

TEISCO
SYNTHESIZER

SX-400

OWNER'S MANUAL

Thank you for your purchase of TEBSCO synthesizer SX400. Your SX400 is the 4-voice-polyphonic synthesizer loading versatile features. Careful reading of this manual describing the fundamental principle as well as the handling of each section will enable you to use your new TEBSCO synthesizer to its full capacity for long.

FEATURES

• 4VCO

SX400 can act 4 synthesizers which will be sometimes a monophonic type or sometimes 4-voice-polyphonic type. Control the pitch and the range of each VCO. It will permit you to combine voices easily as you wish.

from complicated battery-exchange which is inevitable to any other synthesizer. Featuring every possible function of today's technology, from Host Controller, Touch Sensor to Ensemble System, your SX400 is the final goal of a synthesizer.

• MEMORY

With this MEMORY system, your live performance will be perfect. The computer circuit, consisting of ROM and RAM, makes it possible for you to select any tone among the total 16 tones of 8 factory-set tones and 8 user's programming tones only by pressing down a switch. 16 Parameters are all programmable. Also the programmed tone can be changed partially whenever necessary. Repeating this partial change on your program, your tone will be more and more creative and closer to your taste. Equipped with a back-up battery, which can be charged with electricity, your tone program will be kept on memory of the machine even if it is put OFF. Now, you are free

HOW TO CARE SX-400

- About 5 minutes after switched ON will be needed for SX400 to become into its stable function.
- VCO such as Fine Tuning is quite stable. You need not regulate your SX400 every time before you use it. If any regulation is necessary, wait 5 minutes after you have switched it ON and it will be ready to be regulated.
- SX400 loads back-up battery to keep your program until an memory starting its power OFF position. If you don't use your SX400 for long, however, the back-up battery discharges its electricity and your programs might possibly fade away. Keep your SX400 switched ON for about 10 hours at least every 3 months. It will keep your programs memorized on the machine.
- Before you connect or disconnect each cord, be sure to power SX400 OFF or lower volume controls to 0 position.
- Protect your SX400 from shock, direct sun, high temperature, high moisture, dust etc., which might cause any trouble on its function.
- Don't use any cleaner on your SX400.
- If any trouble should occur on your SX400, ask your dealer for repair.

BASIC OPERATION DIAGRAM

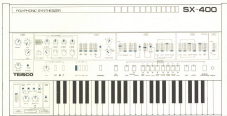
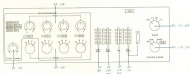


Fig. A

SECTION DIAGRAM

VCO BLOCK



VCF BLOCK

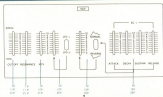
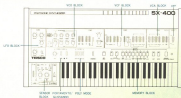


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NAME OF EACH SECTION



CONNECTIONS

Connect the EX-400 to amplifiers according to the connection diagram. Check the connections and turn the power switch **ON**. Be sure to make a position of turning down the volume control before turning on the power switch. If the power switch is turned **ON** with the volume control set to a high set-

ting, the amplifier may be damaged.

Set each control as shown in the basic setting diagram. Be sure to return each control to its basic setting after each function has been checked.

BACK PANEL



● SIGNAL OUT

1 OUTPUT LEVEL SELECTOR SWITCH

Set this switch to the correct level among +4dBm, -10dBm, -20dBm according to the machine.

2 OUTPUT (L,R)

This is the output terminal for a amplifier of a guitar/bass/ keyboard, an audio system or PA system.

3 HEADPHONE

Terminal for headphones.

● EXT. CONTROL

4 EXP. PEDAL

Terminal for a foot pedal.

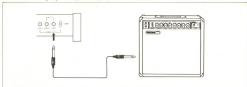
5 KCV, IN

Terminal for connecting another synthesizer to your EX-400. You can control your EX-400 by the synthesizer.

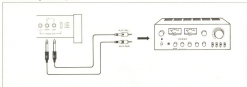
6 DATE, IN

Terminal for connecting another synthesizer.

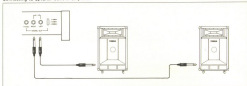
Monaural-connecting to guitar amp, bass amp, keyboard amp.



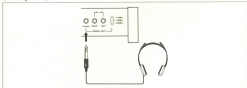
Stereo-connecting to audio system



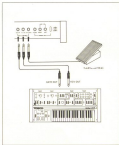
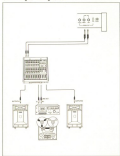
Connecting to Speaker built-in amplifier



Connecting to headphones



Connecting to mixing console



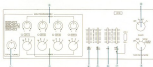
BASIC OPERATION

Let's learn operation of each section of the SX-400 by playing it.

BASIC OPERATION DIAGRAM



(1) VCO BLOCK



1 TOTAL TUNING

The pitch is lowered as the TOTAL TUNING knob is turned to the left and raised as it is turned to the right. This control is used to adjust the pitch when this unit is played with another instrument.

2 PITCH and 3 RANGE

These knobs control the pitch produced by 4 VCOs. The LEDs (Light Emitting Diodes) light according to POLY MODE switch selected. Confirm that the pitch is varied by turning the knob corresponding to the lighted LED.

4 LEO-1 MOD

The volume is enhanced as this control is raised.

5 EG-1 MOD

This control has no effect on sound generated at the basic settings. After the four EG-1 controls have been adjusted appropriately, this control changes the pitch according to the EG-1 control settings.

6 PW

The tone varies as this control is moved.

7 PW MODE

Adjust this control and confirm that the tone automatically varies periodically.

