Appendix C
ASTM® Interface

APPENDIX CONTENTS

APPENDIX OVERVIEW (pg 1 of 1)

This appendix describes the ASTM® bi-directional interface:

- introduction to interface and its functions
- connecting to the host computer (cabling, pin assignments)
- system parameters, defaults, DTE configuration requirements
- loadlist feature, errors, troubleshooting

ASTM® INTERFACE INTRODUCTION (pg 1 of 1)

The purpose of the ASTM® (American Society for Testing and Materials) interface is to allow communication between the LCx® Analyzer and a host computer system. The interface permits communication from the analyzer to the host computer and from the host computer to the analyzer.

Sent from analyzer to host computer:

- Patient results
- Information to be processed, manipulated, reported, or stored

Sent from host computer to analyzer:

- Order lists
- Patient ID
- Sample ID
- Test orders

ACTIVATING THE ASTM® INTERFACE (pg 1 of 1)

In its default mode, the ASTM® interface is OFF. The interface must be activated by setting System Parameter 1.18 to a value of 7598. After the interface is activated, the analyzer is available to communicate with the host system via the COM2 RS232 port.

The interface remains activated even when analyzer power is cycled.

If an Assay Run is canceled while in progress, the load list with the downloaded IDs is maintained intact so that the run can be started again or the IDs can be cleared from Sample Mangement.

To activate the ASTM® interface, set System Parameter 1.18 to a value of 7598. Press:

- SYSTEM
- FILES
  1.18
- DISPLAY
  7598
- STORE

CONNECTING TO THE HOST COMPUTER (pg 1 of 2)

Designated port

The designated port on the analyzer for ASTM® communication is the COM2 RS232 port.

Physical connections

According to the ASTM® specification, the analyzer should be configured as data terminal equipment (DTE) and the host computer as data communication equipment (DCE). The following cabling must be used to make the analyzer appear as DTE, because by default it is configured as DCE.

Cable/connector

The connector is a female DB 25. The cable should be a straight-through 25-pin DB connector cable. A Null Modem cable adapter between the LCx® Analyzer COM2 port and the host computer ties together pins 4&5 and 6&20. One end of the cable has pins 2&3 reversed.

Connecting to the Host computer (pg 2 of 2)

Pin assignments (on COM2 RS-232 port)

DCE	DTE	Pin	Signal	Function
Input	Output	2	TxD	Transmitted Data
Output	Input	3	RxD	Received Data
Input	Output	4	RTS	Request to Send
Output	Input	5	CTS	Clear to Send
Output	Input	6	DSR	Data Set Ready
N/A	N/A	7	SG	Signal Ground
Input	Output	20	DTR	Data Terminal Ready

NOTE: Hardware handshaking and XON/XOFF must NOT be used.

NOTE: The host communication software must NOT enable unlisted signals. Alternately, the unused pins must be disconnected.

SYSTEM PARAMETERS (pg 1 of 1)

Parameter Number and Description	Default Configuration	Options
1.10 COM 2 BAUD	9600 baud	300, 1200, 2400, 4800, 9600 or 19200
1.11 COM 2 CHR LEN	8 data bits	7 or 8
1.12 COM 2 STOP BIT	1 stop bit	1 or 2
1.13 COM 2 PARITY	No parity	0, 1, or 2
1.18 HOST INTERFACE	ACTIVE	must be edited to 7598 (inactive = any value 0-9999 except 7598)
1.20 SPOOLER WARN	1	1, 2, or 3
1.29 XOFF TIMEOUT	20	range 0 - 300

DSR always asserted
CTS always asserted

LOAD LIST FEATURE (pg 1 of 4)

The load list feature enables the operator to enter the sample, reagent lot, technician, and carousel IDs before an assay run begins, or after an assay run has been started on the LCx® Analyzer. Sample IDs may be downloaded to the analyzer through the computer interface.

The host order load list contains:

- the Sample IDs that were downloaded from the computer, and
- the calibrator and control IDs which were automatically assigned by the LCx® Analyzer

Load list setup procedure

1. Place the reagent pack into the analyzer.
2. Press:
   - ASSAY
   - SAMPLE_MGMT
   - START
3. The bar code is read and reagent pack information is displayed.
4. Press:
   - CONTINUE (to proceed)

   or
   - CANCEL (to return to the assay menu)

Host order load list

1. HOST ORDER PENDING is displayed if a host order load list has been downloaded from the host computer.
2. During Sample Mangement or during the Assay Run, press one of these:
   - STORE
     (to store the host order load list)
     Result: Sample management menu is displayed. After the host order load list is stored, it becomes the LCx® Analyzer load list*. If during an Assay Run, the run continues and the spooler capacity test is performed.

     * The load list contains the Sample IDs for the calibrators and controls that were automatically assigned by the analyzer. The remaining Sample IDs are those downloaded from the computer.
   - CLEAR
     (to clear the host order load list)
     Result: Assay menu is displayed. If during an Assay Run, the run continues and the spooler capacity test is performed.
   - PRINT
     (to print the host order load list)

(Step 3 is on the next page.)

