



## MODE Quick Start Guide (QSG)

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## **This document contains the following information:**

- Section 1     Getting Started
- Section 2     Auto Survey
- Section 3     Logging
- Section 4     Registration
- Section 5     Mobile Subscriber Direction Finding (MS DF)
- Section 6     Long Term Evolution (LTE) Redirect MS DF

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### **WARNING: ITAR CONTROLLED INFORMATION**

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## 1-1 SCOPE

This document provides a quick reference to the Gemini modes that are common to all protocols.

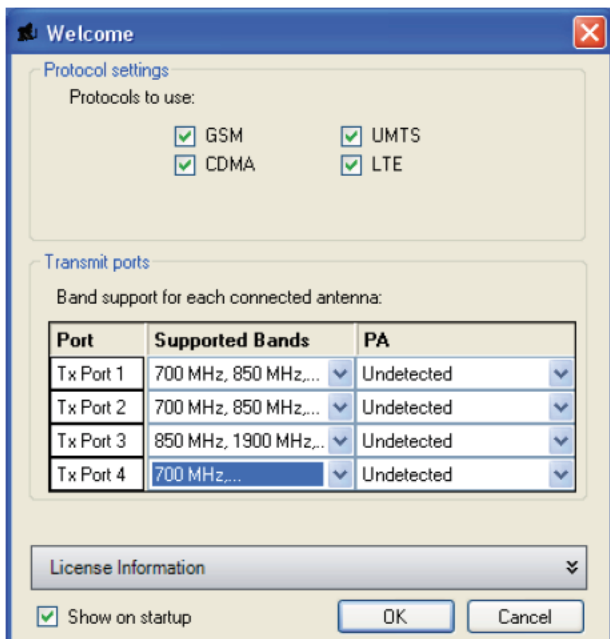
## 1-2 BASIC GEMINI FUNCTIONALITY

The Gemini RayFish Controller enables operators to run different protocols with ease. Gemini provides the capability to run GSM, CDMA, UMTS, and LTE simultaneously on any of its multi-radio systems. KingFish is limited to one protocol at a time; however, protocols can be enabled/disabled without having to restart the Gemini controller.

The Gemini application can be opened without connecting hardware. When using Gemini without hardware, Gemini makes available a reduced set of preferences. For example, Gemini can be configured to enable Bluetooth search on start-up. The Bluetooth search on start-up option would be accessible in the General preferences tab without having to have hardware connected. All mode-specific preferences and mode data will not be visible when the application is launched without hardware.

## 1-3 GEMINI WELCOME SCREEN

The Gemini **Welcome** screen (see [Welcome Screen figure](#)) allows the user to enable/disable protocols and modify transmit port settings.



### Welcome Screen

On startup, the user has the option to select which protocols they want to enable. If the protocol check boxes are grayed out, this is because the license code is either invalid or expired. Gemini requires a license code to enable each protocol. Once this license code is entered, it is stored on the RayFish system and will not have to be entered again.

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## GETTING STARTED

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### 1-4 GEMINI PORT CONFIGURATION

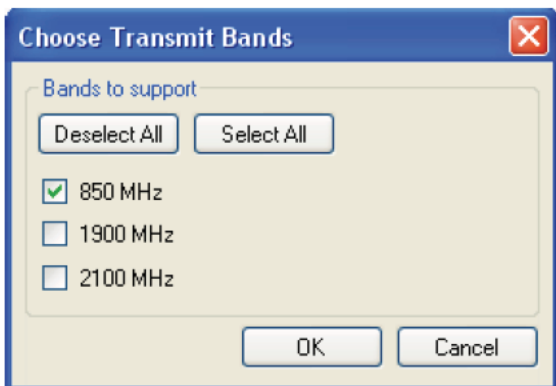
The *Transmit ports* area on the **Welcome** dialog is unique to systems capable of simultaneous multiple transmissions.

The typical transmit port configuration includes direct connection to Harpoon Power Amplifiers (**PA**). Each Harpoon is a band-specific **PA** which means only one band can be configured per the system's transmit port due to this static connection. If **PA(s)** are showing as undetected, and the Harpoon is not available in the **PA** drop-down menu, ensure that each transmit port has been configured for one of the bands supported by the connected **PA**.

#### CAUTION

DO NOT use the Laird antennas, included in the RayFish kits, to transmit with the Harpoons. The recommended antenna to be used with Harpoons is the CMP-727 that is included with the Harpoon kit.

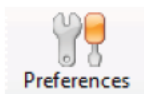
The **Transmit Bands** figure shows that the user has correctly selected only one band for this transmit port. Once this has been confirmed, the **PA** for 850/1900 should be available under the **PA** drop-down listbox.



### Transmit Bands

## 1-5 GENERAL PREFERENCES

Access General **Preferences** dialog (as shown in [General Preferences figure](#)) via main window's menu (i.e., **Edit > Preferences**), or by selecting the **Preferences** toolbar button on the main window.

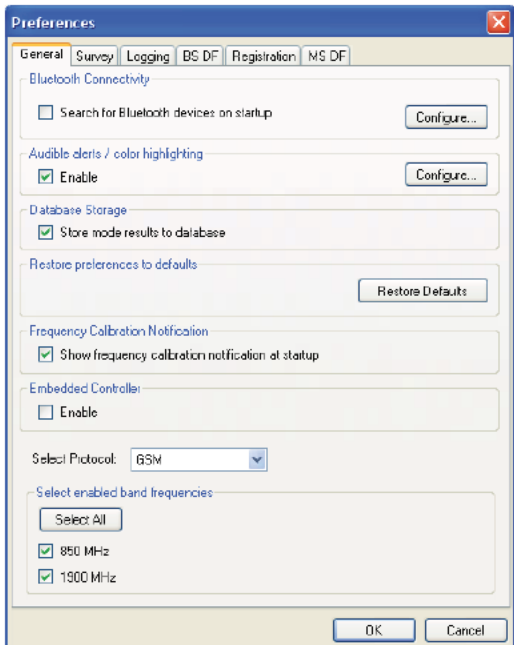


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# GETTING STARTED

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## General Preferences

- **Bluetooth Connectivity:**
  - The ***Search for Bluetooth devices on startup*** checkbox, if checked, will search for a KingFish connection via Bluetooth before attempting to connect via USB
  - Select the configure button to clear any KingFish that have been previously setup as a favorite



- **Audible Alerts / Color Highlighting:**
  - Checking/un-checking this box enables/disables sounds and colored highlighting in Gemini
  - If this box is checked, subscriber matches will alert the user visually and/or audibly
  - If unchecked, the user will not be alerted of subscriber matches
- **Database Storage:**
  - This option enables/disables database storage for operational results
  - Check this box to enable data storage while running Gemini
- **Restore Preferences to Defaults:**
  - This button restores Gemini preferences to their default state
- **Embedded Controller:**
  - Gemini 2.2.2 or greater has the ability to use the Single Board Computer (SBC) inside of the SR11
  - This option turns on the SBC, however, without the proper kit from Harris, this option should not be enabled
  - To inquire about this functionality please contact Harris Support (call 1-800-358-5297)
- **Frequency Calibration Notification (only applicable to CDMA):**
  - This checkbox controls the frequency calibration pop-up notification
  - Deselecting this option prevents the notification from displaying
  - It is recommended to perform frequency calibrations only on CDMA

