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USERS' GUIDE

to the

ABLE SYSTEMS Ap25-24, Ap25-32 & Ap25-40

Panel Mounting Printers

(with Serial and Parallel TTL Interface)

Contents

1 INTRODUCTION

This document is a Users' Guide, written for the person designing-in, connecting and using the Able Systems Ap25 panel mount mini printer. Please read it carefully before making any connection.

There are three versions available (each fitted with different printer mechanisms), the Ap25-24 (fitted with the M-160, 24 characters per line), the Ap25-32 (fitted with the M-163, 32 characters per line) and the Ap25-40 (fitted with the M164, 40 characters per line).

2 ON-LINE INFORMATION

Able Systems maintains a site on the World Wide Web. This will include application data updates, product announcements, and e-mail facilities for customer support.

The **URL** of our **web site** is: http://www.able-systems.com
Our **e-mail address** is: able@able-systems.com

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3 PIN CONNECTIONS

The Ap25 has three external connectors or connection areas, for data and power, auxiliary power, and the printer mechanism. There are also some onboard jumpers. Please refer to the layout diagram for connector locations and pin orientation.

3.1 Data/Power Connector J3

Function	J3 Pin no		Function
Data Input D7 (or Serial/Parallel mode select)	1	2	Busy output (high when busy)
Data Input D6 (or Baud Rate Select in serial mode)	3	4	Inverted Mode Select Input (low for inverted/reversed/data mode)
Data Input D5 (or Baud Rate Select in serial mode)	5	6	Ground (0V)
Data Input D4	7	8	Ground (0V)
Data Input D3	9	10	Power for mechanism (+5V)
Data Input D2	11	12	Power for logic (+5V)
Data Input D1	13	14	Reset Input (low to reset)
Data Input D0	15	16	Serial Data / Parallel Data Strobe Input

3.2 Auxiliary Power Connector J4

These connections are in parallel with those on J3, and are provided for cases in which the user prefers to separate the data and power connectors, as we would recommend.

J4 Pin no	Function
1	Power for logic (+5V)
2	Power for mechanism (+5V)
3	Ground (0V)

3.3 Paper Take-up Motor Connector J5 (only fitted to customer order)

J5 Pin no	Function
1	Ground (0V)
2	Paper Take-up Motor +ve

The output from Pin 2 is in parallel with the mechanism motor drive, with a protective series resistance of about 16 Ohms. Please consult the factory before making any connection.

4 INSTALLATION

4.1 Power Supply

A clean DC power supply of 5V ± 5% 3A is required to power the Ap25. The rise time of the supply must be short enough to give a valid reset signal to the controller chip. It is recommended that the power supply for the controller circuits is separate from the supply to the mechanism motor and solenoid circuits, to minimise interference.

In the event that the power supply is not adequate to power the Ap25, on board Circuitry will hold the printer in reset and avoid any damage which may occur to the printer mechanism.

4.2 Parallel and Serial Interface Selection

Serial and parallel data modes are selected using D7 (pin 1 on J3):

Parallel mode is selected if D7 is held low (connected to 0V) for a period of 100μs after the printer is reset.

Serial mode is selected if D7 is held high or left unconnected (internal pull-up to +5V) for a period of 100μs after the printer is reset.

In "classic" mode, the parallel interface is selected by having D7 low (logic "0") at power up. In some parallel applications the port driving this pin may be indeterminate at power up and so an alternative parallel select is provided (internal jumpers S5/S6) factory set. If either of the two serial/parallel select pins are held to ground on start up, then parallel mode is selected. Both pins must be left high to select serial data. In order to change from serial to parallel, or from parallel to serial, the printer must be reset.

Serial data Baud rates are selected on D5 and D6 when the printer is in serial mode.

Serial data Baud rates:

Baud	300	1,200	2,400	9,600
D5	1	0	1	0
D6	0	1	1	0

Note that the combination for 9600 Baud was used to select 110 Baud in the Ap24 family.
In order to implement the baud rate the printer must be reset.

4.3 EMC Compliance

As a component, the Ap25 is outside the scope of the EMC Directive and the user must take responsibility for the compliance of the complete equipment or installation.

