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)

(✓) 6. TRIMPOTS : Install T1 through T6 on the board.

(✓) 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.

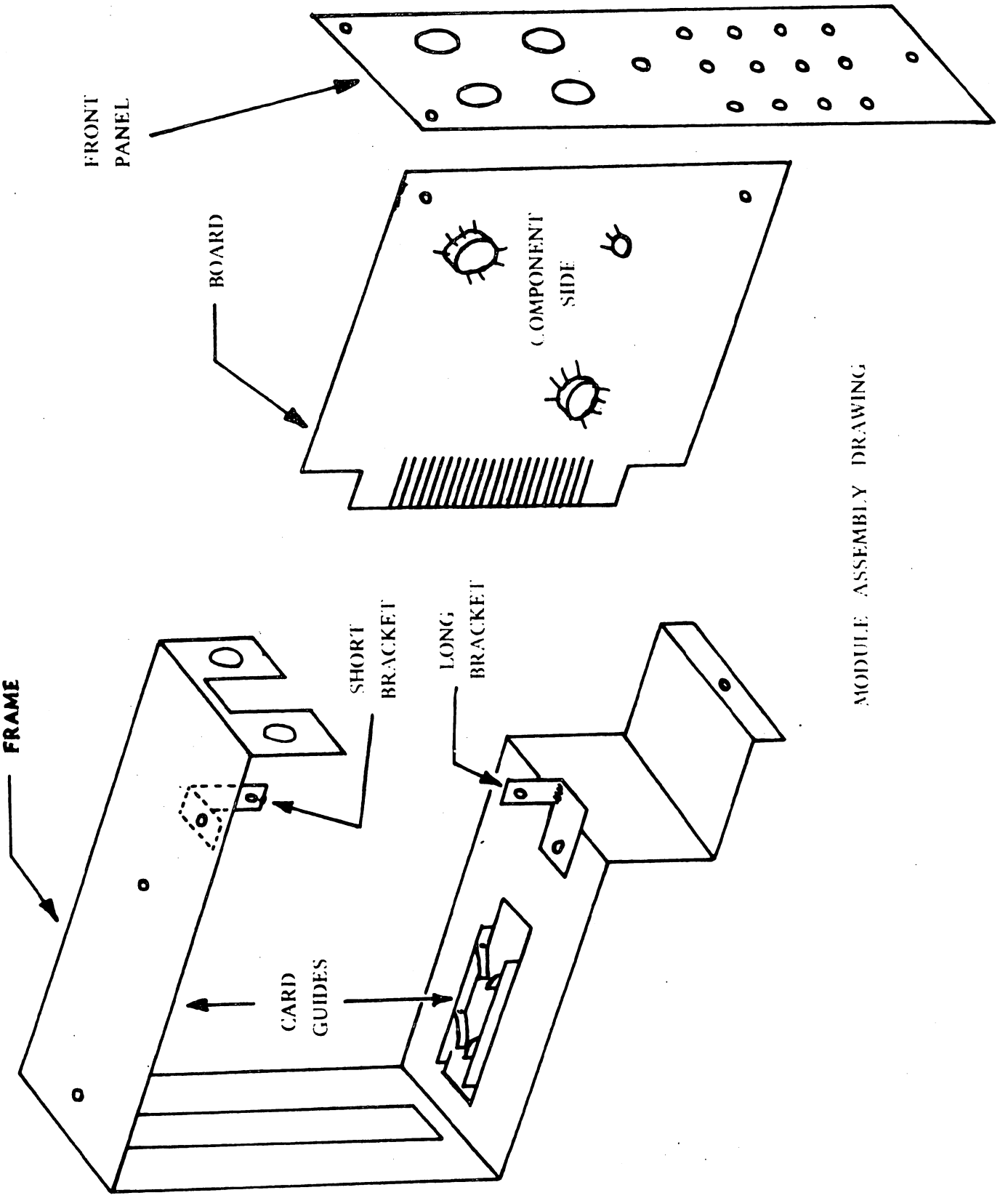
( ) 7. Connect the ground terminals of the jacks together, as shown (labeled "Jack Grounding Wire" on wiring diagram). Use insulated wire.

