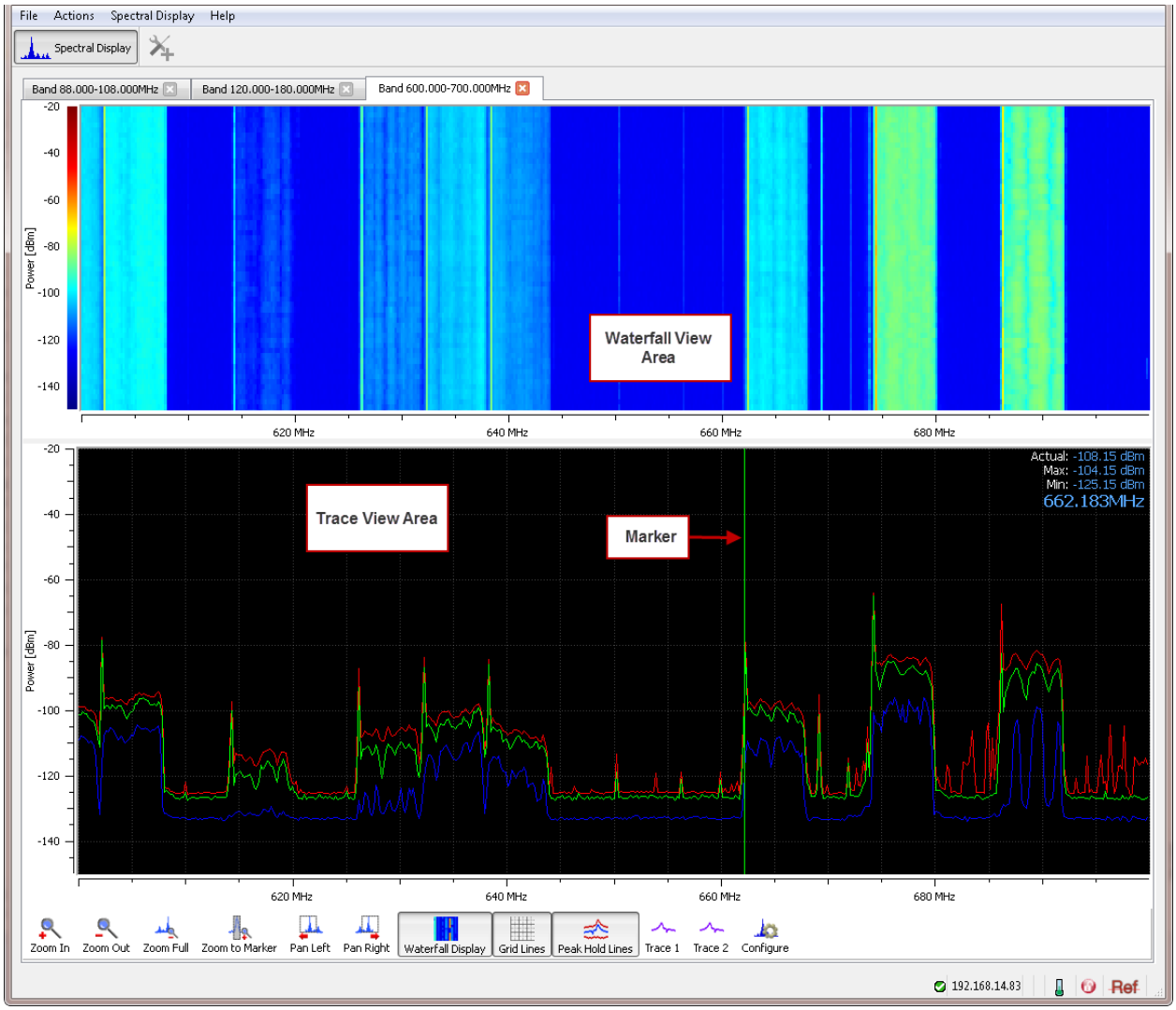
The waterfall (spectrogram) view presents a graph with the frequency in the X axis, time in the Y axis, and signal power as a shade of color. Moving the cursor over any location on the display area will cause the cursor to become a cross and a tool tip to appear. The box will contain the frequency in MHz, the power level in dBm, and the time at the cross's location. For more information on the **Waterfall Display**, see ***Waterfall Display***, below.

The original size of the Display may be changed by grabbing the lower right corner of the screen with the mouse and pulling. Pressing the **Waterfall display** toolbar button will hide the waterfall area at the top of the display and, expand the vertical size of the trace view. The views may be sized by clicking and dragging the bar that separates the two views.

The default configuration is **Waterfall Display** on, **Grid Lines** on, and **Peak Hold Lines** on.

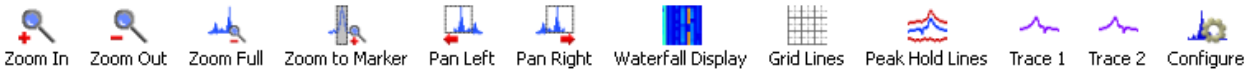
A marker can be placed on the display by clicking on the trace view where you like the marker to appear. The marker can be moved by clicking in a different location. A marker is not available in the waterfall view. For more information on the marker, see ***Trace View Marker***, below.

To change scans, select the tab above the display for the desired scan.



4.1.6.3.1.2. Spectral Display Toolbar

The Spectral Display has a toolbar:

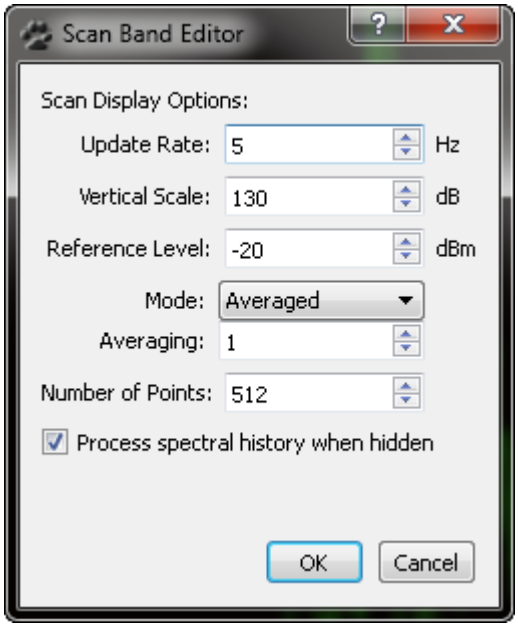


The available toolbar selections are:

-  – **Zoom In** – Zoom in on the display 1 step per mouse click (Displayed frequency span is 50% of previous span per step).
-  – **Zoom Out** – Zoom out on the display by 1 step per mouse click (Displayed frequency span is 200% of previous span per step and zoom cannot exceed original magnification).
-  – **Zoom Full** – Return display to original magnification.
-  – **Zoom to Marker** –Zoom to the marker and attempt to center the marker within the display's width.
-  – **Pan Left**– Move a zoomed display to the left 25% of the displayed frequency range. As an example, If the original scan frequency was 80 MHz to 120 MHz, but the display was zoomed to a span of 90 MHz to 110 MHz and then **Pan Left** was selected, the displayed frequency range would shift to 85 MHz to 105 MHz.
-  – **Pan Right** – Move a zoomed display to the right 25% of displayed frequency range. (See **Pan Left**, above).
-  – **Waterfall Display** – Show / hide the waterfall view.
-  – **Grid Lines** – Turn on / off the grid display.
-  – **Peak Hold Lines** – Show and Hide the maximum and minimum frequency values in the spectral area.
-  – **Trace 1 / 2** – Create a curve plot copy of the current frequency values in the spectral area.
-  – **Configure** – Edit the parameters of the current pan.

4.1.6.3.1.3. Scan Band Editor Dialog

Clicking the Spectral Display toolbar's **Configure** icon brings up the **Scan Band Editor** dialog. When the pan was first created, you were asked to enter the scan's start Frequency and stop Frequency. The **Scan Band Editor** dialog allows additional controls over the scan display. The options are:



- **Update Rate** field – The display refresh rate in Hz (updates per second). A higher refresh rate consumes more bandwidth from the network connection to the DRT unit. The default value is 5 Hz and the limits are 1 Hz to 250 Hz. The arrows increment / decrement the value in 1 Hz steps.
- **Vertical Scale** field – The range in dB between the maximum level of signal displayed and the minimum level center frequency. The default value is 130 dB and the limits are 50 dB to 200 dB. The arrows increment / decrement the value in 1 dB steps.
- **Reverence Level** field – The level in dBm of the maximum signal strength displayed. The default value is -20 dBm and the limits are -200 dBm to 200 dBm. The arrows increment / decrement the value in 1 dBm steps.
- **Mode** selection – The operating mode of the display. The options are:
    - **Averaged** – The average of a specified number of scans is displayed.
    - **Peak Hold –** The trace is composed of the strongest observed measurements for each frequency.
    - **Freeze** – The next scan processed is displayed and held until the Mode is changed
- **Averaging** field – The number of scans to be averaged for the plot displayed. This term is grayed out unless the **Mode** is set to **Averaged**. The default value is 1 and the limits are 1 to 99. The arrows increment / decrement the value in steps of 1.
- **Number of Points** field – The number of points displayed on the spectral display. The default value is 512 and the limits are 100 to 1000. The arrows increment / decrement the value in steps of 1.
- **Process spectral history when hidden** check box – Allows you to select if the spectral data continues to be processed while the waterfall view is hidden. With the box unchecked, if the waterfall view is turned off and then turned back on, the waterfall view will initially be blank, but will fill. However, with the box checked, if the waterfall view is turned off and then turned back on, the waterfall view will contain recently processed data.

4.1.6.3.1.4. Waterfall Display

The waterfall (spectrogram) view presents spectral density over time. Like the trace view, the frequency is on the horizontal axis and the waterfall view's horizontal axis is synced with the trace view's horizontal axis. The vertical axis represents the time and the shade of color represents signal power at that given frequency and time. Time in the spectrogram runs chronologically from bottom to top. As the spectrogram runs, the previous measurements move up one position, so that the current measurements are at the bottom of the plot. The view presents approximately 45 seconds of data.

4.1.6.3.1.5. Trace View Marker

In addition to the tool tip to obtain frequency and power information from the trace view, you can also place a marker anywhere on the display. To place a marker anywhere on the trace view, position the cursor on a particular location on the display and click the mouse. A display will appear at the upper right corner of the trace view which lists the center frequency of the marker in MHz and the current (**Actual**) power level of the signal in dBm. If the **Peak Hold Lines** option is selected, in addition to the current (**Actual**) power level, the display will also provide the minimum (**Min**) and maximum (**Max**) observed power levels measured since **Peak Hold Lines** was selected.

Once placed on the display, the marker cannot be removed.

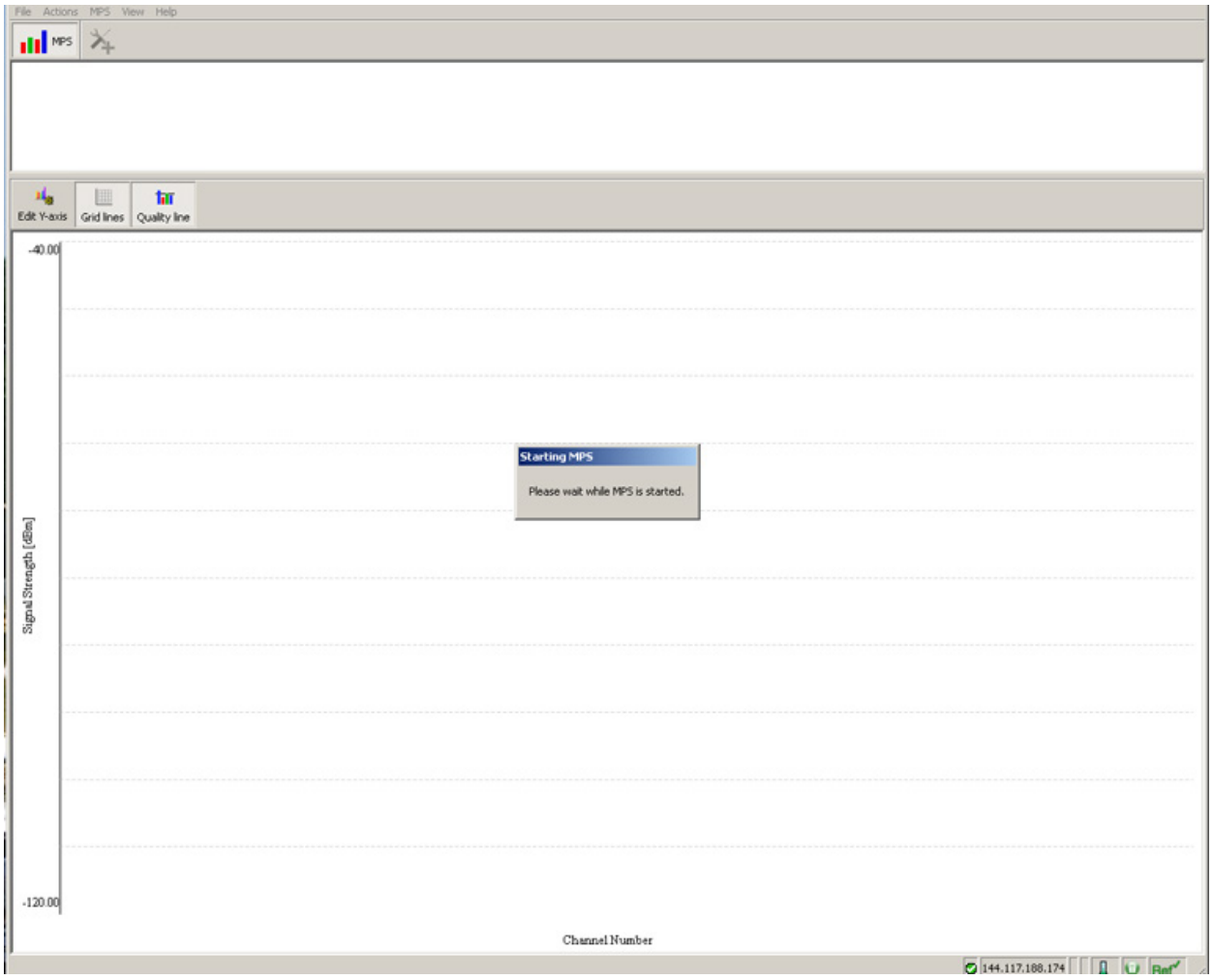
4.1.7. MPS (Multi-Protocol Scanner)

4.1.7.1. Configure MPS Service

A ***quick start guide*** is provided at the end of these instructions.

4.1.7.1.1. Configure a New Scan

- To start a new service when another service is already running, on the main menu click **Actions** > **Shutdown Active Service**. Then click the **Tools** icon > select **MPS** and click **Next**.
- Click the Tools icon, highlight the **MPS** selection and click **Next** to launch the **MPS Configuration Wizard**.

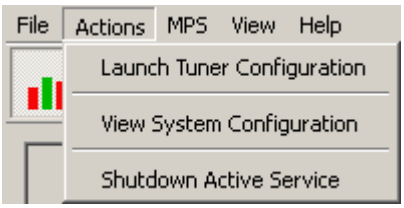


4.1.7.1.2. MPS Main Menu

4.1.7.1.2.1. Actions Menu

Actions has these options:

- **Launch Tuner Configuration** – this option is covered in the ***Main Menu / Actions Menu*** section.
- **View System Configuration** – a portion of this option is covered in the ***Main Menu / Actions Menu*** section. The portion that is MPS specific is discussed in ***View MPS_System_Configuration***, below.
- **Shutdown Active Service –** this option is covered in the ***Main Menu / Actions Menu*** section.



4.1.7.1.2.2. MPS View System Configuration

Selecting **View System Configuration** brings up the **System & Service Configuration** dialog. Logging, provider aliasing, and the overhead fields that are displayed are selected on the **System & Service Configuration>Software** dialog. NOTE: Items in **MPS View System Configuration** are described in detail in the section ***View System Configuration***. The settings are different for each wireless protocol. When all selections and edits on **System & Service Configuration** are complete, click **OK**.

Logging

This dialog allows you to enable logging and configure the data file. To enable logging:

1. Check the **Enable Logging** box.
2. Enter a file name in the **Base File Name** field. This entry can be any combination of letters and numbers; however spaces are not allowed. The file name written on the SD card will contain this base filename plus a timestamp in the format BaseName_Timestamp.log.
3. Enter / set the desired size of each log file in the **Max File Size (KB)** field. Log data is stored in a file on the SD card until the file size limit is reached. At that time the file is closed and a new file is created. The default file size is 1000 kB and the limits are 100 kB to 100,000 kB. The arrows increment / decrement the value in 1 kB steps.
4. Click **Apply**.

Provider Aliasing

Provider Aliasing allows you to apply a highlight color to the displayed signal to identify the provider of the service associated with the signal.

NOTE: EV-DO and TD-SCDMA do NOT support Provider Aliasing.

Add an Alias

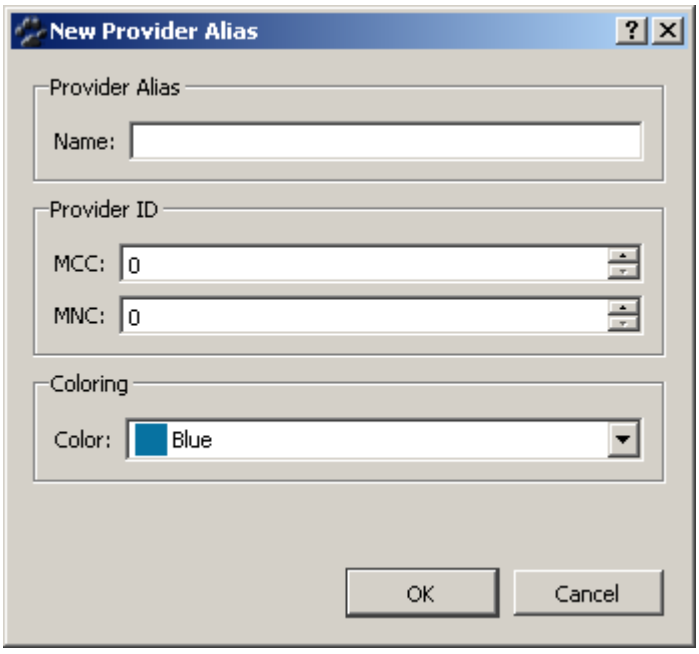
Under **Software**>**MPS** [Format] (e.g., **MPS GSM**) select Provider Aliasing.

To create an alias, click the + box in the upper right area of the **Aliases** section of the dialog. This will bring up a **New Provider Alias** page.

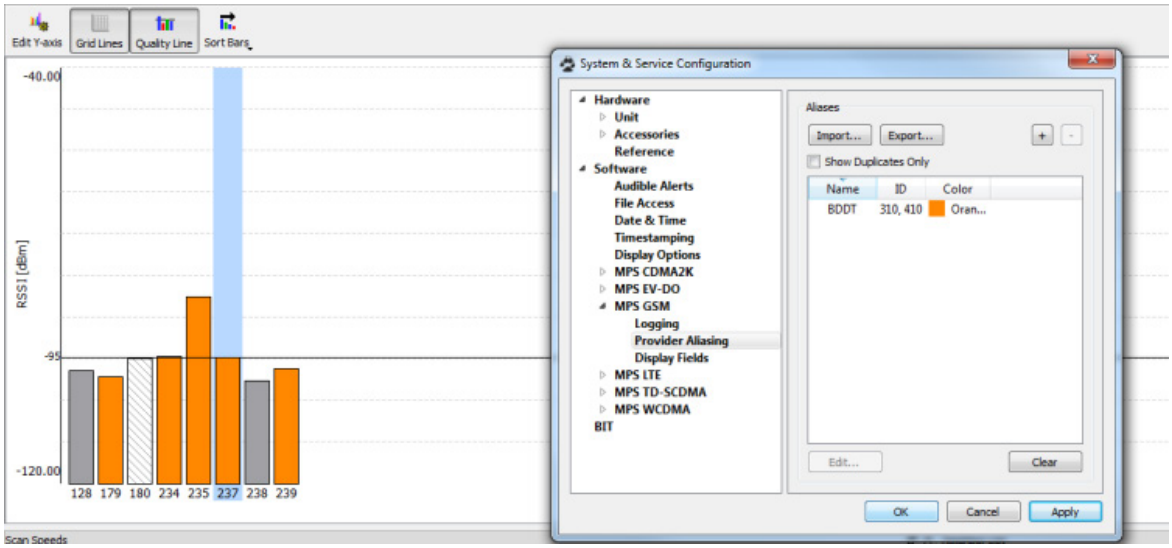
This page is populated as follows:

- **Provider Alias** – Enter a name to describe the cellular provider in the associated field. The name can be any combination of letters and numbers with spaces allowed.

- **Provider ID** – Enter the provider's ID code in the associated fields:
    - For **GSM, LTE** and **WCDMA** the values are **MCC** and **MNC.**
        - **MNC** – Enter the provider's MNC code:
          If there is a question about the correct code to use with:
            - GSM, the MNC is detected and reported in the **Channel Details / Overhead Data** area of the main display.
            - LTE, the MNC is detected and reported as the second column in the **PLMN Identity List** table and in the **Channel Details / Overhead Data** area of the main display.
            - WCDMA, the MNC is detected and reported in the **Channel Details / Overhead Data** area of the main display.
        - **MCC** – Enter the provider's MCC code:
          If there is a question about the correct code to use with:
            - GSM, the MCC is detected and reported in the **Channel Details / Overhead Data** area of the main display.
            - LTE, the MCC is detected and reported as the first column in the **PLMN Identity** List table and in the **Channel Details / Overhead Data** area of the main display..
            - WCDMA, the MCC is detected and reported in the **Channel Details / Overhead Data** area of the main display.
    - For CDMA2K, the values are **SID** and **NID**. They are reported in the **Channel Details / Overhead Data** area of the main display.
- **Coloring** – Select a color that represents the cellular provider.
    - **Color** – Select the desired highlight color from the list provided. The default is **Blue**. Note that the color will not automatically change when a new alias is created.



When you have finished creating the new Provider Alias, the channels associated with the Provider Alias that you configured appear on the Channel Graph and in the Bubble Map in the color you selected to indicate the Service Provider.



Edit an Alias

To edit an entry, either double-click the entry or highlight the entry and click **Edit.** To clear a single entry, highlight the entry and click the - box or to clear the complete list, click the **Clear** button (you will be asked to confirm the request to clear all providers). When the aliasing is complete, click **Apply**.

Import and Export Aliasing Files

When an Aliasing configuration has been successfully created, it can be saved for reuse. When you select **Export,** the file will be saved on the unit and a **Save As** *Windows* dialog will allow you to save the file to your PC. If the initial location is not where you want the file saved, you can navigate to a different location or create a location for saving the file. Enter the file name in the **File Name** field at the bottom of the screen and click **Save**. The configuration will be saved on the controller PC with that name and a .pac extension. The configuration file on the PC is available for use with any other unit.

Once the Aliasing configuration file has been saved, it can be recalled by clicking **Import** and selecting the desired file.

Display Fields

NOTE: TD-SCDMA does not support **Displayed Fields**. The **Displayed Fields** dialog allows you to select the fields that will be displayed in the **Channel Details** area. Once selected, the order of the fields can be changed using the buttons on the right side of the page. To change the order, highlight the field to be moved and click:

 Move the field to the top of the list.

 Move the field up one line.

 Move the field down one line.

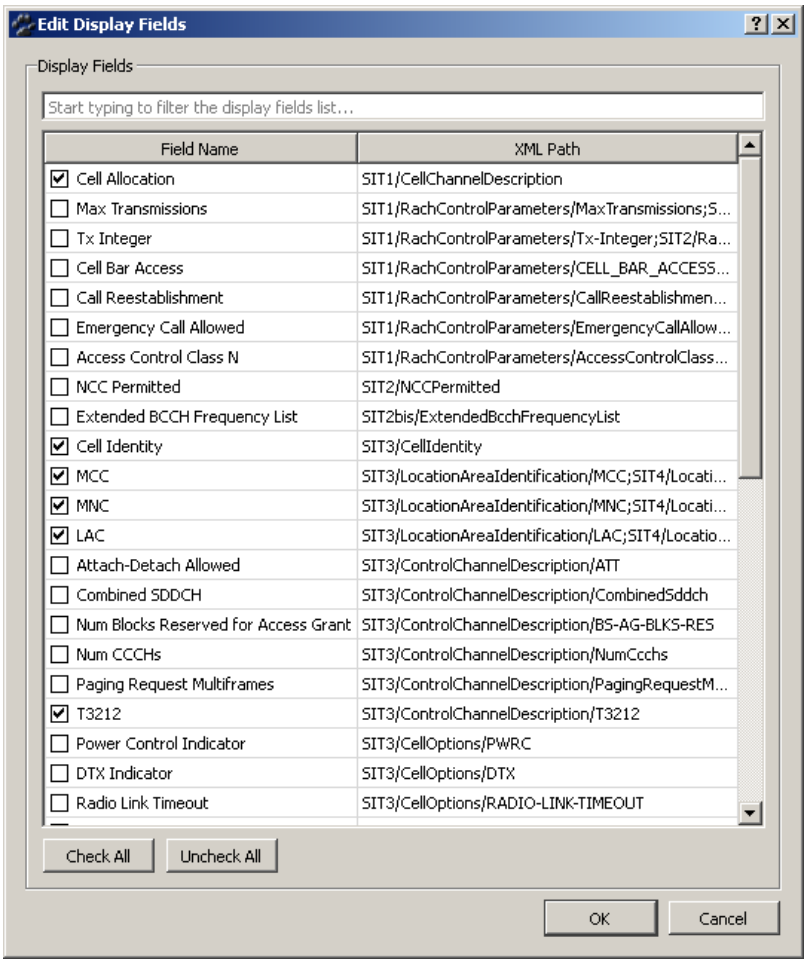
 Move the field to the bottom of the list.

When the order is correct, click **Apply**.

Modify the Displayed Fields

To modify the fields displayed, click **Edit**. The **Edit Display Fields** dialog will appear. From the list, check each **Field Name** line that is to be displayed and ensure that all others are unchecked. Clicking the **Check All** button will check all the **Field Name** lines and clicking the **Uncheck All** button will remove the check from all the **Field Name** lines. There is no limit to the number of fields you can select. To edit the field name appearing in the **Field Name** column, double-click the name or press **F2** and make the desired changes to the name.

The **XML Path** column identifies where in the XML tree the parameter is defined. The top field, an entry field containing the grayed text **Start typing to filter the display fields list,** is used to filter the selections displayed. As an example, enter the word "**cell"** in this field and only Field Names and XML Paths that contain the word "cell**"** will be displayed or enter **"BCH"** and only field names and/or XML Paths that contain BCH will be displayed. To display the full selection, remove the typed entry. When the selection is complete, click **OK**.



4.1.7.1.3. View Menu

The options appearing on the **View** menu vary according to the protocols running on the unit. The following list:

- **Scan Speeds** – **Scan Speeds** allows you to view the Scan Rate, the Cell Scan Rate, The Revisit Rate, and the Number of Channels scanned for each protocol and for each band examined in the protocol. (All protocols)
- **Channel Details** – **Channel Details** allows you to display or not display **Channel Details** information. (All protocols)
- **Channel History View** – **Channel History View** option allows you to present or not present a graphical display of selected metrics, such as C/I and RSSI. (All protocols)

- **MIMO** - **MIMO** allows you to display or not display MIMO information for a channel. (LTE protocol only)
- **Scan Results** – **Scan Results** allows you to display or not display tabulated data by channel / cell of the signals found in the selected band. (All protocols)
- **Neighbor List** – **Neighbor List** allows you to display or not display a list of neighboring cells that can be used for the handoff of a mobile call. (CDMA2K and GSM protocol only)
- **PLMN Identity List** – **PLMN Identity List** allows you to display or not display the **MCC** and **MNC** for the channel and any **Cell Barred** conditions that could exist. (LTE protocol only)
- **Cell Info List** – **Cell Info List** allows you to display or not display tabulated information about the cell, such as PSC, Cell ID, Tx Diversity, and Reference Time Difference To Cell. (WCDMA protocol only)
- **Priority List** - **Priority List** allows you to display or not display the priorities of neighboring LTE cells in Priority Lists. (WCDMA only)

4.1.7.1.4. MPS Menu

MPS menu options:

Enable Logging - Select to enable logging for all configured protocols. You can also use the keyboard shortcut **Ctrl-L**.

Launch Wizard – Opens the **MPS Configuration Wizard** to set up scan criteria. You can also use the keyboard shortcut **Ctrl-W**.

