Chapter 23

Printers

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23.1 The use of this chapter

This chapter is designed to be of use to AR's servicing printers. It will also be of use to Printer Specialists, but they will need more comprehensive information. It is expected that engineers using this chapter have the appropriate pocket service guides, manuals **AND THE HARDCOPY HINTS** see Appendix A for the current copy of these.

Laser Printers have deliberately been left out of this chapter. They are special in as much as they have health and safety conotations and the fraternity of laser trained engineers is tight enough that circulation of technical updates does not need to to be be in general circulation, and indeed may lead non-trained engineers to dable with them.

23.2 Glossary of printer terms

BOF ... Bottom Of Form
BTO ... Band Time Out
B Series ... Data Products printers of the LP25/6 family
CCA ... DP term for PCB
Char ... Character
Co Pot ... Copies Pot. Adjusts for paper thickness.
CPS ... Printer speed in Char Per Second (Dot Matrix Printers)
CPI ... Print density in Char Per Inch
CR ... Carriage Return
DAVFU ... Direct Access VFU
DP ... Data Products
I/F ... Interface
FF ... Form Feed
FLSS ... Forms Length Select Switch
L/C ... LowerCase - small letters
LLD ... Long Line Driver
L/L ... Long Line
LF ... Line Feed
LPM ... Printer speed in Lines Per Minute (hammer bank printers)
par gen ... parity generation

perf skip . . . perforation skipover
PPM . . . Printer speed in Pages Per Minute (Laser and Ink Jet printers)
RWS . . . ribbon weld skipover
Slew . . . Paper movement rate during FF i.e. not LF (printing normally)
S/L . . . Short line (as opposed to long line driver)
TCVFU . . . Tape Control Vertical Forms Unit
TOF . . . Top Of Form
U/C . . . Uppercase
VCL . . . This is the voltage in DP printers that controls the print density. It varies with the Co Pot (1.5 to 6.0 volts)
VFU . . . Vertical Forms Unit

23.3 Printers and Part numbers in this chapter

The traditional printers from dataproducts i.e. LP01 through LP26 do not have IPB's, so for this reason common parts for these printers have been included in this chapter. LP27/9 and other printers are included in IPB's on fiche.

Whilst it is preferable that trained engineers attend printer calls, it is not altogether necessary for first line servicing, with the following exceptions.

1. **Laser Printers** see table for non dataproducts printers.
   These employ a different technology and are much more complex, high powered laser technology is used, which means it is a health and safety issue to work on them when not trained properly. Health and safety also requires that an eyesight test is required before working on them, so that any damage done to the eyes can be accredited properly.

2. LCG/P01
   These are very easily damaged by pressing the wrong maintenance buttons. These parts are very expensive.

To this end various items have been included , so that engineers fresh to a different printer will have a chance of fixing it, providing he/she has a grasp of the technology.

Table 23–1: Printers (Other Than DP) In the Systems Space

DEC Printer	Manufacturer	Model	Speed	type
LS01	Centronic	101A	180 cps	Dot Matrix head draft
LXY11	Printronix	P300	300 lpm	Dot Matrix Bank Graphics
LXY12	Printronix	P600	600 lpm	Dot Matrix Bank Graphics
LXY21	Printronix	P300 VDE	300 lpm	Dot Matrix Bank Graphics
LXY22	Printronix	P600 VDE	600 lpm	Dot Matrix Bank Graphics
LG01	Mannesman Tally	M660	600 lpm	Dot Matrix Bank Draft
LG02	Mannesman Tally	M660	600 lpm	Dot Matrix Bank Graphics
LG31	Genicom		300 lpm	Dot Matrix Bank Draft
LG06	Printronix		600 lpm	Dot Matrix Bank Draft
LN01	Xerox	2700	12 ppm	Laser
LPS40	Ricoh[1]		40 ppm	Laser Ethernet Postscript
LPS20	Ricoh[1]		20/8[2] ppm	Laser Ethernet Postscript
LPS17	Cannon		17/7[2] ppm	Laser Ethernet Postscript
LPS32	Ricoh[1]		32/16[2] ppm	Laser Ethernet Postscript
LCG01	Tektronix		0.5 ppm	Ink Jet Parallel Interface
LCP01	Tektronix		0.5 ppm	Ink Jet Serial Interface

[1]Only the print engine is Ricoh, there are many DEC parts

[2] Speeds given are simplex/duplex

Data Products printers come in the following flavours:

Digital [1]	Data Products	Comments [2]
LP01	2310	Zoned 80 col drum
LP02	2410	Zoned 132 col drum
LP04	2470	1250/900 LPM drum
LP05	2230	300/240 LPM drum
LP06	2260	600/480 LPM drum
LP07	2550	1220/905 LPM drum
LP11		[3]
LP14	2290	660/900 LPM drum
LP25	B300	300/215 LPM band
LP26	B600	600/445 LPM band
	B900	900 LPM band similar to LP26
	B1000	1000 LPM band similar to LP26
LP37	LB1515	1500/1200/800 LPM band
	LB325	300 LPM band
	LB625	600 LPM band
LP27	BP1500	1500/1200/800 band
LP29	BP2000	2000/1650/1250[4] LPM band

[1]As a rule LSPxx means a long line driver is used, LPxxS means a serial interface is used.

[2]The speeds, in lines per minute (LPM), are for 96 and 64 character versions respectively (lowercase and uppercase or just uppercase).

[3]The LP11 is the interface (M7258), however it is sometimes used to denote the LP14, because the LP14 has LP11 written on the front of it. This is further complicated by the option designator referring to the whole subsystem (i.e. LP11-VD is an LP11 plus LP05 plus cables)

[4]The normal DP char band print speed is 1650/1250 Digital LP29s use an optimised Band that does 2000/1650/1250 LPM for 48/64/96 chars

23.4 LG01 and LG02

23.4.1 General notes

These are dot matrix printers that employ a bank of pins driven by hammers. Each pin covers two characters by using a shuffle mechanism, driven by a linear motor. A line of dots is produced, then the paper is stepped up to produce the next line of dots. Several lines like this make up a character.

The LG01 is physically similar to the LG02, however there is a great difference in the firmware, and control panels.

There are two main mechanical paper controls:

1. Wheel at the LHS from the front, alters the platen gap, for paper thickness. It is marked A B C etc. A is for one part paper.
2. The wheel at the RHS from the front, alters the paper tension, between the upper and lower tractors.

The paper tension is important for this kind of printer (this includes the LXY printers) because any paper slack will be taken up by the first row of dots, which will compress the tops of the characters, especially at the LHS.

23.4.2 Self Test

The LG02 is fairly straight forward to self test, and has a very useful status report facility, as well. All its set ups and parameters are done through the control panel.

The LG01 is not so straight forward. Parameters are done on DIL switches. The self test is done through the control panel which involves sequences of pressing the switches. Note that the switches in certain modes loose there normal function, and are numbered for this reason.

In order to do a simple ASCII scroll self test on the LG01 do the following.

Press	Action of printer
stop	Goes offline
Mode	Goes into Mode option
Up/Down key several times till test appears	Now in test mode
1 then Up/Down till PRINT appears	level 1 tests. Print selected
2 then Up/Down till UPER appears	level 2 test. Uppercase selected
3 then Up/Down till USTD appears	level 3 test. Uppercase standard
Enter	test entered
Run	printer starts printing
Stop	printer stops printing

In this way various tests are available as follows

level 1	level 2	level 3	use/prints
PRINT	UPER	USTD	prints uppercase standard
"	"	APAP	advance paper and print
"	"	A132	prints uppercase USA ASCII
"	"	63/9	slightly different u/c USA ASCII
"	"	ECMA	sound/buzzer test
"	LOWR	LCST	prints lower and upper case
"	"	100%	l/c and u/c USA ASCII
"	PLOT	GRID	Plots a grid to check wavy lines
"	"	CROS	Plots crosshatch to check hammer alignment
"	"	PBOX	Plots mailbox - last line entered
"	OPTN	CNFG	PRINTS A LIST OF THE CONFIGURATION INCLUDING INTERFACE SWITCH SETTINGS
"	"	CHRS	Char matrix chosen is printed as ASCII scroll
"	"	MBOX	Prints mailbox - last line of data
DIAG	LOCL	SHO	Shuttle alignment test
"	"	SHFQ	Shuttle frequency test
"	"	SWIT	Switch test
"	"	INDI	Indicators test - also buzzer
"	"	MOTR	Starts up all motors - paper - ribbon etc
"	ONLN	DUMP	Prints all chars including control codes

23.4.3 LG01 and LG02 Reliability Improvement

The reliability of the LG0x printers has always been in question. There have been questions about power supplies the paper feed system and the hammerbank plus other smaller items.

A package has been put together to tackle this lack of reliability which should be done to all LG0x's. Full details of this is in the district database (see appendix A).

Table 23–2: Checklist of Items to check etc

Part/Area	Old /Bad part /Action	New Part /Action
Paperout Switch	Cherry p/n 75545	Cherry p/n 75887
29-27967-01		
Air Flow Sensor	Date code: xx-89	Date code: xx-91
29-25558-00		Posn angle correct
Door Catch	V/n 401801-01	V/n 401801-02
29-26864		
PCB retain backets	None or one bracket fitted	Two brackets
FD-35529-01 & FD-35530-01		
Power Amp edge conns	Dirty	Clean with Tex Pad
Paper Dr & Shuttle	Mult fail due to	New Trble document
Servo faults	poor trbleshooting	shpd with spares
Hammer faults	Mult fail due to	New Trble document
	poor trbleshooting	shpd with spares
Ham bank align	Cannot get tools	Now avail
LARs Reports	Poor analysis	Use new guidelines

23.5 LP05

23.5.1 LP05 Servo PCB Setups

The dataproducts (DP) manuals do have setups for the servo PCB, but they are long winded and take a completely unsetup machine, as in manufacture. Refer to the DP manuals for a definitive answer to queries.

For the other adjustments i.e. hammer flight times refer to the manual.

All plugs are refered to as follows:
A14P5 pin 3 . . . A means the printer; 14 is the servo PCB; P5 is the plug and its number. (J5 would be a jack or socket)

23.5.2 LP05 Set Up Of Hammer Bank

The LP05 manual addendum adjustments should be used. The timings for the DP 2230, (in the main part of the manual) are different from the LP05.

Mechanical Adjustments

1.

Preliminary Stop Nuts and tacho Adjustment

a. With the power off, adjust the stop nuts either side of the stop bracket to 100 thou (one tenth of an inch).

b. Ensure the inner coil of the tacho is flush with the inboard end of its magnet housing, and that nothing catches with hammer bank movement.

2.

Preliminary Position Flag Adjustment

a. Disconnect A14P5. Power on.

b. Slacken the flag hold down screw

c. Use a DVM

+ve lead on A14J3 pin 5
-ve lead on A14J6 pin 3

d. With the flag to the left there should be at least -ve 0.4 volts

e. Insert a 50 thou feeler gauge against a stop nut such that 50 thou of LEFTWARDS movement of the hammer bank is achieved.

f. Move the FLAG slowly to the right ensuring it is parallel with the hammer bank movement to the first null of the DVM

g. Tighten the flag hold down screw and remove feeler gauge.

3.

Emitter Balance With the DVM still connected as above, move the hammer bank to the right and left against the end stops. The two voltages obtained should be opposite in polarity and the amplitudes within 0.1 volts of each other. e.g. hammer bank against left stop +0.5 volts, against right stop -0.4 volts, is within spec.

4.

Position flag final adjustment

a. Reconnect all plugs and power on

b. Use a DVM

+ve lead A14J6 pin 1
-ve lead E1

c. As with emitter balance above, with the hammer bank at the leftmost and rightmost positions, the voltages should be within 0.06 volts amplitude.

d. If they are not slightly adjust the position of the flag to suit, making sure that the readings are still around the first null.

5.

Final Stop Nuts Adjustment With all plugs connected and powered up, adjust clearance to the stop nuts to 25 thou. The hammer bank can be moved by closing the drum gate, pressing clear, then opening the drum gate.

LP05 Hammer Bank Electrical Adjustments

1.

Acceleration/Deceleration Timing Adjustment

a. Print inhibit switch ON (no print)
b. Put paper in tractors but not pulling it through (edges folded over)
c. Arrange for self test to do "line feeds", see Section 23.5.4.
d. Scope the following
   Chan 1 J23 pin 2 (5 volt logic)
   Chan 2 J3 pin 3 (5 volt logic)
   Trigger Chan 1 negative Ground to J8 pin 1
e. Adjust R186 so that the falling edge of Chan 1 is 8.4 + or - 0.1 milli sec from the rising edge of Chan 2

2.

Move Left To Right Adjustment

a. Leave paper movement as above

b. Scope the following
   Chan 1 J3 pin 5 (9 volt pk to pk)
   Chan 2 J3 pin 3 (12 volt pk to pk)
   Trigger J23 pin 2 negative Ground to j8 pin 1

c. Chan 2 should be a +ve waveform. (See manual for picture). Adjust R145 for minimum overshoot/undershoot.

d. Trigger positive. Chan 2 should be a -ve waveform now. Adjust R127 for minimum overshoot/undershoot.

3.

Timing verification

a. Still doing carriage returns as above

b. Scope the following
   Chan 1 J22 pin 3 (5 volt logic)
   Chan 2 J23 pin 1
   Trigger Chan 1 positive Ground J8 pin 1

c. Check the time from the leading edge of Chan 1 to the falling edge of Chan 2 . This should be between 32 and 39 milli secs. If hammer bank is not as quick as this, it indicates something is catching during the hammer bank movement, or the mechanism is worn out.

23.5.3 LP05 Paper Feed Servo Adjustments

1.

Acceleration/deceleration Timing

a. Get the printer to do line feeds (paper feed)
   Print inhibit on
   Disengage paper from tractor teeth, defeating paper switches
   Choose 6 LPI (lines per inch)
   Select self test line feed commands, see Section 23.5.4
b. Set up Scope
   Chan 1 J20 pin 4 paper feed clock +5 volt pulse
   Chan 2 J21 pin 1 paper feed motion +5 volt pulse
   Trigger Chan 1 positive Ground J8 pin 1
c. Adjust R287 (centre right of servo PCB) to 7 + or - 0.1 millisecs from the rising edge of Chan 1 to to rising edge of Chan 2

2.

Paper Step Adjustment

a. Set up for line feed commands as above
b. Set switch to 6 LPI
c. Set up Scope
   Chan 1 J11 pin 2 (paper feed position, 1 to 2 volt sig)
   Chan 2 J11 pin 3 (paper feed velocity, 1 to 2 volt sig)
   Trigger J21 pin 1 (paper feed motion)
d. Adjust R218 (centre right servo PCB) for minimum overshoot/undershoot (see manual for waveform)
e. Put switch to 8 LPI
f. Adjust R204 (Top right of servo PCB) for minimum overshoot/undershoot

3.

Slew Speed (speed whilst form feeding)

a. Put switch to 6 LPI
b. Set self test for form feed commands, see Section 23.5.4 with 2^2 and 2^3 ON all others OFF.
c. Scope J20 pin 4 paper feed clock
d. Adjust R206 (top right servo PCB) for 8.1 + or - 0.2 milli secs between clock pulses. Note make sure printer is actually doing form feeds.

4.

Timing Verification This verifies that the line feed cycle is within spec. If previous set ups are OK and this is wrong, it means the mechanics are getting bound up, or need seeing to.

a. Set the self test for line feed at 6 LPI

b. Set the Scope
   Chan 1 J21 pin 1 (paper feed motion)
   Chan 2 J20 pin 4 (paper feed clock)
   Trigger Chan 1 negative

c. Check the trailing edge of Chan 1 is 35 to 41 milli secs from trailing edge of Chan 2.

23.5.4 LP05 and LP06 SELF TEST

These are on top of the logic assembly, at the left of the printer.

The instructions on the door of the LP05/6 control box are not particularly wrong, but do tend to be confusing. It is difficult to isolate what is wrong, if the printer does not respond. Here are the definitive settings.

Paper feed This is the code for line feed i.e. it moves the paper at printing speed (not the slew rate, which is form feed rate)

Select the following switches
test, single char, both
Choose line feeds (2^1 and 2^6 ON all others off)

Sliding Pattern

Select the following switches,
test, sliding, both
Choose line feeds (2^1 and 2^3 ON all others off)

Print all H's

Select the following switches,
test, single char, both
Choose H's (2^3 and 2^6 ON all others off)

Set Bank LP05 All hammers are firing simultaneously. This is needed to set up hammer flight times.

Select the following switches,
set bank, fixed, odd
Char switches here have the effect of choosing the number of columns, increase the count until they are all firing

Set Bank LP06 The LP06 has a different drum, all hammers are firing simultaneously when a single char is chosen, see all H's above.

Set Bank LP14 This is different again. There is a toggle switch for this on the top logic board, then put the printer on line.

23.5.5 Printer Drums and their Speeds

These are useful for qualifying part numbers for drums, however we have found recently drums for these printers are impossible to get, they were made virtually individually, with the customers requirements in terms of desired characters, and dataproducts say they need to make them up individually now, costing thousands of pounds. The drum is officially classed as media, according to the contract, so the customer pays if a new one is required. This effectively condemns one of these printers should the drum become defective.

Printer	Char's	Drum Speed
LP05	64	1000
LP05	96	673
LP06	64	800
LP06	96	533
LP14	64	1280
LP14	96	857

23.5.6 LP05 LP06 and LP14 Part Numbers

These printers, called the Data Products 2200 series, have many common parts, as categorised in the Table 23–3. Even for an individual printer, say the LP05, the parts are different depending on the serial number and what options are fitted on it.

