Dan Dugan Sound Design

Model M Automatic Mixing Controller

User Guide

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Author: Rob Wenig

Dan Dugan Sound Design
290 Napoleon St., San Francisco, CA 94124
Phone: (415) 821-9776 Fax: (415) 826-7699

Important Safety Instructions and Warnings

The Model M's circuitry is made in the USA and meets applicable national safety standards.

Standards Compliance

The third-party power supply provided with this product has been certified to comply with UL and CE.

Safety Instructions

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. **WARNING!** To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.
7. Clean only with dry cloth.
8. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
9. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
10. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
11. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
12. Only use attachments/accessories specified by the manufacturer.
13. Unplug this apparatus during lightning storms or when unused for long periods of time.
14. **WARNING!** Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
15. **WARNING!** To reduce the risk of electric shock, DO NOT REMOVE COVER. No user serviceable parts inside.

Warranty Statement

Warranty: One year parts and labor

Dan Dugan Sound Design warrants that Model M hardware will be free from defects in components and workmanship for a period of 12 months from the date of invoice. During the warranty period, Dan Dugan Sound Design will cover the cost of all parts and labor to remedy the defect, or replace products which prove to be defective. Dan Dugan Sound Design is not obliged to honor this warranty if the hardware has failed to be maintained and operated as specified by Dan Dugan Sound Design, in the accompanying documentation, or other than in accordance with industry standards. Defects caused by unauthorized modifications, misuse, negligence, act of God or accident are not covered by this warranty. Software is provided as a convenience, but due to the wide variety of computer systems, cannot be guaranteed to work. This Limited Warranty is exclusive and no other warranty is expressed or implied. Dan Dugan Sound Design does not warrant that Dan Dugan Sound Design software, or any third-party software, is error free. Third party branded or manufactured goods are supplied by Dan Dugan Sound Design with care but without responsibility and subject only to third party suppliers' warranties. In all other respects Dan Dugan Sound Design is not liable for consequential damages.

Table of Contents

Chapter 1: Introduction

The Dugan Model M Automatic Mixing Controller helps professional audio mixers handle multiple live mics without having to continually ride their individual faders. This signal processor patches into the input insert points of an audio mixing console. It detects which mics are being used and makes fast, transparent cross-fades, freeing the mixer to focus on balance and sound quality instead of being chained to the faders. The Model M tracks unscripted dialogue, eliminating cueing mistakes and late fade-ups, while avoiding the choppy and distracting effects common to noise gates.

The Model M includes three patented automatic mixing algorithms:

- **Dugan Speech System**™ for all dialog applications
- **Dugan Music System**™ for mixing a musical group
- **Dugan Gain Limiting**™ for reducing feedback when using the Music System

The Model M can:

- connect up to 64 channels (MADI), or 16 channels (ADAT);
- be remote controlled from the Dugan Control Panel for Java (included) and Dugan Control Panel for iPad (sold separately);
- be physically controlled from its own front panel;
- be remote controlled from the Dugan Model K Tactile Control Panel;
- link with other Dugan automatic mixing controllers to create a larger system;
- partition channels into one to three groups that can span linked units;
- create separate systems that do not interact (i.e., for separate studios);
- conveniently connect multiple devices via three network ports;
- be powered by PoE.

The Model M supports a broad spectrum of live mixing applications:

- Conference reinforcement, video trucks
- Houses of worship
- TV news and sports panels, reality and game shows
- Wireless mics for theater
- Boardrooms and civic meeting rooms
- Teleconferencing and distance learning

The Model M dramatically improves live mixing with multiple mics by:

- eliminating late upcuts;
- reducing PA feedback and studio noise;
- reducing comb filtering from adjacent mics.

Chapter 2: Theory of the Speech and Music Systems

Dugan Speech System

The Dugan Speech System is a patented and trademarked automatic mixing function. The Speech System distributes the gain of one open microphone over the entire system, maintaining a natural ambience. It is essential to distinguish this behavior from the annoying fluctuation of levels and uneven ambience in a conventional gating system.

The system automatically manages any number of live mics in unpredictable dialogue situations. When one person speaks, that mic's gain fades up instantly, and the others down. When the speaker pauses, all mics fade to medium gains that sum to equal one mic at full gain. The result sounds like passing one mic around among the speakers. When several people talk at once, the gain is shared.

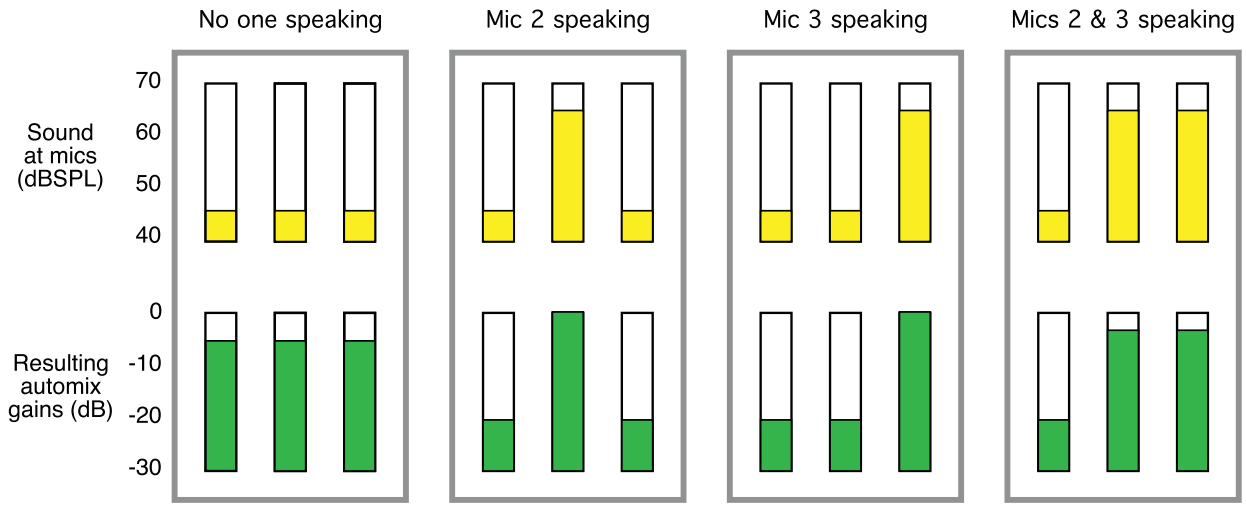

Figure 2-1 Four snapshots of a three-mic system

Figure 2-1 shows the Speech System in action with a three-mic system.

- The first frame shows no one speaking; the sound levels at all mics are low. The system fades all channels to medium gains that sum to the equivalent of one mic at full gain.
- The second frame shows one person speaking. The system automatically fades his/her gain to full, while the other two inputs are turned down.
- The third frame shows a different person speaking. The system automatically fades his/her gain to full, while the other two inputs are turned down.
- The fourth frame shows two people speaking simultaneously. The system automatically shares the gain between them, while the other input is turned down.

Insert Patching

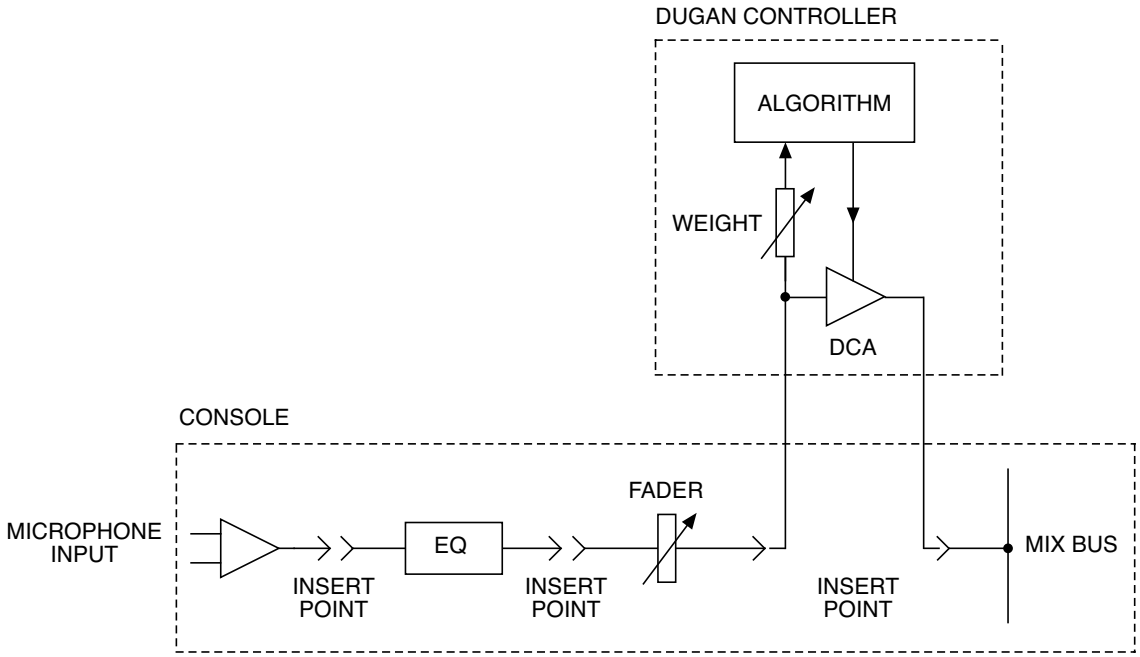

Figure 2-2 Post-fader insert patching

The Dugan Speech System is best patched post-EQ, post-fader, pre-compressor:

- **Post-EQ**: Equalization can be applied to different mic types so they sound more alike, which benefits both the sound quality and the automixing process.

- **Post-fader**: This allows muting channels on the console by pulling down the fader or activating the mute button. A pre-fader patch leaves the mic in the automix even when the fader is down or the console channel is muted.

  Most analog consoles only have pre-fader inserts. You can use Dugan automixing with these consoles but you must be careful to mute channels by muting on the Dugan, not the console.

- **Pre-compressor**: The Dugan Speech System works on the level differences between channels. Compression reduces level differences between channels, making automixing less effective. It is OK to patch post-compressor if only occasional peak limiting occurs. However, if compression is active during normal speech, better results will be obtained by patching the Dugan pre-compressor.

Dugan Music System

Music System

The Music System is a soft-gating or ducking system with its threshold set by an audio signal, typically from a mic measuring the ambient sound level. Each channel has a 2:1 expansion ratio below the floating threshold.

The Music System can also be used to duck an audience mix when the people on stage talk, attenuating the sound of the PA in the room. Use an aux send of the stage vocal mix to supply the threshold signal instead of a mic.

The following example (Figure 2-3) shows how the Music System works with three background vocalists.

