

Handwritten scribbles

DX

OWNER'S MANUAL



OBERHEIM ELECTRONICS, INC.



D X O W N E R ' S M A N U A L

by

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CAUTION:

To Prevent fire or shock hazard do not expose this appliance to rain or moisture.. Do not remove cover. No user serviceable parts inside. Refer servicing to qualified service personel.

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 persuant 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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1. INTRODUCTION

CONGRATULATIONS!

You have just purchased a most powerful tool for composition and performance. The Oberheim DX Programmable Digital Drum Machine represents an evolutionary step in the design of drum computers. The DX has been designed by the Oberheim staff with the idea of giving you better value in a digital drum machine without sacrificing sound or features.

The DX utilizes the sounds of real drums. Recordings of real drums are digitized, stored in computer memory, and are made available at the touch of a button. A drumbeat may be recorded in realtime at any speed, remembered, and edited to make any beat of any length, tempo, or style--in short, any drum beat that you hear in your head, you can create on the DX. After you have created your drumbeats, you can save them on tape for future use. The DX even has a battery to keep the memory on when the power is off.

The DX operates like a tape recorder: Record your rhythms; then PLAY them back. But there's more to it than that. There are many more features that are incorporated into the DX to actually give you much more control over your music than a tape recorder gives you.

Good luck!

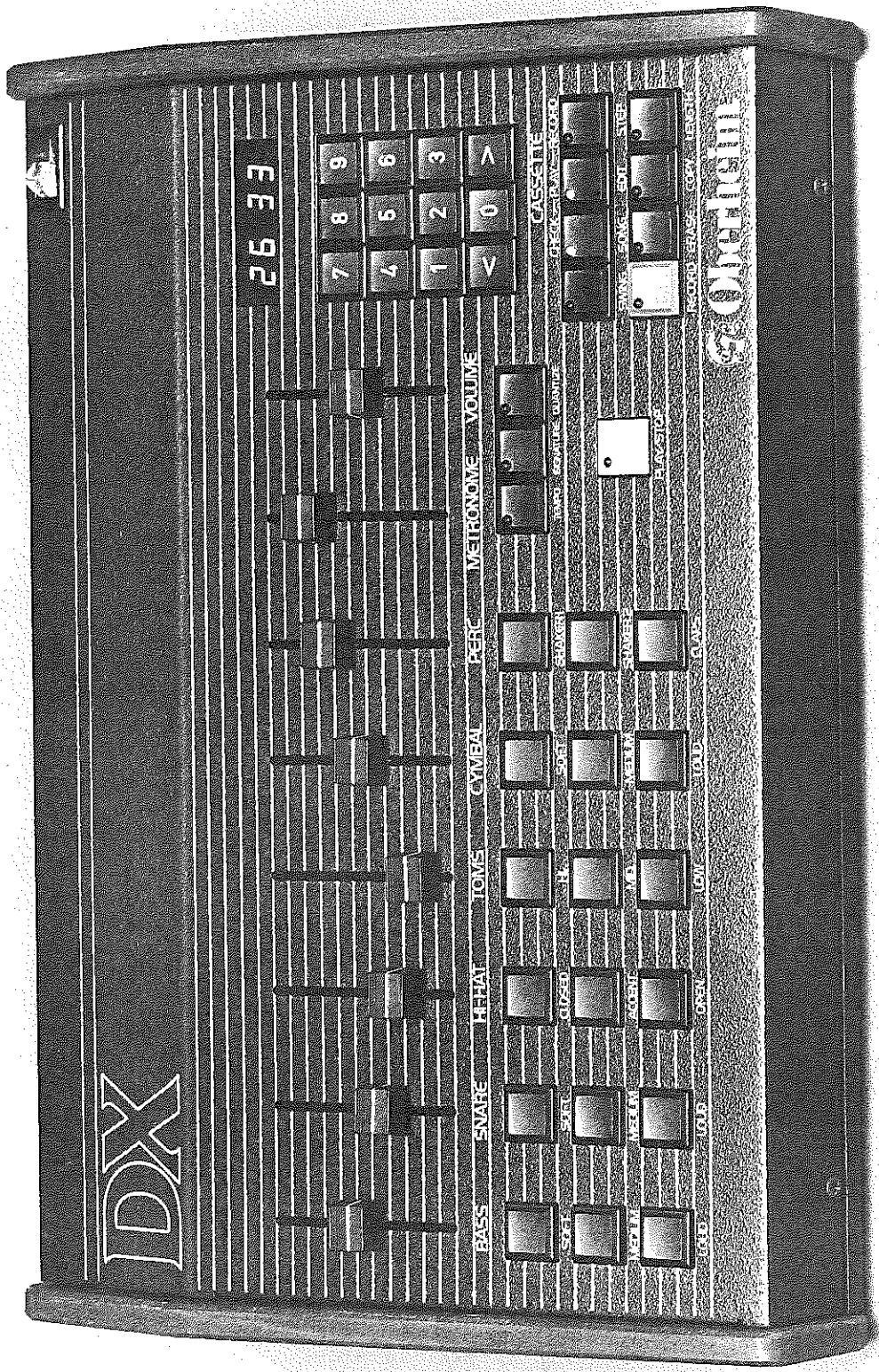


Fig. 1-1: Front panel photograph

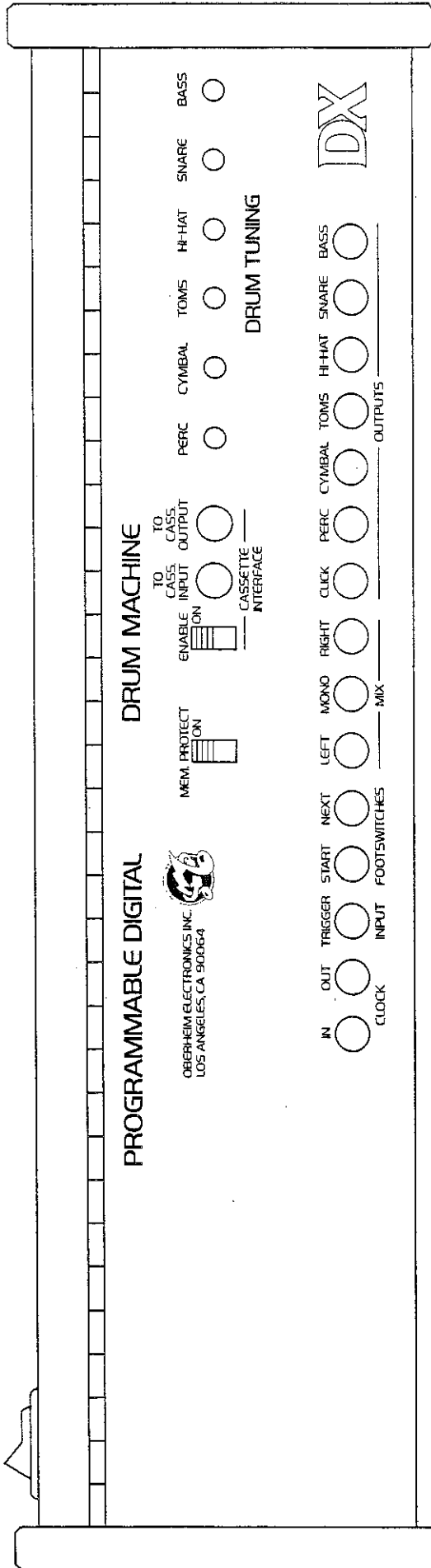


Fig. 1-2: Rear panel drawing

2. H O O K U P

2.1. POWER

The DX comes from the factory set to operate on 115 Volts. If the local power is 220-240 Volts, you will need to change the power selection switch inside the DX. Remove the two screws at the front of the chassis and then lift up the front panel. You will find the power selection switch on the right side, behind the transformer. For 100-120 Volt operation, switch it to "115". For 220-240 Volt operation, set the switch to "230". Close the lid and replace the screws.

