

OB-XA
POLYPHONIC SYNTHESIZER

OWNERS MANUAL

Third Edition April 1982

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CAUTION:

To Prevent fire or shock hazard do not expose this appliance to rain or moisture.

WARNING:

This equipment generates and uses radio frequency energy and if not installed and used properly, i.e., in strict accordance with the instruction manual, may cause harmful interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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CONGRATULATIONS!

You have just purchased a most powerful tool for synthesizer performance and composition.

The Oberheim OB-Xa/120 Polyphonic Synthesizer is the latest result of the evolutionary philosophy of product development at Oberheim Electronics. The OB-Xa is an update of the OB-X, which was originally introduced in June 1978. Since the introduction of the OB-Xa in December 1980, numerous changes and improvements have been made. These include the expansion of program memory from 32 Programs to 120 Programs; doubling of the Split and Double Programs; the addition of Square Wave Modulation with the modulation lever; a quieter output section; an improved Auto-Tune circuit which will turn off out-of-tune voices; improved Cassette Interface; and the latest update, the addition of several Portamento modes, which present additional new possibilities for sound composition.

The OB-Xa is complemented by the DSX Digital Polyphonic Sequencer, which stores notes and patch changes in much the same way that the OB-Xa stores sounds, digitally.

In fact, the OB-Xa is a complete microcomputer system, with microprocessor, memory, cassette data storage, and most of all, the computer program or "software". Yet the OB-Xa has been designed to be used by the beginning and professional synthesist alike.

So, work with your new synthesizer; experiment with it. You'll find that the OB-Xa gives you more control over your sound than ever before.

And isn't more control what synthesizers are all about?

MANUAL

VOLUME: Controls output volume.
BALANCE: Controls relative volume of UPPER and LOWER programs when in SPLIT or DOUBLE mode.
AUTO: Automatically tunes all oscillators.
HOLD: Allows note or chord to be held indefinitely.
CHORD: Allows selected chord to be transposed by lowest note on the keyboard.

MODULATION

LFO RATE: Controls frequency and wave form of low frequency oscillator.
FREQUENCY: Controls amount and destinations of frequency modulation.
PULSE WIDTH: Controls amount and destinations of pulse width modulation.

FILTER

FILTER: Controls frequency and resonance of filter.
OSC-1:
OSC-2 HALF/FULL: Mixes sound sources
NOISE:
FOUR POLE: Selects either two-pole or four-pole filter.
TRACK: Applies the keyboard control voltage to the filter frequency.

CONTROL

PORTAMENTO: Controls rate of portamento.
UNISON: Places OB-Xa in unison mode.
OSC-2 DETUNE: Detunes oscillator two, sharp or flat on all voices.

OSCILLATORS

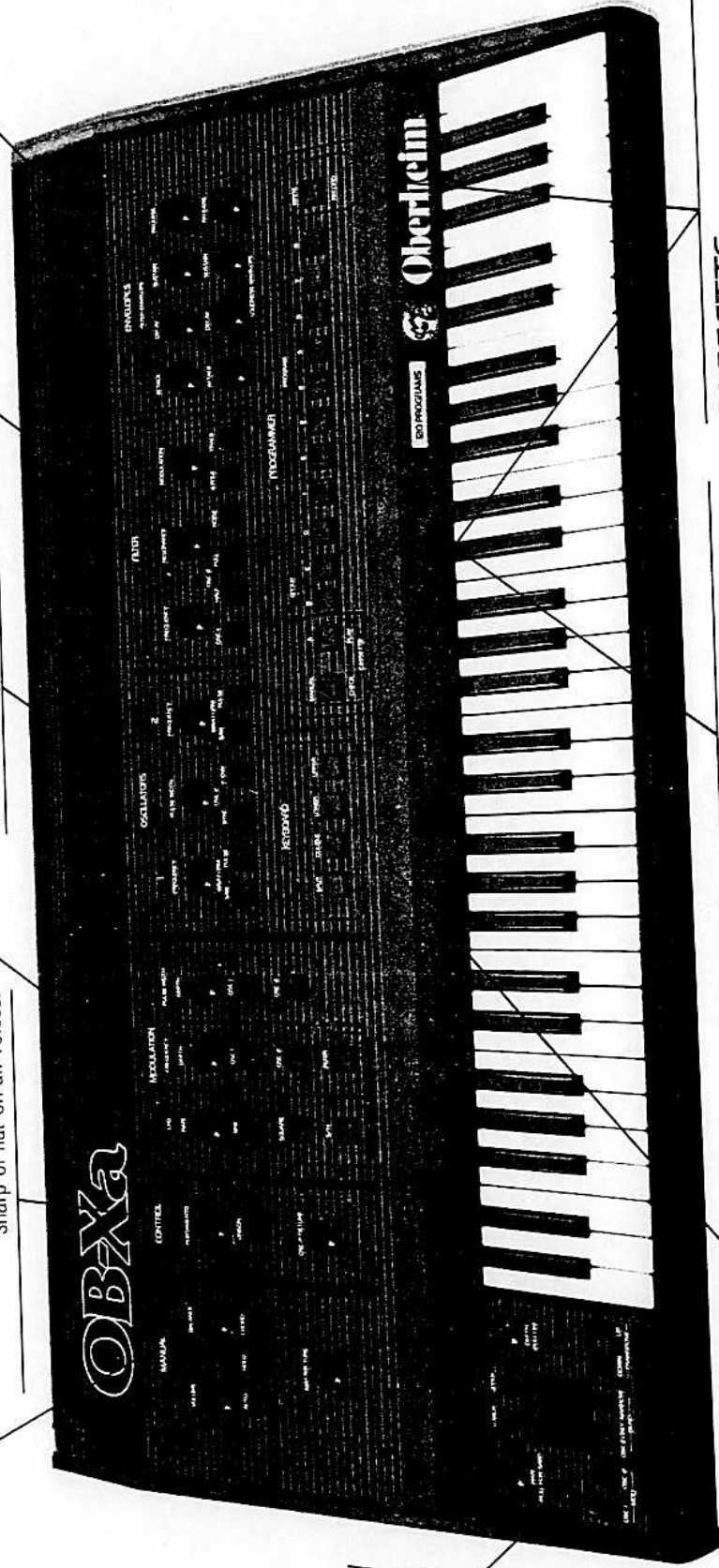
Selects frequency and waveform of oscillators; also selects SYNC and modulation of VC02 by FILTER ENVELOPE.

ENVELOPES

Controls FILTER and LOUDNESS ENVELOPES.

MODULATION PANEL

Controls Pitch Bend, Vibrato and Transposition.



KEYBOARD

Selects SPLIT and DOUBLE modes.

PROGRAMMER

MANUAL: Allows panel controls to operate without program.
GROUP/PROGRAM: Selects patches, SPLIT and DOUBLE programs.
WRITE: Stores patches, SPLIT and DOUBLE programs in memory.

CASSETTE

The CHECK, PLAY and RECORD switches become active when the ENABLE ON switch on the rear panel is in the ON position.
CHECK: Checks cassette data.
PLAY: Plays data from tape into memory.
RECORD: Records data from memory onto tape.

- 1) First, make sure the 115/230 Voltage switch on the rear panel is set for the local AC power;
- 2) Apply power and plug into your sound system;
- 3) Press "AUTO" to tune all of the oscillators;
- 4) Select a programmed sound by pressing a GROUP (A thru D, or any combination) and a PROGRAM (1 thru 8);
- 5) Set the VOLUME control to an appropriate level.
- 6) Play!

The unit comes from the factory pre-programmed with 104 Sound Programs, 8 Split Programs, and 8 Double Programs. These include a great variety of sounds which will quickly acquaint you with the capabilities of your instrument. The OB-Xa Programmed Patches book details these factory programs.

You can adjust the output volume of the OB-Xa with the VOLUME control in the upper left hand corner. This control simultaneously controls both the stereo outputs and the mono output. The MASTER TUNE control allows the instrument to be fine-tuned to other instruments. When this control is within the "dead-zone" near the top center, the instrument is tuned to standard A-440 pitch.

**** NOTE ****

If a mono amplifier is being used, be sure to use the mono output.

