

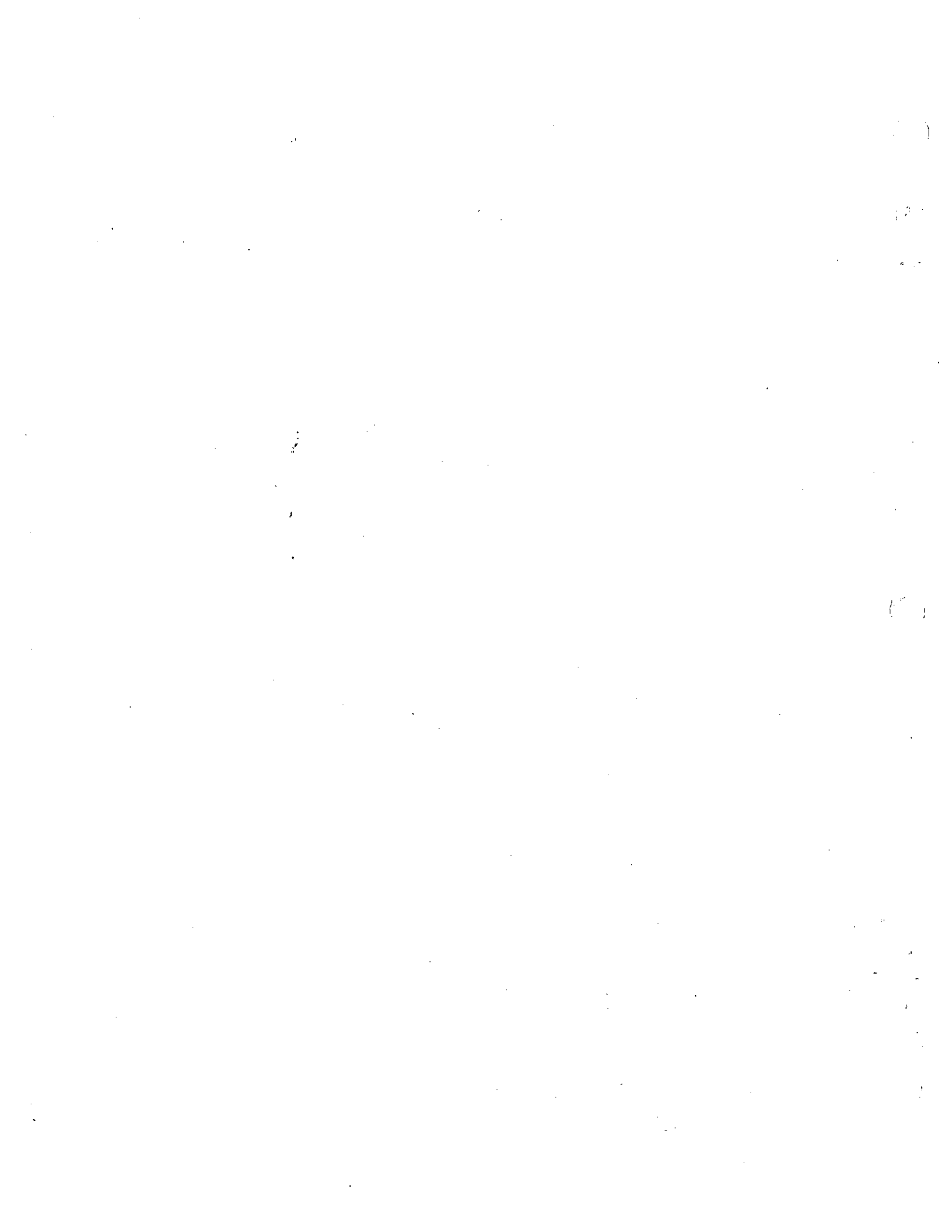
# **LED METERING**

## **Installation and Operations Manual**

***RADIO SYSTEMS***

5113 WEST CHESTER PIKE • EDGEMONT, PA 19028 • 215/356-4700

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## LED METERING

The Radio System's LED Bar Graph meter is designed to be used as an independent VU or peak reading audio-level meter. Each meter is manufactured as a stand-alone device with companion audio input and power supply circuitry. The meters are available packaged in a table-top box, or on a bracket for customer custom mounting. These brackets are also available factory rack mounted in 1, 2, 3 or 5 meter assemblies. The 1, 2 and 3 meter assemblies are mounted horizontally on a 3 1/2" high (2 rack unit) panel. Five meter assemblies are mounted vertically on a 7" high (4 rack units) panel.

