Roche Diagnostics

Urisys 1800

Host Interface Manual

Version 4.0

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VERSION HISTORY

Version	Date	Software version	Modifications
1.0	April 2004	1.0.0.0403	Functions of Urisys 1800 implemented in this Manual. Author C. Felder
2.0	July 2004	1.0.0.0406	Additional functions descript. Author C. Felder
3.0	October 2004	1.1.0.0408	Additional protocols descript. Author C. Felder
4.0	September 2005	2.0.0.0502 2.0.0.0503 2.0.0.0504	-Range Table: New format for Arbitrary values (e.g. +++ → 3+) -Urisys 2400 protocol implemented. -Baud rates of 1200 and 2400 are supported. -ASTM and Urisys 2400: Results with T-Flags are sent to the host. -ASTM: The Arbitrary values for color and clarity are not sent to the host. -Range Table: Change of the Arbitrary values (neg. → neg, pos.→pos, norm.→NORM). -Urisys 2400: The following transformations are done (I→L, neg→NEG,pos→POS,norm→NORM). -Urisys 2400: Small modification in the Termination Record.

Version	Date	Software version	Modifications
		2.0.0.0505	-Urisys 2400: After every result record a comment record is sent to the host. -Urisys 2400: The “T “flag is mapped to “R” flag. -Miditron Junior I+II, Chemstrip Criterion I+II: Sample ID right justified.
		2.0.1.0506	-Miditron M & Chemstrip UA: The Arbitrary parameters are converted to uppercase letters for all parameters except SG and pH.

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1 Purpose

This document describes the behavior of the Urisys 1800 analyzer data interchange interface when interacting with a L*aboratory* I*nformation* S*ystem (LIS)* also called host system.

1.1 Audience

This document is written for technicians who must configure the Urisys LIS Interface in the environment of a laboratory. Depending on the type of host system and on the work flows in the laboratory the Urisys LIS interface offers a set of configurable features.

1.2 References

Referenced documents:

[1] Roche Diagnostics ASTM+ Interface Specification Version 2.0

[2] E 1394-91 Standard Specification for Transferring Information between Clinical Instruments and Computer Systems, A*merican* S*ociety for* T*esting and* M*aterials* (ASTM)

[3] Host Interface Manual Miditron M Version 3.1-1993

[4] Miditron Junior Urine Analyzer Host Interface Document Version 1.0a

[5] Urisys 2400 HIF document available on GRIPS

1.3 Used Syntax and Abbreviations

Used Syntax

<SpecimenID>	Meaning any string (not containing delimiters), representing a value of the ASTM field “SpecimenID”.
<OrderID>	Meaning as described above, but this is an optional field.
char	Single character. Content specified by standard.
text	String. Variable length.
pos_int	Positive integer (0 to 65535)
d_t	Date and time format as specified by ASTM 6.6.2 (YYYYMMDDHHMMSS)
date	Date format as specified by ASTM 6.6.2 (YYYYMMDD)

Terms

ASTM	American Society for Testing and Materials
LIS	Laboratory Information System

1.4 Further Help

In case of questions please contact your **local Roche Diagnostics Service Department**.

Or alternatively the Global Systems Support:

E-Mail Address: mannheim.GSSLABIN@roche.com

Clarify Queue: GSSLABIN

2 Introduction

This document describes the behavior of the Urisys 1800 Host Interface to a host system, when connected to a Laboratory Information System via null modem cable (RS 232).

2.1 Overview of the Urisys 1800 analyzer

The Urisys 1800 analyzer is a semi-automatic urinalysis system intended for in vitro qualitative or semi-quantitative determination of urine analyses, including specific gravity (SG), pH, leukocytes, nitrite, protein, glucose, ketones, urobilinogen, bilirubin and erythrocytes and color.

2.2 Supported host protocols

Urisys 1800 supports the following host protocols:

• ASTM		
• Miditron M		European checksum
• Miditron M encoded		European checksum
• Miditron Junior I		European checksum
• Miditron Junior II	sample ID with 10 characters	European checksum
	sample ID with 13 characters	European checksum
• Chemstrip UA		American checksum
• Chemstrip Criterion I		American checksum
• Chemstrip Criterion II	sample ID with 10 characters	American checksum
	sample ID with 13 characters	American checksum
• Urisys 2400		

NOTE: Only for Canada:
For the URICHEM 1000 analyzer: chose Chemstrip UA protocol
For the Miditron Jr and Jr II analyzer: chose Chemstrip Criterion I or Chemstrip Criterion II protocol in the configuration screen of the Urisys 1800

To select the used host protocol go to Configuration > System Parameters > Host Comm.

2.3 Supported Work Flows

The instrument initiates always the communication to the LIS host.
The Urisys 1800 device is the master at all times.

2.3.1 **Upload** (Urisys 1800 ⇨ Host)

ASTM protocol

- strip results
  - sample ID / sequence number
  - date and time of calculation
  - strip results
  - units

    - flags
    - color and clarity of sample
    - sediment results
    - compensated rawdata (optional)
    - Instrument ID
    - User ID
    - Software version
    - Range tables (Int/US/Jap)

- control results
    - name and lot ID
    - control results for three levels
    - date and time of control calculation
    - units
    - flag
    - color
    - compensated rawdata (optional)
    - Instrument ID
    - User ID
    - Software version
    - Range tables (Int/US/Jap)

Miditron M

- strip results
    - sample ID / sequence number
    - date and time of calculation
    - strip results
    - units
    - color and clarity of sample
    - sediment results

    Note: Invalid results (T-Flag) are not transmitted to the host

- control results
    - *not supported*

Miditron M encoded

- strip results
    - sample ID / sequence number
    - date and time of calculation
    - strip results coded
    - color and clarity of sample coded
    - sediment results coded

    Note: Invalid results (T-Flag) are not transmitted to the host!

- control results
    - *not supported*

Miditron Junior

- strip results
  - sample ID / sequence number
  - date and time of calculation
  - strip results
  - units

  Note: Invalid results (T-Flag) are not transmitted to the host!

- control results
  - *not supported*

Miditron Junior *II*

- strip results
  - sample ID / sequence number
  - date and time of calculation
  - strip results
  - units
  - color and clarity of sample coded

  Note: Invalid results (T-Flag) are not transmitted to the host!

- control results
  - *not supported*

Chemstrip UA

- strip results
  - sample ID / sequence number
  - date and time of calculation
  - strip results
  - units
  - color and clarity of sample
  - sediment results

  Note: Invalid results (T-Flag) are not transmitted to the host!

- control results
  - *not supported*

Chemstrip Criterion

- strip results
  - sample ID / sequence number
  - date and time of calculation
  - strip results
  - units

  Note: Invalid results (T-Flag) are not transmitted to the host!

- control results
  - *not supported*

Chemstrip Criterion II

- strip results
  - sample ID / sequence number
  - date and time of calculation
  - strip results
  - units
  - color and clarity of sample coded

  Note: Invalid results (T-Flag) are not transmitted to the host!

- control results
  - *not supported*

Urisys 2400

- strip results
  - sample ID / sequence number
  - date and time of calculation
  - strip results
  - units
  - flags
  - color and clarity of sample
  - compensated rawdata (optional)
  - Instrument ID
  - User ID
  - Software version
  - Range tables (Int/US/Jap)

- control results
  - name and lot ID
  - control results for three levels
  - date and time of control calculation
  - units
  - flags
  - color
  - compensated rawdata (optional)
  - Instrument ID
  - User ID
  - Software version
  - Range tables (Int/US/Jap)

2.3.2 Download (Host ⇨ Urisys 1800)

The download of a sample ID list can be initialized from the Urisys 1800 by clicking the button <Download>
Note: not supported from Urisys2400 protocol

3 LIS Interface configuration

To configure the host settings and enable host communication go to the configuration menu. Default setting for the Host communication is OFF. (Utilities > System Parameters > Host Comm)

Changes in the Host Communication are only possible if Host is set to off.

3.1 Communication settings

The following host communication settings are configurable on the Urisys 1800 User Interface:

Item	Specification	default
Baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600	9600
Data bits	7, 8	8
Stop bits	1, 2	1
Flow control	None, Xon-Xoff, RTS-CTS	None
Parity	None, odd, even	None
Checksum	ON, OFF	ON

(Data bits 7 not supported. Flow control RTS-CTS not supported)

3.2 Serial cable

Urisys 1800 communicates to the host over a serial asynchronous interface cable (RS 232). The port used for the host is COM 2.

Plug 9 pin female		Plug 9 pin female
1		1
2	———	3
3	———	2
4	———	6
5	———	5
6	———	4
7	———	8
8	———	7
9		9

The maximum cable length is 15 m.

If flow control is set to “none” or “Xon-Xoff” then no handshake connections (pin 7/8) are required.

4 Error handling

In case the host does not acknowledge a sent data record Urisys 1800 will not resend this record and an error message is displayed in the alarm monitor.

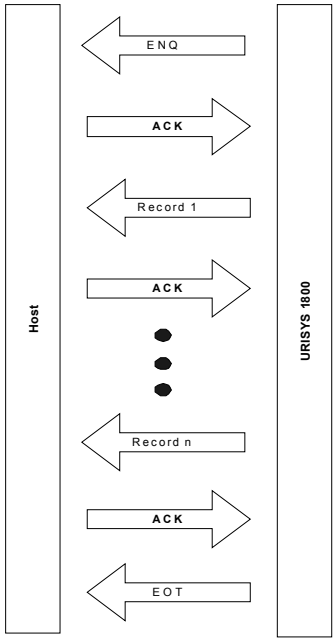
If the host receives a data record but misapprehend it (e.g. wrong checksum) and answers with a NAK or a replay, the defective record is retransmitted at least 3 times. After the 3 attempts the communication will be stopped and an error message is displayed in the alarm monitor.

5 ASTM Protocol

General
The ASTM protocol divides communication data into messages and records.
A message is a self-contained information packet. For example Test-strip results or control results are sent to the host as a complete message.
Each message can consist of different records. Urisys 1800 uses the following ASTM-records:

Identifier	Name	Description
H	Header Record	First record in every message
P	Patient Information Record	This record is used to download patient demographics from the Host to the instrument. In Urisys 1800 no patient data can be handled. Therefore the patient record is always empty.
O	Order Record	The test Order Record defines the attributes of a particular order.
R	Result Record	Result data
C	Comment Record	In URISYS 1800 this record is used for the transmission of sample flags and result flags.
M	Manufacturer Record	In URISYS 1800 this record is used for the transmission of raw data, additional control information and sediment data
Q	Request Information Record	(Query) Work list Request
L	Termination Record	Last record in every message.

Communication structure
Only the Urisys 1800 can start a communication, i.e. the Urisys 1800 is master at all times.
A communication is initialized when the ASCII character ENQ (Hex 05) is dispatched to the host. The host (Slave) acknowledges it's readiness to communicate by sending the ASCII- character ACK (Hex 06), or if it is not ready it will send the ASCII-character NAK (Hex 15) i.e. Not Acknowledged.
If the host has positively Acknowledged it's readiness to communicate, the Urisys 1800 then sends the message Record by Record (different to Urisys 2400; there all records are sent in one message).
The host must also confirm receipt of each record with an acknowledge ACK character. If the host sends a not acknowledged (NAK) character instead, the Urisys 1800 will resend the last record sent. The message is completed with a Termination Record.
The communication session is terminated with the ASCII-character EOT (Hex 04).



Record structure
Each record has the following structure:

ASCII-character STX (Hex 02)
Record No.
Different records according to the descriptions in the following chapters
ASCII- character ETX (Hex 03)
Checksum
ASCII- character CR (Hex 0D)
ASCII- character LF (Hex 0A)

Supported fields
The tables below show which fields are supported by the LIS interface and which restriction is demanded.
Furthermore the ASTM standard defines some fields which are not supported in ASTM+ at all. These unsupported ASTM+ fields are not listed in this document.
A grayed background shows optional or conditional ASTM fields which are not supported by the Urisys 1800 LIS interface at all.

5.1 Message Header Record

Message Header Record			
ASTM	**Field Name**	**Content**	**Remark**
7.1.1	Record Type Id	"H"	Header
7.1.2	Field delimiter	"|"	Needed by ASTM, defines the delimiter for the subfields.
	Repeat delimiter	"\"	
	Component delimiter	"^"	
	Escape delimiter	"&"	
7.1.3	Message Control ID		Not supported
7.1.4	Access Passwords		Not supported
7.1.5	SenderName or ID	URISYS 1800^serial no.^software version^range boundary setting	first sub field contains "URISYS 1800", second sub field contains serial number (10 digits, e.g. 0000000001), third sub field contains the software version, and the fourth sub field contains the range boundary setting (Int/US/Jap)
7.1.6	Sender Street Address		Not supported
7.1.7	Reserved Field		Not supported
7.1.8	Sender Telephone Number		Not supported
7.1.9	Characteristics of Sender		Not supported
7.1.10	Receiver ID		Not supported
7.1.11	Comment of special instructions		Not supported
7.1.12	Processing ID	P	Always P (production)
7.1.13	Version Number		Not supported
7.1.14	Date and time of message	20040324145843	ASTM date_time format.
All further fields are not supported			

Example of header record:
H|\^&|||URISYS 1800^0000000001^2.0.0.0505^Int ||||||P||20040101154716

5.2 Patient Information Record

In Urisys 1800 no patient data can be handled. The patient record is always empty.

