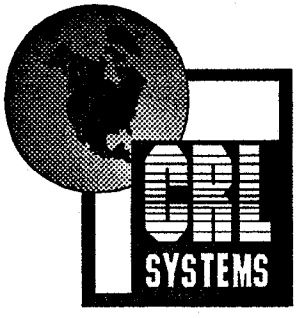
Amigo AM

Complete AM Audio Processing System

Quick Installation Guide



Circuit Research Labs, Inc.
2522 W. Geneva Drive
Tempe AZ 85282 USA
Tel: +1 (602) 438-0888
Fax: +1 (602) 438-8227

Section 2 - Installation

2.1 Preparation for Installation

This sections covers the procedures that must be followed to prepare the AMIGO AM for installation. Do not mount the AMIGO AM in an equipment rack until the internal jumpers have been checked (see 2.1.3).

2.1.1 AC Voltage Selection

Caution: Do not connect the AMIGO AM to AC Power until the Power Entry Module has been checked and/or set for the correct AC Voltage.

AMIGO AM is equipped with a Power Entry Module located on the rear panel. Inside the Power Entry Module is a voltage selector card. The card is used to set the proper AC line voltage for the AMIGO AM.

The card has 4 positions: 100VAC, 120VAC, 220VAC and 240VAC. Refer to Table 2-1 to determine the correct card position. Table 2-1 also lists the correct fuse size for each voltage.

A. Checking card position

Table 2-1 AC Line Voltage Selection

Card Position	AC Voltage Range	Fuse Rating
100	95 to 110VAC	1/4 AMP Slo-Blo
120	110 to 130VAC	1/4 AMP Slo-Blo
220	210 to 230VAC	1/8 AMP Slo-Blo
240	230 to 250VAC	1/8 AMP Slo-Blo

1. Locate the clear plastic cover located on the right side of the Power Entry Module.

2. Look through the plastic cover. A small card is located at the bottom. The card is light green in color with white lettering. A large white colored number will be visible on the card. The number will be either 100, 120, 220 or 240. This number indicates which AC line voltage the Power Entry Module has been programmed for. If the number is not correct, the following procedure explains how to change the card position and check fuse size.

B. Changing the card position and fuse

1. Disconnect the power cord from the module. Open the compartment containing the fuse and the voltage selector card by sliding the clear plastic cover to the left side of the module.

2. Remove the voltage selector card. This is done by pulling firmly on the edge of the card. Pull the card straight back. A small hole is located in the card that may be used to help remove the card.

3. Look at the top and bottom of the card. Two numbers are located on each side of the card. Turn the card so the correct number will be visible after the card is installed.

4. Install the voltage selector card firmly into the module slot. Make sure the correct number is still visible.

5. Remove the fuse from the fuse holder on the back of the compartment cover. Check the fuse to make sure it is the correct size for the voltage selected. If it is not the correct size, select a fuse as listed in Table 2-1 and insert the fuse in the fuse holder.

6. Close the compartment cover and insert the line cord into the receptacle on the module.

2.1.2 Power Cord Information

A. AC Power Inlet Connector

The AMIGO AM is connected to a power source through the Power Entry Module. This module contains a standard male IEC 320 AC power inlet connector.

B. Detachable Cordset (supplied with AMIGO AM)

The AMIGO AM is supplied with a detachable cordset. The cordset is designed to plug into the Power Entry Module. The power cord plug is intended for North American 120 Volt/60 Hz operation. The plug may require replacement with a type matching the power source (refer to TABLE 2-2 for power cord conductor identification). Optionally, a cordset may be substituted which already has the correct power source plug. Any cordset may be used that mates with a IEC 320 "Cold" Connector.

Table 2-2 Power Cord Conductor Identification

CORD SET CONDUCTOR	COLOR	ALTERNATE COLOR
Line (Hot or Ungrounded)	BROWN	BLACK
Neutral (grounded)	BLUE	WHITE
Grounding (Earthing)	GREEN/ YELLOW	GREEN

2.1.3 Internal Programming Jumpers

The AMIGO AM is equipped with internal jumpers to customize the unit to your requirements. This section contains instructions for checking the AMIGO AM internal programming jumpers. Tables 2-3 through 2-5 list each jumper, the factory set position and a brief description of its function. Check each jumper to ensure it is in the correct position.

1. REMOVE TOP COVER. Using a #1 Phillips Head Screwdriver, remove 8 screws holding the cover in place. Remove the top cover and set aside.

2. CHECK EACH JUMPER POSITION. Check the position of each jumper to ensure that it is placed in the correct position. TABLE 2-3 through 2-5 may be used as a guide. Several jumpers are located underneath the AGC circuit board. To access these jumpers, remove the 2 screws located along the right edge of the board.

3. REPLACE TOP COVER.

Table 2-3 Input and Output Jumpers

Jumper	Factory Set Position	Name and Function of Jumper
J10, J11	LOW (-5 to +20dBm)	**INPUT SENSITIVITY:** Selects input sensitivity range. Either LOW (-5 to +20dBm) or HIGH (-25 to 0dBm) may be selected. All 4 jumpers must be in the same position (HIGH or LOW).
J10A, J11A	TERM (600 ohms)	**INPUT IMPEDANCE:** Selects input impedance. Either TERM (600 ohms) or BRIDGE (10kohms) may be selected. Both jumpers are normally set for TERM. For monaural operation, set J10A to TERM and J11A to BRIDGE.
J16, J16A	HIGH (-5 to +15dBm)	**OUTPUT LEVEL:** Selects output level range. Either HIGH (-5 to +15dBm) or LOW (-15 to +5dBm) may be selected. Both jumpers must be in the same position.
J17	L	**OUTPUT MODE:** Selects the type of output signal present on the "Left Channel Barrier Strip Terminals (rear panel)." Either L or L+R may be selected. Select L for stereo operation, L+R for monaural operation.
J17A	R	**OUTPUT MODE:** Selects the type of output signal present on the "Right Channel Barrier Strip Terminals (rear panel)." Either R or L-R may be selected. R is normally selected.

Figure 2-1 Input Jumpers

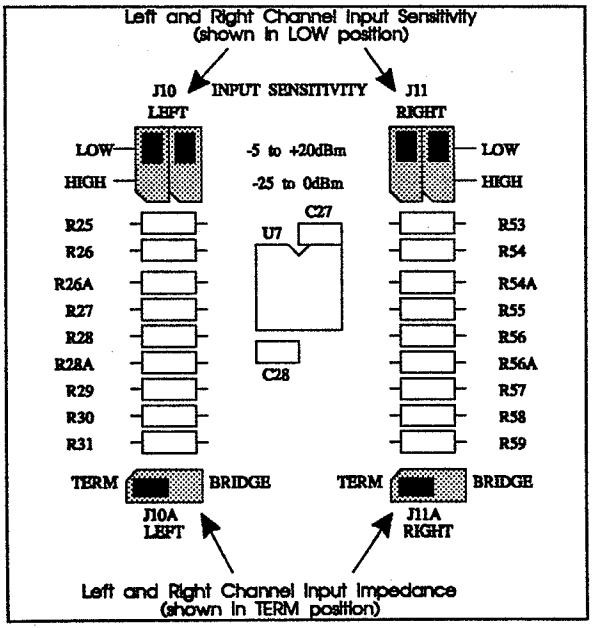


Figure 2-2 Output Jumpers

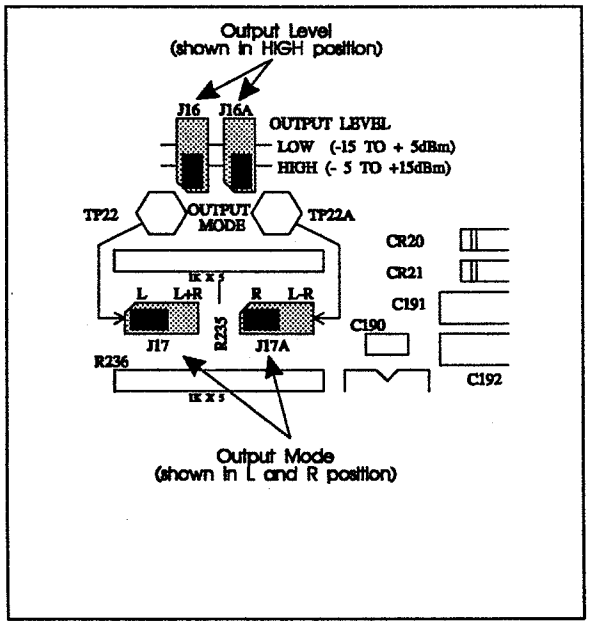


Table 2-4 Processing Jumpers

Jumper	Factory Set Position	Name and Function of Jumper
J4, J5	12 dB	**AGC DRIVE:** Selects the amount of AGC control performed by AMIGO AM. May be set for 0dB, 3dB, 6dB, 9dB, 12dB or 15dB. Smaller numbers (6dB for example) produce less control. Larger numbers produce more control. 12dB is best for most applications. Use -9 when using our SGC800 Studio AGC.
J6, J7, J8	MED	**AGC SPEED:** Selects the Release Time for the AGC. May be set for SLOW, MED or FAST. SLOW will produce less loudness, but better quality. FAST produces more loudness, but with less quality. MED is best for most applications.
J2	HIGH	**ENHANCE LEVEL:** Selects the amount of Stereo Enhancement added to the programming. May be set for LOW or HIGH. HIGH is best for most applications.
J3	HIGH	**SENSITIVITY CONTROL:** Setss the sensitivity of stereo enhancement circuitry. May be set for HIGH or LOW. When LOW is selected, more stereo separation must be present before enhancement will begin. When HIGH is selected, less stereo separation must be present before enhancement. HIGH is best for most applications.
J19, J20	IN	**PHASE PROCESSOR:** Selects whether the Phase Processor circuitry is used. May be set for IN or OUT. When IN is selected, the Phase Processor is used. When OUT is selected, the Phase Processor is not used. Phase Processing improves the loudness and quality of speech and vocals. IN is best for most applications.
J7	-20 dB	**GATE LEVEL:** Selects the audio signal level that AGC Gating occurs. Gating prevents noise, hiss and hum from being amplified during program pauses. May be set for -10dB or -20dB. -20dB is best for most applications. Use -10 when using our SGC800 Studio AGC.

