# Model AMM-3
# AM MODULATION MONITOR

## Guide to Operations



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## WARRANTY AND ASSISTANCE

All Belar products are warranted against defects in materials and workmanship. This warranty applies for one year from the date of delivery, FOB factory or, in the case of certain major components listed in the instruction manual, for the specified period. Belar will repair or replace products which prove to be defective during the warranty period provided that they are returned to Belar prepaid. No other warranty is expressed or implied. Belar is not liable for consequential damages.

For any assistance, contact your Belar Sales Representative or Customer Engineering Service at the Belar factory.

# 1 General Information

## 1-1 General Description

The Belar AMM-3 AM Modulation Monitor, (FCC Type Approval #3-231) is an all solid state precision AM demodulator designed to meet the Federal Communications Commission requirements for measuring the total modulation characteristics of AM broadcast transmitters. Since the input circuitry is non-frequency discriminating, the AMM-3 is also suitable for measuring the modulation characteristics of shortwave transmitters as well as VHF transmitters. Two meters and two peak lights are provided to measure positive and negative modulation simultaneously. The negative modulation meter may be switched to read carrier level. Separate peak indicators are provided to indicate negative peaks in excess of 99% and positive peaks in excess of 125%. The AMM-3 incorporates a carrier-limit alarm and a modulation calibrator to insure the accuracy of the readings at any time.

## 1-2 Physical Description

The AMM-3 is constructed on a standard EIA 5¼ x 19-inch rack mount. Calibration adjustments are located within the unit and are accessible through the back cover. The AC power input, RF input, and monitor outputs are located at the rear of the AMM-3 chassis on individual connectors and a rear terminal block. The AMM-3 is completely solid state, utilizing silicon transistors and integrated circuits for long, trouble-free life. LEDs (light-emitting diodes) are used for the indicators to eliminate lamp burn-out.

The individual circuits are constructed on a military-grade, glass-epoxy, plated, printed circuit board. High-reliability military and industrial grade components are used throughout.

## 1-3 Electrical Description

The AMM-3 is a solid state, low-sensitivity, precision AM demodulator incorporating a highly linear, biased diode detector. The detector circuit will accurately demodulate AM envelopes of carriers from 200 kHz to 160 MHz. Various metering and testing provisions are contained within the monitor to measure transmitter output characteristics. These provisions include a peak-reading positive modulation meter that may be switched to read AM noise; a peak-reading negative modulation meter that may be switched to read carrier level; a positive peak modulation light, adjustable from 1 to 199% peak modulation; a negative peak modulation light, adjustable from 1 to 99% peak modulation; a peak modulation light that responds when the negative modulation exceeds 99%; a peak modulation light that responds when the positive modulation exceeds 125%; a modulation

calibrator to check the ratio between the carrier level and peak modulation reading; a carrier alarm light that responds when the carrier is less than 90% of nominal value and greater than 105% of nominal value (this may be set to other values by the change of potentiometer settings)

Outputs obtained from the monitor include an output for aural monitoring, a distortion meter test output, a transistor driver for carrier alarm, and a transistor driver for remoting each of the four peak lights. FCC type-approved remote metering of the AMM-3 may be externally provided for the modulation meters.

The AMM-3 incorporates an analog divider to provide a true ratio measurement of the modulation envelope and the carrier level. The analog divider continuously references the demodulated output to the carrier so that the modulation readings are independent of carrier level. The carrier level is derived from the modulation cancellation scheme which makes the carrier level reference independent of modulation symmetry.

## 1-4 Electrical Specifications

RF Frequency Range . . . . . 200 kHz to 160 MHz
RF Sensitivity . . . . . 5 to 10 Volts RMS
RF Input Impedance . . . . . 1000Ω standard
(50Ω optional above 3 MHz)
Positive Modulation Meter Range . . . . . 0 to 133% positive
Negative Modulation Meter Range . . . . . 0 to 100% negative
Carrier Level Meter Range . . . . . 0 to 133%

Modulation Meter Accuracies* . . . . . 2% at 100% modulation
Positive Peak Modulation Indicator . . . . . 1 to 199% in 1% increments
Negative Peak Modulation Indicator . . . . . 1 to 99% in 1% increments

Peak Modulation Indicator Accuracies* . . . . . 2%
100% Negative Indicator* . . . . . Adjustable 85 to 100%
125% Positive Indicator* . . . . . Adjustable 100 to 130%

Carrier Alarm . . . . . Fixed to alarm with a -10% and +5% change in carrier level

Frequency Response . . . . . 0.5 dB from 20-25,000 Hz
Pulse Response . . . . . Overshoot less than 1%
Distortion . . . . . O.25% max at 99% modulation
Signal to Noise Ratio . . . . . 75 dB

Remote Metering . . Meters may be remotely metered-5000Ω external loop resistance

Aural Monitoring Output . . . . . +10 dBm, 600Ω
Aural Proof-of-Performance Output . . . . . 2.5 Volts RMS
Power Requirements . . . . . 115/230 V, 50 to 400 Hz, at 15 Watts

Operating Temperature . . . . . 0°C to +50°C

* Over a ±30% input carrier level change.

## 1-5 Mechanical Specifications

Dimensions . . . . . 5¼ x 19 x 8 inches overall
(133 x 483 x 203mm)
Net Weight . . . . . 10 pounds (4.5 kg)
Shipping Weight . . . . . 14 pounds (6.4 kg)

## 1-6 Instrument Identification

The instrument is identified by the model number and a six-digit serial number. The model number and serial number appear on a plate located on the rear panel. All correspondence to your Belar representative or to the Belar factory in regard to the instrument should reference the model number and complete serial number.

## 1-7 Accessories

The Belar AMM-3 Modulation Monitor may be used for remote monitoring of an AM transmitter with either the Belar MP-7 Remote Meter and Flasher Panel or the Belar RFA-2 AM RF Amplifier. The MP-7 Remote Meter and Flasher Panel contains two modulation meters, four peak lights, and a carrier-alarm light. The AM RF amplifier provides pre-amplification and selectivity to permit direct off-air monitoring with the AMM-3.

# 2 Installation

## 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 damage claim or for possible future use.

The AMM-3 is shipped with an instruction book, three wire line cord, and four beige rack mount screws.

## 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, 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 to the carton.
e. Use large FRAGILE labels on each surface.
f. Return the unit, freight prepaid, via UPS air or other air freight. Be sure to insure the unit for full value.

## 2-4 Preparation for Use

The AMM-3 AM Modulation Monitor is designed to be mounted in a standard 19 inch rack mount. When mounted in a rack, a slight air space should be provided above and below the unit. When the monitor is mounted above high-heat generating equipment

such as power supplies or amplifiers, consideration should be given to cooling requirements which allow a free movement of cooler air around the AMM-3. In no instance should the ambient chassis temperature be allowed to rise above 50°C (122°F). Mount the AMM-3 to the rack mount using the screws provided.

The Model AMM-3 can be operated from either a 105 to 125 Vac or 210 to 250 Vac single phase, 50 to 400 Hz power source. Make sure the unit is set for the proper voltage as follows:

*Units with serial number 142421 and lower:*
Unplug the line cord. Slide the switch (S1) to 115V or 230V position. Ensure that the fuse (F1) is the proper current rating for selected voltage (½A 250V for 115Vac, ¼A 250V for 230Vac). Plug the line cord back in.

*Units with serial number 142422 and higher:*
Unplug the line cord. Open the fuse compartment door and pull lever to remove fuse. Using needlenose pliers, pull the voltage select board straight out of the power entry module. While facing the rear of the unit, orient the voltage select board so the desired line voltage is face up and reads correctly ("120" for 115Vac operation, "240" for 230Vac operation. The "100" and "220" positions on the bottom of the board are not used.) Reinsert the board into the power entry module, install the proper fuse (½A 250V for 115Vac, ¼A 250V for 230Vac), close the fuse door, and plug the line cord back in.

The Model AMM-3 is supplied with a three-conductor power cable which, when plugged into an appropriate receptacle, grounds the unit. The offset pin on the power cable three-prong connector is the ground wire. To preserve the grounding feature when operating the unit from a two-contact outlet, use a three-prong to two-prong adaptor and connect the green pigtail on the adaptor to ground. Attach the power cable between the unit and the power source receptacle.

**CAUTION: DO NOT APPLY MORE THAN 15 VOLTS RF TO THE MONITOR OR THE RF INPUT CIRCUIT MAY BE DAMAGED! BEFORE APPLYING ANY RF INPUT, TURN CARRIER LEVEL CONTROL MAXIMUM COUNTERCLOCKWISE!**

Damage as a result of excessive RF input is *not* covered under the warranty.

Connect a coaxial cable between the monitoring probe on the transmitter (or RF Amplifier) and the RF INPUT connector J2, at the rear of the main chassis.

If desired, connect the external aural monitoring amplifier to terminals 11 and 12 on TB-1. Note that this is an unbalanced 600Ω output with terminal 12 grounded. A remote carrier level meter may be connected to terminals 8 and 12 with 10kΩ loop resistance.

Remote modulation meters may be connected to terminals 9 and 12 for positive and 10 and 12 for negative modulation. Observe the proper polarities (terminals 8,9 and 10 are positive terminals), and note that the external loop resistance requirements must be met. If only one remote meter is used, the other modulation metering circuit must be terminated on TB-1 in order for the internal meters to read correctly when the remote meter switch is depressed. For example, if only the positive remote modulation meter is used and the remote meter switch is depressed, the positive modulation meter will read correctly but the negative modulation meter will read approximately 6% low unless a 7.5kΩ resistor is placed between terminals 10 and 12 on TB-1. Remote modulation meters should be obtained from Belar in order to conform with the correct ballistic requirements.

A remote positive peak modulation light may be connected to terminals 1 and 3 on TB-1. A remote negative peak modulation light may be connected to terminals 1 and 4 on TB-1. Remote 100% negative, 125% positive, and carrier alarm lights may be connected to the appropriate terminals on TB-1. Note that terminal 1 is a 5-volt DC source, and if light-emitting diodes (LEDs) are used for the lights, series resistors must be used to limit the current to safe values for the LEDs used. The remote meters and lights are contained in the MP-7 Remote Meter and Flasher Panel.

# 3 Operation

## 3-1 Initial Operation

1. Before turning the unit on, ensure that the unit has been configured to operate with the line voltage you will be using (see *Section 2-4 Preparation for Use*).

2. Depress the ZERO switch, NEG mod switch and release the REMOTE switch. Turn CARRIER SET control on the back apron maximum counterclockwise.

3. Depress the POWER switch. Note that the MODULATION meters indicate approximately zero. Allow a few minutes warm-up.

4. After warm-up, the MODULATION meters should read zero. If they do not read zero but are only off a few percentage points, they may be set to read zero with the mechanical zero controls on the meters. If the zero is off more than a few percentage points, the zero should be set according to step 8 of the modulation processor alignment procedure in the maintenance section. The electrical zeros are stabilized by feed-back operational amplifiers and normally do not need readjustments.

5. Depress CARRIER switch. Rotate the CARRIER SET control clockwise. The CARRIER ALARM light will go out at approximately 90% carrier. Continue to rotate the control so that the CARRIER level meter reads 100%. Note that this is the carrier level set point for measuring carrier shift and carrier level. Note that the modulation readings are independent of carrier level (within the range 50% to 130%).

6. Depress the CAL switch. The MODULATION meters will read 100% to verify the accuracy of the calibration. The +125% light will be on. The -100% light will be on.

7. Adjust the POSITIVE thumbwheel switch to the point where the POSITIVE peak modulation light just turns on. This setting will be 100%. Note that the NEGATIVE peak modulation light is on. The 100% point is not on the NEGATIVE thumbwheel switch but is switched in with the CAL switch.

8. Depress OPER switch and the monitor is ready for operation with the right meter reading positive modulation. Note that the left meter reads negative modulation when the NEG switch is depressed and carrier level when the CARRIER switch is depressed.

