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HD Radio

AM Series Transmitters

AM-1A, AM-2.5E, AM-5E, AM-6A, AM-10A and AM-500A

Transmitter Preparation and ASi 10 Setup for HD Operation

Application Guide

597-0125-001, Revision D
1/26/07

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AM-1A, AM-2.5E, AM-5E, AM-6A, AM-10A and AM-500A
Transmitter Preparation and ASi 10 Setup for HD Operation Application Guide

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1 Preparing to Modify the AM Transmitter

1.1 Purpose of this Document

This document discusses in detail the necessary changes that must be made to Broadcast Electronics AM-500A, AM-1A, AM-2.5E, AM-5E, AM-6A, or AM-10A AM Series Transmitters to enable HD Operation. After these changes are made to the transmitter, a B.E. ASi 10 AM HD Signal Generator may then be installed and connected to the AM Transmitter. The setup instructions for the ASi 10 are included in this document. The ASi 10 comes with an Installation Kit (979-0544) that contains the necessary items for connection of the ASi 10 to a B.E. AM Transmitter.

1.2 Additional Documentation to Review

In addition to this document, please review the **ASi 10 Manual (597-0542-003),** and **AM Transmitter C90 Replacement Guide Technical Bulletin (597-0501-001).** These documents are included in the shipment from B.E. and may also be found at **www.bdcast.com** under the "**Support**" tab, then "**all Product Manuals**" or "**all Technical Bulletins**."

1.3 Tools / Items Needed

You will also need a few tools and other items In addition to the ASi 10 Installation Kit (979-0544).

- ☐ Needle Nose Pliers (for relocating Jumpers of ECU Controller)
- ☐ Tuning Tool
- ☐ No. 2 Phillips Screwdriver
- ☐ 50Ω Load (suitable for the transmitter's RF Output power)
- ☐ Spectrum Analyzer
- ☐ External Variable or Fixed Attenuator
- ☐ Soldering Iron and Tools
- ☐ Wire Strippers

1.4 Estimated Time for Replacement

Providing that you have the tools and items listed above, it will take approximately 2 - 3 hours to prepare the transmitter, install the ASi 10, and setup the system for HD Operation. If the transmitter has already been upgraded, it will take approximately 30 minutes - 1 hour to install and setup the ASi. Please note that the transmitter will be off of the air during this entire process.

1.5 ESD Awareness

When handling the transmitter's Exciter / Controller PCB, be sure to exercise ESD precautions as the Exciter / Controller has ESD sensitive components.

2 Determine the Age of your Transmitter

Use **Figures 1** and **2** to determine the age of your transmitter.

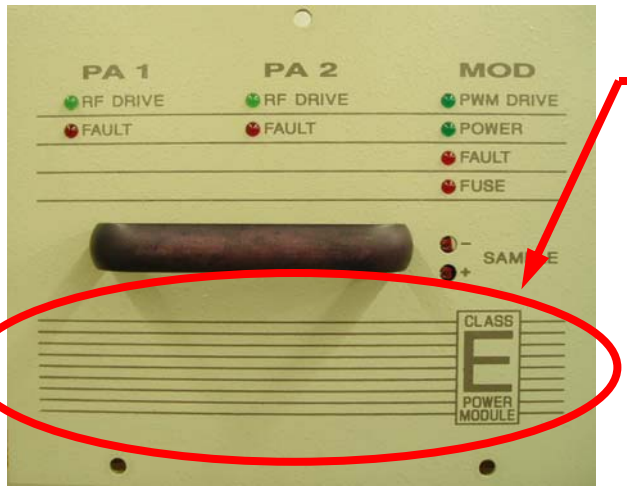


Figure 1 – PA Module with (9) Horizontal Lines

Note the Horizontal Lines that are Silkscreened on the Front Panel of the Transmitter's PA Modules.

If there are **(9) Horizontal Lines**, the transmitter was shipped **PRIOR** to September 1st, 2004, and **WILL REQUIRE ADDITIONAL FIELD UPGRADES BEFORE SETTING UP FOR HD OPERATION!!!!** If this is the case, contact RF Customer Service immediately and request the HD Upgrade Kit for your specific AM transmitter. The kit will include new PA Modules, a new Exciter / Controller Board, and a new Motherboard.

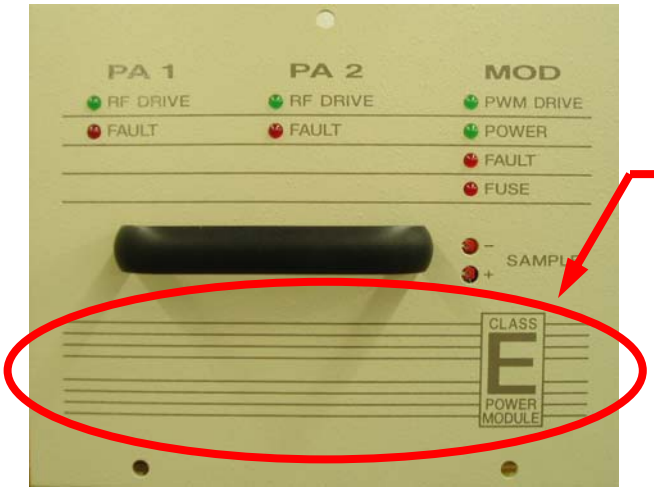


Figure 2 – PA Module with (8) Horizontal Lines

If there are **(8) Horizontal Lines** as shown in **Figure 2**, the transmitter shipped September 1st, 2004, or Later, and is ready for Setup for HD Operation.

2.1 Transmitters shipped PRIOR to September 1st, 2004

If your transmitter shipped **PRIOR** to **September 1st, 2004**, contact RF Customer Service IMMEDIATELY and request the HD Upgrade Kit for your specific AM Transmitter. The kit will include new PA Module(s), a new Exciter / Controller Board, and a new Motherboard for your transmitter. These items **MUST** be upgraded before proceeding with the Setup for HD Operation described in this document.

See **Figures 1** and **2** to determine the age of your transmitter.

2.2 Transmitters shipped September 1st, 2004 or LATER

Transmitters shipped September 1st, 2004 or later, only require a few jumper setting changes on the Transmitter's Controller Board, installation of an IBOC Bypass Board (919-0560), as well as installation of an ASi 10.

Note: If the transmitter shipped as an HD Transmitter with an ASi 10, the transmitter and ASi 10 were setup together as a system and tested at the factory (jumpers on the Exciter / Controller are already set and the IBOC Board Assembly will already be installed).

See **Figures 1** and **2** to determine the age of your transmitter.

3 Ensure that C90 has been Updated

Before proceeding with setting up the transmitter for HD operation, ensure that the AM Transmitter Exciter Controller Board's C90 has been updated with a "**CERAMIC, 0.1uF, 50V, 10% Capacitor** (B.E. P/N 003-1066)."

ASi 10 units shipped 12/18/2006 or later have this part included in the ASi 10 Installation Kit. Please contact B.E. RF Customer Service if you need this component.

For additional information, see B.E. document "**AM Transmitter C90 Replacement Guide Technical Bulletin**" (597-0501-001). This document was included in the shipment from B.E. but may also be found at **www.bdcast.com** under the "**Support**" tab, then "**all Technical Bulletins**."

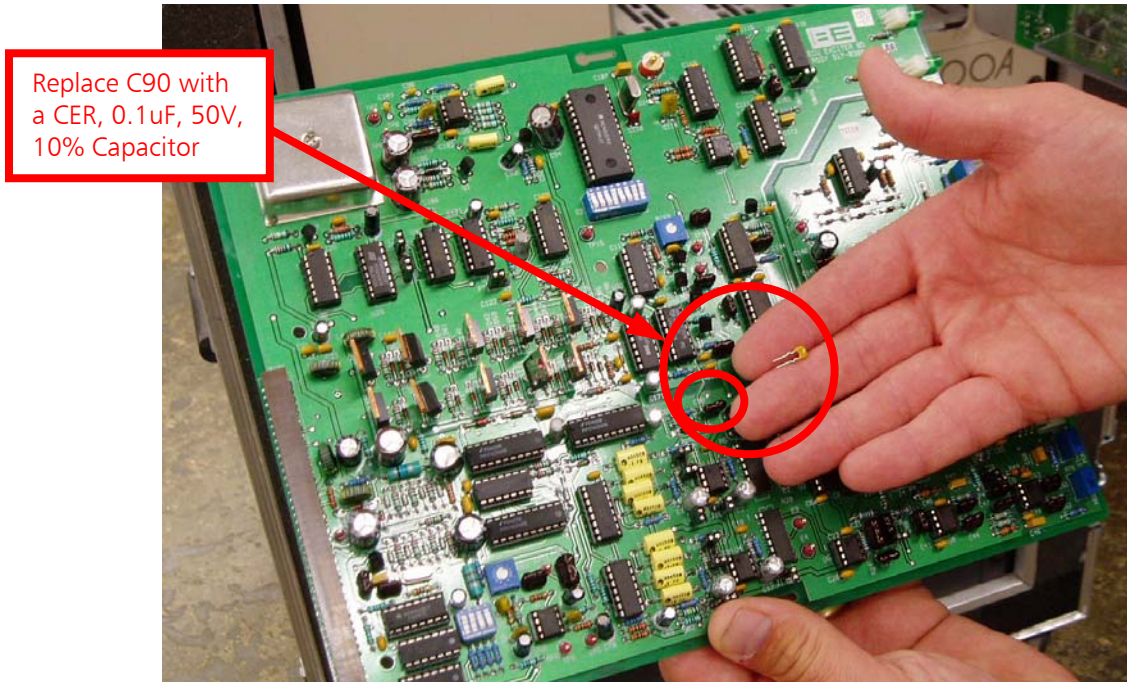


Figure 3 – C90 Location

4 Preparing the Transmitter for HD Operation

4.1 Turn the Transmitter's AC Breaker to OFF

Turn the AC Breaker to the **OFF** position

Note: The AC Breaker is on the rear of some models.

Figure 4 – Turn the AC Breaker to OFF

4.2 Open the AM Transmitter's Exciter / Control Access Door

Figure 5 – AM Transmitter Exciter / Control Access Door

4.3 Remove the Exciter / Control Board (917-0300)

Figure 6 – Remove the Exciter / Control Board

4.4 Exciter Control Board Jumper Settings for HD Operation

Next, relocate the Jumpers on the Exciter Control Board to enable HD operation.

Exciter Control Board (917-0300) Jumper Settings		
Jumper	**HD Operation**	**Analog Operation**
JP4	2-3	2-3
JP7	1-2	2-3
JP12A	1-2	OPEN
JP12B	3-4	OPEN
JP13A	1-2	OPEN
JP13B	3-4	OPEN
JP14	1-2	OPEN
JP15	1-2	OPEN
JP16	1-2	OPEN
JP17	1-2	OPEN
JP18	1-2	1-2
JP19	1-2	1-2
JP20	1-2	OPEN
JP21	1-2	2-3
JP22	2-3	1-2

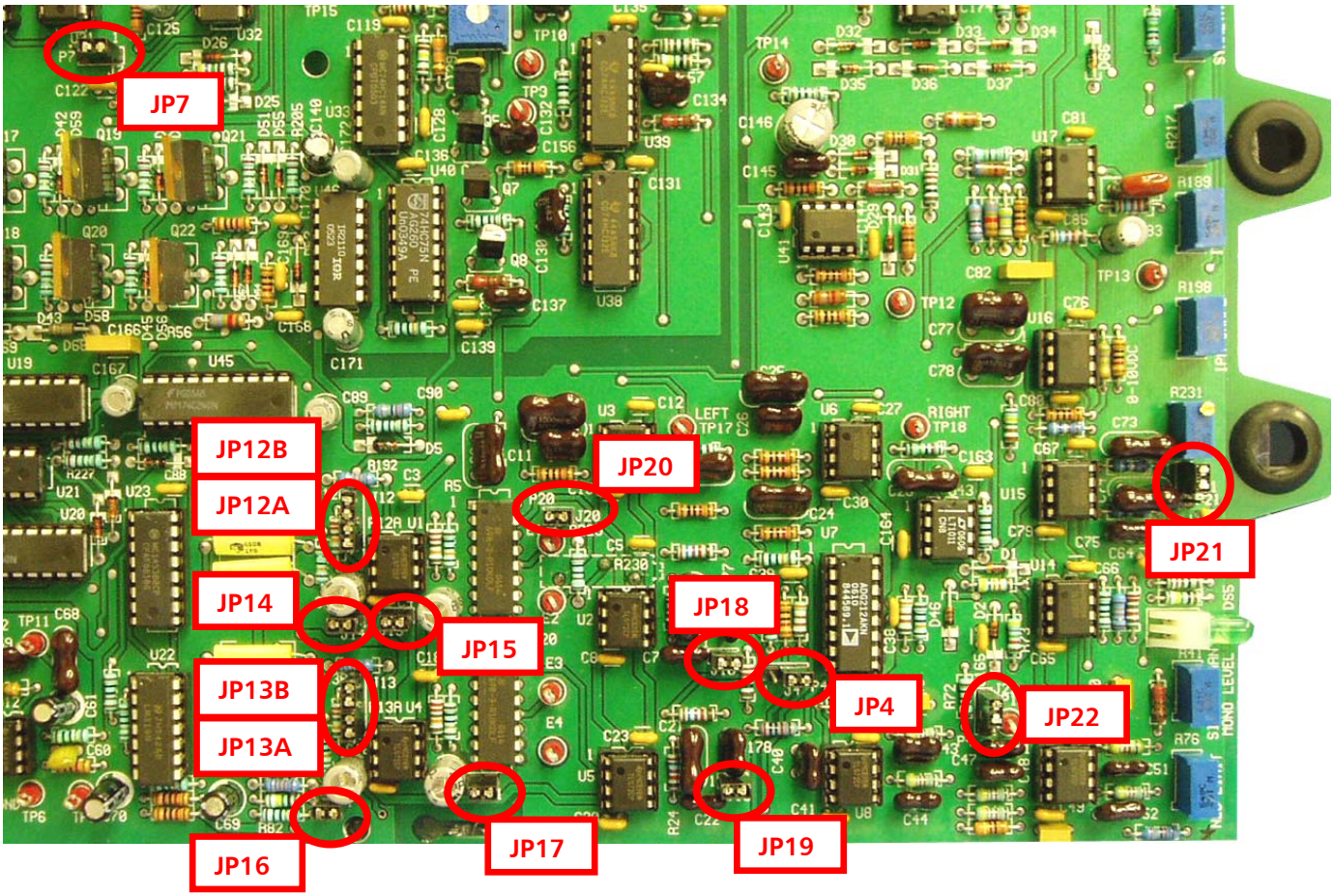


Figure 7 – Exciter Control Board (917-0300) Jumper Locations

4.5 Install IBOC Bypass PCB Assy (919-0560)

Included in the ASi 10 Installation Kit is an **IBOC Bypass PCB Assy (919-0560)** and the necessary mounting hardware to install it.

4.5.1 Install Standoffs

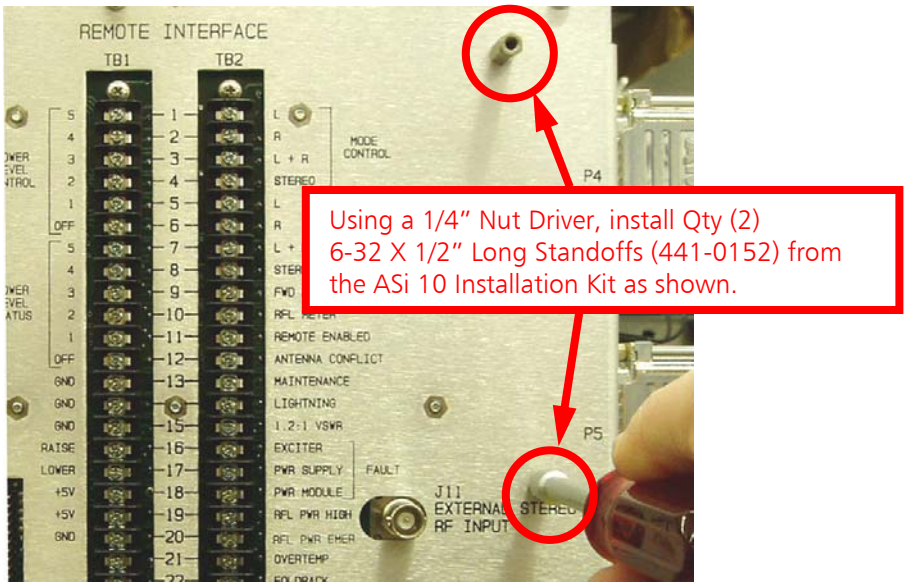


Figure 8 – Install Standoffs

4.5.2 Install IBOC Bypass PCB Assy (919-0560)

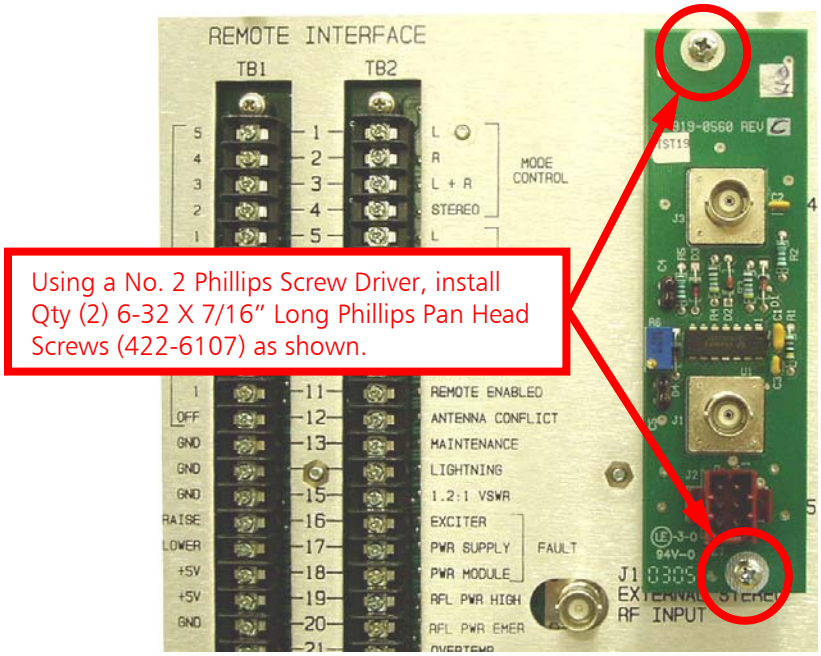


Figure 9 – Install Mounting Screws

4.5.3 Install Transmitter to ASi 10 Cabling

For "**A-Series**" transmitters, install the "longer" Coax Cable included in the Installation Kit from **J3** of the **IBOC BYPASS PCB** to **AM PHASE OUT** on the rear of the **ASi 10**.

For "**E-Series**" transmitters, this cable is internal to the transmitter cabinet and normally routes from the **EXTERNAL RF INPUT** feedthru connector in the top of the cabinet and then connects to the ECU's RF INPUT J11. For **HD Operation**, disconnect this cable from **J11** on the **ECU** and then connect to **J3** on the **IBOC Bypass PCB**.

Install the "shorter" Coax Cable included in the Installation Kit from **J1** of the **IBOC Bypass PCB** to **J11** on the rear of the **Transmitter Controller** as shown.

For "**A-Series**" transmitters, connect the XLR to stripped wire (BLK/RED) cable (supplied in the ASi Installation Kit) to **AM TX AUDIO OUT** on the rear of the **ASi 10** and then to **TB2-25 (RED +)** and **TB2-26 (BLK -)** on the ECU.

For "**E-Series**" transmitters, connect the XLR to stripped wire (BLK/RED) cable (supplied in the ASi Installation Kit) to **AM TX AUDIO OUT** on the rear of the **ASi 10** and then terminate the stripped wire ends (BLK/RED) into the solder cup DB9 male connector (supplied in the ASi installation kit; **RED+ to Pin1** and **BLK- to Pin 2**). The DB9 plugs into **J3** on the top of the transmitter cabinet. An internal cable then routes the Audio to TB1.

