GUARDIAN AND DL-3400 INTEROPERABILITY

PN 009-5006-002
Revision 0
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CalAmp®

TECHNICAL SERVICE APPLICATION NOTE

OVERVIEW

The following document is designed to provide information for the implementation of the Guardian Wireless Modem/Analog Radio into an existing DL-3400 analog system.

PRODUCT

DL-3400 Analog Transceiver, Guardian-X00 Wireless Modem

APPLICATION

The DL-3400 is an analog transceiver that can operate in the VHF, UHF and 900 MHz frequency bands depending on part number ordered. The radio can operate at 25 KHz bandwidth or 12.5 KHz also depending on the part number that is ordered.

The Guardian wireless modem can operate at VHF, 200 MHz, UHF and 900 MHz frequencies. The radio will operate at 25 KHz of bandwidth or 12.5 KHz of bandwidth. The user can select the operating mode by using the Guardian FPS (Field Programming Software) and selecting the proper bandwidth. Reference User Manual part number 001-5006-000 for additional information on Guardian frequency ranges and bandwidth selection.

The Guardian and DL-3400 are over the air compatible (OTA). A Guardian will be configured through the FPS to match the parameters of the existing DL-3400 system.

HARDWARE

Although the Guardian and DL-3400 are OTA compatible there are physical differences between the two product lines:

- Antenna connector
  - DL-3400 – Female SMA connector
  - Guardian – Female TNC connector
  - The following coaxial adapter cables are available for the Guardian
    - 250-0697-103 18” TNC – Male to Type N – Male RG-400
    - 250-0697-104 48” TNC – Male to Type N – Male RG-400
    - 250-0697-105 72” TNC – Male to Type N – Male RG-400
    - 250-0697-106 18” TNC – Male to Type N – Female RG-400
- Power connection
  - DL-3400 utilizes a red and black wire from the 10 pin interface cable
    - Power Input: 10-15 VDC @ 3 amps maximum
  - Guardian utilizes a 4 pin power connector
    - Uses a 3 wire connection. The ‘White’ wire must be connected to B+
    - Power cable is included with the radio
    - Power cable PN# 897-5008-010
    - Power Input: 10-30 VDC @ 60 Watts maximum
- Interface connections
  - DL-3400 uses a 10 pin ribbon cable connector
  - DL-3400 user interface cable goes from a 10 pin ribbon connection to spade lug terminations, PN# 023-3410-109
  - Guardian uses an 8 pin ‘User’ interface connector
    - Connector is included with radio
    - Connector PN# 415-1001-208
    - Contacts can be opened with small screwdriver

        - Contacts can be opened with insertion tool PN# 250-5006-001
- Mechanical footprint
    - The DL-3400 and the Guardian do not use the same mechanical footprint.
    - Reference Guardian Technical Manual 001-5006-000 which shows the mechanical layout of the radio
    - See page 13 Section 1.4.7 fig. 1-2 for chassis dimensions
- Programming
    - The Guardian uses programming software unique to the Guardian
    - The Guardian programming cable is simply a standard DB-9 to DB-9 'straight through' serial cable and no longer requires unique cabling.
    - Programming cable PN# 697-4008-408
    - Programming software allows choice between 'Modem' and 'Loader' mode. Loader mode is the analog equivalent to the DL-3400.

PROGRAMMING AND SETUP

Programming of the DL-3400 and Guardian is done using unique FPS for each transceiver. Since both transceivers are transparent in their operation with the application there is no need to be concerned about Master and Remote configurations.

The first step in adding a Guardian into an existing system is to read the parameters of the DL-3400. Log parameter settings so that a thorough record is available for programming the Guardian. See Figures 1-3.