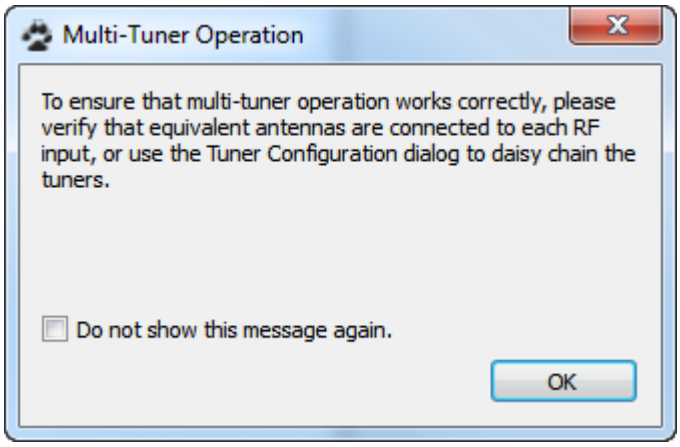
4.1.7.1.4.1. MPS Configuration Wizard

The MPS Configuration Wizard allows you to select the protocol and then the bands associated with that protocol.

The **MPS Configuration Wizard** dialog will also open when MPS starts.

NOTE: You can select CDMA2K, WCDMA, TD-SCDMA, LTE, GSM, EV-DO simultaneously with no restrictions.

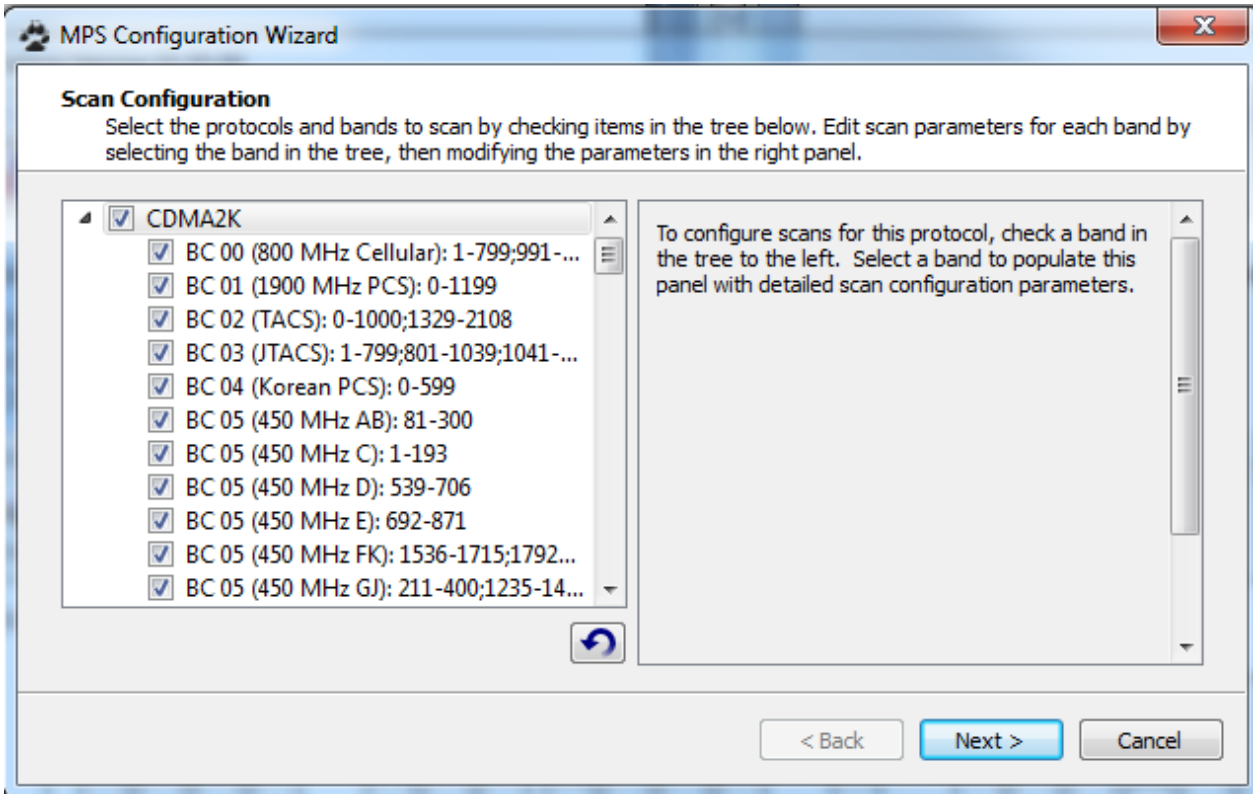
When the wizard opens, an Information box appears:



This Information box is a reminder to check unit/antenna connections when performing multi-tuner operations. To disable the appearance of this Information box whenever the wizard is started, check **Do not show this message again**.

After the wizard opens, configure the MPS scan:

1. Determine the protocol(s) to be scanned.
2. In the left pane of the **MPS Configuration Wizard** check each of the bands within the protocol(s) that you wish to scan. If needed,click the **Revert** button  to revert the selected bands back to the default list of bands for that protocol. **NOTE**: The sub-trees beneath each of the protocols in the Wizard's Scan Configuration tree only expand if at least one band is being scanned.
3. Configure the **Channel Range** for each band selected. Refer to ***Basic Settings***, below.
4. Configure the Advanced Settings for each band selected. Refer to ***CDMA2K Advanced Settings***, ***LTE Advanced Settings*** and ***WCDMA Advanced Settings***, ***EV-DO Advanced Settings***, and ***TD-SCDMA Advanced Settings*** below.
5. Once the protocol(s), band(s) and channels have been selected, click **Next** to advance to the Logging Configuration page. Refer to ***Logging Configuration***, below.
6. Configure the **Logging Parameters** then click **Finish.**

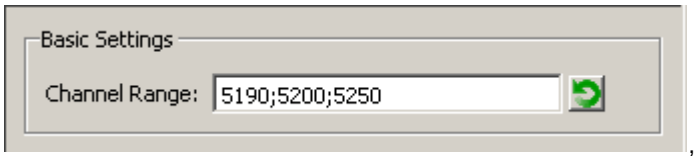


Once the protocol has started and the window has reconfigured, the **Channel Details** area will appear on the right side of the window and, depending on the protocol, the **Channel History View, Scan Results**, **Neighbor List, PLMN Identity List,** or **Cell Info List** area will appear at the bottom of the window. Any of these items can be deselected from the **View** pull-down menu or by clicking the "**X**" in the upper right corner. Also, the area can be moved to any area of the monitor's screen by clicking and dragging on the area's label. Once relocated, the area can be moved back to the window in the same way.

NOTE: Channels in the GUI are based on the channel center frequencies as defined in the protocol specification. The signal bandwidth centered on each channel depends on the task type. For some task types, the bandwidth exceeds the center frequency step size, and for other types it is less.

Basic Settings

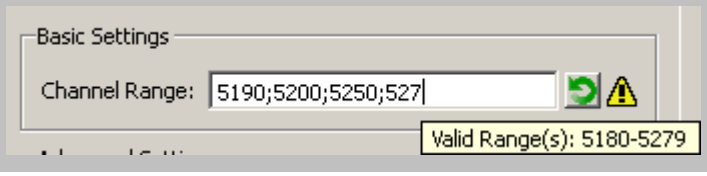
The **Channel Range** field will be displayed at the top of the right pane of the **MPS Configuration Wizard** when a band is highlighted. The channels within the designated band can be edited. Anytime a band's configuration is modified, that band is checked. All channels in each band are selected by default.



To edit the channels numbers selected, highlight the current bands / range then:

- Enter individual channels separated by a semicolon or a comma. The channels must be within the selected band. As an example, enter channel numbers 5190, 5200, and 5250 from the band 5180 to 5279 (5190;5200;5250). NOTE: Although entered as a comma, a semi-colon will be displayed in the list.
- Enter a range of channels with the upper and lower limits separated by a dash and without spaces. As an example, enter channels 5200 through 5210 from the band 5180 to 5279 (5200-5210).
- Use a combination of the two. The channels can be selected using either of the two ways or the two methods can be combined. As an example, enter channel 5190 and channels 5200 through 5210 from the band 5180 to 5279 (5190;5200-5210).

NOTE: While changes are being made, a yellow triangle will appear at the end of the line to indicate that an error exists in the line. This error can be as simple as you have exceeded the range of the band, you have too few digits in the channel number, or you have a semicolon at the end of the list and you need to add another channel or remove the semicolon. The default is all channels in each band are selected. At any time you can revert to all the channels in the band by clicking the reset icon, . If you attempt to exit the editor while an error condition exists, you will receive an Invalid Input error box and the input will be reset to the original values. In the example below, removing the three numbers and semicolon or adding a final digit to the list will correct the error condition.



Target List Field

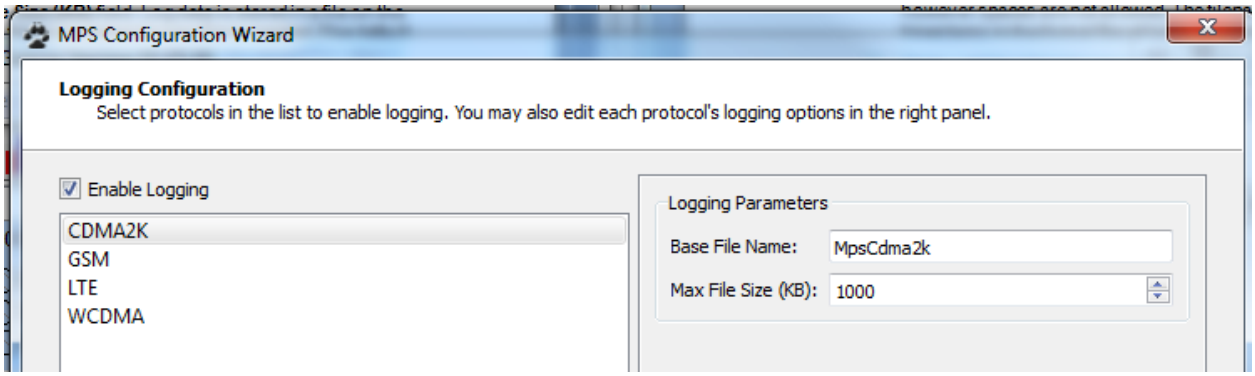
Channel Range can be used in combination with the **Target List** field. The Target List field allows you to set another filter. The criteria type is different for each format. See the Format sections for details on the **Target List** field.

Logging Configuration

Once the protocol, band(s) and channels have been selected, you will advance to the **Logging Configuration** page. Here you can enable logging by checking the **Enable Logging** box above the list of protocols and select the base file name and max file size.

NOTE:

- More than one protocol can be selected, but scan data will only be logged for the protocol(s) that are actively scanning.
- Logging can be enabled at any time using main menu > **MPS** > **Enable Logging**



For each protocol:

- Enter a file name in the **Base File Name** field. This entry can be any combination of letters and numbers; however spaces are not allowed. The full filename will contain this base filename plus a timestamp in the format BaseName_Timestamp.log.
- Enter / set the desired size of each log file in the **Max File Size (KB)** field. Log data is stored in a file until the file size limit is reached. At that time the file is closed and a new file is created. The default file size is 1000 kB and the limits are 100 kB to 100,000 kB. The arrows increment / decrement the value in 1 kB steps.

When all values have been set, click **Finish**.

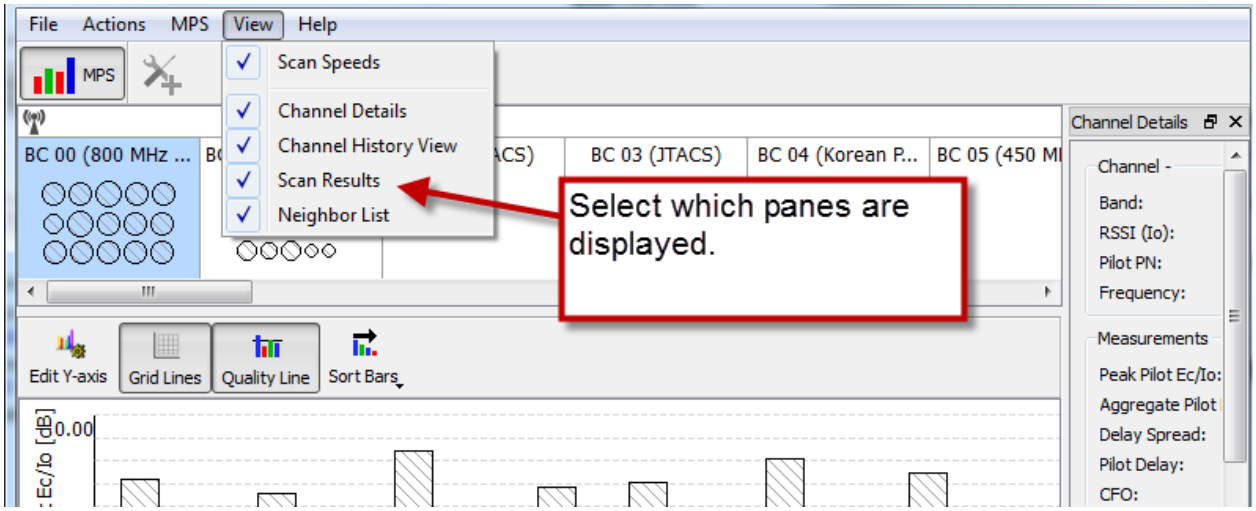
MPS log files are XML files that can be opened with an Editor such as *Notepad++* or *WordPad* on the Control PC for easier reading. You can also open them in a web browser such as MS Windows *Explorer* or Mozilla *Firefox*.

See the section ***Display Fields*** for a description of how to choose fields to be displayed in the log files.

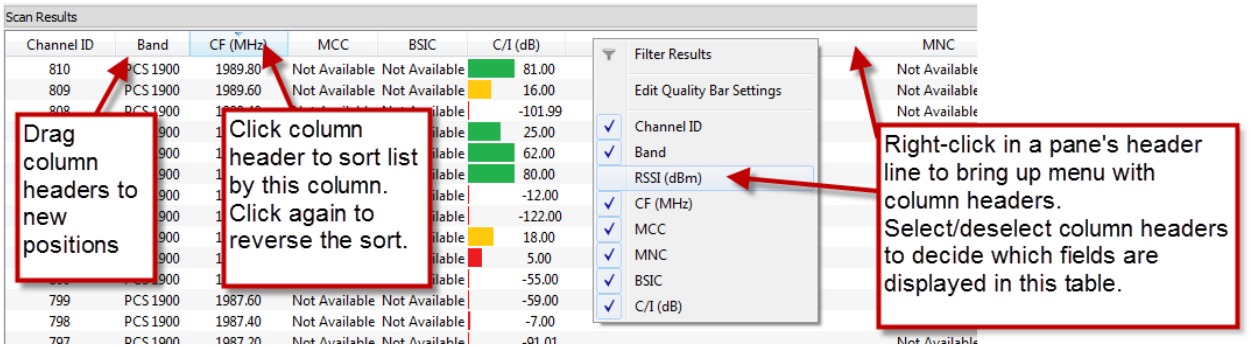
4.1.7.1.5. Dockable/Floating Panes

Once a scan is configured, the various panes available for display in the main window are floating and they can be closed out, repositioned, resized, or put back into the main window. This allows flexibility so you can get the exact screen layout that you need for your mission.

If a pane was deleted from the display, you can bring it back via the main menu > **View** where the panes for the protocol are listed. The type of available panes varies by the protocol being scanned.



You can organize the displays of many tables using the column headers as shown in the graphic below:

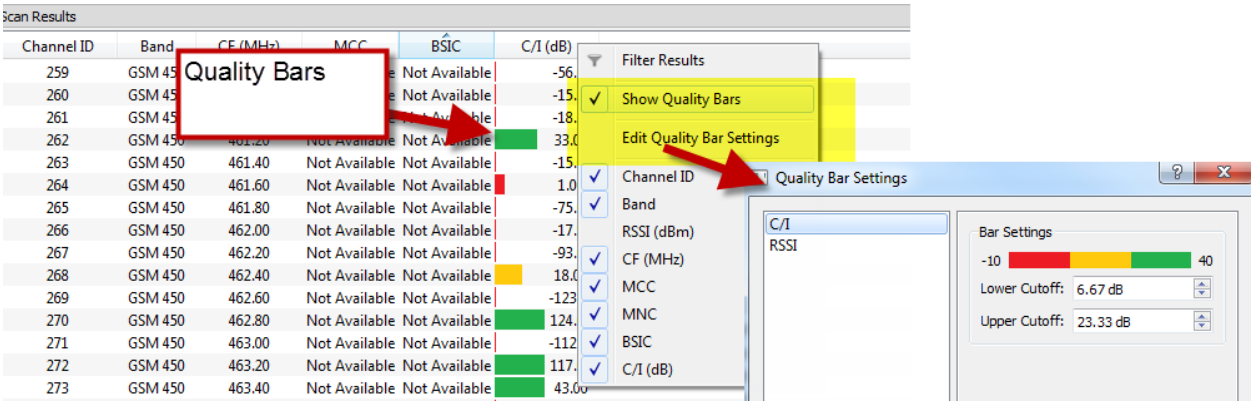


Panes may be empty. They will only display that data is "Not Available" if you have selected a channel, but that particular piece of data is not currently available for that channel.

4.1.7.1.6. Scan Result Metrics

By default, the Scan Results pane shows colored bars indicating the quality of scanned channels: the bars in the top 33% are drawn in green; bars in the bottom 33% are red; and bars in the middle 33% are yellow.

- You can select to not show quality bars: right-click in the header for the value and deselect **Show Quality Bars**. This should be done for each measurement and does not apply to all columns in the table.
- You can also modify the quality cutoff points at which bars change color: right-click in the header of the Scan Results table and select **Edit Quality Bar Settings**.



4.1.7.1.7. Neighbor List

The Neighbor List contains basic information about each of the neighboring channels associated with a selected channel including the Frequency and Band. Signal information varies for each protocol.

4.1.7.1.8. Bubble Map

The Bubble Map area identifies the bands selected to be scanned and provides a graphic indication of the signals detected within each band. The signals detected will reflect the aliasing colors if aliasing has been configured for that signal's provider. Click in a band box to display the channels detected in that band in the Channel Graph area. Hold CTRL and click bands to select multiple bands or click the protocol line ("GSM") to select all bands.

4.1.7.1.9. Channel Graph

Channel Graph displays the channels detected (in the band(s) selected in the **Bubble Map**) and the signal quality of each signal. Clicking on a signal selects that signal for display in the **Detail Panel** area.

- **Display Options** lets you modify the way channel information is displayed with these selections:
  - **Grid lines** – Places horizontal grid lines on the Channel Graph. Click the button to add the lines and click again to remove the lines. The default is on.
  - **Quality line** – When a channel in this display is selected, place a line on the display that identifies the level of the y-axis parameter of the selected signal. The default is ON.
  - **Sort Bars** - Two sorting schemes are available: channel number and signal quality. Click and hold the button to display both options and then select one. Bars may get out of order over time, so once the display has been populated, click the button briefly to force the bars to be sorted again by the last selection.
- **Signal Fill/Colors**: If aliases have been established, the detected signals will display the associated colors. Refer to ***Provider Aliasing*** for information on setting up aliasing. The Channel Graph display will show all the detected signals. If multiple bands are selected, the signals of all bands will be displayed in the Channel Graph. Signals with gray cross hatch have been only detected (no provider information decoded). Signals with blue cross hatch have been detected and decoded, but not aliased by the user. Signals with a color fill (aliased) have been detected, decoded, and aliased. Signals with a gray fill represent signals that were detected and then lost. They will return to a gray cross hatch when redetected, blue cross hatch when redetected and redecoded, or a color when redetected, redecoded, and realiased.

4.1.7.1.10. Channel Detail Pane

Once a signal has been selected in the Channel Graph area, the information about that signal is displayed in the Channel Detail Pane:

- **Channel –** Basic channel information and measurements of the signal selected.
- M**easurements -** Detailed channel measurements.
- **Overhead Data** – Detailed Overhead Data decoded for the channel. Select the Overhead Data to be displayed and the order of the items displayed in ***Display Fields*****.**

NOTE: Configuration of the ***Advanced Settings*** and the ***Scan Measurements***, below, will not change the parameters displayed in **Overhead Data** and **Measurements**.

4.1.7.1.11. Channel History

The **Channel History** view provides a Trend Graph for a selected channel.

Trend Graph

The Trend Graph plots the measurements over time that are associated with the channel(s) you select in the Channel Graph. Multiple lines of measurements (represented by colors and symbols) in the Trend Graph include the measurements listed in the Metrics column. The colors and symbols that you choose from the drop-downs for a metric in the Plot Legend appear in the Trend Graph as the metrics are collected. Double-click the Color or Symbol in the row to enable the drop-down.

For example, the blue line made up of squares in the Trend Graph illustrated below represents a measurement of *Peak CPICH Ec/Io* metric for the channel selected in the Channel Graph; the red plain line represents a measurement of *Aggregate CPICH Ec/Io*.

To pause the data streaming in the Trend Graph, click the **Hold** button at the top of the Channel History view. You can adjust the graph background by clicking the **Grid Style** button to show a grid of just vertical or horizontal lines or both. You can also remove the grid lines altogether by choosing **None** from the Grid Style drop-down.

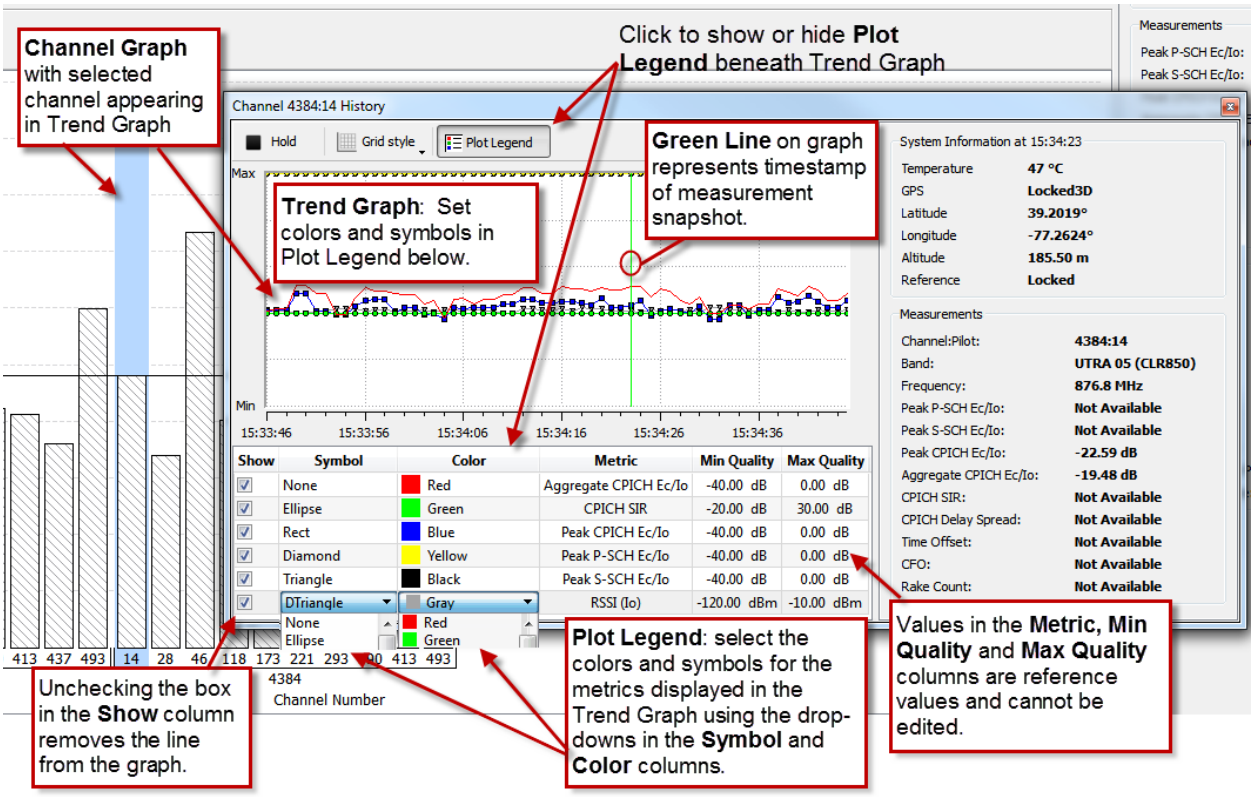
You can click anywhere in the graph to select a snapshot of the measurements. The selected timestamp is highlighted with a green vertical line and the data for that timestamp appears in the Measurements panel to the right.

Plot Legend

The Plot Legend beneath the Trend Graph appears when you click the **Plot Legend** button at the top of the Channel History View and shows the metrics that are to be plotted for the selected channel (s), their associated symbols, and the bounds for each that appear in the Min and Max Quality columns.

System Information and Measurements Panels

The panel to the right shows the measurements being taken for the currently selected snapshot. The text will include system information at the time of the snapshot including GPS data, reference clock lock status and system temperature. If there is a problem with the system, such as losing GPS or reference lock, or the temperature reaching a dangerous temperature, a warning icon will be drawn on the graph for each snapshot for the duration of the problem. For example, if the system loses GPS lock for 10 seconds then regains lock, there will be 10 warning icons drawn along with the metrics for that 10 seconds.



4.1.7.1.12. Scan Speeds

The **Scan Speeds** view provides a list of the **Channels per second**, the **Cells per Second,** the **Revisit Rate**, and the **Number of Channels** scanned for each protocol scanned and for each band scanned within that protocol. The parameters presented are:

- **Channels per second** – The frequency at which channels in the protocol / band are scanned (in channels/second).
- **Cells per second – The frequency at which each cell within the protocol / band is scanned.**
- **Revisit Rate – The time between scans of each protocol / band (in ms).**

- **Number of Channels** – The total number of channels selected to be scanned within that protocol / band.

Protocol/Band	Channels per sec	Cells per second	Revisit Period (ms	Number of Channels
GSM	29.7	0.2	34584	1026
DCS 1800	12.5	0.0	30000	374
GSM 450	1.2	0.0	30000	35
GSM 850	3.2	0.0	39157	124
PCS 1900	10.0	0.1	30000	299
R-GSM ...	2.9	0.0	66896	194

NOTE: **Channel Details**, **Scan Results**, **Neighbor List**, **Channel History,** and **Scan Speeds** can be displayed in several configurations: side-by-side, tabbed, or a combination of the two. The characteristics are:

- In side-by-side mode, all the selections are nested side-by-side and a portion of each selected parameter is displayed across the width of the display at the bottom.
- In the tabbed mode, all the selections are nested on top of each other and the total width of the display presents only one of the tabbed parameters. To view a specific parameter, select that tab.
- In the combined mode, some selections are nested on top of each other and some are side-by-side at the bottom of the display.

4.1.7.1.13. Scan Measurements and Overhead Messages

To select the scan measurements or overhead measurements, click **Edit** in the **Scan Measurements** or **Overhead Messages** area to bring up the **Scan Measurements** dialog. This dialog will allow you to identify the measurements that will be performed in addition to the basic measurements. The **Scan Measurements** dialog is divided into two sections: **Inactive** and **Active**. In each category, **Inactive** identifies the measurements that will not being performed and **Active** lists all the measurements that will be performed.

To add a measurement, highlight that measurement in the **Inactive** area and click --> **;** or to remove a measurement from the **Active** list, highlight that measurement and click <--. When all measurements are configured on the S**can Measurements/Overhead Messages** dialog, click **OK** to accept the changes and return to the **MPS Configuration Wizard**. The Scan Measurements and Overhead Messages lists will update to reflect the changes made in the **Scan Measurements** dialog.

The fields you add to the **Active** area will be present on the Channel Details pane in the Measurements and Overhead Messages panels even if they are not selected. The field labels appear with no data next to them. Measurements and Overhead Messages in log files are also affected by the choices made in the **Scan Measurements** dialog. The measured data and overhead message data appears in the log files IF chosen. If you do not choose certain fields, they do NOT appear in the log files.