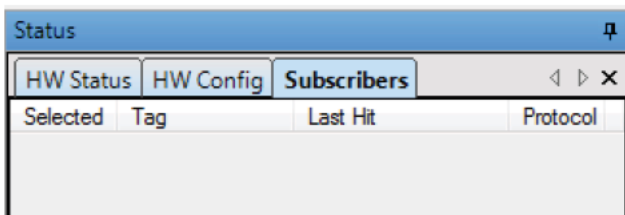
## GETTING STARTED

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- **Select Protocol:**
  - This drop-down reveals protocol-specific preferences
- **Select Enabled Band Frequencies:**
  - Disable or enable Bands

### 1-6 SUBSCRIBER MANAGEMENT

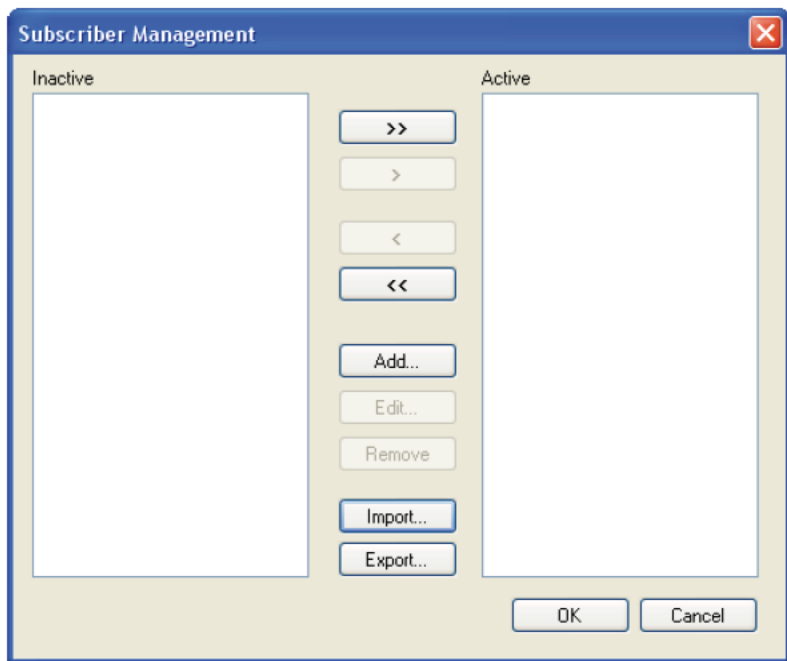
The **Subscribers** tab displays all of the active subscribers that have been directly entered by the user. The **Subscribers** tab can be found in the Status view. Refer to the [Access Subscribers Tab from Status figure](#).



#### [Access Subscribers Tab from Status](#)

From this tab the user can right-click and select **Manage Subscribers** option which can also be accessed via the main menu (i.e., **Edit > Subscribers**).

The **Manage Subscribers** option displays the **Subscriber Management** dialog (see [Subscriber Management Dialog figure](#)).



### Subscriber Management Dialog

The user can add a subscriber from this dialog screen by selecting the **Add** button. The **Add** button displays the **Add Subscriber** dialog (see [Add Subscriber](#) figure).

The **Add Subscriber** dialog is split into two sides, a PLMN-based ID (left side) for GSM/UMTS/LTE Subscribers and a SID-based ID (right side) for CDMA Subscribers.

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**NOTE**

A CDMA Subscriber with LTE capabilities will have both ID types.

The screenshot shows a software dialog box titled "Add Subscriber". It features a "Tag" field with the value "Eisen" and a checked "Active" checkbox. Below these are fields for "TMSI", "IMSI", "IMEI", and "PLMN" (with "Add..." and "Clear" buttons). To the right are fields for "ESN (Hex)", "ESN (Dec)", "MEID", "MDN", "MSID/MIN", and "SID" (with "Add..." and "Clear" buttons). A "Comments" field with a "Modem" checkbox is at the bottom. "OK" and "Cancel" buttons are in the bottom right corner.

**Add Subscriber**

The **Tag** is the unique name that the user will use to identify the subscriber.

The following is a description of each text field (depending on Protocol selected):

**PLMN Identifiers**

- **TMSI** – Temporary Mobile Subscriber Identity. This is a temporary ID assigned to the MS which is used in lieu of the IMSI/IMEI

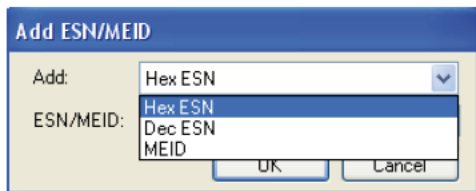
**NOTE**

The TMSI is not used during the subscriber match process.

- **IMSI** – International Mobile Subscriber Identity. This is the ID that is assigned to the SIM card
- **IMEI** – International Mobile Equipment Identity. This is the ID that is assigned to the MS equipment
- **PLMN** – Public Land Mobile Network. This ID is unique to each provider and is how Gemini determines which provider to transmit

## SID Identifiers

- **ESN (Hex)** – The electronic serial number hexadecimal format
- **ESN (Dec)** – The electronic serial number in decimal format
- **Add ESN/MEID** button – Select to display **Add ESN/MEID** dialog and add Subscriber by selected option and add/modify subscriber ESN/MEID



### Add ESN/MEID Dialog

- Select *Hex ESN* to add the Hex ESN and populate the ESN (Hex) field in **Add Subscriber** dialog
- Select *Dec ESN* to add Dec ESN and create the Hex ESN. ESN (Hex) and ESN (Dec) fields are populated in **Add Subscriber** dialog
- Select *MEID* to add Mobile Equipment Identifier (MEID) and create an Hex ESN. The MEID and ESN (Hex) fields are populated in **Add Subscriber** dialog

## GETTING STARTED

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**GETTING STARTED**

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**NOTE**

As of Gemini 2.2.2 or greater, when the user adds the MEID, Gemini automatically converts it to the ESN.

- **MDN** – Mobile Directory Number. This field is not used in the subscriber match process. It is just for reference purposes. Prior to wireless number portability, the MDN was the same number as the MIN for many mobile phones.
- **MSID/MIN** – Mobile Subscriber Identifier / Mobile Identification Number. The unique identifier assigned by the wireless service provider to each phone

**NOTE**

Without the MSID / MIN entered, Gemini cannot determine the hash channel. Hashing is explained in more detail later in this document.

