ARIES MUSIC SYSTEM 300 SYNTHESIZER

AR-338 PMS VOLTAGE CONTROLLED OSCILLATOR

ASSEMBLY INSTRUCTIONS

It is recommended that you do the following before you proceed:
Find a place where you can work through completion, without disturbing your set-up
Use adequate lighting
Wash your hands before starting. This removes contaminating oils and perspiration and makes assembly more comfortable
As you proceed, check off each step with a pencil

( ) 1. PREPARATION:
Lay the circuit board down on a sheet of white paper. PLACE METAL FOIL SIDE DOWN! Turn board so that connector strip is on the left.
Lay the assembly drawing down near the board
Unpack the 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 and tinned (solder coated)
Solder; USE ONLY THIN ROSIN-COATED SOLDER!
Small, diagonal, wire cutters
Small wire strippers
Small long-nose pliers
Flat blade screw driver
½" or #16 nut driver
5/16" or #10 nut driver
¼" or #8 nut driver
A pair of regular pliers can substitute for the nut drivers but will not be as easy to use.

( ) 2. RESISTORS:
Carefully install all resistors on the circuit board. Double check your installation against the P.C. board component layout drawing to be sure that the correct value is in the correct location. To prepare the resistor for insertion hold the body of the resistor between the thumb and index finger of your left hand. With the thumb and index finger of your right hand bend both the leads of the resistor at once to form right angles with the body. The resistor will now insert easily into the P.C. board. Once the resistor is inserted, bend the leads on the foil side to hold the resistor in place. Solder the resistors to the board and cut the leads about 1/16 of an inch from the board.
1) Install all twelve 100K 5% resistors; R14,15,41,49,50,61,64, 66,67,68,69,& 71; solder & cut leads
2) Install all eight 47K resistors; R1,3,6,19,26,44,48,57; solder & cut leads
3) Install all four 1K resistors: R11,30,31 & 72; solder & cut leads
4) Install all three 18K resistors; R7, 10, & 73; solder & cut leads
5) Install all three 39K resistors; R51, 59, & 60; solder & cut leads
6) Install all three 470K resistors; R21, 39 & 42; solder & cut leads
7) Install both 330ohm resistors; R2 & 5; solder & cut leads
8) Install both 390ohm resistors; R45 & 63; solder & cut leads
9) Install both 10K resistors; R33 & 70; solder & cut leads
10) Install both 15K resistors; R25 & 37; solder & cut leads
11) Install both 20K resistors; R32 & 34; solder & cut leads
12) Install both 22K resistors; R29 & 35; solder & cut leads
13) Install both 33K resistors; R8 & 12; solder & cut leads

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ASSEMBLY INSTRUCTIONS CONTINUED

14) Install both 68K resistors; R9 & 13; solder & cut leads
15) Install both 100K, 1% resistors; R20 & 22; solder & cut leads
16) Install both 150K resistors; R16, & 17; solder & cut leads
17) Install both 1.5K resistors; R62 & 65; solder & cut leads
18) Install the 1K tempco resistor; R-43; solder & cut leads
19) Install the 2.2K resistor; R-36; solder & cut leads
20) Install the 5.6K resistor; R-56; solder & cut leads
21) Install the 7.5K resistor; R-27; solder & cut leads
22) Install the 12K resistor; R-28; solder & cut leads
23) Install the 27K resistor; R4; solder & cut leads
24) Install the 54.9K 1% resistor; R-40; solder & cut leads
25) Install the 90.9K 1% resistor; R-38; solder & cut leads
26) Install the 274K 1% resistor; R-24; solder & cut leads
27) Install the 560K resistor; solder & cut leads (R-47)
28) Install the 1M resistor; R-18; solder & cut leads
29) Install the 2.2M resistor; R-46; solder & cut leads
30) Install the 3.3M resistor; R-23; solder & cut leads
31) Install the 22M resistor; R-58; solder & cut leads

( ) 3.DIODES:
Install diodes CR1 - 5. Double check the polarity of the diodes. Solder and cut leads.

