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SPECIFICATION

Rev. 5.0

Application: POS

VACUUM FLUORESCENT DISPLAY MODULE

Model No.: **20LL04DA1**

Rev. No	Issued Date	Description	Note
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**Notice:** Any other products and companies' names used herein are for identification purposes only.  
They may be trademarks of their respective companies.

## 1. SCOPE

- \* This specification applies to VFD module (Model No.; 20LL04DA1) manufactured by SSVD (Shanghai Samsung Vacuum Devices.)

## 2. FEATURES

- \* Since a DC/DC converter is used, the range of +5V<sub>DC</sub> to 26V<sub>DC</sub> power source can be used freely to operate the module.
- \* Uses RS-232 serial interface with communication speeds from 4,800 to 38,400bps.
- \* Display windowing commands are available using PTC or Epson command sets.
- \* High quality blue-green(505nm) vacuum fluorescent display provides an attractive and readable medium. Other colors can be achieved by simple wavelength filters.
- \* Has the ability to design user-defined characters that are stored in a non-volatile EEPROM.
- \* Command emulation modes include: PTC, EPSON, ADM787, ADM788, AEDEX, UTC\_S, UTC\_E, DSP800, ICD-2002.

## 3. OPERATING RECOMMENDATIONS

- \* Fixed display for prolonged periods of time leads to deterioration of the quality of display. Mobile display or changing between regular and inverted display to avoid fixed display for prolonged periods of time are recommended.
- \* Avoid applying excessive shock or vibration beyond the specification for the VFD module.
- \* Since VFDs are made of glass material, careful handling is required. i.e. Direct impact with hard material to the glass surface (especially exhaust tip) may crack the glass.
- \* When mounting the VFD module to your system, leave a slight gap between the VFD glass and your front panel. The module should be mounted without stress to avoid flexing of the PCB.
- \* Avoid plugging or unplugging the interface connection with the power on, otherwise it may cause the severe damage to input circuitry.
- \* Exceeding any of maximum ratings may cause the permanent damage.
- \* Since the VFD modules contain high voltage source, careful handling is required during powered on.
- \* When the power is turned off, the capacitor does not discharge immediately. The high voltage applied to the VFD must not contact to the ICs. In other words, the short-circuiting of mounted components on PCB within 30 seconds after power-off may cause damage to the module.
- \* The power supply must be capable of providing at least 5 times the rated current, because the inrush current maybe 5 times the specified current consumption when the power is turned on.
- \* Avoid using the module where excessive noise interference is expected. Noise may affect the interface signal and causes improper operation. And it is important to keep the length of the interface cable less than two meters.
- \* Since all VFD modules contain C-MOS ICs, anti-static handling procedures are always required.

## 4. PRODUCT SPECIFICATIONS

### 4.1 Type

|                 |                                                          |
|-----------------|----------------------------------------------------------|
| Model Number    | 20LL04DA1                                                |
| Number of Digit | 40 Digits (2 Lines * 20 Characters)                      |
| Display Format  | 5*7 Dot Matrix, Comma, Decimal Point and Annunciator (▼) |

### 4.2 Outer Dimensions, Weight

| Parameter        | Symbols       | Specification       | Unit |
|------------------|---------------|---------------------|------|
| Outer Dimensions | W * H * t     | 220.0 * 50.0 * 20.6 | mm   |
| Glass Size       | W * H         | 200.0 * 40.0        | mm   |
| Display Area     | W * H         | 167.4 * 23.2        | mm   |
| Character Pitch  | CP(x) * CP(y) | 8.45 * 11.05        | mm   |
| Character Size   | CW * CH       | 5.45 * 9.15         | mm   |
| Weight           | -             | approx. 180         | g    |

### 4.3 Environment Conditions

| Parameter                | Symbol | Min.                              | Max. | Unit |
|--------------------------|--------|-----------------------------------|------|------|
| Operating Temperature    | TOPR   | 0                                 | +70  | °C   |
| Storage Temperature      | TSTG   | -40                               | +85  | °C   |
| Humidity (Operating)     | TOPR   | 20                                | 85   | %    |
| Humidity (Non-operating) | TSTG   | 20                                | 95   | %    |
| Vibration                | -      | 4G (Amplitude=1mm, Freq.=10~55Hz) |      | -    |
| Mechanical Shock         | -      | 40G (Duration=10ms)               |      | -    |

### 4.4 Absolute Maximum Rating

| Parameter            | Symbol | Min.  | Max. | Unit |
|----------------------|--------|-------|------|------|
| Power Supply Voltage | VCC    | -0.3  | 30.0 | VDC  |
| Signal Input Voltage | VIN    | -25.0 | 30.0 | VDC  |

### 4.5 Recommended Operating Conditions

| Parameter                | Symbol | Min.  | Typ.  | Max. | Unit |
|--------------------------|--------|-------|-------|------|------|
| Power Supply Voltage (*) | VCC    | 4.5   | -     | 26.0 | VDC  |
| Signal Input Voltage     | SPACE  | 3.0   | 12.0  | 15.0 | VDC  |
|                          | MARK   | -15.0 | -12.0 | -3.0 | VDC  |

(\*) +5VDC, +9VDC, +12VDC or +24VDC can be used for operating this module.

### 4.6 Electrical DC Characteristics

| Parameter                                | Test Condition  | Min.                                    | Typ.  | Max.  | Unit              |     |
|------------------------------------------|-----------------|-----------------------------------------|-------|-------|-------------------|-----|
| Supply Current (*)<br>(All dots are lit) | VCC = + 5.0 VDC | -                                       | 900   | 1,350 | mA                |     |
|                                          | VCC = +12.0 VDC | -                                       | 400   | 600   | mA                |     |
|                                          | VCC = +24.0 VDC | -                                       | 200   | 300   | mA                |     |
| Signal Output Voltage                    | SPACE<br>MARK   | All Outputs Loaded<br>with 3kOhm to GND | +3.0  | +8.0  | -                 | VDC |
|                                          |                 |                                         | -     | -8.0  | -3.0              | VDC |
| Input Threshold Voltage                  | LOW<br>HIGH     | VCC = +12.0 VDC                         | 0.8   | 1.3   | -                 | VDC |
|                                          |                 |                                         | -     | 1.8   | 2.4               | VDC |
| RS-232 Input Hysterisys                  | VCC = +12.0 VDC | 0.2                                     | 0.5   | 1.0   | VDC               |     |
| RS-232 Input Resistance                  | VCC = +12.0 VDC | 3.0                                     | 5.0   | 7.0   | kOhm              |     |
| Luminance                                | VCC = +12.0 VDC | 350                                     | 700   | -     | cd/m <sup>2</sup> |     |
|                                          |                 | (102)                                   | (204) | -     | (ft-L)            |     |
| Display Color                            | Without Filter  | x = 0.25, y = 0.44                      |       | -     |                   |     |

(\*) The inrush current can be 5 times the specified maximum supply current at power on.

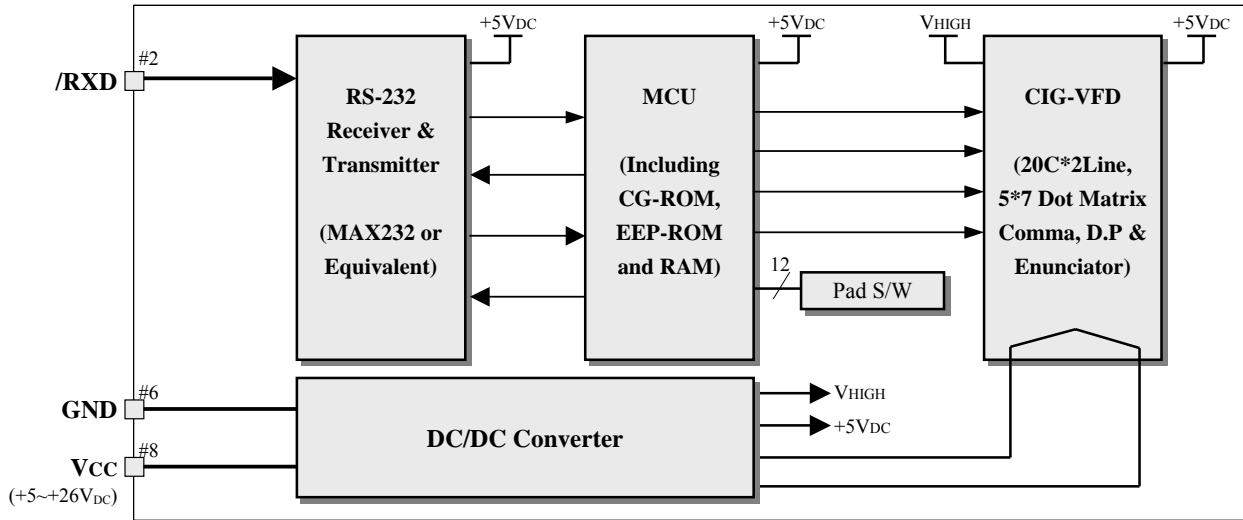
**4.7 Signal Interfacing Connector**

\* Connector1 (Male): 5267-08A (by Molex, 8-Pin Header) or equivalent

→ Recommended Mate Socket (Female): 5264-08 (by Molex) or equivalent

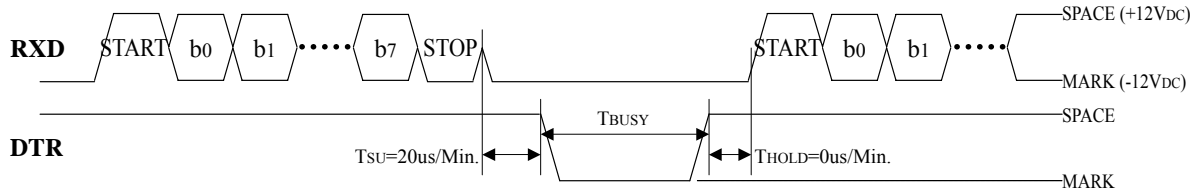
| No. | Signals | Description                     |
|-----|---------|---------------------------------|
| 1   | NC      | No connection                   |
| 2   | /RXD    | Data Receive from Host          |
| 3   | NC      | No connection                   |
| 4   | NC      | No connection                   |
| 5   | NC      | No connection                   |
| 6   | GND     | Ground                          |
| 7   | NC      | No connection                   |
| 8   | VCC     | Power supply (+5 VDC ~ +26 VDC) |

**4.8 System Block Diagram**



### 4.9 Serial Data Input Stream

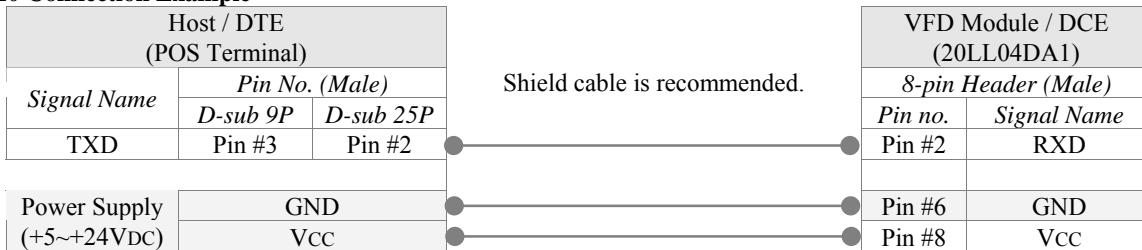
(Example of non parity, 8-bit data, 1 stop bit)



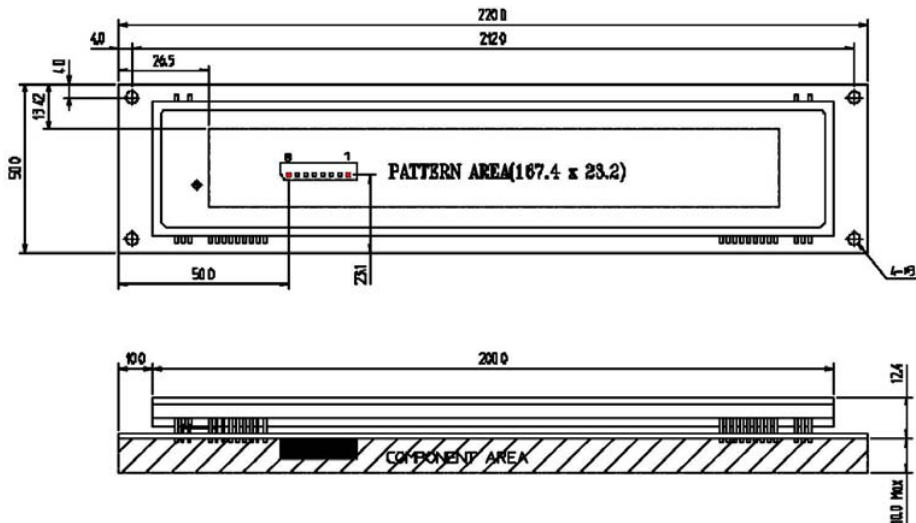
During MARK level of DTR, it is usually prohibited to receive the next following data. We recommend that a user should check whether DTR output signal is going to SPACE level, before sending data.

T<sub>BUSY</sub> is the decoding and execution time of micro-controller in this module. Each control command and character code have different T<sub>BUSY</sub> interval. During power-on-reset and self test mode, the T<sub>BUSY</sub> is set to MARK level. Therefore a user must check the DTR signal before sending any data.

### 4.10 Connection Example

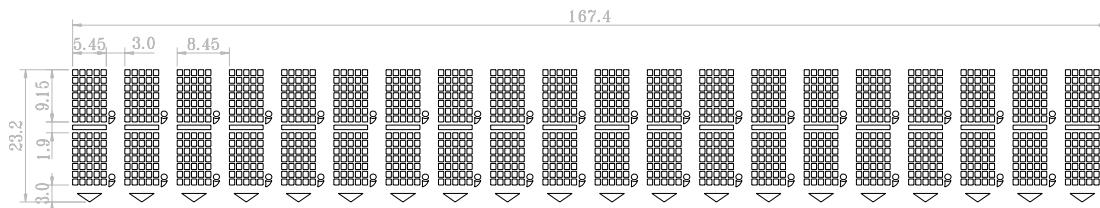


### 4.11 Outer Dimensions



- Unit: mm
- Tolerances unless otherwise specified:
  - Mounting Holes: +/-0.3
  - Length < 10.0: +/-0.5
  - Length ≥ 10.0: +/-1.0

### 4.12 Pattern Details





## 5. PAD SWITCH SETTING & SELF-TEST

The PAD switches are located on the display module's rear side (component side). The switch settings are read only when the power is turned on.

If the system command of "Recall Data from EEP-ROM (<STX> <ENQ> T n <ETX>," refer to section 6.8 will be entered, then all the default setting register values are updated to the recalled EEP-ROM contents.

When the J1 is closed (set to Logic-"0") at power on then all default setting values are not determined by PAD switches but EEP-ROM data.

