fairlight

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Memory

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The Fairlight has a memory range of 32 meg starting at HEX address 2000000 and ending at address 3FFFFFF. The waveform ram cards can be set up to begin and end in any continuous block within this region.

For the purposes of diagnosing problems with memory please refer to pages 81, 82, 83, and 84 of the Rev 11 A/B user manual.

If you do need to reassign memory cards follow the DIP switch set ups outlined. To make it easy for all concerned it is important to know which memory section is in which digital card cage slot. It is vital that the memory is continuous.

As an example, if you have 1 x 8 meg card and the remaining cards were 6 x 2 meg you would place the 8 meg card in slot 7 and use set up 8 for that card. The 2 meg card in slot 6 would be set up 11, slot 5 would be set up 10, slot 4 would be set up 9, slot 3 would be set up 8, slot 2 would be set up 7, slot 1 would be set up 6. The total continuous memory is 20 meg and starts at address 2C00000 and finishes at address 3E00000.

In another example, if you have 2 x 8 meg cards, 1 x 4 meg and 2 x 2 meg. You would place the first 8 meg card in slot 7 and use set up 8, you would place the second 8 meg card in slot 6 and use set up 9, you would place the 4 meg card in slot 5 and use set up 3, you would place the first 2 meg card in slot 4 and use set up 5, you would place the second 2 meg card in slot 3 and use set up 4. Slots 2 and 1 remain unused. The total continuous memory is 24 meg and starts at address 2800000 and finishes at address 3E00000.

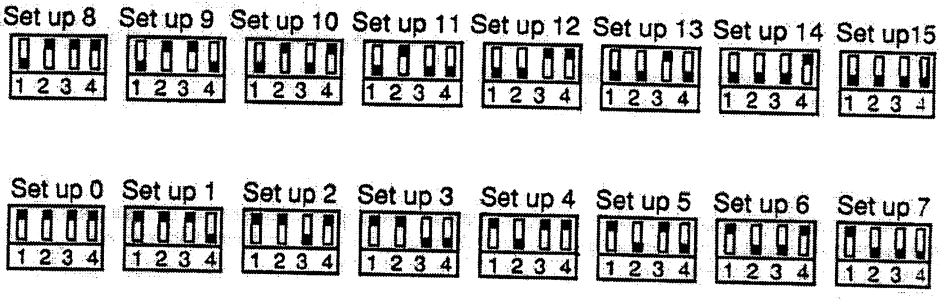
As a matter of consistency install 8 meg cards first then 4 meg then 2 meg starting at slot 7.

If you have any questions regarding this memory card set up procedure please do not hesitate in contacting us directly.

Waveform Memory Map

Waveform Ram START ADDRESS	2 Meg Card	4 Meg Card	8 Meg Card
2000000	Set up 0	Set up 0	Set up 11
2200000	Set up 1		
2400000	Set up 2	Set up 1	
2600000	Set up 3		
2800000	Set up 4	Set up 2	Set up 10
2A00000	Set up 5		
2C00000	Set up 6	Set up 3	
2E00000	Set up 7		
3000000	Set up 8	Set up 4	Set up 9
3200000	Set up 9		
3400000	Set up 10	Set up 5	
3600000	Set up 11		
3800000	Set up 12	Set up 6	Set up 8
3A00000	Set up 13		
3C00000	Set up 14	Set up 7	
3E00000	Set up 15		

CARD DIP SWITCH SET UP



Note: Modifications for 2, 4, 8 meg cards refer to FCN`s 47,48,56,69,70,78

WSDIAG Waveform Diagnostics

Introduction

For the MFX hardware that is being used to run the disk recorder applications, a high performance is required, and particularly where machines have been upgraded in the field to MFX specification, testing of the boards is highly desirable. For this reason, a software testing set has been released on current Waveform Supervisor ROMs (revision 5 and later).

The program, which is called WSDIAG, is primarily a waveform RAM test. But it differs from previous (QDOS-based) diagnostics in that it can selectively run the channel cards and the Waveform Supervisor DMA in the same area of memory that is being tested. In this way, faults in the other waveform-connected cards can be detected that could result in corruption of memory during disk recorder operations.

Importance of Waveform RAM

Waveform RAM is used in Revision 11 operations for three distinct purposes:

1. It acts as a buffer for audio data coming off disk and being clocked out by the channel cards in sync with timecode.
2. It holds the file /c0/cmi11fast which is used for fast page changing.
3. It holds some information about the Master Recordings

Because of the importance of the data that is held, it is essential that the memory remain bit perfect at all times. In particular, because the Master Recording information is held in RAM, failure of even one bit in memory can result in some of the serious error messages mentioned in the previous section.

Influence of Channel Cards on Memory

The channel cards have, as one of their tasks, the responsibility to generate addresses of sounds (or clips) in Waveform RAM. These are fed to the RAM, and the data at the address is read. Then it is bussed out to the Channel Support Card and from there to the audio outputs.

If the Channel Cards are faulty, they can cause incorrect addresses to be accessed by the Waveform Supervisor when it is writing to memory. This means that the wrong data is overwritten, and this data could be an important part of the edit list of a disk recorder file. In this way a faulty channel card can cause the loss of a whole file.

In a machine that is exhibiting any of the faults or errors described above, the channel cards are the strongest suspect.

Running WSDIAG

Starting WSDIAG

To enter the WSDIAG program type:

QUIT<RETURN> to exit into the operating system

WSDIAG<RETURN>

Now start the memory test by typing:

m<RETURN>

This is a useful first test, putting the entire memory range of the machine under the microscope. The memory tests performed include constant number tests, walking address tests, bus-banging (changing of all ones to zeroes and vice versa on successive locations), and random number tests. The tests are performed endlessly, and the machine reports the pass number it is currently on. The screen also gives information about the range of memory being tested (in this case all), tells you if it is writing or reading, and displays a rotating bar to let you know that it is running (if no errors occur, this is the only moving item displayed). If the machine performs 5 successful passes of the test, then it is likely that the channel

cards, Waveform Supervisor and memory cards are all working well, at least in the area of waveform RAM access.

