

***PDX3 / LDX9 / LTX9 / LDX1 Series***

***Serial & USB Interface Customer Displays***

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***2 by 20 character display***

# ***USER MANUAL***

Oct 2018



## **NOTICE**

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# 1 FEATURES

The PDX3000/LDX9000/LTX9000/LDX1000 family of universal command customer displays offers a wide range of high quality features and models to choice from. Listed below are the features incorporated into each customer display. Not all features are available in all models. The model identification chart will assist you in selecting the model best suited to the application needs.

The PDX3000/LDX9000/LTX9000/LDX1000 family line displays of serial port or USB port interfaces has been pre-assembled to make the installation as simple as possible.

- Two line display with twenty 5/9 mm high characters each line
- Bright blue-green fluorescent display
- Available as pole displays (PDX3000/LDX9000/LDX1000) and table-top displays (LTX9000)
- Pre-downloadable or Pre-selectable command sets for emulating current and future customer displays
- Supports wide variety of languages with multiple fonts, including English, Spanish, German, French, and Italian, ...
- Programmable power-up default setting for international symbols and font code selection
- OPOS/JPOS compatible
- Better visibility due to optically matched anti-scratch lens and wider character pitch
- Long life and trouble free operation
- Adjustable viewing angles
- Available with 120VAC / 220VAC power adapters
- Available in beige or dark gray
- Port powered or self-powered USB interface
- Direct RS232C, or RS232 pass-thru interface
- Programmable RS232C baud rate, supporting high speed up to 19,200 baud rate
- User definable character
- Automatic standard or smart message scrolling on top or bottom line
- Real time clock display
- One time message scrolling

## 2 CARTON CONTENTS

	<b>PDX3000</b>	<b>LDX9000</b>	<b>LTX9000</b>	<b>LDX1000</b>
1	PDX3 pole display	LDX9 pole display	LTX9 table display	LDX1 pole display
2	USB/DB9 cable with MiniDIN10 interconnector detachable from main cable		USB/DB9 cable, detachable	USB/DB9 cable
3	Power adapter 7.5VAC/DC			Power adapter 5VDC
4	Metal base plate with mounting hardware		N/A	Metal base plate with mounting hardware
5	Quick Installation Guide			

## 3 HARDWARE INSTALLATION

The PDX3000/LDX9000/LTX9000/LDX1000 family of universal line displays has been pre-assembled to make the installation as simple as possible. Please follow steps below for models of different interfaces.

### 3.1 Steps For Hardware Installation

#### 3.1.1 Serial interface displays

- Mount the pole display to the metal base plate using the mounting hardware provided.
- The pole display can be used in a freestanding mode or attached to the counter using the remaining mounting hardware.
- Connect the DB9F connector to the computer's serial port (for example, COM1 or COM2) if serial interface model is used.
- For serial pass-through model, connect the DB25M connector to the peripheral device and turn on power of the peripheral device.
- Connect the female power jack of the power adapter to the male power jack of the interface cable.
- Plug the power adapter into a 120VAC outlet.
- A start up text message will be present for a short time to identify the selected command set and selected baud rate. When this message disappears the cursor will be displayed at the left-most digit of the top row.

#### 3.1.2 USB interface displays

- Mount the pole display to the metal base plate using the mounting hardware provided.
- The pole display can be used in a freestanding mode or attached to the counter using the remaining mounting hardware.
- Install USB driver following instructions on "USB DRIVER INSTALLATION" section.
- Plug the USB cable from the pole display into the computer's USB port.
- For double sided USB pole displays, connect the female power jack of the power adapter to the male power jack of the interface cable and plug the power adapter into a 120VAC outlet.
- A start up text message will be present for a short time to identify the selected command set. The test message will NOT be present until USB driver is installed correctly. When this message disappears, the cursor will be displayed at the left-most digit of the top row.

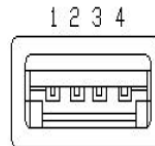
### 3.2 Interface Specification

There are several connection interfaces for the PDX3000/LDX9000/LTX9000/LDX1000 family of universal displays.

- **USB Interface Connector**

All USB pole displays will have standard USB type-A connectors. It is connected to the USB port of the computer.

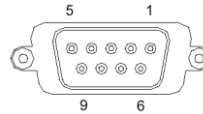
- 1: V+
- 2: D-
- 3: D+
- 4: Ground



- **Serial Interface Connector**

The pin out configuration for the standard serial pole display is a DB9F connector. It plugs directly into the serial port of the computer.

- 1: DCD (tied to pins 4&6)
- 2: NC
- 3: TXD from PC
- 4: DTR (tied to pins 1&6)
- 5: Ground
- 6: DSR (tied to pins 1&4)
- 7: RTS (tied to pin 8)
- 8: CTS (tied to pin 7)
- 9: +5 VDC



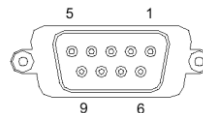
**DB9F (to computer)**

- **Serial pass-through Interface Connectors (LDX9000 & PDX3000 only)**

For pass-through models, the display cable comes with two connectors. The DB9F is to be connected to the computer while the DB25M is for connection to the peripheral.

To computer:

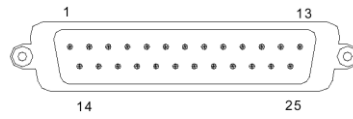
- 1: DCD (tied to pins 4&6)
- 2: TXD to PC
- 3: RXD from PC
- 4: DTR (tied to pins 1&6)
- 5: Ground
- 6: DSR (tied to pins 1&4)
- 7: RTS (tied to pin 8)
- 8: CTS (tied to pin 7)
- 9: +5 VDC



**DB9F (to computer)**

To peripheral:

- 1: NC
- 2: TXD to peripheral
- 3: RXD from peripheral
- 4: RTS
- 5: CTS (tied to pin 20)
- 6: NC
- 7: Ground
- 8: NC
- 9-19: NC
- 20: DTR (tied to pin 5)
- 21-25: NC



**DB25M (to peripheral)**



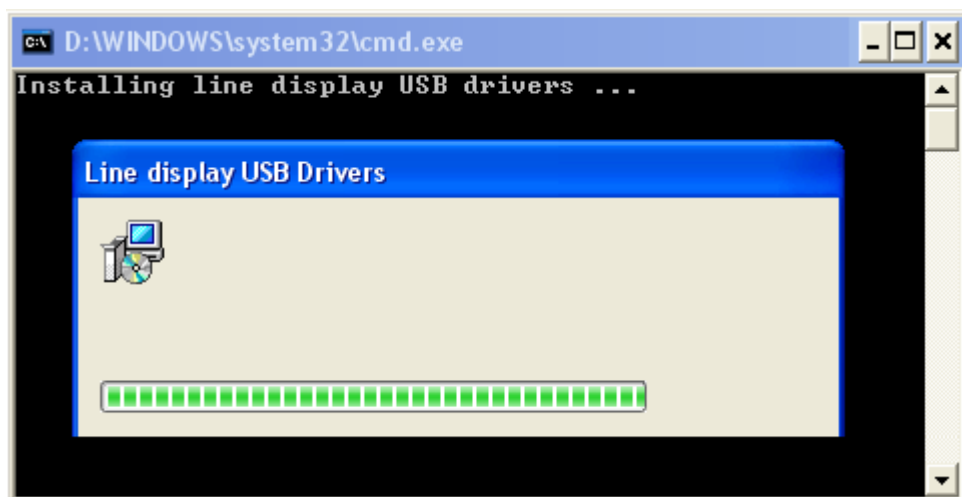
## 4 USB DRIVER INSTALLATION

### 4.1 WINDOWS 7 and WINDOWS 8 and WINDOWS 10

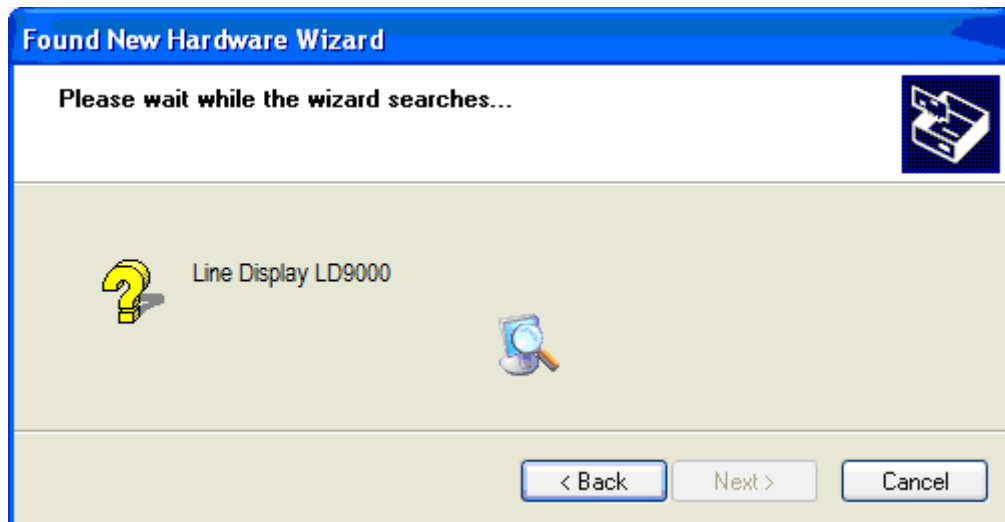
The USB drivers are available on our web site at [www.logiccontrols.com](http://www.logiccontrols.com). Please download and unzip the driver files before installation. There are two types of driver interface available. If the POS software is only able to access COM port for the pole display, use the virtual COM port interface. After the driver is installed, the USB interface will be assigned a COM port name so that the POS software will be able to communicate with the USB display as a COM port. Note that the operating system will assign the display a different COM port number if the display is plugged into a different USB port. Another driver interface use a specific device name (\\.\LCPD3\, \\.\LCLD9\, or \\.\LCLD1\) to access the pole display directly.

Install this driver if you are using OPOS or the POS software was tailored to use this device name.

