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Ap1200
Thermal Printer

User Guide

Version 3.1

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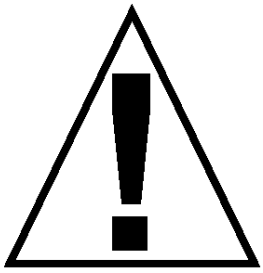
3 INTRODUCTION

This document is a User Guide, written for the person connecting and using the ABLE Systems Ap1200 printer. Please read this Guide carefully before making any connection, opening the doors or installing the printer.



CAUTION

Product Safety is a serious issue.
Read the *Product Safety* section before using these products.
In case of doubt, refer to ABLE Systems.

3.1 PROGRAMMERS GUIDE

A separate document, the '*Programmers Guide for the Ap1200 Printer*', providing details of the control codes, and describing the internal operation of this product is available.

3.2 COPYRIGHT AND CONFIDENTIALITY NOTICE

ABLE Systems Limited property is subject to copyright. This includes single chip controller firmware, layout diagrams, circuit diagrams, pin connection lists, application data.

Other property may also be subject to copyright. However, you may copy this leaflet if you are an ABLE Systems customer AND the copy is for your own use.
If you want to copy information to anyone else then you must first obtain permission from ABLE Systems.

No warranty in respect of patent rights of ABLE Systems or of third parties is given.
You must not amend or copy controller firmware. You may be prosecuted if you do.

The Ap1200 printer is design registered in the UK (No 2092320), in France (No 004938) and in the USA (US Design Patent No D466919). You must not copy it or offer copies for sale.

3.3 EMC DISCLAIMER

The European Union (EU) has introduced laws covering Electro-Magnetic Compatibility (EMC). This section defines our current view of this law, as it relates to the Ap1200.

ABLE Systems believes that the Ap1200 is exempt from this law because:
It is a component, designed for building into other products, AND
it cannot be used without additional support, AND
it does not contain a power supply

Responsibility for EMC compliance rests with the System Integrator.

However, to aid system integrators, ABLE Systems has carried out fully traceable EMC testing and a copy of a test certificate may be provided on request. If installed according to the recommendations in this User Guide, the Ap1200 will not compromise the EMC performance of host equipment.

The Ap1200 must be installed using cables of length 3m or less.

The Ap1200 will be likely to satisfy EMC regulations when built into other products because; -
It is electro-magnetically quite moderate, AND
It can be connected to an internal data source / power supply, AND
It is fitted with an earthing wire.

Customers should ensure that there is a sound earth connection to the panel clamp, and the data and power connections are enclosed by the equipment they are mounted in and are no more than 3m long.

CAUTION

Before handling the printer, or even opening the doors, users must ensure that they are properly discharged to earth.

3.4 PRODUCT SAFETY

This product contains moving parts. Keep clothing and hair away from this product.

CAUTION

Do not apply mains voltage power to this product
Ensure you understand the section on power supplies before using this product. If in doubt refer to ABLE Systems for advice.