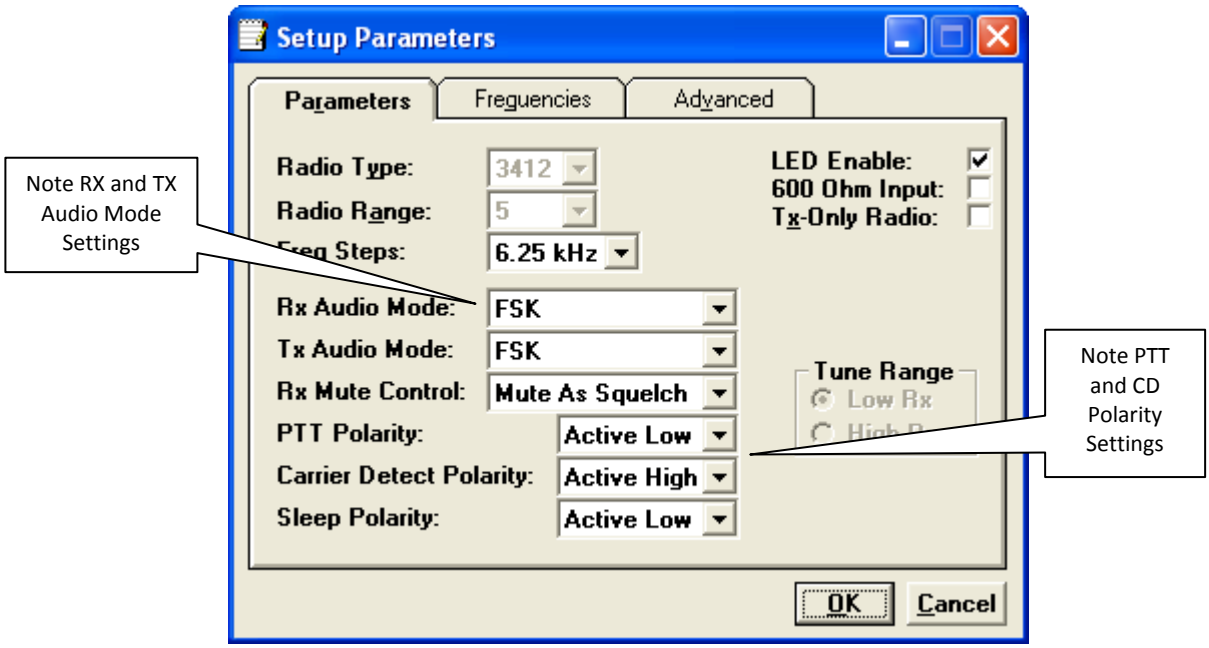

Fig. 1

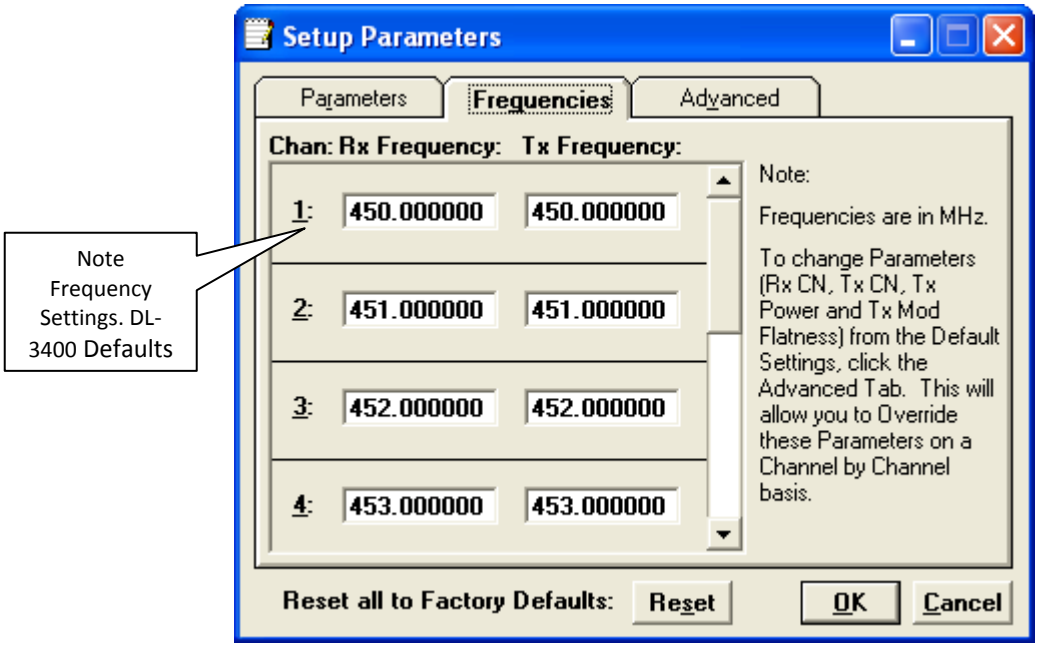

Fig. 2

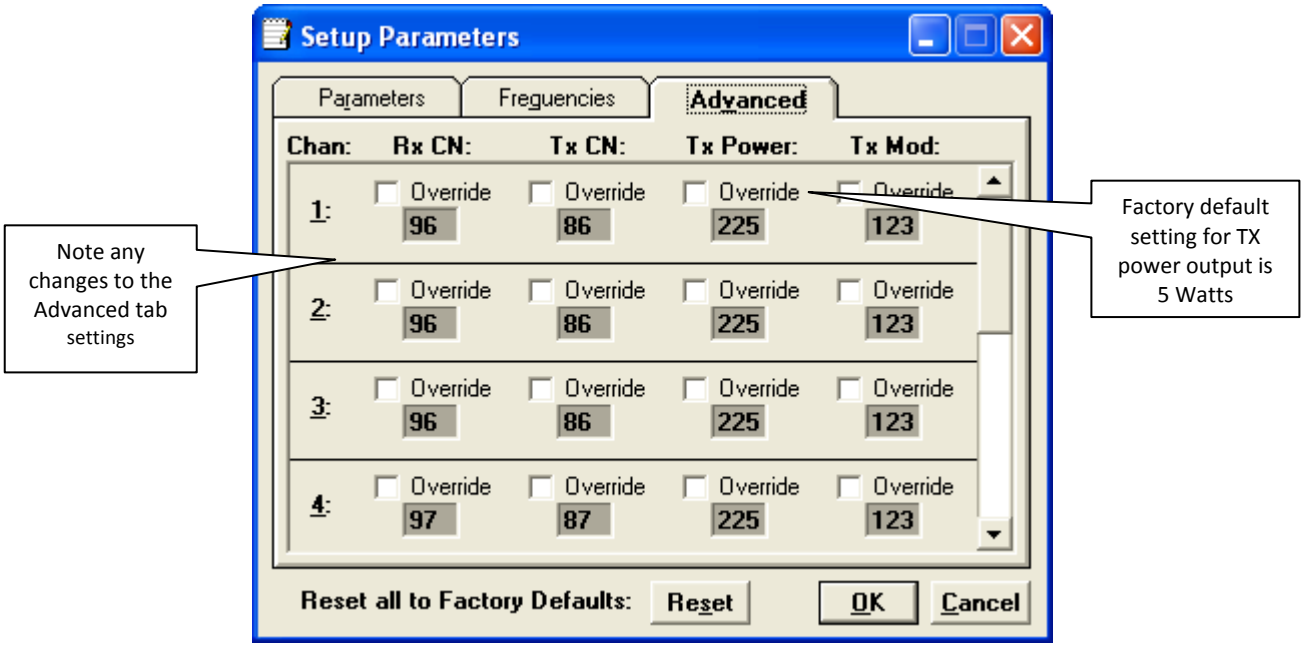

Fig. 3

SET GUARDIAN PARAMETERS

Once the parameters for the existing DL-3400 system are logged, connect the Guardian to proper power supply voltage (10-30 VDC 60 Watt maximum at 10 watt RF power). Connect antenna port to 50 ohm termination. Connect DB-9 to DB-9 data cable (PN# 697-4008-408 or equivalent) to Guardian “Setup” port.

- Note: Guardian FPS is defaulted to COM 1. Change if necessary.
- Programming parameters are 57,600 8, N, 1, DTR – None
- Handshaking should be set to “Buffered with no HS”

With the Guardian connected to proper power source, antenna terminated and programming cable connected to the “Setup” port of the radio/modem, press the “Config” button in the upper left corner as shown in Fig. 4.

Fig. 4

The Guardian FPS will read and display the current configuration of the radio/modem connected to the computer. (Fig. 5). Selection of “Loader” mode will change the configuration screen to allow analog radio settings.