Patient Record			
ASTM	**Field Name**	**Content**	**Remark**
8.1.1	**Record Type Id**	"P"	Patient
8.1.2	**Sequence Number**	1	Defined by ASTM 6.6.7 always 1. No patient demographics sent
All further fields are not supported			

Example of patient record:
P|1

5.3 Test-Order Record

Test-Order Record			
ASTM	**Field Name**	**Content**	**Remark**
9.4.1	Record Type Id	"O"	Order
9.4.2	Sequence Number	1	Defined by ASTM 6.6.7, always 1 since in Urisys 1800 only one order per message can be sent.
9.4.3	SpecimenID	Sample ID	ID of the sample, numerical or alphanumerical (max 13 digits)
9.4.4	OrderID	Sequence number	Only used for result upload, Urisys 1800 inserts a sequence number from the database. Order download empty
	^ RackCarrierID		not supported
	^ PositionOnRackCarrier		not supported
	^ Format		not supported
	^ RackCarrierType	“CONTROL” or “SAMPLE”	Control for control samples Sample for patient samples.
9.4.5	Universal testID		not supported
9.4.6	Priority	R	Always “R” (routine sample)
9.4.7	RequestedDateTime		not supported
9.4.8	CollectionDateTime		not supported
9.4.9	CollectionEndDateTime		not supported
9.4.10	CollectionVolume		not supported
9.4.12	ActionCode	X or X\Q	Always X, in case of control samples “\Q” is added
9.4.13	DangerCode		not supported
9.4.14	ClinicalInformation		not supported
9.4.15	ReceivedDateTime		ASTM date_time format. YYYYMMDDhhmmss
All further fields are not supported			

Example of order record by order downloads:
O|1||3^^^^SAMPLE||R||||||X|||20000106205333

Example of order record by result uploads:
O|1|123456789|12^^^^SAMPLE||R||||||X|||20000106205745

5.4 Result Record

Result Record			
ASTM	**Field Name**	**Content**	**Remark**
10.1.1	Record Type Id	"R"	Result
10.1.2	Sequence Number	1 – 12	Defined by ASTM 6.6.7, Urisys 1800 measures always 12 results (color and clarity included)
10.1.3	Universal Test ID	Test code ^ ^ ^Test No	test code is an alphanumerical value (e.g. “SG”) test number list (fixation): 1: SG 2: pH 3: LEU 4: NIT 5: PRO 6: GLU 7: KET 8: UBG 9: BIL 10: ERY 11: COL 12: CLA
10.1.4	DataMeasurement value	Current result value^ arbitrary value	Result value: Numerical value (e.g. 1.303) or/and alphanumerical value (e.g. “neg”, “pos” and “norm”) Arbitrary value: this subfield is only used if arbitrary values are in use in combination with others (Conventional or SI) arbitrary values for color and clarity do not exist
10.1.5	DataMeasurementResult.ValUnit	unit	Alphanumerical value e.g. “mg/dl” only ASCII characters from 1-127 are supported ’µ’ character is translated to a ‘u’ character.
10.1.6	Reference Range		not supported
10.1.7	ResultAbnormalFlag		not supported, abnormal flags are sent in the comment record
10.1.8	NatureOfAbnormability		not supported
10.1.9	ResultStatus		not supported
10.1.11	Operator	User ID	User Id of operator who performed the test
10.1.12	DateTimeTestStarted		not supported
All further fields are not supported			

Example of result record:
R|1|SG^^^1|1.030|||||||Ally

5.5 Comment Record

Comment Record			
ASTM	**Field Name**	**Content**	**Remark**
11.1.1	Record Type Id	"C"	Comment Record
11.1.2	Sequence Number		Use the same sequence number as the prior result record. (Not implemented according to the ASTM standard).
11.1.3	Comment source	I	Needed by ASTM, always “I”
11.1.4	Comment Text	Sample flags / sample result flags	Result flag codes
11.1.5	Comment type	I	Needed by ASTM, always “I”

Example of a comment record:
C|1|I|*|I|

5.5.1 Result Flag Codes

Result flags are always sent in a comment record.

Contol Result	Sample Result	Description
*	*	Abnormal
S	S	Sieve
	!	Edited result
	#	Changed ref
T	T	Test strip error. No result generated. Result field always empty
C	C	Calibration expired

Trace Example: Result record with an empty DataMeasurement value field (ASTM 10.1.4).
The corresponding comment record sends a “T” flag.

URI [STX]5R|6|GLU^^^6|||||||[CR][ETX]61[CR][LF]
HOST [ACK]
URI [STX]6C|6|I|T|I|[CR][ETX]11[CR][LF]

In the printout and the User Interface an additional information for the „T“ Flag is displayed.
This Flag comment is not transmitted to the host at all.

5.6 Manufacturer Record (Result Context Record - RC)

URISYS uses this record to transmit the control name as well as the control lot number. It is sent at the end of the control result record.

No.	Field	Content	Comment
1	record type ID	M	needed by ASTM, always “M”
2	Sequence no.		Defined by ASTM 6.6.7
3	record type sub-ID	RC	always “RC” (result context)
4	test strip cassette lot number		always empty
5	date/time test strip cassette set		always empty
6	control name	e.g. CONTROL-LOW	control name
7	control identifier	e.g. 001	control lot no

Example:
M|1|RC|||Controlhigh|Lotnumber|

5.7 Manufacturer Record (Sediment Result Record - SD)

No.	Field	Content	Comment
1	record type ID	M	needed by ASTM, always “M”
2	Sequence no.	1-30	needed by ASTM 6.6.7, Urisys 1800 can determine up to 30 sediment results
3	record type sub-ID	SD	always “SD” (sediment)
4	test code	e.g. LEUCO	
5	result value	e.g. FEW	

Example:
M|1|SD|LEUCO|FEW|

5.8 Manufacturer Record (Raw Result Record)

For special application (e.g. evaluation / research) it is possible to send the raw results to the host using this record. It is possible to activate this application via the User Interface
(Utilities > Tools2 > Service “RawData to Host” > ON)

Raw result Record			
ASTM	**Field Name**	**Content**	**Remark**
	Record Type Id	“M”	Needed by ASTM for transfer of raw results
	Sequence Number	1-16	Urisys1800 determines always 16 results
	Record type sub-ID	RR	Raw result
	Raw result value	Reflectance	floating number in the format ##.## (e.g. 88.06) fix order for raw result value: 1: COM blue 2: COM green 3: COM orange 4: ERY green 5: ERY orange 6: LEU green 7: NIT green 8: KET green 9: GLU green 10: PRO orange 11: UBG green 12: BIL green 13: pH green 14: pH orange 15: SG orange 16: not used, always 0

Example of a raw result record:
M|1|RR|89.56|

5.9 Request Information Record

With the request information record the Urisys 1800 requests the work list from the host. The host must answer within 3 seconds.

Request Information Record			
ASTM	**Field Name**	**Content**	**Remark**
12.1.1	Record Type Id	"Q"	Query record
12.1.2	Sequence Number	1	Defined by ASTM 6.6.7. Always 1
12.1.3	Record type sub-ID	^ALL	Request for all orders

Example of request information record:
Q|1|^ALL

5.10 Message Terminator Record

Message Terminator Record			
ASTM	**Field Name**	**Content**	**Remark**
13.1.1	Record Type Id	"L"	Message Terminator
13.1.2	Sequence Number	1	Defined by ASTM 6.6.7. Always 1
13.1.3	Termination Code	N	N: Normal termination

Example of Message Terminator record:
L|1|N

5.11 ASTM trace examples

5.11.1 Order Download

The work list download is initialized by pressing the button “Download”.

Urisys 1800 send a Query for open orders (work list)

```
URISYS [ENQ]
Host   [ACK]
URISYS [STX]1H|\^&|||URISYS·1800^121^^Int|||||||P||20
       050217103409[CR][ETX]78[CR][LF]
Host   [ACK]
URISYS [STX]2Q|1|^ALL[ETX]F3[CR][LF]
Host   [ACK]
URISYS [STX]3L|1|N[ETX]06[CR][LF]
Host   [ACK]
URISYS [EOT]
```

After the query Urisys 1800 waits 3 seconds for an answer from the host .

```
Host   [ENQ]
URISYS [ACK]
Host   [STX]1H|\^&|||6146000-00-15|||||||P|[ETX]0A[CR][LF]
URISYS [ACK]
Host   [STX]2O|1|100|^^^^SAMPLE||R||||||X|||20040124104711[ETX]5B[CR][LF]
URISYS [ACK]
Host   [STX]3O|1|101|^^^^SAMPLE||R||||||X|||20040124104711[ETX]5B[CR][LF]
URISYS [ACK]
Host   [STX]4O|1|102|^^^^SAMPLE||R||||||X|||20040124104711[ETX]5B[CR][LF]
URISYS [ACK]
Host   [STX]5O|1|103|^^^^SAMPLE||R||||||X|||20040124104711[ETX]5B[CR][LF]
URISYS [ACK]
Host   [STX]6O|1|104|^^^^SAMPLE||R||||||X|||20040124104711[ETX]5B[CR][LF]
URISYS [ACK]
Host   [STX]3L|1|N[ETX]06[CR][LF]
URISYS [ACK]
Host   [EOT]
```

Downloaded sample ID’s = 100, 101, 102, 103 und 104

5.11.2 Upload Sample Results (without raw data and sediment data)

```
URISYS 09:28:05,775 [ENQ]
Host   09:28:05,805 [ACK]
URISYS 09:28:05,846 [STX]1H|\^&|||URISYS·1800^1^2.0.0.0505·Test^In
                    t|||||||P||19720210172536[CR][ETX]C7[CR][LF]
Host   09:28:05,926 [ACK]
URISYS 09:28:05,956 [STX]2P|1[CR][ETX]3F[CR][LF]
Host   09:28:05,966 [ACK]
URISYS 09:28:06,006 [STX]3O|1|123456|6^^^^SAMPLE||R||||||X|||19720
                    210172000[CR][ETX]9A[CR][LF]
Host   09:28:06,066 [ACK]
URISYS 09:28:06,106 [STX]4R|1|SG^^^1|1.015|||||||service|[CR][ETX]
                    E6[CR][LF]
Host   09:28:06,146 [ACK]
```

```
URISYS 09:28:06,186 [STX]5R|2|pH^^^2|7|||||||service|[CR][ETX]49[C
                    R][LF]
Host   09:28:06,226 [ACK]
URISYS 09:28:06,256 [STX]6R|3|LEU^^^3|100|/ul||||||service|[CR][ET
                    X]E4[CR][LF]
Host   09:28:06,306 [ACK]
URISYS 09:28:06,336 [STX]7C|3|I|*^S|I|[CR][ETX]96[CR][LF]
Host   09:28:06,356 [ACK]
URISYS 09:28:06,396 [STX]0R|4|NIT^^^4|pos|||||||service|[CR][ETX]9
                    6[CR][LF]
Host   09:28:06,436 [ACK]
URISYS 09:28:06,476 [STX]1C|4|I|*^S|I|[CR][ETX]91[CR][LF]
Host   09:28:06,496 [ACK]
URISYS 09:28:06,537 [STX]2R|5|PRO^^^5|75|mg/dl||||||service|[CR][E
                    TX]8D[CR][LF]
Host   09:28:06,587 [ACK]
URISYS 09:28:06,617 [STX]3C|5|I|*^S|I|[CR][ETX]94[CR][LF]
Host   09:28:06,637 [ACK]
URISYS 09:28:06,677 [STX]4R|6|GLU^^^6|norm|||||||service|[CR][ETX]
                    05[CR][LF]
Host   09:28:06,717 [ACK]
URISYS 09:28:06,757 [STX]5R|7|KET^^^7|neg|||||||service|[CR][ETX]8
                    2[CR][LF]
Host   09:28:06,797 [ACK]
URISYS 09:28:06,837 [STX]6R|8|UBG^^^8|1|mg/dl||||||service|[CR][ET
                    X]49[CR][LF]
Host   09:28:06,877 [ACK]
URISYS 09:28:06,917 [STX]7C|8|I|*|I|[CR][ETX]EA[CR][LF]
Host   09:28:06,937 [ACK]
URISYS 09:28:06,977 [STX]0R|9|BIL^^^9|neg|||||||service|[CR][ETX]7
                    4[CR][LF]
Host   09:28:07,017 [ACK]
URISYS 09:28:07,057 [STX]1R|10|ERY^^^10|250|/ul||||||service|[CR][
                    ETX]4B[CR][LF]
Host   09:28:07,107 [ACK]
URISYS 09:28:07,137 [STX]2C|10|I|*^S|I|[CR][ETX]BF[CR][LF]
Host   09:28:07,157 [ACK]
URISYS 09:28:07,198 [STX]3R|11|COL^^^11|yellow||||||service|[CR][
                    ETX]32[CR][LF]
Host   09:28:07,248 [ACK]
URISYS 09:28:07,278 [STX]4R|12|CLA^^^12|||||||service|[CR][ETX]8B
                    [CR][LF]
Host   09:28:07,318 [ACK]
URISYS 09:28:07,358 [STX]5L|1|N[CR][ETX]08[CR][LF]
Host   09:28:07,368 [ACK]
URISYS 09:28:07,408 [EOT]
```

5.11.3 Upload Sample Results (without raw data, with sediment data)

```
URISYS 09:44:53,655 [ENQ]
Host   09:44:53,665 [ACK]
URISYS 09:44:53,695 [STX]1H|\^&|||URISYS·1800^1^2.0.0.0505·Test^In
                    t|||||||P||19720210174224[CR][ETX]C3[CR][LF]
Host   09:44:53,775 [ACK]
URISYS 09:44:53,806 [STX]2P|1[CR][ETX]3F[CR][LF]
Host   09:44:53,816 [ACK]
URISYS 09:44:53,856 [STX]3O|1|456789|8^^^^SAMPLE||R||||||X|||19720
```

```
                    210173752[CR][ETX]BD[CR][LF]
Host    09:44:53,916 [ACK]
URISYS 09:44:53,956 [STX]4R|1|SG^^^1|1.010|||||||service|[CR][ETX]
                    E1[CR][LF]
Host    09:44:53,996 [ACK]
URISYS 09:44:54,036 [STX]5R|2|pH^^^2|8|||||||service|[CR][ETX]4A[C
                    R][LF]
Host    09:44:54,076 [ACK]
URISYS 09:44:54,106 [STX]6C|2|I|*^S|I|[CR][ETX]94[CR][LF]
Host    09:44:54,126 [ACK]
URISYS 09:44:54,166 [STX]7R|3|LEU^^^3|neg|||||||service|[CR][ETX]7
                    E[CR][LF]
Host    09:44:54,206 [ACK]
URISYS 09:44:54,246 [STX]0R|4|NIT^^^4|pos|||||||service|[CR][ETX]9
                    6[CR][LF]
Host    09:44:54,286 [ACK]
URISYS 09:44:54,326 [STX]1C|4|I|*^S|I|[CR][ETX]91[CR][LF]
Host    09:44:54,346 [ACK]
URISYS 09:44:54,386 [STX]2R|5|PRO^^^5|neg|||||||service|[CR][ETX]8
                    8[CR][LF]
Host    09:44:54,426 [ACK]
URISYS 09:44:54,467 [STX]3R|6|GLU^^^6|norm|||||||service|[CR][ETX]
                    04[CR][LF]
Host    09:44:54,507 [ACK]
URISYS 09:44:54,547 [STX]4R|7|KET^^^7|neg|||||||service|[CR][ETX]8
                    1[CR][LF]
Host    09:44:54,587 [ACK]
URISYS 09:44:54,627 [STX]5R|8|UBG^^^8|norm|||||||service|[CR][ETX]
                    00[CR][LF]
Host    09:44:54,667 [ACK]
URISYS 09:44:54,707 [STX]6R|9|BIL^^^9|neg|||||||service|[CR][ETX]7
                    A[CR][LF]
Host    09:44:54,747 [ACK]
URISYS 09:44:54,787 [STX]7R|10|ERY^^^10|neg|||||||service|[CR][ETX
                    ]E4[CR][LF]
Host    09:44:54,827 [ACK]
URISYS 09:44:54,867 [STX]0R|11|COL^^^11|p.yel|||||||service|[CR][E
                    TX]7B[CR][LF]
Host    09:44:54,917 [ACK]
URISYS 09:44:54,947 [STX]1R|12|CLA^^^12|||||||service|[CR][ETX]88
                    [CR][LF]
Host    09:44:54,987 [ACK]
URISYS 09:44:55,027 [STX]2M|1|SD|Param1|001|[CR][ETX]76[CR][LF]
Host    09:44:55,057 [ACK]
URISYS 09:44:55,087 [STX]3M|2|SD|Param2|005|[CR][ETX]7D[CR][LF]
Host    09:44:55,118 [ACK]
URISYS 09:44:55,148 [STX]4M|3|SD|Param3|007|[CR][ETX]82[CR][LF]
Host    09:44:55,178 [ACK]
URISYS 09:44:55,208 [STX]5M|4|SD|Param4|010|[CR][ETX]7F[CR][LF]
Host    09:44:55,238 [ACK]
URISYS 09:44:55,268 [STX]6M|5|SD|Param5|013|[CR][ETX]85[CR][LF]
Host    09:44:55,298 [ACK]
URISYS 09:44:55,328 [STX]7L|1|N[CR][ETX]0A[CR][LF]
Host    09:44:55,338 [ACK]
URISYS 09:44:55,378 [EOT]
```