( ) 4.Install capacitors. Observe polarity on the tantalum and polystyrene capacitors. Solder and cut leads.

a) 10,000pf polystyrene capacitor	C-5
b) 1000pf " "	C-6
c) 1uf tantalum capacitor	C-12 & 13
d) 10pf disc capacitor	C-9
e) 20pf " "	C-10
f) 50pf " "	C-1 & 2
g) 100pf " "	C-7
h) 330pf " "	C-3
i) 1000pf " "	C-4 & 11
j) .1uf " "	C-8

Capacitor C-8 is optional. If it is inserted it will capacitively couple the linear FM input. If the modulating waveform has a DC component and if it is in the low audio frequency range, this capacitor will block the DC component. The result is that the pitch of the modulated VCO will not be shifted by the DC component. If this capacitor is not installed, a jumper must be installed in its place. We suggest that you 1st complete the module by leaving out this capacitor and later experimenting with capacitively coupling this input by inserting it. In this way you can make your own choice on which you prefer.

( ) 5. Install all four transistors. Check from correct orientation of the leads
a) Install NPN 2N3393 Q1 & 2
b) Install NPN MPSA-14 Darlington; Q-3
c) Install PNP 2N3638 Q-4

( ) 6. Install all six IC's
a) Install the three TL)82 op. amps. U-1, 2, & 3
b) Install the two 1458 op. amps. U-5, & 6
c) Install the SSM 2030's

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ASSEMBLY INSTRUCTIONS, CONT.

( ) 7. Install the six trim pots
a) Install the 20K multi-turn trim T-5
b) Install the 10K multi-turn trim T-6
c) Install the 50K single turn trim T-1, 2, 3 & 4

SNAP BOTH WIRE SADDLES INTO PLACE

THIS COMPLETES THE ASSEMBLY OF THE P.C. BOARD. FOR THE TIME BEING, LAY IT ASIDE AND GO TO THE NEXT SECTION

FRONT PANEL ASSEMBLY PROCEDURE (see drawing)

Aries Music front panels are made of anodized aluminum. They will not be scratched in normal operation, but they can be scratched with pliers or a nut driver. When using tools on the front panel, be very careful not to scratch it.

( ) 1. Mount the top 2 dual pots. Do not fully tighten the nuts because they will be later removed for final assembly. If the pots have a small flange which prohibits them from being mounted flush against the face panel, bend the flange outward so the pots can be mounted flush.

( ) 2. Mount the additional 3 dual pots and the single pot. Pot 3/4 is LOG. On each of these pots there are 2 nuts. Screw the 1st one, the larger of the two, on to the threads and tighten it firmly against the body of the pot. Place the lock washers between this nut and the back side of the front panel. Mount the pots on the panel and attach them with the 2nd nut. Tighten this nut firmly.

( ) 3. Mount all 14 jacks as shown in the diagram. The washer goes on the front of the face panel.

( ) 4. Mount the 6 terminal switch (S-2) so that the terminals are oriented as in the drawing. It makes no difference which row of terminals is on top. There are 2 nuts with each switch also. Screw the 1st nut onto the bushing about 1/8" from the body of the switch. Next place the lock washer on the bushing and insert switch into the face panel securing it with the 2nd nut. The purpose of the 1st nut is to space the switch so its bushing protrudes from the face panel as far as the jacks' bushings.

( ) 5. Mount the 3 terminal switch (S-1) so that the terminals are oriented as in the drawing. It makes no difference which terminal is on the right. Follow the above mounting procedure.

PANEL WIRING

USING BUSS WIRE:
1) Connect the shunts to the grounds of the following 4 jacks: Jack 3FM, LIN, FM, SYNC & SOFT.
2) Connect Grounds of all 14 jacks together as shown in the wiring diagram.