## 3-2 Normal Operation

For normal operation, leave the AMM-3 in OPER and NEG switch positions when broadcasting super-modulation. The MODULATION meters will read positive and negative modulations simultaneously. Nominal changes (±30%) in RF level will not affect the accuracy of either the MODULATION meters or the peak lights; however, the CARRIER ALARM will turn on at deviations greater than -10% or +5%.

The POSITIVE thumbwheel switch is usually set to a level slightly lower than +125%, say +120%. The NEGATIVE thumbwheel switch is usually set to a level slightly lower than 99%, say 95%. Then the modulation may be set for frequently recurring peaks of -95%. Note that the correct type of audio processing limiter must be used for this type of operation. The separate -100% and +125% lights are used to insure the maximum level of modulation without exceeding the limits set by the FCC.

When the CARRIER switch is depressed, percent carrier shift is read on the left MODULATION meter as a change in carrier intensity during modulation. Note that due to the unique modulation cancellation scheme in the AMM-3 to regenerate unmodulated carrier, this change in carrier intensity is independent of modulation symmetry. In this manner, accurate carrier shifts are measured.

## 3-3 Transmitter Measurements

Normal transmitter proof-of-performance measurements may be made with the AMM-3. Frequency response, distortion, and noise measurements may be made through the rear panel AUDIO TEST jack J3. 2.5 volts RMS is available at 100% modulation so that most distortion and noise analyzers may be used. The bandwidth at this test jack is limited to 25 kHz by an additional low-pass filter. If the full 50 kHz bandwidth is needed, the aural output from terminals 11 and 12 on TB-1 may be used. The output level from these terminals is 5 volts RMS unterminated. Percent modulation is read on the MODULATION meters and percent carrier shift is read on the left MODULATION meter when the CARRIER level switch is depressed.

Note that positive peaks of up to 199% may be measured with the POSITIVE peak modulation light since the overload point of the associated circuitry is greater than 200%. Also note that it is impossible to modulate more than 100% negative since by definition 100% negative modulation is carrier shut-off. Conventional monitors may read more than 100% negative modulation because overshoots may be generated in their filters at carrier shut-off and these monitors read the overshoot. The Belar AMM-3 employs a phase linear filter that produces no overshoot so that carrier shut-off produces 100% negative modulation.

AM noise on an unmodulated carrier may be measured by depressing the NOISE switch. This switches in a 40 dB amplifier on the right meter. A 0 dB meter reading corresponds to a 40 dB signal-to-noise ratio; a -20 dB meter reading corresponds to a 60 dB signal-to-noise ratio, etc.

### 3-4 NRSC De-emphasis Modification

This modification de-emphasizes the demodulated audio output of the Belar AMM-3 AM Modulation Monitor. With the modification installed, the monitor's audio output frequency response closely approximates the interim NRSC de-emphasis characteristic.

This change affects the audio present at the AUDIO TEST output (J3), the AURAL MONITOR OUTPUT (TB1, screw 11) and the AUX AUDIO OUTPUT (TB1, screw 7).

Parts required:

| Quantity | Description | Belar Part No. |
|---|---|---|
| 1 | 38.3kΩ 1% metal film resistor | 0721-3832 |
| 1 | 12.1kΩ 1% metal film resistor | 0721-1212 |
| 1 | 1500pF 2.5% 160V poly capacitor | 0130-1522 |

Procedure:

Remove the existing R77 (39kΩ carbon resistor) from the A1 board by cutting the leads as close to the *resistor body* as possible. (See accompanying component layout sheet for R77 location).

Preform the modification parts by connecting the 12.1kΩ resistor and 1500pF capacitor in series and then connecting these two across the 38.3kΩ resistor as shown on the modification schematic. Use short leads and be careful not to use excessive heat when soldering the parts together.

Mechanically connect the modification network to the original R77 leads on the A1 board. Solder the network to these leads using as little heat as possible so the leads do not pull out of the board. This completes the modification.

# 4 Maintenance

## 4-1 Test Equipment

1. Voltmeter
2. High Frequency oscilloscope with 5" display
3. Linear modulator, output level of 5-10 volts RMS unmodulated*
4. Low distortion oscillator

*Note: The modulation meter and peak lights respond to peak values of modulation so that if there is distortion in the modulator, the peak indications will be the true peak values, i.e., the sum of the fundamental and the harmonics or distortion products. The most common mistake made in calibrating AM monitors is to adjust the modulation level until carrier shut-off is reached. This is defined as 100% negative and, indeed, it is 100% negative, but the positive value is not necessarily 100%. If the distortion is 3% at this level (typical of many transmitters), the positive value of modulation may be anywhere from 97% to 103%, depending on the phase of the harmonics, and the monitor will read this. For this reason, the monitor should be calibrated at just 100% negative on the negative indications and then the modulation backed off to 90% for the positive indications so they can be set in the region where the transmitter is more linear.

## 4-2 Power Supply Alignment

1. Set mechanical zero on both meters.

2. Turn power on and allow to warm up for 15 minutes.

3. With voltmeter, measure voltage at U1 Pin 7. Voltage should be +15 volts ±0.5 volts. Adjust R88 for correct reading.

4. With voltmeter, measure voltage at U1 Pin 4. Voltage should be -15 volts ±0.5 volts. Adjust R82 for correct reading.

## 4-3 Modulation Processor Alignment

1. Apply an unmodulated RF level of 5-10 volts RMS to input, J2, of monitor.

2. Place function switch in CAR position and adjust Carrier Set potentiometer (R1) on rear chassis for 100% on the left-hand meter.

3. Place function switch in ZERO position.

4. Disconnect Carrier Reference (yellow/white) wire from Pin 13. Connect a jumper wire from the positive terminal of filter capacitor C5 on chassis to Pin 13 on the board. Connect oscilloscope at the junction of R44 (750Ω ¼w) and Q4. Adjust vertical amplifier for maximum sensitivity. If R38 is in need of adjustment, a 120 Hz ripple will appear on the oscilloscope. Adjust R38 to balance the 120 Hz ripple to zero. Reconnect Carrier Reference wire to Pin 13.

5. Place function switch in ZERO mode and the probe of the voltmeter at the junction of R44 and Q4. The voltmeter should measure zero volts. Adjust R32 for correct reading.

6. Place function switch in the OPER. mode, and apply a 1 kHz tone to the modulator and adjust the level for a modulation reading of 80-90%, as observed on the oscilloscope.

7. Slowly adjust Carrier Set Potentiometer (R1) on rear chassis so that the carrier level is varied from 50% to 133%. Place left-hand meter in NEG position. The modulation meters should remain within 2% as the carrier input level is adjusted. If they do not, then R30 should be adjusted for minimum meter variation as the carrier level is adjusted. (If the positive meter shows a 10% positive variation when the carrier level is changed from 133% to 50%, then the meter reading should be reduced by 15% when the carrier level is set to 50% by adjusting R30).

8. Re-check step 5, then place the function switches in ZERO and NEG position. The negative meter should read zero. Adjust R55 for correct reading. The positive meter should also read zero. Adjust R56 for correct reading. Set Carrier Level to 100%.

9. Apply a 1 kHz tone to the modulator and adjust level for 100% negative modulation as observed on the oscilloscope. Depress OPER on function switch. Negative meter should indicate 100%. If not, adjust R25 for correct reading (SEE NOTE) repeat steps 5,8 and 9 to achieve optimum operation.

10. Depress CAL switch. Negative meter should indicate 100%. Adjust R120 for correct indication. The positive meter should indicate 100%. Adjust R50 for correct reading.

Note: When properly calibrated (using 80% modulation as a reference) the modulation reading should not change with carrier level variations from 50% to 130%.

## 4-4 Peak Indicator Alignment

+125% Peak Indicator:

With CAL switch depressed, the 125% peak indicator should be on. If not, adjust R130 for correct indication.

Positive Peak Indicator:

With CAL switch depressed and thumbwheel switch adjusted for 100 the Positive Indicator should be on. Advance the thumbwheel switch for a reading of 101. The Positive Peak Indicator should be off. If not, adjust R104 so that the peak indicator turns on at 100 and off at 101.

-100% Peak Indicator:

Depress CAL switch. -100% peak indicator should be on. If not, adjust R132 for correct indication.

Negative Peak Indicator:

Depress CAL switch. Negative peak indicator should be on. If not, adjust R128 for correct indication.

Carrier Limit Alarm Indicator:

Depress CAR switch. Adjust carrier input level for 100% on meter. Carrier alarm indicator should be off.

a. Lower Limit Adjustment: Set carrier level for 90% on meter. Carrier alarm indicator should be on. If not, adjust R18 for correct operation.

b. Upper Limit Adjustment: Set carrier level for 105% on meter. Carrier alarm indicator should be on. If not, adjust R65 for correct operation.

## 4-5 Noise Measurement Calibration

Depress OPER switch. Adjust the modulation level for a reading of 100% on positive meter, and a modulating frequency of 400 Hz. Reduce the modulation level 40 dB. Depress Noise Switch, positive meter should indicate 100%. If not, adjust R75 for correct reading.

# 5 Diagrams, Schematics and Parts Lists

**Replaceable Parts.** This page contains information for ordering replaceable parts for the monitor. The tables that follow list the parts in alphanumeric order by reference designation and provides 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.*

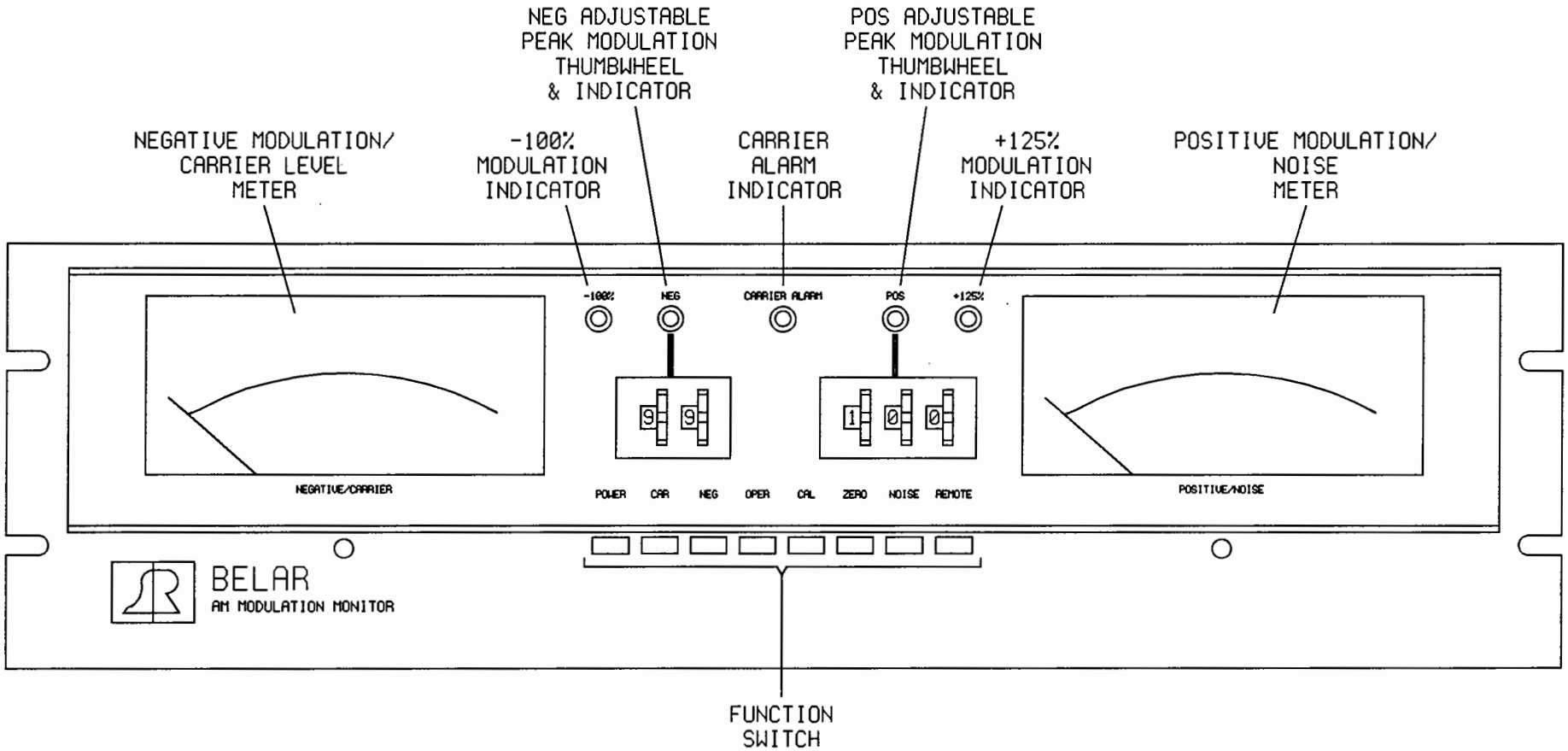
Orders may also be taken over the telephone. Parts orders can be put on your VISA, MasterCard, or American Express card, or we can ship them COD.