Figure 2-3 AGC Drive, Speed & Stereo Enhance Jumpers

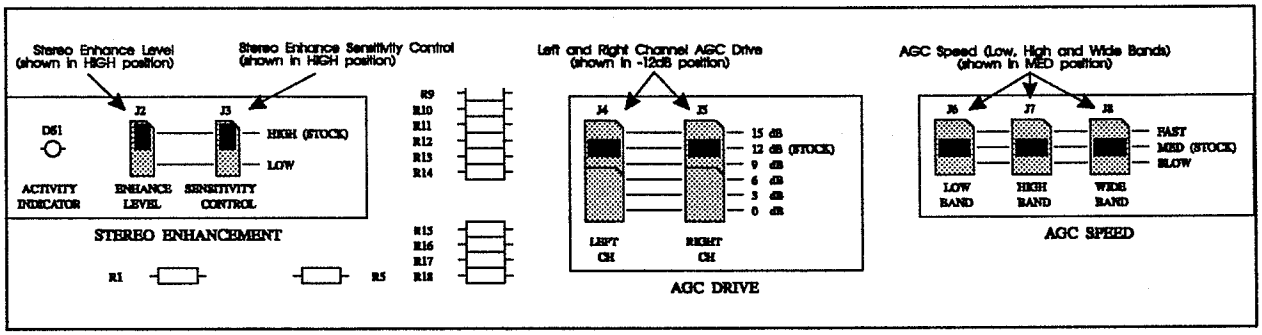


Figure 2-4 Phase Processor Jumper

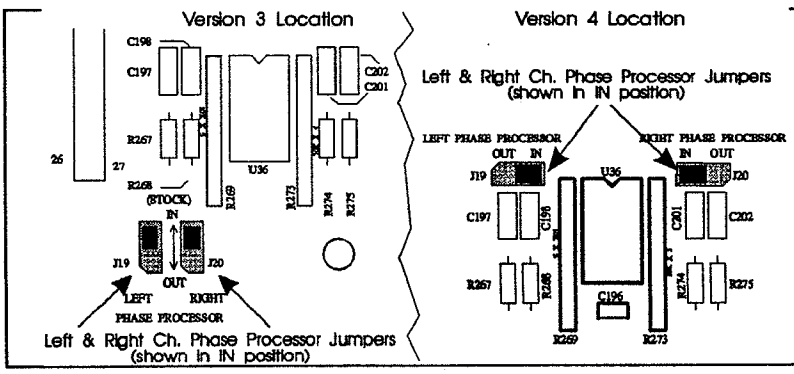


Figure 2-5 Gate Level Jumper

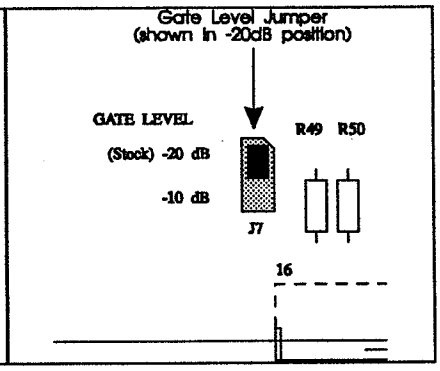


Table 2-5 Special Jumpers

Jumper	Factory Set Position	Name and Function of Jumper
J9	OUT	**MONO TILT CORRECT:** Enables tilt correction circuitry for the Auxiliary Mono Output terminals (rear panel). Setting the jumper to IN will enable tilt correction. OUT disables tilt correction. The jumper position depends upon the type of transmitter used. Set to OUT for all "PDM" and Solid State type transmitters. Set to IN for any tube type transmitter which uses a Modulation Transformer or Reactor.
J13	OUT	**NARROWBAND L-R:** Enables a special 5kHz lowpass filter in the L-R (stereo) limiter. Setting the jumper to IN enables the filter, OUT disables the filter. Enabling the filter reduces the amount of transmitted high frequency power. This feature is intended for stations with narrowband antenna systems. Note that J13 and J12 MUST be set in the same position (IN or OUT). See 3.7 for more information.
J12	OUT	**L+R NARROWBAND DELAY EQUALIZER:** Enables the L+R narrowband delay equalizer. Setting the jumper to IN enables the equalizer, OUT disables the equalizer. This jumper MUST be set to the same position as J13 (Narrowband L-R).
J3, J4	INSTALLED	**+15V, -15V POWER SUPPLY:** Used for power supply testing only. Removing the jumpers disconnect the power supply from all circuitry.
J500, J501	OUT	**L+R, L-R HF SHELF:** Enables a high frequency shelving filter to improve the high frequency modulation capability of plate modulated transmitters. Setting the jumper to IN enables theHF Shelf, OUT disables the HF Shelf. If using a plate modulated transmitter, set both jumpers to IN. For all other transmitter types, set both jumpers to OUT. **NOTE:** Version 3 circuit boards DO NOT contain J500 and J501. In order to enable the HF Shelf on this version, a 4.75 kohm 1/4W 1% resistor (included with the rack mounting hardware) must be installed on the main circuit board at R154 and R239 (see figure 2-11). DO NOT install these resistors unless you want to enable the HF Shelf for operation with a plate modulated transmitter.