5 OPERATION and PROGRAMMING

5.1 Parallel Data Mode

D7 to D0 are the data connections for parallel mode 8 bit data. If using one of the backwards compatible 7 bit character sets (Ap24 family) D6 to D0 are the data connections. Positive true ASCII

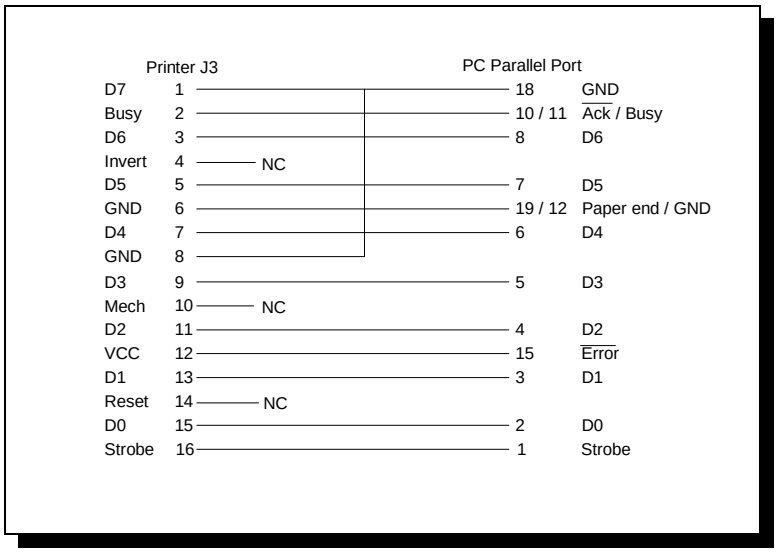

Fig. 5.1 Parallel Connection to a PC

codes are accepted at TTL or 5V CMOS levels. The data inputs are not latched and must be static during the handshake sequence. The Data Strobe input times the incoming data transfer. When the printer is not busy (the busy signal is low) the data must be held static on the data pins and the strobe signal taken low until the busy signal goes high to acknowledge the data transfer. The data strobe must then be taken high ready to transmit the next byte. Figure 5.1 shows typical connections to a PC parallel port.

5.2 Serial Data Mode

The serial data input accepts a TTL or 5V CMOS positive true signal. The busy signal will be low when the printer is ready to accept data. The Ap25 is not suitable for direct connection to a PC RS232 Com. port. (Please refer to ASL for a converter board, or alternatively Able Systems produce an Ap25S which is the serial RS232 version of the Ap25 and is suitable for direct connection to a PC.) Figure 5.2 shows typical connections to a PC serial com. port for the Ap25.

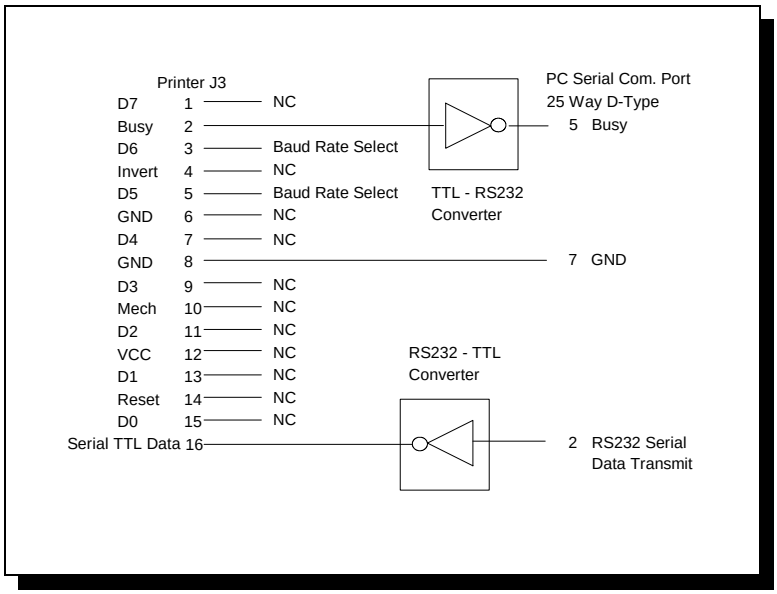

Fig. 5.2 Serial Connection to a PC

5.3 Busy Output Signal

The controller asserts the Busy output when the input buffer is one character away from being full. The following character will, however, be loaded into the input buffer. This avoids any data being lost due to the host not responding to the busy signal immediately (such as with a double-buffered UART in a PC).

5.4 Printing modes and data buffer

Character printing modes include graphics, inverted, double height and double width. Graphics mode is cancelled at the end of every dot line, whereas the combinations of double height and width remain in force until cancelled by a new command.