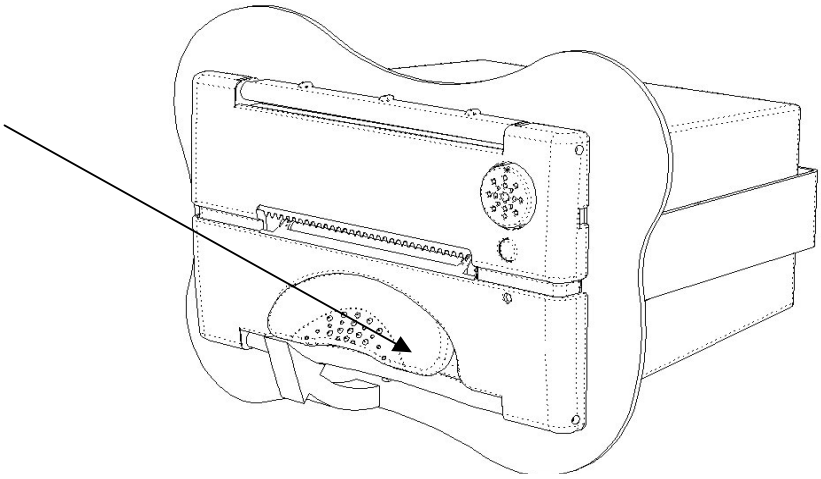
4 OPERATION

4.1 OPENING THE DOORS

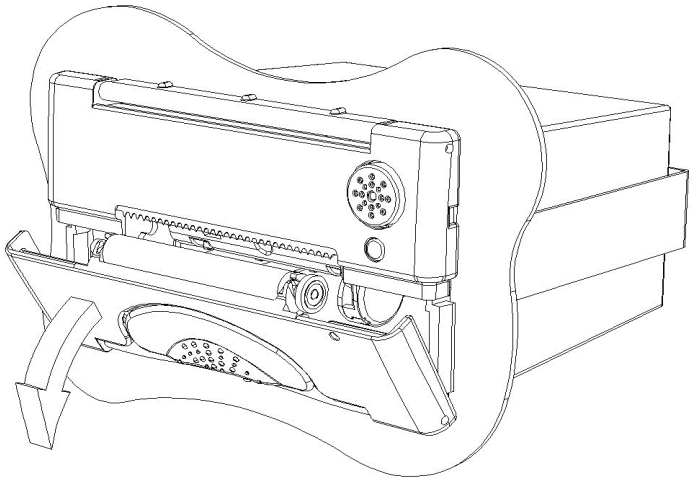
CAUTION

Before handling the printer, users must ensure that they are properly discharged to earth.

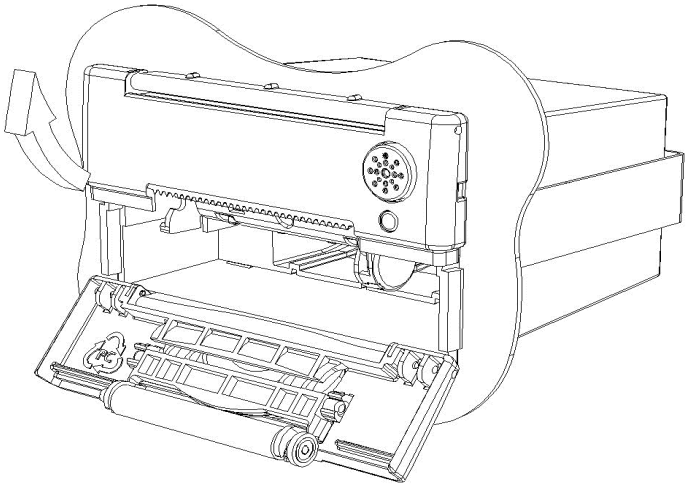
Step1:
Use the index finger to pull *release lever* open



Step 2:
Continue to swing open this door until it is held in the fully opened position.



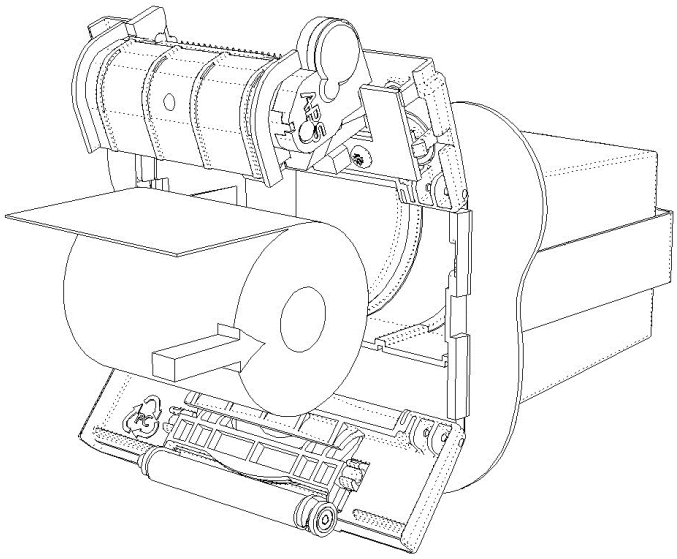
Step 3:
Swing open the door with the *printer mechanism* attached (normally top door), until it is in the fully open position.
Do not grip the tear bar or the print head whilst opening.



