YAMAHA

DUAL CHANNEL POLYPHONIC SYNTHESIZER

CS70M

TROUBLESHOOTING

006485

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CS70M

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1.Performance Checks

〔1〕PERFORMANCE CHECKS

The CS70M should be checked and, if necessary, readjusted after repairs to ensure that it is operating properly. In addition, portions of the synthesizer may require readjustment if components are replaced or other electrical repairs are made. This procedure provides instructions for checking the performance of this CS70M against the specifications.

The following preliminary procedure ensures that the instrument malfunction is not caused by improper control settings, and helps determine where to begin on the trouble-shooting chart.

Incorrect control settings can indicate a trouble that does not exist. If there are any questions concerning correct function or operating of any control, see the operating descriptions of the SERVICE GUIDE.

〔2〕TROUBLESHOOTING TECHNIQUES

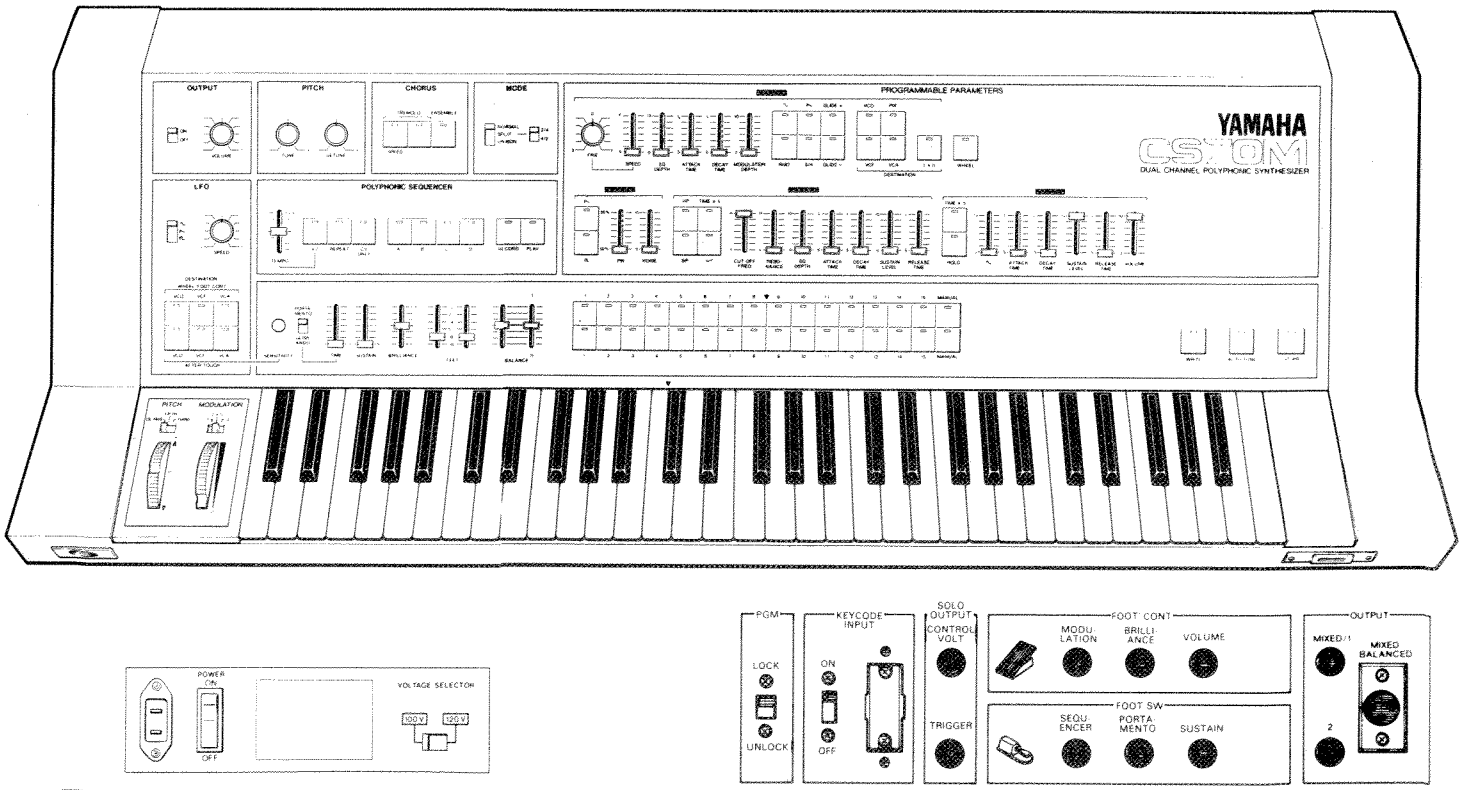
This trouble-shooting procedure is arranged in an order which checks the simple trouble possibilities before proceeding with extensive trouble-shooting. The first few checks ensure proper waveshape operation. If the trouble is not located by these checks, the remaining steps aid in locating the defective component.

To locate the source of a malfunction in instrument operation, the trouble symptom will often indicate the identity of the faulty circuit(s).

If the trouble symptom does not indicate which circuit is causing problems, a more systematic troubleshooting procedure is necessary. OVERALL QUICK REFERENCE TROUBLE-SHOOTING provides a general guide for locating the circuits which are most likely causing the instrument to malfunction.

NOTE:
Voltages and waveforms given on the diagrams are not absolute and may vary slightly between instruments.

Panel layout



(3)PANEL SETTINGS

The following preliminary procedure ensures that the instrument malfunction is not caused by improper control setting and helps determine where to begin on troubleshooting chart:

BLOCK	FUNCTION	POSITION
OUTPUT	ON/OFF	ON
	VOLUME	10
PITCH	TUNE	CENTER
	DETUNE	CENTER
CHORUS	SPEED	OFF
	TREMOLO	OFF
	ENSEMBLE	OFF
MODE	NORMAL/SPLIT/UNISON	NORMAL
	2/4 / 4/2	2/4
LFO	∿/⋀/⊓	∿
	SPEED	CENTER
	WHEEL/FOOT CONT.	BOTH OFF
	AFTER TOUCH	OFF
	SENSITIVITY	Fully turn to right
POLYPHONIC SEQUENCER	TEMPO	CENTER
	OTHER SWITCHES	OFF
PROGRAMMABLE VCO PARAMETERS	VCO ⋀	ON
	⊓	OFF
	PW	50%
	NOISE	0
	FEET-I	8′
	FEET-II	8′
	VCF HP, BP	OFF
	TIME x 5	OFF
	⋁	OFF
	CUT OFF FREQUENCY	H
	RESONANCE	L
	EG DEPTH	0
	ATTACK TIME	S
	DECAY TIME	S
	SUSTAIN LEVEL	10
	RELEASE TIME	S
	VCA TIME x 5	OFF
	HOLD	OFF
	∿	0
	ATTACK TIME	S
	DECAY TIME	S
	SUSTAIN LEVEL	10
	RELEASE TIME	S
	VOLUME	10

BLOCK	FUNCTION		POSITION
PROGRAMMABLE VCO PARAMETERS	LFO	FINE	CENTER
		SPEED	S
		EG DEPTH	0
		ATTACK TIME	S
		MODULATION–DEPTH	0
		∿, ⋀, S/H GLIDE +, GLIDE–, RMO	∿
		VCO, PW, VCF, VCA	OFF
		I + II	OFF
		WHEEL	OFF
EFFECT	PORTAMENTO/GLISSANDO		PORTAMENTO
	TIME		S
	SUSTAIN		S
	BRILLIANCE		CENTER
	2-4 BALANCE		CENTER
	I-II BALANCE		CENTER
PROGRAMMER	I CHANNEL		MANUAL
	II CHANNEL		MANUAL
	WRITE		
AUTO TUNE	AUTO TUNE		OFF
CARD	STORE		OFF
PITCH	OCTAVE/FIFTH/THIRD		OCTAVE
	WHEEL		CENTER
MODULATION	I/I + II/II		I + II
	WHEEL		0
REAR PANEL	MIXED/1		Connect with an external amplifier
	2		NO CONNECTION
	OTHER JACKS		NO CONNECTION
	KEYCODE		INPUT
	ON/OFF		OFF
	PGM LOCK/UNLOCK		UNLOCK

(4) DIGITAL QUICK CHECK POINTS (CPU)

Refer to overall Troubleshooting diagrams to determine which circuit part of the CPU circuit board is malfunctioning.

CPU CIRCUIT

① **CLOCK ϕ**

Check for IC No. 28, pin 6 on CPU circuit board.

The clock waveform is outlined in Figure 1 below.

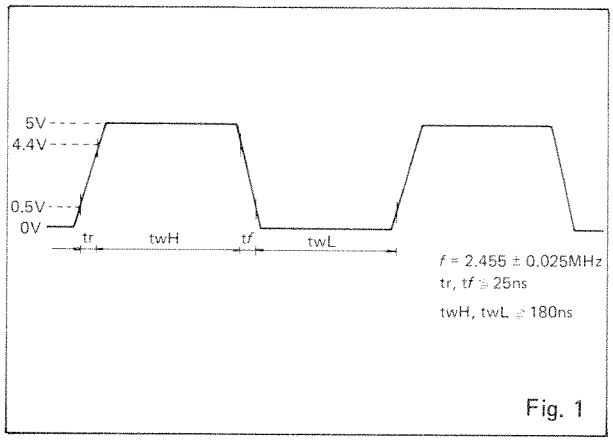


Fig. 1

② **$\overline{\text{NMI}}$**

Check for IC No. 28, pin 17 on CPU circuit board.

A symmetrical square wave signal of 1.67 ± 0.02 msec cycle period is obtained at pin 17 of IC28.

③ **$\overline{\text{INT}}$**

Check for IC No. 29, pin 11 on CPU circuit board.

A symmetrical square wave signal of 13.3 ± 0.2 msec cycle period is obtained at pin 11 of IC29.

④ The CPU of the Z80 address map is provided below for reference purpose.
Note, however, that since A14 and A15 are not decoded in this model address 400-FFFF involve repetition of addresses 0000-3FFF.

Memory Address Map

Address No.	ROM/RAM
0000 – 07FF	ROM IC 49
0800 – 0FFF	ROM IC 50
1000 – 17FF	ROM IC 51
1800 – 2BFF	Free
2000 – 2FFF (Timbre memory)	RAM IC 68, 69
3000 – 33FF (SEQUENCER)	RAM IC 66, 67
3400 – 37FF (SEQUENCER)(I/O)	RAM IC 70, 71
3800 – 3BFF (SEQUENCER)	RAM IC 64, 65
3000 – 3FFF (SEQUENCER)	RAM IC 62, 63

⑤ **INITIAL CLEAR AND RAM BACK UP CIRCUITS**

Check for memory back up and initial clear circuits.

Waveforms as provided in Figure 3.
Should be obtained when +5 volts and TS is set to ON or OFF.

Circuit diagram as shown in Figure 2 should be provided for initial clear and RAM Back up circuits purpose only.

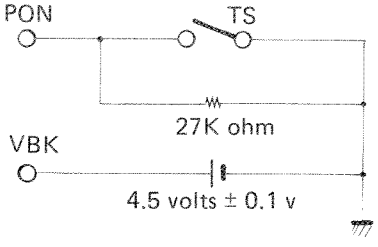


Fig. 2

See CS70M OVERALL CIRCUIT DIAGRAM FOR TROUBLESHOOTING.