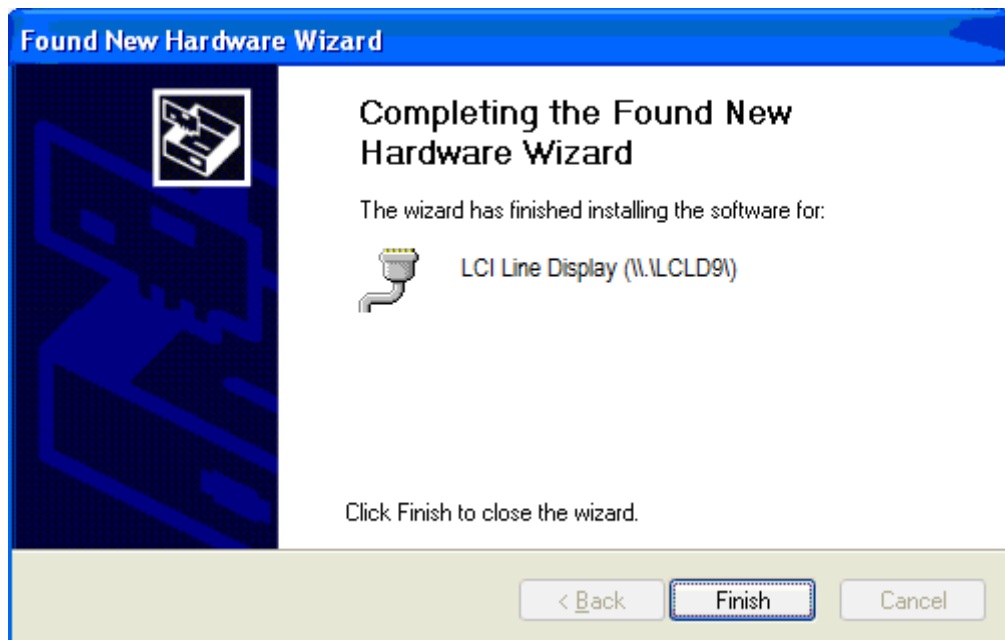
1. DO NOT plug the device in USB port
2. Run "install.bat" batch program in this driver package:



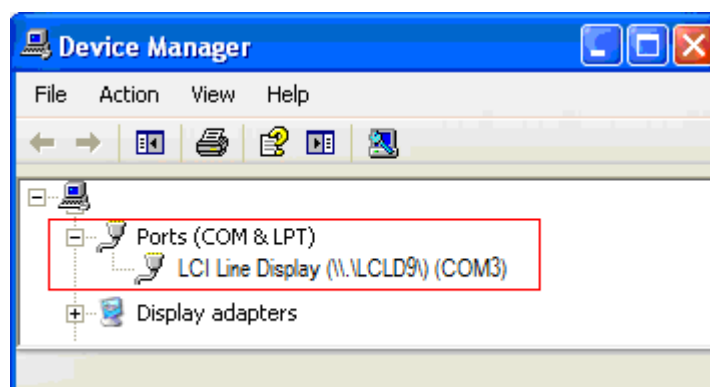
3. Plug the device in USB port and wait for the hardware wizard message box to display:



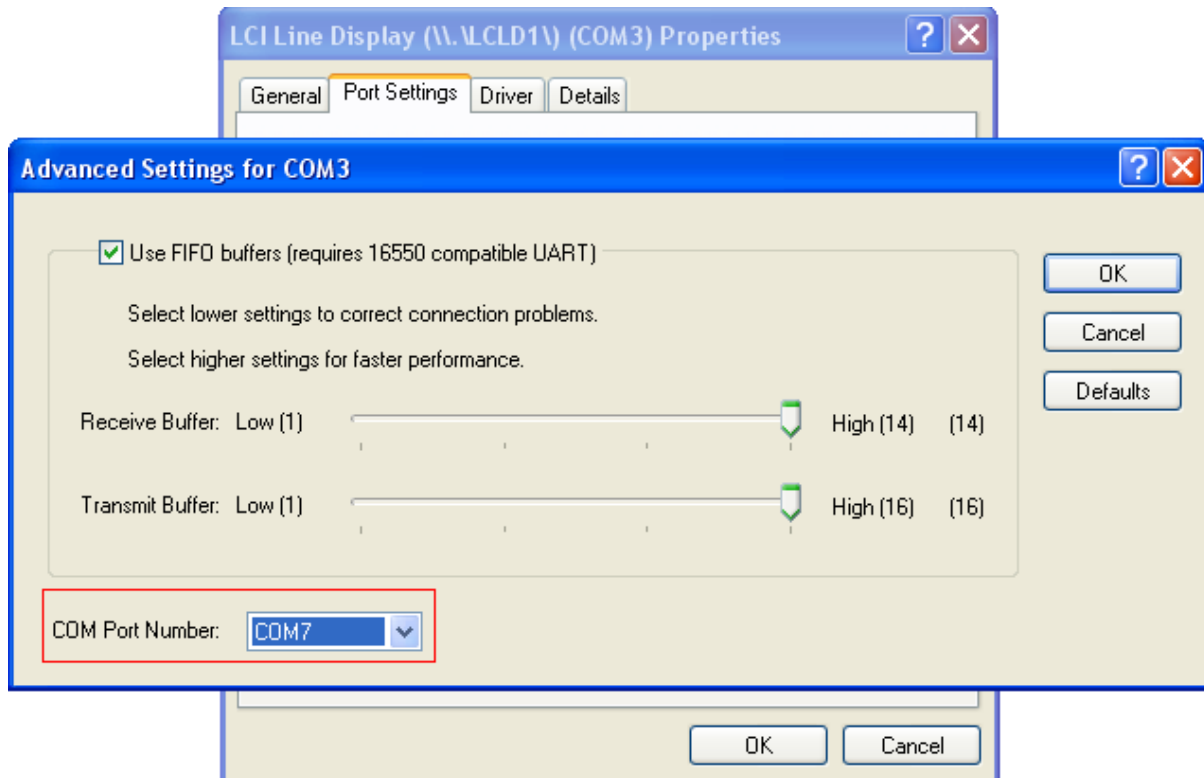
4. Click <Next> button to continue installation automatically. When finished, click <Finish> button to end installation (this can delay some seconds):



5. Invoke Device Manager to check COM port number or the device driver's name. The driver is installed under "Ports (COM & LPT)":



6. To change the assigned COM port number, double click "LCI Line Display (\\.\LCLD9) (COMx)" to display the Properties dialog box and select <Port Settings> tab. Then click <Advanced...> button
7. Click on COM port number box to select from the list of unused port number and click <OK> to accept new settings (example COM7):



8. Unplug the device and plug the device again to check COM7.

**NOTE:**

It's better to set the virtual COM port number x between 1 – 8.

## 4.2 MAC OS X 10.6.6, 10.6.6 X64, 10.5.8 INTEL, 10.5.8 PPC

Latest USB drivers are available on our web site at [www.bematechus.com](http://www.bematechus.com). Please download and unzip the driver files before installation.

1. DO NOT plug the line display in USB port
2. Download the zip file into "Documents" folder. Unzip the zip file.
3. Double-click "Install\_lcpdDll" to Install LCI pole display API library.
4. Plug the pole display to Mac PC USB socket. And wait until a logo message displayed on the screen of the device.
5. Run the testing program by double clicking "QcPdUsb" to test the API.

### Note1:

If error message box pop out:

1. "QcPdUsb cannot be opened because of a problem" - the driver was not installed properly.
2. "No LCPD devices found" - check the connection of the USB line display with Mac PC.
3. "... tty ..." - do the followings:
  - Open the terminal in the "Applications -> Utilities".
  - Run "cd usr".
  - Run "cd local".
  - Run "sudo rmdir lib" to remove the folder.
  - Run "cd .." to return to "usr" folder.
  - Run "sudo rmdir local" to remove the folder.
  - Run "cd .." to return to current user folder.
  - Run "sudo rmdir usr" to remove the folder.

### Note2:

To run the testing program in a terminal:

1. Open a terminal window.
2. Navigate to the testing program folder with "cd" command.
3. Run "chmod 755 example" in the terminal window.
4. Run "./example".

### 4.3 LINUX KERNEL 2.6.XX

1. Login as root user.
2. Copy "setup" folder to Linux.
3. Modify the permissions of "install.sh" and "testlcpd" by the following command:
  - `chmod 777 install.sh`
  - `chmod 777 testlcpd`
4. Modify install.sh according to your Linux distribution.  
Type "vi install.sh"
  - Find the line of "AUTO\_FILE=/etc/rc.d/rc.local",
  - If you use Redhat/Fedora, keep it as it's.
  - If you use Suse, modify it to "AUTO\_FILE=/etc/rc.d/boot.local"
  - If you use Ubuntu/Xubuntu, modify it to "AUTO\_FILE=/etc/rc.local"
5. Install driver:  
Type "./install.sh".
6. Enter the auto-run shell script as step 4, add the following line right after "mknod /dev/usb/lcpd c 180 128" line.
  - `chmod 777 /dev/usb/lcpd`
7. In the script as step 4 (for example, rc.local or boot.local), if "exit 0" line exists, please move it to the LAST line!
8. Type "lsmod" to check if "usb\_lcpd" has been loaded into system.
  - `lsmod | grep usb_lcpd`
9. Connect PD to USB Port.
10. Test PD.
  - After installed driver, enter "setup" folder and type "./testlcpd" to see if data on PD.
11. If you want to change USB port in which PD's plugged, please follow the steps below.
  - Unplug the USB cable of PD.
  - Run "rmmod usb\_lcpd" and "rm /dev/usb/lcpd" commands.
  - Replug in USB cable of PD to another USB port.
  - Run "./install.sh" again under setup folder.

**Note:**

Tested under Fedora 5 (Kernel:2.6.15-1.2054\_FC5smp), Suse 10 (2.6.16.60-0.21-smp), and Xubuntu 8.10 (Kernel:2.6.27-7-generic)

**PRE-REQUERIMENTS:**

Linux Kernel source files installed on the system

Ex:

for debian/ubuntu, type  
"sudo apt-get install linux-source".

To development tools installed (gcc).

## 5 COMMAND SETS AND CONFIGURATION

### 5.1 DOWNLOAD COMMAND SETS

The PDX3000/LDX9000/LDX1000 family of pole displays is controlled by command codes and data from the computer. The pole display is able to emulate different popular command sets to meet requirements of different POS software. Please download the required command set to the display according to requirement of the POS software with the provided download utility software.

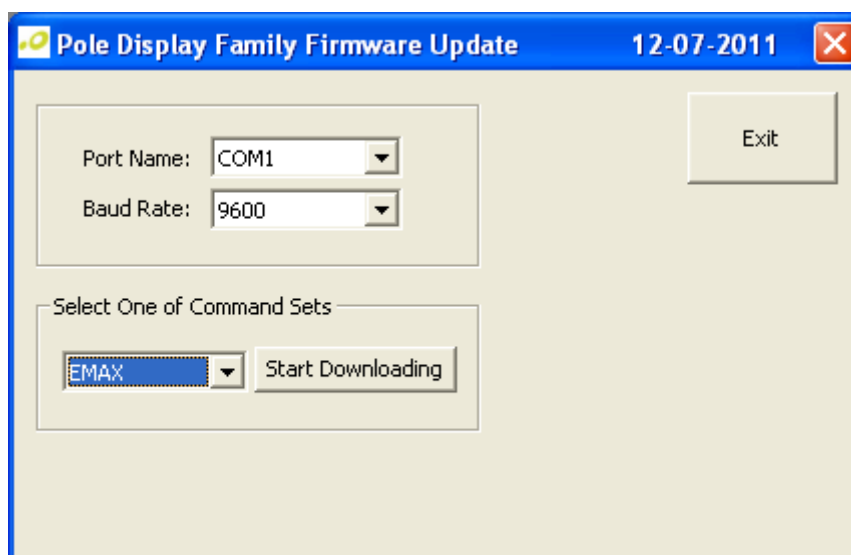
The tool for download and the files containing the set of commands are available on our web site at [www.logiccontrols.com](http://www.logiccontrols.com). Please download and unzip the files before installation.