4.1.7.2. CDMA2K

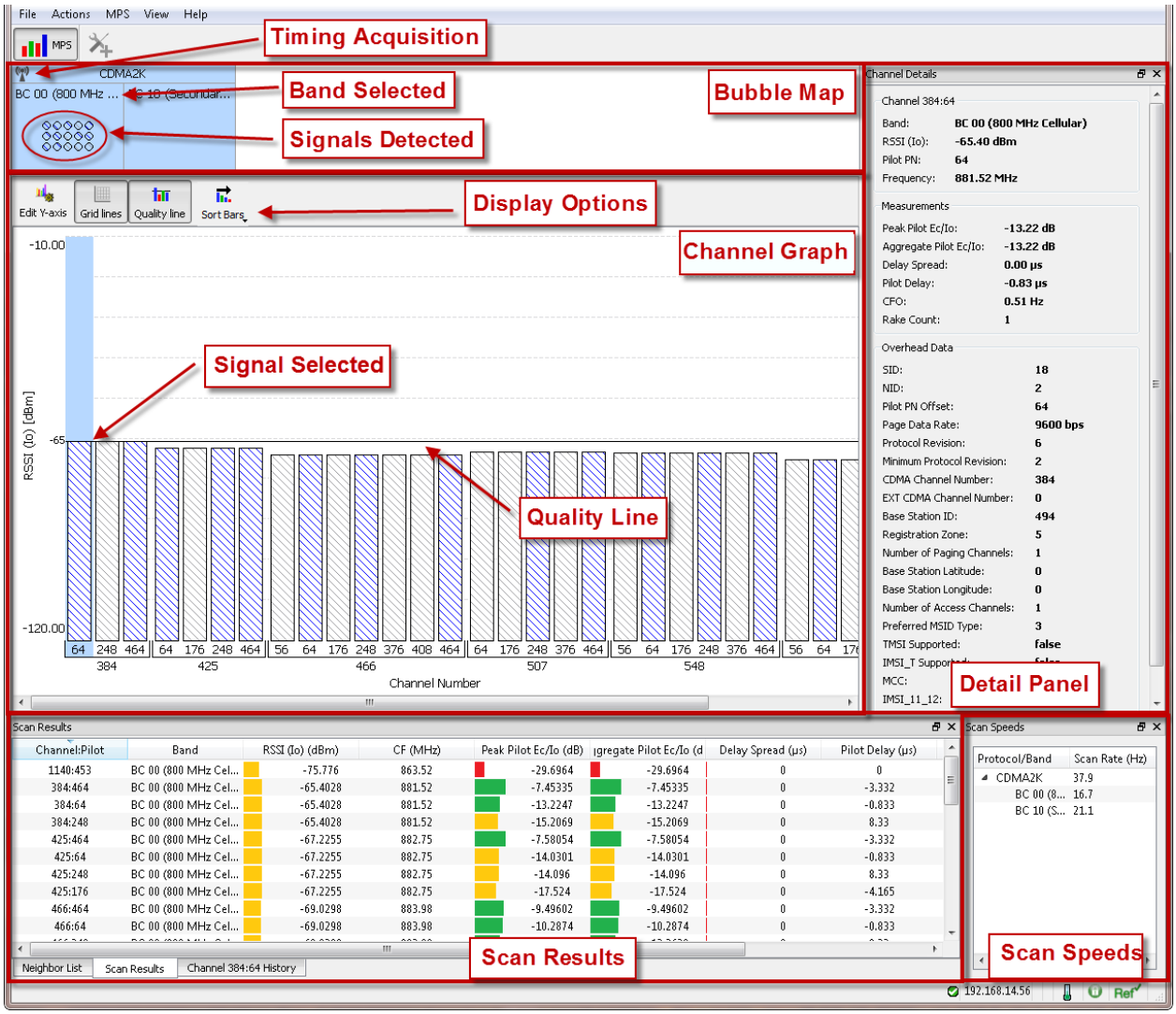
The CDMA format (previously released as the IS-95 format) encompasses cellular systems using IS-95 or cdma2000 protocols. CDMA systems are completely digital systems.

NOTE: Prior to indoor operation, the system should be synchronized with the GPS system outdoors. This ensures proper indoor operation for up to 8 hours for all scan scenarios under typical conditions. Once the GPS signal is lost, the number of RF channels that can be properly scanned will depend on how long the GPS has been lost.

Once the band(s) have been selected, scanning for signals begins. The main window displays as described in the section that describes the MPS GUI. The items listed below with their descriptions pertain to this protocol:

- **Bubble Map**
  - The CDMA2K protocol includes a Timing Acquisition icon on the left side of the protocol line. This icon will display a question mark when network timing is unknown, will display a magnifying glass while searching for network sync, and will display a tower when network timing is acquired.
  - If network timing is not acquired within 1 minute, an error box will appear stating that network timing is taking longer than expected. It will also provide possible solutions to the problem.
- **Channel Graph**

  The options are:
  - **Edit Y-axis** – Allows you to select the quality metric plotted on the y-axis and specify the bounds of the y-axis for the selected metric. The available quality metrics depend on the protocol:
    - **Aggregate Pilot Ec/Io** (in dB) – The ratio of the pilot peak signal to the aggregation of all the peaks in the Chip Window above the Chip Window Threshold. [Default]
    - **Delay Spread** (in µs) – A measure of the richness of the channel, the difference between the earliest significant multipath component's time of arrival (typically line of sight) and the latest.
    - **Peak Pilot Ec/Io** (in dB) **–** The ratio of the pilot peak signal to the power of the signal within the Chip Window.
    - **RSSI** (in dBm) – The strength by channel of a signal received by the unit which can be from any source -- a base station, a mobile station, or noise.
- **Scan Results –** Information about each Channel ID for all bands scanned in the selected protocol. Refer to ***Scan Result Metrics***.
- **Channel XXX:YY History –** Information about operating parameters for the selected channel. Refer to ***Channel_History***.



4.1.7.2.1. CDMA2K Scan Configuration

The configuration options available for CDMA2K are selected on the **Scan Configuration** page. For information on **Channel Settings**, refer to ***Basic Settings***.

4.1.7.2.2. CDMA2K Channel Details and Neighbor Lists

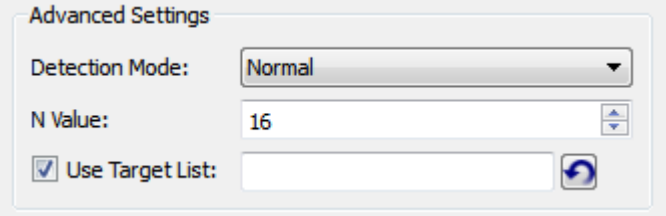
The available channel details and Neighbor Lists are listed in the following table:

Channel Details	Neighbor Lists
Channel	Pilot PN
Band	Configuration
RSSI (I_0)	Search Priority
Pilot PN	Band
Frequency	Frequency
	Search Window Size

4.1.7.2.3. CDMA2K Advanced Settings

The remaining Scan Parameters are also configured from the **MPS Configuration Wizard**. Refer to the ***Launch Wizard*** section. Once a band has been selected, the right panel of the **MPS Configuration Wizard** will display the **Basic Settings** area which allows you to set the **Channel Range**, the **Advanced Settings** area which allows you to configure the scan parameters, and the **Scan Measurements** area which indicates the measurements being made and allows you to edit the measurements selection.

The parameters configured for this band will not apply to other bands.



The *Advanced Settings* fields allow the following selections and their options:

- **Detection Mode**:
  - **Normal –** High speed scanning with normal sensitivity.
  - **Enhanced –** Enhanced sensitivity with reduced scan speed.
- **N Value –** The maximum number of pilots within each channel for which data will be returned. Enter / set the number of pilots. The limits are 0 to 32. The arrows increment / decrement the value in steps of 1. The default value is 16. The number of values in the **Use Target List** field override the N Value that you set here.
- **Use Target List** - When checked, this field uses the PN Offset value to further filter a scan. Use the **Target List** field in conjunction with the channel ranges added in the **Channel Ranges** field to filter the results of scans. You do not have to set either the Channel Range or use the **Target List** field. They can be used separately or together to create a filter for a scan. Only those channels that meet the criteria that you enter in the field will be displayed/logged. Hover over the field to bring up instructions on how to enter field criteria.

4.1.7.2.4. CDMA2K Scan Measurements and Overhead Messages

The available measurements for this protocol are listed in the following table:

Scan Measurements	Overhead Measurements
Peak Pilot Ec/Io	Sync Message
Aggregate Pilot Ec/Io	System Parameters Message
Pilot Delay	Extended System Parameters Message
Delay Spread	Access Parameters Message
Rake Count	Neighbor List Message
CFO	Extended Neighbor List Message
	General Neighbor List Message
	CDMA Channel List Message
	Extended CDMA Channel List Message
	Global Service Redirection Message

4.1.7.2.5. Log Data

Refer to ***Logging Configuration*** section for information on setting up and enabling CDMA2K Logging. Logging can also be configured after you select the protocol / bands in the **MPS Configuration Wizard**.

The values of the items measured will be repeated until the data card has been filled or the logging requirement has been removed.

See the section ***Display Fields*** for a description of how to choose fields to be displayed in the log files.

4.1.7.2.5.1. Items Measured and Logged

CDMA2K log files contain categories and subcategories of information that together describe how the system is configured, what data was collected from scans, and the measurements associated with the collection. The CDMA2K log files contain the following major fields and their subfields:

CDMA2K Log Fields

Field Name	Field Contents	Values
PilotPnOffset	Base Station Pilot PN offset in units of 64 PN chips.	0 - 511
OperationMode	How the DRT scanner will collect data.	*Normal*: standard measurement scan which meets published performance specifications. *Enhanced*: Enhanced sensitivity which meets published performance specifications. *Survey*: RESERVED
PagingChannelCollectionSettings	Enable either all Paging Channel message IDs or a list of specific Paging Channel message IDs.	Refer to Table 3.1.2.3.1.1.2-1 of 3GPP2 C.S0004-C "Signaling Link Access Control (LAC) Standard for cdma2000 Spread Spectrum Systems" for list of Paging Channel message IDs.
CollectAll	Collect and report all Paging Channel messages.	TRUE/FALSE
CollectMessageIDs	All Paging Channel messages. NOTE: If CollectAll is disabled, only the message IDs from this list will be reported in the overhead data.	0 - 64
OverheadCollectionSettings		
RevisitPeriod	How often overhead data should be reported when the scanner revisits a channel.	1
DwellTime	How long the system should decode data for a single PN (units of milliseconds).	3000
SuppressDuplicates	Only the first decoded message for each enabled Message ID will be reported for each overhead revisit if this option is set to true. Otherwise, all messages decoded during the dwell time for each enabled	TRUE/FALSE

Field Name	Field Contents	Values
	Message ID will be reported.	
CollectSyncMessage	Enable/disable measurements to include Sync Message from the Sync Channel if it could be decoded.	TRUE/FALSE
TimePositionData	Binary data with timestamp and position information.	Time: timestamp Example: 2013-10-14T13:48:19.789886 Position: GPS position (Latitude & Longitude) could be 0.
MessageData		
MessageId	Message ID of the decoded message. Refer to the appropriate code channel in 3GPP2 C.S0004-C "Signaling Link Access Control (LAC) Standard for cdma200 Spread Spectrum Systems Table 3.1.2.3.1.1.2-1 for Paging Channel Message IDs."	Example: 4
Data	Decoded code channel message	Message Length Message ID LAC-PDU: Refer to the appropriate code channel in 3GPP2 C.S0004-C "Signaling Link Access Control (LAC) Standard for cdma2000® Spread Spectrum Systems"- Section 1.2.5.2 for how LAC PDUs are assembled on the Paging channel. Refer to the appropriate code channel in 3GPP2 C.S0005-C "Upper Layer (Layer 3) Signaling Standard for cdma2000® Spread Spectrum Systems"- Table 3.7.2.3-1 for Paging Channel Layer 3 messages Example: 0C0458127ED1224D00
MeasurementEnable		
EnablePilotDelay	Enable/disable measurements to include pilot delay (usec)	TRUE/FALSE
EnablePeakPilotEcIo	Enable/disable measurements to include Peak Pilot Ec/Io (dB)	TRUE/FALSE
EnableAggregatePilotEcIo	Enable/disable measurements to include Aggregate Pilot Ec/Io (db)	TRUE/FALSE
EnableDelaySpread	Enable/disable measurements to include delay spread (usec)	TRUE/FALSE
EnableRakeCount	Enable/disable measurements to include rake count	TRUE/FALSE

Field Name	Field Contents	Values
EnableCFO	Enable/disable measurements to include CFO (Hz)	TRUE/FALSE
OverheadCollectionSettings		
MeasurementData		
PilotPnOffset	Pilot PN Offset for the base station in units of 64 PN chips in usec	Example: 176
PeakPilotEcIo	The received energy per chip of the peak pilot component divided by the total power in dB.	Example: -12.24414
AggregatePilotEcIo	The received energy per chip of all the resolvable multipath components divided by the total power in dB.	min/max occurrence = 0/1 Example: -12.24414
DelaySpread	The difference between first and last resolvable multipath components within power delay profile in usec.	Example: 0
PilotDelay	The difference between the reference pilot PN offset and the received PN offset.	Example: 0
CFO	Carrier Frequency Offset. The difference between a reference frequency and the frequency of a received Radio Frequency (RF) carrier. Units (Hz).	Example: 9.83857
RakeCount	Measurement of the resolvable multipath components in the power delay profile of a pilot PN	Example: 1
MeasurementRecord		
Time	Timestamp relative to the unit system time of the data record	Time: timestamp Example: 2013-10-14T13:48:19.789886
Position	GPS position of the data record	Position: GPS position (Latitude & Longitude) could be 0.
Channel	CDMA Channel Number	Example: 1061
Io RSSI	Received power within the relevant channel bandwidth in dBm	Example: -93.88354
ScanParameters		
Band	RF band to be scanned	Values: "BC 00 (800 MHz Cellular)", "BC 01 (1900 MHz PCS)", "BC 02 (TACS.)", "BC 03 (JTACS)", "BC 04

Field Name	Field Contents	Values
		(Korean PCS)", "BC 05 (450 MHz AB)", "BC 05 (450 MHz C)", "BC 05 (450 MHz D)" "BC 05 (450 MHz E)", "BC 05 (450 MHz FK)", "BC 05 (450 MHz GJ)", "BC 05 (450 MHz HI)", "BC 05 (450 MHz L)", "BC 06 (2 GHz)", BC 07 (Upper 700 MHz)", "BC 08 (1800 MHz)", "BC 09 (900 MHz)", "BC 10 (Secondary 800 MHz)", "BC 11 (400 MHz European PAMR)", "BC 12 (800 MHz PAMR)", "BC 13 (2.5 MHz IMT-2000 Extension)", "BC 14 (US PCS 1.9 GHz)", "BC 15 (AWS)", "BC 16 (US 2.5 GHz)", "BC 18 (700 MHz Public Safety)", "BC 19 (Lower 700 MHz)", "BC 20 (L-Band)"
ChannelList	List of Cdma2k channel numbers for the band to be scanned	
TopNValue	Number of the top pilots to report for each channel.	Values: 1 - 32
Operation	Detection mode enumeration	Normal
MeasurementModes	Selected data to be measured	
ScanConfig	Configuration	
ScanData	Channel Measurements	
OverheadData		
Channel	CDMA Channel Number	Example: 384
PilotPnOffset	Pilot PN Offset for the base station in units of 64 PN chips	Example:179
SyncMessage	Layer 3 PDU of the Sync Channel Message. Refer to section 3.7.2.3.2.26 in 3GPP2 C.S0005-C "Upper Layer (Layer 3) Signaling Standard for cdma2000® Spread Spectrum Systems"	Example: Time: 2013-11-27T10:57:36.153991 Position: Latitude39.20190433333333 Longitude-77.26245216666666 Data:1A01050200240005D0E9CCED48A54C739CA6D443606036AF396A
PagingChannelMessages	Messages decoded on the Primary Paging Channel. Will only include those that were enabled in the scan config	Example: Message ID: 3 Time: 2013-11-27T10:57:36.421203 Position: Latitude: 39.20190433333333 Longitude: -77.26245216666666 Data: 2A03E81681202601F01603000802F01702E00900280F82A00200700300883300183603904000000

Field Name	Field Contents	Values
TimingStatus	Status of network timing acquisition	
Time	Timestamp relative to the unit system time of the timing status	Time: 2013-11-27T10:57:36.421203
State	Whether the system has acquired the system timing offset	Acquired - The system has successfully determined the timing offset. Searching - The system is attempting to determine the timing offset based off of CDMA network timing information. Timedout - The system timed out while searching for system timing. Undetermined - The system was unable to determine the timing offset.
Source	GPS - Timing offset was determined using the GPS resource as a reference	CDMA - Timing offset was determined using the local CDMA system as a reference. None - Timing offset was not determined

4.1.7.3. EV-DO

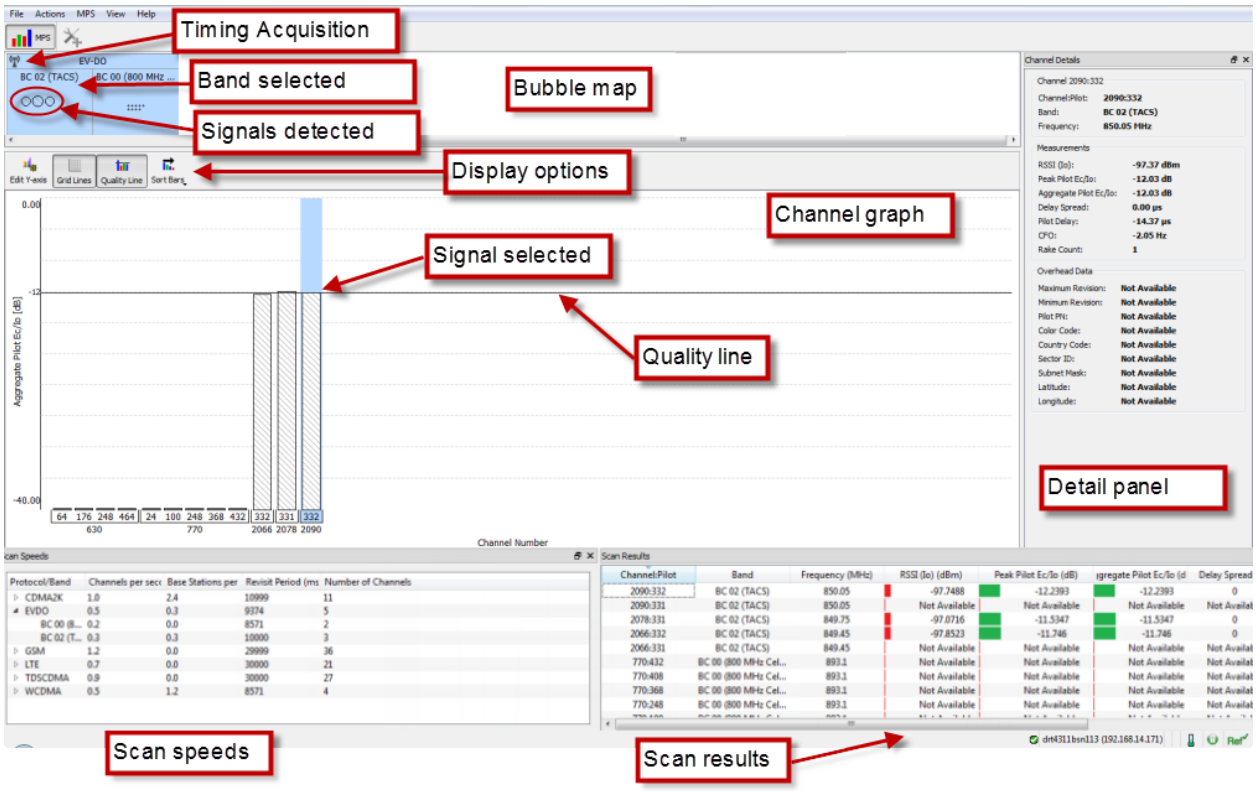
cdma2000 1xEV-DO (hereinafter referred to as EV-DO) wireless protocol is a 3G wireless mobile broadband technology that provides a data transmission capability and is available from multiple service providers. EV-DO provides connectivity to the Internet and stands for Evolution Data Only/Evolution Data Optimized.

Once the band(s) have been selected, scanning for signals begins. The main window displays as described in the section that describes the MPS GUI. The items listed below with their descriptions pertain to this protocol:

NOTE: EV-DO does NOT support Provider Aliasing.

- **Bubble Map**
  - The EV-DO protocol includes a Timing Acquisition icon on the left side of the protocol line. This icon will display a question mark when network timing is unknown, will display a magnifying glass while searching for network sync, and will display a tower when network timing is acquired.
  - If network timing is not acquired within 1 minute, an error box will appear stating that network timing is taking longer than expected. It will also provide possible solutions to the problem.
- **Channel Graph**

  The options are:
  - **Edit Y-axis** – Allows you to select the quality metric plotted on the y-axis and specify the bounds of the y-axis for the selected metric. The available quality metrics depend on the protocol:
    - **Aggregate Pilot Ec/Io** (in dB) – The ratio of the pilot peak signal to the aggregation of all the peaks in the Chip Window above the Chip Window Threshold. [Default]
    - **Peak Pilot Ec/Io** (in dB) **–** The ratio of the pilot peak signal to the power of the signal within the Chip Window.
    - **RSSI/Io** (in dBm) – The strength by channel of a signal received by the unit which can be from any source -- a base station, a mobile station, or noise.
- **Scan Results –** Information about each Channel ID for all bands scanned in the selected protocol. Refer to ***Scan Result Metrics***.
- **Channel XXX:YY History –** Information about operating parameters for the selected channel. Refer to ***Channel History***.



4.1.7.3.1. EV-DO Scan Configuration

The configuration options available for EV-DO are selected on the **Scan Configuration** page. For information on **Channel Settings**, refer to ***Basic Settings***.

4.1.7.3.2. EV-DO Channel Details and Neighbor Lists

The available Channel Details and Neighbor Lists for this protocol are listed in the following table:

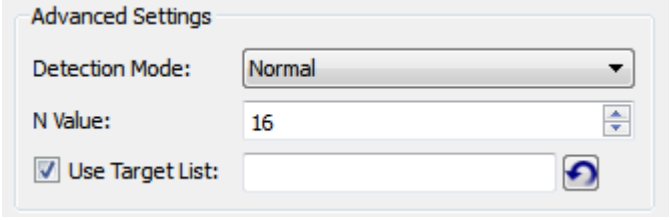
Channel Details	Neighbor Lists
Channel Pilot	Pilot PN
Band	Channel
Frequency	System Type
	Band Class
	Search Window Size Index
	Search Window Offset Index

4.1.7.3.3. EV-DO Advanced Settings

The remaining Scan Parameters are also configured from the **MPS Configuration Wizard**. Refer to the ***Launch Wizard*** section. Once a band has been selected, the right panel of the **MPS Configuration Wizard** will display the **Basic Settings** area which allows you to set the **Channel Range**, the **Advanced Settings** area which allows

you to configure the scan parameters, and the **Scan Measurements** area which indicates the measurements being made and allows you to edit the measurements selection.

The parameters configured for this band will not apply to other bands.



The **Advanced Settings** fields allow the following selections and their options:

- **Detection Mode**:
  - **Normal –** High speed scanning with normal sensitivity.
  - **Enhanced –** Enhanced sensitivity with reduced scan speed.
- **N Value –** The maximum number of pilots within each channel for which data will be returned. Enter / set the number of pilots. The limits are 0 to 32. The arrows increment / decrement the value in steps of 1. The default value is 16. The number of values in the **Use Target List** field override the N value that you set here.
- **Use Target List** - When checked, this field uses the PN Offset value to further filter a scan. Use the **Target List** field in conjunction with the channel ranges added in the **Channel Ranges** field to filter the results of scans. You do not have to set either the Channel Range or use the **Target List** field. They can be used separately or together to create a filter for a scan. Only those channels that meet the criteria that you enter in the field will be displayed/logged. Hover over the field to bring up instructions on how to enter field criteria.

4.1.7.3.4. EV-DO Scan Measurements and Overhead Messages

The available measurements for this protocol are listed in the following table:

Scan Measurements	Overhead Measurements
Peak Pilot Ec/Io	Sync Message
Aggregate Pilot Ec/Io	Sector Parameters Message
Delay Spread	Quick Configuration Message
Pilot Delay	Access Parameters Message
CFO	
Rake Count	
RSSI Io	

4.1.7.3.5. Log Data

Refer to ***Logging Configuration*** section for information on setting up and enabling EV-DO Logging. Logging can also be configured after you select the protocol / bands in the **MPS Configuration Wizard**.

The values of the items measured will be repeated until the data card has been filled or the logging requirement has been removed.

See the section ***Display Fields*** for a description of how to choose fields to be displayed in the log files.

4.1.7.3.5.1. Items Measured and Logged

EV-DO log files contain categories and subcategories of information that together describe how the system is configured, what data was collected from scans, and the measurements associated with the collection. The EV-DO log files contain the following major fields and their subfields:

EV-DO Log Fields

Field Name	Field Contents	Values
SyncMessage	Record type generated during EV-DO access network synchronization	
MaximumRevision	Maximum Air-Interface protocol revision supported by the access network	Values: 0 - 255
MinimumRevision	Minimum Air-Interface protocol revision supported by the access network	Values: 0 - MaximumRevision
PilotPN	Pilot PN sequence offset index	
SystemTime	System time in units of 26.66 ms	
QuickConfigMessage		
ColorCode	Color code that corresponds to the sector	
SectorId24	Least significant 24 bits of the sector ID value corresponding to the sector.	
SectorSignature	Value of the SectorSignature field of the next SectorParameters message to be transmitted	
AccessSignature	Value of the AccessSignature parameter from the AccessParameters message that is Public Data of the Access Channel MAC Protocol	
Redirect	Set to true if all access terminals	

Field Name	Field Contents	Values
	are being redirected away from this access network	
RpcCount63to0	Maximum number of RPC channels supported by this sector corresponding to Traffic Channels associated with MAC indexes 0 through 63, inclusive	Values: 0 - 63
ForwardTrafficValid127to64	Set to true if the Forward Traffic Channel associated with MACIndex 128-n is valid	
RpcCount130to383Included	Maximum number of RPC channels supported by this sector corresponding to Traffic Channels associated with MAC indexes 130 through 383, inclusive	
RpcCount128to383	Maximum number of RPC channels supported by this sector corresponding to Traffic Channels associated with MAC indexes 128 through 383, inclusive	
ForwardTrafficValid130to383	Set to true if the Forward Traffic Channel associated with MACIndex 64-n is valid	
SectorParametersMessage		
CountryCode	Three-digit Binary Coded Decimal (BCD) representation of the Mobile Country Code associated with this sector	
SectorId	Sector Address Identifier	
SubnetMask	The number of consecutive 1s in the subnet mask of the subnet to which this sector belongs	
SectorSignature	SectorParameters message signature. This signature will change when the contents of the message changes	
Latitude	Latitude in units of decimal degrees	
Longitude	Longitude in units of decimal degrees	

Field Name	Field Contents	Values
RouteUpdateRadius	A non-zero value indicates the "distance" beyond with the access terminal is to send a new RouteUpdate message. Zero = no distance RouteUpdates	
LeapSeconds	Number of leap seconds that have occurred since the start of system time	
LocalTimeOffset	Offset of local time from system time, in units of minutes expressed as a signed 2's complement number	
ReverseLinkSilenceDuration	Duration of the Reverse Link Silence interval in units of frames	
ReverseLinkSilencePeriod	The period of the Reverse Link Silence interval that starts at System Time T as defined by the equation T mod (2048*2^ReverseLinkSilencePeriod - 1) = 0. In units of frames	
ChannelList	Channel record specification for each channel	
NeighborList	NID roamer registration indicator	
Neighbor		
AccessParametersMessage		
AccessCycleDuration	Duration of an Access Channel Cycle in units of slots	
AccessSignature	Network changes this field if the parameters of this message change	
OpenLoopAdjust	Negative of the nominal power to be used in the open loop power estimate, in units of 1 dB	
ProbeInitialAdjust	Correction factor for the open loop power estimate. A two's complement value in units of 1 dB	
ProbeNumStep	Maximum number of access probes to be transmitted in a single access probe sequence. Range 1	

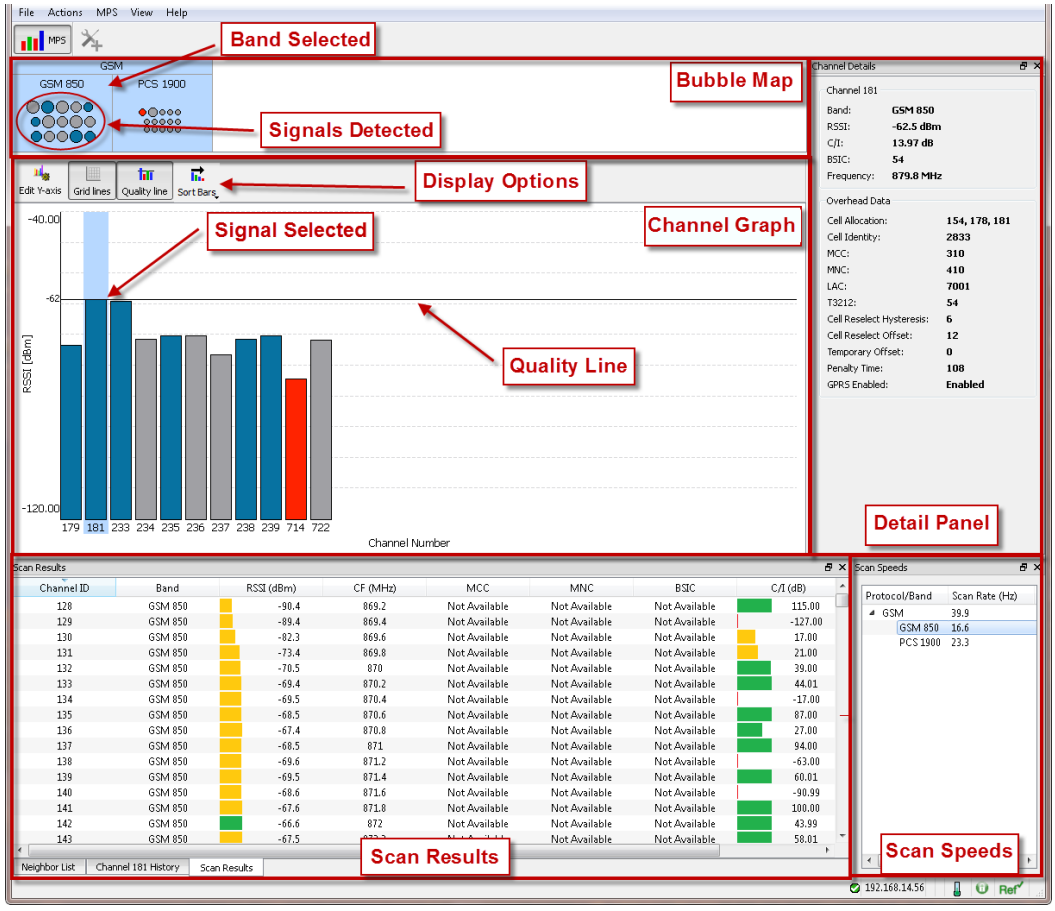
Field Name	Field Contents	Values
	to 15	
PowerStep	Power increase between probes, in resolution of 0.5 dB	
PreambleLength	Length of the access probe preamble, in frames	
CapsuleLengthMax	Maximum number of frames in an Access Channel Capsule. Range 2 to 15	
APersistence	Access persistence vector. 0x3F corresponds to 0 as the corresponding persistence probability. Other values shall use 2-n/4 as the persistence probability	
Channel		
SystemType	EV-DO compliant system or cdma2000 compliant system	Values: EVDO Values: cdma2000
BandClass	Band class number	
ChannelNumber	Channel number	
Neighbor		
PilotPn	PN offset of neighbor sector to be added to the Neighbor set	
Channel	Channel specification	
SearchWindowSize	Index into Table 6.8.6.2-1 corresponding to the Search Window Size to be for this neighboring pilot	
SearchWindowOffset	Index into Table 6.8.6.2-2 corresponding to the Search Window Offset to be for this neighboring pilot	

4.1.7.4. GSM

GSM stands for Global System for Mobile Communications. GSM is a TDMA, digital cellular format used worldwide. There are four types of GSM: 450 MHz, 900 MHz, 1800 MHz, and 1900 MHz.