The programs on the OB-Xa/120 are divided into 15 GROUPS of 8 PROGRAMS each. The 15 GROUPS are selected by pressing the four GROUP buttons ("A", "B", "C", & "D") individually OR in any combination ("AB", "AC", "BC", "ABC", "ABCD", etc.). The PROGRAM within the selected GROUP is then selected by pressing one of the eight PROGRAM buttons. The PROGRAM button may be pressed at any time--before, after, or at the same time as the GROUP button--but the GROUP button or buttons must all be held down AT THE SAME TIME, like playing a chord.

MODIFYING SOUND PROGRAMS

Any sound recalled by the programmer can be modified (edited) by changing the controls on the front panel. The controls add to, or subtract from, the settings stored in the computer program. For example, the release time of the LOUDNESS ENVELOPE can be made longer than programmed simply by turning up the RELEASE control on the LOUDNESS ENVELOPE. This feature allows quick yet smooth modifications of existing programs.

When selecting a program, the front panel settings do not affect the sound of the instrument. For instance, if a sound had originally been programmed with a FILTER FREQUENCY setting at 12 o'clock, but later the program is recalled with the FILTER FREQUENCY control set at 9 o'clock, the program sound will be the same as if the FILTER FREQUENCY control was set at 12 o'clock. If it is desired to further increase or decrease a control setting, and the control is already at its maximum or minimum position, simply rotate the control all the way in the opposite direction and then make your desired setting.

The original, unmodified sound program can be recalled by pressing the appropriate GROUP and PROGRAM buttons again. The modified sound program can be recorded into the program memory as well. See "WRITING PROGRAMS".

CREATING NEW SOUNDS

The OB-Xa can be used to create completely new sounds, rather than alter existing sounds as described above, by using the MANUAL MODE. In MANUAL, the OB-Xa circuitry responds to the absolute settings of the controls. For instance, if the OSC 1 FREQUENCY control is set at 11 o'clock, upon entering MANUAL mode the pitch of this oscillator will be one octave above its base pitch. In general, when one enters the MANUAL mode from one of the programs, the sound of the instrument will change to reflect the actual physical settings of the controls. The various on-off states of the switches will be those that existed the last time the OB-Xa was in the MANUAL mode.

The MANUAL MODE cannot be used while in SPLIT or DOUBLE modes.

New, modified, or even existing programs can be written into the OB-Xa's memory. This is done with the following procedure:

- 1) Press and hold WRITE and wait for the WRITE light to come on;
- 2) Continue to hold WRITE and select a GROUP (A thru D, or any combination)
- 3) Continue to hold WRITE and select a PROGRAM (1 thru 8).

The write operation actually occurs when the WRITE switch is being pressed at the same time a PROGRAM switch is pressed, with the WRITE light on. Programming SPLIT combinations will be discussed later in this manual.

**** NOTE ****

Programs will not be recorded if the PROTECT switch inside the unit is on (see MEMORY PROTECT SWITCH, page 25).

MOVING PROGRAMS

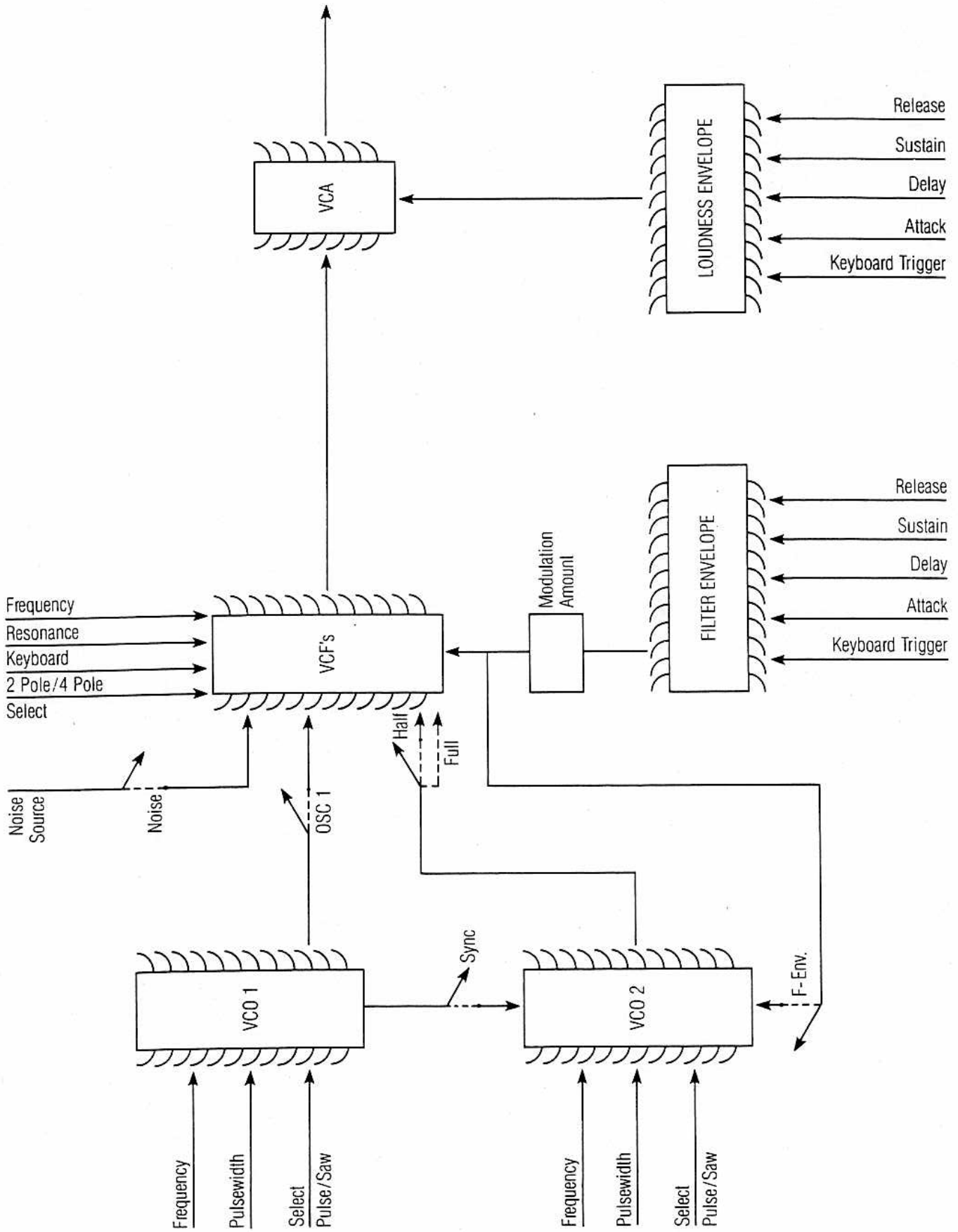
Occasionally it may be desirable to move a complete program from one program memory location to another. To do this, simply select the program you wish to move, and then write into the desired new program location, as described above.

The OB-Xa is a Polyphonic Synthesizer with up to eight voices. Each Voice inside the OB-Xa is a complete synthesizer, with two Voltage Controlled Oscillators (VCOs), two Voltage Controlled Filters (VCFs), a Voltage Controlled Amplifier (VCA), and two Envelope Generators. The voice is configured as shown in the accompanying diagram (next page).

