EUROMAP 17	**Protocol for Communication between Plastic Processing Machinery or Central Computer and Peripheral Equipment**

Version 1.2, March 2007
(25 pages)

This recommendation was prepared by the Technical Commission of EUROMAP.

Version 1.1: April 1992
Version 1.2: March 2007

Further manufacturers included.

EUROMAP 17

PROTOCOL FOR COMMUNICATION BETWEEN PLASTIC PROCESSSING MACHINERY OR CENTRAL COMPUTER AND PERIPHERAL EQUIPMENT

Version 1.1, Apr. 1992

This recommendation was prepared by the Working Group "Electronic Control of Injection Moulding Machines" of EUROMAP.

Contents

1. General Specifications

1.1 Multidrop Link

- Transmission Standard

  RS 485, half duplex,
  galvanic isolation
  (max. 1200 m without repeater)

- Data Rates

  1200, 2400, 4800, 9600 Baud
  (9600 Baud preferable, selection
  not with this protocol)

- Character Format

  8 bit - ASCII ,
  1 start, 1 parity, 1 stop bit,

  ASCII control characters :
  00 Hex - 1F Hex and FF Hex,
  ASCII text characters:
  20 Hex - FE Hex,

  for binary block transfer:
  00 Hex - FF Hex

- Parity

  even

- Communication Principle

  master - slave
  machine/computer : master
  peripheral equipment : slave

- connector

  Han 3 A,
  master: female connector
  slave : male connector for input,
  female connector for
  output (in parallel)

pin	signal
1	DATA
2	DATA*
3	GND
Shielding	RGND

- cable

  twisted pair cable with common
  shielding, 0.25 mm^2 per wire
  (2 pairs, one for data,
  one for ground)

The protocol defines the necessary procedures for establishment of connection, message transfer and termination of the connection. Messages consist of ASCII characters including non-printable control characters. Only for block transfers there are also binary data allowed. There are two main categories of messages available:

- read from peripheral equipment : R
- write to peripheral equipment : W

1.2 Explanation of Terms

1.2.1 Address = device address = node address

2 bytes : 00 to 99,

ADD1 and ADD2

1.2.2 Control Characters

STX	Start of Text
ETX	End of Text
EOT	End of Transmission
ENQ	Enquiry
ACK	Positive Acknowledgement
NAK	Negative Acknowledgement
ETB	End of Text Block
DLE	Data Link Escape

1.2.3 Data Format for Parameters

- Fixed Format of eight characters for numbers, no space allowed, decimal point also transferred, negative numbers with minus instead of decimal point. If no decimal point and no minus sign is used, it is a positive integer number :

  D1, D2, D3, D4, D5, D6, D7, D8

e. g.	+5.3	5.300000 05.30000 005.3000
	-5.3	5-300000 05-30000 005-3000
	1500	00001500
	-1500	0001500-

- Fixed Format of eight ASCII-characters for names excluding control characters

- binary coded status word

  D1, D2, D3, D4, D5, D6, D7, D8

  D1 .... D8 are ASCII characters representing a hexadecimal digit (0-9, A-F)
  Format :

```
          ---------
bit        0
           1     D8
           2
           3
          ---------
bit        4
           5     D7
           6
           7
          ---------
bit        8
           9     D6
          10
          11
          ---------
bit       12
          13     D5
          14
          15
          ---------
bit       16
          17     D4
          18
          19
          ---------
bit       20
          21     D3
          22
          23
          ---------
bit       24
          25     D2
          26
          27
          ---------
bit       28
          29     D1
          30
          31
          ---------
```

  D1 is used to transfer the most significant nibble of the status word.

  e.g.:

  If bit 0 = 1 and all other bits are 0, then
  D1 ... D8 = 0 0 0 0 0 0 0 1
  (ASCII characters : 30 30 30 30 30 30 30 31 Hex) must be transferred.

1.2.4 Mnemonics

N1, N2 : two characters to specify the channel number as ASCII number (00 - 99),

N3, N4 : two characters to specify the channel number as ASCII number (00 - 99),

C1, C2 : two characters to specify the actual parameter or parameter set that is exchanged.

e.g.

