

ARIES System 300 Music Synthesizer Module AR-327
Multifunction Voltage-Controlled Filter
Assembly Instructions

(Please refer to the System 300 General Assembly Instructions as a general guide to parts identification and mounting.)

We highly recommend that you:

- (a) Find a place where you can work through completion, without disturbing set-up.
- (b) Use adequate lighting.
- (c) Make sure your hands are free of grease or oil which would interfere with proper soldering.
- (d) Check off each of the following steps, as you proceed.

- () 1. PREPARATION: Lay the printed circuit board, METAL FOIL SIDE DOWN, on a sheet of white paper. Turn board so that connector strip is to the left.

Place the LAYOUT DRAWING down flat, near the board.

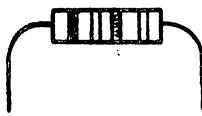
Unpack all parts carefully, and place in a large box or tray, so they won't get lost.

Have the following tools nearby:

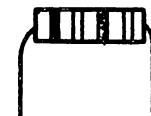
- * Pencil - tip soldering iron, hot, clean, and tinned (solder coated).
- * Solder---USE ONLY thin ROSIN-CORE (Electronic grade) solder. Any other type will destroy the connections, and voids the warranty!
- * Small Diagonal wire cutters.
- * Small wire stripper.
- * Small long-nose pliers.
- * Small or medium flat-blade screwdriver.

- ✓ 2. RESISTORS : Carefully install all 52 resistors on the board (labelled R1 thru R52 on the Layout drawing, Schematic drawing, and Parts list). NOTE: To avoid possible lead breakage, bend leads about 1/16" away from body of resistor, as shown here:

CORRECT:



INCORRECT:



Incidentally, you should use the same caution on other components.

- ✓ 3. POTTED EXPONENTIAL BLOCK : This MAY be already installed on board. If NOT, insert the 6 wires as shown on Layout drawing, and solder.

- ✓ 4. DIODES : Install all 4 (D1 thru D4). OBSERVE POLARITY ! (Direction of band).

- ✓ 5. CAPACITORS : Install C1 through C15. On C1,2,& 14, observe polarity. Note, also, that C8 & C10 are Mica or Film capacitors, rather than Discs.

ARIES AR-327 Assembly Instructions (cont'd)

- (V) 6. TRIMPOTS : Install T1 through T6 on the board.
- (V) 7. TRANSISTORS : Carefully install all 6 transistors, as shown on the Layout drawing.(Q1 thru Q6) Note that there 3 different type numbers (see also the Parts List.)
- () 8. INTEGRATED CIRCUITS (301 Type) : Install all 5, paying particular attention to the position of the tab above pin 8. These devices may be labelled LM 301, SG 301, LM 301A, etc., the important thing being the number 301. (U1,2,4,6,8).
- () 9. INTEGRATED CIRCUITS (CA 3080 Type) : Install all 3 (U3,5,7). Observe position of tab.
- () 10. JUMPER WIRES : Cut and strip a piece of INSULATED wire to fit where J1 is shown, on the Layout drawing. Install. Repeat for J2 thru J7.