- **SIDs** – System Identification Number. This is the provider ID. The user must enter this ID in order for Gemini to know which provider to transmit

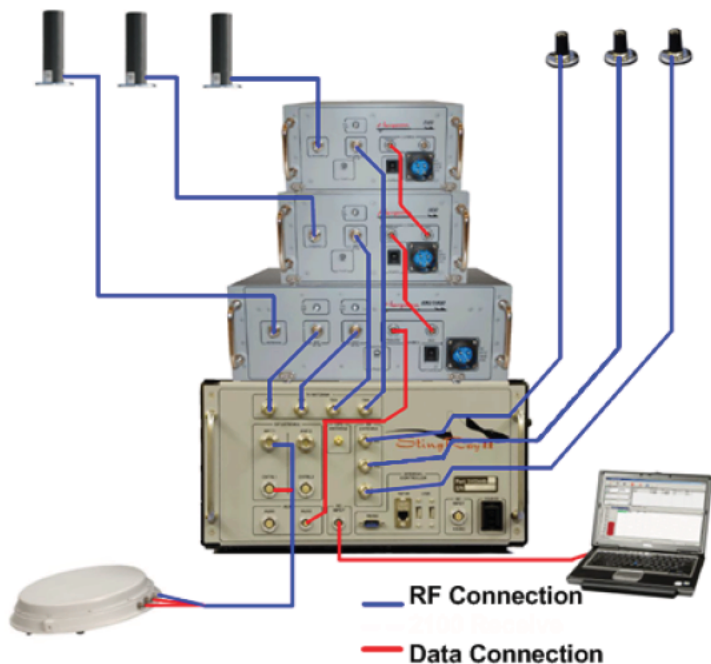
**LTE**

The LTE protocol includes all text fields associated with both PLMN and SID identifiers.

## 1-7 HARDWARE DIAGRAMS

### 1-7.1 STINGRAY II

The [StingRay II Diagram](#) figure shows how to properly connect the StingRay II and Harpoons (where red illustrates USB and blue illustrates RF connections).



[StingRay II Diagram](#)

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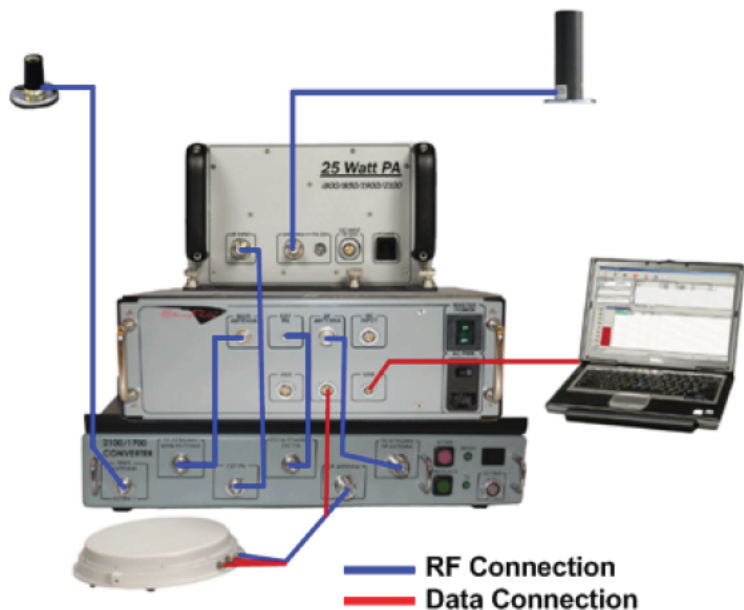
The StingRay II receive ports support the following bands:

- RX 1 – 850/1900 MHz
- RX 2 – 2100 Uplink (CDMA/UMTS 2100 MS RX)
- RX 3 – iDEN/2100 Downlink (CDMA/UMTS 2100 BTS RX)



## 1-7.2 STINGRAY I

The [StingRay I Diagram figure](#) shows how to connect a StingRay I to a PA and a Converter box.



[StingRay I Diagram](#)

### NOTE

The Converter box is only to be used for 2100, otherwise the operator must enable bypass (if applicable) or disconnect the converter box.

## GETTING STARTED

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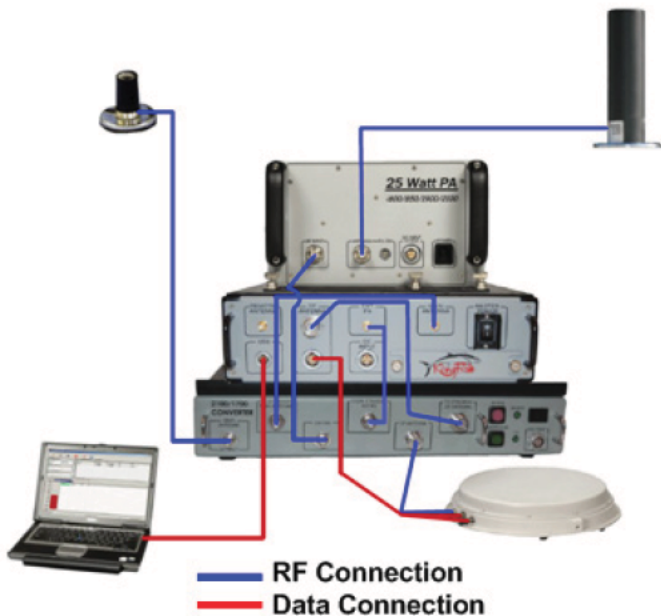
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**GETTING STARTED**

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**1-7.3 KINGFISH**

The **KingFish Diagram** figure shows how to connect a KingFish to a PA and a Converter box.



[KingFish Diagram](#)

**NOTE**

The Converter box is only to be used for 2100, otherwise the operator must enable bypass (if applicable) or disconnect the converter box.

## 1-7.4 HAILSTORM SETUP

### WARNING

Do Not connect the conical Larid Rx antennas from the HailStorm kit to the Harpoons. Doing so could ruin the antenna and/or the Harpoon.

Harpoons are only to be used with the cylindrical ARA antennas included in the Harpoon kit.

