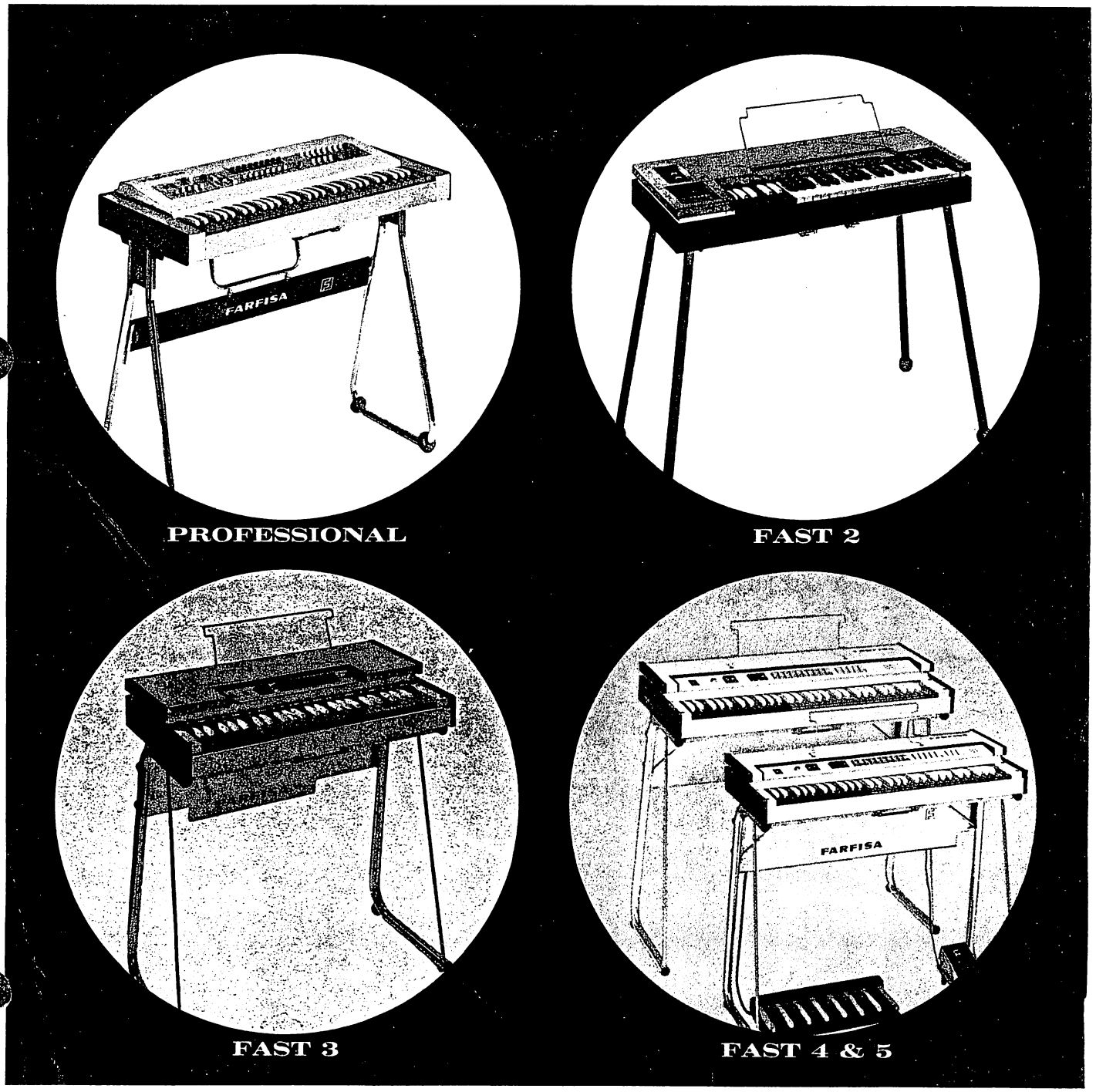
FARFISA PORTABLE ORGANS

SERVICE MANUAL



L. D. HEATER
SUBSIDIARY OF CHICAGO MUSICAL INSTRUMENT CO.
Music Company • DISTRIBUTORS OF FINE MUSICAL MERCHANDISE
10300 S.W. ALLEN BLVD. • BEAVERTON, OREGON 97005 • (503) 646-8121

Stocks Music:

In reply to your questions re the Fast 4, I am sending a service manual which should be of help if you have a service man there.
In your description of the trouble, I would suggest that you change the tone generator 'A' board. Your trouble seems to be in that board since you refer to the A note in each case.

Elliot Sweetland

TABLE OF CONTENTS

TABLE OF CONTENTS

SERVICE INFORMATION

SCHEMATIC

PHOTOGRAPHS

SERVICE ACCESS AND CIRCUIT LOCATION

PRINTED CIRCUIT BOARDS

PARTS

SPECIFICATIONS

MAIN FEATURES

Keyboard 48 Notes—F to E.
Manual Bass 12 Notes—F to E.
4 Voice Stops (violet tabs):
Clarinet—Flute—Reed—Strings.
Vibrato Stops (blue tabs):
Vibrato On/Off—Slow/Fast.
Overall Volume Control.
Manual Bass Volume Control.
Built-in 10 Watt solid-state amplifier.
Outlet for external additional amplifier.
2 Elliptical Loudspeakers.
Mains Switch and Pilot-light.
Mains Voltage: 117 V
Dimensions: 31" x 14½" x 35½"
Weight: 44 lbs.
4 Removable Legs and Retractable carrying handle.
Metal cabinet covered with washable plastic.
Swell Pedal (optional).

ADJUSTMENTS
FAST 2

VR1 VIBRATO SPEED

Vibrato speed may be adjusted using a small regular screwdriver. Proper speed is between 6-7 Hertz with the Vibrato speed tabswitch set in the Fast position.

VR4 ORGAN VOLUME

Set to customer preference! Take into consideration that a full setting may overdrive the speakers causing distortion.

VR5 BIAS

This adjustment is carefully set at the factory. Adjustment should not be necessary unless amplifier transistors or their associated components are replaced. To set this adjustment: First, turn on the Flute tabswitch and hold a three note chord. Then position the Bias adjustment at the point of minimum distortion. Try other chords on the keyboard, both high and low, to make sure the adjustment is satisfactory over the entire keyboard range.

L1 TUNING

The 12 Tone Generator Master Oscillator circuits determine the pitch of the entire organ. Adjusting any one of the Master Oscillator tuning adjustments will tune all the notes of that tone generator. Tuning any group of 12 notes automatically tunes the entire organ.

Tuning may be accomplished by using a small non-conductive screwdriver and one of the following methods:

1. Set of 12 Tuning Forks: Zero beat the note of the organ to be tuned to the sound of the corresponding tuning fork. This is a highly accurate tuning method.
2. Strobo Conn or Strobo Tuner: This is done by visual observation of a strob pattern. Simply follow directions supplied with the Strobotuner. This is a highly accurate tuning method.
3. Another instrument: Zero beat the note of the organ to be tuned to the sound of a corresponding note on an "in tune" instrument (piano, organ, accordion, etc.) Accuracy is dependent upon the tuning of the other instruments. This method is especially desirable when the other instrument is to be played with the organ.
4. One Tuning Fork: One tuning fork is used to set the "temperament" (one note). The other 11 notes are set by ear using the number of beats between "4ths" and "5ths." This requires a trained ear. Accuracy is dependent upon the tuner.

TRANSISTOR VOLTAGES

Q No.	Circuit	Collector	Emitter	Base
Q1	Vibrato Oscillator	+5.5*	+2.8	+2.8
Q2	Vibrato Emitter Follower	+12	+5*	+.7*
Q3	Master Oscillator	+2.7	+12	+13
Q4	1st Divider	+6	+1.2	+1.4
Q5	1st Divider	+6	+1.2	+1.4
Q6	2nd Divider	+6	+1.2	+1.4
Q7	2nd Divider	+6	+1.2	+1.4
Q8	Treble Sole Divider	+1.5 or +10	+1.1	+1 or +1.8
Q9	Treble Solo Divider	+1.5 or +10	+1.1	+1 or +1.8
Q10	1st Bass Divider	+1.5 or +10	+1.1	+1 or +1.8
Q11	1st Bass Divider	+1.5 or +10	+1.1	+1 or +1.8
Q12	2nd Bass Divider	+1.5 or +10	+1.1	+1 or +1.8
Q13	2nd Bass Divider	+1.5 or +10	+1.1	+1 or +1.8
Q14	Preamp #1	+2.5	+.1	+.2
Q15	Preamp #2	+4.5	+.7	+.4
Q16	Input Preamp	+.7	+14	+13
Q17	Bias Transistor	+16	+14	+14.5
Q18	Voltage Amp	+14	ϕ	+.7
Q19	Driver #1	+32	+15	+16
Q20	Driver #2	+.6	+15	+14.5
Q21	Output	+32	+15	+15.5
Q22	Output	+15	ϕ	+.6

*Pulse Voltage

IMPORTANT

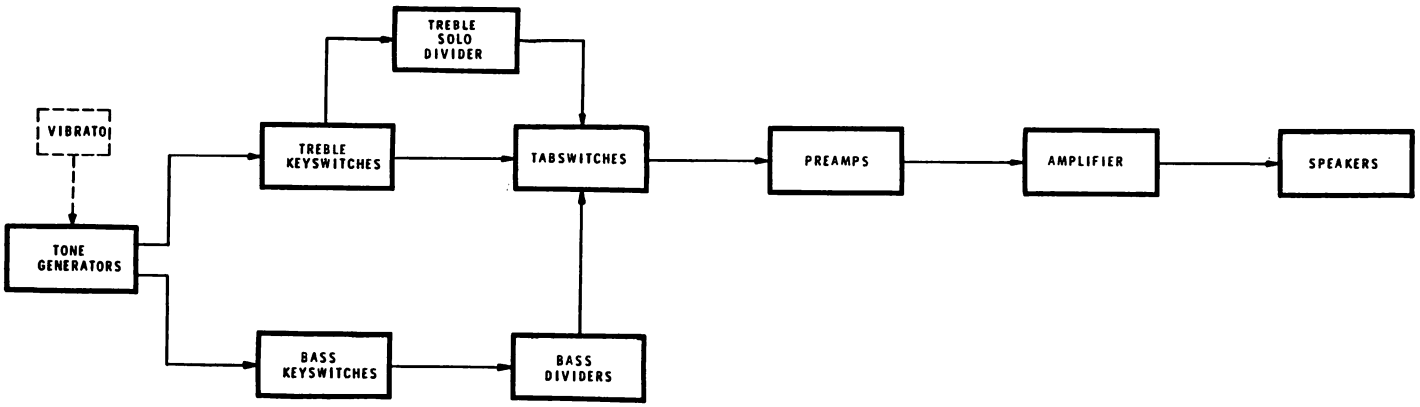
The above voltage readings were measured to ground with a Simpson Model 260 V. O. M. Voltage readings shown are intended only as a guide in troubleshooting. Voltage will vary from organ to organ due to normal manufacturing tolerances.

CAUTION

Exercise extreme care when making voltage measurements. Accidental shorting of transistor leads may damage the transistor.

BLOCK DIAGRAM

F.A.S.T. 2

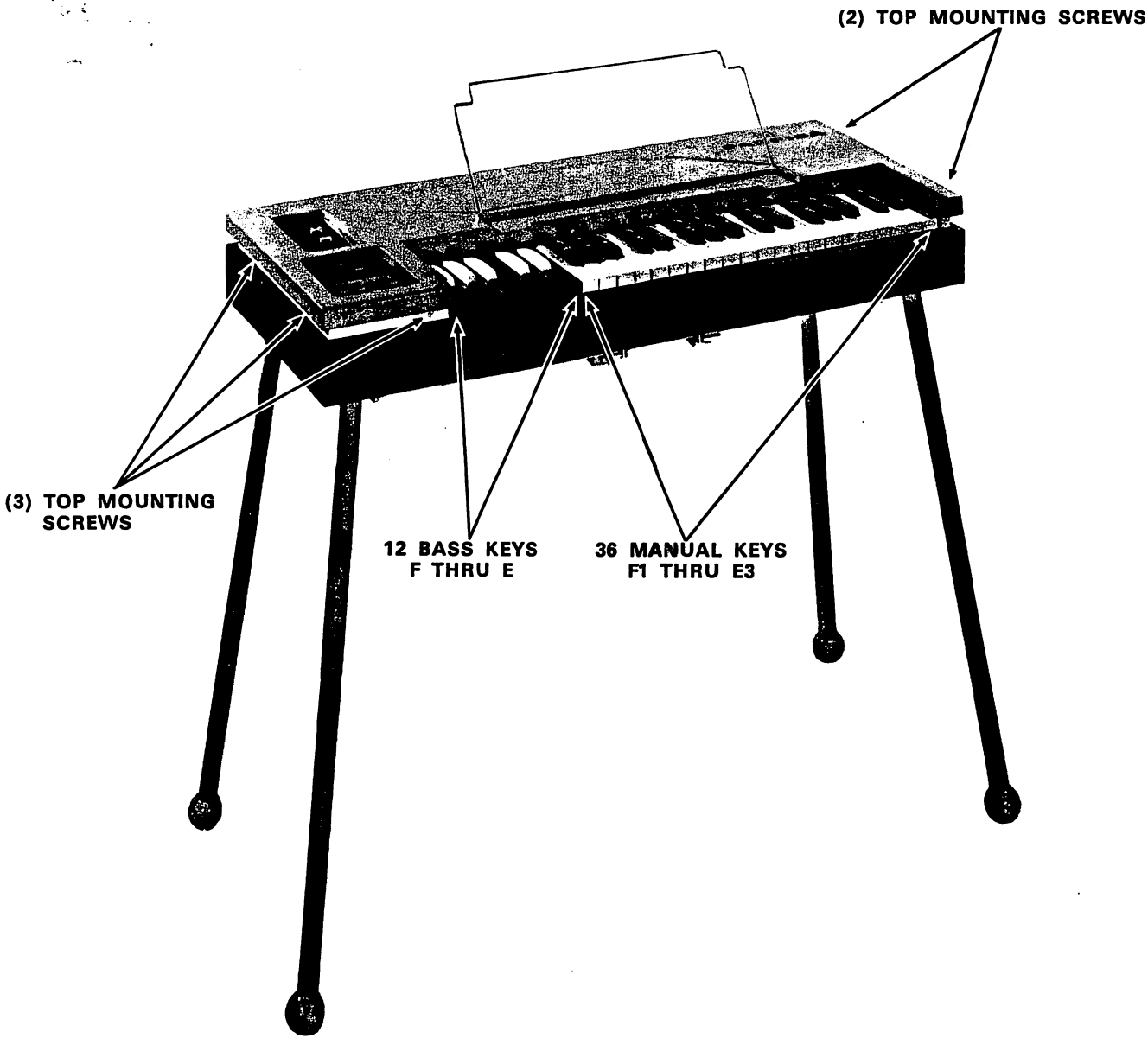


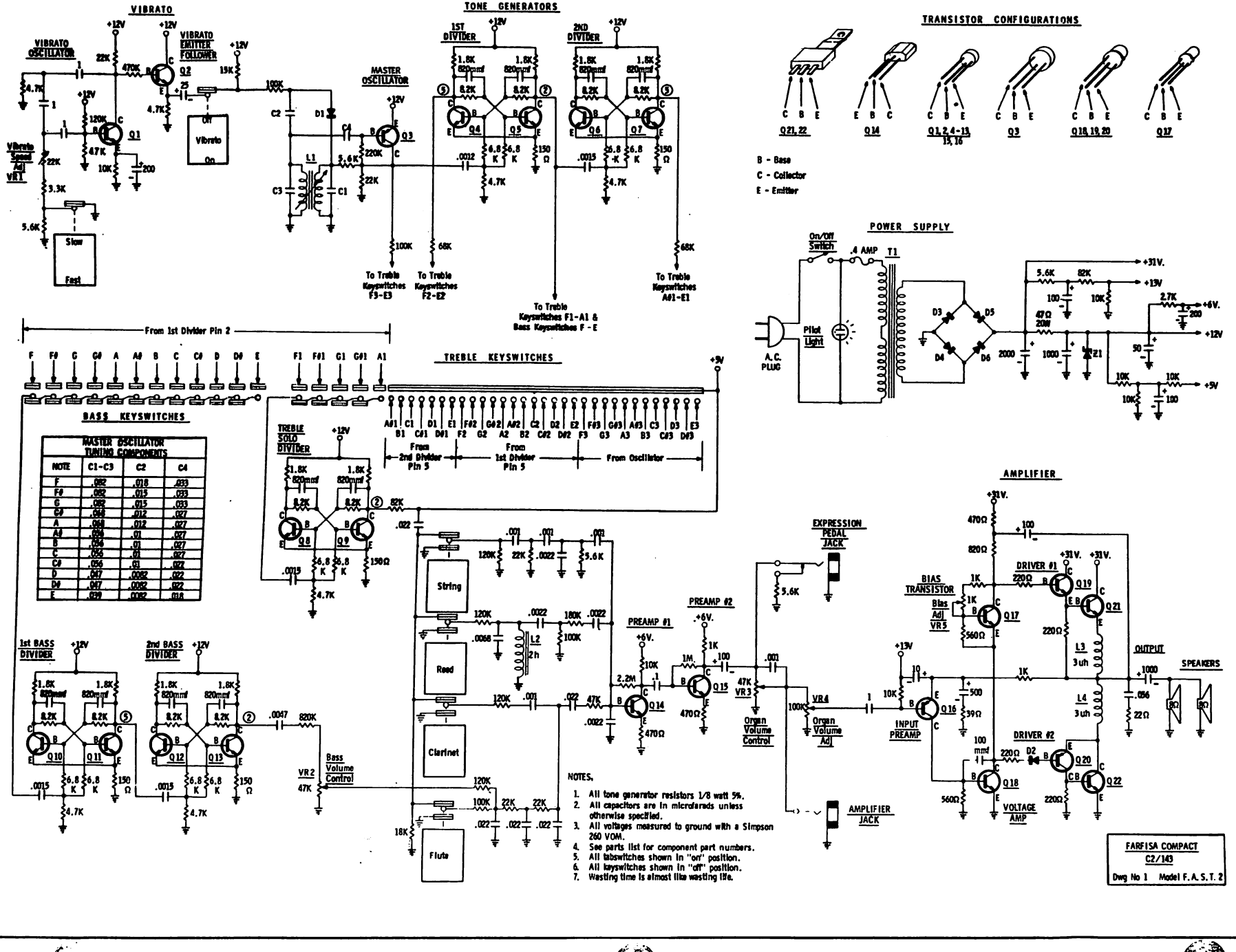
LEGEND

SIGNAL FLOW

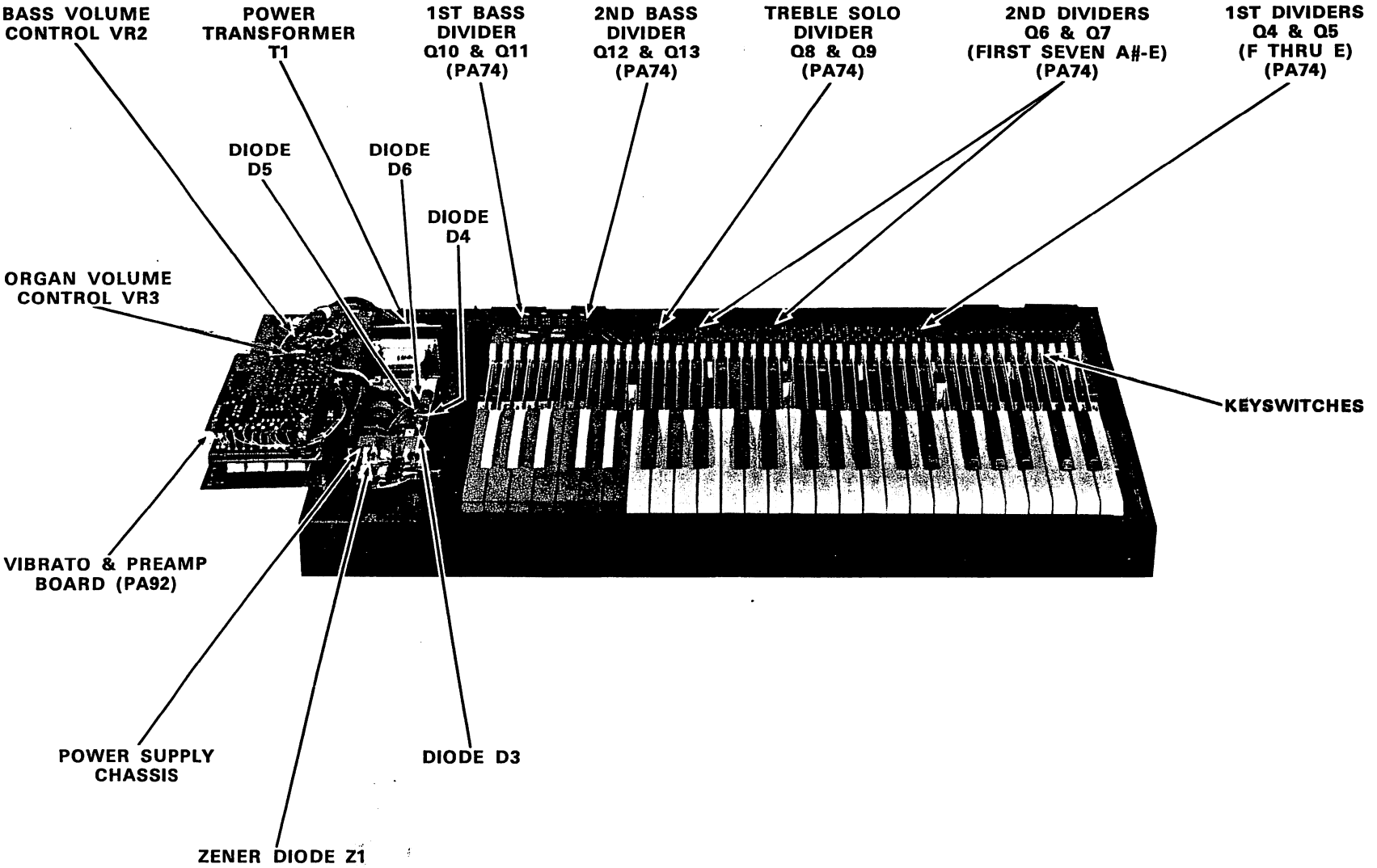
CONTROL

FRONT VIEW
FAST 2

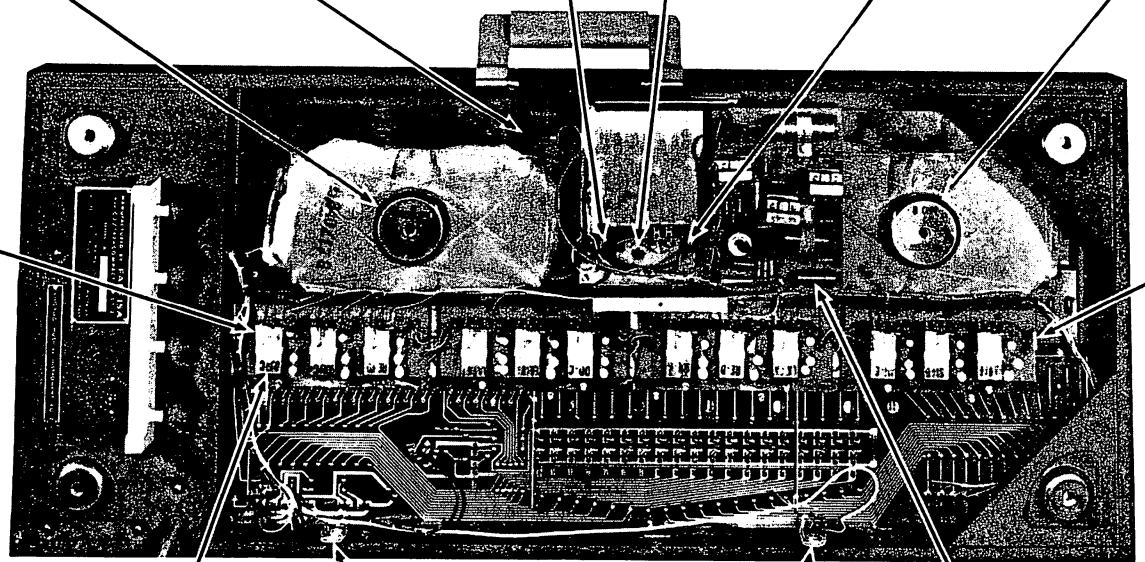




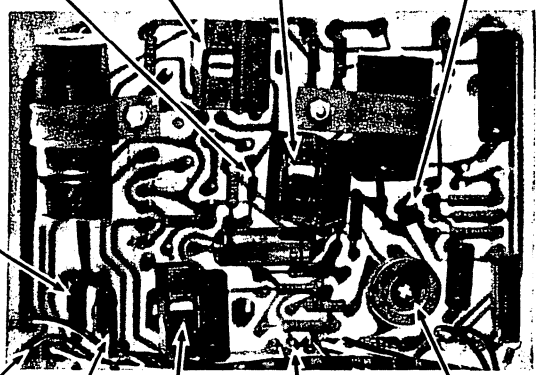
TOP VIEW
(Power Supply Exposed)
FAST 2



BOTTOM VIEW
FAST 2



AMPLIFIER BOARD
FAST 2
(PA58)



VIBRATO & PREAMP BOARD
FAST 2
(PA92)

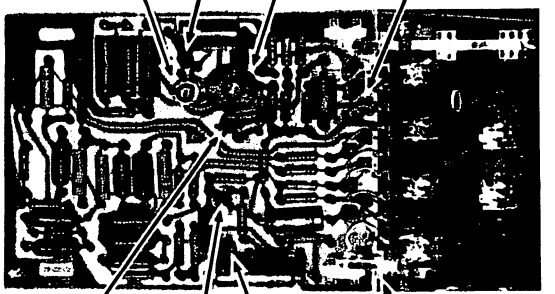


TABLE OF CONTENTS

SPECIFICATIONS

Keyboard: 49 notes C to C
Manual Bass: 12 notes C to B
Overall Volume Control
Optional Swell Pedal

Voice Stops (violet tabs):
- Bass 16′
- Clarinet 16′
- Flute 8′
- Oboe 8′
- Trumpet 8′
- Strings 8′
- Flute 4′

Vibrato Stops (blue tabs):
- Vibrato On/Off
- Slow / Fast

Manual Bass Selector tab

Manual Bass Volume Balance Control tab

Mains Switch

Pilot Light

Mains Voltage (for USA and CANADA): 117 Volt AC

Dimensions: 31″ x 17″ x 32.5″

Weight: 44 lbs. — 20 Kg.

