

# **POS Surveillance System**

## **Solution Guide**

Version 1.2

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# 1. Introduction

Integrated POS surveillance system comprises several components mainly including point-of-sales, cameras and digital video recorders which are capable of recording transaction data. It provides retail managers and shop or company owner with a complete picture of trade activity and also enables emphasizing of suspected or questionable event such as “Sweet hearting discounts” and flagged transactions including “Voids”, “No Sales” and reducing the time spent on reviewing recorded video. With security being the top of mind for retailers, text overlay of transaction data onto POS surveillance video is quickly becoming the application of choice for fraud-conscious merchants.

## Traditional Security Monitoring vs. POS Surveillance System

| Traditional (CCTV) Security Monitoring  | POS Surveillance System  |
|---|--|
| <p><b>#On Point-of-sale side:</b></p> <ol style="list-style-type: none"> <li>1. Find out the suspicious transactions</li> <li>2. Get the time of targeted transaction</li> </ol> <p><b>#On surveillance system side:</b></p> <ol style="list-style-type: none"> <li>1. Search the video by the time</li> <li>2. Check the recorded video with transaction data</li> </ol> | <p><b>#On surveillance system side:</b></p> <ol style="list-style-type: none"> <li>1. Find out the suspicious transactions with the time</li> <li>2. Check the recorded video with transaction data</li> <li>3. Remote accessibility via Internet</li> </ol> |

### Who can be benefit from POS Surveillance System?

Small family-owned stores to retail chain-stores rely on POS Surveillance System as added security to help in reducing the potential for damage, theft, and fraud. The use of POS Surveillance can also aid in tracking cash transaction to capture fraudulent activities, not only video image but also transaction data, that occur frequently in the retail environment.

## 1.1 Benefits

- **Reduction of losses at shopping centers:** incontrovertible proofs of trade violation (false discount cards, misappropriation of profit, fictitious return of products, imposition of clients, etc.)
- **Enhanced quality of services:** managers possess full information on personnel’s actions, which greatly improves labor discipline. Network features of the system allow the managers to receive information in minutes, even without leaving the office

- **Registration of all purchases** with indication of date, attachment of video record of both salesman and client
- **Centralized control of POS network** over a trade outlet operations from any point of the world via Central Management System
- **Operative real-time management**
- **Powerful analysis toolset:** basic and extended requests, search of specified events.

## 1.2 Features

- **Data synchronization:** Every sales transaction's text information applies to video image
- **Video Text Overlay:** Transaction text message can be displayed or hidden on screen and on the video files.
- **Exception text:** 16 sets of exception event text can be predefined. For example, all the transactions containing the keyword "VOID" will be marked.
- **Quick search:** The data can be searched by product name, price, and channel. Also, combination of words can be used on the search function.
- **Remote control:** Remote playback and text overlay allow users to control the business even they are thousands of miles away from the store.

## 2. Devices Required for POS Surveillance

### System

A POS surveillance system is mainly composed of the devices listed as follows:

- Dome/Fixed Camera
- DVR
- POS/Cash Register
- Receipt Printer/Pole Display (optional)
- Data Converter (optional)

Illustration of POS surveillance system wiring will be shown in the later section: **System Connectivity (with RS232 DB9 Y-cable)**.

### 3. Supported Models

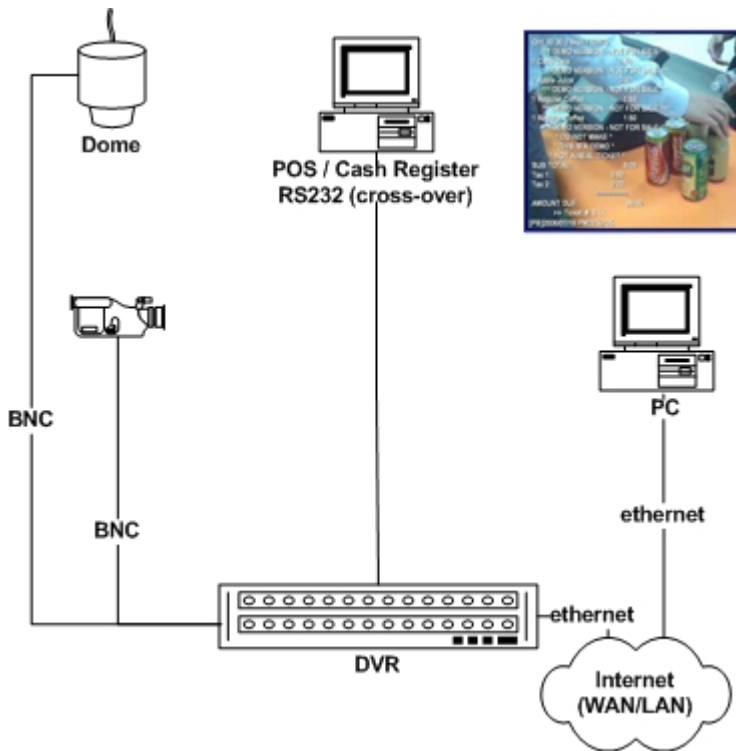
Pole displays/printers that follow the protocols such as EPSON (ESC/POS), PaernerTech, UTC, AEDEX etc. should work fine. For details of various models support, refer to **Appendix C: List of Supported Models**.

#### \*\*\*Data Converter

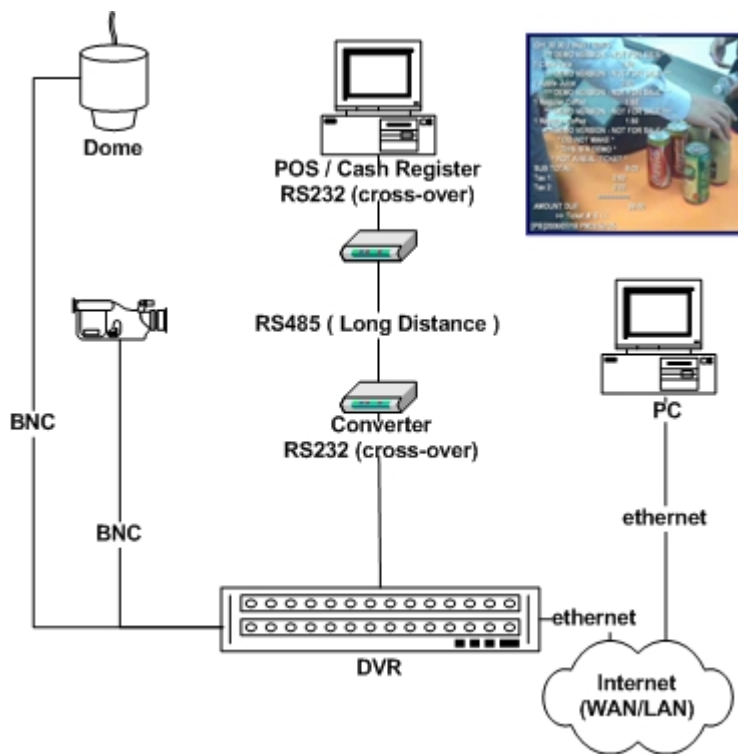
The Data Converter is for text data collecting and transmitting to a single DVR in a POS surveillance system with more than one cash register, especially in the system of large scale such as hypermarkets.

