MUSICAM USA®

A d/b/a of Corporate Computer Systems, Inc.

670 No. Beers St., Bldg. 4, Holmdel, NJ 07733 USA
Tel: 732-739-5600 Fax: 732-739-1818
www.musicamusa.com

NETSTAR™

Users Guide

MUSICAM USA

NETSTAR Users Guide

for Software Revisions 3.3.4 and higher

Corporate Computer Systems, Inc.
670 North Beers Street • Building 4
Holmdel, NJ 07733 USA
Phone 732.739.5600 • Fax 732.739.1818
www.musicamusa.com

Jan 2005

MUSICAM USA Part Number: 100-2003-001

The CCS ***NetStar*** *Encoder/Decoder uses a lithium battery. The following cautionary statement is included in this manual only for the purpose of compliance to Underwriters Laboratories requirements and does not imply user authorization to open and access the unit*

CAUTION: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturers instructions.

Table of Contents

About this document

A

PURPOSE

This **NetStar Users Guide,** is designed to help in the configuration and use of the MUSICAM USA **NetStar** Advanced Audio CODEC. Written for the novice user, and providing for a broad familiarity with the **NetStar**, enough information is provided to assist with advanced configuration and simple troubleshooting.

REISSUE INFORMATION

It may become necessary to reissue all or part of this document. This document may also contain placeholders (TBP) for information that will be included in subsequent releases of this document.

If the necessary changes apply to specific areas of the document and can reasonably be accomplished by replacing chapters, a replacement chapter addendum may be used rather than replacing the entire document.

MUSICAM USA will make every attempt to contact you if there are changes to be made. We suggest you register as a user by completing and returning the registration form that is shipped with the **NetStar**. You can also determine the current manual version by checking our Web Site, www.musicamusa.com.

DOCUMENT SYNOPSIS

The **NetStar** is an advanced audio CODEC with many basic and advanced capabilities and features. Since in some cases the **NetStar** may not be equipped with all options nor will all advanced features be used, it is not necessary to read the entire manual. A synopsis of each chapter's contents is provided here.

The electronic version (pdf format) of this document makes extensive use of bookmarks, cross-references and hyperlinks to assist in the location of important information. It is available on CD-ROM from MUSICAM USA, or on-line at www.musicamusa.com.

Chapter 1: Feature Overview and Model Description.
This chapter describes the core **NetStar** features as well as available options to tailor **NetStar** to your applications. All users should read this chapter.

Quick-Start:
This chapter discusses all possible audio and connection options. You need only read the portions of this chapter that pertain to your hardware or application.

Chapter 2: Installation
This chapter gives installation hints and instructions on configuring **NetStar** for your applications. Audio and network options, cable requirements, connectors, and adjustments are described here. Since all available audio and network interface options are discussed here, it is not necessary to read this entire chapter; rather, only the sections pertaining to installed options are required.

Quick-Start:
All 500 Series users unfamiliar with *NETSTAR* operation should read this chapter

Chapter 3: The Front Panel
This chapter fully describes all of the features and controls of the **NetStar** Front Panel, including the menu structure. Owners of 300 Series Models can skip this chapter.

All 300 Series users MUST read this chapter

Chapter 4: Remote Control
This chapter describes the three methods for controlling your **NetStar** remotely: Using a Web Browser, Telnet or RS232 remote control. All owners of 300 Series models and those owners of 500 Series models that will be using remote control should read this chapter.

Chapter 5: Choosing an Algorithm
This chapter describes the benefits and pitfalls of coding, the many algorithm and mode options available to you, and gives a description of each option.

Chapter 6: Interfaces
This chapter guides you through the steps necessary to configure the **NetStar** for your network or connection type, including LAN, ISDN and dedicated data protocols. It is not necessary to read this entire chapter; rather, only the sections pertaining to the connections in use are required.

Chapter 7: Configuration
This chapter describes configuring **NetStar**'s encoder, and should be read by all users.

Quick-Start:

All users unfamiliar with ***NETSTAR*** operation should read this chapter

Chapter 8: Connections

This chapter describes the various network connection types and the necessary steps for connecting to another codec.

Chapter 9: The Profile List

With just a few button presses or mouse clicks, the Profile List makes even the most complex configurations or connections easy to use.

CONVENTIONS

Listed here are the standard font conventions used throughout this document.

References to other MUSICAM USA documents appear underlined:

CDQPrima Technical Reference Manual

In the on-line version, if these referenced are in a colored font, these are hyperlinks, and clicking on them will load the document from our Web Site.

References to figures, tables, chapters, or sections within this document appear in normal text for the paper version, but are hyperlinks in the electronic version:

Refer to Table 2-3

Text representing what would be shown on a terminal is shown in Courier New font:

```
MC>CSS
```

Keypad buttons are shown as:

ENTER

Front panel display text is shown as Ariel Bold font:

SYSTEM SETUP

Terminal commands are shown in Courier New Bold font, variable parameters associated with these terminal commands are shown in Courier New Italic:

encode *algorithm/bitrate/samplerate/mode*

Keypad commands are shown two ways. Both have the same meaning:

	MPEGL2 ***BitRate***
Basic Enc Setup	MPEGL3
	AAC
	AAC-LD

and

<Basic Enc Setup><MPEGL2><bitrate*t*>

Both mean the following: Scroll to 'Basic Encoder Setup' and press **ENTER**, scroll to 'MPEGL2' and press **ENTER**, select a line format and press **ENTER**.

Chapter 1

Feature Overview and Model Description

This chapter describes core **NETSTAR** *features as well as available options to tailor your* **NETSTAR** *to your applications*

1. NETSTAR Overview

The **NetStar** is an advanced audio codec that can be configured as a stereo high-fidelity bi-directional audio codec capable of connecting to other codecs via ISDN, and dedicated data lines. **NetStar** can connect over a LAN or the Internet. **NetStar** offers full compatibility with all existing G.722 and MPEG based codecs, but adds additional state-of-the-art compression algorithms. **NetStar** can send and receive uncompressed PCM audio over a LAN, WAN, or IP Network of sufficient bandwidth. Standard in **NetStar** is a total of six compression algorithms, including G.711 for ISDN connections to and from POTS telephones, and uncompressed audio. An IP interface is standard in every **NetStar**. An optional and 1 BRI ISDN Terminal Adapter and Multi-Function interface and cables provide single and dual-port V.35, X.21, and RS422 network connections.

NetStar Net500 Series models are housed in a 2U high chassis with a friendly user interface, a seven-line LCD menu display, large buttons, LCD status indicators, peak and average reading VU meters and a headphone monitoring system. All **NetStar** models allow full remote control from anywhere in the world from any network-connected PC. **NetStar**'s audio coding features are unparalleled as well. In addition to uncompressed audio over IP, six different compression algorithms allow connections to almost all current codecs on the market. **NetStar**'s algorithms include:

- G.711
- G.722
- MPEG 1 & 2 Layer II
- MPEG 1 & 2 Layer III
- MPEG 2 AAC-LC
- MPEG 4 AAC Low Delay
- Linear Audio (PCM)

1.1 NETSTAR Models

Four **NetStar** models are available. All contain the same core features and outstanding performance and audio specifications.

Models **NET500-US** and **NET500-EU** are full featured, including LAN port and ISDN terminal adapter (for North American operation and elsewhere, respectively). In addition to full network remote control, the **NET500-US** and **NET500-EU** include a full function front panel with user-friendly keypad and display setup and operation, and separate VU meters for send and receive audio.

Models **NET300-US**(North American operation) and NET300-EU, while keeping all of the superb audio and remote control features of the 500 models, are designed exclusively for remote operation, and therefore do not contain front-panel controls or indicators.

NETSTAR Audio Features	500	300
ISO/MPEG Layer II	✓	✓
ISO/MPEG Layer III	✓	✓
MPEG-2 AAC-LC	✓	✓
MPEG-4 AAC-Low Delay	✓	✓
CCITT G.722 over ISDN and dedicated lines	✓	✓
G.711 for ISDN to POTS connections with two coding algorithms	✓	✓
Liner audio over IP	✓	✓
8 to 48 kHz sampling rates	✓	✓
Full stereo, joint stereo, dual mono and monaural modes	✓	✓
Input level adjustable +12 to -40 dB	✓	✓

NETSTAR Audio Features	500	300
Output attenuation up to 40 dB	✓	✓
Independent Mono Operation	✓	✓
Broadcast capabilities	✓	✓
Gold plated Neutrik® XLR connectors	✓	✓
Neutrik dual-mode XLR/TRS connectors for balanced/unbalanced analog input	✓	✓
Analog and AES/EBU or S/PDIF digital audio I/O	✓	✓
Large VU meters for encoded or decoded audio	✓	
High quality headphone monitor amplifier	✓	
Simultaneous headphone monitoring of send and receive audio	✓	

NETSTAR Connections	500	300
Ethernet for audio connection and control	Standard	Standard
ISDN – 'S/T' and 'U' interfaces available	Optional	Optional
Dual port V.35 / X.21 / RS422	Optional	Optional

NETSTAR Features	500	300
Automatic decoder configuration upon connection	✓	✓
Automatic encoder configuration upon receiver frame	✓	✓
Intuitive menus	✓	
8 TTL Level inputs	✓	✓
8 TTL "contact closure" outputs	✓	✓
Asynchronous ancillary data	✓	✓
10/100 Base T Ethernet remote control	✓	✓
Software update via Ethernet	✓	✓
Built in Web Server for remote control	✓	✓
Telnet Remote Control	✓	✓
Status LEDs show connection and frame state, and headphone source	✓	

NETSTAR Mechanical Features	500	300
Dimensions: 19" rack mount or table-top, 2U high	✓	✓
Whisper quiet fan for long component life	✓	✓
World Power Supply, rear master power switch	✓	✓
Extra-large keypad with tactile and audible feedback	✓	
7 line backlit LCD display with "soft" menus	✓	
Adjustable display contrast	✓	
Intelligent VU metering with adjustable peak-hold	✓	
Keypad beeper and audible alarm	✓	
Headphone jack with retractable rotary volume control	✓	

1.2 NETSTAR Features

The rich feature set contained in the **NetStar** makes it the most versatile and advanced audio codec available anywhere.

1.2.1 Mechanical Features

NetStar is housed in an attractive 19" chassis that can be used as a table-top unit or can be rack mounted using the provided mounting brackets. **NetStar** is cooled using a fan located in the rear of the chassis. **NetStar** contains an international power supply that does not require jumper or switch setting adjustments for voltage or frequency changes. A master power switch is located on the rear panel.

The **NetStar 500** has a large, seven-line backlit Graphic LCD display for viewing and changing system settings and reviewing system status. The display contrast can be adjusted over a wide range for ease of viewing from any angle and features a "soft" menu structure. Status LEDs showing connection and frame state are bright enough to be seen from a distance.

The **NetStar 500** can be configured and used from the large, built in keypad with tactile and (user selectable) audible feedback. In addition to the numeric dialing keypad, the menu navigation keys provide direct function access, easy-access speed-dial and directory maintenance. In addition, the numeric keypad can be used for setup and configuration since most menu selections are numbered. One-touch 'Dial' and 'End' keys allow quick connections when using ISDN or the Ethernet to connect. A Headphone select key allows you to monitor either send or receive audio, or both send and receive audio *simultaneously*.

1.2.2 Audio Features

NetStar's analog and digital audio input and output circuits are state-of-the-art for high quality, low noise and low distortion audio. In addition, high quality gold plated Neutrik® XLR connectors are used for digital and analog audio I/O. The analog audio input connectors combine both XLR and phone-type (tip-ring-sleeve) plugs. **NetStar's** +18 dBu nominal input levels assure ample headroom for all applications without the need for audio limiters. For matching levels, the input level can be adjusted between -40 to +12 dB in 0.1 dB steps. Up to 40 dB of attenuation, in 0.1 dB steps, can be added to the output audio. Professional quality AES/EBU or consumer-grade S/PDIF digital audio input and output, with internal high-quality rate converters are standard.
NetStar 500 series models include a high quality headphone monitor circuit, complete with retractable volume control.

1.2.3 Coding Algorithms

In addition to linear audio via IP, **NetStar** supports six compression algorithms and multiple sampling rates allowing the widest connectivity available anywhere. It's easy to reconfigure to enable connections for any purpose, from studio master quality sessions using IP connections to ISDN. Send and receive audio can use different compression algorithms and connection paths.
NetStar recognizes the algorithm, line format, mode, bit and sample rate of incoming connections, automatically configuring the decoder and (optionally) the encoder to match.
Following is a short description of **NetStar's** currently available algorithms.

ISO/MPEG-1 & 2 Layer 2[1]: Arguably the most popular compression algorithm for ISDN and dedicated data links, ISO/MPEG-1 and 2, Layer 2 (better known as 'MPEG Layer 2') is available in the **NetStar**. It is fully compatible with all other MUSICAM USA MPEG Layer 2 compatible codecs, as well as those from other manufacturers. Supported bit rates range from 32 to 384 kb/s, sample rates from 8 to 48 kHz. MPEG Layer 2 allows nearly transparent, joint stereo audio to be sent using as little as 128 kb/s, and CD-quality stereo audio at 192 kb/s and higher.

[1] ISO/MPEG Layer-2 audio coding technology licensed from QDesign http://www.qdesign.com/

NetStar's Layer 2 is fully compatible with all Layer 2 compatible codecs on the market today.

ISO/MPEG-2 Layer 3[2]: Industry standard MPEG-2 Layer 3 (better known as 'MPEG Layer 3') can deliver near-CD quality true stereo using as little as 128 kb/s, and 15 kHz monaural audio using as little as 64 kb/s. **NetStar** supports Layer 3 bit rates from 24 to 320 kb/s and sampling rates from 8 to 48 kHz. Although requiring lower bit rates than Layer 2, Layer 3 has longer delay and may be more prone to audible artifacts, especially when subjected to multiple encodings.

NetStar's Layer 3 is fully compatible with all Layer 3 compatible codecs on the market today.

MPEG-2 AAC[3]: Originally called NBC (Non-Backward Compatible) MPEG-2 and now called Advanced Audio Coding, AAC is a very advanced algorithm that can deliver "indistinguishable quality" monaural audio at 64 kb/s. At 128 kb/s, AAC has been judged to deliver the same quality stereo audio that Layer 2 can deliver at 192 kb/s. With this performance, using ISDN, AAC can deliver indistinguishable, true stereo audio anywhere in the world. **NetStar** supports AAC bit rates from 24 to 320 kb/s and sampling rates from 8 to 48 kHz.

MPEG-4 AAC-LD[3]: Bearing in mind that the more complex algorithms require more processing power and have longer delays, a low-delay AAC coding algorithm, AAC-LD, was developed in an attempt to reduce the delay of standard MPEG-2 AAC. Trade-offs must be made to achieve lower delay, and thus AAC-LD achieves the same quality/bit rate performance of MPEG Layer 3, with a fraction of the delay. **NetStar** supports AAC-LD bit rates from 24 to 320 kb/s and sampling rates from 8 to 48 kHz.

G.722: This early PCM-based algorithm yields 7.5 kHz commentary grade audio over a 64 kb/s channel. With very low delay, this algorithm is ideally suited for voice applications such as news, sports, etc., and is arguably the most widely available algorithm.

---

[2] MPEG Layer-3 audio coding technology licensed from Fraunhofer IIS and Thompson multimedia

[3] MPEG AAC audio coding technology licensed by Fraunhofer IIS (http://www.iis.fhg.de/amm/)

With very low delay, G.722 is often used for talkback, where delay can be a factor. G.722 sample rate is fixed at 16 kHz, and the bit rate is fixed at 64 kb/s per channel.

NetStar's G.722 is fully compatible with all G.722 compatible codecs on the market today.

G.711: Using the NetStar's ISDN Option, G.711 allows you to dial from an ISDN line to a standard POTS telephone, or vice-versa. Using the top-quality digital audio systems of the **NetStar**, coupled with the reliability of ISDN, the ability to call a standard telephone adds the flexibility to connect to the field when ISDN may not be available at the far end. Two coding schemes are available for worldwide compatibility, A-Law and U-Law. The fidelity of G.711 is limited by the telephone set and the Phone Company to standard phone-set quality.

1.2.4 Ancillary Data

When using any MPEG algorithm, including both AAC modes, **NetStar** accepts one channel of ancillary data to be multiplexed into the audio bit stream and subsequently demultiplexed at the far end. This RS232 data path supports multiple baud rates and can be used for many different user applications. Ancillary data is bi-directional.

Ancillary data can be used for remote control of peripheral equipment at the far end. For example, transmitter or recording equipment can be monitored or controlled using ancillary data. Since ancillary data is sent in the audio bit stream, the bits used for the ancillary data are not available for audio data. Therefore, it is not advisable to use a high ancillary data rate with a low transmission rate. One key feature, however, is that if no ancillary data is present, no bits are robbed from the audio data, even if **NetStar** is configured to send ancillary data. Bandwidth is used only as needed.

1.2.5 Contact Closures

In addition to the RS232 data path, **NetStar** is equipped with eight TTL inputs and outputs, which can be used for end-to-end remote control. These contact closures can be mapped for end-to-end control, or can be used to control **NetStar's** internal functions, such as dialing a profile.

1.2.6 Control Features

NetStar 500 Series codecs can be configured and controlled from the front panel using the built in LCD display and keypad buttons.
With a built-in Webserver, full remote control is possible with all models through the Internet, using a computer's Web Browser connected through the **NetStar**'s LAN port. Remote control is possible either locally (using a crossover CAT-5 cable connected directly from a computer to your **NetStar**) or from anywhere in the world through the Internet. Full on-line help is available. The **NetStar's** Web Browser interface is password protected.
You can also use Telnet protocols for Internet control. In addition, there is also an RS232C port for control using terminal emulation or Telnet software.

1.2.7 On-Site Software Upgrades

One of the most important features of your **NetStar** is remote software updates through the Ethernet port. Units do not need to be opened or returned to the factory for software upgrades. New software can be loaded either from an attached PC, or directly from our TFTP site through the Internet. Visit the **NetStar** support page at www.musicamusa.com or contact MUSICAM USA for more information.

1.2.8 Digital Interface Module

In addition to the LAN connector and the ISDN interface, the **NetStar** architecture uses a plug-in module to interface to other digital transmission facilities. **NetStar** currently supports a two-line interface card that can be used with V.35, X.21, and RS422 digital interfaces. This multifunction interface is **NetStar**'s only option. Adapter cables for V.35 and X.21/RS422 are available in either single- or dual-port versions.

Chapter

2

Installation

This chapter gives installation hints and instructions on configuring NETSTAR for your applications

2. Unpacking, Inspection and Installation

Upon opening the shipping carton, examine your **NetStar** for mechanical defects. Report any problems promptly to MUSICAM USA or your sales representative. Plug the unit into the main power and turn on the unit's main power by the rear panel power switch. No adjustments for line voltage or frequency are required. The front panel LCD of the 500 Series models should illuminate and display the power-up and 'Starting' screens. The 300 Series models have a power indicator LED. Once booted, the front panel display (500 models only) should look similar to Figure 2-1, depending on the last used configuration:

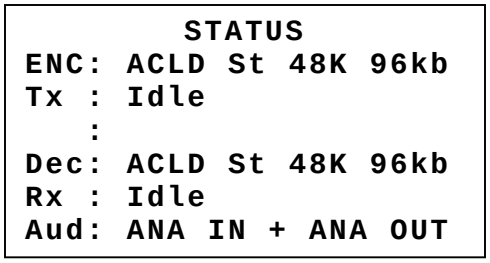


Figure 2-1 Front Panel Display

This 'home' screen indicates the current state of the encoder, decoder, send and receive connections, and the audio input and output mode.

2.1 Location of Units

NetStar has been designed to allow installation at locations with high RF fields and unstable power supplies. **NetStar** may be used with any AC power source between 90 and 240 VAC, 47 to 63 Hz. The only consideration when rack mounting your **NetStar** is that enough room on the sides should be provided for adequate ventilation and the rear-mounted fan must not be blocked.

2.1.1 Rack Mount or Table Top

The rack-mount ears can be removed and rubber feet applied for tabletop operation.

2.2 Environmental Considerations

It is important that the ambient temperature specifications are met. It is usually possible to stack **NetStar** units directly on top of other electronic equipment; however, this should be avoided if the lower equipment produces a lot of heat. It is important that the **NetStar** not be exposed to condensing humidity or fungal environments.

2.3 Optional Network Module

All **NetStar** models may be equipped with a multi-function network card providing two ports that can be configured for V.35 or X.21/RS422 connections to dedicated digital lines. These ports are both present on the single D connector provided, but may be individually accessed through available adaptor cables.

2.4 Rear Panel

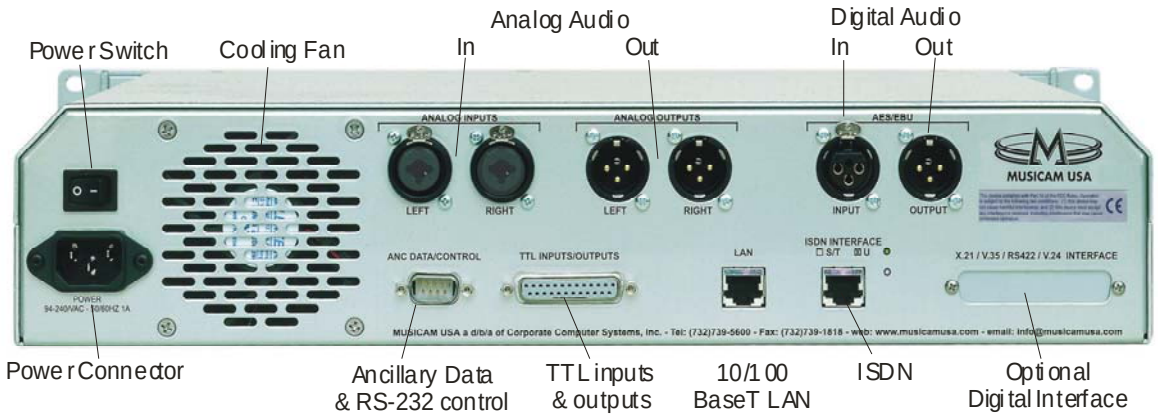


*Figure 2-2 **NetStar** Rear Panel*

2.4.1 Power Connector and Mains Switch

Located conveniently on the rear of the **NetStar** is the power connector and mains switch. The power connector mates to standard industrial

three-prong power cords appropriate for the country of operation. With a universal power supply, there is no need to set the **NetStar** for use in different countries.

2.4.2 10/100 Base T LAN Connector

With a built-in Web Server and Telnet support, the **NetStar** can be connected directly to the Internet for audio transmission as well as control and setup. No adapters are required since this 10/100 Mb/s port conforms to the standard and accepted wiring configuration.

2.4.2.1 LAN Wiring Considerations

As always, quality CAT-5 cabling should be used. LAN connections are typically limited to 100 meters (328 feet) without a hub, router or switch. Ethernet Extenders are available from vendors such as Patton Electronics Co. (Gaithersburg, MD). These devices can extend Ethernet cabling distances to well over 1000 meters.

When connecting two **NetStar** codecs back-to-back directly, or connecting a **NetStar** to a computer directly; that is, with no infrastructure, you must use a crossover CAT-5 cable as shown in Figure 2-3. When connecting a **NetStar** to an infrastructure (a hub, switch, router, cable/DSL modem), use a straight-through cable.

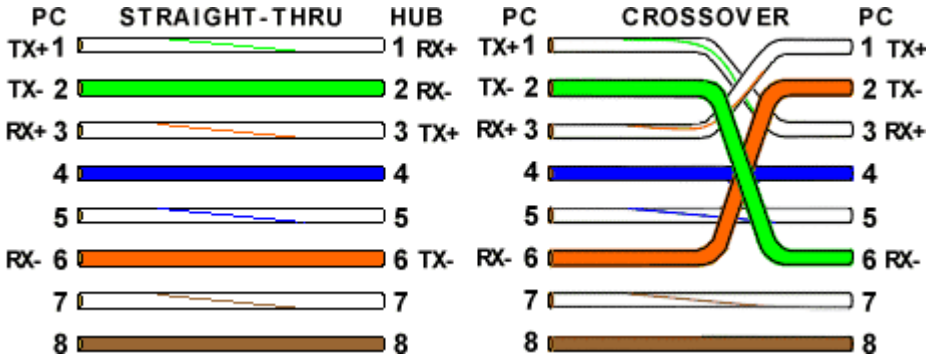


Figure 2-3 CAT-5 Cable Wiring

These are standard configuration cables and are available in any computer supply store.

2.4.3 TTL Input/Output

This 25-pin connector is used for both the eight isolated inputs (logic 0 = open, logic 1 = grounded) and eight TTL level (logic 0 = GND, logic 1 = +3.3 Volt) outputs. The default mode is for each input to control a TTL closure on the far-end **NetStar**. The connector is wired as shown in Table 2-1.

Alarm/Relay Connectors		
Pin Number	**Function**	**Direction**
1	n/c	
2	TTL0	Out
3	TTL1	Out
4	TTL2	Out
5	TTL3	Out
6	TTL4	Out
7	TTL5	Out
8	TTL6	Out
9	TTL7	Out
10	IN0	In
11	IN1	In
12	IN2	In
13	IN3	In
14	IN4	In
15	IN5	In
16	IN6	In
17	IN7	In
18 - 25	GND	

Table 2-1 TTL I/O Connector

2.4.3.1 Contact Closure TTL Wiring Considerations

The type of wiring used depends on the wire length and the environment. For short lengths, six feet or less, standard flat 25 conductor ribbon cable may be used unless located in an electrically noisy environment. For this situation, or for lengths up to 25 feet, at a minimum, twisted-pair ribbon cable may be used. MUSICAM USA, however, recommends shielded twisted-pair cable.

2.4.4 Ancillary Data

This 9-pin connector is used for bi-directional RS232 asynchronous ancillary data at speeds ranging from 300 to 38,400 kb/s. The ancillary data format used is compatible with all CCS/MUSICAM USA codecs and with many others. This connector can also be used for local RS232 remote control.

Pin	Function	Pin	Function
1	DCD (input)	6	DSR (input)
2	RXD (input)	7	RTS (output)
3	TXD (output)	8	CTS (input)
4	DTR (output)	9	N/C
5	Ground		

Table 2-2 Ancillary Data Connector

2.4.4.1 Ancillary Data Wiring Considerations

The same safeguards as discussed for TTL wiring should be employed here.

2.4.5 ISDN Connector (Optional)

Depending on whether your **NetStar** has the TA401 (S/T) or TA501 (U) option installed, the ISDN connector will be either an 'S/T' or 'U' interface. North American ISDN requires the user to provide an NT-1 (included internally in US units) and the Telco connects to a 'U' interface. Elsewhere, the Telco provides the NT-1 and an 'S/T' interface is required in the **NetStar**. The TA401 module may be used in North America with the addition of an external NT-1.

2.4.5.1 ISDN Cable Requirements

An RJ-45 connector is supplied for ISDN connections. Standard ISDN wiring practices should be observed.

Sometimes, the telephone company may provide only a four-wire RJ-11 connector for the U interface. If you don't have an RJ-11 to RJ-45 adapter cord, a standard RJ-11 plug *will* fit into the RJ-45 jack.

Although, depending on wire quality, your **NetStar** can be located thousands of feet from the Telco termination; you should attempt to keep line lengths as short as possible.

