





A Division of ECC Development Corporation Preliminary Edition

# Oberheim

Mattrix-6

6-Voice Polyphonic MIDI Synthesizer SERVICE MANUAL

Preliminary Edition - February 1986

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# MATRIX-6 SERVICE MANUAL PRELIMINARY EDITION - February, 1986



# CALIBRATIONS

- TUNE While in MASTER EDIT, pressing the B button puts the MATRIX-6 into AutoTune. The cycle takes approximately two to three seconds to complete, during which time the display reads "TUNING...". While in TUNE mode, the processor is tuning the MATRIX-6's three High Frequency Oscillators (HFOs).
- 2. CALIBRATE While in MASTER EDIT, pressing the A button puts the MATRIX-6 into Parameter Select mode. While in this mode, call up parameter 52 and the display should read "52 CALIBRATE". Now press the D button. This will put the MATRIX-6 into VALUE mode and the display will read "READY?". Press the YES button on the Keypad the display will blank out during the Calibration routine. When the process is finished, the display will return to read "52 CALIBRATE".

The CALIBRATE function calibrates the three HFOs as well as the VCF Frequency, Pulse Widths, Resonance amount and VCA2 level on each voice. If the MATRIX-6 encounters any problems while tuning the voices, it will display which voice and the section of that voice that is having the problem. To display tuning failures enter CALIBRATE mode and, with the display blank, press and hold the C button until the display returns to "52 CALIBRATE".

If the MATRIX-6 tunes all six voices without encountering any problems, the display will remain blank during the tuning process. When problems are encountered, the display will indicate which of the four sections of the tuning process and the voice or voices that are bad. Failures in any of the four sections of the tuning process are displayed with the following messages:

"BAD OSC ** "	for problems with the HFOs.
"BAD WAVE ** "	for oscillator waveform problems.
"BAD RES ** "	for resonance problems.
"BAD VCF ** "	for filter problems.

The two stars in each message represent a two digit number that indicates which voice or voices have failed that section of the Calibration. The number is a

MATRIX-6 Service Manual ECC / Oberheim - Los Angeles, CA 90064 - Part # 950060 Page 1 decimal equivalent of a binary number, with each digit in the binary number corresponding to a particular voice. For example, if the display reads "*BAD OSC* 63 ", it would be broken down like this:

Decimal number -	63					
Value of binary digits -	32	16	8	4	2	1
Binary equivalent -	1	1	1	1	1	1
Corresponding bad voices -	V6	V5	V4	V3	V2	V1

So if the display reads "*BAD OSC 63* " this means that all six of the voices have failed the Oscillator section of the tuning. Now if the display reads "*BAD WAVE 24* ", it would be broken down like this:

Decimal number -	24					
Value of binary digits -	32	16	8	4	2	1
Binary equivalant -	0	1	1	0	0	0
Corresponding bad voices -	-	V5	V4	40 em		614 Her

With "BAD WAVE 24 ", Voices four and five have failed the waveform Calibration.

Note: When trying to display the tuning failures, be sure to watch the display, because the failure displays are only shown for a short time.

When tuning failures are encountered, run the CALIBRATE function two more times. If there are no more failures after the third attempt, Tuning is OK. This will happen most often when the unit is cold.

**3. DAC CALIBRATION** - To enter this mode, the MATRIX-6 must be in MASTER EDIT parameter select mode. With parameter "52 CALIBRATE" displayed, first press and hold the **D** button. Next, press and hold the **C** button then press and hold the **B** button. The MATRIX-6 is now in DAC CALIBRATION mode and all three held buttons can be released. The display should read "*TUNING...*".

Caution: Be careful not to short any pins when zeroing the DAC.

With a DVM in the millivolt range, set the DAC output to 0.000 volts. The DAC output is measured at pin 6 of U712 on the Voice board. Connect the DVM ground to the ground leg of C13 (the leg toward rear of unit). C13 is directly behind U704. Adjust the DAC output to zero by turning the trimmer located directly behind U712. To exit DAC CALIBRATION mode press the MASTER button.

Note: After zeroing the DAC, the MASTER EDIT parameter number "52 CALIBRATE" must be preformed.

4. HFO CALIBRATION - To enter the High Frequency Oscillator Calibration mode, the MATRIX-6 must be in the MASTER EDIT parameter select mode.

Select parameter number "52 CALIBRATE". Now press and hold the **C** button, then press and hold the **B** button. The MATRIX-6 is now in HFO CALIBRATION mode and the held buttons can be released.

Caution: when adjusting the coils of the HFO's, take care not to damage the very fragile core.

When adjusting HFOs, be sure to remove adjusting tool from the core of the coil before taking the frequency measurement.

There are three High Frequency Oscillators which need to be adjusted when Calibrating HIFO's. The adjustments are made first at L2, then L3 and last L1. Use a Frequency Counter to set the frequency of all three Oscillators between 3.500 and 3.505 MegaHZ. After L1 is set, the frequency of L2 and L3 should be double checked to make sure they have not changed.

To adjust L2 connect Frequency Counter to pin 14 of U732. To adjust L3 connect Frequency Counter to pin 14 of U733. To adjust L1 connect Frequency Counter to pin 14 of U736.

After adjusting all three HFOs, exit HFO CALIBRATION mode by pressing MASTER button.

Note: After Calibrating the HFOs, the MASTER EDIT parameter "52 CALIBRATE" must be preformed.

5. PROCESSOR RESET & INITIALIZE - First, make sure the AC power is turned off. Press and hold the red STORE button. Turn the AC power on and the display should have one or two characters flickering in the display. Now release the STORE button and the display will go blank for a few seconds. When the display resets, it will recall patch number "00". Although the unit will display patch "00", it will be playing the initialized patch.

### POWER SUPPLY

VOLTAGE	TOLERANCES	J03 PIN # *
-5	+/- 200mv	1
+5A	+/- 200mv	3,4
+5B	+/- 200mv	5,6
+12	+/- 500mv	7,8
-12	+/- 500mv	9,10
-42	-41v to -45v	n/a **

\* J03 is the connector located on the Power Supply board.

\*\* The -42 volt supply is measured on the noncomponent side of the Display Board, at the point labeled "-42", located directly behind the fluorescent display.

# MEMORY VOLTAGE

The memory voltage is measured at pin 28 of U7 orU8.

Power off: The voltage should range from +3 to +2.4 volts. If the voltage goes below +2.4, the MATRIX-6 may lose all or part of its memory.

Power on : The voltage should be 4.4 volts +/- 60mv.

### TAD

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# Oberheim Matrix 6 / 6R V 2.0 ↔ (6 Voice Synthesizer)

### System Exclusive

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The M-6 uses System Exclusive messages to send patches from one unit to another and to allow one M-6 to be the "front panel" for another when editing patches and setting parameters. This section describes the system exclusive message functions and formats.

#### General Format

All system exclusive messages generated and recognized by the M-6 have the same general structure. This structure consists of three parts: a Lead-In, which starts and identifies the system exclusive sequence, an operation, which contains an opcode and data bytes, and an End of Exclusive status byte. There can only be one operation in the system exclusive message.