USING BLACK WIRE, MAKE AND SOLDER THE FOLLOWING CONNECTIONS. THESE WIRES SHOULD BE AS SHORT AS CONVENIENTLY POSSIBLE EXCEPT WHERE OTHERWISE INDICATED.

a) Connect the CCW of P6 to the CCW of P5

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ASSEMBLY INSTRUCTIONS, CONT.

b) Connect the CCW of P4 to the CCW of P3
c) Connect the CCW of P6 to the CCW of P4
d) Connect the CCW of P6 to GND jack sync
e) Connect GND jack sync to TERM 6 of S-2
f) Connect TERM 6 of S-2 to CT of P11
g) Connect CT of P11 to CCW of P9
h) Connect CCW of P9 to CCW of P7 (This wire should be 3" long)
i) Connect CCW of P7 to CW of P8

USING RED WIRE

a) Connect the CW of P1 to CW of P2
b) Connect the CW of P2 to CW of P10

USING VIOLET WIRE

a) Connect the CCW of P1 to the CCW of P2
b) Connect the CCW of P2 to the CCW of P8 (This wire should be 3" long)
c) Connect the CCW of P8 to the CCW of P10 (This wire should be 3" long)
d) Connect the CCW of P10 to TERM 4 of S-2

CONNECT THESE WIRES FROM POTS TO JACKS.

They should run along the face panel in the most direct and logical route. They should be as short as conveniently possible and should not excessively "loop".

1) ORANGE from CW P9 to TIP jack TRI PWM
2) BROWN from CW P7 to TIP jack PWM SAW
3) BROWN from CW P3 to TIP jack 1 FM
4) ORANGE from CW P4 to TIP jack 2 FM
5) WHITE from CW P5 to TIP jack MOD

USING 14" LENGTHS OF COLOR CODED WIRE, CONNECT ONE END TO THE FOLLOWING TERMINALS:

1) Connect WHITE wire to CCW of P11
2) Connect GREY wire to CW of P11
3) Connect ORANGE wire to CT of P9
4) Connect GREEN wire to CT of P10
5) Connect BROWN wire to CT of P7
6) Connect YELLOW wire to CT of P8
7) Connect VIOLET wire to CCW of P1
8) Connect GREY wire to CT of P1
9) Connect RED wire to CW of P1
10) Connect WHITE wire to CT of P2
11) Connect BROWN wire to CT of P3
12) Connect ORANGE wire to CT of P4
13) Connect WHITE wire to CT of P5
14) Connect YELLOW wire to CT of P6
15) Connect VIOLET wire to CW of P6
16) Connect GREEN wire to terminal 1 of switch S-1
17) Connect ORANGE wire to terminal 2 of switch S-1
18) Connect BROWN wire to terminal 3 of switch S-1
19) Connect BLACK wire to GND of JACK 1FM
20) Connect BLUE wire to TIP of JACK SYNC

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ASSEMBLY INSTRUCTIONS CONT.

21) Connect YELLOW wire to TIP of JACK 3FM
22) Connect GREY wire to TIP of JACK SOFT
23) Connect GREEN wire to TIP of JACK LIN FM
24) Connect WHITE wire to TIP of JACK SINE
25) Connect YELLOW wire to TIP of JACK TRl
26) Connect ORANGE wire to TIP of JACK PAN OUT
27) Connect BLUE wire to TIP of JACK PUL OUT
28) Connect GREEN wire to TIP of JACK OUT SAW
29) Connect BLUE wire to TERMINAL 5 of S-2
30) Connect BLUE wire to TERMINAL 2 of S-2
31) Connect BLUE wire to TERMINAL 1 of S-2

MODULE ASSEMBLY INSTRUCTIONS. PLEASE REFER TO MODULE ASSEMBLY DRAWING.