! NOTE: Proper ISDN wiring is essential for dependable operation

Unlike standard phone circuits, *extension lines are not permitted* with IDSN. You cannot have an ISDN line service two rooms. Splices should be avoided as well. MUSICAM USA strongly recommends that existing

building phone wiring *not* be used for ISDN since in most cases you cannot tell if there are splices or extensions, especially in older buildings.

NetStar's ISDN terminal adapter configuration menu does not require unnecessary information. Only those parameters appropriate for the country setting are required.

2.4.6 Multi-Function Card (Optional)

This 37 pin connector on the optional NETMF-1 interface supports two digital I/O ports, and can be used for either V.35 or X.21/RS422 protocols. Protocol selection is made using appropriate cables, available from MUSICAM USA as shown in Table 2-3. The multi-function card supports all **NetStar**'s bit rates and algorithms.

MUSICAM USA Cable Part No.	Cable Description
C2100	Single port X.21/RS422, 5 foot (1.5m) Single DB15M
C2200	Dual port X.21/RS422, 5 foot (1.5m) Dual DB15M
C2300	Single port V.35 5 foot (1.5m) Single Winchester Block
C2400	Dual port V.35 5 foot (1.5m) Dual Winchester Block

Table 2-3 Available Digital Interface Cables

2.4.6.1 Digital Interface Wiring Considerations

As with all digital interfaces, normal high-speed wiring practices should be followed. Do not use flat ribbon cable. Although twisted-pair ribbon cable can be used for short lengths, MUSICAM USA suggests always using shielded twisted pair cable. Cable lengths up to 4000' are possible, but long cables should be avoided unless all possible RF precautions are provided.

2.4.7 Analog Audio Inputs

The Neutrik multi-connector used for analog audio input accepts both XLR and standard three-conductor 'tip-ring-sleeve' phone plugs for balanced signals as shown in Table 2-4. For unbalanced inputs, ground the – terminal and connect the signal lead to the + terminal.

XLR Pin	Phone Plug	Function
1	Sleeve	Ground
2	Tip	+
3	Ring	–

Table 2-4 Audio Input Multi-Connector

The input impedance is selectable from jumpers located inside the **NetStar** on the rear-panel motherboard as shown in Table 2-5:

Channel	Jumper Location	600 Ω	> 12 KΩ
Left	J1	pins 2-3	open
Right	J2	pins 2-3	open

Table 2-5 Analog Input Impedance Selection

A nominal input level of +18 dB is supported. Up to 12 dB of gain or 40 dB of attenuation can be added to the input signal for level matching with other equipment.

2.4.8 Analog Audio Outputs

Balanced analog audio outputs are available on these XLR connectors. The nominal 18 dB output level can be attenuated up to 40 dB for level matching with other equipment. For unbalanced outputs, ground the – terminal and connect the signal lead to the + terminal.
The connectors use standard XLR wiring conventions as shown in Table 2-6:

XLR Pin	Function
1	Ground
2	+
3	–

Table 2-6 XLR Analog Output Connector

Output impedance is selectable from jumpers located inside the **NetStar** on the rear-panel motherboard as shown in Table 2-7. Two jumpers for each channel must be set.

Channel	Jumper 1 Location	< 20 Ω	600 Ω	Jumper 2 Location	< 20 Ω	600 Ω
Left	J3	pins 2-4	pins 1-3	J4	pins 1-3	pins 2-4
Right	J5	pins 2-4	pins 1-3	J6	pins 1-3	pins 2-4

Table 2-7 Analog Output Impedance Selection

2.4.9 Digital Audio I/O

Both professional grade AES/EBU and consumer grade S/PDIF digital audio inputs and outputs are available at these XLR connectors. Selection

of AES/EBU vs. S/PDIF is done through a jumper change on the audio daughterboard.

Jumper JP1 is for input selection, and the positions are clearly labeled AES/EBU or S/PDIF. Jumper JP2 selects output format, and is also clearly labeled.

Both AES/EBU and S/PDIF impedances conform to the standards at 110 and 75 Ω respectively.

2.4.9.1 AES/EBU or S/PDIF Timing Considerations

Timing for the encoder is provided by the AES/EBU or S/PDIF audio itself, and therefore, no external timing source is required. The **NetStar** encoder contains very high quality rate converters, and supports 32, 44.1 and 48 kHz digital audio sampling rates.

2.4.10 Audio Cabling

As with all professional audio applications, utmost care should be taken with audio cabling for your **NetStar**. For all balanced audio cabling, only high-quality, shielded twisted-pair audio cables should be used, mated to high-quality XLR connectors. With proper cabling techniques, long lengths can be used, but excess cable should be avoided.

Unbalanced audio cable techniques can also be used with **NetStar**; however, cable lengths should be limited to less than 50 feet, less if in a high RF environment. Only high quality shielded audio cable and connectors should be used.

2.4.11 Ancillary Data

Ancillary data can be used for remote control of peripheral equipment at the far end; for example, transmitting or recording equipment can be controlled using ancillary data. In addition to the RS232 data path, **NetStar** is equipped with eight inputs and eight TTL outputs, which can be controlled internally or from the far-end codec.

2.4.12 Control Features

NetStar 500 Series Models can be configured and controlled from the front panel using, the built in LCD display and soft-touch keypad. The basic keypad contains the cursor, numeric keypad, dial and headphone keys required for all setup and control functions.

With a built-in Web Server, full remote control is possible, on all **NetStar** models, using a Web Browser connected through the Internet to **NetStar**'s LAN port. Remote control is possible from anywhere in the world

through the Internet, or locally, using a crossover CAT-5 cable. Full on-line help is available. In addition, Telnet remote control is possible both through the LAN connector and the RS232 data port.

2.4.13 On-Site Software Upgrades

One of the most important features of your **NetStar** is remote software updates the Ethernet port. Units do not need to be opened or returned to the factory for software upgrades. New software is loaded either from an attached PC, or from a remote location through the Internet.

2.4.14 Digital Interface Module

In addition to the LAN connector and the ISDN interface, the **NetStar** architecture uses plug-in modules to interface to other digital transmission facilities. **NetStar** currently supports a two-line interface card that can be used with V.35, X.21, RS422 and RS449 digital interfaces.

This Page Intentionally Left Blank.

Chapter

3

Operation

*This chapter illustrates that using the **NETSTAR 500** Series models from the front panel is easy and intuitive.*

3. The Front Panel

The front panel of the **NetStar 500** Series codecs contains enough functionality to completely control all aspects of the **NetStar**. As shown in

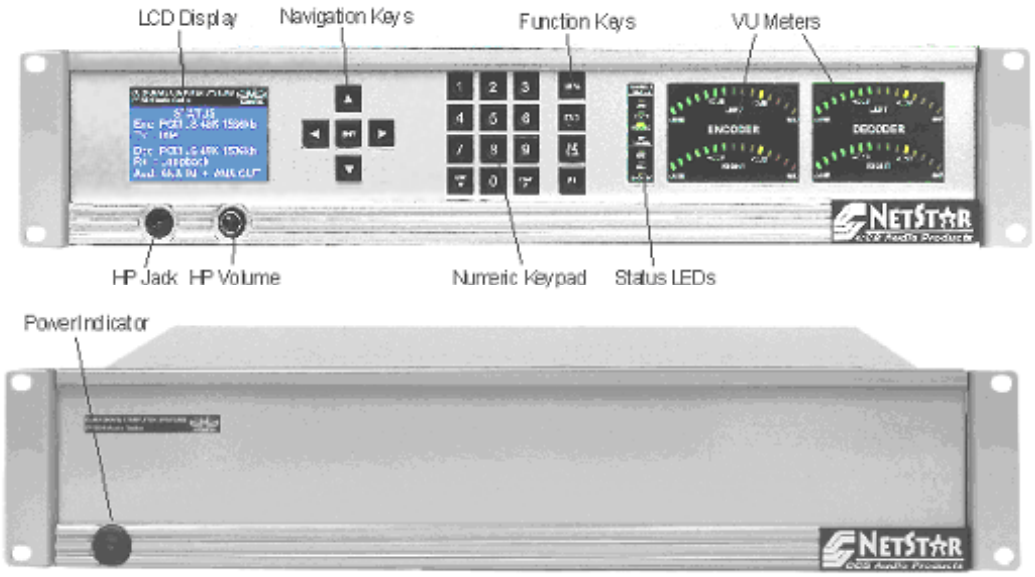


Figure 3-1, **NetStar**'s front panel contains an easy to read LCD display and large buttons with both tactile and audible feedback, plus VU meters, headphone monitor system and status LEDs.

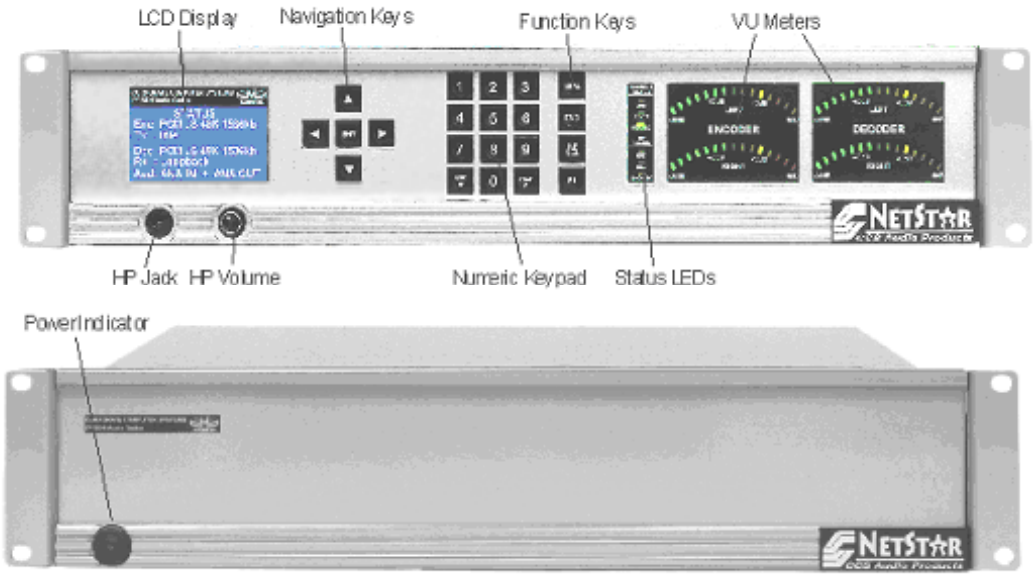


*Figure 3-1 **NetStar** 500 & 300 Front Panel*

3.1 LCD Display

While starting, the LCD display will show the **NetStar** logo and an indication that the codec is starting. Once booted, the status display, a sample shown in Figure 3-2, will be shown.

```
        STATUS
ENC: ACLD St 48K 96kb
Tx : Idle
   :
Dec: ACLD St 48K 96kb
Rx : Idle
Aud: ANA IN + ANA OUT
```

*Figure 3-2 **NetStar** "Home" Status Screen*

The first of four status screens is the 'home' screen, and shows the configuration and connection status of the **NetStar**. When in a menu screen, if no entries are made for a period of time, the display will revert to this screen.

When controlling the **NetStar** from the front panel, all configurations are performed using simple menus.

3.2 Navigation Keypad

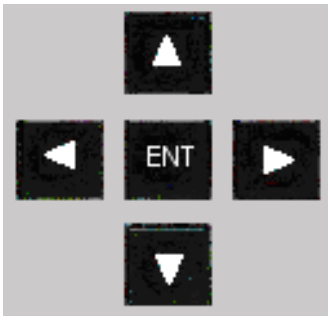


Figure 3-3 Navigation Keypad

The five button navigation keypad, shown in Figure 3-3 is used for menu navigation and configuring the **NetStar**. When the Status screen is displayed (Figure 3-2), pressing any key will evoke the **MAIN MENU**, as shown in Figure 3-4.

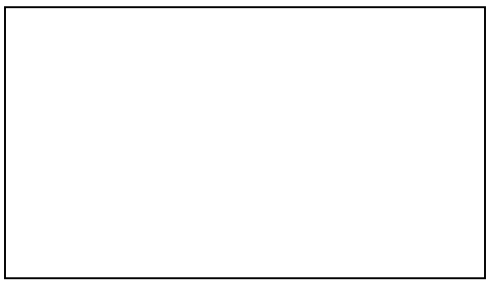


Figure 3-4 Main Menu

Once in the MAIN MENU, or any other menu, the navigation buttons work as follows:

Up ▲: Moves the cursor (the highlighted item) to the next higher position. If the cursor is already at the top position, it will wrap-around to the bottom position. In the example screen shown \above, pressing the ▲ button moves the cursor, currently at 1. Set Mode, to position **5. Reboot**.

Down ▼: Moves the cursor (the highlighted item) to the next lower position. If the cursor is already at the bottom position, it will wrap-around to the top position. In the example screen shown above, pressing the ▼ button moves the cursor to position **2. Connect**.

Previous ◀: Goes to the previous menu screen. For example, pressing the ◀ button from the MAIN MENU will go back to the **MAIN STATUS SCREEN**.

Next ▶: Moves to the next menu level or accepts the current value. In many cases, this button functions exactly like the ENT button. In the example above, with **1. Set Mode** highlighted, pressing the ▶ button goes to the next menu level, the **MODE MENU**.

Enter **ENT**: Pressing this button accepts the current value as highlighted or evokes the next menu level. In many cases, this button functions exactly like the ▶ button. In the example above, with **1. Set Mode** highlighted, pressing the **ENT** button goes to the next menu level, the **MODE MENU**.

3.3 Numeric Keypad

Figure 3-5 Numeric Keypad

The numeric keys, shown in Figure 3-5 are used for dialing ISDN lines, setting IP addresses, and can also be used for selecting numbered menu items. For example, from the **MAIN MENU** shown in Figure 3-4, pressing **4** takes you directly to the **CONFIG MENU**.

The **ESC** key moves up one menu level and the **STAT** key toggles between the current menu and the three status screen. An example of the first of the three status screens has already been shown in Figure 3-2. Pressing the **STAT** button again goes to the second status screen, **ISDN Status**, as shown in Figure 3-6:

```
      ISDN STATUS

LN1: Ready

LN2: Ready
```

Figure 3-6 ISDN Status Screen

Pressing the **STAT** button again shows the status of the IP connection:

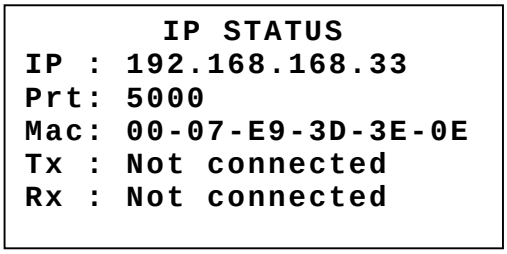


Figure 3-7 IP Status Screen

Pressing the **STAT** button again shows the **Fault History Screen**:

```
     FAULT HISTORY

Now: OK

Hist: None
```

Figure 3-8 Fault History Screen

Pressing the **STAT** button again reverts to the first status screen.

3.4 Quick Keys

Figure 3-9 Quick Keys

DIAL: Pressing this key takes you directly to the **DIAL** menu.

END: Pressing this key takes you directly to the **END** CONNECTION menu.

HP SEL: This key is used to select the source for the headphone jack. Used in conjunction with the headphone status LEDs, this button is used to toggle between local (encoder) audio, remote (decoder) audio, or both simultaneously, as well as no headphone audio.

F1: This key currently has no function.

3.5 Status LEDs

Figure 3-10 Status LEDs

The top group of status LEDs indicates which ISDN lines are connected and the decoder frame state (for any connection type). The bottom LEDs indicate which audio source is being fed to the headphone jack.

3.6 VU Meters

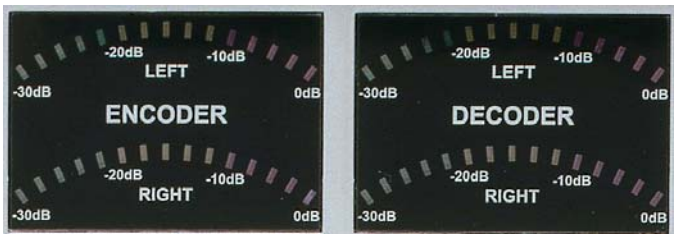


Figure 3-11 VU Meters

The four 15-segment VU meters monitor both channels of encoded and decoded audio. The peak-hold feature is adjustable between 0.5 and 2 seconds, in half-second steps.

From -30 to -12 dB, the level indication is green. Above -12 to -8 dB, the LEDs are amber, and above -8 dB, red.

3.7 Headphones

Along the lower bezel, the headphone jack accepts standard 1/4" stereo headphones, and its level is controlled by the recessed volume control just to the right of the jack. Pressing on the recessed control makes it pop out for easy adjustment.

3.8 Menu Structure

NetStar's simplified top-down menu structure, shown in Figure 3-12 on the next page, allows you to access all functions with just a few button presses.

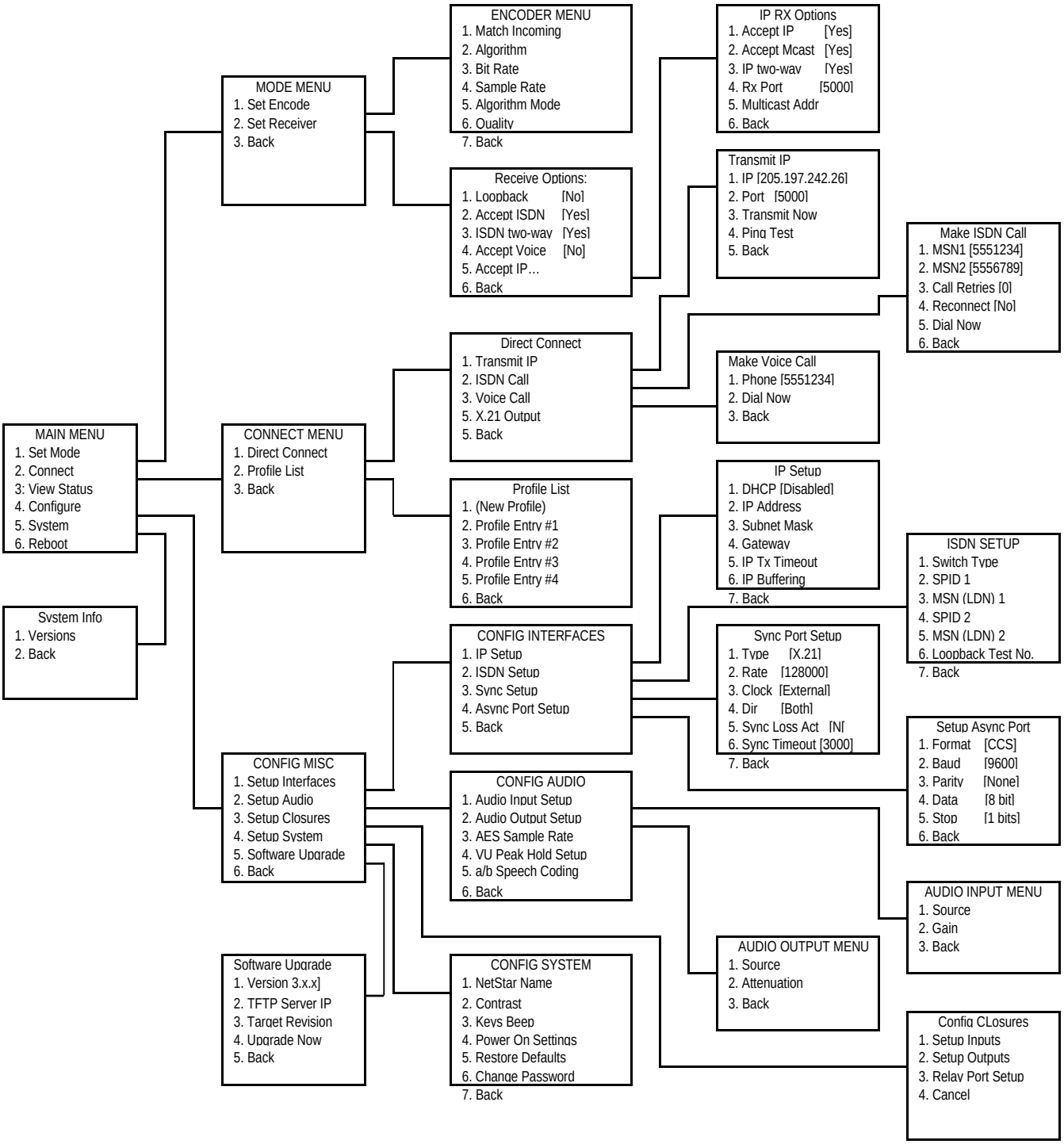


Figure 3-12 NetStar Menu Structure as of Version 3.3.4

Chapter

4

Remote Control

NETSTAR is fully and easily controllable from anywhere in the world

NOTE!

If you will not be using remote control, you can skip to Chapter 5

4. Remote Control Times Four

Both 300 and 500 Series **NetStar** codecs can be remotely controlled, either from a locally attached terminal/computer, or from anywhere in the world. There are four ways to do this.

1. Using any Web Browser, **NetStar**'s built-in HTTP server allows full remote control and diagnostics from anywhere in the world.
2. Using **NetStar**'s IP connection, but without a browser, you can control **NetStar** from anywhere in the world using any of the available Telnet programs (including the DOS command prompt from Microsoft Windows).
3. **NetStar**'s serial interface allows you to connect any dumb terminal or PC running a Terminal Emulation program for local control, again, using the Telnet protocol.
4. **NetStar's** programmable TTL inputs give you eight "contact closure" inputs that can be used to control certain functions, like 'Dial Profile' and 'Disconnect'.

4.1 First-Time Remote Control

The first time you want to control your **NetStar** remotely, you have to pre-configure either **NetStar** or your remote control protocol and computer settings to do so.

Although **NetStar** 500 Series units can be pre-configured from the front panel to match your computer's setting, you don't have that luxury with

any 300 Series models. **In the case of the 300 Series models, you must first configure the IP port using RS232 remote control, or ask MUSICAM USA to pre-program the IP port before we ship NetStar to you**.

Port	Parameter	Factory Default
IP	DHCP	Disabled
	Address	192.168.168.0
	Subnet Mask	255.255.255.0
	Gateway	192.168.168.1
Serial Port	Format	None(Remote Control)
	Baud	9600
	Parity	None
	Data Bits	8
	Stop Bits	1
	Flow Control	None

*Table 4-1 **NetStar** Port Factory Defaults*

4.1.1 Network Configuration for First-Time Remote Control

With any 500 Series Model **NetStar**, you can configure the network interface to match your service or computer's settings as discussed in Section **6.1**. Be sure to read and understand what is meant by network groups, static vs. dynamic IP addressing, and global IP addresses. Alternatively, you can change your computers network settings to match **NetStar**'s defaults.

NOTE!
We strongly recommend that you DO NOT enable DHCP (Dynamic IP addressing), if possible with any 300 Series NetStar. When DHCP is enabled, you cannot assume that the IP address will be the same every time you turn on your NetStar. Since there is no front panel display of the current IP address, you may not be able to connect to your NetStar if the address changes.

4.2 Remote Control via Web Browser

The easiest way to control and configure **NetStar** is by using a Web Browser connected through the LAN port. The computer can be local, connected directly via a crossover CAT-5 cable, or anywhere in the world connected through an IP network or the Internet.
From any Web Browser (web browsers are available for any operating system and platform, including Linux, UNIX, Mac OS, and Windows)

enter the IP address of your **NetStar** in the Browser's address bar as shown here. Press Enter or click the 'Go' icon.

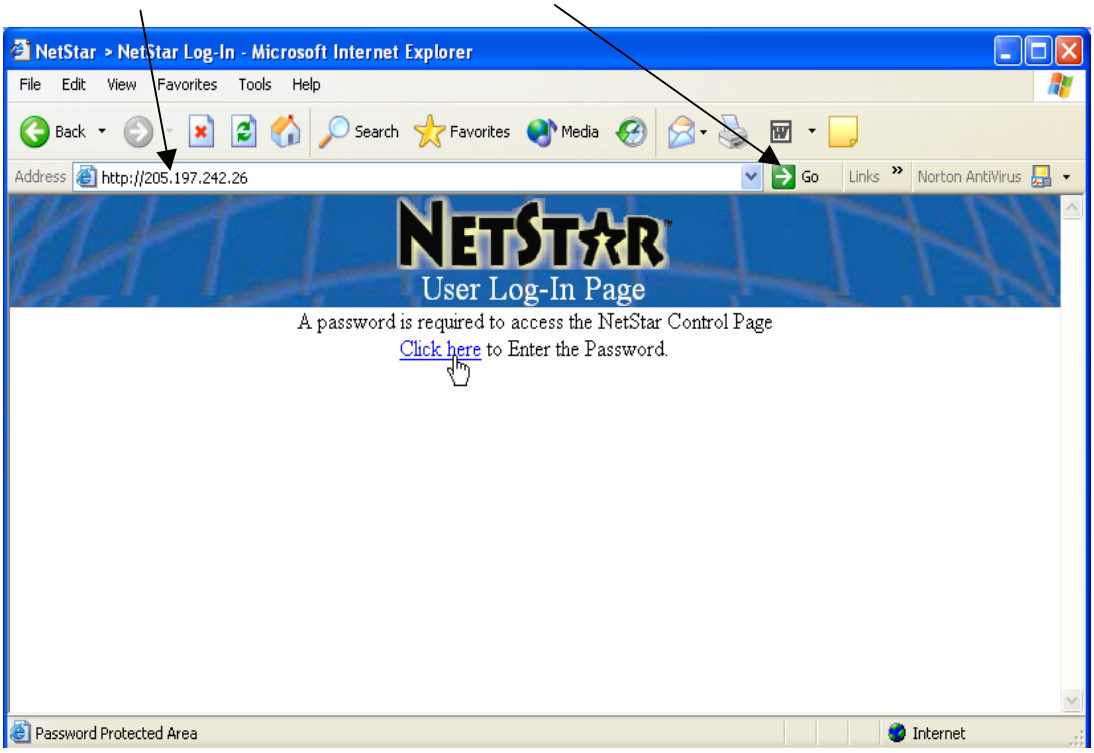


*Figure 4-1 **NetStar** Login Page*

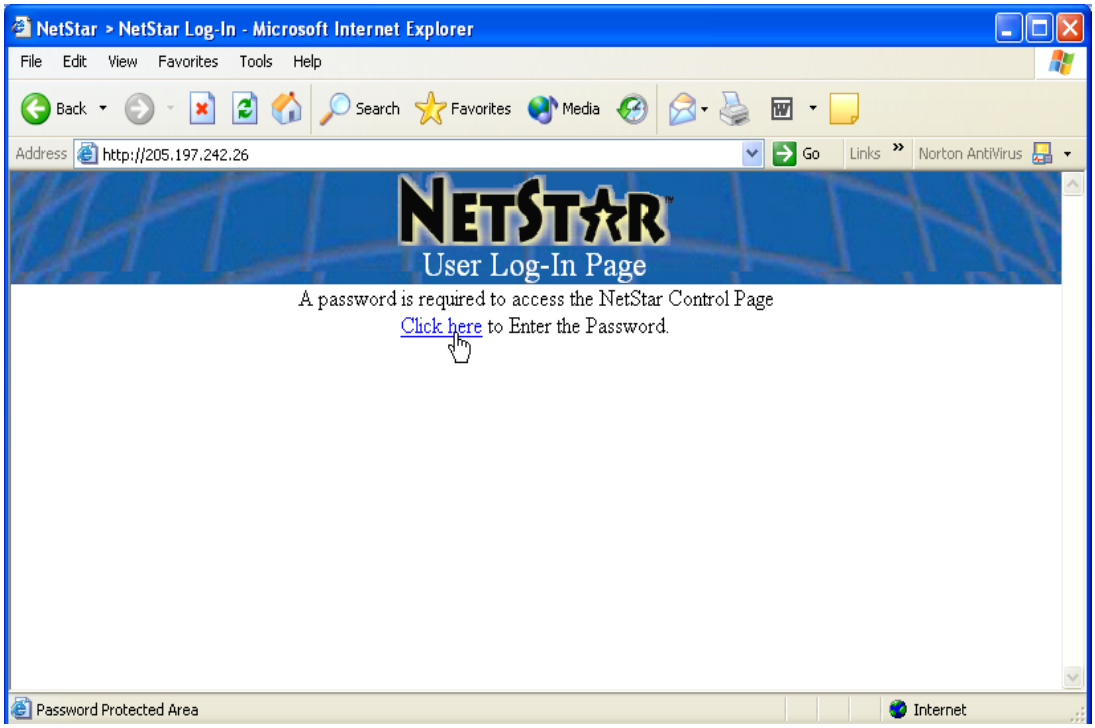


Figure 4-1 shows **NetStar**'s 'Login Page.' This is where you need to enter the password that allows you access to **NetStar**'s Control Page.

