

Model FMRR-1A FM REBROADCAST RECEIVER

Guide to Operations

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BELAR ELECTRONICS LABORATORY, INC.

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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.

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1 General Information

1-1 General Description

The Belar FMRR-1A FM Rebroadcast Receiver is a crystal controlled, fixed frequency receiver designed for use in rebroadcasting and other applications that require accurate FM reception and composite output.

The precision demodulator features two buffered, 75 ohm composite outputs suitable for rebroadcast of mono, stereo, and SCA signals.

1-2 Physical Description

The FMRR-1A is constructed on a standard EIA 1 $\frac{3}{4}$ x 19 inch rack mount panel (one EIA rack unit). Factory adjustments are located within the unit. The RF input and composite outputs are BNC connectors located on the rear of the unit. Balanced audio is available on a rear-mounted XLR-type connector. There is also a headphone jack on the front panel. Two input attenuator switches, a crystal oscillator power switch, a mute switch, and a calibrator switch are located on the rear of the unit. Carrier-failure relay contacts (NO or NC) are also located on the rear panel.

1-3 Electrical Description

The FMRR-1A consists of an RF amplifier section and a precision demodulator section. The RF amplifier is a solid state superheterodyne type RF amplifier designed to accurately receive FM signals for measurement and monitoring purposes. It features a proprietary multi-stage IF filter and crystal-controlled pre-selector for maximum performance.

The precision demodulator is the same high-quality demod as used in the FMMA-1 The Wizard. It incorporates a highly linear and stable digital pulse counting discriminator to demodulate the FM signal. The demodulator has two 75 ohm buffered composite outputs, and a balanced audio output on an XLR-type connector.

Upon loss of carrier (or low signal), the unit will automatically mute the audio and composite outputs, and activate the carrier alarm contacts.

1-4 Electrical and Mechanical Specifications

RF Input Sensitivity	100 μ V
Signal-to-Noise Ratio:	
100 μ V input	75 dB
500 μ V input	85 dB
RF Input Impedance	75 Ω , BNC Connector
Input Attenuator	0, 6, 12, 18 dB
RF Frequency Range	87.75 - 107.95 MHz (specify frequency)
Carrier Alarm Relay	Form C, 4 watts max, 0.2 amps max, 100 VDC max DO NOT CONNECT 115VAC TO THIS RELAY!
Output	two 75 ohm Buffered Composite, 4.2V P-P (1.5 Vrms)
Audio Output	600 ohm balanced, XLR-type connector, +10dBm
Headphone Audio Output (front panel) ...	Stereo headphone jack wired mono, 5 Vrms
De-emphasis	selectable, 75 μ sec, 50 μ sec, or none
Capture Ratio	1.5 dB
Selectivity:	
Alternate Channel	27 dB
3rd Adjacent Channel	46 dB
Harmonic Distortion	< 0.03%
@ 1 kHz, 75 kHz deviation	
Separation	
1 kHz	65 dB
15 kHz	55 dB
Dimensions	1 EIA Rack Unit 1.75"H x 12.5"D x 19"W
Power Requirements	100-240 Vac, 50/60 Hz
Power Consumption	13 W
Shipping Weight	10 lbs (4.5 kgs)

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 FMRR-1A is shipped with an instruction book, three wire line cord, and four black 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 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.

2-4 Preparation for Use

The FMRR-1A FM Receiver is designed to be mounted in a standard 19-inch rack. When the receiver 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 FMRR-1A. In no instance should the ambient chassis temperature be allowed to rise above 45°C (113°F).

Units beginning with serial number 420060:

These units can be operated from a 100 to 240 Vac, single phase, 50-60 Hz power source with no user adjustments. The fuse should be a 5mm x 20mm type GMA-3, 3AMP-250V (UL/CSA) or T3.15A-250V (IEC) fuse only. A spare fuse is stored in the removable fuse compartment.

Units prior to serial number 420060:

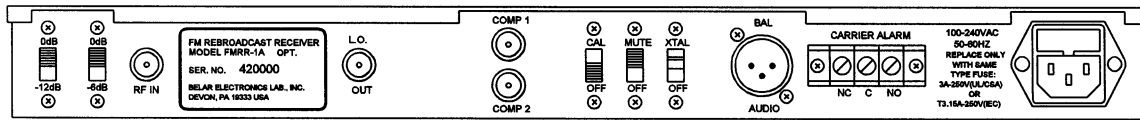
These units can be operated from either a 105 to 125 Vac or 210 to 250 Vac single phase, 50 to 60 Hz power source. Make sure the unit is set for the proper voltage as follows:

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 115 Vac operation, "240" for 230 Vac 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 115 Vac, ¼A 250V for 230 Vac), close the fuse door, and plug the line cord back in.

Connect the three-wire grounded line cord provided. If a substitute line cord is used, be sure that the ground lead is connected to "G" on the line cord receptacle.

2-5 Interconnections & Controls

FMRR-1A Rear Panel Jacks and Switches



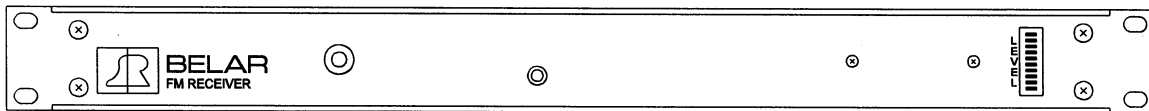
RF IN	RF Input: connect your receiving antenna to this input.
0dB-6dB 0dB-12dB	These attenuation switches reduce the RF input level by 6 dB, 12 dB, or 18 dB. These switches may be used in high signal strength areas to prevent overload and for optimum signal-to-noise ratio.
L.O. OUT	Local Oscillator output used for tuning the unit at the factory.
COMP1 COMP2	These two jacks provide separate 75 ohm buffered composite outputs.
CAL	This switch turns on the internal calibrator on the demod, when a calibration tone is required (for use with the Belar FMS-2 Stereo monitor, for example).
MUTE	When enabled, the unit mutes the audio and composite outputs when the receiving frequency is weak or non-existent.
XTAL	This switch turns off the crystal oscillator for retuning the receiver. THIS PROCEDURE IS DONE AT THE FACTORY, and this switch should remain in the ON position (up) at all times.
XLR Connector	Audio Out, 600Ω, balanced, +10 dBm. Pin 1 is ground, pin 2 is +, pin 3 is -. 
Carrier Alarm	Provides a contact closure or opening, depending on which contacts are used, upon loss of carrier or low signal level. Contacts are rated at 4 watts, 0.2 amps max, 100 Vdc max. DO NOT USE THIS RELAY TO DIRECTLY SWITCH 115Vac CIRCUITS.

3 Operation

3-1 Initial Operation

1. Connect your receiving antenna cable to the RF Input Jack on the back of the unit. A good antenna positioned for minimum multipath is critical to achieving good reception.
2. Ensure that units prior to serial number 420060 are set for the proper line voltage (see *Section 2-4*) and plug in the line cord.

3-2 Front Panel Indicators and Controls



The RF Level indicator shows the relative strength of the RF Input. At least 1 indicator bar should be lit for adequate reception.

The stereo headphone jack is wired for mono and is suitable for headphone impedances of 200 ohms or greater. A mono headphone plug should not be used in this jack as it will short the output.

3-3 De-emphasis

The de-emphasis is set at the factory at 75 μ -seconds unless 50 μ -seconds was specified with order. The de-emphasis is easily changed with Jumper P2 (see FMRR-1A/4 A4 Demodulator Board Connections & Adjustments diagram in *Section 4*). The 75 μ -second setting is with the jumper toward the front of the unit; the 50 μ -second setting is with jumper toward the rear of the unit. Removing the jumper completely removes the de-emphasis.

4 Diagrams, Schematics and Parts Lists

Replaceable Parts. This page contains information for ordering replaceable parts for the unit. 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:

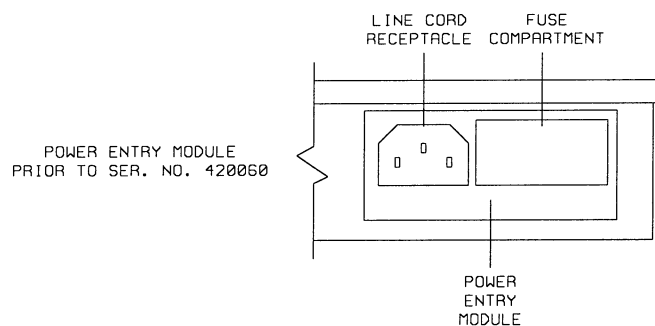
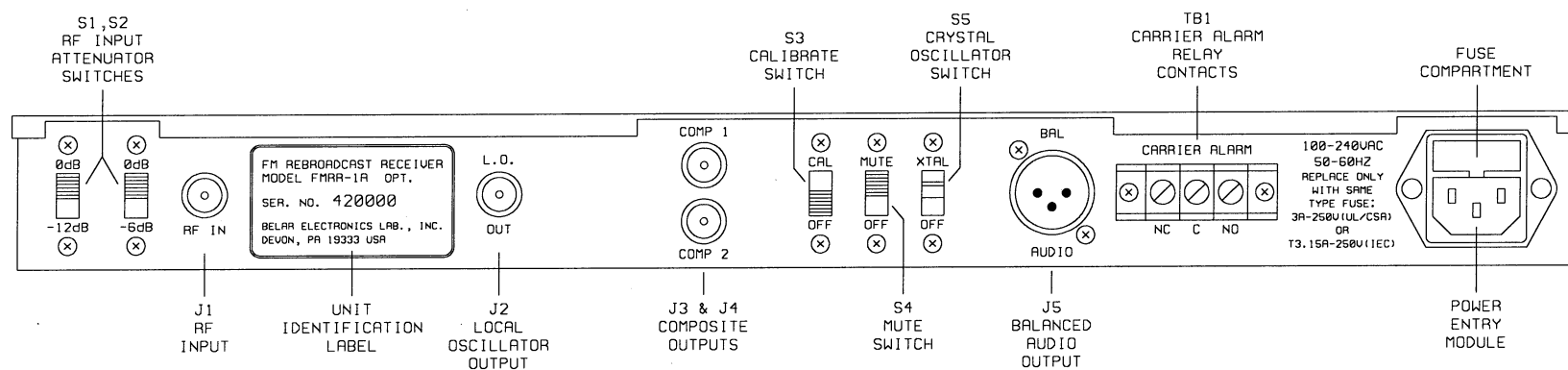
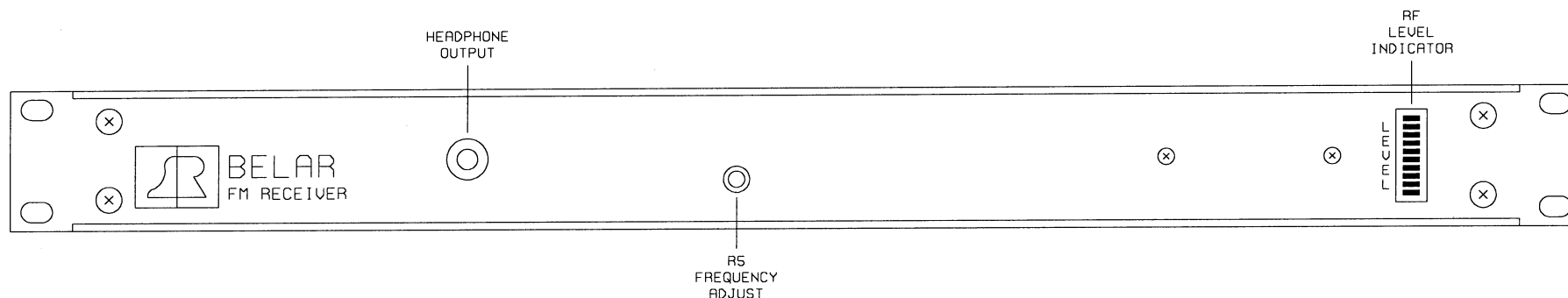
- a. Model number and serial number of unit.
- b. Description of part, *including the reference designation and location.*

REFERENCE DESIGNATORS

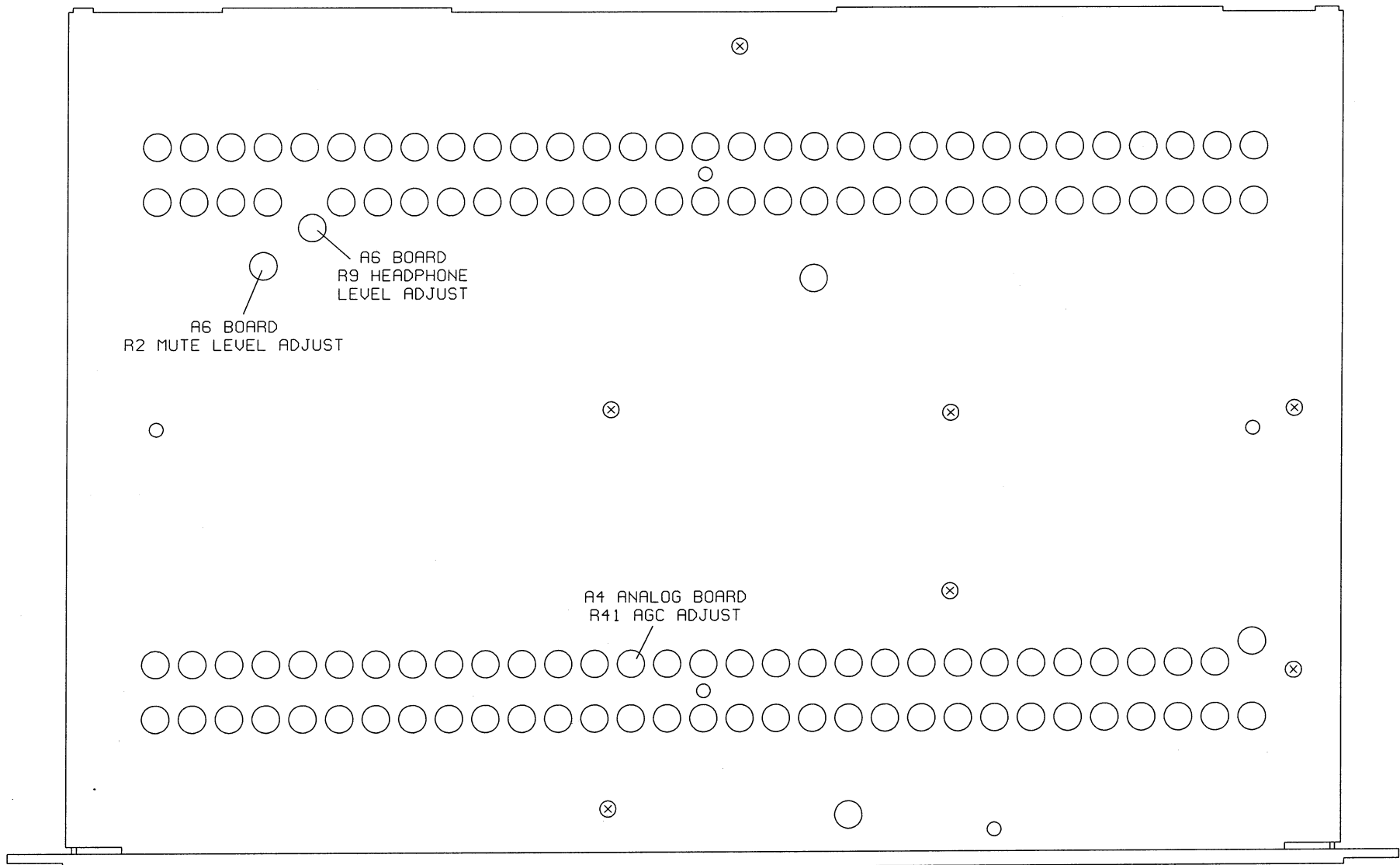
A	= assembly	J	= jack	S	= switch
BR	= diode bridge	L	= inductor	T	= transformer
C	= capacitor	M	= meter	TB	= terminal block
CR	= diode or LED	P	= plug	U	= integrated circuit
DS	= display or lamp	Q	= transistor	W	= cable
F	= fuse	R	= resistor	X	= socket
FL	= filter	RL	= relay	Y	= crystal
HDR	= header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