RED Wire (TB1-30; +5V)
BLK Wire (TB2-30; GND)

AUDIO BYPASS CONTROL CABLE (included in the Installation Kit) –

1. Connect **P2** to **J2** on the **IBOC Bypass PCB**.
2. Connect **RED Wire (TB1-30; +5V)** and **BLK Wire (TB2-30; GND)**
3. Connect **P3** to **AUDIO BYPASS** on the rear of the **ASi 10**.
4. Connect **P9** to **OUTPUTS 13 thru 16** on the rear of the **ASi 10.**
5. Install **GROUND LUG** on the rear of **ASi 10** as shown.

Figure 10 – Transmitter to ASi 10 Cable Connections

5 ASi 10 Installation / System Connections

Install the ASi 10 AM HD Signal Generator into an ancillary equipment rack near the transmitter. The following diagram shows all of the ASi connections that must be made for proper HD operation.

NOTE: Please do note that if you are connecting to an "**E-Series Transmitter**" that the **AM PHASE OUT** (item 5) and **AM TX AUDIO OUT** (item 12) route to the top of the transmitter cabinet and connect to the Customer I/O Connection Panel.

In addition to the information listed below, be sure to closely review the Typical AM HD System Interconnect Drawings (597-0125-002 for "A-Series") and (597-0125-003 for "E-Series") located in the back of this document before proceeding.

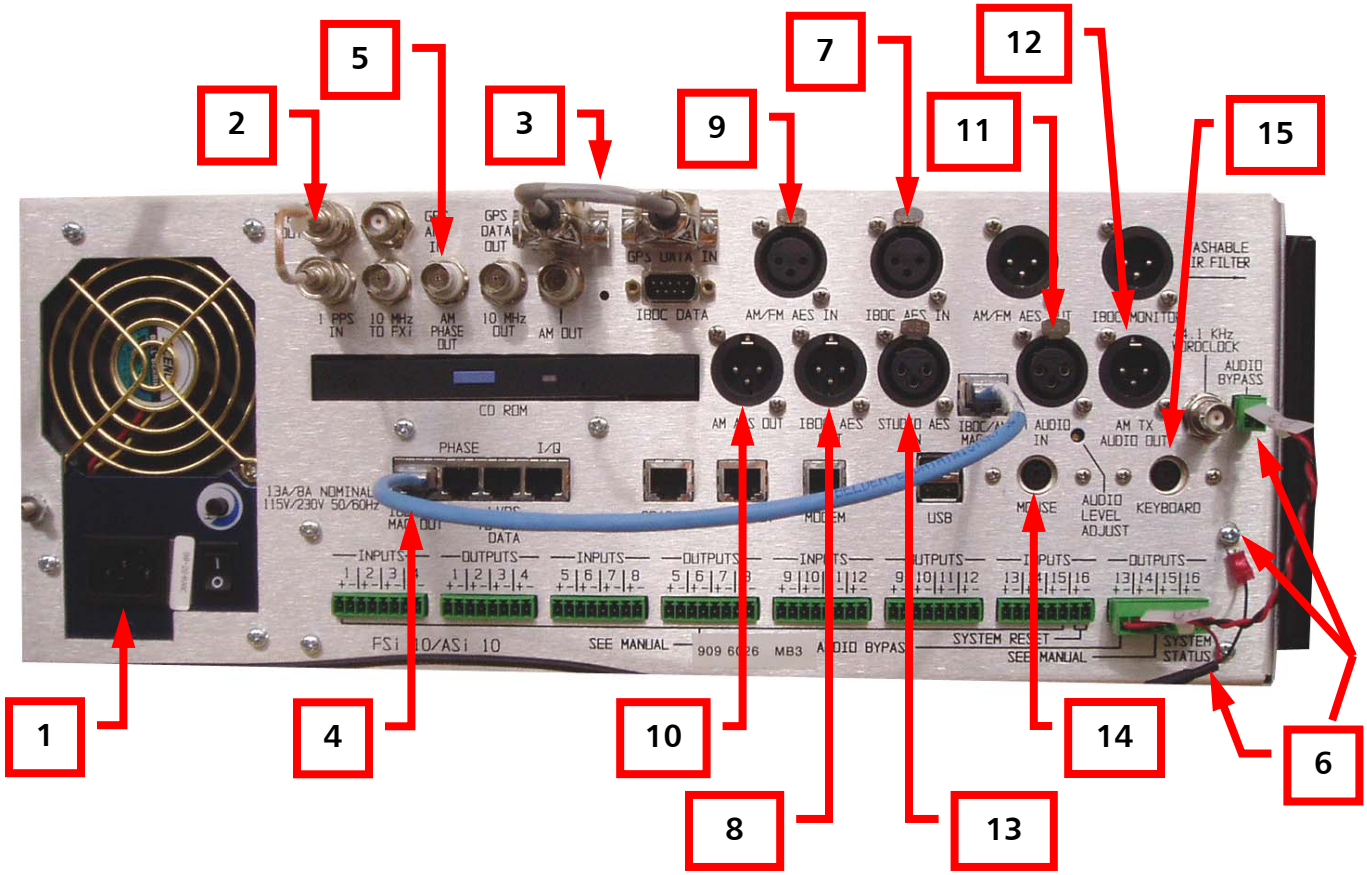


Figure 11 – ASi 10 AM IBOC Signal Generator Connections

1) **AC POWER –** AC Line Cord (682-0001 or 682-0003) supplied in the ASi 10 Installation Kit.

2) **1PPS OUT** to **1PPS IN –** Jumper Cable (949-0543) supplied in the ASi 10 Installation Kit.

3) **GPS DATA OUT** to **GPS DATA IN –** Jumper Cable (949-0542) supplied in the ASi 10 Installation Kit.

4) **IBOC AM/MAG OUT** to **IBOC AM/MAG IN –** Jumper Cable (949-0547) supplied in the ASi 10 Installation Kit.

5) **AM PHASE OUT –** If connecting to an "**A-Series**" transmitter connect the "longer" BNC to BNC Coax Cable supplied in the ASi 10 Installation Kit to here and then to J3 on the IBOC Bypass Board (919-0560) that was installed on the rear of the transmitter controller (see Figure 10 for transmitter controller connection).

   If connecting to an "**E-Series**" transmitter, route to the top of the transmitter cabinet and connect to the **EXTERNAL RF** input.

   Reference the **Typical AM HD System Interconnect Drawings** (597-0125-002 for "A-Series") and (597-0125-003 for "E-Series") located in the back of this document.

6) **AUDIO BYPASS CONTROL –** These connections are for bypass operation. If the ASi 10 faults or has a power failure, audio will then be routed directly to the transmitter. This cable has (6) connections, (3) on the ASi, (3) on the transmitter controller. All (6) connections must be made to ensure proper operation (see Figure 10 for transmitter controller connections).

   On the rear of the ASi:
   - ☐ Connect P3 to Audio Bypass as shown.
   - ☐ Connect P9 to Status Outputs 13 thru 16 as shown.
   - ☐ Connect the GND lug to the chassis as shown.

   On the rear of the Transmitter Controller:
   - ☐ Connect P2 to J2 on the IBOC Bypass Board (919-0560).
   - ☐ Connect RED wire to TB1-30 (+5V).
   - ☐ Connect BLK wire to TB2-30 (GND)

7) **IBOC AES IN –** Connect an AES audio cable here and to the **HD AES OUPUT** of the **HD Processor** (XLR connectors and AES/EBU cable are supplied in the ASi 10 Installation Kit).

8) **IBOC AES OUT –** Connect an AES audio cable here and to the **HD AES INPUT** of the **HD Processor** (XLR connectors and AES/EBU cable are supplied in the ASi 10 Installation Kit).

9) **AM/FM AES IN –** Connect an AES audio cable here and to the **AM AES DIGITAL OUPUT** of the **ANALOG Processor** (XLR connectors and AES/EBU cable are supplied in the ASi 10 Installation Kit).

10) **AM AES OUT –** Connect an AES audio cable here and to the **AM AES DIGITAL INPUT** of the **ANALOG Processor** (XLR connectors and AES/EBU cable are supplied in the ASi 10 Installation Kit).

11) **AM AUDIO IN –** Connect a mono analog audio cable here and to the **ANALOG OUPUT (1 or 2)** of the **ANALOG Processor** (mono analog cable, Belden 8451, and XLR connectors are supplied in the ASi 10 Installation Kit). This input will be used when the ASi is in Bypass or Night time operation.

12) **AM TX AUDIO OUT –** For "**A-Series**" transmitters connect the XLR to stripped wire (BLK/RED) cable (supplied in the ASi Installation Kit) to here and then to TB2-25 (RED +) and TB2-26 (BLK -) on the rear of the transmitter's controller (see Figure 10 also).

   If connecting to an "**E-Series**" transmitter, terminate the stripped wire ends (BLK/RED) into the solder cup DB9 male connector (supplied in the ASi installation kit; **RED+ to Pin1** and **BLK- to Pin 2**) and then plug into **J3** on the top of the transmitter cabinet.

   Reference the **Typical AM HD System Interconnect Drawings** (597-0125-002 for "A-Series") and (597-0125-003 for "E-Series") located in the back of this document.

13) **STUDIO AES IN –** Connect an AES cable here and to the Studio Audio Source (XLR connectors and AES/EBU cable are supplied in the ASi 10 Installation Kit).

14) **Mouse –** (an external mouse MUST be connected to the ASi 10 when upgrading software or changing the I.P. Address).

15) **Keyboard –** (an external keyboard MUST be connected to the ASi 10 when upgrading software or changing the I.P. Address).

NOTE: Reference the **Typical AM HD System Interconnect Drawings** (597-0125-002 for "A-Series") and (597-0125-003 for "E-Series") located in the back of this document.

6 Audio Processing Equipment

Install Audio Processing Equipment into the ancillary equipment rack for both the AM ANALOG and AM HD signals.

Example processors:

- Orban 6200 (or equivalent) for AM HD audio processing.
- Orban 9200 (or equivalent) for AM ANALOG audio processing.

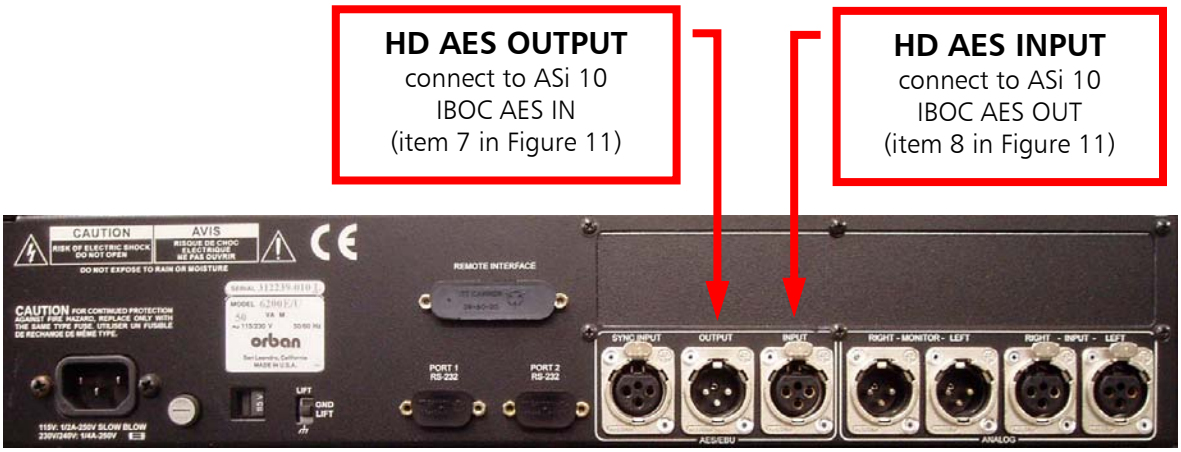


Figure 12 – Orban 6200 AM HD Audio Processor

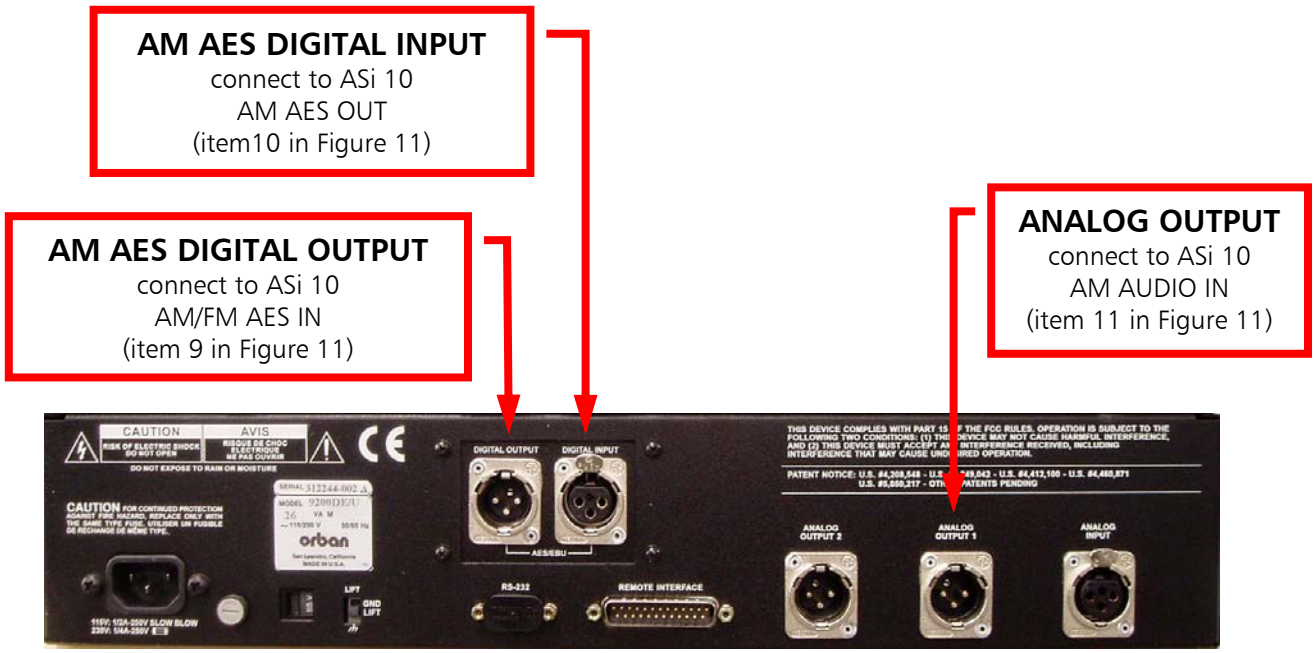


Figure 13 – Orban 9200 AM Analog Audio Processor

NOTE: Reference the **Typical AM HD System Interconnect Drawings** (597-0125-002 for "A-Series") and (597-0125-003 for "E-Series") located in the back of this document.

7 Audio Cables

The ASi 10 Installation Kit comes with XLR connectors and 50 feet of AES/EBU cable to allow for custom fitting of cables.

10 feet of mono analog cable (Belden 8451) is also supplied in the ASi 10 Installation Kit and should be used for the ASi (AM AUDIO IN) to the Analog Processor (ANALOG OUTPUT) connection.

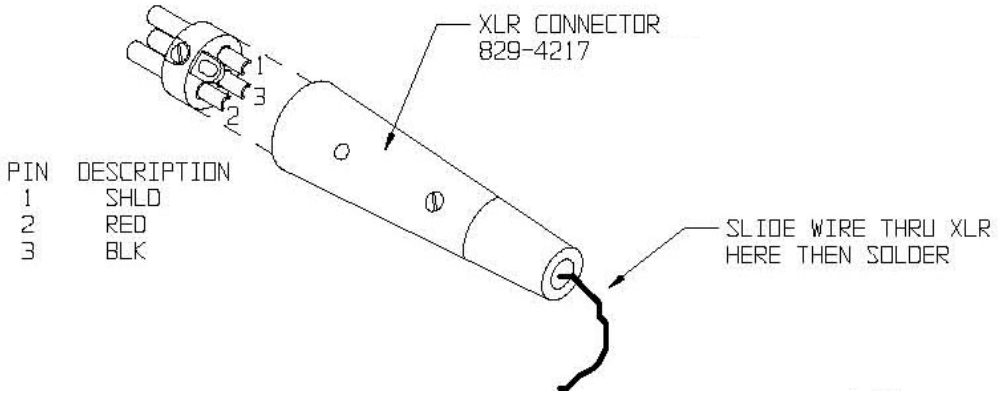


Figure 14 – Male XLR Connector Pinout

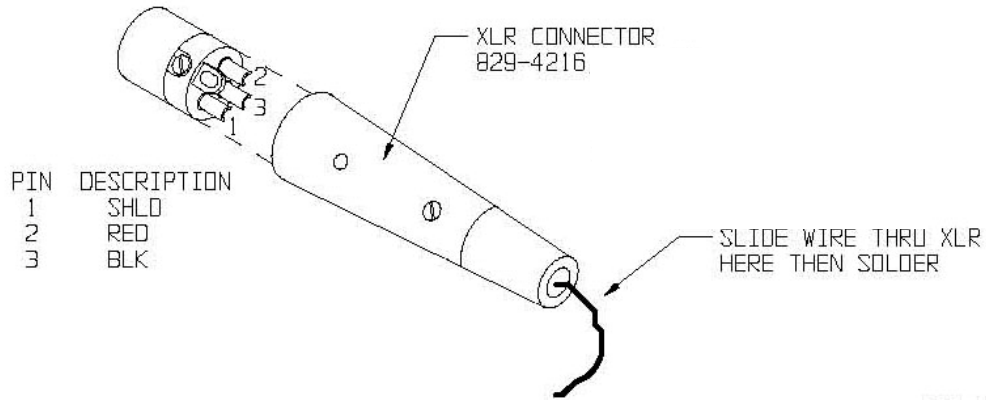


Figure 15 – Female XLR Connector Pinout

8 Adjust FWD PWR via R231 (if necessary)

After setting the transmitter up for HD operation, it may be necessary to adjust the transmitter's FWD power. See the factory test data that was shipped with the transmitter to verify the transmitter's TPO.

Step 1 - On the ASi Main GUI, turn Digital Carriers OFF and Analog Modulation OFF.

Step 2 - Set the transmitter at TPO (normally programmed power level 5). If the transmitter is not operating at TPO, proceed to Step 3.

Step 3 - Turn the transmitter's RF Output Power OFF.

Step 4 - Remove the Exciter Controller from the transmitter.

Step 5 - Using the Extender Card (917-0208) supplied with the transmitter, install the Exciter Control Board so that R231 may be adjusted with the transmitter operating.

Step 6 - Turn the transmitter's RF Output Power ON at TPO.

Step 7 - Next, adjust R231 (on the component side of the board) to raise / lower the transmitter's fwd power on the front panel meter until TPO is achieved.

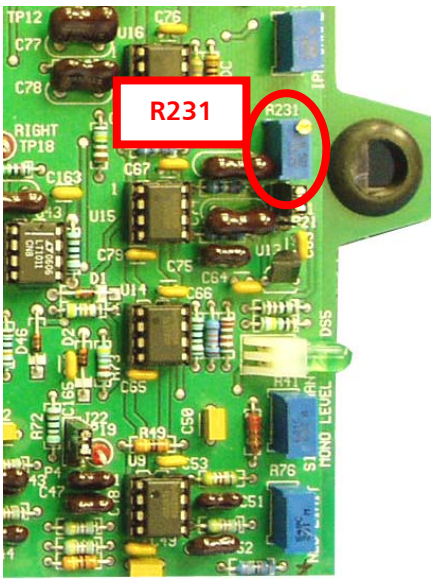


Figure 16 – R231 on Exciter Control Board

Step 8 - Turn the transmitter's RF Output Power OFF.

