

bleeps
and
peeps

WWW.BLEEPS-AND-PEEPS.COM

Service Manual

OBSX

Polyphonic Synthesizer

**First Edition
September 1979**

**Oberheim Electronics, Inc.
1455 19th Street
Santa Monica, Ca 90404**

CALIBRATION PROCEEDURES

- Control Board Calibration
- Voice Card Replacement and Calibration
- Power Supply Calbiration
- Mother Board Calibration

DIAGRAMS

- Wiring Block Diagram
- Sub-Assembly and Connector Placement Diagram
- Control Board and Voice Card Trimmer Placement Diagram
- Power Supply and Mother Board Trimmer Placement Diagram

SCHEMATICS

- Power Supply Schematic
- Processor, Control, Pots and Keyboard Schematic (4 Sheets)
- Mother Board Schematic
- Voice Card Schematic
- Bend Assembly Schematic
- Rear Panel Schematic

PRINTED CIRCUIT COMPOSITES

- Control Board Composite
- Processor Board Composite
- Mother Board Composite
- Power Supply and Voice Card Composites

ENGINEERING CHANGE ORDERS (5 Sheets)

INTERCONNECT LISTS

- Control Board Interconnect List
- Power Supply Board Interconnect List
- Pot Board Interconnect List
- Mother Board Interconnect List

CONTROL BOARD CALIBRATION

This document describes the procedure for calibrating the OB-X Control board. The following equipment is required:

Digital voltmeter (4 1/2 digits minimum)
Oscilloscope
Audio amplifier with speaker or headphones
(Note: Headphones may be plugged directly into the OB-X providing they are wired monophonically and have an input impedance of at least 600 ohms.)

This procedure makes reference to notes C0 through C4. C0 is low C on the keyboard, and C4 is high C. Refer to the Control Board and Voice Card Trimmer Placement Diagram for locations of trimmers to be adjusted.

Set the following front panel controls as indicated:

Manual	-	On
Unison	-	On
Portamento	-	Minimum (full CCW)
VCO1 Frequency	-	Minimum (full CCW)
VCO2 Frequency	-	Minimum (full CCW)
VCO2 Detune	-	Center (LED off)
Volume	-	As desired

All voltage measurements should be referenced to ground at connector pin A8.

DAC CALIBRATION

Using the DVM, monitor KEYCV1 at connector pin M9. Depress key C0 and note the voltage; this is the offset voltage and it should be 0.000 v +/- 15 mv. Depress C1 and adjust trimmer T9 so that KEYCV1 is 1.000 v +/- 2 mv more than the offset voltage. Repeat this procedure for each octave (C2, C3, and C4) to obtain KEYCV1 voltages of 2.000 v, 3.000 v, and 4.000 v +/- 2 mv more than the offset.

BEND CIRCUIT CALIBRATION

Turn Unison off, and set the switches on the Bend assembly as follows:

Up Octave/Down Octave	-	Down Octave
Narrow/Broad	-	Broad
VCO2 Only/Both	-	Both

Monitor the voltage at pin 1 of the 324 at location A1, and adjust trimmer T4 for 0.000 v +/- 20 mv.

Measure the VCO1 Frequency control voltage, VCO1F, at connector pin N1. This voltage, which should be 0.000 v +/- 25 mv, is the Bend pot offset voltage. This offset voltage must be added to (or subtracted from) the voltages stated for the following Bend circuit adjustments; e. g., if the offset voltage is -20 mv, T1 would be adjusted for 0.980 v and T2 would be adjusted for -1.020 v.

Move the Bend lever fully towards the front of the unit, and adjust trimmer T1 for 1.000 v +/- 2 mv.

Move the Bend lever fully towards the rear of the unit, and adjust trimmer T2 for -1.000 v +/- 2 mv.

Set the Narrow/Broad switch to Narrow, move the Bend lever fully to the front, and adjust trimmer T3 to 0.167 v +/- 2 mv.

Set the Octave switch to its center position, and adjust trimmer T6 for 1.000 v +/- 2 mv.

Set the Octave switch to the Up position, and adjust trimmer T7 for 2.000 v +/- 2 mv.

LFO RATE CALIBRATION

Set the LFO Rate pot to maximum (full CW). Observe the triangle wave with an oscilloscope at pin 7 of the 324 at location A11, and adjust trimmer T5 to obtain a period of 50 +/- 5 msec.

PORTAMENTO CALIBRATION

Set the Portamento pot to maximum (full CW). While alternately playing two keys one octave apart, adjust trimmer T8 to obtain maximum portamento; i. e., the maximum time period for the oscillators to change from one pitch to the other after a key is depressed. With T8 adjusted for maximum portamento, this time period may be anywhere from 1 to 2 1/2 seconds for a one octave change, and the variation among voices may be as much as a 2 to 1 ratio between the shortest and longest periods.

VOICE CARD REPLACEMENT AND CALIBRATION PROCEDURE

This document describes the procedure for replacing and calibrating voice cards in the OB-X. The following equipment is necessary for calibration:

- Digital voltmeter (3 1/2 digits minimum)
- Oscilloscope (optional)
- Audio amplifier with speaker or headphones
(Note: Headphones may be plugged directly into the OB-X provided they are wired monophonically and have an input impedance of at least 600 ohms.)

This procedure makes reference to notes C0 through C4. C0 is low C on the keyboard, and C4 is high C. Refer to the Control Board and Voice Card Trimmer Placement Diagram for locations of the trimmers to be adjusted.

VOICE CARD REPLACEMENT AND PRELIMINARY CONTROL SETTINGS

Locate the defective voice card, and replace it with a new card.

**CAUTION: A.C. POWER MUST BE OFF DURING
CARD REMOVAL AND REPLACEMENT.**

As an aid in determining which card in a unit is defective, it should be realized that touching the "tempco" resistors (refer to the Trimmer Placement Diagram) on a voice card which is gated on will cause a significant change in pitch of the oscillators on that card. With Unison off, a defective card can thus be located by stepping through the voices, using the keyboard, until the defective voice is gated on. While holding this voice on, touch the tempco resistors on each card until a pitch change is heard, thus identifying the bad card.

With a new voice card installed, close the cover, turn on power, and wait 15 minutes to allow the unit to warm up. Plug the amplifier or headphones into the Left Output jack. Set the following switches and controls as indicated:

- Manual - On
- Unison - On
- Volume - As desired
- Master Tune - Center (dead zone)
- Test 1 - Down (the Test switches are located inside the unit at the bottom of Pot Board No. 2)

Set the Pan pots on the Mother Board to full Left (full CCW) position for the new voice and for one known, calibrated voice to be used as a reference; set all other Pan pots to full Right. (Refer to the Power Supply & Mother Board Trimmer Placement Diagram for locations of the Pan pots.)

VCO1 CALIBRATION

Initial Frequency Adjustment

Set switches and controls as follows:

VCO1	- On
VCO2	- Off
VCO1 Waveform	- Pulse
VCO2 Waveform	- Pulse
VCO2 Detune	- Center (LED off)
Filter Frequency	- Maximum (full CW)
Loudness Sustain	- Center or more CW
All other parameters not otherwise set - Full CCW or Off	

Hold note C3 and adjust trimmer T4 until the frequency of the new voice is beatless with the reference voice.

NOTE: The following two adjustments, Volt/Octave and Hi-Track, are performed at the factory and normally do not require readjustment upon installation of the card in a unit. However, they should be performed if the voice does not sound right after the rest of the adjustment procedure has been performed.

Volt/Octave Adjustment

Hold note C0 and adjust trimmer T8 until the voice is beatless with the reference. Hold note C3 and determine if still beatless; if not, repeat the Initial Frequency adjustment. It is sometimes necessary to repeat the Initial Frequency and Volt/Octave adjustments a few times in order to obtain proper tracking of the voice card to the keyboard.

Hi-Track Adjustment

Hold note C5 and adjust trimmer T5 until beatless. Recheck the Initial Frequency and Volt/Octave adjustments, and repeat if necessary.

Pulse Width Adjustment

Set the Pulse Width pot on the front panel to full CCW, and adjust trimmer T6 for a 50% duty cycle. If an oscilloscope is available, the voice output can be monitored at connector pin G2; if the adjustment is being made by ear, adjust T6 for the most "hollow" sound. (The reference voice can be eliminated during this adjustment by turning its Pan pot fully CW.)

VCO2 CALIBRATION

VCO2 is calibrated by repeating the above procedure, with VCO1 off and VCO2 on, and adjusting the following trimmers:

Initial Frequency - T1
Volt/Octave - T7
Hi-Track - T2
Pulse Width - T3

FILTER CALIBRATION

Set the front panel controls and switches as follows:

VCO1 - Off
VCO2 - Off
Noise - Full
KBD Track - On
Filter Frequency - Minimum (full CCW)
Modulation - Minimum (full CCW)
Resonance - Maximum (full CW)

Initial Frequency Adjustment

Hold note C3 and, using the Pan pots to control the audio, listen to the two voices (new card and reference) alternately. Adjust trimmer T9 to tune the card being calibrated to the same pitch as the reference.

