THERMAL PRINTING SOLUTIONS

TPOSS001 PRINTER

USER MANUAL

MADE IN EUROPE

Reference 3104058 Issue C
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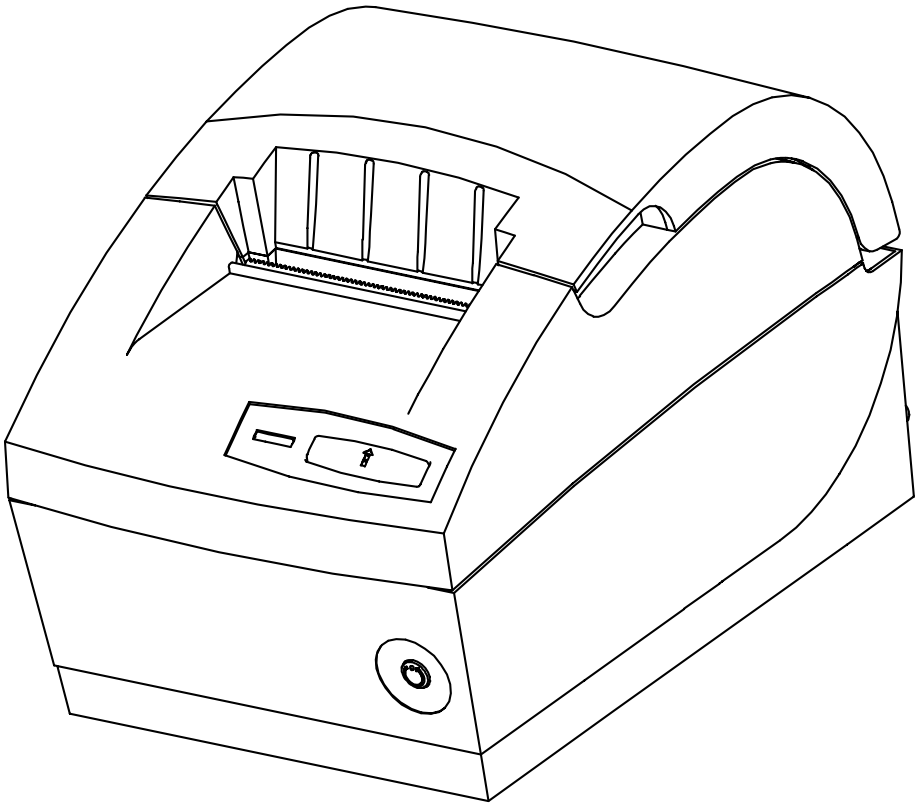

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EVOLUTIONS		
Date	**Issue**	**Modifications**
	Z	Creation
	A	
11/98	B	
06/02	C	Document name change (TPOS becomes TPOSS001)

INTRODUCTION

The purpose of the manual is to describe the communication between the machine and the computer and the different commands. This manual holds a lot of important information:

- Printer Ethernet Protocol
  This document presents a special Ethernet protocol, implemented in the TPOS printer.
- ARP which is used by the host to interrogate the network of printers
- RARP which is used when a new printer is connected to the network
- UDP/IP which is used to command the printers
- The list of the control codes implemented in the printer
  The control codes are sorted by item. All bytes are in hexadecimal.
  Bytes written with lower case letters are variable or defined by the host.
- Firmware flash download protocol

The communication is based on the special Ethernet protocol defined.

***Notes*:**

Soft version 0 to 03 on B models:
- for commands CDP / PDB command reply depends on preceding command
- the printer physical address 02 : 00 : 00 : 00 : 00 : dip (it will be 02 : 00 : ip0 : ip1 : ip2 : dip) on next version.
- correction of a bug: MSG NUMBER FRAG/OFFSET inverted.

Soft version 1.01on B models
- NACK implemented (see CDB and PDB).

Soft version 1.04 on B models
- Add of code HTT Heating Time Tuning
- Add of block management (using ntb and nntb)
- Add of Buzz Control

Soft version 2.00 on B models
- Add Autotest pointer
- New 448 dots head

Soft version 2.01 on B models **(described in this manual)**
- Add PC down

Other Available manuals:

Service guide	FDE 3104059
Set-up guide	FDE 3104057

Axiohm

CONTENTS

1 TECHNICAL SPECIFICATIONS

ITEM	VALUE	UNITS
Printing method	Static thermal dot line printing	-
Paper loading	Clamshell	-
Number of resistor dots	448	-
Resolution	8	Dots/mm
Printing width	56	mm
Printing speed	100	mm/s
Paper width	58	mm
Paper bucket diameter	90	mm
Data Buffer	100k	Bytes
Head temperature detection	By Thermistor	-
Paper empty detection	Opto-sensor	-
Printer voltage range	20 - 26.4	V DC
Current consumption	24V, 50 W	from power supply
Power supply	110-220 V AC / 24 V DC 50-60	V Hz
Maximum duty cycle (to avoid motor temperature rise)	20	%
Storage range	- 20 to + 60	°C
Operating range	-10 to 50	°C
Electrical life time	10×10^8	pulses
Mechanical life time (abrasion)	100	Km
Over all dimensions: Width Depth Height	 121 180 124	 mm mm mm
Weight (Without paper roll)	600	g
Recommended paper	Kansaki T0 281 CA	-
Maximum paper thickness	60	µ
Interface	Ethernet	RJ 45
Certification : EMI Safety	CE Class A, FCC Class A. UL 1950, EN 60950,VCCI Electrical Appliance and Material Control Law of Japan (T-MARK)	- -

2 List of control codes

COMMAND	DESCRIPTION	Page
<AT>	**A**uto-**T**est	34
<BEO>	**B**uzz **E**nd of **O**rder	31
<CDB>	**C**oupon **D**ata **B**lock	20
<CR>	**C**old **R**eset	30
<HTT>	**H**eating **T**ime **T**uning	35
<MTB>	**M**odify **B**uzz **T**iming	32
<OPS>	**O**rder for **P**rinting **S**peed	36
<PB>	**P**rint **B**uffer	23
<PDB>	**P**rint **D**ata **B**lock	24
<PI>	**P**rinter **I**dentification	26
<PS>	**P**rinter **S**tatus	27
<WR>	**W**arm **R**eset	30

<FDD>	**F**lash **D**ata **D**ownload	39
<FDM>	**F**lash **D**ownload **M**ode	38
<FPDP>	**F**lash **P**c **D**own **P**arameter	41
<FSD>	**F**lash **S**tatus **D**ownload	40
<GPF>	**G**o **P**rogram **F**lash	37

3 Internet Protocols

Internet organization is composed of layers, which have different purpose. Here is the description of the different layers so the different protocols we meet in Internet.

Hierarchic Organization:

<table>
<tr><td colspan="3"></td><td>NFS</td><td colspan="3"></td></tr>
<tr><td>WWW</td><td>FTP</td><td>TFTP</td><td>Telnet</td><td colspan="2">Shell</td><td>AP</td></tr>
<tr><td colspan="3">TCP</td><td colspan="2">UDP</td><td>ICMP</td><td>IGMP</td></tr>
<tr><td colspan="5">IP</td><td>ARP</td><td>RARP</td></tr>
<tr><td colspan="7">Physical layer (Ethernet standard)</td></tr>
</table>

Physical layer

It is an Ethernet type and is realized by a local network.

Network layer

IP (**I**nternet **P**rotocol) is used to wrap up TCP, UDP Etc. This protocol allows communication between two machines referred by IP addresses. It is defined by the **R**equest **for C**omments 791.

ARP (**A**ddress **R**esolution **P**rotocol) is a physical address and Internet address association referred by ARP.
It is defined by the RFC 826.

RARP (Reverse **A**ddress **R**esolution **P**rotocol) is an Internet address and Physical address association referred by RARP.
It is defined by the RFC 903.

Transport layer

ICMP (**I**nternet **C**ontrol **Message P**rotocol) is used to transport information intended to the network management.

The RFC 1112, RFC 792, RFC 1256 define IGMP (Internet Group Membership Protocol). It's a participation protocol of a multipoint group.

UDP (**U**ser **D**atagram **P**rotocol) is uses to exchange data in unconnected mode.
It is defined by the RFC 768 and referred by UDP.

TCP (**T**ransport **C**ontrol **P**rotocol) is used to transport information flow in connected mode.
The RFC 793, RFC 11232, RFC 1323 define it

Application layer

- WWW
- FTP
- NFTP
- Telnet
- **AP** (**A**xiohm **P**rotocol)
- Etc ...

4 Ethernet Format data fRAME

All Ethernet equipment have a universal and unique address, represented by 48 bits.

An Ethernet address consist of 6 bytes, in hexadecimal, separated by the character ":".

Ex.: 08:00:20:0C:F3:4C

FF:FF:FF:FF:FF:FF is a diffusion address or the Broadcast. The message is sent to all the machines.
00:00:00:00:00:00 is reserved.