Figure 2-6 Tilt Correction Jumper

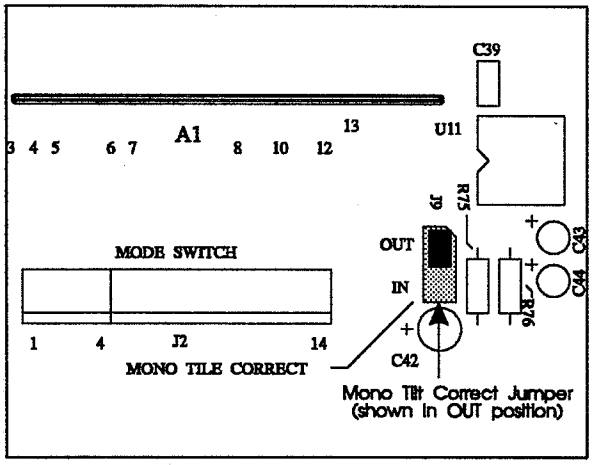


Figure 2-7 Power Supply Jumpers

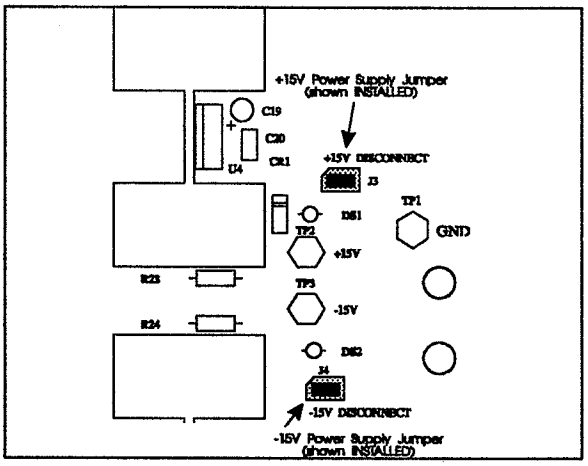


Figure 2-8 Narrowband L-R Filter Jumper

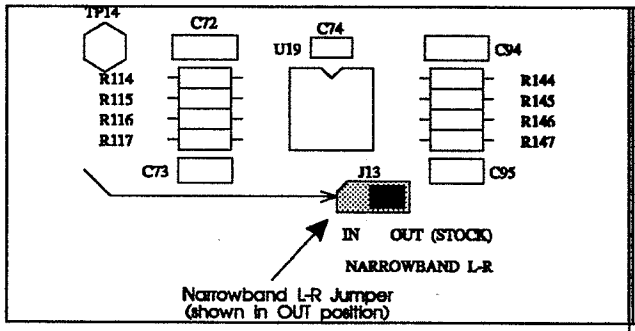


Figure 2-9 Narrowband L+R Delay Equalizer

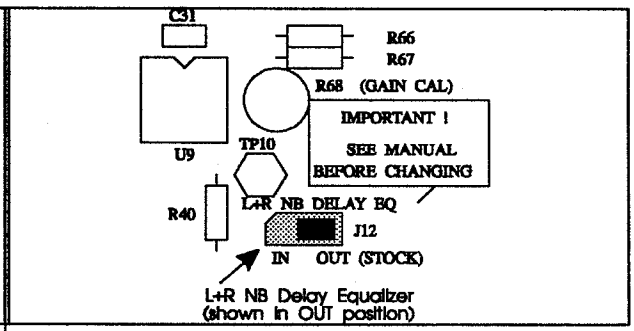


Figure 2-10 L+R & L-R HF Shelf Jumper

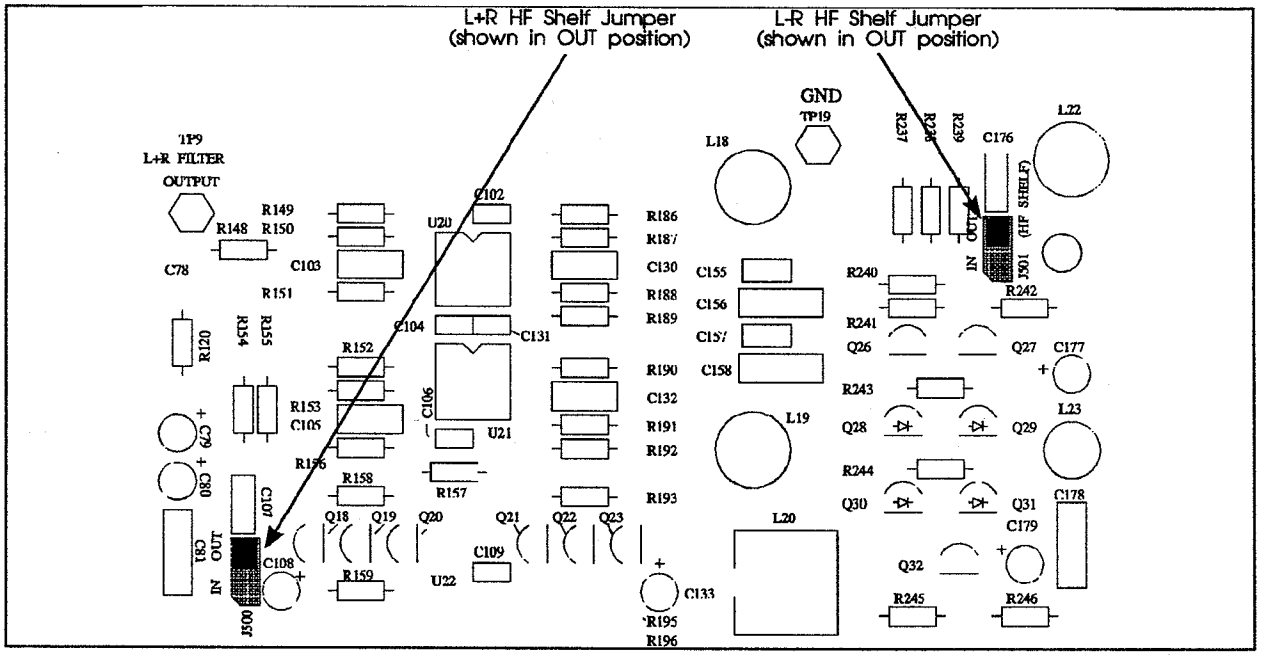
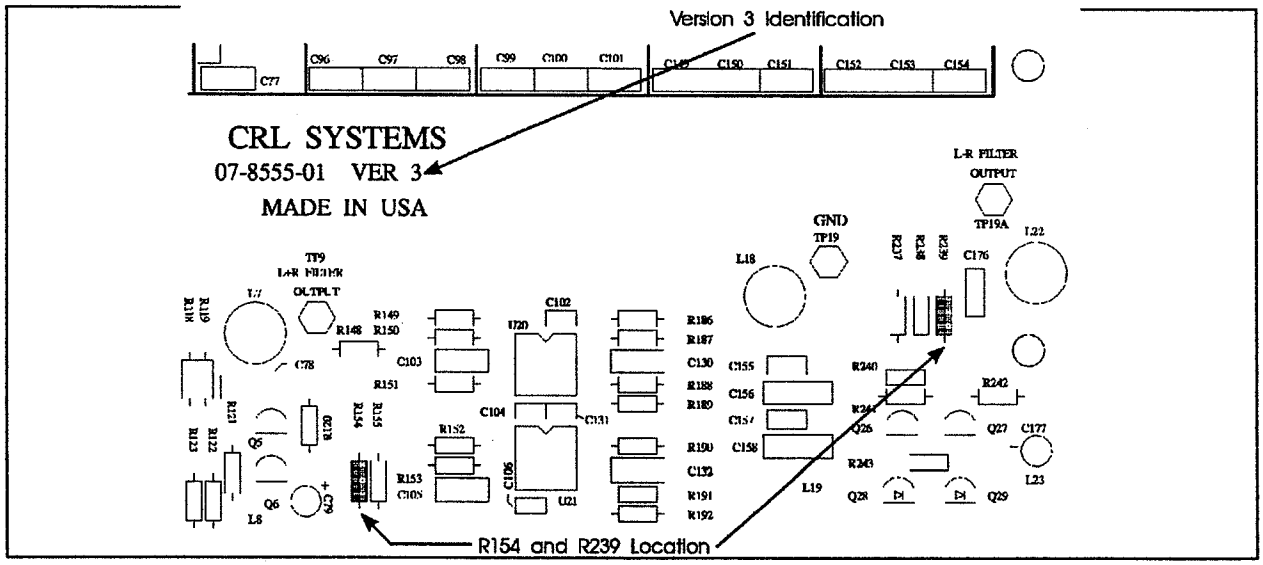


Figure 2-11 Version 3 - Enabling the HF Shelf



2.2 System Configurations

This section covers the various ways the AMIGO AM may be installed in a broadcast station.

2.2.1 General Information

AMIGO AM was designed to operate as a stand alone processor (no other audio processing is required). All audio processing functions (AGC, compression, limiting and audio filtering) are provided by AMIGO AM. Any equipment that was previously used to provide these functions will be replaced by AMIGO AM. If the studio and transmitter are at different locations, a Studio AGC may be used with AMIGO AM (see 2.2.2).

Always install AMIGO AM at the transmitter location. AMIGO AM produces a precisely limited audio signal. Atttempting to send this signal from the studio to a remote transmitter site through a telephone line or Aural STL will cause the signal to ring and overshoot. The overhsoots will require the modulation level to be reduced as much as 30 to 40%. To maximimize the performance and coverage area of the transmission system, always install AMIGO AM at the transmitter location.

2.2.2 Using AMIGO AM with a Studio AGC

If the studio and transmitter are at different locations, a Studio AGC may be used with AMIGO AM. The studio AGC is installed at the studio location, AMIGO AM at the tranmsitter location. The purpose of the studio AGC is to protect the studio to transmitter link (telephone lines or aural STLs) from overloads and clipping. In addition, the studio AGC will maxamize the signal-to-noise ratio of the link. This happens because the link can be safely driven with a higher signal level.

When using a studio AGC, our SGC800 is recommended. The SGC800 is one of the cleanest processors available, finding application in satellite up-links, down links, and hundreds of broadcast stations throughout the world. Exclusive Dynafex Noise Reduction (patented by CRL) effective removes noise from virtually any noisy source. SGC800 offers the following features:

- Advanced dual-band AGC, exhibiting very low distortion.
- Gating to prevent amplification of background noise during pauses.
- Exclusing Dynafex Noise Reduction, patented by CRL.
- Front panel equalization control to allow fine tuning of the program tonal balance (similiar to a bass/treble control).
- 1 unit rack space requirement.

NOTE: AMIGO AM is a very high quality audio processor. When chosing a studio AGC, audio quality is very important. The studio AGC s quality must be as good as that produced by AMIGO AM. If it is not, the quality of your stations sound will not be as good as it could be.

When using a studio AGC, our SGC800 is recommented. The SGC800 is one of the cleanest processors available

2.2.3 Standard AMIGO AM Connections

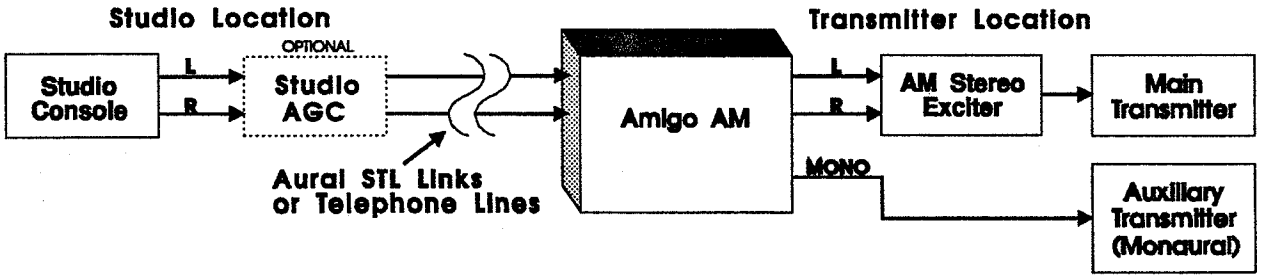
Standard AMIGO AM connections are pictured in Figure 2-10.

If the studio and transmitter are at the same location, AMIGO AMs input is connected to the studio console.

If the studio and transmitter are at different locations, a studio AGC may be connected between the console and studio-to-transmitter link. Using a studio AGC is optional (see 2.2.2).

AMIGO AMs stereo output is connected to the AM Stereo Exciter. The mono output is connected to an auxiliary (standby) monaural transmitter.

Figure 2-12 Standard AMIGO AM Connection



2.2.4 Connecting 2 Stereo Transmitters

Connecting 2 stereo transmitters to AMIGO AM is pictured in Figure 2-11. AMIGO AMs input is connected the same as shown in figure 2-10. The stereo output is connected to a stereo distribution amplifier. The distribution amplifier outputs are connected to the AM stereo exciters.

There are 2 general requirements when chosing or building a stereo distribution amplifer. First, each output must have its own gain control. These gain controls are used to adjust the modulation level of each transmitter.

The second requirement is the distribution amplifiers frequency responce. The frequency response must be - 3dB from about 0.1Hz to at least 20kHz. If these specifications are not met, AMIGO AMs precisely limited ouput will be affected. Ringing and overshoots that occur in the distribution amplifier will force the modulation level to be lowered. A lower modulation level will decrease the coverage area of your station. To avoid this problem, only use a high quality distribution amplifier.