FMRR-1A FRONT & REAR VIEW
BELAR ELECTRONICS



FMRR-1A
TOP COVER ADJUSTMENT HOLE LOCATIONS
BELAR ELECTRONICS

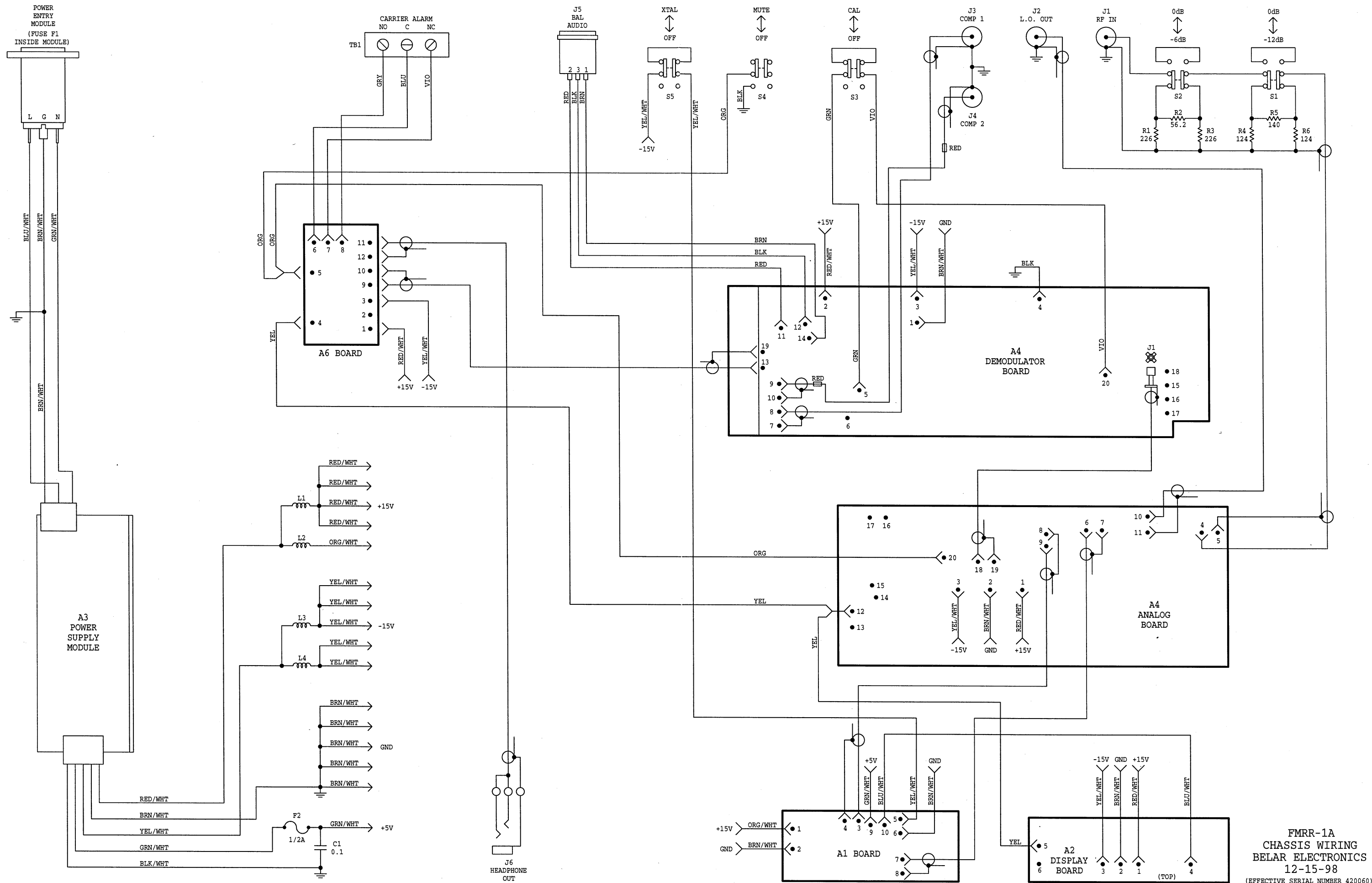
FMRR-1A PARTS LISTS

MAIN CHASSIS

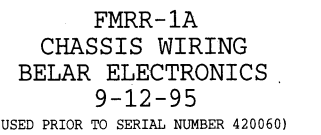
Reference Designation	Description		Part Number
A3	POWER SUPPLY MODULE: 15V, 15W	(note 2)	4005-0019A
--	POWER ENTRY MODULE: 6EGG1-1	(note 2)	0360-0021
F1	FUSE: GMA-3A 250V(UL/CSA) or T3.15A-250V(IEC)	(note 2)	2110-0009
--	FUSE HOLDER: CHASSIS MOUNT	(note 2)	2110-0010
F2	FUSE: AGC 1/2A 250V	(note 2)	2110-0001
--	POWER ENTRY MODULE: 6J4	(note 1)	0360-0020
	FUSE: AGC 1/2A 250V	(note 1)	2110-0001
BR1	DIODE: BRIDGE KBPC602 GI	(note 1)	1900-0025
C1	C: FIXED CERAMIC 0.1uF 50V	(note 2)	0151-0006
J1 thru J4	JACK: BNC		0360-0005
J5	JACK: XLR MALE		0360-0047
J6	JACK: HEADPHONE		0365-0044
L1 thru L4	CHOKE: RF	(note 2)	9140-0011
R1	R: METAL FILM 226 1%		0721-2260
R2	R: METAL FILM 56.2 1%		0721-56R2
R3	R: METAL FILM 226 1%		0721-2260
R4	R: METAL FILM 124 1%		0721-1240
R5	R: METAL FILM 140 1%		0721-1400
R6	R: METAL FILM 124 1%		0721-1240
S1 thru S4	SWITCH: SLIDE, DPDT		3102-0003
S5	SWITCH: SLIDE, DPDT		3102-0001
T1	TRANSFORMER: POWER, DMPC-Y-12	(note 1)	9100-0020
T2	TRANSFORMER: POWER, DPC-34-700	(note 1)	9100-0022
TB1	TERMINAL BLOCK: 3 POSITION		0360-0051
--	LINE CORD (115 Vac line voltage)		8120-0002
--	LINE CORD (230 Vac line voltage)		8120-0004

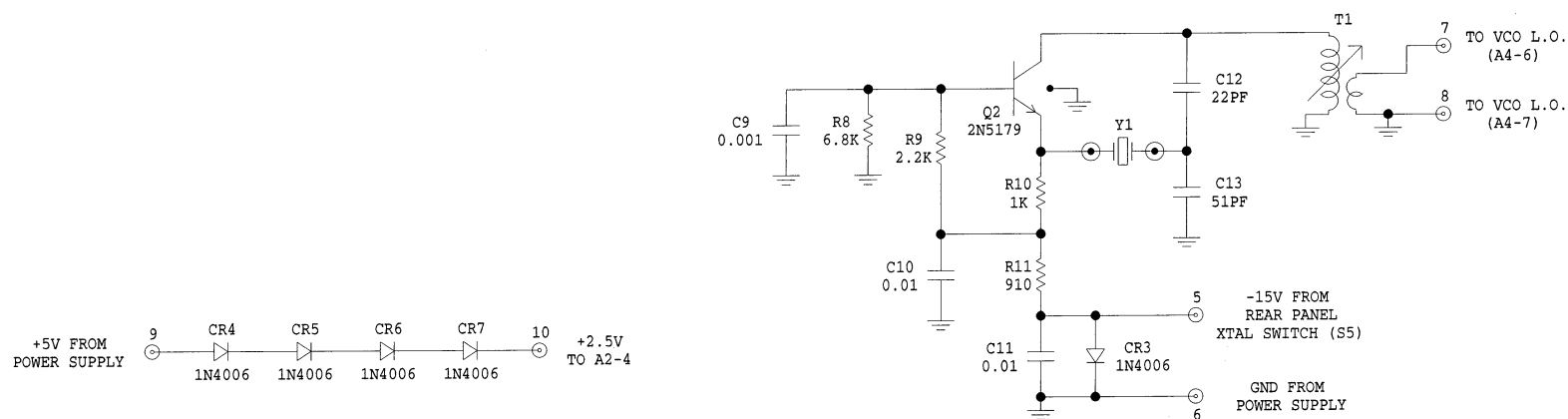
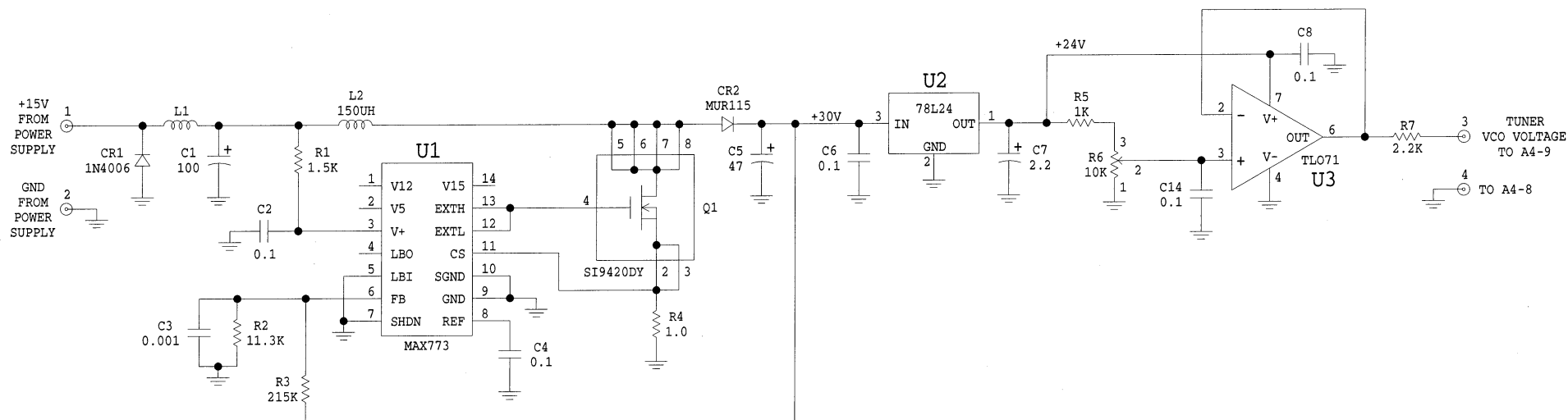
note 1: USED PRIOR TO SERIAL NUMBER 420060.

note 2: USED BEGINNING SERIAL NUMBER 420060.

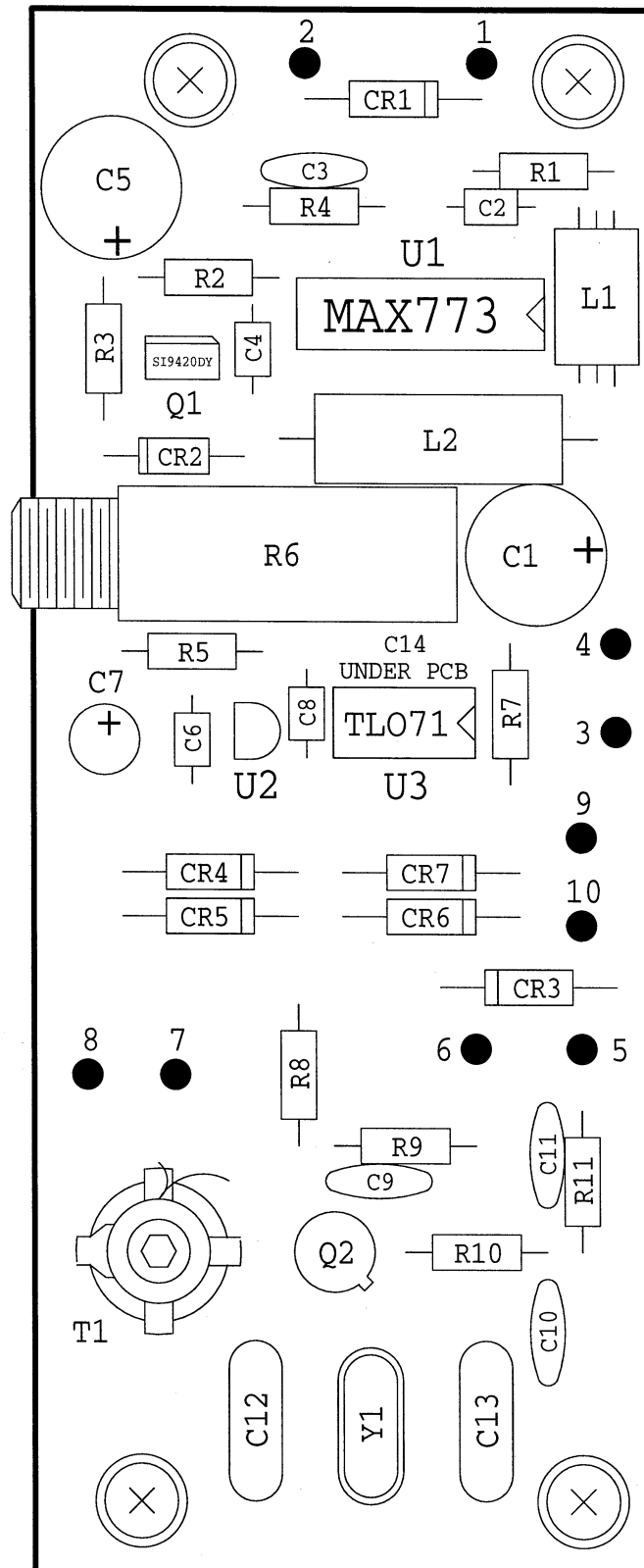


FMRR-1A
CHASSIS WIRING
BELAR ELECTRONICS
12-15-98
(EFFECTIVE SERIAL NUMBER 420060)

