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DMS-100 Family

TOPS IWS

Audio Card Configuration and Diagnostics

IWS 17.0 and up

November 2002

NORTEL NETWORKS™

DMS-100 Family

TOPS IWS

Audio Card Configuration and Diagnostics

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1.0 Introduction

The TOPS IWS ISA or PCI Universal Audio Card provides the voice connection between TOPS IWS positions and the DMS switch. This adapter card plugs into a PCI or combination slot on the TOPS IWS platform and connects to the switch through voice cables. The switch transmits voice data digitally to the audio card, with no attenuation of the voice signal. The audio card provides ports for two operator headset jacks.

This document explains how to configure and test both the ISA and the PCI audio cards. It does not explain how to install the audio card hardware or software. Installation is described in *TOPS IWS Base Platform User's Guide*, 297-2251-010, because the audio card software is installed as part of IWS base software installation. The audio card files are part of the IWS base software, which contains the following components:

- Configuration file for the audio card (AUDIOINI.INI)
- Windows-based editing tool for the AUDIOINI.INI file (AUDTOOL.EXE)
- Windows-based audio card diagnostics to test the audio card (WAUDDIAG.EXE)
- PCI audio card flash loader (FLASH32.EXE)

Note: The *Base Platform User's Guide* also describes three audio card options that are set in the IWS initialization file MPXINI.INI. These options tell the IWS base software whether the audio card is installed in the position, whether it has an audio clock connection, and whether the status of the headset should determine the logon and logoff states of the position.

Chapter 2.0, "Hardware configuration," is divided into two sections that cover the two supported versions of the TOPS IWS audio card:

- the Industry Standard Architecture (ISA) card (NTNX52BC)
- the Peripheral Component Interconnect (PCI) card (NTNX52CC)

Turn to one of the following pages for instructions on configuring your version of the audio card:

- For the ISA card, begin on page 11.
- For the PCI card, begin on page 13.

Chapter 3.0, "Software configuration," explains how to use the Windows-based editor called "Audtool" to change the AUDIOINI.INI file. It also describes the audio card configuration file, providing a breakdown of the structure and an explanation of all the possible values.

Chapter 4.0, "Diagnostics," explains the Windows-based audio card diagnostics (WAUDDIAG.EXE) that are used to test the audio card.

Chapter 5.0, "PCI audio card (NTNX52CC) flash loader," explains how to verify that you have the correct firmware release and how to flash load the digital signal processor (DSP)

firmware if necessary. All IWS software at release 10.0 or higher requires DSP release 10.0 or higher firmware.

Note: This document assumes a familiarity with MS DOS and Windows XP Professional environments. Some commands and steps mentioned in this book are described in more detail in MS DOS, Windows XP Professional, and computer hardware documentation.

2.0 Hardware configuration

The first step in configuring audio card hardware depends on which version of the audio card you have. The ISA audio card requires some setup, as described in section 2.1. The PCI audio card is “plug and play,” as described in section 2.2.

2.1 TOPS IWS ISA Universal Audio Card (NTNX52BC)

This section contains instructions for setting the input/output I/O addresses and interrupt levels for the NTNX52BC (TOPS IWS ISA Universal Audio Card) in a Nortel Networks-supported computer platform. *TOPS IWS Base Platform User’s Guide*, 297-2251-010, provides detailed instructions on loading software to support the card.

The ISA bus platform has no automated way to check for or avoid bus conflicts. When adapter cards are plugged into the ISA bus, you must ensure that none of the following settings conflict:

- base (I/O) address
- interrupt levels
- dynamic memory allocation (DMA) channels

The I/O base address and the interrupt levels for the NTNX52BC audio card are determined by the settings of switch S1 on the audio card. The DMA channel is not controlled by switch S1.

Figure 1 shows the location of switch S1 on the NTNX52BC audio card.

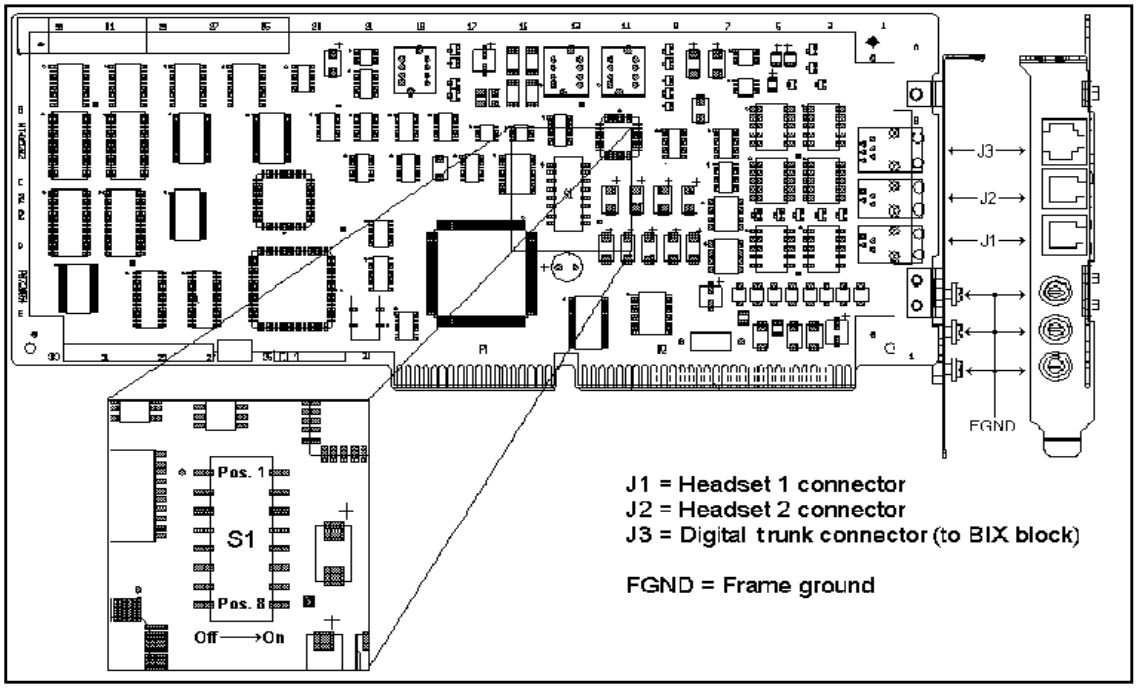

Figure 1. Location of switch S1 on NTNX52BC ISA audio card

2.1.1 Base I/O address

This section explains how to change the base address used by the NTNX52BC audio card. In most cases, the default settings can be used without conflict and no changes are necessary. It may be necessary to change the settings if they conflict with those of other ISA cards in the PC. The eight-position switch S1 on the NTNX52BC audio card controls the base address of the I/O registers and the interrupt line used by the card.

Note: The default setting for switch S1 is all eight positions set to ON.

Table 1 defines S1 switch settings for the four possible register base addresses on the ISA card. The NTNX52BC audio card uses four register locations, each needing four bytes of memory, starting at the address selected as the base address. For example, if 140 hex is the base address, the NTNX52BC audio card has I/O registers at 140, 144, 148, and 14C hex.

Valid settings for the base address are 140, 240, 340, and 440 hex.

Table 1. Base address selection for ISA registers

Switch setting	Base address
position 8 = ON, position 7 = ON	140 hex (default)
position 8 = OFF, position 7 = ON	240 hex
position 8 = ON, position 7 = OFF	340 hex
position 8 = OFF, position 7 = OFF	440 hex

2.1.2 Interrupt levels

Switch S1 on the NTNX52BC audio card is also used to select the interrupt levels. As with the base address, in most cases the default setting causes no conflicts in the PC and does not need to be changed. Table 2 defines the S1 switch settings for valid IRQ interrupts for the NTNX52BC audio card.

Table 2. ISA interrupt level selection

Switch setting	Interrupt level
position 6 = ON, position 5 = ON	IRQ10 (Default)
position 6 = OFF, position 5 = ON	IRQ11
position 6 = ON, position5 = OFF	IRQ 12 **DO NOT USE - Reserved for Windows mouse port interrupt**
position 6 = OFF, position 5 = OFF	IRQ15

Valid values for the IRQ interrupts are 10, 11, and 15.

Note: Interrupt 12 has been removed, because it is used by Windows for the mouse port.

2.1.3 DMA channel

The DMA channel for the NTNX52BC audio card is fixed as channel 3 and cannot be changed by switch S1.