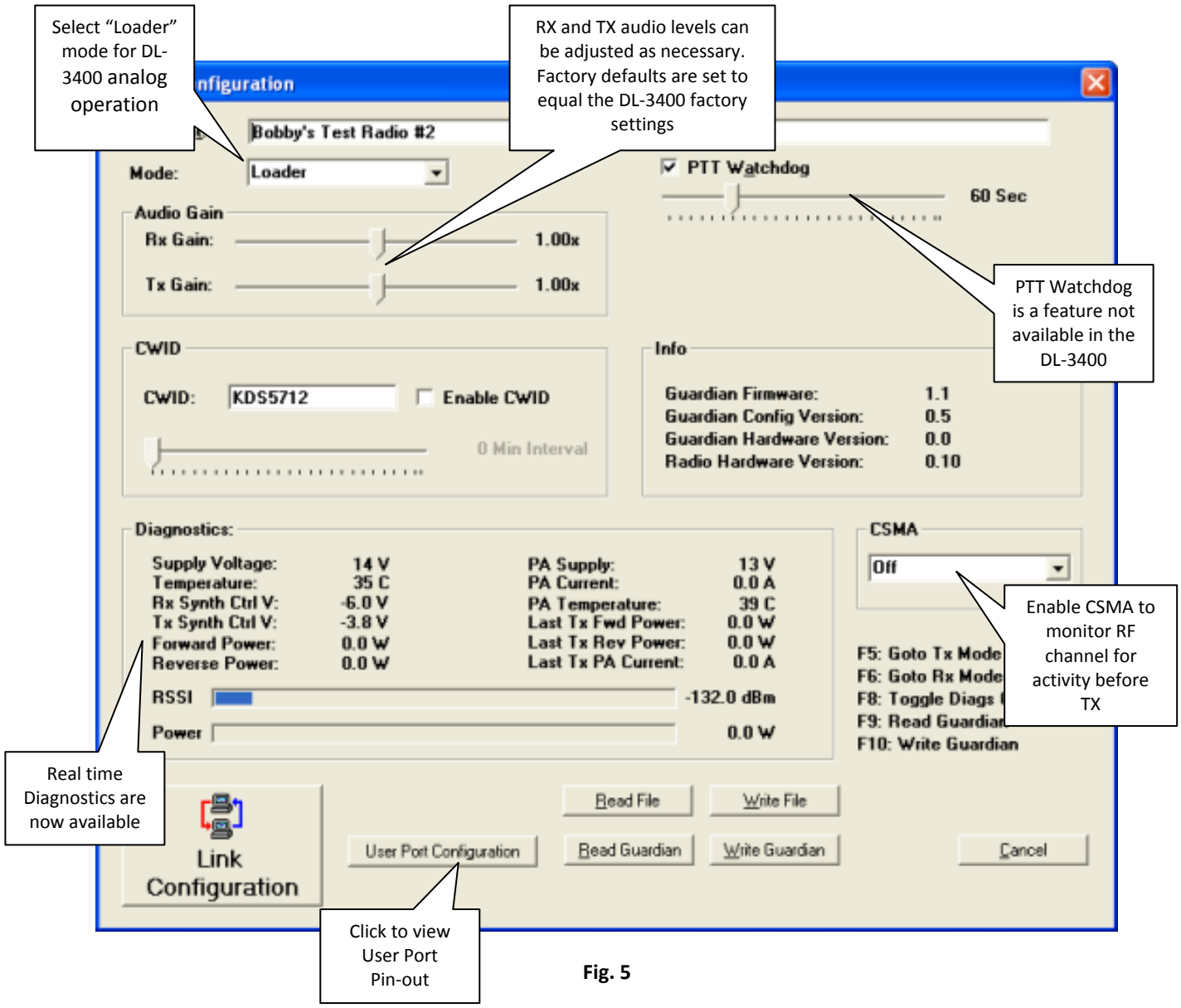

Fig. 5

- The “PTT Watchdog” performs same function as in the T-96SR. This can be adjusted or left at factory default. Note: This feature is not available in the DL-3400 transceiver.
- Information and real time diagnostics are available on this screen.
- CWID is a new feature not available on the DL-3400. Station /License call signs can be transmitted at selected intervals. This feature is used when the analog system shares a ‘Voice Channel’ with another system and is required to identify itself using Morse code. (Fig. 5)
- The Guardian RX and TX audio levels are preset to match the DL-3400 factory levels. These can be adjusted as necessary for the User’s application. See manual 001-5006-000 for additional information. (Fig. 5)
- CSMA (Carrier Sense Multiple Access) is a feature added to the Guardian that is not available on the DL-3400.
    - This feature allows the radio to monitor the RF channel for activity
    - There are two modes to select from when CSMA mode is enabled:
        - No TX when the radio/modem is receiving valid user data
        - No TX when the radio/modem is receiving an RF carrier
        - See Fig. 5
- There is a new feature added to the Guardian that allows the radio to be used as a modem (T-96SR compatible) or to be used as an analog radio (DL-3400 compatible). For this application only the ‘Loader’ mode will be used. (Fig. 5)

LINK CONFIGURATION

Click the “Link Configuration” button to advance to the modem settings. This is the screen that sets the RF channel frequencies and Loader settings. See Fig. 6.

