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USER GUIDE

to the

Ap863

Thermal Printer

(Including Operator Guide)

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2 INTRODUCTION

This document is a User Guide, written for the person connecting and using the Able Systems Ap863 thermal printer. Please read this Guide carefully before making any connection. Appended to this document is an Operator Guide, which is suitable for copying and presenting to end-users.

A separate Programmer Guide provides details of the control codes, and describes the internal operation of this product.

The Ap863 is part of the Ap800 Series of electronic printers and shares many features of the range.

2.1 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.

During 2002 the Ap863-F will be improved to include a flash-reprogrammable microcontroller. This will give the added benefit of allowing firmware upgrades under customer control. Refer to the factory for more information.

2.2 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 Ap863 printer has been applied for.

EPSON is a registered mark of its owner Seiko Epson Corporation. References to this or other owners' marks in this document are for illustrative purposes only.

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

2.3 DOCUMENTATION REVISION HISTORY

Title (and Revision Number)	Issue Date	Comments
User Guide to the Ap863	09 Aug 2001	Original release
User Guide to the Ap863 (Rev 2)	15 Oct 2001	Corrected images of power packs in section 4.1
User Guide to the Ap863 (Rev 3.0)	01 May 2002	Added this Revision History Added flash firmware information in section 2 Added Accessory summary information in section 2 Added OEM power pack in section 4
User Guide to the Ap863 (Rev 3.1)	09 July 2002	Added TTL interface version in section 7 Other minor layout changes

2.4 ACCESSORIES AND OPTIONS

The following table details full Able Systems part codes for products related to the Ap863 printer:

	ASL Product Code	Description
Printers	07-AP863	Standard RS-232 serial printer
	07-AP863-TTL	As above, with TTL serial interface
Paper	04-A05848TPR1	Thermal Paper Roll (48 mm dia, 25 m long approx)
	04-A05860TPR1	Thermal Paper Roll (60 mm dia, 45 m long approx)
Power Packs	07-AP800BP-01	Battery Pack (950 mAH NiCd)
	07-AP800-MHBP	Battery Pack (1300 mAH NiMH)
	07-AP800-PSA	Universal mains PSU adaptor
	07-AP800DC-DC	12V Vehicle PSU adaptor
	07-AP800-OEMPSA	Unterminated OEM 5-7.5V DC adaptor pack
Chargers	07-BC801B	UK plug style charger (for use with battery pack only)
	07-BC801E	Euro plug style charger (for use with battery pack only)
	07-BC801A	USA plug style charger (for use with battery pack only)
Cables and Adaptors	07-AP800-BOC	Unterminated OEM cable for data and charger input
	07-AP800-BDC	Combined data and charger cable with D-25 for direct PC connection
	07-AP800-9W-BDC	Combined data and charger cable with D-9 for direct PC connection
		Parallel data convertor cable for direct PC connection
		IrDA convertor cable for direct PC connection

3 MODES OF OPERATION

The Ap863 has three operating modes, when not actually printing:

- "Idle Mode": ready to accept data, but no data are in the buffer awaiting printing, and the printer motor is not running;
- "Sleep Mode": effectively switched off and awaiting either a press on the paper feed button, connection of the external charger, or some external data to exit sleep mode and enter idle mode;
- "Spooling Mode": active, but storing data for later printing.

Modes are indicated by different colour combinations on the front-panel LED (see section 6). No light is emitted in sleep mode.

No hardware power switch is fitted, as power control is either automatic or by command from the host computer. To save power, the printer enters sleep mode after a period of inactivity, factory-set to 30 seconds, but programmable from the host. It can also be programmed to stay idle indefinitely or to go to sleep on command.

3.1 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 in the normal way, and can also produce a demonstration print (see below). 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.

3.2 SLEEP MODE

In sleep mode, power consumption is negligible, but data stored in the buffer are lost. Special routines allow for data to be printed out automatically before going to sleep. User programmable settings such as Baud rate and operational preferences are, however, retained during sleep mode or battery replacement. The system designer can maximise battery life by arranging that the printer is generally in sleep mode, except when printing or sending status data.

The printer enters sleep mode as follows:

- by command from the host;
- at the end of the (programmable) period of inactivity.