8 SHAPE

- OFF — No sound signal is output.
- N — A sound with a fast tone is generated.
- U — A sound like that of a clarinet is generated.
- A — A sound with a soft tone is generated.

9 SUB OSC & NOISE

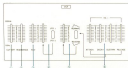
Turn this knob after setting the SHAPE switch to OFF.

- OFF — No sound is output.
- SUB — Sound with a pitch 1 octave lower than the pitch assigned to the key is output.
- NOISE — White noise is output.

SUB & — Sound with a pitch 1 octave lower than that of the NOISE key and white noise are output together.

Confirm that various combinations of sound are obtained by adjusting this knob together with the SHAPE knob.

(II) VCF BLOCK



1 CUT OFF

The higher this control is raised, the sharper is the tone produced. The brightness of the tone is decreased (that is, high frequency components of the sound are lost) as this control is lowered until finally no sound is output.

2 RESONANCE

The tone is given a certain character as this control is raised. Check that the character given varies according to the CUT OFF control setting.

3 KCV

Press and hold the C key next to the lowest key and lower the CUT OFF control until the sound disappears. Then, raise the CUT OFF control a little. Press the keys under this condition and confirm that the sound volume is decreased and finally becomes zero as higher notes are played. Then, raise the KCV control and confirm that sound is output at one pitch.

4 MODULATION LFO-I/LFO-II

The tone is modulated and the amplitude of modulation increases as this control is raised.

5 MODULATION EG-I (NORMAL/EG-I (REVERSE))

Raise this control and adjust the four EG-I (LFO) control. Confirm that the tone varies according to the MODERN control setting. Setting the selector switch to the REVERSE position reverses the tone variation condition.

6 EG-I

Adjust the four controls with the MODULATION control raised.

ATTACK - The rate at which modulation increases is reduced as this control is raised.

DECAY - The DECAY control varies the amount of time required for the degree of modulation to drop from its maximum level to the level determined by the SUSTAIN control. The tone will not be affected by this control when the SUSTAIN control is set to maximum.

SUSTAIN - This control sets the level of modulation which is maintained after modulation decays until the key is released.

RELEASE - This control determines the modulation characteristics of the reverberations after the key has been released. The function of this control will be apparent when it is adjusted with the EG-I RELEASE control in the VCA block raised.

(III) VCA BLOCK



1 EG-II

These controls determine variation of the sound level after a key is pressed.

ATTACK - The rate at which the sound level increases is reduced as this control is raised.

DECAY - The DECAY control determines the amount of time required for the sound level to drop from its maximum level to level determined by the sustain control. The sound level will not be affected by this control when the SUSTAIN control is set to maximum.

SUSTAIN - This control determines the sound level which is maintained after decay until the key is released.

RELEASE - This control determines the rate at which the sound disappears after the key has been released. The rate at which the sound disappears is reduced as this control is raised.

2 LEVEL

The sound level is increased as this control is raised.

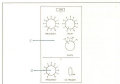
3 LFO MOD

This control produces a periodic variation in the sound level. The amplitude of variation is increased as this control is raised.

(IV) HPF



(V) LFO BLOCK



1 LFO-I

● FREQUENCY




This knob varies the frequency of the LFO-I signal. Adjust this knob with the LFO-I MOD control in the VCO section raised. Confirm that the frequency of oscillate rises as this knob is turned clockwise. Adjust this knob with the LFO MOD control in the VCF section raised. Confirm that the frequency of tone variation changes according to the position of this knob.

● DELAY

This control knob determines the time required for the LFO start oscillation after a key has been pressed. Turn this knob with the LFO-I MOD control in the VCO section raised. Confirm that the time required for oscillate to start after a key has been pressed is increased as this knob is turned clockwise.

● SHAPE

This control varies the waveform of the LFO-I signal. To understand the function of this control, perform the following. Set the FREQUENCY knob to "0" and set the LFO-I MOD control in the VCO section to a high position. The manner in which the pitch varies during a vibrato cycle then changes as this control is turned.

-  — The pitch rises gradually, then drops rapidly during a vibrato cycle.
-  — The pitch rises rapidly, then drops slowly during a vibrato cycle.
-  — High and low pitches are repeated.
-  — The pitch rises gradually, then drops gradually during a vibrato cycle.

2 LFO-II

● FREQUENCY

This control has the same function as the FREQUENCY control of the LFO-I. Set the selector of the VCF section to the LFO-II position and raise the MOD control. Then, turn the FREQUENCY control and confirm that the frequency of tone variation changes according to the control setting.

● TRIGGER ON

This switch allows the EG-I and EG-II sections to be triggered at a rate determined by the FREQUENCY knob. Normally, these sections are triggered once when a key is pressed. However, turning this key ON repeats the tone modulation cycle at a rate determined by the FREQUENCY control of LFO-II while a key is held down.

(VI) POLY MODE



The POLY MODE selector switches change the manner in which sound is output. The LED Light Emitting Diode corresponding to the switch pressed lights. Adjust the PITCH and RANGE controls corresponding to the lighting LED and check the operation of WDS.

QUAD — One VCO is assigned to each key at a time. Therefore, a chord consisting of up to four notes can be obtained by pressing four keys.

DUAL — Two VCOs are assigned to one key at a time. Therefore, two notes are obtained by pressing one key. Two keys can be pressed at one time. The interval can be varied with the PITCH and RANGE controls.

MONO — Four VCOs are assigned to one key at a time. Therefore, four notes are obtained by pressing one key. The intervals can be varied with the PITCH and RANGE controls.

