

MP517III (18pin Head) control board designing guidance ver 1.0.0

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This guidance is a reference for the software designing of 18 pin printing by MP517III. Other designing method such as hardware designing, motor controlling, and other sensor controlling can be referred to MP500 (9 pin) guidance.

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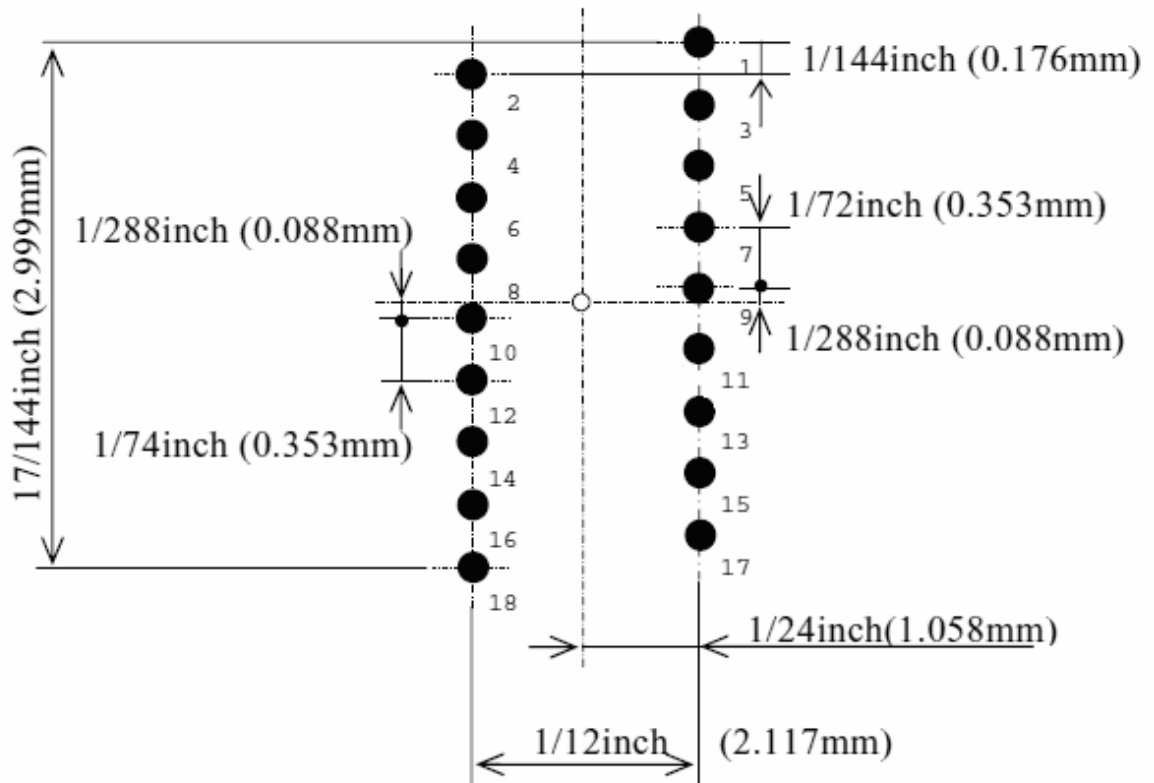
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Chapter 1 : 18 pin Head Controlling

1-1 Head Structure



Above is the illustration of 18 pin print head. **Even number of pins are 14 half dot apart from odd number of pins horizontally**, and half dot apart from odd number of pins vertically.

1-2 Print head firing

1-2-1 Basic 1 pass ANK font

To print ANK, use only odd number of pins like 9 pin head.

In case of 7x9 half ANK font, the horizontal matrix consists of 7 half dot. In this font, the next dot is not continuous as following example of printing “2p” (32h, 70h).

In case of **7x9 half dot**, the font data consists of as following for example.