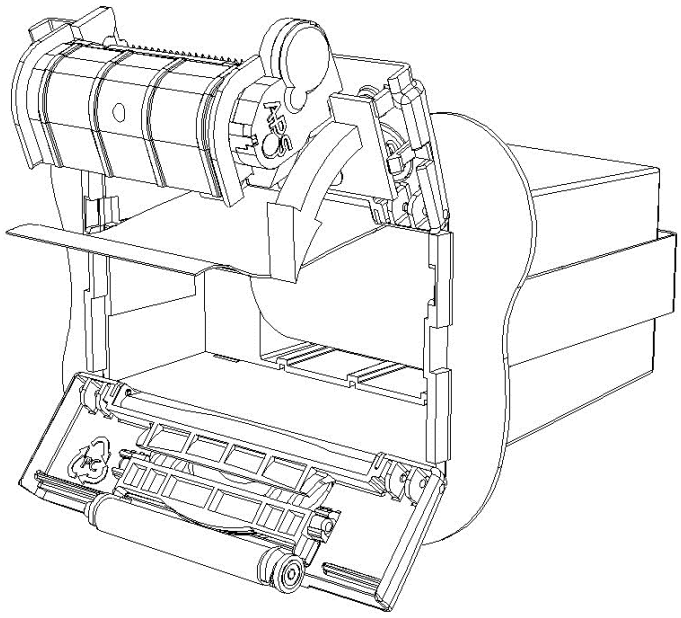
4.2 CHANGING THE PAPER

Step 1
To open the doors please follow the procedure as detailed in the section 'Opening The Doors', above.

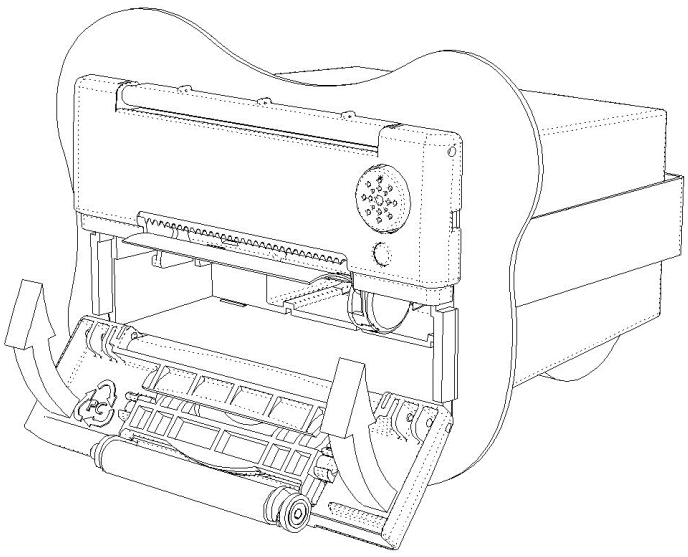
Step 2
Discard a few turns in case they have been damaged or have glue on.
Ensure the coated surface is orientated correctly to contact the print head.



Step 3:
Close *printer door*, ensuring the paper is carefully aligned in the paper path.



Step 4:
Close *release lever* door.
Apply pressure to both sides of the door.
When the LED stops flashing the printer is ready to print.



4.3 SELECTING SUITABLE PAPER ROLLS

Make sure you use quality paper. Extra dust and wear may result from non-approved products. This may affect warranty.
The paper roll is normally supplied separately to avoid unrolling or damage in transit.
Paper rolls must be 57.5 $^{\pm 0.5}$ mm wide, ∅46 mm $^{+0 / -0.6}$ and have the thermally sensitive coating on the outside.
Suitable rolls are available as ASL Product Codes:

04-A05846TPR1 Thermal Paper Roll (∅46mm max, 25m long approx.)

4.4 REMOVING PAPER OR CLEARING A JAM

If some paper remains in the printer when a new roll is required or a paper jam has occurred, simply open the doors as described above.
Double-clicking the paper feed button will print out any stored data, if the printer was in spooling mode.

4.5 PAPER FEED BUTTON

Pressing the paper feed button when the printer is idle advances paper at up to 50 mm per second, depending on the voltage supplied. However, the feed button has several additional functions:

- A single press and release of the button:
  in idle or spooling mode, advances paper (in steps of 1/16 mm);

- "Double-clicking*" the button:
  - in idle mode, prints a demo/test message including the firmware version, encoded calibration data, and the full character set;
  - in spooling mode, or having been out of paper, prints any stored data and enters idle mode.

  * Double-clicking means pressing and releasing twice in quick succession. The double-click period is like that of a PC mouse.