2.2.5 Using AMIGO AM in Mono

Connecting AMIGO AM for mono is illustrated in figure 2-12. Note that the input is connected to both Left and Right channels. This is required in order for AMIGO AM to operate properly. The main transmitter is connected to a L+R (mono) output. This output is configured by an internal programming jumper to appear at the Left Channel Output terminals. An auxiliary (standby) transmitter may be connected to the Auxiliary Mono Ouput.

Three internal programming jumpers must be set for AMIGO AM to operate properly in mono:

- **Set J10A to TERM, J11A to BRIDGE.** These jumpers will configure AMIGO AMs input impedance for 600 ohms (see Table 2-3).
- **Set J17 to L+R.** This will configure AMIGO AM to provide a mono signal at the Left Channel Output Terminals (see Table 2-3).

2.3 Rack Mounting.

After the internal programming jumpers have been set, AMIGO AM can be mounted in an equipment rack. The rack should be constructed of metal and must be grounded to the transmitter site grounding system. This precaution will minimize RF feedback and interference.

2.3.1 Rack Requirements

The AMIGO AM is designed to mount in a standard 19-inch (48.26cm) equipment rack. The equipment height is 1.75 inches (4.45cm), requiring 1 Unit of rack space. The equipment depth is 17 inches (43.2cm), including all protruding connectors. The total depth required to mount the AMIGO AM is 18 inches

Figure 2-13 Connecting 2 Stereo Transmitters

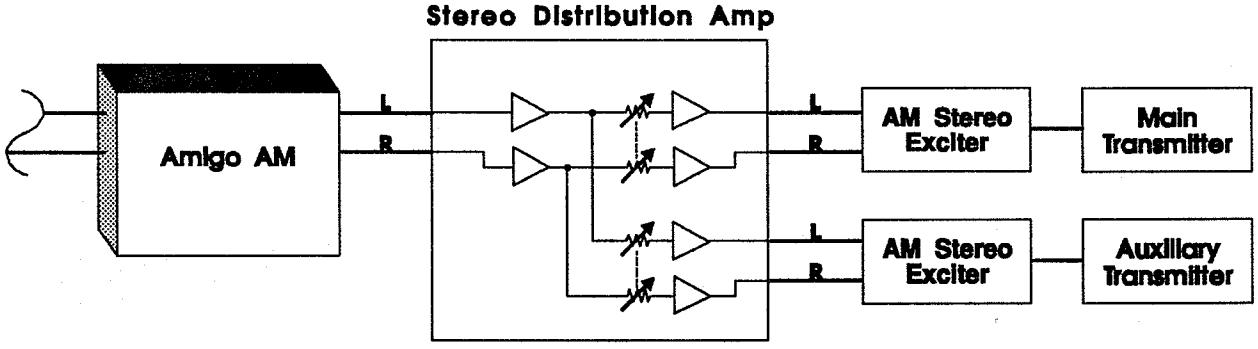
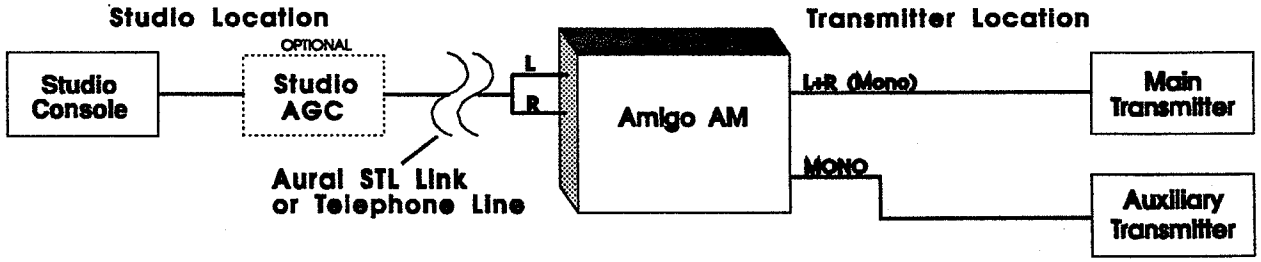


Figure 2-14 Using AMIGO AM in Mono



(45.7cm). This allows room for power and signal connections, and air circulation.

2.3.2 Mounting Hardware and Installation

Mounting hardware is included with the AMIGO AM. Included are four screws and four nylon bushings. Nylon bushings are included to prevent the screws from scratching the front panel.

1. Place a bushing on each of the screws. The screw head must face the concave side of the bushing.

2. Hold the AMIGO AM in the desired rack position. Be certain that each of the front panel mounting holes is aligned with a mounting hole in the equipment rack.

3. Insert a screw through each of the four front panel mounting holes, and tighten.

2.4 AMIGO AM Wiring

2.4.1 General Information

Careful attention to wiring and grounding is very important.

Always used two conductor shielded audio cable such as Belden 8451 (red and black twisted pair inside a shielded covering) to interconnect the equipment, including the console. Failure to use shielded cable most likely will cause problems. Unshielded wiring will pick up noise from fluorescent lighting, automotive ignition noise, motors starting and stopping, and RF interference.

Connect the shield at one end only when installing a length of shielded cable, . Connecting the shield at both ends may cause a ground loop or hum.

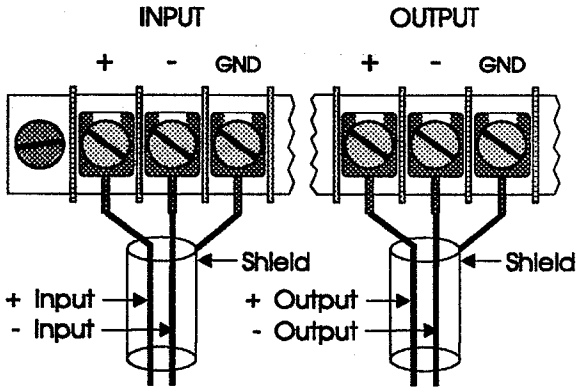
Grounding is equally important. Ungrounded equipment is likely to pick up noise. Ideally, all equipment should be grounded to a common point such as an equipment rack. The rack should then be grounded to the station's main ground point or the power line ground. Installations at transmitter sites is even more critical due to the large amounts of RF energy. All equipment racks should be connected to the transmitter's ground terminal with heavy copper strap. Oftentimes, the transmitter installation manual will offer information that is helpful to the installation of a ground system.

This unit may be wired for either balanced or unbalanced operation. Most broadcast equipment is designed for balanced line operation. **Unbalanced operation is not recommended** since RFI and hum suppression is most effective when a balanced line connection is used.

2.4.2 Wiring for Balanced Operation

Wiring for balanced operation is pictured in Figure 2-13.

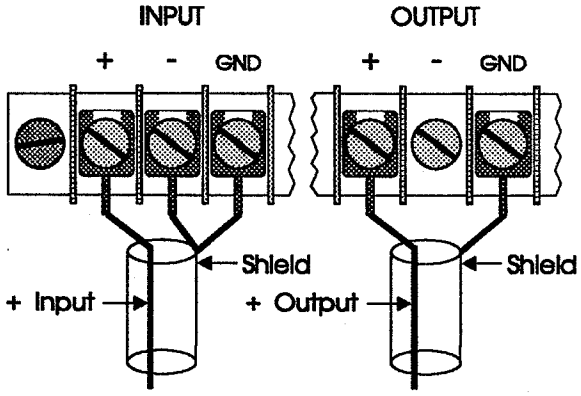
Figure 2-15 Wiring for Balanced Operation



2.4.3 Wiring for Unbalanced Operation

Wiring for unbalanced operation is pictured in Figure 2-14. Note that the Input - terminal is connected to the ground terminal. Also note that the Output - terminal is not connected. AMIGO AM does not use a transformer output. Accidental grounding of the negative (-) output terminal will short half of the output circuit. Also, the output levels will be 6 dB lower than the balanced output levels.

Figure 2-16 Wiring for Unbalanced Operation



2.4.4 Standard AMIGO AM Wiring

Standard wiring is pictured in Figure 2-15. All shields are connected in this illustration. Please note that the shield should only be connected on one end of each cable. Generally, the shield is connected on the end of the cable coming from the Output Terminals of a piece of equipment. The end of the cable going to the Input Terminals of another piece of equipment is left unconnected.

2.4.5 Wiring AMIGO AM for Mono

Wiring AMIGO AM for Mono is pictured in Figure 2-15. Please note that the input cable is connected to both left and right channels. Normally, the input cable is connected to the left channel. Two small jumper wires are then connected from the left channel + and - terminals to the right channel + and - terminals. Also note that the output to the main transmitter is connected to the left channel output.

2.4.6 Installation is now complete.

The installation of AMIGO AM is now complete. The following items should now be completed:

- Check and set AC Input Module (see 2.1.1)
- Check internal programming jumpers (see 2.1.3)
- Mount AMIGO AM in an equipment rack (see 2.1.6)
- Wire AMIGO AM inputs and outputs (2.3.4 or 2.3.5)

The following section of this manual will cover the operation, setup procedure and sound setting for AMIGO AM.