2.2 TOPS IWS PCI Universal Audio Card (NTNX52CC)

The NTNX52CC (TOPS IWS PCI Universal Audio Card) must be used in a Nortel Networks-supported computer platform.

The PCI bus architecture of the NTNX52CC audio card is a “plug and play” design, which means you are not required to change switch settings or interrupt lines. When properly installed, the card is automatically assigned an available interrupt and I/O port by the computer. Figure 2 shows the NTNX52CC PCI audio card.

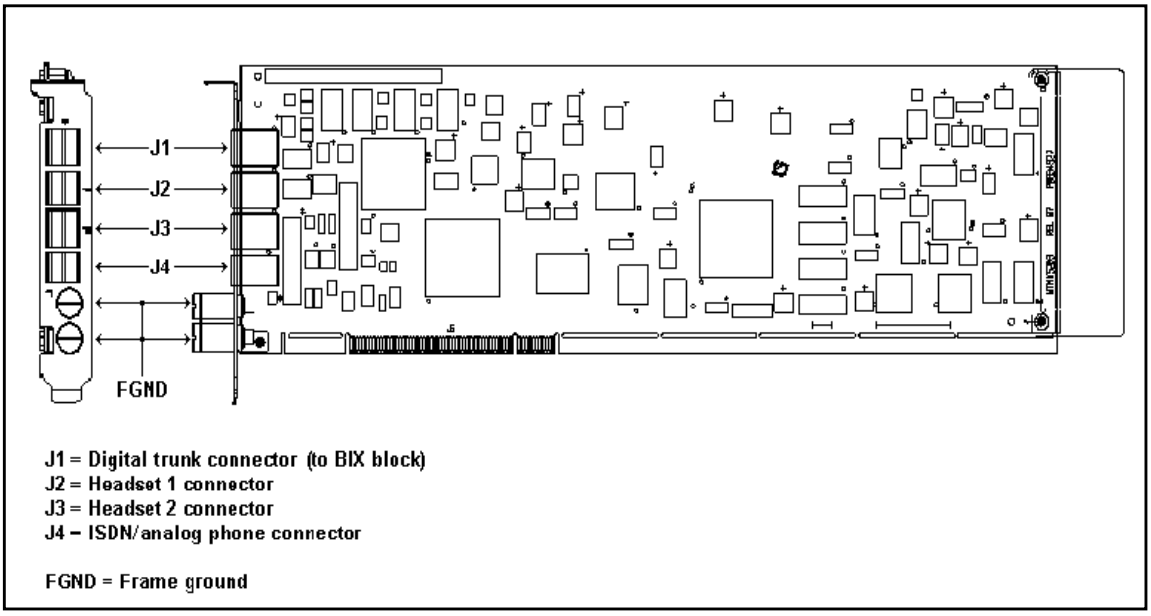

Figure 2. NTNX52CC PCI audio card

Install the software for this card as described in *TOPS IWS Base Platform User’s Guide*, 297-2251-010.

3.0 Software configuration

The configuration data used with the audio card is contained in the audio card initialization file (C:\WINDOWS\AUDIOINI.INI). Both the IWS base software and the audio card diagnostics use the AUDIOINI.INI file.

AUDTOOL.EXE is a Windows program in the IWS base software that provides a graphical interface for changing parameters in the AUDIOINI.INI file. Once Windows is running, this program can be invoked in one of the following ways:

- Open the TOPS IWS program group and select the Audtool icon to run.
- Select Run from the Start menu and enter `C:\MPXBASE\TOOLS\AUDTOOL.EXE` as the program to be run.
- Use the Windows Explorer in the Programs group to select the C:\MPXBASE\TOOLS directory, and select the AUDTOOL.EXE file to run the program.
- Select AUDIOINI from the Run menu of the PVTOOL.EXE application provided with the IWS software.

The AUDIOINI.INI – Audtool Application dialog box has six major sections:

- PCM Conversion
- Trunk Selection
- Headset Type
- Headset Volume
- DTMF Level
- DTMF Duration

Figure 3 shows the AUDIOINI.INI – Audtool Application dialog box.

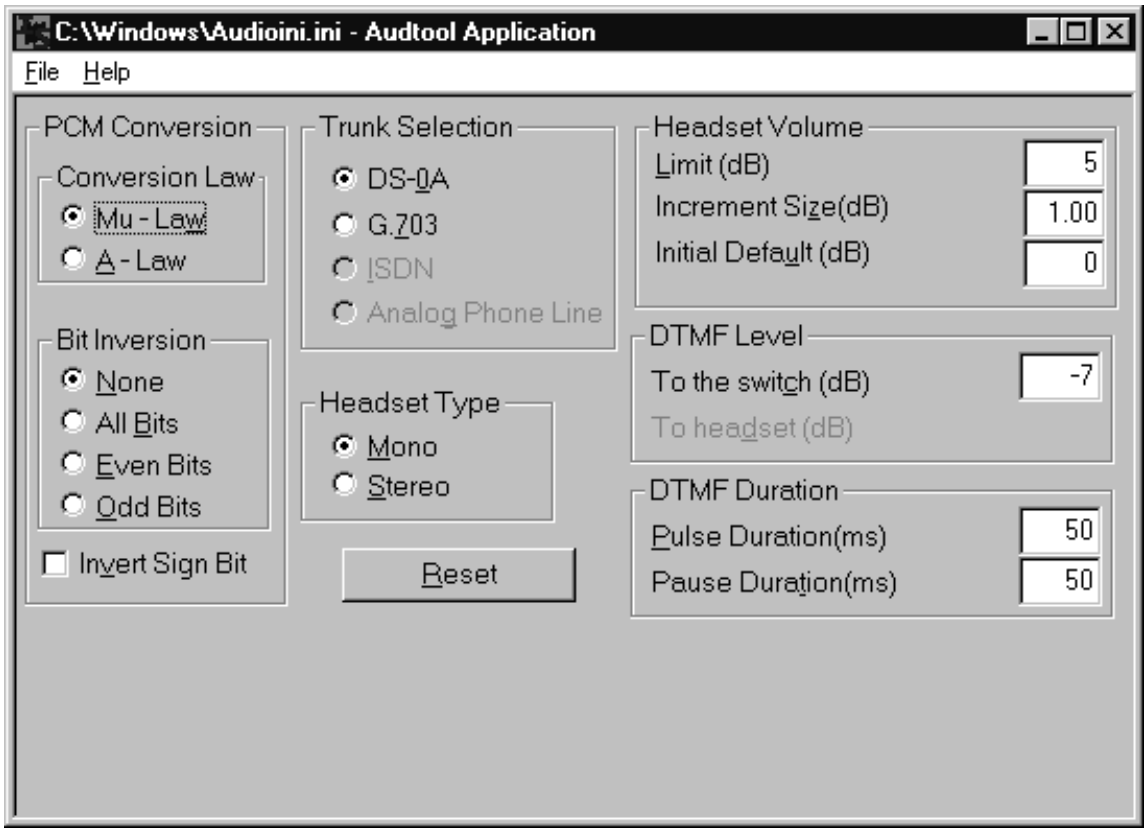

Figure 3. AUDIOINI.INI – Audtool Application dialog box for NTNX52CC

3.1 PCM Conversion

This section displays three choices for pulse code modulation (PCM):

- PCM Conversion Law
- Bit Inversion
- Invert Sign Bit

The specifications set in this section must match the requirements of the network channel bank connection to the IWS audio card.

3.1.1 PCM Conversion Law

PCM Conversion Law can be set to either Mu-Law (default) or A-Law.

This field corresponds to the Conversion field in the AUDIOINI.INI file. In AUDIOINI.INI, this setting selects the PCM Linear conversion for the switch-side audio path. The default value for this setting is 0 (Mu-Law). The following values are valid:

0 = Mu-Law conversion both directions
1 = A-Law conversion both directions

3.1.2 Bit Inversion

Bit Inversion has four possible settings:

- None -- for no bit inversion
- All Bits -- for inversion of all seven data bits
- Even Bits -- for inversion of all even data bits
- Odd Bits -- for inversion of all odd data bits

This field corresponds to the Inversion field in the AUDIOINI.INI file. In AUDIOINI.INI, this setting determines the PCM Linear Bit Inversion for the switch-side audio path. The default value for this setting is 0 (No bit inversion, both directions). The following values are valid:

0 = No inversion both directions
1 = All data bits inverted both directions
2 = Even data bits inverted both directions
3 = Odd data bits inverted both directions

3.1.3 Invert Sign Bit

Invert Sign Bit can be selected to invert the data's sign bit. The default setting is no inversion of the seven data bits or the sign bit.