5.11.4 Upload Sample Results (with raw data, without sediment data)

```
URISYS 09:41:27,130 [ENQ]
Host   09:41:27,130 [ACK]
URISYS 09:41:27,170 [STX]1H|\^&|||URISYS·1800^1^2.0.0.0505·Test^In
                    t|||||||P||19720210173857[CR][ETX]CE[CR][LF]
Host   09:41:27,240 [ACK]
URISYS 09:41:27,280 [STX]2P|1[CR][ETX]3F[CR][LF]
Host   09:41:27,290 [ACK]
URISYS 09:41:27,330 [STX]3O|1|123456|6^^^^SAMPLE||R||||||X|||19720
                    210172000[CR][ETX]9A[CR][LF]
Host   09:41:27,390 [ACK]
URISYS 09:41:27,430 [STX]4R|1|SG^^^1|1.015|||||||service|[CR][ETX]
                    E6[CR][LF]
Host   09:41:27,470 [ACK]
URISYS 09:41:27,510 [STX]5R|2|pH^^^2|7|||||||service|[CR][ETX]49[C
                    R][LF]
Host   09:41:27,540 [ACK]
URISYS 09:41:27,580 [STX]6R|3|LEU^^^3|100|/ul||||||service|[CR][ET
                    X]E4[CR][LF]
Host   09:41:27,621 [ACK]
URISYS 09:41:27,661 [STX]7C|3|I|*^S|I|[CR][ETX]96[CR][LF]
Host   09:41:27,681 [ACK]
URISYS 09:41:27,721 [STX]0R|4|NIT^^^4|pos|||||||service|[CR][ETX]9
                    6[CR][LF]
Host   09:41:27,761 [ACK]
URISYS 09:41:27,801 [STX]1C|4|I|*^S|I|[CR][ETX]91[CR][LF]
Host   09:41:27,821 [ACK]
URISYS 09:41:27,861 [STX]2R|5|PRO^^^5|75|mg/dl||||||service|[CR][E
                    TX]8D[CR][LF]
Host   09:41:27,901 [ACK]
URISYS 09:41:27,941 [STX]3C|5|I|*^S|I|[CR][ETX]94[CR][LF]
Host   09:41:27,961 [ACK]
URISYS 09:41:28,001 [STX]4R|6|GLU^^^6|norm|||||||service|[CR][ETX]
                    05[CR][LF]
Host   09:41:28,041 [ACK]
URISYS 09:41:28,081 [STX]5R|7|KET^^^7|neg|||||||service|[CR][ETX]8
                    2[CR][LF]
Host   09:41:28,121 [ACK]
URISYS 09:41:28,161 [STX]6R|8|UBG^^^8|1|mg/dl||||||service|[CR][ET
                    X]49[CR][LF]
Host   09:41:28,201 [ACK]
URISYS 09:41:28,241 [STX]7C|8|I|*|I|[CR][ETX]EA[CR][LF]
Host   09:41:28,262 [ACK]
URISYS 09:41:28,302 [STX]0R|9|BIL^^^9|neg|||||||service|[CR][ETX]7
                    4[CR][LF]
Host   09:41:28,342 [ACK]
URISYS 09:41:28,382 [STX]1R|10|ERY^^^10|250|/ul||||||service|[CR][
                    ETX]4B[CR][LF]
Host   09:41:28,422 [ACK]
URISYS 09:41:28,462 [STX]2C|10|I|*^S|I|[CR][ETX]BF[CR][LF]
Host   09:41:28,482 [ACK]
URISYS 09:41:28,522 [STX]3R|11|COL^^^11|yellow||||||service|[CR][
                    ETX]32[CR][LF]
Host   09:41:28,562 [ACK]
URISYS 09:41:28,602 [STX]4R|12|CLA^^^12|||||||service|[CR][ETX]8B
                    [CR][LF]
Host   09:41:28,642 [ACK]
```

```
URISYS 09:41:28,682 [STX]5M|1|RR|67.57|[CR][ETX]5E[CR][LF]
Host   09:41:28,702 [ACK]
URISYS 09:41:28,742 [STX]6M|2|RR|70.85|[CR][ETX]5B[CR][LF]
Host   09:41:28,762 [ACK]
URISYS 09:41:28,802 [STX]7M|3|RR|68.74|[CR][ETX]62[CR][LF]
Host   09:41:28,822 [ACK]
URISYS 09:41:28,862 [STX]0M|4|RR|22.75|[CR][ETX]53[CR][LF]
Host   09:41:28,882 [ACK]
URISYS 09:41:28,923 [STX]1M|5|RR|16.86|[CR][ETX]5A[CR][LF]
Host   09:41:28,943 [ACK]
URISYS 09:41:28,983 [STX]2M|6|RR|59.16|[CR][ETX]5C[CR][LF]
Host   09:41:29,003 [ACK]
URISYS 09:41:29,043 [STX]3M|7|RR|41.89|[CR][ETX]5F[CR][LF]
Host   09:41:29,063 [ACK]
URISYS 09:41:29,103 [STX]4M|8|RR|52.22|[CR][ETX]56[CR][LF]
Host   09:41:29,123 [ACK]
URISYS 09:41:29,163 [STX]5M|9|RR|64.87|[CR][ETX]66[CR][LF]
Host   09:41:29,183 [ACK]
URISYS 09:41:29,223 [STX]6M|10|RR|46.68|[CR][ETX]8E[CR][LF]
Host   09:41:29,243 [ACK]
URISYS 09:41:29,283 [STX]7M|11|RR|59.30|[CR][ETX]89[CR][LF]
Host   09:41:29,303 [ACK]
URISYS 09:41:29,343 [STX]0M|12|RR|68.31|[CR][ETX]84[CR][LF]
Host   09:41:29,363 [ACK]
URISYS 09:41:29,403 [STX]1M|13|RR|53.00|[CR][ETX]7C[CR][LF]
Host   09:41:29,423 [ACK]
URISYS 09:41:29,463 [STX]2M|14|RR|45.80|[CR][ETX]87[CR][LF]
Host   09:41:29,483 [ACK]
URISYS 09:41:29,523 [STX]3M|15|RR|19.70|[CR][ETX]89[CR][LF]
Host   09:41:29,543 [ACK]
URISYS 09:41:29,584 [STX]4M|16|RR|0|[CR][ETX]BC[CR][LF]
Host   09:41:29,594 [ACK]
URISYS 09:41:29,644 [STX]5L|1|N[CR][ETX]08[CR][LF]
Host   09:41:29,654 [ACK]
URISYS 09:41:29,684 [EOT]
```

5.11.5 Upload Control Results

```
URISYS 09:49:19,041 [ENQ]
Host   09:49:19,041 [ACK]
URISYS 09:49:19,081 [STX]1H|\^&|||URISYS·1800^1^2.0.0.0505·Test^In
                    t|||||||P||19720210174649[CR][ETX]CE[CR][LF]
Host   09:49:19,151 [ACK]
URISYS 09:49:19,191 [STX]2P|1[CR][ETX]3F[CR][LF]
Host   09:49:19,201 [ACK]
URISYS 09:49:19,241 [STX]3O|1||0^^^^CONTROL||R||||||X\Q|||19720210
                    174648[CR][ETX]7F[CR][LF]
Host   09:49:19,291 [ACK]
URISYS 09:49:19,331 [STX]4R|1|SG^^^1|1.020|||||||service|[CR][ETX]
                    E2[CR][LF]
Host   09:49:19,371 [ACK]
URISYS 09:49:19,411 [STX]5C|1|I|*|I|[CR][ETX]E1[CR][LF]
Host   09:49:19,431 [ACK]
URISYS 09:49:19,461 [STX]6R|2|pH^^^2|6|||||||service|[CR][ETX]49[C
                    R][LF]
Host   09:49:19,501 [ACK]
URISYS 09:49:19,541 [STX]7C|2|I|*|I|[CR][ETX]E4[CR][LF]
```

```
Host   09:49:19,562 [ACK]
URISYS 09:49:19,602 [STX]0R|3|LEU^^^3|neg|||||||service|[CR][ETX]7
                    7[CR][LF]
Host   09:49:19,642 [ACK]
URISYS 09:49:19,682 [STX]1R|4|NIT^^^4|pos|||||||service|[CR][ETX]9
                    7[CR][LF]
Host   09:49:19,722 [ACK]
URISYS 09:49:19,762 [STX]2C|4|I|*|I|[CR][ETX]E1[CR][LF]
Host   09:49:19,782 [ACK]
URISYS 09:49:19,822 [STX]3R|5|PRO^^^5|neg|||||||service|[CR][ETX]8
                    9[CR][LF]
Host   09:49:19,862 [ACK]
URISYS 09:49:19,902 [STX]4R|6|GLU^^^6|norm|||||||service|[CR][ETX]
                    05[CR][LF]
Host   09:49:19,942 [ACK]
URISYS 09:49:19,982 [STX]5R|7|KET^^^7|neg|||||||service|[CR][ETX]8
                    2[CR][LF]
Host   09:49:20,022 [ACK]
URISYS 09:49:20,062 [STX]6R|8|UBG^^^8|norm|||||||service|[CR][ETX]
                    01[CR][LF]
Host   09:49:20,102 [ACK]
URISYS 09:49:20,142 [STX]7R|9|BIL^^^9|neg|||||||service|[CR][ETX]7
                    B[CR][LF]
Host   09:49:20,182 [ACK]
URISYS 09:49:20,223 [STX]0R|10|ERY^^^10|neg|||||||service|[CR][ETX
                    ]DD[CR][LF]
Host   09:49:20,263 [ACK]
URISYS 09:49:20,303 [STX]1R|11|COL^^^11|yellow|||||||service|[CR][
                    ETX]30[CR][LF]
Host   09:49:20,343 [ACK]
URISYS 09:49:20,393 [STX]2C|11|I|*|I|[CR][ETX]0F[CR][LF]
Host   09:49:20,413 [ACK]
URISYS 09:49:20,453 [STX]3M|1|RC|||Control1|Lot1|[CR][ETX]2C[CR][L
                    F]
Host   09:49:20,483 [ACK]
URISYS 09:49:20,523 [STX]4L|1|N[CR][ETX]07[CR][LF]
Host   09:49:20,533 [ACK]
URISYS 09:49:20,563 [EOT]
```

6 Miditron M Protocol

6.1 Communication block „Readiness“

When Urisys 1800 or the host will start a communication this communication block is sent.
The receiver has to answer with a confirmation. For example: With the communication block “Readiness” Urisys 1800 checks if the host is ready for a data transmission. The host must answer with the communication block “Confirmation”.

Please refer to trace example 1 and 2.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	<	Readiness for upload data transmission	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3=	LRC calculation	2
5	Block terminator	CR	Hex 13	1

6.2 Communication block „Confirmation“

Urisys 1800 or the host confirms the readiness with the communication „Confirmation“.
This block is also used to confirm single communication blocks in a multi–block message.

Please refer trace example 1 and 2 below.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	>	Confirmation	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3?	LRC calculation	2
5	Block terminator	CR	Hex 13	1

6.3 Communication block „End of transmission“

A data transmission is terminated with the communication block “end of transmission”. This communication block signalizes the end of a message. It is used for result uploads as well as for work list downloads.

Please refer to example 1, 2, 3 and 4 below.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	:	End of transmission	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3;	LRC calculation	2
5	Block terminator	CR	Hex 13	1

6.4 Communication block „Replay“

In case of faulty or incomplete transmission of a communication block (e.g. wrong checksum) the communication block “Replay” requests a retransmit.

Please refer to example 4 below.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	?	Replay of last transmitted data	1
3	End of text (ETX)	ETX	Hex 3	1
4	Checksum	3;	LRC calculation	2
5	Block terminator	CR	Hex 13	1

6.5 Communication block “Download Work list” (function code A)

This communication block is used to transmit the work list from the host to Urisys 1800.
For each sample ID a communication block must be sent.

Refer to trace example 3 and 4 for more details.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	;	Start download	1
3	Message control ID	A	Function code A	1
4	Separator	·	Space	1
5	Sample ID	10	Left hand oriented	
43	End of text (ETX)	ETX	Hex 03	1
44	Checksum	6}	LRC calculation	2
45	Block terminator	CR	Hex 13	1

6.6 Communication block “Strip results”

With the communication block “Strip results” test strip results will be transmitted to the host.

Refer to trace example 1 and 2 for more details.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	;	Start up- or download	1
3	Message control ID	C	Function code C	1
4	Separator	·	Space	1
5	Sample ID	11111111··	left hand oriented, if no sample ID given this field contains only spaces	10
6	Separator	·	Space	1
7	Sequence no.	····9	right hand oriented, if no sequence no. given this field contains only spaces	5
8	Separator	·	Space	1
9	Date	01.01.04	date of test strip measuring (DD.MM.YY)	8

10	Separator	·	Space	1
11	Time	12:05	time of test strip measuring (hh:mm)	5
12	Separator	·	Space	1
13	Test code SG	SG		2
14	Result for SG	1.030	right hand oriented	5
15	Separator	·	Space	1
16	Arbitrary	····	Arbitrary (always empty)	4
17	Separator	·	Space	1
18	Test code PH	PH		2
19	Result for PH	··6	right hand oriented	3
20	Separator	·	Space	1
21	Arbitrary	····	Arbitrary (always empty)	4
22	Separator	·	Space	1
23	Test code LEU	LEU		3
24	Result for LEU	·····neg.	right hand oriented	11
25	Separator	·	Space	1
26	Arbitrary	····	Arbitrary (in capital letters)	4
27	Separator	·	Space	1
28	Test code NIT	NIT		3
29	Result for NIT	Pos		3
30	Separator	·	Space	1
31	Arbitrary	····	Arbitrary (in capital letters)	4
32	Separator	·	Space	1
33	Test code PRO	PRO		3
34	Result for PRO	·····neg.	right hand oriented	11
35	Separator	·	Space	1
36	Arbitrary	····	Arbitrary (in capital letters)	4
37	Separator	·	Space	1
38	Test code GLU	GLU		3
39	Result for GLU	·····100	right hand oriented	11
40	Separator	·	Space	1
41	Arbitrary	····	Arbitrary (in capital letters)	4
42	Separator	·	Space	1
43	Test code KET	KET		3
44	Result for KET	·····neg.	right hand oriented	11
45	Separator	·	Space	1
46	Arbitrary	····	Arbitrary (in capital letters)	4
47	Separator	·	Space	1
48	Test code UBG	UBG		3
49	Result for UBG	·····norm.	right hand oriented	11
50	Separator	·	Space	1
51	Arbitrary	····	Arbitrary (in capital letters)	4
52	Separator	·	Space	1
53	Test code BIL	BIL		3
54	Result for BIL	·····neg	right hand oriented	11
55	Separator	·	Space	1
56	Arbitrary	····	Arbitrary (in capital letters)	4
57	Separator	·	space	1
58	Test code ERY	ERY		3
59	Result for ERY	·····neg.	right hand oriented	11
60	Separator	·	Space	1
61	Arbitrary	····	Arbitrary (in capital letters)	4
62	Separator	·	Space	1

63	NAG (not assigned)	NAG	Not supported in URISYS 1800	3
64	Result for NAG	··········	Not used, always empty	11
65	Separator	·	Space	1
66	Arbitrary	····	Arbitrary (in capital letters)	4
67	Separator	·	Space	1
68	End of text (ETX)	ETX	Hex 03	1
69	Checksum	6}	LRC calculation	2
70	Block terminator	CR	Hex 13	1

6.7 Communication block „Sediment results“ (function code D)

With this block the sediment data can be sent to the host. It is only possible to send it as an appendix to the “strip results” block. A maximum of 10 sediment results can be sent in one block but the communication block “Sediment results” can be sent repeatedly.

