



USER GUIDE

INDUSTRIAL DATA COMMUNICATIONS

LincView

Diagnostics Software Version 2.14

Multipoint Spread Spectrum Radio Diagnostics
Software for SRM Product Family



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1.0 Introduction

The multipoint diagnostics program allows monitoring of the performance of Data-Linc Group 900 MHz or 2.4 GHz radio modems used a point-to-multipoint network. The diagnostic program provides powerful features that enable the user to quickly and conveniently identify network problems as well as potential problems. The program also allows remote control of the programmable parameters of all of the radios in a network. The diagnostics program will not function in point-to-point networks.

When using the SRM6000/6100 the diagnostic program may be run directly from an available RS-232 communications port of a computer connected directly to the master radio's diagnostics port (optional), or from a remote computer using the TCPIP connect feature. The diagnostics program will not interfere with the operation of an applications program running on the network

When using the SRM6210E/6310E the diagnostics program connects to the master modem in the same way the serial modem does or through the Ethernet connection on the modem.

Note: When the modems are configured for use with the diagnostics program, some applications and/or equipment attached to the modems may not run or run correctly. Contact Data-Linc Group for further information.

1.1 Radio Compatibility

The diagnostics program requires each radio in the network to have firmware version 5.77 or higher (900 MHz) or 1.81 or higher (2.4 GHz) for display of diagnostic data and remote programming. Radios that do not have the required firmware version installed are network-compatible and will communicate with radios that do have the diagnostic firmware installed. The master modem in a network using this diagnostics program must have a firmware number of 2.xx for 900 MHz or 3.xx for 2.4 GHz. The serial modems must have a diagnostics port while the Ethernet modems can use the diagnostics port or they can use the Ethernet port. The diagnostics port is only required on the master modem and is not provide on every modem.

If any of the radios in your network do not have the required firmware or the network master does not have a diagnostics port, contact Data-Linc Group for further assistance.

1.2 The Serial Diagnostics Cable

The diagnostics program requires a Serial Cable to connect the master radio to diagnostics computer.

Contact Data-Linc Group for the price and availability of the Serial Diagnostics Cable.

1.3 The Diagnostics Computer

The diagnostics computer may be any computer with Windows '95, Windows NT 4.0 or later versions of Windows installed. When using the serial modem and using the comm port to connect, the diagnostics computer must also have an available RS-232 communications port.

The application program and the diagnostics program may be run on the same computer. A menu in the diagnostics program allows any RS-232 communications port 1 through 8 on a computer to be selected for the diagnostics interface.

If the TCPIP connect feature is selected, the master radio must be connected to the Intranet/Internet through a terminal server, router or other TCPIP-addressable device. The diagnostics program will not create an Intranet/Internet connection. The diagnostics computer must be connected to the Intranet/Internet before activating the TCPIP connect feature

2.0 Starting The Diagnostics Program

To run the diagnostic program, all of the radios in the network must have the required version of firmware installed. The radios must be programmed for multipoint operation. The master radio must be connected to the diagnostic computer or a TCPIP-addressable device with a Serial Diagnostics Cable. When using the Ethernet modems, the modems must be connected to the same Ethernet network as the diagnostic computer and have IP addresses that are compatible. The diagnostics program LINCVIEW214.EXE must be installed and running on the diagnostic computer. The remote diagnostics function must be enabled on the master radio by setting it to any setting from 1 to 63 for a serial connection and set to 129 for an Ethernet connection. Refer to the Data-Linc Group Wireless Modem User's Guide for more information on programming the radios.

2.1 Enabling Diagnostics In The Master Radio

Enable the diagnostics function on the Master radio by opening Main Menu item (5) Edit MultiPoint Parameters and selecting Menu Item (B) Diagnostics as shown in Figure 2.1. The setting range of this parameter is 1 to 63 for a serial connection and set to 129 for an Ethernet connection. A setting of 1 will cause the diagnostics data to be updated more quickly, but the execution of the applications program running on the network may be noticeably slowed. A setting of 63 will slow the update rate of the diagnostics data, but the applications program will operate with little or no effect. It is not necessary to enable diagnostics on any other radios in the network.

If using an UDP connection (Ethernet modem only), see section **2.6.0.1** of this manual for other configuration requirements.

Refer to the Data-Linc Group Radio Modem Users Manual for more information on general programming Data-Linc Group radio modems.

Figure 2.1

```
MULTIPOINT PARAMETERS

(0) Number Repeaters      0
(1) Master Packet Repeat  3
(2) Max Slave Retry      3
(3) Retry Odds           3
(4) DTR Connect          0
(5) Repeater Frequency   0
(6) NetWork ID           0200
(7) Reserved
(8) MultiMasterSync      0
(9) 1 PPS Enable/Delay  255
(A) Slave/Repeater       0
(B) Diagnostics          1
(C) SubNet ID            Disabled
(D) Radio ID             0000
(Esc) Exit to Main Menu

Enter Choice  _
```

2.2 Connecting The Serial Diagnostics Cable

When using the serial modems, the Serial Diagnostics Cable must be connected to the Master radio's diagnostic port.

2.3 Installing The Diagnostics Program On The Diagnostics Computer

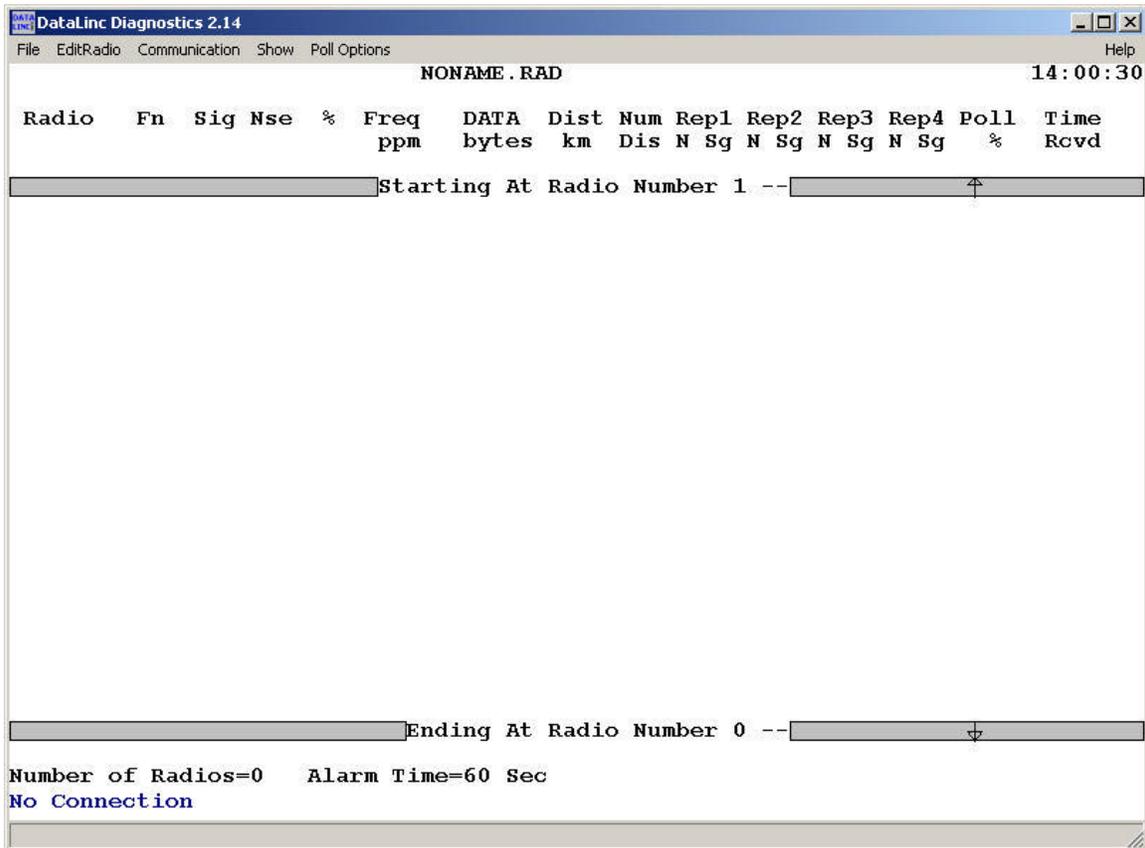
Create a new folder on the internal hard drive of the diagnostics computer. Label the folder with a name such as "DATA-LINC GROUP DIAGNOSTICS" so that it can be easily located. Certain functions performed by the diagnostics program will automatically store to and retrieve files from this folder.

Locate the diagnostics program on the 3.5" diskette supplied and copy or move the program to the new folder created above. For added convenience, create a shortcut to the diagnostics program and paste it on the desktop.

