ADVIA® 2120
HEMATOLOGY
SYSTEM

ADVIA®120 Hematology System
ADVIA®2120 Hematology System

Communication Links Between the Data Manager and a Host Computer

REF 07599674 (067D0068-01)
Rev. A, 2004-04

CE

Bayer HealthCare

© 2004 Bayer HealthCare LLC. All rights reserved.

No part of this manual or the products it describes may be reproduced by any means or in any form without prior consent in writing from Bayer HealthCare LLC.

ADVIA, TESTpoint, and SETpoint are trademarks of Bayer HealthCare LLC.

Bayer HealthCare LLC
Subsidiary of Bayer Corporation
Tarrytown, NY 10591-5097 USA

EC REP Bayer Diagnostics Europe Limited
Chapel Lane, Swords, Co. Dublin, Ireland

The information in this manual was correct at the time of printing. However, Bayer HealthCare LLC continues to improve products and reserves the right to change specifications, equipment, and maintenance procedures at any time without notice.

If the ADVIA® 120 or ADVIA 2120 Hematology System is used in a manner differently than specified by Bayer HealthCare LLC, the protection provided by the equipment may be impaired. See the *Operator's Guide* for your system for warnings and hazard statements.

Contents

Purpose 1
Overview 1
Functional Description of Bidirectional Communication (Downloading Workorder Mode) 2
Functional Description of Bidirectional Communications (Query Workorder Mode) 5
Setting Up the Workorder Mode 8
Transmission Characteristics (RS-232) 8
Setting Up TCP/IP on the ADVIA 120 System Computer 10
Transmitting Images to the Host 12
Installing and Configuring FTP Server Software on a Windows NT Host Computer 13
Message Formats 14
Operation of the Bidirectional Communications Link - Without Images (Downloading Workorder Mode) 37
Operation of the Bidirectional Communications Link - With Images (Downloading Workorder Mode) 40
Operation of the Bidirectional Communications Link - With Images (Query Workorder Mode) 43
Operation of the Bidirectional Communications Link - Without Images (Query Workorder Mode) 45
Communications Link Error Handling 47
Communications Link Timing 49

Appendix A: Flexible Communications Format 54
Introduction 54
TRAME.PAR File 54
Viewing / Modifying TRAME.PAR File Entries 59
Lis.ini File Settings for Bidirectional Communication 60
Host Communication Errors Generated by the Flexible Format 60

Appendix B: H• System LIS Data Stream Emulation 63
Introduction 63
Information Managed and Processed by the Data Manager 63
Adding Reticulocyte Data to the Result Message of the Monodirectional Communications Protocol 64
Data Not Transmitted to the Host Computer 66
TRAME.PAR file and Result Message Description 66
Result Part of the Message Structure 66
Parameters to be Defined 67
Parameter Setting 68
One-Way Host Communication Notes 69
Additional Unidirectional Considerations 69
When ACK/NAK = NO: 69
When ACK/NAK = YES: 70

Appendix C: Additional Information 71
“REVIEW NONE” Validation Mode 71
Workorder Update from the Host Computer 72
Partial Transmission to the Host Computer 73
Control Results 73
Transmitting Sample/System Flags to the Host 75
Troubleshooting Tips for Host communication 77

Using the Spy File 79
Configuring a Network Connection 81

Figures

Figure 1: Messages Exchanged Between Data Manager and Host Computer Using Downloading Workorder Mode 3
Figure 2: Messages Exchanged Between Data Manager and Host Computer Using Query Workorder Mode 6
Figure 3: RS-232-C Signal Definitions 9
Figure 4: Message Elements 14
Figure 5: Sequencing of Message Toggle Values 20
Figure 6: Initialization Message: Transmitted from Host Computer to Data Manager (Without Images) 21
Figure 6a: Initialization Message: Transmitted from Host Computer to Data Manager (With Images) 22
Figure 7: Token Transfer Message: Transmitted from Host Computer to Data Manager and from the Data Manager to Host Computer 23
Figure 8: Workorder Message: Transmitted from Host Computer to Data Manager 24
Figure 8a: Workorder Message: Transmitted from Host Computer to Data Manage (Multispecies) 27
Figure 8b: Predefined Species Codes 28
Figure 9: Workorder Validation Message: Transmitted from Data Manager to Host Computer 29
Figure 10: Result Message: Transmitted from Data Manager to Host Computer 30
Figure 10a: Result Message: Transmitted from Data Manager to Host Computer (Multispecies) 32
Figure 11: Query Message: Transmitted from Data Manager to Host Computer 34
Figure 12: No Workorder Message: Transmitted from Host Computer to Data Manager 35
Figure 13: Result Validation Message: Transmitted from Host Computer to Data Manager 36
Figure 14: Dialogue Between the ADVIA 120 Data Manager and a Host Computer In Download Mode (Without Images) 37
Figure 14a: Dialogue Between the ADVIA 120 Data Manager and a Host Computer In Download Mode (With Images) 40
Figure 15: Dialogue Between the ADVIA 120 Data Manager and a Host Computer In Query Mode (Without Images) 43
Figure 15a: Dialogue Between the ADVIA 120 Data Manager and a Host Computer In Query Mode (With Images) 45
Figure 16: Timing Diagram for Token Transfer Dialogue 50
Figure 17: Timing Diagram for Workorder Dialogue 50
Figure 18: Timing Diagram for Results Dialogue 51
Figure 19: Performance Estimates for Workorder Dialogue 52
Figure 20: Performance Estimates for Results Dialogue 53
Figure 21: PATNAM=(30,L,S) 54
Figure A-1: TRAME.PAR File for Host Spec. 79 Data Stream 55
Figure A-2: TRAME.PAR File for Host Spec. 79 Data Stream (MultiSpecies) 56
Figure C-1: Partial Transmission Flow Diagram 74
Figure C-2: Condensed Example of a Spy File 80

Tables

Table 1: Types of Messages 15
Table 2: ASCII Character Codes 16
Table 3: tls, tS, and Watchdog Time Intervals 49
Table 4: Summary of Estimated Throughput Performance 49
Table A-1: List of Available Keys 57
Table A-2: Host Communication Errors Generated by the Flexible Format 62

Table B-1: Reticulocyte Addition to Test Dictionary 65
Table B-2: Tests (and Default Host Numbers) Reference List for H•1 Protocols 68
Table C-1: Sample/System Flags 76

IMPORTANT

If you previously used Host Spec. 79 or the H•1 Emulation LIS Communication Protocols on your Technicon H•1, H•2, or H•3 system and wish to connect an ADVIA 120 system in its place, ensure that the TRAME.PAR on the ADVIA 120 or ADVIA 2120 system is exactly the same as the TRAME.PAR on your Technicon H•1, H•2, or H•3 system's computer.

If you used the H•1 Emulation Protocol, refer to **Additional Unidirectional Considerations** in **Appendix B** to set the following items:

- } Item 1 – To Select **UNIDIRECTIONAL COMMUNICATIONS**
- } Item 3 – **ACK/NAK**
- } Item 4 – **EXTENDED OUTPUT**
- } Item 9 – **TRAME.PAR** file modified to add RETIC test

Purpose

This document describes the bidirectional communication link* between the Data Manager software in use on the ADVIA 120 or ADVIA 2120 Hematology System and a laboratory information system (Host Computer). This bidirectional link is commonly known as the Host Spec. 79 protocol.

This document is intended for the Information Systems (IS) professional responsible for connecting the Data Manager and your Host Computer. Please contact Bayer Customer Service if you need additional information.

Overview

The communication link enables workorders to be transmitted from the Host Computer to the Data Manager and results to be transmitted from the Data Manager to the Host Computer.

There are two mutually exclusive modes by which workorders can be transmitted: downloading mode and query mode. Use the HOST WORKORDERS TRANSFER MODE parameter on the **Customer Parameters** window to select the desired mode. See Figure 2.

} **Downloading workorder mode (D mode)**
The Host Computer can download workorders identified by a sample identification number (Sid#) whenever it is the Master** device. Workorders can be downloaded in any sequence. When the Data Manager receives a request by Sid# or R&P# from the analyzer, it searches its own database for the matching workorder. If none is found, the default profile is used. The Data Manager will not try to get the workorder from the Host Computer.

} **Query workorder mode (Q mode)**
The Host Computer does not download a workorder until one is requested by the Data Manager. When the Data Manager receives a request based on the Sid# from the analyzer, it searches its own database for the matching workorder. If none is found, the Data Manager sends a request based on the Sid# to the Host Computer. The R&P# is not used in the Query mode. If the matching workorder is available, the Host Computer downloads it to the Data Manager. If none exists, the Data Manager is informed and the default profile is used.

} **Full Query workorder mode (F mode)**
The Host Computer does not download a workorder until one is requested by the Data Manager. When the Data Manager receives a request based on the Sid# from the analyzer, the Data Manager sends a request based on the Sid# to the Host Computer. The R&P# is not used in the Full Query mode. If the matching workorder is available, the Host Computer downloads it to the Data Manager. If none exists, the Data Manager is informed and the default profile is used. The Data Manager database is never consulted. When using F mode, the customer parameter **Replace sample in complete by workorder** must be set **=Y**.

The QUERY TO HOST TIME-OUT VALUE parameter on the **Customer Parameters** window determines how long the Data Manager will wait for a response from the Host Computer. If the workorder is not received before the time out is exceeded, the Data Manager sends the analyzer a message that no workorder exists and the default profile is used. If the workorder is sent after the QUERY TO HOST TIME-OUT VALUE but before the Host_Watchdog parameter (see page 49), the workorder is created and stored in the Data Manager database. For this reason, the QUERY TO HOST TIME-OUT VALUE parameter must be less than the Host_Watchdog parameter.

NOTE
Regardless of the HOST WORKORDERS TRANSFER MODE parameter selection, the system uses the Downloading Workorder mode if the Position Mode option is selected in the **Routine Parameters** window.

* These descriptions are not applicable to the one-way communication link used for H•1 data stream emulation format explained in Appendix B.

** The device (Host Computer or Data Manager) with control of the communication line is called the “Master” device and is expected to initiate each exchange of messages.

Functional Description of Bidirectional Communication (Downloading Workorder Mode)

Figure 1 illustrates the types of dialogues that can occur between the Host Computer and the ADVIA Data Manager. The following paragraphs describe the message exchanges illustrated in Figure 1.

Initialization Phase (Figure 1, A)

At the start of communications, the Host Computer is the "Master" device that sends an Initialization message to the Data Manager. In this way, the Data Manager is informed that the Host Computer is ready for communication.

Workorder Transmission (Figure 1, B)

After the Initialization Phase, the Host Computer remains the "Master" device and can start transmitting workorders one at a time in a sequence that is determined by the Host Computer. Each workorder is verified by the Data Manager, which transmits a Workorder Validation message. The Host Computer must not transmit the next workorder until the Workorder Validation message for the previous workorder is received and decoded. A workorder must be downloaded to the Data Manager before the associated sample is aspirated by the analyzer. If not, the analyzer will perform the default profile instead of the tests requested in the workorder

Token Transfer from Host Computer to Data Manager (Figure 1, C)

After the Host Computer has finished downloading workorders, it can transmit a Token Transfer message that makes the Data Manager the "Master" device with control of the communication line.

Results Transmission (Figure 1, D1 and D2)

Once the Data Manager is the "Master" device, results can be uploaded to the Host Computer as they become available. Results are transmitted for unknown and, optionally, control samples. Results for calibration samples are not stored at the Data Manager and, consequently, cannot be uploaded to the Host Computer. Results for the next sample are not sent until the Data Manager receives a Result Validation message indicating that the Host Computer has sufficient space available.

When transmitting images with results, the images are transmitted immediately after the results. Images are transmitted only through the ethernet connection, but results can be transmitted through either the RS232 connection or the ethernet connection. (See Figure 1, D2.)

Token Transfer from Data Manager to Host Computer (Figure 1, E)

After the Data Manager has finished sending results, it can transmit a Token Transfer message that again makes the Host Computer the "Master" device with control of the communications line. The Host Computer can now resume downloading workorders.

Host Computer Assumes Control to Download Workorders (Figure 1, F)

While the Data Manager is uploading results, the Host Computer can assume control of the communication line so that workorders can be downloaded. Since a workorder is required to provide the analyzer with the desired test selectivity for each sample, the Host Computer must have this capability to delay results transmission in order to download workorders. The message sequence is as follows:

1. The Data Manager uploads a Results message.
2. In the Result Validation message, the Host Computer indicates the Results message was received correctly, and that no more Result messages are to be uploaded.
3. The Host Computer is now the "Master" device and starts to download workorders.

No Workorders or Results Transmitted

When there are no workorders or results to be transmitted, the Host Computer and Data Manager alternately exchange control of the communications line via the Token Transfer.

OPERATION	DATA MANAGER	MESSAGES EXCHANGED	HOST COMPUTER
A. Initialization Phase	Slave	Initialization Message ← Acknowledgment →	Master
B. Downloading Workorders	Slave	Workorder Message ← Acknowledgment → Workorder Validation Message → Acknowledgment ← Workorder Message ← Acknowledgment → Workorder Validation Message → Acknowledgment ← ⇓	Master
C. Token Transfer	Slave	Token Transfer Message ← Acknowledgment →	Master
D1. Transmission Results (Without Images)	Master	Result Message → Acknowledgment ← Results Validation Message ← Acknowledgment → Result Message → Acknowledgment ← Result Validation Message ← Acknowledgment → ⇓	Slave

Figure 1: Messages Exchanged Between the Data Manager and a Host Computer Using Downloading Workorder Mode (1 of 2)

OPERATION	DATA MANAGER	MESSAGES EXCHANGED	HOST COMPUTER
D2. Transmission Results (With Images)	Master	Result Message → Images (via ethernet) → Acknowledgment ← Results Validation Message ← Acknowledgment → Result Message → Images (via ethernet) → Acknowledgment ← Results Validation Message ← Acknowledgment → ⇓	Slave
E. Token Transfer	Master	Token Transfer Message → Acknowledgment ←	Slave
F. Request for Downloading Workorders	Master	Result Message → Acknowledgment ← Result Validation/Control Request ← Acknowledgment →	Slave
	Slave	Workorder Message ← Acknowledgment → Workorder Validation Message → Acknowledgment ←	Master

Figure 1: Messages Exchanged Between the Data Manager and a Host Computer Using Downloading Workorder Mode (2 of 2)

Functional Description of Bidirectional Communications (Query Workorder Mode and Full Query Workorder Mode)

Figure 2 illustrates the types of dialogues that can occur between the Host Computer and the ADVIA Data Manager. The following paragraphs describe the message exchanges illustrated in Figure 2.

Initialization Phase (Figure 2, A)

At the start of communications, the Host Computer is the "Master" device that sends an Initialization message to the Data Manager. In this way, the Data Manager is informed that the Host Computer is ready for communication. The Host Computer then sends the Token Transfer message to make the Data Manager the "Master" device.

Workorder Query (Figure 2, B)

In the Query mode, once initialized, the Data Manager transmits the Query message if the analyzer requests a workorder that is not in the system's database. In the Full Query mode, the Data Manager always requests a workorder without checking its own database. Assuming that the workorder is available, the Host Computer sends the Workorder message. After reviewing the Workorder message, the Data Manager sends the Workorder Validation message to the Host Computer. The Data Manager sends the test orders to the analyzer.

Results Transmission (Figure 2, C1 and C2)

Once the Data Manager is the "Master" device, results can be uploaded to the Host Computer as they become available. Results are transmitted for unknown and, optionally, control samples. Results for calibration samples are not stored at the Data Manager and, consequently, cannot be uploaded to the Host Computer. Results for the next sample are not sent until the Data Manager receives a Result Validation message indicating that the Host Computer has sufficient space available.

When transmitting images with results, the images are transmitted immediately after the results. Images are transmitted only through the ethernet connection, but results can be transmitted through either the RS232 connection or the ethernet connection. (See Figure 1, D2.)

No Workorders or Results Transmitted

When there are no workorders or results to be transmitted, the Host Computer and Data Manager alternately exchange control of the communications line via the Token Transfer.

OPERATION	DATA MANAGER	MESSAGES EXCHANGED	HOST COMPUTER
A. Initialization Phase	Slave	Initialization Message ←	Master
		Acknowledgment →	
	Master	Token Transfer Message ←	Slave
		Acknowledgment →	
B. Workorder Query	Master	Workorder Query Message →	Slave
		Workorder Message ←	
		Acknowledgment →	
		Workorder Validation Message →	
		Acknowledgment ←	
		⇓	
C1. Transmission Results (Without Images)	Master	Result Message →	Slave
		Acknowledgment ←	
		Results Validation Message ←	
		Acknowledgment →	
		Result Message →	
		Acknowledgment ←	
		Result Validation Message ←	
		Acknowledgment →	
		⇓	

Figure 2: Messages Exchanged Between the Data Manager and a Host Computer Using Query Workorder Mode

(1 of 2)

OPERATION	DATA MANAGER	MESSAGES EXCHANGED	HOST COMPUTER
C2. Transmission Results (With Images)	Master	Result Message → Images (via ethernet) → Acknowledgment ← Results Validation Message ← Acknowledgment → Result Message → Images (via ethernet) → Acknowledgment ← Results Validation Message ← Acknowledgment → ⇓	Slave

Figure 2: Messages Exchanged Between the Data Manager and a Host Computer Using Query Workorder Mode

(2 of 2)

Setting up the Workorder Mode

1. On the **Customize** menu, click **System Setup**, then click **Tools Modify**.
2. After Edit Mode initialization, the **Tools** list appears.
3. Double-click **Customer Parameters.**
4. To select **D** for Downloading Mode, **Q** for Query to Host, or **F** for Full Query to Host, do the following:
   a. Press the ↓ key on the keyboard to scroll parameters down, or press the ↑ key to scroll the parameters up.
   b. When **+HOST WORKORDERS TRANSFER MODE [D, Q, F]** appears alongside the parameter value text box (almost at end of file), move the cursor onto the text box,use the **Backspace** or **Del** keys to erase the current value, then type in the new value. Type **D** for Downloading Mode, **Q** for Query to Host, or F for Full Query to Host in the parameter value text box, then click **Ok** or press **Enter**. The default is **D**.
   c. If **Q** is entered into the parameter value text box press the ↓ key on the keyboard until **+QUERY TO HOST TIME-OUT VALUE [5, 13]** appears alongside the parameter value text box, type the desired time-out (5 - 13), then click **Ok** or press **Enter**. The default is 7.
5. To exit **Customer Parameters**, do the following:
   a. On the **File** menu click **Save**, then click **Exit**.
   b. When the **Tools** list appears, click **Exit** to leave Edit Mode.

Transmission Characteristics (RS-232)

Connecting the Data Manager and a Host Computer

The communication link provides serial data transmission from the serial communication port (Com 1 on the Intel Computer or Serial A on the Hewlett Packard Computer) at the rear of the computer. This communication link is compatible with devices that conform to EIA Standard RS-232-C (including modems). Figure 3 illustrates the RS-232-C signal assignments.

Handshaking

Clear-to-Send / Request-to-Send are supported.