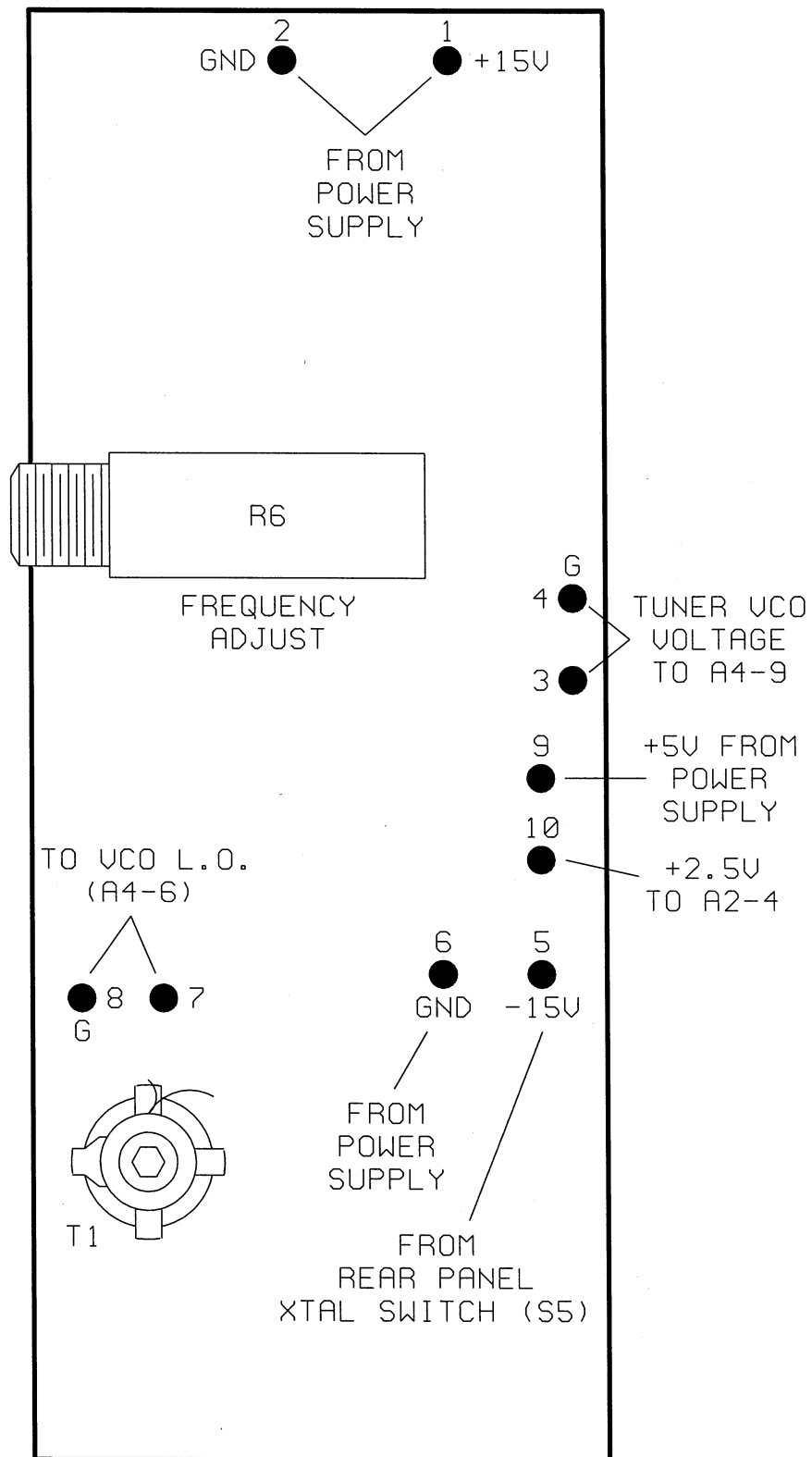




FMRR-1A A1 BOARD
REV. B
BELAR ELECTRONICS
10-17-01
(EFFECTIVE S/N 420060)



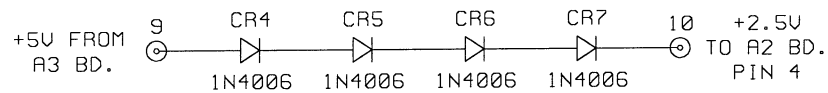
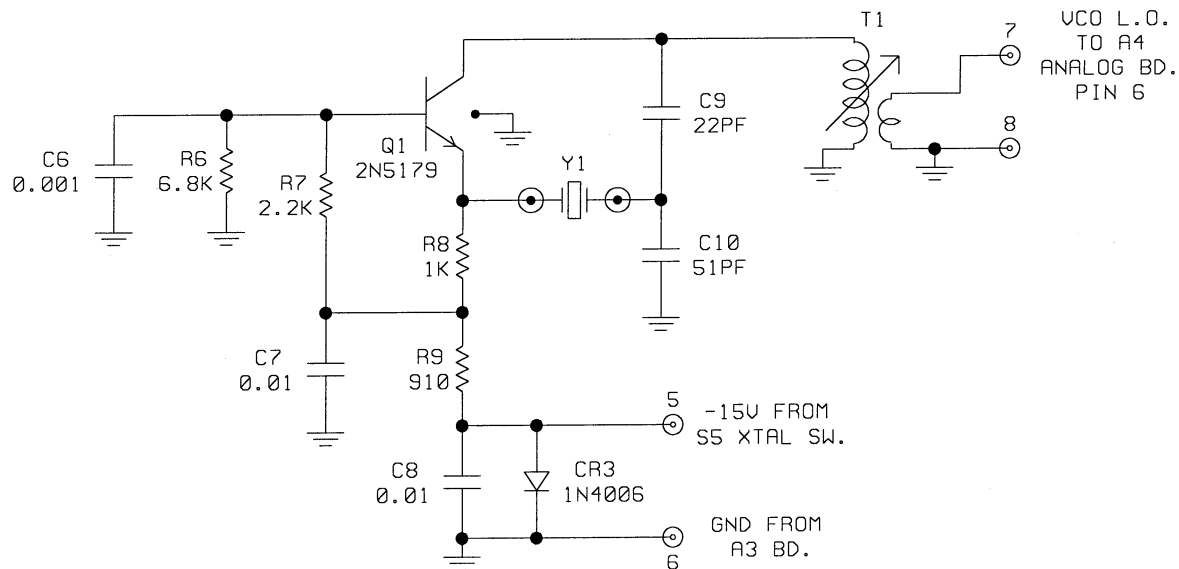
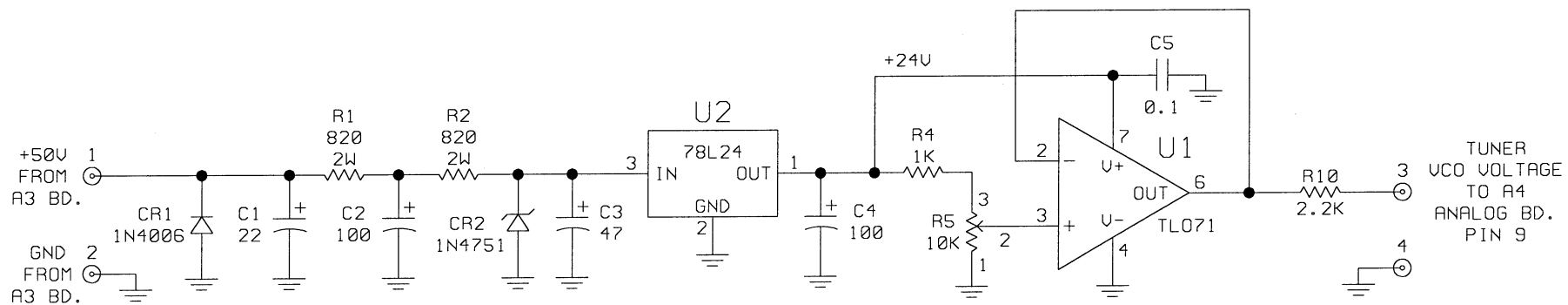
FMRR-1A A1 BOARD
REV. B
COMPONENT LAYOUT
BELAR ELECTRONICS
(EFFECTIVE S/N 420060)



FMRR-1A A1 BOARD
 REV. B
 CONNECTIONS & ADJUSTMENTS
 BELAR ELECTRONICS
 (EFFECTIVE S/N 420060)

A1 BOARD FMRR-1A, Rev. B
(used beginning serial number 420060)

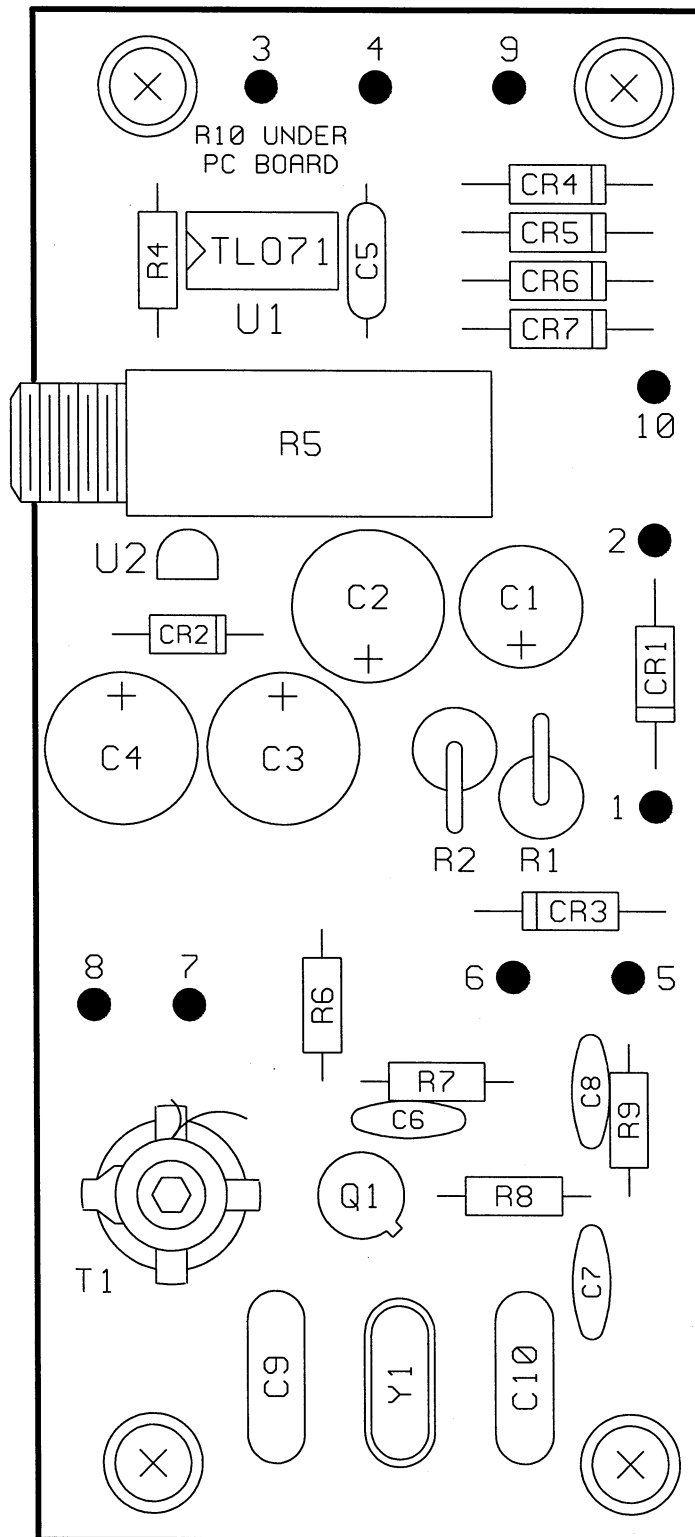
Reference Designation	Description	Part Number
C1	C: FIXED ELEC 100uF 35V	0180-0018
C2	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C3	C: FIXED CERAMIC 0.001uF 1kV	0151-0002
C4	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C5	C: FIXED ELEC 47uF 63V	0180-0017
C6	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C7	C: FIXED TANT 2.2uF 35V	0185-0009
C8	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C9	C: FIXED CERAMIC 0.001uF 1kV	0151-0002
C10,C11	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C12	C: FIXED MICA 22pF 5%	0140-2205
C13	C: FIXED MICA 51pF 5%	0140-5105
C14	C: FIXED CERAMIC 0.1uF 50V	0151-0006
CR1	DIODE: 1N4006	1900-0016
CR2	DIODE: MUR115	1900-0034
CR3 thru CR7	DIODE: 1N4006	1900-0016
Q1	TRANSISTOR: SI9420DY	1850-0035
Q2	TRANSISTOR: 2N5179	1850-0023
R1	R: METAL FILM 1.5k 2% 1/4W	0751-1522
R2	R: METAL FILM 11.3k 1%	0721-1132
R3	R: METAL FILM 215k 1%	0721-2153
R4	R: METAL FILM 1.0 2% 1/4W	0751-1R02
R5	R: METAL FILM 1k 2% 1/4W	0751-1022
R6	R: VAR COMP 10k, 10 TURN	2100-0018
R7	R: METAL FILM 2.2k 2% 1/4W	0751-2222
R8	R: METAL FILM 6.8k 2% 1/4W	0751-6822
R9	R: METAL FILM 2.2k 2% 1/4W	0751-2222
R10	R: METAL FILM 1k 2% 1/4W	0751-1022
R11	R: METAL FILM 910 2% 1/4W	0751-9112
L1	CHOKE: RF	9140-0011
L2	CHOKE: 150 uH	9140-0150
T1	TRANSFORMER: VARIABLE	Belar
U1	IC: MAX773	1826-0059
U2	IC: 78L24CP	1826-0016
U3	IC: TLO71	1826-0004
Y1	XTAL: 10.7MHz ABOVE CHANNEL FREQUENCY	



NOTE: PC BOARD IS MARKED "RFA-1A A1"