- Frame 1 shows no one singing. The system keeps all channels at a low gain.
- Frame 2 shows one person singing. The system automatically fades his/her gain to full, while the other two inputs stay low.

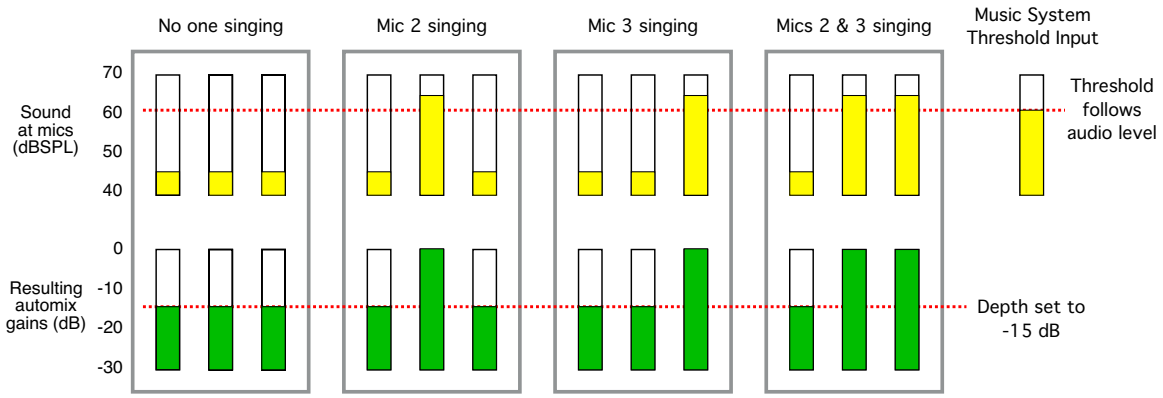

Figure 2-3 Function of the Dugan Music System

- Frame 3 shows a different person singing. The system automatically fades his/her gain to full, while the previous singer's mic and the other input stay low.
- Frame 4 shows two people singing together. The system automatically gives their channels full gain, while the other input stays low.

Insert Patching

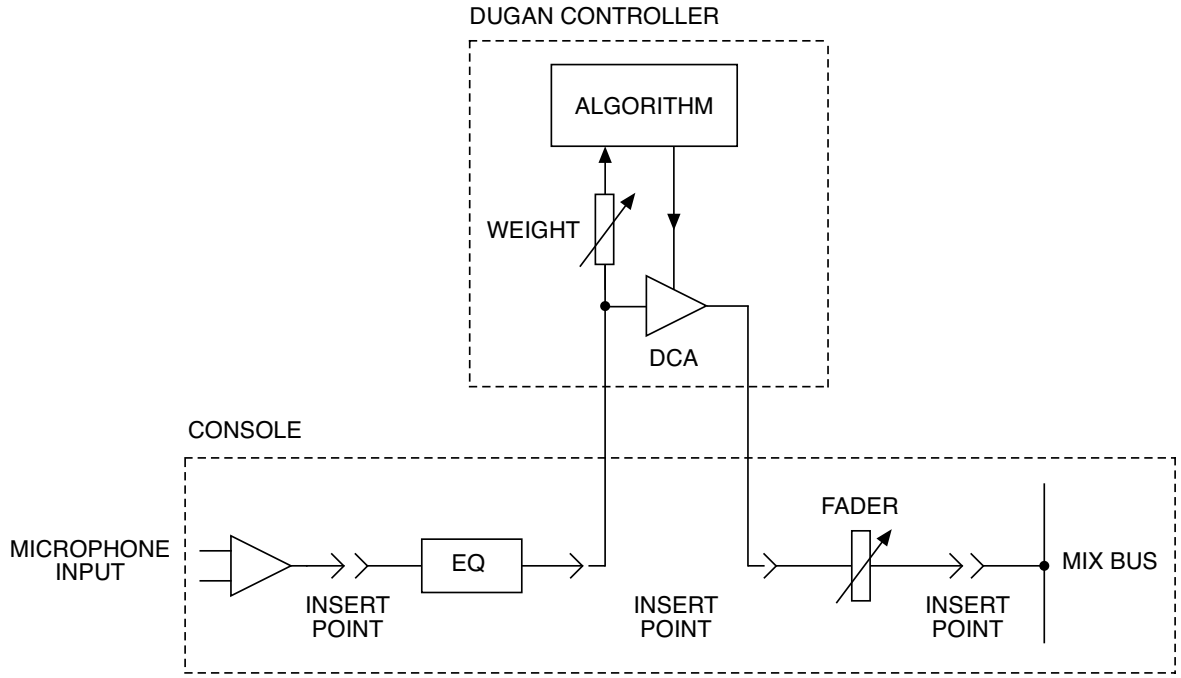

Figure 2-4 Pre-fader insert patching

The Dugan Music System is best patched post-EQ, pre-fader, pre-compressor:

- **Post-EQ**: Equalization can be applied to different mic types so they sound more alike, which benefits both the sound quality and the automixing process.

- **Pre-fader**: This allows the expansion threshold for automixing to remain stable while adjusting the mix with the faders.

- **Pre-compressor**: The Dugan Music System works better with consistent ambience caused by bleed from neighboring voices and instruments. It is OK to patch post-compressor if only occasional peak limiting occurs. However, if compression is active during normal singing or playing, better results will be obtained by patching the Dugan pre-compressor.

Gain Limiting

Gain Limiting reduces master gain as new mics become active, thus avoiding feedback and noise. This is commonly called *NOM* (number of open mics) gain adjustment. Unlike NOM functions on other systems, Dugan Gain Limiting does not base its gain limiting calculation on the number of open mics. Instead it sums the gains of all active channels (including partially attenuated channels), compares them to a gain threshold, and reduces the gain appropriately.

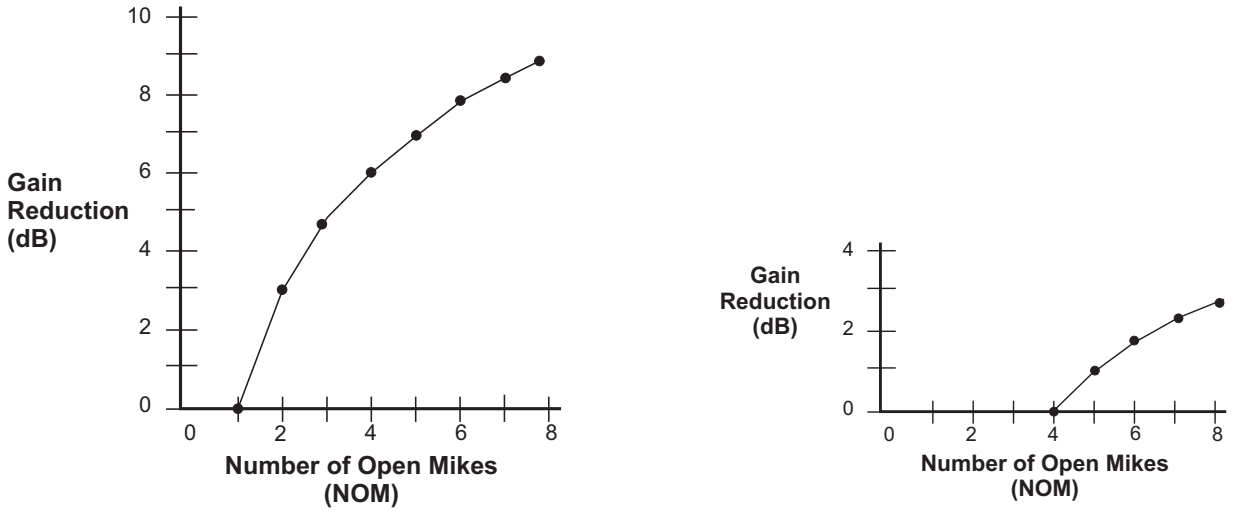

Figure 2-5 NOM and gain reduction: NOM =1 (left); NOM = 4 (right)

Conventional automatic mixing implementations always assume an NOM of 1. The Dugan's unique implementation allows you to set the number of mics that will operate at full gain before gain limiting occurs. For example, if there is enough gain before feedback to tolerate four open mics, the gain limit can be set to 4. Gain reduction begins when the fifth mic turns on.

NOTE: *Since the Model M has no master audio channel, Gain Limiting reduces the gain on all channels in the group for which* **NOM** *is active.*

Chapter 3: Installation

Rack Mounting

One or two half-rack-sized Dugan controllers can be mounted in a single rack space. Each unit ships with one long and one short rack ear and one joining plate. Two units provide the necessary parts for mounting side-by-side.

The rack ears for older half-rack Dugans differ slightly from the current design, but the joining plates are the same. All half-rack-sized Dugans can be mounted side-by-side using the appropriate rack ear for each unit.

To rack-mount a single unit, attach one long and one short rack ear, then mount in the rack.

To mount two units side-by-side:

1. For the left unit, remove the four screws from the right side of the top and bottom lids.
2. Attach the top and bottom joining plates to the left unit.
3. For the right unit, remove the four screws from the left side of the top and bottom lids.
4. Attach the top and bottom joining plates to the right unit.
5. Attach the appropriate short rack ears to the left and right units.

Connections

Model M channels are patched as inserts to your console's input channels. Where they are inserted depends on whether you are using the Dugan Speech System (see page 12), the Dugan Music System (see page 14), or both.

NOTE: *When an actor both sings and speaks, it is best to route the same mic through two Dugan channels (one for the Music and one for the Speech System) and switch between them. See Musical Theater on page 47 for more information.*

Audio I/O

The rear panel has the following connectors: MADI, Word Clock, ADAT, network connectors, and power. It also has two switches: **MADI–ADAT** and **NORM–SLAVE**.

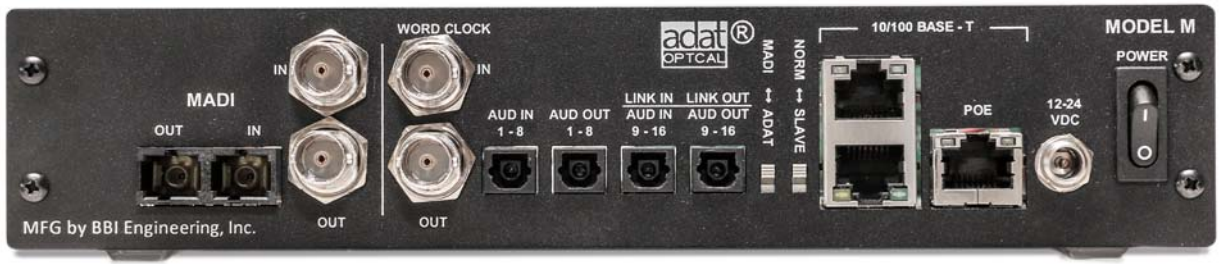

Figure 3-1 Model M rear panel connectors

The **MADI–ADAT** switch selects whether the input is derived from the **MADI** (up position) or **ADAT** (down position) connectors. In the **ADAT** position, the **LINK** connectors are re-purposed to carry eight additional ADAT channels, so linking multiple units is not possible (see *Linking* on page 19).