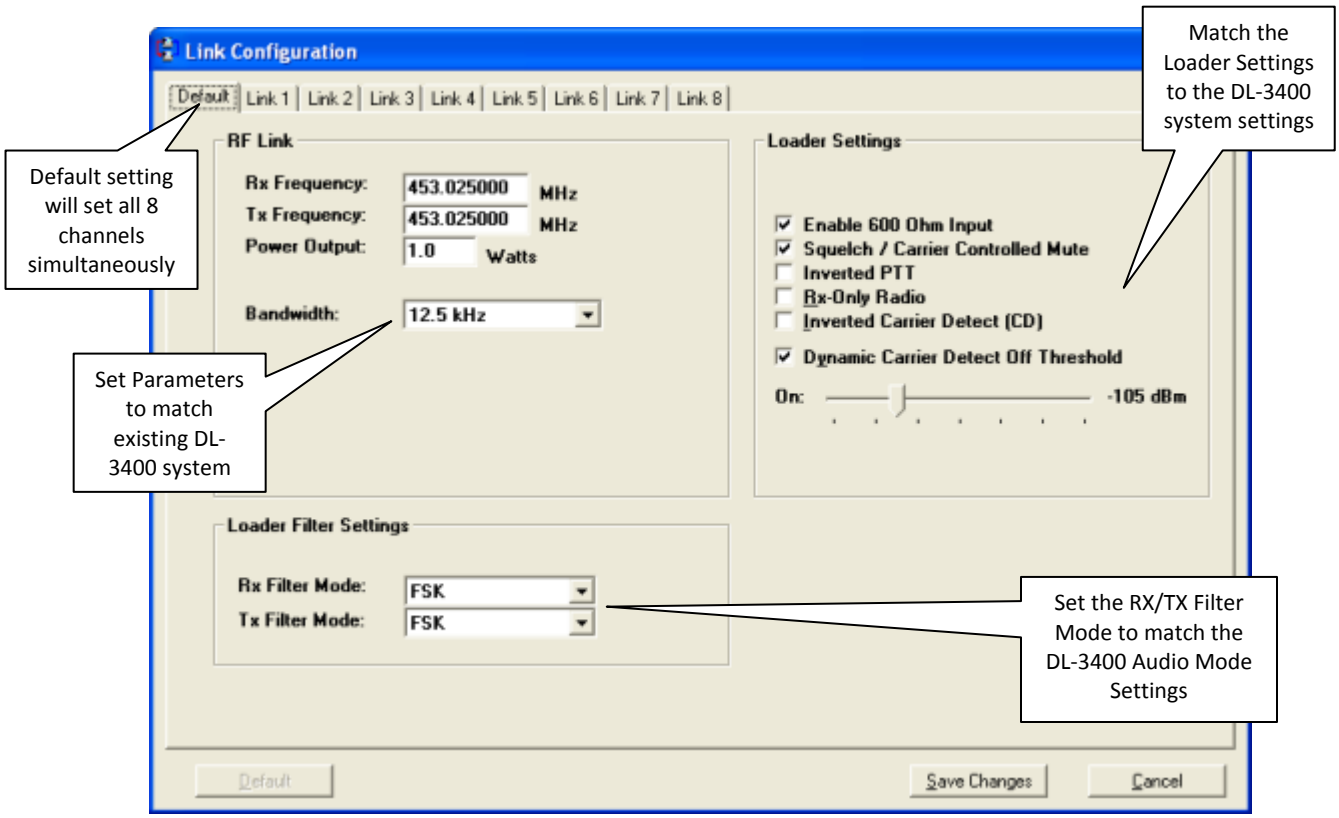

Fig. 6

Unlike the DL-3400 where all 8 channels were programmed one channel at a time, the Guardian has a “Default” setting that will set all 8 channels simultaneously. (Fig. 6)

- Using the information gathered from the DL-3400 programming set the RF Link information to match the system parameters.
- Channel bandwidth is now selectable for either 25 KHz or 12.5 KHz
- Set TX Output Power to desired power level; 1-10Watts
- Select the RX and TX Filter Mode to match the DL-3400 RX/TX Audio Mode (Fig. 6)

Refer to the parameters gathered from the DL-3400 programming to set the “Loader Settings”. Set Squelch, PTT Polarity, RX/TX audio impedance to match the DL-3400 system settings. (Fig. 6)

Dynamic Carrier Detect acts the same as in the T-96SR. The Carrier Sense level is set by selecting the “On” level. This is the RSSI (Receive Signal Strength Indication) or signal strength required to open the squelch setting in the receiver. The Carrier Sense “Off” level is set automatically to 5 dBm below the “On” level. (Fig. 6)

When all parameters are selected and verified to be correct, click “Save Changes” at the bottom of the Link Configuration screen. The Link Configuration screen will close.

The User Port pin-out configuration can be displayed by clicking the “User Port Configuration” button on the User Configuration screen. (Fig. 5)

