

Boehringer Mannheim
Miditron[®] *Junior* Urine Analyzer
Host Interface Document
*****Version 1.0a*****

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Introduction

Document Purpose

This document provides the specifications for data transmission of results from a **Boehringer Mannheim Mditron® Junior Urine Analyzer** to an external laboratory host computer via an asynchronous serial connection. Questions concerning this document should be referred to the local **Boehringer Mannheim Technical Support Group** .

Document Conventions

All example data streams will be represented as follows:

STX	;	A	◇	12345670	ETX	99	CR
				01			

Space characters (ASCII 32) are represented by the ◇ symbol. All ASCII values are represented in decimal base. STX, ETX, and CR are the only control characters used, and will be represented by standard acronyms, as shown above. Each field is contained within a box.

Document Contents

This document is divided into sections. For further information about each section, please see:

Topic	See Page
Analyzer Overview	2
Protocol	3
Timing and Handshaking	4
Results	8
Enabling the Host	11
Checksum Calculation	13
Troubleshooting	18
Appendix A - ASCII Chart	19
Appendix B - Parameter Range Table	17

Analyzer Overview

Analyzer Description

The **Boehringer Mannheim Mditron® Junior Urine Analyzer** is a semi-automated reflectance photometer intended for in-vitro semi-quantitative reading of urine test strips. The urine test strips are multiparameter strips used for the determination of specific gravity, pH, leukocytes, nitrite, glucose, ketone, urobilinogen, bilirubin, and blood in urine. The analyzer can store results for up to 150 strips in memory.

Analyzer Operation

Detailed operating instructions are beyond the scope of this document. The following specifications and operational overview are limited to information required for developing a host interface. For more information on the operation and maintenance of the **Boehringer Mannheim Mditron® Junior Urine Analyzer** see the Operator's Manual delivered with the analyzer.

Operation Modes

Several different modes of operation are available, and are listed below.

- Operation without IDs
 - Operation with IDs, Real Time
 - Enter Ids By Reading Tube Bar Codes
 - Enter Ids Manually Using A Bar Code Sheet
 - Operation With IDs And An Internal Worklist
 - Enter IDs by reading tube bar codes
 - Enter IDs manually using a bar code sheet
-

Protocol

Overview

The interface is a simple bidirectional serial interface. All communications originate at the analyzer. The host need only:

- Send a packet (MOR) to tell the analyzer whether it is ready to receive when the analyzer requests attention.
 - Send a packet (MOR) to tell the analyzer that the last result packet was good, and please send another.
 - Send a packet (REP) to tell the analyzer that the last received packet had an error, so please send it again.
-

Packet Types

The **Boehringer Mannheim Mditron® Junior Urine Analyzer** uses different packets to determine the operation of the host interface and to transfer results. The types of packets are:

Packet	Sender	Description	Frame ID	Example
REP	Host or Analyzer	Repeat Request	? (63 ₁₀)	STX?ETX3FCR
SPM	Analyzer	Start Communication	< (60 ₁₀)	STX<ETX3CCR
MOR	Host	Send next packet	> (62 ₁₀)	STX>ETX3ECR
SPE	Analyzer	Results Packet	; (59 ₁₀)	STX;E...Data...ETX?? ¹ CR
END	Analyzer	End Communication	: (58 ₁₀)	STX:ETX3ACR

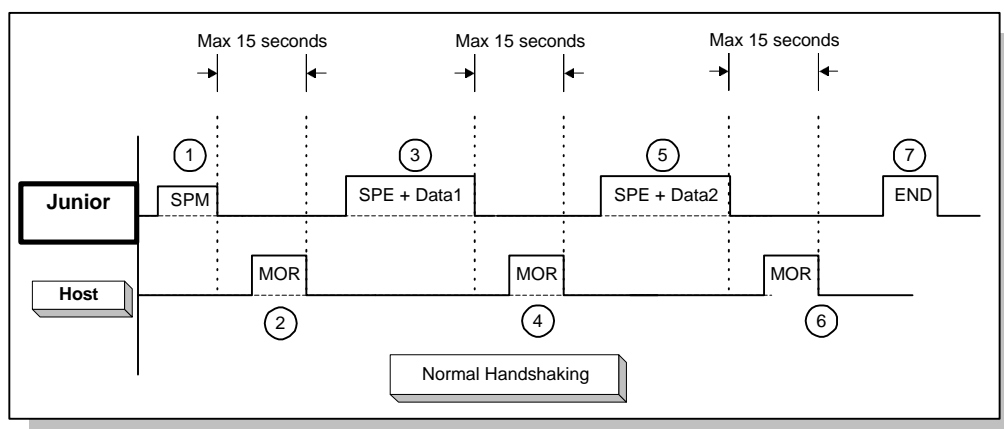
All of the packets have a fixed format and content. The checksums will always be the same with the exception of the SPE, which will vary since SPEs contain different results.