### 5.1 Command Type Select

| J5    | J4    | J3    | J2    | Function Description | Default Selection |
|-------|-------|-------|-------|----------------------|-------------------|
| Open  | Open  | Open  | Open  | CD5220               | Default           |
| Open  | Open  | Open  | Short | DSP800               |                   |
| Open  | Open  | Short | Open  | EPSON ESC/POS        |                   |
| Open  | Open  | Short | Short | ADM788               |                   |
| Open  | Short | Open  | Open  | ADM787               |                   |
| Open  | Short | Open  | Short | AEDEX                |                   |
| Open  | Short | Short | Open  | UTC Standard         |                   |
| Open  | Short | Short | Short | UTC Enhance          |                   |
| Short | Open  | Open  | Open  | ICD2002              |                   |
| ×     | ×     | ×     | ×     |                      | Factory Define    |

### 5.2 Baud Rate Select

| J8    | J7    | J6    | Baud Rate(bps) | Default Selection |
|-------|-------|-------|----------------|-------------------|
| Open  | Open  | Open  | 9,600          | Default           |
| Open  | Open  | Short | 4,800          |                   |
| Open  | Short | Open  | Reserved       |                   |
| Open  | Short | Short | Reserved       |                   |
| Short | Open  | Open  | Reserved       |                   |
| Short | Open  | Short | Reserved       |                   |
| Short | Short | Open  | 38,400         |                   |
| Short | Short | Short | 19,200         |                   |

### 5.2 International Character Set

| J12   | J11   | J10   | J9    | Code Table<br>(Code 80H~FFH) | International Character set<br>(Code 20H~7FH) | Default Selection |
|-------|-------|-------|-------|------------------------------|-----------------------------------------------|-------------------|
| Open  | Open  | Open  | Open  | PC437                        | USA                                           | Default           |
| Open  | Open  | Open  | Short | Katakana                     | JAPAN                                         |                   |
| Open  | Open  | Short | Open  | PC850                        | USA                                           |                   |
| Open  | Open  | Short | Short | PC860                        | USA                                           |                   |
| Open  | Short | Open  | Open  | PC863                        | USA                                           |                   |
| Open  | Short | Open  | Short | PC865                        | USA                                           |                   |
| Open  | Short | Short | Open  | SLAVONIC                     | SLAVONIC                                      |                   |
| Open  | Short | Short | Short | RUSSIA                       | RUSSIA                                        |                   |
| Short | Open  | Open  | Open  | PC858                        | NORWAY                                        |                   |
| Short | Open  | Open  | Short | WPC1252                      | USA                                           |                   |
| Short | Open  | Short | Open  | WPC1250                      | USA                                           |                   |
| ×     | ×     | ×     | ×     | Factory Define               | Factory Define                                |                   |

## 6. SYSTEM COMMAND DETAILS

Following system commands start with <STX> and ends with <ETX>, can be valid regardless of the emulation mode (display control command type).

When the system power is turned on, default set-up values are determined by DIP switched if J1 switch is set to OFF.

In case of J1 ON, all setup values which were stored into the non-volatile memory (EEP-ROM) can be reinstalled.

### 6.1 Set Communication Option

|              |                                                                                                               |        |     |        |     |        |
|--------------|---------------------------------------------------------------------------------------------------------------|--------|-----|--------|-----|--------|
| ASCII Format | <STX> <ENQ> P n <ETX>                                                                                         |        |     |        |     |        |
| Dec. Format  | 2, 5, 80, n, 3 (49 ≤ n ≤ 54, default n=49: non parity, 8-bit word length, 1 stop bit)                         |        |     |        |     |        |
| Hex. Format  | [02h] [05h] [50h] n [03h] (31h ≤ n ≤ 36h, default n=31h / Non-parity, 8-bit length, 1-stop bit)               |        |     |        |     |        |
| Description  | Change the display communication parity. Set 7 or 8 data bits and the parity set for even, odd or non-parity. |        |     |        |     |        |
|              | n                                                                                                             | Parity | n   | Parity | n   | Parity |
|              | 31h                                                                                                           | N-8-1  | 33h | E-8-1  | 35h | O-8-1  |
|              | 32h                                                                                                           | N-7-1  | 34h | E-7-1  | 36h | O-7-1  |

### 6.2 Set Baud-Rate

|              |                                                                                                          |           |     |           |     |           |     |            |
|--------------|----------------------------------------------------------------------------------------------------------|-----------|-----|-----------|-----|-----------|-----|------------|
| ASCII Format | <STX> <ENQ> B n <ETX>                                                                                    |           |     |           |     |           |     |            |
| Dec. Format  | 2, 5, 66, n, 3 (48 ≤ n ≤ 55, default n=48: 9,600bps)                                                     |           |     |           |     |           |     |            |
| Hex. Format  | [02h] [05h] [42h] n [03h] (30h ≤ n ≤ 37h, default n=30h / 9,600 bps)                                     |           |     |           |     |           |     |            |
| Description  | Change the display communication baud rate. The baud rate setting can be selected from 300 to 38,400bps. |           |     |           |     |           |     |            |
|              | n                                                                                                        | Baud-rate | n   | Baud-rate | n   | Baud-rate | n   | Baud-rate  |
|              | 30h                                                                                                      | 9,600 bps | 32h | Reserved  | 34h | Reserved  | 36h | 38,400 bps |
|              | 31h                                                                                                      | 4,800 bps | 33h |           | 35h |           | 37h | 19,200 bps |

### 6.3 Select Command Emulation Mode

|              |                                                                                                                                                                           |               |     |              |     |              |     |              |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----|--------------|-----|--------------|-----|--------------|
| ASCII Format | <STX> <ENQ> C n <ETX>                                                                                                                                                     |               |     |              |     |              |     |              |
| Dec. Format  | 2, 5, 67, n, 3 (48 ≤ n ≤ 63, default n=30: SDI's Standard mode)                                                                                                           |               |     |              |     |              |     |              |
| Hex. Format  | [02h] [05h] [43h] n [03h] (30h ≤ n ≤ 3Fh, default n=30h/Samsung VFD's Standard)                                                                                           |               |     |              |     |              |     |              |
| Description  | This command will change the emulation mode and initialize the display. The setting value will be saved into EEPROM, and reloaded when the power will be turned on again. |               |     |              |     |              |     |              |
|              | n                                                                                                                                                                         | Command mode  | n   | Command mode | n   | Command mode | n   | Command mode |
|              | 30h                                                                                                                                                                       | Samsung VFD   | 34h | AEDEX        | 38h | NCR RealPOS  | 3Ch | Reserved     |
|              | 31h                                                                                                                                                                       | Epson ESC/POS | 35h | UTC Standard | 39h | PD6000       | 3Dh | Reserved     |
|              | 32h                                                                                                                                                                       | ADM787/788    | 36h | UTC Enhance  | 3Ah | ICD2002      | 3Eh | Reserved     |
|              | 33h                                                                                                                                                                       | DSP800        | 37h | CD5220       | 3Bh | Reserved     | 3Fh | Reserved     |

### 6.4 Save Display Demo Data to EEPROM

|              |                                                                                                                                                      |  |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| ASCII Format | <STX> <ENQ> L n d1.....dm <ETX>                                                                                                                      |  |
| Dec. Format  | 2, 5, 76, n, d1.....dm, 3 (n=49 or 50, d1.....dm: message data, maximum character is under 200)                                                      |  |
| Hex. Format  | [02h] [05h] [4Ch] n d1.....dm [03h] (n=31h or 32h)                                                                                                   |  |
| Description  | Save demo message for upper line and bottom line to EEPROM.<br>n=31h : save data message for upper line,<br>n=32h : save data message for lower line |  |

### 6.5 Run Demo Message

|              |                                                                                  |  |
|--------------|----------------------------------------------------------------------------------|--|
| ASCII Format | <STX> <ENQ> D <MD8> <ETX>                                                        |  |
| Dec. Format  | 2, 5, 68, 8, 3                                                                   |  |
| Hex. Format  | [02h] [05h] [44h] [08h] [03h]                                                    |  |
| Description  | Run the demo messages which were saved by <STX> <ENQ> L command for the display. |  |

### 6.6 Reset EEPROM

|              |                                                                                                                                                                                                    |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASCII Format | <STX> <ENQ> <MD7> n <ETX>                                                                                                                                                                          |
| Dec. Format  | 2, 5, 7, n, 3 (49≤n≤51)                                                                                                                                                                            |
| Hex. Format  | [02h] [05h] [07h] n [03h] (31h≤n≤33h)                                                                                                                                                              |
| Description  | This command will reset the content of EEPROM.<br>n=31h, clear all EEPROM contents including default setting value<br>n=32h, clear upper line data message<br>n=33h, clear lower line data message |

### 6.7 Set International Code Set

|              |                                                                                                                                                                                                                            |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASCII Format | <STX> <ENQ> S n <ETX>                                                                                                                                                                                                      |
| Dec. Format  | 2, 5, 83, n, 3 (n: refer to below Table 6.7, default n=0: U.S.A)                                                                                                                                                           |
| Hex. Format  | [02h] [05h] [53h] n [03h] (default n=00h: U.S.A)                                                                                                                                                                           |
| Description  | Change the display international character font. This module has 16 kinds of international code set. The setting value is saved into EEPROM, and the EEPROM value will be reloaded when the power will be turned on again. |

(Table 6.7) Setting Value to select International code set (Please refer to the Appendix-3 for 5\*7 dot format)

| Country          | Value of 'n' to select International code set |                     |                           |
|------------------|-----------------------------------------------|---------------------|---------------------------|
|                  | ASCII Format                                  | Dec. Format         | Hex. Format               |
| U.S.A            | (NUL) '0' 'A' 'L' or 'R'                      | 0, 48, 65, 76 or 82 | 00h, 30h, 41h, 4Ch or 52h |
| France           | (MD1) '1' or 'F'                              | 1, 49 or 70         | 01h, 31h or 46h           |
| Germany          | (MD2) '2' or 'G'                              | 2, 50 or 71         | 02h, 32h or 47h           |
| U.K              | (MD3) '3' or 'U'                              | 3, 51 or 85         | 03h, 33h or 55h           |
| Denmark-1        | (MD4) '4' or 'D'                              | 4, 52 or 68         | 04h, 34h or 44h           |
| Sweden           | (MD5) '5' or 'W'                              | 5, 53 or 87         | 05h, 35h or 57h           |
| Italy            | (MD6) '6' or 'I'                              | 6, 54 or 73         | 06h, 36h or 49h           |
| Spain-1          | (MD7) '7' or 'S'                              | 7, 55 or 83         | 07h, 37h or 53h           |
| Japan            | (MD8) '8' or 'J'                              | 8, 56 or 74         | 08h, 38h or 4Ah           |
| Norway           | (HT) '9' or 'N'                               | 9, 57 or 78         | 09h, 39h or 4Eh           |
| Denmark -2       | (LF) ':' or 'E'                               | 10, 58 or 69        | 0Ah, 3Ah or 45h           |
| Spain-2          | (VT) ';' or 'P'                               | 11, 59 or 80        | 0Bh, 3Bh or 50h           |
| Latin America    | (FF) '<' or 'T'                               | 12, 60 or 84        | 0Ch, 3Ch or 54h           |
| Korea            | (CR) '=' or 'K'                               | 13, 61 or 75        | 0Dh, 3Dh or 4Bh           |
| Slovenia/Croatia | (SLE1) '>' or 'V'                             | 14, 62 or 86        | 0Eh, 3Eh or 56h           |
| China            | (SLE2) '?' or 'C'                             | 15, 63 or 67        | 0Fh, 3Fh or 43h           |

### 6.8 Store or Recall Title Data to/from EEPROM

|              |                                                                                                                                                                                                                       |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASCII Format | <STX> <ENQ> T n <ETX>                                                                                                                                                                                                 |
| Dec. Format  | 2, 5, 84, n, 3 (n = 1 or 2)                                                                                                                                                                                           |
| Hex. Format  | [02h] [05h] [54h] n [03h] (n = 01h or 02h)                                                                                                                                                                            |
| Description  | This command will store the contents of RAM into EEPROM including user-defined characters.<br>n=01h, store all the RAM contents to EEPROM including user-defined characters<br>n=02h, recall all the data from EEPROM |

### 6.9 Show Information

|              |                                                                                                                                                                                                                                                                                                                           |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASCII Format | <STX> <ENQ> V n <ETX>                                                                                                                                                                                                                                                                                                     |
| Dec. Format  | 2, 5, 86, n, 3 (1≤n≤5)                                                                                                                                                                                                                                                                                                    |
| Hex. Format  | [02h] [05h] [56h] n [03h] (01h≤n≤05h)                                                                                                                                                                                                                                                                                     |
| Description  | This command will show display information.<br>n=01h, show the controller's firmware<br>n=02h, show communication option (parity, data length and baud-rate)<br>n=03h, show command mode<br>n=04h, show international code set and Character font table<br>n=05h, show all above information (same as self test function) |

### 6.10 Set Character Code Table

|              |                                                                                                                                                                                                                                                                                     |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASCII Format | <STX> <ENQ> F <i>n</i> <ETX>                                                                                                                                                                                                                                                        |
| Dec. Format  | 2, 5, 70, <i>n</i> , 3 ( <i>n</i> : refer to below Table 6.10, default <i>n</i> =0: PC-437)                                                                                                                                                                                         |
| Hex. Format  | [02h] [05h] [46h] <i>n</i> [03h] ( <i>n</i> : refer to below table value and it's corresponding code set)                                                                                                                                                                           |
| Description  | Change the display Character font table. A user can change the character data which are correspond to high level of MSB (data code area = 80h~FFh). A total of 16 different Character font tables can be selected by <i>n</i> value. The setting function will be saved to EEP-ROM. |

(Table 6.10) Setting Value to select Character Font Table

| Character Font Table |                               | Value of 'n' to select Character Font Table |                    |                        |                        |
|----------------------|-------------------------------|---------------------------------------------|--------------------|------------------------|------------------------|
| Symbol               | Description                   | ASCII Format                                | Dec. Format        | Hex. Format            | Reference              |
| <b>PC-437</b>        | <b>Standard European</b>      | (NUL), '0' or 'A'                           | <b>0, 48 or 65</b> | <b>00h, 30h or 41h</b> | <b>A4.1 on Page-37</b> |
| JIS                  | Japanese Katakana             | (MD1), '1' or 'J'                           | 1, 49 or 74        | 01h, 31h or 4Ah        | A4.2 on Page-37        |
| PC-850               | Multilingual                  | (MD2), '2' or 'M'                           | 2, 50 or 77        | 02h, 32h or 4Dh        | A4.3 on Page-38        |
| PC-860               | Portuguese                    | (MD3), '3' or 'P'                           | 3, 51 or 80        | 03h, 33h or 50h        | A4.4 on Page-38        |
| PC-863               | Canadian French               | (MD4), '4' or 'F'                           | 4, 52 or 70        | 04h, 34h or 46h        | A4.5 on Page-39        |
| PC-865               | Nordic                        | (MD5), '5' or 'N'                           | 5, 53 or 78        | 05h, 35h or 4Eh        | A4.6 on Page-39        |
|                      | <i>Reserved</i>               |                                             |                    |                        |                        |
| WPC-1250             | Central European Windows Code | (SLE1), '7' or 'C'                          | 14, 55 or 67       | 0Eh, 37h or 43h        | A4.7 on Page-40        |
| WPC-1251             | Cyrillic Windows Code         | (SLE2), '8' or 'Y'                          | 15, 56 or 89       | 0Fh, 38h or 59h        | A4.8 on Page-40        |
| WPC-1252             | Western European Windows Code | (DLE), '9' or 'W'                           | 16, 57 or 82       | 10h, 39h or 52h        | A4.9 on Page-41        |
| PC-866               | Cyrillic-2 (Russian)          | (DC1), ':' or 'R'                           | 17, 58 or 89       | 11h, 3Ah or 59h        | A4.10 on Page-41       |
| PC-852               | Latin-2 (Slavonic)            | (DC2), ';' or 'L'                           | 18, 59 or 76       | 12h, 3Bh or 4Ch        | A4.11 on Page-42       |
| PC-858               | Euro                          | (DC3), '<' or 'E'                           | 19, 60 or 69       | 13h, 3Ch or 45h        | A4.12 on Page-42       |
|                      | <i>Reserved</i>               |                                             |                    |                        |                        |
| WPC-1253             | Greek Windows Code            | (SF1), '>' or 'G'                           | 30, 62 or 71       | 1Eh, 3Eh or 47h        | A4.13 on Page-43       |
| WPC-1254             | Turkish Windows Code          | (SF2), '?' or 'T'                           | 31, 63 or 84       | 1Fh, 3Fh or 54h        | A4.14 on Page-43       |

## 7. DISPLAY CONTROL COMMANDS

There are two ways to choose command emulation mode.