REFERENCE DESIGNATORS

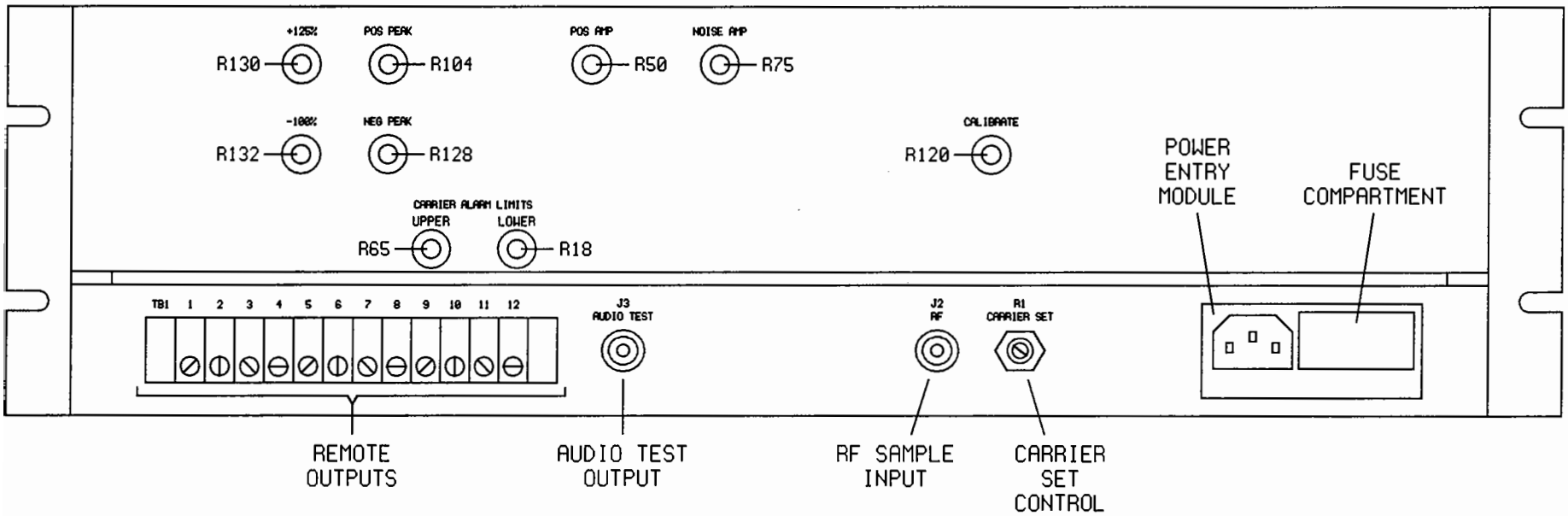
| | | | | | |
|---|---|---|---|---|---|
| A | = assembly | J | = jack | S | = switch |
| BR | = diode bridge | L | = inductor | T | = transformer |
| C | = capacitor | M | = meter | TB | = terminal block |
| CR | = diode or LED | P | = plug | U | = integrated circuit |
| DS | = display or lamp | Q |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

ABBREVIATIONS

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




AMM-3 FRONT PANEL
CONTROLS & INDICATORS
BELAR ELECTRONICS




TB1 CONNECTIONS:

1. +5VDC
2. CARRIER LIMIT ALARM
3. +125% MODULATION INDICATOR
4. ADJ. NEGATIVE MODULATION PEAK INDICATOR
5. ADJ. POSITIVE MODULATION PEAK INDICATOR
6. -100% MODULATION INDICATOR
7. AUX AUDIO OUTPUT
8. CARRIER LEVEL
9. POSITIVE MODULATION REMOTE METER
10. NEGATIVE MODULATION REMOTE METER
11. AURAL MONITOR SIGNAL (600 OHM)
12. GROUND

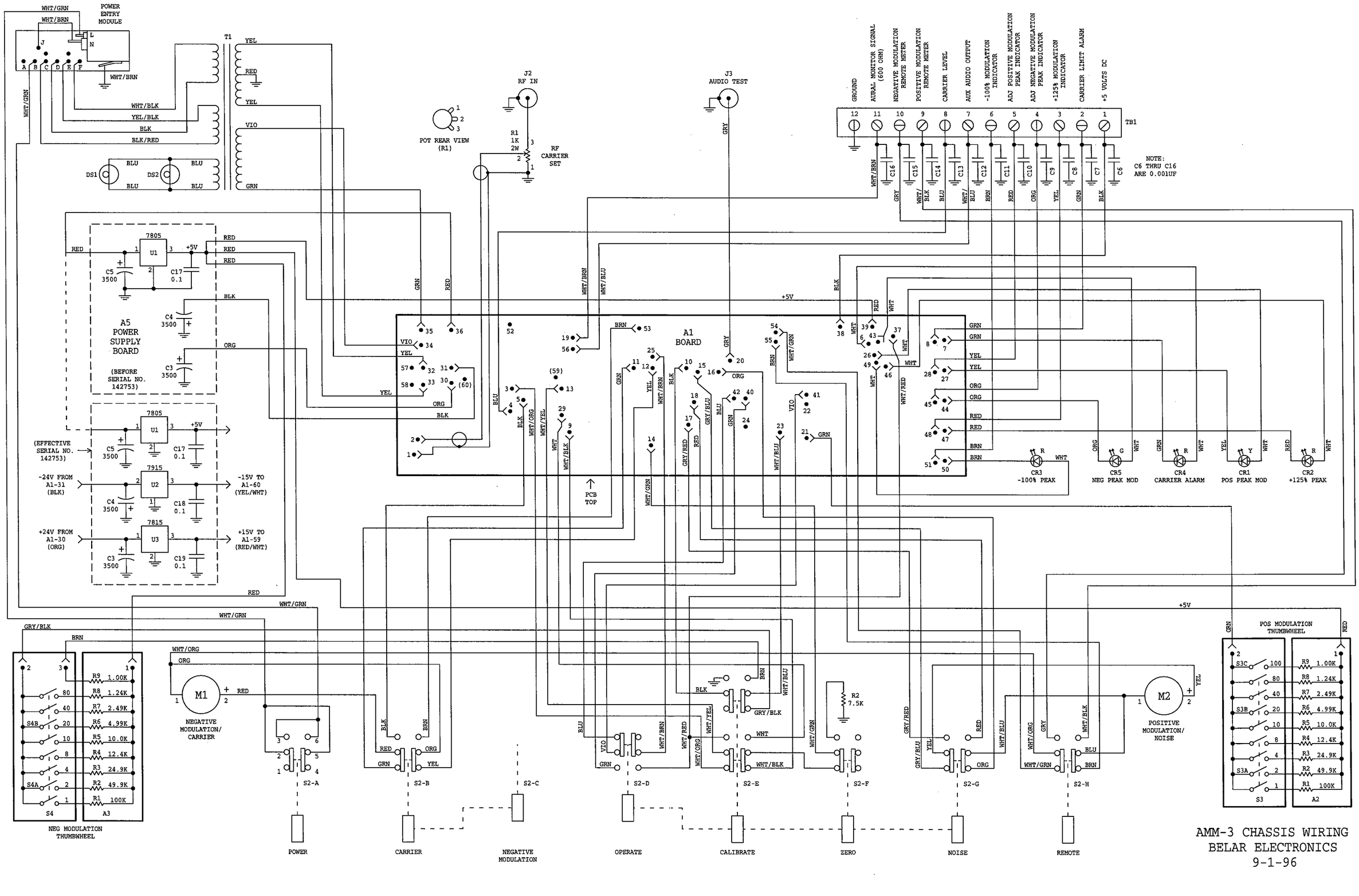
AMM-3 REAR PANEL
CONNECTIONS & ADJUSTMENTS
BELAR ELECTRONICS

