AD-8121

Multi-Function Printer

MAINTENANCE MANUAL

MULTI-FUNCTION PRINTER

A&D

A&D Company, Limited

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Compliance with FCC Rules

Please note that this equipment generates, uses and can radiate radio frequency energy. This equipment has been tested and has been found to comply with the limits of a Class A computing device pursuant to Subpart J of Part 15 of FCC rules. These rules are designed to provide reasonable protection against interference when equipment is operated in a commercial environment. If this unit is operated in a residential area it might cause some interference and under these circumstances the user would be required to take, at his own expense, whatever measures are necessary to eliminate the interference.

(FCC = Federal Communications Commission in the U.S.A.)

Introduction

The AD-8121 Compact Printer is designed to receive data from A&D's optional RS-232C or Current Loop interface. The AD-8121 is especially designed to be used with A&D's Weighing Indicators, Platform Scales or Electronic Balances. The AD-8121 printer provides statistical calculations as well as printing normal weight percentage or counting data. The AD-8121 can be set to mode 3 and used as a simple printer with other kinds of equipment.

❑ Printers can be used anywhere with power supplied by 4 Penlight/LR6/R6/AA/UM-3 type batteries.

❑ Compatible not only with the RS-232C, but also Current Loop interfaces.

❑ Long (50m/54 yards) recording paper standard.

❑ Battery life (20°C/68°F): approximately 3500 data operations can be printed continuously with one set of alkaline batteries.

❑ AC/DC adaptor is available, see parts list for the correct voltage.

❑ The AD-8121 does not provide statistical calculations if set to mode 3.

Precautions

Many problems can be avoided by making sure that the user is familiar with some proper maintenance procedures.

❑ Wait more than two seconds to switch ON after tuning OFF the power supply switch.

❑ Only use the correct grade of paper (WP:PP143).

❑ Remove the batteries when not using the AD-8121 for a long period of time to prevent potential damage from battery leakage.

❑ When inserting the batteries, observe the polarity ("+" or "-" direction).

❑ Use only the proper A&D AC/DC adaptor. Other commercial adapters may not meet necessary requirements.

❑ Do not use the optional AC/DC adaptor on a power circuit contaminated with noise, usually associated with motors and heavy machinery, or lines carrying other transmissions (use batteries).

❑ Make sure that the power switch is OFF before connecting / disconnecting the data input cable.

❑ Do not expose the printer to high humidity, heat, dirt, chemicals or direct sunlight.

❑ Do not use detergents or chemical cleaners to clean the printer case, use only a damp cloth.

❑ If a problem is encountered during operation, check that the power supply LED is ON, that the cable connections are secure and check the Instruction Manual for the correct parameter and MODE switch settings.

Specifications

Print Method	Dot-matrix impact printing
Character	5 x 7 dot-matrix 2.5 (H) x 1.8 (W) mm
Print Speed	1 line per second
Number of Characters	16 characters per line
Power Supply	① AC adapter (9V, 500mA) ② 4 "AA" alkaline cells
Data Input System	① RS-232C interface ② Current loop (20mA)
Dimensions	180 (W) x 160 (D) x 80.5 (H) mm
Weight	400g
Operating Temperature	0°C to 40°C
Storage Temperature	-10°C to 50°C

Description

Included in Product Shipment

Qty	Item	Qty	Item
1	AD-8121 Multi-Function Printer	1	Printer cover
1	RS-232C interface cable (1m)	1	Printer paper cover
1	Ink ribbon cassette	4	Batteries
1	Recording paper (50m / 54 yd)	1	Plug for remote print switch
1	Recording paper spool shaft.	1	Instruction Manual

## Optional / Accessories

OP-01 Adaptor cable for current loop (50cm/20").

AX-PP143-S   Recording Paper, 50 meters / 54 yards. 10 rolls to a set.
AX-SW128   Foot switch.
AC/DC adapters:

Model #	Voltage	Plug type
AX-TB105	100	A
AX-TB106	120	A
AX-TB107	220	-
AX-TB107-BF	220	BF
AX-TB107-S	220	S
AX-TB121	220	C
AX-TB122	240	-
AX-TB122-BF	240	BF
AX-TB122-C	240	C
AX-TB169	240	S

Printer paper cover

Printer cover

Statistic calculation mode LED

POWER LED
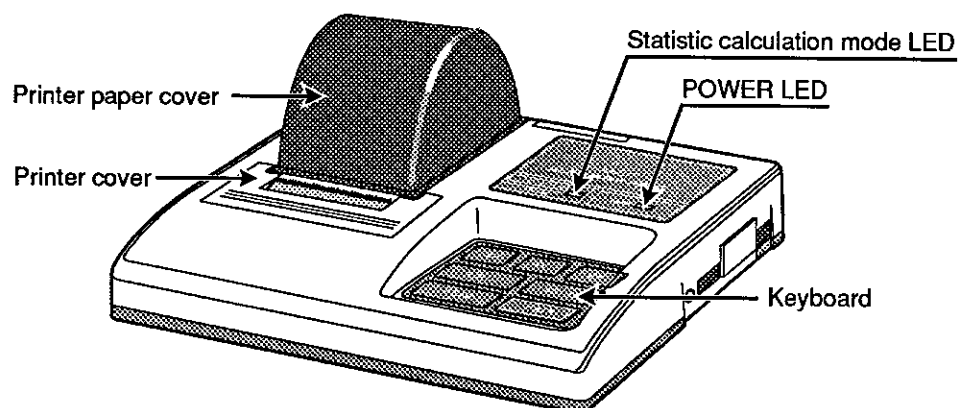
Keyboard

Keyboard (Note: for the **AD-8121 in mode 3**, Dump Print mode, only the **DATA** and **Feed** keys and the **Power** switch are active)

CL Key	"Clear" - clears all the statistical data in memory.
CE Key	"Clear Entry" - if an input error is made, CE cancels the last entry and prints "CANCEL".
STAT Key	"Statistical data selection" - Switch between Weight data (green lamp) or Quantity Counting data (red lamp) for statistical calculations.
RSLT Key	"Statistical calculation RESULT print key" - clears statistics from memory.
FEED Key	"Paper Feed" - Feeds the paper.
DATA Key	"Either DATA input or PRINT key in MODE 1 or 2"
MODE 1:	DATA key has no effect in MODE 1.
MODE 2:	Print the data and input the data for statistical calculations.