### Interconnection

The input impedance of each meter amplifier channel is 40k ohms. They can be connected directly across any balanced line without effecting signal level or frequency response. For unbalanced lines, connect the hot side of the input to the "+" terminal of the meter, and the ground side of the input in common to the "-" and "G" meter terminals.

For 0 VU, input levels can be as low as 50 mv (-24 dbm). Maximum recommended input level for 0 VU is 2.5 v (+10 dbm).

### Calibration and Operation

Each meter has three adjustments, which should be made using a tone generator. Refer to illustration 12B, for the location of all of the variable meter controls on the rear of each meter.

To set meter sensitivity, connect a tone generator to an input. Use an independent, calibrated meter to determine that the input levels are at the desired value. Set the meter response mode switch for VU. Adjust the left and right sensitivity controls to light the last yellow LED, for 0 VU reading.

To set the peak flasher, first determine what level above 0 db you want the flasher to indicate. This will depend on overall system headroom, and/or processing. However, between 10 db and 14 db is generally practical. Increase the tone level by this amount, as indicated on the external reference meter. The bar graph meter should "peg". Set the peak indicator threshold control to just light the peak indicator LED on the back of the meter. This LED is provided, unlike the peak lamp on the front of the meter, to have no holding function - enabling more accurate calibration.

To operate the meter in the peak mode, select peak on the response mode switch and follow the same calibration procedure. However, sensitivity controls should be adjusted with the tone set at the peak value of the desired nominal output level. Otherwise, meters will be overly sensitive, and "peg" continuously. It is suggested that the peak flasher be adjusted to illuminate at this same peak level.

### Circuit Description

Circuit board VM2 performs signal processing for both channel displays. IC201 and IC202 are input amplifiers and precision full wave rectifiers. One section of each quad IC is a DC amplifier which provide proper drive signal to the bar graph drivers.

SW1 selects the detector mode for VU or peak displays.

IC203 is a comparator which looks simultaneously at left and right signals and will trigger the peak flasher when either level exceeds the set level. D209 indicates peaks before the holding circuit to enable more precise setting of the peak.

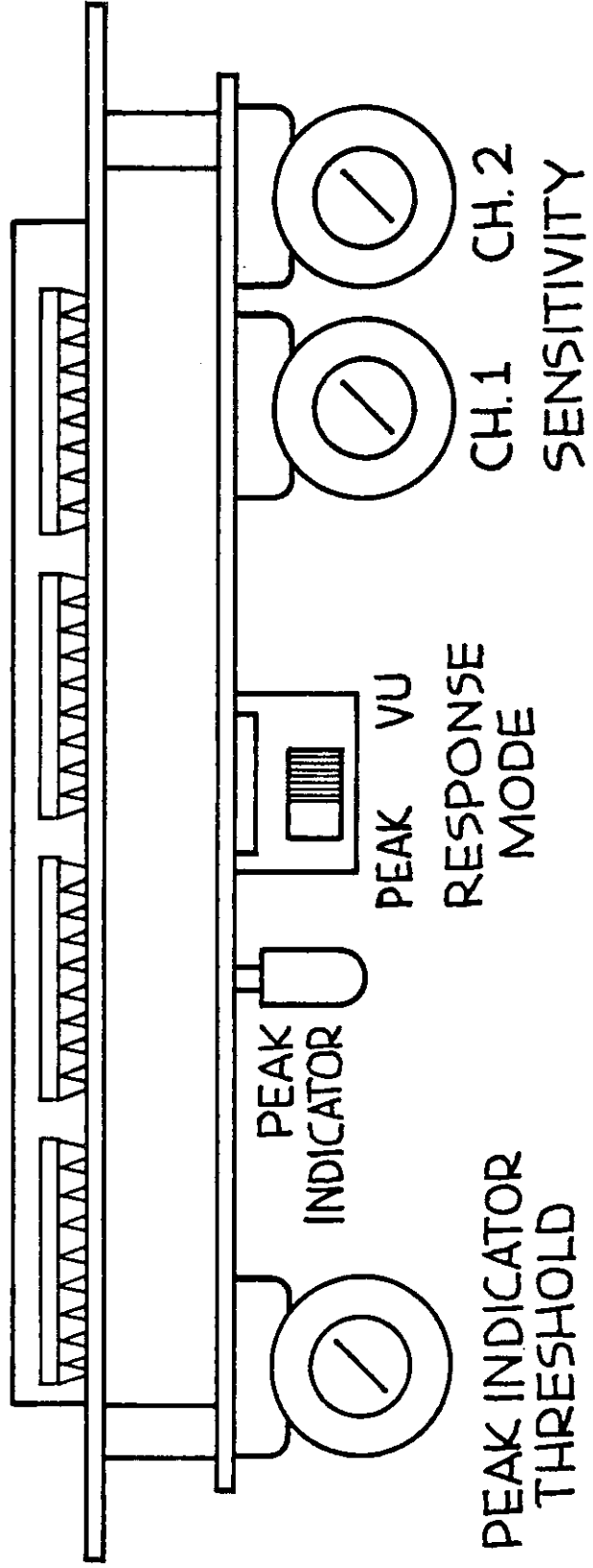
Board VM1 is the display and driver board. The driver chips are operated in the bar mode with their reference ladders connected in series. Each ladder is shunted by a precision resistor for maximum accuracy. JC109 provides on-card regulation of the reference ladder source voltage.