This field corresponds to the SignBit field in the AUDIOINI.INI file. In AUDIOINI.INI, this setting determines the PCM Linear Sign Bit Inversion for the switch-side audio path. The default value for this setting is 0 (No Sign bit inversion). The following values are valid:

0 = Sign bit not inverted
1 = Sign bit inverted

3.2 Trunk selection

This section displays choices for one of four digital trunk options:

- DS-0A (default)
- G.703
- ISDN (not currently supported)
- Analog phone line (not currently supported)

The ISA card (NTNX52BC) can be used only with a DS-0A trunk. If an ISA card is installed, the radio buttons are not activated and the default trunk option (DS-0A) is automatically used.

The radio buttons are activated only if the PCI Audio Card (NTNX52CC) is installed. The specifications set in this section must be selected so that they match the digital trunk being used.

This field corresponds to the Trunk field in the AUDIOINI.INI file.

3.3 Headset Type

This section displays choices for either a monaural (mono) or a stereo headset jack assembly. The ISA card (NTNX52BC) can be used only with mono headsets. If an ISA card is installed, the two radio buttons are not activated, and the default headset type option (mono) is automatically used.

Note: The radio buttons are not activated when the PCI audio card (NTNX52CC) is installed, because the use of stereo headsets is not currently supported.

This field corresponds to the Headset field in the AUDIOINI.INI file.

3.4 Headset Volume

This section displays choices for Limit, Increment Size, and Initial Default.

3.4.1 Headset Volume Limit

The Headset Volume Limit allows you to limit the range by which the position headset volume can be increased or decreased. The value for this field is in dB, and the valid range can be set to any whole number from 1 to 16. For example, a volume limit setting of 5 specifies a range from -5dB to +5dB. The initial default setting for this field is 5dB.

This field corresponds to the VolumeLimit field in the AUDIOINI.INI file.

3.4.2 Headset Volume Increment Size

The Headset Volume Increment Size allows you to specify the incremental rate by which the headset volume can be increased or decreased. The value for this field is in dB. For the ISA card (NTNX52BC) the valid range is from 0.25dB to 16dB, in increments of 0.25dB. For the PCI audio card (NTNX52CC) the valid range is from 0.25dB to 6dB, in increments of 0.25dB. For both versions of the audio card, the initial default setting for this field is 1dB.

This field corresponds to the VolumeIncrement field in the AUDIOINI.INI file. In the AUDIOINI.INI file, VolumeIncrement determines the size of the amounts by which the volume can be increased or decreased. The valid range for the NTNX52BC (ISA) audio card is from 1 to 64 (0.25 dB to 16.0 dB) in increments of 1. The valid range for the NTNX52CC (PCI) audio card is from 1 to 24 (0.25 dB to 6.0 dB) in increments of 1. Thus each incremental increase or decrease of 1 represents a 0.25 dB change. For example: a setting of 24 would equal a 6.0 dB increment. The default setting for this parameter is 4 (a 1 dB increment).

Note: The step increment and range for this parameter differ between the Audtool and the AUDIOINI.INI file. The Audtool application uses 0.25 dB steps over the valid range of the installed audio card, whereas AUDIOINI.INI uses increment steps of 1. For example,

an Audtool Application setting of 4.0 dB would equal an AUDIOINI.INI setting of 16.

The Audtool automatically limits the increment size to the valid range for the installed audio card. If the VolumeIncrement variable in the AUDIOINI.INI file is manually set to a value greater than that allowed for the installed audio card, an IWS initialization error occurs during restart.

If the Increment Size setting is set higher than the Limit setting, the headset volume is clipped to the value set by the Limit setting.

3.4.3 Headset Volume Initial Default

The Headset Volume Initial Default allows you to set a default headset volume. The initial default is dependent upon the value entered in the Limit field. If the Limit field is set to 16, the Initial Default field can be set from -16dB to +16dB. If the Limit field is set to 5, the Initial Default value can be set only between -5dB and +5dB.

If this field is set, it is used during initialization of the IWS position; otherwise, an IWS default setting of 0dB is used. Both the PCI and the ISA audio cards default back to this setting at login, unless the person logging in is the same one who last logged off the position. In this case, the position does not revert to the default volume level but instead retains that operator's previous volume adjustments.

This field corresponds to the VolumeDefault field in the AUDIOINI.INI file. In AUDIOINI.INI, the VolumeDefault option determines the decibel level to which the headset volume defaults at login. The value in this field must be within the limits of the decibel range set by the VolumeLimit option. For example, if the VolumeLimit option is 16, the range of valid values for the VolumeDefault option is +/-16dB. If the VolumeLimit option is set at its default value of 5, the range of valid values for this option is +/-5dB. If this field is commented out, the default value is 0.

3.5 DTMF Level

This section displays choices for DTMF transmission levels to the switch and to the headset. These two selections are used only with the ISA audio card (NTNX52BC). When the PCI audio card (NTNX52CC) is used, the DTMF Level To Headset option is ignored.

3.5.1 DTMF Level To the switch

The valid range of values for DTMF Level To the switch is from -32dB to -1dB in increments of 1dB. The default setting is -7 dB.

Note: For the ISA audio card (NTNX52BC), setting the To the switch value to 32 (-32dB) mutes the DTMF to the switch. The PCI audio card (NTNX52CC) does not support muting DTMF to the switch.

This field corresponds to the DTMFSwitchLevel field in the AUDIOINI.INI file. In AUDIOINI.INI, this setting sets the DTMF transmission level to the switch. The value is

in -dB and the valid range is 1 to 32 (-1 dB to -32 dB). The default value is 7 (-7 dB).

Note: The Audtool entry for this parameter is in the range from -1 to -32 (in dB), while the AUDIOINI.INI setting is in the range from 1 to 32 (in -dB).

3.5.2 DTMF Level To headset

Note: This option applies only to the NTNX52BC card. It is not currently supported on the NTNX52CC card.

The valid range of values for the DTMF Level To headset is from -47dB to -1dB. For the -1dB to -15dB range, the DTMF level to the headset can be set in 1 dB increments. For the -16dB to -47dB range, only odd-numbered settings are allowed. For example, settings of -17dB or -47dB are allowed, but settings of -16dB or -46dB are not allowed. The default setting for the DTMF level to the headset is -11 dB.

Note: An exception to this statement is that setting the To the switch value to -32dB mutes the DTMF to the headset.

This field corresponds to the DTMFHdsetLevel field in the AUDIOINI.INI file. In AUDIOINI.INI, this setting determines the DTMF transmission level to the headsets. The value is in -dB, and the valid range is 1 to 15 (-1 dB to -15 dB) in 1 dB increments, and 16 to 31 (17 dB to -47 db) in 2 dB increments. The default value of this setting is 11 (-11 dB).

Note 1: A setting of 32 (-32 dB) is also valid. Setting the value of this parameter to 32 mutes the DTMF to the headset.

Note 2: The Audtool entry for this parameter is entered as a negative number in the range -1 to -47 (in dB), while the AUDIOINI.INI setting is entered as a positive number in the range from 1 to 47 (in -dB).

3.6 DTMF Duration

This section displays choices for Pulse Duration and Pause Duration. The range of acceptable values for both selections is from 10ms to 250ms in increments of 10.0ms. The default value for both the pulse duration and the pause duration is 50ms.

Note 1: If you enter a value within the acceptable range but not in the correct increment, the entry is rounded down to the next valid setting when you save the new file entries.

Note 2: The Audtool automatically limits the pulse duration and pause duration to the valid range. If you enter an invalid value and try to save the new setting, an error message is displayed stating that the valid range for these entries is from 10ms to 250ms. The exception is the value range from 251ms to 259ms. Entered values between 251ms and 259ms are automatically rounded down to 250ms when the new settings are saved.

3.6.1 Pulse Duration (ms)

This field corresponds to the DTMFPulseDur field in the AUDIOINI.INI file. This setting

determines the DTMF pulse duration for the DTMF signals generated. The value is in 10 ms increments, and the range is 1 to 25 (10 ms to 250 ms), with a default of 5 (50 ms).

3.6.2 Pause Duration (ms)

This field corresponds to the DTMFPauseDur field in the AUDIOINI.INI file. This setting determines the DTMF pause duration between DTMF signals generated. The value is in 10 ms increments, and the range is 1 to 25 (10 ms to 250 ms), with a default of 5 (50 ms).