But, the Ap863 will never enter sleep mode when:

- a charger is connected;
- in spooling mode (see below);

The printer is woken up from sleep mode as follows:

- 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. These data will be lost. There is a delay of up to 100 ms before the serial output lines are established and the printer is ready to accept data;
- by pressing and releasing the paper feed button;
- by connecting the external battery charger.

When the Ap863 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 Ap863 to wake and sleep under PC control.

3.3 SPOOLING MODE

In spooling mode, data is 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, or a jam cleared, and the buffer contains data.

The buffer will automatically enter spooling mode by a paper low condition (this is selectable); it can also 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. Power consumption in spooling mode is similar to that in idle mode.

3.4 CONTINUOUS OPERATION

The Ap863 has an intelligent regulator to control battery charging from an external +12 V DC charger. Please see Section 8.3 for the charger specification, or Section 4 for an overview of the available Power Pack Options.

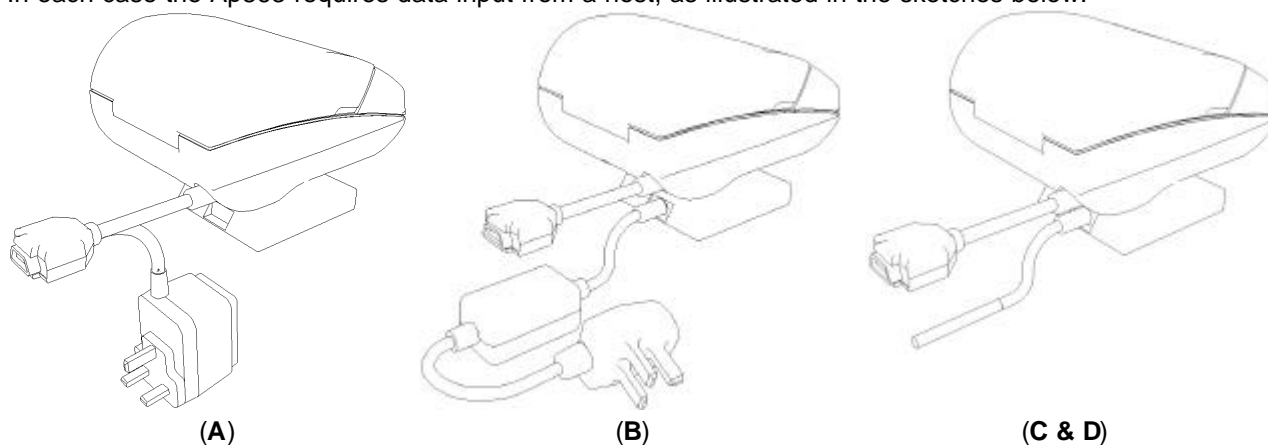
4 BATTERY PACKS AND POWER SUPPLIES

4.1 OVERVIEW OF POWER PACK OPTIONS

The options for powering the Ap863 may be summarised as follows:

- A. a battery pack, (see section '4.5 Battery Pack Types And Capacity'), with optional external charger (see section '8.3 Battery Charger Details'), and optional cable (see section '8.2 Combined Data/Charger Adaptor Cables)
- B. a mains powered PSU (Universal mains input with 2-pin IEC mains socket) (ASL Product Code AP800-PSA)
- C. a vehicle adaptor suitable for direct connection to a vehicle supply (see section '4.7 Direct Vehicle Adaptor Power Pack') (ASL Product Code AP800DC-DC)
- D. an OEM 5-7.5V DC adaptor pack (see section '4.8 OEM 5-7.5V DC Adaptor pack')

In each case the Ap863 requires data input from a host, as illustrated in the sketches below:



All four 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 Ap863 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 Ap863 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.

CAUTION: Take care not to damage the exposed metal contacts within the printer while changing 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 Ap863. These are:

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

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 Ap863. A flat battery can normally be completely recharged in about 15 hours at the normal rate. (See section '8.3 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.

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.

4.7 VEHICLE ADAPTOR POWER PACK

The Direct Vehicle Adaptor Power Pack is designed to be operated from a standard +12V (Negative Earth) vehicle power source. It must be connected on a cable loom which is capable of supplying 10A and have a 10A in-line fuse in the positive connection.