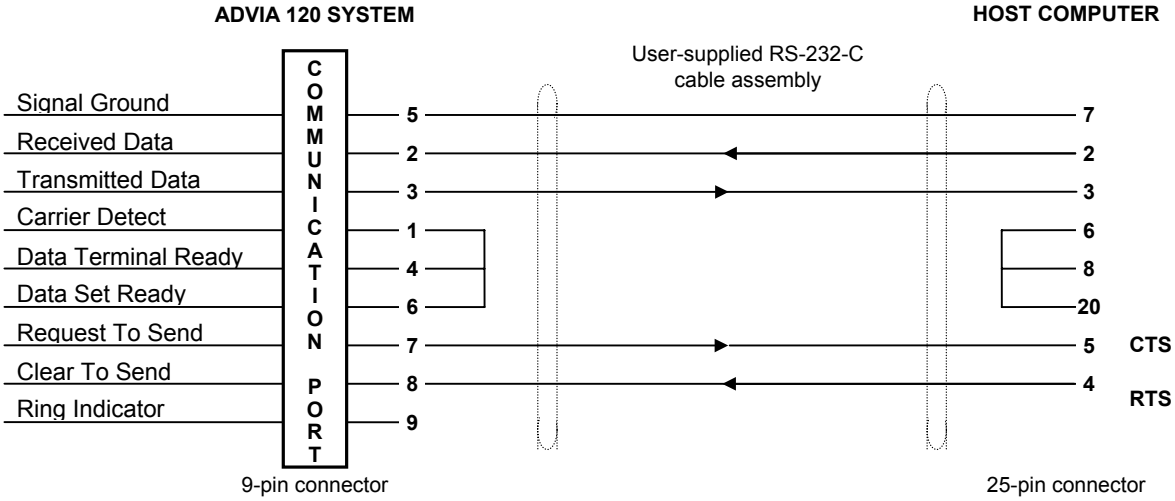
ASCII Character Formats and Transmission Rates

Character transmission from the communication port is asynchronous, half-duplex type. The following ASCII (American Standard Code [for] Information Interchange) character formats are available:

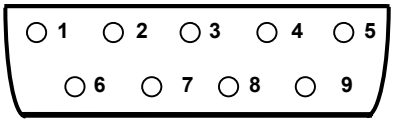
PARAMETER	CHOICES
Start Bit	Always **1**
Data Bits	**7** or **8**
Parity Bit	**ODD**, **EVEN**, **NONE, MARK, SENSE**
Stop Bits	**1** or **2**

The available transmission baud rates are: 300 bps, 600 bps, 1200 bps, 2400 bps, 4800 bps, and 9600 bps.

The desired character format and transmission rate are selected via the **PORT CONFIGURATION** (host) window of the Data Manager.



PIN	SIGNAL DESCRIPTION	REMARKS
1	Carrier Detect	Since the CARRIER DETECT function is not supported at this time, connect a jumper wire between pins 1 and 4 so that CARRIER DETECT is continuously enabled.
2	Received Data	Message transmitted by the Host Computer to the Data Manager.
3	Transmitted Data	The serial character stream from the Data Manager is transmitted to the Host Computer via pin 3 with a nominal voltage swing of ±10 volts with respect to pin 5 (signal ground). A negative voltage represents a MARK, or binary ONE. A positive voltage represents a SPACE, or binary ZERO. The voltage at pin 3 will not exceed ± 25 volts. The user should terminate the **Transmitted Data** line (pin 3) with a load impedance that has a d-c resistance between 3 kΩ and 7 kΩ. The measurement method and capacitive loading should conform to those specified in paragraph 2.4 of EIA Standard RS-232-C.
4	Data Terminal Ready	The DATA TERMINAL READY line is continuously set high (on) to indicate that the Data Manager is ready to communicate even when it is not.
5	Signal Ground	
6	Data Set Ready	Since the DATA SET READY function is not supported at this time, connect a jumper wire between pins 4 and 6 so that DATA SET READY is continuously enabled.
7	Request To Send	The REQUEST TO SEND line is set high (on) to indicate that the Data Manager has data to transmit. The REQUEST TO SEND is set low if the Data Manager requests a stop of communications.
8	Clear To Send	When able to accept data, the Host Computer sets the CLEAR TO SEND line high (on). No data are transmitted from the Data Manager unless the CLEAR TO SEND line is high (on). If the CLEAR TO SEND function is not supported by the Host Computer, connect a jumper wire between pins 7 and 8 on the workstation connector so that CLEAR TO SEND is enabled when required.
9		Not used.



9-Pin Communications Port

Figure 3: RS-232-C Signal Definitions

Network Link (Required for image transmission)

Network communication is done through an ethernet connection between the system PC and the Host computer, which send and receive messages via a network socket. The system PC is the socket server and the Host computer is a socket client. The Host computer initiates communication by sending an initialization (I) message. The hematology system software must be running for the Host computer to initiate communication. The TCP/IP protocol must be enabled on both the hematology system PC and Host computer.

Setting up TCP/IP on the ADVIA 120 or 2120 Hematology System

The communication link provides network data transmission via the network connecting the system PC and the Host computer. TCP/IP protocol should be enabled on both systems.

To set up a network connection to a properly configured host computer

1 To transmit images to the host computer, you must choose one of the following when installing the system software:
   - Choose **Host Spec 79 Network** to transmit images and *all* data using the network connection.
   - Choose **Host Spec 79 Serial** to transmit images through the network connection and transmit all other data through the serial port.

     If you chose Host Spec 79 Serial and want to transmit images through the network connection, you must perform the following procedure:
     - **a** On the **Customize** menu, click **System Setup**, then click **Tools Modify**. In the tools list, double-click **Port Configuration**.
     - **b** Double-click **LIS**.
     - **c** In the **Device Details** dialog box, click the **Image** button.
     - **d** In the **Image Transfer** dialog box, enter the host name supplied by the site host administrator.
     - **e** In the **Received Time Out** field, enter **60** and then click **OK**.
     - **f** In the **Device Details** dialog box, click **OK**.
     - **g** On the **Settings** menu, click **Exit**.

2 Set Windows network settings.
   - **a** On the Windows **Start** menu, click **Settings**, then click **Control Panel**.
   - **b** In the **Control Panel** window**,** double-click the **Network** icon.
   - **c** Click the **Bindings** tab.
   - **d** In the **Show Bindings for:** box, select **all protocols**.
   - **e** Double-click **TCP/IP Protocol**, select **[1] 3Com Ethernet III Adapter** (or the adapter that is *not* the instrument; the instrument is already enabled), then click **Enable**. Don't restart the computer until you have finished changing all the settings.
   - **f** Click the **Protocols** tab.
   - **g** Double-click **TCP/IP Protocol**.
   - **h** In the **Adapter** box, select **[1] 3Com Ethernet III Adapter**(or the adapter that is *not* the instrument).
   - **i** Select **Specify an IP address** and enter the appropriate IP address and Subnet Mask. The host computer administrator should supply the addresses. The Subnet Mask for Adapter [1] *must* be different from the Subnet Mask for Adapter [2]. Click **OK** to accept the changes and close the dialog box.
   - **j** Close the **Control Panel** window.
   - **k** Use Windows Explorer to open the directory **C:\WINNT\system32\drivers\etc.**
   - **l** Double-click **Services**. In the **Open with** box, select **Notepad** and click **OK**. At the bottom of the document, type **lisdat 701/tcp**, then press the **Enter** key twice. Save the file, print it for future reference, and close Notepad.
   - **m** Use Windows Explorer to open the directory **C:\WINNT\system32\drivers\etc.** Double-click **Hosts**. In the **Open with** box, select **Notepad** and click **OK**. At the bottom of the document, type the host IP address and the host computer name supplied by the host computer administrator**.** Make sure the address and name are

separated by at least one space. Press the **Enter** key. Save the file, print it for future reference, and close Notepad. You must enter this information every time you install or upgrade the software.

n Shut down the computer.

o With the power off, connect the system PC to the network using the telephone-type jack (twisted-pair cable) on the ethernet card to which the analyzer is *not* connected. If there is only one card, the necessary connector is on the computer's motherboard.

NOTE

If you use coaxial cable for the network connection, you must modify the adapter settings in Windows.

p Restart the computer.

To verify that you have established a network connection after the host computer has been configured

On the system PC:

1 On the Windows **Start** menu, point to **Programs**, and then click **Command Prompt**.

2 In the **Command Prompt** window, type **ping** followed by a space and then the IP address of the host computer. Then press **Enter**.The site host administrator can supply you with the IP address. For example, if the host IP address is 10.13.93.87 you would type **ping 10.13.93.87**.

3 If you are transmitting images to the Host, perform the following:

a In the **Command Prompt** window, type **ftp** followed by the host name (available from the site host administrator), and then press **Enter**. For example, if the host name is **ALEX1**, type "**ftp ALEX1**"

b At the **User Name** prompt, type **anonymous** and press **Enter**.

c At the **Password** prompt, press **Enter**. There is no password.

d At the prompt, type **put** followed by a valid path and file name, and then press **Enter**. For example, if there is a file on the system **C:\bin\1003_54.rd**, type "**put C:\bin\1003_54.rd**". The system should acknowledge that the file was sent.

e Type **Quit**, and then press **Enter.**

f Close the **Command Prompt** window.

On the LIS computer:

1 On the Windows **Start** menu, point to **Programs**, and then click **Command Prompt**.

2 In the **Command Prompt** window, type **ping** followed by the IP address of the system computer (not the address of the analyzer, which is 140.250.74.171) and verify that you get a response.

3 Close the **Command Prompt** window.

Transmitting Images to the Host

It is possible to transmit to a host computer any images associated with a sample. The system transmits images as 256-color bitmap files. Because the image files are large, the serial connection that the system normally uses for data transmission is insufficient. If you want to transmit images to the host, you must install a network connection. In addition, the system software must be installed and configured correctly by your local service provider or distributor.

} The system can send an image to the host under the following conditions:

- In the **Port Configuration** window, **ftp** is set to **Image Service**.
- In the **Customer Parameters** window, the **Image to Host** option is selected.
- In the **Routine Parameters** window, the **Patients** check box in the **Host Transmission** area is selected. The **Controls** check box must be selected if you want to transmit images for control samples.
- The result transmitted is the final transmission for the sample.
- The image test does not have a Rerun, Dilution, or Delete disposition.
- The image has not been masked in the **Review/Edit** tab.

} If your system is set to transmit standard-sized images (default setting), the image files will not be larger than 120KB. If your system is set to transmit zoomed images, the files will not be larger than 420KB. This setting can be changed only by Bayer Field Service Personnel. Contact your Bayer representative to set your system to transmit zoomed images.

} The default background color of transmitted images is white. If you want change the setting in order to transmit images with a black background, contact your Bayer representative.

} The system names image files based on the connection code transmitted in the initialization message. For example, if the connection code is **001**, the first image transmitted is **W0010001.bmp**, the second **W0010002.bmp**, the third **W0010003.bmp**, and so on.

IMPORTANT

Rename and move image files from the transfer directory immediately. Whenever the system shuts down or switches modes, the bitmap names start from the beginning (W0010001.bmp in the example above). If you have not renamed or moved a file, the new file will overwrite it. In addition, after 10,000 images (W0019999.bmp in the example), the system starts numbering images from the beginning.

Installing and Configuring FTP Server Software on a Windows NT Host Computer

In order to receive images, the host computer must be configured with FTP server software. If the host computer is Windows NT based, you can use the Microsoft FTP server. Do not perform the following procedure if the host is UNIX based or is running on another type of operating system.

To install the FTP server software

1. On the Windows **Start** menu, point to **Settings**, and then click **Control Panel** on the submenu.
2. In the **Control Panel** window, double-click **Network**.
3. In the **Network** dialog box, click the **Services** tab.
4. Click **Add**. The **Select Network Services** box appears.
5. Select **Microsoft Peer Web Server**, and then click **OK**.
6. Follow the directions that appear on the screen.
7. When the **Microsoft Peer Web Services Setup** dialog box appears, select **Internet Service Manager** and **FTP Service**, and then click **OK**.
8. When the **Publishing Directories** dialog box appears, in the **FTP Publishing Directory** box type **C:\ftproot**, and then click **OK**.
9. Follow the directions that appear on the screen to complete the installation. Now you must configure the software.

To configure the FTP server software for Windows NT

On the Windows Start menu, point to Programs, and then point to Microsoft Peer Web Services on the submenu, and then click Internet Service Manager.

1. Select the computer and then, on the **Properties** menu, click **Server Services**.
2. In the **FTP Service Properties** dialog box, click the **Service** tab.
3. Set the following values:

TCP Port	21
Connection Timeout	32000 seconds
Maximum Connections	1000
Allow Anonymous Connections	✓
Allow only anonymous connections	✓

   Username and **Password** can be set to anything.
4. Click the **Directories** tab.
5. In **Directory Listing Style**, select **MS-DOS**, and then click **Add**.
6. In the **Directory Properties** dialog box, type **C:\ftproot\wst** in the **Directory** box.
7. Select both the **Read** checkbox and the **Write** checkbox and then click **OK**.
8. Click **OK**.
9. Close the **Internet Service Manager** window.

Message Formats

The following paragraphs describe the messages employed during the bidirectional exchange of information between the Data Manager and the Host Computer.* The different types of messages are listed in Table 1.

NOTE
To see how the different types of messages are employed in the bidirectional interface, refer to paragraph titled "OPERATION OF THE BIDIRECTIONAL COMMUNICATIONS LINK."

Message Elements

Figure 4 illustrates the basic elements that can comprise a message. Unless otherwise specified, all characters are transmitted in ASCII. See Table 2.

STX	MT	ID CODE	DATA	LRC	ETX

Figure 4: Message Elements

} **STX (Start of Text)**
STX is a communications control character (ASCII 02h**) that indicates the beginning of a message.

} **MT (Message Toggle)**
The message toggle (MT) is a sequential hexadecimal ASCII code that identifies each message packet. For complete details, refer to the paragraph titled "Responding to a Message (MT or NACK)."

} **ID Code**
The ID Code consists of a letter and a space that identifies the type of message. For example: The letter "I" and a space identify an Initialization message. For the ID Code assigned to each type of message, refer to Table 1.

} **Data**
Depending upon message type, the data element can contain a code letter, order information, or test results.

} **LRC (Longitudinal Redundancy Check)**
The LRC byte verifies the accuracy of each transmitted message. Before transmission, the value of the LRC byte (expressed in hexadecimal code) is calculated by the "exclusive-or'ing" of all data bytes in the message, with the exception of LRC, STX, and ETX. Since the LRC byte precedes the ETX byte within the data stream, the calculated value for LRC cannot be equal to that of the ETX byte (03h). Therefore, if the calculated LRC value is 03h, the transmitted LRC byte is set to the substitute value 7Fh in order to avoid erroneous action by the receiving device.

} **ETX (End of Text)**
ETX is a communications control character (ASCII 03h**) that indicates the end of a message.

NOTE
The ETX byte must follow the LRC byte, and the LRC value must be 7Fh**.

* These descriptions are not applicable to the one-way communication link used for the Technicon H•1 data stream emulation format explained in Appendix B.

** The lower case h indicates that the number is hexadecimal (radix 16).

Table 1: Types of Messages

NAME	ID CODE	ORIGIN	PURPOSE	FORMAT
Initialization	I	Host Computer	Informs the Data Manager that the Host Computer is initialized (MT=30h) and is ready for communication. Since an initialization message is required to reestablish the communications link after a program reload or a communications error occurs at the Data Manager, the Host Computer should automatically transmit an initialization message packet if it does not receive an expected reply from the Data Manager after an "extended" period of time defined by the **Watchdog** parameter. Upon initialization, the Host Computer is the "Master" device, which is expected to initiate the next communication.	Figure 6
Token Transfer	S	Host Computer or Data Manager	Makes the receiving device the "Master" device, which is expected to initiate the next communication. Typically, if a device has no information to transmit, it sends a token transfer message to enable the other device to assume control. **Note:** When using the query mode, the S message must be returned from the host in less than 2 seconds.	Figure 7
Workorder	Y	Host computer	Provides workorder information (e.g., sample identification number and test number for each ordered test).	Figure 8
Workorder Validation	E	Data Manager	Provides the following status information concerning the order message just received from the Host Computer: • The contents of the workorder are valid, or • The workorder contains an error that is identified by means of a coded flag. In Workorder Query mode, also informs the Host Computer that the Data Manager is remaining the master device.	Figure 9
Result	R	Data Manager	Provides the test results for sample identified by sample number.	Figure 10
Query	Q	Data Manager	Workorder Query mode only: Requests a workorder from the Host Computer based on the Sid# in the message. (The R&P# cannot be used.)	Figure 11
No Order	N	Host Computer	Informs the Data Manager that there is No Request or No Workorder for the requested sample.	Figure 12
Result Validation	Z	Host Computer	Provides the following status information concerning the results message just received from the Data Manager: • The results message is accepted; send the next one. • The results message is not accepted because the Host Computer results buffer is full. The Host Computer is assuming control as the "Master" device. • The results message is accepted, but the Host Computer does not want to receive any more results at this time and is assuming control as the "Master" device so that workorders can be downloaded. Since a result validation message is expected in response to each result message sent to the Host computer, the Data Manager will not transmit the next result message until a result validation message is received for the last result message.	Figure 13

Table 2: ASCII Character Codes

CHARACTER	ASCII CODE (Hexadecimal)	CHARACTER	ASCII CODE (Hexadecimal)	CHARACTER	ASCII CODE (Hexadecimal)
NUL	00h	+	2Bh	V	56h
SOH	01h	,	2Ch	W	57h
STX	02h	-	2Dh	X	58h
ETX	03h	.	2Eh	Y	59h
EOT	04h	/	2Fh	Z	5Ah
ENQ	05h	0	30h	[	5Bh
ACK	06h	1	31h	\	5Ch
BEL	07h	2	32h	]	5Dh
BS	08h	3	33h	^	5Eh
HT	09h	4	34h	_	5Fh
LF	0Ah	5	35h	‘	60h
VT	0Bh	6	36h	a	61h
FF	0Ch	7	37h	b	62h
CR	0Dh	8	38h	c	63h
SO	0Eh	9	39h	d	64h
SI	OFh	:	3Ah	e	65h
DLE	10h	;	3Bh	f	66h
DC 1 (X_ON)	11h	<	3Ch	g	67h
DC 2 (TAPE)	12h	=	3Dh	h	68h
DC 3 (X_ON)	13h	>	3Eh	i	69h
DC 4 (TAPE)	14h	?	3Fh	j	6Ah
NACK	15h	@	40h	k	6Bh
SYN	16h	A	41h	l	6Ch
ETB	17h	B	42h	m	6Dh
CAN	18h	C	43h	n	6Eh
EM	19h	D	44h	o	6Fh
SUB	1Ah	E	45h	p	70h
ESC	1Bh	F	46h	q	71h
FS	1Ch	G	47h	r	72h
GS	1Dh	H	48h	s	73h
RS	1Eh	I	49h	t	74h
US	1Fh	J	4Ah	u	75h
SP	20h	K	4Bh	v	76h
!	21h	L	4Ch	w	77h
"	22h	M	4Dh	x	78h
#	23h	N	4Eh	y	79h
$	24h	O	4Fh	z	7Ah
%	25h	P	50h	{	7Bh
&	26h	Q	51h	|	7Ch
’	27h	R	52h	} (ALT MOD)	7Dh
(	28h	S	53h	~	7Eh
)	29h	T	54h	DEL (RUB OUT)	7Fh
*	2Ah	U	55h	DEFAULT LRC*	7Fh

*See Message Formats for description of LRC on page 14.

Responding to a Message (MT or NACK)

To confirm the identity and transmission quality of each message, the receiving device (Data Manager or Host Computer) must respond to each message with an MT or NACK.

As illustrated in Figure 4, the second byte of each message is a message toggle (MT), a sequential hexadecimal ASCII code, ranging from 30h (ASCII character "0") to 5Ah (ASCII character "Z"). After the last message toggle code, 5Ah, is used, the codes are recycled beginning with 30h.