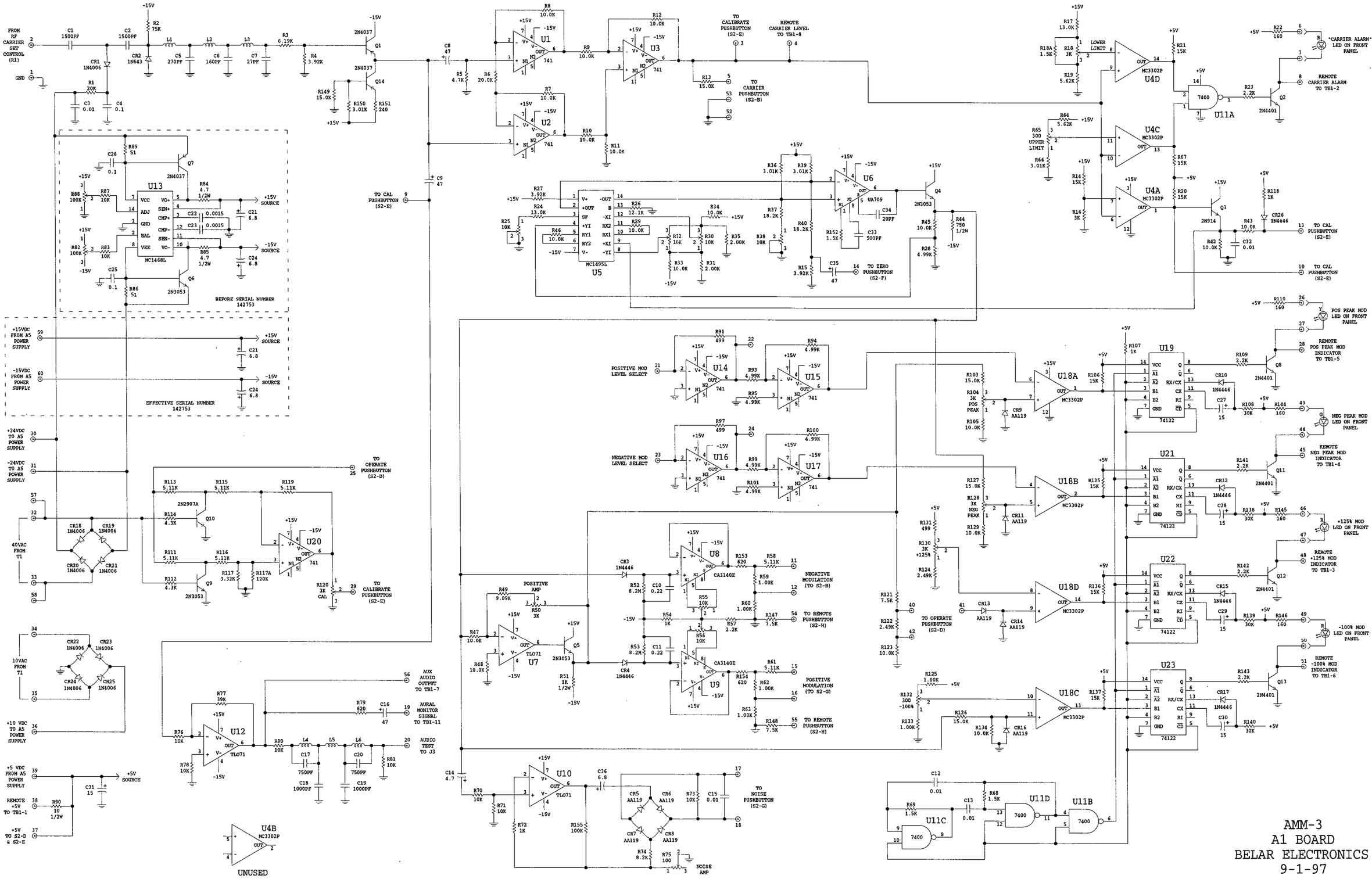
# AMM-3 PARTS LISTS

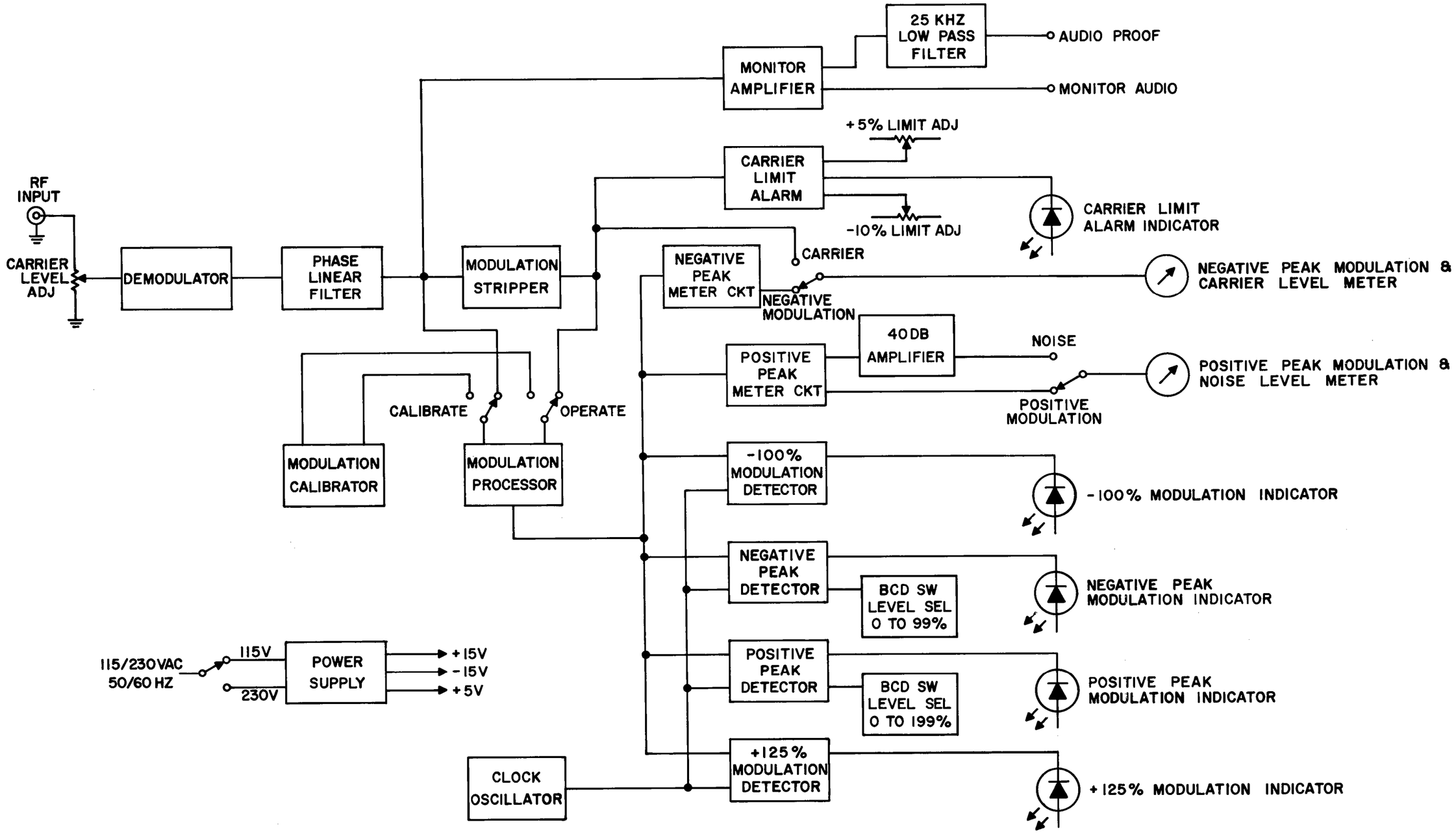
## MAIN CHASSIS

| Reference Designation | Description | | Part Number |
|---|---|---|---|
| C1,C2 | C: FIXED CERAMIC 0.01uF 1.4kV | (NOTE 2) | 0151-0010 |
| C3 thru C5 | C: FIXED ELECT 3500uF 40V | (NOTE 1) | 0180-0026 |
| C6 thru C16 | C: FIXED CERAMIC 0.001uF 1kV | | 0151-0002 |
| C17 | C: FIXED CERAMIC 0.1uF 50V | (NOTE 1) | 0151-0006 |
| CR1 | LED: YELLOW MV5353 | | 1910-0002 |
| CR2 thru CR4 | LED: RED MV5053 | | 1910-0001 |
| CR5 | LED: GREEN MV5253 | | 1910-0003 |
| DS1,DS2 | LAMP: 1847 | | 2140-0005 |
| -- | SOCKET: LAMP | | 1450-0012 |
| F1 | FUSE: AGC 1/2A 250V (115 Vac line voltage) | | 2110-0001 |
| | AGC 1/4A 250V (230 Vac Line voltage) | | 2110-0002 |
| -- | FUSEHOLDER: | (NOTE 2) | 2110-0003 |
| J1 | JACK: POWER | (NOTE 2) | 0360-0010 |
| J2,J3 | JACK: BNC | | 0360-0005 |
| M1,M2 | METER: MOD 0-133% | | 1120-0012 |
| R1 | R: VAR COMP 1k 2W | | 2100-0007 |
| R2 | R: METAL FILM 7.5k 2% 1/4W | | 0751-7522 |
| -- | R: FIXED NON-IND 56 20W | (NOTE 3) | 0811-0021 |
| S1 | SWITCH: SLIDE 115/230V SELECTOR | (NOTE 2) | 3102-0002 |
| S2 | SWITCH: PUSHBUTTON (8 button) | | 3101-0014 |
| S3 | SWITCH: THUMBWHEEL (3 Section) | | 3103-0002A |
| S4 | SWITCH: THUMBWHEEL (2 Section) | | 3103-0003A |
| T1 | TRANSFORMER: POWER | | 9100-0010 |
| TB1 | TERMINAL BLOCK: 12 SCREW | | 0360-0002 |
| U1 | IC: 7805CT | | 1826-0014 |
| -- | LINE CORD | | 8120-0002 |

NOTE 1: Prior to serial number 142296 - C3 thru C5 were 1000uF 50v (0180-0002) and C17 was not used.
NOTE 2: Beginning serial number 142422 these parts are replaced by the 6J4 power entry module (0360-0020).
NOTE 3: Optional 50 ohm input termination.


POWER ENTRY MODULE
WHT/GRN
WHT/BRN
WHT/BLK
YEL/BLK
BLK
BLK/RED
T1
YEL
RED
VIO
GRN
DS1
DS2
BLU
POT REAR VIEW (R1)
J2 RF IN
R1 1K 2W
RF CARRIER SET
J3 AUDIO TEST
GRY
GROUND
AURAL MONITOR SIGNAL (600 OHM)
NEGATIVE MODULATION REMOTE METER
POSITIVE MODULATION REMOTE METER
CARRIER LEVEL
AUX AUDIO OUTPUT
-100% MODULATION INDICATOR
ADJ POSITIVE MODULATION PEAK INDICATOR
ADJ NEGATIVE MODULATION PEAK INDICATOR
+125% MODULATION INDICATOR
CARRIER LIMIT ALARM
+5 VOLTS DC
TB1
NOTE: C6 THRU C16 ARE 0.001UF
A5 POWER SUPPLY BOARD
(BEFORE SERIAL NO. 142753)
(EFFECTIVE SERIAL NO. 142753)
7805
7915
7815
U1
U2
U3
C5 3500
C4 3500
C3 3500
C17 0.1
C18 0.1
C19 0.1
-24V FROM A1-31 (BLK)
-15V TO A1-60 (YEL/WHT)
+24V FROM A1-30 (ORG)
+15V TO A1-59 (RED/WHT)
A1 BOARD
PCB TOP
+5V
CR3 -100% PEAK
CR5 NEG PEAK MOD
CR4 CARRIER ALARM
CR1 POS PEAK MOD
CR2 +125% PEAK
NEG MODULATION THUMBWHEEL
S4
A3
M1
NEGATIVE MODULATION/ CARRIER
M2
POSITIVE MODULATION/ NOISE
POS MODULATION THUMBWHEEL
S3
A2
R1 100K
R2 7.5K
R3 24.9K
R4 12.4K
R5 10.0K
R6 4.99K
R7 2.49K
R8 1.24K
R9 1.00K
S2-A
S2-B
S2-C
S2-D
S2-E
S2-F
S2-G
S2-H
POWER
CARRIER
NEGATIVE MODULATION
OPERATE
CALIBRATE
ZERO
NOISE
REMOTE
AMM-3 CHASSIS WIRING
BELAR ELECTRONICS
9-1-96


