

AMMA-2 Precision Digital AM Modulation Monitor/Analyzer

The Wizard System

Guide to Operations

8/02

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Appendix A: Using The Wizard Software

1 General Description

The AMMA- 2 is a DSP-based, microprocessor-controlled, digital AM modulation monitor/analyzer that precisely measures positive and negative peak modulation, peaks per minute, average peak modulation, modulation density, and more. In addition to monitoring standard AM modulation, the AMMA-2 accurately monitors modulation-dependent carrier level (MDCL) AM transmissions. During MDCL broadcasts, the RF carrier level becomes a dynamic component of the AM signal. The AMMA-2 tracks the carrier, capturing the highest and lowest values of the carrier level, as well as the decibel ratio of the carrier high/low. Modulation readings are referenced to the carrier level appropriate for the MDCL system in use. The optional remote meter panel displays positive modulation, negative modulation, and carrier level simultaneously on three large analog meters.

The AMMA-2 features user-defined parameters and settings for maximum flexibility. Two large UP/DOWN MENU keys are used to cycle the 16-character alphanumeric display to the desired menu; the UP/DOWN PARAMETER keys are then used to select the desired setting. The unit configuration may be saved to the on-board non-volatile memory so the settings are retained in the event of a power loss.

A noise menu selection displays RMS-detected SNR in decibels (flat or de-emphasized) on the front panel. A carrier cutoff indicator consisting of three front panel LEDs continuously monitors the approach of negative modulation to carrier cutoff.

A unique "Normal Modulation" indicator shows when modulation is falling within user-defined parameters.

A built-in Audio Sentry audio failure alarm alerts you to loss of modulation or drops in modulation level.

An RS-232/RS-422 port allows the AMMA-2 to be accessed via personal computer. The ASCII command set, documented in this manual, provides an easy way for users to write their own command and control software. Alternately, the AMMA-2 will be supported in the future by The Wizard Software, which provides unit control and graphing and logging capability for all the AMMA-2 measurements.

A remote alarm connector consisting of 8 pairs of relay contacts provides alarm status information for hard-wired applications. NRSC de-emphasis may be selected internally by moving a jumper plug.

1-1 Measurements:

- Positive Peak Modulation in Percent
- Negative Peak Modulation in Percent
- Positive Peaks-per-Minute Count
- Negative Peaks-per-Minute Count
- Positive Peak Average & Peak Min Modulation
- Negative Peak Average & Peak Min Modulation
- Positive Average/Peak Modulation Ratio
- Negative Average/Peak Modulation Ratio
- Normal Modulation Peaks-per-Minute Count
- AM Noise rms detected in dB
- Carrier Level
- Carrier Reference
- Carrier High in sliding 1 minute window
- Carrier Low in sliding 1 minute window
- Carrier Ratio High/Low in dB

1-2 Settable Parameters:

- Positive & Negative Peak Modulation Indicator
- Positive & Negative Peaks/Minute Indicator
- Normal Modulation Indicator
- Positive & Negative Peaks/Minute Duration
- Audio Failure Alarm - Time & Modulation
- Modulation Mode (Normal/MDCL/IMOD/Norm5K/Norm8K/Fixed)
- MDCL Reference
- Carrier Shift Alarm
- Carrier Failure Alarm - Time & Level
- Display Hold Time
- Time Mode (Real/Past)
- Infinite Hold
- Audio Outputs (Test/Meter)
- Modulation Calibrator
- Tuning Frequency
- Tuning Mode (Dir/Auto/Scan/Lock)
- Tuning Frequency Increments

1-3 Specifications:

RF Frequency Range	250 kHz to 30 MHz
RF Tuning Increments	1 kHz
RF Sensitivity	1 to 10 V rms
RF Input Impedance	500 Ω or 50 Ω , internally connected
Accuracy	1.0%
Display	Large 3 digit LED for Negative Modulation 16-character alphanumeric LED display for menus and parameters
Frequency Response	± 0.1 dB, 30 Hz to 10.2 kHz -3 dB @ 11.9 kHz -100 dB @ 16 kHz
Audio Outputs	
Audio Monitor	+10 dBm, 600 Ω , balanced (XLR)
Audio Test	2.5 V rms, unbalanced (BNC)
Frequency Response	± 0.1 dB, 30 Hz to 10.2 kHz
Distortion	$\leq 0.1\%$ @ 99% modulation
IMD (SMPTE, CCIF and DIM)	$\leq 0.1\%$ @ 99% modulation
Signal to noise ratio	75 dB
Delay	Test 3 ms, Meter 90 ms
Automatic Carrier Level Adjustment range	25-150%
Remote Meter Output	Jack for optional MP-17 analog remote meter panel
Remote Alarms	Relays for Loss of Modulation, Normal, Negative PPM, Positive PPM Loss of Carrier, Remote, and General. Relays can be set NO or NC
Serial Interface	RS-232/RS-422
Unit Interface	Wizard Standard Interface
Power Requirements	20 Watts, 100-240 Vac, 50/60 Hz
Dimensions	1 3/4"H x 14"D x 19"W (EIA rack mount)
Shipping Weight	10 lbs (4.5 kg)

2 Unpacking

2-1 Initial Inspection

Check the shipping carton for external damage. If the carton exhibits evidence of abuse in handling (holes, broken corners, etc.) ask the carrier's agent to be present when the unit is unpacked. Carefully unpack the unit to avoid damaging the equipment through use of careless procedures. Inspect all equipment for physical damage immediately after unpacking. Bent or broken parts, dents and scratches should be noted. If damage is found, refer to Paragraph 2-2 for the recommended claim procedure. Keep all packing material for proof of claim or for possible future use.

2-2 Claims

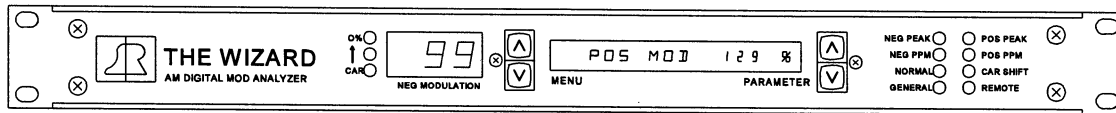
If the unit has been damaged, notify the carrier immediately. File a claim with the carrier or transportation company and advise Belar of such action to arrange the repair or replacement of the unit without waiting for a claim to be settled with the carrier.

2-3 Repacking for Shipment

If the unit is to be returned to Belar, attach a tag to it showing owner and owner's address. A description of the service required should be included on the tag. The original shipping carton and packaging materials should be used for reshipment. If they are not available or reusable, Belar can provide a replacement box and packaging at a nominal cost. Alternatively, the unit should be repackaged in the following manner:

- a) Use a double-walled carton with a minimum test strength of 275 pounds.
- b) Use heavy paper or sheets of cardboard to protect all surfaces.
- c) Use at least 4 inches of tightly packed, industry approved, shock absorbing material such as extra firm polyurethane foam or rubberized hair. **Newspaper is not sufficient for cushioning material!**
- d) Use heavy duty shipping tape to secure the outside of the carton.
- e) Use large **FRAGILE** labels on each surface.
- f) Return the unit, freight prepaid. Be sure to insure the unit for full value.

3 Front Panel Operation



The **CARRIER CUTOFF** LED's indicate the carrier's approach to cutoff. The green light illuminates when the negative modulation envelope is >97%, the yellow at >98%, and the red at >99%. These LED's are normalized to the instantaneous carrier level and remain calibrated as the carrier level is changed, independent of modulation mode.

The **NEG MODULATION** display shows the total negative peak modulation, expressed in percent modulation referenced to the carrier level shown on the "CAR REF" display on the main menu.
NOTE: When the AMMA-2 is operating in the standard MDCL mode (see section 5.2), the AM carrier may be cut off when the NEG MODULATION display reads less than 100%.

The **MENU/PARAMETER WINDOW** is a 16-character alphanumeric display that displays menu selections and associated parameters or measurements.

To the left of the Menu/Parameter Window, the **UP** and **DOWN MENU** buttons are used to scroll through the various menu selections of The Wizard. The menu selections are arranged in six loops, one for measurements and five for settings. Either the UP or DOWN button will get you to your menu choice—but usually one direction will get you there more quickly than the other.

To the right of the Menu/Parameter Window, the **UP** and **DOWN PARAMETER** buttons are used to scroll through the available settings for a given menu selection, where applicable. The main loop, which includes the display shown in the figure above, consists of all of the measurements The Wizard can make, as well as the five displays POS SETTINGS, NEG SETTINGS, CAR SETTINGS, UNIT SETTINGS and FREQ SETTINGS. These five other loops (individually accessed by pressing the UP PARAMETER button at any one of these "---- SETTINGS" windows) consist of all the settable parameters in the unit, such as HOLD TIME, TIME MODE, etc. These parameters are all explained in *Section 3-1 through 3-6 Menu Selections*, following.

On the far right of the front panel are eight **ALARM LEDS**. All but the NEG PEAK, POS PEAK, and CAR SHIFT alarm LEDs have corresponding relays, available through a rear panel connection.

The **NEG PEAK** LED lights when the negative modulation equals or exceeds the – PEAK MOD parameter setting. Similarly, the **POS PEAK** LED lights when the positive modulation equals or exceeds the + PEAK MOD parameter setting.

The **NEG PPM** LED lights when the number of negative peaks per minute equals or exceeds the

– PPM THRESH parameter setting. Similarly, the **POS PPM** LED lights when the number of positive peaks per minute equals or exceeds the +PPM THRESH parameter setting.

The **NORMAL** Modulation indicator lights when the number of positive peaks per minute within a selectable minimum and maximum exceeds a selectable threshold setting. When this LED is green and no modulation alarms are present, modulation is normal.

The **CAR SHIFT** LED lights when the preset carrier shift threshold is exceeded.

The **GENERAL** LED lights when one or more general alarms is active. The alarm conditions pending are displayed in the alphanumeric display, alternating with the current menu setting. The alarm conditions currently implemented are the AUDIO FAILURE alarm, CARRIER FAILURE alarm, and LOW CARRIER alarm.

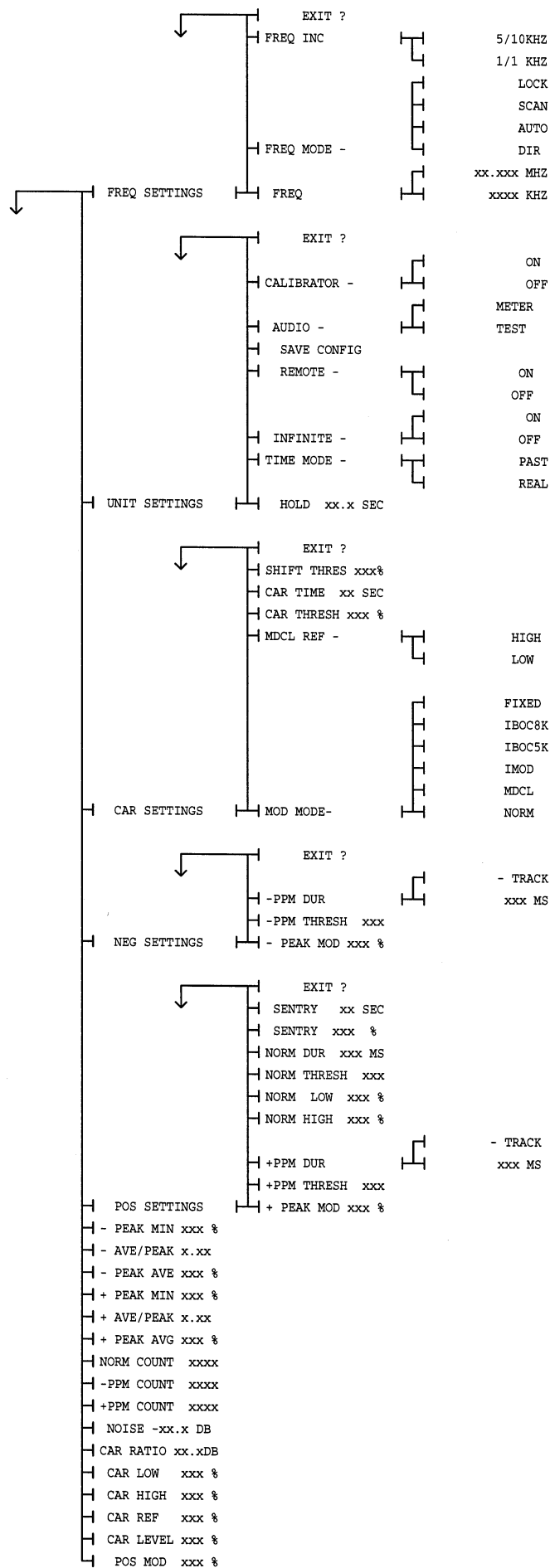
The yellow **REMOTE** LED lights when The Wizard is actively connected to a remote computer through the RS-232/422 port on the rear panel.

3-1 Main Menu Selections

The following Main Menu Selections are shown in the order that they appear beginning with initialization and then the use of the UP MENU push-button.

POS MOD xxx %	This display shows the current positive peak modulation referenced to the carrier level shown on the “CAR REF” display (see “CAR REF” below).
CAR LEVEL xxx %	Displays the present carrier level.
CAR REF xxx %	Displays the carrier reference level used to compute the positive and negative modulation readings. How the reference level is selected is determined by the MOD MODE selected.
CAR HIGH xxx %	Displays the highest carrier level measured in the last minute. This value may be selected as the CAR REF in the MDCL mode of operation.
CAR LOW xxx %	Displays the lowest carrier level measured in the last minute. This value may also be used as the CAR REF in the MDCL mode of operation.
CAR RATIO xx.x DB	Displays the ratio in dB of the CAR HIGH/CAR LOW readings.
NOISE –xx.x DB	Displays the rms-detected value of the demodulator’s audio output. The readings can be de-emphasized by pressing the UP PARAMETER button.

+PPM COUNT xxxx	Displays the current number of positive peaks that have reached or exceeded the +PEAK MOD threshold in a sliding one minute window.
–PPM COUNT xxxx	Displays the current number of negative peaks that have reached or exceeded the –PEAK MOD threshold in a sliding one minute window.
NORM COUNT xxxx	Displays the current count of peaks that fall at or within the NORM LOW and NORM HIGH window. When this count is equal to or higher than the NORM THRESH setting, the NORMAL LED will be lit.
+ PEAK AVG xxx %	Displays the average of all positive peaks measured during the measurement window (HOLD TIME).
+ AVE/PEAK x.xx	Displays +PEAK AVE/POS MOD. This is the average value of all positive peak indications during the previous time window divided by the largest positive peak modulation reading occurring during that same window. This measurement is a good indication of audio compression.
+ PEAK MIN xxx %	Displays the smallest (or minimum) positive peak measured during the measurement window (HOLD TIME).
– PEAK AVE xxx %	Displays the average of all negative peaks measured during the measurement window (HOLD TIME).
– AVE/PEAK x.xx	Displays –PEAK AVE/NEG MODULATION. This is the average value of all negative peak indications during the previous time window divided by the largest negative peak modulation reading occurring during that same window. This measurement is a good indication of audio compression.
– PEAK MIN xxx %	Displays the minimum negative peak measured during the measurement window (HOLD TIME)
POS SETTINGS	Press the UP PARAMETER button to enter the positive modulation settings submenu. This submenu provides access to all parameters which affect readings generated from positive modulation data.
NEG SETTINGS	Press the UP PARAMETER button to enter the negative modulation settings submenu. This submenu provides access to all parameters which affect readings generated from negative modulation data.
CAR SETTINGS	Press the UP PARAMETER button to enter the carrier level settings submenu. This submenu provides access to all parameters which affect readings generated from carrier level data.



NOTES:

1. THE AMMA-2 COMES UP AT "POS MOD xxx %" WHEN IT INITIALIZES. THE FLOW CHART SHOULD BE READ FROM THE BOTTOM UP.
2. USE OF THE UP/DOWN MENU AND PARAMETER BUTTONS CORRESPOND TO THE DIRECTION ON THE CHART FROM THE USER'S CURRENT LOCATION.
3. A DOWNWARD POINTING ARROW SHOWS WHICH SELECTION THE MENU RETURNS TO WHEN THE LOOP IS EXITED.

UNIT SETTINGS

Press the UP PARAMETER button to enter the unit settings submenu. This submenu allows access to all parameters which affect the entire unit's operation.

FREQ SETTINGS

Press the UP PARAMETER button to enter the frequency settings submenu. This submenu contains the parameters related to the frequency tuning of the unit.

3-2 POS SETTINGS Menu Selections

+ PEAK MOD xxx %

Presets the peak threshold for the POS PEAK light and the Positive Peaks Per Minute (PPM) counting. The positive peak threshold is user selectable in 1% increments from 0 to 150%.

+PPM THRESH xxx

Number of peaks threshold for positive PPM counting that, when exceeded, activates the POS PPM light. This is user selectable from 1 to 100 Peaks Per Minute.

+PPM DUR xxxx MS +PPM DUR – TRACK

Presets the duration of the time window for the positive peak counting. Any number of positive peaks occurring during this time window is counted as one peak. This is user-selectable from 10 ms to 500 ms, plus "TRACK". In the "TRACK" mode the +PPM COUNT tracks the POS PEAK light, counting each flash as one peak.

NORM HIGH xxx %

Sets the upper limit for the normal modulation PPM counts. The range of this setting is from the NORM LOW setting to 150%, in 1% increments.

NORM LOW xxx %

Sets the lower limit for the normal modulation PPM counts. The range of this setting is from 0% to the NORM HIGH setting, in 1% increments.

NORM THRESH xxx

Presets the threshold for Normal PPM counting, that, when exceeded, activates the NORMAL LED. This is user-selectable from 1 to 100 PPM.