Whenever the communication link is initialized, the first message (Initialization) transmitted by the Host Computer has message toggle 30h. Thereafter, the message toggle code for each new message is incremented by one, whether the message originates at the Host Computer or at the Data Manager. See Figure 5.

The operation of the message response function is illustrated as follows:

The sender begins by transmitting a message packet containing a message toggle code that we will assume to be 3Eh (ASCII character ">"). After checking the quality of the transmission, the receiving device responds as follows:

} If the transmission quality is acceptable, the receiving device sends an MT response of one byte equal to the received message toggle code (i. e., 3Eh in this example).

Upon receiving the MT response, the sender compares the received MT with the one in the message it transmitted. If they match, the dialogue continues. If not, the communication link must be reinitiated. For more details, see paragraph titled "COMMUNICATION LINK ERROR HANDLING."

} If the receiving device detects a transmission fault (e. g., an LRC error), the message is rejected and a NACK (Negative Acknowledge) response with hexadecimal value of 15h is sent. Upon receiving the NACK, the sender retransmits the message. If this same message is rejected a second time, the communication link must be reinitiated. For more details, see paragraph titled "COMMUNICATION LINK ERROR HANDLING."

} Depending on the internal parameters, the delay before and number of transmissions may be specified by the operator.

Data Stream Format for Each Message Packet

The Host Spec. 79 data stream formats are provided in Figures 6 through 13.*****

NOTE

As desired, the Flexible Communication Format feature can be used to modify the Workorder "Y" and Results "R" messages with respect to selecting which data items are transmitted, locating the position of each data item within the data stream, and specifying individual data item characteristics such as length, justification, and padding. For complete details, refer to Appendix A.

In order to minimize the message length, tests in the Workorder "Y" and Results "R" messages are identified by their test number instead of by their test name. The test number used by the Host Computer is entered into the **Host Number** field of the **Test Dictionary** window on the Data Manager. The Data Manager divides results into two types: numeric test results, and morphology flags. Note that although the **Host Number** field of the **Test Dictionary** window can contain four characters, the test number in the "Y" and "R" messages are limited to **three** characters. Host numbers greater than "999" should not be entered into the **Test Dictionary**. Test results with Host Numbers greater than "999" will not be sent to the Host Computer and will cause Error Messages to appear in the Error Log during Host Computer communications. Host numbers coming from the Host Computer in the "Y" message must be padded with zeroes, for example, 001,011.

***** When the Data Manager software is loaded, the user must select either Bidirectional protocol Host Spec. 79 or one of the unidirectional system protocols described in Appendix A.

The H• Emulation One-way data stream format is described in Appendix B.

Each elementary test is associated in “Y” and “R” messages to a host number. The images (for example, cytograms) are not transmitted to the host.

Numeric test results are comprised of five characters plus one byte which is the disposition flag. This disposition flag may be accompanied with or replaced by an associated analytic alarm (for example, an *). The structure of the numeric results is “xxxxxy” (where x is a number from 0 to 9, a blank space, decimal separator, or dash), and “y” is either an “A,” “D,” “E,” “X”,or “I.” The following are examples of the numeric type results: WBC, RBC, HGB, HCT, MCV, MCH, MCHC, PLT, RDW, HDW, MPV, PDW, PCT, %NEUT, %LYMPH, %MONO, %EOS, %BASO, %LUC, LI, MPXI, #NEUT, #LYMPH, #MONO, #EOS, #BASO, #LUC, CHCM.

The transcoding of morphology flags is determined by the setting within the WDR.PAR file (see description beginning at the bottom of this page) and internal system parameters. The transcoding table defined in the WDR.PAR file is used by the instrument communication when results are received. Examples of tests affected by this setting are: ANISO, MICRO, MACRO, VAR, HYPO, HYPER, LSHIFT, ATYP, BLASTS.

If the WDR.PAR file is not used, results may contain “+,” a blank space, and are left justified (filled with spaces at the right).

The length of the Workorder “Y” and Results “R” messages is variable and depends upon the number of tests and, if applicable, the number of sample/system flags present in the message.The length of all other messages is fixed.

Unless modified via the Flexible Communication Format feature, specific data fields are arranged as follows: The contents of all alphanumeric data fields are left-justified alphanumeric characters filled with spaces (20h) on the right. The contents of all numerical data fields except **Sample Identification Number** are right-justified numerical characters filled with spaces (20h) on the left. The **Sample Identification Number** data field is right-justified but is filled with zeros (30h) on the left. When information is not available for a data field (e.g. birthdate), it is filled with spaces (20h).

IMPORTANT

} All desired tests must be specifically requested. No profiles or predefined sets of tests (for example, CBC/Diff) are recognized by the system.

} A maximum of 110 elementary tests may be transmitted using Host Spec. 79.

} Only Controls and Patient samples are managed by the Data Manager. Primers, Calibrators are not recognized.

} The decimal separator is specified at installation by the operating system's regional settings. To transmit a different decimal separator, add the following lines to **Lis.ini** using Notepad:

Host_Decimal = <character you want to transmit>

Host_Thousand = <character you want to transmit>

The characters you choose *must not* be the same.

} The Data Manager manages a maximum of 14 characters in the Sid#.

} If a misread tube is transmitted to the host (not changed by the user), the tube is assigned an Sid# of 999xxxx where xxxx represents a sequential number dedicated to misread tubes on the Data Manager.

} The IDEE transmitted from a control is coded with a “00000009xxxx00” if the length of the field is 14 characters with 7 significant digits). The contents of this field can be changed according to an internal parameter. It defines the number of leading zeroes and therefore, the number of usable digits.

WDR.PAR Description

The WDR.PAR is used by instrument communication links capable of sending result comments when the workstation is set up with Host Spec. 79. The absence of this field will not generate an error. Each line of the file describes a single result comment and is divided into two columns by a single space.

The first column indicates the comment result transmitted to the Data Manager. If the comment contains space characters, they will be replaced by the "@" character in the WDR.PAR file. The second column indicates the comment which may be defined in the "Text" dictionary and displayed in the **Review / Edit tab**.
The following is an example of a WDR.PAR file:

```
WDR.PAR
???? @
+@ @ @ SLIGHT
++ @ @ MOD
+++@ MARKED
```

NOTE
The comment result in the first column of WDR.PAR must not exceed five characters.

If the instrument transmits a comment not described in the WDR.PAR file, the first line in the WDR.PAR file can be coded with question marks (????) in the first column and a default comment in the second column indicating that the received comment result is not described in the WDR.PAR file.

If the instrument sends a comment result the operator does not wish displayed in the **Review / Edit** tab, translate the comment to "@" in the second column.

If needed, the result comment field can be translated into a numeric result which will be compared to validation ranges using the Data Manager validation process.

Example:

} "+" can be translated to "1."

} "+ +" can be translated to "2."

} "+ + +" can be translated to "3."

These numeric values can then be compared to numeric validation ranges, that can be set up in the **Test Dictionary**.

The following message exchanges illustrate the Initialization and incrementing of MT values after each new message for the downloading mode. Operation using the Query Mode is conceptually identical.

DATA MANAGER	DIRECTION OF DATA FLOW	HOST COMPUTER
		Host computer sends Initialization "I" message with MT 30h.
	<<<<<<<<<<<<<<	**STX/30h/I#/CRLF/LRC/ETX***
If message is received successfully, Data Manager responds with MT 30h.		
30h	>>>>>>>>>>>>>>	
		Host computer downloads a workorder using the next MT (31h).
	<<<<<<<<<<<<<<	**STX/31h/Y#/ORDER/LRC/ETX**
If message is received successfully, Data Manager responds with MT 31h.		
31h	>>>>>>>>>>>>>>	
If order contents are acceptable, Data Manager sends validation message using the next MT (32h).		
STX/32h/E#/VALID/LRC/ETX	>>>>>>>>>>>>>>	
		If message is received successfully, Host Computer sends MT 32h.
	<<<<<<<<<<<<<<	**32h.**
		Host computer downloads a workorder using the next MT (33h).
	<<<<<<<<<<<<<<	**STX/33h/Y#/ORDER/LRC/ETX**

The following message exchanges illustrate the rollover in MT values after 5Ah.

		Assume that Host Computer uses MT 5Ah, the last value in the set.
	<<<<<<<<<<<<<<	**STX/5Ah/Y#/ORDER/LRC/ETX**
If message is received successfully, Data Manager responds with MT 5Ah.		
5Ah	>>>>>>>>>>>>>>	
If order contents are acceptable, Data Manager sends validation message using the next MT (30h), which is the first value in the set.		
STX/30h/E#/VALID/LRC/ETX	>>>>>>>>>>>>>>	
		If message is received successfully, Host Computer sends MT 30h.
	<<<<<<<<<<<<<<	**30h**
		Host computer downloads a workorder using next MT (31h).
	<<<<<<<<<<<<<<	**STX/31h/Y#/ORDER/LRC/ETX**

*__#__ = space, __/__= delimiter for illustrative purposes; not part of transmitted message.

Figure 5: Sequencing of Message Toggle Values

Figure 6: Initialization Message (Without Images): Transmitted from Host Computer to Data Manager

ITEM	TRANSMITTED DATA FIELDS	DATA BYTES
1	STX (Start of Text)	1
2	MT (Message Toggle value = 30h)	1
3	ID Code= I (Initialization)	1
4A	Space	1
5	Carriage Return/Line Feed	2
6	LRC (Longitudinal Redundancy Check of all characters within field delimited by STX and ETX codes)	1
7	ETX (End of Text)	1
	TOTAL	**8**

Figure 6a: Initialization Message (With Images): Transmitted from Host Computer to Data Manager

ITEM	TRANSMITTED DATA FIELDS	DATA BYTES
1	STX (Start of Text)	1
2	MT (Message Toggle value = 30h)	1
3	ID Code = I (Initialization)	1
4	Space	1
5	Separator ("|" character)	1
6	Connection ID Code (This is a number from 000 to 999 that the system software uses as part of the image file name to identify the system that sent the image.)	3
7	Separator ("|" character)	1
8	Image Directory (the FTP path for storing the image files) The path name must contain **\ftproot** and the alias name used. **Example:** c:\ftproot\image with the alias of /image. The I message contains I |001|/image/| Depending on the operating environment of the Host computer, the path name may be specified using a forward slash (/) or back slash (\).	flexible
9	Separator ("|" character)	1
10	Carriage Return/Line Feed	2
11	LRC (Longitudinal Redundancy Check of all characters within field delimited by STX and ETX codes)	1
12	ETX (End of Text)	1

Figure 7: Token Transfer Message: Transmitted from Host Computer to Data Manager and from the Data Manager to Host Computer

ITEM	TRANSMITTED DATA FIELDS	NO. OF DATA BYTES
1	STX (Start of Text)	1
2	MT (Message Toggle code; a sequential hexadecimal code, ranging from 30h to 5Ah)	1
3	ID Code=S (Token Transfer)	1
4	Spaces	10
6	Carriage Return/Line Feed	2
7	LRC (Longitudinal Redundancy Check of all characters within field delimited by STX and ETX codes)	1
8	ETX (End of Text)	1
	TOTAL	**17**

Figure 8: Workorder Message: Transmitted from Host Computer to Data Manager

ITEM	TRANSMITTED DATA FIELDS	NO. OF DATA BYTES
1	STX (Start of Text)	1
2	MT (Message Toggle code; a sequential hexadecimal code, ranging from 30h to 5Ah)	1
3	ID Code =Y (Order information enclosed)	1
4A	Spaces	2
4B	STAT INDICATOR U: The workorder applies to a STAT order SP: No STAT indicator	1
4C	Update Indicator defined as follows: (# =Space) # No update - new workorder is being transmitted A Transmitted workorder is an update and is processed as follows assuming that Data Manager is operated in Review and Edit mode: **Sample ID matches an existing order:** A workorder in the database may be updated from the host computer. Patient and tube information, as well as test selection information contained in the database, may be revised even after sample processing unless the tube status is **All Complete**. If an update order corresponds to an unmatched tube, the two will be paired and the update order is processed as a workorder. If an update order from the host adds a test to an existing workorder (not considered Incomplete), the tube moves to the **Pending** file. Update information is rejected in the following cases: The update order message sent from the Host Computer to the Data Manager does not contain an indicator specifying it is updating an order previously received by the Data Manager. If the sample type for the selected sample is different in the database and the update order. If the sample selected for revision (updating) is classified as **All Complete**, the update order will be disposed of as a new workorder. A test previously assigned a result value may not be deleted. If a test with no current associated result is deleted via an update order, all previously determined results for this test on the specified sample are deleted. Sample ID does not match an existing order: The transmitted order is treated as a new workorder. (Continued)	1

* Illustrates the original "Y" message format for the Host Spec. 79 data stream. As desired, this format can be modified using the Flexible Communication Format feature described in Appendix A. The actual message format is defined in the TRAME.PAR file that can be viewed in the **Format** window of the **Tools**.

** For each test request (items 26A-74A), the B & C items are not transmitted unless a previous result is supplied.

(1 of 3)

ITEM	TRANSMITTED DATA FIELDS	NO. OF DATA BYTES
4D	Space	1
5A	Sample Identification Number	14*
5B	Space	25
7	Patient Identification Number (hospital number)	14
8	Spaces	3
9	Patient Name (NAME)	30
10	Space	1
11	Date Of Birth XX/XX/XXXX Month (2 left digits) Delimiter (/) Day (2 middle digits) Delimiter (/) Year (4 right digits)	10**
12	Space	1
13	Patient Sex (SEX): M= male, F= female, Space= Unknown	1
14	Space	1
15	Collection Date XX/XX/XX Month (2 left digits) Delimiter (/) Day (2 middle digits) Delimiter (/) Year (2 right digits)	8
16	Space	1
17	Collection Time XXXX Hour (2 left digits) Minutes (2 right digits)	4
18	Space	1
19	Location	6
20	Space	1
21	Doctor	6
22	Space	1
23	Carriage Return/Line Feed	2
24A	Test number for Test Request #1 (Use test number entered into the **Host Number** field of the **Test Dictionary** window.) Test number must be padded with zeroes (e.g. 005, 079)	3

* Sample identification number (IDee) can be from 4 to 14 bytes. If other than 14, the definition of IDee in the TRAME.PAR file must be changed to match. See Appendix.

** The patient's age is calculated using the date of birth (DOB) and the collection date. If DOB is downloaded, the collection date must also be downloaded so that the age can be properly calculated.

Figure 8: Workorder Message: Transmitted from Host Computer to Data Manager (2 of 3)

ITEM	TRANSMITTED DATA FIELDS	NO. OF DATA BYTES
25B	Date or Time of Previous Result (Optional)* The first byte of this field is D or T to indicate that the date (D) or time (T) of the previous result that is being sent. As applicable, the remaining six bytes are sent as follows: DATE / TIME Month (MM) / Hour (HH) / (2 left digits) Day (DD) / Minutes (MM) / (2 middle digits) Year (YY) / Seconds YY) / (2 right digits)	7
25C	Previous Result value (Optional)*	5
26	Test number for Test Request #2. **Test number must be padded with zeroes (e.g. 005, 079)**	3
27 ⇓ 134	Test number for Test Request #3 ⇓ Test number for Test Request #110	3 ⇓ 3
135	Carriage Return/Line Feed	2
136	LRC (Longitudinal Redundancy Check of all characters within field delimited by STX and LRC/ETX codes)	1
137	ETX (End of Text)	1

* For each test request, the Host Computer can optionally supply a previous result for use in the Delta Check feature. Previous result data are contained in two fields. The first field (seven bytes) supplies the date or time of the previous result, while the second field (five bytes) provides the result. If no previous result is being supplied, the Host Computer does not transmit anything for these fields.

Figure 8: Workorder Message: Transmitted from Host Computer to Data Manager (3 of 3)

Figure 8a: Workorder Message (Multispecies): Transmitted from Host Computer to Data Manager

ITEM	TRANSMITTED DATA FIELDS	DATA BYTES
1	STX (Start of Text)	1
2	MT (Message Toggle code; a sequential hexadecimal code, ranging from 30h to 5Ah)	1
3	ID Code =Y (Order information enclosed)	1
4A	Spaces	2
4B	STAT INDICATOR U: The workorder applies to a STAT order Space: No STAT indicator	1
4C	Update Indicator defined as follows: (# =Space) # No update - new workorder is being transmitted A Transmitted workorder is an update and is processed as follows assuming that Data Manager is operated in Review and Edit mode:	1
4D	Space	1
5A	Sample Identification Number	14
5B	Spaces	20
5C	Species Code (See Figure 8b: Predefined Species Codes on page 28.) If you do not opt to include the species code in the workorder message, the species code will default to human and cannot be changed. Note: Make sure the total number of data bytes in 5A-5C is 38.	4
6	Space	1
7	Patient Identification Number (hospital number)	14
8	Spaces	3
9	Patient Name (name)	30
10	Space	1
11	Date Of Birth XX/XX/XXXX Month (2 left digits) Delimiter (/) Day (2 middle digits) Delimiter (/) Year (4 right digits)	10
12	Space	1
13	Patient Sex (SEX): M= male, F= female, Space= Unknown	1
14	Space	1
15	Collection Date XX/XX/XX Month (2 left digits) Delimiter (/) Day (2 middle digits) Delimiter (/) Year (2 right digits)	8
…	… (These fields are unchanged; see figure 8.)	…
137	ETX (End of Text)	1

Figure 8b:Predefined Species Codes

Code	Species
0000	Human
0100	Rat
0200	Rat LE
0300	Rat SD
0400	Rat Wistar
0500	Mouse
0600	Mouse Balb
0700	Mouse CD1
0800	Mouse C57BL
0900	Cynomolgus Monkey
1000	Rhesus Monkey
1100	Rabbit
1200	Rabbit NZW
1300	Guinea Pig
1400	Dog
1500	Cat
1600	Horse
1700	Cattle
1800	Goat
1900	Pig
2000	Sheep

Figure 9: Workorder Validation Message: Transmitted from Data Manager to Host Computer

ITEM	TRANSMITTED DATA FIELDS	NO. OF DATA BYTES
1	STX (Start of Text)	1
2	MT (Message Toggle code; a sequential hexadecimal code, ranging from 30h to 5Ah)	1
3	ID Code= E (Workorder Validation)	1
4	Spaces	8
5	Error (flag) Code defined as follows: (#=Space) Downloading Mode: #0 Workorder message content is valid. #4 Invalid test number (not defined) Query Mode: 10 Workorder message content is valid. Data manager is remaining the master device. 14 Invalid test number (not defined). Data manager is remaining the master device.	2
6	Carriage Return/Line Feed	2
7	LRC (Longitudinal Redundancy Check of all characters within field delimited by STX and ETX codes)	1
8	ETX (End of Text)	1
	TOTAL	**17**

Figure 10: Result Message: Transmitted from Data Manager to Host Computer

Illustrates the original “R” message format for the Host Spec. 79 data stream. This format can be modified using the Flexible Communication Format feature described in Appendix A. The actual message format is defined in the TRAME.PAR file, which can be viewed via the **Format** window of the **Tools**.

