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ASTi
Radio Diagnostic Tool
User Guide

Document: DOC-01-RDT-UG-1

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Revision A (April 2008)

Product Name: Radio Diagnostic Tool

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1.0. Introduction

The Radio Diagnostic Tool (RDT) is a network analysis tool for DIS radio traffic. The tool presents the user with a variety of 'views' that provide the ability to list and examine radios that have been detected on the connected network. A significant feature of the tool is the capability to define up to eight 'expected radio' lists that the tool will use to compare against, and identify those radios that are present, missing and unknown. This capability is unique in the industry and is targeted particularly at voice communication co-ordination staff tasked with managing large-scale networked exercises, where the capability to know who is and isn't 'up' on a network is of great benefit. Other features of the tool apply to anyone who has an interest in either looking at or validating DIS radio traffic and the detail underlying the radio data.

Recent enhancements to the tool include the ability to define user entered plain text 'names' as substitute labels for DIS ID numbers and IP addresses to aid in rapid assimilation of who is and isn't present on a network, and extended capabilities such as the ability to monitor Link-16 data terminals.

RDT also integrates seamlessly with the ASTi PC'ver simulated radio PC product to allow an operator to interact with the radio environment. PC'ver itself is a fully featured DIS radio simulation providing either 2 or 4 (depending on purchased version) independently configurable radios, plus 2 or 4 network intercom channels. Full details of PC'ver can be found on the PC'ver web site - http://www.astipcver.com. When run in conjunction with RDT, one radio and one intercom of PC'ver become available for control by RDT. This powerful combination not only allows an operator to view the network radios via RDT, but also to very easily tune the PC radio or intercom to match any of the detected network radios and transmit and receive on the selected frequency or channel. PC'ver automatically matches the correct extended radio parameters without operator interaction, this greatly simplifies the operator’s workload when interacting with radios using features such as crypto and frequency hopping.

2.0. Installation

Download RDT from the installation software CD. The user must follow the installation prompts to download the software.

2.1. Product Licensing

RDT requires a computer-specific license file that references the PC's ethernet hardware MAC address of the computer it is running on. A separate license file is issued in addition to the product installation CD. Place the license file (.pvl) in the following directory:

```
c:\Documents and Settings \All Users\Documents\ASTi License
   Files directory
```

Note: If you did not provide ASTi with your PC's MAC address at the time of purchase, contact ASTi at support@asti-usa.com to receive your license file.