See the description of the set of commands in < COMMAND SETS DESCRIPTION> section to select one command set in “Select One of Command Sets” box for downloading:

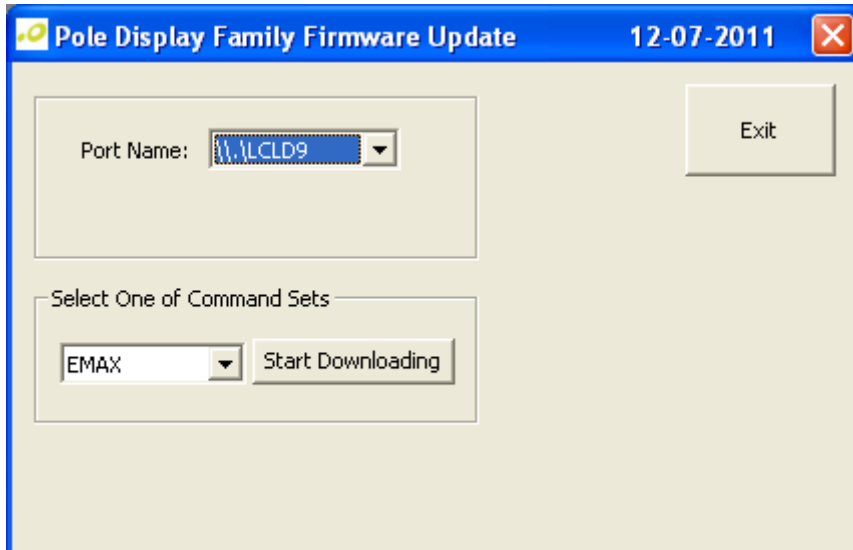
- EMAX – Emax command emulation
- FIRICH = Firich command emulation
- IEE – Iee command emulation
- LCIGP – Logic Controls command set group
- PTC – PartnerTech CD7220/5220 command emulation

The utility program must be in the same folder as all command files.

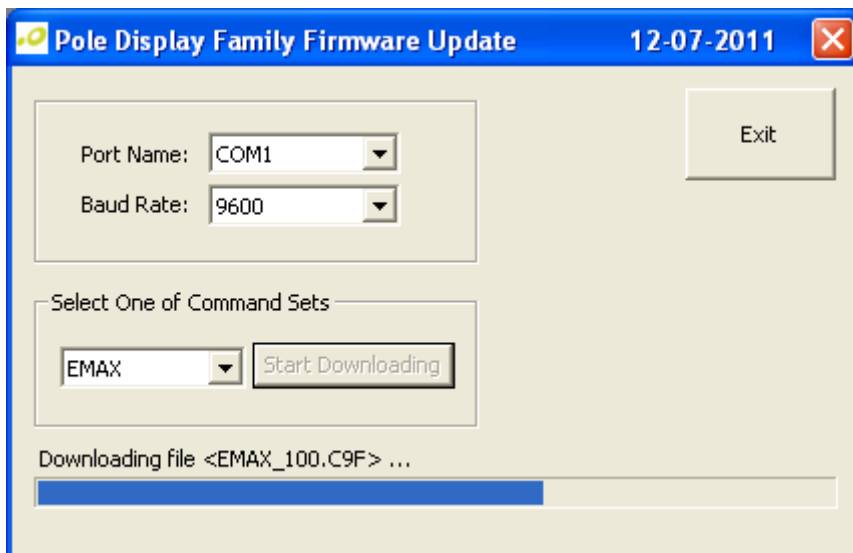
1. If the pole display is connected in USB socket, disconnect and connect again in USB socket. Don't send any command to pole display until to transfer the new set command.
2. Run the software utility existent in the package.



Or, a USB device name interface selected in <Port Name>.



3. Select the <Port Name>, and baud rate if USB device name interface is NOT selected. Select the set command and click <Start Downloading> button (example below for Emax set commands):



4. The pole display will show:

**LOGIC CONTROLS  
DOWNLOADING CODE**

5. Wait for the final message (below success):





The pole display will show:



**xxxxxx** = Name of command set.

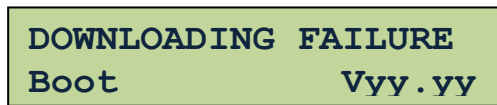
Example: <LCI> for Logic Controls

**Vyy.yy** = Firmware version of the pole display.

**zzzzz** = Serial port baud rate if NOT USB interface

**NOTE:**

If the pole display shows:



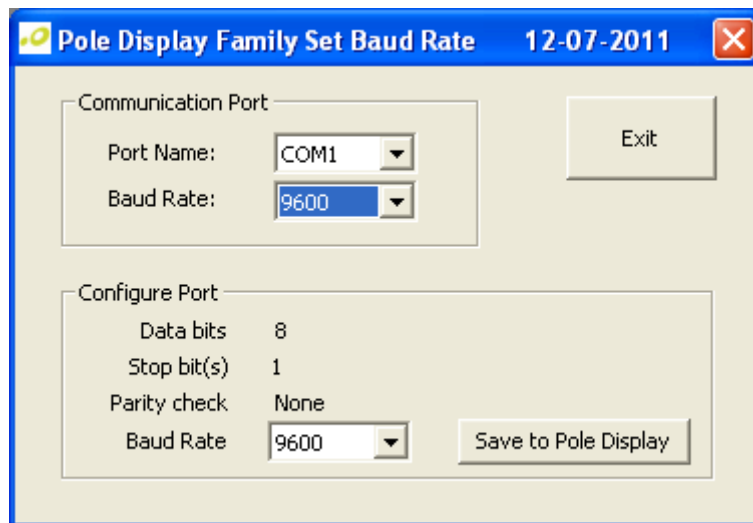
The command set downloading is NOT successful. Do the steps 1 – 5 again. The baud rate must be 9600 if a serial interface used.

## 5.2 Serial Port Configuration

The pole displays with serial interface were factory configured for serial RS232C interface using the following protocol:

- Baud Rate: 9600
- Data Bits: 8
- Stop Bit: 1
- Parity: None

The baud rate is programmable with the software utility.



Configuration options are as follows:

- 2400
- 4800
- 9800
- 19200

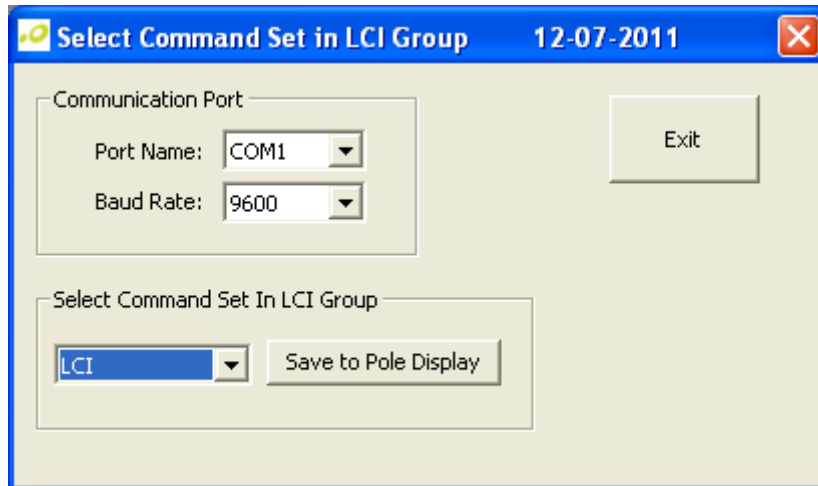
1. Select the port name and the baud rate in the “Communication Port” group box. The baud rate must match the baud rate data shown on the pole display.
2. Select the baud rate in the “Configure Port” group box.
3. Click “Save to Pine Display” to save the configuration into the display.

Then the pole display will be reset automatically, and show the new baud rate saved.

### 5.3 SELECT COMMAND SET

A software utility can be used to select one of the command sets when LCIGP is downloaded in flash ROM. This is default firmware downloaded in the pole display.

Run the software utility.



Command set options are as follows:

- LCI – Logic Controls command set with OPOS command codes
- AEDEX – Aedex command emulation
- NORITAKE – Noritake command emulation
- LCI3400 – Logic Controls PD3400 model command emulation
- UTC1100(SD) – Ultimate1100 command emulation with initial stand mode
- UTC1100(EN) – Ultimate1100 command emulation with initial enhanced mode
- UTC220XLT – Ultimate220XLT command emulation
- EPSON110-D202 – Epson 110-D202 command emulation

1. Select the port name and the baud rate in the “Communication Port” group box. The baud rate must match the baud rate data shown on the pole display.
2. Select the command set.
3. Click “Save to Pole Display” to save the command into the display.

Then the pole display will be reset automatically, and show the new command set saved.

## 6 FUNCTIONAL TEST

The following test sequence will verify that your pole display is working properly. Before you start this procedure, you must install the pole display correctly as outlined under the INSTALLATION sections. The functional test described below is for the **LCI command set**. Verify that the display is loaded with the LCI command set before testing.

The functional test should be done under COMMAND prompt window in Windows XP, Vista and Seven.

**NOTE:** The actual key entries in the text below are enclosed within quotation marks ( " " ). Do **not** type the quotation marks as part of your entries.

### 6.1 Com (Virtual) Port Interface

Close all opened application programs that use the same COM port before going into COMMAND prompt. Enter the following command lines to open the COM port and test with the pole display:

1. Check the assigned COM port number under Device Manager.
2. In COMMAND prompt window, type "**MODE COMx**" and press <ENTER> key where 'x' it the assigned COM port number. Use "**MODE COMx 96,N,8,1**" if it is a serial interface.
3. In COMMAND prompt window DOS windows, type "**ECHO ABCDEFGH > COMx**" and press <ENTER> key where 'x' it the assigned COM port number. The display will show "ABCDEFGH" on the first line.

### 6.2 Device Name Interface

In COMMAND prompt window, type "**ECHO ABCDEFGH>\\.\LCLD9\**", "**ECHO ABCDEFGH>\\.\LCLD1\**", or, "**ECHO ABCDEFGH>\\.\LCPD3\**", and press ENTER key. The display will show "ABCDEFGH" on the first line.

## 7 OPOS DRIVER INSTALLATION

If the POS software uses OPOS (OLE-POS) software interface for controlling the pole display operations, OPOS drivers must be installed. The OPOS driver supplied by Logic Controls will work with the default Logic Controls command set.

