Manual for RS232 and parallel links

imaje 9040

imaje 9040 S

imaje 9040 IP65

imaje 9040 Contrast

Small character ink-jet printing

imaje

A DOVER COMPANY

Contents

Contents

Contents

Contents

General

General

■ Introduction

This manual concerns 9040, 9040 IP65, 9040 Contrast and 9040 S printers which have an asynchronous, half duplex serial interface connected to a computer in V24 voltage level mode.

The RS232C (or V24) standard describes the signals available during dialog between a DTE (Data Terminal Equipment) and a DCE (Data Communication Equipment).

No more than 7 signals are used to connect to a printer.

NOTE	*The printer should be considered as a DTE.*

IMPORTANT	*Avoid making any modifications using the printer keyboard during a V24 dialog (risk of conflict).* *It is also recommended that 9040, 9040 IP65, 9040 Contrast and 9040 S printers be left in "main menu" mode during V24 dialog.*

■ Description of signals used

Reference (GND)

Common ground between computer and printer.

DSR (Data Set Ready) voltage level transmission

This is an input to the printer. This signal enables the printer's V24 mode.

A symbol is displayed on the printer display when the DSR signal is active. 
(in lower left corner of display window).

DTR (Data Terminal Ready) voltage level transmission

This is an output from the printer. This signal is active as soon as the printer is ready to dialog.

TXD (Transmit Data) voltage level transmission

This is an output from the printer. Data transmitted.

RXD (Receive Data) voltage level transmission

This is an input to the printer. Data received.

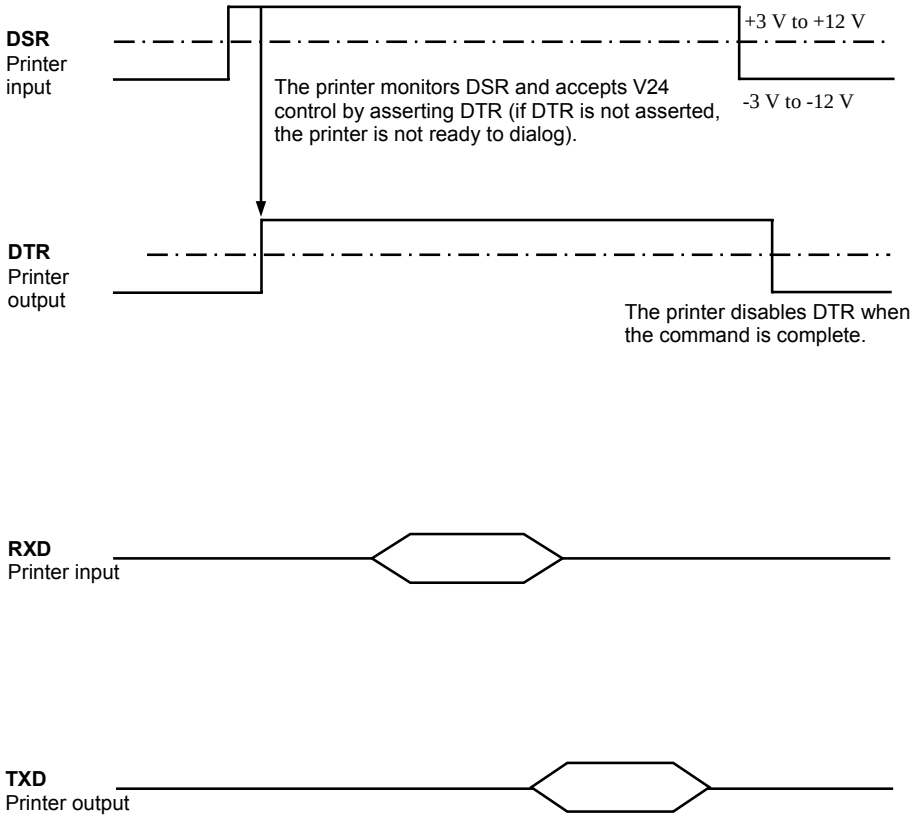
■ Electrical specifications

The electrical specifications are defined by the V24 RS232C standard.

The input control signals (DSR, RXD) are active when their voltage level is between +3 V and +12 V and inactive between -3 V and -12 V.

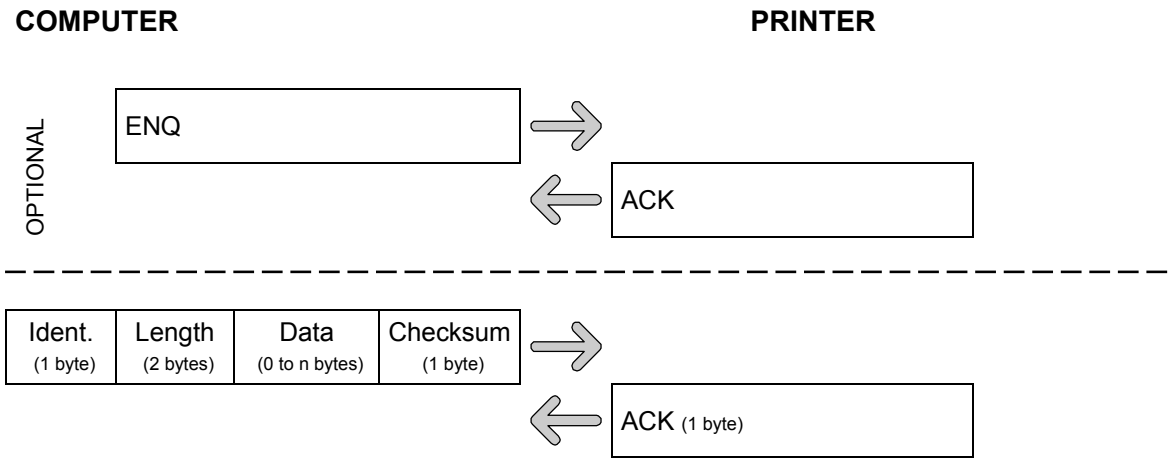
The output control signals (DTR, TXD) are active with a voltage of 9 V and inactive with a voltage of -9 V.

■ Timing diagram

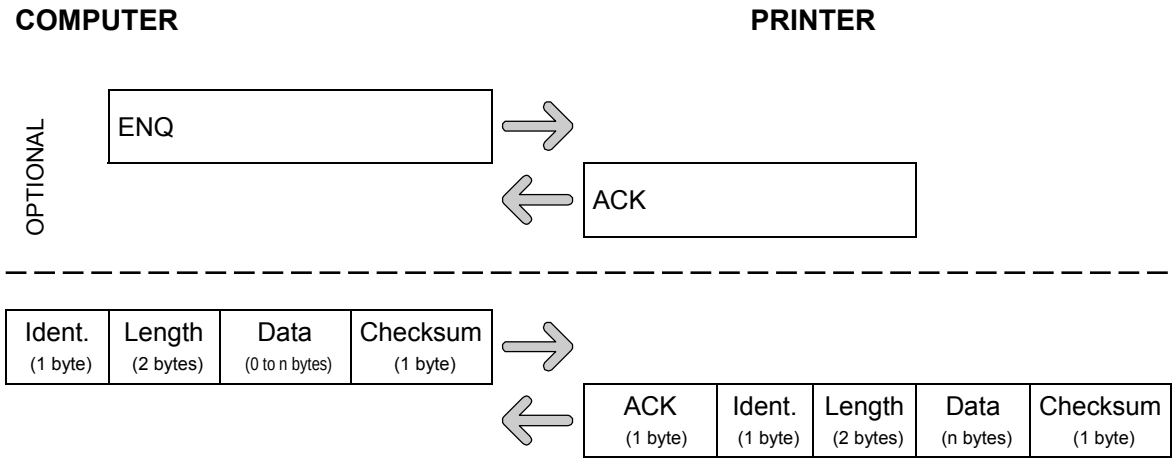


■ General principle of dialog

Data sent from computer to printer



Data requested by computer from printer



NOTE	*All data coded in several bytes must be transmitted with the high order byte first.* *All bytes must be transmitted with the low order bit first.*

General

Identifier (1 hexadecimal byte)

Specific to each command.

Length (2 hexadecimal bytes)

The length is a hexadecimal value representing the number of bytes present after the two length bytes and not including the check byte (Checksum).

Data

Zero bytes for a general request from the computer to the printer.

1 byte specifying the jet number for a request concerning a jet.

n bytes starting with a byte specifying the jet number for a transmission concerning a jet.

n bytes (without specifying the jet number) for a transmission concerning the printer in general.

Check byte (Checksum)

This corresponds to an exclusive OR of all preceding bytes (identifier, length and data bytes).

Truth table for the "exclusive OR" function used for the checksum.

X	Y	Result
0	0	0
0	1	1
1	0	1
1	1	0

Example of checksum calculation for 2 bytes:

- Value: 15 h, or binary 00010101
- Value: 56 h, or binary 01010110

Result 01000011

or in hexadecimal = 43 h

Reminder

Binary, decimal, hexadecimal conversion.

Decimal	Binary	Hexadecimal
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F

7	6	5	4	3	2	1	0
0	0	1	1	1	0	1	0

3 A **i.e. 3Ah**

A byte (8 bits) corresponds to two hexadecimal digits.

The symbol "h" signifies hexadecimal notation.

The ASCII standard associates an alpha-numeric symbol with each byte.

■ Hardware configuration

Presentation of the industrial interface board terminal block

To access the industrial interface board, open the top of the cabinet, pass the connecting cable through one of the cable glands and connect the wires to the appropriate terminal block.

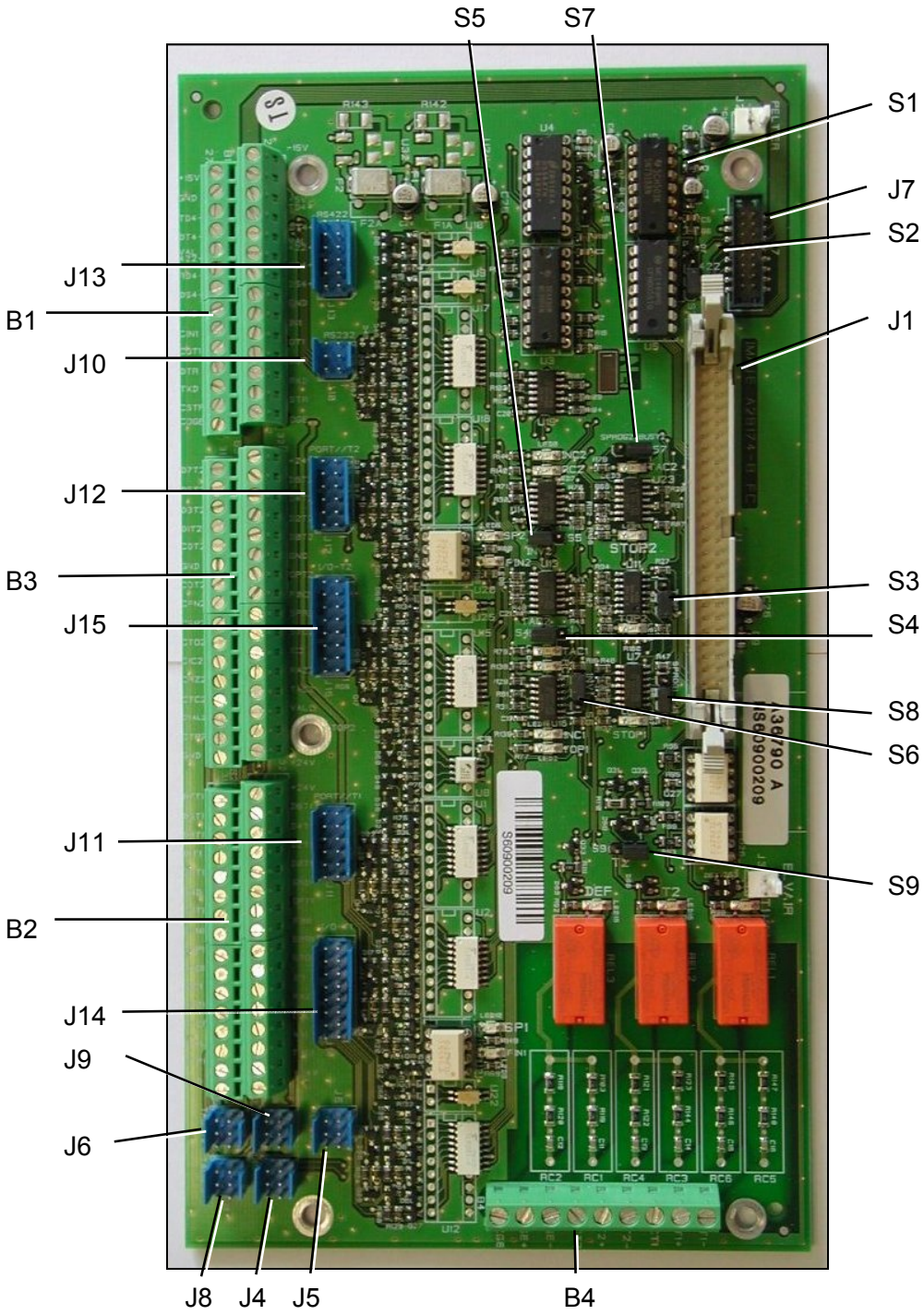
NOTE *The shield of the connection cable used must be connected to the edge of the metal cable clamp on the printer and should never be connected to the printer. The same type of connection must be used on the computer.*

Terminal block B1: Communication

Terminal	Connector HE14	Marked	Signal	I/O	Comments
B1-5	J10-3	TXD	TXDEXT	S	TX RS232
B1-6	J10-4	RXD	RXDEXT	E	RX RS232
B1-7	J10-2	DTR	DTREXT	S	DTR RS232
B1-8	J10-1	DSR	DSREXT	E	DSR RS232
B1-24	J13-10	TD4+	TXD422+	S	TX RS422 +
B1-23	J13-9	TD4-	TXD422-	S	TX RS422 -
B1-18	J13-4	RD4+	RXD422+	E	RX RS422 +
B1-17	J13-3	RD4-	RXD422-	E	RX RS422 -
B1-22	J13-8	DT4+	DTR422+	S	DTR RS422 +
B1-21	J13-7	DT4-	DTR422-	S	DTR RS422 -
B1-16	J13-2	DS4+	DSR422+	E	DSR RS422 +
B1-15	J13-1	DS4-	DSR422-	E	DSR RS422 -
B1-20		VAL422+	VALID422+	E	Enable RS422
B1-19		VAL422-	VALID422-	E	Enable RS422
B1-10		OT1	OUT1	S	Not use borne positive
B1-9		COT1	COMOUT1	S	Not use borne negative
B1-12		IN1	IN1	E	Not use borne positive
B1-11		CIN1	COMIN1	E	Not use borne negative
B1-13/14/25		GND	GND		
B1-26		+5V	+5V	S	
B1-27		+15V	+15V	S	
B1-28		-15V	-15V	S	

IMPORTANT: The +5 V, +15 V and -15 V outputs are not fuse protected, and they must be used with caution.

Industrial interface board



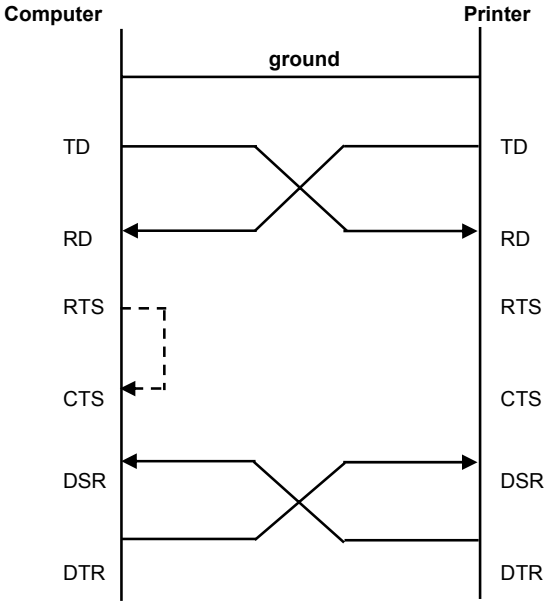
Jumper positions

The jumpers located on the industrial interface board are used to configure the serial link.

Standard positions	NAME	MARKED	POSITION	FUNCTION/COMMENTS
1	S1- 1	VAL	VAL	Point-to-point RS422 link (only one printer on the link).
3	S1- 3	VAL	not VAL	Multipoint RS422 link (printer selected with VALID422).
1	S2- 1	RXD	232	RS232 mode selected for serial link.
3	S2- 3	RXD	422	RS422 mode selected for serial link.
3	S3- 3	TOP2	TOP2	DTOPIMP2 signal taken from DTOP2 optocoupled input.
1	S3- 1	TOP2	not TOP2	DTOPIMP2 signal taken from DTOP1 input (for dual head operation with only one DTOP cell).
3	S4- 3	TAC2	TAC2	TACHYIMP2 signal taken from TACHY2 optocoupled input.
1	S4- 1	TAC2	not TAC2	TACHYIMP2 signal taken from TACHY1 input (for dual head operation with only one tacho).
3	S5- 3	INV2	INV2	DTOPIMP2 signal inverted.
1	S5- 1	INV2	Not INV2	DTOPIMP2 signal not inverted.
3	S6- 3	INV1		DTOPIMP1 signal inverted.
1	S6- 1	INV1	Not INV1	DTOPIMP1 signal not inverted.
3	S7- 3	SPROG2	SPROG2	SPROGI2 signal operates as SPROG.
1	S7- 1	BUSY2	BUSY2	SPROGI2 signal operates as BUSY.
3	S8- 3	SPROG1	SPROG1	SPROGI1 signal operates as SPROG.
1	S8- 1	BUSY1	BUSY1	SPROGI1 signal operates as BUSY.
3	S9- 3	T2	T2	24V alarm on J5 operates with 2 heads
1	S9- 1	T2	Not T2	24V alarm on J5 operates with one head

Recommended connection diagram

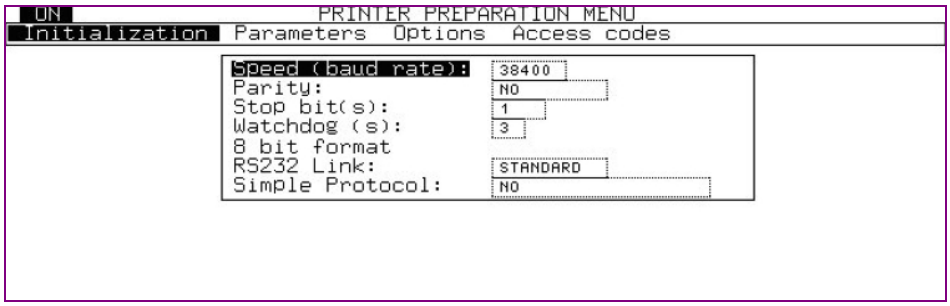
WIRING DIAGRAM



■ Programming the printer

The transmission speed, format and watchdog value can be programmed in the **PRINTER PREPARATION, Initialization, RS232 link** menu.