1. Performance Checks

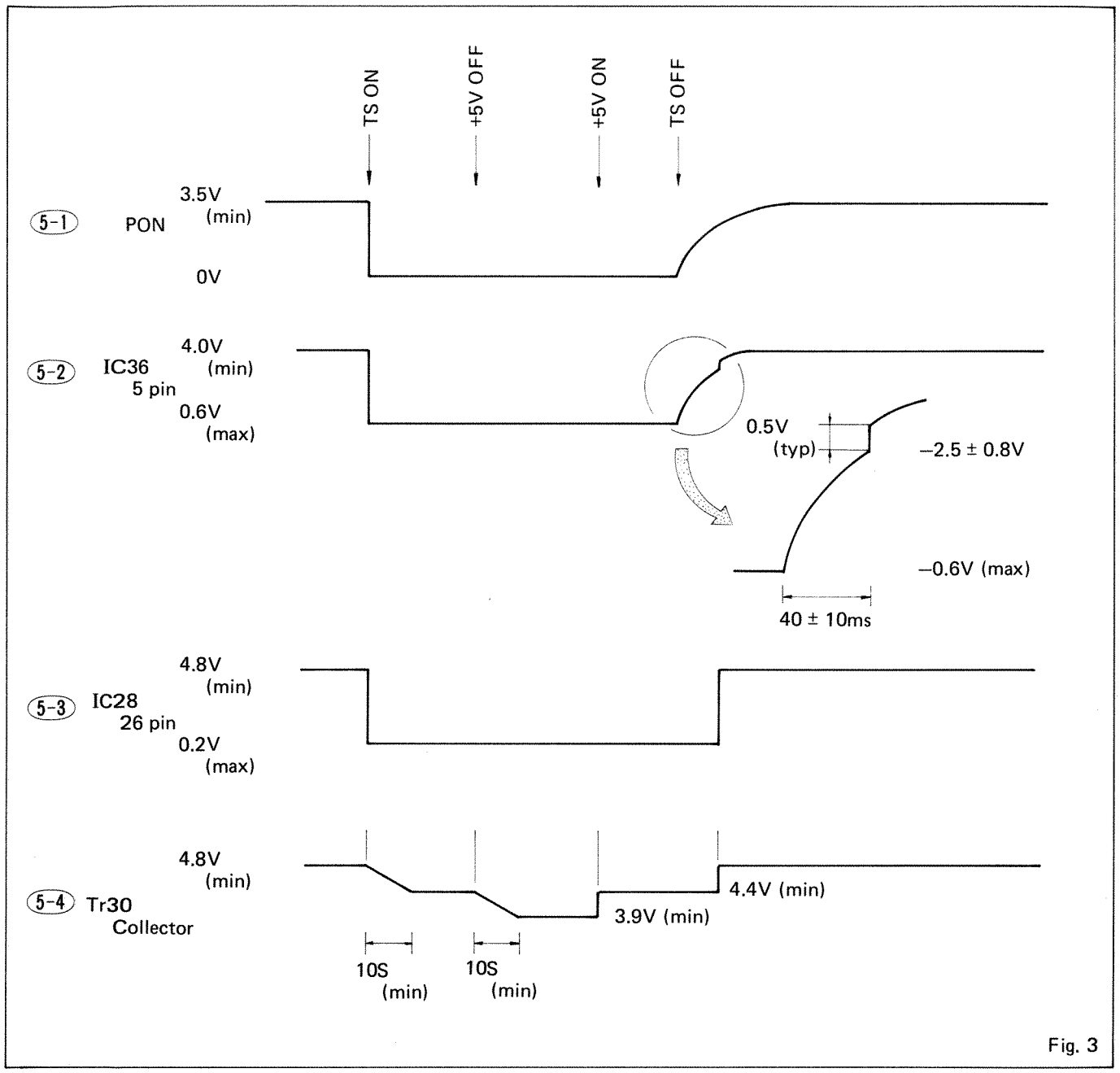


Fig. 3

*See CS70M OVERALL CIRCUIT DIAGRAM FOR TROUBLESHOOTING.

⑥ CARD READER INTERFACE

The I/O address map for the card reader is outlined below.

Address	I/O	PORT
70	out	Data control (IC52)
12	in	Data switch (2/2 IC45)
13	in	Flag (2/2 IC45)

(6-1) DATA CONTROL OUTPUT CHECK

Check for IC No. 52 pins 2, 7 and 10 on CPU circuit board.

When data is written into IC52, the contents of data bits 0 ~ 2 are inverted and obtained at MCS, MRS and RWC. And when bit (10 pin) is 0, a symmetrical square wave signal with a 1.67 msec cycle appears at the WDT terminal.

When this bit is 1, however, the cycle time is halved.

(6-2) DATA SWITCH INPUT CHECK

Check for IC No. 45 1/2 pins 4, 6 and 10 on CPU circuit board.

When data switch input reads I/O address No. 12 (IC 45 1/2), the WPS, MADS and CLS pin status (H or L) is obtained by data bits 0 ~ 2 (IC No. 45 1/2 pins 4, 6 and 10).

And if a suitable pulse is applied to DCP terminal, the DDP status will be latched by that pulse, inverted, and be obtained at IC45 1/2 pin 4 of I/O address 12.

(6-3) FLAG CHECK

Check for IC No. 45 2/2 and 46 1/2 pin 11.

The output data accepted flag (IC 33 1/2 is set by the leading edge of ACP, and reset by writing in CPU I/O address No. 70 IC No. 52, the status appearing in bit 7 of I/O address No. 13 IC 45 2/2, pin 11. The input data ready flag (IC 46 1/2 is set by the leading edge of the pulse applied to DCP and reset by reading CPU I/O address 12 IC 45 1/2, the status appearing in bit 6 of I/O address 13 IC 45 2/2.

⑦ LED DRIVER CIRCUIT CHECK

The I/O address map for control panel LEDs is shown in the following table.

I/O Address Map

Address	in/out	PORT
50	out	LED anode driver (IC57)
60	out	LED cathode driver (IC56)

(7-1) The contents of bits 0 ~ 2 (D0 ~ D2 IC57) of the data written in address No. 50 of IC57 are decoded by IC60 and obtained in negative logic at CM0 ~ CM7. The data written in address No. 60 of IC56, on the other hand, is obtained at LE0 ~ LE7.

(7-2) Waveforms as shown in Figure 4 should be obtained.

Time chart and waveforms

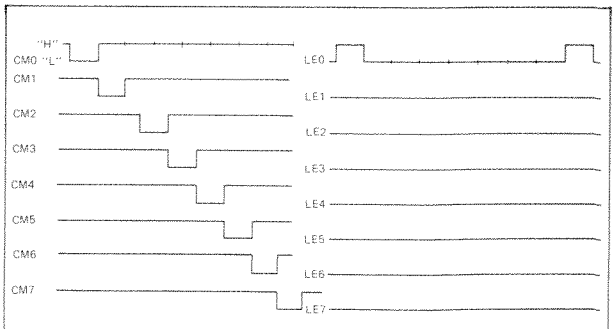


Fig. 4

*See CS70M OVERALL CIRCUIT DIAGRAM FOR TROUBLESHOOTING.

⑧ PANEL SWITCH CIRCUIT CHECK

The I/O address map for panel control switches is shown in the following table.

Panel Switch I/O Address Map

Address	in/out	PORT
30	out	Panel switch address (IC58)
40	out	Panel switch strobe (IC59)
10	in	Panel switch data (IC47)

⑧-1 The bit 0 ~ bit 3 (D0 ~ D3) contents of the data written in I/O port address No. 30 (IC58) is obtained at the PAA ~ PAD terminals, while the bit 0 ~ bit 2 contents (D0 ~ D2) of the data written in I/O port address No. 40 (IC59) is obtained at the IS1 ~ IS3 terminals.

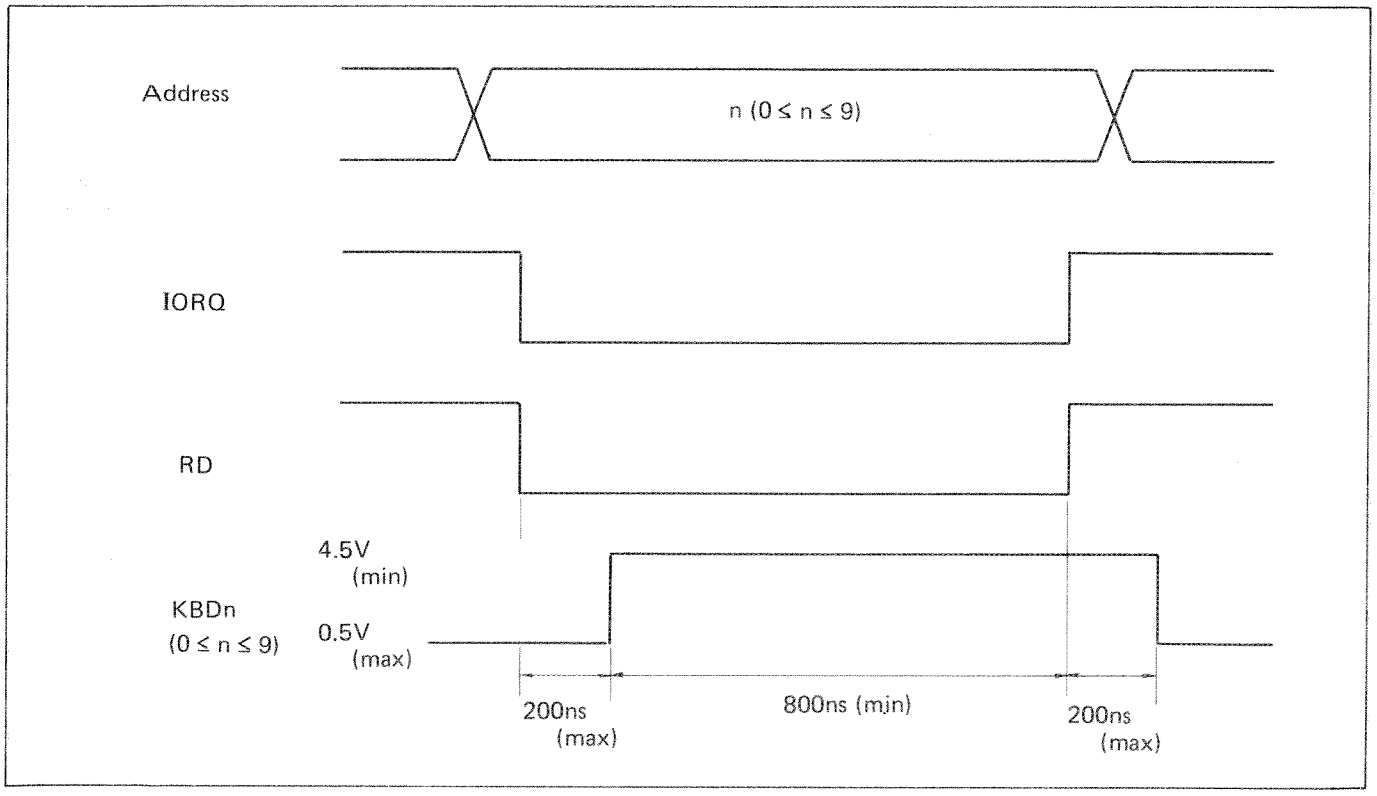
⑧-2 And when I/O port address No. 10 (IC47) is read, the PD0 ~ PD5 terminal status is obtained in bit 0 ~ bit 5 (IC47 outputs).

⑨ KEYBOARD DATA CIRCUIT CHECK

IC No. 42 outputs, pins 3, 5, 7, 9, 11 and 13 on CPU circuit board.

IC No. 43 1/2 outputs, pins 3, 5, 7 and 9.

⑨-1 When CPU reads I/O address No. 00 ~ 09 (IC42, IC43 1/2), waveforms as shown in Figure 5 should be obtained at the KBD0 ~ KBD9 terminals. And C# ~ F# and CL terminal status are obtained in bit 0 ~ bit 6 at output terminals of IC42 and IC43 2/2.



*See CS70M OVERALL CIRCUIT DIAGRAM FOR TROUBLESHOOTING.

[5] FUNCTIONS

Note:

1. All settings should be made as shown in item [3] panel settings unless specified.
2. When performing any checks, depress the A4 unless otherwise specified.
3. The MIX/1 jack on the rear panel is used as a monitor terminal.
4. Each key should be depressed six times for monitoring of each item, and see if the procedure is correct for each key depression.

The same procedure should be made from item A. through C. for both I and II controls. At that time, however, I-II BALANCE should be set to I when I controls are monitored, and set to II when II controls are monitored.