Some of the functions of the paper feed button can be invoked or disabled under control of the host.

4.6 LED INDICATIONS

The LED on the *printer door* of the Ap1200 indicates the following printer conditions:

- Steady illumination means that all is normal.
  Flashing on and off indicates either:
  - the printer is out of paper
  - the doors are not closed
  - or a combination of the two
- Very rapid flashing indicates the power supply voltage is too low.
- No light indicates that the unit has no power.
- The LED is extinguished while the Paper Feed button is being pressed.

Other LED Patterns

Other LED patterns may be programmed into the Ap1200 on request or by the system designer. Please refer to the Programmers Guide for details of how to set up the Ap1200 for these functions

4.7 MODES OF OPERATION

The Ap1200 has two operating modes, when not actually printing:

1. Idle Mode: ready to accept data, but no data are in the buffer awaiting printing, and the printer motor is not running;
2. Spooling Mode: active, but storing data for later printing.

No hardware power switch is fitted.

Idle Mode

In idle mode, the printer is ready to receive data, which will be printed as soon as complete lines or graphics patterns are decoded. It responds to the paper feed button in the normal way, and can also produce a demonstration print.

Spooling Mode

In spooling mode, data are received and stored, but not printed. This is useful when printing needs to be suppressed during data transfer (for example in mobile radio systems); or when the paper needs to be changed and the buffer contains data.

The buffer will enter spooling mode by a command from the host.
The spooling mode is exited by a command from the host; or, the paper feed button being double-clicked (see below). Any stored data will then be printed out.

4.8 USAGE RESTRICTIONS

The Ap1200 is not intended for continuous printing use. The ELM205-ST mechanism used in the printer imposes certain voltage dependent limitations on continuous printing. The following table gives the maximum operating duty cycle at a selection of operating voltages.

Voltage	Maximum Duty Cycle %
5.0	60
6.0	40
7.0	30
8.0	20

Note that the maximum period for continuous printing is 30 seconds at any voltage.

For example, at 6.0 volts, the duty cycle must be 40% or less. Therefore, after printing for 30 seconds, the printer must be allowed to rest for at least 45 seconds.

Failure to observe this restriction may result in permanent damage to the printer mechanism.

4.9 NOTES ON PRINTER FIRMWARE REVISIONS (INCLUDING FLASH)

Able Systems reserves the right to modify and improve the firmware in its printer products at any time. Whilst every effort is made to ensure backward compatibility, no guarantee in this respect is given or implied.

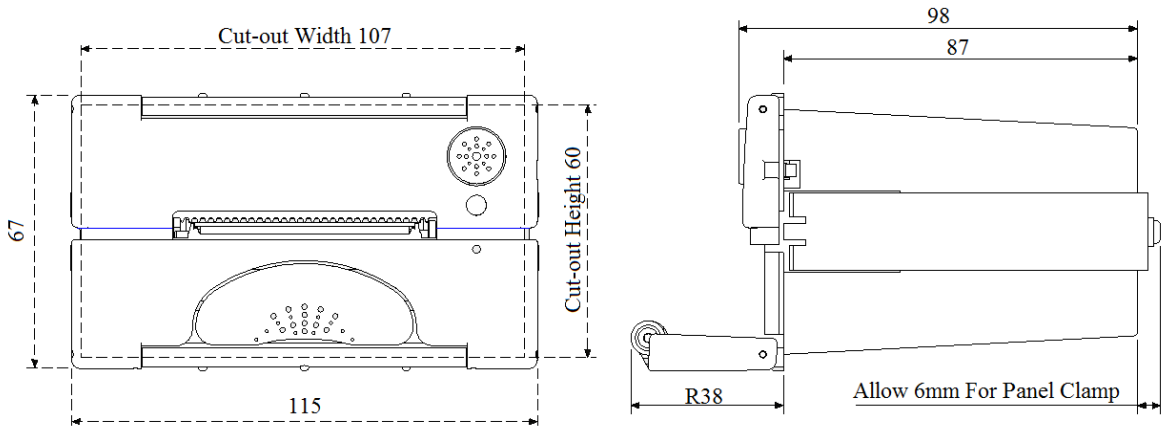
The Ap1200 printer contains a flash-reprogramable microcontroller. This allows firmware upgrades and font manipulation under customer control.