Figure 2-17 Standard AMIGO AM Wiring

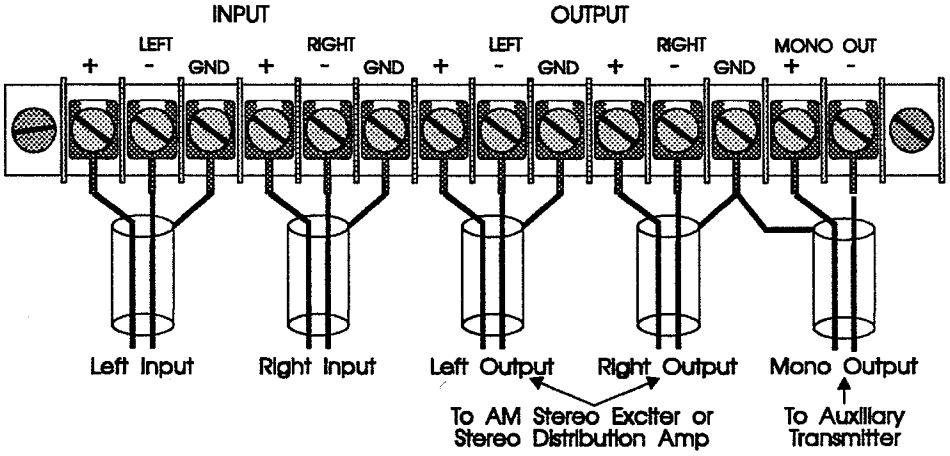
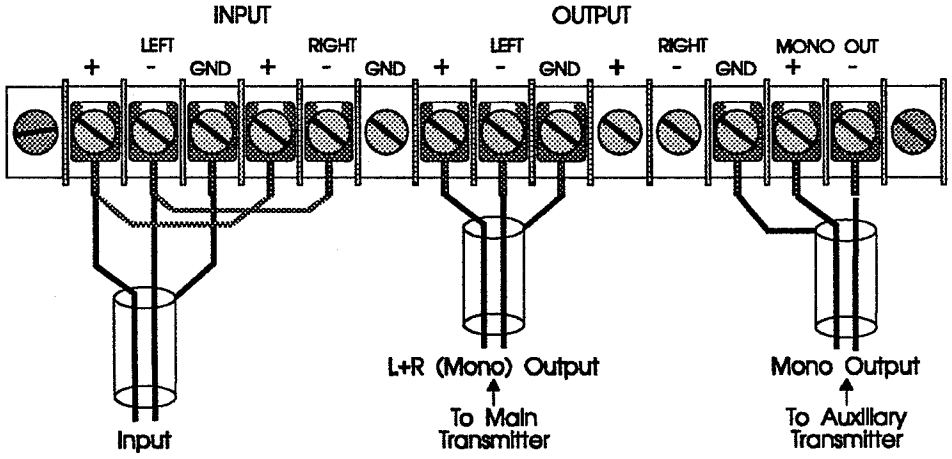


Figure 2-18 Wiring AMIGO AM for Mono



Section 3 - Operation

3.1 General

This section contains:

3.2 Front Panel Controls

The front panel layout of AMIGO AM is pictured in Figure 3-1. All important controls are located on the front panel, and are designed to make installation quick and easy. The controls are grouped into 4 convenient sections:

Input Level Section

Processing Adjust Section

Output Section

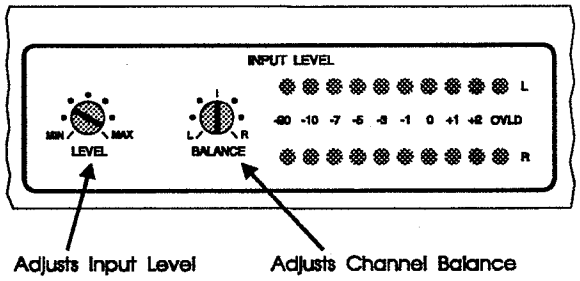
Stereo Adjust Section

3.2.1 Input Level Section

The Input Level Section is pictured in Figure 3-2 and contains:

- *Input Level Control* adjusts left and right channel input level. Turning the control clockwise increases the input level, while turning the control counter-clockwise decreases the input level.
- *Input Balance Control* adjusts input channel balance. Turning the control counter-clockwise increases the left channel input level, while turning the control clockwise increases the right channel input level. Normally, the control is set at the 12 o'clock position.
- *Input Level Meter* displays left and right channel input level. Any change made with the Input Level or Balance control is displayed on the meter. This feature makes input level and balance adjustments quick and easy. Meter calibration is in decibles and reads from -20dB to +2dB. A Red Overload LED is included to indicate when the input level is too high.

Figure 3-2 Input Level Section

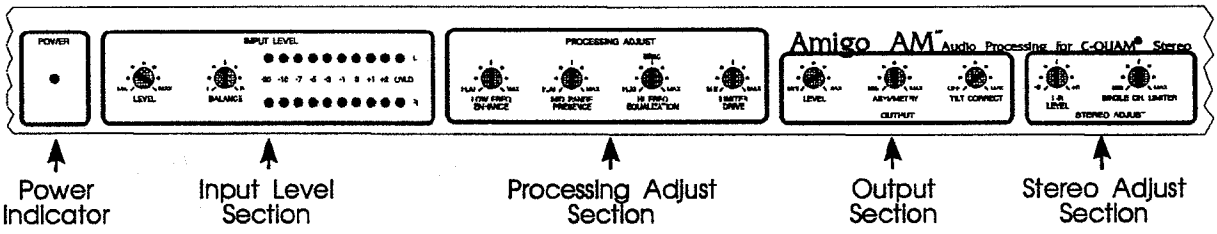


3.2.2 Processing Adjust Section

The Processing Section is pictured in Figure 3-3 and contains:

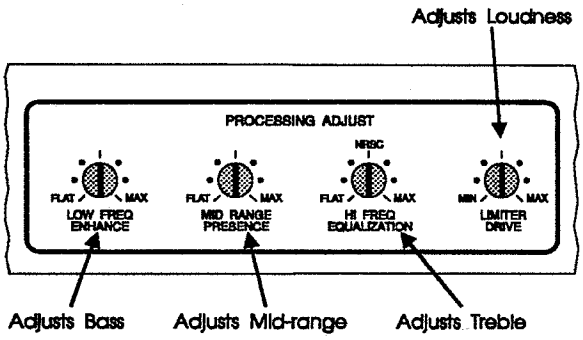
- *Low Frequency Enhance Control* adds bass to your sound. Turning the control clockwise increases the amount of bass. The control range is from +1dB to +4.5dB of boost at about 90Hz.
- *Mid Range Presence Control* adds mid range presence. Turning the control clockwise increases the amount of mid range. The control range is from 0dB to +4.5dB of boost at 3.1kHz.
- *High Frequency Equalization Control* adds treble. Turning the control clockwise increases the amounts of treble. A NRSC detent is located at the 12 o'clock position. The NRSC position adds the exact amount of high frequency equalization specified by NRSC Standards. The control range is from 0dB to +12dB of boost at 9.5kHz.

Figure 3-1 Front Panel View



- *Limiter Drive Control* adjusts loudness. Turning the control clockwise increases loudness, counterclockwise decreases loudness. The control range is from 0dB to 6dB of limiting. There is always a compromise between loudness, sound quality and coverage area. Increasing loudness lessens quality, but increases your stations coverage area. Less loudness improves quality, but decreases coverage area. The 12 o'clock position is designed to provide the best compromise between loudness, quality and coverage area.

Figure 3-3 Processing Adjust Section

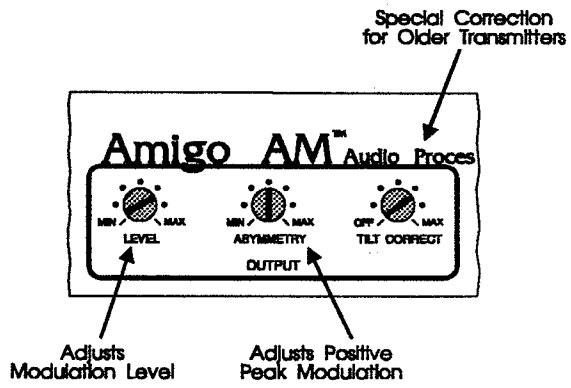


3.2.3 Output Section

The Output Section is pictured in Figure 3-4 and contains:

- *Output Level Control* adjusts the transmitter modulation level. This control has been specially designed to adjust monaural and stereo modulation at the same time. This feature eliminates the difficulty of setting monaural and stereo modulation usually experienced with other audio processors.
- *Asymmetry Control* adjusts the amount of monaural positive peak modulation.
- *Tilt Correction Control* is only used with tube type transmitters that contain a modulation transformer or reactor. PDM and solid state transmitters DO NOT require this correction. Tilt Correction compensates for low frequency "tilt" (phase shift) found in plate modulated transmitters. Proper compensation will generally allow the modulation level to be increased as much as 20 to 30%.

Figure 3-4 Output Section

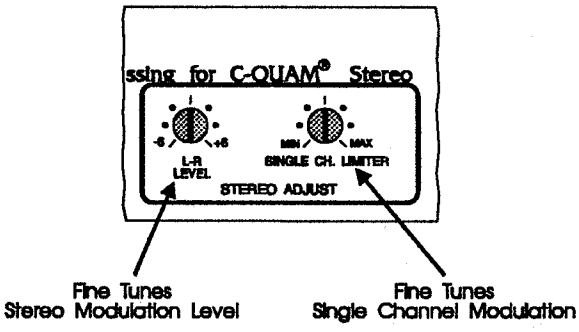


3.2.4 Stereo Adjust Section

The Stereo Section is pictured in Figure 3-5 and contains:

- *L-R Level Control* allows fine tuning of the stereo modulation level, or to reduce the amount of transmitted stereo information. The 12 o'clock position is factory calibrated to produce the optimum amount of stereo modulation in case a stereo modulation monitor is not available to make this adjustment.
- *Single Channel Limiter Control* fine tunes the maximum negative modulation level that can be produced by a single channel. This feature is required to ensure proper operation of AM stereo receivers. The 12 o'clock position is designed to produce the approximate amount of required limiting (-70%) in case a stereo modulation monitor is not available to make this adjustment. Turning the control fully counterclockwise will disable single channel limiting. This should be done before conducting "proof-of-performance" tests.