¹ ?? represents the checksum, which will vary depending on the Results Packet content. For more information, see the Checksum Calculation section.

Timing and Handshaking

Description The *Junior* will always act as the ‘master’ in communicating with the host. As the master, the *Junior* always initiates conversations. The following diagrams and tables describe normal and abnormal communication exchanges.

Normal Operation After a series of strips have been processed, the operator can send them to the host. The following diagram and table shows the sequence of events.

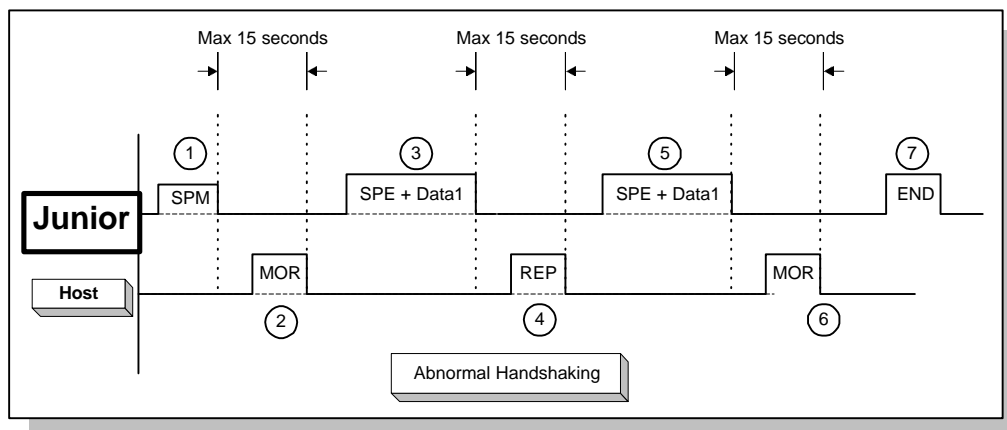


Event	Description
①	The operator presses the ‘reprint/send key’ on the <i>Junior</i> . The <i>Junior</i> sends the SPM message to the host, requesting permission to send results.
②	The host responds with the MOR message, giving the <i>Junior</i> permission to send a result.
③	The <i>Junior</i> sends the SPE message, which contains results for the first sample.
④	The host responds with the MOR message, giving the <i>Junior</i> permission to send the next result.
⑤	The <i>Junior</i> sends the SPE message, which contains results for the second sample.
⑥	The host responds with the MOR message, giving the <i>Junior</i> permission to send the next result.
⑦	The <i>Junior</i> sends the END message, telling the host it is finished sending results. The host does not reply to this message.

Timing and Handshaking, Continued

Abnormal Operation

After a series of strips have been processed, the operator can send them to the host. The following diagram and table shows the sequence of events when trouble occurs, and only one sample is being sent.