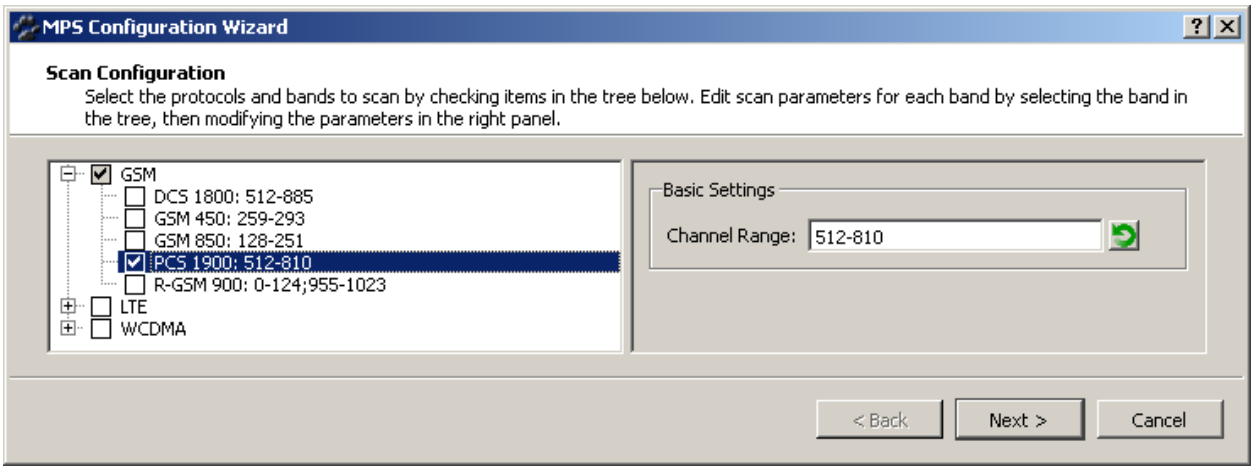
Once the band(s) have been selected, scanning for signals begins. The main window displays as described in the section that describes the MPS GUI. The items listed below with their descriptions pertain to this protocol:

- **Channel Graph** –This area displays the channels detected (in the band(s) selected in the **Bubble Map**) and the signal quality of each signal.
    - **Edit Y-axis** – Allows you to select the quality metric plotted on the y-axis and specify the bounds of the y-axis for the selected metric. The available quality metrics for this format are:
        - **RSSI** (in dBm) – The strength by channel of a signal received by the unit which can be from any source -- a base station, a mobile station, or noise. [Default]
        - **C/I** (in dB) – The carrier-to-interference ratio by channel.
- **Channel XXX History –** Information about operating parameters for the selected channel. Refer to ***Channel History***.
- **Scan Speeds –** Refer to ***Scan Speeds***.



4.1.7.4.1. GSM Scan Configuration

The scan configuration options are selected on the **Scan Configuration** page. For information on **Channel Settings**, refer to ***Basic Settings***.



4.1.7.4.2. GSM Channel Details and Neighbor Lists

The available Channel Details and Neighbor Lists for this protocol are listed in the following table:

Channel Details	Neighbor Lists
Channel	Band
Band	Channel ID
RSSI	RSSI
C/I	Neighbors
BSIC	
Frequency	
RSSI Io	

4.1.7.4.2.1. Scan Measurements and Overhead Messages

The available measurements for this protocol are listed in the following table:

Scan Measurements	Overhead Measurements
C/I	SI 1
	SI 2
	SI 2bis
	SI 2ter
	SI 2quater
	SI 3
	SI 4

Scan Measurements	Overhead Measurements
	SI 5
	SI 5bis
	SI 5ter
	SI 6
	SI 7
	SI 8
	SI 9
	SI 13
	SI 13alt
	SI 14
	SI 15
	SI 16
	SI 17
	SI 18
	SI 19
	SI 20
	SI 21
	SI 22
	SI 23
	SI 2n (all SI messages in the 2'n' group will appear)

4.1.7.4.3. Log Data

Refer to ***Logging Configuration*** section for information on setting up and enabling GSM Logging. Logging can also be configured after you select the protocol / bands in the **MPS Configuration Wizard**.

The values of the items measured will be repeated until the data card has been filled or the logging requirement has been removed.

See the section ***Display Fields*** for a description of how to choose fields to be displayed in the log files.

4.1.7.4.3.1. Items Measured and Logged

GSM log files contain categories and subcategories of information that together describe how the system is configured, what data was collected from scans, and the measurements associated with the collection. The GSM log files contain the following major fields and their subfields:

GSM Log Fields

Field Name	Field Contents	Values
MeasurementRecord	Record type generated for all scanned channels that provides RSSI, C/I, and BSIC (if available)	
Time	Time that measurement was collected	Example: 2013-10-22T17:02:26.688415
Position	If there was a GPS lock, the location at which the measurement	Example: Position: GPS position (Latitude &

Field Name	Field Contents	Values
	was taken	Longitude) could be 0.
Channel	Channel being scanned	Example: 549
BSIC	If detected, the Base Station Identification Code (BSIC) of the channel	
RSSI	The channel Received Signal Strength Indication (RSSI) of the channel in dBm	Example: -101.1842
CIR	The Signal-to-Interference ratio (C/I) of the channel. This value is only present if a BSIC was detected and CIR is enabled for collection.	
SIDATA	For channels that have a BSIC, this message represents an overhead message that was decoded.	
Time	Time that data was collected	Example: 2013-10-22T17:02:26.688415
Position	If there was a GPS lock, the location at which the measurement was taken	Example: Position: GPS position (Latitude & Longitude) could be 0.
FrameNumber	Frame number of the overhead message that was decoded	
MinCIR	The minimum Signal-to-Interference ratio (C/I) calculated during the decoding of the overhead message	
Type	Message Type as defined by 3GPP TS 04.08 Section 10.4	
Data	Raw data for Layer 3 overhead messages	

4.1.7.5. LTE

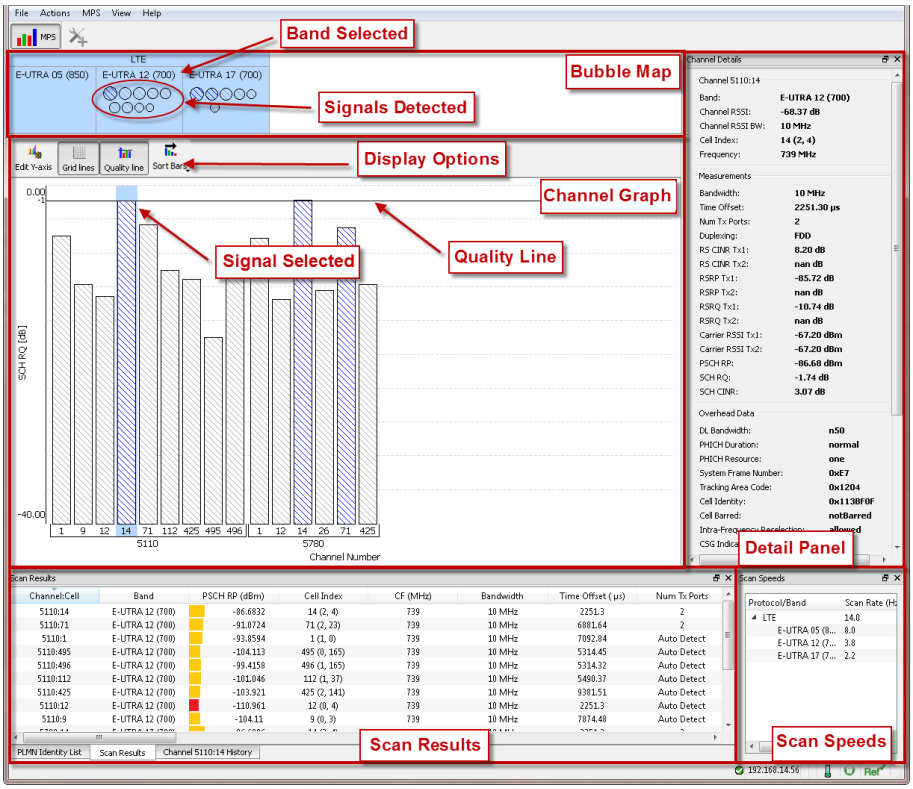
Long Term Evolution (LTE) is a 4G mobile broadband technology that provides high-speed data for mobile phones and terminals.

Once the band(s) have been selected, scanning for signals begins. The main window displays as described in the section that describes the MPS GUI. The items listed below with their descriptions pertain to this protocol:

- **Channel Graph** –This area displays the channels detected (in the band(s) selected in the **Bubble Map**) and the signal quality of each signal.
    - **Edit Y-axis** – Allows you to select the quality metric plotted on the y-axis and specify the bounds of the y-axis for the selected metric. The available quality metrics for this format are:
        - **BCH RP** (dBm) - Measure and return BCH Receive Power
        - **CFO** (Hz) - Center frequency offset of the channel
        - **Carrier RSSI Tx1** (dBm) –RSSI value of the RF carrier at full channel bandwidth
        - **Carrier RSSI Tx2** (dBm) –RSSI value of the RF carrier at full channel bandwidth
        - **Carrier RSSI Tx3** (dBm) –RSSI value of the RF carrier at full channel bandwidth
        - **Carrier RSSI Tx4** (dBm) –RSSI value of the RF carrier at full channel bandwidth
        - **Delay Spread** (µs) - Average delay spread
        - **PSCH RP** (dBm) – Received power value of the PSCH per sub-carrier (in dBm) [Default]
        - **RS CINR Tx1** (dB) - CINR value of the Reference Signal for TX port 0
        - **RS CINR Tx2** (dB) - CINR value of the Reference Signal for TX port 1
        - **RS CINR Tx3** (dB) - CINR value of the Reference Signal for TX port 2
        - **RS CINR Tx4** (dB) - CINR value of the Reference Signal for TX port 3
        - **RSRP Tx1** (dBm) - Reference Signal Received Power for TX port 0
        - **RSRP Tx2** (dBm) - Reference Signal Received Power for TX port 1
        - **RSRP Tx3** (dBm) - Reference Signal Received Power for TX port 2
        - **RSRP Tx4** (dBm) - Reference Signal Received Power for TX port 3
        - **RSRQ Tx1** (dB) - Reference Signal Received Quality Es/Io for TX port 0
        - **RSRQ Tx2** (dB) - Reference Signal Received Quality Es/Io for TX port 1
        - **RSRQ Tx3** (dB) - Reference Signal Received Quality Es/Io for TX port 2
        - **RSRQ Tx4** (dB) - Reference Signal Received Quality Es/Io for TX port 3
        - **SCH CINR** (dB) – Carrier-to-Interference Noise Ratio (CINR) of the synchronization channel
        - **SCH RQ** (dB) – Receive quality of the synchronization channel signal
        - **SSCHP RP** (dBm) - Received power value of the SSCH per sub-carrier
        - **Time Offset** (µs) - Time offset
        - **RSSI (dBm)** - Received Signal Strength Indicator
- **Scan Results –** Information about each Channel ID for all bands scanned in the selected protocol. Refer to ***Scan Result Metrics***.
- **PLMN Identity List –** The PLMN Identity List area displays the **MCC** and **MNC** of each of the selected cells and whether that PLMN identity is barred.

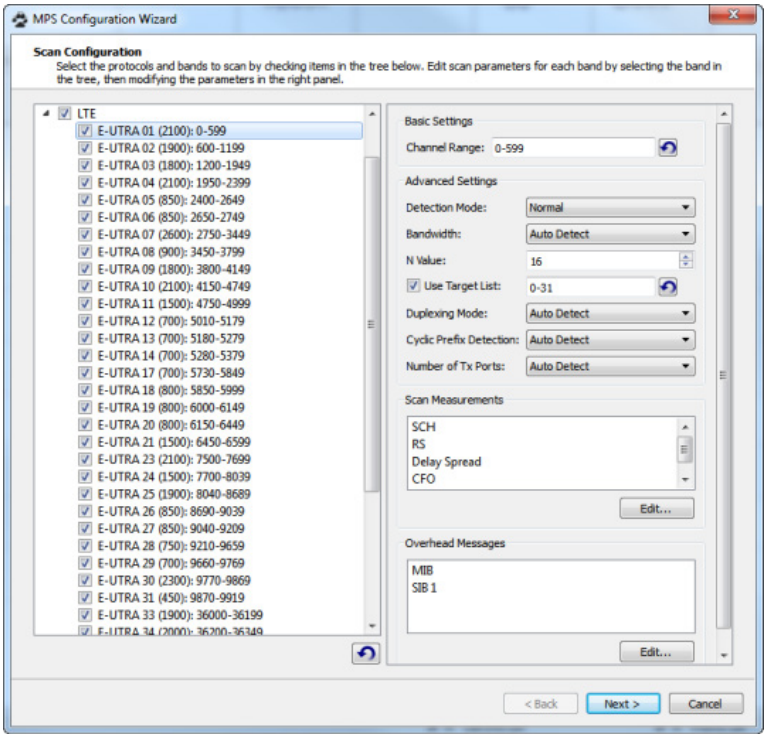
- **Channel XXX:YY History –** Information about operating parameters for the selected channel. Refer to **Channel_History**.
- **Scan Speeds –** Refer to **Scan_Speeds**.
- **LTE MIMO** - Refer to the section on ***Scanning_Individual_and_Simultaneous_Protocols__V2_scanners_*** and refer to the Hardware Manual that comes with your system for instructions on making hardware connections and configuring the software for LTE MIMO operations. Setting up MIMO on a DRT unit with two tuners enables RSRP, RSCINR, RSRQ for receive port 2. **NOTE**: A MIMO setup is not required to obtain RSRP, RSRQ, and RSCINR measurements from all Base Stations (BTS) transmit ports using one scanner receive port.

How you view MIMO channel information can be changed from Tile to Tab format using the **View** menu at the top. The **TxRx** indicators in the measurement windows refer to TX channel input and Rx channel output.



4.1.7.5.1. LTE Scan Configuration

The scan configuration options are selected on the **Scan Configuration** page. For information on **Channel Settings**, refer to ***Basic Settings***.



4.1.7.5.2. LTE Channel Details and Neighbor Lists

The available Channel Details and Neighbor Lists for this protocol are listed in the following table:

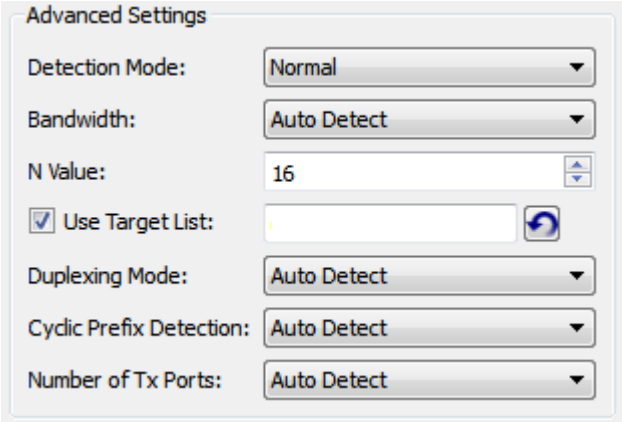
Channel Details	Neighbor Lists
Channel	**NOT AVAILABLE FOR LTE**
Channel Pilot	
Band	
Frequency	

4.1.7.5.3. LTE Advanced Settings

The *Advanced Settings* fields allow you to configure the scan parameters. The parameters configured for this band will not apply to other LTE bands and include:

- **Detection Mode**:
    - **Normal - High speed scanning with normal sensitivity.**
    - **Enhanced – Enhanced sensitivity with reduced scan speed.**
    - **Survey – Reserved for future use.**
- **Bandwidth** – The signal bandwidth to be used:
    - **AutoDetect –** The signal bandwidth will be automatically detected.
    - **1.4MHz –** A signal bandwidth of 1.4 MHz will be used to measure the received signal.
    - **3MHz –** A signal bandwidth of 3 MHz will be used to measure the received signal.
    - **5MHz –** A signal bandwidth of 5 MHz will be used to measure the received signal.
    - **10MHz –** A signal bandwidth of 10 MHz will be used to measure the received signal.
    - **15MHz –** A signal bandwidth of 15 MHz will be used to measure the received signal.
    - **20MHz –** A signal bandwidth of 20 MHz will be used to measure the received signal.
- **N Value –** The maximum number of cells within each channel for which data will be returned. Enter / set the number of cells. The limits are 0 to 32. The arrows increment / decrement the value in steps of 1. The default value is 16. The number of values in the **Use Target List** field override the N value that you set here.
- **Use Target List** - When checked, this field uses the **Cell Index** value to further filter a scan. Use the **Target List** field in conjunction with the channel ranges added in the **Channel Ranges** field to filter the results of scans. You do not have to set either the Channel Range or use the **Target List** field. They can be used separately or together to create a filter for a scan. Only those channels that meet the criteria that you enter in the field will be displayed/logged. Hover over the field to bring up instructions on how to enter field criteria.
- **Duplexing Mode**
    - **AutoDetect** – Selects the duplexing mode based on the band(s) being monitored.
    - **FDD** – Return data sets for signals decoded using FDD (Frequency Division Duplexing).
    - **TDD** – Return data sets for signals decoded using TDD (Time Division Duplexing).
- **Cyclic Prefix Detection –** Return data sets for signals decoded using the designated cyclic prefix mode.
    - **AutoDetect**– Blind detection of cyclic prefix length.
    - **Normal**– Detection using normal cyclic prefix length.
    - **Extended**– Detection using extended cyclic prefix length.

- **Number of Tx Ports –** Return data sets for signals using a specific number of transmit ports (antennas) by the base station. Unless the number of ports is known, it is recommended that you use AutoDetect.
  - **AutoDetect–** Return data sets for base stations with all transmit port configurations.
  - **1 –** Return data sets for base stations with one transmit port.
  - **2 –** Return data sets for base stations with two transmit ports.
  - **4** – Return data sets for base stations with four transmit ports.



4.1.7.5.4. Scan Measurements and Overhead Messages

Following configuration of the other **Advanced Settings**, click **Edit** in the **Scan Measurements** area. To configure the LTE scan measurements, access the Scan Measurements dialog. This dialog will allow you to identify the measurements that will be performed in addition to the basic measurements. The **Scan Measurements** dialog is divided into two sections: **All Scan Measurements** and **Active Scan Measurements**. **All Scan Measurements** identifies all the possible measurements that can be performed and **Active Scan Measurements** lists all the measurements that will be performed.

To add a measurement, highlight that measurement in the **All Scan Measurements** area and click **Add Selected**; or to remove a measurement from the **Active Scan Measurements** list, highlight that measurement and click **Remove Selection**.

The available measurements for this protocol are listed in the following table:

Scan Measurements	Overhead Measurements
RS - Measure and return RSRP, RSRQ	MIB - Return Master Information Block (MIB) message (see 3GPP TS 36.331 Sec. 6.2.2)
SCH - Measure and return Cell Index, PSCH RP, SSCH RP, and SCHRQ	SIB Type 1 - Return System Information Block (SIB) Type1 message (see 3GPP TS 36.331 Sec. 6.2.2)
CFO - Measure and return CFO	
Delay Spread - Measure and return Delay Spread	
MIMO - Multiple Input Multiple Output	

4.1.7.5.5. Log Data

Refer to ***Logging Configuration*** for information on setting up and enabling LTE Logging. Logging can also be configured after you select the protocol / bands in the **MPS Configuration Wizard**. The values of the items measured will be repeated until the data card has been filled or the logging requirement has been removed.

See the section ***Display Fields*** for a description of how to choose fields to be displayed in the log files.

4.1.7.5.5.1. Items Measured and Logged

LTE log files contain categories and subcategories of information that together describe how the system is configured, what data was collected from scans, and the measurements associated with the collection. The LTE log files contain the following major fields and their subfields:

LTE Log Fields

Field Name	Field Contents	Values
CellIndex		
CellIndex	LTE Cell Index	Values: 0 - 503
PCI	Physical-Layer Cell Identity (PCI) or Cell ID is used for cell identification and channel synchronization	Values: 0 - 2
PCIG	Physical-Layer Cell Identity Group (PCIG) or the Identity of a cell within a group.	Values: 0 - 167
MeasurementData		
CellId	Physical-Layer Cell Identity (PCI) or Cell ID is used for cell identification and channel synchronization	Values: 0 - 2
Bandwidth	Channel bandwidth detected for the cell	
NumTxPortsDetected	Number of Tx antennas measured	
TimeOffset	Time offset in microseconds, US units	Example: 10.80729
DelaySpread	Average delay spread in microseconds, US units	
CFO	Center Frequency offset of a channel in Hz	
BchRp	Received power value of the BCH per sub-carrier	
SchMeasurement	SCH related measurements. Returned only if SCH is enabled.	
RsMeasurements	RS measurements per Tx-Rx antenna pair, for example, Tx1Rx1, Tx1Rx2, Tx2Rx1, Tx2Rx2, etc.	

Field Name	Field Contents	Values
H	Returned if MIMO is enabled. Length is in number of resource blocks and is based on measured channel bandwidth. NOT IMPLEMENTED	Values: 1 - 100
WideBandCQ	Returned if MIMO is enabled. A wideband channel quality indicator value is a single 4-bit integer representing an effective SINR as observed by the UE over the entire channel bandwidth. NOT IMPLEMENTED	
SubBandCQ	Returned if MIMO is enabled. The subband is predefined based on the bandwidth. A subband channel quality indicator report consists of a vector of SINR observed by the UE over a subband. NOT IMPLEMENTED	Example: 0 - 13
ThroughputEstimate	Returned if MIMO is enabled. NOT IMPLEMENTED	
SchMeasurementData		
PschRp	Received power value of the PSCH per sub-carrier in dBm	
SschRp	Received power value of the SSCH per sub-carrier in dBm	
SchRq	SCH received quality Es/Io value	
SchCinr	CINR value of the SCH	
RsMeasurementData		
RsRp	The Reference Signal Received Power for the particular TxPort and RxPort in dBm	Example: -91.56906
RsRq	The Reference Signal Received Quality Es/Io for the particular TxPort and RxPort in dB	Example: -12.13142

Field Name	Field Contents	Values
RsCinr	The CINR value of the Reference Signal for the particular TxPort and RxPort in dB	Example: 11.55972
CarrierRssi	The RSSI value of the RF carrier at the channel bandwidth	Example: -71.65675
MeasurementRecord		
Time	Timestamp of the data record	Example: 2013-10-22T17:02:26.688415 min/max occurrence = 0/1
Position	GPS Position	Position: GPS position (Latitude & Longitude) could be 0.
Channel	Channel number	
ChannelRssi	Cell-independent channel power measurement. Based on the user-selected bandwidth, in Autodetect mode the unit determines the appropriate bandwidth, in dBm	Example: -74.74452
RssiBandwidth	Bandwidth used to measure channel RSSI	Example: 1_4MHz
DuplexingDetected	Indicates type of duplexing detected	Example:FDD
CyclicPrefixDetected	Indicates type of cyclic prefix detected	Example: AutoDetect
TddSubFrameConfiguration	TDD UL/DL subframe configurations (Table 4.2-2 in 3GPP TS 36.211). Returned only when TDD is selected AND we have detected a cell of sufficient quality	Values: 0 - 6
CellMeasurements	Measurement data	
ScanParameters		
Band	RF band that is to be scanned.	"E-UTRA 01 (2100)", "E-UTRA 02 (1900)", "E-UTRA 03 (1800)", "E-UTRA 04 (2100)", "E-UTRA 05 (850)", "E-UTRA 06 (850)", "E-UTRA 07 (2600)", "E-UTRA 08 (900)", "E-UTRA 09 (1800)", "E-UTRA 10 (2100)", "E-UTRA 11 (1500)", "E-UTRA 12 (700)", "E-

Field Name	Field Contents	Values
		UTRA 13 (700)", "E-UTRA 14 (700)", "E-UTRA 17 (700)", "E-UTRA 18 (800)", "E-UTRA 19 (800)", "E-UTRA 20 (800)", "E-UTRA 21 (1500)", "E-UTRA 23 (2100)", "E-UTRA 24 (1500)", "E-UTRA 25 (1900)", "E-UTRA 26 (850)", "E-UTRA 27 (850)", "E-UTRA 28 (750)", "E-UTRA 29 (700)","E-UTRA 33 (1900)", "E-UTRA 34 (2000)", "E-UTRA 35 (1900)", "E-UTRA 36 (1900)", "E-UTRA 37 (1900)", "E-UTRA 38 (2600)", "E-UTRA 39 (1900)", "E-UTRA 40 (2300)", "E-UTRA 41 (2500)", "E-UTRA 44 (700)" NOTE: E-UTRA 01 through E-UTRA 26 are FDD bands and are included in the original LTE key. E-UTRA 33 through E-UTRA 41 are TDD bands are included in an optional LTE key. Contact DRT for more information.
ChannelList	List of ARFCNs of the bands to be scanned	
Bandwidth	Channel bandwidth	
TopNValue	Number of top cells to report for each channel	Values: 1 - 32
TargetList	List of target cells to look for.	
TargetId	TargetId is the cell index	Values: 1 - 32
DuplexingDetect	Duplexing detection mode	
CyclicPrefixDetect	Cyclic prefix detection mode	
Operation	Operation mode enumeration	
NumTxPortDetect	Number of TX antennas	
OverheadData	Includes MIB and SIBs	
Channel	Channel number	
CellId	Physical-Layer Cell Identity	
Mib	MIB raw data. Returned only if MIB is enabled.	
Sib1	SIB1 raw data. Returned only if SIB1 is enabled.	

4.1.7.6. LTE Interference Analysis Tool (IAT)

This release includes an LTE Interference Analysis Tool (IAT), available in MPS with the appropriate key. This tool analyzes signal anomalies in a single channel and cell within a single LTE band. LTE technology uses Orthogonal Frequency Division Modulation (OFDM) to allocate RF resources to users. The IAT application is used to analyze LTE RF measurements obtained from a scan.