MADI

MADI I/O can use a dual SC optical cable for input and output or two BNC coaxial connectors for input and output. The Model M automatically selects the active input. If signal is present at both inputs, optical is selected.

Select the desired cable and connect the appropriate MADI ports on your console and the Dugan.

MADI connections can carry up to 64 audio channels. You can select a block of channels for Dugan processing. MADI channels not assigned to the Dugan are passed through unprocessed. MADI channels are assigned from the unit's front panel (see page 54).

ADAT

Each of four ADAT connectors carries eight channels, two for input, two for output.

1. Connect console insert outputs to **AUD IN 1–8** and **AUD IN 9–16**.
2. Connect **AUD OUT 1–8** and **AUD OUT 9–16** to the console insert inputs.

Unprocessed Outputs

Unprocessed splits of the input signals are always present on the outputs of the unused I/O connectors. These are typically sent to a multitrack recorder. The position of the **MADI-ADAT** switch determines the I/O:

- **MADI**: MADI inputs 1–16 are mirrored to ADAT outputs 1–16.
- **ADAT**: ADAT inputs 1–16 are mirrored to MADI outputs 1–16.

Linking

Up to eight Dugan units can be linked into a single automatic mixing system. All digital Dugan models can be linked in any combination. The audio I/O for each must be configured and connected individually. Linking passes only control information between Dugans, not audio.

One unit must be set to be the master and the others slaves.

1. Designate one unit as the master by setting the **NORM–SLAVE** switch on the rear panel to **NORM** (up).
2. Designate any other units as slaves by setting their **NORM–SLAVE** switches on the rear panel to **SLAVE** (down).
3. Use ADAT (TOSLINK) cables to link units in a ring network.

   Note that all **LINK IN** and **LINK OUT** connectors are used to create the ring.

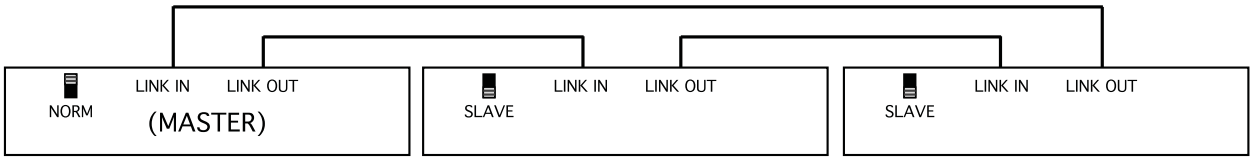

Figure 3-2 Linking Dugan units

Word Clock

By default, Word Clock is derived from the active MADI or ADAT input. However, if a Word Clock signal is sent to **WORD CLK IN**, the Model M will use that as its Word Clock source. In all cases, the Word Clock output is sent to **WORD CLK OUT**.

Network

A network switch with three Ethernet connectors is provided as a convenience when connecting a computer and other devices into a network. One connector accepts Power over Ethernet (PoE).

Power

A power connector accepts a locking power cable. In an emergency, the Model M can accept power supplies within the range 12–24 VDC, 2 A (minimum), center pin positive.

Chapter 4: Connecting to a Computer

Two Java applets are provided with the Model M:

- The Dugan Utility helps you connect to a network.
  It is also used to update the firmware (see Chapter 9: *Updates*).
- The Dugan Control Panel offers convenient monitoring and operational capabilities.

Insert the USB thumb drive supplied with the Model M, or download the latest version from:

http://www.dandugan.com/downloads

To connect the Model M directly to a computer, use one of the rear panel **10-100-1000 BASE-T** jacks. An older PC may require a crossover cable.

Use a straight Ethernet cable to connect to a network.

Windows users must turn the Windows firewall off. The Windows Firewall blocks port 9776 used by the Dugan software to communicate. If you must leave the Windows firewall on, open this port.

We recommend turning off the computer's WiFi during this process because it sometimes interferes. You can turn it back on after the connection has been established.

For those who wish to set a specific IP address, proceed to *Setting a Specific IP Address* on page 24.

Establishing Network Connections

iPad

We recommend using a computer to complete your network connection before using the iPad app.

1. Launch **Dugan-Utility-***yyyymmdd***.jar**.
2. If the Dugan Utility does not launch, install the latest version of Java from:

   http://www.java.com/en/

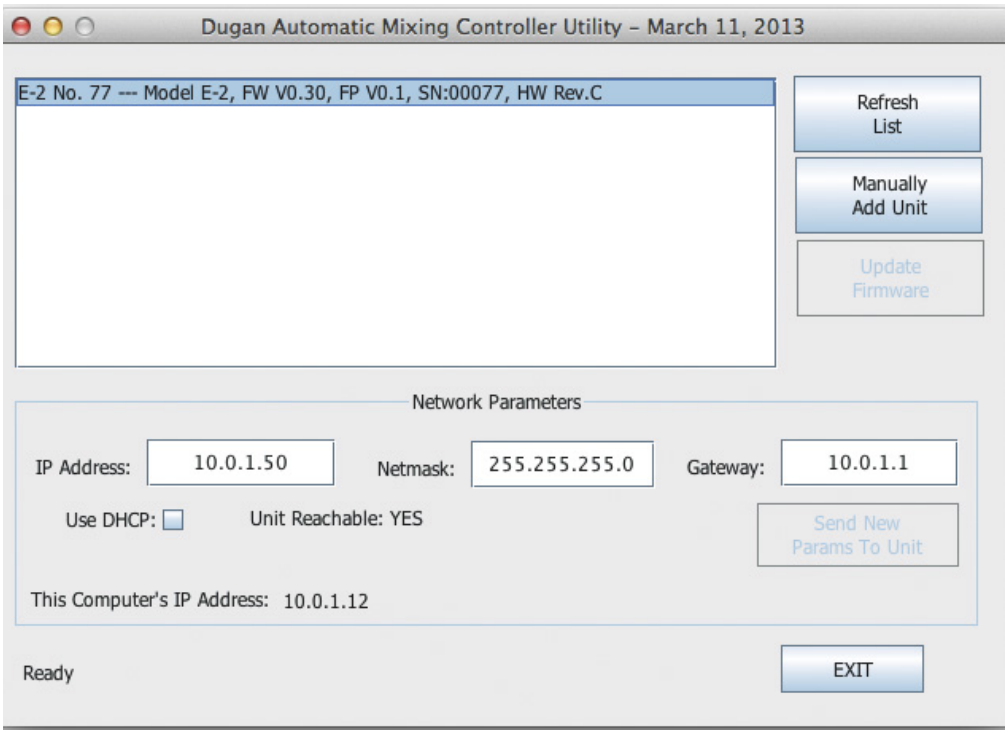

Figure 4-1 Dugan Utility

3. Wait a minute and if the list pane is blank, click **Refresh List**.

   If the list pane remains blank, proceed to *Manually Add Unit* below.

   If the list pane displays Dugan units, continue.
4. Click on the first unit in the list so it is highlighted.

   The Network Parameters section displays information about that unit.

   If **Unit Reachable** is **YES**, you are ready to use the Dugan Control Panel with that unit. If you have additional Dugan units to connect, select the next unit in the list and repeat this step. If you are finished with installation, proceed to Chapter 5: *Dugan Control Panel Software*.

   If **Unit Reachable** is **NO**, proceed to the next step.
5. Select the **Use DHCP** parameter.

6. Click **Send New Params to Unit**.
7. Click **Refresh List**.
8. Highlight the unit in the list pane again.

   If **Unit Reachable** is **YES**, this unit is ready to use with the Dugan Control Panel. If you have additional Dugan units to connect, select the next unit in the list and repeat Step 4. If you are finished with installation, proceed to Chapter 5: *Dugan Control Panel Software*.

   If **Unit Reachable** is **NO**, proceed to the next step.
9. De-select the **Use DHCP** parameter.
10. Copy **This Computer's IP Address** to the **IP Address** field, and increase the value in the last (fourth) group by one.

    For example, if **This Computer's IP Address** is 192.168.1.101, set **IP Address** to 192.168.1.102.
11. Click **Send New Params to Unit**.
12. Click **Refresh List**.
13. Highlight the unit in the list pane again.

    If **Unit Reachable** is **YES**, this unit is ready to use with the Dugan Control Panel. If you have additional Dugan units to connect, select the next unit in the list and repeat Step 4. If you are finished with installation, proceed to Chapter 5: *Dugan Control Panel Software*.

Manually Add Unit

If the Dugan unit does not appear in the Dugan Utility list pane, you can manually add the unit. First you need to know the IP address of the unit.

To determine the IP address:

1. On the front panel, select **MENU** by pressing the up and left navigation arrows.
2. Press **ENTER**.

   The **MENU** screen appears.
3. Select **Network Configuration** by pressing the up and down navigation arrows.
4. Press **ENTER**.

   The **Network Configuration** screen appears.
5. Note the **IP Address**.

To manually add the unit:

1. In the Dugan Utility, click **Manually Add Unit.**
2. Enter the IP address from the **Network Configuration** screen.
3. Click **OK** to exit the dialog.
4. Click **Refresh List**.

Setting a Specific IP Address

Users with IT expertise can set a specific IP address for any Dugan unit on the network. Operating the real-time Dugan Control Panel requires that the Dugan unit and computer be on the same subnet.