( ) 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.

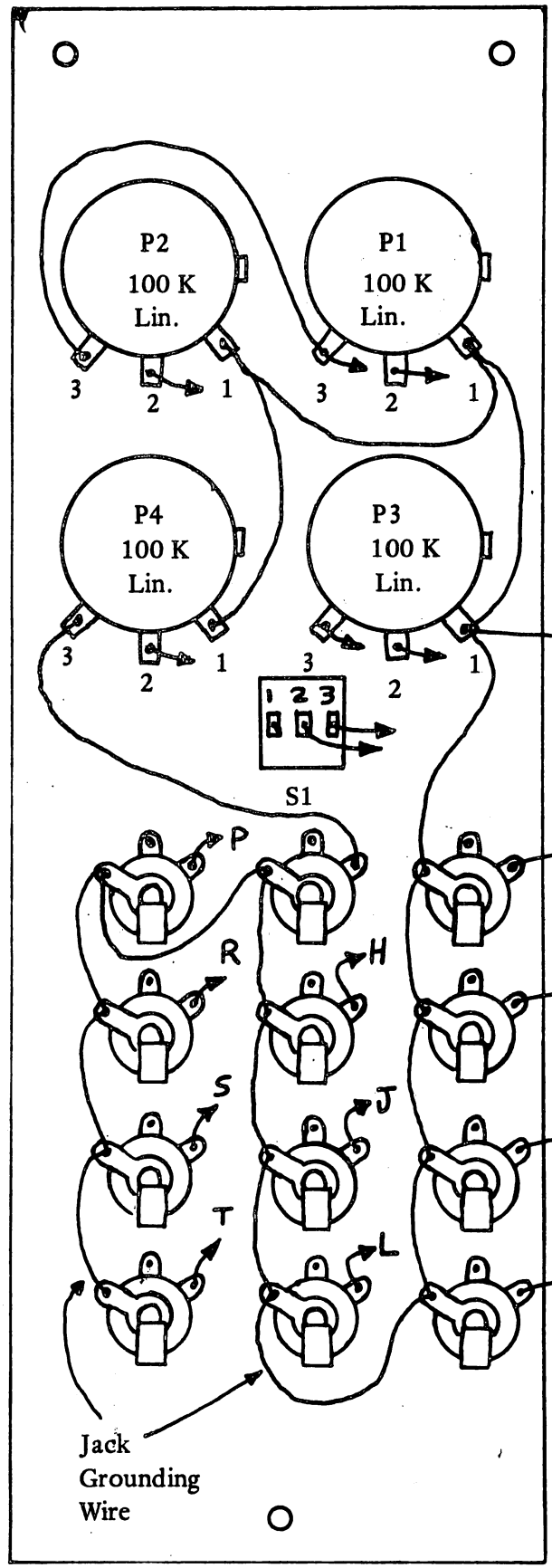
(cont'd on page 5)

ARIES SYSTEM 300



MODULE ASSEMBLY DRAWING

AR–327 Multifunction VCF PANEL WIRING DIAGRAM
(Rear View)



Arrows indicate wires to the P.C. board. All wires, and jack grounding wire, must be INSULATED.

Letters refer to P.C. board edge connector strip.

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, ±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, ± 0.1V.

(✓) 11. Set front panel RESONANCE knob down to 0.5. Adjust T5 (Lo -"Q", L–H trim) for 0V, ± 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.

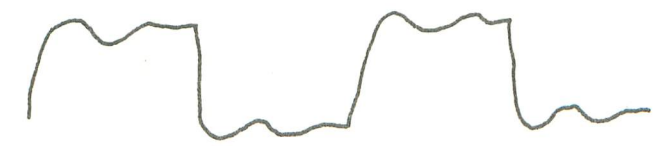
( ) 13. Reset FREQUENCY knob to 16 K (up fully). Set generator frequency to 16 KHz. Adjust T6 (1V/Oct. trim) for maximum A.C. voltage reading on meter, at bandpass output.

