RANE
D I G I T A L

Quick Start

Ok, if you've read the NM 84 manual you might get a sense of déjà vu when you read this one. Maybe not quite as strong as if you were watching another Adam Sandler movie, but déjà vu just the same. The reason for the similarity is that the complicated stuff (network design) is such a large part of the installation. This is basically the same for both units.

First, design the network – a dedicated network for CobraNet audio is recommended, but not required when using switch-based networks. The NM 48's CobraNet technology utilizes standard 100Base-T Ethernet hardware. For CobraNet and network design assistance and a list of other CobraNet licensed and tested devices, visit *www.peakaudio.com/cobranet*.

Rear Panel. Connect up to 4 line-level, analog audio inputs to the XLR **INPUTS**. Each of the eight **OUTPUTS** can independently receive any of the 4 Local Input audio channels or any single Audio Channel from one of four CobraNet Bundles from 1 through 999, plus off/none. Connect the network cable to the **100Base-T** RJ-45 jack. The **RS-232** jack transports RS-232 data over the network to other NM, RS-232 device ports. The RS-232 port does not provide control of the NM 48. Connect contact closures to the **MEMORY RECALL PORT (MRP)** to recall Memories on this device or any other NM device(s) connected on the same network. Connect the locking 5-pin DIN jack on the enclosed RS 3 power supply to the NM 48 **POWER** connector. The RS 3 power supply does indeed connect earth ground – the 3rd pin of the AC line cord – to the NM 48 chassis metal. Depressing the recessed **FP LOCK** (Front Panel Lock) button at this point disallows further front panel setup, so only press this button in once you're completely done setting up the NM 48.

Front Panel. There are 14 LCD screens allowing access to all NM 48 parameters. The first eight LCD screens set up the Outputs; Output 1: through Output 8:, respectively. Each of the 8 Outputs can receive any of the local Input channels or any CobraNet Audio Channel from one of four Bundles. Use the Copy field to copy and paste between the various screens. The next screen allows the Inputs; Input 1: through Input 4:, to be turned On or Muted.

The NetRx: LCD edit page sets up the four possible CobraNet Bundles (Bndl) that the NM 48 can receive from the network; use NetRx's Bndl A, Bndl B, Bndl C and Bndl D fields to set the received Bundle(s).

The four NM 48 Input audio channels can be transmitted on up to 4 different CobraNet Bundles. Each of the 4 Bundles contains all four Input audio channels and are transmitted in 24-bit resolution. CobraNet designates each of the four, Audio Channels (i.e., AudCh 1 through AudCh 4, respectively). The Network Transmit LCD screen (NetTx) allows selection of the four Bundles to transmit, each of which are independently assignable to one of the 999 Bundles using the four NetTx fields; Bndl A, Bndl B, Bndl C and Bndl D.

The Mem (Memory) LCD screen allows 16 unique NM 48 setups to be stored and recalled in the 16 memory locations. Additionally, the NM 48's MRP status can be transmitted over the network for other NM devices to "listen to." Set the MRP Tx (MRP Transmit) and MRP Rx (MRP Receive) fields for any or none of the 16 available MRP channels. The Serial: LCD screen sets the RS-232 serial port's Baud rate and the 232 Tx and 232 Rx fields which set the transmit and receive RS-232 channels. There are 255 serial data channels available for transport over the network.

The final Config: LCD screen displays the current/editable IP Address and the editable Name of the NM 48 device (8 characters max). Set the IP address to 0.0.0.0 (the default) to enable CobraNet's Discovery Utility (Disco) to dynamically assign the IP address. Peak Audio's Discovery Utility allows you to plug into a CobraNet network with a standard Ethernet computer card (NIC) and discover all of the CobraNet devices on the network. The Disco software utility has the ability to dynamically assign IP addresses as well as update CobraNet firmware on the discovered CobraNet devices. Disco is available from www.peakaudio.com/cobranet as well as many music retailers which carry The Village People, KC & the Sunshine Band, Wild Cherry and the like.

Do yourself a favor and at least read the *Important Big Picture Concepts* section found elsewhere in this manual. Reviewing the Network Examples provides insight into a logical order for design work and would also be a way to avoid initial confusion.

WEAR PARTS: This product contains no wear parts.
CobraNet is a trademark of Peak Audio, Inc.

Front Panel Description

Output 1:   Source   Input   Mute
Copy   Local   Off   On

OUTPUTS

1   2   3   4   5   6   7   8

EDIT EDIT EDIT EDIT EDIT EDIT EDIT EDIT

RANE
DIGITAL

CONNECTED BY
CobraNet

NM 48
NETWORK
PREAMP

EXE

MAX

SHIFT

MIN

DATA
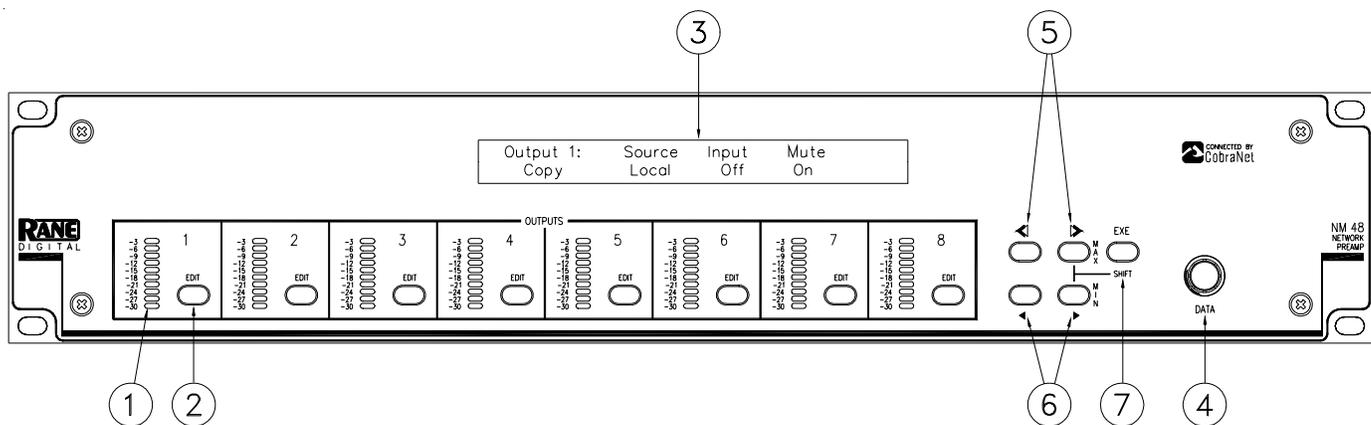
① **Output Meters** should be self explanatory. They are *peak* meters. The only quirk to these meters is the Mute condition which is indicated by only the top red indicator – and no others – illuminated.

② **Edit buttons** are provide a quick and convenient way to get to the Edit page for the individual Outputs.

③ **LCD Display** which displays Edit Pages.

④ **DATA wheel**. Allows adjustment of the underlined parameter after it is selected with the Page (see ⑤) and Cursor (see ⑥) buttons. Turn the DATA wheel clockwise to increase the parameter, turn it counterclockwise to decrease the parameter.

⑤ **Page buttons**. The Previous Page << and Next Page >> buttons scroll through all Edit Pages. When the EXE button is pressed and held and MAX >> is pressed, the selected parameter jumps to its highest or to a larger value (see ⑦).

⑥ **Cursor buttons**. When pressed, the Previous < and Next > Cursor buttons move the cursor through each of the adjustable fields on each page. These buttons select each adjustable parameter along the bottom row by moving the underline cursor left < or right >. When any parameter is selected, the DATA wheel adjusts that parameter. When the EXE button is pressed and held and MIN > is pressed, the selected parameter jumps to its lowest or to a smaller value (see ⑦).

⑦ **EXE (Execute) button**. Several commands are implemented with this button. Pressing EXE when the Copy, Paste and Load # commands are underlined executes that function. Holding down EXE while pressing MAX >> alters the selected parameter to its highest or higher nominal value. Holding down EXE while pressing MIN > alters the selected parameter to its lowest or lower value or Off.