Volt/Octave Adjustment

Hold note C2 and adjust trimmer T10 until the voice is the same pitch as the reference. Hold note C3 and check the Initial Frequency adjustment; repeat these two adjustments as necessary. Hold note C4 and again adjust trimmer T10 until the two voices have the same pitch. Recheck the Initial Frequency at C3 and readjust as necessary. (Note: the filter will track the keyboard over only an approximately three octave range.)

VCA OFFSET

With both oscillators off, gate the voice on (depress any key). Measure the voltage at pin 6 of the TL081 at location A17 with a DVM, and adjust trimmer T11 for 0.000 v +/- 10 mv.

CAUTION: AT THE CONCLUSION OF THIS PROCEDURE
BE SURE TO DO THE FOLLOWING:

TURN OFF THE TEST 1 SWITCH (SET TO THE UP POSITION)

RETURN THE PAN POTS TO THEIR ORIGINAL POSITIONS

ON 6- AND 8-VOICE UNITS, RECONNECT THE CABLES TO
MOTHER BOARD NO. 2 AND REINSTALL THE RETAINING SCREWS

POWER SUPPLY CALIBRATION

This document describes the procedure for calibrating the OB-X Power Supply board. The only two voltages requiring calibration are +19 v and -19 v; all other voltages are developed by 3-terminal regulators having no adjustment capability.

Using connector pin F2 as the ground reference, monitor the voltage on pin F1 and adjust trimmer T102 for +19.0 v +/- 200 mv. Monitor the voltage at pin F4 and adjust trimmer T101 for -19.0 v +/- 200 mv.

The other voltages generated on the Power Supply board should also be checked to assure that they are within tolerance, as follows:

E1	- 5.0 v +/- 250 mv	-5.05
- E3	+12.0 v +/- 600 mv	-0.64
E4	+ 4.8 v +/- 250 mv	4.49
E6	+ 5.0 v +/- 250 mv	5.05
- E7	+15.0 v +/- 750 mv	-1.03
E9	-15.0 v +/- 750 mv	-15.04

Note: Pin E4 should measure a minimum of 2.3 v with power off (this is the backup battery voltage for the program memory).

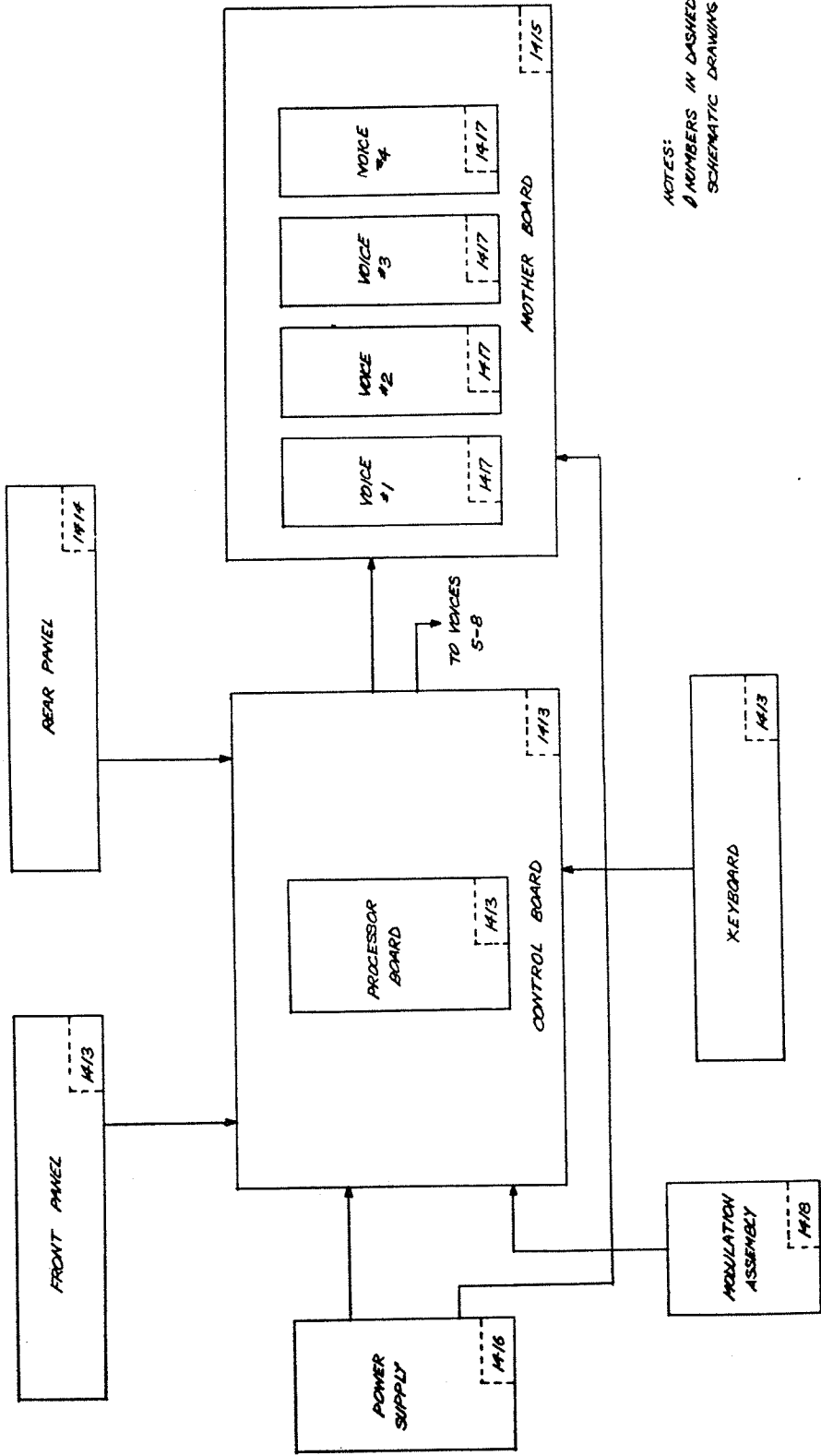
- 20

0.09

This document describes the procedure for calibrating the OB-X Mother board. Calibration consists of adjusting the two distortion trimmers, T201 and T202. For this procedure the front panel Volume pot must be set to maximum (full CW), and no keys on the keyboard should be depressed.

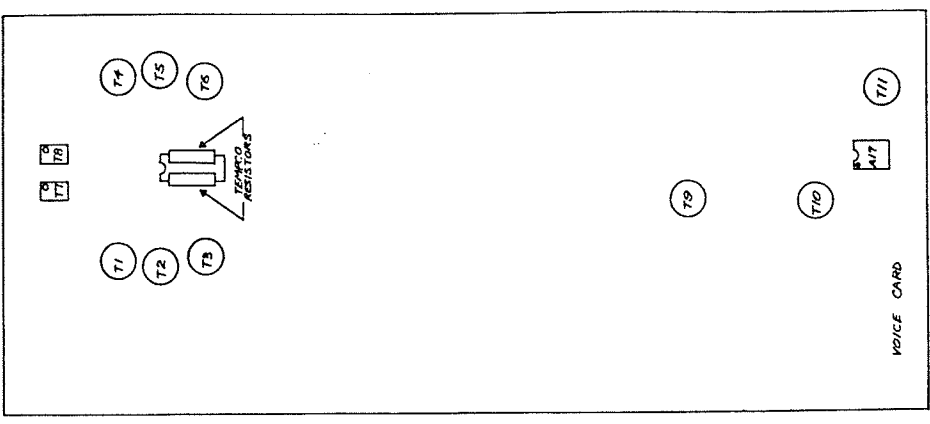
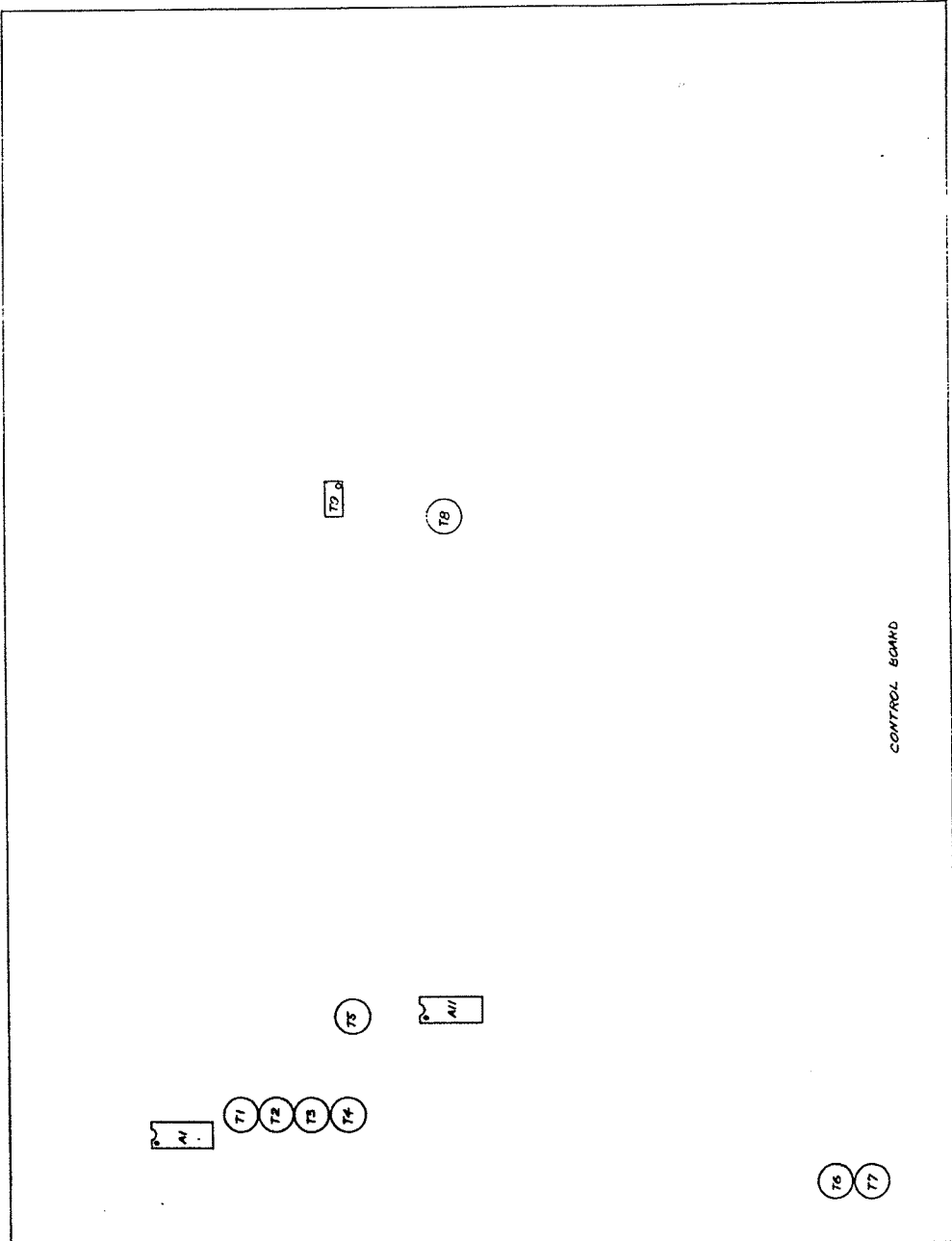
Using a DVM, monitor the output (pin 6) of the final TL081 in the right channel and adjust trimmer T201 for 0.00 v +/- 20 mv. Repeat this procedure for the left channel, adjusting trimmer T202.