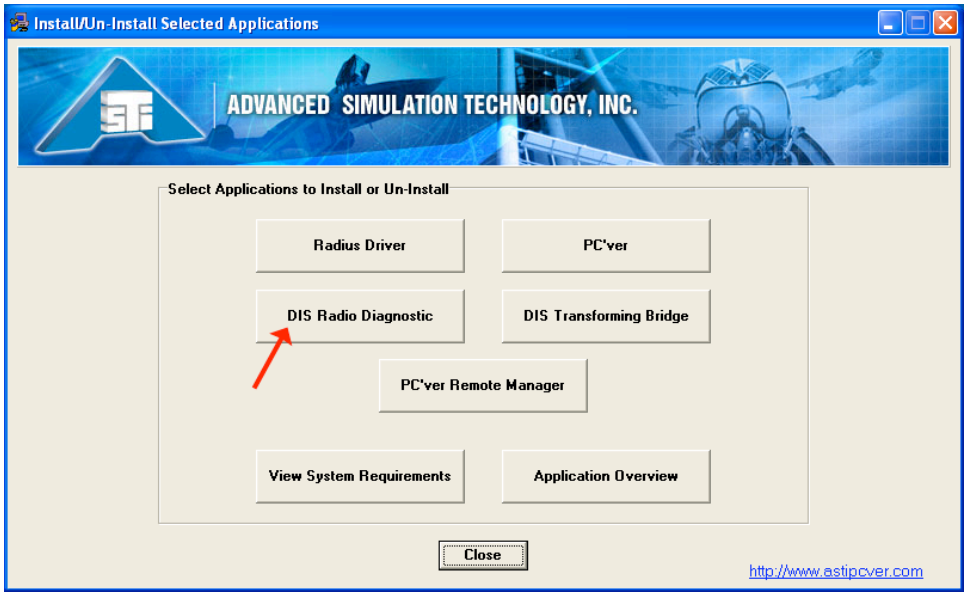

Figure 1: Start Menu

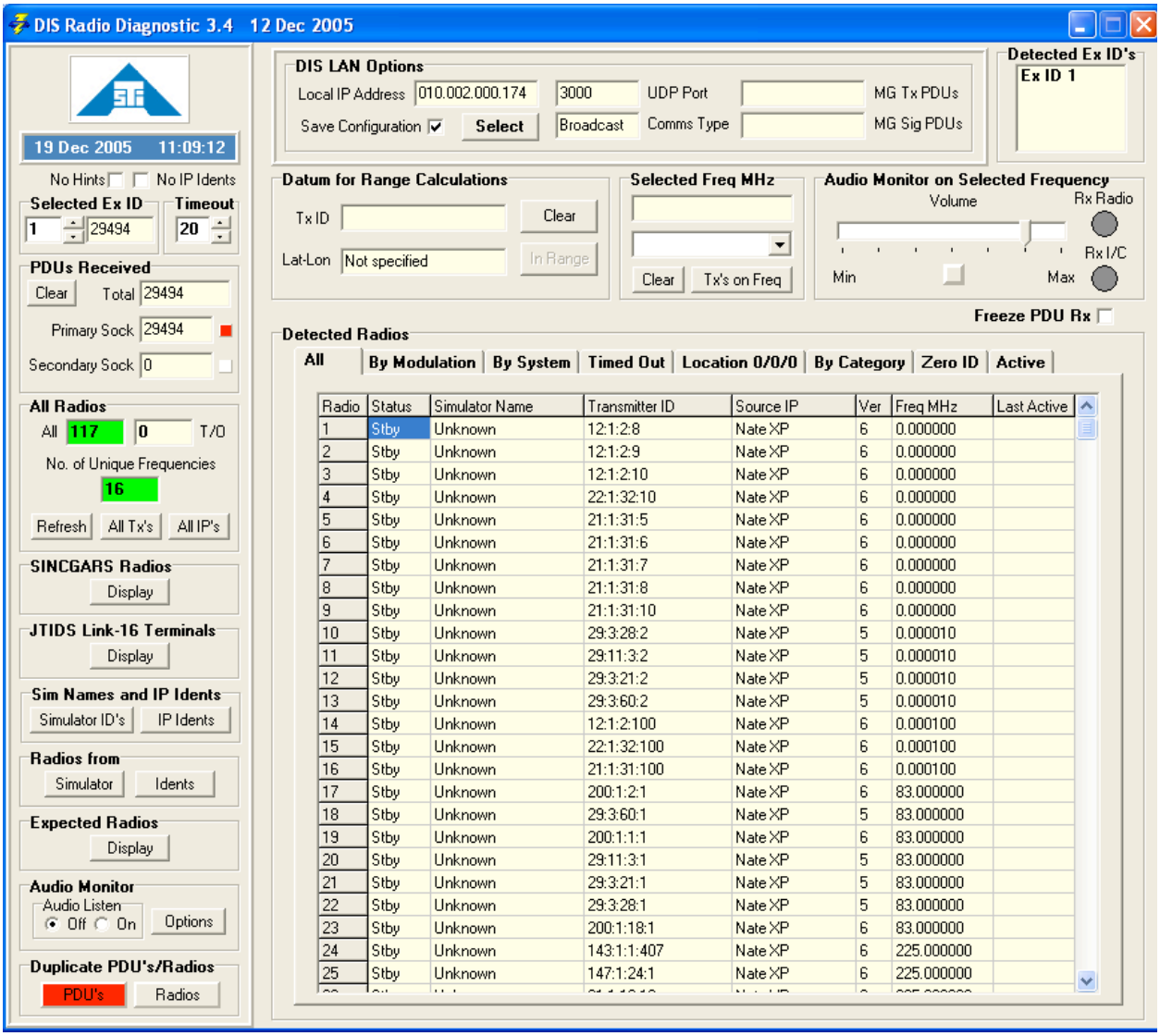

Figure 2: RDT Main Screen

2.1. System Requirements

- Microsoft Windows XP (Home or Pro)
- 1.8GHz MHz Intel compatible PC (P4 recommended, see note 1 regarding use with Celeron)
- 256 MB of RAM (or more, more is always better)
- Available hard drive space of 50 MB
- Standard network interface card (NIC/Ethernet)
- Video resolution of at least 1152 x 864 (*see note below*)
- Mouse
- Keyboard
- CD-ROM drive for software installation

Note: For best results, it is recommended to use video settings of 1280 x 1024. The Radio Diagnostic Tool uses a dynamically updated display of the current radio environment, and as such places a high loading on the video display system of the computer. Therefore our recommendation is to use a video expansion card (PCI or AGP depending on your machine configuration). This will ensure optimum system performance, particularly when exploiting the linked operation abilities of RDT and PC'ver. This recommendation becomes a system requirement if using a computer equipped with a Celeron processor.

