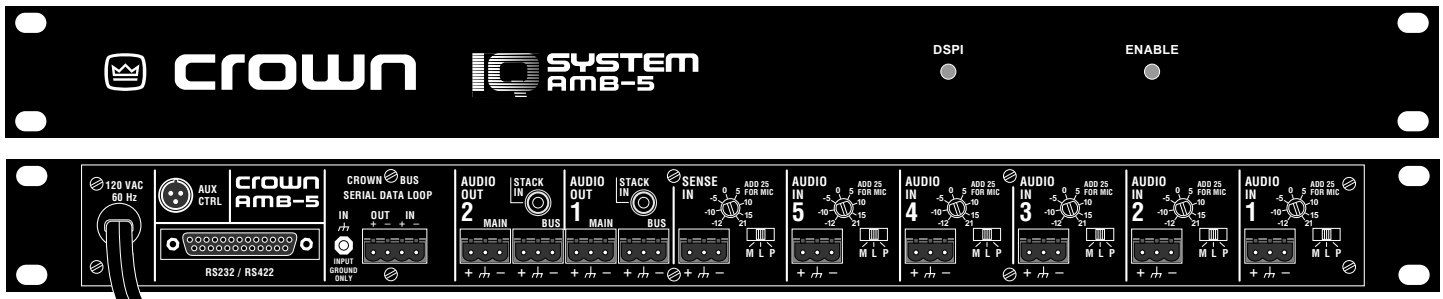


AMB-5™ Ambient Noise Sensing Mixer



AMB-5 AMBIENT NOISE SENSING AUTOMATIC MIXER
(Front Panel shown above, Rear Panel shown below)

OVERVIEW

What is an AMB-5?

The AMB-5 is a single rack space five by one automatic mixer designed to be configured with a computer and appropriate software. Once initially setup the computer becomes optional. The key to the ability of the AMB-5 operating as a stand alone automatic mixer is distributed intelligence™. In an IQ System the brains of the system live out in the system. This means the audio system is not going to be lost even if the computer or communication cables fail. The AMB-5 is a unique mixer because it is capable of sensing ambient crowd or machine noise. It uses this as a reference to adjust the gain of the five main audio inputs. The AMB-5 also has a non-automated output which may be used for monitoring or other purposes.

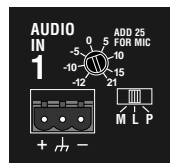
HARDWARE BLOCK DIAGRAM

Refer to the pictures of the front and rear panels shown above and the block diagram of the AMB-5 mixer on Page 2.

Audio Main Inputs:

Six balanced inputs with removable 3 pin barrier block. The preamp stage includes:

- M/L/P switches set each input to line level (L) with 0 dB gain, mic level (M) with 25 dB additional gain, or phantom (P) which is 25 dB additional gain and +44 VDC phantom power.
- A trim pot at each input allows for prefade gain adjustment of -12 dB to +21 dB gain after the M/L/P switch.
- Main input 6 is the noise sensing



input. Although it is used differently than the other main inputs, it has the same basic features as main inputs. Prefade sensors at the output of each preamp stage sense input audio level just before the input signal is delivered to the processor controlled VCAs. There are two VCAs under processor control at the output of each sensor. One VCA controls the gain from input to output mix 1 and the other VCA controls gain from the input to output mix 2. The net result is 11 VCAs total, five per output mix with one VCA to route ambient noise (input 6) to output 2. Note that in the AMB-5 there is no VCA control for input 6 to output 1.

Audio Stack Inputs:

Two inputs, one per output mix. Connections are via unbalanced RCA phono jacks. These inputs are op-amp isolated. There is no processor control of audio coming into these inputs. The purpose of the stack inputs is to allow construction of a wide mixer with more than six inputs by taking the outputs of one mixer and going into the stack inputs of a second mixer. This means that main inputs do not have to be used to expand the effective size of the overall mixer.

Audio Main Outputs:

There are two summing buses. Each summing bus provides the output mix for the corresponding output channel. Op-amps buffer the summing bus to the output connection and balance the audio output. The outputs are via 3 pin removable barrier blocks.

Audio Bus Outputs:

In addition to the two main outputs, there

are also two bus outputs. Bus outputs 1 and 2 provide the same audio output as main outputs 1 and 2. Op-amps buffer the summing bus to the output connection and balance the audio output. What makes the Bus Outputs different are relays under processor control which may be used to turn on or off the Bus Output drive. 3 Pin removable barrier blocks are used.

