

**LCD Controller Manual**  
**MSMF320240-2 Version 2.07**

## 1. MSMF320240-2

### 2. MSMF320240-2 Connector

- 2-1 LCD Module Interface Connector
- 2-2 Backlight Power Connector
- 2-3 RS-232C Connector
- 2-4 Power Connector
- 2-5 Touch Connector
- 2-6 Expansion Memory Interface

### 3.

#### 3-1.

- 3-1-1
- 3-1-2
- 3-1-3 Text Layer
- 3-1-4 Graphic Layer
- 3-1-5 Text Layer ON/OFF
- 3-1-6 Text Layer
- 3-1-7 Serial Baud Rate
- 3-1-8 Text Layer, Graphic Layer ON/OFF
- 3-1-9 Text, Graphic Layer Clear
- 3-1-10 Text Layer Cursor
- 3-1-11 Text Layer Rectangle
- 3-1-12 Blink
- 3-1-13 CCFL Power ON/OFF
- 3-1-14 LCD Bias Voltage UP/DOWN
- 3-1-15 MSMF320240-2 Rebooting
- 3-1-16 Graphic Layer /
- 3-1-17 Graphic Layer Line /
- 3-1-18 Graphic Layer / Rectangle /
- 3-1-19 Graphic Layer / /
- 3-1-20 Graphic Layer / /
- 3-1-21 Reset
- 3-1-22 Image display
- 3-1-23 Touch

### 4. MSMF320240-2 Image Overwrite

- [ 1.] MSMF320240-2 Special Font

## 1. MSMF320240-2

### ◆ MSMF320240-2

◆ LCD Resolution : FSTN Mono 320\*240 dots

◆

:

KS5601

◆ LCD Bias Voltage 가

◆ LCD Back Light : Inverter \_On/Off 가

◆ Font : 16\*16 dots

16\*16 dots

8\*16 dots

8\*16 dots

16\*16

◆ Touch Panel Interface

◆ Expansion Memory Interface

320\*240 BMP 53 [Page] 가

(Serial overwrite program )

Font

,

/

,

/

### ◆ MSMF320240-2

◆ CPU : Atmega128-16A1

◆ Display Type : FSTN Mono 320\*240 dots

◆ : DC 5[V]

◆ LCD Backlight Inverter

◆ : RS-232C

=> 4800, 9600, 19200, 57600, 115200 [bps]

(Default 57600[bps]) : Software

=> 9600, 19200, 57600, 115200 [bps] : Hardware

### ◆ MSMF320240-2

◆ Text Layer, Graphic Layer : Layer ON/OFF

◆ , : 가 2 , 2 , 가 2

◆ Graphic : , Line, Rectangle ,

- ◆ LCD Bias Voltage
- ◆ / Font
- ◆ 320\*240 Mono BMP Image display 가 ( 53 [Page] )
- ◆ Image display Text/Graphic Layer 가 (default Text Layer)
- ◆
- ◆ Cursor , Cursor ,Cursor Off
- ◆ : Enter
- ◆ Backspace
- ◆
- ◆ Clear : Block Clear , Clear
- ◆
- ◆ Rectangle : Text Layer, Graphic Layer

