HORIBA Medical

ABX Micros 60 / ABX Micros CRP

Hematology Analyzer

Output Format for Host Connection

Ref: RAA031CEN

Output Format for Host Connection

HORIBA ABX SAS
Parc Euromédecine
Rue du Caducée
BP 7290
34184 Montpellier Cedex 4
FRANCE

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Contents

1. Foreword

1.1. Document Update

1.1.1. Revisions

Internal Reference	Software Version used for Documentation	Document Date Issued
RAA031BEN	-	07/2008
RAA031CEN	2.4.x (ABX Micros 60) / 2.5.x (ABX Micros CRP)	02/2022

1.1.2. What's New?

Update	Chapter
Update	Introduction Message Structure Separation Thresholds Packet Type Example of Data Frame
Addition of protocol configuration information	To Configure the Protocol (ABX Micros 60) To Configure the Protocol (ABX Micros CRP)
Addition of date format specification for Italian	Identifier List (Instrument to Host)

2. Introduction

The ABX Format is currently supported to be compliant with existing connections.

Different protocols can be used on HORIBA Medical instrument.

A connection between a computer (host) and a HORIBA Medical instrument can be performed when the protocol, the format description and the connection mode have been properly setup.

Term	Definition	Hexadecimal value
<STX>	Start of frame	$02
<ETX>	End of text. Required at the end of each record.	$03
<LF>	Line feed	$0A
<CR>	Carriage return	$0D
LIS	Laboratory Information System	

3. Protocol Configuration

3.1. To Configure the Protocol (ABX Micros 60)

Access: ***Main Menu*** > ***5 - Setup*** > ***5 - Host options*** > ***1 - Host comm.***

You can choose the protocol format to use.

1. Select the required protocol format:
   - **1 - Format Argos**
   - **3 - Format ABX**
2. Press **Enter** to confirm.

3.2. To Configure the Protocol (ABX Micros CRP)

You can choose the protocol format to use.

1. Press the **Service** key on the operation panel.
2. Press the arrows to select the **F3** function.
3. Press **Enter** while pressing the **Service** key to validate your choice.
4. Press **Enter** while pressing the **Service** key to validate your choice.
5. Press the **Service** key and the arrows to select the **F35** function.
6. Select the required protocol format:
   - **2 - ARGOS**
   - **3 - ABX**
7. Press **Enter** while pressing the **Service** key to validate your choice.

4. ABX Format

The ABX format supports unidirectional or bidirectional connections.

The ABX Micros 60 / ABX Micros CRP instruments use only unidirectional mode.

The ABX format can have a different number of fields according to the transmitted items set up by the user (results, curves, flags, etc.) or to the type of cycle.

Fields sequence is not fixed.

The result identifier is different according to the type of result: patient result ("RESULT"), QC result (QC-RES), etc.

4.1. Protocol Configuration

4.1.1. Message Structure

Unidirectional mode

Instrument	<>	Host	Comment
<STX> + RESULT + <ETX>	>		

Lines structure

Header:

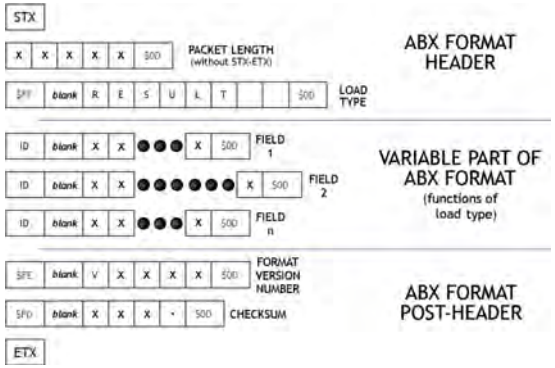
- STX
- Size + carriage return (Size: 5 bytes representing the total amount of the data except STX and ETX)
- Identifier followed by a load type + carriage return (Load: 8 character string preceded by a blank indicating the type of data)

Variable part:

- Identifier followed by the information associated with the load type + carriage return (identifier: 1 byte moving about $21 to $FF, it describes the information type which follows this indicator, always followed by a blank character $20)
- Remainder of the other Identifiers and Information associated with the load type +carriage returns.
- Other load type blocs + associated Information

Post-header:

- Identifier followed by checksum + carriage return (checksum: Sum modulo 65536 of all characters except ETX, STX and all information about checksum (identifier - space - checksum - carriage return) in the hexadecimal format on 4 bytes, preceded by a blank character $20).
- ETX



4.2. Data Transmitted by the Analyzer to the Host

4.2.1. Packet Type

The information described in the packet type allows the specification of the global message content: hematological routine results or statistic results.