( ) 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

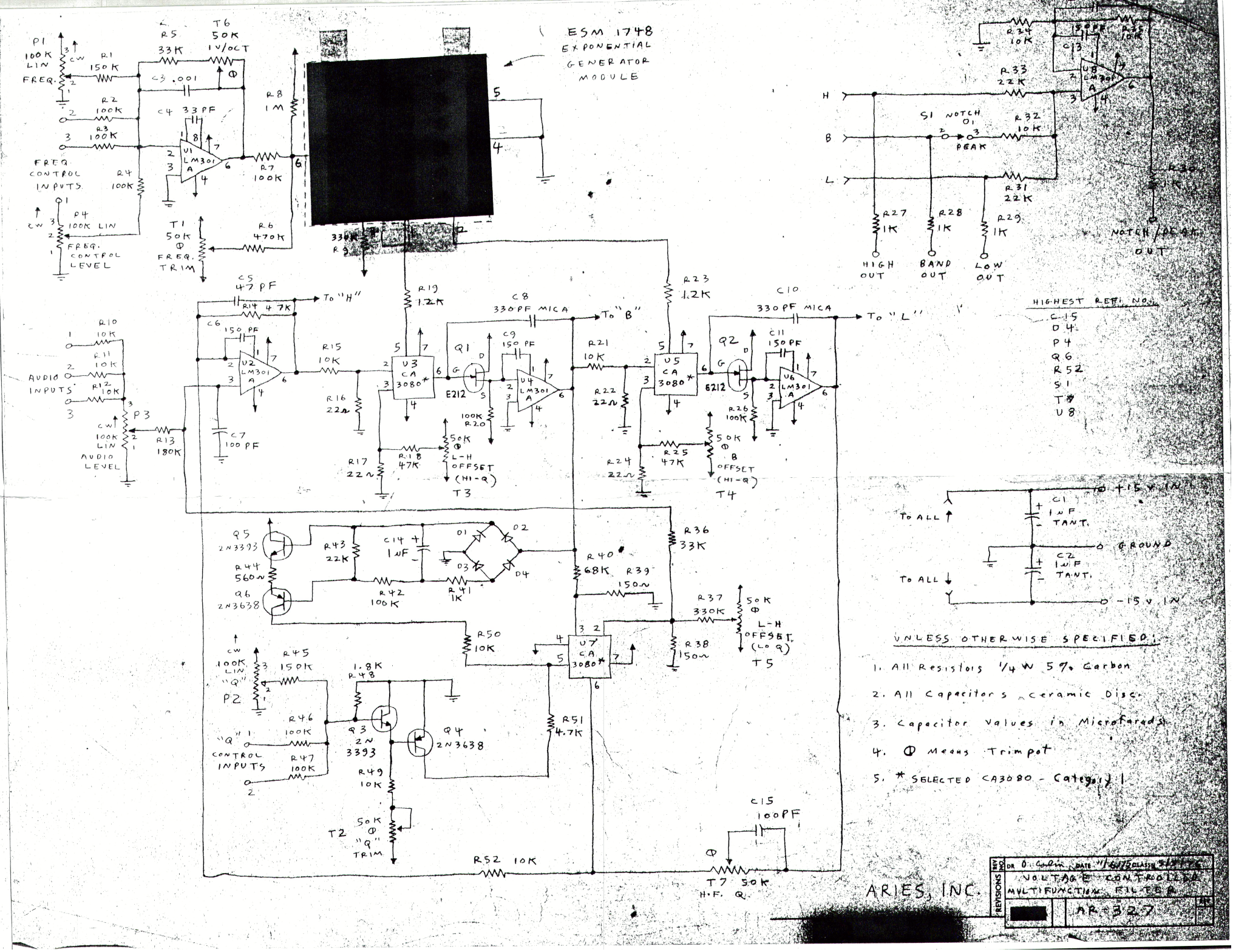
"Q" too low

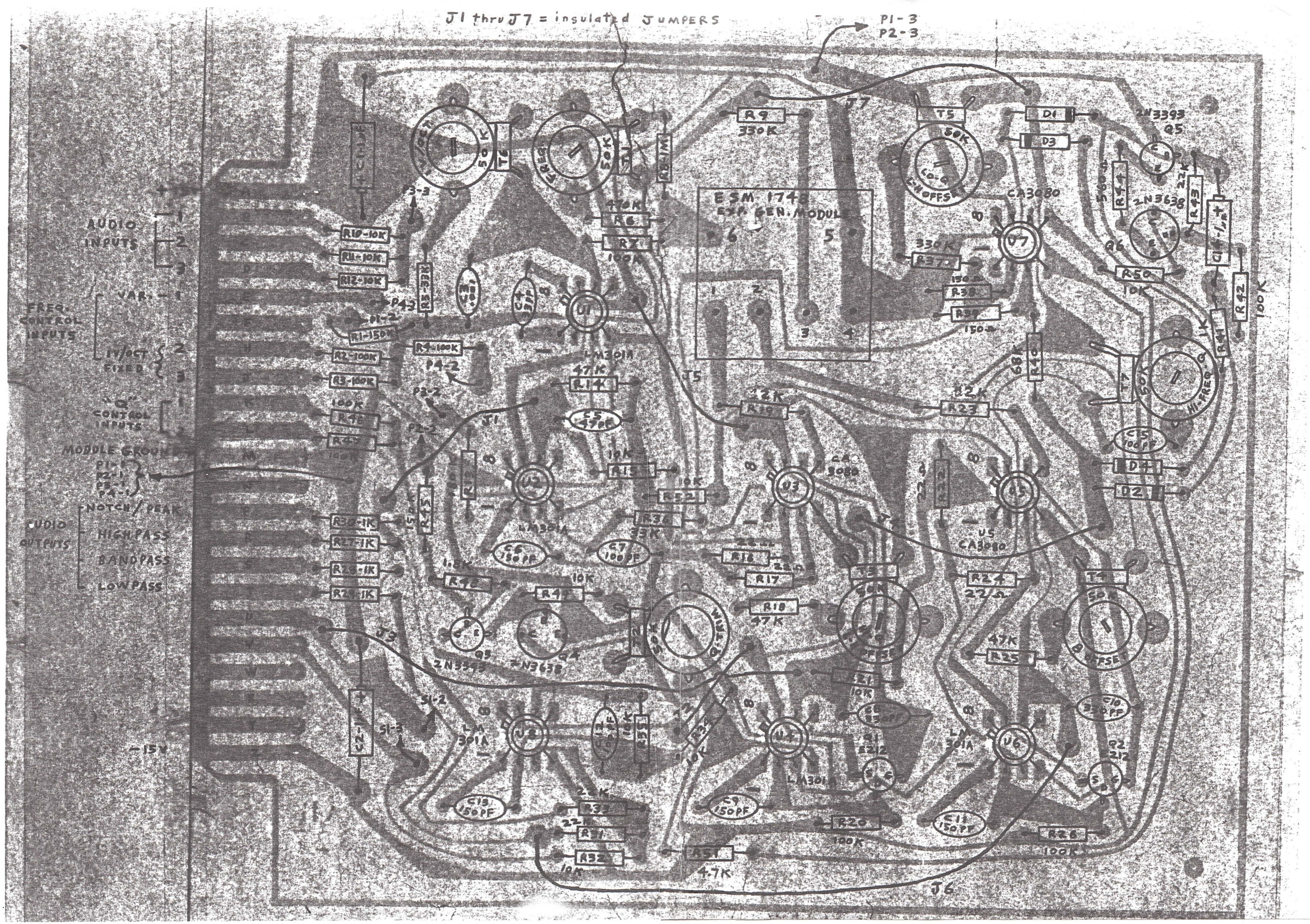
AR-327

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, ¼" shaft	100K, Linear
Q1, 2	2	F.E.T., N-Channet	E212 (Siliconix)
Q3, 5	2	Transistor, NPN	2N3393
Q4, 6	2	Transistor, PNP	2N3638
R1, 45	2	Resistor, Carbon ¼ watt	150K, 10%
R2, 3, 4, 7, 20, 26, 42, 46, 47	9	" " "	100K, 10%
R5, 36	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, ¼" shaft	
	1	Frame	
	2	Brackets	
	6	Screws, 4-40 x 3/16"	
	6	Nuts, 4-40	
	12	Mini-Phone Jacks	

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


ESM 1748
EXPONENTIAL
GENERATOR
MODULE
P1 100K LIN FREQ.
R1 150K
R2 100K
R3 100K
R4 100K
FREQ. CONTROL INPUTS
P4 100K LIN