### 4. Integrated System Configuration

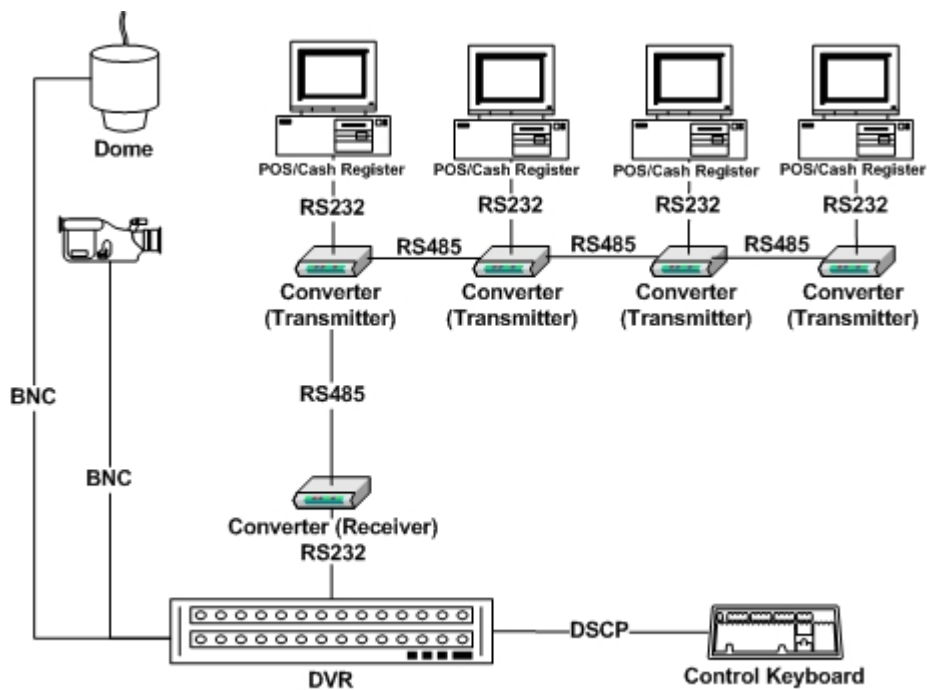
#### ■ Single POS—Direct Connection



■ Single POS—Long Distance (Up to 1 km)



■ Multi-POS Surveillance

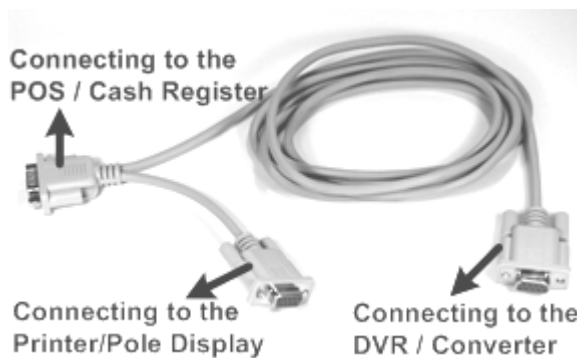


\*\*\* RS232 (cross-over)

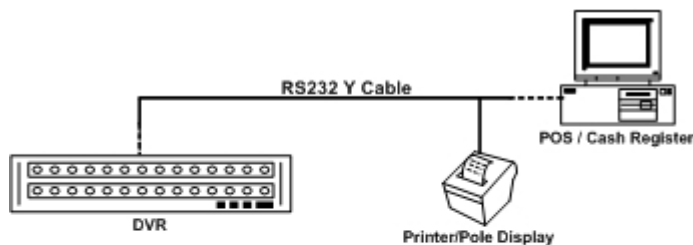
## 5. System Connectivity (with RS232 DB9 Y Cable)


The RS232 DB9 Y Cable (see the figure below) is available in both Text Module and Data Converter packages for easy wiring. Please refer to the Y Cable's figure below for each connector's usage. Also refer to the following diagrams for single / multi- POS connection with the Y Cable.