SOLO — One VCO is assigned to one key, but only one key is effective at a time.

In any of the above modes, the key pressed last has priority.

(VII) PORTAMENTO/GLISSANDO



When the ON/OFF switch is set to ON, this control varies the manner in which the tone changes when two keys are pressed in succession.

PORTAMENTO — The tone changes smoothly between the two notes.

GLISSANDO — The tone changes chromatically between the two notes.

SPEED — This knob varies the time required for the pitch to vary from one key to another.

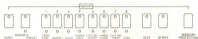
(VIII) ENSEMBLE

This switch imparts a stereophonic effect to the sound output.

(IX) KEY HOLD

Press this switch with a key held down. Confirm that output is maintained after the key is released. Pressing the key again stops the sound.

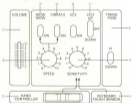
(X) MEMORY



The MEMORY section stores the setting of controls in memory. Set the MEMORY/PRESET switch to the PRESET position and press any of preset switches PRE1 - PRE10; sound is then generated according to the preset control setting, regardless of

the current control setting on the panel. For the operating procedure, see "OPERATION OF EACH CIRCUIT SECTION, EXCEPT MEMORY".

(XI) SENSOR BLOCK



1 VOLUME - Master volume control

2 TRANSPOSE

Setting this switch to DOWN lowers the pitch of all keys by 1 octave.

3 HAND CONTROLLER

This lever controls the effect of the WOW WOW, VIBRATO, VCF and VCO switches.

4 KEYBOARD TOUCH SENSOR

The effects of the WOW WOW, VIBRATO, VCF and VCO switches can be controlled according to the pressure applied to the keyboard.

5 SENSITIVITY

Varies the sensitivity of the HAND CONTROLLER and KEYBOARD TOUCH SENSOR.

6 SPEED

Varies the WOW WOW and VIBRATO speeds.

7 VCO UP/OFF/DOWN

The pitch is changed according to the setting of this switch when the HAND CONTROLLER or KEYBOARD TOUCH SENSOR are used.

8 VCF ON

When this switch is ON, the tone is controlled by the HAND CONTROLLER and KEYBOARD TOUCH SENSOR.

9 VIBRATO

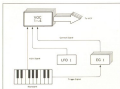
When this switch is ON, vibrato is added to the sound according to operation of the HAND CONTROLLER and KEYBOARD TOUCH SENSOR.

10 WOW WOW

When this switch is ON, wow-wow is added to the sound according to operation of the HAND CONTROLLER and KEYBOARD TOUCH SENSOR.

OPERATION OF EACH CIRCUIT BLOCK

(1) VCO BLOCK (Voltage Controlled Oscillator Block)



VCO is an abbreviation for Voltage Controlled Oscillator. The VCO block is the sound source of the synthesizer. The frequency produced is selected not only by the keyboard, but by the LFO and EG.

1 TOTAL TUNING

This knob adjusts the pitch of sound generated and is useful for matching the pitch of the SR-480 to that of other instruments. This knob controls all four built-in VCOs simultaneously. The adjustable range is about 100 cents (about a half step higher and lower).

**The setting of this knob cannot be stored in memory.

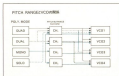
2 PITCH

These four knobs correspond to the four built-in VCOs. Each PITCH control can vary the pitch of the corresponding VCO(s) within an interval of approximately 5 degrees. The function of each knob varies according to the POLY MODE switch selected.

- a. **DUAD** – The CH1 knob controls the four VCOs simultaneously.
- b. **DUAL** – The CH1 and CH2 knobs both control two VCOs simultaneously.
- c. **MONO** – Each knob controls the corresponding VCO.
- d. **SOLO** – Only the CH1 knob controls a VCO.

For convenience, the red LED light emitting diode indicators corresponding to CH1 through CH4 light according to the POLY MODE switch selected.

**The control settings cannot be stored in memory.



3 RANGE



These knobs change the range of the four VCOs in octave units over 8 octaves. The function of each knob differs according to the POLY MODE switch selected.

- a. **DUAD** – The CH1 knob controls the four VCOs simultaneously.
- b. **DUAL** – The CH1 and CH2 knobs both control two VCOs simultaneously.
- c. **MONO** – Each knob controls the corresponding VCO.
- d. **SOLO** – Only the CH1 knob controls a VCO.

The red LED indicators corresponding to CH1 through CH4 light according to the POLY MODE switch selected.

**Only the setting of the CH1 knob can be stored in memory.

4 LFO-1 MOD. (LFO 1 Modulation)



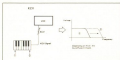
This control adjusts the level LFO-1 signal. All VCO signals can be frequency modulated (i.e., given a vibrato effect) with the signal generated by LFO-1. This control varies the depth of modulation.

5 EG-1 MOD. (EG 1 Modulation)



All four VCO signals can be frequency modulated with the envelope signal generated by the EG-1. The EG-1 MOD control adjusts the depth of modulation.

3 KCV (Keyboard Controlled Voltage)



This control generates the difference in tone between high keys and low keys. Setting this key to the minimum sets the cut-off frequency to that determined by CUT OFF 1. This generates the difference in tone between high keys and low keys. Increasing this control applies the keyboard controlled voltage to the VCF circuits so that the cut-off frequency is varied according to the key pressed. This results in uniform tone over the entire keyboard range.