Electrical Specification

Input Voltage Range:	+11v to +18v	(with over-voltage spike protection)
Supply Current Requirement: (typical)	2mA 100mA 3A average 10A peak	(Printer in Sleep Mode) (Printer in Idle Mode) (Printer Printing) (Printer Printing)

N.B. The average and peak current requirements can be adjusted by firmware control codes. See the Programmer Guide or contact Able Systems for details.

Printer Side Connector: Molex Mini-Fit Junior Series 2 way
Part Number: 39-01-2021
Fitted with Molex Crimp Terminal
Part Number 39-00-0041

User Side Connector: Molex Mini-Fit Junior Series 2way
Part Number: 39-01-2020
Recommended Molex Crimp Terminal (for the above connector)
Part Number: 39-00-0039 (2 off required)

4.8 OEM 5-7.5V DC ADAPTOR PACK

The Direct 'Raw DC' Input Power Pack is designed to be operated from a 5V to 7.5V voltage source which is capable of supplying the primary power for the printer. It must be connected on a cable loom which is capable of supplying 10A and have a 10A in-line fuse in the positive connection.

Electrical Specification

Input Voltage Range:	+5.0V to +7.5V	(without any over-voltage or reversal protection)
Supply Current Requirement: (typical)	2mA 100mA 3A average 10A peak	(Printer in Sleep Mode) (Printer in Idle Mode) (Printer Printing) (Printer Printing)

N.B. The average and peak current requirements can be adjusted by firmware control codes. See the Programmer Guide or contact Able Systems for details.

Printer Side Connector: This product has a cable with pre-stripped and tinned ends ready for connection to the host PSU.

5 PAPER

Pressing the paper feed button when the printer is idle advances paper at up to 50 mm per second, depending on the battery voltage. 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);
- in sleep mode, wakes up the printer into idle mode;

"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.

5.1 LOADING PAPER

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

Paper rolls must be 57.5 ± 0.5 mm wide, 60 mm maximum diameter and have the thermally sensitive coating on the outside.

Suitable rolls are available as ASL Product Codes:

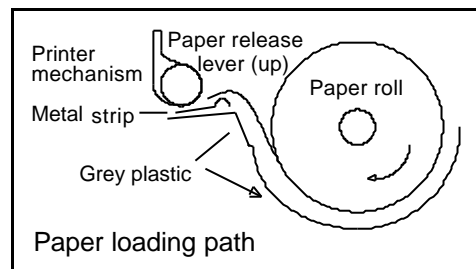
04-A05848TPR1 Thermal Paper Roll (48 mm dia, 25 m long approx)

04-A05860TPR1 Thermal Paper Roll (60 mm dia, 45 m long approx)

Discard a few turns 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 must flow from the bottom of the roll.

Auto-loading paper

In the Ap863, there should be no need to raise the paper release lever when loading paper. Switch on the printer by pressing the paper feed button once. Prepare the end of the paper into a clean edge at right-angles, and introduce it into the rear of the mechanism, between the rubber roller and the metal strip, and press gently so that the mechanism grips the paper and feeds it through. There is an optical sensor which "sees" the paper and will drive the motor for a predetermined time. If the paper fails to grip and advance the paper, withdraw the paper and try again. When it reappears above the rubber, press the paper feed button, and allow enough to feed through for good alignment, thread the paper through the exit slot and close the lid.



Check that the paper still advances properly, and tear off any excess by pulling the paper sharply towards you across the serrated edges. In the event of a jam or other paper loading problem, raise the paper release lever (as shown in the diagram) and carefully withdraw the paper, checking that no scraps have been left in the mechanism. Discard any damaged paper from the end of the roll, lower the paper release lever, and try again.

If for some reason the auto-loading feature fails to operate, either press the paper feed button while introducing the paper to the mechanism, or (for example, if the paper must be changed when the battery is flat) raise the paper release lever, and feed the paper through the mechanism by hand.

5.2 PAPER OUT AND PAPER LOW SENSORS

A reflective optical paper sensor within the mechanism of the Ap863 printer detects the presence of paper, and is used to enable auto-loading as above. It can also be used to identify an out-of-paper (as opposed to paper low) condition, and/or to sense black marks to register with pre-printed forms.