Aux Port:

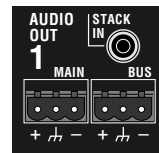
The unit is equipped with a TB-3M type mini-XLR port. This port may be used to provide a control signal or sense a control signal. Pin 1 is ground reference. Pin 2 is output under processor control. When on it provides 10 VDC at 16 ma. When off it is open collector (high impedance). Pin 3 is sensing input. +5 to +30 VDC is sensed as a logic high. The circuit floats, therefore tie to ground or TTL source for definite high or low.

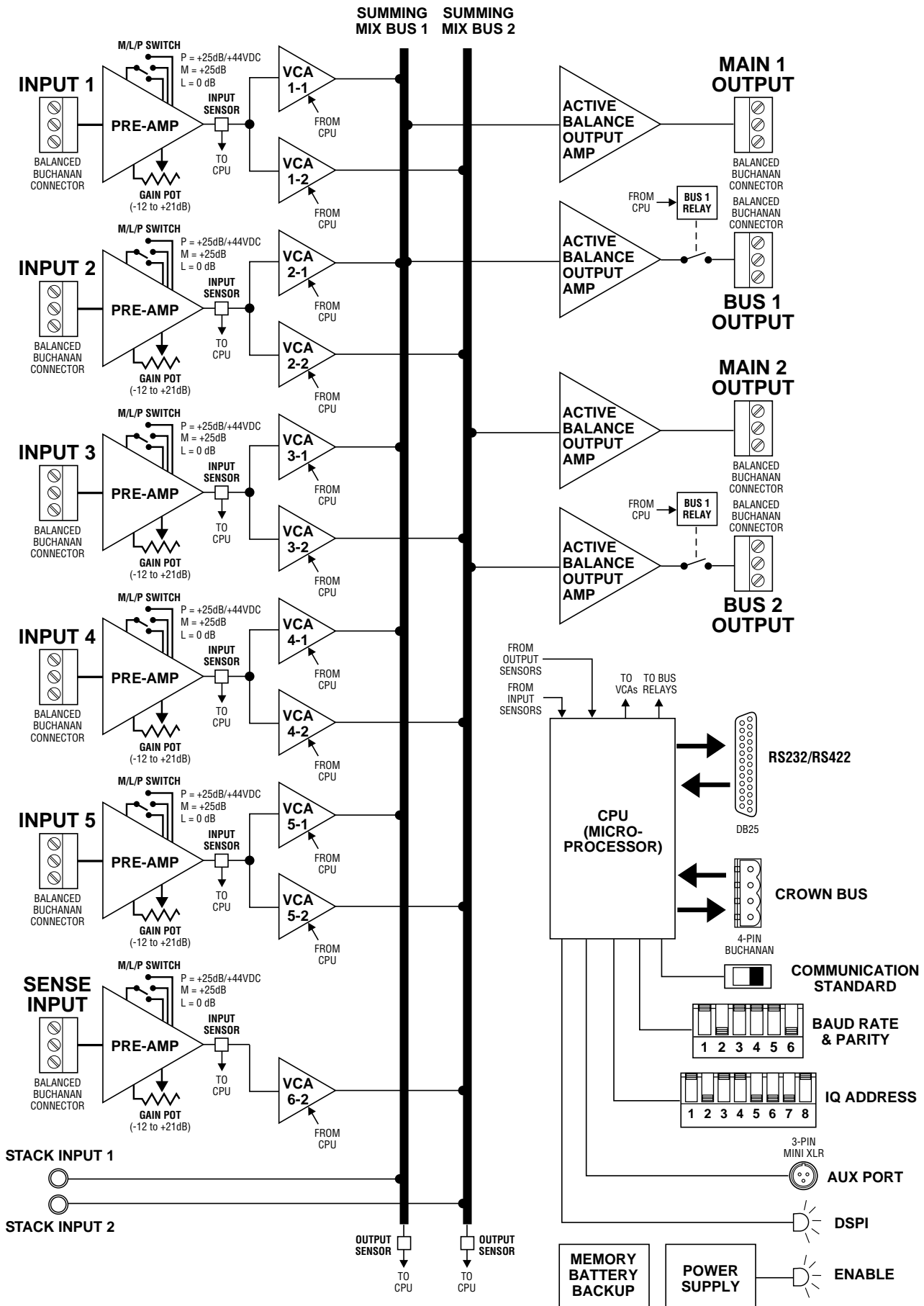
Indicators:

A Power light on the front panel indicates the unit is powered. A DSPI data signal presence indicator indicates communication.

