

# WHITE PAPER

## Replacement Strategy for out-of-date Printers in BS2000/OSD Migration Solutions and Products

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Many BS2000 customers are using printers that are not developed, and even not maintained any more. Sooner or later, they will be faced with the problem of replacement. The present document analyses the technical solutions, with the focus on:

- providing a clear message to the vendors and the customers
- emphasizing the solutions keeping the business by Fujitsu and Océ



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## Out-of-date BS2000 printers

### Mechanical printers

Numerous BS2000 customers are still using mechanical printers that have reached the MEK90 status. The most important types are:

	3348	3349	3337	3338
<b>Lines/min</b>	2200 – 3600	2200 – 3600	600	1200
<b>Pages/min min (*)</b>	30 - 50	30 - 50	10	20
<b>Pages/min av (*)</b>	60-100	60-100	20	40
<b>Pages/min max (*)</b>	90-150	90-150	30	60
<b>Pages/month</b>	<270000	<270000	70000	140000

(\*) In this table, the number of pages/minute is based on the assumption of 60 lines/page. However it is not necessarily the case. If we suppose a document with 30% filled pages, the number of pages/min can be 2 times more. In this investigation, we will consider an average value of 50% filled pages, giving 14 to 60 pages/minute.

### LIP printers

The LP65 printers support the LIP data stream. This data stream is not developed any more, and no new printer is able to support it. The main LIP printer is the 3365. This protocol has also been supported by the PageStream printers PS55, PS75 and PS158. For the comparisons, we will consider a speed of 55 to 158 pages/minute.

### HP printers

The most used printers are the "HP" (High Performance) laser printers from Océ. The HP data stream is a frozen technology. It is however still supported, up to now, by the SRA controller running on Océ Production printers, as an alternative to the modern AFP/IPDS data stream, but the printer must be re-booted to switch from a mode to the other one. The support of HP will however be removed from the controller relatively soon.

## Spool & Print products overview

Several printing products are (or have been) used on BS2000/OSD:

### ■ Local Spool

This usually concerns the devices locally attached to the host by CT2 or CTS (Escon). Such a connection provides a very high reliability.

For local printing, the user does not specify the printer to be used, but rather the required features (data stream, resources ...). The device selection results from the scheduling parameters and algorithm.

All 333x and 334x printers belong to the local Spool with a speed equivalent to 15 – 60 pages/min.

The LIP and HP printers also belong to this category.

The HP printers have a speed ranging from 50 to 1000 pages/min.

Let us remark that neither the LIP, nor the HP printers can be considered as a candidate for replacing the mechanical printers; in contrary, they both belong to a frozen technology, and also need a replacement strategy.

Last but not least the LAN printer 9045 (see RSO), connected to an SX server (or SR2000), with a speed equivalent to 15-50 pages/min, is also supported by local Spool, via Line Printer emulation in X2000 (resp. SINIX2000).

### ■ ROUTER

This product runs like a Spool Printer-controller and sends to a PRISMAproduction server all the information needed to complete a Print Job. It gets from Spool the input data (in AFP or text) and the resources if required.

The PRISMAproduction printers have a speed ranging from 50 to 1000 pages/min

AFP is the de-facto standard for the production printers. It is, of course, quite able to replace the mechanical printers.

### ■ RSO

This only concerns the network printers (or servers), with the exception of the IPDS printers. The user has to specify the printer. The administrator has however the possibility to define "Printer Pools", that can be specified too. The job is executed on one of the printers of the pool (provided that at least one printer is able to process it).

Typical RSO printers are the types 90xx and 4850. In addition, RSO currently supports PCL printers like the Océ 3165.