1. The Logic Controls OPOS display drivers come in a CD. Either copy all files in the CD into a hard disk folder or use the CD directly for installation.
2. Click on file <setup.exe> to start installation and follow instructions on the screen to go through installation.
3. After installation, setup the OPOS driver by running PDSetup.exe. Start <PDSetup> under Start Menu -> Programs -> LC OPOS -> Setup. The left part of the dialog window is for setting up the configuration and the right part is for testing commands sent to the OPOS display.
4. Select appropriate port name (for USB with device name drivers, select LD1USB). Next, setup LDN (Logic Device Name). Click Add new LDN and a new form will be displayed. Enter a new LDN, for example, "LineDisplay" and then click OK.
5. To rename an LDN or delete an LDN, click Rename LDN or Delete LDN.
6. To test the pole display, follow the order of buttons. First click "Open", then "Claim", then "Enable Device". Now the pole display is ready to display messages.
7. Click on "DisplayText", a string is displayed on the pole display. Test other functions to verify operations.
8. Click on "Release" and then "Close". Click on "Exit" to quit the program. The OPOS driver has been setup and ready to run OPOS application software.
9. Set up the POS software to use the same Logical Device Name configured in the OPOS driver and test with the POS software.

## 8 COMMAND SETS DESCRIPTION

Commands are transmitted to the pole display as ASCII codes. The command codes listed below are expressed in:

- **Hexadecimal** (base 16) numbers enclosed inside angle brackets < >
- **Decimal** numbers enclosed in parenthesis ( )
- **ASCII** characters enclosed in curly brackets { }. Do not include the brackets as part of the command. ' ^ ' character denotes 'Ctrl' in the keyboard. Press and hold 'Ctrl', then press the next key.

### 8.1 LCI Group Command Sets

The LCI group command sets include 7 command sets. The Ultimate1100 command set has standard initial mode and enhanced initial mode.

#### 8.1.1 Logic Controls (LCI) Command Set

##### 1. Vertical Scroll Mode <12> or (18) or {^R}

Default mode.

Data is written into the second row and transferred to the first row when line feed (value is <0A>) is received, leaving the second row empty. The cursor stays in the second line, but in the same column. Send carriage return (value is <0D>) for to position in the first column (of second line).

##### 2. Normal Display Mode <11> or (17) or {^Q}

Data can be written into either row. The cursor moves to the left most digit of the other row when one line is full.

##### 3. Brightness Control <04> <n>

The brightness level (n) of the display can be adjusted using this command followed by a data byte:

n = <20>, 20%

n = <40>, 40%

n = <60>, 60%

n = <FF>, 100%. Default mode.

##### 4. Back Space <08> or (08) or {^H}

The cursor position moves one digit to the left erasing the previous information.

##### 5. Horizontal Tab <09> or (09) or {^I}

The cursor position shifts one digit to the right without erasing character at original cursor position.

##### 6. Line Feed <0A> or (10) or {^J}

The cursor position moves to the same position in the other row. In vertical scroll mode, if cursor was in second row, the cursor will not move and display will scroll up.

##### 7. Carriage Return <0D> or (13) or {^M}

Move the cursor to the left most digit of the row it is in.

### 8. Digit Select <10> <n>

Move the cursor to any position on the display with this command followed by a data byte (n) of <00> to <27>, or in decimal (00) to (39).

Row	Column																			
1	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13
2	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27

### 9. Cursor On <13> or (19) or {^S}

Turn on the cursor.

### 10. Cursor Off <14> or (20) or {^T}

Turn off the cursor.

### 11. Reset <1F> or (31) or {^\_}

All characters are erased and all settings are returned to the power-on reset conditions.

### 12. Down Load Font <03> <X> <G> <H> <J> <K> <M>

Assign an ASCII character (<20> to <7F>) to a different style font (custom character graphics). The “X” represents the ASCII code for the selected character. The data “G”, “H”, “J”, “K” and “M” represent the 5 x 7 segments that will make up the special font. These 5 bytes are translated to binary (1 and 0) to indicate whether a dot is to be turned ON or OFF.

	1	2	3	4	5
1	G0	G1	G2	G3	G4
2	G5	G6	G7	H0	H1
3	H2	H3	H4	H5	H6
4	H7	J0	J1	J2	J3
5	J4	J5	J6	J7	K0
6	K1	K2	K3	K4	K5
7	K6	K7	M0	M1	M2

Example to replace character "|" (ASCII code 7C) with “8”:

	1	2	3	4	5
1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

2E (0010 1110)
46 (0100 0110)
17 (0001 0111)
A3 (1010 0011)
03 (0000 0011)

The command is: <03> <7C> <2E> <46> <17> <A3> <03>

### 13. Message Scroll Left on Top Line <05> <Data> <0D>

Scroll a continuous message of up to 45 characters from right to left on the top line.

**14. Message Scroll Left on Bottom Line <1B> <06> <Data> <0D>**

Scroll a continuous message of up to 45 characters from right to left on the bottom line.

**15. Message Scroll Right on Top Line <1B> <07> <Data> <0D>**

Scroll a continuous message of up to 45 characters from left to right on the top line.

**16. Message Scroll Right on Bottom Line <1B> <0B> <Data> <0D>**

Scroll a continuous message of up to 45 characters from left to right on the bottom line.

**17. Clock Display <1B> <1A> <h><h> <3A> <m><m>**

Displays real time clock on bottom line in the 12 hour format <hh:mm>.

**18. Smart Message Scroll Left on Top Line**

**<1B> <15> <Data> <1C> ... <1C> ... <Data> <0D>**

Scrolls a multi-part message of up to total of 45 characters from left to right on the top line. Message parts are separated by <1C> and each part must be less than 20 characters.

**19. Smart Message Scroll Left on Bottom Line**

**<1B> <16> <Data> <1C> ... <1C> ... <Data> <0D>**

Scrolls a multi-part message of up to total of 45 characters from left to right on the bottom line. Message parts are separated by <1C> and each part must be less than 20 characters.

**20. Smart Message Scroll Right on Top Line**

**<1B> <13> <Data> <1C> ... <1C> ... <Data> <0D>**

Scrolls a multi-part message of up to total of 45 characters from right to left on the top line. Message parts are separated by <1C> and each part must be less than 20 characters.

**21. Smart Message Scroll Right on Bottom Line**

**<1B> <14> <Data> <1C> ... <1C> ... <Data> <0D>**

Scrolls a multi-part message of up to total of 45 characters from right to left on the bottom line. Message parts are separated by <1C> and each part must be less than 20 characters.

**22. Select Font Code <1B> <25> <n>**

Select font code (0-6) for extended ASCII characters from <80> to <FF>. Refer to the font code tables for list of font selections (see “Character Code Tables” in the end of this manual).

<b>n</b>	<b>Font Code Page</b>
0	Logic Controls
1	PC437
2	PC850
3	PC858
4	PC863
5	PC865
6	PC852



**23. Select International Symbols <1B> <26> <n>**

Select international symbol set (0-13) for various languages. Refer to the international symbol table for list of language symbol selections (see “Character Code Tables” in the end of this manual).

<b>n</b>	<b>Character set</b>
0	U.S.A.
1	France
2	Germany
3	U.K.
4	Denmark I
5	Sweden
6	Italy
7	Spain
8	Japan
9	Norway
10	Denmark II
11	Spain II
12	Latin America
13	Korea

**24. Save Font Code and International Symbols <1B> <27> <n> <m>**

Save font code <n> (0-6) and international symbol set <m> (0-13). The setting will be saved and will be loaded at power up. Refer to the font code tables and international symbol table for list of font and language symbol selections (see “Character Code Tables” in the end of this manual).

**25. Set pass-through Code <01>**

Set line display on pass-through mode. All data codes will be by-pass to the peripheral device when the line display on direct display mode.

**26. Set direct display codes <21> <23> <02>**

Set line display on direct display mode. Default mode.

**27. Set Both Side Display mode <1B><0C>, (27)(12), {^[ ][^L]}:**

After this command, all messages followed are displayed on both sides of double sided displays (*for double sided displays only*).

**28. Set Front Side Display mode <1B><0E>, (27)(14), {^[ ][^N]}:**

After this command, all messages followed are displayed only on front side of double sided displays (*for double sided displays only*).

**29. Set Back Side Display mode <1B><0F>, (27)(15), {^[ ][^O]}:**

After this command, all messages followed are displayed only on back side of double sided displays (*for double sided displays only*).

### 8.1.2 Aedex Command Set

The default is on pass-through mode. All data codes will be by-pass to the peripheral device except the following commands.

**1. Top Line - Alphanumeric <21> <23> <31> <Data> <0D>**

The characters will be displayed on the top line of the pole display.

**2. Bottom Line – Alphanumeric <21> <23> <32> <Data> <0D>**

The characters will be displayed on the bottom line of the pole display.

**3. Alphanumeric Message Scroll <21> <23> <34> <Data> <0D>**

A continuous scrolling message of up to 45 characters will be shown on the first line of the display.

**4. Time Display <21> <23> <35> <h><h> <3A> <m><m> <0D>**

This command will place the time value on the bottom line of the display.

Where: { hh:mm } corresponds to hours and minutes in ASCII format, and separated for double point <3A>.

**5. One Time Alphanumeric Message Scroll <21> <23> <36> <Data> <0D>**

A onetime message of up to 45 characters will scroll once on the top line.

**6. Disable Character Trapping <21> <23> <37> <Data> <0D>**

N/A

**7. Change Attention Code <21> <23> <38> <H1> <H2> <0D>**

This command allows the standard attention codes (<21> <23>) to be changed to another set of codes (<H1> <H2>).

**8. Send Up to 40 Alphanumeric Characters <21> <23> <39> <Data> <0D>**

This command allows up to 40 characters to be sent to the display in one long string on both lines.

**9. Reset display <21> <23> <41> <0D>**

All characters are erased and all settings are returned to the power-on reset conditions.

**<Data>:**

No more than 45 characters.

### 8.1.3 Noritake Command Set

#### 1. Vertical Scroll Mode <12> or <DC1>

Data is written into the second row and transferred to the first row when carriage return is received, leaving the second row empty.

#### 2. Character Over Write Mode <11> or <DC2>

This is the default mode. Data can be written into either row.

After writing a character the cursor moves one position to the right. When the write-in position is the least significant digit (LSD) of the first row the cursor will move to the most significant digit (MSD) of the second row.

#### 3. Brightness Control <1B> <4C> <n>

The brightness of the display can be adjusted using this command followed by a data byte (n):

n = <FF> 100% Brightness

n = <BF> 75% Brightness

n = <7F> 50% Brightness

n = <3F> 25% Brightness

#### 4. Back Space <08>

This command moves the cursor position one digit to the left without erasing the information in that position.

#### 5. Horizontal Tab <09>

<DC1> Mode:

The cursor shifts to the right one digit. When the cursor is on the LSD of the 1st row it will move to the MSD of the 2nd row. Similarly, when the cursor is on the LSD of the 2nd row it will move to the MSD of the 1st row.