1. Launch **Dugan-Utility-*vxx*.jar**.

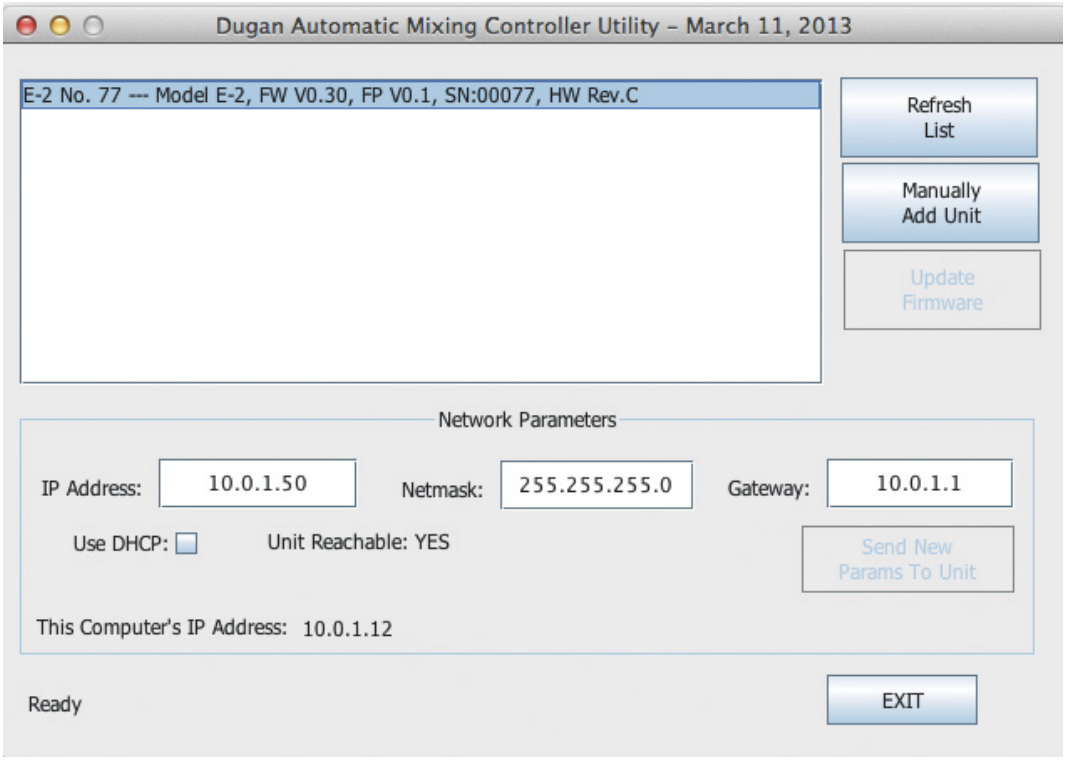

Figure 4-2 Dugan Utility

2. Wait a minute and if the list pane is blank, click **Refresh List**.
   If the list pane remains blank, skip back to *Manually Add Unit* above.
   If the list pane displays Dugan units, continue.
3. Click on the first unit in the list so it is highlighted.
   The Network Parameters section displays information about that unit.
4. If **Use DHCP** is selected, de-select it.
5. Enter the desired IP address into the **IP Address** field.
6. Click **Send New Params to Unit**.
   The Model M will reboot.
7. Click **Refresh List** to confirm the settings.
8. Repeat from step 3 to set IP addresses for additional units.

Chapter 5: Dugan Control Panel Software

The Dugan Control Panel software has both Java and iPad versions. This chapter discusses the Java version. The few differences in the iPad app are noted.

NOTE: *After configuring settings with the Dugan Control Panel, it can be disconnected. All settings are retained and the unit continues to function on its own.*

Figure 5-1 Dugan Control Panel

Launch the **Dugan-Control-Panel-*vxxx*.jar**. If this file is not available and you have an Internet connection, you can obtain the latest version from:

http://www.dandugan.com/downloads

The Dugan Control Panel has three panes. The controls displayed in these panes depend on which Dugan device is selected in the Top Pane.

Top Pane	icons for all connected Dugan units
Channel Pane	man, auto, mute, preset, music, NOM, override, group, weight, bypass, and channel name controls
Master Pane	OVERRIDE, PRESET, MUTE, meters, system, and reset controls

Top Pane

The Top Pane displays all connected Dugan units. The selected block is enclosed by a yellow rectangle. Clicking on another block selects it and deselects the previous block.

NOTE: *The last block of a unit may have fewer than eight channels.*

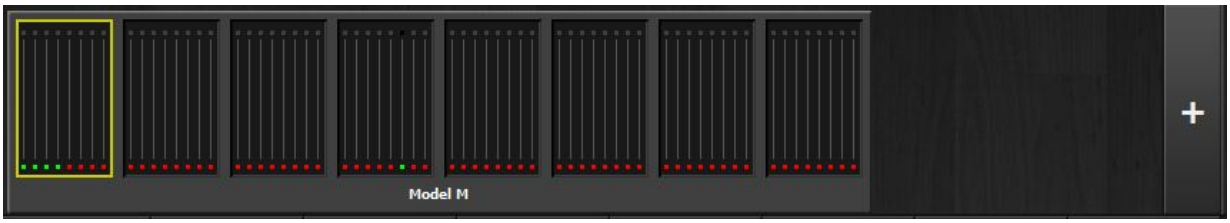

Figure 5-2 Top Pane

If all connected units do not appear in the Top Pane, see Establishing Network Connections. If the Top Pane is full, a thin scroll bar appears along the bottom.

To display a unit's IP address, hover the mouse over the unit's name.

iPad *To display a unit's IP address, touch and hold the unit's name.*

Adding Units Manually

To add a unit with a known IP address manually, click the **+** sign at the right of the Top Pane and enter the IP address in the dialog that appears.

To display a unit's IP address, hover the mouse over the unit's name.

Setting Controls

Controls can be adjusted five ways:

- Enter a dB value in the numeric field.
- Drag in the numeric field (not on iPad).

When a slider is present:

- Drag the slider up or down.
- Click in the slider track to raise or lower the value by 0.5 dB.
- Ctrl-click anywhere on the slider to reset its value to 0 (touch and hold on iPad).

Naming Units and Channels

Connected units are displayed in the top pane in alphabetical order. If you wish to display them in your own order, use numerical prefixes.

To name a unit and its channels:

1. Select a unit in the top pane.
2. Select the yellow text in the Master Pane (under the Dugan logo) and type a name.
3. Press the Enter key on the keyboard to set the name.
4. To name a channel, select the yellow text and type a name.
5. Press the Enter key on the keyboard to set the name.

Channel naming can be cleared by recalling Scene 0 (*Scenes Panel* on page 39).

Channel Pane

The Channel Pane contains the controls and indicators for each channel. Channels are either in **bypass** or one of three operating modes: **man**, **auto**, or **mute**. The active channel mode illuminates. All transitions are made with a smooth, rapid fade. Select a channel mode by pressing the individual mode buttons or the Master **PRESET** button.

Figure 5-3 shows a typical system: channels 1–4 in **auto** with ambient noise, and channels 5–8 in **mute**.

Figure 5-3 Channel Pane

Level Indicator

Each channel has a **level** LED that lights green when the audio level is adequate for automatic mixing. It should remain green when no one is talking.

- If the **level** indicator blinks, raise the console's channel input gain.
- If the **level** LED lights red, lower the console's channel input gain.

Bypass

When **bypass** is active, the signal passes through without automixing. A bypassed channel appears inactive, with all lights extinguished.

Figure 5-4 bypass button lit

Man and **bypass** modes are similar:

- **bypass** makes an instantaneous transition, which can cause an audible click.
- **man** performs a quick fade without sonic artifacts.

To deactivate **bypass**, you can:

- Click **bypass** again;

  - *OR* -

- Click any of the three channel mode buttons.

Channel Modes

There are three channel modes: **man**, **auto**, and **mute**. Changing modes initiates a half-second fade to the new mode. Like radio buttons, you can only choose one mode at a time.

Figure 5-5 Channel modes

Man

In **man** mode there is no automixing, and the signal passes through at unity gain.

Even though **man** and **bypass** modes perform similar functions, we recommend using **man** during live mixing to prevent clicks.

Auto

This is the normal Dugan automixing mode.

Mute

The channel is muted when **mute** is active.

Preset

Use the Preset function to store your favorite channel mode settings, which may be restored by pressing the Master **PRESET** button. When the unit powers up, the channels default to their preset modes.

To set channel presets:

1. Click the channel **preset** button next to the desired channel mode button.
2. For all unused channels, click the **preset** button next to the **mute** button.

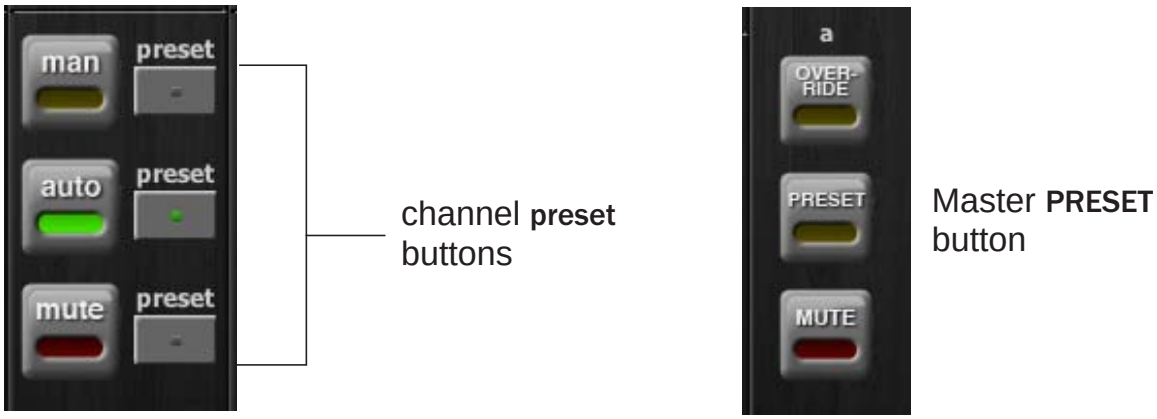

Figure 5-6 Channel **preset** (left) and Master **PRESET** (right) buttons

The preset indicators should mirror your normal working combination of input modes. The normal condition can then be restored by pressing the Master **PRESET** button.

Channel Groups

Each channel can be assigned to one group: a, b, or c. Each group functions as a separate, independent automatic mixer that can span multiple linked Dugans. Channels assigned to groups need not be contiguous.

Applications where groups are helpful include:

- **Separate Rooms**: Assign the mics in each room to different groups so they function as separate automatic mixers.
- **Stereo Panning**: Assign the mics panned left, right, and center to groups a, b, and c, respectively, to maintain a stable stereo ambience.

To assign a channel to a group, click the **group** button until the desired group letter appears. The channel strip background is tinted green (**group b**) or blue (**group c**); **group a** is not tinted (Figure 5-7). A set of **OVERRIDE**, **PRESET**, and **MUTE** buttons appears in the Master Pane for each group.

Figure 5-7 Channels in three groups

Override

Override can be used to instantly mute all mics except one (the host or chairperson). However, any number of mics can be included in the override group. It can thus be used to make a dramatic A/B comparison between automatic and conventional mixing.

To assign channels to an override group, activate the **override** button on each channel.

Pressing the Master section **OVERRIDE** button puts channels with their **override** buttons lit into **man** mode. All other channels are muted. Press the **OVERRIDE** button again to restore normal automixing operation.

Meters

The meters have three display modes. The default mode is **auto mix gain**, which is the most useful display during normal operation. The input and output meters are only used when setting or checking levels.

Table 5-1 Meter modes

	Meter Displays	Meter Color
auto mix gain	action of the Dugan Speech System	green
input	input level	yellow
output	output level	blue

Click on the Master **meters** button to cycle through the three meter display modes.