## 2. MSMF320240-2 Connector

2 MSMF320240-2 Dimensions Connector

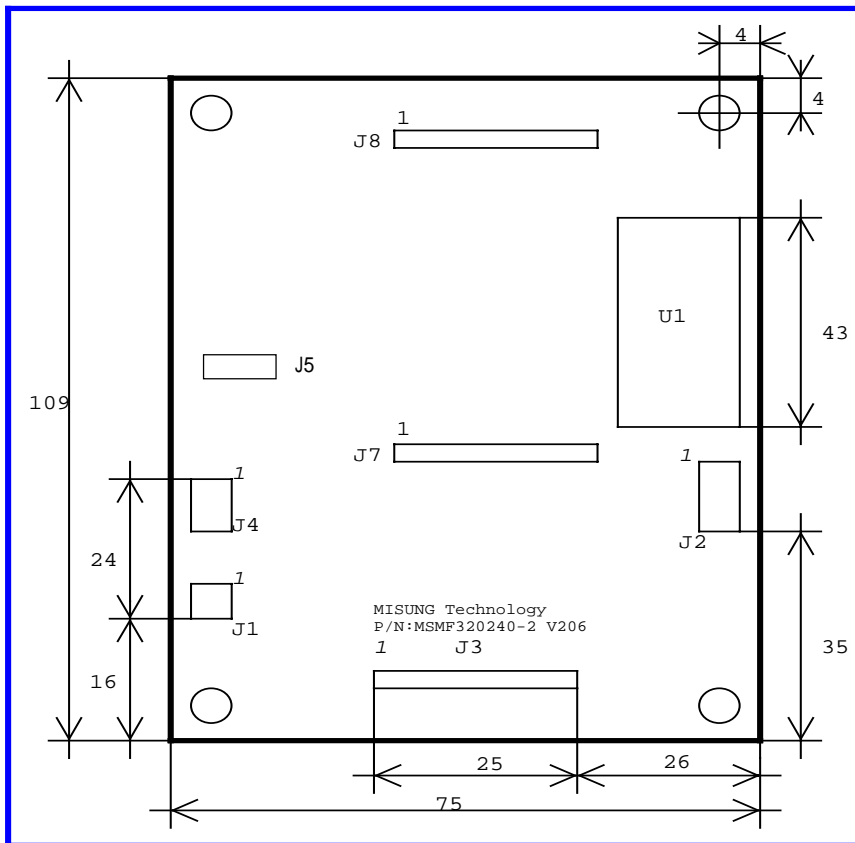
### MSMF320240-2



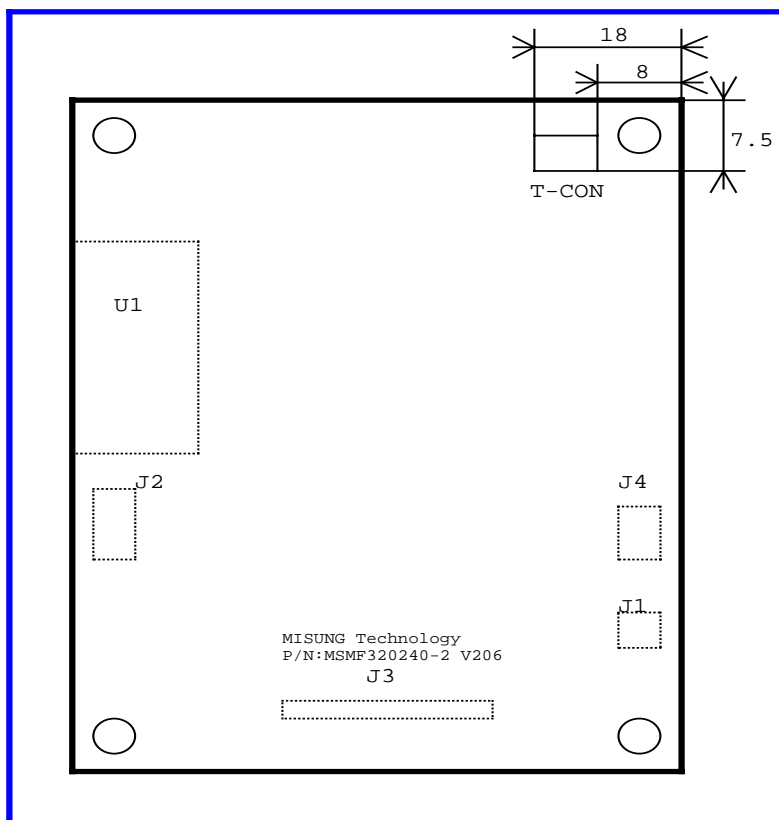
Expansion Board



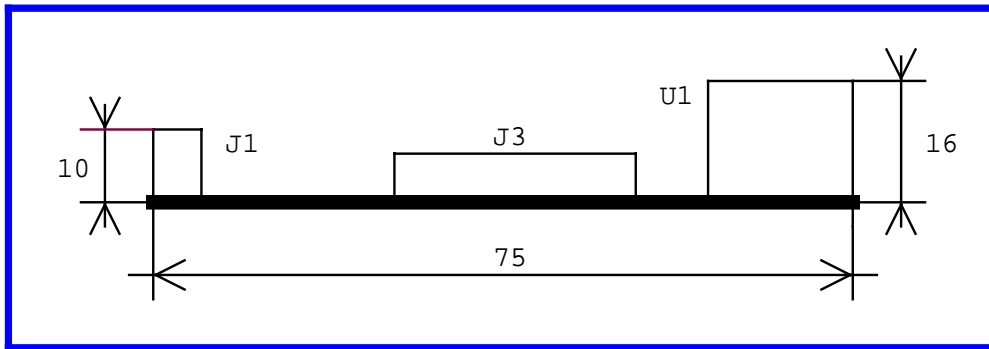
**MSMF320240-2 Dimensions**



**MSMF320240-2 Dimensions**



## MSMF320240-2



## 2-1. LCD Module Interface Connector : J3

| Pin Number | Symbol | Description           |
|------------|--------|-----------------------|
| 1          | VSS    | GND                   |
| 2          | VDD    | +5 VDC                |
| 3          | VO     | Voltage for LCD Logic |
| 4          | A0     | Data                  |
| 5          | /WR    | Data write signal     |
| 6          | /RD    | Data read signal      |
| 7          | D0     | Data                  |
| 8          | D1     | Data                  |
| 9          | D2     | Data                  |
| 10         | D3     | Data                  |
| 11         | D4     | Data                  |
| 12         | D5     | Data                  |
| 13         | D6     | Data                  |
| 14         | D7     | Data                  |
| 15         | /CS    | Chip select signal    |
| 16         | /RST   | Reset                 |
| 17         | VEE    | Voltage for LCD Drive |
| 18         | SEL1   | Data                  |
| 19         | NC     | Not use               |
| 20         | NC     | Not use               |
| 21         | NC     | Not use               |
| 22         | NC     | Not use               |

**2-2. Backlight Power Connector : J2**

| Pin Number | Symbol  | Description  |
|------------|---------|--------------|
| 1          | OUT     | CCFL OUT     |
| 2          | OPEN    | OPEN         |
| 3          | OPEN    | OPEN         |
| 4          | OUT_COM | CCFL_COM OUT |

**2-3. RS-232C Connector : J4**

| Pin Number | Symbol | Description                    |
|------------|--------|--------------------------------|
| 1          | RXD    | Receive Data : LCD Controller  |
| 2          | TXD    | Transmit Data : LCD Controller |
| 3          | GND    | Ground                         |

**2-4. Power Connector : J1**

| Pin Number | Symbol | Description |
|------------|--------|-------------|
| 1          | VCC    | DC+5[V]     |
| 2          | GND    | Ground      |

**2-5. Touch Connector : T-CON**

| Pin Number | Symbol | Description |
|------------|--------|-------------|
| 1          | X+     |             |
| 2          | Y-     |             |
| 3          | X-     |             |
| 4          | Y+     |             |

**2-6. Expansion Memory Interface : J7**

| Pin Number | Symbol | Description |
|------------|--------|-------------|
| 1          | VCC    | +5 [VDC]    |
| 2          | Open   | Not use     |
| 3          | Data   | use         |
| 4          | Data   | use         |
| 5          | Date   | use         |
| 6          | Date   | use         |
| 7          | Open   | Not use     |
| 8          | GND    | GND         |



**2-6-1. Expansion Memory Interface : J8**

| Pin Number | Symbol | Description |
|------------|--------|-------------|
| 1          | D0     | Data        |
| 2          | D1     | Data        |
| 3          | D2     | Data        |
| 4          | D3     | Data        |
| 5          | D4     | Data        |
| 6          | D5     | Data        |
| 7          | D6     | Data        |
| 8          | D7     | Data        |

## 3.

'Esc' = 0x1b [hex]

|        |  |        | Parameter  |       |
|--------|--|--------|--|-------|
| 'Esc'  | 'K'                                    | '0x01' |  | 3-1-1 |
|        |  | '0x02' | KS5601   |       |
|        |  | '0x03' | (default)  |       |
|        |  | '0x04' |  |       |
| 'Esc'  | 'E'                                    | '0x01' |  | 3-1-2 |
|        |  | '0x02' |  |       |
|        |  | '0x03' | (default)  |       |
|        |  | '0x04' |  |       |
| 'Esc'  | 'P'                                    | '0x01' | Text Layer ON  | 3-1-3 |
|        |  | '0x02' | Text Layer ON  |       |
|        |  | '0x03' | Graphic Layer ON   | 3-1-4 |
|        |  | '0x04' | Graphic Layer ON   |       |
|        |  | '0x05' | Text Layer ON  | 3-1-5 |
|        |  | '0x06' | Text Layer OFF   |       |
|        |  | '0x07' | Text Layer Font ON   |       |
|        |  | '0x08' | Text Layer Font 가 ON   | 3-1-6 |
|        |  | '0x09' | Text Layer Font ON   |       |
|        |  | '0x0a' | Text Layer Font OFF  |       |
|        |  | '0x0b' | Serial baud rate 4800 [bps]  | 3-1-7 |
|        |  | '0x0c' | Serial baud rate 9600 [bps]  |       |
|        |  | '0x0d' | Serial baud rate 19200 [bps]   |       |
| '0x0e' | Serial baud rate 57600 [bps] (default) |        |  |       |
| '0x0f' | Text Layer ON                          | 3-1-8  |  |       |
| '0x10' | Text Layer OFF                         |        |  |       |
| '0x11' | Graphic Layer ON                       |        |  |       |
| '0x12' | Graphic Layer OFF                      |        |  |       |
| '0x13' | Serial baud rate 115200 [bps]          |        |  |       |
| 'Esc'  | 'D'                                    | '0x01' | Text Layer clear   | 3-1-9 |
|        |  | '0x02' | (X1,Y1,X2,Y2) Text Layer clear<br>(X1,Y1,X2,Y2 hex<br>가 :0x00 ~ 0x27 :0x00 ~ 0x0e)         |       |
|        |  | '0x03' | Graphic Layer clear  |       |
|        |  | '0x04' | (X1,Y1,X2,Y2) Graphic Layer clear<br>(X1, Y1, X2, Y2 hex<br>가 :0x000 ~ 0x13f :0x00 ~ 0xEf) |       |