Crown Bus Port:

The Crown Bus is a serial data loop where components are connected into the loop and one component serves as system interface for all. This unit may serve as a system interface or may simply operate as a component on a Crown Bus data loop. Although the Crown Bus may function on a variety of media, Crown uses a two-wire 20 ma current loop for input and output Crown Bus connections. On this unit connections are made via 4 pin removable barrier block. Even if the unit is communicating directly with a PC via its serial port, it always functions in software as an ad-





AMB-5 Basic Block Diagram (Page 2 of 5)

AMB-5 Automatic Mixer (Page 3 of 5)

dressable component on a Crown Bus loop. The unit must have a valid loop address. A valid address is:

- 1 to 250 set via 8 segment DIP switch
- No other AMB on the same Crown Bus data loop may have the same address.

The Crown Bus is asynchronous with 8 data bits, 1 start bit, 1 stop bit, no parity, and operates at 38400 baud. The AMB is not a U-Code protocol component.

Serial Port:

The serial port on this unit is a female 25 pin D-Shell. RS232 and RS422 are supported with 8 Data bits, 1 start bit, 1 stop bit, no parity. Up to 19200 baud supported. The serial port for the AMB may be used for direct communication with a PC such that the AMB serves as interface:

- May serve as interface for up to 20 components connected to the Crown Bus.
- Components supported include other AMB units, SMX-6 mixers, MPX-6 mixers, PIP-AP, PIP-APM, PIP-APS, all MRX matrixers, and the

White 4700 Series EQ.

- No support for U-Code protocol.

Setup Switches:

- The IQ Address is set by an 8 segment DIP switch. Valid address values are 1 to 250 (0 and 251-255 are reserved for system usage).
- RS232/422 Standard switch must be configured appropriately for use of the serial port.
- Baud is adjustable via DIP switch up to 19200. This setting must be configured properly for use of the serial port.
- Parity is set ON or OFF and ODD or EVEN via DIP switch. Normally set to OFF, this setting only applies to use of the serial port.

Memory Backup:

The unit is equipped with a rechargeable battery. The unit has 60 day memory backup on full charge.

COMPUTERIZED FEATURES

Monitoring:

Input audio level monitoring has a range of -40 to +25 dB. Input level is sensed between the preamp and VCAs for a total of 6 sensors, one per input. The output audio level is sensed at each

output mix bus with a range of -40 to +25 dB.

DSPI:

The Data Signal Presence Indicator (DSPI) light on the front panel flashes to indicate data traffic addressed to or from the unit. This light may be forced on from software.

Aux Port:

The aux port on the mixer is used to send or receive a control voltage. From software you may turn the aux output on or off. IQ software is also able to sense the status of the aux input and is capable of taking independent action based on a sensed input.

Bus Output Relays:

Audio bus outputs are identical to their respective main outputs in every way except for the addition of software controlled isolation relays.

