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USER GUIDE

to the

ABLE SYSTEMS Ap890 and Ap892 Hand Held Impact Printer

(Incorporating A191C8 Firmware)

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1 INTRODUCTION

This document is a User Guide, written for the person connecting and using the Able Systems Ap890 or Ap892 hand held impact printer. Please read this Guide carefully before making any connection.

The Ap890 and Ap892 are part of the Ap800 Series of Hand-Held Packaged Printers and share many features of the range.

- The Ap890 includes the EPSON M190 24-column impact printer mechanism
- The Ap892 includes the EPSON M192 40-column impact printer mechanism

Throughout this User Guide the name Ap890 should be taken to refer to both the Ap890 and the Ap892 where no distinction is necessary.

The Ap890 always requires a data input from a host. The power arrangement may be:

- a battery pack (and optional charger) for mobile applications
- a direct mains powered PSU unit
- a direct vehicle adaptor for powering from a vehicle supply

The Ap890 contains the A191SC microcontroller, which is also featured in the Able Systems Ap24-XS Panel Mounted printer range. The host programming control codes are identical for these products.

1.1 COPYRIGHT NOTICE AND DISCLAIMER

Copyright subsists in all Able Systems intellectual property, including controller firmware (embedded software) and circuit diagrams, pin connection lists and application data. No warranty in respect of patent rights of Able Systems Limited or of third parties is given. Unauthorised reproduction or amendment of controller firmware may result in prosecution.

Design Registration of the Ap800 printer has been applied for.

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Able Systems do not assume responsibility for interchangeable functionality of other parties' command sets.

2 MODES OF OPERATION

The Ap890 has three operating modes:

- **"Idle Mode"**: awake and ready to accept data, but no data are in the buffer awaiting printing, and the printer motor is not running
- **"Printing Mode"**: data received into the buffer is printed out
- **"Sleep Mode"**: effectively switched off, and awaiting a press on the paper feed button, connection of the external charger, or some data from the host to exit sleep mode

Operational status is indicated by colour combinations on the front-panel LED. These can indicate charger/battery status, paper status and so on. No light is emitted in sleep mode. (See section '6.1 Standard LED Patterns' for more details).

2.1 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 by Fast Feeding paper. Power consumption is such that a fully-charged battery pack would last up to 10 hours, but the printer will normally switch from idle mode into sleep mode when there is no activity, extending battery life.

2.2 SLEEP AND WAKING MODES

The Ap890 enters sleep mode automatically after a factory-set inactivity timeout period, normally approximately 30 seconds. The printer will not go to sleep with a charger connected.

The printer may be woken by:

- pressing the paper feed button
- sending data from the host
- connecting the charger unit

To wake the printer by a data stream from the host, a certain period of logical '0' bits is required, typically a string of 50 NUL characters at 9,600 Baud is sufficient. These characters will be lost.

When the printer awakes, there is a delay of up to 100 ms before the serial output lines are fully established and the printer is ready to accept data. The printer transmits an XON character, and de-asserts the Busy output, when it has fully woken up and is ready to receive data.

When the Ap890 is used with either the direct mains powered PSU or the direct vehicle adaptor, no external charger is required. However, making a connection from a PC handshaking output (DTR or CSR) to the 'Charger' input may be used to force the Ap890 to wake and sleep under PC control.

2.3 PAPER FEED BUTTON

As the Ap890 has no external power switch, additional functions have been assigned to the paper feed button.

- In Idle Mode, the feed button advances paper at the Fast Feed rate
- In Printing Mode, the feed button is ignored
- In Sleep Mode,
 - ⇒ A single press and release of the button wakes up the printer into idle mode
 - ⇒ If the button is held for more than 3 seconds after waking, the printer produces a Self Test print which includes the firmware version and the full character set. This print continues as long as the button is pressed.