The following dialog box is displayed.



The following parameters may be set:

□ Transmission speed (in baud): 9600 - 19200 - 38400 or 115200.

□ Parity: none, even, or odd.

□ Number of stop bits 1 or 2.

□ Watchdog value (in seconds): 1 to 99.

□ Fixed format, 8 bits: (not adjustable).

□ RS232 link Direct, Standard or Test.

□ Simple protocol: None, Message selection, or External Variables.

IMPORTANT	*Using the printer keyboard during V24 exchanges may slow transmission or cause conflicts. It is highly recommend to lock out access to the keyboard during the communication process using the V24 commands provided.*

■ RS232 link

□ **Direct:**

The operator interface sends V24 commands to the CPU without processing them.

This is the quickest mode of operation.

In the PRODUCTION menu:

. The current message is not displayed.

. Message names are replaced by asterisks (*).

. The PC interface is not updated.

Any menu open is automatically closed when a message is received.

□ **Standard:**

The operator interface takes into account V24 commands on their way to the CPU. The processing time is at least 80 ms.

In the PRODUCTION menu:

. Pressing 1 or 2 displays the current message on head 1 or 2.

. The message name varies to match the current message.

□ **Test:**

This mode of operation is not recommended for applications where the message changes regularly.

Processing time to display message (3 to 10 s).

In the PRODUCTION menu:

. All messages sent or selected by V24 are automatically displayed.

. The message name also changes to match the external selection.

■ Simple protocol

□ **None:**

Only the conventional protocol is used for external communication (identifier - length - data - check byte).

□ **Message selection:**

In addition to the conventional protocol, the name of a message may be transmitted in a simplified protocol to select it for printing.

Format: STX (02h) / Message name (maximum 8 characters) / ETX (03h).

. This command only addresses head 1 of the printer.

. It should preferably be used without a library.

. Messages may be selected from all those stored in the interface.

□ **External variables:**

In addition to the conventional protocol, the contents of external variables may be transmitted in a simplified protocol to update the message printed.

Format: STX (02h) / Variable1, Variable 2, … (in ASCII) / ETX (03h).

. This command only addresses head 1 of the printer.

. The number of characters sent must be equal to the total number of characters reserved in all external fields in the message.

. Variable values are sent in turn, in the order of their respective fields in the message to be printed, from jet 1 to jet n.

. If an external variable is declared in a barcode with plain text transcription, the frame value must be sent together with the plain text value. In this case the variable is sent twice, at the reserved locations.

Example: STX (02h) / Variable 1, Variable 1 / ETX (03h).

CAUTION: APPLIES TO EXTERNAL VARIABLES

he update affects all jets for the current message, on head 1 only. The message must be selected manually on the operator interface, not by external communication.The maximum size of variables is 1022 characters. No checks are made on variable values. Users must ensure that the content is consistent with the fields reserved in the message to be printed.If the list of variables is incomplete or empty, it is completed with spaces.If the list is too long it is truncated.

Lists of identifiers

Lists of identifiers

■ General list of V24 commands

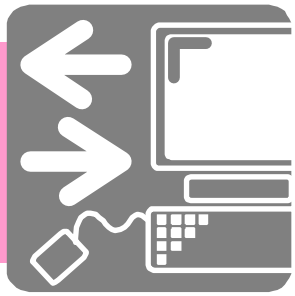
Identifier	Description of command
05h	V24 dialog request
0Fh	Permit menu modification by keyboard if DSR active
20h	Request printer parameters
30h	Printer shutdown / start-up
31h	Transmit jet status / Maintenance
32h	Request jet status / Maintenance
33h	Request jet speed and phase
35h	Request IC solenoid valve, Fluid levels and viscosity meter condition
36h	Transmit printer initialization
37h	Request CRCs of printer PROMs
39h	Request current counters
3Ah	Reset counters
3Bh	Request printer faults
3Ch	Reset faults
3Eh	Transmit keyboard code
3Fh	Transmit security code
41h	Transmit print acknowledgement request
43h	Request complete current message
45h	Request keyboard code
4Dh	Request status for Contrast
50h	Upload files to Master, IP65, Contrast
51h	Transmit current counter value
52h	Request tables of months and time codes
53h	Transmit tables of months and time codes
56h	Request PPP printing counter
57h	Transmit non-library message (complete, parameters or text)
58h	Transmit library message (complete, parameters or text)
59h	Transmit partial message
5Ah	Transmit message number to print
5Bh	Transmit external variables
94h	Manual printing / Order printing
C8h	Initialize autodating
D6h	Request autodating
DEh	Request for an autodating table
DFh	Transmit autodating table

■ List of transmissions to printer

Description of command	Identifier
PRINTER	
Printer shutdown / start-up	30h
Reset faults	3Ch
Transmit keyboard code	3Eh
Transmit security code	3Fh
Permit menu modification by keyboard if DSR active	0Fh
Transmit print acknowledgement request	41h
Transmit printer initialization	36h
Upload files to Master, IP65, Contrast	50h
HEAD	
Transmit jet status / Maintenance	31h
MESSAGE	
Transmit message number to print	5Ah
Transmit external variables	5Bh
Transmit non-library message (complete, parameters or text)	57h
Transmit library message (complete, parameters or text)	58h
Transmit partial message	59h
VARIABLES	
Transmit current counter value	51h
Reset counters	3Ah
Transmit tables of months and time codes	53h
Initialize autodating	C8h
Transmit autodating table	DFh

■ List of requests to printer

Description of command	Identifier
PRINTER	
V24 dialog request	05h
Request keyboard code	45h
Request printer parameters	20h
Request IC solenoid valve, Fluid levels and viscosity meter condition	35h
Request CRCs of printer PROMs	37h
Request printer faults	3Bh
Request status for Contrast Printer	4Dh
HEAD	
Request jet status / Maintenance	32h
Request jet speed and phase	33h
MESSAGE	
Request complete current message	43h
Manual printing / Order printing	94h
VARIABLES	
Request current counters	39h
Request PPP printing counter	56h
Request autodating	D6h
Request for an autodating table	DEh
Request tables of months and time codes	52h



Transmissions to printer

Transmissions to printer

Transmissions to printer

■ Transmissions regarding the printer

Printer shutdown / start-up

COMPUTER **PRINTER**

Identifier	30h
Length	00h, 01h
Data	00h, 01h ou FFh
Checksum	xxh

06h	ACK

or

15h	NACK

00h : long shutdown

01h :short shutdown

FFh : start-up

Transmissions to printer

Reset faults

COMPUTER **PRINTER**

Identifier	3Ch
Length	00h, 00h
Checksum	3Ch

06h	ACK

or

15h	NACK

Transmit keyboard code

COMPUTER **PRINTER**

Identifier	3Eh
Length	00h, 03h
Code 1 (1 ASCII)	Between 20h and 60h
Code 2 (1 ASCII)	Between 20h and 60h
Code 3 (1 ASCII)	Between 20h and 60h
Checksum	xxh

06h	ACK

or

15h	NACK

The keyboard code is a sequence of 3 alphanumeric ASCII characters between 20h and 60h inclusive.

To clear the keyboard locking code, simply send the sequence: 20h/20h/20h,

Transmit security code

This code protects V24 messages. It may be initialized or modified but not displayed. The computer must know the security code to send other instruction sequences.

COMPUTER **PRINTER**

Identifier	3Fh
Length	00h, 03h
Code 1 (1 ASCII)	xxh
Code 2 (1 ASCII)	xxh
Code 3 (1 ASCII)	xxh
Checksum	xxh

06h	ACK

or

15h	NACK

The security code is a sequence of 3 alphanumeric ASCII characters between 20h and 60h inclusive.

If the printer replies NACK, the security code is incorrect.

NOTE *If the security code is sent to the printer as the last command when last used, it must also be sent as the first sequence of each exchange.*

REMINDER *After the CPU board memory is reset, the printer automatically sets the security code "TWO".*

Permit menu modification by keyboard if DSR active

COMPUTER **PRINTER**

Identifier	0Fh
Length	00h, 01h
Keyboard ON/OFF	00h or FFh
Checksum	xxh

Keyboard prohibited (default value after reset)
Keyboard authorized

06h	ACK

or

15h	NACK

REMINDER *Avoid making any modifications using the printer keyboard during a V24 dialog (risk of conflict).*
It is also recommended that Master, IP65 and Contrast printers be left in "main menu" mode during V24 dialog.

Transmit print acknowledgement request

COMPUTER **PRINTER**

Identifier		41h
Length		00h, 02h
Data	Jet number	xxh
	Print acknowledgement	xxh
Checksum		xxh

06h	ACK

or

15h	NACK

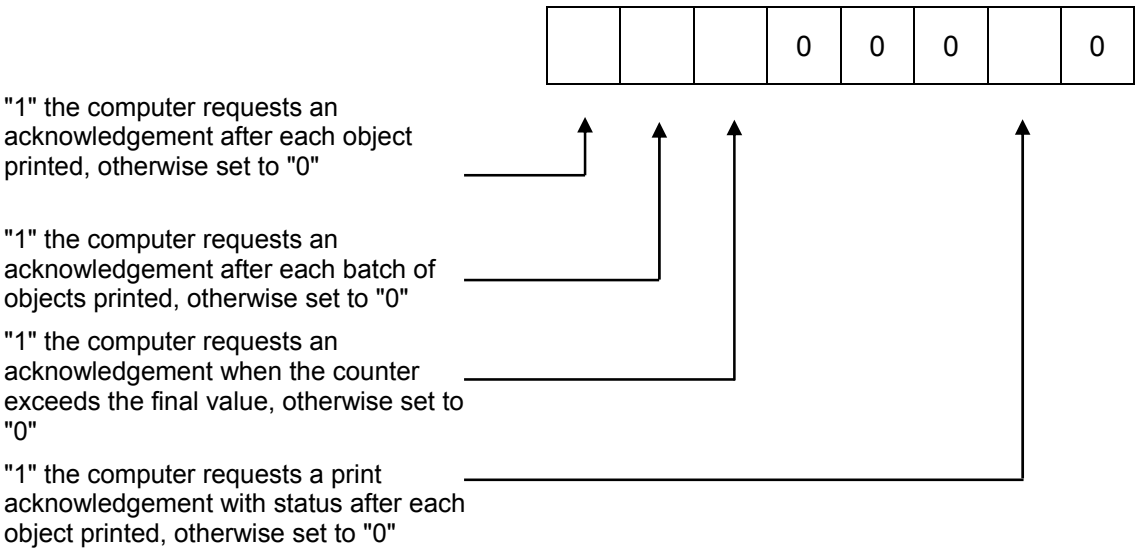
IMPORTANT *The print acknowledgement request must be sent to all jets on a given head.*

Detail of data

□ Detail of "Jet number" byte

Printer	Head	Jet	Jet number
1.1	1	1	01h
1.2	1	1	01h
		2	02h
2.1	1	1	01h
	2	3	03h
2.2	1	1	01h
		2	02h
	2	3	03h
		4	04h

□ Detail of the "Print acknowledgement" byte



NOTE *All these modes are exclusives.*

Transmissions to printer

■ Print acknowledgement

COMPUTER **PRINTER**

xxh	Print acknowledgement

□ Detail of the print acknowledgement

Head 1	Head 2	
E5h	E6h	After each object
E9h	EAh	After each batch
F1h	F2h	After each final counter value
E1h	E2h	When DTOP is received if printing is impossible (fault or jet in start-up or shutdown phase)

■ Print acknowledgement with status after each object

COMPUTER **PRINTER**

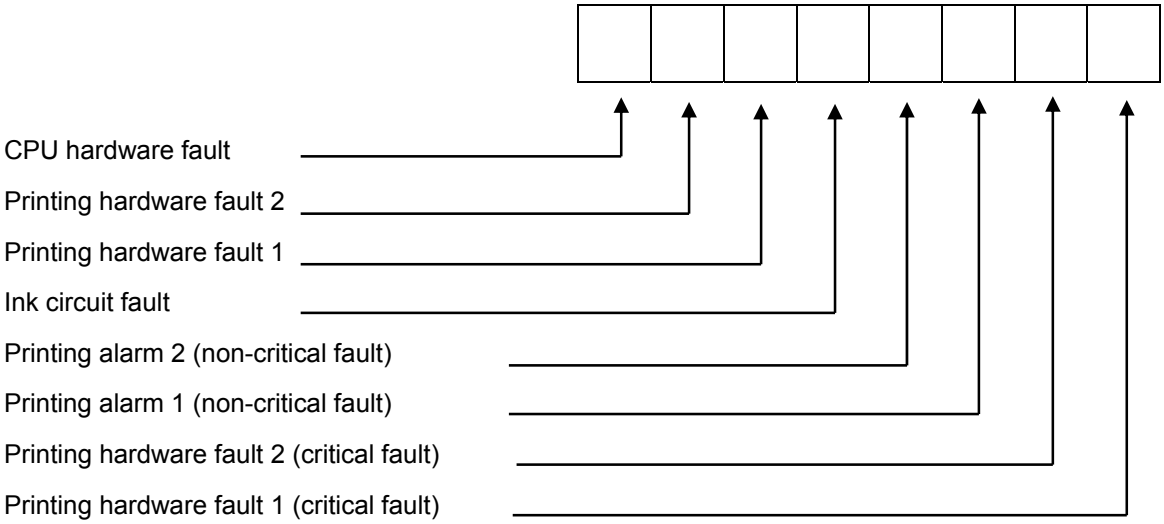
xxh	Print acknowledgement after each object	Data
xxh	General faults	
xxh xxh	Motor speed	
xxh	Pressure	
xxh	Viscosity	
xxh	Jet 1 speed	
xxh	Jet 2 speed	
xxh	Jet 3 speed	
xxh	Jet 4 speed	

Detail of data

□ Detail of the print acknowledgement

Head 1	Head 2	
E5h	E6h	After each object
E1h	E2h	When DTOP is received if printing is impossible (fault or jet in start-up or shutdown phase)

□ Detail of the "General faults" byte



1 = fault

0 = no fault

□ Detail of "Motor speed" byte:

The printer sends two hexadecimal bytes representing the motor speed in decimal.

Calculation of motor speed in revolutions per minute: $\frac{3000}{\text{Motor speed in decimal}}$

□ Detail of "Max. pressure" byte

The printer sends one hexadecimal byte representing the pressure in decimal.

Calculation of pressure in millibar: pressure in decimal × 19.6 for M and G heads.
pressure in decimal × 39.2 for P head.

□ Detail of "Viscosity" byte:

The printer sends one hexadecimal byte representing the the time in seconds to fill the viscosity meter.

□ Detail of the "Jet speed" bytes:

The printer sends one hexadecimal byte representing the jet speed in decimal.

Jet speed calculation in m/s $\frac{\text{Jet speed in decimal}}{10}$

Transmissions to printer

Transmit printer initialization

COMPUTER **PRINTER**

Identifier		36h
Length		00h, 11h
Data (17 bytes)	Not used	xxh
	V24 watchdog (2 bytes)	xxh, xxh
	Cover/recov. fault (1 byte)	xxh
	Head type (1 byte)	xxh
	Deferred stop time (2 bytes)	xxh, xxh
	Autodating Run/Stop (1 byte)	xxh
	Printer running time (2 bytes)	xxh, xxh
	Not used	xxh, xxh
	Number of messages in library (1 byte)	xxh
	Jet 1 alignment (1 byte)	xxh
	Jet 2 alignment (1 byte)	xxh
	Jet 3 alignment (1 byte)	xxh
	Jet 4 alignment (1 byte)	xxh
Checksum		xxh

06h	ACK

or

15h	NACK

Detail of data

□ V24 watchdog:

Time in tens of milliseconds, from 1 to 9999, coded as 2 hexadecimal bytes.

□ Cover/recov. fault byte:

Status 0 = Fault active

Status 1 = Fault inactive

0	0	0			0	0	0

Cover

Recov.

□ Head type:

00h: 1 single-jet head	03h: 2 dual-jet heads
01h: 2 single-jet heads	
02h: 1 dual-jet head	

□ Deferred stop time:

Time in minutes coded as 2 hexadecimal bytes.

□ Autodating Run/Stop:

00h = Run
FFh = Stop

□ Printer running time:

Printer running time expressed in hours and coded as 2 hexadecimal bytes.

□ Number of messages in library:

Maximum number of messages in library, coded as 1 hexadecimal byte.

□ Jet "n" alignment:

Number of frames delay assigned to a jet relative to another to align printing from each.

This number is coded as 1 hexadecimal byte for each jet.

Upload files to Master, IP65, and Contrast

■ Send files by block

For editing: upload the .HEM , IMAJE.INI, S4P.BDG and *.GCG files

The uploaded files are copied to the root of drive **C**.

The format for the exchange is as follows:

COMPUTER **PRINTER**

Identifier		**50h**
Length		xxh, xxh
Data	**First block**	**00h**
	File name (DOS)	**- - -**
Checksum		xxh

06h	ACK

or

15h	NACK

Transmissions to printer

COMPUTER **PRINTER**

Identifier		**50h**
Length		xxh, xxh
Data	**Blocks 1 (N-1)**	**01h**
	File data (x bytes)	**- - -**
Checksum		xxh

06h	ACK
or	
15h	NACK

COMPUTER **PRINTER**

Identifier		**50h**
Length		xxh, xxh
Data	**Last block N**	**80h**
	File data (x bytes)	**- - -**
Checksum		xxh

06h	ACK
or	
15h	NACK

Detail of data:

□ "File name" bytes:

Maximum 8 characters (DOS format).