ABLE Systems has produced various PC based utilities to allow easy font generation and re-programming. Refer to the factory for more information if required.

5 INSTALLATION

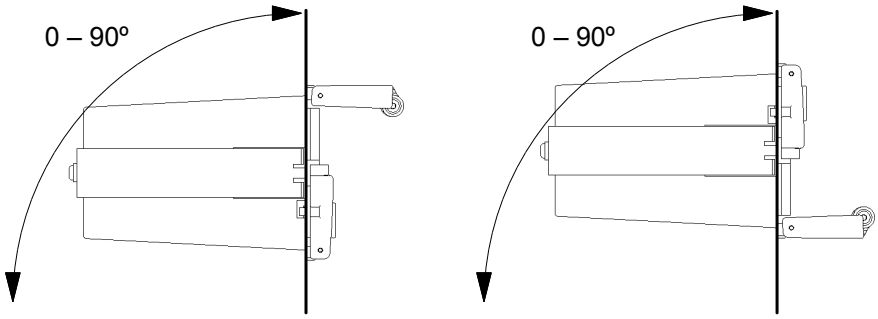
5.1 PANEL CUT-OUT

You will need a hole with the following dimensions:
Width = 107 mm (+1mm / -0mm)
Height = 60 mm (+2mm / -0mm)
Depth = 93 mm (minimum)

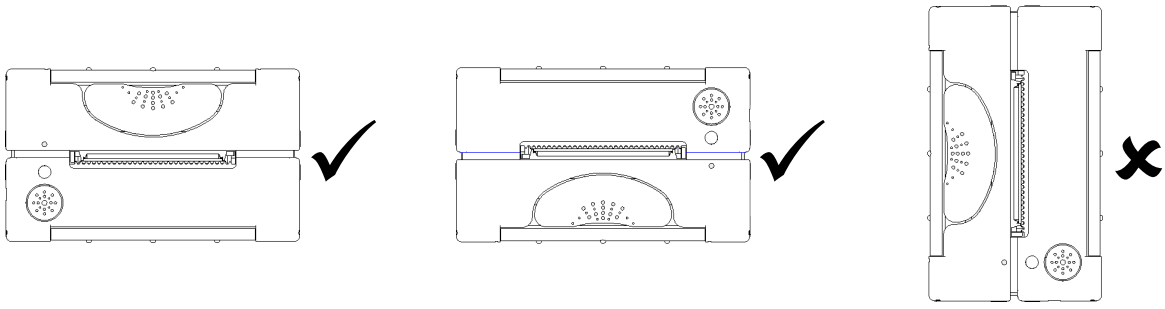


5.2 MOUNTING ANGLES

The printer can be mounted anywhere between 90 and -90 degrees:



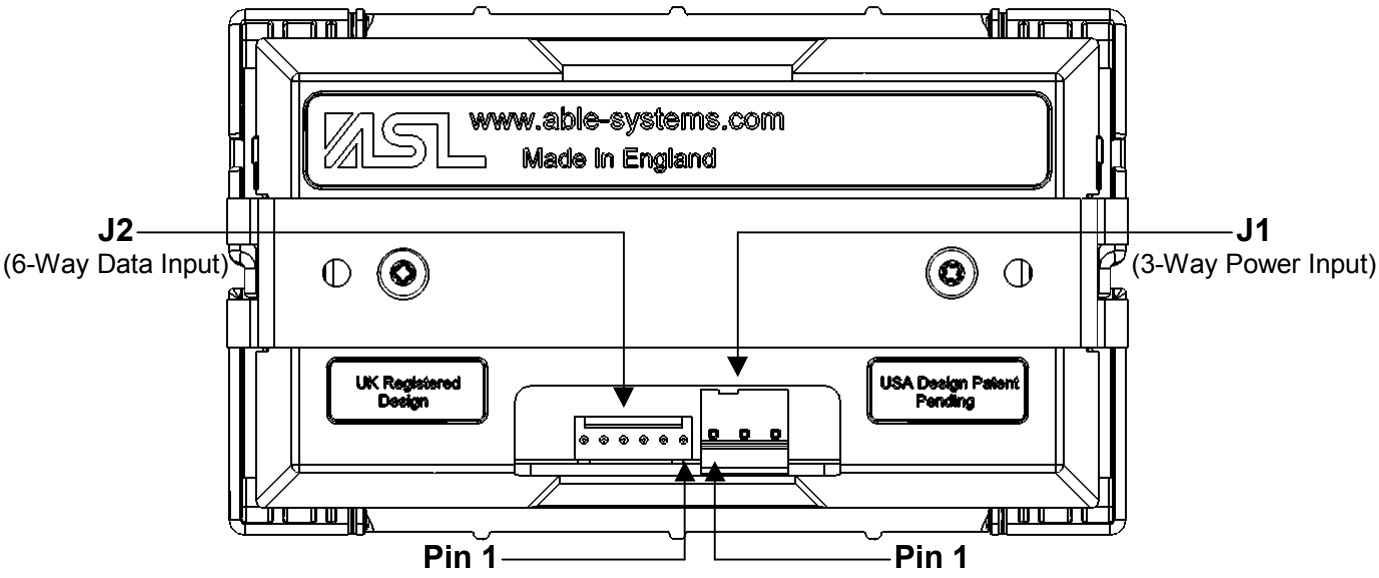
The printer can be mounted upside down or the ‘right way up’ but not on its side:



If you wish to mount the Ap1200 at a different angle to those recommended, please contact Able Systems for more information.

5.3 CONNECTOR DETAILS

The printer has two user connectors detailed below:



Connector Part Numbers

Reference	Connector	Suggested Mating Part
J1	3-Way Power Input Molex Part No: 26-60-4030	09-91-0300 (Molex Housing) 08-52-0072 (Molex Crimp)
J2	6-Way Data Input Molex Part No: 22-27-2061	22-01-2065 (Molex Housing) 08-50-0032 (Molex Crimp)

5.4 CONNECTOR PINOUTS

J1 Pinouts

This 3-way power connector has the following pinouts:

Pin	Assignment
Pin 1	Power Ground
Pin 2	Vmech (DC Power In)
Pin 3	Power Ground

Caution - Reversing the power input connections, even momentarily, can cause irrevocable damage to the Ap1200.

N.B. Previous versions of the Ap1200 featured a 2-way power connector (Molex Part No: 26-60-4020) A 2-way mating part which was wired for an old-style Ap1200 may be used with the new 3-way connector, but extreme care must be taken to ensure correct connections are made.

J2 Pinouts

This 6-way data connector on the standard Ap1200 has the following pinouts:

Pin	Name	Function	
Pin 1	SGND	Signal Ground	(Common with Power Ground on J1)
Pin 2	RxD	Receive	(RS 232)
Pin 3	BUSY	Busy	(RS 232)
Pin 4	TxD	Transmit	(RS 232)
Pin 5	N/C	Reserved	(Do Not Connect)
Pin 6	RESET	Reset Input	(Active high)

5.5 POWER SUPPLY REQUIREMENT

The DC power should be supplied between +4.75V DC and +8.5V DC. For best printing use between + 5V DC and +7.5V DC. Do not go above +8.5V DC.

Average current during printing is normally around 2A. Peak current may be up to 10A. We recommend a 3A power supply, although a higher specification may be necessary for some applications. Avoid voltage drops by taking care over wiring and connections. Lower currents may be accomodated via the software Power Save mode (refer to the Programmers Guide for details).

N.B. Do not interrupt, reverse or reduce the voltage or damage will occur.

5.6 EXTERNAL RESET

An external reset input is provided on the standard Ap1200. This should be left unconnected or connected to SGND if not used. To reset the printer, between +2V and +25V should be applied.

5.7 ADDITIONAL CONNECTOR OPTIONS

The Ap1200 is available with the following optional features, some of which may be mixed. For example, the shutdown option is available with RS232 or TTL interface, but not with analog input.

Please contact the factory for further details of these options, if required.

	Standard Configuration	TTL Interface Option	Separate +5V Option	Shutdown Option	Analog Input Option
Pin 1	Signal Ground				
Pin 2	RxD (RS 232)	RxD (TTL)			
Pin 3	Busy (RS 232)	Busy (TTL)			
Pin 4	TxD (RS 232)	TxD (TTL			
Pin 5	Reserved (No Connect)		+5V input for controller logic		
Pin 6	Reset Input			Shutdown Input	Analog Input

6 CONNECTING UP TO A PERSONAL COMPUTER

6.1 SUGGESTED CONNECTIONS TO A PC

To operate from a PC, you will need a cable to connect from the Ap1200 J2 connector to a serial COM port on the PC. These COM ports can be either 9-Pin or 25-Pin type. For connections to a 9-Pin COM port see Table 1. For connections to a 25-Pin COM port see Table 2.