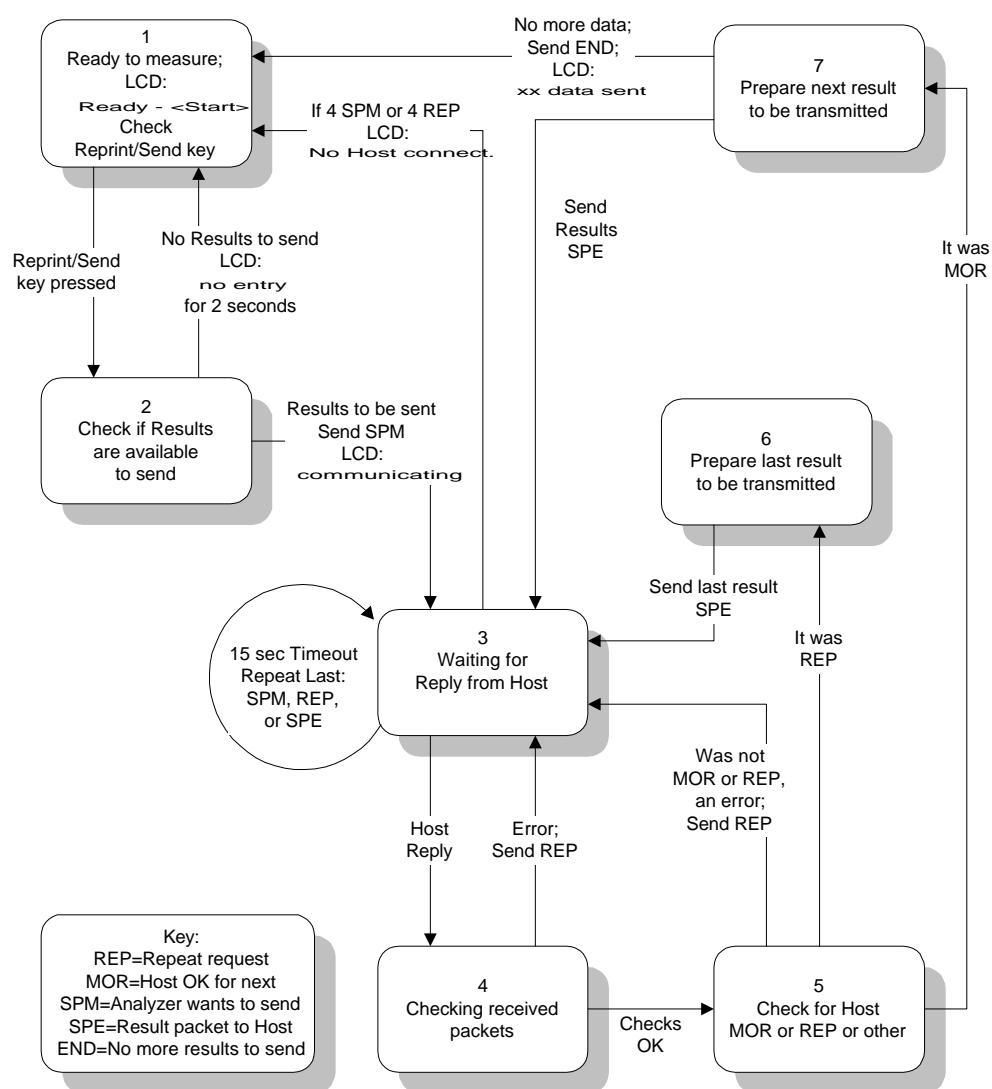
Event	Description
①	The operator presses the 'reprint/send key' on the Junior. The Junior sends the SPM message to the host, requesting permission to send results.
②	The host responds with the MOR message, giving the Junior permission to send a result. The host must respond within 15 seconds.
③	The Junior sends the SPE message, which contains results for the first sample.
④	The host responds with the MOR message, giving the Junior permission to send the next result.
⑤	The Junior sends the SPE message, which again contains results for the first sample.
⑥	The host responds with the MOR message, giving the Junior permission to send the next result.
⑦	The Junior sends the END message, telling the host it is finished sending results. The host does not reply to this message.

- Special Notes**
1. The host should only send the MOR or REP messages, and in response to only the REP, SPE, or SPM packets from the analyzer.
 2. The analyzer will attempt to send it's packets for a total of four times, terminate the communication cycle and post the 'No host connect.' message to the LCD.
 3. Upon receipt of four consecutive REP packets from the host, the analyzer will send the END packet, terminate the communication cycle and post the 'No host connect.' message to the LCD.
-

Timing and Handshaking, Continued

Status Transition Diagram

The diagram below may be helpful in understanding the operation of the host interface when the operator initiates transmission of results to the host.



Results

Result Packet Structure The results packet has a structure as shown below:

					Conven- tional	Conven- tional & Arbitrary	Units Settings Arbitrary	SI	SI & Arbitrary
Start	Stop	Len	Content	Comment	Example 1	Example 2	Example 3	Example 4	Example 5
1	1	1	STX	Start of Text (ASCII 02)	STX	STX	STX	STX	STX
2	2	1	:	Frame ID (ASCII 59)	:	:	:	:	:
3	3	1	E	Function Code (ASCII 69)	E	E	E	E	E
4	4	1	Space		␣	␣	␣	␣	␣
5	14	10	Chars	Sample ID	5462145698	␣␣␣␣␣␣␣␣␣␣	␣␣␣␣␣␣␣␣␣␣	␣␣␣␣␣␣␣␣␣␣	␣␣␣␣␣␣␣␣␣␣
15	15	1	Space		␣	␣	␣	␣	␣
16	20	5	nnnnn	Sequence Number	␣␣␣␣1	␣␣␣10	␣␣␣13	␣␣␣15	␣␣␣18
21	21	1	Space		␣	␣	␣	␣	␣
22	23	2	nn	Day of Month	12	12	12	12	12
24	24	1	Separator	. (ASCII 46)	.	.	.	.	.
25	26	2	nn	Month	01	01	01	01	01
27	27	1	Separator	. (ASCII 46)	.	.	.	.	.
28	29	2	nn	Year	96	96	96	96	96
30	30	1	Space		␣	␣	␣	␣	␣
31	32	2	nn	Measurement Hour	11	13	13	13	13
33	33	1	Separator	: (ASCII 58)	:	:	:	:	:
34	35	2	nn	Measurement Minute	58	27	34	38	43
36	36	1	Space		␣	␣	␣	␣	␣
37	38	2	SG	Specific Gravity Test Name	SG	SG	SG	SG	SG
39	43	5	nnnnn	Specific Gravity Result	1.020	1.020	1.020	1.025	1.025
44	48	5	Chars	Specific Gravity Arbitrary	␣␣␣␣␣	␣␣␣␣␣	␣␣␣␣␣	␣␣␣␣␣	␣␣␣␣␣
49	49	1	Space		␣	␣	␣	␣	␣
50	51	2	PH	pH Test Name	PH	PH	PH	PH	PH
52	54	3	nnn	pH Results	␣␣6	␣␣5	␣␣6	␣␣5	␣␣5
55	59	5	Chars	pH Arbitrary	␣␣␣␣␣	␣␣␣␣␣	␣␣␣␣␣	␣␣␣␣␣	␣␣␣␣␣
60	60	1	Space		␣	␣	␣	␣	␣
61	63	3	LEU	Leukocyte Test Name	LEU	LEU	LEU	LEU	LEU
64	74	11	Chars	Leukocyte Result	␣␣␣␣␣␣␣neg	␣␣␣␣␣␣␣neg	␣␣␣␣␣␣␣␣␣	␣␣␣␣␣␣␣neg	␣␣␣␣␣␣␣neg
75	79	5	Chars	Leukocyte Arbitrary	␣␣␣␣␣	␣␣␣␣␣	␣␣neg	␣␣␣␣␣	␣␣␣␣␣
80	80	1	Space		␣	␣	␣	␣	␣
81	83	3	NIT	Nitrite Test Name	NIT	NIT	NIT	NIT	NIT
84	86	3	Chars	Nitrite Result	pos	neg	␣␣␣	neg	neg
87	91	5	Chars	Nitrite Arbitrary	␣␣pos	␣␣␣␣␣	␣␣neg	␣␣␣␣␣	␣␣␣␣␣
92	92	1	Space		␣	␣	␣	␣	␣
93	95	3	PRO	Protein Test Name	PRO	PRO	PRO	PRO	PRO
96	106	11	Chars	Protein Result	␣␣100␣mg/dl	␣␣␣␣␣␣␣neg	␣␣␣␣␣␣␣␣␣	␣␣␣0.15␣g/l	␣␣␣␣␣␣␣neg
107	111	5	Chars	Protein Arbitrary	␣␣␣2+	␣␣␣␣␣	␣␣␣2+	trace	␣␣␣␣␣
112	112	1	Space		␣	␣	␣	␣	␣
113	115	3	GLU	Glucose Test Name	GLU	GLU	GLU	GLU	GLU
116	126	11	Chars	Glucose Result	␣␣250␣mg/dl	␣␣␣␣␣␣␣norm	␣␣␣␣␣␣␣␣␣	␣␣␣␣␣␣␣norm	␣␣␣␣␣␣␣norm
127	131	5	Chars	Glucose Arbitrary	␣␣␣2+	␣␣␣␣␣	␣␣␣2+	␣␣␣␣␣	␣␣␣␣␣
132	132	1	Space		␣	␣	␣	␣	␣

Results, Continued

Result Packet Structure (continued)