By enabling one or more of the views provided in LTE IAT, you will see anomalies or interfering signals within Base Station transmissions scanned by the DRT unit. These anomalies appear as spikes in a subframe or slot indicating what could be an interfering signal.

NOTE: LTE technology uses complex waveforms that include many intricacies. This section does not illustrate all of the possible types of interfering signals and the effects that they might have on LTE signals. This section shows you how to use the IAT application as a tool to determine how various types of interference affect specific LTE signals.

A description of some of the LTE structures you will see in IAT views are included in the following table:

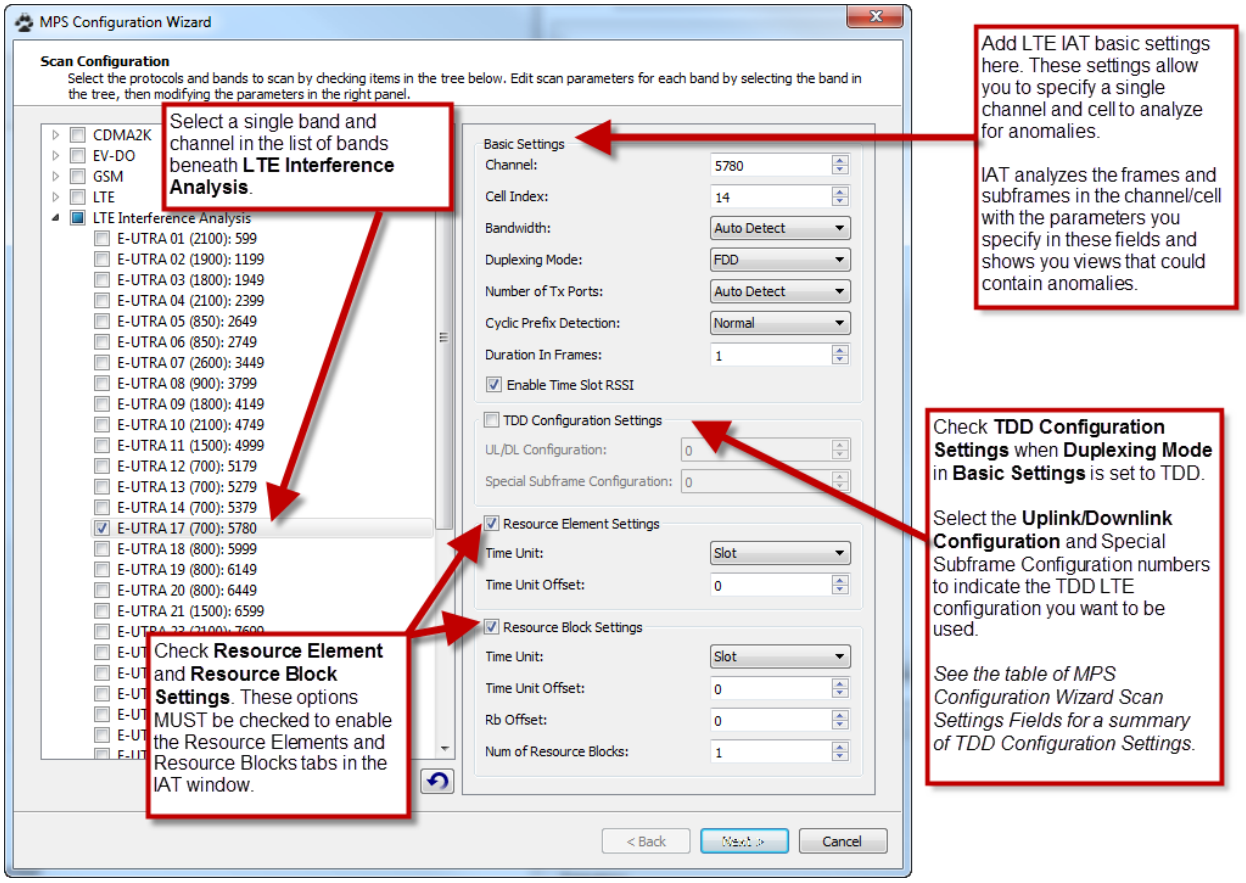
IAT Views and their Related LTE Structures

LTE Structural Elements	Description
Resource Block	This structure contains both subcarrier (frequency) and slot (time) data. The IAT Resource Blocks view shows RF power measurements related to Resource Blocks in a transmission. Resource Blocks consist of one slot and 12 subcarriers.
Resource Element	This structure contains both subcarrier (frequency) and slot (time) data. The IAT Resource Elements view shows subcarriers on the Y axis and symbols on the X axis. One Resource Element consists of one symbol and one subcarrier.
Subcarrier	Multiple small channels with a fixed spacing of 15 kHz. A 20 MHz LTE band contains 1200 subcarriers. A 10 MHz LTE band contains 600 subcarriers. A 5 MHz band contains 300 subcarriers.
Frame	The time duration for one frame is 10 milliseconds or 100 frames per second. One LTE frame consists of 10 subframes of data or 20 slots.
Subframe	One subframe of LTE data is made up of two slots. The time duration of 1 subframe is 1.0 milliseconds. The number of symbols within one subframe is either 14 or 12.
Slot or Time Slot	One slot is made up of 7 symbols. The time duration for 1 slot is 0.5 milliseconds. The length of a slot is fixed.
Symbol	Seven symbols occupy one slot and contain smaller structures that carry timing instructions. The time duration for one symbol is 66.7 microseconds.

4.1.7.6.1. Configuration

IAT is configured in MPS using the Configuration Wizard. IAT analyzes a single channel and cell in a single LTE band. For a complete discussion of the MPS Configuration Wizard see ***Configure a New Scan***.

NOTE: IAT Analysis works best when analyzing channels with higher power values. You might want to scan for LTE channels in the area before configuring LTE IAT to see which channels have the highest power values.



MPS Configuration Wizard Scan Settings Fields

Field Name	Field Contents	Field Values
Basic Settings		
Channel	A single Band/Channel number selected during IAT configuration on the **Scan Configuration** page in the MPS Configuration Wizard.	Type the channel number in the field after running an LTE scan. Or, if you know the channel number without scanning channels in the area, you can select it by clicking the Up and Down arrows in the field.
Cell Index	A single cell index number selected during IAT configuration on the **Scan Configuration** page in the MPS Configuration Wizard.	Type the cell index number in the field after running an LTE scan. Or, if you know the cell index number, you can select it by clicking the Up and Down arrows in the field.
Bandwidth	Channel bandwidth to detect for the cell	Leave Auto Detect (default) in the Bandwidth field or select a bandwidth from

Field Name	Field Contents	Field Values
		the drop-down.
Duplexing Mode	The type of duplex mode to use for an analysis. The default mode is FDD.	Frequency Division Duplex Mode (FDD). Default setting. Time Division Duplex Mode (TDD) You must check the TDD Settings box to apply to scan using TDD duplex mode.
Number of Tx Ports	Number of transmit ports with antennas attached. Unless the number of ports is known, it is recommended that you use Auto Detect.	Leave Auto Detect (default) in the field or select the number of TX ports from the drop-down.
Cyclic Prefix Detection	Return data sets for signals decoded using the designated cyclic prefix mode	Leave Auto Detect (default) in the field or select the cyclic prefix mode detection method from the drop-down: • Normal • Extended
Duration in Frames	FDD Frames A basic LTE frame is 10 ms. long and is divided into 20 individual time slots. LTE subframes consist of two slots, so there are 10 LTE subframes within one LTE frame of data. IAT lets you configure the number of 10 millisecond frames. TDD Frames LTE TDD frames consist of two half frames, each of which is 5 ms. long. LTE half frames are split into 5 subframes, each of which is 1 ms. long.	Enter a value from 1 to 9 frames. The default value is 1. You can also click the Up and Down arrows to change the value.
Enable Time Slot RSSI	Enables the Time Slot view on the Resource Elements tab in the IAT GUI when checked. The Time Slot view shows the relative signal strength for the defined time slots. NOTE: An LTE data frame is divided into 20 individual time slots. Subframes of data visible in the Time Slot RSSI view consist of 2 slots.	Enables Time Slot RSSI view. If this box is not checked the Time Slot RSSI view is empty.
TDD Configuration Settings		
TDD Configuration Settings	Applies TDD duplex mode settings to a scan. See the following entries for a description of each of the settings.	Check to enable Time Division Duplex Mode.
UL/DL Configuration	Uplink/Downlink Configuration In TDD duplex mode, uplink and downlink signals share a single bandwidth by allotting different time periods to the uplink and downlink signals. There are 0 through 6 different patterns of uplink-downlink switching that are called uplink-downlink	Select the **UL/DL Configuration** to apply to the TDD setting: 0 through 6.

Field Name	Field Contents	Field Values
	configurations 0 through 6. For a description of the actual uplink-downlink patterns, see Release 11 of the *3GPP TS 36.211 Standard*.	
Special Subframe Configuration	Special Subframe Configuration The special subframe UL/DL Configuration contains a portion of downlink signals at the start of the subframe, a portion of unused signal time span or symbol called the Guard Period, and a portion of uplink signals at the end of the subframe. These combinations of 10 values (0 through 9) are called Special Subframe Configurations. NOTE: Special Subframe Configurations consist of both a downlink and an uplink subframe with differences occurring in the patterns if either Normal Cyclic Prefix or Extended Cyclic Prefix is selected in the **Cyclic Prefix Detection** field. For a description of the Special Subframe patterns, see Release 11 of the *3GPP TS 36.211 Standard*.	Select the **Special Subframe Configuration** 0 through 9 from the drop-down.
Resource Element Settings		
Resource Element Settings	Enables the Resource Elements view on the Resource Elements tab in the IAT GUI when checked. In LTE a Resource Element is the smallest part of a Frame consisting of the Uplink/Downlink activity. NOTE: OFDMA is a multi-carrier technology that allocates radio resources to multiple users based on frequency (subcarriers) and time (symbols) using OFDM. In LTE technology OFDM subcarriers are typically spaced at 15 kHz and modulated with QPSK, 16-QAM, or 64-QAM modulation.	Check to enable Resource Elements. If this box is not checked, the Resource Element view will be empty.
Time Unit	An LTE Subframe is 1 ms long. An LTE slot is 0.5 ms long.	Select Slot or Subframe from the drop-down.
Time Unit Offset	An index of the timing relationship between Uplink and Downlink transmissions within Slot or Subframe types.	If you selected Slot in the **Time Unit** field, select an **Offset** value 0 through 19 from the drop-down. If you selected Subframe in the **Time Unit** field, select an **Offset** value 01 through 9 (FDD) from the drop-down. 0 through 9 (TDD)

Field Name	Field Contents	Field Values
Resource Block Settings		
Resource Block Settings	Enables the Resource Blocks view on the Resource Blocks tab in the IAT GUI when checked. LTE Resource Blocks or RB bandwidths are 180 kHz wide and 1 ms long. A Resource Block is the smallest unit of bandwidth resources that can be allocated during an LTE session.	Check to enable Resource Blocks. If this box is not checked, the Resource Block view will be empty.
Time Unit	An LTE Subframe is 1 ms long. An LTE slot is 0.5 ms long.	Select **Slot** or **Subframe** from the drop-down.
Time Unit Offset	An index of the timing relationship between Uplink and Downlink transmissions within Slot or Subframe types.	If you selected Slot in the **Time Unit** field, select an **Offset** value 0 through 19 from the drop-down. If you selected Subframe in the **Time Unit** field, select an **Offset** value 01 through 9 (FDD) from the drop-down. 0 through 9 (TDD)
Rb Offset	An index of the timing relationship between Uplink and Downlink transmissions within a Resource Block.	Select **Offset** value 0 through 99 from the drop-down.
Num of Resource Blocks	The number of Resource Blocks available in LTE depends on a given channel bandwidth. One hundred Resource Blocks can fit in the maximum channel bandwidth (for LTE) of 20 MHz. **NOTE**: The following list describes the *Maximum Number of Resource Blocks* allowed per selected Bandwidth when setting the Number of Resource Blocks: If Bandwidth is 1.4, Maximum Number of RBs is 6. If Bandwidth is 3, Maximum Number of RBs is 15. If Bandwidth is 5, Maximum Number of RBs is 25. If Bandwidth is 10, Maximum Number of RBs is 50. If Bandwidth is 15, Maximum Number of RBs is 75. If Bandwidth is 20, Maximum Number of RBs is 100.	Select **Number of Resource Blocks** 1 through 100 from the drop-down. Use the list of *Maximum Number of Resource Blocks* allowed per selected Bandwidth given in the previous column to determine the correct setting for your session.

4.1.7.6.2. LTE IAT Views (No Interference)

LTE IAT presents three graphical views of LTE signal activity (measurements of the RF environment being scanned) within slots or subframes. The three views, Resource Elements, Resource Blocks, and Time Slot RSSI, present signal activity for a single LTE channel and cell. The views that follow are configured with FDD duplexing mode. Where the views differ between FDD and TDD duplexing modes, both the FDD and TDD views are shown with the differences highlighted.

To configure IAT to use TDD duplexing mode, fill out the TDD Configuration Settings section in the Configuration Wizard. The GUI descriptions given for FDD apply to TDD as well.

4.1.7.6.2.1. Resource Elements View (FDD)

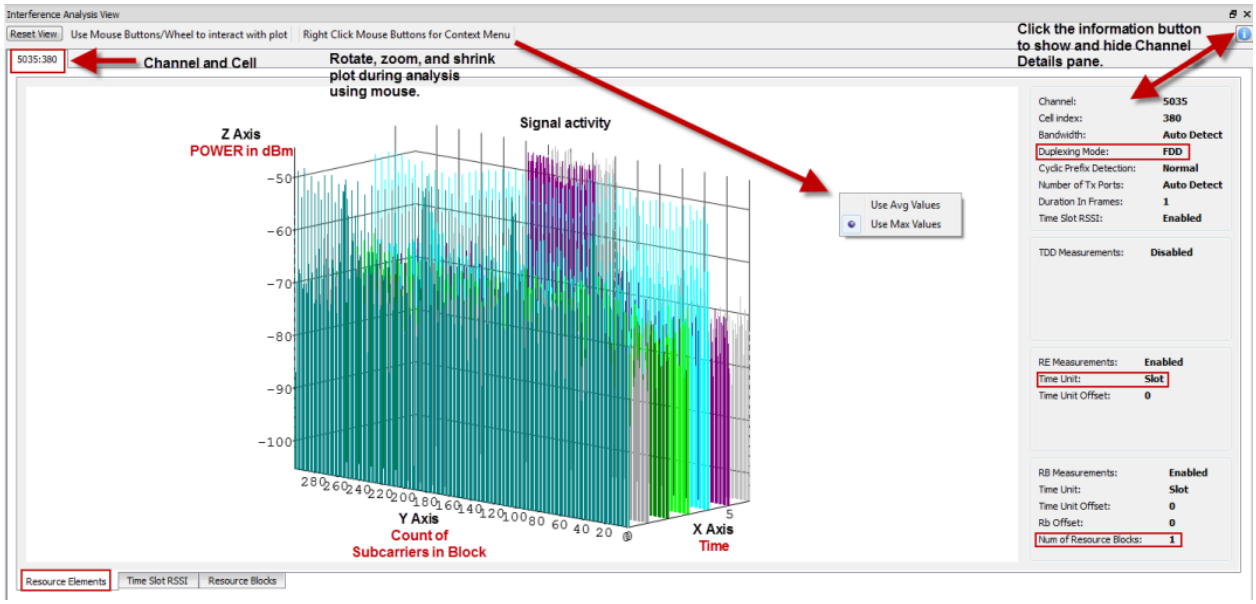
The **Resource Elements** view presents an interactive 3D plot of LTE signal activity within Slots or Subframes. The graph has three scales:

- Time in symbols: 0-6 or 0-12 if you selected Normal Cyclic Prefix.
- Subcarrier count each 15 kHz subcarrier on the Y axis.
- Power in dBm - 60 to -100 on the Z axis

The example below shows a 10 MHz LTE signal centered at 731.5 MHz (channel 5035/cell 380). **NOTE**: Your signal views will be different.

A right-click menu provides a way to show **Max** (Maximum) or **Avg** (Average) power values displayed on the plot.

The Channel Details pane shows the settings that you selected when configuring IAT in the Configuration Wizard. **NOTE**: You cannot change the settings that appear here using the Channels Detail pane. You MUST open the Configuration Wizard from the **MPS menu** > **Launch Wizard**.



Interacting with the Plot

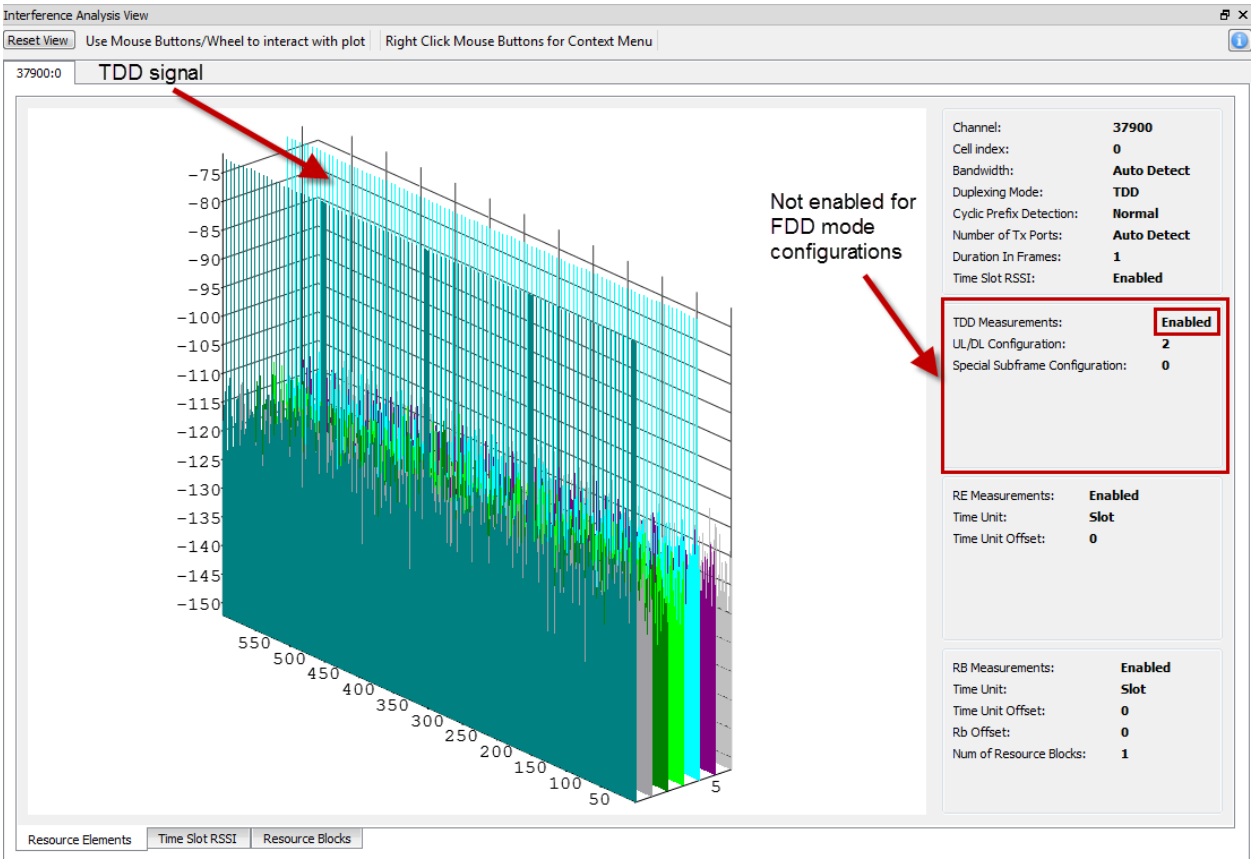
Each symbol on the X axis (Time) in the plot is represented by a different color so that the different symbols will stand out during analysis.

The ability to interact with the Resource Elements view lets you zoom into and out of the plot and rotate it 360 degrees using buttons and wheels or track balls on a pointing device, such as, a mouse. When rotating a view, it is best to move slowly to let the view adjust during the rotation. Click the **Reset View** button in the top left corner to return to default viewing size and angle.

NOTE: In some rotated plots the scales on the X, Y, and Z axis are difficult to read. When the scales are garbled because of a rotation, moving a few more rotations to the left or right usually makes the scales readable again.

4.1.7.6.2.2. Resource Elements View (TDD)

The Resource Elements view used to depict TDD Resource Elements is the same as the Resource Elements view used to depict FDD, only the signal and configuration details shown in the Channel Details panel depicted are different.

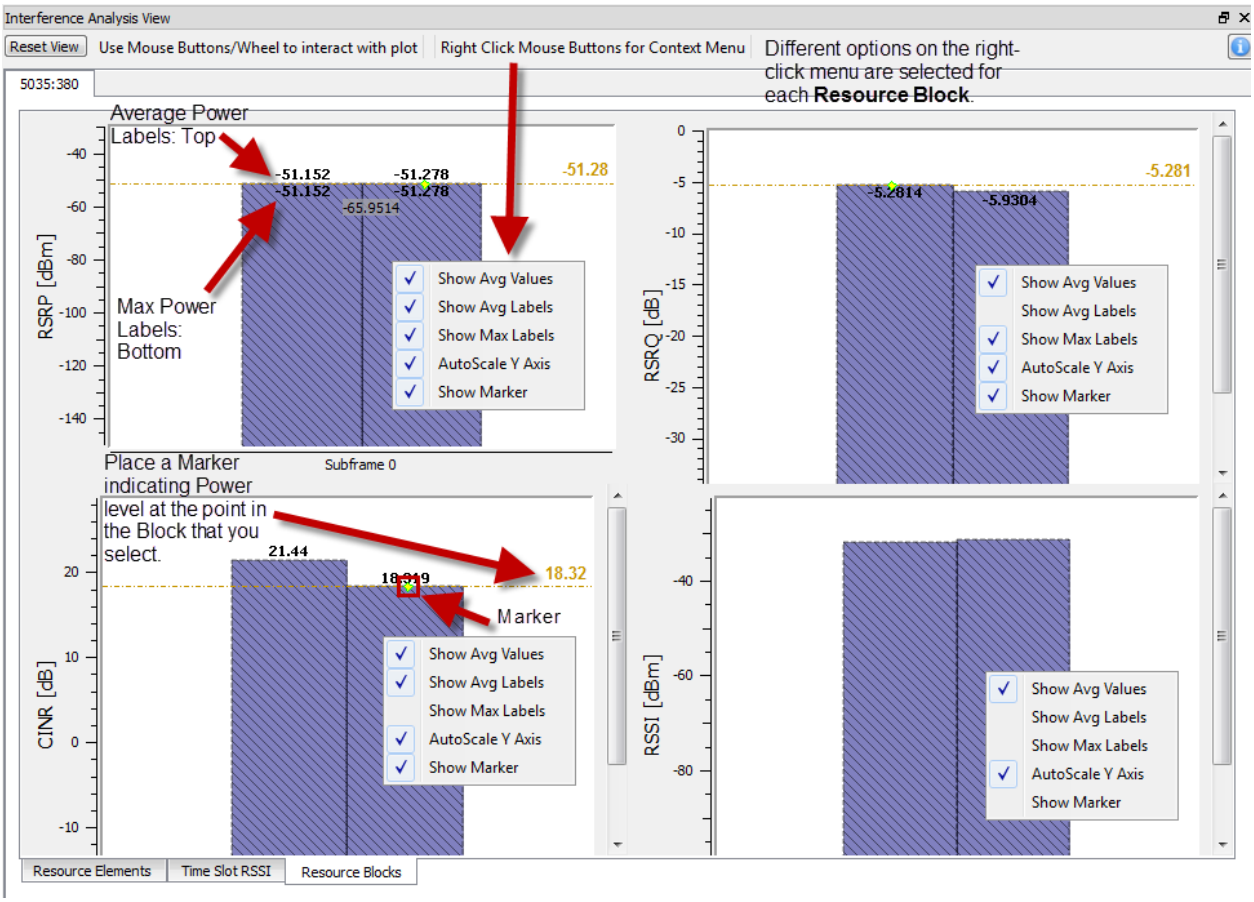


4.1.7.6.2.3. Resource Blocks View

The **Resource Blocks** view presents an interactive view of the power and quality measurements associated with LTE Resource Blocks. IAT only measures downlink slots or subframes. Uplink and TDD special subframes are not measured.

- CINR: Carrier-to-Interference Noise Ratio (CINR) of the reference signal
- RSRP: Reference Signal Received Power for TX port 1 in dBm
- RSRQ: Reference Signal Received Quality Es/Io for TX port 1 in dB
- RSSI: Received Signal Strength Indicator for the Resource Blocks selected in the Configuration Wizard in dBm

A right-click menu provides a way to show **Max** (Maximum) or **Avg** (Average) power values displayed on the plot.

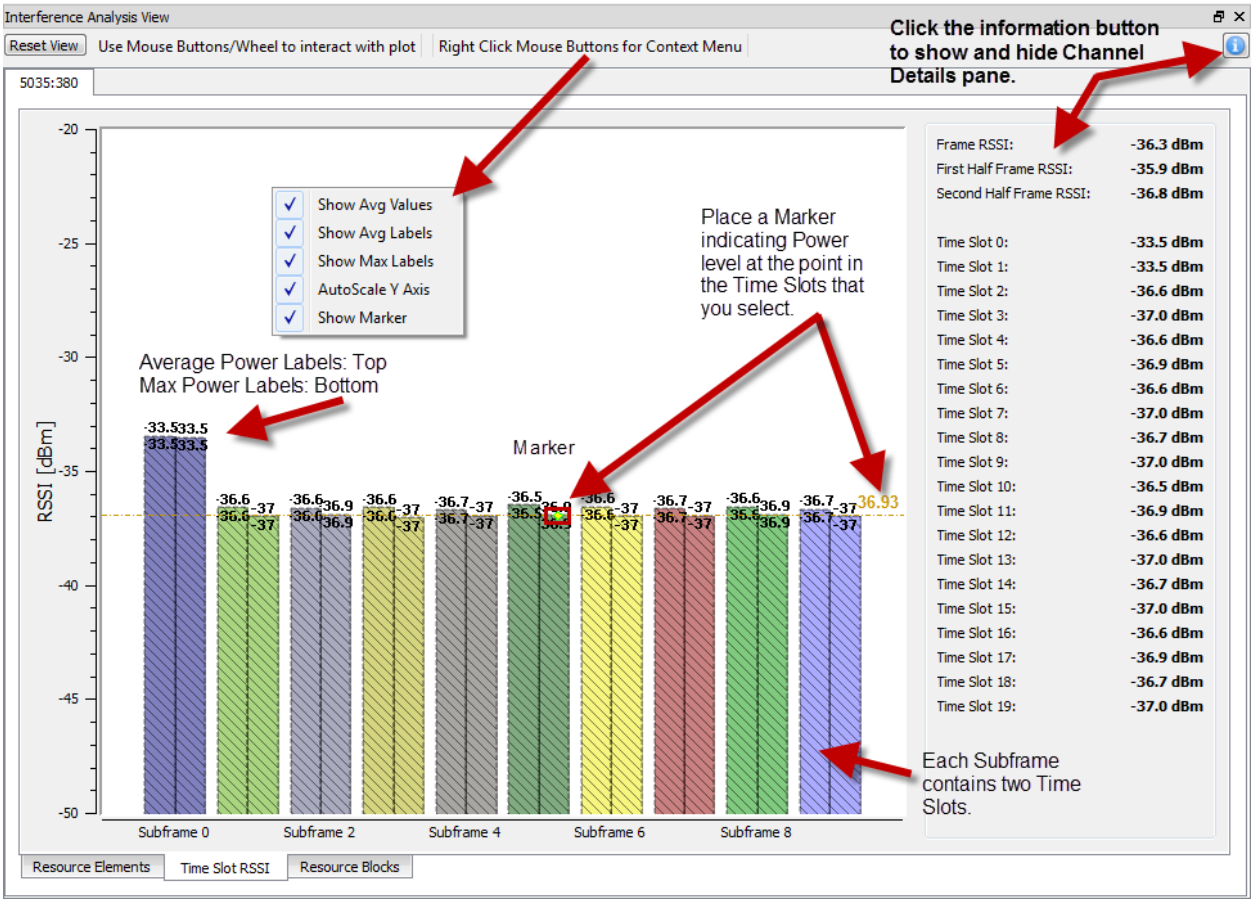


Interacting with the Plot

The ability to interact with the Resource Blocks view lets you zoom into and out of the plots using the buttons and wheels or track balls on a pointing device, such as, a mouse. Zooming on one of the Resource Blocks in the view displays the measurements on smaller sections of a block. Left-click the mouse and drag the rectangle that appears to outline the section of the Resource Block for which you wish to view measurements. The view automatically adjusts to the zoom location in the Block. Power values are associated with each of the lines in the Resource Block when you position the mouse on a line.