Letters (ABCD) are included in Table 23–3 for serial numbers as follows:

LP05 (2230)

A . . . S/N C0018 to C0185 (Non UL)
B . . . S/N C0186 to C5999 (UL)
C . . . S/N F6000 to F12104 (UL Design Improvement)
D . . . S/N F12105 and Subs (UL Design Improvement)

LP06 (2260)

A . . . S/N D0001 to D1934
B . . . S/N D1935 and Subs

LP14 (2290)

A . . . S/N E0001 and Subs

Table 23–3: LP05/6/14 (DP 2200 Series) Popular Parts List

Description	Dec Part	DP part	LP05	LP06	LP14
Printed Circuit Boards (CCA's)					
CCA, Configured Logic	29-21112	244705-XXX	ABCD		
Configured Logic	29-22417	244706-XXX		AB	
CCA,Configured Microprocessor	29-22865	Various[4]			A
CCA, Servo	29-21113	237525-001	ABCD		
CCA, Servo	29-22416	237880-001		AB	
CCA, Servo	29-22844	241975-002			A
CCA, Hammer Driver	29-21114	238005-001	ABCD	AB	A
CCA, Back Panel, Hammer Driver	None	235090-001	AB		
CCA, Back Panel, Hammer Driver	+L-40752	236790-001	CD		
CCA, Back Panel, Hammer Driver, Upper	None	237595-001		AB	A
CCA, Back Panel, Hammer Driver, Lower	None	237600-001		AB	A
CCA, Regulator	29-21115	238030-001	ABCD		
CCA, Regulator	29-22415	237580-001		AB	
CCA, Regulator	29-22839	238125-001			A
CCA, VDE Hammer Supply	29-22838	237865-001		AB	A
CCA, Control Panel	29-23072	241523-001	ABCD	AB	A
CCA, I/O	29-21148	243470-019	ABCD	AB	A
CCA, Power Dist	29-21471	236847-001	BCD	AB	A
CCA, Self Test (64)	29-21222	244455-001	ABCD	AB	A
CCA, Self Test (96)		244455-003	ABCD	AB	A
Motors Pulleys Belts etc					
Drum		Order Individually[5]			
Motor, Blower	29-22313	801117-001	AB		
Motor, Blower	29-22858	801346-001	CD	AB	A
Motor, Drum	29-21124	800954-001	ABCD	AB	A
Motor, Drum, Start Cap	29-23013	800183-001	ABCD	AB	A
Motor, Paper Feed	29-21125	801040-001	ABCD		
Motor, Paper Feed	29-22857	801325-001			A

[4] The usual DP part no is 251625-xxx

[5] Drums are the customers responsibility and very expensive, and take a long time to come from DP, if one is worn out, the customer ought to consider another printer.

Table 23–3 (Cont.): LP05/6/14 (DP 2200 Series) Popular Parts List

Description	Dec Part	DP part	LP05	LP06	LP14
Motors Pulleys Belts etc					
Motor, Paper Feed	29-22427	801325-002		AB	
CCA, Emitter/sensor, for PF motor	29-24076	Various	ABCD		
CCA, Emitter/Sensor, for PF motor	29-24075	Various		AB	A
Motor, Ribbon	None	235691-001	A		
Motor, Ribbon	29-21120	801148-001	BCD	AB	A
Bearing, Drum	29-20126		ABCD	AB	A
Belt, Drum 64char 1000rpm	29-21119	800104-002	ABCD		
Belt, Drum 96char 673rpm	29-21849	801632-005	ABCD		
Belt, Drum 64char 1200rpm	29-21119	800104-002	ABCD		
Belt, Drum 96char 800rpm	29-22541	801632-007	ABCD		
Belt, Drum 64char 800rpm	29-21119	800104-002		AB	
Belt, Drum 96char 533rpm	None	801632-003		AB	
Belt, Drum 64char 1280rpm	29-23367	801632-009			A
Belt, Drum 96char 857rpm	29-22541	801632-007			A
Pulley 64char 1000rpm [3]	29-23640	243450-003	ABCD		
Pulley 96char 673rpm [3]	None	243450-006	ABCD		
Pulley 64char 1200rpm	None	243450-002	ABDC		
Pulley 96char 800rpm	29-23958	243450-005	ABCD		
Pulley 64char 800rpm	29-23958	243450-005		AB	
Pulley 96char 533rpm	None	243450-007		AB	
Pulley 64char 1280rpm	29-23943	243450-001			A
Pulley 96char 857rpm	None	243450-004			A
Belt, Paper Feed	29-12432	800299-003	ABCD		
Belt, Paper Feed	29-12519	800299-013		AB	A
Power Supplies and their parts					
Transformer, Power	Replaced by 29-21139	800942-001	A		
transformer, Power	29-21139	800942-003	BCD		
Transformer, Power	29-22426	801199-001		AB	
Transformer, Power	29-22856	801139-001			A

[3] Normal DEC supplied version

Table 23–3 (Cont.): LP05/6/14 (DP 2200 Series) Popular Parts List

Description	Dec Part	DP part	LP05	LP06	LP14
Power Supplies and their parts					
Capacitor Pack Assembly	29-21146	243035-001	ABCD		
Capacitor Pack Assembly	29-22424	242060-001		AB	
Capacitor Pack Assembly	None	242060-002			A
Capacitor, 30K UF, 75V	29-21141	800092-758	ABCD	AB	A
Capacitor, 32K UF, 25V	29-21144	800092-255	ABCD		
Capacitor, 71K UF, 25V	29-21142	800092-257	ABCD		
Capacitor, 75K UF, 15V	29-21143	800092-157	ABCD		
Circuit Breaker	29-21129	800797-003	ABCD		
Circuit Breaker	29-22853	800797-005		AB	A
Relay, 12V, DPDT	29-21140	801010-001	ABCD	AB	A
Paper and Ribbon Parts					
Spool, Ribbon Drive	None	236727-001	A		
Spool, Ribbon Drive	29-22267	236727-001	BCD	AB	A
Bearings, Drum	29-20126	800625-005	ABCD	AB	A
Spring Assy., Paper Tension/Mask	29-23068	238039-002	ABCD	AB	A
Backstop Screws	29-23610	238840-001	ABCD	AB	A
Tractor Assy, Right	29-21473	243365-001	ABCD	AB	A
Tractor Assy, Left	29-21472	243365-002	ABCD	AB	A
Tractor Assy, Right, manual adj[6]	29-81383	243360-001	ABCD	AB	A
Tractor Assy, Left, manual adj[6]	29-81382	243360-002	ABCD	AB	A
Tractor Chain	29-22859	801456-002	ABCD	AB	A
Tractor Spring	29-22540	243325-001	[1]	[1]	[1]
Pressure Plate, Tractor, Right	29-22539	243362-001	[1]	[1]	[1]
Pressure Plate, Tractor, Left	29-22538	243364-001	[1]	[1]	[1]
Switch, Paper Out	29-22837	237402-001	AB		
Switch, Paper Out	29-22837	237810-001	CD	AB	A
Switch, Limit, Top Left Torn Paper	29-21128	233585-005	ABCD	AB	A
Switch, Limit, Top Right Torn Paper	None	233585-006	ABCD	AB	

[1] Spares for 243365 and 239200 Tractors only

[6]Manual adjust tractors are used on most Non Dec DP printers and are reputedly much better (not so stiff). There is an adjustment proc in the DP manual for these.

Table 23–3 (Cont.): LP05/6/14 (DP 2200 Series) Popular Parts List

Description	Dec Part	DP part	LP05	LP06	LP14
Paper and Ribbon Parts					
Ribbon Deskew kit[8]	29-22842	Unknown	ABCD		
Hammer, and Hammer Bank Parts					
DRUMS		Not available easily see <REFERENCE>(drumlist)			
Hammer Module	29-21116	237851-171	ABCD	AB	A
CCA, Emitter/Sensor, Hammer Bank	29-24196	Unknown	ABCD		
Magnet, Transducer	None	240780-001	AB		
Coil Assembly, Transducer	29-28165	various	AB		
Magnet, Transducer	29-23644	240787-001	CD		
Coil Assembly Hammer Bank Drive Transducer	29-21865	240179-001	CD		
Other Small Parts					
Switch, 6/8 LP1	29-21896	800502-003	ABC	A	
Switch, Forms Reset	29-21897	800502-004	ABC	A	
Switch, 6/8 LP1	29-22851	800502-010	D	B	A
Switch, Forms Reset	29-22852	800502-011	D	B	A
Switch, Drum Gate Interlock	29-15026	800129-001	ABCD	AB	A
Switch, Plenum	29-22848	800129-007		AB	A
Lamps, Indicator	29-21117	800785-002	ABC	A	
Lamps, Indicator	29-22849	800163-006	D	B	A
Lamps, LED Visible	29-21470	801082-001	ABCD	AB	A
Drum Transducer Assembly Spares Kit	None	243370-001	ABCD	AB	A
Txducer w/cable & no Conn. Housing	29-23666	801619-002	ABCD	AB	A
Fuse, 1/16 Amp, SB		800917-116	ABCD	AB	A
Fuse, 8 Amp	29-17912	800816-080	ABCD	AB	A
Fuse, 1 Amp		800316-010	ABCD	AB	A
Fuse, 15 Amp	90-07226	800316-150	ABCD	AB	A
Shipping Retainer, Hammer Bank	None	241398-001	ABCD		
Cover hinge R.H.	29-23070	Unknown	ABCD	AB	A
Cover hinge L.H.	29-23071	Unknown	ABCD	AB	A

[8] See LP05-TT-17

Table 23–3 (Cont.): LP05/6/14 (DP 2200 Series) Popular Parts List

Description	Dec Part	DP part	LP05	LP06	LP14
Other Small Parts					
Drum Gate Hinge Kit [9]	Unknown	243305-001	ABCD	AB	A
Active Ribbon Control System[2]					
CCA, Control	29-22420	237650-001	BCD	AB	A
CCA, Ribbon Sensor	29-22421	237655-002	BCD	AB	A
CCA, Cam Sensor	29-22446	237950-001	BCD	AB	A
Motor, AC	29-22425	801150-001	BCD	AB	A
Other Printer Options					
Elapsed Time Meter 60 HZ	None	237385-001	ABCD	AB	A
Elapsed Time Meter 50 HZ	None	237385-002	ABCD	AB	A
CCA, External Exerciser	29-21122	236707-001	ABCD	AB	A
CCA, FLSS	29-21895	237407-002	ABCD	AB	A
CCA, Tape Reader VFU 11	29-21121	238044-001	ABCD	AB	A
Tape Reader	None	240125-001	ABCD		
Tape Reader	None	240125-002		AB	A
CCA, Direct Access VFU	29-21121	243269-001	ABCD	AB	
CCA, Direct Access VFU	29-23021	243269-003			A
Long Line I/O (Std) CCA, Receiver/Driver	29-22309	237465-001	ABCD	AB	A
Long Line I/O (Std) CCA, I/O	29-22867	246723-001	ABCD	AB	A
Low True I/O (Std) CCA,	None	241441-001	ABCD	AB	A
CCA, True Underline I/O without VFU	None	241442-XXX	ABCD	AB	A
CCA, True Underline I/O With VFU	None	241450-XXX	ABCD	AB	A
[2] Paper Motion Sensor Assembly	+L-10415	237728-001	ABCD	AB	A
Static Eliminator Bar[2]	29-22262	801095-001	ABCD	AB	A
Static Eliminator Power Pak	29-22263	801096-001	ABCD		
Static Eliminator Power Pak	29-22855	801096-003		AB	A
Static Eliminator Fuse (150mA)	None	800917-151			
Conversion Kit, 64 to 96 char [7]	29-23315	Unknown	ABCD	AB	A

[2] Standard on LP14's
[7] Includes Txdcr bracket, Pulley and belt. See LP05-TT-10
[9] See LP05-TT-37 and 52. Includes, Top Bush (235053-001), Lower Bush (235005-001), and Eccentric (236856-001)

23.6 Data Products B series printers (LP25/6)

Most of the information on the B series printers e.g. LP25 and LP26 comes from the B-book produced by Ian Price, Country Support . . .

23.6.1 I/O Harness

. . . This is the assembly on the back of the printer into which the interface cable from the processor is plugged. Attached to this socket, on the inside of the printer, is a PCB about 3" x 5" in size. On this PCB, where necessary, are mounted the termination resistors. The correct values of termination resistors are necessary for optimum interface signal quality. The resistors needed when the printer is driven by an LP11, LPV11 or DMF32 are as follows . . .

330 ohm Pull Down (Locations: R2, R4, R6, . . . R24)
150 ohm Pull Up (Locations: R1, R3, R5, . . . R23)

This configuration is indicated by a variant of "-004" in the Data Products part number of the I/O Harness. If modifying an existing I/O Harness that does not have the correct value termination resistors the part numbers for the resistors are:

330 ohm, 0.5 Watt Resistors	13-00296
150 ohm, 0.5 Watt Resistors	13-00249

The I/O Harness used with Long Line printers is different and does not have termination resistors because differential signals are used. Usually DEC supplied printers have an Amphenol, 50 pin "D" type plug. Printers not supplied by DEC may have a Winchester 50 pin, or a Centronics connector. To change this to the Amphenol type will entail changes, to the printer, system interfaces, and to the Processor pcb proms.

For parts see Table 23–17

23.6.2 Motherboard

Two different types of Motherboard are used.

The B300 LPM has 6 slots
The B600, B900, B1000 has 7 slots

The 5 rearmost slots have pins bussed through. So all PCB's except the hammer drivers can be changed round for fault finding purposes, but there is a preferred slot usage.

Table 23–4: Preferred Motherboard Slot Usage

Slot Position	Module
Rear (1st) Slot	Spare or Serial Interface
2nd Slot	Parallel Interface
3rd Slot	Processor PCB
4th Slot	Timing and Status PCB
5th Slot	Power Board
6th Slot	Hammer Driver (even hammers)
7th Slot †	Hammer Driver (odd hammers)

† The 7th slot does not exist on LP25s & B300s.

Mounted on the Motherboard is a relay (DEC part number 12-10683) which switches regulated 38 volts to the Power Board (MC38) for the Motors and Clamps and to the Hammer Driver Boards (HD38) to fire the hammers.

Socket J2 on the Motherboard is where the optional Elapsed Time Meters would plug into. This is not a very common option. Part numbers for Motherboards that are available are detailed in table Table 23–17 as pcb, motherboard.

23.6.3 Parallel Interface Module

The following notes appertain to the interface and its host connection.

1. Short line interface - uses TTL - up to 50 feet.
2. Long line interface - differential signals - up to 500 feet
3. Vertical Forms Unit (VFU) - has extra logic on the PCB - it has paper tape (TCVFU), or down line loads (DAVFU), for form feed information - processor proms are different. See Table 23–17, proc, proms - has 4 switch packs (otherwise there are 2)
4. Centronics - different processor proms - LP11 is configured as an LS11 (DMF32 and LPV11 cannot support it)
5. Forms Length Select Switch (FLSS). The prom in Interface PCB MEM 1 is (29-23405), If the prom is not present the form feed is 11 or 12 inches, see SW2-6 in Table 23–6

The following abbreviations are used in Table 23–6 and Table 23–5. Refer also to the glossary in Section 23.2.

PRMV . . . I/F line for Paper Moving status
par . . . parity
par gen . . . parity generation
perf skip . . . perforation skipover

Table 23–5: Interface Module Normal Switch Settings

Switch Number	1	2	3	4	5	6	7	8
				Switch Pack 1				
Non VFU	[2]	ON	ON	ON	OFF	[2]	OFF	OFF
With VFU	[2]	OFF	ON	ON	OFF	[2]	OFF	OFF
				Switch Pack 2				
Non VFU	OFF	ON[1]	OFF[1]	ON[1]	ON	[2]	OFF[1]	OFF
With VFU	OFF	ON[1]	OFF[1]	ON[1]	ON	[2]	OFF[1]	OFF
				Switch Pack 3				
With VFU	[2]	[2]	[2]	[2]	OFF	[2]	[2]	x
				Switch Pack 4				
With VFU	[2]	[2]	[2]	[2]	[2]	[2]	[2]	x

[1]The switch may legitimately be in the other position for a different function
[2]Switch position is immaterial. It won't affect the printer operation in "DEC land"

Table 23–6: Short or Long Line Interface

Switch	Purpose Off	Purpose On
	Switch Pack 1	
SW1-1	VFU verify shorted to NotVFU (Asserts user VFU)	Open indicates no VFU
SW1-2	Allows user paper instr sig to reach printer	Disables paper instr (VFU not used)
SW1-3	All 8 data lines used	Disables 8th data line when only 7 data lines used
SW1-4	In high true state allows user Buffer Clear sig to reach printer	In low true state allows Buffer Clear sig to reach printer
SW1-5	High true user signals	Low true user signals
SW1-6	Opens 8th data line to par gen	Enables this, SW1-7 Off
SW1-7	Opens paper instr line to par gen	Enables this, SW1-6 Off
SW1-8	Prevents par being output from printer	Allows this
	Switch Pack 2	
SW2-1	No LF gen when CR received	Generates LF when CR received
SW2-2	Perf skip	See separate table
SW2-3	Perf skip	See separate table
SW2-4	At paper out prints until BOF reached	At paper out stops immediately[1]
SW2-5	Error if more than 8 CR received	Error on more than 140 CR
SW2-6	FF length 11 ins[2]	FF 12 ins[2]
SW2-7	Perf Skip Enabled as set by SW2-2-3	Disabled
SW2-8	Disables Band Image Prom check	Enabled
	Switch Pack 3	
SW3-1	Disables VFU Skipover	Enables
SW3-2-3	TCVFU BOF Control	See separate table
SW3-4	Not Used	
SW3-5	Tells the user a 12 channel Tape Reader is available	Tells the user the tape reader can be used [3]
SW3-6	Reports paper moving, on the PRMV I/F line	When SW3-8 is on as well, TCVFU Chan 9 is on PRMV line
SW3-7	Reports tape Chan 1 on user TOF I/F line	Reports tape Chan 9 on user TOF I/F line
SW3-8	Allows VFU ready on user PRMV line	When SW3-6 is on as well, TCVFU Chan 9 is on PRMV line
	Switch Pack 4	
SW4-1-2	I/O signal data line polarity	See separate table
SW4-3	Max of 15 line skips	Max of 63 line skips
SW4-4	IBM 1403 signals not used	IBM 1403 sigs can be used
SW4-5	Allows paper to skip past TOF during skipover	Stops line skipping at TOF
SW4-6-7-8	Not Used	

[1]Displays 16. Pressing On Line then steps up another line

[2]These apply only if no FLSS PROM is present

[3]Automatic tape read occurs at power up

Table 23–7: Switches mentioned in Table 23–6

SW2-2	SW2-3	Perf Skip
Off	Off	3 Line Skipover
On	Off	0 Line Skipover
Off	On	6 Line Skipover
On	On	4 Line Skipover

SW2-2	SW2-3	TCVFU Bottom of Form control
Off	Off	Tape Chan No 12
On	Off	Tape Chan No 2
Off	On	Tape Chan No 11
On	On	Tape Chan No 8

SW4-1	SW4-2	Selection of I/O data line and polarities for the tape Chan and line skip commands

SW4-1	SW4-2	Data Line	Tape Chan Cmd/(Pol)	Line Skip Cmd/(Pol)
Off	Off	5	False (Low)	True (High)
On	Off	7	False (Low)	True (High)
Off	On	5	True (High)	False (Low)
On	On	7	True (High)	False (Low)

23.6.4 Serial Interface Module

The Serial Interface uses either standard RS232C Voltage or the 20mA Current Loop method. It supports XON/XOFF is configurable for Simplex (normal mode) communication format, Unblocked Duplex (which uses ACK or NAK codes back to the system after each line to indicate good or bad data received), or Blocked Duplex (which also uses ACK and NAK, but after a block of data bounded by STX and ETX codes).