As an alternative, an audio method of calibration can be used. Plug an amplifier with a speaker or headphones into the Right Output jack, hold down the Auto Tune switch on the front panel, and adjust T201 for minimum loudness of the "thump". Repeat for the left channel.

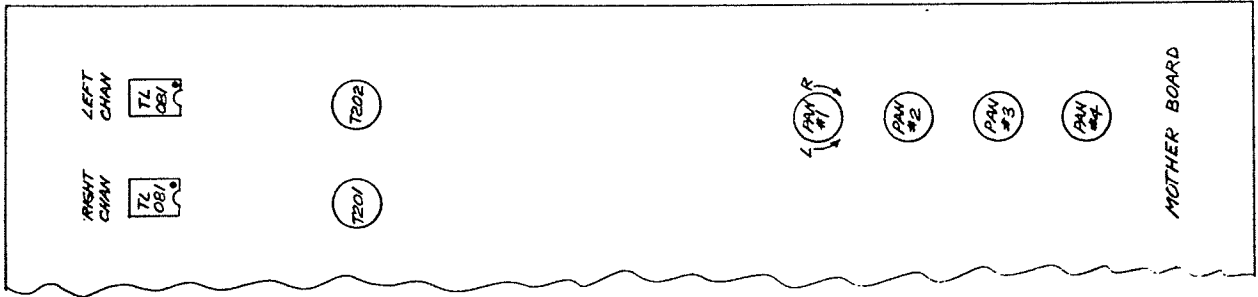
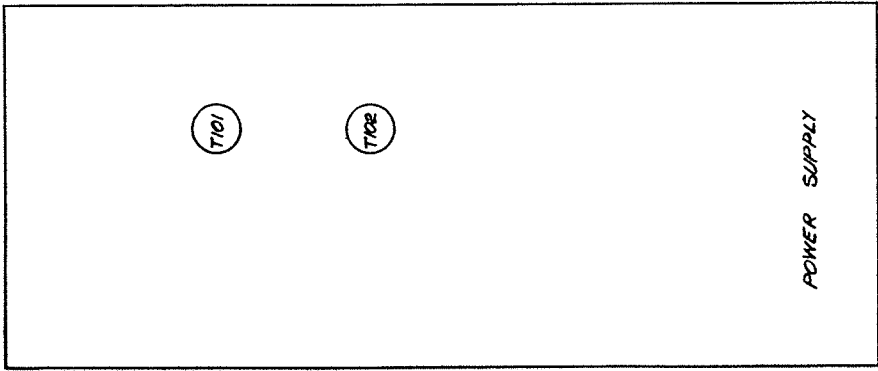