	9014	9015	9016	9017	9045	4850	3155	3165
<b>FanFold</b>	X	X	X	X	X	X		
<b>CutSheet</b>	X	X	X				X	X
<b>chars/sec</b>	600	700	500	700				
<b>Lines/min</b>					500-1500	1700		
<b>Pages/min</b>	10	15	10	10	15-50	30	52	62
<b>Pages/month</b>	20.000	30.000	20.000	40.000	300.000	200.000		

The RSO printers were originally connected to an NEA network, giving a very good reliability. Most customers have however migrated to the LAN. With such a network, the reliability of the printers depends on the availability of the information reported,

either by the network (SEH card), or by the printer itself. If no information is available, no level of reliability can be guaranteed (see Reliability section).

#### ■ **SCSI-PCL printing**

This function has been frozen. However the software developed for SCSI-PCL is still available.

It consists in converting the data stream of local jobs (text file and HP) into PCL and processing it on PCL printers. The conversion-software could be reused in other environment.

The typical printer for this application is the PS158 (158 pages/min).

#### ■ **Distributed Print Services (Dprint)**

With the Distributed Printing, print jobs can be transferred from a host to another one.

## Technical aspects

The printers supported by BS2000/OSD cannot be so simply interchanged. A list of requirements must be considered (not necessarily fulfilled), to avoid the following kinds of incompatibilities:

- data stream incompatibility (implies a modification of the application)
- print volumes incompatibility (the slowest mechanical printers have a speed of about 50 pages/min)
- job submission interface incompatibility (implies a modification of the application or of the JCL)
- jobs and printer management incompatibility
- connection incompatibility
- reliability differences (level and nature)
- paper differences (customers will not necessarily accept replacing a fanfold by a cut sheet)
- need to pay additional licenses

Some other aspects can be important for the customers too, e.g. the possibility to share the devices with other enterprise printing activities.

## Data streams

In addition to the text mode (Carriage Control byte and text), 3 advanced data streams are supported by the local Spool:

Printer	Data stream	Comment
AFP	AFP	The IBM standard for page printing
	Mixed mode	Text mode and AFP resources
	TRC	Extrapolation of the Carriage Controls
LIP	EXCCW	More or less comparable to AFP Totally frozen
	Extended line mode	Simplified LIP mode
HP <sup>1</sup>	Model 2	Predecessor of AFP. No development any more. Soon not supported any more by new printers
All	Line mode	Supported by all printers

Modern printers support AFP, PCL and/or PostScript. Our goal is thus to submit the other ones (Text, HP, LIP) to such printers, after executing the needed conversions.

#### ■ **Text files**

Both the local Spool (with Router if needed) and RSO are able to print text files on any kind of printer. In general, the administrator has to define the needed forms to the new device types.

#### ■ **HP files**

The HP2AFP product converts HP data stream into AFP. The concerned resources must be previously converted into AFP ones (product Transcon). An HP-to-PCL filter has also been developed in the frame of SCSI-PCL. Although SCSI-PCL is now frozen, this filter is still valid.

#### ■ **LIP files**

There is no BS2000 solution for converting LIP mode, but a LIP-to-PCL converter exists on MS/Windows (developed by Gölnitz + Partner GmbH).

<sup>1</sup> HP is the BS2000 name for those printers. In general, the same printer can be started in AFP or HP mode.