Refer to Windows documentation or help screens for instructions on creating folders, moving files and creating shortcuts.

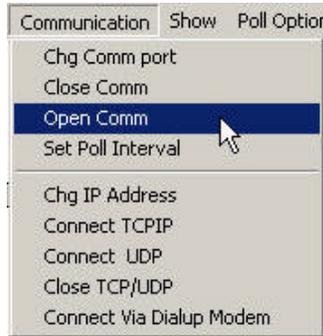
2.4 Running The Diagnostics Program Through A Comm Port

Locate the program file LincView214.exe on the diagnostics computer. Open or run the file to begin execution of the program. Diagnostics Screen 0 will be displayed as shown below, but no diagnostics data will be displayed and the message "No Connection" will be displayed at the bottom of the screen.

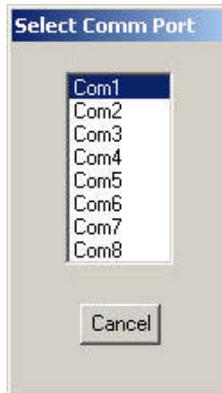


2.4.1 Selecting The Communications Port

Click on Communication to open the Communications Menu. The default port for the diagnostics program is Comm Port 1. If this is the port on the diagnostics computer that is connected to the Diagnostic port of the radio, click **Open Comm**.



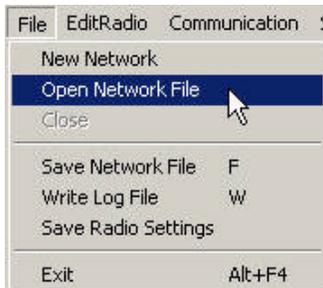
To select a communications port other than Comm 1, click on **Chg Comm port** to display the Select Comm Port menu. Select the Comm Port, 1 to 8, to be used for the diagnostics program. Click **Open Comm**.



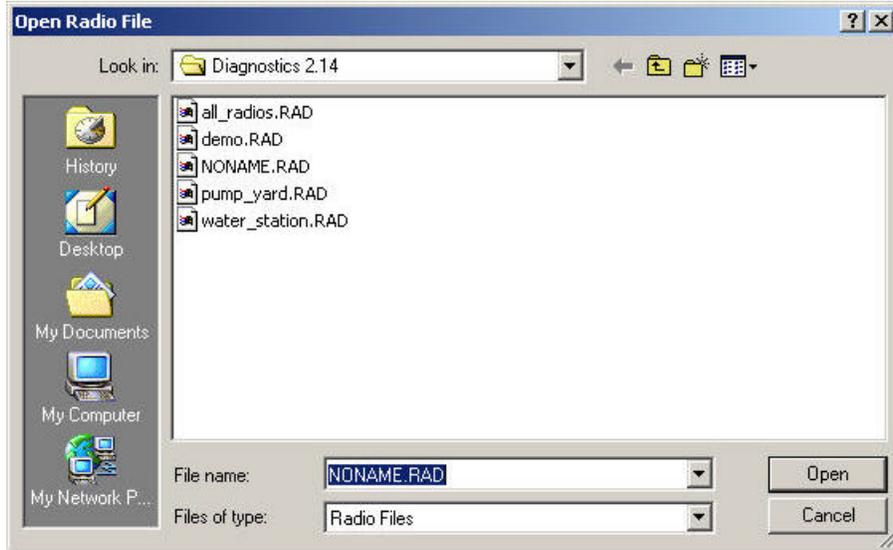
When the Comm. port is opened, the diagnostics program displays the call number of the Master Radio on the top line of Screen 0 above the scroll bar. The program begins searching for other radios in the network using a random poll of call numbers. Any radio that responds to the poll will have its call number added to the list in Screen 0. If the applications program is running and data is transmitted through any radio in the network, the call number of that radio will be automatically added to the list.

2.4.2 Recalling A Stored Network Configuration

To open a previously stored network configuration, click on File to display the File menu.



Select **Open Network File** to display a listing of network configuration files. If the file name is typed in the dialog box, it is not necessary to enter the .rad extension. Click on **OPEN** to open the configuration file. The diagnostic program will begin polling the radio call numbers saved in the file using the polling method that was active when the configuration was saved. The Comm port must be opened as described above for polling to begin. See section 4.1.19 for info on saving a network file.

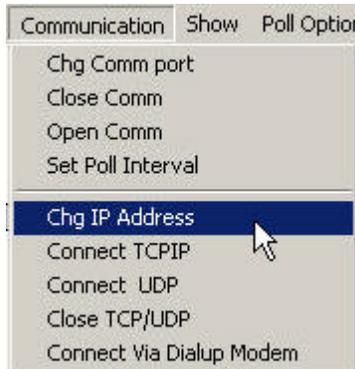


2.5 Running The Diagnostics Program Through An IP Connection (SRM6000/6100 only)

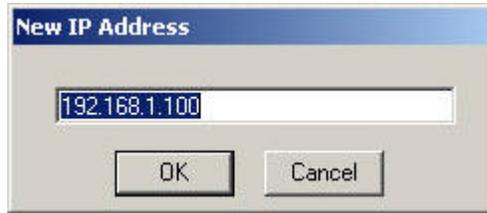
The diagnostics program may be operated from a remote computer using the TCP/IP connect feature. If the TCP/IP connect feature is selected, the master radio must be connected to the Intranet/Internet through a terminal server, router or other TCP/IP-addressable device. The diagnostics program will not create an Intranet/Internet connection. The diagnostics computer must be connected to the Intranet/Internet before activating the TCP/IP connect feature. Locate the program file LincView214.exe on the diagnostics computer. Open or run the file to begin execution of the program. Diagnostics Screen 0 will be displayed but no diagnostics data will be displayed.

2.5.1 Entering A New IP Address and Port Address

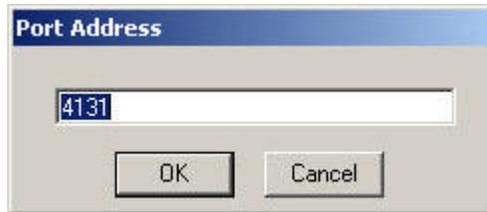
Click on Communication to open the Communications Menu.



Select **Chg IP Address** to display the New IP Address dialog box. Enter the new TCP/IP address and click on OK.



After the New IP Address has been entered, the Port Address dialog box is displayed. Enter the port address and click OK.



2.5.2 Establishing The IP Connection

Click on Communication to open the communications menu. Click on **Connect TCPIP** to establish the IP connection. The message "No Connection" is displayed in the lower left corner of the screen until the IP connection is established. The diagnostics program will try for about one minute to establish the connection. During this attempt time, no other menu functions of the diagnostics program will function. If the IP connection was not established within this period, the diagnostics program will time out and return control of other menu functions. The "No Connection" message will remain on the display.



When the connection is established, the IP address is displayed in the lower left corner of the screen.

2.5.3 Recalling A Stored IP Connection

Follow the instructions in Paragraph 2.4.2 to recall a previously stored IP network connection. The network configuration file will contain the IP and Port addresses, so it is not necessary to reenter these addresses. Select the network to be opened and establish the IP connection as shown in Paragraph 2.5.2.

2.6 Running the Diagnostics Program Through An Ethernet Connection (SRM6210E/6310E only)

The diagnostics program may be operated from a local or remote computer using an Ethernet connection via the UDP Connect option. Locate the program file LincView214.exe on the diagnostics computer. Open or run the file to begin execution of the program. Diagnostics Screen 0 will be displayed but no diagnostics data will be displayed.

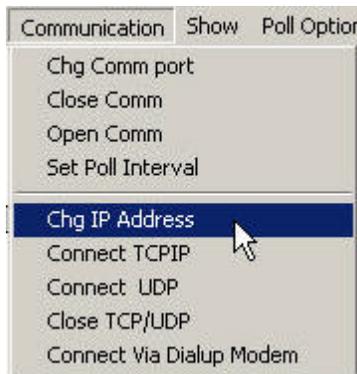
Note: When using Diagnostics with the SRM6210E/6310E modems, the modems must be configured with an IP address and compression must be turned on. Please refer to the “SRM6210E/6310E User’s Guide” for further information on setting the IP address (*Radio Setup Menu*) and turning on compression (*Switch Settings*).