3.7 Saving changes made using Audtool

The menu at the top of the dialog box allows you to save the changes or open a different file. You can save the changes made by selecting Save from the File menu. This action saves the changes to the file you are currently editing. (The name of the file you are currently editing is shown on the title bar of the dialog box.) You can save the changes to a different file by selecting Save As from the File menu. A dialog box asks you to specify the name of the file to which to save the changes.

You can also open a configuration file by selecting Open from the File menu. If the file opened is not in the format of the initialization file of the audio card, a message box asks whether the file should be opened anyway. To avoid saving the changes, you can select the Reset button. This sets all the parameters to their last saved values.

If you make changes and select Exit from the File menu without saving the changes, a dialog box asks whether the changes made should be saved. Values entered in the edit boxes are not checked for validity until the file is saved. If an invalid value has been entered, a message box is displayed showing the allowed range of values. After a save, the display shows the values saved to the AUDIOINI.INI file.

3.8 AUDIOINI.INI file

This section provides an example of the AUDIOINI.INI file, which the IWS base application uses to configure the audio card installed in each IWS position.

The AUDIOINI.INI file is located in the C:\WINDOWS directory.

3.8.1 AUDIOINI.INI format

The AUDIOINI.INI file includes comment lines, which begin with a semicolon, and sections, which are composed of entries. An entry can have an integer value or a string value. This is the basic form of the file:

```
; Comment
[section name]
entry=value
```

3.8.2 AUDIOINI.INI example

The following example shows the sections and entries that make up the AUDIOINI.INI file. Sample values are included for each entry.

```
[mpxaudio]

;*********************************************************************
; Note: These settings are only valid for the NTNX51BE,
;       the NTNX52BC, and the NTNX52CC audio cards.
;       These settings will be ignored if an earlier version
;       of the audio card is installed.
;*********************************************************************

; Changes the limit to which you can increment or decrement
; the volume using the "volume up" or "volume down" commands.
; The value is in dB, and the valid range for this field is 1 to 16
; The default value is 5 if this field is commented out.

VolumeLimit=5


;*********************************************************************
; Change the increment by which the volume is incremented or
decremented
; when using the "volume up" or "volume down" commands.
;
; For NTNX52BC audio card: The value is in .25 dB increments, and the
; valid range for this field is 1 to 64.
; (1=.25db increments, 64=16db increments)
;
; For NTNX52CC audio card: The value is in .25 dB increments, and the
; valid range for this field is 1 to 24.
; (1=.25db increments, 24=6db increments)
;
; The default value is 4 (1db increment) if this field is commented
; out.
; Note: The volume will be clipped to the value set by the VolumeLimit
;       if the VolumeIncrement is set higher than the VolumeLimit.

VolumeIncrement=4


;*********************************************************************
; The headset volume default is used during initialization of the IWS.
; The value is in dB, and the valid range for this field is any + or -
; integer value within the range, including the value itself set by the
; volume limit field. For example, if limit is 5, volume default then
; can be 5, 4, 3, 2, 1, 0 -1, -2, -3, -4, -5.
; The default value is 0 if this field is commented out.


VolumeDefault=0
```

```
;*********************************************************************
; Selects the PCM Linear conversion for the switch side.
; The default is Mu-law, noninverting, and sign bit noninverting
; if these fields are commented out.
;
; Valid values for Conversion field are:
;
; 0=Mu-Law conversion both directions
; 1=A-Law conversion both directions
; 2=Mu-Law conversion from switch
; 3=A-Law conversion from switch
; 4=Mu-Law conversion to switch
; 5=A-Law conversion to switch
;
; Valid values for Inversion field are:
;
; 0=No inversion both directions
; 1=All data bits inverted both directions
; 2=Even data bits inverted both directions
; 3=Odd data bits inverted both directions
; 4=No inversion from switch
; 5=All data bits inverted from switch
; 6=Even data bits inverted from switch
; 7=Odd data bits inverted from switch
; 8=No inversion to switch
; 9=All data bits inverted to switch
; 10=Even data bits inverted to switch
; 11=Odd data bits inverted to switch
;
; Valid values for SignBit field are:
;
; 0=Sign bit not inverted
; 1=Sign bit inverted

Conversion=0
Inversion=0
SignBit=0

;*********************************************************************
; Select the DTMF transmission levels to the switch and headset.
; The default is -7db for the Switch level and -11db for the
; headset level if these fields are commented out.  Valid ranges for
; these fields are:
;
; DTMFSwitchLevel: 1 to 31 (-1dB to -31dB)
;                  32      (Mutes DTMF to switch, this mute
;                          functionality is NOT supported for PCI
;                          audio card)
;
; DTMFHdsetLevel:  1 to 15  (-1dB to -15dB, in 1dB increments)
;                  16 to 31 (-17dB to -47dB, in 2dB increments)
;                  32       (Mutes DTMF to headsets)
;
```

```
DTMFSwitchLevel=7
DTMFHdsetLevel=11

;*********************************************************************
; Select the DTMF on and off durations of the DTMF signals generated.
; The default is 50ms for the pulse duration and the pause duration if
; these fields are commented out.
;
; The values are in 10ms increments, and the valid ranges for these
; fields are:
;
; DTMFPulseDur: 1 to 25 (10ms to 250ms)
;
; DTMFPauseDur: 1 to 25 (10ms to 250ms)

DTMFPulseDur=5
DTMFPauseDur=5

;*********************************************************************
; The remaining settings only apply to NTNX52CC PCI audio cards.
; Select the type of headset being used, and the trunk to use.
;
; headset: 0=mono headsets (default)
;          1=stereo headsets
;
; trunk: 0=DS0-A (default)
;        1=G.703
;        2=ISDN
;        3=POTS
;

headset=0
trunk=0

;*********************************************************************
; The Diagnostics section was added as an information only section.
; Nothing is done with the following information. It is for field
; support personnel use only and just shows the last date/time that
; the Diagnostics application was run.
[Diagnostics]
```

4.0 Diagnostics

The IWS base diskettes include a Windows-based diagnostics program for the IWS audio card. This section describes how to run the diagnostics.

After installation, the Windows-based audio card diagnostics reside in the file WAUDDIAG.EXE in the C:\MPXBASE\TOOLS directory. This application must be run from Microsoft Windows after the IWS audio card driver has been installed. It cannot be run while the IWS base application is running. If the IWS base application is running, press **Ctrl**+**Alt**+**Del**, select MPX Base Application, tab to the End Task button, and press **Enter**.

Windows provides several options for running the diagnostics. Below are three possibilities:

- Select Run from the Start menu, then type `C:\MPXBASE\TOOLS\WAUDDIAG.EXE`, and press **Enter**.
- Open the TOPS IWS program group and select Audio Card Diags.
- Use Windows Explorer in the Programs menu to select first the C:\MPXBASE\TOOLS directory and then within that, WAUDDIAG.EXE.

Figure 4 shows the main Audio Card Diagnostics window after WAUDDIAG.EXE is run. In this figure the firmware version is 10.00; however, the version number displayed may differ from the one shown.