3.0. RDT Features

3.1. Detected Radios List

The central workstation of the tool revolves around the ‘Detected Radios’ list. This is the central list display that on initial start-up will display all radios detected on the currently selected DIS exercise. This list by default will accommodate 2000 entries, but will dynamically resize in 200 block increments to accommodate exercises with greater numbers of radios. The way this list is populated is such that, from start-up, each and every independent radio transmitter is added to the list, and the associated list entry is updated each time a data PDU from the source radio object is received. The current state of the radio is therefore reflected on the list in real-time. If a radio does not issue a data PDU within the user defined time-out period then it will be tagged as 'timed out', but is not removed from the list. This feature allows the user to identify that a radio was present but for whatever reason has 'dropped' from the network. The user may at any time reset the list by clicking the 'refresh' button. This rebuilds the list basis from new and allows an updated status of the network to be viewed.

The ‘Detected Radios’ list has a number of filtered views that may be selected to allow the user to more closely focus on radios of a particular type or operational mode. These are described below, and are all based on the current DIS 1278.A Standard, and associated field enumerations.

Detected Radios list features:

- **ALL** - view all transmitters in the currently detected exercise since RDT start-up or last “refresh.”

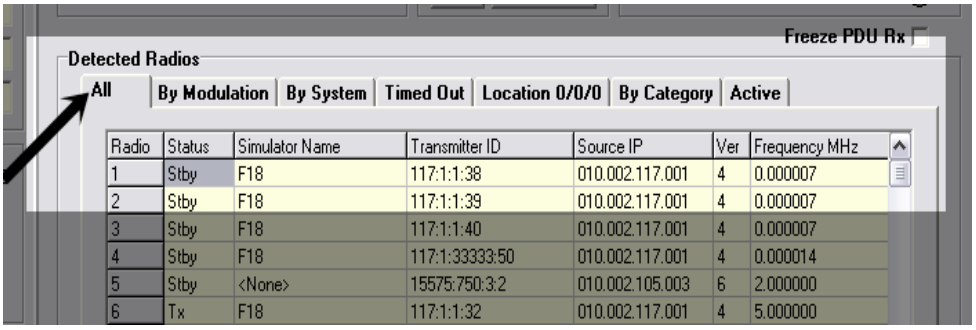

Figure 3: View All Radios

- **Modulation** - filter view based on selected major and optionally minor modulation type, i.e. Amplitude (AM), Angle (FM), etc.

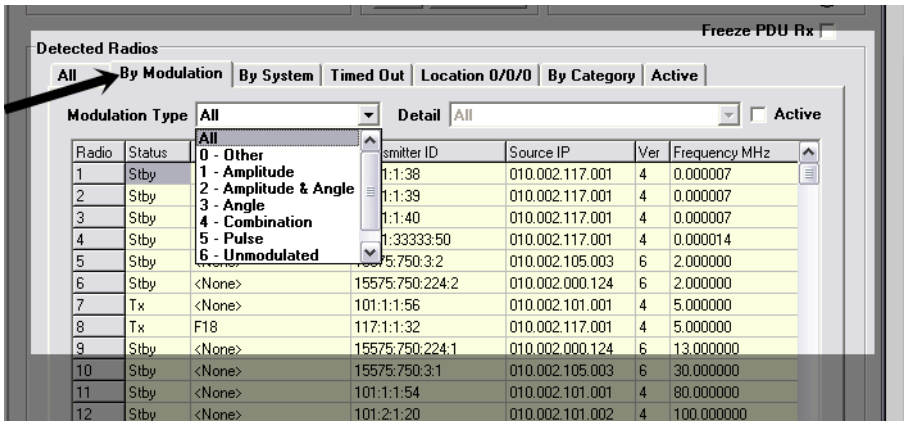

Figure 4: View By Modulation

- **System** - filter view based on selected transmitter system type, i.e. Generic, HQ, SINCGARS, etc.