□ "Length" bytes:

The computer sends 2 hexadecimal bytes representing the length of the data (block number + file data).

Maximum size of file data = 1 KB (1024 bytes).

□ "Block number" bytes:

Blocks must be sent in the following order:

00h = send DOS file name in file data (first block),

01h = send blocks 1 to (N-1) of file data

80h = send last block (N) of file data

IMPORTANT	*If the file already exists in the printer, it is overwritten when the first block containing the file name is received.* *Files uploaded are only taken into account when the printer is restarted.*

■ Command to upload .HEM file

COMPUTER **PRINTER**

Identifier	**50h**
Length	00h, 01h
Upload .HEM file	**81h**
Checksum	D0h

06h	ACK

or

15h	NACK

NOTE	*The printer's response may take 3 or 6 minutes depending on the number of heads.* *The printer restarts automatically after this command.*

■ Transmission concerning heads

Transmit jet condition/maintenance

COMPUTER **PRINTER**

Identifier		31h
Length		00h, 02h
Data	jet number	xxh
	Jet status	xxh
Checksum		xxh

06h	ACK

or

15h	NACK

Detail of data:

□ Jet number:

To control the jet(s) on head 1, send the hexadecimal value 01h.

To control the jet(s) on head 2, send the hexadecimal value 03h.

□ Jet status:

0	Stop jet	00h
1	Start jet	01h
2	Refresh	02h
3	Stabilize jet	03h
4	Introduce solvent	04h
5	Unclog nozzle	05h
6	Adjust jet in gutter	06h
9	Pause printing	09h

Transmissions to printer

■ Transmissions concerning messages

Transmit message number to print

COMPUTER **PRINTER**

Identifier	5Ah
Length	00h, 03h
Head number: 01h = head 1 02h = head 2	xxh
Message number (001 to 127)	xxh, xxh
Checksum	xxh

06h	ACK

or

15h	NACK

Transmit non-library message (complete, parameters or text)

COMPUTER → **PRINTER**

Identifier (1 byte)	57h
Length (2 bytes)	xxh, xxh
Head number: 01h = head 1 02h = head 2	xxh
Data - structure indicator - general parameters - variable item parameters - message to print	xxh - - - xxh
Checksum (1 byte)	xxh

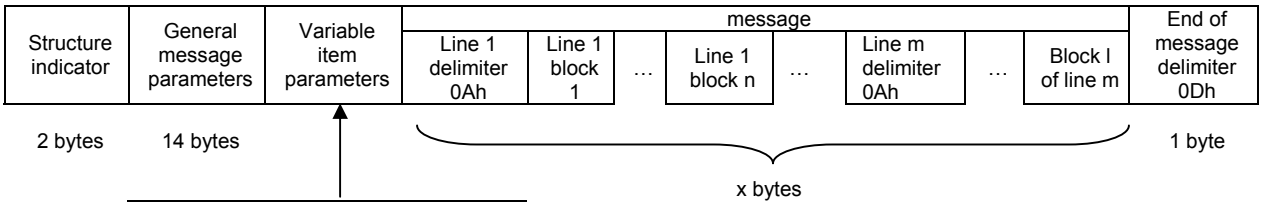
← PRINTER

06h	ACK

or

15h	NACK

■ Detail of data



See section "Details of data".

IMPORTANT *The transmission, including the identifier and checksum, may reach a total of 4 kbytes.*

Transmit library message (complete, parameters or text)

COMPUTER **PRINTER**

Identifier (1 byte)	58h
Length (2 bytes)	xxh, xxh
Head number: 01h = head 1 02h = head 2	xxh
Data - message number (001 to 127) - message title (8 ASCII characters) - message parameters and text (n bytes)	xxh, xxh
Checksum (1 byte)	xxh

06h	ACK

or

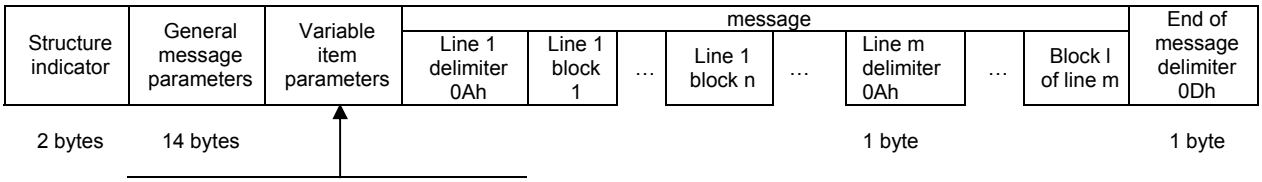
15h	NACK

■ Details of data

- Message number in library

- Message title
The title selected for this message, comprising 8 alphanumeric characters compatible with DOS file names.

- Message parameters and text



See section "Details of data".

Transmit partial message

This transmission can be used to modify the contents of the active message for printing without modifying its structure.

COMPUTER **PRINTER**

Identifier (1 byte)	59h
Length (2 bytes)	xxh, xxh
Head number: 01h = head 1 02h = head 2	xxh
Data - number of zones to modify (1 byte) - modification	xxh - - xxh
Checksum (1 byte)	xxh

06h	ACK

or

15h	NACK

■ Detail of data

Number of zones to modify	Line number 'K' (0 to 15)	Position of first character to modify in the line (0 to x)	Number of characters to modify in the zone (1 to x)	SYMBOLS	…	Line number 'I' (0 to 15)	…
1 byte	1 byte	2 bytes	2 bytes	P bytes		1 byte	

A "zone" is a continuous sequence of characters in a given block.
For example, there are two possibilities to modify the I and the E of IMAJE:

I M A J E 2 zones will be modified (Number of zones = 02h)

Zone 1 Zone 2

or

I M A J E only 1 zone will be modified (Number of zones = 01h)

Zone 1

The structure of the lines may not be modified.

The first line corresponds to number "0" and the first byte following the delimiter 0Ah corresponds to position "0".

Details of message composition are given in the section "Details of data".

IMPORTANT *The transmission, including the identifier and checksum, may reach a total of 2 kbytes.*

Transmit external variables

COMPUTER **PRINTER**

Identifier (1 byte)	5Bh
Length (2 bytes)	xxh, xxh
Head number: 01h = head 1 02h = head 2	xxh
Data : - delimiter: start of external variable 1 - variable external 1 text (n bytes) - delimiter: end of external variable 1 … - delimiter: start of external variable 10 - variable external 10 text (n bytes) - delimiter: end of external variable 10	12h xxh 12h … 12h xxh 12h
Checksum (1 byte)	xxh

06h	ACK
or	
15h	NACK

■ Detail of data

This command may only be used if the active message already contains the zones to modify surrounded by delimiters 12h.

If a zone is to be left unmodified it must be transmitted with text = 0 characters.

Maximum 10 variables per message

See section "Details of data".

Transmissions to printer

■ Transmissions regarding variable items (counter, time code, autodating)

Transmit current counter value

COMPUTER **PRINTER**

Identifier		51h
Length		00h, 0Ah
Data	Jet number (1 to 4)	xxh
	Current value of counter	9 ASCII
Checksum		xxh

06h	ACK

or

15h	NACK

Detail of data

Counters

Heads	counters
1	1
1	2
2	3
2	4

Transmissions to printer

Reset counters

COMPUTER **PRINTER**

Identifier		3Ah
Length		00h, 01h
Data	Jet number	xxh
	Checksum	xxh

06h	ACK

or

15h	NACK

Detail of data

counters

Jets	counters
1	1
2	2
3	3
4	4

Transmissions to printer

Transmit tables of months and time codes

COMPUTER **PRINTER**

Identifier		53h
Length		01h, 02h
Data	Date change time HHMM	4 ASCII
	Time code digits	192 bytes
	Time code letters	26 bytes
	Month tables	36 bytes
Checksum byte		xxh

06h	ACK

or

15h	NACK

Detail of data

□ "Date change time" bytes HHMM in ASCII.

□ "Time code digits" bytes: 96 2-digit codes:
01-02-03-04-05-06-07-08-09-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24….96

□ "Time code letters" bytes: 26 1-digit codes:
A-B-C-D-E-F-G-H-I-J-K-L-M-N-O-P-Q-R-S-T-U-V-W-X-Y-Z.

□ "Month table" bytes: 12 3-digit codes:
JAN-FEB-MAR-APR-MAY-JUN-JUL-AUG-SEP-OCT-NOV-DEC.

Transmissions to printer

Initialize autodating

COMPUTER **PRINTER**

Identifier			C8h
Length			00h, 07h
Data	Second	(1 byte)	xxh
	Minute	(1 byte)	xxh
	Hour	(1 byte)	xxh
	Day of month	(1 byte)	xxh
	Month of year	(1 byte)	xxh
	Year	(1 byte)	xxh
	24-hour mode	(1 byte)	20h
Checksum			xxh

06h	ACK

or

15h	NACK

All the data bytes except the 24-hour mode are coded in BCD (Binary Coded Decimal).
Units are represented by the low order half-byte.
The minimum and maximum values for these bytes are in decimal:

- □ seconds 00 to 59
- □ minutes 00 to 59
- □ hours 00 to 23
- □ day 01 to 31
- □ month 01 to 12
- □ year 00 to 99

Transmit autodating table

COMPUTER **PRINTER**

Identifier (1 byte)	DFh
Length (2 bytes)	xxh, xxh
Data : - type of table (1 byte) - table (n bytes)	xxh xxh, …
Checksum (1 byte)	xxh

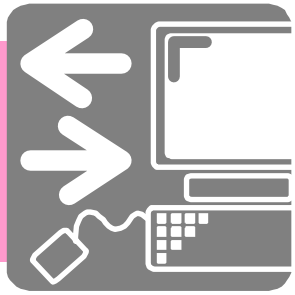
■ Detail of data

. Type of table

00h	table of hours
01h	table of minutes
02h:	table of weekdays
03h:	table of days of the year
04h:	table of months
05h	table of weeks
06h:	table of months of the year
07h	table of current year

. Table

table of hours	24 x 3 ASCII characters
table of minutes	60 x 3 ASCII characters
table of weekdays	7 x 3 ASCII characters
table of days of the year	366 x 3 ASCII characters
table of days of the month	31 x 3 ASCII characters
table of weeks	53 x 3 ASCII characters
table of months of the year	12 x 3 ASCII characters
table of current year	10 x 3 ASCII characters



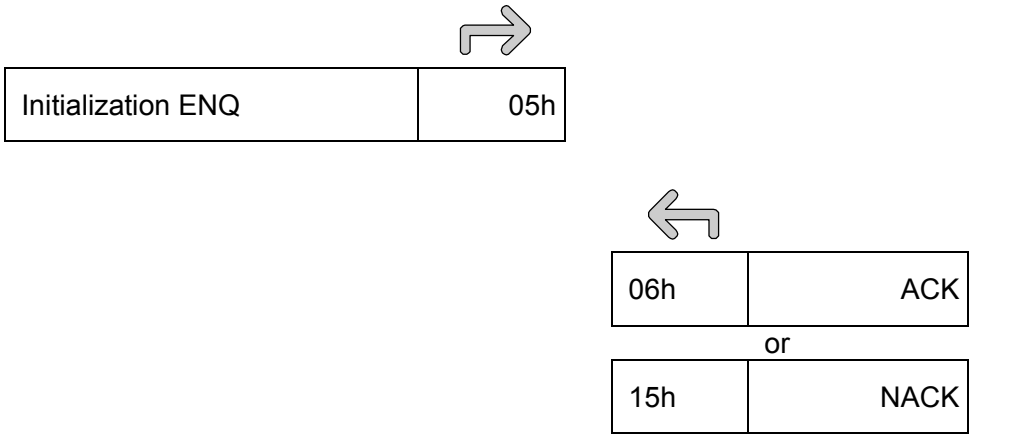
Requests to the printer

Requests to the printer

■ Requests regarding the printer

V24 dialog request

This request is optional. It does however provide a check that the printer is "ready" to dialog, and may be sent before every exchange.



The printer replies with NACK:

- □ if the link is locked by a security code,
- □ if the menu is in keyboard modification mode.

Request keyboard code

COMPUTER **PRINTER**

Identifier	45h
Length	00h, 00h
Checksum	45h

06h	ACK
45h	Identifier
00h, 03h	Length
Between 20h, 60h	Code 1 (1 ASCII)
Between 20h, 60h	Code 2 (1 ASCII)
Between 20h, 60h	Code 3 (1 ASCII)
xxh	Checksum

or

15h	NACK

Requests to the printer

Request printer parameters

COMPUTER → **PRINTER**

Identifier	20h
Length	00h, 00h
Checksum	20h

← **PRINTER**

06h	ACK	
20h	Identifier	
00h, 1Ah	Length	
* 4 ASCII	Motor speed (rpm) or Transfer time (s)	Data
20h	Space	
4 ASCII	Pressure (x, xx) (bar)	
20h	Space	
2 ASCII	Visco filling time (s)	
20h	Space	
2 ASCII	Number of times additive added	
20h	Space	
4 ASCII	Average jet speed (m/s) (xx,x)	
20h	Space	
2 ASCII	Temp. of electronics (°C)	
20h	Space	
2 ASCII	Temp of ink circuit (°C)	
xxh	Checksum	

or

15h	NACK

* Transfer time: for 9040 Contrast printers.
Motor speed: for other printers.

Requests to the printer

Request condition of ink circuit solenoid valves, fluid levels, measured viscosity, reference viscosity and number of additive additions.

COMPUTER → **PRINTER**

Identifier	35h
Length	00h, 00h
Checksum	35h

06h	ACK
35h	Identifier
00h, 05h	Length
xxh xxh xxh xxh xxh	State of IC SVs (1 byte) Levels (1 byte) Visco (s) (1 byte) Reference visco (s) (1 byte) No. times additive added (1 byte)
xxh	Checksum

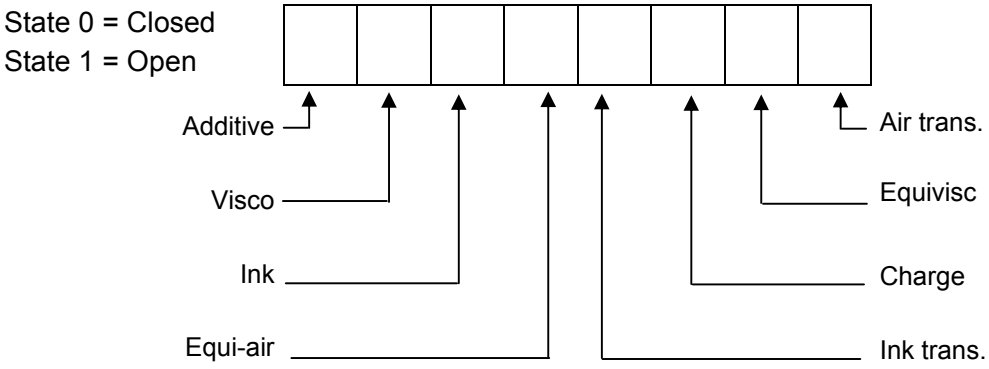
Data

or

15h	NACK

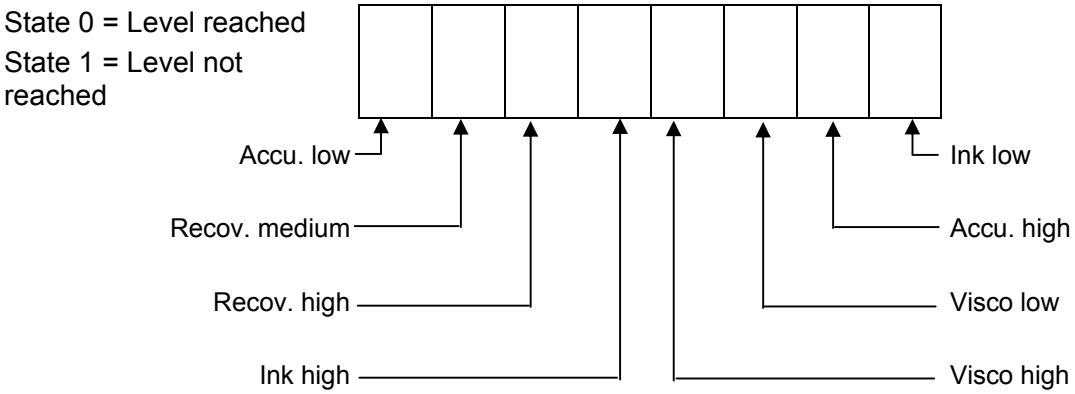
Detail of data

□ IC SV byte:



NOTE *Only on Contrast printers are all of these solenoid valves used. On other printers, only the Additive and Visco solenoid valves are used.*

□ Levels byte:



□ Viscosity byte:

The value of this byte represents the viscosity meter filling time in seconds, coded in hexadecimal.

□ Visco reference byte:

Viscosity reference time in seconds, coded in hexadecimal.

□ Number of times additive added byte:

Number of additions, coded in hexadecimal.

Requests to the printer

Request CRCs of printer PROMs

COMPUTER → **PRINTER**

Identifier	37h
Length	00h, 00h
Checksum	37h

← **PRINTER**

06h	ACK	
37h	Identifier	
00h, 1Bh	Length	
xxh	Cover/recov. fault. (1 byte)	Data
xxh, xxh	Printer running time (2 bytes)	
xxh, xxh	CPU program CHCK (3 bytes)	
xxh	IMP1 nozzle type (1 byte)	
xxh	IMP1 frame gen. type (1 byte)	
00h, 00h, 00h	3 unused bytes	
xxh	IMP2 nozzle type (1 byte)	
xxh	IMP2 frame gen type (1 byte)	
00h, 00h, 00h	3 unused bytes	
xxh	IMP3 nozzle type (1 byte)	
xxh	IMP3 frame gen type (1 byte)	
00h, 00h, 00h	3 unused bytes	
xxh	IMP4 nozzle type (1 byte)	
xxh	IMP4 frame gen type (1 byte)	
00h, 00h, 00h	3 unused bytes	
xxh	Autodating Run/Stop (1 byte)	
xxh	Checksum	

or

15h	NACK

Detail of data

□ "Cover/recov. fault" byte:

Status 0 = Fault active
Status 1 = Fault inactive

0	0	0			0	0	0

Cover — Recov.