4 MODULATION LFO-I/LFO-II



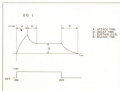
This control varies the level of the LFO-I/LFO-II-generated signal which is applied to the VCF circuits to control the cut-off frequency. The selector switch selects either LFO-I or LFO-II as the control signal source. This function provides the same result as increasing and decreasing the CUT OFF control repeatedly at a constant rate. That is, the tone is varied periodically according to the waveform and frequency of the LFO signal selected. This causes the wobble effect.

5 MODULATION EG-I (NORMAL/EG-I (REVERSE))



This control varies the level of the EG-I signal which is applied to the VCF circuits to control the cut-off frequency. This function produces the same result as varying the CUT OFF control according to the EG-I signal envelope determined by the ADSR controls. The tone varies according to the shape of the envelope. When the selector switch is set to the REVERSE position, the cut-off frequency is varied according to the reversed envelope of the EG-I SIGNAL.

6 EG-I Envelope Generator I

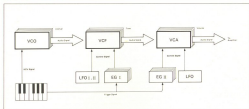


EG-I is an abbreviation for Envelope Generator I. There are four controls provided for controlling envelope generator I: ATTACK TIME, DECAY TIME, SUSTAIN LEVEL, and RELEASE TIME. These are referred to as ADSR controls by using the first letters of the names of the individual controls. Generation of an envelope signal is initiated by operation of the keyboard. The envelope signal generated by envelope generator I controls the oscillator frequency of the VCOs and cut-off frequency of the VCFs (i.e., the tone).

When the VCF controls are controlled, the effect of this function is remarkable when a sound which includes many harmonics is the attack phase, such as a guitar sound, is generated.

- **ATTACK** - Determines the attack time of the envelope signal. Increasing this control slows the rate of attack.
- **DECAY** - Determines the decay time, which is the time required for the signal level of the envelope to drop from the maximum to the sustain level. Increasing this control slows the decay time.
- **SUSTAIN LEVEL** - Determines the sound level which is maintained after the decay time until the key is released. Increasing this control increases the level.
- **RELEASE TIME** - Determines the damping time of the sound level after the key has been released. Increasing this control increases the damping time, or after sound.

(III) VCA BLOCK (Voltage Controlled Amplifier Block)



VCA is an abbreviation for Voltage Controlled Amplifier. The VCA block varies the level of the original sound generated by the VCO and VCF blocks. This is an electronic volume control operated under control of the envelope signal of EG-II and the LFO signal.

1 EG-II (Envelope Generator II)



The EG-II is an envelope generator dedicated to the VCA. The amplitude of the original sound is varied according to the envelope signal generated by the EG-II. Generation of an envelope signal is initiated by operation of the keyboard. ATTACK TIME, DECAY TIME, SUSTAIN LEVEL and RELEASE TIME controls are provided.

- **ATTACK** — Determines the time required for the sound volume to reach its maximum level after a key has been pressed.
- **DECAY** — Determines the time required for the sound level to drop from its maximum level to the sustain level.
- **SUSTAIN** — Determines the level which is maintained following the decay phase until the key is released.

- **RELEASE** — Determines the damping time after the key has been released. Increasing this control lengthens the after sound.

2 LEVEL

Controls the sound volume. This control is provided to balance the sound level input to the memory block with the sound levels which are already stored in memory.

3 LFO MOD.

As described previously, the VCA is controlled not only with the EG-II signal, but with the LFO-I signal. The LFO-I signal varies the sound volume periodically; that is, it produces a tremolo effect in the sound. This control varies the depth of the tremolo effect.



(IV) HPF (High Pass Filter)



HPF is an abbreviation for High Pass Filter. This control varies the cut-off frequency of the high pass filter. The high pass filter cuts fundamental signals which cannot be cut by the VCF block or varies the composition of the harmonics to change the tone quality. The HPF block has only a single channel, although the VCO, VCF and VCA blocks have four channels. Therefore, the signals of four channels are mixed into one channel prior to this block.

(V) LFO

LFO is an abbreviation for Low Frequency Oscillator. The LFO block generates signals of from 0.2Hz to 10Hz. This low frequency signal is used to modulate the sound signals generated in the VCO and VCF blocks. The original sound signal is frequency modulated when the LFO signal is applied to the VCO block; therefore, a vibrato effect is obtained. When the LFO signal is applied to the VCA block, the tone of the original sound signal is varied periodically; that is, a tremolo or wobble effect is obtained.

1 LFO-I FREQUENCY

This control varies the oscillation frequency of LFO-I within 0.2Hz – 10Hz.

2 LFO-I DELAY

This control determines the time required for the sound to be output from LFO-I after a key has been pressed. The time is increased as this knob is turned to the right. This control is used when a delayed vibrato effect is necessary.

3 LFO-I SHAPE

This switch selects the waveforms output by LFO-I to generate variations in modulation.

(VI) POLY. MODE

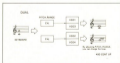
These switches assign VCOs to the key pressed. They are closely related to the VCO **PITCH** and **RANGE** controls. (See the explanation of 2 **PITCH** and 3 **RANGE** of 91 VCO.)

1 QUAD



One VCO is assigned to a key in the QUAD mode. The SX-400 operates as a 4-voice poly-phonic synthesizer in this mode. That is, four separate frequencies can be obtained. Therefore, a chord (such as Maj^7 or m^7) can be generated. When more than four keys are pressed, keys pressed last have priority.

2 DUAL



The VCOs are assigned to a key in the DUAL mode. The SX-400 then operates as a 2-voice synthesizer. By operating the **PITCH** and **RANGE** controls, two VCO frequencies can be set in intervals such as perfect fourths or fifths, major thirds, etc.

