
M-2 DIGITAL

MULTIBAND DUAL VOICE PROCESSOR

TECHNICAL MANUAL

 *Wheatstone Corporation*

600 Industrial Drive, New Bern, North Carolina, USA 28562

VORSIS ULTRA-HIGH RESOLUTION PROCESSING

M-2 Digital Multiband Dual Voice Processor Technical Manual - 1st Edition

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Attention!

Federal Communications Commission (FCC) Compliance Notice: Radio Frequency Notice

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



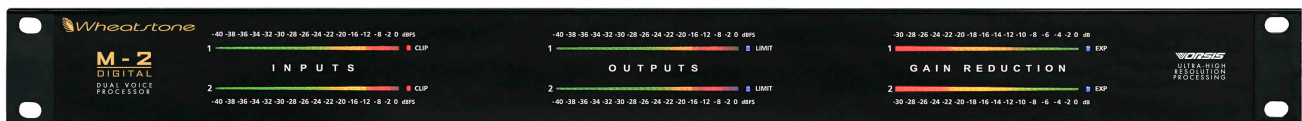
This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take appropriate measures.

This equipment must be installed and wired properly in order to assure compliance with FCC regulations.

Caution! Any modifications not expressly approved in writing by Wheatstone could void the user's authority to operate this equipment.

M-2 Digital Multiband Dual Voice Processor

Quick Start Guide



Please inspect the contents of the shipping package to ensure that the following items are present:

- | | |
|--|---------|
| - Wheatstone M-2 Unit | - Qty 1 |
| - M-2 Technical Manual and Software CD | - Qty 1 |
| - AC Power Cord | - Qty 1 |
| - Quick Start Guide | - Qty 1 |

Install and Connect the M-2

1. Install the M-2 in the equipment rack using *at least* two rack screws. If only two screws are used they *must* be installed in the bottom holes of the rack ears to prevent undue stress on the front panel and possible bending.
2. Connect the microphone to the XLR female microphone input on the rear panel.
3. Connect either line level analog out or AES digital out XLR connector to your desired signal path.
4. When using the M-2 GUI software connect rear panel Ethernet RJ--45 jack as appropriate for your intended use:
 - a) a direct connection to PC uses crossover CAT5 cable;
 - b) a connection to your LAN requires a straight through CAT5 cable between the M-2 and the Ethernet switch or HUB.
5. Connect the AC power cord to the M-2 rear panel connector and then plug it into AC power. The M-2 unit will power up.

Installing GUI Software

The M-2 must be controlled using the included Microsoft Windows-based PC GUI software. To install the software insert the M-2 software CD into a Windows XP/2000 computer's CD drive and follow the steps below to install the software. If the software installation does not automatically start when the CD is inserted into the drive, you can start the installation manually by:

- Clicking Start
- Then click Run
- Then click Browse
- Browse the "My Computer" device tree to locate the CDROM device and then double click it.
- When the contents of the CDROM drive appear in the window, locate the autorun.inf or M2GUISETUP_X_X_X.EXE file on the CDROM and double click it.
- Follow the on screen instructions to complete the GUI installation.

Configuring the M-2 IP Address*

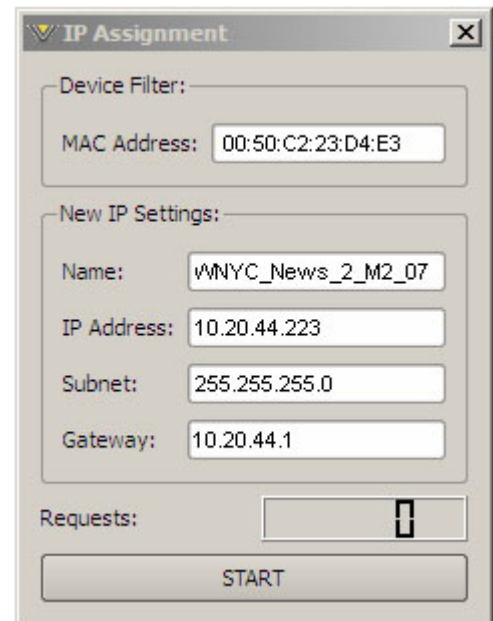
Once the GUI has been installed on the host PC it's time to configure it and the M-2 so that they can communicate with each other. This requires configuration for both the M-2 *and* the remote GUI so that they agree on the networking parameters.

PLEASE NOTE: As shipped from the factory, the M-2 is pre-programmed with an IP address of 192.168.1.192, a subnet of 255.255.255.0, and a gateway of 192.168.1.1. If these settings will work in your application, you DO NOT need to change the M-2's IP address. Proceed to following section, *Configuring the GUI*.

Before starting the configuration procedure, please locate and carefully make a note of the M-2's 12-digit MAC Address which is located on a label either on the top cover or the rear panel.

Note that if the MAC address is not entered carefully and correctly in the following steps, the M-2's IP address will not be changed!

Start the M-2 GUI software. Then right click on the control area of the GUI and select Hardware/Assign IP Address. The window on the right will appear:



**The M-2 does not support DHCP (Dynamic Host Configuration Protocol) and therefore it requires a static TCP/IP address on the Network it is connected to. Its presence on the network will not interfere with DHCP addressing of other network connected devices as long as the IP address that is configured for the M-2 does not conflict with the address of any other device on the network. Please consult your friendly IT manager if necessary.*

Next, carefully enter your M-2's MAC address in the MAC Address field. The MAC address must be carefully entered because the GUI will "send" the IP address information to the device that owns the MAC address that was entered in this step. If the MAC address is incorrect, the M-2 will never "hear" it.

Next, enter a pet name for your M-2, like AirStudio1, etc.

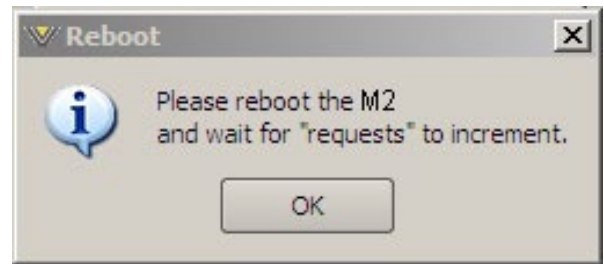
Then, enter the IP address that you wish the M-2 to have, noting that this address must be unique if the M-2 will be communicating over your network.

Next enter the desired Subnet Mask and Gateway IP addresses.

Once this is done, click the "Start" button at the bottom of the IP address configuration box. A message similar to the one on the right should appear:

Click OK. Remove power to the M-2 for a few seconds and then reapply it.

As the M-2 is booting up, the "Requests" number in the IP Assignment window should increment to something other than zero (please see the bottom of the image on the right). When this occurs the M-2 has received and acknowledged its new IP address and is now ready for use on your network. Click the **X** in the upper right corner of the IP Assignment window to dismiss the dialog.



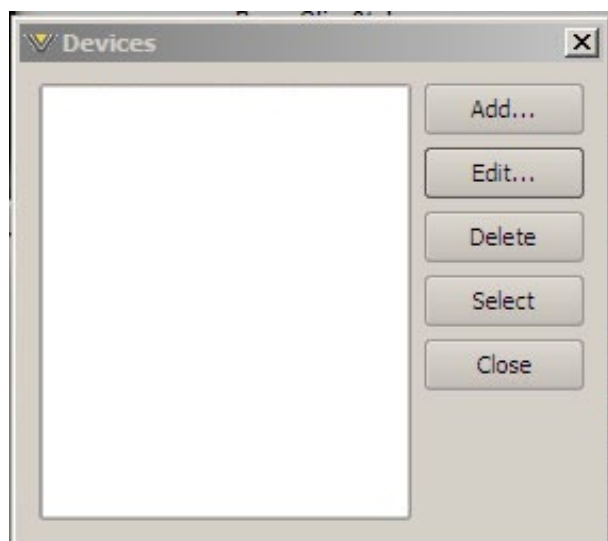
Configuring the GUI

Now that the M-2 has its own TCP/IP identity, we must configure the GUI so that it can talk to the M-2. This is done by adding “devices” to the list of M-2’s that the GUI knows about. To do this, locate and click on the “Devices” button located along the right side of the GUI.

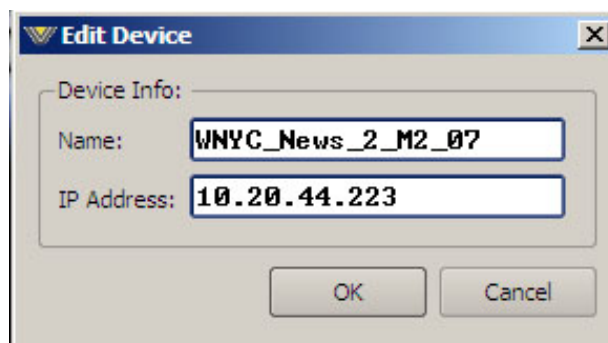


Location of “Devices” button

When this is done, the following window will pop up:



Next, click the “Add” button and a new dialog box will appear. This is how new devices are added or the configuration of existing devices modified.

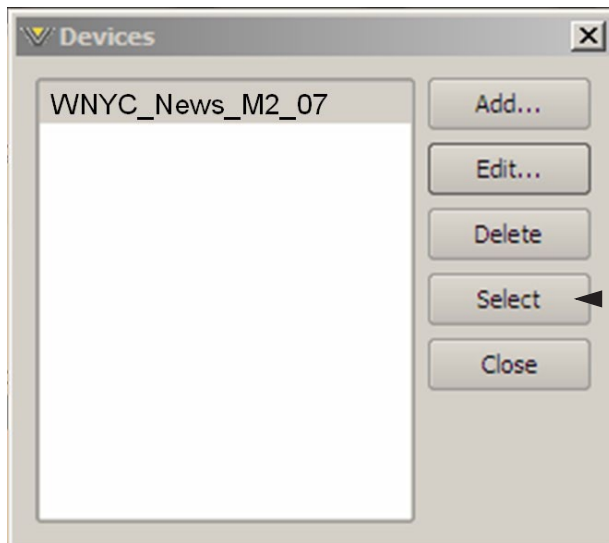


First, enter the same pet name that you used when you assigned the IP address to the M-2. The above dialog shows us adding a new device called “WNYC_News_2_M2_07.”

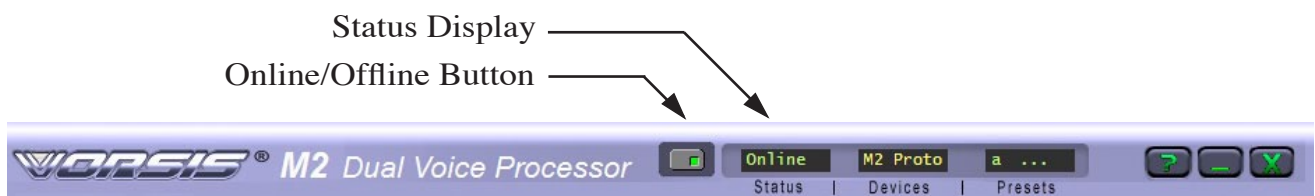
Then enter the IP address that you configured the M-2 for in the previous steps. Note that it is always best to completely delete any existing data in the IP Address box and then enter the complete address from scratch.

After this is done you may click “OK” on the Edit Device box. Then, in the Devices Dialog box highlight (single left click) the M-2 device that you just added (shown highlighted in the image on the left) and click on “Select.”

This step tells the GUI specifically which M-2 you want to connect to.



Next, click on the Online/Offline button just to the left of the Status indicator, unless the button's green indicator is already lit.



In the Status window you may see the message “Trying” as the GUI is handshaking with the M-2. Once the handshake is complete and communication protocols are locked in the Status message should revert to “Online.” The device’s name will show up in the Devices display.

If for some reason the GUI cannot connect with the M-2, the “Trying” status message will remain and will occasionally blink as the GUI retries the establishment of a connection. Under these circumstances the configuration of the GUI and M-2 should be carefully examined to ensure that the destination TCP/IP address is consistent between the two.

Once these steps are complete you are now ready to use the M-2 from anywhere in the world through its advanced Graphical User Interface.

M-2 Digital Multiband Dual Voice Processor Technical Manual

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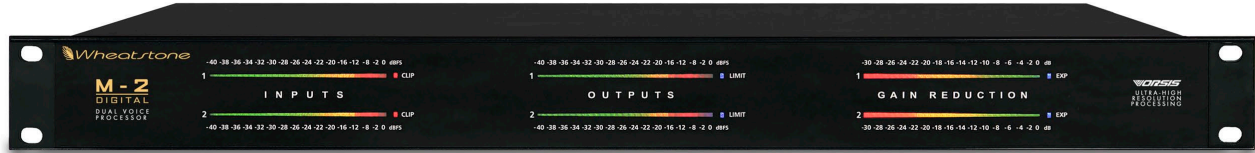
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General Information

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General Information

Introduction

The Wheatstone M-2 Digital Dual Voice Processor is a uniquely flexible and easy-to-use *multiband* voice processor designed for professional audio applications. It offers user presets, security, networkability, an all digital and fanless DSP-based framework, and easy to set up parameters. The unit occupies one 19" wide rack space (height 1 3/4"), and is 12" deep (not including connectors).

All adjustments of the M-2's sound are controlled from the remote GUI, enabling remote control of all parameters. The use of presets allows voice talent to have their own sound simply at the press of a button. In fact, from one GUI it is possible to control an entire facility equipped with M-2's, making multiple Microphone Processor management easy and straightforward.

The M-2's hardware includes two channels equipped with very high quality, low-noise microphone preamplifiers, four bands of parametric EQ, and Vorsis-designed processing tools such as de-essers, compressors, and expanders. The unit comes loaded with factory designed presets, and thanks to the flexibility of the software-based GUI designing *your own* sound is quite easy.