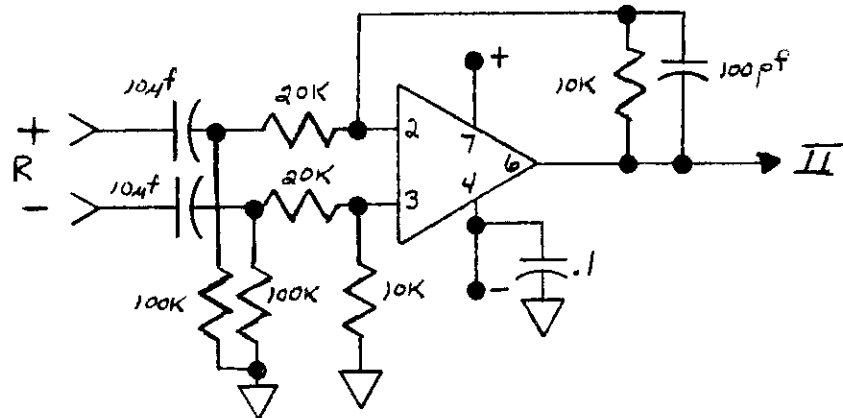
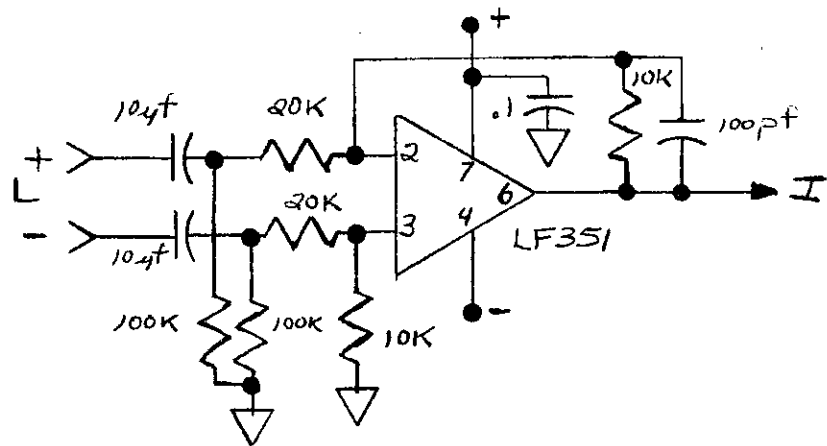
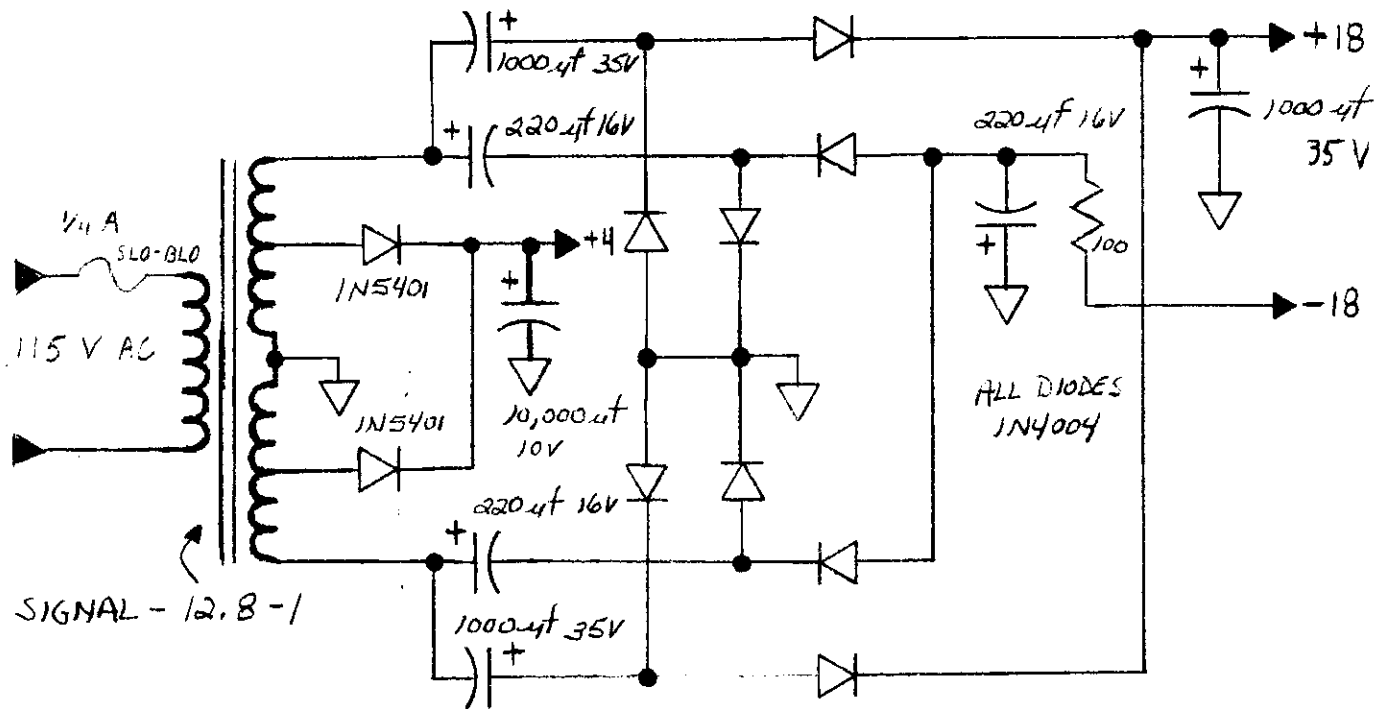
The power supply/audio input board provides unregulated +4 volts for the LED segments and unregulated +18 volts for signal processing. It also houses two op amp, balanced audio input stages. These amplifiers run at a gain of 1/2 to preserve the headroom of the meter input stages.