2.6.0 Configuring an IP Address in the modem

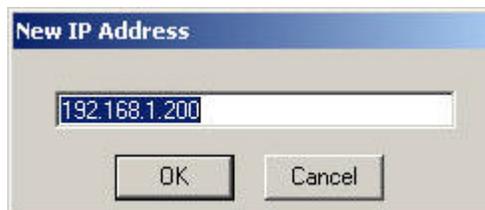
Go to “Set Operation Mode” and type “F” on your keyboard. The menu that comes up will tell you what the current IP address is (the default is 255.255.255.255). To enter a new address, select “4” and enter each number followed by the “enter” key (example: “192” [enter] “168” [enter] etc...). Select a 4 digit address that will work with the computer that will be running the diagnostic program. If you are not sure what the address needs to be, consult with your IT manager or contact Data-Linc Group for further assistance. Note: Data-Linc Group will only be able to consult with you on the set up of the radio modem. You will need to know how your computer is set up prior to using the diagnostic program.

2.6.1 Entering A New IP Address

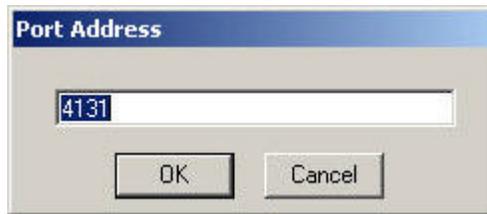
Click on the Communication to open the Communications Menu.



Select **Chg IP Address** to display the New IP Address dialog box. Enter the IP address of the master modem and click on OK (see section 2.6.0.1 of this manual for information on setting the IP address in the modem)

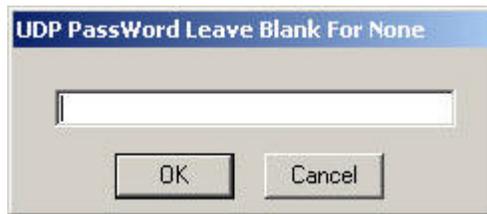


After the New IP Address has been entered, the Port Address dialog box will appear. Unlike a terminal server, router or other TCP/IP device, the SRM6210E/6310E modems use a fixed port address of 4131. Enter 4131 into the port address box.

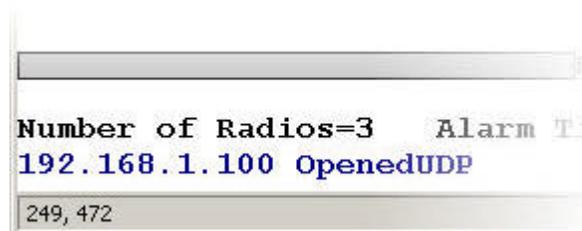


2.6.2 Establishing The UDP Connection

Click on Communication to open the communications menu. Click on **Connect UDP**. The box "UDP Password" will open. If the modem has a password set in it, enter the password (see the "SRM6210E/6310E User's Guild" for information on setting the password) and click "OK". If no password was set (default) then click "OK" with the default characters that appear with the box.

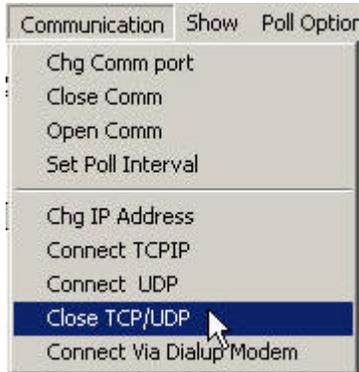


The message at the lower left corner of the display screen will switch from "No Connection" to "OpenedUDP".



The master's call number and data should appear on the screen. This is an indicator of the connection to the master. If no data appears, there is no connection between the master modem and the diagnostics program. Check to make sure the master modem is configured correctly and the IP address and UDP Password information is entered correctly.

Note: To change the UDP Password, TCP/IP and Port Address settings in the diagnostics program, the program must be in a "No Connection" state. Use the "Close TCP/UDP" button to get to the "No Connection" state.



2.6.3 Recalling A Stored UDP Connection

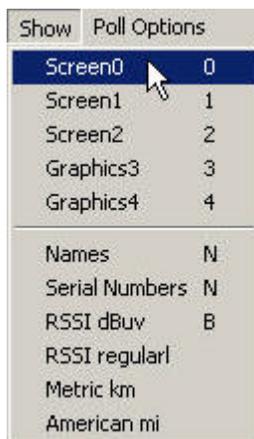
Follow the instructions in Paragraph 2.4.2 to recall a previously stored IP network connection. The network configuration file will contain the IP address of the master modem in the network, so it is not necessary to reenter this address. To establish the connection, follow the instructions in Paragraph 2.6.2.

3.0 Setting Up The Diagnostics Display

Diagnostics data is presented on five separate screens. These screens provide comprehensive monitoring of all radio network parameters including automatic logging of data from each radio in the network. One of the screens, Screen 2, also allows the operating parameters of any radio in the network to be changed from the Master radio. Changing radio parameters is discussed in Section 4.3.

3.1 Navigating Between The Diagnostics Screens

Clicking on the Show Menu and selecting the screen to be viewed may select any of the diagnostics screens. The screens may also be selected by typing the number of the screen when any of the screens are displayed.



3.2 Displaying Radio Call numbers Or Names

Diagnostics Screens 0 and 1 will display a list of radio call numbers or radio names if a name has been assigned to a call number as shown in Paragraph 3.3. If call numbers are displayed, click on the Show Menu and select Names. The list of radio names for each radio will be displayed. If a name has not been assigned to a radio call number, "New Radio" will be displayed when Names is selected.

If Names are displayed, select "Serial numbers" to change the display to list radio call numbers.

The N key may also be used to toggle the Screen 0 and Screen 1 displays between call numbers and names.

Show	Poll Options
Screen0	0
Screen1	1
Screen2	2
Graphics3	3
Graphics4	4
Names	N
Serial Numbers	N
RSSI dBuv	B
RSSI regular	
Metric km	
American mi	

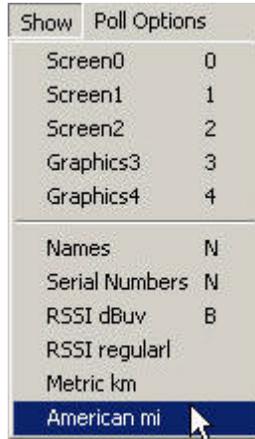
3.3 Selecting Signal Strength Units

Noise level and signal level units may be switched between standard units and dBuv. Standard units are the same values that are displayed in the radio statistics menu 4. To change the units to dBuv, select the Show menu and select RSSI dBuv. To change to Standard units select RSSI regular.

Show	Poll Options
Screen0	0
Screen1	1
Screen2	2
Graphics3	3
Graphics4	4
Names	N
Serial Numbers	N
RSSI dBuv	B
RSSI regular	
Metric km	
American mi	

3.4 Selecting American Or Metric Units

Metric or American units may be selected for display of temperature and distance values in Screens 0 and 1. To change the display to American, Miles and degrees F, open the Show Menu and select American mi,F. To display metric units, select Metric km,C.

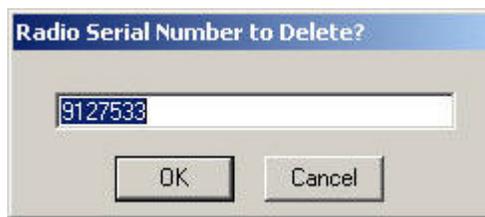


3.5 Deleting A Radio From the List

If a radio is removed from the network, its call number may be removed from the list by selecting Delete Radio in the Edit Radio Menu. The D key may also be pressed as a shortcut to the Delete Radio function.



A dialog box is opened asking the call number of the radio to be deleted. Enter the seven-digit call number of the radio to be deleted. It is not necessary to enter the hyphen in the call number. The call number that is entered will be deleted from the display.



Note: If a radio is deleted from the list but remains in the network and is detected by the diagnostics program, its number will be restored to the list of radios.

3.6 Polling A Specific Radio

An individual radio may be polled by opening the Edit Radio Menu and selecting PollRadio. The P key may also be pressed as a shortcut to the Poll Radio function.



A dialog box is opened asking for the call number of the radio to be polled. Enter the seven-digit call number of the radio to be polled. It is not necessary to enter the hyphen in the call number. The radio call number will be polled and the call number will be added to the radio list.

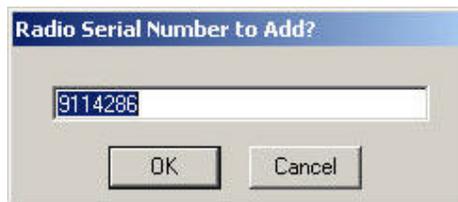


3.7 Entering A Radio Name

A name may be associated with a radio call number by opening the Edit Radio Menu and selecting Add Radio. The A key may be pressed as a shortcut to the Add Radio function.



A dialog box is opened asking for the call number of the radio to be named. Enter the seven-digit call number of the radio. It is not necessary to enter the hyphen in the call number.