### Use of RS232 DB9 Y Cable Connectors

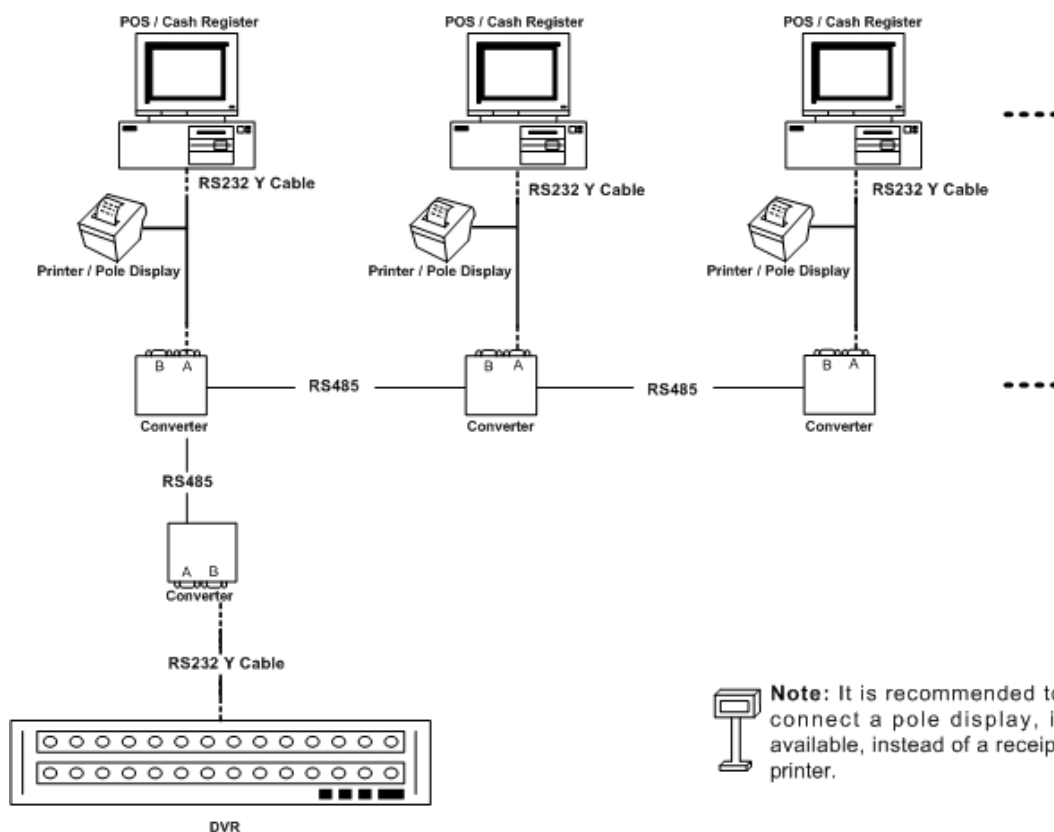


### Single POS Connection via the DB9 Y Cable



 **Note:** It is recommended to connect a pole display, if available, instead of a receipt printer.

## Multi-POS Connection via DB9 Y Cables



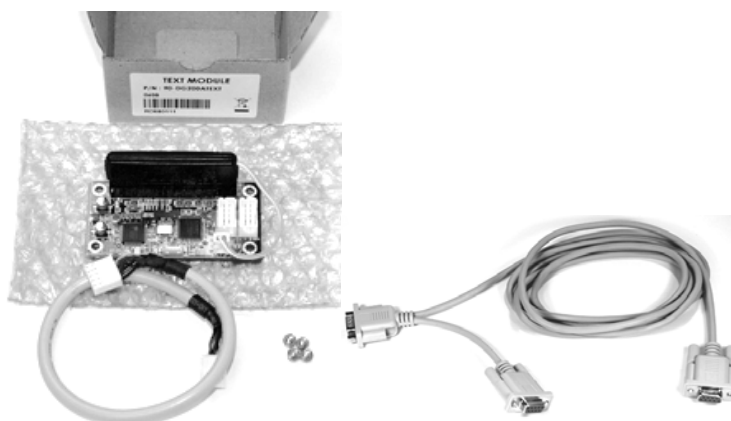
## 6. Set-up of Connected Devices

The following sub-sections will explain how to setup the connection of the POS module and the DVR.

### 6.1 Text Module Installation

Before attaching the Text Module to the DVR, please check if the Text Module package contains the items listed below.

1. Text Module x1
2. USB Cable x1
3. Screws x4
4. Y-cable x1

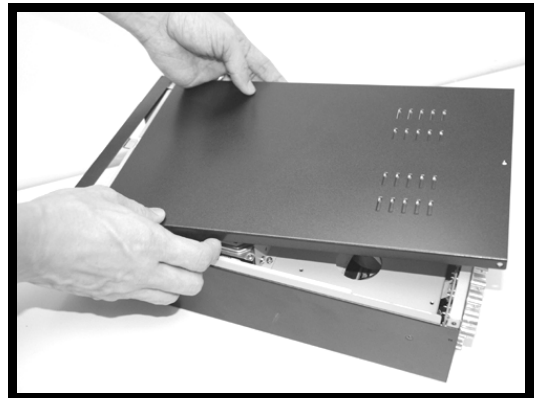
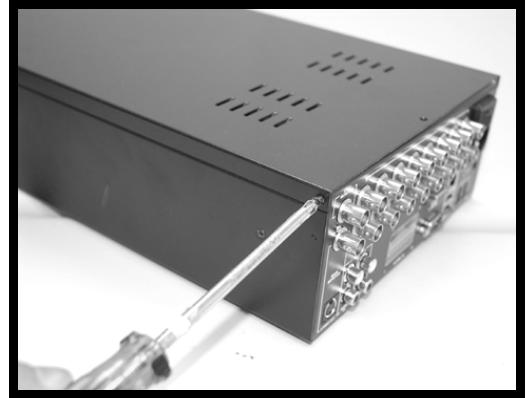




Follow the steps below to install the Text Module.

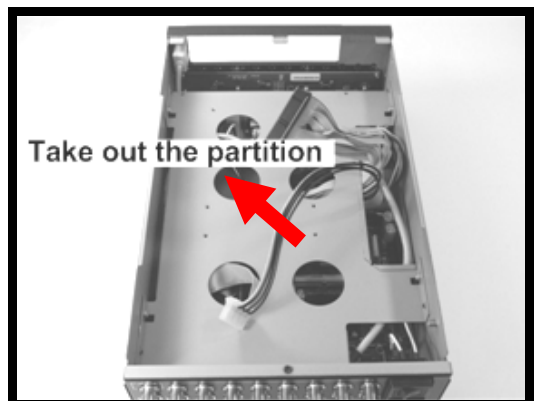
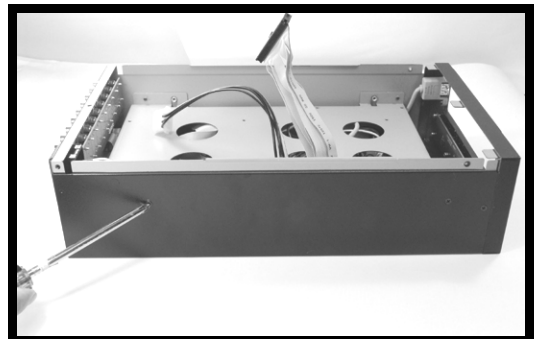
**STEP 1**

Unscrew the DVR's cover plate and remove it from the unit, as shown in the figures.



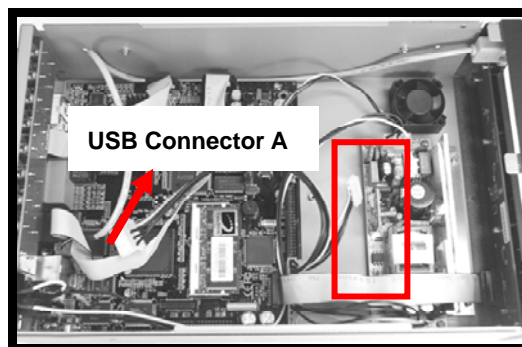
**STEP 2**

Loosen the screws on the side panels to disassemble the partition.

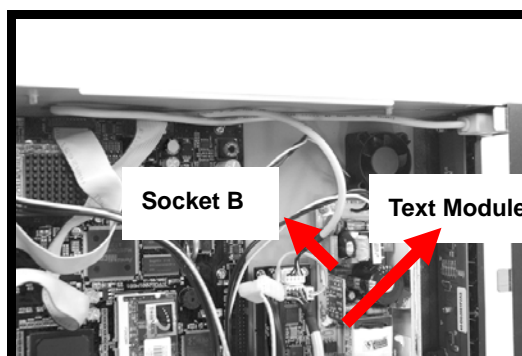


**STEP 3**

Fasten the Text Module on the location, which is marked as a frame in the right figure. Then pull out USB Connector A from Socket A (on the Main Board) and connect it to Socket B (on the Text Module), as shown in the next figure.