### Warranty

Radio Systems warrants for one year from date of purchase, parts and labor on any unit returned to us for repair. Please ship the unit prepaid with a note detailing the malfunction and reason for return. Repair and return of the unit will be made promptly. Within the warranty period, there is no charge for this service on units which show no sign of misuse or unauthorized alterations.

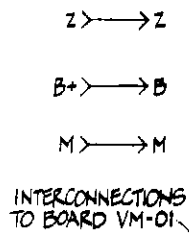
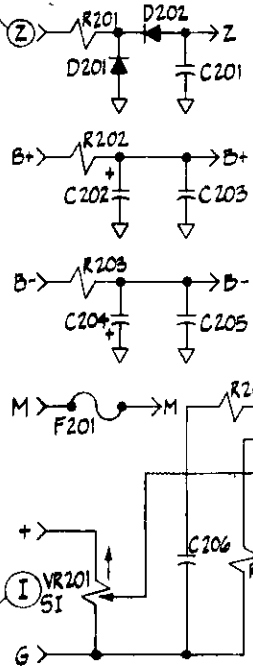
Illustration 12-B  
Bar graph meter control locations



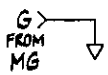
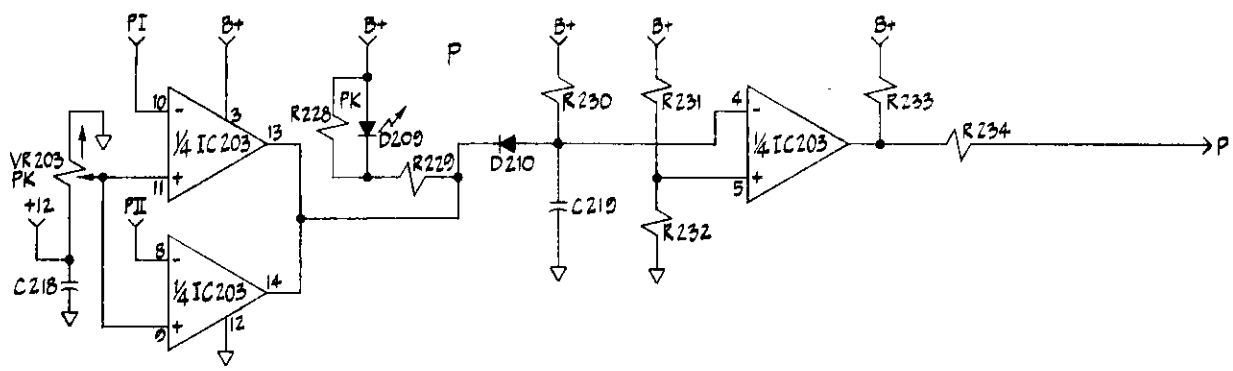
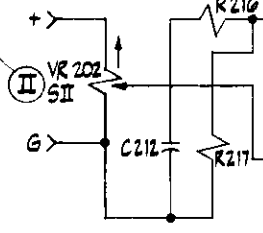




**POWER SUPPLY  
TERMINAL DESIGNATIONS**



**SIGNAL INPUT DESIGNATIONS**



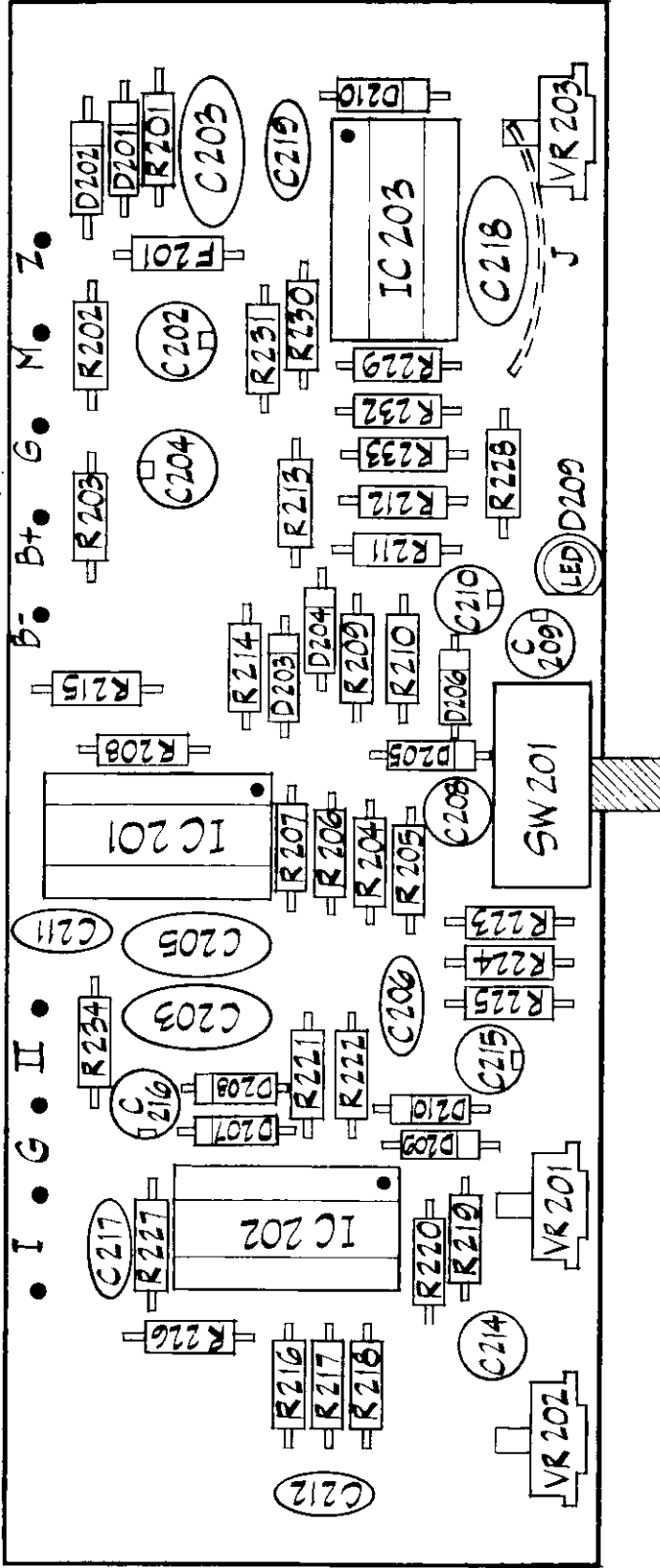
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Drawn By <b>RS</b>	Date <b>6/83</b>	Radio Systems Inc. Edgemont PA
Checked By <b>EC</b>	Date <b>9/83</b>	Product
Dwg VM-2	Type <b>SCH.</b>	Title <b>BAR GRAPH SIGNAL</b>