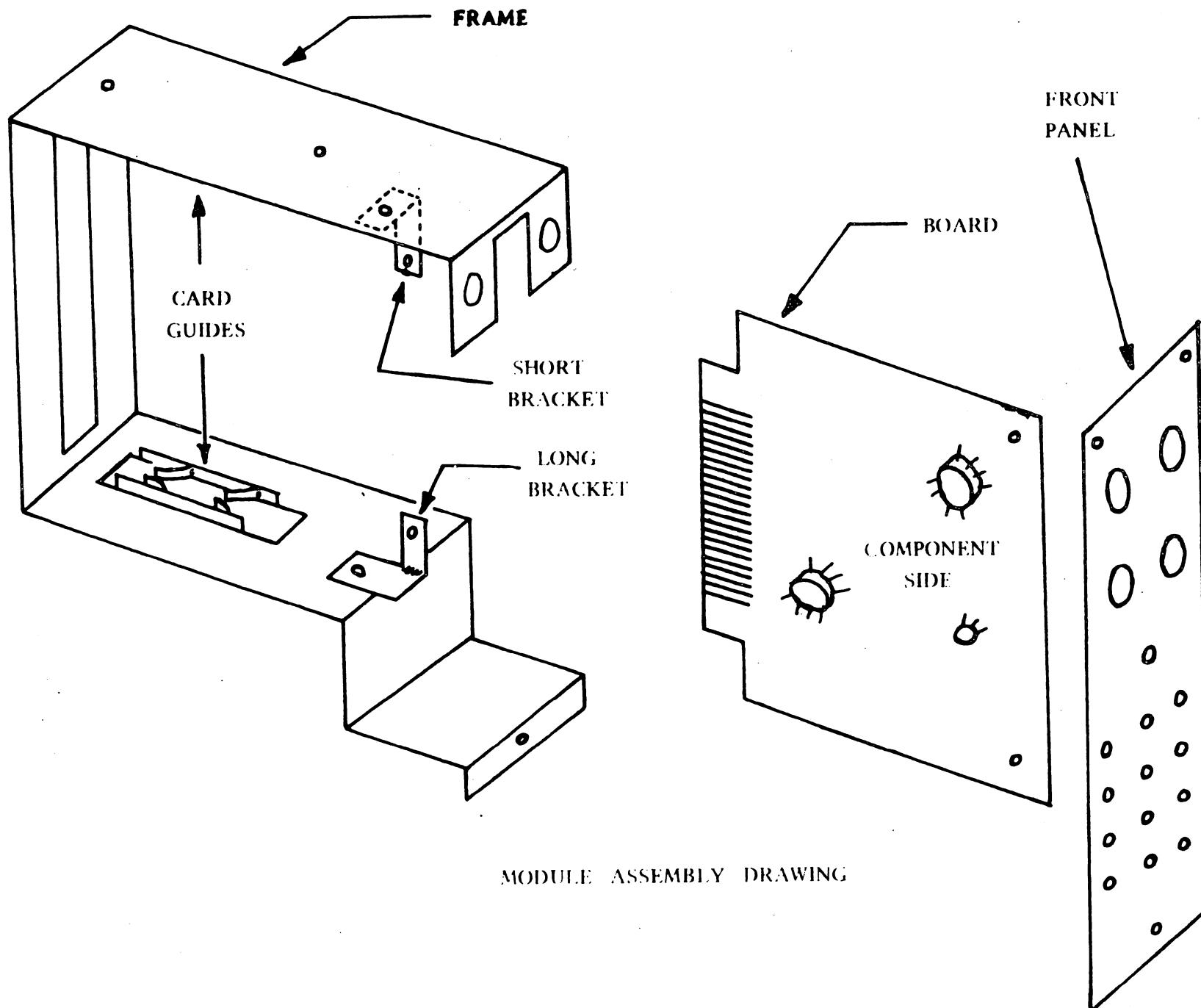
THIS COMPLETES ASSEMBLY OF THE P.C. BOARD

MODULE ASSEMBLY & PANEL WIRING :