<DC2> Mode:

When the cursor is on the LSD of the 2nd row, the character is displayed in the 2nd row are shifted up to the 1st row and the cursor moves to the MSD of the 2nd row.

Subsequently the 2nd row is cleared.

#### 6. Line Feed <0A>

<DC1> Mode:

The cursor moves from its present position to the same position in the opposite row.

<DC2> Mode:

When the cursor is positioned in the 2nd row the character(s) displayed there will be shifted to the 1st row leaving the 2nd row empty. The cursor will remain in the same position on the 2nd row.

#### 7. Carriage Return <0D>

The cursor moves to the MSD of the row that it is in.

#### 8. Digit Select <1B> <48> <P>

Move the cursor to any position on the display. "P" is the digit position where the cursor is to be moved to. P is represented as a 2 digit hex number.

#### 9. Cursor On <15>

Set cursor on. Default set.

**10. Cursor Off <16>**

Set cursor off.

**11. Reset <1B> <49>**

All characters are erased and all settings are turned to the power-on reset conditions.

**12. Clear <0E>**

All displayed characters are cleared. The cursor does not move.

**13. Alphanumeric Message Scroll <05> <Data> <0D>**

A message of up to 45 characters will be continuously scrolled on the first line of the display. The message will continue to scroll until another attention code is received by the display.

**14. Down Load Font <1B> <43> <X> <F> <F> <F> <F> <F>**

Allows a programmer to assign a keyboard key (00 Hex to FF Hex) a different style font.

The <1B> <43> represents the command code;

The <X> represents the selected key;

The <F> represent the 5 segments which will make up the special font.

**15. Set pass-through Code <01>**

Set line display on pass-through mode. All data codes will be by-pass to the peripheral device when the line display on direct display mode.

**16. Set direct display codes <21> <23> <02>**

Set line display on direct display mode. Default mode.

**<Data>:**

No more than 45 characters.

## 8.1.4 LCI3400 Command Set

### 1. Vertical Scroll Mode (DC2) <IF><12>

Data is written into the second row and transferred to the first row when carriage return is received, leaving the second row empty. All data is written into the second row of the display.

### 2. Character Over Write Mode (DCI) <IF><11>

This is the default mode. Data can be written into either row. After writing a character the cursor moves one position to the right. When the write-in position is the least significant digit (LSD) of the first row the cursor will move to the most significant digit (MSD) of the second row.

### 3. Brightness Control <1F><58><n>

The brightness of the display can be adjusted using this command followed by a data byte (n):

- n = <FF> 100% Brightness
- n = <BF> 60% Brightness
- n = <7F> 40% Brightness
- n = <3F> 20% Brightness

### 4. Back Space <08>

Move the cursor position one digit to the left.

### 5. Horizontal Tab <09>

Move cursor position one digit to the right. Its function depends on whether vertical scroll mode or normal scroll mode is selected.

### 6. Line Feed - Down <0A>

Move cursor up or down. Its function depends on whether vertical scroll mode or normal scroll mode is selected.

### 7. Line Feed – Up <IF><0A>

Move cursor up or down. Its function depends on whether vertical scroll mode or normal scroll mode is selected.

### 8. Move Cursor to MSD <0D>

Move cursor position to the MSD of the current line.

### 9. Move Cursor to LSD <IF><0D>

Move cursor position to the LSD of the current line.

### 10. Move Cursor - Home <0C>

Move cursor position to the MSD of the up line.

### 11. Move Cursor - Lower Right Corner <IF><42>

Move cursor position to the LSD of the down line.

### 12. Move Cursor to Specified Position <1 F><24><P>

Move the cursor to any position on the display. “P” is the digit position where the cursor is to be moved to. P is represented as a 2 digit hex number. Move the cursor to any position on the display.

**13. Reset <IB><40>**

All characters are erased and settings are returned to the power-on conditions.

**14. Select Character Inversion <1 F><72>**

Invert all the pixels for each character.

**15. Delete Character Inversion <1F><52>**

Restores character inversion to its default font.

**16. Blink the Current Display <IF><45>**

Blink all characters on the display.

**17. Delete Display Blink <IF>c65>**

Stop character blinking.

**18. Down Load Font <1 B><26><X> <F> <F> <F> <F> <F>**

Assign a standard keyboard key a different style font.

**19. Delete Down Load Font <IB><3F><X>**

A down loadable font can be restored to its original value.

**20. Set pass-through Code <01>**

Set line display on pass-through mode. All data codes will be by-pass to the peripheral device when the line display on direct display mode.

**21. Set direct display codes <21> <23> <02>**

Set line display on direct display mode. Default mode.

## 8.1.5 UTC1100(SD) Command Set

### 1. Brightness <04> <n>

Brightness level (n = level).

n = <20>, 20%

n = <40>, 40%

n = <60>, 60%

n = <FF>, 100%

### 2. Back Spacing <08>

Move cursor position to the left one position, erasing the character, if any, that was in that position.

### 3. Horizontal Tab <09>

Horizontal tab.

### 4. Line Feed <0A>

Line feed.

### 5. Carriage Return <0D>

Move cursor to the first position of the current line.

### 6. Display Position <10> <n>

Move the cursor to any position on the display. "n" is the digit position where the cursor is to be moved to.

### 7. Normal Display Mode <11>

After writing a character, the cursor is shifted automatically to the right one position.

### 8. Vertical Scroll Mode <12>

After writing the characters up to the last position of the second row, all characters displayed in the second row are shifted to the upper row (first row), clearing the second row. Default mode.

### 9. Pass-Through Mode <1B> <64>

This command is used in Direct to pole mode to begin passing data through to the attached device.

### 10. Reset Display <1F>

The display will be cleared and reset to the default of <DC2> mode (Vertical Scroll). The cursor will be positioned to the first position on the top line.

### 11. Flashing Text Start <1C>

Start blinking text.

### 12. Flashing Text End <1D>

Stop blinking text.

**13. Clear To End Of Line <18>**

Clear To End Of Line. This command will clear out the display from the current write-in position to the end of the current line.

**14. Clear To End Of Display <19>**

Clear To End Of Display. This command will clear out the display from the current write-in position to the end of the second line.

**15. Select Font <1A> <n>**

Select Font n.

n = <01> PC437 - American.

n = <02> PC437 - British.

n = <03> PC850 - German.

n = <04> PC850 - French.

n = <05> PC863 - French Canadian.

n = <06> PC850 - Spanish.

n = <07> PD220XL.

**16. Clear Display <1E>**

Clear Display. These commands are used to clear the display and move the cursor to the home position without changing any modes in effect.

**17. Cursor On <13> or (19) or {^S}**

Turn on the cursor.

**18. Cursor Off <14> or (20) or {^T}**

Turn off the cursor.



## 8.1.6 UTC1100(EN) Command Set

The default is on pass-through mode. All data codes will be by-pass to the peripheral device except the following commands.

### 1. Top line Alphanumeric <1B> <75> <41> Data <0D>

The leftmost 20 characters, following the command terminated by a <0D> (Carriage Return) will be displayed on the top line.

To clear top line use: <1B> <75> <41> <0D>.

### 2. Bottom line Alphanumeric <1B> <75> <42> Data <0D>

The leftmost 20 characters, following the command terminated by a CR (Carriage Return) will be displayed on the bottom line.

To clear bottom line use: <1B> <75> <42> <0D>.

### 3. Top Line Ongoing Message Scroll <1B> <75> <44> Data <0D>

A message of up to 40 characters will be scrolled continuously on the top line of the display.

### 4. Time Display Bottom Line <1B> <75> <45> hh:mm <0D>

Time value (12 hour clock) will be shown on the bottom line in the format { hh:mm:ss } and continuously updated until cleared by a command to write to the bottom line.

To re-display previously set time use: <1B> <75> <45> <0D>

### 5. Top Line 1 Time Message Scroll <1B> <75> <46> Data <0D>

A message of up to 40 characters will scroll once on the top line.

### 6. Send Up to 40 Alphanumeric Characters <21> <23> <39> <Data> <0D>

This command allows up to 40 characters to be sent to the display in one long string on both lines.

### 7. Disable Menu Buttons <1B> <75> <47> <0D>

N/A.

### 8. Direct To Pole Mode <1B> <1E>

Enter or return to direct mode to display characters on pole display.

### 9. Flashing Text Start <0F>

Start blinking text.

### 10. Flashing Text End <0E>

Stop blinking text.

### 11. Select Font <1B> <75> <6C> <n> <0D>

Select Font n:

n = <01> PC437 - American.

n = <02> PC437 - British.

n = <03> PC850 - German.

n = <04> PC850 - French.

n = <05> PC863 - French Canadian.

n = <06> PC850 - Spanish.

n = <07> PD220XL.

**12. Down Line Load <1B> <75> <74> <63> Select <0D>**

N/A.

**13. Redefine Graphic <1B> <75> <48> cc H1 H2 H3 H4 H5 H6 H7 <0D>**

Redefine Graphic.

cc = character to change (in hexadecimal).

Allow the generation of custom character font.

**14. Send Version String <1B> <75> <4A> <0D>**

Display firmware version on pole display.

## 8.1.7 UTC220XLT Command Set

### 1. Top line Alphanumeric <1B> <75> <41> Data <0D>

The leftmost 20 characters, following the command terminated by a <0D> (Carriage Return) will be displayed on the top line.

To clear top line use: <1B> <75> <41> <0D>.

This command is only effective on pass-through mode.

### 2. Bottom line Alphanumeric <1B> <75> <42> Data <0D>

The leftmost 20 characters, following the command terminated by a CR (Carriage Return) will be displayed on the bottom line.

To clear bottom line use: <1B> <75> <42> <0D>.

This command is only effective on pass-through mode.

### 3. Top Line Ongoing Message Scroll <1B> <75> <44> Data <0D>

A message of up to 40 characters will be scrolled continuously on the top line of the display.

This command is only effective on pass-through mode.

### 4. Time Display Bottom Line <1B> <75> <45> hh:mm <0D>

Time value (12 hour clock) will be shown on the bottom line in the format { hh:mm:ss } and continuously updated until cleared by a command to write to the bottom line.

To re-display previously set time use: <1B> <75> <45> <0D>

This command is only effective on pass-through mode.

### 5. Top Line 1 Time Message Scroll <1B> <75> <46> Data <0D>

A message of up to 40 characters will scroll once on the top line.

This command is only effective on pass-through mode.

### 6. Back Spacing <08>

Move cursor position to the left one position, erasing the character, if any, that was in that position.

### 7. Horizontal Tab <09>

Horizontal tab.

### 8. Line Feed <0A>

Line feed.

### 9. Carriage Return <0D>

Move cursor to the first position of the current line.

### 10. Display Position <10> <n>

Move the cursor to any position on the display. “n” is the digit position where the cursor is to be moved to.