FROM RF CARRIER SET CONTROL (R1)
GND
C1 1500PF
C2 1500PF
CR1 1N4006
CR2 1N643
L1
L2
L3
C5 270PF
C6 160PF
C7 27PF
R1 20K
C3 0.01
C4 0.1
R2 75K
R3 6.19K
R4 3.92K
2N4037 Q1
2N4037 Q14
R149 15.0K
R150 3.01K
R151 240
C8 47
R5 4.7K
R6 20.0K
R8 10.0K
R7 10.0K
U1
U2
U3
741
R9 10.0K
R10 10.0K
R11 10.0K
R12 10.0K
R13 15.0K
TO CALIBRATE PUSHBUTTON (S2-E)
REMOTE CARRIER LEVEL TO TB1-8
TO CARRIER PUSHBUTTON (S2-B)
TO CAL PUSHBUTTON (S2-E)
C9 47
R89 51
Q7 2N4037
C26 0.1
U13
MC1468L
VCC
VEE
VO+
VO-
SEN+
SEN-
CMP+
CMP-
ADJ
GND
BAL
R84 4.7 1/2W
R85 4.7 1/2W
C22 0.0015
C23 0.0015
C21 6.8
C24 6.8
R88 100K
R87 10K
R82 100K
R83 10K
C25 0.1
R86 51
Q6 2N3053
+15V SOURCE
-15V SOURCE
BEFORE SERIAL NUMBER 142753
+15VDC FROM A5 POWER SUPPLY
-15VDC FROM A5 POWER SUPPLY
EFFECTIVE SERIAL NUMBER 142753
+24VDC TO A5 POWER SUPPLY
-24VDC TO A5 POWER SUPPLY
40VAC FROM T1
CR18 1N4006
CR19 1N4006
CR20 1N4006
CR21 1N4006
R113 5.11K
R115 5.11K
R119 5.11K
R114 4.3K
Q10 2N2907A
R111 5.11K
R116 5.11K
R117 3.32K
R117A 120K
R112 4.3K
Q9 2N3053
U20
R120 3K CAL
TO OPERATE PUSHBUTTON (S2-D)
TO CALIBRATE PUSHBUTTON (S2-E)
10VAC FROM T1
CR22 1N4006
CR23 1N4006
CR24 1N4006
CR25 1N4006
+10 VDC TO A5 POWER SUPPLY
+5 VDC FROM A5 POWER SUPPLY
REMOTE +5V TO TB1-1
+5V TO S2-D & S2-E
C31 15
R90 10 1/2W
+5V SOURCE
U4B
MC3302P
UNUSED
AUX AUDIO OUTPUT TO TB1-7
AURAL MONITOR SIGNAL TO TB1-11
AUDIO TEST TO J3
R77 39K
U12
TLO71
R76 10K
R78 10K
R80 10K
R81 10K
R79 620
C16 47
L4
L5
L6
C17 750PF
C20 750PF
C18 1000PF
C19 1000PF
R27 3.92K
R24 13.0K
R25 10K
R46 10.0K
U5
MC1495L
R29 10.0K
R26 12.1K
R34 10.0K
R12 10K
R30 10K
R35 2.00K
R33 10.0K
R31 2.00K
R36 3.01K
R39 3.01K
R37 18.2K
R40 18.2K
R38 10K
U6
UA709
C34 20PF
C33 500PF
R152 1.5K
R15 3.92K
C35 47
TO ZERO PUSHBUTTON (S2-F)
Q4 2N3053
R45 10.0K
R44 750 1/2W
R28 4.99K
-15V
R17 13.0K
R18A 1.5K
R18 3K
R19 5.62K
LOWER LIMIT
U4D
MC3302P
R64 5.62K
R65 300 UPPER LIMIT
R66 3.01K
U4C
R14 15K
R16 3K
U4A
R21 15K
R67 15K
R20 15K
Q3 2N914
R42 10.0K
C32 0.01
R43 10.0K
R118 1K
CR26 1N4446
TO CAL PUSHBUTTON (S2-E)
R22 160
"CARRIER ALARM" LED ON FRONT PANEL
7400
U11A
R23 2.2K
Q2 2N4401
REMOTE CARRIER ALARM TO TB1-2
POSITIVE MOD LEVEL SELECT
R91 499
U14
R93 4.99K
U15
R94 4.99K
R95 4.99K
NEGATIVE MOD LEVEL SELECT
R97 499
U16
R99 4.99K
U17
R100 4.99K
R101 4.99K
R103 15.0K
R104 3K POS PEAK
R105 10.0K
CR9 AA119
U18A
MC3302P
R107 1K
U19
74122
R106 15K
CR10 1N4446
R109 2.2K
Q8 2N4401
POS PEAK MOD LED ON FRONT PANEL
REMOTE POS PEAK MOD INDICATOR TO TB1-5
R110 160
R108 30K
R144 160
NEG PEAK MOD LED ON FRONT PANEL
REMOTE NEG PEAK MOD INDICATOR TO TB1-4
U21
R127 15.0K
R128 3K NEG PEAK
R129 10.0K
CR11 AA119
U18B
R135 15K
CR12 1N4446
R141 2.2K
Q11 2N4401
R138 30K
R145 160
+125% MOD LED ON FRONT PANEL
REMOTE +125% MOD INDICATOR TO TB1-3
U22
R131 499
R130 3K +125%
R124 2.49K
R121 7.5K
R122 2.49K
R123 10.0K
TO OPERATE PUSHBUTTON (S2-D)
CR13 AA119
CR14 AA119
U18D
R136 15K
CR15 1N4446
R142 2.2K
Q12 2N4401
R139 30K
R146 160
-100% MOD LED ON FRONT PANEL
REMOTE -100% MOD INDICATOR TO TB1-6
U23
R125 1.00K
R132 300 -100%
R133 1.00K
R126 15.0K
R134 10.0K
CR16 AA119
U18C
R137 15K
CR17 1N4446
R143 2.2K
Q13 2N4401
R140 30K
C12 0.01
R69 1.5K
C13 0.01
R68 1.5K
U11C
U11D
U11B
R49 9.09K
POSITIVE AMP
R50 3K
R47 10.0K
R48 10.0K
U7
TLO71
Q5 2N3053
R51 1K 1/2W
CR3 1N4446
CR4 1N4446
U8
CA3140E
U9
C10 0.22
C11 0.22
R52 8.2M
R53 8.2M
R54 1K
R55 10K
R56 10K
R57 2.2K
R153 620
R58 5.11K
R59 1.00K
R60 1.00K
R147 7.5K
R154 620
R61 5.11K
R62 1.00K
R63 1.00K
R148 7.5K
NEGATIVE MODULATION (TO S2-B)
TO REMOTE PUSHBUTTON (S2-H)
POSITIVE MODULATION (TO S2-G)
C14 4.7
R70 10K
R71 10K
R72 1K
U10
C36 6.8
R155 100K
CR5 AA119
CR6 AA119
CR7 AA119
CR8 AA119
R73 10K
C15 0.01
R74 8.2K
R75 100
NOISE AMP
TO NOISE PUSHBUTTON (S2-G)
AMM-3
A1 BOARD
BELAR ELECTRONICS
9-1-97




BLOCK DIAGRAM, AMM-3

# AMM-3 A1 BOARD
# PART LOCATIONS

| Des/Loc | Des/Loc | Des/Loc | Des/Loc | Des/Loc | Des/Loc | Des/Loc |
|---|---|---|---|---|---|---|
| C1 L1 | CR11 C3 | R9 K2 | R55 H1 | R102 -- | R148 E4 | 14 G1 |
| C2 K1 | CR12 B3 | R10 L2 | R56 F1 | R103 C1 | R149 J2 | 15 F3 |
| C3 L2 | CR13 D3 | R11 J2 | R57 F1 | R104 C1 | R150 J2 | 16 F3 |
| C4 L1 | CR14 C3 | R12 K2 | R58 G3 | R105 C1 | R151 J2 | 17 F2 |
| C5 K1 | CR15 B2 | R13 J2 | R59 G3 | R106 B3 | R152 G2 | 18 F2 |
| C6 J1 | CR16 C3 | R14 D4 | R60 G3 | R107 B1 | R153 * | 19 I4 |
| C7 I1 | CR17 B1 | R15 G1 | R61 F3 | R108 B4 | R154 * | 20 E3 |
| C8 J2 | CR18 L3 | R16 D4 | R62 F3 | R109 A3 | R155 * | 21 D1 |
| C9 I1 | CR19 L3 | R17 D3 | R63 E3 | R110 C4 | | 22 D2 |
| C10 G3 | CR20 L3 | R18 E3 | R64 D3 | R111 H3 | U1 K2 | 23 D2 |
| C11 E3 | CR21 L3 | R18A * | R65 D3 | R112 H4 | U2 L2 | 24 E2 |
| C12 A4 | CR22 L4 | R19 E3 | R66 C3 | R113 G4 | U3 J2 | 25 G3 |
| C13 B4 | CR23 L4 | R20 C4 | R67 C4 | R114 H4 | U4 D4 | 26 B4 |
| C14 G3 | CR24 L4 | R21 C4 | R68 B4 | R115 G4 | U5 H2 | 27 A3 |
| C15 F2 | CR25 L4 | R22 C4 | R69 B4 | R116 H3 | U6 G2 | 28 A3 |
| C16 I4 | CR26 C4 | R23 A4 | R70 F3 | R117 H3 | U7 F2 | 29 I2 |
| C17 G4 | | R24 H2 | R71 F3 | R117A H3 | U8 G2 | 30 K3 |
| C18 G3 | L1 K1 | R25 H1 | R72 G1 | R118 C4 | U9 F2 | 31 K3 |
| C19 F3 | L2 J1 | R26 I2 | R73 F1 | R119 G4 | U10 G2 | 32 L3 |
| C20 E4 | L3 J1 | R27 H2 | R74 G1 | R120 I2 | U11 B4 | 33 L3 |
| C21 I2 | L4 G4 | R28 H2 | R75 G1 | R121 E2 | U12 I3 | 34 L4 |
| C22 J3 | L5 F4 | R29 I2 | R76 I3 | R122 E2 | U13 J4 | 35 L4 |
| C23 K3 | L6 E4 | R30 I1 | R77 I3 | R123 E2 | U14 D2 | 36 K4 |
| C24 I1 | | R31 H2 | R78 I3 | R124 B1 | U15 D2 | 37 B4 |
| C25 J4 | Q1 I1 | R32 H1 | R79 I4 | R125 C2 | U16 E2 | 38 C4 |
| C26 J4 | Q2 A4 | R33 H2 | R80 G4 | R126 C3 | U17 E2 | 39 B4 |
| C27 A4 | Q3 H3 | R34 H2 | R81 E3 | R127 C2 | U18 C3 | 40 E2 |
| C28 A3 | Q4 G1 | R35 H2 | R82 I3 | R128 C2 | U19 B3 | 41 D2 |
| C29 A2 | Q5 E1 | R36 G1 | R83 J3 | R129 C2 | U20 H4 | 42 E2 |
| C30 A1 | Q6 K4 | R37 H2 | R84 I3 | R130 C1 | U21 B2 | 43 B4 |
| C31 B4 | Q7 I4 | R38 I1 | R85 K3 | R131 C1 | U22 B2 | 44 A2 |
| C32 H3 | Q8 A3 | R39 H2 | R86 J4 | R132 C2 | U23 B1 | 45 A2 |
| C33 G2 | Q9 H4 | R40 G1 | R87 J3 | R133 B2 | | 46 B3 |
| C34 G2 | Q10 H4 | R41 -- | R88 K3 | R134 C3 | pins | 47 A2 |
| C35 G1 | Q11 A3 | R42 H3 | R89 J4 | R135 B3 | 1 L1 | 48 A2 |
| C36 * | Q12 A2 | R43 I3 | R90 C4 | R136 B3 | 2 L1 | 49 B3 |
| | Q13 A1 | R44 G2 | R91 D2 | R137 C3 | 3 J3 | 50 A1 |
| CR1 L1 | Q14 J2 | R45 G2 | R92 -- | R138 B3 | 4 J2 | 51 A1 |
| CR2 K1 | | R46 H3 | R93 D2 | R139 B2 | 5 J2 | 52 J4 |
| CR3 G2 | R1 L2 | R47 F1 | R94 D2 | R140 B1 | 6 C4 | 53 G4 |
| CR4 F1 | R2 K1 | R48 F2 | R95 D3 | R141 A3 | 7 A4 | 54 D4 |
| CR5 G2 | R3 I1 | R49 F2 | R96 -- | R142 A2 | 8 A4 | 55 D4 |
| CR6 G2 | R4 I1 | R50 E1 | R97 D2 | R143 A1 | 9 I2 | 56 I4 |
| CR7 G2 | R5 K2 | R51 D1 | R98 -- | R144 B4 | 10 F3 | 57 L3 |
| CR8 G2 | R6 K2 | R52 G3 | R99 E2 | R145 B4 | 11 G3 | 58 L3 |
| CR9 C3 | R7 L2 | R53 E3 | R100 E2 | R146 B4 | 12 G3 | |
| CR10 B3 | R8 K2 | R54 F1 | R101 D2 | R147 E4 | 13 I3 | |