NORM DUR xxxx MS

Presets the duration of the time window for the normal modulation peak counting. Any number of peaks occurring during this time window is counted as one peak. This is user-selectable from 10 ms to 500 ms.

SENTRY xxx %

Threshold in percent positive modulation that will activate the AUDIO FAILURE (loss of modulation) alarm. This is user-selectable in 1% increments from 0 to 100%.

SENTRY xx SEC

Sets the length of time that positive modulation must fall below the SENTRY threshold to activate the AUDIO FAILURE alarm. This is user-selectable in 1 second increments from 0 to 60 seconds. The AUDIO FAILURE alarm is automatically reset when positive modulation is restored.

EXIT ?

Press the UP PARAMETER button to exit this submenu and return to the main menu.

3-3 NEG SETTINGS Menu Selections

– PEAK MOD xxx %

Presets the peak threshold for the NEG PEAK light and the Negative Peaks Per Minute (PPM) counting. The negative peak threshold is user-selectable in 1% increments from 0 to 100%.

–PPM THRESH xxx

Number of Peaks threshold for Negative PPM counting that, when reached or exceeded, activates the NEG PPM light. This is user-selectable from 1 to 100 Peaks Per Minute.

**–PPM DUR xxxx MS
–PPM DUR – TRACK**

Presets the duration of the time window for the negative peak counting. Any number of negative peaks occurring during this time window is counted as one peak. This is user selectable from 10 ms to 500 ms, plus “TRACK”. In the “TRACK” mode the –PPM COUNT tracks the NEG PEAK light, counting each flash as one peak.

EXIT ?

Press the UP PARAMETER button to exit this submenu and return to the main menu.

3-4 CAR SETTINGS Menu Selections

**MOD MODE– NORM/
MDCL/
IMOD/
NORM5K/
NORM8K/
FIXED**

Controls the scaling of the modulation readings with carrier level. In FIXED mode the carrier reference level is fixed at an absolute 100% carrier level. In NORM mode the carrier reference tracks the actual carrier level. Both the FIXED and NORM modes assume that the carrier level is not changing with modulation.

For MDCL mode the carrier reference is determined by selecting either the highest (CAR HIGH) or lowest (CAR LOW) carrier level that has occurred during the previous minute. Whether a high or low reference level is used is determined by the setting of the MDCL REF. In IMOD mode the carrier reference tracks the carrier level but uses filtering which allows the instantaneous modulation readings to be measured even in the presence of a moving carrier.

For NORM5K and NORM8K, the MOD MODE reverts back to the NORMAL mode with the addition of 5K or 8K bandpass and lowpass filters to exclude modulation products above 5K or 8K.

MDCL REF – HIGH/LOW	Determines whether the CAR HIGH or CAR LOW carrier level is used for the MDCL carrier reference. This should be set according to the type of MDCL modulation being monitored.
CAR THRESH xxx %	Presets the threshold (in percent carrier level) that will activate the carrier alarm. This is user selectable in 1% increments from 0 to 100%.
CAR TIME xx SEC	Presets the time allowed after the carrier falls below the CAR THRESHOLD before the carrier alarm is activated. This is user-selectable in 1 second increments from 1 to 60 seconds.
SHIFT THRES xxx%	Presets the carrier shift threshold for the carrier shift alarm/LED. This setting is adjustable, with a range of 0% to 100%, in 1% increments.
EXIT ?	Press the UP PARAMETER button to exit this submenu and return to the main menu.

3-5 UNIT SETTINGS Menu Selections

HOLD xx.x SEC	Presets the time at which readings will be updated or held on the display. This is user-selectable in 0.5 second increments from 0.5 to 10.0 seconds.
TIME MODE – REAL/PAST	Presets the mode in which peaks are displayed. In REAL time mode the display is updated the instant a new peak is detected. In PAST time mode the unit waits the HOLD time and displays the highest peak that occurred during that interval.
INFINITE – ON/OFF	Enables or disables infinite hold of display. If infinite hold is enabled, the display acts as a "high water mark" and will "stick" at the highest negative and positive modulation indications (until infinite hold is turned off).
REMOTE – ON/OFF	Enables or disables the computer communications port. This allows users to enable or block remote access to the unit. Remote cannot be turned off while the unit is in remote mode when someone is communicating remotely. Remote also cannot be turned off remotely.
SAVE CONFIG	Allows user to save all parameters to internal EEPROM so that the unit configuration is preserved when power is removed. Press the UP PARAMETER to save the configuration.

AUDIO – TEST/METER

Selects whether the raw test audio out of the demodulator is fed to the output jacks, or the delayed, scaled, and de-bounced audio which is used to meter modulation and noise.

CALIBRATOR – ON/OFF

Turns the internal calibrator on and off. When the calibrator is on, an internal calibrate signal is generated at 100% carrier level and 100% positive/negative modulation. The modulation frequency is 1 kHz.

EXIT ?

Press the UP PARAMETER button to exit this submenu and return to the main menu.

3-6 FREQ SETTINGS Menu Selections**FREQ xx.xxx KHZ/MHZ**

Displays the carrier frequency the AMMA-2 is currently monitoring. When in FREQ MODE – DIR the tuning frequency can be adjusted using the UP/DOWN PARAMETER buttons.

**FREQ MODE – DIR/AUTO
/SCAN/LOCK**

The Frequency mode settings effects how the AMMA-2 is tuned to the desired carrier frequency. In DIR mode the frequencies are entered using the UP/DOWN PARAMETER buttons. The AUTO mode initiates an automatic tuning sequence whenever the UP/DOWN PARAMETER button is depressed. In SCAN mode the monitor continually calculates and automatically tunes to the incoming carrier frequency. It is not recommended that the unit be left in the SCAN mode during normal unattended operation. Finally, in LOCK mode the current frequency is locked and cannot be changed using the front panel buttons.

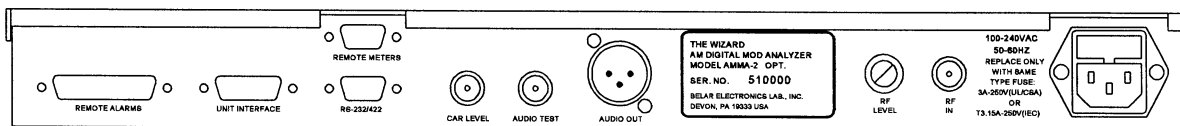
**FREQ INC – 5/10KHZ
1/1 KHZ**

The frequency increment sets the minimum frequency step available for tuning. Selecting 5/10KHZ allows 10 kHz steps in the 250 kHz–2.0 MHZ band, and 5 kHz steps in the 2.0 MHZ–30 MHZ band. Alternately, a 1/1KHZ selection allows 1 kHz steps over the unit's full 250 kHz–30.0 MHZ range.

EXIT ?

Press the UP PARAMETER button to exit this submenu and return to the main menu.

4 Rear Panel



RF Input 250 kHz to 30 MHz, 1 to 10 Volts rms, 50 or 500 Ω unbalanced.

Note: Unless otherwise specified by the customer, the AMMA-2 is normally shipped with the input set for 50 Ω impedance. If it is desired to set the input up for 500 Ω impedance (for use with an RF amplifier, for example), see the chassis wiring schematic at the rear of this manual to see how to modify the RF input impedance.

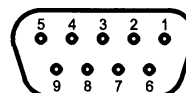
Audio Output XLR connector, 600 Ω balanced, +10 dBm, jumper selectable de-emphasis
Pin 1 is ground, pin 2 is +, pin 3 is -. This output has internally selectable de-emphasis which is normally set in the flat (or "OUT") position from the factory. The de-emphasis can be changed from flat to 75 μ sec (NRSC) by moving jumper P1 on the A1 board to the "IN" position. For the location of this jumper see the *AMMA-2 A1 Board Connections and Adjustments* drawing in Section 8.

Audio Test BNC connector, 1k Ω unbalanced, 2.5 V rms @ 100%

Carrier Level BNC connector, 1k Ω unbalanced, 2.2 Volts @ 100%

Remote Meter Connector female 9 pin D connector

Pin #	Description
1, 2	Pos Mod, Gnd
3, 4	Neg Mod, Gnd
5, 6	Carrier Level, Gnd
7-9	not used



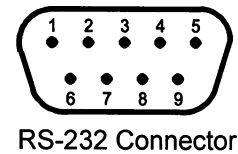
Remote Meter
Connector

RS-232/422 Connector male 9 pin D connector

An internal DIP shunt determines which electrical specification is chosen. The shunt, which is located inside the unit near the connector, should be inserted in the appropriate socket. The socket positions are shown on the *A1 Board Connections and Adjustments* drawing at the rear of this manual.

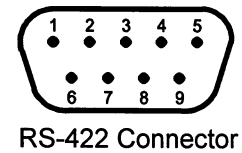
When Configured as RS-232:

Pin #	Type	Description
1	input	CD Carrier detect from Modem
2	input	Rx The Wizard receive data
3	output	Tx The Wizard transmit data
4	output	DTR The Wizard data terminal ready
5	ground	GND signal ground
6-9		not used



When Configured as RS-422:

Pin #	Type	Description
1	input	Rx + The Wizard receive data (+)
2	input	Rx - The Wizard receive data (-)
3	output	Tx + The Wizard transmit data (+)
4	output	Tx - The Wizard transmit data (-)
5	ground	GND signal ground
6-9		not used

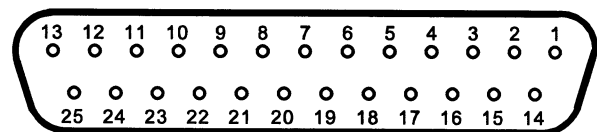


Unit Interface female 15 pin D connector

This interface is used to connect other Belar equipment equipped with an interface so that unified remote operation is possible.

Remote Alarm Connector female 25 pin D connector
Relay contacts rated at 10 W max, 0.5A max, 200 Vdc max

Relay #	Pin	Description
0	1, 2	Loss of Modulation Alarm
1	3, 4	Neg PPM Alarm
2	5, 6	Normal
3	7, 8	General Alarm
4	9, 10	Reserved
5	11, 12	Pos PPM Alarm
6	13, 14	Loss of Carrier Alarm
7	15, 16	Remote



4-1 Accessories

MP-17 Meter Panel

With its three backlit analog meters, the MP-17 Remote Meter Panel provides a continuous display of carrier level, positive modulation and negative modulation. Note: The older MP-14 meter panel which was used with the AMMA-1 modulation monitor may be used with the AMMA-2 monitor but it will only display positive and negative modulation.

See the MP-17 schematic and parts list at the rear of this manual for the Meter Panel connections, calibration procedure and line voltage selection procedure.

5 Installation and Setup

The Wizard is designed to be mounted in a standard 19-inch rack. When the monitor is mounted above high heat generation equipment such as power amplifiers, consideration should be given to cooling requirements which allow a free movement of cooler air around The Wizard. In no instance should the ambient chassis temperature be allowed to rise above 45°C (113°F).

5-1 Standard AM Broadcast Installation and Setup

The procedure shown below should be followed for placing the AMMA-2 into operation.

1. Before applying RF to the AMMA-2, turn the RF LEVEL control, R1, on the rear panel maximum counterclockwise and perform the following steps to power up.
2. These units can be operated from a 100 to 240 V ac, single phase, 50-60 Hz power source with no user adjustments. The fuse should be a 5 mm x 20 mm type GMA-3, 3 AMP-250 V (UL/CSA) or T3.15 A-250 V (IEC) fuse only. A spare fuse is stored in the removable fuse compartment.
3. Connect the three wire grounded power cord between the AMMA-2 AC receptacle and the power source outlet. The AMMA-2 will immediately turn on, as there is no power switch. The 7-segment NEG MODULATION display will show "8.8.8." and the alphanumeric menu display will indicate "INITIALIZATION" while the AMMA-2 is going through its start up procedure.
4. After initialization, the NEG MODULATION display will indicate "0" and the menu display will show "POS MOD 0%". Since RF carrier is not yet present, the menu display will cycle continuously from "***LOW CARRIER**", "***LOW RF LEVEL**", and back to "POS MOD" indicating no audio and no carrier.
5. Change the menu to "CAR SETTINGS" and enter this loop using the UP PARAMETER push-button. Go to "MOD MODE" and set to "NORM". This will turn on the automatic carrier leveling.

NOTE: IF THE "MOD MODE" IS "FIXED", THAT IS, IF THE AUTOMATIC CARRIER LEVELING IS TURNED OFF, THE MODULATION READINGS WILL CHANGE WITH CHANGES IN RF CARRIER LEVEL AND THE MODULATION READINGS WILL BE IN

ERROR. WHEN SET TO "MOD MODE – FIXED", THE MODULATION READING IS REFERENCED TO A FIXED 100% CARRIER LEVEL.

6. Change the menu to "UNIT SETTINGS" and enter this loop. Go to "CALIBRATOR - OFF" and set to "ON". The NEG MODULATION display should read "100" and the NEG PEAK, NEG PPM and NORMAL LEDs should light. The NORMAL LED should go out after a short time. The "100" reading and the LED activity indicate that the negative modulation function is correctly calibrated.
7. Leaving the calibrator turned on, exit this loop and go to the "POS MOD" menu display. The POS MOD reading should be 100%. The 100% reading indicates the positive modulation function is correctly calibrated.
8. Change the menu to "CAR LEVEL". The CAR LEVEL reading should be 100%. The 100% reading indicates the carrier level function is correctly calibrated.
9. Go back to the "UNIT SETTINGS" loop and turn the calibrator off. The menu should read "CALIBRATOR - OFF".

The calibration of the AMMA-2 has now been checked. You may now begin the following procedure to apply RF power to the monitor.

CAUTION: DO NOT APPLY MORE THAN 10 VOLTS RMS OF RF TO THE MONITOR OR THE RF INPUT CIRCUIT MAY BE DAMAGED! BEFORE APPLYING ANY RF INPUT, TURN THE RF LEVEL CONTROL (R1) MAXIMUM COUNTERCLOCKWISE! DAMAGE AS A RESULT OF EXCESSIVE RF INPUT IS NOT COVERED UNDER THE WARRANTY.

The presence of the "**HIGH RF LEVEL**" error message in the display indicates immediate action may be necessary to avoid damage to the AMMA-2.

10. Go to "FREQ SETTINGS" on the main menu and enter this submenu by pressing the UP PARAMETER button. Advance through the "FREQ SETTINGS" submenu using the UP/DOWN PARAMETER buttons and verify that the AMMA-2 is operating in the "FREQ MODE - DIR" mode. In the "FREQ" submenu, use the UP/DOWN PARAMETER buttons to set the "FREQ" display to the carrier frequency of the transmitter.
11. Exit back to the main menu and select the "CAR LEVEL" indication. When the RF input level is properly adjusted, this display will read "100%". Note that the "***LOW CARRIER**" and "***LOW RF LEVEL**" error messages continue to cycle.
12. Adjust the source of the RF carrier sample being used to drive the AMMA-2 so its RF voltage is between 1 Vrms and 10 Vrms (or between 2.8 volts peak-to-peak and 28 volts peak-to-peak for an unmodulated AM carrier). (A wideband oscilloscope or an RF voltmeter are appropriate methods to determine the RF sample voltage.)

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13. With the rear-panel RF LEVEL control, R1, set fully counterclockwise, connect the RF sample measured in step #12 to the RF INPUT jack (J9) on the rear panel of the AMMA-2 using a BNC connector. While viewing the "CAR LEVEL" indication, slowly increase the RF level to the monitor input circuit by rotating the RF LEVEL control clockwise. IF THE FRONT-PANEL CARRIER LEVEL INDICATION REACHES 200% BEFORE THE RF LEVEL CONTROL REACHES 1/4 OF ITS FULL ROTATION, THE VOLTAGE OF THE RF SAMPLE IS TOO HIGH. IMMEDIATELY REMOVE THE RF SAMPLE FROM THE RF INPUT JACK. REDUCE THE RF SAMPLE VOLTAGE AS DESCRIBED IN STEP #12.

NOTE: The cycling of "***HIGH RF LEVEL***" in the display indicates an excessive RF input level. Immediately remove the RF input and set the RF voltage as in step #12. The cycling of "***HIGH CAR LEVEL***" in the display indicates only that the "CAR LEVEL" indication has exceeded 200%.

14. If it is possible in step #13 to obtain a "CAR LEVEL" indication of 100%, but not 200%, the voltage of the RF sample is OK. By rotating the RF LEVEL control counterclockwise, reduce the input level to obtain a "CAR LEVEL" indication of 100%

NOTE: If the AMMA-2 frequency setting, as indicated in the front-panel "FREQ" display, is not the same as the actual carrier frequency, the AMMA-2 will not detect the AM signal. As a result, the "CAR LEVEL" reading will be 0%, and the "*****LOW CAR LEVEL*****" error message will continue to cycle in the display.

15. Change the menu to read "POS MOD". The AMMA-2 is now ready to read and monitor both negative and positive modulations simultaneously. With the MOD MODE - NORM setting the automatic carrier leveling is turned on, the accuracy of the modulation readings will be maintained over the range of 25 to 150% carrier levels.