NOTES:
 Ø NUMBERS IN DASHED BLOCKS INDICATE
 SCHEMATIC DRAWING NUMBERS

OBERHEIM ELECTRONICS, INC.
 OB-X WIRMS BLOCK DIAGRAM
 9-7-79

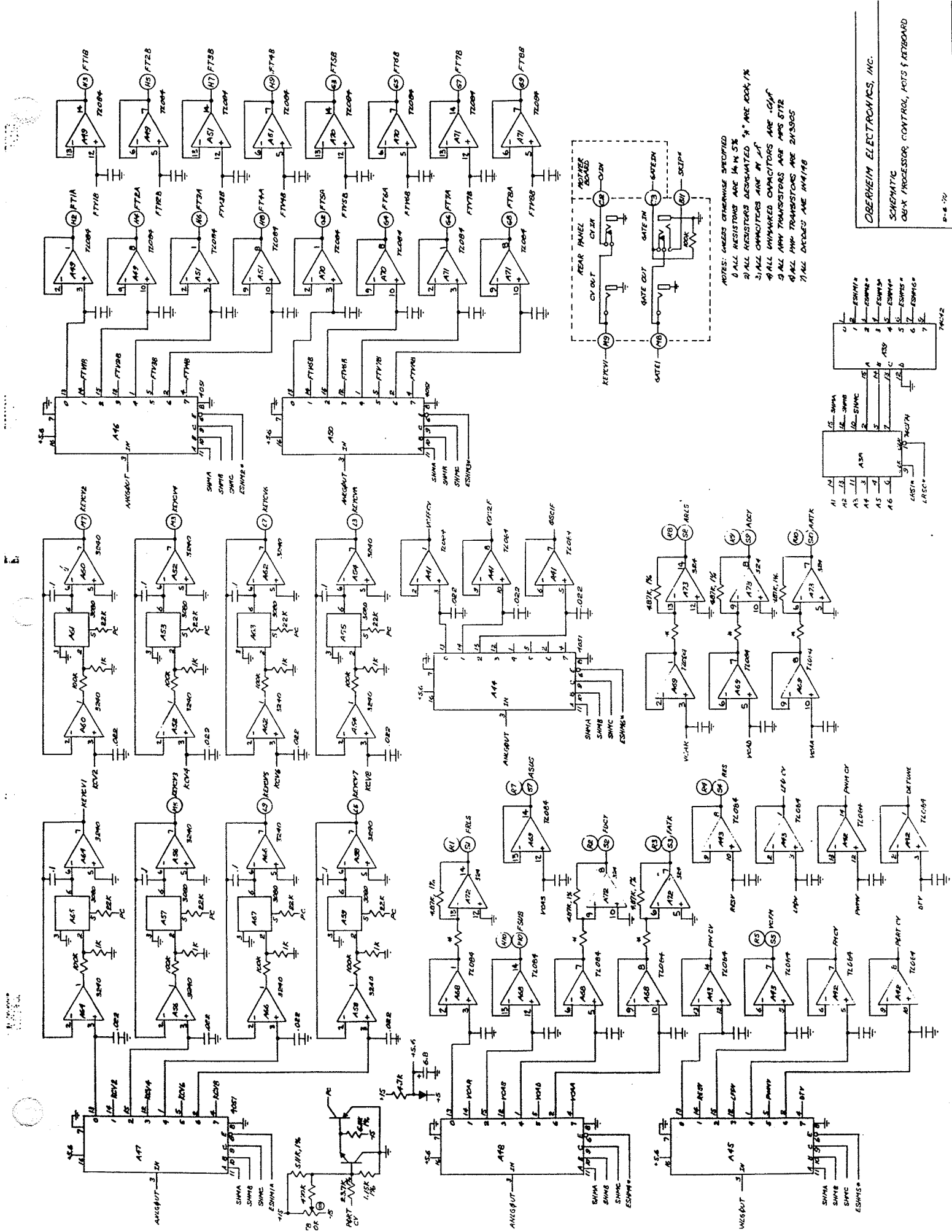


OBERHEIM ELECTRONICS, INC.
 ON-X CONTROL BOARD & VOICE CARD
 TRIMMER PLACEMENT DIAGRAM
 9-18-78
 1425



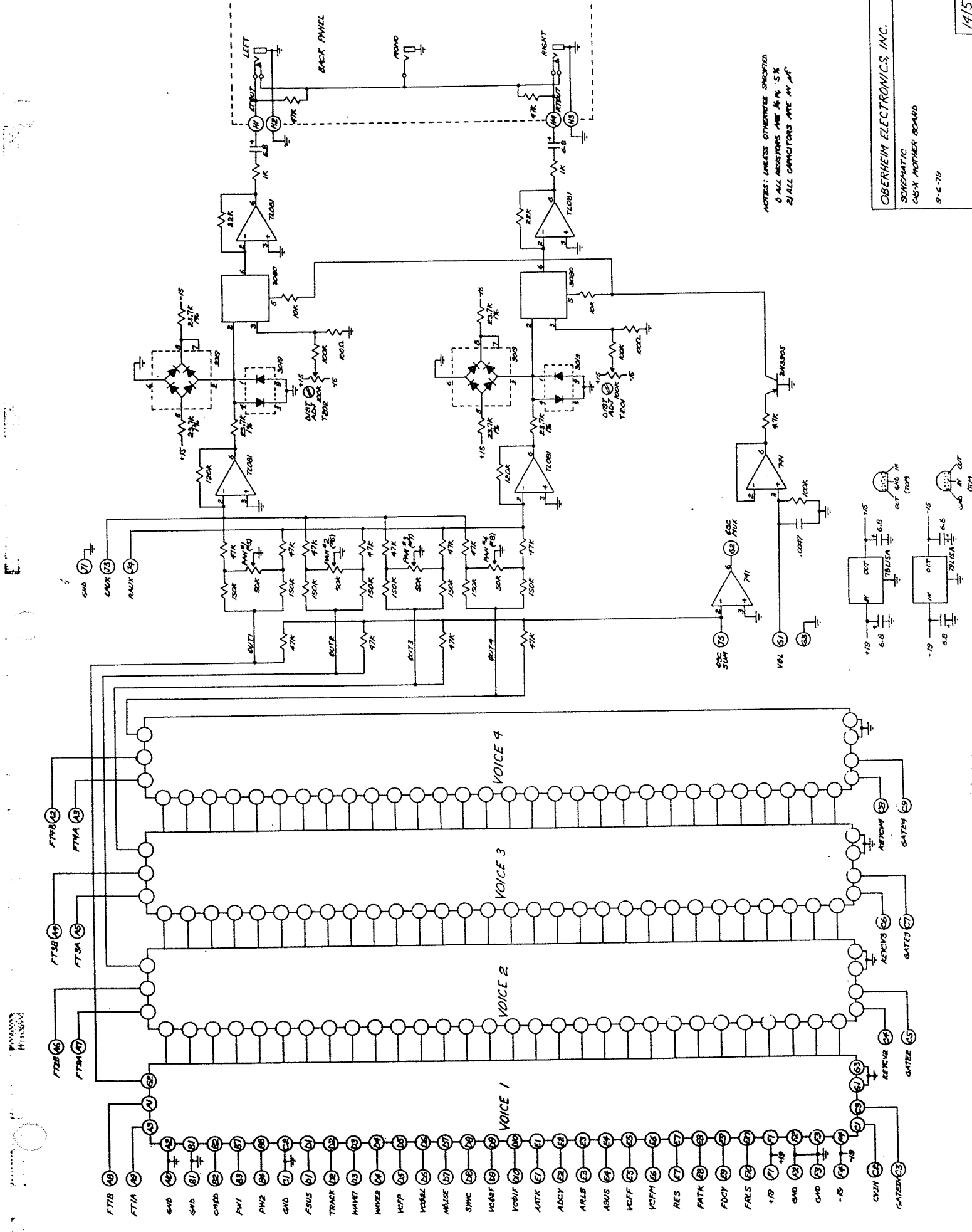
OBERHEIM ELECTRONICS, INC.
 OS-X POWER SUPPLY & MOTHER BOARD
 TRIMMER PLACEMENT DIAGRAM
 9-19-79

1426

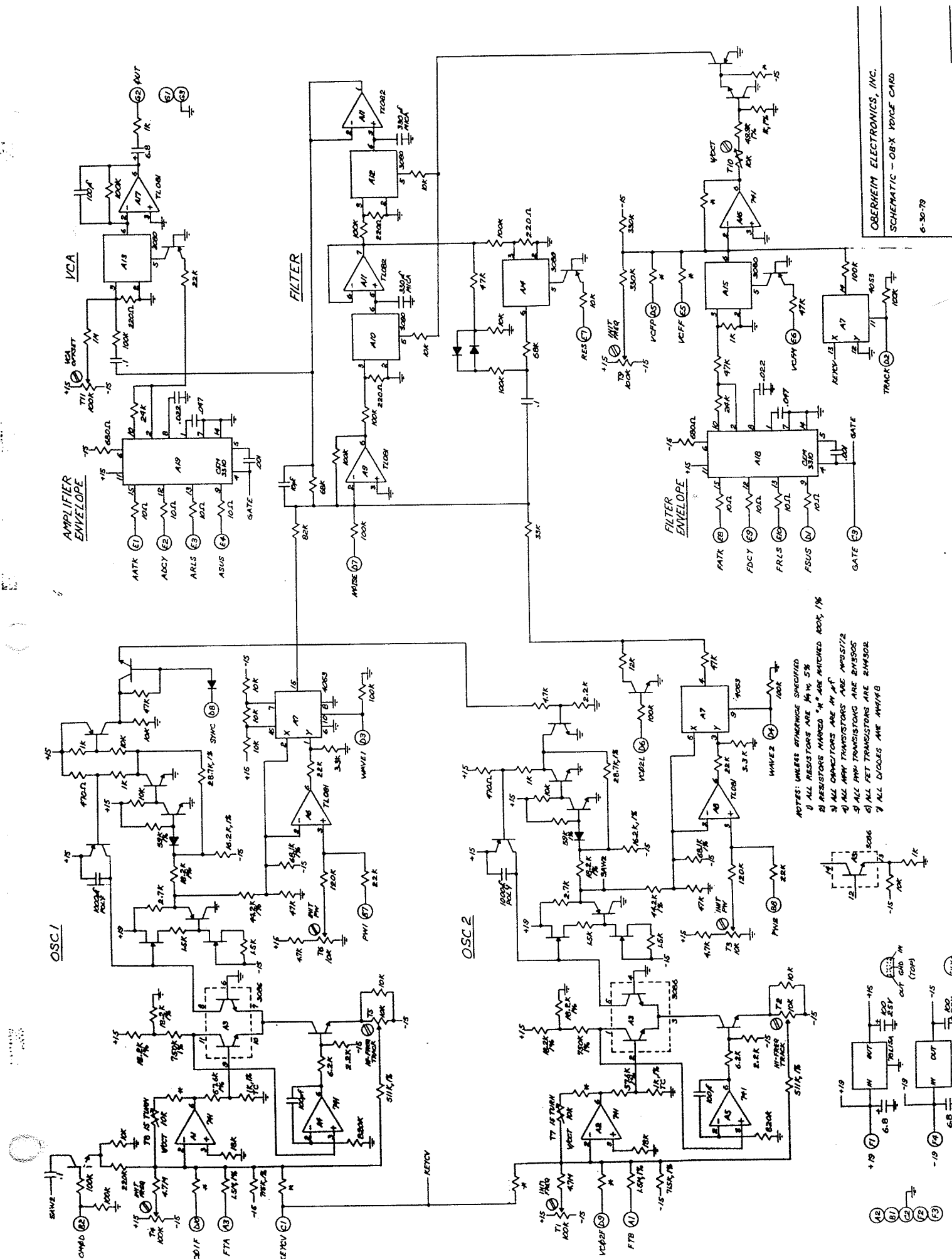


- NOTES: UNLESS OTHERWISE SPECIFIED
 1. ALL RESISTORS ARE 1/4 W. 5%
 2. ALL RESISTORS DESIGNATED "R" ARE 100K/1%
 3. ALL UNMARKED CAPACITORS ARE .01MFD
 4. ALL PNP TRANSISTORS ARE MPS 6712
 5. ALL NPN TRANSISTORS ARE 2N3305
 6. ALL DEDICATED ARE MM1178

OBERHEIM ELECTRONICS, INC.
 SCHEMATIC
 CPUX PROCESSOR CONTROL, MCTS & KEYBOARD

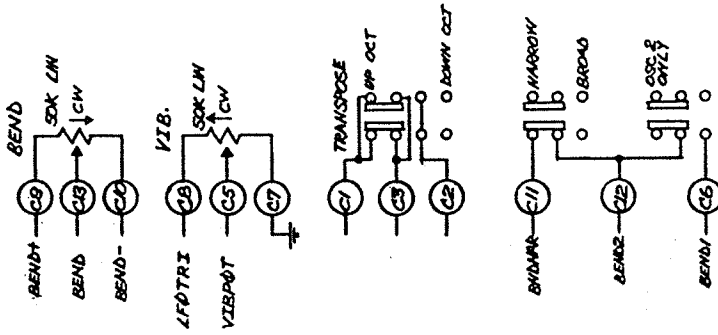


NOTES: UNLESS OTHERWISE SPECIFIED
 1) ALL RESISTORS ARE 1/4 W. 5%
 2) ALL CAPACITORS ARE 10%
 3) ALL CAPACITORS ARE 10%
 4) ALL CAPACITORS ARE 10%