EXT P. jack / INPUT connector   Mode selection DIP switch
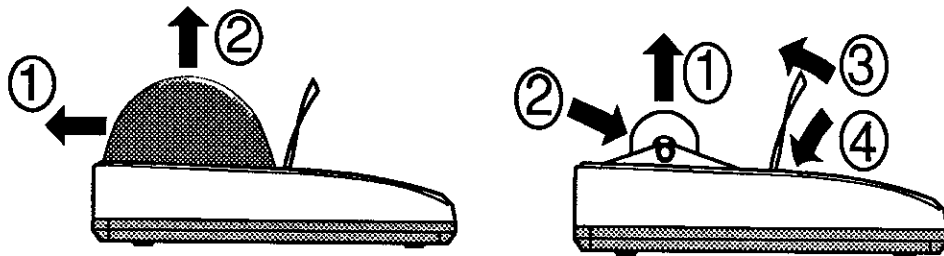

Power switch   Adaptor jack   Battery box
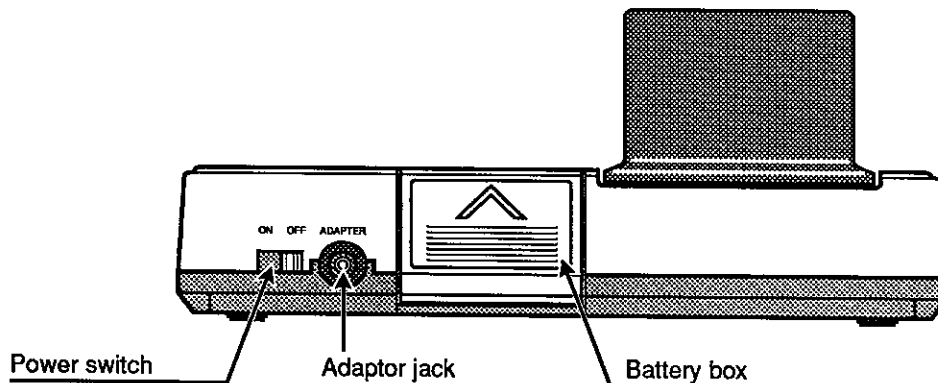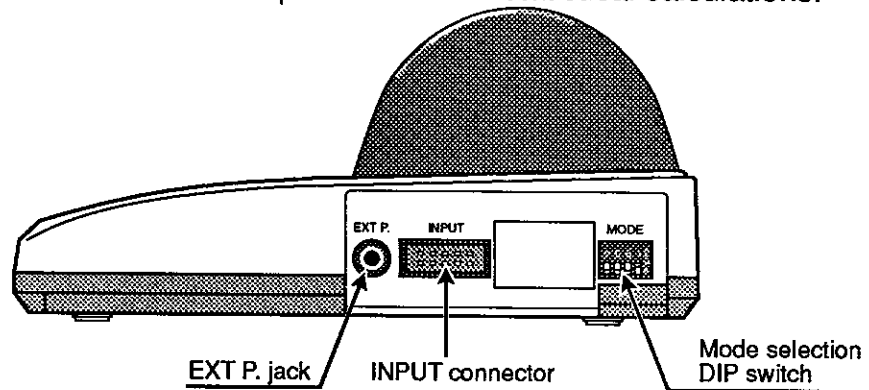
Attention!

❏ *Be sure that all power to the AD-8121 is disconnected before starting any work!*

Step 1. Push the paper roll cover (1) to the rear and lift it straight up (2) to remove.

Step 2. Gently lift out the paper roll (1) and tare the paper off just behind where it inters the printer (2). Pull the paper out of the print head from the top (3), puling it towards the rear of the printer. Place the roll shaft in a safe place for replacement. Lift out the printer cover and ribbon cassette (4).
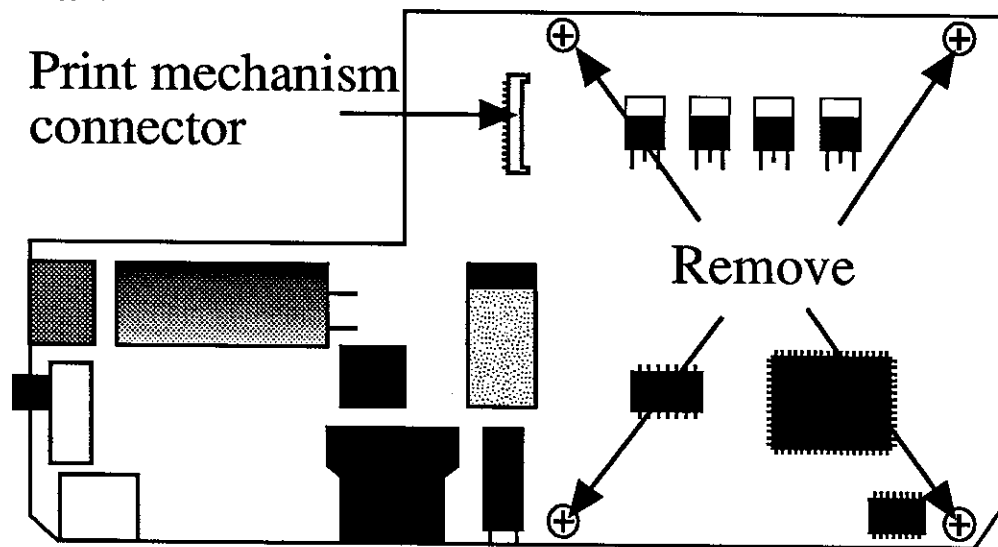
Step 3. Turn the printer over and remove the screws at each corner of the lower case.
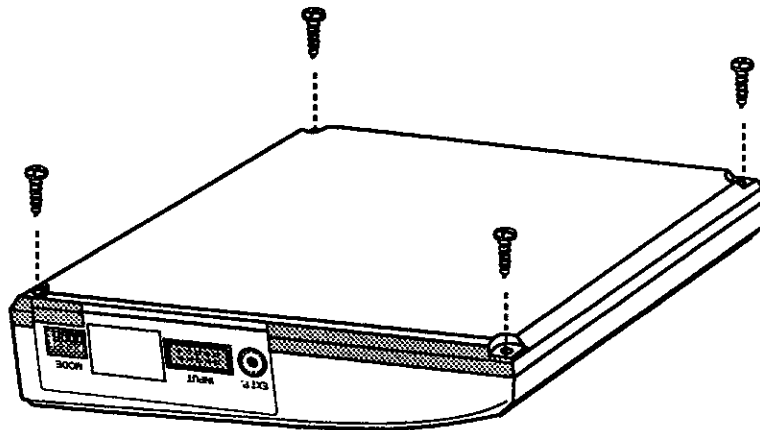
Step 4. Carefully separate the upper and lower halves of the case.
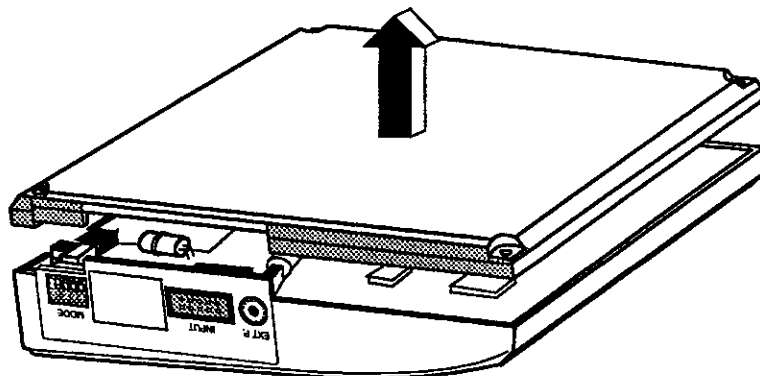
Step 5. Remove the four light colored screws supporting the printed circuit board as shown. Do not remove the black screw near the mode switch.