Pin 1 and Chassis Grounding Note
    All XLR pin 1s on the NM 84 connect directly to the chassis metal via the XLR jack case itself. (Thank Neutrik for providing both a female and a male XLR jack which provide manufacturers with this function.) While viewing the XLR jacks, the lower right screw next to each jack provides the chassis connection. Keeping these screws tight ensures optimal shielding and electromagnetic interference performance.
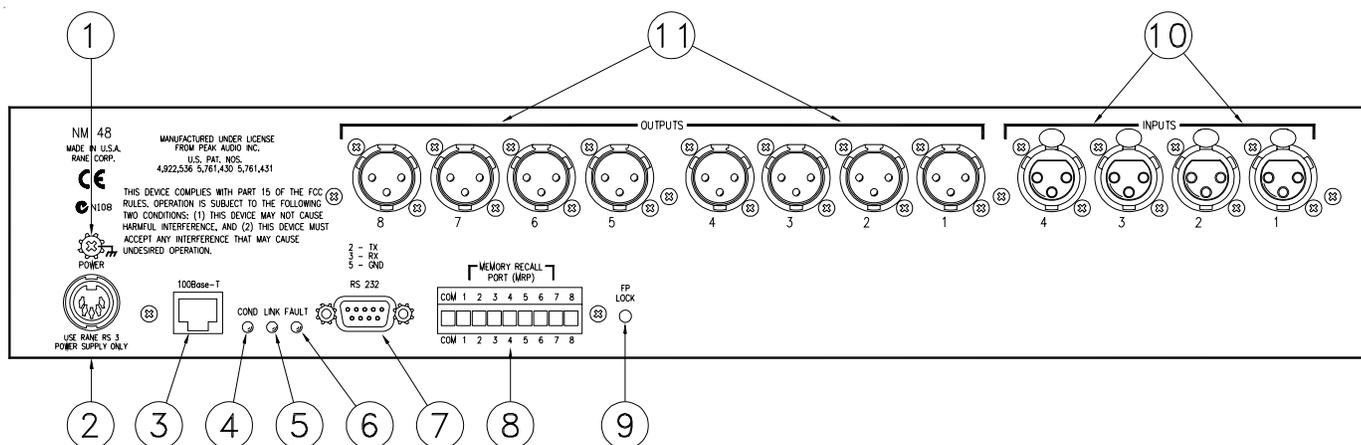
① **Chassis ground screw**. A #6-32 screw is supplied for chassis grounding purposes. The NM 48 does connect the 3rd pin of the AC line cord to the NM 84 chassis metal through the RS 3 power supply. This chassis screw is supplied should you need a point in the rack to earth ground other devices or the metal rack rails. The earth connection is critical and in most installations, required by law. Please refer to the RaneNote, "Sound System Interconnection" (available at *www.rane.com* and included with all Rane products) for further information on system grounding.

② **Power input connector**. Use only an RS 3 power supply from Rane. This unit is supplied with the RS 3 remote power supply suitable for connection to this input connector. Consult the factory for a replacement or a substitute power supply. Using any other type of supply may damage the unit, void the warranty and might make you think a three piece denim suit represents a wise fashion choice. After inserting the power connector into the NM 48, tighten the outer locking ring to insure that the power cable cannot be inadvertently pulled out. Doing so also strengthens your bottle cap opening muscles.

③ **100Base-T jack** connects the NM 48 with a standard RJ-45 connector to either another CobraNet device using a crossover cable or, more often, to a standard 100Base-T repeater hub, switch or media converter in the network.

④ **COND indicator** illuminates yellow when the network's electrons are flowing in the proper direction as indicated by the little directional arrows on the high-end audiophile's network cable of the future. Since audio is flowing over the network cables, audiophiles everywhere may soon be demanding such directional arrows. All joking aside, when lit, the COND indicator means that this unit is the Conductor of the CobraNet network. The Conductor is the one CobraNet device on the network that generates the master clock used to synchronize all other CobraNet devices on the network. Only one device on the network will have the COND indicator *on*. If the Conductor is unplugged, removed from the network, fails or goes on a smoking break, CobraNet automatically assigns a new Conductor on the network. It is rarely important to know which device is the Conductor.

⑤ **LINK indicator** lights green when any packet is present on the network. Yes, this means *any packet*, including packets not intended for the NM 48. It tells you that the network is actually transporting data. If this indicator is off, no data is present.

⑥ **FAULT indicator** lights red when, you guessed it, a fault occurs.

⑦ **RS-232 port** provides a way to transport RS-232 data over the network to subsequent NM device(s). For example, you can send RS-232 serial data to devices such as the RaneWare RW 232 line of audio products. Or, send any ol' RS-232 data across the network; it doesn't have to be Rane equipment either. This port *cannot* be used for serial control of the NM 48. Be sure the NM 48 is configured properly (i.e., baud rate, Rx and Tx channel) for your serial application using the Serial page.

⑧ **Memory Recall Port (MRP)** allows any remote switch to recall the first eight NM 48 Memories. The first eight Memories recall using simple switch closures between two pins. All 16 Memories can be recalled using Binary Mode (see page Manual-16). Switch closures on one NM 48 can be transmitted over the network to other NM devices that are tuned in to the same MRP channel.

⑨ **FP Lock button**. When pressed in, all front panel controls are locked out. The user is able to view, but not edit, all Edit pages. A sharp instrument like a small screw driver or pen must be used to depress the FP Lock button, but not your eyeball.

⑩ **INPUTS** accept balanced, line-level analog audio signals. Shields (pin 1) connect to the chassis through the lower-right XLR mounting screw (when viewed from the rear of the unit). Keep these tight for best EMI protection.

⑪ **OUTPUTS** provide a means for monitoring Local Input audio channels or for monitoring a CobraNet Audio Channel within one of four selected Bundles. Shields (pin 1) connect to the chassis through the lower-right XLR mounting screw (when viewed from the rear of the unit). Keep these tight for best EMI protection.

NM 48 LCD Edit Pages

Each Edit page's name appears in the upper left corner of the LCD display. Fourteen (14) pages are included, free of charge:
- 8 pages for Outputs, named – Output 1 through Output 8 (1 page for each of the Outputs)
- 1 page for Inputs (Inputs)
- 1 page for Network Receivers (NetRx): for selecting which of four CobraNet Bundle(s) to receive from the network.
- 1 page for Network Transmit (NetTx): for selecting which of four CobraNet Bundle(s) to transmit on to the network.

There is one Edit page each for the following:
- Mem: page for Memory Storing, Recalling and setting the Memory Recall Port Transmit (MRP Tx) & MRP Receive (MRP Rx) channels.
- Serial: page for setting the RS-232 Baud rate and Transmit (232 Tx) and Receive (232 Rx) channels.
- Config: page for setting the NM 48 IP Address and Name.

The top row of text on each Edit page contains the parameter names. Their current settings appear below the name. To edit a parameter's setting, place the underline cursor under the value that appears below the parameter name. Use the lower Previous (<) and Next (>) cursor buttons to move the cursor. Edit the parameter value by rotating the Data Wheel. Clockwise rotation increases the value, counterclockwise rotation decreases the value. To quickly maximize or minimize a parameter's value, hold down the EXE button and press Next Page (>>) or Next Cursor (>) buttons, respectively.

Copy, Paste and Load "X" fields are found in several Edit pages. Move the cursor under the Copy field, rotate the Data Wheel to select the desired command, then press the EXE button to execute the command. Use Copy to place the current Edit page's contents in a clipboard. Navigate to the Edit page where you want to paste these settings and execute a Paste by pressing the EXE button. [For convenience, the Copy field is automatically changed to Paste after executing the Copy command.] Load "X" allows the contents stored in Memory "X's" corresponding Edit page to be pasted into the current Edit Page. "X" can be changed to any of the 16 memories, 1 through 16, using the Data Wheel; Load 1, Load 2, Load 3, etc. This is an easy way to copy a single Edit page's contents from a stored memory into the current page.

Output Edit Pages – Output 1 through Output 8

Each of the eight Output Edit pages sets up one of the Outputs. Two modes are possible for each Output, Local or Network (see LCD screen shot below). Both modes have a Mute setting in common. A mute condition is indicated by only the top, red indicator on the meter – and no others – being illuminated.

In Local mode, you simply choose which of the four Inputs (1 through 4 or Off) to assign to the Output.

In Network mode, you choose a Bundle to receiver (NetRx) – A through D – and the specific Audio Channel (AudCh) within that Bundle. Go to the NetRx Edit Page to assign the 4 received Bundles, A through D. For convenience, the Bundle number assigned, if any, in the NetRx page for A through D, is shown in parenthesis on this page, next to the letter; e.g., A(42).

Note: a uniquely received Audio Channel can only be selected by a single Output. In the case where more than one Output is assigned to receive the same Audio Channel from the same Bundle, only the first Output assigned actually receives the Audio Channel; subsequent Outputs display the Audio Channel surrounded by dashes (example: -1-) to indicate it's already in use elsewhere.

Input Parameter	Range & Comments
Source	Network or Local
Mute	Off or On
Input	Off or Input 1 through 4
NetRx (Network Receiver)	Off or A through D (with the current Bundle Assignment shown in parentheses.)
AudCh (Audio Channel)	Off or 1 through 8, dashes indicate a conflict

```
┌─────────────────────────────────────────────┐
│  Output 1:    Source   NetRx   AudCh Mute    │
│     Copy      Network  A( 45)     1   Off     │
└─────────────────────────────────────────────┘
```
Network Mode

```
┌─────────────────────────────────────────────┐
│    In 1:      Source   Input          Mute   │
│    Copy       Local      3            Off     │
└─────────────────────────────────────────────┘
```
Line Mode

Input Edit Page

The Input Edit page (Inputs) allows Muting of the four Inputs.

Input Parameter	Range
In 1 through In 4	On or Mute

```
┌─────────────────────────────────────────────┐
│  Inputs:     In 1   In 2   In 3   In 4       │
│    Copy       On     On     On    Mute       │
└─────────────────────────────────────────────┘
```
Input Edit Page

Network Receive (NetRx) Edit page

CobraNet permits each device to receive up to a maximum of 4 Bundles total. Each Bundle contains 8 Audio Channels. The *NetRx:* edit page allows you to assign which 4 Bundles the NM 48 should receive. You do not need to receive all 4 possible Bundles, only those required for your application. Use the four Bundle fields *Bndl A, Bndl B, Bndl C* and *Bndl D* to tell the NM 48 which four Bundles to receive.