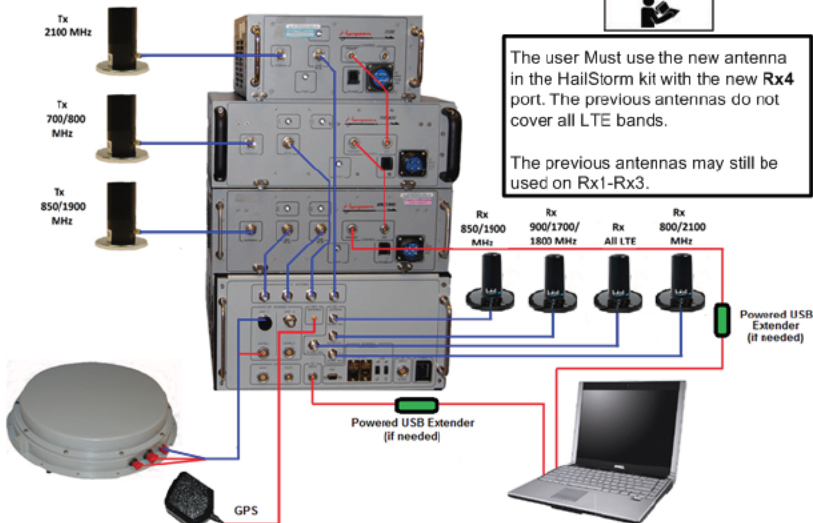
— RF Connection  
— Data Connection

### CAUTION



The user Must use the new antenna in the HailStorm kit with the new Rx4 port. The previous antennas do not cover all LTE bands.

The previous antennas may still be used on Rx1-Rx3.



### CAUTION



Connect the Harpoon's primary USB cable to the PC instead of the HailStorm chassis.

### Hailstorm AmberJack Connection Setup

## GETTING STARTED

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### WARNING

Do Not connect the conical Laird Rx antennas from the HailStorm kit to the Harpoons. Doing so could ruin the antenna and/or the Harpoon.

Harpoons are only to be used with the cylindrical ARA antennas included in the Harpoon kit.

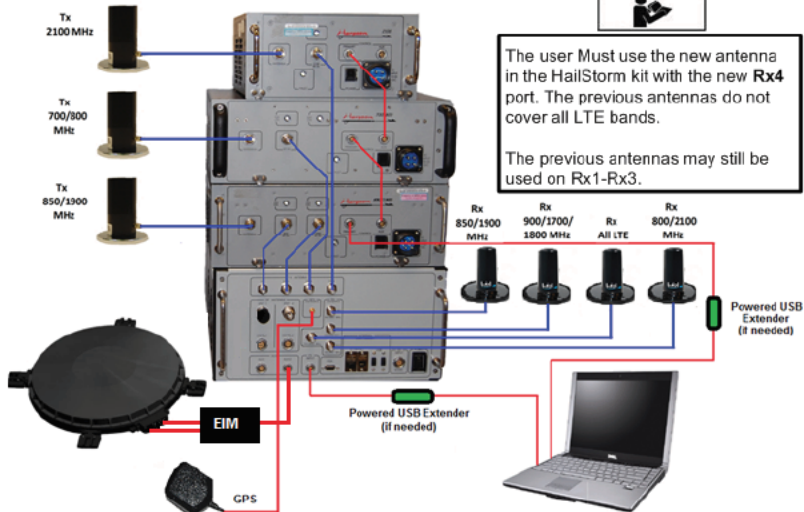
— RF Connection  
— Data Connection

### CAUTION



The user Must use the new antenna in the HailStorm kit with the new Rx4 port. The previous antennas do not cover all LTE bands.

The previous antennas may still be used on Rx1-Rx3.



### CAUTION



Connect the Harpoon's primary USB cable to the PC instead of the HailStorm chassis.

## HailStorm ArrowHead Connection Setup



Hailstorm Faceplate

## GETTING STARTED

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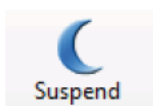
2 - 0

2 - 1  
AUTO SURVEY

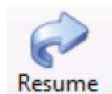
Gemini begins the survey mode automatically when the application is first launched.

## 2-1 SURVEY FUNCTIONALITY

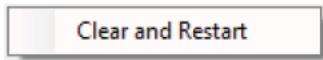
The survey can be suspended at anytime by selecting the **Suspend** button.



Resume the survey at anytime by selecting the **Resume** button.



The user has the ability to clear/restart an individual protocol survey by right-clicking in the desired protocol channel list and selecting **Clear and Restart**. This clears the current channels displayed and cause Gemini to restart the survey for the selected protocol.



## 2-2 SURVEY PREFERENCES

Each protocol has unique conditions that can be changed via the preferences menu.

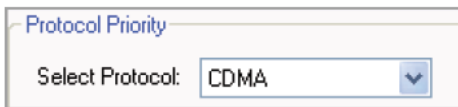
To open preferences, either select **Edit > Preferences** or select the **Preferences** button.



Changes that are made in the preferences menu are retained through subsequent application launches. However, if the Gemini is reinstalled or the reset defaults button has been selected, all preferences reset to their default state.

Each of the four SDRs is assigned a protocol to survey. In some cases, the number of protocols can not be allocated evenly to the SDRs. For example, if GSM, UMTS, and CDMA are enabled, one of three protocols will be allocated to two SDRs while the other two protocols will be allocated to one SDR.

The **Priority Protocol** drop-down box allows the user to select which protocol is assigned to the *extra* SDR.



## AUTO SURVEY

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## **AUTO SURVEY**

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The **Select Protocol** drop-down box displays protocol-specific preferences. All settings below this drop-down box apply only to the selected protocol.



Select Protocol:

The user can also choose to filter out survey results that are below a specific threshold. Each protocol has a default threshold that has been determined to be the optimal setting. Each protocol has a specific, user-configurable, noise threshold. However, Gemini automatically adjusts this value base to create optimal settings, so modification is not recommended.



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Logging enables the user to listen and log over the air messages that are being transmitted between the **Base Transceiver Station (BTS)** and the **Mobile Subscriber (MS)**. Messages are sent in two directions: **Forward** and **Reverse**. Messages received from the **BTS** are forward messages and messages received from the **MS** are reverse messages. Logging is useful in determining when a specific **MS** is in range.

### 3-1 LOGGING FUNCTIONALITY

Logging is accessed via the **Modes > Logging** menu or by selecting the **Logging** button.



Users can log individually selected channels or select multiple providers and log the strongest channel broadcasted by each selected provider.

When the user chooses to begin from the **Channels** tab, the user can only select the number of channels equal to the number of radios.

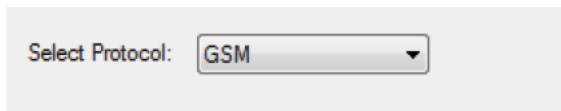
When the user chooses to begin from the **Providers** tab, the user can select multiple providers, however, the number of providers is limited by the number of radios. Gemini will then automatically begin to log the strongest surveyed channel per selected provider.

Once a message to/from any active subscriber in the Subscriber list is detected, Gemini will notify the user.

### 3-2 LOGGING PREFERENCES

Logging preferences can be accessed via the preferences button or by selecting **Edit > Preferences**. All preferences related to logging are on

the **Logging** tab of the preferences dialog. Each protocol has unique preferences that can be accessed via the **Select Protocol** drop-down box.



A screenshot of a user interface element. On the left, the text "Select Protocol:" is followed by a rectangular dropdown menu. The dropdown menu has a light gray background and a thin border. Inside the menu, the text "GSM" is displayed in a dark gray font. To the right of the text "GSM", there is a small, dark gray downward-pointing triangle, indicating that the menu can be expanded to show other options.