SETTING THE PEAK LIGHTS AND DISPLAY TIMES

16. To set the NEG PEAK indicator, change the menu to "NEG SETTINGS" and enter this loop. Go to "- PEAK MOD xxx %". Depress the right UP or DOWN (PARAMETER) button until the desired preset is reached for the NEG PEAK indicator, i.e., "- PEAK MOD 97 %". In this example the NEG PEAK indicator will light when the negative peak modulation equals or exceeds the preset 97%. Note that the maximum negative setting is 100% since negative modulations can never exceed 100%.
17. To set the POS PEAK indicator, change the menu to "POS SETTINGS" and enter this loop. Go to "+ PEAK MOD xxx %". Depress the UP or DOWN PARAMETER button until the desired preset is reached for the POS PEAK indicator, i.e., "+ PEAK MOD 102 %". In this example the POS PEAK indicator will light when the positive peak modulation equals or exceeds the preset 102%. The maximum that this can be set to is 150%.
18. To set the HOLD time, that is, the time at which the readings will be updated or held on the displays, change the menu to "UNIT SETTINGS" and enter this loop. Go to "HOLD xx.x SEC". Depress the UP or DOWN PARAMETER button until the desired HOLD time is reached. For example, "HOLD

1.0 SEC" will then set the time to hold the displays for one second and the value displayed is the highest peak reached in that one second. The HOLD time is the same for both the negative and positive modulation displays. The recommended hold time for initial AMMA-2 use is 1.0 seconds.

19. Enabling the INFINITE hold function will hold the highest peak value displayed until a new higher peak value updates it or until it is turned off. To set the INFINITE hold, go to "INFINITE - xxx" in the "UNIT SETTINGS" loop. Depress the UP or DOWN PARAMETER button to turn the INFINITE hold ON or OFF. Normally this function is used only to measure the highest value of peak modulation in a small portion of audio or when adjusting audio processing equipment. Note that the INFINITE hold is the same for both negative and positive modulation displays.
20. To set the TIME MODE function, change the menu to "UNIT SETTINGS" and enter this loop. Go to "TIME MODE - REAL (or PAST)". Depress the UP PARAMETER button for PAST time or the DOWN PARAMETER button for REAL time. The PAST time mode updates every HOLD time cycle and displays the highest peak modulation value during that HOLD time. Both negative and positive modulation displays are updated at the same time. The REAL time mode instantaneously updates the display every time the peak modulation exceeds the displayed value and then holds that reading for the preset HOLD time. If a new, higher peak is detected during that time, the display is instantly updated and the HOLD time starts from that instant. Note that the negative and positive modulation displays are independent of each other in the REAL time mode.

ADDITIONAL MEASUREMENTS AND DISPLAYS

21. **PEAK AVERAGE** When "+ PEAK AVE" or "- PEAK AVE" is selected in the menu, the numerical value displayed is the average of all positive peaks or negative peaks during the HOLD time window. For example, the display "+ PEAK AVE 89 %" indicates that the average of all positive peaks is 89% in the past one second window if the HOLD time was set to 1.0 second. Note that the positive and negative peak averages are independent of each other.
22. **AVERAGE TO PEAK RATIO** When "+ AVE/PEAK" or "- AVE/PEAK" is selected in the menu, the numerical value displayed is the ratio of the positive or negative peak average to the highest positive or negative peak during the HOLD time window. For example, the display "- AVE/PEAK .78" indicates that the ratio of all negative peaks to the highest negative peak in the past one second window if the HOLD time was set to 1.0 second. A higher ratio is an indication of higher audio compression, thus if the calibrator is turned on, the value will be "1.00". Note that the positive and negative average to peak ratios are independent of each other.
23. **PEAK MINIMUM** When "+ PEAK MIN" or "- PEAK MIN" is selected in the menu, the numerical value displayed is the minimum positive or negative peak during the HOLD time window. For example, the display "+ PEAK MIN 23 %" indicates that the minimum positive peak in the past one second window if the HOLD time was set to 1.0 second. Note that the positive and negative peak minimums are independent of each other.

NOTE: AFTER COMPLETING THE STANDARD AM SETUP, THE MDCL SETUP, OR MODIFYING ANY UNIT OPTIONS OR THE UNIT ID; GO TO *UNIT SETTINGS* UNDER THE

MAIN MENU, SELECT *SAVE CONFIG* AND PRESS THE *UP PARAMETER* BUTTON. THIS PRESERVES ALL THESE SETTINGS WHEN THE UNIT POWER IS REMOVED. IF THIS ISN'T DONE, ALL THE USER-DEFINABLE PARAMETER SETTINGS WILL HAVE TO BE RE-ENTERED WHEN THE UNIT IS POWERED UP AGAIN.

5-2 Modulation-Dependent Carrier Level (MDCL) Installation and Setup

It is assumed that the MDCL function of the AM transmitter has been initially turned off and that the AMMA-2 has been set up using the Standard AM Broadcast Installation and Setup procedure in section 5-1. Before proceeding with the MDCL installation and setup take some time to familiarize yourself with the AMMA-2's operation in standard AM mode.

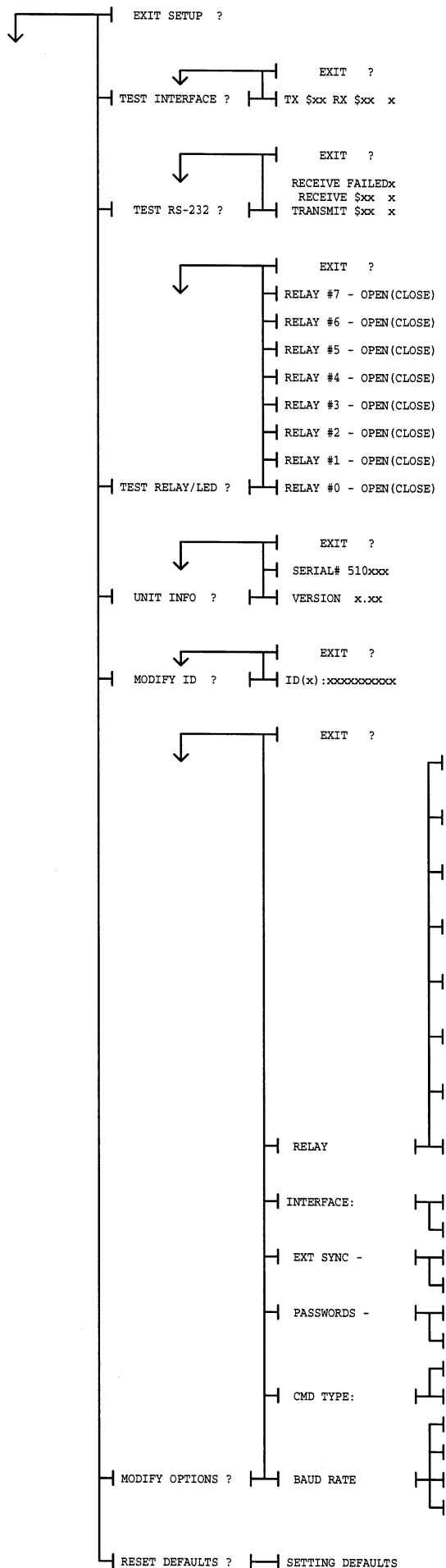
There are two types of MDCL methods used in AM transmitters. The first MDCL method, referred to as Standard MDCL in this discussion, varies the carrier level in proportion to the modulation. This system takes advantage of the fact that the carrier level need only be large enough to support the modulation envelope at any given time. The carrier level can therefore be reduced for low modulation levels and then increased linearly as the modulation increases reaching full carrier at or before 100% negative modulation. For this system, the AMMA-2 tracks the changing carrier level and stores the carrier high in a sliding 1 minute window. This carrier high is used as the reference for calculating the modulation readings, therefore, all modulation readings are reference to carrier full power even at times when the carrier level drops with decreased modulation.

The second type of MDCL operation was developed by the British Broadcasting Corporation (BBC) to improve reception at low modulation levels. This system is referred to as BBC MDCL in this discussion. The BBC scheme uses full carrier level at low modulation levels and decreases the carrier level as the modulation is increased. This system takes advantage of the receiver's AGC circuits and reduces the receiver's AGC at low modulation levels, therefore reducing the noise and interference, and increases the receiver's AGC at high modulation levels, where louder program material will mask noise and interference. The AMMA-2 handles the BBC method by tracking the changing carrier level and capturing the carrier low in a sliding 1 minute window. This carrier low is used as the carrier reference for calculating the modulation readings, consequently, all modulation readings are referenced to the full modulation of this reduced carrier level.

1. Change the menu to read "CAR LEVEL". Re-check the full carrier reading on the AMMA-2 before switching the transmitter into MDCL mode. If the transmitter is going to be used in Standard MDCL mode the carrier level should read 100% for full carrier level and full modulation. From the previous calibration in section 5-1 this 100% carrier level should correspond to full MDCL carrier, proceed to step #2. For BBC MDCL this 100% carrier level will represent zero or low modulation.
2. Change to the "CAR SETTINGS" menu and enter this submenu using the UP PARAMETER button. Find the "MDCL REF" selection using the UP/DOWN PARAMETER buttons select either MDCL REF - HIGH for Standard MDCL, or MDCL REF - LOW for BBC MDCL. Find the "MOD MODE" selection. Select "MOD MODE - MDCL". Exit the CAR SETTINGS submenu.
3. Enable the MDCL function of the transmitter. The unit will grab the appropriate carrier reference the first time the transmitter is fully modulated. To determine if the transmitter and AMMA-2 are operating as expected familiarize yourself with the following additional AMMA-2 measurements.

-
4. “CAR REF” The carrier reference always displays the carrier level the AMMA-2 is currently using to calculate the modulation readings. Depending on the MDCL REF chosen this will be either the carrier high or the carrier low, as captured in the last minute. If the modulation readings don’t seem correct, verify that the CAR REF is capturing the correct carrier level for a reference.
 5. “CAR HIGH” The carrier high displays the highest carrier level recorded in the last one minute using a sliding window. The carrier high will immediately update to a new high and hold that value a full minute unless a higher value is detected. In Standard MDCL this value will also be used as the CAR REF. If the transmitter does not reach full carrier level at least once every minute the AMMA-2 will lose the correct reference level and the modulation readings will not be correct.
 6. “CAR LOW” The carrier low displays the lowest carrier level detected in the last one minute using a sliding window. The carrier low will capture and update immediately to a new low and hold that value a full minute unless a lower value is detected. In BBC MDCL this value is used as the CAR REF. If the carrier does not reach its reference value at full modulation at least once every minute the AMMA-2’s modulation readings will be incorrect.
 7. “CAR RATIO” The carrier ratio displays the dB ratio of the CAR HIGH/CAR LOW. This ratio is determined using the highest and lowest carrier levels detected in the last one minute using a sliding window. The car ratio corresponds to how far the carrier has moved over last minute and can be used to verify the expected range as set on the transmitter.

NOTE: AFTER COMPLETING THE STANDARD AM SETUP, THE MDCL SETUP, OR MODIFYING ANY UNIT OPTIONS OR THE UNIT ID; GO TO *UNIT SETTINGS* UNDER THE MAIN MENU, SELECT *SAVE CONFIG* AND PRESS THE *UP PARAMETER* BUTTON. THIS PRESERVES ALL THESE SETTINGS WHEN THE UNIT POWER IS REMOVED. IF THIS ISN’T DONE, ALL THE USER-DEFINABLE PARAMETER SETTINGS WILL HAVE TO BE RE-ENTERED WHEN THE UNIT IS POWERED UP AGAIN.



NOTES:

1. THE AMMA-2 COMES UP AT "RESET DEFAULTS ?" WHEN A KEY IS PRESSED DURING INITIALIZATION. THE FLOW CHART SHOULD BE READ FROM THE BOTTOM UP.
2. USE OF THE UP/DOWN MENU AND PARAMETER BUTTONS CORRESPOND TO THE DIRECTION ON THE CHART FROM THE USER'S CURRENT LOCATION.
3. A DOWNWARD POINTING ARROW SHOWS WHICH SELECTION THE MENU RETURNS TO WHEN THE LOOP IS EXITED.

6 Running the Setup Program

To run the setup program, plug in The Wizard and press any of the keys located on the front panel while the INITIALIZATION message is being displayed. After a few seconds The Wizard will display a flashing RUNNING SETUP message as it enters the program.

6-1 Main Setup Menu Selections

RESET DEFAULTS ?

Resets The Wizard to default factory settings including the passwords. Pressing the UP PARAMETER key when this message is displayed will reset the unit to default settings. The default settings are as follows:

+ PEAK MOD 125%
+PPM THRESH 10
+PPM DUR 10 MS
NORM HIGH 99 %
NORM LOW 90 %
NORM THRESH 10
NORM DUR 10 MS
SENTRY 0 %
SENTRY 30 SEC
- PEAK MOD 99 %
-PPM THRESH 10
-PPM DUR 10 MS
MOD MODE- NORM
MDCL REF - HIGH
CAR THRESH 0 %
CAR TIME 1 SEC
SHIFT THRESH 10%
HOLD 1.0 SEC
TIME MODE - PAST
INFINITE - OFF
REMOTE - ON
AUDIO - TEST
FREQ 1000 KHZ
FREQ MODE - DIR
FREQ INC 5/10KHZ

PASSWORDS

OBSERVER: BELAR1
OPERATOR: BELAR2
SUPERVISOR: BELAR3

Pressing one of the MENU keys will advance to the next selection.

MODIFY OPTIONS ?	Press the UP PARAMETER button to enter the MODIFY OPTIONS submenu section. This submenu informs The Wizard what options are present and how to configure itself.
MODIFY ID ?	Press the UP PARAMETER button to enter the MODIFY ID submenu section. This submenu allows the user to edit the unit's identification string.
UNIT INFO ?	Displays information about the unit. Pressing the UP PARAMETER key will display information about the unit.
TEST RELAY/LED ?	This submenu allows the relays to be tested. Press the UP PARAMETER button to enter the TEST RELAY/LED submenu.
TEST RS-232 ?	This submenu allows the RS-232 port to be tested. Press the UP PARAMETER button to enter the TEST RS-232 submenu.
TEST INTERFACE ?	This submenu allows the Unit Interface to be tested. Press the UP PARAMETER button to enter the TEST INTERFACE submenu.
EXIT SETUP ?	Exits the SETUP MENU and returns the unit to normal operation. Press the UP PARAMETER button to exit the setup program.

6-2 MODIFY OPTIONS Submenu Selections

For the following prompts the front panel keys responses are:

UP MENU, DN MENU	Advances to the next prompt without altering the current setting.
UP PARAMETER	Indicates a YES/ON response or changes a parameter.
DN PARAMETER	Indicates a NO/OFF response or changes a parameter.
BAUD RATE - 1200/2400/4800/9600	Determines the communications speed of the RS-232/422 port, in bps. <i>Note:</i> setting the speed to 1200 bps will restrict the hold time to a minimum of 1.0 seconds, even when the unit is not being accessed remotely.
CMD TYPE: BELAR/ASCII	Determines the RS-232 Command type. For normal operation, with The Wizard Software, the command type should be set to "BELAR". For use with the <i>AMMA-2 ASCII RS-232 Interface Commands</i> in Section 7, set the command type to "ASCII".

PASSWORDS - ON/OFF	Enables/Disables password protection of The Wizard when it is accessed remotely.
EXT SYNC - ON/OFF	Enables/Disables external sync signal present when The Wizard is being accessed remotely. Generally, the external sync should be enabled, so that when the AMMA-2 is accessed remotely, the computer displays will be synchronized with the unit. Note that if the external sync is enabled, an external sync <i>must</i> be provided when the unit is accessed through the RS-232/422 port, or the unit will not function. If no sync will be provided (as will be the case with certain polling operations), then this setting <i>must</i> be OFF.
INTERFACE: MASTER/SLAVE	Specifies if a second Wizard is present. Pressing the UP PARAMETER key will select this Wizard as the MASTER; pressing the DN PARAMETER key will select it as the SLAVE.

For the following prompts the front panel keys responses are:

UP MENU, DN MENU	Advances to the next prompt without altering the current setting.
UP PARAMETER DN PARAMETER	Selects the next relay to be set. Toggles between NO and NC for the selected relay.
RELAY #0 - NO/NC	Selects the normal and alarm states of alarm relay #0 (LOSS OF MODULATION). If NC is selected, the relay will be Normally Closed (alarm pins 1 & 2 will be connected to each other) and will open (the connection will be broken) under the alarm condition.
RELAY #1 - NO/NC	Selects the normal and alarm states of the NEG PPM relay.
RELAY #2 - NO/NC	Selects the normal and alarm states of the NORMAL relay.
RELAY #3 - NO/NC	Selects the normal and alarm states of the GENERAL relay.
RELAY #4 - NO/NC	This relay is reserved for future use.
RELAY #5 - NO/NC	Selects the normal and alarm states of the POS PPM relay.
RELAY #6 - NO/NC	Selects the normal and alarm states of the CARRIER FAILURE relay.
RELAY #7 - NO/NC	Selects the normal and alarm states of the REMOTE relay.
EXIT ?	Pressing the UP PARAMETER button exits the MODIFY OPTIONS submenu and returns to the Main Setup Menu.

6-3 MODIFY ID Submenu Selections

ID(x):xxxxxxxxxx

The unit ID is a 10 character string used to uniquely identify a unit when it is accessed remotely. The string is set by default to “..AMMA-2..” when the unit is shipped. This string may be altered by using the UP PARAMETER button to scroll through the available ASCII characters at the current cursor position. The current cursor position is indicated in parentheses. The cursor position is changed by using the DOWN PARAMETER button.

EXIT ?

Pressing the UP PARAMETER button exits the MODIFY ID submenu and returns to the Main Setup Menu.

6-4 UNIT INFO Submenu Selections

VERSION x.xx

Indicates the EPROM version installed in the unit.

SERIAL# 510xxx

Indicates the unit’s factory serial number.

EXIT ?

Pressing the UP PARAMETER button exits the UNIT INFO submenu and returns to the Main Setup Menu.

6-5 TEST RELAY/LED Submenu Selections

RELAY #x – OPEN/CLOSE

Allows the relays to be tested. Entering the TEST RELAY/LED submenu will begin the test of Relay #0. For this test the unit is configured so that when the LED is illuminated the relay is closed. The relay test will continually cycle the relay open and closed. The state of the relay will be indicated in the Menu/Parameter window. Each press of the UP PARAMETER key will test the next relay. When finished testing the relays, press the UP MENU button. EXIT ? will show in the MENU/PARAMETER window.