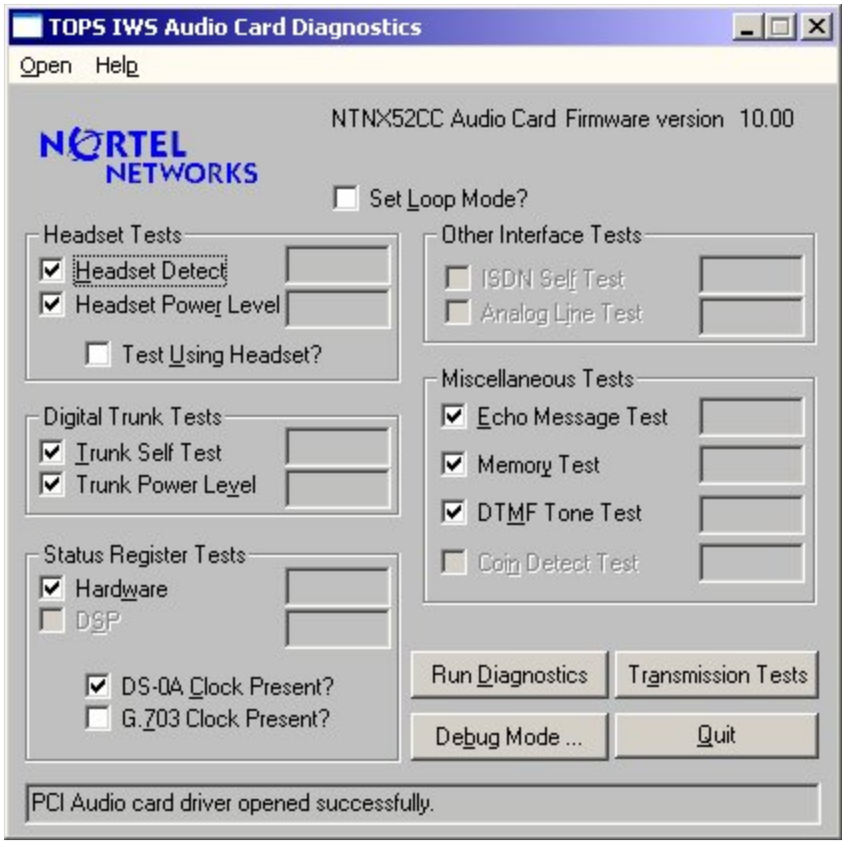

Figure 4. Main window for Audio Card Diagnostics

While tests are not executing, you can use the **Tab** key to jump from control to control and press the spacebar to make a selection. You can also use the **Alt** key with any underlined letter to select that particular control. Each control item has a unique letter or number underlined for this purpose. For example, **Alt+S** toggles the check box for the DSP status register test. To exit the program, either select the Quit button (or press **Alt+Q**) or select the right topmost button on the dialog box (the icon with an **X** in it). To choose debug mode or transmission test, select their respective buttons in the lower right corner of the diagnostics main window.

At the top of the screen is the audio card version that is detected by the audio card driver. The main tests are divided into five areas:

- headset tests
- digital trunk tests
- status register tests
- other interface tests
- miscellaneous tests

Only tests that are valid for the current audio card are enabled. The check box to the left of

each test specifies whether the test is enabled. The default is to run all valid (enabled) tests for the installed audio card. To select the options of testing using headsets, loop mode, and DS-0A clock present, select their corresponding check boxes.

To select loop mode, tab to the Set Loop Mode? field and then press the spacebar to check the box. If loop mode is selected, an Actual Count box, an Error Count box, and a Stop on 1st Error? box are displayed near the Set Loop Mode? box, as shown in Figure 5. The Actual Count box keeps track of which loop of the diagnostics is being executed. The Error Count box keeps track of how many tests have failed so far. Note that this number may be larger than the Actual Count number, since multiple tests can be run for each loop, and the diagnostics program counts the number of tests that fail, not the number of loops with failures. If the Stop on 1st Error? box is checked, the diagnostics stop immediately after the first test failure.

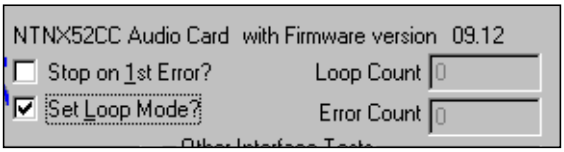

Figure 5. Checking the "Set Loop Mode?" box

When you have selected all the tests you want, select the Run Diagnostics button to execute the tests. Before any tests are run, a dialog box appears, as shown in Figure 6, prompting you to remove any headsets that are plugged in to the audio card headset jacks. After disconnecting all attached headsets, tab to the OK button and press **Enter**.

As the tests run, each selected test displays the word `Testing` in the box to the right of the test name. After the test is completed, the word `Passed` or `Failed` is displayed in the box to the right of the test name to indicate the result of that test. All messages appear in the IWS Diagnostic Message Monitor window (for details, see Figure 10, "IWS Diagnostic Message Monitor window," on page 38). Once test execution has begun, the Run Diagnostics button changes to the Stop Diagnostics button. All other buttons and options are disabled. To stop the diagnostics after the currently running test finishes, press the spacebar. The instruction `Hit spacebar to stop test execution` is displayed whenever the tests are running.

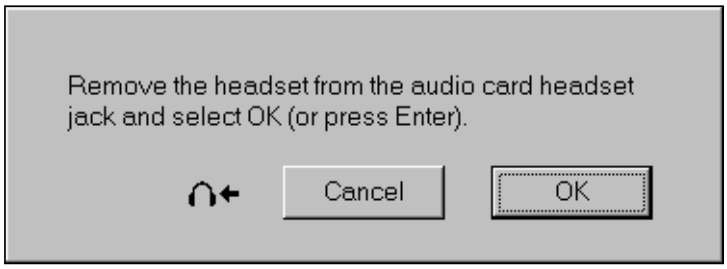

Figure 6. Prompt for removing headsets before test execution

4.1 Windows audio card test descriptions

This section describes each audio card test performed by the Windows-based diagnostics.

4.1.1 Headset tests

Headset Detect (valid for NTNX52BC and NTNX52CC)

This test verifies that the headset insertion and removal circuitry of the audio card works properly. It tests both headset 1 and headset 2 (and also both mono and stereo headset detection in the case of an NTNX52CC PCI Audio Card). Any errors detected are displayed in the IWS Diagnostic Message Monitor window shown in Figure 10, “IWS Diagnostic Message Monitor window,” on page 38, together with an indication of which specific headset interfaces are faulty.

If you do not select Test Using Headsets?, the diagnostics program simulates headset insertion by setting the headset loopback relays. It simulates headset removal by performing a software reset to open the headset relay.

If you select Test Using Headsets?, the actual headset hardware is used to verify the headset insertion and removal circuitry. After you select Run Diagnostics, then insert the headset as directed, and select OK, the diagnostics program checks for headset insertion. Next you are prompted to talk into the headset to verify that the voice path is working correctly. If the voice path is working correctly, select the Passed button; otherwise, select Failed.

If you select Failed, an error message is displayed in the message window and you are asked to remove the headset from the audio card headset jack. After removing the headset, select the OK button to continue.

After the OK button is selected, the diagnostics program tests for the removal of the headset. Headset jack 2 is then tested in the same manner.

Headset Power Level (valid for NTNX52BC and NTNX52CC)

This test verifies the power level of a 1 kHz 0.0 dBm0 signal sent from the digital signal processor (DSP) to the headset being tested and looped back to the DSP. It tests the paths to both headset jack 1 and headset jack 2. (For PCI cards, it tests three different cases: mono mode, stereo mode with left channel looped, and stereo mode with right channel looped for each headset.) The test is not affected by the Test Using Headsets? selection. If the power level read is not within the acceptable range, the power level measured is displayed, along with an error message in the IWS Diagnostic Message Monitor window.

4.1.2 Digital trunk tests

Digital Trunk Self Test (valid for NTNX52BC and NTNX52CC)

The Digital Trunk Self Test verifies that the path from the DSP to the digital voice trunk is working properly. In the case of the NTNX52CC PCI Audio Card, it tests both the DS-0A and the G.703 digital trunk.

DMS Power Level Receive Test (valid for NTNX52BC and NTNX52CC)

The DMS Power Level Receive Test verifies the correct received power level of a 1 kHz 0 dBm0 signal sent out to the digital trunk. The received power level should be within 0.5 dBm0. The test ends with a software reset to ensure that the digital trunk relay is open after the test. On a failure, the power level read is displayed along with an error message.

For the NTNX52CC, the signal is sent to both the DS-0A and the G.703 digital trunk, one after the other, and the power level of the signal received from each trunk is tested and verified.

4.1.3 Status register tests

Hardware Status Register (valid for NTNX52BC and NTNX52CC)

This test verifies that all the bits in the hardware status register are set properly. You must specify whether an external DS-0A composite clock or a G.703 clock is present on the trunk interface. If no clock is present, deselect the DS-0A Clock Present? and G.703 Clock Present check boxes to verify that the Digital Trunk Clock Loss bit in the hardware status register matches with what you have specified. Remove all headsets from the headset jacks. For PCI audio cards, in addition to the Digital Trunk Clock Loss bit, the diagnostics program also tests the Mono/Stereo Mode bit and the DS-0A/G.703 bit. Any error messages are displayed in the IWS Diagnostic Message Monitor window, together with the value read from the register.

DSP Status Register (valid for NTNX52BC)

This test is similar to the hardware status register test. It verifies that all the bits in the DSP status register are set properly. Also, as in the hardware status register test, you must specify whether an external DS-0A composite clock is present in the trunk interface. If the DS-0A clock is not present, deselect the DS-0A Clock Present? check box to verify that the “Digital Trunk Clock Loss” bit in the DSP status register matches with what you have specified. Also, remove all headsets from the headset jacks. Any error messages are displayed in the IWS Diagnostic Message Monitor window, together with the value read from the register.