## LOGGING

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The Registration mode is used to obtain the unique identifiers of **MSs** in the operational area. To achieve as much coverage as possible, performing a 120 second *Single Shot* registration on all potential providers is the preferred operational technique.

The following terms are key informational pieces that are gathered during a registration:

### **GSM**

- **TMSI** – Temporary Mobile Subscriber Identity
- **IMSI** – International Mobile Subscriber Identity
- **IMEI** – International Mobile Equipment Identity

### **UMTS**

- **TMSI** – Temporary Mobile Subscriber Identity
- **IMSI** – International Mobile Subscriber Identity
- **IMEI** – International Mobile Equipment Identity

### **CDMA**

- **ESN (Hex)** – Electronic Serial Number (Hexadecimal)
- **ESN (Dec)** – Electronic Serial Number (Decimal)

<h2><b>NOTE</b></h2>
<p>The ESN is a not always unique to the phone.</p> <ul style="list-style-type: none"><li>• <b>MEID</b> – Mobile Equipment Identifier</li><li>• <b>MSID</b> – Mobile Subscriber Identifier</li></ul>

## LTE:

- **TMSI** – Temporary Mobile Subscriber Identity
- **IMSI** – International Mobile Subscriber Identity
- **IMEI** – International Mobile Equipment Identity

### NOTE

The IMEIs are protected and rarely broadcast.

### NOTE

LTE Registration does not obtain ESN/MEID/MSID. These IDs are only obtained by CDMA Registration.

## 4-1 REGISTRATION FUNCTIONALITY

The registration mode can be accessed via the **Modes > Registration** menu or by selecting the **Registration** button.



Prior to starting **Registration**, the user must select one of the following:

- The channel(s) they would like to use from the **Channels** tab (using check boxes)
- The provider(s) they would like to use from the **Provider(s)** tab (using check boxes)

## REGISTRATION

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## REGISTRATION

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From the **Channels** tab, when running a *Continuous* registration, the number of channels is restricted by the number of radios. However, the user can run a registration on as many channels as desired by selecting the *Single Shot* registration type from the **Preferences** tab in the **Start Registration** dialog.

*Single Shot* with a 120 second *Up time* is the recommended registration setting.

For LTE, if more channels are selected than available slices, the channels will cycle every 60 seconds, if **Continuous** registration is selected.

From the **Providers** tab, the user can transmit on all channels associated with the selected provider(s).

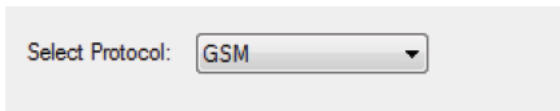
### 4-2 REGISTRATION PREFERENCES

Registration preferences can be accessed via the preferences button or by selecting **Edit > Preferences**. All preferences related to registration are on the **registration** tab of the preferences dialog.

The registration **Type** includes the following:

- **Continuous** – When selected, registration mode will continue to run until the user has selected **Stop**
- **Single Shot** (recommended) – When selected, registration mode will run for one minute and automatically stop
- **Periodic** – When selected, registration mode will run for a user-configurable amount of time (default is 90 seconds)
  - Registration will then restart after the specified downtime has expired
  - This process will continue until the user stops the mode

Each protocol has unique preferences that can be accessed via the **Select Protocol** drop-down box.



The following is a list of preferences and their meanings categorized by Protocol:

## GSM

- **Transmit Options:**
  - **Transmit Tab** – Preferences to change default transmit power level and to enable external PA for StingRay/KingFish only

## CDMA

- **Transmit Timing Source:**
  - **Synchronize with network** (Recommended Option) – CDMA phones listen and decode the pilot and sync channel to develop a highly-accurate synchronization to system time
    - With this method, Gemini synchronizes the transmitters to the network to ensure that the transmitted PN is aligned with Neighbors in the local network's neighbor list
    - Being aligned to a neighbor PN provides a 6dB advantage for cell re-selection
  - **Use PC system time** – If the user is not able to sync with the network sync channel, they can choose to sync using the time on the laptop running Gemini
  - **Specify date/time** – If the user needs to specify the date/time manually, this option would enable them to do so

## REGISTRATION

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**REGISTRATION**

**4 - 5**

**NOTE**

If the laptop time or user specified time differs from the network, this will change the time on the MS.

**UMTS**

- **Transmit Options:**
  - **Transmit Tab** – Preferences to change default transmit power level and to enable external PA for StingRay/KingFish only

**LTE**

- **Method:**
  - **Catch and Release** - Upon registration, RayFish rejects the registered MS and returns it to the network
    - Upon return, the rejected MS will register with the network, referred to as a *Hard Landing*
    - The rejected MS will not try to return to RayFish as long as registration is active
    - To re-register a rejected MS, the Registration mode must be stopped and started again or if Periodic is selected, the MS will re-register on the next uptime interval automatically
- **Transmit Options:**
  - **Power options** – Transmit Power Level is set from 1 to 5, where 5 is the maximum
  - **Display options** – Defaults to enabled. User can disable prior to transmit by deselecting the associated checkbox
    - Show transmit validation dialog prior to transmit
    - Show warning prompts prior to transmit



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MSDF

MS DF is an active mode used to locate a specific **MS** listed in the subscriber list. Utilizing the same active features of registration, Gemini can keep an **MS** connected to the transceiver, receive constant updates from the **MS**, and enable the user to locate it.

## 5-1 MS DF FUNCTIONALITY

The MS DF mode can be accessed via the **Modes > MS DF** menu or by selecting the **MS DF** button.

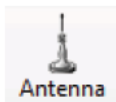


- Prior to starting **MS DF**, the user must select the Subscriber(s) they would like to locate

### NOTE

The user can start MS DF on multiple subscribers, however, Gemini will connect to the first subscriber that it contacts.

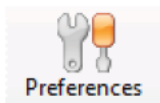
- Once an **MS** is connected, Gemini will receive constant **RSSI/RSCP** (signal strength) updates
- By default, Gemini remains on the main receive path.
- If the user would like to switch to the DF port to use the directional antenna or the AmberJack, the **Antenna** button is selected



- The user can choose to change the default receive path to Automatic, which makes Gemini choose the DF port automatically after the **MS** has been connected (explained in the MS DF preferences section of this guide)

## 5-2 MS DF PREFERENCES

MS DF preferences can be accessed via the preferences button or by selecting **Edit > Preferences**.