EXIT ?

Pressing the UP PARAMETER button exits the TEST RELAY/LED submenu and returns to the Main Setup Menu.

6-6 TEST RS-232 Submenu Selections

TRANSMIT \$xx x	The RS-232 test alternately transmits a \$55 and \$AA over the interface. The display shows the byte being transmitted followed by the byte received. If no byte is received a "RECEIVE FAILED" message is displayed. In addition to testing the Rx and Tx lines the test also toggles the DTR on the Tx and reads the CD line on the Rx. The "0" or "1" displayed after the data byte is the current logic state of the DTR or CD line.
RECEIVE \$xx x	
RECEIVE FAILED x	
EXIT ?	Pressing the UP PARAMETER button exits the TEST RS-232 submenu and returns to the Main Setup Menu.

6-7 TEST INTERFACE Submenu Selections

TX \$xx RX \$xx x	The Interface test alternately transmits a \$55 and \$AA over the unit interface. The display shows the byte being transmitted followed by the byte received , and the channel number.
EXIT ?	Pressing the UP PARAMETER button exits the TEST INTERFACE submenu and returns to the Main Setup Menu.

NOTE: AFTER COMPLETING THE STANDARD AM SETUP, THE MDCL SETUP, OR MODIFYING ANY UNIT OPTIONS OR THE UNIT ID; GO TO *UNIT SETTINGS* UNDER THE MAIN MENU, SELECT *SAVE CONFIG* AND PRESS THE *UP PARAMETER* BUTTON. THIS PRESERVES ALL THESE SETTINGS WHEN THE UNIT POWER IS REMOVED. IF THIS ISN'T DONE, ALL THE USER-DEFINABLE PARAMETER SETTINGS WILL HAVE TO BE RE-ENTERED WHEN THE UNIT IS POWERED UP AGAIN.

7 AMMA-2 ASCII RS-232 Interface Commands

In order for the ASCII command set to be active, the CMD TYPE - ASCII option must be selected. This option is found in the MODIFY OPTIONS section of the SETUP PROGRAM.

'D' - Send Unit Data : Instructs AMMA-2 to send back the current value of the specified data. Use the tables below to determine the second character of the command string.

Positive Modulation Data Available

'A' - Pos Peak Max
'B' - Pos Peak Ave
'C' - Pos Ave/Max
'D' - Pos Peak Min
'E' - Pos PPM Count
'F' - Normal PPM Count

Negative Modulation Data Available

'G' - Neg Peak Max
'H' - Neg Peak Ave
'I' - Neg Ave/Peak
'J' - Neg Peak Min
'K' - Neg PPM Count

Noise Data Available

'L' - Noise

Carrier Level Data Available

'M' - Carrier Level
'N' - Carrier Reference
'O' - Carrier High
'P' - Carrier Low
'Q' - Carrier Ratio

Alarm/Relay Data Available

'R' - Alarms LED
'S' - Alarms Relay
'T' - Display Alarms

The command syntax is:

'D' + X:(ASCII character data specifier) + CR:(carriage return)

The unit will send back four ASCII characters, representing the decimal value of the data, terminated with a carriage return.

Example: Send Positive Peak Modulation

Command Sent: 'D' + 'A' + CR:(carriage return)

ASCII Value : \$44 \$41 \$0D

Data Returned (assume positive peak = 100%): '0100' + CR

ASCII Value: \$30 \$31 \$30 \$30 \$0D

'C' - Send Unit Configuration : Instructs AMMA-2 to send back the current value of the specified parameter. Use the tables below to determine the second character of the command string.

Positive Modulation Parameters Available

'A' - Pos Peak Mod

'B' - Pos PPM Threshold

'C' - Pos PPM Duration Index

'D' - Normal High

'E' - Normal Low

'F' - Normal PPM Threshold

'G' - Normal PPM Duration Index

'H' - Sentry Threshold

'I' - Sentry Time

Negative Modulation Parameters Available

'J' - Neg Peak Mod

'K' - Neg PPM Threshold

'L' - Neg PPM Duration Index

Carrier Level Parameters Available

'M' - Mod Mode

'N' - Carrier Threshold

'O' - Carrier Time

'P' - Carrier Shift Threshold

Unit Parameters Available

'Q' - Peak Hold Time

'R' - Menu Switch

'S' - DSP#1 Switch

'T' - DSP#2 Switch

Frequency Parameters Available

'U' - Tuning Frequency

'V' - Frequency Mode

'W' - Frequency Increment

The command syntax is:

'C' + X:(ASCII character data specifier) + CR:(carriage return)

The unit will send back five ASCII characters, representing the decimal value of the parameter, terminated with a carriage return.

Example: Send Positive Peak Flasher value

Command Sent: 'C' + 'A' + CR:(carriage return)

ASCII Value : \$43 \$41 \$0D

Data Returned (assume flasher set at 100%): '00100' + CR

ASCII Value: \$30 \$30 \$31 \$30 \$30 \$0D

'A' - Alter Unit Configuration Data: Instructs the AMMA-2 to change the specified parameter. The data is range checked in the AMMA-2 with any data out of range being ignored. Use the tables below to determine the second character of the command string.

Positive Modulation Parameters Available

'A' - Pos Peak Mod
'B' - Pos PPM Threshold
'C' - Pos PPM Duration Index
'D' - Normal High
'E' - Normal Low
'F' - Normal PPM Threshold
'G' - Normal PPM Duration Index
'H' - Sentry Threshold
'I' - Sentry Time

Negative Modulation Parameters Available

'J' - Neg Peak Mod
'K' - Neg PPM Threshold
'L' - Neg PPM Duration Index

Noise Parameters Available

'M' - De-Emphasis

Carrier Level Parameters Available

'N' - Mod Mode
'O' - MDCL Reference
'P' - Carrier Threshold
'Q' - Carrier Time
'R' - Carrier Shift Threshold

Unit Parameters Available

'S' - Peak Hold Time
'U' - Time Mode
'V' - Infinite Hold
'W' - Save Config
'X' - Audio Output Select
'Y' - Calibrator

Frequency Parameters Available

'Z' - Tuning Frequency

'I' - Frequency Mode

'V' - Frequency Increment

The command syntax is:

'A' + X:(ASCII character data specifier)

+ XXXXX:(ASCII parameter data)

1st digit = ten thousands

2nd digit = thousands

3rd digit = hundreds

4th digit = tens

5th digit = ones)

+ CR:(carriage return)

Example: Alter Positive Peak Flasher value

Command Sent: 'A' + 'A' + '+00100' + CR:(carriage return)

ASCII Value : \$41 \$41 \$30 \$30 \$31 \$30 \$30 \$0D

UNIT DATA DEFINITIONS

Data	High	Low	Increments
Pos Peak Max	150	0	1%
Pos Peak Ave	150	0	1%
Pos Ave/Max	100	0	0.01
Pos Peak Min	150	0	1%
Pos PPM Count	6000	0	1
Normal PPM Count	6000	0	1
Neg Peak Max	100	0	1%
Neg Peak Ave	100	0	1%
Neg Ave/Peak	100	0	0.01
Neg Peak Min	100	0	1%
Neg PPM Count	6000	0	1

Noise	187	0	0.5 dB
Carrier Level	200	0	1%
Carrier Reference	200	0	1%
Carrier High	200	0	1%
Carrier Low	200	0	1%
Carrier Ratio	256	0	0.1 dB

Alarms LED

bit #0 = REMOTE
 bit #1 = CAR SHIFT
 bit #2 = POS PPM
 bit #3 = POS PEAK
 bit #4 = GENERAL
 bit #5 = NORMAL
 bit #6 = NEG PPM
 bit #7 = NEG PEAK

Alarms RELAY

bit #0 = REMOTE
 bit #1 = LOSS OF CARRIER
 bit #2 = POS PPM
 bit #3 = RESERVED
 bit #4 = GENERAL
 bit #5 = NORMAL
 bit #6 = NEG PPM
 bit #7 = LOSS OF MODULATION

Display Alarms

bit #0 = AUDIO FAILURE
 bit #1 = CARRIER FAILURE
 bit #2 = LOW CARRIER
 bit #3 = HIGH CARRIER
 bit #4 = LOW RF LEVEL
 bit #5 = HIGH RF LEVEL
 bit #6 = RESERVED
 bit #7 = RESERVED

UNIT PARAMETER DEFINITIONS

PARAMETER	High	Low	Increments
Pos Peak Mod	150	0	1%
Pos PPM Threshold	100	1	1
Pos PPM Duration Index	6	0	1
Normal High	150	0	1%
Normal Low	150	0	1%
Normal PPM Threshold	100	1	1
Normal PPM Duration Index	5	0	1
Sentry Threshold	100	0	1%
Sentry Time	60	1	1 sec
Neg Peak Mod	100	0	1%
Neg PPM Threshold	100	1	1
Neg PPM Duration Index	6	0	1
Noise De-Emphasis	1	0	toggle (ON=1, OFF=0)
Mod Mode	3	0	0=FIX, 1=NORM, 2=MDCL, 3=IMOD
MDCL Reference	1	0	toggle (HIGH=1, LOW=0)
Carrier Threshold	100	0	1%
Carrier Time	60	1	1 sec
Carrier Shift Threshold	200	0	1%
Peak Hold Time	20	1	0.5 sec
Time Mode	1	0	toggle (PAST=1, REAL=0)
Infinite Hold	1	0	toggle (ON=1, OFF=0)

Save Config	1	0	1
Audio Output Select	1	0	toggle (TEST=0, METER=1)
Calibrator	1	0	toggle (ON=1, OFF=0)
Tuning Frequency	30000	250	1 kHz
Frequency Mode	3	0	0=DIR, 1=AUTO, 2=SCAN, 3=LOCK
Frequency Increment	1	0	toggle (5/10 KHZ=1, 1/1 KHZ=0)

Menu Switch

- bit #0 = INFINITE
- bit #1 = CALIBRATOR
- bit #2 = TIME MODE
- bit #3 = REMOTE
- bit #4 = RESERVED
- bit #5 = RESERVED
- bit #6 = RESERVED
- bit #7 = RESERVED

DSP #1 Switch bit #0 = CALIBRATOR

- bit #1 = NOISE DE-EMPHASIS
- bit #2 = RESERVED
- bit #3 = RESERVED
- bit #4 = RESERVED
- bit #5 = RESERVED
- bit #6 = RESERVED
- bit #7 = RESERVED

DSP #2 Switch bit #0 = AUDIO TEST/METER SELECT

- bit #1 = RESERVED
- bit #2 = RESERVED
- bit #3 = REMOTE
- bit #4 = RESERVED
- bit #5 = RESERVED
- bit #6 = RESERVED
- bit #7 = RESERVED

8 Diagrams, Schematics and Parts Lists

Replaceable Parts. This page contains information for ordering replaceable parts for The Wizard. The parts lists that follow show the parts in alphanumeric order by reference designation and provide a description of the part with the Belar part number.

Ordering Information. To order a replacement part from Belar, address the order or inquiry to Belar and supply the following information:

- a. Model number and serial number of unit.
- b. Description of part, *including the reference designation and location.*

Orders may also be taken over the telephone. Parts orders can be put on your VISA, MasterCard, or American Express card, or we can ship them COD.

REFERENCE DESIGNATORS

A	= assembly	J	= jack	S	= switch
BR	= diode bridge	L	= inductor	T	= transformer
C	= capacitor	M	= meter	TB	= terminal block
CR	= diode or LED	P	= plug	U	= integrated circuit
DS	= display or lamp	Q	= transistor	W	= cable
F	= fuse	R	= resistor	X	= socket
FL	= filter	RL	= relay	Y	= crystal
HDR	= header connector	RN	= resistor network		

ABBREVIATIONS

ADC	= analog-to-digital converter	pF	= picofarads
BCD	= binary coded decimal	PIV	= peak inverse voltage
CER	= ceramic	POLY	= polystyrene
COMP	= composition	PORC	= porcelain
CONN	= connector	POT	= potentiometer
DAC	= digital-to-analog converter	SEMICON	= semiconductor
DPM	= digital panel meter	SI	= silicon
ELEC	= electrolytic	TANT	= tantalum
GE	= germanium	μ F	= microfarads
IC	= integrated circuit	V	= volt
k	= kilo = 1,000	VAR	= variable
M	= meg = 1,000,000	VDCW	= dc working volts
MOD	= modulation	W	= watts
MY	= Mylar	WW	= wirewound
PC	= printed circuit		

Appendix A: Using The Wizard Software

Getting Started

Using The Wizard Software any Belar Monitor equipped with an RS-232 Port can be operated from any IBM-compatible personal computer, either through a direct connection (on-site) or from any distance via telephone/modem connection. It can also control other Belar units connected to it using The Wizard Interface. With The Wizard Interface multiple units in a series can be accessed remotely using a single RS-232 port.

Direct Connection

Equipment Required:

- The Wizard Software.
- An IBM compatible PC with an RS-232C serial (COM) port.
- An RS-232 cable with a 9 pin female D-connector at one end (for the Belar unit) and the appropriate connector for your computer (generally either a 9 or 25 pin female D-connector). For direct connection to a PC, only a three wire connection is actually needed: Rx, TX and GND. The various cable pinouts are below; your computer manual may also offer helpful information.

Generally, the RS-232 cable for direct connection is referred to as a "null modem" cable. For your convenience, the proper pin-out follows:

Pinout for Direct Connection (if your computer has a 9-pin D connector serial port):

<u>PC</u>	<====>	<u>Belar Unit</u>
2 - Rx	<====	3 - Tx
3 - Tx	====>	2 - Rx
5 - GND	<====>	5 - GND

Pinout for Direct Connection (if your computer has a 25-pin D connector serial port):

<u>PC</u>	<u><==></u>	<u>Belar Unit</u>
3 - Rx	<u><==</u>	3 - Tx
2 - Tx	<u>==></u>	2 - Rx
7 - GND	<u><==></u>	5 - GND

Procedure:

1. Connect one end of your RS-232 cable to the port on the back of the unit labeled "RS232", and connect the other end to the RS-232 (COM) port of your personal computer.
2. For safety's sake, if you plan to run The Wizard Software directly from the floppy disk, make a backup copy first and store the original in a safe place. Alternatively, copy The Wizard software to your hard disk, preferably in its own subdirectory (we suggest C:\WIZ).
3. From the **A>** or **C:\WIZ>** prompt, type **WIZ** and press **Enter**. Once the software has been started, pressing **F1** will bring up context-sensitive help.
4. Using the mouse, select the **Communications** menu from the top of the screen. If you do not have a mouse, press Alt-C. A drop-down menu will appear:

Start Communications
Connect VIA MODEM
Setup MODEM/RS232
Send Command String
Change Password
About
Exit

Select **Setup Modem/RS232** (using the arrow keys) and press **Enter**. Using the arrow and tab keys, configure your computer to the proper COM port, IRQ, and speed. Press **F1** in this screen for more information on any of these selections. Once you have made the selections, select Start Communications to establish a connection to the unit. The unit comes configured from the factory with a Supervisor password of **BELAR3**.

Connection via Modem

Equipment Required:

- The Wizard Software.
- An IBM compatible computer with at least a 1200 baud (preferably 2400 baud or greater) Hayes-compatible modem, internal or external.
- An external 1200 or 2400 baud external modem (for connection to the unit), set up as described below.
- An RS-232 cable with a 9 pin female D-connector at one end (for the unit) and the appropriate connector for your external modem (generally either a 9 or 25 pin female D-connector). For reliable external modem operation all five lines from the unit's RS-232C connector should be used. The pinout of this cable follows.
- A telephone line for connecting the two modems.

Pinout for Modem connection (25-pin D connector serial port at modem):

<u>PC</u>	<u><==></u>	<u>Belar Unit</u>
2 - Rx	<u><==</u>	3 - Tx
3 - Tx	<u>==></u>	2 - Rx
7 - GND	<u><==></u>	5 - GND
8 - CD	<u>==></u>	1 - CD
20 - DTR	<u><==</u>	4 - DTR

External Modem Setup:

Most external modems have non-volatile memory for storing configuration information. In order to configure the modem to work with the unit you must have a computer with a RS-232 port and some kind of communications software or other way of communicating with your modem. Connect the external modem to the computer using the appropriate cable and access it using your communications software. Using the appropriate AT commands set up the modem to do the following:

AT command Description

ATS0=n Puts modem in Auto-Answer mode, where "n" is the number of rings desired before the call will be answered. Note: "n" cannot equal 0 (we suggest n=1).

AT&C1	Carrier Detect (CD) active during connect.
AT&D3	Data Terminal Ready (DTR) disconnect and reset.
AT&W0	Writes user configuration to non-volatile memory.