2.4 PRINTING METHOD

The Ap890 and Ap892 have the following characteristics:

Printer Type	Mech	Chars per Line	Dots Per Line	Dot Width	Dot Height	Print Speed	Fast Feed Speed
Ap890	M-190	24	144	0.33 mm	0.37 mm	2.5 Line/s	6.0 mm/s
Ap892	M-192	40	240	0.20 mm	0.37 mm	1.5 Line/s	3.6 mm/s

Characters are 5 dots wide with a 1 dot space between adjacent characters, and most are 7 dots high. A few (e.g. 'p' or 'q') contain descenders and are 8 dots high. To optimise throughput the 8th dot line is skipped if no descenders are present in a text line. Every text line is followed by a 3 dotline space. Text lines may be printed in double width, double height, or inverted.

During printing the paper is automatically fed by one dot line (0.37mm) each head cycle. The mechanism can also advance the paper by three dot lines (1.11 mm) in a single head cycle. This Fast Feeding is used between text lines, for the Fast Feed command, and when the paper feed button is pressed.

It is not possible to print partial lines in isolation: if such a line remains in the buffer, it will not be printed until flushed out by a line terminator or some following data. Any following data will be printed on the next line. The paper may only be fed through the printer in the forward direction.

The character set is the standard International IBM® character set (Code Page 437), except that it includes the Euro symbol ('€') at position 80H (128 Decimal), in place of the usual capital C with cedilla ('Ç').

2.5 DOT ADDRESSABLE GRAPHICS

Graphics patterns are built up as a succession of complete dot lines across the paper, rather like a TV picture. Complete dot lines must be specified at a time. The data for each dot line of graphics should be encoded as shown:

For the Ap890: **ESC, 01H, d₁...d₂₄** (a total of 26 bytes per dot line)
For the Ap892: **ESC, 01H, d₁...d₄₀** (a total of 42 bytes per dot line)

Bits 5 through 0 of each data byte (d₁ through d₂₄ or d₄₀) are interpreted as encoding individual dots on the paper, where 1 represents a dot, and 0 represents a space. Bits 7 and 6 are ignored.

Large areas of solid dots are not recommended, as they may cause overheating and shorten the ribbon life: try shading. Heavy graphics printing will also drain the battery more quickly.

N.B. If multiple dot lines of graphics are required to be contiguous, care must be taken to ensure that the data rate is high enough to allow continuous printing. This is because the mechanism inserts an additional dot line of space each time the motor stops and restarts. In order for this effect to be avoided the data for each dot line of graphics must be ready and waiting in the printer's buffer by the time the previous dot line has been completed.

2.6 DATA BUFFER

The Ap890 has a nominal 8k byte buffer which enables data to be received while previous lines are being printed. The state of the data buffer is reported to the host by both hardware and software handshaking.

The hardware busy line is asserted when 512 bytes of space remains; and incoming data are no longer passed to the buffer when 48 bytes remain. The hardware busy line goes ready again when 528 bytes become free.

The Ap890 transmits software handshaking codes when the buffer status changes, as follows:

XON	11H	Start transmission
Meaning: The buffer is ready to receive data. Transmitted after a reset, or when the data buffer empties to only 1/4 full.		
XOFF	13H	Stop transmission
Meaning: The buffer is not ready to receive data. Transmitted when the data buffer becomes 3/4 full.		

N.B. An XON character is transmitted when the printer has woken up and is ready to receive data, but no XOFF character is transmitted prior to the Ap890 entering sleep mode.

2.7 SERIAL INTERFACE

The default serial interface format is 9,600 baud, 8 data bits, 1 or 2 stop bits, and no parity. Other formats can be programmed into the Ap890 at the factory.

Serial data is expected on Rx in RS-232C format with -12V meaning 'mark' or logical '1', and +12V meaning 'space' or logical '0', with reference to the common ground. The serial data output line, Tx, transmits XON/XOFF to the host at the same baud rate and format as the serial data input. The hardware busy line, Busy, is true (nominally -12V) when busy. Both serial output lines will relax to approximately 0V when the Ap890 is in sleep mode, and the user must allow a short period after awakening before relying on the values of these signals.

Some host equipment use a constant space condition (+12V) to indicate a reset condition or wait state. Some battery powered host equipment present the same output signal when they go to sleep. By default the Ap890 will ignore this condition, but this type of host behaviour may result in one or more spurious characters being received by the Ap890, or the Ap890 may be prevented from going to sleep.