ITEM	TRANSMITTED DATA FIELDS	NO. OF DATA BYTES
1	STX (Start of Text)	1
2	MT (Message Toggle code; a sequential hexadecimal code, ranging from 30h to 5Ah)	1
3	ID Code = R (Result)	1
4	Space	1
5A	Sample Identification Number	14
5B	Space	1
5C	Rack and Position # XXX-XX	6
5D	Space	11
6	Aspiration Date XX/XX/XX Month (2 left digits) Delimiter (/) Day (2 middle digits) Delimiter (/) Year (2 right digits)	8
7	Space	1
8	Aspiration Time XX:XX:XX Hour (2 left digits) Delimiter (:) Minutes (2 middle digits) Delimiter (:) Seconds (2 right digits)	8
9	Space	3
10	Carriage Return/Line Feed	2
11A	Test Number for Result #1	3
11B	Numeric Value Result #1	5
11C	Flags or Spaces for Result #1	1 (2)*
11D	User Code (Optional)	3#

(1 of 2)

* The default setting is the single-byte disposition code. A Field Service Engineer can change the setting to substitute the error code from the Alarm Dictionary. If necessary, both the error code and the disposition code can be transmitted as a two-byte flag.

\# If the system is not set to transmit the user code, this value is zero (0).

ITEM	TRANSMITTED DATA FIELDS	NO. OF DATA BYTES
11E	Separator ("|" character) (Optional)	1[$]
11F	Reduced codes of sample/system flags[**] for Result #1(Optional)	flexible
11G	Separator ("|" character) (Optional)	1
⇓	⇓	⇓
121A	Test Number for Result #110[##] (The maximum number of tests is 110)	3
121B	Numeric value for Result #110	5[$$]
121C	Flag or Space for Result #110	1 (2)
121D	User Code (Optional)	3
121E	Separator ("|" character) (Optional)	1
121F	Reduced codes of sample/system flags for Result #110(Optional)	flexible
121G	Separator ("|" character) (Optional)	1
122	Carriage Return/Line Feed	2
123	LRC (Longitudinal Redundancy Check of all characters within field delimited by STX and LRC/ETX codes)	1
124	ETX (End of Text)	1

Figure 10: Result Message : Transmitted from Data Manager to Host Computer (2 of 2)

[$] If the system is not set to transmit Sample/System flags, this value is zero (0). If there is no Sample/System flag associated with this result, this value is zero (0). If there is more than one flag associated with a test, the flags are separated by a space. There should be no more than fifteen (15) flags associated with a result.

[**] See Table C-1: Sample/System Flags, on page 76.

[##] If the system is set to transmit images to the Host computer, the last test result will be the image file. The image file is test #250.

[$$] When transmitting an image file, this is a four-digit number followed by a blank space. Ignore the blank space when using this number to create the image file's name.

Figure 10a: Result Message (Multispecies): Transmitted from Data Manager to Host Computer

ITEM	TRANSMITTED DATA FIELDS	DATA BYTES
1	STX (Start of Text)	1
2	MT (Message Toggle code; a sequential hexadecimal code, ranging from 30h to 5Ah)	1
3	ID Code= R (Result)	1
4	Space	1
5A	Sample Identification Number	14
5B	Space	1
5C	Rack and Position # XXX-XX	6
5D	Spaces	6
5E	4-digit Species Code associated	4
5F	Abbreviated Species Name (13 characters maximum)	13
6	Space	1
7	Aspiration Date XX/XX/XX Month (2 left digits) Delimiter (/) Day (2 middle digits) Delimiter (/) Year (2 right digits)	8
8	Space	1
9	Aspiration Time XX:XX:XX Hour (2 left digits) Delimiter (:) Minutes (2 middle digits) Delimiter (:) Seconds (2 right digits)	8
10	Space	3
11	<CR/LF>	2
12A	Test number#1 (Image file test number = 250)	3
12B	Test Result#1	5
12C	Flags or Spaces for Result #1	1 (2)*
12D	User Code (Optional)	3#

(1 of 2)

* The default setting is the single-byte disposition code. A Field Service Engineer can change the setting to substitute the error code from the **Alarm Dictionary**. If necessary, both the error code and the disposition code can be transmitted as a two-byte flag.

\# If the system is not set to transmit the user code, this value is zero (0).

ITEM	TRANSMITTED DATA FIELDS	DATA BYTES
12E	Separator ("|" character) (Optional)	1[$]
12F	Reduced codes of sample/system flags for Result #1[**] (Optional)	flexible[$]
12G	Separator ("|" character) (Optional)	1[$]
⇓	⇓	⇓
122A	Test Number for Result #110[##] (The maximum number of tests is 110)	3
122B	Numeric value for Result #110	5[$$]
122C	Flag or Space for Result #110	1 (2)
122D	User Code (Optional)	3
122E	Separator ("|" character) (Optional)	1
122F	Reduced codes of sample/system flags for Result #110(Optional)	flexible
122G	Separator ("|" character) (Optional)	1
123	Carriage Return/Line Feed	2
124	LRC (Longitudinal Redundancy Check of all characters within field delimited by STX and LRC/ETX codes)	1
125	ETX (End of Text)	1

Figure 10a: Result Message (Multispecies): Transmitted from Data Manager to Host Computer (2 of 2)

[$] If the system is not set to transmit Sample/System flags, this value is zero (0). If there is no Sample/System flag associated with this result, this value is zero (0). If there is more than one flag associated with a test, the flags are separated by a space. There should be no more than fifteen (15) flags associated with a result.

[**] See Table C-1: Sample/System Flags, on page 76

[##] If the system is set to transmit images to the Host computer, the last test result will be the image file. The image file is test #250.

[$$] When transmitting an image file, this is a four-digit number followed by a blank space. Ignore the blank space when using this number to create the image file's name.

Figure 11: Query Message: Transmitted from Data Manager to Host Computer

ITEM	TRANSMITTED DATA FIELDS	NO. OF DATA BYTES
1	STX (Start of Text)	1
2	MT (Message Toggle code; a sequential hexadecimal code, ranging from 30h to 5Ah)	1
3	ID Code= Q (Workorder Query)	1
4	Space	1
5	Sid# of Workorder (i.e., 00000003268912) right justified with leading zeroes	14*
6	Carriage Return/Line Feed	2
7	LRC (Longitudinal Redundancy Check of all characters within field delimited by STX and ETX codes)	1
8	ETX (End of Text)	1
	TOTAL	**22**

* The QUERY MESSAGE will send the Sid# as a 14 character field. If the Host responds with a WORKORDER MESSAGE, the length of the Sid# in that message will be the length as defined in the TRAME.PAR file (that is, IDEE = (XX R, Z) where XX is the actual defined length of the Sid#).

Figure 12: No Workorder Message: Transmitted from Host Computer to Data Manager

ITEM	TRANSMITTED DATA FIELDS	NO. OF DATA BYTES
1	STX (Start of Text)	1
2	MT (Message Toggle code; a sequential hexadecimal code, ranging from 30h to 5Ah)	1
3	ID Code= N (No Workorder)	1
4	Space	1
5	Complementary Code defined as follows: R For Request or W For Workorder	1
6	Space	1
7	Sid# OF QUERY (i.e., 00000003268912) right justified with leading zeroes.	14*
8	Carriage Return/Line Feed	2
9	LRC (Longitudinal Redundancy Check of all characters within field delimited by STX and ETX codes)	1
10	ETX (End of Text)	1
	TOTAL	**24**

* The Sid# in the NO WORKORDER MESSAGE is a fourteen character field regardless of the IDEE length definition in the TRAME.PAR file.

Figure 13: Result Validation Message: Transmitted from Host Computer to Data Manager

ITEM	TRANSMITTED DATA FIELDS	NO. OF DATA BYTES
1	STX (Start of Text)	1
2	MT (Message Toggle code; a sequential hexadecimal code, ranging from 30h to 5Ah)	1
3	ID Code = Z (Result Validation)	1
4	Spaces	17
5	Error (flag) Code defined as follows: (# =Space) #0 Result message content is valid. Send next result packet. #1 Result message cannot be accepted because the Host Computer results file is full. Host computer assumes control as the master device that will initiate the next communication. #2 Result message packet content is valid. However, the Host Computer does not want to receive any more results and is assuming control as the master device that will initiate the next communication.	2
6	Carriage Return/Line Feed	2
7	LRC (Longitudinal Redundancy Check of all characters within field delimited by STX and ETX codes)	1
8	ETX (End of Text)	1
	TOTAL	**26**

Operation of the Bidirectional Communications Link – Without Images (Downloading Workorder Mode)

After defining each of the message packets that comprise the bidirectional communications protocol, it now remains to demonstrate how these messages are actually employed in a typical exchange of information.
Figure 14 illustrates the message exchanges that can occur during operation.

DATA MANAGER	DIRECTION OF DATA FLOW	HOST COMPUTER
	<<<<<<<<<<<<<<	STX/MT/I#/CRLF/LRC/ETX*,**
	<<<<<<<<<<<<<<	STX/MT/I#/CRLF/LRC/ETX
	<<<<<<<<<<<<<<	STX/MT/I#/CRLF/LRC/ETX
	<<<<<<<<<<<<<<	STX/MT/I#/CRLF/LRC/ETX
MT	>>>>>>>>>>>>>>	

When the Data Manager responds to an Initialization "I" message with an MT, the communications link is initialized and ready for use. At this time, the Host Computer is the master device and can download Workorder ("Y") messages, or it can transmit a Token Transfer ("S") message that makes the Data Manager the master device. Assume that the Host Computer wants to download orders.

	<<<<<<<<<<<<<<	STX/MT/Y#/ORDER/LRC/ETX
MT	>>>>>>>>>>>>>>	
STX/MT/E#/VALID/LRC/ETX	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT
	<<<<<<<<<<<<<<	STX/MT/Y#/ORDER/LRC/ETX
MT	>>>>>>>>>>>>>>	
STX/MT/E#/VALID/LRC/ETX	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT
	<<<<<<<<<<<<<<	STX/MT/Y#/ORDER/LRC/ETX
MT	>>>>>>>>>>>>>>	
STX/MT/E#/VALID/LRC/ETX	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT
	<<<<<<<<<<<<<<	STX/MT/S#/LRC/ETX
MT	>>>>>>>>>>>>>>	

The transmission of a Token Transfer ("S") message by the Host Computer informs the Data Manager that the downloading of workorders is completed and makes the Data Manager the master device. The Data Manager can now send results or it can relinquish control by transmitting a Token Transfer ("S") message if no results are available. Assume that there are results to be sent.

STX/MT/R#/RESULT/LRC/ETX	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT
	<<<<<<<<<<<<<<	STX/MT/Z#/VALID/LRC/ETX
MT	>>>>>>>>>>>>>>	

* **#** = space, **/** = delimiter for illustrative purposes; not part of transmitted message.

** Initialization message "I" is retransmitted at time intervals determined by the Host Computer. The Initialization message "I" is transmitted at this time interval until a response is received from the Data Manager.

Figure 14: Dialogue Between the Data Manager and a Host Computer in Download Mode (1 of 3)

DATA MANAGER	DIRECTION OF DATA FLOW	HOST COMPUTER
STX/MT/R#/RESULT/LRC/ETX*	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
If during the transmission of results from the Data Manager, the Host Computer wants to regain control of the communications link so that it can download workorders, the Host Computer transmits a result validation (“Z2”) message informing the Data Manager that the last result message was correctly received and that no more result messages are to be sent.		
	<<<<<<<<<<<<<<	**STX/MT/Z2/VALID/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
The Host Computer can now download Workorder (“Y”) messages to the Data Manager.		
	<<<<<<<<<<<<<<	**STX/MT/Y#/ORDER/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/E#/VALID/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/Y#/ORDER/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/E#/VALID/LRC/ETX>	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/Y#/ORDER/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/E#/VALID/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
When the Host Computer has completed transmitting the Workorder messages, it will transmit a Token Transfer (“S”) message that once again makes the Data Manager the master device.		
	<<<<<<<<<<<<<<	**STX/MT/S#/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
The Data Manager can now send results, or it can relinquish control by transmitting a Token Transfer (“S”) message if no results are available. Assume that the Data Manager transmits results to the Host Computer.		
STX/MT/R#/RESULT/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/Z#/VALID/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	

* # = space, /= delimiter for illustrative purposes; not part of transmitted message.

Figure 14: Dialogue Between the Data Manager and a Host Computer in Download Mode (2 of 3)

DATA MANAGER	DIRECTION OF DATA FLOW	HOST COMPUTER
STX/MT/R#/RESULT/LRC/ETX*	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/Z#/VALID/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
After the Data Manager has transmitted all available results, it sends a Token Transfer (“S”) message that makes the Host Computer the master device.		
STX/MT/S#/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
If the Host Computer has no workorders to send, it transmits a Token Transfer (“S”) message back to the Data Manager. This process will continue indefinitely, toggling control of the line to each device and keeping it active, for either device to use when the need arises.		
	<<<<<<<<<<<<<<	**STX/MT/S#/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/S#/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/S#/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/S#/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/S#/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/S#/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**

* **#** = space, **/**= delimiter for illustrative purposes; not part of transmitted message.

Figure 14: Dialogue Between the Data Manager and a Host Computer in Download Mode (3 of 3)

Operation of the Bidirectional Communications Link – With Images (Downloading Workorder Mode)

After defining each of the message packets that comprise the bidirectional communications protocol, it now remains to demonstrate how these messages are actually employed in a typical exchange of information.
Figure 14a illustrates the message exchanges that can occur during operation.

DATA MANAGER	DIRECTION OF DATA FLOW	HOST COMPUTER
	<<<<<<<<<<<<<<	STX/MT/I#/CRLF/LRC/ETX*,**
	<<<<<<<<<<<<<<	STX/MT/I#/CRLF/LRC/ETX
	<<<<<<<<<<<<<<	STX/MT/I#/CRLF/LRC/ETX
	<<<<<<<<<<<<<<	STX/MT/I#/CRLF/LRC/ETX
MT	>>>>>>>>>>>>>>	

When the Data Manager responds to an Initialization "I" message with an MT, the communications link is initialized and ready for use. At this time, the Host Computer is the master device and can download Workorder ("Y") messages, or it can transmit a Token Transfer ("S") message that makes the Data Manager the master device. Assume that the Host Computer wants to download orders.

	<<<<<<<<<<<<<<	STX/MT/Y#/ORDER/LRC/ETX
MT	>>>>>>>>>>>>>>	
STX/MT/E#/VALID/LRC/ETX	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT
	<<<<<<<<<<<<<<	STX/MT/Y#/ORDER/LRC/ETX
MT	>>>>>>>>>>>>>>	
STX/MT/E#/VALID/LRC/ETX	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT
	<<<<<<<<<<<<<<	STX/MT/Y#/ORDER/LRC/ETX
MT	>>>>>>>>>>>>>>	
STX/MT/E#/VALID/LRC/ETX	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT
	<<<<<<<<<<<<<<	STX/MT/S#/LRC/ETX
MT	>>>>>>>>>>>>>>	

The transmission of a Token Transfer ("S") message by the Host Computer informs the Data Manager that the downloading of workorders is completed and makes the Data Manager the master device. The Data Manager can now send results and images or it can relinquish control by transmitting a Token Transfer ("S") message if no results are available. Assume that there are results to be sent.

STX/MT/R#/RESULT/LRC/ETX	>>>>>>>>>>>>>>	
IMAGE	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT
	<<<<<<<<<<<<<<	STX/MT/Z#/VALID/LRC/ETX
MT	>>>>>>>>>>>>>>	

* **#** = space, **/** = delimiter for illustrative purposes; not part of transmitted message.

** Initialization message "I" is retransmitted at time intervals determined by the Host Computer. The Initialization message "I" is transmitted at this time interval until a response is received from the Data Manager.

Figure 14a: Dialogue Between the Data Manager and a Host Computer in Download Mode (With Images) (1 of 3)

DATA MANAGER	DIRECTION OF DATA FLOW	HOST COMPUTER
STX/MT/R#/RESULT/LRC/ETX*	**>>>>>>>>>>>>>>**	
IMAGE	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
If during the transmission of results from the Data Manager, the Host Computer wants to regain control of the communications link so that it can download workorders, the Host Computer transmits a result validation (“Z2”) message informing the Data Manager that the last result message was correctly received and that no more result messages are to be sent.		
	<<<<<<<<<<<<<<	**STX/MT/Z2/VALID/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
The Host Computer can now download Workorder (“Y”) messages to the Data Manager.		
	<<<<<<<<<<<<<<	**STX/MT/Y#/ORDER/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/E#/VALID/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/Y#/ORDER/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/E#/VALID/LRC/ETX>	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/Y#/ORDER/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/E#/VALID/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
When the Host Computer has completed transmitting the Workorder messages, it will transmit a Token Transfer (“S”) message that once again makes the Data Manager the master device.		
	<<<<<<<<<<<<<<	**STX/MT/S#/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
The Data Manager can now send results, or it can relinquish control by transmitting a Token Transfer (“S”) message if no results are available. Assume that the Data Manager transmits results to the Host Computer.		
STX/MT/R#/RESULT/LRC/ETX	**>>>>>>>>>>>>>>**	
IMAGE	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/Z#/VALID/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	

* # = space, /= delimiter for illustrative purposes; not part of transmitted message.

Figure 14a: Dialogue Between the Data Manager and a Host Computer in Download Mode (With Images) (2 of 3)

DATA MANAGER	DIRECTION OF DATA FLOW	HOST COMPUTER
STX/MT/R#/RESULT/LRC/ETX*	**>>>>>>>>>>>>>>**	
IMAGE (via FTP)	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/Z#/VALID/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
After the Data Manager has transmitted all available results, it sends a Token Transfer (“S”) message that makes the Host Computer the master device.		
STX/MT/S#/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
If the Host Computer has no workorders to send, it transmits a Token Transfer (“S”) message back to the Data Manager. This process will continue indefinitely, toggling control of the line to each device and keeping it active, for either device to use when the need arises.		
	<<<<<<<<<<<<<<	**STX/MT/S#/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/S#/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/S#/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/S#/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/S#/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/S#/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**

* **#** = space, **/**= delimiter for illustrative purposes; not part of transmitted message.

Figure 14a: Dialogue Between the Data Manager and a Host Computer in Download Mode (With Images) (3 of 3)

Operation of the Bidirectional Communications Link – Without Images (Query Workorder Mode / Full Query Workorder Mode)

After defining each of the message packets that comprise the bidirectional communications protocol, it now remains to demonstrate how these messages are actually employed in a typical exchange of information. Figure 15 illustrates the message exchanges that can occur during operation.

DATA MANAGER	DIRECTION OF DATA FLOW	HOST COMPUTER
	<<<<<<<<<<<<<<	STX/MT/I#/CRLF/LRC/ETX*,**
	<<<<<<<<<<<<<<	STX/MT/I#/CRLF/LRC/ETX
	<<<<<<<<<<<<<<	STX/MT/I#/CRLF/LRC/ETX
	<<<<<<<<<<<<<<	STX/MT/I#/CRLF/LRC/ETX
MT	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	STX/MT/S#/LRC/ETX
MT	>>>>>>>>>>>>>>	

When the Data Manager responds to an "I" message with an MT, the communications link is initialized and ready for use. At this time, the **Host Computer** is the master device and must transmit a Token Transfer ("S") message to make the Data Manager the master device.

Assume that there are two samples to be run, and there are no workorders for these samples in the Data Manager's database. Also assume that the Host Computer has the corresponding workorders for these samples.

STX/MT/Q#/SID 1/LRC/ETX	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT
	<<<<<<<<<<<<<<	STX/MT/Y#/ORDER/LRC/ETX
MT	>>>>>>>>>>>>>>	
STX/MT/E#/VALID/LRC/ETX	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT
STX/MT/Q#/SID 2/LRC/ETX	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT
	<<<<<<<<<<<<<<	STX/MT/Y#/ORDER/LRC/ETX
MT	>>>>>>>>>>>>>>	
STX/MT/E#/VALID/LRC/ETX	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT

The Data Manager now has results to transmit to the Host Computer.