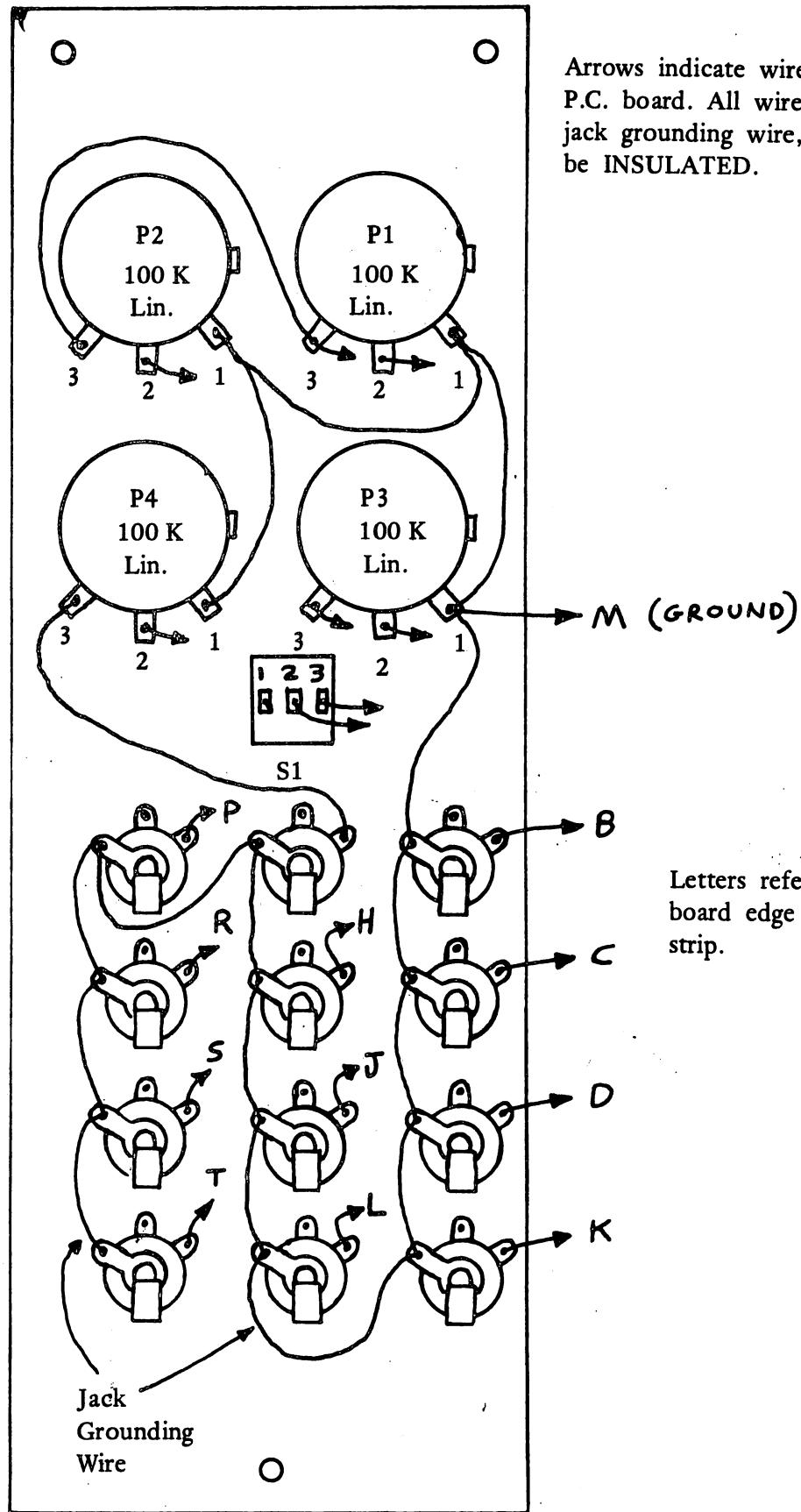
Please refer to Module Assembly drawing.

- () 1. Unpack the frame, bag of hardware, and front panel.
- () 2. Snap the two plastic card guides into the holes in the frame. Be sure that the pairs of tabs point toward the rear, as shown.
- () 3. Slide the printed circuit board into the frame, holding top and bottom of frame together against board, so that the board fits snugly in the guides, between the tabs.
- () 4. Using the 4-40 x 3/8" screws & nuts, mount the two angle brackets to the frame, as shown. The brackets should be on the component side of the board.
- () 5. Now screw the board to the brackets. Insert the 4-40 x 3/8" screw from foil side of board. DOUBLE CHECK THAT SCREW HEAD DOES NOT TOUCH ANY METAL FOIL !!!
- () 6. Refer to PANEL WIRING Diagram. Be careful to avoid scratching front of panel. Mount all 12 mini-phone jacks. Insert jacks from rear, and place washer on front of panel. Tighten nut WITH JACK IN POSITION SHOWN.
- () 7. Connect the ground terminals of the jacks together, as shown (labeled "Jack Grounding Wire" on wiring diagram). Use insulated wire.
- () 8. Mount the switch (S1) on the panel, as shown. Tighten nut over washer on front, being careful not to scratch panel surface.
- () 9. Mount the two LOWER potentiometers (pots) only (P3 and P4), as follows: First, if there is a tab sticking up parallel to the shaft, bend it away. Put lockwasher on pot, and insert pot through hole in panel, from rear. Install nut on front, and tighten WITH POT TURNED IN DIRECTION SHOWN.