FMRR-1A A1 BOARD
REV. A
BELAR ELECTRONICS
10-20-94

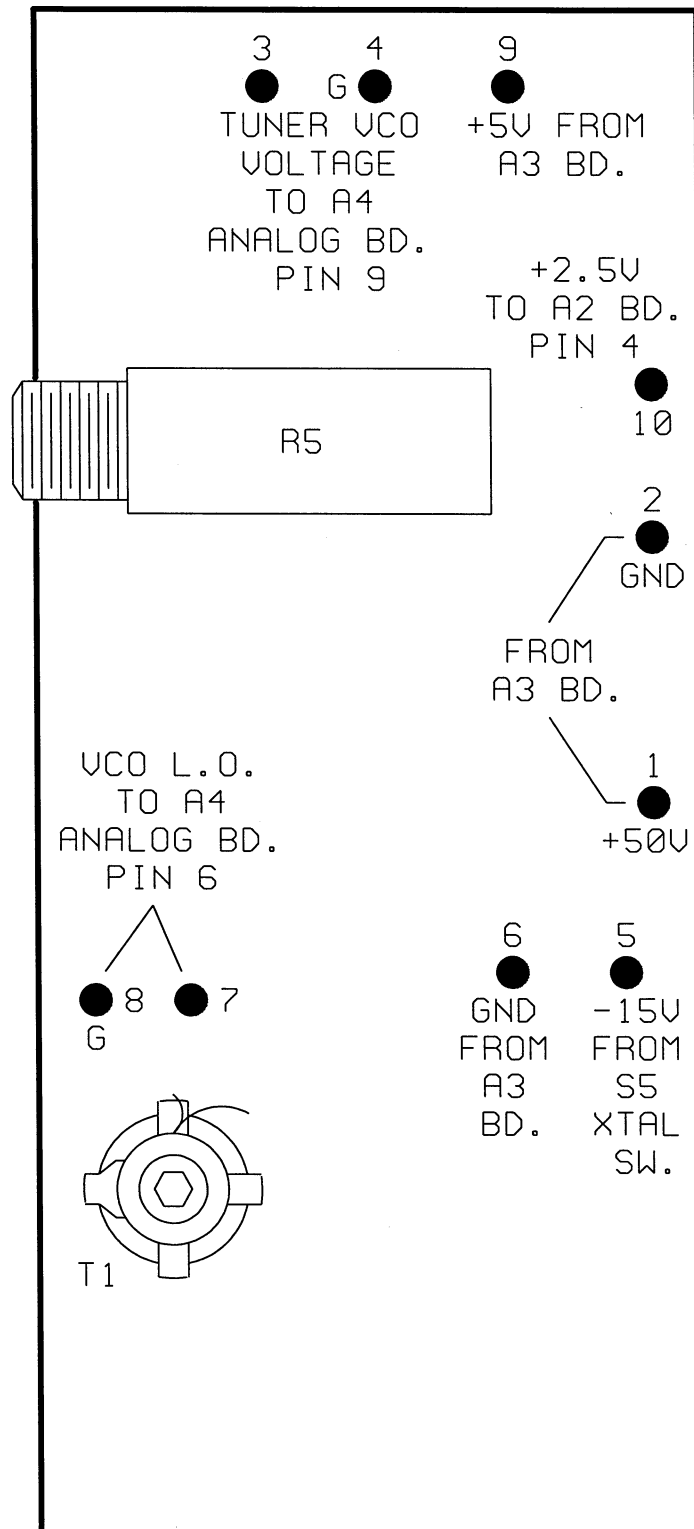
(USED PRIOR TO SERIAL NUMBER 420060)



FMRR-1A A1 BOARD
REV. A
COMPONENT LAYOUT
BELAR ELECTRONICS

NOTE:
BOARD IS MARKED "RFA-1A A1"

(USED PRIOR TO SERIAL NUMBER 420060)



FMRR-1A A1 BOARD

REV. A

CONNECTIONS &

ADJUSTMENTS

BELAR ELECTRONICS

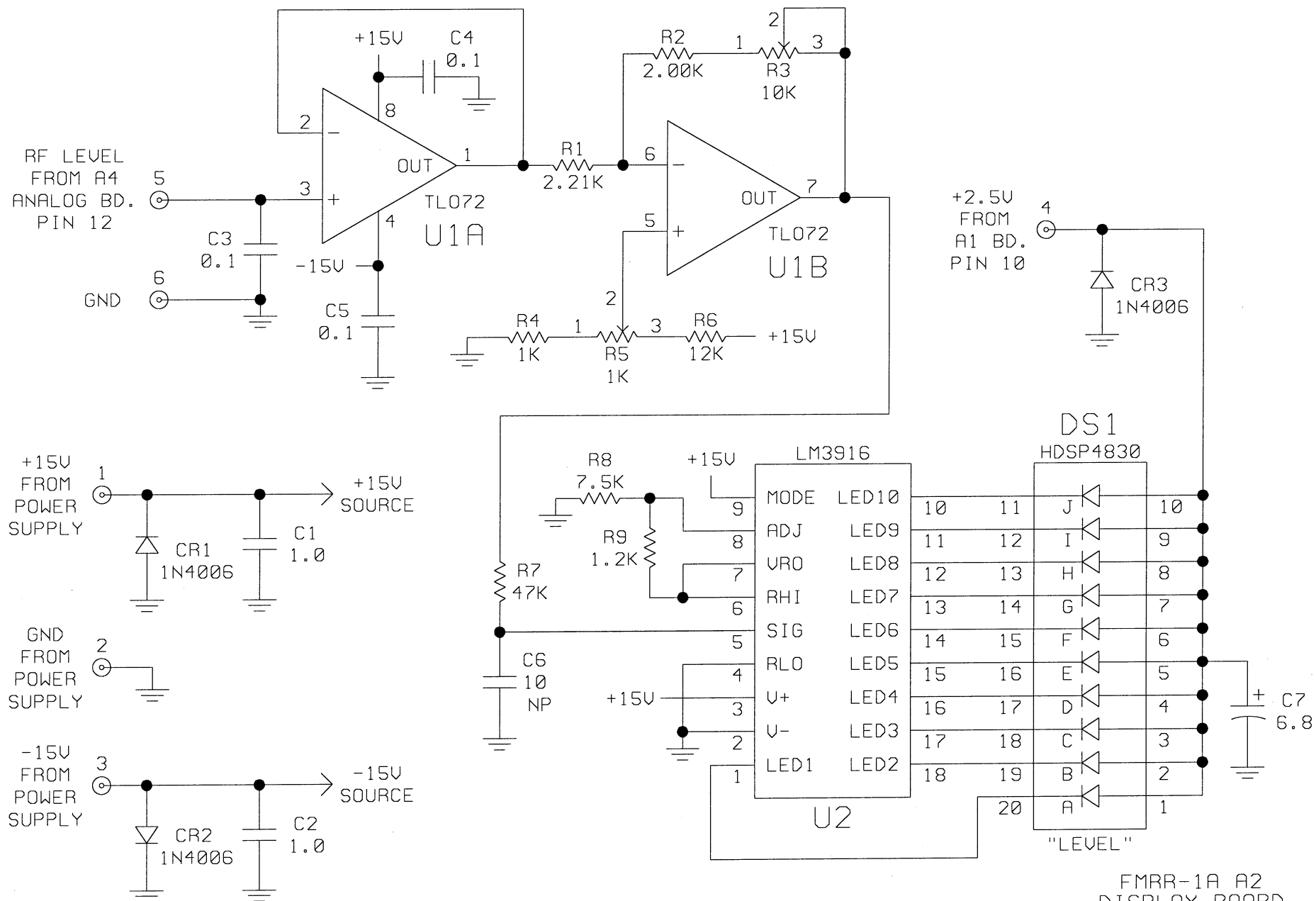
(USED PRIOR TO SERIAL NUMBER 420060)

NOTE:

BOARD IS MARKED "RFA-1A A1"

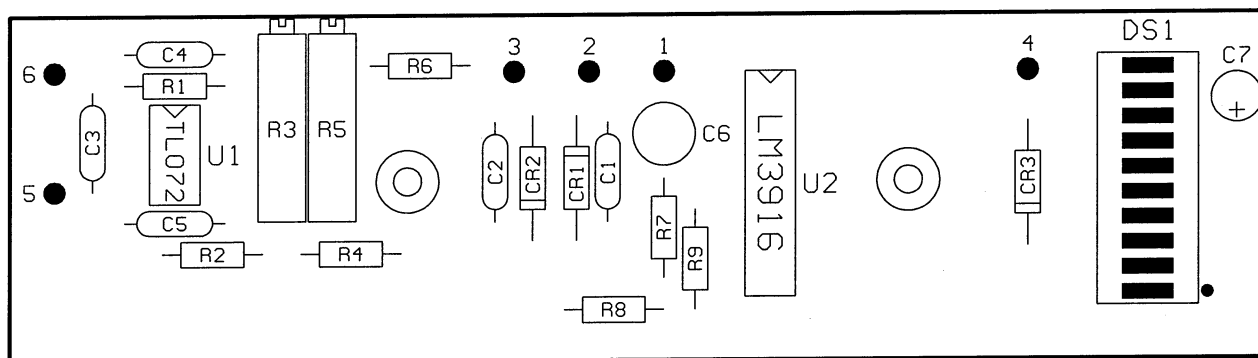
A1 BOARD FMRR-1A, Rev. A
 (used prior to serial number 420060)
 Note: pc board is marked "RFA-1A A1"

Reference Designation	Description	Part Number
C1	C: FIXED ELEC 22uF 100V	0180-0031
C2	C: FIXED ELEC 100uF 63V	0180-0032
C3	C: FIXED ELEC 47uF 50V	0180-0017
C4	C: FIXED ELEC 100uF 35V	0180-0018
C5	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C6	C: FIXED CERAMIC 0.001uF 1kV	0151-0002
C7, C8	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C9	C: FIXED MICA 22pF 5%	0140-2205
C10	C: FIXED MICA 51pF 5%	0140-5105
CR1	DIODE: 1N4006	1900-0016
CR2	DIODE: 1N4751	1900-0030
CR3 thru CR7	DIODE: 1N4006	1900-0016
Q1	TRANSISTOR: 2N5179	1850-0023
R1, R2	R: WIREWOUND 820 5% 2W	0811-0020
R3	(not used)	
R4	R: METAL FILM 1k 2% 1/4W	0751-1022
R5	R: VAR COMP 10k, 10 TURN	2100-0018
R6	R: METAL FILM 6.8k 2% 1/4W	0751-6822
R7	R: METAL FILM 2.2k 2% 1/4W	0751-2222
R8	R: METAL FILM 1k 2% 1/4W	0751-1022
R9	R: METAL FILM 910 2% 1/4W	0751-9112
R10	R: METAL FILM 2.2k 2% 1/4W (R10 is under pc board.)	0751-2222
T1	TRANSFORMER: VARIABLE	Belar
U1	IC: TLO71	1826-0004
U2	IC: 78L24CP	1826-0016
Y1	XTAL: 10.7MHz ABOVE CHANNEL FREQUENCY	



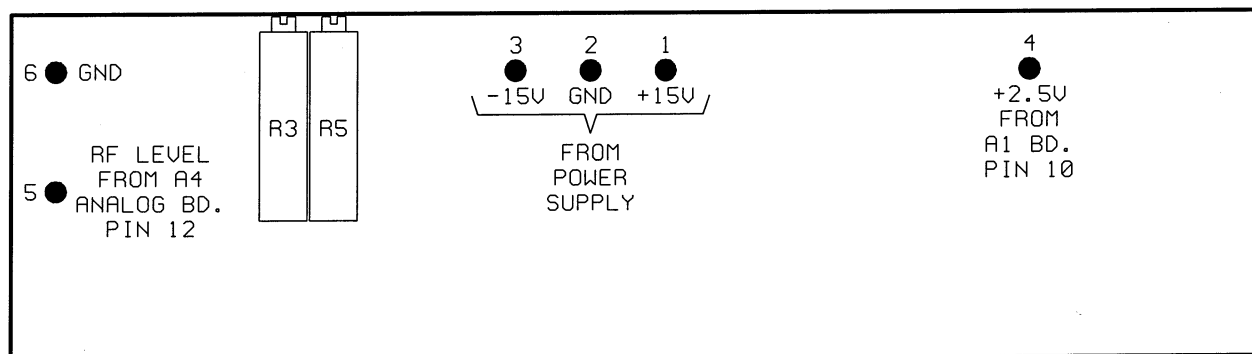
NOTE: PC BOARD IS MARKED "RFA-1A A2"

FMRR-1A A2
DISPLAY BOARD
BELAR ELECTRONICS
10-20-94



FMRR-1A A2
 DISPLAY BOARD
 COMPONENT LAYOUT
 BELAR ELECTRONICS

NOTE: PC BOARD IS MARKED "RFA-1A A2"



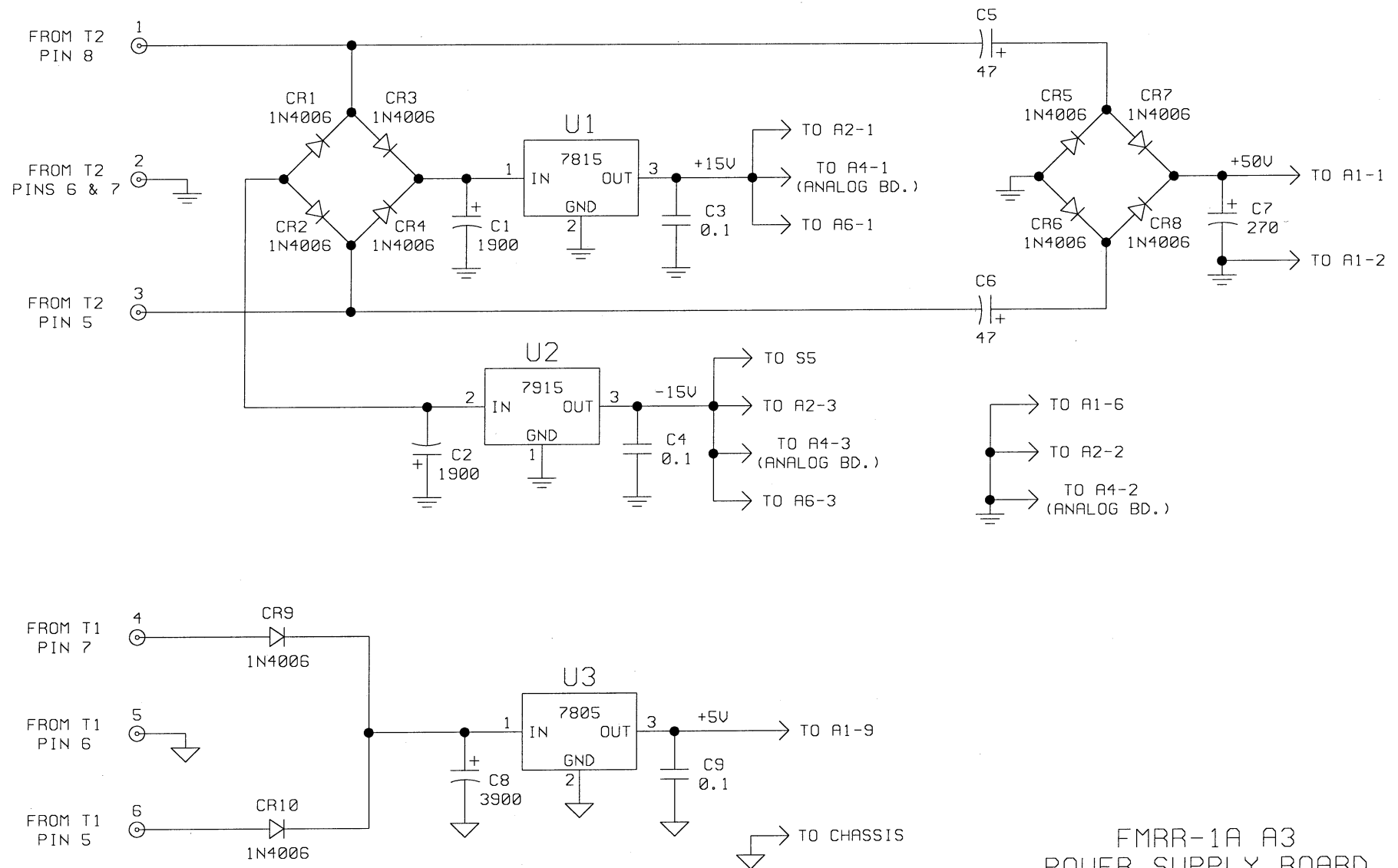
FMRR-1A A2 BOARD
CONNECTIONS & ADJUSTMENTS
BELAR ELECTRONICS

NOTE: PC BOARD IS MARKED "RFA-1A A2"

A2 BOARD FMRR-1A

(Note: pc board is marked "RFA-1A A2")