3 CONTROL CODE TABLES

Codes from 20H to FFH are printable characters. Codes from 00H to 1FH which are not listed below are ignored. Codes forming part of an ESC sequence are exceptions to these rules and may be any value.

All control codes, except the 'CAN' code, are executed when they fall through the data buffer at printing time.

3.1 CODES RECEIVED BY THE Ap890

LF	0AH	Line Feed (Line Terminator)
Works in an either/or way with CR: CR/LF pairs are treated as a single line terminator. Line terminators immediately following full print lines are ignored.		

VTAB	0BH	Vertical TAB
Exactly equivalent to the command ESC,2AH. Fast feed of 30 (10x3) dot line pitches.		

CR	0DH	Carriage Return (Line Terminator)
Works in an either/or way with LF. CR/LF pairs are treated as a single line terminator.		

CAN	18H	(Real time) Abort printing and Reset
Executed immediately when received. Printing may be interrupted part way through a line. All Print Mode settings are cleared. The Ap890-B is actually RESET when the CAN code is received, so any data sent immediately following the CAN code will be lost. The printer transmits an XON character when it is ready to receive data again.		

ESC,n	1BH,n	Self Test, Fast Feed, Graphics and Print Mode Selection
<p>N.B. All ESC sequences should appear at the start of a logical line. If one is received within a normal printable line a line terminator will automatically be inserted before it.</p> <p>If n is an ESC character (1BH): [Self Test Print] A self test print is produced. This consists of a line reporting the Firmware Version number, and a single dump of the entire character set.</p> <p>Otherwise, if bit 5 of n is set: [Fast Feed Command] The least significant 5 bits of n (bits 4 through 0) are used as a binary count for a fast feed operation, encoding the number of 3 dot pitches the paper to be fed.</p> <p>Otherwise, if bit 1 of n is set: [Dot Addressable Graphics Mode] The following 24 or 40 bytes are interpreted as graphics patterns. See section '2.5 Dot Addressable Graphics' for details.</p> <p>Otherwise: [Print Mode Selection] n is interpreted as follows: Bit 0 Select(1) or Clear(0) Inverted Print Mode Bit 1 Must be zero Bit 2 Select(1) or Clear(0) Double Width Mode Bit 3 Select(1) or Clear(0) Double Height Mode Bit 4 Ignored Bit 5 Must be zero Bit 6 Ignored Bit 7 Ignored</p> <p>Print Modes may be combined as required, but affect entire print lines. It is not possible, for example, to mix Double Width and Normal Width text on the same print line. Each of these Print Modes remains in force until actively cancelled, or the printer enters sleep mode.</p>		

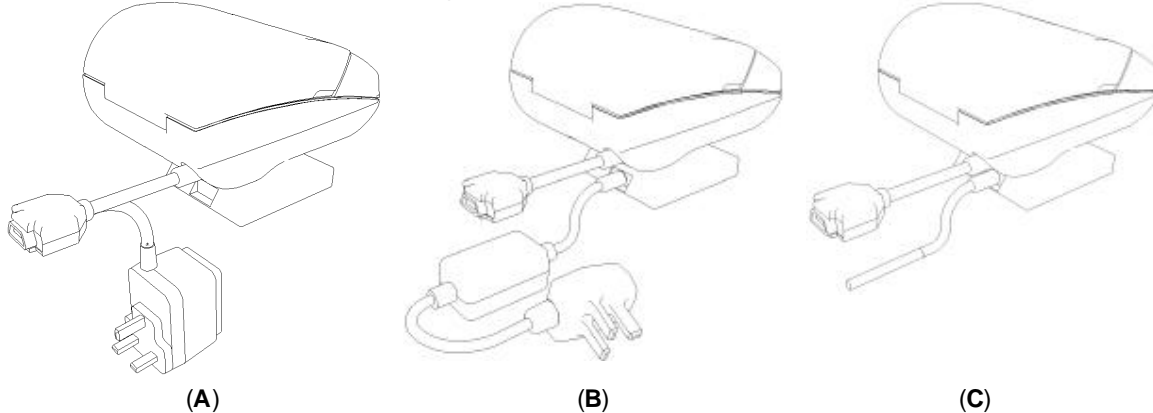
4 BATTERY PACKS AND POWER SUPPLIES

4.1 OVERVIEW OF POWER PACK OPTIONS

The options for powering the Ap890 may be summarised as follows:

- A. a battery pack, (see section '4.5 Battery Pack Types And Capacity'), with optional external charger (see section '7.3 Battery Charger Details'), and optional cable (see section '7.2 Combined Data/Charger Adaptor Cables')
- B. a direct mains powered PSU (Universal mains input with 3-pin IEC mains socket) (ASL Product Code AP800-PSA)
- C. a direct vehicle adaptor suitable for direct connection to a vehicle supply (ASL Product Code AP800-DCC)

In each case the Ap890 requires data input from a host, as illustrated in the sketches below:



All three options are housed in the same type of replaceable pack, which clips into the underside of the printer and can be changed in a few seconds by the user. In each case, the primary power for the printer comes from this replaceable pack.

When used with a battery pack (option A), the printer can operate with, or without, an external charger connected. If required, the charger can be operated continuously to keep the battery fully charged, although a high printing duty cycle may reduce the charge in the battery.

N.B. Operation from the charger alone is not possible: a battery pack must always be fitted.

Battery packs are normally supplied discharged for safety reasons.

When the Ap890 is used with the direct mains powered PSU (option B), or the direct vehicle adaptor (option C), an external charger is not required. However, making a connection to the 'Charger' input will not damage the printer, and may be used to force the Ap890 to wake and sleep as required.

4.2 REMOVING AND REPLACING THE POWER PACK



WARNING! Refer to section '4.3 Battery Pack Handling Precautions'.

To Remove the pack from the printer:

- Lift the rear edge (marked by three moulded bars) and overcome the "click" detent. This may be quite stiff with a new printer and pack.
- Slide the pack towards the rear of the printer, and lift it out.

To Replace the pack:

- The pack will only fit one way. First insert the edge with the gold metallic contacts, and then tilt the rear (sloping) edge downwards so that the pack enters the printer recess in a sliding motion. Press the pack into the printer until a distinct "click" is felt.
- After replacement of the pack, the printer will be in sleep mode.

Section Continues...

CAUTION: Take care not to damage the exposed metal contacts within the printer while changing the the power pack. Do not touch these metal contacts, or the gold contacts on the power pack, as this may impair operation.

4.3 BATTERY PACK HANDLING PRECAUTIONS



WARNING! Battery Handling Precautions

The battery contacts are recessed, and the pack is fitted with an internal safety fuse, but the user must take care to avoid short-circuiting the contacts, by preventing them from touching any metallic object. For example, the battery pack should never be carried loose in a pocket where it could rub against coins, keys or other metallic objects.

Short-circuiting the contacts of the battery pack will cause a heavy current to flow, which may lead to excessive heating of the battery pack or any metallic objects connected to it. This could cause burns, or start a fire.



WARNING! Do Not Try To Open The Battery Pack

The standard battery pack contains five Nickel-Cadmium Cells. Cadmium is a potentially toxic heavy metal, and exposing the cells increases the risk of leakage or short-circuiting.

CAUTION: It is strongly recommended that the external charger is disconnected whenever the battery pack is removed or replaced.

4.4 BATTERY PACK ENVIRONMENTAL CONCERNS

Please observe local standards for the handling, transport and disposal of Nickel-Cadmium Cells. Regulations prohibit the disposal of Nickel-Cadmium Cells in certain countries. Complete battery packs may be returned, at the user's risk and expense, to Able Systems for ecological recycling. Consult the factory for details.

4.5 BATTERY PACK TYPES AND CAPACITY

Two types of battery pack are currently available for use with the Ap890. These are:

- 950 mAh NiCd (ASL Product Code AP800BP-01)
- 1300 mAh NiMH (ASL Product Code AP800-MHBP)

The standard Ap890 is normally supplied with a single NiCd battery pack.

The capacity of a fully charged NiCd pack will normally be sufficient to print normal text along about two full rolls of paper. However, the amount of printing which can be achieved depends greatly on the printing density, idle time and other factors such as the ambient temperature and the history of the battery pack. The NiMH pack capacity may be found to be greater in some applications, but the lifetime will normally be shorter.