Data packet string (8 characters)	Use
RESULT	Hematological result transmission on a routine mode
QC-RES	Result transmission of a control blood
END	Connection end

4.2.2. Identifier List (Instrument to Host)

Identifier	Correspondence	Example	Length	Format
$70 p	Analyzer number	01	2+2+1	Integer
$71 q	Analysis date and time	31/12/99 13h15mn31s[a]	2+19+1	String(19)
$72 r	Analyzer run number	115 or 005CBC06	2+16+1	String(16)
$73 s	Analyzer sequence number			
$74 t	Sampling mode	M: manual (open tube) R: rack (close tube)	2+1+1	String(1)
$75 u	Id # or sample id.	1450302154275-42	2+16+1	String(16)
$76 v	Id. or patient name	SMITH Ronald	2+30+1	String(30)
$77 w	Date of birth	16/03/72 or 03161972	2+8+1	nn/nn/nn or nnnnnnnn
$78 x	Age	7d or 4w or 10m or 54y or 100	2+3+1	String(3)
$79 y	Sex	0, 1 or 2[b]	2+1+1	String(1)
$7A z	Origin	x	2+1+1	String(1)
$7B {	Doctor	Dr Jones	2+15+1	String(15)
$7C |	Department	Cardiology	2+10+1	String(10)
$7D }	Collection date	06/08/99 13h15	2+14+1	nn/nn/nn nnhnn
$7E ~	Comments		2+32+1	String(32)
$7F	Blood type	man[c]	2+16+1	String(16)
$80 ç	Analysis type	A: CBC D: LMG	2+1+1	String(1)
$81 ü	Sample rack type	0: 10 positions 1: 15 positions 2: 32 positions	2+1+1	Integer
$82 é	Number of runs	0, 1, ...	2+1+1	Integer
$83 â	Operator code	Bob	2+3+1	String(3)

[a]: In Italian, the hour separator "h" is replaced by an "a".
[b]: 0 or Blank: Unspecified, 1: Male, 2: Female.
[c]: $7F must be one of the instrument blood type list. If not, it is generated according to the age ($78) or for adults by the sex ($79).

4.2.2.1. Numerical Results Fields

The instrument sends the results to the LIS in standard units.

If one parameter cannot be calculated by the analyzer, the field is replaced with --.--.

Parameter status: Following the numerical field, a first digit gives the counting rejection status or the suspicion, a second one gives the parameter value status according to high and low normal ranges, to high and low extreme values and to the overloading capacities.

Identifier first digit

First digit (letter)	Correspondence
$52 R	Parameter rejected for a counting default
$42 B	Incorrect balance between the counting methods
$53 S	Suspicious parameter value
$20 blank	No anomaly observed

Identifier second digit

Second digit (letter)	Correspondence
$42 B (french) or $4C L (other languages)	Parameter < to the lower extreme value
l$62 b (french) or $6C l (other languages)	Parameter < to the low normal value
$20 blank	Parameter normal value
$68 h	Parameter > to the high normal value
$48 H	Parameter > to the high extreme value
$43 C	Platelet concentrate
$4F O	Parameter exceeding the capacity

Example: 5.5 millions RBC with a counting error in the standard units:

- $32 $20 $30 $35 $2E $35 $30 $52 $68 $0D or
- «2 05.50Rh» + carriage return

CBC numerical result fields list

Identifier	Correspondence	Example	Length
$21 !	WBC	07.40	2+String(7)+1
$32 2	RBC	04.64	2+String(7)+1
$33 3	HGB	14.17	2+String(7)+1
$34 4	HCT	43.95	2+String(7)+1
$35 5	MCV	94.68	2+String(7)+1
$36 6	MCH	30.53	2+String(7)+1
$37 7	MCHC	32.24	2+String(7)+1
$38 8	RDW	12.98	2+String(7)+1
$40 @	PLT	00401	2+String(7)+1
$41 A	MPV	07.94	2+String(7)+1
$42 B	THT	0.318	2+String(7)+1
$43 C	PDW	13.50	2+String(7)+1

LMG numerical result fields list

Identifier	Correspondence	Example	Length
$21 !	WBC	07.40	2+String(7)+1
$22 "	Lymphocytes (#)	02.03	2+String(7)+1
$23 #	Lymphocytes (%)	27.40	2+String(7)+1
$24 $	Monocytes (#)	00.70	2+String(7)+1
$25 %	Monocytes (%)	09.40	2+String(7)+1
$26 &	Granulocytes (#)	04.67	2+String(7)+1
$27 '	Granulocytes (%)	63.20	2+String(7)+1
$32 2	RBC	04.64	2+String(7)+1
$33 3	HGB	14.17	2+String(7)+1
$34 4	HCT	43.95	2+String(7)+1
$35 5	MCV	94.68	2+String(7)+1
$36 6	MCH	30.53	2+String(7)+1

Identifier	Correspondence	Example	Length
$37 7	MCHC	32.24	2+String(7)+1
$38 8	RDW	12.98	2+String(7)+1
$40 @	PLT	00401	2+String(7)+1
$41 A	MPV	07.94	2+String(7)+1
$42 B	THT	0.318	2+String(7)+1
$43 C	PDW	13.50	2+String(7)+1

CRP numerical result fields list (ABX Micros CRP)

Identifier	Correspondence	Example	Length
$4B K	C-Reactive protein	.0600	2+String(7)+1

4.2.2.2. Flag Fields

Flags are transmitted in a comprehensive mode (same presentation than on the screen, that is to say dependant from the language).

They are replaced with blanks when the flag is not detected.

In the following tables, identifiers formats are separated by blanks only for a better comprehension.

Identifier list

Identifier	Parameters	Format	Length
$50 P	WBC or LMG	L1 M1 M2 G1 G2 G3	2+12+1
$53 S	PLT	Pc Sc Mc	2+6+1

For $FB and $FF, the strings having less than 8 characters are completed on the right side by blanks.

4.2.2.3. Pathology Messages Fields

Each pathology is described by a group of 4 characters followed by a blank character, except for the last pathology.

The content of the pathology depends on the chosen language.

Only detected pathologies are transmitted. A common header (????) to the 4 Pathology message groups indicates that the pathological interpretation is impossible.

Identifier	Parameters	Format	Length
$54 T	WBC	String of characters	2+(12(max.)x4)+1
$55 U	RBC	String of characters	2+(7(max.)x4)+1
$56 V	PLT	String of characters	2+(4(max.)x4)+1

4.2.2.4. Other Identifiers

For $FB and $FF, the strings having less than 8 characters are completed on the right side by blanks.

Identifier	Correspondence	Format	Length
$FB	Analyzer name[a]	Character string	2+8+1
$FC	Number	8 hexadecimal bytes	2+8+1
$FD	16 bits checksum value	4 hexadecimal bytes	2+4+1
$FE	Version N° of Identifier list	String of characters: Vx.xx	2+5+1

[a]: 8 characters: MICROS60, CRP

4.3. Histograms and Thresholds

4.3.1. Histograms

Histograms are transmitted on 128 channels, preceded by a blank. They are automatically re-scaled to a 223 maximum amplitude value. The zero amplitude value is $20, the maximum amplitude value is $FF.

Extended format

The extended format includes all the height information relative to each channel. It is constituted by a chart of 256 [RES] entries of 16 bits each. These 512 bytes chart is encoded before being transmitted.

The format is as follows:

- Identifier
- Blank
- Encoding type on 8 characters
- Blank
- Encoded data size on 5 characters
- Blank
- Data
- Carriage return

4.3.2. Separation Thresholds

It is the channel number (decimal value) enclosing areas on the histograms. Each threshold is transmitted on 3 bytes preceded by a blank.