□ "IMP nozzle type" byte:

□ "Printer running time" bytes:

Printer running time expressed in hours and coded as 2 hexadecimal bytes.

0	0	0	0	0			

G nozzle:	0	0	0
M nozzle:	1	0	0
P nozzle:	1	1	0

□ "IMP head control type" byte:

1							

State 0 = ROM
State 1 = RAM

□ "Autodating Run/Stop" byte:

00h = Run FFh = Stop

Request printer faults

This command does not cancel faults.

COMPUTER **PRINTER**

Identifier	3Bh
Length	00h, 00h
Checksum	3Bh

06h	ACK
3Bh	Identifier
00h, 11h	Length
	Faults
xxh	. General
xxh	. Hardware (CPU)
xxh	. Printer
xxh	. Hard IMP jet 1
xxh	. IMP jet 1
xxh	. Head jet 1
xxh	. Hard IMP jet 2
xxh	. IMP jet 2
xxh	. Head jet 2
xxh	. Hard IMP jet 3
xxh	. IMP jet 3
xxh	. Head jet 3
xxh	. Hard IMP jet 4
xxh	. IMP jet 4
xxh	. Head jet 4
xxh	. Phase
xxh	. Sub-phase * or solvent fault
	Data
xxh	Checksum

or

15h	NACK

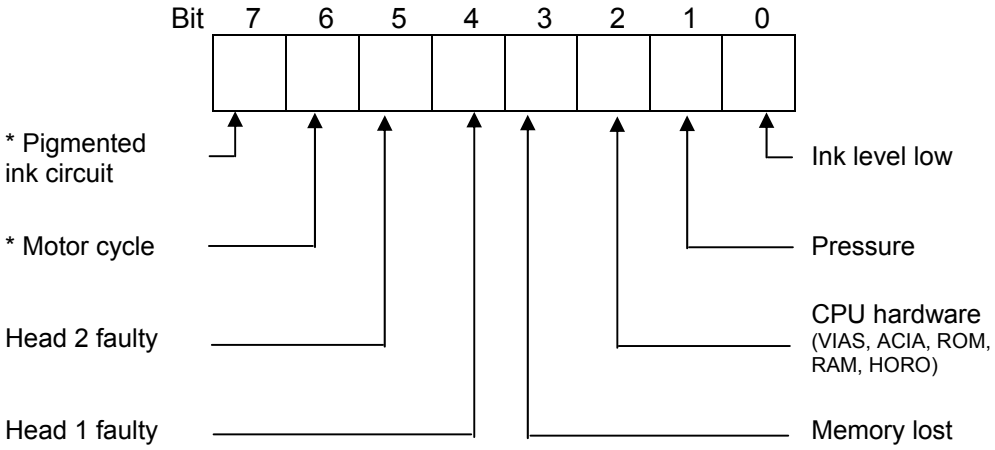
* Sub-phase: for 9040 Contrast printers.
Solvent fault: for other printers.

Detail of data

□ byte : general faults

State 0 = no fault

State 1 = fault



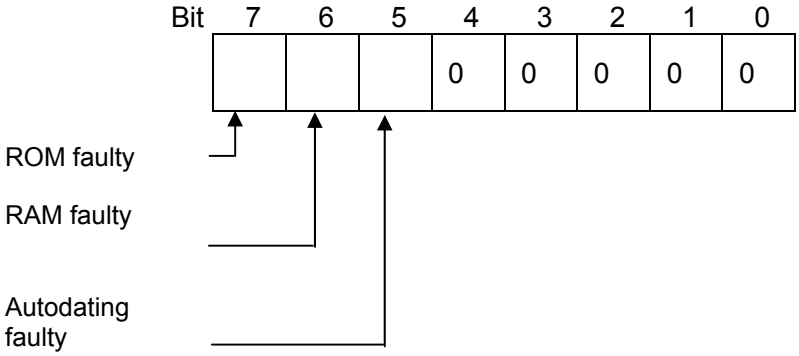
* Bit 7 is only significant on Contrast printers.

* Bit 6 is only significant on Contrast printers.

□ Hardware faults (CPU) byte

State 0 = no fault

State 1 = fault

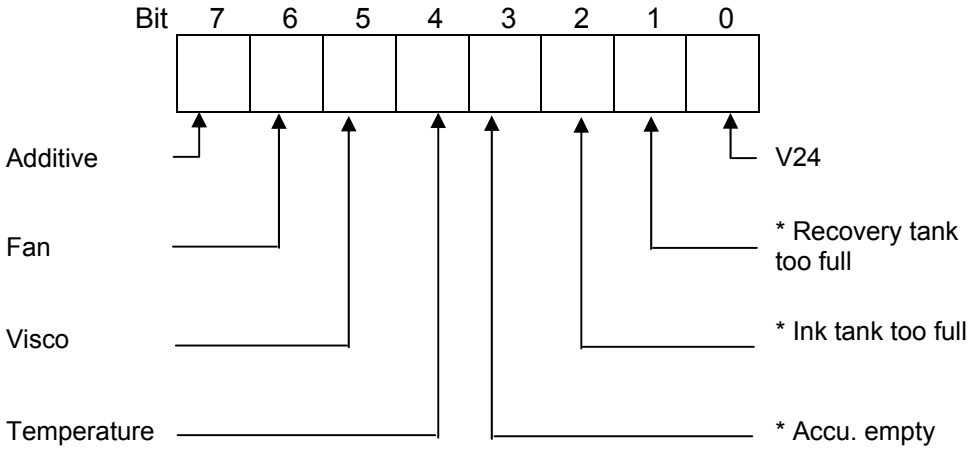


Requests to the printer

□ Printer faults byte

State 0 = no fault

State 1 = fault

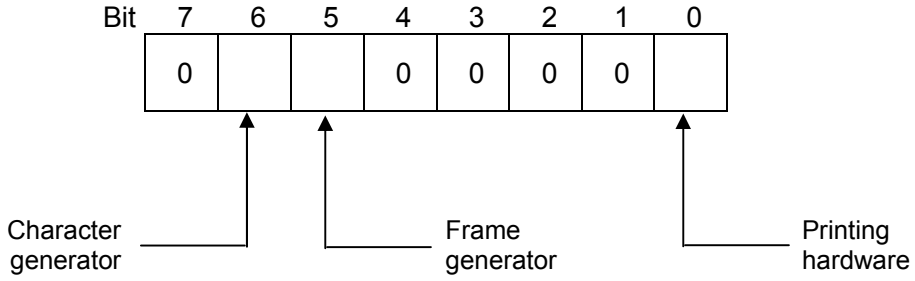


* Bits 1, 2 and 3 are only significant on Contrast printers.

□ IMP jet hardware fault byte

State 0 = no fault

State 1 = fault

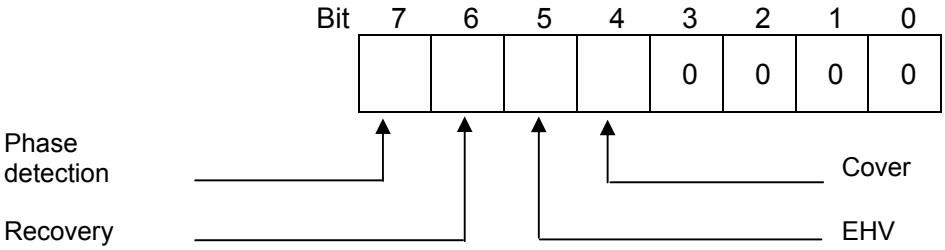


Requests to the printer

□ IMP jet fault byte

State 0 = no fault

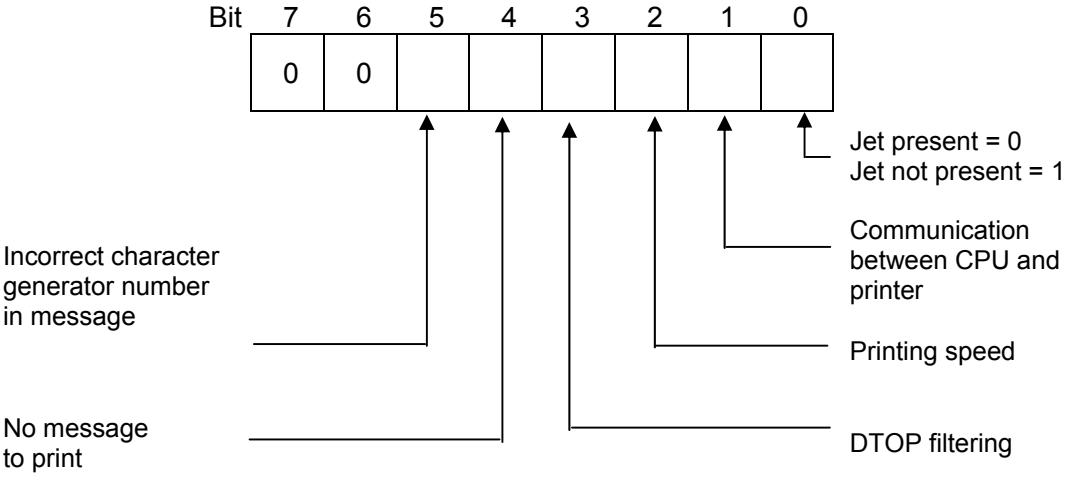
State 1 = fault



□ Head fault byte

State 0 = no fault

State 1 = fault



□ Phase byte (only on Contrast printers)

→ faulty phase number.

□ Sub-phase or solvent fault byte

. sub-phase on Contrast printer

→ faulty sub-phase.

. solvent fault for other printers

Bit 3: viscosity higher than setpoint by 8 seconds.

Bit 2: Additive level low. No link to viscosity.

Status request for Contrast Printers

COMPUTER

Identifier	4Dh
Length	00h, 00h
Checksum byte	4Dh

PRINTER

06h	ACK	
4Dh	Identifier	
00h, 09h	Length	
xxh	IC phase number	Data
xxh	IC sub-phase number	
xxh, xxh	Sub-phase time	
xxh	Levels	
xxh	Solenoid valves	
xxh	AP and discharge solenoid valves	
xxh	Pressure	
xxh	End of phase (standby mode)	

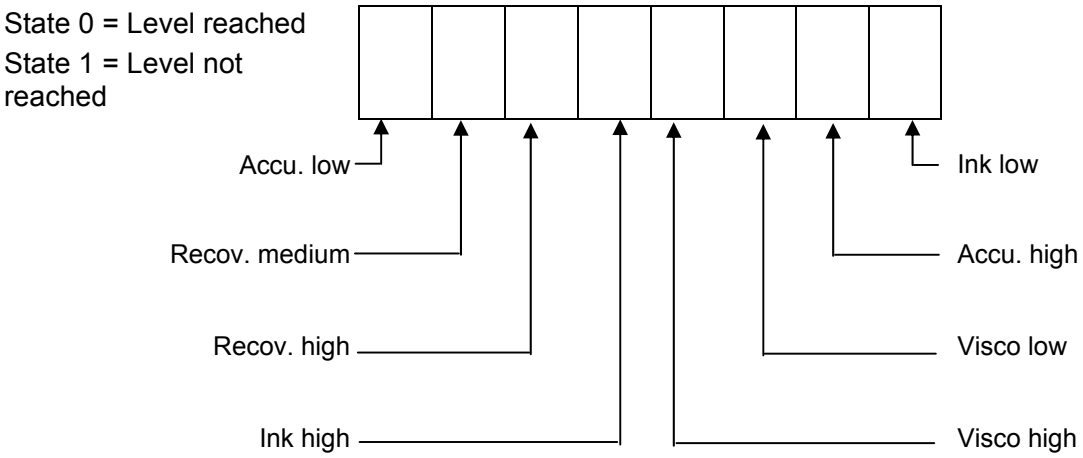
Detail of data

□ "Sub-phase time" byte:

Time expressed in tenths of a second, in 2 bytes.

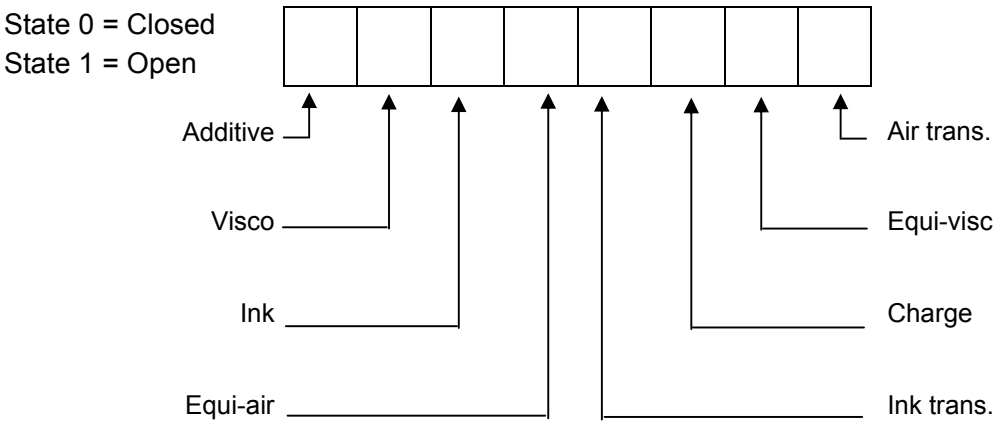
□ "Levels" byte:

State 0 = Level reached
State 1 = Level not reached



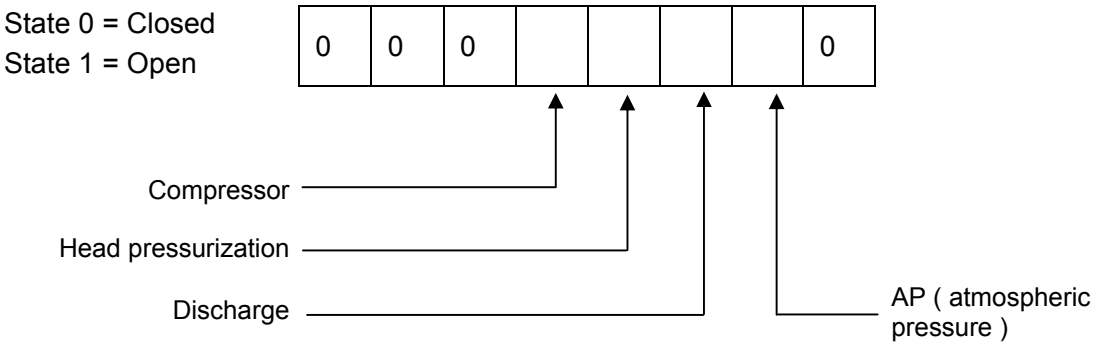
□ "Solenoid valves" byte:

State 0 = Closed
State 1 = Open



□ "AP and discharge solenoid valves" byte:

State 0 = Closed
State 1 = Open



□ "Pressure" byte:

The printer sends one hexadecimal byte representing the pressure in decimal.

Calculation of pressure in millibar:

. pressure in decimal × 19.6 mb per step, for G and M heads.

□ "End of phase" byte: (standby mode)

00h, for current phase.

FFh, for end of phase.

■ Requests concerning heads

Request jet status

COMPUTER **PRINTER**

Identifier	32h
Length	00h, 01h
Jet number	xxh
Checksum	xxh

06h	ACK
32h	Identifier
00h, 01h	Length
xxh	Jet status (Data)
xxh	Checksum

or

15h	NACK

Detail of data:

□ "Jet number" byte:

Printer	Head	Jet	Jet num.
1.1	1	1	01h
1.2	1	1	01h
		2	02h
2.1	1	1	01h
	2	3	03h
2.2	1	1	01h
		2	02h
	2	3	03h
		4	04h

□ "Jet status" byte

00h = jet stopped
01h = jet in start-up phase
02h: = jet in refresh
03h: = jet in stability check
04h: = jet in solvent feed
05h = jet in nozzle unclog
06h = adjustment
07h = jet running

Request jet speed and phase

COMPUTER → **PRINTER**

Identifier		33h
Length		00h, 01h
Data	Jet number	xxh
	Checksum	xxh

06h	ACK	
33h	Identifier	
00h, 02h	Length	
xxh	Jet speed	Data
xxh	Jet phase	Data
xxh	Checksum	

or

15h	NACK

Detail of data:

□ "Jet number" byte:

Printer	Head	Jet	Jet num.
1.1	1	1	01h
1.2	1	1	01h
		2	02h
2.1	1	1	01h
	2	3	03h
2.2	1	1	01h
		2	02h
	2	3	03h
		4	04h

□ "Jet speed" byte

The jet speed is expressed in tenths of a meter per second, coded in 1 hexadecimal byte

□ "Jet phase" byte

8 bits which may each be set to 0 or 1.

Requests to the printer

■ Requests concerning messages

Request complete current message

COMPUTER **PRINTER**

Identifier		43h
Length		00h, 01h
Data	Jet number	xxh
	Checksum	xxh

06h		ACK
43h		Identifier
00h, xxh		Length
Xxh, xxh	Structure indicator	
xxh … xxh	Parameters (x bytes) Contents of message (x bytes)	Data
xxh	Checksum	

or

15h	NACK

Command printing

This command starts printing on the head(s). The printer must be configured in either manual auto or manual object mode.

COMPUTER **PRINTER**

Identifier	94h
Length	00h, 00h
Checksum	xxh

06h	ACK

NOTE	*In "manual object" mode, this command triggers printing on one object.* *In "manual auto" mode, the first command triggers printing and the message is repeated until a second command stops printing.*

Requests to the printer

■ Requests regarding variable items

Request current counters

COMPUTER

Identifier	39h
Length	00h, 01h
Data: Jet number	xxh
Checksum	xxh

PRINTER

06h	ACK	
39h	Identifier	
00h, 0Ch	Length	
9 ASCII 3 xxh	Current value of counter Current value of batch	Data
xxh	Checksum	

or

15h	NACK

Request PPP printing counter

This command only concerns printers with the Pay Per Print option.