A. PROGRAMMABLE PARAMETERS VCO section

1. Waveforms as shown in Figure 1 should be obtained when the key is depressed.

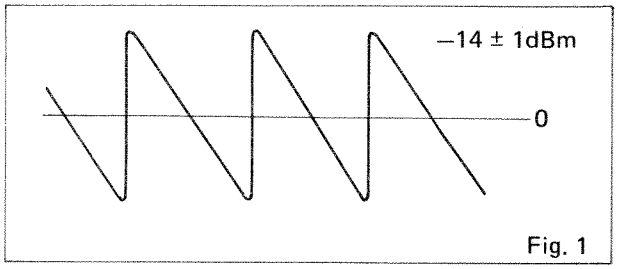


Fig. 1

2. Waveforms as shown in Figure 2 should be obtained when ⌐ and ⌐ are set to OFF and ON, respectively.

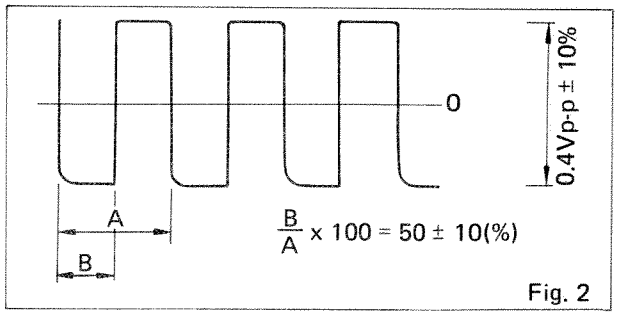


Fig. 2

3. Waveforms should vary as shown in Figure 3 when PW is shifted up to 90% under a condition as described in item A-2.

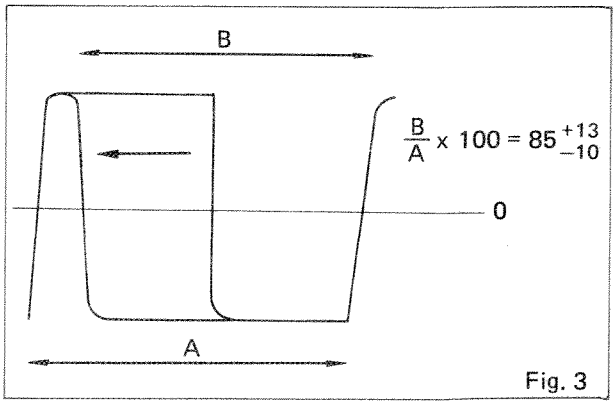


Fig. 3

4. Waveforms as illustrated in Figure 4 should be obtained when ⊓ and NOISE are set to OFF and 10 respectively, with controls set to each specified position in item A-3.

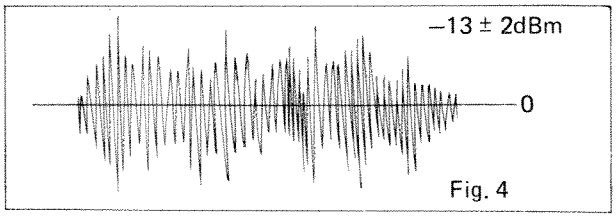


Fig. 4

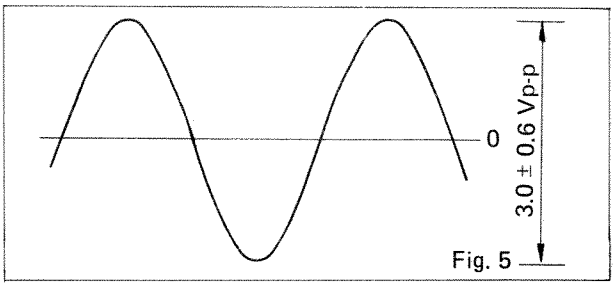


Fig. 5

B. PROGRAMMABLE PARAMETERS VCF section

1. Set RESONANCE switch to H, and bring CUTOFF FREQUENCY switch down to a position where the waveform shown in Figure 5 is obtained. At that time, however, the waveforms given in Figures 6 and 7 are obtained when Hp and Bp are set to ON, respectively.
   After this, BP is switched to OFF, then EG DEPTH is set to 10, and the waveform shown in Figure 8 is obtained.

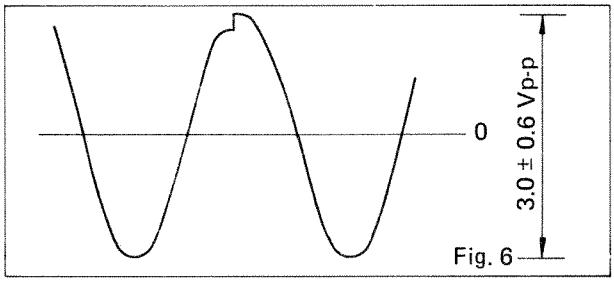


Fig. 6

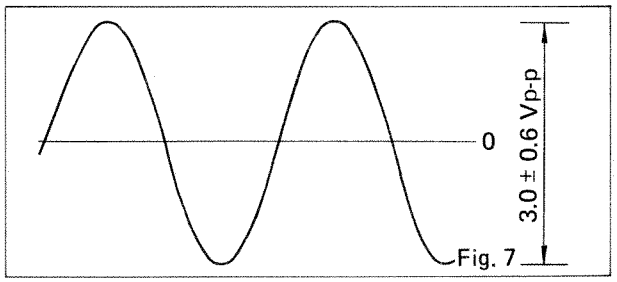


Fig. 7

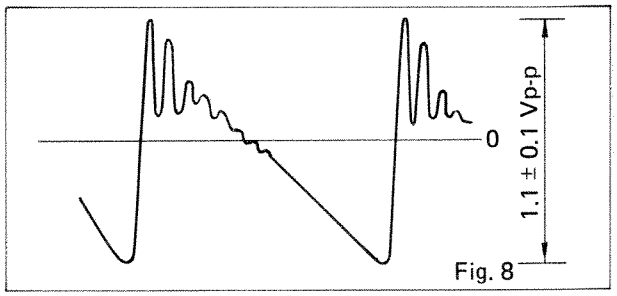


Fig. 8

2. Set ATTACK TIME and SUSTAIN LEVEL switches to L and O respectively, with controls set to each specified position in item B-1. Then, waveforms illustrated in Figure 5 should be obtained immediately after the key is depressed, and becomes what is given in Figure 9 in 1 ± 0.1 second. After that, the wavefoarm instantaneously returns to its initial form, which is shown in Figure 5.

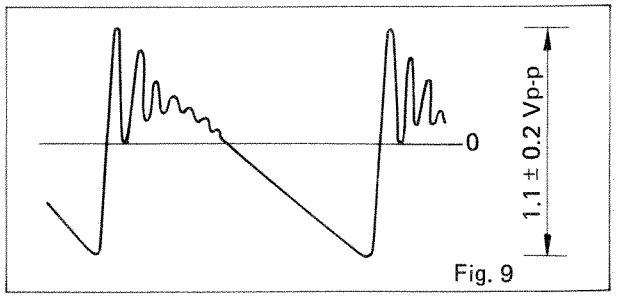


Fig. 9

3. When the previous-mentioned procedure B-2 is finished, set ATTACK TIME and DECAY TIME switches to S and L, respectively, so that waveforms provided in Figure 10 should be obtained when the key is depressed. In addition, waveforms given in Figure 5 should be obtained in 10 ± 2 seconds with a level of more than 90%.

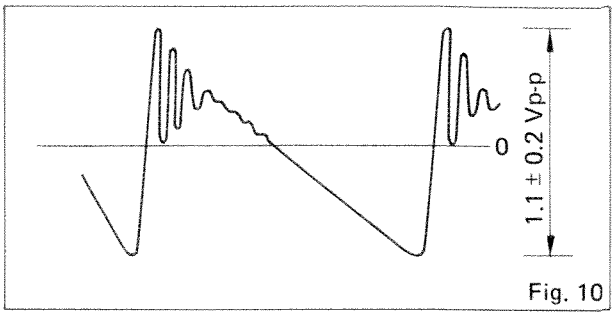


Fig. 10

4. Set the following control in such an order as: DECAY TIME, S; SUSTAIN LEVEL, 10; RELEASE TIME, L; VCA section TIME x 5, ON; and RELEASE, L, with controls set to each specified position in item B-3. After that, waveforms provided in Figure 8 should be obtained when the key is depressed, while waveforms given in Figure 5 should be obtained in 10 ± 2 seconds with a level of more than 90%, when the key is released.

5. Set TIME x 5 to ON with controls set to each specified position in item B-2. At that time, waveforms shown in Figure 5 should be obtained when the key is depressed. Waveform should become as in Figure 9 in 6 ± 1 seconds and turn back to that in Figure 5 immediately.

6. Set ⌄ to On with controls set to each specified position in item B-1. At that time, waveforms as given in Figure 11 should be obtained. There is a click-noise immediately after the key is depressed.

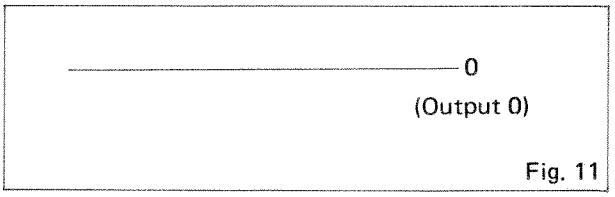


Fig. 11

C. PROGRAMMABLE PARAMETERS VCA section

1. Set ⌃ of the VCO section and ∿ to OFF and 10, respectively. At that time, waveforms as illustrated in Figure 12 should be obtained.

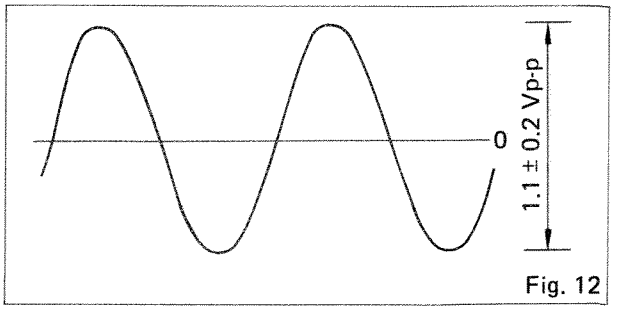


Fig. 12

2. Set ATTACK TIME and SUSTAIN LEVEL switches to L and O respectively, with controls set to each specified position in item C-1. At that time, waveforms should vary as given in Figure 13. Further, T in Figure 13 should expand 6 ± 1 times when TIME x 5 is set to ON.

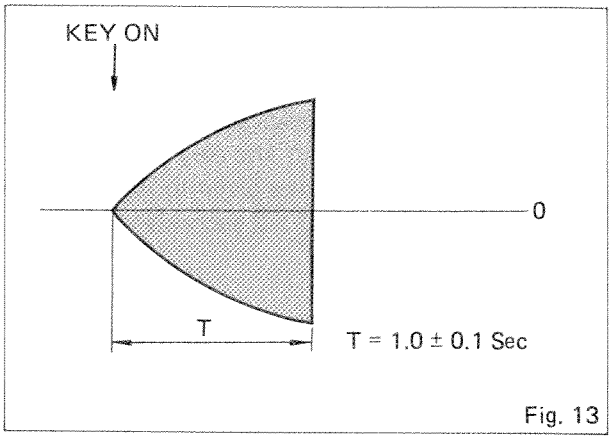


Fig. 13

3. Set DECAY TIME and SUSTAIN LEVEL switches to L and O respectively, with controls set to each specified position in item C-1. At that time, waveforms should vary as illustrated in Figure 14.