A second dialog box is opened asking for the name to be assigned to the radio call number that was just entered. Enter the name to be assigned to the call number and click on OK. The name may be up to eight characters in length. Valid characters are upper and lower case letters, numbers and punctuation marks.



3.8 Selecting The Polling Method

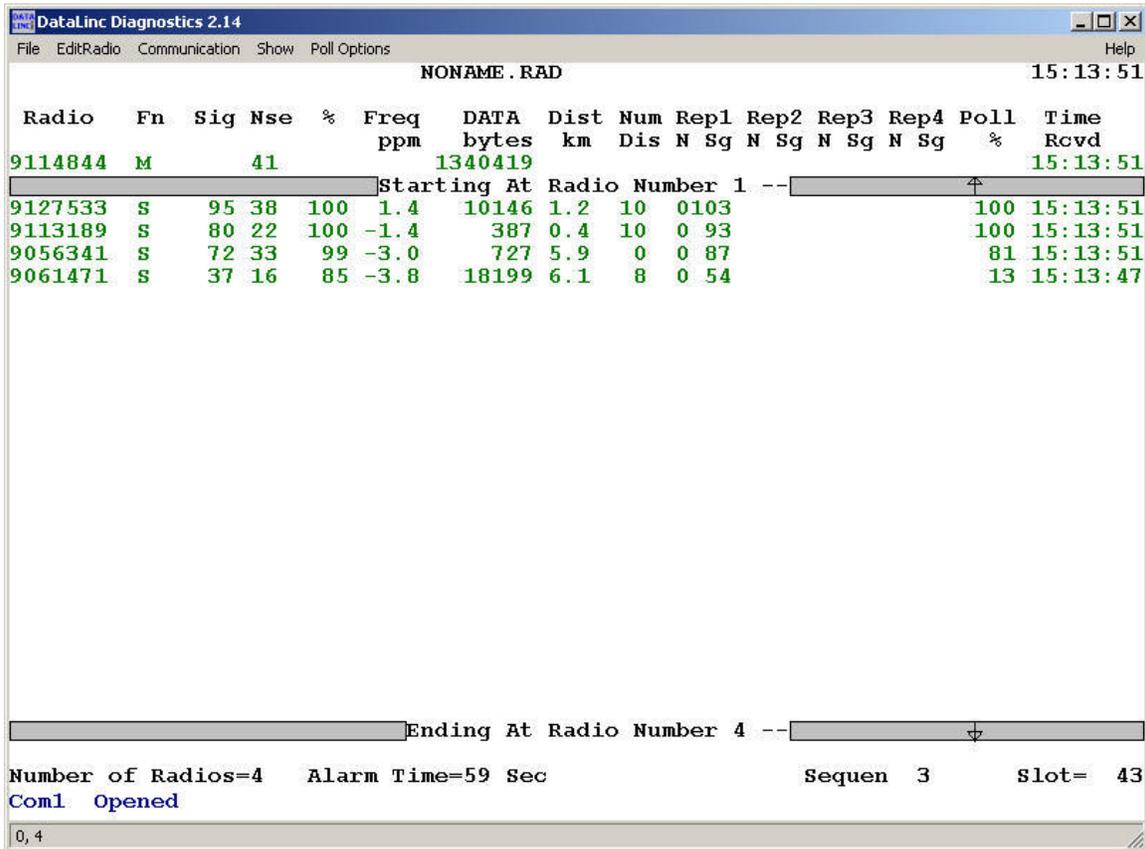
When the diagnostic program is first run on a new network, the default polling method is random. Random polling is done from a list of randomly generated call numbers. As radios respond to the random polls, their call numbers are added to the list. If the network is not in use, and the call numbers of the radios in the network are not known, random polling will eventually identify all of the radios in the network. When all of the radios in the network have been identified, the polling method should be changed to sequential to provide more frequent updates of diagnostic data. Press the S key to change to sequential polling. To switch back to random polling, press the R key. If sequential polling is selected, the master radio will continue to generate random polls at a reduced rate.

4.0 Interpreting The Diagnostics Data

Diagnostics data is presented on five separate screens. These screens provide comprehensive monitoring of all radio network parameters including automatic logging of data from each radio in the network. One of the screens, Screen 2, also allows the operating parameters of any radio in the network to be changed from the Master radio. Changing radio parameters is discussed in Section 4.3.1.

4.1 Diagnostics Screen 0

Diagnostic Screen 0 is shown below. This screen is used to monitor the RF performance of each individual radio link in the network.



The screenshot shows the 'DataLinc Diagnostics 2.14' window. The title bar includes 'File EditRadio Communication Show Poll Options Help'. The main display area shows a table of radio data. The table has columns for Radio, Fn, Sig, Nse, %, Freq (ppm), DATA (bytes), Dist (km), Num (Dis), Rep1 (N), Rep2 (Sg), Rep3 (N), Rep4 (Sg), Poll (%), and Time (Rcvd). The data is as follows:

Radio	Fn	Sig	Nse	%	Freq ppm	DATA bytes	Dist km	Num Dis	Rep1 N	Rep2 Sg	Rep3 N	Rep4 Sg	Poll %	Time Rcvd
9114844	M		41			1340419								15:13:51
Starting At Radio Number 1 --														
9127533	S	95	38	100	1.4	10146	1.2	10	0	103			100	15:13:51
9113189	S	80	22	100	-1.4	387	0.4	10	0	93			100	15:13:51
9056341	S	72	33	99	-3.0	727	5.9	0	0	87			81	15:13:51
9061471	S	37	16	85	-3.8	18199	6.1	8	0	54			13	15:13:47
Ending At Radio Number 4 --														
Number of Radios=4 Alarm Time=59 Sec Sequen 3 Slot= 43														
Com1 Opened														
0, 4														

4.1.1 Network Name

The example screen above displays a network name of NONAME.RAD. This is the default name that the diagnostics program assigns to a new network. If the network has been opened from a previously stored configuration file, the file path and file name are displayed.

4.1.2 System Clock

The system clock in the upper right corner of the display shows the current time of day.

4.1.3 Radio

Displays either the call number or the name assigned to each radio. See Paragraph 3.7 for instructions on naming radios. The call number of the master radio is always displayed first and above the scroll bar. All other radios are listed in the order that the diagnostics program detected them. Press the N key to toggle the display between call number and name. Any radio that does not have a name assigned to it will be displayed as "New Radio" when names are displayed. Both radio names and call numbers are saved when diagnostic data is saved in a network log file.

4.1.4 Fn

Displays the network function of each radio in the network.

M= Master Radio

S=Slave Radio

Rx= Repeater Radio where x is the repeater number assigned by the diagnostics program.

The diagnostics program automatically assigns a number to each repeater. The numbers are assigned in the order that the diagnostics program detects each repeater. Although a radio may be programmed to be a repeater, it will be indicated as a slave until the diagnostics program detects other radios that are linked through it into the network.

4.1.5 Sig

Indicates the received signal level of each radio in the network. The value displayed will either be in standard units, as they would be displayed in Radio Statistics Menu 4, or in dBuv if selected with the Show Menu. See Paragraph 3.3 for more information. For reliable radio performance in all conditions, it is recommended that the value of Sig be at least 40 for all radios.

4.1.6 Nse

Indicates the average noise level at each radio in the network. The value displayed will either be in standard units, as they would be displayed in Radio Statistics Menu 4, or in dBuv if selected with the Show Menu. See Paragraph 3.3 for more information. For reliable radio performance it is recommended that the value of Nse be at least 20 below the value of Sig. If the difference between Sig and Nse drops below 20, these values will be highlighted in red for the radio affected.

4.1.7 %

Indicates the average percent receive rate at each radio in the network. This indicates the percentage of data packets that are received on the first try at each radio site. If a radio is linked to the network through a repeater, the percent receive rate indicates the receive rate from the repeater. For reliable radio performance, a percent receive rate of at least 75% is recommended. If % drops below 75%, the value is highlighted in red for the radio affected.

4.1.8 Freq ppm

Indicates the frequency error of the master reference oscillator of each radio in the network. For specified performance, the reference oscillator should be in the range of ± 10 ppm. The diagnostics program will highlight the value in red if any radio exceeds ± 5 ppm.

4.1.9 DATA bytes

Shows the number of bytes that have been transmitted from every radio in the network if version 5.72 or later firmware (900 MHz radios) is installed on the master and any repeaters. If the master has an earlier version of firmware, the byte count will only be shown for any radios linked directly to the master radio. If any repeater has an earlier version of firmware, the byte count for all radios linked through that repeater will be shown as a cumulative byte count for the repeater. The byte count is useful for monitoring the source of any data transmitted through the network.