The color and clarity appear always after the sediment data. If there are no sediment data available, only color and clarity is transmitted.

Refer to trace example 2 for more details.

No.	Field	Example	Comment	Bytes
1	Start Of Text (STX)	STX	Hex 02	1
2	Frame Code	;	start up- or download	1
3	Message control ID	D	function code	1
4	Separator	·	Space	1
5	Sample ID	11111111··	left hand oriented, if no sample ID is given this field contains only spaces	10
6	Separator	·	space	1
7	Sequence no.	····9	right hand oriented, if no sequence number is given this field contains only spaces	5
8	Separator	·	Space	1
9	Date	········	Always empty	8
10	Separator	·	Space	1
11	Time	·····	Always empty	5
12	Separator	·	Space	1
13	Test code	ERY·····		10
14	Sediment result	++·····	left hand oriented	8
15	Separator	·	Space	1
16	Test code	LEUCO····		10
17	Sediment result	FEW····	right hand oriented	8
18	Separator	·	Space	1
19	Test code	COLOR···		10
20	Sediment result	yellow··	right hand oriented	8
21	Separator	·	Space	1
22	Test code	CLA····		10
23	Sediment result	mucous··	right hand oriented	8
24	Separator	·	Space	1
.				.
.	Sediment results maximum 10 per block	.		
.				.
43	End Of text (ETX)	ETX	Hex 03	1
44	Checksum	6}	LRC calculation	2
45	Block terminator	CR	End of text	1

6.8 Trace examples

6.8.1 Example 1: Upload Sample Results (without sediment data)

```
URISYS 09:47:50,312 [STX]<[ETX]3=[CR]
Host   09:47:50,312 [STX]>[ETX]3?[CR]
URISYS 09:47:50,375 [STX];C·00002··········2·26.08.05·09:45·SG1.01
                    0·····PH··8·····LEU····500·/ul···3+·NITpos··
                    POS·PRO··150·mg/dl···3+·GLU·1000·mg/dl···4+·KE
                    T·····neg··NEG·UBG····4·mg/dl···2+·BIL····3
                    ·mg/dl···2+·ERY····150·/ul···4+·NAG·····
                    ·····[ETX]3<[CR]
Host   09:47:50,625 [STX]>[ETX]3?[CR]
URISYS 09:47:50,671 [STX];D·00002··········2·····COLOR·
                    ···brown···CLA·····[ETX]0;[CR]
Host   09:47:50,765 [STX]>[ETX]3?[CR]
URISYS 09:47:50,812 [STX]:[ETX]3;[CR]
```

6.8.2 Example 2: Upload Sample Results (with sediment data)

```
URISYS 09:52:53,456 [STX]<[ETX]3=[CR]
Host   09:52:53,466 [STX]>[ETX]3?[CR]
URISYS 09:52:53,517 [STX];C·456789·····8·10.02.72·17:37·SG1.01
                    0·····PH··8·····LEU·····neg·····NITpos··
                    ···PRO·····neg·····GLU·····norm·····KE
                    T·····neg·····UBG·····norm·····BIL·····
                    ··neg·····ERY·····neg·····NAG·····
                    ·····[ETX]33[CR]
Host   09:52:53,807 [STX]>[ETX]3?[CR]
URISYS 09:52:53,857 [STX];D·456789·····8·····Param1
                    ···001·····Param2···005·····Param3···007·
                    ····Param4···010·····Param5···013·····COL
                    OR····p.yel···CLA·····clear···[ETX]4=[CR]
Host   09:52:54,037 [STX]>[ETX]3?[CR]
URISYS 09:52:54,097 [STX]:[ETX]3;[CR]
```

6.8.3 Example 3: Download Work list

```
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000010[ETX]19[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000011[ETX]20[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000012[ETX]21[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX]:[ETX]3;[CR]
```

6.8.4 Example 4: Download Work list with transmission error

```
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000010[ETX]19[CR]
```

```
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000011[ETX]20[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000012[ETX]21[CR]
URISYS [STX]?[ETX]3?[CR]
Host   [STX];A·0000000012[ETX]21[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX]:[ETX]3;[CR]
```

7 Protocol Miditron M (encoded)

7.1 Communication block „Readiness“

When Urisys 1800 or the host will start a communication this communication block is sent.
The receiver has to answer with a confirmation. For example: With the communication block “Readiness” Urisys 1800 checks if the host is ready for a data transmission. The host must answer with the communication block “Confirmation”.

Please refer to trace example 1 and 2.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	<	Readiness for upload data transmission	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3=	LRC calculation	2
5	Block terminator	CR	Hex 13	1

7.2 Communication block „Confirmation“

Urisys 1800 or the host confirms the readiness with the communication „Confirmation“.
This block is also used to confirm single communication blocks in a multi–block message.

Please refer to trace example 1 and 2.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	>	Confirmation	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3?	LRC calculation	2
5	Block terminator	CR	Hex 13	1

7.3 Communication block „End of transmission“

A data transmission is terminated with the communication block “end of transmission”. This communication block signalizes the end of a message. It is used for result uploads as well as for work list downloads.

Please refer to trace example 1, 2, 3 and 4.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	:	End of transmission	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3;	LRC calculation	2
5	Block terminator	CR	Hex 13	1

7.4 Communication block „Replay“

In case of faulty or incomplete transmission of a communication block (e.g. wrong checksum) the communication block “Replay” requests a retransmit.

Please refer to trace example 4.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	?	Replay of last transmitted data	1
3	End of text (ETX)	ETX	Hex 3	1
4	Checksum	3;	LRC calculation	2
5	Block terminator	CR	Hex 13	1

7.5 Communication block “Download Work list” (function code A)

This communication block is used to transmit the work list from the host to Urisys 1800.
For each sample ID a communication block must be sent.

Please refer to trace example 3 and 4 below.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	;	Start download	1
3	Message control ID	A	Function code A	1
4	Separator	·	Space	1
5	Sample ID	10·····	Left hand oriented	10
43	End of text (ETX)	ETX	Hex 03	1
44	Checksum	6}	LRC calculation	2
45	Block terminator	CR	Hex 13	1

7.6 Communication block “Strip/sediment results” (function code B)

With this communication block test strip and sediment results can be transmitted to the host.
The last 2 fields of the sediment –parameter (29 and 30) are used for the transmission of color and clarity. Data field from unused sediment data can be skipped.

No.	Field	Example	Comment	Bytes
1	Start Of Text (STX)	STX	hex 02	1
2	Frame Code	;	start up- or download	1
3	Message control ID	B	function code	1
4	Separator	·	Space	1
5	sample ID	0001·····	left hand oriented, if no sample ID given this field contains only spaces	10
6	Separator	·	Space	1
7	sequence no.	····1	right hand oriented, if no sequence no. given this field contains only spaces	5
8	Separator	·	Space	1
9	Date	01.01.04	date of test strip measuring (DD.MM.YY)	8
10	Separator	·	Space	1
11	Time	12:05	time of test strip measuring (hh:mm)	5

12	Separator	·	Space	1
13	Test index	·1	Index 1 = SG	2
14	Result index	·6	Result index according order in range table	2
15	Separator	·	Space	1
16	Test index	·2	Index 2 = PH	2
17	Result index	·1	Result index according order in range table	2
18	Separator	·	Space	1
19	Test index	·3	Index 3 = LEU	2
20	Result index	·0	Result index according order in range table	2
21	Separator	·	Space	1
22	Test index	·4	Index 4 = NIT	2
23	Result index	·1	Result index according order in range table	2
24	Separator	·	Space	1
25	Test index	·5	Index 5 = PRO	2
26	Result index	·0	Result index according order in range table	2
27	Separator	·	Space	1
28	Test index	·6	Index 6 = GLU	2
29	Result index	·2	Result index according order in range table	2
30	Separator	·	Space	1
31	Test index	·7	Index 7 = KET	2
32	Result index	·0	Result index according order in range table	2
33	Separator	·	Space	1
34	Test index	·8	Index 8 = UBG	2
35	Result index	·0	Result index according order in range table	2
36	Separator	·	Space	1
37	Test index	·9	Index 9 = BIL	2
38	Result index	·0	Result index according order in range table	2
39	Separator	·	Space	1
40	Test index	10	Index 10 = ERY	2
41	Result index	·0	Result index according order in range table	2
42	Separator	·	Space	1
43	Test index	11	Index 11 = NAG	2
44	Result index	··	Not Assigned, this field is always empty	2
45	Separator	·	Space	1
46	Test index	12	Index 12 = 1st sediment result	
47	Result	·4	Sediment result	
48	Separator	·	Space	1
·	·	·	·	
·	·	·	·	
135	Test index	40	Index 40 = color	
136	Result index	·3	Result index according order in range table	
137	Separator	·	Space	1
138	Test index	41	Index 41 = clarity	
139	Result index	·3	Result index according order in range table	
140	End Of Text (ETX)	ETX	hex 03	1
141	checksum	6}	LRC calculation	2
142	Carriage Return	CR		1

7.7 Trace Examples

7.7.1 Example 1: Upload sample results (encoded, without sediment data)

```
Urisys [STX]<[ETX]3=[CR]
Host   [STX]>[ETX]3?[CR]
Urisys [STX];B·0001···········1·01.01.04·12:05··1·6··
       2·1··3·0··4·1··5·0··6·2··7·0··8·0··9·0·10·0·11
       ···[ETX]4v[CR]
Host   [STX]>[ETX]3?[CR]
```

7.7.2 Example 2: Upload sample results (encoded, with sediment data)

```
Urisys [STX]<[ETX]3=[CR]
Host   [STX]>[ETX]3?[CR]
Urisys [STX];B·0001···········1·01.01.04·12:05··1·6··
       2·1··3·0··4·1··5·0··6·2··7·0··8·0··9·0·10·0·11
       ···12·4·13·1·14·5·40·3 41·3[ETX]4v[CR]
Host   [STX]>[ETX]3?[CR]
```

7.7.3 Example 3: Download Work list

```
Urisys [STX]>[ETX]3?[CR]
Host   [STX];A·0000000010[ETX]19[CR]
Urisys [STX]>[ETX]3?[CR]
Host   [STX];A·0000000011[ETX]20[CR]
Urisys [STX]>[ETX]3?[CR]
Host   [STX];A·0000000012[ETX]21[CR]
Urisys [STX]>[ETX]3?[CR]
Host   [STX]:[ETX]3;[CR]
```

7.7.4 Example 4 Download Work list with transmission error

Example: Two times same sample ID, creates a transmission error

```
Urisys [STX]>[ETX]3?[CR]
Host   [STX];A·0000000010[ETX]19[CR]
Urisys [STX]>[ETX]3?[CR]
Host   [STX];A·0000000011[ETX]20[CR]
Urisys [STX]>[ETX]3?[CR]
Host   [STX];A·0000000012[ETX]21[CR]
Urisys [STX]?[ETX]3?[CR]
Host   [STX];A·0000000012[ETX]21[CR]
Urisys [STX]>[ETX]3?[CR]
Host   [STX]:[ETX]3;[CR]
```

8 Protocol Miditron Junior I

8.1 Communication block „Readiness“

When Urisys 1800 or the host will start a communication this communication block is sent.
The receiver has to answer with a confirmation. For example: With the communication block “Readiness” Urisys 1800 checks if the host is ready for a data transmission. The host must answer with the communication block “Confirmation”.

Please refer to trace example 1 and 2 below.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	<	Readiness for upload data transmission	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3=	LRC calculation	2
5	Block terminator	CR	Hex 13	1

8.2 Communication block „Confirmation“

Urisys 1800 or the host confirms the readiness with the communication „Confirmation“.
This block is also used to confirm single communication blocks in a multi–block message.

Please refer to trace example 1 and 2.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	>	Confirmation	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3?	LRC calculation	2
5	Block terminator	CR	Hex 13	1

8.3 Communication block „End of transmission“

A data transmission is terminated with the communication block “end of transmission”. This communication block signalizes the end of a message. It is used for result uploads as well as for work list downloads.

Please refer to trace example 1,2 and 3.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	:	End of transmission	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3;	LRC calculation	2
5	Block terminator	CR	Hex 13	1

8.4 Communication block „Replay“

In case of faulty or incomplete transmission of a communication block (e.g. wrong checksum) the communication block “Replay” requests a retransmit.

Refer to trace example 4.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	?	Replay of last transmitted data	1
3	End of text (ETX)	ETX	Hex 3	1
4	Checksum	3;	LRC calculation	2
5	Block terminator	CR	Hex 13	1

8.5 Communication block “Download Work list” (function code A)

This communication block is used to transmit the work list from the host to Urisys 1800. For each sample ID a communication record must be sent.

Refer to trace example 3 and 4.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	;	Start up- or download	1
3	Message control ID	A	Function code A	1
4	Separator	·	Space	1
5	Sample ID	·····10	Right hand oriented	10
43	End of text (ETX)	ETX	Hex 03	1
44	Checksum	6}	LRC calculation	2
45	Block terminator	CR	Hex 13	1

8.6 Communication block “Strip results” (function code E)

This communication block is used to transmit the strip results.

