PROTECH®

5/12

MODELS 2016
DUGAN AUTOMATIC MIXER
INSTALLATION & OPERATION MANUAL

NEW!

- Automatic Mixing with Dugan Speech System.
- 8 Mic/Line Inputs With Selectable Gain Structures.
- 2 Unbalanced CD Inputs
- Phantom Power Capability On Each Input
- Signal Presence Indicator For Each Inputs
- Clip Indicator for Summing Bus
- Assignable Group Mute Per Input
- 10 Segment LED Metering of Output Level
- Remote Gain Control Capability On Master Output.
- Linkable for Up To 64 Inputs

The Protech Audio Model 2016 Automatic Microphone Mixer is designed to be the best operating, most transparent auto-mixer, for rental and portable applications as well as small venues. The 2016 features patented adaptive proportional gain sharing control circuitry. This operating system results in the best, most transparent automatic mixing to be found anywhere. Unlike gated mixers, or quasi-Dugan mixers, the 2016 operates on an elegantly simple principle; each individual input channel is attenuated by an amount, in dB, equal to the difference, in dB, between that channel's level and the sum of all channel levels. The levels are varied on a continuous basis, with no on-off actions, or abrupt gain changes, no threshold.

The 2016 features 8 switchable microphone/line level inputs. Up to 8 units may be linked together to create up to 64 mic/line inputs. In addition each units features two unbalanced inputs that are summed to a common signal and adjustable via a front panel control. The unbalanced inputs may be used in manual or automatic mode.

Access to all feature setting switches is available on the rear panel. Input and output wiring is accomplished via a 2 part plug-in clamp type connector.

In addition to the input mode (mic/line) switch located at each input, the gain of each input is configurable to allow superior signal-to-noise operation

Turning ON the DIP switch pin 4 on each input changes the input gain from 30dB to 50dB

Each iput contains a signal presence LED. In addition a bi-color LED is used to indicate signal presence and clip threshold. Unlike other units, the clip indicator on the Model 2016 indicates clipping of the summing buss, not just an input, since it is possible to clip a summing bus, without clipping an input.

Internal 15 volt phantom power is selected, on a channel-by-channel basis, via the DIP switch position 3 on each input.

The Model 2016 also features an assignable group mute function. Each mic/line input may be assigned to the mute bus via position 5 on the individual input DIP switch. Turning on a given switch will assign that channel to the group mute. Grounding the group mute control pin will mute the assigned channels.

The output level of the automixers may be controlled via the front panel output potentiometer, or via a remote potentiometer. A simple 10K is al that is needed to accomplish remote control.

Both units have been designed with the operator in mind. Control features allow the operator to attend to other functions, without the need to continuously "ride gain".

For additional information on the model 2016, or the Models 2000 Boardroom Automixer, and 2000-C Courtroom Automixer, contact: Applications Assistance

Protech Audio Corporation, PO Box 597, 1158 Cedar River Road, Indian Lake, New York, 12842, Voice 518-648-6410 Fax 518-648-6395

INSTALLATION

The Model 2016 has been shipped from the factory with all inputs set for microphone level operation, and the internal 15 volt phantom power disabled on each input.
If line level operation is required on some inputs, the following steps are required.
Mount the Model in a suitable rack.

Setting Input Type and Gain

Set the appropriate input mode switches (see page 3) to to microphone or line level. If line level is selected check to make sure that the phantom power switch for that channel is in the off position before connecting equipment.
Set the appropriate group mute switch position(s) to "ON" (see page 3).

Wire inputs and outputs using two-conductor shielded cable.

REMOTE LEVEL CONTROL

Wire the 3 "REMOTE CONTROL" connections as shown on page 3.
Raising or lowering the remote pot, will now control the output level.

PHANTOM POWER

See page 3 for locations.

GROUP MUTE

The input DIP switch position 5 (see page 3) assigns individual inputs to the group mute bus. Grounding the group mute screw, on the rear barrier strip, activates the group mute. All screw connections labeled "SH", are ground. Linked chassis's will operate on the master chassis group mute screw terminal.

LINKING

Up to 8 units of the Model 2016 may be linked together, to provide up to 64 inputs, to a common output.
There is a Master/Slave switch on the rear of the chassis (see page 3).
Set the Master/Slave slide switch, on the unit to be designated "Slave", to the slave position.
Plug in a DB9 cable set between the MASDTER and the SLAVE unit as shown on page 3.
Raising or lowering the output pot, on the unit designated "Master", will now control all inputs channels.

ALIGNMENT

Set the output pot to 3:00 position.

While someone speaks into each microphone, adjust the corresponding input pot until the desired output level is achieved. Repeat for each input.