|       |     |        | Parameter     |  |        |
|-------|-----|--------|---------------|--|--------|
| 'Esc' | 'C' | '0x01' | (X,Y)         | Text Layer X,Y cursor<br>Text Display<br>(X,Y hex<br>가 :0x00 ~ 0x27 :0x00 ~ 0x0e)  | 3-1-10 |
|       |     | '0x02' |               | Text Layer cursor  |        |
|       |     | '0x03' |               | Text Layer cursor 8bit Line  |        |
|       |     | '0x04' |               | Text Layer cursor<br>8 x 16 dot  |        |
|       |     | '0x05' |               | Cursor off   |        |
| 'Esc' | 'R' | '0x01' | (X1,Y1,X2,Y2) | Text Layer 1 Line<br>Rectangle<br>(X1,Y1,X2,Y2 hex<br>가 :0x00 ~ 0x27 :0x00 ~ 0x0e) | 3-1-11 |
|       |     | '0x02' | (X1,Y1,X2,Y2) | Text Layer 2 Line<br>Rectangle<br>(X1,Y1,X2,Y2 hex<br>가 :0x00 ~ 0x27 :0x00 ~ 0x0e) |        |
| 'Esc' | 'B' | '0x01' |               | Text Layer ON  | 3-1-12 |
|       |     | '0x02' |               | Text Layer OFF   |        |
|       |     | '0x03' |               | Graphic Layer ON   |        |
|       |     | '0x04' |               | Graphic Layer OFF  |        |
| 'Esc' | 'L' | '0x01' |               | CCFL Power ON  | 3-1-13 |
|       |     | '0x02' |               | CCFL Power OFF   |        |
| 'Esc' | 'V' | '0x01' |               | LCD Bias Voltage UP  | 3-1-14 |
|       |     | '0x02' |               | LCD Bias Voltage DOWN  |        |
| 'Esc' | 'S' |        |               | LCD Bias Voltage Serial Baud rate<br><b>MSMF320240-2 Rebooting</b>                 | 3-1-15 |
| 'Esc' | 'G' | '0x01' | (X,Y)         | Graphic Layer _____<br>X:0x000 ~ 0x13f Y:0x00 ~ 0xEf                               | 3-1-16 |
|       |     | '0x02' | (X,Y)         | Graphic Layer _____<br>X:0x000 ~ 0x13f Y:0x00 ~ 0xEf                               |        |
|       |     | '0x03' | (X1,Y1,X2,Y2) | Graphic Layer <b>Line</b> _____<br>X1,X2:0x000 ~ 0x13f Y1,Y2:0x00 ~ 0xEf           | 3-1-17 |
|       |     | '0x04' | (X1,Y1,X2,Y2) | Graphic Layer <b>Line</b> _____<br>X1,X2:0x000 ~ 0x13f Y1,Y2:0x00 ~ 0xEf           |        |
|       |     | '0x05' | (X1,Y1,X2,Y2) | Graphic Layer <b>Rectangle</b> _____<br>X1,X2:0x000 ~ 0x13f Y1,Y2:0x00 ~ 0xEf      | 3-1-18 |
|       |     | '0x06' | (X1,Y1,X2,Y2) | Graphic Layer <b>Rectangle</b> _____<br>X1,X2:0x000 ~ 0x13f Y1,Y2:0x00 ~ 0xEf      |        |
|       |     | '0x07' | (X1,Y1,X2,Y2) | Graphic Layer <b>Rectangle</b> _____<br>X1,X2:0x000 ~ 0x13f Y1,Y2:0x00 ~ 0xEf      |        |
|       |     | '0x08' | (X1,Y1,X2,Y2) | Graphic Layer <b>Rectangle</b> _____<br>X1,X2:0x000 ~ 0x13f Y1,Y2:0x00 ~ 0xEf      |        |
|       |     | '0x09' | (X,Y,radius)  | Graphic Layer _____<br>X Y<br>X:0x000 ~ 0x13f Y:0x00 ~ 0xEf<br>Radius :0x00 ~ 0x78 |        |

|       |     |        | Parameter    |   |        |
|-------|-----|--------|--------------|---|--------|
|       |     | '0x0a' | (X,Y,radius) | Graphic Layer _____<br>X Y<br>X:0x000 ~ 0x13f Y:0x00 ~ 0xEf<br>Radius :0x00 ~ 0x78  | 3-1-19 |
|       |     | '0x0b' | (X,Y,radius) | Graphic Layer _____<br>X Y<br>X:0x000 ~ 0x13f Y:0x00 ~ 0xEf<br>Radius :0x00 ~ 0x78  |        |
|       |     | '0x0c' | (X,Y,radius) | Graphic Layer _____<br>X Y<br>X:0x000 ~ 0x13f Y:0x00 ~ 0xEf<br>Radius :0x00 ~ 0x78  |        |
|       |     | '0x0d' | (X,Y,a,b)    | Graphic Layer _____<br>X Y<br>X:0x000 ~ 0x13f Y:0x00 ~ 0xEf<br>a :320/2<br>b :240/2 | 3-1-20 |
|       |     | '0x0e' | (X,Y,a,b)    | Graphic Layer _____<br>X Y<br>X:0x000 ~ 0x13f Y:0x00 ~ 0xEf<br>a :320/2<br>b :240/2 |        |
|       |     | '0x0f' | (X,Y,a,b)    | Graphic Layer _____<br>X Y<br>X:0x000 ~ 0x13f Y:0x00 ~ 0xEf<br>a :320/2<br>b :240/2 |        |
|       |     | '0x10' | (X,Y,a,b)    | Graphic Layer _____<br>X Y<br>X:0x000 ~ 0x13f Y:0x00 ~ 0xEf<br>a :320/2<br>b :240/2 |        |
| 'Esc' | 'A' | '0x01' |              | Reset (MSMF320240-2 Rebooting)  | 3-1-21 |
|       |     | '0x02' |              | LCD Bias Voltage Serial Baudrate  |        |
|       |     | '0x03' |              | Echo '0x06' Send  |        |
| 'Esc' | 'I' | '0x01' | (X)          | Image One page draw<br>(X 0x00~0x34)  | 3-1-22 |
|       |     | '0x02' |              | Select Text Layer (default)   |        |
|       |     | '0x03' |              | Select Graphic Layer  |        |
| 'Esc' | 'T' | '0x01' |              | Touch start   | 3-1-23 |
|       |     | '0x02' |              | Touch end   |        |
|       |     | '0x03' |              | Touch start -> Touch input -> Send to serial X,Y value coordinate -> Touch end      |        |

3-1.

|                     |          |               |
|---------------------|----------|---------------|
| Parameter           | '+'      |               |
| <b>'Esc' = 0x1b</b> |          |               |
| Graphic Layer       | X        | MSMF320240-2  |
| . X                 | 가 1 byte | <u>byte</u>   |
| —                   | . ( byte | Graphic Layer |
| X2 )                | .)       | X( X1         |

3-1-1.

|                  |  |
|------------------|--|
|                  | 'ESC'+ 'K'                                   |
|                  | '0x01' or '0x02' or '0x03' or '0x04'         |
| <b>Parameter</b> |  |
|                  | 'ESC'+ 'K'      '0x01'                       |
|                  | '0x02'              KS5601                   |
|                  | '0x03'                      .(default)       |
|                  | '0x04'                                       |
|                  | 'ESC'+ 'K'+ '0x01' =>                        |
|                  | 'ESC'+ 'K'+ '0x02' =>      KS5601            |
|                  | 'ESC'+ 'K'+ '0x03' =>              (default) |
|                  | 'ESC'+ 'K'+ '0x04' =>                        |

3-1-2.

|                  |  |
|------------------|--|
|                  | 'ESC'+ 'E'                                   |
|                  | '0x01' or '0x02' or '0x03' or '0x04'         |
| <b>Parameter</b> |  |
|                  | 'ESC'+ 'E'      '0x01'                       |
|                  | '0x02'                                       |
|                  | '0x03'                      .(default)       |
|                  | '0x04'                                       |
|                  | 'ESC'+ 'E'+ '0x01' =>      ASCII 256         |
|                  | 'ESC'+ 'E'+ '0x02' =>                        |
|                  | 'ESC'+ 'E'+ '0x03' =>              (default) |
|                  | 'ESC'+ 'E'+ '0x04' =>                        |



## 3-1-6. Text Layer

|                  |  |             |            |          |      |
|------------------|--|-------------|------------|----------|------|
|                  | 'ESC'+ 'P'   |             |            |          |      |
|                  | '0x07' or '0x08' or '0x09' or '0x0a'   |             |            |          |      |
| <b>Parameter</b> |  |             |            |          |      |
|                  | 'ESC'+ 'P'<br>(가 , )   | '0x07'<br>가 | Text Layer | Display  | Font |
|                  | , '0x09'   | '0x08'<br>가 |            | , '0x0a' |      |
|                  |  | OFF         |            |          |      |
|                  | 'ESC'+ 'P'+ '0x07' => Text Layer Font<br>8*16 dots => 16*32 dots<br>16*16 dots => 32*32 dots<br>'ESC'+ 'P'+ '0x08' => Text Layer Font 가<br>8*16 dots => 16*16 dots<br>16*16 dots => 32*16 dots<br>'ESC'+ 'P'+ '0x09' => Text Layer Font<br>8*16 dots => 8*32 dots<br>16*16 dots => 16*32 dots<br>'ESC'+ 'P'+ '0x0a' => Text Layer Font OFF |             |            |          |      |