There are two valid formats of the lead in sequence. One is specific to the Matrix-6 and Matrix-6R, and is a "general" message addressable to any device. They differ only in the device ID (06H for the M-6, 7FH for "general"). Unless otherwise noted, the M-6 will recognize system exclusive messages sent with either lead-in, and will always generate the M-6 specific format on transmission. The format of an entire system exclusive message is:

1	FOH	System Exclusive byte
1		Oberheim ID code
	ld	Device ID, 06H for M-6 specific format, 7FH for general format
	opcode>	Opcodes are always in the range 0 through 127 inclusive
<	data bytes>	The number of date bytes is defined by the
		<pre><opcode>.</opcode></pre>
F	7H	The data bytes are always in the range 0 through 7FH. End of System Exclusive (EOX)

While the M-6 always generates an EOX byte to end its system exclusive transmission, it will recognize any status message except real-time messages as ending a received system exclusive message. Any system exclusive message which contains a manufacturer ID other than 10H or a device ID otherthan 06H or 7FH, or an illegal opcode is ignored. In addition, the Matrix-6 will always wait 20 mSec after sending an EOX byte before sending any other data. Conversely, system exclusive data send to the M6 - particularly patch dumps - should be separated by at least 20 mSec.

The individual operations are described on the next page.

#### Oberheim Matrix 6/6R V2.0

#### Patch Transmission

#### See Source

See source The M-6 can both send and receive patches, split patches, and master parameters via MIDI. Patch transmission can be triggered from the front panel or via a MIDI request for a patch dump. The M-6 can also be requested to send all of its single patches, splits and master parameters at once.

#### The operations are:

Request Patch Dump

This message is used by an external device to request the M-6 to dump one or all of its patches *i*ta MIDI. This is usually used in a "closed loop" MIDI configuration: the MIDI Out of the M-6 goes to the MIDI in of the other device, and the MIDI Out of the other device goes to the MIDI In of the V-6. The format of a Request Patch Dump operation is:

Function Byte

- 04H
- Opcode Code indicating what to transmit: 0: Transmit all single patches, splits, and master parameters 1: Transmit a single patch 2: Transmit master parameters Patch number to transmit, in range 0 through 99 for single patches, 0 through 49 for splits. This byte is ignored for Transmit Master Parameters and Transmit All requests, but must be included to pad out the fixed-length message. xx pp

Vhen a DUMP ALL command is received (Code 0), the M-6 will dump all of its internal data as eparate patches, splits and master parameter blocks. This means that each patch in the stream will ave its own system exclusive header and EOX command. If it is desired to transfer this data to a emote data storage device, the user should be required to tell the device when the transfer is one (> 1 second after the '10 SEND ALL' message reappears on the M-6's display) or the evice should assume more data will be incoming until a timeout of > 500 mSec with no further coming data has occurred. The total number of bytes transmitted in response to the dump all ormand is approximately 29 Kbytes including headers, checksums and EOX marks. It should be oted that all data (excluding headers, checksums and EOX marks) is transmitted nibblewise so idicious use of space could store all the transmitted data in as little as 15Kbytes.

lote that for downward compatibility with version1.xx, a single patch can also be requested by the equence F0, 10, 06, 00, pp, F7 where pp is the requested single patch number in the range 0 to 9.

SINGLE PATCH DATA

This message contains the actual single patch data. The opcode is followed by a stream of data bytes containing the patch information. When more than one patch is being transmitted at a time (in a "send all" operation), each patch is send as a separate system exclusive message. The form of a single patch dump operation is:

Byte Function

01H	Opcode
pp	Single patch number from 0 through 99.
xxyy	Patch or parameter data. Each byte is sent
	nibble-by nibble, as follows: each byte in the
	(eight bit) patch data to be transmitted is sent
	as two bytes. The first sent byte, in its least
	significant four bits, contains the least
	significant four bits of the original byte; the
	second sent byte, also in its least significant
	four bits, contains the most significant four
	Format for the exact format of this data.
CC	Checksum. The transmitted (not original) data
	is summed in seven bits ignoring overflows, and
	the result is put here. If this checksum does
	not match that calculated while reading the
	sent patch in, the patch is ignored.

When the M-6 receives a patch data message via MIDI, it checks to see that hardware protect is not on, and the patch whose number is in the message is not protected. It then replaces the patch in M-6 patch storage with the patch received.

#### Split Patch Data

This message contains the actual split patch data. The opcode is followed by a stream of data bytes containing the patch information. The form of a single patch dump operation is:

Byte	Function
02Н РР ××уу	Opcode Split patch number from 0 through 49. Patch data. Each byte is send nibble-by- nibble.as above.
CC	Checksum.

Master Parameter Data

This message contains the actual master parameter data. The opcode is followed by a stream of data bytes containing the parameter information. The form of a master parameter dump operation is:

Byte Function

03H Opcode Parameter data. Each byte is send nibble-by-nibble, as above. Checksum xx...yy CC

#### Remote Editing

The M-6 has a set of system exclusive messages which can be used to edit patch parameters via MIDI. This is an alternative to transmitting the entire patch in its edited form. The primary differences are that this editing operation can be performed much more quickly than retransmitting the entire patch, and any currently gated sounds will continue playing through the remote edit operation. This makes it possible to hear a sound change under remote control without regating the sound after each update. The remote editing system exclusive messages are:

#### Select Quick Patch Edit

This operation selects the Quick mode of the Patch Edit function on the M-6. The M-6 must be in this mode to act upon parameter change commands. This command should be used as a prefix to any remote editing commands. The select Quick Patch Edit operation has the format:

- Function Byte
- 05H 0pcode

#### Change Parameter

This operation changes the value of the specified parameter. If the value specified is out of range for the parameter, the operation is ignored. This operation implicitly selects the specified parameter as the current parameter, just as does the Select Parameter operation. The M-6 must be in quick patch edit mode to perform this operation.

06H	Opcode
pp	Parameter number to change; must be in range 0 through 99, and specify a parameter in the current page.
W	New parameter value.; must be within correct range or current parameter.

#### Remote Mode Change

For compatibility with the Oberheim Xk, Matrix-12 and Xpander, the following codes are recognized, though they can not be generated:

#### Select Single Patch Mode

Function
Start of System Exclusive
Oberheim Mfg ID
Xpander Product Code
Switch Program Mode Opcode
Select Single Patch Mode
End of System Exclusive

### Select Split Mode Byte

FOH

Function

FOH	Start of System Exclusive
1.0H	Oberheim Mfg ID
02H	Xpander Product Code
ODH	Switch Program Mode Opcode
02H	Select Multi-Patch (Split)
F7H	End of System Exclusive

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#### Parameters

For any system exclusive messages to be generated or recognized, the parameter M04 SYSTE EXCLUSIVE must be ON, the master page parameter M10 SEND DATA is used to send a single patch, split patch, or the master parameter set via MIDI to another device. If the M-6 is in single patch mode, M10 SEND DATA sends the currently selected single patch. If the M-6 is in split patch mode, M10 SEND DATA sends the currently selected split patch. The parameter M11 SEND ALL sends all of the M-6's 100 single patches, 50 split patches, and master parameter set to another device. A SEND ALL operation takes about 12 seconds to complete.