Print mechanism connector

Remove

Step 6. Carefully unplug the printer mechanism cable from the printed circuit board as shown. Use a small screwdriver (at arrows) to pry the plug out of the connector. Do not pull on the wires!
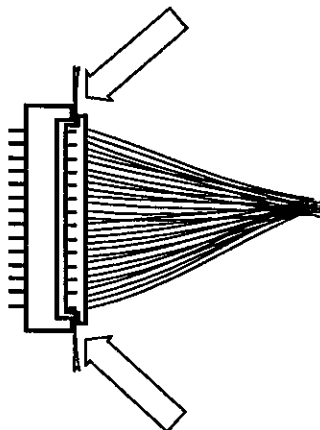
Step 7. Gently ease the printed circuit board away from the case by lifting and tilting the board so that the data connector will clear the edge of the case. The two battery clips are attached to the printed circuit board and will come out with the board. Place the board on an anti-static mat.

Step 8. Remove the key pad strip from the case by gently pushing it out from the top. Do not attempt to remove the carbon contacts from the rubber as this pad is molded as one piece.

Step 9. Remove the four black screws at the corners of the printer support and lift this assembly out of the case. Turn it over and remove the two light colored screws from the front edge of the printer mechanism.

Step 10. Unless it is necessary to replace the name plate, it is best to leave it attached to the case as it is held in with double sided sticky tape.

Reassembly

Replacing the Printer

Step 1. Carefully replace the printer by inserting the rear edge into the slots in the support and fasten it in place with the two screws light colored removed in step 9. of disassembly.

Step 2. Install the printer support in the case with the four black screws removed in step 9. of disassembly.

General Assembly

Step 3. Replace the key pad strip in the case with the DATA and FEED keys to the front (there is a groove in the pad that will hold it in place).

Step 4. Replace the printed circuit board into the case, making sure that the battery contacts are in the battery chamber.

Step 5. Replace the four screws on the opposite sides of the printed circuit board removed in step 5. of disassembly.

Step 6. Insert the print mechanism plug into the connector on the printed circuit board with the slotted side away from the board.

Step 7. Replace the lower case as removed in step 4. of disassembly.

Step 8. Replace the four screws in the corners of the lower case.

Step 9. Place the unit on it's feet and Install the ribbon cassette.

Step 10. Apply power and load the printer paper. Press the feed key to get a short length of paper out of the print mechanism.

Step 11. Place the printer cover in place with the paper through the cutter slot.

Step 12. Place the printer paper cover in place and push it to the front to lock it.

Printer Test

This test requires a source of data capable of transmitting in A&D format. In these test modes all the alphanumeric characters which the printer is capable of printing will be printed. If a personal computer or other data source is used, the data to be transmitted is listed at the end of the printer test section.

Testing in Mode 3

Step 1. Start the test by making sure that the AD-8121 is set to MODE 3.

Step 2. Attach the data source to the printer data input.

Step 3. Turn the power ON.

Step 4. Supply data to the printer (see Test Data for Mode 3).

Step 5. Examine the printout, it should match the data input to the printer.

Test data:

Send any 16 characters, then a wait of 1.1 seconds, then 16 more, etc. The printer will not print a comma "," (the hexadecimal character 2C). The printer requires 1.1 seconds to print one line of 16 characters. If this time period is not observed, the printer will print only "   *   ".

Testing the Communications Interface

This test requires a source of data such as a personal computer or an A&D product capable of transmitting the proper header information. In this test mode the only characters accepted will be standard A&D format.

Step 6. Switch the MODE switch to MODE 1.

Step 7. Supply A&D format data to the printer.

Step 8. Examine the printout, it should match the data input to the printer.

Step 9. Switch the MODE switch to MODE 2.

Step 10. Supply continuous A&D format data to the printer.

Step 11. Press the DATA key.

Step 12. Examine the printout, it should match the data input to the printer.

To perform printing using Modes 1 or 2 a defined data format must be used. For tests using Mode 3, no special format is required, but timing limits must be adhered to. When you connect the AD-8121 with instruments other than A&D products, you must match your instrument's output to A&D format. As there are many types of computers and various computer languages available. No attempt to describe an actual program will be made.