4.1.10 Dist km, Dist mi

Displays the distance from each radio site to its connection to the network. If a radio is linked directly to the master radio, the distance shown is the distance from that radio to the master radio. If a radio is linked to a repeater, the distance shown is the distance from that radio to the repeater. Distances are typically accurate to a range of ± 30 meters if the distance is greater than 1 km. Distances less than this will not be displayed accurately.

Values may be displayed in metric units, km, or American units, miles, by selecting the units with the Show Menu. For more information see Paragraph 3.4.

4.1.11 Num Dis

Displays the total cumulative number of disconnects for each radio in the network. A disconnect occurs whenever a radio loses its connection to the network. Disconnects may result from a disruption due to a poor signal path. Disconnects will also occur whenever the master radio or any repeaters in the link between the master and any radio are removed from operation even momentarily. Any changes made to the settings of the master or any repeaters from diagnostics Screen 2 will cause momentary disconnects to occur in some or all of the radios in a network.

The number of disconnects at any radio is cleared whenever power is interrupted to the radio or whenever the radio is put into setup mode.

4.1.12 Rep 1 N Sg, Rep 2 N Sg, Rep 3 N Sg, Rep 4 N Sg

Shows the repeater path each radio in the network takes back to the master radio. If there are more than four repeaters in any path, the last four repeaters in the path are displayed. N indicates the repeater number from the radio list. Any radio that is linked directly to the master radio will show 0 under the N column. Sg indicates the average received signal strength received by the master or the repeater from the radio shown.

4.1.13 Poll %

Indicates the percent of the time each radio in the network responded to the diagnostic poll from the master radio. The percent poll response will be reduced if the network applications program is transmitting large amounts of data over the network. A poll % decreasing to 0 may indicate that a radio has disconnected from the network.

4.1.14 Time Rcvd

Indicates the time that the last poll response was received from each radio in the network. If the indicated time exceeds the alarm interval, see Paragraph 4.1.17, the time will be highlighted in red.

4.1.15 Upper And Lower Scroll Bars

Up to 33 radios plus the master radio may be displayed on a single page of Screen 0. Scroll bars at the top and the bottom of the page allow the radio list to be scrolled up or down to display additional radios. The upper scroll bar contains the message "Starting At Radio Number" followed by the network number of the radio listed immediately below the upper scroll bar. The lower scroll bar contains the message "Ending At Radio Number" followed by the network number of the radio immediately above the lower scroll bar. The radio list may be scrolled up or down by moving the mouse pointer to either scroll bar and clicking on the bar. The display may also be scrolled up or down by pressing the up or down arrow keys on the keyboard.

4.1.16 Number of Radios

Indicates the total number of radios in the network not counting the master radio.

4.1.17 Alarm Time

Indicates the current setting of the Time Rcvd alarm, see Paragraph 4.1.14. The default setting is 60 seconds. The value may be incremented or decremented with the + and – keys on the numeric keypad.

4.1.18 Poll Status Indicators

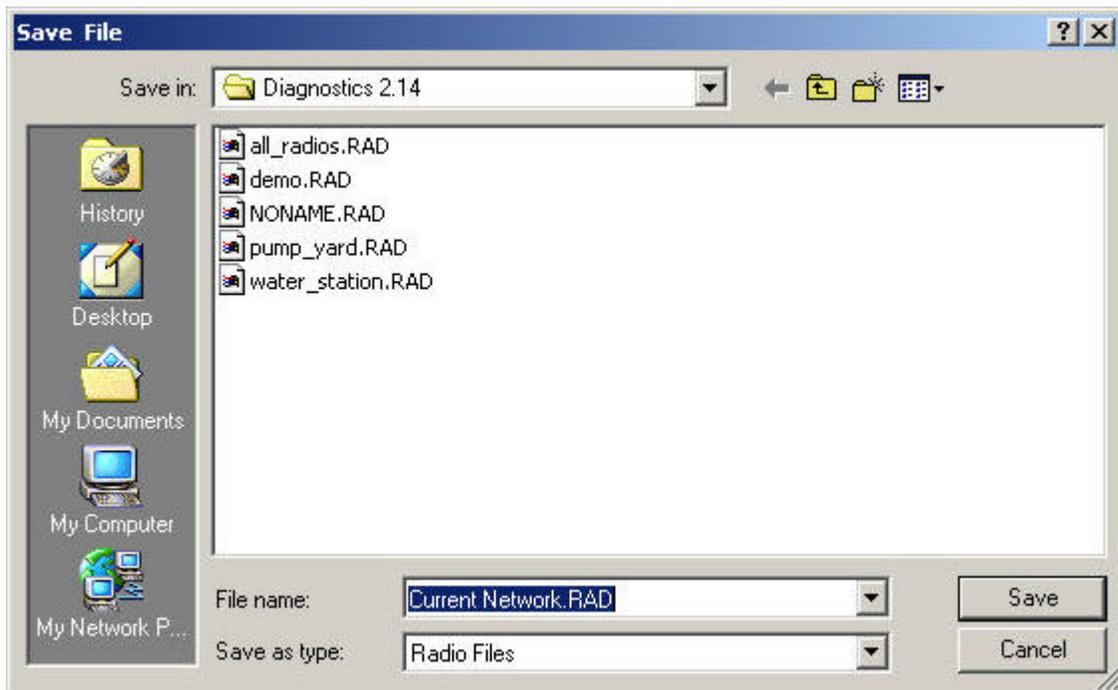
The counters and indexes displayed on the lower right corner of the display are troubleshooting indicators for use by Data-Linc Group. They serve no purpose in the diagnostics program other than to provide an indication that the program is running correctly. One of the indicators will display Random or Sequen depending on the polling method that is active, either random or sequential. The number display next to the indicator indicates where the diagnostic program is in the polling process. If Sequen is displayed, the number indicates which radio number in the list is currently being polled.

4.1.19 Saving The Network Configuration

The current network configuration can be saved by selecting Save Network File in the File Menu or by pressing the F key on the keyboard.

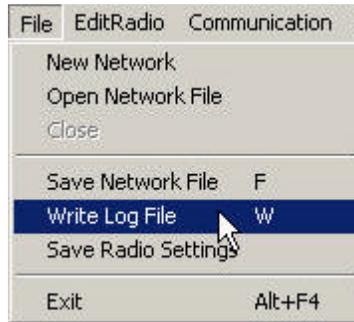


A dialog box is opened requesting the name of the network file. It is not necessary to enter the .RAD extension.

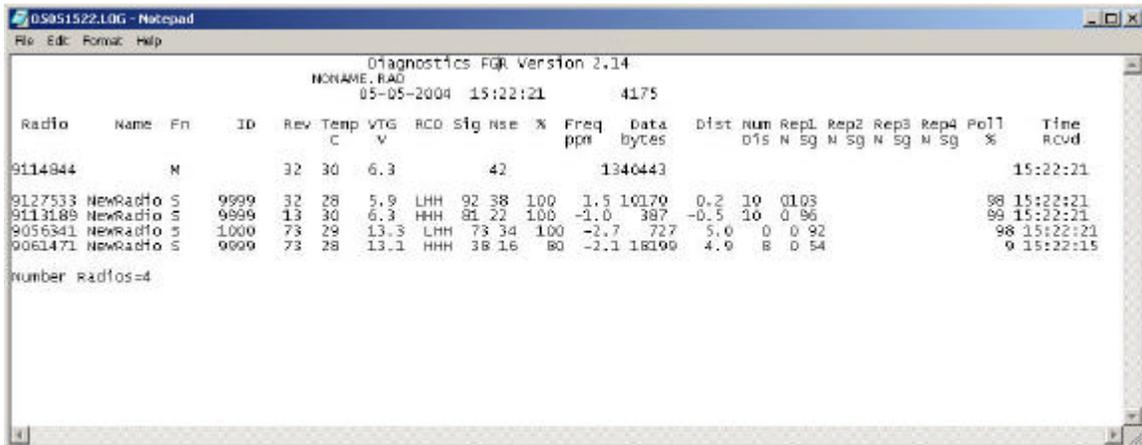


4.1.20 Logging Diagnostics Data

The LincView program will automatically log diagnostics data into a file located in the directory where the program is located. This file is called "current" and it is rewritten once a minute. To take a snapshot of the current diagnostics data, open the File menu and select the "Write Log File" function. This will save a log file in the directory that LincView is stored in and will label it using the month, day, hour, minute and a .LOG suffix. For example, the file 09072146.LOG was saved at 2146 hours (9:46 PM) on September 7.



The files can be opened for viewing and printout with WordPad or a similar text program. The following example shows a sample diagnostic data printout, as it would appear if displayed with Notepad.