The electrical specifications of the M-2's microphone preamplifier approach the theoretically perfect. Noise within the audio band nudges the theoretical minimum, limited only by the thermal (Johnson) noise of the precision resistors* used. Frequency response is ruler flat beyond the extremes of human hearing, and unwanted signal distortions such as THD, IMD, and TIM are vanishingly low.

Static waveform fidelity is virtually perfect, affected only by the input high pass and low pass filters, the phase scrambler when it is in circuit, and any equalization being used.

XLR and CAT5 connectors, which are located on the rear of chassis, make installation very simple.

* Thermal noise is intrinsic to all resistors and is not a sign of poor design or manufacture, although certain types of resistors may have excess noise.

Pre-Installation Notes

- The M-2 should be mounted in a well grounded equipment rack using at least two, and preferably four, rack screws. When only two screws are utilized they must be installed in the two bottom holes in the M-2 front panel rack ears in order to prevent undue twisting and distortion of the front panel.
- If the M-2 is installed in a rack containing heat generating equipment, particularly when it is installed above such equipment, one rack unit (1 3/4") blank or ventilated rack panels should be installed above and below the M-2 in order to aid natural convection cooling.
- The M-2 should be connected to a source of clean AC power. If local power has a history of being unstable, it is wise to incorporate an Uninterruptible Power Source (UPS) in the AC power feed to the M-2*.
- In facilities with a history of damage or surges from lightning or other sources, it is wise to incorporate a good quality AC line surge suppressor in the M-2 power feed*.
- Audio connections to the microphone inputs should be balanced and made with a high quality shielded microphone grade cable. The cable shield should be terminated at both ends of the cable to the XLR connector's Pin #1. We *do not* recommend the use of unbalanced connections at the M-2 inputs.
- As far as signal input polarity is concerned, the XLR Pin #2 is "hot" and the M-2 does not invert the phase of the audio unless the Invert option has been selected. (The exception to the above statement is when the Phase Scrambler is used, which *will* result in frequency dependent phase shift which causes the output signal's phase to be inverted relative to the input signal at certain audio frequencies.)

** As with all computer or microcomputer based digital equipment the M-2 requires clean and surge-free AC power for proper operation. Otherwise unpredictable and hard to identify issues may arise with its operation and, in the extreme case, even equipment damage or corruption of data.*

Rear Panel Connections

All audio input and output, control, Ethernet, and power supply connections are made via various connectors conveniently mounted on the M-2's rear panel. Six XLR connectors are provided: two microphone inputs, two analog and two digital outputs. Five RJ-45 connectors are also provided; two duplicate the signals appearing at the Channel One and Channel Two AES output XLR connectors. The others serve as interfaces for the control and Ethernet connections. The DB-9 connector provides eight GPI inputs for the most used presets. The pinout drawings on pages 1-9 through 1-11 summarize all wiring connections.

Microphone Inputs →



Phantom Power →

Analog Audio Output →

Digital Audio Output →

Control Connectors →

GPI Connector →

Ethernet Connector →

Filtered AC Power Input →

Microphone Inputs

The M-2 possesses TWO microphone level inputs (-50dBu nominal) fed from the female XLR connector to the internal microphone preamplifiers. The microphone preamplifier has digitally controlled gain, up to a maximum of 70dB, and displays remarkably high performance and sonic accuracy. Phantom power is available.

Pin 1 XLR 1 SH – MIC 1 IN SH

Pin 2 XLR 1 HI – MIC 1 IN HI

Pin 3 XLR 1 LO – MIC 1 IN LO

Pin 1 XLR 2 SH – MIC 2 IN SH

Pin 2 XLR 2 HI – MIC 2 IN HI

Pin 3 XLR 2 LO – MIC 2 IN LO

Outputs

The M-2's two processing channels' output signals are available as individual analog line level (+4dBu, balanced) signals on the two male XLR ANALOG OUT connectors as well as in digital AES format on the male XLR AES OUT connectors, paralleled by two RJ-45 AES OUT connectors for CAT5 connection.

Channel One/Two Analog Outputs—XLR-M

Pin 1 XLR 1 SH – LINE 1 OUT SH
 Pin 2 XLR 1 HI – LINE 1 OUT HI
 Pin 3 XLR 1 LO – LINE 1 OUT LO
 Pin 1 XLR 2 SH – LINE 2 OUT SH
 Pin 2 XLR 2 HI – LINE 2 OUT HI
 Pin 3 XLR 2 LO – LINE 2 OUT LO

Channel One/Two AES Outputs—XLR-M & RJ-45

XLR-M

Pin 1 XLR 1 SH – AES 1 OUT SH
 Pin 2 XLR 1 HI – AES 1 OUT HI
 Pin 3 XLR 1 LO – AES 1 OUT LO
 Pin 1 XLR 2 SH – AES 2 OUT SH
 Pin 2 XLR 2 HI – AES 2 OUT HI
 Pin 3 XLR 2 LO – AES 2 OUT LO

RJ-45

Pin 1 RJ-45#1 – AES 1 OUT HI
 Pin 2 RJ-45#1 – AES 1 OUT LO
 Pin 1 RJ-45#2 – AES 2 OUT HI
 Pin 2 RJ-45#2 – AES 2 OUT LO

Remote Control Ports

The M-2's "CONTROL" RJ-45 connectors may be used with the (optional) Wheatstone GP-4S Mic Control Panel, or may be wired to a custom interface if desired. Functions available to each signal processing channel of the M-2 include remote on and off, cough, and tally.

Control—RJ-45

Pin 1 – DIGITAL GROUND
 Pin 2 – COUGH ENABLED (momentary)
 Pin 3 – N/C
 Pin 4 – OFF TALLY (open collector)
 Pin 5 – ON TALLY (open collector)
 Pin 6 – REMOTE OFF (momentary)
 Pin 7 – REMOTE ON (momentary)
 Pin 8 – +5V DIGITAL POWER

Optional GP-4S Mic Control Panel

The optional GP-4S panels connect to the M-2 using a standard straight through CAT5 Ethernet cable of any reasonable length. This panel has “ON,” “OFF,” and “COUGH” switches for remote control of the microphone inputs. The “TB” (talkback) button is designed to interact with Wheatstone audio consoles and has no function in the M-2. The “ON” and “OFF” buttons are LED illuminated. These panels can be mounted directly into a furniture surface or a turret if desired.



To Turn Microphones ON & OFF from a Remote Location

REMOTE ON — When taken low (connected to Digital Ground) activates the ON TALLY and simultaneously unmutes the M-2 audio output for that channel. You must provide a momentary closure between Remote On (Pin 7) and Digital Ground (Pin 1) to latch the microphone audio ON. A user-supplied momentary contact switch or the optional GP-4S panel is required.

REMOTE OFF — When taken low (connected to Digital Ground) activates the OFF TALLY and simultaneously mutes the M-2 audio output for that channel. You must provide a momentary closure between Remote Off (Pin 6) and Digital Ground (Pin 1) to latch the microphone audio OFF. A user-supplied momentary contact switch or the optional GP-4S panel is required.

COUGH — When taken low (connected to Digital Ground) temporarily mutes the microphone for the selected M-2 channel. You must provide a momentary closure between Cough (Pin 2) and Digital Ground (Pin 1) to temporarily mute the microphone. This is a non-latching mode so the microphone will unmute as soon as the switch is released. A user-supplied momentary contact switch or the optional GP-4S panel is required.

On and Off Tallies

ON TALLY — A continuous closure (via open collector) exist between On Tally (Pin 5) and Digital Ground (Pin 1) whenever the microphone audio is unmuted. This allows the microphone ON function to also control an on-air light or other “microphone on” indicator at a remote location.

OFF TALLY — A continuous closure (via open collector) exists between Off Tally (Pin 4) and Digital Ground (Pin 1) whenever the microphone audio is muted. This allows the microphone OFF function to also control a “microphone off” indicator at a remote location.

The ON and OFF tallies can be used to control externally powered tally lights or other functions requiring a continuous closure to function. External tally lights (such as LEDs) can be powered from the tally output by connecting the external LED anode to +5V Digital (Pin 8)* and the external LED cathode to the On Tally port (Pin 5) or Off Tally port (Pin 4).

* An appropriate current limiting resistor must be used so that current drawn from Pin 8 does not exceed 15 milliamps.

General Purpose Interface

The General Purpose Input (GPI) control port on the M-2 works a bit differently than in other Wheatstone processors. In the M-2 the eight GPI inputs operate as follows:

- GPI ports 1 through 4 are hard coded to select presets for M-2 Channel One.
- GPI ports 5 through 8 are hard coded to select presets for Channel Two.

The eight separate General Purpose Inputs share a common return. The rear panel connector is a female DB-9 connector with the following pin assignments. Note that all pins are isolated from M-2 internal circuitry!

GPI—DB-9

- Pin 1 – GPI COM (-)
- Pin 6 – GPI 1 IN (+)
- Pin 2 – GPI 2 IN (+)
- Pin 7 – GPI 3 IN (+)
- Pin 3 – GPI 4 IN (+)
- Pin 8 – GPI 5 IN (+)
- Pin 4 – GPI 6 IN (+)
- Pin 9 – GPI 7 IN (+)
- Pin 5 – GPI 8 IN (+)

The GPI input circuits are optoisolated by devices having an input/output isolation of 1,500VAC. These inputs are expected to work very well in high RF environments and will not cause ground loop issues when connected to external equipment.

Each of the GPI inputs is current limited by a 475 ohm resistance located inside the GPI control circuitry. The LED device inside the optoisolators is rated at a maximum forward current of 50mA and a normal operating current of 5mA.

Before connecting external circuitry to the GPI inputs you should first ascertain whether it will be necessary to utilize additional outboard series resistance in your application!

The following table will serve as a convenient reference to determine if an external resistance is required in your application and if so, what value that resistance should be. Note that in all applications up to and including 48VDC a one-half watt resistor power rating is sufficient.

Applied Voltage to GPI	External Resistance
3.3 VDC	None
5.0 VDC	330 Ohms
6.0 VDC	470 Ohms
7.5 VDC	820 Ohms
10 VDC	1.3 kOhms
12 VDC	1.8 kOhms
15 VDC	2.4 kOhms
24 VDC	3.9 kOhms
30 VDC	5.1 kOhms
48 VDC	9.1 kOhms

Ethernet Interface

The rear panel RJ-45 connector that is assigned to the Ethernet communication function uses a standard 10/100BaseT interface. It employs both UDP and TCP/IP protocols to communicate with the remote GUI software running on a host PC and utilizes common ports to communicate with the M-2.

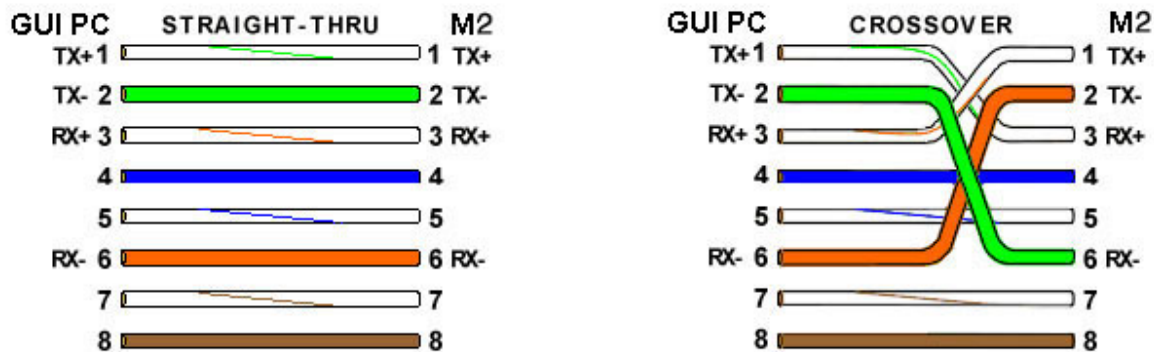
Ethernet—RJ-45

Pin 1 – TXD +
 Pin 2 – TXD -
 Pin 3 – RXD +
 Pin 4 – N/C
 Pin 5 – N/C
 Pin 6 – RXD -
 Pin 7 – N/C
 Pin 8 – N/C

When using the M-2 with a nearby computer and when no local area network is available, you must use a standard Ethernet crossover cable to interconnect the computer and the M-2.

When using the M-2 with a remotely connected computer or when it is interconnected to the remote computer via a LAN you must use a standard straight through Ethernet cable.

Please see the drawing below for the wiring for both straight through and crossover cables.