STX/MT/R#/RESULT/LRC/ETX	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT
	<<<<<<<<<<<<<<	STX/MT/Z#/VALID/LRC/ETX
MT	>>>>>>>>>>>>>>	

* # = space, /= delimiter for illustrative purposes; not part of transmitted message.

** Initialization message "I" is retransmitted at time intervals determined by the Host Computer. The Initialization message "I" is transmitted at this time interval until a response is received from the Data Manager.

Figure 15: Dialogue Between the Data Manager and a Host Computer in Query Mode (1 of 2)

DATA MANAGER	DIRECTION OF DATA FLOW	HOST COMPUTER
STX/MT/R#/RESULT/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<	**STX/MT/Z#/VALID/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	

Assume that two more samples are to be run, and that the Host Computer only has a workorder for one of them

STX/MT/Q#/SID1/LRC/ETX*	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<	**STX/MT/NW/SID1/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/Q#/SID2/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<	**STX/MT/Y#/ORDER/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/E#/VALID2/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<	**MT**

When the Data Manager has no queries or results to send to the Host Computer, it transmits the Token Transfer ("S") message to make the Host Computer the master device. Since the Host Computer does not need to be the master device, it responds by sending the Token Transfer ("S") message to the Data Manager. This process continues indefinitely, toggling control of the line to each device and keeping the line active until the Data Manager needs to send a Query "Q") message or a Result ("R") message.

STX/MT/S#/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<	**STX/MT/S#/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/S#/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<	**STX/MT/S#/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/S#/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<	**MT**

*# = space, / = delimiter for illustrative purposes; not part of transmitted message.

Figure 15: Dialogue Between the Data Manager and a Host Computer in Query Mode (2 of 2)

Operation of the Bidirectional Communications Link – With Images (Query Workorder Mode / Full Query Workorder Mode)

After defining each of the message packets that comprise the bidirectional communications protocol, it now remains to demonstrate how these messages are actually employed in a typical exchange of information. Figure 15a illustrates the message exchanges that can occur during operation.

DATA MANAGER	DIRECTION OF DATA FLOW	HOST COMPUTER
	<<<<<<<<<<<<<<	STX/MT/I#/CRLF/LRC/ETX*,**
	<<<<<<<<<<<<<<	STX/MT/I#/CRLF/LRC/ETX
	<<<<<<<<<<<<<<	STX/MT/I#/CRLF/LRC/ETX
	<<<<<<<<<<<<<<	STX/MT/I#/CRLF/LRC/ETX
MT	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	STX/MT/S#/LRC/ETX
MT	>>>>>>>>>>>>>>	

When the Data Manager responds to an "I" message with an MT, the communications link is initialized and ready for use. At this time, the **Host Computer** is the master device and must transmit a Token Transfer ("S") message to make the Data Manager the master device.

Assume that there are two samples to be run, and there are no workorders for these samples in the Data Manager's database. Also assume that the Host Computer has the corresponding workorders for these samples.

STX/MT/Q#/SID 1/LRC/ETX	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT
	<<<<<<<<<<<<<<	STX/MT/Y#/ORDER/LRC/ETX
MT	>>>>>>>>>>>>>>	
STX/MT/E#/VALID/LRC/ETX	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT
STX/MT/Q#/SID 2/LRC/ETX	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT
	<<<<<<<<<<<<<<	STX/MT/Y#/ORDER/LRC/ETX
MT	>>>>>>>>>>>>>>	
STX/MT/E#/VALID/LRC/ETX	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT

The Data Manager now has results and images to transmit to the Host Computer.

STX/MT/R#/RESULT/LRC/ETX	>>>>>>>>>>>>>>	
IMAGE (via FTP)	>>>>>>>>>>>>>>	
	<<<<<<<<<<<<<<	MT
	<<<<<<<<<<<<<<	STX/MT/Z#/VALID/LRC/ETX
MT	>>>>>>>>>>>>>>	

* # = space, /= delimiter for illustrative purposes; not part of transmitted message.

** Initialization message "I" is retransmitted at time intervals determined by the Host Computer. The Initialization message "I" is transmitted at this time interval until a response is received from the Data Manager.

Figure 15a: Dialogue Between the Data Manager and a Host Computer in Query Mode (With Images) (1 of 2)

DATA MANAGER	DIRECTION OF DATA FLOW	HOST COMPUTER

STX/MT/R#/RESULT/LRC/ETX	**>>>>>>>>>>>>>>**	
IMAGE(via FTP)	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/Z#/VALID/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	

Assume that two more samples are to be run, and that the Host Computer only has a workorder for one of them

STX/MT/Q#/SID1/LRC/ETX*	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/NW/SID1/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/Q#/SID2/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/Y#/ORDER/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/E#/VALID2/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**

When the Data Manager has no queries or results to send to the Host Computer, it transmits the Token Transfer ("S") message to make the Host Computer the master device. Since the Host Computer does not need to be the master device, it responds by sending the Token Transfer ("S") message to the Data Manager. This process continues indefinitely, toggling control of the line to each device and keeping the line active until the Data Manager needs to send a Query "Q") message or a Result ("R") message.

STX/MT/S#/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/S#/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/S#/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**
	<<<<<<<<<<<<<<	**STX/MT/S#/LRC/ETX**
MT	**>>>>>>>>>>>>>>**	
STX/MT/S#/LRC/ETX	**>>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<<	**MT**

***#** = space, **/**= delimiter for illustrative purposes; not part of transmitted message.

Figure 15a: Dialogue Between the Data Manager and a Host Computer in Query Mode (With Images) (2 of 2)

Communications Link Error Handling

The following paragraphs discuss the error conditions monitored by the Data Manager and provide recommendations concerning the handling of error conditions by a Host Computer.

Rejecting Messages (NACK Response)

If the transmission quality or identity of a received message is questionable, the message is rejected by the transmission of a NACK (15h) to the message sender. In such cases, retransmission* of the affected message is attempted. If the retransmitted message is again rejected with a NACK, the communication link must be restarted; the Host Computer sends an Initialization "I" message (MT = 30h).
A message must be rejected with a NACK if any of the following conditions occur:

1. The LRC value calculated by the receiving device does not agree with the LRC value contained within the message.
2. The received message contains the wrong message toggle value.

   For example:

DATA MANAGER	DIRECTION OF DATA FLOW	HOST COMPUTER
STX/42h/R#/RESULT/LRC/ETX**	**>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<	**42h**
	<<<<<<<<<<<<<	**STX/36h/Z#/VALID/LRC/ETX**
MT should be 43h and not 36h.		
15h (NACK)	**>>>>>>>>>>>>>**	
Error message:		
Bad MT. MT 36h instead of 43h		
	<<<<<<<<<<<<<	Assume that Host Computer retransmits message using the correct MT (43h)
		STX/43h/Z#/VALID/LRC/ETX
43h	**>>>>>>>>>>>>>**	

3. The wrong message type was received.
   For example:

STX/MT /R#/RESULT/LRC/ETX	**>>>>>>>>>>>>>**	
	<<<<<<<<<<<<<	**MT**
After acknowledgment of a Result message, Host Computer should send a result validation message and not a workorder.	**<<<<<<<<<<<<<**	**STX/MT/Y#/ORDER/LRC/ETX**
15h (NACK)	**>>>>>>>>>>>>>**	
Error message:		
Type 'Y' not correct		
	<<<<<<<<<<<<<	**STX/MT/Z#/VALID/LRC/ETX**
Correct message type received.		
MT	**>>>>>>>>>>>>>**	

* The number of retransmission attempts can be set with an internal parameter. The system can also be set to delay before retrying.

** **#** = space, **/** = delimiter for illustrative purposes; not part of transmitted message.

Reinitialization

The communication link must be reinitialized after any of the following events:

1. The same message is rejected twice.
2. No message or acknowledgment is received within the watchdog interval described on page 49.
3. An incorrect response is received. That is, the received response is neither a NACK nor is it the MT value contained in the last message. Note that this condition is different than condition 2 described in the previous paragraph "Rejecting Messages (NACK Response)" in which the MT value contained in the received message was out of sequence.
   For example:

DATA MANAGER	DIRECTION OF DATA FLOW	HOST COMPUTER
Assume MT = 44h		
STX/44h/E#/VALID/LRC/ETX	**>>>>>>>>>>>>>>**	
Received MT (36h) does not agree with MT (44h) in transmitted message.	**<<<<<<<<<<<<<<**	**36h**
Data Manager receives next workorder sent by Host Computer, but Data Manager is waiting for Initialization "I" message.	**<<<<<<<<<<<<<<**	**STX/45h/Y#/ORDER/LRC/ETX**
15h (NACK)	**>>>>>>>>>>>>>>**	
Error message: Type 'Y' not correct		
Retransmitted workorder is received, but Data Manager is still waiting for initialization.	**<<<<<<<<<<<<<<**	**STX/45h/Y#/ORDER/LRC/ETX**
15h (NACK)	**>>>>>>>>>>>>>>**	
		Host computer sends Initialization "I" message.
	<<<<<<<<<<<<<<	**STX/30h/I#/CRLF/LRC/ETX**
30h	**>>>>>>>>>>>>>>**	

Communications Link Timing

Definition of tls, tS, and Watchdog Time Intervals

Table 3: tls, tS, and Watchdog Time Intervals

TIME INTERVAL	DEFINITION
tls	This parameter is the line switching delay required between message reception and acknowledgment (MT). With respect to the Data Manager, tls is the minimum delay used between any message reception and acknowledgment (MT), and between acknowledgment (MT) and the next transmission. “tls” is entered in the LIS.INI file where it is identified as “Host_Tmt” and its range of values is from 0 ms to 3500 ms. **The “tls” parameter is preset to 25 ms (0.025 s) for the current software version and can be changed by Technical Service personnel only.**
tS	This parameter is the token swap rate. With respect to the Data Manager, tS is the delay between acknowledgment (MT) of the last received message and the transmission of a Token Transfer “S” message. “tS” is entered in the LIS.INI file where it is identified as “Host_Tws” and its range of values is from 0 ms to 30000 ms. Note that the tS value should be greater than the tls value. **The “tS” parameter is preset to 5000 ms (5 s) for the current software version and can be changed by Technical Service personnel only.**
Watchdog	This parameter is the maximum response delay. If no message is received from the Host Computer within this time limit, the Data Manager assumes that the communication link is down, transmits no more messages, and waits for an Initialization “I” message. “Watchdog” is entered in the LIS.INI file where it is identified as “Host_Watchdog” and its range of values is from 0 ms to 40000 ms. The Host Computer should also employ a maximum response delay parameter that will trigger reinitialization when no message is received from the Data Manager within a specified time interval. **With respect to the Data Manager, the “Watchdog” parameter is preset to 20000 ms (20 s) for the current software version and can be changed by Technical Service personnel only.**

Timing Diagrams

Figures 16, 17, and 18 provide timing diagrams for the token transfer, workorder, and results dialogues, respectively.

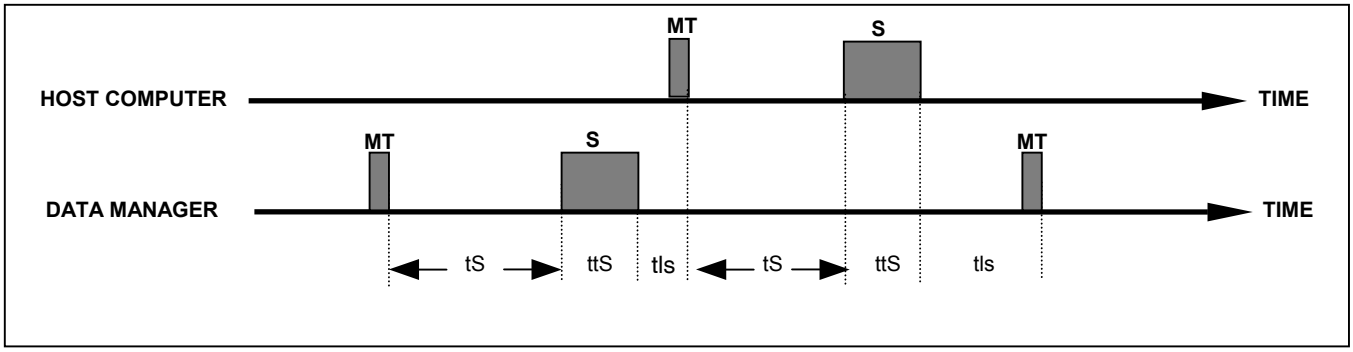
Estimates of Throughput Performance

Figures 19 and 20 graphically provide performance estimates for the workorder and results dialogues, respectively. Table 4 summarizes the throughput performance. These statistics are applicable for the HOST data stream format.

Table 4: Summary of Estimated Throughput Performance*

SPECIFICATION	TRANSMISSION RATE		
	1200 BAUD	4800 BAUD	9600 BAUD
Total time required to handle workorder and result.	11.90 s	7.85 s	7.18 s
Maximum number of samples handled per hour.	303	459	501

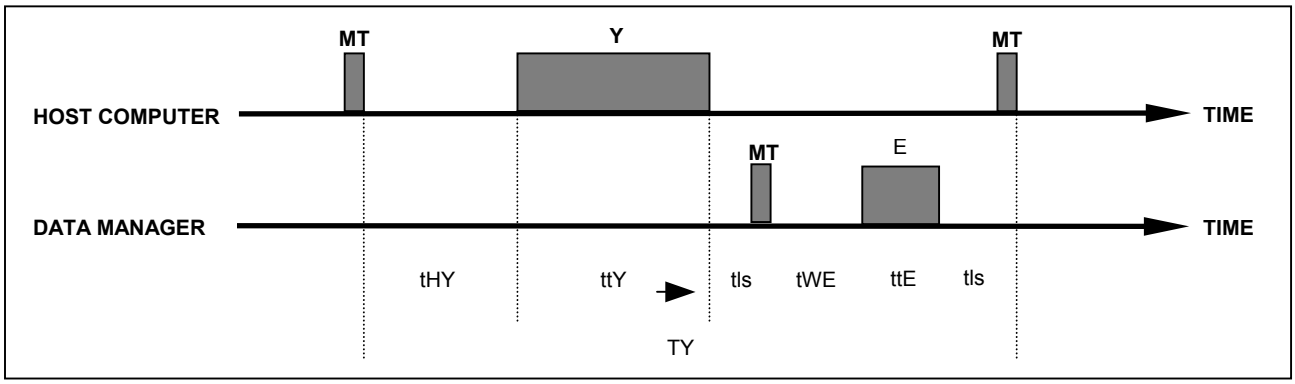
* These performance estimates were obtained by using a “tls” delay of 0.5 s and by requiring the Workorder “Y” and Result “R” messages to handle a large number of tests (34).



LEGEND

TIME INTERVAL	DEFINITION
tS	Delay between acknowledgment (MT) of the last received message and transmission of a Token Transfer "S" message
ttS	Time required to transmit a Token Transfer "S" message
tIs	Delay required between message reception and acknowledgment (MT)

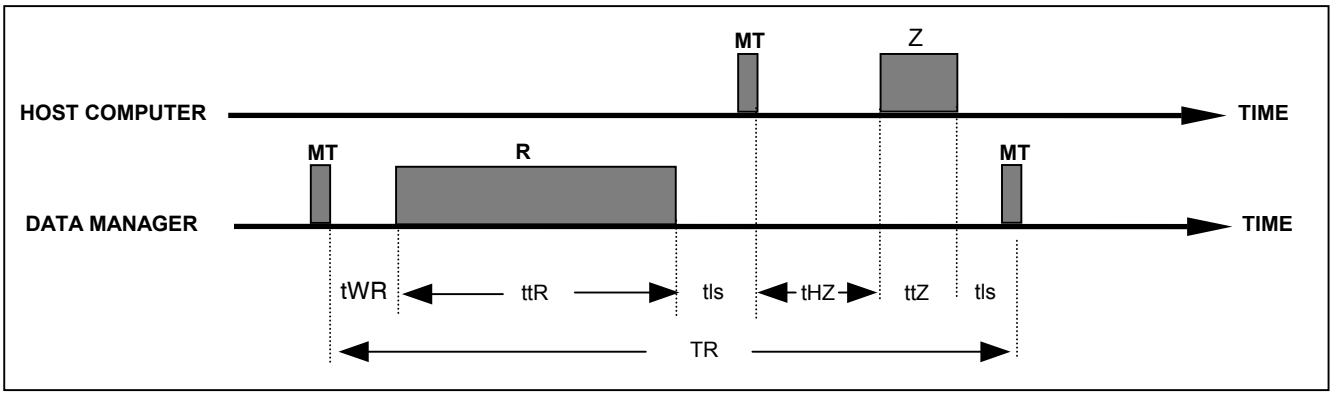
Figure 16: Timing Diagram for Token Transfer Dialogue



LEGEND

TIME INTERVAL	DEFINITION
tHY	Delay required by the Host Computer between acknowledgment (MT) and Workorder "Y" message transmission
ttY	Time required to transmit a Workorder "Y" message
tIs	Delay required between message reception and acknowledgment (MT)
tWE	Delay required by the Data Manager between acknowledgment (MT) and Workorder Validation "E" message transmission
ttE	Time required to transmit a Workorder Validation "E" message
TY	Total time required to handle a Workorder

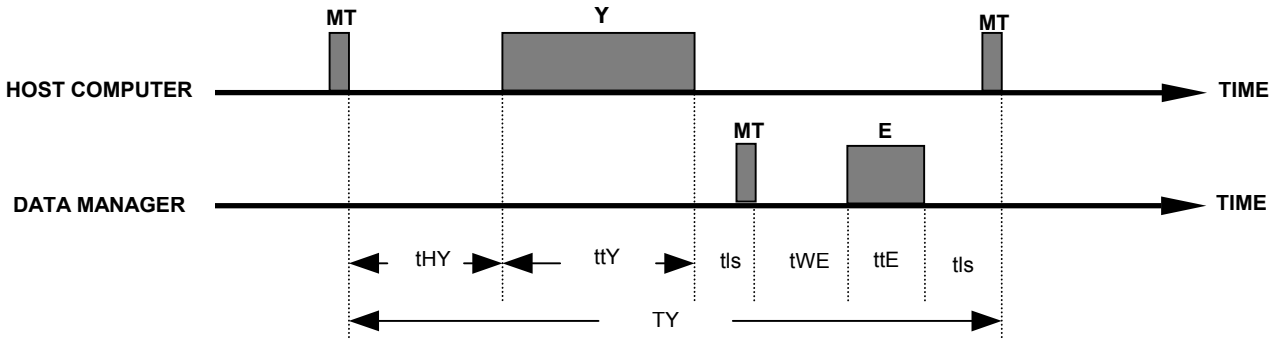
Figure 17: Timing Diagram for Workorder Dialogue



LEGEND

TIME INTERVAL	DEFINITION
tWR	Delay required by the Data Manager between acknowledgment (MT) and Results “R” message transmission
ttR	Time required to transmit a Results “R” message
tls	Delay required between message reception and acknowledgment (MT)
tHZ	Delay required by the Host Computer between acknowledgment (MT) and Result Validation “Z” message transmission
ttZ	Time required to transmit a Result Validation “Z” message
TR	Total time required to handle a Result Validation message