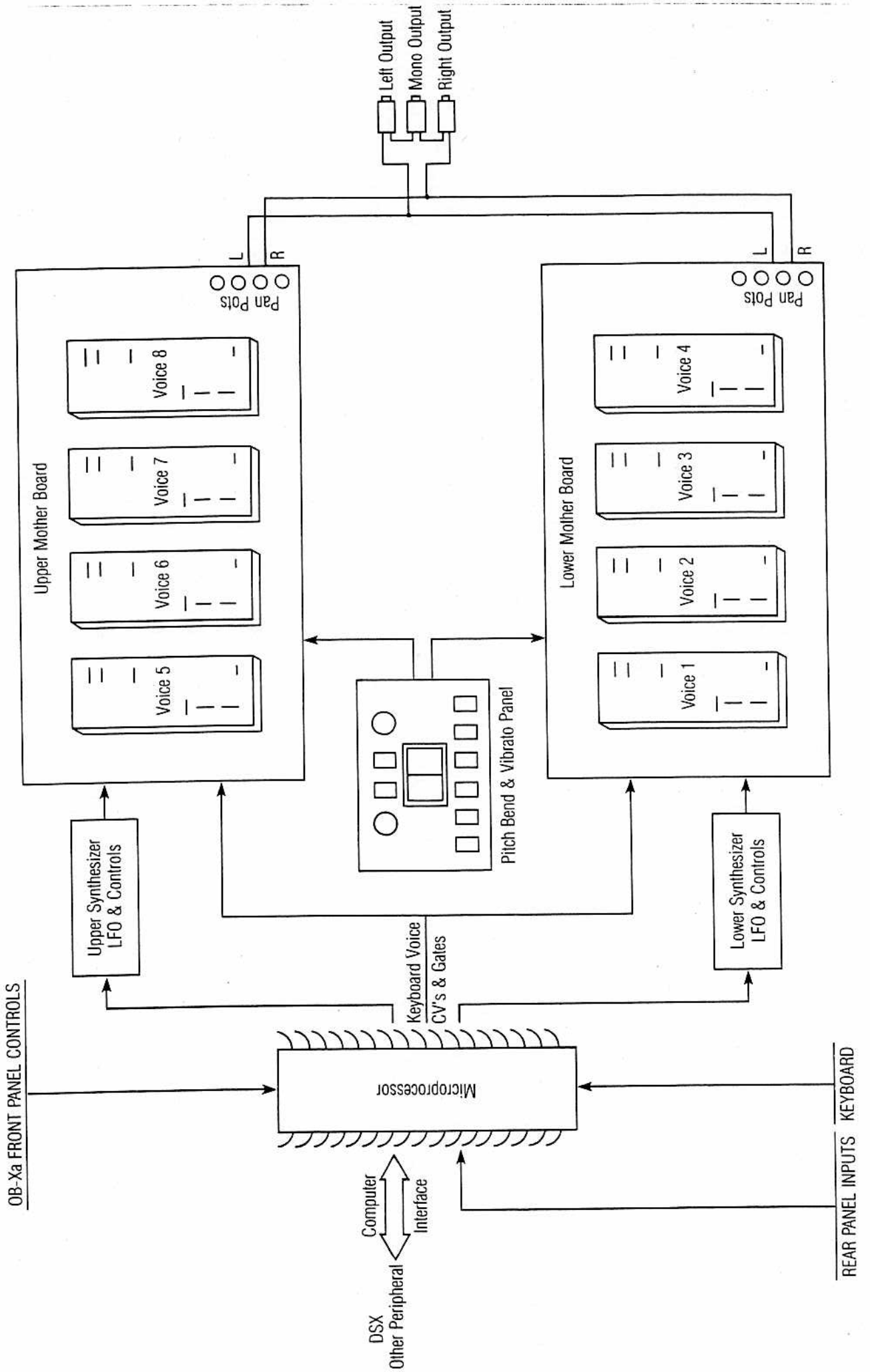
The voices are arranged in two groups of four voices each, referred to as the Upper Voices and Lower Voices, respectively. Each group of voices gets control signals from its own associated control circuitry, which also contains the Low Frequency Oscillator for each group. There is a control circuit for the Upper Voices, and a second for the Lower Voices. Both control circuits are, in turn, controlled by the OB-Xa's onboard computer (see diagram, following page).

It is the computer that looks at the keyboard and the front panel controls, and then communicates the appropriate information to the control circuits and to the voices themselves.

OB-Xa Voice



OB-Xa System Block Diagram



HOLD

This button is used to produce a sustained note or chord. To use, press the HOLD button and simultaneously play one or more notes, and then release the HOLD button. The note or notes played will now be sustained indefinitely. You can play notes one at a time or all at once, while holding down the HOLD button. To cancel the hold function, press HOLD a second time, but be sure not to hold down any keys.

HOLD may be used in Split and Double to sustain different sounds at once.

The HOLD switch is also used to select between Linear and Quantized Portamento modes. See "PORTAMENTO".

CHORD

The HOLD and CHORD switches can be used together to play chords with one key. First, select the desired notes by using the HOLD function as described above. Then, press the CHORD switch. The held chord will cease sounding. By playing low C (C0) on the keyboard, the held chord will be reproduced as previously played. Playing notes above C0 will transpose the chord up by a corresponding interval. If the G above lowest C (G0) is played, the chord will sound transposed up a fifth; if the C two octaves above the lowest C (C2) is played, the chord will sound transposed up by two octaves. If any of the voices have not been used, the actual note being played will sound as well.

The OB-Xa cannot play notes higher than the top note on the keyboard (C5). If a note would be played higher than C5, the OB-Xa will transpose it down by octaves until it is in range. This accounts for the "cluster" effect that results when transposing chords by large intervals. The Transpose switches on the Modulation Panel may be used to achieve a higher range. The chord will always be transposed by the lowest note on the keyboard, even in split. However, individual notes can be played above the note transposing the chord. To exit the CHORD mode, simply press the HOLD switch.

When HOLD is not in use, the CHORD switch can be used as an envelope reset, to shut off the release of the Envelope Generators, causing any released notes to stop sounding. If the Portamento is turned up, pressing the CHORD switch will cause all voices to move immediately to their next note, instead of gliding.

The CHORD switch is also used to enable or disable Portamento Offset. See "PORTAMENTO".

FRONT PANEL CONTROLS / CONTROL SECTION

PORTAMENTO This control determines the rate of portamento or "glide" of each voice as that voice's pitch is changed. Note that the portamento of the OB-Xa is polyphonic, so each voice will glide from note to note independently of all other notes. Portamento also functions in UNISON mode.

--PORTAMENTO MODES--

In newer OB-Xa's (after serial number 820818), the HOLD and CHORD switches are used in conjunction with the WRITE switch to select the Portamento Modes:

HOLD The HOLD switch selects between LINEAR PORTAMENTO (all voices slide smoothly from one note to another), and QUANTIZED PORTAMENTO (all voices move from one note to another in half note steps).

To change between LINEAR and QUANTIZED PORTAMENTO, hold the WRITE switch, and while holding it, press HOLD. There is no need to wait for the WRITE light to come on as with Writing Programs.

CHORD The CHORD switch enables and disables an OFFSET in the Portamento Speed of the voices. The effect of the PORTAMENTO OFFSET is easiest to hear in UNISON. Without OFFSET, all of the voices will glide at exactly the same speed; with OFFSET, the voices will glide at slightly different times, causing a "clustering" effect during the glide.

To enable or disable the PORTAMENTO OFFSET, hold the WRITE switch, and while holding it, press CHORD. There is no need to wait for the WRITE light to come on as with Writing Programs.

The Portamento is set to LINEAR WITH OFFSET when the OB-Xa is first turned on. The Portamento Offset or Quantizing may be changed at anytime, however mode changes are not programmable. Also, if a mode is changed while a chord is being held, the chord being held will be cancelled.

UNISON When switched on, causes all voices to be sounded by one key depression. In UNISON, the OB-Xa keyboard operates with low note rule, which means that the lowest note played on the keyboard will always have priority. When in SPLIT, the UNISON mode is independent for the two halves of the keyboard, so if the upper half is in UNISON, then only the lowest note of the upper half of the keyboard will affect it.

OSC 2 DETUNE This control allows Oscillator 2 to be tuned either flat or sharp relative to Oscillator 1. Turning the control to the left makes Oscillator 2 go flat and to the right makes it go sharp. The LED above the OSC 2 DETUNE control turns on when the Oscillator 2 is detuned from Oscillator 1.

FRONT PANEL CONTROLS / MODULATION SECTION

THE LOW FREQUENCY OSCILLATOR (LFO) is used for modulation at low frequencies --that is, frequencies below the range of hearing. If you were to listen to the LFO directly, you would not hear anything; however by controlling the frequency or pulse width of an oscillator or filter, the effect of the LFO becomes apparent.

--LFO--

RATE This control determines the SPEED of modulation. The range is from approximately 1/10 oscillation per second to 20 oscillations per second.

The following switches determine the TYPE of modulation:

SINE When switched on, selects sine wave modulation from the LFO. This causes a smooth rising and falling of pitch of the oscillators or filter during frequency modulation or smooth changing of the pulse width during pulse width modulation.

SQUARE When switched on, selects square wave modulation from the LFO. This produces a discrete interval change during frequency modulation of oscillators or filter, or a discrete pulse width change during pulse width modulation.

