

Boehringer Mannheim GmbH
STA Coagulation Analyzer
Host Interface Manual

STA Analyzer Host Interface Manual

Including features of Version 620

BM / ID.No. 1704559-001



INSTRUMENTATION DIAGNOSTICA
Technical Product Management and Service

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1. Introduction

This manual describes the connection of the **Boehringer Mannheim STA Analyzer** to a 3rd Party Laboratory Host System via an RS232C asynchronous serial port. It details the communication protocols, the required hardware, and considerations to be taken when interfacing different computer systems.

The following fundamental questions are considered:

Hardware

- What interface hardware is required?
- How is the physical connection established?

Operation and Data Transmission

- How to set transfer and communication parameters?
- What is the format of the transmitted data and how is it used?
- What type of data can be transmitted?
- How is the data transfer initiated?

Software

- What communication protocol is used?
- What are the Host's software requirements?

In case of difficulty please contact the **Boehringer Mannheim Service Department** or alternatively the **Service Management of the Central Marketing Department of **Boehringer Mannheim GmbH** (Germany):**

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2. Interface Set-up

2.1 Data Cable

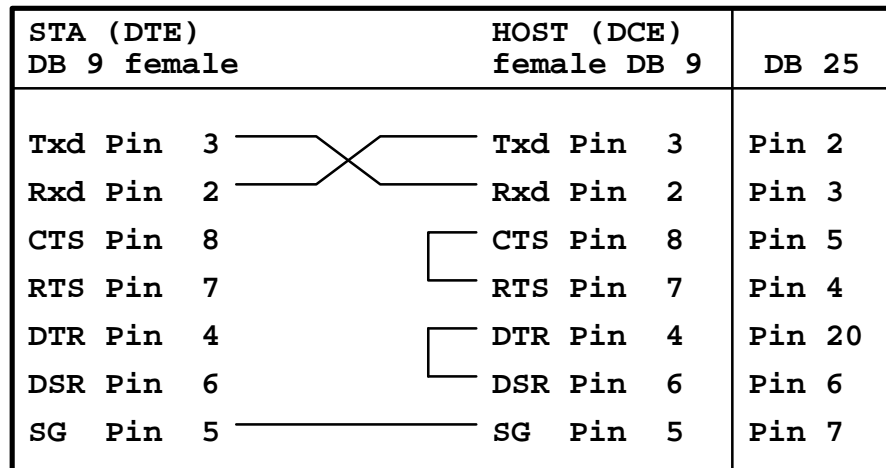


Figure 1 : Data Cable Wiring Diagram

Figure 1 illustrates the wiring of the data cable used to connect the STA Analyzer to the Host.

Connect to the 9-pin male socket at the rear of the analyzer.

2.2 Pin Description

Pin no	Signal	Explanation	Direction
3	Txd	Transmit Data	out
2	Rxd	Receive Data	in
5	SG	Signal Ground	-

Table 1 : Pin-Out Descriptions

Table 1 gives the pin-out descriptions of the used pins. None of the handshake lines is used. They remain unconnected.

2.3 Transmission Specifications

The data transmission specifications are given below.

Item	Specification	Remarks
Interface	RS232C Asynchronous Serial Interface	Max. Cable Length 15m
Handshaking	Software	
Communication Method	Half Duplex	
Character Code	ASCII	

Table 2 : Transmission Specification

3. Host Interface Specific Operation - Protocol Independent

3.1 General Information

3.1.1 Calculation of Access Code

Certain menus items are only available after a 6-digit Access Code is entered.
(SETUP ⇒ GLOBAL OPTIONS).

The screenshot displays the STA Analyzer Host Interface menu system. At the top, a horizontal menu bar includes 'Status', 'Loading', 'Files', 'Calib./Control', 'Setup', 'Maintenance', and 'Halt'. The 'Setup' menu is currently selected, and a sub-menu is displayed below it with options 'Tests' and 'Global Options'. The 'Global Options' option is highlighted. In the background, a table is visible with columns: 'ID', 'Drawer / Pos.', 'PT %', 'APTT sec.', and 'FIB mg/dl'. Overlaid on the right side of the screen is a dialog box that reads 'Please enter your access code :'. Below this text are six vertical input fields for digits. At the bottom of the dialog box are two buttons: 'Validate' (with a left arrow icon) and 'Esc Quit'.

Figure 2 : Entering the Access Code

The Access Code is derived from the system date and is format dependent.

- Digit 1: First digit of day/month (date format dependent)
- Digit 2: First digit of month/day (date format dependent)
- Digit 3: Second digit of day/month (date format dependent)
- Digit 4: Second digit of month/day (date format dependent)
- Digits 5 and 6: Sum of digits 1 to 4 with leading zero if less than 10

3.1.2 Access Code Examples

Example 1:

Calendar Date: 25th of October, 1994.

System Date: 25/10/1994 (date format: DD/MM/YYYY)

Access Code: 215008

Example 2:

System Date: 10/25/1994 (date format: MM/DD/YYYY)

Access Code: 120508

3.2 Result Transmission in Real-Time Mode

Status	Loading	Files	Calib./Control	Setup	Maintenance	Halt
System						
Tests						
Reagents						
Diluents/Controls/Calibrators						
Stop Sample Pipetting			NO			
On-Line Transmission			YES	1	%	TZ N ORM sec.
On-Line Printout			YES		%	TZ H EP sec.
					%	II
					%	V
					%	VII

Figure 3 : The Status Menu

Setting the **ON-LINE TRANSMISSION** option to 'YES' sends the test results as soon as they are available after the measurement.

Note: A transmission rank should be defined first.
(See 3.3 Setting Up Method Ranking)

3.3 Setting Up Method Ranking

The STA Analyzer can define one main, and up to 3 auxiliary tests. Each test is given a unique 2-digit transmission number. This number is used twice during the communication protocol:

1. When a test is selected using the main test transmission number.
2. When the test results are sent to the Host.

Select **SETUP** ⇒ **TESTS** (Screen Page 3/3). A list of installed tests appears. The Transmission Numbers can be set from here.

← Create/Modify
 Esc Options

TEST SETUP

QUICK				
PT	PC	CLOT		
APTT	PS	CLOT		
FIB	MTZ			
HQ				
TZ NORM				
TZ HEP				
II				
V				
VII				
X				
VIII				
IX				
XI				
XII				
ATIII				
PROT C				

= Dependent Test
618.A02

Figure 4 : Setup-Tests, Test List

Selecting a test and pressing <Enter> calls **TEST SETUP** (Screen Page 1/3).
Pressing <PageDown> twice displays the **TRANSMISSION TEST NUMBER** setup page.

PgUp Previous Page Esc Quit				Test Setup - Page 3/3																																																					
PT: QUICK																																																									
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="5" style="text-align: left; padding: 2px;">Printout / Transmission</th> <th colspan="3" style="text-align: left; padding: 2px;">Usual Values (%)</th> </tr> <tr> <th style="width: 15%;"></th> <th style="width: 15%;">Unit</th> <th style="width: 15%;">Convers. Factor</th> <th style="width: 15%;">Print. Test Number</th> <th style="width: 15%;"></th> <th style="width: 15%;">Min.</th> <th style="width: 15%;">Max.</th> </tr> </thead> <tbody> <tr> <td>Main</td> <td>%</td> <td></td> <td>Yes 1</td> <td>STANDARD</td> <td>70.00</td> <td>120.00</td> </tr> <tr> <td>Aux. 1</td> <td>INR</td> <td></td> <td>Yes 2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Aux. 2</td> <td>sec.</td> <td></td> <td>Yes 3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Aux. 3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="4" style="padding: 2px;">Printout Limits</td> <td colspan="3" style="padding: 2px;">Min. 0.00 % Max. 150.00</td> </tr> </tbody> </table>								Printout / Transmission					Usual Values (%)				Unit	Convers. Factor	Print. Test Number		Min.	Max.	Main	%		Yes 1	STANDARD	70.00	120.00	Aux. 1	INR		Yes 2				Aux. 2	sec.		Yes 3				Aux. 3							Printout Limits				Min. 0.00 % Max. 150.00		
Printout / Transmission					Usual Values (%)																																																				
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Printout Limits				Min. 0.00 % Max. 150.00																																																					
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="4" style="text-align: left; padding: 2px;">Quality Control</th> <th style="width: 10%;">Period</th> <th style="width: 10%;">Vial</th> <th style="width: 10%;">Stab.</th> <th style="width: 10%;">Min. Volume</th> </tr> <tr> <th></th> <th>ID</th> <th>Key</th> <th>Name</th> <th>h</th> <th>ml</th> <th>h</th> <th>(ml)</th> </tr> </thead> <tbody> <tr> <td>Level 1</td> <td>11073</td> <td>2</td> <td>PreciClot I</td> <td>24</td> <td>2</td> <td>8</td> <td>0.50</td> </tr> <tr> <td>Level 2</td> <td>11074</td> <td>2</td> <td>PreciClot II</td> <td>24</td> <td>2</td> <td>8</td> <td>0.50</td> </tr> <tr> <td>Level 3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>								Quality Control				Period	Vial	Stab.	Min. Volume		ID	Key	Name	h	ml	h	(ml)	Level 1	11073	2	PreciClot I	24	2	8	0.50	Level 2	11074	2	PreciClot II	24	2	8	0.50	Level 3																	
Quality Control				Period	Vial	Stab.	Min. Volume																																																		
	ID	Key	Name	h	ml	h	(ml)																																																		
Level 1	11073	2	PreciClot I	24	2	8	0.50																																																		
Level 2	11074	2	PreciClot II	24	2	8	0.50																																																		
Level 3																																																									
F1 = Quit				DEL = Modify																																																					

Figure 5 : Test Setup Screen

The section **PRINTOUT / TRANSMISSION** contains the items

- Unit
- Conversion Factor
- Print
- Transmission Test Number

To modify a Transmission Number, select the number and press . The following screen will appear.

← Select
Esc Quit

Test Setup

TRANSMISSION TEST NUMBER

No.	Test	Unit	No.	Test	Unit	No.	Test	Unit	No.	Test	Unit
1	PT	%	17			33			49		
2	PT	INR	18			34			50		
3	PT	sec.	19			35			51		
4	APTT	sec.	20			36			52		
5	FIB	mg/dl	21			37			53		
6	FIB	sec.	22			38			54		
7			23			39			55		
8			24			40			56		
9			25			41			57		
10			26			42			58		
11			27			43			59		
12			28			44			60		
13			29			45			61		
14			30			46			62		
15			31			47			63		
16			32			48			64		

Figure 6 : Transmission Numbers List

Select a free number in the test list and press <Enter>. The test number is automatically entered in the **TRANSMISSION TEST NUMBER** column (Screen Page 3/3).

It is not possible to select an allocated number.

To change a test number return to the **TRANSMISSION TEST NUMBER** section on Screen Page 3/3. Select a test number and press <F1> to delete it. The number can now be reused.

Exiting Test Setup gives a prompt to save any changes. The Access Code must be given. (See 3.1.1 Calculation of Access Code, Page 8).

3.4 Loading Samples

The samples are identified and placed in the sample drawer one at a time. The following settings are required to request a Worklist from the Host.

Enter **LOADING** ⇒ **SAMPLES>DRAWER 1** or press the button at the front of the drawer. The following screen appears:

Esc Options ↑ List/Change			SAMPLE LOADING		
MANUAL MODE		Prefix =			
ID		Pos.		Test Selection	
11078		2/11		Diluent Buffer	
(Normal tube)					
Recorded Profiles			Selection		
1	TZ NORM,MTZ	PT	U	ATIII	
2	HQ	APTT	VII	PROT C	
3		FIB	X	PC CLOT	
4		HQ	VIII	PS CLOT	
5		TZ NORM	IX	MTZ	
6		TZ HEP	XI		
7		II	XII		
SAMPLE IDENTIFICATION		(F12=in priority		F8=Normal/Micro Tube)	

Figure 7 : Sample Loading Screen in MANUAL MODE

The cursor is positioned on the ID field. The instrument then waits for a bar-coded sample cup to pass in front of the bar-code reader, or alternatively, manual input of the bar-code number.

The mode must be changed from MANUAL MODE to AUTO before the instrument requests a Worklist from the Host. To change the mode press <Esc>. A small menu appears in the upper left of the screen. The options are:

- Change Profiles
- Change Prefix
- AUTO mode
- Return to Loading
- Quit

Select AUTO mode.

The Sample Loading screen changes slightly.

Esc Options ↑ List/Change			SAMPLE LOADING	
AUTO MODE				
ID	Pos.	Test Selection		
11078	2/11	Diluent Buffer		
0 (Normal tube)				
Parameters				
Profile BY TELELOADING				
Prefix				
First Number 0				
←J=FILE EDITING		(F12=in priority		F8=Normal/Micro Tube)

Figure 8 : Sample Loading Screen in AUTO MODE

The Profile should be **BY TELELOADING**. If not, press <Esc> and select **CHANGE PROFILE**.

Esc Options ↑ List/Change			SAMPLE LOADING	
AUTO MODE				
ID	Pos.	Test Selection		
11078	2/11	Diluent Buffer		
0 (Normal tube)				
Parameters				
Profile		BY TELELOADING		
Prefix				
First Number		0		
←=FILE EDITING (F12=in priority F8=Normal/Micro Tube)				

Figure 9 : Profile Modification Screen

This menu allows:

- Creation of a group of up to 12 tests.
- Creation of a default group of tests in AUTO mode.
- Downloading.

To Download move the bar to the 'AUTO' row, press <Enter> and type '0' for Downloading. Press <F10> to save and then <Esc> to Quit and return to the Sample Loading menu.

The work flow is as follows:

1. The operator identifies a sample (via manual entry or bar-code reader).
2. The operator inserts the sample in the drawer.
3. The STA Analyzer sends a request for a Worklist for that sample.
4. The Host returns the Worklist (if available).
5. Repeat the above until all samples are loaded.

The run is initiated upon closing the drawer.

When the option **VERIFY PATIENT DATA** is set to 'YES' in **SETUP ⇒ GLOBAL OPTIONS** (Screen Page 2/2), the STA Analyzer expects the Host to send four extra information fields as part of the Worklist.
(See Figure 13 Page 20 and Figure 26 Page 43) These four fields are displayed in a separate window and must be confirmed with <F10>.
See Figure 10.