Weight Controls

The **weight** controls set the side-chain levels for each channel into the control system. This establishes the relative sensitivity of the automatic mix for the channels in use. *They do not change the mix levels*. When the **weight** controls are balanced, each mic has an equal opportunity to take over the system: when one person talks into one mic, he/she gets all the **auto mix gain** and the others get turned down.

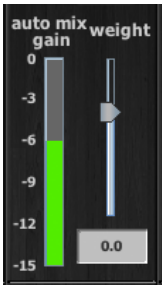

Figure 5-8 Weight controls

The **weight** controls should be used to balance the channel **auto mix gain** indicators when no one is talking. If a console preamp trimmer is turned down, that channel's **weight** control can be turned up to re-balance the automixing, and vice-versa.

To adjust the weight setting, click and drag the **weight** slider or enter a number in the numeric field. Ctrl-click the **weight** slider to reset it to 0.

iPad *Touch and hold the* **weight** *slider to reset its value to 0.*

It is important to understand that **weight** does not set that mic's *level* in the mix when that person speaks, but only its *sensitivity* in activating automatic mixing. The Speech System detects the *ratios* of the levels between channels, not their absolute levels. *The* **weight** *control is not a gate threshold!*

The following example illustrates how **weight** affects **auto mix gain** (see Figure 5-9).

Raising the **weight** control for one channel:

- increases that channel's **auto mix gain** display during ambience and decreases it slightly for the others;
- makes it more difficult for others to speak when someone speaks into the channel with the higher **weight** setting.

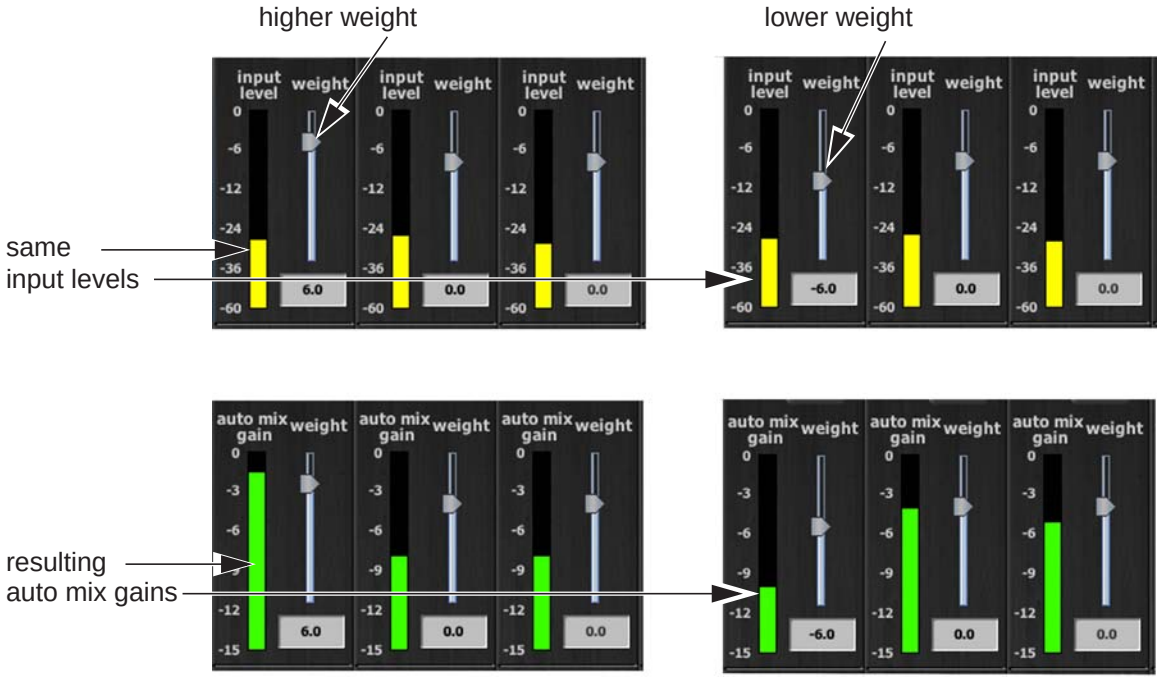

Figure 5-9 How changing one channel's weight control during ambience affects the auto mix gains

Lowering the **weight** control for one channel:

- decreases the **auto mix gain** display during ambience for that channel and increases it slightly for the others;
- makes it more difficult for that channel's talker to be heard over the others.

For optimal performance, balance the **weight** controls so the channel gains display approximately equally when no one is talking.

Figure 5-10 shows eight- and four-mic systems with appropriate **auto mix gain** displays when no one is talking.

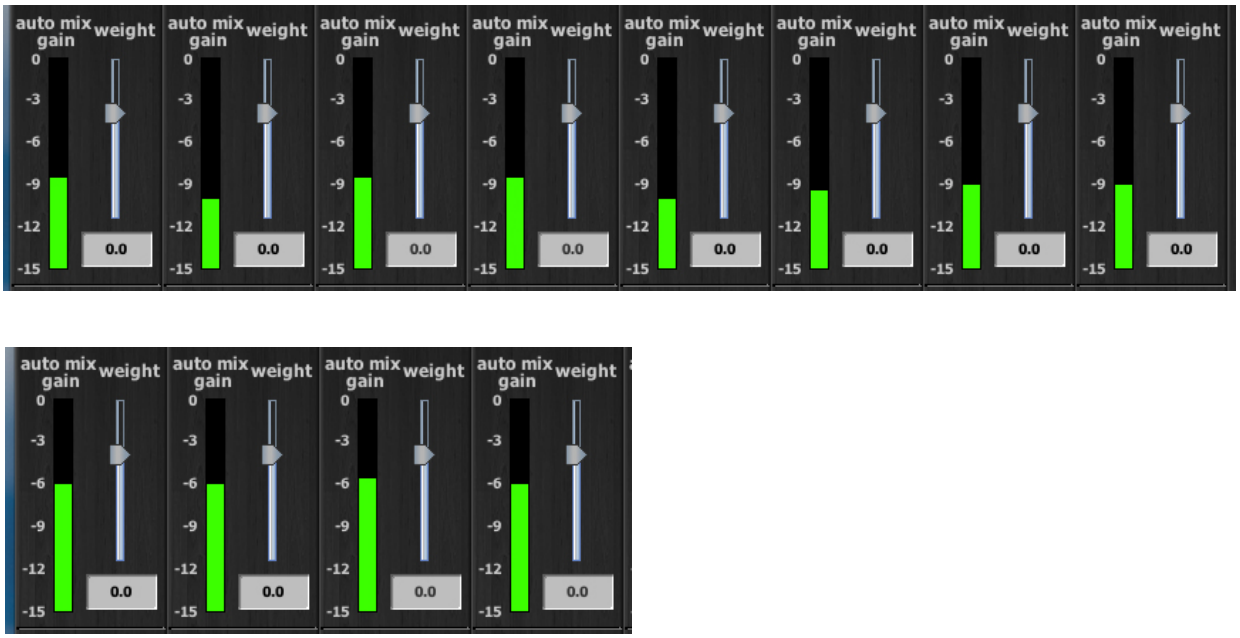

Figure 5-10 Multiple mic ambience: **auto mix gain** hovers around -9 dB for eight mics, -6 dB for four mics

You can perform the following functions using the **weight** controls:

- If there is ongoing noise near one mic (e.g., computer fan or air vent), suppress it by reducing that channel's **weight.** Of course, you will hear that noise increase when that talker speaks.
- To allow the chairperson to override interruptions, set his/her **weight** higher than the other channels. If you set the chairperson's weight too high, quiet speech from the other channels may be lost.
- To duck all mics when another sound source is playing, use a *dummy input*, that does not get routed to a mix bus.

Master Pane

The content of the Master Pane changes to reflect the Dugan device selected. In the figure below, the selected device is a Model M.

The following version numbers are displayed below the Dugan logo.

- the selected unit's firmware
- the currently running Control Panel (CP-J) software

This section documents the Master Pane's controls and indicators.

Figure 5-11 Master Pane with three groups

The Master indicators are:

- **online:** lights when a unit is connected to the Dugan Control Panel
- **MADI-ADAT, norm-slave:** show their rear panel switch settings
- **MADI:** indicates a valid MADI source
- **clock lock:** indicates a valid Word Clock source

The Master controls, located on the far right, include **reset, meters, system, OVERRIDE**, **PRESET**, and **MUTE**. A set of **OVERRIDE**, **PRESET**, and **MUTE** buttons appears for each active group. Each control is discussed below.

Reset

We recommend clicking **reset** before making a new setup, which sets all operating parameters to default values. This does not include setup parameters such as network and MADI configuration or the unit's name.

Meters

The meters have three display modes. The default mode is **auto mix gain**, which is the most useful display during normal operation. The input and output meters are only used when setting or checking levels.

Table 5-2 Meter modes

	Meter Displays	Meter Color
auto mix gain	action of the Dugan Speech System	green
input	input level	yellow
output	output level	blue

Click on the Master **meters** button to cycle through the three meter display modes.

Clock Source

The **clock source** button displays the currently assigned source. If Word Clock and any other clock source is present, the Dugan automatically selects Word Clock.

Click on **clock source** to override the automatically assigned clock source to select your own. Clock sources are MADI, ADAT, Word Clock, and internal (48 kHz).

NOTE: *All mute LEDs flash together if there is no valid clock source. This typically means the unit has no digital signal at the inputs.*

System

It is possible to have multiple *systems* on your network. For example, some facilities may wish to have one network serve separate studios. It is not desirable for these systems to interact or be viewed when using a different studio. The Model M allows you to create up to 16 separate systems on one network.

Separating Systems

To separate multiple systems:

1. Select the first unit to include in the system by clicking it in the Top Pane.
2. Click the **system** button and select a unique number for that system.
3. Repeat for each unit in that physically linked system, making sure to use the same number for each unit in the system.
4. Repeat steps 1–3 for each system.
5. To query which system a unit belongs to, select it in the Top Pane and view its number on the **system** button.

Selecting Units to Display

After dividing units into separate systems, you may want to restrict the units shown in the Top Pane to those in your studio. To do this:

1. Hover the mouse cursor over the names of the units that you want to display, and note their IP addresses.
2. Ctrl-click on the **+** sign at the right of the Top Pane.

   The **+** sign turns red.
3. Quit and relaunch the Dugan Control Panel.

   It opens with **Auto Detect Disabled** in the Top Pane
4. Click on the red **+** sign, and enter the IP address of the first unit you want to add.
5. Repeat step 4 until your units all appear in the Top Pane.

Manually added units must also be removed manually. To remove manually added units from the Top Pane, shift-click on the **+** sign. A dialog appears to confirm that they have been removed.