The image shows a Notepad window titled 'DS951522.LOG - Notepad'. The text content is as follows:

```
Diagnosics FGR Version 2.14
NONAME.RAD
05-05-2004 15:22:21 4175

Radio Name Fn ID Rev Temp VTG RCD Sig Rse % Freq Data Dist Num Repl Rep2 Rep3 Rep4 Pol1 Time
C V N Sg N Sg N Sg N Sg % Rcvd
9114944 M 32 30 6.3 42 1340443 15:22:21
9127533 NewRadio S 9999 32 28 5.9 LHH 92 38 100 1.5 10170 0.2 10 0103 98 15:22:21
9113189 NewRadio S 9999 13 30 6.3 HHH 81 22 100 -1.0 387 -0.5 10 0 86 99 15:22:21
9056341 NewRadio S 1000 73 29 13.3 LHH 73 34 100 -2.7 727 5.0 0 0 92 98 15:22:21
9061471 NewRadio S 9999 73 28 13.1 HHH 38 16 80 -2.1 18199 4.9 8 0 54 9 15:22:15

number radios=4
```

4.2 Diagnostics Screen 1

Diagnostics Screen 1 shown below provides information on the operating environment and the status of the RS-232 data lines at each radio site. Some Screen 1 display fields are redundant with fields that are displayed on Screen 0. This section describes only the fields that are unique to Screen1. For information on the redundant fields, refer to the description of those fields in Section 4.1.

DataLinc Diagnostics 2.14													
NONAME . RAD													15:24:20
Radio	Fn	ID	Rev	Freq ppm	Data bytes	Dist km	Temp C	VTG V	RTS	CTS	DTR	Polls Rcvd	Time Rcvd
9114844	M	0	32		1340566		30	13.3					15:24:20
Starting At Radio Number 1 --													
9127533	S	65535	32	1.5	10170	1.15	28	12.9	L	H	H	6188	15:24:20
9113189	S	65535	13	-0.9	387	0.50	30	13.5	H	H	H	5921	15:24:20
9056341	S	1000	73	-2.7	850	6.03	29	13.5	L	H	H	5609	15:24:20
9061471	S	65535	73	-2.4	18199	5.87	28	13.3	H	H	H	722	15:24:11
Ending At Radio Number 4 --													
Number of Radios=4				Alarm Time=59 Sec				Sequen 4			Slot= 8		
Com1 Opened													
380, 133													

4.2.1 ID

Displays the radio ID number that is entered in the multipoint parameters menu D. This number may be used to identify a radio site or as a convenient way to track a device connected to a radio.

4.2.2 Rev

Displays the last two digits of the current version of firmware installed in each radio. For example, 73 indicates version 5.73 firmware is installed.

4.2.3 Temp C, Temp F

Displays the current operating temperature of each radio in degrees celcius (default) or degrees farenheit. The selection of units is made from the Show menu. See paragraph 3.4 for more information. Data-Linc Group radios provide reliable operation over a temperature range that is typically wider than that of the equipment they are connected to. In extreme temperatures, the temperature reading could be an indication of a temperature-related failure in other equipment at a radio site.

4.2.4 Vtg V

Displays the current DC voltage at the RF board level of each radio in the network. What is considered "Normal" for an operating voltage at this level differs depending on the model. No SRM series modem will be outside 6 to 15VDC. If you see voltages outside of this range, a problem exists. For information on what is normal for what modem, contact Data-Linc Group. A low or high voltage reading may indicate a problem with the power source.

4.2.5 RTS CTS DTR

Displays the status of the indicated RS-232 line of each radio. H indicates a high state and L indicates a low state. This information is not valid on the Ethernet modems.

4.2.6 Polls Rcvd

Indicates the total number of diagnostic polls that have been received by each radio since the diagnostics program was started.

4.3 Diagnostics Screen 2

Diagnostics Screen 2 displays the current settings of the parameters of each radio. Each radio is displayed individually. Use the scroll bars or up and down arrow keys to scroll through the radios. Any parameters that have not yet been read by the diagnostic program will be identified by xxxx. As the diagnostics program runs, the xxxx fields will be filled in with actual values. This process can be sped up on any radio by pressing the P key when the radio is displayed in Screen 2. If the network applications program is running and causing heavy network traffic, it may take several iterations to fill in all of the values. An indicator on the bottom of the screen shows which parameter is being updated. Note: Firmware versions earlier than 5.68 (900 MHz) or 1.60 (2.4 GHz) will not display the settings of the Master radio and will not allow the settings of the Master radio to be changed. A Master radio with an earlier version of firmware will display xxxx for all fields in Screen 2.

The screenshot shows the 'DataLinc Diagnostics 2.14' window. The title bar includes 'File EditRadio Communication Show Poll Options' and 'Help'. The main window displays 'NONAME .RAD' and the time '15:25:32'. The title of the screen is 'Remote Radio Setup Parameters'. Below this, there are two scrollable fields: 'Serial Number' with the value '9114844' and 'Name' with the value 'MASTER'. The main area contains a list of 34 parameters, each with a number, a name, a value, and a status. Parameters 17 through 33 are listed in two columns. At the bottom, there are two more scrollable fields: 'Radio Number' with the value '0' and 'Com1. Opened'. Below these are the fields 'Number of Radios=4', 'Alarm Time=59 Sec', 'Sequen 08', and 'Slot= 84'. The status bar at the very bottom shows '521, 107'.

Parameter	Value	Status
0 Modem Mode	2	Master
1 Baud Rate	48	
2 Baud High Byte	0	BaudRate=9600
3 RS232 Mode	0	8,N,1
4 MODBUS RTU	255	Disabled
5 Retry TimeOut	255	
6 Xtal Tune	174	
7 SlicerThreshold	103	
8 Frequency	131	
9 Freqkey	5	
10 Max Packet Size	9	
11 RF Data Rate	3	
12 Min Packet Size	2	
13 Xmit Power	43	Setting is 1
14 RTS/CTS Control	0	Disabled
15 Hop table size	112	
16 Number Repeaters	0	
17 Master Repeat	3	
18 Max Slave Retry	3	
19 Retry Odds	3	
20 DTR Connect	0	
21 Repeater Freq	0	Disabled
22 LowPower	255	Disabled
23 PPS Enable	255	Disabled
24 Slave/Repeater	255	Disabled
25 Master Sync	255	Disabled
26 Network ID High	255	
27 Network ID Low	200	Network ID=200
28 SubNet ID	255	Disabled
29 Radio ID High	0	
30 Radio ID low	0	Rad Id=0
31 Freq Table	0	
32 Diagnostics	0	
33 Radio ID Super	255	

4.3.1 Changing Radio Parameters

Screen 2 allows the parameters of each radio in the network to be changed from the diagnostics computer connected to the Master radio. Parameter changes are invasive in that they will cause a radio to momentarily disconnect from the network. For this reason, it is recommended that any application program that is running on the network be halted whenever screen 2 is used to change radio parameters. Only one parameter at a time may be changed. The diagnostics program displays some parameters with different values than the values that are displayed in the radio's setup menu. For each of these parameters, a conversion table is provided showing the diagnostics program value and the radio setup menu equivalent value.

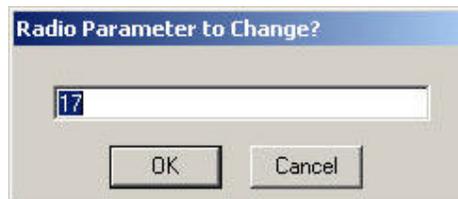
Some parameters, if changed, will cause a radio to disconnect from the network and remain in a disconnected state until the radio through which it is linked into the network is also changed in such a way that the radio can reconnect to the network. It is always advisable to begin at the lowest tier of the network and work inwards towards the Master radio when these parameters are to be changed. Parameters that can cause a radio to disconnect from the network are indicated below with a ⚠ Warning.

It is a good idea to verify that a change has been completed before attempting to send another change. However, this may not be possible if the change has caused the radio to disconnect from the network. A disconnected state can be verified by checking Screen 0 to see if a radio is responding to diagnostic polls.

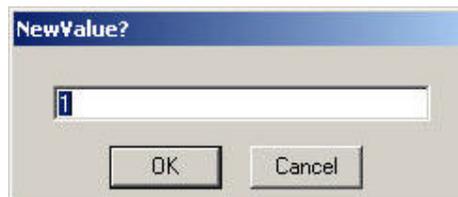
To change a radio parameter, open the Edit Radio menu and select Change EPROM or type C on the keyboard. For more information on each of the radio parameters, refer to the description of the parameter in the Data-Linc Group Operator's Manual.



The diagnostics program will display a dialog box requesting the parameter number from the list in Screen 2 to be changed.