For “2” : h'000,h'042,h'080,h'006,h'088,h'002,h'090,h'062,h'000,h'000

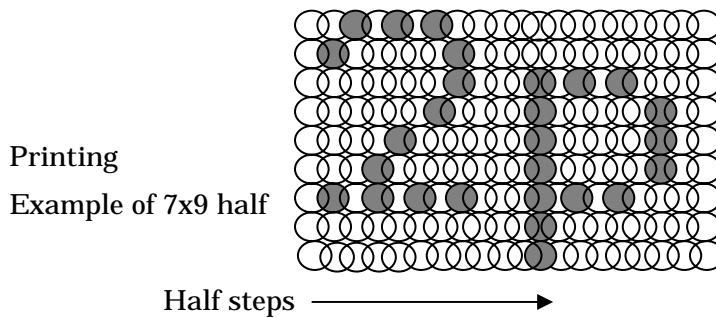
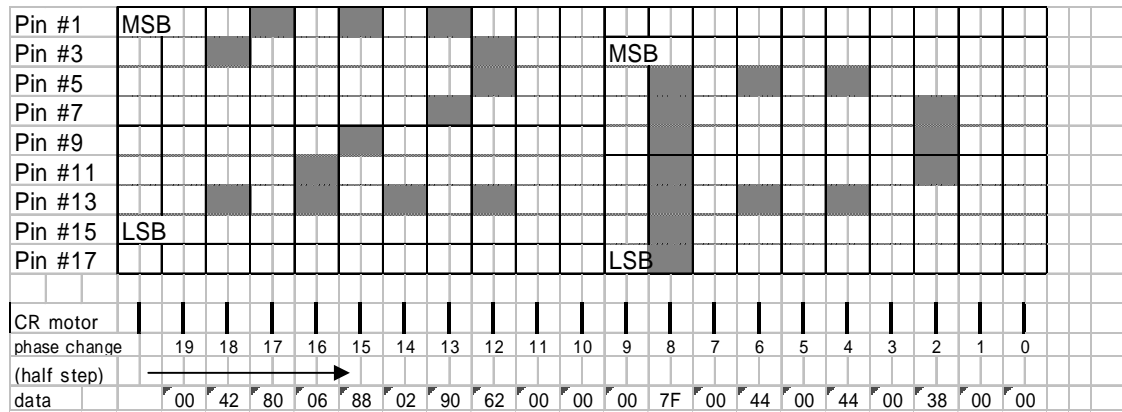
For “p” : h'0FF,h'07F,h'000,h'044,h'000,h'044,h'000,h'038,h'000,h'000

(1st data is “shift sign”. If it is 000, #1 to #15 pin are used. If it is 0FF, #3 to #17 pin are used.
2nd to data to 10th data are each pin fire byte data. #1 to #15 pin ON/OFF are shown as 1 byte

data.)

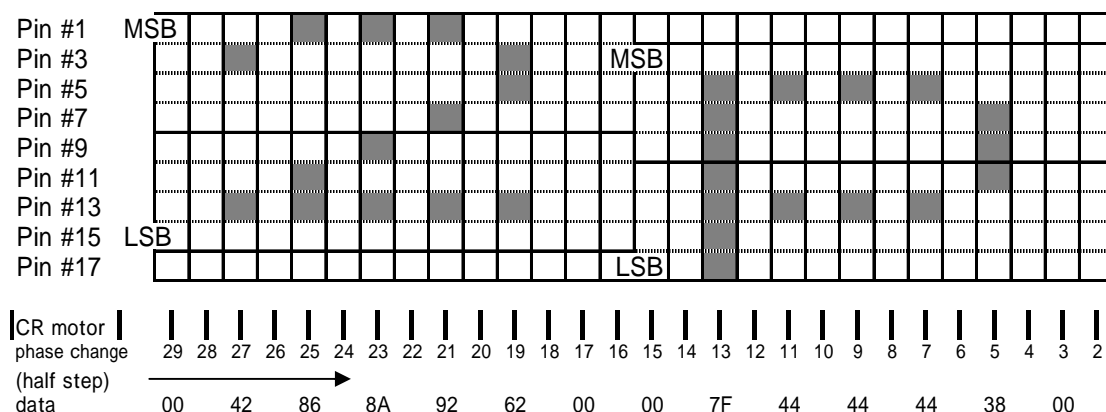
Expand the data to line buffer memory as below

The character which has 000h in 1st data should be shift 1 dot to upper side. In case of 0FFh in 1st data, no change the pin position. Then printing data will be ready.