A mechanical/optical paper sensor acts on the left-hand face of the paper roll, and switches when a few metres of paper remain. 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.

Either or both of these paper sensors may be set up under software control to report these conditions by serial data to the host or changes in the LED colour patterns. Please refer to the Programmers' Guide for details of how to set up the Ap863 for these functions.

The Ap863 can be programmed to enter spooling mode if the paper runs low (see Section 7.2 of this Guide). To exit the spooling mode and print out any stored data, double-click the paper feed button (see above). Please refer to the Programmers' Guide for details of how to set up the Ap863 for these functions.

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: Always raise the paper release lever (a bright green lever at the right hand side of the mechanism) before removing paper. Do not pull the paper in either direction without first raising the lever, or you may cause permanent damage.

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 lift the bright green paper release lever
- Carefully pull the paper back out of the mechanism
- Load a new roll of paper as described above
- Double-clicking the paper feed button will print out any stored data, if the printer was in spooling mode. Refer to Section 7.2.

6 LED INDICATIONS

The LED indicator at the front of the Ap863 has a number of colour combinations, which repeat in up to a 4-phase pattern to provide status information (see tables below).

Generally, if the LED is flashing on and off, it indicates that the Ap863 is running from its battery pack; steady illumination means that the battery is charging. Green confirms that all is normal; orange advises that the paper is low or the printer is in spooling mode; red warns of a low battery.

For USA/Medical applications, the red indication is inappropriate, and a modified LED pattern is implemented. This does not distinguish the spooling mode, and has fewer colour combinations.

No light indicates that the unit is in sleep mode, has a flat battery, or has no battery fitted.

LED Pattern Table, European/Standard Version

Pattern				Battery	Paper	Buffer Mode
Green				Charging	OK	Normal
Green	Orange	Green	Orange	Charging	Low	Normal
Orange				Charging	*	Spooling
Green	Off	Green	Off	Running	OK	Normal
Green	Off	Orange	Off	Running	Low	Normal
Orange	Off	Orange	Off	Running	*	Spooling
Red	Off	Red	Off	Low	OK	Normal
Red	Off	Orange	Off	Low	Low, or	Spooling
No light				Flat, or in sleep mode		

* (Spooling may have resulted from paper becoming low. Refer to Section 7.2)

Although this table may seem complicated, few applications will actually produce many of the combinations.

LED Pattern Table, USA/Medical Version

Pattern		Battery	Paper
Green (continuously 'on')		Charging	OK
Green (long 'on' period)	Off	Running	OK
Green	Off (long 'off' period)	Low	OK
Orange (continuously 'on')		Charging	Low
Orange (long 'on' period)	Off	Running	Low
Orange	Off (long 'off' period)	Low	Low
No light		Flat, or in sleep mode	

Other LED Patterns

Other LED patterns may be programmed into the Ap863 on request or by the system designer. Please refer to the Programmers' Guide for details of how to set up the Ap863 for these functions.

7 PRINTER OPERATION AND PROGRAMMING

The Ap863 has an EPSON M-T102 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 battery voltage and the head temperature.

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.

7.1 DATA BUFFER

The Ap863 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 may be cleared by 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 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 low, or completely out. This makes it easier to change the roll without losing data (refer to Section 5).

In spooling mode, the buffered data are stored without being printed until the mode is exited by:

- a command from the host;
- the paper feed button being double-clicked.

7.3 SERIAL INTERFACE (STANDARD RS-232 VERSION)

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 8 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, TxD, 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. Both serial output lines will relax to approximately 0V when the Ap863 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. The Ap863 can be set to ignore this condition as detailed in the Programmer's Guide, but even then this type of host behaviour may result in one or more spurious characters being received by the Ap863, or the Ap863 may be prevented from going to sleep.

7.4 SERIAL INTERFACE (TTL VERSION)

As an option the Ap863 may be ordered with a TTL serial interface. In this version, the data format is identical to the RS-232 version described above. However, the voltage levels are different.

