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## ABLE Ap24XS and Ap24XS-40 Panel Mount Printer A190SB

## Connection and Application Data Issue 1.2

## Contents

# 1 INTRODUCTION

These notes describe connection procedures to be adopted for the Able Systems Ap24XS and the Ap24XS-40. These products feature:

- Full support of EPSON M190 and M192 mechanisms
- Single or double width print modes (Software selectable)
- Full 224 IBM character set
- Single and double height characters (Software selectable)
- Inverted text mode
- Dot-line graphics
- 8k data buffer allowing data to be received whilst printing
- Serial data interface with selectable Baud rate
- Serial data output for optional XON/XOFF/NAK information
- Paper feed button
- Easy access to paper

For an end user guide, please refer to our separate sheet.
Ap25 Panel Mounting Printer Range, Operator Information.

# 2 IMPORTANT NOTES

Please read these carefully BEFORE proceeding

## 2.1 POWER SUPPLY WARNING

These products require a +5V DC power supply with a tolerance of +/-10%(+/-0.5V). For best printing quality, it should regulated to better than +/-5%(0.25V). The current required varies with the printing density and it is vitally important for correct initialisation and operation that the supply can deliver sudden peak currents during operation and at start up of 5A. It is particularly important that the initial rise-time of the supply is short enough to give a valid reset to the controller (eg 10ms for 10% to 90%). The mean current will typically be 2A.

Note also that these products have split 5V supplies to the mechanism and controller and it is strongly recommended that these be fed from separate regulators. The power to the controller must
then be applied first, and removed last, if there is a significant difference in timing. The controller supply current will be a maximum of 30mA, but the mechanism supply must be capable of 5A.

In considering the power supply arrangements, attention should be paid to the wiring and connections, as significant voltage drops may otherwise occur. The printing performance and reliability may be seriously affected by inadequate supply arrangements.

## 2.2 POWER SUPPLY TEASING

Momentary interruptions to, or reductions in the voltage of the power supply to the controller can result in a fault condition from which it cannot recover until power is completely removed and correctly restored. Under these conditions, the printer solenoids may be energised continuously and burned out in a matter of seconds. The user must ensure that the supply will not be teased in this way, or else protect the system from such effects.

The power supply must not be taken above 6V (5V +20%), or reversed, even under transient conditions. Particular attention should be paid to the power arrangements in vehicle or battery-operated applications, where load dump transients or reversal of replaceable batteries might occur.

Able Systems have many years' experience of the application of these products, and advice will be freely given on request. These notes may seem severe, but what few problems occur are almost invariably related to power supply faults.

### 2.3 EMC WARNING (DISCLAIMER)

Please note that the item to which these 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.

For further details refer to our supplementary sheet; EMC Directive 89/336/EC (Disclaimer).

## 3 HOST CONNECTIONS

### 3.1 SERIAL INTERFACE

The serial interface Baud rates can be selected by a fitting or removing links to the rear panel links LK1. The default mode, with no link made, is 1200 Baud, 8 Data Bits, 1 stop bit and no parity. (See Section 6.3 for details).
Serial data is expected in standard RS-232C format with a 'Low' (-12V) meaning 'mark' or '1'. The serial data out line on J3 pin 2 transmits XON/XOFF/NAK information to the host in the format, and at the baud rate specified for the serial data in. The serial busy line on J3 pin 3 is true (i.e. 'low' (-12V) when busy.
The received data is double-buffered into the controller allowing for rapid data transfer.

### 3.2 NORMAL OPERATION

Whichever data mode is selected, the Controller I.C. will accept data into its buffer, and begin to print it only when a Line Terminator character (i.e. CR (13D) or LF (10D)) is received, or enough data has been received to fill one print line in the current width print mode.
Note that the treatment of CR and LF codes differ slightly from earlier ASL Ap24 series printers (see below).

# 4 PRINTING

## 4.1 CHARACTER PRINTING

Characters are formed from a 5 x 7 matrix, except for some with descenders which use a 5 x 8 matrix. A standard capital letter is 7 dots high and there is a one dot space between columns. If there are no descenders present in the dot line then the controller optimises throughput by skipping the dot line.

The character set includes the full 224 IBM characters as shown in Fig 1.

Text mode prints left to right like a typewriter.

Data mode (reversed/inverted printing) is used in panel-mounting applications.