2.2. SIGNAL

Connect either the LEFT and RIGHT, or the MONO outputs to your amplifier or mixer. The slide pots on the front panel control the relative volumes of each drum voice in the mixed outputs. The left and right outputs form a stereo mix with the kick and toms in the center and the rest of the voices in a preset stereo spread.

Each voice has its own output as well; these are useful if you are connecting the DX to an external mixer. The volume controls have no effect on the level of the individual outputs, so it is possible to use the SNARE and BASS individual outputs, for example, and the mixed outputs for the other voices (turning the SNARE and BASS VOLUME controls to minimum to remove them from the mixed outputs).

3. THE DX VOICES

The DX contains six sets of voices. Each voice has three variations, and some of the voices contain two completely different sounds. The sound of each voice is contained on one or several memory chips.

3.1. THE SOUNDS

The DX contains the following voices and these variations:

BASS	Bass drum, with three volume levels.
SNARE	Snare drum, with three volume levels.
HIHAT	A hihat, with a closed and an accented sound, plus a longer "open" sound.
TOM	A tom-tom, with three individual pitches.
CRASH	A crash cymbal, with three volume levels.
PERC	Two sounds: a shaker with accent, plus hand claps.

3.2. TUNING

The pitch of each of the voices can be tuned up or down half an octave by adjusting the pitch controls located on the rear panel of the DX. When the pitch control is in its center position, the drum is tuned to its original pitch.

4. OPERATION

4.1. SELECTING A SEQUENCE

The DX can store up to 100 drum sequences, numbered 00 thru 99. Select a sequence by pressing two numbers, or one of the arrow buttons. The display will show you which sequence you have selected.

4.2. PLAYING A SEQUENCE

Press PLAY. The sequence will play over and over until you press STOP. You may also select another sequence while playing, and the DX will play it immediately after the first sequence has finished.

4.3. MEMORY PROTECT SWITCH

On the rear panel is the MEMORY PROTECT switch that prohibits all of the functions of the DX that change memory contents such as Record, Erase, Copy, Tempo, Song Edit, and Cassette Play. The MEMORY PROTECT switch is provided to prevent accidental changes in the recorded data. If the MEMORY PROTECT switch is on, attempting to operate any function that would change data results in a "beep" and a "Pro" display reading.

The MEMORY PROTECT switch cannot protect the DX from things like power surges that may cause memory loss in extreme cases. For this reason, it is suggested that all important sequences be saved on cassette as described in the Cassette Interface section.

4.4. RECORDING A SEQUENCE

There are two ways to record on the DX: REALTIME and SINGLE STEP. In REALTIME, the sequence plays over and over and you simply press the buttons where you want the drums to sound. In SINGLE STEP, the sequence advances one beat each time you press a button for a note or a rest, which allows you to record your drum beat very slowly. The REALTIME mode of recording is explained below. The SINGLE STEP mode of recording is explained in the section entitled STEP.

Press and hold RECORD and then press PLAY. The Metronome will click in eighth notes and the DX will record over and over on two measures (you can change the length of the sequence--see "LENGTH"). In RECORD, the DX does not ERASE, so you can build your drumbeat as it loops over, playing the bass drum first, the snare, and then the hi-hat, etc., until you are finished. Then press STOP.

Whenever the DX is in RECORD or PLAY, the right two digits of the display will show the currently selected sequence, and the left two digits will show the measure number of the sequence.

NOTE: The DX will not enter RECORD if the MEMORY PROTECT switch on the rear panel is ON. See "MEMORY PROTECT SWITCH".

OPERATION	PRESS	DISPLAY READS
Select Sequence 00	00	" 00"
Start Recording	RECORD (hold) PLAY	buttons light " 1 00" " 2 00" (The left half of the display flashes the bar number.) play drums
Stop Recording	STOP	" 00"

Fig. 4-1: Recording on Sequence 00

4.5. OVERDUBBING

Overdubbing is the process of recording more parts in synchronization with parts already played. With the DX, overdubbing is the same as normal recording. Whenever you press RECORD and PLAY, the DX simply adds whatever you play to what has already been recorded. In RECORD, the DX does not erase. ERASE is a separate process.

4.6. ERASING

4.6.1. Erasing a Sequence

If you have made a mistake, or would like to record over again, press and hold ERASE, and while holding ERASE press RECORD. This will erase whatever sequence number is being displayed. Your previous recording will be erased, and you may record again from scratch. The DX will "beep" when the erasure actually takes place. The volume of the beep is controlled by the metronome volume control.

OPERATION	PRESS	DISPLAY READS
Erase Sequence 00	ERASE (hold) RECORD	buttons light

The Display will go dark and DX will "beep"

Fig. 4-2: Erasing Sequence 00

NOTE: The DX will not ERASE if the MEMORY PROTECT switch on the rear panel is ON. See "MEMORY PROTECT SWITCH".

4.6.2. Erasing an individual drum

You can erase any single drum (or cymbal) from the entire sequence. Hold ERASE and then press the drum you wish to erase.

OPERATION	PRESS	DISPLAY READS
Erase Crash Cymbal	ERASE (hold) CRASH	button lights

The Display will go dark and DX will "beep"

Fig. 4-3: Erasing Crash Cymbal from Sequence 00

4.6.3. Erasing while in record

You can erase part of a sequence "on-the-fly" while in RECORD: press and hold ERASE; then press RECORD during the section of the sequence that you wish to erase. All drums will be erased while both ERASE and RECORD are held down. You will hear the silence resulting from the erasure as it takes place.

4.6.4. Erasing individual notes in record

You can also erase individual drums in part of a sequence "on-the-fly" while in RECORD: press and hold ERASE; then press the desired drum or drums during the section of the sequence that you wish to erase. All notes on the specified drums will be erased while both ERASE and the drum button(s) are held down. You will hear the erasures as they take place--that is, you won't hear the drums as they are erased.

It is also possible to erase individual notes while in the STEP mode (See "STEP").

4.6.5. Erasing everything

If you want to erase all of the sequences and songs, press ERASE and while holding ERASE, press both of the ARROW buttons simultaneously. The ERASE button will light and the display will ask "CLr?" (clear?). Press ERASE again and all of the buttons will light, and the DX will erase everything.