( ) 1. Unpack the frame, bag of hardware and front panel
( ) 2. Snap the 2 plastic card guides into the holes in the frame. Be sure that the pairs of tabs point to the rear, as shown.
( ) 3. Slide the P.C. Board into the frame holding the top and bottom of the frame together against the board so that the board fits snugly in the guides between the tabs.
( ) 4. Using the 4-40 x 3/8" screws and nuts, mount the 2 angle brackets to the frame, as shown. The brackets should be on the component side of the board.
( ) 5. Screw the board to the brackets. Insert the 4-40 x 3/8" screw from the foil side of PC board.
( ) 6. Refer again to MODULE ASSEMBLY drawing. Mount top of panel to frame using the 2 upper pots. Put on lock washers and insert pot shafts thru rear of upper holes in front of frame. Bring panel against frame, so these pots also go thru matching holes in panel. Tighten nuts on front of panel, with pots oriented as shown in diagram.
( ) 7. Attach bottom of panel to frame, using remaining 4-40 x 3/8" screws and nuts.

FINAL WIRING PROCEDURE

Connect the wires from the front panel to the PC board in this order. Run the wires through the specified wire saddle and around the periphery of the baord to their designations. Cut each wire about 1" longer than absolutely necessary to provide for some slack. Cut, strip, trim, insert and solder each wire.

THROUGH THE BOTTOM WIRE SADDLE

1. Connect BLACK wire from jack ground to M on board
2. Connect GREY wire from Pll to PAN 2 on board
3. Connect VIOLET wire from P2 to -15VZ on board
4. Connect WHITE wire from Pll to PAN 1 on board
5. Connect GREEN wire from P10 to PWM P~INIT on board
6. Connect ORANGE wire from P9 to PWM P~MOD on board
7. Connect BLUE wire from S 2.1 to S 2.1 on board
8. Connect BLUE wire from S 2.2 to S 2.2 on board
9. Connect BLUE wire from jack PUL OUT to PULSE on board
10. Connect ORANGE wire from SWITCH Sl.2 to S 1.2 on board
11. Connect GREEN wire from jack OUT SAW to SAW on board

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ASSEMBLY INSTRUCTIONS, CONT.

12. Connect YELLOW wire from jack TRI to TRI on board
13. Connect VIOLET wire from P6 CW to P6 CW on board
14. Connect WHITE wire from jack SINE to SINE on board

THROUGH THE TOP WIRE SADDLE

1. Connect RED wire from P1 to A + 15v on board
2. Connect ORANGE wire from jack PAN OUT to PAN OUT on board
3. Connect GREEN wire from switch S1.1 to S1.1 on board
4. Connect BROWN wire from switch S1.3 to S1.3 on board
5. Connect BLUE wire from jack SYNC to SYNC on board
6. Connect YELLOW wire from P6 to INIT PHASE on board
7. Connect WHITE wire from P5 to PHASE MOD on board
8. Connect GREEN wire from jack LIN FM IN to FM LINEAR on board
9. Connect GREY wire from jack SOFT SYNC to SOFT SYNC on board
10. Connect BLUE wire from SWITCH 2.5 to S 2.5 on board
11. Connect WHITE wire from P2 to COARSE on board
12. Connect GREY wire from P1 to FINE on board
13. Connect BROWN wire from P3 to FM1 on board
14. Connect ORANGE wire from P4 to FM2 on board
15. Connect YELLOW wire from jack 3FM to FM3 on board
16. Connect YELLOW wire from P8 to PWM P~ INIT on board
17. Connect BROWN wire from P7 to PWM P~ MOD on board

TURN ALL POT SHAFTS FULLY TO THE LEFT & AFIX THE KNOBS IN THIS ORDER

1)	P-11	8)	P-3
2)	P-9	9)	P-4
3)	P-10	10)	P-1
4)	P-7	11)	P-2
5)	P-8		
6)	P-5		
7)	P-6		

AR-338 OSCILLATOR TRIM PROCEDURE

In order to trim your AR-338 you will need the following:

1) A +15V and -15V regulated power supply such as the AR-322. It is important that the AR-338 be trimmed using the supply which will power the cabinet in which the oscillator is to be finally mounted.
2) An oscilloscope with a direct coupled (DC) vertical input.
3) A calibrated voltage source such as the AR-311 keyboard.