All preferences related to registration are on the **MS DF** tab of the preferences dialog (see [General Preferences figure](#) in section 1). The following options are applicable to all protocols:

- **Transmit Options:**
  - Display options showing the **Validation** dialog prior to transmitting and showing warning prompts prior to transmitting
- **Direction Finding Options**
  - Signal Strength bar range
    - **Maximum** – Set the maximum value from the range of -150 dB to 40 dB for the RSCP bar display
    - **Minimum** – Set the minimum value from the range of -150 dB to 40 dB for the RSCP bar display

- **Increment** – Set the increment at which tick marks will be displayed
- **Show Peak** – Select checkbox to show the peak signal strength received
- **Show labels on side** – Select checkbox to enable the signal strength bar to draw its labels next to the power display
- Signal strength bar colors
  - Select the **Bar Color** button and select a different color for the RSCP bar
  - Select the **Peak Color** button and select a different color for the RSCP bar peak
- Auto signal strength bar
  - Select Show additional auto-scaling signal strength bar when no AmberJack is present to
    - a. Center current signal strength within (dB) in the 5dB to 40dB range
    - b. Recenter interval (sec) in the 1 to 30 seconds range
- Compass drawing style
  - Set as a **Clock face** or a **Compass face**
  - The key difference is the labeling around the tick marks that represent either a clock or a compass
- **Audible Signal Strength Options:**
  - Signal strength range for sound levels
    - Select to set the upper and lower bounds for the sound level

Each protocol has unique preferences that can be accessed via the **Select Protocol** drop-down box.

Select Protocol: GSM

The following is a list of preferences and their meanings categorized by Protocol:

## GSM

- **Channel Type:**
  - **SDCCH** – Stand-alone Dedicated Control Channel
    - Provides a slower update rate than TCH
    - This channel type does not function correctly with the SideWinder
  - **TCH** – Traffic Control Channel
    - Provides fast continuous updates from the **MS**
    - This channel type is needed to properly function with the SideWinder
- **Transmit Options:**
  - **Transmit Tab** – Preferences to change default transmit power level and to enable external PA for StingRay/KingFish only
  - **Receive Tab** – Preferences to select default RX path when MS is connected
    - By default, the Main Antenna is selected and the user will have to manually change to the DF Antenna port once the MS is connected
    - This is the recommended option due to the increased sensitivity of the Main Antenna over the DF antenna
    - Automatic option automatically switches the receive path from Main to DF once the **MS** is contacted

- **Audible Signal Strength Options:**
  - Configuration for audible RSSI/RSCP tones:
    - Enable/Disable
    - Frequency Tones
    - Sound Ticks
    - Both – Combines both Freq Tones and Sound Ticks

## **CDMA**

- **Method:**
  - **Zone Registration** – Using this method, Gemini will change the REG Zone causing all mobiles to register with the transceiver, consequently increasing the load on the SDR(s) in densely populated areas and potentially missing subscribers
  - **Paging Only** – Using this method, Gemini will transmit using the network REG Zone and page the **MSID** of the **MS** selected for DF
    - This does not require unrelated subscribers to register with the transceiver and the number of registered mobiles will be nearly zero
    - This allows for greater success, and increased acquisition time in densely populated areas
- **Transmit Timing Source:**
  - **Synchronize with network (Recommended Option)** – CDMA phones listen and decode the pilot and sync channel to develop a highly-accurate synchronization to system time
    - With this method, Gemini synchronizes the transmitters to the network to ensure that the transmitted PN is aligned with Neighbor in the local network's neighbor list
    - Being aligned to a neighbor PN provides a 6dB advantage for cell re-selection

- **Use PC system time** – If the user is not able to sync with the network sync channel, they can choose to sync using the time on the laptop running Gemini
- **Specify date/time** – If the user needs to specify the date/time manually, this option would enable them to do so

## NOTE

If laptop or specified time differs from the network, this will change the time on the MS.

- **Direction Finding Type:**
  - **Periodic** – Using this option provides periodic updates from the MS to Gemini
    - This traffic channel type will not function correctly with the SideWinder
  - **Continuous (TCH)** – Using this option will provide continuous updates from the MS
    - This channel type is required for proper function with the SideWinder
- **Redirection:**
  - CDMA supports the ability to automatically redirect or manually redirect
    - It is recommended to let the system automatically redirect the MS to the most optimal channel with the least interference
    - Gemini is able to determine the most optimal redirect channel using the data collected during channel scan

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**MSDF**

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- **Audible Signal Strength Options:**
  - Configuration for audible RSSI/RSCP tones:
    - Enable/Disable
    - Frequency Tones
    - Sound Ticks
    - Both - Combines both Freq Tones and Sound Ticks
- **Transmit Options:**
  - **Transmit Tab** – Preferences to change default transmit power level and to enable external PA for StingRay/KingFish only
  - **Receive Tab** – Preferences to select default RX path when **MS** is connected
    - By default, the Main Antenna is selected and the user will have to manually change to the DF Antenna port once the **MS** is connected
    - This is the recommended option due to the increased sensitivity of the Main Antenna over the DF antenna
    - Automatic option automatically switches the receive path from Main to DF once the **MS** is contacted



## UMTS

### NOTE

UMTS only uses the page-only method to attract **MS** during MS DF. This is by design and requires that the user has the **IMSI** entered in the subscriber information before starting the mode. Therefore, the user may have to run Registration to gather this information before attempting to DF the **MS**.

- **Redirection:**
  - UMTS supports the ability to automatically redirect or manually redirect
  - It is recommended to let the system automatically redirect the MS to the optimal channel with the least interference
  - Gemini is able to determine the optimal redirect channel using the data collected during channel scan
- **Transmit Options:**
  - **Transmit Tab** – Preferences to change default transmit power level and to enable external PA for StingRay/KingFish only
  - **Receive Tab** – Preferences to select default RX path when MS is connected
  - By default, the Main Antenna is selected and the user will have to manually change to the DF Antenna port once the MS is connected
  - This is the recommended option due to the increased sensitivity of the Main Antenna over the DF antenna
  - Automatic option automatically switches the receive path from Main to DF once the **MS** is contacted

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**MSDF**

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- **Audible Signal Strength Options:**
  - Configuration for audible RSSI/RSCP tones:
    - Enable/Disable
    - Frequency Tones
    - Sound Ticks
    - Both – Combines both Freq Tones and Sound Ticks

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LTE REDIRECT MSDF

LTE MS DF is an active mode used to locate a specific **MS** listed in the subscriber list and located in the area. Using the same active features of registration, Gemini can then keep an **MS** connected to the transceiver, receive constant updates from the **MS** which allows the user to locate it.

## 6-1 MS DF FUNCTIONALITY

The MS DF mode for LTE can be accessed via the **Modes > MS DF** menu or by selecting the **MS DF** button.



- Prior to starting MS DF, the user must select the Subscriber(s) that are to be located

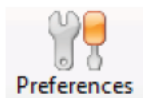
### NOTE

The user can start MS DF on multiple subscribers, however, Gemini will connect to the first subscriber that is contacts.