Figure 18: Timing Diagram for Results Dialogue



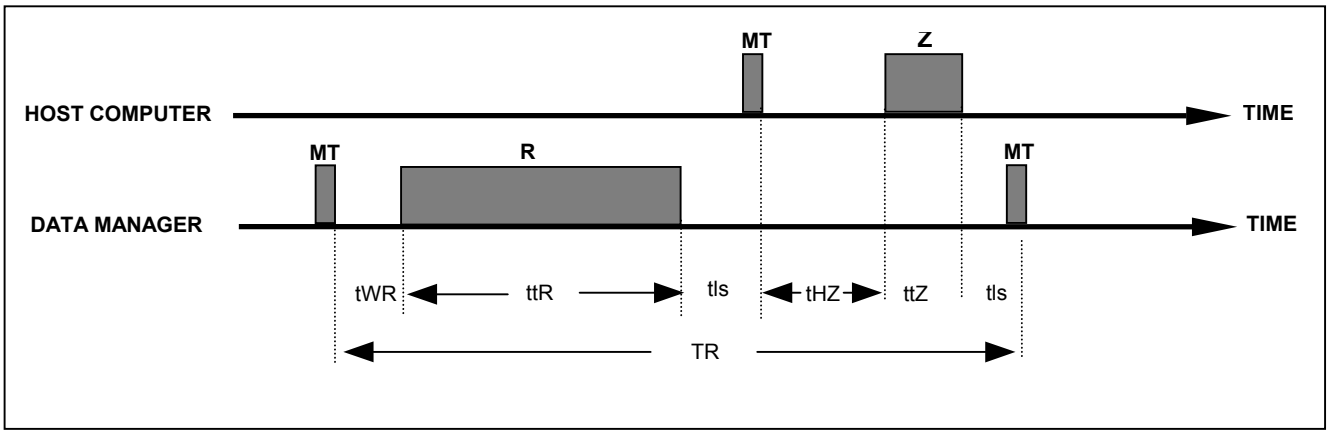
LEGEND

TIME INTERVAL	DEFINITION
tHY	Delay required by the Host Computer between acknowledgment (MT) and Workorder “Y” message transmission (time = 2.00 s)
ttY	Time required to transmit a Workorder “Y” message (time = determined by number of tests requested and baud rate)
tls	Delay required between message reception and acknowledgment (MT) (time = 0.50 s)
tWE	Delay required by the Data Manager between acknowledgment (MT) and Workorder Validation “E” message transmission (time = 1.00 s)
ttE	Time required to transmit an Order Validation “E” message (time = determined by baud rate)
TY	Total time required to handle a Workorder (See Table below)

PERFORMANCE ESTIMATES

TIME INTERVAL	EXPECTED TIMES AT SELECTED TRANSMISSION RATES		
	1200 BAUD	4800 BAUD	9600 BAUD
tHY	2.00 s	2.00 s	2.00 s
ttY	1.98 s	0.49 s	0.25 s
tls	0.50 s	0.50 s	0.50 s
tWE	1.00s	1.00 s	1.00 s
ttE	0.14 s	0.04 s	0.02 s
tls	0.50 s	0.50 s	0.50 s
TY	6.12 s	4.53 s	4.27 s

Figure 19: Performance Estimates for Workorder Dialogue



LEGEND

TIME INTERVAL	DEFINTITION
tWR	Delay required by the Data Manager between acknowledgment (MT) and Results “R” message transmission (time = 1.00 s)
ttR	Time required to transmit a Results “R” message (time = determined by number of tests requested and baud rate)
tls	Delay required between message reception and acknowledgment (MT) (time = 0.5 s)
tHZ	Delay required by the Host Computer between acknowledgment (MT) and Result Validation “Z” message transmission (time = 1.50 s)
ttZ	Time required to transmit a Result Validation “Z” message (time = determined by baud rate)
TR	Total time required to handle a Workorder (See Table below)

PERFORMANCE ESTIMATES

TIME INTERVAL	EXPECTED TIMES AT SELECTED TRANSMISSION RATES		
	1200 BAUD	4800 BAUD	9600 BAUD
tWR	1.00 s	1.00 s	1.00 s
ttR	3.06 s	0.77 s	0.38 s
tls	0.50 s	0.50 s	0.50 s
tHZ	1.50 s	1.50 s	1.50 s
ttZ	0.22 s	0.05 s	0.03 s
tls	0.50 s	0.50 s	0.50 s
TR	6.78 s	4.32 s	3.91 s

Figure 20: Performance Estimates for Results Dialogue

Appendix A: Flexible Communications Format

Introduction

The Flexible Communications Format enables the user to modify the transmitted data stream with respect to selecting which data items are transmitted, locating the position of each data item within the data stream, and specifying individual data item characteristics such as length, justification, and padding. This feature cannot be used to modify transmission of the actual test results (for example, result value, flags).

IMPORTANT

The Flexible Communications Format is intended to be used by software professionals in consultation with Bayer Customer Service Personnel. To avoid degrading performance of the communications link, inexperienced individuals must not attempt to use this feature unaided.

TRAME.PAR File

The communication protocol that connects the Data Manager and a Host Computer is defined by a text parameter file or "frame" that is named "TRAME.PAR". The specific TRAME.PAR file created for your Data Manager is selected during installation of the Data Manager software. For a description of Bidirectional Communication Host Spec. 79 refer to Figures 6 through 13.

Figure A-1 illustrates the original TRAME.PAR file for the HOST data stream.

The TRAME.PAR file contains three parts:

} The first part, a single word on the first line of the file, identifies the data stream type (i. e., HOST).

} The second part lists the data items or "keys" that can be included in a message and specifies their characteristics. Test-related data items for orders and results are not listed because they cannot be modified.

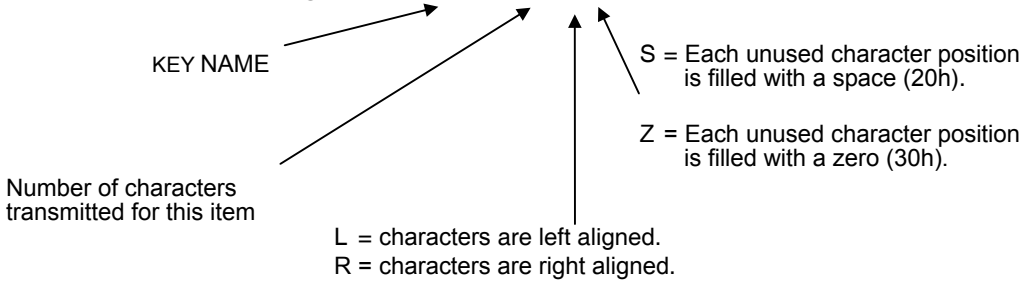
} The third part defines the message frame — the sequence by which data items are transmitted. Depending upon the communications protocol, up to two message frames are provided: one for the Result "R" message, and one for the Workorder "Y" message.

Data stream formats for other messages (I, S, E, Z, Q, N) cannot be modified.

Keys and Their Characteristics

Keys are individual items of patient or sample information. A complete list of available keys is provided in Table A-1. As illustrated below, each key has three revisable characteristics that are enclosed within parentheses and separated by a comma. Each key definition is terminated by a period.

Figure 21: PATNAM=(30,L,S)



The "PATNAM" key specifies the patient name. This data item contains 30 character positions. Filled character positions are left justified. Any unused character positions are filled with spaces. The key name must belong to the list specified in Table A-1.

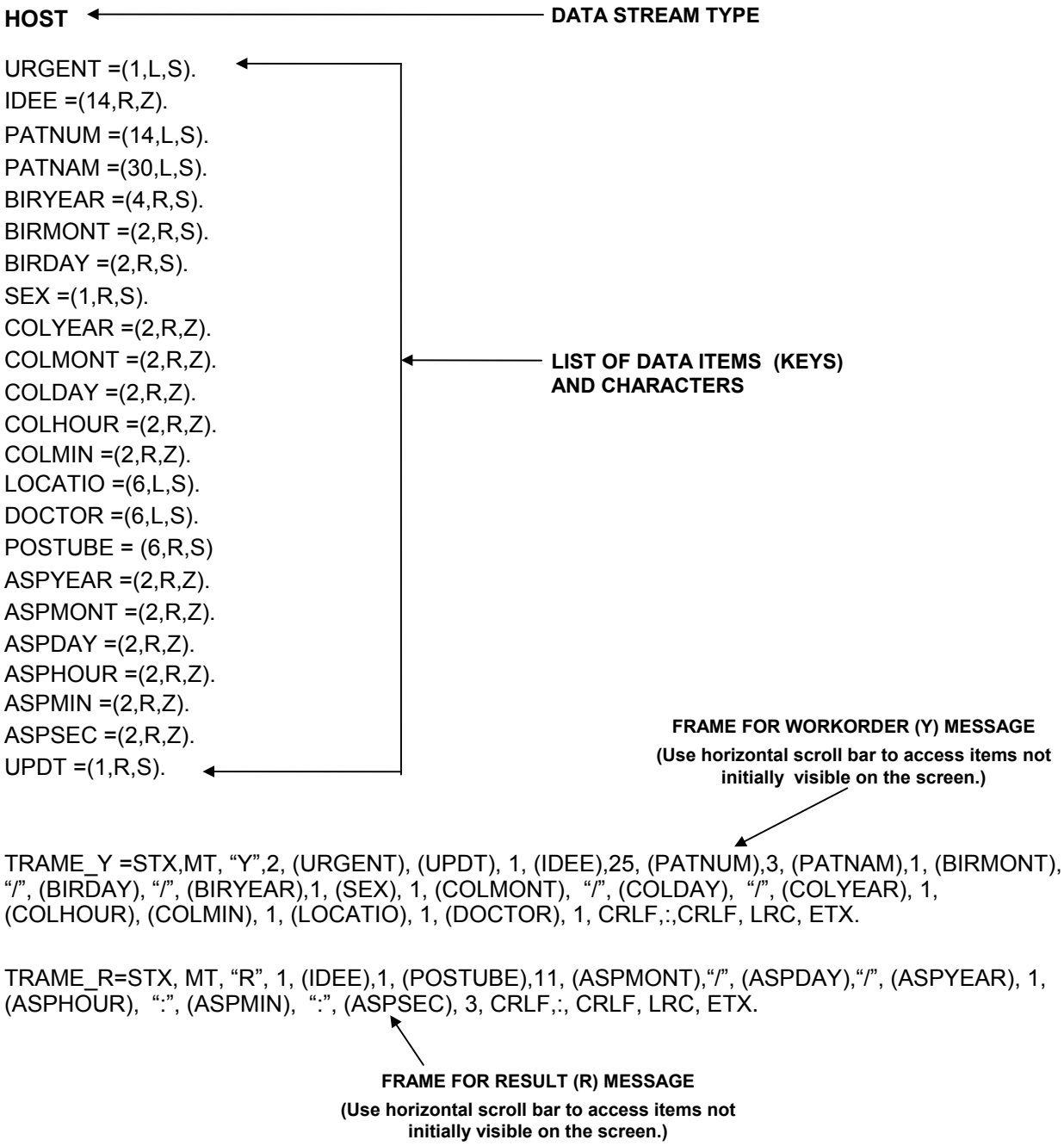


Figure A-1: TRAME.PAR File for Host Spec. 79 Data Stream

```
HOST
URGENT =(1,L,S).
IDEE =(14,R,Z).
SPCODE =(4,R,S).
SPTEXT =(13,L,S).
PATNUM =(14,L,S).
PATNAM =(30,L,S).
BIRYEAR =(4,R,S).
BIRMONT =(2,R,S).
BIRDAY =(2,R,S).
SEX =(1,R,S).
COLYEAR =(2,R,Z).
COLMONT =(2,R,Z).
COLDAY =(2,R,Z).
COLHOUR =(2,R,Z).
COLMIN =(2,R,Z).
LOCATIO =(6,L,S).
DOCTOR =(6,L,S).
POSTUBE =(6,R,S).
ASPYEAR =(2,R,Z).
ASPMONT =(2,R,Z).
ASPDAY =(2,R,Z).
ASPHOUR =(2,R,Z).
ASPMIN =(2,R,Z).
ASPSEC =(2,R,Z).
UPDT =(1,R,S).
TRAME_Y
=STX,MT,"Y",2,(URGENT),(UPDT),1,(IDEE),20,(SPCODE),1,(PATNUM),3,(PATNAM),1,(BIRMONT),"/",
(BIRDAY),"/",(BIRYEAR),1,(SEX),1,(COLMONT),"/",(COLDAY),"/",(COLYEAR),1,(COLHOUR),(COLMIN)
,
1,(LOCATIO),1,(DOCTOR),1,CRLF,:,CRLF,LRC,ETX.
TRAME_R
=STX,MT,"R",1,(IDEE),1,(POSTUBE),6,(SPCODE),(SPTEXT),1,(ASPMONT),"/",(ASPDAY),"/",
(ASPYEAR),1,(ASPHOUR),":",(ASPMIN),":",(ASPSEC),3,CRLF,:,CRLF,LRC,ETX.
```

Figure A-2: TRAME.PAR File for Host Spec. 79 Data Stream (MultiSpecies)

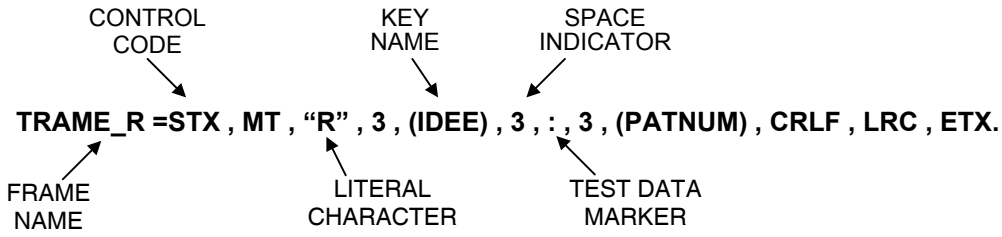
Table A-1: List of Available Keys

KEYNAME	DESCRIPTION	STANDARD FORMAT	APPLICABLE TO MESSAGE
PATNUM	Patient identification number	14, L, S	Y, R
PATNAM	Patient name	30, L, S	Y
SEX	Patient sex*	1, R, S	Y
IDEE	Sample identification number	14, R, Z	Y, R
POSTUBE	Sample Rack and Position #	6, R,S	R
URGENT	STAT sample (Y/N)	1,L,S	Y
LOCATIO	Location code or Location text	6, L, S (code)	Y
DOCTOR	Doctor code or Doctor text	6, L, S (code)	Y
COLYEAR	Sample collection date: Year	2, R, Z	Y
COLMONT	Sample collection date: Month	2, R, Z	Y
COLDAY	Sample collection date: Day	2, R, Z	Y
COLHOUR	Sample collection time: Hour	2, R, Z	Y
COLMIN	Sample collection time: Minutes	2, R, Z	Y
COLSEC	Sample collection time: Seconds	2, R, Z	Y
ASPYEAR	Sample aspiration date: Year	2, R, Z	R
ASPMONT	Sample aspiration date: Month	2, R, Z	R
ASPDAY	Sample aspiration date: Day	2, R, Z	R
ASPHOUR	Sample aspiration time: Hour	2, R, Z	R
ASPMIN	Sample aspiration time: Minutes	2, R, Z	R
ASPSEC	Sample aspiration time: Seconds	2, R, Z	R
BIRYEAR	Patient Birthday: Year	4, R, S	Y
BIRMONT	Patient Birthday: Month	2, R, S	Y
BIRDAY	Patient Birthday: Day	2, R, S	Y
UPDT	Order Update indicator from Host Computer	1, R, S	Y
COCOM	Order Comment Code	5, L, S	Y, R
CPCOM	Patient Comment Code	5, L, S	Y, R
For MultiSpecies Systems Only:			
SPCODE	Species Code	4,R,S	Y,R
SPTEXT	Species Name	13,L,S	R

* Uppercase Only

Message Frame

The message frame specifies the sequence by which data items are transmitted. The elements of a message frame are as follows:



} The Frame Name identifies the message frame.
- TRAME_Y is the message frame used to transmit workorder information.
- TRAME_R is the message frame used to transmit the results.
- The Frame Name is followed by a space and an equal symbol =.

} Control Codes are non-printable characters that mark a specific event or initiate some action.
- STX (Start of Text) control character (ASCII 02h) indicates the beginning of a message.
- MT (message toggle) is a sequential hexadecimal ASCII code that identifies each message packet. For complete details, refer to the paragraph titled "Responding To A Message (MT or NACK)" on page 17.
- Integers (e. g., 3) indicate the number of space characters (ASCII 20h) transmitted. Typically, spaces are used to separate individual data items or to reserve fields for data items not currently used.
- CRLF control characters (ASCII 0Dh and 0Ah) initiate a carriage return followed by a line feed.
- LRC (Longitudinal Redundancy Check) verifies the accuracy of each transmitted message. Before transmission, the value of the LRC byte (expressed in hexadecimal code) is calculated by the "exclusive-or'ing" of all data bytes in the message, with the exception of LRC, STX, and ETX. Since the LRC byte precedes the ETX byte within the data stream, the calculated value for LRC cannot be equal to that of the ETX byte (03h). Therefore, if the calculated LRC value is 03h, the transmitted LRC byte must be 7Fh in order to avoid erroneous action by the receiving device.
- ETX (End of Text) control character (ASCII 03h) indicates the end of a message.

} Literal characters are transmitted exactly as shown except for the quotation marks. Typically, literal characters are used to identify the message ("R") or to organize separate but related data items (e. g., "/ " to delimit day, month, and year data items in a date). Do not include spaces within the quotation marks. For example: To transmit the letter R followed by three spaces, enter: "R", 3. Do not enter: "R _ _ _."

} The key name within parentheses identifies the specific data item that is transmitted.

} The colon (:) (without quotation marks) indicates the position of test related information that has no fixed size. In the "Y" message, the colon (:) indicates where test requests will be transmitted (the number of requested tests is not always the same). Similarly, in the "R" message, the colon (:) indicates where the test results and, if applicable, the sample/system flags and user code will be transmitted (the number of results is not always the same).

} The end of each message frame is indicated by a final period.

Viewing / Modifying TRAME.PAR File Entries

The TRAME.PAR file can be viewed or modified using the **Format** window of the **Tools** icon.
The **View Only** mode is actuated by selecting **Tools View** option from the **Customize** menu tab.
The **Edit** mode (modification) is activated by selecting **System Setu**p then **Tools Modify** from the **Customize** menu**.**

NOTE

Before modifying the TRAME.PAR file, it is strongly recommended that you back up the Dictionary files. This will allow you to recover from any problems arising form an erroneous modifications. The following paragraphs assume that the reader is familiar with operation of the **Format** window. If more detailed information is required, refer to the online Help.

Viewing the TRAME.PAR File

1. Select **Customize** menu.
2. Select **Tools View** tab.
3. Select the **Format** menu item.
4. The **Format** window opens and is titled **View - No file loaded**.
5. Select the **Load** command from the **File** pull-down menu.
6. Select **TRAME.PAR** from list in the dialog box, then select **Ok** command button.
7. The file contents appear within the window which is retitled **View - TRAME.PAR**.
8. When done viewing the file contents, select the **Exit** menu bar command.

Modifying the TRAME.PAR File

1. Select **Customize** menu.
2. Select **System Setup** then **Tools Modify**.
3. Select the **Format** menu item.
4. The **Format** window opens and is titled **Edit - No file loaded**.
5. Select the **Load** command from the **File** pull-down menu.
6. Select the **TRAME.PAR** file from the list in the dialog box, then select **Ok**.
7. Read the important message that is displayed, then select **Ok**.

IMPORTANT

The Flexible Communications Format is intended to be used by software professionals in consultation with Bayer Customer Service. To avoid degrading performance of the communications link, inexperienced individuals must not attempt to use this feature unaided.