ARIES SYSTEM 300



**AR-327 Multifunction VCF PANEL WIRING DIAGRAM
(Rear View)**



ARIES AR-327 Assembly Instructions (cont'd)

- () 10. Refer again to MODULE ASSEMBLY drawing. Mount top of panel to frame, using the two UPPER pots (P1 and P2): Bend tab, if any, away; put on lockwasher; and insert pot shaft through rear of upper holes in front of frame. Bring panel against frame, so these pots also go through matching holes in panel. Tighten nuts on front of panel, with pots oriented in same direction as lower pots.
- () 11. Attach bottom of panel to frame, using remaining 4-40 x 3/8" screws & nuts.
- () 12. Turn all pot shafts fully counterclockwise, and mount the knobs pointing to the leftmost number. Tighten knob screws.

THIS COMPLETES MODULE ASSEMBLY, EXCEPT FOR FINAL PANEL WIRING.

PANEL WIRING ---- Refer to PANEL WIRING diagram and P.C. LAYOUT drawing:

- () 1. Run a wire from the ground of the upper right jack (viewed from rear of panel, as on drawing), to pin 1 of P3; then to pin 1 of P1, to pin 1 of P2, and finally to pin 1 of P4.
- () 2. Now connect a wire from pin 1 of P3 to the hole in terminal "M" of the P.C. board edge connector strip.
- () 3. Run a wire from pin 3 of P4 to the TIP terminal of the TOP CENTER jack, as shown.
- () 4. Run a wire from pin 3 of P2 to pin 3 of P1. Now connect pin 3 of P1 to the point shown on the LAYOUT drawing, labelled "P1-3, P2-3", on the P.C. board.
- () 5. Connect pin 2 of P1 to the corresponding point on the board, as shown on Layout.
- () 6. Connect pin 2 of P2 to its corresponding point on board.
- () 7. Connect pin 2 of P3 to its corresponding point on board.
- () 8. Connect pin 2 of P4 to its corresponding point on board.
- () 9. Connect pin 3 of P3 to its corresponding point on board.
- () 10. Now, wire pins 2 and 3 of switch S1 to their appropriate points on the board. (pin 1 of S1 has no connection.)
- () 11. Finally, wire ONE AT A TIME, the tip terminals of the 11remaining jacks, to the holes in the board edge connector strip, indicated by the lettered arrows on the PANEL WIRING diagram. Wire in the following order, checking each letter as you go:

() P () R () S () T () H () J () L () B () C
 () D () K

YOUR AR-327 Multifunction V.C.F. is now COMPLETELY ASSEMBLED, and ready for trimming.

NOTE : It is highly advisable to thoroughly dust off the board with a toothbrush, etc., to remove any metal particles, or other debris. If washing the board becomes necessary, use ONLY clean toluene. NEVER use water, alcohol, or anything else!

ARIES AR-327 Multifunction V.C.F. TRIM PROCEDURE

All that remains now is for the 7 trimpots to be adjusted. Although not difficult, you should approach this procedure with care and patience, in order to obtain maximum performance.

REQUIRED : ± 15 Volt, dual regulated Power Supply, such as ARIES AR-322

A.C./D.C. Voltmeter or D.C. Coupled Oscilloscope

Audio Sine Wave Generator, such as ARIES AR-317 V.C.O.

OPTIONAL : D.C. Oscilloscope

Square Wave Generator (AR-317 also has square wave.)