**3-1-7. Serial Baud Rate**

|                  | 'ESC'+ 'P' (Software )  |    |            |   |            |   |   |   |      |   |   |   |       |   |   |   |       |   |   |   |        |
|------------------|---|----|------------|---|------------|---|---|---|------|---|---|---|-------|---|---|---|-------|---|---|---|--------|
|                  | '0x0b' or '0x0c' or '0x0d' or '0x0e'  |    |            |   |            |   |   |   |      |   |   |   |       |   |   |   |       |   |   |   |        |
| <b>Parameter</b> |   |    |            |   |            |   |   |   |      |   |   |   |       |   |   |   |       |   |   |   |        |
|                  | <p>'ESC'+ 'P'                    '0x0b'                    Baud Rate    4800[bps]</p> <p>   '0x0c'                    9600[bps]                    ,</p> <p>'0x0d'                    19200[bps]                    .</p> <p>'0x0e'                    57600[bps]                    .</p> <p><b>115200[bps]                    =&gt;    3-1-8</b></p>  |    |            |   |            |   |   |   |      |   |   |   |       |   |   |   |       |   |   |   |        |
|                  | <p>'ESC'+ 'P'+ '0x0b' =&gt; Serial Baud Rate 4800[bps]</p> <p>'ESC'+ 'P'+ '0x0c' =&gt; Serial Baud Rate 9600[bps]</p> <p>'ESC'+ 'P'+ '0x0d' =&gt; Serial Baud Rate 19200[bps]</p> <p>'ESC'+ 'P'+ '0x0e' =&gt; Serial Baud Rate 57600[bps]</p>   |    |            |   |            |   |   |   |      |   |   |   |       |   |   |   |       |   |   |   |        |
|                  | J5    Head pin                    (Hardware )   |    |            |   |            |   |   |   |      |   |   |   |       |   |   |   |       |   |   |   |        |
|                  | <p style="text-align: center;">J5    Head pin</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>NO</th> <th>2</th> <th>3</th> <th>(baudrate)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0</td> <td>0</td> <td>9600</td> </tr> <tr> <td>2</td> <td>0</td> <td>1</td> <td>19200</td> </tr> <tr> <td>3</td> <td>1</td> <td>0</td> <td>57600</td> </tr> <tr> <td>4</td> <td>1</td> <td>1</td> <td>115200</td> </tr> </tbody> </table> | NO | 2          | 3 | (baudrate) | 1 | 0 | 0 | 9600 | 2 | 0 | 1 | 19200 | 3 | 1 | 0 | 57600 | 4 | 1 | 1 | 115200 |
| NO               | 2   | 3  | (baudrate) |   |            |   |   |   |      |   |   |   |       |   |   |   |       |   |   |   |        |
| 1                | 0   | 0  | 9600       |   |            |   |   |   |      |   |   |   |       |   |   |   |       |   |   |   |        |
| 2                | 0   | 1  | 19200      |   |            |   |   |   |      |   |   |   |       |   |   |   |       |   |   |   |        |
| 3                | 1   | 0  | 57600      |   |            |   |   |   |      |   |   |   |       |   |   |   |       |   |   |   |        |
| 4                | 1   | 1  | 115200     |   |            |   |   |   |      |   |   |   |       |   |   |   |       |   |   |   |        |
|                  | <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>NO.1 [9600]</p> </div> <div style="text-align: center;"> <p>NO.2 [19200]</p> </div> <div style="text-align: center;"> <p>NO.3 [57600] -&gt;default</p> </div> </div> <div style="margin-top: 20px;"> <p>NO.4 [115200]</p> </div> <div style="margin-top: 20px;"> <p>Software    Buadrate    1</p> <p>open                    .(2,3                    )</p> </div>         |    |            |   |            |   |   |   |      |   |   |   |       |   |   |   |       |   |   |   |        |



## 3-1-8. Text Layer, Graphic Layer ON/OFF

|                  |  |
|------------------|--|
|                  | 'ESC'+ 'P'   |
|                  | '0x0f' or '0x10' or '0x11' or '0x12' or '0x13'   |
| <b>Parameter</b> |  |
|                  | <p>'ESC'+ 'P'                      '0x0f'                      Text Layer                      ,</p> <p>'0x10'                      Text Layer                      가 OFF                      .</p> <p>'0x11'                      Graphic Layer                      ,</p> <p>'0x12'                      Graphic Layer                      OFF                      .</p> <p>'0x13'                      <b>Serial</b>                      가 115200[bps]                      .</p> |
|                  | <p>'ESC'+ 'P'+ '0x0f' =&gt; Text Layer                      ON</p> <p>'ESC'+ 'P'+ '0x10' =&gt; Text Layer                      OFF</p> <p>'ESC'+ 'P'+ '0x11' =&gt; Graphic Layer                      ON</p> <p>'ESC'+ 'P'+ '0x12' =&gt; Graphic Layer                      OFF</p> <p>'ESC'+ 'P'+ '0x13' =&gt; <b>Serial Baud Rate 115200[bps]</b></p>  |

## 3-1-9. Text, Graphic Layer Clear

|                  |  |
|------------------|--|
|                  | 'ESC'+ 'D'   |
|                  | '0x01' or '0x02' or '0x03' or '0x04'   |
| <b>Parameter</b> | 'X1'+ 'Y1'+ 'X2'+ 'Y2'   |
|                  | <p>'ESC'+ 'D'                      '0x01'                      Text Layer                      Clear                      , '0x02'</p> <p style="padding-left: 100px;">Parameter                      Text Layer가 Clear</p> <p>.</p> <p>'0x03'                      Graphic Layer                      Clear                      , '0x04'</p> <p style="padding-left: 100px;">Parameter                      Graphic Layer가 Clear                      .</p> <p>, Text Layer                      X1                      X2                      0x00 ~ 0x27</p> <p style="padding-left: 40px;">Text Layer                      Y1                      Y2                      0x00 ~ 0x0e</p> <p>, Graphic Layer                      X1                      X2                      0x00 ~ 0x13f</p> <p style="padding-left: 40px;">Graphic Layer                      Y1                      Y2                      0x00 ~ 0xef</p> <p><b>Graphic Layer</b>                      X1                      X2                      MSMF320240-2 Board</p> <hr/> <p>byte</p> <p>_____ ) X2 = 0x136(310 decimal)                      byte</p> <p>_____ 0x01                      ,                      0x36                      .</p> <p>, Text Layer                      8*16 dots</p> <p style="padding-left: 40px;">Text Layer                      X                      320/8</p> <p>0x00 ~ 0x27                      . Y                      240/16</p> <p>0x00 ~ 0x0e가</p> |

|  |   |
|--|---|
|  | 'ESC'+ 'D'+ '0x01' => Text Layer      Clear                                   |
|  | Text Layer                    (5, 0, 20, 11)      Clear                       |
|  | => 'ESC'+ 'D'+ '0x02'+ '0x05'+ '0x00'+ '0x14'+ '0x0b'                         |
|  | <br>  |
|  | 'ESC'+ 'D'+ '0x03' => Graphic Layer      Clear                                |
|  | Graphic Layer                    (10, 25, 300, 210)      Clear                |
|  | => 'ESC'+ 'D'+ '0x04'+ ' <u>0x00'+ '0x0a'+ '0x19'+ '0x01'+ '0x2c'+ '0xd2'</u> |
|  | Graphic Layer                    Clear  |
|  | X1    X2  |
|  | <br>  |
| <u>Graphic Layer</u> X <u>MSMF320240-2</u>                           |   |
| <u>byte</u> .  |   |
| (10, 25, 300, 210)                    X1                    가 1 byte |   |
| <u>byte</u> .  |   |
| byte                    Graphic Layer                                |   |
| X( X1                    X2 )                    .                   |   |