Ethernet Frame:

PREAMBLE							SFD
10101010	10101010	10101010	10101010	10101010	10101010	10101010	10101011
Destination address (48 bits)							
Source address (48 bits)							
Protocol (16 bits)							
Data (from 46 to 1500 bytes) (PAD)							
FCS (32 bits CRC)							

SFD: Start Frame Delimiter
FCS: Frame Check Sequence

The Ethernet frame starts with seven bytes which values are 0xAA and one byte which value is 0xAB. This allows to the material to resynchronize itself.
If the last two bytes are decrypted, the synchronization is done.

A minimum fame size for the data is required for correct operation and if necessary, the data field is extended by appending extra bits (PAD) in units of octets after the data.

A Cyclic Redundancy Check (CRC) is used by the transmit and receive algorithms to generate a CRC value for the FCS field
The CRC signal is used for the checksum.

Different protocols are available:

0800 : IP protocol
0806 : ARP protocol
0835 : RARP protocol

5 ARP Typical Frame

Address Resolution Protocol has been created to find the physical address of a machine which Internet address is known in our case.

ARP Frame:

Destination Ethernet Address (48 Bits)			Source Ethernet Address (48 Bits)		
Ethernet Protocol (16 Bits)	Material (16 Bits)	IP Protocol (16 Bits)	L.H. (8 Bits)	L.P. (8 Bits)	Operation (16 Bits)
Source hardware Address (L.H. octets)			Source protocol Address (L.P. octets)		
Destination hardware Address (L.H. octets)			Destination protocol Address (L.P. octets)		

ARP frame is an Ethernet frame so it's preceded by 8 synchronizing bytes, which are:

10101010	10101010	10101010	10101010	10101010	10101010	10101010	10101011

Frame description:

Destination Ethernet Address represents the destination machine address.

Source Ethernet address represents the source machine address.

Ethernet protocol value is 0x0806 corresponding to the ARP protocol.

Material represents Ethernet which value is 1.

IP protocol value is 0x800 and indicates the protocolary address nature conveyed in the frame.

L.H. is the length, in bytes, of material addresses; the value for Ethernet is 6.

L.P. is the length, in bytes, of protocolary addresses; the value for IP is 4.

Operation specifies the frame nature: 1 for an ARP request and 2 for a reply.

Source hardware Address, Source protocol Address, Destination hardware Address and Destination protocol Address contains known parts of protocolary and material address of the destination and the source.

Algorithm:

- The ARP frame is sent to all the networked machines. The destination Ethernet address is the broadcast address: **FF:FF:FF:FF:FF:FF**.
- The machine, which recognizes its IP address, replies to the source machine. The machine sends a reply ARP frame, which contained the right protocolary and material source address.
- The first machine decrypts the reply and stores in its memory the two addresses for a future using.

5.1 Host Request

FF : FF : FF : FF : FF : FF	Broadcast
aa1 : aa2 : aa3 : aa4 : aa5 : aa6	Source Host Physical Address
08 : 06	ARP Protocol
00 : 01	Ethernet
08 : 00	IP Protocol
06	Ethernet Address Length
04	IP Address Length
00 : 01	Request
aa1 : aa2 : aa3 : aa4 : aa5 : aa6	Source Host Physical Address
ip0 : ip1 : ip2 : 80	Host IP Address
00 : 00 : 00 : 00 : 00 : 00	Destination Printer Physical Address (Unused)
ip0 : ip1 : ip2 : dip	Printer IP Address (DIP : 0..127)

PAD

CRC

Frame example:

FF FF FF FF FF FF	**00 00 1A 18 1F 7D**	**08 06**	**00 01**	**08 00**	**06**	**04**	**00 01**
Broadcast	Host physical address	ARP protocol	Ethernet	IP protocol	Ethernet address length	IP Address length	Request

00 00 1A 18 1F 7D	**C2 3F 14 80**	**00 00 00 00 00 00**	**C2 3F 14 00**
Host physical address	Host IP address	Destination printer	Printer IP address

5.2 Printer Reply

aa1 : aa2 : aa3 : aa4 : aa5 : aa6	Destination Host Physical Address
bb1 : bb2 : bb3 : bb4 : bb5 : dip	Source Printer Physical Address (DIP : 0..127)
08 : 06	ARP Protocol
00 : 01	Ethernet
08 : 00	IP Protocol
06	Ethernet Address Length
04	IP Address Length
00 : 02	Reply
bb1 : bb2 : bb3 : bb4 : bb5 : dip	Source Printer Physical Address
ip0 : ip1 : ip2 : dip	Printer IP Address
aa1 : aa2 : aa3 : aa4 : aa5 : aa6	Destination Host Physical Address
ip0 : ip1 : ip2 : 80	Host IP Address

PAD

CRC

Frame example:

00 00 1A 18 1F 7D	**02 00 C2 3F 14 00**	**08 06**	**00 01**	**08 00**	**06**	**04**
Host physical address	Printer Physical address	ARP protocol	Ethernet	IP protocol	Ethernet address length	IP Address length

00 02	**02 00 C203F014 00**	**C2 3F 14 00**	**00 00 1A 18 1F 7D**	**C2 3F 14 80**
Reply	Printer Physical address	Printer IP address	Host physical address	Host IP address

If a byte is written using lower case letters, it is “variable”, otherwise it is “constant”.

- **ip0**, **ip1**, **ip2** : these bytes are defined by the user. IP addresses are stored in flash, and cannot be modified.
- **dip** : this byte comes from the DIPswitches configuration.
- **aa1**..**aa6** : the host physical address is stored in RAM. aa1 two least significant bits are : 10.
- **bb1**..**bb5** : the printer physical address is stored in RAM. This address in unique. Its value after a Reset is :

  02 : 00 : 00 :00 :00 : dip / 02 : 00 : ip0 : ip1 : ip2 : dip depending on soft version.

6 RARP (Reverse ARP) Typical Frame

Reverse Address Resolution Protocol has been created to find the IP address of the current machine.

RARP frame: It is similar to the ARP Frame.

<table>
<tr><td colspan="3">Destination Ethernet Address (48 Bits)</td><td colspan="3">Source Ethernet Address (48 Bits)</td></tr>
<tr><td>Ethernet Protocol (16 Bits)</td><td>Material (16 Bits)</td><td>IP Protocol (16 Bits)</td><td>L.H. (8 Bits)</td><td>L.P. (8 Bits)</td><td>Operation (16 Bits)</td></tr>
<tr><td colspan="3">Source hardware Address (L.H. octets)</td><td colspan="3">Source protocol Address (L.P. octets)</td></tr>
<tr><td colspan="3">Destination hardware Address (L.H. octets)</td><td colspan="3">Destination protocol Address (L.P. octets)</td></tr>
</table>

Frame description:

Destination Ethernet Address represents the destination machine address.

Source Ethernet address represents the source machine address.

Ethernet protocol value is 0x0835 corresponding to the RARP protocol.

Material represents Ethernet which value is 1.

IP protocol value is 0x800 and indicates the protocolary address nature conveyed in the frame.

L.H. is the length, in bytes, of material addresses; the value for Ethernet is 6.

L.P. is the length, in bytes, of protocolary addresses; the value for IP is 4.

Operation specifies the frame nature: 3 for an RARP request and 4 for a reply.

Source hardware Address, Source protocol Address, Destination hardware Address and Destination protocol Address contained known parts of protocolary and material address of the destination and the source.

Algorithm:

- The RARP frame is sent to all the networked machines. The destination Ethernet address is the broadcast address: **FF:FF:FF:FF:FF:FF**.
- The mainframe RARP on the network replies to the source machine. It sends a reply RARP frame, which contains the right protocolary and material source address.
- The first machine decrypts the reply and stores in its memory the two addresses for a future using.

  The algorithm is also used to find the IP address of a machine which Ethernet address is known.

See Chapter "AUTOMATIC REQUEST PROCESS " P. 40

6.1 Host Request

FF : FF : FF : FF : FF : FF	Broadcast
aa1 : aa2 : aa3 : aa4 : aa5 : aa6	Source Host Physical Address
08 : 35	RARP Protocol
00 : 01	Ethernet
08 : 00	IP Protocol
06	Ethernet Address Length
04	IP Address Length
00 : 03	Request
aa1 : aa2 : aa3 : aa4 : aa5 : aa6	Source Host Physical Address
ip0 : ip1 : ip2 : 80	Host IP Address
00 : 00 : 00 : 00 : 00 : 00	Destination Printer Physical Address (Unused)
ip0 : ip1 : ip2 : dip	Printer IP Address (DIP : 0..127)
PAD	Extra octets to get a minimum frame.
CRC	

6.2 Printer Reply

aa1 : aa2 : aa3 : aa4 : aa5 : aa6	Destination Host Physical Address
bb1 : bb2 : bb3 : bb4 : bb5 : dip	Source Printer Physical Address (DIP : 0..127)
08 : 35	RARP Protocol
00 : 01	Ethernet
08 : 00	IP Protocol
06	Ethernet Address Length
04	IP Address Length
00 : 04	Reply
bb1 : bb2 : bb3 : bb4 : bb5 : dip	Source Printer Physical Address
ip0 : ip1 : ip2 : dip	Printer IP Address
aa1 : aa2 : aa3 : aa4 : aa5 : aa6	Destination Host Physical Address
ip0 : ip1 : ip2 : 80	Host IP Address
PAD	
CRC	

The printers obtained IP address Host from the ARP or RARP protocol.