4.2.1 Web Page Password

When you click on the link labeled "Click here to Enter the Password", a new window will open allowing you to enter the password.

By default, the **NetStar**'s password is the same as it's serial number. The serial number is located on the rear panel of the **NetStar**. If the correct password is entered, you will be redirected to **NetStar** 'Home Page'.

To change the password, from the front panel menu use the following sequence:

<4. Configure><4. Setup System><6. Change Password>

4. Configure	4. Setup System	1. NetStar Name 2. Contrast 3. Keys Beep 4. Power On Settings 5. Restore Defaults 6. Change Password

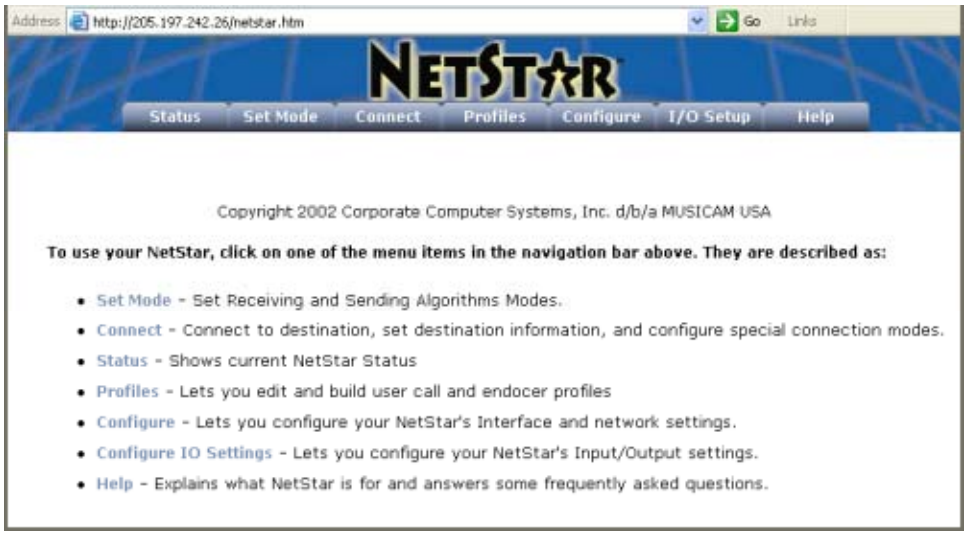


Figure 4-2 ***NetStar*** *'Home Page'*

Figure 4-2 shows **NetStar**'s 'Home Page.' From this page you can access *all* of **NetStar**'s features and controls. By clicking on any button on the menu bar, or any highlighted (blue) word (shown above), individual configuration pages are displayed.

4.2.2 Status Page

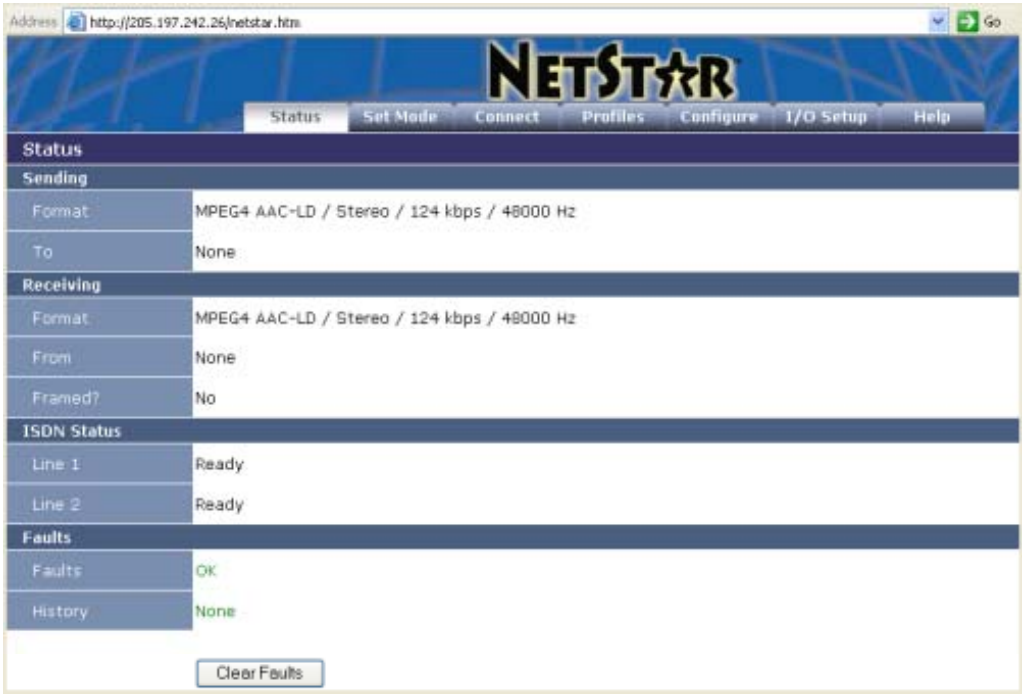


Figure 4-3 Status Page

Although you cannot change any settings from the Status page, shown in

Figure 4-3, you can view the sending and receiving configuration and connection, the status of the ISDN lines, and any current or previous system faults. Clicking 'Clear Faults' clears all faults from **NetStar**'s

memory, resetting the page displayed as well as the STATUS screen on 500 Series models.

4.2.3 Set Mode Page

The Set Mode page, shown in Figure 4-4, allows you to configure all variables of the encoder and decoder, including loopback mode. Using pull-down menus, you can select the type of connections to answer, encoder algorithm, sample rate, bit rate, mode quality, and ancillary data mode.

You can make multiple changes at one time, and no setting is changed until you click **Apply Changes.**

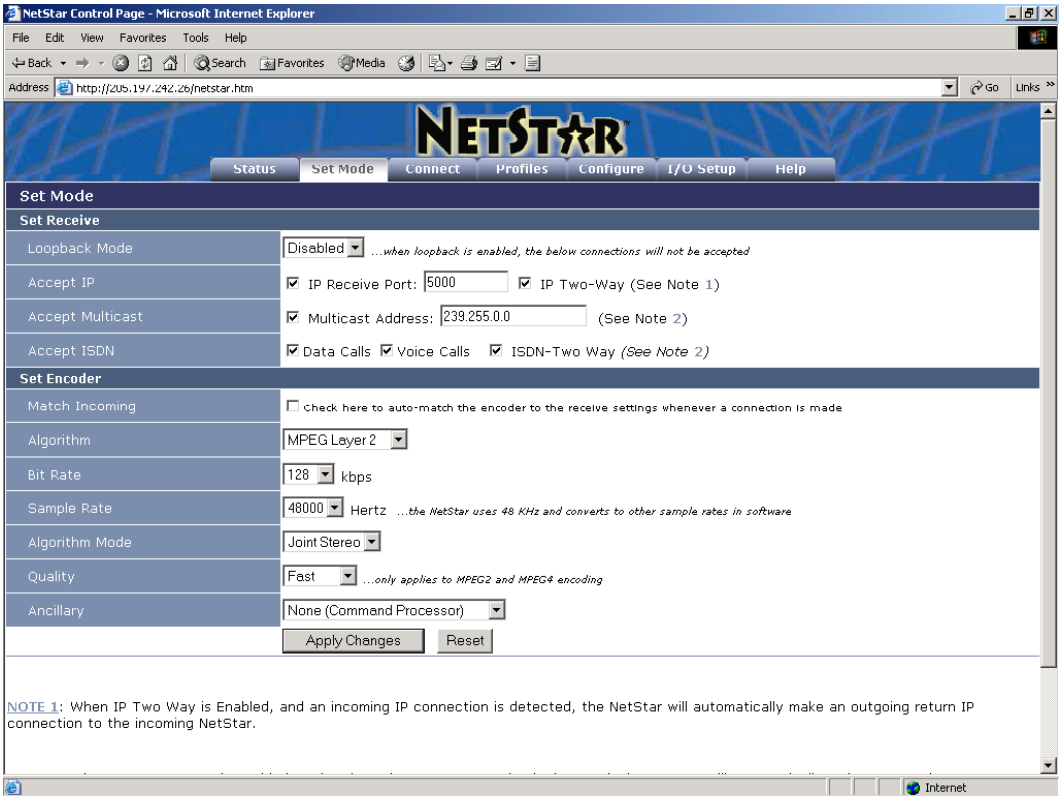


Figure 4-4 Set Mode Page

4.2.4 Connect Page

From the **Connect** page, shown in Figure 4-5, you can establish or terminate either the send or receive connection, or both.

Remember, **NetStar** can function as a separate encoder and decoder, so you can have different send and receive connections, established and terminated independently. For example, you can use **NetStar** to receive audio via the Internet and send different audio via ISDN.

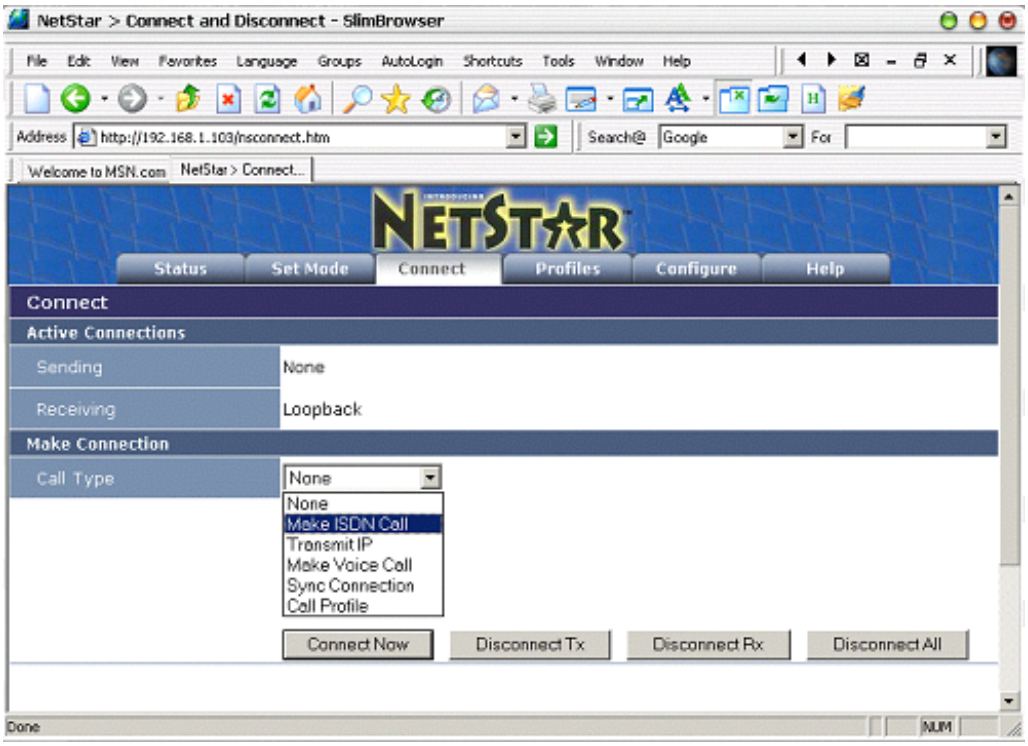


Figure 4-5 Connect Page

4.2.5 Profiles Page

One of the most useful features of **NetStar** is the Connection Profiles. The **Profile Page** (Figure 4-6) gives you the ability to create, edit, and store connection '**Profiles**'. Each profile contains all the information needed to establish a connection to another codec, regardless of connection or codec type. You can even make non-connecting (non-initiating) profiles to quickly reconfigure your **NetStar** for making connections to another codec.

Using standard pull-down menus, each profile contains all information required by **NetStar**, including:

- Profile name
- Encode algorithm (remember, decode algorithm synchronizes automatically to the far end signal
- Encode bit rate (Select 'Auto' to match the incoming line connection bit rate
- Sample rate
- Algorithm mode
- Call type
- Connection information, depending on call type selected; i.e., IP address and port, ISDN or phone numbers

To connect to another codec using a profile (or configure your **NetStar** using a non-connecting profile), select '**Call Type**' = '**Call Profile**' from the **Connect Screen** (Figure 4-5).

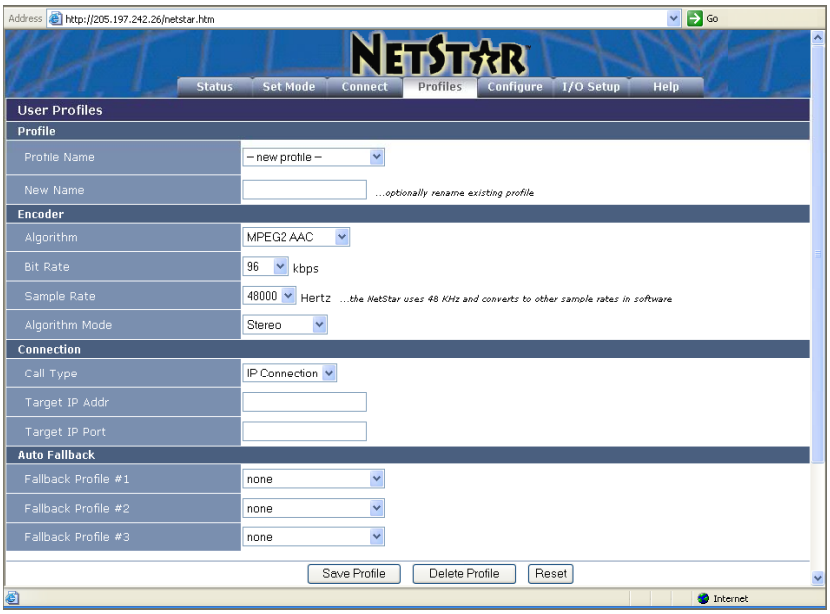


Figure 4-6 Profiles Page

4.2.6 Configure Page

The **Configure Page**

(Figure 4-7) lets you set or change any non-algorithm related configuration, including ISDN and network configuration, audio input and output selection, and ancillary data/RS232 port configuration.

Many changes can be made before clicking the '**Apply Changes**' button. You can return to the original settings without accepting any changes by clicking the **'Reset'** button.

Figure 4-7 Configure Page

4.3 RS232/Telnet Remote Control

For those users without a Web Browser or Internet/Network access, you can still remotely control your **NetStar**. Two methods are available: Telnet uses the Network connection and Telnet program (the DOS command prompt works fine) and RS232 remote control uses a dumb terminal (or terminal emulation program) and an RS232 null-modem cable to connect to **NetStar**. Although the connection to **NetStar** is different, both methods use the same commands and protocols.

4.3.1 Telnet Connections

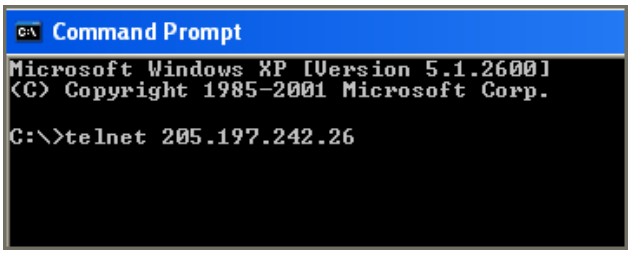
Telnet control of **NetStar** uses the same network connections as IP remote control and audio transmission. The basics of network connections can be found in Section **6.1**. As with all other remote control techniques, the computer/terminal settings must match **NetStar**'s network settings.

There are many Telnet programs that can be used, but one of the easiest, the 'DOS' command prompt, will be shown here.

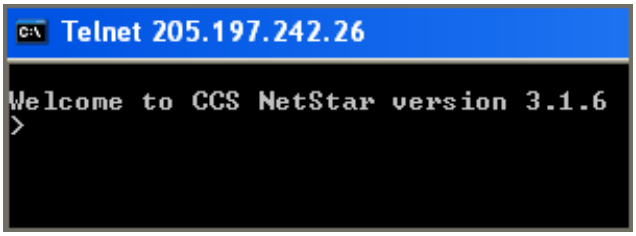
From the command prompt, type:

`telnet` *`address`*

where *`address`* is the IP address of the **NetStar** you want to control, and press 'enter'.



If connected properly, the response will be the **NetStar** welcome message and command prompt, as shown:



4.3.2 RS232 Connection

For users without network access, **NetStar** can be easily controlled using any terminal or terminal emulation program connected through the Anc Data/Control port. Additionally, you can also control **NetStar** from anywhere in the world via a dial-up modem connected to this port.

Connect the serial port of your computer/terminal to **NetStar**'s RS232 port using a null-modem cable, as shown in Figure 4-8.

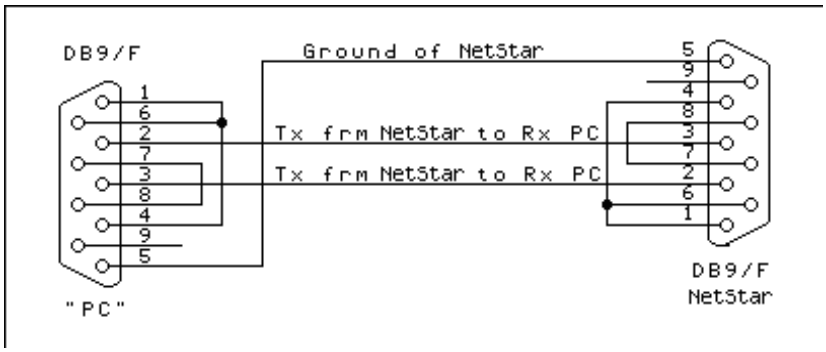


Figure 4-8 Null-Modem Cable

If properly connected, you should see **NetStar**'s command prompt, as shown in Figure 4-9 (you may have to hit 'return' to get it):

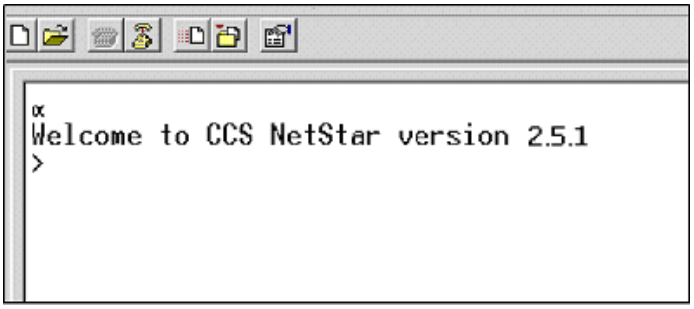


*Figure 4-9 **NetStar** Command Prompt*

4.3.3 Remote Control Commands

Both Telnet and RS232 remote control use the same command syntax.

To see all of the available remote control commands, from the prompt, type:

```
help
```

and hit 'return'. The response is shown in Figure 4-10.

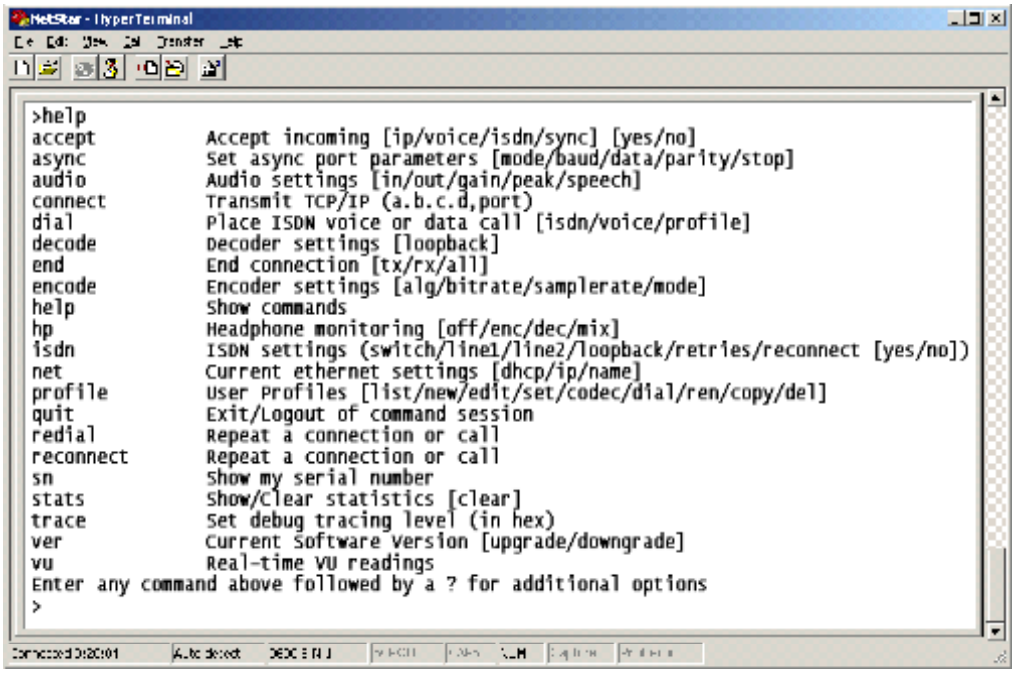


Figure 4-10 NetStar Command Display

To get the syntax for any command, type

command ?

and hit 'return', for example:

Figure 4-11 Command Help Example

Now, to determine what parameters and syntax the command uses, type

command function ?

and hit 'return', for example:

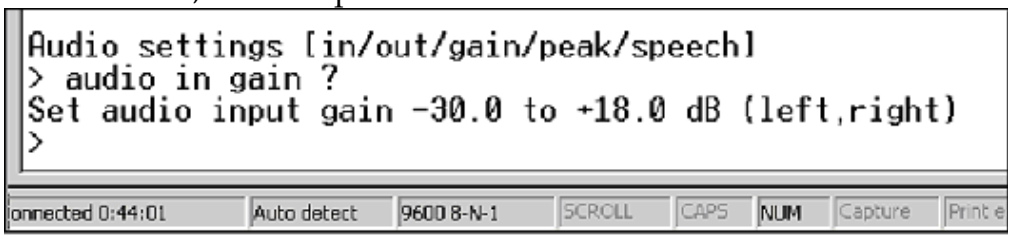


Figure 4-12 Parameter Syntax Help Example

So, to set the audio gain, we type:

audio in gain -1.0,-1.0

This sets the audio gain to -1.0 dB for both the left and right channels.

A complete list of all commands and command syntax can be found in Appendix B.

This Page Intentionally Left Blank.

Chapter

5

Coding

The choice of coding algorithm is up to you. NETSTAR has six to choose from, plus uncompressed audio over IP.

5. Choosing an Algorithm

The selection of which algorithm is right for you can sometimes be quite daunting. When there are only one or two algorithms in common with the codec at the other end, the choice is easier, but not always intuitive. Just because an algorithm may sound better to you, or use lower connection rates, doesn't mean that it's the right algorithm to use. Everything must be considered, including source material, the application, delay, and most importantly, what will happen to the audio after it leaves the receiving codec.

5.1 Coding and Compression 101

Audio compression has come a long way since the days of 7.5 kHz PCM coding, and today's algorithms can reproduce audio that is indistinguishable from the source at bit rates low enough for ISDN connectivity.

Still, the question is asked, "Why would I *want* to compress?" The answer is simple, *bandwidth!* Until every home, office, and business in the world is wired with a minimum of a T1 circuit (1.5 Mb/s, the minimum bit rate required for two-channel CD quality audio) and there is a world-wide infrastructure capable of supporting it, compression is a fact of life.

With a bandwidth of 20 Hz - 20,000 Hz, and a signal-to-noise ratio better than 92 dB, the bandwidth requirement for a high quality stereo audio signal is approximately 1.4 Mbps (million bits per second) (2 x 706 kb/s for a 44.1 kHz, 16 bit PCM signal). This format is frequently used by and recommended for professional and consumer equipment by a number of international bodies such as CCIR and IEC. One of the most used product types with this format is the Compact Disc. Due to the direct relationship

between bit rate and costs for transmission and storage, it is desirable to reduce the rate.

This leads to another question, "Is compression right for me?" This answer is not as simple. The answer depends on several factors, but the three most important factors are: the application, bandwidth availability, and what compression schemes are available.

Compression comes in two flavors: *lossless* or *lossy*. Lossless compression is just that; data is compressed, stored and/or transmitted, and then re-constructed, bit-for-bit, exactly as the original. Run-Length Encoding (RLE) is an example of lossless compression. Used by FAX machines and archiving programs such as WinZip®, compression ratios depend solely on the data being compressed, and can vary from 0 to 99%. Since the compression ratio is unpredictable, lossless compression is not suited for *real-time*, constant bit rate applications, such as audio transmission over ISDN or dedicated data circuits.

Lossy compression is just that; information is actually lost. Once compressed using a lossy algorithm, the original bit sequence cannot be exactly re-created; only an approximate re-creation is possible. The accuracy of this re-creation depends on how many bits are lost and the importance of those bits. Lossy compression is not for every application; diagnostics for example. You would not want your cardiologist listening to a recording of your heart that has been compressed. Nor would you want to make a studio master recording using any form of compression. This is why **NetStar**, in addition to multiple compression algorithms, offers uncompressed audio transmission over the IP networks.

Almost all audio compression algorithms are based on the fact that the human auditory system is not perfect. Research in the mid-20th Century showed that a person cannot hear all sounds, especially very quiet sounds, nor can a person distinguish sound location at certain frequencies. (Next time a cell phone rings in a crowd, try to quickly locate where it's coming from.)

In addition, the ear cannot differentiate even moderate level sounds in the presence of loud sounds. Try an experiment while driving to work…turn your radio up loud and the road noise seems to disappear. It doesn't really disappear, you just don't perceive it.

Every audio signal contains signal components which are not responsible for the identification of the audio signal; i.e., for the determination of timbre and localization. The information process in the brain does not

require these irrelevant signals. The reduction of irrelevance means that these signal components are not transmitted, which results in a lower bit rate without any perceived degradation of the audio quality. Furthermore, it is possible to allow a certain degree of quantizing noise, which is inaudible to the human ear due to the masking effects of the audio itself.

To understand this masking effect, the concept of a masking tone must be defined. A masking tone, often called a "masker," is simply a high amplitude audio signal occurring over a relatively narrow frequency span. Typically, an audio signal contains a number of these masking tones occurring at several different frequencies.