This format is shown below:

Test Data for use with Non A&D Instruments

The data to be transmitted must have this format:

Communication Method	RS-232C or current loop
Baud Rate	2400bps
Data Bit	7 bits
Parity Bit	1 bit (even)
Stop Bit	1 bit
Code	ASCII

Character String	S	T	,	␣	␣	,	-	1	2	3	.	4	5	6	7	a	t	m	CR	LF
Hexadecimal	53	54	2C	20	20	2C	2D	31	32	33	2E	34	35	36	37	61	74	6D	0D	0A

Header 1   Header 2   Numeric data   Unit   Terminator

Example:

Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Print example	W	T			-	1	2	3	.	4	5	6	7	a	t	m

Numeric data   Unit

Will yield:

WT -123.4567 g

Header 1, Header 2

Select data to be transmitted using the following table:

Abbreviation for the type of weighing data	Header 1	Header 2	Character string printed automatically when there is no data indicating unit
AQ	AQ	*1	⊔PC
GS	ST	GS	⊔⊔T
NT	ST	NT	⊔Kg
QT	QT	*1	⊔PC
TR	ST	TR	⊔⊔T
UW	UW	*1	⊔⊔g
WT	ST	*1	⊔⊔g
*1 indicates that header 2 may be omitted		⊔ indicates a space	

When there is a terminator (CR LF) after the numeric data, the defined character string will be printed automatically by header 1 and header 2 data.

Header 1, header 2 and numeric data are respectively separated by ",". You may in some cases omit header 2.

Numeric data

Numeric data is a character string which contains a decimal point (.) and requires a polarity sign (+ or-). The positive sign (+) will not be printed. Up to 7 digits can be used for the numeric part.

Unit

Up to three alpha characters or spaces can be used. They will be printed right-justified as in the example. The specified character string will be converted automatically as shown below.

Received data	Printed data
*2G	⊔⊔g
KG, Kg, kG	⊔kg
LB, Lb, IB	⊔lb
OZ, Oz	⊔oz
"*2" indicates any character	

Terminator

The printer starts printing when it receives a terminator. the terminator is fixed as "CR LF" (hexadecimal 0D,0A). A wait of 1.1 seconds is required after the terminator before the printer will accept the next data string.
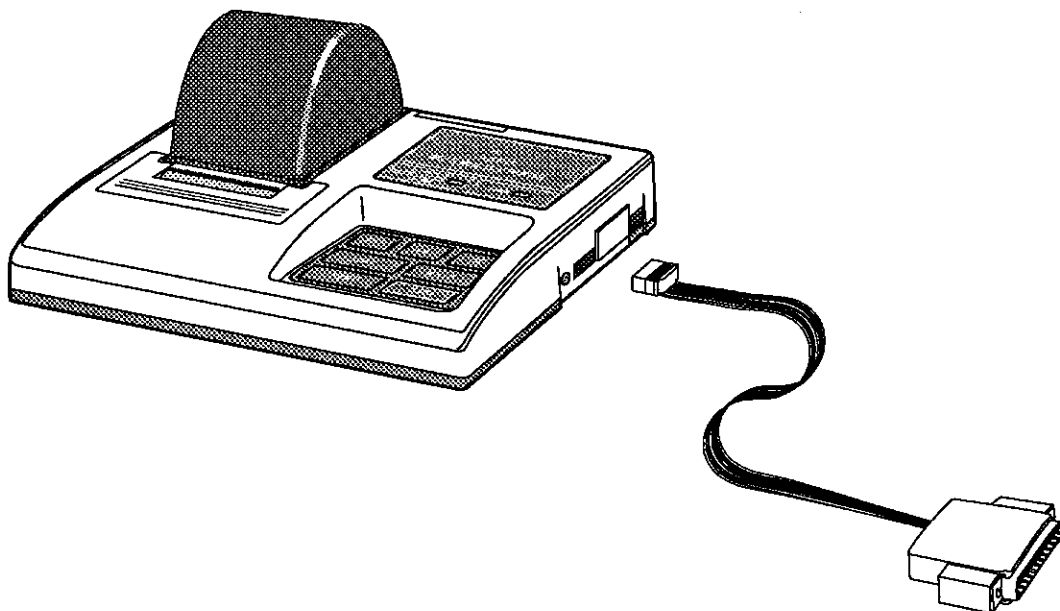
Connections

Attention!

❏ *Be sure that the AD-8121 is turned OFF before connecting any data cables!*

Connection to Weighing Instruments

For data supply from an RS-232C interface, plug the 25 pin connector into the output connector of the Weighing Instrument and plug the smaller connector in to the printer as shown. For data supply by current Loop, use the OP-01 adaptor cable and connect it to the Weighing Instrument after setting the printer mode switch No.4 to on.

Set the data transmission speed of the Weighing Instrument to 2,400 baud.

Connection to Optional AC/DC Adaptor

Connect the AC/DC adaptor to the AD-8121 as shown.
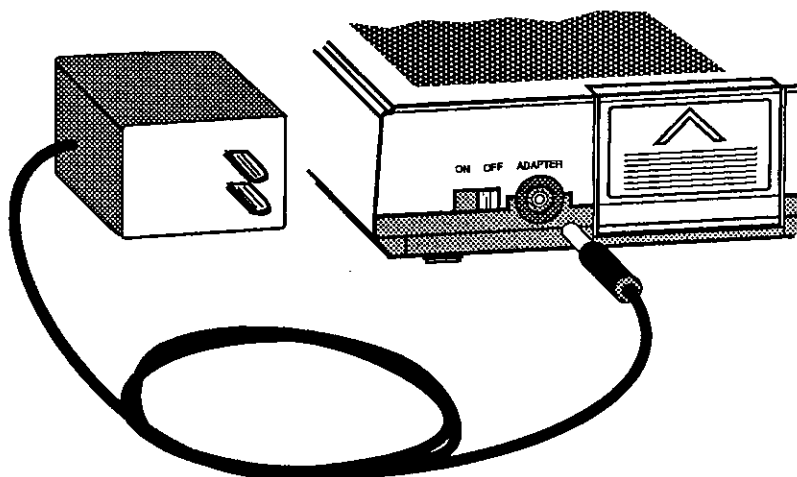
Connection to Optional Foot Switch