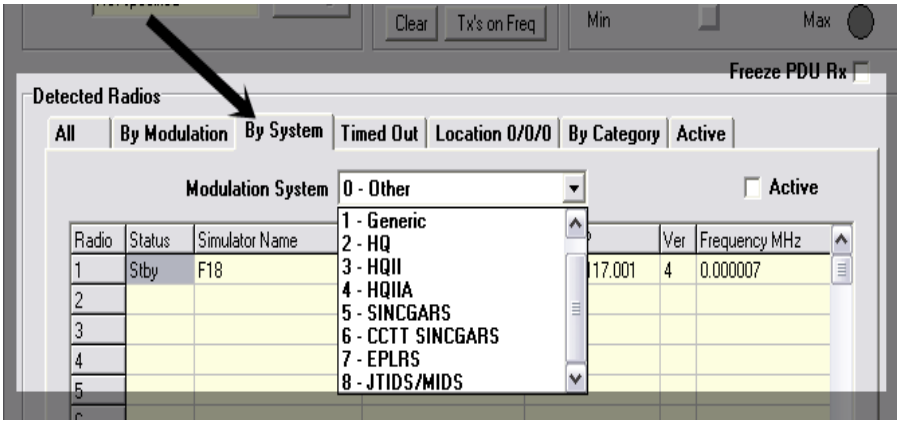

Figure 5: View By System

- **Timed Out** - filter view displaying only transmitters that are timed out. This view will list any transmitter that was logged as being active but for whatever reason is no longer issuing updates.

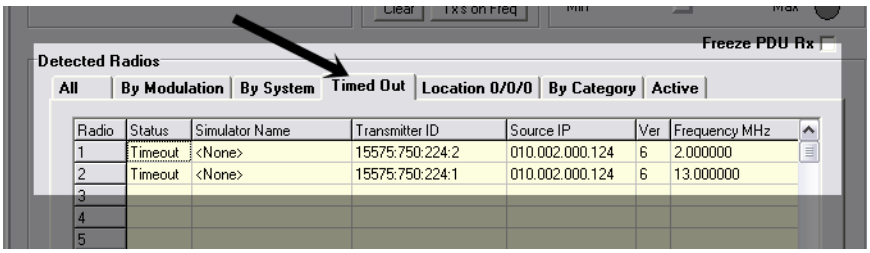

Figure 6: View By Timed Out

- **Location 0/0/0** - filter view displaying only transmitters that are defined to have a position of World Center (or 0,0,0 in geocentric DIS co-ordinates).

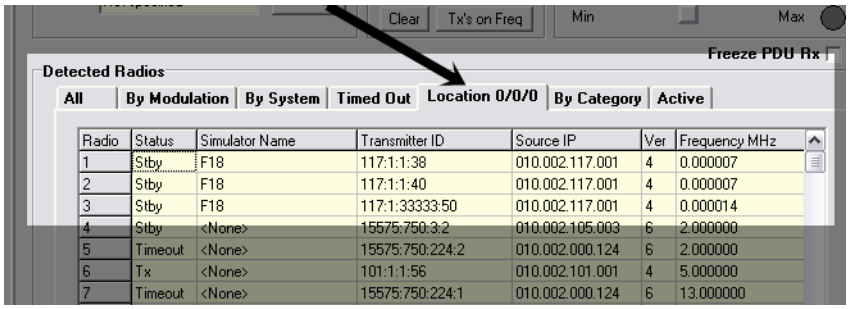

Figure 7: View By Location 0/0/0

- **By category** - filter view based on selected transmitter category, i.e. other, voice tx/rx, VOR/ILS, etc. This is a somewhat rarely implemented feature within the DIS radio simulation world.

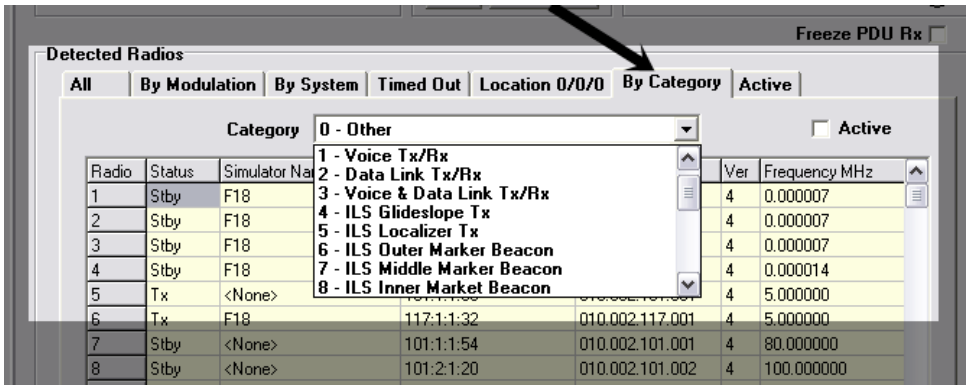

Figure 8: View By Category

- **Zero ID** - filter view displays all transmitters with a zero in the ID values. The purpose of this filter is to detect invalid values.