The Serial Interface requires 2 proms. The Prom "-001" plugs into MEM 1 and "-002" plugs into MEM 2. Part number details of the PCBs and PROMs are detailed in Table 23–17.

The serial interface is an EXTRA PCB and has a small cable to the parallel interface (must be short line without VFU). The DP serial interface is not capable of VFU, however the Centronics serial interface is, because its protocol uses control codes.

The cables needed for normal distribution panels, (eg DZ11,DMF32 etc) are Null Modem cables such as a BC03M, or BC22D. If connecting to a Modem a BC05D, BC22E or BC22F should be used.

Table 23–8: Normal Switch configuration of Serial Interface

Switch Number	1	2	3	4	5	6	7	8
Switch Pack 1	ON	OFF	OFF	ON	ON	ON	ON	ON
Switch Pack 2	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF
Switch Pack 3	ON	OFF	OFF	OFF	ON	ON	OFF	OFF

Table 23–9: Serial Interface Switch Packs - Purpose

Switch	Purpose OFF	Purpose ON
SW1-1	data strobe "low true" - Centronics interface	"high true" - short line interface
SW1-2	not used	not used
SW1-3	Busy Sig "high true"	"low true"
SW1-4	Busy Sig will be OR'd with DTR on the CD line	Busy and DTR on separate lines
SW1-5	20 mA selected	RS232C selected
SW1-6	CTS under user control	CTS always enabled
SW1-7	DCD under user control	DCD always enabled
SW1-8	DSR under user control	DSR always enabled
SW2-1 thro SW2-5	Not Used	-
SW2-6	parity bit checked	parity not checked
SW2-7/8	see Table 23–10	-
SW3-1/4	see Table 23–11	-
SW3-5	8 data no parity	7 data no parity
SW3-6	2 stop bits	1 stop bit
SW3-7	include parity bit	no parity bit
SW3-8	even parity	odd parity

Table 23–10: Serial Interface SW2-7 and 8

SW2-7	SW2-8	Mode
Off	Off	Simplex
On	Off	Stops Communication (Not used)
Off	On	Unblocked Full Duplex
On	On	Blocked Full Duplex

Table 23–11: Serial Interface SW3-1 through SW3-4

Baud Rate	SW3-1	SW3-2	SW3-3	SW3-4
50	On	On	On	On
75	Off	On	On	On
110	On	Off	On	On
134.5	Off	Off	On	On
150	On	On	Off	On
300	Off	On	Off	On
600	On	Off	Off	On
1200	Off	Off	Off	On
1800	On	On	On	Off
2000	Off	On	On	Off
2400	On	Off	On	Off
3600	Off	Off	On	Off
4800	On	On	Off	Off
7200	Off	On	Off	Off
9600	On	Off	Off	Off
19200	Off	Off	Off	Off

23.6.5 Processor Module

The Proms in this module serve the following function:

For 300 and 600 LPM printers;

MEM1 to MEM5 are processor proms;
MEM6 to MEM8 are band image proms;

For 900 and 1000 LPM printers;

MEM1 to MEM6 are processor proms;
MEM13 to MEM15 are band image proms.

Processor Prom Kits

Each kit consists of 5 proms (or 6 proms for 900 and 1000 LPM printers). Those with a variant of -001 plug into location MEM 1, those with a variant of -002 plug into location MEM 2 etc.

There are different PROM's for ribbon weld skipover (RWS), these are provided as standard now. i.e. If non RWS PROM's are ordered, RWS PROM's are sent by default. See RWS under Ribbons heading.

Band Image Proms

1. These are common across all these printers.
2. There is a different prom for each different character set that is available.
3. It is possible for the customer to use up to 3 different types of print band on a printer, as there is space for 3 Band Image Proms.
4. Any, or all, of the 3 plug-in IC positions reserved for the Band Image Proms can be used as they are in parallel.

The bands commonly used by DEC's customers in the UK have both a "pound" sign and a "dollar" sign on them. But to print the "pound" sign for ASCII code 43 the correct "UK" prom has to be installed; if a "US" prom is installed a "hash" sign will be printed for ASCII code 43. It is illegal to have a US and a UK band image prom, for a particular band, in the printer at the same time.

There are two types of band, one for 300 LPM bands, and one for 600, 900 and 1000 LPM bands. Table 23–17 details the most common bands and Band Image Proms used in the UK, together with DEC, Data Products and DecDirect part numbers.

The standard 64 character band image proms used by DEC automatically convert lowercase character codes into the corresponding uppercase character code.

The 300 LPM models can be configured to produce CONDENSED PRINT. This means the horizontal character density is 15 cpi, but the printout is restricted to a maximum of 136 columns width. All that is involved is a special print band, all other parts even the proms are standard.

Table 23–12: 15 CPI band part numbers

Band Type	DP Part No.
15 CPI, 64 Characters	250040-019
15 CPI, 96 Characters	250041-022

Band Timeout Switch

This is a switch pack with 5 switches. One switch is put to the ON position to setup the band time out. The approximate time out for each switch position is given in Table 23–13. The normal configuration is to have switch 2 ON with the others OFF.

Table 23–13: Band Timeout Switch Settings

Switch ON	1	2	3	4	5
Timeout (secs)	2	4	8	16	32

If all of the switches are OFF then the band will not be driven at all and a Band Speed error code will be displayed. If all of the switches are ON then the the band will not time out. This can be useful when trouble shooting some fault conditions.

23.6.6 Timing and Status Module

The Timing and Status Module does the following:

1. enables the Processor Module to monitor the current status of the printer.
2. monitors the timing marks on the Print Band (via a Band Transducer).
3. controls hammer timing
4. monitors power supply voltages, the transducer, band drive, paper feed drive, and hammer firing for fault conditions.

It includes a print inhibit switch which prevents the hammers firing for trouble shooting purposes. For normal printer operation this switch is positioned to the left, when viewing the module from the component side.

The Timing and Status module is configured for the printer models by the installation of a different Band Speed Header (position J2) and Program Header (position J4).

The Timing and Status module has undergone several design changes. This has resulted in certain compatibility problems. All versions have the same DEC part No, but different DP part No's.

1. 257520-001 is the old design and cannot be used on B900 and B1000
2. 263075-001 is the old design modified to take the new headers for B900 and B1000.
3. 263080-001 is the new design

There are hundreds of header PROM's for the different Timing and status and hammer driver PCB's. Some are listed in Table 23–17, but for a complete list refer to the B Book.

The types of Band Speed and Program Header depend on:

1. The speed of the printer
2. The processor microcode
3. The Timing and Status module type.

23.6.7 Power Board

The Power Board provides:

1. +5 and +12 regulated DC voltages
2. VCL voltage, this acts as a reference voltage for the hammer driver circuit. Its value varies with the position of the copies potentiometer on the Operators Control Panel.
3. MC 38v (Motors and Clamps 38v) to power the paper feed and band drive motors, and paper clamp solenoids.
4. A thermistor which acts as an air flow sensor (fan failure)
5. Drive for the paper clamp solenoids

23.6.7.1 Paper Clamp Solenoids

The purpose of these is to clamp the paper and hold it steady whilst printing. It is not usually noticed if these do not operate.

300 and 600 LPM printers have two (sometimes three).
900 and 1000 LPM printers use sprung pressure rollers instead of paper clamp solenoids.

Early 300 & 600 LPM printers had 3 paper clamp solenoids, and 3 two pin sockets in which to plug them. Later printers have only 2 of each.

If there is 2 solenoids and 3 sockets then the spare 3rd socket should have its two pins shorted together.
If there is 3 solenoids and 2 sockets then leave the right hand clamp solenoid disconnected.

The later Power Boards have 7 jumper positions on them. W1 and W2 are factory selected and should not be altered. W3,4,5,6 and 7 are the same for all speeds of printer. ie.
W3 IN, W4 OUT, W5 IN, W6 IN, W7 OUT.

23.6.8 Hammer Driver Module

Hammer information is multiplexed from the processor module to this PCB, were it is decoded to fire individual hammers.

A Header Plug is installed into location J18 to control the hammer flight time. The type of Header is dependent on . . .

printer speed
processor microcode

The 300 LPM printer has only one Hammer Driver PCB. The 600, 900, and 1000 LPM printers use 2 Hammer Driver PCB's, the front one is used to drive the lower (odd with blue connectors) hammers and the rear one to drive the upper (even with white connectors) hammers.

The hammers are assembled in blocks of four.

The 300 LPM printer has 68 double width hammers whereas the 600, 900, and 1000 LPM printers have 136 single width hammers. The standard printers only print a maximum of 132 columns. To enable printing of 136 columns different hammer driver PCB's, with extra components, are used. Printers configured with the Centronics Compatible Interface can only print 132 columns.

23.6.9 Power Supply

There is a 115v 60Hz "domestic" (to the USA) power supply available, it is not used on the B900 or B1000. The "Universal" power supply is capable of being configured for inputs of 115v or 240v and 50Hz or 60Hz, and is the one normally fitted.

To convert a printer fitted with the Domestic 115v, 60Hz power supply to work on 240v entails replacing the Domestic Power Supply with a Universal Power Supply. The part numbers are:

Universal Power Supply Assy. (pedestal printers). DP Part No. 251102-003
Universal Power Supply Assy. (acoustic cabinet). DP Part No. 251102-002

The Universal Power Supply consists of:

1. constant voltage transformer
2. resonant capacitor
3. 38v preload resistor
4. power switch
5. 2 pole circuit breaker
6. Universal Rectifier PCB with a 38v regulator
7. Capacitor Bank assembly
8. Auxiliary capacitor pack (extra 38v for extra hammers) for 600, 900 and 1000 LPM printers)
9. A.C. line filter, added where thought necessary. Part No 29-23776

Double sets of plugs and sockets are provided in the Universal Power Supply to accommodate the four possible combinations of mains input voltage and frequency.

The configuration of these is:

Plug	Purpose.	Sockets to be used
P4	Selects transformer primary windings for the input voltage	J4A for 90V - 132V J4B for 180V - 250V
P5	Selects the transformer secondary windings	J5A for 50Hz J5B for 60Hz
P9	Connects the resonant capacitor to the correct transformer winding.	J9A for 50Hz J9B for 60Hz

Other sockets on the Universal Rectifier are used as follows:

J1 AC mains input volts (ie 240v) into the PCB. Pins 2 and 4 are linked as an interlock.

J2 115 volts power for the fan for logic cooling. Pins 3 and 4 are linked as an interlock.

J3 115 volts power for the Hammer Bank Blower in Acoustic Cabinets. Otherwise it is left empty.

J6 Output volts to the Capacitor Bank.

J7 Preload resistor for 38 volts. Pins 8 and 9 are linked as an interlock.

J8 Plug with pins 2 and 3 shorted to link logic ground to frame ground. Installed in printers in DEC land.

There is an FCO on the mains input on LP25/6 printers, see Section 23.6.13

23.6.10 Ribbon Drive

The ribbon drive mechanics have undergone several design changes. These have been detailed below.

Posidrive

The original printers had "O" ring section ribbon drive belts. These had a tendency to stretch and slip. In October 1981 the band deck casting design was changed slightly; also a die cast was now used instead of a sand cast. At this time POSIDRIVE was introduced for the ribbon drive. This entailed a toothed ribbon drive belt, toothed ribbon drive and driven pulleys, and a ribbon tension arm. If the casting is of the old type, certain options are not available, such as RWS.

The ribbon pivot arm was also changed at this time to incorporate a microswitch, to detect a build up of ribbon between the two stuffing rollers, brought about by ribbon packing failure.

Different band drive pulleys, band drive motor assembly, band idler pulley spindle assemblies, and front right hand ribbon guide posts were also introduced.

Ribbon Guide Posts

In the original printers the front right hand ribbon guide post (the first post that the ribbon comes to) was a push fit into the casting. With the posidrive casting this post is fixed with a screw through its centre into a threaded hole in the casting.

With the introduction of the Ribbon Weld Skipover option the front right hand post has changed again.

The other posts have remained basically unchanged. However there was a period of about 12 months when the rear left hand post (ie the third post) was replaced with a conical, capstan shaped post. This made the printer more tolerant of the varying quality ribbons which DEC was using at that time. This is not now the case.

Ribbon Drive Clutch

Subsequent to posidrive a SLIP CLUTCH assembly was brought out to replace the toothed ribbon drive pulley on the band motor shaft. The aim of this is to prevent printer damage in the event of a ribbon jam.

Ribbon Pivot Arm

About 1985 the ribbon pivot arm assembly was changed to have a proper bearing surface for the ribbon packing roller to rotate in, to reduce wear. The part number remained the same.

23.6.10.1 Ribbons

DEC originally supplied ribbons that were 4 thou thick. With the benefit of experience this changed and DEC now recommends and supplies 5 thou thick ribbons with Ribbon Weld Skipover.

23.6.10.2 Ribbon Weld Skipover (RWS)

This was introduced to prolong ribbon life by preventing the print hammers from hitting and weakening the welded join in the ribbon. This involves some hardware changes and special Ribbon Weld Skipover ribbons which incorporate a metallised paint patch or a metal thread at the ribbon join. These are now standard under DecDirect part number LP25R-01.

The hardware changes for RWS are:

1. A new right hand front ribbon guide post assembly which has two electrical contacts shorted together by the metal at the ribbon join.

2. A different Interlock Transition PCB which includes circuitry to interpret the join detection. A jumper, W1, can be inserted to allow the ribbon join detection circuitry to be disabled if necessary. Another jumper, W2, is always inserted.

3. Different sets of microcode proms for the Processor PCB to handle the RWS option. See (Table 23–17 "proc, proms" for part number details of these proms).

It is possible to convert some of the older printers to RWS operation; but only those printers with the Posidrive casting because prior to this the front right hand ribbon guide post is not compatible.

RWS, New Parts:

Part Description	DEC Part Number	Data Products Part Number
Front right hand post replaced	29-25375	257562-001
RWS ribbon guide post & cable	-	273481-001
Non RWS Interlock Transition PCB	29-23397	256440-001
RWS Interlock Transition PCB	-	273340-001
RWS Processor PCB proms	see Table 23–17, "proc,proms"	

23.6.11 Printer Covers and Cabinets

The DEC supplied LP25 and LP26 have a DEC designed and supplied cover. It is a different colour and shape. The DEC cover has gas struts to prevent the operator access lid from closing too fast.

If a decision is made to replace a Data Products cover on a B300 or B600 with a DEC cover then a spacer will be needed to raise up the operators panel. The DEC part number for this spacer is 74-24068.

Acoustic Cabinets

1. All B900 & B1000 printers and some B300 & B600 printers have them
2. The Operators Control Panel is a different shape. So part numbers for the Control Panel Assembly, the Control Panel PCB and the FLSS Switch Assembly are different to those used in the standard pedestal mounted printers.
3. An extra blower fan provides cooling for the hammers. It is powered from socket J3 on the Universal Rectifier PCB.
4. They have a paper puller to aid paper movement.

23.6.12 Paper Puller

The paper puller motor is connected to the input mains. There are various types and which have different connections. The terminal strip refered to in Table 23–14 is physically near to the motor.

When fitting a new motor first determine which type of motor has been supplied by its cable colours, (see Table 23–14 and then wire up also as Table 23–14.

Table 23–14: Paper Puller wiring configurations 230 volt

TERM STRIP	mains wire		motor type A		motor type B		motor type C	
	wire	colour	wire	colour	wire	colour	wire	colour
1	6	black	2	black	2	white		brown
2[1]			3	rd/wht	3	black		black
2[1]			4	blk/wht	4	yellow		blue
3			5	red	5	red		yel/wht
4	7	white	1	white	1	blue		white

[1]There are two wires on terminal 2

The 115v motor connections have not been included here. See the B Book for these.