- Info Field 1 (16 characters) example below: 1234567890123456
- Info Field 2 (12 characters) example below: 123456789012
- Info Field 3 (6 characters) example below: 123456
- Info Field 4 (4 characters) example below: 1234

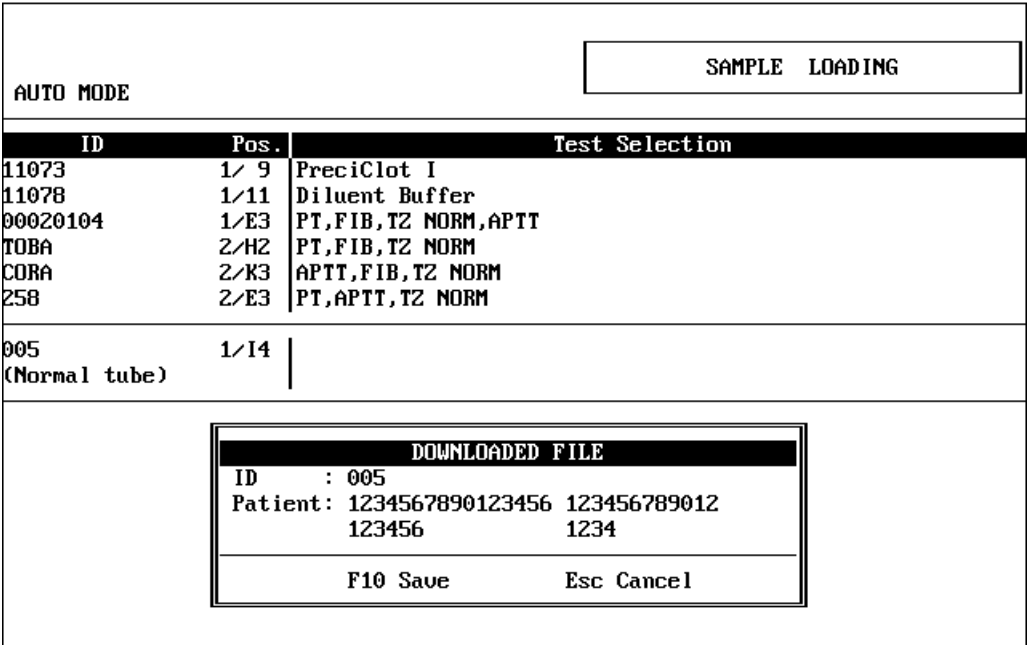


Figure 10 : Info Field Window on Reception of Worklist

3.5 Result Transmission in Batch Mode

The operator can repeat the transmission of the run's results in 'Batch Mode'.

Select **FILES** ⇒ **CONFIRMATION>PRINTOUT>TRANSMISSION**. The Sample List is then displayed.

← Process F6 Print Esc Options		CONFIRMATION / PRINTOUT	
■ Confirmed 0	■ Complete 4	■ Complete/Error 1	■ Incomplete 0
P■1 P■2 P■3 P■4 P■5			
T = Transmitted P = Printed			

Figure 11 : Sample List Screen

Press <Esc> to call up a small menu in the upper left of the display. This gives the following options:

- Change File Selection
- Transmit
- Print
- Quit

'Transmit' offers the choice of transmitting all, or only new results to the Host.

At the Sample List select the required sample using the cursor keys. Press <Enter> to show a sample's results.

Current Selection			CONFIRMATION / PRINTOUT			
<input type="checkbox"/> Confirmed <input type="checkbox"/> Complete/Error <input type="checkbox"/> Complete <input type="checkbox"/> Incomplete			<div>FILE PROCESSING</div>			
Validation Range 70.0 .. 130.0 %			Status COMPLETE File ID 2		Printed (Normal)	
	sec.	%	Test		Result	Status
Raw Dat.1	32.3	63	HQ	63 %	1.28 INR	32.3 sec.
Raw Dat.2						to confirm
MEAN						
PgUp Previous File						
PgDn Next File						
Esc List						
F1 Confirm File						
F2 Accept Test						
F3 Rerun -						
F4 Delete -						
F5 Insert -						
F6 Print ↵						
F10 Save						
F11 Save + Transmit						
F12 STAT / NORMAL Note:						

Figure 12 : Results Screen

A single test can be selected and sent to the Host by pressing <F11>.

3.6 Quality Control Result Transmission in Batch Mode

Quality Control Results are sent to the Host in real-time when the ASTM protocol is selected.

The Quality Control Results can be sent in Batch Mode after the run.

Select **CALIB./CONTROL** ⇒ **QUALITY CONTROL**. The Test List is then displayed.

Select the required test and press <Enter>.

Display the Result List with <F1>.

Transfer the Control Results with <F11>.

4. Protocol Description

The STA Analyzer provides two different Host interface protocols:

1. **Std-Bi Protocol**

2. **ASTM Protocol**

Use **SETUP** ⇒ **GLOBAL OPTIONS** (Screen Page 2/2) to select the working protocol. See Figure 13 on page 20 for Std-Bi Protocol, and Figure 26 page 43 for ASTM.

Std-Bi operation is described in Chapter 5. ASTM is described Chapter 6.

5. Std-Bi Protocol

5.1 Host Interface Settings (Std-Bi)

All Host Interface Settings are made in **SETUP** ⇒ **GLOBAL OPTIONS** (Screen Page 2/2)

Access to the **GLOBAL OPTIONS** screen requires the 6-digit Access Code. (See 3.1.1 Calculation of Access Code Page 8)

Successful entry of the Access Code displays **GLOBAL OPTIONS** (Screen Page 1/2). Press <PageDown> to display the following screen:

Esc Quit PgUp Page 1		GLOBAL OPTIONS		
Page 2/2				
COMMUNICATIONS			FILE ACQUISITION	
Protocol	Std-Bi	Item	Format	Name
Station Number (0..99)	99	1	16 characters	ID
Baud Rate (bauds)	9600	2	16 -	Name
Parity	none	3	12 -	Vorname
Number of Data Bits	8	4	6 -	Station
Number of Stop Bits	1	5	4 -	Bemerkung
Number of On Error Retries	3			
Verify Patient Data	yes		ID Type	AlphaNum
Checksum Type	7Fh			
Use Error Codes	yes		MISCELLANEOUS	
Use Alarm Codes	no		Time Format	hh:mm:ss
Waiting Delay			Date Format	jj/mm/aaaa
Ack/Nack	5 sec.		Printer	BJ 300
File Downloading	5 sec.			
Key DEL = Modification				

Figure 13 : STA Global Options Screen (Std-Bi)

GLOBAL OPTIONS (Screen Page 2/2) shows the following options for the Std-Bi protocol:

- **Protocol**
Selection of the protocol type
Range: Std-Bi/ASTM
- **Station Number**
2-digit Instrument Identification Number
Range: 0 to 99
- **Baud Rate**
Baud rate of the serial interface (baud = bits per second)
Range: 9600, 4800, 2400, 1200, 600, 300

- **Parity**
Type of parity check
Range: none, odd or even
- **Number of Data Bits**
Number of data bits per character
Range: 7 or 8
- **Number of Stop Bits**
Number of stop bits
Range: 1 or 2
- **Number of On Error Retries**
Number of times the STA repeats a message when a [NAK] is received
Range: 1 to 9
- **Verify Patient Data**
YES: If the worklist from the host contains the info fields they are displayed after reception in a separate window for confirmation.
NO: Even if the worklist from the host contains the info fields they are not displayed for confirmation.
Range: YES / NO
- **Checksum Type**
7Fh Each character (except [STX], [ETX] and 7Fh) is XOR'd with 7Fh. If the result is equal to 03h then the character is replaced with 7Fh.
OR 40 Each character is OR'd with the checksum character and 40h.
Range: 7Fh / 40h
- **Use Error Codes**
Range: YES/NO
- **Use Alarm Codes**
Range: YES/NO

Use Error Codes	Use Alarm Codes	Action Taken
NO	NO	Only validated results transmitted
YES	NO	All results sent with Error Code
YES	YES	All results sent with Error/Alarm Code

There are two different tables for Error/Alarm codes. See Table 10 page 34

- **Waiting Delay Ack/Nack**
Time, in seconds, the STA waits for a [ACK] or [NAK] before generating a time out error.
Range: 1 to 99 seconds
- **Waiting Delay File Downloading**
Time, in seconds, the STA waits for a Worklist before generating a time out error.
Range: 1 to 99 seconds
- **ID Type**
Format of the 8-character Patient ID.
The STA can define a 16-character Patient ID. For compatibility with the Std-Bi protocol, this is reduced to 8 characters.
Numerical: Only Numerical ID's accepted. Values less than 9999999 are padded with leading zeros (30h).
Alphanum: Only the first 8 characters are accepted. If the length is less than 8 the input is padded with leading spaces (20h).
Range: Numerical/Alphanum

Note: Any ID defined with more than 8 characters will not be transmitted.

5.2 Definitions

5.2.1 Trace Format (Std-Bi)

To aid readability the following control character definitions will be used:

Code	Description	Mnemonic
01 hex	Connect Request	[SOH]
02 hex	Start of Text	[STX]
03 hex	End of Text	[ETX]
06 hex	Acknowledge	[ACK]
15 hex	Not Acknowledged	[NAK]
20 hex	Space Character	(= Code 250)
00 to FF	Checksum Character	[xxh]

Table 3 : Control Character Definitions used in Std-Bi Example Traces

5.2.2 Checksum Calculation (Std-Bi)

The typical Std-Bi protocol text structure is as follows:

Item	Start-of-Text	Text	Checksum	End-of-Text
Length	1	Variable	1	1
Trace	[STX]		[xxh]	[ETX]

Table 4 : Typical Text Format for the Std-Bi Protocol.

The Checksum Method is defined in **GLOBAL OPTIONS** (Screen Page 2/2).
(See Figure 13 Page 10).

5.2.2.1 The 7Fh Checksum Method

1. The Exclusive-OR sum of all characters in the Text section is found.
2. Only if the result has the value 03h it is replaced by the value 7Fh.

5.2.2.2 The OR 40h Checksum Method

1. The Exclusive-OR sum of all characters in the Text section is found.
2. The result OR'd by 40h to obtain the final Checksum.

5.3 User Maintenance (Std-Bi)

The User Maintenance menu is accessed via the main menu option **MAINTENANCE**.

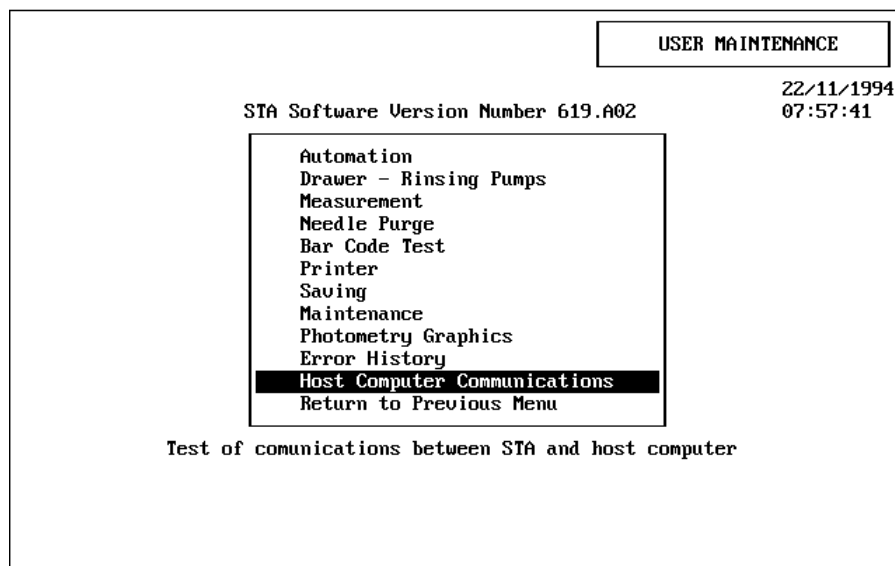


Figure 14 : Main Menu of User Maintenance.

Select **HOST COMPUTER COMMUNICATIONS** to display the communication parameters:

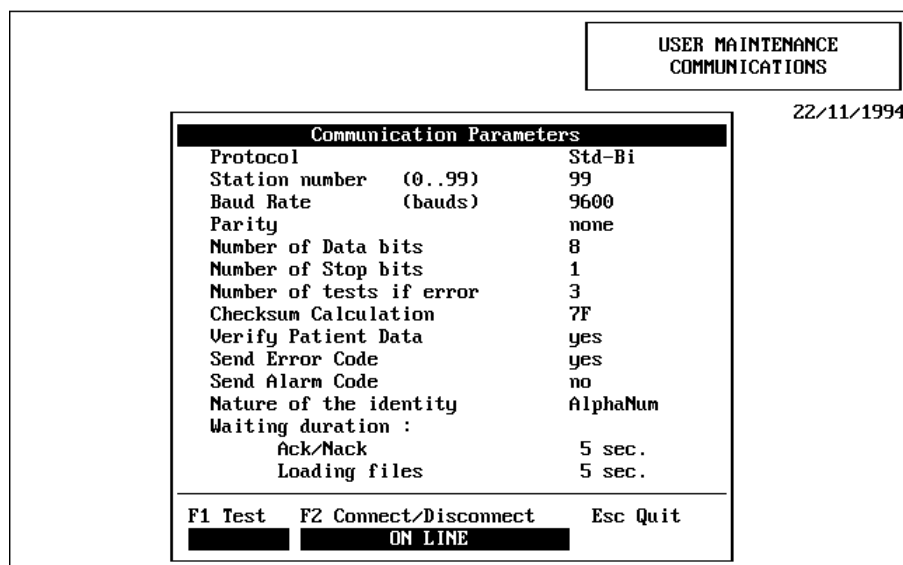


Figure 15 : User Maintenance Parameters and Test Functions (Std-Bi).

Modify the Parameters via the **SETUP** ⇒ **GLOBAL OPTIONS** Menu (Screen Page 2/2). (See Figure 13 Page 20). Refer to Chapter 5.1 for an explanation of the parameters.

Two test functions are available on this screen:

- <F1> Line Test.
- <F2> Connect/Disconnect.

5.3.1 <F1> Line Test.

When <F1> is pressed the STA Analyzer sends: [STX]EF[ETX]
(This is the character 'E' with an incorrect Checksum character 'F').

If the Host returns the expected [NAK] : PASSED is displayed.

If not; FAILED is displayed.

5.3.2 <F2> Connect / Disconnect

The <F1> Line Test is made with a check on the return delay from the Host against the parameters specified in Global Options.

The STA Analyzer then sends a [SOH] to establish a connection.

If the Host returns the expected [SOH] : ON LINE is displayed.

If not; OFF LINE is displayed.

After a successfully establishing a connection the <F2> key just initiates the Line Test.

5.4 Data Transmission Control (Std-Bi)

This section describes the complete protocol between the STA Analyzer and the Host.

5.4.1 Establishment Phase

5.4.1.1 Objective

After switching the analyzer ON a Global Verification is performed. The STA Analyzer automatically performs the Line Test (see chapter 5.4.4).

If the Line Test fails the STA tries to establish the connection by sending a control character.

If the connection is unsuccessful the operator can request a connection manually via the **MAINTENANCE** ⇒ **HOST COMPUTER COMMUNICATIONS** menu. See Chapter 5.3 User Maintenance (Std-Bi) Page 23

Protocol:

The STA Analyzer sends [SOH].

The Host returns a [SOH] within the pre-determined time.

If the return is not within the specified delay, or not received, the Establishment Phase is considered false.

5.4.1.2 Data Flow

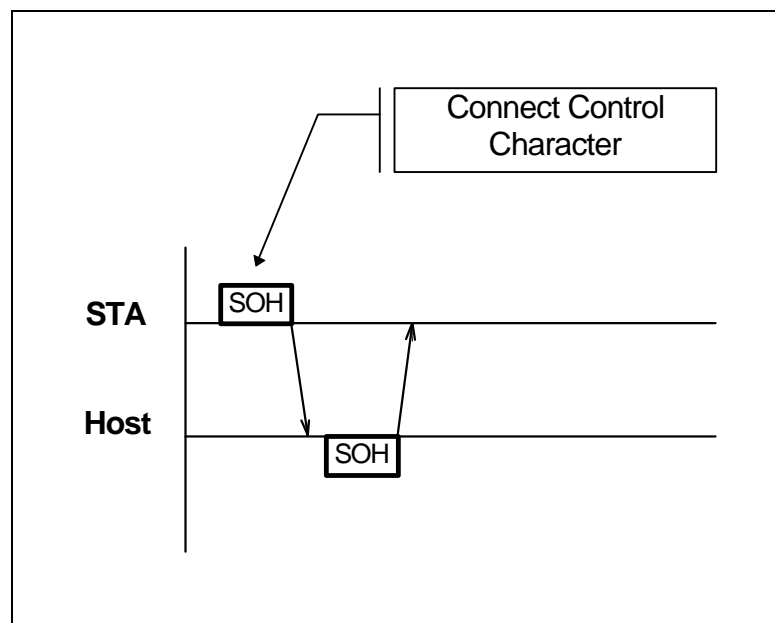
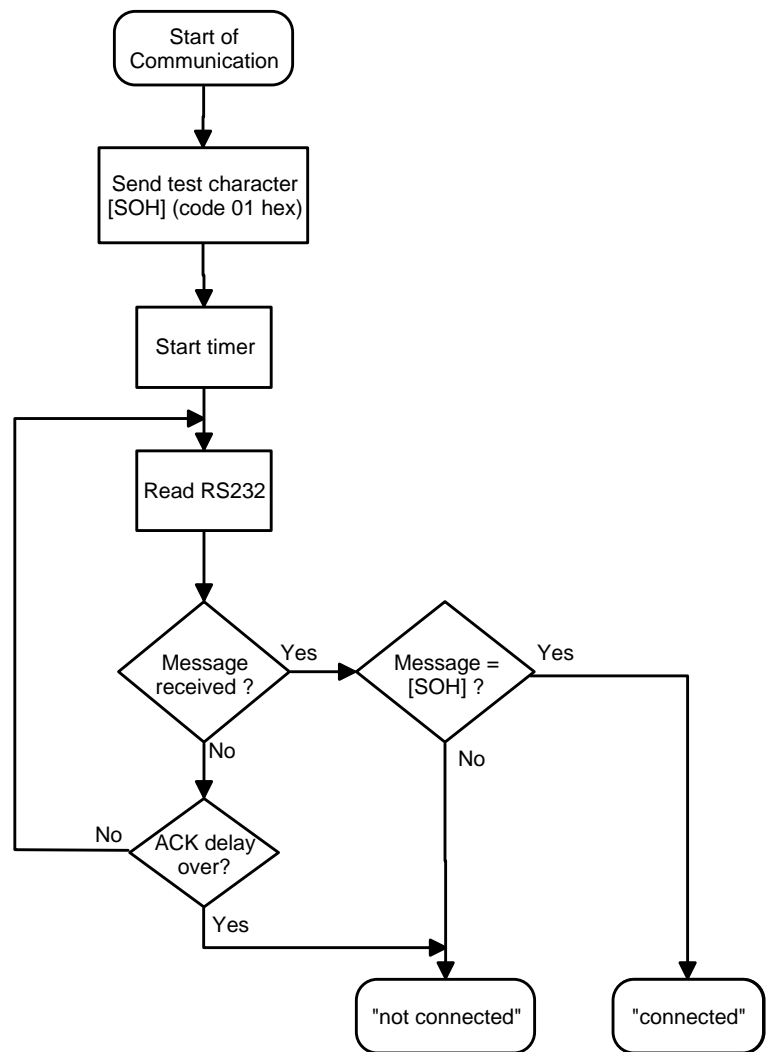


Figure 16 : Establishment Phase with Successful Response.

5.4.1.3 Flow Chart



[STA_HO_2.ABC]

Figure 17 : Flow Chart of Establishment Phase (Std-Bi).

5.4.1.4 Trace Example

```

STA 16:27:05 [SOH]
Host 16:27:05 [SOH]

```

Trace Example 1 : Establishment Phase

5.4.2 Worklist Request / Worklist

5.4.2.1 Objective

- a) Assuming the STA is configured AUTO MODE and BY TELELOADING, then a Worklist Request is sent to the Host after a sample is placed and identified.
- b) The Host responds to the Worklist Request by sending a Worklist containing the transmission numbers of the selected tests.

Protocol:

The STA sends a Worklist Request 'Q' message and waits for a [ACK] or [NAK] from the Host within the specified delay. See Global Options (Screen Page 2/2).

When the Host responds with [ACK], the STA waits for the Worklist 'T' message to arrive within the pre-defined File Downloading Delay. If unsuccessful that patient sample is regarded as invalid and the Worklist Not Received error is displayed.

When the Host responds with [NAK], the STA repeats the message until the required 'Number of On Error Retries' is reached. If all attempts fail then that patient sample is regarded as invalid and the Worklist Not Received error is displayed.

5.4.2.2 Message Format

a) Worklist Request

Item	Start-of-Text	Frame ID	Station	Patient ID	Checks	End-of-Text
Length	1	1	2	8	1	1
Trace	[STX]	Q	xx	pppppppp	[cch]	[ETX]
Code	02 hex	51 hex				03 hex
Note			1	2	3	

Table 5 : Structure of Worklist Request Message (Std-Bi).

b1) Worklist Type 1 - Without Information Fields.

Item	Start-of-Text	Frame ID	Station	Patient ID	Methods	Checks	End-of-Text
Length	1	1	2	8	2 to 24	1	1
Trace	[STX]	Q	xx	pppppppp	mm	[cch]	[ETX]
Code	02 hex	51 hex					03 hex
Note			1	2	4	3	

Table 6 : Structure of Worklist Message Without Info. (Std-Bi).

b2) Worklist Type 2 - With Information Fields

Item	Start-of-Text	Frame ID	Station	Patient ID	Info	Methods	Checks	End-of-Text
Length	1	1	2	8	38	2 to 24	1	1
Trace	[STX]	Q	xx	pppppppp	aaaa...	mm	[cch]	[ETX]
Code	02 hex	51 hex						03 hex
Note			1	2	5	4	3	

Table 7 : Structure of Worklist Message With Info. (Std-Bi).

Notes:

Note 1: Station Number. Defined in **GLOBAL OPTIONS** (Screen Page 2/2).

Note 2: Patient Identification. Defined as an 8-character Numerical or Alphanumerical. See **GLOBAL OPTIONS** (Screen Page 2/2).

The Numerical ID is left justified and padded with zeros (30h).

The Alphanumeric ID is left justified and padded with spaces (20h).

Note 3: Checksum. Method defined in **GLOBAL OPTIONS** (Screen Page 2/2).

Note 4: Methods. This field is repeated up to 12 times depending on the number of methods requested. See **TEST SETUP** menu for Method Ranking. For each method one main unit and one rank is defined. There are up to 3 ranks for secondary units. The main unit rank is used to determine the method. The other ranks are only used to send the results.

Note 5: Info. This Patient Information Field must contain the obligatory character '/' (2F hex) at the end of Info Field 1.

- 1) The STA Analyzer automatically identifies the format (1 or 2).
- 2) If format 2 is found the INFO field is truncated as follows:

Info Field 1	16	Characters (including '/')
Info Field 2	12	Characters
Info Field 3	6	Characters
Info Field 4	4	Characters
Total	38	Characters

The Operator is strongly recommended to keep these settings. This ensures a clear Patient Information display in the various menus of the STA software.

5.4.2.3 Data Flow

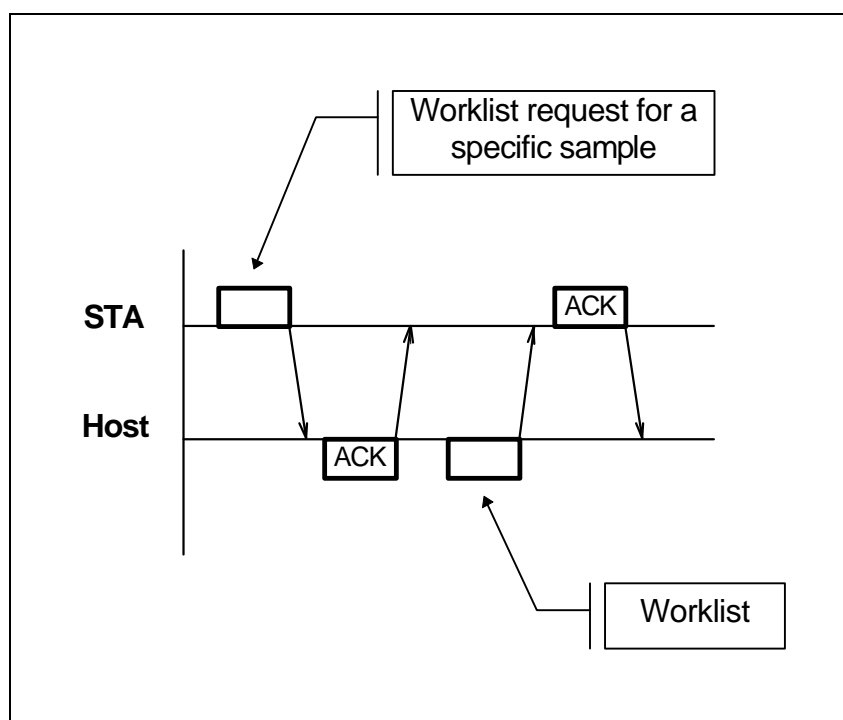
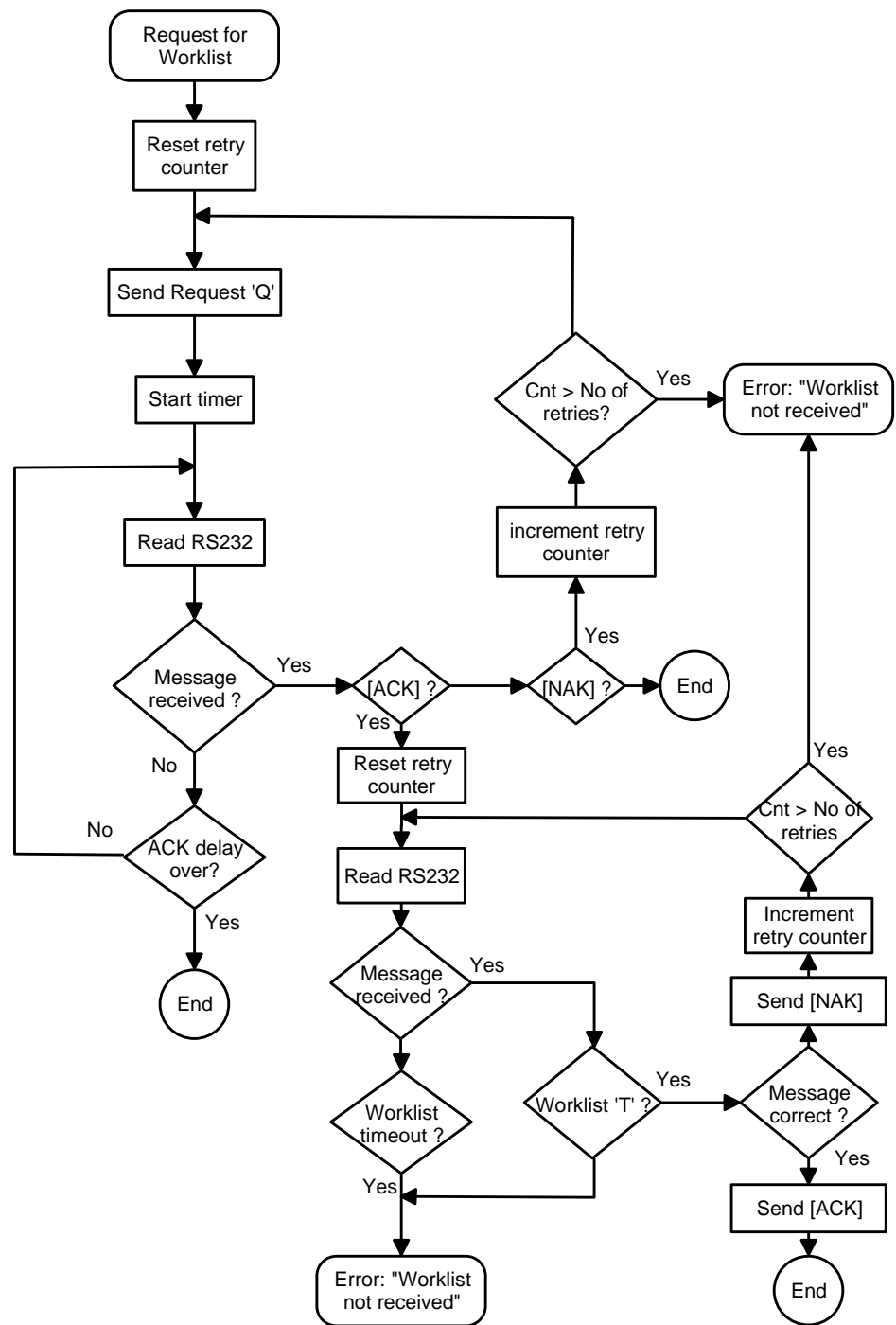


Figure 18 : Worklist Request and Worklist Response

5.4.2.4 Flow Chart



[STA_HO_3.ABC]

Figure 19 : Flow Chart of Worklist Request (Std-Bi)

5.4.2.5 Trace Example

a) Worklist with Information Fields

```
STA 16:27:51 [STX]Q99.....003[42h][ETX]
Host 16:27:51 [ACK]
Host 16:27:51 [STX]T99.....003Inf1...../Inf2.....Inf3..Inf401
                04[49h][ETX]
STA 16:27:51 [ACK]
```

Analyzer sends worklist request.

```
STA 16:27:51 [STX]Q99.....003[42h][ETX]
```

<pre>[STX] Q 99 .....003 End code [42h] [ETX]</pre>	<pre>Start of text (ASCII code 02 hex) Frame character: Worklist request Station number : 99 Sample-ID : 003 Code 42 hex represents for the checksum character 'B' End of text (ASCII code 03 hex)</pre>
--	--

Host sends back the worklist.

```
Host 16:27:51 [STX]T99.....003Inf1...../Inf2.....Inf3..Inf401
                04[49h][ETX]
```

<pre>[STX] T 99 .....003 Info fields Inf1...../ Inf2..... Inf3.. Inf4 Selected methods 0104 End code [49h] [ETX]</pre>	<pre>Start of text (ASCII code 02 hex) Frame character: Worklist Station number : 99 Sample-ID : 003 Info field 1 (16 characters) Info field 2 (12 characters) Info field 3 (6 characters) Info field 4 (4 characters) Tests with method numbers 1 and 4 selected Code 49 hex represents the checksum character 'I' End of text (ASCII code 03 hex)</pre>
---	---

Trace Example 2 : Worklist Request and Worklist with Info Fields (Std-Bi).

b) Worklist without Info Fields

```
STA 16:28:10 [STX]Q99.....003[42h] [ETX]
Host 16:28:10 [ACK]
Host 16:28:10 [STX]T99.....0030104[42h] [ETX]
STA 16:28:10 [ACK]
```

See example a) for format explanation.

5.4.3 Result Transmission

5.4.3.1 Objective

Results are transmitted to the Host in Real-Time (as and when available), or in Batch Mode after the completion of the run (operator initiated).

Protocol:

The STA sends a Result 'R' message and waits for a [ACK] or [NAK] from the Host within the specified delay.

When the Host responds with [ACK], the STA waits 500 msec before sending the message.

If the Host responds with [NAK], the STA repeats the message until the required 'Number of On Error Retries' is reached. See Global Options (Screen Page 2/2).

If all attempts fail then STA stops transmission and reports a communication failure.

5.4.3.2 Message Format

Item	Start-of-Text	Frame ID	Station	Patient ID	Zeros	Results	Checks	End-of-Text
Length	1	1	2	8	4	See Below	1	1
Trace	[STX]	R	xx	pppppppp	0000		[cch]	[ETX]
Code	02 hex	52 hex			4 * 48 hex			03 hex
Note			1	2			3	

Table 8 : Structure of Result Message (Std-Bi).

Format of the Results Field:

Item	Test Result 1			....	Test Result n		
	Method Rank	Value	Alarm				
	Length	2	4	2			
	Trace	mm	RRRR	AA			
	Note	5	6	7			

Notes:

Note 1: Station Number. Defined in **GLOBAL OPTIONS** (Screen Page 2/2).

Note 2: Patient Identification. Defined as 8-character Numeric or Alphanumeric.
See **GLOBAL OPTIONS** (Screen Page 2/2).

The numerical ID is left justified and padded with zero's (30h).

The alphanumeric ID is left justified and padded with spaces (20h).

Note 3: Checksum. Method defined in **GLOBAL OPTIONS** (Screen Page 2/2).

Note 4: Results. Total Length never exceeds 237 characters. Patient Files of greater size are sent as several messages with the same heading.

Note 5: Method Rank. See **TEST SETUP** Menu for Method Ranking definition. For each method one main unit and one rank is defined. There can be up to 3 ranks for secondary units. The main unit rank is used to determine the method. The other ranks are only used to send the results. The field is right justified and padded with zeros (30h).

Note 6: Result Value. The Result Field RRRR holds an integer value. A division factor is applied to obtain the real value. See Table 9.

Units	Division Factor
sec	10
%	1
INR	100
g/l	100
mg/dl	1
ratio	100
ng/ml	100
U/ml	100
IU/ml	100
AU1	**
AU2	**
AU3	**

Table 9 : Units and Division Factors

** : Consistent with decimal point position defined in Global Options (Screen Page 1/2).

The Result Field is right justified and with padded zeros.

Note 7: Error or Error/Alarm Code. There are 2 characters in this field. The first character is always 7Fh. The second character indicates the Error or Error Alarm Code. See the tables below.

If 'Use Error Codes' and 'Use Alarm Codes' are both set to 'NO' in **GLOBAL OPTIONS** (Screen Page 2/2) only validated 6-character results are transmitted (2 character Method Rank and 4 character Value).

Error Codes

When 'Use Error Codes' = 'YES' and 'Use Alarm Codes' = 'NO', the following applies:

Characters	ASCII Code	Error Message
'1'	31 hex	To be confirmed
'2'	32 hex	Technical Error
'3'	33 hex	> T max.
'4'	34 hex	< T min.
'5'	35 hex	Margin > Tolerance
'8'	38 hex	R < R min./Colorimetry
'A'	41 hex	Confirmed

Table 10 : Error Codes (Std-Bi).

Error and Alarm Codes

When 'Use Error Codes' = 'YES' and 'Use Alarm Codes' = 'YES', the following applies:

	Characters	ASCII Code	Error Message	Alarm Code
Group 1	'2'	32 hex	Technical Error	Not Used
	'3'	33 hex	T > T max.	Not Used
	'4'	34 hex	T < T min.	Not Used
	'5'	35 hex	Margin < Tolerance	Not Used
	'8'	38 hex	Linearity	Not Used
Group 2	'A'	41 hex	Confirmed	Without
	'B'	42 hex	Confirmed	1
	'C'	43 hex	Confirmed	2

	'O'	4F hex	Confirmed	14
Group 3	'1'	31 hex	To be confirmed	Without
	'b'	62 hex	To be confirmed	1
	'c'	63 hex	To be confirmed	2

	'o'	6F hex	To be confirmed	14

Table 11 : Error and Alarm Codes (Std-Bi).

Code	Description	
1	Result:	Confirmed with T>max.
2	Calibration Control:	Overridden
3	Quality Control:	Out of Range or Not Done
4	Quality Control:	Overridden
5	Arm #3:	No Level Detection
6	Arm #2:	No Level Detection
7	Arm #1:	No Level Detection
8	Result:	Value in Primary Unit Skewed
9	Result:	Dilution Change
10	Result:	Rerun Test
11	Reagent Drawer	Temperature Out of Limits
12	Syringe Arm #3:	Maintenance Data Overdue
13	Syringe Arm #2:	Maintenance Data Overdue
14	Syringe Arm #1:	Maintenance Data Overdue

Table 12 : Alarm Code Descriptions (Std-Bi).

Note: If there are multiple alarms for a result, the highest priority code is transmitted. Code 1 is the highest of 14 priority levels.

5.4.3.3 Data Flow

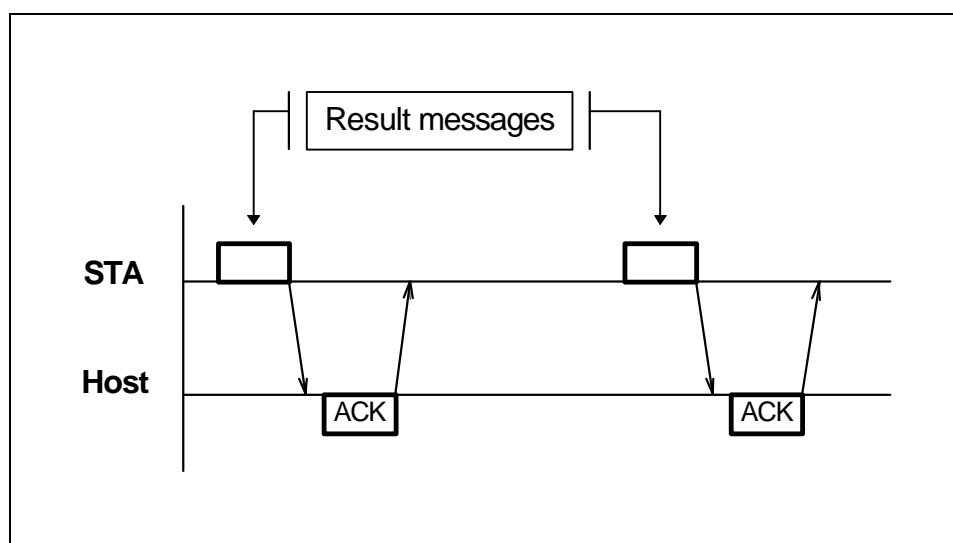


Figure 20 : Result Transmission with Positive Acknowledgment.

5.4.3.4 Flow Chart

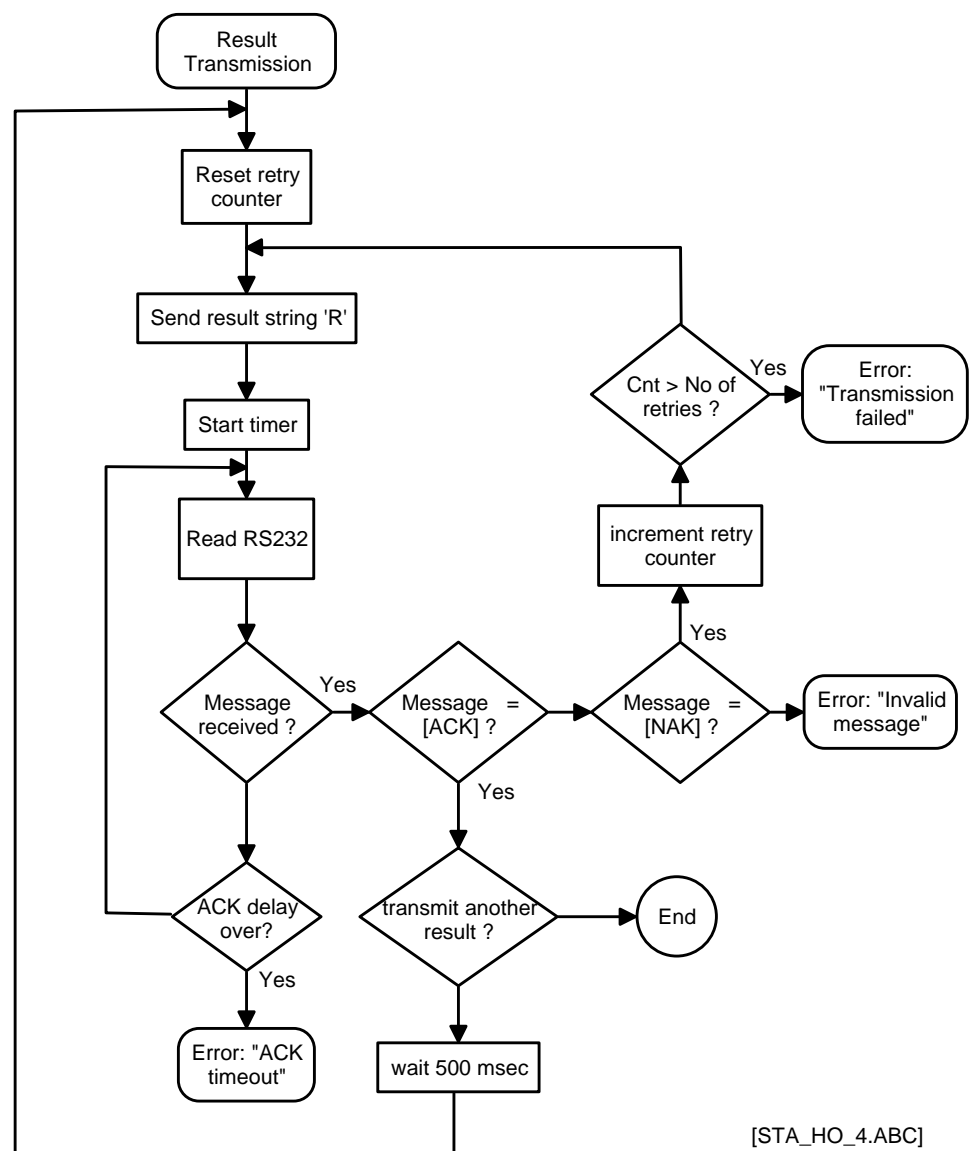


Figure 21 : Flow Chart of Result Transmission (Std-Bi).

5.4.3.5 Trace Example

a) Results with Error Codes

```
STA 16:31:50 [STX]R99.....0030000010123•A024567•1030054•1040456•1[33h]
[ETX]
Host 16:31:50 [ACK]
```

Analyzer sends results with error codes.

```
STA 16:31:50 [STX]R99.....0030000010123•A024567•1030054•1040456•1[33h]
[ETX]
(the character • represents the character code 7F hex)
```

[STX]	Start of text (ASCII code 02 hex)
R	Frame character: Result
99	Station number : 99
.....003	Sample-ID : 003
Results	
0000	4 zeros
01	Method rank : 1
0123	Result : 123
•A	Error code : A (= confirmed)
02	Method rank : 2
4567	Result : 4567
•1	Error code : 1 (= to be confirmed)
03	Method rank : 3
0054	Result : 54
•1	Error code : 1 (= to be confirmed)
04	Method rank : 4
0456	Result : 456
•1	Error code : 1 (= to be confirmed)
End code	
[33h]	Code 33 hex represents the checksum character '3'
[ETX]	End of text (ASCII code 03 hex)

Trace Example 3 : Result transmission with error codes (Std-Bi)

b) Results without Error Codes - only validated results are transmitted.

STA 16:31:31 [STX]R99.....0030000010123[40h][ETX]
Host 16:31:31 [ACK]

Analyzer sends only validated results. STA 16:31:31 [STX]R99.....0030000010123[40h][ETX]	
[STX] R 99.....003 Results 0000 01 0123 End code [40h] [ETX]	Start of text (ASCII code 02 hex) Frame character: Result Station number : 99 Sample-ID : 003 4 zeros Method rank : 1 Result : 123 Code 40 hex represents the checksum character '@' End of text (ASCII code 03 hex)

Trace Example 4 : Result transmission without error codes (Std-Bi)

5.4.4 Line Test

5.4.4.1 Objective

Test the communications link between the STA Analyzer and the Host.

This message is always sent by the STA software during 'Global Verification'.

The operator can request a the test from the **MAINTENANCE** ⇒ **HOST COMPUTER** Communication menu. See User Maintenance (Std-Bi) Page 23.

The Line Test initiates a message with an incorrect checksum. The Host should then respond with a [NAK].

Protocol:

The STA Analyzer sends a message with an incorrect checksum and waits for a [NAK] within the pre-defined delay time. If the Host fails to respond, or is late or incorrect, then the line is considered disconnected and no transmission is possible.

5.4.4.2 Message Format

Item	Start-of-Text	Frame Type	Checksum	End-of-Text
Length	1	1	1	1
Trace	[STX]	E	[46h]	[ETX]
Code	02 hex	45 hex	46 hex	03 hex

Table 13 : Structure of Line Test (Std-Bi).

5.4.4.3 Data Flow

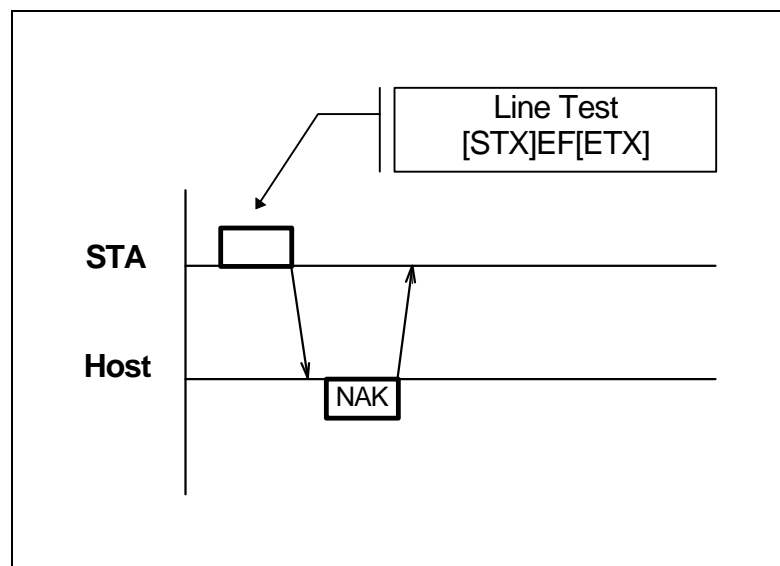


Figure 22 : Line Test with Correct Response.