- (✓) 1. Refer to the AR-327 P.C. Layout drawing. Find T7 (H.F. Q. trim). Turn T7 FULLY COUNTERCLOCKWISE (left).
- (✓) 2. Turn ALL 6 OTHER TRIMPOTS to approximate CENTER of their rotation.
- (✓) 3. BEFORE TURNING ON power supply, connect the + 15 V output to terminal "A" of the AR-327 P.C. edge connector strip. Connect power supply GROUND to terminal "M", or to the AR-327 frame. Connect the - 15 V output to terminal "Z".
CAUTION !! IMPROPER CONNECTIONS CAN DESTROY COMPONENTS !
- (✓) 4. Set Voltmeter (or Scope) on appropriate range for measuring up to 15 volts D.C. Connect POS meter lead to AR-327 frame, and NEG lead to the end of R19 which comes from the potted Exponential module (the end towards connector strip).
- (✓) 5. Set FRONT PANEL controls as follows: FREQUENCY knob up fully (16K), RESONANCE knob fully left (0.5), AUDIO knob at 0, and Fc CONTROL knob at 0.
- (✓) 6. TURN ON POWER SUPPLY. IMMEDIATELY feel ALL I.C.'s and TRANSISTORS repeatedly, for about 30 seconds, to check for overheating. Slight warming is normal on the I.C.'s, but TURN POWER OFF IMMEDIATELY in the event of any device becoming HOT to the touch! In this case, check your wiring, and check for any shorts, such as metal specks on the board.
- (✓) 7. If all seems well, adjust T1 (Frequency trim) for a reading of 1 Volt on the meter. Now, shift the NEG meter lead to R23 (end towards connector strip). The voltage here should be between 0 and 8 volts.
- (✓) 8. Connect meter NEG lead to the end of R51 nearest the connector strip. Leave the POS lead grounded. Adjust T2 ("Q" trim) for a reading of 11 volts.
- (✓) 9. Reset the following front panel controls: FREQUENCY knob = 1K, RESONANCE = 32. Connect voltmeter NEG lead to frame (ground), and POS lead to the BANDPASS output (terminal "S" on connector strip). The voltage here may initially be anywhere from + 15V to - 15V. Adjust T4 ("B" Offset trim) for a reading of 0V, $\pm 0.1V$.

AR-327 TRIM PROCEDURE (cont'd)

- (*✓*) 10. Connect meter POS lead to the LOWPASS output (terminal "T"). Keep NEG lead grounded. Adjust T3 (Hi - "Q", L-H trim) for 0V, $\pm 0.1V$.
- (*✓*) 11. Set front panel RESONANCE knob down to 0.5. Adjust T5 (Lo - "Q", L-H trim) for 0V, $\pm 0.1V$ reading at the lowpass output.
- () 12. Set RESONANCE knob to 4. Set meter to 10 Volts A.C., or next higher A.C. range. Connect meter (or Scope, if desired) between BANDPASS output (terminal "S") and ground. Connect a sine-wave generator between AUDIO INPUT 2 (terminal "C") and ground, and set the generator to a frequency of 16 Hz, and a level of approximately 1 volt. Set front panel FREQUENCY knob down to 16, and turn up the AUDIO knob fully. Now, carefully adjust T1 (Freq. trim) for a MAXIMUM A.C. voltage reading at the bandpass output. Check the setting by varying the generator, SLOWLY, above and below 16 Hz. Peak response should be at 16 Hz.
- () 13. Reset FREQUENCY knob to 16 K (up fully). Set generator frequency to 16 KHz. Adjust T6 (1V/Oct. trim) for maximum A.C. voltage reading on meter, at bandpass output.
- () 14. Disconnect audio generator from input. Set front panel controls as follows: FREQUENCY = 16 K, RESONANCE = 512, AUDIO = 0, Fc CONTROL = 2. CAREFULLY make a temporary connection (such as with a clip - lead) from FREQ. CONTROL 1 input jack to the + 15 Volt supply. While watching the A.C. meter, slowly turn T7 (H.F. "Q" trim) clockwise. At some point, the meter should suddenly indicate a signal, which is the filter self-oscillating. Back off the trimpot until the meter indicates that the oscillation has stopped. Remove the connection from + 15V to the FREQ. CONTROL input.