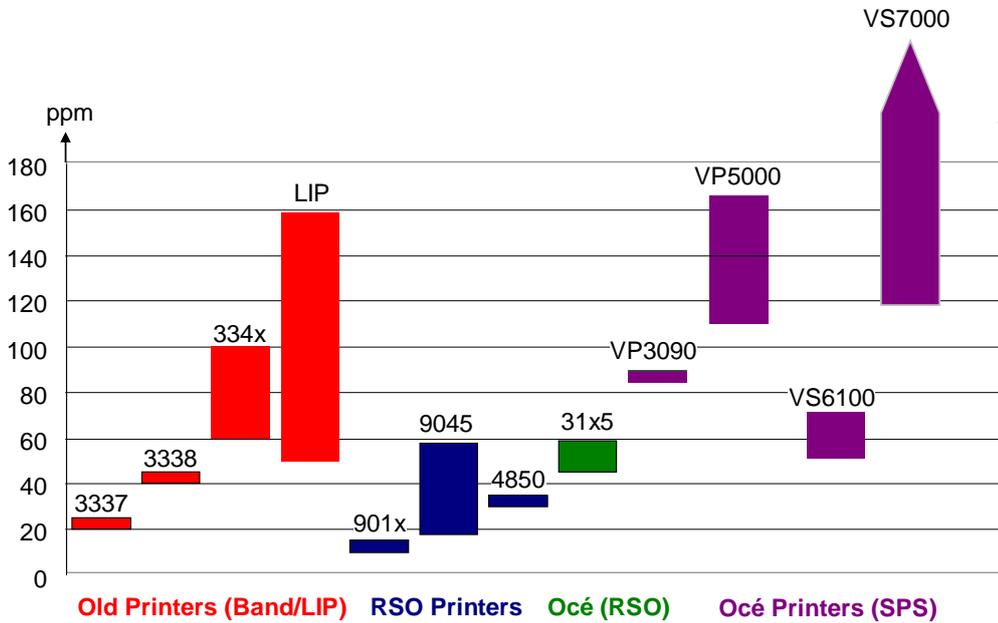
In summary, the following conversion possibilities exist or could be introduced:

Printer / Spooler Data stream	AFP/ Spool	PCL/ RSO	PostScript/ RSO
AFP	Y	-	-
LIP	-	(GP filter on PC)	-
HP	HP2AFP	(SCSI-PCL filter)	-
Text mode	Y	Y	Y

### Print volumes

The Océ offer contains:

- The VarioStream 6100, Fan Fold (IPDS and PCL), with a speed of 50 to 70 pages/minute (70 in A4 landscape, 100 in A4 2-up), depending on the quality of the printing
- The VarioStream 7000, Fan Fold (IPDS and PCL), with a speed of 120 to 420 pages/minute (120 to 420 in A4 landscape, 180 to 600 in A4 2-up)
- The VarioPrint 3090, Cut Sheet (IPDS and PCL), with a speed of 85 pages/minute
- The VarioPrint 5000, Cut Sheet (IPDS and PCL), with a speed of 110/158 pages/minute
- The 3145, 3155, 3165, Cut Sheet (PCL), with a speed ranging from 45 to 55 pages/minute



As seen in this picture, the VS6100 (fanfold) and 3155/3165 (cut sheet) are faster than the 3337, 3338 and correspond to the slowest 334x. The VS7000 are faster than the fastest 334x. In most cases, a relatively good correspondence can be found with some new printers. The possibility to use cut sheet printers instead of fanfold makes the comparison much easier.

### Job submission

The same commands are used to submit Print jobs, depending on the destination:

- **Local Spool**  
The user has no right to choose the printer, except indirectly by the needed features. However a "Destination" parameter can be specified, provided that the system administrator has specified the same destination name for one or several printers. In this case, the job can only be scheduled on one of those printers. In most cases, there is no such parameter in the existing programs or JCL.
- **Router**  
A job is directed to a Router if the print parameters specify that it is an APA job, or if adequate filters have been started to convert an HP or Text job into AFP. However the Spool will not use this possibility if a printer is available, that can process the job without filtering.
- **RSO**  
The device name or a destination name must be specified in the command. If it is a destination name, and several printers have been started with this name, the scheduling will treat this set of printers exactly like the set of local printers.
- **SCSI-PCL**  
This processing was integrated in the local Spool.

In conclusion, it will always be possible to direct a job (text or HP) to an AFP printer, without modifying the submission, provided that there is no other possibility.

In general, the redirection of a text job to an RSO printer needs to modify the job submission by specifying a device or destination. A possibility exists to declare a default device or destination, for commands where it is missing. Without this declaration, the default is "Local". But this declaration will concern all jobs. If HP or AFP jobs are submitted, while the default is an RSO destination, those jobs will be rejected.