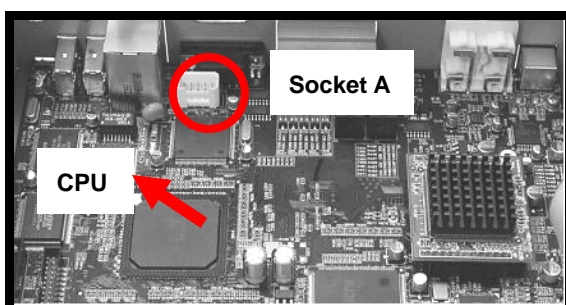


**Figure:**  
**USB Connector A in Socket B**

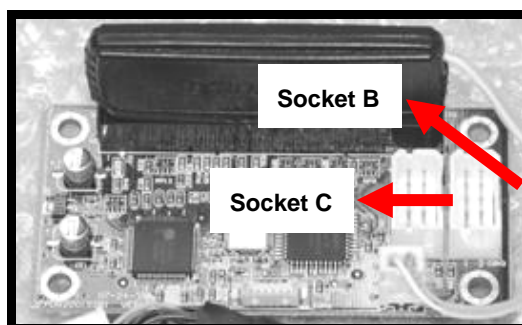


Refer to the figures below for the designation of each connector on the Main Board and Text Module.

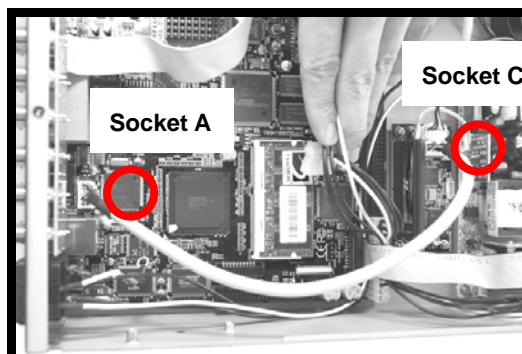
**Main Board**



**Text Module**

**STEP 4**

Use the USB Cable, equipped with the Text Module, connects Socket A (on the Main Board) and Socket C (on the Text Module).



Reverse the steps 1 and 2 to assemble the DVR's partition and the cover.

## 6.2 OSD Set-up (Local/Remote)

After completing Text Module installation, please carry on the DVR's OSD setup for activating the text function. To setup the Text Overlay function, enter the OSD setup menu with the correct administrator password, and then select "Text Setup".



- Main Menu
1. System Setup
  2. Monitor Setup
  3. Camera Setup
  4. Record Setup
  5. Sequence Setup
  6. Event Setup
  7. Database Setup
  8. Configuration
  9. Video Export
  10. Text Setup
  11. Shutdown

Four items: Text Function, Text Overlay, Exception Text Setup and Input Setup, are found in the sub-menu of "Text Setup." Details of each item are described in the following sections. The column below shows the Text Setup menu.

- Text Setup
- |                         |           |
|-------------------------|-----------|
| 1. Text Function        | ON        |
| 2. Text Overlay         | LIVE & PB |
| 3. Exception Text Setup |           |
| 4. Input Setup          |           |

### ■ Text Function

When selecting "ON", transaction data will be saved in text database.



**NOTE:** Once the Text Function is set to "ON," remember to assign a port for the POS/cash register or modem under the item **Input Setup**. Further details will be described later.

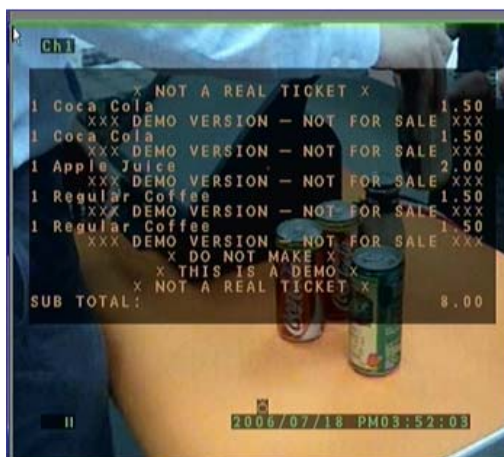
## ■ Text Overlay

Select to show text overlay in LIVE mode, PB mode, or both.

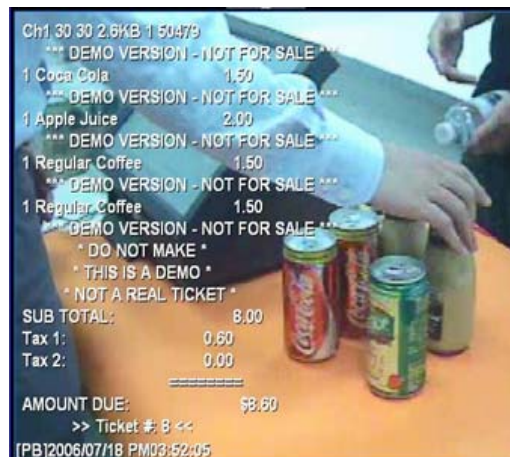
- Available options-- OFF, Only Live, Only PB, Live/PB
- Max lines displayed on OSD : 15 lines
- 42 bytes per line
- Text will be blanked out if no more data input in 8 seconds.
- Line compress feature--- When data length in one line exceeds the limit, the DVR will try to eliminate some continuous space to fit the line length limitation. Thus the text format on screen might differ slightly from print-out.
- Supports only English & West European characters so far.
- Text Overlay only displays in full screen mode.
- PB overlay is only available when PB speed is 1x forward.



**NOTE:** Remote Live— Text Overlay must be active for LIVE; Remote PB— Text Overlay must be active for PB. Furthermore, when seeing in Remote LIVE and Remote PB, it is possible to lose text data in low bandwidth network. We recommend using Remote Archive function to archive complete video and use “Local Playback of DVRRemote”, “DVRPlayer” and CMS to playback DRV file in single screen mode as shown below.



LOCAL



REMOTE

■ **Exception Text Setup**

The submenu of the item: Exception Text Setup is shown below.

| Except Text Setup   |         |
|---------------------|---------|
| Exception No.       | 1       |
| Trigger             | OFF     |
| Exception String    | NO SALE |
| By Numerals         | OFF     |
| Value               |         |
| Value (Upper Limit) |         |

- Exception No.-----16 sets available
- Trigger----When turned “ON”, those transactions containing “Exception Strings” and meeting “Numerals” conditions will be marked as exceptions in text database and then trigger preset actions such as alarm output, alarm message via e-mail, SMS, etc. Exceptions can also be quickly searched via Text Query in Search menu.
- Exception String---Define Exception String. Max length: 24 bytes. The “Exception String” is case-sensitive. Only exactly matched ones will be marked as exceptions.
- By Numerals
  - \* OFF
  - \* Specific
  - \* Greater Equal Than
  - \* Less Equal Than
  - \* Inside The Range
  - \* Outside The Range

“Exception String” must be defined first before “By Numerals” takes effect. If “By Numerals” is enabled, only transactions that meet both “Exception String” and “By Numerals” conditions will be marked as exceptions and trigger an action.



**NOTE:** Only when Trigger is ON that the transactions will be marked as exceptions in text database. Otherwise, the stored data won't be marked as exceptions.