As shown in Figure 5-1, a masking tone renders smaller amplitude tones close to it inaudible due to its masking effect (the car radio and the road noise). The exact shape of the masking effect is called the masking threshold. The aggregate of all the maskers defines a global masking threshold and the sounds below the global masking threshold are inaudible. Since these sounds are considered inaudible, they need not be transmitted. Other signal components above the masking threshold require only the level of quantization to keep quantization noise below the masking threshold, thus keeping the quantization-induced noise inaudible as well.

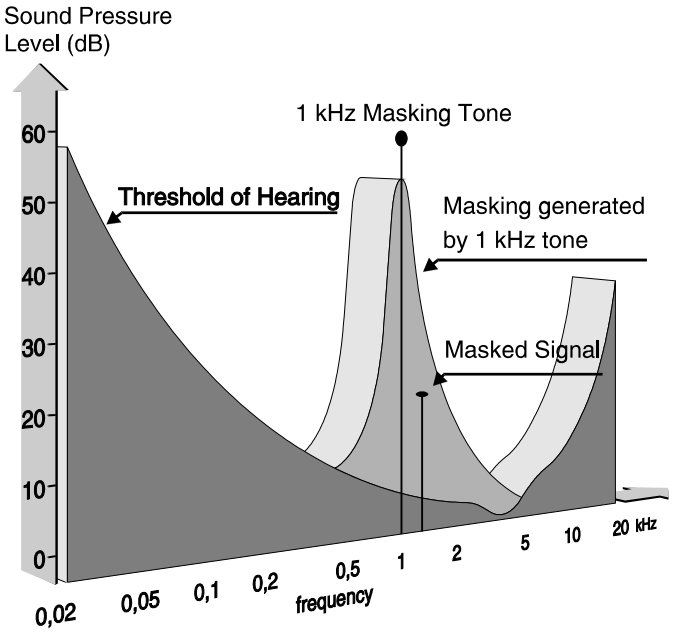


Figure 5-1 Masking threshold generated by a 1 kHz tone

5.1.1 Audio Compression History

The recent decades have brought improvements in the area of high quality audio transmission and storage. More and more memory and signal processing power at the developer's disposal has resulted in real-time perceptual coding techniques. The earlier MPEG audio standards follow a simulation of the human sound perception for the encoding process. The bit rate needed for transmission or storage of high quality audio signals (1,412 kb/s for Compact Disc) had been reduced to about 192 kb/s or less as a result of major progress in the development of source coding techniques that utilize knowledge of the auditory system. This means that the average quantization of the audio signal at a sampling frequency of 44.1 kHz would be approximately 2 bits per sample instead of 16 bits per sample as used in CDs. Despite this high reduction in bit rate, no quality differences are detectable, even by well trained listeners.

With these earlier MPEG encoding schemes, real-time audio transmission was possible via available multiples of 64 kb/s digital transmission channels. The relatively low cost of ISDN, fractional T1 and satellite channels now lessens the need for high bit rate channels and allows economical use of 192 kb/s and higher bit rates. Utilizing higher channel rates results in higher quality audio.

Newer MPEG algorithms, such as MPEG-2 AAC, (Advanced Audio Coding), provide audio that has been judged indistinguishable from the source with as little as 64 kb/s per channel.

The knowledge of how the human ear perceives sound is not new in the field of audio coding. The 3 kHz bandwidth of the telephone was chosen because of the "source and sink;" i.e., the human auditory and speech system. It has been known for a number of years that the main format areas of speech, which result in intelligibility and speaker recognition, are in the frequency range of 300 Hz to 3 kHz. To store or transmit audio signals efficiently, the source and sink must match the transmission system in order to transmit and/or store audio economically.

Before the MPEG (Motion Pictures Experts Group) began the design of a high quality coding algorithm for video and audio, algorithms such as CCITT G.722 were well known and used frequently for audio transmission. The G.722 algorithm provides a bandwidth of less than 7.5 kHz and a signal-to-noise ratio of 78 dB at 64 kb/s transmission rates.

5.1.2 Coding Performance Considerations

Before discussing the various quality aspects of coding algorithms, it is necessary to define the terms used to represent the field of use of the audio. The four commonly discussed fields of use are:

- Contribution
- Distribution
- Emission
- Commentary

The term *contribution* is used to describe audio quality suitable for digital mastering. Its use would be in the transmission of a digital master from one archive to another. It is assumed that the original copy is in a 16 bit linear PCM format and it is to be encoded, transmitted, decoded and stored in a 16 bit linear PCM format at the far end. Because the audio may be the source of future encode and decode cycles (tandeming, or cascading), any contribution grade compression system must be able to withstand many encode-decode cycles and the effects of post production without any apparent degradation to the audio.

Distribution grade systems are used to transmit audio between two storage devices. However, the number of encode-decode cycles is limited to only a few. Distribution grade systems are used when the number of audio encode-decode cycles is limited.

Emission grade systems are used when there is only one encode-decode cycle anticipated. This is the case when audio is encoded and transmitted from one place to another, decoded and stored on an analog tape and the only future manipulations done are in the analog domain.

Commentary grade systems are used for transmitting voice grade audio.

These definitions do not mention the analog bandwidth or the exact quality of the audio. They are subjectively vague terms used to describe the ability of the audio to withstand multiple encode-decode cycles. In all cases, the encoded audio is assumed to be indistinguishable from the original.

Good coding algorithm design allows the digital bit rate, analog bandwidth and quality to be generally related by the formula

$$\text{Audio Quality} = \frac{\text{Digital Bit Rate}}{\text{Analog Bandwidth}}$$

As indicated above, audio quality increases as the bit rate increases and the analog bandwidth is kept constant. Similarly, if the digital bit rate is kept constant while the analog bandwidth is decreased, then the quality improves.

Today, with many coding algorithms to choose from, another ratio becomes important as well:

$$\text{Audio Quality} = \text{Coding Complexity} \times \text{Bit Rate}$$

As indicated above, when keeping the bit rate constant, audio quality increases as coding complexity increases.

This may suggest that more powerful coding algorithms are always superior; however, this is not necessarily the case. As with anything else, tradeoffs must be made. More aggressive algorithms require faster, more powerful processors; or, with the same processing power, exhibit longer delays. In addition, selecting the proper algorithm requires more than just selecting the best sounding one. Delay is an issue, as is what will be happening to the audio after it leaves your studio. Will it be encoded again? If so, what algorithm will be used?

5.1.3 Cascading and Transcoding

Lossy algorithms are just that; information is discarded, or lost, in the process of compression. Higher compression ratios result in more lost information. If an audio signal is to be recompressed (using the same or different algorithm for the next compression cycles), you should start with as little compression as you possibly can. This means that you should start with the highest bit rate possible. Don't expect 128 kb/s audio to cascade many times and still sound good, regardless of the algorithm used.

Why should this matter? The simple answer is that you may have no control of how the audio is used after it leaves your codec. You probably don't have any control over any compression that may be performed in editing and post-production, storage, distribution and transmission. It is common practice for radio stations to store music in compressed form and to re-compress when the program audio is sent to a distant transmitter via STL.

It is very difficult to flatly state that you can code *x* times with a particular algorithm at a particular bit rate and *y* times with some other algorithm; it's just not that simple. For example, MPEG Layer 2 can be cascaded up to 15 times at 384 kb/s, but the number decreases if some of those compression cycles are at Layer 3, even at the maximum bit rate. Throw in an algorithm of a different class, such as G.722 or CEDAT, and the number is further reduced. If cascading or transcoding cannot be avoided, earlier compression cycles should be at higher bit rates than the following cycles.

The overriding goal is to get as much coding 'headroom' as possible by using the highest bit rates possible, regardless of algorithm. There is the old adage 'garbage in, garbage out' as well. Start with bad audio or insufficient bit rate, and it only gets worse, regardless of the headroom in later stages.

5.1.4 Codec Compression Algorithms and Modes

In addition to linear (uncompressed) audio, there are currently six compression algorithms available in the **NetStar**. Each has its advantages and disadvantages. Many algorithms support multiple modes and bit rates. Which algorithm you use depends on a number of factors, including desired audio quality, delay, cost of the transmission line, and compatibility with other codecs. This chapter serves as a guide for choosing the best algorithm and mode for your applications when a choice is available.

5.1.4.1 Stereo and Dual Mono

Users have expressed confusion concerning the differences between stereo, dual mono and joint stereo. From a coding and compression standpoint, stereo and dual mono are identical. That is, half of the total bits are assigned to the left channel, and half of the total bits are assigned to the right channel. Left is always left, and right is always right…no blending, no sound stage manipulations. The only real difference between stereo and dual mono may be in a header bit and channel timing.

5.1.4.2 Joint Stereo

Unlike dual mono or stereo, joint stereo employs real-time bit allocation techniques and dynamically assigns bits to the channels and frequency bands that need them the most. Bits are allocated on a frame-by-frame basis. This dynamic bit allocation results in considerably wider bandwidths and higher signal-to-noise ratios than possible with the fixed bit allocation of the other modes. If the bit allocation circuitry determines

that enough capacity is available for true stereo, then stereo frames will be sent.

Unlike stereo and dual mono, joint stereo may manipulate the left-right sound stage and stereo separation at high frequencies. The infinite left-right sound stage is blended into seven locations at high frequencies should the bit allocation circuitry deem it necessary. However, it has been shown that any spatial blending performed by the bit allocation is in frequency bands where the human auditory system would normally blend stereo signals. This is one of the basic premises behind psychoacoustic modeling, on which all MPEG algorithms are based.

After rigorous testing with trained listeners, joint stereo audio has been determined to yield higher perceived audio quality than stereo or dual mono at low bit rates, such as those encountered with single BRI ISDN lines.

5.1.4.3 G.711

G.711 allows ISDN codec, such as **NetStar**, to connect from an ISDN circuit to a standard telephone connected to a standard telephone circuit (POTS). Although the audio quality is limited to that of a standard telephone, 300 Hz to 3 kHz, this feature allows you to use a studio located **NetStar** in those situations where ISDN is just not available in the field.

NetStar supports two different coding schemes with G.711, A-law and μ-law. μ-law is an American POTS coding standard where frequencies are coded in a logarithmic scale, yielding wider frequency range but less resolution. A-Law is a European POTS coding standard (still G.711) where frequencies are coded linearly, yielding greater midrange quality/resolution but less frequency range.

5.1.4.4 G.722

G.722 is one of the earliest audio coding algorithms to be standardized. G.722 is a relatively simple algorithm based on ADPCM (adaptive pulse code modulation) offering full duplex 7.5 kHz commentary grade audio over a single ISDN "B" channel. The key advantages of G.722 are its compatibility with most other codecs and very low delay times. G.722 is therefore ideal for situations where instantaneous talkback is required, such as dial-in talk shows and distant interviews. The main disadvantages are the limited audio fidelity, comparatively poor signal-to-noise ratio, and poor cascading properties. G.722 is not recommended for music applications. The bit rate (64 kb/s), sample rate (16 kHz) and mode (mono) are fixed by the algorithm and cannot be changed.

! NOTE: G.722 supports only 16 kHz sampling

Please note that some codecs manufactured by others will indicate that G.722 supports sample rates other than 16 kHz. This is not true. The G.722 standard specifies 16 kHz sampling; these codecs improperly display the sample rate.

Recommended applications for G.722:

- Sports, news, traffic and weather reporting
- Call-in talk shows
- Compatibility with G.722 codecs
- Low-delay return audio for high-fidelity remotes

5.1.4.5 ISO/MPEG Layer 2

Less aggressive than Layer 3 and optimized for 96 kb/s per channel, Layer 2 provides transparent, CD quality stereo audio using as little as 192 kb/s. With lower delay, higher immunity to cascading and transcoding effects, and fewer artifacts than Layer 3, Layer 2 should be considered as an alternative to Layer 3 or AAC-LD, even though higher bit rates may be needed.

This perceptual based coding algorithm splits the audio spectrum into 32 bands for processing. At low bit rates, 64 kb/s per channel, Layer 2 can deliver emission grade audio. At bit rates higher than 192 kb/s, Layer 2 delivers transparent distribution grade stereo with immunity to degradation even after up to 15 cascades (at 384 kb/s). In addition, Layer 2 is less affected by post processing than Layer 3 or AAC-LD. If the bandwidth is available, we strongly recommend using Layer 2 at 192 kb/s instead of Layer 3 at 128 kb/s.

NetStar supports all ISO/MPEG Standard Layer 2 bit rates from 24 to 384 kb/s and sample rates from 16 to 48 kHz for compatibility with the tens of thousands of Layer 2 codecs currently in use. Mono, Dual Mono, Joint Stereo and Full Stereo modes are supported as well. With ISDN lines, **NetStar** supports single and 2-line connection modes, including CCS I-MUX.

When using Layer 2 with low bit rates, better audio is achieved with lower sample rates. Table 5-1 shows supported or recommended combinations:

Bit Rate (kb/s)	Sample Rate (kHz)		
	24	32	48
24	x	nr	nr
32	M	nr	nr
48	M	nr	nr
64	M, JS	M	nr
80	M, JS	M, JS	M
96	All	M, JS	M
112	All	All	M, JS
128	All	All	M, JS
144	x	All	M, JS
160	x	All	M, JS
192	x	DM, JS, FS	DM, JS, FS
224	x	DM, JS, FS	DM, JS, FS
256	x	DM, JS, FS	DM, JS, FS
320	x	DM, JS, FS	DM, JS, FS

Areas marked with x are not supported by this algorithm, nr = not recommended
Table 5-1 MPEG Layer 2 Modes

5.1.4.6 ISO/MPEG Layer 3

More aggressive than Layer 2, ISO/MPEG-1 Layer 3 is optimized for 64 kb/s per channel, and can deliver full duplex, 15 kHz monaural audio using only one 64 kb/s ISDN 'B' channel. At 128 kb/s, transparent 20 kHz monaural audio is possible. Near-transparent 20 kHz audio is possible in joint-stereo mode. In dual mono or stereo modes, near-transparent 15 kHz audio is obtained.

Dividing the audio spectrum into 576 bands, Layer 3 adds Huffman coding to a perceptual based algorithm. This results in a higher compression ratio (for equivalent performance) but longer delay. Offering a wider bandwidth than MPEG Layer 2 at low bit rates, the inherent drawbacks of this algorithm may outweigh this benefit. The disadvantages of using Layer 3 are long coding delay times and poor

cascading ability. In addition, audible artifacts may be noticeable when using Layer 3 at lower bit rates, and post-processing may further degrade the audio.

All else being equal, at ISDN bit rates, we recommend using Layer 3 only when AAC is not supported at the far end. Even at 112 or 128 kb/s, digital artifacts may be noticeable; and the delay, cascading and post-processing limitations are still present. If AAC is not available at both ends, and higher bandwidth is available, we recommend using Layer 3 at a higher bit rate.

At bit rates higher than 128 kb/s (not supported with internal terminal adapter), there is no advantage to using Layer 3 over AAC or Layer 2. **NetStar** supports Layer 3 bit rates from 24 to 320 kb/s and sample rates from 8 to 48 kHz for compatibility with all Layer 3 codecs. Table 5-2 shows supported combinations:

Bit Rate (kb/s)	Sample Rate (kHz)		
	24	32	48
64	M	M	M
80	M, JS	M	M
96	M, JS	M, JS	M, JS
112	x	All	All
128	x	All	All
144	x	DM, JS, FS	DM, JS, FS
160	x	DM, JS, FS	DM, JS, FS
192	x	DM, JS, FS	DM, JS, FS
224	x	DM, JS, FS	DM, JS, FS
256	x	DM, JS, FS	DM, JS, FS
320	x	DM, JS, FS	DM, JS, FS

Areas marked with X are not supported by this algorithm

Table 5-2 MPEG Layer 3 Modes

5.1.4.7 MPEG-2 AAC

A collaboration between industry heavyweights looking to create a truly transparent coding scheme for 128 kb/s transmission, MPEG-2 AAC is designed to provide nearly transparent, true stereo reproduction with bit rates as low as 96 kb/s. AAC has been judged to achieve this ITU requirement of "indistinguishable quality" stereo audio at bit rates as low as 128 kb/s. Thus, AAC provides the best possible audio when using

ISDN. Supporting the most bit and sample rate combinations, as shown in Table 5-3, AAC can be tailored to provide the best possible audio at any bit rate between 8 and 320 kHz. Remember, at lower bit rates, lower sample rates result in superior audio. Table 5-3 shows allowable bit and sample rate combinations:

Bit Rate	Sample Rate								
	8K	11.025K	12K	16K	22.05K	24K	32K	44.1K	48K
24	M	M	M	M	M	M	M	M	M
32	M,S	M,S	M,S	M,S	M,S	M,S	M,S	M,S	M
48	S	M,S	M,S	M,S	M,S	M,S	M,S	M,S	M,DM,S
64	S	S	S	M,S	M,S	M,S	M,S	M,S	M,DM,S
80	S	S	S	M,S	M,S	M,S	M,S	M,S	M,DM,S
96	X	S	S	S	M,S	M,S	M,S	M,S	M,DM,S
112	X	X	X	S	M,S	M,S	M,S	M,S	M,DM,S
128	X	X	X	S	S	S	M,S	M,S	M,DM,S
144	X	X	X	S	S	S	M,S	M,S	M,DM,S
160	X	X	X	X	S	S	M,S	M,S	M,DM,S
192	X	X	X	X	S	S	S	S	DM,S
224	X	X	X	X	X	S	S	S	DM,S
256	X	X	X	X	X	X	S	S	DM,S
320	X	X	X	X	X	X	S	S	DM,S

Areas marked with X are not supported by this algorithm

Table 5-3 AAC supported modes

AAC is a very aggressive algorithm, with temporal noise shaping, perceptual noise shaping, 2,048 filter bands, and a new predictive model. As such, cascading and transcoding should be avoided at lower bit rates. In addition, long coding delays need to be considered. With moderate transmission rates, say ≥ 128 kb/s, AAC does transcode and cascade well, and mild post processing does not aversely affect coded audio.

5.1.4.8 MPEG-4 AAC LD (Low Delay)

With aggressive algorithms such as AAC and MPEG Layer 3, delay becomes an issue to be considered. The designers of AAC have produced a low delay variant to address this issue. With about 1/3 the delay of AAC, AAC-LD must make some compromises.

Dividing the audio spectrum into 2,048 bands, AAC-LD builds on the Huffman encoded perceptual algorithm (MPEG Layer 3) by adding temporal noise shaping and adaptive linear prediction. With about the same coding power as MPEG Layer 3 but about a quarter of its delay, AAC-LD can reproduce 15 or 20 kHz mono audio using one 64 kb/s

channel, and true 15 or 20 kHz stereo at 128 kb/s. Tests have demonstrated that AAC-LD had superior performance to Layer 3 on about 50% of the test materials, and was never worse.

Supporting bit rates from 32 to 320 kb/s and sample rates from 22.05 to 48 kHz, there is a combination of bit and sample rates, shown in Table 5-4 for most applications. Remember, in some applications, lower sample rates may actually result in superior audio.

Bit Rate	Sample Rate				
	22.05K	24K	32K	44.1K	48K
32	M	M	M	M	M
48	M,S	M,S	M,S	M,S	M,S
64	M,S	M,S	M,S	M,S	M,S
80	M,S	M,S	M,S	M,S	M,S
96	S	M,S	M,S	M,S	M,S
112	S	M,S	M,S	M,S	M,S
128	S	S	M,S	M,S	M,S
144	S	S	S	M,S	M,S
160	S	S	S	M,S	M,S
192	X	S	S	S	S
224	X	X	S	S	S
256	X	X	X	S	S
320	X	X	X	S	S

Areas marked with X are not supported by this algorithm

Table 5-4 AAC-LD supported modes

Low delay AAC is ideal in situations where the quality of Layer 3 is acceptable, but the delay is not. As with other aggressive algorithms, cascading and transcoding should be avoided. In addition, audible artifacts may be noticeable when using AAC-LD at lower bit rates, and post-processing may further degrade the audio.

5.1.4.9 Uncompressed

NetStar supports uncompressed audio transmission over IP. Uncompressed audio offers the best possible quality…it's just like sending a CD or DAT to the far end in real time. Uncompressed audio is for the most demanding applications, such as studio mastering or studio-to-transmitter links. Completely transparent, and, since there is no

compression, uncompressed audio can theoretically pass through infinite transmission cycles without any degradation.

Bit rates and sample rates are fixed and depend on the algorithm mode and sampling rate.

Note that uncompressed audio transmission can be bi-directional, but since it requires a minimum of 768 kb/s of transmission bandwidth for each channel in each direction, uncompressed works only over IP, and requires a minimum of a T1 line for stereo transmissions.

5.1.5 Algorithm, Mode, Bit and Sample Rate

Since no single algorithm/mode/sample rate/bit rate combination is ideal for all applications, **NetStar** offers several different combinations, each with advantages and disadvantages. In addition, the full range of available algorithms insures that your **NetStar** can connect with the widest number of codecs. The tables on the next couple of pages compare some of the available algorithms and bit rates. Recommended algorithm combinations are indicated with a ✓. In some instances, especially at lower bit rates, using a lower sample rate will result in better audio, with wider bandwidths and reduced artifacts. **NetStar** will not allow you to select any invalid combinations of algorithm, bit rate, sample rate and mode.

Algorithm	Sample rate	Mode	Bandwidth	Delay	Cascade	
G.722	16 kHz	mono	7.5 kHz	very low	Poor	
Layer 2	24 kHz	mono	10.2 kHz	moderate	Good	✓
Layer 2	48 kHz	mono	8.5 kHz	low	fair	
Layer 3	32 kHz	mono	15 kHz	long	fair	✓
Layer 3	48 kHz	mono	15 kHz	long	Poor	
Layer 3	32 kHz	JS	14 kHz	long	Poor	
AAC-LD	32 kHz	mono	15 kHz	moderate	fair	✓
AAC-LD	48 kHz	mono	15 kHz	moderate	fair	
AAC-LD	32 kHz	stereo	15 kHz	moderate	poor	
AAC	32 kHz	mono	15 kHz	long	poor	✓
AAC	48 kHz	mono	15 kHz	long	poor	✓
AAC	32 kHz	stereo	15 kHz	long	poor	

Table 5-5 Algorithm Qualities at 64 kb/s

Algorithm	Sample rate	Mode	Bandwidth	Delay	Cascade	
Layer 2	48 kHz	mono	20 kHz	moderate	good	✓
Layer 2	48 kHz	JS	20 kHz	moderate	fair	✓
Layer 2	48 kHz	stereo	10.2 kHz	moderate	poor	
Layer 2	24 kHz	stereo	10.2 kHz	moderate	good	
Layer 3	48 kHz	mono	20 kHz	long	good	
Layer 3	48 kHz	JS	20 kHz	long	fair	
Layer 3	32 kHz	stereo	15 kHz	long	poor	✓
AAC-LD	32 kHz	mono	20 kHz	long	poor	
AAC-LD	32 kHz	stereo	20 kHz	long	poor	
AAC-LD	48 kHz	mono	20 kHz	long	poor	
AAC-LD	48 kHz	stereo	20 kHz	long	poor	✓
AAC	32 kHz	mono	20 kHz	moderate	poor	✓
AAC	32 kHz	stereo	20 kHz	moderate	poor	✓
AAC	48 kHz	mono	20 kHz	moderate	poor	✓
AAC	48 kHz	stereo	20 kHz	moderate	poor	✓

Table 5-6 Algorithm Qualities at 128 kb/s

Algorithm	Sample rate	Mode	Bandwidth	Delay	Cascade	
Layer 2	48 kHz	JS	20 kHz	low	Good	✓
Layer 2	48 kHz	stereo	20 kHz	low	Good	✓
Layer 3	48 kHz	JS	20 kHz	long	Good	
Layer 3	48 kHz	stereo	20 kHz	long	Good	
AAC-LD	32 kHz	stereo	15 kHz	low	good to excellent	
AAC-LD	48 kHz	mono	20 kHz	low	very good to excellent	✓
AAC-LD	48 kHz	stereo	20 kHz	low	good to excellent	✓
AAC	32 kHz	stereo	15 kHz	moderate	excellent	✓
AAC	48 kHz	stereo	20 kHz	moderate	Very good	✓

Table 5-7 Algorithm Qualities at > 128 kb/s

Other combinations of algorithm, mode, bit rate and sample rate are possible, but not *all* combinations are valid. You should be careful when using a remote control device since there may be no check on parameter validity. Refer to the previous sections of this chapter for valid bit rate/sample rate/mode combinations for each algorithm.

Chapter

6

Your Network Connections

NETSTAR offers you a choice of connections, from ISDN to the Internet

This chapter discusses connecting your **NetStar** to *your* network, either IP, ISDN or dedicated lines. For connecting your **NetStar** to another codec at a remote location, skip to Chapter 8.

6. Interfaces

With its 10/100BaseT port and optional ISDN Terminal Adapter, **NetStar** offers the flexibility you have been looking for. Add the optional Multi-Function Interface, and you have a system also capable of using dedicated data lines with V.35, X.21 or RS422 interfaces, or directly feeding satellite uplink modulators.

Although not difficult, connecting your **NetStar** for the first time, or changing the connection type, does require some configuration.

6.1 IP Connections

With its built-in Ethernet port and Web Server, **NetStar** allows you to connect to another **NetStar** codec either directly, through a Local-Area Network (LAN), Wide-Area Network (WAN), Virtual Private Network (VPN), or through the Internet. Except for the direct "back-to-back" connections, some basic knowledge of the network is required. In addition, depending on location, you may have to contact your IT department or Internet service provider. If your **NetStar** will be located behind a firewall or Proxy Server, your IT department will be required to open the ports used by **NetStar**.

6.1.1 DHCP vs. Static IP Addressing

Every Internet-ready device, including **NetStar**, requires an IP (Internet Protocol) address. In addition to every device having its own unique IP address, a Subnet Mask is also used for each IP device. Some systems also

use a “Gateway” computer; i.e., a computer used to connect a local LAN to a WAN or Internet. The meanings and technical background of IP addressing, Subnet Masks and Gateways are beyond the scope of this manual and can be found elsewhere.

The following, although not a complete discussion of IP addressing, will suffice for this manual section. Both IP address and Subnet Masks consist of four groups of three digit numbers between 000 and 255, separated by a period. IP addresses can be manually entered or can be automatically provided by the network infrastructure (servers, switches, other computers on the network, or the Internet provider). A "network group" is determined by the first three numbers of the IP address.

For example:

192.168.100.101 and 192.168.100.104

are in the same network group, but

192.168.100.101 and 192.168.233.104

are not. In addition, if two devices on the same LAN have the same IP address and they are both turned on, there will be an address conflict, and neither device may be recognized.

192.168.100.101 and 192.168.100.101

cannot be used together.

Each device connected to a LAN must have a unique IP address *and* be in the same network group in order to communicate with each other.

! NOTE:
For Internet connections you must have a global, or public IP address

Each device on a LAN must also use the same Subnet Mask. This rule does not apply to WAN or Internet communications (those communications that pass through servers or gateways).

Devices on the Internet must have a *global* or *public* IP address to be seen by other devices on the Internet. Without a global address, only devices on the LAN side if the gateway or router can see your **NetStar**.

Static IP addresses are those that are manually entered. Once entered, they are always the same, that is, until they are manually changed. If you are just going to connect to another codec locally, that is, either back-to-back, or over a LAN or VPN, there is no problem with static IP addressing. If connecting over a WAN or the Internet, then you must consult your IT department or Internet service provider and ask for a global IP address. A global IP address is an address that can be reached by

others not located within your LAN or VPN. In addition, if your network uses a firewall, it must allow access to your IP address from outsiders.