In each case the color code for the GUI PC end of the cable is as follows:

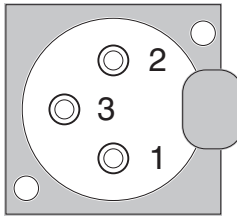
- 1 – White w/Orange tracer
- 2 – Solid Orange
- 3 – White w/Green tracer
- 4 – Solid Blue
- 5 – White w/Blue tracer
- 6 – Solid Green
- 7 – White w/Brown tracer
- 8 – Solid Brown

GENERAL INFORMATION



Mic In - XLR-F

XLR 1-F

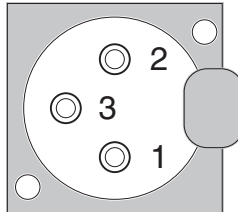


PIN 1 XLR 1 SH - MIC 1 IN SH

PIN 2 XLR 1 HI - MIC 1 IN HI

PIN 3 XLR 1 LO - MIC 1 IN LO

XLR 2-F



PIN 1 XLR 2 SH - MIC 2 IN SH

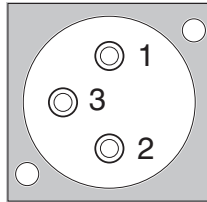
PIN 2 XLR 2 HI - MIC 2 IN HI

PIN 3 XLR 2 LO - MIC 2 IN LO



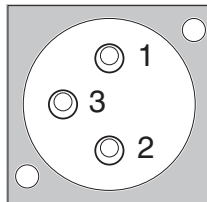
Analog Out - XLR-M

XLR1-M



PIN 1 XLR 1 SH - LINE 1 OUT SH
PIN 2 XLR 1 HI - LINE 1 OUT HI
PIN 3 XLR 1 LO - LINE 1 OUT LO

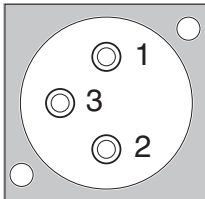
XLR2-M



PIN 1 XLR 2 SH - LINE 2 OUT SH
PIN 2 XLR 2 HI - LINE 2 OUT HI
PIN 3 XLR 2 LO - LINE 2 OUT LO

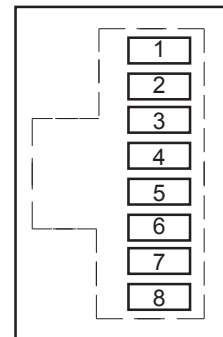
AES Out - XLR-M & RJ-45

XLR1-M



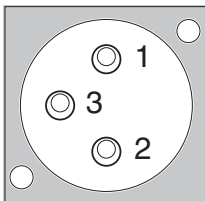
PIN 1 XLR1 SH - AES 1 OUT SH
PIN 2 XLR1 HI - AES 1 OUT HI
PIN 3 XLR1 LO - AES 1 OUT LO

RJ-45 #1



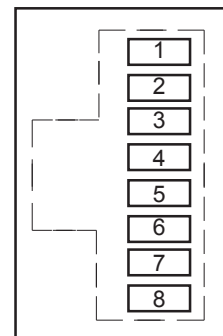
AES 1 OUT HI
AES 1 OUT LO
N/C
N/C
N/C
N/C
N/C
N/C

XLR2-M



PIN 1 XLR2 SH - AES 2 OUT SH
PIN 2 XLR2 HI - AES 2 OUT HI
PIN 3 XLR2 LO - AES 2 OUT LO

RJ-45 #2

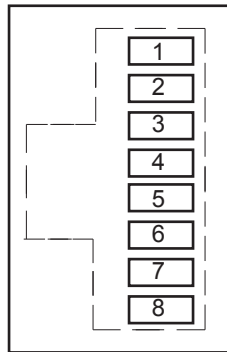


AES 2 OUT HI
AES 2 OUT LO
N/C
N/C
N/C
N/C
N/C
N/C



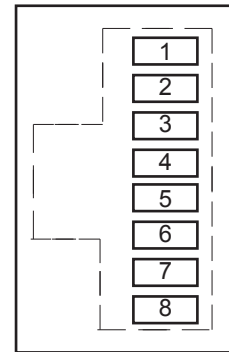
Control - RJ-45

**MIC 1
RJ-45 #1**



DIGITAL GROUND
COUGH ENABLED
N/C
OFF TALLY
ON TALLY
REMOTE OFF
REMOTE ON
+5V DIGITAL

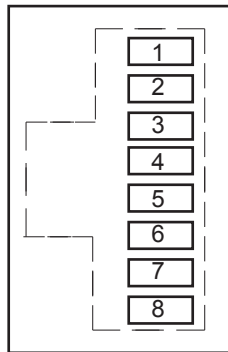
**MIC 2
RJ-45 #2**



DIGITAL GROUND
COUGH ENABLED
N/C
OFF TALLY
ON TALLY
REMOTE OFF
REMOTE ON
+5V DIGITAL

Ethernet - RJ-45

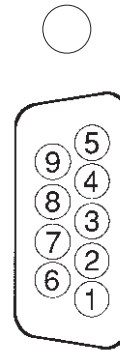
**ETH
RJ-45**



TXD +
TXD -
RXD +
N/C
N/C
RXD -
N/C
N/C

GPI - DB-9

GPI 7 IN (+)
GPI 5 IN (+)
GPI 3 IN (+)
GPI 1 IN (+)



GPI 8 IN (+)
GPI 6 IN (+)
GPI 4 IN (+)
GPI 2 IN (+)
GPI COM (-)

M-2 Operating Guide

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M-2 Operating Guide



Remote Interfacing with the M-2 GUI

A PC application program to control one or many M-2s is supplied with the product. It is a Windows® Graphical User Interface (GUI) program, which has been very carefully designed to be intuitive and straightforward in use. The GUI has three different user levels, levels of complexity if you will, designed to accommodate users at all skill levels.

- The ECI or “Expert Control Interface” makes every M-2 control available. It is intended as a wide open window to the M-2’s many features and settings - no controls are hidden from the user.
- The SSI or “Standard Simplified Interface” has been designed for users with basic familiarity with audio processors but who don’t need to know all the nuances of what happens under the hood in order to tune up the M-2 to get the desired sound.
- The TCI or “Talent Control Interface” is designed to be installed on an air studio PC where the on-air talent can use it to select the microphone processing preset that should be in use for their show.



The TCI hides all controls associated with creating and changing the sound of the M-2. This user interface only allows the selecting of presets and the configuration of the M-2 device to connect to.

The GUI is supplied as a self-installing program which may be executed from any directory on the computer. Upon installation, and unless another installation path is selected, the GUI will install itself under “Program Files\Vorsis\M2” and a “M-2” icon will appear on the desktop. Double-clicking on this icon will start the GUI program.

The software is compatible with all recent releases of Microsoft Windows® including Windows 2000, Windows XP Home and Professional, Vista, and Windows 7 operating systems.

The GUI is designed to operate a virtually unlimited number of M-2 microphone processors. Each M-2 unit is associated with its own static TCP/IP address as is the controlling PC. Remember that in most networks the address xxx.xxx.xxx.255 is a reserved broadcast address and should never be used for configuring network devices.

Since all the M-2's to be operated by a single GUI must be configured with TCP/IP addresses within the same subnet, the number of devices “reachable” by the GUI is limited by the subnetting scheme used.

It is possible to remotely operate any number of M-2 processors if the network, the M-2's, and the GUI PC's are all configured appropriately according to accepted networking standards.

It is also possible to operate the M-2 via a variety of available wireless protocols and hardware. Given the current state of flux of wireless technology we will leave it up to the ingenuity of the end user to design and implement the best way to operate the M-2 wirelessly in their particular environment.

To configure the M-2 network connection a basic familiarity with Windows navigation techniques is assumed. If terms such as “left-click,” “right-click,” “double-click,” and “drag-and-drop” seem alien, operating the M-2 GUI could be problematic.

Architecture of the GUI

The M-2 GUI allows you to control and view how the M-2 is reacting to the audio passing through it, and do it in real time. It also allows you to make changes to the processing while viewing the significance any change is having on the audio.

Connecting the M-2 and the GUI

With LAN (Local Area Network)

The M-2 and a Windows® PC running the M-2's GUI program can be connected over a standard Ethernet Local Area Network (LAN).

Once the M-2 is installed, powered-up, and verified to be operating normally, a CAT5 cable connected to a 100baseT LAN should be inserted into the appropriate socket on the rear panel. Likewise, the GUI should be installed on the desired PC that has been verified to be working correctly with the LAN.

Without LAN (Local Area Network)

It is also possible to work without a LAN by connecting the M-2 and the PC Ethernet ports together using a standard Ethernet crossover cable.

Host PC Requirements

Constraints for the host PC are not extraordinary – it should preferably be at least 1GHz in speed and the screen resolution at least 1024 x 768 pixels. The LAN should be 100baseT (100MHz) capable. Any recent Windows operating system is quite sufficient.

Using the GUI

The GUI screen may be maneuvered around the computer's screen by left-clicking-and-dragging the GUI near the “Vorsis” logo at the upper left of the application screen. In true “Windows” fashion, the GUI may be minimized (taken off the screen) and closed by way of the familiar controls at the extreme top right.

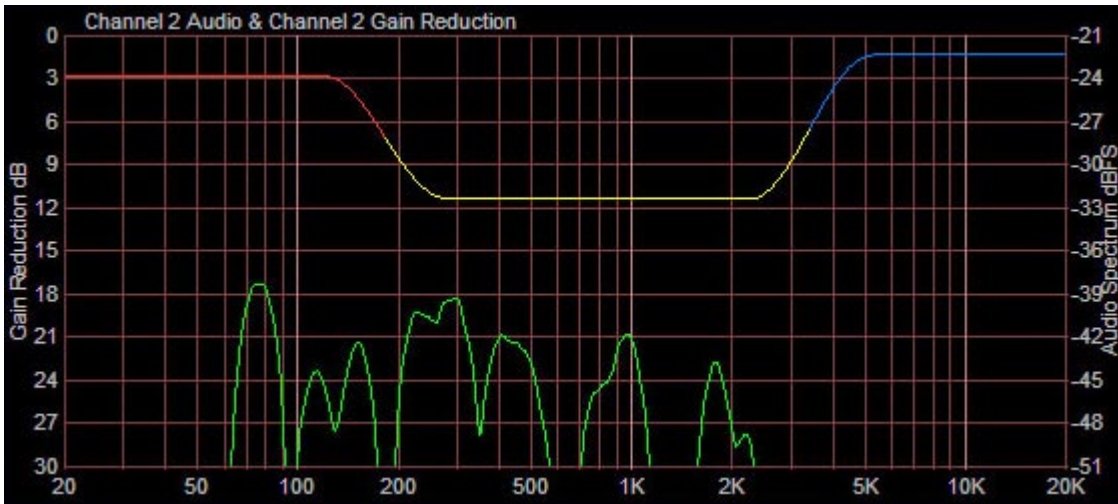
Description of the features and functions of the GUI will follow different discrete regions of the screen. It will begin with the most eye-catching region containing the Dynamic Displays. The Control Area will be covered next, followed by the Side Bar buttons, and winding up with the Title Bar and Menus.



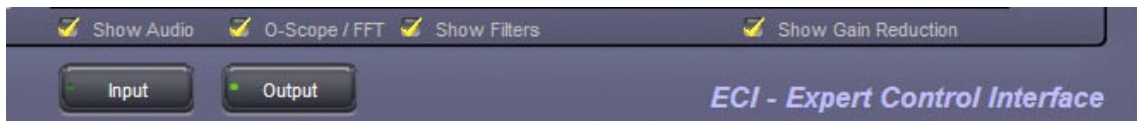
Dynamic Display Region

Frequency-Domain Graph

Visually, the most interesting and useful element on the main screen, and dominating the lower half of both the ECI and SSI versions of the GUI, is a large graphical display logarithmically depicting the standard audio frequency range of 20Hz – 20 kHz. The vertical axis scale may be altered by clicking and dragging the scale up or down. The overall displayed vertical range remains at 30dB, with gradations every 3dB.



Along the bottom of the large graphical area is a row of four small checkboxes for enabling different views within that display area. When selected or deselected a yellow checkmark appears and disappears respectively.



Show Audio — When selected (and O-Scope/FFT is unchecked), an FFT (Fast Fourier Transform) of the audio is displayed in real time showing audio frequency spectra versus time.

O-Scope (oscilloscope)/FFT — When “O-Scope/FFT” and “Show Audio” are simultaneously selected, the display substitutes a real time amplitude versus time display instead of the FFT which shows frequency versus time.

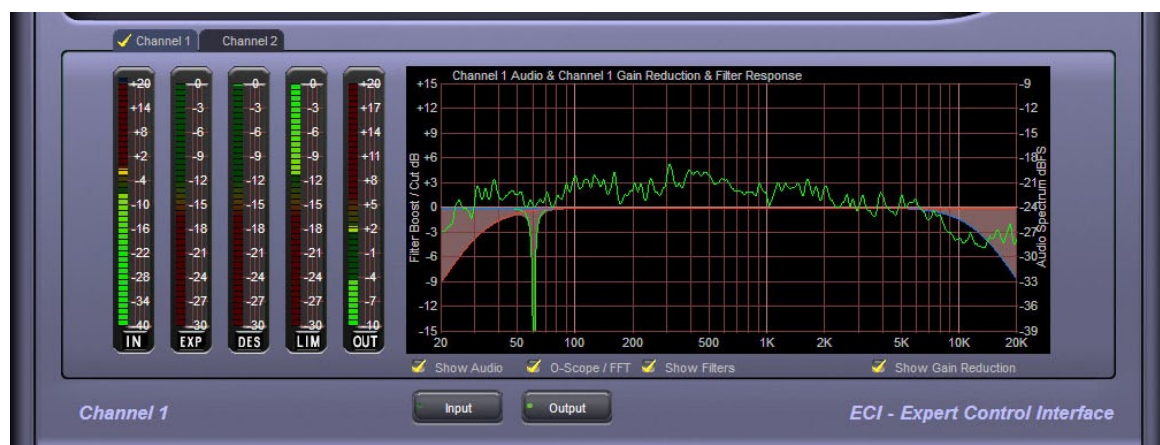
Show Filters — When enabled the end user can view how the parametric equalizer, sweepable filter set, and de-esser’s frequency responses are being affected by the filters operating in those processing stages.

Show Gain Reduction — When selected, displays the amount of gain control in dB occurring in the compressor, expander, or de-esser.

Displayed Signal Selection — Directly underneath the small checkboxes are two large buttons labeled **INPUT** and **OUTPUT**.

When **INPUT** is selected, the graphical display shows audio presented at the input to the selected channel of the M-2. When **OUTPUT** is selected the graphical display shows the audio after the M-2 has processed it. The mode that has been selected is indicated by a small green “on” light in the selected button.

Bargraph Metering



To the left of the graphical display area are five vertical bargraphs, each having a 30dB vertical display range, except for IN, which has a 60dB range. From left to right they are:

- **IN** - Displays the channel 1/channel 2 input signal level.
- **EXP** - Displays the amount gain control occurring within the Expander algorithm.
- **DES** - Displays the amount of de-essing when it is occurring.
- **LIM** - Displays the amount of limiter gain control occurring within the final limiter when it is engaged.
- **OUT** - Displays the channel 1/channel 2 audio output amplitude in dBu.