4.7. TEMPO

The DX defaults to a tempo of 80 Beats per Minute, but can be varied within a range of 25 to 250 Beats per Minute. You can change the tempo at any time by entering the tempo mode. Press TEMPO. The Tempo button will light and the display will show the tempo currently selected. You can change the tempo by pressing the buttons with the arrows to increase or decrease the tempo, or you can enter the desired Beats per Minute on the keypad. To exit the tempo mode press TEMPO once again.

To program the tempo in a sequence press TEMPO while in Record, set to the desired speed and press TEMPO once again to exit. Whenever that sequence is recalled, the DX will recall the tempo as well. You can change the tempo at any time, but the programmed tempo will be changed only when the tempo is set while recording.

OPERATION	PRESS	DISPLAY READS
Enter Tempo Mode	TEMPO (button lights)	" 80"
Set 105 Beats per Minute	105	" 1 05"
Exit Tempo Mode	TEMPO	" 00"

Fig. 4-4: Setting the Tempo to 105 Beats per Minute

**** NOTE: ****

Not every tempo marking between 25 and 250 Beats per Minute can be played. Near the high end of this range the tempo steps are larger than one Beat per Minute. If you enter a tempo which cannot be played, the DX will play the nearest valid tempo to the one which you entered. Also, if you try to RECORD an invalid tempo, the DX will actually record the nearest valid one.

If you enter a number that is out of the tempo range, the display will flash. You must set the tempo to be in range before you can exit from the tempo mode.

The arrow buttons will always step between valid tempos.

4.8. LENGTH

A sequence can be any length from 1 to 99 measures. The DX sets a length of 2 measures for each sequence unless you set it differently by accessing LENGTH. You can then set the desired number of measures with the arrows or with the keypad.

OPERATION	PRESS	DISPLAY READS
Enter Length Mode	LENGTH (button lights)	" 2"
Set Length to 4 Bars	>	" 3"
	>	" 4"
Exit Length Mode	LENGTH (light goes out)	" 00"

Fig. 4-5: Setting the Sequence Length to 4 Bars

If you have recorded a sequence and then shorten the length, you will lose the measures you have cut. If you lengthen a sequence you have recorded, rests will appear at the end.

If the MEMORY PROTECT switch is on, the Length of a sequence cannot be changed, although the Length may be displayed.

The length of each measure is set by SIGNATURE.

4.9. SIGNATURE

The SIGNATURE button is used to change the time signature.

You can set the DX to play in most any time signature. There can be between 1 and 99 beats per measure, and between a half note and a thirty-second note can receive one beat.

Press SIGNATURE. The time signature will appear on the display and the beats per measure (left side) will flash. You can use the arrows to increase or decrease the beats per measure or you can enter the desired value with the keypad.

Press SIGNATURE again, and the beat value (right side) will now flash. You can use the arrow buttons to increase or decrease the beat value to any common increment.

NOTE: You can only change the time signature if the selected sequence is empty. If the sequence is not empty, the display will not flash and the time signature cannot be changed.

OPERATION	PRESS	DISPLAY READS
Access Signature Mode	SIGNATURE (Button lights)	" <u>4</u> 4"
Change to 3 Beats per Bar	<	" <u>3</u> 4"
Access Beat Value	SIGNATURE	" 3 <u>4</u> "
Change to Eighth note value	>	" 3 <u>6</u> "
	>	" 3 <u>8</u> "
Exit time signature	SIGNATURE	" 00"

Fig. 4-6: Setting the Time Signature to 3/8

4.10. QUANTIZE

Quantizing automatically corrects your playing to the nearest beat. The quantizing value also establishes the smallest beat that can be recorded and is also used for establishing the value of a "Beat" as used in STEP and SWING.

The DX is normally set to quantize to a sixteenth note. To change the quantizing, press QUANTIZE. The display will show the value of quantizing currently set. You can now enter the note value that the DX will round off to by using the arrows to increase or decrease the number in the display. The quantize values are:

1- 4	Quarter Note
1- 6	Quarter Note Triplet
1- 8	Eighth Note
1- 12	Eighth Note Triplet
1- 16	Sixteenth Note
1- 24	Sixteenth Note Triplet
1- 32	Thirty-Second Note
1- 48	Thirty-Second Note Triplet
OFF	Quantize Defeated (1/192 note resolution)

Table 4-1: Possible Quantize Values

OPERATION	PRESS	DISPLAY READS
Access Quantize Mode	QUANTIZE	"1- 16"
Set Eighth Notes	<	"1- 12"
	<	"1- 8"
Exit Quantize Mode	QUANTIZE	" 00"

Fig. 4-7: Set Quantizing to Eighth Notes

Quantize is a record function. That is, it only corrects what you are recording. This enables you to record over and over on the same sequence in different quantize modes. Quantizing is also independent of the metronome. It is possible to quantize to the nearest quarter note, even though the metronome is clicking in sixteenth notes.

NOTE: Changing the quantize value will reset the swing to 50% (no swing).

4.11. METRONOME

The metronome can be set to click in any note value between half notes and thirty-second notes. The metronome defaults to eighth notes and varies in speed according to the tempo.

4.11.1. Listening to the metronome

The METRONOME is heard through the mixed outputs of the DX while in RECORD, and is accented on each downbeat. The bar number will change on each downbeat, as well.

The METRONOME also appears at the CLICK OUT jack on the rear panel while in RECORD or PLAY and may be routed through an external mixer. The output of the CLICK OUT jack is not accented and has been designed to be used to clock analog sequencers and other devices, such as the Arpeggiator of the OB-8. See "SYNCHRONIZING THE DX AND OTHER SEQUENCERS".

4.11.2. Setting the value of the metronome

To change the value of the metronome clicks, hold the EDIT button and while holding the EDIT button, press the QUANTIZE button. Both the EDIT and QUANTIZE buttons will now be lit and the metric value of the click currently set will show on the display. You can now change the note value that the Metronome will click at by using the arrows to increase or decrease the number in the display. The metronome will remain at its selected value until changed. The click values are:

1- 2	Half Note
1- 4	Quarter Note
1- 6	Quarter Note Triplet
1- 8	Eighth Note
1- 12	Eighth Note Triplet
1- 16	Sixteenth Note
1- 24	Sixteenth Note Triplet
1- 32	Thirty-Second Note

Table 4-2: Possible Metronome Values

To exit, press EDIT again.

4.12. STEP

STEP allows you to record or edit a sequence one beat at a time. Normally the beat is set to a sixteenth note (this can be changed-- see QUANTIZING). STEP mode cannot be used if quantize is off.

NOTE: The DX will not enter the STEP mode if the MEMORY PROTECT switch on the rear panel is ON. See "MEMORY PROTECT SWITCH".

4.12.1. Recording in Step

From stop, pressing STEP places you at the beginning of the sequence. Every time a drum is pressed, the sequence advances one beat. To program a rest, press the forward arrow. To stop, press STEP once again.

While in Step mode, the right half of the display will show the beat number, and the left half of the display will show the bar number. If you press STEP while in RECORD, the sequence will step from its present location and go back to RECORD when STEP is pressed again.

4.12.2. Erasing in Step

While in STEP, you can erase any of the drums one beat at a time. Pressing ERASE and the desired DRUM erases only that drum on that beat.