Refer to trace example 1 and 2.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	;	Start up- or download	1
3	Message control ID	E	Function code E	1
4	Separator	·	Space	1
5	Sample ID	····123456	right hand oriented, if no sample ID given this field contains only spaces	10
6	Separator	·	Space	1
7	Sequence no.	····9	right hand oriented, if no sequence no. given this field contains only spaces	5
8	Separator	·	Space	1

9	Date	01.01.04	date of test strip measuring (DD.MM.YY)	8
10	Separator	·	Space	1
11	Time	12:05	time of test strip measuring (hh:mm)	5
12	Separator	·	Space	1
13	Test code SG	SG		2
14	Result for SG	1.030	right hand oriented	5
15	Separator	·	Space	1
16	Arbitrary	····	Arbitrary (always empty)	4
17	Separator	·	Space	1
18	Test code PH	PH		2
19	Result for PH	··6	right hand oriented	3
20	Separator	·	Space	1
21	Arbitrary	····	Arbitrary (always empty)	4
22	Separator	·	Space	1
23	Test code LEU	LEU		3
24	Result for LEU	·····neg.	right hand oriented	11
25	Separator	·	Space	1
26	Arbitrary	·+++	Arbitrary	4
27	Separator	·	Space	1
28	Test code NIT	NIT		3
29	Result for NIT	Pos		3
30	Separator	·	Space	1
31	Arbitrary	·pos	Arbitrary	4
32	Separator	·	Space	1
33	Test code PRO	PRO		3
34	Result for PRO	·····neg.	right hand oriented	11
35	Separator	·	space	1
36	Arbitrary	·+++	Arbitrary	4
37	Separator	·	space	1
38	Test code GLU	GLU		3
39	Result for GLU	·····100	right hand oriented	11
40	Separator	·	space	1
41	Arbitrary	·+++	Arbitrary	4
42	Separator	·	space	1
43	Test code KET	KET		3
44	Result for KET	·····neg.	right hand oriented	11
45	Separator	·	space	1
46	Arbitrary	**++++**	Arbitrary	4
47	Separator	·	space	1
48	Test code UBG	UBG		3
49	Result for UBG	·····norm.	right hand oriented	11
50	Separator	·	space	1
51	Arbitrary	·+++	Arbitrary	4
52	Separator	·	space	1
53	Test code BIL	BIL		3
54	Result for BIL	.....neg	right hand oriented	11
55	Separator	·	space	1
56	Arbitrary	··++	Arbitrary	4
57	Separator	·	space	1
58	Test code ERY	ERY		3
59	Result for ERY	·····neg.	right hand oriented	11
60	Separator	·	space	1

61	Arbitrary	++++	Arbitrary	4
62	Separator	·	space	1
63	NAG (not assigned)	NAG	Not supported in URISYS 1800	3
64	Result for NAG	··········	Not used, always empty	11
65	Separator	·	Space	1
66	Arbitrary	····	Arbitrary	4
67	Separator	·	Space	1
68	End of text (ETX)	ETX	Hex 03	1
69	Checksum	6}	LRC calculation	2
70	Block terminator	CR	Hex 13	1

8.7 Trace example

8.7.1 Example 1 Upload Sample Results:

```
URISYS 09:48:55,968 [STX]<[ETX]3=[CR]
Host   09:48:55,968 [STX]>[ETX]3?[CR]
URISYS 09:48:56,031 [STX];E·····00002····2·26.08.05·09:45·SG1.01
                    0·····PH··8·····LEU····500·/ul···3+·NITpos··
                    pos·PRO··150·mg/dl···3+·GLU·1000·mg/dl···4+·KE
                    T·····neg··neg·UBG····4·mg/dl···2+·BIL····3
                    ·mg/dl···2+·ERY····150·/ul···4+·NAG··········
                    ·····[ETX]3:[CR]
Host   09:48:56,281 [STX]>[ETX]3?[CR]
URISYS 09:48:56,328 [STX]:[ETX]3;[CR]
```

8.7.2 Example 2 Download Work list

```
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000010[ETX]19[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000011[ETX]20[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000012[ETX]21[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX]:[ETX]3;[CR]
```

8.7.3 Example 4 Download Work list with transmission error

Example: Two times same sample ID, creates a transmission error

```
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000010[ETX]19[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000011[ETX]20[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000012[ETX]21[CR]
URISYS [STX]?[ETX]3?[CR]
Host   [STX];A·0000000012[ETX]21[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX]:[ETX]3;[CR]
```

9 Protocol Miditron Junior II

(10 and 13 digit Sample ID)

9.1 Communication block „Readiness“

When Urisys 1800 or the host will start a communication this communication block is sent.
The receiver has to answer with a confirmation. For example: With the communication block “Readiness” Urisys 1800 checks if the host is ready for a data transmission. The host must answer with the communication block “Confirmation”.

Please refer to trace example 1 and 2 below.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	<	Readiness for upload data transmission	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3=	LRC calculation	2
5	Block terminator	CR	Hex 13	1

9.2 Communication block „Confirmation“

Urisys 1800 or the host confirms the readiness with the communication „Confirmation“.
This block is also used to confirm single communication blocks in a multi–block message.

Please refer to trace example 1, 2, 3 and 4.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	>	Confirmation	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3?	LRC calculation	2
5	Block terminator	CR	Hex 13	1

9.3 Communication block „End of transmission“

A data transmission is terminated with the communication block “end of transmission”. This communication block signalizes the end of a message. It is used for result uploads as well as for work list downloads.

Please refer to trace example 1, 2, 3 and 4.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	:	End of transmission	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3;	LRC calculation	2
5	Block terminator	CR	Hex 13	1

9.4 Communication block „Replay“

In case of faulty or incomplete transmission of a communication block (e.g. wrong checksum) the communication block “Replay” requests a retransmit.

Refer to trace example 3 and 4.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	?	Replay of last transmitted data	1
3	End of text (ETX)	ETX	Hex 3	1
4	Checksum	3;	LRC calculation	2
5	Block terminator	CR	Hex 13	1

9.5 Communication block “Download Work list” (function code A)

This communication block is used to transmit the work list from the host to Urisys 1800. For each sample ID a communication record must be sent.

Refer to trace example 3 and 4.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	;	Start up- or download	1
3	Message control ID	A	Function code A	1
4	Separator	·	Space	1
5	Sample ID	·····11111111 or ··11111111	Right hand oriented	10 or 13
43	End of text (ETX)	ETX	Hex 03	1
44	Checksum	6}	LRC calculation	2
45	Block terminator	CR	Hex 13	1

9.6 Communication block “Strip results” (function code E)

This communication block is used to transmit the strip results.

Refer to trace example 1 and 2.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	;	Start up- or download	1
3	Message control ID	E	Function code E	1
4	Separator	·	Space	1
5	Sample ID	·····11111111 or ··11111111	right hand oriented, if no sample ID given this field contains only spaces	10 or 13
6	Separator	·	Space	1
7	Sequence no.	····9	Right hand oriented, if no sequence no. given this field contains only spaces	5
8	Separator	·	Space	1
9	Date	01.01.04	Date of test strip measuring (DD.MM.YY)	8

10	Separator	·	Space	1
11	Time	12:05	Time of test strip measuring (hh:mm)	5
12	Separator	·	Space	1
13	Test code SG	SG		2
14	Result for SG	1.030	Right hand oriented	5
15	Separator	·	Space	1
16	Arbitrary	····	Arbitrary (always empty)	4
17	Separator	·	Space	1
18	Test code PH	PH		2
19	Result for PH	··6	right hand oriented	3
20	Separator	·	Space	1
21	Arbitrary	····	Arbitrary (always empty)	4
22	Separator	·	Space	1
23	Test code LEU	LEU		3
24	Result for LEU	·····neg.	right hand oriented	11
25	Separator	·	Space	1
26	Arbitrary	·+++	Arbitrary	4
27	Separator	·	Space	1
28	Test code NIT	NIT		3
29	Result for NIT	pos		3
30	Separator	·	Space	1
31	Arbitrary	·pos	Arbitrary	4
32	Separator	·	Space	1
33	Test code PRO	PRO		3
34	Result for PRO	·····neg.	right hand oriented	11
35	Separator	·	space	1
36	Arbitrary	·+++	Arbitrary	4
37	Separator	·	space	1
38	Test code GLU	GLU		3
39	Result for GLU	·····100	right hand oriented	11
40	Separator	·	space	1
41	Arbitrary	·+++	Arbitrary	4
42	Separator	·	space	1
43	Test code KET	KET		3
44	Result for KET	·····neg.	right hand oriented	11
45	Separator	·	space	1
46	Arbitrary	**++++**	Arbitrary	4
47	Separator	·	space	1
48	Test code UBG	UBG		3
49	Result for UBG	·····norm.	right hand oriented	11
50	Separator	·	space	1
51	Arbitrary	·+++	Arbitrary	4
52	Separator	·	space	1
53	Test code BIL	BIL		3
54	Result for BIL	·····neg	right hand oriented	11
55	Separator	·	space	1
56	Arbitrary	··++	Arbitrary	4
57	Separator	·	space	1
58	Test code ERY	ERY		3
59	Result for ERY	·····neg.	right hand oriented	11
60	Separator	·	space	1
61	Arbitrary	**++++**	Arbitrary	4
62	Separator	·	space	1

63	NAG (not assigned)	NAG	Not supported in URISYS 1800	3
64	Result for NAG	··········	Not used, always empty	11
65	Separator	·	Space	1
66	Arbitrary	····	Arbitrary	4
67	Separator	·	Space	1
68	End of text (ETX)	ETX	Hex 03	1
69	Checksum	6}	LRC calculation	2
70	Block terminator	CR	Hex 13	1

9.7 Communication block „color and clarity“ (function code D)

With this block color and clarity data can be sent to the host. It is only possible to send it as an appendix to the “strip results” block. A maximum of 10 sediment results can be sent in one block but the communication block “color and clarity” can be sent repeatedly.

Refer to trace example 1 and 2 for better understanding.

No.	Field	Example	Comment	Bytes
1	Start Of Text (STX)	STX	Hex 02	1
2	Frame Code	;	start up- or download	1
3	Message control ID	D	function code	1
4	Separator	·	Space	1
5	Sample ID	·····11111111 or ··11111111	Right hand oriented, if no sample ID given this field contains only spaces	10 or 13
6	Separator	·	space	1
7	Sequence no.	····9	right hand oriented, if no sequence no. given this field contains only spaces	5
8	Separator	·	Space	1
9	Date	01.01.04	date of test strip measuring	8
10	Separator	·	space	1
11	Time	12:05	time of test strip measuring	5
12	Separator	·	space	1
13	Test code	yellow··········	color	18
14	Separator	·	Space	1
15	Test code	clear···········	clarity	18
16	Separator	·	Space	1
17	End Of text (ETX)	ETX	Hex 03	1
18	Checksum	6}	LRC calculation	2
19	Block terminator	CR	End of text	1

9.8 Trace example

9.8.1.1 Example 1 Upload Sample Results (10 digits patient ID):

```
URISYS 09:50:03,140 [STX]<[ETX]3=[CR]
Host   09:50:03,156 [STX]>[ETX]3?[CR]
URISYS 09:50:03,203 [STX];E·····00002·····2·26.08.05·09:45·SG1.01
                    0·····PH··8·····LEU····500·/ul···3+·NITpos··
                    pos·PRO··150·mg/dl···3+·GLU·1000·mg/dl···4+·KE
                    T·····neg··neg·UBG····4·mg/dl···2+·BIL····3
                    ·mg/dl···2+·ERY····150·/ul···4+·NAG··········
                    ·····[ETX]3:[CR]
```

```
Host    09:50:03,453 [STX]>[ETX]3?[CR]
URISYS  09:50:03,500 [STX];D·····00002····2·26.08.05·09:45·brown·
                     ·····························[ETX]03[CR]
Host    09:50:03,593 [STX]>[ETX]3?[CR]
URISYS  09:50:03,640 [STX]:[ETX]3;[CR]
```

9.8.1.2 Example 2: Upload Sample Results (13 digits patient ID):

```
URISYS  09:59:02,819 [STX]<[ETX]3=[CR]
Host    09:59:02,819 [STX]>[ETX]3?[CR]
URISYS  09:59:02,879 [STX];E·····123456····6·10.02.72·17:20·SG1
                     .015·····PH··7·····LEU····100·/ul·····NITpo
                     s·····PRO···75·mg/dl·····GLU·····norm····
                     ·KET·····neg·····UBG····1·mg/dl·····BIL··
                     ·····neg·····ERY····250·/ul·····NAG·····
                     ·····[ETX]56[CR]
Host    09:59:03,199 [STX]>[ETX]3?[CR]
URISYS  09:59:03,259 [STX];D·····123456····6·10.02.72·17:20·yel
                     low···········mucous···········[ETX]61[CR]
Host    09:59:03,339 [STX]>[ETX]3?[CR]
URISYS  09:59:03,399 [STX]:[ETX]3;[CR]
```

9.8.1.3 Example 3: Download Work list

```
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000010[ETX]19[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000011[ETX]20[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000012[ETX]21[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX]:[ETX]3;[CR]
```

9.8.1.4 Example 4: Download Work list with transmission error

```
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000010[ETX]19[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000011[ETX]20[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX];A·0000000012[ETX]21[CR]
URISYS [STX]?[ETX]3?[CR]
Host   [STX];A·0000000012[ETX]21[CR]
URISYS [STX]>[ETX]3?[CR]
Host   [STX]:[ETX]3;[CR]
```

10 Protocol Chemstrip UA

10.1 Communication block „Readiness“

When Urisys 1800 or the host will start a communication this communication block is sent.
The receiver has to answer with a confirmation. For example: With the communication block “Readiness” Urisys 1800 checks if the host is ready for a data transmission. The host must answer with the communication block “Confirmation”.

Please refer to trace example 1.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	<	Readiness for upload data transmission	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3C	LRC calculation	2
5	Block terminator	CR	Hex 13	1

10.2 Communication block „Confirmation“

Urisys 1800 or the host confirms the readiness with the communication „Confirmation“.
This block is also used to confirm single communication blocks in a multi–block message.

Please refer to trace example 1, 2 and 3.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	>	Confirmation	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3E	LRC calculation	2
5	Block terminator	CR	Hex 13	1

10.3 Communication block „End of transmission“

A data transmission is terminated with the communication block “end of transmission”. This communication block signalizes the end of a message. It is used for result uploads as well as for work list downloads.

Please refer to trace example 1, 2 and 3.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	:	End of transmission	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3A	LRC calculation	2
5	Block terminator	CR	Hex 13	1

10.4 Communication block „Replay“

In case of faulty or incomplete transmission of a communication block (e.g. wrong checksum) the communication block “Replay” requests a retransmit.

Refer to trace example 3.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	?	Replay of last transmitted data	1
3	End of text (ETX)	ETX	Hex 3	1
4	Checksum	3D	LRC calculation	2
5	Block terminator	CR	Hex 13	1

10.5 Communication block “Download Worklist” (function code A)

This communication block is used to transmit the work list from the host to Urisys 1800.
For each sample ID a communication block must be sent.