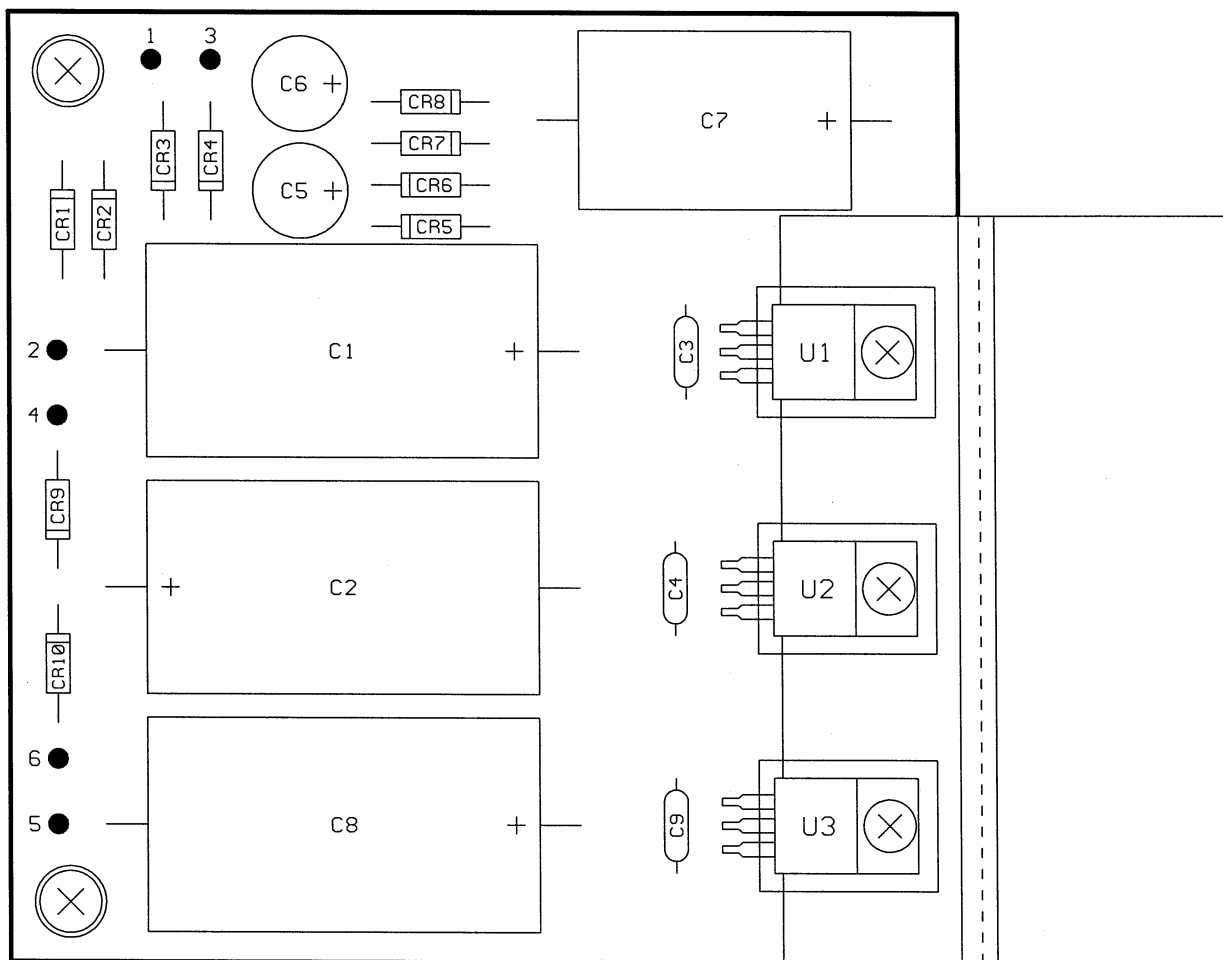
Reference Designation	Description	Part Number
C1,C2	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C3 thru C5	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C6	C: FIXED ELEC 10uF 35V NON-POLAR	0180-0029
C7	C: FIXED TANT 6.8uF 25V	0185-0002
CR1 thru CR3	DIODE: 1N4006	1900-0016
DS1	DISPLAY: HDSP-4830	1930-0006
R1	R: METAL FILM 2.21k 1%	0721-2211
R2	R: METAL FILM 2.00k 1%	0721-2001
R3	R: VAR COMP 10k, 10 TURN	2100-0018
R4	R: METAL FILM 1k 2% 1/4W	0751-1022
R5	R: VAR COMP 1k, 10 TURN	2100-0023
R6	R: METAL FILM 12k 2% 1/4W	0751-1232
R7	R: METAL FILM 47k 2% 1/4W	0751-4732
R8	R: METAL FILM 7.5k 2% 1/4W	0751-7522
R9	R: METAL FILM 1.2k 2% 1/4W	0751-1222
U1	IC: TLO72	1826-0038
U2	IC: LM3916	1826-0049



FMRR-1A A3
POWER SUPPLY BOARD
BELAR ELECTRONICS
11-14-94

NOTE: PC BOARD IS MARKED "RFA A3"

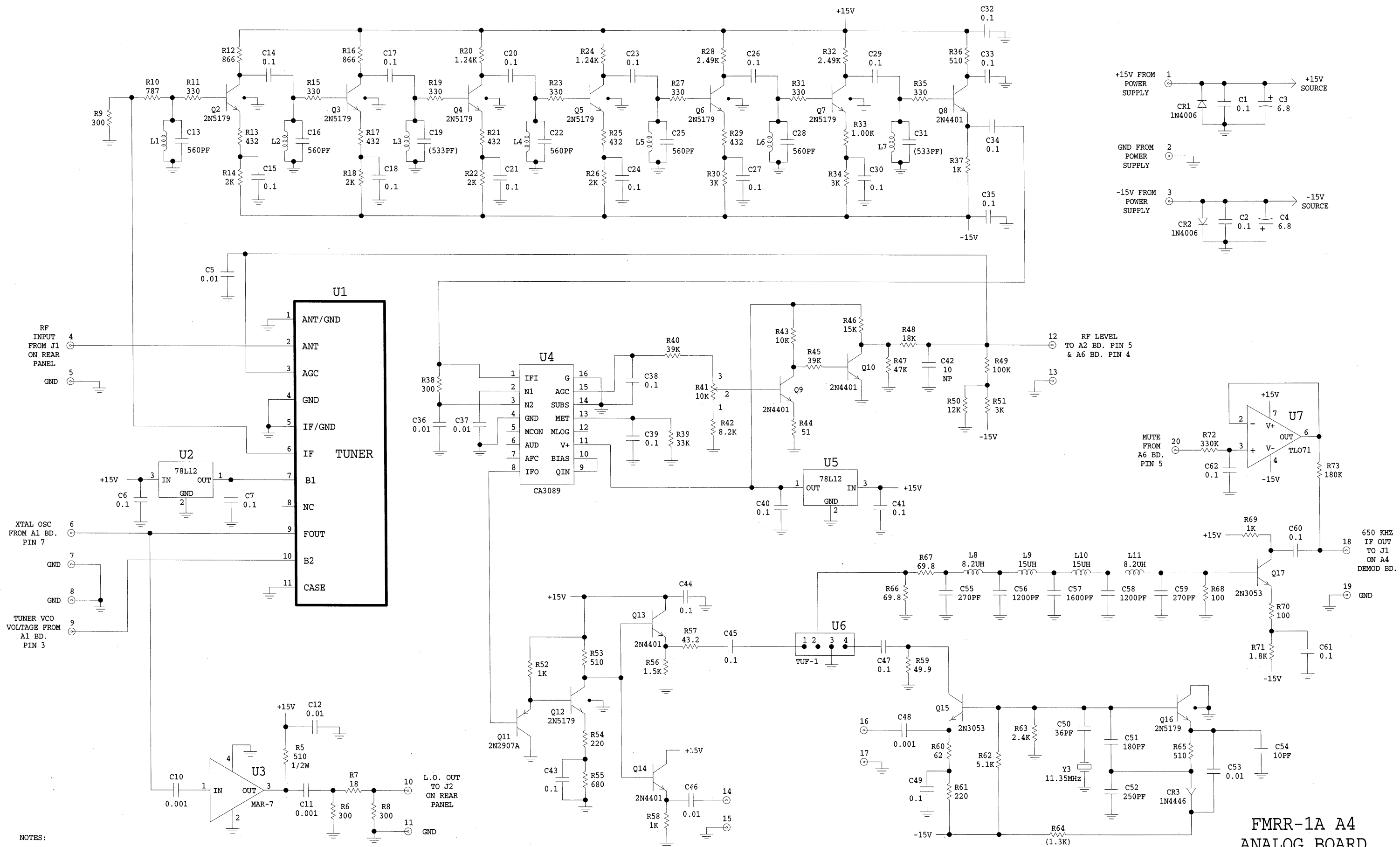
(ONLY USED PRIOR TO SERIAL NUMBER 420060)



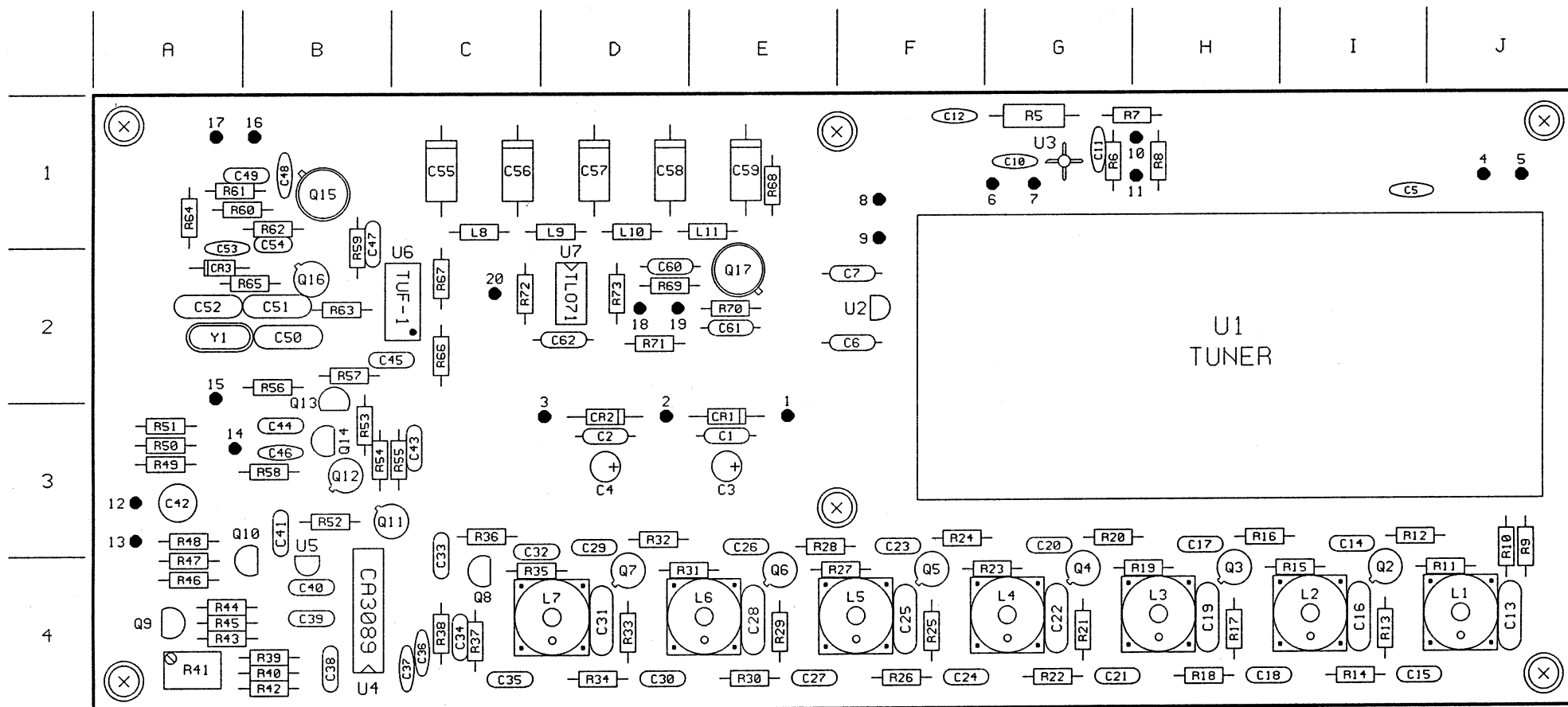
FMRR-1A A3 BOARD
 COMPONENT LAYOUT
 BELAR ELECTRONICS
 (ONLY USED PRIOR TO SERIAL NUMBER 420060)

A3 BOARD FMRR-1A
(Only used prior to serial number 420060)

Reference Designation	Description	Part Number
C1,C2	C: FIXED ELEC 1900uF 50V	0180-0027
C3,C4	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C5,C6	C: FIXED ELEC 47uF 50V	0180-0017
C7	C: FIXED ELEC 270uF 100V	0180-0034
C8	C: FIXED ELEC 3900uF 25V	0180-0035
C9	C: FIXED CERAMIC 0.1uF 50V	0151-0006
CR1 thru CR10	DIODE: 1N4006	1900-0016
U1	IC: 7815C	1826-0031
U2	IC: 7915C	1826-0033
U3	IC: 7805C	1826-0014