OPERATION	PRESS	DISPLAY READS
Access Step Mode	STEP	" 1 0"
Step to beat 4	>	" 1 1"
	>	" 1 2"
	>	" 1 3"
	>	" 1 4"
Record Snare on beat 5	SNARE	" 1 5"
Step to beat 7	>	" 1 6"
	>	" 1 7"
Erase Crash on beat 7	ERASE (hold) CRASH (the DX will "beep")	" 1 7"
Exit Step Mode	STEP	" 00"

Fig. 4-8: Recording and Erasing in STEP

Note: Erasing while in step will only erase notes recorded with the current quantize and swing values.

4.13. SWING

SWING is similar to QUANTIZE in that it corrects the timing of your recordings, however SWING will alter the time so that the first half of the beat gets more than half of the time, creating a "shuffle" feel. Swing can only be used when the Quantize is set to eighth or sixteenth notes.

Press SWING. The display will show the current swing value which is normally set to 50% (the first half of the beat gets 50% of the time). To change the swing value, press the arrows to increase or decrease the percentage (between 50% and 70% in six steps). A Swing value of 66% will change two eighth notes to a pair of tied eighth note triplets followed by a third eighth note triplet. SWING is a RECORD function. That is, it will record your playing corrected to the swing value you have selected.

OPERATION	PRESS	DISPLAY READS
Access Swing Mode	SWING (button lights)	" 50"
Increase Swing to 66%	>	" 54"
	>	" 58"
	>	" 62"
	>	" 66"
Exit Swing Mode	SWING	" 00"

Fig. 4-9: Setting Swing Value to 66%

You can swing in either eighth or sixteenth notes by selecting eighth or sixteenth note quantizing. If QUANTIZE is set to a value other than eighths or sixteenths, the DX will "beep" and the QUANTIZE button will light.

NOTE: Changing the quantize value will reset the swing to 50 % (no swing).

4.14. COPYING SEQUENCES

It is possible to copy one sequence to another. Press COPY. The display will ask you to specify which sequence to copy to which location:

OPERATION	PRESS	DISPLAY READS
Access Copy Mode	COPY (button lights)	"00 "
Select Sequence 25	25 COPY	"25 " "25 00"
Select Sequence 01	01	"25 01"
Execute the copy (DX "Beeps" and then exits Copy Mode)	COPY	" 01"

Fig. 4-10: Copy Sequence 25 to Sequence 01

NOTE: The DX will not enter the COPY mode if the MEMORY PROTECT switch on the rear panel is ON. See "MEMORY PROTECT SWITCH".

4.15. APPENDING SEQUENCES

There are two ways to join sequences together. One is by playing one sequence after another in a SONG (see COMBINING SEQUENCES INTO SONGS, below); the other is to APPEND several existing sequences into one larger sequence. Appending sequences is useful when the same set of rhythms is to be played over and over, for example in a composition having 3 bars of 4/4 followed by 1 bar of 7/8 as a basic phrase element. By making a sequence of 3 bars of 4/4, another of 1 bar of 7/8, and then appending the 7/8 onto the end of the 4/4, you have quickly created your basic phrase element, which can then be repeated over and over, and combined with other sequences as part of a song.

Appending sequences is similar to copying them except that while COPY REPLACES the old sequence with the new one, APPEND ADDS the new sequence to the end of the old one. The process is the same except that you must press RECORD while pressing COPY to execute.

OPERATION	PRESS	DISPLAY READS
Access Copy Mode	COPY (button lights)	"00 "
Select Sequence 25	25 COPY	"25 " "25 00"
Select Sequence 01	01	"25 01"
Access Append Mode	RECORD (hold) (Record button lights)	
Execute Appended Copy (DX "Beeps" and then exits Copy Mode)	COPY	" 01"

Fig. 4-11: Append Sequence 25 to Sequence 01

It is possible to append a sequence to itself. This effectively doubles the length of the sequence. It is also possible to append several sequences, one after another, to one sequence. Appended sequences may be of any time signature or length, however the tempo of the first part of the sequence will be applied to the rest of the sequence as well. If sequences of different time signatures are appended together, the length may not equal an exact number of measures and this will be reflected by a "P" (for Plus) in the length of the sequence. For example, appending a 7/8 sequence to a 4/4 sequence (each of 1 bar length) will cause the display to read:

" 1 P"

because the length of the new sequence is not quite 2 bars of 4/4.

NOTE: Changing the length of a sequence will always result in an exact number of bars.

5. COMBINING SEQUENCES INTO SONGS

One prominent feature of music is that it is organized into sections that repeat and alternate with each other. A SONG allows you to record each section of a piece as a separate sequence and then combine sequences into a complete composition, saving a lot of memory space, not to mention time and effort.

A song then, is a combination of sequences. In addition to the 100 sequences, the DX also contains 50 songs, numbered 00 thru 49. Unlike a sequence (appended or otherwise), a song does not remember the notes, but only a listing of sequences that you wish to play. There can be as many as 255 sequences contained within a song, and each sequence within a song can have its own tempo, length, and time signature.

5.1. SELECTING A SONG

To enter the song mode, press SONG. The Song button will light and the DX will select the song previously selected. To select a song simply press the number of the desired Song.

To exit the song mode, press SONG again.

If you select a song number that is not in the range 0 to 49, the display will change to the song number + "?", e.g. "56 ?". Nothing can be done in song mode until a valid song number is selected.

5.2. PLAYING A SONG

Once the desired song has been selected, press PLAY and the selected song will play from beginning to end and then stop.

OPERATION:	PRESS:	DISPLAY READS:
Access song mode	SONG (button lights)	" 00"
Play song 00	PLAY	" 1 01"

Fig. 5-1: Play Song 00

As the DX plays through the different sequences in the Song, the number of the SEQUENCE being played will be shown on the right half of the display. Each sequence in the Song is given an ascending PART number that reflects its order in the Song. This PART number is shown on the left of the display.

Pressing PLAY while in SONG EDIT will start the DX playing from the edit location.

5.3. EDITING A SONG

Recording a song is different than recording a sequence, because you are not playing any notes, just making a list of sequences.

To edit a song press SONG, then EDIT. Once you enter SONG EDIT mode, the DX will ask you to select the sequences that will make up the song; the SONG LIST.

OPERATION:	PRESS:	DISPLAY READS:
Access Song Mode	SONG (button lights)	" 00"
Access Edit Mode	EDIT (button lights)	" 1 "
	(The left half of the display shows the PART number of the Song. The right half of the display shows the SEQUENCE number contained in that PART. If there is a Sequence number in the right half of the display, the song is not empty and should be erased before recording; see ERASING A SONG.)	
Start Song with Sequence 01	01	" 1 01"
	(The DX will "beep" whenever you insert or delete a sequence)	
Advance to Part 2	>	" 2 "
Continue with Sequence 02	02	" 2 02"
Advance to Part 3	>	" 3 03"
Continue with Sequence 01	01	" 3 01"
Advance to Part 4	>	" 4 "
Continue with Sequence 00	00	" 4 00"
Advance to Part 5	>	" 5 "
Repeat Sequence 00	00	" 5 00"
Finish	EDIT (light goes out)	" 00"

Fig. 5-2: Editing Song 00

To play the song you have just created, press PLAY. If you press PLAY while the EDIT light is still on, you will start playing at the displayed part number. Realize that the DX will play through all of the selected sequences, even if some of them are empty.