*ON PC BOTTOM --NOT USED

A1 BOARD AMM-3

| Reference Designation | Description | Part Number |
|---|---|---|
| C1,C2 | C: FIXED MICA 1500pF 5% | 0141-1525 |
| C3 | C: FIXED CERAMIC 0.01uF 100V | 0151-0003 |
| C4 | C: FIXED CERAMIC 0.1uF 50V | 0151-0006 |
| C5 | C: FIXED MICA 270pF 5% | 0140-2715 |
| C6 | C: FIXED MICA 160pF 5% | 0140-1615 |
| C7 | C: FIXED MICA 27pF 5% | 0140-2705 |
| C8,C9 | C: FIXED ELEC 47uF 63V | 0180-0017 |
| C10,C11 | C: FIXED FILM 0.22uF 10% 80V | 0120-2241 |
| C12,C13 | C: FIXED CERAMIC 0.01uF 100V | 0151-0003 |
| C14 | C: FIXED TANT 4.7uF 25V | 0185-0001 |
| C15 | C: FIXED CERAMIC 0.01uF 100V | 0151-0003 |
| C16 | C: FIXED ELEC 47uF 63V | 0180-0017 |
| C17 | C: FIXED MICA 750pF 5% | 0140-7515 |
| C18,C19 | C: FIXED POLY 1000pF 2.5% 160V | 0130-1022 |
| C20 | C: FIXED MICA 750pF 5% | 0140-7515 |
| C21 | C: FIXED TANT 6.8uF 25V | 0185-0002 |
| C22,C23 | C: FIXED CERAMIC 0.0015uF 1kV | 0151-0009 |
| C24 | C: FIXED TANT 6.8uF 25V | 0185-0002 |
| C25,C26 | C: FIXED CERAMIC 0.1uF 50V | 0151-0006 |
| C27 thru C31 | C: FIXED TANT 15uF 15V | 0185-0003 |
| C32 | C: FIXED CERAMIC 0.01uF 100V | 0151-0003 |
| C33 | C: FIXED MICA 500pF 5% | 0140-5015 |
| C34 | C: FIXED MICA 20pF 5% | 0140-2005 |
| C35 | C: FIXED ELEC 47uF 63V | 0180-0017 |
| C36 | C: FIXED TANT 6.8uF 25V | 0185-0002 |
| | (C36 is on PC bottom under U10.) | |
| CR1 | DIODE: 1N4006 | 1900-0016 |
| CR2 | DIODE: 1N643 | 1900-0017 |
| CR3,CR4 | DIODE: 1N4446 | 1900-0002 |
| CR5 thru CR9 | DIODE: AA119 | 1900-0001 |
| CR10 | DIODE: 1N4446 | 1900-0002 |
| CR11 | DIODE: AA119 | 1900-0001 |
| CR12 | DIODE: 1N4446 | 1900-0002 |
| CR13,CR14 | DIODE: AA119 | 1900-0001 |
| CR15 | DIODE: 1N4446 | 1900-0002 |
| CR16 | DIODE: AA119 | 1900-0001 |
| CR17 | DIODE: 1N4446 | 1900-0002 |
| CR18 thru CR25 | DIODE: 1N4006 | 1900-0016 |
| CR26 | DIODE: 1N4446 | 1900-0002 |
| L1 thru L6 | INDUCTOR: | Belar |
| Q1 | TRANSISTOR: 2N4037 | 1850-0011 |
| Q2 | TRANSISTOR: 2N4401 | 1850-0028 |
| Q3 | TRANSISTOR: 2N914 | 1850-0006 |
| Q4 thru Q6 | TRANSISTOR: 2N3053 | 1850-0008 |
| Q7 | TRANSISTOR: 2N4037 | 1850-0011 |
| Q8 | TRANSISTOR: 2N4401 | 1850-0028 |
| Q9 | TRANSISTOR: 2N3053 | 1850-0008 |
| Q10 | TRANSISTOR: 2N2907A | 1850-0027 |

A1 BOARD AMM-3 CONT.

| Reference Designation | Description | Part Number |
|---|---|---|
| Q11 thru Q13 | TRANSISTOR: 2N4401 | 1850-0028 |
| Q14 | TRANSISTOR: 2N4037 | 1850-0011 |
| R1 | R: METAL FILM 20k 2% 1/4W | 0751-2032 |
| R2 | R: METAL FILM 75k 2% 1/4W | 0751-7532 |
| R3 | R: METAL FILM 6.19k 1% | 0721-6191 |
| R4 | R: METAL FILM 3.92k 1% | 0721-3921 |
| R5 | R: METAL FILM 4.7k 2% 1/4W | 0751-4722 |
| R6 | R: METAL FILM 20.0k 1% | 0721-2002 |
| R7 thru R12 | R: METAL FILM 10.0k 1% | 0721-1002 |
| R13 | R: METAL FILM 15.0k 1% | 0721-1502 |
| R14 | R: METAL FILM 15k 2% 1/4W | 0751-1532 |
| R15 | R: METAL FILM 3.92k 1% | 0721-3921 |
| R16 | R: METAL FILM 3k 2% 1/4W | 0751-3022 |
| R17 | R: METAL FILM 13.0k 1% | 0721-1302 |
| R18 | R: VAR WW 3k 2W | 2100-0005 |
| (Previously, R18 was a 1k WW 2W pot and R18A was not used.) | | |
| R18A | R: METAL FILM 1.5k 2% 1/4W | 0751-1522 |
| (R18A is on PC bottom under R18.) | | |
| R19 | R: METAL FILM 5.62k 1% | 0721-5621 |
| R20,R21 | R: METAL FILM 15k 2% 1/4W | 0751-1532 |
| R22 | R: METAL FILM 160 2% 1/4W | 0751-1612 |
| R23 | R: METAL FILM 2.2k 2% 1/4W | 0751-2222 |
| R24 | R: METAL FILM 13.0k 1% | 0721-1302 |
| R25 | R: VAR COMP 10k, 10 TURN | 2100-0018 |
| R26 | R: METAL FILM 12.1k 1% | 0721-1212 |
| R27 | R: METAL FILM 3.92k 1% | 0721-3921 |
| R28 | R: METAL FILM 4.99k 1% | 0721-4991 |
| R29 | R: METAL FILM 10.0k 1% | 0721-1002 |
| R30 | R: VAR COMP 10k, 10 TURN | 2100-0018 |
| R31 | R: METAL FILM 2.00k 1% | 0721-2001 |
| R32 | R: VAR COMP 10k, 10 TURN | 2100-0018 |
| R33,R34 | R: METAL FILM 10.0k 1% | 0721-1002 |
| R35 | R: METAL FILM 2.00k 1% | 0721-2001 |
| R36 | R: METAL FILM 3.01k 1% | 0721-3011 |
| R37 | R: METAL FILM 18.2k 1% | 0721-1822 |
| R38 | R: VAR COMP 10k, 10 TURN | 2100-0018 |
| R39 | R: METAL FILM 3.01k 1% | 0721-3011 |
| R40 | R: METAL FILM 18.2k 1% | 0721-1822 |
| R41 | not used | |
| R42,R43 | R: METAL FILM 10.0k 1% | 0721-1002 |
| R44 | R: METAL FILM 750 2% 1/2W | 0771-7512 |
| R45 thru R48 | R: METAL FILM 10.0k 1% | 0721-1002 |
| R49 | R: METAL FILM 9.09k 1% | 0721-9091 |
| R50 | R: VAR WW 3k 2W | 2100-0005 |
| R51 | R: METAL FILM 1k 2% 1/2W | 0771-1022 |
| R52,R53 | R: FIXED CARBON 8.2M 5% 1/4W | 0683-8255 |
| R54 | R: METAL FILM 1k 2% 1/4W | 0751-1022 |
| R55,R56 | R: VAR COMP 10k, 10 TURN | 2100-0018 |
| R57 | R: METAL FILM 2.2k 2% 1/4W | 0751-2222 |
| R58 | R: METAL FILM 5.11k 1% | 0721-5111 |

A1 BOARD AMM-3 CONT.

| Reference Designation | Description | Part Number |
|---|---|---|
| R59,R60 | R: METAL FILM 1.00k 1% | 0721-1001 |
| R61 | R: METAL FILM 5.11k 1% | 0721-5111 |
| R62,R63 | R: METAL FILM 1.00k 1% | 0721-1001 |
| R64 | R: METAL FILM 5.62k 1% | 0721-5621 |
| R65 | R: VAR WW 300 2W | 2100-0004 |
| R66 | R: METAL FILM 3.01k 1% | 0721-3011 |
| R67 | R: METAL FILM 15k 2% 1/4W | 0751-1532 |
| R68,R69 | R: METAL FILM 1.5k 2% 1/4W | 0751-1522 |
| R70,R71 | R: METAL FILM 10k 2% 1/4W | 0751-1032 |
| R72 | R: METAL FILM 1k 2% 1/4W | 0751-1022 |
| R73 | R: METAL FILM 10k 2% 1/4W | 0751-1032 |
| R74 | R: METAL FILM 8.2k 2% 1/4W | 0751-8222 |
| R75 | R: VAR WW 100 2W | 2100-0013 |
| R76 | R: METAL FILM 10k 2% 1/4W | 0751-1032 |
| R77 | R: METAL FILM 39k 2% 1/4W | 0751-3932 |
| R78 | R: METAL FILM 10k 2% 1/4W | 0751-1032 |
| R79 | R: METAL FILM 620 2% 1/4W | 0751-6212 |
| R80,R81 | R: METAL FILM 10k 2% 1/4W | 0751-1032 |
| R82 | R: VAR COMP 100k | 2100-0019 |
| R83 | R: METAL FILM 10k 2% 1/4W | 0751-1032 |
| R84,R85 | R: METAL FILM 4.7 2% 1/2W | 0771-47G2 |
| R86 | R: METAL FILM 51 2% 1/4W | 0751-5102 |
| R87 | R: METAL FILM 10k 2% 1/4W | 0751-1032 |
| R88 | R: VAR COMP 100k | 2100-0019 |
| R89 | R: METAL FILM 51 2% 1/4W | 0751-5102 |
| R90 | R: METAL FILM 10 2% 1/2W | 0771-1002 |
| R91 | R: METAL FILM 499 1% | 0721-4990 |
| R92 | not used | |
| R93 thru R95 | R: METAL FILM 4.99k 1% | 0721-4991 |
| R96 | not used | |
| R97 | R: METAL FILM 499 1% | 0721-4990 |
| R98 | not used | |
| R99 thru R101 | R: METAL FILM 4.99k 1% | 0721-4991 |
| R102 | not used | |
| R103 | R: METAL FILM 15.0k 1% | 0721-1502 |
| R104 | R: VAR WW 3k 2W | 2100-0005 |
| R105 | R: METAL FILM 10.0k 1% | 0721-1002 |
| R106 | R: METAL FILM 15k 2% 1/4W | 0751-1532 |
| R107 | R: METAL FILM 1k 2% 1/4W | 0751-1022 |
| R108 | R: METAL FILM 30k 2% 1/4W | 0751-3032 |
| R109 | R: METAL FILM 2.2k 2% 1/4W | 0751-2222 |
| R110 | R: METAL FILM 160 2% 1/4W | 0751-1612 |
| R111 | R: METAL FILM 5.11k 1% | 0721-5111 |
| R112 | R: METAL FILM 4.3k 2% 1/4W | 0751-4322 |
| R113 | R: METAL FILM 5.11k 1% | 0721-5111 |
| R114 | R: METAL FILM 4.3k 2% 1/4W | 0751-4322 |
| R115,R116 | R: METAL FILM 5.11k 1% | 0721-5111 |
| R117 | R: METAL FILM 3.32k 1% | 0721-3321 |
| R117A | R: METAL FILM 120k 2% 1/4W | 0751-1242 |
| R118 | R: METAL FILM 1k 2% 1/4W | 0751-1022 |
| R119 | R: METAL FILM 5.11k 1% | 0721-5111 |

A1 BOARD AMM-3 CONT.