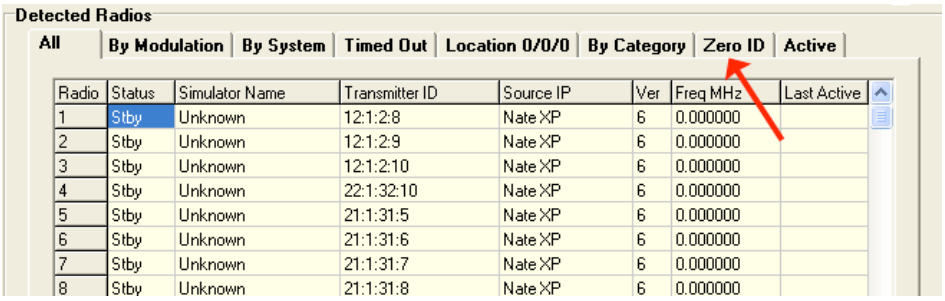

Figure 9: View Zero ID

- **Active** - filter view displaying only transmitters that have been logged as being in active transmit since RDT was started or since last “refresh”.

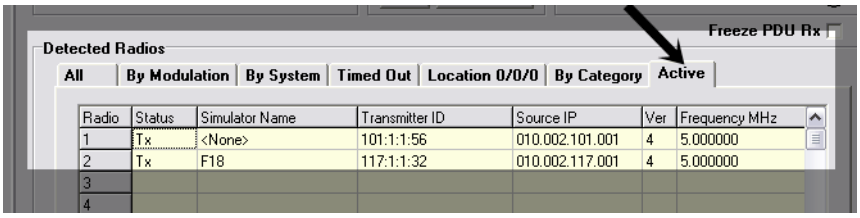

Figure 10: View By Active

Double clicking any entry in the list will bring up a Radio Detail Inspector window that will show the full data entry for the selected radio. Multiple Radio Detail Inspectors may be displayed to allow comparison of radios.

A single-click will select an entry in the list, and following this with a right click will allow the user to:

- **Set as datum** - (extended feature, contact ASTi for operational details).
- **Select Frequency to Monitor** - enables monitoring of the audio on the selected frequency.
- **Tune PC'ver to match** - (only available if PC'ver is running) Tunes the local PC'ver radio #1 (or intercom #1 if the channel number is below 100,000) to match the currently selected radio entry.
- **Export as Comma Separated Variables** - (extended feature, contact ASTi for operational details).

3.2. Left Column Features

The left column area of the tool provides access to some of the extended features of the tool, and allows access to define user entered 'plain text' names as substitutions for numeric identifiers. The most significant of these features include the “Expected Radios”, “Radios From”, and “Duplicate Radios”.

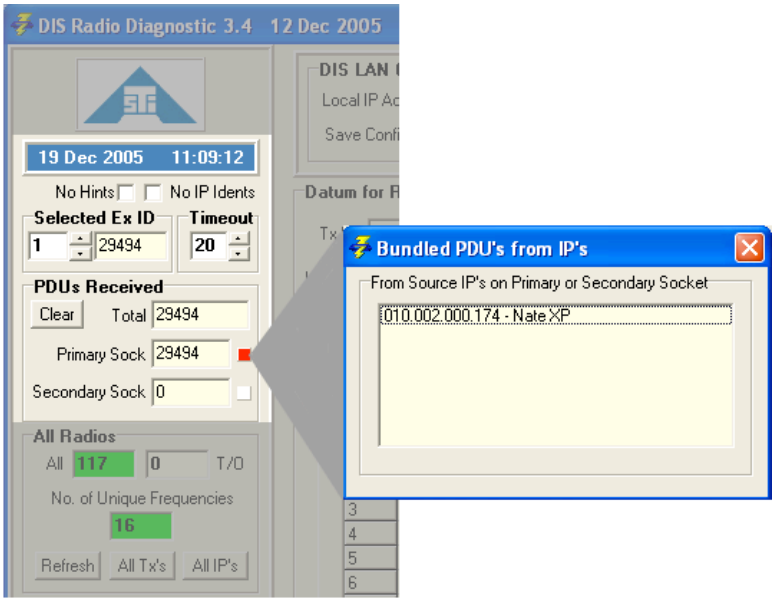

Figure 11: Top Left Column

The Left Column from top to bottom includes:

- **No IP Idents** - This suppresses use of the name substitution for IP addresses in the ‘Detected Radios’ list display (and other views) to allow rapid viewing of source IP addresses if required. See “IP Idents” to set-up name substitution.
- **Selected Ex ID** - Displays the currently selected DIS exercise number that the tool is currently displaying data for, and allows manual selection. Exercise selection is also possible from the “Detected Ex Ids” display in the top right section of the tool - see “Top Section” for details.
- **Time Out** - Current time value (in seconds) used by the tool as the maximum period that may elapse between radio data PDU updates before the tool logs a radio as being “timed out”. Note that a subsequent update will restore an entry from the “timed out” state to active (either “standby” or “active tx”). The user may modify the setting as required (typical values may be 10 to 20 seconds).
- **PDU’s Received** - Displays the total PDU’s received and filters between primary and secondary socket. Secondary socket PDU’s are only displayed when the user sets the IP address settings to use multicast multiple groups. The small box to the right of the primary and secondary sock values represents bundled PDU’s. This box will turn red when bundled PDU’s are detected. The user can click this box to view the bundled PDU’s.