Step 9 - Remove the extender card a re-install the Exciter Control Board.

Step 10 - Turn the transmitter's RF Output Power ON to ensure operation at TPO.

Step 11 - Turn the transmitter's RF Output Power OFF before proceeding.

9 Verify / Configure ASi 10 Settings

Turn the AC Power Switch on the rear of the unit to ON.

9.1 Verify I/Q Scale Factor

Step 1 - When the ASi GUI appears, select **SIGNAL**, then **I/Q Scale Factor**.

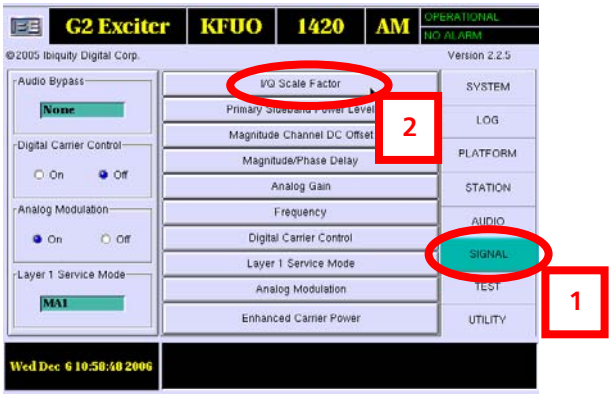


Figure 17 – I/Q Scale Factor

Step 2 - Ensure that the **I/Q Scale Factor** is set **12000.0**. If is not, use the keypad to change, select **Apply** then select **Enter** after making changes.

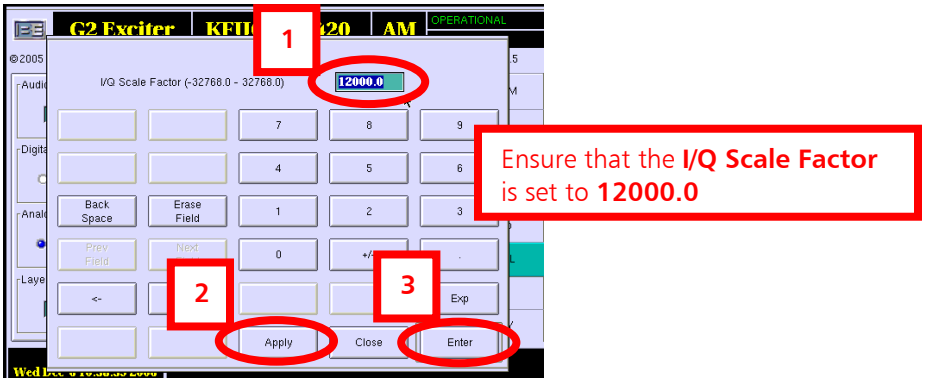


Figure 18 – I/Q Scale Factor

9.2 Verify Sideband Level Settings

Step 1 - Select **SIGNAL**, then **Primary Sideband Power Level**.

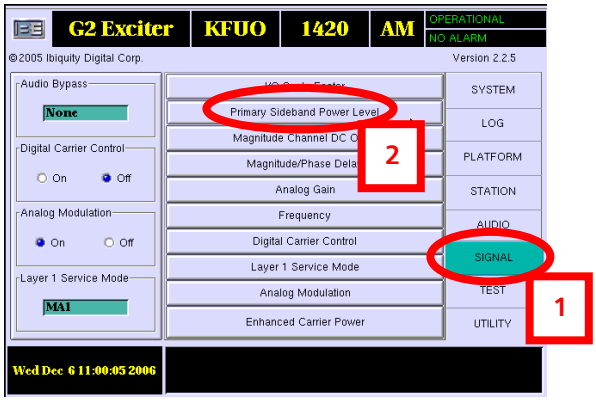


Figure 19 – Primary Sideband Power Level

Step 2 – The Primary Sideband Power Level settings should be set to their defaults.

The default is **0.000 dB** for both **Upper** and **Lower Sideband Scaling**.

The default **Scaling Increment** is **1.000 dB** for both.

Change these settings, if necessary, to match the defaults and then select **Close**.

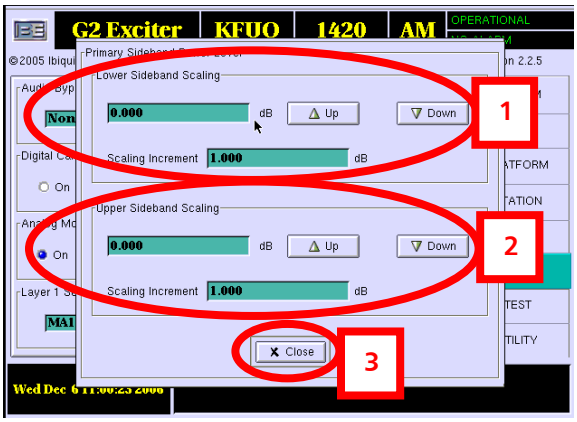


Figure 20 – Primary Sideband Power Level

9.3 Verify Magnitude DC Offset

Step 1 - Select **SIGNAL**, then **Magnitude Channel DC Offset**.

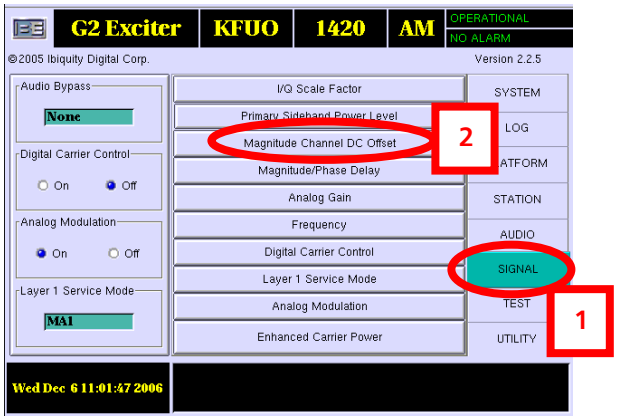


Figure 21 – Magnitude Channel DC Offset

Step 2 – The Magnitude DC Channel should be set to **-1.0000** as shown. If necessary, use the keypad to change, select **Apply**, then **Enter**.

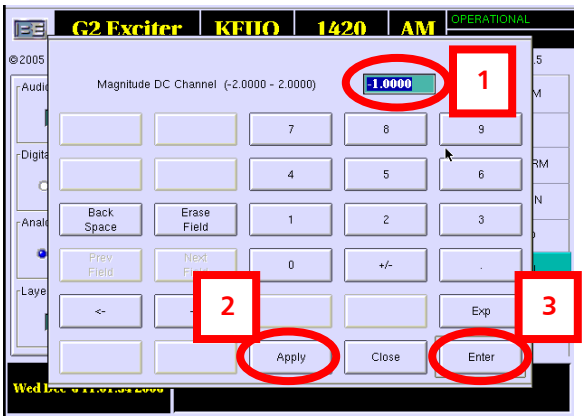


Figure 22 – Magnitude Channel DC Offset

9.4 Verify Magnitude / Phase Delay

Step 1 - Select **SIGNAL**, then **Magnitude / Phase Delay.**

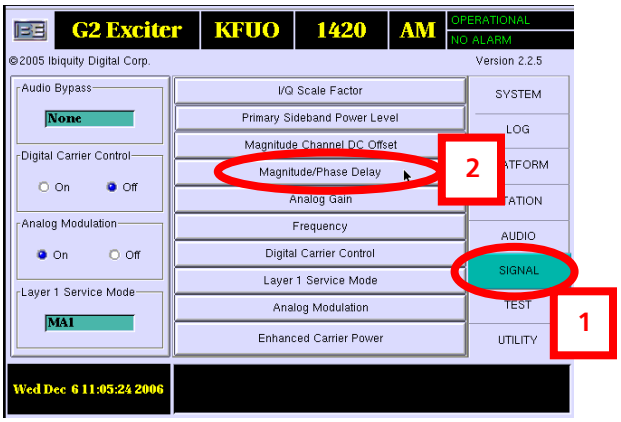


Figure 23 – Magnitude / Phase Delay

Step 2 – There is no default for Magnitude Phase Delay.

The ASi 10 is tested with the shipped transmitter (or test transmitter if shipped as a replacement).

When shipped as a replacement, the Magnitude and Phase Delay will most likely need to be adjusted slightly for best HD operation with your existing transmitter. This is discussed further later in this document.

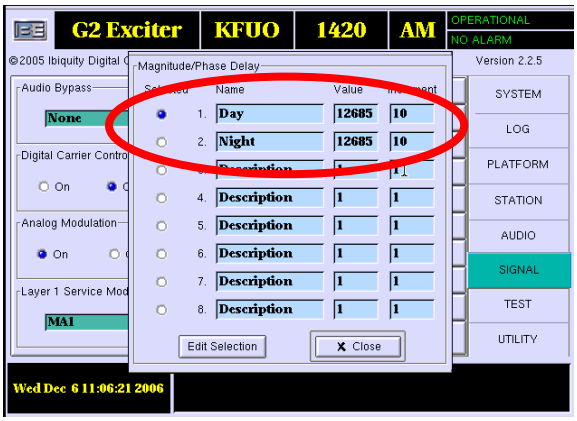


Figure 24 – Magnitude / Phase Delay

9.5 Verify Analog Gain

Step 1 - Select **SIGNAL**, then **Analog Gain**.

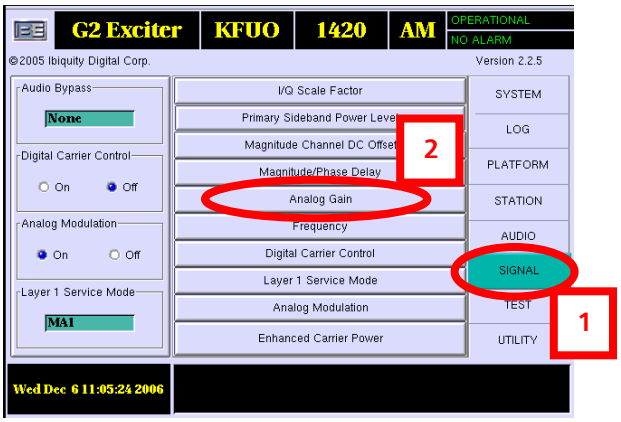


Figure 25 – Analog Gain

Step 2 – Ensure that the **Analog Gain** is set to **1.000**, select **Apply**, then **Enter**.

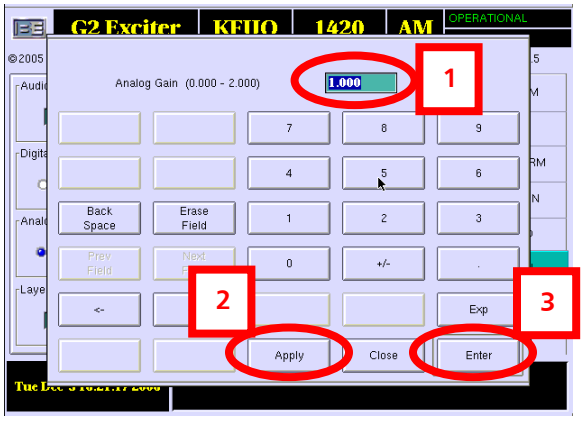


Figure 26 – Analog Gain

9.6 Verify Frequency

Step 1 - Select **SIGNAL**, then **Frequency**.

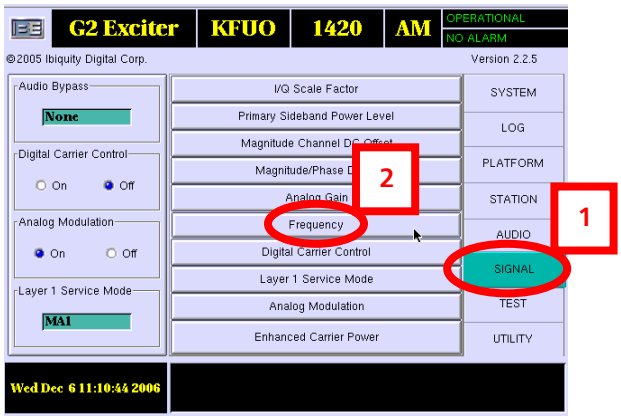


Figure 27 – Frequency

Step 2 – Verify that the Frequency matches exactly that of the AM Transmitter.

PLEASE NOTE: If the frequency is set differently in the ASi than the transmitter, damage to the transmitter's PA Modules may result as the PA Modules contain frequency dependent components.

If necessary, use the keypad to change the frequency, select **Apply**, then **Enter**.

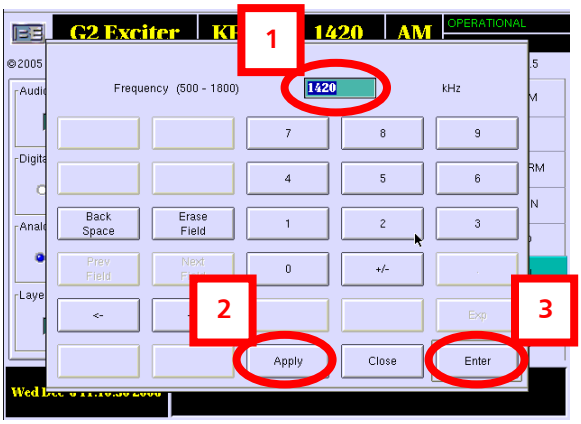


Figure 28 – Frequency

9.7 Verify Enhanced Carrier Power

Step 1 - Select **SIGNAL**, then **Enhanced Carrier Power**.

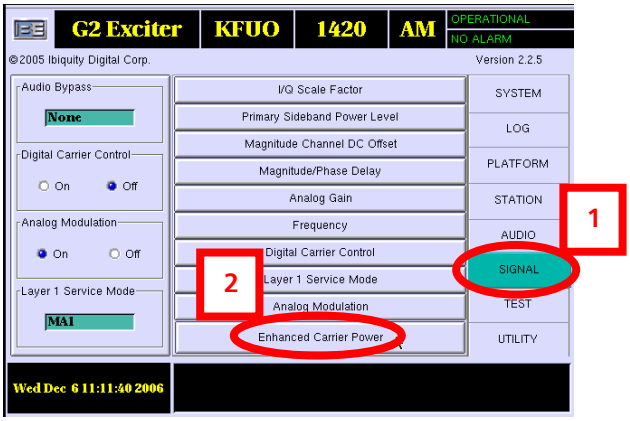


Figure 29 – Enhanced Carrier Power

Step 2 - Select **Normal**, then **OK**.

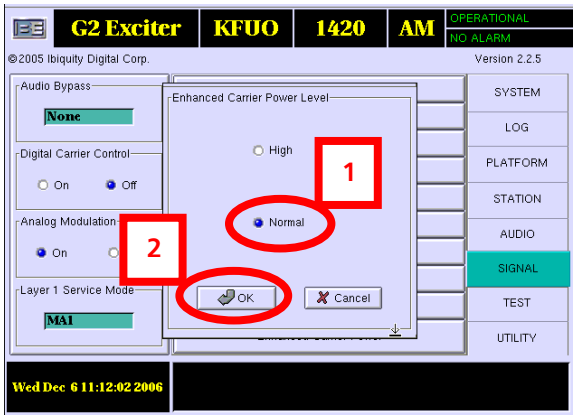


Figure 30 – Enhanced Carrier Power Level

9.8 Verify Analog Audio Bandwidth

Step 1 - Select **AUDIO**, then **Analog Audio Bandwidth.**

Figure 31 – Analog Audio Bandwidth

Step 2 - Select **5 kHz Internal**, then **OK.**

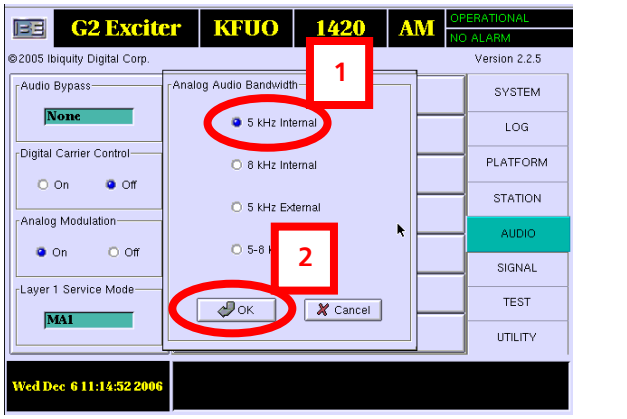


Figure 32 – Analog Audio Bandwidth

9.9 Verify Audio Level Control

Step 1 - Select **AUDIO**, then **Audio Level Control.**

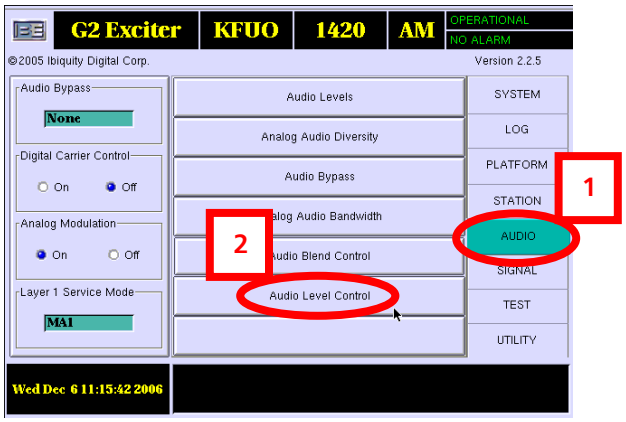


Figure 33 – Audio Level Control

Step 2 – The default is **0**. This setting may need adjustment later but should be set to **0** for now. If necessary, use the keypad to change, select **Apply**, then **Enter**.

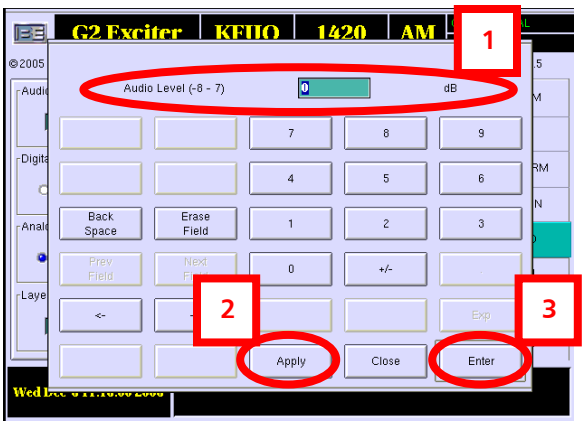


Figure 34 – Audio Level Control

9.10 Verify Watchdog is Enabled

Step 1 - Select **STATION**, then **Station Interface.**

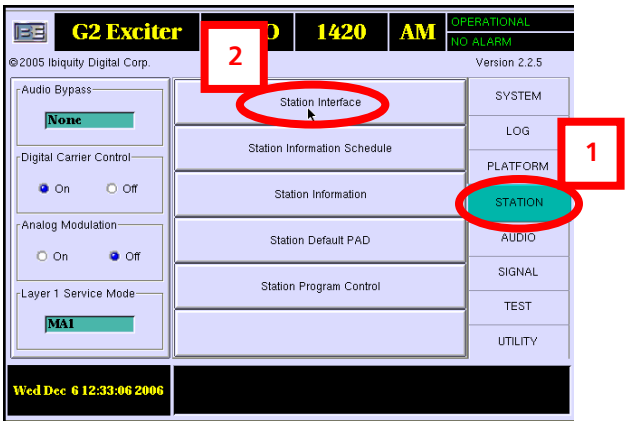


Figure 35 – Station Interface

Step 2 – Ensure that **Watchdog Enable** is selected. When Watchdog is Enabled, the Watchdog timer on the Station Interface Card (SIC) will be enabled. When it is enabled, the SIC will monitor the motherboard. If there is no activity for 1 second the host processor is assumed to be locked up. The Audio Bypass relays will be set to Bypass, the system operational relay will be opened, and the exciter will be re-booted. Enabling the Watchdog circuit may prevent a "DEAD AIR" situation if the motherboard or host processor locks up on the ASi.