For data acquisition by pressing the foot switch, connect the foot switch to "EXT P" (External Print) on the AD-8121 as shown (note that in mode 3, the AD-8121 operates the same as with the DATA key).
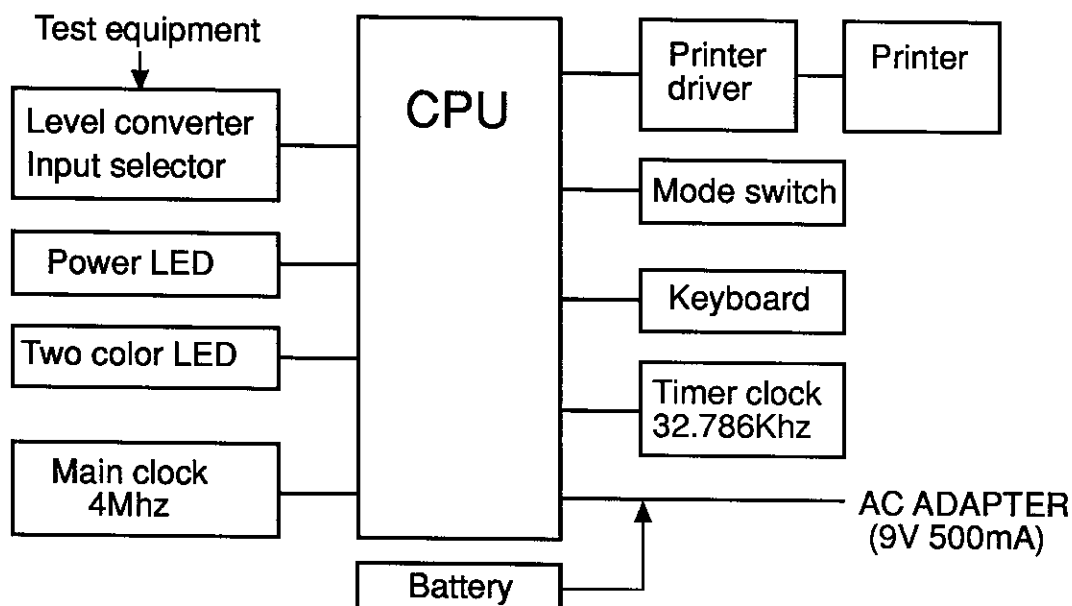
Foot switch
(optional)
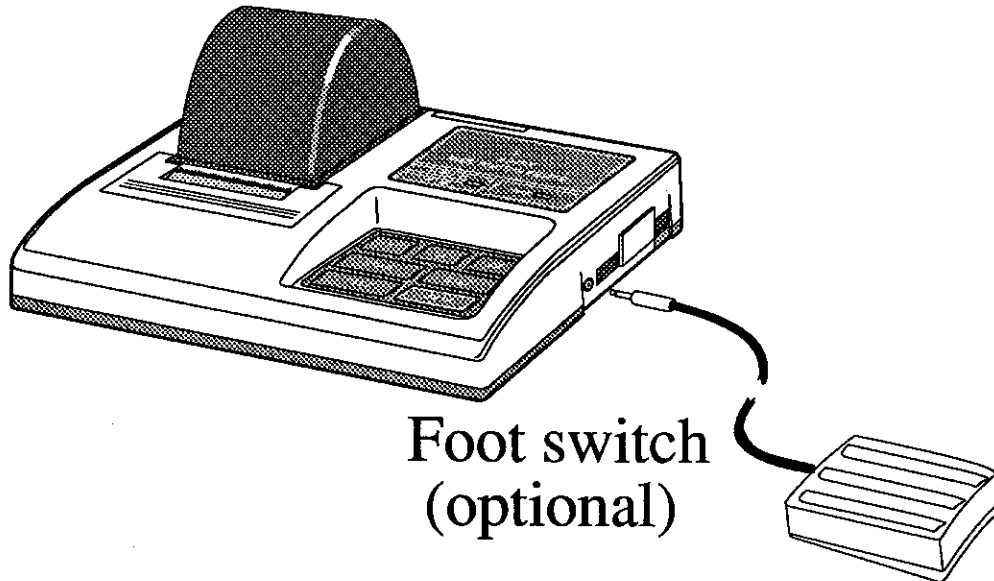
Principal of Operation

Block Diagram

Figure 1

Errors

| Problem	Probable cause
*	① Unstable or "over" data was input. ② Input data does not contain proper header information (set to mode 1 or 2).
C ERROR	① Improper cable connection. ② Baud rate is not 2400bps. ③ Source is not transmitting data (power off).
F ERROR	① Data contains noise.
NO DATA	① Source is not transmitting data (power on).
Power LED not on	① AC adapter not connected to AC line. ② Batteries dead. ③ Power switch off.
Power LED on, but printer does nothing	① Defective printed circuit board. ② Defective print mechanism.
Prints ok, but will not do statistics.	① Printer set to mode 3. ② Defective printed circuit board.
Prints headers	① Printer set to mode 3.

Operation. . .The detected signal from the tachometer generator is shaped into a pulse to establish the character dot timing.

Figure 2

Tachometer Generator

Timing Pulse
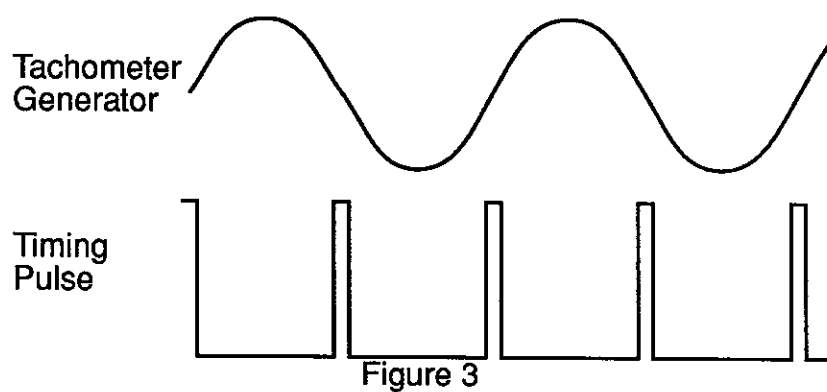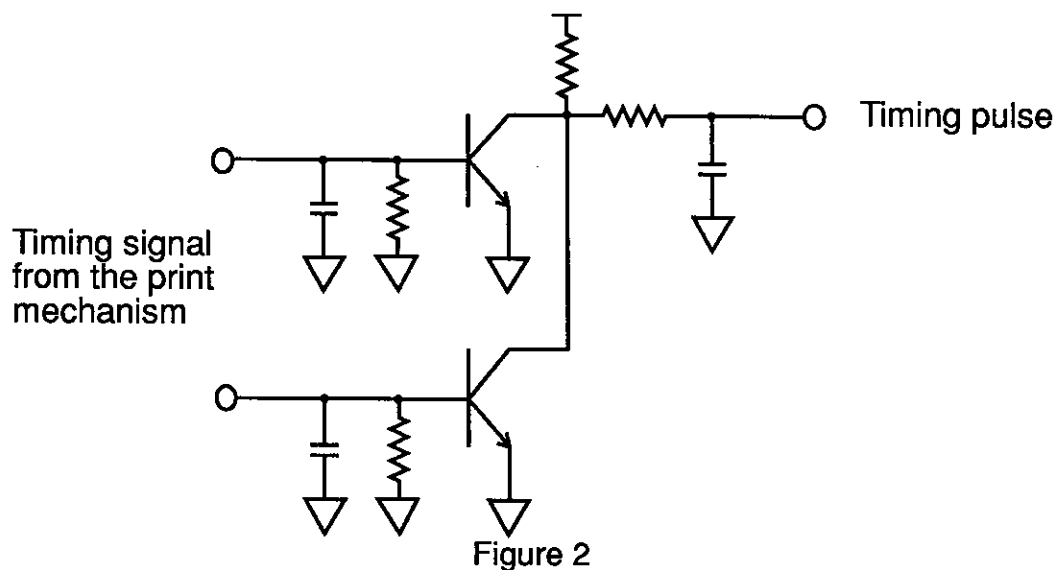
Figure 3