COMPUTER **PRINTER**

Identifier	56h
Length	00h, 00h
Checksum	xxh

06h	ACK	
56h	Identifier	
00h, 04h	Length	
4 xxh	Printing counter in HEXADECIMAL	Data
xxh	Checksum	

or

15h	NACK

Requests to the printer

Request autodating

COMPUTER **PRINTER**

Identifier	D6h
Length	00h, 00h
Checksum	D6h

06h	ACK	
9Ch	Identifier	
00h, 16h	Length	
2 ASCII	Seconds	Data
2 ASCII	Minutes	
2 ASCII	Hours	
20h, 20h	2 spaces	
2 ASCII	Day of month	
20h, 20h, 20h	3 spaces	
20h, 20h	2 spaces	
2 ASCII	Month in digits	
3 ASCII	Month in letters	
2 ASCII	Year	
xxh	Checksum	

or

15h	NACK

Requests to the printer

Request for an autodating table

CALCULATOR **PRINTER**

Identification (1 byte)	DEh
Length (2 bytes)	00h, 01h
Data (1 byte): - type of table 00h to 0Bh	xxh
Checksum (1 byte)	xxh

DFh	Identification (1 byte)
xxh, xxh	Length (2 bytes)
xxh xxh,…	Data: - type of table (1 byte) - table (n bytes)
xxh	Checksum (1 byte)

■ Data details

□ Request : Type of table: (1 byte)

- 00h Hours table
- 01h Minutes table
- 02h Day of the week table
- 03h Day of the year table
- 04h Day of the month table
- 05h Weeks table
- 06h Month of year table
- 07h Year table

Requests to the printer

□ Answer : Autodating table (n bytes)

- Hours table	24 x 3 characters ASCII
- Minutes table	60 x 3 characters ASCII
- Day of the week table	7 x 3 characters ASCII
- Day of the year table	366 x 3 characters ASCII
- Day of the month table	31 x 3 characters ASCII
- Weeks table	53 x 3 characters ASCII
- Month of year table	12 x 3 characters ASCII
- Year table	10 x 3 characters ASCII

Request tables of months and time codes

COMPUTER **PRINTER**

Identifier	52h
Length	00h, 00h
Checksum	52h

06h	ACK	
52h	Identifier	
01h, 02h	Length	
4 ASCII	Date change time HHMM	Data
192 bytes	Time code digits	
26 bytes	Time code letters	
36 bytes	Table of months	
xxh	Checksum byte	

or

15h	NACK

Detail of data

- □ "Date change time" bytes : HHMM in ASCII.
- □ "Time code digits" bytes: 96 2-digit codes

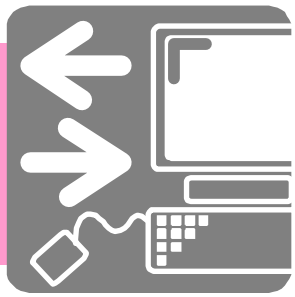
01-02-03-04-05-06-07-08-09-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24- - - - 96.

- □ "Time code letters" bytes: 26 1-digit codes

A-B-C-D-E-F-G-H-I-J-K-L-M-N-O-P-Q-R-S-T-U-V-W-X-Y-Z.

- □ "Month table" bytes: 12 3-digit codes

JAN-FEB-MAR-APR-MAY-JUN-JUL-AUG-SEP-OCT-NOV-DEC.



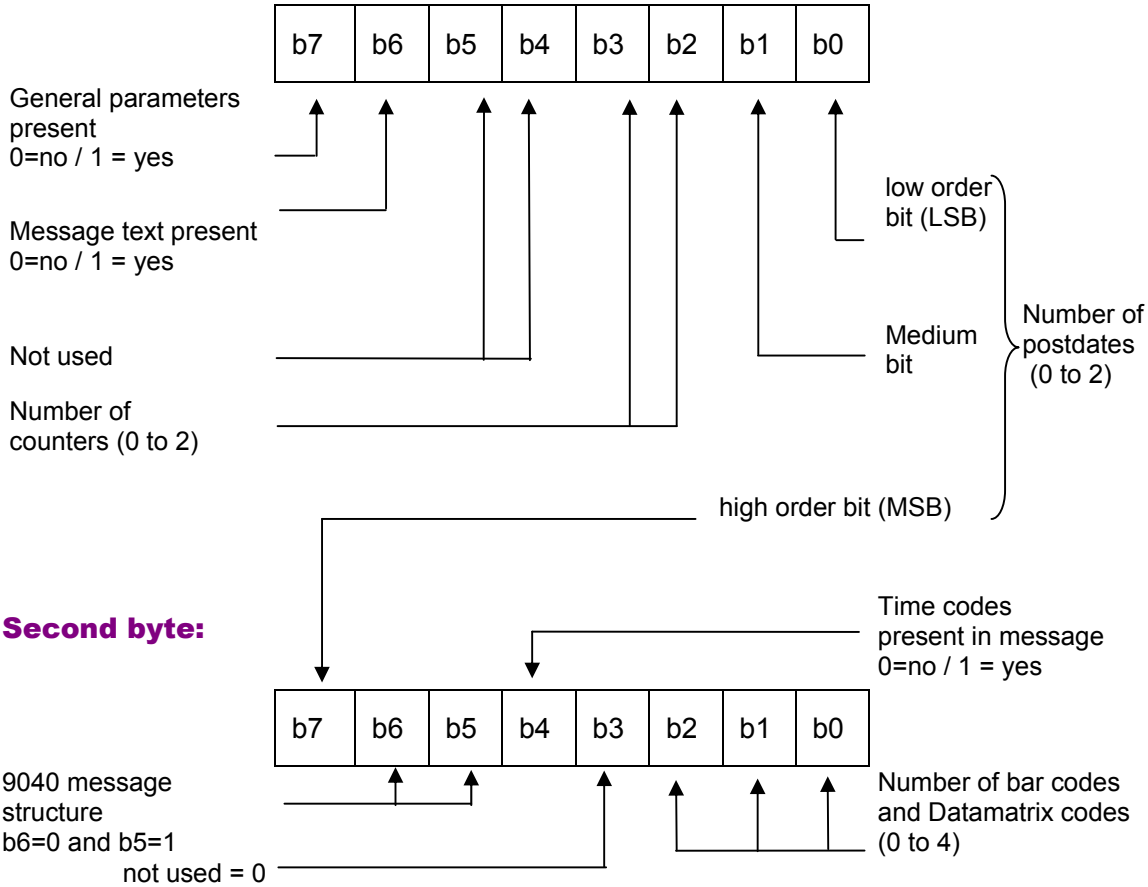
Details of data

Details of data

■ Details of message data

Structure indicator

First byte:

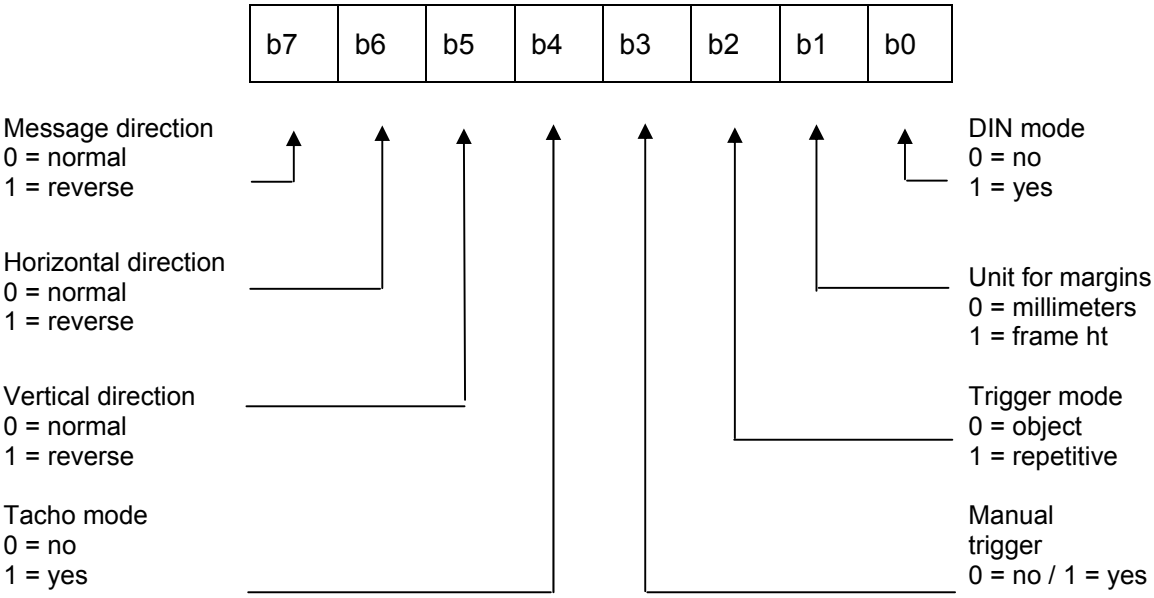


Second byte:

IMPORTANT	*If the structure indicator is defined with variable items (counter, bar codes, Datamatrix codes, postdate) the parameters for these items must be inserted (see "Variable item parameters" section).*

General message parameters

Byte 1:



Byte 2: Multi top value	1 to 255
Byte 3: Object top filter (Step value =100µ)	01 to 10
Byte 4: Tacho division	001 to 127
Bit 7: 0 detection via tachometer 1 detection via cells	
Bytes 5 and 6: Forward margin	0003 to 9000 mm
Bytes 7 and 8: Return margin	0003 to 9000 mm
Bytes 9 and 10: interval	0003 to 9000 mm
Bytes 11 and 12: Printing speed	0001 to 9999 mm/s
Bytes 13 and 14: Algorithm number.	(see "List of fonts" section)

Variable item parameters

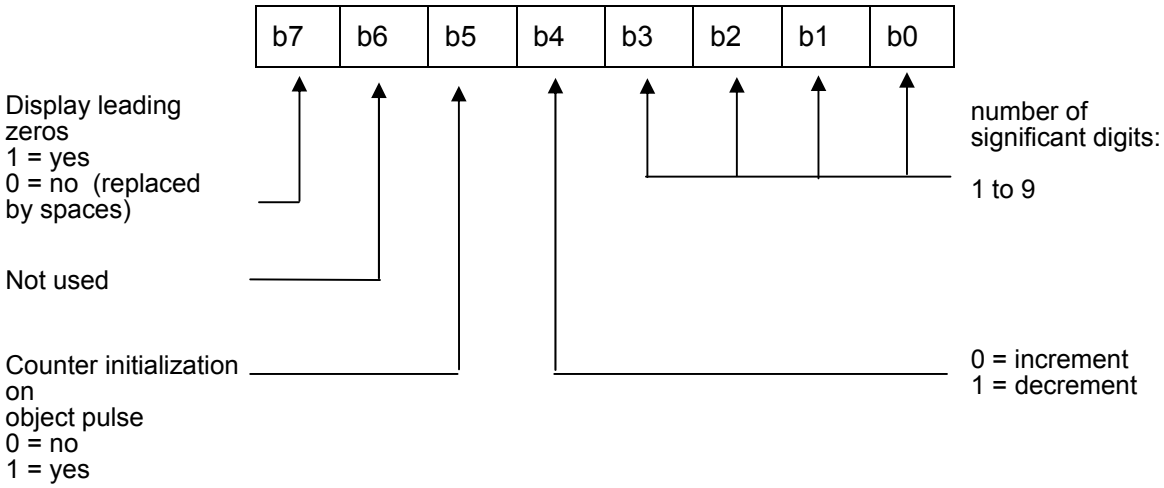
- Counter 1 parameters	26 bytes
- Counter 2 parameters	26 bytes
- Postdate 1	2 bytes
- Postdate 2	2 bytes
- Bar code or Datamatrix 1	10 bytes
- Bar code or Datamatrix 2	10 bytes
- Bar code or Datamatrix 3	10 bytes
- Bar code or Datamatrix 4	10 bytes

IMPORTANT *The order of the various parameters is fixed, though they may be omitted if the structure flag is set accordingly.*

■ Counters

IMPORTANT *The 26 bytes below must be configured for a counter.*
Each counter has a corresponding 26-byte configuration.

Byte 1:



Byte 2:

increment	b7	b6	b5	b4	b3	b2	b1	b0
1 = Externe	**0**	**0**	**1**	0	0	0	0	**0**
3 = Object	**0**	**1**	**1**	0	0	0	0	0
4 = Message	**1**	**0**	**0**	0	0	0	0	0

Chaining counter:

Counters	Chaining							overflow bit of following counter
1	0	0	0	0	0	0	0	**1**
2	**1**	**0**	**1**	0	0	0	0	0

Bytes 3 to 26:

- Start value (9 bytes) 000000000 to 999999999
- End value (9 bytes) 000000000 to 999999999
- Counter step (2 bytes) 01 to 99
- Increment divider (4 bytes, batch counter *) 000000 to 99999

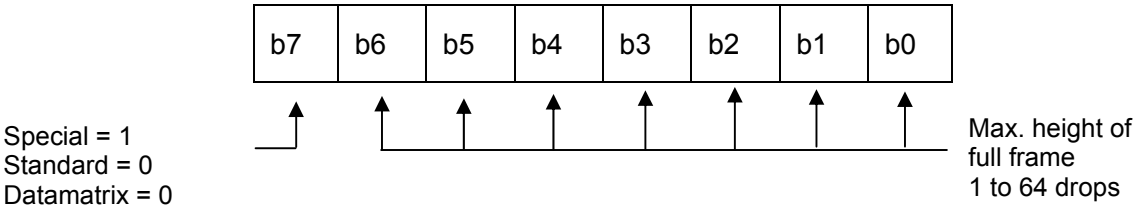
** Only the 3 low order bytes are significant*

■ Postdates (2 bytes)

- Bits 0 to 13: postdate interval 0 to 9999 days.
- Bits 14 and 15: Postdate unit 0 = days / 2 = months

■ Bar codes and Datamatrix

Byte 1:



- Special: bar code printed with "JET Height" frame.
- Standard: bar code printed with height defined by bits b0 to b6 (example codes: 2/5, Code 39).
- Datamatrix: the height must be an even drop size, between 8 and 24 drops. If the height selected is odd, the size is rounded down to an even size.

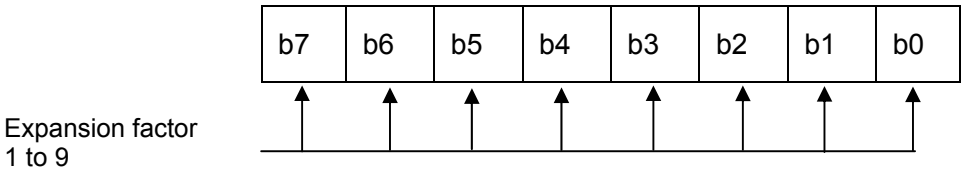
NOTE *For standard and Datamatrix codes, the height must correspond to a font height resident in the printer.*

Byte 2: identification of code

xxh	Code type
- 00h	2/5 interleaved
- 01h	Code 39
- 02h	EAN13
- 03h	Not used
- 04h	EAN8
- 05h	Not used
- 06h	UPCA
- 07h	Not used
- 08h	UPCE
- 09h	Not used
- 0Eh	EAN128
- 0Fh	Not used
- 10h	Code 128
- 11h	Not used
- 14h	HIBC
- 17h	Datamatrix
- 12h	ITF 6
- 13h	ITF 14

The printer uses the code identification to select the correct encoding rule, which also contains the frame structures used by the code.

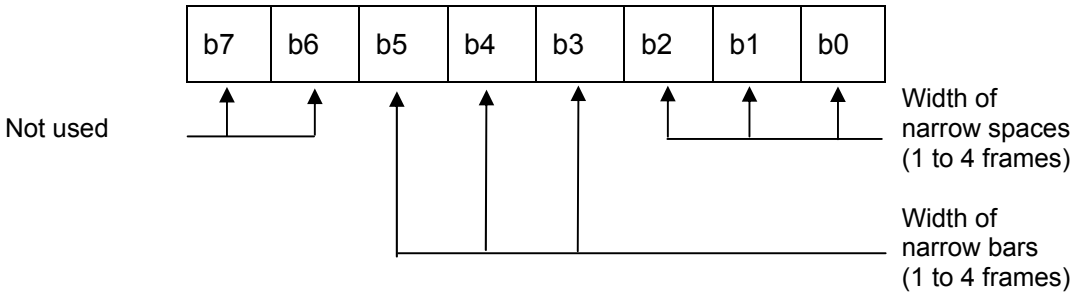
Byte 3:



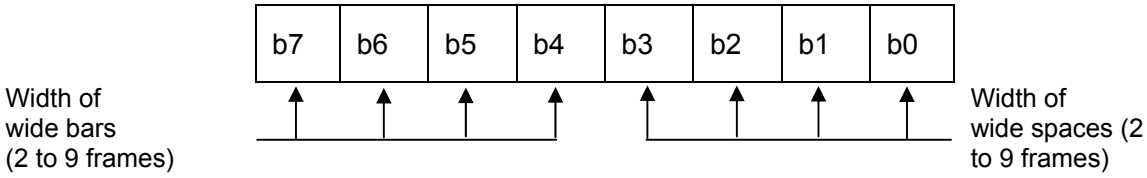
IMPORTANT

- *For industrial codes, this value is always equal to 1.*
- *For Datamatrix codes, the expansion may only vary between 1 and 2. An expansion of 2 may only be used with a height of at least 16 drops.*

Byte 4:



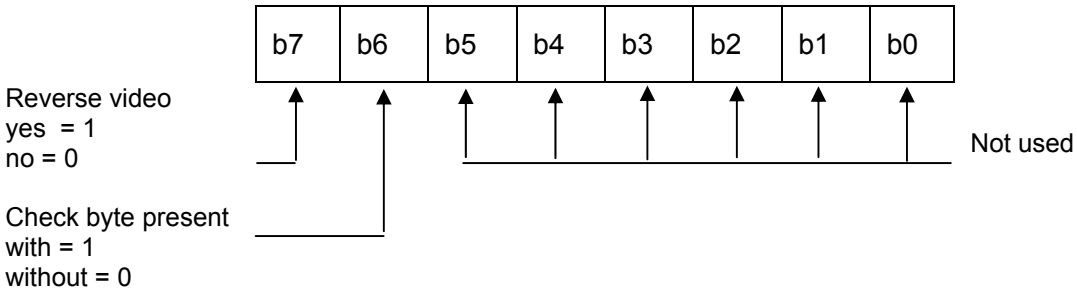
Byte 5:



IMPORTANT

- *The width of a narrow item must be less than that of a wide item.*
- *For distribution and Datamatrix codes, the width value for narrow items is set at 1 (09h) and the value for wide items is set at 2 (22h).*

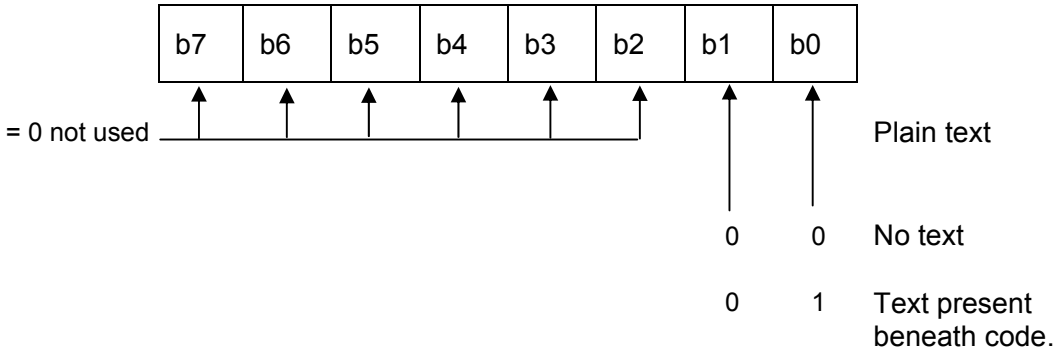
Byte 6:



For the Datamatrix code, this byte is set to 40h.