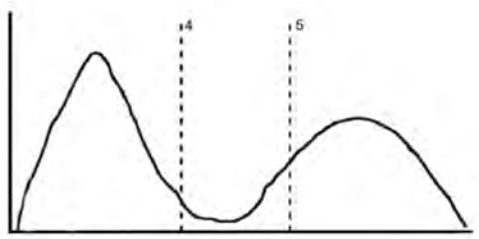
WBC thresholds

1-3 thresholds values are always 0 and concern other instruments.

For the analyzers in LMG mode, the 4-5 thresholds allow the separation of the 3 populations Lymphocytes, Monocytes and Granulocytes.

Example 1: output format of the WBC curve thresholds for an LMG sampling.

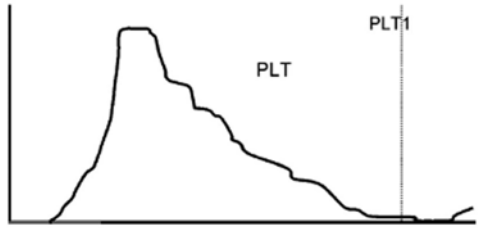
«] 000 000 000 040 060» + carriage return.



4 = Lymphocytes/monocytes separation
5 = Monocytes/granulocytes separation

PLT thresholds

Threshold 1 is the number of the last channel used to calculate the PLT number.



Identifier	Parameters	Format	Length
$57 W	WBC	Amplitude of each channel	2+128+1
$58 X	RBC	Amplitude of each channel	2+128+1
$59 Y	PLT	Amplitude of each channel	2+128+1
$5D]	WBC thresholds	5 thresholds	1+20+1
$5F _	PLT thresholds	1 threshold	1+4+1

Identifier	Parameters	Format	Length
$6C l	WBC	Extended format	See description
$6D m	RBC	Extended format	See description
$6E n	PLT	Extended format	See description
$6F o	BAS	Extended format	See description

4.4. Example of Data Frame

4.4.1. Example of Result Sent by the Instrument

```
ÿ RESULT
p 66
q 28/08/19 18h36mn03s
u 0000000000000001
s 0001
v AUTOSID001
t R
€ D
! 007.1
2 04.82
3 013.1
4 038.9 l
5 00081 l
6 027.1
7 033.6
8 016.0 h
@ 00422 h
A 008.8
# 033.1
% 007.8
' 059.1
" 002.3
$ 000.5
& 004.3
W ':KSQVbzžÆíýÿïÞÊ±-'skbXQMMICEIOMKOSVZ\^Z`gigeegmsvuqsvzqkkqxzxuovxxoimkke`
\TXSSKGEB>::<:421221-)''%#####!#!! ! ! %
X $%%"#"###&),:L^yœÔáÿäíÑÈ³žŒ }{}zrql|hi_dVUURKF=<7320-***'&&%$&#######"!!""!"!!! !! ! &
Y !"#$&'*-0357;?CGJMOPRSUVVXWXXYXXVURNMJHFCB@=;9643110/--,,-+**)))(''&&&%%%%%
%$%$$$$######"""""""!!!!!!!""!!"""""!!""""""""#
S
_ 105
P L1
] 000 000 000 025 035
Q
û MICROS60
þ V2.8
ý A724
```

4.4.2. Example of QC Result Sent by the Instrument

```
ÿ QC-RES
p 44
q 13/10/09 17h15mn00s
u MX099N
s MX099N
v MX099N
```

t R

€ D

! 007.1

2 04.27

3 015.3

4 034.2 l

5 00080

6 035.8 h

7 044.8 h

8 013.5

@ 00225

A 006.9

B .156

C 014.8

030.0

% 007.8

' 062.2

" 002.1

$ 000.5

& 004.5

W """)/4/-++2;Oh^³ØúÿüèÜÌÁ¨}od][XVOMKKBB==;962//24222446642229;;;;?
BFMRXV[]fmtx}"†ŠŠ"˜ ¡˜ª£‚¡˜˜š-'-"† thaaa_XTRKF?=;9 † X "!"! " !"!"%&).5BN^{ ™®ÒÚñýÿþìðãÌ˙ ™…
{h^OF=81.+*)&%&&%##&&$&%%$'%%$%&$#####"#"!!!!! $

Y %-;DMUZaakovz|zvoskkbaZVOLPVQE>ACA><8;:>883/+**+*+**'')+'%%&'&&#%%%%%%
%##"!"!"!""##"""""!! !"##""""!!!!! !!!