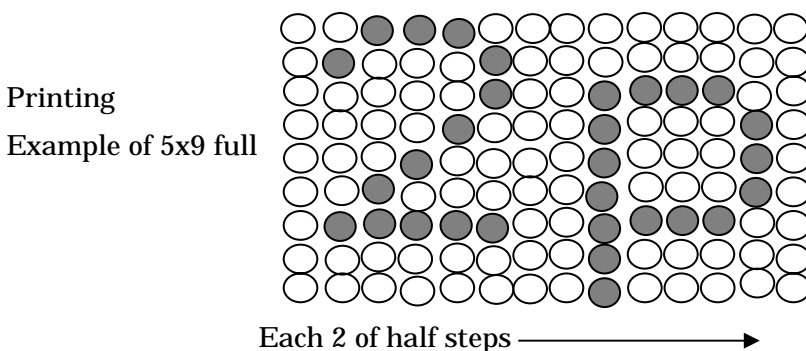


(1st data is "shift sign". If it is 000, #1 to #15 pin are used. If it is 0FF, #3 to #17 pin are used. 2nd to data to 10th data are each pin fire byte data. #1 to #15 pin ON/OFF are shown as 1 byte data.)

The character which has 000h of 1st data should be shift 1 dot to upper side. In case of 0FFh of 1st data, no change. Then printing data will be ready.



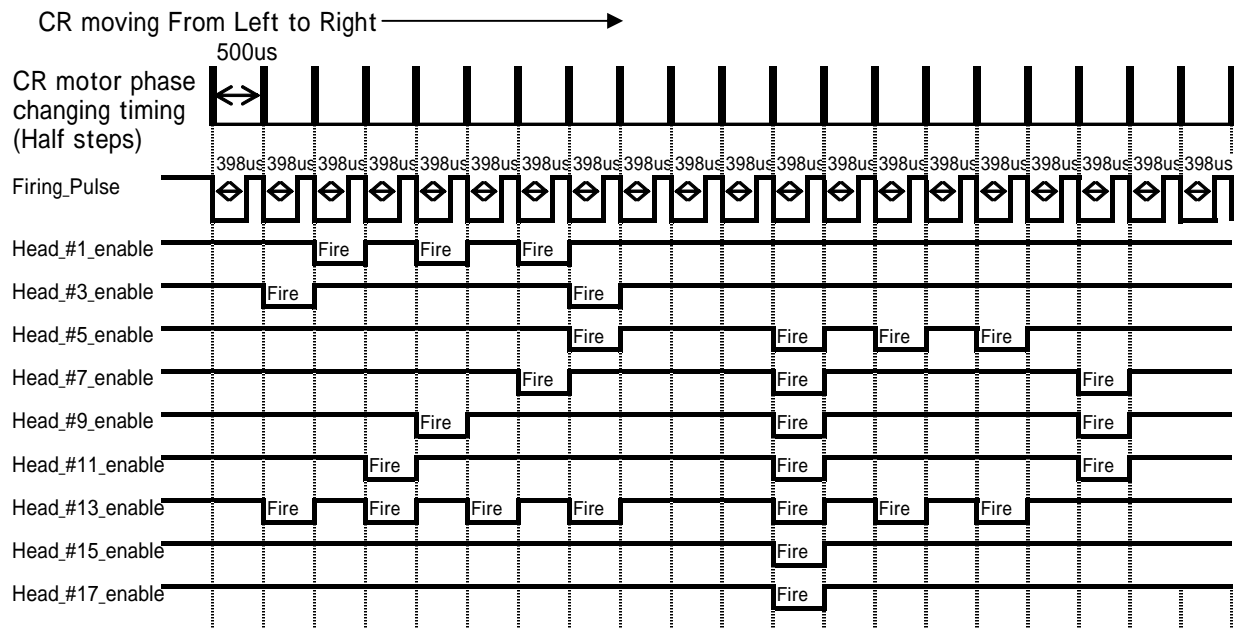
Expand the data to line buffer memory as below.