3-1-10. Text Layer      Cursor

|                  |  |
|------------------|--|
|                  | 'ESC'+ 'C'   |
|                  | '0x01' or '0x02' or '0x03' or '0x04' or '0x05'   |
| <b>Parameter</b> | 'X'+ 'Y' or 'None'   |
|                  | 'ESC'+ 'C'      '0x01'                    Parameter  |
|                  | Cursor가                    .   |
|                  | (Graphic Layer      Cursor                    .)   |
|                  | _____ Text Layer                    X _____ 0x00 ~ 0x27      ,                               |
|                  | Y _____ 0x00 ~ 0x0e      .   |
|                  | 'ESC'+ 'C'                    가 '0x02'                    Cursor                    , '0x03' |
|                  | Cursor      Line, '0x04'                    Cursor      Block                    .           |
|                  | '0x05'                    Cursor off                    .                                    |
|                  | 'ESC'+ 'C'+ '0x01'+ 'X'+ 'Y' => Text Layer (X, Y)                    Cursor                  |
|                  | 'ESC'+ 'C'+ '0x02' => Cursor   |
|                  | 'ESC'+ 'C'+ '0x03' => Cursor      Line   |
|                  | 'ESC'+ 'C'+ '0x04' => Cursor      Block  |
|                  | 'ESC'+ 'C'+ '0x05' => Cursor OFF   |

**3-1-11. Text Layer Rectangle**

|                  |  |
|------------------|--|
|                  | 'ESC'+ 'R'   |
|                  | '0x01' or '0x02'   |
| <b>Parameter</b> | 'X1'+ 'Y1'+ 'X2'+ 'Y2'   |
|                  | 'ESC'+ 'R'      '0x01'      Parameter      1 Line<br>Rectangle .<br>'0x02'가      Parameter      2 Line<br>Rectangle .<br>_____ Text Layer      X _____ 0x00 ~ 0x27 ,<br>Y _____ 0x00 ~ 0x0e .  |
|                  | 'ESC'+ 'R'+ '0x01'+ 'X1'+ 'Y1'+ 'X2'+ 'Y2' => Text Layer (X1, Y1, X2, Y2)<br>1 Line Rectangle<br>) (5, 3, 35, 12) 1 Line Rectangle<br>=> 'ESC'+ 'R'+ '0x01'+ '0x05'+ '0x03'+ '0x23'+ '0x0c'<br>'ESC'+ 'R'+ '0x02'+ 'X1'+ 'Y1'+ 'X2'+ 'Y2' => Text Layer (X1, Y1, X2, Y2)<br>2 Line Rectangle<br>) (5, 3, 35, 12) 2 Line Rectangle<br>=> 'ESC'+ 'R'+ '0x02'+ '0x05'+ '0x03'+ '0x23'+ '0x0c' |

**3-1-12. Blink**

|                  |   |
|------------------|---|
|                  | 'ESC'+ 'B'  |
|                  | '0x01' or '0x02' or '0x03' or '0x04'  |
| <b>Parameter</b> |   |
|                  | 'ESC'+ 'B'      '0x01'      Text Layer      가      ON.<br>'0x02'      Text Layer      OFF.<br>'0x03'      Graphic Layer      ON.<br>'0x04'      Graphic Layer      OFF.               |
|                  | 'ESC'+ 'B'+ '0x01' => Text Layer      ON.<br>'ESC'+ 'B'+ '0x02' => Text Layer      OFF<br>'ESC'+ 'B'+ '0x03' => Graphic Layer      ON<br>'ESC'+ 'B'+ '0x04' => Graphic Layer      OFF |



## 3-1-16. Graphic Layer /

|                  |   |
|------------------|---|
|                  | 'ESC'+ 'G'  |
|                  | '0x01' or '0x02'  |
| <b>Parameter</b> | 'X'+ 'Y'  |
|                  | 'ESC'+ 'G' '0x01' Parameter<br>Graphic Layer .<br>'0x02'가 Parameter Graphic Layer<br>____ Graphic Layer <u>X</u> <u>0x000 ~ 0x13f</u> ,<br><u>Y</u> <u>0x00 ~ 0xef</u> .  |
|                  | 'ESC'+ 'G'+ '0x01'+ 'X'+ 'Y' => (X, Y) .<br>) Graphic Layer (50, 80)<br>=> 'ESC'+ 'G'+ '0x01'+ ' <u>0x00</u> '+' <u>0x32</u> '+'0x50'<br>'ESC'+ 'G'+ '0x02'+ 'X'+ 'Y' => (X, Y) .<br>) Graphic Layer (310, 80)<br>=> 'ESC'+ 'G'+ '0x02'+ ' <u>0x01</u> '+' <u>0x36</u> '+'0x50'<br>X<br><u>Graphic Layer X</u> <u>MSMF320240-2</u><br><u>byte</u> . (50, 80) X 가<br>1 byte _____ byte . |

## 3-1-17. Graphic Layer Line /

|                  |   |
|------------------|---|
|                  | 'ESC'+ 'G'  |
|                  | '0x03' or '0x04'  |
| <b>Parameter</b> | 'X1'+ 'Y1'+ 'X2'+ 'Y2'  |
|                  | 'ESC'+ 'G' '0x03' Parameter<br>Graphic Layer Line .<br>'0x04'가 Parameter Graphic Layer<br>Line . _____ Graphic Layer <u>X</u> _____<br><u>0x000 ~ 0x13f</u> , <u>Y</u> <u>0x00 ~ 0xef</u> .   |
|                  | 'ESC'+ 'G'+ '0x03'+ 'X1'+ 'Y1'+ 'X2'+ 'Y2' => (X1,Y1,X2,Y2) Line .<br>) Graphic Layer (0, 10, 319, 229) Line<br>=> 'ESC'+ 'G'+ '0x03'+ ' <u>0x00</u> '+' <u>0x00</u> '+'0x0a'+ ' <u>0x01</u> '+' <u>0x3f</u> '+'0xe5'<br>'ESC'+ 'G'+ '0x04'+ 'X1'+ 'Y1'+ 'X2'+ 'Y2' => (X1,Y1,X2,Y2) Line<br>.<br>) Graphic Layer (0, 10, 319, 229) Line<br>=> 'ESC'+ 'G'+ '0x04'+ ' <u>0x00</u> '+' <u>0x00</u> '+'0x0a'+ ' <u>0x01</u> '+' <u>0x3f</u> '+'0xe5'<br>X1, X2 |