N1	N2	N3	N4	C1	C2	
0	1	1	6	S	A	first setpoint of temperature for 16 chanels
1	7	3	2	H	P	heating proportional band for 16 chanels
0	0	0	0	H	I	heating integral time for a single chanel
0	6	0	9	S	W	status word for 4 chanels
0	3	0	7	M	W	mode word for 5 chanels

not allowed:

N1	N2	N3	N4	C1	C2
0	1	1	7	S	A

1.2.5 Block Check Character

check digit as exclusive or of specified transferred characters

2. Read Parameters from Peripheral Equipment

2.1 Enquiry

EOT STX ADD1 ADD2 N1 N2 N3 N4 C1 C2 ENQ ETX BCC

N1 N2 : starting channel

N3 N4 : ending channel, included

Remark: If only one channel is transferred starting and ending channel has the same number. Maximum channels from starting to ending channel is 16. If no channel is available then channel no. is from 00 to 00.

EOT : Resets all peripheral equipment on the link

BCC : exclusive or of characters excluding STX up to and including ETX

2.2 Valid Response

a) STX ADD1 ADD2 N1 N2 N3 N4 C1 C2

D1 .... D8 (D1 .... D8 D1 ... D8) ETX BCC

(D1 .... D8 D1 ... D8) : optional, depending on numbers of channels

N1 N2 : starting channel

N3 N4 : ending channel, included

Remark: If only one channel is transferred starting and ending channel has the same number. Maximum channels from starting to ending channel is 16. If no channel is available then channel no. is from 00 to 00.

BCC : exclusive or of characters excluding STX up to and including ETX

b) NAK

negative acknowledgement, string and BCC is correct, content incorrect, terminate read parameter

c) ENQ

Slave is not able to answer immediately, no communication error, repeat after a delay

d) No Response

After a time-out of 400 ms, the master tries again up to 3 times maximum, incorrect BCC, incorrect parity, no connection

2.3 Termination

EOT

Master transfers EOT for termination.

3. Write Parameters to Peripheral Equipment

3.1 Establish Connection

EOT STX ADD1 ADD2 N1 N2 N3 N4 C1 C2

D1 ... D8 (D1 .... D8 D1 ... D8) ETX BCC

(D1 .... D8 D1 ... D8) : optional, depending on numbers of channels

N1 N2 : starting channel

N3 N4 : ending channel, included

Remark: If only one channel is transferred starting and ending channel has the same number. Maximum channels from starting to ending channel is 16. If no channel is available then channel no. is from 00 to 00.

BCC : exclusive or of characters excluding STX up to and including ETX

3.2 Responses

a) ACK

positive acknowledgement, string is correctly received with correct BCC and content

b) NAK

negative acknowledgement, string and BCC is correct, content incorrect, terminate write parameter

c) ENQ

Slave is not able to answer immediately, no communication error, repeat after a delay

d) No Response

After a time-out of 400 ms, the master tries again up to 3 times maximum, incorrect BCC, incorrect parity, no connection

3.3 Termination

EOT

Master transfers EOT for termination.

4. Block Transfer

This is to be used for upload and download of data which contain more than one single parameter. The data can be coded in ASCII or binary. The data are transparent to the protocol beside the block transfer for DI, DM, DE and CN.

If an upload or download is started it must be finalized or terminated. There is no mandatory disconnection with reestablishment possible with this protocol.

The block length is 128 bytes. All data must be divided into this block length. Each block obtains a block number of three digits. If the last block is smaller than 128 bytes it will be transferred as a shorter block.

If a byte within a binary block contains the ASCII control characters STX, ETX, EOT, ETB, ENQ, DLE or FF Hex, the byte must be preceeded by the ASCII control character DLE. This character DLE has not to be considered as one of D0 to D127. The BCC is calculated including these DLE characters.

Note: In this case the length of the message is increased by DLE characters.