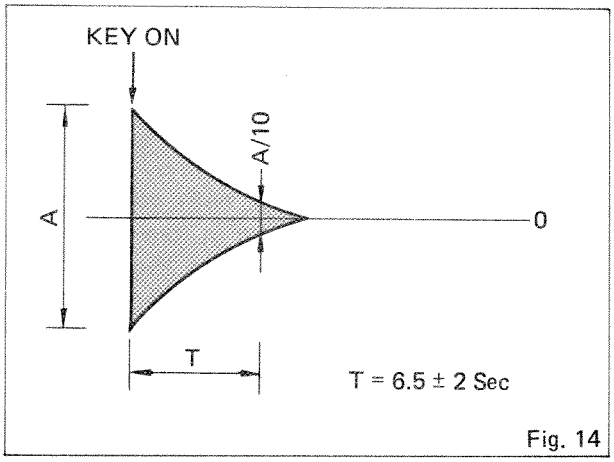


Fig. 14

4. Set RELEASE TIME and SUSTAIN LEVEL switches to L and O respectively, with controls set to each specified position in item C-1. At that time, waveforms should vary as given in Figure 15.

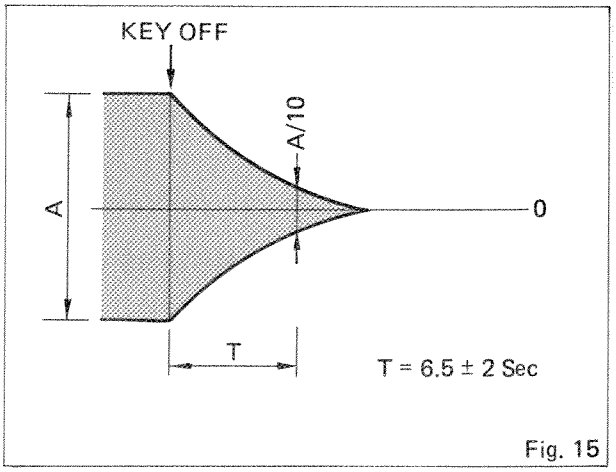


Fig. 15

5. Set HOLD switch to ON with the key being depressed, with controls set to each specified position in item C-1. The waveforms should remain as in Figure 12 even if the key is released. Furthermore, when HOLD switch is set to OFF, the output fades out.

D. PROGRAMMABLE PARAMETERS LFO section

1. Set SPEED and MODULATION DEPTH switches to F and 10 respectively, with controls set to each specified position in item [3] panel setting. Waveforms shown in Figure 16 should be obtained when VCA is set to ON. After that, T should be 15 $^{+4}_{-2}$ % smaller when FINE is set to +, and when set to −, T should be larger than 15 $^{+4}_{-2}$ %.

   After that, adjust the FINE switch so that T becomes 10 ± 0.2 msec. The frequency should be 0.1 ± 0.02Hz when SPEED switch is set to S.

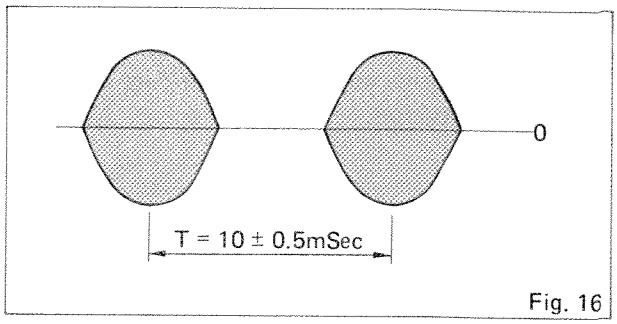


Fig. 16

2. Set SPEED switch to F with controls set to each specified position in item D-1. In addition, set EG DEPTH and ATTACK TIME switches to 10 and L, respectively, so that T in Figure 16 should become 2 ± 0.4 msec, and then, 10 ± 0.2 msec in 5 ± 0.5 seconds after the key is depressed (See Figure 17).
   Then, set ATTACK TIME and DECAY TIME switches to S and L, respectively. After the key is depressed, T should be 2 mSec ± 0.4 mSec instataneously, then it should gradually increase.

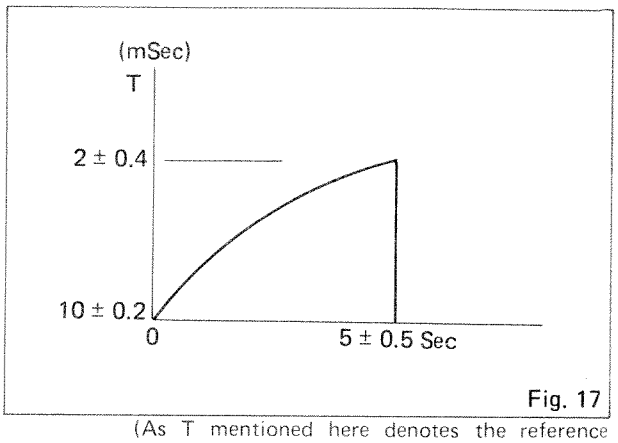


Fig. 17

(As T mentioned here denotes the reference value, no specified measurements will be required.).

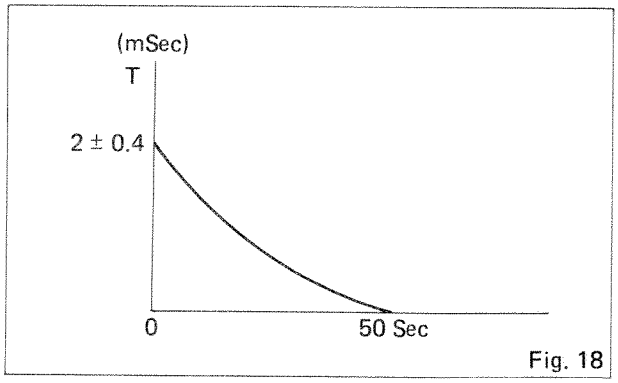


Fig. 18

(As T mentioned here denotes the reference value, no specified measurements will be required.)

3. Set ⌒ to ON with controls set to each specified position in item D-1. At that time, waveforms as provided in Figure 19 should be obtained.

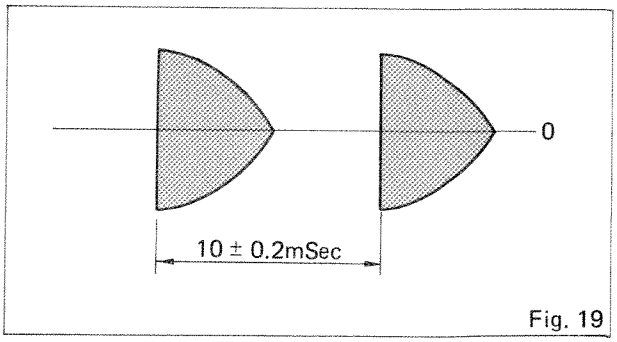


Fig. 19

4. Set S/H to ON with controls set to each specified position in item D-3. At that time, waveforms as illustrated in Figure 20 should be obtained.

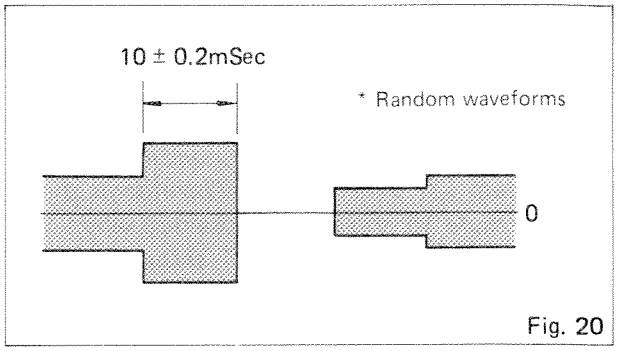


Fig. 20

5. Set ATTACK TIME switch to L with controls set to each specified position in item D-4. Waveforms as given in Figure 21 should be obtained when GLIDE switch is set to ON.

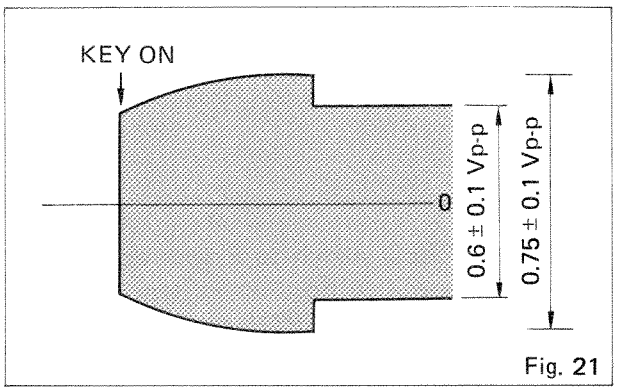


Fig. 21

6. Set GLIDE-switch to ON with controls set to each specified position in item D-5. At that time, waveforms as provided in Figure 22 should be obtained.

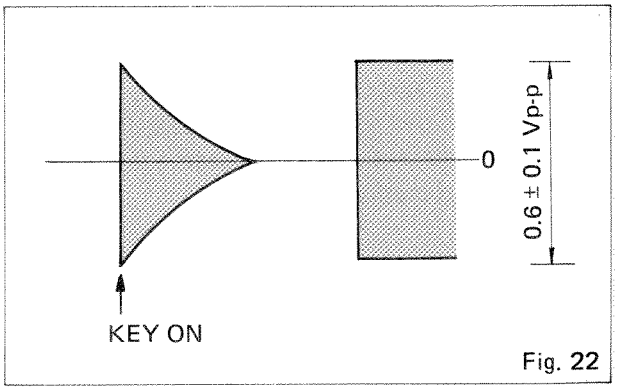


Fig. 22

7. Set VCA and VCO to OFF and ON respectively, with controls set to each specified position in item D-1. At that time, as shown in Figure 23, sound frequency should vary according to the LFO period.

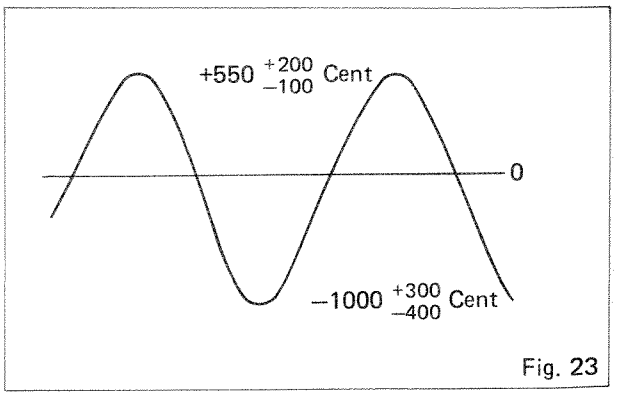


Fig. 23

8. Set VCO and PW to OFF and ON respectively, with controls set to each specified position in item D-2. At that time, waveforms should vary as illustrated in Figure 24.

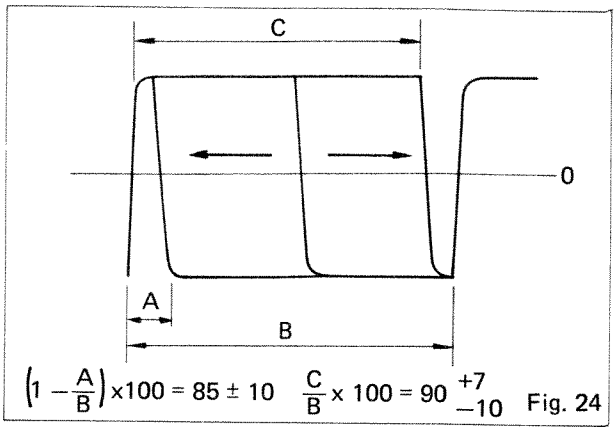


Fig. 24

9. Set VCA and RESONANCE to OFF and H respectively, with controls set to each specified position in item D-1, and bring CUT-OFF FREQUENCY switch down to a position where a waveform indicated in Figure 5 is obtained. After that, set RESONANCE to L, waveform as shown in Figure 25 is obtained when VCF is set to ON.