S/H When switched on, selects a random output from the LFO. This produces a sequence of random pitches during frequency modulation of oscillators or filter, or a sequence of random pulse widths during pulse width modulation.

---FREQUENCY---

DEPTH This control determines the AMOUNT of frequency modulation. Small amounts of frequency modulation are frequently used to create vibrato effects; larger amounts can be used for special effects.

OSC 1 Pressing this switch routes frequency modulation to Oscillator 1.

OSC 2 Pressing this switch routes frequency modulation to Oscillator 2.

FILTER Pressing this switch routes frequency modulation to the Filter.

FRONT PANEL CONTROLS / MODULATION SECTION

--PULSE WIDTH--

- DEPTH This control determines the AMOUNT of pulse width modulation. Pulse width modulation does not alter the pitch of the oscillators but rather the shape of the pulse wave, causing a change in the timbre of the sound not unlike the effect of a rotating speaker on an organ.
- OSC 1 Pressing this switch routes modulation to the pulse width of Oscillator 1.
- OSC 2 Pressing this switch routes modulation to the pulse width of Oscillator 2.

OSCILLATORS SECTION

The controls in the OSCILLATORS section control the range and shape of the sound.

- 1 FREQUENCY This control determines the initial frequency of Oscillator 1. It operates in one octave steps within a four octave range.
- SAW/PULSE WAVEFORM These switches choose the waveform of Oscillator 1. A Sawtooth wave contains all of the harmonic overtones, while a Pulse wave skips some of the harmonics, and the sound is not as "fat" as a result.
- PULSE WIDTH This control sets the initial pulse width of both oscillators. When it is set fully counter-clockwise a square wave (50 % duty cycle) is selected. Turning this control clockwise makes the sound progressively thinner and more nasal.
- SYNC Pressing this switch causes Oscillator 2 to lock onto a harmonic of Oscillator 1. Since Oscillator 2 is syncing to Oscillator 1, changing the frequency of Oscillator 2 will cause a timbral change rather than a pitch change.
- F-ENV This switch allows the FILTER ENVELOPE to modulate the frequency of OSC 2. The amount is controlled by the MODULATION control in the FILTER section. With this control at its maximum setting, and the FILTER ENVELOPE SUSTAIN level at maximum, OSC 2 will increase in pitch one octave.
- 2 FREQUENCY This control determines the initial frequency of Oscillator 2. It operates in half-step increments over a five octave range.
- SAW/PULSE WAVEFORM These switches choose the waveform of Oscillator 2.

FRONT PANEL CONTROLS / FILTER SECTION

The Voltage Controlled Low Pass Filters (VCF) are used to control the brightness of the sound, filtering out the higher frequencies (the "buzz") in a very controllable manner. The Filter is arguably the most important component in a synthesizer, because it is the primary control of the timbre, or tone color of the sound. Because of this, each voice of the OB-Xa contains two filters, a 2-Pole and a 4-Pole. In the OB-Xa, the Filter Section also selects the sound sources (Oscillators and Noise) that are used in the patch.

- FREQUENCY This control sets the initial cut-off frequency of the Filter.
- RESONANCE This control determines the amount of resonance ("Q" or "emphasis") of the Filter. The RESONANCE emphasizes the cut-off frequency of the Filter. As the RESONANCE is increased, the overall volume of the sound will increase in the 2-POLE mode and decrease in the 4-POLE mode.
- MODULATION This control determines the amount of Filter Envelope which modulates the Filter. Modulation of the Filter by the Envelope is a critical element in the synthesis of brass sounds as well as creating percussion in organ sounds, to name just a few uses. The MODULATION control also determines how much Filter Envelope will modulate OSC 2 when the F-ENV switch is on. The LFO can also modulate the Filter. See "MODULATION SECTION"
- OSC 1 When this switch is on, Oscillator 1 is routed into the Filter.
- OSC 2
HALF/FULL When either of these switches are on, Oscillator 2 is routed into the Filter. The FULL switch selects the full output of the oscillator and the HALF switch selects a signal level approximately 5 db below full output.
- NOISE When this switch is on the Noise Generator is routed into the Filter.
- 4-POLE Turning this switch on selects the 4-POLE filter. When this switch is off the 2-POLE filter is selected. The effect of this switch is to change the sharpness of the filtering effect. The 4-POLE filter has a 24db/octave slope (sharper), which results in a fuller sound. The 2-POLE filter has a 12db/octave slope (more gradual), which results in a brighter sound.
- TRACK This switch adds the control voltage from the keyboard to control the Filter Frequency. When on, the Filter in each voice will track the keyboard, and "open up" as higher notes are played. The TRANSPOSE and MASTER TUNE controls will also control the Filter when TRACK is switched on.

The Envelope Generators control the timing of the sound. It is the Envelopes that make a long sound long, and a short sound short. For example, the difference between a cresting ocean wave, and an explosion. There are two envelopes on each voice of the OB-Xa; one that controls the Filter for timbral control, and one that controls the Voltage Controlled Amplifier (VCA) for loudness control.

---FILTER ENVELOPE---

- ATTACK** The Attack section of the envelope operates as soon as a key is pressed on the keyboard. This control sets the time the Filter takes to get to its maximum effect, as determined by the MODULATION control in the FILTER SECTION. The shortest time is selected by setting the ATTACK control fully counter-clockwise.
- DECAY** The Decay section of the envelope comes into operation as soon as the envelope has reached its maximum level (as soon as the Attack is completed). This control sets the time the Filter takes to reach the sustain level, as set by the SUSTAIN control, while a key on the keyboard is being held down.
- SUSTAIN** This control sets the level the Filter Envelope goes to following its initial decay, as set by the DECAY control. The Envelope will stay at the Sustain Level as long as the key on the keyboard is held down.
- RELEASE** Once the key is released, the Envelope moves to the Release section, and completes its cycle. The RELEASE control sets the time the Filter takes to go from the Sustain level, to the off level. If the SUSTAIN control is set to minimum, the Release section will have no effect on the sound if the key is pressed and held down. If the key is pressed and immediately let go (in less time than the combined Attack and Decay time), then the Release Section will still have an effect.

When the F-ENV switch is on, the Filter Envelope modulates OSC 2 as well as the FILTER. The pitch of OSC 2 will directly correspond to the shape of this Envelope. The ATTACK determines how fast OSC 2's pitch will rise, the DECAY determines how fast OSC 2 will decrease in pitch to the level set by the SUSTAIN control, and the RELEASE determines how fast OSC 2 will decrease in pitch after a note has been released. The MODULATION control in the Filter Section will control the range of the effect of the Filter Envelope on both the Filter as well as Oscillator 2.

---LOUDNESS ENVELOPE---

- ATTACK** The Attack section of the envelope operates as soon as a key is pressed on the keyboard. This control sets the time the sound takes to get to its maximum loudness. The shortest time is selected by setting the ATTACK control fully counter-clockwise.
- DECAY** The Decay section of the envelope comes into operation as soon as the envelope has reached its maximum level (as soon as the Attack is completed). This control sets the time that the VCA (that controls loudness) takes to reach the sustain level, as set by the SUSTAIN control, while a key on the keyboard is being held down.
- SUSTAIN** This control sets the level the Loudness Envelope goes to following its initial decay, as set by the DECAY control. The Envelope will stay at the Sustain Level as long as the key on the keyboard is held down.
- RELEASE** Once the key is released, the Envelope moves to the Release section, and completes its cycle. The RELEASE control sets the time the sound takes to go from the Sustain level, to the minimum level. If the SUSTAIN control is set to minimum, the Release section will have no effect on the sound if the key is pressed and held down. If the key is pressed and immediately let go (in less time than the combined Attack and Decay time), then the Release Section will still have an effect.

KEYBOARD SECTION (SPLITS AND DOUBLES)

The KEYBOARD section controls the operation of Splits and Doubles on the OB-Xa. The OB-Xa's normal configuration is that of a single 8-voice synthesizer. SPLIT and DOUBLE allow the OB-Xa to be split into two separate polyphonic synthesizers (hereafter called LOWER and UPPER), each capable of different sounds and transpositions. An 8-voice OB-Xa therefore becomes two 4-voices, a 6-voice becomes two 3-voices, and a 4-voice becomes two 2-voices. In the SPLIT mode, the LOWER voices are played with the lower half of the keyboard, while the UPPER voices are played with the upper half of the keyboard. The SPLIT LOCATION can be placed anywhere on the keyboard, and either half of the keyboard can be transposed into any key without affecting the other half. The DOUBLE mode causes the two halves of the keyboard to play simultaneously, with the upper and lower voices capable of having different sounds. The upper and lower voices can still be programmed and transposed independently, and the balance between them can be changed using the BALANCE control.