NOTE: The DX will not EDIT a SONG if the MEMORY PROTECT switch on the rear panel is ON. See "MEMORY PROTECT SWITCH".

You can revise the listing in a song by repeating the steps in the example above. If there are already sequences contained in the song the display will display the sequence contained in the first part. You may move through the song list by using the forward and reverse arrows to get to the part of the song that you wish to revise. You have three editing options:

REPLACE

You can REPLACE any sequence currently displayed with another simply by entering the new sequence number.

INSERT

By pressing RECORD and EDIT, the DX will insert sequence 00 into the song list before the sequence previously displayed. You can then REPLACE sequence 00 with the desired sequence by entering its number.

DELETE

By pressing ERASE and EDIT, the DX will remove the displayed sequence from the song list.

When the right half of the display is empty, the song is at the end. Typing numbers at the end of the song will add sequences to the end of the song.

OPERATION:	PRESS:	DISPLAY READS:
Access Song Mode	SONG (button lights)	" 00"
Access Edit Mode	EDIT (button lights)	" 1 01"
Advance to the next part	>	" 2 02"
Advance to the next part	>	" 3 01"
Replace Sequence 01 with Sequence 05	05	" 3 05"
Advance to the next part	>	" 4 00"
Advance to the next part	>	" 5 00"
-----continued-----		

OPERATION:	PRESS:	DISPLAY READS:
Delete Sequence 00	ERASE (hold) EDIT ("beep")	" 5 00" " 5 "
		(You just removed the last sequence in the song so you are now at the end)
Rewind back	<	" 4 00"
Rewind back	<	" 3 05"
Insert a sequence	RECORD (hold) EDIT ("beep")	" 3 00"
		(Remember, you just inserted a sequence, so all the sequences after get moved back accordingly.)
Replace Sequence 00 with Sequence 26	26	" 3 26"
Finish Editing	EDIT (light goes out)	" 00"

Fig. 5-3: Re-editing Song 00

5.4. ERASING A SONG

You may erase an entire song by holding ERASE and pressing SONG. Individual sequences within a song may be deleted in the edit song mode (see RECORDING A SONG).

5.5. SONG TEMPO

Each sequence within a song will play at its programmed tempo, allowing tempo changes within a song. The Tempo of the entire Song can be increased or decreased by pressing the TEMPO button while in SONG. Use the arrow buttons to increase or decrease the SONG TEMPO.

When in song mode, changing the tempo changes the tempos of each sequence in that song by a proportional amount, and the display will show the percent change i.e., " 10" (if 10% faster), or " - 10" (if 10% slower). Any change in the Song Tempo will be stored with the Song as well. The tempos programmed with each individual sequence are not affected.

6. UTILIZATION OF MEMORY

The total memory capacity of the DX is 2000 events. There are many ways this capacity can be divided among the sequences. For instance, the DX can accommodate one sequence of 2000 notes, or 100 sequences of 20 notes each. In general, it is best to take advantage of the repetitive nature of music by programming several short sequences and selecting between them.

Each part of a song requires one-third as much memory as a single event in a sequence! A song consisting of one bar repeated eight times uses only one fifth the memory of an eight bar sequence. Therefore, the most efficient use of memory is achieved by using the SONG mode whenever possible.

6.1. DISPLAY OF AVAILABLE MEMORY SPACE

The percentage of memory space left can be displayed when in Sequence mode and in STOP (all button lights off), by pressing and holding both EDIT and LENGTH. The display reads the percentage of memory available for recording the current sequence. The percentage free may vary depending on the length of the current sequence.

Note: The DX will never be 100% empty even after erasing everything, because it uses memory space to set all 100 sequences to 2 bars of rests in 4/4 time with a tempo of 80 beats per minute. The DX will show approximately 95% left after erasing everything.

6.2. RUNNING OUT OF MEMORY

If the available memory space is exhausted while in Record, Copy, Length, or any other mode, the DX display will stop recording, "beep", and display "FULL".

7. CASSETTE INTERFACE

The DX 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 proper connecting cables.

Cassettes recorded on the DX are compatible with those recorded on the Oberheim DMX Drum Machine. Tapes recorded on the DMX will play on the DX, however the DX will ignore the DMX's additional Tom-toms (4,5, & 6), Tambourine & Rimshot, and will play the DMX's Ride Cymbal as soft Crashes.

7.1. CASSETTE INTERFACE CONNECTIONS

Connect the Line or Ext. Speaker Output of your cassette recorder to the jack labeled "TO OUTPUT" on the rear of the DX. Connect the "TO INPUT" jack on the rear panel of the DX to the Line or Aux Input (preferably) or Mic Input of your cassette recorder.

** NOTES **

It is necessary to use both the record and the playback cables to transfer cassette data.

To reduce hum, remove the cables to the cassette recorder when not using the Cassette Interface.

7.2. RECORDING PROGRAMS ONTO TAPE

- 1) Connect the Cassette Recorder to the Cassette Interface Jacks on the rear panel of the DX as described in "CASSETTE INTERFACE CONNECTIONS", above.
- 2) Enable the Cassette Interface by throwing the switch on the rear panel. The display will now read "CASS".
- 3) If the tape recorder has a record level control, set it so that the leader tone registers 0 VU.
- 4) Press the RECORD switch on the tape recorder. You should now hear a steady tone through the MIXED OUTPUTS of the DX. The volume of the tone you hear is controlled by the Metronome control.
- 5) Press the CASSETTE RECORD button on the DX (same as the STEP button). After the RECORD switch is pressed, ten seconds of the steady "leader" tone will be sent out followed by the actual memory information. During this time, the RECORD button will be lit. After all of the memory information has been transferred, the RECORD button light will go out and the DX will "beep".
- 6) It is very important to immediately CHECK a tape after recording. See "CHECKING PROGRAMS RECORDED ON TAPE", below.

7.3. CHECKING PROGRAMS RECORDED ON TAPE

The CHECK function of the Cassette Interface enables verification of the data on a tape without actually transferring the data into the DX'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 DX as described in "CASSETTE INTERFACE CONNECTIONS", above.
- 2) Enable the Cassette Interface by throwing the switch on the rear panel. The display will now read "CASS".
- 3) Press the PLAY switch on the tape recorder. You will now be able to monitor the tape through the MIXED OUTPUTS of the DX.
- 4) Wait until the "leader" tone is heard, and then press the CASSETTE CHECK button on the DX. Several seconds of the "leader" tone should be heard between pressing CHECK and hearing the rough sound of the memory information. The CHECK button will be lit from the time the button is pressed until the information transfer has been completed. The light will then turn off and the DX will "beep".
- 5) If an error is detected, all three of the cassette buttons will light, the DX will "beep" twice, and the display will read "bAd".

NOTES: Once the leader tone has started the cassette interface must complete its cycle.

Some cassette recorders invert the phase of the signal in the process of recording and playing back. If your cassette recorder NEVER plays data properly, the inverted phase may be the problem. To set the DX to read inverted data, hold the "0" button while pressing CHECK. The display will read "-CAS", indicating that the DX is expecting inverted data.

If the volume is too low or the phase of the tape recorder is wrong, and the DX gets stuck in CHECK or PLAY, reset the DX by turning it off and then on again.

7.4. PLAYING PROGRAMS FROM TAPE INTO THE DX

- 1) Connect the Cassette Recorder to the Cassette Interface Jacks on the rear panel of the DX as described in "CASSETTE INTERFACE CONNECTIONS", above.
- 2) Set the playback volume on the tape recorder to 3/4 of maximum.
- 3) Enable the Cassette Interface by throwing the switch on the rear panel. The display will now read "CASS".
- 4) Press the PLAY switch on the tape recorder. You will now be able to monitor the tape through the MIXED OUTPUTS of the DX.
- 5) Wait until the "leader" tone is heard, and then press the CASSETTE PLAY button on the DX. Several seconds of the "leader" tone should be heard between pressing PLAY and hearing the rough sound of the memory information. The PLAY button will be lit from the time the button is pressed until the information transfer has been completed. The light will then turn off and the DX will "beep".
- 6) If an error is detected, all three of the cassette buttons will light, the DX will "beep" twice, and the display will read "bAd".

NOTE: The DX will not enter the CASSETTE PLAY mode if the MEMORY PROTECT switch on the rear panel is ON. The CHECK mode will still function. See "MEMORY PROTECT SWITCH".

7.4.1. Tape Recorder Phasing

Some cassette recorders invert the phase of the signal in the process of recording and playing back. If your cassette recorder NEVER plays data properly, the inverted phase may be the problem. To set the DX to read inverted data, hold the "0" button while pressing PLAY. The display will read "-CAS", indicating that the DX is expecting inverted data.

7.5. POSSIBLE CAUSES OF TAPE TRANSFER ERRORS

If errors are found during the play or check process, the display will read "bAd" If this happens, one of the following reasons might be responsible:

- A) 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 is very low, the DX will not acknowledge the data at all.
- B) The PLAY or CHECK button was pressed before the leader tone started.
- C) The leader tone is too short. Several seconds of the "leader" tone should be heard between pressing PLAY and hearing the rough sound of the memory information.
- D) 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.
- E) Some cassette recorders invert the phase of the signal in the process of recording and playing back. If your cassette recorder NEVER checks or plays data properly, the inverted phase may be the problem. To set the DX to read inverted data, hold the "0" button while pressing CHECK or PLAY. The display will change to read "-CAS", indicating that the DX is expecting inverted data.
- F) The playback head azimuth of the tape recorder may be out of alignment. This will only affect recordings made on other tape recorders.
- G) The Batteries in the cassette machine are too weak.
- H) There is a bad spot on the tape.
- I) Sometimes tape errors are caused by poor recordings. Set the recording level manually if possible, and use a LINE or AUX input if available.

8. BATTERY BACKUP

The DX contains a lithium battery that maintains power to the memory even when the DX is unplugged. This way you can turn off the power and not lose your sequences.

With normal use, battery should last 5 years before needing replacement. However, you should always record important sequences onto cassette, using the Cassette Interface.

9. SYNCHRONIZING THE DX

9.1. SYNCHRONIZING TO THE DSX SEQUENCER

The Oberheim DX, DMX Digital Drum Machine, and DSX Digital Polyphonic Sequencer have all been designed to operate in sync with each other. When the DX runs in tandem with a DSX, DMX, or another DX, one unit must be the master and the others the slaves.

9.1.1. Hookup

Using a cable with a mono 1/4" phone plug at each end, connect the CLOCK OUT jack on the rear panel of the unit to be the master to the CLOCK IN jack on the rear panel of the unit to be the slave.

9.1.2. External Clock Operation

Each unit will operate the same as before with the following exceptions:

The TEMPO is controlled by the master. Increasing the tempo on the master will increase the tempo on the slave as well. The DX and DSX have the same TEMPO programming. Recordings may be made separately and synchronized later.

To Record, press RECORD and PLAY as before. The only difference here is that recording on the slave will not start until the master is playing.

9.1.3. Synchronization Tricks

The synchronization between the DX and the DSX is the EXTERNAL CLOCK, of which the metronome is a subdivision. The tempo of the master unit will control the tempo of the slave. Sequences may be any length on either machine. When the master starts, the external clock will start the slave at the same time (the slave must be in PLAY or RECORD). When the master sequence stops, the external clock from the master will stop and consequently, so will the slave, even if it has not finished its sequence or if it finished and started over. The same with songs. The sequences within a song will play one after the other until the end of the master song.

A DSX can be synchronized to tape and then slave a DX. Play the sync tone from the tape into the DSX (SYNC TO TAPE INPUT) and then out of the DSX (CLOCK OUT) to the DX (CLOCK IN).

9.1.4. External / Internal Clock Selection

Whenever a plug is inserted into the EXTERNAL CLOCK input, the DX will switch to external clock operation and a period on the right side of the display will light up indicating that DX is set to run from an external clock.

Once an external clock is connected, the DX can be switched between internal (normal) and external (slaved) clock operation by pressing and holding EDIT and pressing SWING. The period in the display will be on whenever the DX is set to run from the external clock. The clock source can be selected while in Stop, Play, or Record modes.

9.2. SYNCHRONIZING WITH OTHER SEQUENCERS AND ARPEGGIATORS

The DX has been designed to slave other sequencers or arpeggiators, including the Arpeggiator in the Oberheim OB-8 Polyphonic Synthesizer, by using the metronome as a clock. The CLICK OUT of the DX outputs the metronome at all times for this reason. The tempo of the DX will control the tempo at which metronome clicks, and the metric relationship of the metronome (sixteenths, quarters, etc.) may be altered by changing the CLICK VALUE of the metronome (see METRONOME).

To run the OB-8 arpeggiator from the metronome of the DX simply connect the CLICK OUT of the DX to the ARPEGGIATOR CLOCK IN on the OB-8.

10. EXTERNAL TRIGGER INPUT

The DX has an external trigger jack which enables you to control any drum or any combination of drums from an external source. For example, you might use a GATE from a sequencer such as the Oberheim DSX to trigger the drums.

The EXTERNAL TRIGGER INPUT acts essentially the same as pressing one of the drum buttons on the front panel. When in record, triggering any of the voices externally will cause them to be recorded subject to the same correction schemes (QUANTIZE and SWING) that would apply to the buttons on the front panel.

10.1. TRIGGERING THE INPUT

The EXTERNAL TRIGGER INPUT is designed to be triggered by either the closing of a switch (such as the Oberheim S-OBX Footswitch) or a trigger voltage of +5 Volts or more. Note that the input is designed so that the trigger is generated on the falling edge of the voltage. This means that the input will be triggered when the voltage changes from +5 Volts to 0 Volts. This type of inverted trigger is available on the Oberheim DSX Sequencer by setting the GATE OUTPUTS to their inverted polarity (see the DSX Owner's Manual) and is also the type of voltage generated by a S-TRIG gate.