Metal cabinet covered with washable vinyl—plastic edges—metal folding legs—retractable carrying handle—removable music rack.

ADJUSTMENTS
FAST 3

VR1 VIBRATO SPEED

Vibrato speed may be adjusted using a small regular screwdriver. Proper speed is between 6-7 Hertz with the Vibrato speed tabswitch set in the Fast position.

VR3 D. C. BALANCE

A slight amount of D. C. voltage is supplied through the D. C. Balance Adj. to the 16′-8′-4′ manual keyswitches. This is done to minimize key click. To adjust the D. C. Balance:

1. Turn on the Flute 4′, Flute 8′ and Bass 16′ Tabswitches.
2. Repeatedly depress several manual keys while turning the D. C. Balance Adj. (Use a small regular screwdriver.)
3. Set Adjustment at point of least amount of D. C. click.

L1 TUNING

The 12 Tone Generator Master Oscillator circuits determine the pitch of the entire organ. Adjusting any one of the Master Oscillator tuning adjustments will tune all the notes of that tone generator. Tuning any group of 12 notes automatically tunes the entire organ.

Tuning may be accomplished by using a small nonconductive screwdriver and one of the following methods:

1. Set of 12 Tuning Forks: Zero beat the note of the organ to be tuned to the sound of the corresponding tuning fork. This is a highly accurate tuning method.
2. Strobo Conn or Strobo Tuner: This is done by visual observation of a strob pattern. Simply follow directions supplied with the Strobotuner. This is a highly accurate tuning method.
3. Another instrument: Zero beat the note of the organ to be tuned to the sound of a corresponding note on an "in tune" instrument (piano, organ, accordion, etc.) Accuracy is dependent upon the tuning of the other instruments. This method is especially desirable when the other instrument is to be played with the organ.
4. One Tuning Fork: One tuning fork is used to set the "temperment" (one note). The other 11 notes are set by ear using the number of beats between "4ths" and "5ths". This requires a trained ear. Accuracy is dependent upon the tuner.

TRANSISTOR VOLTAGES

Q No.	Circuit	Collector	Emitter	Base
Q1	Vib. Oscillator	+5V*	+8.4V	+7.5V
Q2	Vib. Emitter Follower	ϕV	+2.5V*	+2V*
Q3	Master Oscillator	+1.8V	+7.4V	+7.4V
Q4	Buffer	+3.6V	+8.4V	+8.4V
Q5	1st Divider	+4.4V	+8.4V	+10V
Q6	1st Divider	+4.4V	+8.4V	+10V
Q7	2nd Divider	+4.4V	+8.4V	+10V
Q8	2nd Divider	+4.4V	+8.4V	+10V
Q9	3rd Divider	+4.4V	+8.4V	+10V
Q10	3rd Divider	+4.4V	+8.4V	+10V
Q11	16′ Solo Divider	+4.4V	+7.4V	+7.4V
Q12	16′ Solo Divider	+4.4V	+7.4V	+7.4V
Q13	Preamp #1	+6V	+.2V	+.1V
Q14	Preamp #2	+4.4V	+.2V	+.1V
Q15	Output Preamp	+4.4V	+1.5V	+.2V

*Pulse Voltage

IMPORTANT

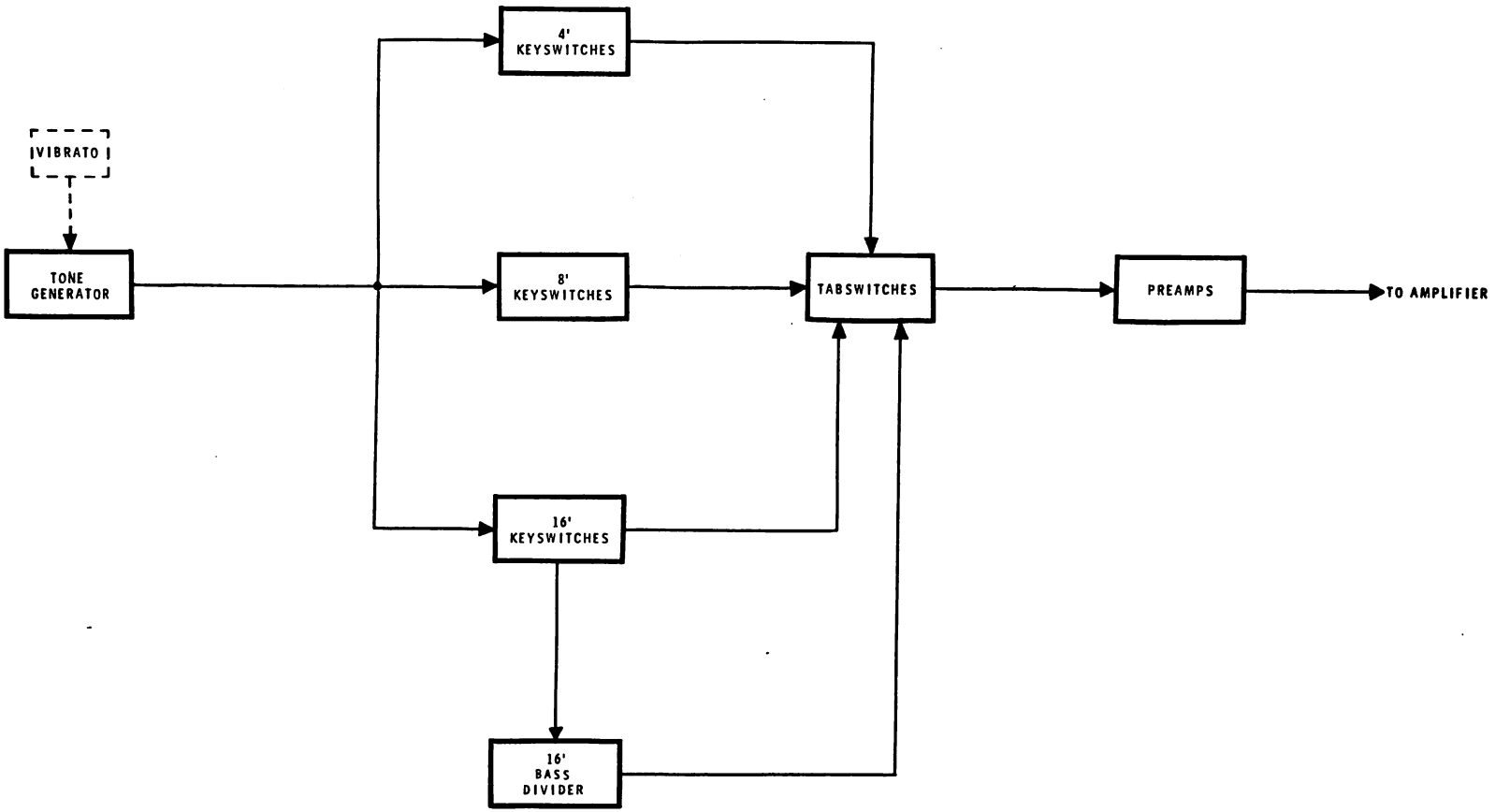
The above voltage readings were measured to ground with a Simpson Model 260 V.O.M. Voltage readings shown are intended only as a guide in troubleshooting. Voltages will vary from organ to organ due to normal manufacturing tolerances.

CAUTION

Exercise extreme care when making voltage measurements. Accidental shorting of transistor leads may damage the transistor.

BLOCK DIAGRAM

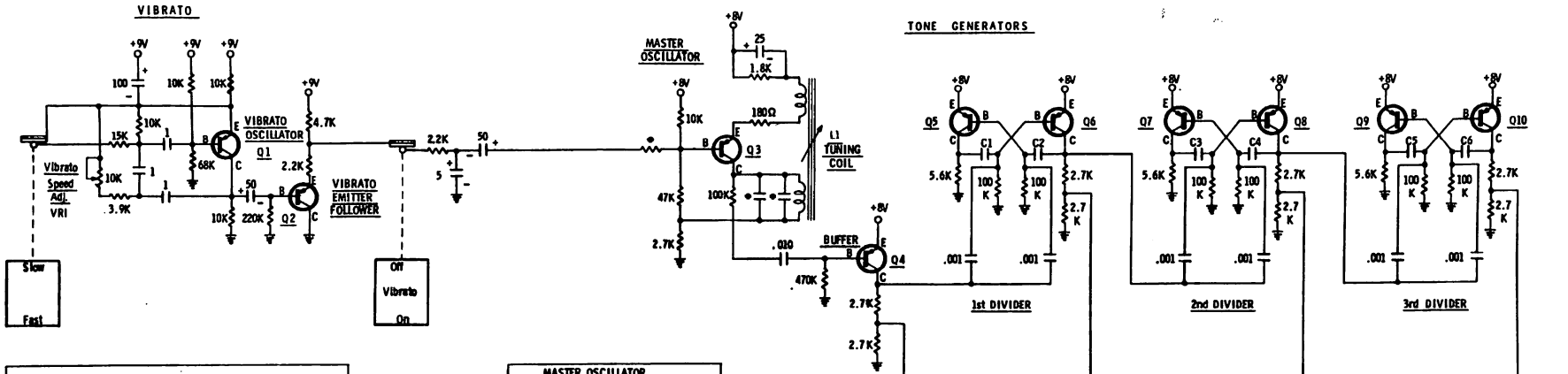
F.A.S.T. 3



LEGEND

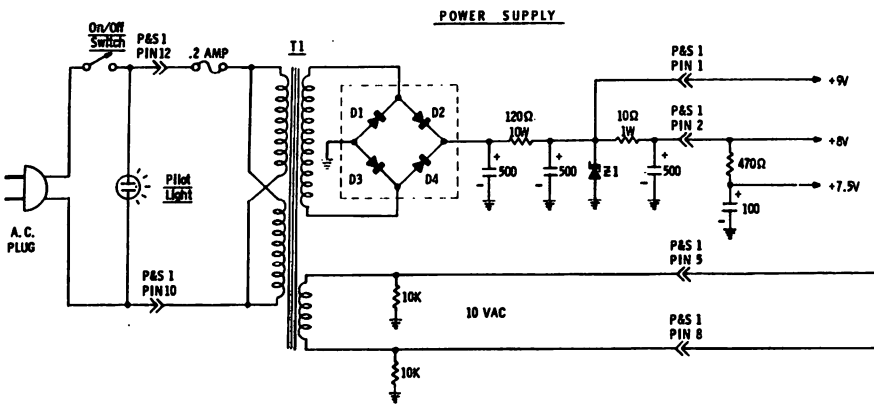
SIGNAL FLOW

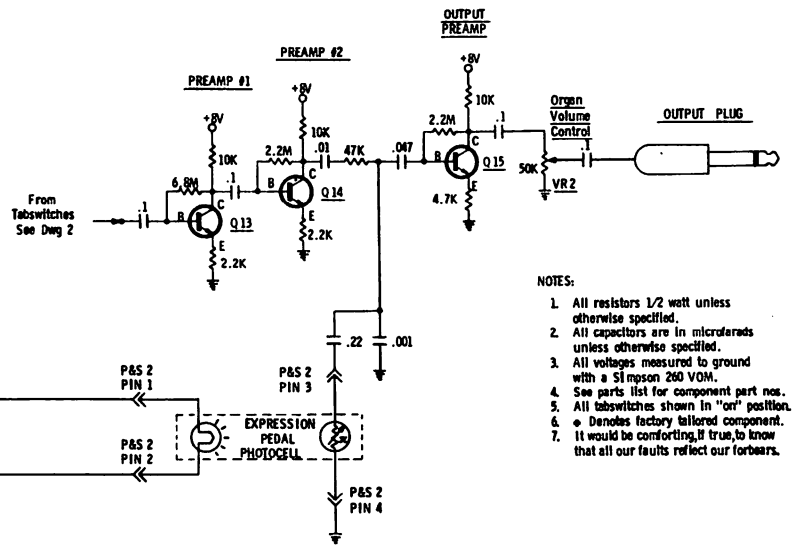
CONTROL



PLUG & SOCKET CONNECTIONS			
P&S No.	PIN No.	Voltage	INFORMATION
1	1	+9V	To Vibrato
	2	+8V	To Tone Generators & Preamps
	3	⏚	Ground
	4	----	Not Used
	5	10 VAC	To Expression Pedal lamp
	6	⏚	Ground
	7	----	Not Used
	8	10 VAC	To Expression Pedal lamp
	9	----	Not Used
	10	117VAC	From A.C. Plug
	11	----	Not Used
	12	117VAC	From On/Off Switch
4	1	10 VAC	To Expression Pedal lamp
	2	10 VAC	To Expression Pedal lamp
	3	Audio	To Expression Pedal Photocell
	4	⏚	Ground

MASTER OSCILLATOR TUNING COMPONENTS			
NOTE	C1-C2	C3-C4	C5-C6
C	.022	.047	.1
C#	.022	.047	.1
D	.022	.039	.082
D#	.022	.039	.082
E	.015	.033	.068
F	.015	.033	.068
F#	.015	.033	.068
G	.015	.033	.068
G#	.012	.027	.056
A	.012	.027	.056
A#	.012	.027	.056
B	.012	.027	.056



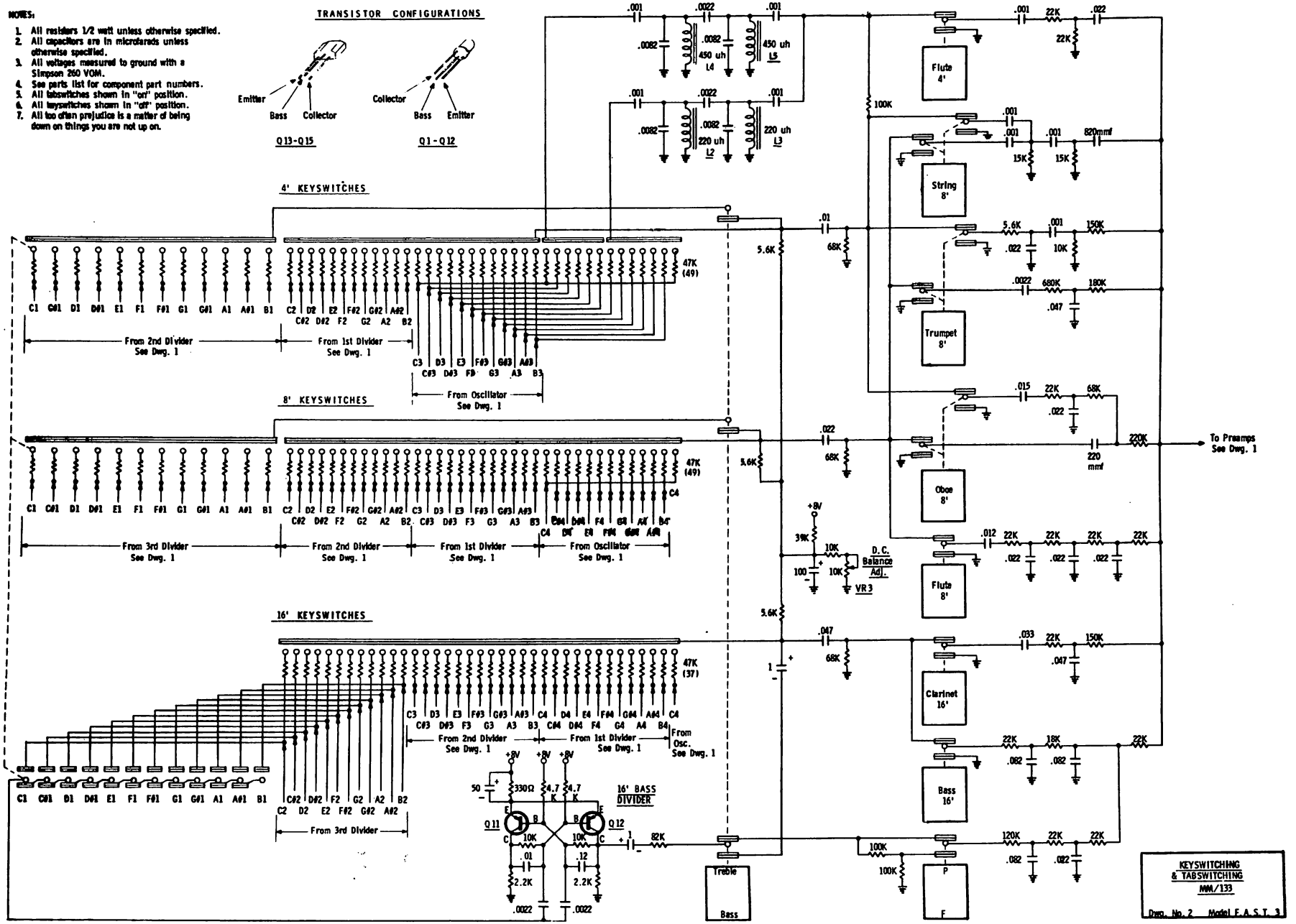


NOTES:

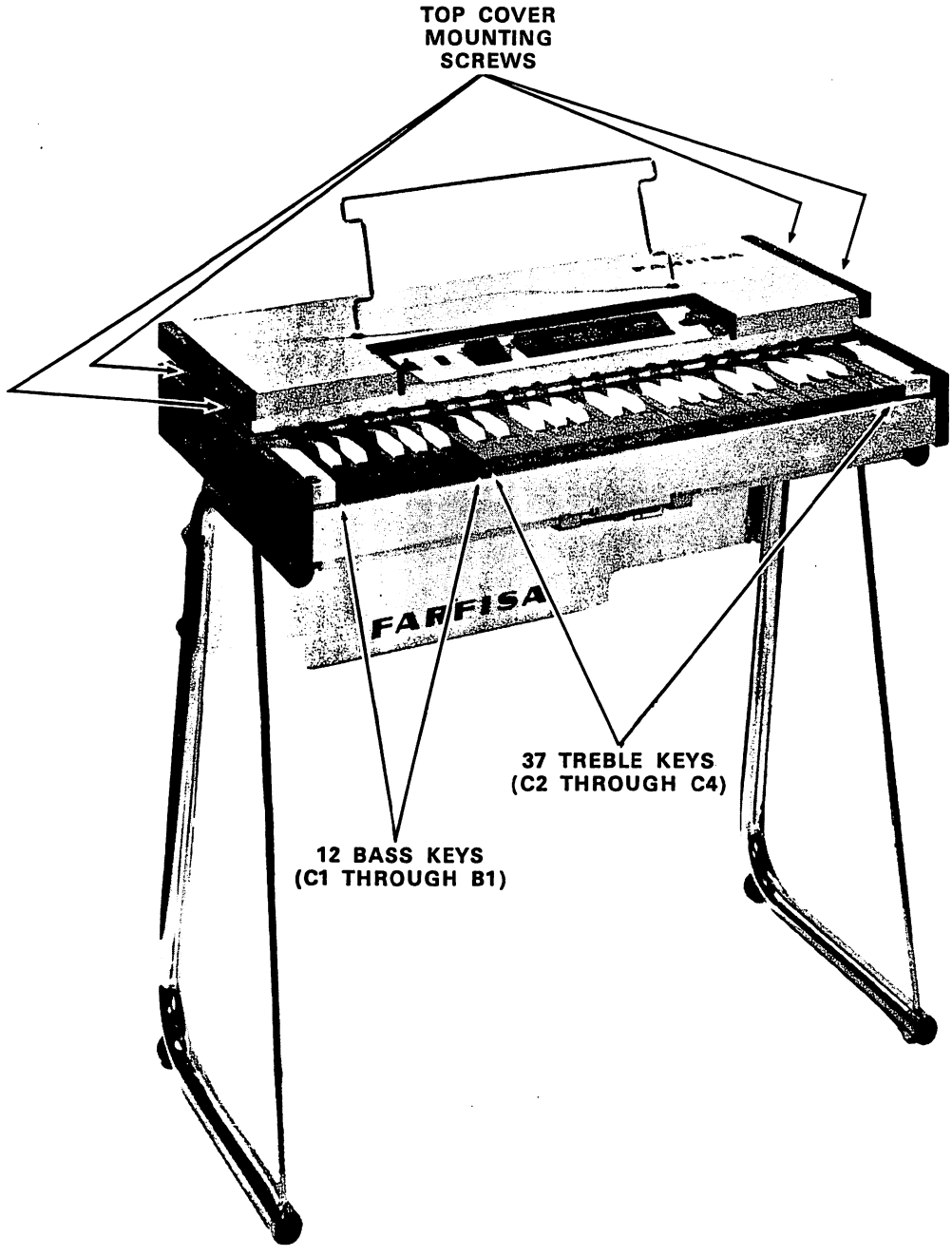
1. All resistors 1/2 watt unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See parts list for component part nos.
5. All tabswitches shown in "on" position.
6. ◆ Denotes factory tailored component.
7. It would be comforting, if true, to know that all our faults reflect our forbears.