- 1) Use <STX> <ENQ> C n <ETX> command. (Refer to section 6.3)
- 2) Recall from EEPROM by <STX> <ENQ> T n <ETX>, n=02h. (Refer to section 6.8)

### 7.1 SDI's Standard Command List

| ASCII Command   |             |             | Function                                    | Descriptions |
|-----------------|-------------|-------------|---------------------------------------------|--------------|
| <BS>            | <ESC> [ D   | <NUL> K     | Move cursor left (back space)               | section 8.1  |
| <HT>            | <ESC> [ C   | <NUL> M     | Move cursor right (horizontal tab)          | section 8.2  |
| <LF>            | <ESC> [ B   | <NUL> P     | Move cursor down (line feed)                | section 8.3  |
| <US> <LF>       | <ESC> [ A   | <NUL> H     | Move cursor up                              | section 8.4  |
| <HOM>           | <ESC> [ H   |             | Move cursor to home position                | section 8.5  |
| <CR>            | <ESC> [ L   | <NUL> G     | Move cursor to left-most position           | section 8.6  |
| <US> <CR>       | <ESC> [ R   | <NUL> O     | Move cursor to right-most position          | section 8.7  |
| <US> B          | <ESC> [ K   |             | Move cursor to bottom position              | section 8.8  |
| <US> \$ x y     | <ESC> l x y | <ESC> P x y | Move cursor to specified position           | section 8.9  |
| <CLR>           |             |             | Clear display screen, and clear string mode | section 8.10 |
| <CAN>           |             |             | Clear cursor line, and clear string mode    | section 8.11 |
| <ESC> @         |             |             | Initialize display                          | section 8.12 |
| <ESC> = n       |             |             | Select peripheral device(s)                 | section 8.13 |
| <ESC> % n       |             |             | Select/Cancel user-defined characters       | section 8.14 |
| <ESC> & s n m a |             |             | Define user-defined characters              | section 8.15 |
| <ESC> ? n       |             |             | Delete user-defined characters              | section 8.16 |
| <ESC> s <MD1>   |             |             | Store user-defined characters into EEPROM   | section 8.17 |
| <ESC> d <MD1>   |             |             | Reload user-defined characters from EEPROM  | section 8.18 |
| <ESC> R n       | <ESC> f n   |             | Select an international code set            | section 8.19 |
| <ESC> t n       | <ESC> c n   |             | Select a character font table               | section 8.20 |
| <ESC> W n m     |             |             | Select/Cancel window range                  | section 8.21 |
| <US> <MD1>      | <ESC> <DC1> |             | Overwrite mode                              | section 8.22 |
| <US> <MD2>      | <ESC> <DC2> |             | Vertical scroll mode                        | section 8.23 |
| <US> <MD3>      | <ESC> <DC3> |             | Horizontal scroll mode                      | section 8.24 |
| <US> E n        |             |             | Set display screen blink interval           | section 8.25 |
| <US> T h m      |             |             | Set and display counter (set time)          | section 8.26 |
| <US> U          |             |             | Display counter (display time)              | section 8.27 |
| <US> X n        | <ESC> * n   |             | Brightness adjustment (dimming control)     | section 8.28 |
| <US> r n        |             |             | Turn reversed character mode on/off         | section 8.29 |
| <US> v n        |             |             | Status confirmation by DTR signal           | section 8.30 |
| <US> @          |             |             | Execute self-test                           | section 8.31 |
| <US> :          |             |             | Start/End macro definition                  | section 8.32 |
| <US> ^ n m      |             |             | Execute and quit defined macro              | section 8.33 |
| <US> . n        |             |             | Display period                              | section 8.34 |
| <US> , n        |             |             | Display comma                               | section 8.35 |
| <US> ; n        |             |             | Display period and comma                    | section 8.36 |
| <US> # n m      |             |             | Turn annunciator on/off                     | section 8.37 |
| <US> C n        | <ESC> _ n   |             | Set cursor on/off                           | section 8.38 |
| <US> <DC1> n    |             |             | Set line blinking                           | section 8.39 |
| <US> <DC2> n    |             |             | Clear line blinking                         | section 8.40 |
| <ESC> Q A       | <ESC> F A   |             | Write string character to upper line        | section 8.43 |
| <ESC> Q B       | <ESC> F B   |             | Write string character to lower line        | section 8.44 |
| <ESC> Q D       | <ESC> F D   |             | Upper line message scroll continuously      | section 8.45 |
| <ESC> Q O       | <ESC> F O   |             | Lower line message scroll continuously      | section 8.46 |

## 7.2 EPSON ESC/POS Emulation Mode

| ASCII Command                                                           | Function                                    | Descriptions |
|-------------------------------------------------------------------------|---------------------------------------------|--------------|
| <BS>                                                                    | Move cursor left (back space)               | section 8.1  |
| <HT>                                                                    | Move cursor right (horizontal tab)          | section 8.2  |
| <LF>                                                                    | Move cursor down (line feed)                | section 8.3  |
| <US> <LF>                                                               | Move cursor up                              | section 8.4  |
| <HOM>                                                                   | Move cursor to home position                | section 8.5  |
| <CR>                                                                    | Move cursor to left-most position           | section 8.6  |
| <US> <CR>                                                               | Move cursor to right-most position          | section 8.7  |
| <US> B                                                                  | Move cursor to bottom position              | section 8.8  |
| <US> \$ x y                                                             | Move cursor to specified position           | section 8.9  |
| <CLR>                                                                   | Clear display screen, and clear string mode | section 8.10 |
| <CAN>                                                                   | Clear cursor line, and clear string mode    | section 8.11 |
| <ESC> @                                                                 | Initialize display                          | section 8.12 |
| <ESC> = n                                                               | Select peripheral device(s)                 | section 8.13 |
| <ESC> % n                                                               | Select/Cancel user-defined characters       | section 8.14 |
| <ESC> & s n m a (p <sub>1</sub> ... p <sub>a</sub> )*(m-n+1)            | Define user-defined characters              | section 8.15 |
| <ESC> ? n                                                               | Delete user-defined characters              | section 8.16 |
| <ESC> s <MD1>                                                           | Store user-defined characters into EEPROM   | section 8.17 |
| <ESC> d <MD1>                                                           | Reload user-defined characters from EEPROM  | section 8.18 |
| <ESC> R n                                                               | Select an international code set            | section 8.19 |
| <ESC> t n                                                               | Select a character font table               | section 8.20 |
| <ESC> W n m x <sub>1</sub> y <sub>1</sub> x <sub>2</sub> y <sub>2</sub> | Select/Cancel window range                  | section 8.21 |
| <US> <MD1>                                                              | Overwrite mode                              | section 8.22 |
| <US> <MD2>                                                              | Vertical scroll mode                        | section 8.23 |
| <US> <MD3>                                                              | Horizontal scroll mode                      | section 8.24 |
| <US> E n                                                                | Set display screen blink interval           | section 8.25 |
| <US> T h m                                                              | Set and display counter (set time)          | section 8.26 |
| <US> U                                                                  | Display counter (display time)              | section 8.27 |
| <US> X n                                                                | Brightness adjustment (dimming control)     | section 8.28 |
| <US> r n                                                                | Turn reversed character mode on/off         | section 8.29 |
| <US> v n                                                                | Status confirmation by DTR signal           | section 8.30 |
| <US> @                                                                  | Execute self-test                           | section 8.31 |
| <US> :                                                                  | Start/End macro definition                  | section 8.32 |
| <US> ^ n m                                                              | Execute and quit defined macro              | section 8.33 |
| <US> . n                                                                | Display period                              | section 8.34 |
| <US> , n                                                                | Display comma                               | section 8.35 |
| <US> ; n                                                                | Display period and comma                    | section 8.36 |
| <US> # n m                                                              | Turn annunciator on/off                     | section 8.37 |
| <US> C n                                                                | Set cursor on/off                           | section 8.38 |
| <US> <DC1> n                                                            | Set line blinking                           | section 8.39 |
| <US> <DC2> n                                                            | Clear line blinking                         | section 8.40 |

### 7.3 ADM787/788 Emulation Mode

| ASCII Command | Hex. Code | Function Description                                                |
|---------------|-----------|---------------------------------------------------------------------|
| <CLR          | 0Ch       | Clear display                                                       |
| <CR>          | 0Dh       | Carriage return                                                     |
| <SLE1>        | 0Eh       | Clear upper line and move cursor to upper left-end position         |
| <SLE2>        | 0Fh       | Clear bottom line and move cursor to bottom left-end position       |
| <DC0> n       | 10h n     | Set period to upper line, last n position ( $31h \leq n \leq 44h$ ) |
| <DC1> n       | 11h n     | Set line blinking ( $n=1$ : upper line, $n=2$ : bottom line)        |
| <DC2> n       | 12h n     | Clear Line Blinking ( $n=1$ : upper line, $n=2$ : bottom line)      |
| <SF1>         | 1Eh       | Clear field 1 and move cursor to field 1, first position            |
| <SF2>         | 1Fh       | Clear field 2 and move cursor to field 2, first position            |

### 7.4 DSP-800 (Giga Tech) Emulation Mode

| ASCII Command                                         | Hex. Code                                          | Function Description                                                                                                     |
|-------------------------------------------------------|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <EOT><SOH> I n <ETB>                                  | 04h 01h 49h n 17h                                  | Select international code set<br>( $30h \leq n \leq 3Fh$ , see Table 6.7 on Page-12)                                     |
| <EOT><SOH> P n <ETB>                                  | 04h 01h 50h n 17h                                  | Move cursor to specified position ( $31h \leq n \leq 58h$ ,<br>$n=31h$ :home position, $n=58h$ :right-end of lower line) |
| <EOT><SOH> C n m <ETB>                                | 04h 01h 43h n m 17h                                | Clear display range from n position to m position and<br>move cursor to n position ( $31h \leq n \leq m \leq 58h$ )      |
| <EOT><SOH> S n <ETB>                                  | 04h 01h 53h n 17h                                  | Save current display data to n'th layer for demo view<br>data ( $01h \leq n \leq 03h$ or $31h \leq n \leq 33h$ )         |
| <EOT><SOH> D n m <ETB>                                | 04h 01h 44h n 17h                                  | Display the saved demo message<br>( $01h \leq n \leq 03h$ or $31h \leq n \leq 33h$ )                                     |
| <EOT><SOH> A n <ETB>                                  | 04h 01h 41h n 17h                                  | Brightness adjustment ( $01h \leq n \leq 04h$ or $31h \leq n \leq 34h$ ,<br>$01h$ & $31h$ :lowest, $04h$ & $34h$ :100%)  |
| <EOT><SOH> F n <ETB>                                  | 04h 01h 46h n 17h                                  | Blink display screen ( $00h \leq n \leq FFh$ )                                                                           |
| <EOT><SOH> & n p <sub>1</sub> ...p <sub>5</sub> <ETB> | 04h 01h 26h n p <sub>1</sub> ...p <sub>5</sub> 17h | Define download characters ( $20h \leq n$ )                                                                              |
| <EOT><SOH> ? n <ETB>                                  | 04h 01h 3Fh n 17h                                  | Delete download characters ( $20h \leq n$ )                                                                              |
| <EOT><SOH> = n <ETB>                                  | 04h 01h 3Dh n 17h                                  | Select peripheral device ( $n=1$ :printer, $n=2$ :display)                                                               |
| <EOT><SOH> % <ETB>                                    | 04h 01h 25h 17h                                    | Initialize display                                                                                                       |
| <EOT><SOH> @ <ETB>                                    | 04h 01h 40h 17h                                    | Execute self-test                                                                                                        |
| <EOT><SOH> B n N <ETB>                                | 04h 01h 42h n 4Eh 17h                              | Set baud-rate and parity ( $31h \leq n \leq 36h$ )                                                                       |

### 7.5 AEDEX Emulation Mode

| ASCII Command                                                | Hex. Code                                                         | Function Description                                                                                    |
|--------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| ! # 1 d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> <CR> | 21h 23h 31h d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> 0Dh | Upper line display ( $1 \leq n \leq 20$ , $20h \leq dn \leq FFh$ )<br>-. Clear upper line: ! # 1 <CR>   |
| ! # 2 d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> <CR> | 21h 23h 32h d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> 0Dh | Bottom line display ( $1 \leq n \leq 20$ , $20h \leq dn \leq FFh$ )<br>-. Clear bottom line: ! # 2 <CR> |
| ! # 4 d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> <CR> | 21h 23h 34h d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> 0Dh | Upper line message scroll continuously ( $1 \leq n \leq 40$ )                                           |
| ! # 5 hh:mm <CR>                                             | 21h 23h 35h hh:mm 0Dh                                             | Display time (h,m=0~9)<br>-. Display previously set time: ! # 5 <CR>                                    |
| ! # 6 d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> <CR> | 21h 23h 36h d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> 0Dh | Upper line message scroll one time ( $1 \leq n \leq 40$ )                                               |
| ! # 8 n m <CR>                                               | 21h 23h 38h n m 0Dh                                               | Change attention code ( $20h \leq n, m$ )                                                               |
| ! # 9 d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> <CR> | 21h 23h 39h d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> 0Dh | Two line display ( $1 \leq n \leq 40$ )<br>-. Clear display: ! # 9 <CR>                                 |



## 7.6 UTC Standard Emulation Mode

| Command | Hex. Code | Function Description                                                           |
|---------|-----------|--------------------------------------------------------------------------------|
| <EOT> n | 04h n     | Display dimming (n=20h:20%, 40h:40%, 60h:60%, FFh:100%)                        |
| <BS>    | 08h       | Back space                                                                     |
| <HT>    | 09h       | Horizontal tab                                                                 |
| <LF>    | 0Ah       | Line feed                                                                      |
| <CR>    | 0Dh       | Carriage return                                                                |
| <DLE> n | 10h n     | Display position (00h<n<27h, n=00h:home position, 27h:right end of lower line) |
| <DC1>   | 11h       | Overwrite display mode                                                         |
| <DC2>   | 12h       | Vertical scroll mode                                                           |
| <DC3>   | 13h       | Cursor on                                                                      |
| <DC4>   | 14h       | Cursor off                                                                     |
| <CAN>   | 18h       | Clear to end of line                                                           |
| <EM>    | 19h       | Clear to end of display                                                        |
| <SUB> n | 1Ah n     | Select international code set (30h<n<3Fh, refer to Table 6.7 on Page-12)       |
| <ESC> d | 1Bh 64h   | Change to UTC enhanced mode                                                    |
| <FS>    | 1Ch       | Flashing text start                                                            |
| <GS>    | 1Dh       | Flashing text stop                                                             |
| <RS>    | 1Eh       | Clear display and cursor home                                                  |
| <US>    | 1Fh       | Reset                                                                          |