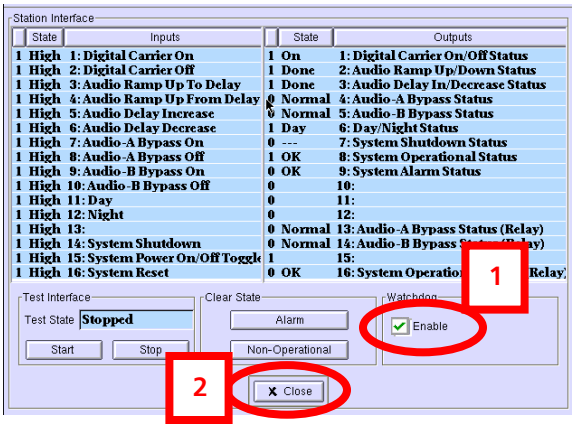


Figure 36 – Station Interface

10 System Setup for Test (Positive Peak of 100%)

10.1 Ensure that all ASi, Processor, and TX Connections Have Been Made.
10.2 Ensure that the ASi and Processors are ON and Operational.
10.3 Ensure that the Transmitter's AC Breaker is ON.
10.4 Ensure that the Transmitter's RF Output is OFF.
10.5 Ensure that an Audio Source has been connected to the System.

10.6 Ensure Digital Carriers are OFF and Analog Modulation ON

Next, on the ASi 10 main GUI menu, ensure that **Digital Carrier Control** is set to **OFF** and **Analog Modulation** is set to **ON**.

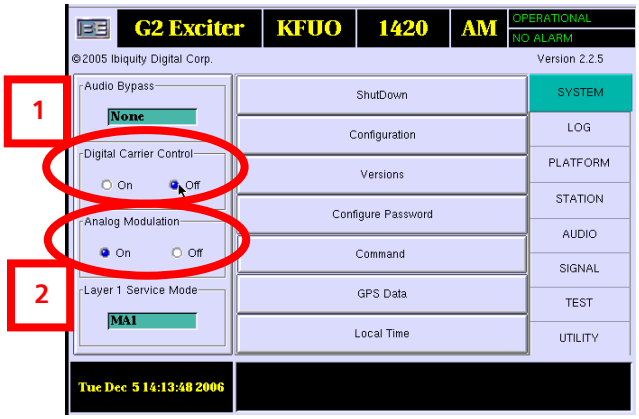


Figure 37 – Digital Carriers / Analog Modulation

10.7 Set Analog Gain to 1.000

Step 1 - Next, on the ASi main GUI go to **SIGNAL**, then **Analog Gain**.

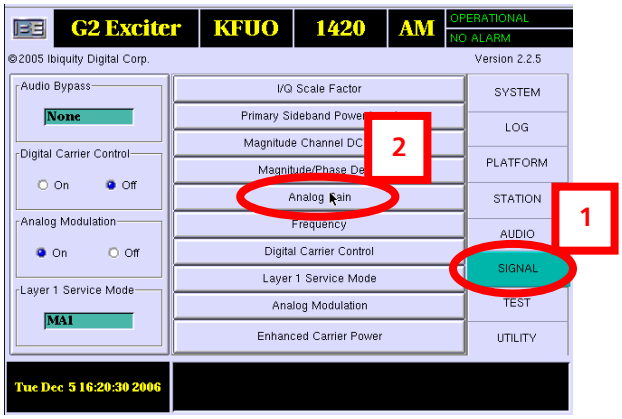


Figure 38 – Set Analog Gain

Step 2 – Using the keypad set the **Analog Gain** to **1.000**, select **Apply**, then **Enter**.

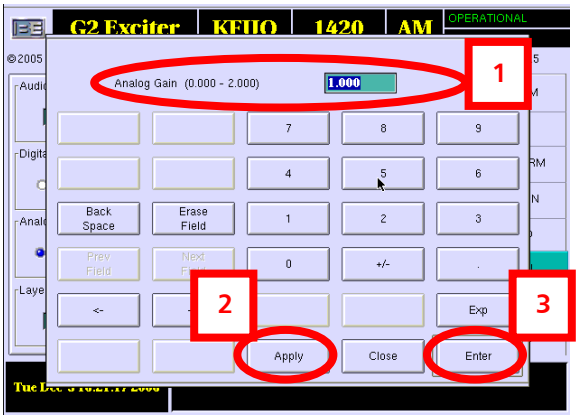


Figure 39 – Set Analog Gain

10.8 Set the AM AES ANALOG Processor for TEST mode (Tone)

Next, go the **AM AES ANALOG** Processor and setup for **TEST** mode.

Set the unit as follows:

- ☐ set Test Mode for Sine Operation
- ☐ set Frequency of 1kHz
- ☐ set Sine Level to 100%
- ☐ set Positive Peak Modulation Level of 100%
- ☐ set Digital Output for AM Modulation (not HD/DRM) to 0 dBfs

10.9 Set Positive Peak Indicator to 100%

Step 1 – Ensure that the Transmitter's RF Output is OFF.

Step 2 – Set the Bar Graph polarity to (+) on the front of the transmitter.

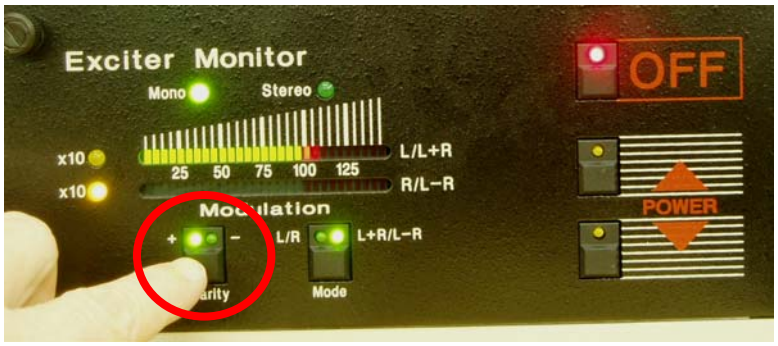


Figure 40 – Set Bar Graph for Positive Polarity

Step 3 – Open the door to gain access to the transmitter's Exciter / Controller Board.

Step 4 – Next, adjust the potentiometer R230 on the back side of the Exciter Controller Board until the red bar is lit on the bar graph (100%).

Turning R230 CW lowers the level. Turning R230 CCW raises the level.

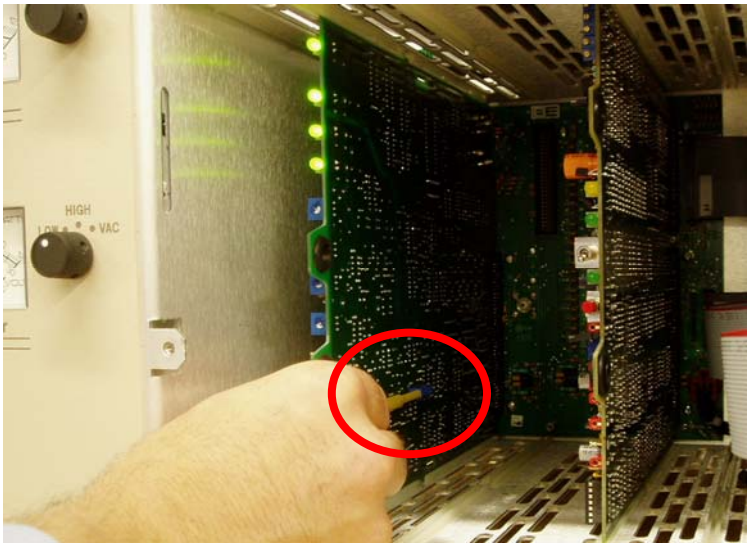


Figure 41 – Adjusting R230

Step 5 – Adjust R230 for 100% positive peak modulation.

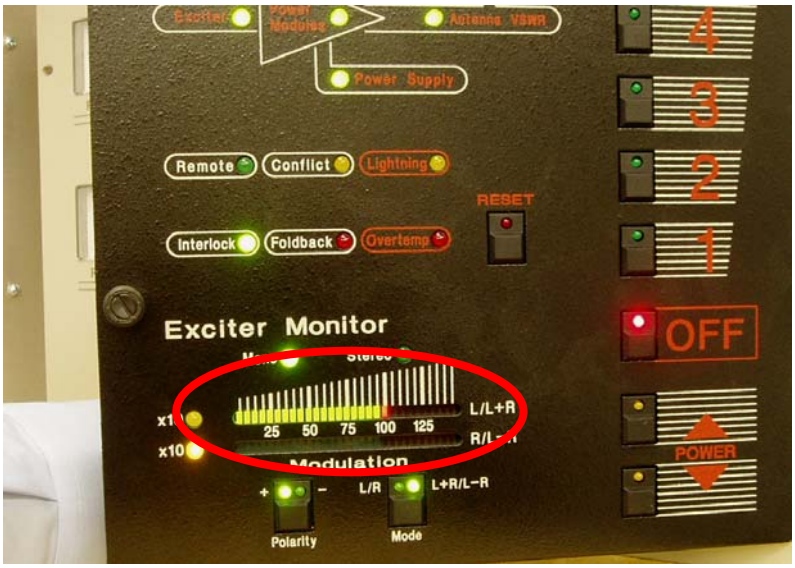


Figure 42 – 100% Positive Peak

10.10 Set Negative Peak Indicator to Approximately 97%

Step 1 – Ensure that the Transmitter's RF Output is OFF.

Step 2 – Set the Bar Graph polarity to (-) on the front of the transmitter.

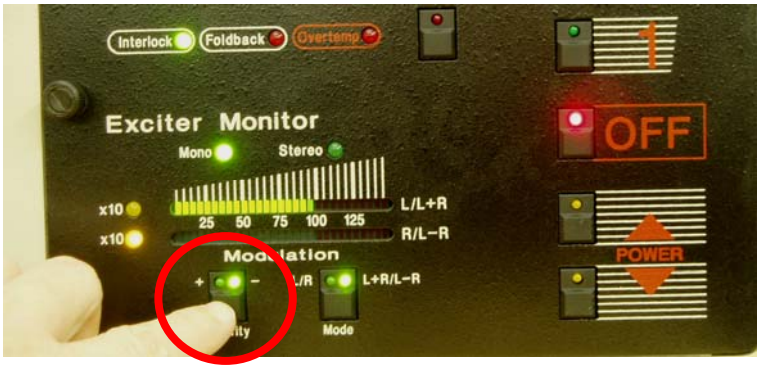


Figure 43 – Set Bar Graph for Negative Polarity

Step 4 – Open the door to gain access to the transmitter's Exciter / Controller Board.

Step 5 – Adjust the **NEGATIVE LIMIT** potentiometer **R76** until the bar graph reads 100% (one red light ON in bar graph at 100%).

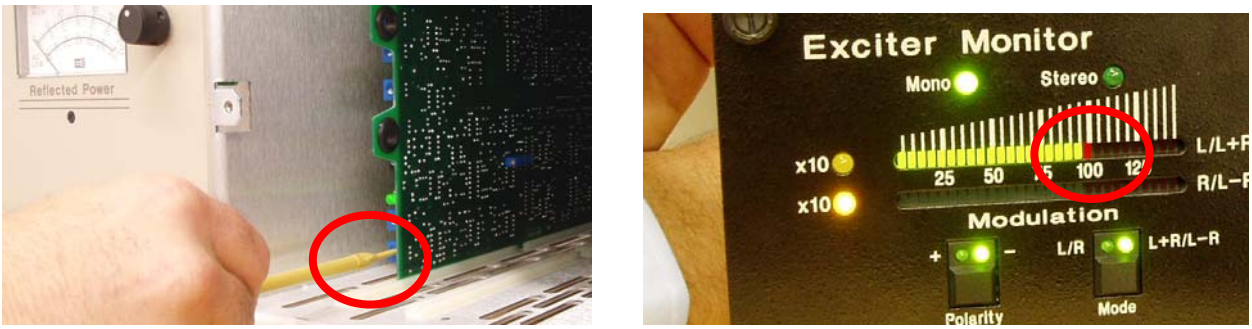


Figure 44 – R76

Step 6 – Adjust **R76 CW very slowly** until the **red light is barely extinguished.**

Figure 45 – Approximately 97% Negative Peak

11 System Setup for Operation (Positive Peak of 125%)

11.1 Apply Normal Audio Programming to the System

First, ensure that Normal Audio Programming content has been applied to the system via the **STUDIO AES IN** port on the rear of the **ASi 10**.

11.2 Set the AM AES ANALOG Processor for OPERATE mode

Next, go the **AM AES ANALOG** Processor and setup for **OPERATE** mode.

Set the unit as follows:

- ☐ set to OPERATE Mode (with Omnia Processor change the "Preset" to your program type)
- ☐ set Digital Output for AM Modulation (not HD/DRM) to -2.0 dBfs
- ☐ set Positive Peak Modulation Level to 125%

11.3 Set Analog Gain to 1.250

Step 1 - Next, on the ASi main GUI go to **SIGNAL**, then **Analog Gain**.

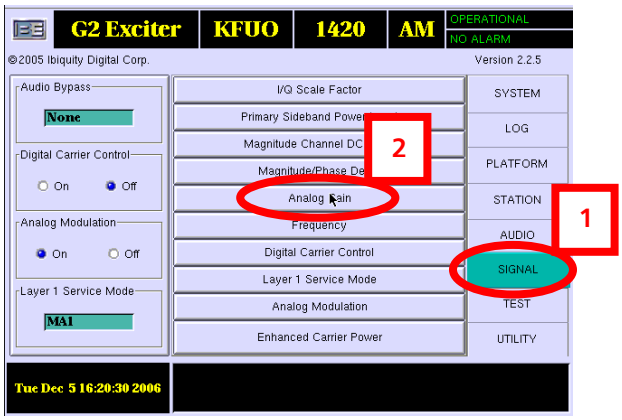


Figure 46 – Set Analog Gain

Step 2 – Using the keypad set the **Analog Gain** to **1.250**, select **Apply**, then **Enter**.

Figure 47 – Set Analog Gain

11.4 Positive Peak Bar Graph

Select the Bar Graph Polarity button and change to (+) on the front of the transmitter. The bar graph should now indicate 125% positive peak modulation if audio content is applied to the system.

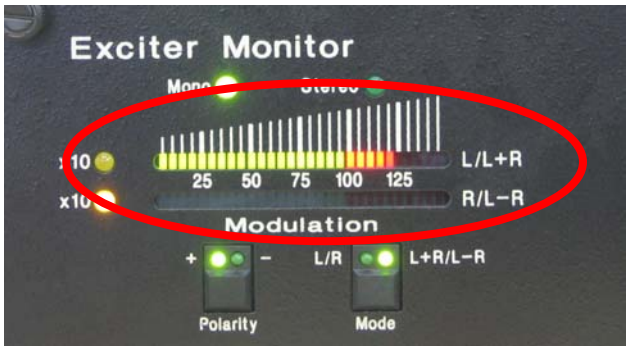


Figure 48 – 125% Positive Peak Modulation

11.5 Negative Peak Bar Graph

Select the Bar Graph Polarity button and changes to (-) on the front of the transmitter. The bar graph should now indicate approximately 97% negative peak modulation if audio content is applied to the system.

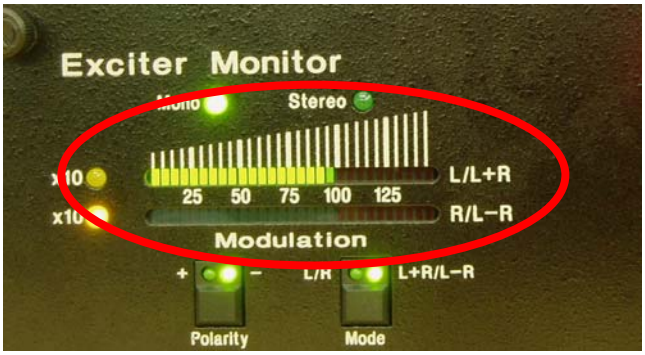


Figure 49 – Approximately 97% Negative Peak Modulation

11.6 Negative Limit Indicator DS5 (on Exciter Control Board)

If **DS5** is lit, slowly adjust **R76 CCW** until **DS5** is extinguished.

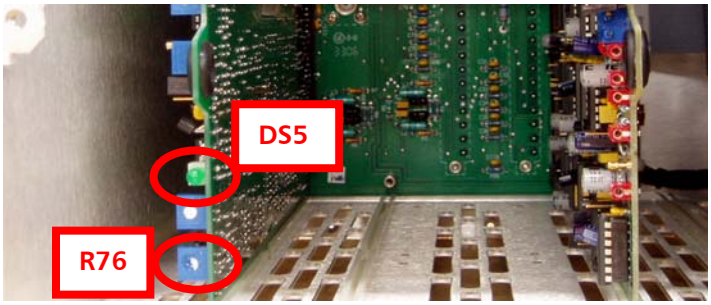


Figure 50 – DS5 Negative Limit Indicator

12 Tuning For IBOC Operation

12.1 Connect the Transmitter to a 50Ω Load (not the Antenna system!)

Ensure that the Transmitter is connected into a known good 50Ω load (not the Antenna System at this point).

12.2 Turn the Transmitter's RF Output Power ON

Turn the Transmitter's RF Output Power ON (select a lower preset power level at this point).

12.3 Turn Digital Carriers ON, Analog Modulation OFF

Next, on the ASi turn **Digital Carrier Control** to **ON**, and **Analog Modulation** to **OFF**.

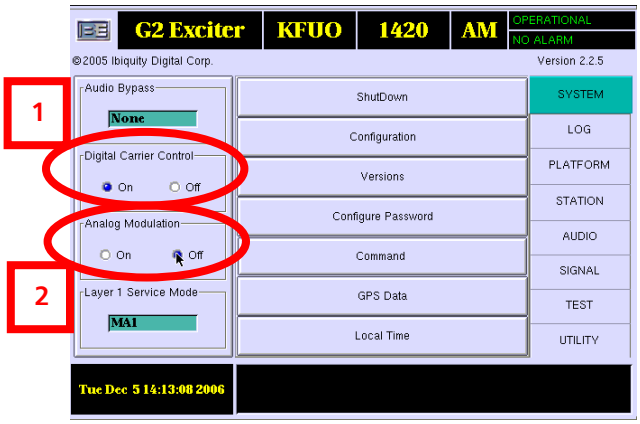


Figure 51 – Digital Carrier Control ON / Analog Modulation OFF

12.4 Checking the AM IBOC Spectrum

12.4.1 AM Spectral Measurements

The following identifies how to measure an AM TX for operation in HD.

12.4.2 AM Spectral Emissions Limits

The following table is the emissions mask for AM HD performance as specified by iBiquity. This is the emissions limits when the analog bandwidth is 5kHz.

Note that all measurements are made in a 300Hz bandwidth and relative to an un-modulated carrier.

AM HD FCC Spectral Mask	
offset from carrier frequency	level relative to unmodulated carrier (dB/300Hz)
5 to 10kHz	-34.3 dB
10 to 15kHz	-26.8dB
15 to 15.2 kHz	-28 dB
15.2 to15.8 kHz	[-39 - (Freq offset in kHz - 15.2) * 43.3] dB
15.8-25 kHz	-65 dB
25-30.5 kHz	[-65 - (Freq offset in kHz - 25) * 1.273] dB
30.5-75 kHz	[-72 - (Freq offset in kHz - 30.5) * 0.292] dB
>75 kHz	-80dB

Figure 52 - AM HD Spectral Mask Limits

In addition, there are two notes on the iBiquity specification in regard to discrete spurious such as in a PWM TX.

They are:

1) No more than two discrete components within 75 kHz of the carrier frequency shall exceed the spectral emission limits by more than 10dB.