TONE GENERATORS, VIBRATO, PREAMPS & POWER SUPPLY
MM/133
Dwg. No. 1 Model F.A.S.T.3

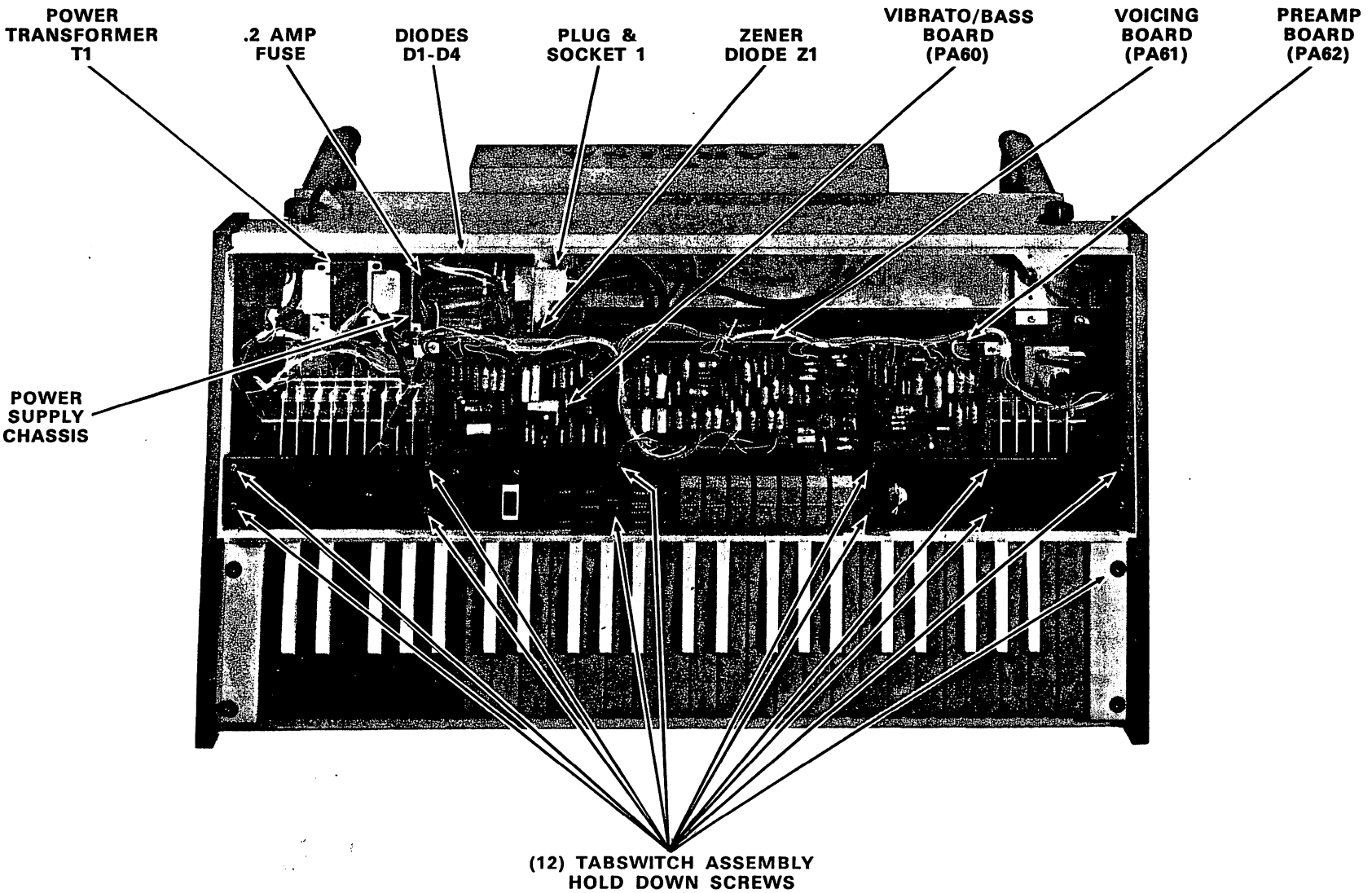
F.A.S.T. 3



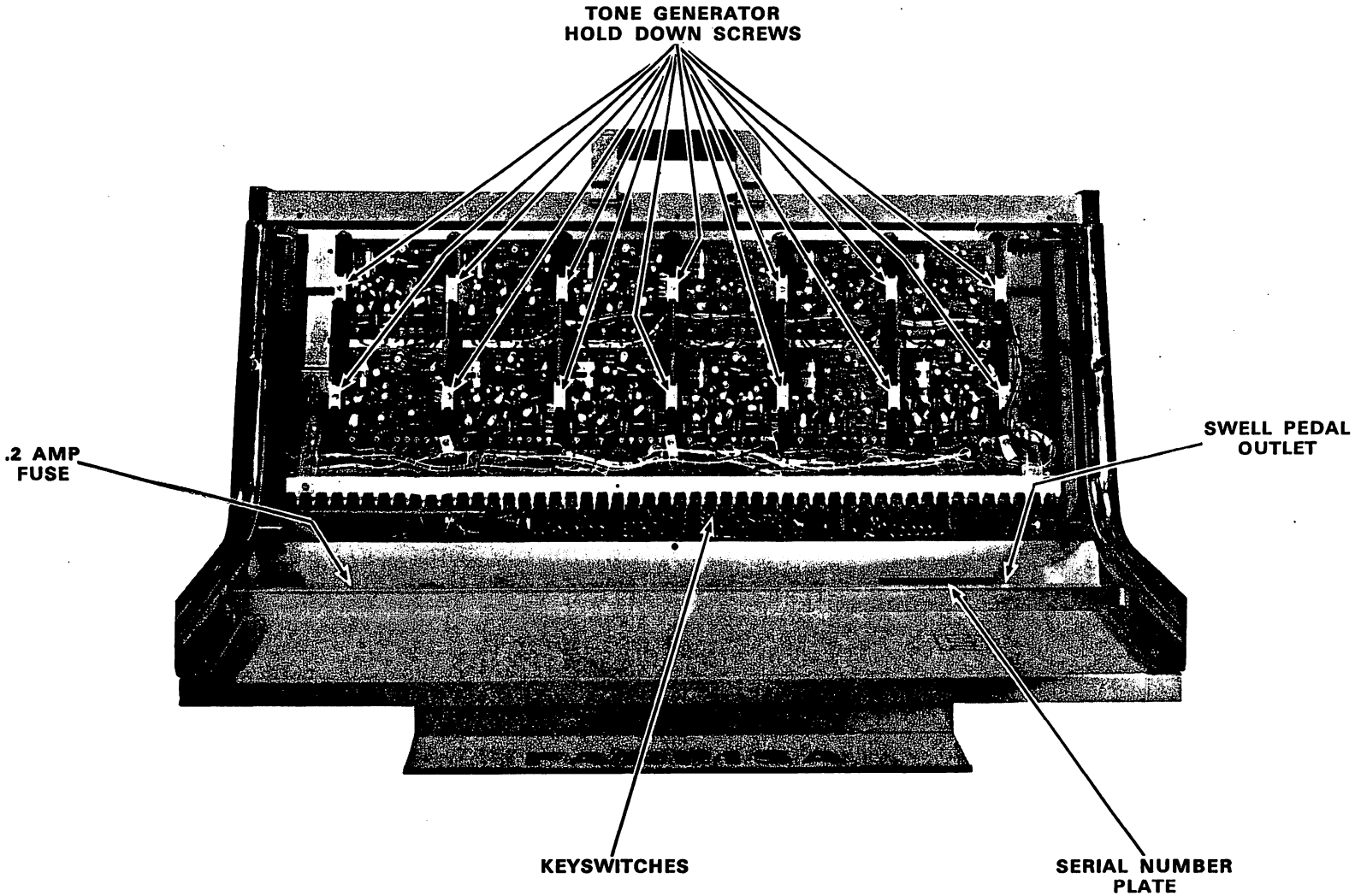
FRONT VIEW
FAST 3



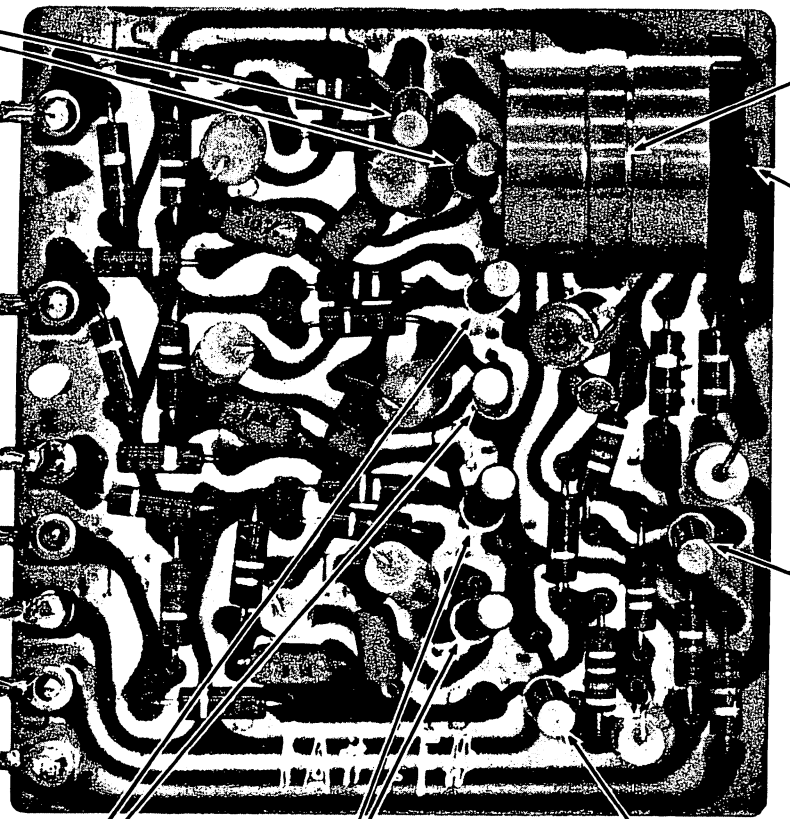
TOP VIEW
FAST 3
(With Cover Removed)



BOTTOM VIEW
FAST 3



TONE GENERATOR BOARD
FAST 3
(PA23)



3RD DIVIDER Q9-Q10

3RD DIVIDER OUTPUT

2ND DIVIDER OUTPUT

1ST DIVIDER OUTPUT

BUFFER OUTPUT

GROUND TERMINAL

+8V TERMINAL

COMMON VIBRATO LINE

TUNING COIL L2

TUNING ADJUSTMENT

MASTER OSCILLATOR Q3

2ND DIVIDER Q7-Q8

1ST DIVIDER Q5-Q6

BUFFER Q4

VIBRATO/BASS, VOICING & PREAMP BOARDS
FAST 3

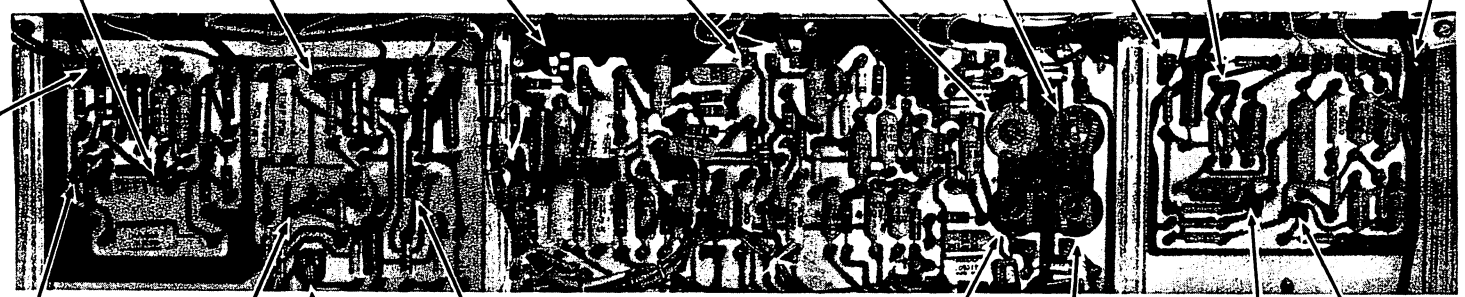


TABLE OF CONTENTS

SERVICE INFORMATION

SCHEMATICS

PHOTOGRAPHS

SERVICE ACCESS AND CIRCUIT LOCATION

PRINTED CIRCUIT BOARDS

PARTS

SPECIFICATIONS

Keyboard: C to C
Manual Bass: C1 to B1
Extended Bass: C2 to B2

Voice Stops (violet tabs):
- Bass 16′
- Bass Clarinet 16′
- Flute 8′
- Oboe 8′
- Trumpet 8′
- Strings 8′
- Flute 4′
- Piccolo 4′

Mixture Stops (violet tabs):
- Mixture (mixed frequencies of 5-1/3′ and 2-2/3′)
- Mixture: Brilliant

Vibrato Stops (blue tabs):
- Vibrato On/Off
- Slow / Fast
- Light / Heavy

Percussion Stops (orange tabs):
- Manual Bass On/Off
- Treble On/Off
- Long / Short
- Mixture On/Off
- Mixture Soft / Sharp

Sustain Stops (yellow tabs) Fast 5 Only:
- Celest 8′
- Clavicord 8′
- Kinura 8′

Manual Bass Selector (dark-grey tab):
- Bass / Treble

Pedal and Manual Bass Sound (black tab):
- Soft / Sharp

Rotating General Volume Control

Swell Pedal Volume Control

Mains Switch and Pilot Light

Mains Voltage: 117 Volt AC

Dimensions: 37″ x 17″ x 36″

Weight: 62 lbs.

Metal cabinet covered with washable vinyl—plastic edges—chromed folding legs—retractable carrying handle—removable music rack—socket for headphone—socket for the connection of an optional 13-note pedalboard—carrying bag supplied with the instrument.

ADJUSTMENTS
FAST 4 & 5

VR1 VIBRATO SPEED
Vibrato speed may be adjusted using a small regular screwdriver. Proper speed is between 6-7 Hertz with the Vibrato speed tabswitch set in the Fast position.

VR2 VOLTAGE
This adjustment is carefully set at the factory! Readjustment should not be necessary unless Power Supply components are replaced. To adjust, connect a D.C. voltmeter to supply voltage "A", then set the adjustment so that the meter reads +12 volts. Improper voltage adjustment will result in unstable tone generator operation. Always check the "A" supply voltage before servicing tone generators.

VR3 STABILITY
The stability adjustment is carefully set at the factory! Readjustment should not be necessary unless Power Supply components are replaced. This adjustment has a wide range of normal operation. Only extreme settings on this adjustment will result in unstable Power Supply operation.

VR5-VR9, VR12 & VR13 FILTERS
These adjustments are carefully set at the factory! Readjustment should not be necessary unless Filter components are replaced. To adjust a filter: First, connect an A.C. voltmeter across the speakers in the amplifier to which the organ is connected. Then, with a clip lead, ground the transistor collector lead of the filter requiring adjustment. While the filter is grounded—and using one flute tabswitch at a time —locate a group of dead keys on the keyboard and hold down one key at or near the center of this group. Next, while holding the note, remove the clip lead from the filter transistor. Now with the note playing, adjust the A.C. meter range so that the meter needle reads near center scale. (Use any meter range and organ volume combination that is convenient.) With the note still playing, set the filter adjustment to a point that gives the maximum increase in A.C. voltage.

VR10, VR11 PERCUSSION LENGTH & ATTACK
These two adjustments affect each other. Adjustment of either one changes the other. Proper adjustment is achieved when the percussion functions with the least key pop and with a distinct difference in percussion length between short and long percussion tabswitch settings. Extreme adjustment of either length or attack will result in **no percussion.** Always try adjusting percussion before servicing the percussion circuits.

L1 TUNING
The 12 Tone Generator Master Oscillator circuits determine the pitch of the entire organ. Adjusting any one of the Master Oscillator tuning adjustments will tune all the notes of that tone generator. Tuning any group of 12 notes automatically tunes the entire organ.

Tuning may be accomplished by using a small nonconductive screwdriver and one of the following methods:

1. Set of 12 Tuning Forks: Zero beat the note of the organ to be tuned to the sound of the corresponding tuning fork. This is a highly accurate method for tuning.
2. Strobo Conn or Strobo Tuner: This is done by visual observation of a strob pattern. Simply follow directions supplied with the Strobotuner. This is a highly accurate tuning method.
3. Another instrument: Zero beat the note of the organ to be tuned to the sound of a corresponding note on an "in tune" instrument (piano, organ, accordion, etc.) Accuracy is dependent upon the tuning of the other instruments. This method is especially desirable when the other instrument is to be played with the organ.
4. One Tuning Fork: One tuning fork is used to set the "temperment" (one note). The other 11 notes are set by ear using the number of beats between "4ths" and "5ths". This requires a trained ear. Accuracy is dependent upon the tuner.

TRANSISTOR VOLTAGES

Q No.	Circuit	Collector	Emitter	Base
Q1	Master Oscillator	+2.2	+12	+12
Q2	1st Divider	+5.5	+1	+1.2
Q3	1st Divider	+5.5	+1	+1.2
Q4	2nd Divider	+5.5	+1	+1.2
Q5	2nd Divider	+5.5	+1	+1.2
Q6	3rd Divider	+5.5	+1	+1.2
Q7	3rd Divider	+5.5	+1	+1.2
Q8	4th Divider	+5.5	+1	+1.2
Q9	4th Divider	+5.5	+1	+1.2
Q10	5th Divider	+5.5	+1	+1.2
Q11	5th Divider	+5.5	+1	+1.2
Q12	Vibrato Oscillator	+5.2*	+2.6	+2.8
Q13	Emitter Follower	+12	+4.5*	+1.8*
Q14	Voltage Sensor	—12	+5.6	+5
Q15	Voltage Regulator	ϕ	—12	—12
Q16	Voltage Regulator	ϕ	—12	—12
Q17	16′ Solo Divider	+10/+5.5	+1	+1.8/+1.3
Q18	16′ Solo Divider	+1.2/+5.5	+1	+.9/+1.3
Q19	Pedal Solo Divider	+1/+5.5	+1	+1.8/+1.3
Q20	Pedal Solo Divider	+10/+5.5	+1	+.9/+1.3
Q21	Bass Preamp	+5.5	+.8	+1
Q22	3320 Cycles Flute Filter	+5.5	+.8	+1
Q23	1660 Cycles Flute Filter	+5.5	+.8	+1
Q24	830 Cycles Flute Filter	+5.5	+.8	+1
Q25	415 Cycles Flute Filter	+5.5	+.8	+1
Q26	207 Cycles Flute Filter	+5.5	+.8	+1
Q27	String Preamp	+3.6	+1.1	+1.2
Q27	String Preamp	+5.8	+.6	+1
Q28	Trumpet Filter	+6	+.6	+1
Q29	Oboe Filter	+5.8	+.6	+1
Q30	Treble Preamp	+5.6	+.6	+1
Q31	Percussion Pulse Detector	+.8	+.5	+1.2
Q32	1 Shot Multivibrator	+.1	ϕ	+.3
Q33	1 Shot Multivibrator	+11.2	ϕ	+.1
Q34	Percussion Driver	ϕ	+9.5	+10
Q35	Percussion Keyer	+11.5	+11.5	ϕ
Q36	Percussion Preamp	+6	+.7	+1.2
Q37	Output Preamp	+9	+3	+3.3
Q38	Celest Filter #1	+5.8	+.6	+1
Q39	Celest Filter #2	+5.8	+.6	+1
Q40	Sustain Voice Preamp #1	+5.8	+.6	+1
Q41	Sustain Preamp #2	+6	+.6	+1
Q42	16′ Solo Preamp	+12/+5.5	ϕ	ϕ/+.6
Q43	Muter Preamp #1	+5.6	+.6	+1
Q44	Muter Preamp #2	+9	+6.2	+5.6
Q45	Muter Driver	+6.5	ϕ	ϕ
Q46	Muter	ϕ	ϕ	+.5

*Pulse Voltage

IMPORTANT

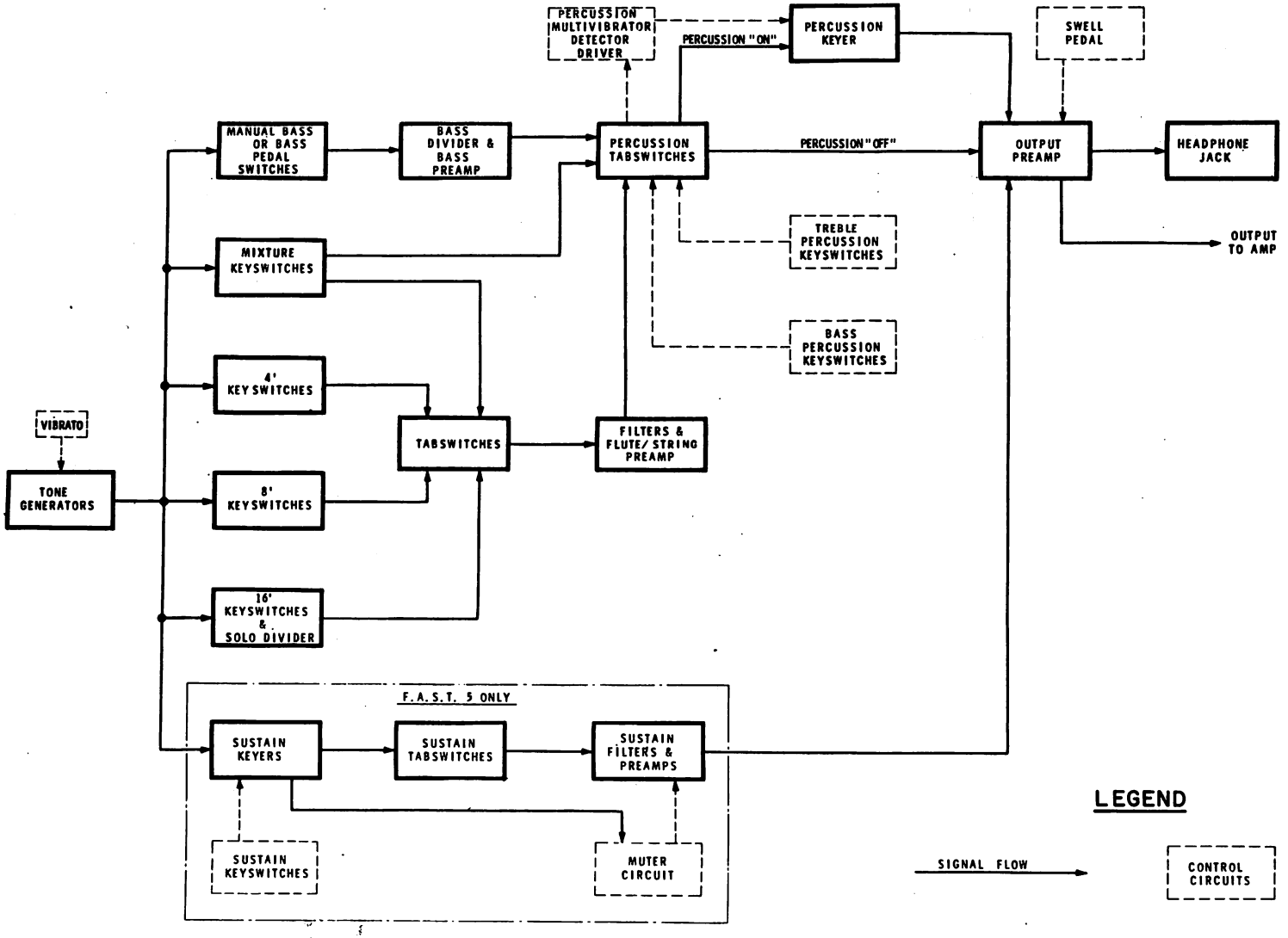
The above voltage readings were measured to ground with a Simpson Model 260 V.O.M. Voltage readings shown are intended only as a guide in troubleshooting. Voltages will vary from organ to organ due to normal manufacturing tolerances.

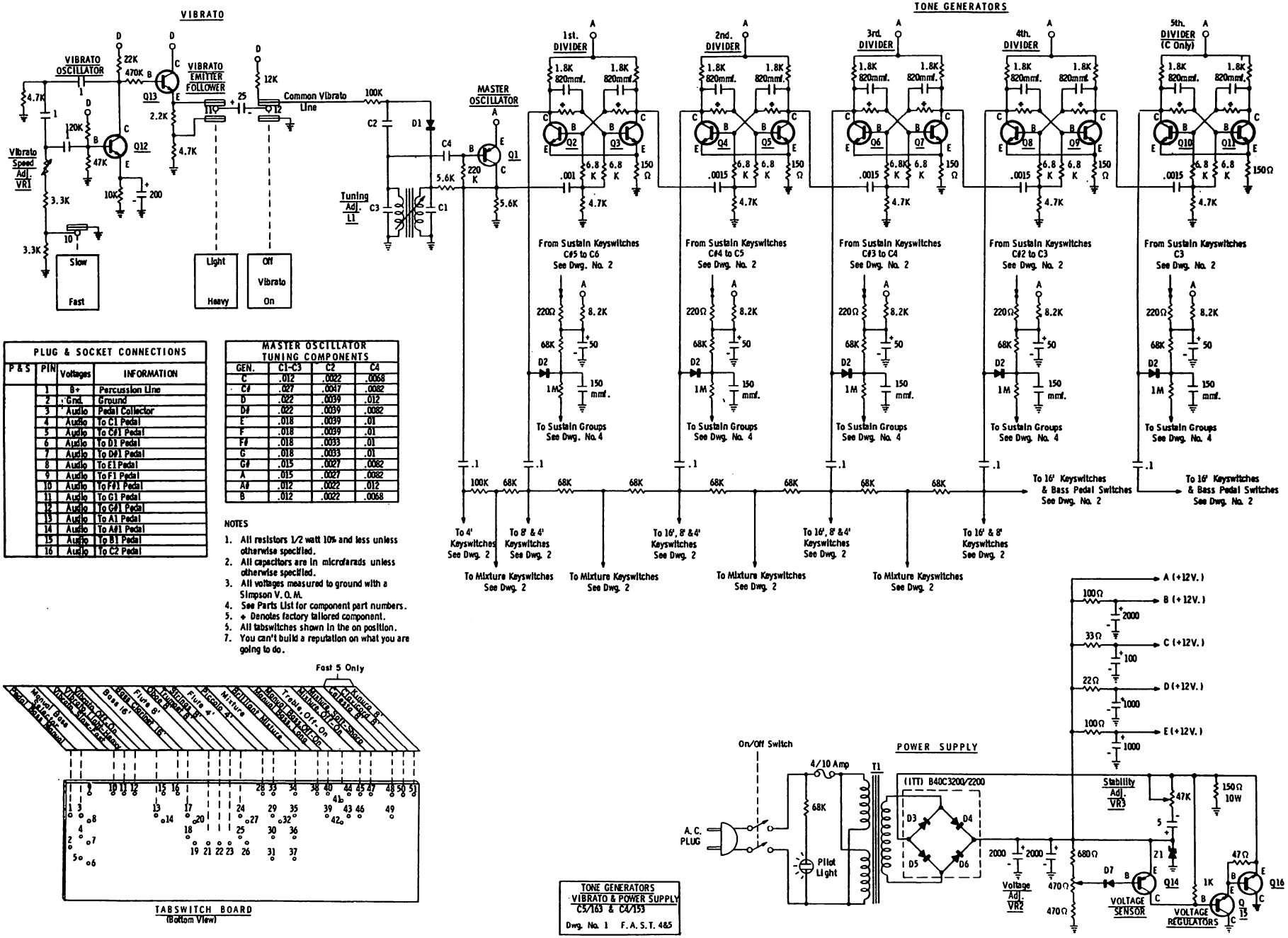
CAUTION

Exercise extreme care when making voltage measurements. Accidental shorting of transistor leads may damage the transistor.