Conditions: Last byte >= 0x80 ; default value = C2:3F:14:80 at reset.
IP Host = XX:XX:XX:1xxxxxxx.

7 UDP/IP Typical Frame

The UDP frame is described as follows:

Host computer sends each frame using the following format:

Media **A**ccess **C**ontrol	bb1 : bb2 : bb3 : bb4 : bb5 : dip	Destination MAC Address (Printer #dip)
MAC	aa1 : aa2 : aa3 : aa4 : aa5 : aa6	Source MAC Address (CMC Computer)
MAC	08 : 00	Frame Type : IP

IP	45 : 08	IP Info
IP	zz : zz	IP length
IP	nn : nn	Message Number
IP	40 : 00	No Fragmentation
IP	01	Do Not Route
IP	11	UDP Protocol
IP	00 : 00	CRC
IP	ip0 : ip1 : ip2 : 80	Source IP Address (Host Computer)
IP	ip0 : ip1 : ip2 : dip	Destination IP Address (Printer #dip)
UDP	77 : 77 : 77 : 77	Port Numbers
UDP	yy : yy	UDP Length
UDP	00 : 00	Unused CRC
AP	UDP Data	AXIOHM Protocol Data
MAC	CRC : CRC : CRC : CRC	CRC (Checked by Ethernet Circuit)

Frame example:

00 00 1A 18 1F 7D	**02 00 C2 3F 14 00**	**08 00**	**45 08**	**00 28**	**00 00**
Destination MAC address	Source MAC address	IP Frame	IP Info.	IP length	Message number

40 00	**01**	**11**	**CC BE**	**C2 3F 14 80**	**C2 3F 14 00**
No fragmentation	Do not route	UDP protocol	CRC	Source IP address	Destination IP address

77 77 77 77	**00 14**	**00 00**	**00 00 00 06 00 00 00 00 00 00 00 00 00 00 00 00 00 00**
Port numbers	UDP Length	Unused CRC	Axiohm protocol Data

Host computer receives each frame (from the printer) using the following format:

MAC	aa1 : aa2 : aa3 : aa4 : aa5 : aa6	Source MAC Address (Host Computer)
MAC	bb1 : bb2 : bb3 : bb4 : bb5 : dip	Destination MAC Address (Printer #dip)
MAC	08 : 00	Frame Type : IP
IP	45 : 08	IP Info
IP	zz : zz	IP length
IP	nn : nn	Message Number
IP	40 : 00	No Fragmentation
IP	01	Do Not Route
IP	11	UDP Protocol
IP	00 : 00	Unused CRC
IP	ip0 : ip1 : ip2 : dip	Source IP Address (Printer #dip)
IP	ip0 : ip1 : ip2 : 80	Destination IP Address (Host Computer)
UDP	77 : 77 : 77 : 77	Port Numbers
UDP	yy : yy	UDP Length
UDP	00 : 00	Unused CRC
AP	UDP Data	AXIOHM Protocol Data
MAC	CRC : CRC : CRC : CRC	CRC (Checked by Ethernet Circuit)

Frame example:

00 00 1A 18 1F 7D	**02 00 C2 3F 14 00**	**08 00**	**45 08**	**00 68**	**00 00**
Source Mac address	Destination MAC address	IP Frame	IP Info.	IP length	Message number

40 00	**01**	**11**	**CC BE**	**C0 3F 14 80**	**C2 3F 14 00**
No fragmentation	Do not route	UDP protocol	Unused CRC	Source IP address	Destination IP address

77 77 77 77	**00 54**	**00 00**	**00 00 00 04 00 00 00 00 00 00 00 00 00 00 00 00**
Port numbers	UDP Length	Unused CRC	Axiohm protocol Data

31 31 31 31 31 31 31 31 31 31 30 31 30 30 30 43 FF 38 00 08 30 30	**49 5D F6 8E**
Axiohm protocol Data	CRC

For each format (sent or received), if a byte is written using lower case letters, it is “variable”, otherwise it is “constant”.

CRC IP:

The CRC is calculated on the header of the IP layer.

IP	45:08	IP Info
IP	zz:zz	IP Length
IP	nn:nn	Message number
IP	40:00	No fragmentation
IP	01:11	Do not route /UDP Protocol
IP	00:00	IP CRC
IP	ip0:ip1:ip2:80	Source IP Address
IP	ip0:ip1:ip2:dip	Destination IP Address

8 AP (AXIOHM Protocol)

8.1 Packet received by the printer (Command Packet)

This describes the UDP Data containing the coupon graphic description, or a command for the printer.
A data packet is containing a header (APH), and the command data.

Axiohm Protocol Header (APH): 12 bytes
Axiohm Command Data (ACD): max. 1456 bytes (26 graphics lines, 3.25 mm)
Maximum packet length: 12+1458 = 1468 bytes.
Bitmap data breadth = 56 bytes.
Heating time but on the prototype most variations, no finished.
Speed printer default value = 16.
Size of black mark 5*5 mm for Paper Jam.
Size of download file 64Ko.

8.2 Packet sent by the printer (Reply Packet)

This describes the UDP Data sent by the printer in answer to a command (status, ...).

Axiohm Protocol Header (APH): 12 bytes
Axiohm Reply Data (ARD): max. 1456 bytes (26 graphics lines, 3.25 mm)
Maximum packet length: 12+1458 = 1468 bytes.

8.3 APH Detail

XX : XX	Identification Message Number
CC : CC	Command Identification
CP1	Command Parameter
CP2	Command Parameter
...	
CP8	Command Parameter

The identification number is managed by the host, and helps synchronizing the frames. It is returned, by the printer, in the reply packet.

The number of parameters depends on the command: some commands need no parameters, others need one, ...

Example:

<CDB> Coupon Data Block
This command allows graphic data in the printer buffer.

Command Packet:

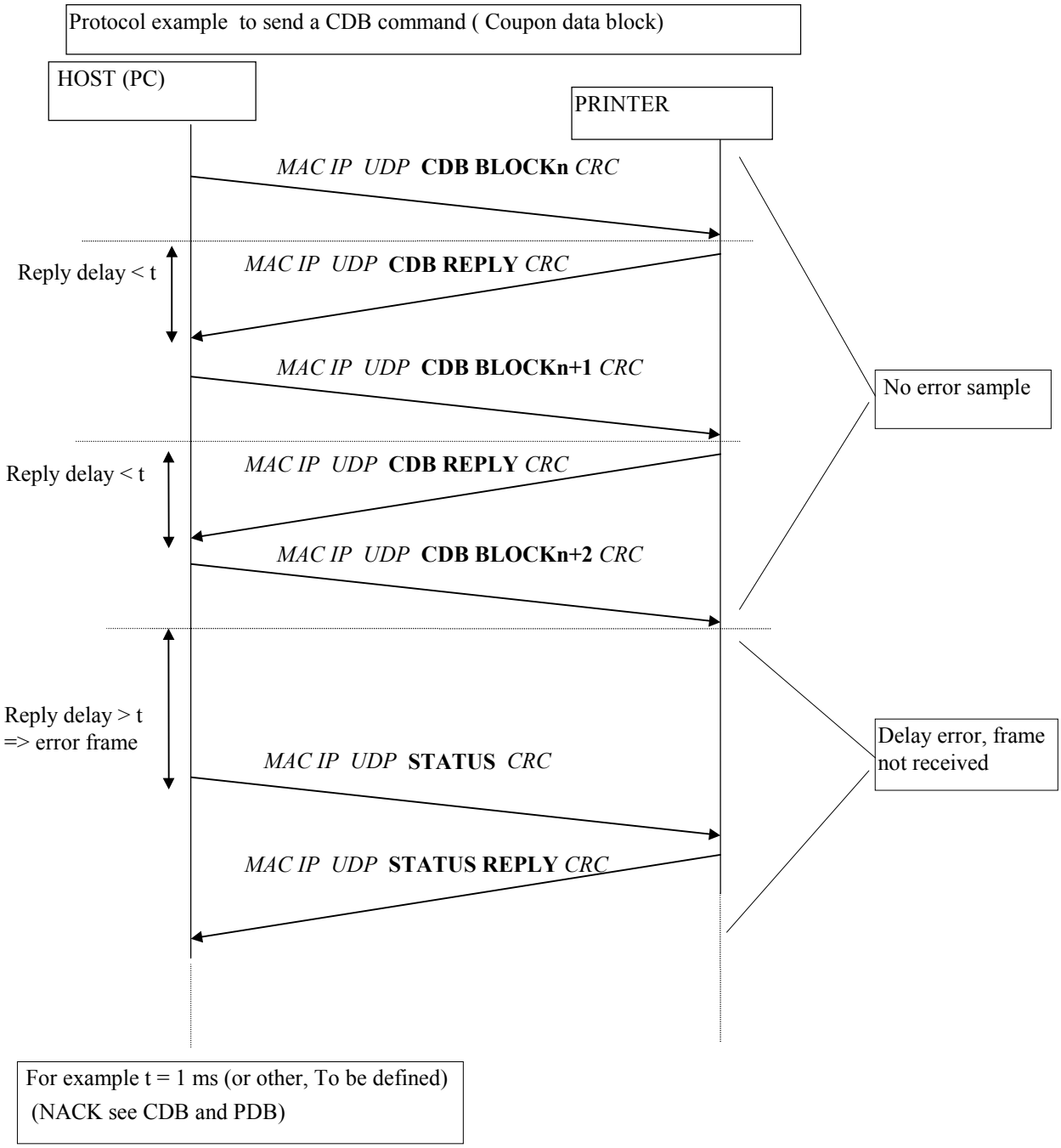
APH	im1 : im2	IMN
	00 : 01	Command Id
	pss	Paper Saving System
	jt	Jam Test
	cn	Coupon Number
	dbn	Data Block Number
	ntb	Number of Transmitted Block
	00 : 00 : 00	No other parameter
ACD	xx : xx : ..... : xx	