2) No more than four discrete components removed from the carrier frequency by more than 75 kHz shall exceed the spectral emission limits by more than 5dB.

Figure 53 below shows the AM spectral emissions limits mask for HD in red. The limit shown in red is the implementation of the table in **Figure 52** above. The emissions limits shown in blue in **Figure 53** below are the AM emissions limits as set by the FCC and are currently documented in the FCC rules for standard AM operation without HD.

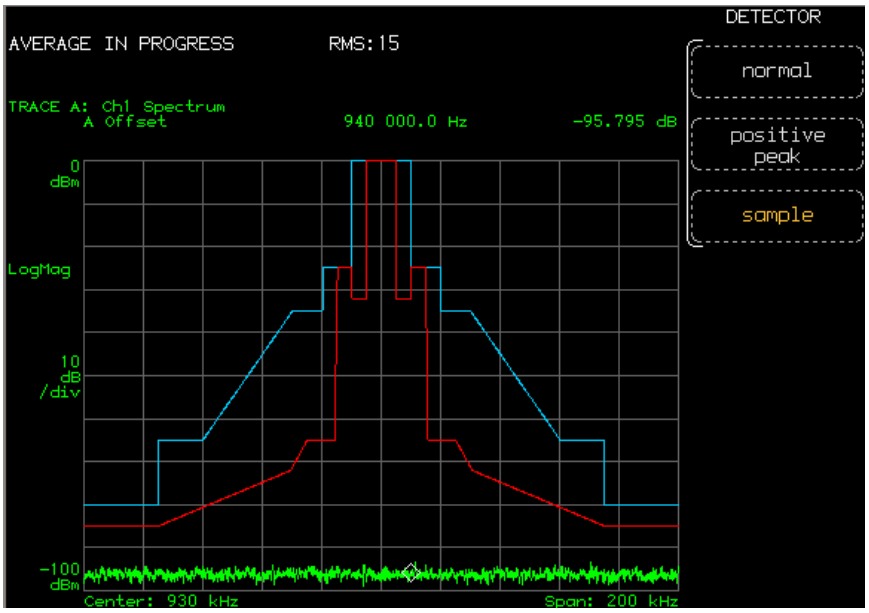


Figure 53 - Emissions Limits in Graphical Form

12.4.3 Setting up the Spectrum Analyzer

Reference:

Setting the reference for the measurement is critical to taking accurate data and the following steps should be taken. When setting this reference point the analyzer detector MUST be set to peak.

1) The reference level on the spectrum analyzer should be set at 0dBm. That is the top line on the spectrum is 0dBm. All measurements should be referenced to this point.

2) Apply an un-modulated AM signal to the spectrum analyzer input (external variable and/or fixed attenuation should be in line with the front to avoid overdriving or damage to the spectrum). Adjust the external variable attenuator until the un-modulated AM carrier is at the 0dBM reference line.

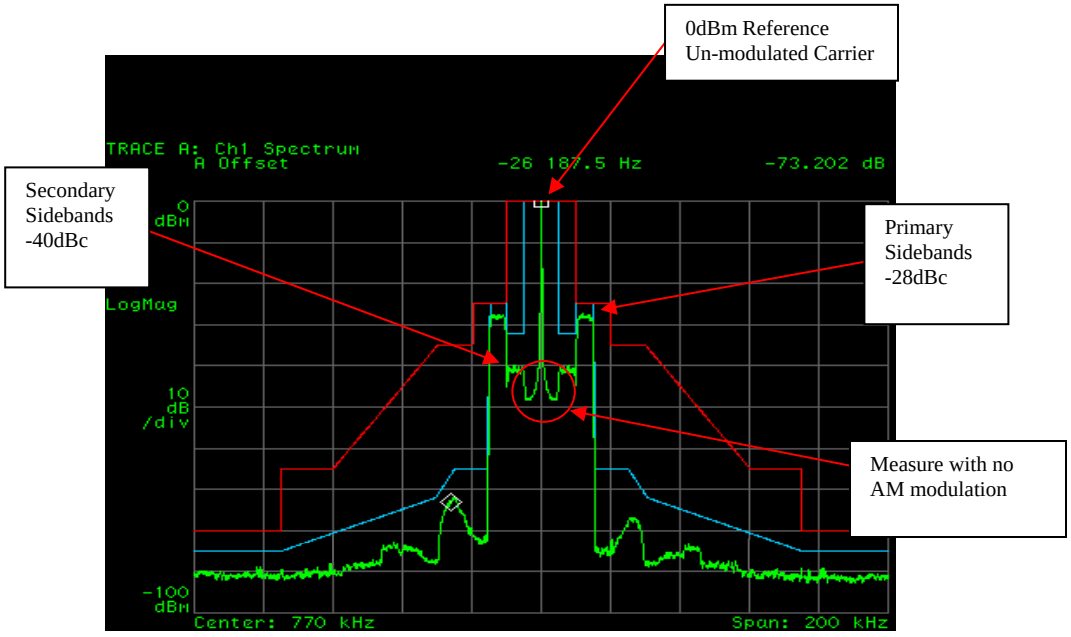


Figure 54 - 0dBm reference (Aligned AM IBOC Transmitter)

Resolution Bandwidth, Span, Detector, and Averaging:

When measuring an AM HD spectrum the spectrum analyzer must have the **Resolution Bandwidth** (RBW) set to **300Hz**. The **Span** setting of **200 kHz** is not required but is a good setting to view performance. The **Detector** should be set to **Sample** and **Averaging** should be set to **30**.

An un-modulated AM transmitter spectrum that is properly aligned magnitude and phase should appear as shown in Figure above. It is critical that this measurement is made with no AM modulation. In addition the primary sidebands should be ~28dB down from the un-modulated carrier and the secondary sidebands should be ~40dB down from the un-modulated carrier in a good system.

All measurement **MUST** be made into a known good 50 ohm load prior to putting TX into an antenna system. This ensures that the TX is known to be operating properly aside from the antenna system.

NOTE: When the TX is operated into an antenna system the magnitude and phase will have to be re-adjusted for best spectral performance.

Figure 55 below shows an AM transmitter with the phase and magnitude misaligned. As you can see the inter-modulation products fall outside the emissions mask and this system should be adjusted for proper operation.

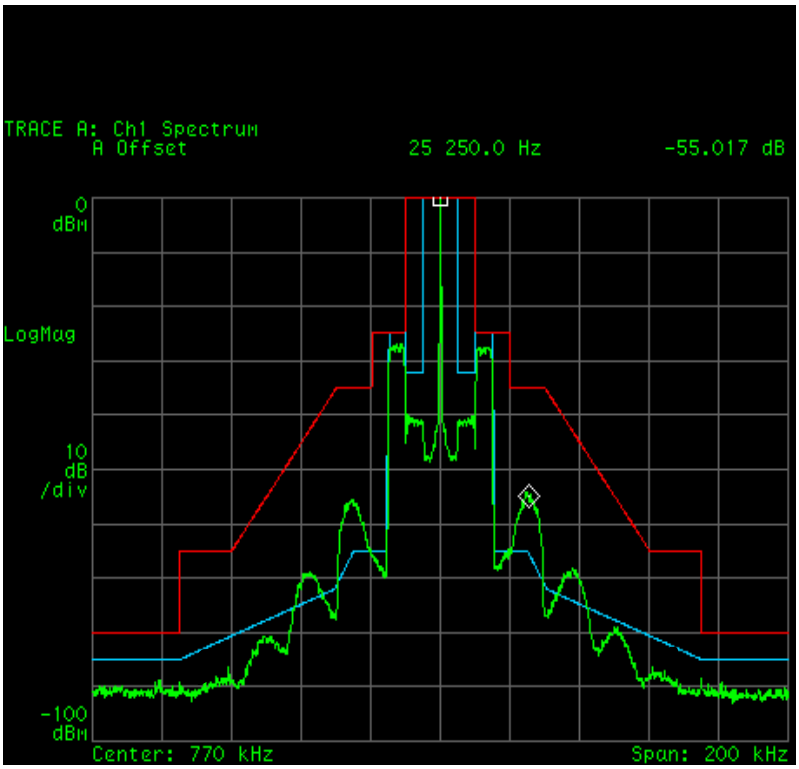


Figure 55 - Misaligned AM Transmitter

12.5 Aligning the IBOC Spectrum

There are three adjustments for aligning the AM IBOC Spectrum.

12.5.1 Adjusting Magnitude / Phase in the ASi 10

The first adjustment method to be used is changing the Magnitude/Phase Delay in the ASi 10. This is an empirical process to find the best value for your specific system.

Step 1 - Select **SIGNAL**, then **Magnitude / Phase Delay.**

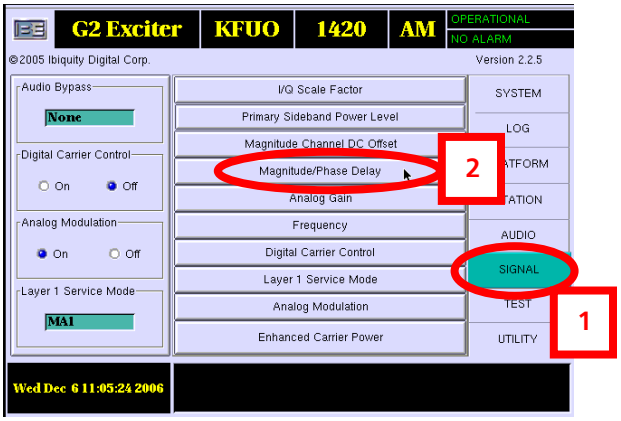


Figure 56 – Magnitude / Phase Delay

Step 2 – Ensure that **Day** is selected, then select **Edit Selection**.

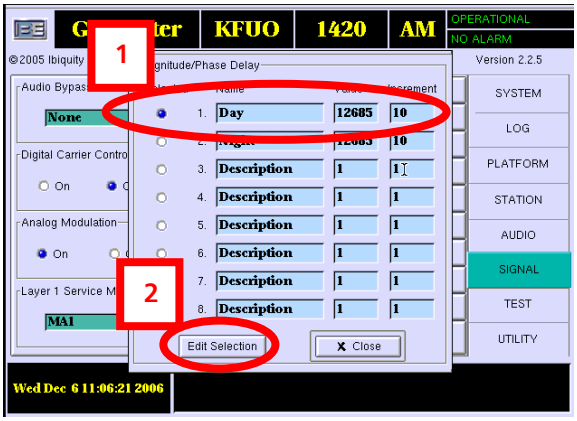


Figure 57 – Magnitude / Phase Delay

Step 3 – Select the **Increment** box and the virtual keypad will appear.

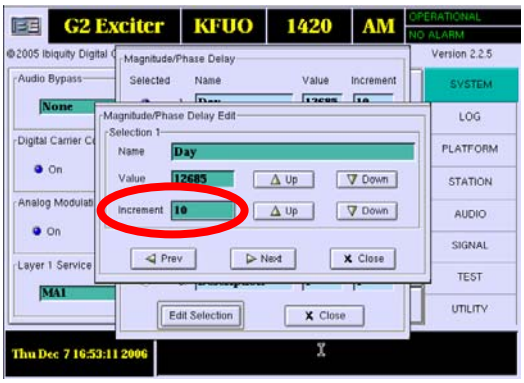


Figure 58 – Magnitude / Phase Delay

Step 4 – Using the keypad set the **Increment** to **100**, select **Apply**, then **Enter**.

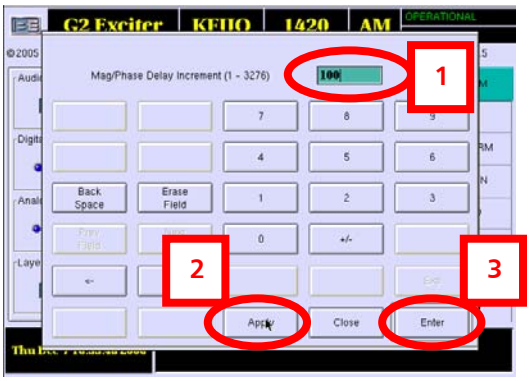


Figure 59 – Magnitude / Phase Delay

Step 5 – Increment the value up and view the spectrum.
Step 6 – Increment the value down and view the spectrum.

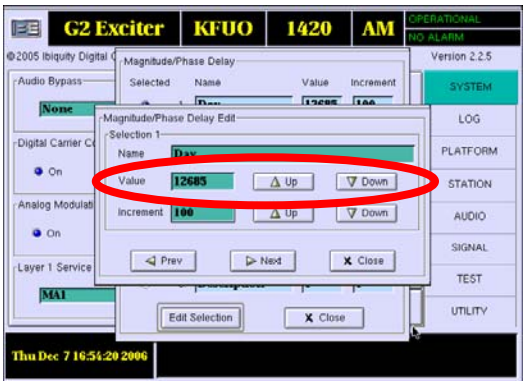


Figure 60 – Magnitude / Phase Delay

Step 7 – Monitor the Spectrum Analyzer and record the best minimum value from Steps 5 and 6 that achieved the best alignment.

Step 8 – Repeat Steps 5 – 7 with the increment setting at 10.

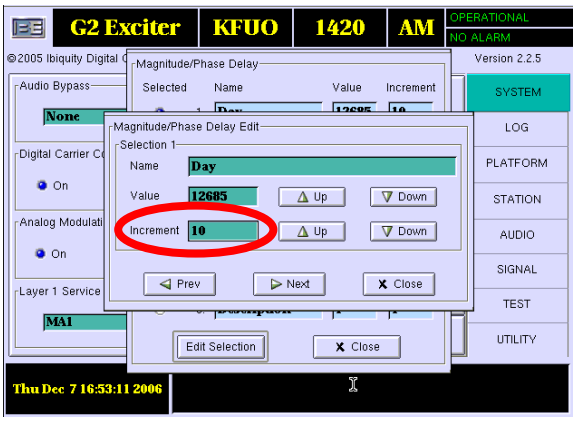


Figure 61 – Magnitude / Phase Delay

Step 9 – View spectrum and if spectrum is similar to **Figure 54** and within the mask, no further adjustments are needed. If the transmitter does not meet the mask, proceed to **Section 12.5.2.**

12.5.2 Adjust R230 (Only if Necessary)

Note: This adjustment is normally not needed.

After setting the Magnitude/Phase Delay, use potentiometer R230 on the back side of the Exciter Control Board to make fine adjustments while monitoring the Spectrum. **DO NOT** turn this pot more than 1 turn in either direction.

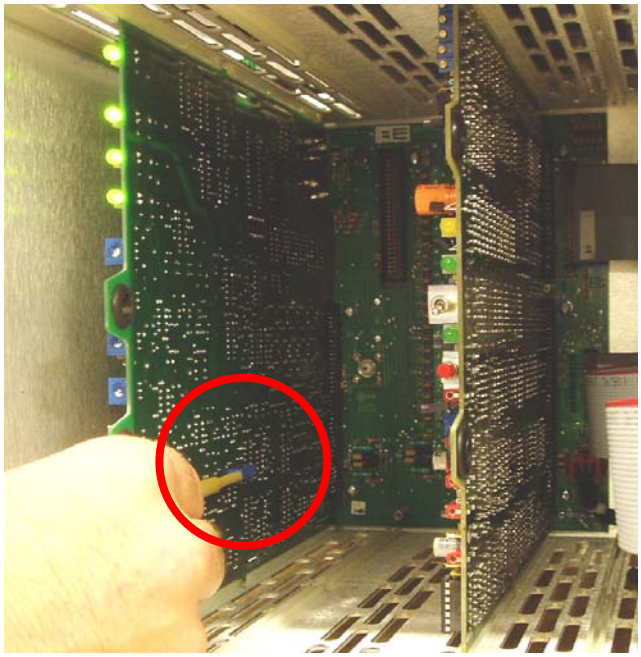


Figure 62 – R230

12.5.3 Adjust R45 on the ASi 10 DUC Board (Only if Necessary)

There is one more final tweak that may be made. However, this should **ONLY** be used if the first two methods do not yield the desired results.

R45 is located on the back side of the DUC Board which is inside of the ASi 10 (remove cover to gain access). Adjust R45 while monitoring the Spectrum. **DO NOT** turn this pot more than an 1/8 of a turn in either direction. A very slight adjustment here will greatly impact the Spectrum!

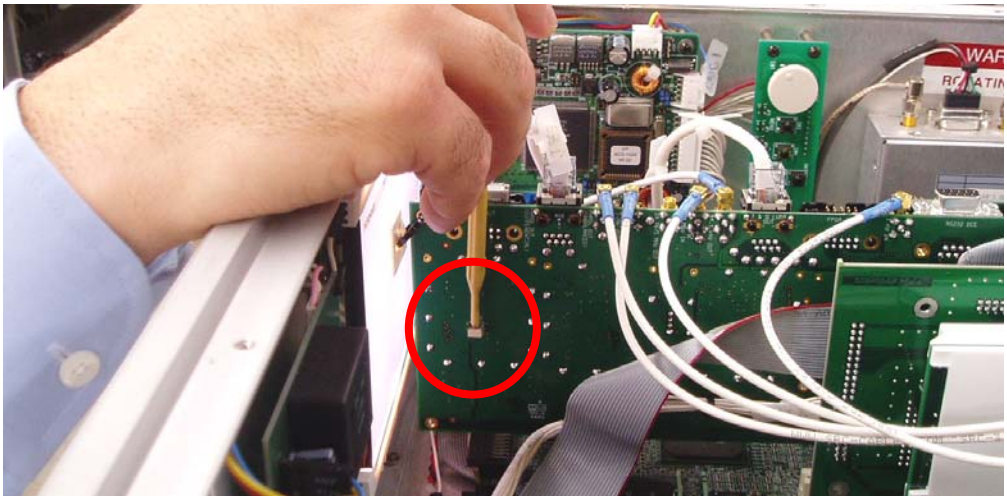


Figure 63 – R45

12.5.4 Verify Spectrum

Verify that the spectrum is similar to **Figure 54** and within the mask.

12.6 Turn Digital Carriers ON, Analog Modulation ON

Next, on the ASi turn **Digital Carrier Control** to **ON**, and **Analog Modulation** to **ON**.

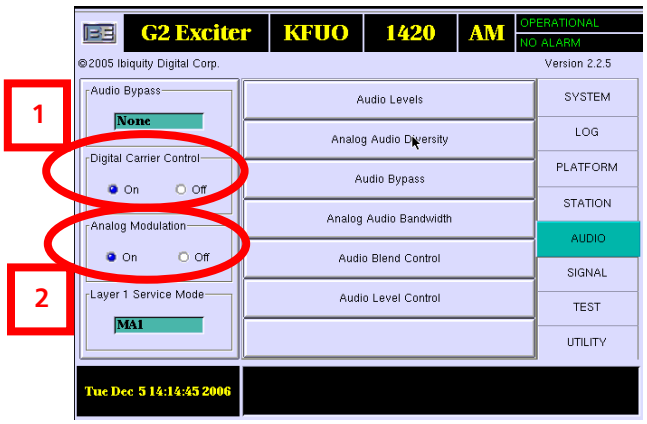


Figure 64 – Digital Carrier Control ON / Analog Modulation ON

12.7 Positive Peak Bar Graph

Set the Bar Graph polarity to (+) on the front of the transmitter. The bar graph should indicate 125% positive peak modulation if audio content is applied to the system.

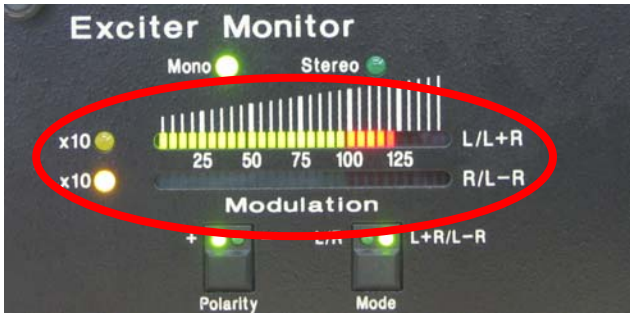


Figure 65 – 125% Positive Peak Modulation

12.8 Negative Peak Bar Graph

Set the Bar Graph polarity to (-) on the front of the transmitter. The bar graph should indicate approximately 97% negative peak modulation if audio content is applied to the system.