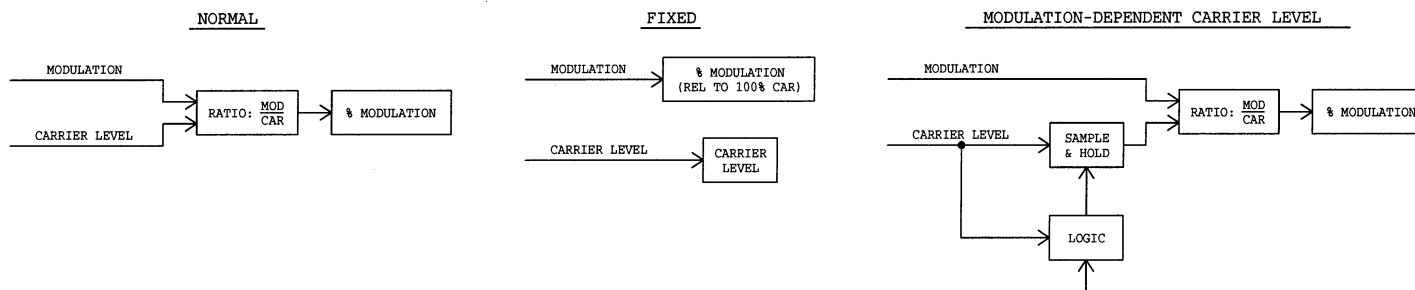
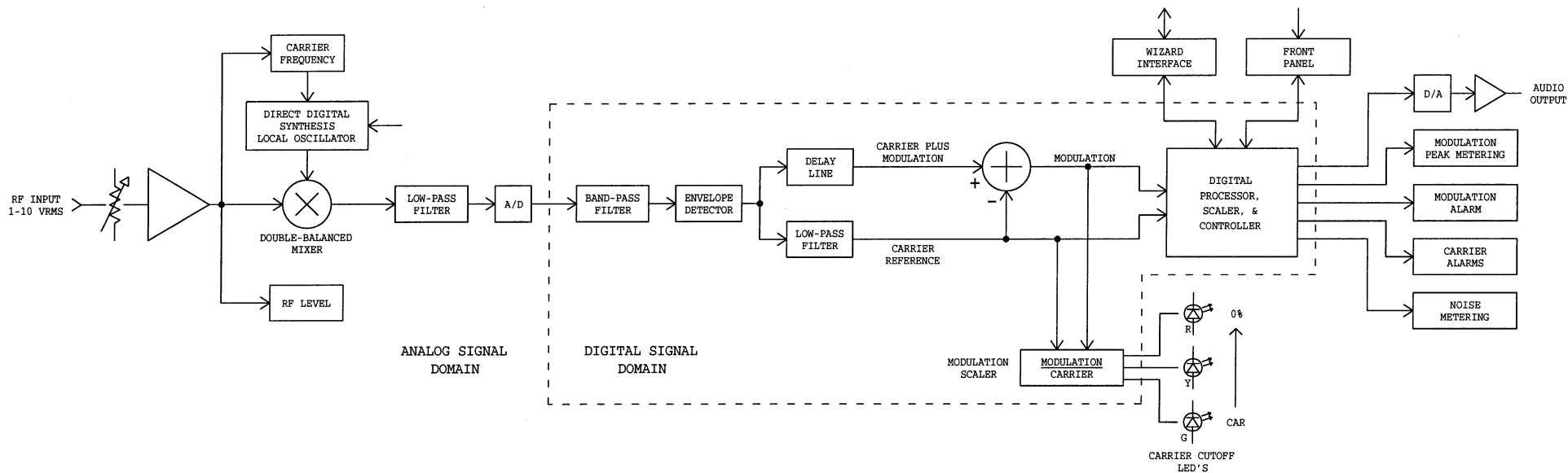
Some modems have various data compression schemes to increase the apparent speed under certain circumstances. Be sure to configure your modem to disable such compression schemes. Refer to your modem and communication software manuals if you encounter problems.

Procedure:

1. For safety's sake, if you plan to run The Wizard software directly from the floppy disk, make a backup copy first and store the original in a safe place. Alternatively, copy The Wizard software to your hard disk, preferably in its own subdirectory (we suggest C:\WIZ).
2. From the **A>** or **C:\WIZ>** prompt, type **WIZ** and press **Enter**. The Wizard front panel will appear in the lower half of your screen.
3. Using the mouse, select the **Communications** menu from the top of the screen. If you do not have a mouse, press Alt-C. A drop-down menu will appear:

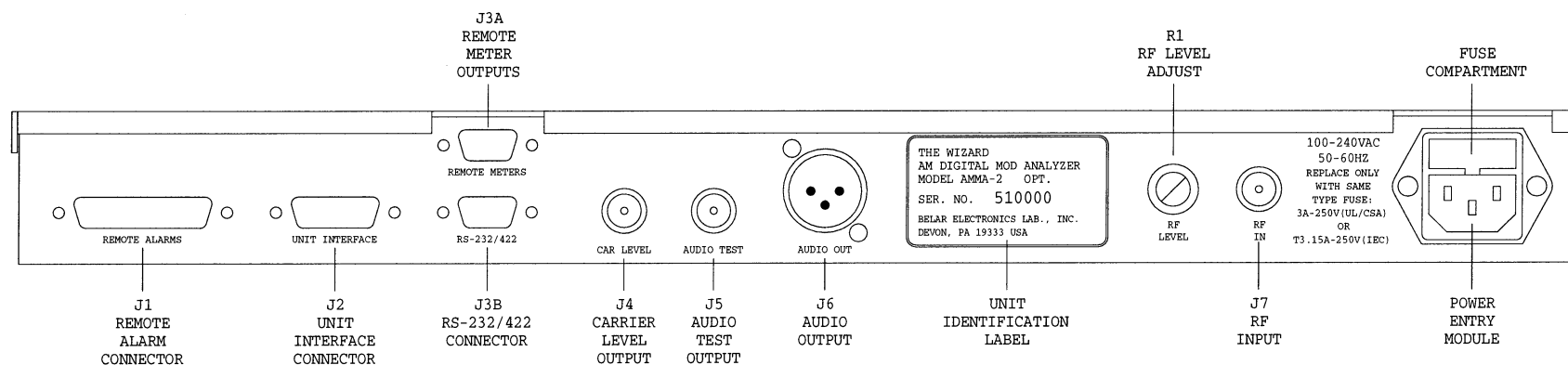
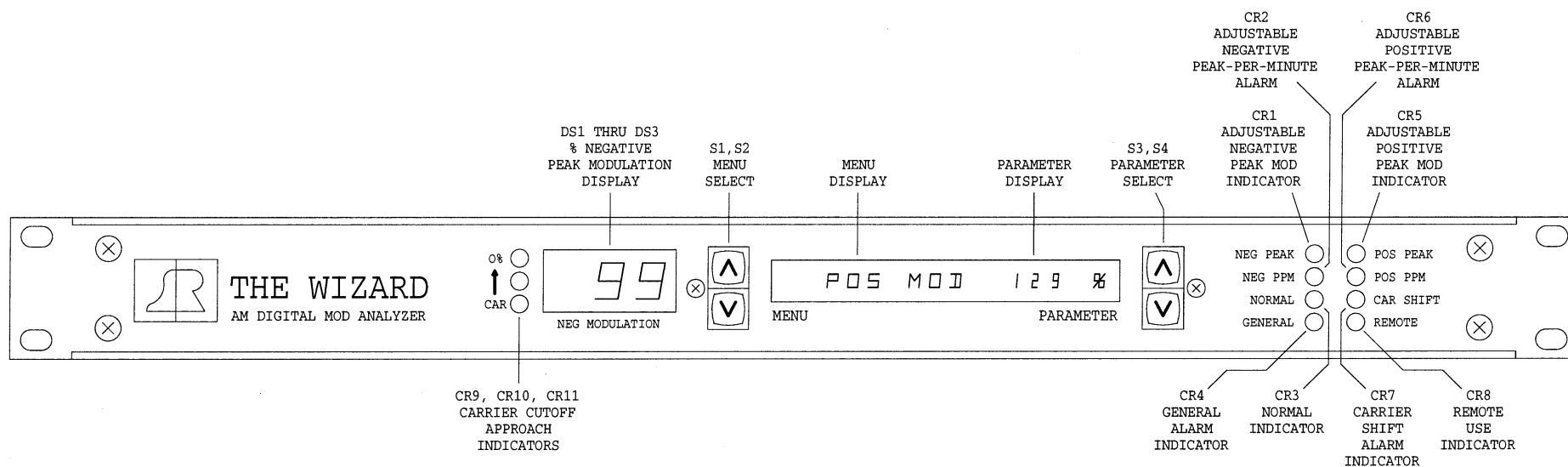
Start Communications
Connect VIA MODEM
Setup MODEM/RS232
Send Command String
Change Password
About
Exit

Select **Setup Modem/RS232** (using the arrow keys) and press **Enter**. Using the arrow and tab keys, configure your computer to the proper COM port, IRQ, speed, and telephone number(s). Press **F1** in this screen for more information on any of these selections. Once you have made the selections, select **Connect VIA MODEM** to instruct your modem to dial up the modem at the remote unit and established a connection. The unit comes configured from the factory with a Supervisor password of **BELAR3**.

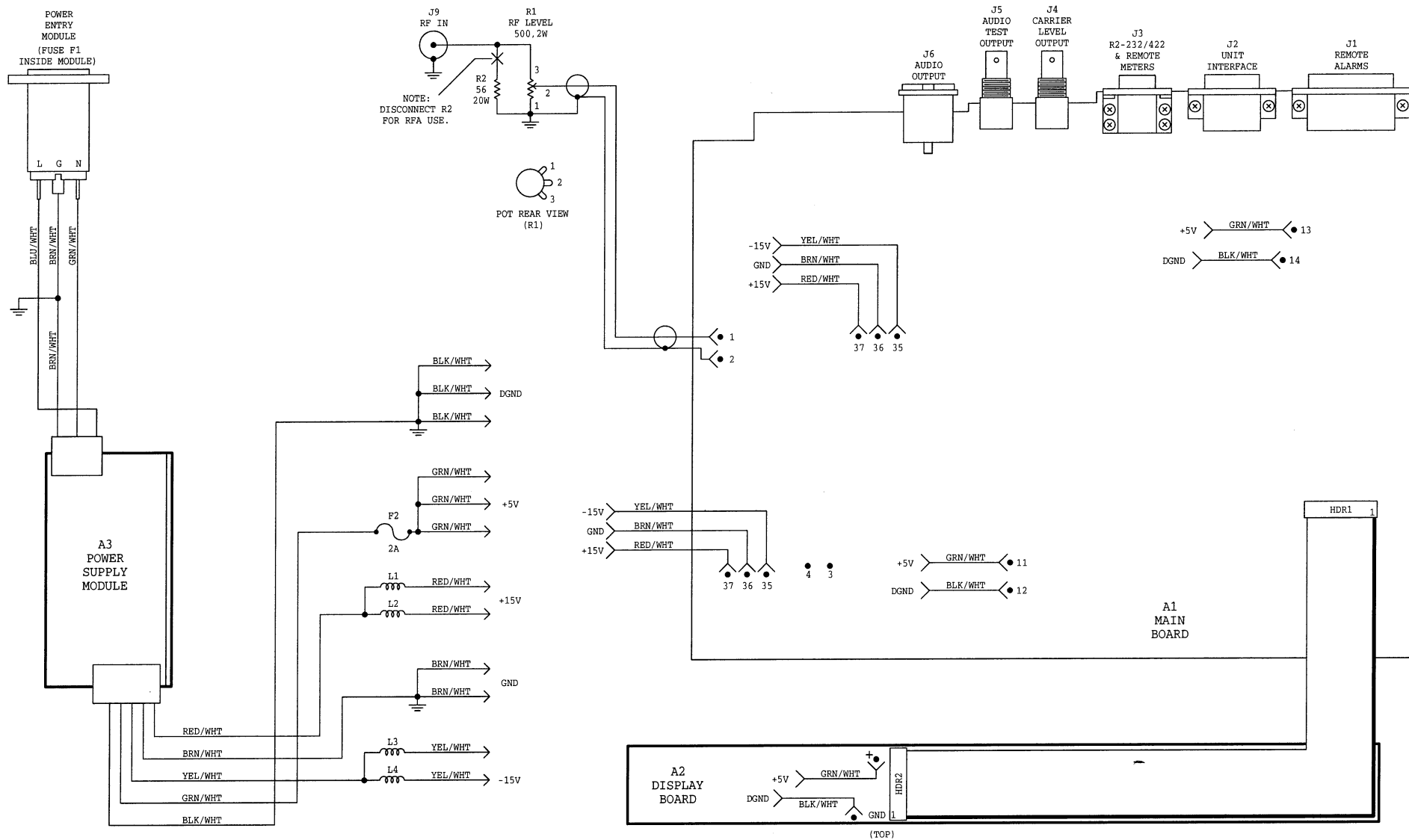


AMMA-2 CARRIER/MODULATION MEASUREMENT CONFIGURATIONS

AMMA-2 AM WIZARD BLOCK DIAGRAM



AMMA-2 FRONT & REAR VIEW
BELAR ELECTRONICS

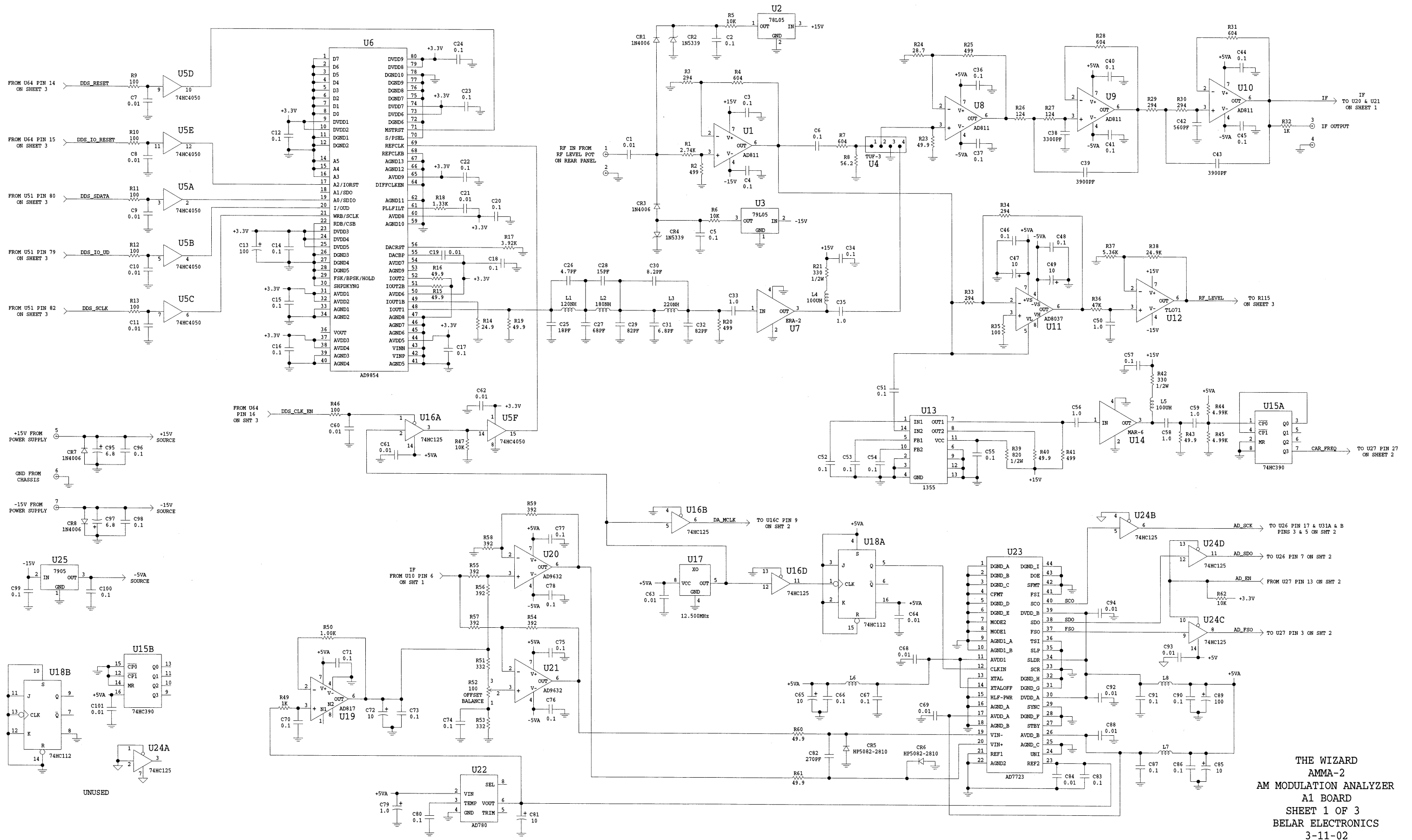


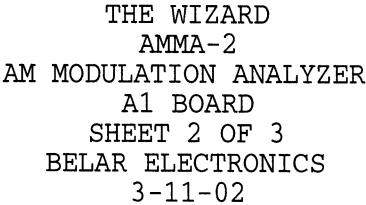
AMMA-2 CHASSIS WIRING
BELAR ELECTRONICS
8-17-01