IMPORTANT *If a check byte is used, its location must be reserved in the text of the code. A check byte must never be the last character of a variable item.*

Byte 7:



The next three bytes are reserved and set to 00h.

■ Time code

Bytes 1 and 2: Start time, coded in hexadecimal

From 00 hours 00 minutes to 23 hours 59 minutes

Bytes 3 and 4: Interval, coded in hexadecimal

From 00 hours 00 minutes to 23 hours 59 minutes

Byte 5: Type of code

00h: Two-digit numeric code

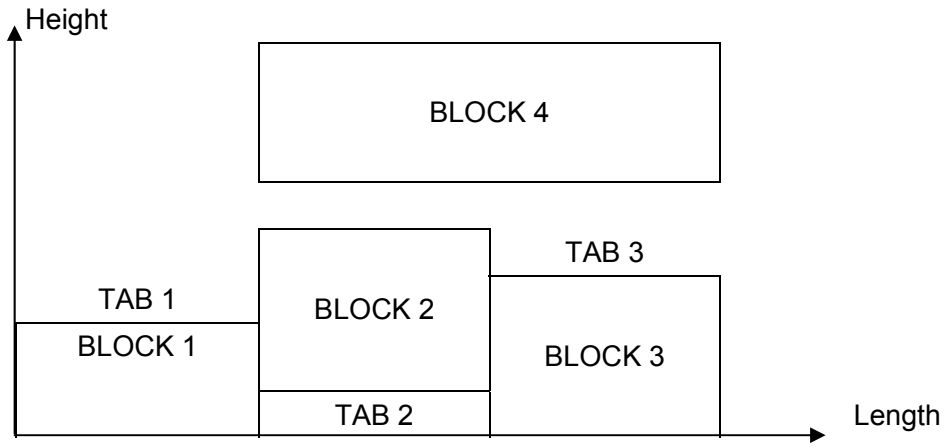
FFh: Alphabetic code (whole alphabet)

7Fh: Alpha-numeric code (without letters I and O)

Definition of lines

A line is a set of blocks. The start of line delimiter 0Ah is used for each line. The end of message delimiter 0Dh is used at the end of the message.

Example message:



This message may be split up in three different ways:

. Either: line 1 comprising BLOCK 1, BLOCK 2, BLOCK 3.
line 2 comprising TAB 1 and BLOCK 4.

. Or: line 1 comprising BLOCK 1, BLOCK 4.
line 2 comprising TAB 1 and BLOCK 2, BLOCK 3.

. Or: line 1 comprising TAB 1 and BLOCK 4.
line 2 comprising TAB1, BLOCK 2 and TAB 3.
line 3 comprising BLOCK 1, TAB 2 and BLOCK 3.

The number of variable lines per message is limited to 16.

Definition of blocks

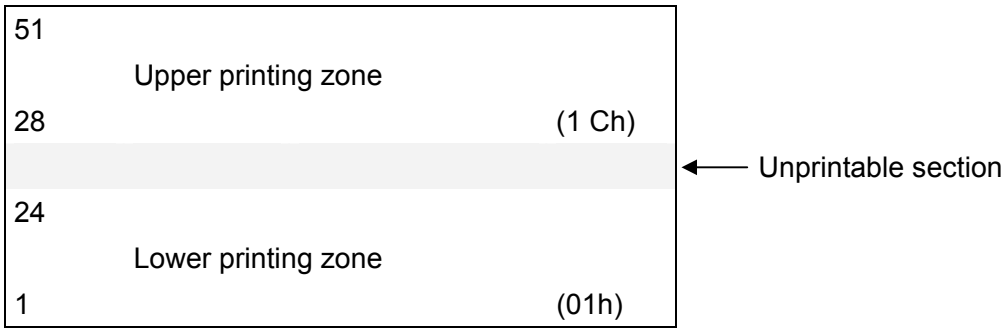
A block is a set of items produced with the same character generator, same expansion and same vertical position.

Position 2 bytes 8xh, xxh	Character generators (1 byte)	Expansion 1 byte	Identifier 1 byte 10h	TEXT	Identifier 1 byte 10h	Expansion 1 byte	Character generators (1 byte)	position 2 bytes 8xh, xxh

■ Position

These two bytes give the vertical position of the block as a number of drops relative to the first drop at the bottom of the character.

The available zone covers 24 drops per jet.
The first position of the lower zone is 80h 01h
The first position of the upper zone is 80h 1Ch.



■ Character generator

Character generator number coded in 1 byte.

The list of character generator numbers is given in the "List of fonts" section.

■ Expansion

Expansion of the entire block, 1 to 9 in hexadecimal.

■ Identifier

Start and end of text identifier 10h.

List of standard fonts

Number	Name	Format
201	ARA 07143	7X6
202	ARA 07BA	7X6
210	ARA 16143	16X12
204	ARA 16BA	16X12
205	ARA 24BA	24X21
208	ARA 24143	24X21
66	CYR 07106	7X6
81	CYR 11107	11X8
68	CYR 16107	16X12
69	GRE 07116	7X6
71	GRE 16117	16X12
77	GRE 24117	24X21
86	HEB 05099	5x6
72	HEB 07099	7x6
74	HEB 16099	16X12
78	HEB 24099	24X21
58	SCI 05084	5x6
60	SCI 07119	7x6
62	SCI 16119	16x12
83	SIN 05116	5x6
52	SIN 07118	7x6
79	SIN 09110	9x6
54	SIN 11118	11X8
56	SIN 16119	16X12
57	SIN 24058	24X21
146	0C16_ITF	16X12
253	PARAL	
254	DAMIER	
255	J1000	

Detail of text

The text may comprise the following items:

- alpha-numeric characters,
- and/or counter,
- and/or autodating,
- and/or bar codes and Datamatrix,
- and/or tabulations,
- external variables,
- graphic block.

■ Alphanumeric characters

Characters coded in ASCII.

■ Counter

Delimiter 1 byte 1Ch	Counter number 01 to 02 1 byte - xxh	Delimiter 1 byte 1Ch

■ Autodating 1

Delimiter 1Ah	One or more autodating items	Delimiter 1Ah

Autodating items:

Autodating 1

41h 42h	= seconds (00 to 59)	(2 hex bytes)
43h 44h	= minutes (00 to 59)	(2 hex bytes)
45h 46h	= hours (00 to 23)	(2 hex bytes)
47h 48h	= 12/24 hour mode (AM/PM)	(2 hex bytes)
49h 4Ah	= day of month (01 to 31)	(2 hex bytes)
4Bh 4Ch 4Dh	= day of year (001 to 366)	(3 hex bytes)
4Eh 4Fh	= week of year (01 to 53)	(2 hex bytes)
50h 51h	= month of year (01 to 12)	(2 hex bytes)
52h 53h 54h	= month of year in letters of current language (JAN to DEC) *	(3 hex bytes)
55h 56h	= year (00 to 99)	(2 hex bytes)

* Only for languages using Latin characters.

Postdate 1

57h=	postday of month (01 to 31)	(2 hex bytes)
58h		
59h	= postday of year (001 to 366)	(3 hex bytes)
5Ah		
5Bh		
5Eh	= postweek of year (01 to 53)	(2 hex bytes)
5Dh		
5Eh	= postmonth of year (01 to 12)	(2 hex bytes)
5Fh		
60h	= postmonth of year in letters of	(3 hex bytes)
61h	current language (JAN to DEC) *	
62h		
63h	= postyear (00 to 99)	(2 hex bytes)
64h		
65h	= time code in letters (A to Z)	(1 hex byte)
66h	= time code in digits (01 to 99)	(2 hex bytes)
67h		
68h	= time code in letters (A to Z without O and I)	(1 hex byte)
69h	= day of the week in digits 1 to 7	(1 hex byte)
6Ah	= postday of the year (modulo 1000)	(3 hex bytes)
6Bh		
6Ch		
6Dh	= delimiter (" : ") colon	(1 hex byte)
6Eh	= delimiter (" / ") slash	(1 hex byte)
6Fh	= delimiter (" . ") period	(1 hex byte)
70h	= delimiter (" ") space	(1 hex byte)

Items are received as bytes used to address a table containing the autodating items to be printed.

* Only for languages using Latin characters.

To avoid having too many blocks, the 4 delimiters ("/", ":", ".", " ") are included in the autodating items. These delimiters are fixed.

■ Autodating 2

Delimiter 1 byte 1Bh	One or more autodating items	Delimiter 1 byte 1Bh

Postdate 2

41h-42h	= postday of month (01 to 31)	(2 hex bytes)
43h-44h-45h	= postday of year (001 to 366)	(3 hex bytes)
49h-4Ah	= month of year (01 to 52)	(2 hex bytes)
4Bh-4Ch	= postmonth of year (01 to 12)	(2 hex bytes)
4Dh-4Eh	= postyear (00 to 99)	(2 hex bytes)
52h-53h-54h	= postmonth of year in letters (JAN to DEC)	(3 hex bytes)

Tables of parameters

55h-56h-57h	= hours from autodating table	(3 hex bytes)
58h-59h-5Ah	= minutes from autodating table	(3 hex bytes)
5Bh-5Ch-5Dh	= month of year from autodating table	(3 hex bytes)
5Eh-5Fh-60h	= days of week from autodating table	(3 hex bytes)
61h-62h-63h	= days of month from autodating table	(3 hex bytes)
64h-65h-66h	= days of year from autodating table	(3 hex bytes)
67h-68h-69h	= weeks of year from autodating table	(3 hex bytes)
6Ah-6Bh-6Ch	= years from autodating table	(3 hex bytes)
70h	= delimiter (" : ") colon	(1 hex byte)
71h	= delimiter (" / ") slash	(1 hex byte)
72h	= delimiter (" . ") period	(1 hex byte)
73h	= delimiter (" ") space	(1 hex byte)

REMARQUE *Items are received as bytes used to address a table containing the autodating items to be printed.*

Use of tables:
- A table of 1 to 3 characters is associated with each parameter. The number of characters printed is determined by the message items.
- If an item in the table is equal to 00, it is not printed.

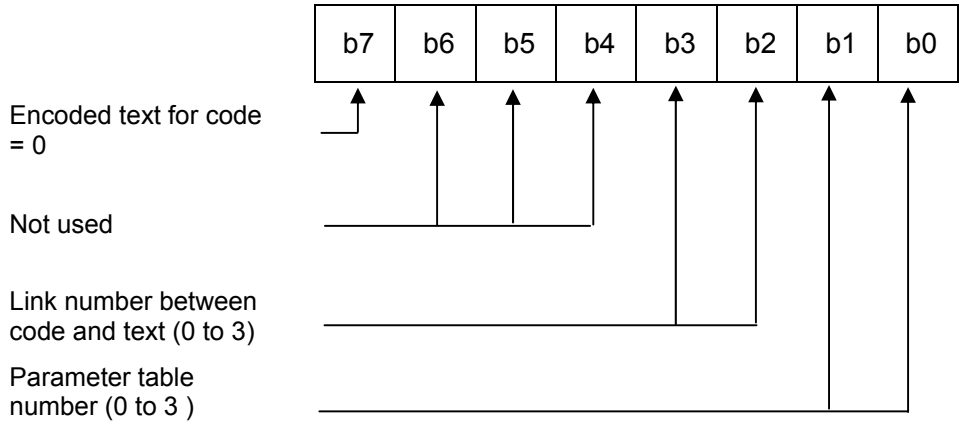
■ Bar codes and Datamatrix

Encoded code to be printed:

Delimiter 1Fh	Definition of code 1 byte	Items to encode	Delimiter 1Fh

Definition of code

A maximum of 4 codes per message can be printed. Their parameters are explained in the "Variable item parameters" section. In the following order:
code 1, code 2, code 3 and code 4.
The code number is used to select a code type with the corresponding characteristics (height, width, etc.).



. Item to encode:

- symbols:

Symbols as ASCII characters

Details of data

- autodating items:

Delimiter 1Ah	AUTODATING	Delimiter 1Ah	See previous section "Autodating"

- or extended autodating items:

Delimiter 1Bh	EXTENDED AUTODATING	Delimiter 1Bh	See previous section "Autodating"

- counters:

Delimiter 1Ch	Counter number 01 to 15 1 byte xxh	Delimiter 1Ch

- external variables:

Delimiter 12h	Text to modify n bytes	Delimiter 12h

. Maximum encoding capacity of Datamatrix code

Code height (number of cells)	8	8	10	12	12	12	16	16	16	18	20	22	24
Code width (number of cells)	18	26	10	12	26	36	16	32	49	18	20	22	24
Number of encoded numeric characters	10	16	6	10	32	44	24	64	98	36	44	60	72
Number of encoded alphanumeric characters	7	12	4	7	24	33	18	48	63	27	33	45	54
Number of characters 8 coded ASCII bits	5	8	3	5	16	22	12	32	49	18	22	30	36

Expansion 1

Height of printed code (number of drops)	8	8	10	12	12	12	16	16	16	18	20	22	24
Width of printed code (number of drops)	18	26	10	12	26	36	16	32	49	18	20	22	24

Expansion 2

Height of printed code (number of drops)	16	16	20	24	24	24
Width of printed code (number of drops)	36	52	20	24	52	72

Plain text code to print:

Delimiter 1Fh	Definition of code 1 byte	Plain text code items to print n bytes	Delimiter 1Fh

The plain text code to print may only be used with distribution codes.

Bit 7 of the code definition byte (code text indicator) is set to 1.

The content is identical to the encoded code printed with an additional item to encode: tabulation. The text may contain fixed or variable items.

The location of the check byte is reserved at the end of the text.

Spaces between characters must be replaced by tabulation blocks.

IMPORTANT *For EAN 128 and code 128, add 20h to the characters to be encoded (except the 4 delimiters).*

■ Tabulation

A tabulation comprises white frames and is used to position blocks horizontally. See the "Definition of lines" section and the "Transmission of an entire message" example.

Delimiter 1Eh	Number of white frames 1 to 255 1 byte	Delimiter 1Eh

NOTE *There is no limit to the number of tabulations; expansion is not taken into account.*

■ External variables

This block is used to mark a portion of text to be modified from the serial link. This function can only be used if an external variable block is first defined in the current message. The text to modify may comprise any printable item.

Any variable items contained in external variables must be complete.

The message structure may not be modified.

There may be a maximum of 10 variables in a message.

If a block defined is not to be modified, the text zone to modify must be equal to 0 bytes.

Delimiter 12h	Text to modify n bytes	Delimiter 12h

NOTE *When printing a bar code with plain text containing external variable zones, these zones must be separated by fixed items.*

■ Graphic block

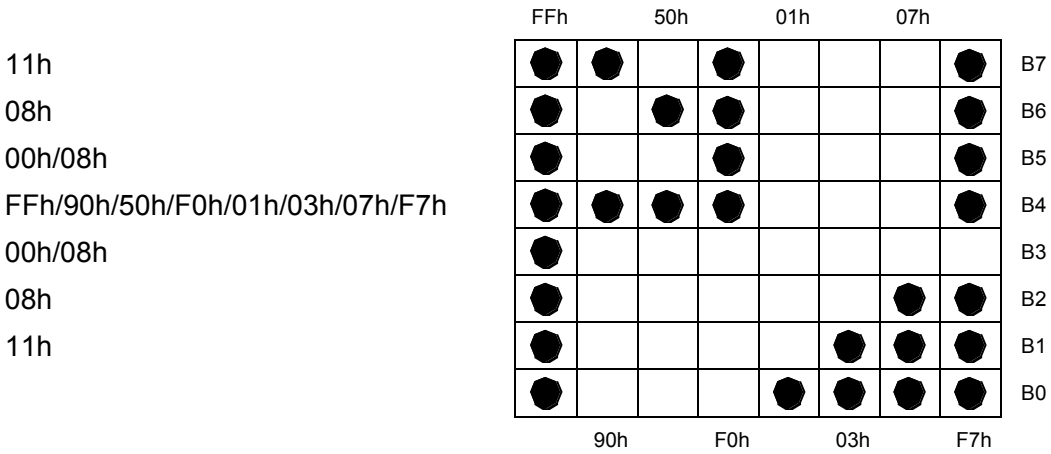
This block is used to insert graphics in a message to print.

The block may not be edited on the terminal.

The current expansion is not taken into account when printing this block.