- ▲ - The amplitude of the LFO-I output signal gradually increases, then drops rapidly. This is repeated.
- ∩ - The amplitude of the LFO-I output signal rises rapidly, then decreases gradually. This is repeated.
- - High and low levels are repeatedly switched.
- ∧ - The amplitude increases gradually, then decreases gradually. This is repeated. It is recommended that this waveform be used for vibrato effects.

The periodical variations in voltage described above cause the frequency or tone to be varied when the LFO signal is used to modulate the original sound signal at VCO or VCA.

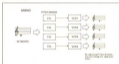
4 LFO-II FREQUENCY

This control varies the oscillation frequency of LFO-II within 0.4Hz – 14Hz.

5 LFO-II EG TRIGGER ON

This switch allows both EG-I and EG-II to be triggered at a rate determined by the LFO-II FREQUENCY knob. This switch is effective for generating a repetitive sound, such as that of a maracas.

3 MONO



All four VCOs are assigned to a key in the MONO mode. This allows deep chords to be obtained. This mode makes the best use of the functions of the **PITCH** and **RANGE** controls.

4 SOLO



Only the VCO of CH1 is assigned to a key in the SOLO mode. The SX-400 then operates as a monophonic synthesizer. This mode is suitable for solo performances using postcards or glassware.

* In any mode, keys pressed last have priority.

(VII) PORTAMENTO/GLISSANDO

This knob has a function which varies the pitch between the notes produced by two keys. For example, when a C key is pressed first, then the C key one octave higher is pressed, the pitch is increased continuously from low C to high C. If another key is then pressed, the pitch is again varied to the new pitch.

1 SPEED

This control determines the timing of portamento and glissando. The time is reduced as the knob is turned to the left. For glissando, the time required for the pitch to vary from one note to another does not become zero even when the knob is set to the 0 position.

(VIII) ENSEMBLE

This switch turns the ensemble circuit ON. The ensemble circuit adds a stereophonic effect to the original sound. This circuit uses a 2-channel BBD (bucket brigade device) to delay

2 GLIS. PORTA.

This switch selects either glissando and portamento.

▶ PORTAMENTO

The pitch is varied smoothly.

▶ GLISSANDO

The pitch is varied dramatically.

3 ON OFF

This switch turns the PORTAMENTO/GLISSANDO mode ON/OFF.

the sound signal, so that a pseudo-stereophonic effect is produced. This circuit is effective when string ensemble sound is generated. When this switch is OFF, the output is monaural.

(IX) KEY HOLD

This switch maintains a key sound; that is, it locks the VCO signal corresponding to the key pressed. Take the following steps to maintain a key sound.

- 1 Press and hold the key to be maintained.
- 2 Press the KEY HOLD switch.

3 Release the key.

The LED lights to indicate that the key sound is maintained. To release the key sound, press the KEY HOLD switch again. The LED then goes off.

(X) MEMORY

Section possible MEMORY.



The memory system is one of the major features of the SX-400. The settings of programmable controls of each section can be preset in memory by the built-in computer. This enables the performer to generate programmed sound with a single action. This function is effective during live performances, etc. and reduces the work load on the keyboardist so that he can concentrate upon play. There are 8 memory channels for preset by the manufacturer and 8 for preset by the user.

1 PANEL

This switch selects between the sound generated by the panel setting and the sound generated by a memory channel. When this switch is ON, the LED lights and the sound generated by the panel setting is selected. When the switch is OFF, the LED is OFF and the preset sound is selected. This switch is automatically set to ON when the power switch is turned ON.

2 MEMORY/PRESET

This switch selects one of the manufacturer or user preset memory channels. The green LED lights when a manufacturer preset channel is selected and the red LED lights when a user preset channel is selected. This switch is automatically set to the manufacturer channels when the power switch is turned ON.

3 PRESET SWITCHES 1 - 8

These switches select the memory channel whose preset information is required. When one of these switches is ON, the corresponding LED lights. Only one switch can be turned ON at a time.

4 EDIT

This switch is used to modify part of the preset information or to transfer preset information from one memory channel to another. There are 4 edit functions.

(A) EXCHANGE function I



Transfer user preset information to another channel; for example, to transfer information in the memory channel corresponding to SW2 to the memory channel corresponding to SW1, take the following steps.

- (1) Set the MEMORY/PRESET switch to the MEMORY position, then press SW2.
- (2) Press the EDIT switch and confirm that the LED lights.
- (3) Press the WRITE and PROTECTION switches simultaneously and confirm that the WRITE LED lights.
- (4) Press SW1.

The preset information is transferred to the memory channel corresponding to SW1, but the same information still remains in the memory channel corresponding to SW2. This operation cannot be performed for the manufacturer preset memory channels.

(B) EXCHANGE function II



Transfer manufacturer preset information to a user preset memory channel; for example to transfer the preset information in the manufacturer preset memory channel corresponding to SW8 (BTRAP) to the user preset memory channel corresponding to SW2, take the following steps.

- (1) Set the MEMORY/PRESET switch to the PRESET position, then press SW8.
- (2) Press the EDIT switch and confirm that the EDIT LED lights.
- (3) Press the MEMORY/PRESET switch and confirm that the red LED on the MEMORY side lights.
- (4) Press the WRITE and PROTECTION switches simultaneously and confirm that the LED of the WRITE switch lights.
- (5) Press SW2.

(C) PARTIAL CHANGE function



To modify part of the preset information, take the following steps.