## 4.2 GRAPHICS PRINTING

Graphics codes are received as 6-bit dot groups when the control Bit 1 has been set by the appropriate 'ESC' sequence, for example 'ESC & H02'. Since the graphics mode is cleared after every dot line, this sequence must be sent each time. Graphics patterns are built up as a succession of dot lines across the paper, rather like a TV picture. The number of dots and dot groups varies according to the mechanism, as follows:

| Mechanism | M190 | M192 |
|---|---|---|
| Dots/line | 144 | 240 |
| Dot groups | 24 | 40 |

The most significant bit of each group of 6 dots is always printed first (ie. at the left hand end in text mode). The printer must always receive a full dot line's worth of code, even if some are blank, before it will print. Large areas of solid dots are not recommended as they cause overheating and shorten ribbon life: try shading instead. Heavy graphics printing may also require a higher current power supply.

## 4.3 PAPER FEEDING AND SELF TEST

The front panel paper feed button will cause paper to be fed through the mechanism at a rate of about 6 lines a second. If the paper feed button is pressed during power up then a self test message and the full character set will be printed. The character set will continue to be printed until the paper feed button is released. The controller will then revert to normal data entry mode.

## 4.4 PAPER TAKE-UP

The Ap24XS has the capability via connector J2 to drive a suitable 5V paper take-up device (for example the Able Systems Ap24PTD).
This signal only drives the PTD when the printer paper feed motor is energised.

# 5 HOST PROGRAMMING

## 5.1 OVERVIEW

The Ap24XS interface has an 8k buffer to optimise throughput of printed data. This enables data to be received into the buffer while previous lines are being printed, thus maximising print speed. The buffer contents will be printed out automatically when a full line has been received (the line length being dependent on the mechanism type and the current print mode). The buffer is cleared by a CAN code or by a hardware reset. A partially full line will be printed on receipt of an appropriate control code. Alternative printing modes including graphics, are invoked by 'Escape' sequences. Each 'Escape' code sequence must be the first code in a line, i.e. it must immediately follow a valid line termination sequence (CR or LF).
ASCII codes from 20 to FF are treated as printable characters. Codes from 00 to IF Hex are reserved for control functions as follows:

| | |
|---|---|
| LF (OA Hex) | Causes printout of buffer contents in selected print mode, with automatic paper feed. If no printable characters have been received then just a paper feed results. |
| VTAB (OB Hex) | Causes a fast feeding of 30 dot line pitches. |
| CR (OD Hex) | Behaves exactly like LF. The controller responds intelligently to combinations of the LF and CR codes, providing an extra line feed only if one or both of the codes is or are, repeated. |
| CAN (18 Hex) | Abort all printing immediately, clear the print buffer and revert to cold start settings |
| ESC (lB Hex) | Causes the controller to expect the next code as a special parameter, with its bits uniquely coded as follows: |

When Bits 5 and 6 are zero:

| | | |
|---|---|---|
| Bit 0 (LSB) | 0 for text mode | 1 for data mode (inverted, reversed) printing |
| Bit 1 | 0 for characters | 1 for graphics printing |
| Bit 2 | 0 for single width | 1 for double width printing |
| Bit 3 | 0 for single height | 1 for double height printing Bit 4 0 (except for self-test, see below)*. |

*The special combination 'ESC ESC' is used to initiate a self-test sequence, which results in a printout of the character set.
The graphics bit is cleared to zero after each dot line (see section 4.2).
The print modes may be combined as required, for example double height and double width inverted printing is perfectly permissible, but modes may not be mixed on one line.
When bits 5 and 6 are set, bits 4-0 take on different functions, by encoding in binary the number of 3 dot pitches the paper is to be fed.

| | | |
|---|---|---|
| Bit 5 | 0 for no fast feed | 1 for fast feed |
| Bit 6 | Must be set to 1 | |
| Bits 4-0 | Binary count of number of steps. | |

For example, by sending 'ESC & H29' (binary 0010 1001) the controller will feed nine fast feed steps each of three dot line pitches.