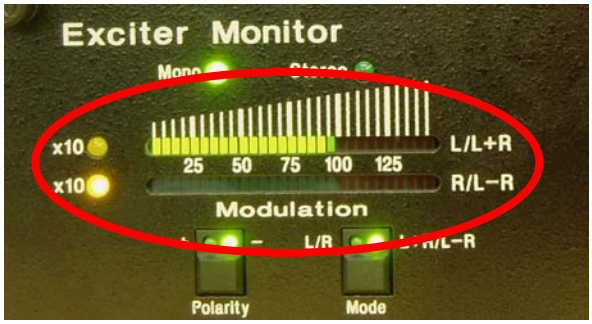


Figure 66 – Approximately 97% Negative Peak Modulation

12.9 Fine Tuning for Optimum Spectral Performance

To ensure that the spectrum is aligned for HD operation and also meets the NRSC FCC masks under peak hold conditions, further adjustments may be required as follows. These adjustments are required when the negative peaks are clipped causing bursts of noise in the spectral output as shown in **Figure 67** below.

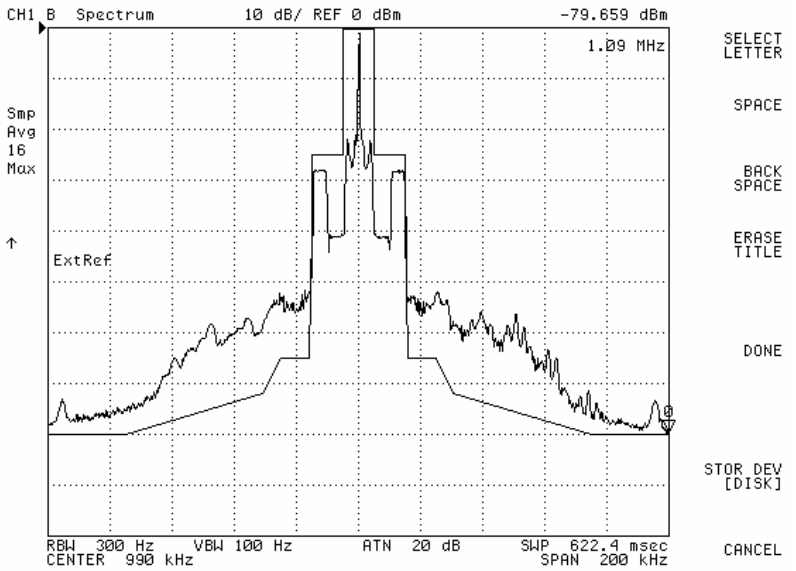


Figure 67 – Spectrum with Bursts of Noise

12.9.1 Adjust R76 all the way CCW.

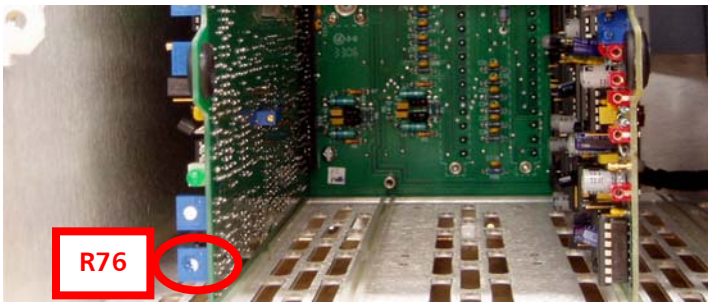


Figure 68 – Adjust R76 all the way CCW

12.9.2 Adjust the ASi 10 Analog Gain to 1.100

Step 1 – Select **SIGNAL**, then **Analog Gain**.

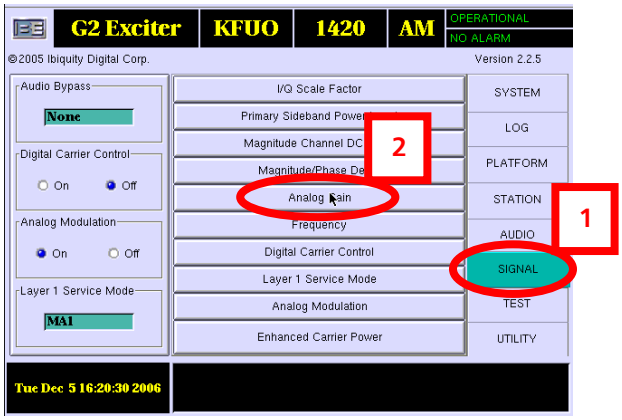


Figure 69 – Set Analog Gain

Step 2 – Using the keypad set the **Analog Gain** to **1.100**, select **Apply**, then **Enter**.

Figure 70 – Set Analog Gain

12.9.3 Adjust the AM AES ANALOG Processor

Go the **AM AES ANALOG** Processor and set the unit as follows:

- ☐ set Digital Output for AM Modulation (not HD/DRM) to -3.0 dBfs
- ☐ set Positive Peak Modulation Level to ~ 130 - 140%

12.9.4 Verify Spectrum

Verify that the spectrum is similar to **Figure 54** and within the mask. Also verify positive and negative peak modulation levels on the front of the transmitter.

13 Verify Operation on HD Receiver

Tune an HD Receiver to the transmitter frequency and verify that it locks up. See Section 10 for adjusting the Audio Level Control.

14 Setup Audio Bypass

Step 1 - Select **AUDIO**, then **Audio Bypass.**

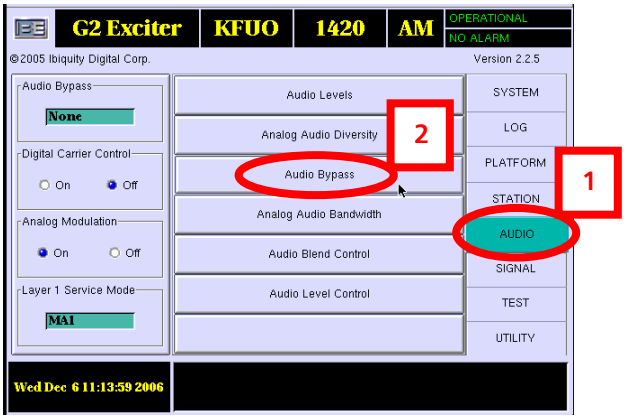


Figure 71 – Audio Bypass

Step 2 – To enable **Audio-A Bypass**, select **ON**, then **OK.** Both the **Auto Startup** and **Auto Shutdown** check boxes should be checked.

With **Audio Bypass** set to **ON**, the system will now automatically route audio from the AES AM ANALOG audio processor directly to the transmitter in the event that the Audio Output from the ASi is lost.

(Note: **Audio-B Bypass** is not used for normal operation.)

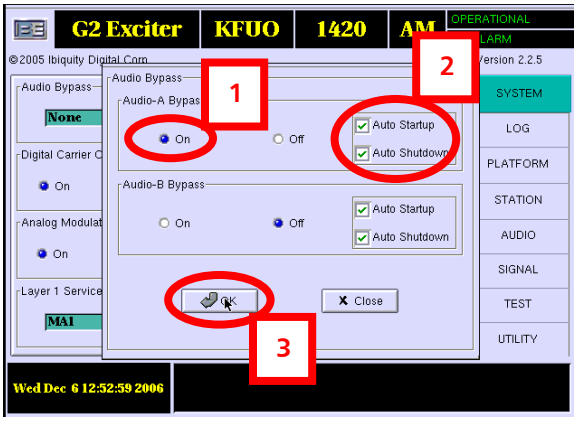


Figure 72 – Audio Bypass

Step 3 – Next, adjust the **AUDIO LEVEL ADJUST** pot on the rear of the ASi 10 to achieve the same level of positive peak modulation (125%) .

- Turn the pot **CCW** to **decrease** the modulation level.
- Turn the pot **CW** to **increase** the modulation level.

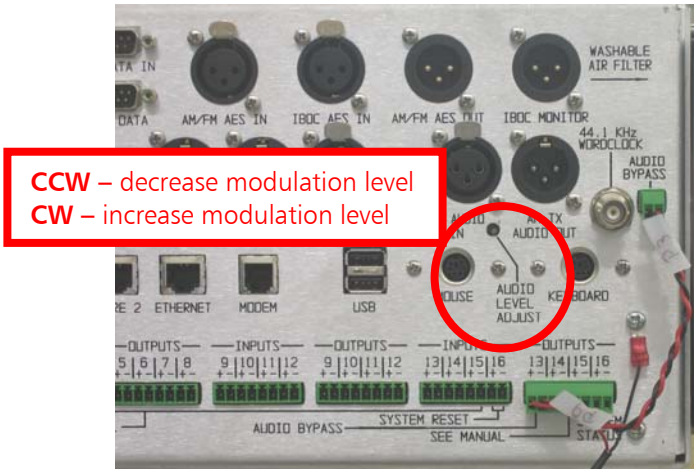


Figure 73 – Audio Level Adjust Pot (rear of ASi - some cabling removed for clarity)

15 Connect the Transmitter into the Antenna System

Disconnect the transmitter from the 50Ω test load and connect to the antenna system. Monitor the spectrum and ensure it is similar to **Figure 54** and within the mask. If the spectrum is not within the mask proceed to the next section.

15.1 Re-adjust Phase / Magnitude (Only if Necessary)

If the output spectrum does not meet the mask, go to section 9 and perform these steps with the transmitter connected into the antenna system.

15.2 Adjust Sideband Levels (Only if Necessary)

If the spectrum is still not within the mask, adjust the sideband levels as shown below.

Step 1 - Select **SIGNAL**, then **Primary Sideband Power Level**.

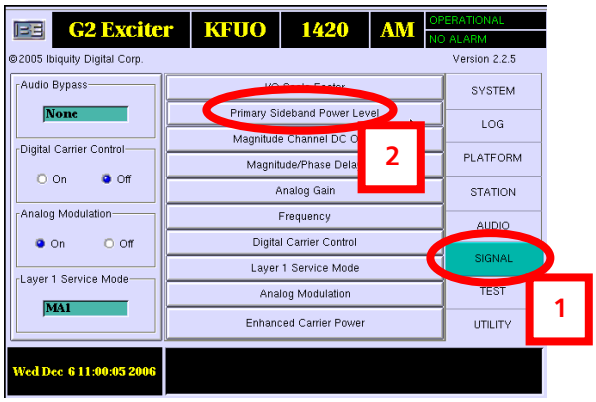


Figure 74 – Primary Sideband Power Level

Step 2 – The default Primary Sideband Power Level setting is **0.000 dB** for both **Upper** and **Lower Sideband Scaling** while the default **Scaling Increment** is **1.000 dB** for both.

Change these settings, if necessary, by **1.000 dB** and select **Close**.

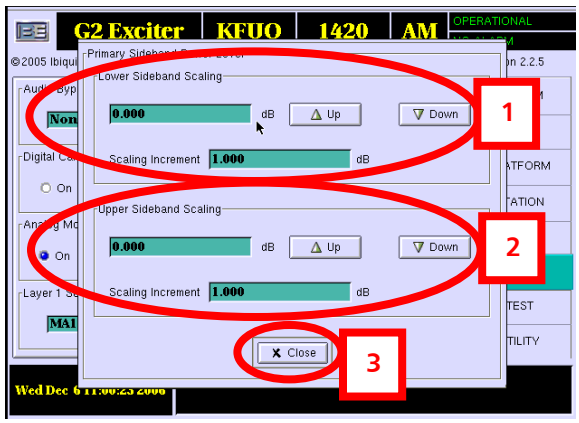


Figure 75 – Primary Sideband Power Level

16 Audio Level Control

After the HD system is completely installed, it may be necessary to adjust the Audio Level Control in the ASi 10 to ensure that the Analog and HD signal levels are approximately the same. This is important so when a receiver goes from the Analog signal to the HD signal (or vice versa) the volume level to the listeners is the same.

Step 1 - On a HD Receiver tune to the broadcast signal of the transmitter. The HD receiver first will go to the analog signal and then to the HD signal. Listen for this change and adjust the Audio Level control until the volume level is approximately the same for both signals.

Step 2 - Select **AUDIO**, then **Audio Level Control.**

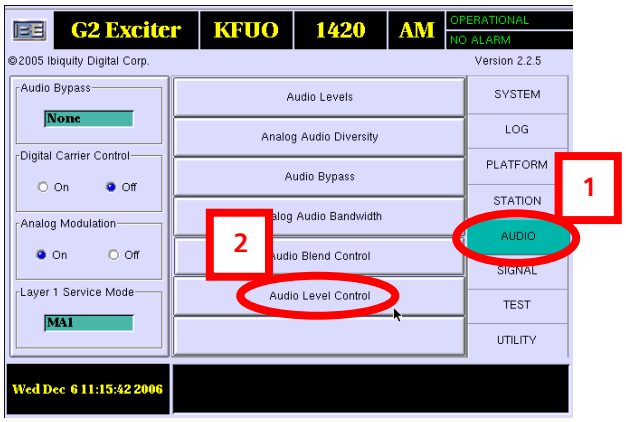


Figure 76 – Audio Level Control

Step 3 - The default is **0**. The range for this setting is (-8 to +7dB).

If the HD signal level is lower than the Analog, increase this value select **Apply**, then **Enter**.

If the HD signal level is higher than the Analog, decrease this value select **Apply**, then **Enter**.

Make small adjustments in either direction and listen to the affect on the HD receiver.

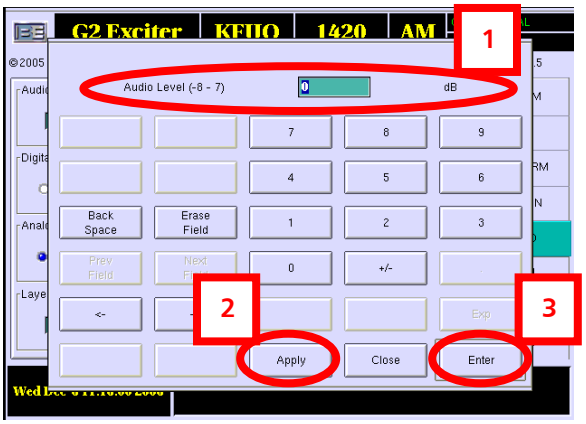


Figure 77 – Audio Level Control

Step 4 – Repeat process until the HD and Analog signal levels are the same.

17 Second Harmonic Null Adjust Pot (R6 on IBOC Bypass PCB)

On the IBOC Bypass PCB Assembly (919-0560 – installed on the rear of the transmitter controller in Section 4.5) there is a 2nd Harmonic Null Adjust potentiometer, R6. Use a spectrum analyzer to monitor the transmitter's 2nd harmonic and adjust R6 only if needed. Ensure that the spectrum is similar to **Figure 54** and within the mask.

Figure 78 – 2nd Harmonic Null Adjust Potentiometer R6

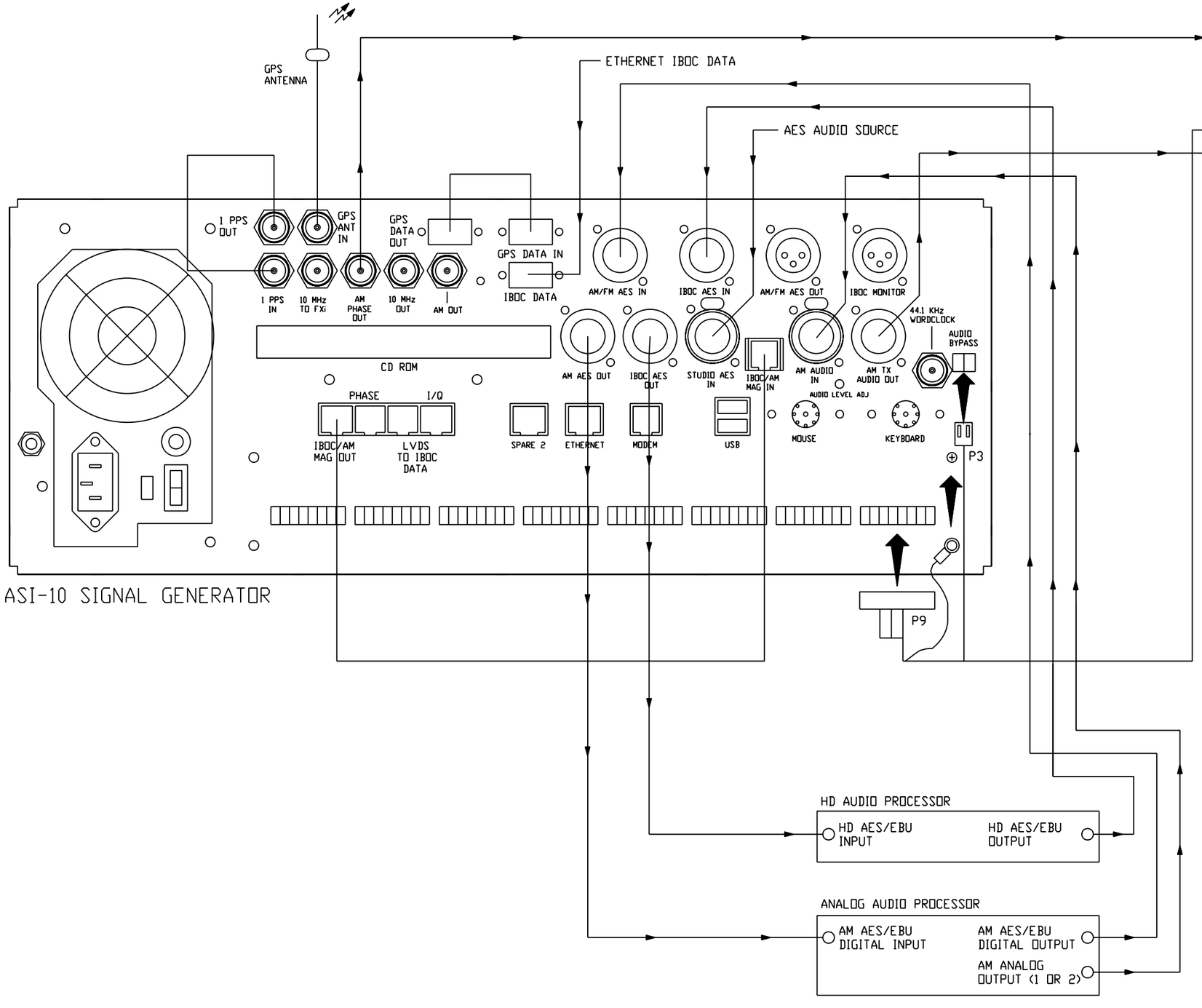
18 RF Customer Service Contact Information