Table 1

Ap1200 J2 Pin	Ap1200 Signal Name	PC D-9 Pin	PC Signal Name	Function (refers to PC)
2	RXD	3	TXD	Transmit Output (RS 232)
4	TXD	2	RXD	Receive Input (RS 232)
1	SGND	5	SGND	Signal Ground
3	BUSY	6 & 8	DSR & CTS	Busy Input (RS 232)
Other pins are unconnected				

Table 2

Ap1200 J2 Pin	Ap1200 Signal Name	PC D-25 Pin	PC Signal Name	Function (refers to PC)
2	RXD	2	TXD	Transmit Output (RS 232)
4	TXD	3	RXD	Receive Input (RS 232)
1	SGND	7	SGND	Signal Ground
3	BUSY	5 & 6	DSR & CTS	Busy Input (RS 232)
Other pins are unconnected				

It is strongly recommended that a screened data cable be used, with its braided screen connected to the system ground.

6.2 GETTING STARTED

You may find that you can connect up the printer to your Personal Computer (PC), and everything works perfectly first time. However, there are many variables, and the following guide may help if you find you need some assistance. These are only suggestions, and may not work with all PC's.

Connecting To A PC

- First, you need to **GET THE PRINTER GOING**

Before trying to send data to it from your computer, it may be a good idea to check that the printer works by itself.
Before handling the pre-production Ap1200 printer please ensure that you are fully discharged.

- Connect the unit to a suitable power supply as defined in the section 'Power Supply Requirement'.
- The green LED indicator should come on (possibly flashing).
- Ensure paper is loaded (see section 'Changing The Paper')
- Press the feed button to check that paper feeds.
- Press the paper feed button again twice in quick succession (like double-clicking a PC mouse) and the printer should print a self-test message. This will show that the printer is operational, and also reports the way in which the printer's serial data interface is configured.
- Next, you need to make some **HARDWARE CONNECTIONS**

The back panel of a PC normally includes three D-type (keystone-shaped) connectors, typically as follows:

D-9 Plug (male): COM1: Serial port for mouse, serial printer, etc
D-25 Plug (male): COM2: Serial port for modem, serial printer, etc
D-25 Socket (female): LPT: Parallel ('Centronics') port for parallel printer, etc

Section Continues...

You can use either of the two serial ports for the Ap1200, whichever is free.
COM2: is assumed in what follows, as most likely to be available.

You will need a suitable cable (see section *'Suggested connections to a PC'*) which connects the appropriate pins of the computer to the printer. To start with, since the printer has a large data buffer, the only essential pins are Ground (common) and TXD (transmit data), although the computer itself may need to see a connection to its CTS and DTR inputs to indicate that the printer is not busy.

- Now you will need to **SET UP YOUR COMPUTER'S SERIAL PORT** to match the printer (it is also possible to change the printer's settings, but not until you have established communication with the computer).

Your proposed application program may have a way of doing this, or you can get to the DOS prompt [e.g. **C:\>**] and type the following command line (assuming you have connected the printer to COM2:):
MODE COM2:9600,N,8,2 [RETURN]
This will set up the port (COM2:) to **9600** baud, **N**o parity, **8** data bits, and **2** stop bits which is the default setting for the Ap1200.

- Now, **SEND SOME DATA TO THE PRINTER** from your computer. An easy way to do this from the DOS prompt is to type:

DIR >COM2: [RETURN]
This should send a directory listing to the printer. The lines will probably overflow, but it will at least show that the communication between the computer and the printer is working.
You can also send data from **QBASIC**, e.g.:

```
OPEN "COM2:9600,N,8,2" FOR RANDOM AS #1
PRINT#1, "Hello"
```

Or, you can use the special Able Systems set-up software **AP8612.EXE** which we can supply on a floppy disc, or by email, on request: this will allow the printer settings to be changed and includes some diagnostic routines.
Alternatively, in Windows, use the **TERMINAL** program to send some text to the printer.