BLOCK DIAGRAM

F.A.S.T. 4&5





PLUG & SOCKET CONNECTIONS			
P&S	PIN	Voltages	INFORMATION
	1	B+	Percussion Line
	2	Gnd.	Ground
	3	Audio	Pedal Collector
	4	Audio	To C1 Pedal
	5	Audio	To C#1 Pedal
	6	Audio	To D1 Pedal
	7	Audio	To D#1 Pedal
	8	Audio	To E1 Pedal
	9	Audio	To F1 Pedal
	10	Audio	To F#1 Pedal
	11	Audio	To G1 Pedal
	12	Audio	To G#1 Pedal
	13	Audio	To A1 Pedal
	14	Audio	To A#1 Pedal
	15	Audio	To B1 Pedal
	16	Audio	To C2 Pedal

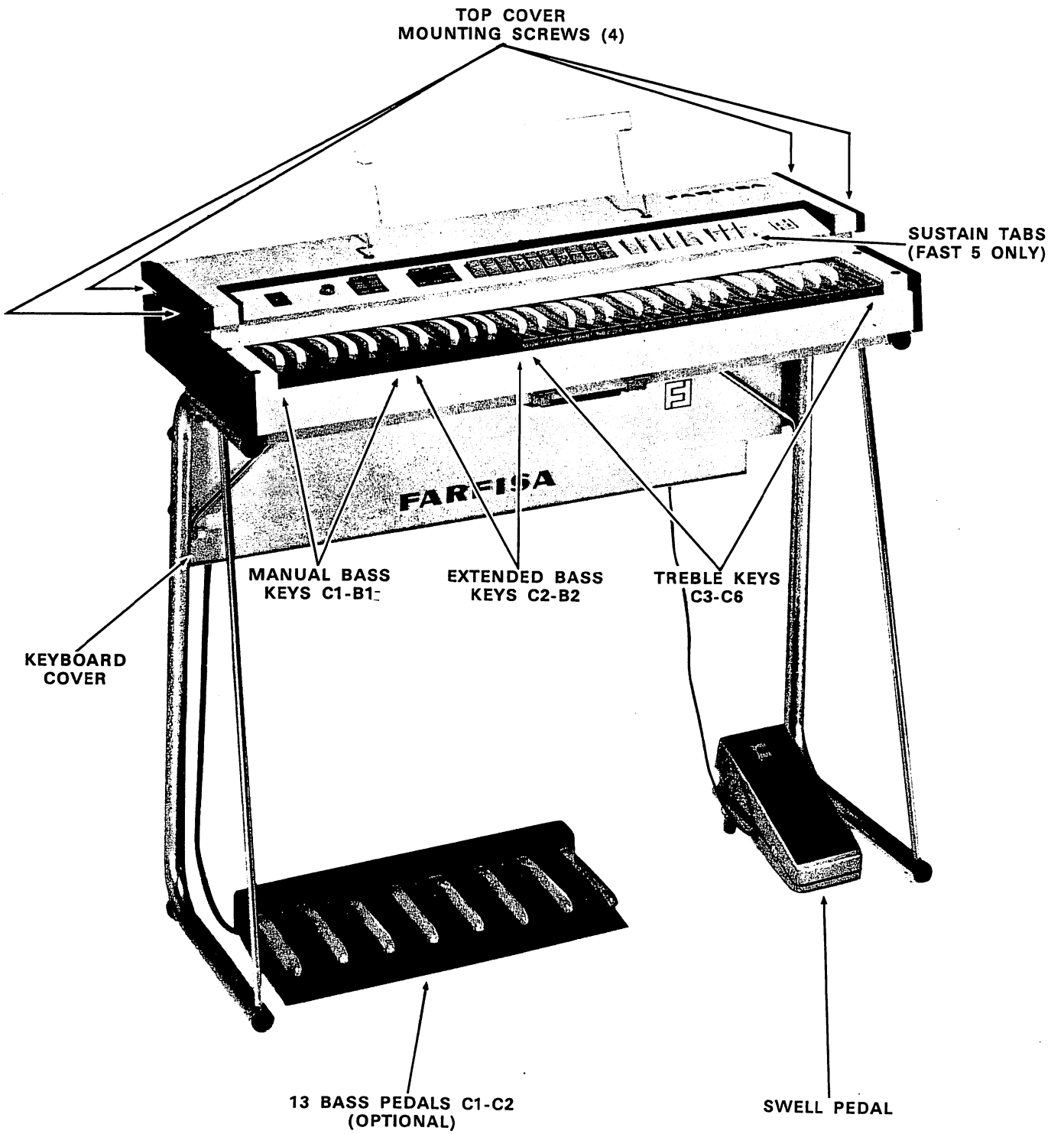
MASTER OSCILLATOR TUNING COMPONENTS			
GEN.	C1-C3	C2	C4
C	.012	.0022	.0068
C#	.027	.0047	.0082
D	.022	.0039	.012
D#	.022	.0039	.0082
E	.018	.0039	.01
F	.018	.0039	.01
F#	.018	.0033	.01
G	.018	.0033	.01
G#	.015	.0027	.0082
A	.015	.0027	.0082
A#	.012	.0022	.012
B	.012	.0022	.0068

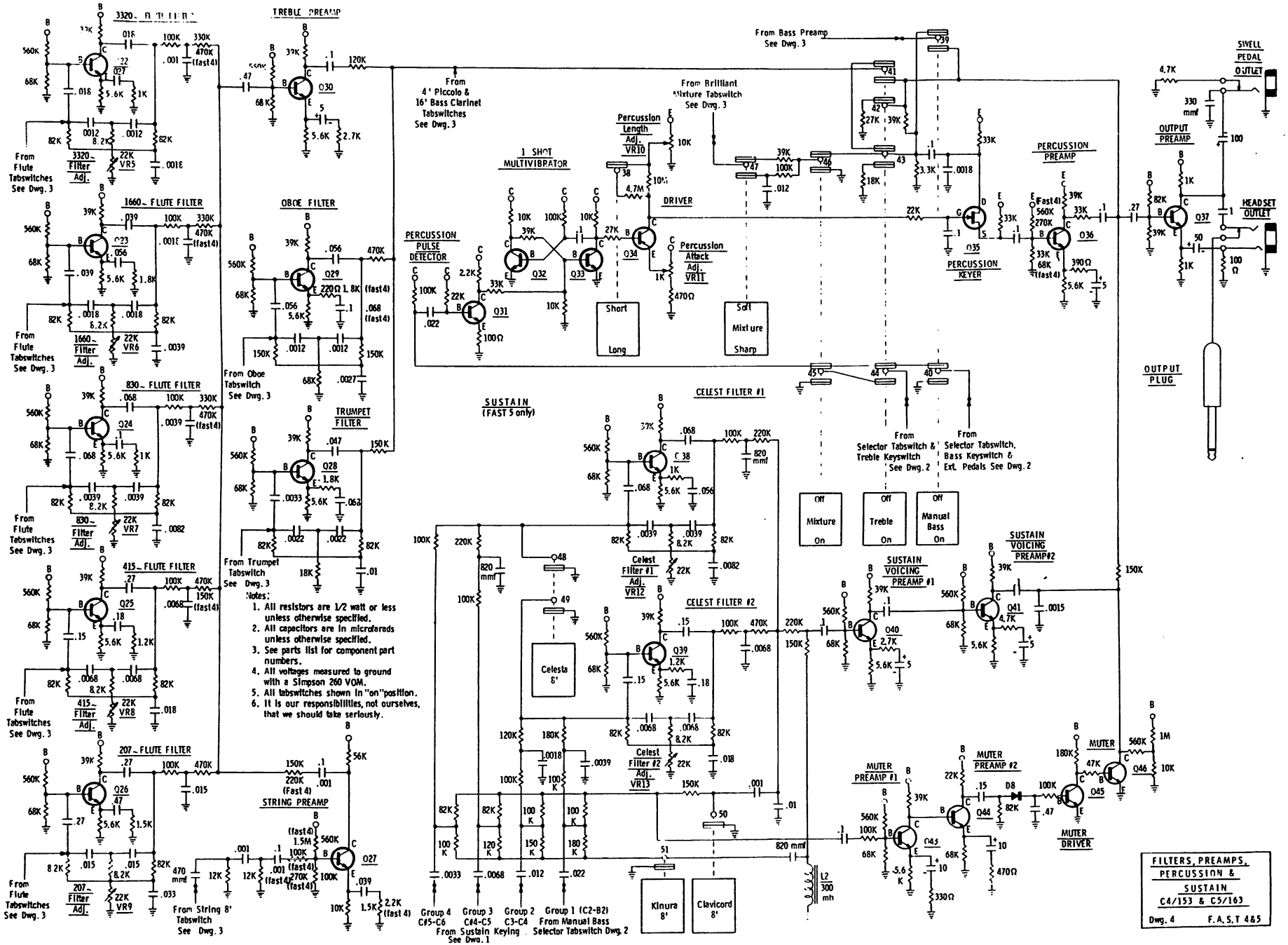
NOTES

1. All resistors 1/2 watt 10% and less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson V. O. M.
4. See Parts List for component part numbers.
5. * Denotes factory tailored component.
5. All tabswitches shown in the on position.
7. You can't build a reputation on what you are going to do.

TONE GENERATORS
VIBRATO & POWER SUPPLY
C5/163 & C4/153
Dwg. No. 1 F. A. S. T. 485

FRONT VIEW
FAST 4 & 5

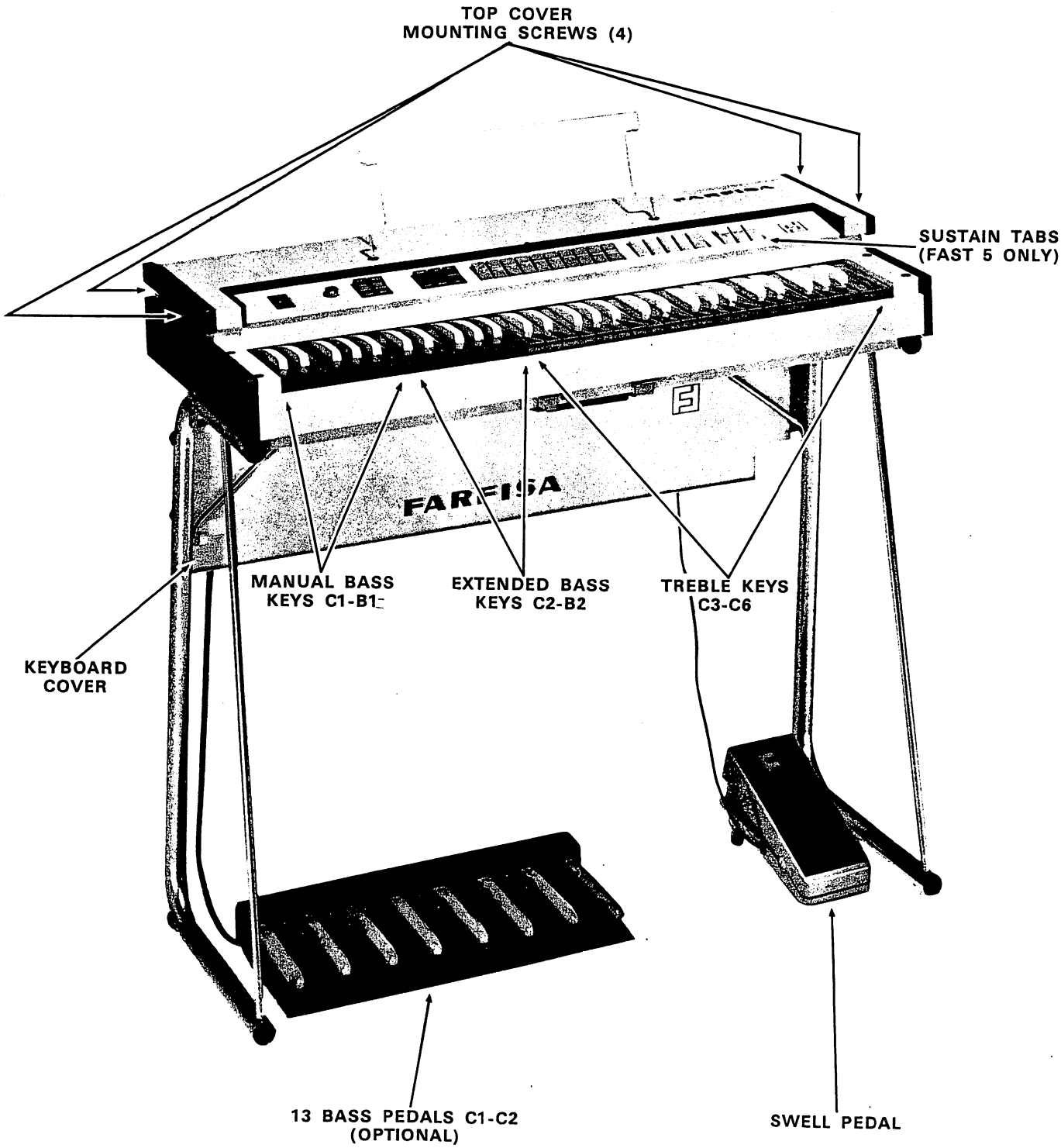




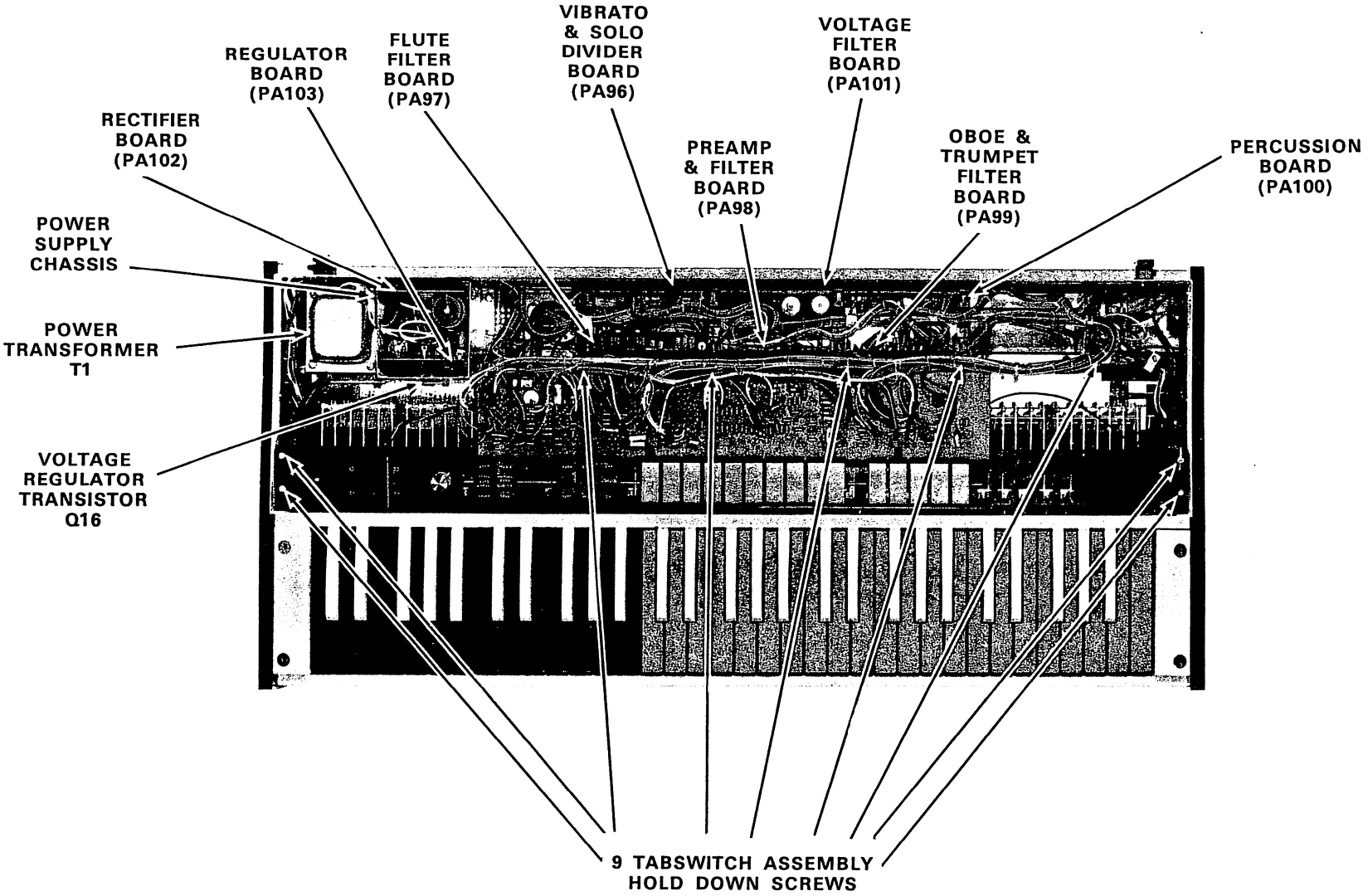
Notes:
1. All resistors are 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. See parts list for component part numbers.
4. All voltages measured to ground with a Simpson 260 VOM.
5. All tabswitches shown in "on" position.
6. It is our responsibilities, not ourselves, that we should take seriously.

FAST 4 & 5

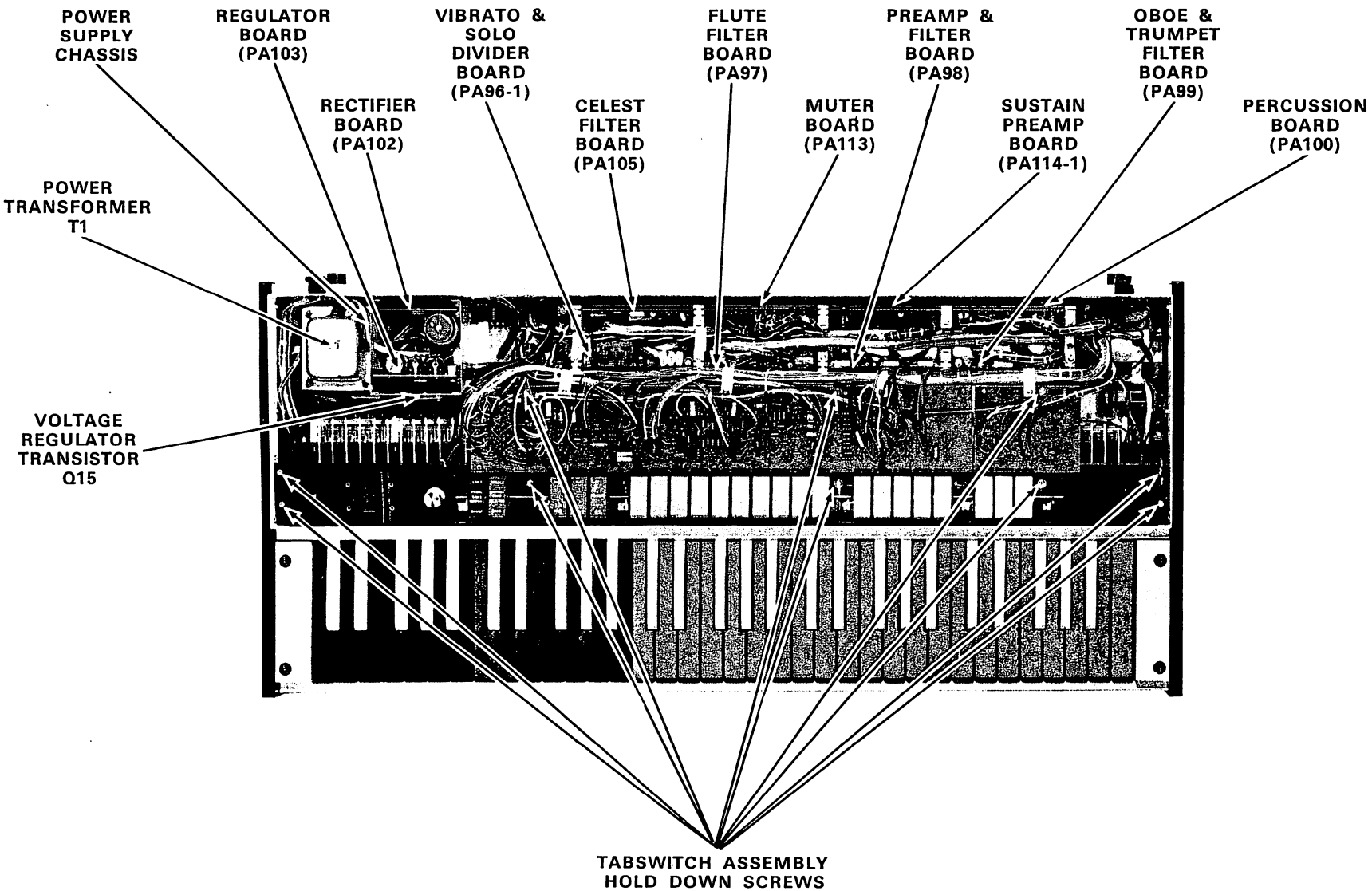
FRONT VIEW
FAST 4 & 5



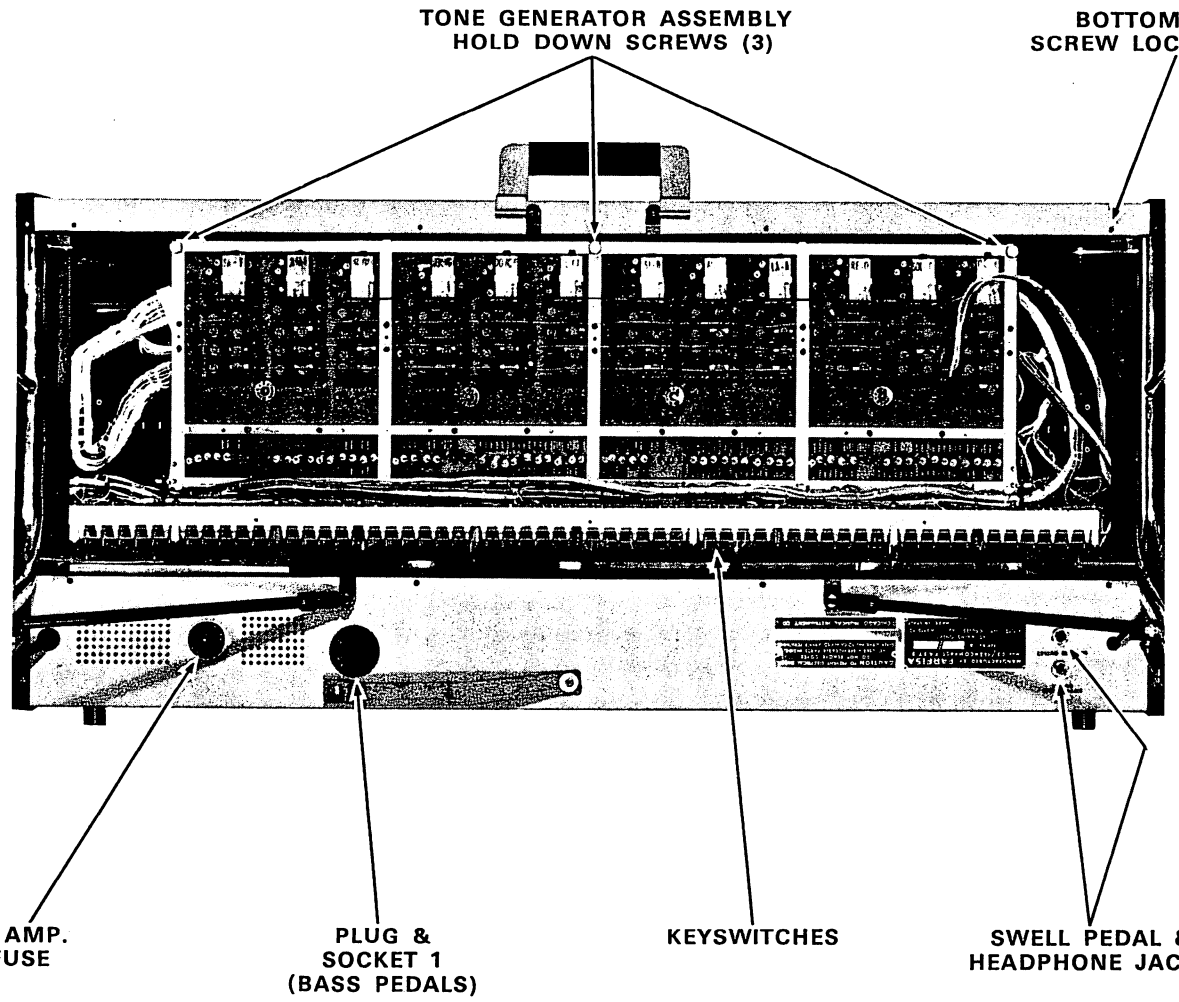
TOP VIEW
FAST 4
(With Cover Removed)



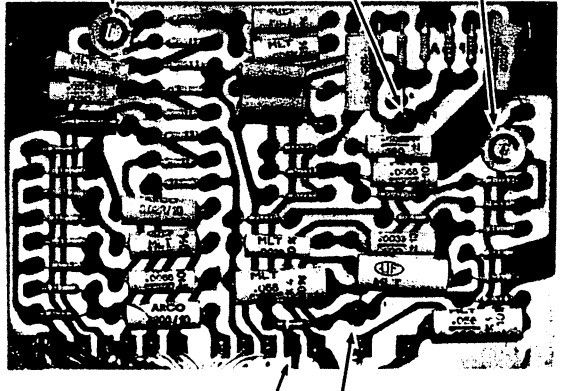
TOP VIEW
FAST 5
(With Cover Removed)



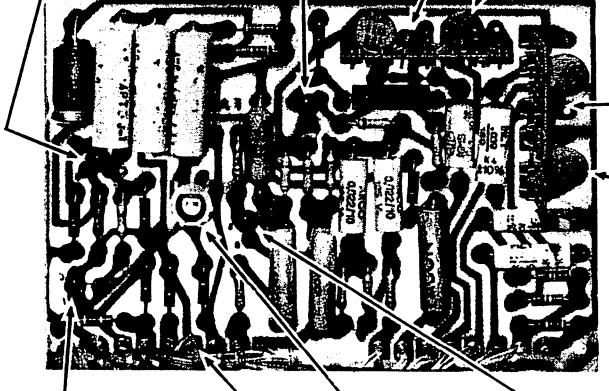
BOTTOM VIEW
FAST 4 & 5
(With Bottom Panel Removed)
(Fast 5 Shown)



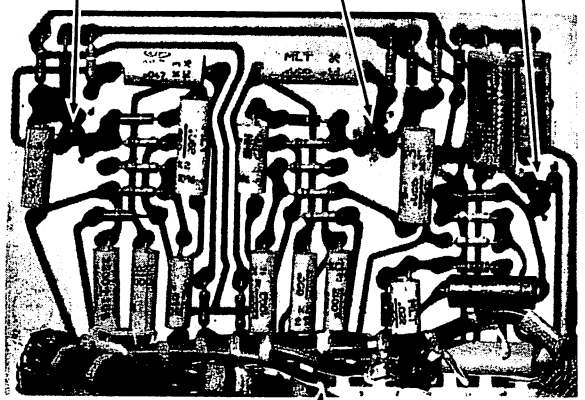
CELEST FILTER BOARD
(PA-105 FAST 5 ONLY)



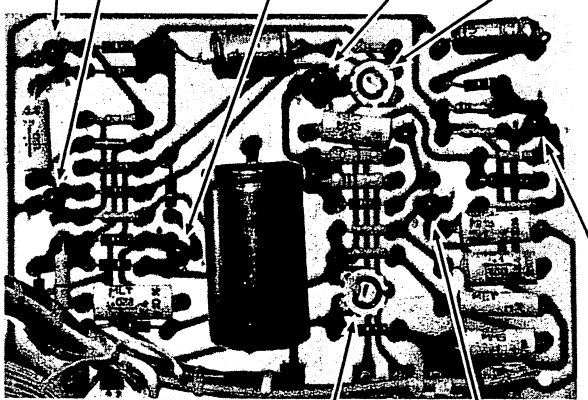
VIBRATO & SOLO BOARD
(PA96 FAST 4) (PA96-1 FAST 5)