- Once an **MS** is contacted, it will be handed over to its supported 3G protocol, where it will then provide constant **RSSI/RSCP** (signal strength) updates

## 6-2 MS DF PREFERENCES

MS DF preferences can be accessed via the preferences icon or by selecting **Edit > Preferences**.



All preferences related to MS DF will be on the **MS DF** tab of the **Preferences** dialog (see [General Preferences figure](#) in Chapter 1). Each protocol has unique preferences that can be accessed via the **Select Protocol** drop-down box.



There are no LTE-specific MS DF Preferences.

## 6-3 LTE REDIRECT MS DF

To run LTE MS DF Mode:

- Step 1. From the Gemini RayFish Controller, select the **Subscribers** tab and select one (1) to eight (8) Subscribers.
  - Up to 8 LTE/UMTS/GSM subscribers can be selected
  - Only 1 LTE/CDMA subscriber can be selected

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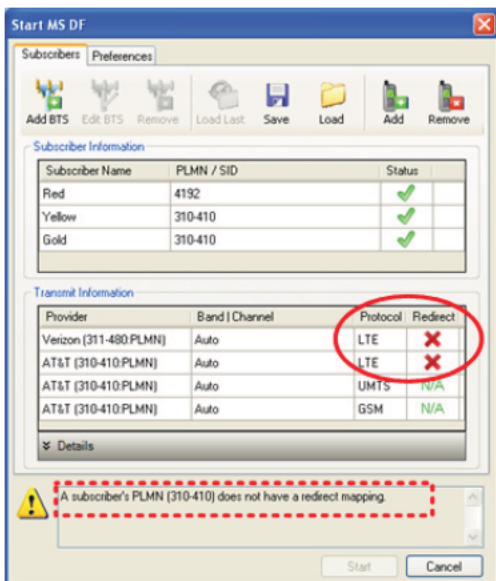
**LTE REDIRECT MSDF**

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**NOTE**

If the subscriber does not have a PLMN or SID associated with it, the user will have to select the provider from the **Provider** tab on the Environment view.

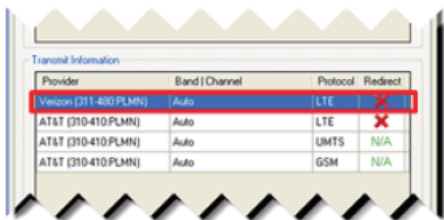
- Step 2. Select the **MS DF** toolbar icon to display the **Start MS DF** dialog.
- The red **X** indicates that the Subscriber's PLMN has not been mapped for redirection



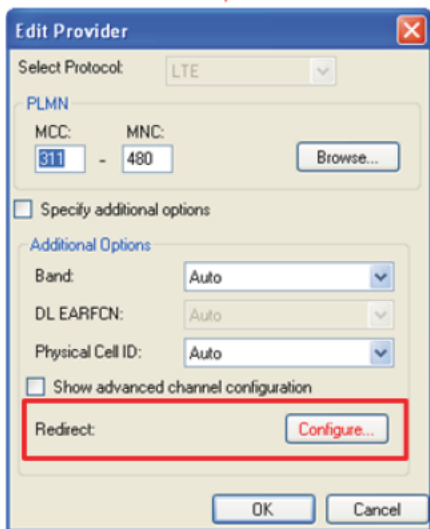
No  
Redirect  
Mapping

Start MS DF (LTE) Dialog with No Redirect Mapping

- Step 3. Select and double-click the row containing the red X to display the **Edit Provider** dialog.



Provider	Band   Channel	Protocol	Redirect
Verizon (311-490.PLMN)	Auto	LTE	X
AT&T (310-410.PLMN)	Auto	LTE	X
AT&T (310-410.PLMN)	Auto	UMTS	N/A
AT&T (310-410.PLMN)	Auto	GSM	N/A



**Edit Provider**

Select Protocol: LTE

PLMN

MCC: 311 - MNC: 490 [Browse...]

Specify additional options

Additional Options

Band: Auto

DL EARFCN: Auto

Physical Cell ID: Auto

Show advanced channel configuration

Redirect: [Configure...]

OK Cancel

### Configure Redirect

- **Configure** button text is red if Redirection has not been specified

## LTE REDIRECT MSDF

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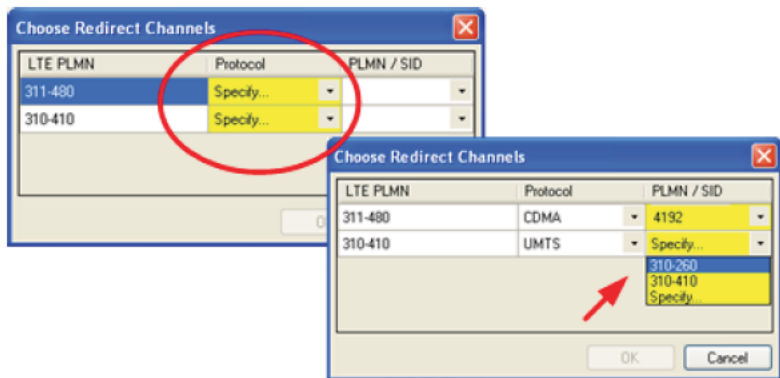
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**LTE REDIRECT MSDF**

**6 - 5**

Step 4. Select the **Configure** button to display options for mapping and choose redirect channels.



Choose Redirect Channels

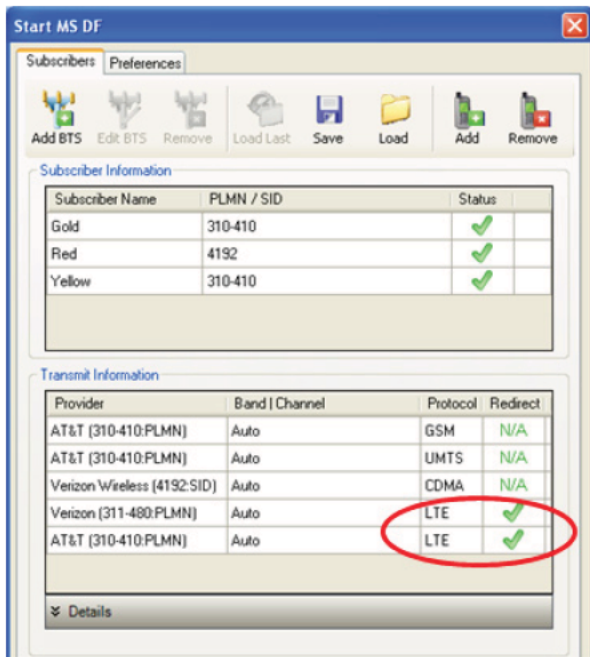
- The *LTE PLMN* listed in the first column requires a redirect PLMN mapping

Step 5. Select the 3G Protocol associated with the LTE PLMN from the **Protocol** drop-down list.

Step 6. Select the 3G PLMN/SID associated with the LTE PLMN from the **PLMN/SID** drop-down list.