Reset signal

Operation. . .The reset signal determines the printer home position in each dot row.
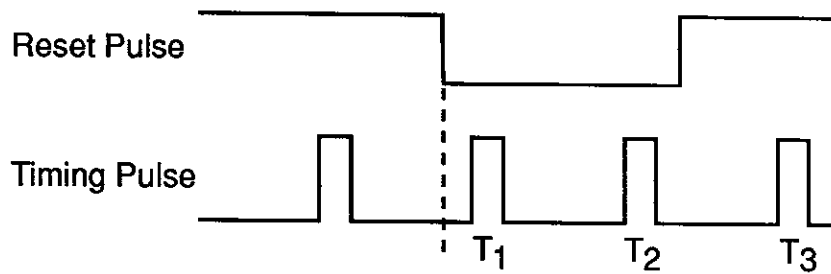

Reset Pulse

Reed Switch
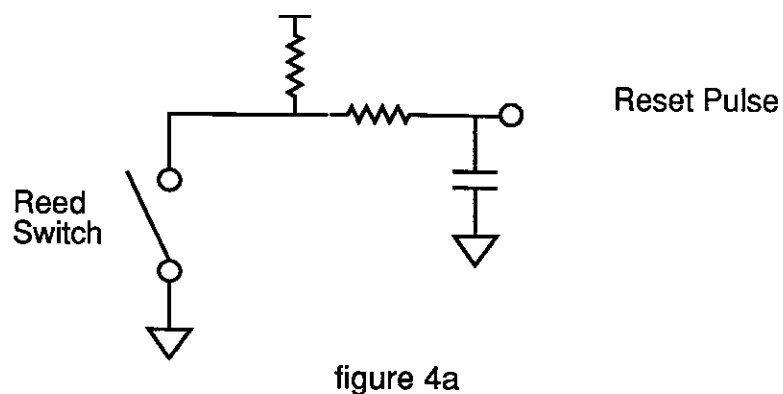
figure 4a

Figure 4b

The CPU circuit counts the timing pulses generated immediately after the reset signal activates; 168 pulses consisting of 96 pulses for printing one dot line, and 72 pulses for the head to return to the home position. The circuit repeats the above sequence ten times for one print cycle.

(5x7 dot-matrix, 3 dots for line space)

Motor control

Operation. . .The motor drive signal drives and stops the motor. For a sudden stop, a transistor shorts the motor terminals.
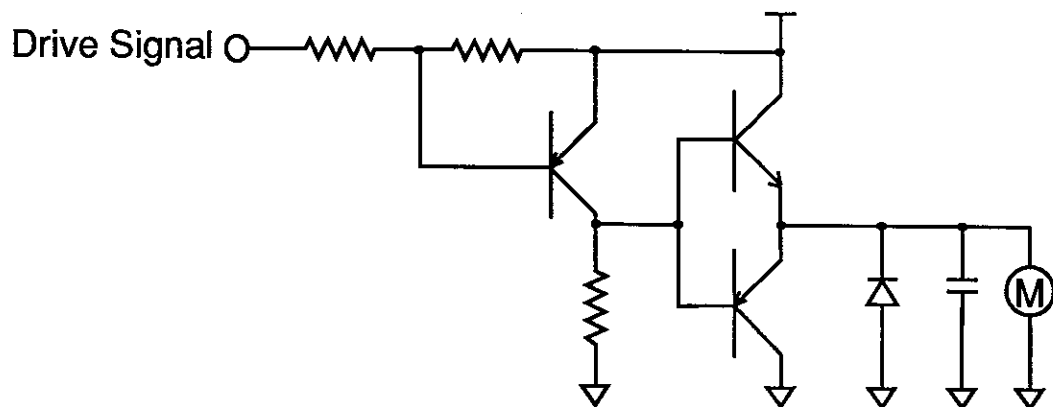