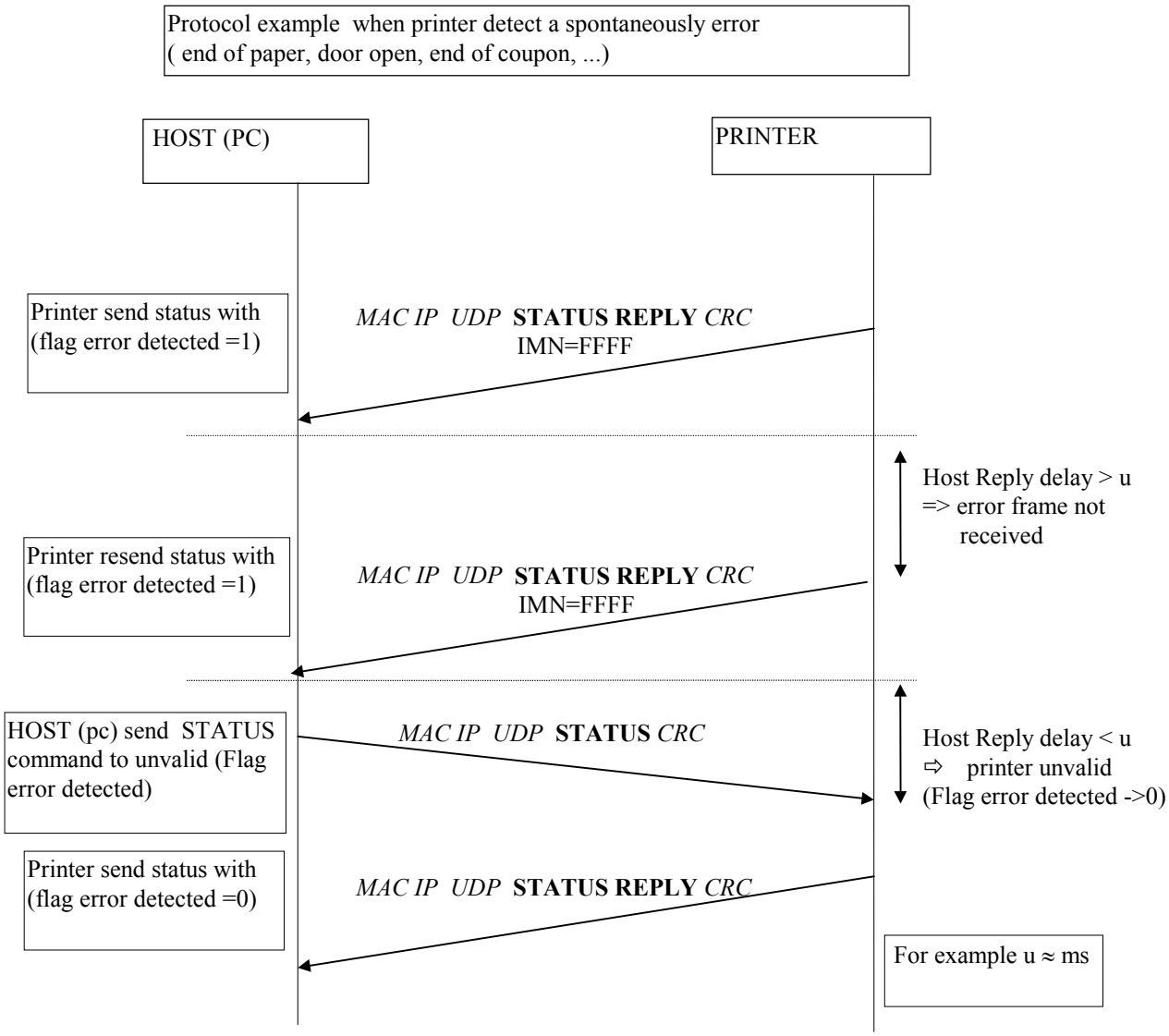
Reply Packet in case of no lost frame and correct ntb value:

APH	im1 : im2	IMN returned
	00 : 01	Command Id
	pss : jt : cn : dbn : ntb : 00 : 00 : 00	Parameters returned
ARD	ne	Network Error
	fe	Frame Error
	sf	Status Flag
	bfs	Buffer Free Space
	lrc	Last Received Coupon
	lrb	Last Received Block
	lpc	Last Printed Coupon
	lpb	Last Printed Block
	cip	Coupon in Progress
	bip	Block in Progress
	nntb	Next Number Transmitted Block (waited by printer)
	00	Word management

9 Data Exchange

The protocol being defined, the Data Exchange process between the host and one printer is described by the following diagram:




Protocol example when printer detect a spontaneously error
(end of paper, door open, end of coupon, ...)
HOST (PC)
PRINTER
Printer send status with
(flag error detected =1)
MAC IP UDP STATUS REPLY CRC
IMN=FFFF
Host Reply delay > u
=> error frame not
received
Printer resend status with
(flag error detected =1)
MAC IP UDP STATUS REPLY CRC
IMN=FFFF
HOST (pc) send STATUS
command to unvalid (Flag
error detected)
MAC IP UDP STATUS CRC
Host Reply delay < u
⇨ printer unvalid
(Flag error detected ->0)
Printer send status with
(flag error detected =0)
MAC IP UDP STATUS REPLY CRC
For example u ≈ ms

10 Coupon Printing Process

Here is the description of Coupon printing process.

- The host sends the coupon, divided into several graphic blocks, to the printer, using several <CDB> commands.
- The host sends the printing command (see PB and PDB).
- Then, the printer prints the coupon.
- While printing, the printer is able to receive other commands. If the data packet received while printing is big, the printer may reduce its speed, to manage the data incoming.

11 Control Codes description

11.1 Coupon Printing

The format of a Coupon Printing is Absolute binary modulo 56 bytes.

<CDB> Coupon Data Block

This command allows graphic data into the printer buffer.

Command Packet:

APH	im1 : im2	IMN
	00 : 01	Command Id
	pss	Paper Saving System
	jt	Jam Test
	cn	Coupon Number
	dbn	Data Block Number
	ntb	Number of Transmitted Block
	00 : 00 : 00	No other parameter
ACD	xx : xx : ..... : xx	Graphic Data

Reply Packet in case of no lost frame and correct ntb value:

APH	im1 : im2	IMN returned
	00 : 01	Command Id
	pss : jt : cn : dbn : ntb : 00 : 00 : 00	Parameters returned
ARD	ne	Network Error
	fe	Frame Error
	sf	Status Flag
	bfs	Buffer Free Space
	lrc	Last Received Coupon
	lrb	Last Received Block
	lpc	Last Printed Coupon
	lpb	Last Printed Block
	cip	Coupon in Progress
	bip	Block in Progress
	nntb	Next Number Transmitted Block (waited by printer)
	00	Word management

ACTION: block ntb captured by printer and nntb is incremented

Reply Packet in case of no lost frame and ntb value = (nntb - 1):

APH	im1 : im2	IMN returned
	00 : 01	Command Id
	pss : jt : cn : dbn : ntb : 00 : 00 : 00	Parameters returned
ARD	ne	Network Error
	fe	Frame Error
	sf	Status Flag
	bfs	Buffer Free Space
	lrc	Last Received Coupon
	lrb	Last Received Block
	lpc	Last Printed Coupon
	lpb	Last Printed Block
	cip	Coupon in Progress
	bip	Block in Progress
	nntb	Next Number Transmitted Block (waited by printer)
	00	Word management

ACTION: block ntb not captured by printer. nntb is not incremented. Flag frame error "fe" is incremented.