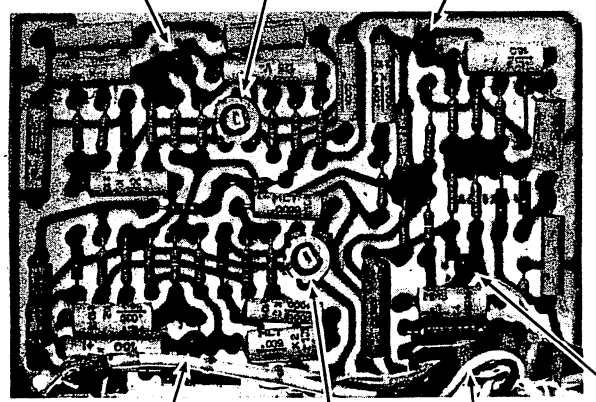
OBOE & TRUMPET FILTER BOARD
(FAST 4 & 5 PA99)



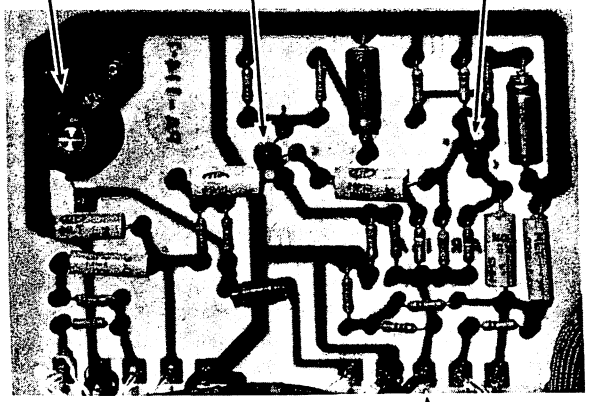
PERCUSSION BOARD
(FAST 4 & 5 PA100)



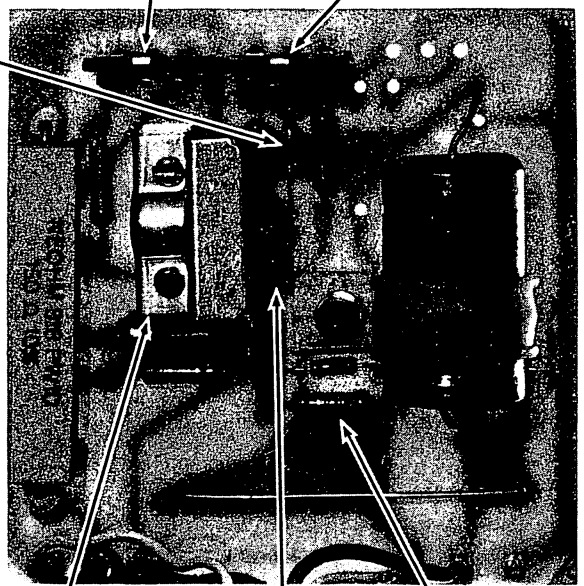
PREAMP & FILTER BOARD
(FAST 4 & 5 PA98)



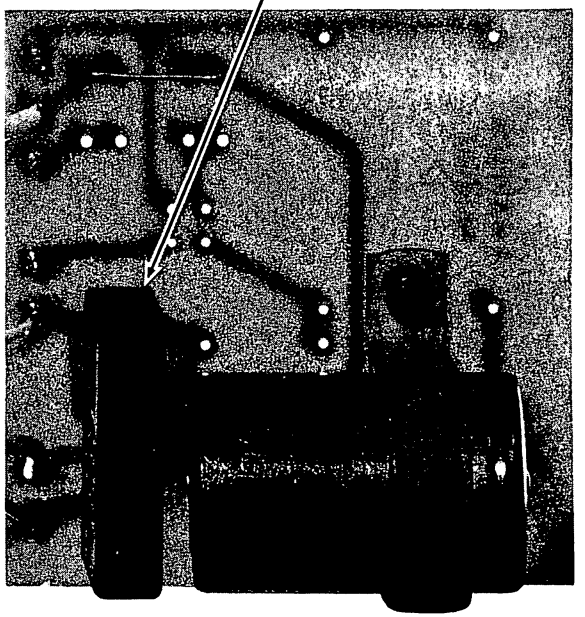
SUSTAIN PREAMP BOARD
(PA114-1 FAST 5 ONLY)



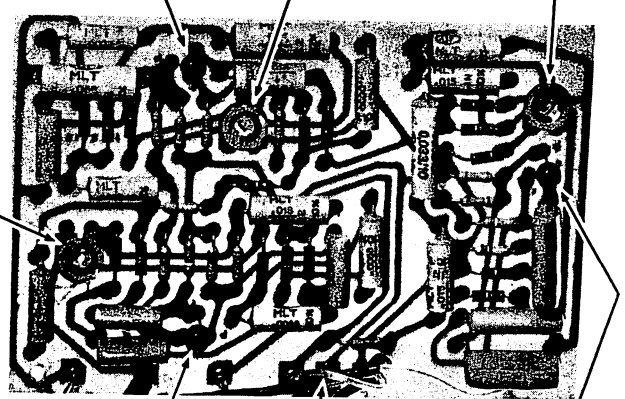
REGULATOR BOARD
FAST 4 & 5
(PA103)



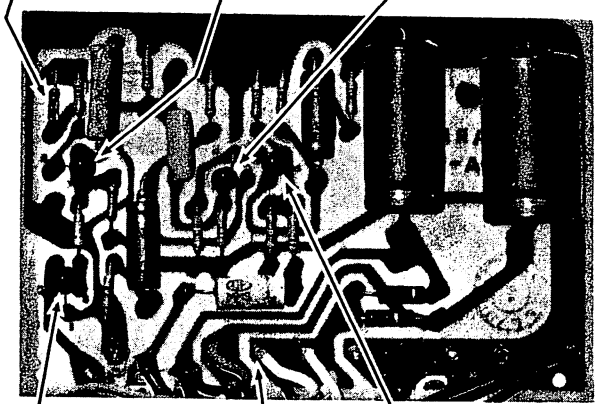
RECTIFIER BOARD
FAST 4 & 5
(PA102)



FLUTE FILTER BOARD
FAST 4 & 5
(PA97)



MUTER BOARD
(PA-113 FAST 5 ONLY)



TONE GENERATOR BOARD
(With Oscillator, Divider & Sustain Keyer Boards)
FAST 4 & 5 (PA76)

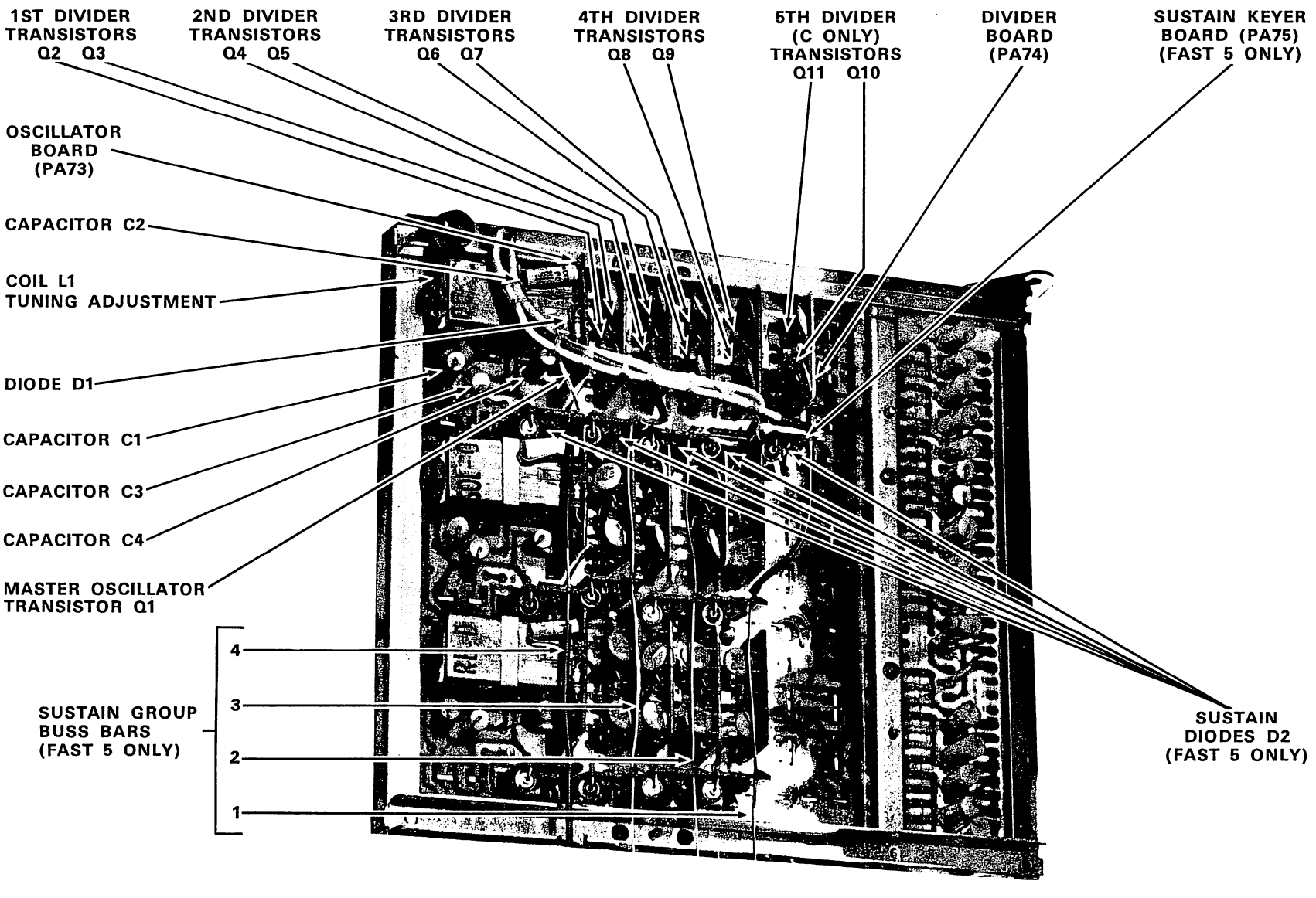


TABLE OF CONTENTS

SERVICE INFORMATION

SCHEMATICS

PHOTOGRAPHS

SERVICE ACCESS AND CIRCUIT LOCATION

PRINTED CIRCUIT BOARDS

PARTS

SPECIFICATIONS

MAIN FEATURES
61 Notes Keyboard—C to C
Phonic extension: 32.7 cycles to 7,902 cycles

Swell Pedal

Flute Section
8 Voice Stops: 16′ - 8′ - 5-1/3′
4′ - 2-2/3′ - 2′ - 1-3/5′ - 1-1/3′
Cancel Tab
Independent Volume Control
Independent Vibrato Control

Clarinet-Sharp Section
4 Clarinet Voice Stops: 16′ - 8′ - 5-1/3′ - 4′
4 Sharp Voice Stops: 2-2/3′ - 2′ - 1-3/5′ - 1-1/3′
Cancel Tab
Independent Volume Control
Independent Vibrato Control

Percussion Section
8 Stops: 16′ - 8′ - 5-1/3′ - 4′ - 2-2/3′ - 2′ - 1-3/5′ - 1-1/3′
Percussion length control: Short - Medium - Long
Cancel Tab operating on the 3 lowest octaves
Cancel Tab operating on the 2 highest octaves
2-position tab for Percussion with synchronized repetition or for Percussion according to the Phrasing.
Independent Volume Control

Sustain Section
3 Stops: Celesta - Harpsichord - Kinura
2-position Sustain length control tab
Cancel Tab operating on the 3 lowest octaves
Independent Volume Control
Independent Vibrato Control

Vibrato Section
3 Stops: On/Off - Slow/Fast - Light/Heavy

Overall Output Volume Control

Output for Stereo Headset

Tilting Keyboard

On/Off switch and Pilot lamp
Folding legs
Elegant carrying bag
Voltage: 115 Volt AC, 60 cycles
Dimensions when in use: 38" x 18¾" x 36"
Dimensions of the instrument closed:
40" x 10" x 20"
Weight: 67 lbs.

ADJUSTMENTS
PROFESSIONAL

VR1-VR11 FILTERS
These adjustments are carefully set at the factory! Readjustment should not be necessary unless Filter components are replaced. To adjust a filter: First, connect an A.C. voltmeter across the speakers in the amplifier to which the organ is connected. Then, with a clip lead, ground the transistor collector lead of the filter requiring adjustment. While the filter is grounded and using only one flute tabswitch at a time, locate a group of dead keys on the keyboard and hold down one key at or near the center of this group. Next, while holding the note, remove the clip lead from the filter transistor. Now with the note playing, adjust the A.C. meter range so that the meter needle reads near center scale. (Use any meter range and organ volume combination that is convenient). With the note still playing, set the filter adjustment to a point that gives the maximum increase in A.C. voltage.

VR12-VR13 VIBRATO DEPTH & LEVEL
These two adjustments affect each other. Adjustment of one will change the other. Proper adjustment is achieved when the vibrato functions clearly. Extreme setting of either the depth or level adjustments will result in **no vibrato.** Always try adjusting vibrato before servicing the vibrato circuits.

VR14-VR15 PERCUSSION LENGTH & ATTACK
These two adjustments affect each other. Adjustment of one will change the other. Proper adjustment is achieved when the percussion functions with the least amount of key pop; and with a distinct difference in percussion length between short and long percussion tabswitch settings. Extreme setting of either the length or attack adjustments will result in **no percussion.** Always try adjusting percussion before servicing the percussion circuits.

VR16 SQUELCH
The function of this adjustment is to compensate for tolerences in Squelch Keyer transistors. Since this adjustment is carefully set at the factory, adjustment should only be necessary when squelch circuit components are replaced. Proper setting is achieved when this adjustment is at or near center and the organ plays with ample volume range.

VR17 ORGAN LEVEL
Set this adjustment according to customer preference! A normal setting is approximately three-fourths toward full volume.

VR22 +12 VOLTAGE
This adjustment is carefully set at the factory! Readjustment should not be necessary unless Power Supply components are replaced. To adjust, connect a D.C. voltmeter to plug and socket #1 pin 3, then set the adjustment so that the meter reads +12 volts. Improper voltage adjustment will result in unstable tone generator operation. Always check the +12 volt supply voltage before servicing tone generators.

VR23 STABILITY
The stability adjustment is carefully set at the factory! Readjustment should not be necessary unless Power Supply components are replaced. This adjustment has a wide range of normal operation. Only extreme settings on this adjustment will result in unstable Power Supply operation.

VR24 +6 VOLTAGE
This adjustment is carefully set at the factory! Readjustment should not be necessary unless Power Supply components are replaced. To adjust, connect a D.C. voltmeter to plug and socket #1 pin 5, then set the adjustment so that the meter reads +6 volts. +6V is used for audio ground. Low or missing +6V will result in hum and increased sound leakage. Always check the +6 volt supply voltage before servicing.

L1 TUNING
The 12 Tone Generator Master Oscillator circuits determine the pitch of the entire organ. Adjusting any one of the Master Oscillator tuning adjustments will tune all the notes of that tone generator. Tuning any group of 12 notes automatically tunes the entire organ.

Tuning may be accomplished by using a small non-conductive screwdriver and one of the following methods:

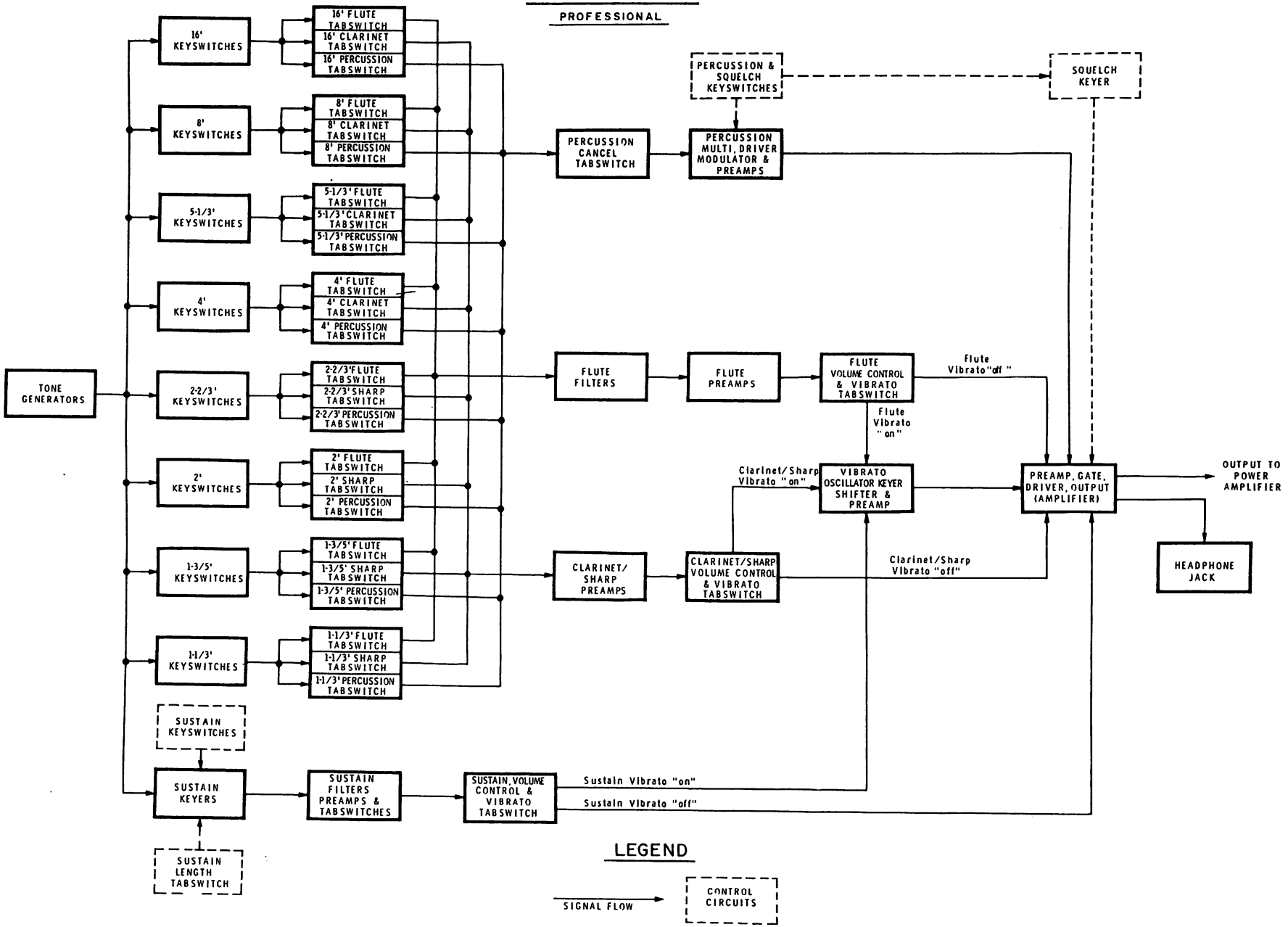
1. Set of 12 Tuning Forks: Zero beat the note of the organ to be tuned to the sound of the corresponding tuning fork. This is a highly accurate method for tuning.
2. Strobo Conn or Strobo Tuner: This is done by visual observation of a strob pattern. Simply follow directions supplied with the Strobotuner. This is a highly accurate tuning method.
3. Another instrument: Zero beat the note of the organ to be tuned to the sound of a corresponding note on an "in tune" instrument (piano, organ, accordion, etc.). Accuracy is dependent upon the tuning of the other instruments. This method is especially desirable when the other instrument is to be played with the organ.
4. One Tuning Fork: One tuning fork is used to set the "temperment" (one note). The other 11 notes are set by ear using the number of beats between "4ths" and "5ths." This requires a trained ear. Accuracy is dependent upon the tuner.

TRANSISTOR VOLTAGES

Q No.	Circuit	Collector or Drain	Emitter or Source	Base or Gate
Q1	Master Oscillator	+2.2	+12	+14
Q2-Q3	1st Divider	+6	+1.3	+1.5
Q4-Q5	2nd Divider	+6	+1.3	+1.5
Q6-Q7	3rd Divider	+6	+1.3	+1.5
Q8-Q9	4th Divider	+6	+1.3	+1.5
Q10-Q11	5th Divider	+6	+1.3	+1.5
Q12-Q13	6th Divider	+6	+1.3	+1.5
Q14	16′ Solo Divider	+10	+1.1	+1
Q15	16′ Solo Divider	+1.3	+1.1	+1.8
Q16	Clarinet/Sharp Preamp	+3.8	+.7	+.4
Q17	Clarinet/Sharp Preamp	+4.5	+3.1	+3.8
Q18	103—Flute Filter	+4.9	+.7	+1
Q19	206—Flute Filter	+4.9	+.7	+1
Q20	412—Flute Filter	+4.9	+.7	+1
Q21	824—Flute Filter	+4.9	+.7	+1
Q22	1648—Flute Filter	+4.9	+.7	+1
Q23	3296—Flute Filter	+4.9	+.7	+1
Q24	6592—Flute Filter	+5.4	+.7	+.6
Q25	Flute Preamp	+3.5	+.9	+1
Q26	206—Celeste Filter	+5.5	+.5	+.5
Q27	412—Celeste Filter	+5	+.5	+.5
Q28	824—Celeste Filter	+5.2	+.5	+.5
Q29	1648—Celeste Filter	+5.5	+.5	+.5
Q30	Celeste/Kinura Preamp	+4.9	+.6	+.9
Q31	Percussion Multivibrator	+.3	ϕ	+.7
Q32	Percussion Multivibrator	+12	ϕ	ϕ
Q33	Percussion Driver	ϕ	+9	+12
Q34	Percussion Modulator	+9	ϕ	+9
Q35	Percussion Preamp	+3.5	+.5	+.4
Q36	Percussion Preamp	+6	+3	+3.5
Q37	Vibrato Oscillator	+5	+1.7	+1.5
Q38	Vibrato Phase Shifter	+9	+.5	+.7
Q39	Vibrato Phase Keyer	+9	+9	+2.8
Q40	Vibrato Output Preamp	+5		+.3
Q41	Squelch Keyer	ϕ	+11	+8.8
Q42	Amp Input Preamp	+7	+1	+1.2
Q43	Squelch Gate	+1.3	+4	+1.5
Q44	Driver	+4.2	+.7	+1.3
Q45	Output	ϕ	+5	+4.2
Q46	Output	+12	+5.5	+6
Q47	Voltage Sensor	−12	+5.8	+5.2
Q48	Voltage Regulator	ϕ	−12.5	−12.5
Q49	Voltage Regulator	ϕ	+12	+12

BLOCK DIAGRAM

PROFESSIONAL

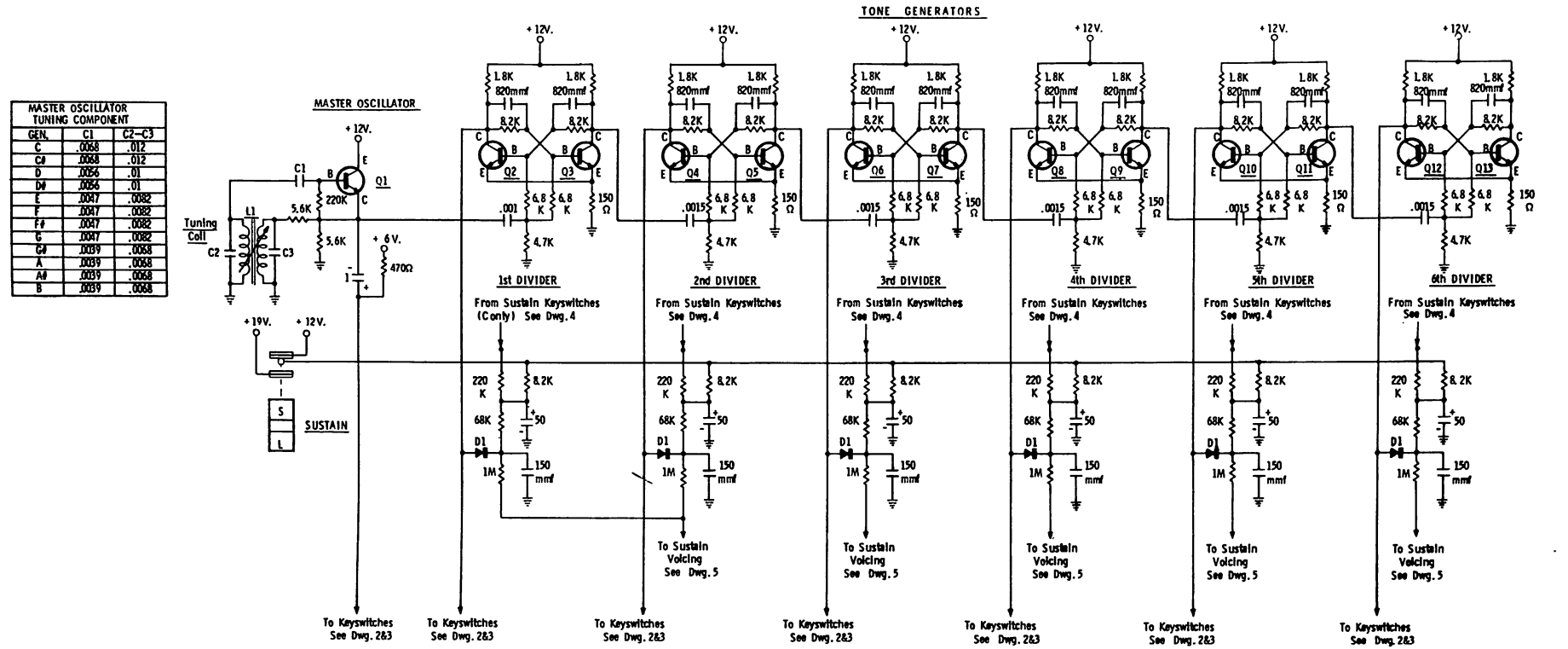


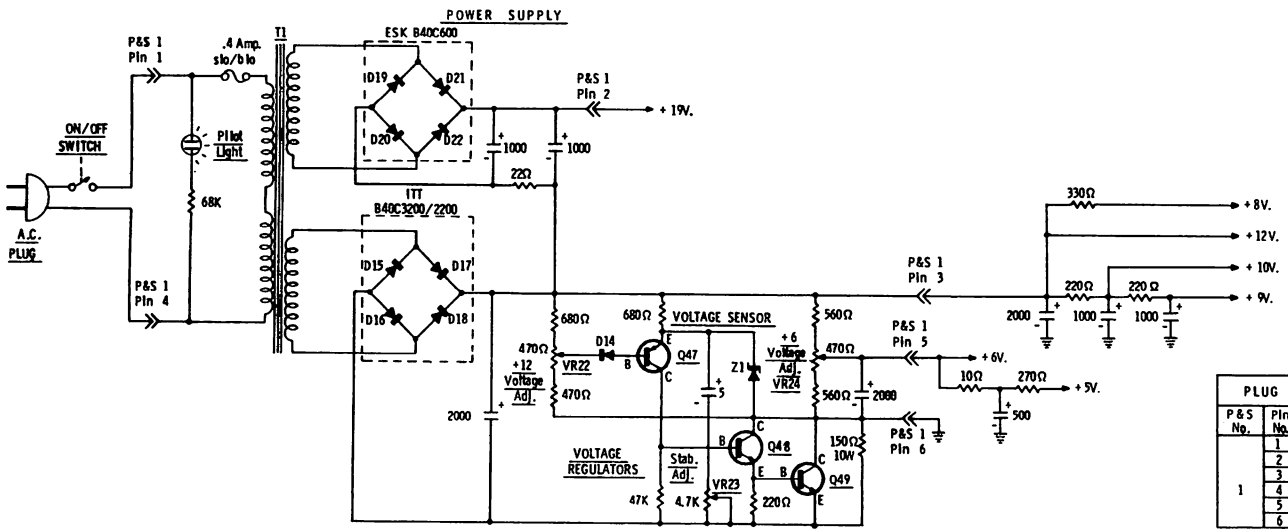
LEGEND

SIGNAL FLOW

CONTROL CIRCUITS

MASTER OSCILLATOR TUNING COMPONENT		
GEN.	C1	C2—C3
C	.0068	.012
C#	.0068	.012
D	.0056	.01
D#	.0056	.01
E	.0047	.0082
F	.0047	.0082
F#	.0047	.0082
G	.0047	.0082
G#	.0039	.0068
A	.0039	.0068
A#	.0039	.0068
B	.0039	.0068