- NOTES: UNLESS OTHERWISE SPECIFIED
- 1) ALL RESISTORS ARE 1/4 W 5%
 - 2) RESISTORS MARKED "M" ARE MATCHED 100K 1%
 - 3) ALL CAPACITORS ARE MFD
 - 4) ALL PNP TRANSISTORS ARE 2N4302
 - 5) ALL PNP TRANSISTORS ARE 2N4302
 - 6) ALL PNP TRANSISTORS ARE 2N4302
 - 7) ALL DIODES ARE 1N4148

OBERHEIM ELECTRONICS, INC.
SCHEMATIC - OBX VOICE CARD
6-30-79

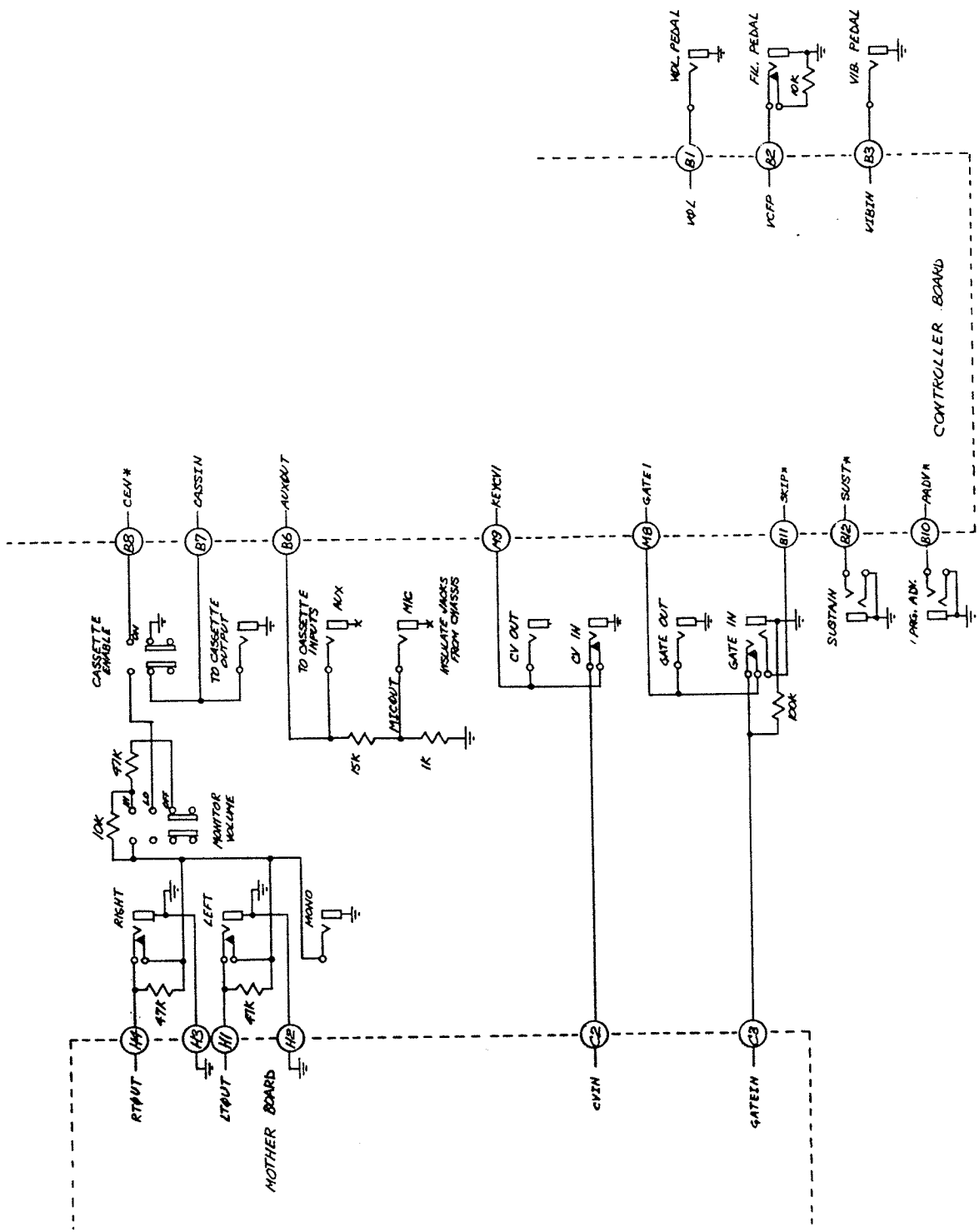


OBERHEIM ELECTRONICS, INC.

SCHEMATIC - OB-X BEND ASSEMBLY

6-30-79

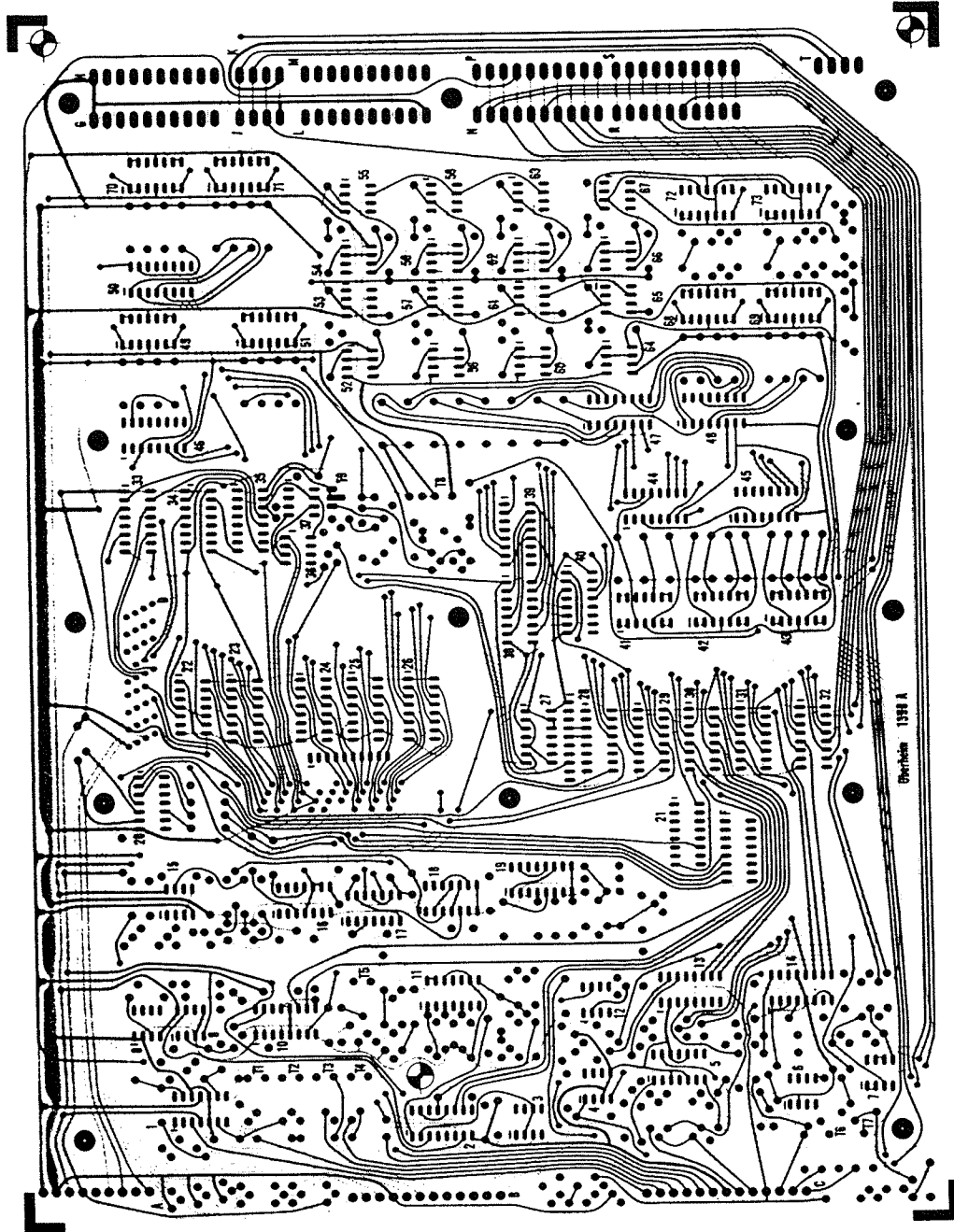
1418



OBERHEIM ELECTRONICS, INC.
SCHEMATIC - OBS-X REAR PANEL

9-6-79

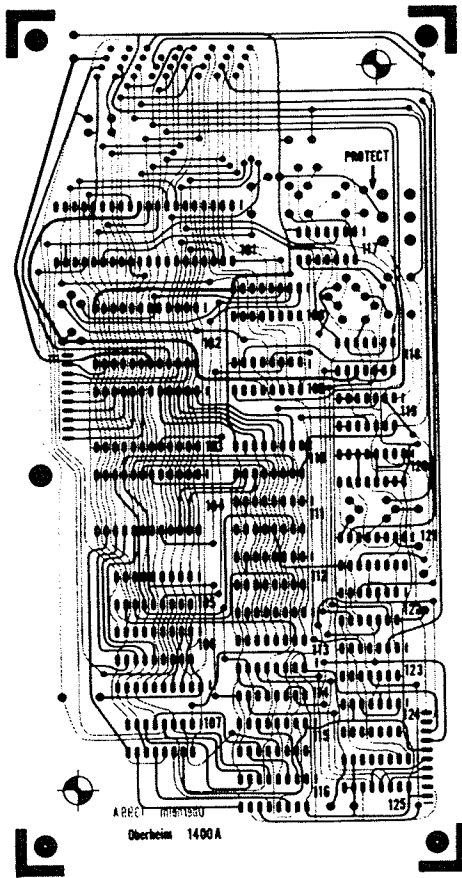
1414



08-X-1388 A

OBERHEIM ELECTRONICS, INC.