## 6 CONNECTION DATA

**N.B: FIRST READ SECTION 2**

Please refer to figure 2 for connector layout

### 6.1 POWER CONNECTOR J1

These products are fitted with a 0.1" pitch square wire, right angle, friction lock connector. A suitable mating connector would be a Molex type 2695 part number 22-01-3037 and crimp terminal Molex type 40445.

| Pin | Function |
|---|---|
| 1 | 0V |
| 2 | +5V DC Power Input (Controller) |
| 3 | 3 +5V DC Power Input (Mechanism) |

### 6.2 SERIAL CONNECTOR J3

4-way 0.1" pitch polarised Molex (Mating connector type 22-01-3047 with crimp terminal type 40445)

| Pin | Function |
|---|---|
| 1 | Serial data input (Rxd) |
| 2 | Serial data output (Txd) |
| 3 | Busy output (DTR) |
| 4 | Ground (Signal common 0V) |

### 6.3 SERIAL BAUD RATE AND DATA INVERSION OPTIONS LK1 See fig. 2

3 position 0.1" pitch header.

The baud rate and default data inversion options are selected by fitting jumper links to the pins of LK1 in the positions A, B and C shown in fig.2.

Inverted (reverse) data mode is enabled by fitting a jumper to LK1 in the position A.

The different baud rates are selected by fitting or removing jumper links to LK1 in the positions shown below before applying power to the printer.

| Baud Rate | B | C |
|---|---|---|
| 1200 | Not fitted | Not fitted |
| 2400 | Fitted | Not Fitted |
| 4800 | Not fitted | Fitted |
| 9600 | Fitted | Fitted |

### 6.4 PAPER TAKE-UP DEVICE J2 Fig. 2

2-way 0.1" pitch polarised Molex (Mating connector type 22-01-3027 with crimps 40445)

Please note that this connector is only suitable for ASL paper take-up device products.

| Pin | Function |
|---|---|
| 1 | 0V (Gnd) |
| 2 | Motor Positive |

In case of difficulty, or for advice on application of the these products please contact the factory.

(9.7.93) I.C.Sherwood (Converted to electronic format 22.11.01)

## A190SB Mechanism Connector J4 Pin Connections

| Pin | Function | Pin | Function |
|---|---|---|---|
| 1 | Paper Feed Magnet | 10 | Print Solenoid E |
| 2 | Paper Feed return | 11 | Print Solenoid F |
| 3 | Reed Switch Input | 12 | Print Solenoid G |
| 4 | Reed Switch Return | 13 | Print Solenoid H |
| 5 | Motor Drive + | 14 | Print Solenoid Common (Return) |
| 6 | Motor Return | 15 | Print Solenoid Common (Return) |
| 7 | Print Solenoid B | 16 | Print Solenoid A |
| 8 | Print Solenoid C | 17 | Tacho Bias |
| 9 | Print Solenoid D | 18 | Tacho Input |

Please note that no connector is fitted for J4 as standard. The holes in the pcb will accept 0.1" pitch, 18 way, 7/0.203mm ribbon cable.