1-2-2 Each Head Coil firing (CR moving Left to Right)

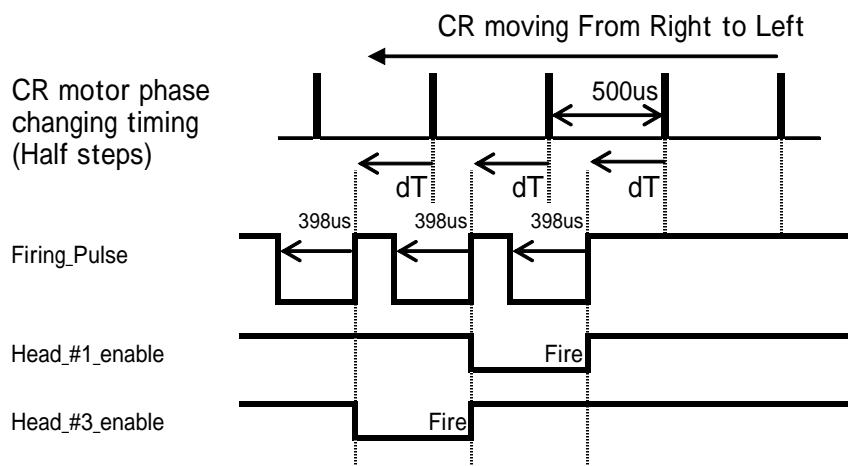
The horizontal dot shall not be fired continuously because of half dot printing. In case of continuous half dot printing, printing head response cannot follow its frequency.

Example of the printing from left to right is shown as following. Simply, firing should be done each dot at the same time of CR motor phase changing. Below are example of 7x9 half “2p” which is generated by 1-2-1.



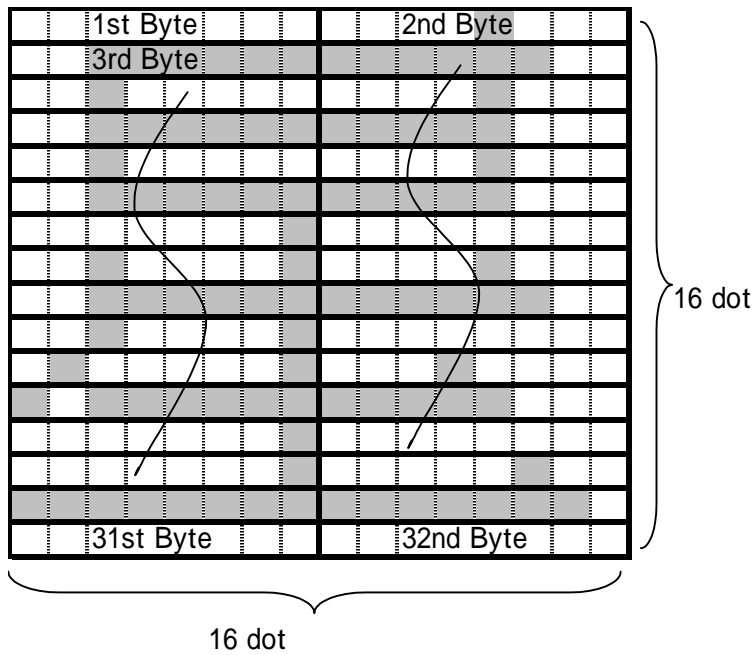
1-2-3 Each Head Coil firing (CR moving Right to Left)

In case of CR moving Right to Left, the firing timing must be considered to dot alignment. Dot alignment adjusting can be achieved by adjusting delay time (dT) from CR motor phase changing timing.