Step 7. Select **OK** to save the mapping and redisplay the **Subscribers** tab.





The **green** checkmarks indicate that the redirect mapping is specified.

### Redirect Mapping Completed

Step 8. Select the **Start** button.

- The **Transmit Validation** dialog displays

Step 9. Select the **Continue** button from the **Transmit Validation** dialog.

## LTE REDIRECT MSDF

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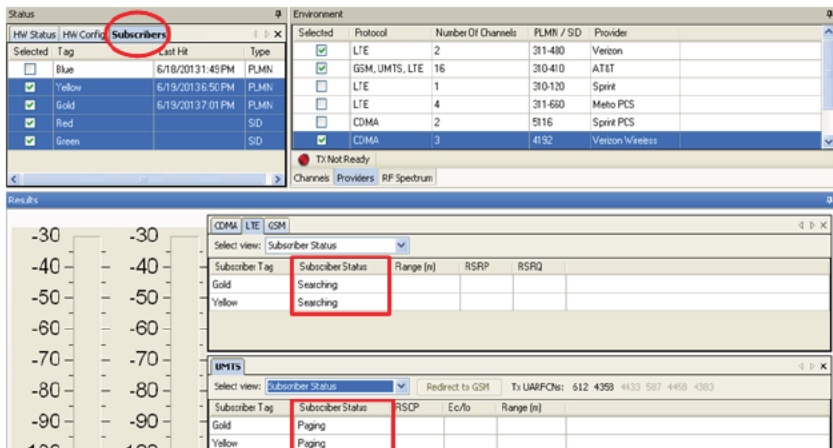
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**LTE REDIRECT MSDF**

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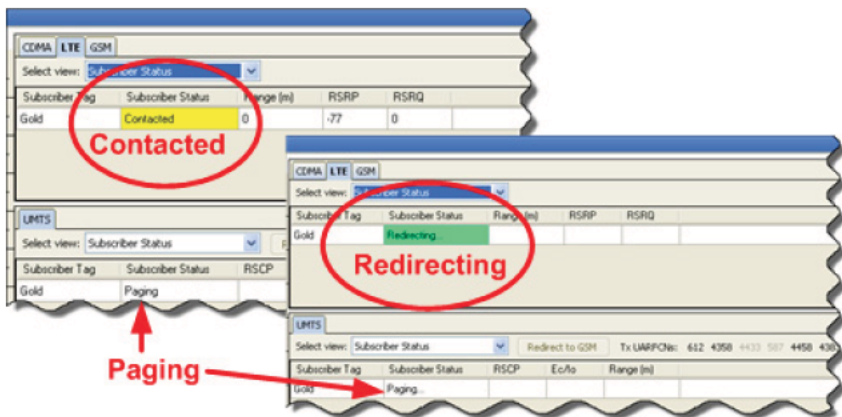
**MSDF Mode Transmitting (LTE)**

The following list describes the Subscriber status messages that are displayed while transmitting.

- **Searching** – Slices are registering LTE devices in the area and searching for one that matches any Subscriber's identification information
- **Paging** – SDRs are searching devices that match any Subscriber's identification information. Depending on the option selected, this may happen via Catch and Release or via Page
- **Contacted** – A Subscriber has been found on LTE. Subscriber Status cell highlighted yellow
- **Redirecting** – The Subscriber is being redirected to its associated 3G protocol. Subscriber Status cell highlighted green
- **Connected** – Channel redirection detected. One of the Subscribers is within range

- **Inactive** – Once a subscriber is connected, all protocols that are not connected to the subscriber go inactive
- **Lost - Repaging** – Subscriber connection has been lost. SDRs are now attempting to reconnect on 3G. Subscriber Status cell highlighted Maroon
- **Lost - Searching** – Subscriber connection has been lost. Slices are now attempting to reconnect on LTE

The following figures illustrate the Subscriber status messages for MS DF redirect.



MS DF Mode Transmitting, Contacted and Redirecting Statuses

## LTE REDIRECT MSDF

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**LTE REDIRECT MSDF**

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The screenshot shows the LTE section of a subscriber status interface. At the top, there are tabs for CDMA, LTE, and GSM. Below them is a 'Select view:' dropdown menu set to 'Subscriber Status'. A table lists subscriber information with columns: Subscriber Tag, Subscriber Status, Range (m), RSRP, and RSRQ. The first row shows 'Gold' with a red arrow pointing to 'Inactive'. Below this is a section for UMTS with a message: 'Channel redirection detected. One of the subscribers is within range.' Below that is another table with columns: Subscriber Tag, Subscriber Status, RSCP, Ec/Io, and Range (m). The first row shows 'Gold' with a red circle around 'Connected'.

Subscriber Tag	Subscriber Status	Range (m)	RSRP	RSRQ
Gold	Inactive			

Subscriber Tag	Subscriber Status	RSCP	Ec/Io	Range (m)
Gold	Connected	-81	-5	0

**MS DF Mode Connected Status - Channel Redirection Detected**

If the connection to the Subscriber is lost due to interference or distance, the searching / paging will restart and indicate a lost status.

The screenshot shows the LTE section of a subscriber status interface. At the top, there are tabs for CDMA, LTE, and GSM. Below them is a 'Select view:' dropdown menu set to 'Subscriber Status'. A table lists subscriber information with columns: Subscriber Tag, Subscriber Status, Range (m), RSRP, and RSRQ. The first row shows 'Gold' with a red arrow pointing to 'Searching'. Below this is a section for UMTS with a 'Redirect to GSM' button and 'Tx UARFCNs: 612 4358 4433 587 445'. Below that is another table with columns: Subscriber Tag, Subscriber Status, RSCP, Ec/Io, and Range (m). The first row shows 'Gold' with a red circle around 'Lost - Repaging'.

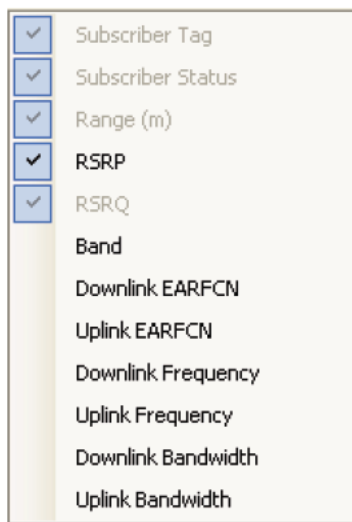
Subscriber Tag	Subscriber Status	Range (m)	RSRP	RSRQ
Gold	Searching			

Subscriber Tag	Subscriber Status	RSCP	Ec/Io	Range (m)
Gold	Lost - Repaging			

**MS DF Mode Transmitting. Lost-Repaging Status**

The *Results View* display allows the user to change what is displayed in the results. The user modifies the view by right-clicking on a column and selecting or deselecting column name.



### Modify LTE MS DF Column Display

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