10. Control settings in items D-1, and 7 through 9 should be made on II keys (only the modulation check should be made for item 1). In this case, however, items 1, and 7 through 9 should be obtained with I + II set

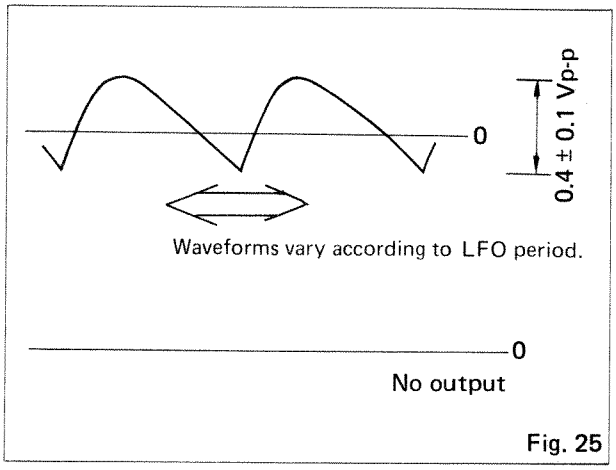


Fig. 25

11. Set MODULATION DEPTH switch to 0 with controls set to each specified position in item D-1. When WHEEL of the MODULATION section is set to ON, and turned to a maximum level, waveforms as given in Figure 26 should be obtained. In this case, waveforms as provided in Figure 1 should also be obtained when WHEEL switch is set to OFF.

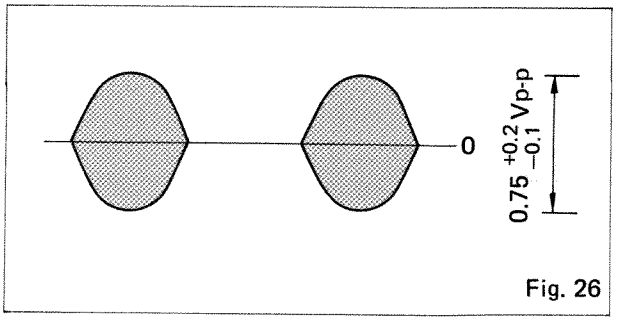


Fig. 26

12. Set RMO to ON with controls set to each specified position in item [3] panel setting. In addition, ⌇ of the VCO section is switched to OFF, and ∿ of the VCA section is set to 10. At that time, waveforms as shown in Figure 27 should be obtained.

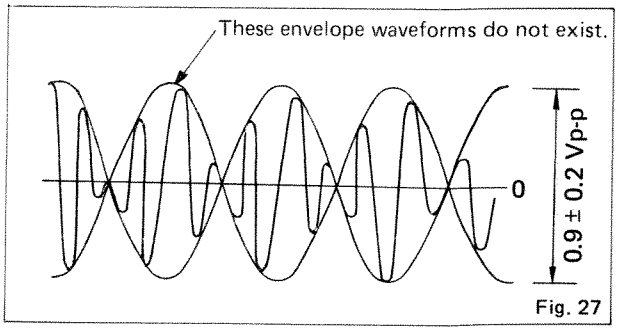


Fig. 27

E. LFO section/MODULATION section

1. Set WHEEL-VCA (hereinafter refered to as W-VCA) and SPEED switches to ON and F respectively. Further, when MODULATION WHEEL is turned upward, waveforms as given in Figure 28 should be obtained. Likewise, when SPEED switch is set to S, T in Figure 28 should become 20 ± 4 seconds.

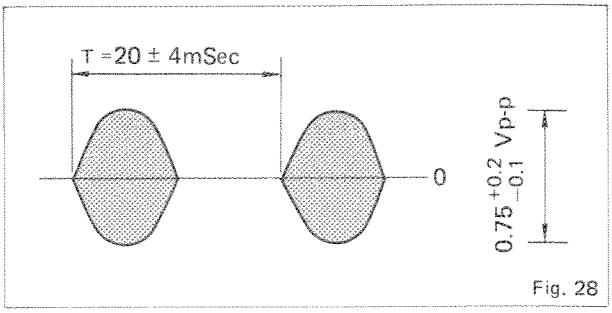


Fig. 28

2. Waveforms as provided in Figures 29 and 30 should be obtained when speed switch is set to the center position and ∿/◺/⊓ controls set to each specified position in item E-1.

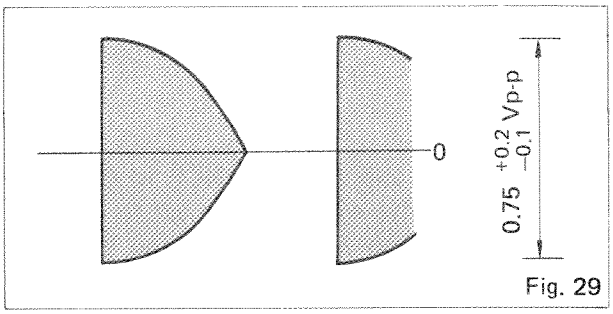


Fig. 29

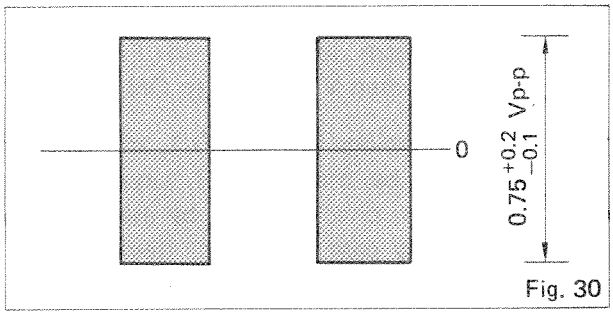


Fig. 30

3. Set ∿/◺/⊓/W-VCA and WHEEL-VCO (hereinafter refered to as W-VCO) to ⊓, OFF, and ON, respectively. At that time, waveforms as shown in Figure 31 should be obtained. Set W-VCO and RESONANCE of the VCF section to OFF and H, respectively. And bring CUT OFF FREQUENCY switch down to a position where a waveform indicated in Figure 5 is obtained. After that, set RESONANCE to L.

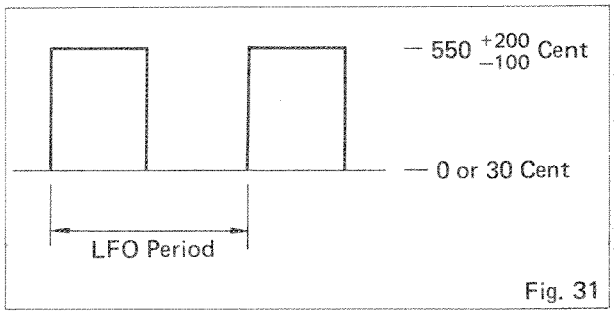


Fig. 31

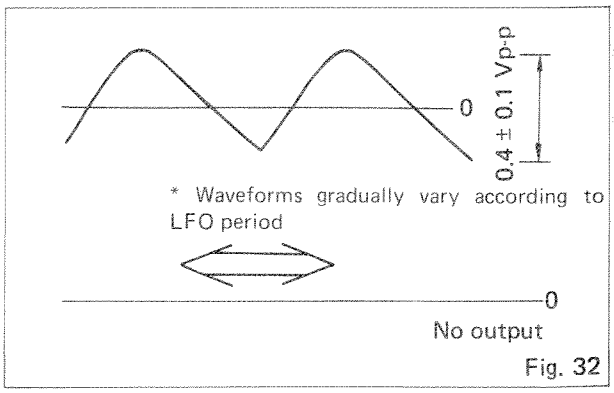


Fig. 32

4. Set W-VCF and AFTER TOUCH-VCO (hereinafter refered to as A-VCO) to ON, with controls set to each specified position in item E-3. When the key is depressed with a pressure of approximately 500g, the sound frequency should be modulated according to the LFO period. And if further pressure is applied to the key, it should further be modulated.
   VCF section close to the center position, and depress the key. At that time, modulation should be applied to VCF due to the period and waveforms of LFO according to the key depressing pressure. The same should be obtained when A-VCF and A-VCA are set to OFF and ON, respectively. (AFTER TOUCH effects are equivalent to those in MODULATION WHEEL, except for the modulation amount). In this case, however, the more the SENSITIVITY switch is turned left, the less the modulation amount, under a condition that A-VCO effects are being applied.

Introduction

1. **Visual check.**
   Visually check the portion of the instrument in which the trouble is located. Many troubles can be located by visual indications such as unsoldered connections, broken wires, damaged circuit boards, damaged components, etc.

2. **Diagrams.**
   A complete set of diagrams is given in the back of this manual. Each component in this troubleshooting is shown on the appropriate diagram, along with its circuit number and electrical value. Also included on the circuit diagrams are voltages and waveforms which can be expected at various points in the circuitry.

3. Power Switch must be turned off before removing or replacing transistors and ICs, especially.

4. The following equipment is useful for troubleshooting the model CS70M.

   1. Tester
      Some means of testing the transistors, diodes, FET's and ICs used in this instrument is very useful.

   2. Oscilloscope
      A test oscilloscope is required to view waveforms at different points in the circuit.

(3)TROBLESHOOTING EXAMPLE

〈 DC POWER SUPPLY 〉

SYMPTOM	CIRCUIT BOARD	PROBABLE CAUSE
1. No voltage is put out for +5V or is insufficient. Other voltage positions operate correctly.	DC	DC: Tr1–Tr2–0.22Ω-1P–D4–F3 or erroneous adjustment of VR1
2. No voltage is put out for –5V or is insufficient. Other voltage positions operate correctly.	DC	DC: Tr9–Tr12–4.7Ω-230mA
3. More than +5V are put out for +5V. Other voltage positions operate correctly.	DC	DC: Tr4–IC1-1/2–ZD1–D5 or erroneous adjustment of VR1
4. More than –5V are put out for –5V. Other voltage positions are operating correctly.	DC	DC: Tr10–IC2-1/2
5. No voltage is put out for –15V. Other voltage positions operate correctly.	DC	DC: Tr21–Tr20–0.22Ω·1P
6. More than –15V are put out for –15V. Other voltage positions operate correctly.	DC	DC: Tr23–IC3-1/2
7. More than +15V and –15V are put out for each +15V or –15V.Other voltage positions operate correctly.	DC	DC: Tr18–IC3-2/2–ZD4–D8 or erroneous adjustment of VR1
8. Insufficient voltages are put out for both +15V and –15V. Other voltage positions operate correctly.	DC	DC: Tr16–Tr15–0.22Ω·1P or erroneous adjustment of VR1
9. No voltage is put out for –15V and insufficient voltage for +15V. Other voltage positions operate correctly.	DC	DC: Tr19–Tr14–DZ3
10. No voltage is put out for –15V and insufficient voltage for other positions.	DC	DC: Tr8 or Tr24
11. No voltage is put out for –15V and insufficient voltage for +15V, +10V, and –5V positions. +5V operates correctly.	DC	DC: Tr5–4.7Ω·230mA

*See CS70M OVERALL CIRCUIT DIAGRAM FOR TROUBLESHOOTING.

2. Troubleshooting

〈 DC POWER SUPPLY 〉

SYMPTOM	CIRCUIT BOARD	PROBABLE CAUSE
12. No voltage is put out for −5V, excessive voltage for −15V, and insufficient voltage for +5V and +15V. +15V operates correctly.	DC	DC Tr25
13. More than +10V and −5V are put out for +10V and −5V. Other voltage positions operate correctly.	DC	DC Tr6−IC2-2/2−D6−ZD2 or erroneous adjustment of VR1
14. No voltage is put out for +10V, +15V, −15V, and −5V, while more than +5V is put out for +5V.	DC	DC Diode(D3)−Fuse(F1)−(F2)

* All the data cited here are based on conditions under no load in order to prevent ICs in the circuitry.

〈 LFO 〉

1. AFTER TOUCH VCO does not work	LF LF5/7 CPA6/13	1) In I keys LF5/7 *IC14-1/2, 2/2−IC20-3/4−IC16-3/3 *If IC14-1/2 is defective, AFTER TOUCH VCO is not applied to MX1 to 4. If IC14-2/2 is defective, AFTER TOUCH VCO is not applied to MX5 and 6. At that time, WHEEL VCO and PROGRAMMABLE VCO do not work as well. 2) In II keys LF5/7 *IC13-1/2, 2/2−IC20-4/4−IC17-1/3 *If 13-1/2 is defective, AFTER TOUCH VCO is not applied to MY1 to 4. If 13-2/2 is defective, AFTER TOUCH VCO is not applied to MY5 and 6. At that time, WHEEL-VCO and PROGRAMMABLE VCO do not work as well. 3) In both I and II keys CPA6/13 LF IC5-1/2−IC1-1/4−PSW61 or IC42-2/2−IC39

*See CS70M OVERALL CIRCUIT DIAGRAM FOR TROUBLESHOOTING.