Dynamic Host Configuration Protocol (DHCP) allows the network infrastructure (a server, switch, another computer on the network, or your Internet provider) to assign an IP address and Subnet Mask value to any devices connected to the network that allows DHCP. It is *not* guaranteed that each time a device is turned on it will have the same IP address. For this reason, if other codecs will be initiating IP connections to your **NetStar**, we strongly recommend using Static IP addressing. If your **NetStar** will always be initiating the IP connection, than DHCP can be used without problems. Even with DHCP enabled, you may still have to contact your IT department or IP provider to let them know that the address assigned needs to be a global address.

! NOTE: We strongly suggest using Static IP addressing

6.1.2 Gateways and Proxy Servers

A Proxy Server is sort of an intermediary. For example, normally you run HTTP from your home to the destination (e.g., yahoo). With a proxy server things are a little different. The home computer would connect via HTTP to a intermediate computer (proxy server) which would actually terminate the HTTP session. That same intermediate computer would then initiate a second session with your real destination. It's sort of like a bucket brigade. The first session would be a local session, and the second session would be the global session.

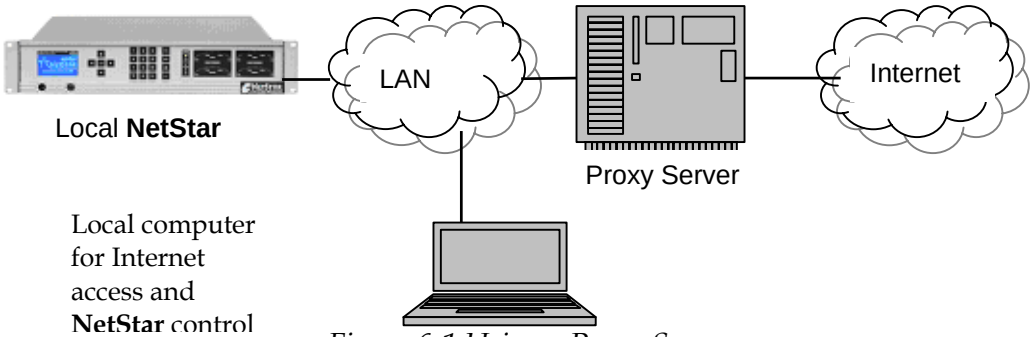


Figure 6-1 Using a Proxy Server

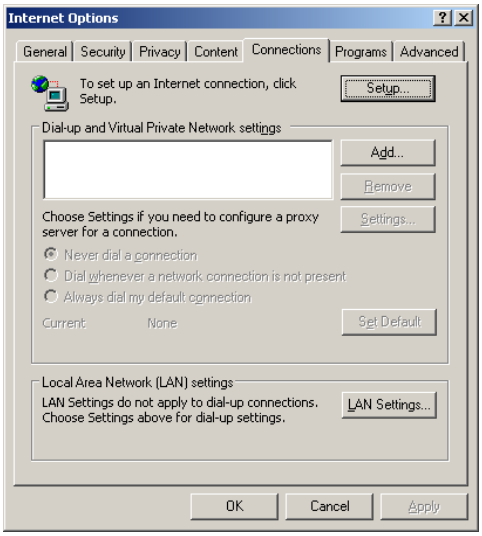
The only time you need to concern yourself with the proxy server is for the configuration shown in Figure 6-1. In some installations, a proxy server is used between the LAN and the Internet. If you want to use the same computer to configure a local **NetStar** and access the Internet, *you need to set your computer to do so.*

It's easy to determine if your installation uses a proxy server. Here's how (this example shows Internet Explorer. Other Browsers are similar):

From the Menu bar, click '**Tools**' and then '**Internet Options**'.

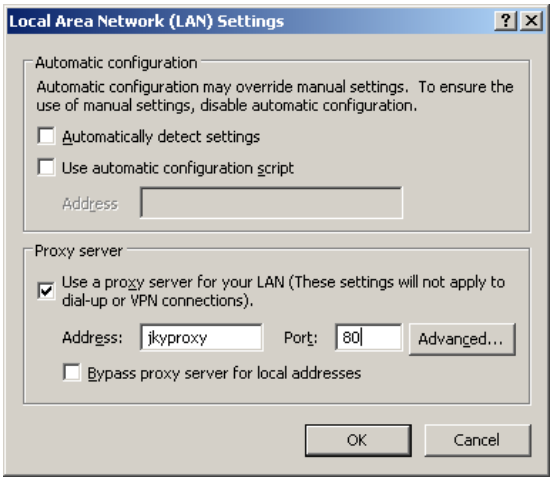
From the window that opens, click on the '**Connections**' tab.

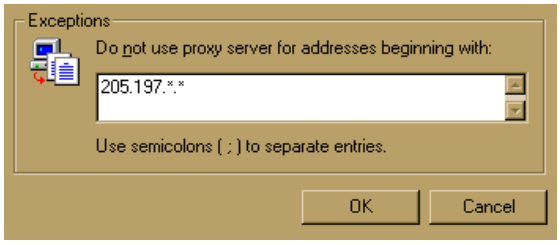
Click on '**LAN Settings**' near the bottom of the window.



In the window that opens, if the '**Use a proxy server**' option is not checked, there is no proxy server, and nothing needs to be done. If this option is checked, check the '**Bypass proxy server for local addresses**' option and click on the 'Advanced' button.

In the lower half of the '**Advanced**' window, enter the first two number sets of the **NetStar**'s IP address, followed by .*.* as shown (remember to put the first two number sets of *your* **NetStar**.





Click 'OK in all open windows to close them.

You are now able to control your local **NetStar** and surf the Internet through the proxy server using the same computer.

A Gateway is almost synonymous with a proxy server, except a gateway takes in a protocol on one side and translates that protocol session to a different protocol and a new session. It's really a translator working at OSI layer 7. A good example is HTTP to SNA. Unlike a proxy server, all devices on the network, including

NetStar, must be configured to use a Gateway. If your installation uses a gateway (ask your IT department or service provider, you must include the gateway's address in the **NetStar** setup.

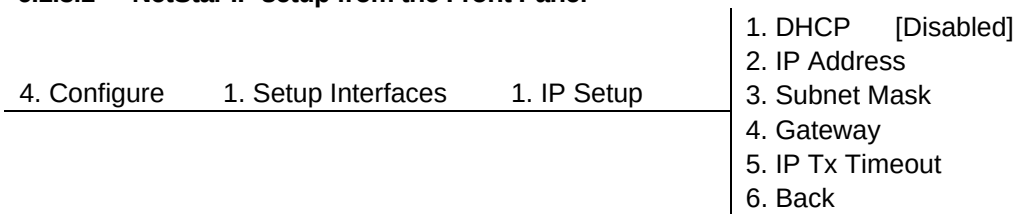
Why do this at all? Because of improved security.

6.1.3 NetStar IP Configuration

NetStar allows you to enable or disable DHCP, change the IP address, Subnet Mask and Gateway, enabling you to use **NetStar** wherever there is a high-speed network connection.

The next section describes configuration from the front panel. For 300 Series units, you can skip to sections 6.1.3.2 or 6.1.3.3.

6.1.3.1 NetStar IP setup from the Front Panel



To set or view the DHCP mode, from the main menu use the following sequence:

<4. Configure><1. Setup Interfaces><1. IP Setup><1. DHCP>

and select either **`Disabled`** or **`Enabled`**. If DHCP has been enabled, all other information, including IP address, Subnet Mask and Gateway, is set by the infrastructure and cannot be set or changed by the user. After any changes to the DHCP settings, you **MUST REBOOT** your **NetStar**.

To set or view the IP address of your **NetStar**, use the sequence:

<4. Configure><1. Setup Interfaces><1. IP Setup><2. IP Address>

The current **NetStar** IP address is then displayed. If you have DHCP disabled, and want to change the address, Use the up arrow ▲ to erase the number in front of the cursor, or use the down arrow ▼ to erase the entire address, then, using the numeric keypad, enter the desired IP address. For three digit numbers, the "dot" (.) between numbers is entered automatically, for numbers less than three digits, use the # key to enter the dot.

In a similar manner, the Subnet Mask is changed or displayed using the keypress sequence:

<4. Configure><1. Setup Interfaces><1. IP Setup><3. Subnet Mask>

The next parameter that may need setting is the Gateway. A Gateway device (this may be router or a server) is a device that connects a LAN, WAN or VPN to the outside world. If you are going to be connecting to a codec via this 'outside world', you will need to enter the IP address of the gateway. This address will be provided by your IT department or Internet service provider.

If required, in a manner similar to above, enter or display the gateway IP address using the keypress sequence:

<4. Configure><1. Setup Interfaces><1. IP Setup><4. Gateway>

6.1.3.2 IP Setup Using a Web Browser

The **NetStar** can be configured and controlled from any computer, anywhere in the world, through a LAN or the Internet. Even if you are not using a LAN or the Internet to connect to another codec, if you want to have network control of your **NetStar**, you will still have to configure the network port and computer. The one caveat is that you will either have to set your computers' network parameters to match **NetStar**'s defaults, or configure the **NetStar**'s LAN parameters from the front panel or RS232 port for the first time before you can configure and control it through the LAN. After this initial configuration, you can set and change just about anything through a network.

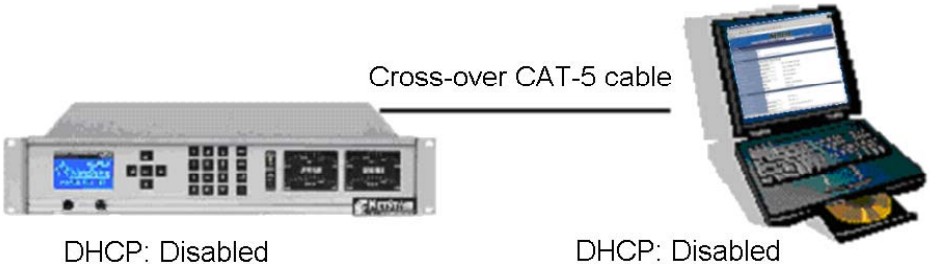


*Figure 6-2 Direct Connect Computer to **NetStar***

If you will be controlling your **NetStar** as shown in *Figure 6-2*, both the computer and **NetStar** interfaces must be set as follows:

- DHCP disabled
- Unique IP address within the same Network Group (Section 6.1.1)
- Both the computer and **NetStar** must use the same Subnet Mask
- A crossover cable must be used between the computer and **NetStar** (see Figure 2-3)
- If connecting to **NetStar** through an infrastructure or Internet, refer to Sections 8.2.3 and 8.2.5.

Setting the network parameters using a net-based Web Browser is done from the **Configure** page as shown in Section 4.2.6. A view of the IP settings part of this page is shown here:

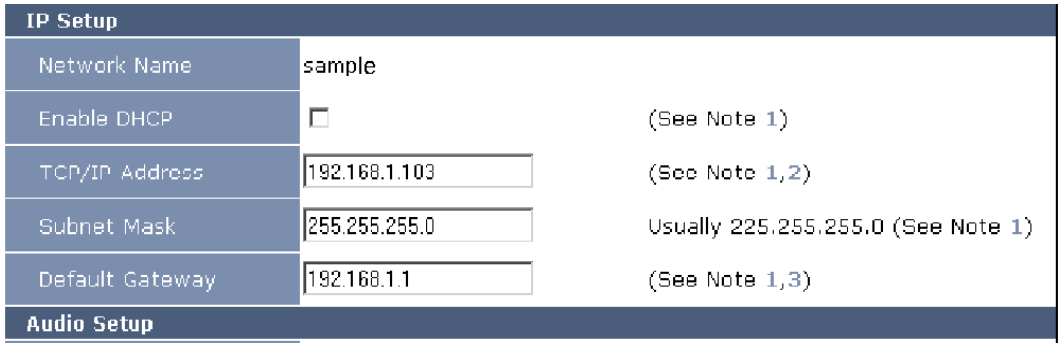


Figure 6-3 Network Parameter Settings Using A Web Browser

You can make all your changes at once, as they are not applied until you click the '**Apply Changes'** button at the bottom of the page.

Be aware that if you change a network setting through the network, you may temporarily lose network control of the NetStar. You will have to reconfigure your PC's network interface or reconfigure NetStar's network interface through the front panel or RS232 port before you regain network control.

For **NetStar** 300 Series codecs you must use the RS232 port to connect to the **NetStar** for the first time. Once connected, you can reconfigure as desired.

6.1.3.3 NetStar IP Setup through Telnet/RS232 Remote Control

All network setup commands are accessed through the 'net' command. The basic syntax is:

`net` *`dhcp/ip/name`*

To enable or disable DHCP (dynamic IP addressing), you enter:

```
net dhcp on
```

or

```
net dhcp off
```

Similarly, to change the IP address, Subnet Mask, and Gateway (all three are entered/changes at the same time):

`net ip` *`ipaddress netmask gateway`*

A sample session is shown *Figure 6-4*:

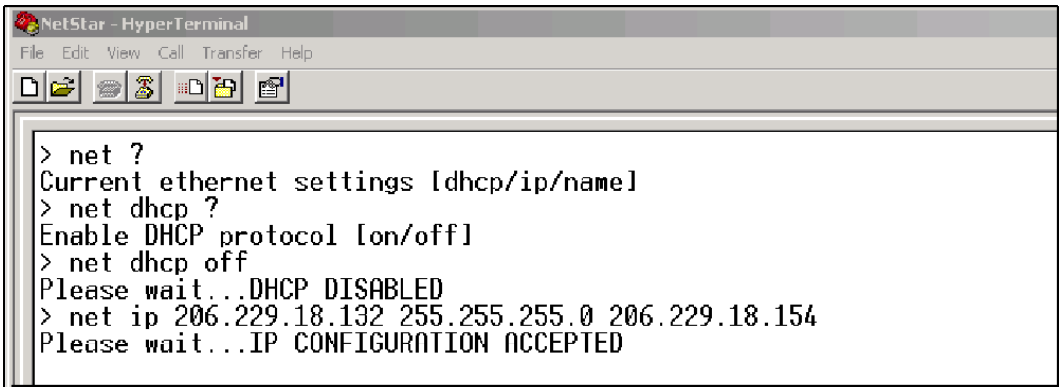


Figure 6-4 Network Setup Session

Observe that even if you are only changing the IP address, you must enter the IP address, subnet mask and gateway values as well.

6.2 ISDN Connections (Optional)

NetStar offer two different optional ISDN modules, the TA501 (North America only), or the TA401 (International operation). The TA501 has a "U" interface with a built-in NT-1 for connecting directly to the telco. With the built-in NT-1, this module can operate (over ISDN) only in North America.

The TA401 does not have a built-in NT-1 and the "S/T" interface connects directly to the telco in non-North American countries. By adding an external, low-cost NT-1 to these worldwide models, you can use the TA401 in North America as well.

NetStar's optional ISDN Terminal Adapter must be configured for use in a particular country and identified (to the telephone Central Office switch) before it can be used.

6.2.1 North American ISDN Setup

Probably the most confusing aspect of ISDN codecs is configuring the Terminal Adapter for the ISDN in your area. This is especially true in North America, where there are several local 'flavors' of ISDN that are all provisioned differently. Elsewhere, configuration of the terminal adapter may be as simple as insuring the proper country is selected.

In North America, the ISDN service provider must supply certain information to allow you to correctly configure the Terminal Adapter:

- ISDN "Switch" Type; e.g., National ISDN or Custom
- Switch manufacturer; e.g. AT&T, Nortel, Siemens
- SPID numbers (Service Provider Identification Numbers). National ISDN (NI1) *always* requires SPID numbers; some locations using Custom ISDN may *not* require SPID numbers. If SPID numbers are required, most areas use two.

As for the Switch Type, this can get confusing and you may have to use the trial-and-error method. If your service provider says you have AT&T/Lucent National ISDN, select **National ISDN**, but if you have AT&T/Lucent Custom, select **AT&T 5ESS**. With Nortel DMS100 and later switches, select **National ISDN**, but with Nortel DMS100 Custom Functional switches, you may have to select **NT1/DMS100 Custom**. With Siemens switches, contact MUSICAM USA.

6.2.2 Non North-American ISDN Setup

As with the North American setup, ISDN configuration nay be the most confusing aspect if ISDN codecs. Fortunately, configuring your **NetStar** for use outside of North America is a little bit easier.

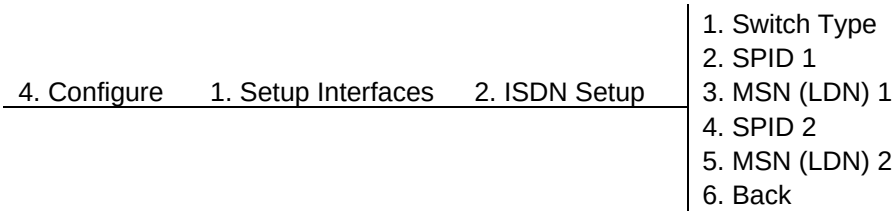
In some instances, all you need to know is what country you're in, other places, you need a little more information, such as in Germany, where you need to know the ETSI protocol, either 1TR6 or DSS1.

- Select **Japan** for most Pacific-rim countries.
- Select **DSS1** for most of Europe, including Germany, Select **1TR6** in Germany if **DSS1** doesn't work.
- In France, select **DSS1**. If this doesn't work, select **VN-4/5**.

LDN/MSN numbers – In most cases, the LDN/MSN numbers are left blank. If the MSN number is needed, enter the entire number as if you were going to dial the number.

6.2.3 Front Panel ISDN Setup

This section describes configuration from the front panel. For 300 Series units, you can skip to Sections 6.2.4 or 6.2.5.



All ISDN settings are entered from the ISDN Setup menu, accessed using the sequence:

<4. Configure><1. Setup Interfaces><2. ISDN Setup>

From the ISDN Setup menu, the following parameters can be set:

1. Switch Type: **The Switch Type selected determines the country of operation.** It is necessary to tell the **NetStar** what country you are in and the switch protocol being used at the Telco central office. The ISDN service provider will give this information to you. You need to set the switch type only once since both "B" channels use the same switch. Select the appropriate switch type for your country or service:

National ISDN – this is the most common configuration in North America. If you are unsure which protocol to use (in North America) start with this one. **For most ISDN service, including AT&T National ISDN, select "National ISDN"**

AT&T 5ESS – This is used in some areas of North America with a specific ISDN variety. Use this for standard North American ISDN using AT&T/Lucent switches (with 'Custom' protocol settings) at the central office. **Select "AT&T 5ESS" only for AT&T custom point-to-point or point-to-multipoint ISDN service available in a limited number of areas in the United States**

NT1/DMS100 Custom – Use this in North America when Nortel (Northern Telecom) switches with a 'Custom' switch protocol are employed in the central office.

NTT Japan – Use this setting for Japan. This setting may also be appropriate for most Far Eastern and Pacific rim countries.

1TR6 Germany – Use this setting for some areas in Germany that do not conform to the DSS1 switching standard

VN 4/5 France – Use this setting for areas of France that do not conform to the DSS1 switching standard.

DSS1 Europe – The most widely used European standard, used in most European countries.

2 & 4. SPID: (North America only): After the switch type is entered, you need to enter up to two SPID numbers, one for each 'B' channel.

For *most* areas in North America, the **NetStar** must be told the SPID number of the ISDN line; that is, the line to which the **NetStar** is connected; i.e., *your* ISDN line. The ISDN service provider in your area gives this number to you. It is important to remember that every time the **NetStar** is moved, or whenever there is a change in the ISDN line, or even Area Code changes, the SPID and ID number, switch type and possibly other parameters for the **NetStar** setup must be updated.

If SPIDs are not used in your area, line 2 may answer the first incoming call and line 1 will answer the second.

As a rule of thumb, SPID numbers always contain your seven or ten digit phone number with some additional numbers either before and/or after it.

SPID numbers DO NOT contain dashes. If given a number with dashes, leave them out.

Also, be advised that BellSouth may not give you a complete SPID number. If the numbers given by BellSouth do not work, try adding a '00' or '01' to the end of the numbers they gave you.

3 & 5. LDN: (North America) If you are required to use two SPID numbers, then you must use ID numbers as well. For North American operation, the ID numbers are just your ten-digit ISDN line (phone) numbers, including area codes.

3 & 5. LDN: (Outside North-America) The MSN (Multiple Subscriber Number) allows you to connect several codecs (terminal adapters) to one ISDN bus, if the DSS1 Euro-ISDN protocol is used. Each BRI requires two MSN numbers, one for each 64 kb/s channel.

6.2.4 ISDN Setup using a Web Browser

The easiest way, by far, to configure ISDN is using a Web Browser; but first, you should read the discussions on configuring ISDN for your area in Sections 6.2.1(North America) or 6.2.2 (elsewhere). You should also be familiar with the previous section which defines the required ISDN parameters.

All ISDN settings are entered through **NetStar**'s Settings page, as shown here:

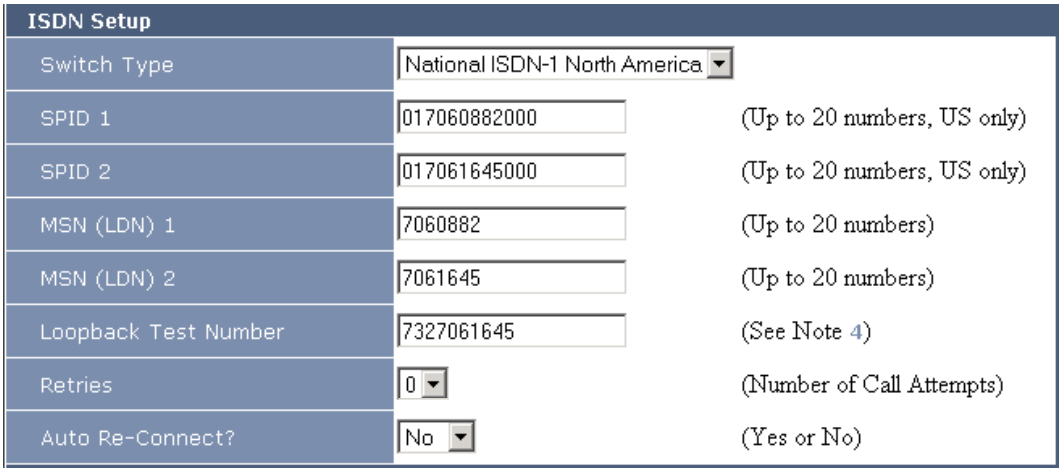


Figure 6-5 ISDN Settings Using A Web Browser

You can make all your changes at once, as they are not applied until you click the 'Apply Changes' button at the bottom of the page.

6.2.5 (Optional) ISDN Setup Using Telnet/RS232

All ISDN setup commands are accessed trough the 'isdn' command. The basic syntax is:

isdn *switch/line1/line2*

To select or change the switch type, you enter:

isdn switch *type*

Similarly, to change the SPID and LDN (North America:

isdn line1 *spid1 ldn1*

and

isdn line2 *spid2 ldn2*

A sample session is shown Figure 6-6:

```
isdn ?
ISDN settings (switch/line1/line2)
> isdn switch ?
ISDN switch type (ni-1/att/nt-1/1tr6/vn45/dss-1/dms100)
> isdn switch ni-1
ISDN SWITCH SET TO ni-1
> isdn line1 ?
Setup ISDN line 1 (spid,msn)
> isdn line1 015551245000 5551245
ISDN LINE1 SET
> isdn line2 015551246 5551246
ISDN LINE2 SET
```

Figure 6-6 ISDN Setup Session

6.3 (Optional) Dual Port Digital Interface Setup

The optional NETMF-1 Multi-Function interface provides one or two V.35 or X.21/RS422 ports. Once installed, all you need to do is enable the ports. The Interface selection is made using different adapter cables, as shown in Table 6-1:

Cable	Function
C2100	Single port X.21/RS422, DB15M
C2200	Dual port X.21/RS422, (2) DB15M
C2300	Single port V.35, Winchester block
C2400	Dual port V.35, (2) Winchester block

Table 6-1 Digital Interface Cable Configurations

6.3.1 Enabling the Digital Interface Ports from the Front Panel

4. Configure → 1. Setup Interfaces → 3. Sync Setup

1. Type [X.21]
2. Rate [128000]
3. Clock [External]
4. Dir [Both]
5. Sync loss Act [N]
6. Sync Timeout
7. Back

All Sync settings are entered from the Sync Setup menu, accessed using the sequence:

<4. Configure><1. Setup Interfaces><3. Sync Setup>

6.3.2 Enabling the Digital Interface Ports from the Network Port

The Sync Port Setup section of the Configure page is shown in Figure 6-7:

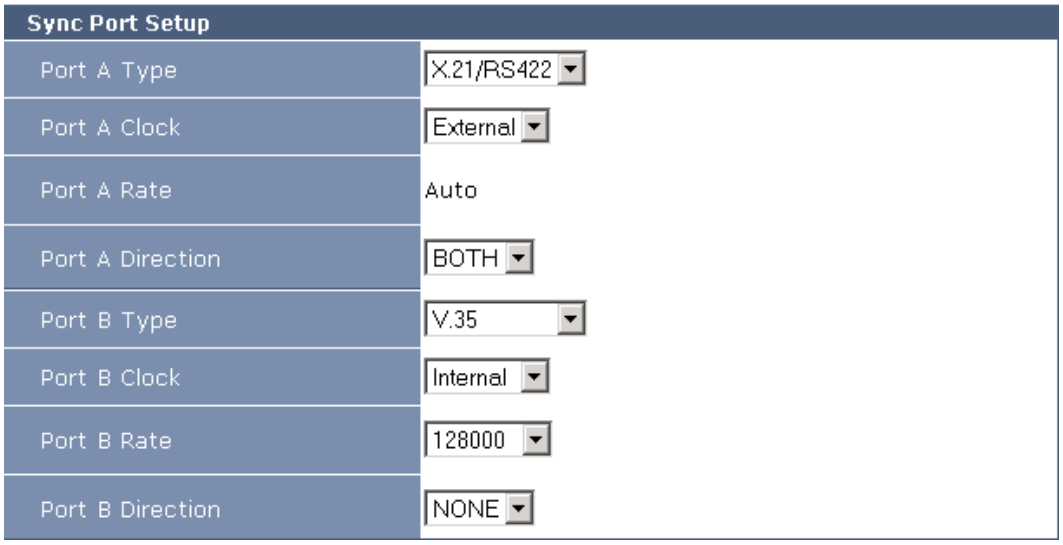


Figure 6-7 Sync Setup Session

Chapter

7

Audio Configuration

The Art of the Algorithm - configuring NETSTAR to use the right one

This chapter discusses configuring the **NetStar** encoder and decoder. For a description of the available algorithms, and a discussion of choosing an algorithm, algorithm advantages, bit rates, etc., please refer to Chapter 5.

7. Configuration

Not only does **NetStar** allow different algorithms to be used for send (encoder) and receive (decoder) audio, but different connections can be used for send and receive as well.

This chapter describes the procedures for setting basic encoder and decoder configurations, and the next chapter discusses making the connections. Chapter 9 discusses the profile directory where you can store frequently used configurations and connection information for later use.

7.1 Encoder Configuration

NetStar's encoder must be configured before it can be used. Once a transmission algorithm is selected, configuring is a straight-forward process that takes only seconds to perform. **NetStar** even remembers the last configuration used when turning the power on.

7.1.1 Automatic Configuration

As we've already mentioned, **NetStar**'s decoder is configured automatically based on the settings of the connected encoder. You can also select to have NetStar's encoder configure automatically based on the decoder settings. Setting the encoder to configure to the automatically configuring decoder, and setting auto-answer connections makes **NetStar** fully automatic, usable in remote or unmanned locations.