There have been changes to other parts of the paper puller to improve its reliability and functionality. These are summarised in Table 23–15

Table 23–15: Paper Puller Part Numbers

PART	Old part No:	New part No:	Reason for change
Motor	810584-001	810584-002	3/16 to 1/4 inch dia shaft
Motor pulley (18 teeth)	810569-001	810569-003	3/16 to 1/4 inch dia shaft.
	810569-003	273595-171	Grub screw to circlip fix.
Step pulley assy.	263306-001	273507-001	Bearings in pulley
Shaft pulley (60 teeth)	810569-002	273589-171	Grub screw to circlip fix.
Pressure roller assy.	248470-001	-	Improved operation
roller	248596-001	267498-001	
toggle	248595-001	273314-001	
holder	248594-001	273315-001	
pin	-	273317-001	
Roller spring	800328-040	800328-036	Lower slip torque
Paper puller assy.	263253-002	274785-001	Better bearings etc.
Upper belt (125 teeth)	810574-001	-	DEC part no. 29-25365
Lower belt (105 teeth)	810574-002	-	DEC part no. 29-25366

23.6.13 Field Change Orders

Table 23–16: B series printer FCOs

FCO No.	FCO Kit No.	Part Affected.	Printers
30-16724-M0001	EQ-01312-01	Mains circuit breaker	B300
30-16724-M0010	EQ-01233-01	Line Filter and Fan Terminals	B300 ("O" ring)
	EQ-01233-02	Band Guard Clip	
30-16724-M0011	EQ-01284-01	Band Cover Microswitch	A few B300s
30-18305-M0002	EQ-01232-01	Line Filter and Fan Terminals	B600
	EQ-01232-02	Band Guard Clip	Posidrive B300, B600, B900,
	EQ-01232-03	Band Guard Clip	B1000
			B600 ("O" Ring)
30-18305-M0003	EQ-01313-01	Circuit breaker	B600
30-18305-M0004	EQ-01285-01	Band Cover Microswitch	A few B600s

23.6.14 Replacing/setting up the PLATTEN on B series printers

The platten on these printers is simply removed by 3 allen screws. However its placement to a few thou is critical to print quality and hammer life.

Setting up the platten requires a jig to be fitted to the printer when it is stripped down, because the reference points are actually at the rear and to the side of the hammer bank. The Digital LP2x series manuals do not include instructions for this jig, but the data products support manuals do.

PRC do own a jig to do this which can be obtained by contacting Derek Drayton at PRC in Dec Park.

A Platten Kit can be ordered from Data Products, which contains a jig which allows a platten to be put back in exactly the same place that it was took off. It does not set a previously incorrectly set platten.

The reasons for changing the platten would be for a bowed platten (check with a straight edge), or indentations due to lots of printing (several years), which causes indistinct characters to be formed.

If the platten has been adjusted by mistake it can be adjusted by inching the platten forward or backward a few thou, clamping it each time, checking for phasing of characters. This presumes the flight times have not been adjusted and they were correct before the platten was moved.

If the printer is suffering poor print quality and the platten gap is suspected, then the jig from PRC should be used or the printer option swapped.

23.7 Popular Part Numbers for B Series Printers

The detailed Illustrated Parts Breakdown for this family of line printers is contained within the Data Products "B Series Master Support and Logistics Manual" It is obtainable from Data Products and has a part number of 255135-001.

Table 23–17: Popular Parts List for B Series printers

Description	Dec Part #	D.P. Part #	Comments	B 3 0 0	B 6 0 0	B 1 0 0
Bands, Band Proms and other band parts						
Band, 64 char.	29-23439	250034-019	Uses US or UK prom	*		
Band, 96 char.	29-23440	250057-022	Uses US or UK prom	*		
Band, 64 char.	29-23626	250035-019	Uses US or UK prom		*	*
Band, 96 char.	29-23627	250045-022	Uses US or UK prom		*	*
Band prom, UK, 64 char.	29-23453	250540-019	Prints pound sign	*	*	*
Band prom, UK, 96 char.	29-23454	250530-022	Prints pound sign	*	*	*
Band prom, US, 64 char.	29-23451	250539-019	Prints # sign	*	*	*
Band prom, US, 96 char.	29-23452	250529-022	Prints # sign	*	*	*
64 band + UK prom	LP25X-BA		DecDirect	*		
64 band + US prom	LP25X-AA		DecDirect	*		
96 band + UK prom	LP25X-BB		DecDirect	*		
96 band + US prom	LP25X-AB		DecDirect	*		
64 band + UK prom	LP26X-BA		DecDirect		*	*
64 band + US prom	LP26X-AA		DecDirect		*	*

Table 23–17 (Cont.): Popular Parts List for B Series printers

Description	Dec Part #	D.P. Part #	Comments	B 3 0 0 0	B 6 0 0	B 1 0 0
Bands, Band Proms and other band parts						
96 band + UK prom	LP26X-BB		DecDirect		*	*
96 band + US prom	LP26X-AB		DecDirect		*	*
Band cover assy	NONE	256294-001		*	*	*
Band drive motor assy	29-23388	263476-001	O ring type	*	*	
Band drive motor assy	29-24118	801669-006	Toothed belt type	*	*	*
Band drive pulley	29-23386	257541-001	O ring type	*	*	
Band drive pulley	NONE	257570-001	Toothed belt type	*	*	*
Band edge guide bearing	29-23414	251704-009	Used on all types	*	*	*
Band idler shaft assy	29-23387	251880-001	O ring type	*	*	
Band idler shaft assy	29-24120	263006-001	Toothed belt type	*	*	*
Band motor ribbon pulley	29-24119	257571-001	O ring type	*	*	
Band motor ribbon pulley	NONE	267362-001	Toothed belt type	*	*	*
Band transducer assy	29-23411	251704-004		*	*	*
Cables						
I/O Harness, long line[3]	29-23437	257342-001	AMP connector	*	*	*
I/O Harness, long line	NONE	257341-001	Winchester conn.	*	*	*
I/O Harness, short line[2]	29-23396	257340-004	AMP socket	*	*	*
I/O Harness, short line	+L-40188	257343-004	Winchester conn.	*	*	*
I/O Harness, serial	2K-E19PA	256275-002	DEC # is not 20mA	*	*	*
I/O Harness, Centronics	NONE	257344-001	Centronics conn.	*	*	*
Interface cable	70-16560-30	-	LP11 or M5973(LLD)	*	*	*
Interface cable	BC27A-30	-	Used on DMF32	*	*	*
Interface cable (CSS)	BN26A-xx	-	Same as 70-16560-xx	*	*	*
Cable,interconnect,Serial	2K-1820A	257299-001	8" ribbon cable	*	*	*
Cable,Interlock-I/F pcb	NONE	247784-001		*	*	*

[2]Normal assemblies on DEC supplied short line printers

[3]normal assemblies on DEC supplied long line printers

Table 23–17 (Cont.): Popular Parts List for B Series printers

Description	Dec Part #	D.P. Part #	Comments	B 3 0 0 0	B 6 0 0	B 1 0 0 0
Power Supply parts and fans						
Blower, hammer bank	+L-40189	267424-001	Acoustic cabs.	*	*	*
Cap,27000UF,75v	29-23427	801743-003	C3,C6	*	*	*
Cap,41000UF,50v	29-23464	801743-002	C2,C5	*	*	*
Cap,83000UF,15v	29-23428	801743-001	C1,C4	*	*	*
Capacitor bank assy	29-25371	263155-001	C1,C2,C3,C4 assy	*	*	*
Circuit breaker,8A/4Amp	12-24141-01	-	Added by FCO	*	*	
Fan assy.	29-23384	257633-003	Includes cable	*	*	*
Fuse,12A,f/b.	90-08279	-	On rect.pcb.,F1,38v	*	*	*
Fuse,20A,s/b.	29-23422	-	On rect.pcb.,F3,+9v	*	*	*
fuse,2A,s/b	90-07216	-	On rect.pcb.,F2,-9v	*	*	*
Fuse,6A,f/b	90-07999	-	On power pcb.,F1,38v	*	*	*
Fuse,pico,2A.	12-11751	-	On I/F pcb.,F1 & F2	*	*	*
Transformer,Universal,kit	29-25370	251704-008	Includes capacitor	*	*	*
Pcb, Universal Rectifier	29-23394	251985-001	240v & 115v land	*	*	*
Pcb, Domestic Rectifier	NONE	251725-001	115v land only	*	*	*
Power Board Shorting Plug	29-23886	263172-001	Fits in socket J3C	*	*	
Line filter	29-23776	251067-001		*	*	*
Relay, Motherboard	12-10683	800795-301	DEC replacement	*	*	*
PCBs and PROMs for them						
Pcb, Hammer Driver (Std)	29-23395	251165-001	132 columns	*	*	*
Pcb, Hammer Driver (opt)	NONE	251165-002	136 columns	*	*	*
Pcb, Interface,Centronics	+L-41050	257265-001		*	*	*
Pcb, Interface,short line	29-23419	257345-001	No DAVFU	*	*	*
Pcb, Interface,short line[2]	29-23438	257345-002	With DAVFU	*	*	*
Pcb, Interface,long line[3]	29-23433	257240-002	With DAVFU	*	*	*
Pcb, Interface,long line	29-25367	257240-001	No DAVFU	*	*	*
Pcb, Interlock Transition	29-23397	256440-001	Non RWS version	*	*	*

[2]Normal assemblies on DEC supplied short line printers

[3]normal assemblies on DEC supplied long line printers

Table 23–17 (Cont.): Popular Parts List for B Series printers

Description	Dec Part #	D.P. Part #	Comments	B 3 0 0	B 6 0	B 1 0 0
PCBs and PROMs for them						
Pcb, Interlock Transition	NONE	273340-001	RWS version	*	*	*
Pcb, Motherboard	29-23404	251995-001		*		
Pcb, Motherboard	29-23619	251190-001			*	*
Pcb, Power Board	29-23402	263040-001	New	*	*	*
Pcb, Power Board	29-23402	257320-001	Old. Plug=29-23386	*	*	*
Pcb, Processor less proms[4]	29-23400	257315-001		*	*	
Pcb, Processor less proms	+L-40184	263230-001	Also +L-10059			*
Pcb, Serial Interface	29-25368	267295-001	(1K buffer) no prom	*	*	*
Pcb, Serial I/F + proms	2K-E19YA	267295-001	+ 263462-999(proms)	*	*	*
Pcb, Timing & Status	29-23401	263080-001	or 263075-001. New	*	*	*
Pcb, Timing & Status	29-23401	257520-001	Old	*	*	
Processor Proms,Centronic	NONE	274374-999	Handles RWS	*		
Processor Proms, w/o VFU	29-23403	257511-999	Set of 5	*		
Processor Proms, w/o VFU	NONE	273351-999	Handles RWS	*		
Processor Proms, with VFU	+L-41046	257512-999	Set of 5	*		
Processor Proms, with VFU	NONE	273352-999	Handles RWS	*		
Proc.Proms,B600,Centronic	NONE	273376-999	Handles RWS		*	
Proc.Proms,B600,w/o VFU	29-23625	257656-999	Set of 5		*	
Proc.Proms,B600,w/o VFU	NONE	273346-999	Handles RWS,DP		*	
Proc.Proms,B600,w/o VFU	NONE	273363-999	Handles RWS,DEC		*	
Proc.Proms,B600,with VFU	29-23935	257657-999	Set of 5		*	
Proc.Proms,B600,with VFU	NONE	273347-999	Handles RWS,DP		*	
Proc.Proms,B600,with VFU	NONE	273361-999	Handles RWS,DEC		*	
Proc.Proms,B900,w/o VFU	NONE	263322-999	Set of 6			
Proc.Proms,B900,with VFU	NONE	263321-999	Set of 6			
Proc.Proms,B1000,w/o VFU	NONE	267441-999	Set of 6			*
Proc.Proms,B1000,w/o VFU	+L-40186	273433-999	Supports RWS			*
Proc.Proms,B1000,w/o VFU	NONE	274635-999	RWS & Microstep			*

[4]D.P. versions -002 and -003 do not have sentinel RAM (not normally supplied)

Table 23–17 (Cont.): Popular Parts List for B Series printers

Description	Dec Part #	D.P. Part #	Comments	B 3 0 0 0	B 6 0 0	B 1 0 0
PCBs and PROMs for them						
Proc.Proms,B1000,with VFU	NONE	267442-999	Set of 6			*
Proc.Proms,B1000,with VFU	+L-40185	273434-999	Supports RWS			*
Proc.Proms,B1000,Centronic	NONE	250671-999	Set of 6			*
Proc.Proms,B1000,Centronic	NONE	273394-999	Supports RWS			*
Proms, Serial I/F,1K Buff.	2K-1819A	263462-999	Set of 2, Standard	*	*	*
Proms, Serial I/F,2K Buff.	NONE	263463-999	Set of 2	*	*	*
Proms, Serial I/F,4K Buff.	NONE	263464-999	Set of 2	*	*	*
Hdr kit, hmr dvr pcb	29-23662	257436-004		*	*	
Hdr kit,B900,Hmr Dvr pcb	+L-40192	257436-005				
Hdr kit,B1000,Hmr Dvr pcb	+L-40192	257436-005				*
Hdr kit, Tim & Stat pcb	29-23663	257435-002	New & old rev T&S	*		
Hdr kit, Tim & Stat pcb	NONE	257435-004	Old rev T&S pcb		*	
Hdr kit, Tim & Stat pcb	NONE	257435-006	New rev T&S pcb		*	
Hdr kit,B900,T & S pcb	NONE	257435-007	Only new rev T&S			
Hdr kit,B1000,T & S pcb	+L-40193	257435-011	Only new rev T&S			*
FLSS prom	29-23405	249320-001	Used on I/F pcb	*	*	*
Hammers and hammer parts						
Hammer assy	29-23409	251704-001		*		
Hammer assy (lower)	29-23620	251704-016			*	*
Hammer assy (upper)	29-23621	251704-015	Also 29-24296		*	*
Hammer backstop screw	29-23610	270724-001	Replaces 248008-001	*	*	*
Hammer bank assy	29-25373	244444-002		*		
Hammer bank assy	NONE	248023-002			*	*
Hammer bank mask-132 col.	NONE	257289-001	With paper compressr		*	*
Hammer bank mask-136 col.	NONE	257289-002	With paper compressr		*	*
Paper parts						
Paper clamp solenoid	29-23406	257380-001		*	*	

Table 23–17 (Cont.): Popular Parts List for B Series printers

Description	Dec Part #	D.P. Part #	Comments	B 3 0 0 0	B 6 0 0	B 1 0 0
Paper parts						
Paper feed belt	29-23423	801669-001		*	*	*
Paper feed clutch assy	29-25374	242454-001	Also +L-40721	*	*	*
Paper fd.shaft LH bushing	29-25376	251704-010	Includes circlip	*	*	*
Paper fd.shaft LH bracket	29-23383	242462-001	LH shaft support	*	*	*
Paper fd.shaft RH bracket	29-23415	251704-011	RH shaft support	*	*	*
Paper feed motor	29-23389	246200-004		*	*	*
Paper feed mtr pulley	29-23410	251704-002	Includes circlip	*	*	*
Paper shaft guide discs	29-25377	267353-001	On clutch shaft	*	*	*
Paper shaft discs clips	NONE	267352-001	Guide discs fixings	*	*	*
Paper guide kit	29-24062	-	Guides in top cover	*	*	
Paper out switch assy	29-23392	246381-002	Includes cable	*		
Ppr.out switch plunger	NONE	246287-001	On platen side	*		
Ppr.out sw.plunger guide	NONE	246288-001	On platen side	*		
Ppr.out sw.plunger spring	29-23417	257400-001	Within spring kit	*		
Ppr.out actuator	NONE	257453-001	Polythene plunger		*	*
Ppr.out sw. cable assy	29-23624	251127-002	With Hall effect sensor		*	*
Ppr.out sw.actuator lever	+L-43908	257451-001	With Magnet		*	*
Paper puller Assy	None	274785-001	Complete assy			*
Paper puller belt,lower	29-25365	810574-001	105 teeth & +L-40190	*	*	*
Paper puller belt,upper	29-25366	810574-002	125 teeth & +L-40191	*	*	*
Paper puller motor	NONE	810584-002	1/4 inch shaft	*	*	*
Paper puller motor pulley	29-25364	810569-003	1/4 inch shaft	*	*	*
Paper puller step pulley	NONE	273507-666	Old: 263306-001	*	*	*
Paper tray plastic clip	29-25359	247963-001	Also 29-23418	*	*	
Tractor assy, left	29-23391	246290-002	With sensor	*	*	*
Tractor assy, right	29-23390	246267-001		*	*	*
Ribbon parts						
Ribbon drive clutch assy	NONE	273485-001	On newer printers	*	*	*

Table 23–17 (Cont.): Popular Parts List for B Series printers

Description	Dec Part #	D.P. Part #	Comments	B 3 0 0 0	B 6 0 0	B 1 0 0 0
Ribbon parts						
Ribbon clutch drive pulley	NONE	273484-001	On newer printers	*	*	*
Ribbon clutch pulley hub	NONE	273461-001	On newer printers	*	*	*
Ribbon clutch plate	29-25062	800295-019	Also DEC +L-10110	*	*	*
Ribbon drive pulley	29-24119	257571-001	O ring type	*	*	
Ribbon drive pulley	NONE	267362-001	Tbothed belt type	*	*	*
Ribbon driven pulley assy	29-23407	251705-001	O ring type	*	*	
Ribbon driven pulley assy	29-24122	263455-001	Tbothed belt type	*	*	*
Ribbon drive belt	29-24027	800238-014	O ring type	*	*	
Ribbon drive belt	29-24121	801669-006	Tbothed belt type	*	*	*
Ribbon mask assy	29-23420	257251-001		*	*	*
Ribbon pivot arm assy	29-23413	257487-001	O ring type	*	*	
Ribbon pivot arm assy	29-24123	267373-001	Tbothed belt type	*	*	*
Ribbon pivot arm shaft	NONE	257664-001	Screws into casting	*	*	*
Ribbon pivot arm shaft	NONE	246196-001	push fit into casting	*	*	*
Ribbon post assy,front RH.	NONE	273481-001	RWS incl. harness	*	*	*
Ribbon post, rear LH,lans	+L-13023	Special	Needs M4X5cm bolt	*	*	*
Ribbon post, rear LH.	29-25360	249281-001	ie third post	*	*	*
Ribbon post, rear RH.	29-25361	249282-001	ie second post	*	*	*
Ribbon post,front RH.	29-25375	257562-001	ie first post	*	*	*
Ribbon rollers	29-23412	251704-005	Set of 2	*	*	*
Ribbon tension arm	NONE	263477-001	On posidrive prntrs	*	*	*
Ribbons (box of 6)	LP25R-01	-	Obtain from A.& S.G.	*	*	*
Ribbon		257428-005	5 mil 50 yards	*	*	*
Ribbon		251938-005	5 mil 70 yards	*	*	*
Ribbon		273429-550	5 mil 50 yards RWS	*	*	*
Ribbon		273430-570	5 mil 70 yards RWS	*	*	*
controls, switches and micro switches						
Control panel assy	29-23408	257301-001	Less knobs,decal	*	*	