Figure 5

Printer Solenoid

Operation. . .The printer solenoid, synchronized with the timing pulse, performs dot printing . One of the 4 drivers is shown below.
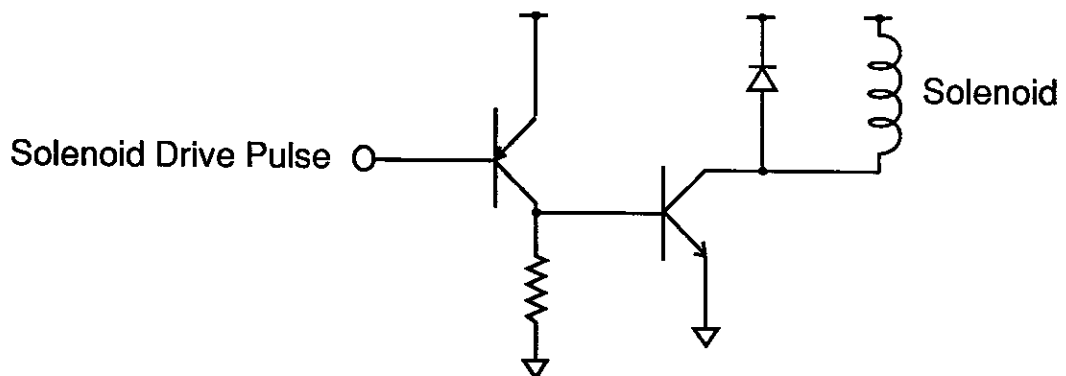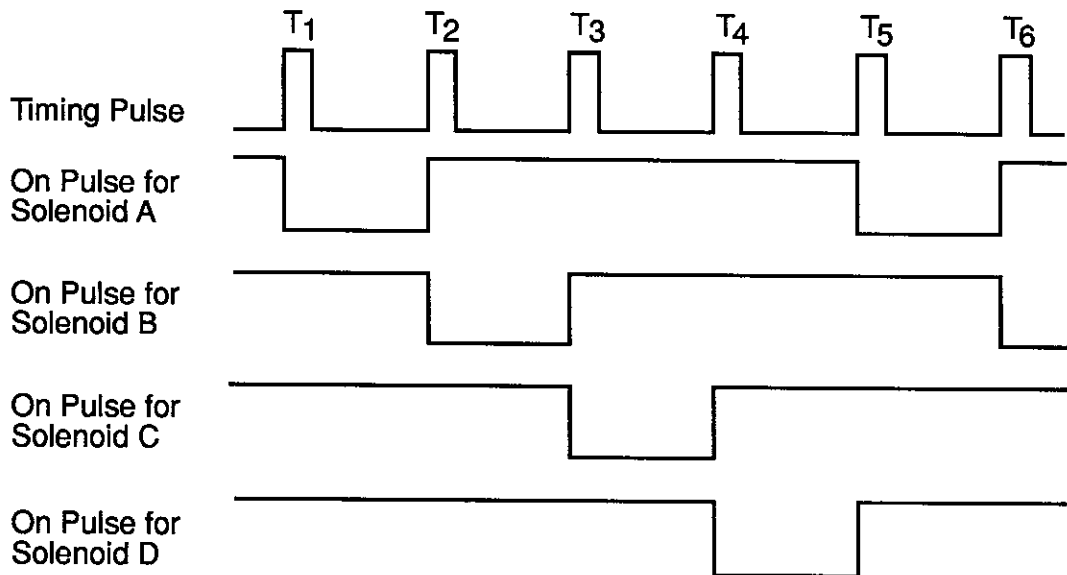

Figure 6

Figure 7

Serial Input

Input Specifications:

Communication Method	RS-232C or 20mA current loop
Baud Rate	2400bps
Data Bit	7 bits
Parity Bit	1 bit (even)
Stop Bit	1 bit
Code	ASCII

Level conversion and input selection:
Q1 converts the RS-232C interface level into a TTL level, while Q2 and Q3 convert the current loop input in a similar manor. A tri-state buffer switches between these two inputs.
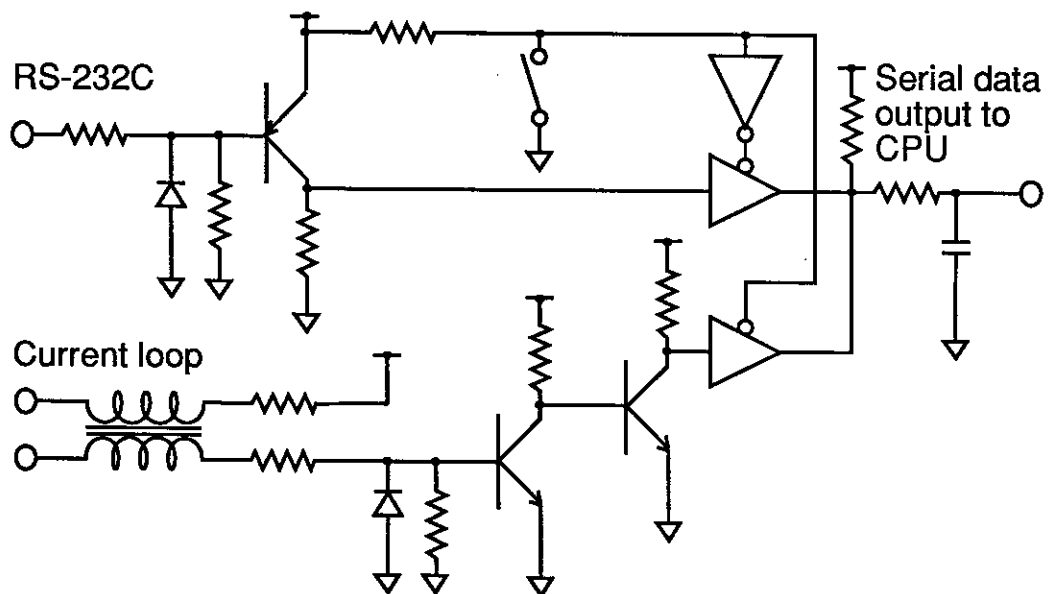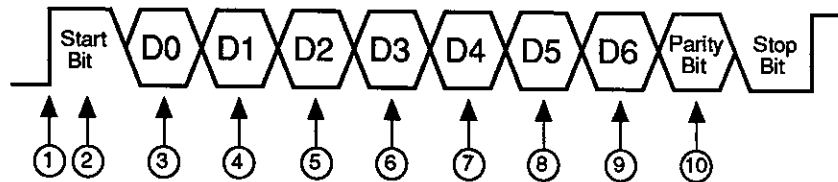

Figure 8

Each bit of the data input is timed. Because the communication data rate is fixed at 2400 bits per second, each bit takes 416µs. The circuit detects the start bit and waits 208µs, then samples, checking the validity of the start bit. If the start bit is valid, the circuit receives incoming data by sampling at 416µs intervals.

1. Start bit leading edge detection.
2. Check if start bit is valid.
3.~9. Data bit sampling.
10. Parity bit sampling

Figure 9

Reset Circuit

The circuit operates as follows using the reset pulse.

1. Checks the memory to confirm normal system operation.
2. Controls the main clock and timer clock.

If an error is detected in step 1, the circuit sets all parameter to the initial condition, then executes step 2.

Figure 10 (Timing Chart) shows the operation of step 2.