## ■ Input Setup

The submenu of the item: Input Setup is shown below.

| Input Setup            |                  |
|------------------------|------------------|
| 1. Port Selection      | Serial Port      |
| 2. Input Source        | Direct Connected |
| 3. Camera Selection    | 1                |
| 4. Text Filter         | ASCII            |
| 5. Manual Filter Setup |                  |
| 6. Input Process       | Canonical        |
| 7. Text Baud Rate      | 9600             |
| 8. Text Bits           | 8                |
| 9. Text Stop           | 1                |
| 10. Text Parity        | NONE             |

- Port Selection

It is essential to select a port for either the POS/cash register or modem when the text function is set on. Meanwhile, also check whether the device is connected to the port selected.

| Port Selection          |      |
|-------------------------|------|
| 1. Serial Port          | Text |
| 2. USB Port-Front       | NONE |
| 3. USB Port-Rear Top    | NONE |
| 4. USB Port-Rear Bottom | NONE |

- Input Source

Select whether the input source is direct connected or connected with the Data Converter. If the input source is direct connected, users may need to go to the next item: **Camera Selection** to select a corresponding camera number.

- Camera Selection

Total 16 camera numbers can be selected.

- Text Filter

Text Filter is for filtering out control codes, so that the transactions data can be read easily. Available options under the item include ASCII, Manual, EPSON (ESC/POS), PartnerTech, etc. For details of supported devices, please refer to **Appendix C: List of Supported Models**. The ASCII table is provided in **Appendix D** for reference.

If it is unable to find supported protocol among the options, please select "Manual" and go to next item to carry on hexadecimal digits input.

- Manual Filter Setup

After entered the Manual Filter Setup menu, users should key in hexadecimal digits. The menu of the item is shown as follows

| Manual Filter Setup |    |
|---------------------|----|
| 1. Header 1         | 30 |
| 2. Header 2         | 30 |

- Input Process

If a Pole Display from a PC based POS will be installed, select <Canonical>. <Non-Canonical> is to be selected when using a Pole Display from a Standalone POS.

- Text Baud Rate, Text Bits, Text Stop & Text Parity

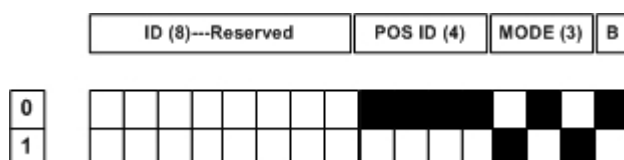
The default settings for these items are listed below:

- \* Text Baud Rate: 9600
- \* Text Bits: 8
- \* Text Stop: 1
- \* Text Parity: None

## 6.3 Data Converter Setting

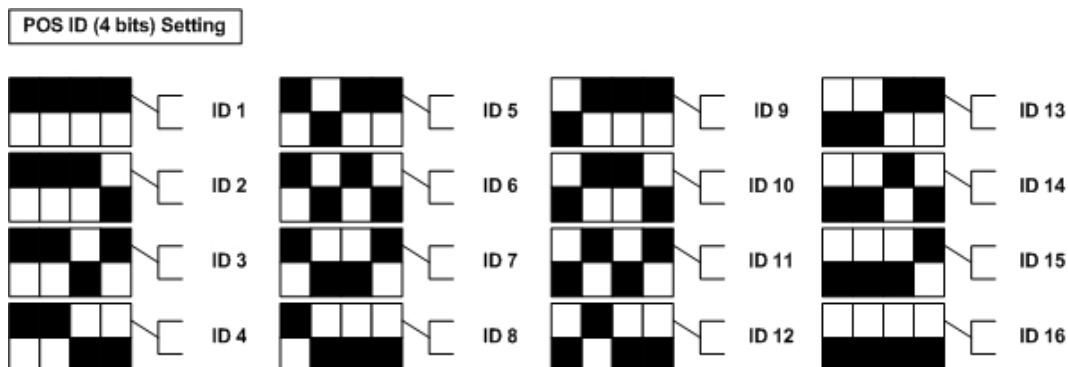
Data Converters are mainly used when users need to connect more than one cash register to a single DVR; see the multi-POS system diagrams in the previous sections. Also refer to the section: **Devices Required for POS Surveillance System** for the description of the Data Converter.

In addition to setting up POS/cash registers, receipt printers and DVR OSD, users also need to set up Data Converters. The dip switch of the Data Converter (see the diagram below) provides various settings for POS ID, Mode and Baud Rate.



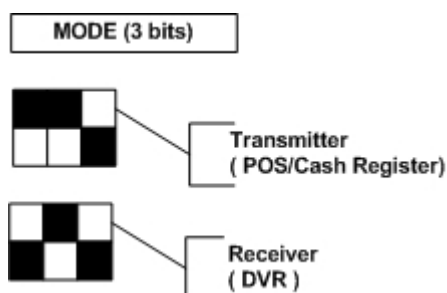
■ **POS ID Setting**

The Data Converter's POS ID should correspond with the cash register's number, i.e. POS ID 1→ Register No.1, POS ID 2→ Register No.2, etc. Please refer to the table below for POS ID setting.



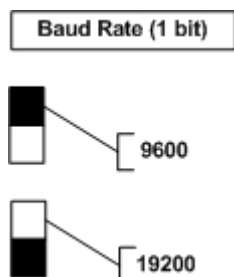
■ **Mode Setting**

Set the mode according to whether the connected device is a transmitter or receiver. Refer to the illustration below for mode setting.



■ **Baud Rate Setting**

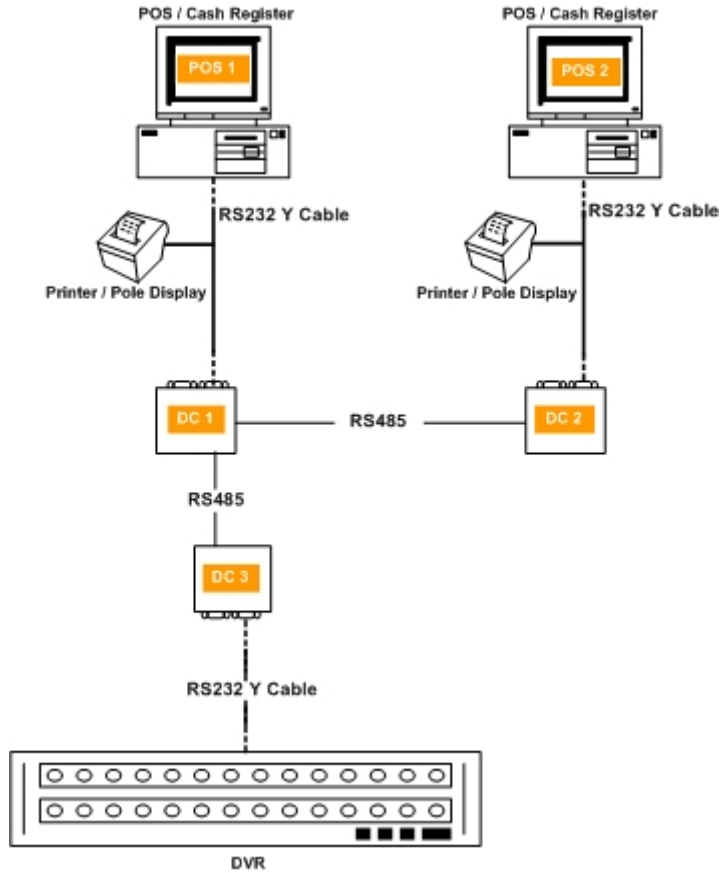
Refer to the illustration below for baud rate designation. The baud rate is subject to the connected device, i.e. POS/cash register or DVR.