Figure 3-5 Stereo Adjust Section



3.3 Rear Panel Controls

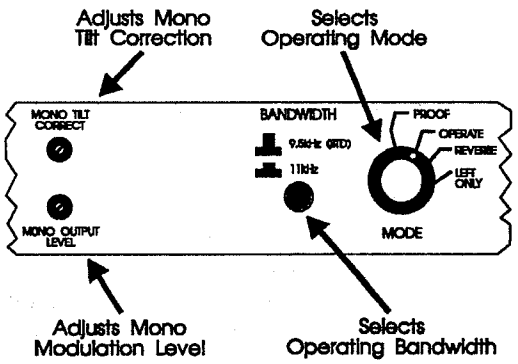
The rear panel controls are pictured in Figure 3-6. Included are:

- *Mode Switch* selects the operating mode. Four modes are available: Proof, Operate, Reverse and Left Only.

SWITCH POSITION	DESCRIPTION
Proof	All equalization and processing circuits are bypassed except single channel limiting.
Operate	Normal position of the Mode Switch. In this position, all functions of AMIGO AM are enabled.
Reverse	This position reverses the polarity or phase of the right channel input. This position is occasionally used to test for an input polarity reversal.
Left Only	This position disconnects the right channel input. This mode is used during setup to fine tune the L-R Level and Single Ch. Limiter Controls.

- Bandwidth Switch selects the operating bandwidth. Two positions are available, 9.5kHz (NRSC) and 11kHz. Normally, the switch is set for the 9.5kHz (NRSC) position.
- *Mono Output Level* adjust the mono output modulation level for an auxiliary transmitter. Please note this is a 22 turn control.
- *Mono Tilt Correct* adjusts the mono output tilt correction for an auxiliary transmitter. Please note that this control only works when internal programming jumper J9 is set to IN. Also note this is a 22 turn control.

Figure 3-6 Rear Panel Controls



3.4 Setup Procedure

This sections begins with the initial adjustment of your audio processing chain (studio console, studio AGC and AMIGO AM). Then, fine tuning your station's sound is covered.

3.4.1 Getting Started

The first step can be time consuming and a little boring, but it is very important. Before doing anything else, look over the installation and setup information included in this manual, and that for any other processor which will be used (such as a Studio AGC). The goal is to understand the basic operation of each control located on the processor. If you are not sure about a control or are confused, call us (or the manufacturer of other equipment used). There is no such thing as a dumb question!

The audio chain must be adjusted from beginning to end. In other words, the Studio AGC (if used) is adjusted first, then AMIGO AM.

Finally, initial adjustments should be made with the transmitter turned OFF.

3.4.2 Start with the Studio Console

Play some every day programming at normal operating levels. If the console operators normally like to "pin" the VU meter, you should do the same. The point is to simulate normal operating levels.

TIP: If possible, play monaural programming. This will make the adjustment of input levels and channel balance much faster and more accurate. It will also be much easier to identify any audio phasing problems (where the + and - wiring connections are reversed)..

3.4.3 Adjusting the Studio AGC

If a Studio AGC is used, it is adjusted first. Start with the input level adjustment or calibration. Next, set the AGC for about 9dB of gain reduction. Sometimes a control is provided for this adjustment, other times the amount of gain reduction is adjusted with the input level control. Next, set the release time to Medium or mid-scale. If the processor includes Gating, always turn it ON. Finally, set the output level to the desired level (usually +4dBm to +8dBm). **NOTE:** If using our SGC800 Studio AGC, refer to section 3.9 for recommended settings.

Note: If the AGC will be driving a STL or phone lines, make sure the output amplitude of the AGC is not too high. A level that is too high will cause distortion.

STLs usually include a peak deviation meter that can be used to check this. If the meter shows excessive deviation, turn the AGC output level down.

Phone lines are harder to check. In addition, they must be checked at the transmitter end. This check can be made with an oscilloscope. Look for clipping on the audio peaks. If an oscilloscope is not available, a pair of high impedance headphones (600 ohms or greater) can be used. Connect them across the phone line. Listen carefully for distortion or an edgy ragged sound.

3.4.4 Initial Control Settings

The next step is to setup AMIGO AM. Begin by setting each control listed in Table 3-1 to the position indicated.

Table 3-1 Initial Control Settings

CONTROL	INITIAL SETTING
Input Level	MIN
Input Balance	12 o'clock
Low Freq Enhance	12 o'clock
Mid Range Presence	12 o'clock
Hi Freq Equalization	12 o'clock
Limiter Drive	12 o'clock
Output Level	MIN
Asymmetry	MIN
Tilt Correct	OFF
L-R Level	12 o'clock
Single Ch Limiter	12 o'clock
Mode (rear panel)	Operate
Bandwidth	9.5kHz or as required
Mono Output Level	Fully counter clockwise (22 turns)
Mono Tilt Correct	Fully counter clockwise (22 turns)

3.4.5 Input Level Adjustment

Turn the LEVEL Control clockwise while watching the Input Level Meter. Adjust the control until the 0 LED is flashing regularly. The +1 LED and +2 LED may flash occasionally, but should not be flashing all the time. **The Red OVLD LEDs should never flash.**

3.4.6 Input Balance Adjustment

This check must be made with monaural programming. Check the Input Meter to see if the LEDs are flashing the same on each channel. If they are not, adjust the Balance Control until they are.

3.4.7 Output Level Adjustment

Note: Before beginning this step, double check the Output Level Control to make sure it is turned fully counter-clockwise.

In this step you will adjust the monaural modulation of your transmitter. The modulation level may be monitored with an oscilloscope, monaural modulation monitor or stereo modulation monitor. If using a modulation monitor, observe the negative L+R (monaural) modulation. If using an oscilloscope, observe an RF sample of the transmitters output.

Begin by turning the transmitter ON. Slowly turn the Output Level Control clockwise while observing the negative L+R modulation level. Adjust the control until the desired negative peak modulation level is reached (usually 90% to 95%).

TIP: If you are making this adjustment with a modulation monitor, set the monitors peak flasher to the desired modulation level (95% for example). Adjust the Output Level Control until the peak flasher just begins to flash. Make sure the monitors -100% flasher does not light. If it does, turn the Output Level down slightly.

If the modulation level is very low even with the Output Level Control turned fully clockwise, there may be a polarity reversal in the AMIGO AM input or output wiring. First, turn the Output Level Control fully clockwise. Next, try turning the rear panel MODE Switch to REVERSE. If this corrects the problem, reverse the right channel input + and - wiring connections. Also return the Mode Switch to the OPERATE position. If

that does not fix the problem, return the Mode Switch to the OPERATE position. Then try reversing the right channel output + and - connections. One of these polarity changes (input or output) should correct the problem.

3.4.8 Tilt Correct Adjustment

This adjustment is only required if you have a tube type transmitter using a modulation transformer or reactor. If you have a PDM or solid state transmitter, skip this step. This section begins with some general information on tilt correction, followed by an adjustment procedure.

Tilt correction is required to compensate for low frequency phase shift and rolloff in the transmitter. If left uncorrected, low frequency square waves (or clipped wave forms) will be tilted. Tilting will cause a loss of peak modulation which will result in less loudness and coverage area.

Figure 3-7 shows what a low frequency square wave looks like on a transmitter that does not need tilt correction. Notice that the positive and negative peaks are perfectly straight. Figure 3-8 shows a transmitter that does need tilt correction. Notice that the positive and negative peaks are tilted.

Figure 3-7 Normal Modulation (no tilt present)

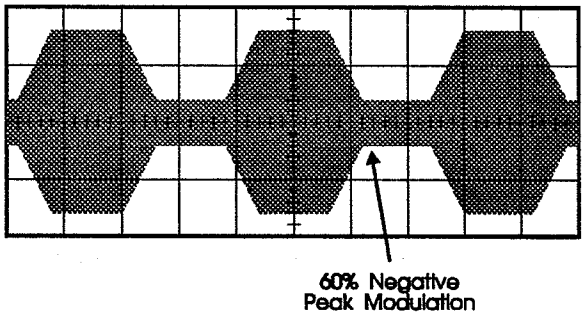
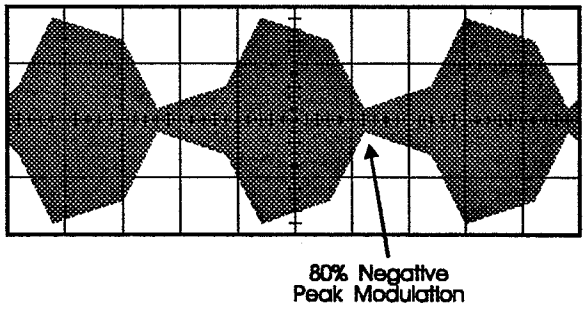


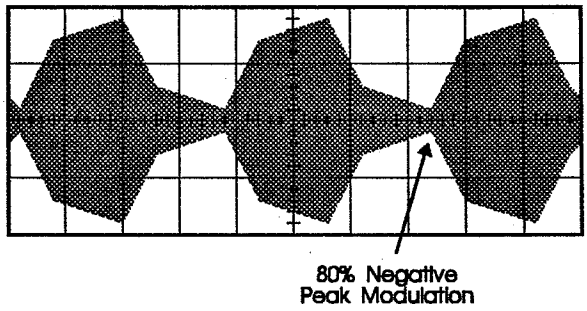
Figure 3-8 Uncorrected Modulation (tilt present)



The loss of peak modulation is illustrated by comparing Figure 3-7 and 3-8 The tilting in Figure 3-8 causes the peak modulation to be 80%. When the tilting is corrected, the peak modulation will decrease to 60% as shown in Figure 3-7. This allows the transmitters modulation level to be increased significantly. Increasing the modulation from 60% to 80% is a 13% (2.5dB) increase in loudness, and will result in a larger coverage area.