〈 LFO 〉

SYMPTOM	CIRCUIT BOARD	PROBABLE CAUSE
2. AFTER TOUCH VCF does not work	LF5/7 CPA6/13	1) In I keys LF5/7 *IC10-1/2, 2/2–IC21-3/4–IC15-3/3 *If IC10-1/2 is defective, AFTER TOUCH VCF is not applied to MX1 to 4. If IC10-2/2 is defective, AFTER TOUCH VCF is not applied to MX5 and 6. At that time, WHEEL-VCF, PROGRAMMABLE-VCF, and FOOT CONTROL BRILLIANCE do not work as well. 2) In II keys LF5/7 *IC9-1/2, 2/2–IC19-4/4–IC18-3/3 * If IC9-1/2 is defective, AFTER TOUCH VCF in not applied to MY1 to 4. If IC9-2/2 is defective, AFTER TOUCH VCF is not applied to MX5 and 6. At that time, WHEEL-VCF, PROGRAMMABLE-VCF, and FOOT CONTROL BRILLIANCE do not work as well. 3) In both I and II keys CPA6/13 IC4-1/2–IC1-3/4–PSW62
3. AFTER TOUCH VCA does not work	LF5/7 CPA6/13	1) In I keys LF5/7 *IC8-1/2, 2/2–IC21-2/4–IC15-1/3 *If IC8-1/2 is defective, AFTER TOUCH VCA is not applied to MX1 to 4. If IC8-2/2 is defective, AFTER TOUCH VCA is not applied to MX5 and 6. At that time, WHEEL-VCA, and PROGRAMMABLE-VCA do not work as well. 2) In II keys LF5/7 *IC7-1/2, 2/2–IC19-1/4–IC18-2/3 *If IC7-1/2 is defective, AFTER TOUCH VCA is not applied to MY1 to 4. If IC7-2/2 is defective, AFTER TOUCH VCA is not applied to MY5 and 6. At that time, WHEEL-VCA and PROGRAMMABLE-VCA do not work as well. 3) In both I and II keys CPA6/13 IC3-1/2–IC2-1/3–PSW63

*See CS70M OVERALL CIRCUIT DIAGRAM FOR TROUBLESHOOTING.

2. Troubleshooting

〈 LFO 〉

SYMPTOM	CIRCUIT BOARD	PROBABLE CAUSE
4. AFTER TOUCH VCA and VCA are not applied to both I and II keys.	LF	LF IC42-1/2–IC37
5. AFTER TOUCH VCO, VCF and VCA are not applied to both both I and II keys.	LF	LF IC34-2/2–IC32-2/2–FET1–IC32-1/2–GP-450F (Touch Sensor)
6. Both AFTER TOUCH and WHEEL do not work on a certain waveform by WAVE SELECTOR.	LF	LF IC36
7. Neither AFTER TOUCH nor WHEEL works on only a waveform by WAVE SELECTOR.	LF	LF IC36–IC35-1/2–IC35-2/2
8. Neither AFTER TOUCH and WHEEL appear on any waveform, nor LED lights ON and OFF.	LF	LF IC33–Tr1 ~ Tr5
9. AFTER TOUCH, WHEEL, and PROGRAMMABLE-VCA are not applied to one of MX1–MY6.	M	M The resistance of 220k ohms is defective for the second pin in IC16.
10. WHEEL-VCF also works on I keys when the ON/OFF switch is turned to OFF.	MO	MO sheet pattern bridge
11. S/H of PROGRAMMABLE LFO does not work.	LF	LF FET3–FET2–Tr7–*IC52-1/2 *If IC52 is defective, LED does not light on and off.
12. RING MODULATION does not work.	DIF CPA	DIF CPA IC3 – IC23
13. No sound comes out when RING MODULATOR is set to ON.	CPA8/13 LF7/7 CPA9/13 LF	CPA8/13 LF7/7 CPA9/13 IC18-1/2–IC54-1/2–IC53–IC54-2/2–FET1 or LF sheet IC50 (At that time, a sine wave of PROGRAMMABLE LFO will not appear.)

〈 VCO 〉 **Note:** In VCO tests, it should be turned to AUTO TUNING, otherwise both a defective circuit board and the coupled board will not operate when turned to AUTO TUNING.

1. Sound does not come out somewhere in MX1--6, or comes out of tune in a certain position, when FOOTAGE is changed.	DIF M	DIF Somewhere in MX1--4 ... IC15 Whether MX5 or 6 ... IC17 Somewhere in MY1--4 ... IC27 Whether MY5 or 6 ... IC29	*M IC1 – IC2 *There are 12 sheets from MX1--MY6 for the M sheet. The same shall apply hereinafter.

See CS70M OVERALL CIRCUIT DIAGRAM FOR TROUBLESHOOTING.

2. Troubleshooting

〈VCO〉

SYMPTOM	CIRCUIT BOARD	PROBABLE CAUSE
2. Some position does not work or comes out of tune between MX1 and MY6, and FOOTAGE does not allow to be changed regardless of the FOOTAGE position.	M	M IC3–IC4–*FET1 *No sound will not come out if FET1 is defective.
3. VCO sine waves do not appear somewhere in MX1–MY6.	M	M IC5 – IC6
4. VCO ⎍ wave or ⩘ wave does not appear somewhere in MX1–MY6.	DIF M	DIF At MX1--4 ... IC15 At MX5, 6 ... IC17 At MY1--4 ... IC27 At MY5, 6 ... IC29 M IC7-3/4, 4/4–IC6
5. Both ⎍ and ⩘ waves do not appear somewhere in MY-MY6.	M	M IC8 – IC9-2/2
6. No sound comes out or scales do not change in some combinations in MX1–MY1 and MX6–MY6.	DIF	CIF At MX1–MY1 IC46–IC77 At MX2–MY2 IC45–IC76 At MX3–MY3 IC44–IC77 At MX4–MY4 IC47–IC76 At MX5–MY5 IC43–IC78 At MX6–MY6 IC40–IC78 IC37
7. Sound levels are insufficient, or no sound comes out in some combinations in MX1–MY1 and MX6–MY6, though sound comes out. And, deteriorated scales or noise can be observed in other combinations as well.	DIF	DIF IC5
8. No sound comes out for MX1 through MY6.	DIF CPA LF	DIF CPA LF IC6 or CVO sheet or IC11-1/2–IC11-2/2–IC56-2/2
9. Although FOOTAGE CHANGE operates, sounds come out of tune, as compared with other circuit boards.	M	M VR1 (B-5K) incorrect adjustment or VCO
10. PITCH is unstable.	LF	LF IC46 or M sheet or VCO
11. Intervals are unstable.	DIF	DIF sheet IC74 oscillation
12. C1 sound keeps coming out.	CPU	CPU sheet and D6 is reverse, or pattern bridge.

*See CS70M OVERALL CIRCUIT DIAGRAM FOR TROUBLESHOOTING.

2. Troubleshooting

〈 VCO 〉

SYMPTOM	CIRCUIT BOARD	PROBABLE CAUSE
13. PW does not work.	DIF M	DIF MX1--4 do not work IC61-3/4–IC9 MX5, 6 " IC65-3/4–IC11 M MY1--4 " IC66-3/4–IC20 or IC6 MY5, 6 " IC72-3/4–IC22
14. PW keeps working.	MO	J wire and lead wire are sheet-circuited on MO sheet.
15. No noise comes out.	LF5/7 LF	LF5/7 LF IC1-1/2–IC4–IC52-2/2–IC34-2/2

〈 VCF 〉

1. Both ⎍ and ⋀ waves are not generated by LPF, HPF, and BPF somewhere in MX1–MY6.	M	M At LPF IC12-3/3 M At BPF, HPF IC7-2/4, 1/4
2. Both ⎍ and ⋀ waves are not generated by either LPF, HPF or BPF in some groups in MX1--4, MX5 and 6, MY1–4, and MY5 and 6.	DIF	DIF At MX1--4 IC16 At MX5, 6 IC18 At MY1--4 IC28 At MY5, 6 IC30
3. Defective waveforms for HP and BP somewhere in MX1--MY6	M	M sheet
4. Both ⋁ and EG DEPTH switches do not work or some groups in MX1--4, MX5 and 6, MY1–4 or MY5 and 6.	DIF	DIF At MX1--4 IC16 At MX5, 6 IC18 At MY1--4 IC28 At MY5, 6 IC30
5. Both ⋁ and EG DEPTH switches do not work somewhere in MX1--MY6.	M	M Tr3 – IC12
6. TIME x 5 does not work or keeps working somewhere in MX1–MY6.	M MO	M Tr4 or MO sheet bridge
7. ⋁ , TIME x 5, EG DEPTH, ATTACK TIME, DECAY TIME, SUSTAIN LEVEL and RELEASE TIME do not work somewhere in MY1--MY6.	M	M IC10-1/2–IC11–IC13–IC17

*See CS70M OVERALL CIRCUIT DIAGRAM FOR TROUBLESHOOTING.

2. Troubleshooting

〈 VCF 〉

SYMPTOM	CIRCUIT BOARD	PROBABLE CAUSE
8. Some of EG DEPTH, ATTACK TIME, DECAY TIME, SUSTAIN LEVEL and RELEASE TIME do not work or keep modulating in some groups in MX1–4, MX5 and 6, MY1–4, and MY5 and 6.	DIF	At MX1–4 DIF EG DEPTH — IC59-4/4 ATTACK TIME — IC60-1/4 DECAY TIME — IC60-3/4 SUSTAIN LEVEL — IC60-4/4 } IC9 RELEASE TIME — IC58-3/4, Tr3–IC8 At MX5, 6 DIF EG DEPTH — IC62-4/4 ATTACK TIME — IC64-1/4 DECAY TIME — IC63-1/4 SUSTAIN LEVEL — IC63-4/4 } IC11 RELEASE TIME — IC62-2/4, Tr5–IC10 At MY1–4 DIF EG DEPTH — IC67-4/4 ATTACK TIME — IC68-1/4 DECAY TIME — IC68-3/4 SUSTAIN LEVEL — IC69-4/4 } IC20 RELEASE TIME — IC66, Tr7–IC21 At MY5, 6 DIF EG DEPTH — IC70-4/4 ATTACK TIME — IC71-1/4 DECAY TIME — IC70-1/4 SUSTAIN LEVEL — IC72-4/4 } IC22 RELEASE TIME — IC72, Tr9–IC23

〈 VCA 〉

1. TIME x 5 does not work in either group in MX1–4, MX5 and 6, MY1–4 and MY5 and 6.	DIF	DIF At MX1–4 IC16 At MX5, 6 IC18 DIF At MY1–4 IC28 At MY5, 6 IC30
2. TIME x 5 does not work or keeps working somewhere in MX1–MY6.	M	M Tr5
3. ATTACK TIME does not work and sound keeps coming out somewhere in MX1–MY6.	M	M IC19...Both VOLUME CONTROL and LFO work. IC16...VOLUME CONTROL works but LFO does not work. IC14...Neither VOLUME nor LFO works and sound levels become larger than other circuit boards.

*See CS70M OVERALL CIRCUIT DIAGRAM FOR TROUBLESHOOTING.