To restore automatic detection, Ctrl-click on the **+** sign, which turns white.

Group Master Controls

The Master Pane displays a set of group master control buttons for each group in use.

Override

Activating the Master **OVERRIDE** button has the following effect on individual channels:

- Channel **override** button active: puts the channel in **man** mode with full gain (no automixing);

  - *OR* -

- Channel **override** button inactive: mutes the channel.

De-activating the Master **OVERRIDE** button returns the channels to normal operation.

Select channel(s) to include in the override group by activating their **override** button(s).

Remove channel(s) from the override group by deactivating their **override** button(s).

Preset

Clicking the Master **PRESET** button sets the channel modes (**man, auto, mute**) to those shown on each channel's **preset** buttons. Use these settings to store your favorite channel mode settings. When the unit powers up, the channels default to their preset modes.

Mute

Click the **MUTE** button to mute a group. Click it again to unmute the group.

Master Panels

One of three panels can overlay the Master Pane. Click a tab on the right margin to open a panel, click its **CLOSE** tab when finished.

Music System Panel

See Chapter 7: *Dugan Music System and Gain Limiting* for a complete discussion of the Music System and its controls.

Model K Devices Panel

This panel lets you pair this instance of the Dugan Control Panel with a Model K Tactile Control Panel. When they are paired, selecting a block of eight channels on one also selects it on the other.

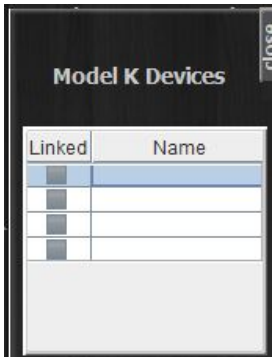

Figure 5-12 Model K panel

Scenes Panel

This panel lets you create, recall, save, rename, and delete scenes. Scenes include all Model M parameters except the MADI and network configurations, and the name of the unit.

Figure 5-13 Scene panel

The current Scene name appears at the top of the Scene panel. A * at the end of the name indicates the Scene has been edited.

Select **Global** to record Scenes for all connected units. Deselect **Global** to restrict Scene save and recall to the current unit.

NOTE: *You cannot* **Save** *or* **Delete** *the Factory Defaults Scene.*

To create a new Scene:

1. Click the **New** button.

   The Scene name dialog appears with an automatically generated name highlighted.
2. If desired, type a new name then press **Enter**.

To recall a Scene:

1. Select a Scene from the list.
2. Click the **Recall** button.

To save changes to the current Scene, click the **Save** button.

To delete the current Scene, click the **Delete** button.

To rename the current Scene:

1. Double-click the Scene name.
2. Type a new name then press **Enter**.

Chapter 6: Pre-fader Insert

The Dugan Speech System is more convenient to operate if patched post-fader. If your console allows a post-fader insert, skip this section. If you must use a pre-fader insert, this section describes how to properly mute and pre-listen to muted channels.

Muting Channels

Mics must be muted by using the **mute** buttons on the Dugan Control Panel. Pulling a fader down on the console will not properly mute a channel. Although that mic is no longer audible in the mix, it still contributes to the gain computations and causes ambient noise fluctuation. In the worst case, this could cut off a speaker.

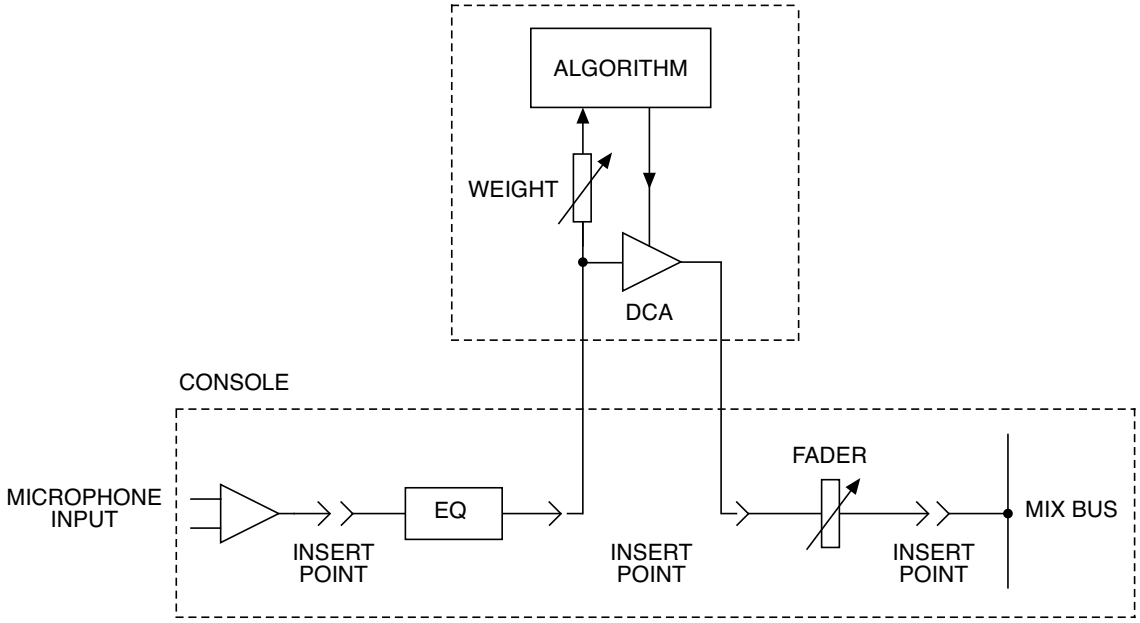

Figure 6-1 Insert points on most analog mixers are pre-fader

To properly mute a channel:

- With the console faders up, adjust levels while people are talking, and mute a mic by clicking the channel **mute** button on the Dugan Control Panel. Enable the mic by activating the **auto** button.

  Muting mics does not alter the overall ambient sound mix: the Speech System raises the ambient gains of the other mics to compensate for the gain subtracted by muting a mic. This occurs during ambience without input to any mic. When one or more mics receive speech input, the gain shifts to the active mics.

  - OR -

- Use the **bypass** button on the Dugan Control Panel with the console fader pulled down. This keeps the mic instantly available on the fader but that channel is no longer in the control mix.

  Be aware that **bypass** may generate a click if it interrupts room rumble, whereas the **mute** button does a quick-fade. The **mute** button can be used with the fader up; **bypass** is best used with the fader down.

Pre-listening to Muted Channels

If your console allows listening to a mic before the insert point, you can mute on the Dugan.

If signal through the Dugan is required to pre-listen to a mic, pull the fader down and put the channel in **bypass** mode. When your mic check is done, switch the channel back to **auto** mode, and raise the fader so the Dugan can cue in the mic.

Chapter 7: Dugan Music System and Gain Limiting

Dugan Gain Limiting is typically used with the Dugan Music System.

Dugan Music System

The Dugan Music System is a soft-gating or ducking system with its threshold set by an audio side-chain, typically from a sensing mic that measures the ambient sound level. Each channel has a 2:1 expansion ratio below the floating threshold.

If at least one channel has an active **music** button, the Dugan Music System panel can be opened by clicking the **music** tab on the right margin of the Master Pane. If more than one group has a music channel, additional columns will appear.

NOTE: *See Setting Controls on page 27 to learn how to set them.*

Figure 7-1 Dugan Music System panel with three groups

Meter

The meter can show the Music System Threshold Input level or NOM Gain Limiting. Clicking the title toggles between them.

NOM Gain Limit

This field controls the NOM (Number-of-Open-Mics) Gain Limit. Enter a new value from 1 to 10.

Music System Threshold Input Channel

This sets the channel from which the Music System in this group derives its threshold.

Music System Threshold Input Level

This control sets the input level for this group's Music System Threshold. The LED indicates signal presence or overload. Set the level with the fader or enter a value in the field.

Auto Mix Depth

This control sets the maximum amount of attenuation applied by the Music System.

Setting up the Music System

Consider the following before placing the sensing mic:

- Use the same type of mic for program and sensing applications.
- Place the sensing mic in the same area, and pointing in the same direction as the program mics.

  This samples, as closely as possible, the ambient sound picked up by the program mics.
- Do not place the sensing mic close to an individual voice or instrument.
- Do not point the sensing mic at a pit orchestra.
- Do not put the sensing mic in the back of the house because of the time delay.

The Music System can also be used to duck an audience mix when the people on stage talk, attenuating the sound of the PA in the room. Use an aux send of the stage vocal mix (post-Dugan) to supply the threshold signal instead of a mic.

Some channels can be set to the Music System while others are in the Speech System. Unlike the Speech System, the Music System channels should be patched post-EQ, *pre-fader* so that fader and threshold adjustments remain independent.

To set up the Music System, you must send a music system threshold signal from the console to the Music System Threshold Input of a Dugan group:

1. Connect the sensing mic to an available console input.
2. Deselect all mix buses from that input strip.
3. Route that input's direct out to an available MADI channel output.
4. Set the console input gain for the sensing mic 10–15 dB higher than the program mics.

   This establishes a general level that will be trimmed in step 13.
5. On the Dugan's Channel Pane, activate the **music** button on the desired channels.

   The **music** tab will appear on the Master Pane when at least one channel is assigned to the Music System.
6. Click the **music** tab on the right margin of the Master Pane to open the Music System panel.

   A column of controls appears for each group with at least one active music channel.
7. Enter the MADI channel number that you chose to use for the music system threshold channel input for that group.
8. If the meter is not set to Music System Threshold Input Level, click the title to toggle it.
9. Start with the **music system threshold** control(s) set to 0 dB (default).
10. On the Channel Pane, start with all channel **thresh** controls at 0 dB (default).
11. Activate the **auto** buttons for all channels in use, and the **mute** buttons for unused channels.
12. On all channels, activate the **preset** button adjacent to the selected mode.

    This preserves your mode settings when the unit is powered off and on.
13. Use the **music system threshold** control to fine tune the threshold for each group so the **auto mix gain** for each music system channel hovers around -15 dB.

    If all the channel **auto mix gain** displays stay at full gain, the threshold signal is missing or too low.

    See page 27 to learn how to enter values.
14. Fine tune individual channels using their **thresh** controls so the **auto mix gain** display stays close to -15 dB.

iPad *To close the Music System pane on an iPad, swipe it to the right.*

Controlling Ambience

Unlike the Speech System, the Music System does not maintain constant ambience. To smooth out the ambience, two methods can be used separately or together:

- The **last hold** function keeps the last mic on that stays above -3 dB gain for 0.5 seconds. When another mic passes the same criteria, it becomes the **last hold** mic.

  To activate the **last hold** function for a group, click that group's **last hold** button.
- Raise the **auto mix depth** control until you do not hear an objectionable shift in ambience. Just a few dB of attenuation may suffice to reduce bleed or feedback.