Node

# System Exclusive Data Format

# Single Patch Data Format

01H Opppppp -patch Matber (0-9) See Single Patch Data Format" 8 48 2 6 bits of it's ASOI represente Keyboard Mode 0 = Rotate 0		gle Patch	mitted Bytes/Sin	1 Total Trans	= 27	Description	Byte	Opcode
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02H O0pppppp split data> Occccccc Split Patch Data Split Number (0-49) Split Number (0-49) See "Split Patch Data Format" 9 00 6 DCO 1 Initial Frequency USB = 1 Semitone   03H -parm data> Occccccc See "Split Patch Data Format" Checksum 10 05 6 DCO 1 Initial Frequency USB = 1 Semitone   04H -parm data> Occccccc See "Global Parameters Data Format" Occccccc 11 03 6 DCO 1 Fixed Modulations Bit 0 - Lever 1   04H O00000xx General Data Request (Rcv Only) Occcle For Request Type 13 06 2 DCO 1 Initial Pulse Width Bit 1 = Whrata   04H O00000xx General Data Request (Rcv Only) Occole For Request Type 13 06 2 DCO 1 Initial Pulse Width Bit 1 = Ware Bit 0 = Pulse   04H O00000xx General Data Request (Rcv Only) Occole For Request Type 13 06 2 DCO 1 Initial Pulse Width Bit 1 = Ware   04H O00000xx General Data Request (Rcv Only) Occole For Request Type 13 06 2 DCO 1 Initial Pulse Width Occole Initial P	alon.	Keyboard Mode 0 = Rotate	2	48	8	Patch Number (0-99) See "Single Patch Data Format"	<patch data=""></patch>	
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ODH Wold Orlange (Rev Only) Bit 0 = Portamento		DCO 1 Click	1	09	22	Description	Byte	Opcode
Bit 1 = Keyboard Tracking En	nable		2	18	23	Mode Change (Rcv Only) Multi Patch Mode (Split Mode)		0DH 02H
0DH Mode Change (Rcv Only) 24 19 1 DCO 2 Click Single Patch Mode 25 02 2 DCO Sync Mode			1		24			
01H Single Patch Mode 26 21 7 VCF Initial Frequency LSB = 1 Semitone		VCF Initial Frequency				Single Patch Mode		01H
27 24 6 VCF Initial Resonance 28 25 2 VCF Fixed Modulations Bit 0 = Lever 1 Bit 1 = VVBrato		VCF Initial Resonance VCF Fixed Modulations Bit 0 = Lever 1						

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Statistics:

35   80   6   LFO Tingger   75   78   2   Env 3 Mode   See Env 1 Mode above     36   86   2   LFO Tingger   76   33   5   Tracking Generator Input Source     37   87   1   Lipo Tingger   77   34   6   Tracking Point 1     38   82   3   Lipo Tingger   78   35   6   Tracking Point 2     39   83   5   Lipo Tingger Compatibility (application of the point 3)   83   6   Tracking Point 4     30   83   5   Lipo Tingger Compatibility (application of the point 3)   83   6   Tracking Point 4     40   88   5   Lipo Tingger Compatibility (application on the point 3)   83   6   Tracking Point 4     41   84   6   Lipo Tingger Compatibility (application on the point 3)   82   43   6   Pamp 1 Mode     42   90   6   Lipo Tingger Compatibility (application on the point 3)   2   2   Extremal Gatad     45   92   3   Lipo 2 Initial Amplitude   6   41   2   Ramp 2 Mode								
29     28     2     VCF Reyboard Modulation B10 = Portamento B10 = Portamenta B10 = Portamento B10 = Portamento B10 = Portamento B1	Byte	Parm	#Bits	Description	Byte	Parm	#Rits	Description
30     6     VCF FM initial Amount     68     70     6     East T Trigger Mode Acoust       31     27     6     VCA I (Exponential) Initial Amount     68     70     7     6     Errol S Initial Attack Time       32     44     6     Portamento Initial Rate     69     71     6     Errol S Initial Attack Time       33     44     6     Portamento Initial Rate     69     71     6     Errol S Initial Attack Time       34     47     1     Legato Portamento Enable     74     79     2     Errol S Initial Release Time       35     80     6     LPO 1 Initial Speed     75     78     2     Errol S Initial Release Time       36     80     2     LPO Trigger     76     33     5     Tracking Generator Input Source       37     87     1     LPO 1 Lag Enable     78     85     6     Tracking Generator Input Source       38     82     3     LPO 1 Work Input Source     78     85     6     Tracking Point 3       39     5	29	26	2	Bit 0 = Portamento	66	68	2	Env 2 Mode See Env 1 Mode Above
31   2/   6   VCA1 (Exponential) Initial Amount   68   70   6   Env 3 Initial Jacks Time     33   46   2   La Constant Time   69   71   6   Env 3 Initial Jacks Time     34   46   2   La Constant Time   71   72   6   Env 3 Initial Jacks Time     35   46   2   La Constant Time   71   73   75   6   Env 3 Initial Jacks Time     36   47   1   Logate Portanento Enable   74   79   2   Env 3 Initial Jacks Time     36   80   6   Logate Portanento Enable   76   33   5   Env 3 Mode     36   86   2   LeO Tingor   76   33   5   Tracking Point 2     38   82   3   LO Tingor Diftigor   78   35   6   Tracking Point 3     39   83   5   LFO 1 Martingor Diftigor   78   36   6   Tracking Point 4     40   85   5   LFO 1 Martingor   78   68   41   28   6   Tracking Point 4     4					67	77	3	
33   46   2   Lag Mode   70   72   5   Env 5 Initial Analy Initial     34   47   1   Constant Time   72   74   6   Env 5 Initial Analy Initial     34   47   1   Lag Mode   71   73   6   Env 5 Initial Analy Initial     34   47   1   Lag Mode   74   79   2   Env 3 Initial Analy Initial     36   86   2   Lag Mode   77   78   7   78   2   Env 3 Initial Analy Initial     36   86   2   Lag Mode   77   78   7   78   78   78   78   78   77   78   86   77   78   86   77   78   85   6   Tracking Point 3   78   76   73   85   6   Tracking Point 4   78   36   6   Tracking Point 4   78   86   77   78   6   Tracking Point 4   76   73   86   6   Tracking Point 4   76   78   86   6   Tracking Point 4   76   78   6 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Env 3 Initial Delay Time</td></t<>								Env 3 Initial Delay Time
0     0     0     0     0     0     0     0     0     0     1     2     1     7     7     3     6     Env 3     5     1     1     2     1     2     1 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
1 = Constant Time     72     74     6     Erv S Initial Angelace Time       34     47     1     Sepannatial     75     6     Erv S Initial Angelace       35     90     6     LFO Infiguer Mode     75     78     2     Evo S Initial Angelace       36     86     2     LFO Infiguer Mode     75     78     2     Evo S Initial Angelace       37     67     1     LFO Infiguer Mode     76     33     5     Tracking Point 1       38     82     3     LFO Infiguer Mode     77     34     6     Tracking Point 1       38     82     3     LFO I NagerMange (see Table 1 below)     78     35     6     Tracking Point 3       40     83     5     LFO 1 Sampled Source Number     82     40     6     Tracking Point 3       41     84     6     LFO 1 MagerMange 16     83     41     2     Ramp 1 Rade       42     90     6     LFO 2 Infial Angelace     63     41     2     Ramp 1 Rade			-	0 = Constant Speed	71			
3 = Exponential     74     79     2     Env S 11FO Trigger Mode ab       35     80     6     LFO 1 Initial Speed     76     78     2     Env S Mode       36     86     2     LFO Trigger     76     33     5     Tracking Generator Input Source       37     87     1     LFO 1 tage frager     78     36     6     Tracking Point 1       38     82     3     LFO 1 tage frager     78     6     Tracking Point 2       38     82     3     LFO 1 tage frager     78     6     Tracking Point 2       39     83     5     LFO 1 samplet Source Number     82     40     6     Ramp 1 Mode       40     85     LFO 1 Samplet Source Number     82     40     6     Ramp 1 Mode       42     90     6     LFO 2 Trigger Mode     83     41     2     Ramp 1 Mode       44     9     6     LFO 2 Trigger Mode     85     43     2     Ramp 1 Mode       45     93     5     LFO 2 Ra								Env 3 Initial Release Time
34   47   1   Logato Portamento Enable   75   78   2   Env S Mode   See Env 1 LPO Tinger Mode ab     36   86   2   LPO Tingger   76   33   5   Env S Mode   See Env 1 LPO Tinger Mode ab     37   87   1   LEO Tingger   77   34   6   Tracking Connerator Input Source   See Table 2 Below   See Tracking Point 1   See Table 2 Below   See Table 3 See Table 2 Below   See Table 3 See Table 2 Below   See Table 3 See Table 3 See Table 2 Below   See Table 3 See Table					73			
36     86     2     LPC Trigger     76     33     5     Ease Emmons     Case Emmons       37     87     1     LPC Trigger     78     33     5     See Table 2 Below       36     82     3     LPC 1 trigger     78     35     6     Tracking Point 1       36     82     3     LPC 1 trigger for trigger     78     35     6     Tracking Point 1       36     82     3     LPC 1 trigger for t				Legato Portamento Enable				See Env 1 LF0 Trigger Mode above
O = No Trigger     76     33     5     Tacking Point Jupus Source       2 = Multi Trigger     77     34     6     Tracking Point J       37     87     1     LFO1 Lag Enable     79     36     6     Tracking Point J       38     82     3     LFO1 Waveshape (see Table 1 below)     80     37     6     Tracking Point 4       39     83     5     LFO1 Stating Point 4     81     38     6     Tracking Point 4       40     88     5     LFO1 Stating Point 4     81     38     6     Tracking Point 4       41     84     6     LFO2 Initial Speed     83     41     2     Ramp 1 Mode       42     90     6     LFO2 Initial Speed     83     41     2     Ramp 1 Mode     0     3     = External Grager       44     97     1     LFO2 Waveshape (see Table 1 below)     84     42     6     Ramp 1 Mode     0     3     = External Grager     2     External Grager     2     2     External Trigger     2 <td></td> <td></td> <td></td> <td></td> <td>75</td> <td>78</td> <td>2</td> <td></td>					75	78	2	
1     Single Trigger     See Table 2 Below       37     67     1     LFO 1 Lag Faable     78     35     6     Tracking Point 2       38     62     3     LFO 1 Lag Faable     78     35     6     Tracking Point 2       38     62     3     LFO 1 Maveshape (see Table 1 below)     80     37     6     Tracking Point 3       40     88     5     LFO 1 Farger     82     40     6     Tracking Point 4       41     84     6     LFO 1 Trigger     83     41     2     Ramp 1 Made       42     90     6     LFO 2 Trigger     8     41     2     Ramp 1 Made       43     96     2     LFO 2 Trigger     8     4     2     Ramp 1 Made       44     97     1     LFO 2 Ling Erable     8     4     2     Ramp 2 Made       45     92     3     LFO 2 Maveshap (see Table 1 below)     84     42     6     Ramp 2 Made       46     93     5     LFO 2 Maveshap (see	00	00	2		76	33	5	
37     87     1     LFO I Lag Enable     78     35     6     Tracking Point 2       38     82     3     LFO I Waveshape (see Table 1 below)     80     37     6     Tracking Point 3       39     83     5     LFO I Sampled Source Number     81     38     6     Tracking Point 5       40     88     5     LFO 1 Sampled Source Number     82     40     6     Pamp 1 Mato       41     84     6     LFO 2 Initial Speed     83     41     2     Barn 1 Mato       42     90     6     LFO 2 Initial Speed     83     41     2     Barn 1 Mato       43     96     2     LFO 2 Initial Speed     8     41     2     Barn 1 Tagger     2     2 <td></td> <td></td> <td></td> <td></td> <td>N 1</td> <td></td> <td></td> <td>See Table 2 Below</td>					N 1			See Table 2 Below
37   87   1   LPC1 tag Enable   79   36   6   Tracking Point 3     38   82   3   LPC1 Hartigger point   80   37   6   Tracking Point 4     40   83   5   LPC1 Flerigger point   81   38   6   Tracking Point 5     41   84   6   LPC1 initial Amplitude   83   41   2   Ramp 1 Made     42   90   6   LPC2 Trigger   83   41   2   Ramp 1 Mode     43   96   2   LPC2 Trigger   1   MUB Trigger   2   LEC2 Initial Amplitude   83   41   2   Ramp 2 Mode     44   97   1   LPC2 Retrigger point   84   42   6   Ramp 2 Mode   3   2   External Gaudd     45   92   3   Env Trigger Mode   86   01   7 (Signed)   DC0 1 Freq. by LPO 1 Amount     810   Reset   87   47   (Signed)   DC0 2 Freq. by LPO 1 Amount     812   External Trigger   88   11   7 (Signed)   DC0 2 Freq. by LPO 1 Amount   Bt2								