The level meters are dual-indicating peak-over-average, with peaks riding as a lone “dot” over a solid bar-graphed average. An “Over” indication is at the top (but slightly distanced from) the input level bargraphs.

Signal Path Selection



Above the bargraph meters are tabs labeled Channel 1 and Channel 2, that select which of the two signal channels within the M-2 is being operated upon / displayed.

Control Area Region

When the GUI software is in its ECI or SSI modes the large area above the graph and meters host the controls available at those user levels (note that no controls are available when the GUI is in its TCI mode).

To operate the controls either place the cursor above the desired control and use the mouse's scroll wheel to "increase" or "decrease" the control's position; or left click on the control, and slide the mouse to move the control - up or right increases the control's indicated position, down or left decreases it. The behavior of the controls can be made finer by holding down the keyboard's control key ("Ctrl") while adjusting, or coarser using shift.

When the GUI software is in its ECI or SSI modes there is a row of buttons across the upper portion of the GUI corresponding to the various processing sections and in the signal flow order. A small indicator at the left end of each button indicates if signal processing within that block is active. Left-clicking a button opens a panel of controls for that portion of the signal-processing.



Input Cal. — Displays the controls for the microphone input gains, phase scramblers, phase inversion controls, and phantom power. Gains access to the controls for the High Pass, Low Pass, and Notch Filters.

Expander — Gains access to the controls associated with the Downward Expander, noting that the ECI mode has some controls that the SSI mode does not have.

De-esser — Gains access to the controls for the de-esser stage. Like the Expander, the ECI mode has some controls that the SSI mode does not have.

Compressor — Displays the controls for the multiband voice processing section. Like the Parametric EQ and Expander the ECI mode has some controls that the SSI mode does not have.

Parametric EQ — Displays the controls for the four-band fully parametric equalizer. Note again that the ECI mode has some controls that the SSI mode does not have.

Output — This screen hosts the controls for engaging and using the final Peak Limiter as well as the Output level controls.

System — Gains access to settings for security, user level selection, I/O-Settings-follow-Presets mode, and output sample rate.

INPUT CALIBRATION & SWEEPABLE FILTER SET



M-2 Input Calibration & Sweepable Filter Set Screen

(Note that the M-2's two microphone preamplifiers and associated controls are accessed using the Channel 1 and Channel 2 tabs shown on the lower left side of the GUI.)

Microphone Preamp Gain

Each of the two M-2 microphone preamplifiers is equipped with a gain control capable of being adjusted to accommodate virtually any microphone and acoustical environment. The gain controls each have a gain range of 80dB, allowing the preamplifier gain to be adjusted from -10dB (10dB loss) to +70dB in 1dB steps.

Microphone Phase

The electrical phase of each microphone channel may be reversed simply by clicking on the Microphone Phase checkbox. When the selected M-2 input is in phase with the output the checkbox displays a plus sign (“+”). If the signal phase from input to output has been inverted the box will display a minus sign (“-”).

Phase Scrambler

Each channel of the M-2 is equipped with a fourth order all-pass network which is designed to rearrange the microphone signal's phase-verses-time alignment of its harmonics relative to its fundamentals. This results in positive and negative signal peaks being more equal.

Once the positive-to-negative energy distribution is corrected voice signals are easier to process by later processing, with the end result being an increase in voice loudness.

The waveform below is typical of many human voices. Notice how the amount of signal inside the peaks both above and below the center line is unequal? This means

that the voice is asymmetrical and can benefit from the use of phase scrambling (or de-correlation, as it's sometimes called).



Asymmetrical Voice Waveform

Below is the same voice after processing by the phase scrambler. Notice how the amount of energy inside the peaks above and below the center line is more equal? This is what the phase scrambler does... it just “rearranges” energy...



Symmetrical Voice Waveform

It is important to understand that neither the frequency content nor RMS energy of the voice waveform are altered by the phase scrambler, nor does it add any form of nonlinear distortion. It only rearranges the phase relationships of the signal's harmonics to its fundamental frequencies.

Phantom Power

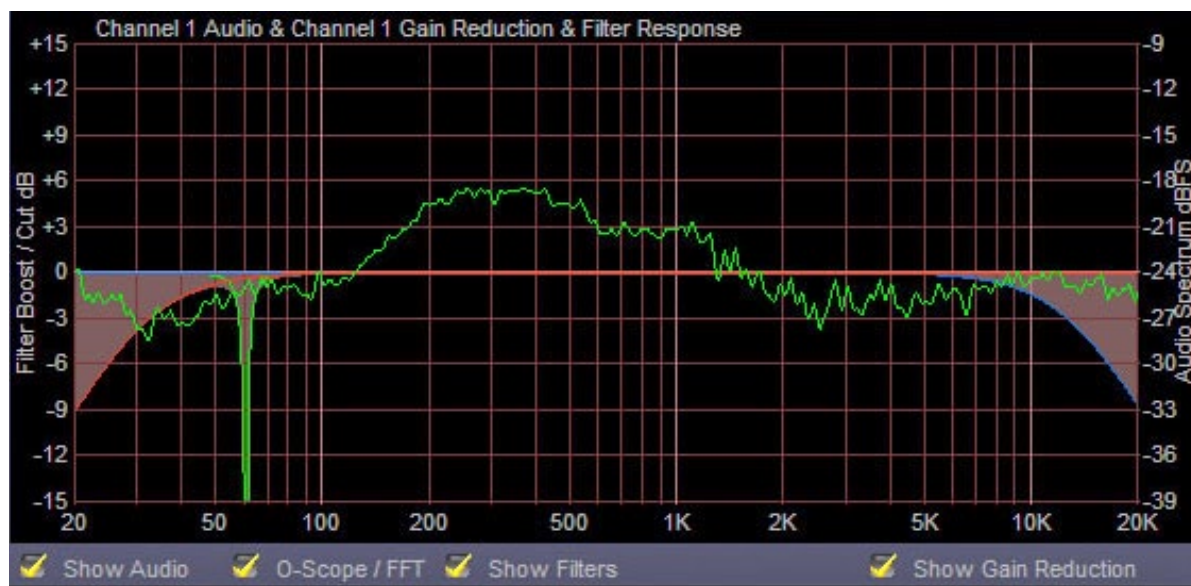
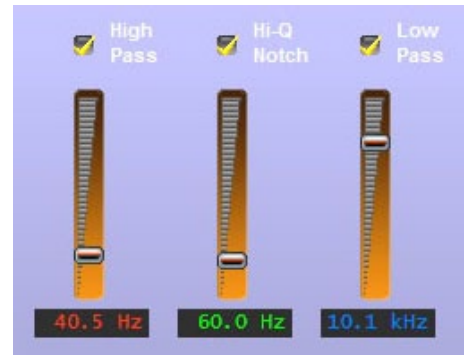
The M-2 may supply phantom power to microphones that require it. To enable phantom power, two steps may be required.

1. The M-2 is shipped from the factory with internal jumper J3 set to open. When this two pin header is open it prevents phantom power from being applied to the channel 1 or channel 2 microphone input connectors, even if the logic switch in the input screen of the GUI has been set to enable phantom power. This jumper provides a protection mechanism for those installations where only dynamic microphones are used, thereby preventing potential microphone damage if for some reason the phantom power enable checkboxes in the GUI are checked.
2. In the Channel 1 and Channel 2 views of the GUI's Input screen is a phantom power enable checkbox. When selected (and when the above mentioned jumper is also in place inside the M-2) phantom power will be provided to the microphone connected to the selected channel.

Filters

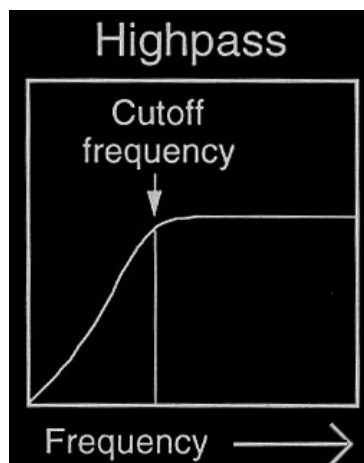
The M-2 is equipped with an effective set of specialized and “sweepable” audio filters that can be used to condition the audio signal prior to further processing. The controls available in the ECI and SSI GUI’s appear as follows.

When the controls have been set for a particular response the combined effect of the three controls appears as shaded curves in the lower graphical area. An example is shown below. Note that Show Filters must be checked to see the filter response.



Filter Set - Display of Overall Combined Response

The M-2’s filter set is useful for removing low level hums, hiss, and other objectionable noises as well as for creating certain special effects.

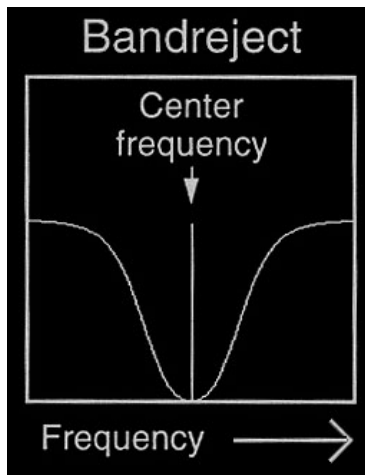


High Pass Filter

The High Pass Filter in the M-2 is used to remove undesired, wideband low frequency sounds such as rumble and other noises from the incoming audio.

Essentially, a high pass filter removes frequencies below a certain frequency setting without affecting frequencies above that setting.

The graphic at left demonstrates what happens to the audio energy that is below the setting of the Frequency (cutoff) control.

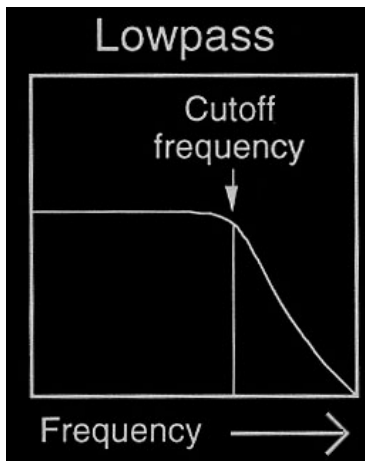


Notch Filter

The Notch Filter in the M-2 is used to remove a “narrow” band of frequencies without affecting audio above and below that frequency.

Essentially, a notch filter is used to remove a single undesired signal such as a hum, tone, or other fairly narrow signal.

Notch filters are also commonly called Band Reject filters because the name serves to describe exactly what the filter does - it rejects a band of frequencies.



Low Pass Filter

The Low Pass Filter in the M-2 is used to remove undesired, wideband high frequency sounds such as hiss from the incoming audio.

Essentially, a high pass filter removes frequencies above a certain frequency setting without affecting frequencies below that setting.

The graphic on the right demonstrates what happens to the audio energy that is above the setting of the Frequency (cutoff) control.

Sweepable Filter Set Example:

Suppose it is desired to make a full bandwidth audio signal sound like it was transmitted over a telephone. To do this one might set the High Pass Filter to a setting of about 300 Hz and then set the Low Pass Filter to about 3 kHz. These settings would remove frequencies below 300 Hz and above 3 kHz, which is a lot like what happens on a common telephone circuit!

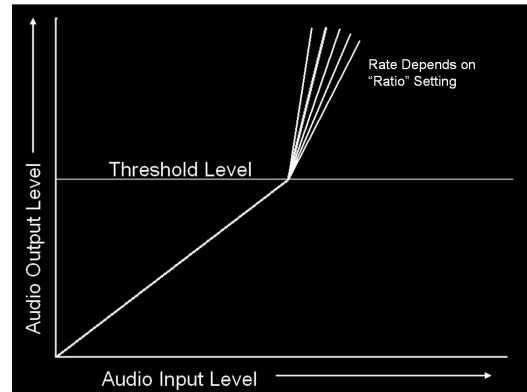
When the ECI or SSI GUI is being used all controls just explained are present in the Input Calibration screen.

DOWNWARD EXPANDER

Downward Expanders operate a lot like a compressor turned upside down. What this means is that unlike a compressor, whose purpose is usually to make softer sounds louder and louder sounds softer, an expander is used to make loud sounds louder and softer sounds softer. In fact an expander can even be adjusted so that when the audio signal falls below a certain threshold level, it is turned down to the point of being completely off if desired.

The graphic on the right shows how the audio output signal level increases faster than the input level is rising once audio level has achieved and exceeded the Expander threshold.

The Expander controls available to the user depend on the GUI mode. The two screens below demonstrate this difference.



ECI Mode Expander Screen



SSI Mode Expander Screen

Threshold

Thresh (or Threshold) adjusts the audio level at which expansion begins. Said another way, as the audio level into the expander is increasing, nothing happens to the rate of change of the audio level increasing at the output of the expander until the threshold is reached. Once that happens, the audio level at the output of the expander will begin to increase at a rate that is faster than the increase at the expander input.

Open

Once the Expander threshold is reached it begins to take action to increase the audio level towards the normal unity gain (expanders do not add gain!). How fast it does this once the threshold is achieved is controlled by the control labeled “Open.” Think of the Open control as telling the expander how fast to go from an audio reduced mode to an audio level normal mode.

Faster Open times make sure the expander reacts as soon as an audio signal above threshold is present. Set too fast and it might open the expander on clicks and pops. Set too slow and it might clip the first syllable from a spoken word.

Ratio

The expander’s Ratio control adjusts how aggressively it restores the level to normal. Lower ratios such as 1:1 don’t do anything. Higher ratios such as 1:6 would be considered aggressive and might make the operation of the expander audible (or too audible).

Note that the calibration of the ratio control, such as 1:2, is backwards from that used with compressors. That’s because, as we explained before, the operation of an expander is like a compressor turned upside down. So rather than a compressor allowing a 1dB increase of output level for every 4dB of input level increase (4:1) the expander does the opposite - it allows (for the same settings) a 4dB increase in output level for every 1dB increase in input level.

Note: The Ratio control is absent from the GUI when it is in its SSI mode!

Wait

Once the audio level falls back below the expander threshold the expander must take steps to reduce the audio level according to the Ratio setting as explained above.