Table 23–17 (Cont.): Popular Parts List for B Series printers

Description	Dec Part #	D.P. Part #	Comments	B 3 0 0 0	B 6 0 0	B 1 0 0
controls, switches and micro switches						
Control panel assy	NONE	263640-001	On acoustic cabinet	*	*	*
Control panel decal	29-23588	249214-001	Includes knobs	*	*	*
Control panel pcb	NONE	263435-001	Pedestal printers	*	*	
Control panel pcb	NONE	263435-003	Acoustic cabinet	*	*	*
Control panel spacer	74-24068	-	Use with DEC cover	*	*	
Forms length select sw.	29-23393	247837-001	Bracket+switch	*	*	
FLSS with VFU sw.	29-23434	247968-001	Bracket+switches	*	*	
FLSS kit without VFU	NONE	263499-002	Acoustic cabinet	*	*	*
FLSS kit with VFU	NONE	263499-001	Acoustic cabinet	*	*	*
Microswitch,band cover	29-23385	246125-001	Includes cable	*	*	*
Microswitch,band cover	29-25054	273411-001	RWS with ribbon post	*	*	*
Microswitch,hammer bank	29-23399	249221-001	Includes cable	*	*	*
Microswitch,hammer bank	29-23421	800679-003	No cable	*	*	*
Switch, ON/OFF, front	29-25378	800931-005		*	*	
Cabinet and Misc small parts						
Column decal on platen	NONE	267244-001		*	*	*
Cover window kit	29-24064	-	Glass,foam,glue,etc	*	*	
Cover assy, DEC.	29-23973	263373-001		*	*	
Cover latch assy,non-DEC	NONE	267391-001	On fixed part	*	*	
Cover latch bar,non-DEC	NONE	257415-001	On fixed part	*	*	
Cover latch plate,non-DEC	NONE	267387-001	On opening part	*	*	
Earth brush, copper	29-26952-01	251846-001	LH end of P/F shaft	*	*	*
Earth brush, steel	+L-10699	273551-001	Same but newer type	*	*	*
Gas spring kit,old part #	29-24063	-	2 gas springs + h/w	*	*	
Gas springs, 2 off	29-25263	-	New #, no nuts etc.	*	*	
Gas spring mounting kit	29-25262	-	New part #	*	*	
Hinge bracket kit, lid.	29-24065	-	2 hinges,nuts etc	*	*	
Hinge assy, lid, LH	29-25362	257208-001	DEC & nonDEC lid	*	*	

Table 23–17 (Cont.): Popular Parts List for B Series printers

Description	Dec Part #	D.P. Part #	Comments	B 3 0 0 0	B 6 0 0	B 1 0 0
Cabinet and Misc small parts						
Hinge assy, lid, RH	29-25363	257208-002	DEC & nonDEC lid	*	*	
Misc. hardware kit	29-23418	251704-014		*	*	*
Resistors, zero ohm	90-09185	-	Jumper use	*	*	*
Resistors, 150 ohm, 0.5 W	13-00249	-	Termination use	*	*	*
Resistors, 330 ohm, 0.5 W	13-00296	-	Termination use	*	*	*
Screw/nut/washer kit	29-23416	251704-012		*	*	*
Spring/circlip kit	29-23417	251704-013		*	*	*
Static elim. tinsel	29-23972	810447-001	Ref LP25-TT-9	*	*	*

23.8 Running EVAAA

EVAAA is a level 2R diag. It needs the driver in VMS so it will not run standalone.

The complications in running EVAAA come because of the user set up for his printer, such items as queues, forms, and printer characteristics, must be set to what EVAAA wants before it is run. The following sequence will do this, but remember that you need to check what the customer had and then put them back before you finish.

Get the customer to do the changes to his software, or at least get the customers permission. Be careful with the files on the print que.

If all else fails, the details of the way his printer is set up is contained in the system startup file SYSTARTUP.COM or SYSTARTUP_V5.COM. Rebooting should return his parameters to normal.

EVAAA is only of use on directly driven printers, such as an LP11, DMF etc, they are no use on ethernet, or on a VAX Q Bus system. For the PDP's (Unibus and Q Bus) the ZL???? diagnostics are more straightforward, being standalone, as are MDM diagnostics on VAX Q Bus systems.

To show the users parameters for printer LPA0:

```
$ SHOW PRINTER LPA0:
$ SHOW DEV LPA0:/FULL
```

If the printer is a serial one do $SHOW TERM TXA7 for example
If the printer is spooled, note the name of the queue. For a printer named SYS$PRINT you need to:

```
$ STOP/QUE/NEXT SYS$PRINT
$ STOP/REQUE SYS$PRINT
$ SET DEV/NOSPOOLED LPA0:
```

If these commands are returned with a message such as "still channels open", then it is quite possible that other ques are pointing at this que. i.e. If FRED1$PRINT and FRED2$PRINT are pointing at SYS$PRINT then SYS$PRINT cannot be stopped till FRED1$PRINT and FRED2$PRINT are both stopped. Do a $SHO QUE/ALL to see which ques are still running.

These are the parameters that EVAAA requires, include the ones that are not like this from the show commands above.

```
$ SET PRINTER LPA0:/CR/PF/LOWERCASE/PAGE=0/NOPASSALL/PRINTALL/WIDTH=255/WRAP
```

Diagnostic Supervisor can now be run. Do not forget if on a cluster to attach the CI node and diagnostic disk, then do a "SET LOAD".

Now load EVAAA and then attach the printer and then start it, for an LP25 called LPA0: on a typical 11780 this would be:

```
DS> LOAD EVAAA
DS> ATTACH DW780 SBI DW0 3 4
DS> ATTACH LP11 DW0 LPA 777514 200 4
DS> ATTACH LP25 LPA LPA0
DS> SHOW DEVICE
DS> SELECT LPA0
DS> SET TRACE
DS> START
```

To revert to the customers settings, first do a:

```
$ SET PRINTER LPA0:/ . . .   as above
```

Then start the que again:

```
$ SET DEVICE/SPOOLED SYS$PRINT
$ START/QUE/NEXT SYS$PRINT
or
$ START/QUE/ON=LPA0: SYS$PRINT
```

23.9 Interfaces and Connecting Printers

23.9.1 LP25/6 and B Series Interface Conversions

Occasionally the need arises to convert the type of Interface that the printer uses. In most cases there is no conversion kit available (the exception is when converting from a Short Line Interface to a Serial Interface). It is therefore necessary, in most cases, to obtain the parts individually.

To use the two tables below: one for printers without the VFU option; and one for printers with the VFU option; find the type of Interface Conversion that you are doing in the top section of the relevant table, and read down that column. Refer to the left hand column for the details of the parts to be either added, removed or kept.

S/L is an abbreviation for Short Line
L/L is an abbreviation for Long Line
I/F is an abbreviation for Interface
I/O is an abbreviation for Input Output
w/o is an abbreviation for without

Table 23–18: Interface Conversions Without VFU

Part	Short to Long	Long to Short	Short to Serial	Serial to Short	Long to Serial	Serial to Long
I/F PCB w/o VFU S/L (29-23419)	remove	add	keep	keep	add	remove
I/F PCB w/o VFU L/L (29-25367)	add	remove	-	-	remove	add
I/O Harness S/L (29-23396)	remove	add	remove	add	-	-
I/O Harness L/L (29-23437)	add	remove	-	-	remove	add
Non VFU Proc Proms [1]	keep	keep	keep	keep	keep	keep
Serial Interface PCB [2]	-	-	add	remove	add	remove
Interconnect Cable [3]	-	-	add	remove	add	remove
Serial I/O Harness [3]	-	-	add	remove	add	remove

[1]See Table 23–17 "proc, proms" for part number details
[2]See Table 23–17 "serial interface" for part number details
[3]See Table 23–17 for part number details

Table 23–19: Interface Conversions With VFU

PART [1]	Short to Long	Long to Short	Short to Serial NO VFU	Serial to Short VFU	Long to Serial NO VFU	Serial to Long VFU
I/F PCB w/o VFU S/L (29-23419)	-	-	-	remove	-	remove
I/F PCB with VFU S/L (29-23438)	remove	add	keep	add	add	-
I/F PCB with VFU L/L (29-23433)	add	remove	-	-	remove	add
I/O Harness S/L (29-23396)	remove	add	remove	add	-	-
I/O Harness L/L (29-23437)	add	remove	-	-	remove	add
VFU Proc Proms [2]	keep	keep	keep	add	keep	add
Non VFU Proc Proms [2]	-	-	-	remove	-	remove
Serial Interface PCB [3]	-	-	add	remove	add	remove
Interconnect Cable [3]	-	-	add	remove	add	remove
Serial I/O Harness [3]	-	-	add	remove	add	remove
FLSS/VFU Switch Assy (29-23434)	keep	keep	keep	add	keep	add
FLSS Switch Assy (29-23393)	-	-	-	remove	-	remove

[1] VFU operation is not possible with the combination of the Serial I/F and the Data Products Short Line with VFU Interface. See the section on serial Interface.
[2]See Table 23–17 "proc, proms" for part number details
[3]See Table 23–17 for part number details

23.9.2 LP11 Jumper Information

There are up to 17 jumpers and wire links on the LP11 M7258. These cause confusion, and aggravation in the field, because the LP11 manuals describe the function of some links and leave it to the engineer to decide what he should have for his option.

Here is the list published by Ian Price, with some explanations from me.

Table 23–20: LP11 Jumper Designations

Jumper	Posn on PCB	Description	Cent ronics	Vers atec	LP/LXY	LA11
J1	RH Bot	Data bit 6 [1]	out	in	out	in
J2	RH Bot	Data bit 6 [1]	in	out	in	out
J3	RH Bot	Data bit 6 straight thro	in	in	in	in
J4	RH Bot	Data bit 6 goes to data bit 8	out	out	out	out
J5	RH Bot	Data bit 8 straight thro	in	in	in	in
J6	Top Mid	Demand polarity	in	out	in	in
J7	Top Mid	Demand polarity	out	in	out	out
J8	Top Mid	Strobe polarity	out	out	out	out
J9	Top Mid	Strobe polarity	in	in	in	in
J10	Top Mid	Buffer clear logic	out	in	out	out
J11	Top Mid	Buffer clear logic	in	out	in	in
J12	LH Mid	U/B Address lines 0,2	out	out	out	out
J13	LH Mid	U/B Address lines 4,6	out	out	out	out
J14	LH Mid	U/B Address lines All	in	in	in	in
N1	LH Top	Allow NPRs	in	in	in	in
W1-W4	RH Top	Data bits 8,7,6,5	in	in	in	in
W5	RH Top	Allow sig Prime	out	in	out	out
W6-W9	RH Top	Data bits 4,3,2,1	in	in	in	in
W10	RH Top	Strobe polarity DP Ov no data	in	out	out	in
W11-W15	RH Top	Connects unused signals buff clr, rem eot, rem FF, Line term, Mode	in	in	in	in
W16[2]	RH Top	Strobe polarity	out	in	in	out
W17[3]	Bot Mid	LP11 produces LF/FF[4]	in	in	in	in
A3-A12	LH Top	Address jumpers (jumper for 0s)			17514 A7,A5,A4 in	
V2-V8	LH Bot	Vector jumpers (jumper for 1s)			200 V7 in	

[1]Put J1 Out and J2 In if it is desired that the M7258 converts any lowercase letters to uppercase letters. Normally the printer is capable of performing this function if it has a 64 character set.

[2]M7258s between Rev L and Rev R do not have jumper W16. Instead a piece of ECO wire from IC E19 pin 11 to Berg pin VV performs the function of W16.

[3]M7258s before Rev R do not have W17. Pin 6 of IC E16 track has to be cut to simulate the removal of jumper W17

[4]If W17 is installed carriage return will be sent automatically after a line feed or form feed.

23.9.3 Printer Cables and Long Line Drivers

Printer cables are not a problem if the correct one is used. Long line drivers use twisted pairs on different conductors, and different printers use different signals, so it is important to use the correct one. It may work OK to start with, but may play up later or when connected to a different interface.

Table 23–21: Maximum Cable Lengths

Type of interface	length maximum
Parallel/Short line	50 feet[2]
Parallel/Long line	500 feet
Serial/RS232C	50 feet[1]
Serial/fibre optic (FOCFA)	100 metres
Parallel/fibre optic (LLF01)	500 metres

[1]without a modem, with a modem it can be any distance

[2] The LP11 and LPV11 support 50 feet of cable in total, however the usual cable configuration includes cabinetry cables, so that the only cable possible is the 30 foot one. For cables that go direct from the LP11 or LPV11 (70 class cables) then the 50 foot cable is permissible. See table Table 23–23

Table 23–22: Parallel Printers and Cables

CPU + BUS	Interface	PCB	cable	bulkhead	cable	printer
PDP QBus	LPV11	M8027	70-11212-xx	-	-	LP05
PDP/VAX QBus	LPV11	M8027	70-16560-xx	-	-	LP25/6/7/9[2]
MVAX2 QBus[4]	LPV11	M8027	BC05L-xx	70-20398	BC27A-xx	LP25/6
PDP/VAX QBus	LPV11-SA[3]	M8086-PA	-	-		LP25/6/7/9[2]
PDP U/B	LP11	M7258	70-11212-xx	-	-	LP05/6/14
PDP/VAX U/B	LP11	M7258	70-16560-xx	-	-	LP25/6/7/9[2]
VAX U/B	LP11	M7258	BC05L-10	70-20397	BC27A-xx	LP25/6/7/9 [2]
VAX U/B	DMF32	M8396	BC06R	H3020[1]	BC27A	LP25/6/7/9 [2]
VAX BI	DMB32	T1012	17-00740-xx	H3033	BC27A-xx	LP25/6/7/9
Ethernet	DS250		BC27A-xx			LP/LG

[1]Previous to an FCO this distribution panel was a 70-18754 the PCB is a 54-14459

[2]Can also be used on LN01, LXYxx and LGxx printers that support parrallel dataproducts connections

[3] This is the only option supported by the BA2xx and BA4xx boxes i.e. our current product range. On the M8086 are 2 printer ports that come straight off the metalwork that is attached to the board. A standard BC27A would fit but then the CPU front cover would not fit. The correct cable has a right angle plug. For non standard options contact the author.

[4] This refers to the BA23 and BA123 enclosures

Serial printers are not such a problem. They are connected with a serial comms cable with the required number of connectors, this depends on the way the printer interface is set up, especially the flow control. A cable that should meet any requirements is a BC22D, to go straight from a distribution panel to the printer. (i.e. it is a null modem cable)

Table 23–23: Interface Cables and their details

Cable	Host End Type/Gend/pins	Printer End Type/Gend/pins	Comments
BC27A-xx	Amp/male/37	Amp/male/50	Short Line from bulkhead connectors of most of DECs current parrallel printers. The most common parrallel cable. xx = 30 ro 50 feet
BC27B-xx	Amp/male/37	Winch/male/50	Short Line from bulkhead to LP05/6/7/14 printers. xx = 30 or 50 feet.
BC27L-xx	Amp/male/37[1]	Amp/male/50	Short line connection from LPV11-SA (M8086-PA) to all current parallel printers. The only cable supported in a BA2xx or BA4xx enclosure.
BN26A-xx			Same as 70-16560
BN27B-xx	Amp/male/37	Amp/male/50	Long Line from a bulkhead connector to current parallel printers. xx = 3 9 16 30 45 75 or A5 (150) metres.
70-11212-xx	Berg/female/40	Winc/male/50	Short or Long Line direct from an LP11 or LPV11[1] to a LP05/6/7/14. The old traditional printer cable. xx = 25 50 75 or A0 (100) feet.
70-16560-xx	Berg/female/40	Amp/male/50	Short or Long Line direct from an LP11 or LPV11[1] to an LP/LG parallel printer. xx = 30 50 A0 (100) feet.
BC22D-xx	Amp/fem/25	Amp/fem/25	Serial 6 wire shielded RS232 null modem (crossed) cable for local connection of serial printer. xx = 10 25 50 feet
BC22E-xx	Amp/male/25	Amp/fem/25	Serial 16 wire shielded RS232 modem (straight though) cable for connecting certain serial printers to async modems. xx = 10 25 50 feet
BC22F-xx		Same as BC22E except has 25 wires for more modem control	
BC16E-xx	MMJ/6	MMJ/6	RS423 serial unshielded null modem (crossed) cable for use with some modems or sites with MMJ/RS423 telephone type sockets. Note the 6 wires support only DTR and DSR with no earth. xx = 10 25 50 feet Use with RS232 to MMJ adapters as follows: H8575-A . . . RS232 female straight through H8571-D . . . RS232 Male Crossed H8571-E . . . RS232 Male straight through

[1] LPV11-SA. This is a right angled plug so that the BA2xx BA4xx front door will close. Note that on BA2xx and BA4xx enclosures the LPV11 (M8027) (PCB without a front plate) is not supported as DEC do not make one. See my notes in Table 23–22

Amp . . . means Amphenol type or D Type 2 or 3 rows of pins as used by RS232.
Winc . . . means Winchester, a large plug used by LP05, 4 rows of pins every other row offset. Rarely used by current printers.
Berg . . . or IDC connector, is the type PCBs usually employ 50 pins in 2 rows .1 inch spacing
MMJ . . . RS423 US telephone plug (US plug is slightly smaller than our BT plug)

23.9.4 Interface handshaking

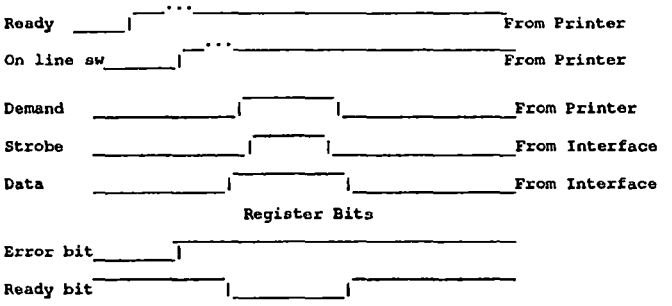
When printers get hung up, it is necessary to get at the parallel interface connections with a scope or otherwise to see why. This tells you whether it is a fault with the host, printer or cable. If it only happens occasionally it is important to get it right first time.