38     82     3     LFO1 Waveshape (see Table 1 below)     80     37     6     Tracking Point 4       40     88     5     LFO1 Sampled Source Number     81     38     6     Tracking Point 5       40     88     5     LFO1 Sampled Source Number     82     40     6     Ramp 1 Rate       41     84     6     LFO 2 Initial Speed     83     41     2     Ramp 1 Mode       42     90     6     LFO 2 Initial Speed     83     41     2     Ramp 1 Mode       43     96     2     LFO 2 Initial Amplitude     83     42     6     Ramp 2 Rate       44     97     1     LFO 2 Waveshape (see Table 1 below)     84     42     6     Ramp 2 Rate       45     92     3     LFO 2 Waveshape (see Table 1 below)     84     42     6     Ramp 2 Mode       47     98     5     LFO 2 Initial Amplitude     87     4     7 (Signed)     DCO 1 Freq, b LFO 1 Amount       50     50     6     Ervt 1 initial Delay Time				LFO 1 Lag Enable	79			
40   88   5   LFO 1 Sampled Source Number   82   40   6   Ramp 1 Made     41   84   6   LFO 1 Sampled Source Number   83   41   2   Ramp 1 Made     42   90   6   LFO 2 Initial Applitude   83   41   2   Ramp 1 Made     43   96   2   LFO 2 Iniger   2   Ramp 1 Made   2   Ramp 1 Made     44   97   1   LFO 2 Lag Enable   3   External Gated   3   = External Gated     45   92   3   LFO 2 Hatrigger point   85   43   2   Ramp 2 Made     46   93   5   LFO 2 Hetrigger point   85   43   2   Ramp 2 Made     49   57   3   Env Trigger Mode   86   01   7 (Signed)   DCO 1 Freq. by LFO 1 Amount     50   50   6   Env1 Initial Attack Time   91   22   7 (Signed)   VCF Freq. by Pressure Amount     51   51   6   Env1 Initial Attack Time   91   23   7 (Signed)   VCA 2 by Env 1 Amount     52   52			3					Tracking Point 4
41   84   6   LFO2 Initial Applitude   83   41   2   Ramp 1 Mode     42   90   6   LFO2 Trigger   0   Single Trigger   0   8ingle Trigger     43   96   2   LFO2 Trigger   8   Hold Trigger   2   External Trigger     44   97   1   LFO2 Lag Enable   8   8   4   2   6   Ramp 2 Rate   3   = External Trigger   3   = External Cated   3   = External Trigger   3   = External Cated   3   = External Cated   3   = External Trigger   Bit 1   No   No <td< td=""><td></td><td></td><td>5</td><td>LFO 1 Retrigger point LFO 1 Sampled Source Number</td><td></td><td></td><td></td><td>Tracking Point 5 Bamp 1 Pate</td></td<>			5	LFO 1 Retrigger point LFO 1 Sampled Source Number				Tracking Point 5 Bamp 1 Pate
43   96   2   LFO 2 Trigger   1   = Multi Trigger     44   97   1   LFO 2 Lag Enable   3   = External Trigger     45   92   3   LFO 2 Waveshape (see Table 1 below)   84   42   6   Ramp 2 Rate     47   98   5   LFO 2 Initial Amplitude   85   43   2   Ramp 2 Mode     49   57   3   Env Trigger Mode   86   01   7 (Signed)   DCO 1 Frac, by LFO 1 Amount     Bit 1 = Mult Trigger   88   11   7 (Signed)   DCO 2 Freq, by LFO 1 Amount     Bit 2 = External Trigger   88   14   7 (Signed)   DCO 2 Freq, by LFO 1 Amount     50   50   6   Env 1 Initial Delay Time   90   22   7 (Signed)   DCO 2 Freq, by LFO 2 Amount     51   51   6   Env 1 Initial Delay Time   91   23   7 (Signed)   VCF Freq, by Env 1 Amount     52   52   6   Env 1 Initial Amplitude   93   29   7 (Signed)   VCA 1 by Velocity Amount     54   54   6   Env 1 Initial Amplitude   94   56   7 (Signed)<			6	LFOInitial Amplitude				
44   97   1   LFO 2 lag Enable   1   LFO 2 Lag Enable   2   = External Trigger     45   92   3   LFO 2 Waveshape (see Table 1 below)   84   42   6   Ramp 2 Rate     46   93   5   LFO 2 Initial Amplitude   85   43   2   Ramp 2 Mode     47   98   5   LFO 2 Initial Amplitude   87   04   7 (Signed)   DCO 1 Freq. by LFO 1 Amount     88   11   multi Trigger   88   11   7 (Signed)   DCO 2 PW by LFO 2 Amount     90   50   6   Env Trigger Mode   86   11   7 (Signed)   DCO 2 PW by LFO 2 Amount     51   50   6   Env 1 Initial Attack Time   91   23   7 (Signed)   DCO 2 PW by LFO 2 Amount     52   52   6   Env 1 Initial Attack Time   91   23   7 (Signed)   UCA 1 by Velocity Amount     53   53   6   Env 1 Initial Attack Time   91   23   7 (Signed)   UCA 1 by Velocity Amount     54   54   6   Env 1 Initial Amplitude   95   66   7 (Signed)   Env 1 Ampl								0 = Single Trigger
44   97   1   LFO 2 Lag Enable   3 = External Gated     45   92   3   LFO 2 Waveshape (see Table 1 below)   84   42   6   Ramp 2 Mode     46   93   5   LFO 2 Initial Amplitude   85   43   2   Ramp 2 Mode     47   98   5   LFO 2 Initial Amplitude   86   01   7 (Signed)   DCO 1 Freq. by LFO 1 Amount     49   57   3   Env Trigger Mode   86   01   7 (Signed)   DCO 2 PW by LFO 2 Amount     50   50   6   Env1 Initial Attack Time   91   23   7 (Signed)   UCC 2 preq. by LFO 1 Amount     51   51   6   Env1 Initial Attack Time   91   23   7 (Signed)   VCF Freq. by Prv 1 Amount     52   52   6   Env1 Initial Attack Time   91   23   7 (Signed)   VCA 1 by Velocity Amount     54   54   6   Env 1 Initial Amplitude   93   29   7 (Signed)   UCA 1 by Velocity Amount     55   55   6   Env 1 Initial Amplitude   93   29   7 (Signed)   Env 2 Amplitude by Velocity Amount <td></td> <td></td> <td>2</td> <td>See LFO 1 Triggers above</td> <td>1</td> <td></td> <td></td> <td>1 = Multi Trigger 2 - External Trigger</td>			2	See LFO 1 Triggers above	1			1 = Multi Trigger 2 - External Trigger
46935LFO 2 Retriger pointLeft of NotionBit 2Left of NotionRamp 2 Mode47985LFO 2 Initial Amplitude86017 (Signed)DCO 1 Free, by LFO 1 Amount49573Env Trigger Mode86017 (Signed)DCO 1 Free, by LFO 1 Amount8109573Env Trigger Mode87047 (Signed)DCO 1 Free, by LFO 1 Amount50506Env 1 Initial Delay Time90227 (Signed)DCO 2 Free, by LFO 1 Amount51516Env 1 Initial Decay Time91237 (Signed)VCF Free, by Pressure Amount52526Env 1 Initial Decay Time92287 (Signed)VCA 1 by Velocity Amount54556Env 1 Initial Amplitude95667 (Signed)LFO 1 Amplitude by Velocity Amount54546Env 1 Initial Amplitude95667 (Signed)VCA 1 by Velocity Amount55556Env 1 Initial Amplitude95667 (Signed)LFO 1 Amplitude by Velocity Amount56592Env 1 Initial Amplitude96767 (Signed)LFO 2 Amp by Pressure Amount57582Env 1 Mode100317 (Signed)LFO 2 Amp by Pressure Amount58673Env 1 Trigger Mode98957 (Signed)LFO 2 Amp by Pressure Amount58673Env 1 Trigger Mode100317 (Signed) </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>3 = External Gated</td>								3 = External Gated
47985LFO 2 Initial AmplitudeSee ramp 1 mode above"49573Env Trigger Mode86017 (Signed)DCO 1 Freq. by LFO 1 AmountBit 0 = Reset87047 (Signed)DCO 2 Freq. by LFO 1 AmountBit 1 = Mult Trigger88117 (Signed)DCO 2 Freq. by LFO 1 Amount50506Env 1 Initial Delay Time90227 (Signed)VCC Freq. by Env 1 Amount51516Env 1 Initial Delay Time91237 (Signed)VCF Freq. by Pressure Amount52526Env 1 Initial Decay Time92287 (Signed)VCA 2 by Env 2 Amount53536Env 1 Initial Amplitude93297 (Signed)VCA 2 by Env 2 Amount54546Env 1 Initial Amplitude95667 (Signed)Env 2 Amplitude by Velocity Amount56592Env 1 Initial Amplitude95667 (Signed)LFO 1 Amp. by Ramp 1 Amount57582Env 1 Mode97857 (Signed)LFO 1 Amp. by Ramp 2 Amount58673Env 2 Initial Amplitude98957 (Signed)LFO 1 Speed by Pressure Amount58673Env 2 Initial Amplitude91327 (Signed)VCF Freq. by Ramp 2 Amount59606Env 2 Initial Amplitude917 (Signed)LFO 1 Speed by Ressure Amount59606Env 2 Initial Amplitude100317 (Si			5					
49   57   3   Env Ingger Mode   86   01   7 (Signed)   DC0 1 Freq. by LF0 1 Amount     Bit 0 = Reset   87   04   7 (Signed)   DC0 2 Freq. by LF0 1 Amount     50   50   6   Env 1 Initial Delay Time   88   11   7 (Signed)   DC0 2 Freq. by LF0 1 Amount     51   51   6   Env 1 Initial Delay Time   90   22   7 (Signed)   DC0 2 Freq. by Event Amount     52   52   6   Env 1 Initial Decay Time   91   23   7 (Signed)   VCF Freq. by Event Amount     53   53   6   Env 1 Initial Attack Time   91   23   7 (Signed)   VCA 2 by Event Amount     54   54   6   Env 1 Initial Release Time   92   28   7 (Signed)   VCA 2 by Event Amount     55   55   6   Env 1 Initial Amplitude   95   66   7 (Signed)   Env 2 Amplitude by Velocity Amount     56   59   2   Env 1 Initial Amplitude   95   66   7 (Signed)   Env 2 Amplitude by Velocity Amount     57   58   2   Env 1 Initial Amplitude   96   76   7 (Sig	47	98	5	LFO 2 Initial Amplitude	00	40	2	
Bit 1 = Multi Trigger     88     11     7 (Signed)     DOO 1 Free, by LPO 1 Amount Bit 2 = External Trigger       50     50     6     Env 1 Initial Delay Time     90     22     7 (Signed)     DOO 2 Free, by LPO 1 Amount DOO 2 PW by LPO 2 Amount       51     51     6     Env 1 Initial Delay Time     90     22     7 (Signed)     VCF Free, by Pressure Amount       52     52     6     Env 1 Initial Decay Time     91     23     7 (Signed)     VCF Free, by Pressure Amount       53     53     6     Env 1 Sustain Level     93     29     7 (Signed)     VCA 1 by Velocity Amount       54     54     6     Env 1 Initial Amplitude     95     66     7 (Signed)     Env 2 Amplitude by Velocity Amount       55     55     6     Env 1 Initial Amplitude     95     66     7 (Signed)     Env 2 Amplitude by Velocity Amount       61     D = 0 ADDR Mode     96     76     7 (Signed)     Env 1 Amount by Pressure Amount       75     58     2     Env 1 Mode     99     45     7 (Signed)     VCF FM Amount by Pressure Amount <t< td=""><td>49</td><td>57</td><td>3</td><td>Env Trigger Mode</td><td></td><td></td><td></td><td>DCO 1 Freq. by LFO 1 Amount</td></t<>	49	57	3	Env Trigger Mode				DCO 1 Freq. by LFO 1 Amount
Bit 2 = External Trigger     89     14     7 (Signed)     DOC 2 PW by LPC 2 Amount       50     50     6     Env1 Initial Delay Time     90     22     7 (Signed)     VCF Freq. by Env 1 Amount       51     51     6     Env1 Initial Attack Time     91     23     7 (Signed)     VCF Freq. by Env 1 Amount       52     52     6     Env1 Initial Attack Time     92     28     7 (Signed)     VCA 1 by Velocity Amount       53     53     6     Env1 Initial Attack Time     93     29     7 (Signed)     VCA 2 by Env 1 Amount       54     54     6     Env1 Initial Attack Time     94     56     7 (Signed)     Env 1 Amplitude by Velocity Amount       55     55     6     Env1 Initial Attack Time     95     66     7 (Signed)     Env 1 Amplitude by Velocity Amount       56     59     2     Env1 Initial Attack Time     95     66     7 (Signed)     LFO 1 Amp. by Ramp 1 Amount       57     58     2     Env1 Initial Mode     96     7 (Signed)     LFO 2 Amount by Env 3 Amount       57							7 (Signed) 7 (Signed)	DCO 1 PW by LFO 2 Amount