Figure 3-9 shows too much tilt correction. Notice that the positive and negative peaks are tilted in the opposite direction as the uncorrected peaks (Figure 3-8). Also notice that the peak modulation level has increased to 80%. When adjusting the Tilt Correct Control, the goal is to straighten the peaks. Too little or too much correction will cause the peaks to be tilted in one direction or the other.

Figure 3-9 Over-corrected Modulation



The best way to adjust tilt correction is to observe an RF sample (from the transmitter) with an oscilloscope. If an oscilloscope is not available, a modulation monitor can be used but it is more difficult to make an accurate adjustment.

This adjustment will be made with program material. Although using a signal generator will produce greater accuracy at a single frequency, program material is the preferred signal source. This is due to the fact that the average tilt can be corrected over a wider range of frequencies when program material is used.

Tilt Correction Procedure:

1. Turn AMIGO AMs Output Level Control to produce about 70% negative modulation.

2. The following control changes are intended to produce highly clipped audio wave forms. The audio being transmitted will be very distorted. First, note the setting of the Input Level Control so it may be reset when the procedure is completed. Next, turn the Input Level Control until the Red OVLD LEDs on the Input Meter

begin to flash. Finally, set the controls listed in Table 3-2 to the positions indicated.

Table 3-2 Control Settings to Adjust Tilt Correction

CONTROL	SETTING
Low Freq Enhance	MAX
Mid Range Presence	FLAT
Hi Freq Equalization	FLAT
Limiter Drive	MAX

3. If using an oscilloscope, observe the negative peaks of bass or low frequency notes as they occur. If they are tilted, correction is needed. Turn the Tilt Correct Control clockwise slightly until it "clicks" on. Slowly turn the control clockwise while observing the clipped low frequency notes. Adjust the control until the tilting is removed. Keep in mind that if too much correction is applied, the tilting will reappear in the opposite direction.

4. If using a modulation monitor, observe the negative peak modulation. Keep in mind that this method is not as accurate as using an oscilloscope. The goal of this method is to apply correction until the lowest peak modulation level is observed. Adjustments must be made slowly. In addition, the affect of each adjustment should be observed for several moments to determine if the peak modulation has decreased or increased. Slowly turn the Tilt Correct Control clockwise while observing the peak modulation. As the control is turned clockwise, the peak modulation will decrease. Eventually as the control is turned clockwise, a position will be found that causes the peak modulation to increase. When this position is found, turn the control counterclockwise until the lowest amount of peak modulation is observed.

5. If it was not possible to make the correction, turn the Tilt Correct Control to the OUT position. The condition of transmitter modulating components should be checked before attempting to repeat this procedure. In addition, check for the presence of inadequate (too small in value or defective) AC coupling capacitors at the transmitter audio input or modulator.

6. Tilt Correction should now be completed. Turn the Input Level control back to its original position. Next, set the controls listed in Table 3-3 to the positions indicated. Finally, the Output Level Adjustment will have to be made again (repeat section 3.4.7).

Table 3-3 Control Settings after Tilt Correction

CONTROL	SETTING
Low Freq Enhance	12 o'clock
Mid Range Presence	12 o'clock
Hi Freq Equalization	12 o'clock
Limiter Drive	12 o'clock

3.4.9 Asymmetry Adjustment

In this step you will adjust the transmitters monaural positive peak modulation. A modulation monitor should be used to make this adjustment. Using an oscilloscope to make an accurate adjustment is very difficult. If a modulation monitor is not available, you have two options. First, leave the Asymmetry Control in the MIN position. Second, turn the Asymmetry Control to the 12 o'clock position. This will produce about 110% positive peak modulation. If your have a PDM or Solid State transmitter, turning the control to 12 o'clock is a good option. If your have a tube type transmitter with a modulation transformer (or reactor), the best option is to leave the control in the MIN position. Oftentimes, these types of transmitters do not handle positive peak modulation above 100% to 105% without causing distortion.

Begin by setting the modulation monitor to measure L+R (monaural) positive peak modulation. Slowly turn the Asymmetry Control clockwise while observing the L+R positive peak modulation. Adjust the control until the desired positive peak modulation level is reached (usually 115% to 125%).

If the positive peak modulation does not change when turning the Asymmetry Control: two problems can cause this to happen. Begin by checking the negative peak modulation. See if the negative peak modulation changes when the Asymmetry Control is turned. If it does, there is a wiring problem (the output polarity is reversed).

If the negative peak modulation does not change when turning the Asymmetry Control in the previous check: there is probably a transmitter problem. For some reason, the transmitter can not produce positive peak modulation. The best option at this point to to leave the Asymmetry Control in the MIN position. As soon as possible, the transmitter should be checked to determine the problem.

Turn the transmitter OFF. Reverse the Left Channel Output + and - wiring connections. Also, reverse the Right Channel Output + and - wiring connections. Next, turn AMIGO AMs Output Level and Asymmetry Controls fully counter-clockwise. Finally repeat the Output Level Adjustment (see 3.4.7) and Asymmetry Adjustment (see 3.4.9).

3.4.10 Stereo Balance Adjustment

In this step you will fine tune the stereo balance to produce the best possible channel separation. A stereo modulation monitor is required to make this adjustment. If one is not available, leave the L-R Level Control in the 12 o'clock position.

1. Turn the rear panel Mode Switch to the LEFT ONLY position.

2. Set the stereo modulation monitor to measure right channel modulation.

3. Very little right channel modulation should be observed on the monitor.

4. The L-R Level Control is adjusted to produce the smallest amount of right channel modulation. Try turning the control clockwise, then counter-clockwise. Leave the control in the position that produces the smallest amount of right channel modulation. Typically, the right channel modulation should be -25dB to -30dB.

3.4.11 Single Channel Limiter Adjustment

In this step you will fine tune the single channel limiter. A monaural or stereo modulation monitor is required to make this adjustment. If one is not available, leave the Single Ch Limiter Control in the 12 o'clock position.

1. The rear panel Mode Switch should still be in the LEFT ONLY position.

2. Set the modulation monitor to measure negative L+R (monaural) modulation. Adjust the Single Ch Limiter Control until the modulation monitor shows -70% peak modulation.

TIP: Set the monitors peak flasher to 70% Turn the control counter-clockwise until the peak flasher stops flashing. Then turn the control clockwise until the peak flasher just starts to flash.

3. Turn the rear panel Mode Switch to the Operate position.

3.4.12 Final Checks

The basic adjustment of AMIGO AM is now complete. Before proceeding, it is a good idea to watch the input level meter and the modulation level of the transmitter for awhile. Sometimes a slight adjustment needs to be made.

Begin with the Input Meter. Make sure the red OVLD Leds never flash. Next, watch the negative and positive peak modulation L+R (monaural) levels. Make sure -100% and +125 limits are not exceeded.

3.4.13 Monaural Output Adjustments

Note: If the auxiliary transmitter will require tilt correction, internal programming jumper J9 must be set to IN. The factory set position for this jumper is OUT. The Mono Tilt Correction control is disabled in the OUT position.

This section covers the setup procedure for AMIGO AM to drive a monaural auxiliary transmitter. Please note that the stereo setup should be done before starting this procedure (section 3.4.1 through 3.4.12).

1. Make sure the rear panel Mono Output Level and Mono Tilt Correct controls are turned fully counter-clockwise. Both controls are 22 turn potentiometers, so be sure to turn each control at least 22 turns.

2. Connect an oscilloscope or modulation monitor to a RF sample output of the auxiliary transmitter.

3. Turn the MONO OUT control clockwise until the desired negative modulation peaks as observed on the oscilloscope or modulation monitor (usually about 95%).

Note: The asymmetry has been previously set for the main transmitter in Section 3.4.9. Verify that the auxiliary transmitter is capable of the positive peak modulation previously set for the main transmitter. For example, if the main transmitter's positive peak modulation was set for 120%, the auxiliary transmitter should be producing positive peaks of about 120%. If the positive peak capability of the auxiliary transmitter is significantly less than the main transmitter it may be desirable to reduce the amount of positive peak modulation to a level that the auxiliary transmitter can produce using the procedure in Section 3.4.9.

4. If the auxiliary transmitter requires tilt correction, the adjustment is made using the procedure in Section 3.4.8 using the rear panel control (instead of the front panel control described in 3.4.8).

3.5 Using AMIGO AM in Mono

This section describes the differences in the setup procedure (section 3.4) if you are using AMIGO AM in mono.

Basically, the setup procedure for using AMIGO AM in mono is almost identical to the stereo setup procedure. The only difference is that two stereo adjustments do not need to be made.

3.5.1 Mono Setup Procedure

1. Perform the adjustments in section 3.4.1 to 3.4.9.

2. Skip section 3.4.10 (Stereo Balance Adjustment). This sections covers the adjustment of the L-R LEVEL Control. Leave this control in the 12 o'clock position.

3. Skip section 3.4.11 (Single Channel Limiter Adjustment). This sections covers the adjustment of the SINGLE CH. LIMITER Control. Leave this control in the 12 o'clock position.