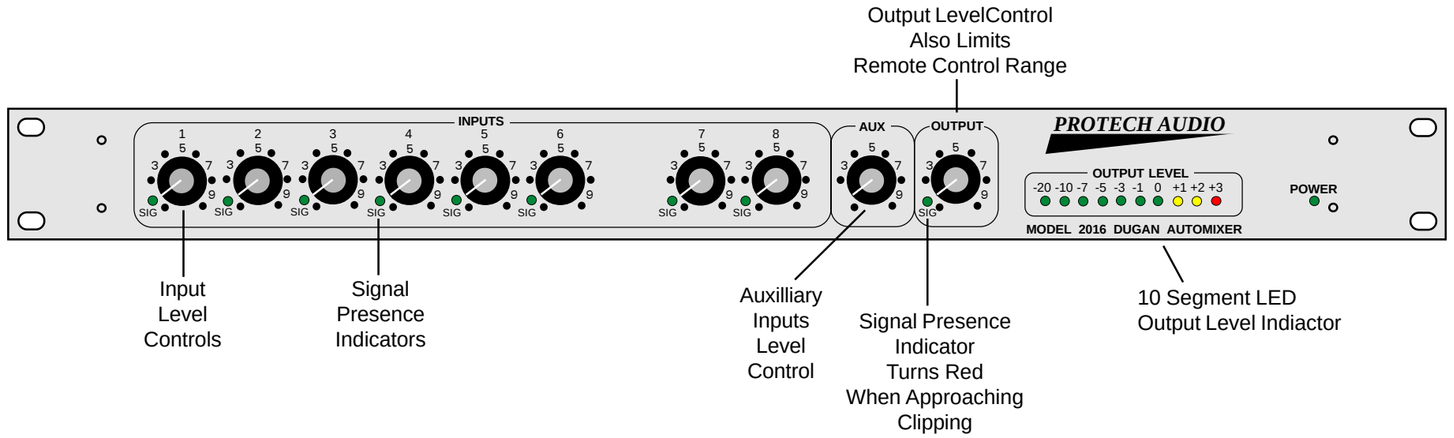
If high output level microphones (Condenser Mics) are to be used, it may be desirous to lower the input preamplifier stage to 30dB of gain. See page 3 for location of gain setting switch for each input channel.

Each channel has a signal presence indicator.

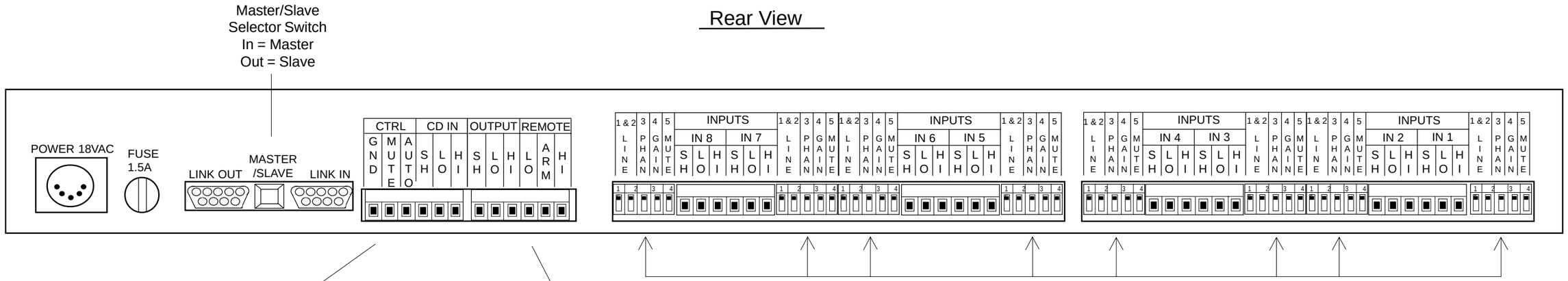
The Signal Presence/Clip indicator located at the output control turns green when the input summing bus reaches -15dB, and turns red when the bus reaches +15dB.

The alignment is now completed. The Model 2016 will ride gain on each input, in similar fashion to an experienced sound system operator, but much faster.

Front View



Rear View



Copyright Protech Audio Corporation 2012

Dugan Operation

How does an accurate implementation of the Dugan Speech system algorithm result in superior audio performance?

First, the algorithm provides more useable gain to active inputs. Unlike gating automixers, the Dugan Speech System subtracts gain from unused inputs, and makes that gain available to active inputs. Gating automixers leave that gain in the unused inputs, and therefore cannot achieve the same output level before feedback.

Trying to process coherent signals also creates problems for the gated automixers (see next page). A gated mixer does not recognize the difference between coherent and non-coherent signals. These artifacts are most noticeable in recorded proceedings, or teleconferencing applications.