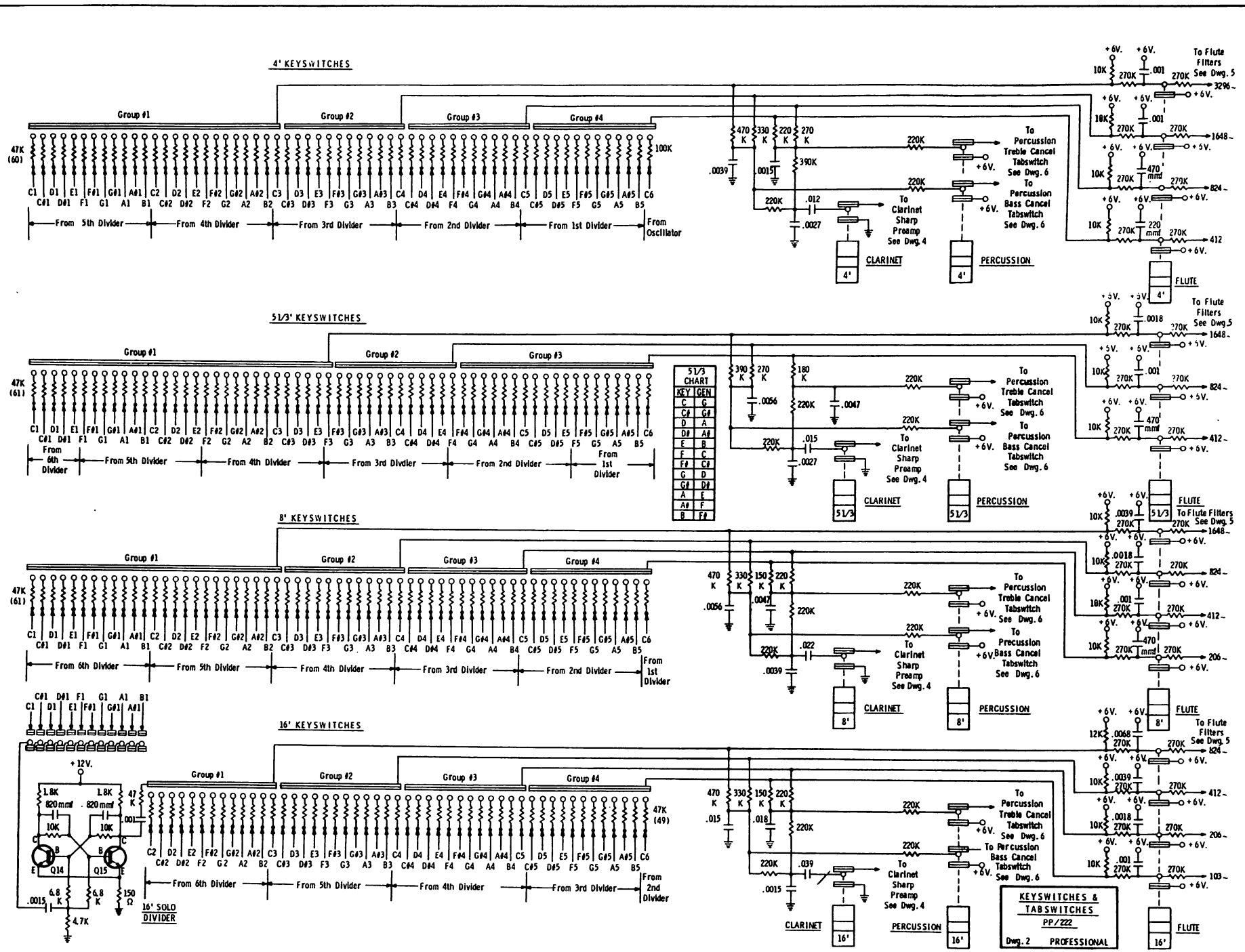


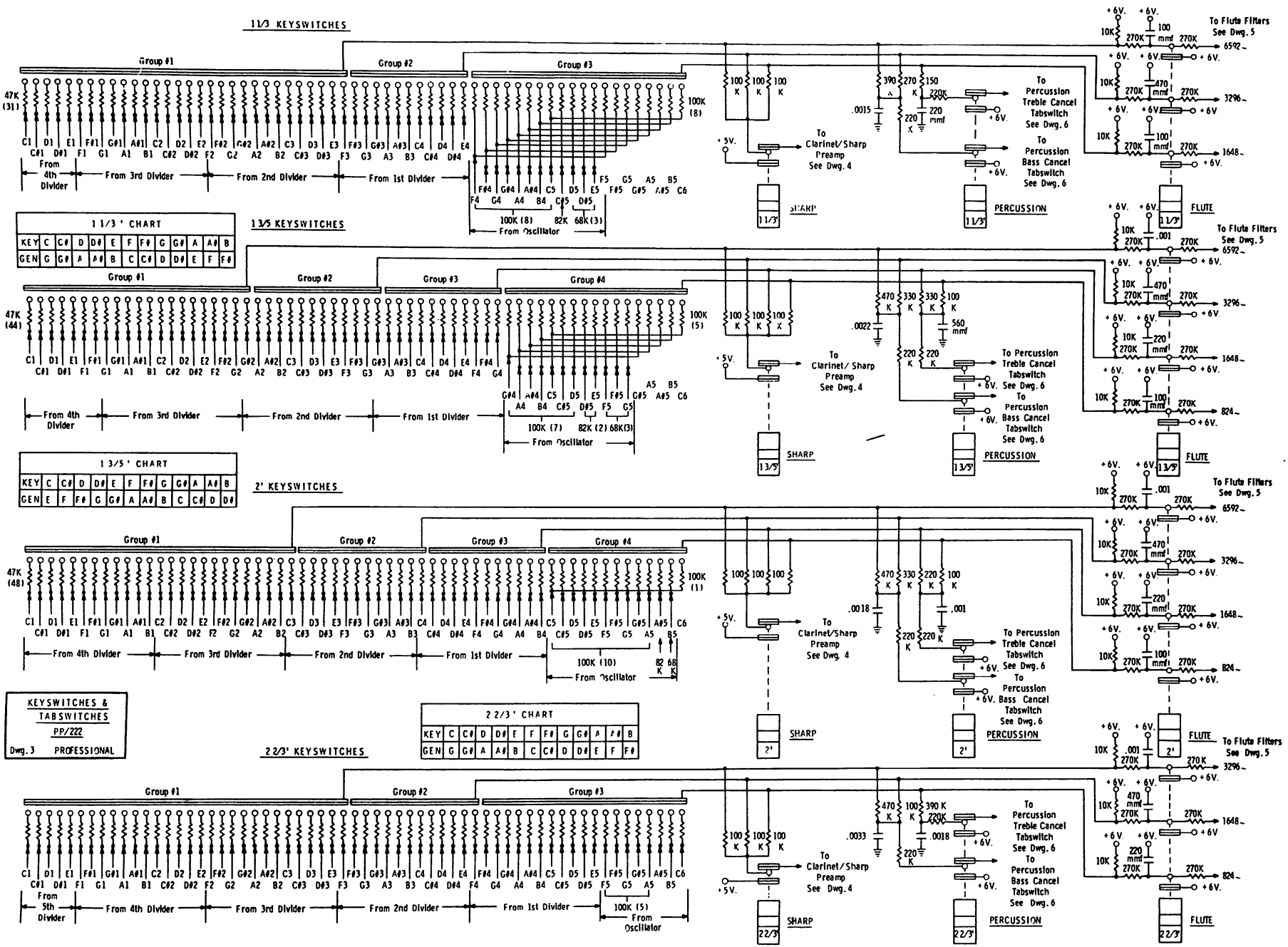


NOTES:
1. All resistors 1/2 watt 10% unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See parts list for component part numbers.
5. Radar spelled backwards is radar. They get you coming and going.
6. All tabswitches shown in " on " position.

PLUG & SOCKET CONNECTIONS			
P&S No.	Pin No.	Voltage	INFORMATION
1	1	117 VAC	Line Voltage
	2	+19V.	Sustain Short B+
	3	+12V.	Organ B+
	4	117 VAC	Line Voltage
	5	+6V.	Audio Ground
	6	Gnd.	Ground

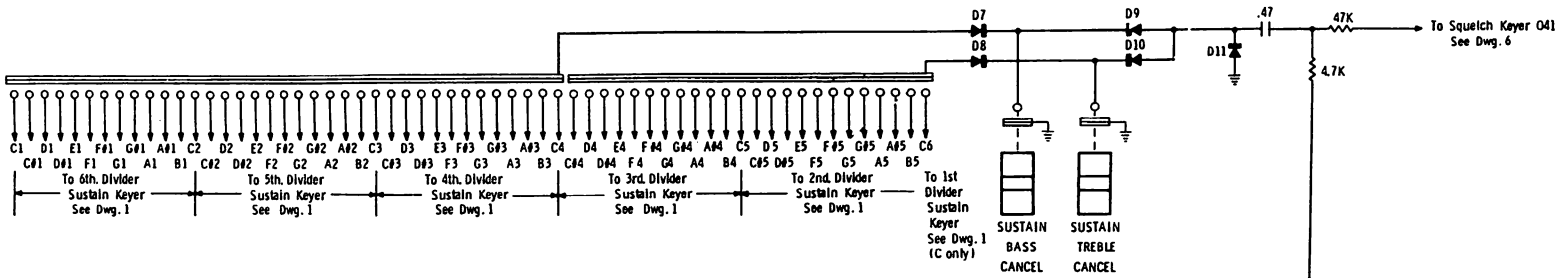
TONE GENERATORS, & POWER SUPPLY
PP/222
Dwg. No. 1 PROFESSIONAL



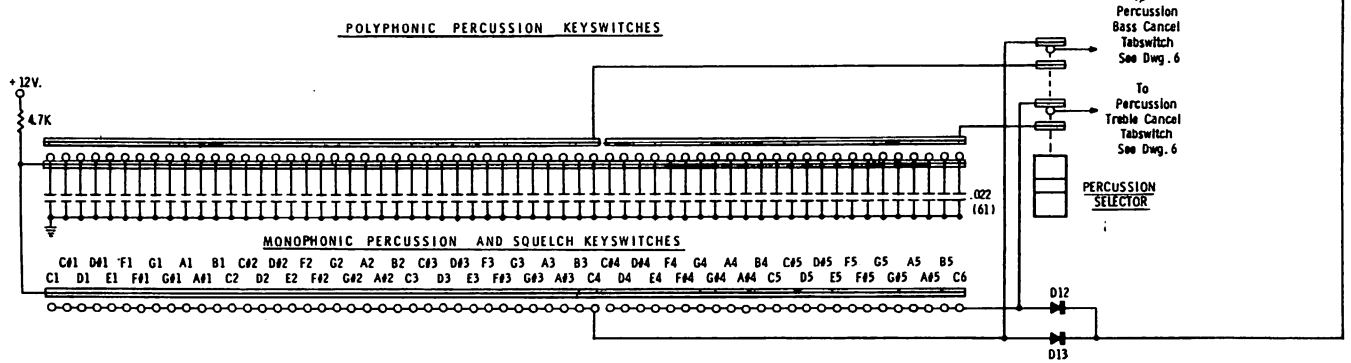


KEYSWITCHES & TABSWITCHES
PP/222
Dwg. 3 PROFESSIONAL

SUSTAIN KEYSWITCHES



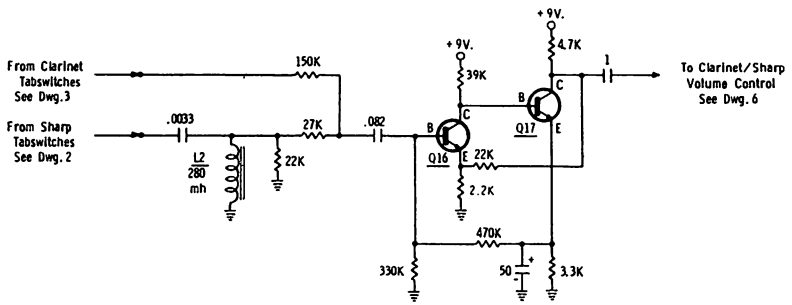
POLYPHONIC PERCUSSION KEYSWITCHES



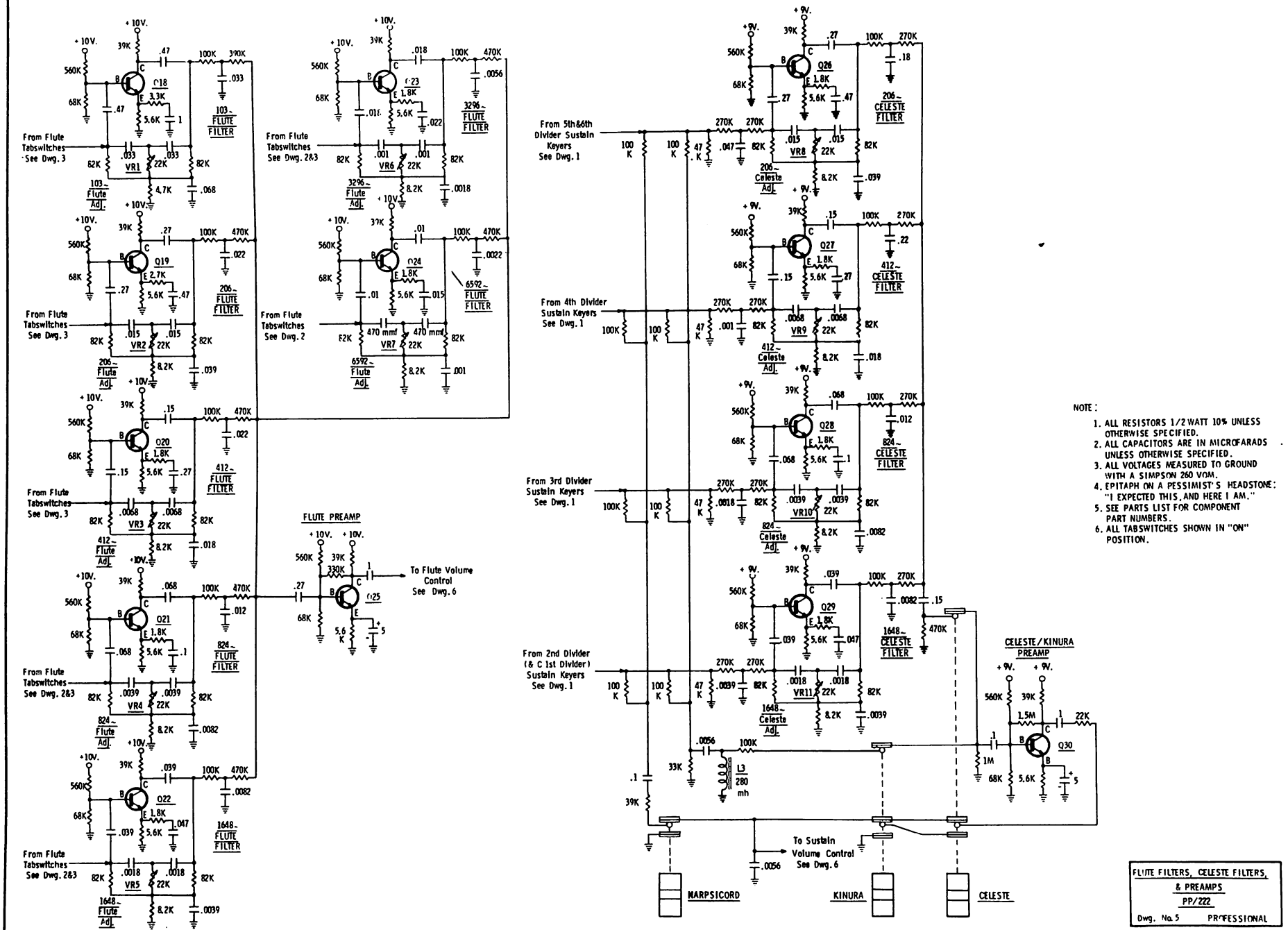
NOTES:

1. All resistors 1/2 watt 10% unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. Winning's not everything, but losing is just plain nothing!
5. All keyswitches shown in " off " position.
6. See parts list for component part numbers.

CLARINET / SHARP PREAMPS



SUSTAIN KEYSWITCHES, PERCUSSION KEYSWITCHES & CLARINET/SHARP PREAMP
PP/222
Dwg. No. 4 PROFESSIONAL

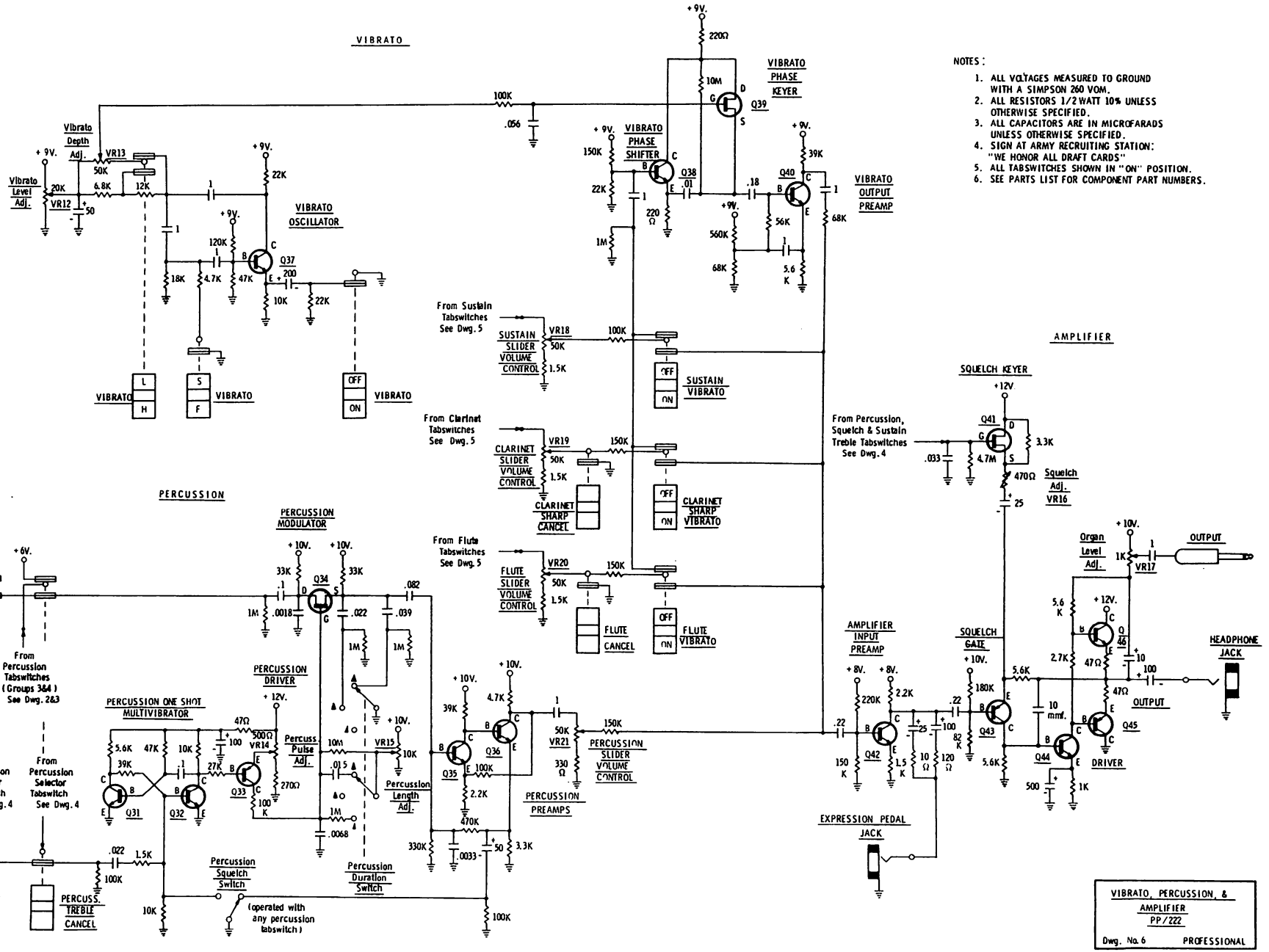


NOTE:

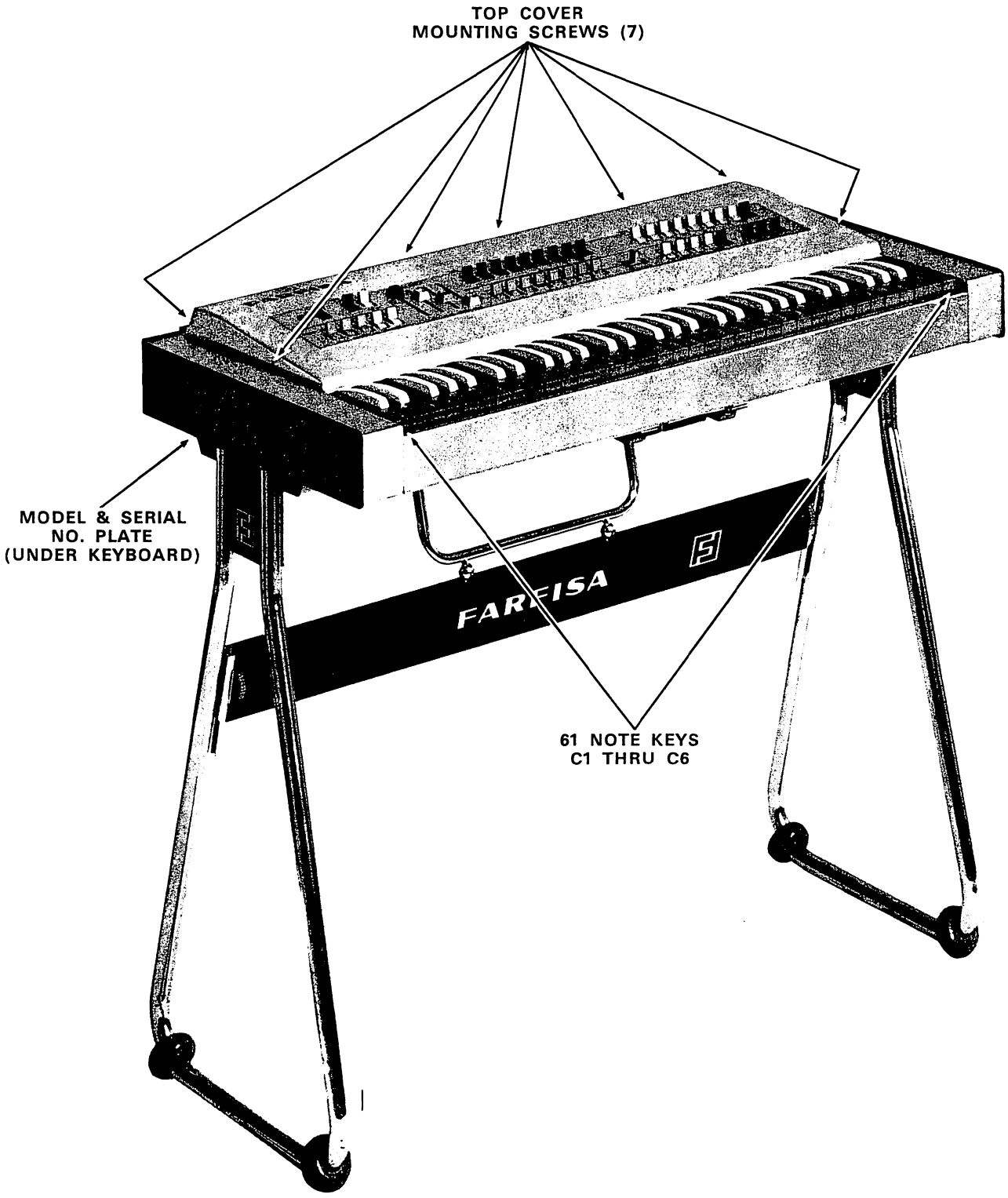
1. ALL RESISTORS 1/2 WATT 10% UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
3. ALL VOLTAGES MEASURED TO GROUND WITH A SIMPSON 260 VOM.
4. EPITAPH ON A PESSIMIST'S HEADSTONE: "I EXPECTED THIS, AND HERE I AM."
5. SEE PARTS LIST FOR COMPONENT PART NUMBERS.
6. ALL TABSWITCHES SHOWN IN "ON" POSITION.