4.1 Read Blocks of Data from Peripheral Equipment

4.1.1 Enquiry from Master

```
EOT  STX  ADD1  ADD2  N1  N2  N3  N4  C1  C2  P1 ... P8

ENQ  ETX  BCC
```

N1 N2 : starting channel

N3 N4 : ending channel, included

Remark: If only one channel is transferred starting and ending channel has the same number. Maximum channels from starting to ending channel is 16. If no channel is available then channel no. is from 00 to 00.

P1 ... P8 : program name with ASCII-characters, e.g. for handling devices, filled with ASCII-blank if not used,

BCC : exclusive or of characters excluding STX up to and including ETX

with C1 C2

U L (upload), e.g.

4.1.2 Valid Response of Slave

a) STX ADD1 ADD2 N1 N2 N3 N4 C1 C2 P1 ... P8

B1 B2 B3 D0 ... D127 ETB BCC

N1 N2 : starting channel

N3 N4 : ending channel, included

P1 ... P8 : program name with ASCII-characters, e.g. for handling devices, filled with ASCII-blank if not used,

with B1 B2 B3 as block number with numerical ASCII value (000 - 999) starting with block number 000

ETX is used instead of ETB for the last block.

b) NAK

negative acknowledgement, string and BCC is correct, content incorrect, terminate upload

c) ENQ

Slave is not able to answer immediately, no communication error, repeat after a delay

d) No Response

After a time-out of 400 ms, the master tries again up to 3 times maximum, incorrect BCC, incorrect parity, no connection

4.1.3 Further Enquiry and Termination from Master

a) NAK B1 B2 B3

repeat from block number B1 B2 B3 on

b) ACK B1 B2 B3

acknowledge correct block number B1 B2 B3

c) EOT

terminate upload

4.2 Write Blocks of Data to Peripheral Equipment

4.2.1 Establish Connection from Master

EOT STX ADD1 ADD2 N1 N2 N3 N4 C1 C2 P1 ... P8

B1 B2 B3 D0 ... D127 ETB BCC

N1 N2 : starting channel

N3 N4 : ending channel, included

Remark: If only one channel is transferred starting and ending channel has the same number. Maximum channels from starting to ending channel is 16. If no channel is available then channel no. is from 00 to 00.

P1 ... P8 : program name with ASCII-characters, e.g. for handling devices, filled with ASCII-blank if not used,

BCC : exclusive or of characters excluding STX up to and including ETB

with C1 C2

D L (download), e.g.

with B1 B2 B3 as block number with numerical ASCII value (000 - 999) starting with block number 000

ETX is used instead of ETB for the last block.

4.2.2 Valid Response of Slave

a) ACK

positive acknowledgement, string is correctly received with correct BCC and content

b) NAK

negative acknowledgement, string and BCC is correct, content incorrect

c) ENQ

Slave is not able to answer immediately, no communication error, repeat after a delay

d) No Response

After a time-out of 400 ms, the master tries again up to 3 times maximum, incorrect BCC, incorrect parity, no connection

4.2.3 Termination from Master

EOT

Master transfers EOT for termination.

5. Standard Question and Standard Answer

The purpose of this feature is to have a quick polling procedure of the master.

5.1 Standard Question

This is the polling of the slaves by the master. It is done with the procedure "Read Parameters from the Peripheral Equipment" with C1 C2 = F F .

5.2 Standard Answer

This is the valid response to the standard question with
C1 C2 = F F and

```
D1 = N1
D2 = N2
D3 = C1 (requested mnemonic)
D4 = C2 (requested mnemonic)
D5 = 0
D6 = 0
D7 = 0
D8 = 0 = no service requested
     1 = parameter read or upload requested
     2 = parameter write or download requested
     3 = reinitialize ( e.g. download complete data set or all
                        parameters )
```

For the specified channel no. and parameter the action equivalent to D8 is requested.

e.g. : If any bit changes in the SW automatically the standard answer with D3 D4 = S W and D8 = 1 is generated from the peripheral equipment.

If actual values change this method is not valid.

A request for any service through the standard answer is only transferred once.

6. Units

C1 C2 = U N for this purpose.
D1 .... D8 = 00000000 for metric units
= 00000001 for imperial units

7. Upload of the Device Identification

C1 C2 = D I (Device Identification) for this purpose. The block transfer with ASCII characters is used.