RF Customer Service -

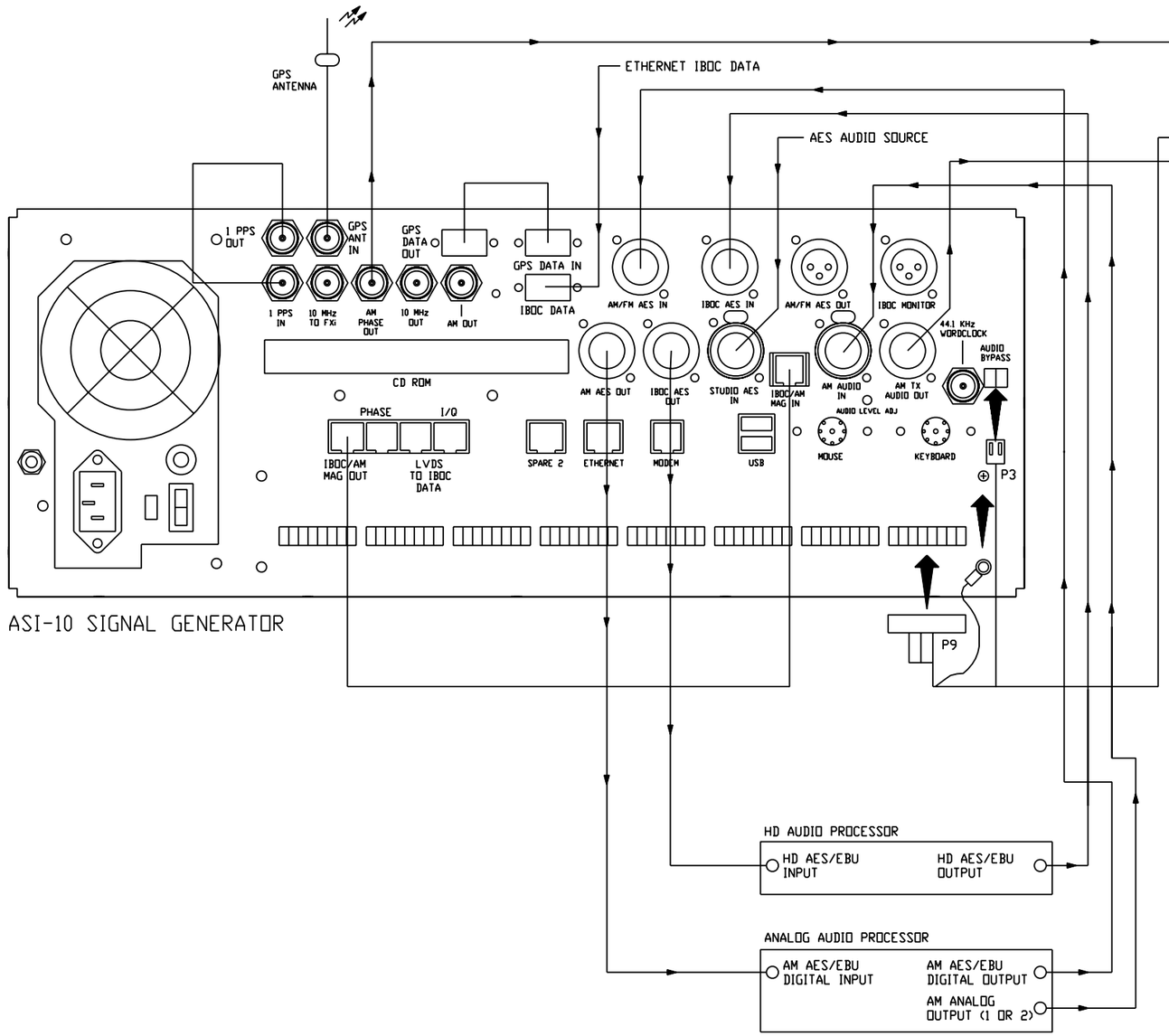
Telephone: (217) 224-9617
E-Mail: rfservice@bdcast.com
Fax: (217) 224-9607

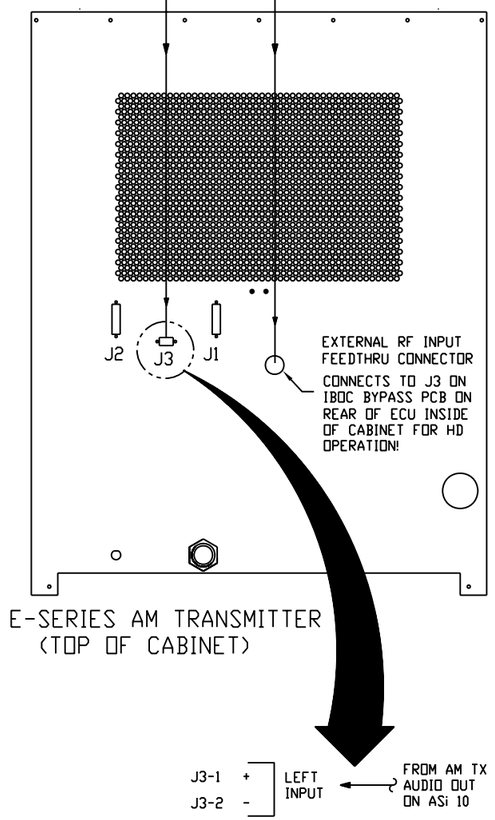
19 Schematics

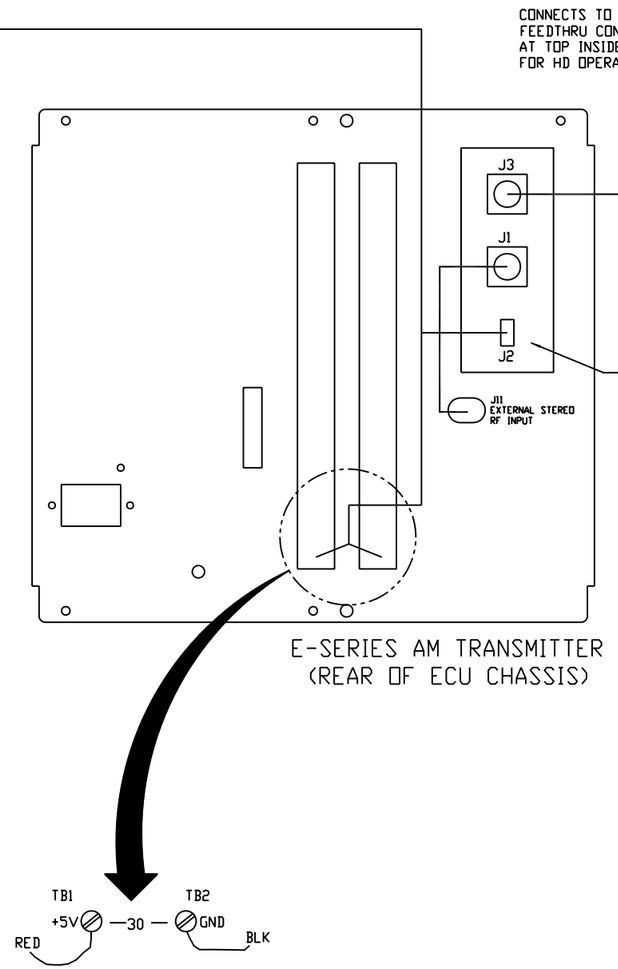
19.1 Typical AM HD System Interconnect – "A" Series Tx (597-0125-002)
19.2 Typical AM HD System Interconnect – "E" Series Tx (597-0125-003)
19.3 AM Transmitter Exciter Controller PCB (917-0300)
19.4 IBOC Bypass PCB (919-0560)



"A-SERIES TRANSMITTER"
TYPICAL AM HD SYSTEM INTERCONNECT DRAWING
597-0125-002 REV A







"E-SERIES TRANSMITTER"
TYPICAL AM HD SYSTEM INTERCONNECT DRAWING
597-0125-003 REV A

REVISIONS					
REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN
1	11-20-95	PROTOTYPE RELEASE	MERK	JW	----
2	1-25-96	SEE SHEET 2.	MH	JW	----
3	6-26-96	SEE SHEET 4.	MH	JW	----
A	8-9-96	ENGINEERING RELEASE WITHOUT CHANGE.	MH	JW	----
B	1-22-97	SEE SHEET 2.	KT	JW	9791
C	10-13-97	SEE SHEET 2.	KT	JW	9870
D	2-26-98	ADDED TP19;ALSO SEE SHEET 2.	MH	JW	9940
E	7-20-98	SHEET 2.	MSE	JW	9990
F	1-25-99	SHEET 2.	KT	JW	10082
G	2-21-00	SHEET 4.	KT	JW	10263
H	4-5-01	CHGD U3,U6,U8,U9 TO TL072, SEE SHEETS 2-4 ALSO	KT	JW	10428
M	11-13-02	ADDED J14-J19,P14-P19,C177 & C178	KT	JW	10827
N	3-12-03	ADDED J20,P20,R229 & R230; SEE SHEET 2 ALSO	KT	JW	10918
P	5-11-04	DEL JP2,JP3; ADD JP22;CHGD C42-C44,C46-C48,C50-C52,R43-R51	KT	JW	11151
R	7-14-04	TIE R8 NET TO R10 NET & R23 NET TO R25 NET	KT	JW	11195
T	1-10-05	CHGD JUMPER SETTINGS FOR JP18 & JP19	KT	JW	11232
U	3-1-05	CHGD R229 TO 1K	KT		11252
V	6-27-06	CHGD C90 TO .1uF(003-1066)	JTB		11443

LEFT INPUT

RIGHT INPUT

PART OF MOTHERBOARD

P101 30 C147 .1uF C148 .1uF R192 113K +15V C3 0.1 U1/A

P12A J12/A LEFT HI PASS DEFEAT R1 100K R2 221K

C1 10uF N.P.

P101 31 C149 .1uF C150 .1uF R193 113K U1/B

P12B J12/B LEFT HI PASS DEFEAT R3 100K R4 221K

C2 10uF N.P. C4 0.1 -15V

P101 36 C151 .1uF C152 .1uF R194 113K +15V C18 0.1 U4/A

P13A J13/A RIGHT HI PASS DEFEAT R16 100K R17 221K

C16 10uF N.P.

P101 37 C153 .1uF C154 .1uF R185 113K U4/B

P13B J13/B RIGHT HI PASS DEFEAT R18 100K R19 221K

C17 10uF N.P. C19 0.1 -15V

P1 +5V R52 10K L1 22uH C31 0.1 C32 10uF C33 0.1 R31 221 DS1 +5V RFGND

P101 1 P101 41

P101 15 P101 55 L2 22uH C34 22uF C35 0.1 R53 10K R32 1.24K DS2 +15V TP2

P101 16 P101 56 L3 22uH C36 22uF C37 0.1 R54 10K R33 1.24K DS3 -15V TP3

P101 29 P101 69 P101 68 P101 71 P101 35 P101 74 P101 75 P101 76 P101 70

P101 77 P101 38 P101 78 P101 39 P101 79 P101 40

TP4

U2/A U2/B U3/A U3/B U4/A U4/B U5/A U5/B U6/A U6/B U8/A U8/B U9/A U9/B TL072

C5 .1 C6 1000pF C7 150pF C8 0.1 C9 500pF C10 1000pF C11 150pF C12 0.1 C13 C14 1000pF C15 0.1 C20 0.1 C21 1000pF C22 150pF C23 0.1 C24 500pF C25 1000pF C26 150pF C27 0.1 C28 C29 1000pF C30 0.1 C31 0.1 C32 10uF C33 0.1 C34 22uF C35 0.1 C36 22uF C37 0.1 C38 0.1 C39 0.1 C40 33pF C41 0.1 C42 0.01uF C43 100pF C44 47pF C45 0.1 C46 0.01uF C47 100pF C48 47pF C49 0.1 C50 0.01uF C51 100pF C52 47pF C53 0.1 C177 150pF C178 150pF

R5 10K R8 26.7K R9 26.7K R10 10K R11 10K R12 10K R14 15K R15 100 R20 10K R23 26.7K R24 26.7K R25 10K R26 10K R27 10K R29 15K R30 100 R34 100K R35 10K R36 100K R37 100K R38 39.2K R39 39.2K R40 221 R41 20K CW R42 20.0K R43 340 R44 43.2K R45 43.2K R46 340 R47 43.2K R48 43.2K R49 340 R50 43.2K R51 43.2K R229 1K R230 2K CW

E1 E2 E3 E4 SEE TABLE

INPUT LEVEL	RESISTOR VALUE
+10dBm	NONE
+8dBm	38.3K
+4dBm	10.0K
0dBm	4.64K

P18 J18 P19 J19 P20 J20

2.19V =100%

TP17 LEFT P101 32 LEFT OUTPUT

TP18 RIGHT P101 34 RIGHT OUTPUT

TP19 L+R P22 J22 H.F. BOOST OUT IN

P4 J4 RIGHT LEFT MONAURAL TRANSMITTER ACTIVE CHANNEL SELECT

U7 SINGLE CHANNEL MONO LEVEL

P101 72 MONO SC P101 73 MONO R P101 33 MONO L

JUMPER PIN SETTINGS		
J/P	IBOC	STANDARD
JP4	2-3	2-3
JP7	1-2	2-3
JP12A	1-2	OPEN
JP12B	3-4	OPEN
JP13A	1-2	OPEN
JP13B	3-4	OPEN
JP14	1-2	OPEN
JP15	1-2	OPEN
JP16	1-2	OPEN

JUMPER PIN SETTINGS		
J/P	IBOC	STANDARD
JP17	1-2	OPEN
JP18	1-2	1-2
JP19	1-2	1-2
JP20	1-2	OPEN
JP21	1-2	2-3
JP22	2-3	1-2

NOTES:
1. ALL RESISTORS IN OHMS; 1/4W, 1% UNLESS OTHERWISE SPECIFIED.
2. LAST COMPONENT USED:R231,C178,U47, J21,Q23,D55,D69,Y2,L6,E10,P19,TP19 & S2.
3. COMPONENTS NOT USED:C28,C86,C87,C161,D3,D6,D8,D10, D12,D14,D16,D18,D20,D28,D47,D49,Q1,Q2,Q9-Q11,R13,R28, R57,R95-R98,R103-R111,U18.
4. SEE ASSEMBLY:AC 917-0300.
5. ALL UNMARKED GROUNDS ARE AUDIO GROUND SHEETS 1&2 ALL OTHER GROUND IS RF GROUND SHEET 3&4.
6. FOR 10KHz SPACING, Y1=10.24MHz P/N 390-0013 FOR 9KHz SPACING, Y1=9.216MHz P/N 390-0017

TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°

DWN. BY M. MERKEL 11-20-95
CHKD
ME
PROJ. ENGR. 8-16-96 JW
MFG.

MATERIAL SEE B/M 917-0300
FINISH
SEE DWG RA592-0000
NEXT ASSY.

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O.BOX 3606 QUINCY, IL. 62305 217/224-9600
TELEX 250142 CABLE BROADCAST FAX 217/224-9687

TITLE: ECU EXCITER BD

TYPE S SIZE B DWG. NO. 917-0300 REV V

MODEL AM-1A SCALE NONE SHEET 1 OF 4

REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN
K	4-5-01	CHGD U14-U17 TO TL072	KT	JW	10428
L	2-5-02	ADDED C13	KT	JW	10622
N	3-12-03	ADDED J21,P21 & R231	KT	JW	10918
R	7-14-04	CHGD R63 FROM 34K TO 32.4K	KT	JW	11185
U	6-27-06	CHGDC90 TO .1uF(003-1065)	JTB		11443

REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN
1	11-20-95	PROTOTYPE RELEASE	MERK	JW	----
2	1-25-96	CHANGED C167 TO 1uF NON-POLARIZED.	MH	JW	----
A	8-9-96	ENGINEERING RELEASE WITHOUT CHANGE.	MH	JW	----
B	1-22-97	ADDED C173,D64,D65,Q23,R212 & R213.	KT	JW	9791
C	10-13-97	ADDED C174-176,D66,D67,R214-217 & U47.	KT	JW	9870
D	2-26-98	R217 WAS 1K.	MH	JW	9940
E	7-20-98	REMOVE +15V FROM PIN 10 ON U47/B	MSE	JW	9990
F	1-25-99	ADDED D68 & D69.	KT	JW	10082
J	3-23-00	D7,D9,D11,D13,D15,D17,D19,D21,D48,D50 WERE 201-2800 DEL D6,D8,D10,D12,D14,D16,D18,D20,D47 & D49; ADDED R219-228	KT	JW	10284

TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

DWN. BY M. MERKEL	11-20-95	MATERIAL SEE B/M 917-0300
CHKD		
ME		FINISH
PROJ. ENGR. JW	8-16-96	SEE DWG AA592-0000
MFG.		NEXT ASSY.

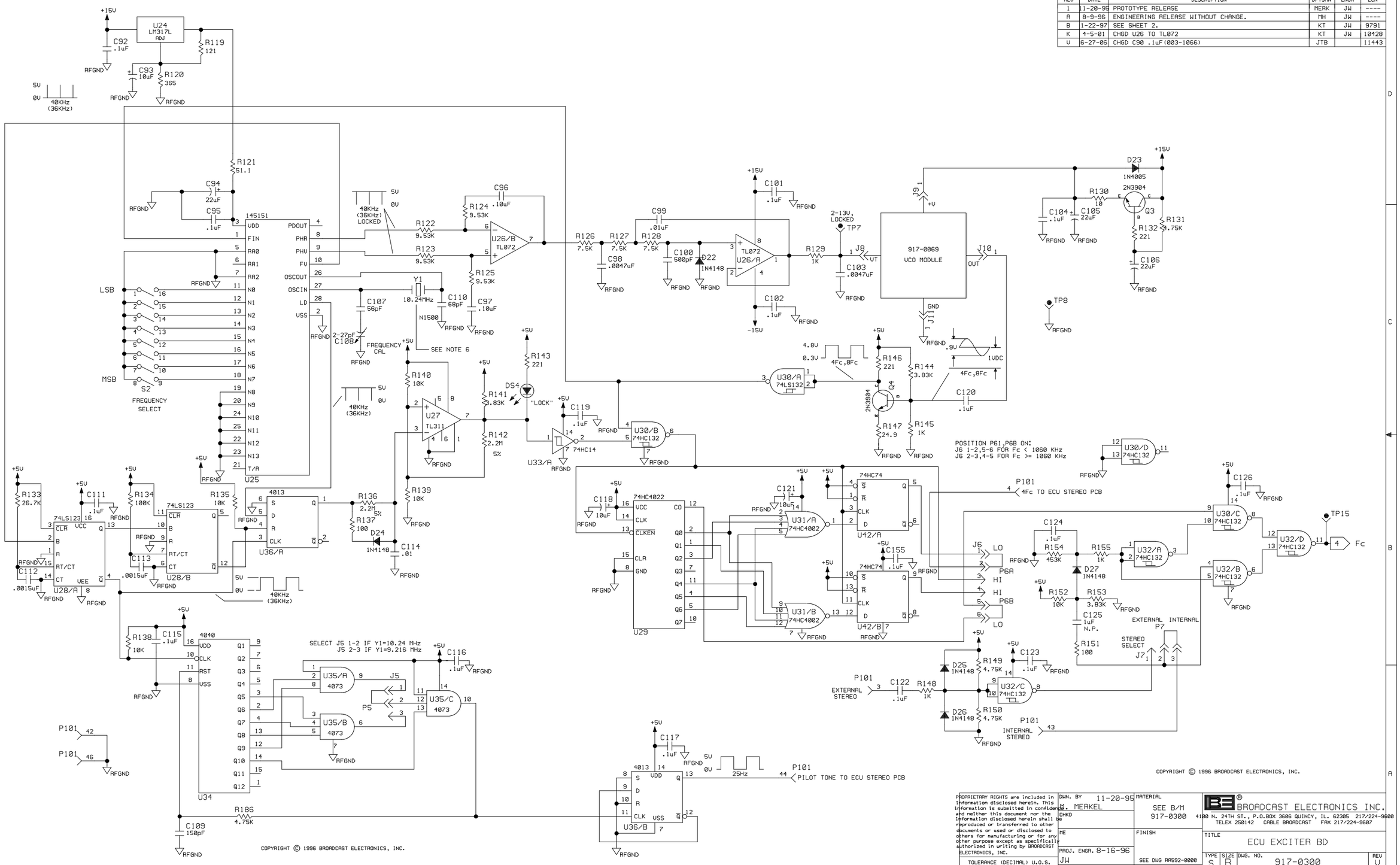
BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O.BOX 3606 QUINCY, IL. 62305 217/224-9600
TELEX 250142 CABLE BROADCAST FAX 217/224-9607

TITLE: ECU EXCITER BD

TYPE	SIZE	DWG. NO.	REV
S	B	917-0300	V

MODEL AM-1A | SCALE NONE | SHEET 2 OF 4

REVISIONS					
REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN
1	11-20-95	PROTOTYPE RELEASE	MERK	JW	----
A	8-9-96	ENGINEERING RELEASE WITHOUT CHANGE.	MH	JW	----
B	1-22-97	SEE SHEET 2.	KT	JW	9791
K	4-5-01	CHGD U26 TO TL072	KT	JW	10428
V	6-27-06	CHGD C90 .1uF(003-1066)	JTB		11443



TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

DWN. BY 11-20-95
M. MERKEL
CHKD
ME
PROJ. ENGR. 8-16-96
JW
MFG.