4.1.7.6.2.4. Time Slot View (FDD)

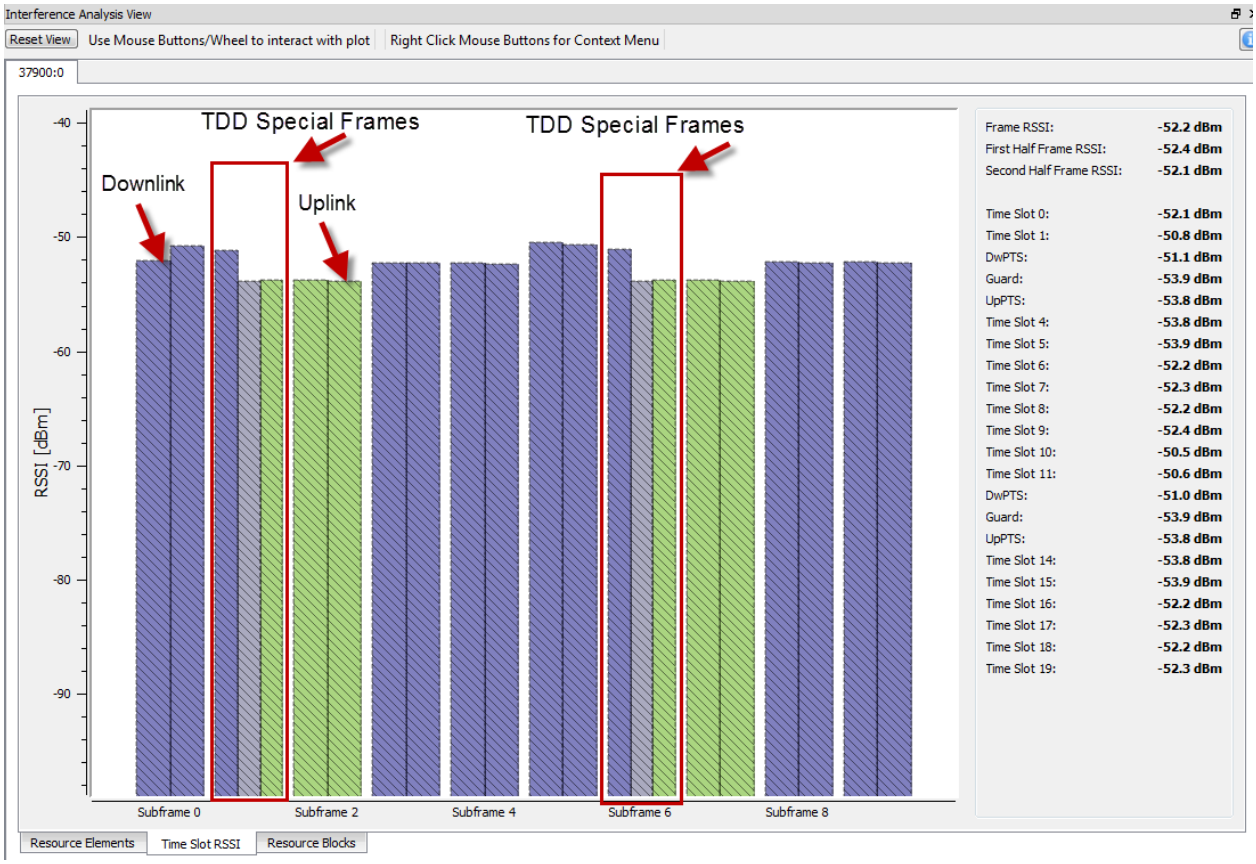
The **Time Slot RSSI** view presents an interactive view of the signal strength (RSSI). LTE time slots within a subframe are divided into two slots.



4.1.7.6.2.5. Time Slot View (TDD)

The **Time Slot RSSI** view for TDD also presents an interactive view of the signal strength (RSSI) in LTE downlink/uplink subframes or time slots, whichever time unit you selected during configuration. LTE time slots within a subframe are divided into two slots. Downlink subframe is purple. Uplink subframes are green. TDD Special Frames are colored in this way:

- Downlink (DwPTS): PURPLE
- Guard: GRAY
- Uplink (UpPTS): GREEN



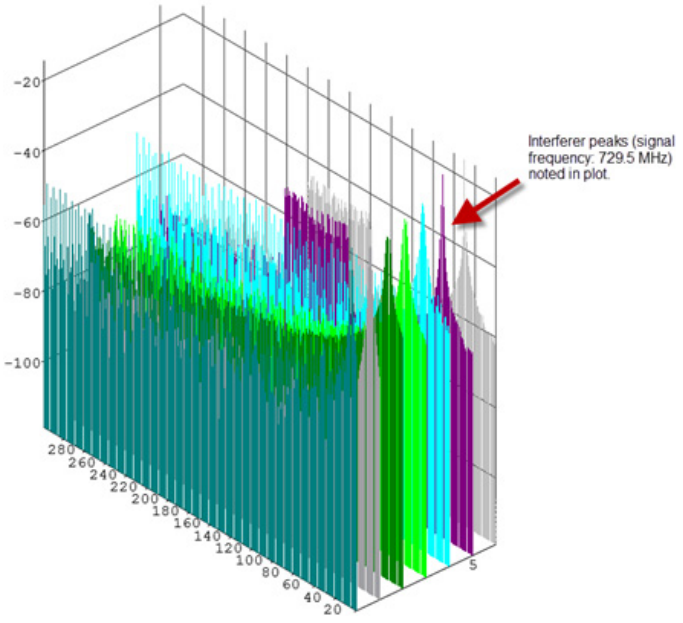
Interacting with the Plot

The ability to interact with the Time Slot RSSI view lets you zoom into and out of the plots using the buttons and wheels or track balls on a pointing device, such as, a mouse. Zooming on one of the Time Slots in the view displays the power values on smaller sections of a time slot. Left-click the mouse and drag the rectangle that appears to outline the section of the Time Slot for which you wish to view Power values. The view automatically adjusts to the zoom location in the Time Slot. Power values are associated with each of the lines in the Time Slot when you position the mouse on a line.

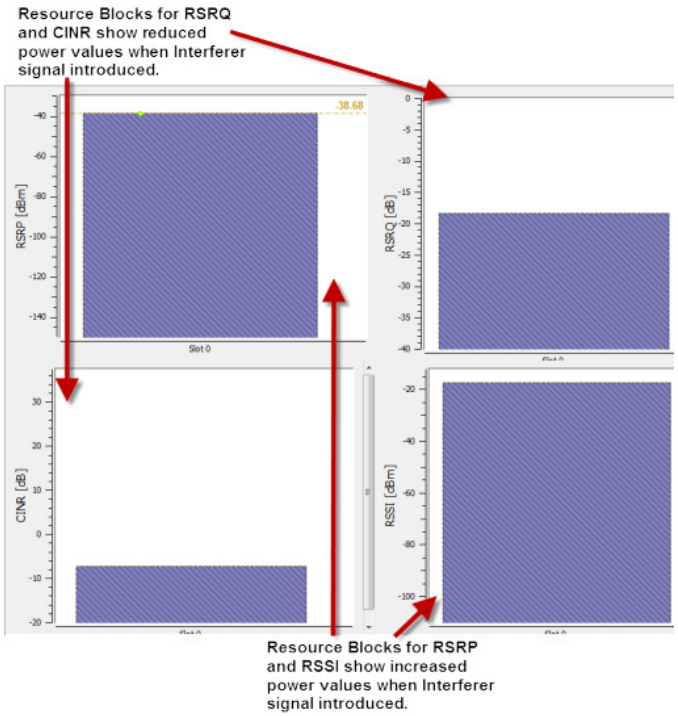
4.1.7.6.3. LTE IAT FDD View with GSM Interference Signal (729.5 MHz)

The examples below show a 10 MHz LTE signal centered at 731.5 MHz (channel 5035/cell 380). An Interferer signal 729.5 MHz was introduced into a scan at -30 dBm. The effects of this interfering signal appears in the Resource Elements, Resource Blocks, and Time Slots views shown below. **NOTE**: Your signal views will be different.

Resource Elements Plot with Interferer Signal (729.5 MHz)



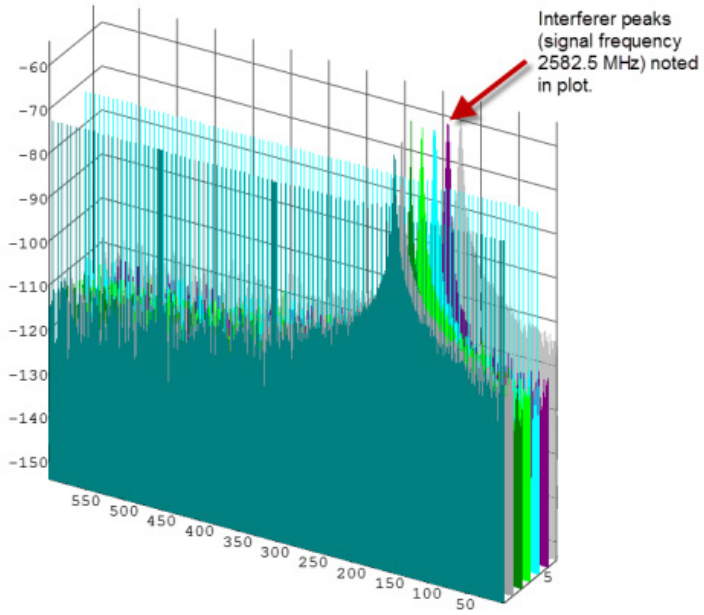
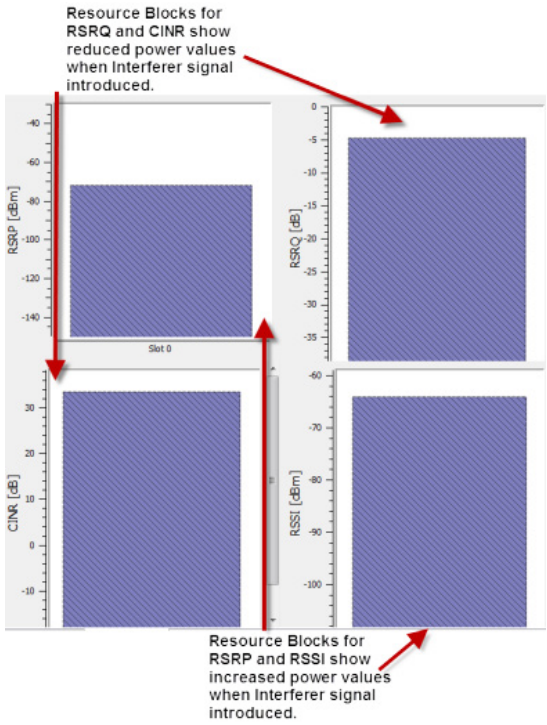
Resource Blocks Plot with Interferer Signal (729.5 MHz)



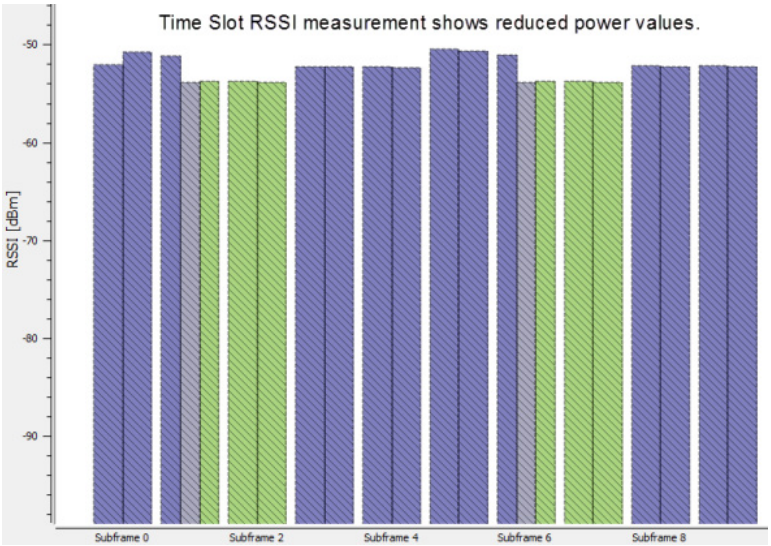
Time Slot Plot with Interferer Signal (729.5 MHz)

4.1.7.6.4. LTE IAT TDD View with Interference Signal (2585 MHz)

The examples below show a 10 MHz LTE signal centered at 2585 MHz (channel 37900/cell 392). An Interferer signal 2582.5 MHz was introduced into a scan at -50 dBm. The effects of this interfering signal appears in the Resource Elements, Resource Blocks, and Time Slots views shown below. **NOTE**: Your signal views will be different.

Resource Elements Plot with Interferer Signal (2582.5 MHz)	Resource Blocks Plot with Interferer Signal (2582.5 MHz)
	

Time Slot Plot with Interferer Signal (2582.5 MHz)



4.1.7.7. TD-SCDMA

Time Division Synchronous Code Division Multiple Access (TD-SCDMA) wireless protocol is a is a 3G wireless mobile broadband technology and a member of the UMTS mobile telecommunications family of networks developed in the People's Republic of China as an alternative to WCDMA.

Once the band(s) have been selected, scanning for signals begins. The main window displays as described in the section that describes the MPS GUI. The items listed below with their descriptions pertain to this protocol:

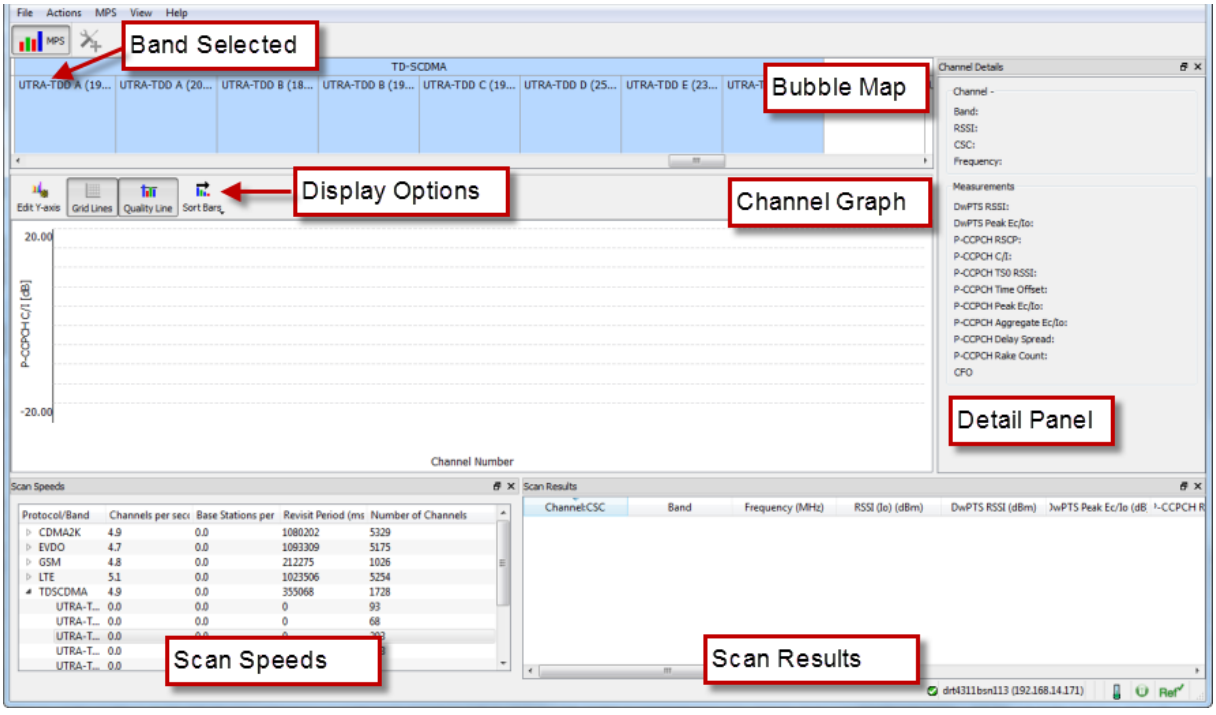
NOTE: TD-SCDMA does NOT support the decoding or display of Overhead messages either in the GUI or on the DRT system. The GUI does NOT support Provider Aliasing.

- **Channel Graph**

  The options are:

  - **Edit Y-axis** – Allows you to select the quality metric plotted on the y-axis and specify the bounds of the y-axis for the selected metric. The available quality metrics depend on the protocol:
    - **DwPTS Peak Ec/Io**
    - **DwPTS RSSI** (in dBm)
    - **P-CCPCH Aggregate Ec/Io**
    - **P-CCPCH C/I**
    - **P-CCPCH Peak Ec/Io**
    - **P-CCPCH RSCP**
    - **P-CCPCH TS0 RSSI**
    - **RSSI (Io)**

- **Scan Results** – Information about each Channel ID for all bands scanned in the selected protocol. Refer to ***Scan Result Metrics***.
- **Channel XXX:YY History** – Information about operating parameters for the selected channel. Refer to ***Channel History***.



4.1.7.7.1. TD-SCDMA Scan Configuration

The configuration options available for TD-SCDMA are selected on the **Scan Configuration** page. For information on **Channel Settings**, refer to ***Basic Settings***.

4.1.7.7.2. TD-SCDMA Channel Details and Neighbor Lists

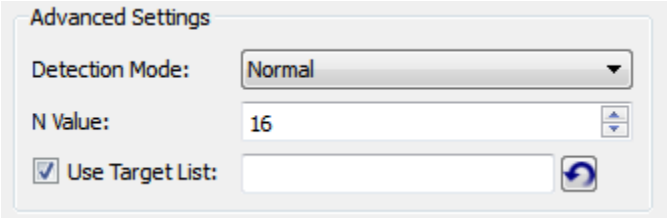
The available Channel Details and Neighbor Lists for this protocol are listed in the following table:

Channel Details	Neighbor Lists
Band	**NOT AVAILABLE FOR TD-SCDMA**
RSSI	
CSC	
Frequency	

4.1.7.7.3. TD-SCDMA Advanced Settings

The remaining Scan Parameters are also configured from the **MPS Configuration Wizard**. Refer to the ***Launch Wizard*** section. Once a band has been selected, the right panel of the **MPS Configuration Wizard** will display the **Basic Settings** area which allows you to set the **Channel Range**, the **Advanced Settings** area which allows you to configure the scan parameters, and the **Scan Measurements** area which indicates the measurements being made and allows you to edit the measurements selection.

The parameters configured for this band will not apply to other bands.



The *Advanced Settings* fields allow the following selections and their options:

- **Detection Mode**:
  - **Normal –** High speed scanning with normal sensitivity.
  - **Enhanced –** Enhanced sensitivity with reduced scan speed.
- **N Value –** The maximum number of pilots within each channel for which data will be returned. Enter / set the number of pilots. The limits are 0 to 32. The arrows increment / decrement the value in steps of 1. The default value is 16. The number of values in the **Use Target List** field override the N value that you set here.
- **Use Target List** - When checked, this field uses the Cell Scrambling Code (CSC) value to further filter a scan. Use the **Target List** field in conjunction with the channel ranges added in the **Channel Ranges** field to filter the results of scans. You do not have to set either the Channel Range or use the **Target List** field. They can be used separately or together to create a filter for a scan. Only those channels that meet the criteria that you enter in the field will be displayed/logged. Hover over the field to bring up instructions on how to enter field criteria.

4.1.7.7.4. TD-SCDMA Scan Measurements and Overhead Messages

The available measurements for this protocol are listed in the following table:

Scan Measurements	Overhead Measurements
Downlink Pilot Time Slot RSSI	**TD-SCDMA does NOT support the decoding or display of Overhead messages either in the GUI or on the DRT system.**
Downlink Pilot Time Slot Peak Ec/Io	
P-CCPCH RSCP	
P-CCPCH C/I	
P-CCPCH TS0 RSSI	
P-CCPCH Time Offset	
P-CCPCH Peak Ec/Io	
P-CCPCH Aggregate Ec/Io	
P-CCPCH Delay Spread	
P-CCPCH Rake Count	
CFO	

4.1.7.7.5. Log Data

Refer to ***Logging Configuration*** section for information on setting up and enabling EVDO Logging. Logging can also be configured after you select the protocol / bands in the **MPS Configuration Wizard**.

The values of the items measured will be repeated until the data card has been filled or the logging requirement has been removed. See the section ***Display Fields*** for a description of how to choose fields to be displayed in the log files.

4.1.7.7.5.1. Items Measured and Logged

TD-SCDMA log files contain categories and subcategories of information that together describe how the system is configured, what data was collected from scans, and the measurements associated with the collection. The TD-SCDMA log files contain the following major fields and their subfields:

TD-SCDMA Log Fields

Field Name	Field Contents	Values
MeasurementEnable		
EnableDwptsRssi	Measure and return DwPTS RSSI	
EnableDwptsPeakEcIo	Measure and return DwPTS Peak Ec/Io	
EnablePccpchRscp	Measure and return P-CCPCH RSCP	
EnablePccpchC2I	Measure and return P-CCPCH C/I	
EnablePccpchTs0Rssi	Measure and return P-CCPCH TS0 RSSI	
EnablePccpchTimeOffset	Measure and return P-CCPCH TimeOffset	
EnablePccpchPeakEcIo	Measure and return P-CCPCH Peak Ec/Io	
EnablePccpchAggregateEcIo	Measure and return P-CCPCH Aggregate Ec/Io	
EnablePccpchRakeCount	Return a count of the fingers used in RAKE receiver implementation calculations	
EnablePccpchDelaySpread	Measure and return P-CCPCH delay spread	
EnableCFO	Measure and return CFO - Carrier Frequency Offset	
MeasurementData		
CSC	Cell Scrambling Code Number	Values: 0 - 127
DwptsRssi	Downlink Pilot Time Slot RSSI in dBm	
DwptsPeakEcIo	Downlink Pilot Time Slot Peak Ec/Io in dB	
PccpchRscp	Primary Common Control Physical Channel Received Signal Code Power in dBm	
PccpchC2I	Primary Common Control Physical Channel C/I (RSCP/ISCP) in dB	
PccpchTs0Rssi	Primary Common Control Physical Channel Time Slot 0 RSSI	

Field Name	Field Contents	Values
PccpchTimeOffset	Primary Common Control Physical Channel Time Offset related to GPS	
PccpchPeakEcIo	Measure and return P-CCPCH Peak Ec/Io	
PccpchAggregateEcIo	Measure and return P-CCPCH aggregate Ec/Io	
PccpchRakeCount	Return a count of the fingers used in RAKE receiver implementation calculations	
PccpchDelaySpread	Measure and return P-CCPCH delay spread	
CFO	Measure and return CFO - Carrier Frequency Offset	
MeasurementRecord		
Timestamp	Timestamp relative to the unit system time of the data record	
Position	GPS Position of the data record	Position: GPS position (Latitude & Longitude) could be 0.
Channel	UTRA Absolute Radio Frequency Channel Number (UARFCN)	
RSSI	Carrier RSSI (Io) Wideband received power within the relevant channel bandwidth in dBm	
CellMeasurements	Cell measurement data	Values: 0 - 32
ScanParameters		
Band	The RF band that is to be scanned - #GPP TS 25.102 V10.3.0 (2011-09)	Values: "UTRA-TDD A (1900)", "UTRA-TDD A (2010)", "UTRA-TDD B (1850)", "UTRA-TDD B (1930)", "UTRA-TDD C (1910)", "UTRA-TDD D (2570)", "UTRA-TDD E (2300)", "UTRA-TDD F (1880)"
ChannelList	List of UARFCNs of the band to be scanned	
TopNValue	Number of the top cells to report for each channel. TopNValue will only be used if TargetList is empty	Values: 1 - 32
TargetList	List of Cells to look for. When the list is empty, it is a topN scan	
TargetId	TargetId is the Cell Scrambling Code	Values: 0 - 127
Operation	Operation mode enumeration	
MeasurementModes	Selected measurement data	

4.1.7.8. WCDMA

Wideband Code Division Multiple Access or WCDMA is a 3G wireless mobile broadband technology and a member of the Universal Mobile Telecommunications System (UMTS).

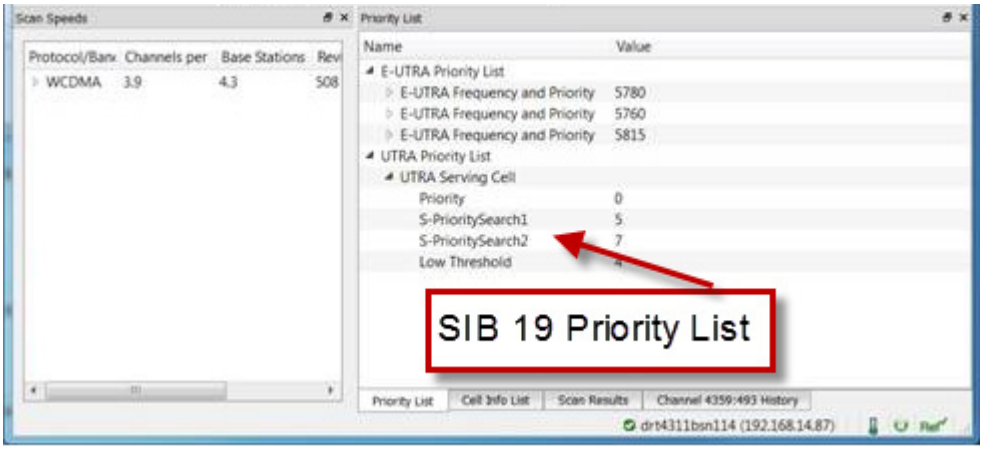
Once the band(s) have been selected, scanning for signals begins. The main window displays as described in the section that describes the MPS GUI. The items listed below with their descriptions pertain to this protocol:

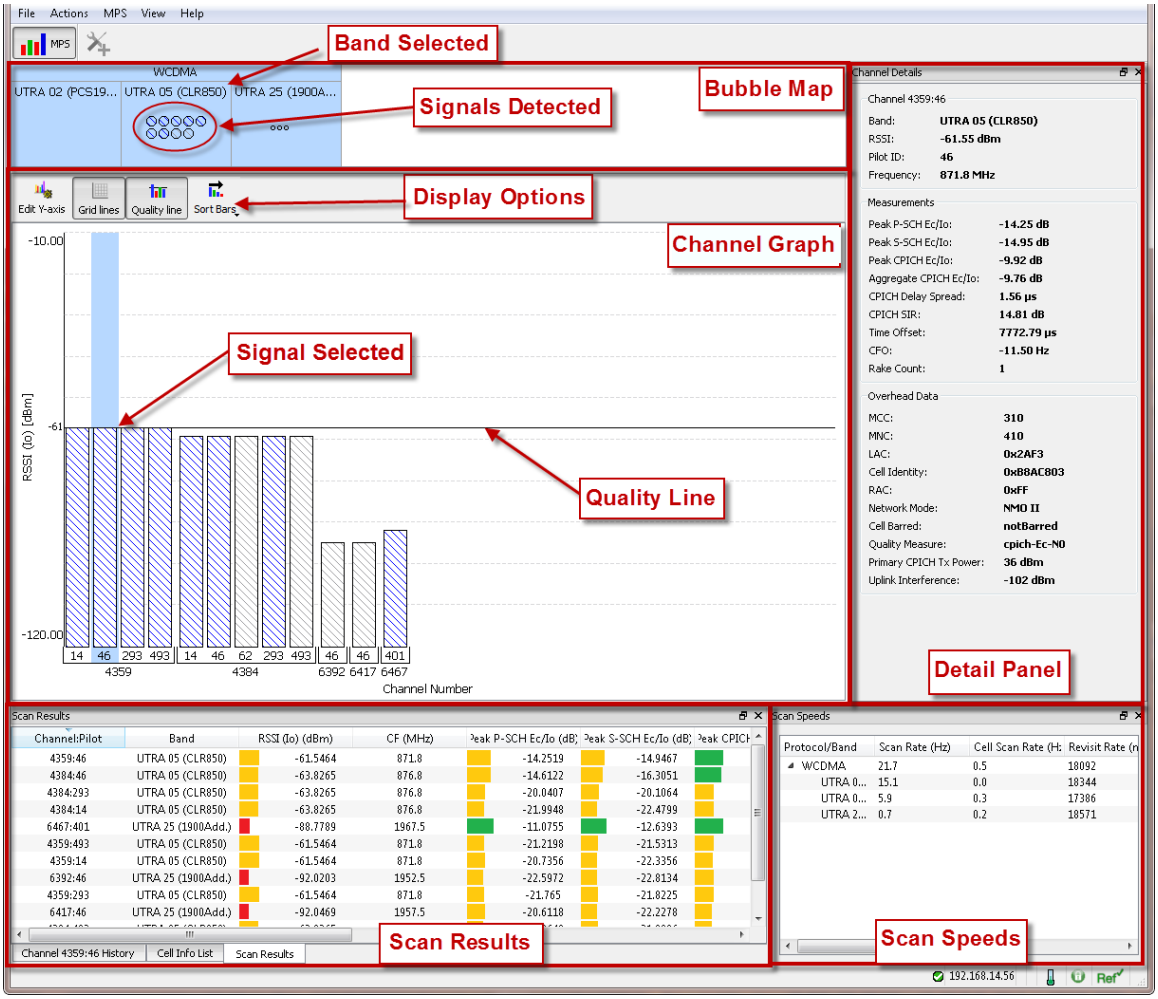
- **Channel Graph** –This area displays the channels detected (in the band(s) selected in the **Bubble Map**) and the signal quality of each signal. Clicking on a signal will select that signal for display in the **Detail Panel** area.
    - **Edit Y-axis** – Allows you to select the quality metric plotted on the y-axis and specify the bounds of the y-axis for the selected metric. The available quality metrics for this format are:
        - **Agg. CPICH Ec/Io** (in dB) – The ratio of the common pilot channel power to the total channel aggregate power.
        - **CPICH SIR** (in dB) – The common pilot channel signal interference ratio.
        - **Peak CPICH Ec/Io** (in dB) – The ratio of the common pilot channel peak power to the total channel power. [Default]
        - **Peak P-SCH Ec/Io** (in dB) – The ratio of the primary synchronization channel peak power to the total channel power.
        - **Peak S-SCH Ec/Io** (in dB) – The ratio of the secondary synchronization channel peak power to the total channel power.
        - **RSSI (Io)** (in dBm) – The strength by channel of the broadband interference received by the unit.