FREQ. CONTROL LEVEL
R5 33K
T6 50K 1V/OCT
C3 .001
C4 33PF
U1 LM301 A
R8 1M
R7 100K
T1 50K FREQ. TRIM
R6 470K
330K R3
C5 47PF
R14 4.7K
To "H"
R19 1.2K
C8 330PF MICA
To "B"
R23 1.2K
C10 330PF MICA
To "L"
R10 10K
R11 10K
R12 10K
AUDIO INPUTS
P3 100K LIN AUDIO LEVEL
R13 180K
C6 150 PF
U2 LM301 A
R15 10K
C7 100 PF
U3 CA 3080*
Q1 E212
C9 150 PF
U4 LM301 A
R16 22K
R17 22K
R18 47K
50K L-H OFFSET (HI-Q) T3
100K R20
R21 10K
U5 CA 3080*
Q2 6212
C11 150PF
U6 LM301 A
R22 22K
R24 22K
R25 47K
50K B OFFSET (HI-Q) T4
R26 100K
R27 1K
R28 1K
R29 1K
HIGH OUT
BAND OUT
LOW OUT
S1 NOTCH PEAK
R32 10K
R33 22K
R31 22K
R30 1K
NOTCH/PEAK OUT
R34 10K
R35 10K
C13
U8 LM301 A
H
B
L
HIGHEST REF. NO.
C15
D4
P4
Q6
R52
S1
T#
U8
Q5 2N3393
Q6 2N3638
R44 560Ω
R43 22K
C14 1NF TANT.
D1
D2
D3
D4
R42 100K
R41 1K
R40 68K