FMRR-1A A4
ANALOG BOARD
BELAR ELECTRONICS
2-24-98

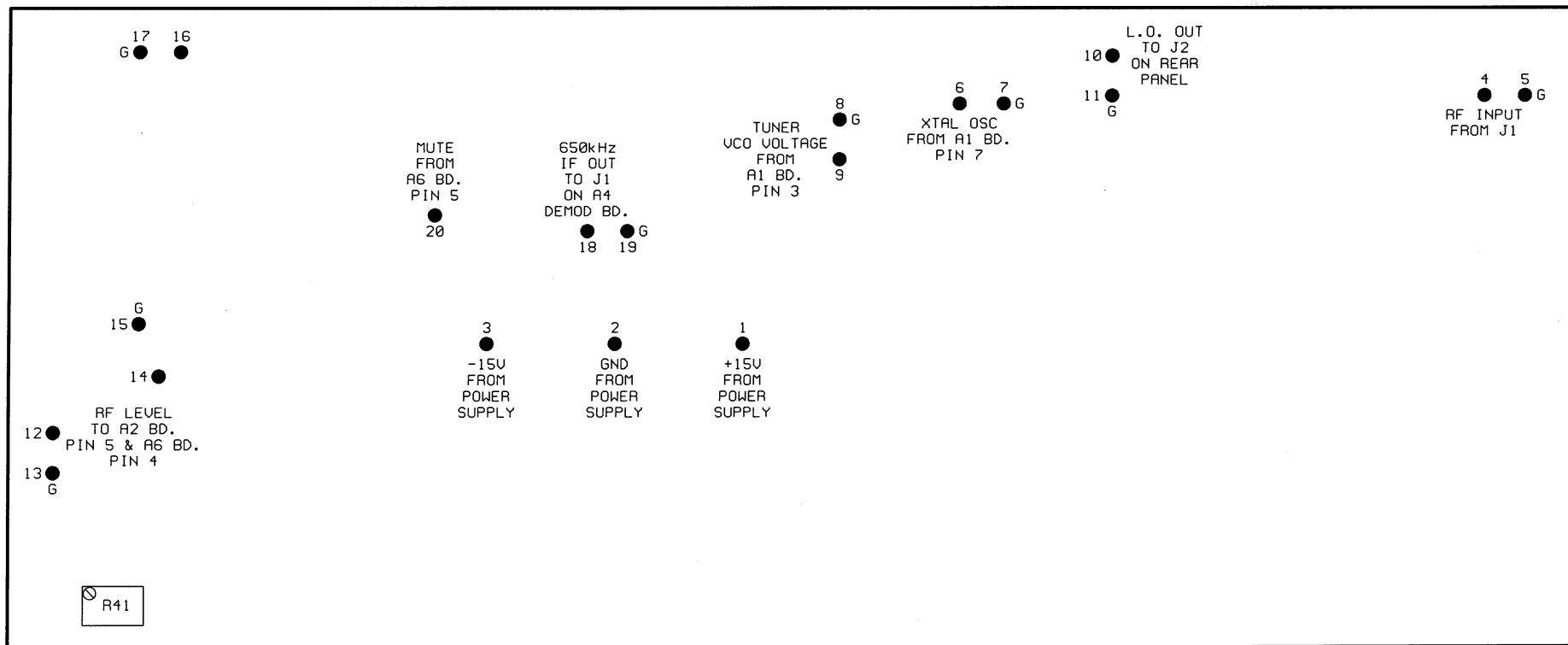


FMRR-1A & -4 A4
ANALOG BOARD
COMPONENT LAYOUT
BELAR ELECTRONICS

FMRR-1A & -4 A4 ANALOG 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>
C1 E3	C42 A3	Q3 H4	R28 E3	R67 C2	
C2 D3	C43 C3	Q4 G4	R29 E4	R68 E1	
C3 E3	C44 B3	Q5 F4	R30 E4	R69 D2	
C4 D3	C45 B2	Q6 E4	R31 D4	R70 E2	
C5 I1	C46 B3	Q7 D4	R32 D3	R71 D2	
C6 F2	C47 B1	Q8 C4	R33 D4	R72 C2	
C7 F2	C48 B1	Q9 A4	R34 D4	R73 D2	
C10 G1	C49 B1	Q10 B4	R35 C4		
C11 G1	C50 B2	Q11 B3	R36 C3	U1 H2	
C12 F1	C51 B2	Q12 B3	R37 C4	U2 F2	
C13 J4	C52 A2	Q13 B2	R38 C4	U3 G1	
C14 I3	C53 A1	Q14 B3	R39 B4	U4 B4	
C15 I4	C54 B1	Q15 B1	R40 B4	U5 B4	
C16 I4	C55 C1	Q16 B2	R41 A4	U6 C2	
C17 H3	C56 C1	Q17 E2	R42 B4	U7 D2	
C18 H4	C57 D1		R43 A4		
C19 H4	C58 D1	R5 G1	R44 A4	Y1 A2	
C20 G3	C59 E1	R6 G1	R45 A4		
C21 G4	C60 D2	R7 G1	R46 A4	<u>pins</u>	
C22 G4	C61 E2	R8 H1	R47 A4	1 E3	
C23 F3	C62 D2	R9 J3	R48 A3	2 D3	
C24 F4		R10 J3	R49 A3	3 D3	
C25 F4	CR1 E3	R11 J4	R50 A3	4 J1	
C26 E3	CR2 D3	R12 I3	R51 A3	5 J1	
C27 E4	CR3 A2	R13 I4	R52 B3	6 G1	
C28 E4		R14 I4	R53 B3	7 G1	
C29 D3	L1 J4	R15 I4	R54 B3	8 F1	
C30 D4	L2 I4	R16 H3	R55 C3	9 F1	
C31 D4	L3 H4	R17 H4	R56 B2	10 H1	
C32 C3	L4 G4	R18 H4	R57 B2	11 H1	
C33 C3	L5 F4	R19 H4	R58 B3	12 A3	
C34 C4	L6 E4	R20 G3	R59 B1	13 A3	
C35 C4	L7 D4	R21 G4	R60 A1	14 A3	
C36 C4	L8 C1	R22 G4	R61 A1	15 A2	
C37 C4	L9 D1	R23 G4	R62 B1	16 B1	
C38 B4	L10 D1	R24 F3	R63 B2	17 A1	
C39 B4	L11 E1	R25 F4	R64 A1	18 D2	
C40 B4		R26 F4	R65 B2	19 D2	
C41 B3	Q2 I4	R27 F4	R66 C2	20 C2	

*note: pc board is marked "RFA A4"



FMRR-1A A4
ANALOG BOARD
CONNECTIONS & ADJUSTMENTS
BELAR ELECTRONICS

A4 ANALOG BOARD FMRR-1A & -4
(Note: pc board is marked "RFA A4")

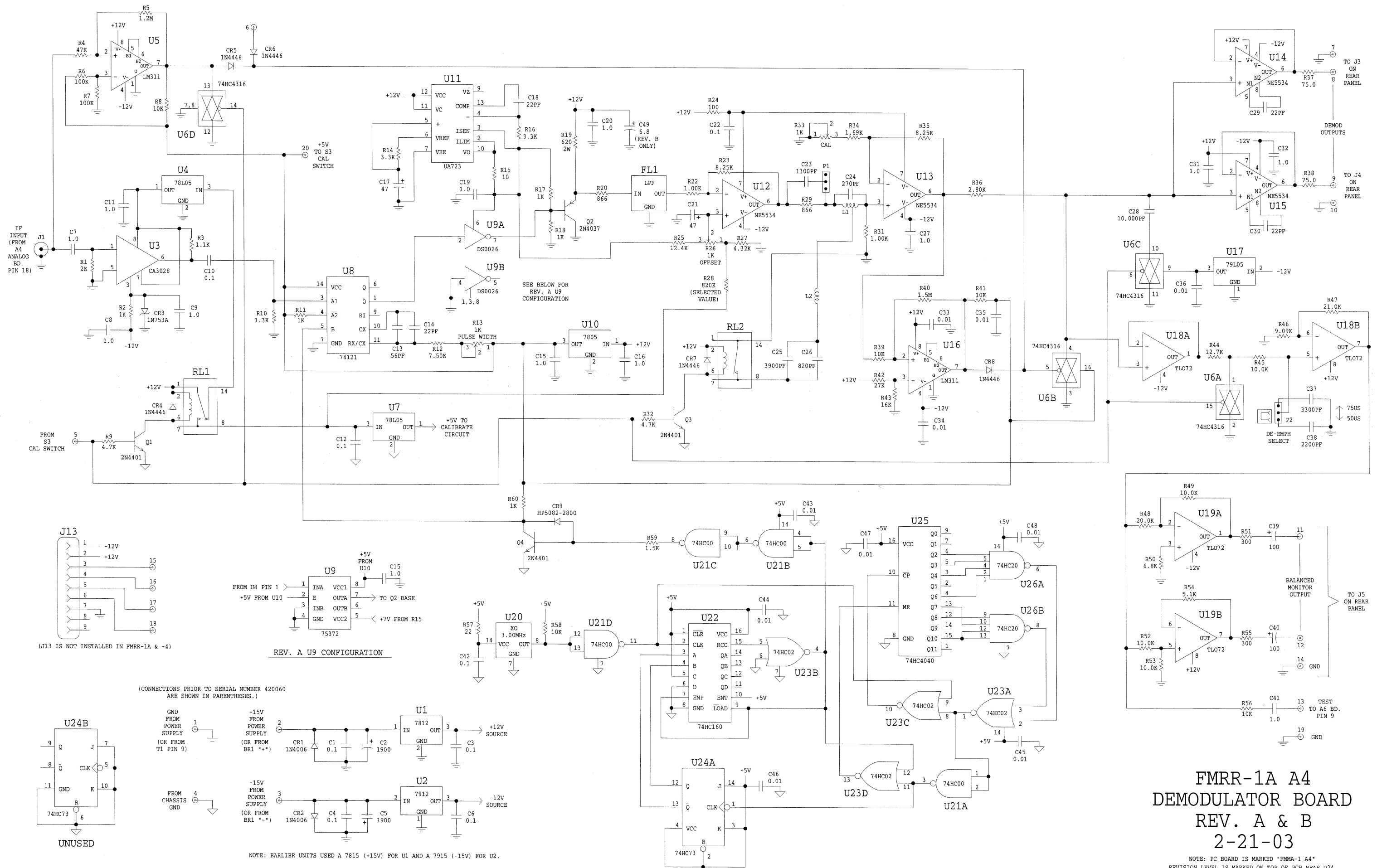
Reference Designation	Description	Part Number
C1,C2	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C3,C4	C: FIXED TANT 6.8uF 25V	0185-0002
C5	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C6,C7	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C8,C9	not used	
C10,C11	C: FIXED CERAMIC 0.001uF 1kV	0151-0002
C12	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C13	C: FIXED MICA 560pF 2%	0140-5612
C14,C15	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C16	C: FIXED MICA 560pF 2%	0140-5612
C17,C18	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C19	C: FIXED MICA 500pF 2%	0140-5012
	(C19 selected for value, nominal value shown)	
C20,C21	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C22	C: FIXED MICA 560pF 2%	0140-5612
C23,C24	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C25	C: FIXED MICA 560pF 2%	0140-5612
C26,C27	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C28	C: FIXED MICA 560pF 2%	0140-5612
C29,C30	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C31	C: FIXED MICA 500pF 2%	0140-5012
	(C31 selected for value, nominal value shown)	
C32 thru C35	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C36,C37	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C38 thru C41	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C42	C: FIXED ELEC 10uF 35V NON-POLAR	0180-0029
C43 thru C45	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C46	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C47	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C48	C: FIXED CERAMIC 0.001uF 1kV	0151-0002
C49	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C50	C: FIXED MICA 36pF 5%	0140-3605
C51	C: FIXED MICA 180pF 5%	0140-1815
C52	C: FIXED MICA 250pF 5%	0140-2515
C53	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C54	C: FIXED MICA 10pF 5%	0142-1005
C55	C: FIXED POLY 270pF 2.5% 160V	0130-2712
C56	C: FIXED POLY 1200pF 2.5% 160V	0130-1222
C57	C: FIXED POLY 1600pF 2.5% 160V	0130-1622
C58	C: FIXED POLY 1200pF 2.5% 160V	0130-1222
C59	C: FIXED POLY 270pF 2.5% 160V	0130-2712
C60 thru C62	C: FIXED CERAMIC 0.1uF 50V	0151-0006
CR1,CR2	DIODE: 1N4006	1900-0016
CR3	DIODE: 1N4446	1900-0002
L1 thru L7	COIL:	Belar
L8	CHOKE: 8.2uH	9141-0015
L9,L10	CHOKE: 15uH	9141-0025
L11	CHOKE: 8.2uH	9141-0015

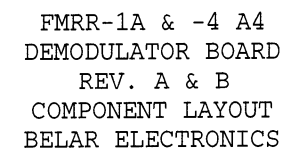
A4 ANALOG BOARD FMRR-1A & -4 cont.

Reference Designation	Description	Part Number
Q1	not used	
Q2 thru Q7	TRANSISTOR: 2N5179	1850-0023
Q8 thru Q10	TRANSISTOR: 2N4401	1850-0028
Q11	TRANSISTOR: 2N2907A	1850-0027
Q12	TRANSISTOR: 2N5179	1850-0023
Q13,Q14	TRANSISTOR: 2N4401	1850-0028
Q15	TRANSISTOR: 2N3053	1850-0008
Q16	TRANSISTOR: 2N5179	1850-0023
Q17	TRANSISTOR: 2N3053	1850-0008
R1 thru R4	not used	
R5	R: METAL FILM 510 2% 1/2W	0771-5112
R6	R: METAL FILM 300 2% 1/4W	0751-3012
R7	R: METAL FILM 18 2% 1/4W	0751-1802
R8,R9	R: METAL FILM 300 2% 1/4W	0751-3012
R10	R: METAL FILM 787 1%	0721-7870
R11	R: METAL FILM 330 2% 1/4W	0751-3312
R12	R: METAL FILM 866 1%	0721-8660
R13	R: METAL FILM 432 1%	0721-4320
R14	R: METAL FILM 2k 2% 1/4W	0751-2022
R15	R: METAL FILM 330 2% 1/4W	0751-3312
R16	R: METAL FILM 866 1%	0721-8660
R17	R: METAL FILM 432 1%	0721-4320
R18	R: METAL FILM 2k 2% 1/4W	0751-2022
R19	R: METAL FILM 330 2% 1/4W	0751-3312
R20	R: METAL FILM 1.24k 1%	0721-1241
R21	R: METAL FILM 432 1%	0721-4320
R22	R: METAL FILM 2k 2% 1/4W	0751-2022
R23	R: METAL FILM 330 2% 1/4W	0751-3312
R24	R: METAL FILM 1.24k 1%	0721-1241
R25	R: METAL FILM 432 1%	0721-4320
R26	R: METAL FILM 2k 2% 1/4W	0751-2022
R27	R: METAL FILM 330 2% 1/4W	0751-3312
R28	R: METAL FILM 2.49k 1%	0721-2491
R29	R: METAL FILM 432 1%	0721-4320
R30	R: METAL FILM 3k 2% 1/4W	0751-3022
R31	R: METAL FILM 330 2% 1/4W	0751-3312
R32	R: METAL FILM 2.49k 1%	0721-2491
R33	R: METAL FILM 1.00k 1%	0721-1001
R34	R: METAL FILM 3k 2% 1/4W	0751-3022
R35	R: METAL FILM 330 2% 1/4W	0751-3312
R36	R: METAL FILM 510 2% 1/4W	0751-5112
R37	R: METAL FILM 1k 2% 1/4W	0751-1022
R38	R: METAL FILM 300 2% 1/4W	0751-3012
R39	R: METAL FILM 33k 2% 1/4W	0751-3332
R40	R: METAL FILM 39k 2% 1/4W	0751-3932
R41	R: VAR COMP 10k, 10 TURN	2100-0024
R42	R: METAL FILM 8.2k 2% 1/4W	0751-8222

A4 ANALOG BOARD FMRR-1A & -4 cont.