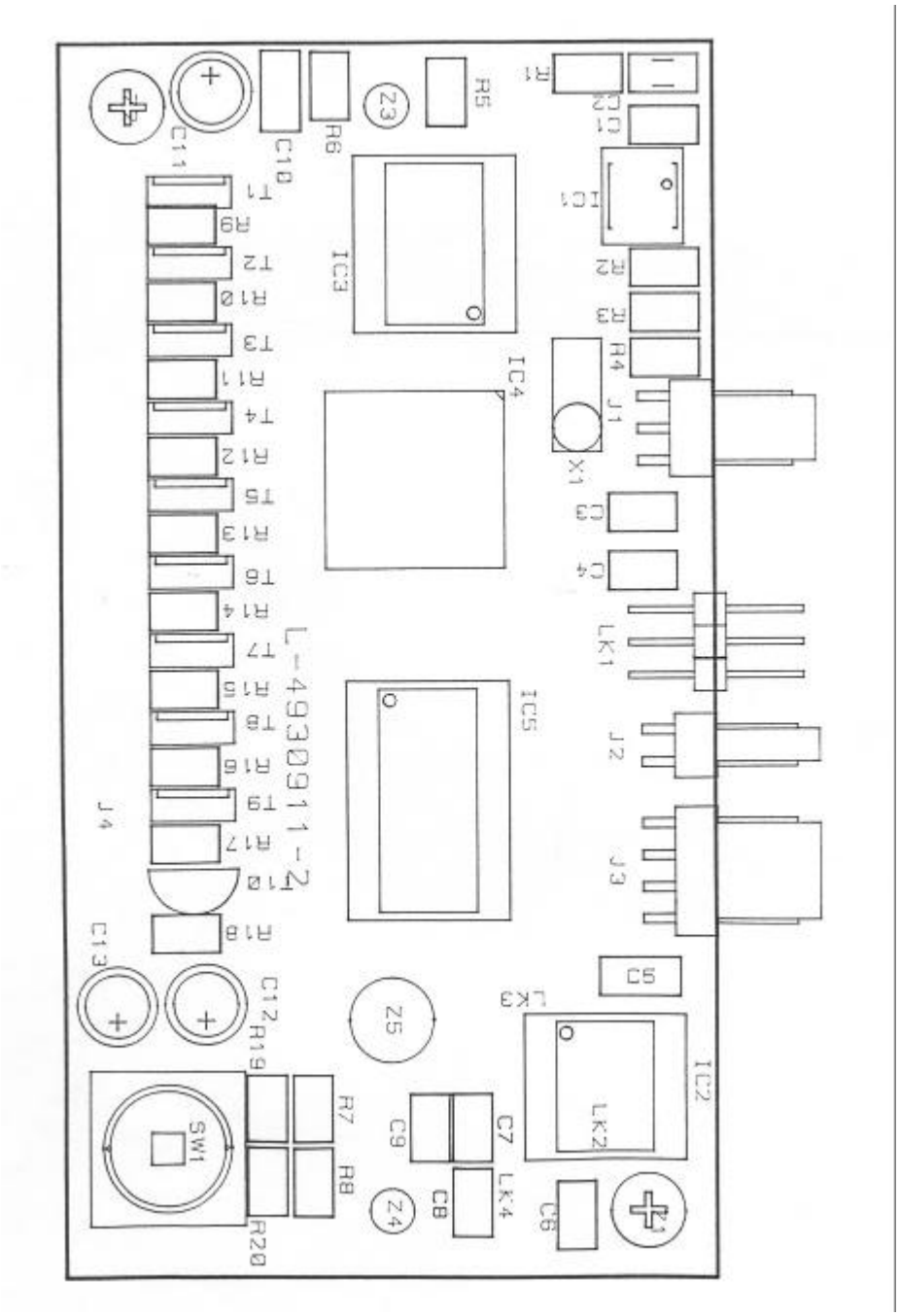

**Figure 1: Character Set**


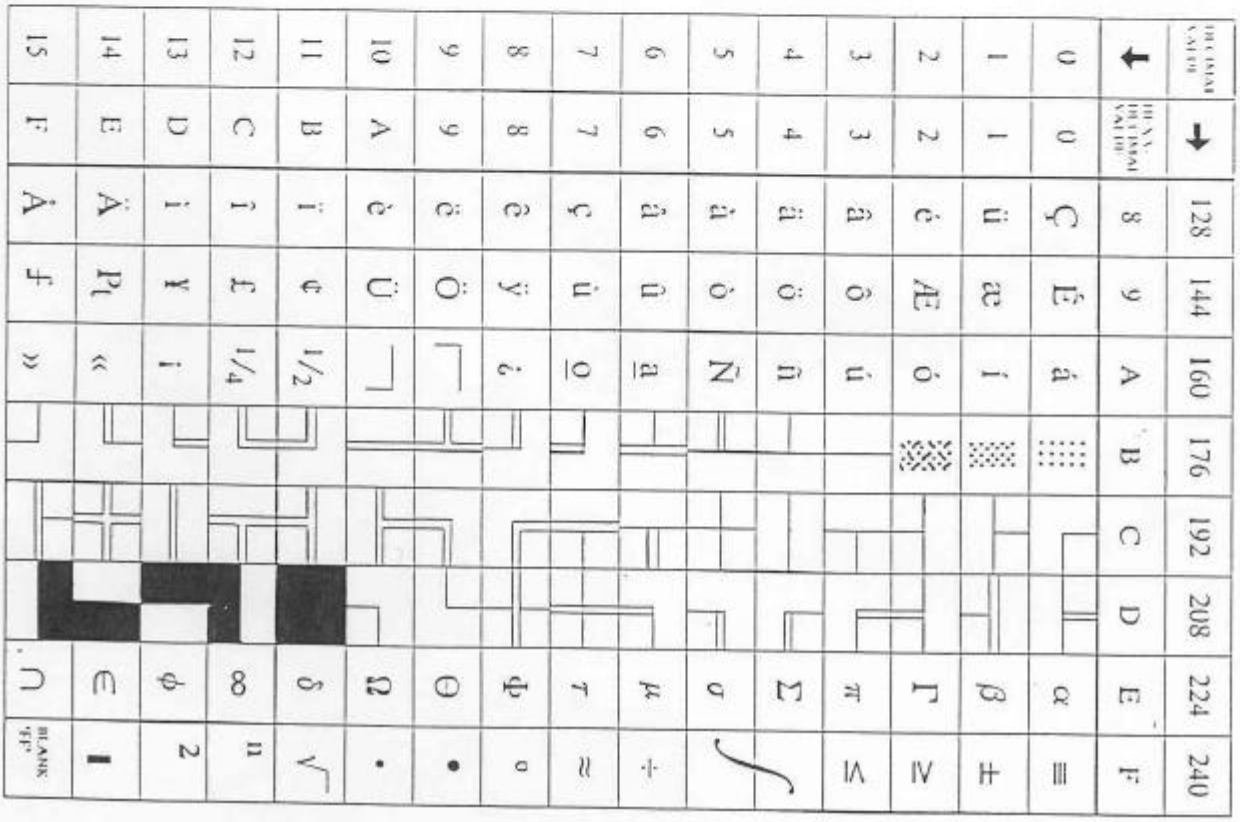