Reply Packet in case of : no lost frame, ntb ≠ nntb, ntb ≠ (nntb -1)

APH	im1 : im2	IMN returned
	7F : 01	Command Id + NACK Id (7F)
	pss : jt : cn : dbn : ntb : 00 : 00 : 00	Parameters returned
ARD	ne	Network Error
	fe	Frame Error
	sf	Status Flag
	lrc	Buffer Free Space
	lrb	Last Received Coupon
	lpc	Last Received Block
	lpb	Last Printed Coupon
	cip	Last Printed Block
	bip	Coupon in Progress
	nntb	Block in Progress
		Next Number Transmitted Block (waited by printer)
	00	Word management

ACTION: Flag frame error "fe" is incremented.

Reply Packet in case of lost frame:

APH	im1 : im2	IMN returned
	7F : 01	Command Id + NACK Id (7F)
	pss : jt : cn : dbn : ntb: 00 : 00 : 00	Parameters returned
ARD		No Data

ACTION: Network error "ne" is incremented.

Bytes presentation

Graphic data is N bytes, N is modulo 54 and N is 1458 max.
This N byte defines a graphic block.
A coupon is divided into graphic blocks.

Bytes:

- **im1** : **im2** : Identification Message Number
- **pss** : Paper Saving System (automatic paper return)
  pss = 00 : Paper Saving System disabled.
  pss = FF : Paper Saving System enabled.
- **jt** : Jam Test
  jt = 00 : Jam Test is disabled, during the graphic block printing.
  jt = FF : Jam Test enabled, the block must contain the black mark (to be implemented, more technical tests are required to specify the mark size).
  jt = 7F : Jam Test Enabled, the black mark is automatically added by the printer at the end of the block.
- **cn** : Coupon Number
- **dbn** : Data Block Number
- **sf** : Status Flag
  sf = FF : a printer error occurred (byte if, pof, cof, pjf or cjf has been set to FF, see <PS> command).
  sf = 00 : no printer error.

The following bytes are defined for the <PS> Printer Status command.

- **ne** : Network Error
- **fe** : Frame Error
- **bfs** : Buffer Free Space (number of blocks of 1458 bytes)
- **lrc** : Last Received Coupon Number
- **lrb** : Last Received Block Number
- **lpc** : Last Printed Coupon Number
- **lpb** : Last Printed Block Number
- **cip** : Coupon In Progress Number
- **bip** : Block In Progress Number
- **nntb** : Next Number Transmitted Block (waited by printer)

<PB> Print Buffer

This command prints the whole graphic data, which is in the buffer.

Command Packet:

APH	im1 : im2	IMN
	00 : 02	Command Id
	00 : 00 : 00 : 00 : 00 : 00 : 00 : 00	No parameter
ACD		No Data

Reply Packet:

APH	im1 : im2	IMN returned
	00 : 02	Command Id
	00 : 00 : 00 : 00 : 00 : 00 : 00 : 00	Parameters returned
ARD	ne	Network Error
	fe	Frame Error
	sf	Status Flag
	bfs	Buffer Free Space
	lrc	Last Received Coupon
	lrb	Last Received Block
	lpc	Last Printed Coupon
	lpb	Last Printed Block
	cip	Coupon in Progress
	bip	Block in Progress
	nntb	Next Number Transmitted Block (waited by printer)
	00	Word management

ACTION: Print captured blocks.

<PDB> Print Data Block

This command allows printing of a graphic data block into the printer buffer.
It is equivalent to : <CDB> + <PB>.

Command Packet:

APH	im1 : im2	IMN
	00 : 03	Command Id
	pss	Paper Saving System
	jt	Jam Test
	cn	Coupon Number
	dbn	Data Block Number
	ntb	Number of Transmitted Block
	00 : 00 : 00	No other parameter
ACD	xx : xx : ..... : xx	Graphic Data

Reply Packet in case of no lost frame and correct ntb value:

APH	im1 : im2	IMN returned
	00 : 03	Command Id
	pss : jt : cn : dbn : ntb : 00 : 00 : 00	Parameters returned
ARD	ne	Network Error
	fe	Frame Error
	sf	Status Flag
	bfs	Buffer Free Space
	lrc	Last Received Coupon
	lrb	Last Received Block
	lpc	Last Printed Coupon
	lpb	Last Printed Block
	cip	Coupon in Progress
	bip	Block in Progress
	nntb	Next Number Transmitted Block (waited by printer)
	00	Word management

ACTION: block ntb captured and printed and nntb is incremented

Reply Packet in case of no lost frame and ntb value = (nntb - 1) :

APH	im1 : im2	IMN returned
	00 : 03	Command Id
	pss : jt : cn : dbn : ntb : 00 : 00 : 00	Parameters returned
ARD	ne	Network Error
	fe	Frame Error
	sf	Status Flag
	bfs	Buffer Free Space
	lrc	Last Received Coupon
	lrb	Last Received Block
	lpc	Last Printed Coupon
	lpb	Last Printed Block
	cip	Coupon in Progress
	bip	Block in Progress
	nntb	Next Number Transmitted Block (waited by printer)
	00	Word management

ACTION: block ntb not captured.
nntb is not incremented.
Flag frame error "fe" is incremented.

Reply Packet in case of : no lost frame, ntb ≠ nntb, ntb ≠ (nntb -1)

APH	im1 : im2	IMN returned
	7F : 03	Command Id + NACK Id (7F)
	pss : jt : cn : dbn : ntb : 00 : 00 : 00	Parameters returned
ARD	ne	Network Error
	fe	Frame Error
	sf	Status Flag
	bfs	Buffer Free Space
	lrc	Last Received Coupon
	lrb	Last Received Block
	lpc	Last Printed Coupon
	lpb	Last Printed Block
	cip	Coupon in Progress
	bip	Block in Progress
	nntb	Next Number Transmitted Block (waited by printer)
	00	Word management

ACTION: Flag frame error "fe" is incremented.

Reply Packet in case of lost frame :

APH	im1 : im2	IMN returned
	7F : 03	Command Id + NACK Id (7F)
	pss : jt : cn : dbn : ntb : 00 : 00 : 00	Parameters returned
ARD		No Data

ACTION: Network error "ne" is incremented.

11.2 Printer Status

<PI> Printer Identification

This command is used to have the printer identification.

Command Packet:

APH	im1 : im2	IMN
	00 : 04	Command Id
	00 : 00 : 00 : 00 : 00 : 00 : 00 : 00	No parameter
ACD		No data

Reply Packet:

APH	im1 : im2	IMN returned
	00 : 04	Command Id
	00 : 00 : 00 : 00 : 00 : 00 : 00 : 00	Parameters returned
ARD	yy1 : yy2	Year
	ww1 : ww2	Week
	sn1 : sn2 : sn3 : sn4 : sn5 : sn6	Serial Number
	fr1 : fr2 : fr3 : fr4	Firmware Revision
	hr1 : hr2 : hr3 : hr4	Hardware Revision
	co	Cutter Option
	pb	Print head Bytes
	nfp1 : nfp2	Number of Flash Program
	pcdr1 : pcdr2	Pc Down Revision

Bytes presentation:

- **yy1** : **yy2** : Manufacturing Year (1997 -> yy1='9'=39h, yy2='7'=37h)
- **ww1** : **ww2** : Manufacturing Week (51 -> yy1='5'=35h, yy2='1'=31h)
- **sn1** : **...** : **sn6** : Serial Number (000001 -> 30h : 30h : 30h : 30h : 30h : 31h)
- **fr1** : ... : **fr4** : Firmware Revision (01.01 -> 30h : 31h : 30h : 31h)
- **hr1** : ... : **hr4** : Hardware Revision (02.01 -> 30h : 32h : 30h : 31h)
- **co** : Cutter Option
  co = 00 : cutter is present.
  co = FF : cutter is not present.
- **pb** : Print head Bytes (56 bytes -> 38h)
- **nfp1** : **nfp2** : Number of Flash Programming
- **pcdr1** : **pcdr2** : Pc down Revision flash memory (**See F**lash **P**c **D**own **P**arameter).

<PS> Printer Status

This command is used to have the printer status.