Do not forget to look at an LP11 printer from the software end. VMS commands

```
$ mc sysgen
sysgen> show/unibus
.
.
Address 777514 (801F94C) responds with value 80C0 (hex)
.
```

This indicates an error bit set (8) i.e. printer is off line and Ready and Interrupt Enable are set (C), telling the cpu it is ready to send a char to the printer when the data buffer gets written (777516) whence ready will go low until the interface sees demand go low from the printer

Dataproducts interface handshaking



Proceedure to this diagram

1. Ready is also known as con(nection) verify, which goes high when printer is powered on
2. When printer goes "on line" - Demand goes high - error bit in the CSR register goes low.
3. CPU is flagged through CPU bus interrupt system and Interrupt Service Routine and if it has something to print will update the data buffer.
4. The Interface puts its CSR ready bit low - puts data on the data lines to the printer and after a skew delay to let lines settle asserts strobe high.
5. As soon as the printer sees strobe it asserts demand high and clocks in data to its data buffer
6. When strobe goes low - demand goes low - and ready bit in CSR register goes high - and data buffer in interface is cleared.
7. CPU then gets interrupt and the ISR sends another char to data buffer reg. which starts over again, at item 3

Centronics handshaking

This is similar but uses different signal names

On the Centronics interface I scoped (it was very rudementary) and used only Busy and strobe and these signals were inverted to this diagram. The LP11 caters for inverted signals as do the Dataproducts printers

The LP11 uses only bits 6 (interupt enable), 7 (Ready) and 15 (error or on line). The LPV11, DMF, DMB and DS250 use more bits, which do not affect the basic handshaking described above, they are status bits from other signals like a separate connection verify to on line. The appropriate manual should be referenced, if necessary.

23.9.5 Long Line Drivers

The Long Line Driver allows printers to operate up to 500 feet from the computer by using balanced cable pairs. These are driven off a +5v rail only, from a single height (M5973) at the LP11 end and by a different interface than normal at the printer end. The M5973 can plug into any Unibus slot, but it is traditionally in slot B (the LP11 plugs into slots C through F), and is joined to the LP11 by a standard 50 way berg cable.

Table 23–24: Configurations

LP11	Cable	LLD	Cable	Bulkhead	Cable	Printer
M7258	2K-EC0MA-00[2]	M5973		BN26A-15[1]		B-series
M7258	2K-EC0MA-00[2]	M5973		pigtail 2K-EC0BA-00 . . . customer cable with connector kit 2K-E14RA-00 . . . pigtail 2K-EC0AA-00		B-series
M7258	2K-EC0MA-00[2]	M5973	BN27A-03	70-19474-02	BN27B-16[1]	B-series
M7258	2K-EC0MA-00 [2]	M5973			70-11212-xx	LP05/6/14

[1]These cables are denoted in metres, not the usual feet. i.e. the BN26A-15 is 15 metres long.

[2]The 2K-EC0MA-00 cable can be substituted for any BC08R cable, the only special feature of the 2K-EC0MA-00 is that it is very short.

Table 23–25: M5973 Switch Settings

Switch	Signal	LSP25[2]	LA180	LP11	LS11
E2-1	Fault	on	on	on	off
E2-2	Select	off	on	off	off
E2-3	P. Paper	off	off	off	on
E2-4	P. Paper	on	on	on	off
E2-5	+Select	off[1]	on	off[1]	off
E2-6	+P. Paper	off	off	off	on
E2-7	-Select	off[1]	on	off[1]	off
E2-8	-P. Paper	off	off	off	on

[1]Select lines are not used here, but they are normally left off

[2] The LSP25 is the option designator for the Long Line installation complete (see list at the beginning of this chapter, thats why the sw setttings are same as LP11)

For a more definitive reason for the switches see the print set.

23.9.6 Fibre Optic Cables

There are two types available for printers:

1. The LLF01 a parallel one for LP27/9 and LG01/2 with up to 500 metres (BN25J-E0)
2. The FOCFA a serial one for LG01/2 with up to 100 metres (BN25J-A0)

Both these consist of fibre optic transmitters and receivers powered by H7132 power supplies plugged into the mains at either end. H7132 power supplies are changed complete as one FRU.

Table 23–26: Fibre Optic configurations

Interface	TX/RX	Fibre Optic Cable	TX/RX	Printer
Parallel	70-24862-01	BN25J-xx	70-24861-01	LP27/9 LG01/2
Serial	FOCFA-BB	BN25J-xx	FOCFA-BB	LG01/2

23.9.7 DecServer 250 Problems

LG02 Firmware

VER 3 firmware must be fitted to LG02s on DecServer 250s, or various symptoms will occur such as: lost files; stalled Ques; printer hangs; or other printer errors. It is unpredictable.

Fit EQ-01562-01 for FCO LG02 F3 to upgrade the firmware.

The firmware rev is on the first line of the status report. Press the report key.

Failure to boot DS250 when parallel printers plugged in

This problem shows as LED D2 out after power up (normally a DS250 problem), if the parallel printer is plugged in and is off.

Therefore ensure the printer/s are switched on or unplugged before switching on the DS250, until a permanent solution is found.

Long Line Drivers

The normal long line driver LLD01 cannot be used on the DS250 (check the printer is not configured for this). The fibre optic option LLF01 should be used if required.

Failure to print or printing "garbage"

For day one problems ensure the printer is fitted with the following:

Printer	Part Description	Dec part	Vendor part
LG02	Control I/O Assy	29-26617-00	610040-3
LG01	Parallel Interf Assy	29-25564-00	610424-1
LP37	DEC I/O Interf Assy	29-27511-01	295025-001
LP29	I/O Harness Assy[1]	29-81384-00	263984-004
LP27	I/O Harness Assy[1]	29-26203-00	263984-003
LP25/6	I/O Harness Assy	29-23396-00	257340-004
LXYs	A6 Logic R Pack at location 3A	29-24724-00	220 ohm
	Same at Location 2A	13-00005-08	330 ohm

[1] LP27 and LP29 harnesses are interchangeable and are also used on the BP1500 and BP2000

23.10 LG06 Problems

23.10.1 LG06 Firmware

There have been lots of problems with firmware with this printer, in some 6 months we have had as many releases.

Among the problems are: paper out problems; and slow printing because of the time taken to change fonts.

Table 23–27: Current firmware (Sept 92)

Name	Version	Position	Vendor part
DPU	V2.02	H1	150896-001
DPU	V2.02	H2	150896-002
DPU	V2.02	J1	150896-003
DPU	V2.02	J2	150896-004
FONT	V2.01	M1	150897-001
FONT	V2.01	M2	150897-002
FONT	V2.01	P1	150897-003
FONT	V2.01	P2	150897-004
RTPU	V2.03	J8	150888-001
PFC	V2.01	J10	151006-001
RSP	V2.01	Mech Driver	151006-001

All these are on the Common Controller PCBA 29-29288-01 except the RSP which as indicated is on the Mec Driver PCBA 29-29289-01.

If the PROM KIT 29-29287-01 is ordered the latest firmware should be in it, but dont hold your breath.

The DPU is the main firmware which contains all the bugs and fixes.

23.10.2 LG06 Control Panel Awkwardness

The LG06 Control Panel Assy is at risk of faulty operation, because the buttons are very difficult to push. Printers with Serial Numbers previous to S/N 400 may be affected. The date code on the suspected Operators Control Panel is previous to 0792 (Week 7 of 1992).

ACTION TO BE TAKEN

Replace the Control Panel Assy DEC P/N 29-29286-01 (VPN 150337-301) ensure that the date code is 0892 or higher.

23.10.3 Replacing paper on the LG06

Paper loading instructions in the manual are inadequate for "hot" paper changes, or changing paper in the middle of a print job. Page 3-10 in the the User's Manual EK-ELG06-UG 2nd edition, January 1992, only describes the startup or initial paper loading procedure. This will be corrected in the next edition, Errata sheets will be provided with future printer orders.

Using the wrong paper loading method may cause a the user to lose Top Of Form (TOF).

How to load paper in the middle of a print run

1. Press the Clear Key to silence the alarm. [PAPER OUT]
2. Raise the printer cover.
3. Fully raise the Forms Thickness Lever.
4. Press the Clear Key to silence the alarm. [PLATEN OPEN]
5. Open the floor cabinet front door and align the paper supply with the label on the floor of the cabinet.
6. Without removing the the existing paper, feed the new paper up through the paper slot until it appears behind and above the ribbon mask, but in front of the existing paper. It may be necessary to press the existing paper back gently.
7. Line the edge of the new paper with the perforation of the existing paper.
8. Open the right tractor gate by swinging it out.
9. Lay the new paper over the existing paper on the tractor sprockets and close the right tractor gate.
10. Repeat steps 8 and 9 with the left tractor gate.
11. Close the forms thickness adjustment lever and the floor cabinet front door.
12. Press the Clear Key to clear the fault. [PAPER OUT]
13. Press the On line Key to continue .

23.11 Printronix LXY

23.11.1 FLow Control with LXY printers

From Ian Price of PTG

A potential for loss of data exists if an LXY printer is connected to a Multiplexer or similar communications device, that interupt flow control information.

The LXY family of printers is working per specification. The design of these printers when they were introduced did not require this capability. As such, the LXY printers can not be used in a shared environment.

The following is extracted from PRISM PRO7719.

VAX4000 connected to the Ethernet, Muxserver 300—modem—line- —modem—DECmux 300—Prinztronix Printer. With the Print queues are set up using LAYSYM, so that Multiple systems have access to the Prinztronix. If the Prinztronix is on-line, and a file is que'd to the printer. A logical link is established thru the Muxserver/DECmux to the Printer. Flow control is handled in a normal fashion. In this particular configuration XON/XOFF is used.

When the print job is completed. LAT logs the port out. If a user take the Prinztronix off-line to change paper, ribbon, whatever. An XOFF is sent down the line. However, because the port was logged out, the XOFF never gets back to the system. So if a FILE is que'd to that same Prinztronix printer while it is off-line, the data goes into the bit bucket.

If the Prinztronix is put back on-line while a file is being passed to it, then the print function will start at whatever point in the file its at and flow control resumes its normal operation.

The above was noted while monitoring the line with an HP4953 and monitoring the DECmux port the printer was connected to.

23.11.2 LXY Capacitors in power supplies blowing up - safety

```
*****************************************************************
*                                                               *
*       SAFETY ALERT   SAFETY ALERT    SAFETY ALERT             *
*                                                               *
*       DANGER OF CAPACITOR C1 VENTING/EXPLODING                *
*                                                               *
*              ********** WARNING **********                    *
*                                                               *
*    Never remove jumper J-10 or J-16 from the Power Supply     *
*    PCB. Doing so, creates an over voltage condition           *
*    damaging and overheating capacitor C1.                     *
*                                                               *
*    In normal operation with the printer fully enclosed, no    *
*    hazard exits.  However, service personnel should be aware  *
*    that there is a potential hazard if it occurs when the     *
*    capacitor is exposed.                                      *
*****************************************************************
```

An FCO program has been actioned to replace all LXYs capacitors. (Sept 92)

Note that many large capacitors are liable to this sort of action (well known in TV servicing), so treat with respect any large capacitor in electronic equipment.

IF THE CAPACITOR C1 VENTS, HYDROGEN GAS IS RELEASED. THE FOLLOWING SAFETY APPLIES

1. **EYE CONTACT.** Contact lenses must be removed at once. Immediately, flush the open eye for 15 minutes with large amounts of water. If pain is experienced, apply 2 drops of tetracaine (Pontocaine). Seek immediate medical attention.
2. **SKIN OR CLOTHING CONTACT.** Flush thoroughly with running water as soon as possible after contact, can then wash with soap or mild detergent.
3. **MOUTH CONTACT OR ACCIDENTAL SWALLOWING.** Drink large quantities of water or milk. Follow with Milk of Magnesia, beaten egg, or vegetable oil. Call physician immediately.

It is also noted that the substance data sheet for the capacitor indicates there are no known carcinogens in the capacitor.

23.12 Printer Media Kit

During printer calls to do with print quality, engineers very often get caught in a cleft stick. The engineer requires the band or batch of ribbons to be changed, in his/her fault finding procedure, however he cannot obtain bands or ribbons from logistics as they are customer media. The customer will probably say he does not mind buying new media if it is faulty, but only if it is faulty. The engineer cannot say it is definitely faulty as he needs it for fault finding purposes.

Even if the customer does agree to trying new media (the correct path according to contractual obligations), it may delay the fault finding process several days.

This kit is set up to this end. **It contains media that the engineer can BORROW,** to aid in the fault finding process.

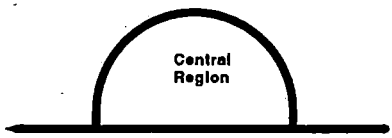
To date (Sept 92) we have the following in it.

DecDirect Part No	Vendor Part No	Printers used	Description
LP05R-01		LP05, LP06	Ribbon
LP25R-06		LP25, LP26	Ribbon
LP27R-01		LP27, LP07, LP14	Ribbon
LP29X-AC	267576-001	LP29	Band US($ and # sign) upper case only(64 chars)
LP29X-EA	267576-007	LP29	Band UK($ and pound sign) upper case only
		Can be obtained from I.S. at Welwyn	
LGR31-01		LG31	Ribbon

This includes all the old items I.S. used to have.

It is hoped that this kit will **build up not contract,** as items are required.

The kit is kept in the logistics room at Welwyn with a log book in it.



F A C T F L A S H

Options Affected: Printers attached to DecServer 250
Submitted By: Jim Egginton
Date: 14-MAR-1991
Filing Instructions: At end of Chapter 23 Printers

Various problems with DecServer 250 parallel ports

LG02 Firmware

VER 3 firmware must be fitted to LG02s on DecServer 250s, or various symptoms will occur such as: lost files; stalled Ques; printer hangs; or other printer errors. It is unpredictable.

Fit EQ-01562-01 for FCO LG02 F3 to upgrade the firmware.

The firmware rev is on the first line of the status report. Press the report key.

Failure to boot DS250 when parallel printers plugged in

This problem shows as LED D2 out after power up (normally a DS250 problem), if the parallel printer is plugged in and is off.

Therefore ensure the printer/s are switched on or unplugged before switching on the DS250, until a permanent solution is found.

Long Line Drivers

The normal long line driver LLD01 cannot be used on the DS250 (check the printer is not configured for this). The fibre optic option LLF01 should be used if required.

Failure to print or printing "garbage"

For day one problems ensure the printer is fitted with the following:

Printer	Part Description	Dec part	Vendor part
LG02	Control I/O Assy	29-26617-00	610040-3
LG01	Parallel Interf Assy	29-25564-00	610424-1
LP37	DEC I/O Interf Assy	29-27511-01	295025-001
LP29	I/O Harness Assy[1]	29-81384-00	263984-004
LP27	I/O Harness Assy[1]	29-26203-00	263984-003
LP25/6	I/O Harness Assy	29-23396-00	257340-004
LXYs	A6 Logic R Pack at location 3A	29-24724-00	220 ohm
	Same at Location 2A	13-00005-08	330 ohm

Options Affected: LP27 LP29
Submitted By: Jim Egginton
Date: 21-APR-1989
Filing Instructions: With printers chapter

LP27 paper feed idler bearings

There has been a long running problem with the idlers that tension the paper feed belt on LP27s and LP29s. The answer this district came to was to use sealed bearings. These were purchased locally, through a bearing supplier, as they are commercially standard bearings.

The symptoms seen are very intermittent loss of top of form (misses a paper motor step), or wavy print across the line (paper motor step is gradual). The reason is that paper dust gets in these bearings and makes them gritty.

CSSE have come up with an answer in Tech Tip TT-09 on SB 549. This TT includes bearings that have nylon washers and a different bearing keep, to stop dust getting at the rollers. However the parts referred to in the TT are not available and one of them costs over a thousand dollars.

The parts that are actually required for one printer are:-

Quantity	Part number	Description
2	29-26201-00	Bearings
2	FD-13885-01	Bearing Keep
4	FD-13884-01	Nylon washers
2[1]	29-25167-00	Tractor shaft Pulley

1

The TT says the bearings should be lubricated with Silicone Grease (90-09299). They are not oiled bearings, so the use of oil will quickly degrade them.

Previous to this we had obtained sealed bearings locally, which seems to me a better answer (we know sealed bearings work well). So if problems still exist with the above parts, then we should go back to the locally purchased sealed bearings.

[1] These are optional, it is nice to have new pulleys

F A C T F L A S H

Options Affected: LG01 LG02
Submitted By: Jim Egginton
Date: 28-MAR-1990
Filing Instructions: End of Printers Chapter 23

New LG ribbon assembly

The ribbon present microswitch, that used to keep breaking, has now been replaced.

The part number for the microswitch 29-25581 is now obsolete

It is replaced by 29-25562 which is a whole new assembly

F A C T F L A S H

Options Affected: LPS32
Submitted By: Jim Egginton
Date: 18-JUN-1993
Filing Instructions: Chapter 23

LPS32 New IPB available

The LPS32 Original IPB contains some errors

You can obtain the new version by ordering EK-LPS32-IP.B01 through LOS (Literature Ordering System) or by copying the postscript file from:

```
GEM::DISK$PRINTERS:[LPS32]LPS32_IPB_B01.PS_LZ;1   6427
```

This file is compressed (indicated by extension "PS_LZ"). This saves disk blocks and reduces transmission time when you copy it. You will need the utility to decompress it on your system. The 3 files that comprise the Compress/Decompress utility are also in the above directory. Copy them across to a VMS system and just type @COMPRESS at the "$" prompt, and then answer the questions. The 3 files are:

```
COMPRESS.COM     8
LZCOMP.EXE     142
LZDCMP.EXE     136
```

The decompressed block size of the IPB file is 83701, so few engineers will be able to copy it.