## Jobs and printers management

The jobs management for SPOOL and RSO is very similar, provided that the "Destinations" and "Printer Pools" are used. In local Spool, a printer pool made of one single printer allows the user to implicitly submit a job to this specific printer. A pool of RSO printers is handled exactly like the pool of local printers, with the same load distribution, and minimization of the manual operations.

The end user has a similar control and follow-up possibility.

The main difference however concerns the meaning of the status "job completed".

With the local Spool, the printer is controlled until the end of the job. Spool is informed of the problems, and takes such actions like re-printing some pages, and so on.

With RSO, this control is very dependent on the device. With "mute" printers, there is no information at all. For printers like the Océ3165, the files to be printed are saved in the printers' memory. No information is sent afterwards.

## Printer connections

Most local printers are connected by a Channel Type 2 or Type S (Escon). This possibility is not necessarily available for all replacement candidates. TCP/IP is, of course, incomparably cheaper, and allows sharing the devices with other mainframes or other servers. However it has the following drawbacks:

- the reliability is not equivalent (see other sections)
- the capacity is variable (except if a separate segment is used)

Of course, a separate segment can be used between the mainframe and the printer, but in this case, the shareability is lost.

## Reliability

About the reliability, changes can be observed when the print job is handled by RSO. The reliability offered by RSO differs from the local Spool one and is explained hereafter.

The reliability currently offered by RSO covers the fault prevention, the error detection, the error reporting and recovery processing. All these features are based on the availability of information reported either by the network or by the printer itself. The non-availability of such information inhibits the RSO reliability processing.

On TCP/IP-connected printers, RSO can only ensure an accurate recovery (without data loss) when a dialogue may exist between RSO and the printer. Such dialogue enables RSO to be sure that the printer has received each RSO buffer (that's what we call 'synchronization') and also to be warned of possible printer problems such as paper-end, off-line ... (that's what we call 'polling').

Synchronization is then the only way to avoid losing data in case of troubles (printer problems or TCP/IP connection loss). Indeed, when it didn't receive within an interval of time an acknowledgement from the printer corresponding to each sent RSO buffer, RSO assumes a problem might occur and stops printing (keeping in mind that it should restart from the last buffer for which it receives an acknowledgement).

For PCL printers, RSO uses the PCL ECHO command to synchronize the transmission of each message. This method of synchronization ensures that the print output can be continued correctly when problems should occur.

For PCL and PostScript printers, it also uses several PJI commands to synchronize the start and end of the print job. This method of synchronization only ensures that the printer is ready to start a print job and that it has successfully received the complete job. It does not guarantee that the print job can restart correctly should problems occur.

Polling only enables to detect what kind of printer problems occur (paper end, off-line ...) and then to give the user more accurate information about printing troubles.

RSO uses various PJI commands to query the printer status.

In order to take benefit of these protocols, one has to be aware of having the 'hardware' supporting it but also of being sure not having any other 'hardware' in the path (between RSO and the printer) that prevents the dialogue from taking place.

## Forms

The mechanical printers use continuous forms, whose size is usually greater than A4. However the print-quality of the modern printers is much better, which should allow a reduction of the size, while the recto-verso could be an advantageous replacement for the fan-fold.

This alternative could be proposed to the customer, with the additional advantage that a cut-sheet printer can be used, as well for the mainframe documents than for the office ones.

## Additional licenses

All the printers to be replaced are supported by Local Spool that is part of the GA. Any solution based on ROUTER or RSO means, for a part of the customers, the acquisition of this product, and thus an additional cost (but additional revenue for Fujitsu or Océ).

## Migration strategy

### Text files

Text file jobs can be processed on any kind of printer by any product.