5.4.4.4 Flow Chart

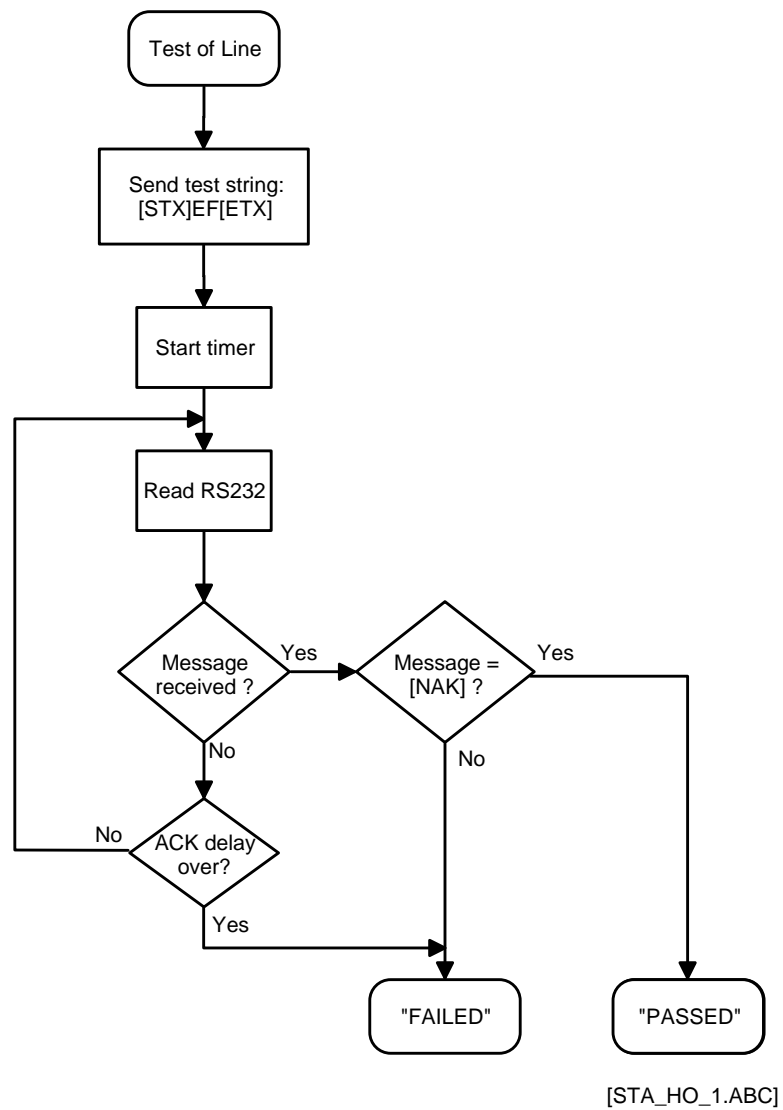


Figure 23 : Flow Chart of Line Test (Std-Bi).

5.4.4.5 Trace Example

```
STA 16:27:12 [STX] E [46h] [ETX]
Host 16:27:12 [NAK]
```

Trace Example 5 : Line Test (Std-Bi).

5.4.5 Termination Phase

5.4.5.1 Objective

The STA Analyzer sends an 'E' to the Host to terminate communications. No check is made for acknowledgment from the Host. The Termination Phase is optional. Its use depends upon the Host Computer.

5.4.5.2 Message Format

Item	Start-of-Text	Frame Type	Checksum	End-of-Text
Length	1	1	1	1
Trace	[STX]	E	[45h]	[ETX]
Code	02 hex	45 hex	45 hex	03 hex

Table 14 : Structure of Termination Message (Std-Bi).

5.4.5.3 Data Flow

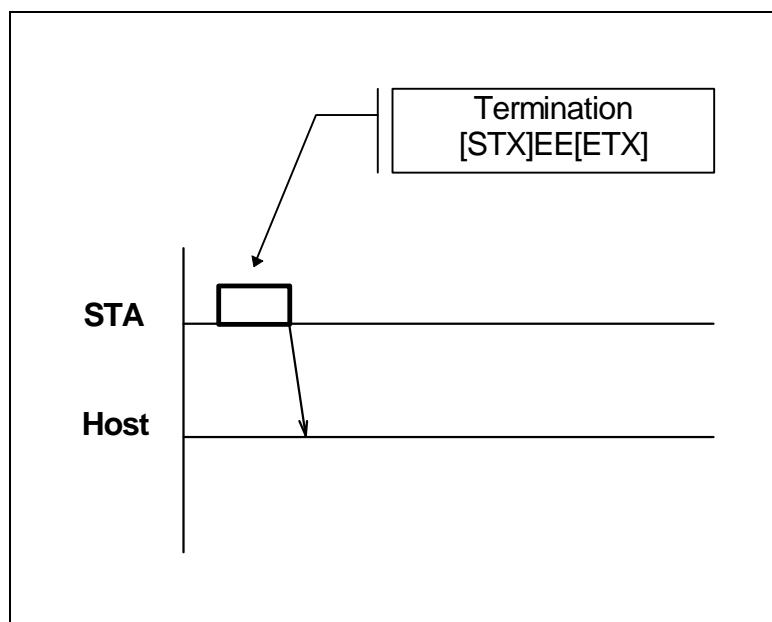


Figure 24 : Termination Phase Without Response

5.4.5.4 Flow Chart

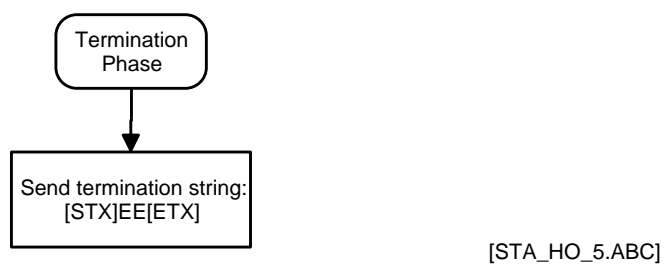


Figure 25 : Flow Chart of Termination Phase

5.4.5.5 Trace Example

```
STA 16:27:18 [STX] E [45h] [ETX]
```

Trace Example 6 : Termination Phase (Std-Bi).

6. ASTM Protocol

Details of the ASTM protocol can be found in the following papers:

- **ASTM E1381-94 Low Level Protocol:**
Specification for Low Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Computer Systems.
- **ASTM E1394-91 High Level Protocol:**
Standard Specification for Transferring Information Between Clinical Instruments and Computer Systems.

6.1 Host Interface Settings (ASTM)

All Host Interface settings are made in **SETUP** ⇒ **GLOBAL OPTIONS** (Screen Page 2/2).

Access to the **GLOBAL OPTIONS** screen requires the 6-digit Access Code. (See 3.1.1 Calculation of Access Code Page 8)

Successful entry of the correct Access Code displays **GLOBAL OPTIONS** (Screen Page 1/2). Press <PageDown> to display the following screen:

Esc Quit PgUp Page 1		GLOBAL OPTIONS	
Page 2/2			
COMMUNICATIONS		FILE ACQUISITION	
		Item	Name
Protocol	ASTM	1	16 characters
Station Number (0..99)	99	2	16 - Name
Baud Rate (bauds)	9600	3	12 - Vorname
Parity	none	4	6 - Station
Number of Data Bits	8	5	4 - Bemerkung
Number of Stop Bits	1		ID Type
Number of On Error Retries	3		AlphaNum
Verify Patient Data	yes		
		MISCELLANEOUS	
		Time Format	hh:mm:ss
		Date Format	jj/mm/aaaa
		Printer	BJ 300
Key DEL = Modification			

Figure 26 : STA Global Options Screen (ASTM)

GLOBAL OPTIONS (Screen Page 2/2) displays the following options for the ASTM protocol:

- **Protocol**
Selection of the protocol type
Range: Std-Bi/ASTM
- **Station Number**
2-digit Instrument Identification Number
Range: 0 to 99
- **Baud Rate**
Baud rate of the serial interface (baud = bits per second)
Range: 9600, 4800, 2400, 1200, 600, 300
- **Parity**
Type of parity check
Range: none, odd or even
- **Number of Data Bits**
Number of data bits per character
Range: 7 or 8
- **Number of Stop Bits**
Number of stop bits
Range: 1 or 2
- **Number of On Error Retries**
Number of times the STA repeats a frame when it receives a character different from [ACK] or [EOT]. This number has to be set to 6.
Range: 1 to 9
- **Verify Patient Data**
YES: The four information fields in the Worklist from Host are displayed after reception in a separate window for confirmation.
NO: The four information fields in the Worklist from Host are not displayed in a separate window for confirmation..
Range: YES / NO
- **ID Type**
Format of the 16-character Patient ID.
Range: Numerical/Alphanum

6.2 Definitions

6.2.1 Trace Format (ASTM)

To aid readability the following control character definitions will be used:

Code	Description	Mnemonic
02 hex	Start of Text	[STX]
03 hex	End of Text	[ETX]
04 hex	End of Transmission	[EOT]
05 hex	Enquiry	[ENQ]
06 hex	Acknowledge	[ACK]
0A hex	Line Feed	[LF]
0D hex	Carriage Return	[CR]
15 hex	Not Acknowledged	[NAK]
17 hex	End of Transmission Block	[ETB]

Table 15 : Control Character Definitions used in ASTM Example Traces

6.2.2 Checksum Calculation (ASTM)

The record format for the ASTM protocol is as follows:

Item	Start-of-Text [STX]	Data Section	End Code [ETX] CH CL [CR] [LF]
Length	1	Variable	5

Table 16 : Common Text Format for the ASTM Protocol.

The Checksum is the sum of all the characters except; the Checksum, [CR] and [LF]. That is the Data Section + [ETX]. The Checksum is the Least Significant 8-bits of the result, in hexadecimal format.

Example:

Sum of all character codes: 122 decimal

Hexadecimal Format 7A hex

The two characters '7' and 'A' are transferred as the Checksum characters CH and CL respectively.

6.3 User Maintenance (ASTM)

The User Maintenance menu is accessed via the main menu option Maintenance.

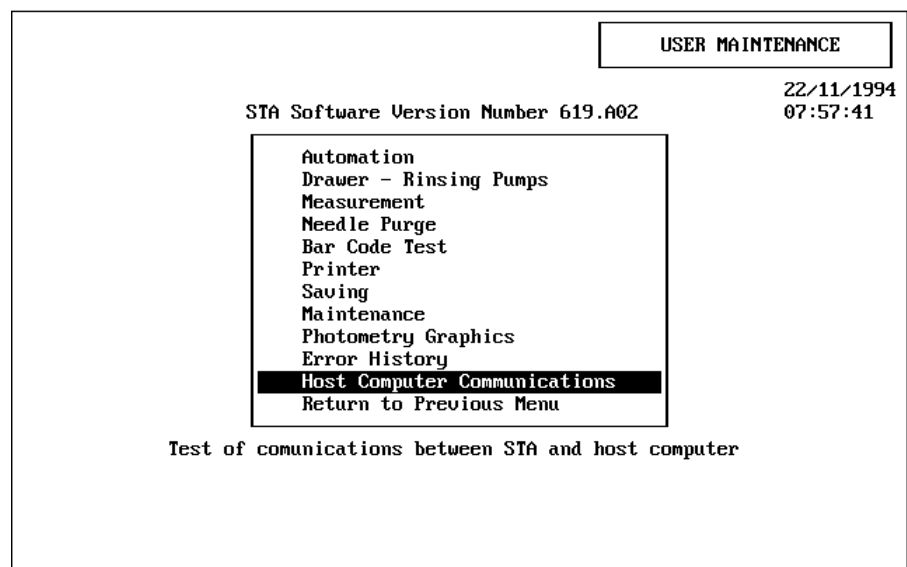


Figure 27 : Main Menu of User Maintenance.

Select **HOST COMPUTER COMMUNICATIONS** to display the Communication Parameters:

**USER MAINTENANCE
COMMUNICATIONS**

25/11/1994

Communication parameters

Protocol		ASTM
Station number	(0..99)	99
Baud Rate	(bauds)	9600
Parity		none
Number of Data bits		8
Number of Stop bits		1
Number of tests if error		3
Verify Patient Data		yes
ID Type		AlphaNum

F1 TestEscReturn to menu

Figure 28 : User Maintenance Parameters and Test Functions (ASTM).

Modify the Parameters via the **SETUP** ⇒ **GLOBAL OPTIONS** Menu (Screen Page 2/2). (See Figure 26 Page 43).

Refer to 6.1 Host Interface Settings (ASTM) Page 43 for an explanation of the parameters.

There is one test function available on this screen:

- **<F1> Line Test.**

The STA Analyzer sends [ENQ] to the Host.

The Host is expected to respond with [ACK].

When the [ACK] is received the STA Analyzer terminates the Line Test with [EOT] and the PASSED message is displayed.

If the Host failed to respond, FAILED is displayed.

6.4 Data Transmission Control (ASTM)

The following chapters describe the complete communication between the STA Analyzer and the Host Computer.

6.4.1 Common Transmission Procedure

As required by the ASTM Protocol Specification the STA Analyzer recognizes three line modes:

- Idle: No communication in progress.
- Tx: Transmission by STA Analyzer
- Rx: Reception by STA Analyzer

The following procedure is used whenever information is sent over the link by either the STA or the Host. This procedure has three phases:

- **Establishment Phase**
The link is claimed by the sender (STA or Host).
- **Transfer Phase**
Transmission of the different records making up the message.
- **Termination Phase**
The link is released

The three phases are shown below:

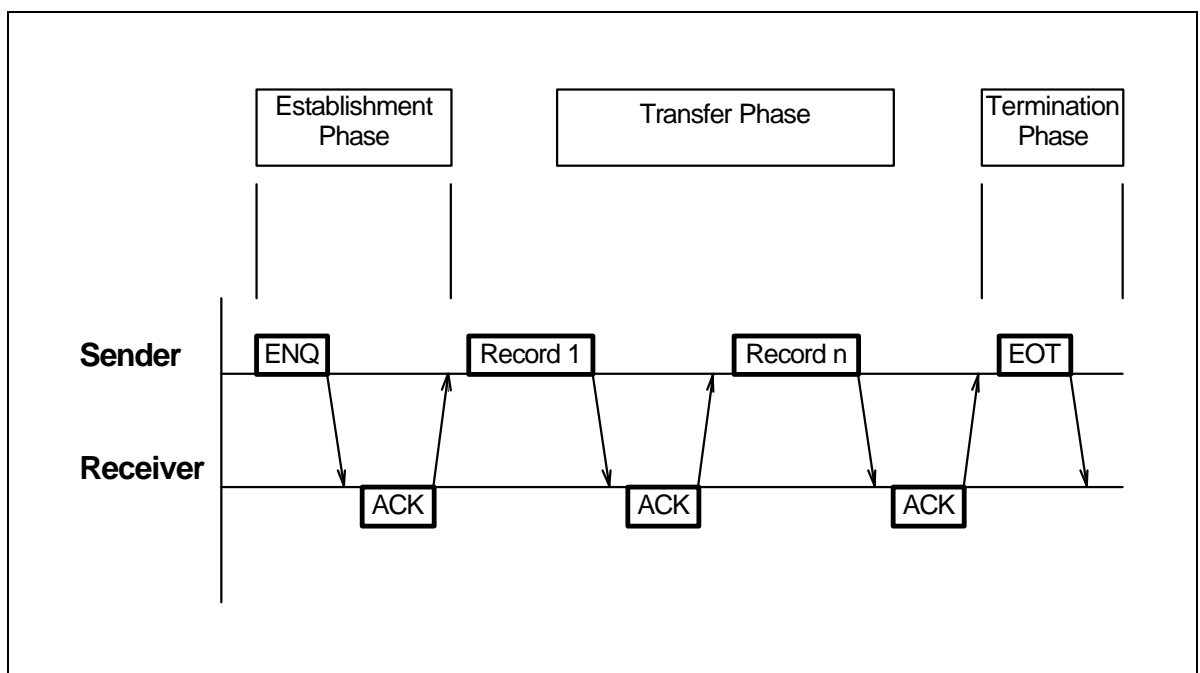


Figure 29 : Transmission Control of Information Exchange (ASTM).

6.4.2 Communication Phases

6.4.2.1 Establishment Phase (STA to Host)

If the STA is in Idle Mode it sends an [ENQ]. The possible responses from the Host are:

1. **The Host sends an [ACK].**

The STA changes to Transmission Mode. If the STA is in Normal Mode it initiates the Record Transfer. Alternatively, if the STA is in Test Mode, it initiates the Termination Phase by sending an [EOT].

2. **The Host sends an [ENQ].**

The STA waits 5 seconds and then returns another [ENQ]. This cycle is repeated until a [ACK], [NAK], or any other character is received.

3. **The Host sends some other characters.**

The STA waits 10 seconds and then returns another [ENQ]. This cycle is repeated until the 'Number of On Error Retries' is reached. At this point the STA initiates the Termination Phase by sending an [EOT] and displays an error message.

4. **The Host does not respond.**

The STA waits 15 seconds, initiates the Termination Phase by sending an [EOT], and displays an error message.

6.4.2.2 Transfer Phase (STA to Host)

The STA transmits the first record. The possible responses from the Host are:

1. **The Host sends a [ACK] or [EOT].**

The STA sends the next record.

Caution! The STA regards the [EOT] as an acknowledgment and continues to transmit records.

2. **The Host sends some other characters.**

The STA waits 10 seconds and then repeats the transmission of the record. This cycle is repeated until the 'Number of On Error Retries' is reached. At this point the STA initiates the Termination Phase by sending an [EOT] and displays an error message.

3. **The Host does not respond.**

The STA waits 15 seconds, initiates the Termination Phase by sending an [EOT] and displays an error message.

6.4.2.3 Termination Phase (STA to Host)

The STA transmits an [EOT]. It does not wait for a response. The STA changes to **Idle** Mode.

6.4.2.4 Receiver Reaction (Host to STA)

The possible responses from the STA to a Host message are:

1. The Host sends a [ENQ]

If the STA is in Idle Mode it replies with an [ACK] and changes to Reception Mode.

2. The Host sends a [EOT]

If the STA is in Reception Mode and a Header Record has been received, the STA goes to Idle Mode and releases the link. The received records are then analyzed by the STA.

If the STA is in Transmission Mode, the STA regards the [EOT] as an acknowledgment and continues to transmit records.

3. The Host sends some other characters.

The STA receives the characters as part of a record. When a complete record is transmitted the STA verifies the Checksum. If this is satisfactory, the STA returns an [ACK]. If not, a [NAK] is sent.

6.4.3 Flow Charts

6.4.3.1 Reception/Transmission Sequence

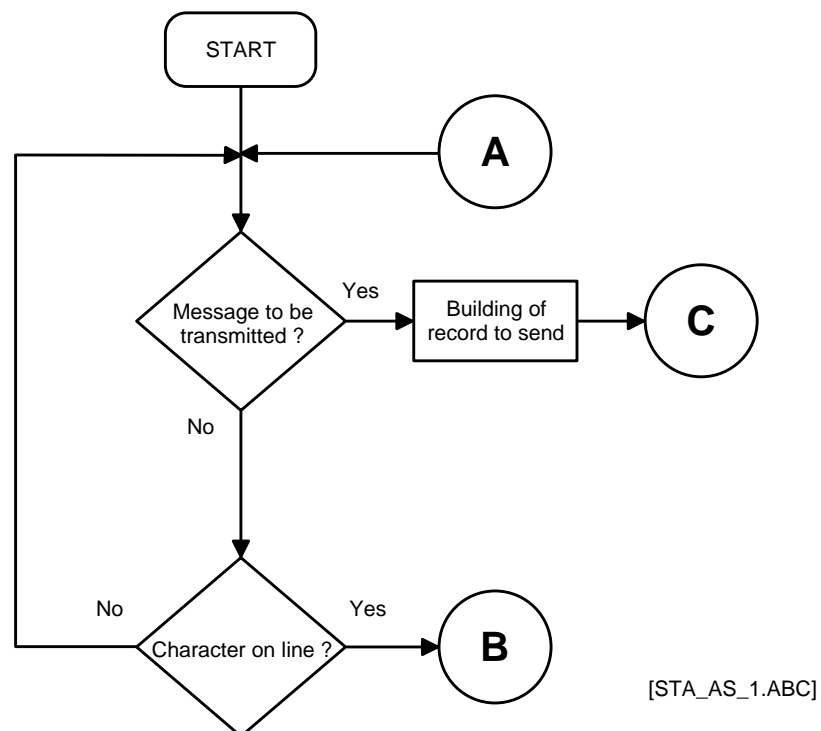
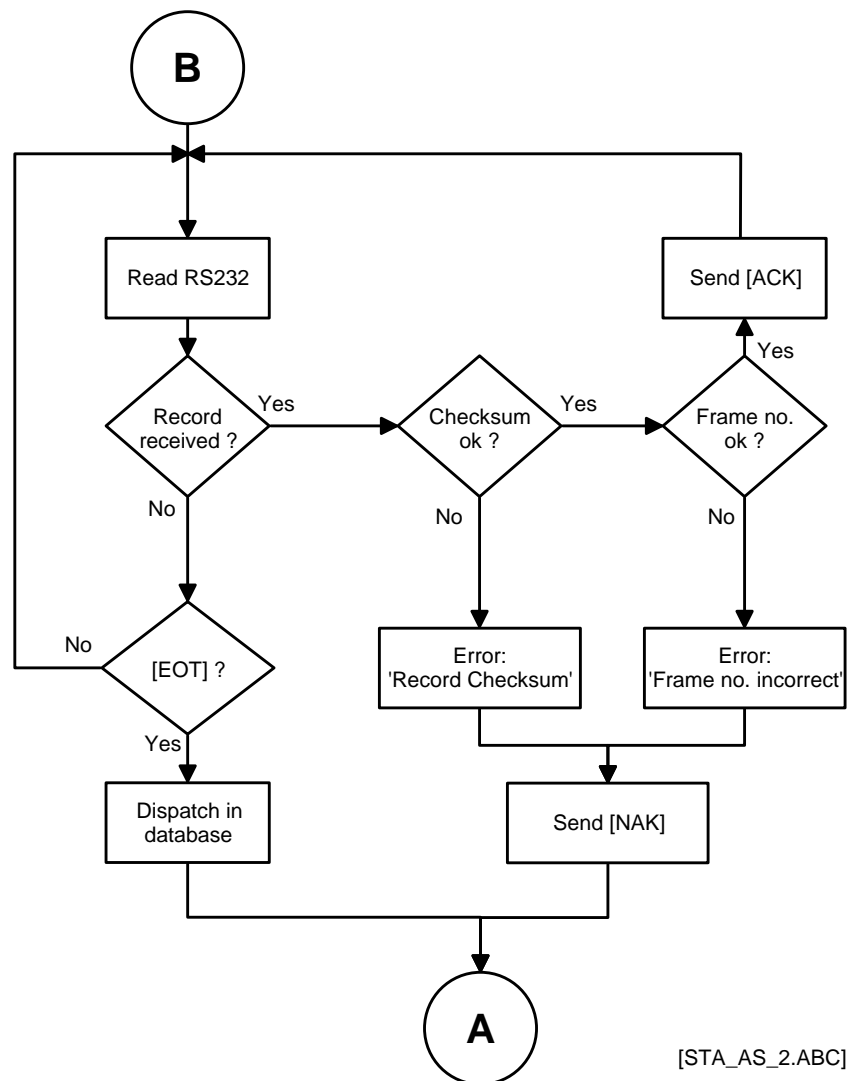
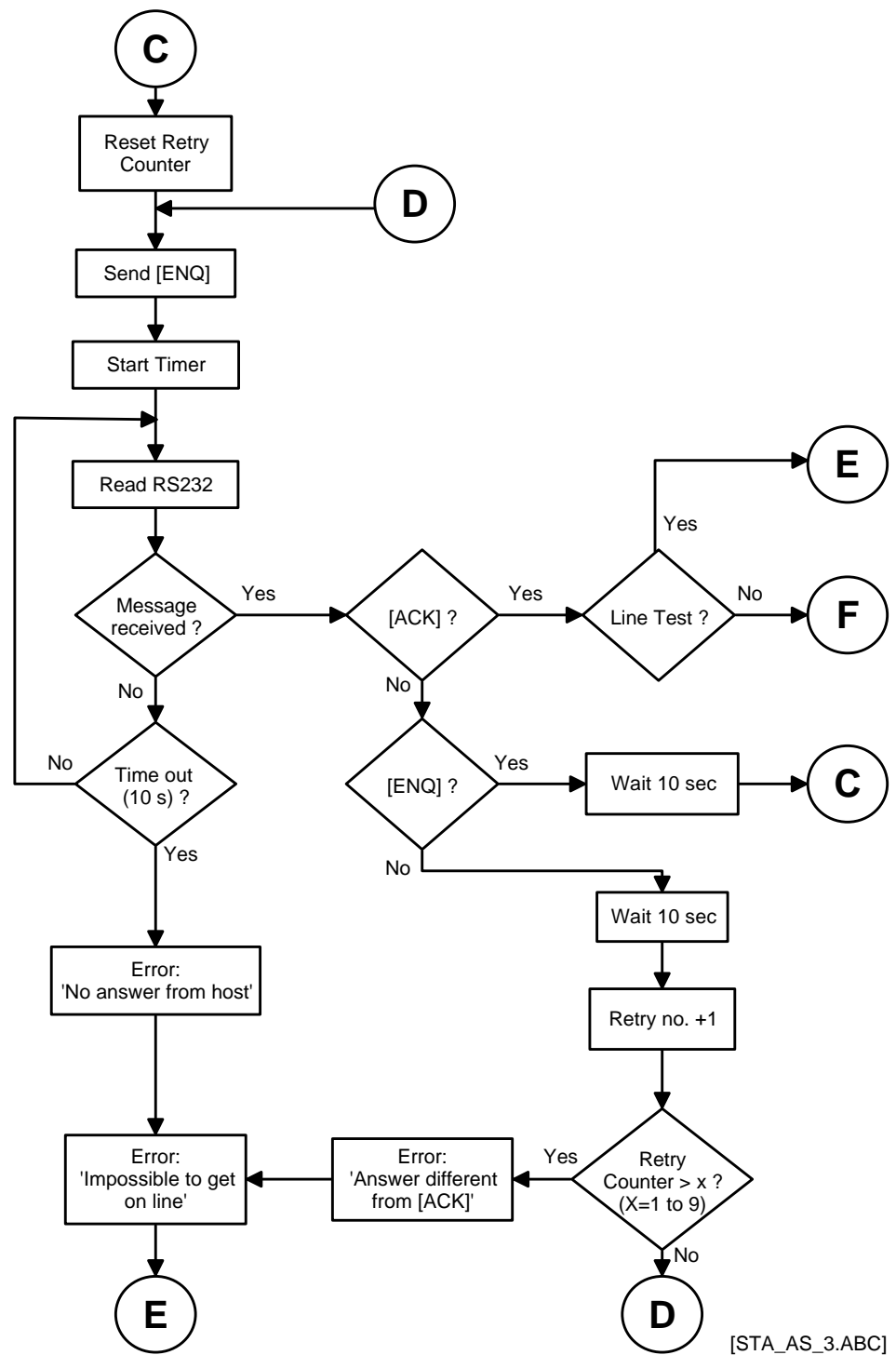


Figure 30 : Flow Chart of Reception/Transmission (ASTM).

6.4.3.2 Reception of a Record**Figure 31 : Flow Chart of Reception of a Record (ASTM).**

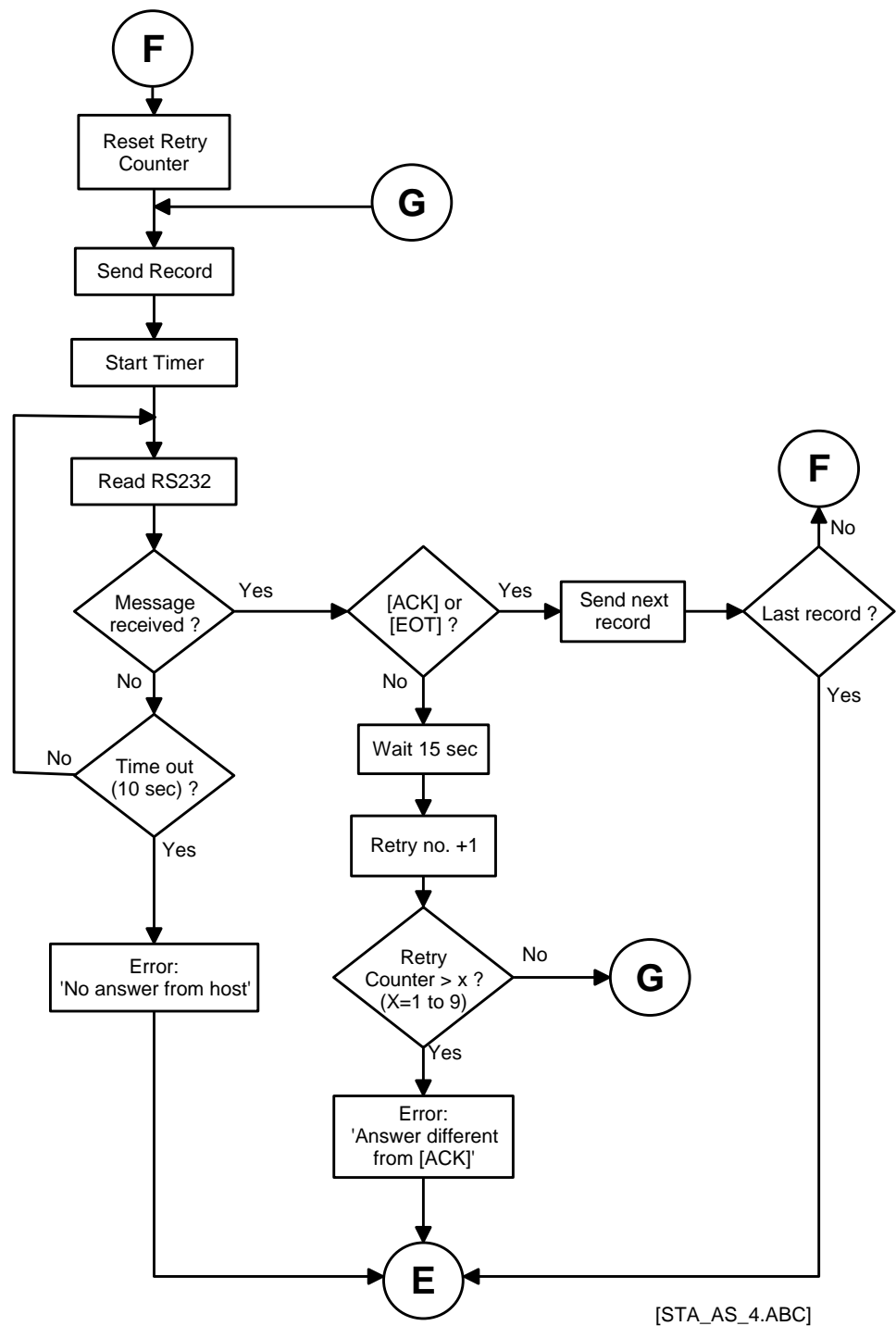
6.4.3.3 Establishment Phase



[STA_AS_3.ABC]

Figure 32 : Flow Chart of Establishment Phase (ASTM).

6.4.3.4 Transfer Phase



[STA_AS_4.ABC]

Figure 33 : Flow Chart of Transfer Phase (ASTM).

6.4.3.5 Termination Phase

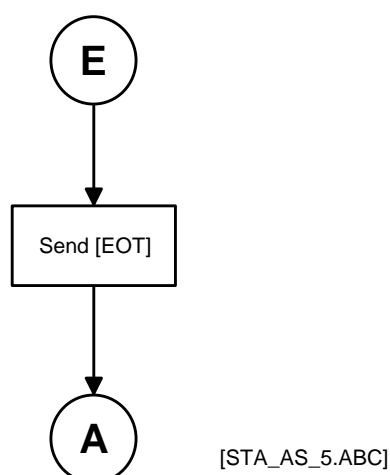


Figure 34 : Flow Chart of Termination Phase (ASTM).

6.4.4 Record Sequence

There are three different messages sent between the STA and the Host. Each of these contain Records (Refer to ASTM-1394-91 specifications):

1. **Request for Worklist:** (STA to Host)
 - Message Header Record
 - Request Info. Record
 - Message Terminator Record
2. **Worklist:** (Host to STA)
 - Message Header Record
 - Patient Record
 - Test Order Record 1
 - ...
 - Patient Record (optionally)
 - Test Order Record 1 (optionally)
 - Message Terminator Record
3. **Result:** (STA to Host)
 - Message Header Record
 - Patient Record
 - Test Order Record 2
 - Result Record (Unit 1)
 - Manufacturer Information Record (Unit 1)
 - ...
 - Result Record (Unit n, with n=1 to 4)
 - Manufacturer Information Record (Unit n, with n=1 to 4)
 - Message Terminator Record

A Worklist is normally sent in response to a Worklist Request, although, the ASTM protocol also allows the sending of a modified Worklist for an already existing sample entry at the STA without first sending a request.

If the operator identifies and positions the samples in routine so fast that the worklist request for the next sample is earlier than the worklist from the host for the previous sample the request from the STA has higher priority and the host must buffer the request until he gets the line for sending the worklist.

Depending on the speed of the operator it could happen that the host must buffer all requests of one drawer.

When the host gets the line for worklist transmission the host can send the methods for all buffered samples within one worklist transmission by repetition of the Patient and Test Order records (see **2. Worklist** above)

6.5 Record Structure

6.5.1 Record Types

Table 17 lists the different Record types with their identification characters and the included information.

No	Name	Char	Sender	Contents (STA specific)	ASTM
1	Message Header	H	STA/Host	Delimiters, Station no., Version no., Date, Time	7.1.
2	Patient Information	P	STA/Host	four Info fields	8.1.
3	Request Information	Q	STA	Sample ID	12.1.
4	Test Order 1	O	Host	Sample ID, selected Methods	9.4.
5	Test Order 2	O	STA	Sample ID	9.4.
6	Result	R	STA	Method no, Result, Unit, Date and Time (if control result)	10.1.
7	Manufacturer Information	M	STA	Error and Alarm code	15.1
8	Message Terminator	L	STA/Host		13.1.

Table 17 : Record Types (ASTM)

6.5.2 General Record Format

All the above listed records have the same record format. This is shown below in Table 18. The Data Section consists of several Data Fields containing the information. The format of these Data Fields is defined in the ASTM specification.

Item	Start-of-text [STX]	Frame Number	Record Type	Data Section	End Code [ETX] CH CL [CR][LF]
Length	1	1	1	variable	5

Table 18 : General Record Format (ASTM)

If the Record Field (Record Type + Data Section) exceeds 240 characters the message is divided into several parts. Each part, except the last, replaces the [ETX] character with [ETB].

6.5.3 Record Details

The following delimiters are used inside the Records:

Delimiter	Char	Code
Field	|	7C hex
Repeat	\	5C hex
Component	^	5E hex
Escape	&	26 hex

Table 19 : Record Delimiters (ASTM)

The STA recognizes the delimiters used by the Host; thus the Host and the STA may use different delimiters.

6.5.3.1 Header Record

In the following tables only the marked Data Fields are used.

Upload Example:

```
[STX]1H|\^&||99^2.00|||||P|1.00|19950112104500[CR][End-code]
```

Download Example:

```
[STX]1H|\^&||99^2.00[CR][End-code]
```

Example	Content	Upload STA > Host WL Request / Result	Download Host > STA Worklist	Len	ASTM
[STX]	Start-of-text			1	1381
1	Frame number from 0 to 7			1	1381
H	Record Type ID H = Header record			1	7.1.1
| \ ^ &	Delimiter definition | = field delimiter \ = repeat delimiter ^ = component delimiter & = escape delimiter			4	7.1.2
	Message Control ID				7.1.3
	Access Password				7.1.4
99	Sender Name or ID Station number (1 to 99) Defined in GLOBAL OPTIONS			2	7.1.5
^ 2.00	Version of STA implementation			4	
	Sender Street Address				7.1.6
	Reserved Field				7.1.7
	Sender Telephone Number				7.1.8
	Characteristics of sender				7.1.9
	Receiver ID				7.1.10
	Comment or special instructions				7.1.11
P	Processing ID P = Production Q = Quality Control			1	7.1.12
1.00	Version No ASTM protocol version, currently '1.00'			4	7.1.13
19950112 104500	Date and time of message Format: YYYYMMDDHHMMSS			14	7.1.14
[CR]	Carriage return			1	1394
[End-code]	End-of-text, Checksum, Carriage return, Line feed			5	1381

Table 20 : Record Header Structure (ASTM)

6.5.3.2 Patient Record

Upload / Download Example

```
[STX]1P|1|||Info 1^Info 2^Info 3^Inf4[CR][End-code]
```

Example	Content	Upload STA > Host Result	Download Host > STA Worklist	Len	ASTM
[STX]	Start-of-text			1	1381
1	Frame number from 0 to 7			1	1381
P	Record Type ID P = Patient record			1	8.1.1
1	Sequence Number			max. 2	8.1.2
	Practice Assigned Patient ID				8.1.3
	Laboratory Assigned ID				8.1.4
Info 1 ^ Info 2 ^ Info 3 ^ Inf4	Patient ID No.3 Information no. 1 (e.g. name) ^ Information no. 2 (e.g. forename) ^ Information no. 3 (e.g. bed no) ^ Information no. 4 (e.g. department)			max. 16 max. 12 max. 6 max. 4	8.1.5
[CR]	Carriage return			1	1394
[End-code]	End-of-text, Checksum, Carriage return, Line feed			5	1381

Table 21 : Patient Record Structure (ASTM)

Note: Empty Information Fields do not overwrite existing Information Fields at the instrument.

6.5.3.3 Request Record

```
[STX]1Q|1|^100001[CR][End-code]
```

Example	Content	Upload STA > Host WL Request	Download Host > STA	Len	ASTM
[STX]	Start-of-text			1	1381
1	Frame number from 0 to 7			1	1381
Q	Record Type ID Q = Request record			1	12.1.1
1	Sequence Number			max. 2	12.1.2
^ 100001	Starting range ID number Computer System Patient ID ^ Specimen ID			max. 16	12.1.3
[CR]	Carriage return			1	1394
[End-code]	End-of-text, Checksum, Carriage return, Line feed			5	1381

Table 22 : Request Record Structure (ASTM)

6.5.3.4 Test Order Record

Upload Example

```
[STX]10|1|100001||R[CR][End-code]
```

Download Example

```
[STX]10|1|100001|^^^10\^^^11\^^^12|R[CR][End-code]
```

Example	Content	Upload STA > Host Result	Download Host > STA Worklist	Len	ASTM
[STX]	Start-of-text			1	1381
1	Frame number from 0 to 7			1	1381
O	Record Type ID O = Order record			1	9.4.1
1	Sequence Number			max 2	9.4.2
100001	Specimen ID			max 16	9.4.3
	Instrument Specimen ID				9.4.4
^ ^ ^ 10 ^^^11 ^^^12	Universal Test ID Universal Test ID Part 1 Universal Test ID Name Universal Test ID Type Manufacturers or Local Code (Transmission rank of the main unit of the test to be performed.) If there is more than one test, the following tests will be separated by the repeat delimiter			max. 3 per rank	9.4.5
R	Priority R = Routine S = STAT			1	9.4.6
[CR]	Carriage return			1	1394
[End-code]	End-of-text, Checksum, Carriage return, Line feed			5	1381

Table 23 : Test Order Record Structure (ASTM)

6.5.3.5 Result Record

```
[STX]1R|1|^^10|100|%|||F|||19950112134500[CR][End-code]
```

Example	Content	Upload STA > Host Result	Download Host > STA	Len	ASTM
[STX]	Start-of-text			1	1381
1	Frame number from 0 to 7			1	1381
R	Record Type ID R = Result record			1	10.1.1
1	Sequence Number			max. 2	10.1.2
^	Universal Test ID			max. 3 per rank	
^	Universal Test ID Part 1				
^	Universal Test ID Name				
^	Universal Test ID Type				
10	Manufacturer's or Local Code (Transmission rank of the measured data)				
100	Data Measurement or Value			max. 7	10.1.4
%	Units				10.1.5
	Reference Ranges				10.1.6
	Result Abnormal Flags				10.1.7
	Nature of Abnormality Testing				10.1.8
F	Result Status F = Final results			1	10.1.9
	Date of Change in instrument normative Values or Units				10.1.1 0
	Operator Identification				10.1.1 1
	Date / Time Test started				10.1.1 2
19950112 134500	Date / Time Test completed Format: YYYYMMDDHHMMSS	<i>only for control results</i>		14	10.1.1 3
[CR]	Carriage return			1	1394
[End-code]	End-of-text, Checksum, Carriage return, Line feed			5	1381

Table 24 : Result Record Structure(ASTM)

List of Units:

Units	Result Format
sec	xxx.x
%, mg/dl	xxxxx
OD, OD/min	x.xxx
Ratio, g/l, ng/ml, U/ml, IU/ml	xx.xx
UA1, UA2, UA3	0 to 3 decimals

A result record is always followed by a Manufacturer Information Record.

6.5.3.6 Manufacturer Information Record for Error / Alarm Codes

[STX]1M|1|A|@[CR][End-code]

Example	Content	Upload STA > Host Result	Download Host > STA	Len	ASTM
[STX]	Start-of-text			1	1381
1	Frame number from 0 to 7			1	1381
M	Record Type ID M = Manufacturer Information record			1	15.1.1
1	Sequence Number			max. 2	15.1.2
A	Error Code A = Validated (see Tables below)			1	15.1.3
@	Alarm Code @ = No Alarm (see Tables below)			1	15.1.4
[CR]	Carriage return			1	1394
[End-code]	End-of-text, Checksum, Carriage return, Line feed			5	1381

Table 25 : Structure of Manufacturer Information Record for Error/Alarm codes (ASTM)

6.5.3.6.1 Definition of Error Codes

Character	ASCII Code	Error Code Definition	Result from STA
'1'	31 hex	'to be confirmed'	Result value
'2'	32 hex	'technical error'	no result
'3'	33 hex	'> Tmax'	Tmax value
'4'	34 hex	'< Tmin'	Tmin value
'5'	35 hex	'margin > tolerance'	no result
'8'	38 hex	'R < R min. /colorimetry'	no result
'A'	41 hex	'confirmed'	Result value

Table 26 : Definition of Error Codes (ASTM)

6.5.3.6.2 Definition of Alarm Codes

Characters	ASCII Code	Alarm Description	
@	40 hex	No alarm:	
'A'	41 hex	Result:	Confirmed with T>max.
'B'	42 hex	Calibration Control:	Overridden
'C'	43 hex	Quality Control:	Out of range or not done
'D'	44 hex	Quality Control:	Overridden
'E'	45 hex	Arm #3:	No level detection
'F'	46 hex	Arm #2:	No level detection
'G'	47 hex	Arm #1:	No level detection
'H'	48 hex	Result:	Value in primary units skewed (results cut to limit value)
'I'	49 hex	Result:	Dilution change (in rerun)
'J'	4A hex	Result:	Rerun test
'K'	4B hex	Reagent drawer:	Temperature out of limit
'L'	4C hex	Syringe Arm #3:	Maintenance date overdue
'M'	4D hex	Syringe Arm #2:	Maintenance date overdue
'N'	4E hex	Syringe Arm #1:	Maintenance date overdue

Table 27 : Definition of Alarm Codes (ASTM)

Note: If there are multiple alarms for a result, the highest priority code is transmitted. Alarm codes are classified from @ to N. The highest priority is code @.

6.5.3.7 Terminator Record

Upload / Download Example

```
[STX]1L|1|N[CR][End-code]
```

Example	Content	Upload STA>Host WI request Result	Download Host>STA Worklist	Len	ASTM
[STX]	Start-of-text			1	1381
1	Frame number from 0 to 7			1	1381
L	Record Type ID L = Terminator record			1	13.1.1
1	Sequence Number			1	13.1.2
N	Terminator Code N = Normal end of message			1	13.1.3
[CR]	Carriage return			1	1394
[End-code]	End-of-text, Checksum, Carriage return, Line feed			5	1381

Table 28 : Structure of Termination Record (ASTM)

6.6 Trace Examples (ASTM)

The following definitions are used to aid readability:

Code	Meaning	Mnemonic
02 hex	Start of Text	[STX]
03 hex	End of Text	[ETX]
04 hex	End of Transmission	[EOT]
05 hex	Enquiry	[ENQ]
06 hex	Acknowledge	[ACK]
0A hex	Line Feed	[LF]
0D hex	Carriage Return	[CR]
15 hex	Not Acknowledged	[NAK]
17 hex	End of Transmission Block	[ETB]

Table 29 : Replaced Control Characters in Example Traces (ASTM)

6.6.1 Worklist Request from STA to Host

```

STA 12:38:42 [ENQ]
Host 12:38:42 [ACK]
STA 12:38:42 [STX]1H|\^&|||99^2.00|||||P|1.00|19950307123642[CR][ET
X]28[CR][LF]
Host 12:38:42 [ACK]
STA 12:38:42 [STX]2Q|1|^001[CR][ETX]AB[CR][LF]
Host 12:38:42 [ACK]
STA 12:38:43 [STX]3L|1|N[CR][ETX]06[CR][LF]
Host 12:38:43 [ACK]
STA 12:38:43 [EOT]

```

Analyzer initiates Worklist request transmission.

Header Record

```

[STX]
1
H
|\^&
99
2.00
P
1.00
19950307
123642
[CR][ETX]28[CR][LF]

```

```

Start of text (ASCII code 02 hex)
Frame number
Header record
Delimiter Definition
Station number
Version level of Stage instrument implementation
Production
Version level of ASTM specs. (E1394-91)
Date (Format: YYYYMMDD)
Time (Format: HHMMSS)
End-code with Checksum '28'

```

Request Record

```

[STX]
2
Q
1
001
[CR][ETX]AB[CR][LF]

```

```

Start of text (ASCII code 02 hex)
Frame number
Request record
Request number
Sample Identification
End-code with Checksum 'AB'

```

Termination Record

```

[STX]
3
L
1
N
[CR][ETX]06[CR][LF]

```

```

Start of text (ASCII code 02 hex)
Frame number
Termination record
Sequence no.
Normal end
End-code with Checksum '06'

```

Trace Example 7 : Worklist Request (ASTM)

6.6.2 Worklist from Host to STA

```

Host 12:38:43 [ENQ]
STA 12:38:43 [ACK]
Host 12:38:43 [STX]1H|\^&||99^2.00[CR][ETX]E9[CR][LF]
STA 12:38:44 [ACK]
Host 12:38:44 [STX]2P|1||Info 1^Info 2^Info 3^Inf4[CR][ETX]B8[CR][LF]
STA 12:38:44 [ACK]
Host 12:38:45 [STX]3O|1|001||^6\^9|R[CR][ETX]11[CR][LF]
STA 12:38:45 [ACK]
Host 12:38:45 [STX]4L|1|N[CR][ETX]07[CR][LF]
STA 12:38:45 [ACK]
Host 12:38:45 [EOT]

```

Host initiates Worklist transmission.

Header Record [STX] 1 H |\^& 99 2.00 [CR][ETX]E9[CR][LF]	Start of text (ASCII code 02 hex) Frame number Header record Delimiter Definition Station number Version level of Stage instrument implementation End-code with Checksum 'E9'
Patient Record [STX] 2 P 1 Info 1 Info 2 Info 3 Inf4 [CR][ETX]B8[CR][LF]	Start of text (ASCII code 02 hex) Frame number Patient record Patient number Info field 1 Info field 2 Info field 3 Info field 4 End-code with Checksum 'B8'
Test Order Record 1 [STX] 3 O 1 001 6\9 R [CR][ETX]11[CR][LF]	Start of text (ASCII code 02 hex) Frame number Test order record Test order record number Sample Identification Selected methods : 6, 9 Routine Result End-code with Checksum '11'
Termination Record [STX] 4 L 1 N [CR][ETX]07[CR][LF]	Start of text (ASCII code 02 hex) Frame number Termination record Sequence no. Normal end End-code with Checksum '07'

Trace Example 8 : Worklist (ASTM)

6.6.2.1 Routine Result Transmission

```

STA 11:16:09 [ENQ]
Host 11:16:09 [ACK]
STA 11:16:09 [STX]1H|\^&|||72^2.00|||||P|1.00|19950614111501[CR][ET
X]17[CR][LF]
Host 11:16:09 [ACK]
STA 11:16:09 [STX]2P|1|||STAT^^^ [CR][ETX]09[CR][LF]
Host 11:16:09 [ACK]
STA 11:16:10 [STX]3O|1|000012|||R[CR][ETX]A4[CR][LF]
Host 11:16:10 [ACK]
STA 11:16:10 [STX]4R|1|^17|14.7|Sek|||F|||[CR][ETX]4C[CR][LF]
Host 11:16:10 [ACK]
STA 11:16:10 [STX]5M|1|A|[CR][ETX]B8[CR][LF]
Host 11:16:10 [ACK]
STA 11:16:11 [STX]6R|2|^18|0.84|Ratio|||F|||[CR][ETX]2C[CR][LF]
Host 11:16:11 [ACK]
STA 11:16:11 [STX]7M|2|A|[CR][ETX]BB[CR][LF]
Host 11:16:11 [ACK]
STA 11:16:11 [STX]0L|1|N[CR][ETX]03[CR][LF]
Host 11:16:11 [ACK]
STA 11:16:12 [EOT]

```

Analyzer initiates result transmission.

Header Record [STX] 1 H |\^& 72 2.00 P 1.00 19950614 111501 [CR][ETX]17[CR][LF]	Start of text (ASCII code 02 hex) Frame number Header record Delimiter Definition Station number Version level of Stage instrument implementation Production Version level of ASTM specs. (E1394-91) Date (Format: YYYYMMDD) Time (Format: HHMMSS) End-code with Checksum '17'
Patient Record [STX] 2 P 1 STAT [CR][ETX]09[CR][LF]	Start of text (ASCII code 02 hex) Frame number Patient record Patient number Info field 1 Info fields 2 to 4 are empty End-code with Checksum '09'
Test Order Record 2 [STX] 3 O 1 000012 R [CR][ETX]A4[CR][LF]	Start of text (ASCII code 02 hex) Frame number Test order record Record number Sample Identification Routine End-code with Checksum 'A4'

Trace continued.

Result Record 1 [STX] 4 R 1 17 14.7 Sek F [CR][ETX]4C[CR][LF]	Start of text (ASCII code 02 hex) Frame number Result record Result number Main unit rank Result for main unit Unit Final result End-code with Checksum '4C'
Manufacturer Info Record 1 [STX] 5 M 1 A @ [CR][ETX]B8[CR][LF]	Start of text (ASCII code 02 hex) Frame number Manufacturer information record Sequence number Error code Alarm code End-code with Checksum 'B8'
Result Record 2 [STX] 6 R 2 18 0.84 Ratio F [CR][ETX]2C[CR][LF]	Start of text (ASCII code 02 hex) Frame number Result record Result number Secondary unit rank Result for secondary unit Unit Final result End-code with Checksum '2C'
Manufacturer Info Record 2 [STX] 7 M 2 A @ [CR][ETX]BB[CR][LF]	Start of text (ASCII code 02 hex) Frame number Manufacturer information record Sequence number Error code Alarm code End-code with Checksum 'BB'
Termination Record [STX] 6 L 1 N [CR][ETX]09[CR][LF]	Start of text (ASCII code 02 hex) Frame number Termination record Sequence no. Normal end End-code with Checksum '09'

Trace Example 9: Result Transmission (ASTM)

6.6.2.2 Quality Control Result Transmission

```
STA 13:37:59 [ENQ]
Host 13:37:59 [ACK]
STA 13:37:59 [STX]1H|\^&|||99^2.00|||||Q|1.00|19950307133600[CR][ETX]24[CR][LF]
Host 13:38:00 [ACK]
STA 13:38:00 [STX]2P|1|||[CR][ETX]B3[CR][LF]
Host 13:38:00 [ACK]
STA 13:38:00 [STX]3O|1|11073|||R[CR][ETX]7D[CR][LF]
Host 13:38:01 [ACK]
STA 13:38:01 [STX]4R|1|^^^6|50|%|||F|||19950307104300[CR][ETX]81[CR][LF]
Host 13:38:01 [ACK]
STA 13:38:02 [STX]5M|1|A|[CR][ETX]B8[CR][LF]
Host 13:38:02 [ACK]
STA 13:38:02 [STX]6L|1|N[CR][ETX]09[CR][LF]
Host 13:38:02 [ACK]
STA 13:38:03 [EOT]
```

Analyzer initiates result transmission.	
Header Record [STX] 1 H |\^& 99 2.00 Q 1.00 19950307 133600 [CR][ETX]24[CR][LF]	Start of text (ASCII code 02 hex) Frame number Header record Delimiter Definition Station number Version level of Stage instrument implementation Quality Control Version level of ASTM specs. (E1394-91) Date (Format: YYYYMMDD) Time (Format: HHMMSS) End-code with Checksum '24'
Patient Record [STX] 2 P 1 [CR][ETX]B3[CR][LF]	Start of text (ASCII code 02 hex) Frame number Patient record Patient number End-code with Checksum 'B3'
Test Order Record 2 [STX] 3 O 1 11073 R [CR][ETX]7D[CR][LF]	Start of text (ASCII code 02 hex) Frame number Test order record Record number Control Identification Routine End-code with Checksum '7D'
Result Record [STX] 4 R 1 6 50 % F 19950307 104300 [CR][ETX]81[CR][LF]	Start of text (ASCII code 02 hex) Frame number Result record Result number Main unit rank : 1 Result for main unit : 50 Unit Final result Date Time End-code with Checksum '81'
Manufacturer Info Record [STX] 5 M 1 A @ [CR][ETX]B8[CR][LF]	Start of text (ASCII code 02 hex) Frame number Manufacturer information record Sequence number Error code Alarm code End-code with Checksum 'B8'
Termination Record [STX] 6 L 1 N [CR][ETX]09[CR][LF]	Start of text (ASCII code 02 hex) Frame number Termination record Sequence no. Normal end End-code with Checksum '09'

Trace Example 10 : Quality Control Result Transmission (ASTM)

7. Service Maintenance

From the main **USER MAINTENANCE** menu access the **SERVICE MAINTENANCE** menu by pressing <Alt>+<F10> and entering the Access Code. See Chapter page for the calculation of this code)

This is the main **SERVICE MAINTENANCE** menu:

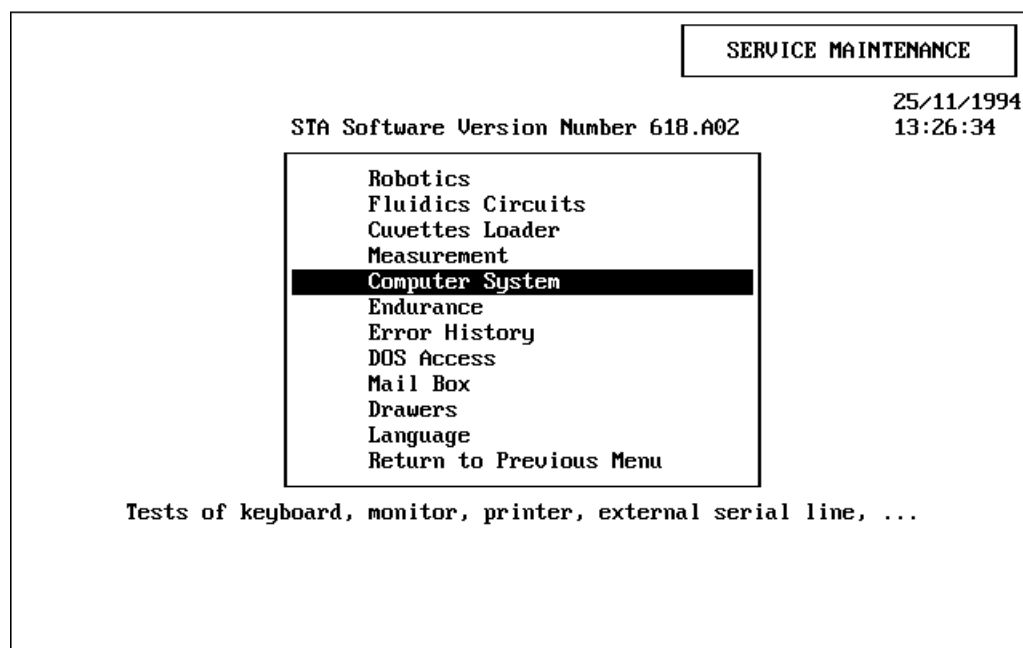


Figure 35 : Main menu of Service Maintenance

Selecting the menu option **COMPUTER SYSTEM** opens another menu with the following options:

- Printer
- Keyboard
- External Serial Line
- Beep
- Monitor
- Return to previous menu

The option **EXTERNAL SERIAL LINE** opens the serial interface screen:

Esc	Return to previous menu	SERVICE MAINTENANCE EXTERNAL SERIAL LINE																
F1	Plug mode																	
F2	Console mode		F3 Clear screen															
Mode : Plug		25/11/1994																
Transmitted Character	<div style="border: 1px solid black; padding: 5px;"> <p align="center">SERIAL LINE PARAMETERS</p> <p>External port on the STA is COM2.</p> <table> <tr> <td>Baud Rate :</td> <td>9600</td> <td>STA/Host</td> <td>9600</td> </tr> <tr> <td>Parity :</td> <td>No</td> <td>Without</td> <td></td> </tr> <tr> <td>n Data :</td> <td>8</td> <td></td> <td>8</td> </tr> <tr> <td>n Stop :</td> <td>1</td> <td></td> <td>1</td> </tr> </table> <p>Del Modify</p> <p>F10 Save and continue</p> </div>		Baud Rate :	9600	STA/Host	9600	Parity :	No	Without		n Data :	8		8	n Stop :	1		1
Baud Rate :	9600	STA/Host	9600															
Parity :	No	Without																
n Data :	8		8															
n Stop :	1		1															
Received Character																		

Figure 36 : External Line Test function within Service Maintenance

The Baud Rate, Parity, Number of Data and Number of Stop Bits are defined from the start up window.

Confirm the configuration with <F10>.

From this point on all keyboard input is sent via COM2 to the Host.

There are two test modes which are selected by the <F1> and <F2> keys:

1. **<F1> Plug Mode**

Placing a 'Loop Back' connector at rear of the STA allows typed characters to be received and displayed in the 'Received Characters' window.

This plug directly connects the Transmit and Receive pins (2 and 3).

2. **<F2> Console Mode**

Characters are sent via the Host port to an external device.

These options test the function of COM2 port.

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Appendix A - Alarm Messages

No	Title	Text
12.01.00	SYSTEM HOST RECEPTION	Incorrect station number Message not taken into account
12.02.00	SYSTEM HOST RECEPTION	Identity not found in database Message not taken into account
12.03.00	SYSTEM HOST RECEPTION	All transmitted ranks unknown Message not taken into account
12.03.01	SYSTEM HOST RECEPTION	Duplicated rank transmitted Message not taken into account
12.04.00	SYSTEM HOST RECEPTION	Buffer tempo writing impossible
12.05.00	SYSTEM HOST RECEPTION	Buffer tempo reading impossible
12.06.00	SYSTEM HOST TRANSMISSION	NACK transmission impossible
12.07.00	SYSTEM HOST RECEPTION	Incorrect checksum
12.08.00	SYSTEM HOST TRANSMISSION	ACK transmission impossible
12.09.00	SYSTEM HOST RECEPTION	No response
12.09.01	SYSTEM HOST RECEPTION	Defective transmission (NACK response)
12.09.02	SYSTEM HOST RECEPTION	Work list not returned
12.10.00	SYSTEM HOST TRANSMISSION	File transmission impossible
12.11.00	SYSTEM HOST TRANSMISSION	No result for this identification
12.12.00	SYSTEM HOST TRANSMISSION	STA not connected Please connect
12.13.00	SYSTEM HOST TRANSMISSION	Identity not found in database
12.14.00	SYSTEM HOST TRANSMISSION	Invalid identity > 8 characters
12.15.00	SYSTEM HOST TRANSMISSION	Invalid Result format
12.20.00	SYSTEM HOST TRANSMISSION	Impossible to open line
12.21.00	SYSTEM HOST TRANSMISSION	Response different of ACK
12.22.00	SYSTEM HOST TRANSMISSION	No response
12.23.00	SYSTEM HOST RECEPTION	Incorrect sequence number
12.24.00	SYSTEM HOST RECEPTION	Incorrect sequence checksum
12.25.00	SYSTEM HOST RECEPTION	Incorrect instrument number
12.26.00	SYSTEM HOST RECEPTION	Incorrect version number
12.27.00	SYSTEM HOST RECEPTION	Returned identity unknown

Appendix B - ASCII Chart

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