### 11. Normal Display Mode <11>

After writing a character, the cursor is shifted automatically to the right one position.

**12. Vertical Scroll Mode <12>**

After writing the characters up to the last position of the second row, all characters displayed in the second row are shifted to the upper row (first row), clearing the second row. Default mode.

**13. Cursor On <13> or (19) or {^S}**

Turn on the cursor.

**14. Cursor Off <14> or (20) or {^T}**

Turn off the cursor.

**15. Down Line Load <1B> <75> <74> <63> Select <0D>**

N/A.

**16. Pass-Through Mode <1B> <64>**

This command is used in Direct to pole mode to begin passing data through to the attached device.

**17. Direct To Pole Display Mode <1B> <1E>**

Enter or return to direct mode to display characters on pole display.

**18. Reset Display <1F>**

The display will be cleared and reset to the default of <DC2> mode (Vertical Scroll). The cursor will be positioned to the first position on the top line.

**19. Flashing Text Start <0F>**

Start blinking text.

**20. Flashing Text End <0E>**

Stop blinking text.

**21. Brightness <04> <n>**

Brightness level (n = level).

n = <20>, 20%

n = <40>, 40%

n = <60>, 60%

n = <FF>, 100%

## 8.1.8 Epson110-D202 Command Set

### 1. Move Cursor Left <08>

Move the cursor one character to the left.

### 2. Move Cursor Right <09>

Move the cursor one character to the right.

### 3. Move Cursor Down <0A>

Move the cursor down one line.

### 4. Move Cursor Up <1F> <0A>

Move the cursor up one line.

### 5. Move Cursor to home position <0B>

Move the cursor to the left most position on the upper line (home position).

### 6. Move Cursor to left most position <0D>

Move the cursor to the left most position on the current line.

### 7. Move Cursor to right most position <1F> <0D>

Move the cursor to the left right most position on the current line.

### 8. Move Cursor to bottom position <1F> <42>

Move the cursor to the right most position on the lower line (bottom position).

### 9. Move Cursor to specified position <1F> <24> <n> <m>

Move the cursor to specified position, the n column and the m line.

### 10. Clear Display Screen <0C>

Clear all of the displayed characters. After the command is executed the cursor moves to the home position.

### 11. Clear Cursor Line <18>

Clear the line containing the cursor.

### 12. Selected peripheral device <1B> <3D> <n>

Select or cancel a peripheral device(s) from the following table in accordance with the value of n.

n = 1 peripheral device

n = 2 pole display

n = 3 both pole display and peripheral device

### 13. Initialize Display <1B> <40>

Clear the data in the input buffer and resets the various settings to their initial values.

### 14. Select / Cancel download Character Set <1B> <25> <n>

Select or cancels the download character set

n = 1 the download character set is selected.

n = 0 the download character set is canceled.

**15. Define download characters <1B> <26> <01> <n> <m> [a (p1.. ps) x a] (m-n+1)**

Define download characters. Range:

$$32 \leq n = m \leq 126$$

$$0 \leq a \leq 5$$

$$0 \leq p1 \dots ps \times a \leq 255$$

**16. Delete Download Characters <1B> <3F> <n>**

Delete the specified download character. This command delete the pattern defined for the character code specified by n.

**17. Select International Character Set <1B> <52> <n>**

Select international character set from the following table:

n	Character set
0	U.S.A.
1	France
2	Germany
3	U.K.
4	Denmark I
5	Sweden
6	Italy
7	Spain
8	Japan
9	Norway
10	Denmark II

**18. Select Character Code Table <1B> <74> <n>**

Select page n from the character code table. Default n is 0 (zero).

n	Font Code Page
0	PC437
1	Japanese Katakana – Epson
2	PC850
3	PC860
4	PC863
5	PC865

**19. Specify / Cancel the Windows Range <1B> <57> <n> <m> (x1 y1 x2 y2)**

N/A

**20. Specify overwrite mode <1F> <01>**

Set the screen display mode to the overwrite mode.

**21. Specify Vertical Scroll Mode <1F> <02>**

Set the screen display mode to the vertical scroll mode.

**22. Specify Horizontal Scroll Mode <1F> <03>**

Set the screen display mode to the horizontal scroll mode.

**23. Turns Blinking On / Off <1F> <45> <n>**

Turn blinking of the display screen on or off.

n specifies the blinking interval such that the on-time and off-time will both be about n x 50 ms. The on-time and off-time interval is repeated.

**24. Setting and display of time counter <1F> <54> <h> <m>**

Set the time and displays it at the bottom right corner.

h: hour, m: minute.

Range:

$$0 \leq h \leq 23$$

$$0 \leq m \leq 59$$

**25. Display of Time Counter <1F> <55>**

Display the timer at the bottom right corner. After displaying the time, the cursor will return to the home position.

**26. Brightness Level <1F> <58> <n>**

Brightness level (n = level).

n = <01>, 20%

n = <02>, 40%

n = <03>, 60%

n = <04>, 100%. Default mode.

**27. Select / Cancel reverse characters <1F> <72> <n>**

Select / Cancel reverse display mode.

n = <01>, Reverse.

n = <00>, Cancel (normal).

**28. Set cursor ON / OFF <1F> <43> <n>**

Set cursor on or off

n = <00> cursor is set to OFF

n = <01> cursor is set to ON

## 8.2 Emax Command Set

### 1. Clear all characters

Clear all of the displayed characters on dumb terminal mode.

### 2. Move cursor to home

Move the cursor to the left most position on the upper line. Make cursor on, and clear all of the displayed characters, and enter dumb terminal mode when the pole display is under non-terminal mode.

### 3. Write to Line 1 <21> <23> <31> <Data> <0D>

Turn off cursor, and display characters of data left justified on top line. Data is ASCII format. Enter non-terminal mode.

### 4. Write to Line 2 <21> <23> <32> <Data> <0D>

Turn off cursor, and display characters of data left justified on bottom line. Data is ASCII format. Enter non-terminal mode.

### 5. Auto Scan Message (Continuous) <21> <23> <34> <Data1 > <0D>

Turn off cursor and steps repeatedly through a message (Data1) of up to 45 characters on the first line. Enter non-terminal mode.

### 6. Set and Display 24 Hour Clock: <21> <23> <35> <h><h> <3A> <m><m> <0D>

Turn off cursor, set the clock to “hh:mm”, and displays the time in the last 5 character positions of bottom line. The hour must be in the range 00 through 23. The minute must be in the range 00 through 59. . Enter non-terminal mode

Where:

{ hh:mm } Correspond to hours and minutes in ASCII format, separate for double point.

Display 24 Hour Clock <21> <23> <35> <0D>.

### 7. Auto Scan Message (Single Pass) <21> <23> <36> <Data1> <0D>

Turn off cursor and steps only one time through a message (Data1) of up to 45 characters on the first line. Enter non-terminal mode.

### 8. Change the Aedex Command Prefix <21> <23> <38> <H1> <H2> <0D>

Change the power-up default codes (<21> <23>) to two new characters (<H1> <H2>). Enter non-terminal mode.

### 9. Write Two Lines <21> <23> <39> <Data2> <0D>

Turn off cursor, and write 0 to 40 characters (Data2) up to 20 left justified on top line followed by up to 20 more left justified on line. Enter non-terminal mode.

#### <Data>:

More than 20 characters will be displayed on dumb terminal mode.

#### <Data1>:

More than 45 characters will be displayed on dumb terminal mode.

#### <Data2>:

More than 40 characters will be displayed on dumb terminal mode.



### 8.3 Firich Command Set

**1. Overwrite Mode <1B> <11> or <1B> <40>**

This is the default mode. Set the display to overwrite mode. This is the default power on display mode.

**2. Vertical Scroll Mode <1B> <12>**

Set the display to vertical scroll mode.

**3. Horizontal Scroll Mode <1B> <13>**

Set the display to horizontal scroll mode.

**4. Display Top Line <1B> <51> <41> <Data> <0D>**

Set string display mode, and write string to top line.

**5. Display Bottom Line <1B> <51> <42> <Data> <0D>**

Set string display mode, and write string to bottom line.

**6. Scroll String Top Line <1B> <51> <44> <Data> <0D>**

Set string display mode, and scroll a up to 20 characters continuously on the upper line.

**7. Move Cursor Up <1B> <5B> <41>**

Move the cursor up one line. When the cursor is at the upper line, this command operates differently depending on the display mode:

- Overwrite mode:  
The cursor is moved to the same column on the lower line.
- 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.
- Horizontal scroll mode:  
The cursor is not moved.

**8. Move cursor down <1B> <5B> <42>**

**9. Move cursor down <0A>**

Move the cursor down one line. When the cursor is at the lower line, this command operates differently depending on the display mode:

- Overwrite mode:  
The cursor is moved to the same column on the upper line.
- 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.
- Horizontal scroll mode:  
The cursor is not moved

**10. Move cursor right <1B> <5B> <43>**

**11. Move cursor right <09>**

Move the cursor one position to the right. When the cursor is at the right end, this command operates differently depending on the display mode:

- Overwrite mode:

- The cursor moves to the left end of the other line.
- Vertical scroll mode:  
When the cursor is at the upper right end, it is moved to the lower left end. When the cursor is at the lower right end, the lower line message is moved to the upper line. The lower line is cleared, and the cursor moves to the lower left end.
- Horizontal scroll mode:  
All characters on the current line are scrolled one to the left in the window. The cursor is not moved but the character area at the right end of the window is cleared.

**12. Move cursor left <1B> <5B> <44>**

**13. Move cursor left <08>**

Move the cursor one position to the left. When the cursor is at the left end, this command operates differently depending on the display mode:

- Overwrite mode:  
The cursor moves to the right end of the other line.
- Vertical scroll mode:  
When the cursor is at the lower left end, it is moved to the upper right end. When the cursor is at the upper left end, the upper line message is moved to the lower line. The upper line is cleared, and the cursor moves to the upper right end.
- Horizontal scroll mode:  
All characters on the current line are scrolled one to the right in the window. The cursor is not moved but the character area at the left end of the window is cleared.

**14. Move cursor to home position <1B> <5B> <48>**

**15. Move cursor to home position <0B>**

Move the cursor to the left-most position on the upper line.

**16. Move cursor to left-most position <1B> <5B> <4C>**

**17. Move cursor to left-most position <0D>**

Move the cursor to the left-most position on the current line.

**18. Move cursor to the right-most position <1B> <5B> <52>**

Move the cursor to the right-most position on the current line.

**19. Move cursor to the bottom position <1B> <5B> <4B>**

Move the cursor to the right-most position on the lower line.

**20. Move cursor to the specified position <1B> <6C> <X> <Y>**

Move the cursor to the X-th column on the Y-th line.

**21. Initialize display <1B> <40>**

Clear the data in the input buffer and reset settings to power on defaults.