In the present status, we can consider using IPDS or PCL printers, and using Fan Fold or Cut Sheet printers, provided that the customer accepts the change. In this table, we do not mention VSxxx printers running in PCL5 because they have never been tested with RSO. But with a correct configuration (1 controller task/printer), this should be valid too.

For the same reason, we do not mention the 3090 in LAN – IPDS.

#	Printer	Data Stream	Connection	Product	Migration	Advantages / Drawbacks
1	VS6100 VS7000	IPDS	CT2	ROUTER	Declare filter Redefine forms	+ application transparent + optimal reliability - ROUTER license
2	VS6100 VS7000	IPDS	LAN	ROUTER	Declare filter Redefine forms	+ application transparent + high reliability + no channel (cost) - ROUTER license
3	3155 3165	PCL	LAN	RSO	Define destination Redefine forms	+ application transparent + no channel (cost) - conditional reliability - RSO license - Cut Sheet form
4	3155 3165	PCL	LAN	RSO	Destination in PRINT command Redefine forms	+ no channel (cost) - not application transparent - conditional reliability - RSO license - Cut Sheet form
5	9045	ANSI	LAN	X2000 (Xprint)	Redefine forms	+ application transparent + no channel (cost) + no license - not for S1xx server

Remarks:

#### Solution 1

The filter is a simple declaration to indicate to the scheduler that text files can be sent to the IPDS printer. Except this declaration, the administrator has to define the used forms for the APA device type.

#### Solution 2

This solution is comparable to the first one, except that a LAN connection is used, that is a much cheaper hardware. The reliability can be affected by the load of the LAN.

#### Solution 3

This solution is based on RSO. It is possible to automatically submit all jobs to RSO, by declaring a default destination to replace \*LOCAL. This is possible only if no job at all is to be treated by the local Spool. The reliability is depending on the configuration.

The solution uses a cut sheet printer. This change of support should be accepted by certain customers, when considering the improved quality of the printed document. In many cases, the same printer can be used, both for the mainframe and for the office printing.

#### Solution 4

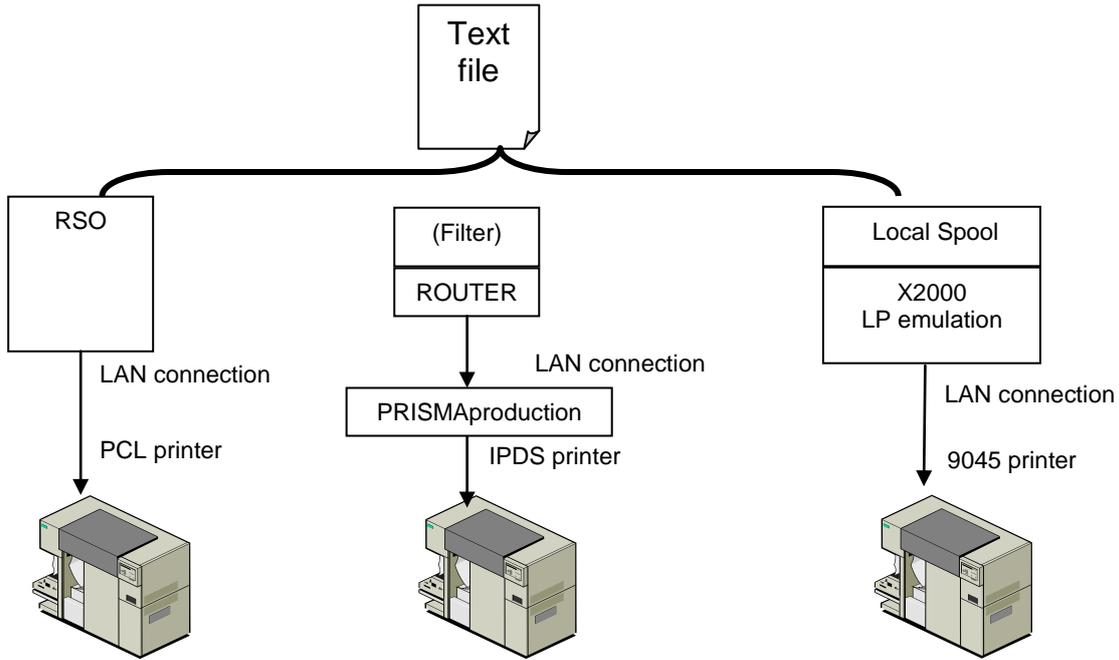
If the customer also has HP or AFP jobs, to be treated by the local Spool, the previous solution does not work. It is then necessary to modify the PRINT commands. This case is however not current: if the customer has an AFP printer, the Text jobs can be sent to this printer without problem.