THE AR-327 is now FULLY TRIMMED. However, if you have a scope and a square-wave generator, you might want to adjust the "Q" with the following, more accurate trim:

- () 1. Set FREQUENCY = 1K, RESONANCE = 0.5, AUDIO= 5, Fc CONTROL = 0. Feed in a square-wave, at approx. 200 Hz, and 10 Volts peak-to-peak or less (AR-317 VCO output is ideal), to AUDIO INPUT 2.
- () 2. Observe LOWPASS output on scope. Adjust T2 ("Q" trim) for the sharpest corners possible WITHOUT OVERSHOOT, as illustrated. NOTE: If T2 is too far counterclockwise, the filter may distort. It is advisable to start with T2 fully clockwise, and then turn back until the square-wave overshoot just disappears.



"Q" too high (Overshoots)



"Q" just right



"Q" too low

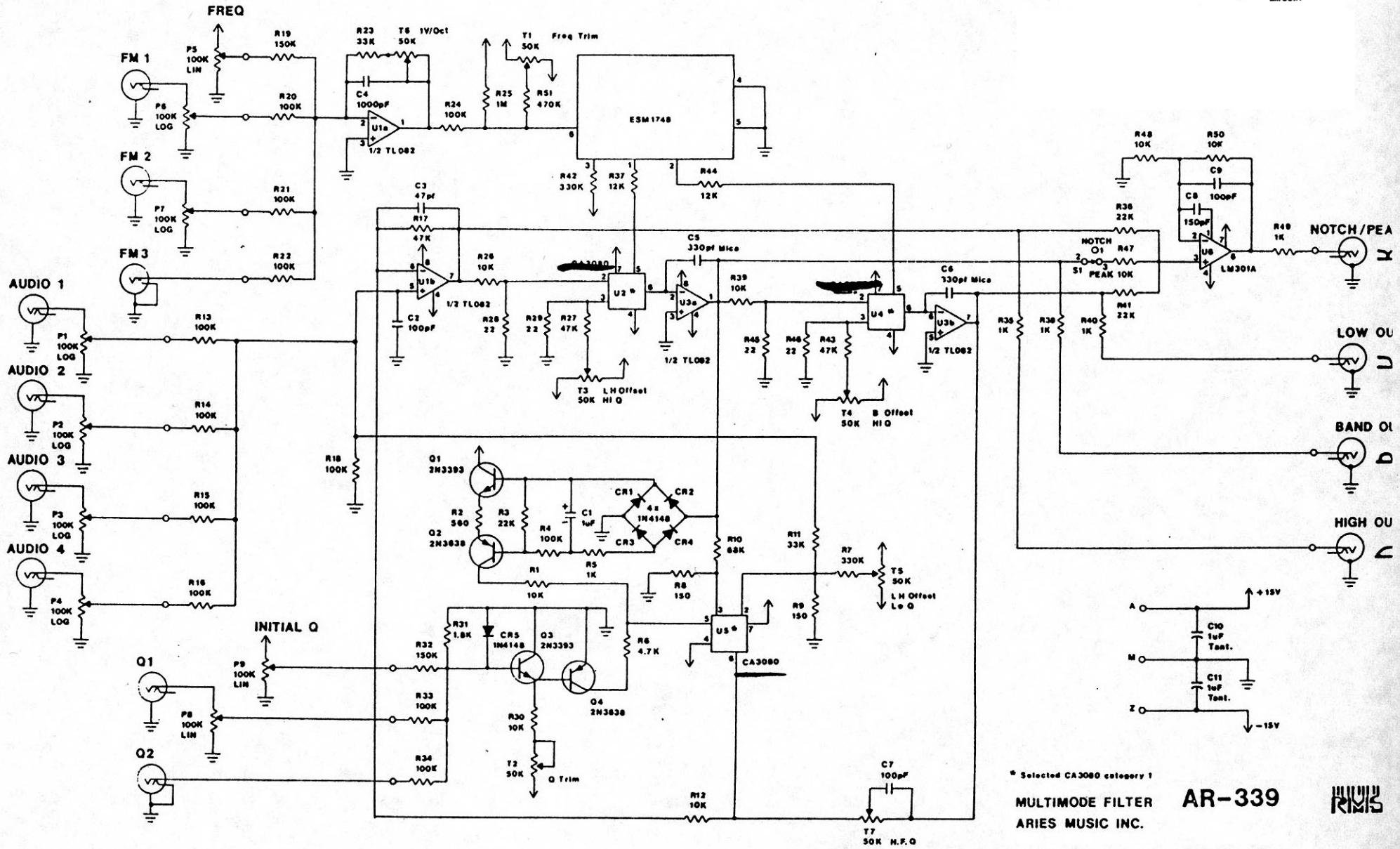
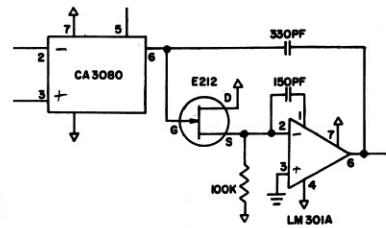
~~ANSWER~~
PARTS LIST * ARIES MODULE AR-327 * Multifunction Voltage-Controlled Filter