4. Perform the adjustments in section 3.4.12 and 3.4.13.

3.6 Adjusting Your Station's Sound

3.6.1 General Guidelines

The last step in setting up an audio processing chain is the most fun. The hard work of installing the equipment is done, and now it is time to make the equipment produce the type of sound you want.

Before starting, a few general guidelines:

1. Do most of your critical listening with a radio or stereo that you are used to listening to. It will be more comfortable for you. But be sure to listen to other radios too. All radios and stereos generally sound different from each other. Sometimes it is necessary to make an compromise when making adjustments. For example, if the amount of bass is adjusted when listening to a naturally bassy radio, other radios will sound thin or lacking in bass. In this situation, the bass should be set to sound good in the other radios, but not too boomy in the first radio.

2. Make one adjustment at a time. Listen to the change and evaluate the difference. Then make the next adjustment. Making many adjustments at the same time can make it very difficult to decide which adjustment caused a particular difference.

3. The best way to learn what each processing control does is to try it. Do not be afraid to play with the controls! Any of the 4 controls located in the Processing Adjust Section can be safely turned through the entire range. Try turning each control throughout its range. Listen to each change. Some changes may be subtle and difficult to notice. Other changes will be very noticeable. The experience you gain by playing with the controls will be very useful later on.

3.6.2 Start by listening to your station for a while.

Before making any changes, listen to your station for awhile. Then compare your station to other stations in the area. As you listen, think about the following items:

- How does the Bass sound (too much, not enough or just right) ?
- How does the Mid Range (voices for example) sound (too much, not enough or just right) ?
- How is the station loudness (too much, not enough or just right) ? When judging loudness, it is best to compare your station's loudness to another station in your area. Try to remember how your loudness compared to the other station before AMIGO AM was installed. Then compare that to your loudness now. This might help you decide if your loudness is OK.
- How is your station's audio quality (very good or too distorted) ? Like judging loudness, audio quality should be judged by comparing your quality to another station in the area. Also, try to remember how your quality compared before AMIGO AM was installed.

- How does the the audio fade at the end of a song (too much, not enough or just right) ?

After making an evaluation of your station's sound, you should have a fairly good idea of any changes you would like to try.

3.6.3 Adjusting Bass and Mid Range

Adjusting Bass and Mid Range is very easy. Both of these controls were set to the 12 o'clock position initially. If you would like a different amount of bass or mid-range, try the settings in the following tables.

Table 3-4 Recommended Bass Settings

Station Format	Low Freq Enhance Setting
Music	12 to 2 o'clock
Talk	3 o'clock

Table 3-5 Recommended Mid-Range Settings

Desired Sound	Mid Range Presence Setting
Warm (less brightness)	9 to 10 o'clock
Standard Brightness	11 to 1 o'clock
Bright	2 to 3 o'clock
Very Bright	3 o'clock to MAX

After making the change, listen to your station for awhile. Also compare your station to others in your area. Do you like that change, was it too much or not enough ? If you do not like the change, try changing the control again. By using this procedure (listening, control change, listening, and so on), you will quickly learn which setting you like best.

3.6.4 Adjusting Loudness and Quality

Loudness and quality are both controlled by the Limiter Drive Control. There is always a compromise between loudness, sound quality and coverage area. Increasing loudness lessens quality, but increases your stations coverage area. Less loudness improves quality, but decreases coverage area. The 12 o'clock position is designed to provide the best compromise between loudness, quality and coverage area.

If you want more loudness, try turning the Limiter Drive Control clockwise. Try the 1 o'clock position, then the 2 o'clock position, and finally the 3 o'clock position. The amount of audible distortion will increase as the control is turned up. The trick in producing maximum loudness and coverage is to find the control setting that produces objectionable distortion (distortion that will be noticed by your listeners). Once this point is found, turn the control down slightly.

TIP: Sometimes hearing distortion is difficult until excessive amount are present. Hearing subtle amounts of distortion involves training the ear to know what to listen for. Once you know what to listen for, even small amounts of distortion are easy to hear.

The best type of programming to hear distortion is music with female vocals. Try to find a song where the singer has alot of substained notes. For example, she may sing a word and stretch out the word for several seconds at a steady volume.

Listen carefully to each substained note or word. Is it clear and smooth, or is it rough and edgy ? If it is rough sounding, you are probably hearing distortion. Next, try listening to a different song or even a different singer. If you still hear a rough edge on the substained notes, you definitely are hearing distortion

Table 3-6 Recommended Loudness Settings

Desired Loudness & Quality	Limiter Drive Setting
Fair loudness, Excellent quality	10 to 11 o'clock
Loud, Very Good quality	12 o'clock
Very loud, Fair quality	1 to 2 o'clock
Extreme loudness, Poor quality	3 o'clock to MAX

Note: Loudness is also controlled by the AGC Speed programming jumpers (J6, J7 and J8). These jumpers were factory set to the Medium position. Changing these jumpers to Fast will increase loudness, while SLOW will decrease loudness.

If quality is the objective instead of loudness, try turning the Limiter Drive Control counter-clockwise. Try the 11 o'clock position, then the 10 o'clock position. Experiment with different settings until you find the one you like. The following table lists control settings to produce various amounts of loudness and quality.

3.6.5 Adjusting the amount of audio fade

The amount of fading that occurs at the end of a song is determined by the amount of AGC gain reduction used. Large amounts of AGC gain reduction will reduce or eliminate fading. Smaller amounts of gain reduction will allow a larger, more natural fade.

AGC gain reduction is produced by AMIGO AM and the Studio AGC (if used). The amount of gain reduction produced by AMIGO AM is controlled by internal programming jumpers (J4 and J5). These jumpers are factory set for 12dB.

If the audio fades too much, change J4 and J5 to 15 dB. If a Studio AGC is used, try increasing the amount of gain reduction it produces before changing J4 and J5.

If the audio does not fade enough, change J4 and J5 to 9 dB. If a Studio AGC is used, try decreasing the amount of gain reduction it produces before changing J4 and J5.

3.7 Stereo Distortion Problems

3.7.1 General

Occasionally, excessive amounts of stereo distortion can be heard in stereo receivers. This type of distortion affects high frequency sounds. Instead of sounding smooth and clear, they will have a "spitting" sound. For example, the letter "s" will sound more like the letter "p" or "f."

This problem is usually is caused by a poor impedance match between the transmitter and antenna system at higher audio frequencies. This situation is sometimes found in stations using a highly directional pattern. It also occurs sometimes when 2 stations are multiplexed into a single antenna.

3.7.2 5kHz Stereo Filter

AMIGO AM includes a 5kHz Stereo Filter to reduce the effects of this problem if it occurs. This filter reduces the bandwidth of the stereo information (L-R) from 9.5kHz to 5.0kHz. Mono information is not affected in any way. The net result of this filter is a reduction of transmitted power at frequencies above 5kHz. This results in less reflected power (from the antenna system back into the transmitter) and less distortion.

3.7.3 Using the 5kHz Stereo Filter

If the stereo distorting described above occurs, we recommend that you try enabling the special 5kHz Stereo Filter. The filter is enabled by moving J13 (Narrow band L-R) and J12 (L+R Narrowlband Delay Equalizer) to the IN position (see Table 2-5).

After the filter is enabled, listen to your station to see if the amount of stereo distortion is reduced. If it is, the problem was probably caused by a poor impedance match between the transmitter and antenna system at higher audio frequencies.

If the amount of distortion was reduced, but is still objectionable, you can reduce the distortion more by turning the L-R Level Control counterclockwise. Doing so will decrease your stations stereo channel separation, but it will reduce the remaining distortion. The trick in making this adjustment is to turn the control counterclockwise enough to eliminate the distortion, but not any more that that. This will preserve as much channel separation as possible. Start by turning the control counter clockwise to about 11 o'clock. Then listen to your audio on a AM stereo receiver. If the amount of distortion is reduced enough, leave the control at 11 o'clock. If the distortion is still too noticeable, try turning the control to 10 o'clock. Then listen to the stereo receiver again. Continue this process until the amount of distortion has been reduced to your satisfaction.

3.8 Proof of Performance Measurements

3.8.1 PreparingAMIGO AM for a proof

1. Turn the rear panel Mode Switch to "Proof ."

2. Note the position of the Single Ch. Limiter control.

3. Turn the Single Ch. Limiter control fully counter clockwise. The control will "click" as it reaches the counter clockwise position.

4. AMIGO AM is now prepared for testing. All AGC, limiting and filter circuit stages have been bypassed.

3.8.2 Putting AMIGO AM back On The Air

1. Turn the Mode Switch to "Operate."

2. Turn the Single Ch. Limiter control to the position noted in step 2 above.

3. AMIGO AM is now ready for on-the-air operation.

3.9 Recommended SGC800 Settings

If you are using our SGC800 Studio AGC with AMIGO AM, the control settings presented in Table 3-7 are recommended for the SGC800. Please note that the last two controls in the table are located inside the SGC800 on the main circuit board.

In addition, two changes in jumper settings are recommended for AMIGO AM. First, the Gate Level jumper, J7 should be set for -10 dB. This jumper is located on the main circuit board (see figure 2-5). Second, the AGC Drive jumpers, J4 and J5, should be changed to -9 dB. These jumpers are located on the AGC/Stereo Enhance circuit board (see figure 2-3).

These recommended settings are the result of feedback from our customers during the final field testing phase of AMIGO AM's development.

Figure 3-10 SGC800 Recommended Settings

CONTROL	SETTING
G/R	-12
OPERATION	M or F
GATE	ON
BAND	BOTH
EQ	1 o'clock
THRESHOLD	-40
J11, J19 (Internal Jumpers)	HIGH
R31 (Internal Gate Level)	-25