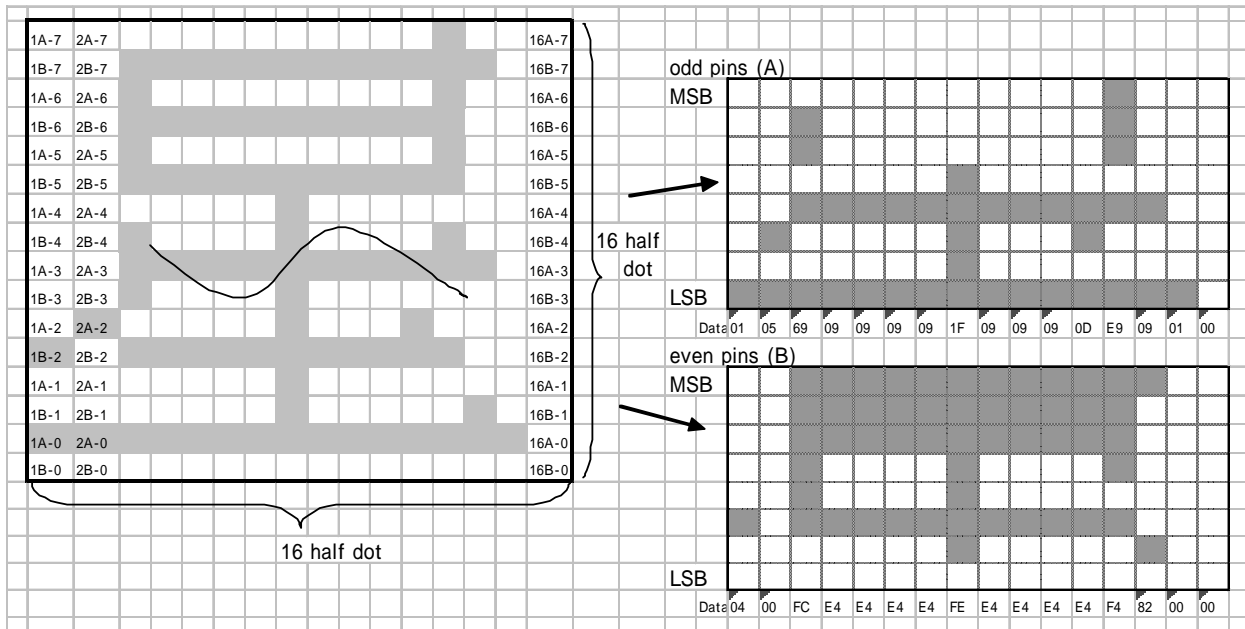


1-2-4 Making printing data of 16x16 Chinese character

How to read the data of font is depending on font data structure which you have. But most of Chinese character font is stored in the ROM as following order.

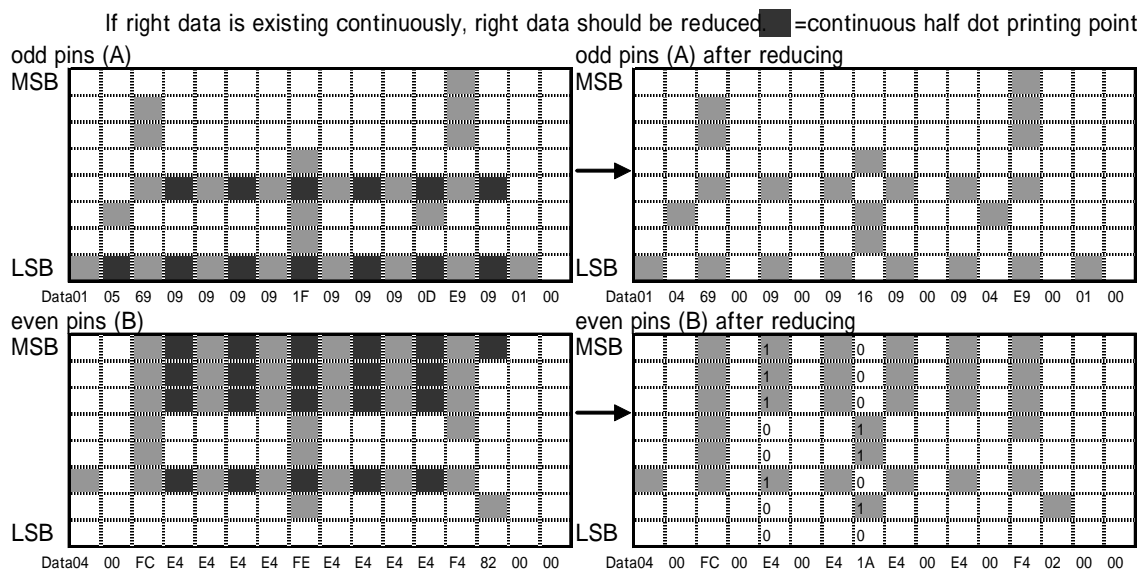


After reading these 32 bytes data, data structure should be changed to below order. “A” means odd pin printing data, “B” means even pin printing data. For example, 2A-7 is MSB of 2nd dot on odd pin pass, 2B-1 is LSB of 2nd dot on even dot. (2a-7,2A-6,2A-5,2A-4,2A-3,2A-2,2A-1,2A-0 is shown as 00000101.) 1A to 16A are 16 byte of odd pin data as 01 05 69 09 09 09 09 1F 09 09 09 0D E9 09 01 00. 1B to 16B are 16 byte of even pin data as 04 00 FC E4 E4 E4 E4 FE E4 E4 E4 E4 F4 82 00 00.