R39 150Ω
R36 33K
R37 330K
50K L-H OFFSET (LO Q) T5
R38 150Ω
R50 10K
U7 CA 3080*
R45 150K
P2 100K LIN "Q"
1.8K R48
R46 100K
R47 100K
"Q" CONTROL INPUTS
Q3 2N 3393
Q4 2N3638
R49 10K
50K "Q" TRIM T2
R51 4.7K
C15 100PF
R52 10K
T7 5.0K H.F. Q
+15 V. IN
C1 1NF TANT.
TO ALL
GROUND
C2 1NF TANT.
-15 V. IN
UNLESS OTHERWISE SPECIFIED:-
1. All Resistors 1/4 W 5% Carbon
2. All Capacitors Ceramic Disc.
3. Capacitor Values in Microfarads
4. Φ Means Trimpot
5. * SELECTED CA3080 - Category 1
ARIES, INC.
VOLTAGE CONTROLLED MULTIFUNCTION FILTER
AR-327


J1 thru J7 = insulated JUMPERS
P1-3
P2-3
ESM 1748
EXP. GEN. MODULE
AUDIO INPUTS
FREQ. CONTROL INPUTS
"Q" CONTROL INPUTS
MODULE GROUND
AUDIO OUTPUTS
NOTCH/PEAK
HIGHPASS
BANDPASS
LOWPASS
-15V
CA3080
LM301A
2N3393
2N3638
LO-Q OFFSET
HI-FREQ