Gain Limiting

Gain Limiting and the Music System

NOTE: *See Chapter 2:Theory of the Speech and Music Systems.*

The Dugan's unique implementation lets you set the number of mics allowed at full gain before gain limiting occurs. This can prevent feedback as the Music System turns on more mics.

NOTE: *Gain Limiting is the only automatic mixing function that can be active when the channel is in* **man** *mode.*

To activate Gain Limiting:

1. Activate the **NOM** buttons on each channel you wish to include.
2. Set the master **NOM gain limit** field in the range 1–10 (see page 27 to learn how to set controls).
3. Toggle the meter title to **NOM gain limiting** to view the amount of gain reduction.

Gain Limiting and the Speech System

The Speech System always maintains NOM = 1, which makes Gain Limiting unnecessary. Typically, the **NOM** controls have no effect when using the Speech System. However, the **NOM** function can help avoid feedback when

- mics are switched to manual;

  - OR -

- the Master **OVERRIDE** button is pressed with multiple mics selected.

If either case applies,

1. Turn on **NOM** for all channels.
2. Set the **NOM gain limit** field to **1**.

If some channels are set to Speech and others to Music Systems, you can choose whether they should interact. If you do not want the master gain reduction of the Music System mics to affect those in the Speech System, turn the **NOM** buttons off for the Speech System channels.

Musical Theater

When an actor sings and speaks, like in musical theater, it is best to switch between the Dugan Music and Speech Systems.

If your console allows separate pre- and post-fader insert points:

1. Patch two channels on the Dugan for each singing/speaking mic: One (pre-fader) for the Music System, and the second for the Speech System (post-fader).
2. To automate switching between singing and speaking, use scenes on the console to alternately activate the appropriate insert, or switch channel modes between **auto** and **man** using scenes on the Dugan (see *Scenes Panel* on page 39).

   For example, when the actor sings, the Speech System channel would be in **man** mode while the Music System channel is in **auto** mode.

If your console does not allow separate pre- and post-fader insert points:

1. Patch the Dugan post-fader.
2. Activate **music** for the channel when the actor sings.
3. To automate switching between singing and speaking, use scenes on the Dugan to toggle the **music** button (see *Scenes Panel* on page 39).

Chapter 8: Front Panel

Since the front panel is so small, use the Dugan Control Panel on a computer or iPad if available. If necessary, the Model M front panel can perform all operations of the Dugan Control Panel except editing names. It has a display, navigation arrow buttons, and a dual-function encoder knob that can be pushed or turned. The cursor is a box around a selected item that is moved using the navigation arrow buttons.

NOTE: *Pressing the* **ENTER** *button or the knob performs the same function. We will refer to the item which is easiest to use in the context.*

All Channels Screen

This displays the status of all channels, and like the Top Pane in the Dugan Control Panel, allows you to select a block of eight channels to view in detail.

Channel Block Selection

To view a block of eight channels in detail:

1. Use the navigation arrows or turn the knob to select the desired block.
2. Press the **ENTER** button or the knob to switch the display to that eight-channel block.

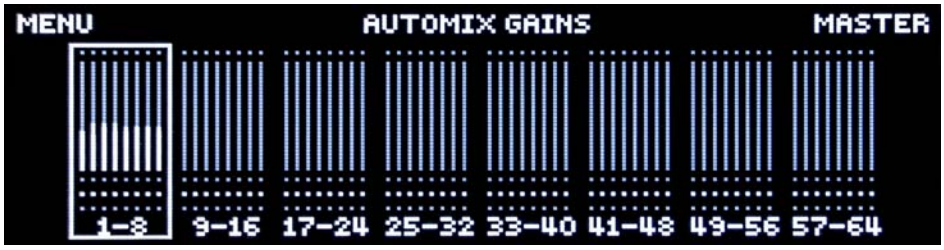

Figure 8-1 All Channels screen

Top Row

Activating **MENU** or **MASTER** jumps to the MENU or Group Master screens, respectively.

To change the meter display:

1. Use the navigation arrow buttons to highlight the meter selection in the top row.

   It will read **GAINS**, **INPUTS**, or **OUTPUTS**.
2. To change the meter mode, turn the knob.

   The display changes without pressing the knob. When finished, use the navigation arrows to continue editing other parameters.

Eight Channels Screen

This miniature version of the Dugan Control Panel displays real-time channel activity, and can be used to operate the unit if necessary.

The screen has three navigable sections: The top row, the miniature control panel, and the double arrows in the bottom row.

NOTE: *The miniature control panel uses the full screen height. For navigation purposes, the top row items are above the controls, and the double arrows are below them.*

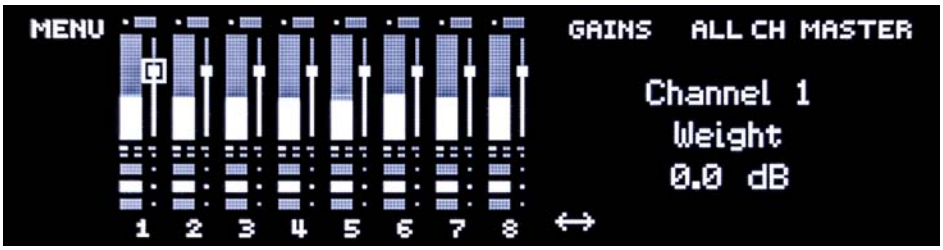

Figure 8-2 Eight Channels screen

When the double arrows are highlighted, rotating the knob selects the next or previous group of eight channels to display. The double arrows are below the bottom buttons of the control panel.

NOTE: *Press the left and right arrow navigation buttons together to jump to the double arrows from anywhere on the screen.*

Top Row

MENU, **ALL CHAN**, and **MASTER** jump to their respective screens.

To change the meter display:

1. Use the navigation arrow buttons to highlight the meter selection in the top row.

   It will read **GAINS**, **INPUTS**, or **OUTPUTS**.

2. To change the meter mode, turn the knob.

   The display changes without pressing the knob. When finished, use the navigation arrows to continue editing other parameters.

Channel Controls

The Dugan Control Panel's controls are all available. Each control's label and value appear on the right side of the screen when that control is selected.

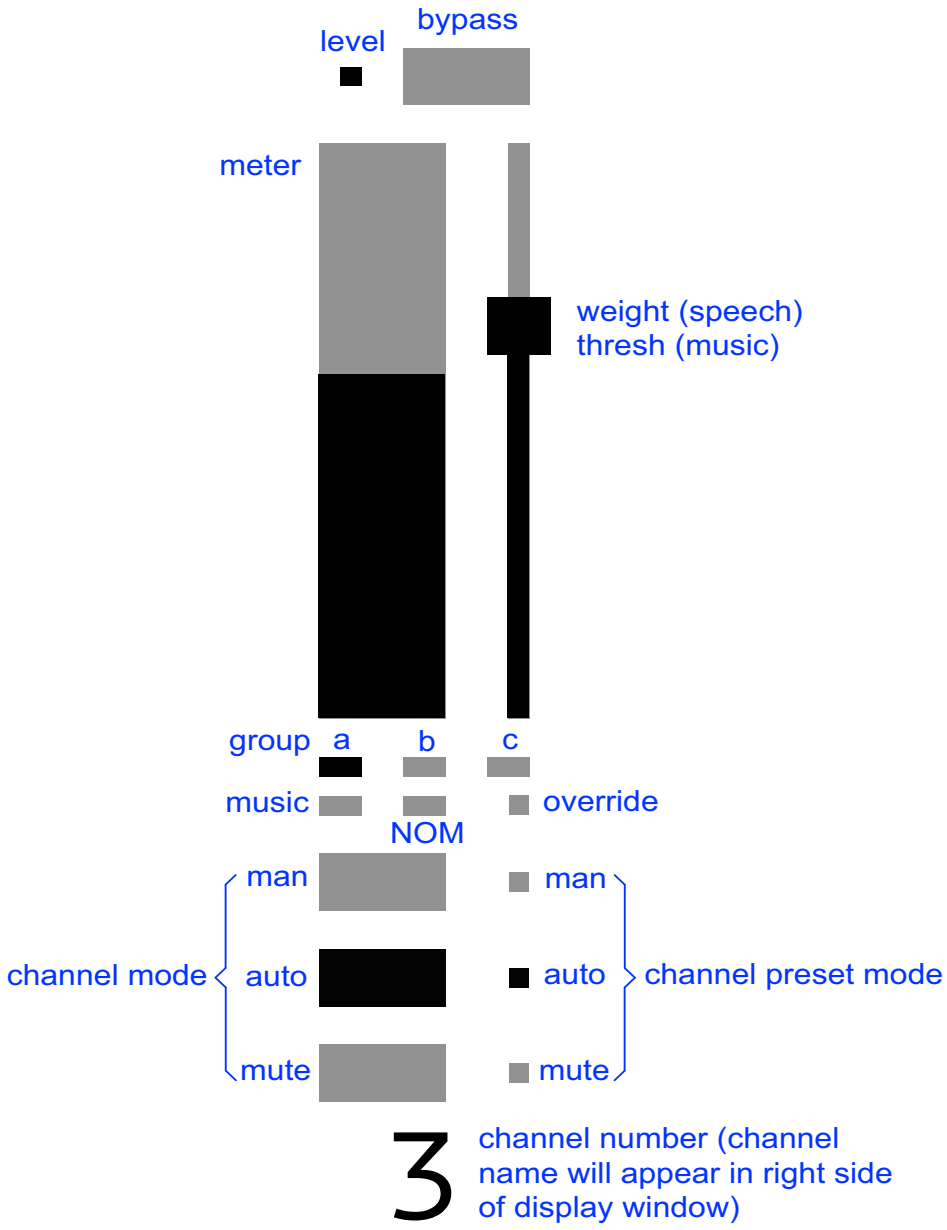

Figure 8-3 Channel controls detail

To understand these controls, see Chapter 5: *Dugan Control Panel Software*.

Group Master Screen

Each group with channels assigned to it has a Group Master screen.

Figure 8-4 Group Master screen

Top Row

The two items in the top row, **MENU** and **CHANS**, jump to different screens.

Group Master Controls

Nine items can be highlighted. The double arrow jumps to other groups if present (the arrows will be inactive if no other groups exist).

To learn about these group controls, see *Master Pane* on page 35.

Menu Screen

This screen provides access to less frequently used screens and to set the synchronization source.

Figure 8-5 Menu screen

Select the desired Sync source, and press **ENTER** or the knob to set.

Select **8-ch** or **16-ch** ADAT I/O mode. Note that when MADI is selected, the ADAT output channels mirror the first 8 or 16 MADI inputs. Conversely, when ADAT is selected, the MADI output channels mirror the first 8 or 16 ADAT inputs.