With the printer awake but idle, a fully charged battery would last for up to 10 hours, but the built-in sleep mode shuts down the printer completely, reducing energy consumption to a negligible rate.

In the event of the battery becoming exhausted, the printer will automatically protect its own control circuitry by entering sleep mode if the instantaneous battery voltage drops below a threshold (e.g. during a particularly heavy section of print). In this case data stored in the buffer is lost.

4.6 BATTERY PACK RECHARGING

The battery pack can be recharged while installed in the Ap890. A flat battery can normally be completely recharged in about 15 hours at the normal rate. See section '7.3 Battery Charger Details'. If it is not convenient to recharge the pack within the printer, it may be exchanged for a fully-charged pack (see section '4.2 Removing And Replacing The Power Pack'). The discharged pack can then be recharged in the printer at another time. A separate charging unit will be available, so that multiple packs can be recharged while the printer remains in use.

Section Continues...

The battery pack should be capable of between 500 and 1000 complete charge and discharge cycles, though this may be reduced in very repetitive applications. If a particular battery pack appears not to be holding charge as well as expected, it may be worn out and should be replaced by a new one. Please consult the factory for further details and recommended battery treatment.

During battery charging, the printer may become quite warm. This can crease the paper within the mechanism. The system designer may wish to feed out some paper before printing begins, either controlled from the host, or by the user pressing the paper feed button.

5 PAPER AND RIBBONS

The Ap890 is normally supplied with a separate paper roll and fitted with a purple ribbon.

Paper rolls must be 57.5 ±0.5mm, and of maximum diameter 60mm.

Spare paper rolls are available (ASL Product Code A160PR).
Spare purple ribbons are available (ASL Product Code A160IRCP).

Black ribbons, alternative paper roll sizes, alternative paper roll types (e.g. two-part paper, 'action' paper, etc) and commodity packs, containing several standard paper rolls and ribbons, are all available. Contact ASL for details.

5.1 LOADING PAPER

A paper roll is normally supplied separately to avoid unrolling or damage in transit.

To load a new roll of paper:

- Discard a few turns of paper in case they have been damaged or have glue on
- Mount the roll between the bosses in the paper holder area: the right-hand boss is on a sprung support. The paper should flow from the bottom of the roll
- Prepare the end of the paper into a clean edge at right-angles, and introduce into the rear of the mechanism while pressing the paper feed button: the target point is just above a bright metal strip. The paper should be straight, and pointing forwards into the printer
- Once the mechanism grips the paper, allow enough to feed through for good alignment, thread the paper through the exit slot and close the lid.
- Check that it still advances properly, and tear off any excess by pulling the paper sharply towards you across the serrated edges.

5.2 PAPER LOW SENSOR

A mechanical/optical paper sensor acts on the left-hand face of the paper roll, and is activated when only a few metres of paper remain. When this sensor becomes active, the LED flashes orange (see section '6.1 Standard LED Patterns').

To avoid spurious 'paper low' reports, ensure that the roll is correctly located on the bosses, and that the right-hand paper support has returned to the vertical position. A foam pad is fitted behind the right-hand support on some models to maintain the correct pressure.

The standard paper rolls normally supplied by Able Systems have a red marking towards the end of the roll, providing a further indication that the roll is nearly exhausted.

5.3 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, you need to take special care not to pull the paper out of the printer in a reverse direction.

CAUTION: Do not pull paper in the reverse direction out of the printer. This can cause permanent damage to the mechanism.