Start	Stop	Len	Content	Comment	Units Settings				
					Conven- tional	Conven- tional & Arbitrary	Arbitrary	SI	SI & Arbitrary
Example 1	Example 2	Example 3	Example 4	Example 5					
133	135	3	KET	Ketone Test Name	KET	KET	KET	KET	KET
136	146	11	Chars	Ketone Results	00000000neg	00000000neg	0000000000	00000000neg	00000000neg
147	151	5	Chars	Ketone Arbitrary	00000	00000	00neg	00000	00000
152	152	1	Space		0	0	0	0	0
153	155	3	UBG	Urobilinogen Test Name	UBG	UBG	UBG	UBG	UBG
156	166	11	Chars	Urobilinogen Results	0000000norm	0000000norm	0000000000	0000000norm	0000000norm
167	171	5	Chars	Urobilinogen Arbitrary	00000	00000	00000	00000	00000
172	172	1	Space		0	0	0	0	0
173	175	3	BIL	Bilirubin Test Name	BIL	BIL	BIL	BIL	BIL
176	186	11	Chars	Bilirubin Results	00000000neg	00000000neg	0000000000	00000000neg	00000000neg
187	191	5	Chars	Bilirubin Arbitrary	00000	00000	00neg	00000	00000
192	192	1	Space		0	0	0	0	0
193	195	3	BLD	Blood Test Name	BLD	BLD	BLD	BLD	BLD
196	206	11	Chars	Blood Results	00000150/ul	00000050/ul	0000000000	00000050/ul	00000050/ul
207	211	5	Chars	Blood Arbitrary	0003+	0002+	0004+	0002+	0002+
212	212	1	Space		0	0	0	0	0
213	232	20	Not Used	Not Used	NAG00000000 0000000000	NAG00000000 0000000000	NAG00000000 0000000000	NAG00000000 0000000000	NAG00000000 0000000000
233	233	1	ETX	End of Text ETX	ETX	ETX	ETX	ETX	ETX
234	235	2	Chars	Checksum	59	86	9D	0D	91
236	236	1	CR	Carriage Return (213)	CR	CR	CR	CR	CR

Results, Continued

Units Settings The Junior system has flexible units settings that include the following: (all examples are taken from the Result Packet Structure table on the previous pages, using the Blood test)

Setting	Result Example	Arbitrary Example
Conventional	◇◇◇◇◇150/ul	◇◇◇3+
Conventional & Arbitrary	◇◇◇◇◇◇50/ul	◇◇◇2+
Arbitrary	◇◇◇◇◇◇◇◇◇◇	◇◇◇4+
SI	◇◇◇◇◇◇50/ul	◇◇◇2+
SI & Arbitrary	◇◇◇◇◇◇50/ul	◇◇◇2+

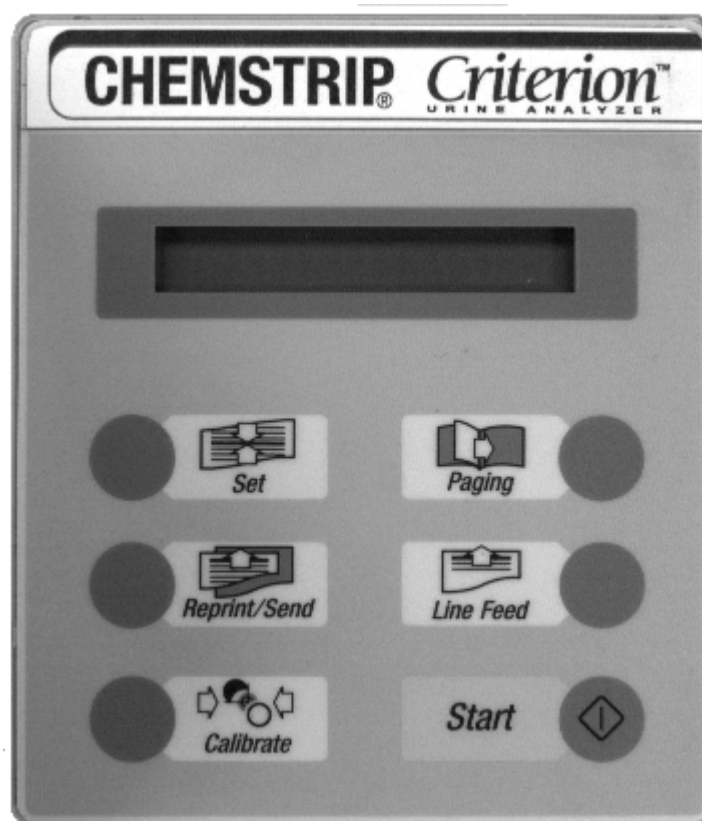
Important Notes

1. The above examples represent different samples.
 2. If the setting is for only Arbitrary, then results are generally blank.
 3. If a particular test has no arbitrary settings for the generated result, then the result will be shown in the result column.
 4. The above settings are operator selectable, and affect both the host and the analyzer print settings.
 5. According to the used language the reported parameter name could be slightly different.
-