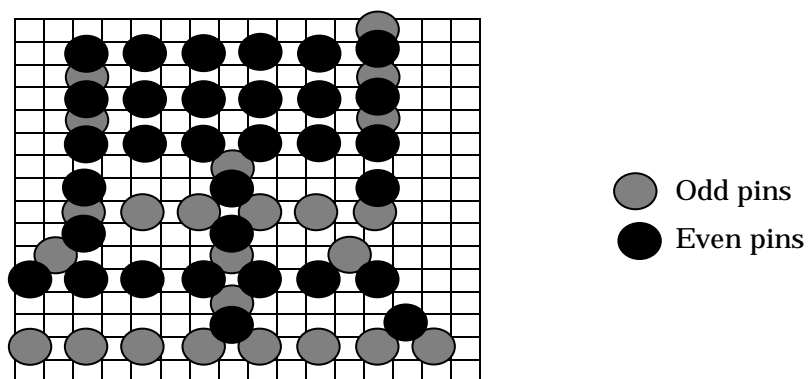


1-2-5 Reducing continuous half dot data for 16x16 Chinese character

After making printing data, there are still continuous half dot existing. For small size half dot 16x16 printing, continuous half dot data for horizontal direction must be reduced.



Finally, odd pins printing and even pins after 14 half dot moving. Each dot firing is same method as 1-2-2 and 1-2-3.