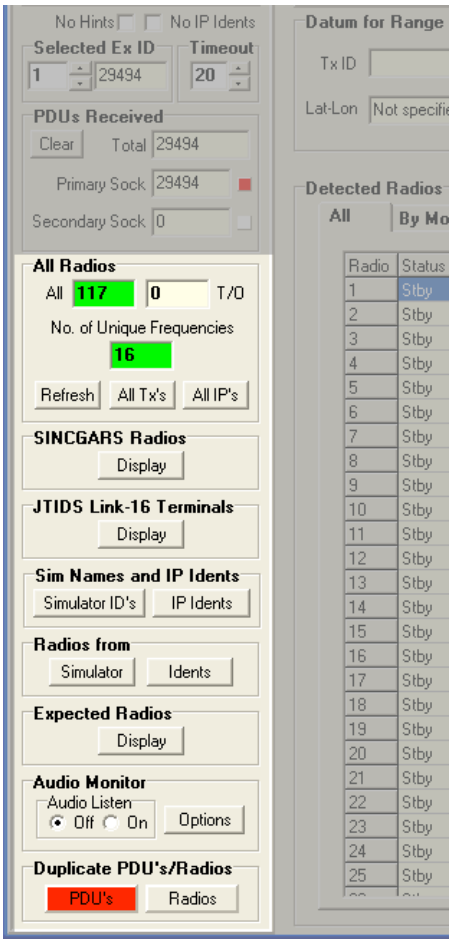

Figure 12: Bottom Left Column

- **All Radios** - select “Refresh” to reset the base radio list. This action restarts data logging and rebuilds the All Radios list (and hence removes any “Timed Out” entries).
- **SINCGARS Radios** - displays a filter window listing only radios of system type 5 or 6 (“sincgars” or “SINCGARS”).
- **JTIDS Link 16 Terminals** - displays a filter view window of all radios reported as system type Link 16. This is an evolving feature of DIS, and may be the subject of future enhancement.

- **Sim Names and IP Idents** - displays a list view of the currently active Simulator Name substitutions for DIS site and host ID numbers, or a list view of the currently active IP Identifier substitutions for IP address numbers. Each list view includes the ability for the user to manually enter a number/name entry, save the current list (to a named file, multiple files can be used to store different lists), and load a list. Also available is the ability to fill the numeric data from the current “Detected Radios” list view. The user can therefore rapidly populate the list and decide which entries to allocate name substitutions. This feature is intended to alleviate the need for the operator to remember many numeric identifiers since names are more rapidly assimilated and understood. The entered name substitutions are reflected through all list displays of RDT once active.
- **Radios From Simulator** - displays a view window that shows only radios from a selected simulator (which is analogous to a DIS site and host ID). This option displays up to eight views that may be defined. Further filtering options are available from this view. Each view is named according to the simulator name. The simulator name is defined by the user from the ‘Sim Names and IP Idents’ window).
- **Idents** - displays a view window that shows whether the named IP Idents (analogous to IP addresses) are active. This provides a simple mechanism for an operator to validate that all simulations expected on the network are present.
- **Expected Radios** - Displays a view window that shows a comparative status of the expected radios that the user has identified versus what is logged in the ‘Detected Radios’ list. A prerequisite of this is the existence of a reference list to perform this comparison. This view also allows the user to build the expected radio list. This may be done manually by entering the required data, or the user may click the “Fill From Current” button that will populate the list using the ‘Detected Radios’ list view. Note that data used to fill the list will reflect the currently chosen filter view (if any) of the ‘Detected Radios’ list, such that it is simple to populate the list with only radios with modulation AM for example. The current status of the radios in the list will be reported as “present”, “timed out”, or “not detected”. Also available from this view is a list of “unknown radios” that are not listed in the current “expected radios” list. Radios may be added to the expected list by selection from the “unknown” listing. The ‘Expected Radios’ view window includes the ability to create and save up to eight(8) individual list views and save these to a file, and the ability to load a set of pages. This facility allows a series of expected views to be created by the user for re-use and ease of exercise management.