SIGNAL INPUTS



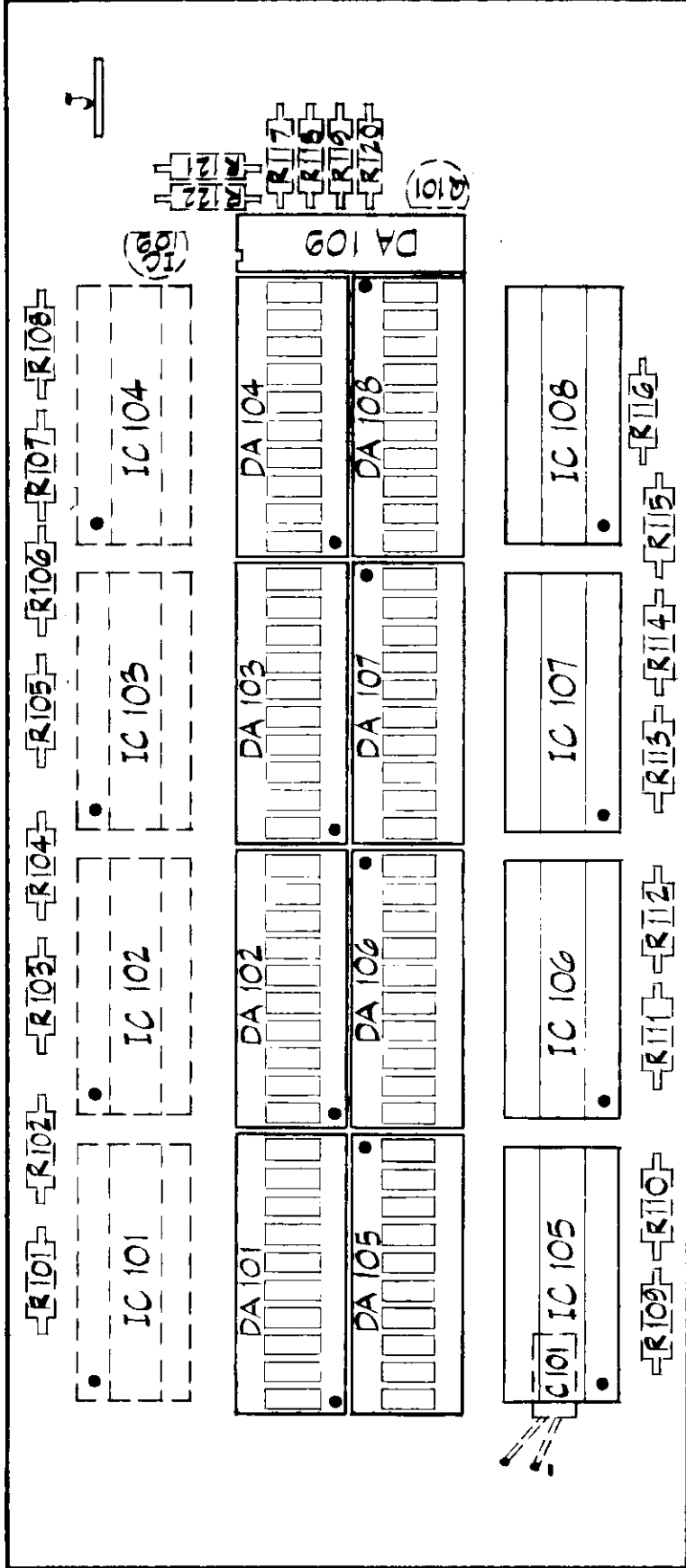
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Drawn By **RS**  
 Checked By **EC**  
 Dwg. No. **VM-2**