Command Packet:

APH	im1 : im2	IMN
	00 : 05	Command Id
	mpf	Mask Byte
	00 : 00 : 00 : 00 : 00 : 00 : 00	No other parameter
ACD		No data

Reply Packet:

APH	im1 : im2	IMN returned
	00 : 05	Command Id
	mpf : 00 : 00 : 00 : 00 : 00 : 00 : 00	Parameters returned
ARD	pf	Power Failure
	if	Initialization Flag
	pmf	Printing Mire Flag
	pof	Paper Out Flag
	cof	Cover Open Flag
	pjf	Paper Jam Flag
	cjf	Cutter Jam Flag
	bo	Buffer Overflow
	ne	Network Error
	fe	Frame Error
	sf	Status Flag
	bfs	Buffer Free Space
	lrc	Last Received Coupon
	lrb	Last Received Block
	lpc	Last Printed Coupon
	lpb	Last Printed Block
	cip	Coupon in Progress
	bip	Block in Progress

Bytes presentation:

- **mpf**

This mask is allows by the host to reset the power failure flag: **pf**.

- **pf** : Power Failure
  pf = FF : a printer power failure occurred. Must be reset by the host using the mask byte mpf.
  pf = 00 : no power failure occurred since last pf byte reset.
- **ne** : Network Error
  ne is incremented each time a network error occurs.
- **fe** : Frame Error
  fe is incremented each time a network error occurs.
- **bo** : Buffer Overflow
  bo is incremented each time a network error occurs.
- **if** : Initialization Flag
  if = FF : Initialization is in process (printing data received are not taken in account).
  if = 00 : Initialization is over.
- **pmf** : Printing Mire Flag
  pmf = FF : Printer printing Autotest or Pc down mire, buffer data receive busy.
  pmf = 00 : no valid off.
- **pof** : Paper Out Flag
  pof = FF : paper out, paper roll is empty.
  pof = 00 : paper is present.
- **cof** : Cover Open Flag
  cof = FF : printer cover is open.
  cof = 00 : printer cover is closed.
- **pjf** : Paper Jam Flag
  pjf = FF : paper jam.
  pjf = 00 : no paper jam.
- **cjf** : Cutter Jam Flag
  cjf = FF : cutter jam.
  cjf = 00 : no cutter jam.
- **bfs** : Buffer Free Space (number of blocks of 1458 bytes available for data storage)
- **lrc** : Last Received Coupon Number
- **lrb** : Last Received Block Number
- **lpc** : Last Printed Coupon Number
- **lpb** : Last Printed Block Number
- **cip** : Coupon In Progress Number
- **bip** : Block In Progress Number

Note: All the flags are set to 00 when a reset occur (Reset button, <CR> commands).
If the flag value is FF, the next value will be 00 (FF + 1)

When an error occurs (pof, cof, pjf, cjf, pmf), the printer goes into the Initialization mode :

- byte 'if' is set to FF,
- data buffer is voided,
- no data can be stored into the buffer,
- fsb has its maximum value,
- lrc, lrb, cip and bip are set to 00.
- nntb is set to 00

11.3 Reset Commands

<CR> Cold Reset

This command is used to reset the printer (same function as the reset button).
When a cold reset occurs, the printing process stops, the buffer is voided, the printer is initialized, IP and physical addresses are lost.

Command Packet:

APH	im1 : im2	IMN
	00 : 08	Command Id
	00 : 00 : 00 : 00 : 00 : 00 : 00 : 00	No parameter
ACD		No data

Reply Packet:

APH	im1 : im2	IMN returned
	00 : 08	Command Id
	00 : 00 : 00 : 00 : 00 : 00 : 00 : 00	Parameters returned
ARD		No data

<WR> Warm Reset

This command is used to reset a printer in a soft manner.
When a warm reset occurs, the printing process stops; the buffer is voided; the printer is initialized. However, IP and physical addresses are not lost.

Command Packet:

APH	im1 : im2	IMN
	00 : 09	Command Id
	00 : 00 : 00 : 00 : 00 : 00 : 00 : 00	No parameter
ACD		No data

Reply Packet:

APH	im1 : im2	IMN returned
	00 : 09	Command Id
	00 : 00 : 00 : 00 : 00 : 00 : 00 : 00	Parameters returned
ARD		No data

11.4 Buzz Commands

<BEO > Buzz End of Order

This command can be used as an information for the user.
It is available only when printer is OK (no flag error). Its action cannot be simultaneous to printing mode.
When warm or cold reset, or flag error occurs, the buffer is voided and the command is stopped.

Command Packet:

APH	im1 : im2	IMN
	00 : 0A	Command Id
	tbr	Time Buzz Regulation
	00 : 00 : 00 : 00 : 00 : 00 : 00	No parameter
ACD		No data

Reply Packet:

APH	im1 : im2	IMN returned
	00 : 0A	Command Id
	tbr : 00 : 00 : 00 : 00 : 00 : 00 : 00	Parameters returned
ARD		No data

Bytes:

- **tbr**: Time Buzz Regulation
  tbr = [1;255] ≅ [62 ms; 16s]
  Example: tbr = 25 gives a beep time of about 1.56 s

<MTB > Modify Buzz Timing

This command is used to modify beep time and frequency for each defined alert.

Command Packet:

APH	im1 : im2	IMN
	00 : 0B	Command Id
	00	Not used
	da	Define Alert
	hfton	High Frequency Time On
	hftoff	High Frequency Time Off
	tonm	Time On Msb "word"
	tonl	Time On Lsb
	toffm	Time Off Msb "word"
	toffl	Time Off Lsb
ACD		No data

Reply Packet:

APH	im1 : im2	IMN returned
	00 : 0B : 00	Command Id
	00 : da : hfton : hftoff : tonm : tonl : toffm : toffl	Parameters returned
ARD		No data

Default values for "da" are presented bellow. They are set at each printer initialization.

Alert type	da	hfton	hftoff	ton (word)	toff (word)
Cover Open	0	4	1	1500	15 000
Paper Jam	1	4	1	500	500
Paper Out	2	4	1	500	1000
Cutter Jam	3	4	1	500	1000 TBD
End of Order	4	4	1	250	250

hfton and hftoff range:

hfton or hftoff = [0 ; 255] gives about [42 µs ; 10.75 ms]

example: (hfton , hftoff) = (1, 1) gives a beep frequency of about 5.952 kHz
(hfton , hftoff) = (4 , 4) gives a beep frequency of about 2.380 kHz

ton and toff "word" range:

ton or toff = [0 ; 0xFFFF] gives about [420 µs ; 27.52 s]

example: (ton , toff) = (1500, 15 000) gives about (630 ms, 6.3 s)

11.5 Other Commands

<AT> Auto Test

This command is used to print an auto test coupon.

Command Packet:

APH	im1 : im2	IMN
	00 : 06	Command Id
	00 : 00 : 00 : 00 : 00 : 00 : 00 : 00	No parameter
ACD		No data

Reply Packet:

APH	im1 : im2	IMN returned
	00 : 06	Command Id
	00 : 00 : 00 : 00 : 00 : 00 : 00 : 00	Parameters returned
ARD		No data

<HTT> Heating Time Tuning

This command is used to tune the heating time on the printer, i.e. the printing quality. It allows the heating time to vary from -30% to +10%, based on the standard value.

Command Packet:

APH	im1 : im2	IMN
	00 : 07	Command Id
	htp	Heating Time Percent
	00 : 00 : 00 : 00 : 00 : 00 : 00	No other parameter
ACD		No data

Reply Packet:

APH	im1 : im2	IMN IMN returned
	00 : 07	Command Id
	htp htp : 00 : 00 : 00 : 00 : 00 : 00 : 00	Parameters returned
ARD		No data

Bytes:

- **htp** : Heating Time Percent
  htp byte represents the value in percent for heating time variation.

  Examples:
  htp = E2 for -30 %.
  htp = 0A for +10 %.
  htp = F6 for -10 %.

<OPS> Order for Printing Speed

This command allows the user to control and modify the printing speed.

Command Packet:

APH	im1 : im2	IMN
	00 : 0C	Command Id
	SO	Speed Order
	00 : 00 : 00 : 00 : 00 : 00 : 00	No parameter
ACD		No data

Reply Packet:

APH	im1 : im2	IMN returned
	00 : 0C	Command Id
	SO	Speed Order
	00 : 00 : 00 : 00 : 00 : 00 : 00	Parameters returned
ARD		No data

DESCRIPTION:

- Value for SO (« Only for information »):

0 → limit about 17mm/s max
1 → limit about 17mm/s max
2 → limit about 41mm/s max
3 → limit about 41mm/s max
4 → limit about 54mm/s max
5 → limit about 69mm/s max
6 → limit about 71mm/s max
7 → limit about 73mm/s max
8 → limit about 70mm/s max
9 → limit about 78mm/s max
10 → limit about 80mm/s max
11 → limit about 84mm/s max
12 → limit about 87mm/s max
13 → limit about 94mm/s max
14 → limit about 96mm/s max
15 → limit about 100mm/s max
16 → limit about 104mm/s max. default value printer initialization for version 2.xx
17 → limit about 108mm/s max

- COLD RESET no modification value of SO.