The settings of the back panel switches are indicated, but they cannot be changed here.

MADI Configuration Screen

This screen lets you choose which MADI channels to use with this device. All channels not used by this device are passed through.

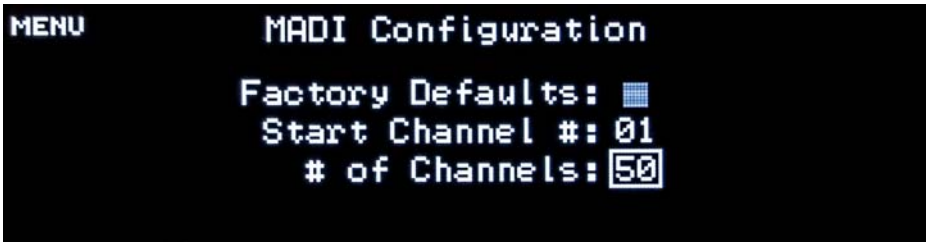

Figure 8-6 MADI Configuration screen

Highlight either **Start Channel No.** or **No. of Channels** and turn the knob to set that parameter. The **No. of Channels** automatically shows the number of available channels based on the current **Start Channel No**.

The **No. of Channels** can be adjusted independently. For example, setting the **Start Channel No.** to 8 sets the **No. of Channels** to 56.

Selecting **Reset Factory** sets the **Start Channel No.** to 1 and **No. of Channels** to the maximum allowed by the current sample rate.

NOTE: *MADI channels not assigned to the Dugan are passed through unprocessed.*

Network Configuration Screen

This screen lets you configure the network parameters for this device.

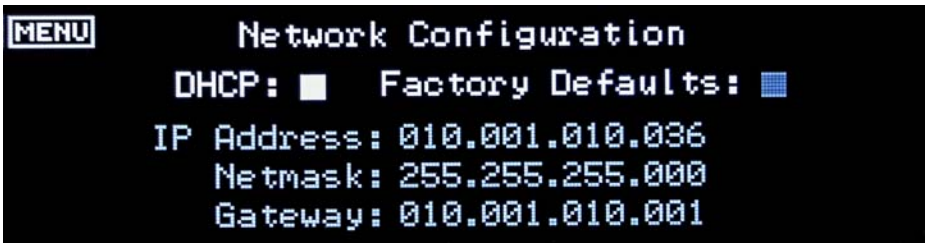

Figure 8-7 Network Configuration screen

We recommend selecting **DHCP** which will supply valid **IP Address**, **Netmask**, and **Gateway** values automatically. Those users familiar with network settings can enter them manually. Navigate to the desired group field and turn the knob to change the value.

Click **SET** to activate your edited settings or **CANCEL** to discard changes. Both options return to the Menu Screen.

See Chapter 5: *Dugan Control Panel Software* to troubleshoot network settings.

Scene Memory Screen

This screen lets you recall, save, and create a new scene. Scenes include all Model M parameters except the MADI and network configurations, and the name of the unit. The last Scene recalled shows in the **Recall** field. A ***** at the end of the Scene name indicates the Scene has been edited.

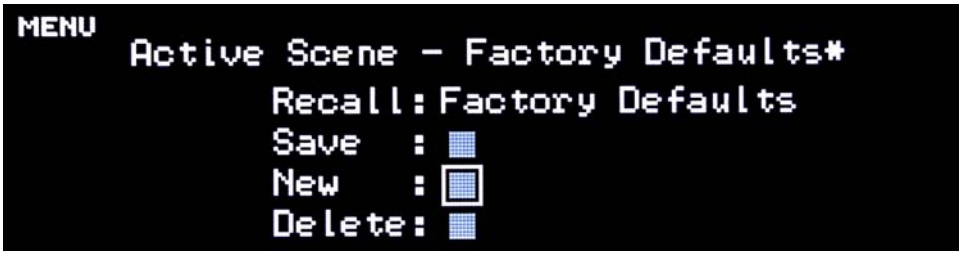

Figure 8-8 Scene Memory screen

To recall a Scene:

1. Turn the knob to scroll through Scenes, which display in alphanumeric order.
   A Scene name blinks if it has not been recalled.
2. Press the knob to recall that Scene.
   The Scene name stops blinking.

To save the current Scene:

1. Navigate to the **Save** button.
2. Press **ENTER** to update the Scene with the current state of the unit.
   The **Save** button is inactive if the Scene has not been edited.

To create a new Scene:

1. Navigate to the **New** button.
2. Press **ENTER** to create a new Scene with the current state of the unit.
   An automatically generated number is assigned.

To restore all parameters in the unit except the MADI and network configurations, and the unit name, recall Scene 0.

NOTE: *After editing Scene 0, the* **Save** *button will be inactive. Use* **New** *to save the current state of the unit.*

See Chapter 5: *Dugan Control Panel Software* to learn how to name and otherwise manage Scenes.

Chapter 9: Updates

Updates for the Model M can be downloaded.

iPad

To update your Dugan unit firmware, iPad users must connect their Dugan to a computer and run the Dugan Utility.

To update the Dugan Control Panel for iPad, connect to the Apple App Store.

To update your device's software and firmware:

1. Connect to the Internet and download **Dugan-Software-***yyyymmdd***.zip** from:

   http://www.dandugan.com/downloads/

   After the download is complete, the Internet connection is no longer necessary.
2. Unzip the software package.

   It contains the **Dugan-Control-Panel-***vxxx***.jar** and **Dugan-Utility-***yyyymmdd***.jar**. The Dugan Utility contains the latest versions of both the firmware and the safety copy of the Dugan Control Panel that loads automatically into the unit.

   To revert to a previous version, use the older version of the Dugan Utility.
3. Connect the computer to the Dugan units you wish to update.
4. Launch **Dugan-Utility-***yyyymmdd***.jar**.

   The Dugan Utility window appears.

   If the Dugan Utility does not launch, install the Java Runtime Environment.

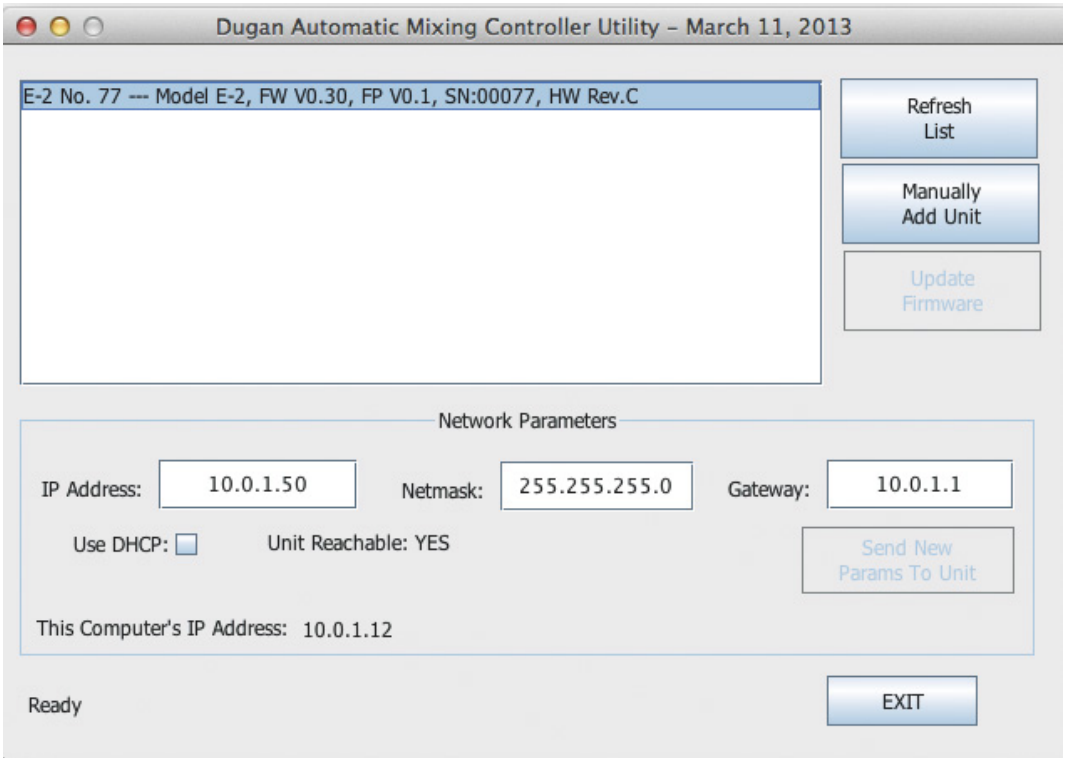

Figure 9-1 Dugan Utility

If you do not see the Dugan unit(s) on your network in the list, see *Establishing Network Connections* on page 22.

5. Select the unit to update from the list.
6. Make sure **Use DHCP** is *NOT* selected for that unit.

   Under certain network conditions, DHCP is not compatible with the firmware update process.
7. Click on **Send New Params To Unit**.
8. Click **Update Firmware**.

   The unit reboots after the update completes.
9. Repeat steps 5 through 8 for each unit you wish to update.

NOTE: *To force an update when the **Update Firmware** button is not blue, Ctrl-click the button.*

NOTE: *If the firmware update process fails, your unit may not pass audio. To recover from this condition, repeat steps 5 through 8 above, but Ctrl-click the **Update Firmware** button.*

Appendix A: Specifications

Audio	
MADI I/O	64 channels maximum, AES10 Optical or 75-ohm coaxial
ADAT I/O	16 channels
Gain	Unity
Sample Rate	96 kHz maximum
Bit Depth	24 bit
Audio Latency	2 ms
Frequency Response	10 Hz – 48 kHz, ± 0.0075 dB @ 96 kHz
Output Noise	-125 dBFS (20 Hz – 20 kHz), -128 dBAFS
Distortion	-125 dBFS
Linking	Up to eight units can be linked into one system in an optical ring network
Connectors	
Audio	**MADI**: SC-DC, BNC **TOSLINK**: ADAT
Word Clock	BNC
Linking	TOSLINK
Network	Three RJ-45
Power	
Connector	Coaxial with locking collar, 5.5 mm o.d., 2 mm i.d.
Electrical	Nominal 12 VDC, 1.5 A maximum; accepts 12–24 VDC
PoE	802.3at Type 2 25.5 W
External Supply	**Input**: 100–240 VAC, 50–60 Hz, 30 W **Output**: 18 VDC, 1.33 A **Approved**: UL, CE
Dimensions	1RU **H** = 1.75 in (4.5 cm) **D** = 8.3 in (21 cm) **W** = 8.75 in (22.2 cm)
Weight	3.4 lb (1.54 kg) 7.0 lb (2.50 kg) in shipping box with power supply