| Reference Designation | Description | Part Number |
|---|---|---|
| R120 | R: VAR WW 3k 2W | 2100-0005 |
| R121 | R: METAL FILM 7.5k 2% 1/4W | 0751-7522 |
| R122 | R: METAL FILM 2.49k 1% | 0721-2491 |
| R123 | R: METAL FILM 10.0k 1% | 0721-1002 |
| R124 | R: METAL FILM 2.49k 1% | 0721-2491 |
| R125 | R: METAL FILM 1.00k 1% | 0721-1001 |
| R126,R127 | R: METAL FILM 15.0k 1% | 0721-1502 |
| R128 | R: VAR WW 3k 2W | 2100-0005 |
| R129 | R: METAL FILM 10.0k 1% | 0721-1002 |
| R130 | R: VAR WW 3k 2W | 2100-0005 |
| R131 | R: METAL FILM 499 1% | 0721-4990 |
| R132 | R: VAR WW 300 2W | 2100-0004 |
| R133 | R: METAL FILM 1.00k 1% | 0721-1001 |
| R134 | R: METAL FILM 10.0k 1% | 0721-1002 |
| R135 thru R137 | R: METAL FILM 15k 2% 1/4W | 0751-1532 |
| R138 thru R140 | R: METAL FILM 30k 2% 1/4W | 0751-3032 |
| R141 thru R143 | R: METAL FILM 2.2k 2% 1/4W | 0751-2222 |
| R144 thru R146 | R: METAL FILM 160 2% 1/4W | 0751-1612 |
| R147,R148 | R: METAL FILM 7.5k 2% 1/4W | 0751-7522 |
| R149 | R: METAL FILM 15.0k 1% | 0721-1502 |
| R150 | R: METAL FILM 3.01k 1% | 0721-3011 |
| R151 | R: METAL FILM 240 2% 1/4W | 0751-2412 |
| R152 | R: METAL FILM 1.5k 2% 1/4W | 0751-1522 |
| R153,R154 | R: METAL FILM 620 2% 1/4W | 0751-6212 |
| | (R153 and R154 are on PC bottom under U8 and U9.) | |
| R155 | R: METAL FILM 100k 2% 1/4W | 0751-1042 |
| | (R155 is on PC bottom under U10.) | |
| U1 thru U3 | IC: MC1741 | 1826-0006 |
| U4 | IC: MC3302P | 1826-0005 |
| U5 | IC: MC1495L | 1826-0007 |
| U6 | IC: UA709CP | 1826-0008 |
| | (Previously, U6 was a metal case MC1709G) | |
| U7 | IC: TL071 | 1826-0004 |
| U8,U9 | IC: CA3140E | 1826-0001 |
| U10 | IC: TL071 | 1826-0004 |
| U11 | IC: 7400 | 1821-0001 |
| U12 | IC: TL071 | 1826-0004 |
| U13 | IC: MC1468L | 1826-0002 |
| U14 thru U17 | IC: MC1741 | 1826-0006 |
| U18 | IC: MC3302P | 1826-0005 |
| U19 | IC: 74122 | 1821-0015 |
| U20 | IC: MC1741 | 1826-0006 |
| U21 thru U23 | IC: 74122 | 1821-0015 |

The AMM-3 power supply has been modified due to the unavailability of the MC1468L I.C. on the A1 board (U13).

BEGINNING WITH SERIAL NUMBER 142753; THE FOLLOWING MANUAL CHANGES APPLY:

1. Disregard the power supply alignment procedure in the maintenace section of the manual.

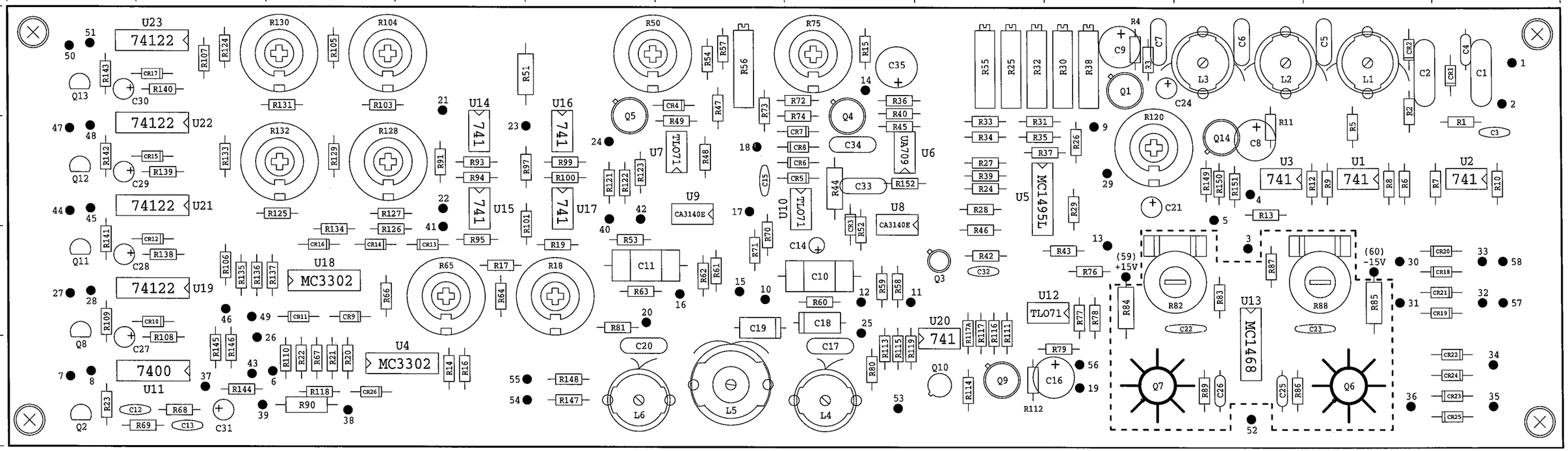
2. The following parts are added to the chassis parts list:

| | | |
|---|---|---|
| C18,C19 | C: FIXED CERAMIC 0.1uF 50V | 0151-0006 |
| U2 | IC: 7915C | 1826-0033 |
| U3 | IC: 7815C | 1826-0031 |

3. The following parts are deleted from the A1 board parts list and part location table:

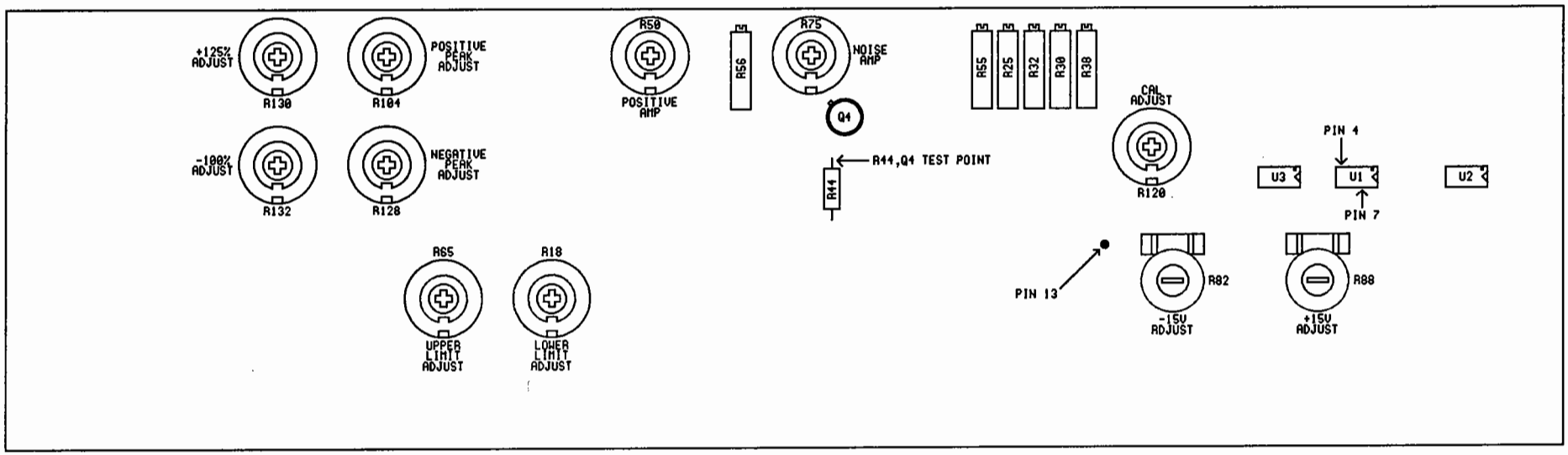
| | | |
|---|---|---|
| C22,C23 | C: FIXED CERAMIC 0.0015uF 1kV | 0151-0009 |
| C25,C26 | C: FIXED CERAMIC 0.1uF 50V | 0151-0006 |
| Q6 | TRANSISTOR: 2N3053 | 1850-0008 |
| Q7 | TRANSISTOR: 2N4037 | 1850-0011 |
| R82 & R88 | R: VAR COMP 100k | 2100-0019 |
| R83 & R87 | R: METAL FILM 10k 2% 1/4W | 0751-1032 |
| R84,R85 | R: METAL FILM 4.7 2% 1/2W | 0771-47G2 |
| R86 & R89 | R: METAL FILM 51 2% 1/4W | 0751-5102 |
| U13 | IC: MC1468L | 1826-0002 |

All the affected drawings show both circuit versions.

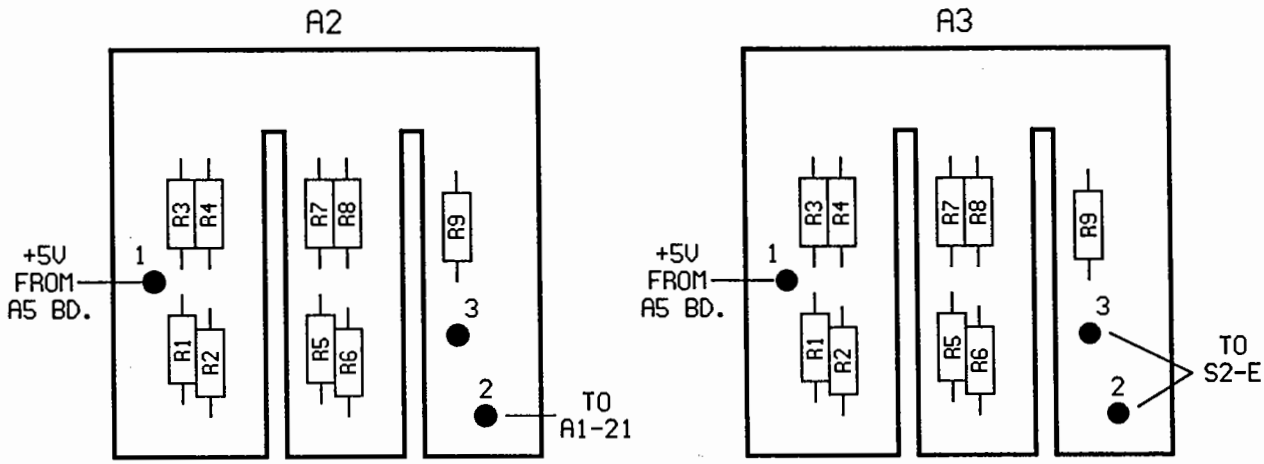



BEGINNING SERIAL NUMBER 142753, THE PARTS INSIDE THE LINE ARE OMITTED AND PINS 59 & 60 ARE ADDED.