## 7.7 UTC Enhanced Emulation Mode

| ASCII Command                                                      | Hex. Code                                                           | Function Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |                |                |                |                |                |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
|--------------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------|---|---|---|---|---|---|---|---|----------|---|---|---|---|---|---|---|---|----------|---|---|---|---|---|---|---|---|----------|---|---|---|---|---|---|---|---|----------|---|---|---|---|---|---|---|---|----------|---|---|---|---|---|---|---|---|----------|---|---|---|---|---|---|---|---|----------|
| <SI>                                                               | 0Fh                                                                 | Flashing text start                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                |                |                |                |                |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| <SO>                                                               | 0Eh                                                                 | Flashing text stop                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |                |                |                |                |                |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| <ESC> u A d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> <CR>   | 1Bh 75h 41h d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> 0Dh   | Upper line display (1<n<20, 20h<d <sub>n</sub> <FFh)<br>-. Clear upper line: <ESC> u A <CR>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                |                |                |                |                |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| <ESC> u B d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> <CR>   | 1Bh 75h 42h d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> 0Dh   | Bottom line display (1<n<20, 20h<d <sub>n</sub> <FFh)<br>-. Clear bottom line: <ESC> u B <CR>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                |                |                |                |                |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| <ESC> u D d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> <CR>   | 1Bh 75h 44h d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> 0Dh   | Upper line message scroll continuously (1<n<40)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                |                |                |                |                |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| <ESC> u E hh:mm <CR>                                               | 1Bh 75h 45h hh:mm 0Dh                                               | Display time (hh, mm=0~9)<br>-. Display previously set time: <ESC> u E <CR>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                |                |                |                |                |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| <ESC> u F d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> <CR>   | 1Bh 75h 46h d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> 0Dh   | Upper line message scroll one time (1<n<40)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                |                |                |                |                |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| <ESC> u G <CR>                                                     | 1Bh 75h 47h 0Dh                                                     | Disable menu buttons until next power up                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                |                |                |                |                |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| <ESC> u H s d <sub>1</sub> d <sub>2</sub> .....d <sub>7</sub> <CR> | 1Bh 75h 48h s d <sub>1</sub> d <sub>2</sub> .....d <sub>7</sub> 0Dh | Define user-defined character<br>-. s: character code (20h<s<FFh)<br>-. d <sub>1</sub> ~d <sub>7</sub> : font data (00h<d <sub>1</sub> ~d <sub>7</sub> <FFh)<br>-. Example: Euro "€" currency symbol design.<br><table border="1" style="margin-left: 20px;"> <thead> <tr> <th>b<sub>7</sub></th> <th>b<sub>6</sub></th> <th>b<sub>5</sub></th> <th>b<sub>4</sub></th> <th>b<sub>3</sub></th> <th>b<sub>2</sub></th> <th>b<sub>1</sub></th> <th>b<sub>0</sub></th> <th>Font data</th> </tr> </thead> <tbody> <tr> <td>*</td> <td>*</td> <td>*</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> <td>0</td> <td>d1 = 06h</td> </tr> <tr> <td>*</td> <td>*</td> <td>*</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> <td>d2 = 09h</td> </tr> <tr> <td>*</td> <td>*</td> <td>*</td> <td>1</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>d3 = 1Ch</td> </tr> <tr> <td>*</td> <td>*</td> <td>*</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>d4 = 08h</td> </tr> <tr> <td>*</td> <td>*</td> <td>*</td> <td>1</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>d5 = 1Ch</td> </tr> <tr> <td>*</td> <td>*</td> <td>*</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> <td>d6 = 09h</td> </tr> <tr> <td>*</td> <td>*</td> <td>*</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> <td>0</td> <td>d7 = 06h</td> </tr> </tbody> </table> | b <sub>7</sub> | b <sub>6</sub> | b <sub>5</sub> | b <sub>4</sub> | b <sub>3</sub> | b <sub>2</sub> | b <sub>1</sub> | b <sub>0</sub> | Font data | * | * | * | 0 | 0 | 1 | 1 | 0 | d1 = 06h | * | * | * | 0 | 1 | 0 | 0 | 1 | d2 = 09h | * | * | * | 1 | 1 | 1 | 0 | 0 | d3 = 1Ch | * | * | * | 0 | 1 | 0 | 0 | 0 | d4 = 08h | * | * | * | 1 | 1 | 1 | 0 | 0 | d5 = 1Ch | * | * | * | 0 | 1 | 0 | 0 | 1 | d6 = 09h | * | * | * | 0 | 0 | 1 | 1 | 0 | d7 = 06h |
| b <sub>7</sub>                                                     | b <sub>6</sub>                                                      | b <sub>5</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | b <sub>4</sub> | b <sub>3</sub> | b <sub>2</sub> | b <sub>1</sub> | b <sub>0</sub> | Font data      |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| *                                                                  | *                                                                   | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0              | 0              | 1              | 1              | 0              | d1 = 06h       |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| *                                                                  | *                                                                   | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0              | 1              | 0              | 0              | 1              | d2 = 09h       |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| *                                                                  | *                                                                   | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1              | 1              | 1              | 0              | 0              | d3 = 1Ch       |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| *                                                                  | *                                                                   | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0              | 1              | 0              | 0              | 0              | d4 = 08h       |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| *                                                                  | *                                                                   | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1              | 1              | 1              | 0              | 0              | d5 = 1Ch       |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| *                                                                  | *                                                                   | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0              | 1              | 0              | 0              | 1              | d6 = 09h       |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| *                                                                  | *                                                                   | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0              | 0              | 1              | 1              | 0              | d7 = 06h       |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| <ESC> u I d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> <CR>   | 1Bh 75h 49h d <sub>1</sub> d <sub>2</sub> .....d <sub>n</sub> 0Dh   | Two line display (1<n<40)<br>-. Clear display: <ESC> u I <CR>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                |                |                |                |                |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| <ESC> u l n <CR>                                                   | 1Bh 75h 6Ch n 0Dh                                                   | Select international code set<br>(30h<n<3Fh, refer to Table 6.7 on Page-12)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                |                |                |                |                |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |
| <ESC> <RS> <CR>                                                    | 1Bh 0Fh 0Dh                                                         | Change to UTC standard mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                |                |                |                |                |                |                |           |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |   |          |



### 7.8 CD-5220 (Partner Tech) Emulation Mode

| ASCII Command                                                     | Function                                                            | Descriptions |
|-------------------------------------------------------------------|---------------------------------------------------------------------|--------------|
| <BS> or <ESC> [ D                                                 | Move cursor left (back space)                                       | section 8.1  |
| <HT> or <ESC> [ C                                                 | Move cursor right (horizontal tab)                                  | section 8.2  |
| <LF> or <ESC> [ B                                                 | Move cursor down (line feed)                                        | section 8.3  |
| <ESC> [ A                                                         | Move cursor up                                                      | section 8.4  |
| <HOM> or <ESC> [ H                                                | Move cursor to home position                                        | section 8.5  |
| <CR> or <ESC> [ L                                                 | Move cursor to left-most position                                   | section 8.6  |
| <ESC> [ R                                                         | Move cursor to right-most position                                  | section 8.7  |
| <ESC> [ K                                                         | Move cursor to bottom position                                      | section 8.8  |
| <ESC> l x y                                                       | Move cursor to specified position                                   | section 8.9  |
| <CLR>                                                             | Clear display screen, and clear string mode                         | section 8.10 |
| <CAN>                                                             | Clear cursor line, and clear string mode                            | section 8.11 |
| <ESC> @                                                           | Initialize display                                                  | section 8.12 |
| <ESC> = n                                                         | Select peripheral device(s)                                         | section 8.13 |
| <ESC> % n                                                         | Select/Cancel user-defined characters                               | section 8.14 |
| <ESC> & s n m a (p <sub>1</sub> ...p <sub>a</sub> )*(m-n+1)       | Define user-defined characters                                      | section 8.15 |
| <ESC> ?                                                           | Delete user-defined characters                                      | section 8.16 |
| <ESC> s <MD1>                                                     | Store user-defined characters into EEP-ROM                          | section 8.17 |
| <ESC> d <MD1>                                                     | Reload user-defined characters from EEP-ROM                         | section 8.18 |
| <ESC> f n                                                         | Select an international code set                                    | section 8.19 |
| <ESC> c n                                                         | Select a character font table                                       | section 8.20 |
| <ESC> W s x <sub>1</sub> x <sub>2</sub> y                         | Reset window range at horizontal scroll mode (*Note-1)              |              |
| <ESC> <DC1>                                                       | Overwrite mode                                                      | section 8.22 |
| <ESC> <DC2>                                                       | Vertical scroll mode                                                | section 8.23 |
| <ESC> <DC3>                                                       | Horizontal scroll mode                                              | section 8.24 |
| <ESC> * n                                                         | Brightness adjustment                                               | section 8.28 |
| <ESC> _ n                                                         | Set cursor on/off                                                   | section 8.38 |
| <ESC> Q A d <sub>1</sub> d <sub>2</sub> ..... d <sub>n</sub> <CR> | Set the string display mode, write string to upper line (** Note-2) | section 8.43 |
| <ESC> Q B d <sub>1</sub> d <sub>2</sub> ..... d <sub>n</sub> <CR> | Set the string display mode, write string to lower line (** Note-2) | section 8.44 |
| <ESC> Q D d <sub>1</sub> d <sub>2</sub> ..... d <sub>n</sub> <CR> | Upper line message scroll continuously (***) Note-3)                | section 8.45 |

(\* Note-1) Detailed description of "<ESC> W s x<sub>1</sub> x<sub>2</sub> y" command

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASCII Format | <ESC> W n x <sub>1</sub> x <sub>2</sub> y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Dec. Format  | 27, 87, n, x <sub>1</sub> , x <sub>2</sub> , y (n=0 or 1, 1≤x <sub>1</sub> ≤x <sub>2</sub> ≤20, y=1 or 2)                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Hex. Format  | [1Bh] [57h] n x <sub>1</sub> x <sub>2</sub> y (n=00h or 01h, 01h≤x <sub>1</sub> ≤x <sub>2</sub> ≤14h, y=01h or 02h)                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Description  | <p>Selects or cancels a single window on the display screen.</p> <p>* n specifies selection or cancellation.</p> <p>When n=0, a window is canceled. (Values x<sub>1</sub>, x<sub>2</sub>, and y are not required.)</p> <p>When n=1, a window is selected. (Values x<sub>1</sub>, x<sub>2</sub>, and y are required.)</p> <p>The x<sub>1</sub> and x<sub>2</sub> set the position of the left column and right column, respectively, of the window. The y sets the upper line or the lower line of the window. This function is valid within the horizontal mode.</p> |

(\*\* Note-2) While using command "<ESC> Q A" or "<ESC> Q B", these two commands can be used with terminal printer: And another commands can not be used except when using command "CLR" or "CAN" to change operating mode.

(\*\*\* Note-3) When using command "ESC Q D", the upper line message will scroll continuously until a new command is received, it will then clear the upper line and move the cursor to the upper left-end position.

### 7.9 NCR RealPOS Emulation Mode

| ASCII Command                                                     | Function                                    | Descriptions |
|-------------------------------------------------------------------|---------------------------------------------|--------------|
| <NUL> K or <BS>                                                   | Move cursor left (back space)               | section 8.1  |
| <NUL> M or <HT>                                                   | Move cursor right (horizontal tab)          | section 8.2  |
| <NUL> P or <LF>                                                   | Move cursor down (line feed)                | section 8.3  |
| <NUL> H                                                           | Move cursor up                              | section 8.4  |
| <HOM>                                                             | Move cursor to home position                | section 8.5  |
| <NUL> G or <CR>                                                   | Move cursor to left-most position           | section 8.6  |
| <NUL> O                                                           | Move cursor to right-most position          | section 8.7  |
| <ESC> P x y                                                       | Move cursor to specified position           | section 8.9  |
| <CLR>                                                             | Clear display screen, and clear string mode | section 8.10 |
| <CAN>                                                             | Clear cursor line, and clear string mode    | section 8.11 |
| <ESC> @                                                           | Initialize display                          | section 8.12 |
| <ESC> <DC1>                                                       | Overwrite mode                              | section 8.22 |
| <ESC> <DC2>                                                       | Vertical scroll mode                        | section 8.23 |
| <ESC> <DC3>                                                       | Horizontal scroll mode                      | section 8.24 |
| <US> E n                                                          | Set display screen blink interval           | section 8.25 |
| <ESC> n                                                           | Set cursor on/off                           | section 8.38 |
| <US> <DC1> n                                                      | Set line blinking                           | section 8.39 |
| <US> <DC2> n                                                      | Clear line blinking                         | section 8.40 |
| <ESC> F A d <sub>1</sub> d <sub>2</sub> ..... d <sub>n</sub> <CR> | Write string character to upper line        | section 8.43 |
| <ESC> F B d <sub>1</sub> d <sub>2</sub> ..... d <sub>n</sub> <CR> | Write string character to lower line        | section 8.44 |
| <ESC> F D d <sub>1</sub> d <sub>2</sub> ..... d <sub>n</sub> <CR> | Upper line message scroll continuously      | section 8.45 |
| <ESC> F O d <sub>1</sub> d <sub>2</sub> ..... d <sub>n</sub> <CR> | Lower line message scroll continuously      | section 8.46 |
| <US> <MD1> n                                                      | Message vertical upper continuously         |              |
| <US> <MD2> n                                                      | Message vertical down continuously          |              |

### 7.10 PD6000 (Logic Controls) Emulation Mode

| ASCII Command                                 | Hex. Code                                  | Function Description                                                                                                                |
|-----------------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <DC2>                                         | 12h                                        | Vertical scroll mode                                                                                                                |
| <DC1>                                         | 11h                                        | Normal display mode                                                                                                                 |
| <EOT> n                                       | 04h n                                      | Brightness control (n=FFh, 60h, 40h, 20h)                                                                                           |
| <BS>                                          | 08h                                        | Back space                                                                                                                          |
| <HT>                                          | 09h                                        | Horizontal tab                                                                                                                      |
| <LF>                                          | 0Ah                                        | Line feed                                                                                                                           |
| <CR>                                          | 0Dh                                        | Carriage return                                                                                                                     |
| <DLE> n                                       | 10h n                                      | Digit select (00h ≤ n ≤ 27h)                                                                                                        |
| <DC3>                                         | 13h                                        | Cursor on                                                                                                                           |
| <DC4>                                         | 14h                                        | Cursor off                                                                                                                          |
| <US>                                          | 1Fh                                        | Reset                                                                                                                               |
| <ETX> n p <sub>1</sub> .....p <sub>5</sub>    | 03h n p <sub>1</sub> .....p <sub>5</sub>   | Define user font (20h ≤ n ≤ FFh, p <sub>1</sub> .....p <sub>5</sub> pattern data)                                                   |
| <ENQ> d <sub>1</sub> .....d <sub>n</sub> <CR> | 05h d <sub>1</sub> .....d <sub>n</sub> 0Dh | Message scroll (up to 40 characters)                                                                                                |
| <SOH>                                         | 01h                                        | Data to peripheral: All data following this command will be sent to the peripheral until a "Data to display" command is received.   |
| ! # <STX>                                     | 21h 23h 02h                                | Data to display: All data following this command will be sent to the pole display until a "Data to peripheral" command is received. |