- **Audio Monitor** - RDT has a stand-alone audio monitor capability. This allows the user to monitor the audio on a particular frequency, selected using the “Selected Frequency” pull-down menu. The audio volume can be adjusted in the “Audio Monitor on Selected Frequency” for more details see “3.3. Top Section.” Audio for the selected frequency is reproduced using the PC's internal soundcard. The Audio Monitor is a less sophisticated option compared to the previously identified PC'ver link capability.

Figure 13: Audio Options

- **Duplicate PDU’s/Radios** - On a DIS network the DIS ID for any unique simulation object must be unique and any pair of radios that have a common DIS ID will not function correctly. The “Radios” button will illuminate red when RDT detects that more than one radio is using a DIS ID. Selection of the button will bring up a view window listing the duplicate radio’s details to allow further diagnosis and resolution. The “PDU’s” button will illuminate red when RDT detects more than one PDU with the same information. Select the button to bring up a view window listing the duplicate PDU’s details to allow further diagnosis and resolution.

Figure 14: Duplicated PDU’s and Radios

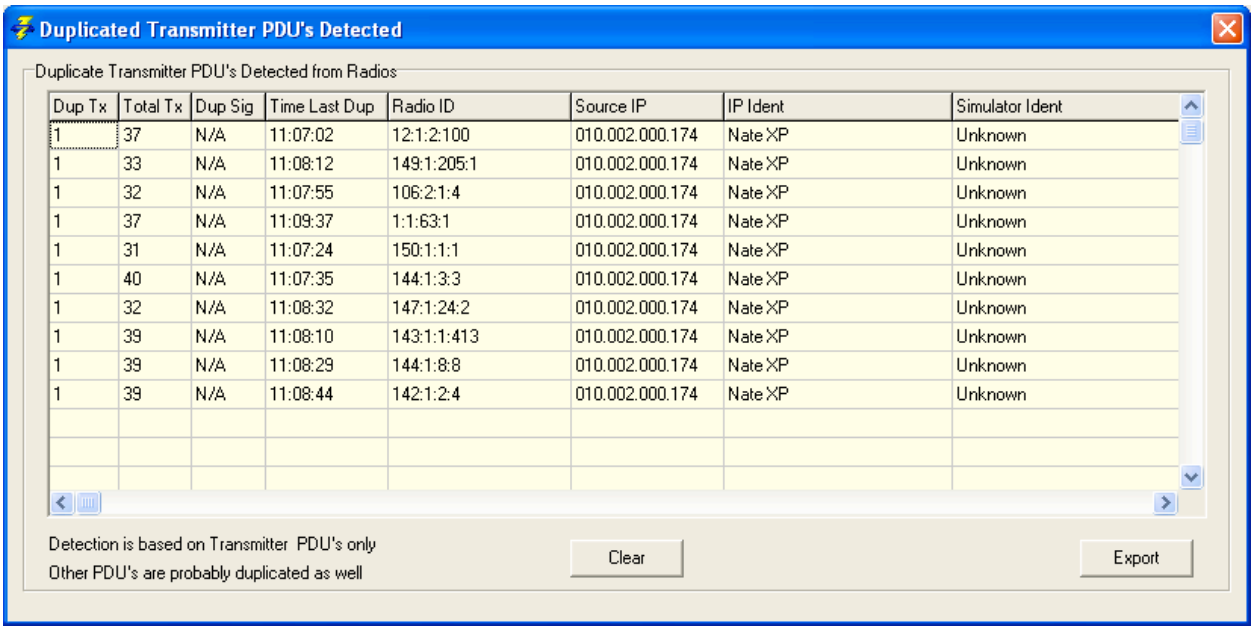

Figure 15: Duplicated Transmitter PDU's

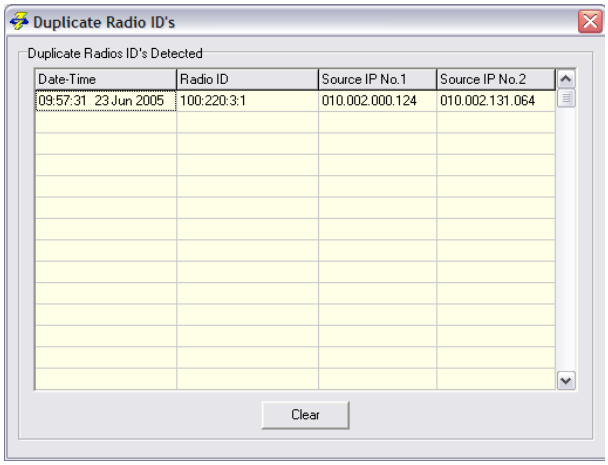

Figure 16: Duplicated Radio IDs

3.3. Top Section

The top section of the tool provides access to basic set-up parameters and some utility features.