Second, by subtracting gain from unused inputs, and moving it to active inputs, the amount of room echo is greatly reduced. A gated mixer would leave unused inputs at higher gain levels, and pick up more room noise. In using the Dugan automixers, the incoming teleconference signal is introduced into the local mix bus. This will turn down the gain on the microphones while the incoming signal is present and greatly reduce acoustic echo.

Perhaps the best way to describe the actual effect of the Dugan Speech System, would be to compare it to an audio professional sitting at a mix position. As an actor or entertainer walks across the stage, the person doing the mixing adjusts the faders on different inputs, to follow the action. At some point the actor will be standing directly in front of a single microphone, and the fader for that channel will be pushed to high gain, while the faders for all the other channel will be pulled down. As the actor walks across the stage, leaving one microphone position and approaching another, the mixer will pull down th fader for the one mic as he or she raises the fader for the new position. No abrupt gain changes, just smooth transitions from oneposition to the next. The Dugan Speech System does the same thing, automatically!

Doing the math.

The original Dugan algorithm works on an elegantly simple principle. *Each individual input channel is attenuated by an amount, equal to the difference in dB, between that channel's level and the level of the sum of all channel before processing. It is a continuous computing function with no threshold and no gating.*

Dugan Vs. Gated Mixing

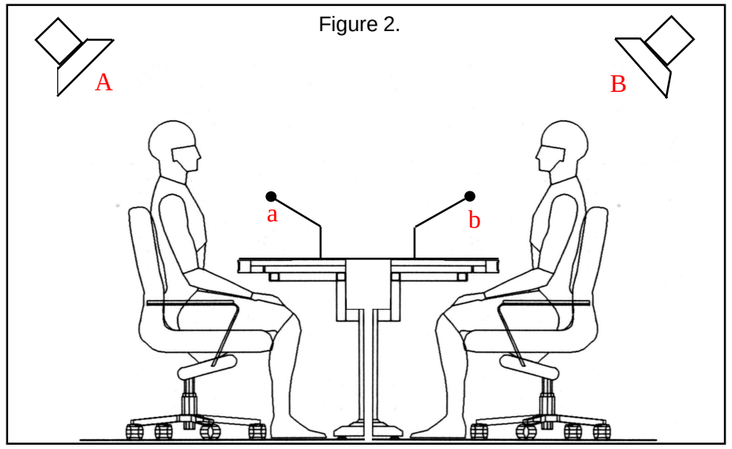
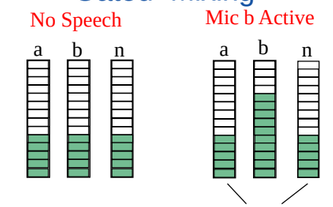


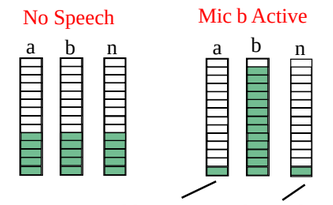
Figure 2.

Gated Mixing



Wasted Gain & Increased Echo

Dugan Mixing



More Useable Gain & Echo Reduced

Example 1- Gated Mixers.

The gain of unused microphone channels would remain at a fixed level, even though another microphone channel is in use. This results in more background noise pickup, or room echo effect from speakers A & B. It also limits the maximum gain available for the active channel, and a lower signal-to-noise ratio.

Example 2 - Dugan Mixing

In Figure 2, microphone "a" would be attenuated, while microphone "b" is in use. This will reduce the level of unwanted signals entering microphone "a". This feature would be effective for all other microphones in the system. The effect is to greatly reduce room echo. Another benefit of the Dugan mixing is the gain reduction in the unused channels makes more gain available in the active channel, resulting in a higher SPL for that signal, and a better signal-to-noise ratio.

COHERENT AND NON-COHERENT SIGNALS

In a boardroom, different talkers use different microphones, and the signals entering these two microphones are totally unrelated to each other. These signals, which bear no relation to each other are called "non-coherent" signals.

A single talker, positioned an equal distance from two microphones, produces an equal signal in both microphones. Signals of this type are called "coherent" signals. Coherent signals do not have to be equal in level, but do have to be very similar. Another example of coherent signals reaching two or more microphones results when a door is slammed or a book is dropped at an approximately equal distance from two or more microphones.

The significance of coherent and non-coherent signals is this: When two non-coherent signals of equal level are mixed together, the resultant signal is 3dB higher than either of the two original signals. When two coherent signals of equal level are mixed together, the resultant signal is **6dB** higher than either of the two original signals.

If the design of an automatic mixer were to fail to recognize that coherent signals add differently than non-coherent signals, the automatic mixer could potentially make serious mixing errors. It would even be possible for the poorly designed automatic mixer to cause the sound system to go into feedback, or create increased acoustic echo amplification. The Dugan Speech System correctly senses the presence of coherent signals.