Enabling the Host

Overview










The Host interface is enabled using the touch keypad on the Junior system. The following figure illustrates the key pad:



Enabling the Host, Continued

Procedure to Enable the Host

Use the following sequence to enable the host:

When the LCD Reads:	Press
READY - <START>	
Setup	
ENGLISH	
24 hours	
hh:mm	
dd:mm:yy	
Host/pc no	
HOST/PC Yes	
setup reprint	
READY - <START>	Finished

Use of the Reprint/Send Button

Enabling the Host/PC does not automatically send results to the host. The operator must, after analyzing strips, press the Reprint/Send button to send results to the host. Only results that have not previously been sent to the host will be sent.

Cable Connections

The table below summarizes the connections needed for host communication. Do not hook to other pins, unless the optional bar code reader is present.

<i>Junior</i>		Signal Direction	Host		
DTE Signal	9 Pin Female		9 Pin Male	25 Pin Male	DCE Signal
RxD	2	↔	3	2	TxD
TxD	3	⇒	2	3	RxD
GND	5	↔	5	7	GND

Communication Parameters

The required serial interface parameters are listed in the table below.

Parameter	Value
Baud Rate	9600
Word Length	8 bits
Parity	None
Stop Bits	1

Checksum Calculation

Overview

All of the messages from the host are fixed, thus requiring no dynamic calculation of checksums. The host need only send the required packets along with the known checksums. The host can also check the REP, SPM, and END messages against stored messages to ensure integrity.

For the results packets (SPE) however, BM highly recommends that the host interface program uses the checksum to ensure data integrity of the result packets. This section describes how the checksum works.

Algorithm a

This check sum is a kind of longitudinal parity test (Longitudinal Redundancy Check ,LRC) of the bits contained in the data protocol. The protocol is linked bit by bit to XOR. The resulting byte is then split into two bytes (to avoid the occurrence of control characters) and attached to the protocol.

All bytes beginning with STX (inclusive) up to ETX (inclusive) are taken into account in the formation of the LRC. Some laboratory computers have a manufacturer-specific transmit/receive driver implemented which cuts off the STX in protocols and does not allow it to get into the usersoftware. In this case, the user must first switch off block testing in the Host.

LRC-Byte = Byte1 XOR Byte2 XOR Byte3
XOR Bytelastr
LRC1-Byte = high-Nibble (shifted by 4 bits) of the
LRC-Byte OR 30_{16}
LRC2-Byte = low-Nibble of the LRC-Byte OR 30_{16}

Example:

		Bit-No.
		8 7 6 5 4 3 2 1
	1	0 1 1 0 0 0 1 0
	2	0 0 0 0 0 0 1 1
Byte-No.	3	0 0 1 1 0 1 1 0
	4	0 0 1 1 1 0 1 0
	5	0 0 1 1 1 1 1 0

LRC-Byte 0 1 0 1 0 0 1 1

high-Nibble 0 1 0 1
low-Nibble 0 0 1 1

LRC 1 - Byte = 0 0 1 1 0 0 0 0 /* 30_{16} */

```

OR   0 0 0 0 0 1 0 1 /* high-Nibble */
-----
      0 0 1 1 0 1 0 1
=====

```

Checksum Calculation, Continued

```

LRC 2 - Byte = 0 0 1 1 0 0 0 0 /* 3016 */
OR            0 0 0 0 0 0 1 1 /* low-Nibble */
-----
      0 0 1 1 0 0 1 1
=====

```

Further examples: MOR-Protocol: ☺>♥3?
 REP-Protocol: ☺?♥3>
 SPM-Protocol: ☺<♥3=

Algorithm b

This check sum is calculated by adding together the bytes to be transferred, the individual bytes being interpreted as positive, whole numbers. STX, the check sum, ETX and CR are not included in the addition. The result of the addition is taken as modulo 256. The resulting number can be represented by a single byte. The two half-bytes of this number are represented as hexadecimal figures ("0".."9", "A".."F"). Leading zeros are included.