D0 D1 D2 from 0 0 0 until 9 9 9 as numerical value is used for the type of peripheral equipment. D0 is equal to the subgroups as built up.

D0 D1 D2	type of peripheral equipment
1 0 1	temperature controllers, hot runner controllers, heating and cooling equipment
1 0 2	chillers
2 0 1	dryers
2 0 2	drying bins
2 0 3	dosing and mixing units
2 0 4	hopper loaders
2 0 5	central material feeding systems
2 0 6	silo systems
3 0 1	handling devices
3 0 2	automatic mould changing systems
4 0 1	equipment for on-line quality control

D3 D4 D5 from 0 0 0 until 9 9 9 as numerical value is used for the manufacturer. 0 0 0 is for a non registered manufacturer.

D3 D4 D5	manufacturer
0 0 1	Acim Jouanin
0 0 2	Autotherm
0 0 3	AZO
0 0 4	B. M. B.
0 0 5	Banburg Plastic
0 0 6	Battenfeld
0 0 7	Billion
0 0 8	B.M. Biraghi
0 0 9	Bucher-Guyer
0 1 0	C K Consultants (Plastic)
0 1 1	Cerco Semip
0 1 2	Cincinnati Milacron
0 1 3	Clayton Plastics
0 1 4	Codim DK
0 1 5	Colortronic
0 1 6	Comat DME
0 1 7	Conair Churchill
0 1 8	Construcciones Margarit
0 1 9	Dal Maschio
0 2 0	Diapam Industrial, S.A.
0 2 1	Engel
0 2 2	Ero Electronic
0 2 3	Eurotherm
0 2 4	Ewikon
0 2 5	Frigomeccanica
0 2 6	Gefran
0 2 7	Gosewehr
0 2 8	Gossen
0 2 9	GWK
0 3 0	Hasco
0 3 1	HB-THERM (Grossenbacher Apparatebau)
0 3 2	Hekuma
0 3 3	Hidrometal
0 3 4	Industrial Somar
0 3 5	Industrias Fiser
0 3 6	Interproind
0 3 7	Intron
0 3 8	Iqap-Lap, S.A.
0 3 9	Italtech
0 4 0	John Brown Plastics
0 4 1	Klöckner Ferromatik Desma
0 4 2	Krauss Maffei
0 4 3	Krupp Formaplast
0 4 4	La Catalana del Fred, S.A.
0 4 5	Mann & Hummel
0 4 6	Mannesmann Demag
0 4 7	Maquinas del Frio Industrial, S.A. "Mafrin"
0 4 8	Marrodan y Rezola
0 4 9	Mateu y Sole
0 5 0	Meplas, S.A.

D3	D4	D5	manufacturer
0	5	1	Metalmeccanica Plast
0	5	2	MIR
0	5	3	Motan
0	5	4	Negri Bossi
0	5	5	Netstal
0	5	6	Novapax
0	5	7	Nuova Plastic Metal
0	5	8	Oima
0	5	9	Philips
0	6	0	Piovan
0	6	1	Plastic Service
0	6	2	Plastimac
0	6	3	Plastmaschinenwerk Schwerin
0	6	4	Presses Kap
0	6	5	Realpress
0	6	6	Regloplas
0	6	7	Reis
0	6	8	Remak
0	6	9	Remu
0	7	0	Rico Rego
0	7	1	S.I.S.E.
0	7	2	Sandretto
0	7	3	Sächsische Kunststofftechnik
0	7	4	Schuntermann & Benninghoven
0	7	5	Sepro
0	7	6	Simar
0	7	7	Single Temperiertechnik
0	7	8	Somos
0	7	9	Stork
0	8	0	Suhling
0	8	1	Sy.Tra.Ma
0	8	2	Tool-Temp
0	8	3	Tria
0	8	4	Triulzi
0	8	5	Wittmann
0	8	6	Mold-Masters
0	8	7	Corema
0	8	8	Husky
0	8	9	NOVA FRIGO
0	9	0	Gammaflux
0	9	1	Dynisco Hotrunners
0	9	2	Mitsui Machine Tool
0	9	3	Vulcanic

D6 D7 from 0 0 until 9 9 as numerical value is used for the number of existing channels.