If you're wondering why you'd need multiple Bundles received by the NM 48, remember that each of the eight NM 48 Outputs can receive an independent Audio Channel from one of these four received Bundles. This allows you to choose any channel present on any four Bundles. As the old saying goes, you can pick your friends…

Parameter	Range
Bndl A (1st of 4)	Off, integers 1 through 999
Bndl B (2nd of 4)	Off, integers 1 through 999

The 3rd and 4th Bundles are labeled C and D, respectively.

```
NetRx:   Bndl A  Bndl B  Bndl C  Bndl D
          390     391       5      Off
```
Network Receive Edit Page

Network Transmit (NetTx) Edit page

The NM 48's four Input audio channels can be transmitted on up to four different CobraNet Bundles. All four Input audio channels are transmitted on each Bundle. The Network Transmit Edit pages set four independent Bundles to transmit using the four Bndl *X* parameters, where *X* is A, B, C or D.

You might be wondering: *why transmit four versions of the same four audio channels over the network*, right? Read the CobraNet Bundles section of this manual for the long answer. The short answer is, when using unicast – point-to-point – networks, often certain channels must be transmitted to more than one location or CobraNet node. Thus the NM 48 provides four Bundles for transmission. CobraNet permits transmission of up to 4 Bundles maximum per CobraNet node.

Parameter	Range
Bndl A (1st of 4)	Off, integers 1 through 999
Bndl B (2nd of 4)	Off, integers 1 through 999

The 3rd and 4th Bundles are labeled C and D, respectively.)

```
NetTx:   Bndl A  Bndl B  Bndl C  Bndl D
          313     321       5      Off
```
Network Transmit Edit Page

Memory Edit page

The Memory Edit page stores and recalls the NM 48 Memories. Memory Recall Port Transmit (MRP Tx) and MRP Receive (MRP Rx) are also set in this page.

Conceptually, the NM 48 contains 17 Memories; Memory zero contains the current settings which are always displayed on the LCD screen. Therefore, all changes made from the front panel alter the current settings – Memory zero. Once the desired settings are reached using the Edit pages, Memory zero (the current settings) can be stored into one of the 16 Memory locations. Additionally, recalling one of the 16 stored Memories places that Memory's contents into Memory zero for display, viewing, and further editing if needed.

The number of the most recently recalled Memory, 1 through 16, is displayed on the top left of the Mem LCD page. *An asterisk (*) appears to the right of this Memory number when the current settings no longer matched the displayed Memory's contents. This provides indication that a change to the NM 48 settings has been made since the last Memory was recalled.*

To store the current settings, move the cursor under Store, use the DATA wheel to display the Memory number to store the currents settings into, then press the EXE button.

To recall, move the cursor under Recall, use the DATA wheel to display the Memory number to recall from, then press the EXE button which overwrites the current settings.

The NM 48 provides up to 16 MRP (Memory) data transport channels which are asynchronously transported over the CobraNet network to other NM devices which are set to "listen" to the corresponding MRP channels. The MRP Tx (MRP Transmit) parameter can be set to one of the 16 MRP channels or Off. The Off setting – you guessed it – turns off MRP transmission. The numeric settings – integers 1 through 16 – tell the NM 48 to Transmit its current MRP contact closure status over the network to other NM devices that are set to receive the corresponding MRP channel. This allows other Rane NM devices to use remotely located NM device's MRP switch states to change Memories.

The MRP Rx (MRP Receive) parameter can be set to Local, Off or integers 1 through 16. The Local setting tells the NM 48 to scan its own rear panel Memory Recall Port for switch closures. Off turns off the MRP completely and 1 through 16 sets the desired MRP channel to "receive from" or "listen to."

Parameter	Range
Store	Integers 1 through 16
Recall	Integers 1 through 16
MRP Tx (MRP transmit)	Off, integers 1 through 16
MRP Rx (MRP Receive)	Local, Off, integers 1 through 16

```
Mem 1*   Store Recall   MRP Tx  Mem Rx
           1     1       Local   Off
```
Memory Edit Page

Serial Edit page

The Serial Edit page configures the RS-232 port. *The Baud parameter must be set to the desired baud rate for the device used with the RS-232 port.* Typical choices up to 38,400 baud are found. See the chart below for the complete list.

The NM 48 provides up to 255 serial data channels asynchronously transported over the CobraNet network to other NM devices set to receive and transmit over corresponding serial channels. The 232 Tx and 232 Rx parameters set these respective transmit and receive serial channels for transport of the RS-232 port's data. Be certain to use one channel for transmit such as 1, and a different channel to receive, such as 2. We know that you know that 1 is different than 2, but this is of course necessary, since RS-232 requires a different transmit and receive pair and therefore independent channels.

Another important thing to remember as far as the 232 port's physical connections go, *be sure you review the required connector sex, male or female, when transporting 232 around. All NM devices contain a female RS-232 (DB-9) connection on the rear.*

For example, when transporting Rane's RW 232 protocol from a computer to an NM 48, over the network to another NM device, the cabling should be as follows: The end of the cable at the computer connection will be female – since the DB-9 on a computer's COM ports are male. The other end of the cable will be male so you can connect it at the initial NM 48 device. At the second NM device, the rear panel DB-9 is female, thus requiring a male on the end of the second cable. The DB-9 Input on RW 232 devices is a female. Therefore, a male-to-male gender bender is required on the RW 232 Input side of the second cable to permit using a standard serial cable.

Parameter	Range
Baud	600, 1200, 2400, 4800, 9600, 19200, 38400
232 Rx (232 Receive)	Off, integers 1 through 255
232 Tx (MRP transmit)	Off, integers 1 through 255

```
 Serial:    Baud    232 Tx   232 Rx
            38400    Off      Off
```
Serial Edit Page

Configuration Edit page

The Config page sets the NM 48's IP address and Name. Set the IP Address to 0.0.0.0 to enable CobraNet's Discovery Utility to dynamically assign the IP address. *Note that the IP address displayed in the NM 48 screen will not be updated to reflect the IP Address assigned by Disco (see the Quick Start on page Manual-1).*

To assign an IP Address using the NM 48 front panel, edit the four IP Address numeric fields until the IP address matches the numbers assigned by your network administrator—if you have one. Perhaps "Audio Network Administrator" is a job title of the future? If you have no administrator, you may use an address out of the internationally accepted private network block of addresses, which is 192.168.nnn.nnn where nnn represents any number between 0 and 255. A good choice might be 192.168.100.100 just because it's easy to remember if you ever need to know it again. Subsequent NM devices might use 192.168.100.101, 192.168.100, 102, …103, …104 etc.

Important note: In systems using a computer with NM devices, the computer must be set such that the IP Addresses it can "talk to" are within range of the IP addresses of the NM devices. See the RaneNote, "Emerging Standards for Networked Audio System Control" for more details.

The Name parameter provides a place to name each NM 48 device to keep your sanity when multiple units are used on the same network. This is particularly useful when using Disco. There are 96 different ASCII characters available for each of the 8 characters available in the Name field. So, feel free to use lower and/or upper case letters, numbers, punctuation marks, et cetera, in the device name.

Parameter	Range
IP Address	0.0.0.0 through 255.255.255.255
Name	8 characters max; 96 possible characters per field thus permitting 4.97×10^{86} names, which I'm told, is more than the number of particles in the universe.

```
 Config:     IP address        Name
            0  .0  .0  .0__    NM 84
```
Configuration Edit Page

Important Big Picture Concepts

There are several imperative concepts which must be known to effectively understand the NM 48 and its CobraNet technology. A few of these are discussed below. Reading the rest of this manual and a thorough visit to *www.peakaudio.com/cobranet* are highly recommended.

NM 48 Memory scheme. All Rane products that contain Memories, including the NM 48, follow a common scheme: The LCD display (or software screen for PC-controlled devices) shows the current settings of the device. Sixteen Memory locations (or some number, depending on the product) exist from which the current device settings are stored and recalled. The current settings are considered Memory zero; some people like to think of Memory zero as "working Memory." All device editing is performed using Memory zero – even though we never display the number zero. There are, therefore, actually 17 Memories – 1 through 16 and zero.

Any changes made to the device are *immediately* stored in Memory zero. Should there be a power interruption, the contents of Memory zero are recalled upon power up from their previous, pre-power-down settings. Thus, work in progress is never lost and the device comes up with the same settings with which it went down.

Once you are happy with the current settings in Memory zero, they can be stored to one of the 16 Memories. To display or edit a previously stored Memory, recall it into Memory Zero. See the Memory Edit section on page Manual-5 for more details.

Control data transmission. In addition to the thousands of audio Bundles available in CobraNet, additional network data space is allocated in CobraNet for control data transmission. This non-Bundle space, if you will, is where the NM 48 transmits the Serial (RS-232) data and Memory data for the MRP. This control data is transported asynchronously over CobraNet (not isochronously like the audio data), although with a theoretical maximum of 9 Mbits/sec there is little need to worry about control data arrival times. This is only 468 times faster than 19200 serial control data!