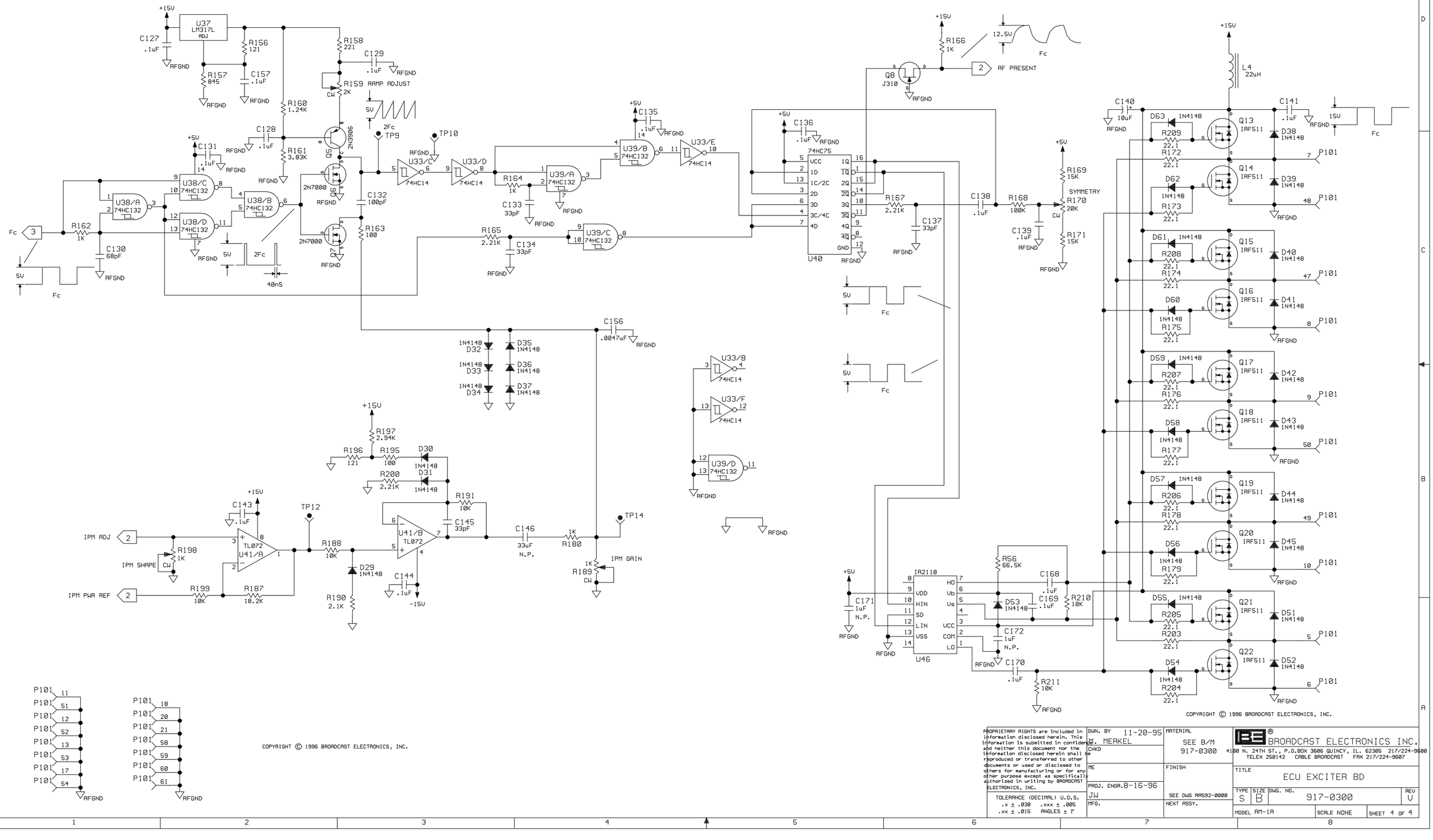
MATERIAL
SEE B/M
917-0300
FINISH
SEE DWG RA592-0000
NEXT ASSY.

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O.BOX 3606 QUINCY, IL. 62305 217/224-9600
TELEX 250142 CABLE BROADCAST FAX 217/224-9607

TITLE
ECU EXCITER BD

TYPE S | SIZE B | DWG. NO. 917-0300 | REV V
MODEL AM-1A | SCALE NONE | SHEET 3 OF 4

REVISIONS					
REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN
1	11-20-95	PROTOTYPE RELEASE	MERK	JW	----
3	6-26-96	CHGD VALUE OF R195 & R200.	MH	JW	----
A	8-9-96	ENGINEERING RELEASE WITHOUT CHANGE.	MH	JW	----
B	1-22-97	SEE SHEET 2.	KT	JW	9791
G	2-21-00	Q13-Q22 WERE 210-0088, U46 WAS A 227-2112	KT	JW	10263
H	3-23-00	ADDED R56	KT	JW	10276
K	4-5-01	CHGD U41 TO TL072	KT	JW	10428
U	6-27-06	CHGD C90 .1uF(003-1066)	JTB		11443



TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

DWN. BY 11-20-95 W. MERKEL
CHKD
ME
PROJ. ENGR. 8-16-96 JW
MFG.

MATERIAL SEE B/M 917-0300
FINISH SEE DWG RA592-0000
NEXT ASSY.

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O.BOX 3606 QUINCY, IL. 62305 217/224-9600
TELEX 250142 CABLE BRODRCAST FAX 217/224-9607

TITLE: ECU EXCITER BD

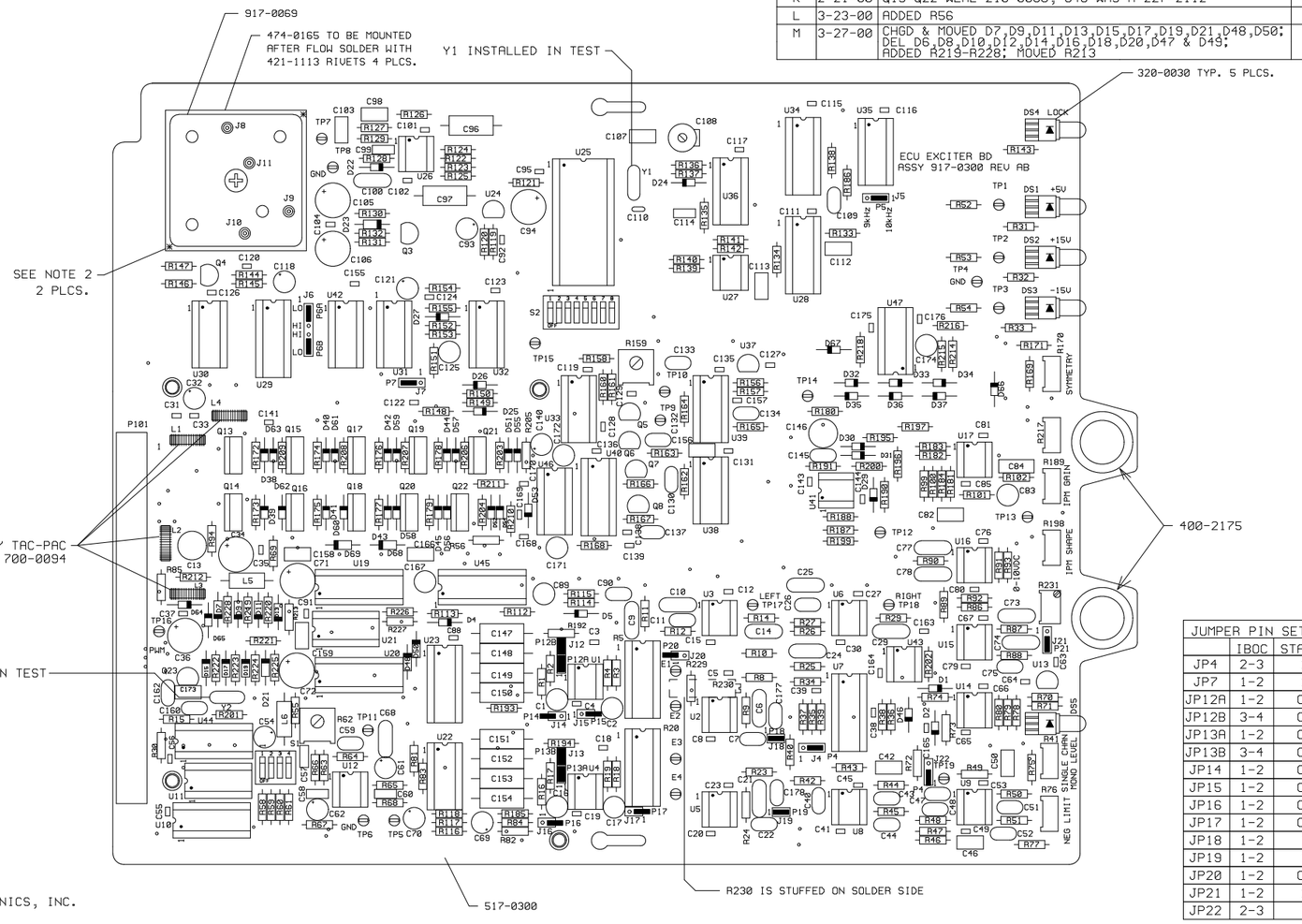
TYPE S | SIZE B | DWG. NO. 917-0300 | REV V

MODEL AM-1A | SCALE NONE | SHEET 4 OF 4

N	4-5-01	CHGD U3,U6,U8,U9,U14-U17,U26,U41 TO TL072	KT	JW	10428
P	2-5-02	ADDED C13, MOVED R94 & L2	KT	JW	10622
R	9-6-02	ADDED NOTES TO INDICATE Y1 & Y2 ARE STUFFED IN TEST	KT	JW	10747
T	11-13-02	ADDED J14-J19,P14-P19,C177 & C178.	KT	JW	10827
U	3-12-03	ADDED J20,J21,P20,P21,R229-R231	KT	JW	10918
V	5-12-04	DEL J2,J3,P2,P3; ADD J22,P22; CHGD C42-C44,C46-C48, C50-C52,R43-R51; MOVED R72,R73,TP19	KT	JW	11151
W	7-14-04	CHGD R63; TIED NETS FROM R23 TO R25 & R8 TO R10	KT	JW	11185
Y	1-10-05	CHGD JUMPER SETTINGS FOR JP18 & JP19	KT	JW	11232
AA	3-1-05	CHGD R229 TO 100-1041	KT	JW	11252
AB	6-27-06	CHGD C90 .1uF (003-1066)	JTB		11443

REVISIONS

REV	DATE	DESCRIPTION	DFTSMN	ENGR	ECN
1	11-27-95	PROTOTYPE RELEASE	MERK	JW	——
2	1-25-96	CHANGED C167 TO 1uF NON-POLARIZED.	MH	JW	----
A	8-9-96	ENGINEERING RELEASE WITHOUT CHANGE.	MH	JW	----
B	11-27-96	320-0030 WAS 4 PLCS IN ERROR	MSE	JW	9747
C	2-21-97	C71 AND C72 WERE 020-1083	MSE	JW	9783
D	3-25-97	ADDED C173,D64,D65,Q23,R212 &R213;MOVED C72,D6 & D7	KT	JW	9791
E	10-13-97	ADDED C174-176,D66,D67,R214-217 & U47.	KT	JW	9870
F	3-2-98	ADDED TP19;R217 CHGD TO 178-2044;DELETED SHIELD/HDWR	MH	JW	9940
G	4-14-98	FIXED TRACE SHORTS ABOVE U19 & U45 ON 517-0300.	MH	JW	9965
H	7-20-98	REMOVED PIN 10 OF U47 FROM +15V	MSE	JW	9990
J	1-26-99	ADDED D68 & D69.	KT	JW	10082
K	2-21-00	Q13-Q22 WERE 210-0088, U46 WAS A 227-2112	KT	JW	10263
L	3-23-00	ADDED R56	KT	JW	10276
M	3-27-00	CHGD & MOVED D7,D9,D11,D13,D15,D17,D19,D21,D48,D50; DEL D6,D8,D10,D12,D14,D16,D18,D20,D47 & D49; ADDED R219-R228; MOVED R213	KT	JW	10284



JUMPER PIN SETTINGS		
	IBOC	STANDARD
JP4	2-3	2-3
JP7	1-2	2-3
JP12A	1-2	OPEN
JP12B	3-4	OPEN
JP13A	1-2	OPEN
JP13B	3-4	OPEN
JP14	1-2	OPEN
JP15	1-2	OPEN
JP16	1-2	OPEN
JP17	1-2	OPEN
JP18	1-2	1-2
JP19	1-2	1-2
JP20	1-2	OPEN
JP21	1-2	2-3
JP22	2-3	1-2

NOTES:
1. SEE SCHEMATIC SB 917-0300.
2. * INDICATES WHERE 917-0069 IS TO BE SOLDERED TO 474-0165 2 PLCS.

TOLERANCE (DECIMAL) U.O.S.
.X ± .030 .XXX ± .005
.XX ± .015 ANGLES + 1°

DWN. BY 11-27-95 M. MERKEL
DESIGNER(S)
PROJ. LEADER 8-16-96 JW
MFG.

MATERIAL SEE B/M 917-0300
FINISH
NEXT ASSY.

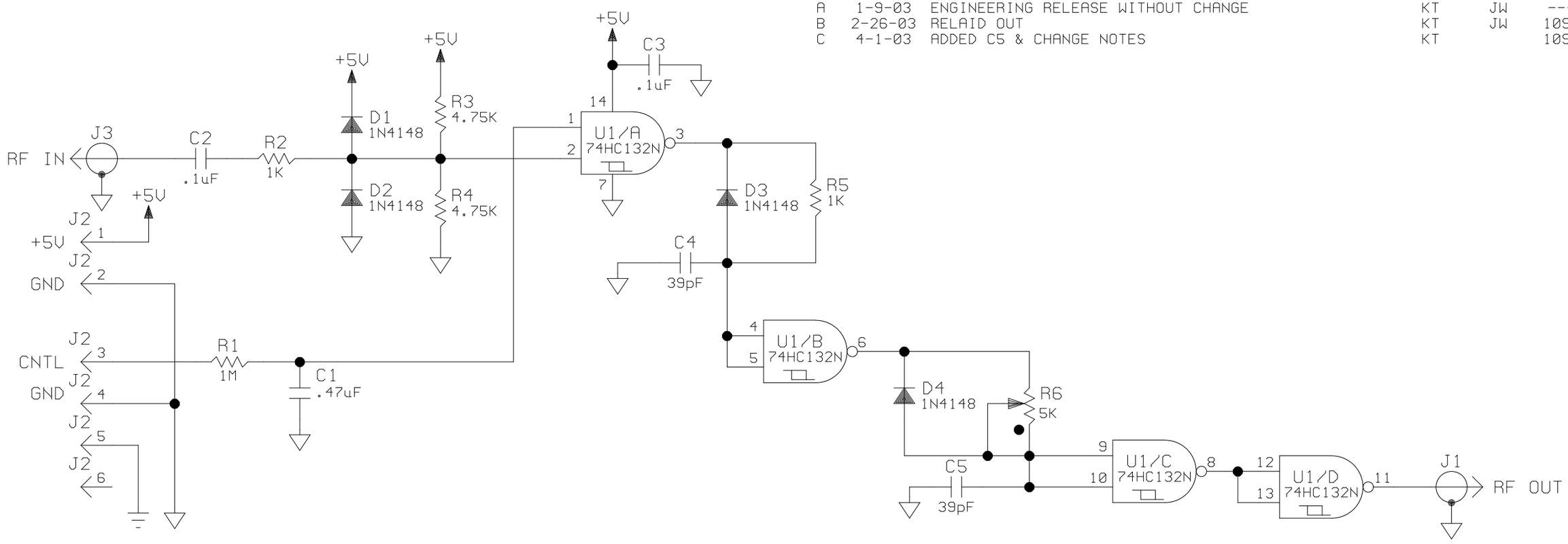
BROADCAST ELECTRONICS INC.
4100 N. 24TH ST. P.O.BOX 3606 QUINCY,IL. 62305
217/224-9600 FAX 217/224-9607

TITLE PCB ASSEMBLY ECU EXCITER BD

TYPE	SIZE	DWG No.	REV
A	A	917-0300	AB

MODEL AM-1A | SCALE 1/1 | SHEET 1 OF 1

REVISIONS					
REV	DATE	DESCRIPTION	DRAFTER	APPROVED	ECN
1	12-11-02	PROTOTYPE RELEASE	KT	JW	----
A	1-9-03	ENGINEERING RELEASE WITHOUT CHANGE	KT	JW	----
B	2-26-03	RELAID OUT	KT	JW	10910
C	4-1-03	ADDED C5 & CHANGE NOTES	KT		10930



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TOLERANCE (DECIMAL) U.O.S.
.x ± .030 .xxx ± .005
.xx ± .015 ANGLES ± 1°

DWN. BY KT 12-10-02
DESIGNER(S)
PROJ. LEADER
MFG.

MATERIAL SEE BOM 919-0560
FINISH
NEXT ASSY.

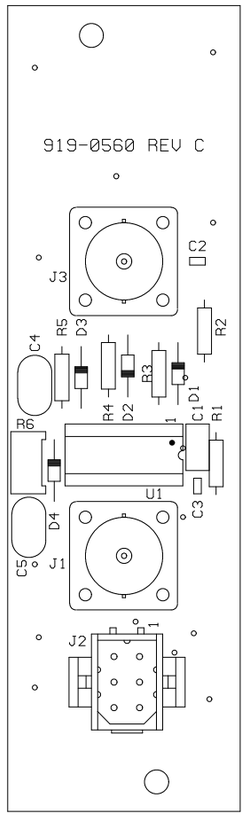
BROADCAST ELECTRONICS INC.
4100 N. 24TH ST., P.O.BOX 3606 QUINCY, IL. 62305
217/224-9600 FAX 217/224-9607

TITLE: AM IBOC BYPASS

TYPE	SIZE	DWG. NO.	REV
S	B	919-0560	C

MODEL AM IBOC | SCALE NONE | SHEET 1 OF 1

REVISIONS					
REV	DATE	DESCRIPTION	DRAFTER	APPROVED	ECN
1	12-11-02	PROTOTYPE RELEASE	KT	JW	----
A	1-9-02	ENGINEERING RELEASE WITHOUT CHANGE	KT	JW	----
B	2-26-03	RELAID OUT	KT	JW	10910
C	4-1-03	ADDED C5 & MOVED R6	KT		10930



TOLERANCE (DECIMAL) U.O.S.
.X ± .030 .XXX ± .005
.XX ± .015 ANGLES + 1°

DWN. BY KT 12-11-02

DESIGNER(S)

PROJ. LEADER

MFG.

MATERIAL SEE BOM 919-0560

FINISH

NEXT ASSY.

BROADCAST ELECTRONICS INC.
4100 N. 24TH ST. P.O.BOX 3606 QUINCY,IL. 62305
217/224-9600 FAX 217/224-9607

TITLE
AM IBOC BYPASS

TYPE	SIZE	DWG No.	REV
A	B	919-0560	C

MODEL AM IBOC | SCALE 1/1 | SHEET 1 OF 1