To enable this feature, from the front panel, select 'Match Incoming' from the ENCODER menu:

<1. Set Mode><1. Set Encoder><1. Match Incoming>

From a Web Browser, check the '**Match Incoming**' box on the Set Mode page.

7.1.2 Algorithm Parameters

Depending on the algorithm selected, different choices for the other configuration parameters become accessible, and will be discussed here. Although **NetStar** will not let you set invalid configuration, be aware that although valid, not all configurations will yield satisfactory audio for your purpose. Full details of each algorithm can be found in Section 5.1.4.

Uncompressed – This PCM based algorithm allows uncompressed audio delivery over a network connection. Since there is no compression, the bit rate required for this selection is directly dependent on the selected sample rate and number of channels.

Parameter	Values
Bit rate:	Fixed according to selected sample rate
Sample Rate:	8, 11.025, 12, 16, 22.05, 24, 32, 44.1, or 48 kHz.
Algorithm Mode:	Mono, Dual Mono, Joint Stereo, Stereo
Quality:	N/A

Table 7-1 Supported Uncompressed Settings

MPEG4 AAC Low Delay – This algorithm provides audio quality similar to MPEG Layer 3, but with lower delay.

Parameter	Values
Bit Rate:	48, 64, 80, 96, 112, 128, 144, 160, 192, 224, 256, or 320 kb/s.
Sample Rate:	22.05, 24, 32, 44.1, or 48 kHz.
Algorithm Mode:	Mono, Stereo
Quality:	High, Medium, Fast

Table 7-2 Supported AAC-LD Settings

MPEG2 AAC LC – at 128 kb/s, this algorithm provides stereo audio quality judged indistinguishable from the source. Lower bit rates are supported and can yield very acceptable audio. Higher bit rates can be used if there will be further compression cycles downstream. MPEG2 AAC has a long delay.

Parameter	Values
Bit Rate:	32, 48, 64, 80, 96, 112, 128, 144, 160, 192, 224, 256, or 320 kb/s.
Sample Rate:	16, 22.05, 24, 32, 44.1, or 48 kHz.
Algorithm Mode:	Mono, Dual Mono, Stereo
Quality:	High, Medium, Fast

Table 7-3 Supported AAC-LC Settings

MPEG Layer 3 – This algorithm provides near CD quality stereo audio at 128 kb/s with long delay. Higher bit rates can be used if there will be further compression cycles downstream.

Parameter	**Values**
Bit Rate:	32, 48, 64, 80, 96, 112, 128, 144, 160, 192, 224, 256, or 320 kb/s.
Sample Rate:	8, 11.025, 12, 16, 22.05, 24, 32, 44.1, or 48 kHz.
Algorithm Mode:	Mono, Dual Mono, Joint Stereo, Stereo
Quality:	N/A

Table 7-4 Supported MPEG Layer 3 Settings

MPEG Layer 2 – This algorithm provides near CD quality at 192 kb/s with short to moderate delay. Although more bit-hungry than Layer 3, MPEG Layer 2 is less susceptible to artifacts, cascades better, and has lower delay. Higher bit rates improve audio quality, reducing artifacts further and allowing more cascades.

Parameter	**Values**
Bit Rate:	24, 32, 48, 64, 80, 96, 112, 128, 144, 160, 192, 224, 256, or 320 kb/s.
Sample Rate:	32, 44.1, or 48 kHz.
Algorithm Mode:	Mono, Dual Mono, Joint Stereo, Stereo
Quality:	N/A

Table 7-5 Supported MPEG Layer 2 Settings

G.722 – This algorithm provides 7 kHz audio with very low delay. A very early algorithm, not designed for music applications.

Parameter	Values
Bit Rate:	Fixed at 64 kb/s per channel
Sample Rate:	Fixed at 16 kHz
Algorithm Mode:	Mono
Quality:	N/A

Table 7-6 Supported G.722 Settings

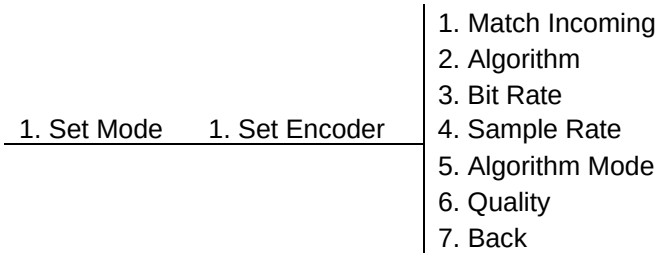
G.711 – Enabling **NetStar** to connect from ISDN to a standard telephone set (or hybrid) at the far-end, this algorithm provides telephone quality audio.

Parameter	Values
Bit Rate:	Fixed at 24 kb/s
Sample Rate:	Fixed at 8 kHz
Algorithm Mode:	Mono
Quality:	N/A

Table 7-7 Supported G.722 Settings

7.1.3 Front Panel Encoder Configuration

The next section describes configuration from the front panel. For 300 Series units, you can skip to Sections 7.1.4 or 7.1.5.



All Encoder settings are entered from the Set Encode menu, accessed using the sequence:

<1. Set Mode><1. Set Encode>

You may notice that when setting the encoder, the parameter selection changes, depending on a previous setting. Not all parameter values are valid for some configurations, and these invalid parameters are not made

available. **NetStar** will not let you enter an invalid algorithm/bit rate/sample rate/algorithm mode combination. If, when configuring, you don't see a parameter value that you want to use, it's because it's not a valid value for the other selections you have made.

7.1.4 Network Remote Encoder Configuration

All encoder parameters (and the decoder as well) are set from the Set Mode page, shown in Figure 7-1.

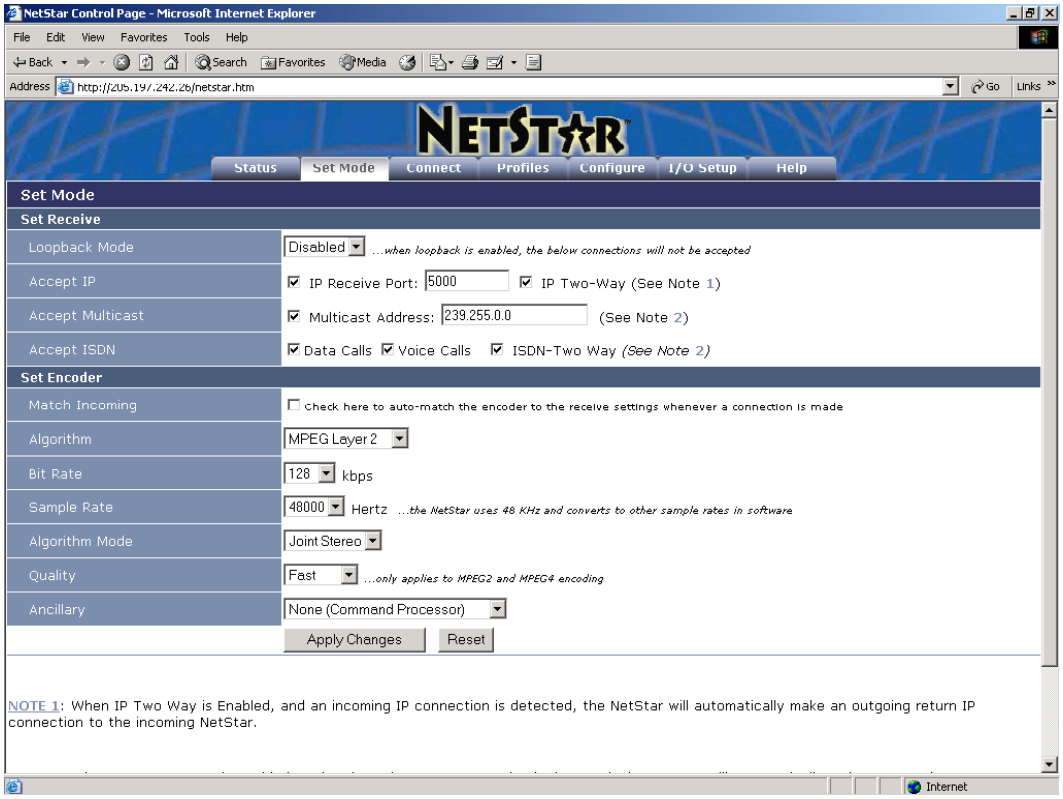


Figure 7-1 Set Mode page for Encoder Settings

You can change one or many parameters, and these changes are not accepted until you click the **Apply Changes** box. Clicking **Reset** (before Apply Changes has been clicked) removes all pending changes.

Although you can select inappropriate or invalid algorithm/bit rate/sample rate/algorithm mode combinations, invalid combinations will not be accepted, and the parameters shown will not change when you click on the **'Apply Changes'** button. This means that if your selected values did not change, you've selected an invalid value.

7.1.5 Encoder Setup Using Telnet/RS232

Using the

encode `algorithm/bitrate/samplerate/mode`

command, setting the encoder using either Telnet or a terminal is easy. An example session is shown in Figure 7-2.

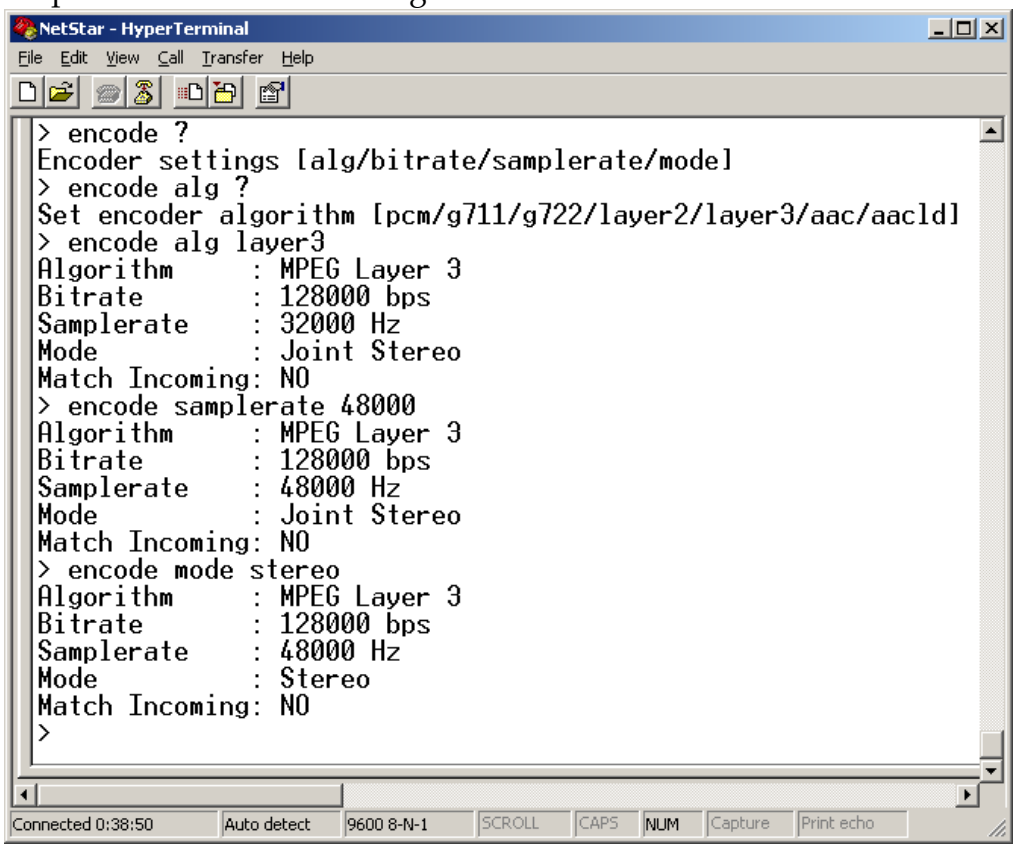


Figure 7-2 Telnet Encoder Setup

You will not be allowed to set an invalid value, and trying to will result in an error message.

7.2 Decoder Configuration

NetStar's decoder configuration is fully automatic, and no user intervention is required. Once connected to another codec, either by initializing the connection, or by accepting a connection, the algorithm, bit rate, sample rate, mode and quality are set automatically to match the far-end encoder. Automatic configuration enables you to set up different algorithms for send and receive audio as easily as setting the same algorithm. All you need to do is tell **NetStar** what types of connections (IP, ISDN, or POTS to accept (see Section 8.1) and **NetStar** does the rest.

7.3 TTL Input/Output Configuration

The **NetStar** is equipped with a 25-pin '**TTL Inputs/Outputs**' connector which is used for both the eight isolated inputs (logic 0 = open, logic 1 = grounded) and eight TTL level outputs (logic 0 = GND, logic 1 = +3.3 Volt).

The **NetStar** utilizes the ancillary data path to pass the Input and Output information. This means that **TTL Inputs/Outputs** are only supported when the **NetStar** is using an algorithm which supports Ancillary Data. Since G.722 and Uncompressed PCM don't support Ancillary Data, **TTL Inputs/Outputs** are unsupported when using these algorithms.

The default mode is for each input to control a TTL closure on the far-end **NetStar**. The connector is wired as shown in Table 2-1.

The Inputs can also be configured to trigger other events, such as Dial a Profile Entry, and the Outputs can be configured to be triggered by NetStar events, such as an incoming ISDN Call, an incoming IP call, etc.

The menu to setup these Inputs/Outputs is located under the **Configure** menu and is labeled '**Setup Closures**'.

Chapter

8

Connecting

Connecting your NETSTAR to another via ISDN, IP or dedicated lines is simple

This chapter discusses connecting your **NetStar** to another codec, either via IP, ISDN or dedicated lines.

8. Connections

With its standard 10/100BaseT port **NetStar** can be used anywhere there is high-speed Internet Access. With the optional ISDN Terminal Adapter, and Digital Interface Module and the appropriate cables, **NetStar** can be used over ISDN or with V.35, X.21 or RS422 digital facilities.

Flexibility is the key to **NetStar**'s utility, with supported bit rates as low as 24 kb/s, even low-speed Internet connections can be used. With the addition of the ISDN and Digital Interface Modules, the NetStar can connect via one or two-line ISDN, dedicated lines, or high-speed Internet for high fidelity. Even delivering uncompressed audio is possible over high-speed Internet.

8.1 Selecting Receive Options

With more than one way of connecting, **NetStar** must be configured to receive incoming "calls" from the far-end codec (unless you will only be initiating the calls). In addition, in many cases you may want to disable a particular connection method. You can set **NetStar** either to accept or reject calls from:

- ISDN
- POTS
- IP Unicast (Point to Point)
- IP Multicast (Point to Multipoint)

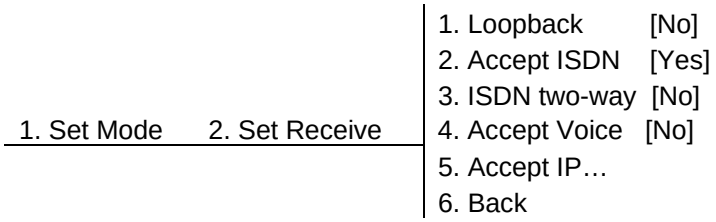
NOTE:

Please consult your IT department or service provider if your NetStar will be located behind a "firewall", since in many cases, the selected port would have to be opened for external access.

For audio transmission, Ports 5000, 5001, and 5002 need to be opened for UDP protocol, and for web page control, port 80 needs to be opened for HTTP Protocol.

8.1.1 Selecting Allowable Connection Types from the Front Panel

The next section describes configuration from the front panel. For 300 Series units, you can skip to Sections 8.1.2 and 8.1.3.



From the front panel, all connection types are enabled or disabled from the '**Set Receive**' menu as shown above.

Loopback – Loopback is a useful diagnostic mode which connects the output of the Encoder to the input of the Decoder. In Loopback, audio present at the inputs should appear at the outputs.

Accept ISDN – Enabling ISDN allows **NetStar** to automatically answer any single or two-line ISDN calls. Disabling this feature prevents answering all ISDN calls, but allows you to place calls.

ISDN two-way – When a NetStar is currently transmitting via IP, and the receive mode is Idle, An incoming ISDN call can be handled two different ways.

- *Method 1: ISDN two-way set to* ***No*** **–** When an incoming ISDN call is received, the NetStar will continue to Transmit to the same connection it is currently transmitting to.

- *Method 2: ISDN two-way set to* ***Yes*** **–** When an incoming ISDN call is received, the NetStar will disconnect the Transmit connection it is currently transmitting to, and Transmit back to the incoming ISDN connection. This is especially useful in automatic backup applications.

Accept Voice – Enabling this feature allows **NetStar** to answer (via your ISDN connection and the G.711 algorithm) calls originating from a standard telephone line. This is not to say that you can connect **NetStar** to a POTS line, **NetStar** must still be connected to the switched telephone network through ISDN. Disabling this feature prevents answering all ISDN calls originating from a voice circuit, but not those originating on an ISDN circuit. You can still place calls to a voice circuit.

Accept IP … - Entering this menu allows the user to configure the IP RX Options

Accept IP – Enabling this feature allows **NetStar** to accept incoming connections through its built-in network interface. Disabling this feature prevents all incoming network connections, but does not stop you from initiating a connection. Even when disabled, IP remote control is still possible.

Please remember that IP connections are one-way, so in order to establish a two-way IP session, you must enable this option.

IP two-way – Enabling this feature tells the **NetStar** to establish a Transmit connection to the incoming IP connection. Please remember that IP connections are one-way, so in order to establish a two-way IP session, you must enable this option.

Rx Port – Just enabling network connections is not sufficient to insure a connection. Internet Protocol requires that a complete IP address also include a port. A 'port' is used in addition to the internet address to fully define the initiating or destination location. The address determines the computer, and the port determines the program on that computer. For example, lets say that your **NetStar**s IP address is 192.168.100.101 and the

receive port is set to 5000. If this is the case, a codec connecting to your **NetStar** would use the complete IP address "192.168.100.101:5000".

Internet protocol also pre-defines certain port numbers for certain functions, for example, port 80 is a standard HTTP port number and 8554 is a standard video streaming port number. 5000 is also one of these reserved ports, for audio streaming, and as such, your enterprise or IT department may have this port blocked. If you can connect to your **NetStar** via a Web Browser (port 80), but can't pass audio (port 5000), have your IT department unblock this port bi-directionally, or ask for another free and unblocked port.

Multicast Addr – Enter the Multicast Address that you wish to receive from. If no address is entered, then no Multicast traffic will be received by the **NetStar.** The standard Multicast address range is 224.0.0.0- 239.255.255.255.

8.1.2 Selecting Connection Types from a Web Browser

From the 'Set Mode' window, a portion shown in Figure 8-1, select which types of connections will be accepted.

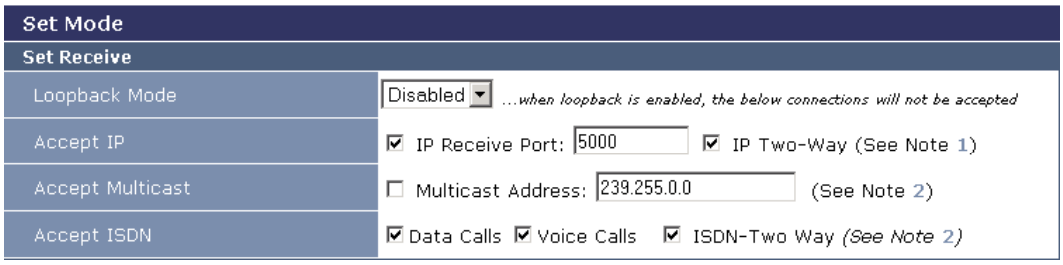


Figure 8-1 Set Receive Window Portion

If you are unfamiliar with these options, refer to Section 8.1.

8.1.3 Selecting Connection Types from Telnet/RS232 Remote Control

The accept command is used for configuring **NetStar** to accept connections. Even if a connection type is disabled, you are still able to initiate connections of this type.

The accept command syntax is:

accept *ip/voice/isdn/sync yes/no*

In the example shown in Figure 8-2, P connections have been disabled, and ISDN connections have been enabled.

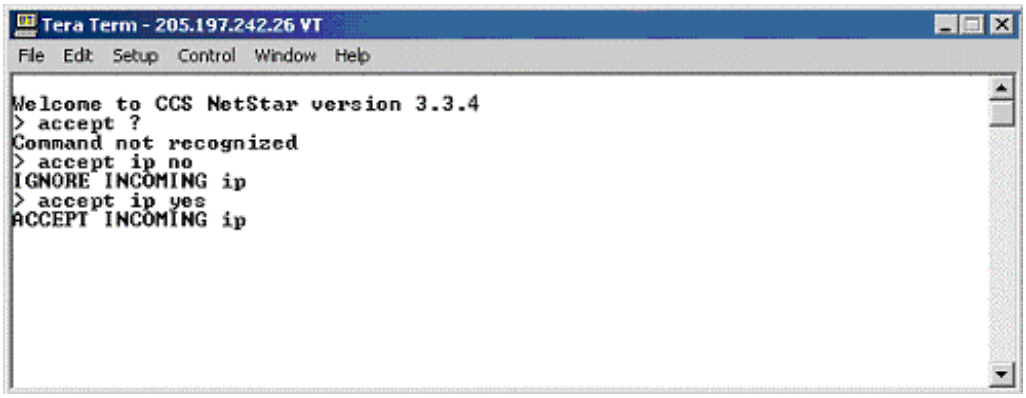


Figure 8-2 Example Accept Connections Dialog

8.2 Network Connections

A "Network" comes in many sizes, from a two-point network, to the Internet. **NetStar** can be used with any size or type of network that conforms to the international TCP/IP Internet Protocol.

8.2.1 Unicast, Multicast, and Broadcast

Information is delivered over a network by three basic methods: unicast, broadcast, and multicast. The differences among unicast, broadcast, and multicast can be summarized as follows:

- **Unicast:** One-to-one, from one source to one destination.
- **Broadcast**: One-to-all, from one source to all possible destinations.
- **Multicast**: One-to-many, from one source to multiple destinations expressing an interest in receiving the traffic.

With unicast traffic, many streams of IP packets that travel across networks flow from a single source to a single destination. This is still the most common form of information transfer on networks.

Broadcast traffic flows from a single source to all possible destinations reachable on the network, which is usually a LAN. Broadcasting is the easiest way to make sure traffic reaches its destinations.

Television networks use broadcasting to distribute video and audio. Even if the television network is a cable television (CATV) system, the source signal reaches all possible destinations, which is the main reason that some channels' content is scrambled. Broadcasting is not feasible on the public Internet because of the enormous amount of unnecessary information that would constantly arrive at each end user's device, the complexities and impact of scrambling, and related privacy issues.

Multicast traffic lies between the extremes of unicast (one source, one destination) and broadcast (one source, all destinations). Multicast is a "one source, many destinations" method of traffic distribution, meaning only the destinations that explicitly indicate their need to receive the information from a particular source will receive the traffic stream.

In IP multicast, the source and destination are almost always hosts and not routers. Multicast routers distribute the multicast traffic across the network from source to destinations. The multicast router must find multicast sources on the network, send out copies of packets on several interfaces, prevent routing loops, connect interested destinations with the proper source, and keep the flow of unwanted packets to a minimum. Standard multicast routing protocols provide most of these capabilities, but some router architectures cannot send multiple copies of packets and so do not support multicasting directly. A multicast address is any address within the range of 224.0.0.0 to 239.255.255.255.

Each connection type, illustrated in the next sections, has certain requirements and caveats that must be understood before they can be used.

8.2.2 Back-to-Back connections

Perhaps the simplest connection method is using **NetStar**'s LAN connector to connect to another local **NetStar**. Back-to back connections assume that there is no network infrastructure (hubs, routers, switches, etc.); just a wire connecting the two codecs. Theoretically, the maximum distance between the two codecs can be up to 2,500 feet, but in actuality, the distance needs to be much shorter, usually 250 feet or less. A back-to-back connection is shown in Figure 8-3:

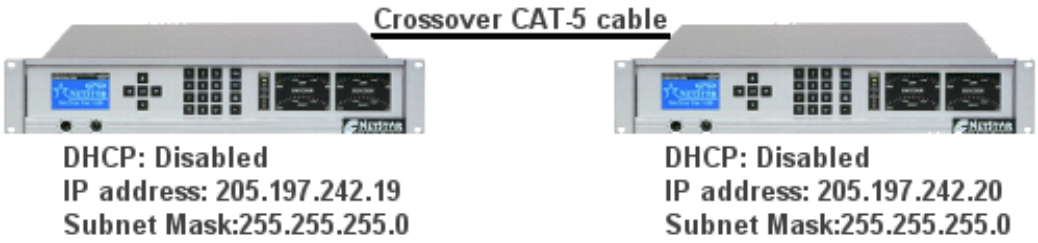


*Figure 8-3 Back-to-Back **NetStar** Connection*

As shown above, each **NetStar** has a unique IP address within the same Network Group, and both units use the same Subnet Mask. Also, since there is no infrastructure to provide addressing, DHCP must be disabled, and the units are connected to each other using a crossover CAT-5 cable.

For a complete discussion of Network Groups and DHCP, refer to Section 6.1.1.

In summary, back-to-back network connections will work only when the following conditions are met:

- Both units use static IP addressing
- Both units have unique IP addresses within the same Network Group
- Both units use the same Subnet Mask
- A crossover CAT-5 cable of 250' or less is used
- The "Connect to" IP address of the initiating unit includes the correct port as well as the IP address of the receiving unit
- IP connections are enabled in the receiving unit

Network remote control (Web Browser or Telnet) is not possible with back-to-back connections. Only RS232 Telnet remote control can be used with this configuration.

8.2.3 Local LAN/VPN/Intranet Connections

Another simple connection involves a LAN or VPN infrastructure, but does not involve the Internet. In this case, both codecs may be separated by a distance, but are on the same LAN/VPN as shown in Figure 8-4.

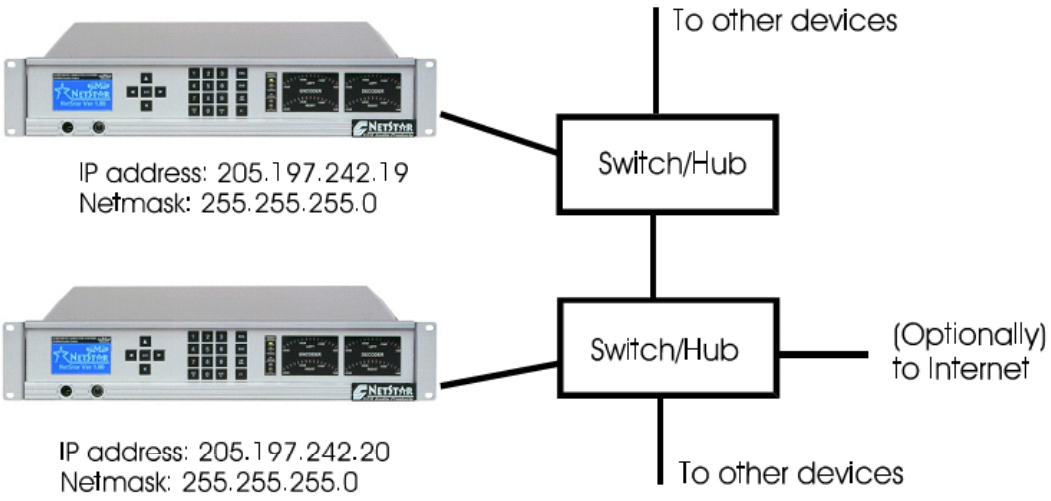


Figure 8-4 Local LAN Connection

Keep in mind that this configuration may be as simple or as complex as you need. For a VPN, the two codecs may be half the world apart or they may be in the same room connected via a LAN. There may be just one

switch or there may be many; there may be no other devices on the network or there could be many. Some networks will have servers, others will not, and there may or may not be an Internet connection.