Before turning on the power supply connect the power supply to the edge connector. Connect +15V to pin A, connect ground ⏚ to pin M, and connect -15v to pin Z. Use either an edge connector or clip leads to make this connection. BE CAUTIOUS: Applying reverse voltages to these terminals could destroy many components.

Set up the face panel of the module as follows: turn the Fine and Coarse pots to the center of their rotation. Turn all other pots fully counter clockwise. Set the range switch to Audio. Connect the negative lead of the oscilloscope to the module frame or some equally convenient ground connection. Connect the positive lead to the tip of the sawtooth output jack. Turn the High Frequency Track (HFT) trim pot T6 fully clockwise. Turn all other trims to the center of their rotation. T6 and T5 are 25 turn trims. These trims have a clutch mechanism which allows them to keep turning even though they are at the end of their rotation. When they have reached the end of their rotation they will produce a slight click after each revolution. After you hear the click turn back 12 turns to reach the center of the rotation.

Turn on the power supply.
You should observe a sawtooth on the oscilloscope. If not, turn off the power supply and check your wiring. If you observed a sawtooth, move the scope probe to the triangle output. Adjust T1 for a symmetrical triangle waveform. Next move the scope probe to the sine output. Adjust T2 symmetry for the most symmetrical waveform (top and bottom should have similar shape. Adjust T3 for the best looking sine wave. If desired, connect the sine wave output to an amplifier and speaker, and adjust T3 for purest tone. NOTE: A distortion meter may be used to get the purest sine wave. Readjust T2 and T3 as necessary, for the best wave form.

The volts per octave trims can be easily adjusted. Listen to and monitor on the scope the pulse output. Adjust the width control for a 50% duty cycle squarewave or the hollowest sounding waveform. Connect a voltage source such as the Aries ke-board to the FM3 input. The keyboard must be accurately calibrated to exactly 1 volt per octave. Play low C on the keyboard and tune the oscillator with the Coarse Freg. control to approximately 125 Hz. This is equivalent to the C below middle C on a piano. Counting from the left, pin down the 4th C with a matchbook. Alternately depress and release the lower C. Adjust T5 for a change of pitch between the two notes of exactly 3 octaves. As you adjust T5 the frequency of the oscillator will shift up or down a small amount. You are adjusting for an exact 3 octave change between the two keys. Ignore the overall frequency shift of the oscillator. When you have gotten close to a 3 octave range, press low C again and return the oscillator to 125 Hz, using the coarse freq. control.

Now adjust the High Frequency Tracking trim (HFT) T6. Remove the match book from the 4th C. Alternately play the 4th and 6th C and adjust T6 for an exact two octave pitch change between the two notes. This trim will also change the overall

center frequency of the oscillator. It will also slightly alter the original V/oct adjustment of T5. When T6 has been adjusted as close as possible, repeat the trim procedure for T5. These adjustments will have to be repeated about three times. Each repetition will require a smaller and smaller change on the trims.

If you do not have a good ear you can use a square wave reference oscillator to help you make these adjustments. After first tuning the original oscillator to 125 Hz at low C, as described in the previous trim procedure, zero beat the reference oscillator to the original oscillator with C4 pinned. Play low C and adjust the V/oct trim T5 for 3 ocatves below the reference oscillators' frequency. Release low C. The original oscillator will have changed pitch slightly. Adjust the reference oscillator to zero beat with the original oscillator. Play low C again and adjust the V/oct trim T5 as before. When you have adjusted T5 for exactly 3 octaves the reference oscillator will no longer need to be retuned.