FLUTE FILTERS, CELESTE FILTERS, & PREAMPS
PP/222
Dwg. No. 5 PROFESSIONAL

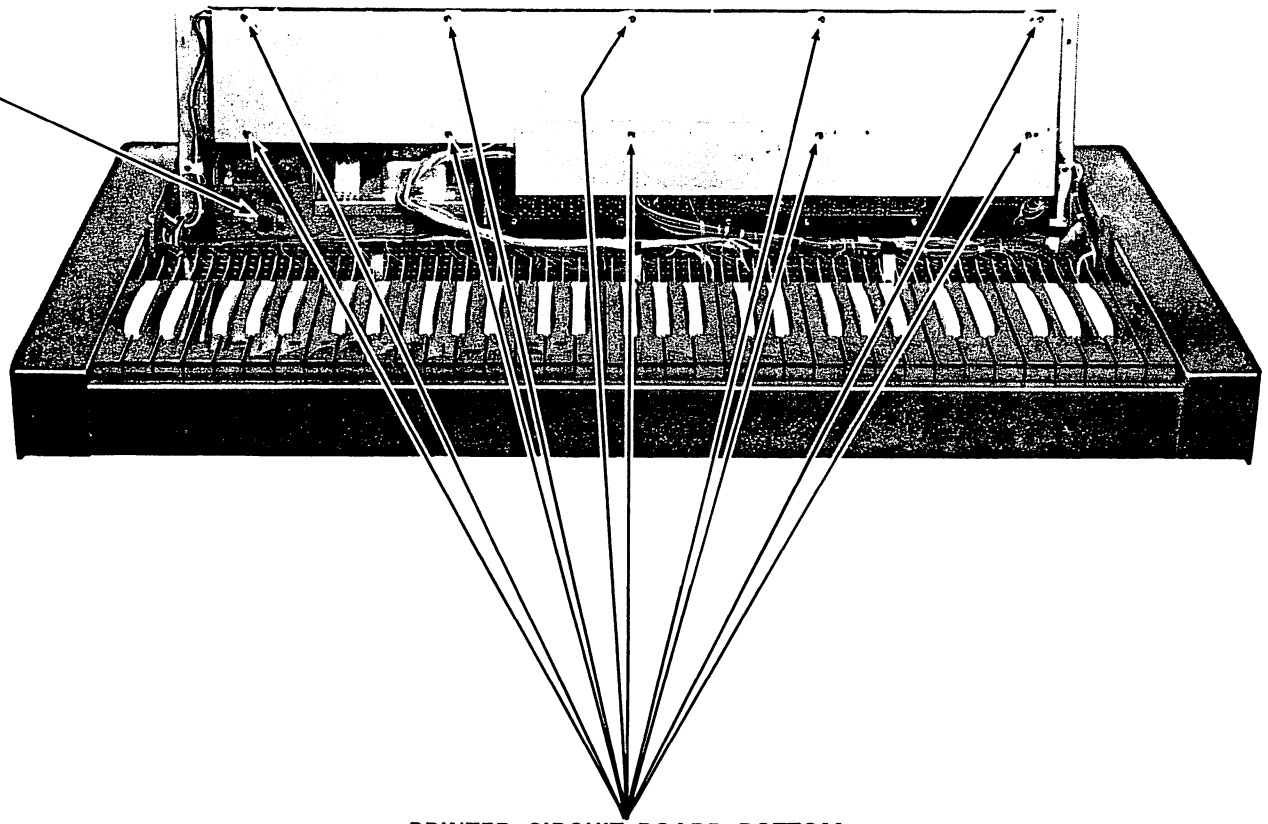
PROFESSIONAL



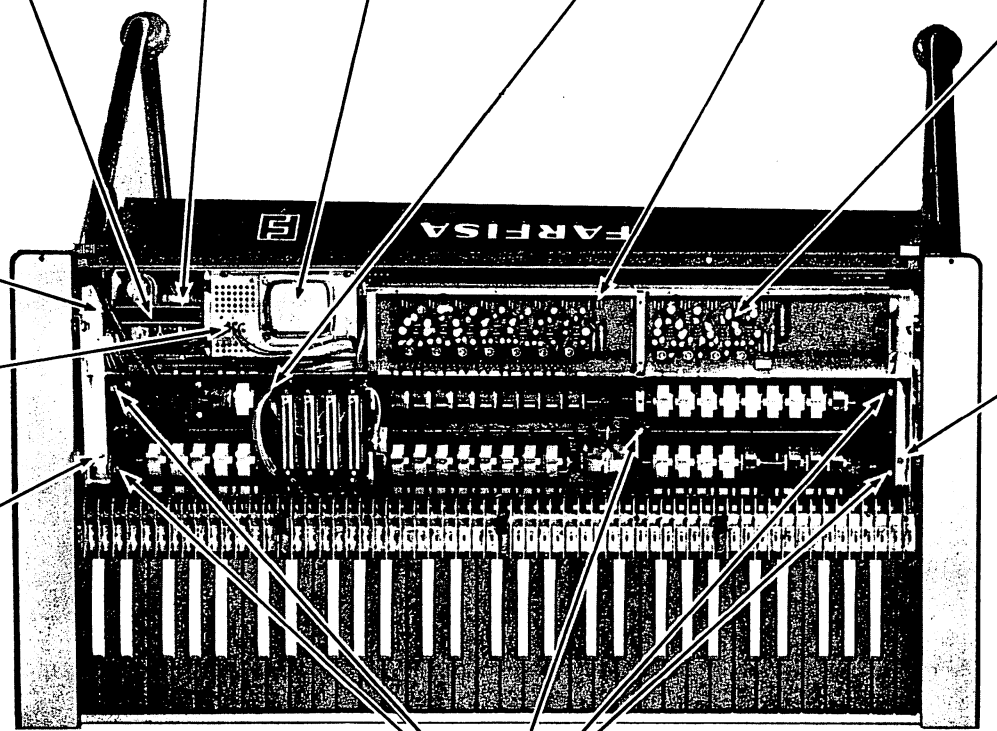
FRONT VIEW
PROFESSIONAL



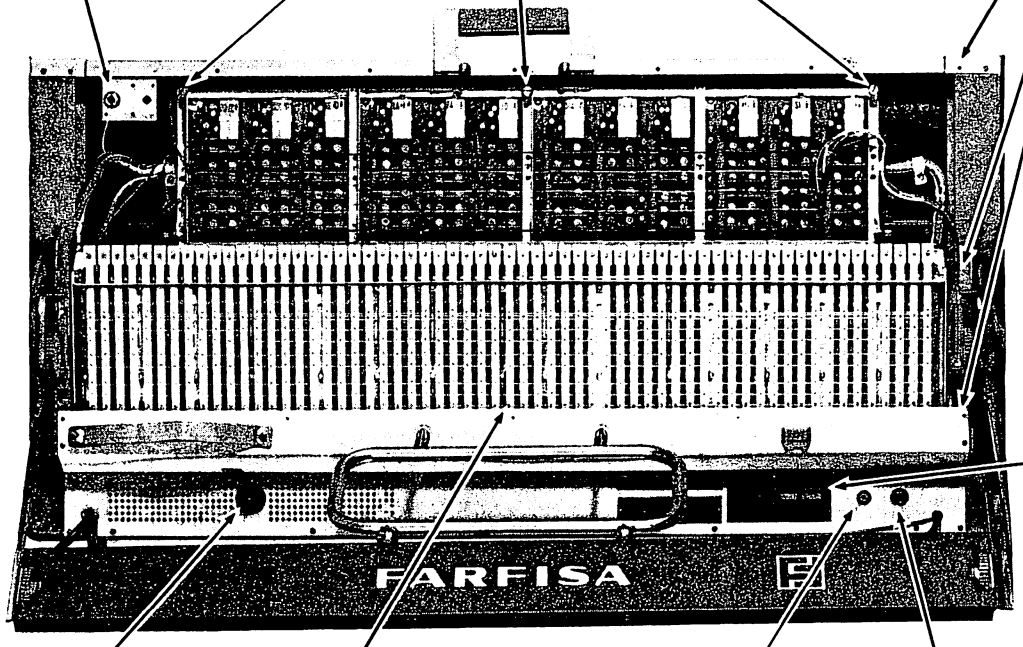
FRONT VIEW
PROFESSIONAL
(Tabswitch Assembly Raised)



TOP VIEW
(With Cover Removed)



BOTTOM VIEW
PROFESSIONAL



HEADPHONE JACK

TONE GENERATOR ASSEMBLY HOLD DOWN SCREWS(3)

BOTTOM PANEL SCREW LOCATIONS (15)

MODEL & SERIAL NO. PLATE

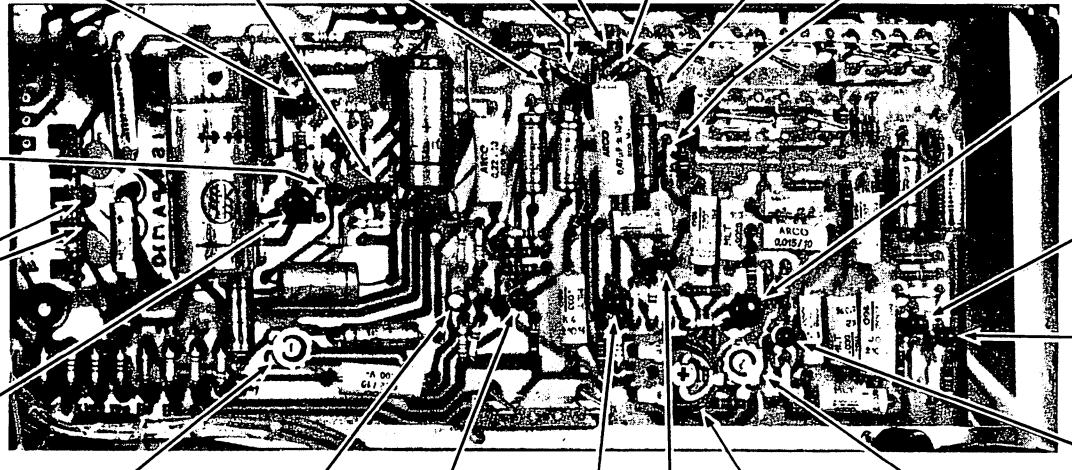
.4 AMP FUSE

KEYSWITCHES
TOP TO BOTTOM
PERCUSSION (MONO.)
PERCUSSION (POLY.)
SUSTAIN
16, 8, 5-1/3, 4, 2-2/3,
1-3/5 & 1-1/3

ORGAN LEVEL ADJ. VR17

SWELL PEDAL JACK

AMPLIFIER & PERCUSSION BOARD
PROFESSIONAL
(PA-110)



SQUELCH GATE TRANSISTOR Q43

DIODE D9

DIODE D7

DIODES D12 & D13

OUTPUT TRANSISTOR Q46

DIODE D10

DIODE D11

DIODE D8

PERCUSSION DRIVER TRANSISTOR Q33

VOLTAGE AMP. TRANSISTOR Q44

PERCUSSION PREAMP #1 TRANSISTOR Q35

SOLO DIVIDER TRANSISTOR Q14 & Q15

PERCUSSION PREAMP #2 TRANSISTOR Q36

OUTPUT TRANSISTOR Q45

PERCUSSION MODULATOR TRANSISTOR Q34

SQUELCH ADJ. VR16

INPUT PREAMP TRANSISTOR Q42

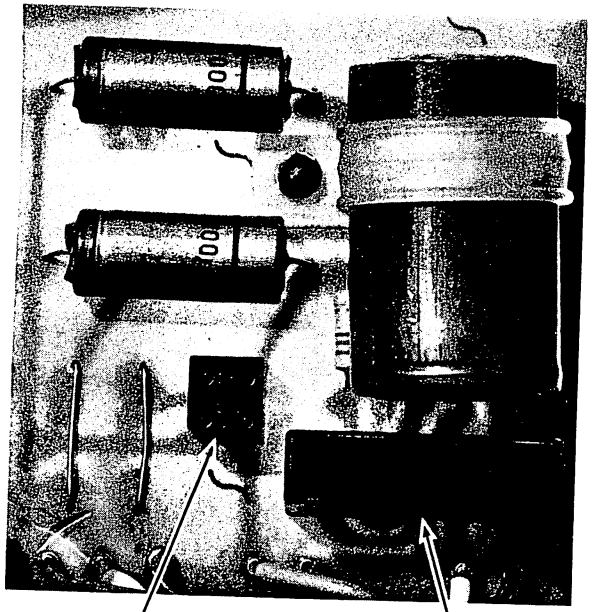
SQUELCH GATE TRANSISTOR Q41

Q31 Q32 PERCUSSION ONE-SHOT MULTIVIBRATOR TRANSISTORS

KEYING ADJ. VR14

PERCUSSION LENGTH ADJ. VR15

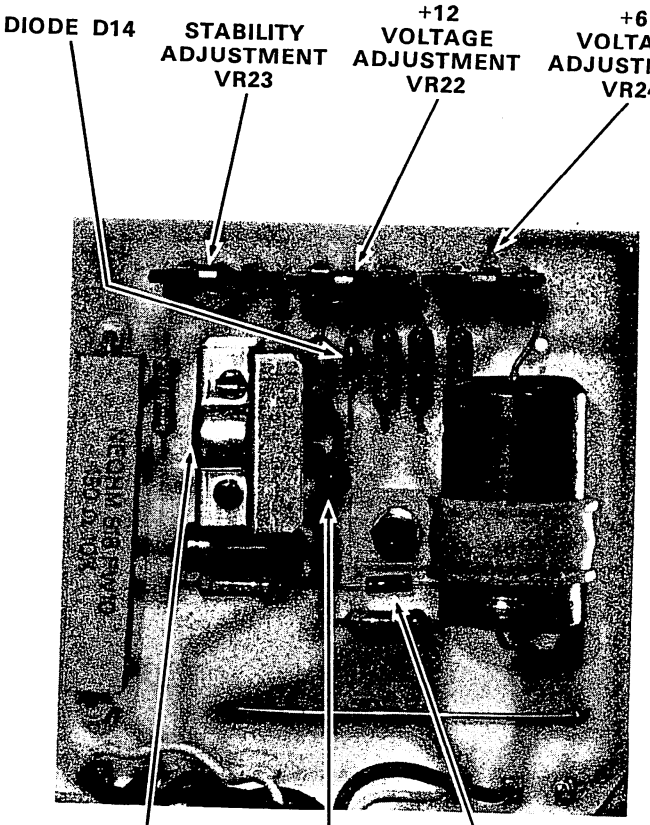
RECTIFIER BOARD
PROFESSIONAL
(PA-117)



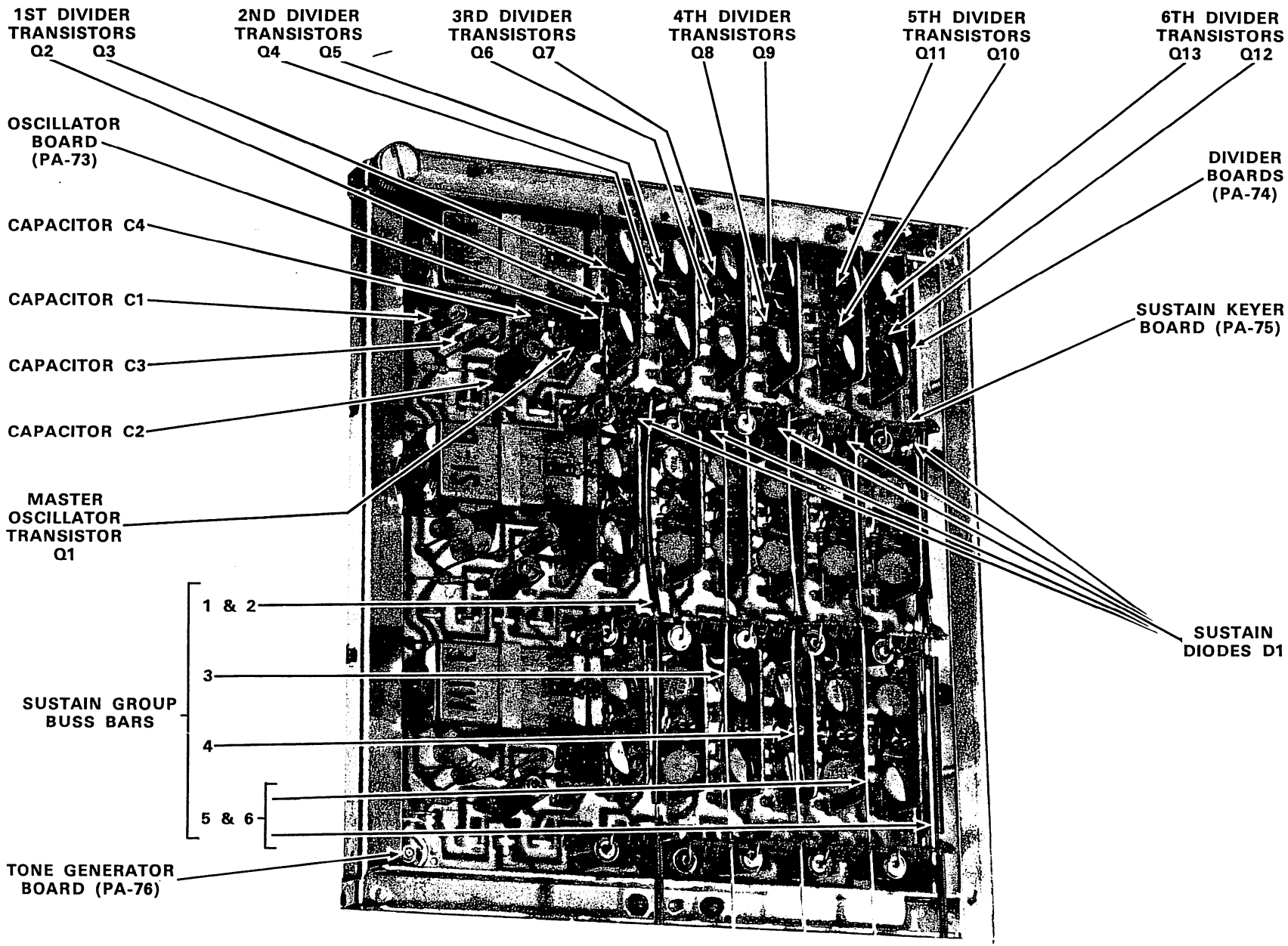
RECTIFIER DIODES D19-D22

RECTIFIER DIODES D15-D18

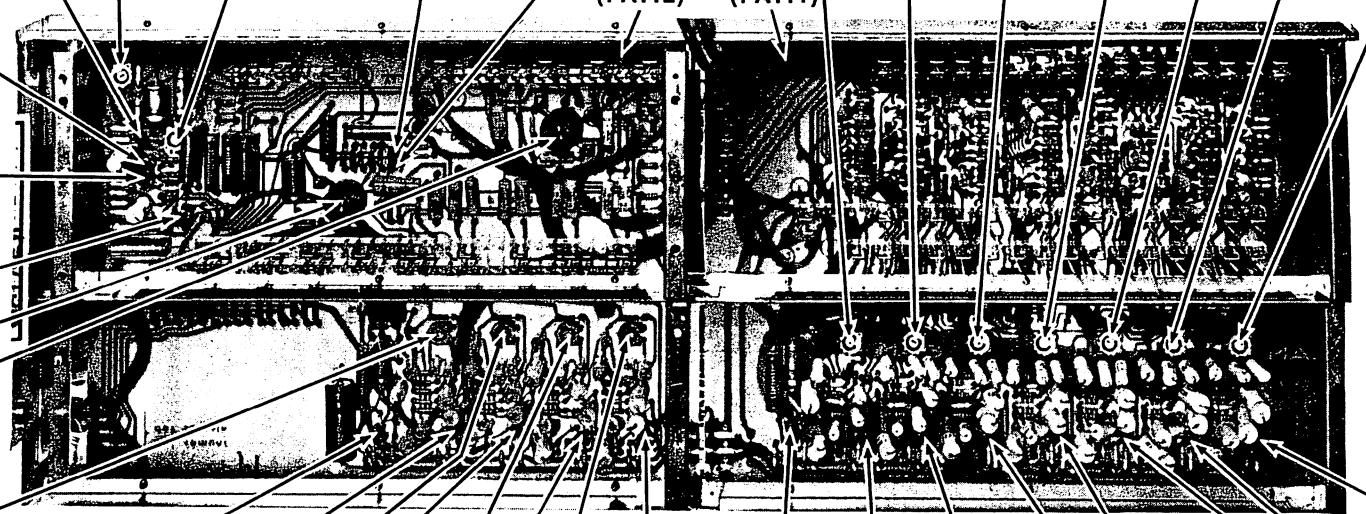
REGULATOR BOARD
PROFESSIONAL
(PA-103)



TONE GENERATOR BOARD
(With Oscillator, Divider & Sustain Keyer Boards)
PROFESSIONAL



VIBRATO, FILTER & PREAMP BOARD (PA-112) & VOICING BOARD (PA-111)
PROFESSIONAL



VIBRATO OSCILLATOR TRANSISTOR Q37
VIBRATO DEPTH ADJ. VR13
VIBRATO LEVEL ADJ. VR12
CLARINET PREAMP #1 TRANSISTOR Q17
CLARINET PREAMP #2 TRANSISTOR Q16
6592~ FLUTE FILTER ADJ. VR7
3296~ FLUTE FILTER ADJ. VR6
1648~ FLUTE FILTER ADJ. VR5
824~ FLUTE FILTER ADJ. VR4
412~ FLUTE FILTER ADJ. VR3
206~ FLUTE FILTER ADJ. VR2
103~ FLUTE FILTER ADJ. VR1
VIBRATO PHASE SHIFTOR TRANSISTOR Q38
VIBRATO PHASE KEYER TRANSISTOR Q39
VIBRATO OUTPUT PREAMP Q40
COIL L2
COIL L3
1648~ CELESTE FILTER ADJ. VR11
CELESTE/ KINURA PREAMP TRANSISTOR Q30
1648~ CELESTE FILTER TRANSISTOR Q29
824~ CELESTE FILTER ADJ. VR10
824~ CELESTE FILTER TRANSISTOR Q28
412~ CELESTE FILTER ADJ. VR9
412~ CELESTE FILTER TRANSISTOR Q27
206~ CELESTE FILTER ADJ. VR8
206~ CELESTE FILTER TRANSISTOR Q26
FLUTE PREAMP TRANSISTOR Q25
6592~ FLUTE FILTER TRANSISTOR Q24
3296~ FLUTE FILTER TRANSISTOR Q23
1648~ FLUTE FILTER TRANSISTOR Q22
824~ FLUTE FILTER TRANSISTOR Q21
412~ FLUTE FILTER TRANSISTOR Q20
206~ FLUTE FILTER TRANSISTOR Q19
103~ FLUTE FILTER TRANSISTOR Q18

PARTS INFORMATION

STANDARD PARTS
Replacements for all standard electronic parts and hardware may be purchased directly from local suppliers generally in less time than would be required to obtain them from the factory.

SPECIAL PARTS
In addition to the standard replacement parts, special electronic and mechanical parts are also used. These parts are manufactured by and to the specifications of the factory. Order these parts directly from the factory since they would be difficult or impossible to obtain from other sources.

PARTS ORDERING INFORMATION
When ordering parts be sure to include the following information:

1. Model and Serial Number
2. Part Number
3. A description of the part
4. Specify how you want the part shipped.

Most special electronic parts and mechanical parts will have a part number stamped on them. In the event that the part number is missing, or you are unable to read the part number, a complete description of the part and where it is used will allow the factory to fill your parts order. When parts are ordered in the proper manner the factory is able to fill your orders promptly—delays that might result are avoided.

ADDRESS PARTS ORDERS TO:

C.M.I. SERVICE DEPT.
7373 No. Cicero Ave.
Chicago, Illinois 60646

IMPORTANT

IN ANY CORRESPONDENCE CONCERNING THIS INSTRUMENT ALWAYS INCLUDE MODEL AND SERIAL NUMBERS

PARTS LIST

THE PARTS LIST CONTAINS THE FOLLOWING INFORMATION:

1. Name of Part
2. Value, Tolerance and Code (when important)
3. Brief description
4. Where the part is found (assembly, printed circuit board and etc.)
5. Schematic Reference Number
6. PART NUMBER — USE IT!

This parts list includes all standard stock replacement parts. No attempt has been made to include every nut, bolt and screw. If the necessity for a non-listed part arises, please write describing the part's location and function as well as model and serial number of the unit.