CobraNet Bundles. The NM 48 can access up to 999 of the over 65,000 Bundles available (using Peak Audio's CobraCad software, all 65,000 Bundles are accessible). CobraNet divides the tens of thousands of Bundles into three different Designations or types for the transport of audio data over the network. The table on page Manual-9 explains the differences between the three types of CobraNet Bundles. There are advantages and disadvantages in using each. The Network Examples section after the table discusses applications for the various Designations.

Bundle Transmission conflicts. *Do not transmit onto the same Bundle from two different CobraNet devices.* Doing so causes the loss of the data sent from the second device.

Firmware primer. The NM 48 contains two pieces of internal firmware. One is the CobraNet firmware for the CobraNet interface, the second is the NM 48's own internal Rane firmware for the front panel interface, et cetera.

The Rane firmware revision number is displayed in the NM 48 LCD display on the *top* line during power up. Both the Rane firmware version (e.g., Version 1.01) and the date the Rane firmware was compiled (e.g., Mar 21, 2000) is displayed. Displaying the additional date is a good way to ensure Y2K compliance. To update the Rane firmware, you must replace an internal chip.

The CobraNet firmware version is displayed on the *bottom* line of the LCD display during power up (e.g., CobraNet rev 2.6.4). *Interoperability between various CobraNet devices requires matching CobraNet firmware versions.* CobraNet's Disco utility provides the means to download new CobraNet firmware into the NM 48. You must obtain Disco and the required binary CobraNet firmware files separately. There is a unique firmware file for each model of CobraNet device; contact Rane for the latest CobraNet firmware if needed.

A Note on Network Hardware. Before running out to your nearest computer retailer for networking equipment, check out the latest list of equipment blessed by Peak Audio at *www.peakaudio.com/cobranet/tested_products.htm*. (As a note of interest, a look through price lists will show you that the price of a non-managed switch has come down close to the price of a repeater hub. *You would be wise to spend the extra bucks and go for the switch, as it will make your network more flexible and expandable.*)

Four basic network hardware devices exist for use in CobraNet network designs. The simplest, least expensive and previously most common are called *repeater hubs*, which send all incoming data out all of their network ports. Thus repeater hubs are always multicast (broadcast) devices – all data goes everywhere. Use repeater hubs only when you have a dedicated CobraNet network (no computers) and when all audio channels are needed at all CobraNet node locations. If, for audio security or other reasons, your application requires certain channels to be accessible only in a certain area of the network, you cannot use repeater hubs (use switched hubs). Also you cannot use repeater hubs in your network if you need to share computer data and CobraNet data on the same network. Repeater hubs are devices for freshmen, Network 101 designs. As with many technologies, repeater hubs have had their day and may soon be a thing of the past.

The second kind of network hardware devices are called switched hubs which are only a little bit more expensive than repeater hubs. Using switches for your network greatly increases the efficiency of the network and allows computer data to be shared on the network. Switches automatically "view" the IP address (destination) of all incoming data and only send the data out the single required port for delivery, therefore, switches are unicast (point-to-point) devices. Switches are the more common network hardware devices used for CobraNet networks. Switched hubs are like the Junior or Senior class of the network world.

A third type of network hardware is a managed switch. Similar to a switch – but the next step up the rung – managed switches can be user-configured in several ways: you can create Virtual LANs (VLANs) and change the network architecture among various VLAN setups; you can set the managed switch up to prioritize the incoming data so audio data has higher priority than computer data, for example. With such capabilities, you can see that managed switches are

not simple, "Networking 101" devices – they're more like the Ph.D. candidates of the network world.

The fourth network hardware device to introduce is called a media converter. These are devices that convert the electrical signal from a set of copper wires (e.g., CAT 5 cable) to the light signal of the fiber optic world. Use media converters when the distance between network nodes exceeds the 100 meter limitation of copper cable.

Delay Times. There is an inherent delay between when audio enters and exits a CobraNet network. For the NM 48, the delay from when analog audio enters the device until it appears at the analog output of another NM 48 on a typical, small network is specified by three numbers. They are CobraNet's fixed 5.33 milliseconds and the A/D and D/A propagation delays – all of which are specified separately on the NM 48 Data Sheet. This allows calculating delay times across the network. The A/D time gets you onto the network; the network delay is fixed between any CobraNet devices; the D/A time is the time between the arrival of the CobraNet audio and the analog audio exiting from the Monitor Outputs when they're configured to monitor Network audio. (See the Peak Audio FAQ web page about the maximum number of switch hops and delay times through network hardware devices.)

Your application dictates whether this propagation delay is acceptable or not. Most CobraNet applications won't have to worry about this, but just to provide some insight, here's two applications that may not like this delay. For example, a theater with an elevated center cluster that provides coverage for listeners in the initial, center seats may not find this delay acceptable. Assuming that no propagation delay is added through other digital signal processing or a digital console (this may be the case), the additional network delay of 6.5175 feet – assuming NM 48s on and off the network – may place the arrival time of the direct sound versus the acoustic arrival outside the Haas effect time. This would make the propagation delay unacceptable for this application. If you're implementing a mic snake type of application and are including the monitor audio for stage members on the network, be sure to not exceed an acceptable delay time; a delay time not much more than 10 milliseconds (or hopefully less) is probably acceptable for monitor applications. Decide for yourself.

That being said, there are upcoming technologies (i.e., vaporware) that may cut this network propagation time in half or more. But, like most vaporware, we'd have to kill you after we told you about it. So, when this *really* becomes available, we'll let you know. This way, we won't have to kill you now.

Cables. Unlike simpler analog audio cable, choosing and installing CAT 5 network cable and connectors can be challenging and deceiving given that 100 megahertz data is being transported. Plus, the connector termination is not intuitively obvious; get it wrong and you'll spend hours blaming equipment when it's the cables all along. (*I know this because I've spent a full day and a half suspecting equipment when the cables were to blame. And yes, the cables had tested fine with a continuity tester, but a continuity tester is nowhere near good enough a test for the required 100 megahertz data we're talking about here.*) This cable stuff requires special attention beyond that normally paid by us audio guys who are

now trying to implement these newfangled audio networks. Do yourself a favor and visit Peak Audio's website where they have a great primer on Network Cabling. *http://www.peakaudio.com/cobranet/network_cabling.htm.* Finding or training people to deal with network cable and network troubleshooting is a worthwhile investment if your future includes networked audio systems.

Remember that the network hardware devices chosen for your network go hand in hand with the Bundles required to deliver audio for a given application. Multicast networks/ Bundles can be transported over repeater hubs or over switches; Unicast networks/Bundles require using switches. You cannot transport unicast data over repeater hubs.

Although the Network Hardware (Table 2) and the CobraNet Bundle (Table 1) are similar, they are listed separately since, for example, multicast data can be transmitted over repeater hubs or switches. Thus listing them separately allows you to determine which approach is best for your given application.

When observing the indicators on switch ports for CobraNet devices, Rane NM devices appear as full duplex devices. ("Rave" devices – available from our friends at QSC Audio – appear as half duplex; this may change however, so check with QSC.)

A Few Words About Networks

The opening primer in the Quick Start about designing a network makes it sound so easy – and it is, relatively – but it's like using three sentences to say *design a sound system for a building*. Like many technologies, there is always something new to learn. Networks and Ethernet may be new to audio folks, but they're old news to computer types. Here are a few good places on the Internet for more information on these subjects:

- Rane's main "network help" links page: *www.rane.com/ethernet.html*
- Network Design: *www.peakaudio.com/cobranet/network_design.htm* The folks at Peak Audio are, obviously, an invaluable resource for CobraNet information. Do not underestimate their interest in the success of your designs or their willingness to help with network design or the myriad questions that arise.
- John's Closet - A down-to-earth set of networking how-to's: *www.johnscloset.net*
- Ethernet Tutorial - A wonderful tutorial in plain English from Lantronix: *www.lantronix.com/training/tutorials*
- Network Design Tutorials & Other Resources - An industrial-strength link list of networking topics: *www.alaska.net/~research/Net/nwpages.htm*
- Ethernet Information - Network Basics / Cabling: *www.helmig.com/j_helmig/basics.htm*

Bundle number	Designation	Description	Advantages	Disadvantages
0 (Off) (hex: $00)	Null	Transmission disabled. Unused channel, i.e., Off.	Perfect for muting audio and saving network bandwidth.	Muted audio never arrives at any destination and is nearly impossible to hear.
1 through 255 (hex: $0001 through $00FF)	Multicast Bundle	Multicast. All CobraNet devices can transmit & receive data through Multicast Bundles.	Allows an unlimited number of receivers per transmission with no additional network bandwidth consumed. [On a CobraNet network, all CobraNet and non-CobraNet devices, such as repeater hubs, receive all Multicast data.]	Consumes resources (bandwidth) network-wide*. Only 32 Multicast Bundles allowed per VLAN when using managed switches. Swamps all 10 Mbit ports on the network. [*Fixed maximum of 8 Bundles using repeater hub networks. Do not mix computer data and CobraNet data on a repeater network.]
256 through 65,279 (hex: $0100 through $FEFF)	Unicast Bundle	Unicast (i.e., point-to-point) data transmission. [With some serious SNMP work, Unicast Bundles can be setup as multicast - this does not mean you'll ever need to do it though. This is also why Multicast Bundles exist.]	There is no fixed maximum number of Bundles on switched networks. Computer data and CobraNet data can more efficiently and reliably exist on the same network. Greatly improves network data throughput and efficiency since data is only passed from point to point and not to every network device. Allows 10 Mbit ports (such as the Rane Via 10).	Cannot send one device's audio to more than one other device without using a second independent Bundle. [The NM 84 allows the same 8 Audio Channels to be transmitted on up to 4 different Bundles - which is the maximum allowable by CobraNet devices.]