When it is necessary to remove the paper from the mechanism, for example when replacing the paper before the end of a roll, or to clear a paper jam, proceed as follows:

- Tear off any paper coming out of the paper exit slot
- Open the printer cover, and carefully remove the paper roll, allowing it to unroll as you do so
- Cut the paper straight across between the roll and the mechanism
- Using the paper feed button, advance the remaining paper until it is completely out of the mechanism; or, if the mechanism and paper are jammed, carefully pull the paper by hand in the normal feeding direction, taking care not to tear the paper or apply excessive force to any part of the mechanism
- Press the paper feed button to exercise the printer for a few cycles and ensure that it is running freely
- Load a new roll of paper as described above

5.4 CHANGING THE INK RIBBON CARTRIDGE

The ink ribbon cartridge can be removed and refitted either with or without paper in the mechanism. The exposed part of the ink ribbon must lie between the front side of the paper (facing the operator) and the mechanism. To change the ink ribbon cartridge:

- Open the printer cover, and snap out the old cartridge by pressing down on the right-hand end (marked "PUSH"). Carefully lift the cartridge so that the ribbon comes away from between the paper (if fitted) and the mechanism
- Check that the exposed part of the ribbon spans the new cartridge tightly; if not, wind it up using the small knurled knob
- Fit the new cartridge, ensuring that the ink ribbon lies neatly between the mechanism and the paper. If the paper is already in place, it will be necessary to thread the paper through the loop of the ribbon
- Press the paper feed button to advance some paper and check that the paper and ribbon are moving freely. Allow enough to feed the paper through the exit slot, and close the lid. Tear off any excess by pulling the paper sharply towards you across the serrated edges.
- If possible, perform a test print to ensure that all is well (see section '2.3 Paper Feed Button').

6 LED INDICATIONS

The LED indicator at the front of the Ap890 provides status information by a number of colour combinations.

6.1 STANDARD LED PATTERNS

The standard Ap890 is optimised for use with a battery pack, and indicates when the printer is operating from its power pack without a charger connected.

Generally, in the standard pattern set, if the LED is flashing on and off, it indicates that the Ap890 is running from its power pack; steady illumination means that the battery is charging. Green confirms that all is normal; orange advises that the paper is low; red warns of a low battery voltage. No light indicates that the unit is in sleep mode, has a flat battery, or has no power pack fitted.

Section Continues...

The standard LED patterns are as follows:

Pattern	Battery	Paper
Steady Green	Charging	OK
Flashing Green/Orange	Charging	Low
Flashing Green	Running	OK
Flashing Orange	Running	Low
Flashing Red	Low	N/A
No light	Flat, or in sleep mode	N/A

6.2 ALTERNATIVE LED PATTERN SET

The Ap890 is also available with an alternative LED pattern set optimised for use with a direct power pack. This case can be thought of as the standard set with the Charger always present, and can be summarised as follows:

Pattern	Power Pack	Paper
Steady Green	Running	OK
Flashing Green/Orange	Running	Low
Flashing Red	Low Voltage	N/A
No light	Sleep mode	N/A

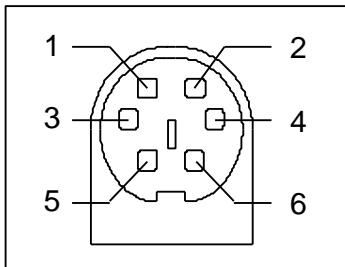
Contact ASL for more details of alternative LED Pattern Sets.

7 CONNECTIONS AND EMC PRECAUTIONS

7.1 CONNECTOR DETAILS

A single socket on the rear of the printer combines all data and charger functions.

Printer side: Hosiden TCS7167 6-way Socket (mini-DIN style)
 User side: Hosiden TCP7160 6-way Plug & Cable or equivalent



Pin	Function	AP800-BOC Colour (typical*)
1	Tx Data Output	Red
2	BUSY Output	White
3	Rx Data Input	Black
4	No Connection	Yellow
5	Ground (0V)	Blue
6	Charger (+12V)	Green
Screen	Frame Ground	Screen (separately sheathed, may be coloured)

Connector viewed from rear of printer. *Cable colours may vary, and the user should verify by measurement.

7.2 COMBINED DATA/CHARGER ADAPTOR CABLES

Various cables with the Hosiden plug pre-fitted at one end are available. The other end of each type of cable has the following termination:

- unterminated OEM cable (ASL Product Code AP800-BOC)
- D-25 data socket and charger jack socket (ASL Product Code AP800-BDC)
- D-9 data socket and charger jack socket (ASL Product Code AP800-9W-BDC)

The AP800-BDC and AP800-9W-BDC are intended for direct connection to PC COM: ports, and direct connection with the battery chargers detailed in section '7.3 Battery Charger Details'.