FRONT PANEL CONTROLS / KEYBOARD SECTION

The KEYBOARD SECTION controls operate individually and in combination with each other to produce ten different functions with just four buttons:

FUNCTION	BUTTONS	DESCRIPTION
Enter Split Mode	SPLIT	When this button is pressed, the OB-Xa enters the SPLIT mode. Pressing it again without any keys held down causes the OB-Xa to exit the SPLIT mode.
Enter Double Mode	DOUBLE	When this switch is pressed the OB-Xa enters the DOUBLE mode. Pressing the switch again causes the OB-Xa to exit the DOUBLE mode.
Change Split Point	SPLIT (hold down) KEY (on the keyboard)	The key depressed is now the lowest note of the UPPER keyboard. This new SPLIT LOCATION will be remembered until a new split is entered, or a split is recalled from memory.
Display Lower Program	LOWER	The Lower Program can be edited or changed without affecting the Upper Program.
Display Upper Program	UPPER	The Upper Program can be edited or changed without affecting the Lower Program.
NOTE: The MANUAL mode cannot be used when in SPLIT or DOUBLE.		
Change Lower Transposition	SPLIT or DOUBLE (hold) LOWER (hold) KEY (on the keyboard)	The Lower Voices are referenced to the lowest "C" on the keyboard (C0). Transpositions may be made to any key. Pressing the "G" above the lowest "C" will transpose the Lower Voices up a fifth. Transpositions may be made in SPLIT or DOUBLE.
Change Upper Transposition	SPLIT or DOUBLE (hold) UPPER (hold) KEY (on the keyboard)	The Upper Voices are referenced to middle "C" on the keyboard (C2). Transpositions may be made to any key. Pressing the "C" below middle "C" will transpose the upper Voices down an octave.
Resetting Split Point & Transpositions	SPLIT or DOUBLE (hold) GROUP A	The SPLIT Location and Transpositions are reset to "normal" (Split Location at middle C, no transpositions).
Recalling Split Programs	SPLIT (hold) PROGRAM (1-8)	There are eight SPLIT PROGRAMS which can be programmed and recalled. (see "PROGRAMMING SPLITS AND DOUBLES", below).
Recalling Double Programs	DOUBLE (hold) PROGRAM (1-8)	There are eight DOUBLE PROGRAMS which can be programmed and recalled. (see "PROGRAMMING SPLITS AND DOUBLES", below).

FRONT PANEL CONTROLS / MODULATION PANEL

The Modulation Panel is located just to the left of the keyboard. It contains a separate LOW FREQUENCY OSCILLATOR (LFO) with sine, sawtooth, and square waveforms which can be assigned to one or both Oscillators. It also contains a PITCH BEND LEVER which can be used to bend Oscillator 2 or both Oscillators up or down an octave or a major second. The functions of the Modulation Panel are not programmable.

When in the SPLIT or DOUBLE mode, the Modulation Panel can be assigned to either or both halves of the keyboard (see "KEYBOARD SECTION").

-- LFO CONTROLS --

- RATE** This controls the rate of the LFO. The rate can be adjusted from about .1 Hz to 20 Hz. The waveform of the LFO is a sine wave when this knob is pushed in, and a sawtooth wave when it is pulled out. A square wave can be obtained by pushing and holding the bend lever towards the rear (away from you), while at the same time pulling up on the RATE knob.
- DEPTH** This control allows you to control the depth of the LFO without using the MODULATION LEVER. Turning the knob determines the modulation depth, and pulling up on the knob puts this control into effect. The amount of depth set by this control is added to the depth controlled by the MODULATION LEVER and the external MODULATION PEDAL.
- OSC 1**
OSC 2 These switches determine the destination of the LFO. The LFO can be assigned to OSC 1, OSC 2, or both. Both switches are automatically turned off during Auto-tune to insure proper tuning.
- MODULATION LEVER** This is the left-most of the two levers on the Modulation Panel. It controls the amount of modulation from the LFO to the assigned Oscillators. Pulling this control towards the front of the unit will add more modulation. If the DEPTH control is on, this lever will add more modulation to the amount set by the DEPTH control. It has no effect when pushed toward the rear.

-- PITCH BEND CONTROLS --

- PITCH BEND LEVER This is the right-most of the two levers on the Modulation Panel. It is used to bend the pitches of the notes being played. Pulling it towards the front causes the pitch to go up, and pushing it towards the rear causes the pitch to go down. Its range is determined by the NARROW switch.
- OSC 2 ONLY When this switch is on, the PITCH BEND lever bends only Oscillator 2 of each voice. When this switch is off, the BEND LEVER bend both Oscillator of each voice.
- Bending only Oscillator 2 has an interesting, timbral effect on programs in which Oscillator 2 is in SYNC.
- NARROW This switch determines the range of the PITCH BEND LEVER. When this switch is on, the PITCH BEND LEVER has a NARROW range of up or down one whole step (e.g. "C" could move up to a "D" or down to a "Bb"). When this switch is off, the PITCH BEND LEVER has a range of up or down one octave.