## 6.4 Example of Data Converter Setting

Suppose that there are two POS/ cash registers connecting to a DVR in a POS surveillance system, like the illustration below.



Each Data Converter's **POS ID** and **Mode** should be set as follows.

**DC 1:** POS ID→1 (0000); Mode→Transmitter (001)

|   | ID (8)---Reserved | POS ID (4) | MODE (3) | B |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|-------------------|------------|----------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 0 |                   |            |          |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 |                   |            |          |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**DC 2:** POS ID→2 (0001); Mode→Transmitter (001)

|   | ID (8)---Reserved | POS ID (4) | MODE (3) | B |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|-------------------|------------|----------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 0 |                   |            |          |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 |                   |            |          |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**DC 3: POS ID→No Function; Mode→Receiver (101)**

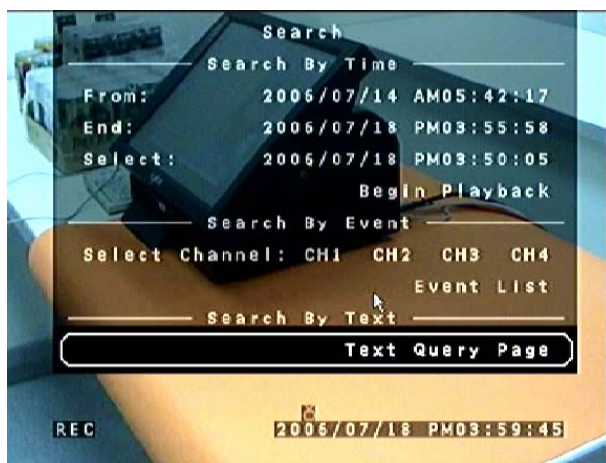
|   | ID (8)---Reserved | POS ID (4) | MODE (3) | B |
|---|-------------------|------------|----------|---|
| 0 |                   |            |          |   |
| 1 |                   |            |          |   |

## 6.5 POS/Cash Register Setting

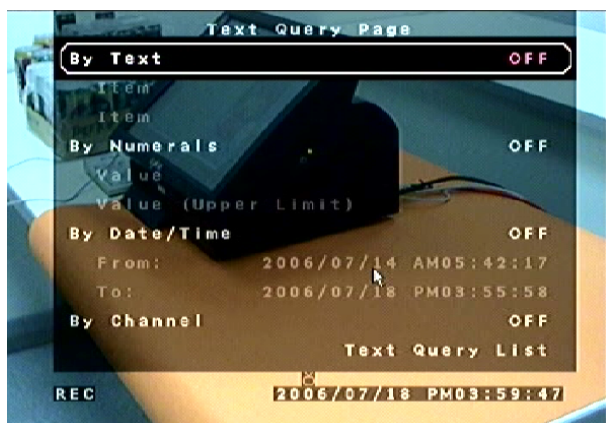
Please refer to the user manual of the POS/cash register in use for printer-related setting.

## 7. Text Operation (Local/Remote)

Users could easily investigate specific transactions data via Text Module's text search function, which can be found on the DVR's Search menu. Press the button SEARCH to enter the Search menu, as shown below. Then move the cursor to the Text Query Page under the item: Search By Text.



Users could search transactions data by four conditions: Text, Numerals, Date/Time and Channel on the Text Query Page, as shown below. "AND" operation will apply if multiple conditions are set simultaneously.





**NOTE:** Searching by Numerals is conditional on transaction output format like this:

|             |      |
|-------------|------|
| XXXXXXXX... | 50.8 |
| XXX...      | 30.2 |

i.e. numerals (unit price) should be set in the very last bits of one line. If not, the database would be hard to separate Numeral from the transaction, which then results in searching by numerals works improperly.

### ■ Searching Condition

- By Text
  - \* OFF
  - \* Specific---- Transactions with the specific keyword will be found.
  - \* AND--- Transactions with the exact two keywords will be found.
  - \* OR--- Any transaction containing one of the two keywords will be found.
  - \* Exception---All triggered exceptions will be listed.



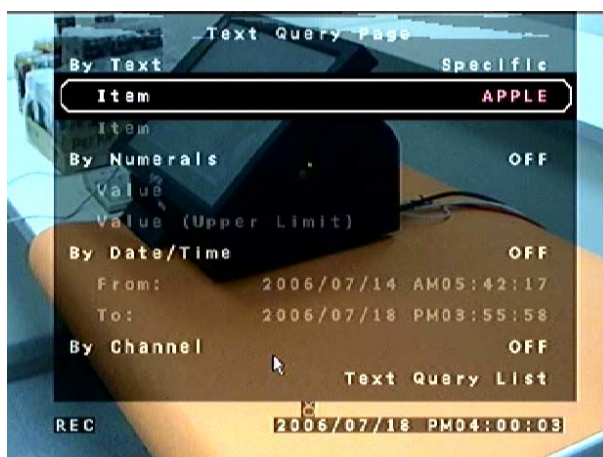
**NOTE:** The search strings mentioned above are case-insensitive -----this differs from “Exception String” setup (see **OSD Set-up > Exception Text Setup > Exception String**).

- By Value
  - \* OFF
  - \* Specific
  - \* Greater Equal Than
  - \* Less Equal Than
  - \* Inside The Range
  - \* Outside The Range
- By Date
- By Channel---All or a specific channel

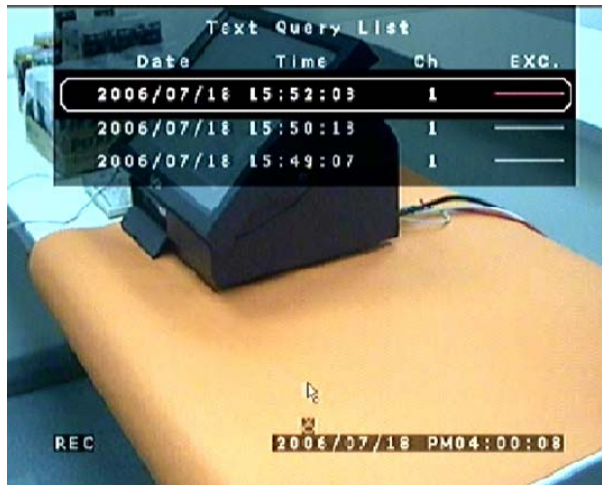
### ■ Searching Result

After determining the research condition(s), move the cursor down to “Text Query List” and press ENTER for searching result. In the Text Query List, Date/Time, Channel and Type will be shown (like event list); see the example below.