Section Continues...

Both the AP800-BDC and AP800-9W-BDC cables feature a co-axial charger socket as follows:

Pin	Dimension (mm)	Function	Ap890 Pin
Inner	Inside Ø 2.1	Positive /Charger (+12V)	6
Outer	Outside Ø 5.5	Negative/Common (0V)	5

The AP800-BDC features a D-25 Female socket with the following pinout:

D-25 Pin	Name	Function (refers to PC)	Ap890 Pin
1	FGND	Frame Ground	Screen
2	TxD	Serial Data Output	3
3	RxD	Serial Data Input	1
5 & 6	CTS & DSR	Busy Input	2
7	SGND	Signal Common 0V	5

The AP800-9W-BDC features a D-9 Female socket with the following pinout:

D-9 Pin	Name	Function (refers to PC)	Ap890 Pin
Shell	FGND	Frame Ground	Screen
3	TxD	Serial Data Output	3
2	RxD	Serial Data Input	1
6 & 8	CTS & DSR	Busy Input	2
5	SGND	Signal Common 0V	5

7.3 BATTERY CHARGER DETAILS

The following mains powered battery chargers are available:

- UK plug style (ASL Product Code BC801B)
- Euro plug style (ASL Product Code BC801E)
- USA plug style (ASL Product Code BC801A)

These chargers are intended for use with the AP800-BDC or AP800-9W-BDC combined adaptor cables (see section '7.2 Combined Data/Charger Adaptor Cables ').

Alternatively, the user may make their own charger arrangements. The recommended battery charger supply voltage is +12 V DC to +15 V DC, at 200 mA.

Lower or higher input voltages will reduce the battery recharging rate:

- below about 11 V, the battery may not recharge at all;
- above about 16 V, heat dissipated in the regulator may switch off the higher recharge rate and even prevent recharging altogether.

The charge current is internally regulated by the Ap890 so that a battery pack will completely charge in about 15 hours, but may be continuously 'trickle-charged' if required.

N.B. The Ap890, when used with a battery pack, is not designed to be charged directly from a vehicle starter battery.

7.4 EMC STATEMENT

The Ap890 is fully EMC (Electro-Magnetic Compatibility) compliant and is CE marked accordingly. A Declaration of Conformity, in accordance with the EMC Directive 89/336/EEC (and as amended) is available from Able Systems on request.

7.5 EMC CAUTION

System EMC compliance remains the responsibility of the system designer. It is recommended that screened cables are used; earthing arrangements will depend on the application. Further advice is available from Able Systems on request.

8 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 information may help if you find you need some assistance. These are only suggestions, and may not work with all PC's.

8.1 CONNECTING TO A PC – A CHECKLIST

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

Check that the printer wakes up when the paper feed button is pressed, and that it produces a Self Test print (see section '2.3 Paper Feed Button'). Remember that battery packs are normally supplied discharged, and should be charged for at least 15 hours before use.

- 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

You can use either of the two serial ports for the Ap890, whichever is free. COM2: is assumed in what follows, as most likely to be available.

Use either a standard cable from Able Systems (see section '7.2 Combined Data/Charger Adaptor Cables'), or make up your own using the information in section '7.1 Connector'.

- Now you will need to **SET UP YOUR COMPUTER'S SERIAL PORT** to match the printer. Your proposed application program may have a way of doing this, or you can get to the DOS prompt [eg **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, **No** parity, **8** data bits, and **2** stop bits which is the default setting for the Ap890.

- 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**, for example:

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

Alternatively, in Windows, use the **TERMINAL** program to send some text to the printer.

8.2 WINDOWS™ PRINTER DRIVERS

At present, no Windows driver specifically written for the Ap890 is available. However, the built-in Windows "Generic/Text-Only" printer driver should work in a limited manner.

8.3 YOUR APPLICATION PROGRAM

Once communications between your computer and the printer have been established, you can try driving the printer from your application program. (Refer to Section '3 Control Code Tables').

8.4 ON-LINE INFORMATION

Able Systems' web site "<http://www.able-systems.com>" includes application data updates, product announcements, and e-mail facilities for customer support.

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.