- (1) Set the MEMORY/PRESET switch to the MEMORY position and press the preset switch corresponding to the memory channel lights which contents are to be modified.
- (2) Press the EDIT switch and confirm that the LED lights.
- (3) Change the control settings which are to be modified by sliding the controls for more than 2sec. The built-in computer detects this change and prepares to store the new control settings. For example, to change the preset sound volume slide the LEVEL control of the VCA block.
- (4) Adjust the control settings as desired while listening to the sound. Pressing the preset switch which was pressed at step (1) at this time cancels this function and returns the control settings to their previous settings.
- (5) Press the WRITE and PROTECTION switches simultaneously.
- (6) Press the preset switch which was pressed at step (1). If another preset switch is pressed, the new control settings are stored in the new memory channel.

(D) To transfer manufacturer preset information to a user preset memory channel modifying a part of the information:

- (1) Set the MEMORY/PRESET switch to the PRESET position and press the preset switch whose corresponding memory channel contains the information to be modified.
- (2) Press the EDIT switch.
- (3) Set the MEMORY/PRESET switch to the MEMORY position.
- (4) Adjust the control settings to be modified.
- (5) Press the WRITE and PROTECTION switches simultaneously.
- (6) Press the preset switch corresponding to the memory channel in which the new control settings are to be stored.

(E) WRITE



Take the following steps to store new user preset information in memory.

- (1) Generate the desired sound by adjusting the various controls.
- (2) Confirm that the MEMORY/PRESET switch is set to MEMORY. If not, press it.
- (3) Press the WRITE and PROTECTION switches simultaneously.
- (4) Press an appropriate preset switch.

The built-in computer only stores the settings of the programmable controls. Therefore, PITCH control settings cannot be stored.

(F) MEMORY PROTECTION

This switch is always used together with the WRITE switch. This switch is provided to prevent the memory contents from being accidentally destroyed.

Setting the PANEL switch ON in the memory write mode cancels the mode.

(XI) SENSOR BLOCK

1 VOLUME

Controls the overall sound volume.

2 TRANSPOSE

Shifts the pitch of each key down by one octave. A total of 61 sound pitches can be obtained with this key. The glissando effect cannot be used when this key is ON.

3 HAND CONTROLLER



The effectors provided on the sensor block WOW, VIBRATO, VCF and VCO can be controlled manually with this controller.

4 KEYBOARD TOUCH SENSOR

A touch sensor is built into the keyboard. By varying the force applied to the keyboard, the same function can be obtained as with the HAND CONTROLLER.

5 SENSITIVITY

This control adjusts the sensitivity of both the HAND CONTROLLER and the KEYBOARD TOUCH SENSOR.

6 SPEED

This control varies the speed of the WOW, VIBRATO and VIBRATO effects.

7 VCO UP/OFF/DOWN

This switch connects the HAND CONTROLLER and KEYBOARD TOUCH SENSOR to the VCO block. In the UP position, the VCO frequency rises as the keyboard pressure is increased. In the DOWN position, the VCO frequency is lowered as the keyboard pressure is increased. HAND CONTROLLER operation is the same for both switch positions.

8 VCF ON

This switch connects the HAND CONTROLLER and KEYBOARD TOUCH SENSOR to the VCF block. Manipulation of the controllers results in shifting the cut-off frequency; that is, in variation in tone quality. With the KEYBOARD TOUCH SENSOR, the cut-off frequency is only raised.

9 VIBRATO

When this switch is ON, the VCO signals are modulated with a periodic signal. The degree of modulation can be controlled with the HAND CONTROLLER or KEYBOARD TOUCH SENSOR so that a vibrato effect can be obtained.

10 WOW WOW

When this switch is ON, sound signals are modulated at the VCF block with a periodic signal, resulting in a wow effect. The degree of modulation can be controlled with the HAND CONTROLLER or KEYBOARD TOUCH SENSOR.

(XII) BACK PANEL



1 SIGNAL OUT

• Output Level Selector Switch

Selects the output level from among 40 dBm, -10 dBm and -30 dBm. Set this switch according to the device connected.

• Output Jacks

Stereo signals are output from both the RIGHT and LEFT jacks when the SENSIBLE switch is ON. A headphone connector jack is also provided, which is useful when practicing at night.

When only the LEFT jack is used, both the right and left channel signals are output together.

3 EXT CONTROL

• EXP PEDAL

A pedal-type foot volume control can be connected to this



jack so that the overall volume can be controlled by foot.

• RCV IN

A control signal from another synthesizer which is equipped with a 1/2olt/V RCV can be applied to this jack. All four VCOs are controlled simultaneously.

• GATE IN

Both RG-1 and RG-2 operate simultaneously when 5.0V or a higher voltage is applied to this jack. This is effective for all four channels.

4 FINE TUNING

These controls fine tune the pitch of the VCOs. To adjust the pitch, take the following steps.

- Set the selector switch to the PROPS A position.
- Press and hold the lowest C key and adjust FINE TUNING VCO1 so that the pitch of the output sound becomes A (440Hz).
- Press and hold the D key next to the lowest C key and adjust FINE TUNING VCO2 so that the pitch of the output sound becomes A (440Hz).
- Press and hold the E key next to the D key and adjust FINE TUNING VCO3 so that the pitch of the output sound becomes A (440Hz).
- Press and hold the F key next to the E key and adjust FINE TUNING VCO4 so that the pitch of the output sound becomes A (440Hz).