### 7.11 ICD-2002 (Puritron) Emulation Mode

| ASCII Command                        | Hex. Code               | Function Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
|--------------------------------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------|-----------------------------------|-----------------|-----|----------|-----|-----------------------------------|-----|-----------|-----|---------------|-----|-----------|-----|------------|--|--|-----|-----------------------------------------|--|--|-----|----------------|--|--|-----|---------------|
| <HT>                                 | 09h                     | Move cursor right (only valid in overwrite mode)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
| <BS>                                 | 08h                     | Move cursor left (only valid in overwrite mode)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
| <CR>                                 | 0Dh                     | Move cursor to left-end position (only valid in overwrite mode)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
| <ESC> @                              | 1Bh 40h                 | Initialize customer display to initial state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
| <ESC> U                              | 1Bh 55h                 | Select upper row as current row (initial default)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
| <ESC> D                              | 1Bh 44h                 | Select lower row as current row                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
| <ESC> A <i>n</i>                     | 1Bh 41h <i>n</i>        | Sets customer display disable or enable<br>( <i>n</i> ="D", 44h: disable, <i>n</i> ="E", 45h: enable)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
| <ESC> C <i>r c</i>                   | 1Bh 43h <i>r c</i>      | Move cursor to specified position (only valid in overwrite mode)<br>( <i>r</i> =55h: upper line, <i>r</i> =44h: lower line, $1 \leq c \leq 20$ : column number)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
| <ESC> E <i>r n</i>                   | 1Bh 45h <i>r n</i>      | Set special effect or display mode of specified row.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
|                                      |                         | <table border="1"> <thead> <tr> <th><i>r</i></th> <th>Select Row</th> <th><i>n</i></th> <th>Select Function</th> </tr> </thead> <tbody> <tr> <td>58h</td> <td>all rows</td> <td>30h</td> <td>shift mode (default display mode)</td> </tr> <tr> <td>55h</td> <td>upper row</td> <td>31h</td> <td>rotation mode</td> </tr> <tr> <td>44h</td> <td>lower row</td> <td>32h</td> <td>blink mode</td> </tr> <tr> <td></td> <td></td> <td>33h</td> <td>clear this row and switch to shift mode</td> </tr> <tr> <td></td> <td></td> <td>34h</td> <td>overwrite mode</td> </tr> <tr> <td></td> <td></td> <td>35h</td> <td>vertical mode</td> </tr> </tbody> </table> | <i>r</i>                                | Select Row | <i>n</i>                          | Select Function | 58h | all rows | 30h | shift mode (default display mode) | 55h | upper row | 31h | rotation mode | 44h | lower row | 32h | blink mode |  |  | 33h | clear this row and switch to shift mode |  |  | 34h | overwrite mode |  |  | 35h | vertical mode |
|                                      |                         | <i>r</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Select Row                              | <i>n</i>   | Select Function                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
|                                      |                         | 58h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | all rows                                | 30h        | shift mode (default display mode) |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
|                                      |                         | 55h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | upper row                               | 31h        | rotation mode                     |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
| 44h                                  | lower row               | 32h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | blink mode                              |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
|                                      |                         | 33h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | clear this row and switch to shift mode |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
|                                      |                         | 34h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | overwrite mode                          |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
|                                      |                         | 35h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | vertical mode                           |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
|                                      |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
|                                      |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
|                                      |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
| <ESC> R <i>n</i>                     | 1Bh 52h <i>n</i>        | Set international code set sets<br>( $30h \leq n \leq 3Fh$ , refer to Table 6.7 on Page-12)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
| <ESC> = <i>n</i>                     | 1Bh 3Dh <i>n</i>        | Select Peripheral ( <i>n</i> =1: printer, <i>n</i> =2: display, <i>n</i> =3: printer & display)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
| <ESC> % <i>n</i>                     | 1Bh 25h <i>n</i>        | Select/cancel character user defined character<br>( <i>n</i> =0: selected, <i>n</i> =1: canceled)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |
| <ESC> & <i>n s [p<sub>n</sub>]*5</i> | 1Bh 26h <i>n s data</i> | Define user font pattern<br><i>n</i> =code for first character, <i>s</i> =code for last character<br><i>data</i> =5 bytes required for each character                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                         |            |                                   |                 |     |          |     |                                   |     |           |     |               |     |           |     |            |  |  |     |                                         |  |  |     |                |  |  |     |               |

## 8. CONTROL COMMAND DESCRIPTIONS

\* Defaults (Initial State at Power-On): The contents of the initial state are shown in below table.

| Setting Items               | Setting Contents                                    |
|-----------------------------|-----------------------------------------------------|
| Command emulation mode      | SDI's VFD Standard                                  |
| Display mode                | Overwrite mode                                      |
| Cursor position             | Home position (the upper left corner of the window) |
| Display screen              | Clear                                               |
| Window                      | Not defined                                         |
| Character code table        | PC-437 (*)                                          |
| International character set | U.S.A. (*)                                          |
| User-defined characters     | Not defined                                         |
| Macro definition            | Not defined                                         |
| Reverse characters          | Canceled                                            |
| Display blinking            | Canceled                                            |
| Brightness adjustment       | 100% (*)                                            |
| Peripheral device selection | Display (*)                                         |
| Set-up time                 | 00:00                                               |

(\*) Set by the memory switch.

### 8.1 Back Space (Move Cursor Left)

| ASCII Format | <BS>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <ESC> [ D         | <NUL> K     |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------|
| Dec. Format  | 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 27, 91, 68        | 0, 75       |
| Hex. Format  | [08h]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | [1Bh] [5Bh] [44h] | [00h] [4Bh] |
| Description  | <p>Moves the cursor one character position to the left. When the cursor is at the left end of a line, the operation of this command depends on the display mode, as follows:</p> <ol style="list-style-type: none"> <li>1) Overwrite mode: When the cursor is at the left end of the lower line, it is moved to the right end of the upper line. When it is at the left end of the upper line, it is moved to the right end of the lower line.</li> <li>2) Vertical scroll mode: When the cursor is at the left end of the lower line, it is moved to the right end of the upper line. When it is at the left end of the upper line, the display on the upper line is scrolled to the lower line and the upper line is cleared. At this time, the cursor moved to the right end of the upper line.</li> <li>3) Horizontal scroll mode: All characters on the current line are scrolled one character to the right. The cursor is not moved, but the character area at the left end is cleared.</li> </ol> <p>* When a window is defined, the cursor is moved only within the current window.</p> |                   |             |

### 8.2 Horizontal Tab (Move Cursor Right)

| ASCII Format | <HT>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <ESC> [ C         | <NUL> M     |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------|
| Dec. Format  | 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 27, 91, 67        | 0, 77       |
| Hex. Format  | [09h]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | [1Bh] [5Bh] [43h] | [00h] [4Dh] |
| Description  | <p>Move the cursor to the right. When the cursor is at the right end of a line, the operation of this command depends on the display mode, as follows:</p> <ol style="list-style-type: none"> <li>1) Overwrite mode: When the cursor is at the right end of the upper line, it is moved to the left end of the lower line. When it is at the right end of the lower line, it is moved to the left end of the upper line.</li> <li>2) Vertical scroll mode: When the cursor is at the right end of the upper line, it is moved to the left end of the lower line. When it is at the right end of the lower line, the display on the lower line is scrolled to the upper line and the lower line is cleared. At this time, the cursor is moved to the left end of the lower line.</li> <li>3) Horizontal scroll mode: All characters on the current line are scrolled one character to the left. The cursor is not moved, but the character area at the left end is cleared.</li> </ol> <p>* When a window is defined, the cursor is moved only within the current window.</p> |                   |             |

### 8.3 Move Cursor Downward (Line Feed)

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |             |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------|
| ASCII Format | <LF>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <ESC> [ B         | <NUL> P     |
| Dec. Format  | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 27, 91, 66        | 0, 80       |
| Hex. Format  | [0Ah]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | [1Bh] [5Bh] [42h] | [00h] [50h] |
| Description  | <p>Moves the cursor down one line. When the cursor is on the lower line, the operation of this command depends on the display mode, as follows:</p> <ol style="list-style-type: none"> <li>1) Overwrite mode: The cursor is moved to the same column on the upper line.</li> <li>2) Vertical scroll mode: The characters displayed on the lower line are scrolled to the upper line, and the lower line is cleared. The cursor remains at the same position.</li> <li>3) Horizontal scroll mode: The cursor is not moved.</li> </ol> <p>* When a window is defined, the cursor is moved only within the current window.</p> |                   |             |

### 8.4 Move Cursor up

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                   |             |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------|
| ASCII Format | <US> <LF>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <ESC> [ A         | <NUL> H     |
| Dec. Format  | 31, 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 27, 91, 65        | 0, 72       |
| Hex. Format  | [1Fh] [0Ah]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | [1Bh] [5Bh] [41h] | [00h] [48h] |
| Description  | <p>Moves the cursor up one line. When the cursor is on the upper line, the operation of this command depends on the display mode, as follows:</p> <ol style="list-style-type: none"> <li>1) Overwrite mode: The cursor is moved to the same column on the lower line.</li> <li>2) Vertical scroll mode: The characters displayed on the upper line are scrolled to the lower line, and the upper line is cleared. The cursor remains at the same position.</li> <li>3) Horizontal scroll mode: The cursor is not moved.</li> </ol> <p>* When a window is defined, the cursor is moved only within the current window.</p> |                   |             |

### 8.5 Cursor Home (Move Cursor to Home Position)

|              |                                                                                                                                                                                                                                                   |                   |  |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--|
| ASCII Format | <HOM>                                                                                                                                                                                                                                             | <ESC> [ H         |  |
| Dec. Format  | 11                                                                                                                                                                                                                                                | 27, 91, 72        |  |
| Hex. Format  | [0Bh]                                                                                                                                                                                                                                             | [1Bh] [5Bh] [48h] |  |
| Description  | <p>Moves the cursor to the left-most position on the upper line (home position).<br/>Home position indicates the first column of the upper line.</p> <p>* When a window is defined, the home position is the upper left corner of the window.</p> |                   |  |

### 8.6 Carriage Return (Move Cursor to Left-most Position)

|              |                                                                                                                                     |                 |             |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------|
| ASCII Format | <CR>                                                                                                                                | <ESC> [ L       | <NUL> G     |
| Dec. Format  | 13                                                                                                                                  | 11, 91, 76      | 0, 71       |
| Hex. Format  | [0Dh]                                                                                                                               | [1Bh][5Bh][4Ch] | [00h] [47h] |
| Description  | <p>Moves the cursor to the left-most position on the current line.</p> <p>* The cursor is moved only within the current window.</p> |                 |             |

### 8.7 Move Cursor to Right-most Position

|              |                                                                                                                                      |                   |  |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------------|--|
| ASCII Format | <US> <CR>                                                                                                                            | <ESC> [ R         |  |
| Dec. Format  | 31, 13                                                                                                                               | 11, 91, 82        |  |
| Hex. Format  | [1Fh] [0Dh]                                                                                                                          | [1Bh] [5Bh] [52h] |  |
| Description  | <p>Moves the cursor to the right-most position on the current line.</p> <p>* The cursor is moved only within the current window.</p> |                   |  |

### 8.8 Move Cursor to Bottom Position

|              |                                                                                                                                                                                                                      |                   |  |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--|
| ASCII Format | <US> B                                                                                                                                                                                                               | <ESC> [ K         |  |
| Dec. Format  | 31, 65                                                                                                                                                                                                               | 11, 91, 75        |  |
| Hex. Format  | [1Fh] [42h]                                                                                                                                                                                                          | [1Bh] [5Bh] [4Bh] |  |
| Description  | <p>Moves the cursor to the bottom position.<br/>The bottom position indicates the 20th column of the lower line.</p> <p>* When a window is defined, the bottom position is the lower right corner of the window.</p> |                   |  |

### 8.9 Move Cursor to Specified Position

|              |                                                                                                                                                                                                                                                                                      |                 |                 |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------|
| ASCII Format | <US> \$ x y                                                                                                                                                                                                                                                                          | <ESC> I x y     | <ESC> P x y     |
| Dec. Format  | 31, 36, x, y                                                                                                                                                                                                                                                                         | 31, 108, x, y   | 31, 80, x, y    |
| Hex. Format  | [1Fh] [24h] x y                                                                                                                                                                                                                                                                      | [1Bh] [6Ch] x y | [1Bh] [50h] x y |
| Description  | <p>Moves the cursor to the nth column on the mth line.<br/>           If a value exceeding the range is specified for x (column) and/or y (line), this command is ignored and the cursor does not move. (range: <math>1 \leq x \leq 20</math>, <math>y = 1 \text{ or } 2</math>)</p> |                 |                 |

### 8.10 Clear Display Screen, and Clear String Mode

|              |                                                                                                                                                                                                                                 |  |  |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <CLR>                                                                                                                                                                                                                           |  |  |
| Dec. Format  | 12                                                                                                                                                                                                                              |  |  |
| Hex. Format  | [0Ch]                                                                                                                                                                                                                           |  |  |
| Description  | <p>Clears all the displayed characters.<br/>           After the command is executed, the cursor moves to the home position.<br/>           * When a window is defined, the cursor is moved only within the current window.</p> |  |  |

### 8.11 Clear Cursor Line, and Clear String Mode

|              |                                                                                                                                                                                                                                                             |  |  |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <CAN>                                                                                                                                                                                                                                                       |  |  |
| Dec. Format  | 24                                                                                                                                                                                                                                                          |  |  |
| Hex. Format  | [18h]                                                                                                                                                                                                                                                       |  |  |
| Description  | <p>Clears the line containing the cursor.<br/>           After this command is executed, the cursor moves to the left-most position on the current line.<br/>           * When a window is defined, the cursor is moved only within the current window.</p> |  |  |

### 8.12 Initialize Display

|              |                                                                                                                                                                                                                                                                                                                                                                |  |  |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <ESC> @                                                                                                                                                                                                                                                                                                                                                        |  |  |
| Dec. Format  | 27, 64                                                                                                                                                                                                                                                                                                                                                         |  |  |
| Hex. Format  | [1Bh] [40h]                                                                                                                                                                                                                                                                                                                                                    |  |  |
| Description  | <p>Resets the various display settings to their initial values.<br/>           The software settings are reset to their power-on values. The jumper switches are not checked again.<br/>           The data in the receive buffer is not cleared. After initializing the display, the display screen is cleared and the cursor moves to the home position.</p> |  |  |

### 8.13 Select Peripheral Device(s)

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <ESC> = n                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |
| Dec. Format  | 27, 61, n                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |
| Hex. Format  | [1Bh] [3Dh] n                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| Description  | <p>Select peripheral device(s)<br/>           * n=01h, enable printer, disable display<br/>           * n=02h, disable printer, enable display<br/>           * n=03h, enable printer, enable display<br/>           * n=04h, display message for customer side (Display data can be accepted when J1 is opened.)<br/>           * n=05h, display message for operator side (Display data can be accepted when J1 is closed.)</p> |  |  |

### 8.14 Select/Cancel User-defined Characters

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <ESC> % n                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| Dec. Format  | 27, 37, n                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| Hex. Format  | [1Bh] [25h] n                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |  |
| Description  | <p>Selects or cancels the user-defined character set. (n = 0 or 1, default n=0)<br/>           When n is 1, the user-defined character set is selected. When the user-defined character set is not defined using the "&lt;ESC&gt; &amp;" command, the internal character set is displayed.<br/>           When n is 0, the user-defined character set is canceled. (The internal character set is selected.) In this case, this command has no effect on the user-defined characters that have already been defined using the "&lt;ESC&gt; &amp;" command.<br/>           This command has no effect on the characters already displayed.</p> |  |  |