AMM-3 A1 BOARD
COMPONENT LAYOUT
BELAR ELECTRONICS




AMM-3 A1 BOARD
CALIBRATION CONTROL COMPONENTS
BELAR ELECTRONICS

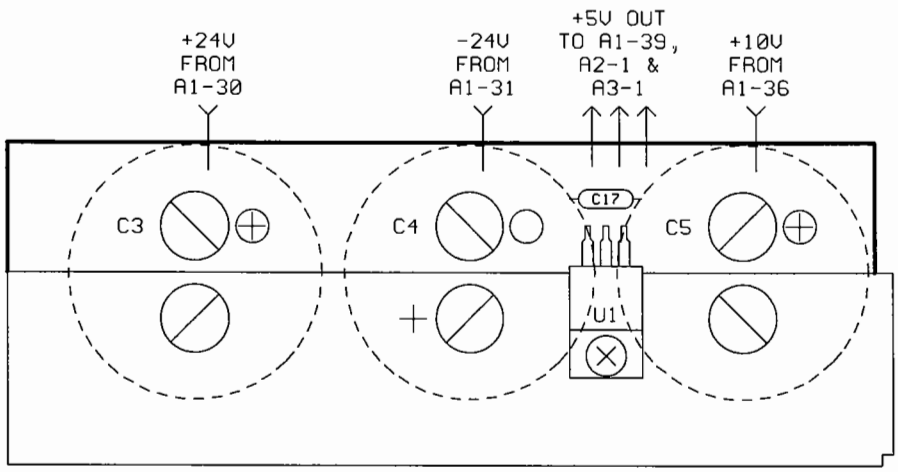



AMM-3 A2 & A3 BOARDS

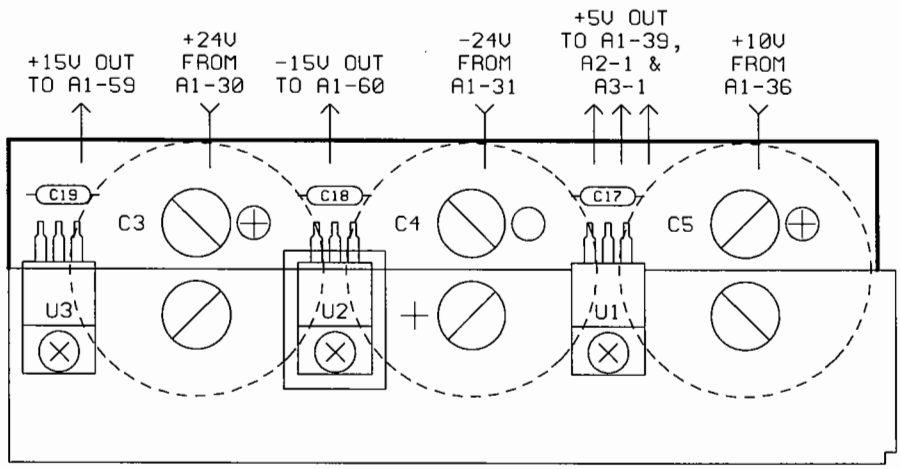
SEE AMM-3 CHASSIS WIRING DRAWING FOR A2 & A3 BOARD SCHEMATICS

AMM-3 - A2 & A3 BOARDS

| Reference Designation | Description | Part Number |
|---|---|---|
| R1 | R: FXD FILM 100k 1% 1/8W | 0721-1003 |
| R2 | R: FXD FILM 49.9k 1% 1/8W | 0721-4992 |
| R3 | R: FXD FILM 24.9k 1% 1/8W | 0721-2492 |
| R4 | R: FXD FILM 12.4k 1% 1/8W | 0721-1242 |
| R5 | R: FXD FILM 10.0k 1% 1/8W | 0721-1002 |
| R6 | R: FXD FILM 4.99k 1% 1/8W | 0721-4991 |
| R7 | R: FXD FILM 2.49k 1% 1/8W | 0721-2491 |
| R8 | R: FXD FILM 1.24k 1% 1/8W | 0721-1241 |
| R9 | R: FXD FILM 1.00k 1% 1/8W | 0721-1001 |

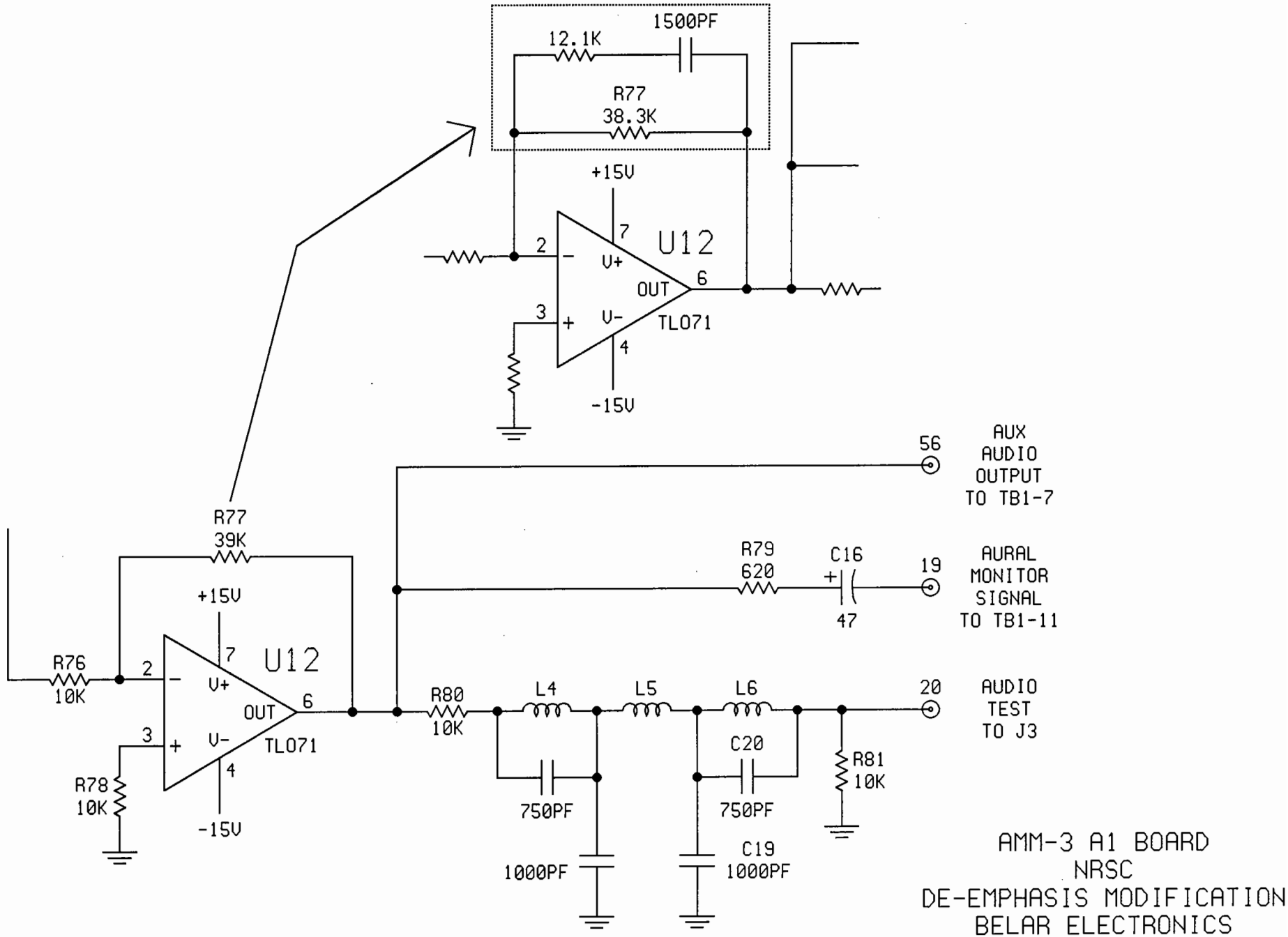


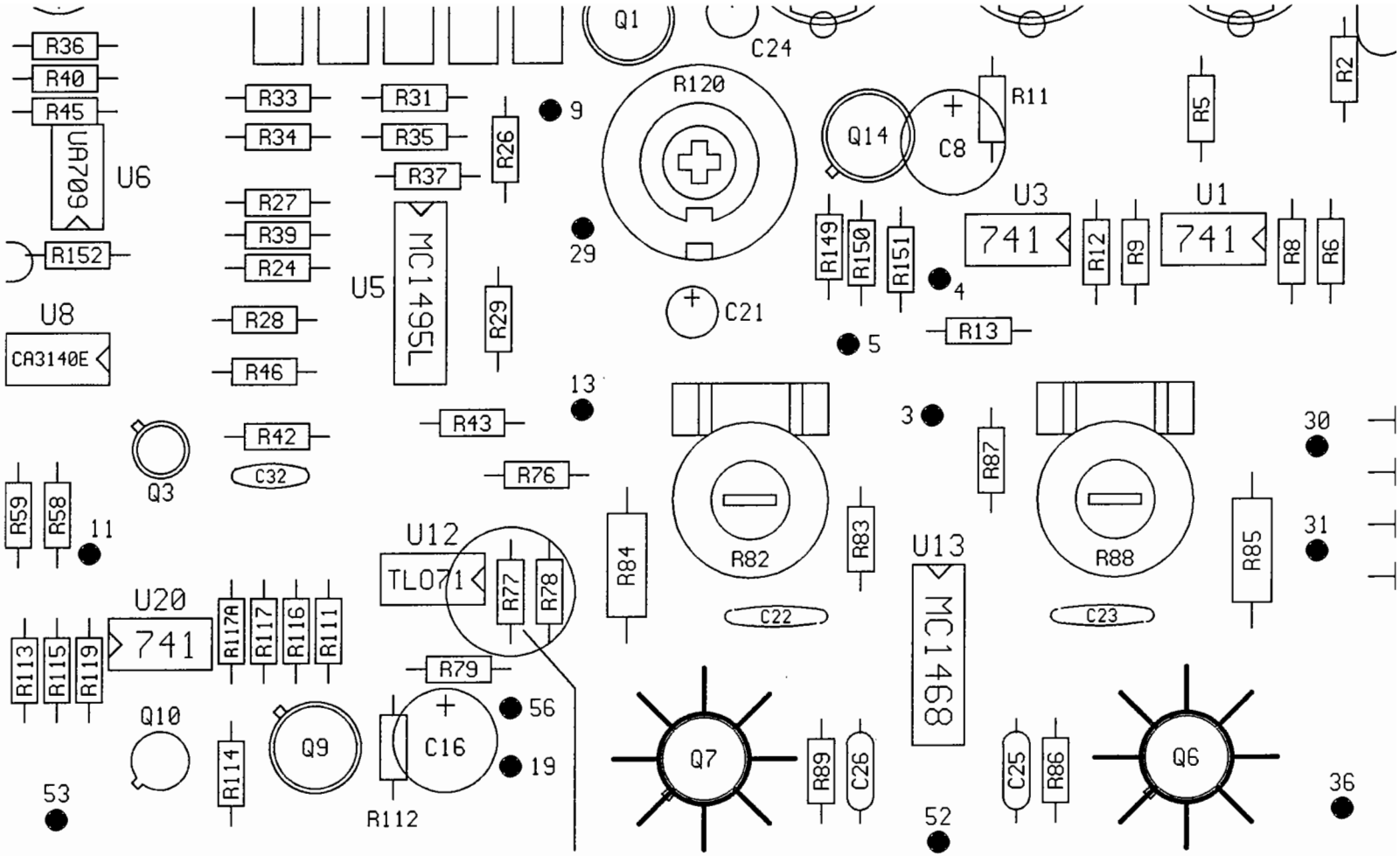

(BEFORE SERIAL NUMBER 142753)



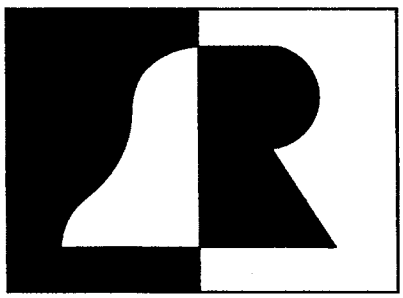

(EFFECTIVE SERIAL NUMBER 142753)

AMM-3
A5 POWER SUPPLY BOARD
COMPONENT LAYOUT


1500PF
12.1K
R77
38.3K
+15V
U12
2
7
V+
OUT
6
3
V-
TL071
4
-15V
56
AUX
AUDIO
OUTPUT
TO TB1-7
R77
39K
R79
620
C16
19
AURAL
MONITOR
SIGNAL
TO TB1-11
47
+15V
U12
R76
10K
2
7
V+
OUT
6
3
V-
TL071
4
R78
10K
-15V
R80
10K
L4
L5
L6
20
AUDIO
TEST
TO J3
C20
R81
10K
750PF
750PF
1000PF
C19
1000PF
AMM-3 A1 BOARD
NRSC
DE-EMPHASIS MODIFICATION
BELAR ELECTRONICS




# AMM-3 A1 BOARD
# NRSC DE-EMPHASIS MODIFICATION
# BELAR ELECTRONICS



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