SOUND SAMPLE

●SYNTHESIZER SOUND I



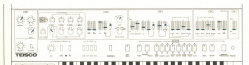
●SYNTHESIZER SOUND II



●SYNTHESIZER SOUND III



●JAZZ ORGAN



SOUND SAMPLE

ELECTRIC BASS



ACCORDION



CLARINET



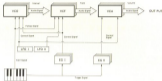
BANJO



SYNTHESIZER DESIGN

Sound is basically determined by pitch, tone and volume. In the sounds which we usually hear, these factors vary in a complicated manner as time passes. Pitch is determined by the fundamental frequency of vibration of the sound source, the tone is determined by the waveform, i.e., the harmonic composition and the volume is determined by the amplitude of vibration. A synthesizer uses voltages to control these factors

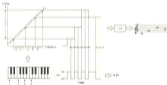
and generates various kinds of sound. The pitch is varied with voltage controlled oscillator (VCO), which are controlled by the keyboard controlled voltage (KCV). The tone is varied with voltage controlled filter (VCF), and the volume is varied with voltage controlled amplifier (VCA). These voltages are changed in a dynamic manner by envelope generators (EG).



(1) KEYBOARD CIRCUIT

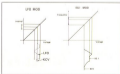
A different voltage is generated by each key on the keyboard. The voltage difference per octave is 1V. The voltage generated by each key is called a KCV (Keyboard Controlled Voltage). A

KCV is maintained by the SR (sample and hold) circuit (even if the key is released) until another key is pressed. A signal which indicates the ON and OFF states of any key on the keyboard is used to trigger the two built-in EGs.



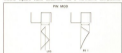
(2) VCO (Voltage Controlled Oscillator) BLOCK

The VCO is the sound source block of the synthesizer; it generates sound signals according to KCVs from the keyboard. The frequency of sound signals generated can be modulated with the signal from the LFO or EG-1 block. In such cases, the frequencies generated are varied according to variation in voltage of the LFO or EG-1 signal. For example, when frequency of sound signals is modulated with the LFO signal, a vibrato effect is imparted to the sound signals. The VCO block can generate three types of waveforms: sawtooth, square and triangular. The tone of the sound generated differs according to the waveform, since these waveforms have different harmonic com-





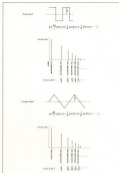
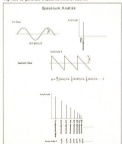
positions. Use them as suitable. The duty ratio of the signal generated can be varied by adjusting the PW (Pulse Width) control, but only when the square wave is selected. The asymmetric square wave obtained has a harmonic composition



which differs from that of the normal symmetrical square wave; therefore, varying the PW control results in variation of the tone. The pulse width can be automatically controlled according to the LFO or SGR signal.

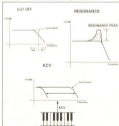
The SUB OSC & WCFE block generates a square wave signal which is one octave lower than the VCO-generated signal and the noise signal. These signals can be added to the signal selected by the SHAPF selector.

Any waveform can be represented as the sum of sine wave signals of different frequencies in a Fourier series. The sine wave with the lowest frequency is called the fundamental wave, and it determines the pitch. The other sine waves are called harmonics, and each harmonic has a frequency which is a multiple of the frequency of the fundamental wave (i.e., the fundamental frequency). The harmonics determine the tone. The process of dividing a waveform into its fundamental and harmonic components and comparing their amplitudes is called spectrum analysis. This is an effective method of learning how to generate a specific kind of sound.

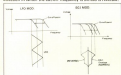


(3) VCF (Voltage Controlled Filter)

The VCF adds tonal variety to sound generated by the OSC-800 by varying the cut-off frequency of the Low-Pass Filter according to the control voltage applied to the VCF. The RESONANCE control generates a peak in frequency response at the cut-off frequency so that harmonics around the cut-off frequency are enhanced and the sound generated has a characteristic tone. The KCV control causes the keyboard controlled voltage to control the VCF so that the cut-off frequency is shifted according to the key pressed; thus, variations in tone due to variation in pitch are prevented.

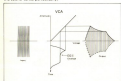


The VCF can also be controlled with the signal generated by the LFO or EG-L. When the VCF is controlled with the LFO signal, the cut-off frequency is shifted periodically according to the LFO signal, resulting in a growling effect. When it is controlled with the EG-L signal, the cut-off frequency is shifted according to the envelope of the signal generated by the EG-L. When the NORMAL/REVERSE switch is set to REVERSE, the direction in which the cut-off frequency is shifted is reversed.



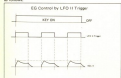
(4) VCA (Voltage Controlled Amplifier)

The VCA is an electronic volume control which determines sound volume according to the control voltage. The control voltage is generated by the EG-H or LFO. When the EG-H is used, the amplitude of the sound varies according to the waveform of the EG-H signal. (This waveform is determined with the ADSR controls). When the LFO is used, the amplitude of the sound varies periodically.



(5) EG (Envelope Generator)

The EG generates VCF and VCA control signals. The waveform of the signal generated is determined by four factors which are adjusted with the ADSR controls. This waveform determines the envelope of the modulated signal. The EG is triggered by signals generated by the keyboard. The four ADSR controls are as follows.



- **ATTACK** – Determines the rate at which the generated signal level increases to the prescribed maximum level.
- **DECAY** – Determines the amount of time required for the signal level to drop from its maximum level to the level determined by the SUSTAIN control.
- **SUSTAIN** – Determines the signal level which is maintained after decay until the key is released.
- **RELEASE** – Determines the rate at which sound disappears after the key has been released.

The EG can also be triggered by the LFO-H signal.