D8 D9 from 0 0 until 9 9 as numerical value is used for the number of manufacturer specific mnemonics.

D10 D11 from 0 0 until 9 9 as numerical value is used for the EUROMAP 17 protocol version.

D10	D11	Version
1	1	Version 1.1

D12 .... D28 is used for the manufacturer protocol version.

8. Upload of Mnemonics of Implemented Parameters

C1 C2 = D M (Device Mnemonics) for this purpose. The block transfer with ASCII characters is used.

All the mnemonics of the implemented parameters which are specified in Euromap 17 are transferred.

9. Upload of Mnemonics of Manufacturer specific Parameters

C1 C2 = D E (Device Extension) for this purpose. The block transfer with ASCII characters is used.

All the mnemonics of the manufacturer specific parameters are transferred. Also the unit, read/write specification and a character string can be transferred for each mnemonic. For this the following structure is used :

```
C1   C2   (U1   U2   U3   U4   R/W   Character string of 25 bytes)
```

( ) : optional

```
R/W : 0 for read only values
      1 for write only values
      2 for read or write values
```

U1 ... U4 : Unit , e.g. bar

All fields are left justified. If no information is available the fields are filled with ASCII blank.

10. Upload of active Channels

C1 C2 = C N (Active Channel Number) for this purpose. The block transfer with ASCII characters is used.

All active channel numbers are transferred, each channel number with two numerical ASCII values.

11. Extended Bachus - Naur Form (EBNF) for ASCII Characters

```
ASCIICharacter           = ASCIIControlCharacter |

                             ASCIITextCharacter .
```

```
ASCIIControlCharacter   = NUL | SOH | STX | ETX | EOT | ENQ |
                          ACK | BEL | BS | HT | LF | VT | FF |
                          CR | SO | SI | DLE | DC1 | DC2 | DC3 |
                          DC4 | NAK | SYN | ETB | CAN | EM | SUB
                          ESC | FS | GS | RS | US | DEL  .
ASCIITextCharacters     =   | ! | " | # | $ | % | ' | ( | ) | * |
                          + | , | - | . | / | 0 | 1 | 2 | 3 | 4 |
                          5 | 6 | 7 | 8 | 9 | : | ; | < | = | > |
                          ? | @ | 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 | [ | \ |
                          ] | ^ | _ | ` | 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 |
                          { | | | } | ~ |   | Ç | ü | é | â | ä |
                          à | å | ç | ê | ë | è | ï | î | ì | Ä |
                          Å | É | æ | Æ | ô | ö | ò | û | ù | ÿ |
                          Ö | Ü | ¢ | £ | ¥ | P | ƒ | á | í | ó |
                          ú | ñ | Ñ | ª | º | ¿ |   |   |   |   |
                          ¡ | « | » | Á | Â | À | Ã | Ê | Ë | È |
                          Í | Î | Ï | Ì | Ó | Ô | Ò | Õ | Ú | Û |
                          Ù | Š | Ÿ | – | Ž |   | õ | š | ž | ⁄ |
                          § | ¤ | ' | “ | ‹ | › | ‘ | ’ | – | † |
                          ‡ | ¶ | ‚ | „ | ” | … |   | ` | ´ | ˆ |
                          ˜ | ¯ | ß | ˘ | ˙ | ¨ | ¸ |   | ˝ | ˛ |
                          ˇ | — | Ł | Ø | ı | ł | ø |   |   |   |
                            |   | ã |   |   | ˚ | • | · |   |   |
                            |    .
```

12. Example for Writing of a Setpoint

For a temperature controller with address number 10 with no channels of company Piovan the first setpoint should be set to 220 °C.