SCALE	APPROVED BY	DRAWN BY
DATE: 9-21-79		REVISED
08-X CONTROL BOARD P.C. ARTWORK		DRAWING NUMBER
COMPOSITE		



OBERHEIM ELECTRONICS, INC.

DRAWN BY

REVISED

SCALE:

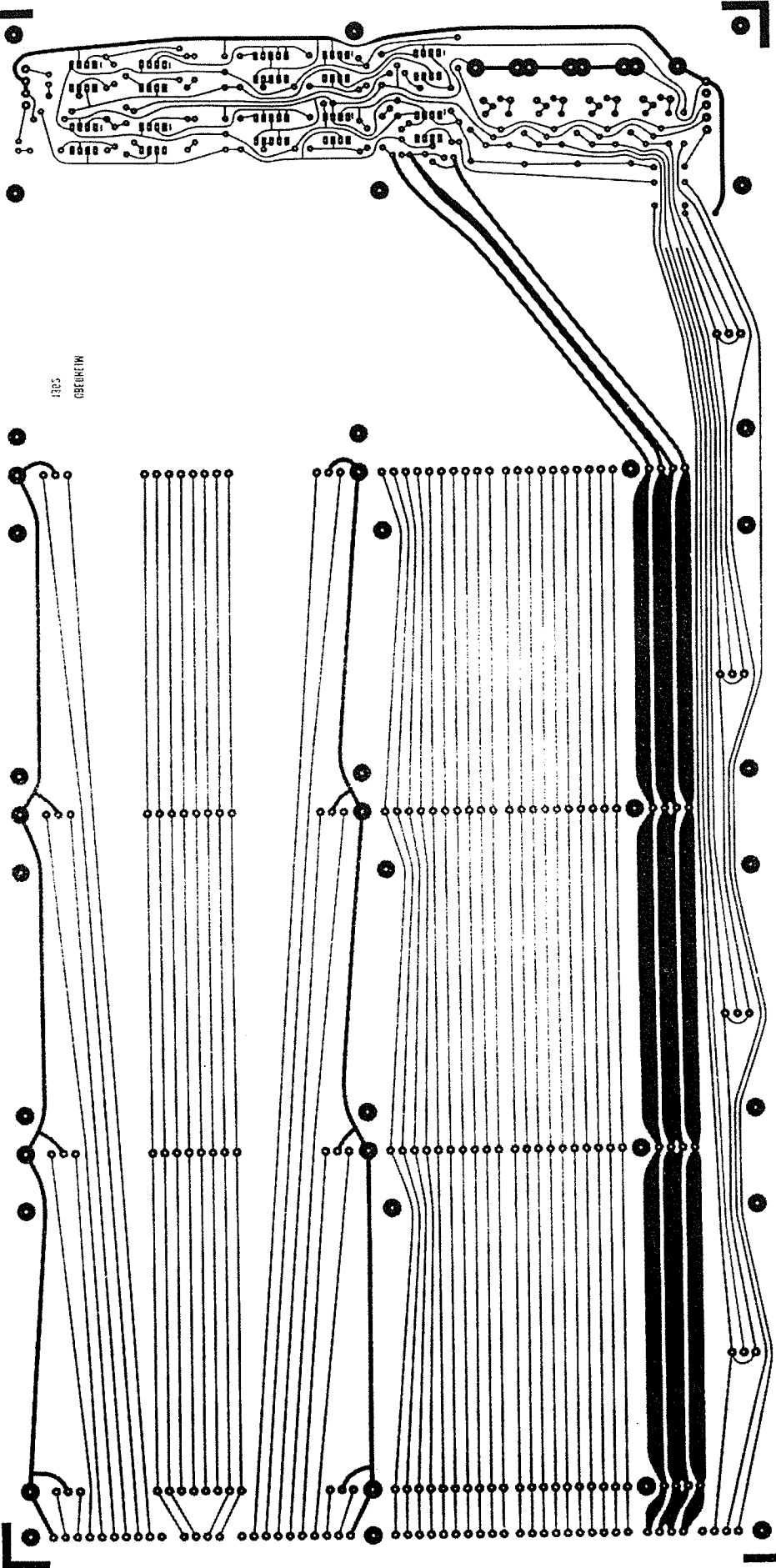
DATE 9-21-79

APPROVED BY:

OB-X PROCESSOR BOARD P.C. ARTWORK

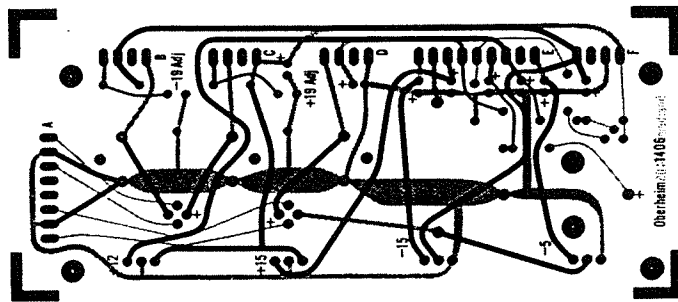
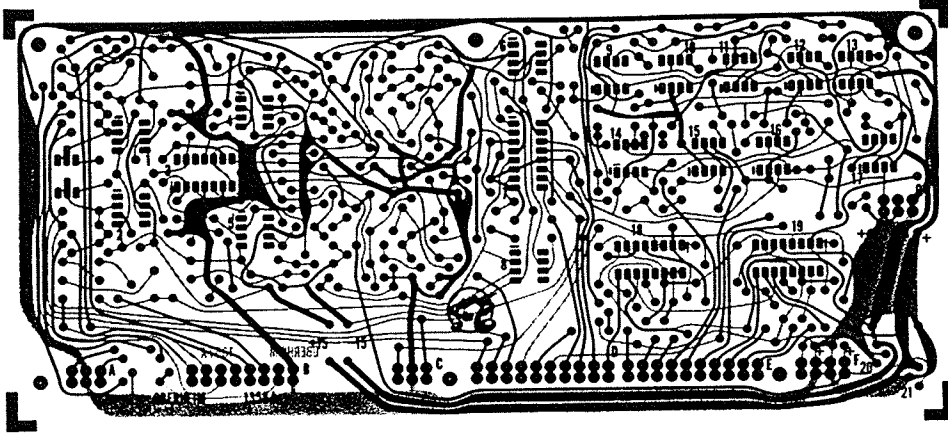
COMPOSITE

DRAWING NUMBER



1285
OBERHEIM

OBERHEIM ELECTRONICS INC.		DATE BY
DESIGN	APPROVED BY	REVIEWED
PART 9-24-79		
CG-X MOTHER BOARD A.C. ARTWORK COMPOSITE		DRAWING NUMBER



OBERHEIM ELECTRONICS, INC.

SCALE:	APPROVED BY:	DRAWN BY:
DATE: 9-21-79		REVISED:
POWER SUPPLY & VOICE CARD P.C. BOARD		
OB-X CDRADATES		
DRAWING NUMBER		

PRODUCT AFFECTED

OB-X

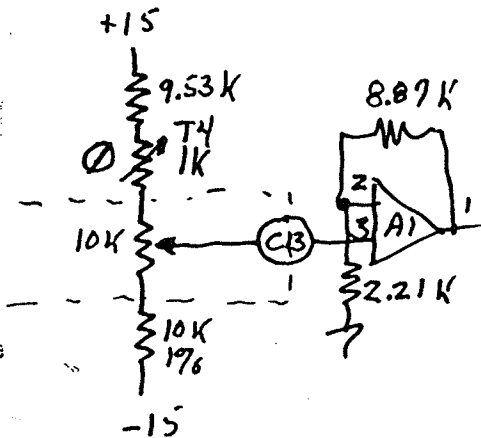
DRAWINGS AFFECTED

1413 sheet 4 of 4

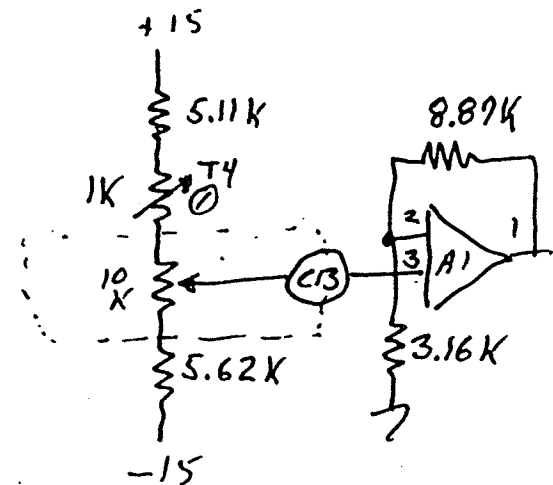
DESCRIPTION OF CHANGE

ON BENDER ELECTRONICS

WAS



NOW



REASON FOR CHANGE

Increase adjustment Range of T4 on process/control

EFFECTIVITY

- FUTURE PRODUCTION ONLY
- RETROFIT UNITS IN PRODUCTION AND INVENTORY
- RETROFIT UNITS IN FIELD
- DRAWING CORRECTION ONLY; HARDWARE NOT AFFECTED
- _____