To search for the apple string “By Text,” users should select “Specific” and input “APPLE” in the Item editing page. Refer to the following figures.

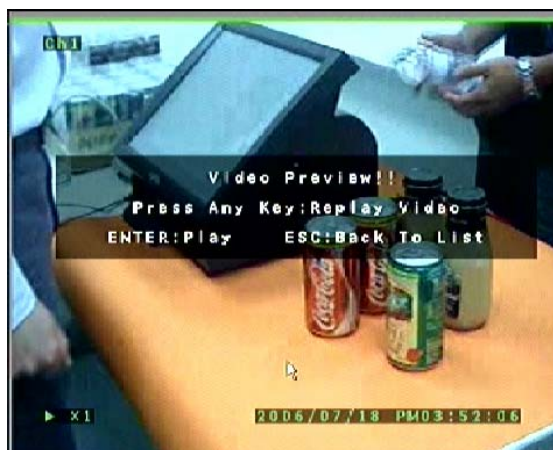


Then, move the cursor down to “Text Query List” and press ENTER for searching result. See the figure below.

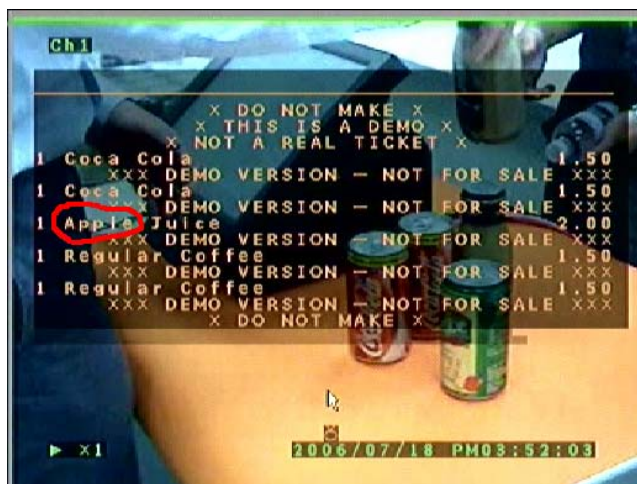


- EXC. is the abbreviation of Exception.
- The EXC. column will show Exception Strings if searching by “Exception.”
- Strings of more than 7 digits will be abbreviated.  
ex. VOID → “VOID”  
NO SALE → “NO SALE”  
BASKETBALL → “BASK...”  
EXC. will show “-----” when searching by other criteria.

In the Text Query List, if the cursor is moved to a specific item (see the above figure) and any key other than “ENTER” is pressed, the DVR will enter the “preview playback” mode. The mode enables quick return to the Text Query List without destroying the list page, so that saves time for calling the list. There is no text overlay in “preview playback”. Press ESC to go back to the Text Query List. Refer to the following picture for the example of the preview playback mode.



Press ENTER to confirm an item, the DVR will enter the playback mode. Refer to the following picture for the example of the playback mode.



## ■ Export

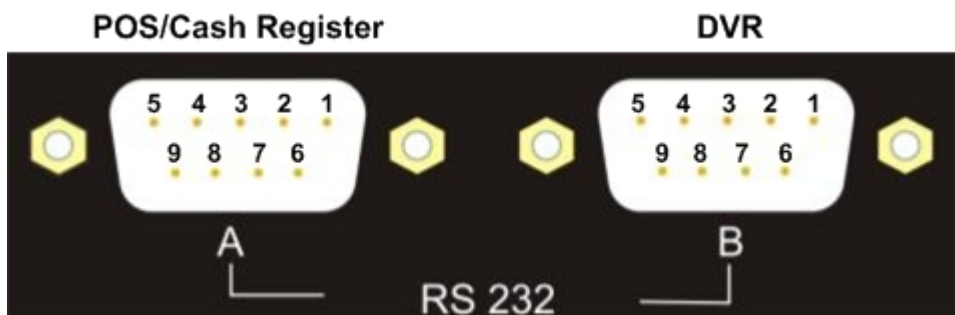
- AVI  
No text overlay support when exporting AVI format
- DRV  
Text overlay is only present in DRV format. Users can use “Local Playback of DVRRemote”, “DVRPlayer” and CMS to playback DRV file.

Text overlay will show when playback DRV file is in full screen mode.



**NOTE:** We recommend using the “ezBurn” function to export DRV file when users have located the wanted video.

## Appendix A: Pin Definition of RS232 DB9 Male



### RS232-A for POS/Cash Register (Half-duplex)

| Pin | Definition |
|-----|------------|
| 1   | -          |
| 2   | RX         |
| 3   | -          |
| 4   | -          |
| 5   | GND        |
| 6   | -          |
| 7   | -          |
| 8   | -          |
| 9   | -          |

### RS232-B for DVR (Full-duplex)

| Pin | Definition |
|-----|------------|
| 1   | -          |
| 2   | RX         |
| 3   | TX         |
| 4   | -          |
| 5   | GND        |
| 6   | -          |
| 7   | RTS        |
| 8   | CTS        |
| 9   | -          |



## Appendix B: POS Menu Tree

The table below is the POS menu tree.

| Item       | Level 1           | Level 2               | Level 3  |  |
|------------|-------------------|-----------------------|--|--|
| Text Setup | 1.Text function   | <ON><OFF>             |  |  |
|            | 2.Text overlay    | <ON><OFF>             |  |  |
|            | 3.Exception Setup | 1.Exception No.       | <1>~<16>   |  |
|            |                   | 2.Trigger             | <ON><OFF>  |  |
|            |                   | 3.Exception String    | Ex: <NO SALE>,<VOID>,<CANCEL>,<br><RETURN>,<COUPOUND>,<DISCOUNT>   |  |
|            |                   | 4.By Numerals         | <OFF>,<Specific>,<Greater Equal Than>,<br><Less Equal Than>,<Inside The Range>,<br><Outside The Range>                 |  |
|            | 4.Input Setup     | 1.Port Selection      | <Text>,<NONE>,<Dial-In/Out>  |  |
|            |                   | 2.Input Source        | <Dyna-D70DC>,<Direct Connected>  |  |
|            |                   | 3.Camera Select       | <1> ~ <16>   |  |
|            |                   | 4.Text Filter         | <ASCII>,<Manual>,<EPSON (ESC/POS)>,<br>< EPSON (ESC/POS)-PD>,<PartnerTech>,<br><UTC>,<AEDEX>,<ADM787/788>,<br><DSP800> |  |
|            |                   | 5.Manual Filter Setup |  |  |
|            |                   | 6.Text Baud Rate      | <9600>,<19200>,<38400>,<57600>,<150>,<br><300>,<600>,<1200>,<2400>,<4800>  |  |
|            |                   | 7.Text Bits           | <6>,<7>,<8>  |  |
|            |                   | 8.Text Stop           | <1>,<2>  |  |
|            |                   | 9.Text Parity         | <None>,<Odd>,<Even>  |  |