4.1.4 Miscellaneous tests

Echo Message Test (valid for NTNX52BC and NTNX52CC)

This test verifies the message interface between the PC and the audio card. The audio card is set up to echo any bytes received back to the PC, and the PC sends a series of bytes to test the interface. If a failure occurs, the bytes sent and received are displayed along with the error message.

Memory Test (valid for NTNX52BC and NTNX2CC)

This test consists of two parts: the ROM test and the RAM test. Any error messages are shown in the IWS Diagnostic Message Monitor window.

DTMF Tone Test (valid for NTNX52BC and NTNX2CC)

This test verifies the signal levels of each of the eight possible tones used in DTMF signaling on the digital trunk (697 Hz, 770 Hz, 852 Hz, 941 Hz, 1209 Hz, 1336 Hz, 1477 Hz, and 1633 Hz). The power level for each tone should be between -6.5 dBm0 and -7.5 dBm0. Any failure in power level causes a display of the power level read along with the error message.

For the NTNX52CC, the test sends DTMF tones out a trunk that has been looped, and tests to see whether they are detected properly by the DSP.

4.2 .Transmission tests

The dialog box shown in Figure 7 is displayed when you select the Transmission Tests button from the main Audio Diagnostics window. This dialog box allows you to set up the audio card for various transmission tests.

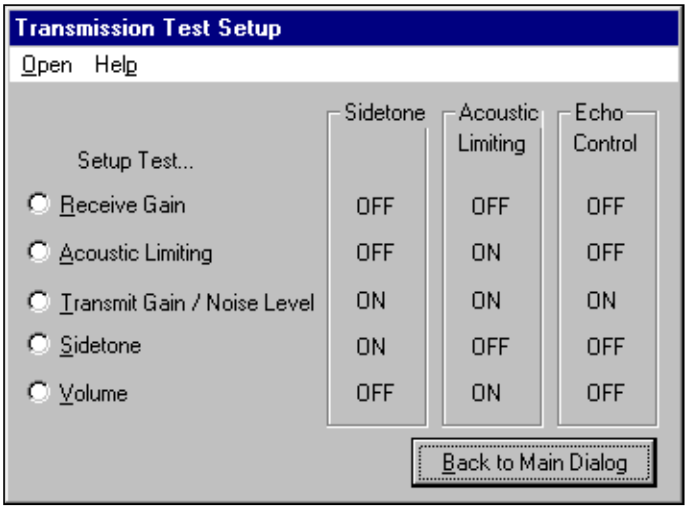

Figure 7. Transmission Test Setup dialog box

Each of the possible transmission test setups is listed, along with how each affects sidetone, acoustic limiting, and echo control. When the dialog box is first displayed, none of the tests is selected. Only one setup can be selected at any time. Once you have selected

a test to run, select the Back to Main Dialog button to close the dialog box. Closing the dialog box DOES NOT reset the settings selected until tests on the main window are run or Debug Mode is entered.

4.3 Debug mode

The dialog box in Figure 8 is displayed when you select the Debug Mode button from the main Audio Diagnostics Window. This dialog box allows you to perform various audio card functions, which are described in detail in the following paragraphs.

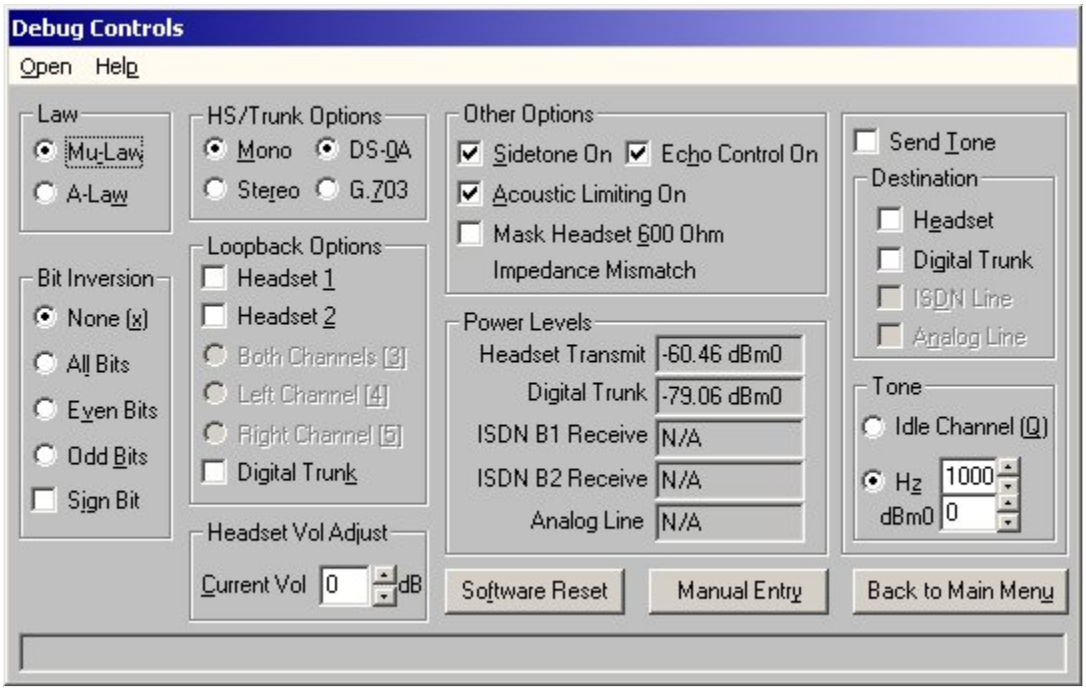

Figure 8. Debug dialog box for NTNX52CC

4.3.1 Law

These buttons select either Mu-law or A-law. These values are set according to values read from the AUDIOINI.INI file. Use the up and down arrow keys to change the law selection.

4.3.2 Bit inversion

These buttons select the bit inversion of the data stream going to and from the DMS switch. These values are set according to values read from the AUDIOINI.INI file. Use the up and down arrow keys to change the data bit inversion selection, and the **Tab** key to move to the Sign bit inversion checkbox.

4.3.3 HS/trunk options

The HS/trunk section provides choices for mono or stereo headsets and for DS-0A or G.703 digital trunks. These values are set according to values read from the AUDIOINI.INI file.

For headset options, note that the mono option is selected, and the stereo option is unavailable. For digital trunks, the G.703 button is activated only when the position is equipped with an NTNX52CC PCI Audio Card.

After a software reset, or when a send tone is stopped, these settings are returned to the values defined in the AUDIOINI.INI file.

4.3.4 Loopback options

Selecting any of these check boxes turns on or off the specified loopback relay (a √ indicates loopback mode). As with previous controls, the loopbacks are set to their default values (all OFF) whenever a software reset is performed or a tone in progress is stopped. All the progress information and any errors that occur are displayed in the IWS Diagnostic Message Monitor Window (see Figure 10, “IWS Diagnostic Message Monitor window,” on page 38).

For the NTNX52CC with the headset set to mono mode, the left and right channel check boxes are disabled.

The stereo mode option is not currently supported.

4.3.5 Headset volume adjustment

Headset volume can be adjusted up or down by the spinner control beside the edit box or by entering a value in the edit box. The maximum volume limit is set to 16dB, and the volume increment is set to 1 dB while in debug mode. A software reset returns the nominal volume level to 0 dB or to a preset default volume level specified in the AUDIOINI.INI file. (For details on setting the default volume level, see Section 3.4, “Headset Volume.”) Since the increment is set to 1 dB, non-integral values are not allowed.

4.3.6 Other options

In this section you can select Sidetone On, Echo Control On or Acoustic Limiting On. Mask Headset 600 Ohm Impedance Mismatch is disabled. A checked box (√) indicates that the parameter is selected.

Selecting the Sidetone On, Echo Control On, or Acoustic Limiting On option turns on or off the specified parameter on the audio card. All status changes and errors that occur are displayed in the IWS Diagnostic Message Monitor Window (see Figure 10, “IWS Diagnostic Message Monitor window,” on page 38). When a software reset is performed or a tone in progress is stopped, these parameters are reset to their default state of ON.

4.3.7 Power levels

The Power Levels boxes are disabled.

4.3.8 Send tone

In this section you can choose to send a tone from the audio card to a specific destination. A tone of the specified type and destination is continuously sent when the Send Tone check box is selected. The message `Tone in progress` is displayed at the bottom of the Debug Controls dialog box. Before the Send Tone checkbox can be checked, however, at least one destination must be selected. If no destination is selected and you check the Send Tone checkbox, a message box is displayed, prompting you to choose a destination.