ASCII-blank is shown in the examples as character: -

12.1 Upload of Device Identification

```
master : EOT  STX  1  0  0  0  0  0  D  I  -  -  -  -  -  -  -  -

         ENQ  ETX  BCC

slave  : STX  1  0  0  0  0  0  D  I  -  -  -  -  -  -  -  -

         0  0  0  1  0  1  0  5  9  0  0  0  0

         1  1  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0

         ETX  BCC
```

explanation:

D I	: Device Identification
B1 B2 B3	: 0 0 0
D0 D1 D2	: 1 0 1
D3 D4 D5	: 0 5 9
D6 D7	: 0 0 for no additional channels
D8 D9	: 0 0 for no manufacturer specific mnemonics
D10 D11	: 1 1 for EUROMAP 17 protocol version 1.1
D12 .. D28	: 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 for manufacturer protocol version

```
master : ACK  0  0  0
```

12.2 Upload of Mnemonics of Implemented Parameters

```
master : EOT  STX  1  0  0  0  0  0  D  M  -  -  -  -  -  -  -  -

         ENQ  ETX  BCC

slave  : STX  1  0  0  0  0  0  D  M  -  -  -  -  -  -  -  -

         0  0  0  S  A  S  B  R  R  R  T  P  V

         C  O  H  P  H  I  H  D  C  P  C  I  C  D  U  A  L  A

         U  D  L  D  M  O  S  O  U  C  L  C  A  C  S  W  M  W

         ETX  BCC
```

explanation :

```
D M        : Device Mnemonics
S A ...    : Implemented Mnemonics
```

```
master : ACK  0  0  0
```

12.3 Write Parameter to Peripheral Equipment (Unit)

```
master : EOT  STX  1  0  0  0  0  0  U  N  0  0  0  0  0  0  0  0

         ETX  BCC

slave  : ACK
```

explanation: master sets metric unit at address 10

12.4 Write Parameter to Peripheral Equipment (setpoint)

```
master : EOT  STX  1  0  0  0  0  0  S  A  0  0  2  2  0  .  0  0

         ETX  BCC

slave  : ACK
```

explanation; master writes setpoint SA of 220 °C to address 10

13. Example for Communication Flow to a Handling Device

There is a communication between an injection moulding machine and a handling device to be realized with the following functions:

- Storing of a part program from the handling device together with the related parameters for the mould on the disk of the injection moulding machine (upload)

- Loading the part program of the handling device from the disk of the injection moulding machine and transferring it to the handling device (download)

- Quick changing of the part program by altering of the program number in the handling device

- Managing an automatic mould changing

- Displaying of error messages of the handling device on the screen of the injection moulding machine

The above mentioned functions are in detail specified. For this the following abbreviations are used:

```
HD  : handling device
IMM : injection moulding machine
```

13.1 Manual storing of a handling device program on the IMM disk (upload)

Step	Action	C1	C2
1	the storing of the program is activated by entering a IMM program name on the IMM control panel. The used name is IMM specific		
2	IMM reads the ASCII-name of the actual HD-program and stores it in a separate IMM-file	A	N
3	upload of the actual HD-part-program in block mode where P1 ... P8 is the program name of step (2). The HD-program is stored as (one) separate file with the IMM-program number of (1)	U	L
4	IMM reads the checksum of the uploaded HD-program and stores it in the IMM-file of (2)	C	K

Remarks:

- the used IMM program name for storing on the IMM disk has nothing to do with the HD-program name. Mould program and HD program are stored in different files, having the same IMM program name but different extensions (e.g. IMM: 12345.DAT and HD: 12345.SHD)
- the name (2) of the HD program and the checksum (4) are stored in an own file. By this method you are able to ask the HD before download, if the program is available in the HD (see function 2)
- there is only one upload for a certain IMM program name (1) and therefore only one complete part program stored under this name
- the storage of a IMM program can be done in every mode of the IMM. Therefore also the HD must be able to do this function in every mode, even if it is producing

13.2 Manual loading of the HD-program from IMM-disk (download)

IMM and HD are not producing.