50   50   6   EnV 1 Initial Delay Ime   90   22   7 (Signed)   VCF Freq. by Env 1 Amount     51   51   6   Env 1 Initial Attack Time   91   23   7 (Signed)   VCF Freq. by Env 1 Amount     52   52   6   Env 1 Initial Attack Time   92   28   7 (Signed)   VCA 1 by Velocity Amount     53   53   6   Env 1 Initial Attack Time   93   29   7 (Signed)   VCA 2 by Env 2 Amount     54   54   6   Env 1 Initial Amplitude   95   66   7 (Signed)   Env 1 Amplitude by Velocity Amo     55   55   6   Env 1 Initial Amplitude   95   66   7 (Signed)   Env 2 Amplitude by Velocity Amo     56   59   2   Env 1 Initial Amplitude   95   7 (Signed)   Env 2 Amplitude by Velocity Amo     56   59   2   Env 1 Mode   97   85   7 (Signed)   LFO 1 Amp. by Ramp 1 Amount     57   58   2   Env 1 Mode   99   45   7 (Signed)   LFO 2 Amp. by Ramp 2 Amount     58   67   3   Env 2 Trigger Mode Above   101 <t< td=""><td>50</td><td>50</td><td>2</td><td>Bit 2 = External Trigger</td><td>89</td><td>14</td><td>7 (Signed)</td><td>DCO 2 PW by LFO 2 Amount</td></t<>	50	50	2	Bit 2 = External Trigger	89	14	7 (Signed)	DCO 2 PW by LFO 2 Amount
52   52   6   Env 1 Initial Decay Time   92   23   7 (Signed)   VCA 1 by Velocity Amount     53   53   6   Env 1 Sustain Level   93   29   7 (Signed)   VCA 2 by Env 2 Amount     54   54   6   Env 1 Initial Amplitude   93   29   7 (Signed)   VCA 2 by Env 2 Amount     55   55   6   Env 1 Initial Amplitude   95   66   7 (Signed)   Env 1 Amplitude by Velocity Amo     56   59   2   Env 1 LFO Trigger Mode   96   76   7 (Signed)   Env 2 Amplitude by Velocity Amount     57   58   2   Env 1 Mode   97   85   7 (Signed)   LFO0 1 Amp. by Ramp 2 Amount     57   58   2   Env 1 Mode   99   45   7 (Signed)   VCF FM Amount by Env 3 Amount     58   67   3   Env 2 Trigger Mode   100   31   7 (Signed)   VCF FM Amount by Pressure Amount     59   60   6   Env 2 Trigger Mode Above   101   32   7 (Signed)   VCF FM Amount by Pressure Amount     59   60   6   Env 2 Trigger Mode Above   1							7 (Signed)	VCF Freq. by Env 1 Amount
53   53   6   Env 1 Sustain Level   93   29   7 (Signed)   VOA 2 by Env 2 Amount     54   54   6   Env 1 Initial Amplitude   94   56   7 (Signed)   Env 1 Amplitude by Velocity Amo     55   55   6   Env 1 Initial Amplitude   95   66   7 (Signed)   Env 2 Amplitude by Velocity Amo     56   59   2   Env 1 LPO Trigger Mode   96   76   7 (Signed)   Env 2 Amplitude by Velocity Amo     57   58   2   Env 1 Mode   97   85   7 (Signed)   Env 2 Amplitude by Velocity Amo     57   58   2   Env 1 Mode   97   85   7 (Signed)   LFO 2 Amp. by Ramp 2 Amount     57   58   2   Env 1 Mode   99   45   7 (Signed)   VCF FM Amount by Env 3 Amoun     58   67   3   Env 2 Trigger Mode   100   31   7 (Signed)   VCF FM Amount by Pressure Amount by Pressure Amount     59   60   6   Env 2 Initial Attack Time   103   91   7 (Signed)   LFO 2 Speed by Keyboard Amount     61   62   63   6   Env 2 I	52	52						VCA 1 by Velocity Amount
55 56 6 Env 1 Initial Amplitude 95 66 7 (Signed) Env 1 Amplitude by Velocity Amo Env 1 LPO Trigger Mode   56 59 2 Env 1 LPO Trigger Mode 96 76 7 (Signed) Env 3 Amplitude by Velocity Amo Bit 0 = Gated   57 58 2 Env 1 Mode 97 85 7 (Signed) Env 3 Amplitude by Velocity Amo Bit 0 = Gated   57 58 2 Env 1 Mode 98 95 7 (Signed) LFO 1 Amp. by Ramp 2 Amount Bit 1 = LFO Trigger Mode   57 58 2 Env 1 Mode 99 45 7 (Signed) VCF FM Amount by Env 3 Amount Bit 0 = DADR Mode   58 67 3 Env 2 Trigger Mode 100 31 7 (Signed) VCF FM Amount by Pressure Amount See Env 1 Trigger Mode Above   59 60 6 Env 2 Initial Attack Time 103 91 7 (Signed) LFO 2 Speed by Keyboard Amount See Env 1 Initial Attack Time 105 7 (Signed) MM Bus 0 Amount   61 62 6 Env 2 Initial Attack Time 106 5 MM Bus 0 Amount   62 63 6 Env 2 Initial Attack Time 107 5 MM Bus 0 Amount   64 6 Env 2 Initial Attack Time 107 5 MM Bus 0 Destination code (					93		7 (Signed)	VCA 2 by Env 2 Amount
56   59   2   Env 1 LFO Trigger Mode   96   76   7 (Signed)   Env 2 Amplitude by Velocity Amo Bit 0 = Gated     57   58   2   Env 1 Mode   99   45   7 (Signed)   LFO 2 Amp. by Ramp 1 Amount     57   58   2   Env 1 Mode   99   45   7 (Signed)   LFO 2 Amp. by Ramp 2 Amount     58   67   3   Env 2 Trigger Mode   100   31   7 (Signed)   VCF FM Amount by Env 3 Amount     58   67   3   Env 2 Intigger Mode   101   32   7 (Signed)   VCF FM Amount by Pressure Amount     59   60   6   Env 2 Intigat Mode Above   103   91   7 (Signed)   LFO 2 Speed by Pressure Amount     59   60   6   Env 2 Initial Attack Time   104   5   "Matarix Modulation" Bus 0 Sustainton code (see tr     60   61   6   Env 2 Initial Attack Time   105   7 (Signed)   MB us 0 Destination code (see tr     62   63   6   Env 2 Initial Attack Time   106   5   MM Bus 0 Destination code (see tr     63   64   6   Env 2 Initial Attack Time   108							7 (Signed)	
bit O = Gated 97 85 7 (Signed) LFO 1 Amp. by Ramp 1 Amount   57 58 2 Env 1 Mode 99 45 7 (Signed) LFO 2 Amp. by Ramp 2 Amount   57 58 2 Env 1 Mode 99 45 7 (Signed) Portamento Rate by Velocity Amount   58 67 3 Env 2 Trigger Mode 100 31 7 (Signed) VCF FM Amount by Pressure Amount   58 67 3 Env 2 Trigger Mode 102 81 7 (Signed) LFO 1 Speed by Pressure Amount   59 60 6 Env 2 Initial Delay Time 104 5 "Matarix Modulation" Bus 0 Source 1   50 61 6 Env 2 Initial Attack Time 105 7 (Signed) LFO 2 Speed by Keyboard Amount   60 61 6 Env 2 Initial Decay Time 104 5 "Matarix Modulation" Bus 0 Source 1   61 62 6 Env 2 Initial Attack Time 105 7 (Signed) MM Bus 0 Destination code (see ta   62 63 6 Env 2 Initial Release Time 108 7 (Signed) MM Bus 1 Destination code (see ta   63 64 6 Env 2 Initial Amplitude 108 7 (Signed) MM Bus 1 Destination code (see ta				Env 1 LFO Trigger Mode				Env 2 Amplitude by Velocity Amount
57 58 2 Env 1 Mode 99 45 7 (Signed) Portamento Rate by Velocity Amo Bit 0 = DADR Mode   58 67 3 Bit 0 = DADR Mode 100 31 7 (Signed) VCF FM Amount by Env 3 Amount   58 67 3 Env 2 Trigger Mode 101 32 7 (Signed) VCF FM Amount by Pressure Amount   59 60 6 Env 2 Initial Attack Time 102 81 7 (Signed) LFO 1 Speed by Pressure Amount   59 60 6 Env 2 Initial Attack Time 104 5 "Matarix Modulation" Bus 0 Source   60 61 6 Env 2 Initial Attack Time 105 7 (Signed) MM Bus 0 Amount   61 62 6 Env 2 Sustain Level 107 5 "Matarix Modulation" Bus Source   63 64 6 Env 2 Initial Release Time 108 7 (Signed) MM Bus 1 Amount   64 65 6 Env 2 Initial Anglitude 108 7 (Signed) MM Bus 1 Destration code (see ta							7 (Signed)	LFO 1 Amp. by Ramp 1 Amount
Bit 0 = DADR Mode 100 31 7 (Signed) VCF FM Amount bit 0 y Env 3 Amoun   58 67 3 Env 2 Trigger Mode 101 32 7 (Signed) VCF FM Amount by Pressure Amoun   58 67 3 Env 2 Trigger Mode 102 81 7 (Signed) VCF FM Amount by Pressure Amoun   59 60 6 Env 2 Initial Objart Time 103 91 7 (Signed) LFO 2 Speed by Keyboard Amoun   60 61 6 Env 2 Initial Attack Time 105 7 (Signed) MM Bus 0 Amount   61 62 6 Env 2 Sustain Level 107 5 MM Bus 0 Destination code (see ta "Matrix Modulation" Bus Source   63 64 6 Env 2 Initial Release Time 108 7 (Signed) MM Bus 1 Destination code (see ta "Matrix Modulation" Bus Source   64 65 6 Env 2 Initial Release Time 108 7 (Signed) MM Bus 1 Destination code (see ta "Matrix Modulation" Bus Source	57	58	2				7 (Signed)	LF0O2 Amp. by Ramp 2 Amount
58 67 3 Env 2 Trigger Mode 101 32 7 (Signed) VCF FM Amount by Pressure Amount   58 67 3 Env 2 Trigger Mode 102 81 7 (Signed) LFO 1 Speed by Pressure Amount   59 60 6 Env 2 Initial Delay Time 103 91 7 (Signed) LFO 1 Speed by Pressure Amount   60 61 6 Env 2 Initial Delay Time 104 5 "Matarix Modulation" Bus 0 Source   60 61 6 Env 2 Initial Attack Time 105 7 (Signed) MM Bus 0 Destination code (see ta   61 62 6 Env 2 Sustain Level 106 5 MM Bus 0 Destination code (see ta   63 64 6 Env 2 Initial Amplitude 108 7 (Signed) MM Bus 1 Amount   64 65 6 Env 2 Initial Amplitude 109 5 MM Bus 1 Destination code (see ta			-	Bit 0 = DADR Mode	100		7 (Signed)	
See Env 1 Trigger Mode Above103917 (Signed)LFO 2 Speed by Presside Amoun59606Env 2 Initial Delay Time1045"Matarix Modulation" Bus 0 Source60616Env 2 Initial Attack Time1057 (Signed)MM Bus 0 Amount61626Env 2 Initial Decay Time1065MM Bus 0 Amount62636Env 2 Sustain Level1075"Matarix Modulation" Bus Source63646Env 2 Initial Amplitude1087 (Signed)MM Bus 1 Amount64656Env 2 Initial Amplitude1095MM Bus 1 Destination code (see ta	EQ	67	0				7 (Signed)	VCF FM Amount by Pressure Amount
59     60     6     Env 2 Initial Delay Time     104     5     "Matarix Modulation" Bus 0 Source       60     61     6     Env 2 Initial Attack Time     105     7 (Signed)     MM Bus 0 Amount       61     62     6     Env 2 Initial Decay Time     106     5     MM Bus 0 Destination code (see tr       62     63     6     Env 2 Sustain Level     107     5     "Matarix Modulation" Bus Source       63     64     6     Env 2 Initial Pelease Time     108     7 (Signed)     MM Bus 1 Amount       64     65     6     Env 2 Initial Amplitude     109     5     MM Bus 1 Destination code (see tr	56	07	3					LFO 1 Speed by Pressure Amount
60     61     6     EnV 2 Initial Attack lime     105     7 (Signed)     MM Bus 0 Amount       61     62     6     Env 2 Initial Attack lime     106     5     MM Bus 0 Destination code (see tr Mus 0 Destination code (see tr Matarix Modulation* Bus Source 1       62     63     6     Env 2 Sustain Level     107     5     *Matarix Modulation* Bus Source 1       63     64     6     Env 2 Initial Angleuse Time     108     7 (Signed)     MM Bus 1 Angunt       64     65     6     Env 2 Initial Anglitude     109     5     MM Bus 1 Destination code (see tr				Env 2 Initial Delay Time	104	51	5 (Signed)	"Matarix Modulation" Bus 0 Source Code (see
62     63     6     Env 2 Sustain Level     107     5     Min bus 0 Destination routed (see to Min bus 0 Destination routed (see to								MM Bus 0 Amount
63 64 6 Env 2 Initial Release Time 108 7 (Signed) MBus 1 Amount 64 65 6 Env 2 Initial Amplitude 109 5 MM Bus 1 Destination code (see ta	62				106	107		MM BUS 0 Destination code (see table 3) "Matarix Modulation" Bus, Source Code (see the
64 65 6 Env 2 Initial Amplitude 109 5 MM Bus 1 Destination code (see ta			6	Env 2 Initial Release Time			7 (Signed)	MM Bux 1 Amount
	64 65	65 69	6	Env 2 Initial Amplitude Env 2 LFO Trigger Mode	109 110		5	MM Bus 1 Destination code (see table 3)
65 69 2 Env 2 LFO Trigger Mode 110 5 Matrix Modulation Bus 2 Source Co See Env 1 LFO Trigger Mode above tbl 2)	00	00	2	See Env 1 LFO Trigger Mode above	110		5	Matrix Modulation Bus 2 Source Code (see