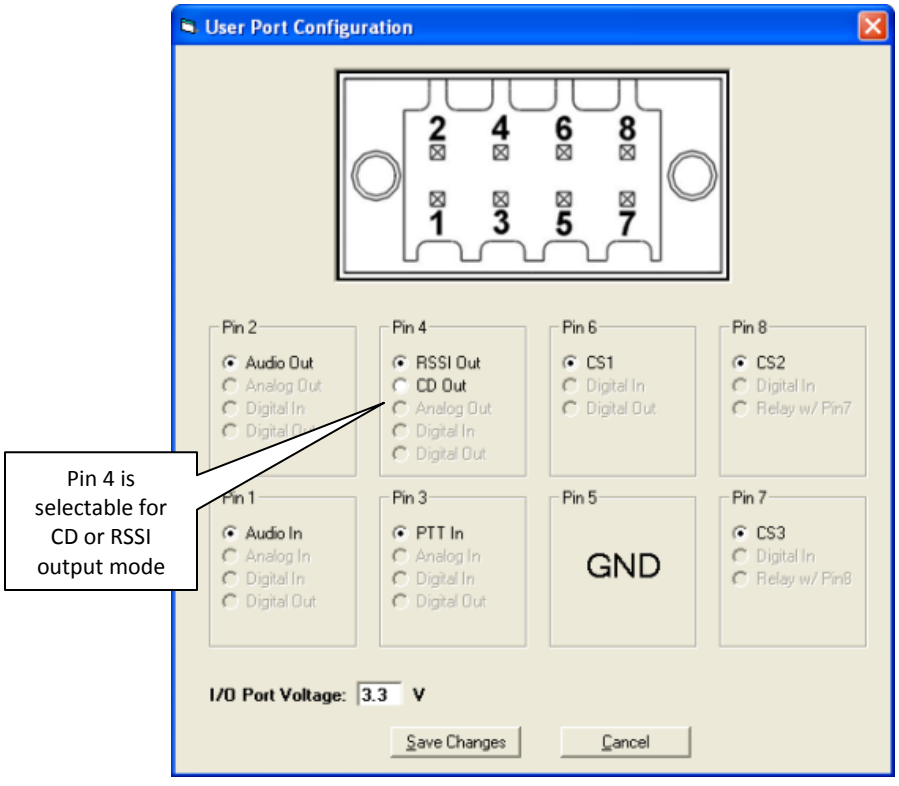

Fig. 7

In ‘Loader’ mode the User Port controls the analog radio functions. Pin 4 can be programmed to provide a Carrier Detect (CD) output; 0-5 VDC or 5-0 VDC. Pin 4 can also be programmed to output the receiver RSSI level as a DC voltage allowing it to be used for system monitoring and control. (Fig. 7)

The following lists the User Interface pin functions in reference to the DL-3400 wiring and cable color code:

Guardian	**DL-3400**
Pin 1 Audio In (TX)	Pin 8 – TX Audio – Yellow Wire
Pin 2 Audio Out (RX)	Pin 10 – RX Audio – White Wire
Pin 3 PTT In	Pin 6 – TX PTT – Orange Wire
Pin 4 CD/RSSI Out	Pin 7 – CD Output – Gray Wire
Pin 5 Ground	Pin 9 – DC Ground – Black Wire