**Figure 2: Ap24XS Connections and Option Links**

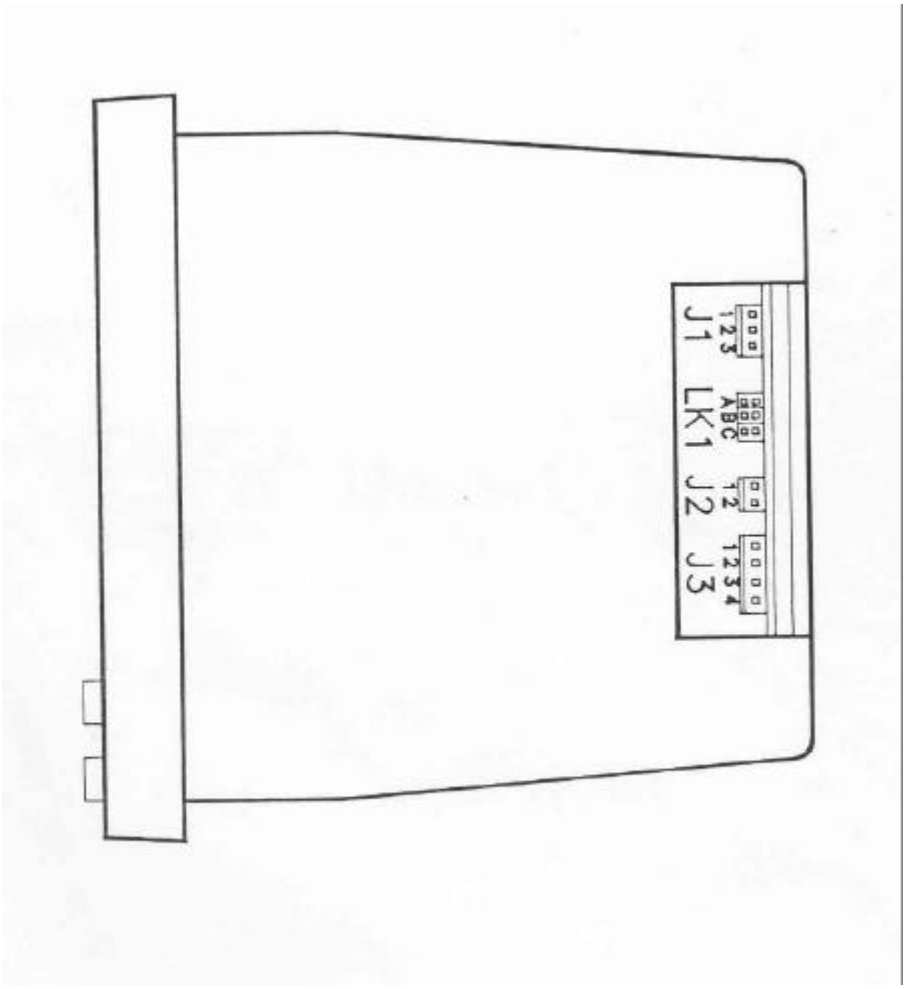

**Figure 3: Ap24 range Panel Mounting Dimensions**