## 3-1-18. Graphic Layer / Rectangle /

|                  |  |
|------------------|--|
|                  | 'ESC'+ 'G'   |
|                  | '0x05' or '0x06' or '0x07' or '0x08'   |
| <b>Parameter</b> | 'X1'+ 'Y1'+ 'X2'+ 'Y2'   |
|                  | <p>'ESC'+ 'G'      '0x05'가      Parameter</p> <p>Graphic Layer      Rectangle      .</p> <p>'0x06'      Parameter      Graphic Layer</p> <p>    Rectangle      .</p> <p>,      '0x07'      Parameter</p> <p>Graphic Layer      Rectangle      .</p> <p>'0x08'      Parameter      Graphic Layer</p> <p>    Rectangle      .</p> <p>_____ Graphic Layer      <u>X</u> _____ <u>0x00 ~ 0x13f</u> ,</p> <p><u>Y</u> _____ <u>0x00 ~ 0xef</u> .</p>  |
|                  | <p>'ESC'+ 'G'+ '0x05'+ 'X1'+ 'Y1'+ 'X2'+ 'Y2'</p> <p>=&gt; (X1,Y1,X2,Y2)      Rectangle      .</p> <p>) Graphic Layer      (10, 10, 100, 100)      Line</p> <p>=&gt; 'ESC'+ 'G'+ '0x05'+ '<u>0x00</u>'+'<u>0x0a</u>'+'0x0a'+ '<u>0x00</u>'+'<u>0x64</u>'+'0x64'</p> <p>'ESC'+ 'G'+ '0x06'+ 'X1'+ 'Y1'+ 'X2'+ 'Y2'</p> <p>=&gt; (X1,Y1,X2,Y2)      Rectangle      .</p> <p>) Graphic Layer      (10, 10, 100, 100)      Rectangle      .</p> <p>=&gt; 'ESC'+ 'G'+ '0x06'+ '<u>0x00</u>'+'<u>0x0a</u>'+'0x0a'+ '<u>0x00</u>'+'<u>0x64</u>'+'0x64'</p> <p>'ESC'+ 'G'+ '0x07'+ 'X1'+ 'Y1'+ 'X2'+ 'Y2'</p> <p>=&gt; (X1,Y1,X2,Y2)      Rectangle      .</p> <p>) Graphic Layer      (10, 10, 100, 100)      Rectangle      .</p> <p>=&gt; 'ESC'+ 'G'+ '0x07'+ '<u>0x00</u>'+'<u>0x0a</u>'+'0x0a'+ '<u>0x00</u>'+'<u>0x64</u>'+'0x64'</p> <p>'ESC'+ 'G'+ '0x08'+ 'X1'+ 'Y1'+ 'X2'+ 'Y2'</p> <p>=&gt; (X1,Y1,X2,Y2)      Rectangle      .</p> <p>) Graphic Layer      (10, 10, 100, 100)      Rectangle      .</p> <p>=&gt; 'ESC'+ 'G'+ '0x08'+ '<u>0x00</u>'+'<u>0x0a</u>'+'0x0a'+ '<u>0x00</u>'+'<u>0x64</u>'+'0x64'</p> <p style="text-align: center;"><b>X1, X2</b></p> |

## 3-1-19. Graphic Layer

|                  |  |
|------------------|--|
|                  | 'ESC'+ 'G'   |
|                  | '0x09' or '0x0a' or '0x0b' or '0x0c'   |
| <b>Parameter</b> | 'X'+ 'Y'+ radius   |
|                  | <p>'ESC'+ 'G'      '0x09'가      Parameter</p> <p>Graphic Layer      radius      .</p> <p>'0x0a'가      Parameter      Graphic Layer</p> <p>        radius      .</p> <p>'0x0b'가      Parameter      Graphic Layer</p> <p>        radius      .</p> <p>'0x0c'      Parameter      Graphic Layer</p> <p>        radius      .</p> <p>_____ Graphic Layer      <u>X</u> _____ <u>0x000 ~ 0x13f</u> ,</p> <p><u>Y</u> _____ <u>0x00 ~ 0xef</u> . <u>radius</u> _____ <u>'0x01' ~ '0x78'</u> .</p>   |
|                  | <p>'ESC'+ 'G'+ '0x09'+ 'X'+ 'Y'+ 'radius'</p> <p>=&gt; (X,Y) 'radius'</p> <p>) Graphic Layer (100, 100) radius = 50</p> <p>=&gt; 'ESC'+ 'G'+ '0x09'+ '<u>0x00</u>'+'<u>0x64</u>'+'0x64'+ '0x32'</p> <p>'ESC'+ 'G'+ '0x0a'+ 'X'+ 'Y'+ 'radius'</p> <p>=&gt; (X,Y) 'radius'</p> <p>) Graphic Layer (100, 100) radius = 50</p> <p>=&gt; 'ESC'+ 'G'+ '0x0a'+ '<u>0x00</u>'+'<u>0x64</u>'+'0x64'+ '0x32'</p> <p>'ESC'+ 'G'+ '0x0b'+ 'X'+ 'Y'+ 'radius'</p> <p>=&gt; (X,Y) 'radius'</p> <p>) Graphic Layer (100, 100) radius = 50</p> <p>=&gt; 'ESC'+ 'G'+ '0x0b'+ '<u>0x00</u>'+'<u>0x64</u>'+'0x64'+ '0x32'</p> <p>'ESC'+ 'G'+ '0x0c'+ 'X'+ 'Y'+ 'radius'</p> <p>=&gt; (X,Y) 'radius'</p> <p>) Graphic Layer (100, 100) radius = 50</p> <p>=&gt; 'ESC'+ 'G'+ '0x0c'+ '<u>0x00</u>'+'<u>0x64</u>'+'0x64'+ '0x32'</p> <p style="text-align: center;">X</p> |

## 3-1-20. Graphic Layer

|                  |  |
|------------------|--|
|                  | 'ESC'+ 'G'   |
|                  | '0x0d' or '0x0e' or '0x0f' or '0x10'   |
| <b>Parameter</b> | 'X'+ 'Y'+ 'a'+ 'b'   |
|                  | <p>'ESC'+ 'G' '0x0d'가 Parameter<br/>Graphic Layer 가 'a' , 'b'</p> <p>'0x0e'가 Parameter Graphic Layer 가<br/>'a' , 'b'</p> <p>'0x0f'가 Parameter Graphic Layer 가<br/>'a' , 'b'</p> <p>'0x10' Parameter Graphic Layer 가<br/>'a' , 'b'</p> <p>_____ Graphic Layer <u>X</u> _____ <u>0x000 ~ 0x13f</u> ,<br/><u>Y</u> _____ <u>0x00 ~ 0xef</u> . 'a' _____ <u>'0x01' ~ '0xa0'</u> , 'b' _____<br/><u>'0x01 ~ 0x78'</u> .</p>   |
|                  | <p>'ESC'+ 'G'+ '0x0d'+ 'X'+ 'Y'+ 'a'+ 'b'<br/>=&gt; (X,Y) 가 'a', 'b'<br/>) Graphic Layer (150, 120) 'a'= 50, 'b'= 20</p> <p>=&gt; 'ESC'+ 'G'+ '0x0d'+ '<u>0x00</u>'+ '<u>0x96</u>'+ '0x78'+ '0x32'+ '0x14'</p> <p>'ESC'+ 'G'+ '0x0e'+ 'X'+ 'Y'+ 'a'+ 'b'<br/>=&gt; (X,Y) 가 'a', 'b'<br/>) Graphic Layer (150, 120) 'a'= 50, 'b'= 20</p> <p>=&gt; 'ESC'+ 'G'+ '0x0e'+ '<u>0x00</u>'+ '<u>0x96</u>'+ '0x78'+ '0x32'+ '0x14'</p> <p>'ESC'+ 'G'+ '0x0f'+ 'X'+ 'Y'+ 'a'+ 'b'<br/>=&gt; (X,Y) 가 'a', 'b'<br/>) Graphic Layer (150, 120) 'a'= 50, 'b'= 20</p> <p>=&gt; 'ESC'+ 'G'+ '0x0f'+ '<u>0x00</u>'+ '<u>0x96</u>'+ '0x78'+ '0x32'+ '0x14'</p> <p>'ESC'+ 'G'+ '0x10'+ 'X'+ 'Y'+ 'a'+ 'b'<br/>=&gt; (X,Y) 가 'a', 'b'<br/>) Graphic Layer (150, 120) 'a'= 50, 'b'= 20</p> <p>=&gt; 'ESC'+ 'G'+ '0x10'+ '<u>0x00</u>'+ '<u>0x96</u>'+ '0x78'+ '0x32'+ '0x14'</p> <p style="text-align: center;">X</p> |



## 3-1-21. Reset

|                  |  |
|------------------|--|
|                  | 'ESC'+ 'A'   |
|                  | '0x01' or '0x02' or '0x03'   |
| <b>Parameter</b> |  |
|                  | 'ESC'+ 'A'      '0x01'      Rebooting      .<br>'0x02'      LCD Bias Voltage      Serial Baudrate<br><b>Rebooting</b><br>'0x03'      MSMF320240-2 System      check      .<br>Serial '0x06'      ,      MSMF320240-2 |
|                  | 'ESC'+ 'A'+ '0x01' => Rebooting<br>'ESC'+ 'A'+ '0x02' => LCD Bias Voltage      Serial Baudrate<br>'ESC'+ 'A'+ '0x03' => MSMF320240-2 System      check   |