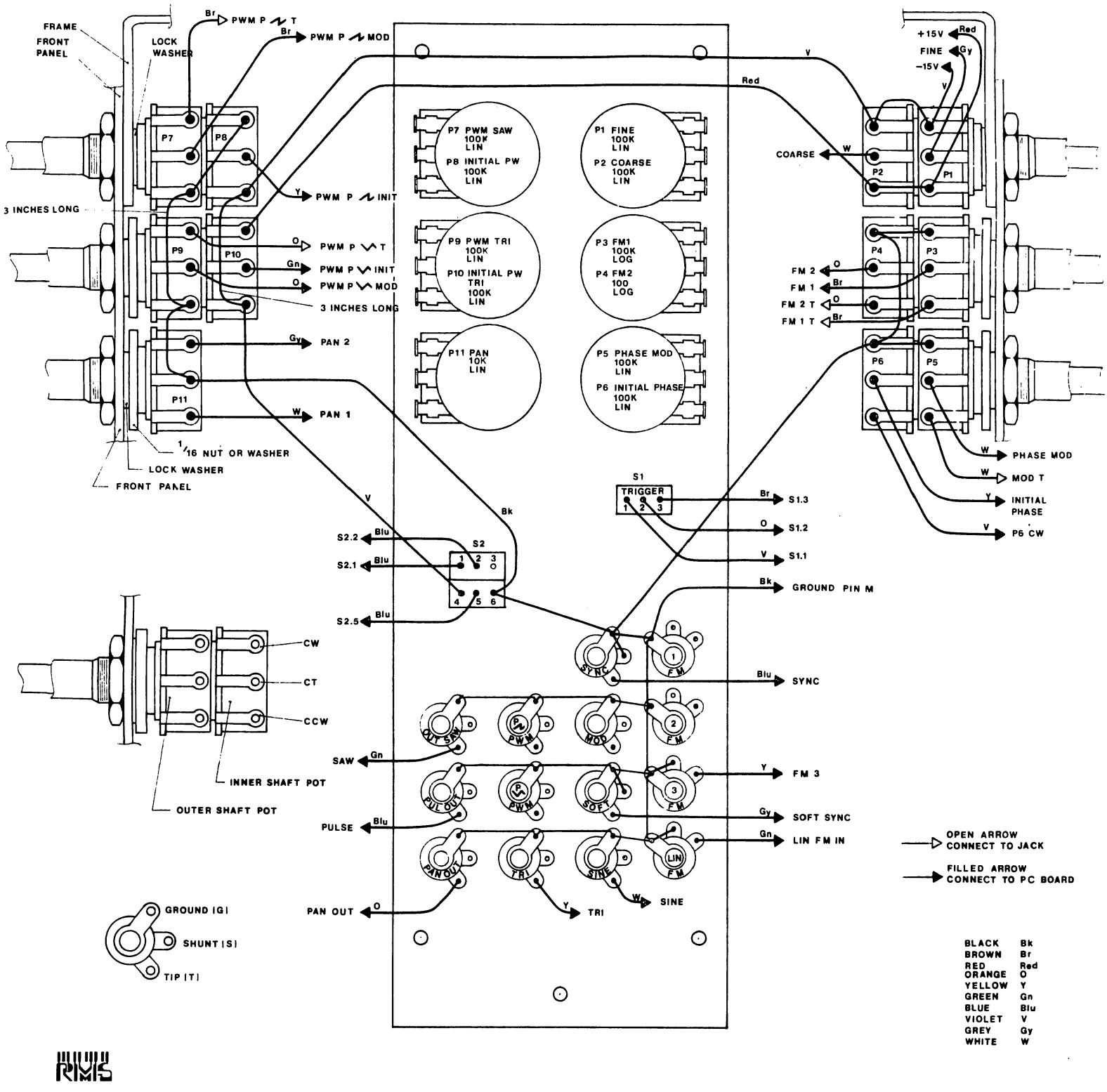
Now go on to T6 the HFT trim. Hold down C4 and zero beat the reference oscillator and the original oscillator. Play C6 and adjust T6 for a two octave change. Play C4 and zero beat the two oscillators.