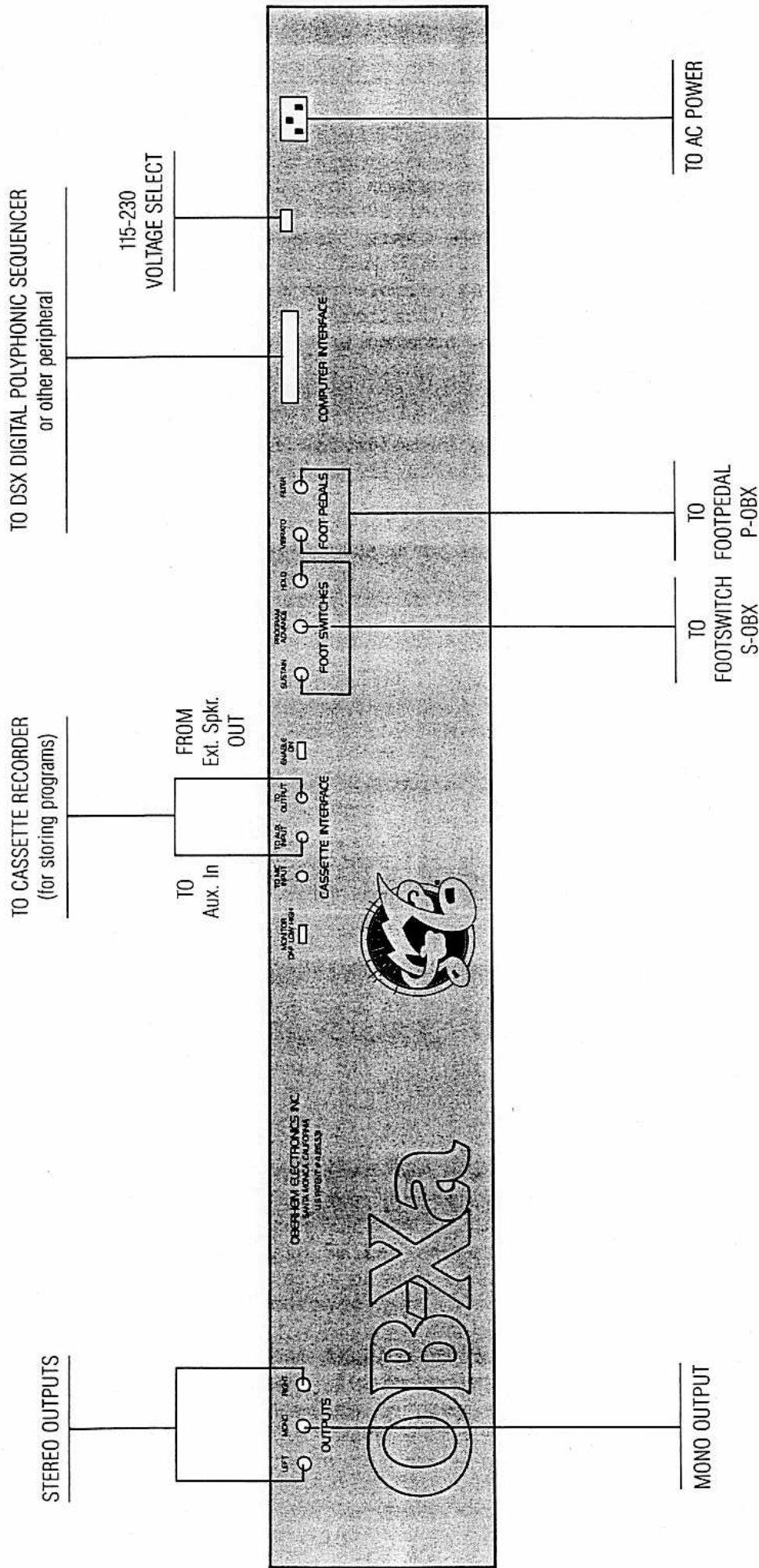
-- TRANSPOSE CONTROLS --

- DOWN & UP These switches act as a master transpose for all voices. They allow you to transpose the entire keyboard up or down one octave from the normal range. When neither of the two switches are on, the keyboard is in the normal range. Switching the DOWN button on transposes the keyboard one octave below normal. Switching it off puts the keyboard back in the normal range. Switching the UP button on transposes the keyboard one octave above normal, and switching it off returns the keyboard to its normal range.

-- MODULATION PANEL ASSIGNMENT --

- LOWER & These buttons are used to assign all of the functions of the UPPER MODULATION PANEL, except for the TRANSPOSE buttons, to either half of the keyboard when in the SPLIT or DOUBLE mode. This allows for MODULATION and PITCH BEND to be assigned to one half of the keyboard, without affecting the other half. In the DOUBLE mode, it can be assigned to one or both of the two Programs being played. The LOWER and UPPER switches will both always stay on when not in the SPLIT or DOUBLE modes. See "KEYBOARD SECTION", above.

OB-Xa Rearpanel Showing Connections



AUDIO OUTPUTS

LEFT/RIGHT

The OB-Xa has a pair of stereo outputs as well as a mono output. Each voice can be individually panned to any position in the stereo spread with the pan pots located inside the unit (see "PAN POTS", Page 26). The LEFT and RIGHT outputs have no relation to the Upper or Lower voices of the synthesizer. Similarly, the BALANCE control on the front panel affects the balance between the Upper and Lower Voices rather than the balance between the Left and Right outputs.

MONO

The mono output is not affected by the panpots. However, the BALANCE control will still affect the balance between the Upper and Lower voices.

The outputs are high impedance (approx. 75K Ohms) and the average output level is 1 Volt peak to peak. A Direct Box is recommended when using the OB-Xa with low impedance recording consoles.

CASSETTE INTERFACE

For more information, see "CASSETTE INTERFACE", Page 20.

MONITOR

This switch allows monitoring of the cassette interface data through the audio outputs.

TO MIC INPUT

This is a low level output for cassette interface data.

TO AUX INPUT

This is a high level output for cassette interface data.

TO OUTPUT

This is the input for cassette interface data.

ENABLE

Turning this switch "ON" (away from the audio output jacks) enables the cassette interface. All normal operations on the instrument are turned off at this time.

FOOT SWITCHES

The Foot Switch inputs are designed for use with the Model S-OBX Foot Switch. The S-OBX contains a momentary, normally open switch.

SUSTAIN

Pressing the Sustain Switch causes the RELEASE on all Envelope Generators to be set to about 3 0' Clock (approximately 7 seconds)

PROGRAM ADVANCE

Pressing the Program Advance Switch advances the programmer to the next program. For example, if program A6 is presently selected and this switch is pressed, the Programmer moves on to program A7. If program ABCD8 is selected and this switch is pressed, the Programmer moves on to program A1.

REAR PANEL CONNECTIONS / FOOT SWITCHES

As the footswitch is depressed, the programs cycle as follows:

GROUP NO.	LIGHTS				GROUP NO.	LIGHTS			
-----	A	B	C	D	-----	A	B	C	D
1	*				9	*			*
2		*			10		*		*
3	*	*			11	*	*		*
4			*		12			*	*
5	*		*		13	*		*	*
6		*	*		14		*	*	*
7	*	*	*		15	*	*	*	*
8				*					

HOLD The Hold switch functions exactly like the HOLD button on the front panel, and will cause the HOLD light to light when in use.

FOOT PEDALS

The Pedal inputs are designed for use with the Model P-OBX Foot Pedal. The P-OBX contains a 50 K Ohm linear potentiometer with its wiper connected to the signal lead of the jack and the "off" or most counter-clockwise connection connected to the ground lead of the jack. The wiper must make contact with the ground terminal when the foot pedal is in the completely "off" position. The third potentiometer connection is not used.

VIBRATO The Vibrato Pedal functions like the Vibrato Lever on the MODULATION PANEL. It allows the user to add vibrato from the LFO in the MODULATION PANEL to whatever oscillators are assigned to it.

FILTER This pedal controls the FILTER FREQUENCY of all voices. The range of the pedal is from a slightly lower frequency than when the pedal is not connected, to a significantly higher frequency.

COMPUTER INTERFACE

The Computer Interface connector is used to interface the OB-Xa to the DSX Digital Polyphonic Sequencer, or other computer peripherals. This connector contains all of the communication lines for the OB-Xa's microprocessor.

POWER

115/230 This switch sets the power requirements of the OB-Xa.

AC RECEPTACLE Connect AC Power to this jack, which is a standard, three-pin grounding connector; Switchcraft Series EAC.

The OB-Xa is equipped with a Cassette Interface which allows programs contained in the program memory to be stored externally on an audio cassette. All that is required to use the Cassette Interface feature is an audio cassette recorder with reasonable frequency response and a pair of mini-plug to mini-plug audio connecting cables. The cassette player must have an earphone or ext. speaker output.

CASSETTE INTERFACE CONNECTIONS

Connect the Earphone or Speaker output of your cassette recorder (a Line output will not work) to the jack labeled "TO OUTPUT" on the rear of the OB-Xa. Connect the "TO LINE INPUT" jack on the rear panel of the OB-Xa to the Line or Aux input of your cassette recorder. If the recorder does not have one, connect the "TO MIC INPUT" jack on the rear panel to the Mic input of your cassette recorder. See the diagram in the "REAR PANEL CONNECTIONS" section of the manual.

**** NOTE ****

To reduce hum, the "TO LINE INPUT" and "TO MIC INPUT" jacks have no ground connection. For this reason, it is necessary to connect both the Input and the Output cables when recording data onto the cassette recorder.

CASSETTE INTERFACE CONTROLS

--REAR PANEL--

- | | |
|---------------------|--|
| CASSETTE
ENABLE | This switch enables the cassette interface. When the Cassette Interface is enabled, the CASSETTE LIGHT on the front panel lights up and all normal functions on the instrument are disabled. |
| CASSETTE
MONITOR | This switch allows monitoring of the cassette interface data through the audio outputs. The switch has three volume levels: Loud, soft, and off. |

--FRONT PANEL--

- | | |
|--------|---|
| RECORD | This function shares a switch with the WRITE function. Pressing RECORD allows you to record your programs onto tape. |
| PLAY | This function shares a switch with the GROUP A function. Pressing PLAY allows you to play your programs from the tape into the OB-Xa. |
| CHECK | This function shares a switch with the MANUAL function. Pressing CHECK allows you to check your program recordings without writing them into the OB-Xa. |

TO RECORD PROGRAMS ONTO TAPE:

- 1) Connect the Cassette Recorder to the Cassette Interface Jacks on the rear panel of the OB-Xa as described in "CASSETTE INTERFACE CONNECTIONS", above.
- 2) Enable the Cassette Interface with the switch on the rear panel.
- 3) Press the RECORD switch on the tape recorder. You should now hear a steady tone through the main outputs of the OB-Xa.
- 4) Press the RECORD switch on the OB-Xa (it shares a button with the WRITE switch). After the RECORD switch is pressed, ten seconds of the steady "leader" tone will be sent out followed by sixteen seconds of the actual memory information. During these twenty-six seconds, the light on the RECORD switch will be on.