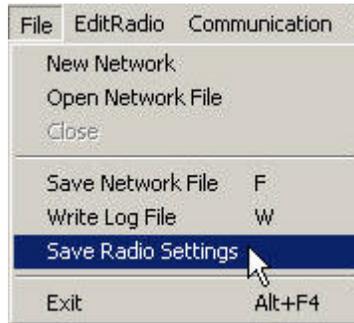


The diagnostics program will then display a dialog box requesting the new value of the parameter.

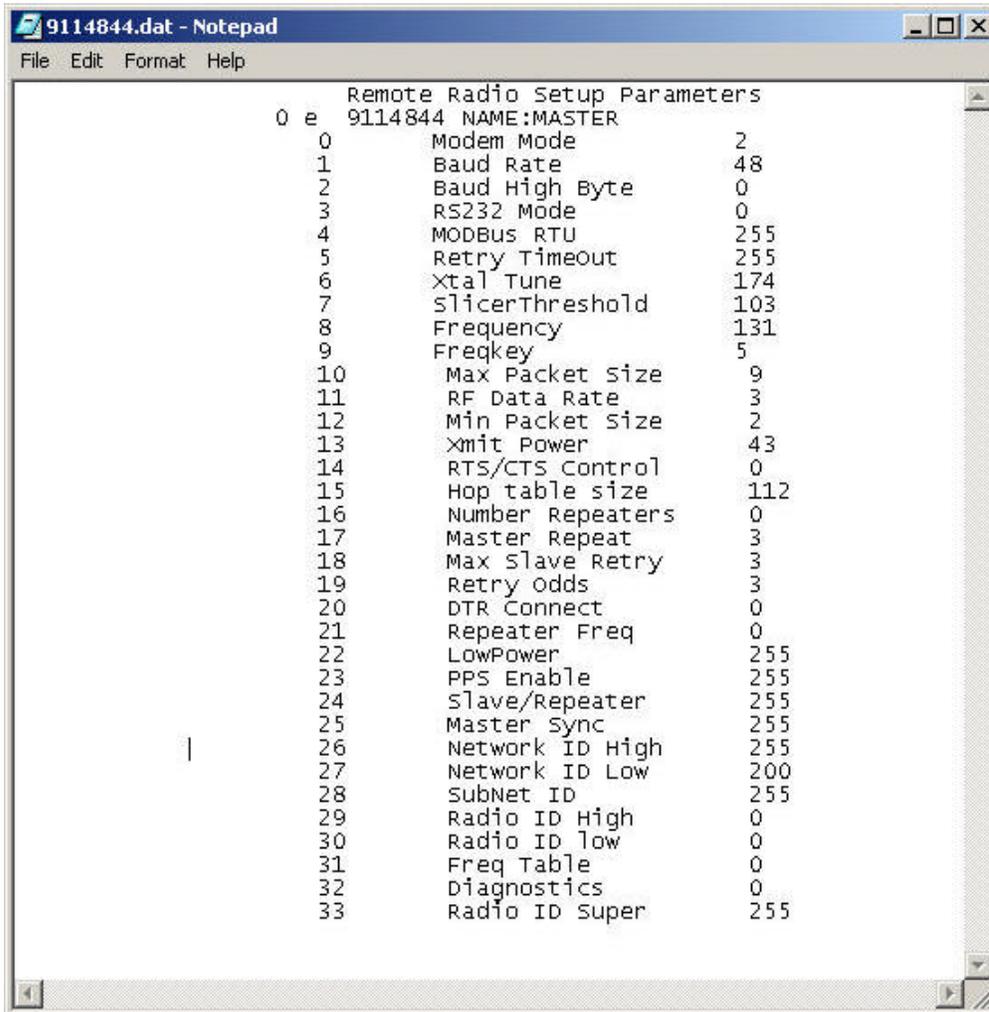


4.3.2 Saving Radio Parameters

The parameters for a radio may be saved by opening the Files menu and selecting Save Radio Settings. A file name will automatically be created with the radio's call number and the suffix .dat. The radio settings will be saved along with data logged with diagnostics Screens 3 and 4. The files may be opened for viewing and printout with Notepad or any similar text program.



An example of a Notepad document appears below.



4.3.3 Radio Parameters

0 Modem Mode

Selects the operating mode of the radio. Mode 2 is a master, mode 3 is a slave and mode 7 is a repeater or a slave/repeater.

1 Baud Rate

Radio RS-232 baud rate. Baud rate is set using two parameters, Baud Rate and Baud High Byte. The combined value of these settings is the radio baud rate, which is displayed next to Baud High Byte. When using the Ethernet modems, do not change the baud rate setting.

Diagnostics Setting	Baud Rate
128	1200
192	2400
96	4800
48	9600
24	19200
12	38400
8	57600
6	76800
4	115200

2 Baud Rate High Byte

Sets the high byte of the baud rate. 1=1200, 0=2400 to 115200.

3 RS232 Mode

Sets the data bits, parity and stop bits. When using the Ethernet modems, this setting must be set to 0.

Diagnostics Setting	Menu Value	Data Bits, Parity, Stop Bits
0	0	8,None, 1
2	1	7,Even, 1
3	2	7, Odd, 1
16	3	8, None, 2
18	4	8, Even, 1
19	5	8, Odd, 1

4 MODBus RTU

Enables and disables MODBus RTU mode. 0 is enabled, 255 is disabled. When using the Ethernet modems, this setting must be set to 0.

5 Retry TimeOut

Controls the setting of Retry TimeOut. The setting range is 8 to 255. A low setting will cause a radio to disconnect from the network more quickly. A lower setting may be helpful for applications that require a radio to switch its network connection between a master to one or more repeaters. A lower setting will also allow radios to respond more quickly to parameter changes made from Screen 2.

6 Xtal Tune

Displayed for information only. This parameter cannot be changed.

7 Slicer Threshold

Displayed for information only. This parameter cannot be changed.

8 Frequency

Displayed for information only. This parameter cannot be changed.

9 Freqkey ☹!

Controls the setting of frequency key. Frequency key is used to avoid interference between overlapping radio networks. The setting range is 0 to 15.

10 Max Packet Size ☹!

Controls maximum packet size. The setting Range is 0 to 9.

11 RF Data Rate ☹!

Controls RF data rate. Valid settings are 2 or 3. All radios in a network must be set to the same value.

12 Min Packet Size ☹!

Controls minimum packet size. The setting Range is 0 to 9.

13 Xmit Power

Sets the radio RF output power.

Diagnostics Setting	Menu Value
39	1 (< 100 mw)
66	2
93	3
120	4
147	5
174	6
201	7
228	8
255	9 (Full Power)

14 RTS/CTS Control

Enables and disables RTS/CTS control. 0 is disabled, 1 is enabled. When using the Ethernet modems, this setting must be set to 0.

15 Hop Table Size ☹!

Controls the number of frequency hop steps used by the radio. Setting range is 50 to 112.

16 Number Repeaters

Enables and disables repeaters. 0 disables repeaters, 1 enables repeaters.

17 Master Repeat

Controls Master Packet Repeat. The parameter applies to Master and must also be set in any repeaters. The setting range is 0 to 9.

18 Max Slave Retry

Sets the maximum slave retries. The setting range is 0 to 9.

19 Retry Odds

Sets the slave retry odds. The setting range is 0 to 9.

20 DTR Connect

Controls DTR connect mode. Valid settings are 0, 1 or 2. When using the Ethernet modems, this setting must be set to 0.

21 Repeater Freq ☹!

Enables and disables the repeater frequency function. This parameter applies to repeaters and slave repeaters. It should only be used when network ID is 255, or if network ID is set to another value and the SubNet ID function is used. 0 is disabled and 1 is enabled.

22 LowPower

Controls low power mode. This parameter should only be used in slave radios. The setting range is 1 to 63. 255= (disabled).

23 PPS Enable ☹!

Enables and disables 1 PPS enable/delay. For normal operation this parameter must be set to 255. The setting range is 0 to 255. When using the Ethernet modems, this setting must be set to 0.

24 Slave/Repeater

Enables and disables the slave/repeater function. This function will work only if modem mode is set to 7. 0 is enabled and 255 is disabled.

25 Master Sync ☹!

Enables and disables multimaster sync. 255 is disabled and 0 is enabled.

26 Network ID High ☹!

Sets the high byte of portion network ID. Valid settings are 255 and 0 to 14. The settings of Network ID High Byte and Network ID Low combine to set the Network ID as shown below. Note: Radios with firmware versions earlier than 5.77 (or greater) (900 MHz) or 1.62 (2.4 GHz) will not accept Network ID values larger than 255. All radios in a network must be set to the same network ID value.