However, inaudible operation of an expander usually requires that it wait briefly before starting to decrease the audio gain. This is so that the normal “trailing off” of speech, such as what happens between sentences or between thoughts, isn’t unnaturally chopped off. The wait control then tells the expander how long to hold the gain normal before starting to reduce it.

If the Wait is set too short the expander might chop off the ends of syllables. Set too long and it might leave the expander open and expose noises between pauses in speech that are undesired.

Note: The Wait control is absent from the GUI when it is in its SSI mode!

Depth

The Expander's Depth control sets how deeply the gain is reduced when the audio is below the expander's threshold. It can be set so that no audible difference is heard when the expander is above and below threshold all the way to where the audio is completely turned off when the expander is below threshold.

Depending on the application the control is usually set somewhere between -6dB and -16dB with 12dB being a very good tradeoff.

If the Depth control is set too aggressively the expander action may become highly irritating, especially if the speaker is talking in an environment with a high background noise level.

Close

Once the audio level falls and the expander's logic decides that it's time to reduce the gain, it needs to know how fast you'd like it to do that. The Close control sets that timing. Faster settings are of course more aggressive and may be audible while slower settings might leave too much background audio audible for too long.

All of the controls in the expander section are highly subjective as to personal taste, microphone type, the characteristics of the human speaker, and of course the acoustical environment.

DE-ESSER

One of the most important and useful tools in a voice processor is an algorithm to manage the “esses” in voice, especially when they are excessive. Essentially a de-esser operates like a dynamic equalizer that automatically restricts the output level within a chosen frequency range depending on the signal level.

The basic idea is to dynamically reduce the sometimes too-prominent and objectionable sibilant “hissy” noises in speech, particularly when poorly recorded or due to poor microphone technique. There are five operating controls involved in the operation of the de-esser when the GUI is in its ECI mode; three controls are present in the SSI mode.



ECI Mode De-Esser Screen



SSI Mode De-Esser Screen

The only difference between the ECI and SSI modes is the De-esser Frequency and Bandwidth controls which are present on the ECI mode screen and absent on the SSI. The SSI mode’s Frequency and Bandwidth values rely on settings recalled from our Factory presets - settings that were empirically determined through thousands of hours of collective tuning listening by audio experts.

Threshold

Threshold is the signal level within the de-esser's selected bandwidth (as set by the FREQ control) at which the de-esser constrains the output level within the de-esser's bandwidth. In other words, a signal within the de-esser's frequency band will not be allowed to exceed this threshold level. The threshold is adjustable over the range of -60dB to -10dB, and controls the amplitude where the de-esser begins to take effect.

Frequency

Adjusts the frequency where the de-esser is most sensitive. With few exceptions, most human speech sibilant artifacts fall between 4kHz and 6kHz, although we've allowed the control to be adjustable over the entire 20Hz to 20kHz audio bandwidth so that it may also be used for special effects.

The GUI Frequency control is reflected in the Dynamic Display screen as shown below at the default frequency of 5kHz:



De-Esser Frequency Display

Attack

Attack, or “attack time,” is the control that determines how fast the de-esser reduces the gain during the chasing of a sibilant sound in voice. Faster attack times, at least in many applications, are usually less audible than slower ones, which may under certain circumstances “punch holes” in the audio - an obvious reduction in output level for a time longer than was necessary to actually process the event that was being controlled.

Bandwidth

The Bandwidth control adjusts how much of the high frequency spectrum either side of the “Frequency” setting is affected when the de-esser is in operation. Smaller octave settings have less effect on adjoining spectrum and larger octave settings affect more. The final bandwidth setting is subjective - smaller octave settings are less audible than larger ones. The final setting must be arrived at through a short period of experimentation.

Release

Release, or “release time,” is the control that determines how fast the de-esser returns the gain to normal after chasing a sibilant sound in voice. Faster release times are usually less audible than slower ones, and the final setting is subjective and must be arrived at through a short period of experimentation.

Enable



When the Enable checkbox in the upper right corner of the De-Esser screen has a yellow checkmark, the de-esser is in the signal path. Use this checkbox to toggle the de-esser in and out of the signal flow.

COMPRESSOR

The compressor section in the M-2 is a descendant of the multiband compressors designed for the high-end Wheatstone processors, and is able to operate in a wideband, two, or three band architecture. The graphics below show the compressor screens available when the M-2 is in either its ECI or SSI modes.



ECI Mode Multiband Compressor Screen



SSI Mode Multiband Compressor Screen

The compressors are “envelope dynamics modifiers” that compress the dynamic range of voice signals, making soft sounds louder and loud sounds softer. With proper adjustment a compressor can create a consistent output level from a talent’s voice and can do it subtly - or - it can do it with a lot of “energy” if that is the sound desired. Basically the compressors allow the overall volume or spectral balance (or both) of the sound to be tailored exactly to taste when the input level varies as the talent speaks.

The M-2 compressors are special feed forward architectures utilizing Vorsis-designed program-related dynamics control algorithms. There are only five main operating controls for each band (one control each in the SSI mode), plus an Enable switch and the Drive and Crossover (X-Over) Frequency controls, making compressor operation easy and intuitive.

The MULTIBAND COMPRESSOR screen of the GUI contains the following controls:

Drive

The Drive control adjusts how aggressively the compressors will work on the audio fed to the multiband compressor section. Higher Drive settings increase the amount of processing while lower settings reduce it.

Low X-Over and High X-Over

These are the controls that set what frequencies will be processed by each of the M-2's three bands.

The way the crossover adjustments work is this:

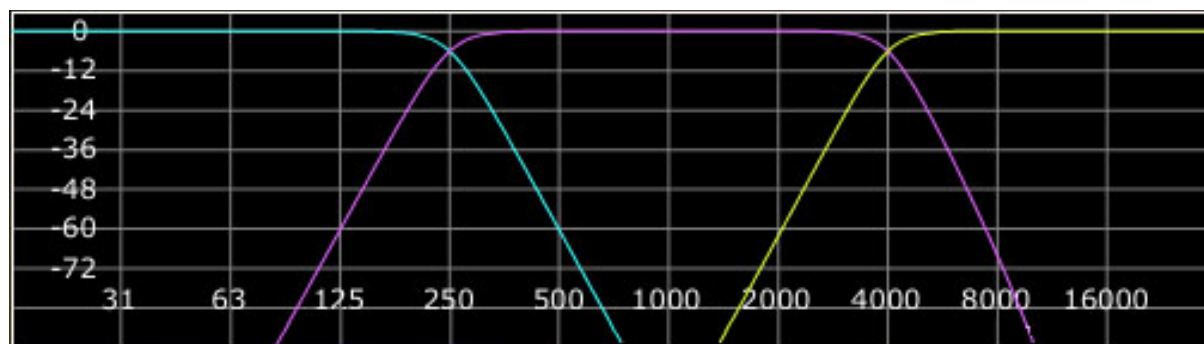


Frequencies below the Low X-Over setting are processed by the “low” band, frequencies above the High X-Over are processed by the high band, and frequencies not processed by either the Low or High bands are processed by the Mid band.

We’ve made the X-Over adjustments adjustable over a very wide range - so much so that the Low Band can be set as low as 20Hz and the high band as high as 20kHz.

Below is an example of using three-band compression to make the low vocal frequencies below 250Hz be separated from the midrange energy while also allowing vocal frequencies above 4kHz to have their energy raised. This setting would create a warm sounding low end and an airy high end, especially for male vocals. Female vocals on the

other hand would benefit most by moving the Low crossover up to about 400Hz and lowering the High crossover down to about 2kHz.



**Three Band Compression
250Hz and 4kHz Crossover Frequencies**

Here are some examples of how this flexibility might be used to create a Wide-band, Two-Band, and Three-Band Compressor section.

Wideband

Suppose the Low Crossover and the High Crossover has been set to 20Hz and 20kHz respectively. Adjusted this way the M-2's compressor becomes a wideband compressor because all of the audio energy higher than 20Hz and lower than 20kHz

(all meaningful audio energy within the “human audible” spectrum) is contained within and processed by the M-2’s Mid band compressor!

Two-Band

Suppose now the Low Crossover is set to 200Hz and the High crossover remains set at 20kHz. Now the M-2’s compressor is a two band compressor with a crossover at 200Hz! The Low band now handles audio energy up to 200Hz and the Mid band is handling the remainder of the energy between 200Hz to 20kHz.

Three-Band

Now let’s set the Low Crossover to 200Hz and the High Crossover to 1.5kHz. With these adjustments the M-2’s compressor is now a full three bands with crossovers at 200Hz and 1.5kHz! The Low band is handling energy up to 200Hz, the Mid band from 200Hz to 1.5kHz and the High band from 1.5kHz upward. No other microphone processor has such flexibility!

Why is so much flexibility needed in a microphone processor? Simply because sometimes a little more processing power in the form of automatic equalization is required. Or, perhaps a special effect is required that simply cannot be achieved with broadband compression. Static equalization can’t fulfill this need either, but multiband compression can!

Threshold

This is the compressor’s Threshold control which determines at what level the compressors begin to affect the output signal. Said another way, until the input level has increased enough to reach the compressor’s threshold setting the output remains unchanged. Once the threshold is reached the output level is reduced as the input continues to rise; how much this occurs is a function of the Ratio (discussed later).

Attack

This control determines how quickly the compressor responds to a signal once it has exceeded the Threshold. The control is adjustable between 0.2 milliseconds and 1 second and is typically adjusted to personal preference. Faster attack times catch signal peaks more quickly but may make the sound “mushy” by removing transient detail.

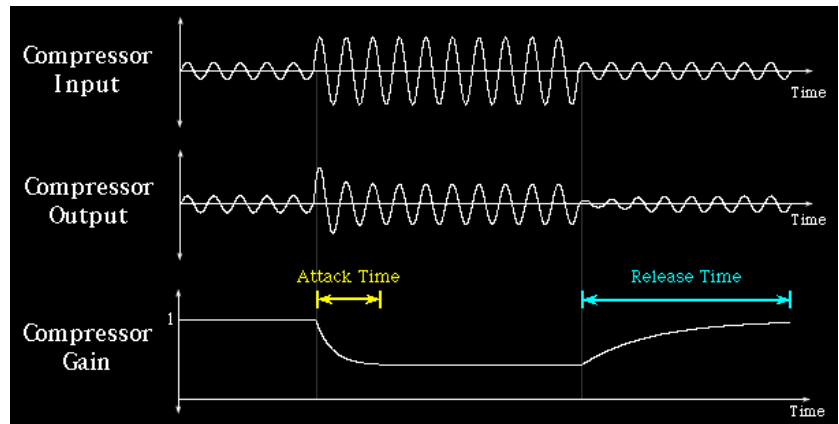
Operation at faster attack times, such as below approximately 10 milliseconds, causes the compressor to operate more like a peak limiter than an average responding compressor. Conversely, slower attack times allow more peaks to escape uncontrolled, which makes the sound more relaxed. The caveat is that slower attack times can allow peaks to escape that have the potential to cause headroom problems further downstream.

Release

The Release time determines how fast the compressor returns the gain back to normal after pushing it down while chasing an audio peak. Refer to the image on the right to see how the gain behaves during the release time phase.

Faster release times increase the average audio energy but can make the resulting sound “busy” if too fast. Slower release times make the sound more natural and relaxed, but

lower the average sound level. Release times in the M-2’s compressors are adjustable between 33.0 milliseconds and 1 second.



Compressor Release Time Operating Hint

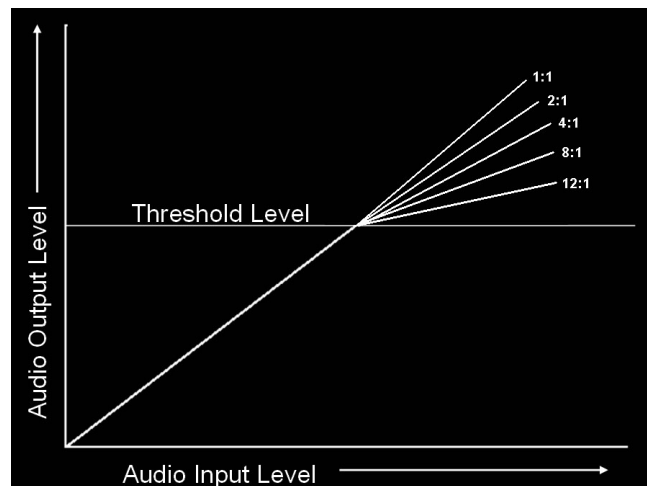
While the compressor’s Attack time and Ratio are typically adjusted to provide moderate peak level protection for equipment following the M-2, the setting of the Release time control is largely an artistic decision. Please allow us to offer three of the most common caveats of operating a compressor with extremely fast release times.

- Very fast release times can increase the amount of intermodulation distortion, or IM. This is because when the compressor release time is set fast enough to “follow” every cycle of a low frequency signal, the lower amplitude, higher frequency signals “go along for the ride.” This results in modulation of the high frequencies by the low frequencies, or what’s known as “intermodulation.”*
- Very fast releases times can exaggerate reverb, whether artificially created by electronic or electromechanical means, or due to the natural early sound reflections from the hard surfaces of the room where the microphone and voice talent are located.
- Very fast release times can accentuate the speaker’s breath sounds or other unwanted background sounds that would (should!) otherwise be inaudible.

** The sound of intermodulation distortion ranges from a subtle “thickening” of the sound, to downright muddy or even “gurgling” at the extreme.*

Ratio

The compression Ratio setting controls the steepness of gain reduction once the audio level has increased enough to reach the Threshold. A ratio of 1 (or 1:1) results in



no compression at all, and at the other extreme a ratio of 20 (or 20:1) makes it operate more like a limiter. The accompanying graphic illustrates this.