**22. Clear display screen and clear string mode <0C>**

Clear all the characters displayed, clear string mode.

**23. Clear cursor line and clear string mode <18>**

Clear the line where the cursor is at, clear string mode.

**24. Set cursor ON or OFF <1B> <5F> <n>**

Set cursor ON or OFF.

*n* = <00> cursor is set to OFF

*n* = <01> cursor is set to ON

**25. Set or cancel the window range at horizontal scroll mode**

<1B> <57> <n> <x1> <x2> <y>

Set or cancel the window on the display screen. The window is effective in the horizontal scroll mode only.

*n* = <00> window is cancelled.

*n* = <01> window is set.

1 <= x1 < x2 <= 20 the left-most and the right-most columns of the window

1 <= y <= 2 the upper or lower line.

**26. Select International font set <1B> <66> <n>**

Select international font. Character codes <00> - <7F>.

<b>n</b>	<b>International Font Set</b>	<b>n</b>	<b>International Font Set</b>
A	U.S.A.	L	Slavonic
D	Denmark I	N	Norway
E	Denmark II	R	Russia
F	France	S	Spain
G	Germany	U	U.K.
I	Italy	W	Sweden
J	Japan		

**27. Select code set <1B> <63> <n>**

Select international code set. Character codes <80> - <FF>

<b>n</b>	<b>International Code Set</b>
A	Comply with ASCII code: PC437
J	Comply with JIS code: Katkana - PTC
L	Comply with Slavonic code
R	Comply with Russia code
P	Comply with PC858

**28. Define user-defined characters <1B><26><01> n m [a (p1.. pa) x (m - n + 1)]**

Define user-defined characters.

<20> <= n = m <= <7F>

0 < a <= 5 Numbers of columns in a character font, if a < <05> then the undefined columns at right side are filled with off.

p1 .. pa: Pattern data. Each byte represents the font pattern of one column.

Example for defining character "A" as "8":

<1B> <26> <01> <41> <41> <05> <36> <49> <49> <49> <36>

**29. Undefined user-defined character <1B> <3F> <n>**

Undefined character code *n* previously defined by user. Built-in font is used subsequently.

<20> <= *n* <= <7F>

**30. Select/cancel user-defined character set <1B> <25> <n>**

Set cursor ON or OFF.

*n* = <00> cancel user-defined character set. Built-in character set is used.

*n* = <01> enable user-defined character set.

**31. Store user-defined character in EEPROM <1B> <73> <01>**

This command is valid only if the display is in enable mode, as set by <Esc> = command.

**32. Restore user-defined character from EEPROM <1B> <64> <01>**

Restore user-defined character pattern that was previously stored by command:  
<1B> <73> <01>

**33. Save current display data in EEPROM <1B> <53> <n>**

Store the current display image for future demo display.

*n* = <31> save image in layer 1.

*n* = <32> save image in layer 2.

...

*n* = <35> save image in layer 5.

**34. Display saved data from EEPROM <1B> <44> <n> <m>**

The data saved by "<1B> <53> *n*" can be displayed by this command.

The layer to be displayed is selected by the bit position within the byte of *n*.

<01> <= *n* <= <1F>

<31> <= *m* <= <33>

**35. Adjust brightness <1B> <2A> <n>**

Adjust display brightness.

*n* = <01>, 20%

*n* = <02>, 40%

*n* = <03>, 60%

*n* = <04>, 100%. Default mode.

**36. Set output device mode <1B> <3D> <n>**

Set output device mode.

*n* = <01> display disable next device enable.

*n* = <02> display enable next device disable.

*n* = <03> display enable next device enable.

**<Data>:**

No more than 20 characters.

## 8.4 IEE Command Set

### 1. Capacity <01>

Not available.

### 2. Display Firmware Version <02>

Display software checksum and software number.

### 3. Read cursor <03>

Not available.

### 4. Read data <04>

Not available.

### 5. Begin blink <06>

Begin blink field at current cursor location.

### 6. End blink <07>

End blink field at current cursor location.

### 7. Backspace <08>

Backspace cursor location one position (cursor stays when at home location).

### 8. Advance cursor <09>

Advance cursor location one position (cursor wraps around after bottom right character location).

### 9. Line Feed <0A>

Line feed (vertical scroll from bottom line; cursor position does not change).

### 10. Clear the display <0C>

Clear the display (cursor stays).

### 11. Carriage Return <0D>

Return cursor to left-most character position of the same line, but do not clear display.

### 12. Make cursor invisible <0E>

Make cursor indicator invisible. The cursor location counter continues to function but there is no visible indicator of next character location.

### 13. Make cursor visible <0F>

Make cursor indicator visible, flashing block. Default mode.

### 14. Automatic Carriage Return & Line Feed <10>

Bottom line data entry with automatic carriage return & line feed. Puts cursor at left side bottom row and data enters beginning at the left-most character. Position of the bottom row, vertical scroll from bottom line after line has been filled.

**15. Normal Data <11>**

Normal data entry with automatic carriage return and line feed. Data enters beginning at the home position, and vertical scroll from bottom line after line has been filled.

**16. Overwrite <12>**

Overwrite of right-most character on the present line / automatic carriage return off.

**17. Horizontal scroll mode <13>**

Set to horizontal scroll mode and from right to left on bottom line only, after line has been filled.

**18. Reset <14>**

All configurations go to default setting and clear all down load characters.

**19. Display Clear <15>**

Clear all characters and put cursor at left side bottom row in mode <10> & home in modes <11>, <12>, <13> and <1A>. Default mode.

**20. Cursor Home <16>**

Move cursor home, upper left-most position.  
Default mode.

**21. Set Bit7 of Next Byte High <19>**

Make next byte from <00> to <7f> as <80> to <ff>.

**22. Wrap Around Data <1A>**

Wrap around data entry. After bottom right character entered, cursor moves to home position.

**23. IEE Specific Response <1B> <05> <49>**

Not available.

**24. Define Download Character <1B> <26> <01> <m> <n> [a (p1.. pa) x (m-n+1)]**

Define download characters.

m = byte location to begin download (<F8> to <FF>)

n = 1

Example for defining character <F8> as a Greek character:

<1B> <26> <01> <F8> <01> <78> <71> <EC> <1A> <02>

**25. Select data output device <1B> <3D> <n>**

n = <01> the display is not selected.

n = <02> the display is selected. All the data from the host is processed in the display.

Default mode.

**26. Delete Download Characters <1B> <3F> <n>**

Delete download character location n (n = <F8> - <FF>).

**27. Terminate Self Test <1B> <40>**

Not available.

**28. Select Character Font Set <1B> <74> <n>**

Select character set.

n = <01>, ASCII and General European.

n = <02>, ASCII and Katakana - IEE.

n = <03>, ASCII and Cyrillic.

n = <04>, ASCII and Hebrew.

n = <05>, ASCII and ISO 8859-1.

n = <06>, ASCII and ISO 8859-2.

n = <07>, ASCII and Greek.

**29. Epson Specific Response <1D> <05>**

Not available.

**30. Move cursor to column Specified <1F> <24> <c> <l>**

Move cursor to column c (<01> - <14>) and line l (<01> - <02>).

**31. Execute Self Test <1F> <40>**

Not available.

**32. Set All Display Blink Field Blink time <1F> <45> <t>**

Set all display blink fields at interval t.

t x 50 msec, 50% duty cycle.

t max = <3F>.

**33. Brightness Level <1F> <58> <n>**

Brightness level (n = level).

n = <01>, 20%

n = <02>, 40%

n = <03>, 60%

n = <04>, 100% . Mode default.

**34. Reverse All Characters or Not <1F> <72> <n>**

Select / Cancel reverse display mode.

n = <01>, Reverse.

n = <00>, Cancel (normal).

## 8.5 PTC7220 Command Set

### 1. Overwrite Mode <1B> <11>

Change the display mode to the overwrite mode. In this mode, the cursor will move rightward and begin from the upper left-end position. Default mode.

### 2. Vertical Scroll Mode <1B> <12>

Set the display to vertical scroll mode.

### 3. Horizontal Scroll Mode <1B> <13>

Set the display to horizontal scroll mode.

### 4. Write string to upper line <1B> <51> <41> <Data> <0D>

Set the string display mode, write to upper or lower line (<Data>). The string display mode will be cancelled and back to last mode after receive CLR or CAN.

### 5. Write string to lower line <1B> <51> <42> <Data> <0D>

Set the string display mode, write to upper or lower line (<Data>). The string display mode will be cancelled and back to last mode after receive CLR or CAN.

### 6. Scroll string on upper line continuously <1B> <51> <44> <Data1> <0D>

The message (previously defined) will scroll continuously in the horizontal direction until a new command is received.

### 7. Move cursor left <1B> <5B> <44>

### 8. Move cursor left <08>

When the current cursor is at the left-end position, this command operates differently depends on the display mode.

- Overwrite mode:  
When the cursor reached the left-end of the lower line, it will continue to the right-end of the upper line, overwrite previous characters. When it reached the left end of the upper line, it will continue to the right-end of the lower line.
- Vertical scroll mode:  
When the cursor reached the left-end of the lower line, the lower line will scroll up and replace the previous upper line, the lower line will be cleared and the cursor will continue to the right end of the lower line.
- Horizontal scroll mode:  
The cursor will remain stationary.

### 9. Move cursor right <1B> <5B> <43>

### 10. Move cursor right <09>

Move the cursor one position to the right. When the cursor is at the right end, this command operates differently depending on the display mode:

- Overwrite mode:  
The cursor moves to the left end of the other line.
- Vertical scroll mode:  
When the cursor is at the upper right end, it is moved to the lower left end. When the cursor is at the lower right end, the lower line message is moved to the upper line. The lower line is cleared, and the cursor moves to the lower left end.
- Horizontal scroll mode:



All characters on the current line are scrolled one to the left in the window. The cursor is not moved but the character area at the right end of the window is cleared.

**11. Move cursor Up <1B> <5B> <41>**

Move the cursor up one line. When the cursor is at the upper line, this command operates differently depending on the display mode:

- Overwrite mode:  
The cursor is moved to the same column on the lower line.
- 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.
- Horizontal scroll mode:  
The cursor is not moved.

**12. Move cursor down <1B> <5B> <42>**

**13. Move cursor down <LF>**

Move the cursor down one line. When the cursor is at the lower line, this command operates differently depending on the display mode:

- Overwrite mode:  
The cursor is moved to the same column on the upper line.
- 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.
- Horizontal scroll mode:  
The cursor will remain stationary.

**14. Move cursor to home position <1B> <5B> <48>**

**15. Move cursor to home position <0B>**

The cursor will move to the left-end position of the upper line.

**16. Move cursor to left-most position <1B> <5B> <4C>**

**17. Move cursor to left-most position <0D>**

The cursor will be moved to the left-end position of the current line.