Alternatively you can mark up your old version of the IPB (EK-LPS32-IP-001) to reflect SOME of the changes as follows:

1. Page 2 - item 8
   a. change description from "Tray Assembly, LCIT" to "LCIT (Large Capacity Input Tray) includes Trays (30-39034-05)"

2. Page 6 -
   a. Item 17 ... add (See Note 1)
   b. add Note 1: If OPC needs to be replaced before normal 100K maintenance, use the OPC Drum from the LPS20 OPC Drum Kit - LPS2X-AC or 29-27398-01.
   c. add (See Note 2) after both *kits . . at bottom
   d. add #2 to Note–>Note 2: See Figure 21 for Service Kit Info.

3. Page 15 -
   a. move original item 10 to side of drawing and mark OLD VERSION (OBSOLETED)
   b. keep part numbers inside old item 10, items 6, 9 & 105
   c. copy new item 10 into drawing where original one was and mark NEW VERSION
   d. copy washer into drawing as part of new item 10 and mark 10 & PART OF NEW VERSION ONLY
   e. have arrow point to old version item 10 with a note which says: (See Note 2 on Page 16)
   f. item 4 & 4A - change from (See Note on Page 16) to (See Note 1 on Page 16)

4. Page 16 -
   a. Item 4 . . change from (See Note) to (See Note 1)
   b. Item 5 . . should be separated from items 6-10
   c. Item 6 . . add (See Note 2) next to description
   d. Item 6 . . remove 29-30269-01 under DEC p/n column
   e. Item 6 . . add N/A under vendor part number column
   f. Item 9 . . add (See Note 2) next to description
   g. Item 9 . . remove G0134251 under vendor p/n column
   h. Item 9 . . add N/A under vendor part number column
   i. Item 105 . . add (See Note 2) next to description
   j. Item 105 . . remove 08053389 under vendor p/n column
   k. Item 105 . . add N/A under vendor part number column
   l. Change from Note: Registration Clutch is included . . . to Note 1: Registration Clutch is included . . .
   m. add Note 2: New OPC Reset Feeler Kit, item 10, should be used rather than replacing individual components. The new kit REPLACES the old kit.
   n. correct section A and B in the index for the above changes (for example removing vendor p/n's)

5. Page 24 -
   a. Item 3 ... remove (100V) from the description.
   b. remove 100V from thermister also in index - pages A-4 & B-7

6. Page 26
   a. Item 2 . . change vendor part number from G6271532 to G6461531
   b. Item 4 . . change vendor part number from G6271531 to G6461530
   c. Item 6 . . change vendor part number from G6271533 to G6461532

7. Page 34 -
   a. change Kits (Not Shown) to TRAY KITS for LCIT (Not Shown)
   b. change part numbers
   Kit 1, LCIT (A4/LT) ... from 30-TBA to LPS3X-LA
   Kit 2, LCIT (5 Trays) .. from 30-TBA to LPS3X-LB
   Kit 3, LCIT (7 Trays) .. from 30-TBA to LPS3X-LC
   c. item 14 - (top item) change description from "Unit Components - LCIT (Large Capacity Input Tray) w/7 Trays (30-39034-05)"
   to
   "LCIT (Large Capacity Input Tray) includes 7 Trays (30-39034-05)"

8. Page 48 -
   a. add (See Note 1) to top of page, next to CONSUMABLES
   b. Item 6 ... add (See Note 2)
   c. add Note 1 to first Note (NOTE 1: Items 2,3,4 ...etc.)
   d. add Note 2 to second note (NOTE 2: If OPC needs to be .... etc.)
   e. change part number (LPS2X-AD to LPS2X-AC or 29-27398-01.)

9. Page 50 -
   a. change Note 3 Process fan p/n TO 29-29633-01 FROM 29-29653-01; this p/n is correctly identified on fig 4.

10. Make changes to affected pages in Part Number Index Section For example:
    a. Section A ..pg A-4 & Section B.. pg B-4
    Renumber / retitle 30-TBA's to new 29 class numbers
    b. delete LPS2X-AD ... add LPS2X-AC

F A C T F L A S H

Options Affected: LG31
Submitted By: Jim Egginton
Date: 25-JUN-1993
Filing Instructions: At end of Chapter 23 Printers

LG31 shipping brackets

If the LG31 prints garbage or looses position or goes into suspended (sus) mode regularly, it maybe that the shipping brackets have been left in.

If the printer has been run for some time with these brackets in place, errors 491 or 700 (which are shuttle motion errors) may result, this may require the replacement of some PCBs, as per the manual troubleshooting flows, to fix the problem, as well as removing the shipping brackets.

The L shaped shipping brackets are underneath the platen mechanism, and can only be seen by looking behind the lower tractors. These brackets stiffen the rubber mountings that support the whole of this mechanism.

The shipping brackets are red.

Could engineers please look for these on fault calls and PMs, and remove if present.

F A C T F L A S H

Options Affected: **LPS17**
Submitted By: **Jim Egginton**
Date: **23-AUG-1993**
Filing Instructions: **Chapter 23**

12 MB Memory is required for LPS17 Duplex Printing

12 MB memory is needed for an LPS17 if the duplex option is installed

The standard for simplex LPS17s is 8 MB.

This information is not mentioned in any of our LPS17 documents.

Future documentation will include this statement.

F A C T F L A S H

Options Affected: LG06
Submitted By: Jim Egginton
Date: 14-SEP-1993
Filing Instructions: Chapter 23

LG06 Shuttle and Ink migration problems.

The LG06 approved ribbon ink content should not exceed 19.5%.

Engineers should inform customers of this. This information has only come about as a solution to a particular CLD, so is not in the usual documentation as yet.

The following is edited from Art Newbury the engineer who worked on the CLD.

Square Tip Hammers:

An ECO by Printronix put into effect in Feb 93 makes the shuttle assembly LESS susceptible to ink migration It is NOT a cure for using the wrong (over inked) ribbon in the printer. Ink content should not exceed 19.5% or this problem (ink migration) will occur. It will take substantially longer with the square tip shuttle than with the earlier design.

Given the rate of consumption of the Shuttle assemblies and the fact that this problem is only present if an over inked ribbon is used or if the Platen adjustments are incorrect there are NO plans to write a Digital FCO for the shuttle assembly.

Printronix has packed, with the new shuttles, a correct ribbon, instructions on how to replace the shuttle and a note about the use of the correct ribbon.

Printronix has made a video on the replacement of the shuttle that also discusses the ribbon issue. I am working to get some changes made to it and then get copies for field distribution.

Adjustments of the Platen gap

This is as critical as the use of the correct ribbon. Knowledge of the use of the forms adjustment is also required for both Service Personnel and the Customer Operators. Misadjustment can cause a squeegee action even on the correct ink content ribbons that will cause failures eventually.

A blitz on this problem was published in November. It states that customers should use the correct ribbon in the printer. Other than the recommended ribbon will cause problems which will require the shuttle assembly to be

Ribbons:

DEC Direct started providing the correct ribbon in Jan 93 due to the efforts of Peter Teague et al. Prior to that an LXY ribbon was routinely substituted for the LG6X ribbon.

Repair Cost:

Assetisation has caused some confusion around the 'repair' charges for this assembly (29-29297-01). Prior to July it was essentially free due to the warranty from Printronix on the part. Today there is a charge of $280 due to the procedure used to determine repair costs and the confusion around new build for this product. This is being looked at.

Field Repair:

While some of our Field Engineers have the skill set to repair the assemblies on the customers site I strongly recommend that this is NOT done. It is a misuse of company resources in that we trade time for material which in most instances of shuttle repair only delays the failure. There are some subtleties of the repair which might not be known to the field. A 'simple' cleaning will solve the problem in the short term but it will cause the migration problem to return even faster as cleaning removes a silicon coating on the hammers which helps reduce the possibility of the problem. Hammer tensions also need to be set correctly and uniformly or there will be problems with print quality. At best field repair will only delay the replacement of the shuttle for weeks or at most months. The root cause of the problem is the use of the wrong ribbon and/or misadjustment of the platen and print density lever.

General:

This appears to be a US problem primarily, maybe because they have had LG06s in the field longer.

F A C T F L A S H

Options Affected: LG31
Submitted By: Jim Egginton
Date: 17-SEP-1993
Filing Instructions: Chapter 23

LG31 tops or bottoms of characters missing

Symptoms

This fault shows up as a few lines of each page having a few rows of print seemingly at random missing either some of the top row of dots or bottom row of dots of the whole row of characters on that line.

This looks somewhat like a ribbon problem where the ribbon is not tracking correctly and therefore missing some of the hammer.

The print as a whole is somewhat light, and looks as though the ribbon could do with changing.

Naturally these items should be checked as well for these symptoms, but no amount of logical troubleshooting will bring you to the following fix.

FIX

Rotate Pot R27 on the SMIH PCB fully clockwise. When it is fully clockwise it will start to click on rotation. Note that it is a 50 turn pot, so if the clicks can not be heard, 50 turns will be necessary.

Perform the Vertical Timing test (FNC + ONL to get ADJ mode, then 6 to start vert timing test. Then FNC will start and stop test) Adjust R27 anti-clockwise to the first correct point where the gull wings are correct. The Gull wings are correct for a fair proportion of pot travel and if the pot is adjusted anticlockwise to the point where the gull wings are just wrong, vertical timing will be wrong.

Additionally

The explanation of the above is all very well but

Changing the SMIH or any of the boards and doing all the setups will not fix this problem once it is evident.
How does Vert timing produce this, you would expect it to be horizontal timing.
Once the procedure has been done it is not possible to reproduce the symptoms by offsetting the pot again.

The only conclusion I can come to is that the fix is somewhat magic. This scenario has been noted several times on the notes files and the fix is down to Chris Tyler of the CSC.

Maybe winding the pot fully clockwise resets some firmware on a board other than the SMIH.

F A C T F L A S H

Options Affected: LPS17
Submitted By: Jim Egginton
Date: 27-OCT-1993
Filing Instructions: Chapter 23

LPS17 CONTROLLER FIRMWARE REVISION

From Ian Price

The LPS17 Service Guide, in various places, tells engineers to upgrade the Controller Firmware to revision 1.1. For example page A4 gives ROM part numbers:

23-251E8-00 V1.1 ROM 0 (for E19)
23-252E8-00 V1.1 ROM 1 (for E24)

Please do NOT try to order these parts as they have been made unavailable! This is because Engineering have made several other changes to the Controller firmware subsequent to V1.1. The changes to the firmware will include:

- improved error reporting in paper jam situations (ref section 7.1.1 in the LPS17 Service Guide)
- faster booting via TCP/IP
- extra error codes for "noboot" situations when using TCP/IP (code 55 for ARP error, code 56 for TFTP error)
- support for future options
- modification of the firmware to support non-parity memory SIMMs

In addition a PAL chip has undergone some changes.

To prevent numerous separate site visits to upgrade LPS17s as each change became available, it has been decided to bring out an FCO that will incorporate all of the changes in one upgrade.

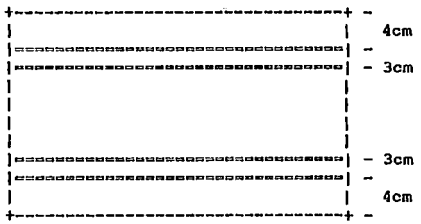
The FCO is expected within the next few months. I will let you all know when it is available.

F A C T F L A S H

Options Affected: LPS17
Submitted By: Jim Egginton
Date: 22-DEC-1993
Filing Instructions: Chapter 28

Grooves (tractor marks) on paper using the LPS17

Some of the pages printed on LPS17s can have slight grooves on them, as shown:



These grooves (or tractor marks) do not affect the printed image, they are present because of the tension between two rollers in the output assembly. These rollers are compressed by leaf springs, which are kept at high pressure to prevent the paper from "rolling over" itself when it exits the printer.

There is no solution. Engineering have done much work and failed to find a suitable fix with a reliable product. The face output tray at the rear does not display these grooves though.

HP use the same print engine (cannon) in their HPIIIsi the grooves are also noticeable on that printer. Canon have been contacted, and said there is nothing they can do.

The grooves seem to fade over time. Also the severity of the grooves will vary with different grades of paper. Use the "face up" output tray, at the rear of the printer, for jobs that need to be groove free.

F A C T F L A S H

Options Affected: LPS20, LPS20 Turbo, LPS32
Submitted By: Jim Egginton
Date: 27-OCT-1993
Filing Instructions: Chapter 23

The "Replace OPC Drum" message does not clear after installing a new drum on the LPS20/32

If the LPS20 "Replace OPC Drum" message stays on, (with supply needed LED ON) after a new OPC drum has been installed, it may be because the sensor flag linkage bracket has been bent and will not activate the sensor when the new drum is installed.

For the LPS32, if the flag does not move far enough to activate the sensor, "Perform User Maintenance" message will remain on the LCD panel.

The answer is to replace the weak sensor-bracket with the new design which will not get bent over time.

Kit name: Drum reset feeler kit
Kit part number: 29-30349-01 (specify Revision B01)

The installation instruction is included in with the new kit.

The part number mentioned in this Blitz is new for the LPS20 (ref. LPS20 IPB, Fig 7, item 3 and others). However it is in the LPS32 IPB (Fig 7, item 10).

The kit itself is not new it is the Revision B01 that is new.

F A C T F L A S H

Options Affected: DECLaser 1152 and 1252
Submitted By: Jim Egginton
Date: 14-FEB-1994
Filing Instructions: At end of Printers chapter 23

DECLaser 1152, 1152+, 1252 and 1252+ Service strategy

From Ian Price

These two products are a "DECLaser 1152 Plus" and a "DECLaser 1252 or 1252E". These printers are configured and sold to dealers by a VAR called Direktek. Details of the products and the support arrangements are as follows:

DECLaser 1152 Plus

This is a normal DECLaser 1152 with an extra 2 Mb memory board (LN07X-UF) and the extra paper tray (LN07X-TG) pre-installed by Direktek. They use all Digital supplied parts so warranty and support for this product are the same as a normal DECLaser 1152.

DECLaser 1252 or 1252E

Direktek here buy a DECLaser 1152 from Digital, remove the normal Interface PCB, and add their own Ethertalk interface PCB. They actually got Engineering approval for this. Customers with this product should not call Digital, they should call Direktek at telephone number: 081-845-5969.

Digital software support does not apply to this product, but hardware warranty does i.e. if anything apart from the Direktek Ethertalk PCB fails in the warranty period then Digital is obliged to fix it on site. If the Direktek PCB goes wrong the normal test prints can be printed from the operators panel. With the Direktek PCB removed testing will be limited to the "engine" test print via the test switch accessible via the rear of the printer.

F A C T F L A S H

Options Affected: Printer Hoods
Submitted By: Jim Egginton
Date: 14-FEB-1994
Filing Instructions: Chapter 23

Printer hoods supplied by DECDirect

Hoods are not covered under the maintenance contract for the printer they are with.

If the customer has problems with the hood supplied by DECDirect they should contact a company called ATEP, their telephone number is: 0827-63443. It is the customers responsibility to call them (and to pay for them, if necessary).

F A C T F L A S H

Options Affected: LPS20
Submitted By: Jim Egginton
Date: 18-FEB-1994
Filing Instructions: Chapter 23 printers

Change in customer consumable kits - What engineers should order

The kits that were available up to last month were:

- LPS2X-AA 29-27421-01 had 2 toner cartridges and a cleaning unit
- LPS2X-AB 29-27401-01 was the 300K maint kit with 110 volt fuser
- LPS2X-AC 29-27398-01 was the OPC drum
- LPS2X-XX 29-27402-01 was the 300K maint kit with 220 volt fuser

This has changed as follows:

- LPS2x-AA has larger toner cartridges and now has the **cleaning unit removed and sold as LPS2X-AD (2 cleaning unit).**
- LPS2X-AB and LPS2X-XX - the shield glass is no longer part of this kit it is now in the LPS2X-AC kit. It is deemed that it will last longer.
- LPS2X-AC - now includes the shield glass
- LPS2X-AD - Consists of 2 cleaning units, and is a new kit.

Engineers should now order the LPS numbers from logistics rather than the 29 class part numbers. They have them all in stock should an engineer want to recompense a customer for a fault consuming consumables. They even have the new LPS2X-AD kit.

F A C T F L A S H

Options Affected: LG12, LG06
Submitted By: Jim Egginton
Date: 29-OCT-1993
Filing Instructions: At end of Chapter 23

LG12 - A New Printer - Similar to LG06

The LG12 is a 1200 LPM printer, similar in mechanical construction to the LG06. The control panel functions and operation are also the same.

The printer is similar enough to the LG06, such that **engineers that are LG06 trained should apear competent on LG12s.**

I have included a list of part numbers here to facilitate this.

However unlike the LG06 where the shuttle assy comes as one complete lump (FRU) on the LG12 it does not and the set ups in this area are quite extensive.

Engineers that service LG12s regularly will still need LG12 training.

There is a service manual in the Tech Library for engineers to copy.

The LG06 and LG12 need a Torque Wrench to set up most of the assy mounting screws. I have included the parts list for these tools in the following table. I expect engineers who frequently service these printers to order and keep these in their tool kits.