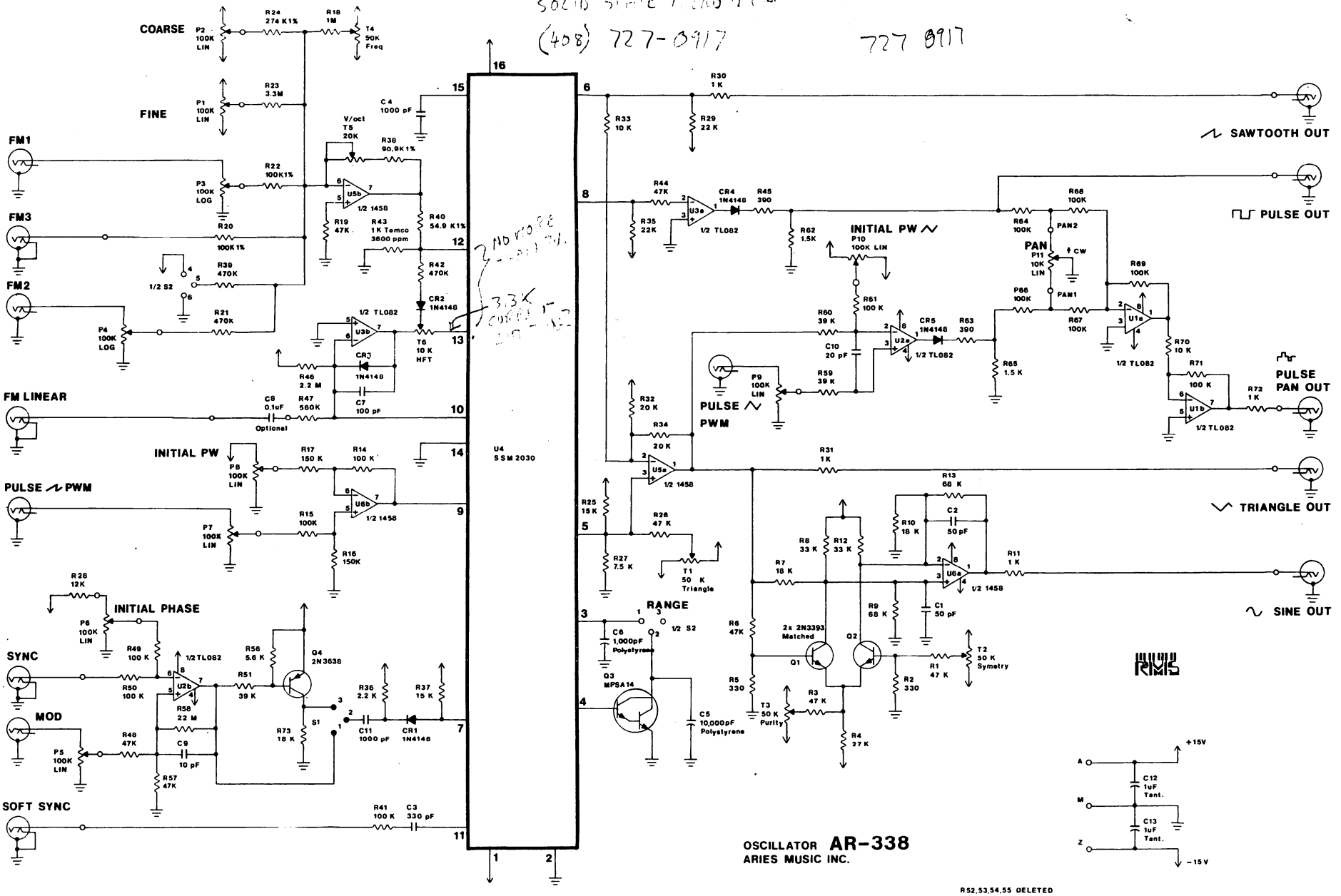
Play C6 and adjust T6 again. After T6 is adjusted it may be necessary to readjust the V/oct trim T5. It takes about 3 repetitions of these adjustments to bring the oscillator into very accurate tracking.