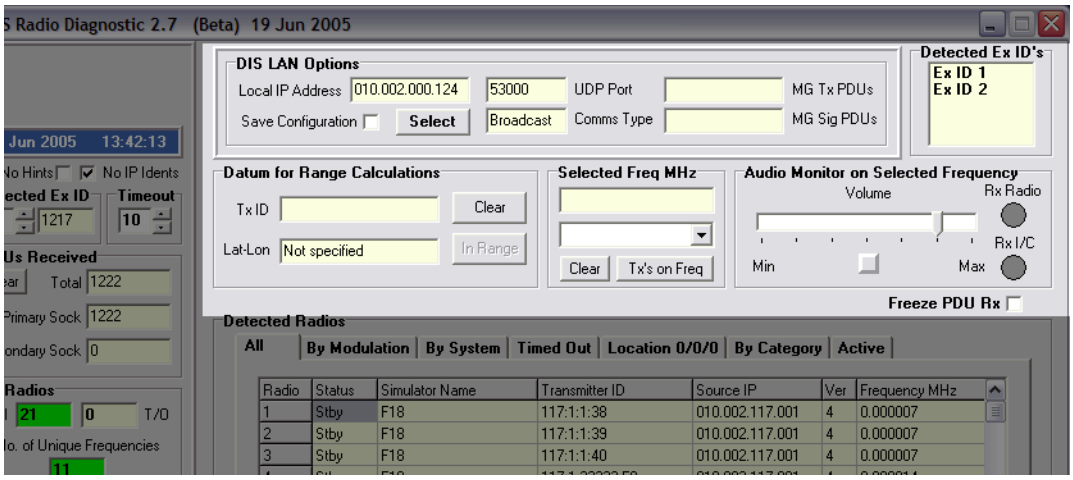

Figure 17: Top Section

The top section includes:

- **DIS Lan Options** - The basic network configuration settings for the tool are set and configured here. This includes the local IP address, subnet mask setting, and the UDP port used to listen for DIS network traffic. Click “Select” to modify any of these settings. Click the “Save Configuration” box to store the values entered.
- **Detected EX IDs** - This tool constantly monitors all received DIS radio data PDU’s and lists the active DIS exercise IDs in use on the network. Double-click on any displayed exercise ID to set RDT to monitor the chosen exercise ID.
- **Selected Freq MHz** - This is a basic monitoring capability that allows the user to select a frequency to monitor the audio, using the internal soundcard of the PC.
- **Audio Monitor** - This allows the user to adjust the volume control for the monitor feature. The audio monitor box is green when active. The “Rx Radio” is red when actively receiving from the network. The “Rx I/C” is yellow when receiving from an intercom channel.

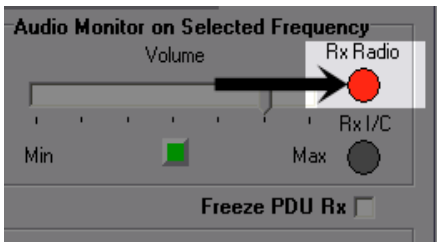

Figure 18: Receiving Radio

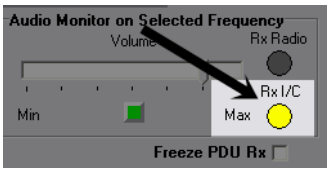

Figure 19: Receiving Intercom Channel

- **Freeze PDU Rx** - When the box is checked all PDU traffic is halted to RDT, while preserving the state and details of all radios in the 'Detected Radios' list. This allows detailed analysis of a particular situation when constant network updates may confuse the situation. Normal operation is resumed by unchecking the box.

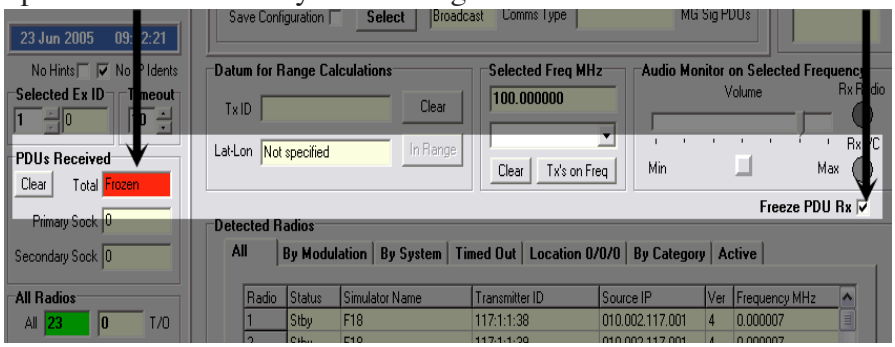

Figure 20: Freeze PDU