WRITTEN BY

J. Cooper

DATE

9/1

APPROVED BY

J. Cooper

DATE

9/20

OBERHEIM ELECTRONICS, INC.
ENGINEERING CHANGE ORDER

ECO NO.
002

PRODUCT AFFECTED

OBX

DRAWINGS AFFECTED

1413

INCORPORATED

SW 793804

DESCRIPTION OF CHANGE

- I) Change .022 μ fd mylar capacitors attached to pins 5 and 10 of IC 41 to .047 μ fd mylar.
- II) Change 47pf disk capacitor attached to pin 1 of A35 to 30pf disk.
- III) Change The "H1" Eprom to "HA1" type

REASON FOR CHANGE

Improve Auto Tune performance

EFFECTIVITY

- FUTURE PRODUCTION ONLY
- RETROFIT UNITS IN PRODUCTION AND INVENTORY
- RETROFIT UNITS IN FIELD
- DRAWING CORRECTION ONLY; HARDWARE NOT AFFECTED
- _____

WRITTEN BY

J. Logan

DATE

9/20/

APPROVED BY

D. J. O'Connell

DATE

9/26/

OBERHEIM ELECTRONICS, INC.
ENGINEERING CHANGE ORDER

ECO NO.
003

PRODUCT AFFECTED

OBX

DRAWINGS AFFECTED

1413

INCORPORATED

SN 793804

DESCRIPTION OF CHANGE

- I) Change The 10K Resistor attached to pin 26 of A101
To 100K
- II) change the 4.7K Resistor attached to connector pin M8
To 3.3K

REASON FOR CHANGE

- 1) MAKE POWER-ON RESET LONGER
- 2) INCREASE GATE OUT VOLTAGE FOR COMPATIBILITY WITH DS-2A

EFFECTIVITY

- FUTURE PRODUCTION ONLY
- RETROFIT UNITS IN PRODUCTION AND INVENTORY
- RETROFIT UNITS IN FIELD
- DRAWING CORRECTION ONLY; HARDWARE NOT AFFECTED
- _____

WRITTEN BY

DATE

J. Logan

9/20/79

APPROVED BY

DATE

Paul Oberheim

9/24

PRODUCT AFFECTED

OB-X

DRAWINGS AFFECTED

1413

DESCRIPTION OF CHANGE

change the eight .022 μ fd mylar capacitors attached to IC A47 to .022 μ fd polystyrene, polycarbonate, or polypropylene.

REASON FOR CHANGE

Improve Auto Tune performance

EFFECTIVITY

- FUTURE PRODUCTION ONLY
- RETROFIT UNITS IN PRODUCTION AND INVENTORY
- RETROFIT UNITS IN FIELD
- DRAWING CORRECTION ONLY; HARDWARE NOT AFFECTED
- _____

WRITTEN BY

J. Cogan

DATE

9/20/

APPROVED BY

John Cogan 9/26

PRODUCT AFFECTED

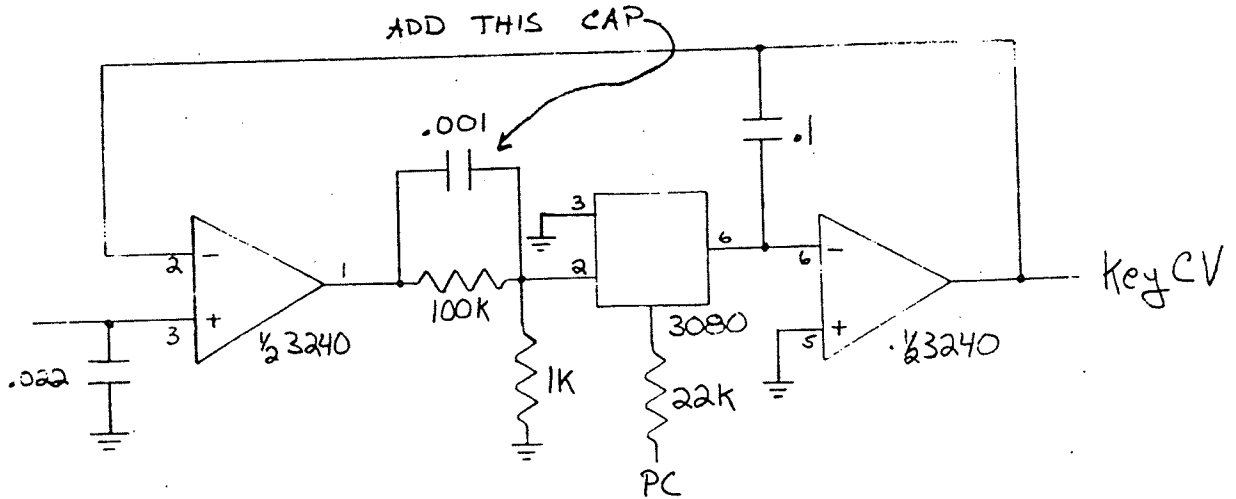
OB-X

DRAWINGS AFFECTED

1413 sheet 3 of 4

DESCRIPTION OF CHANGE

SERVICE NOTE FOR UNSTABLE KEY CV



CHANGE ONLY IF NECESSARY

REASON FOR CHANGE UNSTABLE keyboard control voltages, due to 3240's oscillating. Modification must be made to all key CV circuits. It is important to readjust DAC trimmer T9 on control board after modifying circuit.

EFFECTIVITY

- FUTURE PRODUCTION ONLY
- RETROFIT UNITS IN PRODUCTION AND INVENTORY
- RETROFIT UNITS IN FIELD
- DRAWING CORRECTION ONLY; HARDWARE NOT AFFECTED
- SERVICE NOTE

WRITTEN BY

[Signature]

7-21-

APPROVED BY

[Signature] 9-

ENGINEERING CHANGE ORDER

007

PRODUCT AFFECTED

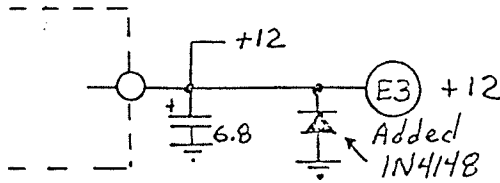
OB-X

DRAWINGS AFFECTED

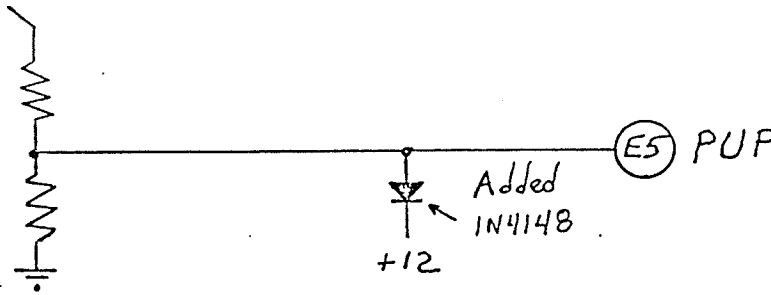
1416

DESCRIPTION OF CHANGE

Add Two 1N4148 diodes as follows:



OB-CP/S



REASON FOR CHANGE

- 1) To prevent lock-up of +12 volt supply upon power up
- 2) To prevent PUP from being generated if +12 volt supply fails

EFFECTIVITY

- FUTURE PRODUCTION ONLY
- RETROFIT UNITS IN PRODUCTION AND INVENTORY
- RETROFIT UNITS IN FIELD
- DRAWING CORRECTION ONLY; HARDWARE NOT AFFECTED

WRITTEN BY

DATE

[Signature]

10/17/99

APPROVED BY

DATE

[Signature]

10/17/99

CONTROL BOARD INTERCONNECT LIST

CONTROL

A1 -5V
 A2 (KEY)
 A3 +12V
 A4 +5MEM
 A5 PUP
 A6 +5V
 A7 +15V
 A8 GND
 A9 -15V

POWER SUPPLY

E1
 E2
 E3
 E4
 E5
 E6
 E7
 E8
 E9

CONTROL

B1 VOL
 B2 VCFP
 B3 VIBIN
 B4 (NC)
 B5 (KEY)
 B6 AUXOUT
 B7 CASSIN
 B8 CEN*
 B9 GND
 B10 PADV*
 B11 SKIP*
 B12 SUST*

REAR PANEL

VOLUME PEDAL JACK--TIP
 FILTER PEDAL JACK--TIP
 VIBRATO PEDAL JACK--TIP

 TO CASS AUX INPUT JACK--TIP
 TO CASS OUTPUT JACK--TIP
 CASSETTE ENABLE SWITCH--ON

 PROGRAM ADVANCE JACK--TIP
 GATE IN JACK--RING
 SUSTAIN FOOTSWITCH JACK--TIP

CONTROL

C1 TRUP
 C2 TRDN
 C3 TRANSP
 C4 (KEY)
 C5 VIBPOT
 C6 BEND1
 C7 GND
 C8 LFOTRI
 C9 BEND+
 C10 BEND-
 C11 BNDNAR
 C12 BEND2
 C13 BEND