6.3 WINDOWS™ PRINTER DRIVERS

A Windows driver specifically written for the Ap1200 is available from Able Systems, and can be downloaded, at the user's risk, from our World Wide Web site (see *'On-line Information'*). It may be necessary to adjust some settings in your application to produce the desired result. It is important to recognise that other Windows printer drivers, even for ESCPOS compatible printers, may not work with the Ap1200, as they format all images as dot graphics patterns, in a way which is unique to each kind of printer. The Windows "Generic Text Only" printer driver should, however, work in a limited manner.

6.4 YOUR APPLICATION PROGRAM

Once communications between your computer and the printer have been established, you can try driving the printer from your application program. As referred to in the *'Programmers Guide'*, the Ap1200 has a control code set based on the EPSON ESCPOS protocol. Many of the commands are as closely compatible as they can be, given the mechanical differences between printers, but if the application program was originally written for another printer, it may need to be modified.

6.5 ON-LINE INFORMATION

ABLE Systems maintains a site on the World Wide Web. This includes application data updates, product announcements, and e-mail facilities for customer support.
The Windows Driver can be downloaded from this site: please note that this is a third-party product, and ABLE Systems do not accept responsibility for the installation or use of this program. Further details are given on the web site.

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

6.6 IF ALL ELSE FAILS…

You are always welcome to contact ABLE Systems or your local supplier for specific assistance.
We would also appreciate reports of any errors in our documentation, or suggested improvements.

7 HOST PROGRAMMING

7.1 DATA BUFFER

The Ap1200 has a nominal 20k byte buffer to optimise throughput: this enables data to be received into the buffer while previous lines are being printed. Printing will be initiated on receipt of a valid logical line of data or a complete graphics pattern. The buffer is cleared by a data command or by a hardware reset. A partially full line will be printed on receipt of an appropriate control code, or after a programmable timeout delay.

7.2 CONTROL CODES

The Ap1200 has an APS ELM205-ST printer mechanism, with a fixed (parallel) print head with 384 horizontally arranged thermal elements. The paper is advanced by a stepper motor, and printing takes place in a single dot row for each step of the paper. Each printed dot is approximately 1/8 mm square. The printing speed and dot density are controlled according to the available voltage and the head temperature.

A reflective optical paper sensor within the mechanism of the Ap1200 printer detects the presence of paper, or whether the doors are open.

Alternative printing modes, including graphics, are invoked by 'Escape' sequences. Control codes and status report protocols are described in detail in the Programmers Guide, available as a separate document.

7.3 SPOOLING MODE

Spooling mode can be entered under command from the host. It can also be programmed to be entered automatically when the paper runs out. This makes it easier to change the roll without losing data.

In spooling mode, the buffered data are stored without being printed until the mode is exited by a command from the host or the paper feed button being double-clicked.

7.4 SERIAL INTERFACE

The serial interface Baud rate is factory set to 9,600 Baud, and the data format should be 8 data bits, 1 or 2 stop bits, and no parity (see section '*Connector Details*' for connection details); other baud rates can be programmed by control codes. Serial data is expected in standard RS-232C format with -12V meaning 'mark' or '1' and +12V a logical '0', with reference to the common ground. The serial data output line transmits XON/XOFF and status information to the host at the same Baud rate and in the same format as the serial data input. The hardware busy line is true (nominal -12V) when busy.

7.5 CHARACTER PRINTING

Several character fonts are supported, the default 32-column character set being formed from a 24x10 dot matrix. The full 224 IBM® character set includes graphics characters, which are extended to link up in both axes where appropriate. Text can be printed in various combinations of single or double width, single or double height, inverted, underlined, and with other attributes. Text and dot-addressable graphics can be mixed within a line.

7.6 GRAPHICS PRINTING

Various dot-addressable graphics modes are supported, at up to 384 dots per line. Refer to the Programmers Guide for full details. The Windows driver operates in the graphics mode.

8 MAINTENANCE & REPAIRS

8.1 PRINTER MAINTENANCE

After some use you may need to remove paper dust from and around the mechanism. Use a small vacuum cleaner to clear.

8.2 PRINTER REPAIRS

ABLE Systems have a full test and repair workshop.
Request a copy of our 'Repair Procedure' for more information.
You will need to obtain an 'RA' number before returning a product for repair to ABLE Systems.
Contact ABLE Systems to obtain this. Your local representative may also offer repair facilities.

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