**8.15 Define User-defined Characters**

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASCII Format | <ESC> & s n m a (p <sub>1</sub> .....p <sub>a</sub> ) <sup>*</sup> (m-n+1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Dec. Format  | 27, 38, s n m a (p <sub>1</sub> ...p <sub>a</sub> ) <sup>*</sup> (m-n+1), s=1, 32≤n≤m≤255, 0≤p <sub>1</sub> .....p <sub>a</sub> ≤255                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Hex. Format  | [1Bh] [26h] s n m [a(p <sub>1</sub> ...p <sub>a</sub> ) <sup>*</sup> (m-n+1), s=01h, 20h≤n≤m≤FFh, 00h≤p <sub>1</sub> .....p <sub>a</sub> ≤FFh                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Description  | <p>Defines user-defined characters.</p> <ul style="list-style-type: none"> <li>* s denotes the number of bytes in the vertical direction. (s=1)</li> <li>* n specifies the beginning character code for the definition, and m specifies the final character code.</li> </ul> <p>When only one character is defined, use n = m.</p> <ul style="list-style-type: none"> <li>* 224 characters can be defined between character codes 20h (32) and FFh (255) in the character code table.</li> <li>* a denotes the number of dots in the horizontal direction. When a &lt; 5, the remaining dots on the right side of the user-defined characters are padded with spaces.</li> <li>* p<sub>1</sub> ... p<sub>a</sub> is the dot data to be defined for the characters. This indicates the dot pattern for a dot in the horizontal direction from the left side.</li> <li>* The number of data items to be defined is s * a. When 8 bits are specified for the communication word length, the most significant bit is ignored.</li> <li>* Once the user-defined characters are defined, they remain effective until they are redefined, "&lt;ESC&gt; @" is executed, or the power is turned off.</li> <li>* When only the user-defined characters are defined and the user-defined character set is not selected using the "&lt;ESC&gt; %" command, the user-defined characters are not displayed.</li> </ul> |
| Example      | <p>To define the character "€" at character code 20h (32) :</p> <p>1) When the most significant bit is processed as "0", or when the communication word length is specified as seven bits, the defined character definition is executed as shown below:<br/>         [1Bh] [26h] [01h] ; define user-defined character<br/>         [20h] [20h] [05h] ; code from 20h to 20h, each character will be composed by 5 bytes<br/>         [12h] [2Ah] [7Fh] [2Ah] [24h] ; left side of above define example (MSB="0")</p> <p>2) When the communication word length is specified as eight bits and the most significant bit is processed as "1", the user-defined character definition is executed as shown below:<br/>         [1Bh] [26h] [01h] ; define user-defined character<br/>         [20h] [20h] [05h] ; code from 20h to 20h, each character will be composed by 5 bytes<br/>         [92h] [AAh] [FFh] [AAh] [A4h] ; right side of above define example (MSB="1")</p>                                                                                                                                                                                                                                                                                                                                                                                                                             |

**8.16 Delete User-defined Characters**

|              |                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <ESC> ? n                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| Dec. Format  | 27, 63, n                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| Hex. Format  | [1Bh] [3Fh] n                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
| Description  | <p>Cancels user-defined characters. (20h≤n≤FFh)</p> <p>This command cancels the pattern defined for the character code specified by n. If specified code is transmitted after the pattern is canceled by this command, the internal character is displayed. If the specified character code is not defined, this command is ignored.</p> <p>This command has no effect on characters already displayed.</p> |  |  |



**8.17 Store User-defined Characters into EEPROM**

|              |                                                                                         |  |  |
|--------------|-----------------------------------------------------------------------------------------|--|--|
| ASCII Format | <ESC> s <MD1>                                                                           |  |  |
| Dec. Format  | 27, 115, 1                                                                              |  |  |
| Hex. Format  | [1Bh] [73h] [01h]                                                                       |  |  |
| Description  | Current using character data, including user-defined characters, is stored into EEPROM. |  |  |

**8.18 Restore User-defined Characters from EEPROM**

|              |                                                                                                 |  |  |
|--------------|-------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <ESC> d <MD1>                                                                                   |  |  |
| Dec. Format  | 27, 100, 1                                                                                      |  |  |
| Hex. Format  | [1Bh] [64h] [01h]                                                                               |  |  |
| Description  | Character font table is reloaded from EEPROM, and the user-defined characters will be selected. |  |  |

**8.19 Select an International Code Set**

|              |                                                                                                                                                                                     |                      |  |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--|
| ASCII Format | <ESC> R <i>n</i>                                                                                                                                                                    | <ESC> f <i>n</i>     |  |
| Dec. Format  | 27, 82, <i>n</i>                                                                                                                                                                    | 27, 102, <i>n</i>    |  |
| Hex. Format  | [1Bh] [52h] <i>n</i>                                                                                                                                                                | [1Bh] [66h] <i>n</i> |  |
| Description  | Set international code set (refer to the Table 6.7 on Page-12 to specify <i>n</i> )<br>After setting international code set, the user-defined characters are subject to be deleted. |                      |  |

**8.20 Select a Character Font Table**

|              |                                                                              |                      |  |
|--------------|------------------------------------------------------------------------------|----------------------|--|
| ASCII Format | <ESC> t <i>n</i>                                                             | <ESC> c <i>n</i>     |  |
| Dec. Format  | 27, 116, <i>n</i>                                                            | 27, 99, <i>n</i>     |  |
| Hex. Format  | [1Bh] [74h] <i>n</i>                                                         | [1Bh] [63h] <i>n</i> |  |
| Description  | Select character font table (see Table 6.10 on Page-13 to specify <i>n</i> ) |                      |  |

**8.21 Select/Cancel Window Range**

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |  |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <ESC> W <i>n m x1 y1 x2 y2</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  |
| Dec. Format  | 27, 87, <i>n, m, x1, y1, x2, y2</i> ( $1 \leq n \leq 4$ , $m=0, 1, 48$ or $49$ , $1 \leq x1 \leq x2 \leq 20$ , $1 \leq y1 \leq y2 \leq 2$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| Hex. Format  | [1Bh] [57h] <i>n m x1 y1 x2 y2</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |
| Description  | <p>Selects or cancels a single window on the display screen.</p> <ul style="list-style-type: none"> <li>* <i>n</i> specifies the window number to be selected or canceled. (<math>01h \leq n \leq 04h</math>)</li> <li>* <i>m</i> specifies selection or cancellation. <ul style="list-style-type: none"> <li>When <math>m=1</math> or <math>49(31h)</math>, a window is selected. (Values <math>x1, y1, x2</math>, and <math>y2</math> are required.)</li> <li>When <math>m=0</math> or <math>48(32h)</math>, a window is canceled. (Values <math>x1, y1, x2</math>, and <math>y2</math> are not required.)</li> </ul> </li> <li>* <math>x1</math> and <math>y1</math> set the positions of the upper left column and line of the window, respectively.</li> <li>* <math>x2</math> and <math>y2</math> set the positions of the lower right column and line of the window, respectively.</li> </ul> <p>Up to four windows can be selected simultaneously on the display screen. However, the window ranges cannot overlap. If a value outside the display screen or overlapping another window is set, this command is ignored. To cancel a window, arguments for the window range (<math>x1, y1, x2</math>, and <math>y2</math>) must not be transmitted.</p> |  |  |

**8.22 Overwrite Mode**

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |  |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--|
| ASCII Format | <US> <MD1>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <ESC> <DC1> |  |
| Dec. Format  | 31, 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 27, 17      |  |
| Hex. Format  | [1Fh] [01h]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | [1Bh] [11h] |  |
| Description  | <p>Selects overwrite mode as the screen display mode.</p> <p>In overwrite mode, entering a character code moves the cursor to the left end of the lower line when the cursor is at the right end of the upper line, and to the left end of the upper line when the cursor is at the right end of the lower line.</p> <p>This mode is selected when the power is turned on.</p> <p>Selecting overwrite mode cancels horizontal or vertical scroll mode.</p> <p>Except when the cursor is at the right end, entering a character code moves the cursor one character to the right after displaying the character.</p> |             |  |



### 8.23 Vertical Scroll Mode

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |             |  |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--|
| ASCII Format | <US> <MD2>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ESC> <DC2> |  |
| Dec. Format  | 31, 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 27, 18      |  |
| Hex. Format  | [1Fh] [02h]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | [1Bh] [12h] |  |
| Description  | <p>Selects vertical scroll mode as the screen display mode.</p> <p>In vertical scroll mode, entering a character code moves the cursor to the left end of the lower line when the cursor is at the right end of the upper line, scrolls the characters displayed on the lower line to the upper line, and clears the lower line when the cursor is at the right end of the lower line. At this time, the cursor is moved to the left end of the lower line.</p> <p>Selecting vertical scroll mode cancels overwrite or horizontal scroll mode.</p> <p>Except when the cursor is at the right end, entering a character code moves the cursor one character to the right after displaying the character.</p> |             |  |

### 8.24 Horizontal Scroll Mode

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |             |  |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--|
| ASCII Format | <US> <MD3>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ESC> <DC3> |  |
| Dec. Format  | 31, 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |             |  |
| Hex. Format  | [1Fh] [03h]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | [1Bh] [13h] |  |
| Description  | <p>Selects horizontal scroll mode as the screen display mode.</p> <p>In horizontal scroll mode, entering a character code scrolls all displayed characters (including commas and periods) one character to the left, then displays the new character at the right end (when the cursor is at the right end of either line.)</p> <p>Selecting horizontal scroll mode cancels overwrite or vertical scroll mode.</p> <p>Except when the cursor is at the right end, entering a character code moves the cursor one character to the right after displaying the character.</p> |             |  |

### 8.25 Set Display Screen Blink Interval

|              |                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <US> E <i>n</i>                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| Dec. Format  | 31, 69, <i>n</i>                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
| Hex. Format  | [1Fh] [45h] <i>n</i>                                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| Description  | <p>Sets or cancels the blink interval of the display screen. (<math>0 \leq n \leq 255</math>)</p> <p><i>n</i> specifies the blink interval. [(<math>n * 50</math> ms.) ON / (<math>n * 50</math> ms.) OFF] is repeated.</p> <p>When <math>n=0</math>, the display is kept on (cancels blinking).</p> <p>When <math>n=255</math>, the display is turned off but the contents of the display are maintained.</p> |  |  |

### 8.26 Set and Display Counter (Set Time)

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <US> T <i>h m</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
| Dec. Format  | 31, 84, <i>h m</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |
| Hex. Format  | [1Fh] [54h] <i>h m</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| Description  | <p>The counter time is set and displayed at the right side of the bottom line.</p> <p>* <i>h</i> is hours, and <i>m</i> is minutes. (<math>0 \leq h \leq 23</math>, <math>0 \leq m \leq 59</math>)</p> <p>When this command is entered, the screen is cleared and the time is displayed in 24-mode at the right side of the bottom line.</p> <p>The time counter starts from the transmitted code <i>h</i>:<i>m</i>:00. After the time is displayed, the cursor moves to the home position. The counter display disappears when any of the following occurs:</p> <ol style="list-style-type: none"> <li>1) The cursor moves to the bottom line.</li> <li>2) Display characters move to the bottom line.</li> <li>3) The &lt;CLR&gt; command is received.</li> </ol> <p>Even if the time counter is cleared, it continues to be updated in the display.</p> |  |  |



**8.27 Display Counter (Display Time)**

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |   |   |   |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |  |  |    |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|--|--|----|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|---|---|--|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|---|---|--|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| ASCII Format | <US> U                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |   |   |   |   |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |  |  |    |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dec. Format  | 31, 85                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |   |   |   |   |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |  |  |    |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Hex. Format  | [1Fh] [55h]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |   |   |   |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |  |  |    |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Description  | <p>Displays the time counter at the right side of the bottom line.<br/>                 If the time has already been set using the "&lt;US&gt; T h m" command, the elapsed time is displayed in real time in the format "hours : minutes : seconds".<br/>                 If the time has not yet been set, the elapsed time (from when the counter was initialized by turning on the power or from the "&lt;ESC&gt; @" command) is displayed in real time in the format "hours : minutes : seconds". After the counter is displayed, the cursor moves to the home position.<br/>                 The counter display is cleared when any of the following occurs:<br/>                 1) The cursor moves to the bottom line.<br/>                 2) Display characters move to the bottom line.<br/>                 3) The "&lt;CLR&gt;" command is received.<br/>                 Even if the time counter is cleared, it continues to be updated in the display.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |   |   |   |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |  |  |    |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Example      | <p>1) Counter display just before receiving "&lt;US&gt; T h m":</p> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td>H</td><td>A</td><td>V</td><td>E</td><td>A</td><td>N</td><td>I</td><td>C</td><td>E</td><td>D</td><td>A</td><td>Y</td><td>!</td><td>!</td><td></td><td></td> </tr> <tr> <td>S</td><td>U</td><td>B</td><td>-</td><td>T</td><td>O</td><td>T</td><td>A</td><td>L</td><td></td><td></td><td></td><td>\$</td><td>3</td><td>2</td><td>.</td><td>9</td><td>5</td> </tr> </table> <p>[Example] Display Before Setting the Counter</p> <p>2) "&lt;US&gt; T h m" (1Fh 54h 17 35) is received:</p> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td><td>7</td><td>:</td><td>3</td><td>5</td><td>:</td><td>0</td><td>0</td> </tr> </table> <p>[Example] Counter Setting Indication<br/>                 Above screen "HAVE A NICE DAY!! / SUB-TOTAL \$32.95" is cleared, and the input time is displayed at the right side of the lower line; counting begins from "17:35:00" seconds.<br/>                 At this time, the cursor moves to the home position indicated by "_".</p> <p>3) Display data "Welcome to E-SHOP!" is received:</p> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td>W</td><td>e</td><td>l</td><td>c</td><td>o</td><td>m</td><td>e</td><td></td><td>t</td><td>o</td><td></td><td>E</td><td>-</td><td>S</td><td>H</td><td>O</td><td>P</td><td>!</td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td><td>7</td><td>:</td><td>3</td><td>5</td><td>:</td><td>0</td><td>0</td> </tr> </table> <p>[Example] Indication When the Cursor Does Not Move<br/>                 Counter display in the bottom line has no effect on data displayed in the top line.</p> <p>4) &lt;LF&gt; (0Ah) is received:</p> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td>W</td><td>e</td><td>l</td><td>c</td><td>o</td><td>m</td><td>e</td><td></td><td>t</td><td>o</td><td></td><td>E</td><td>-</td><td>S</td><td>H</td><td>O</td><td>P</td><td>!</td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table> <p>[Example] Indication When the Cursor Moves<br/>                 Moving the cursor to the bottom line clears the time display, but counting continues internally.<br/>                 (Above example shows assumed overwrite mode.)</p> |   |   | H | A | V | E | A | N | I | C | E  | D | A | Y | ! | ! |   |   | S | U | B | - | T | O | T | A | L |  |  |  | \$ | 3 | 2 | . | 9 | 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 | 7 | : | 3 | 5 | : | 0 | 0 | W | e | l | c | o | m | e |  | t | o |  | E | - | S | H | O | P | ! |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 | 7 | : | 3 | 5 | : | 0 | 0 | W | e | l | c | o | m | e |  | t | o |  | E | - | S | H | O | P | ! |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| H            | A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | V | E | A | N | I | C | E | D | A | Y | !  | ! |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |  |  |    |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| S            | U                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | B | - | T | O | T | A | L |   |   |   | \$ | 3 | 2 | . | 9 | 5 |   |   |   |   |   |   |   |   |   |   |   |  |  |  |    |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |   |   |   |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |  |  |    |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |   |   |   |   |   |   |   |   |   |    |   |   |   | 1 | 7 | : | 3 | 5 | : | 0 | 0 |   |   |   |   |   |  |  |  |    |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| W            | e                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | l | c | o | m | e |   | t | o |   | E | -  | S | H | O | P | ! |   |   |   |   |   |   |   |   |   |   |   |  |  |  |    |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |   |   |   |   |   |   |   |   |   |    |   |   |   | 1 | 7 | : | 3 | 5 | : | 0 | 0 |   |   |   |   |   |  |  |  |    |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| W            | e                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | l | c | o | m | e |   | t | o |   | E | -  | S | H | O | P | ! |   |   |   |   |   |   |   |   |   |   |   |  |  |  |    |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |   |   |   |   |   |   |   |   |   |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |  |  |    |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**8.28 Brightness Adjustment (Dimming Control)**

|              |                                                                                                                                                                                                                                                                                                                                         |               |  |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--|
| ASCII Format | <US> X n                                                                                                                                                                                                                                                                                                                                | <ESC> * n     |  |
| Dec. Format  | 31, 88, n                                                                                                                                                                                                                                                                                                                               | 27, 42, n     |  |
| Hex. Format  | [1Fh] [58h] n                                                                                                                                                                                                                                                                                                                           | [1Bh] [2Ah] n |  |
| Description  | <p>Sets the brightness of the fluorescent character display tube. n selects the percentage of brightness as follows:<br/>                 * n = 01h, Brightness = 20%<br/>                 * n = 02h, Brightness = 40%<br/>                 * n = 03h, Brightness = 60%<br/>                 * n = 04h, Brightness = 100% (default)</p> |               |  |