TO PLAY PROGRAMS FROM TAPE INTO THE OB-Xa:

- 1) Connect the Cassette Recorder to the Cassette Interface Jacks on the rear panel of the OB-Xa as described in "CASSETTE INTERFACE CONNECTIONS", above.
- 2) Enable the Cassette Interface with the switch on the rear panel.
- 3) Press the PLAY switch on the tape recorder. You will now be able to monitor the tape through the main outputs of the OB-Xa.
- 4) As soon as the "leader" tone is heard, press the PLAY switch on the OB-Xa (it shares a button with the GROUP A switch). At least three seconds of the "leader" tone must come between pressing PLAY and the rough sound of the memory information. The light on the PLAY switch will be lit from the time the switch is pressed until the first of the memory information is recognized. At that point, the GROUP lights (A, B, C, D) come on in sequential order four times, indicating that information transfer is taking place.
- 5) If an error is detected, the CHECK light will flash.

*** NOTE ***

If the MEMORY PROTECT switch inside the OB-Xa is set to PROTECT, the new data will not be stored in memory although the lights will sequence. See "MEMORY PROTECT SWITCH", page 25.

THE OB-Xa/120 FACTORY PATCH DIRECTORY

		Program							
		1	2	3	4	5	6	7	8
		Brass Ensemble	Clavinet	Low Strings	Electric Piano	Rotary Organ	Flutes	Harpsichord	Rock Unison
B		French Horns	Celeste	High Strings	Electronic Piano	Pipe Organ	Xa Chorus	Harp I	Calliope
AB		Trumpet Ensemble	Harmonica	Strings I	Accordion	Filter Drone	Bag Pipes	Banjo	Rush Rezz
C		Trumpets	Mellow Wow	Slow Strings	Resonance Sweep	Combo Organ	Double Reed	Farr's Funk	Pizzicato
AC		Modern Horns	Bass I	4-Pole Strings	Reed Piano	Perc Organ	Sax	Harp II	Orient Unison
BC		Tropical Horns	Rubber Clav	Strings II	Edge Piano	Hymn Organ	Recorder	Long Chimes	Unison Fear
ABC		Comp Horns	Bells	Strings III	Soft Piano	Reed Organ	Vocal Wow	Marimba	Terror
D		F-Env Horns	S/H Fifths	Poly Port	Steel Drums	Square Mod	Comp Synth	Unison Port	Delay Mod
AD		Tenth Decay	Sitar	Fiddle	Pulse Comp	PW Rezz	Comedy Comp	Jazz Solo	Earthquake
BD		S/H Port Rezz	Conga	Strings IV	Funk Keys	Organ	Tremolo Rezz	Box O' Pups	Martian Hop
ABD		Claps	Carillon	Solo Strings	Tuned Bees	Rezz Reeds	Three Way	Percussion	Chopper
CD		lo	S/H PW	Strings V	Clarinet	Bright Drone	Solo Unison	Claves	Jet
ACD		Water Wiggle	Water Piano	Slower Strings	Flanged Piano	Space Bugs	Taped Voices	Thunder	Pong
BCD									
ABCD									
		1	2	3	4	5	6	7	8

TO CHECK TAPES:

The CHECK function of the Cassette Interface enables verification of the data on a tape without actually transferring the data into the OB-Xa's memory. A TAPE SHOULD ALWAYS BE CHECKED AFTER RECORDING.

- 1) Connect the Cassette Recorder to the Cassette Interface Jacks on the rear panel of the OB-Xa as described in "CASSETTE INTERFACE CONNECTIONS", above.
- 2) Enable the Cassette Interface with the switch on the rear panel.
- 3) Press the CHECK switch on the tape recorder. You will now be able to monitor the tape through the main outputs of the OB-Xa.
- 4) As soon as the "leader" tone is heard, press the CHECK switch on the OB-Xa (it shares a button with the MANUAL switch). As with the PLAY switch, at least three seconds of "leader" tone must follow pressing the switch and precede the rough sound of the memory information. The CHECK light will be on during the reception of the leader tone and the GROUP lights will sequence, just as during the PLAY operation, however no actual information transfer into memory takes place.
- 5) A CHECK error is indicated if the CHECK light flashes at the end of the operation.

**** NOTE ****

Once the leader tone has started the cassette interface must complete its cycle. However, before the leader tone has started you may cancel the cassette operation by pressing CHORD.

CASSETTE INTERFACE / POSSIBLE CAUSES OF TAPE TRANSFER ERRORS

If errors are found during the play or check process, the CHECK light will flash, or the A, B, C, or D lights will stay on. If this happens, one of the following reasons might be responsible:

- A) There is a bad spot on the tape.
- B) The playback volume is too high or too low. Some trial and error may be required. Generally the best level is as high as possible before distortion occurs (approximately 3/4 of the way up). If the playback volume very low, the OB-Xa will not acknowledge the data at all.
- C) The tone control may be set improperly. It is important that the tone control(s) be set so that neither the high nor the low frequencies are attenuated.
- D) The Batteries in the cassette machine are too weak.
- E) The tape recorder may have too much Wow and Flutter. Listen to the tone that precedes the data. A lot of wavering is an indication that the tape playback suffers from a lot of Wow and Flutter.
- F) Sometimes tape errors are caused by poor recordings. Because of the large amount of gain in a tape recorder mic preamp, it becomes easy for hum, noise, and distortion to obscure the data being recorded, especially when using a tape recorder with Automatic Level Control (ALC). Set the recording level manually if possible, and use a LINE or AUX input if available. When recording data be sure to use BOTH the record and playback cables.
- G) Some cassette recorders invert the phase of the signal in the process of recording and playing back. Cassette data with inverted phase may not play properly. If your cassette recorder NEVER checks or plays data properly, the inverted phase may be the problem. Try reversing the connections on one side of your playback cable, so that the tip of the plug at one end of the cable connects to the sleeve of the plug on the other end.

The Cassette Interface is designed to work with portable cassette recorders having an "Earphone", "Speaker", or "Monitor" output. The Interface is not designed to work with tape recorders having only a line level output. It is possible to use a tape recorder with only a line out if the signal is amplified using, perhaps, the headphone jack of a stereo amplifier, however this set up may be too cumbersome to be practical. It may also be possible to use a portable AM/FM/Cassette stereos if there is an external speaker output, or a "Walkman" type portable with headphone outputs.

CASSETTE INTERFACE / PLAYING OB-Xa/32 AND OB-X TAPES ON THE OB-Xa/120

Older OB-Xa cassettes (32 Programs) as well as OB-X cassettes are compatible with the OB-Xa/120. When playing OB-X tapes into the OB-Xa/120 the GROUP lights will cycle once only, the transferred programs will appear in the first four groups ("A", "B", "AB", & "C"), and the programs in the remaining eleven groups will be unchanged. When playing OB-Xa/32 tapes into the OB-Xa/120, the GROUP lights will cycle twice, and again the transferred programs will appear in the first four groups. The split and double programs will ALL become splits and appear in the eight split program locations. The eight double locations as well as groups "AC", "BC", and "ABC" will become filled with random data (weird sounds or no sound at all), but the other eight groups will remain unchanged. After transferring older tapes, the power should be turned off and then on again for proper operation.

OB-Xa/120 tapes may be played on OB-Xa/32's and OB-X's as well, although only the first 32 programs ("A", "B", "AB", & "C") will be transferred.

OB-Xa programs containing F-ENV will play on OB-X's as X-MOD and vice versa; similarly, 4-POLE on an OB-Xa will appear on an OB-X as HALF NOISE.

Inside the OB-Xa are several infrequently used controls. To operate these controls, it is necessary to open the unit.

*** CAUTION ***

Exercise care when operating controls inside the unit. Some of the circuitry contains high voltages (especially on the left side of the unit, near the AC receptacle) and the possibility of shock exists.

OPENING THE UNIT

- 1) Remove the top two screws on each end bell;
- 2) Raise the OB-Xa cover;
- 3) When finished inside the unit, close the cover and replace the end bell screws.