Serial data is expected on RxD in TTL format with +5V meaning 'mark' or logical '1', and 0V meaning 'space' or logical '0', with reference to the common ground. The serial data output line, TxD, transmits XON/XOFF and status information to the host at the same baud rate and format as the serial data input. The hardware busy line, Busy, is true (nominally +5V) when busy. Both serial output lines will relax to approximately 0V when the Ap863-TTL 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 (0V) to indicate a reset condition or wait state. Some battery powered host equipment present the same output signal when they go to sleep. The Ap863-TTL can be set to ignore this condition as detailed in the Programmer's Guide, but even then this type of host behaviour may result in one or more spurious characters being received by the Ap863-TTL.

The idle condition of the TTL RxD signal is +5V. This condition also causes the Ap863-TTL to wake up and prevents it from going to sleep. If the Ap863-TTL is required to go to sleep then the host equipment must be configured to output 0V.

7.5 CHARACTER PRINTING

Several character fonts are supported, the default 32-column character set being formed from a 24x10 dot matrix. The standard 224 IBM® character set (Code Page 437) includes graphics characters, which are extended to link up in both axes where appropriate. The character set has been modified to include the Euro symbol ('€') at position 80H (128 Decimal), in place of the usual capital C with cedilla ('Ç').

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

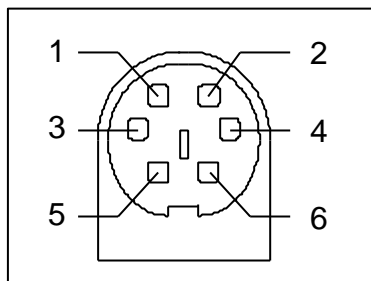
Various dot-addressable graphics modes are supported, at up to 384 dots per line. Refer to the Programmer's Guide for full details. The Windows driver operates in the graphics mode.

8 CONNECTIONS AND EMC PRECAUTIONS

8.1 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	TxD Data Output	Red
2	BUSY Output	White
3	RxD 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.

8.2 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 '8.3 Battery Charger Details'.

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

Pin	Dimension (mm)	Function	Ap863 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)	Ap863 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)	Ap863 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

8.3 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 '8.2 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 between 100 mA and 400mA. An external supply must have an output voltage which remains within this range between these current extremes.

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 Ap863 so that a battery pack will completely charge in about 15 hours, but may be continuously 'trickle-charged' if required.

So that the printer can be continuously powered from the host equipment, the higher charge rate is disabled by default, but can be enabled by a command from the host computer. The user must take care to avoid overcharging the battery pack in this case.

N.B. The Ap863, when used with a battery pack, is not designed to be charged directly from a vehicle starter battery.

8.4 EMC STATEMENT

The Ap863 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.

8.5 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.

9 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.

9.1 CONNECTING TO A PC – A CHECKLIST

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

Make sure that a Power Pack is fitted and switched on. If using a Battery Pack and Charger remember that operation from the charger alone is not possible: a battery pack must always be fitted. **Also remember that battery packs are normally supplied discharged, and should be charged for at least 15 hours before use.**

Wake the printer up by pressing the paper feed button (the green button on the front of the printer) once and releasing it. The LED indicator should light; if it does not, the battery may be flat (or not fitted correctly): connect up the charger, and the light will come on. Other LED colours are discussed in **Section 6**, for example when the printer is out of paper.

When the printer is awake, 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

You can use either of the two serial ports for the Ap863, whichever is free. COM2: is assumed in what follows, as most likely to be available.

You will need a suitable cable. Use either a standard cable from Able Systems (see Section '8.2 Combined Data/Charger Adaptor Cables'), or make up your own using the information in the same section.

- 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 [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 Ap863.

- 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**:

```
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.

Or, you can use the special Able Systems set-up software **AP860.EXE** which we can supply on a floppy disc, or by e-mail on request: this will allow the printer settings to be changed and includes some diagnostic routines.

9.2 WINDOWS™ PRINTER DRIVERS

A Windows driver specifically written for the Ap863 is available from Able Systems, and can be downloaded, at the user's risk, from our World Wide Web site (see below). 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 Ap863, as they format everything 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.

9.3 YOUR APPLICATION PROGRAM

Once communications between your computer and the printer have been established, you can try driving the printer from your application program. As referred to in the Programmers Guide, the Ap863 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.

9.4 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: <http://www.able-systems.com>
Our **e-mail address** is: contact@able-systems.com

9.5 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.

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