The solution uses a cut sheet printer. This change of support should be accepted by certain customers, when considering the improved quality of the printed document. In many cases, the same printer can be used, both for the mainframe and for the office printing.

#### Solution 5

This solution with 9045 as standard system printer is available only for hybrid servers (SX series and SR2000).

**Summary**



**HP jobs**

Using IPDS printers

We have to consider 2 kinds of HP jobs:

- HP Line-mode: text files, but to be processed with specific HP resources (Character sets or FOBs), and which contain so-called “top-of-page control bytes” that determine the particularity of each page (orientation, character set, density).
- HP Page-mode: files containing the HP escape sequences.

They are directly supported by Spool/PRISMAproduction (through a Router) on HP printers.

On IPDS printers, the support is the following:

- HP Line-mode is supported by Prismaproduction (through a Router), with the help of the HP2AFP Step 1 feature available in Spool (on-line filter that interprets the AFP resources and the Top-of-Page control bytes and sends the needed controls to the printer).
- HP Page-mode is supported by the ROUTER with the HP2AFP Step 2 feature that is a separated product, and the TRANSCON product (Transcon converts all the resources, while HP2AFP Step 2 is an off-line filter that converts the HP data stream into AFP).

Those functions are transparently controlled by local Spool, provided that the filters have been started.

Using PCL printers

A HP-to-PCL filter has been developed in the frame of SCSI-PCL that treats Line-Mode as well as Page-Mode print jobs. It can be used also for printing on RSO printers: the configuration file of the filter indicates the printer to which the jobs must be processed after conversion. The resources must be converted by a dedicated tool before submitting any job.

This converter has however some limitations mostly due to the limitations of PCL (s. Annex).

#	Printer	Data Stream	Connect.	Product	Migration	Advantages / Drawbacks
1	VS6100 VS7000	IPDS	CT2	HP2AFP ROUTER	Convert resources Declare filter Redefine forms	+ application transparent + optimal reliability - ROUTER license
2	VS6100 VS7000	IPDS	LAN	HP2AFP ROUTER	Convert resources Declare filter Redefine forms	+ application transparent + high reliability + no channel (cost) - ROUTER license
3	3155 3165	PCL	LAN	HP2PCL RSO	Convert resources Redefine forms	+ application transparent + no channel (cost) + shared with office printing - conditional reliability - RSO license - Functional limitations - Cut Sheet form

The HP2AFP Step1 filter has practically no impact on the performances. In addition, the filter is integrated in the Spool environment, and does not prevent any other feature to be supported. In particular the System Exits are fully supported.