In the latter case, once the threshold is achieved the output level of the compressor will only increase 1dB when the input level increases 20dB. The ratio control, while adjusted to taste, will typically be set somewhere between 2:1 and 6:1 for most voices. Special effects may be achieved using radically different settings.

Low, Mids, and Highs Trim

After the microphone audio has been processed by the multiband compressor it is necessary to mix the bands back together again in the proper proportions - this is what the Trim controls do.

At the output of each compressor band is an adjustable level control that allows the user to tailor how the bands are mixed back together after compression has been applied. When the Trim controls are set to the same settings the mix from all three bands is equal. This will allow a flat overall frequency response if the Threshold controls for all three bands are also set at the same settings. The Trim controls can also apply EQ effects.

Output

After the three band outputs have been mixed back together using the Trim controls the Output control sets the overall output level of the compressor section.

Swap

At the top of the Compressor and Parametric EQ control screens is a button labeled "SWAP." See the discussion of this button in the PARAMETRIC EQUALIZER section of the manual (page 2-25).

Enable



When the Enable checkbox in the upper right corner of the MULTIBAND COMPRESSOR section has a yellow checkmark, the compressor is in the audio path. When this checkbox is not checked, the compressor is not in the signal path. The Enable checkbox toggles this function.

PARAMETRIC EQUALIZER

The adjustment screens for the parametric equalizer as seen in the ECI and SSI control modes are shown below.

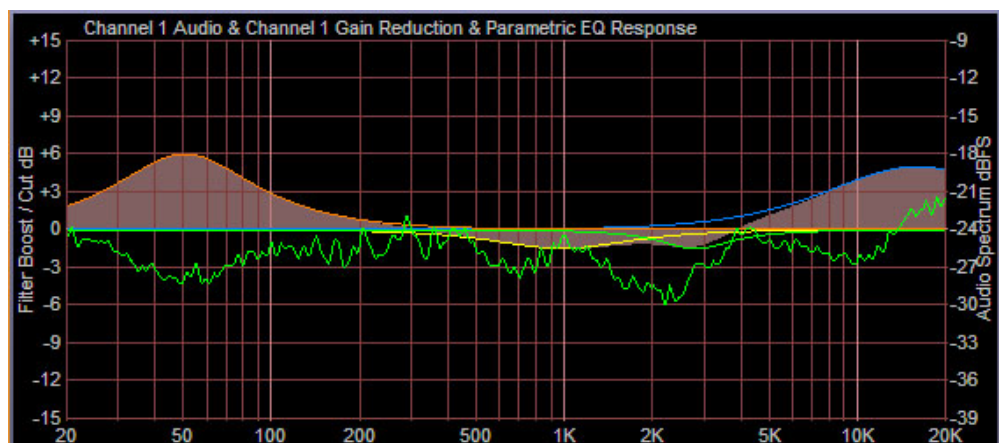


ECI Mode Parametric EQ Screen



SSI Mode Parametric EQ Screen

The graphic on the right shows how equalizer settings are depicted in the Dynamic Display region of the GUI. The shaded areas show the response of each equalizer section as well as the overall combined response when more than one equalizer section overlaps.



Swap

At the top of the Compressor and Parametric EQ control screens is a button labeled “SWAP.”



This button’s purpose is to allow the user to interchange the Compressor and Equalizer sections. In one mode the compressor is prior to the equalizer and in the other the compressor is after it. Which position of the Swap mode is used depends on the sound that the user is trying to achieve.

Placing equalization prior to compression “preloads” the compressor with whatever equalization curve has been set by the equalizer’s controls. For instance, if boost were applied in the equalizer at a certain range of frequencies then the compressor will work harder on that band of frequencies.

Likewise, if the equalization is placed after the compressor then whatever curve the equalizer is set for will be added to whatever frequency response slope is being created in the compressor by the settings of its Threshold, Ratio and Trim controls.

Each setting of the SWAP control creates a different sound and the user is encouraged to experiment with its setting to see what effect it can create based on the equalizer and compressor settings being used.

Enable EQ



When this checkbox has a yellow checkmark the equalizer section is switched in. When it is not checked the equalizer section is not in the signal path. The checkbox has a toggle action behavior - checking it changes the state of the EQ IN function.

FINAL LIMITER / OUTPUT LEVELS

The output screen contains the controls for the final limiter stage and the final output level control. It also contains the final limiter's "Limiter Enable" checkbox that controls whether or not any limiting work is being accomplished by the final limiter. It is not necessary to utilize the final limiter unless specific limitations are to be placed on the maximum peak amplitude at the M-2's outputs.



Final Limiter/Output Levels Screen

The descriptions for the final limiter's controls are as follows, remembering that each channel of the M-2 has its own final limiter settings! Access to each signal chain is by using the Channel 1 and Channel 2 tabs.

Threshold

This control determines at what level the limiter begins to affect the peak output signal. Said another way, until the input level has increased enough to reach the limiter's threshold the output is unchanged. Once the threshold is reached the output level is constrained to the setting of the Threshold control - no further output level increase is permitted.

Attack

This control determines how quickly the limiter responds to an audio peak once it has exceeded the **Threshold**. The control is adjustable between 0.2 milliseconds and 100 milliseconds and is adjusted to personal preference. Faster attack times catch signal peaks more quickly but may make the sound "mushy" and lacking transient detail.

Operation at attack times below approximately 10 milliseconds is usually desired when there is a need to tightly constrain the peak output level. Conversely, slower attack times allow more peaks to escape uncontrolled, making the sound more relaxed. The caveat is that slower attack times can allow peaks to escape that have the potential to cause problems further downstream.

Release

Release determines how fast the limiter returns the gain back to normal after pushing it down after chasing an audio peak. Faster release times increase the average audio energy but might sound “busy” if too fast. Slower release times make the sound more natural and relaxed, but lower the average sound level.

Output Level

This control adjusts the maximum output level of the selected M-2 processing channel. A separate level control is available for each processing channel by using the Channel 1 and Channel 2 tabs.



SYSTEM

The M-2's System screen contains a check box labeled "Input and Output Level Calibrations Are Recalled With Preset Takes" - this is an important concept to understand!



System Screen

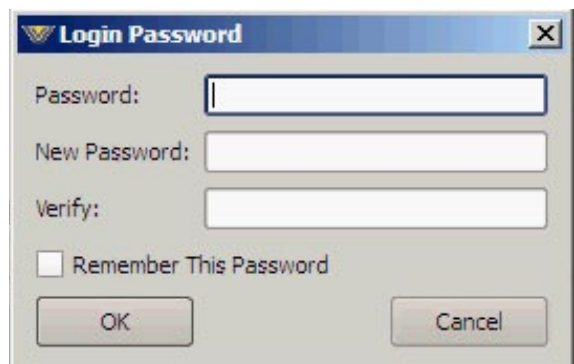
M-2 presets ALWAYS store ALL of the settings being used, even the input and output level calibrations present at the time the preset was saved. By un-checking this box input and output settings stored within a preset will be ignored when presets are recalled.

On the other hand, if this box is checked, then presets will recall all of the settings and therefore will (likely) change the input and output level calibrations to whatever was present when the preset being recalled was last saved.

NOTE: It is unlikely that our Factory presets will have the perfect input and output settings for your application. Therefore if you like a particular factory preset and wish to use it often then you should resave it under a new name after the input and output level settings have been finalized for your application. This will ensure that even if the checkbox is inadvertently selected the input and output levels won't surprise you when your preset is recalled.

Passwords

Functional only when the GUI is online with the M-2, this button is used to access the Passwords security menu for the setting of passwords to restrict the level of user access to certain functions and controls of the M-2. Clicking "Passwords" brings up the Login Password dialog box. To change the password you must enter the old password, then enter the new password, and then enter the new password a second time to verify. If you don't want the M-2 to be password protected, leave both the New Password and Verify Password boxes blank. Check the "Remember This Password" box only if are sure no unauthorized person will use your computer.



Sample Rate

The M-2's AES3 digital outputs can be configured to operate at either 44.1kHz or 48kHz sample rates and the controls used for configuring the M-2's digital outputs are found in the System screen. These controls adjust the sample rates for both the Channel 1 and Channel 2 - the rates cannot be set independently.

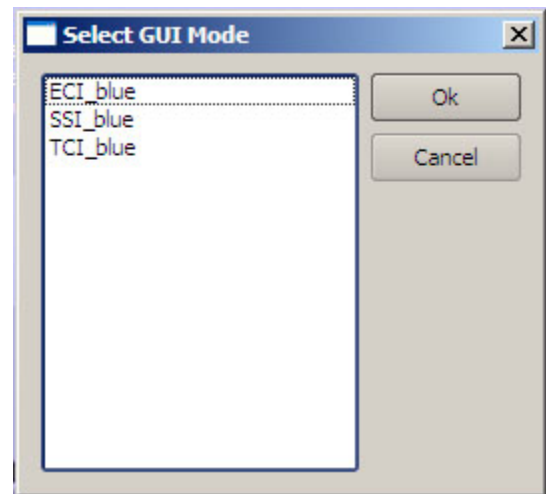


GUI Mode

As we have mentioned previously there are three “user levels” available for the M-2 that the end user can choose from:

- ECI, or Expert Control Interface;
- SSI, or Standard Simplified Interface;
- TCI, or Talent Control Interface.

The ECI provides all controls - nothing is hidden. The SSI interface provides basic controls more easily understood by less advanced users. The TCI provides an interface for air talent so they can change presets but not make any processing adjustments.



Please see Application Note AN2009-02 (on the Wheatstone Processing web site under “Resources” tab) for how the security properties of the M-1 and M-2 product's TCI Interface can be tightly restricted in order to prevent certain kinds of changes by curious air talent.

Side Bar Region

To the right of the control area is a vertical row of four buttons. We will begin by discussing presets and their management, which involves three of the buttons. We'll defer a deeper discussion of the "Devices" button to the very end of this manual section, after presets have been thoroughly covered.

Managing Presets

Let's begin with a simple definition:

A preset is a snapshot of all the settings of the M-2. It is desirable in many situations to have a library, or collection, of presets so that we can accommodate different audio processing needs at different times. As your library of presets grows, preset management (i.e., having presets arranged so that you can find the one you need as quickly as possible) is a major concern.

Several tools are implemented within the M-2 GUI to make your preset managing life easier. We will navigate the discussion of the sidebar buttons, dialog boxes, and preset management philosophy in a way that will, hopefully, help you to get the most out of your M-2 presets.

The M-2 comes with a variety of Factory Presets which are very good starting points for a wide variety of applications. They are quite useful for demonstrating the extreme flexibility of the M-2 Digital Multiband Dual Voice Processor's features. There is one thing can't be said often enough: *If you dial up some settings that you like, SAVE the settings as a preset before you ever load in another preset or twiddle more dials!!*

A Note About Recalling Presets for Each M-2 Channel

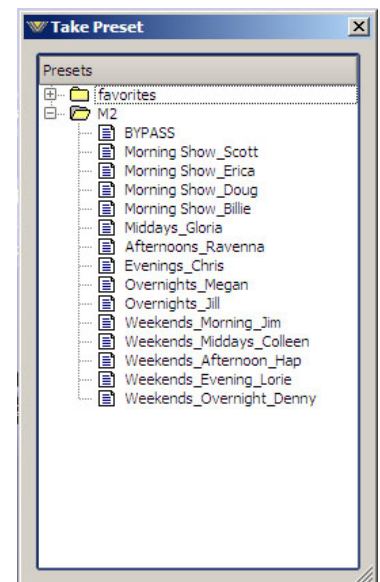
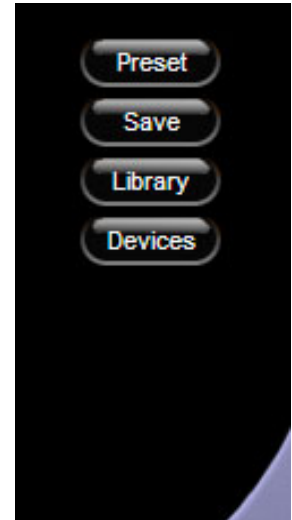
The M-2 can store up to 80 presets in its onboard flash memory. The storing of presets is not limited to doing so on a per-channel basis. In other words, presets are "channel agnostic" and can be recalled to either channel of the M-2 simply by selecting a preset while the GUI view properties are set to either Channel 1 or Channel 2. To select the same preset for both channels, simply select the same preset twice - once while in Channel 1 view mode and then once again while in the Channel 2 view mode.

Preset Button

The most basic operation you can do with a preset is to load it so that the M-2 will operate according to the settings of that preset. Left-click the "Preset" button to start and the "Take Preset" box appears showing the folders that the GUI knows to contain presets. Opening and browsing a folder displays the presets and/or sub-folders, sorted by name.

Double-clicking on a preset brings it immediately into use on the M-2.

For your convenience the "Take Preset" box stays open until it is deliberately closed, allowing different presets to be selected in quick succession. This is a very direct and convenient means of quickly comparing the sound of various presets. To close the form, click the "X" in the upper right corner of the form.



IMPORTANT! Always remember to save your present settings as a preset name before invoking other presets from the list or your settings will be lost...forever!

There is another level of preset management that we will discuss in more detail later, and that is the preset package. A preset package is simply a collection of presets (or even one preset!). When the GUI is used to create, or build, a package, what happens is that the data from a number of individual preset files are combined into a single compressed file having an extension of .pkg. This allows you to transfer a group of presets from one M-2 to another as a single file, rather than as a set of files.

Library Button

The brunt of the preset management tasks are performed from the Preset Library form that comes up when you press the “Library” button in the Side Bar. The form shows preset folders in the upper pane and individual preset files in the lower pane.

A menu has various items depending on what you have highlighted in the upper or lower pane. From this dialog box you can take, save, rename, move, or delete presets, and you can also export and import preset packages. When you are done with this form, click the “X” in the upper right corner to close it. You will need to close this form before you can adjust any GUI controls.