**8.29 Turn Reversed Character Mode On/Off**

|              |                                                                                                                                                                                                              |  |  |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <US> r n                                                                                                                                                                                                     |  |  |
| Dec. Format  | 31, 114, n                                                                                                                                                                                                   |  |  |
| Hex. Format  | [1Fh] [72h] n                                                                                                                                                                                                |  |  |
| Description  | <p>Selects or cancels reverse display of the characters received after this command.</p> <p>* n = 00h or 30h, reverse characters are canceled.</p> <p>* n = 01h or 31h, reverse characters are selected.</p> |  |  |

**8.30 Status Confirmation by DTR Signal**

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <US> v n                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  |
| Dec. Format  | 31, 118, n                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| Hex. Format  | [1Fh] [76h] n                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |
| Description  | <p>Sets the DTR signal in the host interface to the MARK or SPACE state.</p> <p>When n = 01h or 31h, the DTR signal goes to the MARK state, if it is already in the MARK state, the DTR signal does not change.</p> <p>When n = 00h or 30h, the DTR signal goes to the SPACE state if the following conditions are satisfied, if it is already SPACE when n = 0 is received, the DTR signal does not change:</p> <ol style="list-style-type: none"> <li>1) The receive buffer is not in the buffer-full state.</li> <li>2) The self-test is not being executed.</li> </ol> <p>This command is effective only when the display alone is selected by "&lt;ESC&gt; = 2" (printer disable &amp; display enable). Therefore, if the printer is already selected, this command (three bytes) is ignored and is processed as normal data. (The data is transmitted to the printer.)</p> <p>If any data is received during status confirmation using the DTR signal, normal interface timing control is executed immediately.</p> |  |  |

**8.31 Execute Self-test**

|              |                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <US> @                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| Dec. Format  | 31, 64                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| Hex. Format  | [1Fh] [40h]                                                                                                                                                                                                                                                                                                                                                                       |  |  |
| Description  | <p>A series of self-test is displayed. All set values except those listed below are initialized:</p> <ol style="list-style-type: none"> <li>1) User-defined character definitions</li> <li>2) Macro definitions</li> <li>3) Time counter value</li> </ol> <p>After completion of the self-test, the screen is cleared and the display position is moved to the home position.</p> |  |  |

**8.32 Start/End Macro Definition**

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <US> :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |
| Dec. Format  | 31, 58                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |
| Hex. Format  | [1Fh] [3Ah]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
| Description  | <p>Starts or ends a macro definition.</p> <p>Up to 80 bytes can be defined for macro processing (one byte per character). Macro definition processing starts with the first "&lt;US&gt; :" command and ends with the second "&lt;US&gt; :" command.</p> <p>Receipt of either of the two types of data shown below is regarded as a macro definition error. Macro definition processing is stopped, and any following data is processed as normal data. At this time, the macro remains undefined.</p> <ol style="list-style-type: none"> <li>1) The "&lt;US&gt; ^" command is received during a macro processing definition.</li> <li>2) A macro processing definition exceeds 80 bytes (except for the "&lt;US&gt; :" command).</li> </ol> <p>To delete a macro definition, send a "&lt;US&gt; :" command just after "&lt;US&gt; :".</p> |  |  |

**8.33 Execute and Quit Defined Macro**

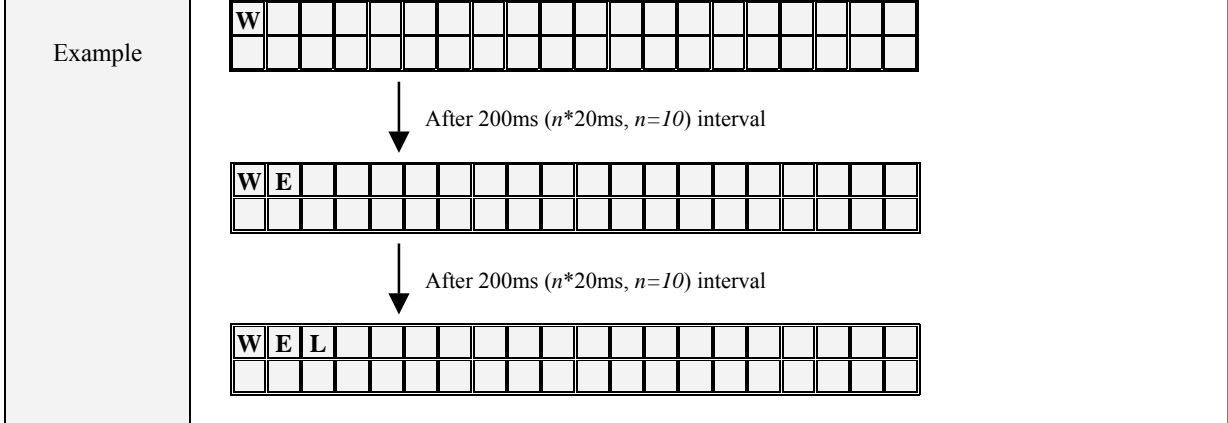
|              |                 |  |  |
|--------------|-----------------|--|--|
| ASCII Format | <US> ^ n m      |  |  |
| Dec. Format  | 31, 94, n m     |  |  |
| Hex. Format  | [1Fh] [5Eh] n m |  |  |

**Description**

Executes the process defined as a macro. ( $00h \leq n \leq FFh$ ,  $00h \leq m \leq FFh$ )  
 $n$  specifies the time interval for displaying characters in units of [ $n*20msec$ ] when a macro is executed. This specifies the time interval before displaying each successive character but does not affect the processing speed of command codes.  
 $m$  specifies the interval of execution. Where macro processing is repeated, it starts over from the beginning after the completion state of the previous macro processing is held for [ $m*50 msec$ ].  
 If data is received from the host during macro processing, the macro processing is terminated.  
 After macro processing is finished, the current window is cleared and the cursor is moved to the home position in the current window.  
 Display settings at the completion of macro processing remain valid.  
 After macro processing is finished, the screen is cleared and the cursor is moved to the home position. Display settings in place at the completion of macro processing remain valid.  
 If a macro is undefined, this command is invalid and the display content is not affected.  
 If "<ESC> = n", "<ESC> @", and "<US> @" are defined in the macro, these commands are ignored when executing the macro commands.  
 Even if the printer is selected (by a peripheral device selection command) when macro processing is started, data is not transmitted to the printer during macro processing.

|                                            |                             |                    |
|--------------------------------------------|-----------------------------|--------------------|
| 1) Start Macro.....                        | <US> :                      | 1Fh, 3Ah           |
| 2) Clear Display.....                      | <CLR>                       | 0Ch                |
| 3) Set Blink (interval=0, blink off) ..... | <US> E 0                    | 1Fh, 45h, 00h      |
| 4) Displayed Character.....                | <b>WELCOME TO SAMSUNG!!</b> |                    |
| 5) Set Blink (interval=10*50ms=0.5s).....  | <US> E 10                   | 1Fh, 45h, 0Ah      |
| 6) End Macro.....                          | <US> :                      | 1Fh, 3Ah           |
| 7) Execute Macro (n=10, m=100).....        | <US> ^ 10 100               | 1Fh, 5Eh, 0Ah, 64h |

\* 1) is the starting command and 6) is the ending command of a macro definition.  
 \* Total 27-byte data from 2) to 5) is stored in the macro definition range. When the display receives the macro execution command, the defined data is in processed order.  
 \* 2) is a screen clear command.  
 \* 3) and 5) are blinking commands.  
 \* Macro execution is started by #7). The time interval for displaying the characters is 200ms ( $n*20ms$ ,  $n=10$ ). When 100ms has passed after the character "W" has been displayed, the next character, "E" is displayed.



The macro execution interval is 5 seconds ( $m*50ms$ ,  $m=100$ ). After the blinking display shown in the figure below is held for 5 seconds, macro processing is repeated from a clear screen.

|   |   |   |   |   |   |   |  |   |   |  |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|--|---|---|--|---|---|---|---|---|---|---|---|---|
| W | E | L | C | O | M | E |  | T | O |  | S | A | M | S | U | N | G | ! | ! |
|---|---|---|---|---|---|---|--|---|---|--|---|---|---|---|---|---|---|---|---|

### 8.34 Display Period

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <US> . <i>n</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |
| Dec. Format  | 31, 46, <i>n</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| Hex. Format  | [1Fh] [2Eh] <i>n</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |
| Description  | <p>Displays the specified character <i>n</i> and a period to the right of the character. (<math>20h \leq n \leq FFh</math>)<br/> <i>n</i> indicates a displayable character code<br/> The period is displayed once only for the specified character <i>n</i> and is not displayed for subsequent characters.<br/> In overwrite mode, if any other character is written in the character position for which the period was displayed, the period is cleared.<br/> In vertical scroll mode, if the display position of the character for which the period was displayed is moved, the period moves with the character.<br/> In horizontal scroll mode, if the display position of the character for which the period was displayed is moved, the period moves with the character.<br/> The cursor moves one character to the right after displaying the period.<br/> The command is not valid for user-defined Characters</p> |  |  |

### 8.35 Display Comma

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <US> , <i>n</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| Dec. Format  | 31, 44, <i>n</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |
| Hex. Format  | [1Fh] [2Ch] <i>n</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| Description  | <p>Displays the specified character <i>n</i> and a period to the right of the character. (<math>20h \leq n \leq FFh</math>)<br/> <i>n</i> indicates a displayable character code<br/> The comma is displayed once only for the specified character <i>n</i> and is not displayed for subsequent characters.<br/> In overwrite mode, if any other character is written in the character position for which the comma was displayed is moved, the comma moves with the character.<br/> In horizontal scroll mode, if the display position of the character for which the comma was displayed is moved, the comma moves with the character.<br/> The cursor moves one character to the right after displaying the comma.<br/> The command is not valid for user-defined characters</p> |  |  |

### 8.36 Display Period and Comma

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <US> ; <i>n</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| Dec. Format  | 31, 59, <i>n</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
| Hex. Format  | [1Fh] [3Bh] <i>n</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |
| Description  | <p>Displays the specified character <i>n</i> and a semicolon (period and comma) to the right of the character. (<math>20h \leq n \leq FFh</math>)<br/> <i>n</i> indicates a displayable character code<br/> The semicolon is displayed once only for the specified character <i>n</i> and is not displayed for subsequent characters.<br/> In overwrite mode, if any other character is written in the character position for which the semicolon was displayed, the semicolon is cleared.<br/> In vertical scroll mode, if the display position of the character for which the semicolon was displayed is moved, the semicolon moves with the character.<br/> In horizontal scroll mode, if the display position of the character for which the semicolon was displayed is moved, the semicolon moves with the character.<br/> The cursor moves one character to the right after displaying the semicolon.<br/> The command is not valid for user-defined character.</p> |  |  |

**8.37 Turn Annunciator On/Off**

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <US> # <i>n m</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |
| Dec. Format  | 31, 35, <i>n, m</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| Hex. Format  | [1Fh] [23h] <i>n m</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  |
| Description  | <p>Turns the annunciator at column <i>m</i> on or off. (<i>n</i>=00h, 01h, 30h or 31h, <math>0 \leq m \leq 20</math>)<br/> When <i>n</i> = 00h or 30h, the annunciator at column <i>m</i> is turned off.<br/> When <i>n</i> = 01h or 31h, the annunciator at column <i>m</i> is turned on.<br/> <i>m</i> specifies the column number (the left-most column is column 1) where the annunciator to be turned on or off is located. However, when <i>m</i> equals 0, all annunciators are either turned off or on, based on the corresponding value of <i>n</i>.</p> <p>The specification to turn on the annunciator (<i>n</i>=1) remains valid until:</p> <ol style="list-style-type: none"> <li>1) The annunciator is turned off using this command (<i>n</i>=0).</li> <li>2) The "&lt;ESC&gt; @", "&lt;US&gt; @", or "&lt;CLR&gt;" command is executed.</li> <li>3) The power is turned off.</li> </ol> |  |  |

**8.38 Set Cursor On/Off**

|              |                                                                                                                                          |                      |  |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--|
| ASCII Format | <US> C <i>n</i>                                                                                                                          | <ESC> <i>n</i>       |  |
| Dec. Format  | 31, 67, <i>n</i>                                                                                                                         | 27, 95, <i>n</i>     |  |
| Hex. Format  | [1Fh] [43h] <i>n</i>                                                                                                                     | [1Bh] [5Fh] <i>n</i> |  |
| Description  | <p>Set cursor ON or OFF (<i>n</i> = 0 or 1)<br/> When <i>n</i>=00h, cursor is turned off<br/> When <i>n</i>=01h, cursor is turned on</p> |                      |  |

**8.39 Set Line Blinking**

|              |                                                                                                                                          |  |  |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <US> <DC1> <i>n</i>                                                                                                                      |  |  |
| Dec. Format  | 31, 17, <i>n</i>                                                                                                                         |  |  |
| Hex. Format  | [1Fh] [11h] <i>n</i>                                                                                                                     |  |  |
| Description  | <p>Set line blinking (<i>n</i> = 31h or 32h)<br/> When <i>n</i>=31h, Upper line blinking<br/> When <i>n</i>=32h, Lower line blinking</p> |  |  |