The polarity of a gate signal can be inverted with the simple circuit shown below:

Fig. 10-1: Gate inverter

The EXTERNAL TRIGGER INPUT can be triggered from drums if the signal is placed through an envelope follower and inverter. A simple circuit is shown here:

Fig. 10-2: Passive envelope follower and inverter

Note: There may be some timing lags when using this circuit. Use of an active envelope follower will reduce the lag time.

Electronic drum pads can also be used to trigger the DX, however the signal level from drum pads tends to be too low and must be amplified (and inverted) to be used with the DX.

10.2. ASSIGNING THE EXTERNAL TRIGGER INPUT

The EXTERNAL TRIGGER INPUT can be assigned to trigger any of the 18 drum buttons. To select which button will be triggered by the input press and hold the EDIT button, press the desired drum button(s), and while holding them release the EDIT button.

Several buttons can be assigned to be triggered by the external input by pressing several drum buttons while holding the EDIT button. Realize that only one of the three buttons on each voice can be played at a time so that if you attempt to assign two of the Tom-Toms to be triggered at once for example, only the lowest one will sound.

The external trigger can be assigned in Play, Record, or Stop. Realize that in Record, the buttons pressed will be recorded in the sequence as well.

11. FOOTSWITCHES

On the rear panel are two jacks for footswitches. These inputs are designed to be used with switches with a MOMENTARY CLOSED configuration such as those available from Oberheim.

11.1. START FOOTSWITCH

When in sequence mode (all button lights off) pressing the START footswitch will play the sequence from the beginning. Pressing the footswitch again will stop it. Pressing it once more will restart the sequence from the beginning.

When in song mode (Song button light on) the switch works a bit differently. From STOP, pressing the footswitch starts the song from the beginning. Pressing it again will stop it. If the footswitch is pressed once more, the song will continue from where it stopped.

11.2. NEXT FOOTSWITCH

When in sequence mode (all button lights off) pressing the NEXT footswitch advances the DX to the next sequence. When playing a sequence, the DX will wait until the sequence currently being played is finished before starting the next sequence.

When in song mode (Song button light on) the switch works a bit differently. From STOP, pressing the footswitch advances the DX to the next song. While playing a song, if the NEXT footswitch is held down at the end of a sequence, the DX will "vamp", that is, repeat the current sequence, and NOT advance to the next sequence in the song. Releasing the switch will allow the song to continue.

A. A WORD ABOUT DIGITAL AUDIO

The DX is not a Synthesizer. It does not synthesize sound. What it does is play back sounds from its memory. These sounds are stored as numbers, inside special integrated circuits called EPROM's (Erasable Programmable Read Only Memory) which are programmed at the factory.

Before explaining how digital audio works, let's digress for a minute and discuss how regular analog audio works:

Sound, as far as your ears are concerned, is caused by very small but regular changes in atmospheric pressure. The air moves back and forth, over and over, alternately pushing and pulling on your eardrums and the rest of your body. When these waves of air occur between 20 and 20,000 times per second, your brain perceives them as sound. So anything that makes noise ultimately must disturb the air in this sort of regular way. Look at the low frequency speaker in your sound system. If you turn the volume way up (don't damage your speakers, though!) you will see the speaker (and feel the air near it) moving in and out, in exactly this sort of regular movement.

So what any analog audio system does, then is provide a pattern of regular movement (Oscillation) for the speaker to move in, so that you feel the air moving in this same pattern so that your brain can translate all this into sound and you can HEAR! Look at a phonograph record very closely and you will see the same repeating wiggles that are amplified by your amplifier to move your speakers.

Digital audio stores, not the oscillations that move your speakers, but a series of numbers that represents those oscillations. Take the groove from that phonograph record and, in your mind, stretch it out in a straight line and place it on a piece of graph paper. Now if you went from the left end of the graph to the right, and every centimeter wrote down a number that represented how far that phonograph wiggle moved up and down, you would become a recorder of digital audio. Now, if you took another piece of graph paper and plotted all those numbers that you just wrote down, you would do what a digital audio recorder does to play back.

So what is programmed inside an EPROM in the DX is a series of numbers (lots of numbers!) that represents the sound of a snare drum. Another one has the representation of the sound that a cymbal makes, and so on, for all of the sounds.

B. DX - FACTORY SEQUENCES / SONGS

The Oberheim DX Digital Drum Machine comes with a set of stock sequences recorded on cassette. These sequences may be used as-is so that you can start using your DX right away, or they can be edited and modified to suit your needs.

The 78 sequences are organized into groups of four: Each group consists of an "A" version, a "B" version (essentially two variations of the same beat), and an "A" and a "B" fill. These four parts are designed to go together for maximum ease in constructing songs. For instance, the "A" part may be used as a verse of a song, and the "B" variation may be used as a chorus or bridge. The "A" and "B" fills are designed to provide smooth transitions from "A" to "B" and back again. Of course it is possible to freely intermix any of the sequences and fills, and this is done in some of the example songs. Sequence 77 is a single beat that can be used as a simple ending for many of the possible songs. Sequence 00 is intended as a brief demonstration of the kinds of things it is possible to program with the DX.

The factory tape also comes with 19 songs, which are not complete songs, but are intended as examples of how typical songs can be constructed using the stock sequences. As with the sequences, these songs may be edited to suit your needs. Song 00 is essentially a "directory" of all the stock sequences: It simply plays all of the 76 rhythms in order, to provide a quick & easy way to audition the stock beats.

The factory sequences consume about 3/4 of the DX's memory capacity. If you want to program your own rhythms and songs, it is best to erase any or all of the stock sequences you do not intend to use. Save the factory cassette, so that you can re-load the factory stocks whenever you want.

- | | | | |
|-----|-------------------|-----|-----------------|
| 0. | Demonstration | | |
| 1. | Rock 1A | 41. | Disco A |
| 2. | Rock 1A Fill | 42. | Disco A Fill |
| 3. | Rock 1B | 43. | Disco B |
| 4. | Rock 1B Fill | 44. | Disco B Fill |
| 5. | Rock 2A | 45. | Funk A |
| 6. | Rock 2A Fill | 46. | Funk A Fill |
| 7. | Rock 2B | 47. | Funk B |
| 8. | Rock 2B Fill | 48. | Funk B Fill |
| 9. | Rock 3A | 49. | Polka A |
| 10. | Rock 3A Fill | 50. | Polka A Fill |
| 11. | Rock 3B | 51. | Polka B |
| 12. | Rock 3B Fill | 52. | Polka B Fill |
| 13. | Rock 4A | 53. | Samba A |
| 14. | Rock 4A Fill | 54. | Samba A Fill |
| 15. | Rock 4B | 55. | Samba B |
| 16. | Rock 4B Fill | 56. | Samba B Fill |
| 17. | Rock 5A | 57. | Bossa A |
| 18. | Rock 5A Fill | 58. | Bossa A Fill |
| 19. | Rock 5B | 59. | Bossa B |
| 20. | Rock 5B Fill | 60. | Bossa B Fill |
| 21. | Shuffle A | 61. | Mambo A |
| 22. | Shuffle A Fill | 62. | Mambo A Fill |
| 23. | Shuffle B | 63. | Mambo B |
| 24. | Shuffle B Fill | 64. | Mambo B Fill |
| 25. | Honky-Tonk A | 65. | Waltz A |
| 26. | Honky-Tonk A Fill | 66. | Waltz A Fill |
| 27. | Honky-Tonk B | 67. | Waltz B |
| 28. | Honky-Tonk B Fill | 68. | Waltz B Fill |
| 29. | Boogie A | 69. | Reggae A |
| 30. | Boogie A Fill | 70. | Reggae A Fill |
| 31. | Boogie B | 71. | Reggae B |
| 32. | Boogie B Fill | 72. | Reggae B Fill |
| 33. | Swing A | 73. | 7/4 Rock A |
| 34. | Swing A Fill | 74. | 7/4 Rock A Fill |
| 35. | Swing B | 75. | 7/4 Rock B |
| 36. | Swing B Fill | 76. | 7/4 Rock B Fill |
| 37. | Country A | 77. | End |
| 38. | Country A Fill | | |
| 39. | Country B | | |
| 40. | Country B Fill | | |