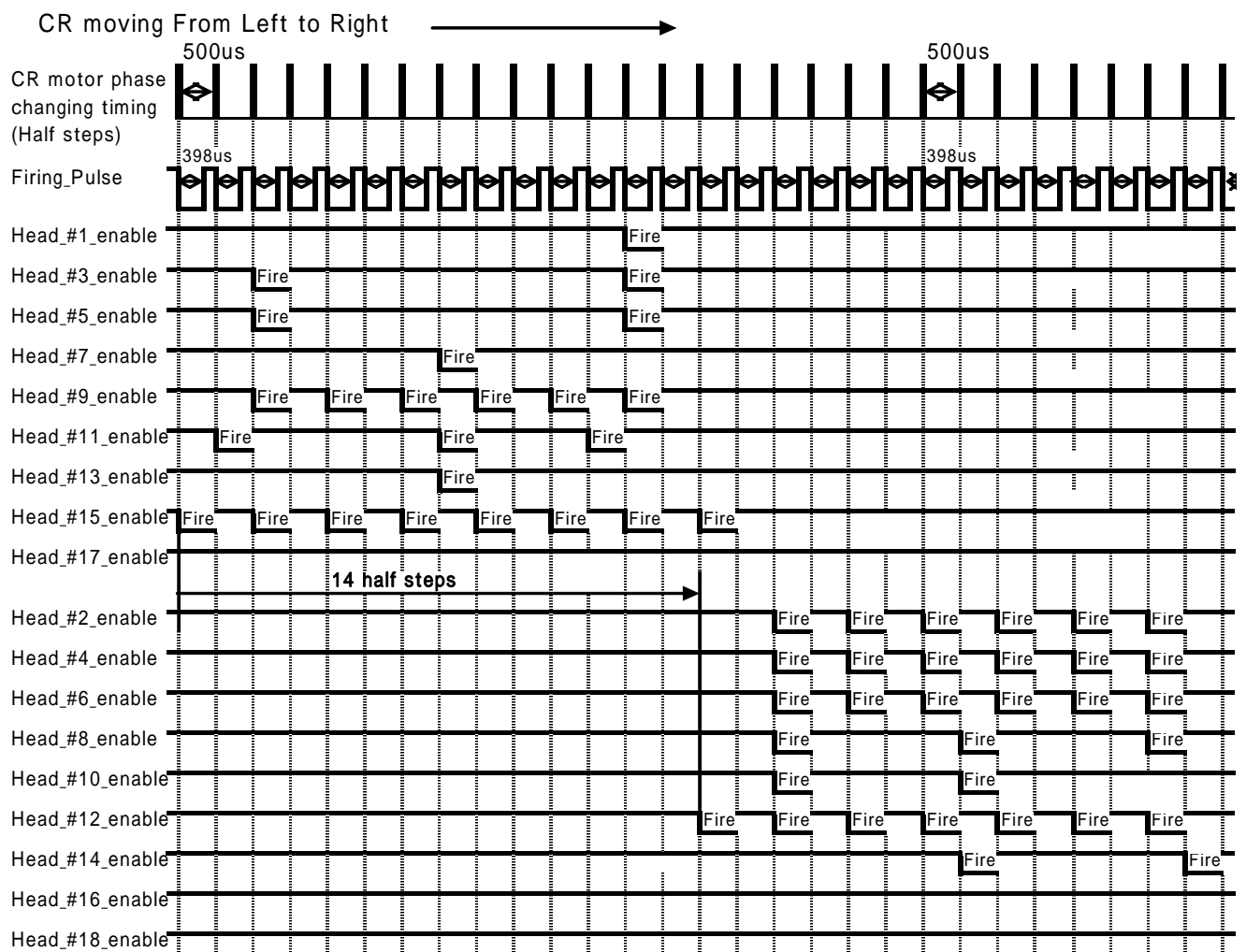


01 04 69 00 09 00 09 16 09 00 09 04 E9 00 01 00 (printing data of each half step : MSB=#1 pin, LSB=#15pin)

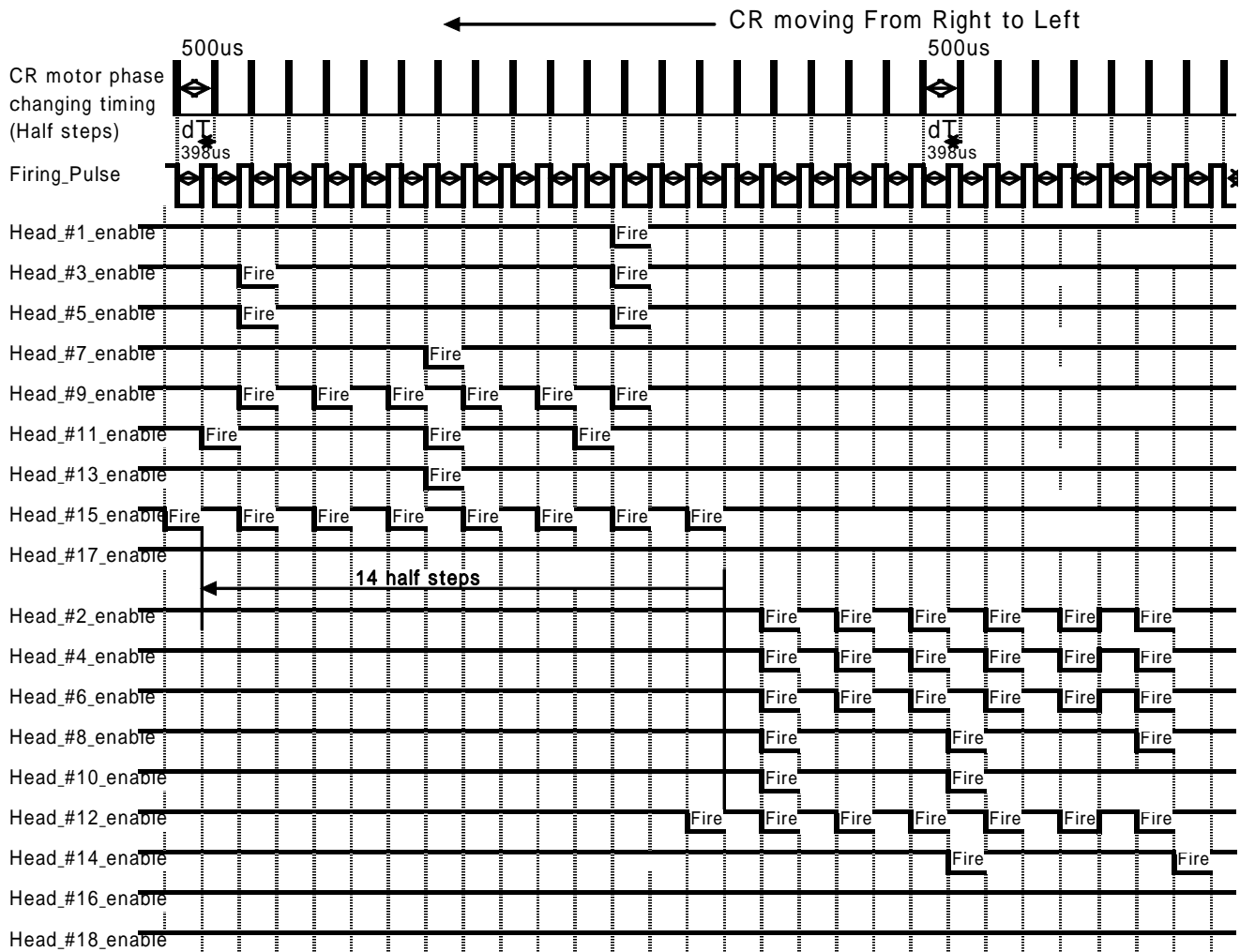
04 00 FC 00 E4 00 E4 1A E4 00 E4 00 F4 02 00 00 (printing data of each half step : MSB=#2 pin, LSB=#16pin)