Date **6/83**  
 Date **9/83**  
 Type **P.C. LAYOUT**

Radio Systems Inc.  
 Edgemont PA  
 Product  
 Title **BAR GRAPH SIGNAL**





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	Drawn By <b>RS</b>	Date <b>6/83</b>
	Checked By <b>EC</b>	Date <b>9/83</b>
Dwg. No. <b>VM.1</b>	Type <b>P.C. LAYOUT</b>	Title <b>BAR GRAPH DISPLAY</b>
Radio Systems Inc. Edgemont PA Product		Title <b>BAR GRAPH DISPLAY</b>

## BAR GRAPH METER ASSEMBLY PARTS LIST

VM-01 (numbers starting at 100) and VM-02 (numbers starting at 200)

C101	Capacitor upright electrolytic 47 uf 16v
DA101	LEd array H-P HDSP-4850 (green)
DA102	LED array H-P HDSP-4850 (green)
DA103	LED array H-P HDSP-4840 (yellow)
DA104	LED array H-P HDSP-4830 (red)
DA105	LED array H-P HDSP-4850 (green)
DA106	LED array H-P HDSP-4850 (green)
DA107	LED array H-P HDSP-4840 (yellow)
DA108	LED array H-P HDSP-4830 (red)
DA109	LED array H-P HDSP-2350 (red)
IC101	Integrated circuit display driver LM 3914N
IC102	Integrated circuit display driver LM 3914N
IC103	Integrated circuit display driver LM 3914N
IC104	Integrated circuit display driver LM 3914N
IC105	Integrated circuit display driver LM 3914N
IC106	Integrated circuit display driver LM 3914N
IC107	Integrated circuit display driver LM 3914N
IC108	Integrated circuit display driver LM 3914N
IC109	Integrated circuit 12V regulator MC 78L12CP
Q101	Transistor 2N3904
R101	Resistor, metal film 221 ohm 1/8W 1%
R102	Resistor, carbon film 2.2k 1/8W 5%
R103	Resistor, metal film 221 ohm 1/8W 1%
R104	Resistor, metal film 2.2K 1/8W 1%
R105	Resistor, metal film 221 ohm 1/8W 1%
R106	Resistor, carbon film 2.2k 1/8W 5%
R107	Resistor, metal film 280 ohm 1/8W 1%
R108	Resistor, carbon film 2.2k 1/8W 5%
R109	Resistor, metal film 221 ohm 1/8W 1%
R110	Resistor, carbon film 2.2k 1/8W 5%
R111	Resistor, metal film 221 ohm 1/8W 1%
R112	Resistor, carbon film 2.2k 1/8W 5%
R113	Resistor, metal film 221 ohm 1/8W 1%
R114	Resistor, carbon film 2.2k 1/8W 5%
R115	Resistor, metal film 280 ohm 1/8W 1%
R116	Resistor, carbon film 2.2k 1/8W 5%
R117	Resistor, carbon film 100 ohm 1/8W 5%
R118	Resistor, carbon film 100 ohm 1/8W 5%
R119	Resistor, carbon film 100 ohm 1/8W 5%
R120	Resistor, carbon film 100 ohm 1/8W 5%
R121	Resistor, carbon film 2.2k 1/8W 5%
R122	Resistor, carbon film 1k 1/8W 5%