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
AMPLIFIER BOARD			
Assembly	Amplifier Board Complete (PA58)		996-011320
Capacitor	Electrolytic 10 UF 65V		945-011203-32
Capacitor	Electrolytic 100 UF 35V		945-011203-19
Capacitor	Electrolytic 500 UF 45V		945-011203-11
Capacitor	Electrolytic 1000 UF 35V		945-011203-22
Coil	3 MH	L3, 4	956-011321
Diode	1X9179	D2	915-011215
Potentiometer	1K Bias Adj	VR5	925-011322
Potentiometer	100K Organ Volume Adj	VR4	925-011323
Transistor	Input Preamp (1W9640)	Q16	991-011225
Transistor	Bias Transistor (BC107)	Q17	991-011313
Transistor	Voltage Amp & Driver #1 (BC142)	Q18, 19	991-011314
Transistor	Driver #2 (BC143)	Q20	991-011315
Transistor	Power (T1P14)	Q21, 22	992-011317
CONSOLE ASSEMBLY			
Cord	A.C.		989-011268
Jack	Expression Pedal		910-011263
Jack	Amplifier		910-011325
Knob	Bass & Organ Volume (Gray, Silver Cap)		915-011324
Pilot Light			939-011326
Potentiometer	47K Bass & Organ Volume Controls	VR2, 3	925-011310
Speaker	8 Ohm		985-011327
Switch	A.C. Off-On		960-011267
DIVIDER BOARD			
Assembly	Divider Board (PA74)		996-011345
Capacitor	Polystyrene 820 MMF		946-011205-821
Transistor	Divider (1W9787)	Q4-13	991-011318
KEYSWITCH ASSEMBLY			
Key	A Natural White		964-011330-1
Key	B Natural White		964-011330-2
Key	C Natural White		964-011330-3
Key	D Natural White		964-011330-4
Key	E Natural White		964-011330-5
Key	F Natural White		964-011330-6
Key	G Natural White		964-011330-7
Key	A Natural Gray		964-011331-1
Key	B Natural Gray		964-011331-2
Key	C Natural Gray		964-011331-3
Key	D Natural Gray		964-011331-4
Key	E Natural Gray		964-011331-5
Key	F Natural Gray		964-011331-6
Key	G Natural Gray		964-011331-7
Key	All Sharp—Gray		964-011332-1
Key	All Sharp—White		964-011332-2
Spring	Key Contact		917-011333
Spring	Sharp Key Balance		975-011239
Spring	Natural Key Balance		975-011283

FAST 2

OSCILLATOR BOARD

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
Assembly	F#, B, E Oscillator Board Complete (PA91)		996-011334-1
Assembly	A, D, G Oscillator Board Complete (PA91)		996-011334-2
Assembly	C, F, A# Oscillator Board Complete (PA91)		996-011334-3
Assembly	D#, G#, C# Oscillator Board Complete (PA91)		996-011334-4
Assembly	A Oscillator Board Complete (PA73)		996-011335-1
Assembly	A# Oscillator Board Complete (PA73)		996-011335-2
Assembly	B Oscillator Board Complete (PA73)		996-011335-3
Assembly	C Oscillator Board Complete (PA73)		996-011335-4
Assembly	C# Oscillator Board Complete (PA73)		996-011335-5
Assembly	D Oscillator Board Complete (PA73)		996-011335-6
Assembly	D# Oscillator Board Complete (PA73)		996-011335-7
Assembly	E Oscillator Board Complete (PA73)		996-011335-8
Assembly	F Oscillator Board Complete (PA73)		996-011335-9
Assembly	F# Oscillator Board Complete (PA73)		996-011335-10
Assembly	G Oscillator Board Complete (PA73)		996-011335-11
Assembly	G# Oscillator Board Complete (PA73)		996-011335-12
Coil	Tuning (Blue Dot)	L1	952-011336
Coil	Tuning (Red Dot)	L1	952-011337
Diode	1W9179	D1	919-011215
Transistor	Oscillator (1W9810/3)	Q3	991-011319

POWER SUPPLY

Assembly	Power Supply Complete		997-011338
Capacitor	Electrolytic 1000 UF 25V		945-011203-18
Capacitor	Electrolytic 2000 UF 55V		945-011203-36
Diode	Rectifier (BYY31)	D3-6	919-011339
Diode	Zener (ZX12)	Z1	919-011340
Fuse	.4 Amp		939-011341
Holder	Fuse		906-006303
Resistor	39 Ohm 20 Watt		924-011230-10
Transformer	Power (1046)	T1	954-011342

TABSWITCH ASSEMBLY

Spring	Contact		975-011243
Tab	Flute		915-011344-1
Tab	Clarinet		915-011344-2
Tab	Reed		915-011344-3
Tab	Strings		915-011344-4
Tab	Vibrato Off-On		915-011344-5
Tab	Slow-Fast		915-011344-6

VIBRATO & PREAMP BOARD

Assembly	Vibrato & Preamp Board Complete (PA92)		996-011328
Capacitor	Electrolytic 25 UF 40V		945-011203-7
Capacitor	Electrolytic 100 UF 12V		945-011203-10
Capacitor	Electrolytic 200 UF 12V		945-011203-16
Capacitor	Electrolytic 200 UF 25V		945-011203-20
Coil	2H Filter	L2	956-011208
Potentiometer	Vibrato Speed (22K)	VR1	925-011329
Transistor	Emitter Follower, Preamp #2 (BC113)	Q2, 15	991-011219
Transistor	Preamp #1 (BC149)	Q14	991-011316
Transistor	Oscillator (1W9787)	Q1	991-011318

FAST 3

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
CONSOLE ASSEMBLY			
Cord	A.C. Power		989-011268
Handle	Cabinet		930-013024-1
Knob	Organ Volume (Gray/Silver Cap)		915-011324
Leg (Left)	Cabinet		939-013024-1
Leg (Right)	Cabinet		939-013024-2
Light	Pilot		939-013025
KEYSWITCH ASSEMBLY			
Actuator	Keyswitch		964-013026
Key	C Natural Dark Gray (Bass)		964-013027-C
Key	D Natural Dark Gray (Bass)		964-013027-D
Key	E Natural Dark Gray (Bass)		964-013027-E
Key	F Natural Dark Gray (Bass)		964-013027-F
Key	G Natural Dark Gray (Bass)		964-013027-G
Key	A Natural Dark Gray (Bass)		964-013027-A
Key	B Natural Dark Gray (Bass)		964-013027-B
Key	C Natural Gray (Treble)		964-013028-C
Key	D Natural Gray (Treble)		964-013028-D
Key	E Natural Gray (Treble)		964-013028-E
Key	F Natural Gray (Treble)		964-013028-F
Key	G Natural Gray (Treble)		964-013028-G
Key	A Natural Gray (Treble)		964-013028-A
Key	B Natural Gray (Treble)		964-013028-B
Key	All Sharps (White)		964-013029
Spring	Key Contact		975-013030
Spring	Bass Contact		975-013031
Spring	Pull Down Actuator		975-013032
Spring	Pull Down Key		975-013033
POWER SUPPLY CHASSIS			
Capacitor	Electrolytic 500 UF 15V		945-011203-23
Capacitor	Electrolytic 500 UF 50V		945-011203-24
Diode	Rectifier	D1-4	919-013036
Diode	Zener (5524)	Z2	919-013035
Fuse	.2 Amp		939-013034
Holder	Fuse		906-006303
Resistor	120 Ohm 10W		924-011330-5
Transformer	Power (T-1042)	T1	954-013037
PREAMP BOARD			
Assembly	Preamp Board (PA-62)		996-013020
Capacitor	Electrolytic 100 UF 12V		945-011203-10
Transistor	Preamp #1, #2 & Output (BC 149)	Q13-15	991-013316
TABSWITCH ASSEMBLY			
Spring	Tabswitch Contact		975-011243
Tab	Manual Bass Selector Treble-Bass		915-011344-7
Tab	PF		915-011344-8
Tab	Bass 16′		915-011344-9

FAST 3

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
Tab	Clarinet 16′		915-011344-10
Tab	Flute 8′		915-011344-11
Tab	Oboe 8′		915-011344-12
Tab	Trumpet 8′		915-011344-13
Tab	Strings 8′		915-011344-14
Tab	Flute 4′		915-011344-15
Tab	Vibrato Off-On		915-011344-5
Tab	Slow-Fast		915-011344-6

TONE GENERATOR BOARDS

Assembly	A Generator Board Complete (PA-23)		996-013021-C
Assembly	A# Generator Board Complete (PA-23)		996-013021-C#
Assembly	B Generator Board Complete (PA-23)		996-013021-D
Assembly	C Generator Board Complete (PA-23)		996-013021-D#
Assembly	C# Generator Board Complete (PA-23)		996-013021-E
Assembly	D Generator Board Complete (PA-23)		996-013021-F
Assembly	D# Generator Board Complete (PA-23)		996-013021-F#
Assembly	E Generator Board Complete (PA-23)		996-013021-G
Assembly	F Generator Board Complete (PA-23)		996-013021-G#
Assembly	F# Generator Board Complete (PA-23)		996-013021-A
Assembly	G Generator Board Complete (PA-23)		996-013021-A#
Assembly	G# Generator Board Complete (PA-23)		996-013021-B
Capacitor	Electrolytic 25 UF 25V		945-011203-25
Coil	Tuning (C—F# Yellow Dot)	L1	952-011207-1
Coil	Tuning (G—B Green Dot)	L1	952-011207-2
Transistor	Oscillator (Y 363)	Q3	991-011224
Transistor	Divider (SFT 352)	Q5-10	991-011222

VIBRATO/BASS BOARD

Assembly	Vibrato/Bass Board (PA-60)		996-013018
Capacitor	Electrolytic 1 UF 40V		945-011203-1
Capacitor	Electrolytic 5 UF 25V		945-011203-2
Capacitor	Electrolytic 50 UF 12V		945-011203-8
Capacitor	Electrolytic 100 UF 12V		945-011203-10
Potentiometer	Vibrato Speed (10K)	VR1	925-011232
Transistor	Vibrato Oscillator (SFT 353)	Q1	991-011223
Transistor	Vibrato Emitter Follower (SFT 367)	Q2	991-011217
Transistor	Bass Divider (SFT 352)	Q11, 12	991-011222

VOICING BOARD

Assembly	Voicing Board (PA-61)		996-013019
Capacitor	Electrolytic 1 UF 40V		945-011203-1
Capacitor	Electrolytic 100 UF 12V		945-011203-10
Coil	Filter (220 MH)	L2, 3	952-013022
Coil	Filter (450 MH)	L4, 5	952-013023
Potentiometer	D.C. Balancing (10K)	VR3	925-011232

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
CELEST FILTER BOARD (FAST 5 ONLY)			
Assembly	Celest Filter Board (PA-105)		996-013043
Potentiometer	22K Celest Filter Adj.	VR12, 13	925-011329
Transistor	Celest Filter (BC 114)	Q38, 39	991-013044
CONSOLE ASSEMBLY			
Cord	A.C. Power		989-011268
Handle	Cabinet (Fast 4)		930-013024-2
Handle	Cabinet (Fast 5)		930-013024-3
Jack	Headphone		906-013038
Jack	Swell Pedal		906-013039
Knob	Bass Volume (Gray/Silver Cap)		915-011324
Light	Pilot		939-013040
Socket	Bass Pedals		906-013041
Switch	Off/On Power		960-013042
FLUTE FILTER BOARD			
Assembly	Flute Filter Board (PA-97)		996-013046
Potentiometer	22K Flute Filter Adj.	VR7-9	925-011329
Transistor	Filter (BC 114)	Q24-26	991-013044
KEYSWITCH ASSEMBLY			
Actuator	Keyswitch (White Plastic)		964-013049
Key	C Natural Black (Bass)		964-013038-C
Key	D Natural Black (Bass)		964-013038-D
Key	E Natural Black (Bass)		964-013038-E
Key	F Natural Black (Bass)		964-013038-F
Key	G Natural Black (Bass)		964-013038-G
Key	A Natural Black (Bass)		964-013038-A
Key	B Natural Black (Bass)		964-013038-B
Key	C Natural Dark Gray (Bass/Treble)		964-013027-C
Key	D Natural Dark Gray (Bass/Treble)		964-013027-D
Key	E Natural Dark Gray (Bass/Treble)		964-013027-E
Key	F Natural Dark Gray (Bass/Treble)		964-013027-F
Key	G Natural Dark Gray (Bass/Treble)		964-013027-G
Key	A Natural Dark Gray (Bass/Treble)		964-013027-A
Key	B Natural Dark Gray (Bass/Treble)		964-013027-B
Key	C Natural Gray (Treble)		964-013028-C
Key	D Natural Gray (Treble)		964-013028-D
Key	E Natural Gray (Treble)		964-013028-E
Key	F Natural Gray (Treble)		964-013028-F
Key	G Natural Gray (Treble)		964-013028-G
Key	A Natural Gray (Treble)		964-013028-A
Key	B Natural Gray (Treble)		964-013028-B
Key	All Sharps (White)		964-013029
Spring	Actuator Pull Down		975-013050
Spring	Key Contact		975-013051

FAST 4 & 5

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
MUTE BOARD (FAST 5 ONLY)			
Assembly	Muter Board (PA-113)		996-013052
Capacitor	Electrolytic 10 UF 12V		996-011203-29
Capacitor	Electrolytic 1000 UF 15V		945-011203-30
Capacitor	Electrolytic 2000 UF 20V		945-011203-31
Diode	Keying (X981)		919-013053
Transistor	Preamps, #1, #2, Driver & Muter (BC 113)	Q43-46	991-011219
OBOE & TRUMPET FILTER BOARD			
Assembly	Oboe & Trumpet Filter Board (PA-99)		996-013048
Capacitor	Electrolytic 1 UF 250V		945-011203-28
Capacitor	Electrolytic 50 UF 12V		945-011203-8
Capacitor	Electrolytic 100 UF 12V		945-011203-10
Transistor	Filter & Output (BC 114)	Q28, 29, 37	991-013044
PERCUSSION BOARD			
Assembly	Percussion Board (PA-100)		996-013054
Capacitor	Electrolytic 5 UF 12V		945-011203-27
Capacitor	Electrolytic 100 UF 15V		945-011203-33
Capacitor	Electrolytic 1000 UF 25V		945-011203-18
Potentiometer	10K Percussion Length Adj	VR10	925-011231
Potentiometer	1K Percussion Attack Adj	VR11	925-011232
Transistor	Multi & Pulse Detector (1W9787)	Q31-33	991-011318
Transistor	Driver (1W9810/1)	Q34	991-011319
Transistor	Keyer (PAC 26)	Q35	991-013055
Transistor	Percussion Preamp (BC 114)	Q36	991-013044
POWER SUPPLY			
Assembly	Rectifier Board (PA-102)		996-013056
Assembly	Regulator Board (PA-103)		996-013057
Capacitor	Electrolytic 5 UF 35V		945-011203-34
Capacitor	Electrolytic 2000 UF 15V		945-011203-35
Capacitor	Electrolytic 2000 UF 45V		945-011203-13
Diode	Keying	D7	919-011215
Diode	Zener (ZF5, 6)	Z1	919-013058
Diode	Rectifier (Semikron B40 C2200/3500)	D3-6	919-013061
Fuse	4/10 Amp.		939-013065
Holder	Fuse		906-006303
Potentiometer	470 Ohm Voltage Adj	VR2	925-013059
Potentiometer	47K Stability Adj	VR3	925-013060
Resistor	150 Ohm 10W (Neoohm 737)		924-013062
Transistor	Voltage Sensor (1W9640)	Q14	991-011225
Transistor	Voltage Regulator (BC 113)	Q15	991-011219
Transistor	Voltage Regulator (RCA 2N5036)	Q16	991-013063
Transformer	Power (T-1045)	T1	954-013064
PREAMP & FILTER BOARD			
Assembly	Preamp & Filter Board (PA-98)		996-013047
Capacitor	Electrolytic 5 UF 12V		945-011203-27
Potentiometer	22K Flute Filter Adj	VR5, 6	925-011329
Transistor	Filter (BC 114)	Q22, 23, 27, 30	991-013044

SUSTAIN PREAMP BOARD (FAST 5 ONLY)

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
Assembly	Sustain Preamp Board (PA-114-1)		996-013066
Capacitor	Electrolytic 5 UF 12V		945-011203-27
Coil	300 MH		952-013067
Transistor	Sustain Voicing Preamp (BC 114)	Q40-42	991-013044

TABSWITCH ASSEMBLY

Actuator	Tabswitch (Black Plastic)		964-013068
Spring	Contact		975-011243
Tab	Pedal Bass Manual Soft-Sharp		915-011344-16
Tab	Manual Bass Selector Treble-Bass		915-011344-7
Tab	Slow Fast		915-011344-6
Tab	Light Heavy		915-011344-17
Tab	Vibrato Off-On		915-011344-5
Tab	Bass 16′		915-011344-9
Tab	Bass Clarinet 16′		915-011344-18
Tab	Flute 8′		915-011344-11
Tab	Oboe 8′		915-011344-12
Tab	Trumpet 8′		915-011344-13
Tab	Strings 8′		915-011344-14
Tab	Flute 4′		915-011344-15
Tab	Piccolo 4′		915-011344-19
Tab	Mixture		915-011344-20
Tab	Brilliance Mixture		915-011344-21
Tab	Long Short		915-011344-22
Tab	Manual Bass Off-On		915-011344-23
Tab	Treble Off-On		915-011344-24
Tab	Mixture Off-On		915-011344-25
Tab	Mixture Soft Sharp		915-011344-26
Tab	Celest 8′		915-011344-27
Tab	Clavicord 8′		915-011344-28
Tab	Kinura 8′		915-011344-29
Potentiometer	Bass Volume (22K)	VR4	925-011329

TONE GENERATOR ASSEMBLY

Assembly	Oscillator Board (PA-73)		996-013069
Assembly	Divider Board (PA-74)		996-013070
Assembly	Sustain Board (PA-75) Fast 5 Only		996-013071
Capacitor	Electrolytic 50 UF 25V		945-011203-39
Coil	Tuning (C# - F#) T-4017		952-011207-1
Coil	Tuning (G - C) T-4018		952-011207-2
Diode	Vibrato & Sustain (1X9809)		919-013072
Transistor	Oscillator (1W9810/3)		991-011319
Transistor	Divider (1W9787)		991-011312

VIBRATO & SOLO DIVIDER BOARD

Assembly	Vibrato & Solo Divider Board (PA-96) Fast 4 Only		996-013073
Assembly	Vibrato & Solo Divider Board (PA-96-1) Fast 5 Only		996-013074
Assembly	Divider Board (PA-74)		996-013070
Capacitor	50 UF 6V		945-011203-37
Capacitor	200 UF 6V		945-011203-38

FAST 4 & 5

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
Potentiometer	Vibrato Speed Adj (22K)	VR1	925-011329
Transistor	Vib. Osc., 16′ & Pedal Solo Divider (1W9787)	Q12, 17-20	991-011318
Transistor	Vibrato Emitter Follower (BC 113)	Q13	991-011219
Transistor	Bass Preamp (BC 114)	Q21	991-013044
Transistor	Driver (1W9787) Fast 5 Only	Q42	991-011318

VOLTAGE FILTER BOARD (FAST 4 ONLY)

Assembly	D. C. Voltage Filter Board (PA-101)		996-013045
Capacitor	Electrolytic 1000 UF 25V		945-011203-18
Capacitor	Electrolytic 2000 UF 15V		945-011203-26

PROFESSIONAL

AMPLIFIER & PERCUSSION BOARD

Assembly	Amplifier & Percussion Board (PA-110)		996-013069
Diode	Keying (1818)	D9, 10	919-013059
Diode	Keying (1728)	D12, 13	919-013060
Diode	Keying (9803)	D7, 8, 11	919-013082
Capacitor	Electrolytic 10 UF 12V		945-011203-29
Capacitor	Electrolytic 25 UF 12V		945-011203-39
Capacitor	Electrolytic 25 UF 25V		945-011203-25
Capacitor	Electrolytic 50 UF 25V		945-011203-9
Capacitor	Electrolytic 100 UF 12V		945-011203-10
Capacitor	Electrolytic 500 UF 6V		945-011203-40
Capacitor	Electrolytic 1000 UF 12V		945-011203-21
Capacitor	Electrolytic 2000 UF 15V		945-011203-26
Potentiometer	500 Ohm Percussion Pulse Adj	VR14	925-013083
Potentiometer	10K Percussion Length Adj	VR15	925-011232
Potentiometer	470 Ohm Squelch Adj	VR16	925-013059
Transistor	16′ Solo Divider (1W1632)	Q14, 15	991-013056
Transistor	Percussion Multi, Preamp & Driver (1W9787)	Q31, 32, 36, 44	991-011318
Transistor	Percussion Driver & Output (1W9810)	Q33, 45	991-011319
Transistor	Percussion Modulator & Squelch Keyer (E103)	Q34, 41	991-013055
Transistor	Percussion Preamp & Output (BC114)	Q35, 46	991-013044
Transistor	Amplifier Input Preamp (BC109B)	Q42	991-013057
Transistor	Squelch Gate (1W9640)	Q43	991-013058

CONSOLE ASSEMBLY

Cord	Output (with plug)		989-013092
Cord	A. C. Power		989-011268
Cover	Organ Top		930-013089
Fuse	4/10 Amp (Slo-Blo)		939-013065
Handle	Cabinet		930-013024-4
Holder	Fuse		906-006303
Jack	Headphone		906-013038
Jack	Swell Pedal		906-013039
Light	Pilot		939-013062
Potentiometer	Level Adjustment	VR17	925-013063
Switch	Off/On Power		960-013064

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
KEYSWITCH ASSEMBLY			
Actuator	Keyswitch (White Plastic)		964-013065
Contact	Spring		975-013051
Key	C Natural Gray with metal channel		964-013065-C
Key	C# Natural Gray with metal channel		964-013065-C#
Key	D Natural Gray with metal channel		964-013065-D
Key	D# Natural Gray with metal channel		964-013065-D#
Key	E Natural Gray with metal channel		964-013065-E
Key	F Natural Gray with metal channel		964-013065-F
Key	F# Natural Gray with metal channel		964-013065-F#
Key	G Natural Gray with metal channel		964-013065-G
Key	G# Natural Gray with metal channel		964-013065-G#
Key	A Natural Gray with metal channel		964-013065-A
Key	A# Natural Gray with metal channel		964-013065-A#
Key	B Natural Gray with metal channel		964-013065-B
Key	All Sharps (White) with metal channel		964-013066
Spring	Pull Down		975-013050
POWER SUPPLY CHASSIS			
Assembly	Rectifier Board (PA-117)		996-013078
Capacitor	Regulator Board (PA-103)		996-013057
Capacitor	Electrolytic 5 UF 40V		945-011203-41
Capacitor	Electrolytic 1000 UF 12V		945-011203-21
Capacitor	Electrolytic 2000 UF 30V		945-011203-42
Capacitor	Electrolytic 2000 UF 12V		954-011203-26
Diode	Keying	D14	919-013081
Diode	Rectifier (Semikron B40C3200/2200)	D15-18	919-013079
Diode	Zener	Z1	919-013083
Fuse	4/10 Amp		939-013065
Holder	Fuse		906-006303
Potentiometer	470 Ohm Voltage Adj	VR22, 24	925-013059
Potentiometer	47K Stability Adj	VR23	925-013060
Resistor	150 Ohm 10W (Neoohm 737)		924-013062
Transistor	Voltage Sensor (1W9640)	Q47	991-011225
Transistor	Voltage Regulator (BC114)	Q48	991-011219
Transistor	Voltage Regulator (RCA 2N5036)	Q49	991-013063
Transformer	Power (T-1048)	T1	954-013081
TABSWITCH ASSEMBLY			
Actuator	Tabswitch (White Plastic)		964-013073
Contact	Spring		917-013074
Knob	Volume Slider (Dark Green)		925-013061-1
Knob	Volume Slider (Light Green)		925-013061-2
Knob	Volume Slider (Orange)		925-013061-3
Knob	Volume Slider (Yellow)	VR18-21	925-013061-4
Potentiometer	Slide-Volume Balance		925-013077
Tab	Blue		915-013075-1
Tab	Green		915-013075-2
Tab	Light Green		915-013075-3
Tab	Yellow		915-013075-4
Tab	Orange		915-013075-5
Tab	Percussion Duration (3 Position)		915-013076
Switch	Percussion Duration (3 Position)		960-013090
Switch	Percussion Squelch		960-013091

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
TONE GENERATOR BOARD			
Assembly	Oscillator Board (PA-73)		997-013086
Assembly	Divider Board (PA-74)		997-013087
Assembly	Sustain Board (PA-75)		997-013088
Assembly	Tone Generator Board (PA-76) (3 Notes)		996-013070
Capacitor	1 UF 40V		945-011203-1
Capacitor	50 UF 25V		945-011203-9
Coil	Tuning (F#-B) T-4023	L1	952-013085-1
Coil	Tuning (C-F) T-4024	L1	952-013085-2
Diode	Keying (1809)	D1	919-013067
Transistor	Master Oscillator (1W9810)	Q1	991-011319
Transistor	Divider (1W9787)	Q2-13	991-011318
VIBRATO, FILTER & PREAMP BOARD			
Assembly	Vibrato, Filter & Preamp Board (PA-112)		996-013035
Capacitor	Electrolytic 50 UF 6V		945-011203-37
Capacitor	Electrolytic 50 UF 25V		945-011203-9
Capacitor	Electrolytic 200 UF 6V		945-011203-38
Capacitor	Electrolytic 500 UF 6V		945-011203-40
Coil	220 MH (18/11-3H1)	L2, 3	952-013022
Potentiometer	20K Vibrato Level	VR12	925-013084
Potentiometer	50K Vibrato Depth	VR13	925-011233
Transistor	Clarinet/Sharp Preamp & Vibrato Osc. (1W9787)	Q16, 17, 37	991-011318
Transistor	Vibrato Phase Shifter & Output Preamp (BC114)	Q38, 40	991-013044
Transistor	Vibrato Phase Keyer (E103)	Q39	991-013055
VOICING BOARD			
Assembly	Voicing Board (PA-111)		996-013071
Capacitor	1 UF 12V		945-011203-1
Capacitor	5 UF 12V		945-011203-27
Capacitor	1000 UF 12V		945-011203-21
Potentiometer	22K Filter Adj	VR1-11	925-011329
Transistor	Flute & Celeste Filters & Flute Preamp (BC114)	Q18-29	991-013044
Transistor	Celeste/Kinura Preamp	Q30	991-013068