The Ap25 will print data before the ESCape code and then implement the new mode selection. The data buffer accommodates 48 bytes, which can extend over many physical print lines, depending on the mechanism in use and the data format; and new data can be entering the buffer as previous data are being printed.

5.5 Character Printing

The Ap25 prints the characters from left to right. The characters fit into a 6 wide × 10 high matrix. The standard letter is 5 wide × 7 high, this provides for a one dot space between each character, a dot

line for descenders and a dot line above and below each character line. The number of characters required to fill a dot line varies according to the printer, as follows:

Printer	Characters per line	Lines per second	Vertical dot pitch	Horizontal dot pitch
Ap25-24	24 characters per line	0.7 lines/second	0.33mm	0.33mm
Ap25-32	32 characters per line	0.5 lines/second	0.33mm	0.25mm
Ap25-40	40 characters per line	0.4 lines/second	0.33mm	0.20mm

The ASCII characters 32 to 255 (32 to 127 if using a backwards compatible 7 bit character set) are in the printable range. Any character below character 32 is ignored unless it is one of the control codes (section 5.7).

5.6 Graphics Printing

The product is programmed to take advantage of the graphics printing capability of the mechanisms. Graphics are received as the least significant 6 bits of each byte. In this way the same number of graphics bytes are required to terminate a line as the number of characters required to print a complete line. The graphics mode is reset at the end of every dot line and hence the graphics command, <ESC><02>, must be entered at the start of every dot line. Graphics patterns are built up as a succession of dot lines across the paper. The number of bytes required to fill a dot line for each mechanism are the same as the number of characters required to fill a dot line. Large areas of solid dots are not recommended as they may cause over heating and shorten the ribbon life. Heavy graphics printing may also require a higher current power supply.
A typical graphics line for the Ap25 would be:

Control code Data (24 bytes for the Ap25-24)
<ESC><02> <00><00><01><02><03><04><05> etc.

5.7 Control Codes

9 character sets which may be selected for backwards compatibility. The default character set is the 8 bit IBM 224-character set.

Previous versions of the Ap24 family have been supplied programmed with 7 bit character sets, UK, French, German, “Scandinavian”, Danish/Norwegian, Swedish, Japanese and Spanish character variations (often to special order). The Ap25 contains all these variants, which are software selected for backwards compatibility. 8 bit data is selected when using the 8 bit IBM character set, otherwise the 8th data bit is ignored.
The structure of the command is as follows:

<ESC><127><n> where **n** is a byte of the form [X,X,X,X,B3,B2,B1,B0] (X = don’t care)
Country selection:

Character set	B3	B2	B1	B0
Full 8 bit IBM (default)	0	0	0	0
UK	0	0	0	1
French	0	0	1	0
German	0	0	1	1
Scandinavian	0	1	0	0
Danish	0	1	0	1
Swedish	0	1	1	0
Japanese	0	1	1	1
Spanish	1	0	0	0

<ESC><n> (If buffer is not empty, print buffer contents and) Set print mode:.
Note: **n** is a byte of the form [0,0,0,0,B3,B2,B1,B0] (all except the lower 4 bits must be zero, to avoid conflict with other ESCape codes).

Mode selection:

Print Mode	B3	B2	B1	B0
Default	0	0	0	0
Inverted (reversed)	X	X	X	1
Graphics mode	X	X	1	X
Double width mode	X	1	X	X
Double height mode	1	X	X	X

Any combination of modes is permissible.

The command <ESC><126> stores the current character set and print mode (double height, etc) in the EEPROM and these will be the default setting the next time the printer is powered on or reset. If this code is not received the Ap25 reverts to previous default values on the next power up.

<ESC><ESC> (Print any buffer contents, and) Print Self test message.

<ESC><127><n> (Print any buffer contents, and) Select country character set.

<ESC><126> (Print any buffer contents, and) Store country character set and print mode in EEPROM.

<ESC><125> (Print any buffer contents, and) Clear the EEPROM.

<CR> Print any buffer contents (line terminator). Treat as <CR><LF>.
<LF> Print any buffer contents (line terminator). Treat as <CR><LF>.
<CR><LF> Print any buffer contents (line terminator). Treat as single <CR><LF>.
<LF><CR> Print any buffer contents (line terminator). Treat as single <CR><LF>.