If the machine encounters errors during this test, they will be reported, with one line across the screen for each error. The format of this report shows you the memory address that gave the error, the value that was written to that address, and the value (different) that was read back.

If there are no errors, the only thing that will change on the screen is the pass number that the test has reached. Note that all machines leaving the Fairlight factory must run WSDIAG for 12 hours without a single memory error, and this is the standard you should expect from your machine. If there are any errors reported, take a note of the first few, then make contact with your distributor or the Fairlight factory.

To stop a memory test, type:

<ctrl - n> That is hold down the ctrl key and press n

Sometimes this must be typed more than once.

Tests with Specific Ranges

If errors occur during these tests, it is possible to narrow down the faulty area of the machine by running only a portion of the cards. The error messages indicate the exact memory cell that is giving errors. You may perform tests on only that part of the memory by noting the 2 meg range in which the faults occur.

To run the test in a specific range of memory, type:

m *range*<RETURN> where range is the range of memory that you wish to test. See Hexadecimal Numbers below for information about calculating the desired range.

Determining Memory Addresses

It may be useful to know the correct addresses of the RAM cards in the system being tested. To find this out type:

wfmfree<RETURN>

If your memory is properly set up this program will give you two numbers, the start adress of the waveform RAM, and the size of the Waveform RAM, both in hexadecimal (see "Hexadecimal Numbers" below, for a brief explanation), and also the size in megabytes. The numbers you will need to use in WSDIAG are the start and the end of waveform RAM in hex. To get the address of the end of waveform RAM, add the start number to the size number, then subtract one. For example, if:

START = 03200000 and SIZE = 00d00000 (this is the normal setup for a 14 megabyte system)

then the address of the end of memory is 3fffffff. The 7 indivdual memory cards will have the following ranges:

3200000 - 33fffff

3400000 - 35fffff

3600000 - 37fffff

3800000 - 39fffff

3a00000 - 3bfffff

3c00000 - 3dfffff

3e00000 - 3fffffff

Or, in the case of a machine containing 8 meg cards, the addresses usually begin at 2000000 or 3000000.

Note: for Waveform Supervisors installed with KMON 20 ROM revision 5 or higher, WSDIAG will automatically select the correct memory range by default. The wfmfree command prints the KMON ROM number on screen.

Varieties of Memory Test

The standard memory test runs through the following types of test:

1. constant - the same value is written to each location in the range
2. bus banging - first ffff0000 is written, then 0000ffff, causing all the ones to change to zeroes and vice versa within adjacent memory cells
3. walking address - writes the actual address of a cell in the cell, thus confirming that the correct address is being written and read
4. random - successive cells are written with random values

It is possible to choose a specific test by adding an option letter to the memory command. For example:

mb3200000-33fffff<RETURN>

would perform a bus-banging test on the 2 meg block starting at 3200000. The complete list of options is:

a	all
b	bus banging
c	constant
w	walking address
r	random

Most errors seem to be generated by the bus banging and random tests.

How to get out of WSDIAG

To exit WSDIAG, type

<ctrl - c>	This will prompt you for a command.
q<RETURN>	Quits WSDIAG
<esc>	This will restart the main MFX program

Hexadecimal Numbers

Many computer interfaces use hexadecimal (or hex) numbers instead of decimal ones. This system is an arithmetic based on sixteen digits instead of 10.

To understand this, consider the way that the decimal number system uses ten actual digits, i.e. 0 to 9, to express a huge range of numbers. As soon as a larger number than 9 is needed, an extra column is added to the left of the existing ones. In hexadecimal arithmetic there are sixteen different numbers going from 0 to 9, then a to f. So a is equivalent to decimal 10, b is 11, and so on up to f which is 15.

The decimal number 16 is expressed as 10, and the decimal number 32 is expressed as 20. Here are a few more equivalents in a table:

Decimal	Hex	
256	100	$(= 16^2)$
273	111	$(= 16^2 + 16^1 + 16^0)$
512	200	$(= 2 \times 16^2)$
4096	1000	$(= 16^3)$
65536	10000	$(= 16^4)$
1048576	100000	$(= 16^5)$ This is exactly a meg in the true sense of k x k (= 1024 x 1024)

When performing addition with hex numbers, allow the numbers to reach 15 before carrying a number to the previous column. For example, 9 + 2 = b, 9 + 5 = e, 9 + 8 = 11, a + b = 15.

```
  03200000
+ 00e00000
= 04000000
```

Working with WSDIAG, you need to be able to work out the last address in a block of some megabytes. In the previous example, we start at address 3200000 (32 meg) and we have e00000 (14 meg) of memory. Though the total of those two numbers is 4000000 (40 meg), the range of addresses ends at one less than that number (i.e. 3fffffff). To establish a 2 megabyte range starting at 03200000, the sum looks like this

```
    03200000
+   00200000
=   03400000
```

so you would type the memory test as follows:

m3200000-33fffff<RETURN>

Conclusion

This is only an introduction to WSDIAG, which has a large number of facilities not described here. It is probably sufficient to use this set commands for general diagnostic work, since a machine which passes the tests with all channels and all memory working is in fine condition as far as its waveform buss is concerned, and one that fails has cards that need repair or replacement.

It is a good idea to use the WSDIAG tests whenever a machine exhibits waveform faults, whether they are clicks and pops in the audio or error messages as listed at the beginning of this manual. It is very unwise to ignore these messages, as they indicate that severe damage to projects is possible or even likely.