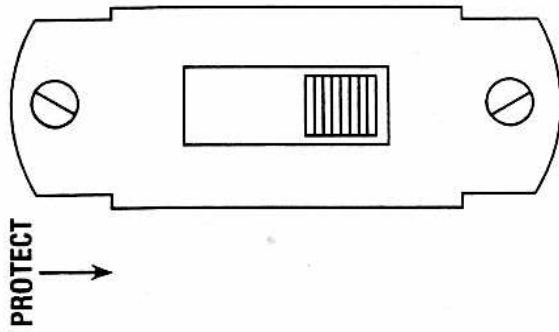
MEMORY PROTECT SWITCH

The OB-Xa contains a MEMORY PROTECT switch, that prevents a user from writing into Program Memory, either with the WRITE switch or with the PLAY switch of the Cassette Interface. This allows one to protect programs from accidental erasure. The MEMORY PROTECT switch is located inside the OB-Xa, on the printed circuit board which holds the microprocessor and the memories. The OB-Xa comes from the factory with this switch set in the protected position.

To change the position of the MEMORY PROTECT switch, follow this procedure:

- 1) Open the unit as described above;
- 2) Locate the PROTECT switch on the processor board;
- 3) To protect programs, position the switch toward the front of the OB-Xa;
- 4) To allow program changes, position the switch away from the front of the OB-Xa.
- 5) Close the cover and replace the end bell screws.

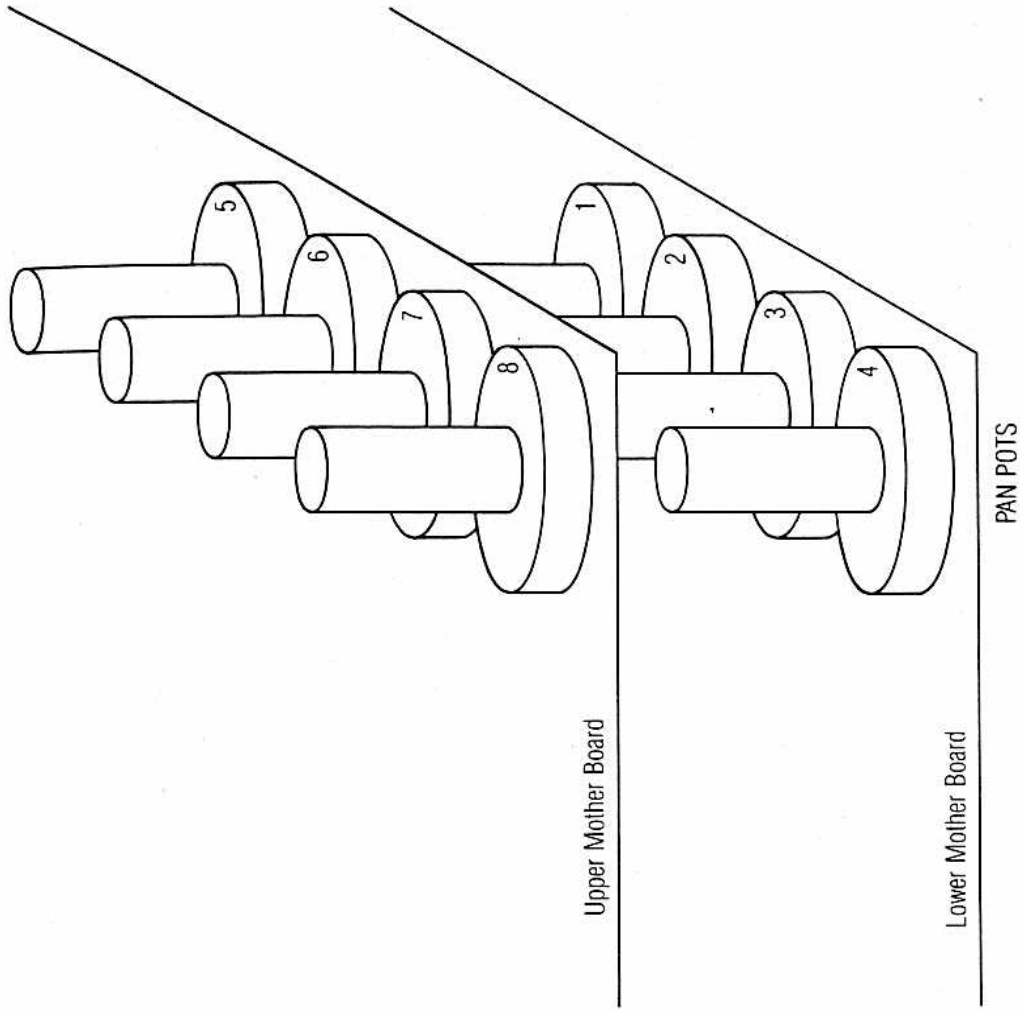
Protect Switch and Pan Pots



PROTECT SWITCH

To protect programs, position the switch toward the front of the OB-Xa.

To allow program changes, position the switch away from the front of the OB-Xa.



The OB-Xa comes from the factory with Voices 1-4 panned all the way to the left and Voices 5-8 panned all the way to the right. Each of the voices can be panned anywhere in the stereo outputs by setting the pan pots located inside the unit. Use the following procedure:

- 1) Open the unit as described above;
- 2) Each voice has its own pan pot, located on the right-hand side of each of the two mother boards. To gain access to the lower voices tray, disconnect the cable connecting the two mother boards, remove the three screws holding down the upper voices tray, and tilt it into a vertical position;
- 3) Determine the sequencing positions of the Voices by playing one note repeatedly, and observing the LEDs on each voice. Voice 1 is the left-most Voice on the lower voices tray, Voice 2 is the second voice from the left on the lower voices tray, etc. A Voice is determined "on" when its associated LED is on.
- 4) Set Voice 1 Pan Pot as desired, sequence to Voice 2 and set its Pan Pot, and repeat for Voices 3 and 4;
- 5) Return the upper voice tray to its normal position, secure with the screws, reconnect the cable, and set the remaining Pan Pots as described above.

VOICE KILL SWITCHES

Inside the OB-Xa is an eight position DIP switch that is used to turn off individual voices. These switches can be used to disable a voice that is not functioning properly or turn on specific voices for testing and calibration. The Voice Kill switches are also used to disable the unused voice positions on a Six-Voice or Four-Voice.

The Voice Kill Switches are located on the Pot Board (the board that contains the knobs and switches on the front panel), next to the Test 1 and Test 2 slide switches. With the point of a pencil, press the individual switch element "OPEN" (down) to turn OFF the corresponding voice.

TEST SWITCHES

Next to the DIP switch you will find two large slide switches labelled TEST 1 and TEST 2.

- TEST 1 The TEST 1 switch, when in the Off (down) position, disables the Auto-Tune circuit.
- TEST 2 The new Auto-Tune circuit (in units above serial number 814203) will remove voices which it cannot tune from the voice assignment rotation. The TEST 2 switch defeats this feature. When the switch is in the Off (Down) position, voices which cannot be tuned by the Auto-Tune circuit will remain in the voice assignment rotation.

SPECIFICATIONS

SYNTHESIZER COMPONENTS: 4, 6, or 8 Voices; 3 Low Frequency Oscillators, Sample/Hold Circuit, Polyphonic Portamento, Pink Noise Source

COMPONENTS IN EACH VOICE:

- 2 Voltage Controlled Oscillators
- 2 Voltage Controlled Filters (2-Pole or 4-Pole low pass type, selectable)
- 2 Envelope Generators
- 1 Voltage Controlled Amplifier

NUMBER OF PROGRAMS: 120 Patch Programs, 8 Split Programs, 8 Double Programs

KEYBOARD: 5 Octaves (C to C)

KEYBOARD MODES: FULL, SPLIT (splits OB-Xa into two independent synthesizers), and DOUBLE (plays both independent synthesizers simultaneously); programmable split point and transpositions anywhere on the keyboard (in SPLIT or DOUBLE)

OUTPUTS: Stereo and Mono signal outputs (Output Level: 1 Volt peak to peak, 75K Ohms Impedance)

Cassette Interface inputs and outputs

Computer Interface (Parallel Interface)

FOOT CONTROLS: Footswitches: Sustain, Hold, Program Advance
Foot Pedals: Filter, Vibrato

POWER: 90-130 or 180-240 Volts AC, 50-60 Hz, 50 Watts

DIMENSIONS: 40"(101.6cm) wide, 20"(50.8cm) deep, 6"(15.24cm) high

WEIGHT: 45 lbs. (20.41kg)