2. Troubleshooting

〈 VCA 〉

SYMPTOM	CIRCUIT BOARD	PROBABLE CAUSE
4. No sound comes out somewhere in MX1 ~ MY6.	M	M: IC14–IC16–IC18–IC19–Tr1
5. No sound comes out or sound keeps coming out in a some group in MX1–MY1 and MX6–MY6.	DIF	DIF: At MX1–MY1 Tr12–IC84-1/2; At MX2–MY2 Tr16–IC81-1/2; At MX3–MY3 Tr11–IC81-2/2; At MX4–MY4 Tr17–IC85-2/2; At MX5–MY5 Tr10–IC82-1/2; At MX6–MY6 Tr14–IC82-2/2; IC80–IC83–IC36–IC5–IC6
6. EG DEPTH and ATTACK TIME do not work or deeper EG DEPTH is observed in a some group in MX1–4, MX5 and 6, MY1–4, and MY5 and 6.	DIF	DIF: At MX1–4 IC8–IC58-4/4; At MX5, 6 IC10–IC63-3/4; At MY1–4 IC21–IC68-4/4; At MY5, 6 IC23–IC71-3/4 — is defective or oscillates.
7. Shallower EG DEPTH or longer ATTACK TIME is observed. Attack sounds keep coming out.	M	M sheet

〈 AMP 〉

1. No sound comes out or sound levels are insufficient with distortion contained, though VCO works somewhere in MX1–MY6.	M	M: IC9-1/2–IC15–IC10-2/2
2. No sound comes out or sound levels are insufficient with distortion contained in a some group in MX1–4, MX5 and 6, MY1–4, and MY5 and 6.	LF6/7 CPA8/13	LF6/7: At MX1–4 IC28-2/2; At MX5, 6 IC28-1/2; At MY1–4 IC29-2/2; At MY5, 6 IC29-1/2; IC31. CPA8/13: IC12, IC13, IC14, IC15; IC17–IC23
3. No sound comes out or sound levels are insufficient with distortion contained, in either whole I keys or II keys.	CPA9/13 CPA8/13 CPA12/13	I keys: CPA9/13 IC16-2/2–FET5–CPA12/13 IC9-1/2–IC7-2/2; II keys: CPA8/13 IC16-1/2–FET2–CPA12/13 IC9-2/2–IC7-1/2
4. No sound comes out or sound levels are insufficient with distortion contained, for headphones.	JK7/8	JK7/8: IC2-1/2–Tr1–Tr2–D2–D3
5. No sound comes out or sound levels are insufficient with distortion contained, for only MIXED 1.	CPA12/13	CPA12/13: IC8-2/2

** See CS70M OVERALL CIRCUIT DIAGRAM FOR TROUBLESHOOTING.*

2. Troubleshooting

〈 AMP 〉

SYMPTOM	CIRCUIT BOARD	PROBABLE CAUSE
6. No sound comes out for both MIXED 1 and 2.	JK8/8	JK8/8: IC1 – Relay
7. No sound comes out or sound levels are insufficient with distortion contained, for only MIXED BALANCED.	CPA12/13	CPA12/13: IC8-1/2
8. No sound comes out for both I and II keys.	CPA12/13	CPA12/13: P.C – Tr19 or Tr13 (CPA12/13)
〈 EFFECTS 〉		
1. ENSEMBLE does not work, though TREMOLO works.	CPA13/13	CPA13/13: IC22-2/2–Tr17–PSW4 (OPEN)
2. TREMOLO does not work, though ENSEMBLE works.	CPA13/13	CPA13/13: IC22-1/2–Tr17–PSW3 (SHORT)
3. Both ENSEMBLE and TREMOLO do not work.	CPA13/13	CPA13/13: IC20-1/4, 3/4, 4/4–IC21-1/3, 2/3, 3/3–Tr21–Tr22 (SHORT)
4. TREMOLO SPEED is fixed to either SLOW or FAST, so that no control is made possible.	CPA13/13	CPA13/13: IC20-2/4–IC19-2/2–Tr18–PSW2
5. Although ENSEMBLE, TREMOLO, and SPEED work correctly, the lamps do not light up.	CPA13/13	ENSEMBLE – Tr15 TREMOLO – Tr14 CPA13/13 SPEED – Tr16
6. No sound comes out or sound levels are insufficient with distortion contained, when either ENSEMBLE or TREMOLO is turned to ON.	CPA12/13 ET	CPA12/13: IC10-2/2–FET3 – ET: Tr1–IC8-1/2–IC9–IC8-2/2 – CPA12/13: FET4
7. TREMOLO keeps working on either I or II keys. At that time, sound levels are large for keys to which TREMOLO is being applied.	CPA12/13	CPA12/13: FET5 (CLOSE) or D40 (OPEN) or FET2 (CLOSE) or D37 (OPEN)
8. ENSEMBLE or TREMOLO does not work smoothly.	ET	ET: IC6–IC7–Tr4, IC4–IC5–Tr3 or IC2–IC3–Tr2 or IC1 (ET sheet)

** See CS70M OVERALL CIRCUIT DIAGRAM FOR TROUBLESHOOTING.*

2. Troubleshooting

〈 AMP 〉

SYMPTOM	CIRCUIT BOARD	PROBABLE CAUSE
9. ENSEMBLE or TREMOLO never works, though the sound comes out.	ET	ET IC1 At that time, sound levels become larger with hi-cut components involved, when either ENSEMBLE or TREMOLO switch is turned to ON.
10. SUSTAIN does not work or keeps working.	CPA3/13	CPA3/13 * Tr7–IC24 * SUSTAIN does not work when Tr7 is turned to OPEN.
11. SUSTAIN does not work or keeps working in a some groups in MX1–4, MX5 and 6, MY1–4, and MY5 and 6.	DIF	DIF At MX1–4, At MX5, 6, At MY1–4, At MY5, 6 do not work when { D2, D6, D10, D14 } open DIF Keep working when { Tr2, Tr4, Tr6, Tr8 } open
12. MOD 2/4 and 4/2 do not work.	CPA2/13	CPA2/13 D23 is connected reversely.
13. AUTO TUNE never works. Sounds in MX1–MY6 comes out at a proper level.	LF6/7 CPU	LF6/7 — CPU IC30-2/2–Tr29–IC22–IC24-2/2
14. Sound leaks at the AUTO TUNE mode.	DIF LF6/7	DIF — LF6/7 IC2–IC53-2/2–IC31 or M sheet
15. Card reader is defective.	CPU	CPU IC46
16. Memory back-up does not work.	CPU	CPU sheet or BATTERY

** See CS70M OVERALL CIRCUIT DIAGRAM FOR TROUBLESHOOTING.*

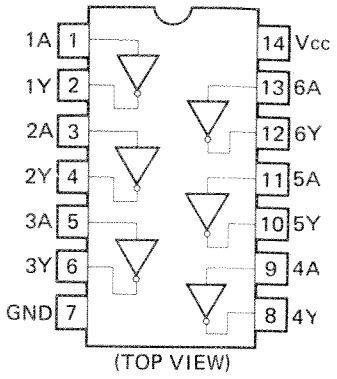
3. IC Pin Configurations

iG032900 (HD74LS04)

Hex Inverters

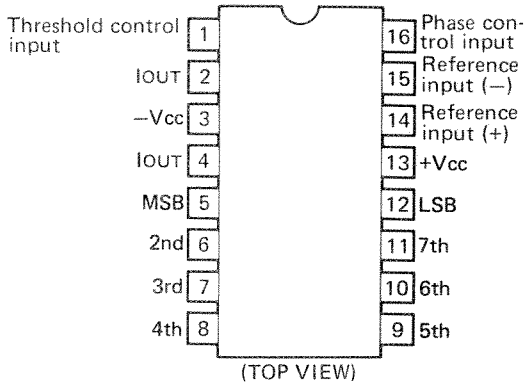
iG052600 (HD74LS05P)

Hex Inverters
(with open Collector Outputs)



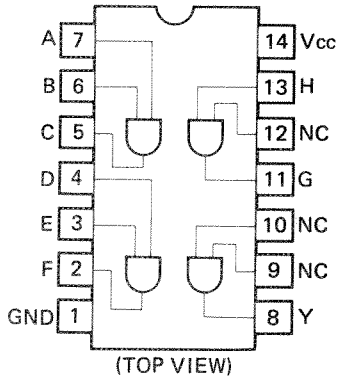
iG033600 (μPC624D)

8 bit D/A Converter



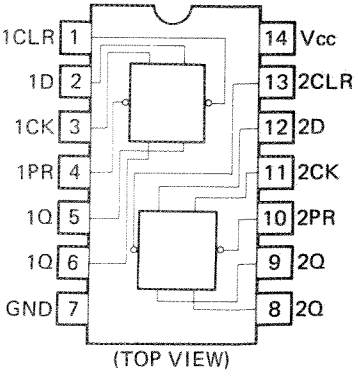
iG043700 (HD74LS08P)

Quadruple 2-input Positive AND Gates



iG044000 (HD74LS74A)

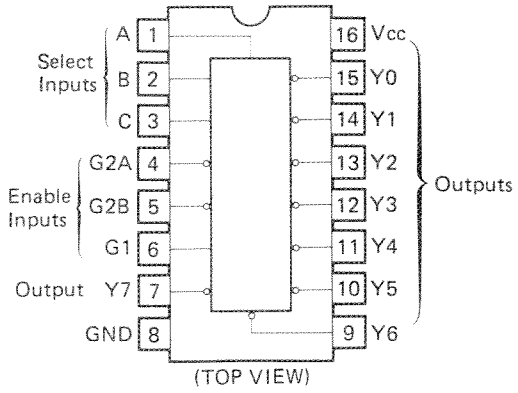
Dual D-type Positive edge-triggered
Flip-Flops (with Preset and Clear)



3. IC Pin Configurations

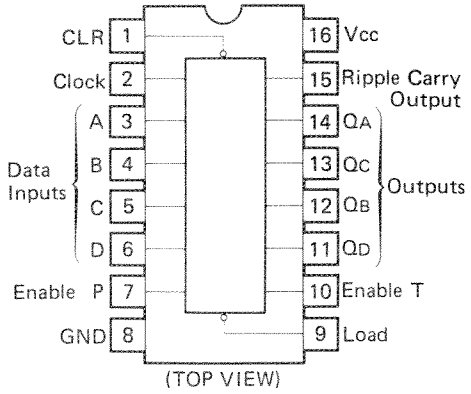
iG044200 (HD74LS138P)

3-Line-to-8-Line
Decoder/Demultiplexer



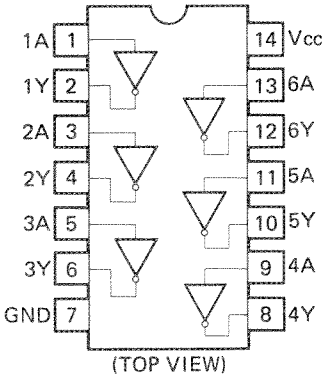
iG044400 (HD74LS161P)

Synchronous 4-bit
Binary Counter (Direct Clear)



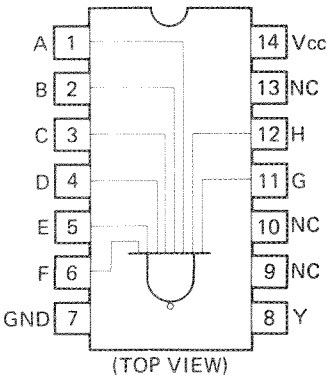
iG049600 (HD74LS14P)

Hex Schmitt Trigger Inverters



iG049700 (HD74LS30P)

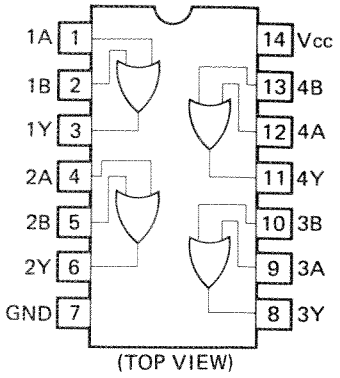
8-input Positive NAND Gate



3. IC Pin Configurations

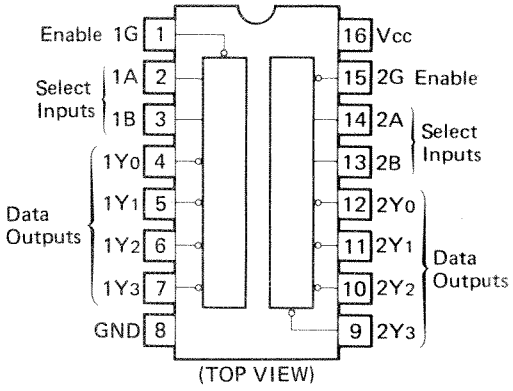
iG049800 (HD74LS32P)