NOTE: Configuration of the ***Advanced Settings*** and the ***Scan Measurements***, below, will not change the parameters displayed in **Overhead Data** and **Measurements**.

- **Scan Results –** Information about each Channel ID for all bands scanned in the selected protocol. Refer to **Scan_Result_Metrics**.
- **Cell Info List –** Basic information about each of a channel's Neighbors that includes Cell ID, Primary Scrambling Code (PSC), Tx Diversity, and Reference Time Difference to Cell.
- **Channel XXX:YY History –** Information about operating parameters for the selected channel. Refer to ***Channel_History***.
- **Scan Speeds –** Information by protocol and band about: Refer to ***Scan_Speeds*****.**
- **Priority List** - SIB 19 specifies the frequencies and priorities of neighboring LTE cells in Priority Lists. If a WCDMA cell detects a neighboring LTE cell with a higher priority than the serving WCDMA cell, the User Equipment (UE) performs a cell re-selection to the LTE cell with a higher priority as long as that LTE cell maintains above minimum signal strength. E-UTRA Priority Lists show Frequency and Priority values. UTRA Priority Lists show current WCDMA serving cell Priority values.

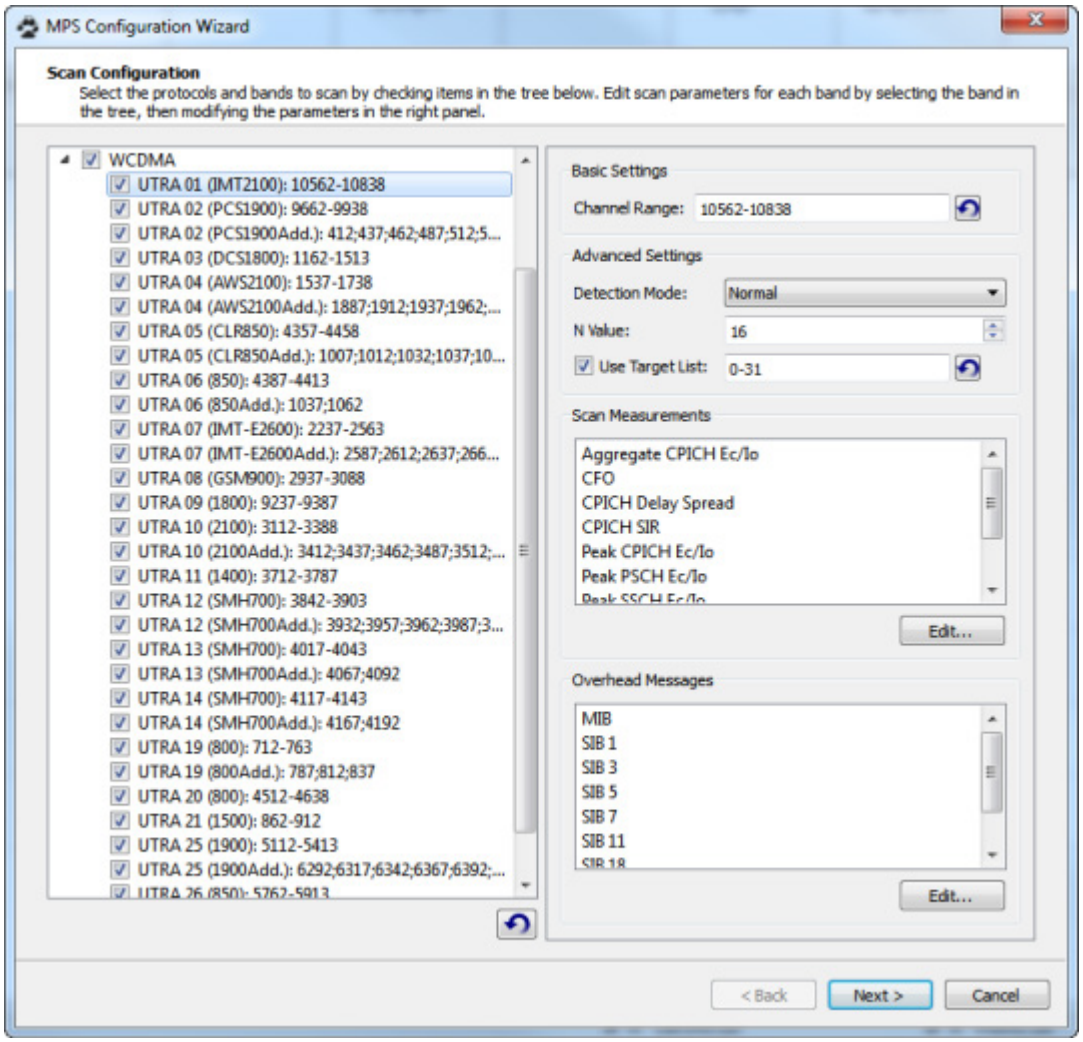
WCDMA Channel Priority Lists with SIB 19 Information





4.1.7.8.1. WCDMA Scan Configuration

The configuration of WCDMA scans is performed through the **MPS Configuration Wizard's Scan Configuration** dialog. For information on **Channel Settings**, refer to ***Basic Settings***.



4.1.7.8.2. WCDMA Channel Details and Neighbor Lists

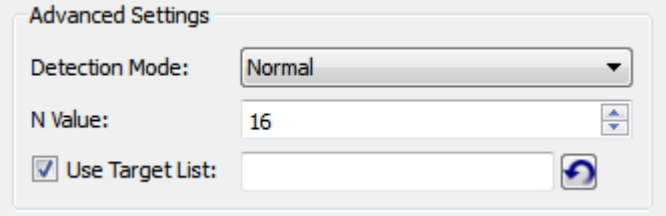
The available Channel Details and Neighbor Lists for this protocol are listed in the following table:

Channel Details	Neighbor Lists
Band	**NOT AVAILABLE FOR WCDMA**
RSSI	
Pilot ID	
Frequency	

4.1.7.8.3. WCDMA Advanced Settings

The remaining WCDMA Scan Parameters are also configured from the **MPS Configuration Wizard**. Refer to the ***Launch Wizard*** section. Once a WCDMA band has been selected, the right panel of the **MPS Configuration Wizard** will display the **Basic Settings** area which allows you to set the **Channel Range**, the **Advanced Settings** area which allows you to configure the scan parameters, and the **Scan Measurements** area which indicates the measurements being made and allows you to edit the measurements selection.

The parameters configured for this band will not apply to other WCDMA bands.



The *Advanced Settings* fields allow the following selections and their options:

- **Detection Mode**:
  - **Normal –** High speed scanning with normal sensitivity.
  - **Enhanced –** Enhanced sensitivity with reduced scan speed.
  - **Survey –** Optimized for blind detection of active channels across multiple bands.
- **N Value –** The maximum number of pilots within each channel for which data will be returned. Enter / set the number of pilots. The limits are 0 to 32. The arrows increment / decrement the value in steps of 1. The default value is 16. The number of values in the **Use Target List** field override the N value that you set here.
- **Use Target List** - When checked, this field uses the Primary Scrambling Code (PSC) value to further filter a scan. Use the **Target List** field in conjunction with the channel ranges added in the ***Channel Ranges*** field to filter the results of scans. You do not have to set either the Channel Range or use the **Target List** field. They can be used separately or together to create a filter for a scan. Only those channels that meet the criteria that you enter in the field will be displayed/logged. Hover over the field to bring up instructions on how to enter field criteria.
- **Logging**
  - **None – Logging is not performed.**
  - **Local** – Data is logged to a local SD card.
  - **Remote** – Data is logged to a pre-established remote location.
  - **Both** – Data is logged to a local SD card and a pre-established remote location.

4.1.7.8.4. WCDMA Scan Measurements and Overhead Messages

Following configuration of the other **Advanced Settings**, click **Edit** in the **Scan Measurements** area. To configure the WCDMA scan measurements, access the **Scan Measurements** dialog. This dialog will allow you to identify the measurements that will be performed in addition to the basic measurements. The **Scan Measurements** dialog is divided into two sections: **All Scan Measurements** and **Active Scan Measurements**. **All Scan Measurements** identifies all the possible measurements that can be performed and **Active Scan Measurements** lists all the measurements that will be performed.

To add a measurement, highlight that measurement in the **All Scan Measurements** area and click **Add Selected;** or to remove a measurement from the **Active Scan Measurements** list, highlight that measurement and click **Remove Selection**.

The available measurements for this protocol are listed in the following table:

Scan Measurements	Overhead Measurements
Aggregate CPICH Ec/Io	MIB
CFO	SIB 1
CPICH Delay Spread	SIB 3
CPICH SIR	SIB 5
Peak CPICH Ec/Io	SIB 5bis
Peak PSCH Ec/Io	SIB 7
Peak SSCH Ec/Io	SIB 11
Rake Count	SIB 18
Time Offset	SIB 19
RSSI (Io)	

4.1.7.8.5. Log Data

Refer to ***Logging Configuration*** for information on setting up and enabling WCDMA Logging. Logging can also be configured after you select the protocol / bands in the **MPS Configuration Wizard**.

The values of the items measured will be repeated until the data card has been filled or the logging requirement has been removed.

See the section ***Display Fields*** for a description of how to choose fields to be displayed in the log files.

4.1.7.8.5.1. Items Measured and Logged

WCDMA log files contain categories and subcategories of information that together describe how the system is configured, what data was collected from scans, and the measurements associated with the collection. The WCDMA log files contain the following major fields and their subfields:

WCDMA Log Fields

Field Name	Field Contents	Values
SibEnableType	Enable either all SIBs or a list of specific SIBs SIB Types include: System Information Block Type 1 System Information Block Type 3 System Information Block Type 5 System Information Block Type 7 System Information Block Type 11 System Information Block Type 18 System Information Block Type 19	
OverheadCollectionSettings		
CollectMib	Collect Master Information Block (MIB)	
CollectSibTypes	Collect selected SIBs. See 3GPP TS 25.331 V11.0.0 (2011-12) Page 1556+ on SIB-Type, SIB-TypeExt1, SIB-TypeExt2 and SIB-TypeExtGANSS.	
MeasurementEnable		
EnablePeakPschEcIo	Measure and return Peak P-SCH Ec/Io - Peak Synchronization Channel	
EnablePeakSschEcIo	Measure and return Peak S-SCH Ec/Io - Secondary Synchronization Channel	
EnablePeakCpichEc/Io	Measure and return Peak CpichEc/Io - Common Pilot Channel	
EnableAggregateCpichEcIo	Measure and return Aggregate CPICH Ec/Io - Common Pilot Channel	
EnableCpichDelaySpread	Measure and return CPICH Delay Spread -	
EnableTimeOffset	Measure and return TimeOffset	
EnableRakeCount	Return a count of the fingers used in RAKE receiver implementation calculations	
EnableCFO	Measure and return CFO - Carrier Frequency Offset	
MeasurementData		
PSC	Primary Scrambling Code	Values: 0 - 511

Field Name	Field Contents	Values
PeakPschEcIo	Peak P-SCH Ec/Io (Ec/No or RSCP/RSSI) The received energy per chip of the peak P-SCH multipath component divided by the power density in the frequency band. See 3GPP TS 25.302 Sec 9.2.3 in dB	
PeakSschEcIo	Peak S-SCH Ec/Io (Ec/No or RSCP/RSSI) The received energy per chip of the peak S-SCH multipath component divided by the power density in the frequency band. See 3GPP TS 25.302 Sec 9.2.3 in dB	
PeakCpichEcIo	Peak CPICH Ec/Io (Ec/No or RSCP/RSSI) The received energy per chip of the peak CPICH multipath component divided by the power density in the frequency band. See 3GPP TS 25.302 Sec 9.2.3 in dB	
AggregateCPICHEcIo	Aggregate CPICH Ec/Io (Ec/No or RSCP/RSSI) The received energy per chip of all the resolvable CPICH multipath components divided by the power density in the frequency band. See 3GPP TS 25.302 Sec 9.2.3 in dB	
CPICHDelaySpread	CPICH Delay Spread - the difference between first and last resolvable multipath components within power delay profile in usec	
CPICHSIR	CPICH SIR ((RSCP/ISCP)*SF) Signal-to-Interference Ratio See 3GPP TS 25.215 Sec. 5.2.2 in dB	
TimeOffset	The time offset of the radio frame (modulo 10 ms) referenced to internal clock in usec	
CFO	Carrier Frequency Offset: The difference between a reference frequency and the frequency of a received Radio Frequency (RF) carrier (Hz)	
RakeCount	Return a count of the fingers used in RAKE receiver implementation calculations	
TimePositionData	Binary data with timestamp and position information	
SibData		
Type	SIB type based on SIB-Type, SIB-TypeExt, SIB-TypeExt2 or SIB-TypeExtGANSS	

Field Name	Field Contents	Values
Data	Raw SIB data, ASN encoded	
MeasurementRecord		
Time	Timestamp relative to the unit system time of the data record	
Position	GPS Position of the data record	Position: GPS position (Latitude & Longitude) could be 0.
Channel	UTRA Absolute Radio Frequency Channel Number (UARFCN)	
RSSI	Carrier RSSI (Io) Wideband received power within the relevant channel bandwidth in dBm	
PilotMeasurements	The measurement data	Values: 0 - 32
ScanParameters		
Band	The RF band that is to be scanned - #GPP TS 25.102 V10.3.0 (2011-09)	Values: "UTRA-TDD A (1900)", "UTRA-TDD A (2010)", "UTRA-TDD B (1850)", "UTRA-TDD B (1930)", "UTRA-TDD C (1910)", "UTRA-TDD D (2570)", "UTRA-TDD E (2300)", "UTRA-TDD F (1880)"
ChannelList	List of UARFCNs of the band to be scanned	
TopNValue	Number of the top cells to report for each channel. TopNValue will only be used if TargetList is empty	Values: 1 - 32
TargetList	List of Cells to look for. When the list is empty, it is a topN scan	
TargetId	TargetId is the Cell Scrambling Code	Values: 0 - 127
Operation	Operation mode enumeration	
MeasurementModes	Selected measurement data	
ScanConfig		
Configuration	Scan parameters	
ScanData		
ChannelMeasurements	Measurement Records	

4.1.7.9. Power Spectrum Tool (PST)

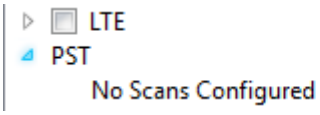
PST is available as a Unit Option. DRT provides a non-GUI interface for configuring these scan types: RSSI, Span0 and Spectrum. Span0 data provides scan data on the signal envelope as a function of time (similar to the data from a Spectrum Analyzer) with Span set to 0 Hz.

PST does not display data in the MPS GUI and does not allow you to configure scans using the MPS GUI. You will only enable PST **logging** using the MPS Wizard and view logging status and configuration options on the **MPS System Configuration** page. You can delete but cannot create PST scans in Galena.

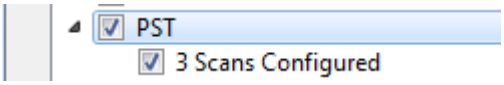
4.1.7.9.1. PST Configuration Status

PST scans have to be configured on the unit for data to be collected and logged. PST Configuration Status appears in the MPS Wizard **Scan Configuration** page according to the following conditions:

- If the PST Unit Option does not reside on the unit, you will not see it in the Scan Configuration protocol list.
- When no scans are configured, the PST protocol appears in the Scan Configuration Protocol list with no check box and the text *No Scans Configured*.



- When scans are configured, you can select the PST protocol in the Scan Configuration Protocol list. The number of available scans will vary according to how many scans are configured on the unit.



Unchecking PST will delete all active PST scans when MPS configuration using the Wizard is finished (when you click **Finish**).

4.1.7.9.2. PST Logging

PST logging is controlled in the MPS Wizard in the same way that logging for selected protocols is controlled: on the **Logging Configuration** page. Click the **PST** protocol and check **Enable Logging**. Fill out the **Logging Parameters** and click **Finish** to begin logging. Remember, you are not enabling or disabling PST when you fill out the Logging Configuration parameters.

4.1.8. Log Files

The DRT4000 software provides the following types of log files:

- Logs containing data collected when running with all or selected protocols. For a detailed discussion of data logging see ***Logging***.
- System debug or configuration logs for viewing or to send via email to DRT Customer Support for troubleshooting. System logs contain information on system diagnostics (error logs) and system configuration (tuners, controllers, and MPS protocols). For a detailed discussion of how to view system logs see ***Retrieve_System_Logs***.

This section describes how to view and manipulate log files once they are enabled and generated.

4.1.8.1. View and Manipulate Log Files

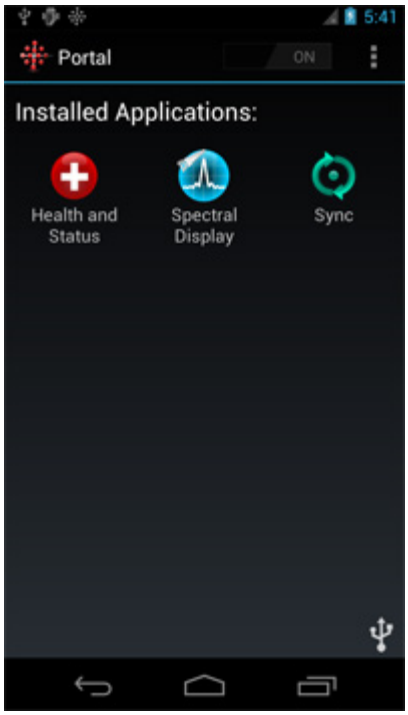
All DRT4000 logs are XML files but are stored with the file extension .log. Log files can be opened using any text editor, such as, *Notepad++*. When opened with a text editor, the contents of the file appear in the original XML format and can be manipulated within the editor.

NOTE: When opened in *Notepad*, log files appear unformatted and are difficult to read and manipulate. Use a text editor with more editing features, such as, Notepad++ to view and manipulate log files.

You can also change the extension of a .log file to .xml and the contents of the file will appear in XML format in the MS *Preview Pane* or the log file can be opened in MS *Excel* or any text editor.

4.2. Android 4300 Software

4.2.1. Open Portal App



The images in this section are screenshots from a prototype GUI running on an Android device connected to a DRT4311B. Screens may look slightly different on different Android devices.

The *Portal* application is an umbrella application that provides access from the Android device to the DRT43xxB system. *Portal* is installed on the Android device as described *above.*

To start:

- Connect the Android device to the DRT system via USB or Bluetooth and open *Portal*. When you connect the Android device to the DRT system via USB, *Portal* should open automatically. When connecting via WiFi over a network, *Portal* will attempt to connect to the last provided unit address.
- If the device does not successfully connect with a DRT unit, the device will prompt you for an IP address. Select or enter an IP address and select **Connect**. If the Android device cannot resolve the IP address, an error message will appear.
- When the device successfully contacts the DRT unit, you may be asked whether you want this device to open Portal whenever this connection is made. Answer as desired.
- Once connected to the DRT unit, *Portal* checks for updates to the sub-applications managed by *Portal*.
    - If a version of the application is detected that is different from that installed on the Android device, you will be notified that a Portal Update is required. Select **OK** and select **Install** to replace the application currently on the device.
    - You will be asked whether you want to update other applications such as **Update Monitor** too. Select **OK** and **Install** as needed.
- You will be asked whether you want the Android device to be synchronized with the versions of software on the DRT system. If you say yes, this will cause *Portal* to overwrite the files on the Android device with the new versions.
- Once the Android device is updated, the name of the DRT43xxB system is displayed on the device and the installed applications are displayed. From here you can begin by opening an application to begin configuration.

4.2.2. Android Sync

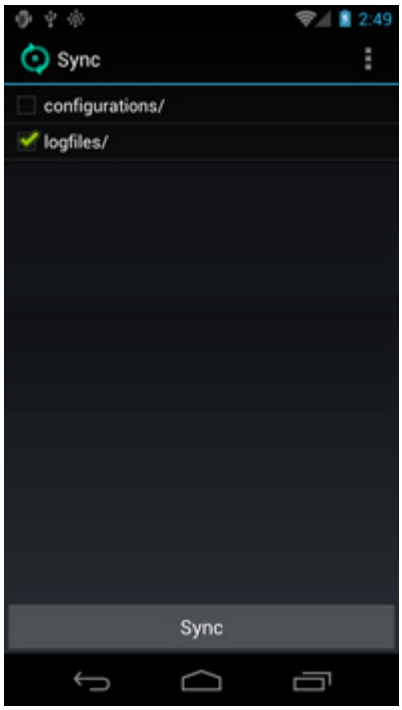
The images in this section are screenshots from a prototype GUI running on an Android device connected to a DRT4311B. Screens may look slightly different on different Android devices.

The *Sync* application is used to pull files from the DRT system to the Android device. The type of files pulled are:

- Configuration Files
- Logs

The *Sync* application is started from the Android device on the **Installed Applications** window. Selecting ***Sync*** will display the directories on the SD card. You should select which items you want to bring to the Android device. Then click the **Sync** button.

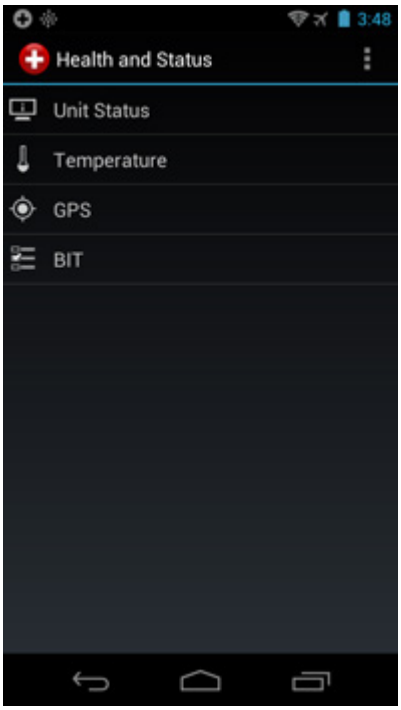
Other files are not utilized by the Android applications.



4.2.3. Android Health and Status

The images in this section are screenshots from a prototype GUI running on an Android device connected to a DRT4311B. Screens may look slightly different on different Android devices.

The *Health & Status* application provides you with information concerning the operating conditions of your DRT unit.



The information provided includes:

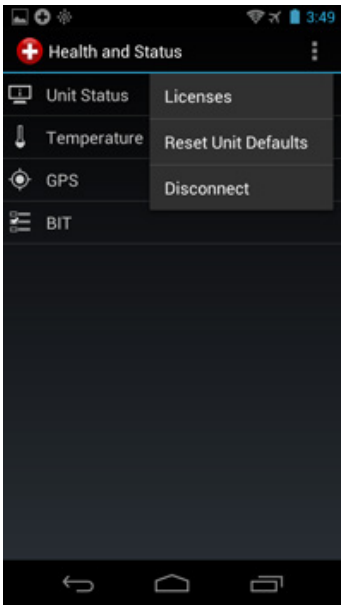
- The ***Unit Status*** selection provides you with:
  - The unit's **Model Number.**
  - The unit's **Serial Number.**
  - The **Software Version** running on the DRT unit.
  - The **SD Card Present** (**true** or **false**).
  - The **Battery** status (percent of available charge and estimated running time remaining in minutes), if installed.
- The ***Temperature*** selection provides you with:
  - The **Temperature Status** of the unit (**LOW**, **HIGH**, **UNKNOWN**, or **OK**).
  - The **Max Temperature**, the current maximum temperature (in ^{o}C) reported by any temperature sensor in the unit.
  - The **Min Temperature**, the current minimum temperature (in ^{o}C) reported by any temperature sensor in the unit.

- The ***GPS*** selection provides you with:
    - The GPS **Lock Status** (**Unlocked, locked 2D**, or **locked 3D**).
    - The unit's **Latitude** (in decimal degrees).
    - The unit's **Longitude** (in decimal degrees).
    - The unit's **Altitude** (in meters) [Only available when GPS is **locked 3D**.]
    - The unit's **Bearing** (in degrees).
    - The unit's **Speed** (in kph).
    - The **Visible Satellites**, the number of satellites being used by the GPS.
    - The unit's GPS **Time** (expressed as dd MMM yyyy hh:mm:ss am/pm).
    - The GPS **Time DOP**, the current value of Time Dilution of Precision (DOP). The smaller the value the better.
    - The GPS **Horizontal DOP**, the current value of Horizontal Dilution of Precision (DOP). This term will have a value whenever there is a **locked 2D** or **locked 3D** status. The smaller the value the better.
    - The GPS **Vertical DOP**, the current value of Vertical Dilution of Precision (DOP). This term will have a valid value whenever there is a **locked 3D** status. With a **locked 2D** status, the entry could be a dash or a number greater than 20. The smaller the value the better.
- The ***BIT*** selection provides you with:
    - The **BIT Results**, the status of the last time Built-in-Test (BIT) was run on the unit (**Passed** or **Failed**).

4.2.3.1. Menu Icon

While in the ***Health and Status*** app, selecting the Menu icon,  , provides other selections:

- **Licenses**
- **Reset Unit Defaults**
- **Disconnect**



Selecting **Licenses** provides you with the information about third party software licenses associated with software used to retrieve, transport, and display the data in the Android App.

Selecting **Reset Unit Defaults** resets the DRT unit to the factory defaults.

Selecting **Disconnect** provides you with these options:

- **Shut Down** - Stops the operation of the DRT unit and shuts it down.
- **Reboot** - Disconnects the DRT unit from the Android device and reboots the DRT unit in the existing configuration. The Android device will not automatically be reconnected, you must reconnect it manually.
- **Disconnect** - Disconnects the Android device from the DRT unit but keeps the DRT unit running using the existing configuration.

4.2.4. Android Spectral Display App

The images in this section are screenshots from a prototype GUI running on an Android device connected to a DRT4311B. Screens may look slightly different on different Android devices.