Step	Action	C1 C2
1	the function "reading a program from IMM disk" is choosen by the operator	
2	the IMM reads the status word from the HD	S W
3	if the HD is still producing (status word: Bit 0=1), an error message is generated in the IMM and the download is terminated	S W Bit 0
4	after entering a IMM program number (IMM specific) on the IMM operating panel the loading of the program is started	
5	taking the ASCII name and checksum of the new HD program from the separate IMM file	
6	check if program is already available on HD	P S
7	HD is answering the checksum in D1... D8 of the asked program if yes. The ckecksum is compared with the stored one of (5). If equal step 8 is skipped. If program is not available the checksum must be "0"	A S
8	download of the new HD program in block mode, where P1 ... P8 is the program name of (5)	D L
9	activating the new HD program by transferring the ASCII name of (5)	A N

Remarks:

- if the HD needs for security in every case a download, when the program has to be changed, the checksum in the answer of (7) has to be "0"

- the new HD program is activated by transferring the new program name (9), but start of HD moving must be activated by external push button

13.3 Automatic mould changing

Step	Action	C1	C2
1	n cycles before mould changing is started the ASCII name and the checksum of the next HD-program is taken from the next separate IMM file		
2	check if program is already available on HD	P	S
3	HD is answering the checksum in D1 ... D8 of the asked program if yes. The ckecksum is compared with the stored one of (1). If equal steps 5-6 are skipped. If program is not available the checksum must be "0"	A	S
4	download of the new HD program in block mode, where P1 ... P8 is the program name of (1)	D	L
5	if the HD response of a block is ENQ, there is no download during HD production possible. The download is terminated by the IMM and will be tried again at (9)		
6	after last part is produced IMM writes "mould change started" to HD	M Bit	W 5=1
7	HD generates "closing mould" over EUROMAP 12 to IMM, finishes with last part and clears peripheral. IMM starts pushing the mould out of the machine		
8	IMM asks HD: home position reached? Waiting for home position reached	S Bit	W 5=1
9	if download was not possible during production (termination in step 5), make again step 4 at this point, if download is necessary at all		
10	activating the new HD program by transferring the ASCII name of (1)	A	N
11	start cycle after automatic mould change	M Bit	W 2=1
12	HD changes gripper if necessary and waits at production point (over machine)		
13	IMM finishes mould change and waits for "close mould" over EUROMAP 12 from HD		

Remarks:

- With step (5) the HD can control if the download of the new program can be done, while the HD is still producing. If the answer of the first downloaded block is ENQ the download is done at the end of production, if it is needed at all. (see steps 2-3)

- to start with change of the mould, the IMM needs the signal "close mould" via EUROMAP 12 (step 7). Otherwise the IMM can't examine if the HD has left the mould region. Because the HD don't generate this signal at normal production end, the bit 5 in the mode word is to be set for "mould change started" (step 6). This bit is early to be set by the IMM while the last part is taken out of the machine

- with "start cycle after automatic mould change" (step 11) the HD is started from the home position. The command works like an external push button

- with the start of the HD (step 11) the signal "close mould" has to be sent to the IMM via EUROMAP 12. By this the IMM will start with production again. However it would be better to send this signal not before the HD has changed the gripper. Otherwise it might be that the first part after mould change is produced, before the HD is ready to take the part out of the machine

13.4 Displaying of HD error messages

Step	Action	C1	C2
1	request for status word with standard answer		
2	the IMM asks if there is an error in the HD. If no (Bit 1=0, Bit 2=0) steps 3-5 are skipped	S Bit	W 1,2
3	IMM generates an alarm with a IMM specific number		
4	for displaying of the HD error message there is a special page on the screen of the IMM to be choosen		
5	upload of the ASCII file of the HD error message in block mode. For positioning carriage return and feed can be used	U	E

Remarks:

- with quitting an alarm in the IMM there is no automatic new start of the HD allowed. For this there is an external push button to be used

- if the special alarm page is displayed on the screen the error messages are only be refreshed in connection with alarm quitting

Annex : Parameter List

For every type of peripheral equipment a parameter list with 2 characters for the mnemonics C1 and C2 is defined (see annex).

EUROMAP

Europäisches Komitee der Hersteller von Kunststoff- und Gummimaschinen

European Committee of Machinery Manufacturers for the Plastics and Rubber Industries

Comité Européen des Constructeurs de Machines pour Plastiques et Caoutchouc

Comitato Europeo Costruttori Macchine per Materie Plastiche e Gomma

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