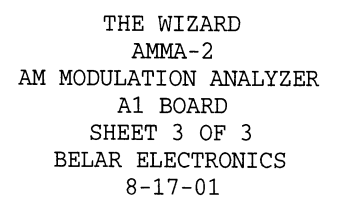
AMMA-2 PARTS LISTS

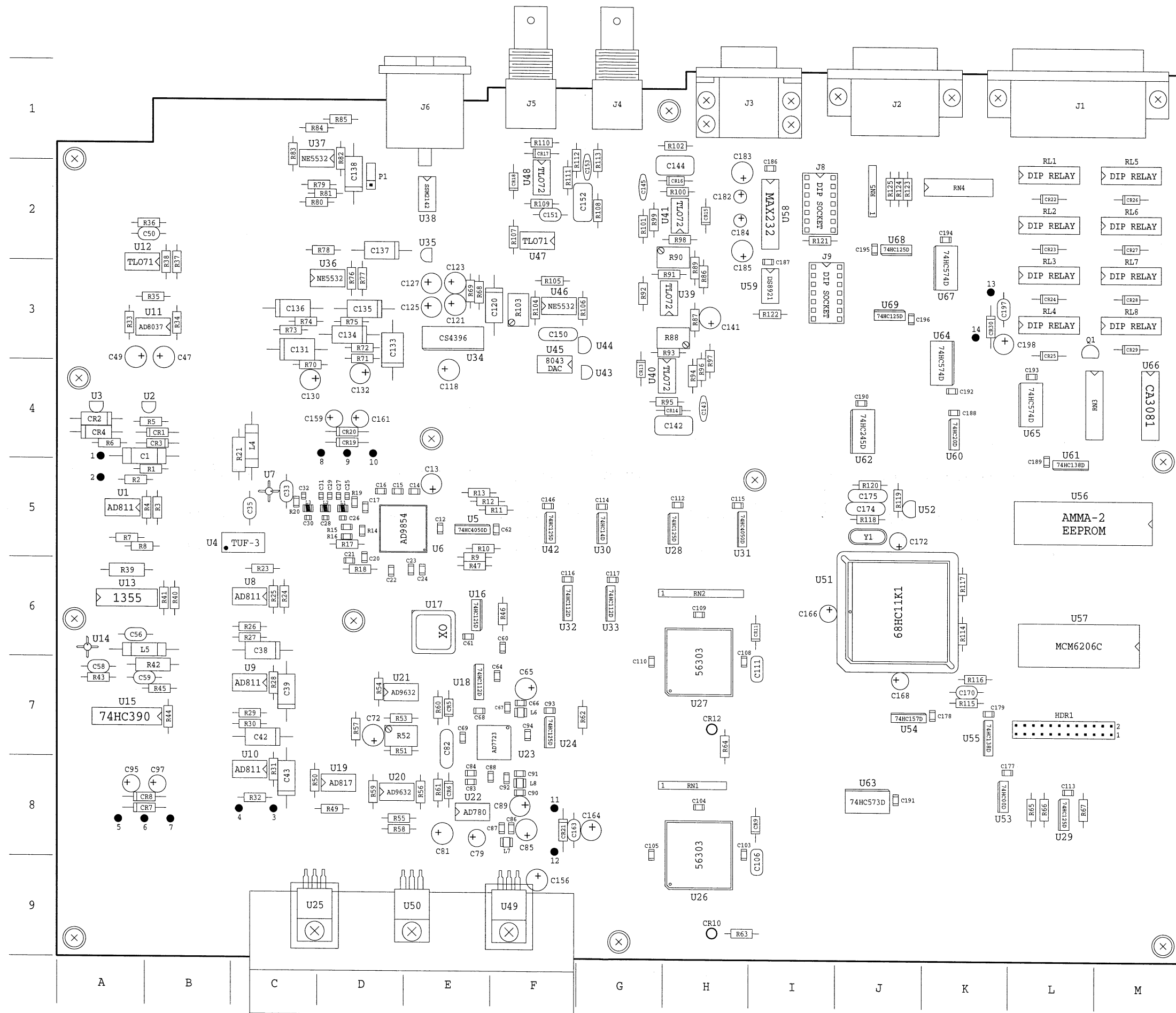
MAIN CHASSIS

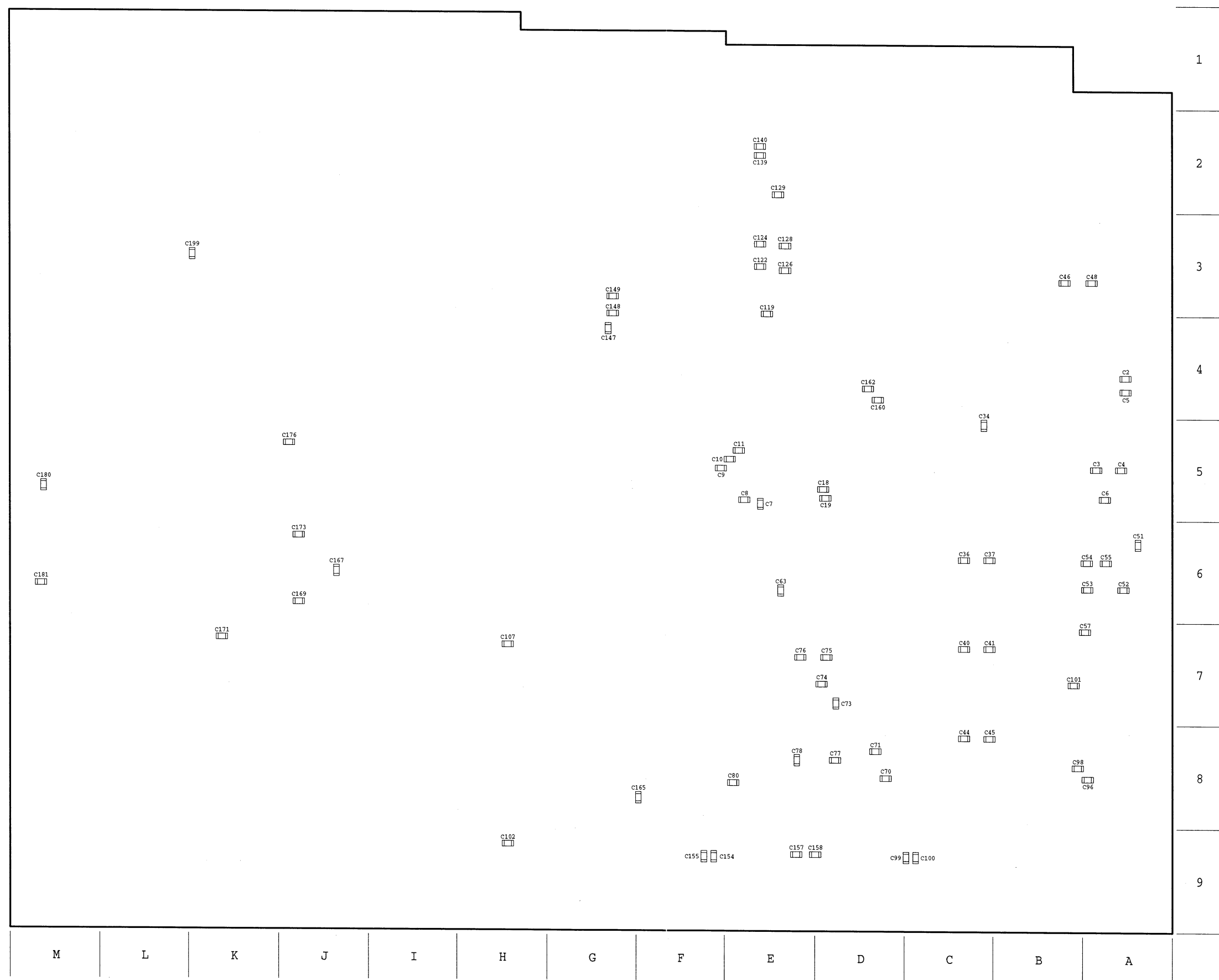
Reference Designation	Description	Part Number
A3	POWER SUPPLY MODULE: 30W	4005-0020A
--	POWER ENTRY MODULE: 6EGG1-1	0360-0021
F1	FUSE: GMA-3A 250V(UL/CSA)	2110-0009
--	or T3.15A-250V(IEC)	
--	FUSE HOLDER: CHASSIS MOUNT	2110-0010
F2	FUSE: AGC-2A 250V	2110-0006
J7	JACK: BNC	0360-0005
L1 thru L4	CHOKE: RF	9140-0011
R1	R: VAR COMP 500 2W	2100-0015
R2	R: FIXED NON-IND 56 20W	0811-0021
--	FLAT CABLE ASSEMBLY: 24 CONDUCTOR	8900-0026
--	LINE CORD (115 Vac line voltage)	8120-0002
--	LINE CORD (230 Vac line voltage)	8120-0004











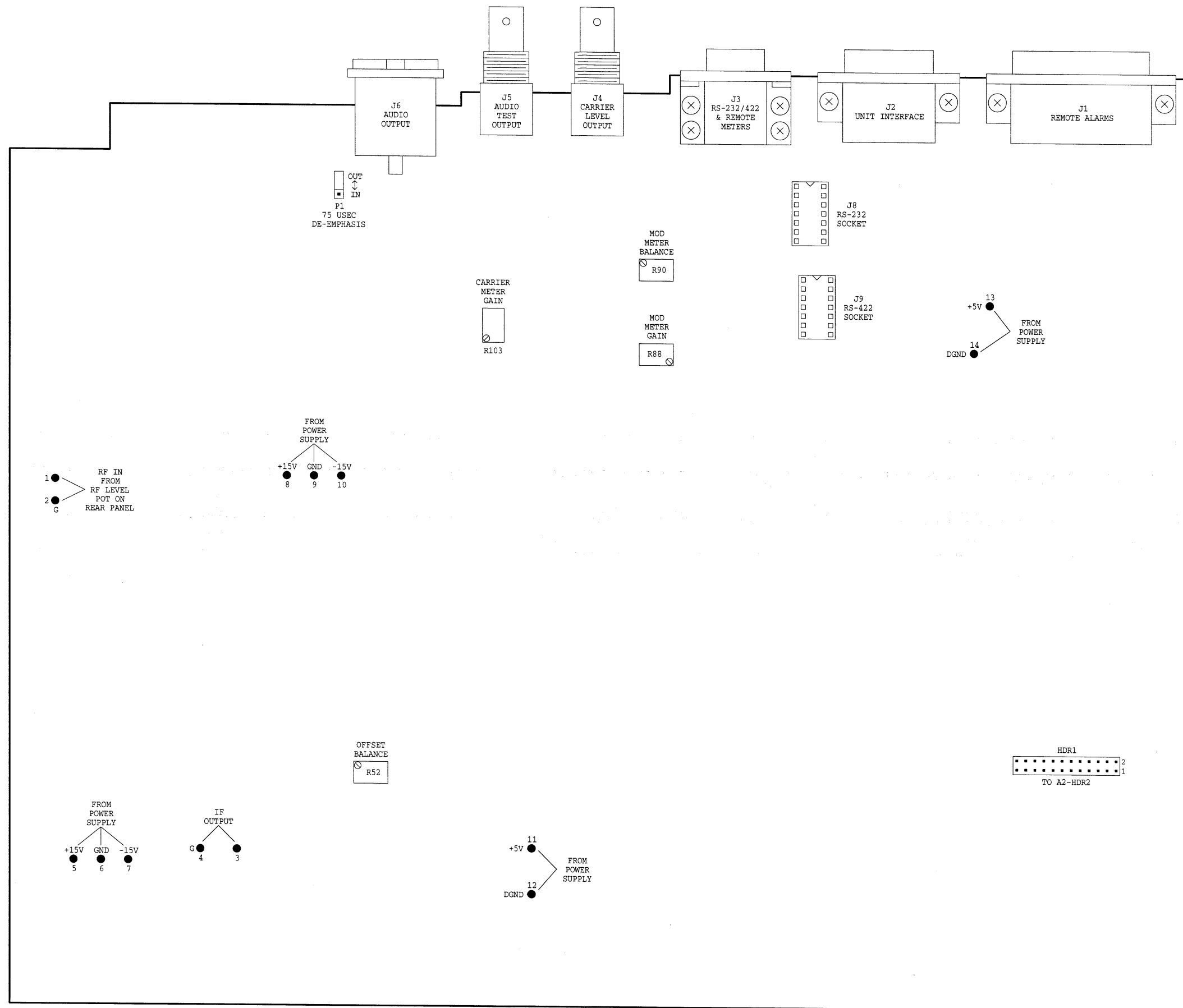
AMMA-2 A1 BOARD
PART LOCATIONS

<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>
C1	A4	C41	C7*	C81	E8	C121	E3	C161	D4	CR1	B4
C2	A4*	C42	C7	C82	E7	C122	E3*	C162	D4*	CR2	A4
C3	A5*	C43	C8	C83	E8	C123	E3	C163	F8	CR3	B4
C4	A5*	C44	C8*	C84	E8	C124	E3*	C164	G8	CR4	A4
C5	A4*	C45	C8*	C85	F8	C125	E3	C165	F8*	CR5	E7
C6	A5*	C46	B3*	C86	F8	C126	E3*	C166	I6	CR6	E8
C7	E5*	C47	B3	C87	F8	C127	E3	C167	J6*	CR7	A8
C8	E5*	C48	A3*	C88	F8	C128	E3*	C168	J7	CR8	A8
C9	F5*	C49	A3	C89	F8	C129	E2*	C169	J6*	CR9	I8
C10	E5*	C50	B2	C90	F8	C130	C4	C170	K7	CR10	H9
C11	E5*	C51	A6*	C91	F8	C131	C3	C171	K7*	CR11	I6
C12	E5	C52	A6*	C92	F8	C132	D4	C172	J5	CR12	H7
C13	E5	C53	A6*	C93	F7	C133	D3	C173	J6*	CR13	G4
C14	E5	C54	A6*	C94	F7	C134	D3	C174	J5	CR14	H4
C15	D5	C55	A6*	C95	A8	C135	D3	C175	J5	CR15	H2
C16	D5	C56	A6	C96	A8*	C136	C3	C176	J5*	CR16	H2
C17	D5	C57	A7*	C97	B8	C137	D2	C177	K8	CR17	F1
C18	D5*	C58	A7	C98	B8*	C138	D2	C178	K7	CR18	F2
C19	D5*	C59	A7	C99	C9*	C139	E2*	C179	K7	CR19	D4
C20	D5	C60	F6	C100	C9*	C140	E2*	C180	M5*	CR20	D4
C21	D6	C61	E6	C101	B7*	C141	H3	C181	M6*	CR21	F8
C22	D6	C62	F5	C102	H9*	C142	H4	C182	H2	CR22	L2
C23	E6	C63	E6*	C103	H8	C143	H4	C183	H2	CR23	L2
C24	E6	C64	F7	C104	H8	C144	H2	C184	H2	CR24	L3
C25	D5	C65	F7	C105	G8	C145	G2	C185	H2	CR25	L3
C26	D5	C66	F7	C106	I9	C146	F5	C186	I2	CR26	M2
C27	D5	C67	F7	C107	H7*	C147	G4*	C187	I2	CR27	M2
C28	D5	C68	E7	C108	H7	C148	G3*	C188	K4	CR28	M3
C29	D5	C69	E7	C109	H6	C149	G3*	C189	L4	CR29	M3
C30	C5	C70	D8*	C110	G7	C150	F3	C190	J4	CR30	K3
C31	D5	C71	D8*	C111	I7	C151	F2	C191	J8		
C32	C5	C72	D7	C112	H5	C152	G2	C192	K4	HDR1	L7
C33	C5	C73	D7*	C113	L8	C153	G2	C193	L4		
C34	C5*	C74	D7*	C114	G5	C154	F9*	C194	K2	J1	L1
C35	C5	C75	D7*	C115	H5	C155	F9*	C195	J2	J2	J1
C36	C6*	C76	E7*	C116	F6	C156	F9	C196	J3	J3	H1
C37	C6*	C77	D8*	C117	G6	C157	E9*	C197	K3	J4	G1
C38	C6	C78	E8*	C118	E4	C158	D9*	C198	K3	J5	F1
C39	C7	C79	E8	C119	E3*	C159	D4	C199	K3*	J6	E1
C40	C7*	C80	E8*	C120	F3	C160	D4*			J7	--

*note: these locations are on bottom of pc board.

AMMA-2 A1 BOARD
PART LOCATIONS
cont.

<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>	<u>Desig/Loc</u>
J8	I2	R26	C6	R67	L8	R108	G2	U8	C6	U49	F9
J9	I3	R27	C6	R68	E3	R109	F2	U9	C7	U50	E9
		R28	C7	R69	E3	R110	F1	U10	C8	U51	J6
L1	D5	R29	C7	R70	C4	R111	F2	U11	B3	U52	J5
L2	D5	R30	C7	R71	D3	R112	F1	U12	A3	U53	K8
L3	C5	R31	C8	R72	D3	R113	G1	U13	A6	U54	J7
L4	C4	R32	C8	R73	C3	R114	K6	U14	A6	U55	K7
L5	A6	R33	A3	R74	C3	R115	K7	U15	A7	U56	L5
L6	F7	R34	B3	R75	D3	R116	K7	U16	E6	U57	L6
L7	F8	R35	B3	R76	D3	R117	K6	U17	E6	U58	I2
L8	F8	R36	B2	R77	D3	R118	J5	U18	E7	U59	I3
		R37	B3	R78	D2	R119	J5	U19	D8	U60	K4
P1	D2	R38	B3	R79	D2	R120	J5	U20	D8	U61	L4
		R39	A6	R80	C2	R121	I2	U21	D7	U62	J4
Q1	L3	R40	B6	R81	D2	R122	I3	U22	E8	U63	J8
		R41	B6	R82	D1	R123	J2	U23	F7	U64	K3
R1	B5	R42	B7	R83	C1	R124	J2	U24	F7	U65	L4
R2	A5	R43	A7	R84	C1	R125	J2	U25	C9	U66	M4
R3	B5	R44	B7	R85	D1			U26	H8	U67	K3
R4	B5	R45	B7	R86	H3	RL1	L2	U27	H7	U68	J2
R5	B4	R46	F6	R87	H3	RL2	L2	U28	H5	U69	J3
R6	A4	R47	E6	R88	H3	RL3	L3	U29	L8		
R7	A5	R48	--	R89	H3	RL4	L3	U30	G5	Y1	J5
R8	A5	R49	D8	R90	H2	RL5	M2	U31	H5		
R9	E5	R50	C8	R91	H3	RL6	M2	U32	F6		<u>pins</u>
R10	E5	R51	D7	R92	G3	RL7	M3	U33	G6	1	A4
R11	F5	R52	D7	R93	H3	RL8	M3	U34	E3	2	A5
R12	E5	R53	D7	R94	H4			U35	E2	3	C8
R13	E5	R54	D7	R95	H4	RN1	H8	U36	D3	4	C8
R14	D5	R55	D8	R96	H4	RN2	H6	U37	C1	5	A8
R15	D5	R56	E8	R97	H3	RN3	L4	U38	E2	6	A8
R16	D5	R57	D7	R98	H2	RN4	K2	U39	H3	7	B8
R17	D5	R58	D8	R99	G2	RN5	J2	U40	H4	8	D4
R18	D6	R59	D8	R100	H2			U41	H2	9	D4
R19	D5	R60	E7	R101	G2	U1	A5	U42	F5	10	D4
R20	C5	R61	E8	R102	H1	U2	B4	U43	G4	11	F8
R21	C4	R62	G7	R103	F3	U3	A4	U44	G3	12	F8
R22	C5	R63	H9	R104	F3	U4	C5	U45	F4	13	K3
R23	C6	R64	H7	R105	F3	U5	E5	U46	F3	14	K3
R24	C6	R65	L8	R106	G3	U6	D5	U47	F2		
R25	C6	R66	L8	R107	F2	U7	C5	U48	F2		