Table B-1: Factory Stock Sequences

- | | |
|--------------------|----------------|
| 0. Directory | 10. Country |
| 1. Hard Rock 1 | 11. Disco |
| 2. Hard Rock 2 | 12. Funk |
| 3. Rock Ballad | 13. Polka |
| 4. Old-time Rock | 14. Samba |
| 5. Slow Rock | 15. Bossa Nova |
| 6. Shuffle | 16. Mambo |
| 7. Honky-Tonk Rock | 17. Waltz |
| 8. Boogie | 18. Reggae |
| 9. Swing | 19. 7/4 Rock |

Table B-2: Factory Stock Songs

C. G L O S S A R Y

This Glossary contains definitions of terms as used in the DX Manual.

BEAT VALUE

The note value of the time signature. In a time signature of 3/4, the BEAT VALUE is equal to a quarter note, and there are three quarter notes per measure.

CLICK VALUE

The note value of the metronome click. The CLICK VALUE may be the same or different than the BEAT VALUE.

CONTROL VOLTAGE

An electrical signal which can be used as an input to Voltage Controllable devices such as Oscillators, Filters, Amplifiers, etc.

DATA

DATA is the information that is processed by the MICROPROCESSOR. It is stored in an ADDRESS.

DEFAULT

The result of not making decisions concerning parameters in the DX. If you do not specify how long a sequence is to be for example, the DX will DEFAULT and specify that the length is to be two bars.

EPROM

This acronym stands for Erasable Programmable Read Only Memory, which is exactly what it is, a memory chip that is programmed with digital data. Once programmed, the memory can only be read from by the MICROPROCESSOR, and can not be written into like the Random Access Memories (RAM). However, an EPROM can be erased by exposing it to ultraviolet light and reprogrammed.

In the DX the digital sounds, as well as the computer program that runs the DX are stored on EPROMS.

EVENT

Any number of drums that are played on the same beat. The DX has the capacity to store 2000 EVENTS, each of which may contain between 1 and 6 notes.

GATE

An electrical signal which can be used to trigger Envelope Generators and other time dependent devices.

SONG

A combination of sequences.

MICROPROCESSOR

The MICROPROCESSOR is the "brain" of the DX. It looks at the SOFTWARE instructions and then carries them out, reading DATA from the proper memory location (ADDRESS), performing the instructed function, and then writing the result in another ADDRESS.

PART

In the DX the term PART refers to a segment of a Song. Each Sequence listed in a Song adds another PART to the Song. Each Song can contain up to 255 parts, each of which is one of the 100 Sequences.

PROMPT

A statement which appears on the display when the DX needs information from you; for example, which sequence to play, what tempo to play at, etc.

QUANTIZE

A process of rounding off, in the case of the DX the rhythms that are played, to the closest specified increment. In the DX, your recordings can be QUANTIZED to the nearest Quarter note, Eighth note, or other smaller subdivisions down to a Forty-Eighth note.

RANDOM ACCESS MEMORY (RAM)

Random Access Memory acts like a piece of scratch paper for the MICROPROCESSOR. Unlike Read Only Memory (ROM, PROM, or EPROM), RAM can be read from AND written into by the MICROPROCESSOR. RAM is usually used in a computer system to store information that is constantly changing. In the case of the DX, that includes notes, tempos, sequences, etc.

SEQUENCE

A succession of events stored in the DX as numbers. The DX will remember the events as played and then will repeat them upon command.

SOFTWARE

The computer program or instructions that the computer follows to do its assigned task. In the DX and other Oberheim products, the SOFTWARE is stored in EPROMS located on the circuit boards.

D. SPECIFICATIONS

NUMBER OF SOUNDS: 18

FREQUENCY RESPONSE: 10-16,000 Hz

(varies among voices and is dependent upon tuning)

DYNAMIC RANGE: 80 db

MAXIMUM NUMBER OF NOTES: 2000 Events, each of which may contain as many as six notes occurring simultaneously

NUMBER OF SEQUENCES: 100

NUMBER OF SONGS: 50

MAXIMUM TYPICAL SEQUENCE LENGTH: 6 Minutes of 1/8 Notes at 80 Beats/Minute

MAXIMUM SEQUENCE LENGTH: Over 5 Hours at 25 Beats/Minute

MAXIMUM SONG LENGTH: 255 Sequences

TEMPO RANGE: 25-250 Beats per Minute (programmable with each sequence and song)

RECORDING MODES:

REAL TIME: Records rhythm as buttons are pressed. Selectable Quantize Mode rounds off rhythms from 1/32 notes to 1/4 notes.

STEP: Notes and rests are programmed separately, one beat at a time. Value of beat may be between 1/4 note and 1/32 note.

INPUTS:

EXTERNAL TRIGGER (programmable): contact closure to ground or voltage
Level: +5 Volts, inverted
Impedance: >4.7 K
Timing: 10ms.

EXTERNAL CLOCK INPUT: Level: 5 Volt positive pulse, TTL compatible
Timing: 300us. min.

FOOTSWITCHES: Start/Stop, Next Sequence; contact closure to ground
Timing: 10ms.

OUTPUTS:

SIGNALS: Stereo and Mono mixed outputs, individual voice outputs
Level: +4dBm (nominal)
Impedance: 50 Ohms, unbalanced

METRONOME: +10V Pulse, Timing: 1ms.

EXTERNAL CLOCK: Level: +5 Volts positive pulse, TTL compatible
Timing: 300us. min.

POWER: 95-130 or 190-260 Volts AC, 18 Watts

DIMENSIONS: 18"L X 11.8"W X 5"H (45.7cm.L X 30.0cm.W X 12.7cm.H)

WEIGHT: 12 Lbs. (5.4 Kg)

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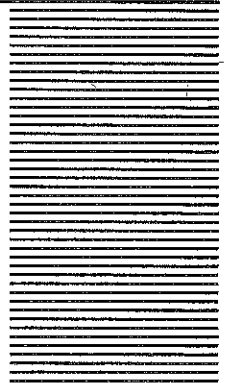
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