(6) HPF (High Pass Filter)

The HPF passes only high frequency components of the generated sound signal. The cut-off frequency is raised as the CUT OFF control is raised. Note that the fundamental frequency and some low order harmonics may be cut off.



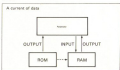
(7) LFO (Low Frequency Oscillator)

The LFO oscillates at a frequency of from 0.4 – 1000. The signal generated is used to modulate the sound signal at the VCF, VCF and VCA.

The LFO-L is equipped with a FREQUENCY control which varies the frequency generated, a DELAY control which determines the time required for the LFO-L to start oscillating after a key has been pressed, and a SHAPES selector which varies the waveform of the signal generated.

(8) MEMORY

The memory block stores the settings of programmable controls and generates sound signals according to the settings stored.



There are 8 memory channels which are preset by the manufacturer. These 8 memory channels are accessed with 26H through 26F, and contain the general settings for the sounds of trombone, trumpet, electric piano, electric guitar, harmonica, electric piano and 26H in ROM (Read Only Memory). The contents of these memory channels cannot be modified.

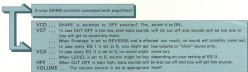
There are 8 memory channels which can be preset by the user. These 8 memory channels are also accessed with 26H through 26F. Data is stored in random access memory. Therefore, data can be stored and read by the user. The data in ROM can be transferred to one of these memory channels to allow part of the data to be modified.

TROUBLE CHECKING No sound comes out!!?

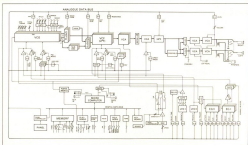
1. Can't obtain any sound which you have set.



2. While playing, SX400 suddenly does not produce any sound or sounds become lower.



BROCK DIAGRAM



INTRODUCTION OF TEISCO PRODUCTS

2VCO DUAL OSC Synthesizer

S-110F

with KEY IN/OUT
with GATE IN/OUT



Portable Type Monophonic
Synthesizer

S-100P

22 Tones

3 Channel - Stereo Type
Mixing

MX-850



6 Channel - Stereo Type
Mixing

MX-650



Monitor Speaker

FB-650

Input 50W (RMS)
30cm Woofer x 1
Horn Speaker x 1

PS-1200M

Output 180W (RMS)
30cm Woofer x 1
Horn Speaker x 1



Speaker-System, Center
in Main Amplifier

PS-620

Output 50W (RMS)
20cm Full-range x 2
Horn Tweeter x 2



Power Amplifier

MA-100

Output 100W (RMS)
4Ω

1000W (RMS) 16Ω

PS-1100M

Output 100W (RMS)
30cm Woofer x 2
Horn Speaker x 2



PS-1100M

Output 100W (RMS)
30cm Woofer x 2
Horn Speaker x 2



TEISCO speaker system is most suitable for your use as a keyboard speaker because the stereo range is large. FB-650 is a monitor speaker and is designed for easy fitting. FB-650 of 100W input is also available.

■ SPECIFICATION

| | |
|-----------------|---|
| ● KEYS | 49KEYS |
| ● TYPE | 4XC0-4XC2P 4XC3- 4XC00ES |
| ● VCO | VCO [L, H, M, R] RANGE: 8K 8' 8' 2' PITCH LFO : MOD. EG : MOD. PW PW MODE (LFO L/EG L) SHAPE (OFF, /, \, /, /, /) SUB OSC & NOISE (OFF, SUB, NOISE, SUB & NOISE) POLY MODE (QUAD, DUAL, MONO, SOLO) |
| ● VCF | CUT OFF (16Hz-200Hz) RESONANCE KEY LFO MOD. (LFO L/LFOH) EG L / (ATTACK, DECAY, SUSTAIN, RELEASE) (NORMAL/REVERSE) |
| ● VCA | EG (ATTACK, DECAY, SUSTAIN, RELEASE) LEVEL LFO MOD. |
| ● H P F | CUT OFF (16Hz-160Hz) |
| ● LFO | LFO I FREQUENCY (0.4Hz-16Hz) DELAY SHAPE (/, \, /, /, /) LFO II FREQUENCY (0.4Hz-16Hz) EG TRIGGER |
| ● EFFECT | PORTAMENTO/ GLISSANDO SPEED, GUS./POLA, ON/OFF TRANSPOSE (H/ DOWN) HAND CONTROLLER/KEYBOARD TOUCH SENSOR SPEED/SENSITIVITY VCO (UP/OFF/DOWN) VCF (ON/OFF) VIBRATO (ON/OFF) WOW WOW (ON/OFF) ENSEMBLE KEY HOLD |
| ● MEMORY | PANEL, MEMORY/PRESET (1-8) EDIT, WRITE, MEMORY PROTECTION |
| ● REAR PANEL | FINE TUNING (VCO -0, MORE X) EXT. CONTROL (GATE IN, KEY IN, EXP. PEDAL) SIGNAL OUT (PHONES, RIGHT, LEFT) +40dB/-10dB/-20dB |
| ● ETC | VOLUME |
| ● VOLTAGE FREQ. | 100V 50/60Hz |
| ● POWER CONS. | 36W |
| ● DIMENSIONS | 185(S)×245(W)×110(D)mm |
| ● WEIGH | 3.2kg |

VCA BLOCK



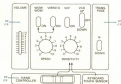
LFO BLOCK



MEMORY BLOCK



SENSOR BLOCK



KAWAI

**KAWAI MEDICAL INSTRUMENTS MANUFACTURING CO., LTD.
HAMAMATSU, JAPAN**

Printed in Japan