**8.40 Clear Line Blinking**

|              |                                                                                                                                                        |  |  |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| ASCII Format | <US> <DC2> <i>n</i>                                                                                                                                    |  |  |
| Dec. Format  | 31, 18, <i>n</i>                                                                                                                                       |  |  |
| Hex. Format  | [1Fh] [12h] <i>n</i>                                                                                                                                   |  |  |
| Description  | <p>Clear line blinking (<i>n</i> = 31h or 32h)<br/> When <i>n</i>=31h, Clear upper line blinking<br/> When <i>n</i>=32h, Clear lower line blinking</p> |  |  |

**8.41 Write String Character to Upper Line**

|              |                                                                                                                                                                                                                                                      |                                                     |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| ASCII Format | <ESC> Q A $d_1 d_2 d_3 d_4 \dots d_n$ <CR>                                                                                                                                                                                                           | <ESC> F A $d_1 d_2 d_3 d_4 \dots d_n$ <CR>          |
| Dec. Format  | 27, 81, 65, $d_1, d_2, d_3, d_4, \dots d_n, 13$                                                                                                                                                                                                      | 27, 70, 65, $d_1, d_2, d_3, d_4, \dots d_n, 13$     |
| Hex. Format  | [1Bh] [51h] [41h] $d_1 d_2 d_3 d_4 \dots d_n$ [0Dh]                                                                                                                                                                                                  | [1Bh] [46h] [41h] $d_1 d_2 d_3 d_4 \dots d_n$ [0Dh] |
| Description  | Set the string display mode, write to upper line $d_1 d_2 d_3 d_4 \dots d_n$ ( $1 \leq n \leq 20, 20h \leq d_n \leq FFh$ ).<br>The string display mode will be cancelled and revert back to the last mode after receiving either "<CLR>" or "<CAN>". |                                                     |

**8.42 Write String Character to Lower Line**

|              |                                                                                                                                                                                                                                                      |                                                     |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| ASCII Format | <ESC> Q B $d_1 d_2 d_3 d_4 \dots d_n$ <CR>                                                                                                                                                                                                           | <ESC> Q B $d_1 d_2 d_3 d_4 \dots d_n$ <CR>          |
| Dec. Format  | 27, 81, 66, $d_1, d_2, d_3, d_4, \dots d_n, 13$                                                                                                                                                                                                      | 27, 70, 66, $d_1, d_2, d_3, d_4, \dots d_n, 13$     |
| Hex. Format  | [1Bh] [51h] [42h] $d_1 d_2 d_3 d_4 \dots d_n$ [0Dh]                                                                                                                                                                                                  | [1Bh] [46h] [42h] $d_1 d_2 d_3 d_4 \dots d_n$ [0Dh] |
| Description  | Set the string display mode, write to lower line $d_1 d_2 d_3 d_4 \dots d_n$ ( $1 \leq n \leq 20, 20h \leq d_n \leq FFh$ ).<br>The string display mode will be cancelled and revert back to the last mode after receiving either "<CLR>" or "<CAN>". |                                                     |

**8.43 Upper Line Message Scroll Continuously**

|              |                                                                                                                                                                                                                                                                                      |                                                     |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| ASCII Format | <ESC> Q D $d_1 d_2 d_3 d_4 \dots d_n$ <CR>                                                                                                                                                                                                                                           | <ESC> F D $d_1 d_2 d_3 d_4 \dots d_n$ <CR>          |
| Dec. Format  | 27, 81, 68, $d_1, d_2, d_3, d_4, \dots d_n, 13$                                                                                                                                                                                                                                      | 27, 70, 68, $d_1, d_2, d_3, d_4, \dots d_n, 13$     |
| Hex. Format  | [1Bh] [51h] [44h] $d_1 d_2 d_3 d_4 \dots d_n$ [0Dh]                                                                                                                                                                                                                                  | [1Bh] [46h] [44h] $d_1 d_2 d_3 d_4 \dots d_n$ [0Dh] |
| Description  | The upper line message will scroll continuously in the horizontal direction until a new command is received. ( $1 \leq n \leq 40, 20h \leq d_n \leq FFh$ ).<br>The string display mode will be cancelled and revert back to the last mode after receiving either "<CLR>" or "<CAN>". |                                                     |

**8.44 Lower Line Message Scroll Continuously**

|              |                                                                                                                                                                                                                                                                                      |                                                     |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| ASCII Format | <ESC> Q O $d_1 d_2 d_3 d_4 \dots d_n$ <CR>                                                                                                                                                                                                                                           | <ESC> F O $d_1 d_2 d_3 d_4 \dots d_n$ <CR>          |
| Dec. Format  | 27, 81, 79, $d_1, d_2, d_3, d_4, \dots d_n, 13$                                                                                                                                                                                                                                      | 27, 70, 79, $d_1, d_2, d_3, d_4, \dots d_n, 13$     |
| Hex. Format  | [1Bh] [51h] [4Fh] $d_1 d_2 d_3 d_4 \dots d_n$ [0Dh]                                                                                                                                                                                                                                  | [1Bh] [46h] [4Fh] $d_1 d_2 d_3 d_4 \dots d_n$ [0Dh] |
| Description  | The lower line message will scroll continuously in the horizontal direction until a new command is received. ( $1 \leq n \leq 40, 20h \leq d_n \leq FFh$ ).<br>The string display mode will be cancelled and revert back to the last mode after receiving either "<CLR>" or "<CAN>". |                                                     |



[Appendix-1] ASCII (American Standard Code for Information Interchange) Code Table

| Dec. | Hex. | Char.  | ASCII Function | Description                        |
|------|------|--------|----------------|------------------------------------|
| 0    | 00h  | Ctrl-@ | <NUL>          | Null                               |
| 1    | 01h  | Ctrl-A | <SOH> or <MD1> | Start of Heading                   |
| 2    | 02h  | Ctrl-B | <STX> or <MD2> | Start of Text                      |
| 3    | 03h  | Ctrl-C | <ETX> or <MD3> | End of Text                        |
| 4    | 04h  | Ctrl-D | <EOT> or <MD4> | End of Transmission                |
| 5    | 05h  | Ctrl-E | <ENQ> or <MD5> | Enquiry                            |
| 6    | 06h  | Ctrl-F | <ACK> or <MD6> | Acknowledge                        |
| 7    | 07h  | Ctrl-G | <BEL> or <MD7> | Bell (audible or attention signal) |
| 8    | 08h  | Ctrl-H | <BS> or <MD8>  | Backspace                          |
| 9    | 09h  | Ctrl-I | <HT>           | Horizontal Tabulation              |
| 10   | 0Ah  | Ctrl-J | <LF> or <NL>   | Line Feed or New Line              |
| 11   | 0Bh  | Ctrl-K | <VT> or <HOM>  | Vertical Tabulation or Home        |
| 12   | 0Ch  | Ctrl-L | <FF> or <NP>   | Form Feed or New Page              |
| 13   | 0Dh  | Ctrl-M | <CR>           | Carriage Return                    |
| 14   | 0Eh  | Ctrl-N | <SO> or <SLE1> | Shift Out                          |
| 15   | 0Fh  | Ctrl-O | <SI> or <SLE2> | Shift In                           |
| 16   | 10h  | Ctrl-P | <DLE>          | Data Link Escape                   |
| 17   | 11h  | Ctrl-Q | <DC1>          | Device Control 1                   |
| 18   | 12h  | Ctrl-R | <DC2>          | Device Control 2                   |
| 19   | 13h  | Ctrl-S | <DC3>          | Device Control 3                   |
| 20   | 14h  | Ctrl-T | <DC4>          | Device Control 4 (Stop)            |
| 21   | 15h  | Ctrl-U | <NAK>          | Negative Acknowledge               |
| 22   | 16h  | Ctrl-V | <SYN>          | Synchronous Idle                   |
| 23   | 17h  | Ctrl-W | <ETB>          | End of Transmission Block          |
| 24   | 18h  | Ctrl-X | <CAN>          | Cancel                             |
| 25   | 19h  | Ctrl-Y | <EM>           | End of Medium                      |
| 26   | 1Ah  | Ctrl-Z | <SUB>          | Substitute                         |
| 27   | 1Bh  | Ctrl-[ | <ESC>          | Escape                             |
| 28   | 1Ch  | Ctrl-\ | <FS>           | File Separator                     |
| 29   | 1Dh  | Ctrl-] | <GS>           | Group Separator                    |
| 30   | 1Eh  | Ctrl-^ | <RS> or <SF1>  | Record Separator                   |
| 31   | 1Fh  | Ctrl-_ | <US> or <SF2>  | Unit Separator                     |

| Dec. | Hex. | Char. | Dec. | Hex. | Char. | Dec. | Hex. | Char. | Dec. | Hex. | Char. | Dec. | Hex. | Char. | Dec. | Hex. | Char. |
|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|
| 32   | 20h  | SP    | 48   | 30h  | 0     | 64   | 40h  | @     | 80   | 50h  | P     | 96   | 60h  | `     | 112  | 70h  | p     |
| 33   | 21h  | !     | 49   | 31h  | 1     | 65   | 41h  | A     | 81   | 51h  | Q     | 97   | 61h  | a     | 113  | 71h  | q     |
| 34   | 22h  | “     | 50   | 32h  | 2     | 66   | 42h  | B     | 82   | 52h  | R     | 98   | 62h  | b     | 114  | 72h  | r     |
| 35   | 23h  | #     | 51   | 33h  | 3     | 67   | 43h  | C     | 83   | 53h  | S     | 99   | 63h  | c     | 115  | 73h  | s     |
| 36   | 24h  | \$    | 52   | 34h  | 4     | 68   | 44h  | D     | 84   | 54h  | T     | 100  | 64h  | d     | 116  | 74h  | t     |
| 37   | 25h  | %     | 53   | 35h  | 5     | 69   | 45h  | E     | 85   | 55h  | U     | 101  | 65h  | e     | 117  | 75h  | u     |
| 38   | 26h  | &     | 54   | 36h  | 6     | 70   | 46h  | F     | 86   | 56h  | V     | 102  | 66h  | f     | 118  | 76h  | v     |
| 39   | 27h  | ‘     | 55   | 37h  | 7     | 71   | 47h  | G     | 87   | 57h  | W     | 103  | 67h  | g     | 119  | 77h  | w     |
| 40   | 28h  | (     | 56   | 38h  | 8     | 72   | 48h  | H     | 88   | 58h  | X     | 104  | 68h  | h     | 120  | 78h  | x     |
| 41   | 29h  | )     | 57   | 39h  | 9     | 73   | 49h  | I     | 89   | 59h  | Y     | 105  | 69h  | i     | 121  | 79h  | y     |
| 42   | 2Ah  | *     | 58   | 3Ah  | :     | 74   | 4Ah  | J     | 90   | 5Ah  | Z     | 106  | 6Ah  | j     | 122  | 7Ah  | z     |
| 43   | 2Bh  | +     | 59   | 3Bh  | ;     | 75   | 4Bh  | K     | 91   | 5Bh  | [     | 107  | 6Bh  | k     | 123  | 7Bh  | {     |
| 44   | 2Ch  | ,     | 60   | 3Ch  | <     | 76   | 4Ch  | L     | 92   | 5Ch  | \     | 108  | 6Ch  | l     | 124  | 7Ch  |       |
| 45   | 2Dh  | -     | 61   | 3Dh  | =     | 77   | 4Dh  | M     | 93   | 5Dh  | ]     | 109  | 6Dh  | m     | 125  | 7Dh  | }     |
| 46   | 2Eh  | .     | 62   | 3Eh  | >     | 78   | 4Eh  | N     | 94   | 5Eh  | ^     | 110  | 6Eh  | n     | 126  | 7Eh  | ~     |
| 47   | 2Fh  | /     | 63   | 3Fh  | ?     | 79   | 4Fh  | O     | 95   | 5Fh  | _     | 111  | 6Fh  | o     | 127  | 7Fh  | DEL   |



[Appendix-2] 5\*7 Dot Matrix Character Font Table (ASCII with PC-437)

| Upper Nibble | Lower Nibble | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|--------------|--------------|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|              | D7           | D6 | D5 | D4 | D3 | D2 | D1 | D0 | 0  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |   |
|              | D6           | D5 | D4 | D3 | D2 | D1 | D0 | 0  | 1  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |   |   |
|              | D5           | D4 | D3 | D2 | D1 | D0 | 0  | 1  | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |   |   |   |
|              | 0            | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |   |
|              | 1            | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |   |
|              | 2            | 0  | 0  | 1  | 1  | 0  | 0  | 1  | 1  | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
|              | 3            | 0  | 1  | 0  | 1  | 0  | 1  | 0  | 1  | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
|              | 4            | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|              | 5            | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|              | 6            | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|              | 7            | 0  | 0  | 1  | 1  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|              | 8            | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|              | 9            | 0  | 1  | 0  | 1  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|              | A            | 0  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|              | B            | 0  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|              | C            | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|              | D            | 1  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|              | E            | 1  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|              | F            | 1  | 0  | 1  | 1  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |



[Appendix-3] International Code Set (Font Map)

| No. | International     | 23h | 24h | 40h | 5Bh | 5Ch | 5Dh | 5Eh | 60h | 7Bh | 7Ch | 7Dh | 7Eh |
|-----|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0   | U.S.A             |     |     |     |     |     |     |     |     |     |     |     |     |
| 1   | FRANCE            |     |     |     |     |     |     |     |     |     |     |     |     |
| 2   | GERMANY           |     |     |     |     |     |     |     |     |     |     |     |     |
| 3   | U.K.              |     |     |     |     |     |     |     |     |     |     |     |     |
| 4   | DENMARK 1         |     |     |     |     |     |     |     |     |     |     |     |     |
| 5   | SWEDEN            |     |     |     |     |     |     |     |     |     |     |     |     |
| 6   | ITALY             |     |     |     |     |     |     |     |     |     |     |     |     |
| 7   | SPAIN 1           |     |     |     |     |     |     |     |     |     |     |     |     |
| 8   | JAPAN             |     |     |     |     |     |     |     |     |     |     |     |     |
| 9   | NORWAY            |     |     |     |     |     |     |     |     |     |     |     |     |
| 10  | DENMARK 2         |     |     |     |     |     |     |     |     |     |     |     |     |
| 11  | SPAIN 2           |     |     |     |     |     |     |     |     |     |     |     |     |
| 12  | LARTIN AMERICA    |     |     |     |     |     |     |     |     |     |     |     |     |
| 13  | KOREA             |     |     |     |     |     |     |     |     |     |     |     |     |
| 14  | SLOVENIA /CROATIA |     |     |     |     |     |     |     |     |     |     |     |     |
| 15  | CHINA             |     |     |     |     |     |     |     |     |     |     |     |     |











A4.9 WPC-1252 (Western European Windows Code Set) Character Font Table

|     | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 80H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 90H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| A0H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| B0H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| C0H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| D0H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| E0H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| F0H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

A4.10 PC-866 (Cyrillic 2) Character Font Table

|     | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 80H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 90H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| A0H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| B0H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| C0H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| D0H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| E0H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| F0H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |







A4.13 WPC-1253 (Greek) Character Font Table

|            | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| <b>80H</b> |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>90H</b> |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>A0H</b> |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>B0H</b> |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>C0H</b> |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>D0H</b> |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>E0H</b> |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>F0H</b> |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

A4.14 WPC-1254 (Turkish) Character Font Table

|            | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| <b>80H</b> |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>90H</b> |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>A0H</b> |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>B0H</b> |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>C0H</b> |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>D0H</b> |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>E0H</b> |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| <b>F0H</b> |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |