1. ASTM PROTOCOL: INTRODUCTION

This chapter explains the standard ASTM protocol developed to allow bidirectional interface between LIS and BT4500.
The communication standard refers to the ASTM E1381-95 protocol.
The standard protocol refers to the ASTM E1394-91 protocol.
To purchase, consult or further info on the ASTM protocol, you can visit the website www.astm.org.
Specifically see:
ASTM E1381-95 Standard Specification for Low-Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Computer Systems
http://www.astm.org/DATABASE.CART/HISTORICAL/E1381-95.htm
ASTM E1394-97 Standard Specification for Transferring Information Between Clinical Instruments and Computer Systems (Withdrawn 2002)
http://www.astm.org/DATABASE.CART/WITHDRAWN/E1394.htm

The communication can be obtained both with RS-232 serial interface, and with TCP/IP version 4.

The LIS may be a computer system as well as any applicative software to which the analyzer is connected.
A message is intended as the "information unit" to be received/transmitted with the ASTM protocol, therefore the whole set of characters composing the sequence to be sent/received.
In the representative tables are outlined only the fields used by the analyzer. All the other information are not archived or processed.

1.1. Protocol Details

Communication phases:

As specified in the ASTM E1381-95 standard, the communication takes place in four phases:

1. The transmitting unit establishes the communication sending an ENQ (0x05) and waits an ACK (0x06) to proceed or a NAK (0x15) if the receiver is not available.
2. All messages composing a pack are sent
3. Wait for an ACK (0x06) to proceed with the following sending or a NAK (0x15) to re-transmit in case of error.
4. Transmission of the character EOT (0x04) to terminate the communication and go back to the waiting status.

Structure of the messages:

All messages are structured as per the ASTM E1381-95 specifications.

- The first character is an STX (0x02)
- The second character is a Frame cyclic counter between 0 and 7. The first message after ENQ, will always start with the counter set at 1. The counter will increase at every frame, and, after having reached the value 7, will be set to 0 and the sequence will start again.
- The terminator is the character ETX (0x03) if the single frame length is less or equal to 240 characters. Otherwise the frames are divided in sub-messages of 240 characters max, terminating with ETB (0x17), except the last one which will terminate with ETX (0x03).
- After the ETX or ETB characters, two checksum characters will follow.
- The message terminates with the sequence CR (0x13) LF (0x10)

Checksum calculation:

The calculation is performed upon the ASTM specifications, starting from the frame number to the ETX or ETB characters included. The sum of every ASCII character value must be performed. The 256 module of the sum must be calculated and transformed into hexadecimal of length 2 (00 to FF).