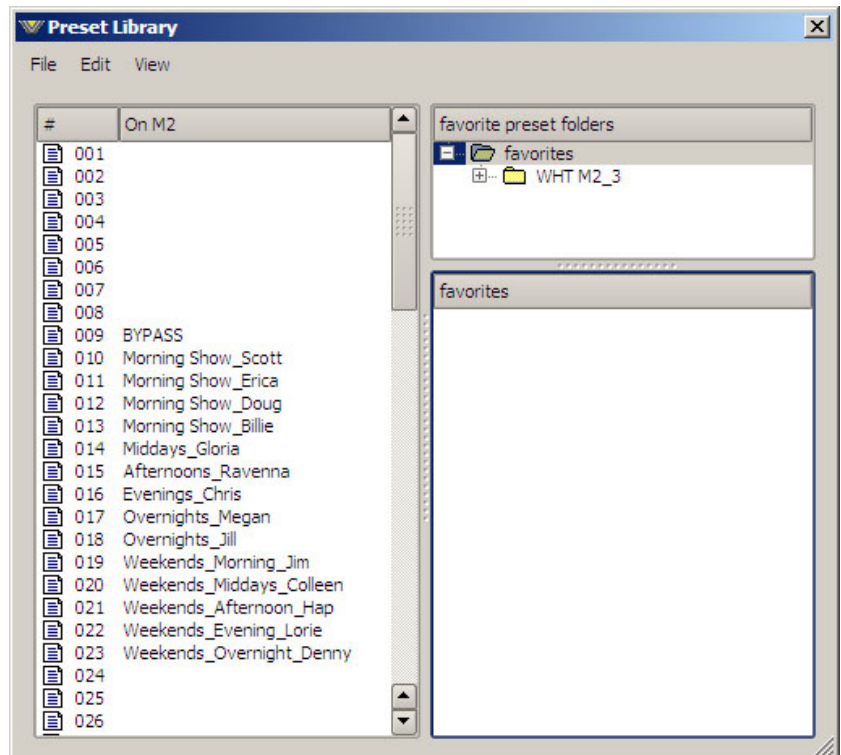
It is important to remember that the dialog window is split logically down the middle - the left side shows what is on the actual M-2 hardware while the right side shows what is available on the *local PC* hosting the GUI.

The following menus and sub-menus appear when the dialog box is used as described.

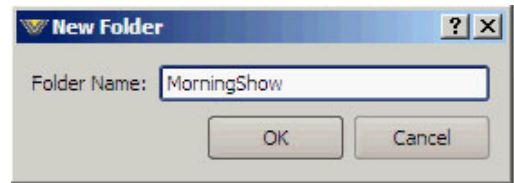
File Menu

The File menu contents depend on whether you have a folder or preset highlighted. The following choices are possible if a folder is highlighted:

Save - This selection brings up the “Save as Preset in Favorites” dialog box, allowing you to save a new preset within the folder you have highlighted. Enter the name for the new preset, then click the **OK** button. Click **Cancel** if you change your mind before you’re done.



New Folder... - This selection brings up the “New Folder” dialog box, allowing you to create a new sub-folder within the folder you have highlighted. Enter the name for the new folder and then click the **OK** button. Click **Cancel** if you change your mind before you’re done.



Install Preset Package... - This selection brings up the “Install Preset Package” dialog, which is a standard Windows Open dialog box. The dialog looks for files of type “Preset Packages (*.pkg)” and starts its search within the M-2 install directory. A package thus imported appears in the Presets dialog box as a new package folder under favorites, having the same name as the .pkg file but without the extension.

The package folder appears as a folder but has a light red coloring within the icon to distinguish it from a standard folder icon. It is possible, but not necessarily recommended, to install the same package twice (or a second package with the same name as the first). The second import will have the same name as the first with the addition of the text “(2).”

Build Preset Package... - This selection brings up the “Build Preset Package” dialog, a standard Windows Save dialog box, allowing you to save all of the presets in the highlighted folder, as well as any sub-folders and their enclosed presets, as a file of type “Preset Packages (*.pkg).” The default file name, which you can change, is the name of the highlighted folder with the extension .pkg added to it, and the default location to save the file to, which you can also change, is the M-2’s install directory.

The following choices are possible if a preset is highlighted:

Save - Brings up the previously discussed “Save as Preset in Favorites” dialog box.

Take - This selection takes the preset, just like double-clicking a file name in the “Take Preset” window.

Edit Menu

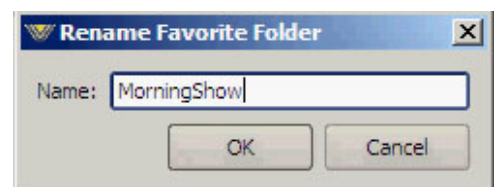
The Edit menu contents also depend on whether you have a folder or preset highlighted. The following choices are possible if a folder is highlighted:

Paste - This selection pastes the clipboard contents (one or more presets) into the highlighted folder.

Remember! There is no overwrite warning! If the target folder already contains a preset of the same name as one being copied, the one from the clipboard will overwrite the one currently in the target folder.

Delete - This selection deletes the highlighted folder after first asking if you are sure this is what you want to do. This menu item is grayed out if you have the top level **Favorites** folder highlighted; you can’t delete this folder.

Rename... - This selection brings up the “Rename Favorite Folder” dialog box, allowing you to rename the folder. Enter the new name for the folder, then click the **OK** button. Click **Cancel** if you change your mind before you’re done. This menu item is grayed out if the highlighted folder is really a preset package. It is also grayed out if you have the top level **Favorites** folder highlighted; you can’t rename this folder.



The following choices are possible if a preset is highlighted (please note that use of the **Shift** or **Ctrl** keys allows you to select multiple preset files for the following operations):

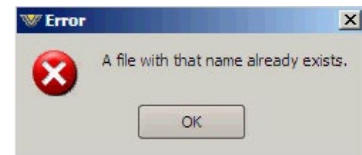
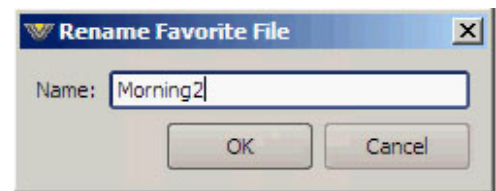
Copy - This selection copies the highlighted preset(s) to the clipboard.

Paste - This selection pastes the preset(s) in the clipboard to the same folder as the highlighted preset file is in.

Remember! There is no overwrite warning! If the target folder already contains a preset of the same name as one being copied, the one from the clipboard will overwrite the one currently in the target folder.

Delete - This selection deletes the highlighted preset(s) after first asking if you are sure this is what you want to do. There is no Undo function for preset deletes.

Rename... - This selection brings up the “Rename Favorite File” dialog box, allowing you to rename the preset file. Enter the new name for the folder, then click the OK button. Click Cancel if you change your mind before you’re done. If you have multiple preset files selected, the “Rename Favorite File” dialog box appears multiple times in sequence, allowing you to rename each file you have selected. If you try to rename a file to the same name as an already existing file you get an error message as shown.



Sort Up - Moves the highlighted preset(s) up in the list.

Sort Down - Moves the highlighted preset(s) down in the list.

View Menu

The View menu is only available when you have a preset file highlighted. The following choices are possible:

Settings... - This selection brings up the “Preset View” form (shown on the next page), which displays a list of all the settings and their values for that particular preset in two re-sizable columns:

Setting presents the name of the control, such as “Input Mic Gain,” while Value indicates the value that control is set to in the preset, such as “-4.0 dB.” Click the “X” in the upper right corner of the form to close it.

If you have multiple preset files selected the “Preset View” form appears multiple times in succession, allowing you to view the settings of each preset in turn. Upon clicking the “X” to close the form for one preset the form reappears for the next preset, and so on until all presets have been viewed.

Diff... - This selection brings up the “Preset Difference” form (shown on the next page), which displays three re-sizable columns:

Preset View	
Setting	Value
Name	Morning Show_Scott
Num IDs	64
CRC	23E490E1
Input Gain	-10.0 dB
Input Phase	+
Input Symmetry	Out
Filter HPF In	In
Filter Notch In	In
Filter LPF In	In
Filter HPF Freq	40.5 Hz
Filter Notch Freq	60.0 Hz
Filter LPF Freq	10.1 kHz
Expander In	In
Expander Thresh	-46.5 FS
Expander Ratio	1 : 2.0
Expander Depth	+12.0 dB
Expander Open	5.0 mS
Expander Hang	82.0 mS
Expander Close	300.0 mS
De-Esser In	In
De-Esser Thresh	-49.0 FS
De-Esser Attack	5.0 mS
De-Esser Release	64.0 mS
De-Esser Freq	5.34 kHz
De-Esser BW	1.35 oct
EQ Pre DYN	DYN>EQ
PEQ Mstr In	In
PEQ 1 In	In
PEQ 2 In	In
PEQ 3 In	In
PEQ 4 In	In
PEQ 1 Freq	50.0 Hz
PEQ 2 Freq	972 Hz
PEQ 3 Freq	2.80 kHz
PEQ 4 Freq	16.0 kHz
PEQ 1 BW	1.00 oct
PEQ 2 BW	1.25 oct
PEQ 3 BW	0.66 oct
PEQ 4 BW	1.45 oct
PEQ 1 Lift	+ 6.0 dB
PEQ 2 Lift	- 1.5 dB
PEQ 3 Lift	- 1.5 dB
PEQ 4 Lift	+ 5.0 dB
Comp In	In
Comp XFR1	250 Hz
Comp XFR2	1.50 kHz
Comp 1 Thresh	-48.5 FS
Comp 1 Ratio	4.00 : 1
Comp 1 Attack	7.8 mS
Comp 1 Release	340.0 mS
Comp 1 Trim	+ 2.0 dB
Comp 2 Thresh	-53.0 FS
Comp 2 Ratio	4.00 : 1
Comp 2 Attack	6.6 mS
Comp 2 Release	240.0 mS
Comp 2 Trim	- 0.5 dB
Comp 3 Thresh	-55.5 FS
Comp 3 Ratio	4.00 : 1
Comp 3 Attack	4.2 mS
Comp 3 Release	290.0 mS
Comp 3 Trim	+ 1.5 dB
Comp Drive	61 %
Comp Makeup	+24.0 dB
Limiter In	In
Limiter Thresh	- 2.5 dB
Limiter Attack	1.2 mS
Limiter Release	80.0 mS
Output Gain	+ 4.0 dB

Preset Difference		
Setting	Current	On M2
Name		Middays_Gloria
Num Parameters	64	64
CRC	9912765A	23E490E1
Input Gain	-10.0 dB	-10.0 dB
Input Phase	+	+
Input Symmetry	Out	Out
Filter HPF In	In	In
Filter Notch In	In	In
Filter LPF In	In	In
Filter HPF Freq	40.5 Hz	40.5 Hz
Filter Notch Freq	60.0 Hz	60.0 Hz
Filter LPF Freq	10.1 kHz	10.1 kHz
Expander In	In	In
Expander Thresh	-45.0 FS	-46.5 FS
Expander Ratio	1 : 2.0	1 : 2.0
Expander Depth	+12.0 dB	+12.0 dB
Expander Open	5.0 mS	5.0 mS
Expander Hang	82.0 mS	82.0 mS
Expander Close	300.0 mS	300.0 mS
De-Esser In	In	In
De-Esser Thresh	-60.0 FS	-49.0 FS
De-Esser Attack	5.0 mS	5.0 mS
De-Esser Release	64.0 mS	64.0 mS
De-Esser Freq	3.89 kHz	5.34 kHz
De-Esser BW	1.00 oct	1.35 oct
EQ Pre DYN	DYN>EQ	DYN>EQ
PEQ Mstr In	In	In
PEQ 1 In	In	In
PEQ 2 In	In	In
PEQ 3 In	In	In
PEQ 4 In	In	In
PEQ 1 Freq	50.0 Hz	50.0 Hz
PEQ 2 Freq	972 Hz	972 Hz
PEQ 3 Freq	5.19 kHz	2.80 kHz
PEQ 4 Freq	5.99 kHz	16.0 kHz
PEQ 1 BW	1.00 oct	1.00 oct
PEQ 2 BW	0.90 oct	1.25 oct
PEQ 3 BW	0.66 oct	0.66 oct
PEQ 4 BW	1.45 oct	1.45 oct
PEQ 1 Lift	+ 6.0 dB	+ 6.0 dB
PEQ 2 Lift	- 1.5 dB	- 1.5 dB
PEQ 3 Lift	- 1.5 dB	- 1.5 dB
PEQ 4 Lift	+ 5.0 dB	+ 5.0 dB
Comp In	In	In
Comp XFR1	250 Hz	250 Hz
Comp XFR2	1.50 kHz	1.50 kHz
Comp 1 Thresh	-48.5 FS	-48.5 FS
Comp 1 Ratio	4.00 : 1	4.00 : 1
Comp 1 Attack	7.8 mS	7.8 mS
Comp 1 Release	340.0 mS	340.0 mS
Comp 1 Trim	+ 2.0 dB	+ 2.0 dB
Comp 2 Thresh	-53.0 FS	-53.0 FS
Comp 2 Ratio	4.00 : 1	4.00 : 1
Comp 2 Attack	6.6 mS	6.6 mS
Comp 2 Release	220.0 mS	240.0 mS
Comp 2 Trim	- 0.5 dB	- 0.5 dB
Comp 3 Thresh	-55.5 FS	-55.5 FS
Comp 3 Ratio	4.00 : 1	4.00 : 1
Comp 3 Attack	4.2 mS	4.2 mS
Comp 3 Release	290.0 mS	290.0 mS
Comp 3 Trim	+ 1.5 dB	+ 1.5 dB
Comp Drive	61 %	61 %
Comp Makeup	+24.0 dB	+24.0 dB
Limiter In	In	In
Limiter Thresh	- 2.5 dB	- 2.5 dB

Print...