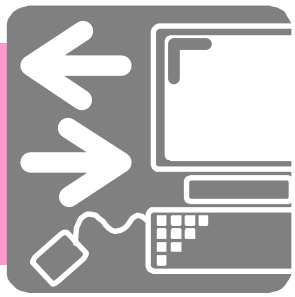
Delimiter 11h	Number of drops in graphic (height) 1 byte	Number of descriptions (width) 2 bytes	Description to print n bytes	Number of descriptions (width) 2 bytes	Number of drops in graphic (height) 1 byte	Delimiter 11h

Example: Protocol to send a graphic with a height of 8 drops



End of message

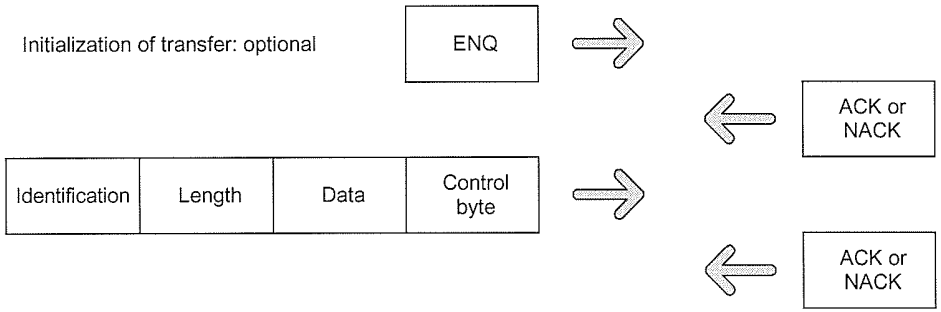
The end of message delimiter is 0Dh.



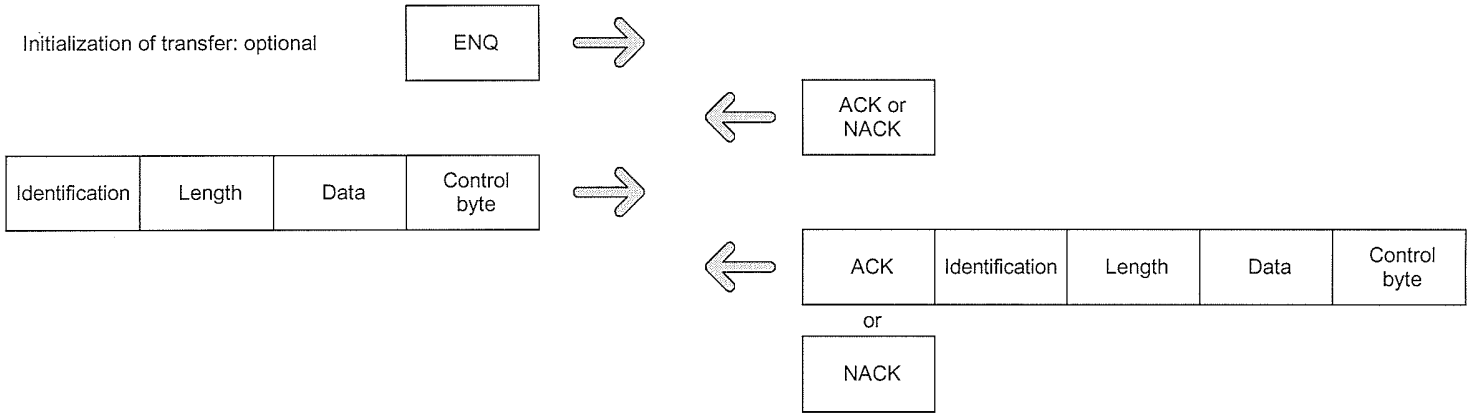
Programming examples and performance

■ Synoptic - General principle of a V24 exchange

CALCULATOR **Data sending from the computer to the printer** **PRINTER**

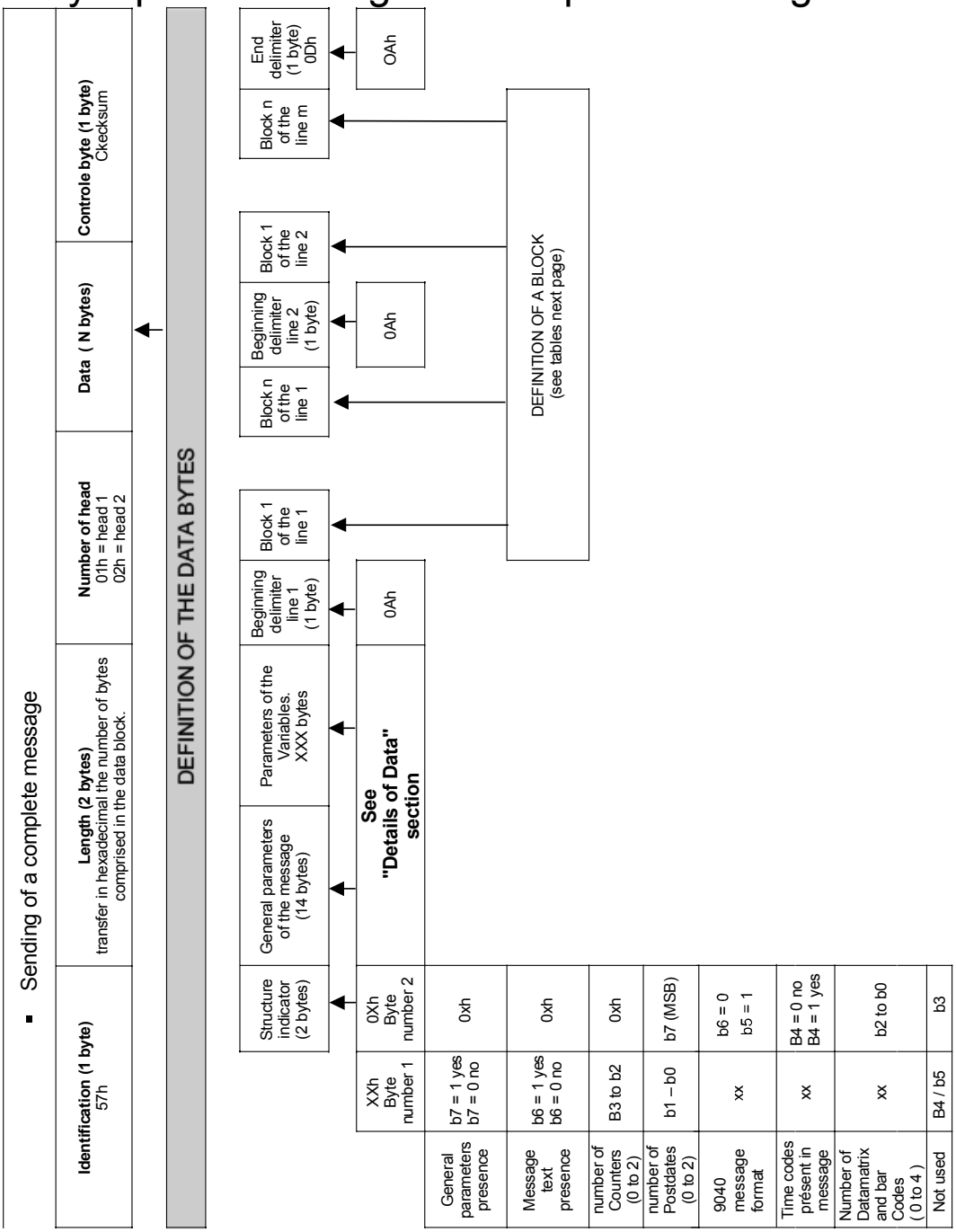


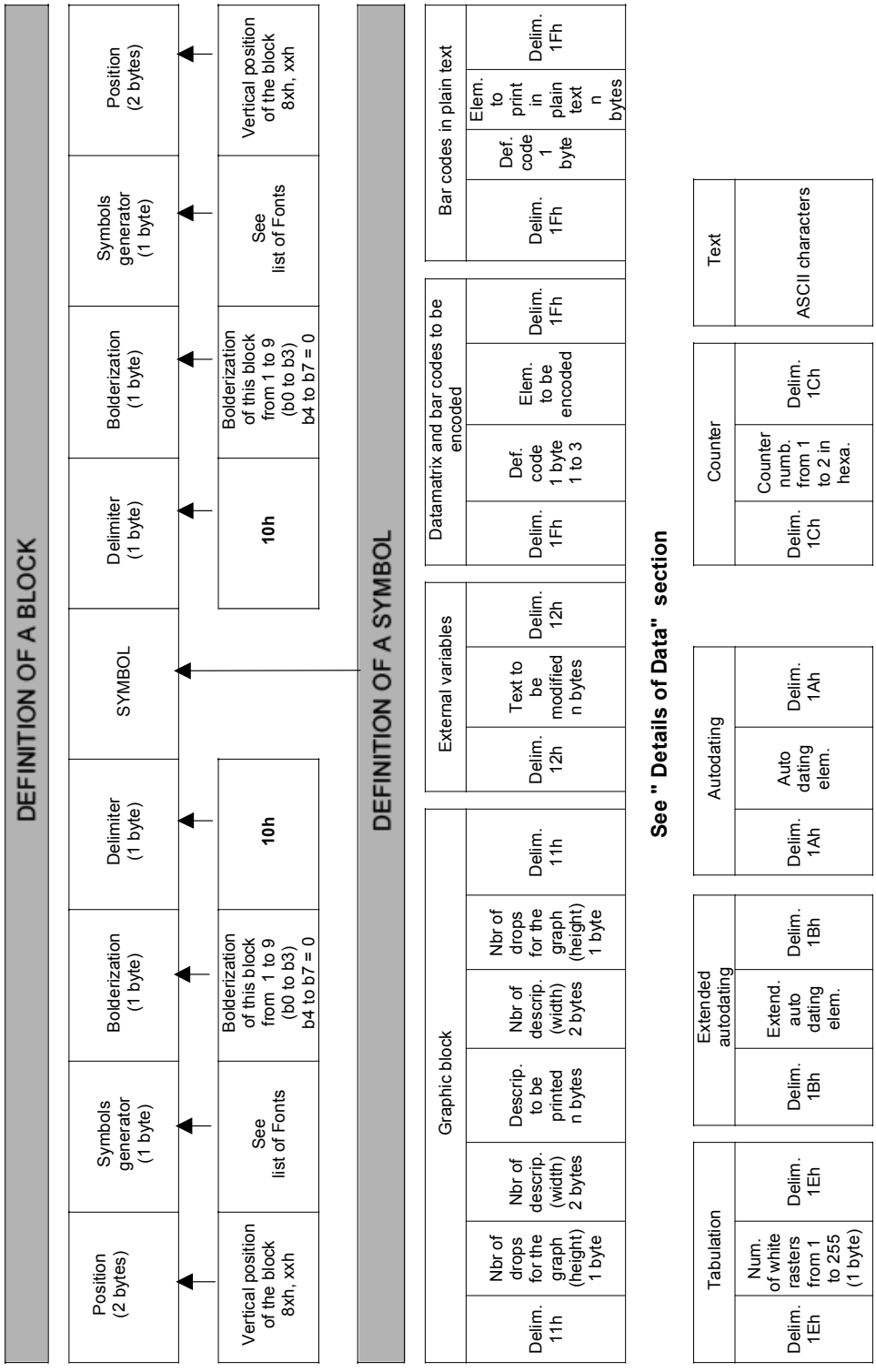
Data request from the computer to the printer



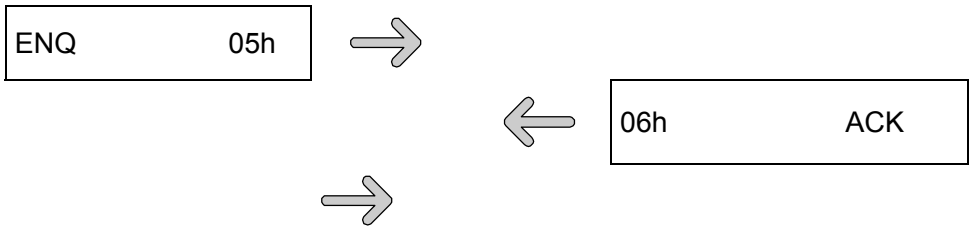
Identification (1 byte)	Length (2 bytes)	Data (0 to n bytes)	Control (1 byte)
Specific for each command. See lists of V24 commands…	The length is the number of bytes comprised between the length and the checksum byte.	Zero byte in case of request from the calculator of the printer. 1 byte specifying the jet number in case of a request concerning a jet. n bytes without specifying the jet number in case of a sending concerning the printer in general. n bytes following are byte specifying the jet number in case of a sending concerning a jet.	Checksum. This represent an "OR" exclusive of all preceding bytes (identification, length and data bytes).

■ Synoptic - Sending of a complete message




DEFINITION OF A BLOCK
Position (2 bytes)
Symbols generator (1 byte)
Bolderization (1 byte)
Delimiter (1 byte)
SYMBOL
Delimiter (1 byte)
Bolderization (1 byte)
Symbols generator (1 byte)
Position (2 bytes)
Vertical position of the block 8xh, xxh
See list of Fonts
Bolderization of this block from 1 to 9 (b0 to b3) b4 to b7 = 0
10h
10h
Bolderization of this block from 1 to 9 (b0 to b3) b4 to b7 = 0
See list of Fonts
Vertical position of the block 8xh, xxh
DEFINITION OF A SYMBOL
Graphic block
Delim. 11h
Nbr of drops for the graph (height) 1 byte
Nbr of descrip. (width) 2 bytes
Descrip. to be printed n bytes
Nbr of descrip. (width) 2 bytes
Nbr of drops for the graph (height) 1 byte
Delim. 11h
External variables
Delim. 12h
Text to be modified n bytes
Delim. 12h
Datamatrix and bar codes to be encoded
Delim. 1Fh
Def. code 1 byte 1 to 3
Elem. to be encoded
Delim. 1Fh
Bar codes in plain text
Delim. 1Fh
Def. code 1 byte
Elem. to print in plain text n bytes
Delim. 1Fh
See " Details of Data" section
Tabulation
Delim. 1Eh
Num. of white rasters from 1 to 255 (1 byte)
Delim. 1Eh
Extended autodating
Delim. 1Bh
Extend. auto dating elem.
Delim. 1Bh
Autodating
Delim. 1Ah
Auto dating elem.
Delim. 1Ah
Counter
Delim. 1Ch
Counter numb. from 1 to 2 in hexa.
Delim. 1Ch
Text
ASCII characters

■ Programming – Transmission of complete message



Identifier		57h
Length		00h 63h
Head 1		01h
Data:		
- Structure indicator: (general parameters present) (message text present)		C0h 20h
- General parameters:		
message direction	normal	10h
horizontal direction	normal	
vertical direction	normal	
tacho mode	yes	
trigger mode	object	
unit	mm	
- Multitop trigger:	no	00h
- Object top filter	100µs	01h
- Tacho division	05	05h
- Forward margin	16	00h 10h
- Return margin	3	00h 03h
- Interval	3	00h 03h
- Printing speed	256 mm/s	01h 00h
- Reserved	0	00h 00h

- Text:	
First line identifier	0Ah
Position of first block	80h 01h
Character generator 056	38h
Expansion 1	01h
Text delimiter	10h
P	50h
R	52h
O	4Fh
D	44h
U	55h
I	49h
T	54h
	20h
L	4Ch
E	45h
	20h
Autodating delimiter	1Ah
Day of month (30)	49h 4Ah
Separator	6Eh
Month (09)	50h 51h
Separator	6Eh
Year (00)	55h 56h
Autodating delimiter	1Ah
Text delimiter	10h
Expansion 1	01h
Character generator 056	38h
Position of first block	80h 01h
Position of second block	80h 01h
Character generator 052	34h
Expansion 2	02h

Text delimiter	10h
	20h
P	50h
O	4Fh
I	49h
D	44h
S	53h
	20h
2	32h
	20h
K	4Bh
G	47h
Text delimiter	10h
Expansion 2	02h
Character generator 052	34h
Position of second block	80h 01h
Second line identifier	0Ah
Position of first block	80h 0Ah
Character generator 052	34h
Expansion 1	01h
Text delimiter	10h
Tabulation delimiter	1Eh
Number of frames: 240	F0h
Tabulation delimiter	1Eh

M	4Dh
A	41h
D	44h
E	45h
	20h
I	49h
N	4Eh
	20h
F	46h
R	52h
A	41h
N	4Eh
C	43h
E	45h
Text delimiter	10h
Expansion 1	01h
Character generator 052	34h
Position of second block	80h 0Ah
End of message delimiter	0Dh
Checksum	2Ch

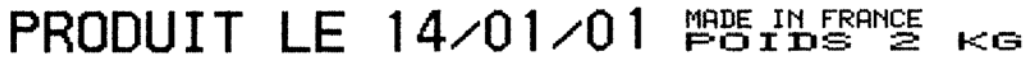
The message printed is as follows:

06h	ACK

PRODUIT LE 30/09/00 MADE IN FRANCE POIDS 2 KG

■ Programming – Transmission of partial message

. Last message printed



. Modification to message by transmitting partial message.

Identifier	59h
Length	00h 1Fh
Head 1	01h
Number of zones to modify	03h
Line number	00h
Position in line	00h 05h
Number of characters to modify	00h 07h
E	45h
M	4Dh
B	42h
A	41h
L	4Ch
L	4Ch
E	45h
Line number	00h
Position in line	00h 2Bh
Number of characters to modify	00h 01h
3	33h
Line number	01h
Position in line	00h 10h
Number of characters to modify	00h 06h
S	53h
U	55h
I	49h
S	53h
S	53h
E	45h
Checksum	0Ch

. New message ready to print:

■ Performance

The performance of the serial link of the printer is measured over a sample of ten messates:

- Message 01: 1 line of 20 static characters
- Message 02: 2 line of 20 static characters
- Message 03: 3 line of 20 static characters
- Message 04: 4 line of 20 static characters
- Message 05: 5 line of 20 static characters
- Message 06: 6 line of 20 static characters
- Message 07: 1 line with a 9-digit counter
  + 1 line with 3 timer elements
- Message 08: 1 line with a 9-digit counter
  + 1 line with 3 timer elements
  + 1 bar code 2/5 of 10 static characters
- Message 09: 1 line with a 9-digit counter
  + 1 line with 3 timer elements
  + 1 bar code 2/5 of 10 static characters
  + 1 line with a EAN 13 code
- Message 10: 1 line with a EAN 13 code

The serial link configuration is as follows:

- 19 200 bauds,
- 1 start bit, 8 bits, 1 stop bit without parity.