Quadruple 2-input
Positive OR Gates



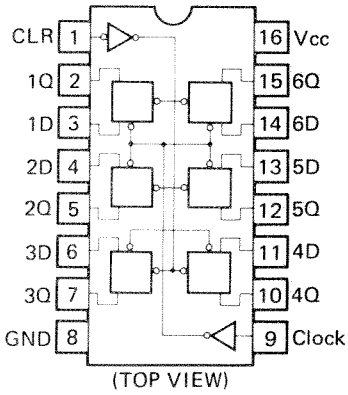
iG049900 (HD74LS139P)

Dual 2-line-to-4-line
Decoders/Demultiplexers



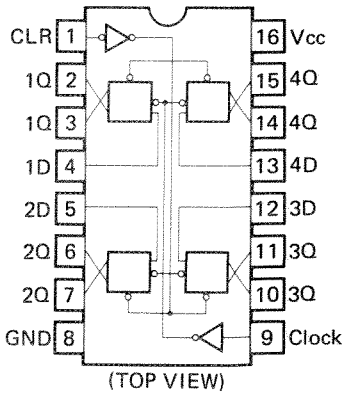
iG050000 (HD74LS174P)

Hex D-type Flip-Flops



iG050100 (HD74LS175P)

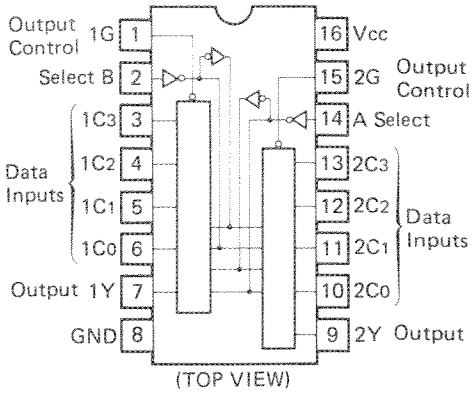
Quadruple D-type Flip-Flops



3. IC Pin Configurations

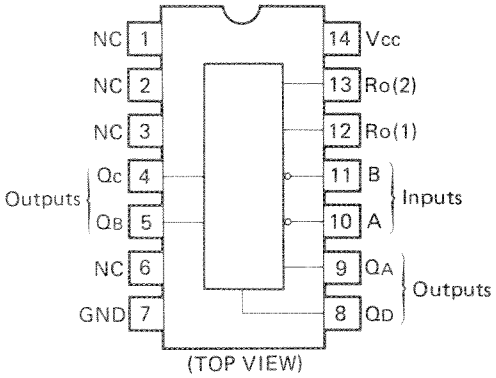
iG050200 (HD74LS253P)

Dual 4 to 1
Data Selectors/Multiplexers



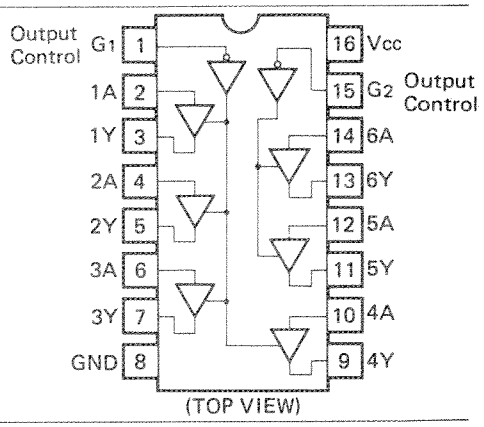
iG050300 (HD74LS293P)

4-bit Binary Counter



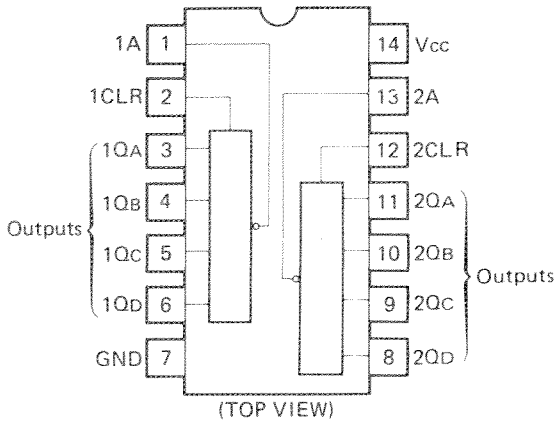
iG050400 (HD74LS367P)

Hex Bus Drivers
(non-inverted data outputs with Tri-state outputs)



iG050600 (HD74LS393P)

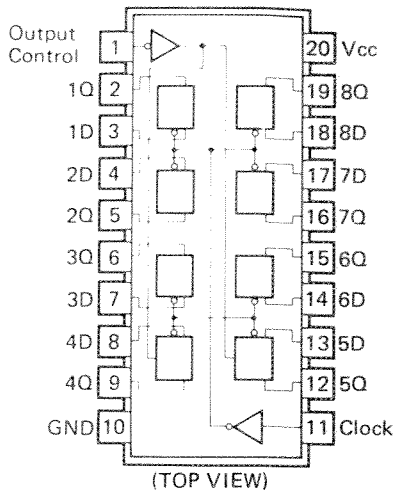
Dual 4-bit Binary Counter



3. IC Pin Configurations

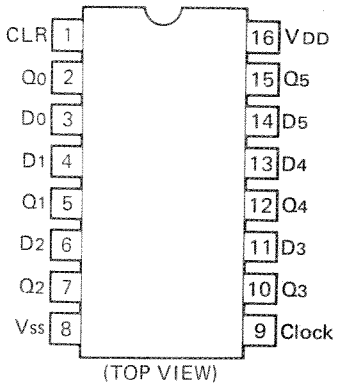
iG050700 (HD74LS374P)

Octal Edge-Triggered Flip-Flops



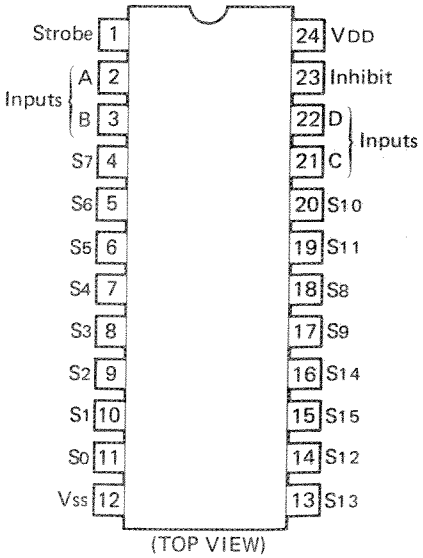
iG050800 (TC40174BP)

Hex D-type Flip-Flops



iG050900 (TC4515BP)

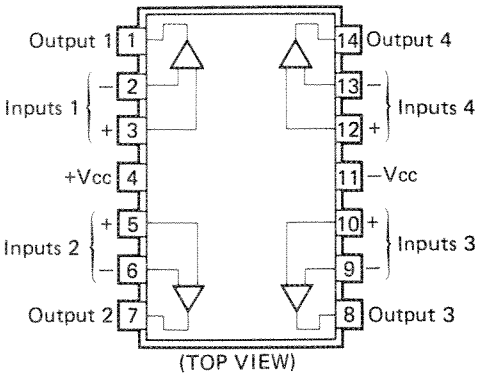
4-bit Latch/4-to-16 Line Decoder
("L" Level Output)



3. IC Pin Configurations

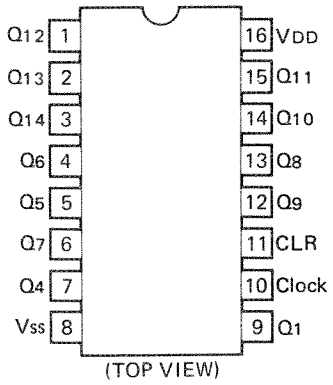
iG051500 (TC084CN)

OP Amp x 4



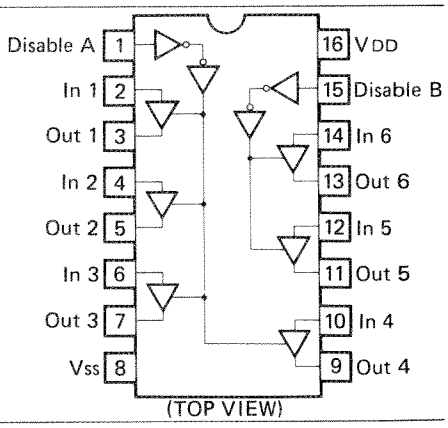
iG051900 (TC4020BP)

14-stage Binary Counter



iG052000 (HD14503BP)

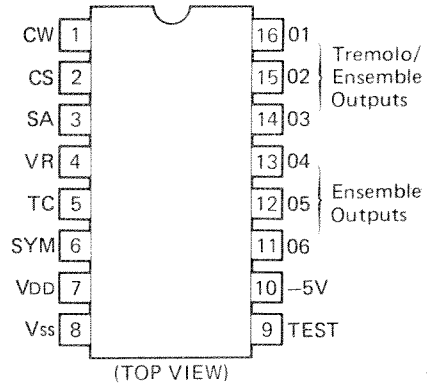
3-state Buffer



iT633000 (YM63300)

SEC II

(Symphonic Ensemble Control II)



CS70M TORABLESHOOTING GUIDE

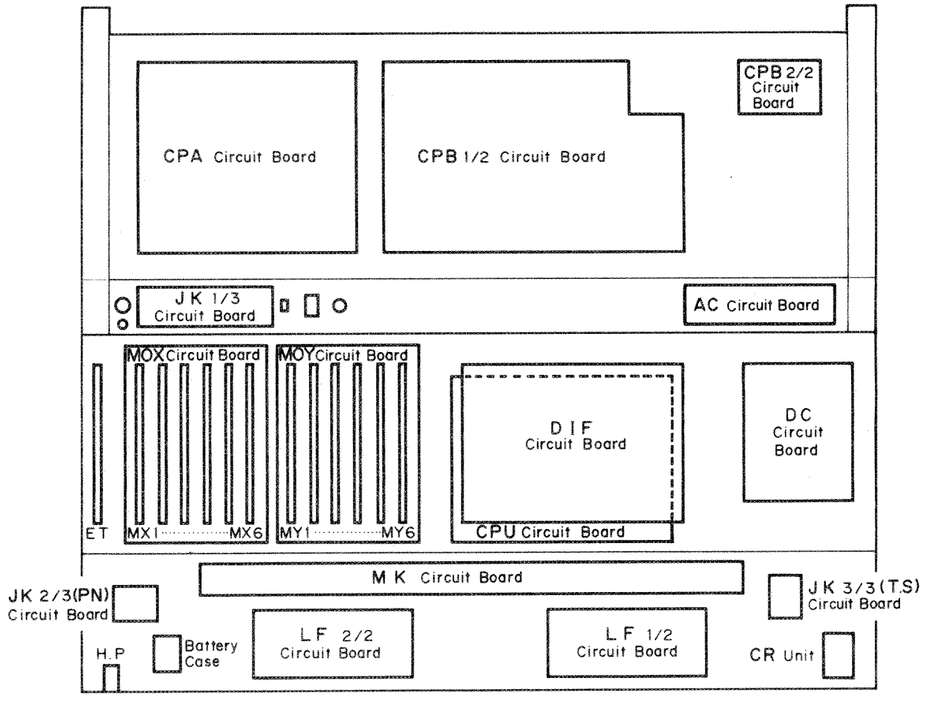
1982年1月　　初版発行

発　行　所：日本楽器製造株式会社
　　電音サービス課

版下・印刷：㈱プロモーションエイド
　　東海電子印刷株式会社

2.Troubleshooting

(1)UNIT LAYOUT



Top View

OVERALL QUICK RFFERENCE TROUBLESHOOTING