## 3-1-22. Image display

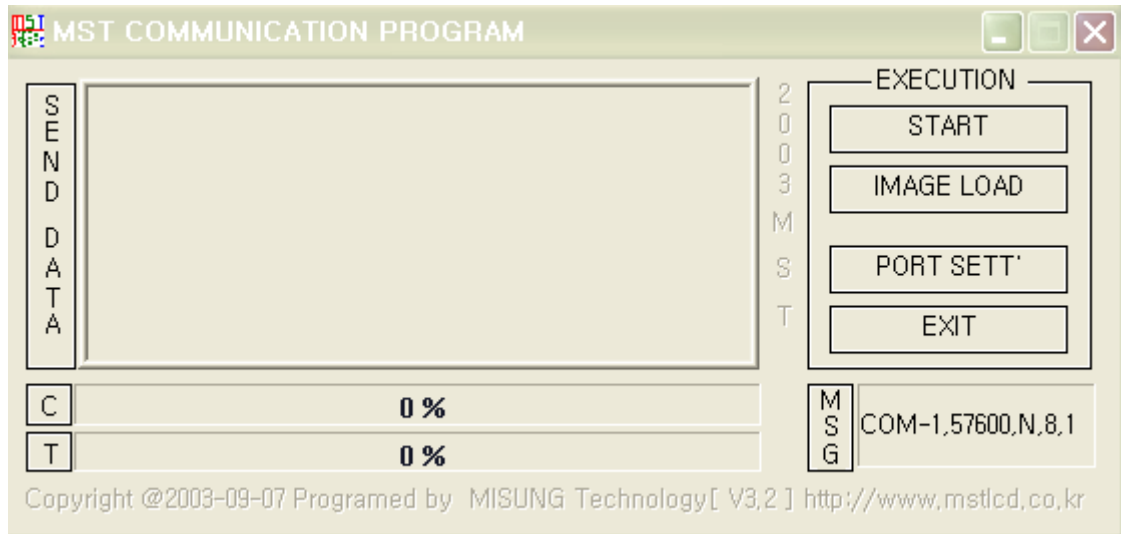
|                  |   |
|------------------|---|
|                  | 'ESC'+ 'I'  |
|                  | '0x01' or '0x02' or '0x03'  |
| <b>Parameter</b> | 'X'   |
|                  | 'ESC'+ 'I'      '0x01'      x (page number)<br>Memory      Image      display      .<br>'X'      [0x00 ~ 0x34]      .<br>* Display      default가 Text Layer      Graphic Layer<br>가      .<br>'0x02'      Image display      Text Layer      display      . (default)<br>'0x03'      Image display      Graphic Layer      display      . |
|                  | 'ESC'+ 'I'+ '0x01'+ 'X' => Image display<br>)      Image      Text Layer(default)      Display<br>'ESC'+ 'I'+ '0x01'+ '0x02'<br>=>      320*240      Text Layer      .<br>'ESC'+ 'I'+ '0x02' => Image display at Text Layer (default)<br>'ESC'+ 'I'+ '0x03' => Image display at Graphic Layer   |

## 3-1-23. Touch

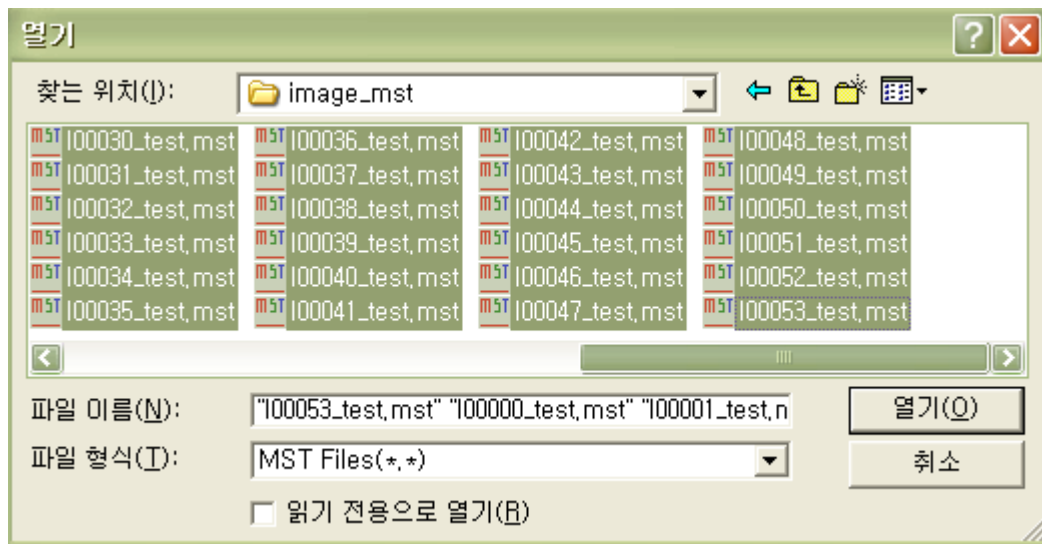
|                  |  |
|------------------|--|
|                  | 'ESC'+ 'T'   |
|                  | '0x01' or '0x02' or '0x03'   |
| <b>Parameter</b> |  |
|                  | <p>'ESC'+ 'T'      '0x01'      Touch      .</p> <p>Touch Panel X (1~319 decimal), Y (1~239)      Touch end</p> <p>end      RS-232C      ASCII "xxx,yyy" format</p> <p>. (Touch event )</p> <p>Touch Panel X, Y      ASCII Format      ,</p> <p>가 .</p> <p>'0x02'      Touch end.</p> <p>'0x03'      'ESC'+ 'T'+ '0x01'      ASCII format      Touch Panel</p> <p>Data X,Y      data      Touch</p> <p>(Touch event )</p> |
|                  | <p>'ESC'+ 'T'+ '0x01' =&gt; Touch end      Touch Panel X,Y</p> <p>'ESC'+ 'T'+ '0x02' =&gt; Touch End</p> <p>'ESC'+ 'T'+ '0x03' =&gt; Touch Panel X,Y      ASCII format</p> <p>(xxx,yyy)      Touch .</p>   |