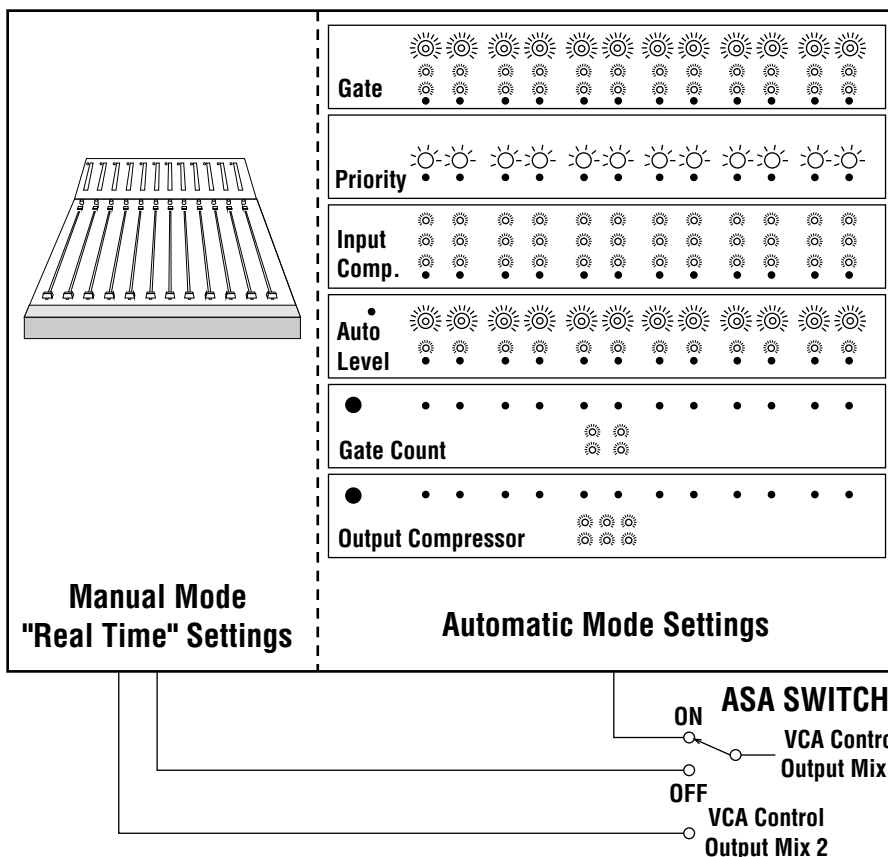
VCA Gain Control:

The heart of the AMB is its functionality as an ambient noise controlled automatic mixer. Each of the five main inputs may be routed to either or both outputs by VCAs under processor control. The noise sensing input (input 6) may also be routed to output 2 under processor control. The processor may, in turn, be set up to control the VCAs routed to output 1 using on board automatic intelligence or may be controlled in real time manually from software. The VCAs routing audio to output 2 are under manual control only. The VCAs offer a control range of -100 to +25 dB.

MANUAL MIXING IN REAL TIME

All setup for manual or automatic operation is accomplished, at least initially, with IQ software from a PC. The AMB has a software switch that puts the unit into a manual mode or an automatic mode. When in manual mode you may make changes from software that affect VCA gain in real time. Gain may also be manipulated in real time from alternate control devices such as a Drone or a third party control device (Ex. AMX, Crestron, Interface Controls, etc.). Once VCA gains are set from the PC (or control device) the processor maintains that gain structure until it receives an instruction to change. In the manual mode the automatic features such as compressors are disabled. Functions other than

AMB-5 Manual or Automatic Operation



AMB-5 Automatic Mixer (Page 4 of 5)

VCA gain control (Bus relays, DSPI, and aux output controls) are only controlled manually. No automatic mode functions are available for VCAs routing signals to output 2.

AUTOMATIC MIXING**Feature Set:**

To make use of the automatic mixing power of the AMB-5 the unit must be configured with IQ software. Once the unit is placed in automatic mode and its intelligence is fully configured, the unit will mix without further outside communication being necessary. Intelligence is programmable independently for each VCA used to route signals to output 1. Features making up the total mixing algorithm are comprised of user defined variables set in software. These features, also called algos, include:

- **Max Gain**
- **Input Noise Gate**
- **Duck Priority**
- **Input Compressor**
- **Auto Level**
- **Output Compressor**
- **Gate Count**
- **Max Number of Open Mics**
- **Ambient Noise Control**

Max Gain

The purpose of Max is to prevent feedback and provide a safety limit. Max Gain is defined as the maximum gain of the VCA regardless of interaction with other algos any time an input is gated on, or if the gate function is not used. Max Gain may be set -100 to +25 dB Gain for each VCA. Two global settings are used to tie Max Gain to the manual gain controls. These are Max Gain Tracks Control Block and Control Block Override. These are two switches which are used, usually together, to allow for smooth operational control of Max Gain for semi-automatic operation. The need for this mode of operation may arise when using third party control system products or some types of IQ controls.

Input Noise Gate

The purpose of a noise gate is to attenuate an input when little or no input signal is present. With the AMB-5 you configure various parameters which define the precise operation of the gating feature at each input. Several other automatic features also depend on proper operation of the gating function. Parameters involved are:

- Gate is an ON/OFF switch to enable or disable this feature for each VCA.

- Threshold is a parameter that sets the input level required to gate on for each VCA. The range is -100 to +25 dB sensed.

- Low Set is a parameter that sets the gain of the VCA when the input is gated off. The range is -100 to +25 dB gain.