Refer to trace example 2 and 3 for more details.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	;	Start up- or download	1
3	Message control ID	A	Function code A	1
4	Separator	·	Space	1
5	Sample ID	10·····	Left hand oriented	10
6	End of text (ETX)	ETX	Hex 03	1
7	Checksum	6A	LRC calculation	2
8	Block terminator	CR	Hex 13	1

10.6 Communication block “Strip results” (function code C)

With the communication block “Strip results” test strip results will be transmitted to the host.

Refer to trace example 1 for more details.

No.	**Field**	**Example**	**Comment**	**Bytes**
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	;	Start up- or download	1
3	Message control ID	C	Function code C	1
4	Separator	·	Space	1
5	Sample ID	11111111··	left hand oriented, if no sample ID given this field contains only spaces	10
6	Separator	·	Space	1
7	Sequence no.	····9	right hand oriented, if no sequence no. given this field contains only spaces	5
8	Separator	·	Space	1
9	Date	01.01.04	date of test strip measuring (DD.MM.YY)	8

10	Separator	·	Space	1
11	Time	12:05	time of test strip measuring (hh:mm)	5
12	Separator	·	Space	1
13	Test code SG	SG		2
14	Result for SG	1.030	right hand oriented	5
15	Separator	·	Space	1
16	Arbitrary	····	Arbitrary (always empty)	4
17	Separator	·	Space	1
18	Test code PH	PH		2
19	Result for PH	··6	right hand oriented	3
20	Separator	·	Space	1
21	Arbitrary	····	Arbitrary (always empty)	4
22	Separator	·	Space	1
23	Test code LEU	LEU		3
24	Result for LEU	·····neg.	right hand oriented	11
25	Separator	·	Space	1
26	Arbitrary	·+++	Arbitrary (in capital letters)	4
27	Separator	·	Space	1
28	Test code NIT	NIT		3
29	Result for NIT	pos		3
30	Separator	·	Space	1
31	Arbitrary	·pos	Arbitrary (in capital letters)	4
32	Separator	·	Space	1
33	Test code PRO	PRO		3
34	Result for PRO	·····neg.	right hand oriented	11
35	Separator	·	space	1
36	Arbitrary	·+++	Arbitrary (in capital letters)	4
37	Separator	·	space	1
38	Test code GLU	GLU		3
39	Result for GLU	·····100	right hand oriented	11
40	Separator	·	space	1
41	Arbitrary	·+++	Arbitrary (in capital letters)	4
42	Separator	·	space	1
43	Test code KET	KET		3
44	Result for KET	·····neg.	right hand oriented	11
45	Separator	·	space	1
46	Arbitrary	**++++**	Arbitrary (in capital letters)	4
47	Separator	·	space	1
48	Test code UBG	UBG		3
49	Result for UBG	·····norm.	right hand oriented	11
50	Separator	·	space	1
51	Arbitrary	·+++	Arbitrary (in capital letters)	4
52	Separator	·	space	1
53	Test code BIL	BIL		3
54	Result for BIL	·····neg	right hand oriented	11
55	Separator	·	space	1
56	Arbitrary	··++	Arbitrary (in capital letters)	4
57	Separator	·	space	1
58	Test code ERY	BLD	USA/Canada uses different test code	3
59	Result for ERY	·····neg.	right hand oriented	11
60	Separator	·	space	1
61	Arbitrary	**++++**	Arbitrary (in capital letters)	4

62	Separator	·	space	1
63	NAG (not assigned)	NAG	Not supported in URISYS 1800	3
64	Result for NAG	··········	Not used, always empty	11
65	Separator	·	Space	1
66	Arbitrary	····	Arbitrary (in capital letters)	4
67	Separator	·	Space	1
68	End of text (ETX)	ETX	Hex 03	1
69	Checksum	81	LRC calculation	2
70	Block terminator	CR	Hex 13	1

10.7 Communication block „Sediment results“ (function code D)

With this block the sediment data can be sent to the host. It is only possible to send it as an appendix to the “strip results” block. A maximum of 10 sediment results can be sent in one block but the communication block “Sediment results” can be sent repeatedly.

The color and clarity appear always after the sediment data. If there are no sediment data available, only color and clarity is transmitted.

Refer to trace example 1 for more details.

No.	Field	Example	Comment	Bytes
1	Start Of Text (STX)	STX	Hex 02	1
2	Frame Code	;	start up- or download	1
3	Message control ID	D	function code	1
4	Separator	·	Space	1
5	Sample ID	11111111··	left hand oriented, if no sample ID given this field contains only spaces	10
6	Separator	·	space	1
7	Sequence no.	····9	right hand oriented, if no sequence no. given this field contains only spaces	5
8	Separator	·	Space	1
9	Date	········	always empty	8
10	Separator	·	Space	1
11	Time	·····	always empty	5
12	Separator	·	Space	1
13	Test code	COLOR·····		10
14	Sediment result	FEW·····	left hand oriented	8
15	Separator	·	Space	1
16	Test code	CLA·····		10
17	Sediment result	mucous··	right hand oriented	8
18	Separator	·	Space	1
19	End Of text (ETX)	ETX	Hex 03	1
20	Checksum	65	LRC calculation	2
21	Block terminator	CR	End of text	1

10.8 Trace examples

10.8.1 Example 1: Upload Sample Results:

```
URISYS 09:52:41,250 [STX]<[ETX]3C[CR]
Host   09:52:41,250 [STX]>[ETX]3E[CR]
```

```
URISYS 09:52:41,312 [STX];C·00002··········2·26.08.05·09:45·SG1.01
                    0·····PH··8·····LEU····500·/ul···3+·NITpos··
                    POS·PRO··150·mg/dl···3+·GLU·1000·mg/dl···4+·KE
                    T·····neg··NEG·UBG····4·mg/dl···2+·BIL····3
                    ·mg/dl···2+·BLD····150·/ul···4+·NAG··········
                    ·····[ETX]E5[CR]
Host   09:52:41,562 [STX]>[ETX]3E[CR]
URISYS 09:52:41,609 [STX];D·00002··········2·············COLOR·
                    ····brown····CLA·············[ETX]9A[CR]
Host   09:52:41,687 [STX]>[ETX]3E[CR]
URISYS 09:52:41,734 [STX]:[ETX]3A[CR]
```

10.8.2 Example 2: Download Worklist

```
URISYS [STX]>[ETX]3E[CR]
Host   [STX];A·0000000010[ETX]19[CR]
URISYS [STX]>[ETX]3E[CR]
Host   [STX];A·0000000011[ETX]20[CR]
URISYS [STX]>[ETX]3E[CR]
Host   [STX];A·0000000012[ETX]21[CR]
URISYS [STX]>[ETX]3E[CR]
Host   [STX]:[ETX]3A[CR]
```

10.8.3 Example 3: Download Worklist with transmission error

```
URISYS [STX]>[ETX]3E[CR]
Host   [STX];A·0000000010[ETX]19[CR]
URISYS [STX]>[ETX]3E[CR]
Host   [STX];A·0000000011[ETX]20[CR]
URISYS [STX]>[ETX]3E[CR]
Host   [STX];A·0000000012[ETX]21[CR]
URISYS [STX]?[ETX]3D[CR]
Host   [STX];A·0000000012[ETX]21[CR]
URISYS [STX]>[ETX]3E[CR]
Host   [STX]:[ETX]3A[CR]
```

11 Protocol Chemstrip Criterion I

11.1 Communication block „Readiness“

When Urisys 1800 or the host will start a communication this communication block is sent.
The receiver has to answer with a confirmation. For example: With the communication block “Readiness” Urisys 1800 checks if the host is ready for a data transmission. The host must answer with the communication block “Confirmation”.

Please refer to trace example 1.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	<	Readiness for upload data transmission	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3C	LRC calculation	2
5	Block terminator	CR	Hex 13	1

11.2 Communication block „Confirmation“

Urisys 1800 or the host confirms the readiness with the communication „Confirmation“.
This block is also used to confirm single communication blocks in a multi–block message.

Please refer trace example 1 and 2 below.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	>	Confirmation	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3E	LRC calculation	2
5	Block terminator	CR	Hex 13	1

11.3 Communication block „End of transmission“

A data transmission is terminated with the communication block “end of transmission”. This communication block signalizes the end of a message. It is used for result uploads as well as for work list downloads.

Please refer to trace example 1, 2 and 3.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	:	End of transmission	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3A	LRC calculation	2
5	Block terminator	CR	Hex 13	1

11.4 Communication block „Replay“

In case of faulty or incomplete transmission of a communication block (e.g. wrong checksum) the communication block “Replay” requests a retransmit.

Please refer to example 3.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	?	Replay of last transmitted data	1
3	End of text (ETX)	ETX	Hex 3	1
4	Checksum	3D	LRC calculation	2
5	Block terminator	CR	Hex 13	1

11.5 Communication block “Download Worklist” (function code A)

This communication block is used to transmit the work list from the host to Urisys 1800.
For each sample ID a communication block must be sent.

Refer to trace example 2 and 3 for more details.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	;	Start up- or download	1
3	Message control ID	A	Function code A	1
4	Separator	·	Space	1
5	Sample ID	·····10	Right hand oriented	10
6	End of text (ETX)	ETX	Hex 03	1
7	Checksum	6A	LRC calculation	2
8	Block terminator	CR	Hex 13	1

11.6 Communication block “Strip results” (function code E)

With the communication block “Strip results” test strip results will be transmitted to the host.

Refer to trace example 1 for more details.

No.	**Field**	**Example**	**Comment**	**Bytes**
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	;	Start up- or download	1
3	Message control ID	E	Function code E	1
4	Separator	·	Space	1
5	Sample ID	··11111111	right hand oriented, if no sample ID given this field contains only spaces	10
6	Separator	·	Space	1
7	Sequence no.	····9	Right hand oriented, if no sequence no. given this field contains only spaces	5
8	Separator	·	Space	1
9	Date	01.01.04	Date of test strip measuring (DD.MM.YY)	8
10	Separator	·	Space	1

11	Time	12:05	Time of test strip measuring (hh:mm)	5
12	Separator	·	Space	1
13	Test code SG	SG		2
14	Result for SG	1.030	right hand oriented	5
15	Separator	·	Space	1
16	Arbitrary	····	Arbitrary (always empty)	4
17	Separator	·	Space	1
18	Test code PH	PH		2
19	Result for PH	··6	right hand oriented	3
20	Separator	·	Space	1
21	Arbitrary	····	Arbitrary (always empty)	4
22	Separator	·	Space	1
23	Test code LEU	LEU		3
24	Result for LEU	·····neg.	right hand oriented	11
25	Separator	·	Space	1
26	Arbitrary	·+++	Arbitrary	4
27	Separator	·	Space	1
28	Test code NIT	NIT		3
29	Result for NIT	pos		3
30	Separator	·	Space	1
31	Arbitrary	·pos	Arbitrary	4
32	Separator	·	Space	1
33	Test code PRO	PRO		3
34	Result for PRO	·····neg.	right hand oriented	11
35	Separator	·	space	1
36	Arbitrary	·+++	Arbitrary	4
37	Separator	·	space	1
38	Test code GLU	GLU		3
39	Result for GLU	·····100	right hand oriented	11
40	Separator	·	space	1
41	Arbitrary	·+++	Arbitrary	4
42	Separator	·	space	1
43	Test code KET	KET		3
44	Result for KET	·····neg.	right hand oriented	11
45	Separator	·	space	1
46	Arbitrary	**++++**	Arbitrary	4
47	Separator	·	space	1
48	Test code UBG	UBG		3
49	Result for UBG	·····norm.	right hand oriented	11
50	Separator	·	space	1
51	Arbitrary	·+++	Arbitrary	4
52	Separator	·	space	1
53	Test code BIL	BIL		3
54	Result for BIL	·····neg	right hand oriented	11
55	Separator	·	space	1
56	Arbitrary	··++	Arbitrary	4
57	Separator	·	space	1
58	Test code ERY	BLD	USA/Canada uses different test code	3
59	Result for ERY	·····neg.	right hand oriented	11
60	Separator	·	Space	1
61	Arbitrary	**++++**	Arbitrary	4
62	Separator	·	space	1

63	NAG (not assigned)	NAG	Not supported in URISYS 1800	3
64	Result for NAG	··········	Not used, always empty	11
65	Separator	·	Space	1
66	Arbitrary	····	Arbitrary	4
67	Separator	·	Space	1
68	End of text (ETX)	ETX	Hex 03	1
69	Checksum	65	LRC calculation	2
70	Block terminator	CR	Hex 13	1

11.7 Trace examples

11.7.1 Example 1: Upload sample sesults

```
URISYS 09:53:39,031 [STX]<[ETX]3C[CR]
Host   09:53:39,031 [STX]>[ETX]3E[CR]
URISYS 09:53:39,093 [STX];E·····00002····2·26.08.05·09:45·SG1.01
                    0·····PH··8·····LEU····500·/ul···3+·NITpos··
                    pos·PRO··150·mg/dl···3+·GLU·1000·mg/dl···4+·KE
                    T·····neg··neg·UBG····4·mg/dl···2+·BIL····3
                    ·mg/dl···2+·BLD····150·/ul···4+·NAG··········
                    ·····[ETX]A7[CR]
Host   09:53:39,343 [STX]>[ETX]3E[CR]
URISYS 09:53:39,390 [STX]:[ETX]3A[CR]
```

11.7.1.1 Example 2: Download work list

```
URISYS [STX]>[ETX]3E[CR]
Host   [STX];A·0000000010[ETX]19[CR]
URISYS [STX]>[ETX]3E[CR]
Host   [STX];A·0000000011[ETX]20[CR]
URISYS [STX]>[ETX]3E[CR]
Host   [STX];A·0000000012[ETX]21[CR]
URISYS [STX]>[ETX]3E[CR]
Host   [STX]:[ETX]3A[CR]
```

11.7.1.2 Example 3: Download work list with transmission error

```
URISYS [STX]>[ETX]3E[CR]
Host   [STX];A·0000000010[ETX]19[CR]
URISYS [STX]>[ETX]3E[CR]
Host   [STX];A·0000000011[ETX]20[CR]
URISYS [STX]>[ETX]3E[CR]
Host   [STX];A·0000000012[ETX]21[CR]
URISYS [STX]?[ETX]3D[CR]
Host   [STX];A·0000000012[ETX]21[CR]
URISYS [STX]>[ETX]3E[CR]
Host   [STX]:[ETX]3A[CR]
```

12 Protocol Chemstrip Criterion II

(10 and 13 digit Sample ID)

12.1 Communication block „Readiness“

When Urisys 1800 or the host will start a communication this communication block is sent.
The receiver has to answer with a confirmation. For example: With the communication block “Readiness” Urisys 1800 checks if the host is ready for a data transmission. The host must answer with the communication block “Confirmation”.

Please refer to trace example 1 and 2.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	<	Readiness for upload data transmission	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3C	LRC calculation	2
5	Block terminator	CR	Hex 13	1

12.2 Communication block „Confirmation“

Urisys 1800 or the host confirms the readiness with the communication „Confirmation“.
This block is also used to confirm single communication blocks in a multi–block message.