Table 1. CobraNet Bundles

Network Examples

There are two ways to transmit CobraNet audio across a network. An example for each transmission method follows. *The application dictates which of the two methods to use.* Some applications may require both methods simultaneously.

Multicast Network example [a.k.a. broadcast] requiring simpler repeater hubs

One way to transmit audio over the network is to allow all of a device's audio channels to be transmitted to all devices. This is called *multicast* in network lingo and can be thought of using the more familiar term: broadcast. Thus, when you transmit audio using one of the *Multicast Bundles* (Bundles 1 through 255), the audio is broadcast to every device on the network.

This broadcasting of all channels everywhere is required for applications such as paging when emergency audio must be delivered to every node. When users at each node need independent access to all available audio channels, use Multicast Bundles. If your application is a large music complex with many audio channels and all the audio channels are required in all rooms or nodes, use a multicast network by selecting Multicast Bundles 1 through 255 for audio transmission.

One advantage when using Multicast Bundles is that an unlimited number of receivers (CobraNet devices) are allowed for a single transmission with no additional network bandwidth being consumed. This is just like radio broadcasts: one transmitter, unlimited receivers.

Another advantage is the lower cost and complexity network that is required to implement the audio system using Multicast Bundles which are implemented utilizing simple Ethernet repeater hubs, which are quite inexpensive. This makes this Multicast application and system a "Networking 101" example – inexpensive and easily implemented.

The disadvantages of Multicast Bundles include the loss of bandwidth network-wide, since every device and every network cable contains the same quantity of data. All multicast data takes up the same amount of bandwidth throughout the entire network. Another thing to be cautious of is that multicast CobraNet data will swamp any 10 megabit (10Base-T) data ports on the network.

Modern computers with 100 Mbit PCI Ethernet interfaces (100Base-T) are quite capable of ignoring this multicast traffic until their network connection becomes saturated. However, if the computer is connected to the network via 10

Network Hardware Device	Advantages	Disadvantages/Limitations
Repeater hubs Operate half duplex; i.e., they cannot transmit & receive simultaneously. Thus, a 100 Mbit network is 100 Mbit network-wide.	Very inexpensive (but likely going away). Perfect when a dedicated CobraNet network is needed and all audio data is required at all CobraNet nodes.	Cannot place a computer or computer data on the same network with CobraNet data using repeater hubs. There is a fixed maximum of 8 Bundles permitted on a repeater hub network. On repeater networks, all devices must operate at the same data rate and in half duplex mode. Must obey network diameter restrictions. As repeater hubs are added to a network, the network bandwidth is divided/shared across network devices.
Switches (unmanaged) Operate full duplex enabling simultaneous transmit and receive. Thus, 100 Mbit networks are 100 Mbit in each direction; 200 Mbit total per switch port!	As switches are added to a network, the network's bandwidth increases. Some switches provide fault tolerance features (i.e., managed switches) and interfaces to other media (i.e., fiber) or network technologies (i.e., ATM). No network diameter restrictions (like repeater hubs have). [Using switch-based networks removes CobraNet's need to detect collisions, thus CobraNet acts differently with repeater vs. switch-based networks — although this is not important to know or understand for design or proper operation.]	Only slightly more expensive than repeater hubs; it is well worth the (literally) few extra dollars more for a switch than a repeater hub.
Managed Switch Managed switches are like switches on steroids; they offer many customizable setup features.	Permit extremely flexible setup, diagnostics and troubleshooting capabilities. Although managed switches are more expensive than non-managed switches, these capabilities more than pay for themselves when network re-configuration or troubleshooting is required, particularly during setup.	More costly than non-managed switches, but worth the expense for many systems due to their advantages.

Table 2. Network Hardware

Mbit Ethernet, that link will easily saturate. In any case, it is not CobraNet which suffers under these conditions, it is the computers.

The final disadvantage using multicast transmission is the inability to *reliably* share computer network data and CobraNet data on the same network. This is not to say that it is impossible, it indeed works. However, the problem is that the network bandwidth required by the computer data is ever-changing and not controlled or monitored by the CobraNet devices. Thus, when the computer data suddenly and unpredictably requires more bandwidth than is available, the entire network bogs down creating computer data collisions which slow down the computer network, and simultaneously creates audio dropouts, pops or ticks. Not fun, or necessary.

Oftentimes however, computer data must be shared on the network or not all audio channels are required at every node. This is where unicast networking comes in.

Unicast Network example [a.k.a. point-to-point] using more flexible switches

A second way to send audio over the network uses a different scheme called *unicast* – or point-to-point. You must use unicast when you require only certain locations on the network to receive certain channels. For example, in a campus-sized church complex, it may be useful to send all channels from the live band mics to the front of house (FOH) mixer, monitor mix location *and* to the recording studio. But the left-center-right (LCR) audio feed to the overflow building across the street only needs three channels. The stereo FM broadcast room only needs a stereo mix and the video truck which is used only every other week may require all channels.

In the above case, it is not required, overly complex, and most importantly, expensive to send all channels to all locations. Thus, a unicast (point-to-point) network to feed the mic channels from the stage to the four required locations – FOH, monitor, recording studio and video truck – is required. Therefore, using Bundles starting at 256 or above, sends the audio over Unicast Bundles which forces the use of network switches (not repeater hubs) which support unicast data.

For the LCR and stereo FM broadcast feeds, you could use hard-wired cable runs which may be less expensive. Or, use a single CAT 5 cable, three CobraNet devices and a couple of dedicated repeater hubs and utilize a single Multicast Bundle (1 through 255) to transmit all 5 audio channels to both the remote LCR and FM locations from the front of the house.

Now let's make things fun and assume, since this church pays no taxes, that their infinite budget (*so common these days*) requires an audio system in the church's on-site hotel and gymnasium. Oh, how fun.

The church's hotel, gymnasium and attached convention center requires a dozen stereo channels of background music as well as 4 paging audio feeds. Additionally, the LCR and stereo feeds from the church are fed into the gymnasium and convention center for more overflow on Christmas, Easter and when Father Guido Sarducci is in town.

Including the 12 stereo background feeds on the network, allows the church complex access to these background music sources for intermissions and open houses.

I think you can see where this is going. By using a combination of multicast and unicast networking, you can easily use CobraNet technology to efficiently distribute many audio channels to and from many locations and save considerable money on cable, conduit, labor and the re-configuration time needed to accommodate the wide variety of audio distribution needs in large and small facilities.

CobraNet network designs must not exceed 32 Multicast Bundles per VLAN. A VLAN (virtual LAN) is an advanced, "Networking 401" term associated with managed switches used on only the most advanced systems. Managed switches allow point-to-point virtual LANs to be defined by the network designer.

Software and Applications

ActiveX and Software issues

Microsoft ActiveX controls (defined in the next section) are of concern to the pro audio community. This technology allows designers of computer-controlled sound systems to create common front-end software control panels that operate different manufacturers' units, without having to know anything about their internal code or algorithms. This is powerful. When more manufacturers jump on the ActiveX bandwagon, systems designers will no longer be limited by the products offered by a single, platform-specific (i.e., closed architecture) manufacturer.

What is ActiveX anyway?

ActiveX is a Microsoft-developed software technology released in 1996. ActiveX, formerly called OLE (Object Linking and Embedding), is loosely based on the Component Object Model (COM), but provides substantially different services to developers. At this point, you might think: WHAT!?^* But keep reading! An ActiveX control is a unit of executable code (such as an .EXE file) that follows the ActiveX specification for providing software objects. This technology allows programmers to assemble reusable software controls into applications and services. However, software development using ActiveX technology should not be confused with Object-Oriented Programming (OOP). OOP

is concerned with creating objects, while ActiveX is concerned with making objects work together. Simply stated, ActiveX is a technology that lets a program (the ActiveX control) interact with other programs over a network (e.g., the Internet or Ethernet), regardless of the language in which they were written. ActiveX controls can do similar things as Java, but they are quite different. Java is a programming language, while ActiveX controls can be written in any language (e.g., Visual Basic, C, C++, even Java). Also, ActiveX runs in a variety of applications, while Java and Javascript usually run only in Web browsers. ActiveX controls can be used in web pages and within visual programming languages such as Borland's Delphi, Sybase's PowerBuilder, Microsoft's Visual Basic and even in tools such as Adobe's GoLive, Macromedia's DreamWeaver and National Instrument's LabVIEW.

In English, for our pro audio applications, ActiveX control objects are the sliders, buttons, indicators and other graphical screen entities. The objects have properties such as slider position and slider range and on or off for buttons and indicators, etc. Once the screen objects are chosen and placed, further ActiveX controls can then be used to link the object's properties to other ActiveX controls. Thus, allowing linking an ActiveX slider to the ActiveX control for a device's level control. Then moving the level control graphic slider subsequently varies the audio level and vice versa.