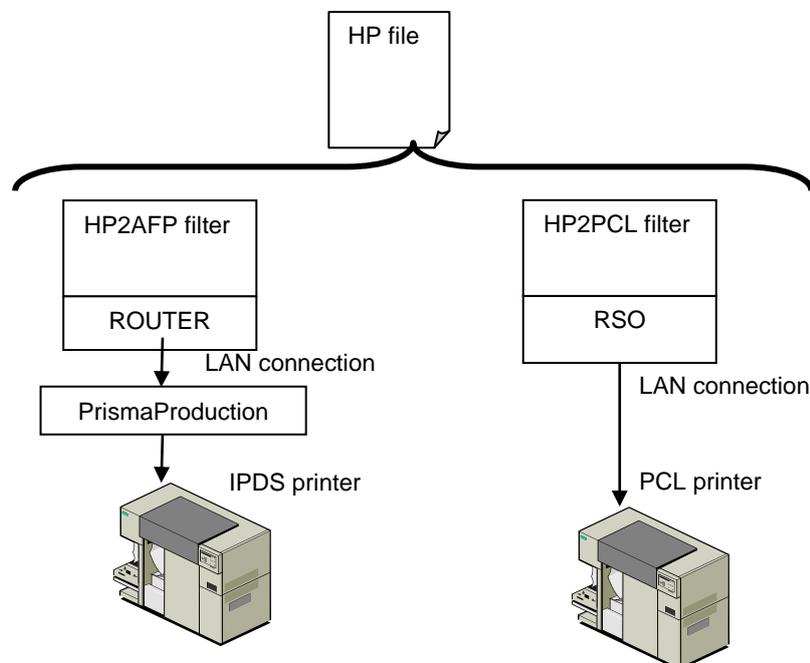
The HP2AFP Step 2 filter converts an HP file into an AFP one. This occurs in a separate job that creates a new file and submits it to the Spool. This implies some restrictions:

- The conversion is outside the Spool environment. Most PRINT command parameters are ignored, and the exits are not activated. In fact, AFP exits can be activated during the second step of the job that is, the printing. But in the best case, this needs new exits to be created. In the worst case, the HP data stream is not valid before the execution of the exits, and the conversion is not possible.
- The conversion is done by a different job, which needs to be scheduled as normal user job. The delay before the start of this job, and the time of the conversion are added to the total execution time.

To improve this situation, it has been decided to integrate the HP2AFP Step 2 filter in the Spool environment. This has the following advantages:

- The HP-relevant command parameters are supported,
- The system exits are activated.

## Summary



## LIP files

As already mentioned, there is no conversion possibility on BS2000. A converter running on MS/Windows is developed by Gölnitz + Partners, and has been successfully used by 3 of the 5 Belgian customers using LIP.

The Gölnitz solution is based on the BS2000 Virtual Printer which catches the LIP jobs and transfers them to a Windows Server with PRISMAoffice.

The migration needs a couple of hours up to a couple of days for the Océ experts.

## Conclusion

The out-of-date printers can be replaced by modern ones, with a comparable capacity; software solutions already exist for supporting the same functionality with unchanged interfaces.

For text and HP files, two kinds of easy solutions can be proposed, based either on ROUTER/IPDS or on RSO/PCL.

For LIP files, there is no local BS2000 solution. However a PC-based solution exists and has already been installed by 3 of the 5 Belgian LIP customers.

## Annex

### HP-to-PCL limitations

Print parameter (/PRINT-DOCUMENT)	
Partial processing of input file (input part)	Supported in part (for sections only)
Partial processing of input data records(record part)	Supported
Partial processing of output file (output part)	Not supported; job rejected with error message
Form	Supported
Loop	Supported
Rotation loop	Supported
Line spacing	Supported
Indentation of print output (left margin)	Supported
Multiple print, max. 255 copies (page copies)	Limited to 99 copies
Character set	Supported
Form overlay	Not supported; job rejected with error message
Form overlay buffer (FOB)	Supported
Rotation	Supported
Alternate rotation	Simulated
Feed control character	Supported
Use of EFO	Not supported; job rejected with error message

Control character evaluation	
Line indentation	Supported
Character density	Supported
Underscoring	Supported
Inverse printing	Not supported; these escape sequences are ignored in the printout
Spaced printing	Simulated in part (characters not widened)
Character set selection	Supported
Use of FOB	Supported
FOB suboverlay features	Not supported; parameter ignored in the printout
Page rotation	Supported