$$CS = (Byte_2 + Byte_3 + \dots + Byte_{Length-4}) \text{ modulo } 256$$

If your software does not have a decimal-hexadecimal routine or function that can return a leading zero, the below algorithms may be helpful.

$$\begin{aligned} CS1\text{-Byte} &= \text{INT}((CS / 16)) + 48 \text{ for } \text{INT}((CS / 16)) \leq 9 \\ &= \text{INT}((CS / 16)) + 55 \text{ for } \text{INT}((CS / 16)) \geq 10 \end{aligned}$$

$$\begin{aligned} CS2\text{-Byte} &= (CS \text{ modulo } 16) + 48 \text{ for } (CS \text{ modulo } 16) \leq 9 \\ &= (CS \text{ modulo } 16) + 55 \text{ for } (CS \text{ modulo } 16) \geq 10 \end{aligned}$$

Example: MOR-Protocol

STX,'>',ETX,'3E',CR

02₁₆ 3E₁₆ 03₁₆ 33₁₆ 45₁₆ 0D₁₆ with
CS = 62 = 3E₁₆

Further examples: MOR-Protocol: ☺>♥3E
REP-Protocol: ☺?♥3F
SPM-Protocol: ☺<♥3C

Checksum Calculation, Continued

Autoadaptation Midityron Jr. is in a position to adapt itself automatically to the test procedure used by the host (checksum a,b). If an error is discovered when checking the test bytes of the receive protocol, the check will be continued using the algorithms of the alternative procedure. If, using the alternative test procedure, the test bytes are recognized as correct, this procedure will be used for all protocols in future. This new setting is retained even after the appliance has been switched off. If the alternative procedure does not recognize any correct test bytes either, an REP protocol is transmitted and there is no change of test procedure.

If, upon startup (i.e. the first time Midityron Jr. is connected up to the host), two different procedures are set, the host must reply to the SPM from Midityron Jr. with an REP or MOR and the relevant test bytes.

Example:

	Midityron Jr.	Host	Remarks:
	/SPM/	----->	(checksum
a)		<----- /MOR/	(checksum
b)	/SPE/+data	----->	(checksum
b)	Henceforth, algorithm b permanently set as the test procedure in Midityron Jr.		
		<----- /MOR/	(checksum
a)		<----- /REP/	(checksum
or			
a)	/SPE/+data	----->	(checksum
a)	Henceforth, algorithm a permanently set as the test procedure in Midityron Jr.		
		<----- /MOR/	(checksum
b)		<----- /REP/	(checksum
or			
b)	/SPE/+data	----->	(checksum
b)			

Henceforth, algorithm b permanently set as the test
procedure in Midityron Jr.

Troubleshooting

Error Messages

If the Junior detects any abnormality during communication, it will display 'No Host connect.' on the LCD screen, and will cease the communication cycle. Refer to the table below for troubleshooting communication problems.

Description	Cause	Remedy
Results are not sent to the host, and 'No Host connect.' is displayed on the LCD.	If the host interface has worked before, but is not now, the host cable may be loose or damaged.	Check the cable to ensure that it is secure, both at the Junior, and at the host.
	If the host has never worked, the cable connections might be incorrect.	Refer to Cable Connections in this document.
	Communication parameters may be set incorrectly at the host side.	Refer to 'Communication Parameters' in this document.
Results are not sent to the host when the Reprint/Send key is pressed, the message 'No Host connect.' <i>does not</i> appear on the LCD, but the results print on the Junior printer	The Junior is not set up correctly for use with a host.	Refer to the 'Procedure to Enable the Host' in this document.
Results are printed when the Reprint/Send key is pressed, but no results are sent to the host, and 'No Entry' is displayed on the LCD.	No results are stored in the Junior that have not been previously sent to the host.	Process more strips.
Some of the results are sent to the host, then 'No Host connect.' is displayed on the LCD.	The host may not be responding in time, or the communications line might be noisy.	Call BM Technical Support