For the NTNX52BC audio card, you can choose to send the signal to the headset jacks, the digital trunk, or both. If tone is being sent and you try to deselect the last remaining destination, a message box prompts you to stop the tone before deselecting the last destination. You can send either a 1 kHz 0 dBm0 tone or an idle tone.

For the NTNX52CC audio card, you can choose to send the signal to one or more of the headset jacks and the digital trunk (whether to send to DS-0A trunk or G.703 trunk is determined by the DS-0A/G.703 settings in the HS/Trunk Options group box). Again, if a tone is being sent, you must select at least one destination.

The frequency of the tone signal can be changed by selecting the spinner control next to the edit box (the frequency is changed in 10 Hz increments), or by manually entering a value. The maximum frequency allowed for the Tone is 3990 Hz, since the Digital Trunk, ISDN line, and Analog Phone Line can transmit frequencies only up to 4 kHz. The power of the signal sent can be changed within a -80 dB to +10 dB range.

These options can be modified at any time, even while the signal is being sent (the Send Tone box is checked). The IWS Diagnostic Message Monitor Window (see Figure 10, “IWS Diagnostic Message Monitor window,” on page 38) displays any changes and also any errors that occur. When the Send Tone box is deselected, any tone signal in progress is stopped, and a software reset is sent to the audio card. This resets all the loopback relays to the off position and all the other settings to their default values. A message box warns you that the settings are being changed.

4.3.9 Software reset

You can reset the software on the audio card by selecting the Software Reset button. This resets all the parameters to their default values and stops any tone in progress. Any errors that occur during software reset are displayed in the IWS Diagnostic Message Monitor Window (see Figure 10, “IWS Diagnostic Message Monitor window,” on page 38).

4.3.10 Manual entry

Selecting the Manual Entry button at the bottom of the Debug dialog box brings up the Manual Debug dialog box as shown in Figure 9, “Manual Debug dialog box,” on page 34.

You can type in any command string to send to the audio card and read or write any of the audio card registers.

4.3.11 Back to main menu

To go back to the TOPS IWS Audio Card Diagnostic dialog box, select the Back to Main Menu button.

4.4 Manual Debug dialog box

The Manual Debug dialog box, shown in Figure 9, provides a low-level interface to the audio card.

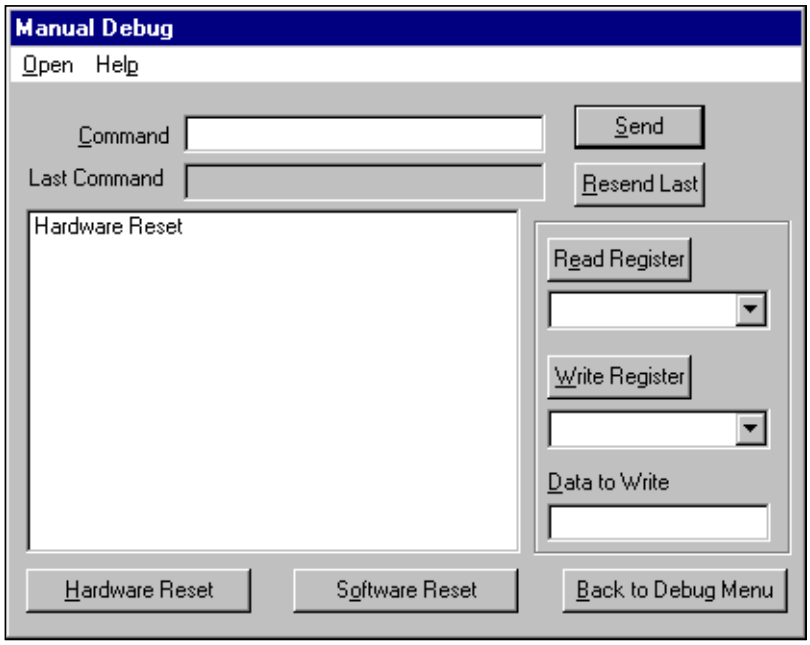

Figure 9. Manual Debug dialog box

4.4.1 Command strings

Command strings entered are sent directly to the audio card, and responses from the audio card are displayed in both the message window in the manual debug dialog box and the IWS Diagnostic Message Monitor Window shown in Figure 10, “IWS Diagnostic Message Monitor window,” on page 38.

To send a raw command to the audio card, first enter the command directly in the Command edit box and then select the Send button.

You can group the commands in 8-bit (2 hex. characters), 16-bit (4 hex. characters), or 32-bit (8 hex. characters) subgroups. The bits should be 32-bit aligned. Any subgroup that is not 8-bit, 16-bit, or 32-bit will have zeros added to the front of it to make it an 8-bit, 16-

bit, or 32-bit subgroup. For example: F is equal to 0F. Also: FF FF FF FF is equal to FFFFFFFF, which is also equal to FF FF FFFF. The command FF FF FFFFFFFF is not allowed (the third 32-bit subgroup does not start on a proper 32-bit aligned position.) F F F F is equal to 0F 0F 0F 0F.

If no command is specified in the edit box and you select the Send button, a message box prompts you to enter commands into the edit box.

4.4.2 Resend last

You can re-send the last command by selecting the Resend Last button. If no previous command is available, a message box displays to inform you.

4.4.3 Read register

You can read specified audio card registers with the drop-down lists. The read drop-down box is located below the Read Register button, on the right side of the dialog box. To read a register, first select a register from the drop-down list. To select the register to read, press the **Tab** key until the drop-down box under the Read Register button is highlighted. Then use the up and down arrow keys to choose the appropriate register. Three registers can be selected from the NTNX52BC audio card:

- Hardware Status Register
- Data Register Byte
- DMA Control Byte

The following registers can be selected from the NTNX52CC audio card:

- Outgoing Mailbox 1
- Outgoing Mailbox 2
- Outgoing Mailbox 3
- Outgoing Mailbox 4
- Incoming Mailbox 1
- Incoming Mailbox 2
- Incoming Mailbox 3
- Incoming Mailbox 4
- FIFO
- Master Write Address Register
- Master Write Transfer Count Register
- Master Read Address
- Master Read Transfer Count Register

- Mailbox Empty/Full Register
- Interrupt Control/Status Register
- Bus Master Control/Status Register

After selecting a register to read, select the Read Register button. The value of the selected register appears in both the message window of the Manual Debug Dialog Box and the IWS Diagnostic Message Monitor Window. If a register has not been selected and you select the Read Register button, a message box displays, instructing you to first select a register.

4.4.4 Write register

You can also write to audio card registers. To write to a register, first select a register from the drop-down list. The write drop-down box is located below the Write Register button, on the right side of the dialog box. To select the register to which to write, press the **Tab** key until the drop-down box under the Write Register button is highlighted. Then choose a register, using the up and down arrow keys.

Two registers can be selected from the NTNX52BC audio card:

- Hardware Status Register
- DMA Control Byte

The following registers can be selected from the NTNX52CC audio card:

- Outgoing Mailbox 1
- Outgoing Mailbox 2
- Outgoing Mailbox 3
- Outgoing Mailbox 4
- Incoming Mailbox 1
- Incoming Mailbox 2
- Incoming Mailbox 3
- Incoming Mailbox 4
- FIFO
- Master Write Address Register
- Master Write Transfer Count Register
- Master Read Address
- Master Read Transfer Count Register
- Mailbox Empty/Full Register
- Interrupt Control/Status Register

- Bus Master Control/Status Register

Next you must enter the string to be written to the register.

For the ISA/MCA and older audio card versions, the most you can enter is 1 byte (8-bit, 2 hex. characters). For the PCI audio card version, the most you can enter is 4 bytes (32-bits, 8 hex. characters). Then select the Write Register button, and the value actually written to the register appears in both the message window of the Manual Debug Dialog Box and the IWS Diagnostic Message Monitor Window. Before selecting the Write Register button, select a register and a string to send to the register. If neither a register nor a string to send has been selected when you select the Write Register button, a message box instructs you to first select a register or enter a string.

4.4.5 Software reset

You can reset the software on the audio card by selecting the Software Reset button. This resets all the parameters to their default values and stops any commands in progress. Any errors that occur during software reset are displayed in the IWS Diagnostic Message Monitor Window (see Figure 10, “IWS Diagnostic Message Monitor window,” on page 38).