A1 BOARD AMMA-2

Reference Designation	Description	Part Number
C1	C: FIXED FILM 0.01uF 10% 200V	0120-1031
C2 thru C6	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C7 thru C11	C: FIXED CERAMIC CHIP 0.01uF 50V	C1206 0151-0021
C12	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C13	C: FIXED TANT 100uF 6.3V	0185-0010
C14 thru C18	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C19	C: FIXED CERAMIC CHIP 0.01uF 50V	C1206 0151-0021
C20	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C21	C: FIXED CERAMIC CHIP 0.01uF 50V	C1206 0151-0021
C22 thru C24	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C25	C: FIXED CERAMIC CHIP 18pF 50V	C0805 0151-0040
C26	C: FIXED CERAMIC CHIP 4.7pF 50V	C0805 0151-0039
C27	C: FIXED CERAMIC CHIP 68pF 50V	C0805 0151-0036
C28	C: FIXED CERAMIC CHIP 15pF 50V	C0805 0151-0038
C29	C: FIXED CERAMIC CHIP 82pF 50V	C0805 0151-0041
C30	C: FIXED CERAMIC CHIP 8.2pF 50V	C0805 0151-0037
C31	C: FIXED CERAMIC CHIP 6.8pF 50V	C0805 0151-0035
C32	C: FIXED CERAMIC CHIP 82pF 50V	C0805 0151-0041
C33	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C34	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C35	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C36, C37	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C38	C: FIXED POLY 3300pF 2.5% 160V	0130-3322
C39	C: FIXED POLY 3900pF 2.5% 160V	0130-3922
C40, C41	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C42	C: FIXED POLY 560pF 2.5% 160V	0130-5612
C43	C: FIXED POLY 3900pF 2.5% 160V	0130-3922
C44 thru C46	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C47	C: FIXED TANT 10uF 16V	0185-0007
C48	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C49	C: FIXED TANT 10uF 16V	0185-0007
C50	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C51 thru C55	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C56	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C57	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C58, C59	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C60 thru C64	C: FIXED CERAMIC CHIP 0.01uF 50V	C1206 0151-0021
C65	C: FIXED TANT 10uF 16V	0185-0007
C66, C67	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C68, C69	C: FIXED CERAMIC CHIP 0.01uF 50V	C1206 0151-0021
C70, C71	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C72	C: FIXED TANT 10uF 16V	0185-0007
C73 THRU C78	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C79	C: FIXED TANT 1.0uF 35V	0185-0006
C80	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C81	C: FIXED TANT 10uF 16V	0185-0007
C82	C: FIXED MICA 270pF 5%	0140-2715
C83	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C84	C: FIXED CERAMIC CHIP 0.01uF 50V	C1206 0151-0021
C85	C: FIXED TANT 10uF 16V	0185-0007

A1 BOARD AMMA-2 cont.

Reference Designation	Description	Part Number
C86,C87	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C88	C: FIXED CERAMIC CHIP 0.01uF 50V	C1206 0151-0021
C89	C: FIXED TANT 100uF 6.3V	0185-0010
C90,C91	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C92 thru C94	C: FIXED CERAMIC CHIP 0.01uF 50V	C1206 0151-0021
C95	C: FIXED TANT 6.8uF 25V	0185-0002
C96	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C97	C: FIXED TANT 6.8uF 25V	0185-0002
C98 thru C100	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C101	C: FIXED CERAMIC CHIP 0.01uF 50V	C1206 0151-0021
C102 thru C105	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C106	C: FIXED FILM 0.01uF 10% 100V	0122-1031
C107 thru C110	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C111	C: FIXED FILM 0.01uF 10% 100V	0122-1031
C112 thru C117	C: FIXED CERAMIC CHIP 0.01uF 50V	C1206 0151-0021
C118	C: FIXED TANT 10uF 16V	0185-0007
C119	C: FIXED CERAMIC CHIP 0.01uF 50V	C1206 0151-0021
C120	C: FIXED POLY 2200pF 2.5% 160V	0130-2222
C121	C: FIXED TANT 10uF 16V	0185-0007
C122	C: FIXED CERAMIC CHIP 0.01uF 50V	C1206 0151-0021
C123	C: FIXED TANT 10uF 16V	0185-0007
C124	C: FIXED CERAMIC CHIP 0.01uF 50V	C1206 0151-0021
C125	C: FIXED TANT 100uF 6.3V	0185-0010
C126	C: FIXED CERAMIC CHIP 0.01uF 50V	C1206 0151-0021
C127	C: FIXED TANT 100uF 6.3V	0185-0010
C128	C: FIXED CERAMIC CHIP 0.01uF 50V	C1206 0151-0021
C129	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C130	C: FIXED TANT 100uF 6.3V	0185-0010
C131	C: FIXED POLY 5600pF 2.5% 160V	0130-5622
C132	C: FIXED TANT 100uF 6.3V	0185-0010
C133	C: FIXED POLY 5600pF 2.5% 160V	0130-5622
C134	C: FIXED POLY 470pF 2.5% 160V	0130-4712
C135,C136	C: FIXED POLY 1500pF 2.5% 160V	0130-1522
C137	C: FIXED POLY 470pF 2.5% 160V	0130-4712
C138	C: FIXED POLY 1500pF 2.5% 160V	0130-1522
C139,C140	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C141	C: FIXED TANT 10uF 16V	0185-0007
C142	C: FIXED FILM 0.047uF 10% 100V	0122-4731
C143	C: FIXED CERAMIC 0.001uF 1kV	0151-0002
C144	C: FIXED FILM 0.047uF 10% 100V	0122-4731
C145	C: FIXED CERAMIC 0.001uF 1kV	0151-0002
C146	C: FIXED CERAMIC CHIP 0.01uF 50V	C1206 0151-0021
C147 thru C149	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C150	C: FIXED MICA 15pF 5%	0140-1505
C151	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C152	C: FIXED FILM 0.047uF 10% 100V	0122-4731
C153	C: FIXED CERAMIC 0.001uF 1kV	0151-0002
C154,C155	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014
C156	C: FIXED TANT 10uF 16V	0185-0007
C157,C158	C: FIXED CERAMIC CHIP 0.1uF 50V	C1206 0151-0014

A1 BOARD AMMA-2 cont.

Reference Designation	Description	Part Number
C159	C: FIXED TANT 6.8uF 25V	0185-0002
C160	C: FIXED CERAMIC CHIP 0.1uF 50V C1206	0151-0014
C161	C: FIXED TANT 6.8uF 25V	0185-0002
C162	C: FIXED CERAMIC CHIP 0.1uF 50V C1206	0151-0014
C163	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C164	C: FIXED TANT 100uF 6.3V	0185-0010
C165	C: FIXED CERAMIC CHIP 0.01uF 50V C1206	0151-0021
C166	C: FIXED TANT 6.8uF 25V	0185-0002
C167	C: FIXED CERAMIC CHIP 0.01uF 50V C1206	0151-0021
C168	C: FIXED TANT 6.8uF 25V	0185-0002
C169	C: FIXED CERAMIC CHIP 0.01uF 50V C1206	0151-0021
C170	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C171	C: FIXED CERAMIC CHIP 0.1uF 50V C1206	0151-0014
C172	C: FIXED TANT 6.8uF 25V	0185-0002
C173	C: FIXED CERAMIC CHIP 0.01uF 50V C1206	0151-0021
C174, C175	C: FIXED MICA 24pF 5%	0140-2405
C176	C: FIXED CERAMIC CHIP 0.1uF 50V C1206	0151-0014
C177 thru C181	C: FIXED CERAMIC CHIP 0.01uF 50V C1206	0151-0021
C182	C: FIXED TANT 4.7uF 10V	0185-0001
C183	C: FIXED TANT 10uF 16V	0185-0007
C184	C: FIXED TANT 4.7uF 10V	0185-0001
C185	C: FIXED TANT 10uF 16V	0185-0007
C186	C: FIXED CERAMIC CHIP 0.01uF 50V C1206	0151-0021
C187	C: FIXED CERAMIC CHIP 0.1uF 50V C1206	0151-0014
C188 thru C196	C: FIXED CERAMIC CHIP 0.01uF 50V C1206	0151-0021
C197	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C198	C: FIXED TANT 100uF 6.3V	0185-0010
C199	C: FIXED CERAMIC CHIP 0.01uF 50V C1206	0151-0021
CR1	DIODE: 1N4006	1900-0016
CR2	DIODE: 1N5339, 5 WATT	1900-0035
CR3	DIODE: 1N4006	1900-0016
CR4	DIODE: 1N5339, 5 WATT	1900-0035
CR5, CR6	DIODE: HP5082-2810	1900-0032
CR7, CR8	DIODE: 1N4006	1900-0016
CR9	DIODE: HP5082-2800	1900-0026
CR10	LED: RED T-1	1910-0004
CR11	DIODE: HP5082-2800	1900-0026
CR12	LED: RED T-1	1910-0004
CR13	DIODE: 1N277 GERMANIUM	1900-0001
CR14	DIODE: 1N4446	1900-0002
CR15	DIODE: 1N277 GERMANIUM	1900-0001
CR16	DIODE: 1N4446	1900-0002
CR17	DIODE: 1N277 GERMANIUM	1900-0001
CR18	DIODE: 1N4446	1900-0002
CR19 thru CR21	DIODE: 1N4006	1900-0016
CR22 thru CR29	DIODE: 1N4446	1900-0002
CR30	DIODE: 1N4006	1900-0016
HDR1	HEADER: 24 PIN	0361-0024

A1 BOARD AMMA-2 cont.

Reference Designation	Description	Part Number
J1	CONNECTOR: "D" SINGLE 25 PIN FEMALE	0360-0035
J2	CONNECTOR: "D" SINGLE 15 PIN FEMALE	0360-0032
J3	CONNECTOR: "D" DUAL 9 PIN FEMALE/MALE	0360-0034
J4,J5	CONNECTOR: BNC PC MOUNT	0360-0014
J6	CONNECTOR: "XLR" MALE	0360-0046
J8,J9	SOCKET: IC 14 PIN	1200-0011
--	SHUNT PLUG: RS-232/422	0365-0043
L1	CHOKE: 120nH IC1008	9145-0006
L2	CHOKE: 180nH IC1008	9145-0004
L3	CHOKE: 220nH IC1008	9145-0003
L4,L5	CHOKE: 100uH	9140-0005
L6 thru L8	L: CHIP BEAD CORE EXC-CL3225U1	9145-0005
P1	PLUG: 3 PIN, PC MOUNT	0365-0030
--	JUMPER: 2 PIN (USED WITH P1)	0365-0028
Q1	TRANSISTOR: 2N4401	1850-0028
R1	R: METAL FILM 2.74k 1%	0721-2741
R2	R: METAL FILM 499 1%	0721-4990
R3	R: METAL FILM 294 1%	0721-2940
R4	R: METAL FILM 604 1%	0721-6040
R5,R6	R: METAL FILM 10k 2% 1/4W	0751-1032
R7	R: METAL FILM 604 1%	0721-6040
R8	R: METAL FILM 56.2 1%	0721-52R2
R9 thru R13	R: METAL FILM 100 2% 1/4W	0751-1012
R14	R: METAL FILM CHIP 24.9 1%	0761-24R9
R15,R16	R: METAL FILM CHIP 49.9 1%	0761-49R9
R17	R: METAL FILM 3.92k 1%	0721-3921
R18	R: METAL FILM 1.33k 1%	0721-1331
R19	R: METAL FILM CHIP 49.9 1%	0761-49R9
R20	R: METAL FILM CHIP 499 1%	0761-4990
R21	R: METAL FILM 330 2% 1/2W	0771-3312
R22	not used	
R23	R: METAL FILM 49.9 1%	0721-49R9
R24	R: METAL FILM 28.7 1%	0721-56R2
R25	R: METAL FILM 499 1%	0721-4990
R26,R27	R: METAL FILM 124 1%	0721-1240
R28	R: METAL FILM 604 1%	0721-6040
R29,R30	R: METAL FILM 294 1%	0721-2940
R31	R: METAL FILM 604 1%	0721-6040
R32	R: METAL FILM 1k 2% 1/4W	0751-1022
R33,R34	R: METAL FILM 294 1%	0721-2940
R35	R: METAL FILM 100 2% 1/4W	0751-1012
R36	R: METAL FILM 47k 2% 1/4W	0751-4732
R37	R: METAL FILM 5.36k 1%	0721-5361
R38	R: METAL FILM 24.9k 1%	0721-2492
R39	R: METAL FILM 820 2% 1/2W	0771-8212
R40	R: METAL FILM 49.9 1%	0721-49R9

A1 BOARD AMMA-2 cont.

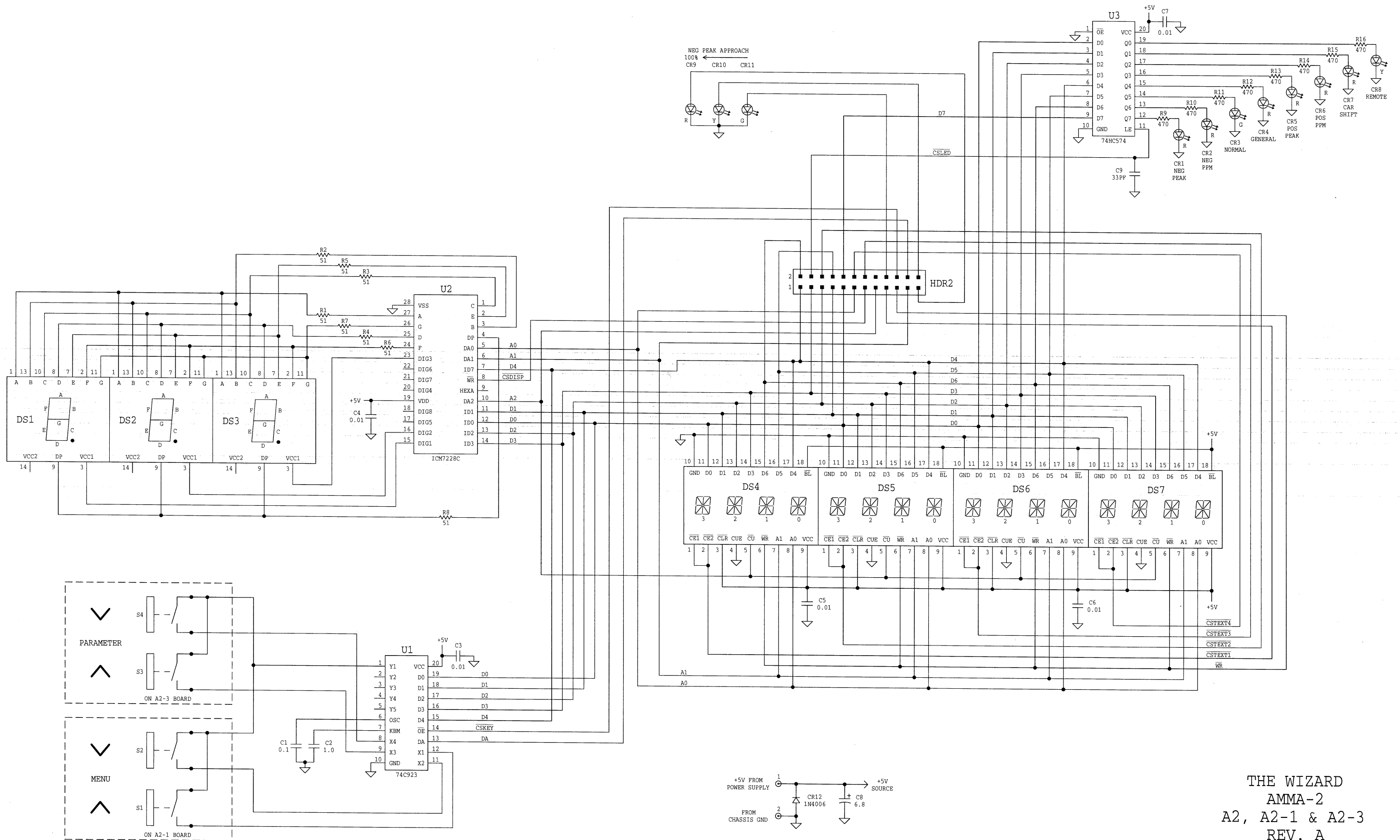
Reference Designation	Description	Part Number
R41	R: METAL FILM 499 1%	0721-4990
R42	R: METAL FILM 330 2% 1/2W	0771-3312
R43	R: METAL FILM 49.9 1%	0721-49R9
R44, R45	R: METAL FILM 4.99k 1%	0721-4991
R46	R: METAL FILM 100 2% 1/4W	0751-1012
R47	R: METAL FILM 10k 2% 1/4W	0751-1032
R48	not used	
R49	R: METAL FILM 1k 2% 1/4W	0751-1022
R50	R: METAL FILM 1.00k 1%	0721-1001
R51	R: METAL FILM 332 1%	0721-3320
R52	R: VAR COMP 100, 10 TURN	2100-0022
R53	R: METAL FILM 332 1%	0721-3320
R54 thru R59	R: METAL FILM 392 1%	0721-3920
R60, R61	R: METAL FILM 49.9 1%	0721-49R9
R62	R: METAL FILM 10k 2% 1/4W	0751-1032
R63, R64	R: METAL FILM 294 1%	0721-2940
R65 thru R67	R: METAL FILM 470 2% 1/4W	0751-4712
R68, R69	R: METAL FILM 294 1%	0721-2940
R70 thru R73	R: METAL FILM 2.74k 1%	0721-2741
R74, R75	R: METAL FILM 1.37k 1%	0721-1371
R76	R: METAL FILM 4.99k 1%	0721-4991
R77	R: METAL FILM 29.4k 1%	0721-2942
R78	R: METAL FILM 10.0k 1%	0721-1002
R79	R: METAL FILM 33.2k 1%	0721-3322
R80	R: METAL FILM 12.1k 1%	0721-1212
R81	R: METAL FILM 38.3k 1%	0721-3832
R82	R: METAL FILM 10.0k 1%	0721-1002
R83	R: METAL FILM 6.65k 1%	0721-6651
R84	R: METAL FILM 12.1k 1%	0721-1212
R85	R: METAL FILM 1k 2% 1/4W	0751-1022
R86	R: METAL FILM 100k 2% 1/4W	0751-1042
R87	R: METAL FILM 27.4k 1%	0721-2742
R88	R: VAR COMP 10k, 10 TURN	2100-0024
R89	R: METAL FILM 29.4k 1%	0721-2942
R90	R: VAR COMP 1k, 10 TURN	2100-0021
R91	R: METAL FILM 9.53k 1%	0721-9531
R92	R: METAL FILM 10.0k 1%	0721-1002
R93	R: METAL FILM 5.1k 2% 1/4W	0751-5122
R94	R: METAL FILM 3.9k 2% 1/4W	0751-3922
R95	R: FIXED CARBON 5.6M 5% 1/4W	0683-5655
R96, R97	R: METAL FILM 100 2% 1/4W	0751-1012
R98	R: METAL FILM 5.1k 2% 1/4W	0751-5122
R99	R: METAL FILM 3.9k 2% 1/4W	0751-3922
R100	R: FIXED CARBON 5.6M 5% 1/4W	0683-5655
R101, R102	R: METAL FILM 100 2% 1/4W	0751-1012
R103	R: VAR COMP 1k, 10 TURN	2100-0021
R104	R: METAL FILM 5.11k 1%	0721-5111
R105	R: METAL FILM 10.0k 1%	0721-1002
R106	R: METAL FILM 2.49k 1%	0721-2491
R107	R: METAL FILM 3.32k 1%	0721-3321