:		Table 1 LF0 Wave cod	les
Byte Parm #Bits 112 5 113 5	Description MM Bus 2 Destination code (see table 3) Matrix Modulation Bus 3 Source Code (see tbl 2)	0 = Triangle 1 = Up Sawtooth 2 = Down Sawtooth 3 = Square	4 = Random 5 = Noise 6 = Sampled Modulation 7 = Not Used
114 7 (Signed) 115 5 116 5 117 7 (Signed) 118 5	MM Bus 3 Amount MM Bus 3 Destination code (see table 3) Matrix Modulation Bus 4 Source Code (see tbl 2) MM Bus 4 Amount MM Bus 4 Destination code (see table 3)	Table 2 Modulation Source Tracking Generator	Codes r Inputs
119 5 120 7 (Signed) 121 5 122 5	Matrix Modulation Bus 5 Source Code (see tbl 2) MM Bus 5 Amount MM Bus 5 Destination code (see table 3) Matrix Modulation Bus 6 Source Code (see	0 = Keyboard 1 = Portamento 2 = Velocity 3 = Release Velocity 4 = Pressure	10 = Envelope 3 11 = Gate 12 = Pedal 1 13 = Pedal 2 14 = LFO 1 15 = LFO 2
122 7 (Signed) 124 5 125 5 126 7 (Signed)	tbl 2) MM Bus 6 Amount MM Bus 6 Destination code (see table 3) Matrix Modulation Bus 7 Source Code (see tbl 2) MM Bus 7 Amount	5 = Tracking Generator 6 = Ramp 1 7 = Ramp 2 8 = Envelope 1 9 = Envelope 2	16 = Vibrato 17 = Lever 1 18 = Lever 2 19 = Lever 3
126 7 (Signed) 127 5 128 5	MM Bus 7 Destination Code (see table 3) Matrix Modulation Bus 8 Source Code (see tbl 2)	Table 3 Modulation Destinati	ion Codes
129 7 (Signed) 130 5 131 5 132 7 (Signed) 133 5	bi 2) MM Bus 8 Amount MM Bus 8 Destination Code (see table 3) Matrix Modulation Bus 9 Source Code (see tbl 2) MM Bus 9 Amount MM Bus 9 Destination code (see table 3)	0 = DCO 1 Frequency 1 = DCO 1 Waveshape 2 = DCO 1 Pulse Width 3 = DCO 2 Prequency 4 = DCO 2 Waveshape 5 = DCO 2 Pulse Width 6 = Mix Lavel 7 = VCF Frequency 8 = VCF Resonance 9 = VCF Resonance 9 = VCF Amount 10 = VCA 1 Lavel 11 = VCA 2 Lavel 12 = LFO 1 Speed 13 = LFO 1 Amplitude 14 = LFO 2 Speed 15 = LFO 2 Amplitude	16 = Env 1 Delay 17 = Env 1 Attack 18 = Env 1 Decay 19 = Env 1 Release 20 = Env 1 Amplitude 21 = Env 1 Attack 23 = Env 1 Attack 23 = Env 1 Attack 24 = Env 1 Release 25 = Env 1 Amplitude 26 = Env 1 Attack 28 = Env 1 Release 30 = Env 1 Release 30 = Env 1 Amplitude 31 = Portamento Time
	an an the second sec		