Reference Designation	Description	Part Number
R43	R: METAL FILM 10k 2% 1/4W	0751-1032
R44	R: METAL FILM 51 2% 1/4W	0751-5102
R45	R: METAL FILM 39k 2% 1/4W	0751-3932
R46	R: METAL FILM 15k 2% 1/4W	0751-1532
R47	R: METAL FILM 47k 2% 1/4W	0751-4732
R48	R: METAL FILM 18k 2% 1/4W	0751-1832
R49	R: METAL FILM 100k 2% 1/4W	0751-1042
R50	R: METAL FILM 12k 2% 1/4W	0751-1232
R51	R: METAL FILM 3k 2% 1/4W	0751-3022
R52	R: METAL FILM 1k 2% 1/4W	0751-1022
R53	R: METAL FILM 510 2% 1/4W	0751-5112
R54	R: METAL FILM 220 2% 1/4W	0751-2212
R55	R: METAL FILM 680 2% 1/4W	0751-6812
R56	R: METAL FILM 1.5k 2% 1/4W	0751-1522
R57	R: METAL FILM 43.2 1%	0721-43R2
R58	R: METAL FILM 1k 2% 1/4W	0751-1022
R59	R: METAL FILM 49.9 1%	0721-49R9
R60	R: METAL FILM 62 2% 1/4W	0751-6202
R61	R: METAL FILM 220 2% 1/4W	0751-2212
R62	R: METAL FILM 5.1k 2% 1/4W	0751-5122
R63	R: METAL FILM 2.4k 2% 1/4W	0751-2422
R64	R: METAL FILM 1.3k 2% 1/4W	0751-1322
	(R64 selected for value, nominal value shown)	
R65	R: METAL FILM 510 2% 1/4W	0751-5112
R66, R67	R: METAL FILM 69.8 1%	0721-69R8
R68	R: METAL FILM 100 1%	0721-1000
R69	R: METAL FILM 1k 2% 1/4W	0751-1022
R70	R: METAL FILM 100 2% 1/4W	0751-1012
R71	R: METAL FILM 1.8k 2% 1/4W	0751-1822
R72	R: METAL FILM 330k 2% 1/4W	0751-3342
R73	R: METAL FILM 180k 2% 1/4W	0751-1842
U1	TUNER ASSEMBLY	0412-0001
U2	IC: 78L12CP	1826-0015
U3	IC: MAR-7	1845-0027
U4	IC: CA3089	1826-0046
U5	IC: 78L12CP	1826-0015
U6	IC: TUF-1	1845-0011
U7	IC: TLO71	1826-0004
Y1	XTAL: 11.35MHz	0413-1135





NOTE: PC BOARD IS MARKED "FMMA-1 A4"

FMRR-1A & -4 A4 DEMODULATOR BOARD Rev A & B
PART LOCATIONS

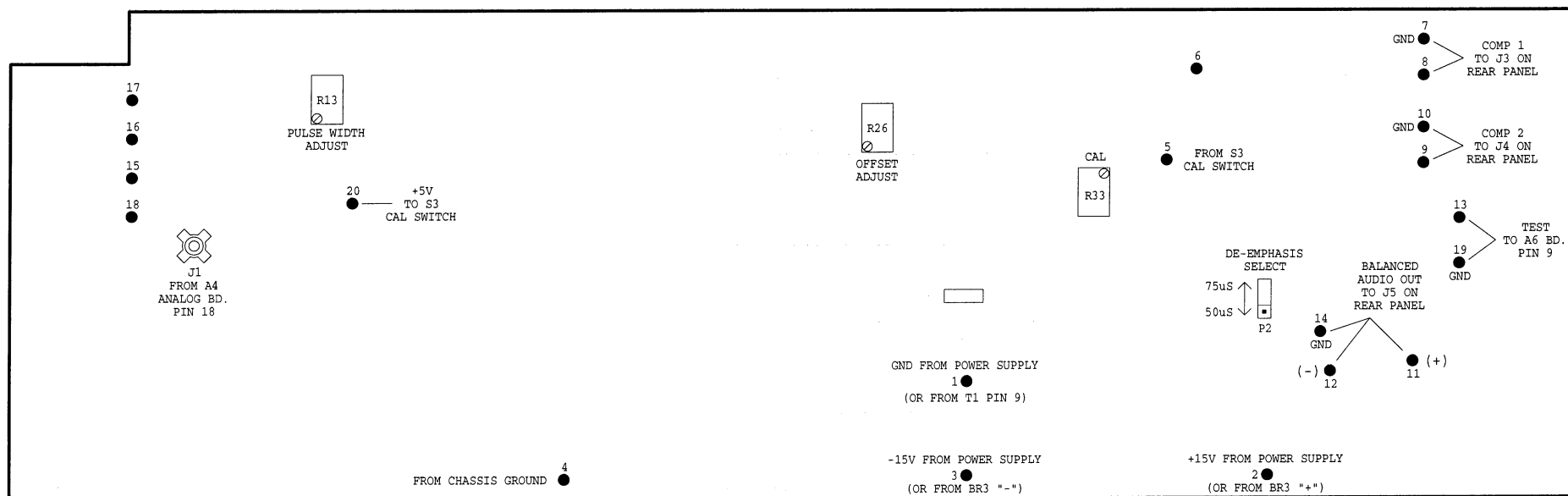
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C1	J1	C33	H2	L1	G2	R22	F2*	R54	I2	U22	B3
C2	H3	C34	H2	L2	G1	R23	F2	R55	I2	U23	C3
C3	J1	C35	H1			R24	F2	R56	I2	U24	A3
C4	J3	C36	H1	P1	G2	R25	D1	R57	C3	U25	A3
C5	F3	C37	I2	P2	H2	R26	F1	R58	C3	U26	B3
C6	J3	C38	H2			R27	F2	R59	C2		
C7	B2	C39	J2	Q1	E3	R28	E2	R60	C2	<u>pins</u>	
C8	B2	C40	I3	Q2	D1	R29	F2			1	G3
C9	B2	C41	J2	Q3	H1	R30	--	RL1	D3	2	I3
C10	B2	C42	D3	Q4	C2	R31	G2	RL2	H1	3	G3
C11	B1	C43	C3			R32	H1			4	D3
C12	D3	C44	B3	R1	B2	R33	G2	U1	J1	5	H1
C13	C1	C45	C3	R2	B2	R34	G2	U2	J3	6	H1
C14	C1	C46	A3	R3	B1	R35	G2	U3	B2	7	J1
C15	D1	C47	A3	R4	B1	R36	H1	U4	B1	8	J1
C16	B2	C48	B3	R5	B1	R37	I1	U5	B1	9	J1
C17	D1	C49	D2~	R6	B1	R38	I1	U6	H1	10	J1
C18	D2			R7	B1	R39	H2	U7	D3	11	I3
C19	D1	CR1	I3	R8	B1	R40	H2	U8	C1	12	I3
C20	D2	CR2	G3	R9	E3	R41	H2	U9	D1	13	J2
C21	E2	CR3	B2	R10	B2	R42	H2	U10	C2	14	I2
C22	F2	CR4	E3	R11	C2	R43	H2	U11	D2	15	A2
C23	F2	CR5	H1	R12	C1	R44	H2	U12	F2	16	A1
C24	G2	CR6	H1	R13	B1	R45	I2	U13	G2	17	A1
C25	F1	CR7	H1	R14	C2	R46	I2	U14	I1	18	A2
C26	F1	CR8	H1	R15	D1	R47	I2	U15	I1	19	J2
C27	G2	CR9	C2	R16	D2	R48	I2	U16	H2	20	C2
C28	I1			R17	D1	R49	I2	U17	H1		
C29	I1	FL1	E1	R18	D1	R50	I2	U18	H2		
C30	I1			R19	D1	R51	J2	U19	I2		
C31	I1	J1	B2	R20	E1*	R52	I2	U20	D3		
C32	I1			R21	--	R53	I2	U21	C3		

*under pc board

R21 & R30 not used

~C49 not used on rev. A board

pc board is marked "FMMA-1 A4"



(CONNECTIONS PRIOR TO SERIAL NUMBER 420060 ARE SHOWN IN PARENTHESES)

FMRR-1A A4
 DEMODULATOR BOARD
 REV. A & B
 CONNECTIONS & ADJUSTMENTS
 BELAR ELECTRONICS

NOTE: PC BOARD IS MARKED "FMMA-1 A4"

A4 DEMODULATOR BOARD FMRR-1A & -4 rev. A & B
(Note: pc board is marked "FMMA-1 A4")

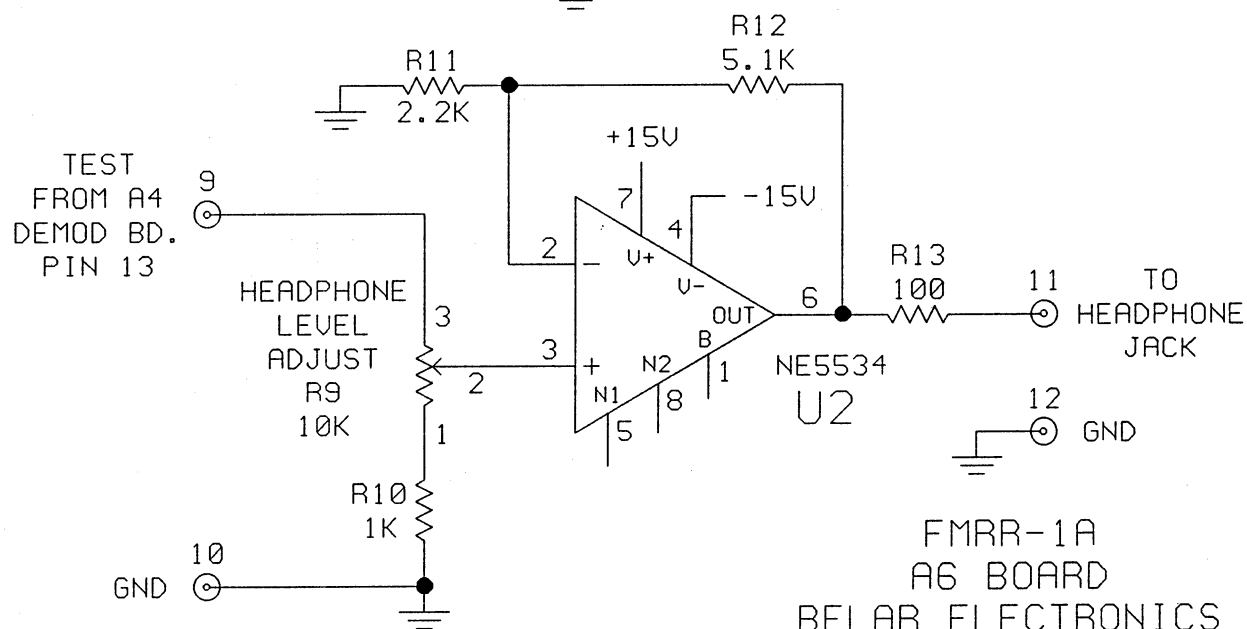
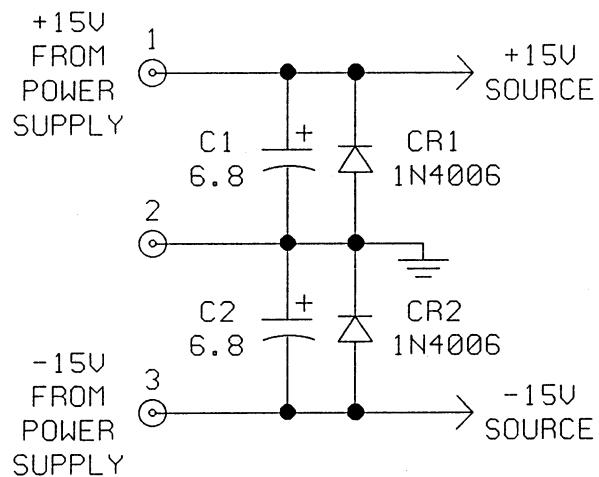
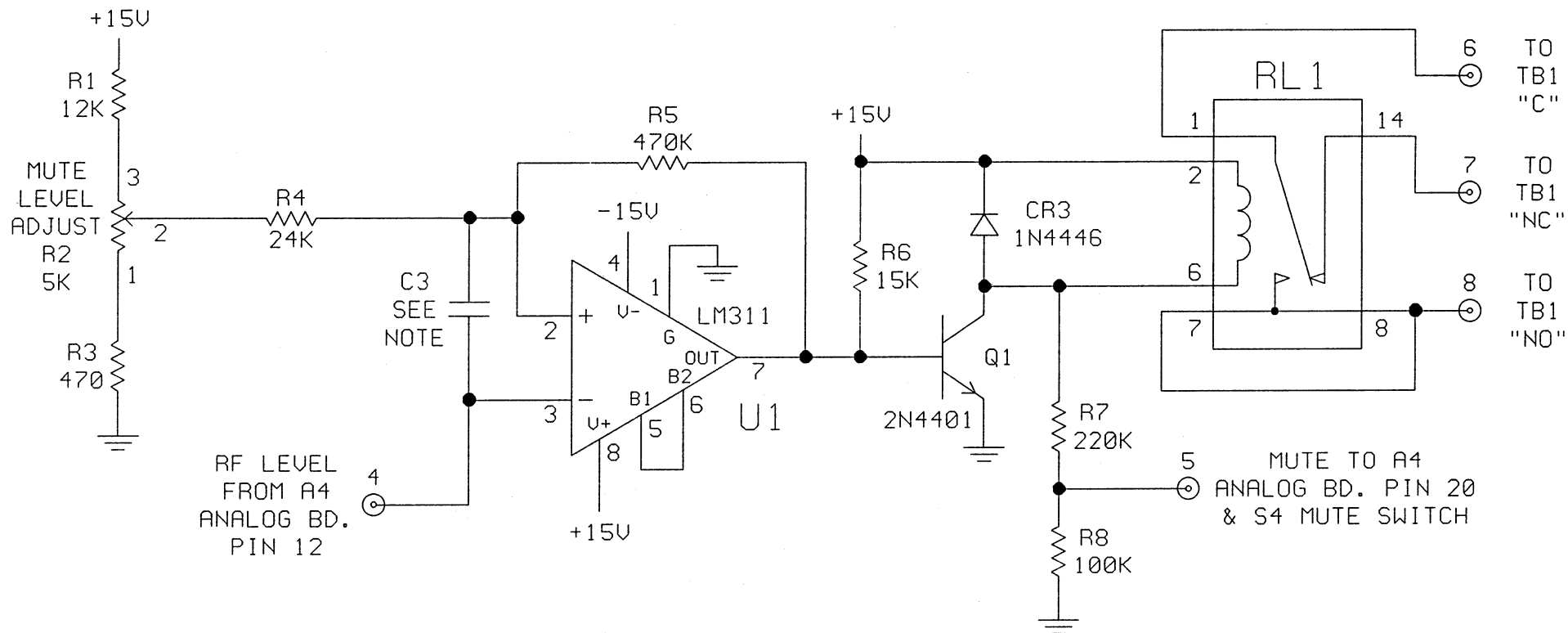
Reference Designation	Description	Part Number
C1	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C2	C: FIXED ELEC 1900uF 50V	0180-0027
C3, C4	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C5	C: FIXED ELEC 1900uF 50V	0180-0027
C6	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C7 thru C9	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C10	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C11	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C12	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C13	C: FIXED CERAMIC 56pF 100V N750	0155-0005
C14	C: FIXED MICA 22pF 5%	0140-2205
C15, C16	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C17	C: FIXED ELEC 47uF 50V	0180-0017
C18	C: FIXED MICA 22pF 5%	0142-2205
C19, C20	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C21	C: FIXED ELEC 47uF 50V	0180-0017
C22	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C23	C: FIXED MICA 1300pF 1%	0141-1321
C24	C: FIXED POLY 270pF 2.5% 160V	0130-2712
C25	C: FIXED POLY 3900pF 2.5% 160V	0130-3922
C26	C: FIXED POLY 820pF* 2.5% 160V *C26 IS SELECTED BY TEST.	0130-8212
C27	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C28	C: FIXED POLY 10000pF 2.5% 160V	0130-1032
C29, C30	C: FIXED MICA 22pF 5%	0142-2205
C31, C32	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C33 thru C36	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C37	C: FIXED POLY 3300pF 2.5% 160V	0130-3322
C38	C: FIXED POLY 2200pF 2.5% 160V	0130-2222
C39, C40	C: FIXED ELEC 100uF 35V	0180-0018
C41	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C42	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C43 thru C48	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C49*	C: FIXED TANT 6.8uF 25V	0185-0002
(*Note: C49 is not used on Rev. A boards.)		
CR1, CR2	DIODE: 1N4006	1900-0016
CR3	DIODE: 1N753A	1900-0006
CR4 thru CR8	DIODE: 1N4446	1900-0002
CR9	DIODE: HP5082-2800	1900-0026
FL1	FILTER: BELAR, LOW PASS	9120-0014
J1	JACK: SMB, PC MOUNT	0360-0040
L1	INDUCTOR: BELAR	9140-0039
L2	INDUCTOR: BELAR	9140-0038

A4 DEMODULATOR BOARD FMRR-1A & -4 rev. A & B cont.