Pin 6 CS1 (Channel Select)	Pin 3 – Freq. Select – Violet Wire
Pin 7 CS3	N/A
Pin 8 CS2	N/A

Note: The Guardian provides for 8 channel selection on the User Interface connector. The DL-3400 allows selection of Channel 1 or 2 on the 10 pin User Interface connector. The remaining channel selection is done using 3 pins on the DB-9 programming connector of the DL-3400.

PROGRAMMING

There are two options for programming the Guardian. There is a “Write Guardian” button used for programming. The other option is to press F10 on the computer keyboard. See Fig. 8.

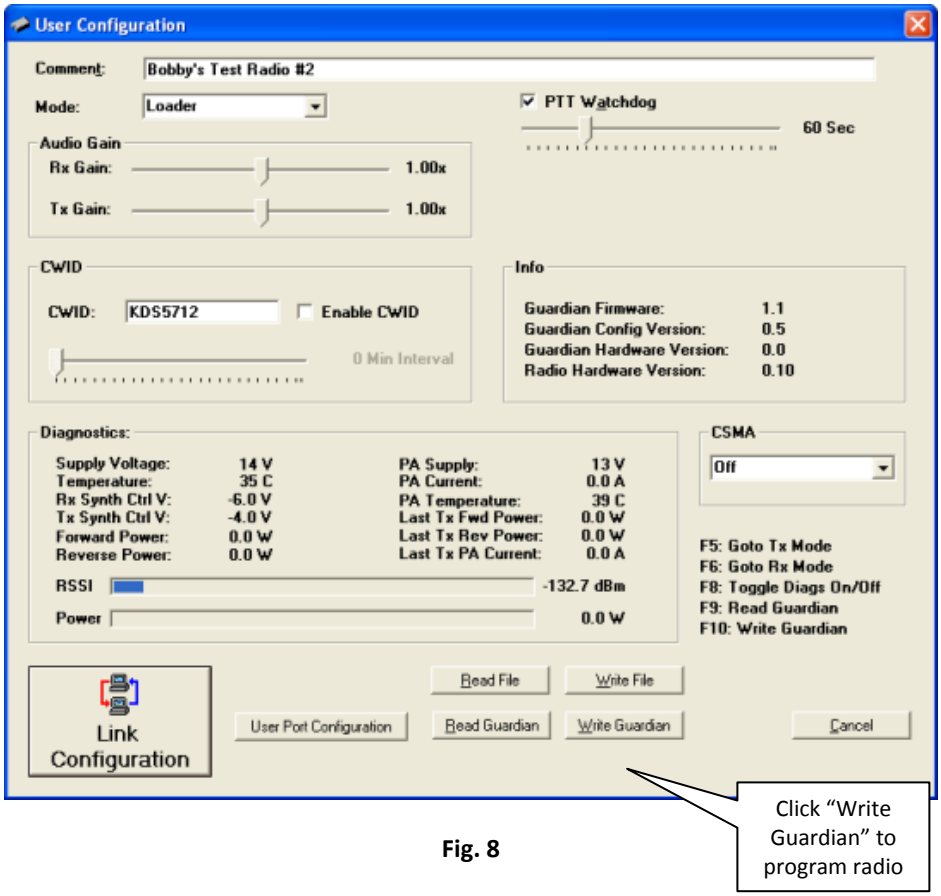

Fig. 8

Fig. 9

Programming of the Guardian is very fast. When complete, click “OK” as shown in Fig. 9

The Guardian has now been configured and is ready for installation.