Appendix A - ASCII Chart

Char Hex Dec	Char Hex Dec	Char Hex Dec	Char Hex Dec	Char Hex Dec	Char Hex Dec	Char Hex Dec	Char Hex Dec
NULL 00 00	DLE 10 16	Space 20 32	0 30 48	@ 40 64	P 50 80	` 60 96	p 70 112
SOH 01 01	DC1 11 17	! 21 33	1 31 49	A 41 65	Q 51 81	a 61 97	q 71 113
STX 02 02	DC2 12 18	" 22 34	2 32 50	B 42 66	R 52 82	b 62 98	r 72 114
ETX 03 03	DC3 13 19	# 23 35	3 33 51	C 43 67	S 53 83	c 63 99	s 73 115
EOT 04 04	DC4 14 20	\$ 24 36	4 34 52	D 44 68	T 54 84	d 64 100	t 74 116
ENQ 05 05	NAK 15 21	% 25 37	5 35 53	E 45 69	U 55 85	e 65 101	u 75 117
ACK 06 06	SYN 16 22	& 26 38	6 36 54	F 46 70	V 56 86	f 66 102	v 76 118
BEL 07 07	ETB 17 23	' 27 39	7 37 55	G 47 71	W 57 87	g 67 103	w 77 119
BS 08 08	CAN 18 24	(28 40	8 38 56	H 48 72	X 58 88	h 68 104	x 78 120
HT 09 09	EM 19 25	) 29 41	9 39 57	I 49 73	Y 59 89	i 69 105	y 79 121
LF 0A 10	SUB 1A 26	* 2A 42	: 3A 58	J 4A 74	Z 5A 90	j 6A 106	z 7A 122
VT 0B 11	ESC 1B 27	+ 2B 43	; 3B 59	K 4B 75	[5B 91	k 6B 107	{ 7B 123
FF 0C 12	FS 1C 28	, 2C 44	< 3C 60	L 4C 76	\ 5C 92	l 6C 108	| 7C 124
CR 0D 13	GS 1D 29	- 2D 45	= 3D 61	M 4D 77	] 5D 93	m 6D 109	} 7D 125
SO 0E 14	RS 1E 30	. 2E 46	> 3E 62	N 4E 78	^ 5E 94	n 6E 110	~ 7E 126
SI 0F 15	US 1F 31	/ 2F 47	? 3F 63	O 4F 79	_ 5F 95	o 6F 111	DEL 7F 127

Appendix B - Parameter Range Table, Europe

Parameter	Conv.	SI	Arbitrary
Specific (SG)	1.000	1.000	1.000
	1.005	1.005	1.005
	1.010	1.010	1.010
	1.015	1.015	1.015
	1.020	1.020	1.020
	1.025	1.025	1.025
	1.030	1.030	1.030
pH	5	5	5
	6	6	6
	6.5	6.5	6.5
	7	7	7
	8	8	8
	9	9	9
Leukocytes (LEU)	neg	neg	neg
	25 / μ l	25 / μ l	1+
	100 / μ l	100 / μ l	2+
	500 / μ l	500 / μ l	3+
Nitrite (NIT)	neg	neg	neg
	pos	pos	pos
Protein (PRO)	neg	neg	neg
	25 mg/dl	0.25 g/l	1+
	75 mg/dl	0.75 g/l	2+
	150 mg/dl	1.5 g/l	3+
	500 mg/dl	5 g/l	4+
Glucose (GLU)	norm	norm	neg
	50 mg/dl	3 mmol/l	1+
	100 mg/dl	6 mmol/l	2+
	300 mg/dl	17 mmol/l	3+
	1000 mg/dl	56 mmol/l	4+
Keton (KET)	neg	neg	neg
	5 mg/dl	0.5 mmol/l	1+
	15 mg/dl	1.5 mmol/l	2+
	50 mg/dl	5 mmol/l	3+
	150 mg/dl	15 mmol/l	4+
Urobilinogen (UBG)	norm	norm	neg
	1 mg/dl	17 μ mol/l	1+
	4 mg/dl	68 μ mol/l	2+
	8 mg/dl	135 μ mol/l	3+
	12 mg/dl	203 μ mol/l	4+
Bilirubin (BIL)	neg	neg	neg
	1 mg/dl	17 μ mol/l	1+
	3 mg/dl	50 μ mol/l	2+
	6 mg/dl	100 μ mol/l	3+
Erythrocytes (ERY)	neg	neg	neg
	10 / μ l	10 / μ l	1+
	25 / μ l	25 / μ l	2+

	50 / μ l	50 / μ l	3+
	150 / μ l	150 / μ l	4+
	250 / μ l	250 / μ l	5+