A character line is automatically terminated and printed if it reaches the full line width for a given mechanism and print mode setting. Note that if any of the above 4 line terminator codes is received immediately after a character which completes a printable line, it will be ignored.

This treatment differs from the Ap24 family but will generally be an improvement.

<VTAB> Print any buffer contents, and feed 30 dot lines.

If the print quality deteriorates due to dot lines being displaced, the EEPROM can be cleared and the chip forced to repeat the first-time initialisation by sending the code <ESC><125>.

/Attachment: Appendix 1(EMC Directive 89/336/EC Disclaimer)
(Operator information)
(Ap25 Dimensions)

EMC Directive 89/336/EC (Disclaimer)

Please note that the item to which the enclosed application data refer is designed to be used as a component in another finished good, and is not intended to be placed on the market or brought into service independently. The system integrator using this item must assume responsibility for Electro-Magnetic Compatibility (EMC) between this item and its environment, both for emissions and immunity/susceptibility.

Particular attention should be paid to the wiring connections between the item and the power supply, data source and other parts of the user's system in case special shielding and/or cable layout is required to meet applicable EMC criteria.

Ap25 Series Panel-Mounting Printers

- To assist OEM customers, we have carried out traceable pre-compliance tests on our most popular Ap24 printer (predecessor to the Ap25), which indicate that the printer itself is unlikely to prevent EMC compliance of the customer's equipment, as follows:

- Since the Ap25 is DC powered and will only be electrically connected within an OEM equipment, conducted emissions and immunity are not relevant, and we consider that the Ap25 falls outside the scope of the Regulations in these regards.

- When fitted in an earthed steel case and connected to an internal data source and power supply, the Ap25 may be expected to comply with the requirements of the EMC Directive in respect of radiated emissions and immunity;

- When fitted with an earthing wire to the mechanism, the Ap25 may also be expected to comply with the requirements in respect of electrostatic discharge (ESD).

Earth Connection and EMC Screening Sleeve

Able Systems Ap25 Series printers are fitted with an earthing wire attached to the metal chassis of the printer mechanism. The other end of the wire will be supplied attached to the panel clamp by an eyelet. Users are recommended to make a sound earth connection to this point, so that the metal parts of the printer are electrically bonded to the earthed parts of the user's equipment.

A steel enclosure (Ap25 EMC Sleeve) for the rear of the Ap25 Series, which replaces the panel clamp, is available to provide additional EMC screening if required.

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J3
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ZD1B
SW1
IC1
IC2
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J206
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J208
J209
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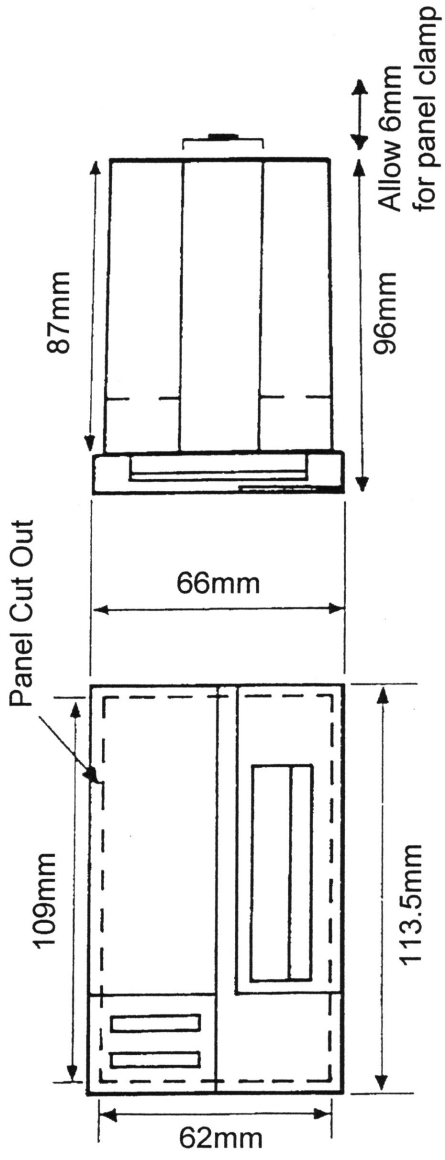
J211
S1 S3 S5
S2 S4 S6
S7
S8
S9
S10

Ap25 Panel Mounting Range

Dimensions



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