8. The file contents appear within the window which is retitled **Edit - TRAME.PAR**.
9. Make desired modifications to the list of data items (keys). See Figure A-1.

   - Use scroll bars to access the remaining file contents.
   - Make desired changes to the key characteristics.

     The syntax of the key entry is fully described on page 54.

     Only one key definition is entered per line.

     The key name must be written in capital letters and it must not exceed seven characters. The key name is followed by a space, and then an equal sign (=).

     The three key characteristics separated by commas are enclosed between parentheses.

     The key entry is terminated with a period.

     A maximum of 50 data items can be included. Only keys listed in Table A-1 can be used.

- Make desired changes to the message frame.

  The syntax of the message frame is fully described on page 58. Items can be deleted directly using **Backspace** or **Delete**. Use **Backspace** to delete characters one at a time. Use **Delete** to erase a block of characters that is selected by dragging the mouse cursor over the desired characters. To add items, use mouse to insert the text cursor at desired place within the frame.

  Only one message frame must be entered per line. The maximum size of the message frame is 255 characters. Do not enter in a space (using **Space Bar**) or a carriage return (using **Return**).

  The frame name must be written in capital letters. The frame name is followed by a space, and then an equal sign (=). The remaining part of the message frame is entered without any keyboard spaces or carriage returns. A comma is used to separate individual message elements.

  The STX control code and MT must follow the equal sign. The message identifier, "Y" or "R", follows MT.

  Key names must be entered within parentheses.

  Enter a number without quotation marks or parentheses to specify the number of spaces to be transmitted between message element. Characters to be transmitted directly as entered (literals) must be enclosed between quotation marks. Do not include spaces within the quotation marks.

  Enter colon ":" without quotation marks or parentheses to indicate where test requests or results are to be inserted.

  The last three message elements must be the CRLF, LRC, and ETX, respectively.

  The message frame is terminated with a period.

10 To save the file contents with your modifications, select the **Save** command from the **File** pull-down menu.

11 When done modifying the file contents, select the **Exit** menu bar command.

If you did not SAVE the file contents with your modifications (step 10), the system will prompt you to do so at this time. If you choose NO, the system EXITs and your modifications **are not saved**.

Lis.ini File Settings for Bidirectional Communication (Host Spec. 79 Serial or Network)

IMPORTANT

A Customer Service Representative can modify the following settings in the Lis.ini file:

} Host_Spy:
Turns the Spy feature on or off. The default is N. Do not change this value; you can turn the Spy feature on and off using **Customer Parameters** in **Tools Modify**.

} Host_Tws:
Sets the time between two "S" messages in ms. The default value is 5000 (5 seconds). The range is 0-30000.

} Host_Tmt:
Sets the minimum delay between message reception and acknowledgement in ms. The default value is 25 (.025 seconds). The range is 0-3500.

} Host_Flag:
Sets the system to transmit the disposition of a result, indicate the result is associated with a Sample/System flag, or both. The default setting is D. When there is no flag or disposition for a result, the system transmits a space.
D = The system transmits the disposition code.
F = The system transmits * if there is a flag.
DF = The system transmits both the disposition code and *.

} Host_Watchdog:
Sets the maximum response delay in ms. The default value is 20000 (20 seconds). The range is 0-40000.

} Host_Maxmt:
Defines the maximum value of the message toggle in hexidecimal notation. The default is 5A.

} Host_Max_Retry_Number:
Sets the maximum number of attempted result transmissions to the host. The default value is 3. The range is 0-99.

} Host_Delay_Before_Retry:
Sets the timeout, in ms, before attempted retransmission of the result message to the host. The default value is 0.

} Host_Send_Initial:
Determines whether the user code is transmitted to the host. The default value is N.

Host Communication Errors Generated by the Flexible Format

When a problem occurs in the Host communications concerning the flexible part of the protocol (TRAME.PAR file), the following error is generated:

TASK : Host Communication

FUNCTION : Error in Host Protocol

COMMENT : Bad analysis for Y message: "Error number"
or Bad analysis for R message: "Error number"

NOTE

A Y (workorder) message is sent from the host computer to the Data Manager. The R (results) message is sent from the Data Manager to the host computer.

This error shows an error message in the following format: ZYYXX

Z= 1 or 2: 1 to indicate a transmission error from the Data Manager to the host (R message), 2 to indicate a reception error from the Host to the Data Manager (Y message).

YY= Key number

XX= Error code

This information can be used by the communications professional to target the problem area. Most syntax errors in the TRAME.PAR file are detected and reported during initialization of the Data Manager. The errors described in Table A-2 are reported when the host communications link is active.

When an error is reported, consider the following:

} Use the key number in the error message to check the key definition in TRAME.PAR.

} Check the value of the data.

} If the reported error indicates bad translation of date or time, verify that the date and time formats are declared correctly in the LSI.INI file (requires assistance from Customer Service Personnel) and are consistent with the Host Computer date and time formats.

The following transmission and reception errors are in addition to those listed in Table A-2.

} Additional transmission errors: 51
5101=Error during buffer allocation
5102=Bad translation of the Aspiration Date format to the protocol format
5103=Bad translation of the Aspiration Time format to the protocol format
5104=Dynamic part – Test#, Result – ("**:**" in the TRAME.PAR) is not found
5105=Incorrect decoding of the tube position (POSTUBE) from Internal Format
5107=Bad translation of the collection time detected

} Additional reception errors: 52
5201=Error during buffer allocation
5202=Bad translation of the Date of Birth incoming from the Host to its internal format
5203=Bad translation of the incoming Collection Date to its internal format
5204=Bad translation of the incoming Collection Time to its internal format

Table A-2: Host Communication Errors Generated by the Flexible Format

KEY IN TRAME.PAR	KEY #	XMIT ERROR #	COMMENT	RECEIVE ERROR #	COMMENT
URGENT	08	10801	Not framed correctly	20801	Field size >1
IDEE	04	10401	Incorrect coding from internal format to LIS	20401	Field size >14
		10402	Not framed correctly	20402	Incorrect coding to Internal format
PATNUM	00			20001	Field size >14
PATNAM	01				
BIRYEAR	31			23101	Field size different from 4, 3, or 2
BIRMONT	32			23201	Field size different from 2
BIRDAY	33			23301	Field size different from 2
COLYEAR	25			22501	Field size different from 4, 3, or 2
COLMONT	26			22601	Field size different from 2
COLDAY	33			23301	Field size different from 2
COLHOUR	34			23401	Field size different from 2
COLMIN	35			23501	Field size different from 2
COLSEC	36			23601	Field size different from 2
ASPYEAR	28	12801	Field size different from 4, 3, or 2	22801	Field size different from 4, 3, or 2
ASPMONT	29	12901	Buffer not correctly filled in.	22901	Field size different from 2
		12902	Field size different from 2.		
ASPDAY	30	13001	Buffer not correctly filled in.	23001	Field size different from 2
		13002	Field size different from 2.		
ASPHOUR	37	13701	Buffer not correctly filled in.	23701	Field size different from 2
		13702	Field size different from 2.		
ASPMIN	38	13701	Buffer not correctly filled in.	23701	Field size different from 2
		13702	Field size different from 2.		
ASPSEC	39	13901	Buffer not correctly filled in.	23701	Field size different from 2
		13702	Field size different from 2.		
SEX	02				
SPFLAG	19	11901	Buffer not correctly filled in		Holdover from earlier version not likely to occur.
ASPECT	13	11301	Buffer not correctly filled in		Holdover from earlier version not likely to occur
LOCATIO	23				
DOCTOR	24				
POSTUBE	07	10701	Buffer not correctly filled in		
		10702	Index Buffer > Buffer Size		
MT	20				
LRC	21	12101	Unable to calculate LRC		

Appendix B: H• System LIS Data Stream Emulation

Introduction

The information contained in Appendix B is directed towards laboratories that currently using Technicon H•1, H•2, or H•3 systems that are interfaced to Host Computers using the standard one-way H•/Host LIS protocol.

This protocol is an emulator of the original Technicon H•1/H•2 protocol, it uses many of the fields as place holders and does not transmit most new ADVIA 120 or 2120 system results and morphology flags. The ADVIA 2120 system does *not* support the H• system LIS data stream emulation.

This communication protocol simulates the standard one-way H•/Host LIS protocol. The communication protocol uses a TRAME.PAR file customized to address the one-way communication needs of the system and the host. For a general description of the TRAME.PAR file, refer to Appendix A.

Information Managed and Processed by the Data Manager

Some formats used by the instrument to manage information are incompatible with the formats defined by the Data Manager. In these cases, the Data Manager must translate the information before processing, then restore it to its original format before sending the data to the host.

The following paragraphs describe only those cases (keywords or data) unique to the H• Emulation TRAME.PAR file.

SEQTUB

SEQTUB defines the Rack and Position number of the tube. This is reflected in the R&P# field on the Data Manager. A zero is added to the left of six characters sent to the host.
The keyword characteristics are: SEQTUB = (7, R, Z).

When samples are run in the open tube or manual closed tube mode 0000000 is sent for the R&P#.

For controls, the value entered in this field is a place holder.

IDEE

IDEE defines the sample identification number. A fourteen-character message is sent by the instrument; however, only twelve characters are recognized by the Data Manager for this H• emulation protocol. In order to transmit this information and match the H• protocol, the default for this field is left-aligned and filled in with spaces up to twelve digits, plus one space up to thirteen digits.

IMPORTANT
To ensure that the correct IDEE number is transmitted to the Host, the IDEE (Bar code) number must be 12 or fewer digits.

If the Host does not interpret the IDEE correctly, try the following to obtain a 13-character field that is right justified with leading zeroes: Use IDEE (13, R, Z), insert a free-text zero before the IDEE keyword and remove the space between the IDEE and SAM keywords. For example: IDEE = (13, R, Z). . . .“0”, (IDEE),(SAM), 1,. . . . Another way would be to set the number of IDEE digits to one higher than you need and the number of space to one less. For example, for 5 IDEE digits, right justified, and padded with zeroes, set IDEE = (6, R, Z) and reduce the number of spaces following the IDEE so . . . (STNNUM), 1, (IDEE), (SAM), 1, “1”. . .

When a tube is misread, the Data Manager assigns an identification number (999xxxx where x is the number of misread tubes) to that tube. For example, if the first tube is misread, the instrument assigns the IDEE “9990001” to that tube. All tubes having readable bar codes are read and assigned the codes specified by the bar code label. When the next misread label is encountered, the code “9990002” is assigned to that tube.

If there is no manual matching on the Data Manager, the 13-digit IDEE number transmitted to the Host Computer for the misread character is “00000999xxxx.”

When a control tube is received from the instrument, The Data Manager identifies the control by:

} Sid# with the C-####-HHMMSS format where ####=the lot number of the control for example.

} Pat# with the 9####00 according to the format defined in the WST.INI file:

When the Data Manager transmits Controls to the Host, the Control SID number is placed in the Patient number field using the following format: 9####00

SAM

SAM originally specified whether a sample was a patient sample or a control sample, but on the ADVIA 120 or 2120 system this field is just a place holder. To differentiate between patient and control samples, use the IDEE field.

Selectivity

Selectivity is defined by a directly transmitted, single character integer within quotation marks (“ ”) defining the type of result message. “0” defines a CBC result, and “1” defines a CBC/Diff result. In the TRAME. PAR file, the value is fixed at “1”, this field is a place holder.

Result Portion of the TRAME.PAR File

Test results are not associated with a test number. Each test has a defined position in the result message. This position number is registered with the Host Computer and is defined in the **host number** field in the Data Manager **Test Dictionary**.

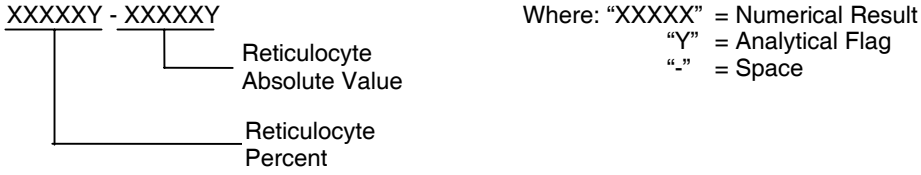
The Data Manager transmits the results, (43 plus 2 Retic tests) exclusively. If test results are missing from the result message, they are replaced by spaces. Test results not initially requested are sent to the Host Computer.

Adding Reticulocyte Data to the Result Message of the Monodirectional Communications Protocol

The following paragraphs describe two new methods of transmitting reticulocyte data to a Host Computer.

The “RETICS” Keyword

This keyword causes reticulocyte data transmitted by the system to be included in the “R” message. This keyword may be inserted in any portion of the “R” message (before the :) which appears in the TRAME.PAR file. The format of the data inserted by the keyword is:



If this transmission method is used, the **Test Dictionary** must be checked. The Host Number for the reticulocyte percentage (% Retics) is 910, while the Host Number for the reticulocyte absolute value (# Retics) is 911. The following procedure describes the addition of Retic data to the host data stream.

1 In the **Test Dictionary**, enter 910 and 911 as the host numbers. Table B-1 illustrates a Test Dictionary example:

Table B-1: Reticulocyte Addition to Test Dictionary

Code	% Retic	# Retic
Type	WB	WB
Active	X	X
Test Number	160	161
Host Number	910	911

2 Revise the TRAME.PAR file using the format tool as follows:
...1,(IDEE),1, (SAM),1,“1”,CRLF, RETICS,1, :,1,CRLF, LRC, ETX.

Substitution of Reticulocyte Data in Place of Unused Parameter

In the **Test Dictionary**, the Host Number for the reticulocyte tests may replace a Host Number currently describing other test parameters. The reticulocyte data will then be transmitted to the Host Computer instead of the data for the replaced test. This transmission method allows the result message format used in the H•1 protocol to remain unchanged.

In some cases an operator may wish to avoid transmitting certain results to the Host Computer. The following example illustrates a situation in which the operator wishes to suppress the LYMPH/NOISE VALLEY and MNY results:

1 Verify that the LYMPH/NOISE VALLEY and MNY tests are not defined in the **Test Dictionary**. If the tests are defined, revise the host numbers to be greater than 71.

NOTE
When selecting a new Host Number, do not select a value used to identify another parameter in the Dictionary. Selecting a value currently assigned to another parameter may result in inaccurate result presentation.

2 To enter the Host Number for % RETIC, click on Update, change the Host Number to 48, then click on **Ok**.
3 To enter the Host Number for # RETIC, click on Update, change the Host Number to 49, then click **Ok**.
4 There is no need to modify the TRAME.PAR file.
The order in which numerical results are communicated to the Host Computer depends on which Host Numbers were used with % RETIC and # RETIC. In the previous example, % RETIC and # RETIC will be communicated in place of LYMPH/NOISE VALLEY and MNY, respectively.

Choosing Binary or ASCII LRC

The monodirectional LIS communications protocol is designed to emulate the Technicon H•1/H•2 communications protocol as closely as possible.

The monodirectional LIS communication protocol has been enhanced to enable the user to use either the existing one-byte binary LRC or a two-byte ASCII LRC. To specify the two-byte ASCII LRC, replace the LRC keyword in the “R” message of the TRAME.PAR file with “ALRC.” The following examples illustrate the one-byte binary LRC and the two-byte ASCII LRC:

One-byte binary LRC:

...1,(IDEE),1,(SAM),1,“1”,CRLF, RETICS, :,1,CRLF,LRC,ETX.

Two-byte ASCII LRC:

...1,(IDEE),1,(SAM),1,“1”,CRLF,RETICS,:,1, CRLF,ALRC,ETX.

The following technical information is required by the individual responsible for programming the Host Computer:

} The LRC is an Exclusive-OR of all the characters in the "R" message except the STX character and the ETX character; however, if its calculated value is 03 (ETX), a value of 127 (7F hex) is substituted. For example, if the default LRC value of 127 (7F hex) is to be transmitted: in the one-byte binary format, the Data Manager transmits 7F hex; however, in the two-byte ASCII format, the Data Manager may transmit 37 hex and 46 hex (the equivalents of the ASCII characters 7 and F, respectively).

Data Not Transmitted to the Host Computer

Sample/System ("asterisk") flags are not transmitted by the Data Manager and are replaced by 8 spaces sent to the Host Computer with the Extended Output.

Primer samples are not managed by the Data Manager and not transmitted to the Host Computer.

Five spaces replace the data in transmissions to the Host Computer, for the link number.

No disposition, nor color associated with the result is transmitted to the Host Computer.

Calibrator samples are not managed by the Data Manager, nor are they transmitted to the Host Computer.

TRAME.PAR file and Result Message Description

Upon installation, select **H•1 Protocol**.

An example of the TRAME.PAR file is:

```
H*
SEQTUB = (7,R, Z)
STNNUM = (3, R, Z)
ASPYEAR = (2, R, Z)
ASPMONT = (2, R, Z)
ASPDAY = (2, R ,Z)
ASPHOUR = (2, R, Z)
ASPMIN = (2, R, Z)
IDEE = (13, L, S)
SAM = (1, R, Z)
TRAME_R
= STX, MT, "R", 1, (SEQTUB), 1, (ASPDAY), "/", (ASPMONT), "/", (ASPYEAR), 1, (ASPHOUR), ":",
(ASPMIN), 1, (STNNUM), 1, (IDEE), 1, (SAM), 1, "1", CRLF ,:, CRLF, LRC, ETX.
```

This file begins with the name of the Emulator Protocol.

Result Part of the Message Structure

Results (numeric or flags) are separated by a single space.

WBC RBC HGB HCT MCH MCHC RDW HDW CR LF
PLT MPV PDW PCT CR LF
NEUTABS LYMPHABS MONOABS EOSABS BASOABS LUCABS CR LF
NEUT% LYMPH% MONO% EOS% BASO% LUC% CR LF
LI MPXI RBCFLAG WBCFLAG CR LF
ANISOFLAG / MICROFLAG / MACROFLAG / VARFLAG / HYPOFLAG / HYPERFLAG
/ LEFTSHIFT / ATYPFLAG / BLASTFLAG / OTHERFLAG1 / OTHERFLAG2 / CR LF

NOTE

The RBCFLAG, WBCFLAG, OTHERFLAG1 and OTHERFLAG2 are place holders. (These flags are not generated by the system.)

%PEROXNOISE LYMPH/NOISEVALLEY MNY(Y position of MN cluster) CR LF
(Include CR and LF only if using the Extended Output option.)

If the **Extended Output** option is defined, these eight-character codes follow those listed above.

NOTE
Because many of these errors do not exist on ADVIA 120 or 2120 systems, eight spaces are transmitted instead.

WBC(PEROX) CHCM WBC(BASO) CR LF

WBC(PEROX)ERROR / RBCERROR / HGBERROR / MCVERROR / RDWERROR / HDWERROR / CHCM ERROR / CR LF

PLTERROR / MPVERROR / PDWERROR / NEUT%ERROR / LYMPH%ERROR / MONO%ERROR / CR, LF

EOS%ERROR / BASO%ERROR / LUC%ERROR / MPXIERROR / WBC(BASO)ERROR / LIERROR

IMPORTANT
No images, Sample/System flags, or User Codes are transmitted to the Host.

The 43 tests defined by the Data Manager are divided into two groups: tests with numerical results and Morphology flags with symbols that correspond to severity levels.

Numeric results are 5-character codes which have an associated analytical flag, which is defined by a single character.

Morphology flags are expressed with up to four characters.

The **Extended Output** option allowing the transmission of CHCM, WBCP, and WBCB values in addition to other results in the result message may be managed by the Data Manager provided it is defined in the LIS.INI file by [Host] Host_H•_ Extended _Output parameter.