Each ActiveX control is made up of Properties and Events. ActiveX control Properties are values associated with the control, which might include such things as level settings, mute condition and meter readings. ActiveX control Events tell the computer something significant has happened, such as a switch closure, button press or clip detection.

ActiveX allows the manufacturer to create an object (a piece of software code) which fully describes a device, while hiding the implementation details such as protocol from the programmer. By hiding the communication details, there is no longer a need for different manufacturers' to agree on protocol. This lack of a protocol standard means that cooperation between manufacturers is not required. It allows each manufacturer to choose the best protocol for their devices.

For example, no longer would you need to know that the 17th byte of a 32-byte status message meant that the unit's second output channel was muted. With an ActiveX control, you might simply refer to the device's output 2 mute status as "Device1.Out2Mute". See the RaneNote "Emerging Standards for Networked Audio System Control" and "Controlling Audio Systems with ActiveX Controls over CobraNet and other Ethernet-based Networks," both downloadable from the Rane website Library.

Implementing ActiveX controls

An example might help clear this up. A few assumptions are that a computer is used to control an audio system over an Ethernet network and that something on the computer's screen controls some function of the system. The basic idea is to place controls on the computer screen and link them, using ActiveX, to a parameter in the system. What's important here is that only the controls required by the computer's end user need be displayed. Additionally, more detailed interfaces

(hidden or password-protected web pages) can then be created to provide any level of system parameter access desirable—from complete system control, to a lone system power button or anything in-between. No longer are systems limited to the number of security levels provided by vendor's software, nor are you limited to controlling a single system parameter per screen control. For example, you can link multiple ActiveX controls to a single screen object, thus adjusting EQ level simultaneously with master level control and limiter threshold. You can also program actions when certain events occur, such as triggering audio playback or turning a system off at a certain time or adjusting delay time as the temperature changes.

You can control different parameters inside the same device from different computers on the network as well as controlling the same parameter from multiple computers. This is one of the major advantages of networks – multiple control locations will automatically be updated when changes are made by any control location.

Microsoft FrontPage 2000 ActiveX Example

Many use Microsoft's FrontPage 2000 to create user interface web pages for computer-controlled systems. These web pages may or may not be accessible over the Internet. Once you master the ActiveX concept, using FrontPage with ActiveX provides literally an infinite number of programming possibilities. More information about the NM 48's ActiveX controls and the ActiveX controls for Rane's RW 232 devices is found in the sections on the next page.

NM 48 ActiveX Example

The short version of the FrontPage 2000 procedure used to setup a web page with ActiveX controls for a Rane NM 48 device's parameters goes as follows:

Insert a Rane NM 48 ActiveX control in a new web page. (This software/control ships with the unit or can be found on our RaneROM or on our website. Running this NM 48 setup procedure registers the Rane NM 48 ActiveX control with the computer used to create the web page. Otherwise, no special icon or folder is created after running the setup, so save time by *not* looking for the NM 48 software/control other than from within FrontPage's ActiveX list.) Set the inserted NM 48 control's Properties for your application. Generally, from FrontPage's *ActiveX Control Properties* window, this involves providing a unique *Name* in the *Object Tag* tab for the control. Then, link this control to the specific NM 48 device by entering the NM 48 device's *IP address* in the *NM 48 SNMP Control Setting* tab. The NM 48 control also must be assigned an update rate which is found on the *NM 48 SNMP Control Setting* tab. A good default value might be "5" which provides an update every half second. Don't get overzealous with this update rate since it's a function of many things and can negatively affect the speed at which controls and parameter changes take effect.

Next, insert an ActiveX slider, button or what have you from the vast list of available ActiveX controls. If you can't find a control that suits your fancy, further ActiveX controls can be found on the Internet as shareware, bought from ActiveX providers often in packages or created from scratch

for complete customization. Adjust the size, orientation and placement of the control for optimum ergonomics being sure to consider the user, the application and the requirement for further controls on this same page. Keeping the number of total controls on any one page low is very wise. See why in the September 2000 AES preprint by Rane's Stephen Macatee and Devin Cook titled *Controlling Audio Systems With ActiveX Controls Over CobraNet And Other Ethernet-Based Networks*.

In the *ActiveX Control Properties* window for the slider (or button…), uniquely *Name* the control in the *Object Tag* tab. Then in the *Parameters* tab, set the control's maximum and minimum value to match the NM 48 device's parameter that you'll link to this slider. Sometimes you'll find that you'll need to adjust these maximum and minimum values here (or in the Script language discussed next) to properly display or be compatible with the parameter being adjusted. For example, the "Mic_Trim" ActiveX control has a minimum value of "0" and a maximum of "36," but the actual displayed range of the Trim control is -20 to +16 dB in 1 dB steps. Thus, there are "36," 1 dB steps. Also, often the control link may be backwards such that the maximum value may correspond to the "lowest" slider position. Fix this when updating the control by subtracting the control's maximum setting from the desired setting within FrontPage's VBScript language.

To link the slider to the desired NM 48 internal device parameter, use Microsoft's VB Script language by associating the slider's Name with the specific NM 48 Control Name. You'll find the list of valid NM 48 ActiveX Control Names at the end of this Manual.

To track slider or system changes and update either the web page, the NM 48 device, or both, we'll need to use Microsoft's Visual Basic Script language. This is where the programming comes in. Yes, it does say *programming*. Remember when you could do your job without the need to program anything except the time on your wind up watch? Some programming tasks here are things like initializing the controls with valid information usually by reading the NM 48 device's current settings, then updating the on-screen controls so they match the device. You also need the Script software to scan for any changes and make updates accordingly. It is also wise to be sure that any requested changes to parameter values are within the proper numerical range, thus avoiding strange and unpredictable behavior. This is usually called "bounds checking" by programmers. Since these web page and network technologies allow multiple control locations, be sure your code handles this. For example, NM 48 device parameters can be changed from the NM 48's front panel, from the web page itself, from another copy of the same web page being run elsewhere on the network, or changes can also be made from contact closure memories. Take this into account when writing the "update settings" code by scanning independently for changes to the device's settings and changes to the web page controls. Then update things so the device settings and the web page controls always match.

Computer IP Setup

If you're using a computer with the NM 48, it must be set for network operation to allow it to speak using TCP/IP protocol. (TCP stands for Transmission Control Protocol.) If your computer is already set up for network operation you can move on in your life and skip this section.

Windows 95/98 PC Network Communications Setup

Note: As you go through the following procedure your computer tells you (on more than one occasion) that it needs to reboot before changes take effect. Just go along with it when this happens. Yeah, it's a big waste of time but this is an owner's manual, not an editorial page – so just do it, OK?

1. Insure you have a functional Ethernet adapter (NIC or Network Interface Card) installed in the PC. If installed, its operation may be checked by right clicking on 'My Computer' followed by a left-click on the selection 'Properties' and again a left-click on the 'Device Manager' tab of the 'System Properties' dialog box. Click on the plus (+) sign to the left of 'Network Adapters' to view the configured adapters. A malfunctioning adapter is indicated by either a yellow question mark or a red 'X'. There are several troubleshooting aids available in Windows Help to assist you in making the network adapter functional.

2. Once you have a correctly operating Ethernet adapter, TCP/IP is easy to configure. To begin, open 'My Computer' or 'Start > Settings,' then 'Control Panel > Network'. The 'Configuration' tab shows a list of configured devices, such as your network card and possibly dial-up networking. Below these is a list of network protocols previously configured for the system. If TCP/IP has been configured and bound to the Ethernet adapter, you will see an entry resembling 'TCP/IP -> NameOfAdapter Pnp LAN Adapter.' If this shows on the list, skip to step 4. If it's not there, go through step 3 first.

3. To add TCP/IP to the LAN Adapter, click the 'Add' button in the Network dialog. A list of network component types displays. Choose 'Protocol,' then 'Add'. A list of manufacturers displays. Click on 'Microsoft', then 'TCP/IP' in the right-hand window, then 'OK'.

4. To be a part of a TCP/IP network, your computer (and each network device including the NM 48) needs a unique IP address of its own. If not already open, open 'Settings > Control Panels > Network.' Highlight the 'TCP/IP -> NameOfAdapter PnP LAN Adapter' by clicking on it. Then choose 'Properties > IP Address.' Click on the 'Specify an IP address' option. If your computer *is* part of an existing network, you must now obtain a valid address from the network administrator—if you have one. If not, you may use an address out of the internationally accepted private network block of addresses, which is 192.168.nnn.nnn where nnn represents any number between 0 and 255. A good choice might be 192.168.100.100 just because it's easy to remember if you ever need to know it again. Set the 'Subnet Mask' to 255.255.0.0 for most installations. These two settings allow a network with addresses in the range of 192.168.0.0 through 192.168.255.255. Click the 'OK' buttons as many times as they appear to extinguish all the network setup dialog boxes.

Note: Once you've set networking on a Win95/98 computer, you'll notice it wants a user name and optional password each time it boots. To eliminate this nuisance, go back in to Control Panel > Network and change the 'Primary Network Logon' selection from 'Client for Microsoft Networks' to 'Windows Logon' then click 'OK' again. Oh, and guess what? Your computer will want to be rebooted again for the change to take effect. Good news, though, it won't ask for a user name and password this time.