Table 1: LG06 and LG12 Part Numbers

LG12 Digital	LG12 Vendor	LG06 Digital	LG06 Vendor	Description
29-30891-01	131907-950			Assy BLOWER
29-29294-01	150261-950	Same		Fan 48V DC
29-29286-01	150377-950	Same		CONTROL PANEL Assy
29-30892-01	131959-950			ASSY COUNTER Weight
FD-38890-01	131865-950			FLYWHEEL Assy
FD-15793-01	131198-950			HAMMER COIL Assy
FD-38422-01	133796-950	29-29280-01		HAMMER COVER Assy
FD-15794-01	131172-950	29-29281-01		HAMMER SPRING Assy
29-30893-01	134500-950	29-29291-01		I/O CABLE Assy
FD-15800-01	131301-950	29-29277-01		MAGNETIC Pickup Assy

Table 1 (Cont.): LG06 and LG12 Part Numbers

LG12 Digital	LG12 Vendor	LG06 Digital	LG06 Vendor	Description
29-30894-01	150165-950	29-29282-01[1]		PAPER MOTOR Assy
29-29282-01	150452-950	Same[1]		PLATEN MOTOR
29-30895-01	133700-950	29-29290-01		POWER SUPPLY Assy
29-30896-01	133914-950			RIBBON DECK
29-29296-01	150868-950	Same		RIBBON HUB kit
29-30897-01	133919-950	29-29282-01[1]		RIBBON MOTOR
29-30898-01	134470-950	29-29297-01		SHUTTLE Frame Assy
FD-32538-01	131168-950			SHUTTLE MOTOR
FD-34554-01	101768-950			BELT SHUTTLE
FD-13861-01	108664-950	29-29283-01		BELT PAPER FEED
29-30899-01	141516-950	29-29284-01		BELT PLATEN TIMING
29-30945-01	101805-950			LUBRICANT, BEARING
29-30900-01	132072-950			OIL WICK
29-30901-01	151085-950	29-29288-01		Common Controller PCB
29-30902-01	134507-950	N/A		HAMMER DRIVER PCB
29-30903-01	150855-950	29-29289-01		MECH DRIVER PCB
29-30904-01	134631-950	29-29287-01		PROM KIT
29-30943-01	131493-950			SHIM ANTI (0.010)
29-30944-01	131493-952			SHIM ANTI (0.005)
29-24417-00	101564-950			SHIM Counter Wt SPRING
29-24420-00	103422-950			SHIM SHUT SPRING
29-30805-01	150834-950	29-29276-01		SWITCH PAPER Detect
FD-15791-01	101867-950	29029275-01		SWITCH PLATEN OPEN
FD-30905-01	134534-950			TOOL ANTI ROTATION
29-24411-00	102382-001	Same		TOOL FORCE/spring gauge
FD-28262-01	132266-950			TOOL HAMMER ALIGN
29-30906-01	134611-950	29-29285-01[2]		TRACTOR LEFT HAND
29-30907-01	134611-951	29-29285-01[2]		TRACTOR RIGHT HAND
		29-29278-01		Ribbon Guide Assy LEFT
		29-29299-01		Ribbon Guide Assy RIGHT
		29-30679-01		Lamp for Control Panel

[1] The LG06 uses the same motor (29-29282-01) for the platen, paper feed and ribbon. The LG12 uses this motor only for the platen open mech

[2] The LG06 has the same tractor set for left and right

Table 1 (Cont.): LG06 and LG12 Part Numbers

LG12 Digital	LG12 Vendor	LG06 Digital	LG06 Vendor	Description
		29-29293-01		Hammerbank Cable Assy
		29-29329-01		Cct Breaker
		29-29508-01		Gas Spring Assy for Cover
		29-29295-01		Fan for Hammerbank
		29-29274-01		Switch Assy for cover
		29-29279-01		Spring for shuttle mech

On an LG06 a torque driver must be used for securing the hammer fret assemblies (12" pounds) to the hammer bank, and for fitting the Shuttle Frame assembly (20" pounds). On an LG12 there are many parts that need torqing up.

Table 2: Part numbers for torque wrench and bits

29-17381-00	Torque Wrench
29-24723-00	Adapter, 1/4 inch square to Hex
29-20995-00	3/16" Hex drive Allen bit
29-18505-00	3/32" Hex drive Allen bit
29-18504-00	5/32" Hex drive Allen bit

F A C T F L A S H

Options Affected: LA310
Submitted By: Jim Egginton
Date: 22-DEC-1993
Filing Instructions: Chapter 23

Functionality of new LA310 firmware

From Ian Price

LA310: NEW REVISION FIRMWARE (V1.0-06).

When using <ESC> sequences to make a "pitch" change in the middle of a long line, the LA310 incorrectly puts in a <CR><LF> and the customers data is spread over two lines instead of one.

Up until now we have issued special firmware to customers that reported the problem to the CSC. But from October 1993 new printers and new Main Board PCBs (p/n 29-30359-01) have the fix incorporated in them. Their revision has changed from A01 to B01.

So obtain a revision B01 board with revision V1.0-06 firmware on it to fix customers that you hear about (V1.0-05 is the current firmware revision).

Also Engineering are working with Olivetti to make an upgrade kit; this will be cheaper than obtaining the complete PCB. I will let you know when I hear that it is available.

F A C T F L A S H

Options Affected: LG06
Submitted By: Jim Egginton
Date: 19-JAN-1994
Filing Instructions: Chapter 23 printers

LG06 New Maintenance Manual 3rd Edition - Includes IPB

There is a new maintenance manual for the LG06 EK-ELG06-MG.003.

Those of you that have a early version (EK-ELG06-MG.001) will have noticed that the Appendices are missing. Appendix C was supposed to be a parts list. The new 3rd edition manual has extensive extra Appendices but no Appendix for parts. The engineer should use the parts lists included on each page of the removal and replacement chapters in the new manual. There is no definitive parts list except in my last factflash mentioned below.

There is no IPB for the LG06, these lists in the removal/replacement chapter are to be taken in lieu of an IPB.

Note that a torque wrench is needed to assemble most major parts of the LG06, I expect engineers working on LG06s to carry a suitable torque wrench with appropriate bits as per my previous factflash of Oct 93 titled "LG12 - A new printer - Similar to LG06"

There is a copy of the 3rd Edition in the tech library at Welwyn for engineers to copy.

F A C T F L A S H

Options Affected: LA424
Submitted By: Jim Egginton
Date: 22-DEC-1993
Filing Instructions: Chapter 23

LA424 Firmware V4.0 - Compatibility/New features from V3.1

From Ian Price

This firmware is to be incorporated in new printers, and the relevant new spare modules. BEWARE there are are potential compatibility pitfalls.

In the case of new printers: they are changed from revision A01 to B01. The revision level change is reflected on the barcode label located on the printer mechanism base. This change indicates that the Interface Board and Main Logic Board have new version 4.0 firmware.

The LA424 firmware is split between two PCBs. They are:

```
29-29973-01    LA424 MAIN BOARD (with I/F, DA & FONT EPROMs)
29-29974-01    LA424 I/F BOARD  (with DOE EPROM)
```

The new spares with F/W 4.0 have changed revisions from A01 to B01, so specify revision B01 when you specifically require the new firmware. i.e. when repairing a revision B01 printer, or a printer that has been upgraded to V4.0 firmware.

CAUTION: both PCBs must be at the same firmware revision. .

If you order:

1. An Interface Board (29-29974-01.B01) you will receive the PCB, one V4.0 firmware EPROM for the Main Board, and an instruction sheet. The instructions will tell you to install the EPROM onto the Main Board to upgrade the printer from V3.1 to V4.0.
2. A Main Board (29-29973-01.B01) you will receive the PCB, and an instruction sheet. The instructions will tell you to take the V3.1 EPROMs from the old Main Board PCB, and to fit them to the new PCB. In this situation the printer will stay at revision V3.1. (if you are fitting a revision B01 Main Board to a V4 firmware printer then you will obviously not downgrade it).

Therefore if you want to upgrade an LA424 from revision 3.1 to 4.0 you will only need to obtain an Interface Board with p/n 29-29974-01.B01.

This is not an FCO, it is a "fit on failure" modification. I have attached a list of the changes that have been implemented in version 4.0 of the firmware.

LA424 FIRMWARE CHANGES BETWEEN V3.1 AND V4.0

1. The following QARs (issues) fixed:
    1. QAR #069: IBM High resolution graphic
    2. QAR #075: Distortion at 13.2 and 18 cpi, draft mode

3. QAR #103: IBM intermittent hang
4. QAR #110: Sixel Ps1 parameter greater than 9 does not default to 0 Subsequent text sometimes hangs Note: the part of the QAR related to the hang only is fixed
5. QAR #117: Printing using bold attribute after Super/Subscript hang the printer
6. QAR #118: Printer looses TOF (Top Of Form) after lines containing space followed by FF
7. QAR #119: Switching from IBM to DEC, some characters get lost

2. Six Parts Mode Improvement

   The "6 part mode" selectable in the set-up menu has been modified to improve print contrast on multiparts forms. The new mode implements a single pass emphasised routine at 10 and 12 cpi in DEC and IBM protocol printing at 20 IPS.

   Software selection for the new six part form mode in DEC and IBM mode is through new commands that have been introduced:
   <ESC>[?8m for enable, <ESC>[?28m for disable

   Note: For compatibility issue, IBM command is not advertised to customers. Only commands in DEC mode are supported.

   DECSCL resets "6 part form" mode when selected into Installation Menu.

F A C T F L A S H

Options Affected: laser printers
Submitted By: Jim Egginton
Date: 16-May-1994
Filing Instructions: At end of Chapter 23, and remove previous version dated 23-Sep-1993

Table of printers and attributes

The number of printers is growing to the extent that it is difficult to keep track of them and their attributes.

This list will be put in the Printers Chapter eventually but it will be a time before the chapter is republished so it will remain a factflash till then.

There is already a list of larger printers in datadoc, these are the ones that are not there.

Table 1: List of Digital Laser Printers

Name	Opt	Spd	Max ppm[1]	Interface	Noise	Weight	comments
LN01	LN01	8		232/Par			Simp Xerox 2700
LN01S	LN01S	8		232			Simp serial i/f?
	LN02			Print Engine for the LPS40 only			
LN03	LN03	3		232			Ricoh LP4080
LN03 Plus	LN03S	3		232			Later Version
Scriptprinter	LN03R	3		232			Postscript Version
LN03 Image	LN03Q	3		232			Later Version
DEClaser 2100	LN05	8	16K	232[2]	54	45	Simplex Cannon LBP-SX
DEClaser 2100 Plus	LN05P	8	16K	232[2]	54	45	Simplex Postscript
DEClaser 2150 Plus	LN05R	8	16K	232[2]	54	45	Simplex Postscript + DCPS
DEClaser 2200	LN06	8	20K	232[2]	54	67	Duplex Cannon LBP-RX
DEClaser 2200 plus	LN06P	8	20K	232[2]	54	67	Duplex postscript
DEClaser 2250	LN06R	8	20K	232[2]	54	67	Duplex postscript + DCPS
DEClaser 1100	LN07	4	6K	232/423/Par	54	25	Simp Cannon LPB-LX
DEClaser 1150	LN07R	4	6K	232/423/Par	54	25	Simp postscript

[1]Max ppm = Maximum pages per month printer is supported to print
[2] Also Centronics parallel, and optional AppleTalk and Novell Ethernet cards

Table 1 (Cont.): List of Digital Laser Printers

Name	Opt	Spd	Max ppm[1]	Interface	Noise	Weight	comments
DEClaser 1152	LN07C	4	6K	232/423/Par	54	25	Simp postscript DCPS
DEClaser 3200	LN08	13/11	35K	423[2]	55	85	Dup Xerox 4213
DEClaser 3250	LN08R	13/11	35K	423[2]	55	85	Dup Postscript
DEClaser 5100	LN09	8	20K	232/423[2]			Simp Postscript 600 dpi, replaces LN05
PrintServer 17	LPS17	17	50K	Ether	50	98	Simp/Dup Cannon LPB-NX
PrintServer 17/600	LPS17/600	17	50K	Ether	50	98	600 dpi, Needs ver5.0 supp host
PrintServer 20	LPS20	20/16	70K	Ether	55	341	Dup Ricoh LP5100
PrintServer 20 Turbo	LPS20+	20/16	70K	Ether	55	341	Dup With fast CPU
PrintServer 32	LPS32	32	150K	Ether	55	341	Simp/Dup Ricoh LP-M32
PrintServer 40	LPS40	40	80K	Ether	Very	Very	Simplex LP4400
PrintServer 40 Plus	LPS40+	40	80K	Ether	Very	Very	Sim with fast CPU

[1]Max ppm = Maximum pages per month printer is supported to print
[2] Also Centronics parallel, and optional AppleTalk and Novell Ethernet cards

Table 2: Dot Matrix printers and other Character Printers

Name	Option	Cols	Max Spd	Interface	Matrix	Comments
Correspondent	LA12			232		Digital Term
DECwriter	LA30			232		Digital Term
DECwriter II	LA35,LA36			232		Digital Term Floor
DECwriter IV	LA34,LA38[2]	132	30	232		Digital Term tabletop
Personal Ptr	LA50	80	100	423/232	7x9	Small TEC printer
Personal Ptr	LA70	80	200	423/Cent	7x9	TEC/TEW GP8908S ptr - 1000 ppm
Companion Ptr	LA75	80	250	423/Cent	7x9	TEC/TEW ptr - 2000 ppm
Companion Ptr +	LA75P	80	240	423/cent	7x9	More Emulations
DECwriter 65	LA65	80	160		12x24	cheap, colour May 94
DECwriter 95	LA95	80	215	232/Cent	12x24	Citizen GSX-240 printer
Letterprinter 100	LA100	132		232		Digital desktop term
DECwriter III	LA120	132		232		Digital floor term
DECwriter III	LS120	132		232		LA180 with keyboard

[2] Recieve only versions are available with these models (no keyboard) usually LAxx-Rx designation

Table 2 (Cont.): Dot Matrix printers and other Character Printers

Name	Option	Cols	Max Spd	Interface	Matrix	Comments
DECprinter I	LA180	132		Par[1]		DECs first dot printer
LetterPrinter	LA210	132	240	232	7x9	Digital ptr - 3000 ppm
MultiPrinter	LA310	132				Olivetti DM309SL printer
MultiPrinter	LA324	132	300	423/Cent	12x24	Bull 4/54 printer - 5000 ppm
MultiPrinter	LA424	132	400	423/cent	12x24	Bull 4/56 ptr - 365 pph draft
DECmultiPrinter 600	LA600	132	600	232/cent	12x24	20K ppm, 55 dba, replaces LG31
LQP01	LQP01	132	12	DP Par	Daisy	Diablo 630 printer
LQP02	LQP02	132	15	232	Daisy	Qume Sprint 9 printer
LQP03	LQP03	132	25	232	Daisy	Qume printer
LQP45	LQP45	132			Daisy	Olivetti DY450 printer.
Teletype	LT33	80	10	20mA	Rot head	Teletype ASR33 Term
Teletype	LT35				Rot head	Teletype ASR35 Term

[1]The LA180 has extras to the Data Products I/F lines and needs a special interface

Table 3: Other technology printers

Name	Option	Max Spd	Interface	Max ppm	Comments
Color Printer	LCP01	.5 ppm	232		Tektronix 4692 ink jet printer
Color Printer	LCg01	.5 ppm	DP Par		Tektronix 4692 ink jet printer
Color Graphics Plotter	LVP16				HP 7475A printer
DECmultiJET 1000	LJ16P	160	Cent Parr	400	Bubble ink-jet with 50 nozzle pinhead - Olivetti JP150
DECmultiJET 1500	LJ18P	180	Cent Parr	400	Same
DECmultiJET 2000	LJ36P	360	Cent Parr	800	Same -Olivetti JP350
DECColorwriter 120ic	LJ120				low cost col ink jet, foll on LJ250
Companion Color	LJ250	3 ppm	232/423	500	Ink Jet - HP Paintjet HP3630
Companion Color	LJ252	3 ppm	Par	500	HP Paintjet HP3630
DECmultijet 500i	LJ500				Fol on LJ36p
Colormate PS	LF01R	106	Par/232/422/App	1500	Color thermal wax 3 colours - NEC Colormate PS
LF01P Portable	LF01P	-	Cent Par	NA	Thermal Fusion - Citizen PN48

Table 3 (Cont.): Other technology printers

Name	Option	Max Spd	Interface	Max ppm	Comments
DECcolorwriter 1000	LF02	2 ppm	Par/232/422	NA	Thermal ribbon colour, follow on lf01r
DECcolorwriter 1000	LF20P				Follow on fm LF01P

F A C T F L A S H

Options Affected: LXYxx/Printronix Printers
Submitted By: Dave Bazley
Date: 30-Jan-1995
Filing Instructions: Understand the implications, then file at the end of chapter 23, Printers

LXYxx and Printronix P300/P600 Printers Safety Issue - Revisited

The following is reproduced from a recent Blitz referring to an old problem. Basically, some years ago an FCO was issued to fix a **safety hazard,** due to a capacitor venting, in these printers. It is now thought that not all printers received this FCO, so **be carefull** .

For further information see the FCO document for LXYXX-S001.

PROBLEM:

Approximately 4 1/2 years ago safety FCO LXYXX-S001 was released to replace the C1 capacitor in the Digital LXYxx and the Printronix P300/P600 printers. The FCO came about primarily due to capacitors reaching the end of their useful life, and as a result of this the risk of venting or rupturing had increased. The old capacitor is a 78K UF 40VDC capacitor and the newer capacitor is a 78K UF 75VDC capacitor.

It has recently come to our attention that there may still be printers being serviced or taken under service contract which have the old capacitors. Being in close proximity to a venting or rupturing capacitor could result in injury. Of particular concern would be eye injury.

RESOLUTION/WORKAROUND:

It is important when servicing the LXYxx or the Printronix P300/P600 printers to check the C1 capacitor to ensure it is the 75VDC version. If it is not it should be replaced as soon as possible. It is also important to check replacement parts. In one situation a replacement power supply assembly had the older capacitor.

Caution should always be used while servicing this or any product which might have large electrolytic capacitors or other components such as batteries, which have a propensity to vent or rupture when they fail. If the component is accessible during servicing, eye protection is recommended. Health and Safety policy EH002 and its associated guideline EL-EH002-01, both available on VTX EHS, provide information on the need and use of Personal Protection Equipment.