Please refer to trace example 1, 2, 3 and 4.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	>	Confirmation	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3E	LRC calculation	2
5	Block terminator	CR	Hex 13	1

12.3 Communication block “End of transmission“

A data transmission is terminated with the communication block “end of transmission”. This communication block signalizes the end of a message. It is used for result uploads as well as for work list downloads.

Please refer to trace example 1, 2, 3 and 4.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	:	End of transmission	1
3	End of text (ETX)	ETX	Hex 03	1
4	Checksum	3A	LRC calculation	2
5	Block terminator	CR	Hex 13	1

12.4 Communication block „Replay“

In case of faulty or incomplete transmission of a communication block (e.g. wrong checksum) the communication block “Replay” requests a retransmit.

Please refer to trace example 3 and 4.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	?	Replay of last transmitted data	1
3	End of text (ETX)	ETX	Hex 3	1
4	Checksum	3D	LRC calculation	2
5	Block terminator	CR	Hex 13	1

12.5 Communication block “Download Worklist” (function code A)

This communication block is used to transmit the work list from the host to Urisys 1800.
For each sample ID a communication block must be sent.

Please refer to trace example 3 and 4 below.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	;	Start up- or download	1
3	Message control ID	A	Function code A	1
4	Separator	·	Space	1
5	Sample ID	··········10 or ·····10	Right hand oriented	10 or 13
6	End of text (ETX)	ETX	Hex 03	1
7	Checksum	6A	LRC calculation	2
8	Block terminator	CR	Hex 13	1

12.6 Communication block “Strip results” (function code E)

This communication block is used to transmit the strip results.

Refer to trace example 1 and 2.

No.	Field	Example	Comment	Bytes
1	Start of text (STX)	STX	Hex 02	1
2	Frame Code	;	Start up- or download	1
3	Message control ID	E	Function code E	1
4	Separator	·	Space	1
5	Sample ID	·····11111111 or ··11111111	right hand oriented, if no sample ID given this field contains only spaces	10 or 13
6	Separator	·	Space	1
7	Sequence no.	····9	Right hand oriented, if no sequence no. given this field contains only spaces	5
8	Separator	·	Space	1
9	Date	01.01.04	Date of test strip measuring (DD.MM.YY)	8

10	Separator	·	Space	1
11	Time	12:05	Time of test strip measuring (hh:mm)	5
12	Separator	·	Space	1
13	Test code SG	SG		2
14	Result for SG	1.030	right hand oriented	5
15	Separator	·	Space	1
16	Arbitrary	····	Arbitrary (always empty)	4
17	Separator	·	Space	1
18	Test code PH	PH		2
19	Result for PH	··6	right hand oriented	3
20	Separator	·	Space	1
21	Arbitrary	····	Arbitrary (always empty)	4
22	Separator	·	Space	1
23	Test code LEU	LEU		3
24	Result for LEU	·····neg.	right hand oriented	11
25	Separator	·	Space	1
26	Arbitrary	·+++	Arbitrary	4
27	Separator	·	Space	1
28	Test code NIT	NIT		3
29	Result for NIT	pos		3
30	Separator	·	Space	1
31	Arbitrary	·pos	Arbitrary	4
32	Separator	·	Space	1
33	Test code PRO	PRO		3
34	Result for PRO	·····neg.	right hand oriented	11
35	Separator	·	space	1
36	Arbitrary	·+++	Arbitrary	4
37	Separator	·	space	1
38	Test code GLU	GLU		3
39	Result for GLU	·····100	right hand oriented	11
40	Separator	·	space	1
41	Arbitrary	·+++	Arbitrary	4
42	Separator	·	space	1
43	Test code KET	KET		3
44	Result for KET	·····neg.	right hand oriented	11
45	Separator	·	space	1
46	Arbitrary	**++++**	Arbitrary	4
47	Separator	·	space	1
48	Test code UBG	UBG		3
49	Result for UBG	·····norm.	right hand oriented	11
50	Separator	·	space	1
51	Arbitrary	·+++	Arbitrary	4
52	Separator	·	space	1
53	Test code BIL	BIL		3
54	Result for BIL	·····neg	right hand oriented	11
55	Separator	·	space	1
56	Arbitrary	··++	Arbitrary	4
57	Separator	·	space	1
58	Test code ERY	BLD	USA/Canada uses different test code	3
59	Result for ERY	·····neg.	right hand oriented	11
60	Separator	·	space	1
61	Arbitrary	**++++**	Arbitrary	4

62	Separator	·	space	1
63	NAG (not assigned)	NAG	Not supported in URISYS 1800	3
64	Result for NAG	··········	Not used, always empty	11
65	Separator	·	Space	1
66	Arbitrary	····	Arbitrary	4
67	Separator	·	Space	1
68	End of text (ETX)	ETX	Hex 03	1
69	Checksum	65	LRC calculation	2
70	Block terminator	CR	Hex 13	1

12.7 Communication block „color and clarity“ (function code D)

With this block color and clarity data can be sent to the host. It is only possible to send it as an appendix to the “strip results” block.

Refer to trace example 1 and 2 for better understanding.

No.	Field	Example	Comment	Bytes
1	Start Of Text (STX)	STX	Hex 02	1
2	Frame Code	;	start up- or download	1
3	Message control ID	D	function code	1
4	Separator	·	Space	1
5	Sample ID	··········10 or ·····10	Right hand oriented, if no sample ID given this field contains only spaces	10 or 13
6	Separator	·	space	1
7	Sequence no.	····9	right hand oriented, if no sequence no. given this field contains only spaces	5
8	Separator	·	Space	1
9	Date	01.01.04	date of test strip measuring (DD.MM.YY)	8
10	Separator	·	space	1
11	Time	12:05	time of test strip measuring	5
12	Separator	·	space	1
13	Test code	yellow··········	color	18
14	Separator	·	Space	1
15	Test code	clear··········	clarity	18
16	Separator	·	Space	1
17	End Of text (ETX)	ETX	Hex 03	1
18	Checksum	72	LRC calculation	2
19	Block terminator	CR	End of text	1

12.8 Trace example

12.8.1 Example 1: Upload Sample Results (10 digits patient ID):

```
URISYS 10:02:15,734 [STX]<[ETX]3C[CR]
Host   10:02:15,734 [STX]>[ETX]3E[CR]
URISYS 10:02:15,785 [STX];E·····123456·····6·10.02.72·17:20·SG1.01
                    5·····PH··7·····LEU····100·/ul·····NITpos··
                    ····PRO···75·mg/dl·····GLU·····norm·····KE
```

```
                    T·····neg·····UBG····1·mg/dl·····BIL·····
                    ···neg·····BLD····250·/ul·····NAG·····
                    ·····[ETX]8D[CR]
Host    10:02:16,075 [STX]>[ETX]3E[CR]
URISYS 10:02:16,125 [STX];D·····123456·····6·10.02.72·17:20·yellow
                    ···········mucous···········[ETX]8E[CR]
Host    10:02:16,205 [STX]>[ETX]3E[CR]
URISYS 10:02:16,255 [STX]:[ETX]3A[CR]
```

12.8.2 Example 2: Upload Sample Results (13 digits patient ID):

```
URISYS 09:55:17,359 [STX]<[ETX]3C[CR]
Host    09:55:17,359 [STX]>[ETX]3E[CR]
URISYS 09:55:17,421 [STX];E·····00002·····2·26.08.05·09:45·SG1
                    .010·····PH··8·····LEU····500·/ul···3+·NITpo
                    s··pos·PRO··150·mg/dl···3+·GLU·1000·mg/dl···4+
                    ·KET·····neg··neg·UBG····4·mg/dl···2+·BIL··
                    ··3·mg/dl···2+·BLD····150·/ul···4+·NAG·····
                    ·····[ETX]07[CR]
Host    09:55:17,671 [STX]>[ETX]3E[CR]
URISYS 09:55:17,718 [STX];D·····00002·····2·26.08.05·09:45·bro
                    wn·····[ETX]A8[CR]
Host    09:55:17,796 [STX]>[ETX]3E[CR]
URISYS 09:55:17,859 [STX]:[ETX]3A[CR]
```

12.8.3 Example 3: Download Worklist

```
URISYS [STX]>[ETX]3E[CR]
Host    [STX];A·0000000010[ETX]19[CR]
URISYS [STX]>[ETX]3E[CR]
Host    [STX];A·0000000011[ETX]20[CR]
URISYS [STX]>[ETX]3E[CR]
Host    [STX];A·0000000012[ETX]21[CR]
URISYS [STX]>[ETX]3E[CR]
Host    [STX]:[ETX]3A[CR]
```

12.8.4 Example 4: Download work list with transmission error

```
URISYS [STX]>[ETX]3E[CR]
Host    [STX];A·0000000010[ETX]19[CR]
URISYS [STX]>[ETX]3E[CR]
Host    [STX];A·0000000011[ETX]20[CR]
URISYS [STX]>[ETX]3E[CR]
Host    [STX];A·0000000012[ETX]21[CR]
URISYS [STX]?[ETX]3D[CR]
Host    [STX];A·0000000012[ETX]21[CR]
URISYS [STX]>[ETX]3E[CR]
Host    [STX]:[ETX]3A[CR]
```

13 Protokoll Urisys 2400 (ASTM)

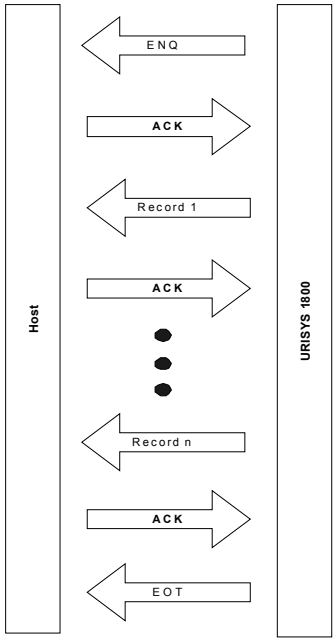
General

The ASTM protocol divides communication data into messages and records.
A message is a self-contained information packet. For example Test-strip results or control results are sent to the host as a complete message.
Each message can consist of different records. Urisys 1800 uses the following ASTM-records:

Identifier	Name	Description
H	Header Record	First record in every message
P	Patient Information Record	This record is used to download patient demographics from the Host to the instrument. In Urisys 1800 no patient data can be handled. Therefore the patient record is always empty.
O	Order Record	The test Order Record defines the attributes of a particular order.
R	Result Record	Result data
C	Comment Record	In URISYS 1800 this record is used for the transmission of sample flags and result flags.
M	Manufacturer Record	In URISYS 1800 this record is used for the transmission of raw data, additional control information and sediment data
Q	Request Information Record	(Query) Work list Request
L	Termination Record	Last record in every message.

Communication structure

Only the Urisys 1800 can start a communication, i.e. the Urisys 1800 is master at all times.
A communication is initialized when the ASCII character ENQ (Hex 05) is dispatched to the host. The host (Slave) acknowledges it's readiness to communicate by sending the ASCII- character ACK (Hex 06), or if it is not ready it will send the ASCII-character NAK (Hex 15) i.e. Not Acknowledged.
If the host has positively Acknowledged it's readiness to communicate, the Urisys 1800 then sends the message Record by Record (different to Urisys 2400; there all records are sent in one message).
The host must also confirm receipt of each record with an acknowledge ACK character. If the host sends a not acknowledged (NAK) character instead, the Urisys 1800 will resend the last record sent. The message is completed with a Termination Record.
The communication session is terminated with the ASCII-character EOT (Hex 04).



Record structure
Each record has the following structure:

ASCII-character STX (Hex 02)
Record No.
Different records according to the descriptions in the following chapters
ASCII- character ETX (Hex 03) or ASCII-Zeichen ETB (Hex 14)
Checksum
ASCII- character CR (Hex 0D)
ASCII- character LF (Hex 0A)

Urisys 2400 sends the messages in frames, each frame contains a maximum of 247 characters (including frame overhead). Messages longer than 240 characters are divided between two or more frames.
A frame is one of two types, an intermediate frame or and end frame.
Intermediate frames terminate with the characters <ETB>, checksum, <CR> and <LF>.
End fames terminate with the characters <ETX>, checksum, <CR> and <LF>.
A message containing 240 characters or less is sent in a sinlge end frame. Longer messages are sent in intermediate frames with the last part of the message sint in an end frame. The frame structure is illustrated as follows:

[STX] + Frame No. + Informationen 1 + **[ETB]** + Checksumme + [CR] + [LF]
[STX] + Frame No. + Informationen 2 + **[ETB]** + Checksumme + [CR] + [LF]
[STX] + Frame No. + Informationen 3 + **[ETX]** + Checksumme + [CR] + [LF]

Supported fields
The tables below show which fields are supported by the LIS interface and which restriction is demanded.
Furthermore the ASTM standard defines some fields which are not supported in ASTM+ at all. These unsupported ASTM+ fields are not listed in this document.
A grayed background shows optional or conditional ASTM fields which are not supported by the Urisys 1800 LIS interface at all.

13.1 Message Header Record

Message Header Record			
ASTM	**Field Name**	**Content**	**Remark**
7.1.1	Record Type Id	"H"	Header
7.1.2	Field delimiter	"|"	Needed by ASTM, defines the delimiter for the subfields.
	Repeat delimiter	"\"	
	Component delimiter	"^"	
	Escape delimiter	"&"	
7.1.3	Message Control ID		Not supported
7.1.4	Access Passwords		Not supported
7.1.5	Sender name or ID	Serial no.	Serial number (10 digits, e.g. 0000000001)
7.1.6	Sender Street Address		Not supported
7.1.7	Reserved Field		Not supported

7.1.8	Sender Telephone Number		Not supported
7.1.9	Characteristics of Sender		Not supported
7.1.10	Receiver ID		Not supported
7.1.11	Comment of special instructions		Not supported
7.1.12	Processing ID	P	Always P (production)
7.1.13	Version Number		
7.1.14	Date and time of message	20040324145843	ASTM date_time format.
All further fields are not supported			

Example of header record:
H|\^&|||0000000001|||||||P|2.0.0.0504[CR]

13.2 Patient Information Record

In Urisys 1800 no patient data can be handled. The patient record is always empty.