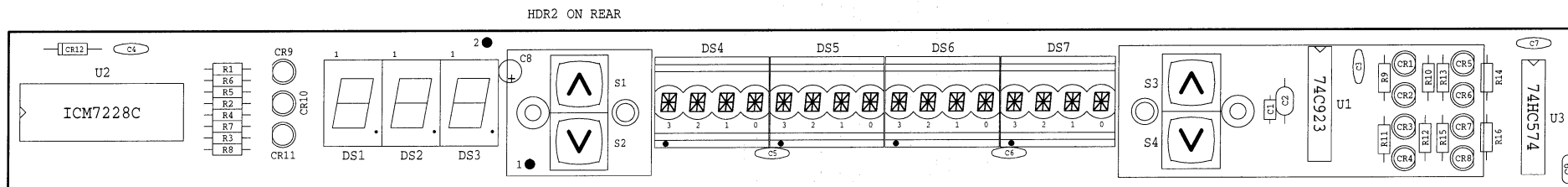
A1 BOARD AMMA-2 cont.

Reference Designation	Description	Part Number
R108	R: METAL FILM 1k 2% 1/4W	0751-1022
R109	R: FIXED CARBON 5.6M 5% 1/4W	0683-5655
R110	R: METAL FILM 5.1k 2% 1/4W	0751-5122
R111	R: METAL FILM 3.9k 2% 1/4W	0751-3922
R112, R113	R: METAL FILM 100 2% 1/4W	0751-1012
R114	R: METAL FILM 4.7k 2% 1/4W	0751-4722
R115	R: METAL FILM 47k 2% 1/4W	0751-4732
R116	R: METAL FILM 1k 2% 1/4W	0751-1022
R117	R: METAL FILM 4.7k 2% 1/4W	0751-4722
R118	R: FIXED CARBON 10M 5% 1/4W	0683-1065
R119	R: METAL FILM 4.7k 2% 1/4W	0751-4722
R120 thru R122	R: METAL FILM 10k 2% 1/4W	0751-1032
R123 thru R125	R: METAL FILM 270 2% 1/4W	0751-2712
RL1 thru RL8	RELAY: JWD-107-1 (or HE721A6341)	1600-0007
RN1	R: NETWORK 8 PIN 10k	0908-1032
RN2	R: NETWORK 10 PIN 10k	0910-1032
RN3	R: NETWORK 16 PIN DIP 4.7k	0908-4722
RN4	R: NETWORK 16 PIN DIP 270	0908-2712
RN5	R: NETWORK 6 PIN 10k	0906-1032
U1	IC: AD811	1827-0014
U2	IC: 78L05CP	1826-0012
U3	IC: 79L05CP	1826-0017
U4	IC: TUF-3	1845-0013
U5	IC: 74HC4050D	1872-0023
U6	IC: AD9854	1890-0007
U7	IC: ERA-2	1845-0031
U8 thru U10	IC: AD811	1827-0014
U11	IC: AD8037	1827-0017
U12	IC: TLO71	1826-0004
U13	IC: 1355	1826-0045
U14	IC: MAR-6	1845-0026
U15	IC: 74HC390	1822-0056
U16	IC: 74HC125D	1872-0021
U17	IC: XO, 12.500 MHz	0416-1250
U18	IC: 74HC112D	1872-0004
U19	IC: AD817	1827-0015
U20, U21	IC: AD9632	1827-0016
U22	IC: AD780	1826-0064
U23	IC: AD7723	1880-0002
U24	IC: 74HC125D	1872-0021
U25	IC: 7905CT	1826-0056
U26, U27	IC: 56303PV100	1890-0005
U28, U29	IC: 74HC125D	1872-0021
U30	IC: 74HC14AD	1872-0010
U31	IC: 74HC4050D	1872-0023
U32, U33	IC: 74HC112D	1872-0004
U34	IC: CS4396	1880-0006

A1 BOARD AMMA-2 cont.

Reference Designation	Description	Part Number
U35	IC: 78LO5CP	1826-0012
U36,U37	IC: NE5532	1826-0037
U38	IC: SSM2142P	1827-0005
U39 thru U41	IC: TLO72	1826-0038
U42	IC: 74HC125D	1872-0021
U43	IC: 78LO5CP	1826-0012
U44	IC: AD680	1826-0051
U45	IC: DAC8043	1830-0001
U46	IC: NE5532	1826-0037
U47	IC: TLO71	1826-0004
U48	IC: TLO72	1826-0038
U49	IC: MC33269T-3.3	1826-0065
U50	IC: 7805CT	1826-0014
U51	IC: MC68HC11K1	1840-0017
U52	IC: MC34064	1826-0048
U53	IC: 74HC00D	1872-0001
U54	IC: 74HC157D	1872-0025
U55	IC: 74HC138D	1872-0024
U56	IC: AMMA-2 EEPROM	1840-0015C
U57	IC: MCM6206C or TC55257DPL-70L	1840-0016
U58	IC: MAX232	1823-0001
U59	IC: DS8921	1823-0007
U60	IC: 74HC20D	1872-0026
U61	IC: 74HC138D	1872-0024
U62	IC: 74HC245D	1872-0027
U63	IC: 74HC573D	1872-0028
U64,U65	IC: 74HC574D	1872-0011
U66	IC: CA3081	1826-0027
U67	IC: 74HC574D	1872-0011
U68,U69	IC: 74HC125D	1872-0021
Y1	XTAL: 16 MHz	0411-0008

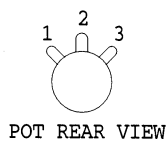
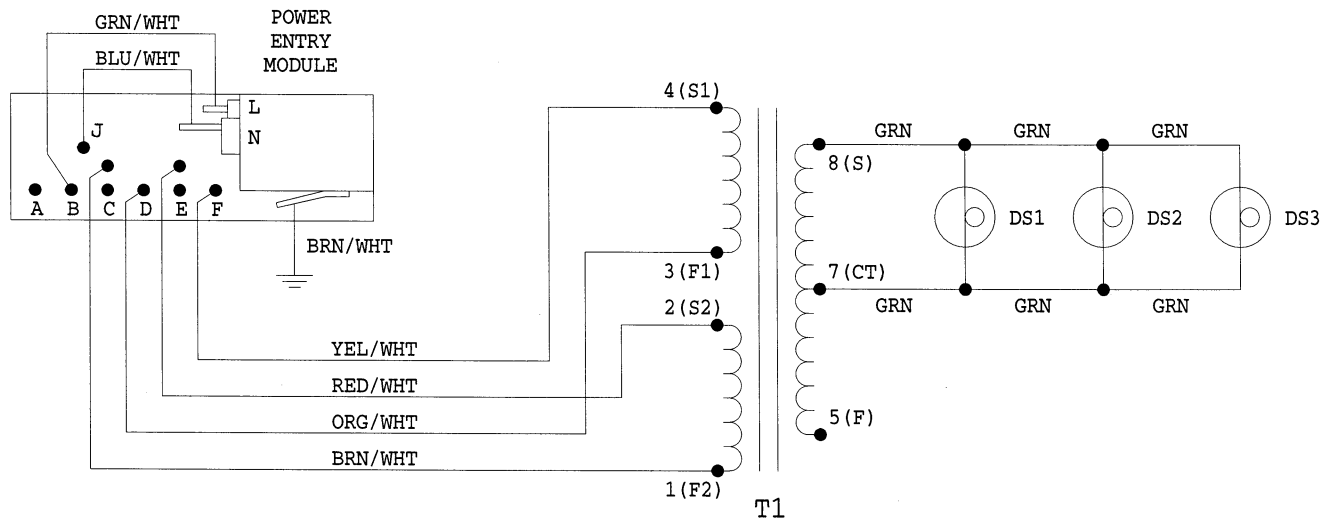
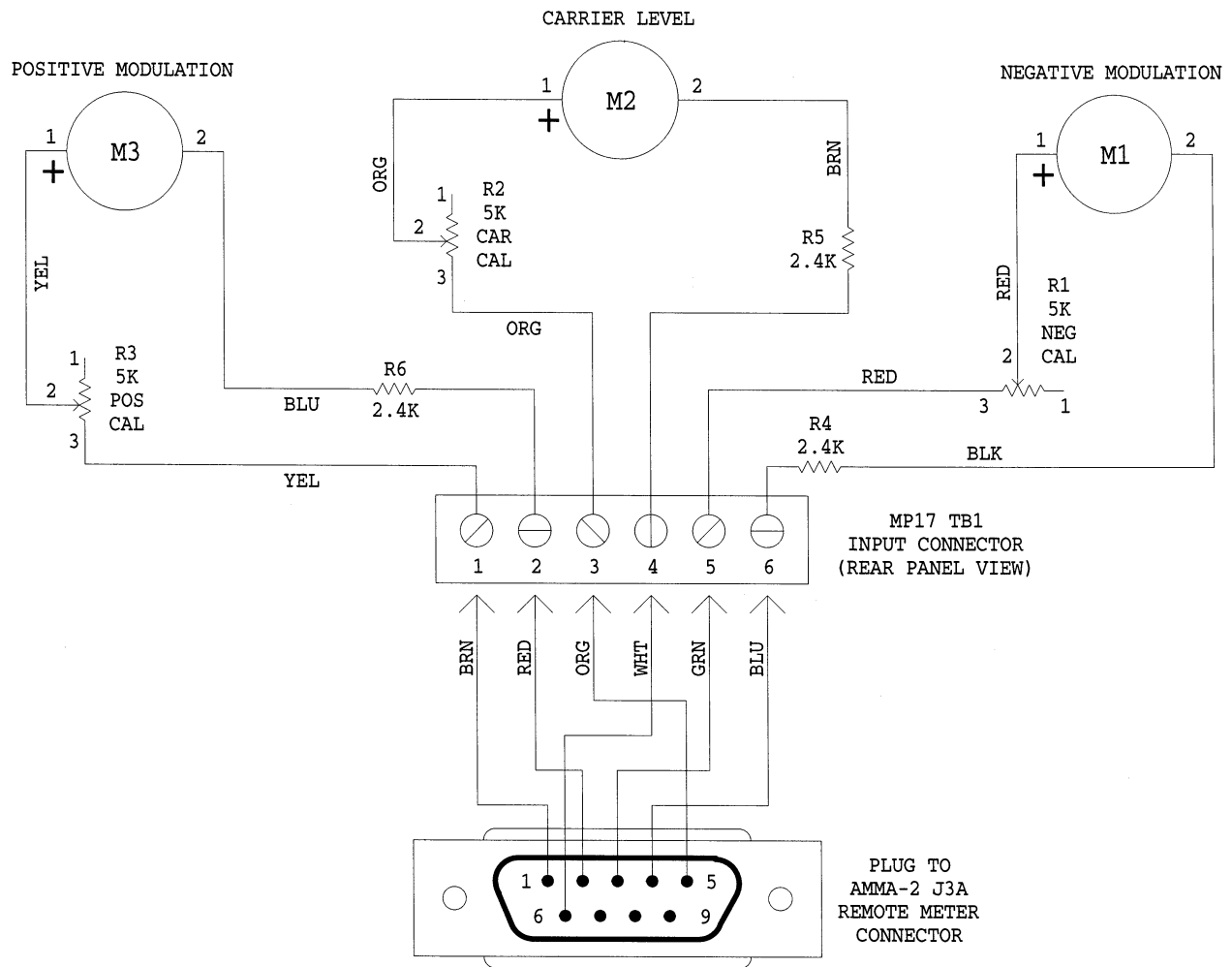




THE WIZARD
 AMMA-2 A2 BOARD
 REV. A
 COMPONENT LAYOUT
 BELAR ELECTRONICS

A2 BOARD AMMA-2, REV. A

Reference Designation	Description	Part Number
C1	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C2	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C3 thru C7	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C8	C: FIXED TANT 6.8uF 25V	0185-0002
C9	C: FIXED MICA 33pF 5%	0142-3305
CR1, CR2	LED: RED MV5053	1910-0001
CR3	LED: GREEN CMD5453	1910-0003
CR4 thru CR7	LED: RED MV5053	1910-0001
CR8	LED: YELLOW MV5353	1910-0002
CR9	LED: RED MV5053	1910-0001
CR10	LED: YELLOW MV5353	1910-0002
CR11	LED: GREEN CMD5453	1910-0003
CR12	DIODE: 1N4006	1900-0016
DS1 thru DS3	DISPLAY: HP5082-7651	1930-0007
DS4 thru DS7*	DISPLAY: HDLO-2416	1930-0008
(prior to rev. A, DS4 thru DS7 were the HPDL2416 display, Belar P/N 1930-0005. These parts are not interchangeable.)		
HDR2	HEADER: 24 PIN	0361-0024
R1 thru R8	R: METAL FILM 51 2% 1/4W	0751-5102
R9 thru R16	R: METAL FILM 470 2% 1/4W	0751-4712
S1 thru S4	SWITCH: PUSHBUTTON, MOMENTARY (ON A2-1 & A2-3 BOARDS)	3105-0001
U1	IC: 74C923	1823-0006
U2	IC: ICM7228C	1823-0002
U3	IC: 74HC574	1822-0053



NOTES:

1. METERS ARE SHOWN FROM REAR.
2. SCHEMATIC SHOWS MP-17 CABLE.

MP-17 CALIBRATION:

1. BEFORE CONNECTING THE MP-17 TO THE AMMA-2, ENSURE THAT THE METERS ARE AT MECHANICAL ZERO.
2. TURN ON THE AMMA-2 CALIBRATOR.
3. ONCE THE AMMA-2 DISPLAY HAS SETTLED, ADJUST R1, R2 AND R3 ON THE REAR OF THE METER PANEL UNTIL ALL THREE METERS READ 100%.

MP-17
AMMA-2 AM WIZARD
REMOTE METER PANEL
BELAR ELECTRONICS
2-12-02

MP-17 PARTS LIST

Reference Designation	Description	Part Number
DS1 thru DS3	LAMP: 755	2140-0005
--	SOCKET: LAMP	1450-0012
--	POWER ENTRY MODULE: 6J4	0360-0020
F1	FUSE: AGC 1/2A 250V	2110-0001
M1 thru M3	METER: MOD 0-133%	1120-0012
R1 thru R3	R: VAR COMP 5k	2100-0008
R4 thru R6	R: METAL FILM 2.4k 2% 1/2W	0771-2422
T1	TRANSFORMER: DP 241-4-10	9100-0024
TB1	TERMINAL BLOCK: 6 SCREW	0360-0003
--	LINE CORD (115 Vac line voltage)	8120-0002
--	LINE CORD (230 Vac line voltage)	8120-0004

MP-17 LINE VOLTAGE SELECTION PROCEDURE

1. Unplug line cord.
2. Open fuse compartment door.
3. Move fuse pull lever to left to remove fuse. Leave fuse pull lever in the leftmost position.
4. Using needle nose pliers, pull the voltage select board straight out of the power entry module.
5. While facing the rear of the unit, orient the voltage select board so the desired line voltage is up and reads correctly ("120" for 115Vac operation, "240" for 230Vac operation).
Note: The "100" and "220" positions on the opposite side of the board are not used.
6. Plug the voltage select board into the power entry module.
7. Install the fuse (F1).
8. Close fuse compartment door.
9. Plug line cord in.