Once the oscillators are tracking perfectly set the Coarse and Fine Freq. pots to the center of their rotation and adjust T4 the frequency trim for a frequency of 400 Hz or approximately Ab in the middle octave of a piano.

Your AR-338 is now trimmed.

AR-338 OSCILLATOR
FRONT PANEL WIRING DIAGRAM





ARIES MUSIC SYSTEM 300 SYNTHESIZER

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PARTS LIST

QUANTITY	DESCRIPTION	VOLTAGE & RATINGS
RESISTORS:		
2	¼w. carbon film; 5%	330 ohm
2	" " " "	390 ohm
8	" " " "	1 K
1	Tel Labs Q81; Tempco	1 K
2	¼w. carbon film; 5%	1.5 K
1	" " " "	2.2 K
1	" " " "	5.6 K
1	" " " "	7.5 K
2	" " " "	10 K
1	" " " "	12 K
2	" " " "	15 K
3	" " " "	18 K
2	" " " "	20 K
2	" " " "	22 K
7	" " " "	27 K
2	" " " "	33 K
3	" " " "	39 K
8	" " " "	47 K
1	1% metal film; green, yellow, white, red, brown	54.9 K
2	¼w. carbon film; 5%	68 K
1	1% metal film; white, black, white, red, brown	90.9 K
2	1% metal film; brown, black, black, orange, brown	100 K
12	¼w. carbon film; 5%	100 K
2	" " " "	150 K
1	1% metal film; red, violet, orange, orange, brown	274 K
3	¼w. carbon film; 5%	470 K
1	" " " "	560 K
1	" " " "	1 M
1	" " " "	2.2 M
1	" " " "	3.3 M
1	" " " "	22 M
TRIM POTS:		
4	Linear	50K
1	multi-turn cermet (Spectrol 64W103)	10K
1	multi-turn cermet (Spectrol 64W203)	20K
CAPACITORS:		
1	Disc	10pf
1	"	20pf
2	"	50pf
1	"	100pf
1	"	330pf
2	"	1000pf
1	"	0.1uf

AR-338 PMS VOLTAGE CONTROLLED OSCILLATOR

PARTS LIST CONT.

QUANTITY	DESCRIPTION	VOLTAGE & RATINGS
1	Mallory SXM 210; Polystyrene cap.	1000pf
1	Mallory SXM 110; " "	10.000pf
2	Tantalum Capacitor	luf
DIODES:		
5		1N4148
TRANSISTORS:		
2	NPN	2N3393
1	NPN Darlington	MPSA-14
1	PNP	2N3638
I.C.:		
3	Op. Amp.	TL082
2	" "	1458
1	VCO	SSM2030
4	Dual pots; linear	100K
1	" " log	100K
1	Single pots; linear	10K
5 sets	Dual concentric knobs	
1	Single knob	
1	Switch; SPST; on-none-on	
1	Switch; DPDT; on-none-on	
14	Mini jacks	
2	Wire saddle	
4	Nuts; 1/16" thick; 3/8" internal diameter	
1	AR-338 Front panel	
1	AR-338 P.C. Board	
1	Module Frame	
1	Bracket; large	
1	Bracket; small	
3	Screws; Phillips head for module mounting	
4	" #4-40 x 3/8"	
2	" Phillips head, black	
6	Nuts; #4-40	
2	P.C. Card guides	
COLOR CODED WIRE		
4	Black	
6	Brown	
2	Red	
7	Orange	
5	Yellow	
6	Green	
6	Blue	
3	Violet	
4	Grey	
6	White	
20"	24 AWG gauge tinned copper buss wire	