Glossary of Terms

As with any technology, new terms are thrown about like a hot Mr. Potatohead at a 5 year old's birthday party. The CobraNet website (*www.peakaudio.com/cobranet*) is an invaluable resource for such jargon and includes a Terminology page for CobraNet terms. Here are a few just to keep things going.

Asynchronous – Not synchronized by a shared signal such as a clock or semaphore, proceeding independently. Email and computer file transfers are examples of asynchronous data streams.

Audio Channel – This is an ambiguous term, but define a single channel of audio in a CobraNet network; note the capital letters. (The term formerly known as *Sub-channel*.)

Broadcast – See Broadcast addressing.

Broadcast addressing – A special case of Multicast addressing. Whereas it is possible, in some cases, to indicate intended recipients of multicast data, broadcast data is unconditionally received by all devices within a network.

Bundle – A group of up to 8 Audio Channels. To transport audio over an Ethernet network, CobraNet places up to 8 Audio Channels in Bundles. (The term formerly known as *Network Channel*.)

Concentrator – A Repeater Hub, Switching Hub or passive interconnect such as a Patch Panel. Concentrator is less technically concise than Hub.

CobraNet – A Peak Audio technology, CobraNet is a combination of hardware, software and protocol which distributes many channels of digital audio over Fast Ethernet. CobraNet supports switched and repeater Ethernet networks. On a repeater network, CobraNet eliminates collisions and allows full bandwidth utilization of the network. CobraNet uses standard Ethernet packets and network infrastructure.

CobraNet node – Any network device which is in compliance with the CobraNet specification for transmission and/or reception of digital audio and associated sample clock.

CobraNet port – The same as CobraNet node, but more specifically, the RJ-45 connector on a CobraNet device.

Conductor – The CobraNet device on the network which supplies the master clock. A conductor arbitration procedure insures that at any time there is one, and only one, conductor per network. The conductor transmits beat packets at a regular interval. The time interval between beat packet transmission is the mechanism of clock delivery. The conductor is also responsible for generating transmission permissions based on forward reservations received in reservation packets. The transmission permissions are published in the beat packet.

Crossover cable – A special network cable that allows two network devices to connect directly together without the need for a hub. The receive and transmit pairs must be swapped within the cable.

One End	Cable	the Other End
TR+ pin 1	———	pin 3 RCV+
TR- pin 2	———	pin 6 RCV-
RCV+ pin 3	———	pin 1 TR+
RCV- pin 6	———	pin 2 TR-

Since a normal (non-crossover) network cable physically looks like a crossover cable, one of three practices are suggested: clearly label all crossover cables so they are not confused with normal "standard" ethernet cables. Wire two female wall plate jacks back to back with the proper swapping and use this adapter as a 2 port hub. Another useful adapter uses a standard RJ-45 at one end and a female wall jack at the other cross-wired. Making these two adapters short helps avoid confusing standard network cables from crossover cables. See *http://www.peakaudio.com/cobranet/network_cabling.htm.*

Fully Switched Network – A network built entirely from Switching Hubs. With the elimination of Repeater Hubs, the collision condition is removed from a fully switched network.

Hub – Hub is not a technically concise term. The term can be used to refer to either a Repeater Hub or a Switching Hub.

Isochronous – Uniform in time; of equal time; performed in equal times; recurring at regular intervals. An isochronous data stream is characterized by the fact that data delivered late is unusable. Live audio and video are examples of isochronous data streams.

Media Converter – A two port Repeater Hub with different media types on each port. Media converters can convert between CAT5 Cable and Fiber.

Multicast – See Multicast addressing.

Multicast addressing – Data which is Multicast is addressed to a group of, or all devices on a network. All devices receive multicast addressed data and decide individually whether the data is relevant to them. A Switched Hub is typically not able to determine appropriate destination port or ports for multicast data and thus must send the data out all ports simultaneously just as a Repeater Hub does. Multicast addressing is to be avoided whenever possible since it uses bandwidth network wide and since all devices are burdened with having to decide whether multicast data is relevant to them.

Network Channel – Old term now called Bundle. (*Hey, Bundle is a Peak Audio term, so call them.*)

Packet – A series of bits containing data and control information, source and destination addresses and formatted for transmission from one node to another.

Performer – All units except the conductor operate as a performer. A performer must re-synthesize a sample clock based on arrival times of received beat packets. A performer may transmit isochronous data packets only if given transmission permission to do so by the conductor.

Repeater Hub – An Ethernet multi-port repeater. A data signal arriving in any port is electrically regenerated and reproduced out all other ports on the hub. A repeater hub does not buffer or interpret the data passing through it. If data signals arrive simultaneously from multiple ports, a collision condition is recognized by the hub and a special jam signal is transmitted out all ports.

Repeater Network – A network built with one or more Repeater Hubs. Repeater networks share the same bandwidth among all connected DTEs.

Sub-channel – Old term now called Audio Channel.

Switched Network – A network built with one or more Switching Hubs. It is possible, even common to build a network from a combination of interconnected Repeater Hubs and Switched Hubs.

Switching Hub - A Switching Hub, or simply "Switch", examines addressing fields on data arriving at each port and attempts to direct the data out the port or ports to which the data is addressed. Data may be buffered within the Switching Hub to avoid the collision condition experienced within a Repeater Hub. A network utilizing Switching Hubs realizes higher overall bandwidth capacity since data may be received through multiple ports simultaneously without conflict.

Unicast – See Unicast addressing.

Unicast addressing – Data which is unicast is addressed to a specific network device. A switching hub examines the unicast address field of the data and determines on which port the addressed device resides and directs the data out only that port. Delivery of an email message is an example of unicast data addressing.

Memory Recall Port

The MEMORY RECALL PORT (MRP) provides contact closure control to recall any of the 16 Memories. Eight of the Memories are recalled with individual switch closures to a single terminal (see the Normal section of Table 1). Memories in multiple units may be recalled by either connecting the MRP terminals in parallel or by transmitting the MRP contact closure over the network. See the Memory Edit Page section of this manual.

Rane Firmware version 1.01 functions as follows: Only momentary switches should be used since only single closures are recognized. The NM 48 MRP is *not* read after power up, therefore, changes to the switch states will not be updated until the MRP conditions are changed when the power is on. If more than one terminal is grounded at a time, only the first closed switch is recognized. Subsequent switches are ignored once the first switch is and remains closed. If multiple switches are closed, once a single switch remains closed will that memory be recalled.

However, certain combinations of terminals may be grounded to activate Paging or Binary modes (see table). A "Binary" mode allows access to all 16 Memories. For example, connect the four contacts of a binary switch, plus the additional Binary mode closures shown in the Table. "Paging" mode provides an easy way to configure a system which uses a single switch (such as a mic or key switch) to toggle between two sequential Memories (See table). When wiring contacts, *only use Normal, Paging or Binary mode — do not switch between modes.*
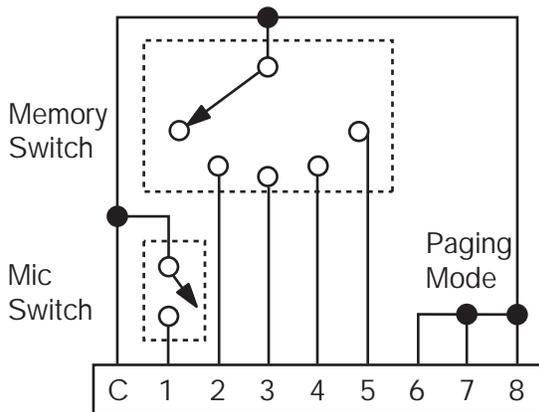
MRP Wiring

MRP Binary Control

"1" = switch closed (between "COM and 1,2,3,etc.)

"0" = switch open

1	2	3	4	5	6	7	8	Mode	Result
1	0	0	0	0	0	0	0	NORMAL	1
0	1	0	0	0	0	0	0		2
0	0	1	0	0	0	0	0		3
0	0	0	1	0	0	0	0		4
0	0	0	0	1	0	0	0		5
0	0	0	0	0	1	0	0		6
0	0	0	0	0	0	1	0		7
0	0	0	0	0	0	0	1		8
0	0	0	0	0	1	1	1	PAGING	1
1	0	0	0	0	1	1	1		2
0	1	0	0	0	1	1	1		3
1	1	0	0	0	1	1	1		4
0	0	1	0	0	1	1	1		5
1	0	1	0	0	1	1	1		6
0	0	0	1	0	1	1	1		7
1	0	0	1	0	1	1	1		8
0	0	0	0	1	1	1	1		9
1	0	0	0	1	1	1	1		10
0	0	0	0	1	1	0	1	BINARY	1
1	0	0	0	1	1	0	1		2
0	1	0	0	1	1	0	1		3
1	1	0	0	1	1	0	1		4
0	0	1	0	1	1	0	1		5
1	0	1	0	1	1	0	1		6
0	1	1	0	1	1	0	1		7
1	1	1	0	1	1	0	1		8
0	0	0	1	1	1	0	1		9
1	0	0	1	1	1	0	1		10
0	1	0	1	1	1	0	1		11
1	1	0	1	1	1	0	1		12
0	0	1	1	1	1	0	1		13
1	0	1	1	1	1	0	1		14
0	1	1	1	1	1	0	1		15
1	1	1	1	1	1	0	1		16

Control Name: Rane Corporation NM 48 SNMP Active X Control

The CobraNet Firmware requires further revisions to allow effective control of an NM 48 via SNMP. Thus, the ActiveX controls for the NM 48 are still pending.