- Delay Time is the time delay in seconds after the input level drops below Threshold until the VCA actually gates off. The range is 0.2 to 30 seconds.

Duck Priority

The duck priority feature allows the mixer to have a priority structure of up to six levels. Parameters involved are:

- Duck priority is an ON/OFF switch tells each VCA whether or not they participate in the priority structure.

- Priority level is a setting from 1 to 6 where 1 = highest and 6 = lowest priority. Each VCA is set independently.

Input Compressor

The AMB-5 mixer is equipped with both input compressor and an output compressor features. The input compressor differs from a conventional compressor due to its feed forward structure. This feed forward technology prevents "breathing" and virtually eliminates "pumping." The parameters for the input compressor are:

- Compressor is the ON/OFF switch for each VCA.

- Threshold is the sensed input level above which the compressor begins to actuate. The range is -100 to +25 dB and is set at each VCA.

- Ratio may be set to 1:1, 2:1, 4:1, 8:1, 16:1, 32:1 or ∞:1 for each VCA.

- Release Time is the time in seconds to release compression at a slope of seconds per 10 dB. The range is 0.2 to 30 seconds for each VCA.

- Attack Time is a global setting for all VCAs and may be set to fast or slow depending on your preference.

Auto Level

The auto level feature of this unit is designed to handle long term input level variations to maintain a consistent output level. This is basically done by selecting a desired average output level then setting up the other parameters to define the response. Parameters include:

- Auto Level is an ON/OFF switch that enables or disables the auto level function for each VCA.

- DAOL (Desired Average Output

Level) is the target output level you set. Once the auto level function is working the VCA raises or lowers gain as necessary to achieve the DAOL given the sensed input level. The DAOL setting range is -100 to +25 dB.

- Reaction Time is the time in seconds to change gain 10 dB toward the necessary gain structure to obtain the DAOL. The range is 0.2 to 30 seconds.

- Idle Gain is the gain that the VCA goes to when the input initially gates on. In other words it is the starting point. Used in conjunction with other features this parameter can afford the mixer a variety of complex effects such as ramping in of background music.

- Auto Level Gate Function is a global setting that may be set to Open To Idle Gain or Open To Last Position. When set to Open To Idle Gain an input will initially gate on to the Idle Gain setting and the auto level feature will take over from there. The advantage to this setting is that it allows for ramping and input gain is the same every time a gate first comes on. When set to Open To Last Position the auto level feature remembers the gain of the VCA at the time the input last gated off so that gain goes back to that level the next time that the gate opens again.

Output Compressor

The AMB output compressor is different than a conventional output compressor because you can actually choose which inputs participate in output compression. This can be a valuable tool if you have microphones on some inputs and a playback source on other inputs. You might reasonably expect that the playback source such as a CD or tape player will not output level which would require compression, so you might not configure those inputs to participate in the output compression scheme. Output compressor parameters are primarily per output rather than input and include:

- Compressor is a master ON/OFF switch that enables or disables output compression.

- Limiter is an ON/OFF switch for each VCA that configures which inputs may participate in output compression.

- Threshold is the sensed output level above which the compressor begins to actuate. The range is from -100 to +25 dB.

AMB-5 Automatic Mixer (Page 5 of 5)

- **Ratio** may be set to 1:1, 2:1, 4:1, 8:1, 16:1, 32:1 or ∞ :1.
- **Release Time** is the time in seconds to release compression at a slope of seconds per 10 dB. The range is 0.2 to 30 seconds.

Gate Count

The gate count feature attenuates all gated on inputs when more than one input is gated on by a predetermined amount. The purpose of this feature is to prevent feedback problems due to multiple open mics. Parameters include:

- **Gate Count Master** is a global ON/OFF switch.
- **Gate Count** is a set of ON/OFF switches that dictates which VCAs participate in the gate count.
- **Amount** is how much attenuation per additional open mic with a range of 0.5 to 16 dB.

Max Number of Open Mics

This feature is sometimes called a filibuster control because it can make the mixer work in a first come first served manner by limiting how many inputs may gate open simultaneously. The only parameter to set is the actual maximum number of open mics. The range is 1 to 5.