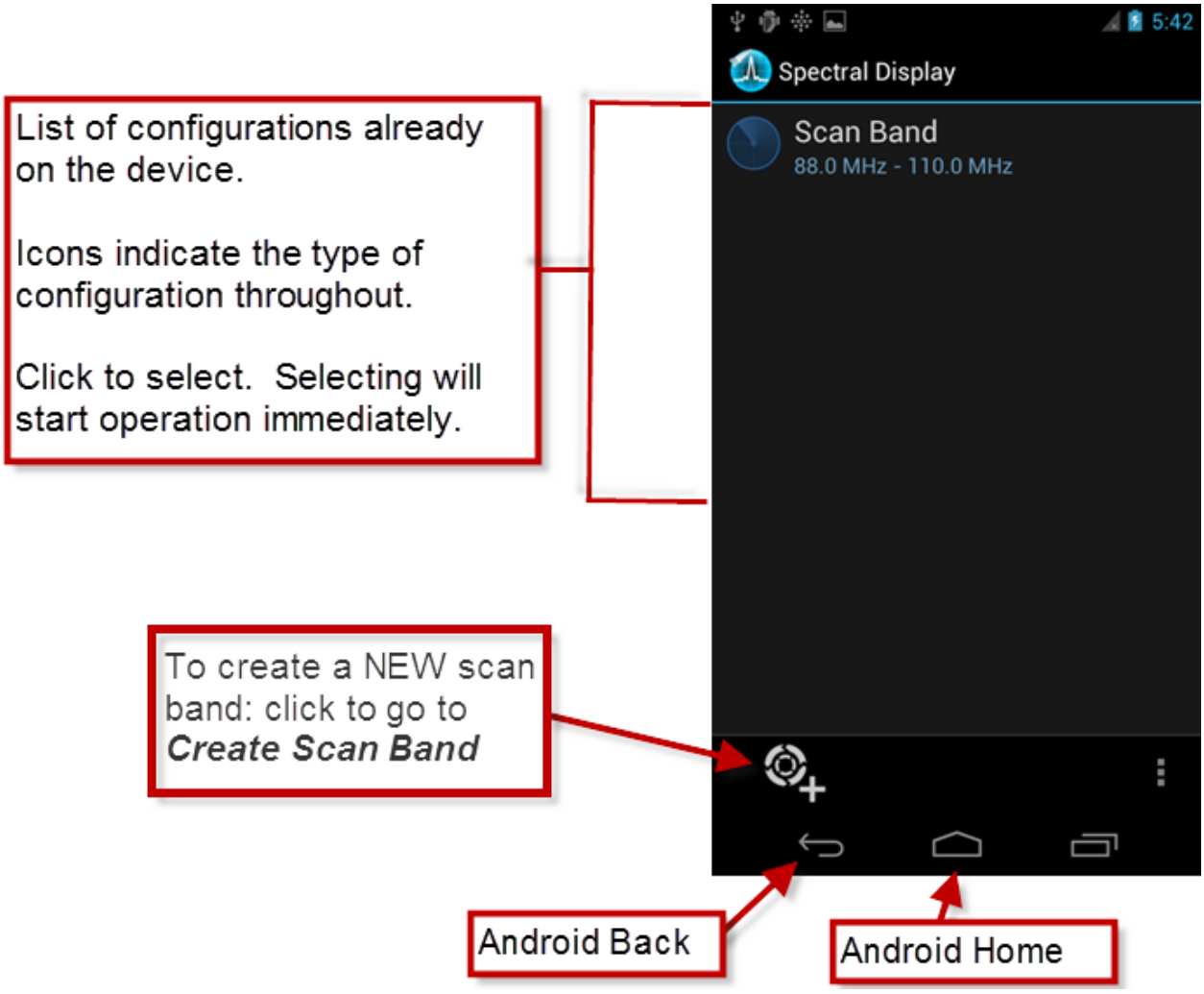
The Android Spectral Display application (app) does not perform general system or tuner configuration: Tuner and system configuration should be done using *Galena* on a PC prior to connecting to the DRT system with the Android device.

- Tuner configuration includes items such as tuner gain settings and coherent tuner operation.
- System settings include GPS, syncing to external 1PPS signal, etc.
- When the Android device disconnects from the DRT system, the DRT system will continue its operations.
  - For the Scan Band configuration, the system will simply continue to scan.

4.2.4.1. Start

To start using the Spectral Display app, on the Android device select **Spectral Display** from the **Installed Applications** page. The **Navigation** page is the starting page of the Spectral Display app, from where all other activities are started. If there are configured scan bands, the system will display a list of them on the **Navigation** page.

Android Spectral Display: Navigation Page



On certain pages, the Spectral Display icon in upper left  will take you back to the **Navigation** page.

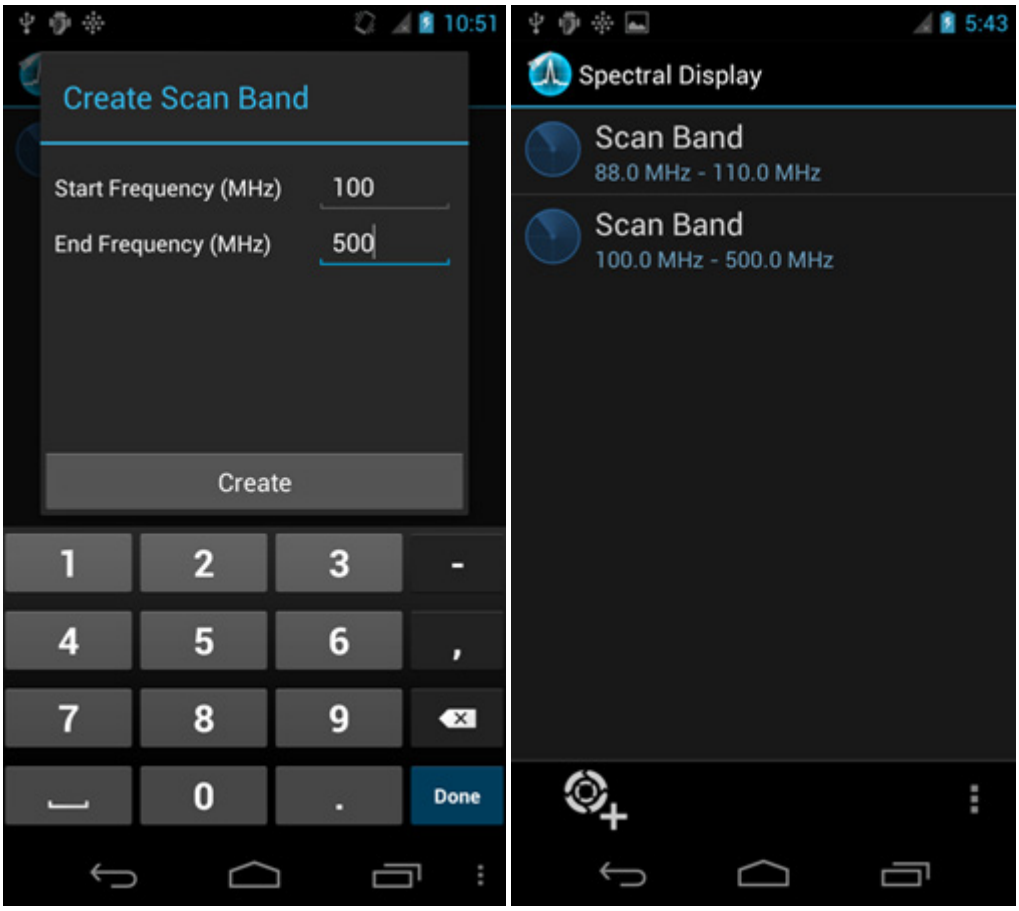
4.2.4.2. Scan Band

Selecting **Scan Band** will open the **Create Scan Band** dialog. The cursor is positioned in the **Start Frequency** field. Enter the **Start Frequency** of the new scan band and click **Next**. The cursor will advance to the **End Frequency** field. Enter the **End Frequency** and click **Create**.

Clicking **Create** takes you to the **Spectral Display** page which shows a list of the defined scan bands. Selecting any one scan band will then configure the unit to scan that frequency range. Multiple scan bands may be defined, but only one can be active at a time. To define another scan band, click this icon, which will take you back to the **Create Scan Band** dialog: 

Android Spectral Display

Create Scan Band **Navigation page lists Scan Bands**



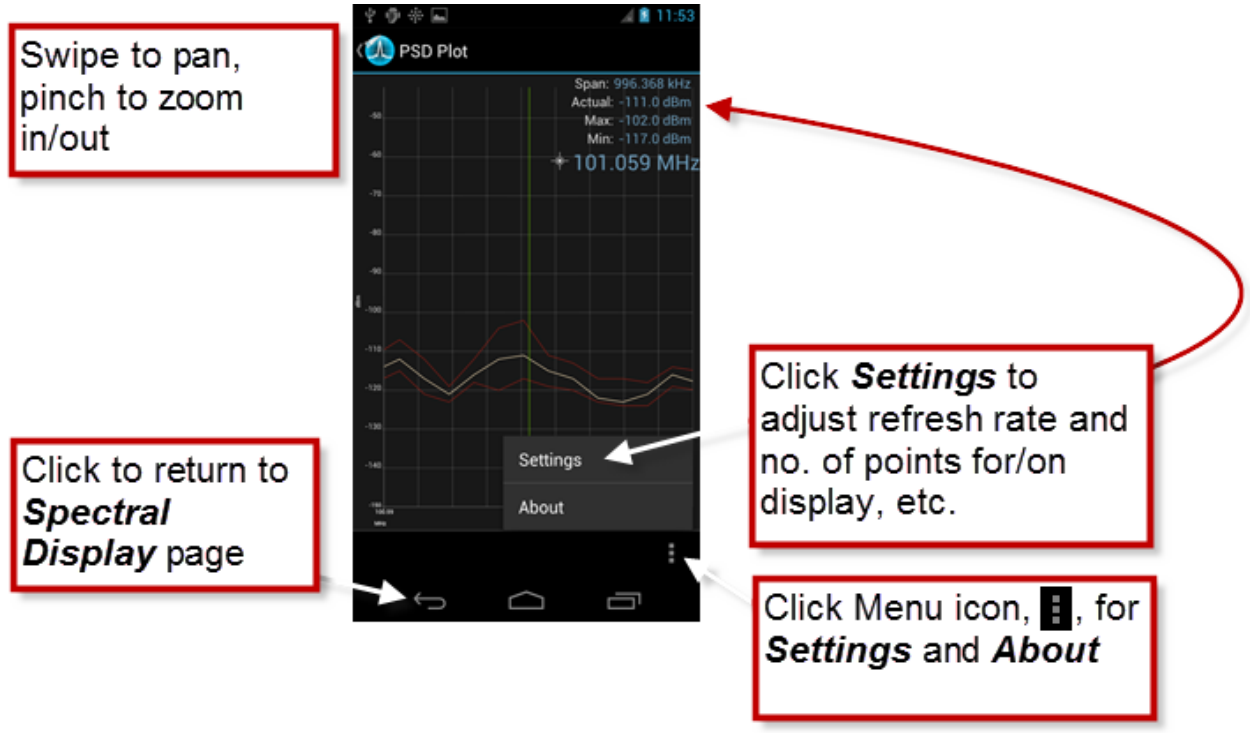
4.2.4.2.1. Scan Band: PSD Plot

From the **Navigation** page, clicking on a Scan Band item opens the **PSD Plot** option (Power Spectral Display) for that scan band, a spectral display of the band being scanned. The PSD Plot is probably most easily viewed using the landscape view (turn the Android device sideways).

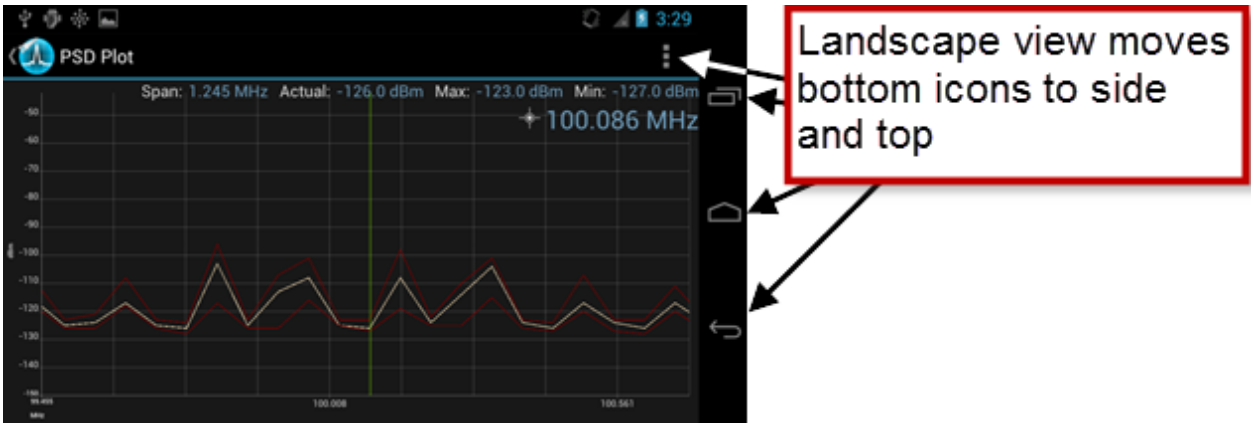
You can pinch to zoom in and out of the spectral display, and swipe left and right to pan around the graph.

Return to the **Spectral Display** page for the list of scan bands by clicking the icon shown in the screenshots below. This icon changes position based on whether the view is landscape or portrait.

Android Spectral Display: Scan Band PSD Plot



Android Spectral Display: Landscape Scan Band PSD Plot



The drawing of PSD Plot may be modified. On multiple windows there is a Menu icon in the lower right (portrait phone display) / upper right (landscape phone display & tablets), . Click this icon and select **Settings** to configure the display or **About** for information about the version of software that is running on the DRT unit.

4.2.4.2.1.1. Spectral Display Settings

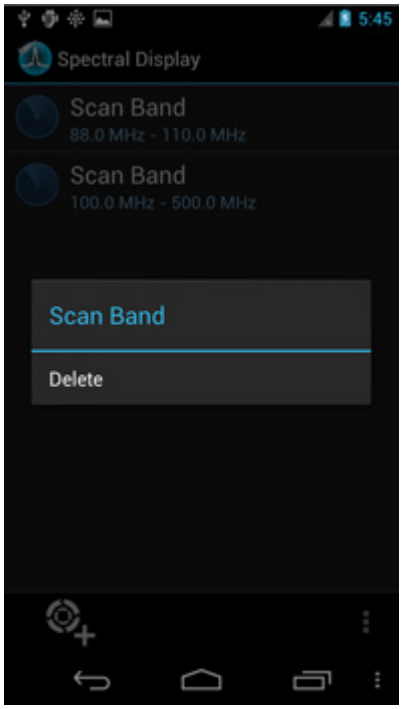
The **Settings** dialog allows you to configure the display. The options are:

- **Refresh Rate** - The rate at which the PSD plot refreshes. Default is 1/sec. Options are 1, 2, 4, and 8 per second. The value is the number of times per second data is requested from the DRT unit. A higher refresh rate consumes more bandwidth from the network connection to the DRT unit.
- **No. of Points** - The number of points displayed on the PSD plot. Default is 250 points. Options are 250, 500, 750, and 1000 points. A higher number of points consumes more bandwidth from the network connection to the DRT unit.
- **Peak Line Color** - Click to select the color of the PSD max and min value lines (if selected, see below).
- **Enable Max Line -** Click to display the PSD maximum value line**.**
- **Enable Min Line** - Click to display the PSD minimum value line.

4.2.4.3. Delete Scan Band Configuration

Android Spectral Display: Delete Configuration

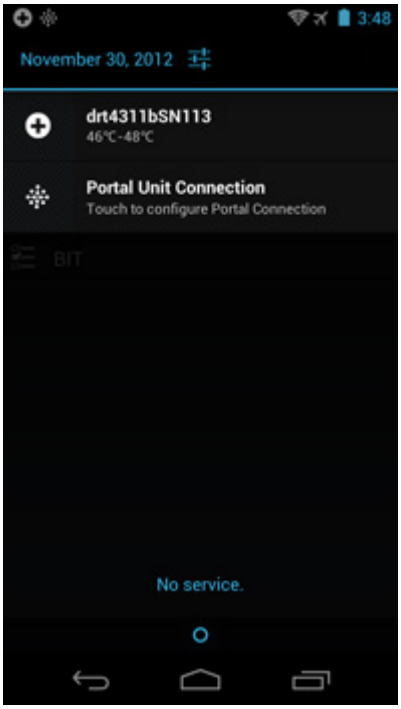
Pressing and holding a scan band configuration on the **Navigation** page will bring up a menu with an option to delete it. Pressing **Delete** on this menu will delete the selected scan band.



4.2.5. Optional Android Navigating

The images in this section are screenshots from a prototype GUI running on an Android device connected to a DRT4311B. Screens may look slightly different on different Android devices.

An optional way to move around the Android App is initiated by swiping down the face of the display. This will bring up a display with the *Health and Status* application icon, , and the *Portal* application icon, . Selecting the *Health and Status* icon, which displays the model number, serial number, and operating temperature of the unit, will take you to the Android Health and Status application. Selecting the *Portal* application will take you to the ***Portal*** application to configure the Portal connection.



5. Open-Source Software

During the creation of the *DRT4300B System Software*, specific functionality was realized through the use of targeted open-source software libraries. In compliance with the terms of use of these software libraries, DRT is providing the licenses and required source for these libraries on the *DRT4300B System Software* DVD.

In addition to the installation files found on the System Software DVD, there are five folders. One of these folders, titled **Open-Source Software**, contains the licenses and required source for the open-source software libraries used. For any questions about any of the open-source software, consult this folder or contact DRT.

6. Troubleshooting

6.1. Locate a Unit on a Network

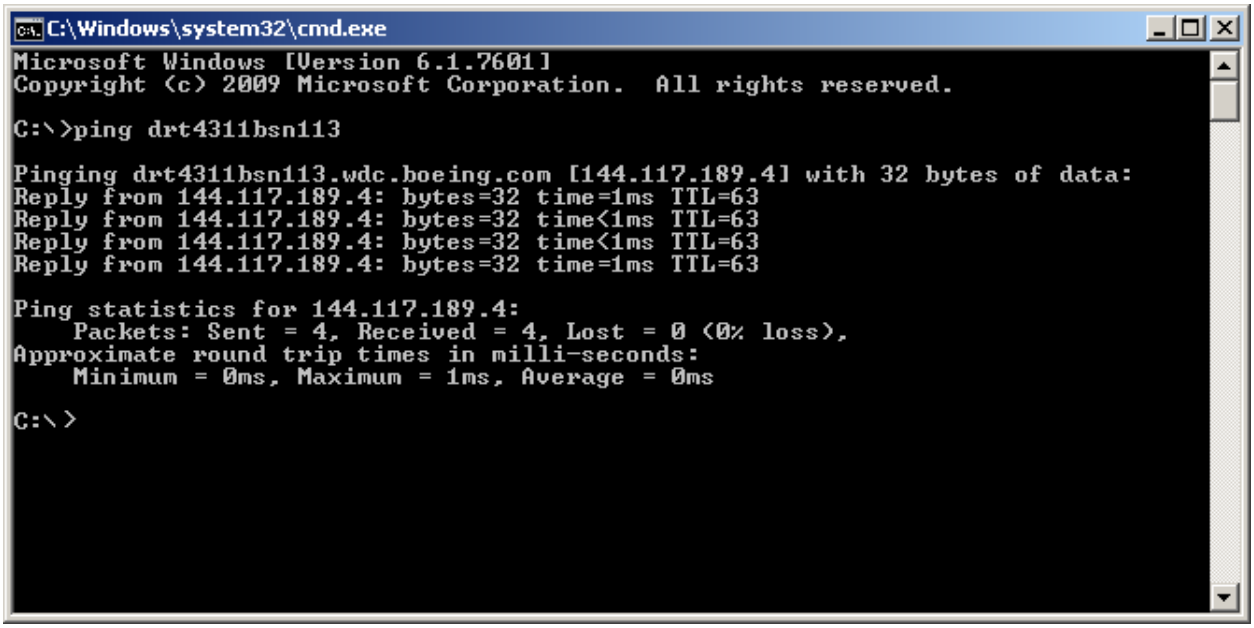
6.1.1. Win XP PC

If the unit is connected to a network when you install/update the embedded software or start the GUI, you must be able to "see the unit" on the network to continue. However, it is possible that the unit is on the network, but the software cannot locate it. This can be for a reason as simple as having a router between your PC and the unit. To locate the unit:

- Click the **Start** button and then click **Run**.
- The **Run** dialog will appear. Enter *cmd* and click **OK**. A command prompt box like the one below will appear with the last line indicating a drive letter followed by a colon, a backslash, and a ">." Enter the word *ping* followed by a space and then the model number and serial number of the unit as follows:

  ping drt4311bsn113

- Press ENTER on the keyboard. The software will interrogate the network in an attempt to locate the unit.
- When it is found, the IP address will be returned four times.



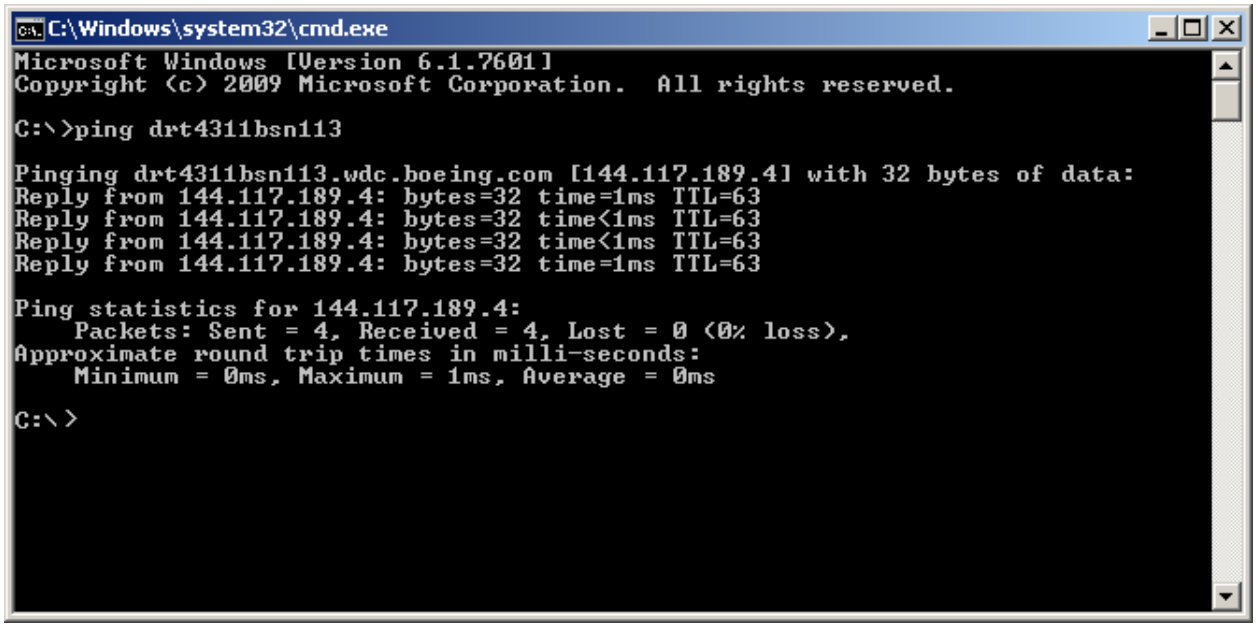
6.1.2. Win 7 PC

If the unit is connected to a network when you install/update the embedded software or start the GUI, you must be able to "see the unit" on the network to continue. However, it is possible that the unit is on the network, but the software cannot locate it. This can be for a reason as simple as having a router between your PC and the unit. To locate the unit:

- Click the **Start** button.
- In the lower left corner there is a field labeled **Search programs and files**. In this field, enter *cmd* and press ENTER on the keyboard or click the  icon. A command prompt box like the one below will appear with the last line indicating a drive letter followed by a colon, a backslash, and a ">." Enter the word *ping* followed by a space and then the model number and serial number of the unit as follows:

  ping drt4311bsn113

- Press ENTER on the keyboard. The software will interrogate the network in an attempt to locate the unit.
- When it is found, the IP address will be returned four times.



6.1.3. Updating Hosts / LMHosts Files

Windows has used both the **HOSTS** and **LMHOSTS** filenames. The existing file may have either filename. As an example, Windows XP Professional SP3 uses **HOSTS**. The files in **C>Windows>System32>Drivers>etc>** include **HOSTS**, **HOSTS.001**, and **LMHOSTS.SAM**. **HOSTS** and **HOSTS.001** are two copies of the same file and **LMHOSTS.SAM** is a sample file providing information about **HOSTS** / **LMHOSTS** files. If it is necessary to modify a HOSTS file, DRT recommends that you modify the **HOSTS** file and leave the **HOSTS.001** as an unmodified backup. **HOSTS** is the file used by Windows.

NOTE: **HOSTS / LMHOSTS** only works with static IP addresses over time.

You cannot add a **HOSTS** / **LMHOSTS** entry for a computer that is a DHCP client because the IP addresses of DHCP clients change dynamically. To avoid problems, make sure that the DRT systems whose names are entered in the **HOSTS** / **LMHOSTS** files are configured with static IP addresses.

If you should receive an error that says "<hostname> does not appear to be a valid name on this network", you may have to make a change to the controller PC's **HOSTS** / **LMHosts** file to resolve the DRT unit's name and IP address. Although it may still be possible to connect to the unit using its IP address, if this error appears *Galena* may have trouble storing information in the default file locations on the unit. Note that adding the DRT system IP address to the **HOSTS** / **LMHosts** file will not help if the DRT system has a dynamic IP address.

- Use *Windows Explorer* to navigate to the **HOSTS** / **LMHosts** file:
  - **C>Windows>System32>Drivers>etc> HOSTS / LMHosts**.
- If the file is not present, you can create one (see below). If it is present, right-click the **HOSTS** / **LMHosts** file and select **Open With>Notepad**.
- Within the file opened in *Notepad*, go to the end of the text and enter the DRT unit's name and its IP address (see example below) and put a carriage return after:

  for example, 192.168.1.100 DRT4311bsn2156

Note: Although 192.168.1.100 is the most common default IP address that DRT gives to new units, it is NOT the only default IP address used. Check your unit's hardware manual for the default IP address.

1. Save the file (*Notepad* main menu>**File>Save**).
2. Close the file.
3. On the Windows task bar, go to **start>Control Panel>Network Connections:**
4. Right-click the **Local Area Connection** and select **Properties** from the pop-up menu. On the **Properties** window:
5. Select (highlight) **Internet Protocol (TCP/IP)** and then click the **Properties** button.
6. Click **Advanced** on lower right.
7. Click the **WINS** tab.
8. Click the **Import HOSTS / LMHosts** button which brings up a *Windows Explorer* dialog.
9. Browse to the file you just changed with *Notepad*, select it and click **Open**.
10. Click **OK.**
11. Click **OK** and/or **Close** to close all the open windows.

To create a **HOSTS** / **LMHosts** file:

12. Open *Notepad*. Enter the DRT unit's IP address and name on the same line and press **ENTER**:

    for example, 192.168.1.100 DRT4311bsn2156

- Note that if you are entering more than one IP address for a DRT system, each entry must be on a separate line and the final entry in the file must be terminated by a carriage return.
- Save the file with the name **HOSTS** / **LMHosts** in this directory: **C:\Windows\System32\Drivers\etc**.
- *Notepad* gives the file the .txt extension—you need to delete the file extension because the **HOSTS** / **LMHosts** file does not have a file extension. Rename the file as simply **HOSTS** / **LMHosts** with no extension.

6.1.4. Troubleshooting USB/Ethernet Connections

If connection to the DRT unit using a USB cable is not possible, it could be an issue because the settings assigned to the USB port are incorrect or a network configuration file has been corrupted. To fix the settings so that a USB connection can be made, connect to the unit using an Ethernet cable and use *Yukon* to fix the USB settings. Then try connecting again to the DRT unit with the USB cable. The USB connection should be available.

For detailed instructions on how to use *Yukon* to make USB and Ethernet connections, see the section ***Connecting to a Unit***.

7. MPS Quick Start Guide

7.1. Configure an MPS Scan

To configure an MPS scan, you can start the Wizard either of two ways:

- When Galena begins from a cold start, the **MPS Configuration Wizard** opens immediately.
- At any time when an MPS mission is running, from the main menu select **MPS** > **Launch Wizard.** This will open the **MPS Configuration Wizard.**

The left side of the dialog lists the available protocols and their available bands. The right side displays settings for the band when a band is highlighted. To configure the scan, for each protocol:

NOTES:

- Prior to indoor operation, the system should be synchronized with the GPS system outdoors. This ensures proper indoor operation for up to 8 hours for all scan scenarios under typical conditions. Once the GPS signal is lost, the number of RF channels that can be properly scanned will depend on how long the GPS has been lost.

1. On the left side:
    - Check the protocol's box to scan all bands within that protocol or
    - Check the box for each band to be scanned.
2. To modify the scan characteristics within a band, highlight the band on the left side of the dialog. On the right side of the dialog:
    - **Basic Settings** > **Channel Range** field (all protocols) identifies the channels to be scanned. Edit this field to restrict the channels scanned.
    - **Advanced Settings** fields allow you to control the scan parameters. Edit these parameters as necessary.
    - **Scan Measurements** field displays the measurements to be made on this band. Click the **Edit** button to modify the measurements.
    - **Overhead Messages** field displays the overhead messages that are collected and reported for this band. Click the **Edit** button to modify the messages.
3. When all protocols and bands have been set, click **Next**. The **Scan Configuration** page is replaced by the **Logging Configuration** page. Refer to ***Logging Configuration*** to configure MPS data logging. (Logging may also be enabled after the scan is configured: from the main menu > select **MPS** > select **Enable Logging**.)
4. Click **Finish** to exit the dialog and begin the operation.