Mic		HMI Base HMI Addr	Oid	NM 84	NM 48
		800000			
1	Index	N/A	[1.3.6.1.4.1.2680.1.2.7.1].1.1.1.1	Ö	Ö
	Mute	800000	[1.3.6.1.4.1.2680.1.2.7.1].1.1.2.1	Ö	Ö
	Phantom	800001	[1.3.6.1.4.1.2680.1.2.7.1].1.1.3.1	Ö	N/A
	Line Mode	800002	[1.3.6.1.4.1.2680.1.2.7.1].1.1.4.1	Ö	N/A
	Mic Gain	800003	[1.3.6.1.4.1.2680.1.2.7.1].1.1.5.1	Ö	N/A
	Line Gain	800004	[1.3.6.1.4.1.2680.1.2.7.1].1.1.6.1	Ö	N/A
	Trim	800005	[1.3.6.1.4.1.2680.1.2.7.1].1.1.7.1	Ö	N/A
	Filter	800006	[1.3.6.1.4.1.2680.1.2.7.1].1.1.8.1	Ö	N/A
	Limiter	800007	[1.3.6.1.4.1.2680.1.2.7.1].1.1.9.1	Ö	N/A
2	Index	N/A	[1.3.6.1.4.1.2680.1.2.7.1].1.1.1.2	Ö	Ö
	Mute	801000	[1.3.6.1.4.1.2680.1.2.7.1].1.1.2.2	Ö	Ö
	Phantom	801001	[1.3.6.1.4.1.2680.1.2.7.1].1.1.3.2	Ö	N/A
	Line Mode	801002	[1.3.6.1.4.1.2680.1.2.7.1].1.1.4.2	Ö	N/A
	Mic Gain	801003	[1.3.6.1.4.1.2680.1.2.7.1].1.1.5.2	Ö	N/A
	Line Gain	801004	[1.3.6.1.4.1.2680.1.2.7.1].1.1.6.2	Ö	N/A
	Trim	801005	[1.3.6.1.4.1.2680.1.2.7.1].1.1.7.2	Ö	N/A
	Filter	801006	[1.3.6.1.4.1.2680.1.2.7.1].1.1.8.2	Ö	N/A
	Limiter	801007	[1.3.6.1.4.1.2680.1.2.7.1].1.1.9.2	Ö	N/A
3	Index	N/A	[1.3.6.1.4.1.2680.1.2.7.1].1.1.1.3	Ö	Ö
	Mute	802000	[1.3.6.1.4.1.2680.1.2.7.1].1.1.2.3	Ö	Ö
	Phantom	802001	[1.3.6.1.4.1.2680.1.2.7.1].1.1.3.3	Ö	N/A
	Line Mode	802002	[1.3.6.1.4.1.2680.1.2.7.1].1.1.4.3	Ö	N/A
	Mic Gain	802003	[1.3.6.1.4.1.2680.1.2.7.1].1.1.5.3	Ö	N/A
	Line Gain	802004	[1.3.6.1.4.1.2680.1.2.7.1].1.1.6.3	Ö	N/A
	Trim	802005	[1.3.6.1.4.1.2680.1.2.7.1].1.1.7.3	Ö	N/A
	Filter	802006	[1.3.6.1.4.1.2680.1.2.7.1].1.1.8.3	Ö	N/A
	Limiter	802007	[1.3.6.1.4.1.2680.1.2.7.1].1.1.9.3	Ö	N/A
4	Index	N/A	[1.3.6.1.4.1.2680.1.2.7.1].1.1.1.4	Ö	Ö
	Mute	803000	[1.3.6.1.4.1.2680.1.2.7.1].1.1.2.4	Ö	Ö
	Phantom	803001	[1.3.6.1.4.1.2680.1.2.7.1].1.1.3.4	Ö	N/A
	Line Mode	803002	[1.3.6.1.4.1.2680.1.2.7.1].1.1.4.4	Ö	N/A
	Mic Gain	803003	[1.3.6.1.4.1.2680.1.2.7.1].1.1.5.4	Ö	N/A
	Line Gain	803004	[1.3.6.1.4.1.2680.1.2.7.1].1.1.6.4	Ö	N/A
	Trim	803005	[1.3.6.1.4.1.2680.1.2.7.1].1.1.7.4	Ö	N/A
	Filter	803006	[1.3.6.1.4.1.2680.1.2.7.1].1.1.8.4	Ö	N/A
	Limiter	803007	[1.3.6.1.4.1.2680.1.2.7.1].1.1.9.4	Ö	N/A
5	Index	N/A	[1.3.6.1.4.1.2680.1.2.7.1].1.1.1.5	Ö	Ö
	Mute	804000	[1.3.6.1.4.1.2680.1.2.7.1].1.1.2.5	Ö	Ö
	Phantom	804001	[1.3.6.1.4.1.2680.1.2.7.1].1.1.3.5	Ö	N/A
	Line Mode	804002	[1.3.6.1.4.1.2680.1.2.7.1].1.1.4.5	Ö	N/A
	Mic Gain	804003	[1.3.6.1.4.1.2680.1.2.7.1].1.1.5.5	Ö	N/A
	Line Gain	804004	[1.3.6.1.4.1.2680.1.2.7.1].1.1.6.5	Ö	N/A
	Trim	804005	[1.3.6.1.4.1.2680.1.2.7.1].1.1.7.5	Ö	N/A
	Filter	804006	[1.3.6.1.4.1.2680.1.2.7.1].1.1.8.5	Ö	N/A
	Limiter	804007	[1.3.6.1.4.1.2680.1.2.7.1].1.1.9.5	Ö	N/A
6	Index	N/A	[1.3.6.1.4.1.2680.1.2.7.1].1.1.1.6	Ö	Ö
	Mute	805000	[1.3.6.1.4.1.2680.1.2.7.1].1.1.2.6	Ö	Ö
	Phantom	805001	[1.3.6.1.4.1.2680.1.2.7.1].1.1.3.6	Ö	N/A
	Line Mode	805002	[1.3.6.1.4.1.2680.1.2.7.1].1.1.4.6	Ö	N/A
	Mic Gain	805003	[1.3.6.1.4.1.2680.1.2.7.1].1.1.5.6	Ö	N/A
	Line Gain	805004	[1.3.6.1.4.1.2680.1.2.7.1].1.1.6.6	Ö	N/A
	Trim	805005	[1.3.6.1.4.1.2680.1.2.7.1].1.1.7.6	Ö	N/A
	Filter	805006	[1.3.6.1.4.1.2680.1.2.7.1].1.1.8.6	Ö	N/A
	Limiter	805007	[1.3.6.1.4.1.2680.1.2.7.1].1.1.9.6	Ö	N/A
7	Index	N/A	[1.3.6.1.4.1.2680.1.2.7.1].1.1.1.7	Ö	Ö
	Mute	806000	[1.3.6.1.4.1.2680.1.2.7.1].1.1.2.7	Ö	Ö
	Phantom	806001	[1.3.6.1.4.1.2680.1.2.7.1].1.1.3.7	Ö	N/A
	Line Mode	806002	[1.3.6.1.4.1.2680.1.2.7.1].1.1.4.7	Ö	N/A
	Mic Gain	806003	[1.3.6.1.4.1.2680.1.2.7.1].1.1.5.7	Ö	N/A
	Line Gain	806004	[1.3.6.1.4.1.2680.1.2.7.1].1.1.6.7	Ö	N/A
	Trim	806005	[1.3.6.1.4.1.2680.1.2.7.1].1.1.7.7	Ö	N/A
	Filter	806006	[1.3.6.1.4.1.2680.1.2.7.1].1.1.8.7	Ö	N/A
	Limiter	806007	[1.3.6.1.4.1.2680.1.2.7.1].1.1.9.7	Ö	N/A
8	Index	N/A	[1.3.6.1.4.1.2680.1.2.7.1].1.1.1.8	Ö	Ö
	Mute	807000	[1.3.6.1.4.1.2680.1.2.7.1].1.1.2.8	Ö	Ö
	Phantom	807001	[1.3.6.1.4.1.2680.1.2.7.1].1.1.3.8	Ö	N/A
	Line Mode	807002	[1.3.6.1.4.1.2680.1.2.7.1].1.1.4.8	Ö	N/A
	Mic Gain	807003	[1.3.6.1.4.1.2680.1.2.7.1].1.1.5.8	Ö	N/A
	Line Gain	807004	[1.3.6.1.4.1.2680.1.2.7.1].1.1.6.8	Ö	N/A
	Trim	807005	[1.3.6.1.4.1.2680.1.2.7.1].1.1.7.8	Ö	N/A
	Filter	807006	[1.3.6.1.4.1.2680.1.2.7.1].1.1.8.8	Ö	N/A
	Limiter	807007	[1.3.6.1.4.1.2680.1.2.7.1].1.1.9.8	Ö	N/A

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