4.4.6 Hardware reset

Selecting the Hardware Reset button sets the audio card hardware back to its initial default state.

4.4.7 Back to debug menu

To go back to the Debug Controls dialog box, select the Back to Debug Menu button.

4.5 IWS Diagnostic Message Monitor window

When the application first starts, the IWS Diagnostic Message Monitor window, as shown in Figure 10, appears in the top left corner of the screen. All the diagnostic output messages appear in this window.

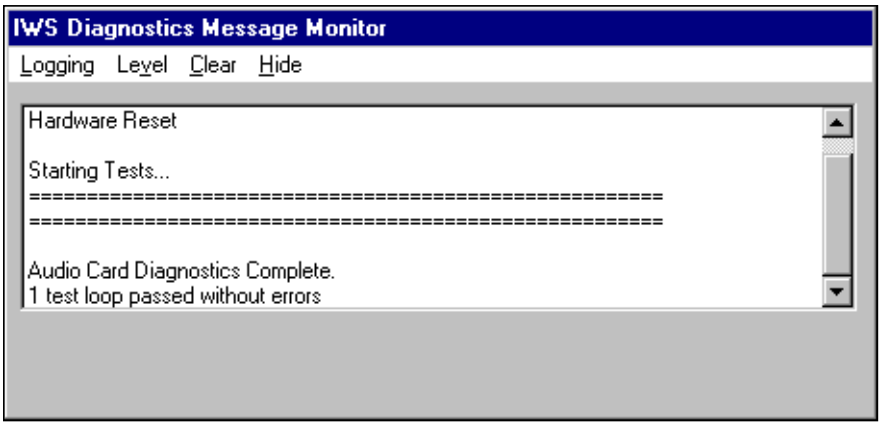

Figure 10. IWS Diagnostic Message Monitor window

You can choose to log all the diagnostic messages or only the error messages. To log all the diagnostic messages, select the menu item Level and then select All Messages. To log only error messages, select the menu item Level, and then select Only Error Messages. The current logging mode is indicated by a check mark beside the menu item, as shown in Figure 11.

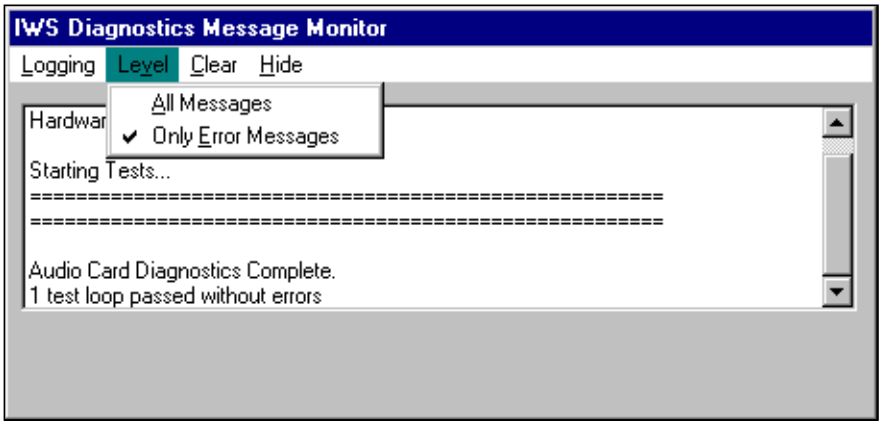

Figure 11. Changing logging mode in the IWS Diagnostic Message Monitor

In addition, you can log the messages to a file by selecting the menu item Logging/Start Logging, as shown in Figure 12.

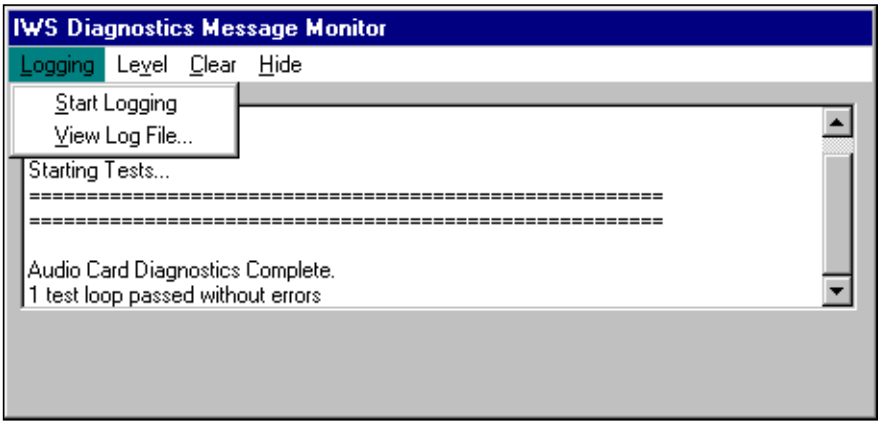

Figure 12. To log messages to a file

A dialog box prompts you to enter the name of the log file, as shown in Figure 13.

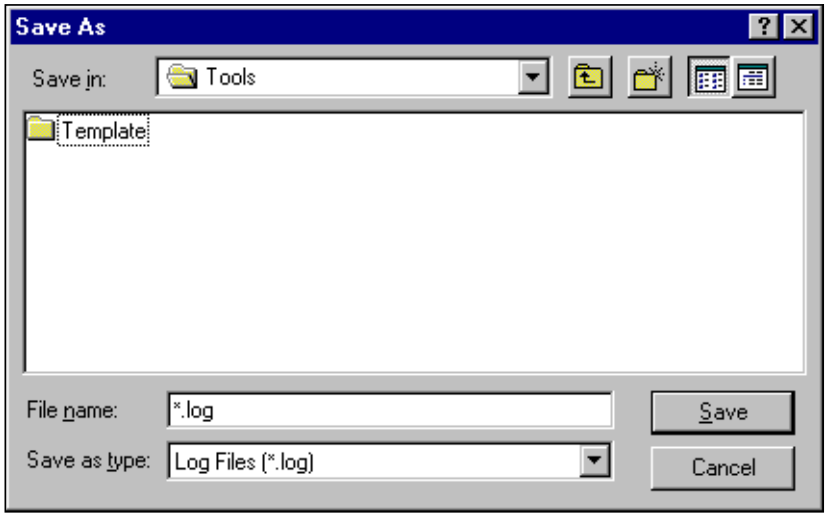

Figure 13. To choose the name of your log file

Select the File name box and enter the name of the file in which to store the logging results. Then select the Save button to close the Save As window, and begin logging results.

After you start logging, the menu item Start Logging is changed to Stop Logging. Until you select Stop Logging, all the messages are saved in the log file you specify.

The IWS Diagnostic Message Monitor window can also be used to view an existing log file. This window provides a convenient means to view an existing log file without the need of opening another text editor or a DOS box. Select the menu item Logging/View existing log file. A dialog box similar to that shown in Figure 13 is displayed. Then specify the name of the log file to view. The file must exist, or an error message will

display. If the file is larger than the space allotted in the IWS Diagnostic Message Monitor window, a message asks whether you want to stop and see what has been displayed so far, or continue and discard data from the top of the log file. The log file is not modified; the top data is just ignored.

To clear the contents on the IWS Diagnostic Message Monitor window, select the Clear menu item.

To close the IWS Diagnostic Message Monitor window, select the Hide menu item. After the IWS Diagnostic Message Monitor window is closed, it can be opened again through the menu item Open/Message Box in any of the other dialog boxes.

5.0 PCI audio card (NTNX52CC) flash loader

As of IWS 17.0, the PCI audio card (NTNX52CC) flash loader is no longer supported or shipped.

6.0 Revisions

6.1 Revisions for release 17.0

- Changes include the following:

— Updated Figure 4 and Figure 8

- Features and functionality no longer supported:

— ISDN Self Test and Analog Phone Line Self Test

— Coin Detect Test

— PCI audio card (NTNX52CC) flash loader

6.2 Revisions for release 15.2

- Released for minor formatting changes. No changes to technical content.

6.3 Revisions for release 15.0

- Text added to state that the PCI audio card does not support muting DTMF to the switch.

6.4 Revisions for release 14.0

- Book revised, edited, and corrected throughout.

6.5 Revisions for release 13.0

- Initial release of this book.

7.0 List of terms

DMA
Dynamic memory allocation

DSP
Digital signal processor

DTMF
Dual-tone multifrequency

IRQ
Interrupt request

ISA
Industry Standard Architecture

IWS
Intelligent Workstation

PCI
Peripheral Component Interconnect

PCM
Pulse code modulation

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