S

_ 105

P

] 000 000 000 035 053

û MICROS60

þ V2.8

5. Argos Format

The Argos format is no longer supported on new system generation.

The Argos format is a fixed format included between STX and ETX. These characters are split into fields representing a transmitted item.

Example	STX	Data	CRC	ETX
Result	STX	"R" / ANALYZER # / N°ID / ID / etc.	CRC	ETX
Patient file	STX	"D" / ANALYZER # / N°ID / ID / etc.	CRC	ETX
End of communication	STX	"E" / ANALYZER # / etc.	CRC	ETX

The fields have a fixed length separated by the $0D character.

5.1. Data Transmitted by the Host to the Analyzer

Host	<>	Instrument	Comments
<SOH>	>		Host takes the Line
	<	<ENQ>	
<STX> + FILE + <ETX>	>		
	<	<ACK>	
	.		
	.		
	.		
<STX> + END + <ETX>	>		Host frees the Line
	<	<ACK>	

5.2. Data Transmitted by the Analyzer to the Host

Host	<>	Instrument	Comments
<SOH>	>		Instrument takes the Line
	<	<ENQ>	
<STX> + RESULT + <ETX>	>		
	<	<ACK>	
	.		
	.		
	.		
<STX> + END + <ETX>	>		Instrument frees the Line
	<	<ACK>	

5.3. Results Characteristics

5.3.1. Key

Total ASCII characters emitted: 406

- (-): blank $20
- (]): Carriage return $0D
- CRC: exclusive «OR» of all the transmitted bytes except ETX and STX, then an inclusive «OR» with a $4O value.
- zzzzz: numeric field completed by zeros on the left. Example: 04.55 (decimal separation with a period). When the analyzer does not transmit parameters, the field (zzzzz) replaces (--.--).
- Y: Alphanumeric character from $20 to $7F.
- #: blank ($20) if automatic sampling. Star ($2A) if manual sampling.

Line free format first digit (R: Reject)

First digit (letter)	Correspondence
R	Parameter rejected for a counting default
B	Incorrect balance between the counting methods
S	Suspicious parameter value
blank	No anomaly observed

Line free format second digit (N: Normalities)

Second digit (letter)	Correspondence
L	Parameter < to the low extreme value
l	Parameter < to the low normal value
blank	Parameter normal value
h	Parameter > to the high normal value
H	Parameter > to the high extreme value
O	Parameter exceeding the capacity

5.3.2. Result Format

Result Format

Line	Data	Comments	Length
Line 1	STX ($02)	Start of text	1
	R ($44)	Character «R»	1
	zz]	Analyzer No	2 + 1
Line 2	YYYYYYYYYYYYYYYY]	Identification No	16 + 1
Line 3	YYYYYYYYYYYYYYYY YYYYYYYYYYYYYY]	Identification	30 + 1
Line 4	zz/zz/zz-zzhzzmnzzs#]	Time & Date	20 + 1
Line 5	zzzzz-RN]	WBC	8 + 1
Line 6	zzzzz-RN]	LYM#	8 + 1
Line 7	zzzzz-RN]	LYM%	8 + 1
Line 8	zzzzz-RN]	MON#	8 + 1
Line 9	zzzzz-RN]	MON%	8 + 1
Line 10	zzzzz-RN]	GRA#	8 + 1
Line 11	zzzzz-RN]	GRA%	8 + 1
Line 12	zzzzz-RN]	NEU#	8 + 1
Line 13	zzzzz-RN]	NEU%	8 + 1
Line 14	zzzzz-RN]	EOS#	8 + 1
Line 15	zzzzz-RN]	EOS%	8 + 1
Line 16	zzzzz-RN]	BAS#	8 + 1
Line 17	zzzzz-RN]	BAS%	8 + 1
Line 18	zzzzz-RN]	ALY#	8 + 1