## Appendix C: List of Supported Models

The supported models for pole displays, printers, and POS machines are listed below.

| <b>Pole Display</b>          | <b>Printer</b>                      | <b>POS Machine</b> |
|------------------------------|-------------------------------------|--------------------|
| Cache Technology VFD-202T    | Citizen CBM-1000 II                 | Acula AQ-812       |
| Citizen C2202                | Citizen CT-S300                     | IBM SurePOS 700    |
| Digipos CD5220               | Dell T200                           | Samsung ER-380M    |
| Emax Pole Display            | Epson TM-T88II/ TM-T88III/ TM-T88IV |                    |
| Epson DM-D Series            | Epson TM-T90                        |                    |
| Logic Controls LD9000        | Epson TM-930 II                     |                    |
| Logic Controls PD3000        | Epson RP-U420                       |                    |
| Logic Controls PD6000        | IBM SureMark TF6                    |                    |
| Logic Controls TD3000        | IBM SureMark TM6                    |                    |
| Magellan                     | Ithaca iTherm 280                   |                    |
| Partnertech CD5220           | Ithaca POSJet 1000                  |                    |
| Posiflex ICD-2002            | POS-X Xr500                         |                    |
| Posiflex PD 302              | Samsung SRP350                      |                    |
| Posiflex PD 303              | Sensor TP-288                       |                    |
| Posiflex PD-2100             | Star TSP100 futurePRNT              |                    |
| Posiflex PD-2200             | Star TSP600                         |                    |
| POS-X Xp8000                 | Star TSP700                         |                    |
| Scales                       | Star TSP800                         |                    |
| Sibnet                       | TPG (Axiohm) A794                   |                    |
| STAR SCD400-PD               | WP-520(ESC/POS)                     |                    |
| Soteke VFD2025               |                                     |                    |
| Soteke VFD2029               |                                     |                    |
| TEC                          |                                     |                    |
| Toledo 8217                  |                                     |                    |
| TYSSO VFD Series             |                                     |                    |
| Ultimate Technology PD1100XL |                                     |                    |
| Wedderburn DS-770            |                                     |                    |

## Appendix D: ASCII Table

| Dec | Hex | Char | Description             | Dec | Hex | Char  | Dec | Hex | Char | Dec | Hex | Char |
|-----|-----|------|-------------------------|-----|-----|-------|-----|-----|------|-----|-----|------|
| 0   | 0   | NUL  | null                    | 32  | 20  | SPACE | 64  | 40  | @    | 96  | 60  | `    |
| 1   | 1   | SOH  | start of heading        | 33  | 21  | !     | 65  | 41  | A    | 97  | 61  | a    |
| 2   | 2   | STX  | start of text           | 34  | 22  | "     | 66  | 42  | B    | 98  | 62  | b    |
| 3   | 3   | ETX  | end of text             | 35  | 23  | #     | 67  | 43  | C    | 99  | 63  | c    |
| 4   | 4   | EOT  | end of transmission     | 36  | 24  | \$    | 68  | 44  | D    | 100 | 64  | d    |
| 5   | 5   | ENQ  | enquiry                 | 37  | 25  | %     | 69  | 45  | E    | 101 | 65  | e    |
| 6   | 6   | ACK  | acknowledge             | 38  | 26  | &     | 70  | 46  | F    | 102 | 66  | f    |
| 7   | 7   | BEL  | bell                    | 39  | 27  | '     | 71  | 47  | G    | 103 | 67  | g    |
| 8   | 8   | BS   | backspace               | 40  | 28  | (     | 72  | 48  | H    | 104 | 68  | h    |
| 9   | 9   | TAB  | horizontal tab          | 41  | 29  | )     | 73  | 49  | I    | 105 | 69  | i    |
| 10  | A   | LF   | new line                | 42  | 2A  | *     | 74  | 4A  | J    | 106 | 6A  | j    |
| 11  | B   | VT   | vertical tab            | 43  | 2B  | +     | 75  | 4B  | K    | 107 | 6B  | k    |
| 12  | C   | FF   | new page                | 44  | 2C  | ,     | 76  | 4C  | L    | 108 | 6C  | l    |
| 13  | D   | CR   | carriage return         | 45  | 2D  | -     | 77  | 4D  | M    | 109 | 6D  | m    |
| 14  | E   | SO   | shift out               | 46  | 2E  | .     | 78  | 4E  | N    | 110 | 6E  | n    |
| 15  | F   | SI   | shift in                | 47  | 2F  | /     | 79  | 4F  | O    | 111 | 6F  | o    |
| 16  | 10  | DLE  | data link escape        | 48  | 30  | 0     | 80  | 50  | P    | 112 | 70  | p    |
| 17  | 11  | DC1  | device control 1        | 49  | 31  | 1     | 81  | 51  | Q    | 113 | 71  | q    |
| 18  | 12  | DC2  | device control 2        | 50  | 32  | 2     | 82  | 52  | R    | 114 | 72  | r    |
| 19  | 13  | DC3  | device control 3        | 51  | 33  | 3     | 83  | 53  | S    | 115 | 73  | s    |
| 20  | 14  | DC4  | device control 4        | 52  | 34  | 4     | 84  | 54  | T    | 116 | 74  | t    |
| 21  | 15  | NAK  | negative<br>acknowledge | 53  | 35  | 5     | 85  | 55  | U    | 117 | 75  | u    |
| 22  | 16  | SYN  | synchronous idle        | 54  | 36  | 6     | 86  | 56  | V    | 118 | 76  | v    |
| 23  | 17  | ETB  | end of trans. block     | 55  | 37  | 7     | 87  | 57  | W    | 119 | 77  | w    |
| 24  | 18  | CAN  | cancel                  | 56  | 38  | 8     | 88  | 58  | X    | 120 | 78  | x    |
| 25  | 19  | EM   | end of medium           | 57  | 39  | 9     | 89  | 59  | Y    | 121 | 79  | y    |
| 26  | 1A  | SUB  | substitute              | 58  | 3A  | :     | 90  | 5A  | Z    | 122 | 7A  | z    |
| 27  | 1B  | ESC  | escape                  | 59  | 3B  | ;     | 91  | 5B  | [    | 123 | 7B  | {    |
| 28  | 1C  | FS   | file separator          | 60  | 3C  | <     | 92  | 5C  | \    | 124 | 7C  |      |
| 29  | 1D  | GS   | group separator         | 61  | 3D  | =     | 93  | 5D  | ]    | 125 | 7D  | }    |
| 30  | 1E  | RS   | record separator        | 62  | 3E  | >     | 94  | 5E  | ^    | 126 | 7E  | ~    |
| 31  | 1F  | US   | unit separator          | 63  | 3F  | ?     | 95  | 5F  | _    | 127 | 7F  | DEL  |