11.6 Flash Commands

< FDM> Flash Download Mode

This command allows access to the download mode of the flash.

Command Packet:

APH	im1 : im2	IMN
	FF : 00	Command ID
	‘ F’ :’L’ : ‘A’ : ‘S’ : ‘H’ : 20 : ‘I’ : ‘N’	Protection parameter
ACD		No data

Command Reply:

APH	im1 : im2	IMN returned
	FF : 00	Command ID
	‘ F’ :’L’ : ‘A’ : ‘S’ : ‘H’ : 20 : ‘I’ : ‘N’	Parameter returned
ARD		No data

Description:

Printer is stopped, data are lost «equivalent to warm reset».
Access to control code is limited ARP,RESET HARD, RESET SOFT.
If loading error is also used as flash mode RESET.

<GPF> Go Program Flash

This command allows the user to enter in Flash programming mode. All the follow instructions will be destined to the Flash.

Command Packet:

APH	im1 : im2	IMN
	FF : 03	Command ID
	‘ F’ :’L’ : ‘A’ : ‘S’ : ‘H’ : 20 : ‘G’ : ‘O’	Protection parameter
ACD		No data

Command Reply:

APH	im1 : im2	IMN
	FF : 03	Command ID
	‘ F’ :’L’ : ‘A’ : ‘S’ : ‘H’ : 20 : ‘G’ : ‘O’	Protection parameter
ARD		

Comments:

Code executed when sd1: sdo = 00 7F
After this code Ethernet link is cut.
At end of programming printer gets reset.
When sdo ≠ 00 7F GPF is not executed,
Command reply is APH Im1 Im2 FF 03 "E""R""R""O""R" 20 "G""O"

<FDD> Flash Data Download

The Flash Data Downloaded command allows downloading of data in the flash.

Command Packet:

APH	im1 : im2	IMN
	FF : 01	Command ID
	Type	Customer = 00
	Ntb	Number transmit block
	00 : 00 : 00 : 00 : 00 : 00	No parameter
ACD		«Data format 1Kbyte only» Program data

Command Reply:

APH	im1 : im2	IMN
	FF : 01	Command ID
	Type	Customer = 00
	Ntb	Number transmit block
	00 : 00 : 00 : 00 : 00 : 00	No parameter
ARD		

Bytes:

Ntb: This parameter corresponds to the number of block the machine will receive.

<FSD> Flash Status Download

The Flash Status Downloaded command allows seeing the status of the flash.

Command Packet:

APH	im1 : im2	IMN
	FF : 02	Command ID
	00 : 00 : 00 : 00 : 00 : 00 : 00 : 00	No parameter
ACD		No data

Command Reply:

APH	im1 : im2	IMN
	FF : 02	Command ID
	00 : 00 : 00 : 00 : 00 : 00 : 00 : 00	No parameter
ARD	lnrb	Last Number Received Block
	nntb	Next Number Wait Transmit Block
	sd1 : sdo	Status Download Operation
	niph0 : niph1 : niph2 : 080h	Ip Address host
	npap1 : npap2 : npap3 : npap4 : npap 5 : dip	Physical Address Printer
	nipp0: nipp1 : nipp2 : dip	Ip address printer

Comments:

sd1 : sdo	Received ON	=	0000
	Verify	=	0001
	Error	=	00FF = > Reset to reload = > FDM
	Receive OFF	=	007F (ready for programming)=> GPF
	Non compatible boot error	=	00AA

Bytes:

niph0: niph1 : niph2 : 080h	Value printer
npap1: npap2 : npap3 : npap4 : npap5	Value printer
nipp0: nipp1 : nipp2	Value printer

< FPDP > Flash PC Down Parameters

This command allows the configuration of the Flash PC Down Parameter. A PC Down message occurs when the machine doesn't receive a command for a certain time. This time is set by the parameter ***pt*** for ***P***rinted ***T***ime.

Command Packet:

APH	im1 : im2	IMN
	FF : 07	Command ID
	pcdr1 : pcdr2	Pc Down Revision
	pt	Printed Time
	mws	Mire Width Size (words modulo)
	mhs1 : mhs1	Mire height Size
	mc1 : mc2	Mire checksum
ACD		No data

Command Reply:

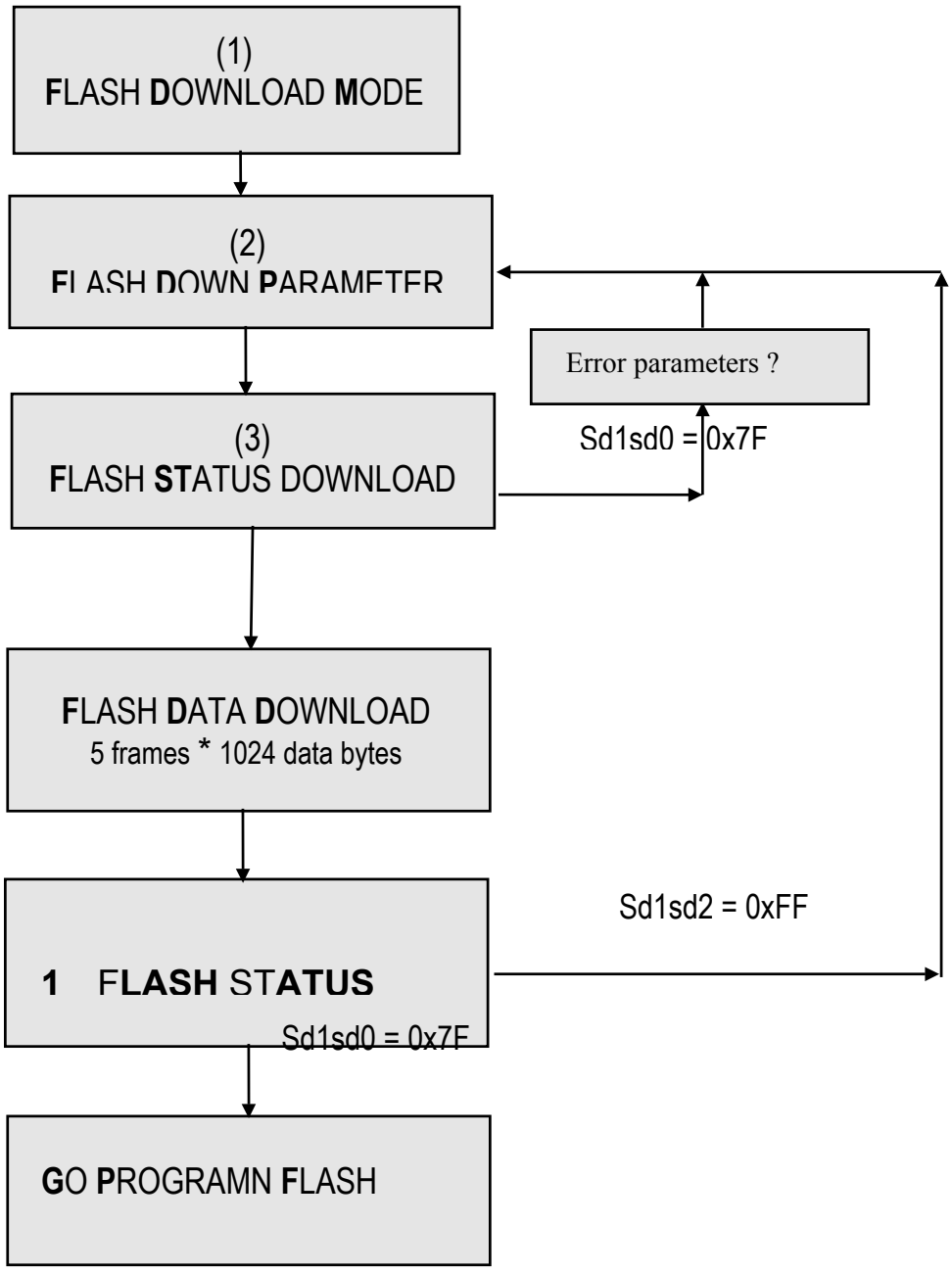
APH	im1 : im2	IMN
	FF : 07	Command ID
	pcdr1 : pcdr2	Pc Down Revision
	pt	Printed Time
	mws	Mire Width Size (words modulo)
	mhs1 : mhs1	Mire height Size
	mc1 : mc2	Mire checksum
ACD		No data

Bytes:

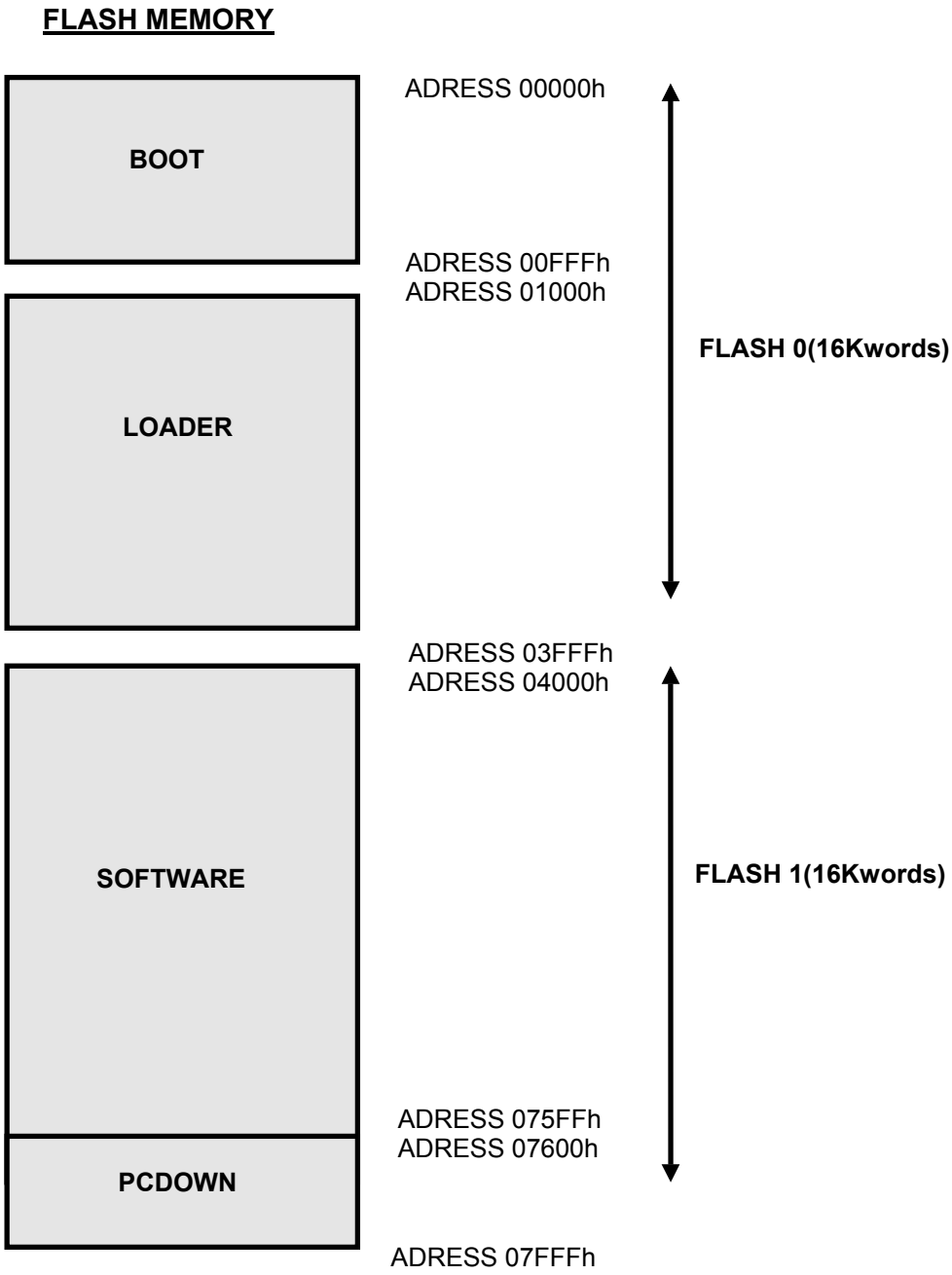
pcdr1 : **pcdr2** :	Pc Down Revision (in ASCII 0.1 → 30.31) Character ASCII available = [0,...,9] or [A,.... , Z] (capital Letter) Default value = 0x0FFFF
pt :	Printed Time → unit interval about 1 minute Value = [1 ;255] ~ [1 minutes ; 4 hours 25]
mws :	Mire Width Size modulo 16 Available Value(*) = [1 ; 14] = [16dots ; 224dots]
mhs1 : **mhs2** :	Mire Height Size Available Value (*) = [1 ;450] = [0.125 mm; 56mm]
mc1 : **mc2** :	Mire Checksum Use Crc_rfc1071 for calculation on Pc down data mire

(*) Mire size max 5 Kbytes:
- Width =14 (224 dots) → Height =182 max. (22.75mm)
- Width = 8 (128 dots) → Height = 320max. (40.00mm)
- Width = 1 (16 dots) → Height = 450 max. (56.00mm)

- **Download Pc down frame**:



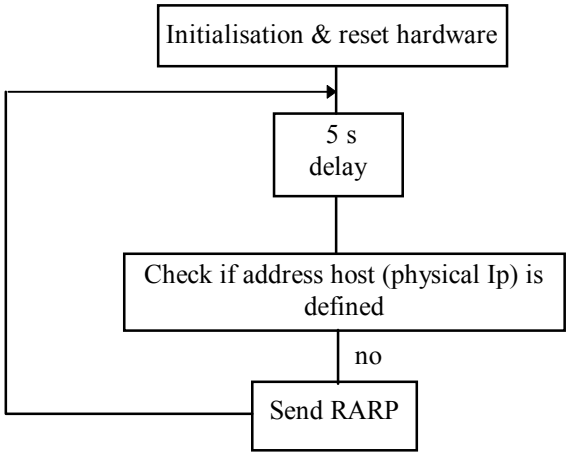
12 FLASH MEMORY ORGANISATION



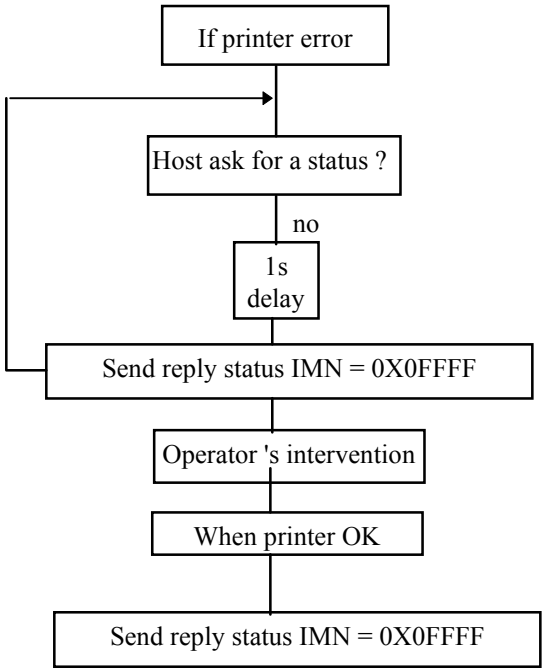
13 AUTOMATIC REQUEST PROCESS

Here are processes executed by the RARP Frame, the "normal" process and the Error Process.

RARP

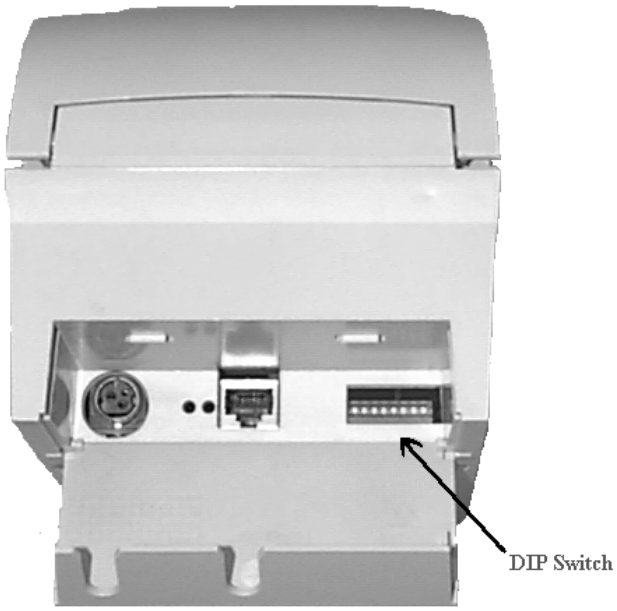


When an ERROR occurs



14 Dip SWITCH SETTING

This is the description of the DIPswitch configuration.



Dip Switch configuration:

	1	2	3	4	5	6	7	8
Binary value = 1	H	H	H	H	H	H	H	Reset hard No valid
	L	L	L	L	L	L	L	Reset hard valid
	==========							BOARD

Dip 1 (Lsb) to 7 (Msb) set Printer address.

exp: all H address dip printer = 0x07F ; all L address = 0

Dip 8 authorizes hard reset for the printer user (with the front printer button, hardware setting).

15 INDEX

P

R

S

T

U

W