C201	Capacitor, dipped mylar	.1uF
C202	Capacitor, upright electrolytic	220uF 25v
C203	Capacitor, dipped mylar	.1uF
C204	Capacitor, upright electrolytic	220uF 25v
C205	Capacitor, dipped mylar	.1uF
C206	Capacitor, disc ceramic	.001uF
C207	Capacitor, non-polar upright electrolytic	2.2uF 25v
C208	Capacitor; upright electrolytic	2.2uF 25v
C209	Capacitor, upright electrolytic	3.3uF 25v
C210	Capacitor, disc ceramic	.47uF 50v
C211	Capacitor, disc ceramic	18pF
C212	Capacitor, non-polar upright electrolytic	.001uF
C213	Capacitor, upright electrolytic	3.3uF 25v
C214	Capacitor, upright electrolytic	2.2uF 25v
C215	Capacitor, disc ceramic	3.3uF 25v
C216	Capacitor, dipped mylar	.47uF 50v
C217	Capacitor, disc ceramic	18pF
D201	Signal diode 1N4148	
D202	Signal diode 1N4148	
D203	Signal diode 1N4148	
D204	Signal diode 1N4148	
D205	Signal diode 1N4148	
D206	Signal diode 1N4148	
D207	Signal diode 1N4148	
D208	Signal diode 1N4148	
D209	Signal diode 1N4148	
D210	Signal diode 1N4148	
D211	Signal diode 1N4148	
D212	LED diode H-P HLMP 3000 (red)	
IC201	Integrated circuit quad op amp	LF347N
IC202	Integrated circuit quad op amp	LF347N
IC203	Integrated circuit quad comparator	LM339N
R201	Resistor, carbon film	10 ohm 1/4w 5%
R202	Resistor, carbon film	10 ohm 1/4w 5%
R203	Resistor, carbon film	10 ohm 1/4w 5%
R204	Resistor, carbon film	20k 1/4w 5%
R205	Resistor, carbon film	1k 1/4w 5%
R206	Resistor, carbon film	20k 1/4w 5%
R207	Resistor, carbon film	100k 1/4w 5%
R208	Resistor, carbon film	270k 1/4w 5%
R209	Resistor, carbon film	270k 1/4w 5%
R210	Resistor, carbon film	270k 1/4w 5%
R211	Resistor, carbon film	20k 1/4w 5%
R212	Resistor, carbon film	62k 1/4w 5%
R213	Resistor, carbon film	100k 1/4w 5%
R214	Resistor, carbon film	4.7k 1/4w 5%
R215	Resistor, carbon film	100k 1/4w 5%
F201	Fuse, picofuse style 2A	

R216	Resistor, carbon film	20k	1/4w	5%
R217	Resistor, carbon film	1k	1/4w	5%
R218	Resistor, carbon film	20k	1/4w	5%
R219	Resistor, carbon film	100k	1/4w	5%
R220	Resistor, carbon film	270k	1/4w	5%
R221	Resistor, carbon film	270k	1/4w	5%
R222	Resistor, carbon film	270k	1/4w	5%
R223	Resistor, carbon film	20k	1/4w	5%
R224	Resistor, carbon film	62k	1/4w	5%
R225	Resistor, carbon film	100k	1/4w	5%
R226	Resistor, carbon film	4.7k	1/4w	5%
R227	Resistor, carbon film	100k	1/4w	5%
R228	Resistor, carbon film	10k	1/4w	5%
R229	Resistor, carbon film	2.2k	1/4w	5%
R230	Resistor, carbon film	22m	1/4w	5%
R231	Resistor, carbon film	1k	1/4w	5%
R232	Resistor, carbon film	10k	1/4w	5%
R233	Resistor, carbon film	10k	1/4w	5%
R234	Resistor, carbon film	10k	1/4w	5%
SW201	Switch, DPDT Alco MSS	2250	RG	
VR201	Potentiometer, trimmer, side adjust	10k		
VR202	Potentiometer, trimmer, side adjust	10k		
VR203	Potentiometer, trimmer, side adjust	10k		