Ambient Noise Control

The ambient noise control feature of the AMB-5 is the feature that sets the AMB-5 apart. It is actually a subtractive system. The other features for automatic mixing are configured first. Mix parameters are setup based on attaining the output level you want under the highest ambient noise conditions that you are going to attempt to compensate for. The ambient noise control feature is then configured to reduce overall gain when the ambient noise is less than maximum. You essentially setup a window of maximum and minimum system gain and configure the ambient noise control feature to control gain within that range. Parameters include:

- **AMB** is the ON/OFF switch for this feature.
- **Attack Time** is the slope of gain increase as the sensed ambient noise increases in seconds per 10 dB. The range is 0.2 to 30 seconds.
- **Decay Time** is the slope of gain decrease as the sensed ambient noise decreases in seconds per 10 dB. The range is 0.2 to 30 seconds.
- **Expansion Ratio** is the ratio of the change in ambient noise to the change in gain. It may be set to 1:1, 1.5:1, 2:1, 3:1, 4:1, or 5:1.
- **Threshold** is the sensed ambient

noise level above which the mix level is adjusted by the ambient noise control function.

- **Ambient Offset** is the reduction in gain, in dB, when ambient noise is below the Threshold. The gain of the mixer at low ambient noise conditions equals programmed level minus Ambient Offset. Gain increases from programmed level minus Ambient Offset toward programmed level according to the Expansion Ratio.

SYSTEM LEVEL INFORMATION

Communication:

In an IQ System the basic communication structure is based on the premise that it must be able to support a PC being used with several IQ components. The computer is connected to the IQ System interface via RS232. The interface converts the protocol from RS232 to Crown Bus media and back again. In a small system or a single AMB system the AMB itself may serve as the system interface. The IQ-INT II, IQ-PSI, Drone, SMX-6, AMB-5 and MPX-6 are all components which may serve as a system interface for an AMB-5. The Crown Bus is a serial data loop carrier of IQ command protocol. Crown has implemented it as a two wire twisted pair current loop to allow for low cost long distance connections. For very long loops (over 1000 feet) data repeaters (IQ-RPT) or fiber optic cable may be used to connect equipment rooms that are some distance apart. The Crown Bus itself does not carry audio.

U-Code Protocol:

U-Code is new form of IQ command protocol developed for enhanced new product and third party product development. At this time the AMB-5 firmware is not written in U-Code. Although it may be used in systems with U-Code products, the AMB-5 may not be used as system interface for U-Code products.

Software:

Several IQ Software packages are available to communicate with an AMB-5. Each unit is shipped with basic DOS software which allows you to communicate with the SMX-6, AMB-5, MPX-6, and MRX Matrixer units. More advanced software includes the Turbo or Sys-

Config software packages. Turbo is a DOS program that includes powerful graphics support and support of the full IQ product line. Sys-Config is an advanced package which has security, scheduling, alert reporting, and other powerful features plus the power of Turbo built in.

PC Requirements:

The computer you select for use with your IQ System is very important. Exact minimum requirement vary depending on the software package being used, but for the more advanced software your machine should at least be a 486SX/33 with the following: 4 MB RAM, 16550 UART for the com port used by IQ, DOS 6.2, Mouse (with DOS driver, third button features supported). In most cases Turbo software will operate as a DOS application from Windows,[®] including Windows 95.[®]

SPECIFICATIONS

Maximum Input Level (Mic): +7 dBu.

Maximum Input Level (Line): +32 dBu.

Phantom Power: +44 VDC.

AC Power: 120/240 VAC 50/60 Hz.

Common Mode Rejection: 55 dB: 60 to 1 kHz typical; 45 dB: 20 to 20 kHz.

Frequency Response: +0/-1 dB, 20 to 20 kHz.
THD: <0.05% at +4 dBm output; <0.15% at +20 dBm output 20 to 20 kHz measured at mic input with 40 dB gain.

Noise: Output noise all inputs off is -80dBu (106 dB below rated output); output noise with one line input at 0 dB is 80 dB; equivalent input noise at mic input with 46 dB of gain and 150 ohm source is -125 dBu. Note that noise specs are typical, unweighted, and 20 to 20 kHz.

Crosstalk: Adjacent inputs/outputs at 1 kHz better than -80 dB; adjacent inputs/outputs 20 to 20 kHz better than -65 dB.

Guaranteed Excellence



Crown International, Inc.
Professional Audio Division
PO Box 1000

Elkhart, IN 46515-1000
Ph. 800-342-6939/219-294-8200
Fax. 219-294-8301

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