4. MSMF320240-2 Image Overwrite

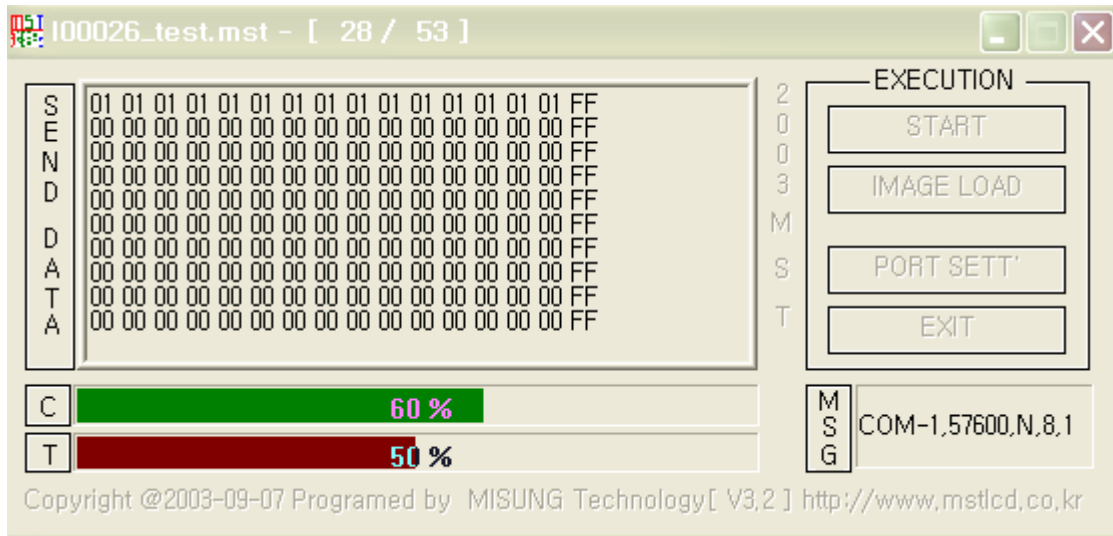
Image Overwrite Application Program



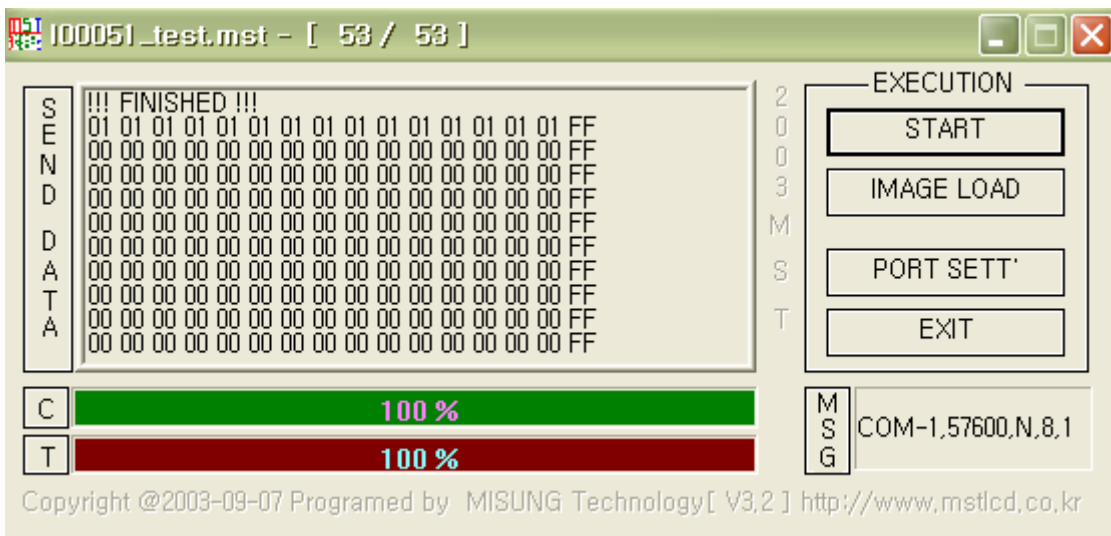
MSMF320240-2가 Image display ,  
 Image page Overwrite .  
 , MSMF320240-2 PC Serial Cable  
 'IMAGE LOAD' image ,



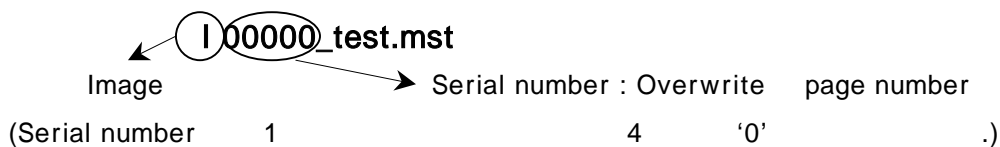
, 'START' MSMF320240-2 Overwrite



Bar Bar Download  
 Bar  
 Bar 가 '100%' Image Overwrite



'IMAGE LOAD' Image



Ex) 1 page Overwrite file 100001\_test.mst

[ 1.] MSMF320240-2

Special Font

< 1- 1 > MSMF320240-2 (Special Font)

Special < 1- 1 >

|      | 0x00            | 0x01            | 0x02           | 0x03            | 0x04 | 0x05 | 0x06              | 0x07              | 0x08 | 0x09 | 0x0A            | 0x0B                | 0x0C                | 0x0D            | 0x0E | 0x0F |
|------|-----------------|-----------------|----------------|-----------------|------|------|-------------------|-------------------|------|------|-----------------|---------------------|---------------------|-----------------|------|------|
| 0x00 |                 | ☎               | ☎              | ☎               | ☎    | ☎    | ☎                 | ☎                 |      | No.  | Co.             | TM.                 | am.                 |                 | FM.  | Tel. |
| 0x10 | I               | II              | III            | IV              | V    | VI   | VII               | VIII              | IX   | X    | ℓℓ              | mℓ                  | dℓ                  | ℓ               | kℓ   | cc   |
| 0x20 | mm <sup>3</sup> | cm <sup>3</sup> | m <sup>3</sup> | km <sup>3</sup> | fm   | nm   | μm                | mm                | cm   | km   | mm <sup>2</sup> | cm <sup>2</sup>     | m <sup>2</sup>      | km <sup>2</sup> | ha   | ℓg   |
| 0x30 | m <sup>g</sup>  | k <sup>g</sup>  | kt             | cal             | kcal | dB   | m <sup>3</sup> /s | m <sup>3</sup> /s | ps   | ns   | μs              | ms                  | pV                  | nV              | μV   | mV   |
| 0x40 | kV              | MV              | PA             | nA              | μA   | mA   | KA                | FW                | nW   | μW   | mW              | kW                  | MW                  | Hz              | kHz  | MHz  |
| 0x50 | GHz             | THz             | Ω              | kΩ              | MΩ   | PF   | nF                | μF                | mol  | cd   | rad             | rad <sup>2</sup> /s | rad <sup>3</sup> /s | sr              | Pa   | kPa  |
| 0x60 | MPa             | GPa             | Wb             | Im              | lx   | Bq   | Gy                | Sv                | °/kg | ㉿    | ㊀               | ㊁                   | ㊂                   | ㊃               | ㊄    | ㊅    |
| 0x70 | ㊆               | ㊇               | ㊈              | ㊉               | ㊊    | ㊋    | ㊌                 | ㊍                 | ㊎    | ㊏    | ㊑               | ㊒                   | ㊓                   | ㊔               | ㊕    | ㊖    |
| 0x80 | ㊗               | ㊘               | ㊙              | ㊚               | ㊛    | ㊜    | ㊝                 | ㊞                 | ㊟    | ㊠    | ㊡               | ㊢                   | ㊣                   | ㊤               | ㊥    | ㊦    |
| 0x90 | ㊧               | ㊨               | ㊩              | ㊪               | ㊫    | ㊬    | ㊭                 | ㊮                 | ㊯    | ㊰    | ㊱               | ㊲                   | ㊳                   | ㊴               | ㊵    | ㊶    |
| 0xA0 | ㊷               | ㊸               | ㊹              | ㊺               | ㊻    | ㊼    | ㊽                 | ㊾                 | ㊿    | ①    | ②               | ③                   | ④                   | ⑤               | ⑥    | ⑦    |
| 0xB0 | ⑧               | ⑨               | ⑩              | ⑪               | ⑫    | ⑬    | ⑭                 | ⑮                 | ⑯    | ⑰    | ⑱               | ⑲                   | ⑳                   | ㉑               | ㉒    | ㉓    |
| 0xC0 | ㉔               | ㉕               | ㉖              | ㉗               | ㉘    | ㉙    | ㉚                 | ㉛                 | ㉜    | ㉝    | ㉞               | ㉟                   | ㊀                   | ㊁               | ㊂    | ㊃    |
| 0xD0 | ㊄               | ㊅               | ㊆              | (a)             | (b)  | (c)  | (d)               | (e)               | (f)  | (g)  | (h)             | (i)                 | (j)                 | (k)             | (l)  | (m)  |
| 0xE0 | (n)             | (o)             | (p)            | (q)             | (r)  | (s)  | (t)               | (u)               | (v)  | (w)  | (x)             | (y)                 | (z)                 | (1)             | (2)  | (3)  |
| 0xF0 | (4)             | (5)             | (6)            | (7)             | (8)  | (9)  | (10)              | (11)              | (12) | (13) | (14)            | (15)                |                     |                 |      |      |

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