**18. Move cursor to right-most position <1B> <5B> <52>**

The cursor will be moved to the right-end position of the current line.

**19. Move cursor to the bottom position <1B> <5B> <4B>**

The cursor will be moved to the right-end position on the lower line.

**20. Move cursor to the specified position <1B> <6C> X Y**

The cursor will be moved to the x column on the y line.

**21. Initialize display <1B> <40>**

The data in the input buffer will be cleared and reset from default.

**22. Set or cancel the window range <1B> <57> <n> <x1> <x2> <y>**

Set or cancel the window on the display screen. The window is effective in the horizontal scroll mode only.

n = <00> window is cancelled.

n = <01> window is set.

1 <= x1 < x2 <= 20 the left-most and the right-most columns of the window

1 <= y <= 2 the upper or lower line.

**23. Clear display screen and clear string mode <0C> or {CLR}**

All the display characters will be cleared, and the string mode will be cancelled.

**24. Clear cursor line and clear string mode <18> or {CAN}**

The current line is cleared, and the string mode is cancelled.

**25. Brightness Adjust <1B> <2A> <n>**

Adjust display brightness.

n = <01>, 20%

n = <02>, 40%

n = <03>, 60%

n = <04>, 100%. Default mode.

**26. Define user-defined character <1B> <26> <01> <n> <m> [a (p1.. pa) x (m-n + 1)]**

Define user-defined characters.

<20> <= n = m <= <7F>

0 < a <= 5 Numbers of columns in a character font, if a < <05> then the undefined columns at right side are filled with off.

p1 .. pa: Pattern data. Each byte represents the font pattern of one column.

Example for defining character "A" as "8":

<1B> <26> <01> <41> <41> <05> <36> <49> <49> <49> <36>

**27. Delete user defined character <1B> <3F> <n>**

User-defined characters are cancelled.

This command cancels the defined characters specified by n.

If specified code is transmitted after the pattern is cancelled the international character will be displayed.

**28. Select / Cancel user defined character <1B> <25> <n>**

Reset user defined character set.

n = <01> user-defined characters are selected. When the user-defined characters are not defined by the ESC & command, the internal character set will be displayed.

n = <00> user-defined characters are cancelled and the international character set is selected.

**29. Set cursor ON or OFF <1B> <5F> <n>**

n = <00> cursor is set to OFF

n = <01> cursor is set to ON

**30. Select international sign font <1B> <66> <n>**

<b>n</b>	<b>International Font Set</b>	<b>n</b>	<b>International Font Set</b>
A	American	N	Norwegian
G	German	W	Swedish
I	Italian	D	Danish I
J	Japanese	E	Danish II
U	British	L	Slavonic
F	French	R	Russian
S	Spanish		reserved

**31. Select international font code <1B> <63> <n>**

<b>n</b>	<b>International Font Set</b>	<b>n</b>	<b>International Font Set</b>
A	Compliance with ASCII code	R	Compliance with RUSSIAN code
J	Compliance with JIS code	L	Compliance with SLAVONIC code

**32. Store user-defined character in EEPROM <1B> <73> <01>**

This command is successful when the display is selected under command <ESC>=<03>. If EEPROM is not supported, this command is ignored.

**33. Restore user-defined character from EEPROM <1B> <64> <01>**

Restore user-defined characters from EEPROM, and the user-defined characters will be selected. If EEPROM is not supported, this command is ignored.

**34. Select peripheral device <1B> <3D> <n>**

Select peripheral device.

n = <01> display disable next device enable.

n = <02> display enable next device disable.

n = <03> display enable next device enable.

**<Data>:**

More than 20 characters will be displayed on dumb terminal mode.

**<Data1>:**

More than 45 characters will be displayed on dumb terminal mode.

## 9 CHARACTER CODE TABLES

The characters displayed on the customer display are defined by the character code tables. Character codes from 00h (hexadecimal) to 1Fh (hexadecimal) are non-displayable control codes.

The standard ASCII code table displayable characters are from 20h (hexadecimal) to 7FH (hexadecimal) and are the same for all font set selections.

For Logic Controls and some other command sets, a few characters among character codes from 20h to 7Fh can be changed by selecting the international symbol set. Refer to International Symbol code table for details.

Character codes 80h to FFh are special characters. Different command sets may have different sets of character fonts. The Logic Controls pole display command set contains 12 sets of font codes selectable by command. Refer to the font code tables for details.

With Logic Controls command set, both International symbol and font setting can be saved into power on default.

### 9.1 ASCII FONT PAGE & INTERNAL SIGN FONT TABLE

#### ASCII font set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20h																
30h																
40h																
50h																
60h																
70h																

**Internal Symbol font table**

n	Country	ASCII codes (Hexadecimal)											
		23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
0	USA												
1	France												
2	Germany												
3	UK												
4	Denmark I												
5	Sweden												
6	Italy												
7	Spain I												
8	Japan												
9	Norway												
10	Denmark II												
11	Spain II												
12	Latin America												
13	Korea												

## 9.2 CHARACTER FONT CODE PAGES

### Logic Controls font set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
80h																
90h																
A0h																
B0h																
C0h																
D0h																
E0h																
F0h																

**PC437 – Standard European font set**

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
80h																
90h																
A0h																
B0h																
C0h																
D0h																
E0h																
F0h																

**PC850 - Multilingual font set**

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
80h																
90h																
A0h																
B0h																
C0h																
D0h																
E0h																
F0h																

**PC852 – Latin2 font set**

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
80h	Š	š	Ž	ž	Č	č	Š	š	Ž	ž	Č	č	Š	š	Ž	ž
90h	š	Š	ž	Ž	č	Č	š	Š	ž	Ž	č	Č	š	Š	ž	Ž
A0h	š	Š	ž	Ž	č	Č	š	Š	ž	Ž	č	Č	š	Š	ž	Ž
B0h	š	Š	ž	Ž	č	Č	š	Š	ž	Ž	č	Č	š	Š	ž	Ž
C0h	š	Š	ž	Ž	č	Č	š	Š	ž	Ž	č	Č	š	Š	ž	Ž
D0h	š	Š	ž	Ž	č	Č	š	Š	ž	Ž	č	Č	š	Š	ž	Ž
E0h	š	Š	ž	Ž	č	Č	š	Š	ž	Ž	č	Č	š	Š	ž	Ž
F0h	š	Š	ž	Ž	č	Č	š	Š	ž	Ž	č	Č	š	Š	ž	Ž

**PC858 font set**

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
80h	Š	š	Ž	ž	Č	č	Š	š	Ž	ž	Č	č	Š	š	Ž	ž
90h	š	Š	ž	Ž	č	Č	š	Š	ž	Ž	č	Č	š	Š	ž	Ž
A0h	š	Š	ž	Ž	č	Č	š	Š	ž	Ž	č	Č	š	Š	ž	Ž
B0h	š	Š	ž	Ž	č	Č	š	Š	ž	Ž	č	Č	š	Š	ž	Ž
C0h	š	Š	ž	Ž	č	Č	š	Š	ž	Ž	č	Č	š	Š	ž	Ž
D0h	š	Š	ž	Ž	č	Č	š	Š	ž	Ž	č	Č	š	Š	ž	Ž
E0h	š	Š	ž	Ž	č	Č	š	Š	ž	Ž	č	Č	š	Š	ž	Ž
F0h	š	Š	ž	Ž	č	Č	š	Š	ž	Ž	č	Č	š	Š	ž	Ž



PC860 - Portuguese font set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
80h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
90h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
A0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
B0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
C0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
D0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
E0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
F0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

PC863 – Canadian French font set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
80h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
90h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
A0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
B0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
C0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
D0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
E0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
F0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

PC865 - Nordic font set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
80h																
90h																
A0h																
B0h																
C0h																
D0h																
E0h																
F0h																

Slavonic font set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
80h																
90h																
A0h																
B0h																
C0h																
D0h																
E0h																
F0h																

Russia font set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
80h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
90h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
A0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
B0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
C0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
D0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
E0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
F0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

Katakana - PTC font set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
80h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
90h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
A0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
B0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
C0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
D0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
E0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
F0h	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

**Other supported font sets:**

PC866 - Cyrillic2 font set

Katakana - Epson font set

Katakana - IEE font set

PD220XL font set

WPC1252 font set

Emax font set

Cyrillic font set

General European font set

Greek font set

Hebrew font set

ISO8859-1 font set

ISO8859-2 font set

## 10 GENERAL SPECIFICATIONS

<b>MODELS</b>	<b>LDX3000</b>	<b>LDX9000</b>	<b>LTX9000</b>	<b>LDX1000</b>
<b>OPTICAL:</b>				
Number of rows	2	2	2	2
Number of digits/row	20	20	20	20
Dot matrix	5 x 7	5 x 7	5 x 7	5 x 7
Digit height	0.20in. (5.0mm)	0.374in. (9.5mm)	0.374in. (9.5mm)	0.362in. (9.2mm)
Digit width	0.14in. (3.5mm)	0.244in. (6.2mm)	0.244in. (6.2mm)	0.150in. (3.8mm)
Character format	ASCII	ASCII	ASCII	ASCII
Brightness (typical)	690 cd/m <sup>2</sup>	900 cd/m <sup>2</sup>	900 cd/m <sup>2</sup>	1200 cd/m <sup>2</sup>
Display color	Green-Blue	Blue-Green	Blue-Green	Blue-Green
MTBF (hours)	300,000	300,000	300,000	300,000
<b>MECHANICAL:</b>				
Weight	2.4 lb.	2.7 lb.	1.4 lb.	1.8 lb.
Dimensions (in inches, w x h x d)				
Display head	7.9 x 3.4 x 1.75	8.50 x 3.37 x 1.75	8.50 x 3.37 x 1.75	6.90 x 2.95 x 1.71
Rectangular base	2.12 x 2.0 x 2.25	2.12 x 2.00 x 2.25	N/A	2.12 x 2.00 x 2.12
Base plate	4.0 x 0.09 x 8.0	4.0 x 0.09 x 8.0	N/A	4.0 x 0.09 x 8.0
Overall height (typical)	25	8 to 25	N/A	21.5
<b>ELECTRICAL:</b>				
Adapter input power	120VAC, 60Hz; optional 220VAC, 50Hz			
Adapter output power	7.5VAC/7.5VDC, 1000mA			5VDC, 800mA
<b>ENVIRONMENTAL:</b>				
Operating temperature	0 to +50 °C			
Storage temperature	-20 to +70 °C			
Relative Humidity	80%, non-condensing			
Vibration (10 to 55 Hz.)	4G's			
Shock	40G's			
<b>CABLES &amp; CONNECTORS:</b>				
Serial (RS-232) cable	DB9 Female connector, detachable cable			DB9 Female
Serial Pass-through cable	DB9F & DB25M connectors	N/A		N/A
USB cable	type A USB connector, detachable cable			type A USB
Power cable (serial and double side displays)	2.5mm DC plug			