Setting... - The names of all the controls available in the M-2's dual processing chains.

Ch (for Channel)... - Indicates which processing channel a particular control has a value set for.

Current... - Displays the current setting of the named control.

Favorite... - Presents the value that the control was set in the M-2 hardware before the control was changed to the new setting reflected in Current (above).

A **“Print”** button at the bottom of the form allows you to produce a printout of the differences as displayed.

Comp 2 Attack	6.6 mS	6.6 mS
Comp 2 Release	220.0 mS	240.0 mS
Comp 2 Trim	- 0.5 dB	- 0.5 dB
Comp 3 Thresh	-55.5 FS	-55.5 FS
Comp 3 Ratio	4.00 : 1	4.00 : 1
Comp 3 Attack	4.2 mS	4.2 mS
Comp 3 Release	290.0 mS	290.0 mS
Comp 3 Trim	+ 1.5 dB	+ 1.5 dB
Comp Drive	61 %	61 %
Comp Makeup	+24.0 dB	+24.0 dB
Limiter In	In	In
Limiter Thresh	- 2.5 dB	- 2.5 dB

On a color printer any line that has a difference between what is stored in the preset that was last loaded and the current control settings will show up in red.

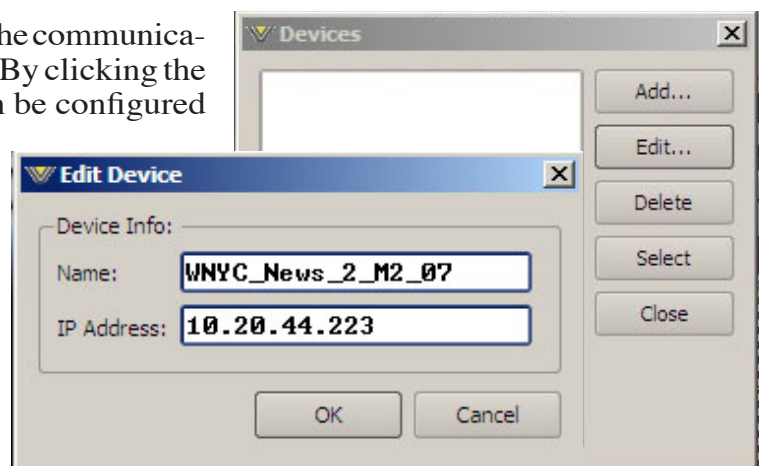
There is an **“X”** in the upper right corner of the form which can be used to close the dialog. If you have multiple preset files selected the **“Preset Difference”** form appears multiple times in succession, allowing you to view the difference information for each preset in turn. Upon clicking the **“X”** to close the form for one preset, the form reappears for the next preset, and so on until differences have been viewed for all presets.

Print.. - This selection brings up a standard Windows *Print* dialog box, allowing you to print the settings for the selected preset to any Windows-defined printer.

Devices Button

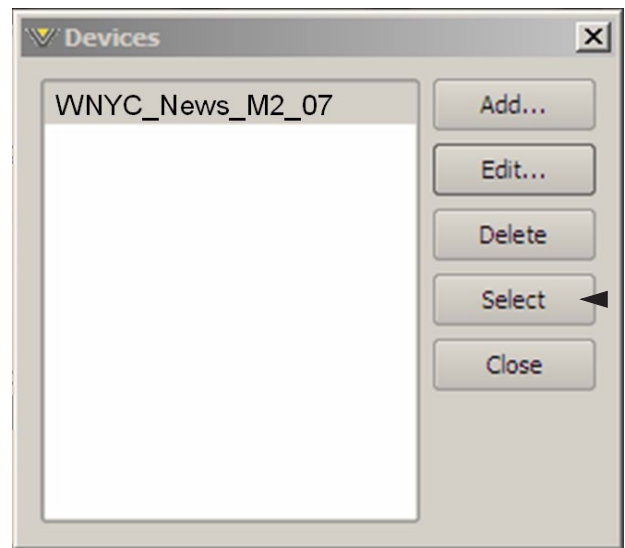
The devices button allows access to the communication configuration settings for the M-2. By clicking the **“Add...”** button, new M-2 devices can be configured for communication with the GUI. The following **“Edit Device”** dialog will appear:

Under **“Device Info”** you can enter the pet name of the M-2 processor that you are configuring. Then, in the IP Address box, enter the IP address that the M-2 should be using on your particular network. After this is done you may click **“OK”** on the Edit Device box.



Then, in the Devices Dialog box highlight (single left click) the M-2 device that you just added (shown highlighted in the image on the left) and click on “Select.”

This step tells the GUI specifically which M-2 you want to connect to.



Title Bar Region



Along the top edge of the M-2 GUI screen (in line with the “M2 Dual Voice Processor” product label to the left, and the Windows About, Minimize, and Exit icons to the right) are “Status” and “Devices” indicators. The M-2 GUI is capable of controlling multiple M-2 units (“Devices”). Whether a connection is made (“Status”) or not, the device presently under command is indicated in the “Devices” box. Double-clicking the “Devices” button on the left will gain access to device management screens.

Status

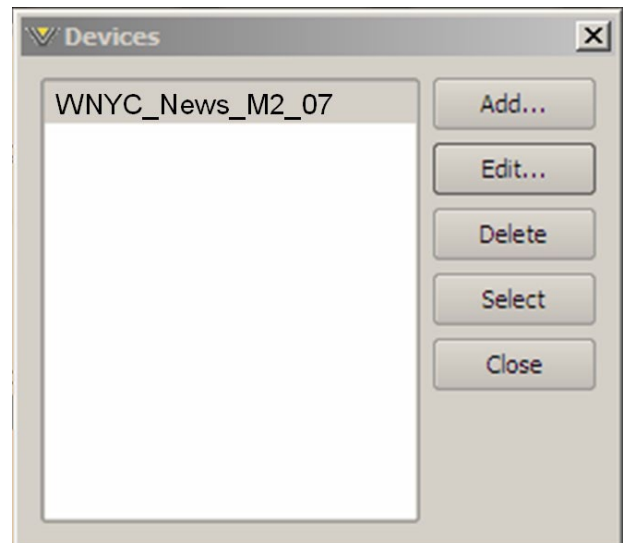
This indicates: “Online,” meaning the GUI is in communication with and directly reflects an M-2; “Offline,” meaning the GUI and M-2 are disconnected and not communicating; or “Trying,” meaning the GUI is attempting to find the M-2 on the LAN and connect to it. An adjacent button toggles between “Online” and “Offline.”

Devices

The name assigned to the M-2 to which the GUI is either currently configured to connect to or is currently connected to (or with which it is attempting to connect) shows in this window.

Double-clicking on the name area brings up the “Devices” dialog box. A list of M-2 devices that have been configured by the GUI are shown here. Highlighting the desired M-2’s name and then hitting the “Select” button tells the GUI which M-2 it is to connect.

In the event no M-2’s are listed or one is adding an additional device, “Add” brings up a small dialog box which asks for the new M-2’s unit name and assigned IP address.

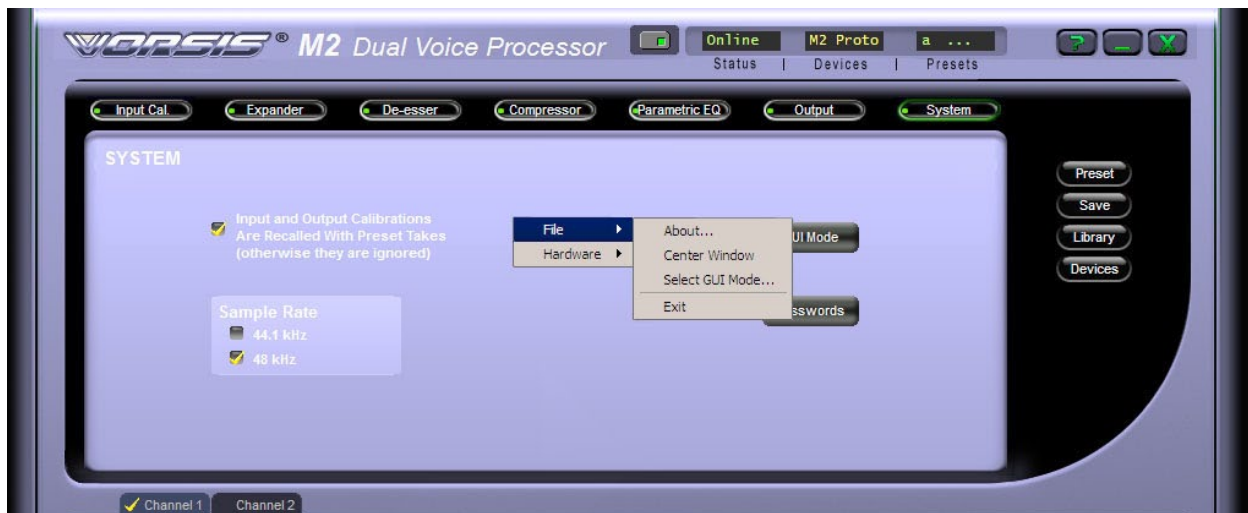


Network Notes

- The M-2 utilizes static TCP/IP addressing and does not use DHCP (Dynamic Host Configuration Protocol); therefore it must be assigned its own IP address. Please consult your local network administrator if the M-2 network configuration poses any unusual challenges.
- The M-2 utilizes both TCP and UDP protocols while communicating with the remote GUI. Therefore the interconnecting network and its hardware (routers, switches, etc.) must be able to pass Ethernet packet traffic to/from the M-2 on TCP port 55898 and UDP ports 60000 through 60010.

Accessing Menu Options

Right clicking anywhere on the controls area of the main M-2 GUI will open a pop up menu tree with access to *File*, *Hardware*, and *Presets* choices. These choices lead to sub-menus and dialog boxes that may also be accessed by clicking on other dedicated buttons on the main M-2 control panel. As with many Windows programs, there are multiple ways to access menu trees - go ahead and explore!



File Menu Items

The *File* menu tree may be accessed by right clicking anywhere on the controls area of the main M-2 GUI. Sub-menu choices include:

About... - brings up the GUI program's About splash screen. Click anywhere on the splash screen to dismiss this screen.

Center Window - centers the GUI window on your display.

Select GUI Mode... - brings up the "Select GUI Mode" form discussed earlier.

Exit - closes the GUI program. Any connected device will continue to operate.

Hardware Menu Items

The *Hardware* menu tree may be accessed by right clicking anywhere on the controls area of the main M-2 GUI. Please note that many of these functions require you to be connected (Online) to an M-2. Sub-menu choices include:

Devices... - opens the "Devices" dialog box. Allows the creation, editing, selection, and deleting of M-2 processors connected to your system.

On-Line Mode... - toggles between ONLINE and OFFLINE modes.

Login Password... - opens the Passwords dialog box for editing login passwords.

Version... - displays the current software versions running on your M-2.

Update - opens the "Choose a file to download" dialog box. Only files of type *.vbn are visible. See the later section on software updates.

Assign IP Address... - opens a dialog box that allows the user to change the IP address parameters of the M-2. Please see the **Read Me!** at the beginning of this manual for complete details on changing the M-2's network configuration settings to match those of your local area network.

Software Updates

At Wheatstone we are always improving our products and future versions of the M-2's internal software may be released to implement new features or correct known problems.

The Software Update menu choice opens a dialog box and prompts the user to select a file to be uploaded to the M-2. Upon completion, you will be asked to restart the M-2 (cycle power). Note that due to the M-2 specific content of the update file and its heavy encryption only verified updates provided by our factory will be accepted by the M-2 during an update process!

Appendix

Contents

Parameters, Units and Ranges.....	A-2
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Parameters, Units and Ranges.

Approximately following the M-2's signal path, these are the values and ranges appropriate to each processing channel.

System Level

Headroom:	20dB
Nominal Operating Level:	-20dBFS
LED Input/Output Level Meter	

Input

Type:	Very Low Noise Electronic Differential
Input Impedance:	> 2kohms at 1kHz
Optimum Source Impedance:	200 ohms
Phantom Power	
Maximum Gain:	70dB
Minimum Gain:	-10dB
Gain Adjust Increments:	1dB
Equivalent Input Noise:	°-128dBu
Frequency Response:	+ / - 0.2dB
THD+N:	<0.03%20Hz - 20kHz@-50dBu input
SMPTE DIM:	0.00007%

Filters

a. High-Pass Filter

Filter Class:	24dB/oct. Butterworth
Frequency:	20Hz – 1kHz
Defaults:	Off

b. Low-Pass Filter

Filter Class:	24dB/oct. Butterworth
Frequency:	1kHz – 20kHz
Defaults:	Off

c. Notch Filter

Filter Class:	24dB/oct. Butterworth
Frequency:	20Hz – 20kHz
Defaults:	Off

Equalization

Four identical, independent bands of parametric equalization:

Frequency:	20Hz – 20kHz
Bandwidth:	0.2 – 3 octaves
Lift / Cut:	+ / - 14dB
Defaults:	All off

Phase Scrambler

Filter Class:	4th order all pass
Phase Delay:	0 to 720 degrees, frequency dependent

De-Esser

Type:	Recursive-style true (not broadband) De-Esser
Threshold:	-10 to -60dBfs
Release:	50mS – 500mS
De-Ess Frequency:	20Hz – 20kHz
Defaults:	Off

Expander

Type:	Downward Expander
Threshold:	-60 – 0dBfs
Close:	50mS – 3Sec.
Depth:	0 – 40dB
Defaults:	Off

Compressor

Threshold:	-70 to -30dBfs
Attack:	0.2mS – 1S
Release:	33mS - 1Sec.
Ratio (soft-knee):	1:1 – 1:20

Control

All parameters accessible via an intuitive MS Windows® compatible graphical user interface via Ethernet interface. Three levels of user access are available: Expert, Simplified, and Talent.

Please contact Wheatstone technical support for assistance or further information regarding the M-2 product.

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