NUMBER	QUANTITY	DESCRIPTION	VALUE & RATINGS
C1, 2, 14	3	Capacitor, Tantalum	1 mfd, 22 V
C3	1	Capacitor, Disc	.001 mfd
C4	1	" "	33 pf
C5	1	" "	47 pf
C6, 9, 11, 13	4	" "	150 pf
C7, 12, 15	3	" "	100 pf
C8, 10	2	Capacitor, Mica or Film	330 pf
D1 thru 4	4	Diode, Silicon	1N 914, 1N4148
P1 thru 4	4	Potentiometer, $\frac{1}{4}$ " shaft	100K, Linear
Q1, 2	2	F.E.T., N-Channel	E212 (Siliconix)
Q3, 5	2	Transistor, NPN	2N3393
Q4, 6	2	Transistor, PNP	2N3638
R1, 45	2	Resistor, Carbon $\frac{1}{2}$ watt	150K, 10%
R2, 3, 4, 7, 20, 26, 42, 46, 47	9	" " "	100K, 10%
R5, 86	2	" " "	33K, 10%
R6	1	" " "	470K, 10%
R8	1	" " "	1 Meg. 10%
R9, 37	2	" " "	330K, 10%
R10, 11, 12, 15, 21, 32, 34, 35, 49, 50, 52	11	" " "	10K, 10%
R13	1	" " "	180K, 10%
R14, 18, 25	3	" " "	47K, 10%
R16, 17, 22, 24	4	" " "	22 ohm, 10%
R51	1	" " "	4.7K, 10%
R27, 28, 29, 30, 41	5	" " "	1K, 10%
R19, 23	2	" " "	12K, 10%
R31, 33, 43	3	" " "	22K, 10%
R38, 39	2	" " "	150 ohm, 10%
R40	1	" " "	68K, 10%
R44	1	" " "	560 ohm, 10%
R48	1	" " "	1.8K, 10%
S1	1	Switch, Toggle	SPST or SPDT
T1 thru T7	7	Trimpot	50K, Linear
U1, 2, 4, 6, 8	5	Operational Amplifier	LM301-A or Equiv.
U3, 5, 7	3	Operational Transconductance Amplifier	CA3080, Selected Category 1
MISC.	1	Exponential Current Source	1748
	2	P.C. Card Guides	
	1	Printed Circuit Board	
	1	Front Panel	
	4	Knobs, $\frac{1}{4}$ " shaft	
	1	Frame	
	2	Brackets	
	6	Screws, 4-40 x 3/16"	
	6	Nuts, 4-40	
	12	Mini-Phone Jacks	

Scan by Manual Manor

QUANTITY	DESCRIPTION
2	P.C. Card Guides
1	Printed Circuit Board
1	Front Panel
4	Knobs, 1/4 " Shaft
1	Frame
2	Brackets
6	Screw, 4-40 x 3/16 "
6	Nut, 4-40
12	Jack, Mini-Phone

The AR-327 filter is similar to the AR-339 but with an E212/LM301 topology instead of TL082 op-amps



* Selected CA3080 category 1
MULTIMODE FILTER
ARIES MUSIC INC.

RMS

AR-339