Time to send a message from the computer to the printer:

$$T = \frac{\text{Nbr of bytes transmitted x Nbr of bits per bytes transmitted}}{\text{Transmission speed}} \text{ in seconds}$$

■ Results

□ Send message to library:

The time includes reception, writing to the library and processing the data before the object TOP signal is enabled.

□ Send message for printing:

The time includes reception and processing the data before the object TOP signal is enabled. The message is saved in the library.

□ Select message number:

The time includes selection of a message number, reading in the library and processing data before enabling the object TOP signal.

1. Direct mode

	Send message for printing	**Send message to library**	**Select message number**
Message 01	40 ms	46 ms	11 ms
Message 02	59 ms	66 ms	11 ms
Message 03	78 ms	84 ms	12 ms
Message 04	100 ms	107 ms	11 ms
Message 05	119 ms	126 ms	12 ms
Message 06	145 ms	153 ms	11 ms
Message 07	79 ms	85 ms	12 ms
Message 08	105 ms	110 ms	12 ms
Message 09	126 ms	132 ms	13 ms
Message 10	103 ms	110 ms	13 ms

NOTE *If the message sent to the library via the serial connection is the active message, the next print operation will be to print the new message.*

2. Standard mode

	Send message for printing	Send message to library	Select message number
Message 01	57 ms	527 ms	560 ms
Message 02	79 ms	542 ms	557 ms
Message 03	100 ms	571 ms	568 ms
Message 04	126 ms	598 ms	561 ms
Message 05	148 ms	619 ms	561 ms
Message 06	178 ms	628 ms	576 ms
Message 07	101 ms	550 ms	564 ms
Message 08	131 ms	590 ms	564 ms
Message 09	155 ms	428 ms	579 ms
Message 10	130 ms	590 ms	567 ms

***CAUTION**:* *It is important to stress that performance can vary in standard mode depending on the space available on the disk on chip. The values shown are therefore for guidance only.*

Parallel link
- Presentation

Parallel link - Presentation

Parallel link - Presentation

■ Introduction

The Parallel Interface can be used to quickly select and print a message stored in the library.

The "Message selection" and "Message library" options are required for this method of operation.

The printer's display is not refreshed when the printer is used in this way.

■ Parallel link characteristics

Signals transmitted on the parallel link

8 data input signals (D0 to D7) are used to select the message number to print.

The "DTOP" input signal is used to validate the active message number in memory and trigger printing.

The "SPROG" output signal indicates that the printer has started printing.

NOTE *As the input/output signals are photocoupled on the industrial interface board, an electrical reference wire is needed for each signal (see figure 2).*

Specifications for levels transmitted

The active level (logic 1) is between 9 and 24 Volts DC.

The inactive level (logic 0) is between 0 and 2 Volts DC (see figure 1).

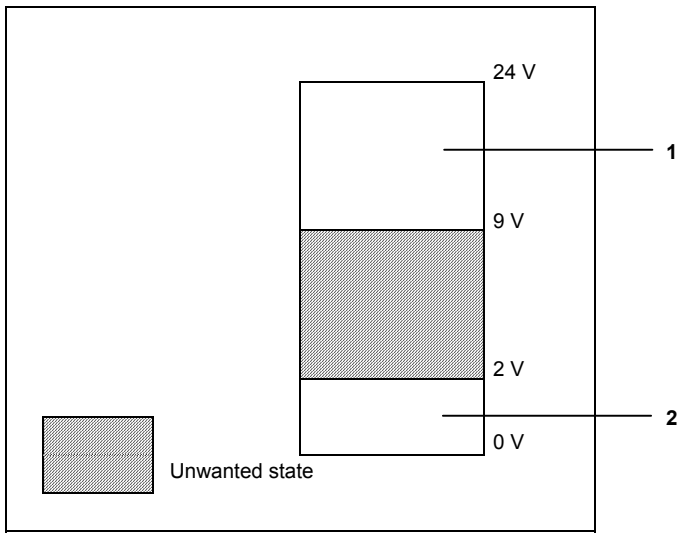
The permitted input current is between 9 and 25 mA.

The input frequency must not exceed 10 kHz.

Figure 1: Permitted voltage levels

1 Active level (logic 1)

2 Inactive level (logic 0)



■ Connection diagrams

To access the industrial interface board, unscrew the two mounting screws in the printer's rear compartment.

Pass the connection cable through one of the cable clamps and attach the wires to the corresponding terminal block.

■ Terminal block B2: Print head 1

TERMINAL		MARKED	SIGNAL	I/O	COMMENTS
B2-4	J4-5	TOP1	DTOP1	I	Head 1 object detection cell, positive terminal.
B2-3	J4-6	CTP1	COMDTOP1	I	Cell, negative terminal.
B2-6		VAL1	VALIMP1	I	Head 1 object detection cell validation input, positive terminal^.
B2-5		CVAL1	COMVALIMP1	I	Object detection cell validation, negative terminal.
B2-8	J8-5	TAC1	TACHY1	I	Head 1 encoder input, positive terminal.
B2-7	J8-6	CTC1	COMTACHY1	I	Encoder, negative terminal.
B2-10	J14-4	RAZ1	RAZC1	I	Head 1, set counter 1 to initial value.
B2-9	J14-3	CRZ1	COMRAZC1	I	
B2-12	J14-6	IC1	INCC1	I	Increment or decrement head 1 counter 1 depending on counter parameters.
B2-11	J14-5	CIC1	COMINCC1	I	
B2-14	J14-8	STO1	STOPI1	I	Stop current printing.
B2-13	J14-7	CTO1	COMSTOPI1	I	

■ Terminal block B2: Print head 1 (continued)

TERMINAL		MARKED	SIGNAL	I/O	COMMENTS
B2-16	J14-10	SPR1	SPROG1	O	Printing in progress/busy, including delay, positive terminal.
B2-15	J14-9	CSP1	COMSPROG1	O	Printing/busy, negative terminal.
B2-18	J14-12	FIN1	VALFINCPT1	O	Indication that final counter value attained.
B2-17	J14-11	CFN1	COMVALCPT1	O	
B2-20	J14-14	OPT1	OPTOT1	O	Head 1 optocoupled alarm, positive terminal.
B2-19	J14-13	COT1	COMOPTOT1	O	Head 1 optocoupled alarm, negative terminal.
B2-24	J11-1	D0T1	D0T1	I	Head 1 parallel interface input D0, positive terminal.
B2-25	J11-2	D1T1	D1T1	I	Head 1 parallel interface input D1, positive terminal.
B2-26	J11-3	D2T1	D2T1	I	Head 1 parallel interface input D2, positive terminal.
B2-27	J11-4	D3T1	D3T1	I	Head 1 parallel interface input D3, positive terminal.
B2-28	J11-5	D4T1	D4T1	I	Head 1 parallel interface input D4, positive terminal.
B2-29	J11-6	D5T1	D5T1	I	Head 1 parallel interface input D5, positive terminal.
B2-30	J11-7	D6T1	D6T1	I	Head 1 parallel interface input D6, positive terminal.
B2-31	J11-8	D7T1	D7T1	I	Head 1 parallel interface input D7, positive terminal.
B2-23	J11-9	CDT1	COMDATA1	I	Common for head 1 parallel interface input data signals, negative terminal.
B2-2/32	J11-11/ J14-16/J5-2/J4-1/J8-1	+24V	+24VT1	O	+ 24 Volts for head 1 accessories. Maximum current available: 300 mA.
B2-1/21/22	J11-10/J14-15/J4-2/J8-2	GND	GND		Ground available for head 1 accessories and optocouplers.

■ Terminal B3: Print head 2 (Identical to terminal block B2/head 1)

■ Photocoupled inputs and outputs

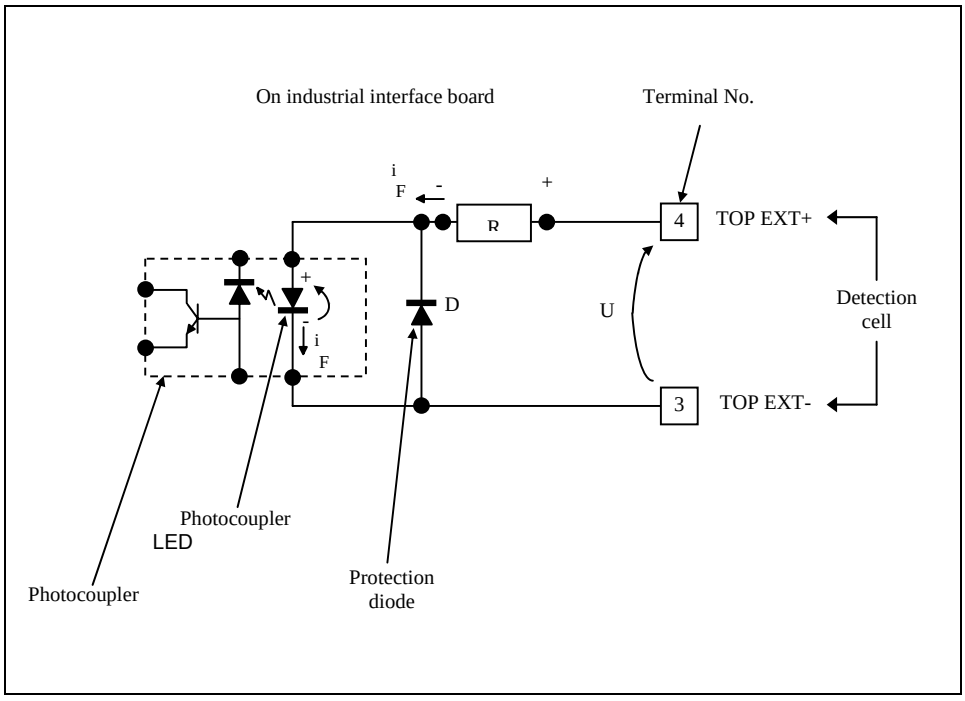
The parallel interface inputs and outputs are photocoupled.

Example wiring: object detection

DTOP 4 ——— + signal from detection cell

CDT 3 ——— - signal from detection cell

Figure 2: Diagram of photocoupled input



The signal generated must be positive relative to the common.

Parallel link - Message selection

Parallel link – Message selection

Parallel link – Message selection

■ Selecting a message from the library

Signals D0 to D7 (representing an 8-bit byte) indicate the number of the active message number and the coding type.

A new message to be printed is validated and printed by sending the DTOP signal

There are three possible ways of coding the message number.

BCD code for message number

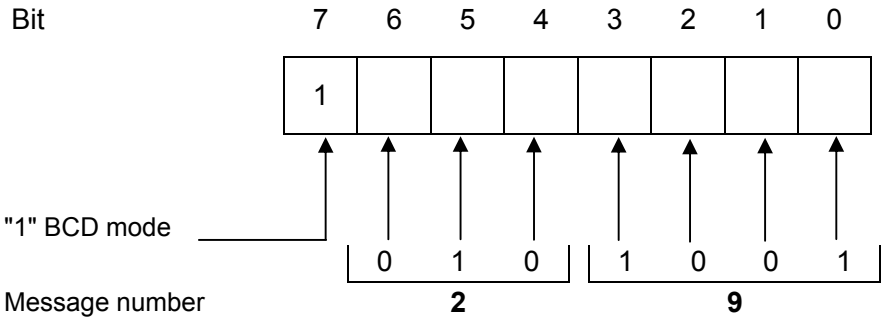
BCD mode (Binary Coded Decimal, base 10) uses 4 bits to express a value from 0 to 9 (0000 to 1001 binary).

The unit digit for the message number is represented by bits 0, 1, 2 and 3.

The tens digit for the message number (0 to 7) is represented by bits 4, 5 and 6.

Bit 7 **must** be set to 1.

Example: request for message 29.



"1" = active level

"0" = inactive level

NOTE *In this mode message numbers 1 to 79 may be selected.*

Parallel link – Message selection

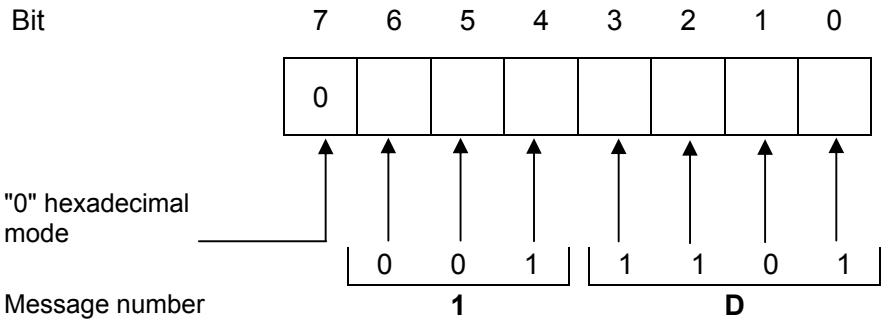
Hexadecimal code for message number

Hexadecimal mode (base 16) is coded in 4 bits with values from 0 to F (0000 to 1111 in binary).

Bits 0 to 6 are used for the message number

Bit 7 **must** be set to 0.

Example: Request for message 29 (1D in hexadecimal).



"1" = active level

"0" = inactive level

NOTE *In this mode message numbers 1 to 127 may be selected.*

Reverse message direction option

If the printer has the "reverse message direction" option, the message number must be coded in hexadecimal.

Bit 7 is used to reverse the message printing direction.

0 = normal direction / 1 = reverse message direction.

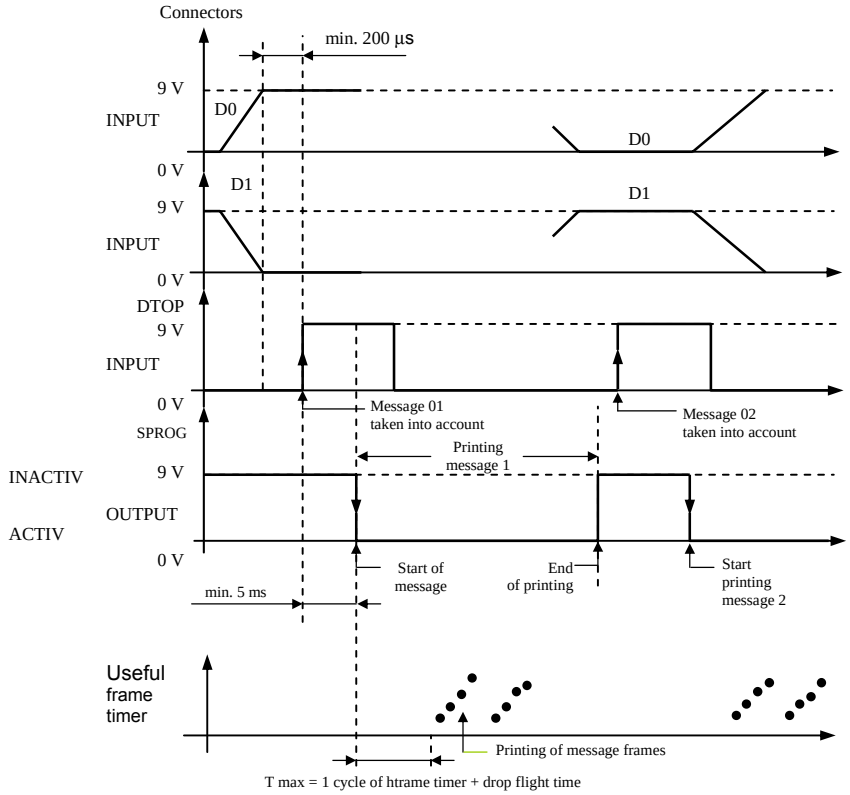
Parallel link – Message selection

■ Diagram of input signals

□ Select message 1: number 1.

□ Select message 2: number 2.

Data bits 2 to 7 are set to 0.



The minimum time between signals D0 to D7 being stable and the DTOP signal is 200 µs.

The DTOP signal may be dropped as soon as the SPROG signal is active.

The SPROG signal becomes active at least 5 ms after the DTOP is received and remains active while the message is printed. It returns to inactive as soon as the printer is available again for a new message.

Parallel link – Message selection

■ General parallel link operation

To print a message from the library:

□ Present the message number to print on the parallel interface (D0-D7) of the corresponding head.

□ Activated the DTOP signal which:

. memorizes the message number,

. initiates printing.

The SPROG signal is active during printing and becomes inactive once the print cycle is complete.

A print cycle comprises:

□ printing the message,

□ phase detection.

When the parallel interface is used in AUTO mode, the SPROG signal operates as described above for each message printed.

It can therefore be used to change the message even in this trigger mode.

If the printer receives a DTOP signal without the external inputs activated, it prints the last message selected.

If the printer receives an invalid message number, it prints the last message selected.

The message number must be between 1 and the size of the library.

Any numbers greater than the size of the library are not valid.

■ Restriction on parallel interface operation

□ The "Non-double printing" cannot be used with the "Message selection" option.

Parallel link – Message selection

■ Use depending on printer configurations

1.1 (one single-jet head) and 1.2 (one twin-jet head) printers

□ **Connections**:

Head 1 → D0-1 to D7-1, DTOP 1, SPROG 1.

□ **Storage in library:**

Message 1	head 1
Message 2	head 1
Message 3	head 1
Message 4	head 1
Message 5	head 1

. etc.

2.1 (two single-jet heads) and 2.2 (two twin-jet heads) printers

□ **Connections**:

Head 1 → D0-1 to D7-1, DTOP 1, SPROG 1.
Head 2 →D0-2 to D7-2, DTOP 2, SPROG 2.

□ **Storage in library:**

Message 1	head 1
Message 2	head 2
Message 3	head 1
Message 4	head 2
Message 5	head 1

. etc.

Revision

■ Manual updates

. Revision index A corresponds to the first issue of this manual.

. The revision index changes each time the manual is updated.

Date of issue	Revision index documentation	Software revision	Pages changed
09/2006	A	J05/M05	First issue

Manuals Department – Imaje S.A.

A36981-A

Imaje S.A.
Siège social :
9, rue Gaspard Monge
BP 110
26501 Bourg-lès-Valence Cedex
France
Tel.: (33) 04 75 75 55 00
Fax: (33) 04 75 82 98 10
http:// www.imaje.com