Patient Record			
ASTM	**Field Name**	**Content**	**Remark**
8.1.1	**Record Type Id**	"P"	Patient
8.1.2	**Sequence Number**	1	Defined by ASTM 6.6.7 always 1. No patient demographics sent
All further fields are not supported			

Example of patient record:
P|1

13.3 Order Record

Test-Order Record			
ASTM	**Field Name**	**Content**	**Remark**
9.4.1	Record Type Id	"O"	Order
9.4.2	Sequence Number	1	Defined by ASTM 6.6.7, always 1 since in Urisys 1800 only one order per message can be sent.
9.4.3	SpecimenID	Sample ID	ID of the sample, numerical or alphanumerical (max 13 digits)
9.4.4	OrderID	Sequence number	Only used for result upload, Urisys 1800 inserts a sequence number from the database. Order download empty
	^ RackCarrierID		not supported
	^ PositionOnRackCarrier		not supported
	^ Format		not supported
	^ RackCarrierType	“CONTROL” or “SAMPLE”	Control for control samples Sample for patient samples.
9.4.5	Universal testID		not supported
9.4.6	Priority	R	Always “R” (routine sample)
9.4.7	RequestedDateTime		not supported
9.4.8	CollectionDateTime		not supported
9.4.9	CollectionEndDateTime		not supported
9.4.10	CollectionVolume		not supported
9.4.12	ActionCode	X or X\Q	Always X, in case of control samples “\Q” is added
9.4.13	DangerCode		not supported
9.4.14	ClinicalInformation		not supported
9.4.15	ReceivedDateTime		ASTM date_time format. YYYYMMDDhhmmss
All further fields are not supported			

Example of order record by order downloads:

O|1||3^^^^SAMPLE||R||||||X|||20000106205333

Example of order record by result uploads:
O|1|123456789|12^^^^SAMPLE||R||||||X|||20000106205745

13.4 Result Record

Result Record			
ASTM	**Field Name**	**Content**	**Remark**
10.1.1	Record Type Id	"R"	Result
10.1.2	Sequence Number	1 – 12	Defined by ASTM 6.6.7, Urisys 1800 measures always 12 results (color and clarity included)
10.1.3	Universal Test ID	Test code ^ ^ ^Test No	test code is an alphanumerical value (e.g. “SG”) test number list (fixation): 1: SG 2: pH 3: LEU 4: NIT 5: PRO 6: GLU 7: KET 8: UBG 9: BIL 10: ERY 11: COL 12: CLA
10.1.4	data or measurement value	result value	numerical value (e.g. 1.030) or alphanumerical value (e.g. „neg.”) IMPORTANT: to be compatible with the original URISYS 2400 analyzer, the following conversions are done in the driver: pos → POS pos. → POS neg → NEG neg. → NEG norm → NORM norm. → NORM
10.1.5	DataMeasurementResult.ValUnit	unit	Alphanumerical value e.g. “mg/dL” only ASCII characters from 1-127 are supported ’µ’ character is translated to a ‘u’ character.
10.1.6	Reference Range		not supported
10.1.7	ResultAbnormalFlag		flag “R”: Test Strip Error
10.1.8	NatureOfAbnormability		not supported
10.1.9	ResultStatus		not supported
10.1.11	Operator	User ID	User Id of operator who performed the test
10.1.12	DateTimeTestStarted		not supported
All further fields are not supported			

Example of result record:
R|1|SG^^^1|1.030|||||Ally

13.5 Comment Record

Every Result Record must have a Comment Record attached. In case of no Flags an empty Comment Record have to be transmitted.

Comment Record			
ASTM	**Field Name**	**Content**	**Remark**
11.1.1	Record Type Id	"C"	Comment Record
11.1.2	Sequence Number		Use the same sequence number as the prior result record. (Not implemented according to the ASTM standard).
11.1.3	Comment source	I	Needed by ASTM, always “I”
11.1.4	Comment Text	Sample flags / sample result flags	Result flag codes, each flag is separated with the ^ delemiter
11.1.5	Comment type	I	Needed by ASTM, always “I”

Example of a comment record:
C|1|I|*|I|

13.6 Manufacturer Record (Raw Result Record - RR)

For special application (e.g. evaluation / research) it is possible to send the raw results to the host using this record. It is possible to activate this application via the User Interface
(Utilities > Tools2 > Service “RawData to Host” > ON)

Raw result Record			
ASTM	**Field Name**	**Content**	**Remark**
	Record Type Id	“M”	Needed by ASTM for transfer of raw results
	Sequence Number	1-16	Urisys1800 determines always 16 results
	Record type sub-ID	RR	Raw result
	Raw result value	Reflectance	floating number in the format ##.## (e.g. 88.06) fix order for raw result value: 1: COM blue 2: COM green 3: COM orange 4: ERY green 5: ERY orange 6: LEU green 7: NIT green 8: KET green 9: GLU green 10: PRO orange 11: UBG green 12: BIL green 13: pH green 14: pH orange 15: SG orange 16: not used, always 0

Example of a raw result record:
M|1|RR|89.56|

13.7 Manufacturer Record (Result Context Record - RC)

URISYS uses this record to transmit the control name as well as the control lot number. It is sent at the end of the control result record.

No.	Field	Content	Comment
1	record type ID	M	needed by ASTM, always “M”
2	Sequence no.		Defined by ASTM 6.6.7
3	record type sub-ID	RC	always “RC” (result context)
4	test strip cassette lot number		always empty
5	date/time test strip cassette set		always empty

6	control name	e.g. CONTROL-LOW	control name
7	control identifier	e.g. 001	control lot no

Example:
M|1|RC|||Controlhigh|Lotnumber|

13.8 Termination Record

Message Terminator Record			
ASTM	**Field Name**	**Content**	**Remark**
13.1.1	Record Type Id	"L"	Message Terminator
13.1.2	Sequence Number	1	Defined by ASTM 6.6.7. Always 1
13.1.3	Termination Code		Empty if normal end of message

Example of Message Terminator record:
L|1|

13.9 Urisys 2400 trace examples

13.9.1 Upload Sample Results (without raw data)

```
URISYS 10:04:03,904 [ENQ]
Host   10:04:03,904 [ACK]
URISYS 10:04:03,944 [STX]1H|\^&|||1|||||||P|2.0.0.0505·Test[CR]P|1
                    [CR]O|1|123456|6^^^service^SAMPLE||R|||||X|||
                    19720210172000[CR]R|1|^^^1|1.015|||||[CR]C|1|I
                    ||I[CR]R|2|^^^2|7|||||[CR]C|2|I||I[CR]R|3|^^^3
                    |100|/uL||||[CR]C|3|I|*^S|I[CR]R|4|^^^4|POS|||
                    ||[CR]C|4|I|*^S|I[CR]R|5|^^^5|75|mg/dL||||[CR]
                    C|5|I|[ETB]49[CR][LF]
Host   10:04:04,204 [ACK]
URISYS 10:04:04,244 [STX]2*^S|I[CR]R|6|^^^6|NORM|||||[CR]C|6|I||I[
                    CR]R|7|^^^7|NEG|||||[CR]C|7|I||I[CR]R|8|^^^8|1
                    |mg/dL||||[CR]C|8|I|*|I[CR]R|9|^^^9|NEG|||||[C
                    R]C|9|I||I[CR]R|10|^^^10|250|/uL||||[CR]C|10|I
                    |*^S|I[CR]R|11|^^^11|yellow|||||[CR]C|11|I||I[
                    CR]R|12|^^^12|mucous|||||[CR]C|12|I||I[CR]L|1|
                    [CR][ETX]35[CR][LF]
Host   10:04:04,494 [ACK]
URISYS 10:04:04,524 [EOT]
```

13.9.2 Upload Sample Results (with raw data)

```
URISYS 10:05:09,574 [ENQ]
Host   10:05:09,574 [ACK]
URISYS 10:05:09,614 [STX]1H|\^&|||1|||||||P|2.0.0.0505·Test[CR]P|1
                    [CR]O|1|123456|6^^^service^SAMPLE||R|||||X|||
                    19720210172000[CR]R|1|^^^1|1.015|||||[CR]C|1|I
                    ||I[CR]R|2|^^^2|7|||||[CR]C|2|I||I[CR]R|3|^^^3
                    |100|/uL||||[CR]C|3|I|*^S|I[CR]R|4|^^^4|POS|||
                    ||[CR]C|4|I|*^S|I[CR]R|5|^^^5|75|mg/dL||||[CR]
                    C|5|I|[ETB]49[CR][LF]
```

```
Host   10:05:09,874 [ACK]
URISYS 10:05:09,915 [STX]2*^S|I[CR]R|6|^^^6|NORM|||||[CR]C|6|I||I[
                    CR]R|7|^^^7|NEG|||||[CR]C|7|I||I[CR]R|8|^^^8|1
                    |mg/dL||||[CR]C|8|I|*|I[CR]R|9|^^^9|NEG|||||[C
                    R]C|9|I||I[CR]R|10|^^^10|250|/uL||||[CR]C|10|I
                    |*^S|I[CR]R|11|^^^11|yellow|||||[CR]C|11|I||I[
                    CR]R|12|^^^12|mucous|||||[CR]C|12|I||I[CR]M|1|
                    RR|67.57|[CR]M|2|R[ETB]B6[CR][LF]
Host   10:05:10,175 [ACK]
URISYS 10:05:10,215 [STX]3R|70.85|[CR]M|3|RR|68.74|[CR]M|4|RR|22.7
                    5|[CR]M|5|RR|16.86|[CR]M|6|RR|59.16|[CR]M|7|RR
                    |41.89|[CR]M|8|RR|52.22|[CR]M|9|RR|64.87|[CR]M
                    |10|RR|46.68|[CR]M|11|RR|59.30|[CR]M|12|RR|68.
                    31|[CR]M|13|RR|53.00|[CR]M|14|RR|45.80|[CR]M|1
                    5|RR|19.70|[CR]M|16|RR|0|[CR]L|1|[CR][ETX]83[C
                    R][LF]
Host   10:05:10,445 [ACK]
URISYS 10:05:10,485 [EOT]
```

13.9.3 Upload Control Results

```
URISYS 10:06:34,942 [ENQ]
Host   10:06:34,942 [ACK]
URISYS 10:06:34,982 [STX]1H|\^&|||1|||||||P|2.0.0.0505·Test[CR]P|1
                    [CR]O|1||0^^^service^CONTROL||R||||||X\Q|||197
                    20210174648[CR]R|1|^^^1|1.020||||||[CR]C|1|I|*|
                    I[CR]R|2|^^^2|6||||||[CR]C|2|I|*|I[CR]R|3|^^^3|
                    NEG||||||[CR]C|3|I||I[CR]R|4|^^^4|POS||||||[CR]C
                    |4|I|*|I[CR]R|5|^^^5|NEG||||||[CR]C|5|I||I[CR]R
                    |6|^^^6|N[ETB]71[CR][LF]
Host   10:06:35,242 [ACK]
URISYS 10:06:35,282 [STX]2ORM|||||[CR]C|6|I||I[CR]R|7|^^^7|NEG||||
                    ||[CR]C|7|I||I[CR]R|8|^^^8|NORM|||||[CR]C|8|I||
                    I[CR]R|9|^^^9|NEG|||||[CR]C|9|I||I[CR]R|10|^^^
                    10|NEG|||||[CR]C|10|I||I[CR]R|11|^^^11|yellow|
                    ||||[CR]C|11|I|*|I[CR]M|1|RC|||Control1|Lot1||[
                    CR]L|1||[CR][ETX]C4[CR][LF]
Host   10:06:35,492 [ACK]
URISYS 10:06:35,522 [EOT]
```

14 Checksum Calculation

All of the messages from the host are fixed, thus requiring no dynamic calculation of checksums. The host needs to send only 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 result packets (SPE) however, we highly recommend that the host interface program uses the checksum to ensure the data integrity.

14.1 European language variations / Algorithm a

For Miditron M, Miditron Junior and **Miditron Junior II**

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.

LRC-Byte = Byte1 XOR Byte2 XOR Byte3 ..... XOR Byte last

LRC1-Byte = high-Nibble (shifted by 4 bits) of the LRC-Byte OR 3016
LRC2-Byte = low-Nibble of LRC-Byte OR 3016

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 /* 3016 */
OR	0 0 0 0 0 1 0 1 /* high-Nibble */
	0 0 1 1 0 1 0 1

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

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 overriding user software. In this case, the user must first switch off block testing in the Host.

14.2 American/Canadian check sum calculation / Algorithm b

For **Chemstrip UA, Chemstrip Criterion** and **Chemstrip Criterion II**

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.

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

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

$$CS1\text{-}Byte = (CS / 16) + 30_{16} \quad \text{for } (CS / 16) \leq 9$$
$$= (CS / 16) + 37_{16} \quad \text{for } (CS / 16) \geq 10$$

$$CS2\text{-}Byte = (CS \text{ modulo } 16) + 30_{16} \quad \text{for } (CS \text{ modulo } 16) \leq 9$$
$$= (CS \text{ modulo } 16) + 37_{16} \quad \text{for } (CS \text{ modulo } 16) \geq 10$$

Example: MOR-Protokoll

STX,'>',ETX,'3E',CR
$02\ 3E\ 03\ 33\ 45\ 0D_{16}$ with $CS = 62 = 3E_{16}$

15 ASCII-Table

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
0	00	Null	32	20	Space	64	40	@	96	60	`
1	01	Start of heading	33	21	!	65	41	A	97	61	a
2	02	Start of text	34	22	"	66	42	B	98	62	b
3	03	End of text	35	23	#	67	43	C	99	63	c
4	04	End of transmit	36	24	$	68	44	D	100	64	d
5	05	Enquiry	37	25	%	69	45	E	101	65	e
6	06	Acknowledge	38	26	&	70	46	F	102	66	f
7	07	Audible bell	39	27	'	71	47	G	103	67	g
8	08	Backspace	40	28	(	72	48	H	104	68	h
9	09	Horizontal tab	41	29	)	73	49	I	105	69	i
10	0A	Line feed	42	2A	*	74	4A	J	106	6A	j
11	0B	Vertical tab	43	2B	+	75	4B	K	107	6B	k
12	0C	Form feed	44	2C	,	76	4C	L	108	6C	l
13	0D	Carriage return	45	2D	-	77	4D	M	109	6D	m
14	0E	Shift out	46	2E	.	78	4E	N	110	6E	n
15	0F	Shift in	47	2F	/	79	4F	O	111	6F	o
16	10	Data link escape	48	30	0	80	50	P	112	70	p
17	11	Device control 1	49	31	1	81	51	Q	113	71	q
18	12	Device control 2	50	32	2	82	52	R	114	72	r
19	13	Device control 3	51	33	3	83	53	S	115	73	s
20	14	Device control 4	52	34	4	84	54	T	116	74	t
21	15	Neg. acknowledge	53	35	5	85	55	U	117	75	u
22	16	Synchronous idle	54	36	6	86	56	V	118	76	v
23	17	End trans. block	55	37	7	87	57	W	119	77	w
24	18	Cancel	56	38	8	88	58	X	120	78	x
25	19	End of medium	57	39	9	89	59	Y	121	79	y
26	1A	Substitution	58	3A	:	90	5A	Z	122	7A	z
27	1B	Escape	59	3B	;	91	5B	[	123	7B	{
28	1C	File separator	60	3C	<	92	5C	\	124	7C	|
29	1D	Group separator	61	3D	=	93	5D	]	125	7D	}
30	1E	Record separator	62	3E	>	94	5E	^	126	7E	~
31	1F	Unit separator	63	3F	?	95	5F	_	127	7F	□