INSTALLATION

As noted on page 1 and page 2 the Guardian footprint is different than the DL-3400.

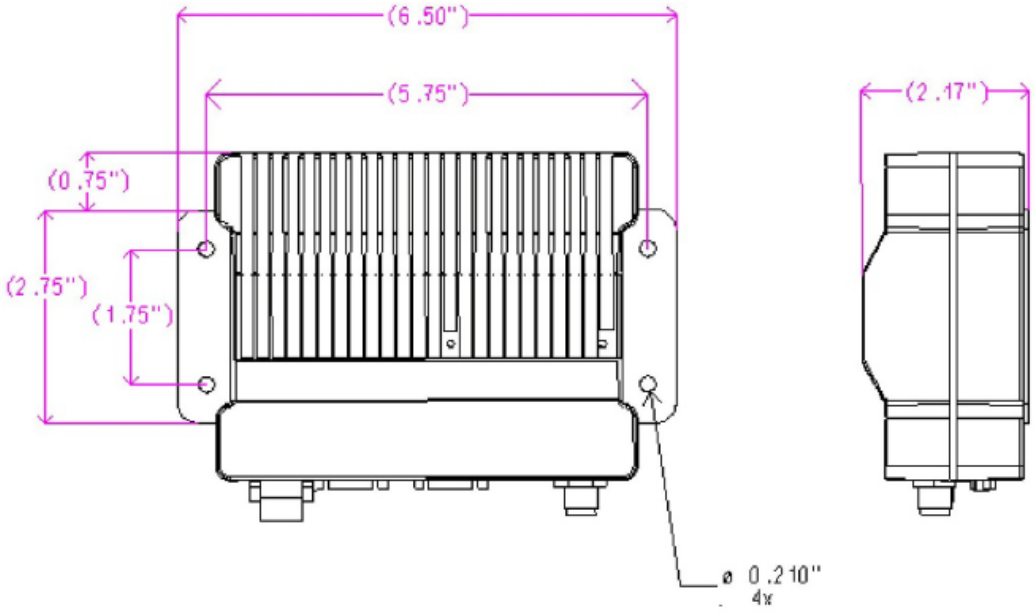

Fig. 10

Figure 10 shows the mechanical dimensions for the Guardian. When mounting the radio, orientation should allow unrestricted airflow from the heat sink fins. If radio location, heat dissipation or duty cycle are a concern, the addition of the Guardian Fan Kit may be considered. The following part numbers are available:

- 150-5008-001 Factory Installed Fan Kit
- 150-5008-002 Field Installed Fan Kit

Contact you sales representative for further information.

Antenna connection is a TNC-Female 50 ohm connector. See page 1 for available cables from CalAmp Corp.

Analog connection is an 8 pin plug-in connector with tension clamp contacts. Radio control and signal connections are made by inserting either a small screwdriver or insertion tool, PN# 250-5006-001 into the connector.

- Strip wire to a maximum of 5/16” or 7 mm for insertion into the connector
- Wire size is from 28 awg to 18 awg and can be either stranded or solid
- Insert screwdriver or insertion tool into the appropriate pin and insert wire
- Remove screwdriver or insertion tool and wire should be locked in place
- Follow the same procedure for removal of wires if necessary

Summary:

Further information is available in the Guardian Technical Manual part number 001-5006-000. This manual is available for download at:

http://www.calamp.com/support/download-library

For technical assistance please contact CalAmp Corp. Wireless Network Group Technical Service at:

wngsupport@calamp.com

Or call 1-507-833-6701 option 1 for Fixed and Legacy products.