MODULATION ASSEMBLY

TRANSCOPE SWITCH--UP
 TRANSCOPE SWITCH--DOWN
 TRANSCOPE SWITCH--CENTER

 VIBRATO POT--WIPER
 BEND OSC SWITCH--BOTH

 VIBRATO POT--CW END
 BEND POT--CCW END
 BEND POT--CW END
 BEND RANGE SWITCH--NARROW
 BEND OSC & RANGE SW'S--CENTER
 BEND POT--WIPER

CONTROL

PROCESSOR

D1	A4	1
D2	A5	2
D3	A6	3
D4	A1	4
D5	A2	5
D6	A3	6
D7	AOA	7
D8	A9	8
D9	A8	9
D10	A7	10
D11	D7	11
D12	D6	12
D13	D5	13
D14	D4	14
D15	D3	15
D16	D2	16
D17	D1	17
D18	D0	18
D19	IOR*	19
D20	IOW*	20
D21	CEN*	21
D22	(NC)	22
D23	ATRST	23
D24	(NC)	24
D25	OSCMUX	25
D26	PUP	26
D27	CASCLK	27
D28	(NC)	28
D29	+5MEM	29
D30	GND	30
D31	(NC)	31
D32	+12V	32
D33	-5V	33
D34	+5V	34

CONTROL

POT NO. 1

E1	LR07	1
E2	LR06	2
E3	LR05	3
E4	LR04	4
E5	LR03	5
E6	LR02	6
E7	LR01	7
E8	LR00	8
E9	GND (ANLG)	9
E10	ANLGIN	10
E11	GND	11
E12	VOLPOT	12
E13	MTUN	13
E14	GND	14
E15	SWEND*	15
E16	-15V	16
E17	+15V	17
E18	SWENE*	18
E19	CEN*	19
E20	+5V	20
E21	SWD6*	21
E22	SWD7*	22
E23	SWD2*	23
E24	SWD1*	24
E25	SWD5*	25
E26	SWD0*	26
E27	SWD4*	27
E28	SWD3*	28
E29	AR5	29
E30	AR4	30
E31	AR3	31
E32	AR2	32
E33	AR1	33
E34	ARO	34

CONTROL

KEYBOARD

F1	SWEN1*	A1
F2	SWEN3*	A2
F3	SWEN5*	A3
F4	SWEN7*	A4
F5	SWD1*	A5
F6	SWD2*	A6
F7	SWD7*	A7
F8	SWD6*	A9
F9	SWD5*	B15
F10	SWD0*	B14
F11	SWD4*	B1
F12	SWD3*	B2
F13	SWEN6*	B3
F14	SWEN4*	B4
F15	SWEN2*	B6
F16	SWENO*	B7

CONTROL

 G1
 G2
 G3
 G4
 G5
 G6
 G7
 G8
 G9
 G10

GND
 FT5A
 FT5B
 FT6A
 FT6B
 FT7A
 FT7B
 FT8A
 FT8B
 (NC)

MOTHER NO. 2

 A10
 A9
 A8
 A7
 A6
 A5
 A4
 A3
 A2
 A1

CONTROL

 H1
 H2
 H3
 H4
 H5
 H6
 H7
 H8
 H9
 H10

GND
 FT1A
 FT1B
 FT2A
 FT2B
 FT3A
 FT3B
 FT4A
 FT4B
 (NC)

MOTHER NO. 1

 A10
 A9
 A8
 A7
 A6
 A5
 A4
 A3
 A2
 A1

CONTROL

 J1
 J2
 J3
 J4

PW2
 PW1
 CMOD
 GND

MOTHER NO. 2

 B4
 B3
 B2
 B1

CONTROL

 K1
 K2
 K3
 K4

PW2
 PW1
 CMOD
 GND

MOTHER NO. 1

 B4
 B3
 B2
 B1

CONTROL

 L1
 L2
 L3
 L4
 L5
 L6
 L7
 L8
 L9
 L10

(NC)
 GATE8
 KEYCV8
 GATE7
 KEYCV7
 GATE6
 KEYCV6
 GATE5
 KEYCV5
 GND

MOTHER NO. 2

 C10
 C9
 C8
 C7
 C6
 C5
 C4
 C3
 C2
 C1

CONTROL

M1 (NC)
M2 GATE4
M3 KEYCV4
M4 GATE3
M5 KEYCV3
M6 GATE2
M7 KEYCV2
M10 GND

MOTHER NO. 1

C10
C9
C8
C7
C6
C5
C4
C1

CONTROL

M8 GATE1
M9 KEYCV1

REAR PANEL

GATE OUT JACK--TIP
CV OUT JACK--TIP

REAR PANEL

GATE IN JACK--TIP GATEIN
CV IN JACK--TIP CVIN

MOTHER NO. 1

C3
C2

CONTROL

N1 VC01F
N2 VC02F
N3 SYNC
N4 NOISE
N5 VC02L
N6 VCFP
N7 WAVE2
N8 WAVE1
N9 TRACK
N10 FSUS

MOTHER NO. 2

D10
D9
D8
D7
D6
D5
D4
D3
D2
D1

CONTROL

P1 VC01F
P2 VC02F
P3 SYNC
P4 NOISE
P5 VC02L
P6 VCFP
P7 WAVE2
P8 WAVE1
P9 TRACK
P10 FSUS

MOTHER NO. 1

D10
D9
D8
D7
D6
D5
D4
D3
D2
D1

CONTROL

R1
R2
R3
R4
R5
R6
R7
R8
R9
R10

FRLS
FDCY
FATK
RES
VCFM
VCFF
ASUS
ARLS
ADCY
AATK

MOTHER NO. 2

E10
E9
E8
E7
E6
E5
E4
E3
E2
E1

CONTROL

S1
S2
S3
S4
S5
S6
S7
S8
S9
S10

FRLS
FDCY
FATK
RES
VCFM
VCFF
ASUS
ARLS
ADCY
AATK

MOTHER NO. 1

E10
E9
E8
E7
E6
E5
E4
E3
E2
E1

CONTROL

T1
T2
T3
T4

(NC)
GND
OSCMUX
VOL

MOTHER NO. 1

G4
G3
G2
G1

POWER SUPPLY BOARD INTERCONNECT LIST

POWER SUPPLY

A1	26VAC
A2	GND (CT)
A3	26VAC
A4	(KEY)
A5	(NC)
A6	10VAC
A7	GND (CT)
A8	10VAC

TRANSFORMER

5
6
7
8
9
10

POWER SUPPLY

B1	-32V
B2	(KEY)
B3	-19V
B4	ADJ

LM337K

CASE
2
1

POWER SUPPLY

C1	+19V
C2	(KEY)
C3	+32V
C4	ADJ

LM317K

CASE
2
1

POWER SUPPLY

D1	GND
D2	(KEY)
D3	+5V
D4	+12V

LM340K

CASE
2
1

POWER SUPPLY

F1	+19V
F2	GND
F3	(KEY)
F4	-19V

MOTHER NO. 1

F1
F2
F3
F4

)
)
) CONTAINED
) IN A
)

MOTHER NO. 1

F1	+19V
F2	GND
F3	(KEY)
F4	-19V

MOTHER NO. 2

F1
F2
F3
F4

) SINGLE
) CABLE
)

POT BOARD INTERCONNECT LIST

POT NO. 1

A1 -15V
 A2 +15V
 A3 PORT
 A4 LFOPOT
 A5 FMPOT
 A6 PWMPOT
 A7 DETUNE
 A8 +5POT

POT NO. 2

A1
 A2
 A3
 A4
 A5
 A6
 A7
 A8

POT NO. 1

B1 GND
 B2 VOLPOT
 B3 MTUN
 B4 SWEND*
 B5 LEDC0*
 B6 SWENA*
 B7 LEDC1*
 B8 SWENB*

POT NO. 2

B1
 B2
 B3
 B4
 B5
 B6
 B7
 B8

POT NO. 1

C1 SWD0*
 C2 SWD1*
 C3 SWD2*
 C4 SWD3*
 C5 SWD4*
 C6 SWD5*
 C7 SWD6*
 C8 SWD7*

POT NO. 2

C1
 C2
 C3
 C4
 C5
 C6
 C7
 C8

POT NO. 1

D1 LEDR0
 D2 LEDR1
 D3 LEDR2
 D4 LEDR3
 D5 LEDR4
 D6 LEDC6*
 D7 LEDC7*
 D8 SWEN9*

POT NO. 2

D1
 D2
 D3
 D4
 D5
 D6
 D7
 D8

MOTHER BOARD INTERCONNECT LIST

MOTHER NO. 1

H1
H2
H3
H4

LTOUT
SHIELD
SHIELD
RTOUT

REAR PANEL

LEFT OUTPUT JACK--TIP
LEFT OUTPUT JACK--SLEEVE
RIGHT OUTPUT JACK--SLEEVE
RIGHT OUTPUT JACK--TIP

MOTHER NO. 1

J1
J2
J3
J4
J5

GND
(NC)
LAUX
RAUX
OSCSUM

MOTHER NO. 2

J1
J2
J3
J4
J5