Even pins fires after 14 half dots of Odd pins

Next chart is showing the relationship between CR motor phase and each pin firing in case of above character printing.



For Carriage moving right to left, timer for delay time dT should be added as same way of 1-2-3.



1-3 Thermistor detection and head heat controlling

In case of hardware of head thermistor on MP517III,

When head temperature becomes 110 C degree, resistance value of thermistor is 2.85 k ohm.

In this temperature, voltage of Analogue port will be $V_{cc} \times 10k / (2.85k + 10k) = 3.89V$

When temperature becomes 110C degree, printing should be limited with uni-directional printing.

When head temperature becomes 130 C degree, resistance value of thermistor is 2.182 k ohm. In this temperature, voltage of Analogue port will be $V_{cc} \times 10k / (1.69k + 10k) = 4.28V$

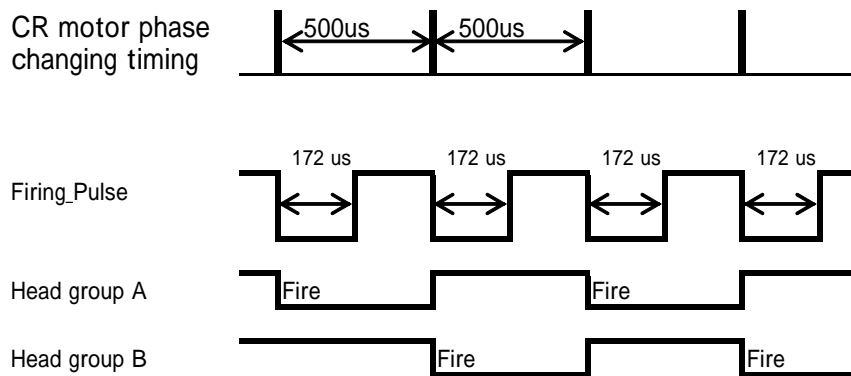
When temperature becomes 130C degree, printing should be stopped.

Printing with the condition of over the established temperature will cause of printer failure.

1-4 Pre-fire

Pre-fire is firing print head when printer power turns on in order to head needle moving smoothly.

In case of pre-fire, you need to set pulse width of head firing **172us** (398us for printing). And firing all #1 to #18 pins for **200 times** with less than **1000Hz** (more than 1 ms interval). Firing should be separated by below group of head pin to be not firing all pins at the same time.



Head Group A : #1, #4, #5, #8, #9, #12, #13, #16, #17

Head Group B : #2, #3, #6, #7, #10, #11, #14, #15, #18

1-5 Beep from printer mechanism

With continuous narrow firing pulse, it sounds like beep. Condition of Printer beep is as following.

Pulse width = 80us for ON, 407.8 us for OFF

Interval (frequency = 2048Hz (488us for 1 cycle)

All pin (#1 to #18) repeat ON/OFF