① When power is supplied from Vcc 2 (lithium battery), "RESET" rises approximately 2ms after Vcc 2 is on, then resets the CPU. The CPU activates and reads the logic P2-7. Because the logic is "L" the circuit operates using the timer clock.

② When power is supplied from Vcc 1 (AC adapter or alkaline battery), "RESET" activates after approximately 1ms, the CPU then reads the logic P2-7 for "H". The circuit operates using the main clock and starts normal operation.
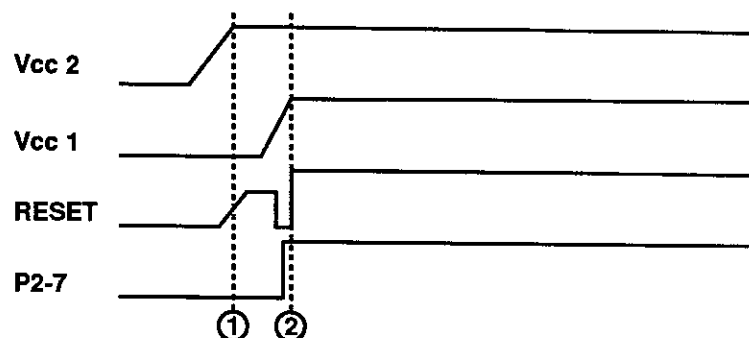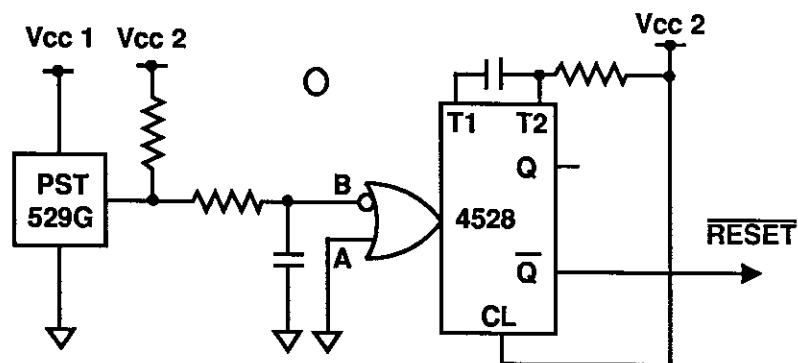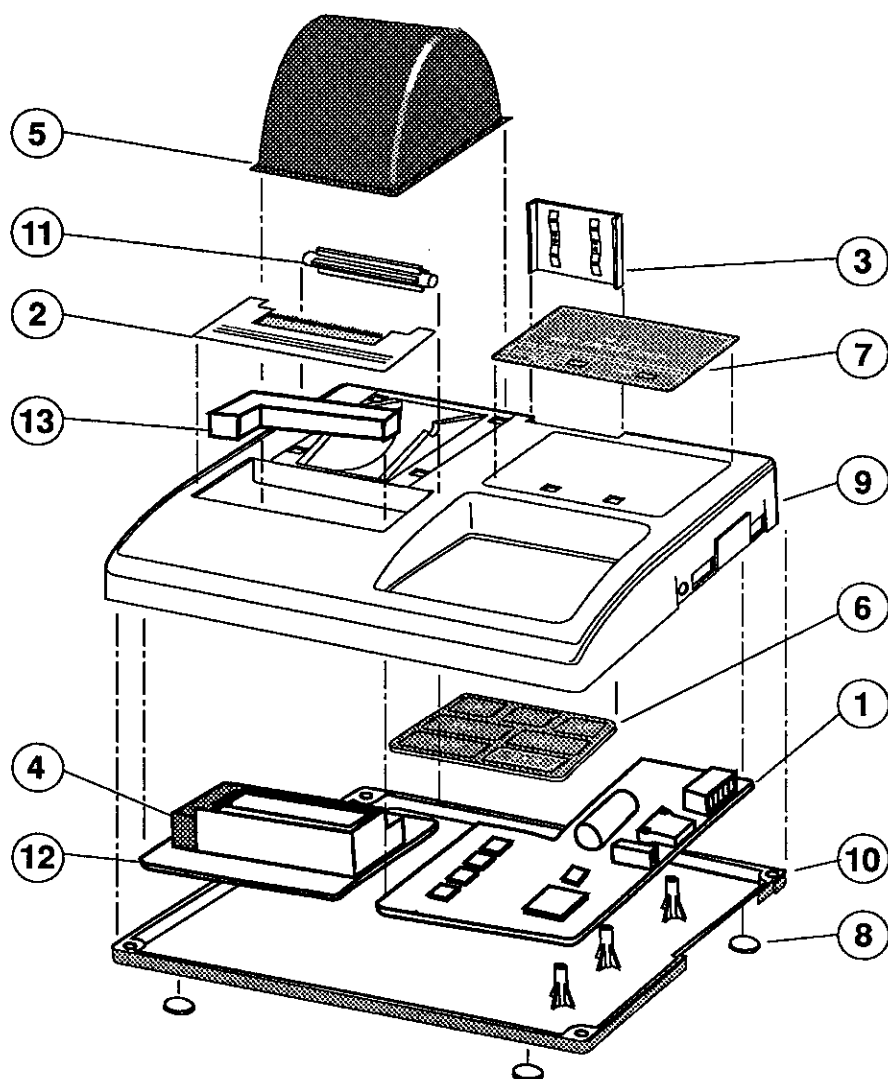

Figure 10

Figure 11

Power Supply

The power supply circuit operates when power is supplied from the AC adapter (9V, 500mA) or alkaline battery. The lithium battery is used to back-up the memory and control the timer.

	Min.	Typ.	Max.	
Memory hold voltage (Vcc 2)	3.0			(V)
Circuit operating voltage (Vcc 1)	4.5		5.5	(V)

Exploded View

Parts List

Item Number	Part Number	Description
1	7PA:8121-0001	Main board
2	7PA:8121-0002	Paper cutter
3	7PA:8121-0003	Battery cover
4	7PA:8121-0004	Printer mechanism
5	7PA:8121-0005	Printer paper cover
6	7PA:8121-0006	Keyboard rubber
7	7PA:8121-0007	LED overlay
8	7PA:8121-0008	Foot
9	7PA:8121-0009	Upper case
10	7PA:8121-0010	Lower case
11	7PA:8121-0011	Paper spindle
12	7PA:8121-0012	Printer support
13	7PA:8121-0013	Ribbon cassette

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