One thing that all of the devices connected to a LAN or VPN have in common is the Network Group and Subnet Mask. As with the back-to-back connection, all devices on the network must have a unique IP address within the same network group (the first three sets of numbers must be the same), and the Subnet Mask of all devices must be the same.

If there is a device on the network that provides the DHCP function (assigning addresses to all other devices on the network), then you can enable this function in the **NetStar** and leave the assignment of IP address and Subnet Mask to this device. Since, in this example, there will be no connection of a **NetStar** through the Internet, it is not necessary to set the Gateway IP in **NetStar**.

In this case, a single computer can control all **NetStar** units on the network. Please note that in this configuration, if your PC is used to access the Internet as well, *and* static IP addressing is used for the **NetStar**s *and* your computer has multiple NICs or addresses (one using static IP addressing for **NetStar** control, one for the Internet access) *and* your installation does use a proxy server, you must tell your computer to ignore using the proxy server for local IP addresses. See Section 6.1.2.

In summary, LAN/VPN infrastructure connections will work only when the following conditions are met:

- Whether static or dynamic IP addressing, both units have unique IP addresses within the same Network Group
- Both units use the same Subnet Mask
- Straight-through CAT-5 cable of 250' or less is used to connect the **NetStar** to the switch/hub
- The "Connect to" IP address of the initiating unit includes the correct port as well as the IP address of the receiving unit
- IP connections are enabled in the receiving unit

8.2.4 Multicast Connections

Another simple connection involves a LAN or VPN infrastructure, but may not involve the Internet. In this case, all codecs may be separated by a distance, but are on the same LAN/VPN with the same subnet as shown in Figure 8-5.

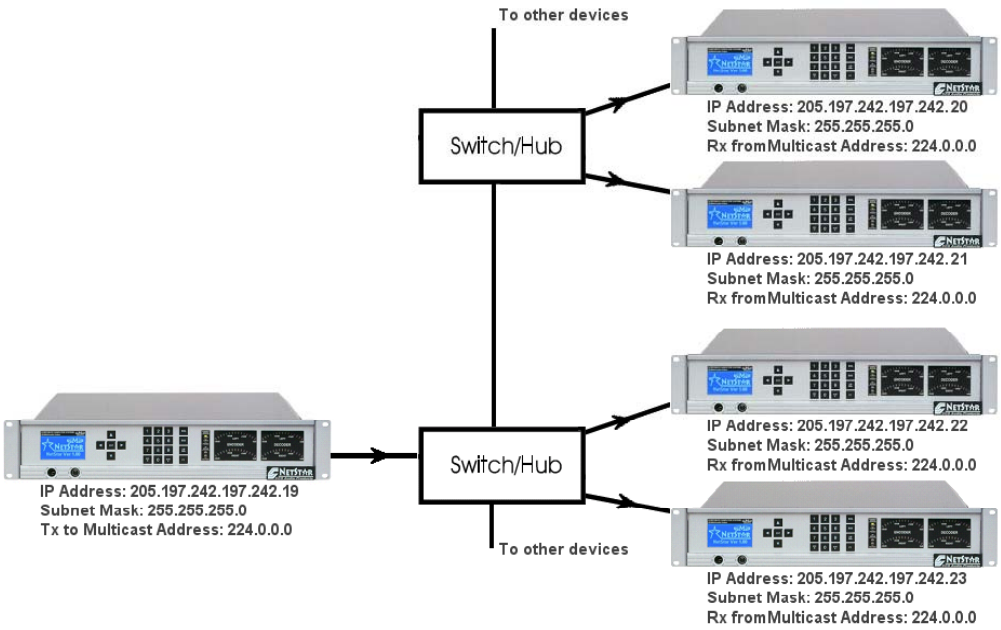


Figure 8-5 Multicast Connection

Keep in mind that this configuration may be as simple or as complex as you need. For a VPN, the codecs may be half the world apart or they may be in the same room connected via a LAN. There may be just one switch or there may be many; there may be no other devices on the network or there could be many. In the case of transmitting Multicast across a VPN, check with your IT department to ensure that Multicast traffic can pass through the network. This will only work with a VPN, since all public Internet routers do not allow multicast packets through.

One thing that all of the devices connected to a LAN or VPN must have in common is the Network Group and Subnet Mask. As with the back-to-back connection, all devices on the network must have a unique IP address within the same network group (the first three sets of numbers must be the same), and the Subnet Mask of all devices must be the same.

In this case, a single computer can transmit the same audio to all other **NetStar** units on the network.

In summary, Multicast connections will work only when the following conditions are met:

- Whether static or dynamic IP addressing, all units have unique IP addresses within the same Network Group
- All units have the same Subnet Mask
- Straight-through CAT-5 cable of 250' or less is used to connect each **NetStar** to the switch/hub
- The "Connect to" IP address of the initiating unit includes the desired Multicast address and port
- Multicast connections are enabled in the receiving unit, as well as the desired Multicast address to receive from.

8.2.5 Internet Connections

When using the **NetStar**'s network interface with the Internet, you can transmit audio via unicast to another **NetStar** almost anywhere in the world, any time, for a low monthly fee. Unlike ISDN and dedicated lines, there are usually no per-minute or per-connection charges. An example is shown in Figure 8-6.

*Figure 8-6 **NetStar** Internet Connection*

In the figure above, the "LAN infrastructure" represents everything connected between the **NetStar** and your IP service provider. This may include switches, hubs, routers, servers, firewalls, other computers, and cable/DSL/fiber modems.

In most instances, you will need to consult your IT department or your service provider for proper configuration. Here's what you need to do:

- If you want to use static IP addressing (recommended), you need to ask your IT department or service provider for a "global", or "public" IP address (an address that others can reach from the Internet).

- You will also need to know the Subnet Mask value and, if a gateway is used, its IP address.

> **NOTE:** Since the two **NetStars** are not on the same LAN, there is no "Unique address within the same network group" or "same Subnet Mask" restrictions as there were in the previous two configurations.
>
> **NOTE:** You *must* have a "global", or "public" IP address.
>
> **NOTE:** Your service provider may charge an additional fee for a static IP address and/or a global address.

- You can let the Service provider or your network assign an IP address (DHCP enabled).

> **NOTE:** An IP address assigned by the service providers still needs to be a "global", or "public" IP address.
>
> **NOTE:** Automatic IP addressing also includes Subnet Mask and gateway settings, which will be set automatically with the IP address.
>
> **NOTE:** If your LAN provides IP addressing (not your service provider) you will need to contact your service provider to make that address global.
>
> **NOTE:** Since your IP address may be different (with DHCP enabled) every time you turn your **NetStar** on, you will have to check the address each time somebody will be connecting to it.

8.2.6 Connecting

Regardless of the connection type you're using, the same fundamental **NetStar** settings are required. As with other types of connections, there is always an initiating codec and a terminating codec. The initiating codec is the one that requests the connection, and the terminating codec is the one that responds to the initiator's request for connection.

IP connections, regardless of the configuration (LAN or Internet) are *one-way* connections. Each end must originate the connection to the other, and terminate the connection as well. The origination codec *sends* audio, it does not *receive* audio, so, for two-way audio, *both* **NetStars** must originate a connection. This can be done automatically by setting the receiving NetStar's '**IP two-way**' setting to '**Yes**'. This tells the NetStar to automatically initiate a send connection to the same IP address and port it

is receiving. This setting is located under '**IP Rx Options**" on the **Set Mode** Menu screen.

With LAN control, this is never a problem, since you can always use a Web Browser or Telnet remote control to make the *far-end* **NetStar** originate a connection to *you*!

The following discussions summarize what is required to connect your **NetStar** to another codec, and are based on configurations and settings already discussed.

8.2.6.1 Far-End Codec Setup

The only setup required for the far-end codec is the IP settings. These include:

- DHCP mode
- IP Address
- Subnet Mask
- Gateway

and the discussion on setting these parameters can be found in Section 6.1.3.

You must also set **NetStar** to accept IP connections, as shown in Section 8.1.

8.2.6.2 Initiating Codec Setup

Once the IP settings have been configured, setting up the initiating codec involves little more than setting the encoder and initiating the connection. You can even skip setting the encoder if you've set it to automatically follow the decoder settings!

See Section 7.1 for encoder configuration.

8.2.6.3 Initiating an IP Connection from the Front Panel

Regardless of how you are controlling your **NetStar**, initiating an IP connection is very easy. Once you have set your encoder to the desired configuration, all you need to know is the IP address and port of the far-end codec, or the Multicast address you have chose to transmit to.

Initiating a Connection from the Front Panel:

- Press the **DIAL** button
- Select '**1. Direct Connect**' and press **ENT**
- Select '**1. Transmit IP**' and press **ENT**

- Select '**1. IP**' and press ENT. Use the up arrow ▲ to erase the digit in front of the cursor, or use the down arrow ▼ to erase the entire address, then using the numeric keypad, enter the IP address of the desired **NetStar**, or the Multicast address you wish to send to. For three digit numbers, the "dot" (.) between numbers is entered automatically, for numbers less than three digits, use the # key to enter the dot.
- Select '**2. Port**' and enter the port you wish to transmit on. (see Section 8.1.5). Use the up arrow ▲ to erase the number in front of the cursor, or use the down arrow ▼ to erase the entire number, then using the numeric keypad, enter the desired port. Press ENT.
- Select '**3. Transmit Now**' and press ENT.

8.2.6.4 Remotely Initiating a Connection using a Web Browser:

Remotely initiating a connection using the NetStar's Web control is also very easy to do. Here's how to do it:

- From the '**Call Type**' pull-down on the '**Connect**' page, select '**Transmit IP**' as shown in Figure 8-7.

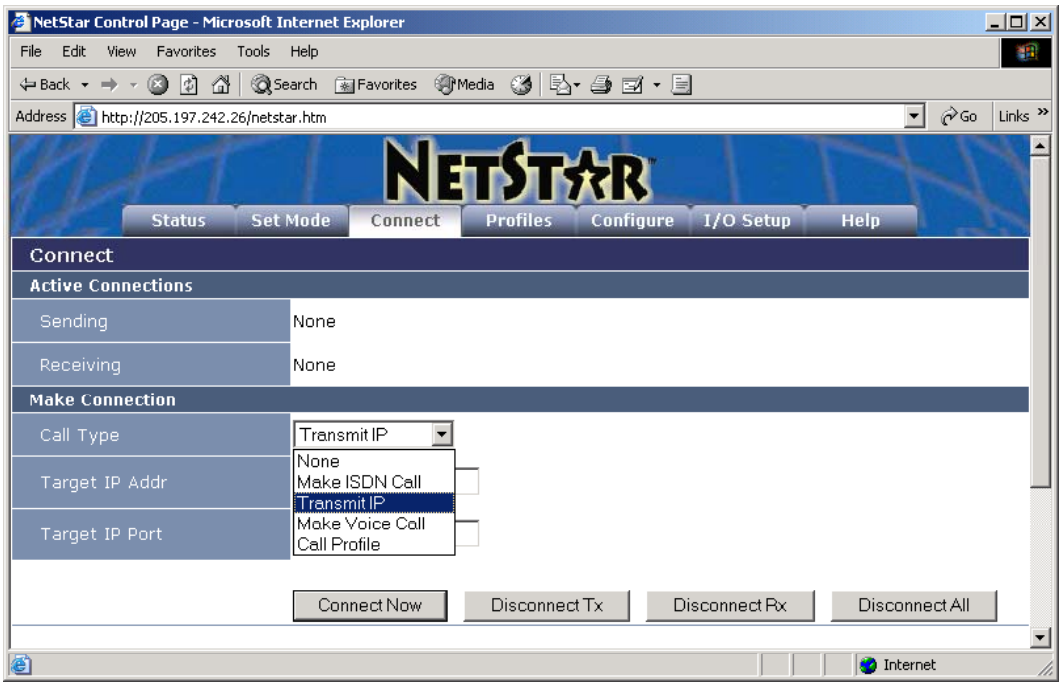


Figure 8-7 Initiating IP call via web control

- Once '**Transmit IP**' is selected, enter the address and port of the far-end codec, or the Multicast Address you wish to use in the space provided, and click '**Connect Now**', as shown in Figure 8-8.

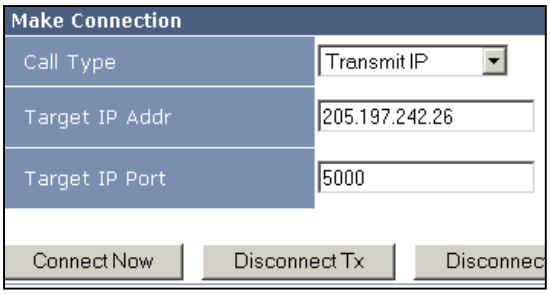


Figure 8-8 Entering IP Connection

8.2.6.5 Remotely Initiating a Connection via Telnet/RS232 Remote Control:

To initiate a remote connection using Telnet Control, use the '**Connect**' command with Telnet/RS232 remote control. As shown in Figure 8-9, the syntax is:

connect *a.b.c.d port*

where a.b.c.d = IP address of far-end codec

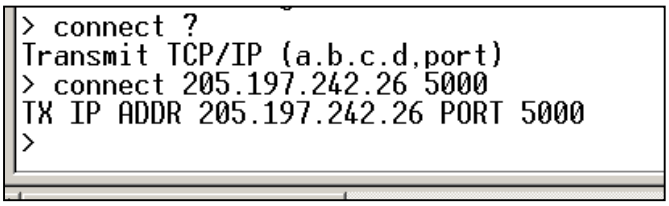


Figure 8-9 Connect Command

If everything has been set correctly, you're connected and sending audio! Please remember that IP connections are one-way, so your decoder will not lock until the far-end codec initiates a connection to you as well. You will know when this is done when the "FRAMED" LED illuminates (See Section 3.5).

NOTE: Two Way IP Connections.

By default, when you make a '`Transmit IP`' connection to another NetStar codec, you are only sending audio to that codec, you are not receiving audio. For two-way audio, the far-end NetStar must set the '`IP two-way`' option to '`Yes`' (See Section 8.1.1). This tells the NetStar to automatically make an IP connection to the same IP address/port as it is receiving.

When two-way communications are established, your decoder will frame to the settings of the far-end encoder, which may be different from your encoder settings. It is thus possible to use different algorithms, or even different connection types for each direction of transmission.

8.2.6.6 Terminating an IP Connection

Although network connections are "free", that is, there is no per-minute charge, you should not leave the connection active when not in use. Terminating a network connection is easy. From the front panel, just press the END button. ***Don't forget…BOTH ends must terminate IP connections!***

From IP remote control, using a Web Browser, just click on '**`Terminate Tx`**' on the **`Connect`** page. From Telnet or RS232 remote control, just type

```
end tx
```

at the command prompt.

8.3 ISDN Connections (Optional)

ISDN (Integrated Services Digital Networks is a switched service that is digital from end-to end. Unlike POTS (Plain Old Telephone Service), even the "last mile" from the telephone central office to your location is digital.

! NOTE:
Even if the ISDN Option is not installed, the menu and web page options are still displayed

A 1-BRI ISDN is composed of two 64 kb/s "Bearer," or "B" channels and a 16 kb/s "Delta" channel for signaling and billing. **NetStar** is designed to work with one or two 'B' channels for 64 or 128 kb/s connections. Unlike IP connections, ISDN connections are two-way, only one end needs to initiate the connection for bi-directional communications.

8.3.1 ISDN Dialing Using the Front Panel

Regardless of how you are controlling your **NetStar**, initiating an ISDN connection is very easy. Once you have set your encoder to the desired configuration (see Section 7.1), all you need to know is the ISDN phone number(s) of the far-end codec.

Note: The codec at the receiving end must be set to accept ISDN calls, and must not be already receiving IP, or ISDN calls. If the NetStar is currently receiving via its optional Sync interface port, incoming ISDN calls will supersede the current connection.

Initiating a Connection from the Front Panel:

- Press the DIAL button
- Select '**1. Direct Connect**'
- Select '**2. ISDN Call**'
- Select '**1. Num1 [ ]**'
- Use the numeric keypad to enter the desired number and press ENT
- If there is already a number displayed, use the up arrow ▲ to erase the digit in front of the cursor, or use the down arrow ▼ to erase the entire number, then using the numeric keypad, enter the desired phone number.
- Press '**2. Dial Now**' to connect

For 128 kb/s, Select '**2. Num2 [ ]**', and enter the second number.

8.3.2 ISDN Dialing Using Network Remote Control

From the **Call Type** pull-down on the **Connections** page, select **Make ISDN Call**, as shown in Figure 8-10.

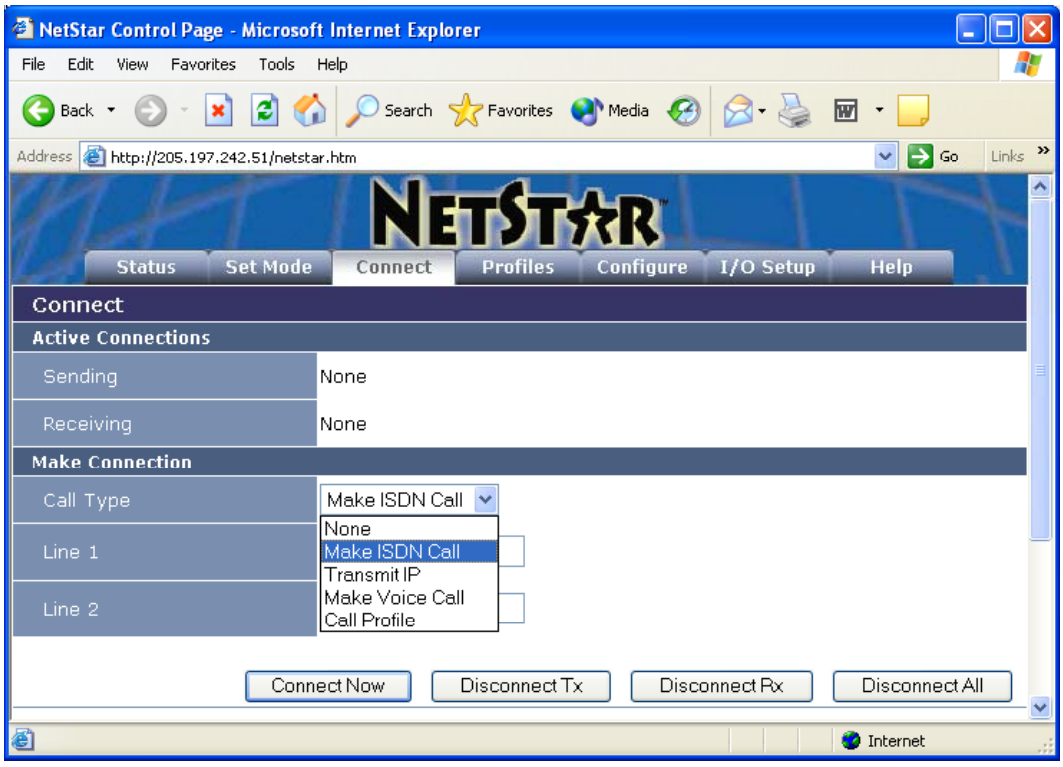


Figure 8-10 Initiating ISDN Call via web page control

Enter the one or two ISDN numbers in the space provided, as shown in Figure 8-11, click '**Connect Now**'.

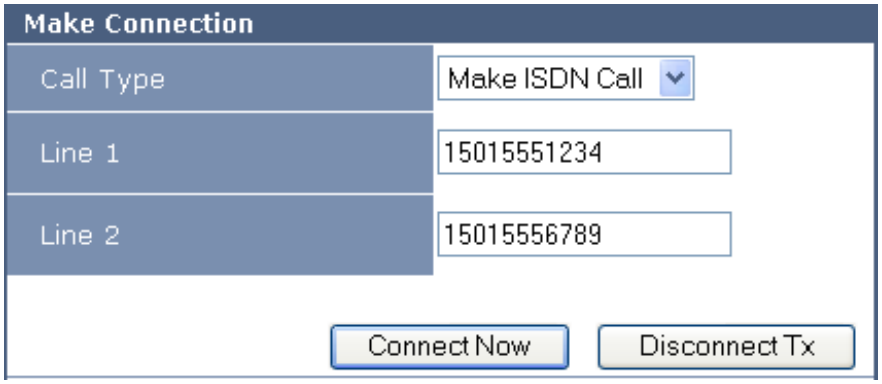


Figure 8-11 Entering ISDN Numbers

8.3.3 ISDN Dialing using Telnet/RS232 Remote Control

Dialing an ISDN connection using Telnet/RS232 remote control is performed using the dial command from the prompt, examples are shown here:

`dial isdn 15015551234`	dials line 1
`dial isdn 15015551234 15015556789`	dials lines 1 & 2

8.3.4 Terminating an ISDN call

Regardless of who initiated the connection or how many lines are connected, to end an ISDN call just press the **END** button from the front panel. From a Web Browser, click 'Disconnect All' from the '**Connection**' page, and using Telnet/RS232 remote control, type

`end all`

from the prompt.

8.4 POTS Connections

Even though **NetStar** connects to the Telco via ISDN, it is possible to dial into or receive calls from a regular telephone via POTS (Plain Old Telephone Service). **NetStar**'s encoder must be configured for G.711 (see Section 7.1), and although the fidelity of the call is limited to that of the telephone, this option can come in handy.

8.4.1 POTS(G.711) Dialing using the Front Panel

Regardless of how you are controlling your **NetStar**, initiating a POTS connection is very easy. Once you have set your encoder to G.711 (see Section 7.1), all you need to know is the number of the telephone you want to connect to.

Initiating a Connection from the Front Panel:

- Press the **DIAL** button
- Select '1. Direct Connect'
- Select '3. Voice Call'
- Select '1. Phone [ ]'
- Use the numeric keypad to enter the desired number and press **ENT**. If there is already a number displayed, use the up arrow ▲ to erase the digit in front of the cursor, or use the down arrow ▼ to erase the entire number, then using the numeric keypad, enter the desired phone number.
- Press '**2. Dial Now**' to connect

8.4.2 Voice Dialing Using Network Remote Control

From the Call Type pull-down on the Connections page, select Make Voice Call, as shown in Figure 8-12. Enter the phone number in the space provided, and click '**Connect Now**'.

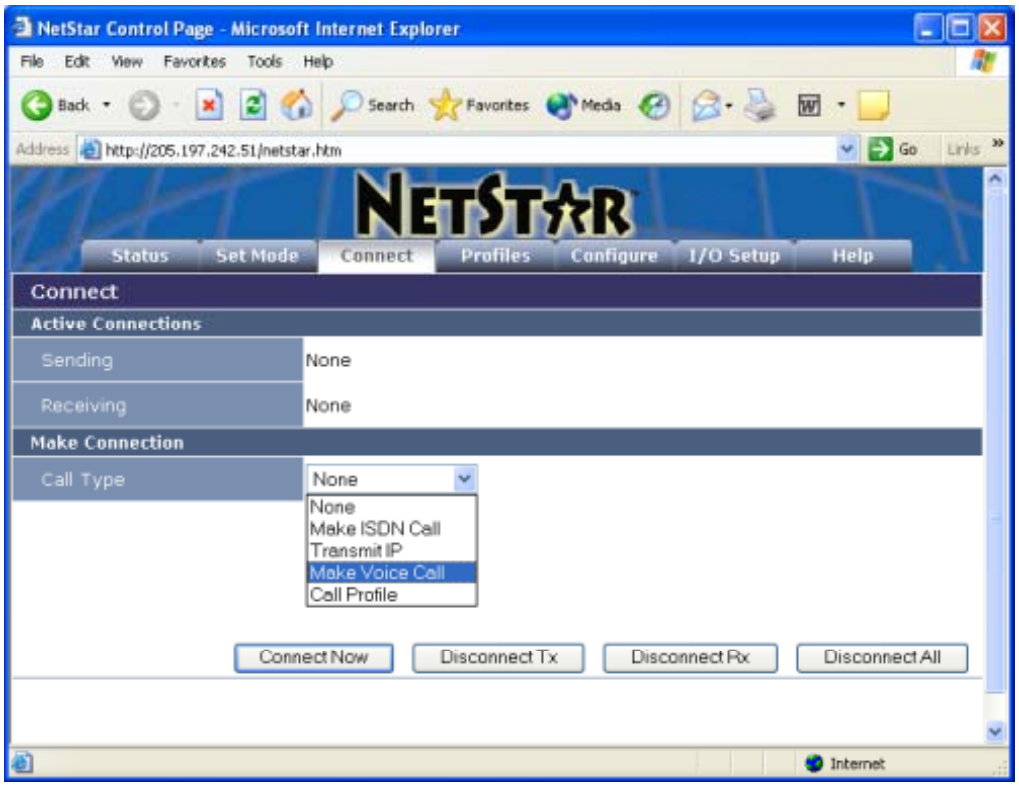


Figure 8-12 Initiating Voice Call

8.4.3 Voice Dialing using Telnet/RS232 Remote Control

Dialing a voice (G.711) connection using Telnet/RS232 remote control is performed using the dial command from the prompt, an example is shown here:

```
dial voice 9735551245
```

8.4.4 Terminating a POTS call

Regardless of who initiated the connection, to end a POTS call just press the **END** button from the front panel. From a Web Browser, click '**Disconnect All**' from the '**Connection**' page, and using Telnet/RS232 remote control, type

```
end all
```

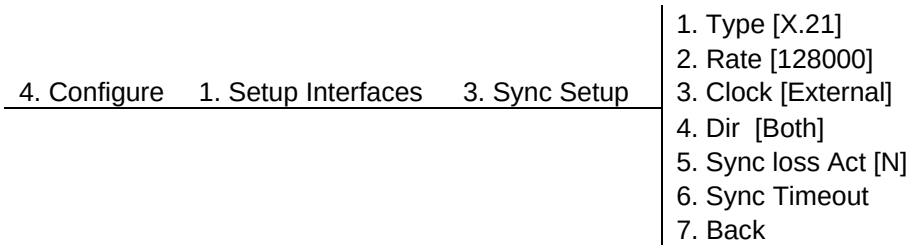
from the prompt.

8.5 Connections via Digital Interface

Unlike IP and ISDN connections, the **NetStar** handles connections via it's optional sync interface differently. If the sync option is installed, all you need to do is configure the interface for the desired type, bitrate, timing source and direction (**Tx, Rx, or Both**).

All Sync settings are entered from the Sync Setup menu, accessed using the sequence:

<4. Configure><1. Setup Interfaces><3. Sync Setup>



8.5.1 Sync Port (Digital Interface) Menu Description

Type Select Sync Port type (X.21, V.35, or RS422)

Rate Select Sync Port Bit Rate

Direction ('Dir') Select Sync Port direction:

If '**Dir**' is set to '**None**', then the **NetStar** will ignore the Digital Interface Port.

If '**Dir**' is set to '**Both**', then the **NetStar** will always attempt to send(**Tx**) and receive(**Rx**) via the Digital Interface Port as long as there are no other current connections.

Sync Loss Act – Select which action to perform upon loss of data from the incoming Sync Port (similar to 'loss of Frame')

Sync Timeout – Amount of time for 'Sync Data loss' before performing 'Sync Loss Act'

NOTE: Sync Port Connections.