Line	Data	Comments	Length
Line 19	zzzzz-RN]	ALY%	8 + 1
Line 20	zzzzz-RN]	LIC#	8 + 1
Line 21	zzzzz-RN]	LIC%	8 + 1
Line 26	zzzzz-RN]	RBC	8 + 1
Line 27	zzzzz-RN]	HGB	8 + 1
Line 28	zzzzz-RN]	HCT	8 + 1
Line 29	zzzzz-RN]	MCV	8 + 1
Line 30	zzzzz-RN]	MCH	8 + 1
Line 31	zzzzz-RN]	MCHC	8 + 1
Line 32	zzzzz-RN]	RDW	8 + 1
Line 34	zzzzz-RN]	PLT	8 + 1
Line 35	zzzzz-RN]	MPV	8 + 1
Line 36	zzzzz-RN]	PCT	8 + 1
Line 37	zzzzz-RN]	PDW	8 + 1
Line 38	ABCDEFGHIJKLMNOPQRSTU]	WBC 5DIFF flags	21 + 1
Line 39	LMMGGG]	WBC LMG flag	6 + 1
Line 40	PSM]	PLT flags	3 + 1
Line 41	CRC		1
Line 42	ETX ($03)	End of text	1
		Total:	406

WBC 5DIFF Flags (Line 38)

Character	French	English
A	Lg	LL
B	Ln	NL
C	Mn	MN
D	Ng	LN
E	Md	RM
F	Nd	RN
G	No	NO
H	Co	CO
I	Ne	NE
J	X2	X2
K	X3	X3
L	MP	MP
M	LOW	LOW
N	LAS	LAS
O	PIT	PIT
P	Mb	MB
Q	FIT	FIT
R	NRBC	NRBC
S	Bg	LB
T	W1	W1
U	W2	W2

LMG Flags (Line 39)

Character	French	English
L	L1	L1
M	M1	M1
M	M2	M2
G	G1	G1
G	G2	G2
G	G3	G3

PLT Flags (Line 40)

Character	French	English
P	PEC	SCL
S	SCH	SCH
M	MIC	MIC

5.4. Patient File Characteristics

5.4.1. Key

- (]): Carriage return $0D.
- CRC: Exclusive “OR” of all the transmitted bytes, except ETX and STX, then the inclusive “OR” with a $40 value.
- Y, Z: Alphanumeric character from $20 to $7F.

5.4.2. Patient File Format

Line	Data	Comments	Length
Line 1	STX ($02)	Start of text	1
	D ($44)	Character «D»	1
	zz]	Analyzer No	2 + 1
Line 2	YYYYYYYYYYYYYYY]	Identification No	16 + 1
Line 3	YYYYYYYYYYYYYYY YYYYYYYYYYYYY]	Identification	30 + 1
Line 4	zz/zz/zz]	Date of birth	8 + 1
Line 5	YYY]	Age	3 + 1
Line 6	z]	Sex	1 + 1
Line 7	Y]	From	1 + 1
Line 8	YYYYYYYYYYYYYYY]	Doctor	15 + 1
Line 9	YYYYYYYYYY]	Department	10 + 1
Line 10	YYYYYYYYYYYYYY]	Sampling date	14 + 1
Line 11	YYYYYYYYYYYYYYYY YYYYYYYYYYYYYYYY]	Comments	32 + 1
Line 12	CRC		1
Line 13	ETX ($03)	End of text	1
		Total:	147

5.5. End of Communication

5.5.1. Key

- (]): Carriage return $OD.
- CRC: Exclusive “OR” of all the transmitted bytes, except ETX and STX, then the inclusive “OR” with a $40 value.
- zz: Number of the analyzer.

5.5.2. Line Free Format

Line	Data	Comments	Length
Line 1	STX ($02)	Start of text	1
	E ($45)	Character «E»	1
	zz]	Analyzer No	2 + 1
Line 2	CRC		1
Line 3	ETX ($03)	End of text	1
		Total:	7