Host order load list (cont)

3. If desired:
   - Manually edit a Sample ID, or enter a reagent lot, technician, or carousel ID, *or*
   - Press:
     - EXIT
       (until the main menu is displayed)
     - RUN
       (to start the assay run)

NOTE: For information on entering IDs manually, refer to Section 5 of the LCx® Analyzer Operations Manual.

Load List Feature (pg 4 of 4)

Interface lock/unlock

Only one load list at a time is handled by the interface. After an order is downloaded, the interface is locked to new downloads.

To unlock the interface:

- clear the order from Sample Management
  or
- allow the run to proceed to completion

After the order is loaded, it is available to the operator via Sample Management. If the operator clears the load list, then the orders must be re-sent by the host system.

If the power to the analyzer is cycled, the load list is lost and must be sent again.

If the instrument has an existing load list and an order is to be downloaded, the existing load list must be cleared from Sample Management before downloading a new order. Return to the READY menu when downloading the order.

If an Assay Run is canceled while in progress, the load list with the downloaded IDs is maintained intact so that the run can be started again or the IDs can be cleared from Sample Management.

SPOOLER BUFFER (pg 1 of 1)

Overview

The analyzer incorporates a spooler buffer that holds up to 4 sets of results. The spooler capacity is checked after the reagent pack is read at the start of an assay run.

The analyzer can be set to generate a warning to the user when the spooler buffer is filled to a point determined by system parameter 1.20 SPOOLER WARN. (This parameter, the number of runs remaining before spooler reaches capacity, can be set to 1, 2, or 3.) The warning is in the form of an error message displayed on the analyzer screen.

Responding to a spooler capacity warning

If the spooler warn error message appears, the operator may:

- continue the run
  or
- cancel the run and establish contact with the host system to dump the spooler contents

If the operator ignores the message:

- the current run results will be stored in the next spooler buffer slot, if available
  or
- the oldest record will be overwritten (if no spooler buffer slots are available)

Error logs

Errors may be sent to either of two files:

- ASTM® error log
- system log file

These error messages are sent to the ASTM® error log file:

- errors that occur during link establishment
- errors that occur during communication between the analyzer and host
- errors that occur during processing of an order

These error messages are sent to the system log file:

- Spooler Run Capacity errors

Printing the ASTM® error log

The error log can be printed on the LCx® printer from the UTILITY\SERVICE menu.

Clearing the ASTM® error log

To clear the log of ASTM® errors, choose [CLR LOG] on the UTILITY\SERVICE menu.

Troubleshooting tips for the analyzer

To troubleshoot communication errors from the analyzer's perspective:

1. Ensure that system parameter 1.18 HOST INTERFACE is set to 7598.
2. Ensure that these system parameters match host values:

1.10	COM 2 BAUD	9600 baud
1.11	COM 2 CHR LEN	8 data bits
1.12	COM 2 STOP BIT	1 stop bit
1.13	COM 2 PARITY	no parity

3. Ensure that system parameter 1.20 SPOOLER WARN is set to the desired value (1, 2, or 3).
4. Ensure that system parameter 1.29 XOFF TIMEOUT is set to the default value of 20.
5. Ensure that the RS-232 cable is seated correctly.
6. Perform RS-232 COM Port Test (VP-44). If test fails, replace CPU board.

ASTM®-specific error codes

EC	Description	Troubleshooting
213	Error While Parsing ASTM Message	A format error occurred in the messages sent by the host system to the analyzer. Error only occurs when the host interface is activated.
214	Error Processing ASTM Order	Error occurs while processing ASTM® orders after the complete message has been received. Error only occurs when host interface is activated.
215	Spooler Run Capacity (logged) Spooler Capacity Remaining: N Run(s) (displayed)	Spooler capacity is checked after reagent pack is read at the start of assay run. If remaining capacity matches system parameter 1.20, a message is displayed. Respond by pressing [PROCEED] or [CANCEL]: • To continue the run, press [PROCEED]. If spooler buffer is at partial capacity, results will be written to the buffer. If spooler buffer is full, the results of the current run will overwrite the oldest record in the buffer. • To cancel the run and contact the host to dump spooler contents, press [CANCEL].

ASTM®-specific error codes (cont)

EC	Description	Troubleshooting
216	ASTM COMM Timeout	Specified event did not occur within defined time constraints.
247	ASTM COMM Bad Message Length	Message length in a frame exceeds 240 characters.
248	ASTM COMM Invalid Frame Type	The frame is not an intermediate or end type.
249	ASTM COMM NUM Retries Exceeded	Analyzer is unable to send a frame to the host after 6 retries.
250	ASTM COMM Invalid Response	Response sent by the host is incorrect.
251	ASTM COMM Invalid Frame	The frame checksum or format is incorrect
252	ASTM Spooler Init	Spooler incorporates a checksum that is updated when results are saved and released. On analyzer power-up, this checksum is verified. If checksum test fails, error will be logged in ASTM® error log.
253	ASTM COMM Bad Frame Num	The frame number is incorrect.