If the NetStar is currently Sending/Receiving via the Sync port, any other incoming connection will override the Sync connection until the incoming connection is dropped.

Chapter

9

Profile List

With the Profile List, NETSTAR remembers all of your frequently used connections

9. The Profile List

Since **NetStar'**s Profile List can be used for all connection types (IP, ISDN, or voice connections), each of the list entries allows you to enter all the information needed to connect to any audio codec, anywhere in the world.

The information contained in each profile in the list includes all encoder settings (it is not necessary to store the decoder settings since decoder configuration is fully automatic) and all connection information (IP address or ISDN/POTS numbers). In addition, profiles without connection information can be used to rapidly configure your **NetStar**.

9.1 Profile Information

Each profile can contain the following information:

- **Profile Name** – A short name that you choose to represent the connection
- **Connection Type** – IP, ISDN, Voice, or None (for configuring Encoder settings without initiating a connection)
- **Connection information** – IP address/port of far end codec, ISDN or POTS numbers
- **Encoder configuration** – Algorithm, bit rate, sample rate, and mode

You will not need to enter all the information for all of the profiles you create, and **NetStar** will not allow inappropriate or invalid information to be entered. For example, if you are creating a profile for an ISDN connection, you will not be able to select an inappropriate bit rate (only 64

or 128 kb/s is allowed), nor will you be able to select an invalid sample rate.

NetStar's profile list is a very powerful feature, and it is very easy to use. From the front panel buttons on 500 Series models, you can create, edit, or delete profile entries. You can even use an existing entry as a base to create a new entry.

9.2 Front Panel Profile List Maintenance

All profile maintenance functions start with the **DIAL** key. Then select

<2. Profile List>

9.2.1 Creating a Profile Entry from the Front Panel

It is easy to create a profile entry by following these simple steps:

- Press the **DIAL** button
- Select '**2. Profile List**'
- Select '**1. (New Profile)**'
- Enter all required information as prompted. Required information includes:
  - Assign a descriptive name to the new profile. Follow the instructions on the screen for entering alpha-numeric data.
  - Connection type (enter '**None**' for configuration only profile)
  - Encoder algorithm, mode, bit rate, and sample rate (remember, the decoder is set automatically once the connection is established)
- When all information is entered, press the ENT button and the profile is saved

9.2.2 Editing an Existing Profile Entry from the Front Panel

In a similar manner, you can edit an existing profile entry by following these simple steps:

- Press the **DIAL** button
- Select '**2. Profile List**'
- Use the up and down arrows to select the profile entry you want to edit
- Select '**2. Edit Profile**'
- You can now change any profile parameter, including connection type, and all encoder settings. You *can not* change the profile name from the front panel.

9.2.3 Using Profiles from the Front Panel

Profiles are used for quick setup and connection to frequently called codecs, or can be used to quickly configure **NetStar** without making a connection.

- Press the **DIAL** button
- Select '2. Profile List'
- Use the up and down arrows to select the profile entry you want
- Depending whether the profile establishes a connection or is just configuring the encoder, select '**`Set Encoder Now`**' or '**`Connect Now`**'

9.2.4 Deleting Profiles from the Front Panel

We recommend that you erase all unused profiles from the list. Deleting unused profiles makes it easier to find those profiles that you do use, since there will be fewer to search.

- Press the **DIAL** button
- Select '**2. Profile List**'
- Use the up and down arrows to select the profile entry
- Select '**3. Delete Profile**'
- Select '**Delete**'

9.3 Web Browser Profile List Maintenance

All profile list maintenance is performed from the '**Profile**' Web Page, shown in Figure 9-1.

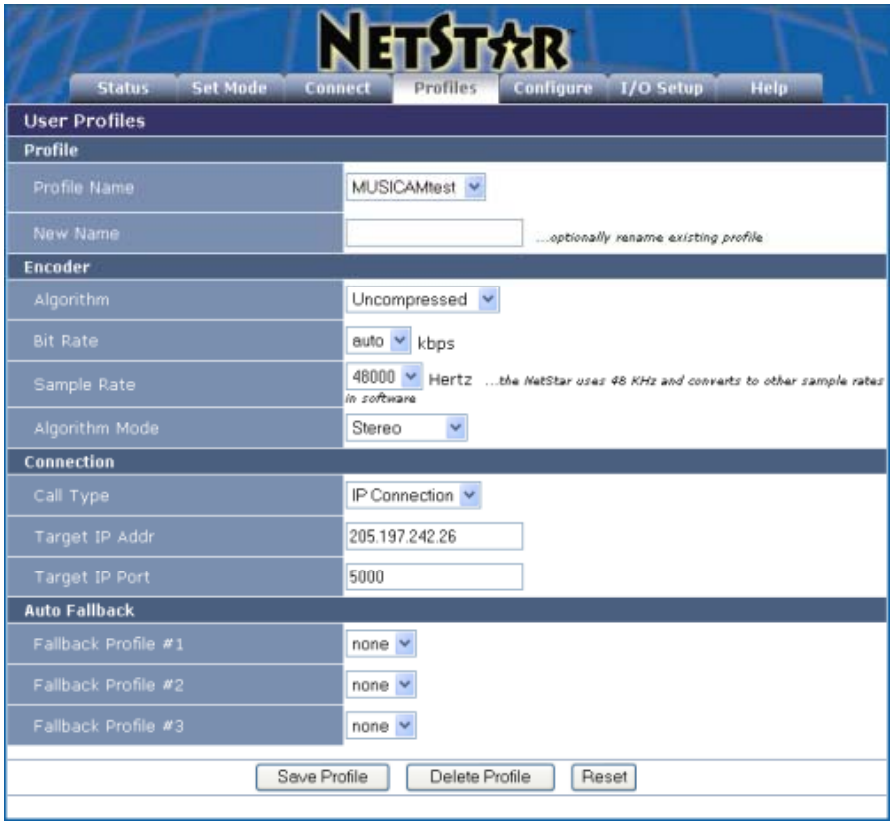


Figure 9-1 Profiles Page

9.3.1 Creating a Profile Entry from a Web Browser

To create a new profile from a web Browser:

- Select '**New Profile**' from the '**Profile Name**' pulldown
- Enter a descriptive name in the space provided
- Use the pulldowns to configure the encoder parameters
- Use the pulldown to select the connections type. Select 'None' to create a configuration-only profile. Once you have selected the connection type, enter the appropriate parameters (ISDN or POTS numbers, IP address and port) for the call type selected
- When done, click '**Save Profile**'

9.3.2 Editing an Existing Profile from a Web Browser

Although is it possible to edit an existing profile entry using any method discussed here, you can change a name of an existing profile only by using a Web Browser.

To edit an existing profile entry:

- Use the '**Profile Name**' pulldown to select the profile you wish to edit
- If you want to change the name, enter a new name in the space provided
- Using the pulldowns, you can change any encoder parameters
- Use the pulldown to change the connections type. Select 'None' to create a configuration-only profile. Once you have selected the connection type, enter the appropriate parameters (ISDN or POTS numbers, IP address and port) for the call type selected
- When done, click '**Save Profile**'

9.3.3 Using Profile from a Web Browser

To configure and/or connect using a profile:

From the '**Connect**' page, select '**Call Profile**' from the '**Call Type**' pulldown and then select the profile using the '**Profile**' pulldown, as shown in Figure 9-2.

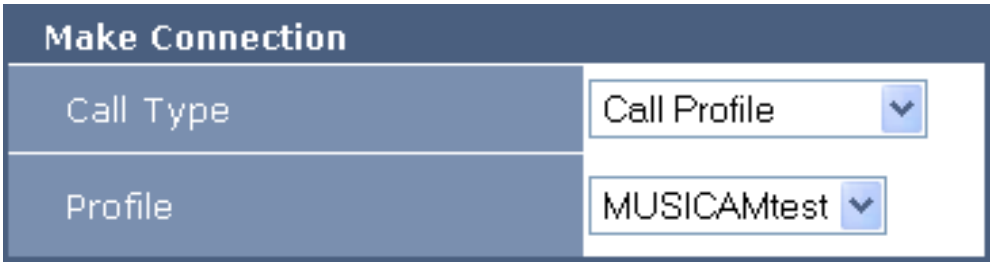


Figure 9-2 Connect Using Profiles

Click the '**Connect Now**' button at the bottom of the 'Connect' page

9.3.4 Deleting Profiles from a Web Browser

Use the '**Profile Name**' pulldown to select the profile you wish to delete.

Click the '**Delete Profile**' button at the bottom of the page. You will be asked to verify the deletion.

9.4 Telnet Profile List Maintenance

All profile maintenance and execution functions use the **profile** command. This command has many options and many parameters that are used with it.

`profile` *`list/new/edit/set/codec/dial/copy/del`*

The profile command allows you to list all profiles, create a new profile, edit an existing profile, set a connection type, evoke a profile (dial), rename, copy or delete a profile. Each profile command function has its own syntax, as shown here:

- **`profile list`** - Lists all profiles alphabetically by name
- **`profile new`** - Creates a new profile with the current Encoder settings
- **`profile edit`** (*profile name*) – Loads an existing profile entry into memory for editing purposes
- **`profile set`** – Loads all current changes into the currently loaded profile
- **`profile codec`** – Copies current Encoder settings into the currently loaded profile
- **`profile dial`** (*profile name*) – Executes the desired profile entry
- **`profile del`** (*profile name*) – Deletes the desired profile entry
- **`profile copy`** (*profile name*) – Copies the settings of a saved profile entry to the currently loaded profile entry

See Figure 9-3 for a sample Telnet session showing some of the profile commands.

```
> profile set codec
Name      : "test"
Connection: None
Algorithm : MPEG Layer 2
Bitrate   : 128000 bps
Samplerate: 32000 Hz
Mode      : Stereo
> profile set ip ?
Set profile connect type to IP (a.b.c.d,port)
> Set profile connect type to IP (a.b.c.d,port)
> profile set ip 205.197.242.26,5000
Name      : "test"
Connection: IP 205.197.242.26:5000
Algorithm : MPEG Layer 2
Bitrate   : 128000 bps
Samplerate: 32000 Hz
Mode      : Stereo
> Name      : "test"
Connection: IP 205.197.242.26:5000
Algorithm : MPEG Layer 2
Bitrate   : 128000 bps
Samplerate: 32000 Hz
Mode      : Stereo
> _
```

Figure 9-3 Using Profiles

Appendices

A

10. Appendix A— ISDN Ordering And Provisioning

A.1.1 North American ISDN Ordering Contacts

Ameritech	800-TEAMDATA
AT&T	800-222-7956
Bell Atlantic	800-570-ISDN
Bellcore	800-992-ISDN
BellSouth	800-428-ISDN
Cincinnati Bell	800-566-DATA
GTE	800-888-8799
MCI	800-MCI-ISDN
Nevada Bell	702-333-4811
Pacific Bell	800-4PB-ISDN
Rochester Telephone	716-777-1234
SNET	203-553-2369
Sprint	913-624-4162
Stentor Canada	800-578-ISDN
Southwestern Bell	800-992-ISDN
US West	800-246-5226 or 303-896-8301
Wiltel	918-588-5069

A.1.2 North American ISDN Provisioning

In an effort to make ISDN ordering and provisioning as easy as possible, we recommend faxing the following five pages to your ISDN service provider. If provisioned as shown on these pages, your IDSN circuit will work with your **NETSTAR**, regardless of terminal adapter used. If given a choice between AT&T Custom or National ISDN, we recommend National ISDN. Also note that **when ordering ISDN service, you must ask for long distance service and specify a carrier.** Unlike regular telephone service, long distance is not automatically provided.

FAX-PAGE 1

A.1.3 AT&T 5ESS Custom

Request from the telephone company an ISDN line in a "Point To Point" configuration with 2B1Q line code. Your ISDN line must be configured to allow circuit switched data and voice on both B-channels and signaling on the D-channel. Request that the telephone company program your ISDN line with the following attributes:

- Maximum terminals set to 1; (this tells the switch that there is 1 terminal active on this line.)
- Maximum B-channels set to 2; Actual User settings (this tells the switch that you are an actual user and may use both B-channels simultaneously.)
- Circuit switched data set to 2; circuit switched data channel set to any (this tells the switch that you may use both B-channels simultaneously. The "Any" tells the switch that either B-channel can be used for data.)
- Terminal type is Type A - Basic Terminal (this tells the switch you are a basic ISDN terminal.)
- Display set to Yes (this tells the switch that you have display capabilities.)
- Call appearance quantity set to 1 (this tells the switch that you want 1 appearance of your primary telephone number.)
- Call appearance preference set to Idle (this tells the switch that your software will make a positive choice of which call appearance it will use to initiate a call.)

The Telephone Company will also need to know any additional voice features that you require on your ISDN lines. Examples of these features are Caller ID and Call Forwarding. PLEASE REMEMBER TO SPECIFY A LONG DISTANCE CARRIER.

FAX-PAGE 2

A.1.4 AT&T 5ESS - National ISDN 1

Request from the telephone company a National ISDN 1 ISDN line in a "multipoint" configuration with 2B1Q line code. The optional "multipoint" configuration will allow you to have a separate telephone number for each B-channel; however, it will physically be only one ISDN line. The Telephone Company should supply you with a different telephone number and SPID (Service Profile Identification) for each B-channel in a multipoint arrangement. Your ISDN line must be configured to allow circuit switched data and voice on both B-channels and signaling on the D-channel. Request that the Telephone Company program your ISDN line with the following attributes:

- Maximum terminals set to 2 (this tells the switch that there are 2 terminals active on this line.)
- Maximum B-channels set to 2; Actual User settings (this tells the switch that you are an actual user and may use both B-channels simultaneously.)
- Circuit switched data set to 2; circuit switched data channel set to any (this tells the switch that you may use both B-channels simultaneously. The "Any" tells the switch that either B-channel can be used for data.)
- Terminal type is Type A - Basic Terminal (this tells the switch you are a basic ISDN terminal.)
- Display set to Yes (this tells the switch that you have display capabilities.)
- Circuit switched data limit set to 2 (this tells the switch that you may receive 2 data calls.)
- Call appearance preference set to Idle (this tells the switch that your software will make a positive choice of which call appearance it will use to initiate a call.)

The Telephone Company will also need to know any additional voice features that you require on your ISDN lines. Examples of these features are Caller ID and Call Forwarding. PLEASE REMEMBER TO SPECIFY A LONG DISTANCE CARRIER.

FAX-PAGE 3

A.1.5 AT&T 5ESS — Custom

- 2B1Q line code
- 2B&D line - Point To Point
    - B1 - circuit switched voice/data
    - B2 - circuit switched voice/data
    - D - signaling only
    - set MTERM to 1
    - set MAXB CHNL to 2; ACT USR to Y
    - set CSD to 2; CSD CHL to ANY
    - set TERMTYP to TYPE-A; DISPLAY to Y
    - set CA QTY to 1
    - set CA PREF to I
- list any additional data features required
- specify long distance carrier

A.1.6

A.1.7 AT&T 5ESS — National ISDN

- 2B1Q line code
- 2B&D line - Standard
    - B1 - circuit switched voice/data
    - B2 - circuit switched voice/data
    - D - signaling only
    - set MTERM to 2
    - set CHNL to 2; ACT USR to Y
    - set CSD to 2; CSD CHL to ANY
    - set TERMTYP to TYPE-A; DISPLAY to Y
    - set CSD limit to 2
    - set CA PREF to I
- Optional - multipoint; different DN for each B-channel, but same OE (office equipment.)
- list any additional data features required
- specify long distance carrier

FAX-PAGE 4

A.1.8 Northern Telecomm DMS-100 BC-35 National ISDN 1

Request from the telephone company a National ISDN 1 ISDN line with 2B1Q line code. Your ISDN line must be configured to allow circuit switched data and voice on both B-channels and signaling on the D-channel. The telephone company should supply you with a separate telephone number and SPID (Service Profile Identification) for each B-channel; however, it will physically be only one ISDN line. Request that the Telephone Company program your ISDN line with the following attributes:

B1 and B2 should be set as follows:

- Set the circuit switch option to Yes; set the barrier restriction option to no packet mode data (NOPMD) only (this tells the switch that you require circuit switch ability on your B-channel, the bearer restriction on your line means that you are not allowed packet data on your B-channel).
- Set protocol to function version 2; (PVC2) (this tells the switch that your CPE software is using National ISDN 1 protocol).
- Set the service profile identification (SPID) suffix to 1 (this tells the switch that the digit following your telephone number will be 1. The SPID format is *area code + 7 digit number + 1 + 00.*
- Set the Terminal Endpoint Identifier (TEI) to Dynamic (this tells the switch that you can accept any TEI value from 64 to 126).
- Set Ring to Yes (this tells the switch to send an alerting message to your CPE when there is an incoming call).
- Set the maximum keys to 10 (this tells the switch how much memory to allocate for features).
- Set Key system (EKTS) option to No (this tells the switch that you are not a key system).
- Place the lower layer compatibility option for data on the B-channels (this tells the switch that your CPE may utilize the lower layer compatibility information element for data on the B-channels).
- Place calling subaddress option for data on the B-channels (this tells the switch that your CPE will send a subaddress).
- Place called subaddress option for data on the B-channels (this tells the switch that your CPE can receive a subaddress).

The Telephone Company will also need to know any additional data features that you require on your ISDN lines.

FAX-PAGE 5

A.1.9 Northern Telecomm DMS-100 BC-35 National ISDN 1

- 2B1Q line code
- 2B&D line
- B1 - set circuit switch to YES; set BEARER RESTRICTION to NOPMD (no packet)
    - functional version 2; (PVC 2)
    - set SPID-SUFFIX to 1
    - set TEI to DYNAMIC
    - set RING to YES
    - set MAXKEYS to 10
    - set EKTS to NO
    - set data option: PROVLLC CMDATA (lower layer compatibility)
    - set data option: PROVCGS CMDATA (calling subaddress)
    - set data option: PROVCDS CMDATA (called subaddress)
- B2 - set circuit switch to YES; set BEARER RESTRICTION to NOPMD (no packet)
    - functional version 2; (PVC 2)
    - set SPID-SUFFIX to 1
    - set TEI to DYNAMIC
    - set RING to YES
    - set MAXKEYS to 10
    - set EKTS to NO
    - set data option: PROVLLC CMDATA (lower layer compatibility)
    - set data option: PROVCGS CMDATA (calling subaddress)
    - set data option: PROVCDS CMDATA (called subaddress)

11. Appendix B – Telnet Command Syntax

accept Set **NetStar** to accept or deny incoming connections. Incoming connection types include IP, ISDN, voice and synchronous (X.21 or V.35)

Syntax: **accept** displays current settings

accept ip/voice/isdn/sync yes/no

Examples: **accept isdn no**

async Set RS232 asynchronous port parameters. The RS232 port can be configured for ancillary data or remote control.

Syntax: **async** displays current settings

async mode/baud/data/parity/stop

mode =	None	Sets port for remote control
	Clear	clear RS232 through data
	Ccs	Format compatible with MUSICAM USA codecs
baud =	2300, 2400, 4800, 9600, 19200, 38400, 57600, 115200	Sets baud rate
data	5, 6, 7, 8	Sets number of data bits
parity	None, odd, even, mark, space	Sets parity mode
stop	1, 2	Stop bits

Examples: **async** baud 19200

async stop 2

audio Sets audio parameters, including input and output, gain, peak level and speech coding

Syntax: **audio** displays current settings

audio in/out/gain/peak/speech

in =	analog, digital gain	Sets audio input source
Out =	analog, digital, atten	Sets audio output
peak =	0 … 5000	Set VU meter peak hold in milliseconds
speech =	alaw, ulaw	Sets G.711 speech coding

Examples: **audio in analog, audio in gain 0db,0db**

audio peak 5000

connect Make an IP connection to a **NetStar**.

Syntax: **connect** displays current connections

connect a.b.c.d,port

Examples: **connect 192.168.10.20,5000**

dial Place an ISDN Data call.

Syntax: **dial** displays current connections

dial isdn/voice/profile

isdn	MSN1, MSN2	ISDN(MSN) Number(s) to dial
voice	phone #	Analog phone number to dial
profile	Profile Name	Name of profile to dial

Examples: **dial isdn 5551234,5552345**
dial voice 5551234
dial profile test

decode Set NetStar's Decoder Loopback mode.

Syntax: **decode** show current decoder settings

decode loopback

loopback	On or Off	Sets loopback setting to either On(enabled) or Off(disabled)

Examples: **decode loopback on**

decode loopback off

encode Set NetStar's Encoder settings.

Syntax: **encode** show current encoder settings

encode alg/bitrate/samplerate/mode

alg =	pcm,	Linear, G.711,
	g711,	G.722,
	g722,	MPEGL2,
	layer2,	MPEGL3,
	layer3,	MPEG2AAC,
	aac,	MPEGL4 AAC-LD
	aacld	
Bitrate	24000-38400	Bitrate (bps)
samplerate	8000-48000	Sample Rate (Hz)
Mode	mono,	Mono
	dual,	Dual Mono
	stereo,	Full Stereo
	joint	Joint Stereo

Examples: **encode alg pcm**

encode bitrate 128000

encode samplerate 48000

end Disconnect current IP/ISDN Connection.

Syntax: **end** Disconnect all current connections

end tx/rx/all

tx	Disconnect Transmit(outgoing) Connections
rx	Disconnect Receive(incoming) Connections
all	Disconnect all current connections

Examples: **end all**

end tx

end rx

help Display list of all available commands

Syntax: **help** Show all commands

hp Set NetStar's headphone monitor settings.

Syntax: **hp** display current headphone mode

hp off/enc/dec/mix

off	Turn off(mute) headphone monitor port
enc	Set Headphone port to monitor the encoder (Audio Input)
dec	Set Headphone port to monitor the decoder (Audio Output)
mix	Set Headphone port to monitor both the encoder (Audio Input) and the decoder (Audio Output)

Examples: **hp off**

hp enc

hp mix

isdn Set NetStar's ISDN interface settings.

Syntax: **isdn** Show current ISDN settings
isdn switch/line1/line2

switch	ni-1	NI-1 North America
	att	AT&T North America
	nt-1	NT1 Northern Telecom
	ntt	NTT Japan
	1tr6	1TF6 Germany
	vn45	VN 4/5 France
	dss-1	DSS1 Europe
	dms100	DMS-100 Custom
Line1	SPID,MSN	SPID and MSN for Line 1. If no SPID, use ""
line2	SPID,MSN	SPID and MSN for Line 2. If no SPID, use ""

Examples:
isdn switch ni-1
isdn line1 0155512340101,5551234
isdn line2 0155523450101,5553456

net Set NetStar's IP(LAN)network interface settings.

Syntax: **net** Show current network settings
net dhcp/ip/name

dhcp	On or Off	Turns On or Off DHCP Protocol
Ip	Local IP, Subnet, gateway	Sets Local IP address, Subnet Mask, and Default Gateway (Only if DHCP is disabled)
Name	Up to 20 Characters	Assigns a "name" to the NetStar for ID purposes

Examples:
net dhcp on
net ip 192.168.10.12,255.255.0.0,192.168.10.1
net name NetStar1

profile Create, list, edit, rename, or delete a User Profile.

Syntax: **profile** Displays current loaded profile.

profile list/new/edit/set/dial/ren/copy/del

list		List all Profiles
new	(Profile Name)	Create new profile entry and loads it for editing
edit	(Profile Name)	Loads a given profile for editing purposes
set	codec	Load current codec settings into profile
	none	Sets Connection type to none
	ip	Sets Connection type to ip with given IP address/port
	voice	Sets Connection type to voice with given phone number to dial
	isdn	Sets Connection type to ISDN with given ISDN number(s) to dial
		Sets Connection type to sync either X.21 or V.35
dial		Dials currently loaded profile
ren	(New Name)	Renames currently loaded profile to desired name
copy	(New Name)	Copies currently loaded profile to a new profile
del		Deletes currently loaded profile

Examples: **profile set test**
profile edit test
profile set codec
profile set isdn 5551234,5553456

quit Exit/Logout of current command session.

Syntax: **quit** Exit/Logout

redial Redial last number

Syntax: **redial** Redials last number

reconnect Repeat last IP connection

Syntax: **reconnect** Repeats last connection

sn Show serial number

Syntax: **sn** shows NetStar's serial number.

ver Display current Software version/Upgrade software.

Syntax: **ver** Displays current software version.

ver upgrade/downgrade

upgrade	target_rev	Desired version number
	tftp_host_ip	TFTP Server IP Address
downgrade	target_rev	Desired version number
	tftp_host_ip	TFTP Server IP Address

Examples: **ver upgrade 2.2.2, 192.168.10.12**

ver downgrade 2.2.0, 192.168.10.12

vu Display real-time VU meter readings.

Syntax: **sn** shows real-time VU meter readings in dB.

This Page Intentionally Left Blank.

12. Appendix C – One Year Limited Warranty

Corporate Computer Systems, Inc,, d/b/a MUSICAM USA warrants to the original purchaser that each of its hardware products and all components therein contained will be free from defects in materials and/or workmanship for one (1) year from the date of purchase. Any warranty hereunder is extended only to the original purchaser and is not assignable.

In the event of a malfunction or other indication of failure attributable directly to faulty workmanship and/or material, MUSICAM USA will, at its option, repair or replace said device or components, to whatever extent it shall deem necessary to restore said device to proper operating condition.

Before returning a device for repair, the customer must call MUSICAM USA at (732) 739-5600, or email support@musicamusa.com to obtain a return authorization number. This number should be included with the customer's mailing address and telephone number when the product is returned.

Products must be returned to:
MUSICAM USA
670 North Beers St. Building #4
Holmdel, NJ 07733
U.S.A.
Attention: RMA #

During the first year after the date of purchase, all labor and materials will be provided without charge. There shall be no warranty for either parts or labor after the expiration of 1 year from the date of purchase.

Units must be returned postage pre-paid. It is recommended that the unit be insured and securely packed when shipped. Units returned which are out of warranty will be repaired or replaced (at the option of MUSICAM USA) and the customer will be charged for parts and labor at current rates.

Units will be returned to the customer after repair or replacement has been completed by carrier and method chosen by MUSICAM USA, to any destination within the United States of America. Should a customer desire some other specific form of conveyance, or be located beyond the US borders, then the customer must bear the cost of return shipment.

The customer shall be solely responsible for the failure of any MUSICAM USA hardware or computer product, or component thereof, resulting from accident, abuse or misapplication of the product, and MUSICAM USA assumes no liability as a consequence of such events under the terms of this Warranty.

While every effort on the part of MUSICAM USA has been made to provide clear and accurate technical information on the application of its products, MUSICAM USA

assumes no liability in any events which may arise from the use of said technical information.

THERE ARE NO OTHER WARRANTIES MUSICAM USA DISCLAIMS ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS. YOU MAY HAVE OTHERS, WHICH VARY FROM STATE TO STATE.

NO LIABILITY FOR CONSEQUENTIAL DAMAGES IN NO EVENT SHALL MUSICAM USA OR ANY OF ITS SUPPLIERS BE LIABLE FOR ANY DAMAGES WHATSOEVER (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF DATA COMMUNICATIONS, LOSS OF BUSINESS INFORMATION, OR OTHER PECUNIARY LOSS) ARISING OUT OF THE USE OF, OR INABILITY TO USE, THIS MUSICAM USA PRODUCT, EVEN IF MUSICAM USA HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. BECAUSE SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.