Network ID High Byte	Network ID Low	Network ID range
255	0 to 255	0 to 255
0	0 to 255	256 to 511
1	0 to 255	512 to 767
2	0 to 255	768 to 1023
3	0 to 255	1024 to 1279
4	0 to 255	1280 to 1535
5	0 to 255	1536 to 1791
6	0 to 255	1792 to 2047
7	0 to 255	2048 to 2303
8	0 to 255	2304 to 2559
9	0 to 255	2560 to 2815
10	0 to 255	2816 to 3071
11	0 to 255	3072 to 3327
12	0 to 255	3328 to 3583
13	0 to 255	3584 to 3839
14	0 to 255	3840 to 4095

27 Network ID Low ☹!

Sets the low byte portion of network ID. All radios in a network must be set to the same network ID value. The setting range is 0 to 255. The settings of Network ID High Byte and Network ID Low combine to set the network ID as shown above.

28 SubNet ID ☹!

Controls Subnet ID function. The Subnet ID value is determined from the following table. Receive Subnet values 0 to F are in columns and transmit Subnet values 0 to F are in rows. For example, to set Receive Subnet to 2 and Transmit Subnet to 3, the setting of Subnet ID would be 50. Setting Subnet ID to 255 (Receive subnet ID F and transmit subnet ID F) disables Subnet ID. Do not set Subnet ID to 0.

		Receive Subnet ID															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Transmit Subnet ID	0	N/A	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	1	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	2	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
	3	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
	4	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
	5	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
	6	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
	7	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
	8	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
	9	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
	A	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
	B	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
	C	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207
	D	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
	E	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
	F	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255

29 Radio ID High

Sets the high byte of radio ID. The setting range is 0 to 255. Radio ID number displayed in screen 1 is Radio ID High x 256 + Radio ID low.

30 Radio ID low

Sets the low byte of radio ID. The setting range is 0 to 255.

31 Freq Table ☹!

Selects frequency hopping frequency range. The setting range is 0 to 6. All radios in a network must be set to the same value.

32 Diagnostics

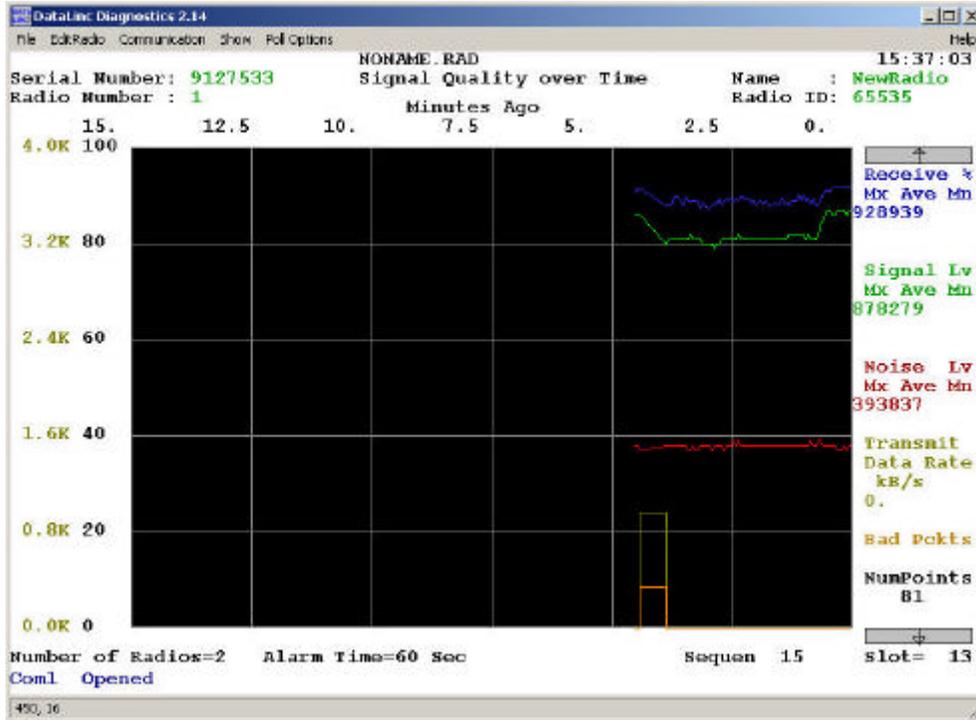
Set in the master modem only and should not be changed via the diagnostics program.

33 Radio ID Super

This parameter is stored when radio settings are saved and is shown when stored radio settings are displayed, however, the feature is not currently functional. Radio ID Super will be available on a future release of firmware.

4.4 Diagnostics Screen 3, Signal Quality over Time

Diagnostics Screen 3 displays a continuous graph showing the history of signal level, noise level and percent receive rate for every radio in a network. The graph begins when the diagnostics program is started and continues as long as the program is running.



4.4.1 Minutes Ago, Hours Ago

Beginning when the diagnostic program is started, the data display rolls to the left side of the screen with the oldest data at the left end of the trace. The graph displays up to 512 points and automatically rescales the horizontal axis x2 when the 512th point is displayed to compress the display to 256 points.

4.4.2 Mx, Ave, Mn

Shows the maximum, average and minimum value for each parameter during the recording period.

4.4.3 Receive %

Displays the percent receive rate. The trace is shown in blue on the display.

4.4.4 Signal Lv

Displays the received signal level. The trace is shown in green.

4.4.5 Noise Lv

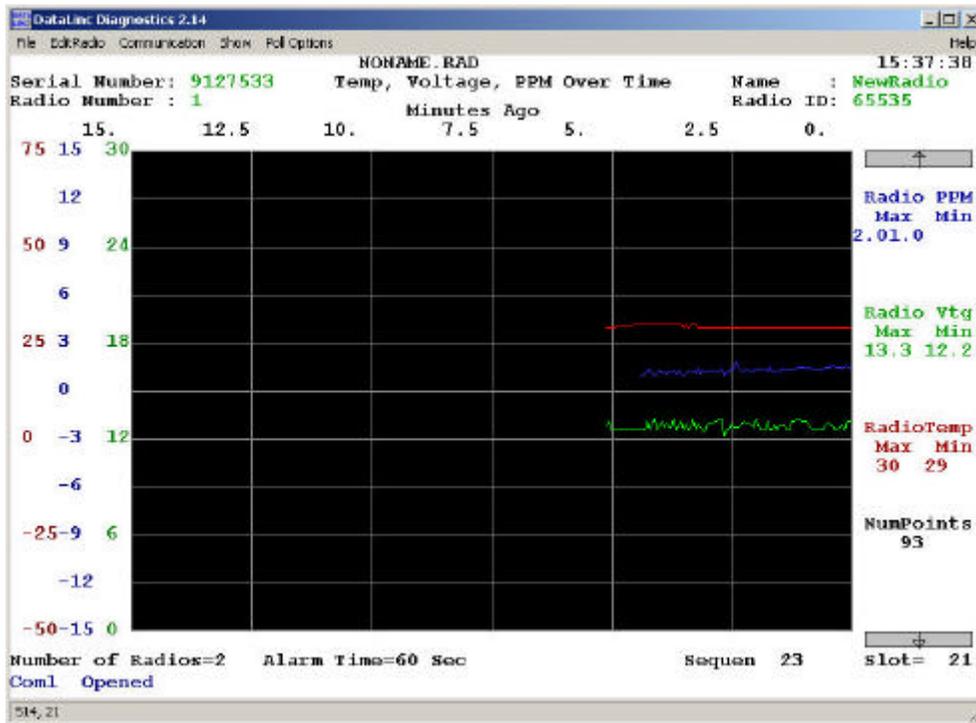
Displays the noise level. The trace is shown in red.

4.4.6 No Points

Indicates the number of points on the horizontal axis.

4.5 Diagnostics Screen 4

Diagnostics Screen 4 displays a continuous graph showing the history of frequency error, DC supply voltage and operating temperature for every radio in a network. The graph begins when the diagnostics program is started and continues as long as the program is running. Some Screen 4 display fields duplicate fields that are displayed on Screen 3. This section describes only the fields that are unique to Screen 4. For information on the duplicated fields, refer to the description of those fields in Section 4.4.



4.5.1 Radio PPM

Displays the frequency error of the master reference oscillator. For specified performance, the oscillator should be in the range of ± 10 PPM. Typical readings are in the range of ± 2.5 PPM. The trace is shown in blue. The vertical scale is displayed to the left of the graph in blue.

4.5.2 Radio Vtg

Displays the radio DC supply voltage. The trace is shown in green. The vertical scale is displayed to the left of the graph in green.

4.5.3 Radio Temp

Displays the radio operating temperature. The trace is shown in red. The vertical scale is shown to the left of the graph in red.