Reference Designation	Description	Part Number
P1,P2	PLUG: 3 PIN, PC MOUNT	0365-0030
--	JUMPER: 2 PIN (USED WITH P2)	0365-0028
Q1	TRANSISTOR: 2N4401	1850-0028
Q2	TRANSISTOR: 2N4037	1850-0011
Q3,Q4	TRANSISTOR: 2N4401	1850-0028
R1	R: METAL FILM 2k 2% 1/4W	0751-2022
R2	R: METAL FILM 1k 2% 1/4W	0751-1022
R3	R: METAL FILM 1.1k 2% 1/4W	0751-1122
R4	R: METAL FILM 47k 2% 1/4W	0751-4732
R5	R: FIXED CARBON 1.2M 5% 1/4W	0683-1255
R6,R7	R: METAL FILM 100k 2% 1/4W	0751-1042
R8	R: METAL FILM 10k 2% 1/4W	0751-1032
R9	R: METAL FILM 4.7k 2% 1/4W	0751-4722
R10	R: METAL FILM 1.3k 2% 1/4W	0751-1322
R11	R: METAL FILM 1k 2% 1/4W	0751-1022
R12	R: METAL FILM 7.50k 1%	0721-7501
R13	R: VAR COMP 1k, 10 TURN	2100-0021
R14	R: METAL FILM 3.3k 2% 1/4W	0751-3322
R15	R: METAL FILM 10 2% 1/4W	0751-1002
R16	R: METAL FILM 3.3k 2% 1/4W	0751-3322
R17,R18	R: METAL FILM 1k 2% 1/4W	0751-1022
R19	R: WIRE WOUND 620 5% 2W	0811-0012
R20*	R: METAL FILM 866 1%	0721-8660
R21	not used	
R22*	R: METAL FILM 1.00k 1%	0721-1001
	(*R20 & R22 are on pc bottom)	
R23	R: METAL FILM 8.25k 1%	0721-8251
R24	R: METAL FILM 100 2% 1/4W	0751-1012
R25	R: METAL FILM 12.4k 1% (Rev. A)	0721-1242
	R: METAL FILM 12.1k 1% (Rev. B)	0721-1212
R26	R: VAR COMP 1k, 10 TURN	2100-0021
R27	R: METAL FILM 4.32k 1% (Rev. A)	0721-4321
	R: METAL FILM 5.11k 1% (Rev. B)	0721-5111
R28	R: METAL FILM 820k 2% 1/4W	0751-8242
R29	R: METAL FILM 866 1%	0721-8660
R30	not used	
R31	R: METAL FILM 1.00k 1%	0721-1001
R32	R: METAL FILM 4.7k 2% 1/4W	0751-4722
R33	R: VAR COMP 1k, 10 TURN	2100-0021
R34	R: METAL FILM 1.69k 1%	0721-1691
R35	R: METAL FILM 8.25k 1%	0721-8251
R36	R: METAL FILM 2.80k 1%	0721-2801
R37,R38	R: METAL FILM 75.0k 1%	0721-75R0
R39	R: METAL FILM 10k 2% 1/4W	0751-1032
R40	R: FIXED CARBON 1.5M 5% 1/4W	0683-1555

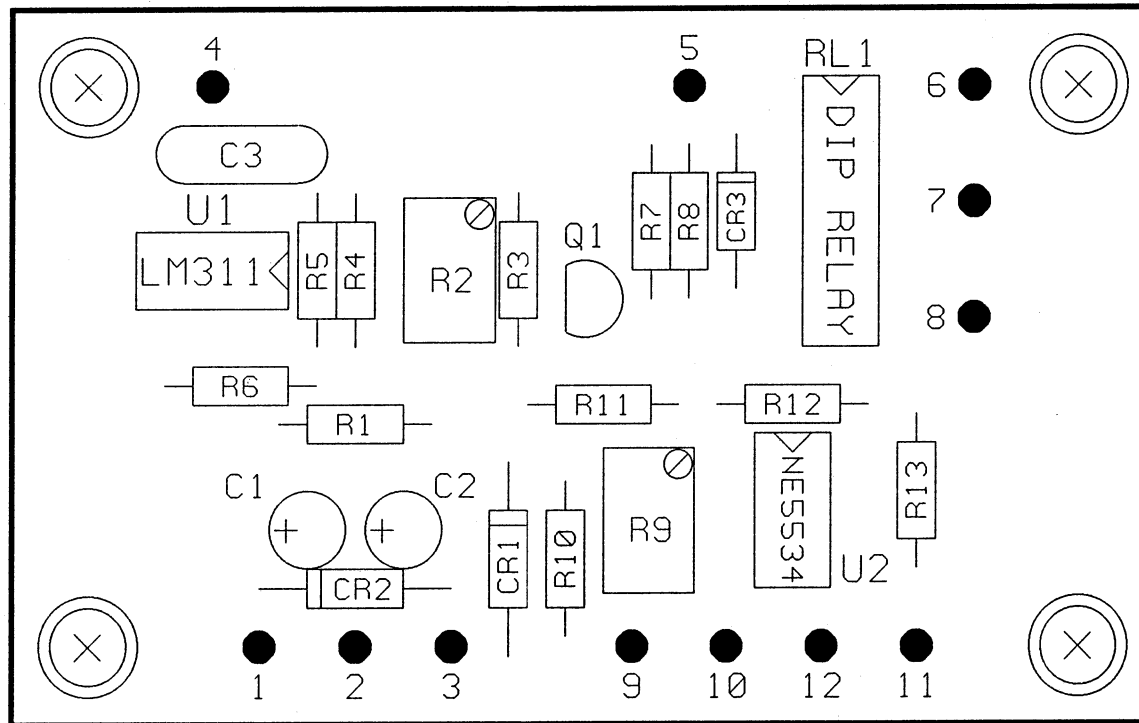
A4 DEMODULATOR BOARD FMRR-1A & -4 rev. A & B cont.

Reference Designation	Description	Part Number
R41	R: METAL FILM 10k 2% 1/4W	0751-1032
R42	R: METAL FILM 27k 2% 1/4W	0751-2732
R43	R: METAL FILM 16k 2% 1/4W	0751-1632
R44	R: METAL FILM 12.7k 1%	0721-1272
R45	R: METAL FILM 10.0k 1%	0721-1002
R46	R: METAL FILM 9.09k 1%	0721-9091
R47	R: METAL FILM 21.0k 1%	0721-2102
R48	R: METAL FILM 20.0k 1%	0721-2002
R49	R: METAL FILM 10.0k 1%	0721-1002
R50	R: METAL FILM 6.8k 2% 1/4W	0751-6822
R51	R: METAL FILM 300 2% 1/4W	0751-3012
R52, R53	R: METAL FILM 10.0k 1%	0721-1002
R54	R: METAL FILM 5.1k 2% 1/4W	0751-5122
R55	R: METAL FILM 300 2% 1/4W	0751-3012
R56	R: METAL FILM 10k 2% 1/4W	0751-1032
R57	R: METAL FILM 22 2% 1/4W	0751-2202
R58	R: METAL FILM 10k 2% 1/4W	0751-1032
R59	R: METAL FILM 1.5k 2% 1/4W	0751-1522
R60	R: METAL FILM 1k 2% 1/4W	0751-1022
RL1	RELAY: JWD-172-3	1600-0005
RL2	RELAY: JWD-171-14	1600-0004
U1	IC: 7812CT*	1826-0060
	(* earlier units used a 7815CT, P/N 1826-0031)	
U2	IC: 7912CT*	1826-0061
	(* earlier units used a 7915CT, P/N 1826-0033)	
U3	IC: CA3028	1826-0034
U4	IC: 78L05CP	1826-0012
U5	IC: LM311	1826-0009
U6	IC: 74HC4316	1822-0051
U7	IC: 78L05CP	1826-0012
U8	IC: 74121	1821-0014
U9*	IC: DS0026	1826-0021
	(*Note: On Rev. A boards, U9 is a 75372 IC, p/n 1823-0004)	
U10	IC: 7805CT	1826-0014
U11	IC: UA723	1820-0012
U12 thru U15	IC: NE5534	1826-0025
U16	IC: LM311	1826-0009
U17	IC: 79L05CP	1826-0017
U18, U19	IC: TLO72	1826-0038
U20	IC: XO, 3.000MHz	0415-0300
U21	IC: 74HC00	1822-0039
U22	IC: 74HC160	1822-0061
U23	IC: 74HC02A	1822-0040
U24	IC: 74HC73	1822-0044
U25	IC: 74HC4040A	1822-0062
U26	IC: 74HC20	1822-0060

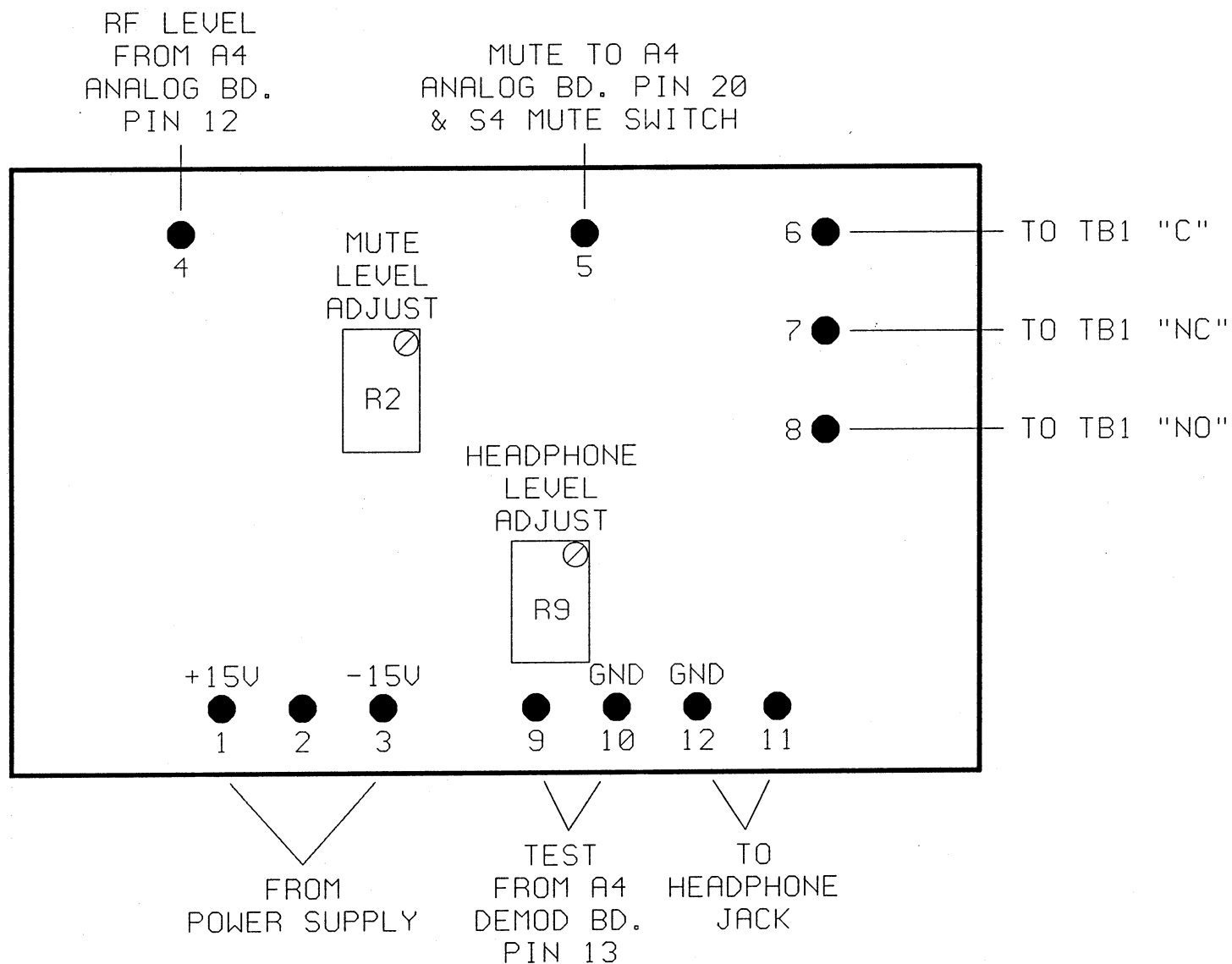


NOTE:
1. C3 ONLY USED WHEN REQUIRED.

FMRR-1A
A6 BOARD
BELAR ELECTRONICS
11-9-94



FMRR-1A A6 BOARD
 COMPONENT LAYOUT
 BELAR ELECTRONICS



FMRR-1A A6 BOARD
CONNECTIONS & ADJUSTMENTS
BELAR ELECTRONICS

A6 BOARD FMRR-1A

Reference Designation	Description	Part Number
C1, C2	C: FIXED TANT 6.8uF 25V	0185-0002
C3*	C: FIXED MICA 5%	
	*C3 only used when required	
CR1, CR2	DIODE: 1N4006	1900-0016
CR3	DIODE: 1N4446	1900-0002
Q1	TRANSISTOR: 2N4401	1850-0028
R1	R: METAL FILM 12k 2% 1/4W	0751-1232
R2	R: VAR COMP 5k, 10 TURN	2100-0020
R3	R: METAL FILM 470 2% 1/4W	0751-4712
R4	R: METAL FILM 24k 2% 1/4W	0751-1242
R5	R: METAL FILM 470k 2% 1/4W	0751-4742
R6	R: METAL FILM 15k 2% 1/4W	0751-1532
R7	R: METAL FILM 220k 2% 1/4W	0751-2242
R8	R: METAL FILM 100k 2% 1/4W	0751-1042
R9	R: VAR COMP 10k, 10 TURN	2100-0024
R10	R: METAL FILM 1k 2% 1/4W	0751-1022
R11	R: METAL FILM 2.2k 2% 1/4W	0751-2222
R12	R: METAL FILM 5.1k 2% 1/4W	0751-5122
R13	R: METAL FILM 100 2% 1/4W	0751-1012
RL1	RELAY: JWD-172-3	1600-0005
U1	IC: LM311	1826-0009
U2	IC: NE5534	1826-0025