Statistics:	Spl es/Split Patcl	lit Patch Dat	a Format
= 36 I 1 byte EOX	NIbbles Tran	smitted + 4 Bytes	Header + 1 byte checksum +
= 41	Total Transm	itted Bytes/Split F	atch
Byte	Parm	# Bits	Description
0-5 6 7 8 9 10 11 12 13 14 15 16 17	0 1 2 3 4 5 6 7	6 Each 6 Each 6 (Signed) 1 7 6 (Signed) 1 6 (Signed) 2	Split Name Each character is represented by the lower 6 bits of it's ASCII representation Not Used Lower Patch Number Lipper Patch Number Left Zone Limit Left Zone Transpose Left Zone MIDI Out Enable Right Zone MIDI Out Enable Left/Right Balance -31 = Left only +31 = Right only Voice Configuration 0 = 2/4 1 = 4/2 2 = 6/0 3 = 0/6

### Global Parameters Data Format

Statistics: 236 Bytes/Global Parameters = 472 Nibbles Transmitted + 4 Bytes Header + 1 byte checksum + 1 byte EOX = 477 Total Transmitted Bytes/Global Parameters Not Used Vibrato Speed Mod Source Code Vibrato Xaveform Vibrato Amplitude Vibrato Speed Mod Source Code Vibrato Speed Modulation Amount Vibrato Amp Modulation Amount Vibrato Amp Modulation Amount Master Tune Velocity Scale Type Velocity Scale Type Velocity Sensitivity MIDI Basic Channel MIDI Dath Changes Enable MIDI Controllers Enable MIDI Controllers Enable MIDI Podal 1 Controller MIDI Podal 1 Controller MIDI Podal 2 Controller MIDI Local Controller Pada 2 Invert Enable Display Brightness SQUICK Enable Patch Map Echo Enable Not Used MIDI Active Sensing Enable Byte Parm #Bits Description  $\begin{matrix} 0 \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 101 \\ 12 \\ 134 \\ 15 \\ 6 \\ 17 \\ 19 \\ 201 \\ 222 \\ 24 \\ 26 \\ 27 \\ 28 \\ 29 \\ 30 \\ 312 \\ 33 \\ 35 \\ 36 \\ 135 \\ 55 \\ 36 \\ 136 \\ 235 \end{matrix}$  $\begin{array}{c} 30\\ 31\\ 32\\ 33\\ 34\\ 35\\ 36\\ 55\\ 40\\ 01\\ 02\\ 36\\ 55\\ 06\\ 07\\ 8\\ 9\\ 42\\ 35\\ 56\\ 17\\ 57\\ \end{array}$ 000000 6 6 (Signed) 2 641 77771 1 5 1 1 44 13 6 1 14 12 15 1 MIDI Ecno Enable Patch Not Used MIDI Mono Mode Enable Input Patch Map Output Patch Map 1 18 6 each 6 each

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