Parameters to be Defined

The following parameters must be defined in the LIS.INI file:

} ADVIA 120 Code Comment:
Used to define whether the “Morphology flags” are processed by the Data Manager. (WDR.PAR) (use with Host Spec. 79)

} Host_Max_Retry_Number:
Used to define the maximum number of message result transmission attempts to the host.

} Host_Delay_Before_Retry:
Used to define the timeout before the retransmission attempt of the result message to the host.

} Host_H•_ACK_NACK:
Defines whether “ACK/NACK” mode is used in the H•/host protocol.

IMPORTANT
A Customer Service Representative must define ACK/NAK parameters as required before your host communication is set up. (The message toggle will not be incremented for each sample unless ACK/NAK is turned on).

} Host_H•_Extended_Output:
Defines whether **Extended Output** option is included in the result message.

Communication also depends on the following parameters: Host_Watchdog, Host_Spy, Host_Tws, Host_Tmt, Host_Maxmt.

Parameter Setting

The table below provides the fixed positions assigned to result messages. These positions are used when completing the **Host number** field in the **Test Dictionary**.

Table B-2: Tests (and Default Host Numbers) Reference List for H•1 Protocols

TEST CODE	HOST No.	TEST CODE	HOST No.	TEST CODE	HOST No.
WBC	1	%LUC	25	MNy	49
RBC	2	Lobularity Index	26	WBCP	50
HGB	3	MPXI	27	CHCM	51
HCT	4			WBCB	52
MCV	5				
MCH	6				
MCHC	7				
RDW	8				
HDW	9				
PLT	10				
MPV	11				
PDW	12	ANISO	36		
PCT	13	MICRO	37		
#NEUT	14	MACRO	38		
#LYMPH	15	VAR	39		
#MONO	16	HYPO	40		
#EOS	17	HYPER	41		
#BASO	18	Left Shift	42		
#LUC	19	ATYP	43		
%NEUT	20	BLASTS Flag	44		
%LYMPH	21				
%MONO	22				
%EOS	23	%Perox noise 1	47		
%BASO	24	Noise/LYMPH valley	48		

One-Way Host Communication Notes

The H•1 Protocol does not support Coded Comments:

ADVIA 120 Coded Comments must be set to NO.

If a "core" numeric test parameter is edited with characters (Coded Comments), that sample will not be transmitted to the host. An error message "Invalid numerical test result format host test #" will be generated.

If a ratio result can not be calculated then ***** is displayed in the result field. Because of ***** the sample will not be transmitted to the host. The Data Manager gives the following error message "Invalid numerical result format host test #." To avoid this, either take a "Delete" disposition on the ratio or Edit or Rerun the component of the ratio so the ratio will be recalculated.

Only the * symbol flag is sent to the Host Computer. Dispositions are not transmitted with the H•1 Protocol.

Additional Unidirectional Considerations

} To select Unidirectional communication, select the H•1 protocol upon installation.
} If the Technicon H•1, H•2, or H•3 system formerly sent the link number in the TRAME.PAR file add...(SAM), 1, "1", 5, CRLF, :, CRLF. . . in order to keep the spacing to the Host Computer the same. (5 spaces are sent).
} If the Technicon H•1 H•2, or H•3 system formerly had ACK/NAK ON, then SET the parameter HOST_H*_ACK_NAK to YES in the LIS.INI file. (This parameter will only be seen if one way communication is loaded at installation).
} If the Technicon H•1, H•2, or H•3 system was setup to transmit in Extended Output, then in LIS.INI determine if **Extended Output** is set to Yes or No. If Yes, it allows for the transmission of any of the following parameters to the Host Computer: Morphology flags, CHCM, WBCP and WBCB values. To set Extended Output to YES, set Host_H •_Extended_Output parameter to YES in LIS.INI.
} The WDR.par file will NOT translate the morphology flags for:+,++,+++ to slight, moderate and severe respectively
} It does not allow partial transmission of results to the host.
} It does not allow for the transmission of the disposition to the host
} ADVIA 120 Coded Comments must be set to NO.
} The TRAME.PAR file must be modified to add the retic test or substitute the retic test for another test in the **Test Dictionary**.

When ACK/NAK = NO:

The LIS indicator on the Instrument Control Panel will remain red regardless of whether the LIS port is active or not.

If the Host Computer is not accepting data, the validated samples will not remain in Current Complete, instead they will move to the Complete status. To keep the samples in Current Complete until the host is back on line:

} Verify in **Routine Parameters** that the Patients and Controls have an "x" next to them in the Host Transmission box.

} Before running samples, in **Tools Modify**, take the Host Computer off line in the **Port Configuration** screen.

} Return to**Tools View** to run and validate samples.

} When the host is active again, through **Tools Modify**, put the host on line.

} Return to **Tools View**; samples are transmitted to the host.

} MT will not increment.

When ACK/NAK = YES:

If the Host Computer should fail to operate, the following conditions occur:

} The **Port Configuration** will still have the Host device indication as online.

} Routine Parameters will have the Host Transmission for Patients and/or Controls as activated.

} The first sample validated after the host failed to operate moves to the complete status and a message appears on the status line: “Tube xxxx not transmitted yet. Waiting for Host response.” (xxxx=Sid#).

} All other samples validated after the first sample, move to and remain in Current Complete.

When the Host Computer is operational again, the first (Complete) sample along with all the samples in Current Complete are transmitted to the Host Computer.

Appendix C: Additional Information

"REVIEW NONE" Validation Mode

The "Review None" validation mode allows the laboratory to perform validation of results at their Host Computer, while allowing the user to employ all other Data Manager features (for example, **Quality Control, Order Entry, Tools, Sample Control Panel**).

The "Review None" validation mode allows the user to transmit all patient results provided by the analyzer to a Host Computer, without having to perform validation procedures at the Data Manager. All results, regardless of value ranges, analytical flags, and dictionary parameters, can be transmitted directly to the laboratory Host Computer. **It is the responsibility of the laboratory to ensure that any results transmitted to a Host Computer can only be accessed by authorized personnel.**

If required, the laboratory can use the Hold status feature in conjunction with the "Review None" mode.

Patient Samples

In "Review None" mode only the Delete disposition as specified in the **Alarm Dictionary** can be automatically applied. Color range flags and delta check flags are applied, but no rerun dispositions can be applied. The patient samples are automatically placed into the Current Complete file to be transmitted to the Host Computer or printer. After transmission to the Host Computer or printer, the results are placed into the Complete file.

To retransmit a patient sample, the sample status can be changed from Complete to Current Complete.

Control Samples

In "Review None" mode, Quality Control samples are held in the incomplete file and require validation. Quality Control samples can be moved to the incomplete status from the Hold, Current Complete, or Complete status. To "Review None" for controls in Customer Parameters set "Review None" mode for control samples =Y.

To retransmit a control sample, the sample status can be changed from Complete to Current Complete.

Customer Parameters

The following parameters appear in the **Customer Parameters** window and should be reviewed by the laboratory interested in operating in the "Review None" mode. These parameters can customize the installation by providing options for the management of unmatched samples and Host management of rerun requests.

Description:
Option for whether all misread samples are to be set to UNMATCHED.
Default value:Y
MISREAD SAMPLE SET TO UNMATCHED [Y, N]=Y

Description:
Option for whether all unmatched samples, except misread, are to be set to UNMATCHED.
Default value: Y
UNMATCHED SAMPLE SET TO UNMATCHED [Y, N]=Y

If either or both of these parameters is set to "Y," when matching is performed in "Review None" mode (either automatically or manually using the same or different Sid#) the sample is automatically placed in the Current Complete (then the Complete) file.

The following parameter allows a laboratory's Host Computer to order reruns (Spec.79 only). When this parameter is set, a workorder (regardless of update indication) sent from the host will cause the Complete file record to be deleted and the new workorder containing the rerun selectivity to be added to the Pending file.

Description:

Option for whether a sample in COMPLETE file can be deleted and replaced by a Workorder downloaded from the HOST.
Default value: N
REPLACE SAMPLE IN COMPLETE BY A WORKORDER [Y, N]=Y

To allow a sample in the Complete file to be deleted and replaced by a workorder downloaded from the Host Computer, type Y (Yes) for this parameter.

NOTE

For accurate review of the data at the Host Computer, analytical flags should be included in the data transmitted to the Host Computer. This option can be selected by Customer Service personnel only.

The "Review None" mode should be selected only when the Total Transmission option is also selected. This option can be selected by Customer Service personnel only.

Workorder Update from the Host Computer

When the Host Computer sends a workorder to the Data Manager, the message contains an indicator specifying that this order is an update to currently existing sample.

If the SID# and the Sample Type match an existing sample and this sample is not in the Unmatched or All Complete status, the update order is accepted and processed as follows:

} Demographic data in the existing sample is replaced by the contents of the update workorder. If the patient ID is different, the patient ID is updated and a message is reported to the **Error Log**.

} Sample data for the existing sample are replaced by the contents of the update workorder.

} Any new test requests (with optional previous results) are added.

NOTE

A previous result cannot be added to an existing test request if a result was already received for this test.
The sample with its new test requests is moved to the Pending file except in the following cases:

- An Incomplete sample remains in Incomplete status
- A Hold sample remains in Hold status
- In partial transmission, a sample in Current Complete remains in Current Complete and will move to Pending status after sending results to the Host Computer as usual.

} A test request is deleted from the existing sample only when the test request in the existing sample does not contain a **current** result.

If the update workorder corresponds to an Unmatched sample, the matching occurs automatically (regardless of the update indicator value). However, if the sample type of the update workorder does not match the sample type of the Unmatched sample, the matching process does not occur, the transmitted workorder is rejected, and a message is reported to the **Error Log**.

If the existing sample is in the All Complete status, the All Complete sample is not modified, and a new workorder is created in the Pending file.

If the update workorder does not match an existing sample, the update workorder is managed as a new workorder.

IMPORTANT

To avoid reporting results for the wrong patient, do not assign the same SID number to more than one patient number. A typical incident in which duplicate SID numbers were assigned to different patient samples is described as follows: A workorder for John Smith was assigned SID = 1000, and PID =100. A workorder for Jane Jones was also assigned a SID =1000 and PID =101. Both workorders were downloaded to the Data Manager and accepted, for example, E message code = 0. However, the second workorder was discarded by the Data Manager but it was never reported to the Host Computer as being discarded. At the Host Computer SID1000 is linked with PID101 and at the Data Manager SID 1000 is linked with PID 100. This kind of problem could cause the results to be matched up with the wrong Patient ID number. At this time Host Spec. 79 Protocol does not include any logical error (e error) for this type of problem, it is the responsibility of the Host Computer to ensure that the problem does not occur.

Partial Transmission to the Host Computer

The patient results can be “partly” transmitted from the Data Manager to the Host Computer.

The “partial transmission” feature allows available sample results to be sent without having to wait for a missing result or a rerun result. This feature is supported for the Host Spec. 79 Protocol, but not for the H• Protocol.

Figure C-1 illustrates the status changes associated with the partial transmission of sample results.

All results are transmitted. The result record should include dispositions so that the Host Computer can “filter” accepted and nonaccepted (rerun) results.

The results are transmitted in validation order.

If you modify the communication setting in the **Routine Parameters** window, this modification is applied to the sample currently moving to the Current Complete status, but not to any samples already in the Current Complete status.

If the Final Patient Report option is selected in the **Routine Parameters** window, this report is not printed for a “partial results” record.

The Time Interval Parameters defined for the host transmission are applicable to “partial results” records. If the transmission is not successful after the specified number of retries, the "partial results" record is moved to the Pending file status.

If the host communication link fails when “partial results” records are already in the Current Complete file status, these records remain in the Current Complete file status.

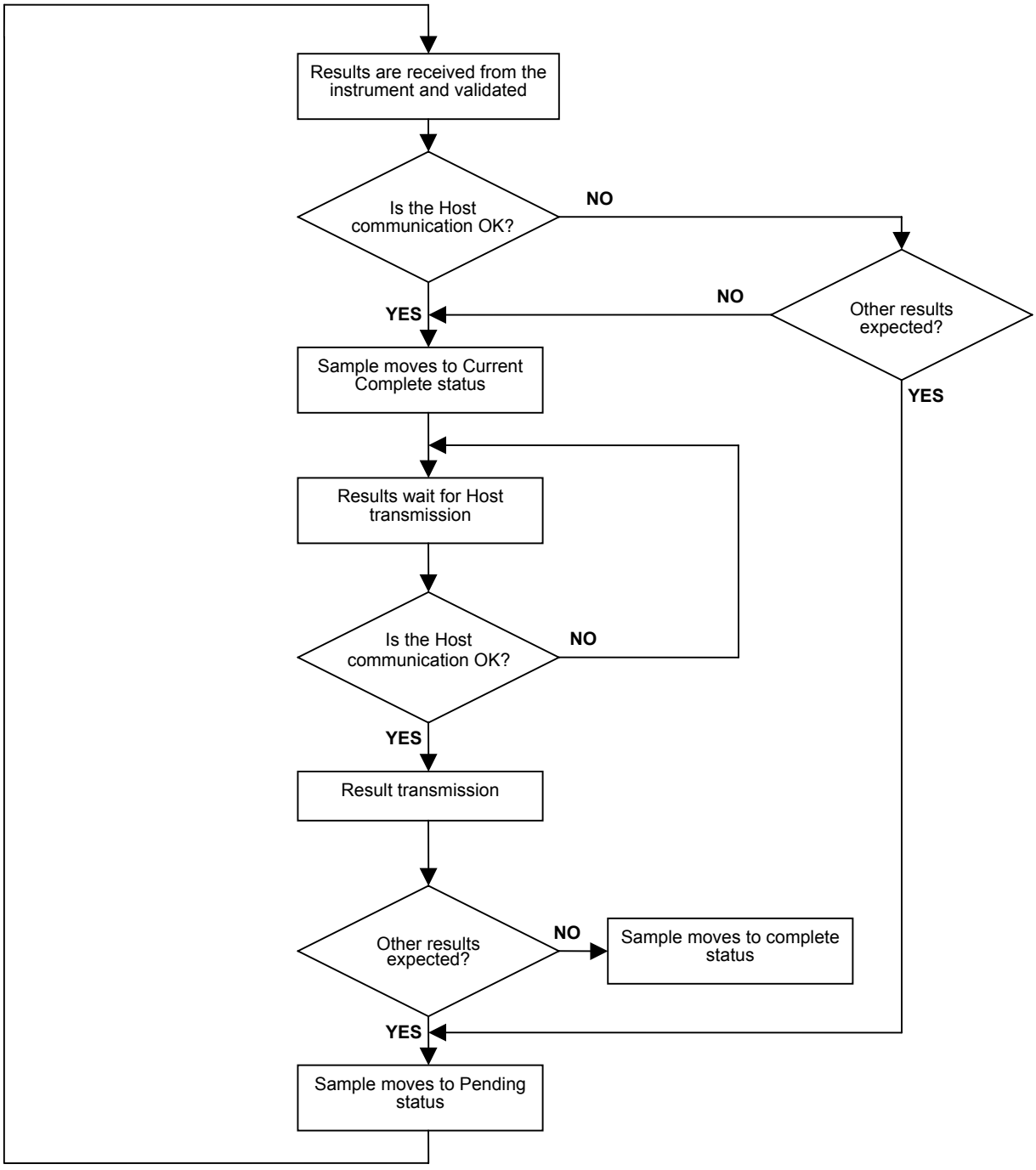
The Partial Transmission feature is preset to **OFF**. For accurate evaluations of the data by the Host Computer, dispositions should be included in the results transmitted to the Host Computer. Both of these options can be selected by Customer Service personnel only.

Control Results

Host Computers receiving control results must be prepared to manage the duplicate sample IDs that are created when the same control is run more than once.

Figure C-1: Partial Transmission Flow Diagram

This figure illustrates the status changes associated with the partial transmission of sample results.



Transmitting Sample/System Flags to the Host

You can transmit the Sample/System flags and user code associated with a sample to a host computer.

} To set the system to transmit the Sample/System flags, in the **Customer Parameters** window set **+SAMPLE SYSTEM FLAGS TRANSFER TO HOST = Y**.

} Your Field Service Engineer must set your system to transmit the User Code.

} If the system is set to use the Review None validation mode and no workorder is associated with a sample when the results are transmitted, the user code **???** will be sent.

} If the system is set to transmit all results regardless of the tests selected in the workorder, the user code for all unrequested tests is transmitted as three blank spaces.

Table C-1: Sample/System Flags

Flag Name	2-Char. Code (transmitted)	6-Char. Code
Baso Count Suspect	BC	B-SUSP
Baso Irregular Flow Rate	BR	BIFR
Baso No Valley	VB	B-NV
Baso Noise	NB	B-NO
Baso Saturation	BS	B-SAT
Baso Temperature Out of Range	TB	BTO
Comparison Error MCHC/CHCM	CC	CHCMCE
Comparison Error WBCB/WBCP	WC	WBC-CE
Hgb Irregular Flow Rate	HR	HGBIFR
Hgb Power Low	PH	HGB-PL
Laser Power Low	PL	LAS-PL
Myeloperoxidase Deficiency	MO	MPO-D
Nucleated Red Blood Cells	RB	N-RBC
Perox Irregular Flow Rate	XR	PXIFR
Perox No Valley	VX	PX-NV
Perox Noise	NX	PX-NO
Perox Power Low	PX	PX-PL
Perox Saturation	XS	PX-SAT
Perox Temperature Out of Range	TX	PXTO
Platelet Clumps	NW	PLT-CL
Platelet Noise	NT	PLT-NO
Platelet Origin Noise	OT	PLTORN
RBC Irregular Flow Rate	RR	RBCIFR
Retic - Plt Interference	CT	RTCINT
Retic Abs Dist Abnorm	CA	RTCADA
Retic Absorption Flatness	RF	RTC-FL
Retic Fit Suspect	FC	RTC-FS
Retic Irregular Flow Rate	CR	RTCIFR
Retic Noise origin	NO	RTC-NO
Retic RBC Count Low	CL	RTC-L
Retic Saturation Cells	CS	RTCSAT
Retic Slope Error	SE	RTC-SE
WBC Substitution	WS	WBCSUB

Troubleshooting Tips for Host Communication

} If the host receives image files that appear to be 0 KB, perform the following:

1. Open Port Configuration in Tools Modify.
2. Double-click LIS.
3. Change the Received Time Out to a value between 60 and 90, depending on the needs of your system and network.
   - If your system is using Host Spec 79 Network, you can edit the value directly on the **Device Details** window.
   - If your System is using Host Spec 79 Serial, you must click **Image** to open the **Image Transfer** box in order to change the value. Enter the value and click **OK**.
4. In the **Device Details** window, click **OK**.

} If your system is set to query to Host for workorders and you notice that the system is running samples using the default selectivity more often than expected:

1. In the **Customer Parameters** window (**Customize** menu, **System Setup** tab, **Tools Modify**), increase **QUERY TO HOST TIME-OUT** to **13**.
2. Make sure the S message is sent to the Data Manager within two (2) seconds.

} To view the messages sent between the Data Manager and Host,use the Spy File. See "Using the Spy File" on page 79.

} To assist in troubleshooting image transfer to the host, enable the trace feature in the **Commuiw.ini** file located in the **C:\Winnt** directory on the system PC.

1. Using Notepad, open **Commuiw.ini**.
2. Change the setting **LogLevel** from **0** (no trace log) to **4** (full trace log).
3. Optional: The entry **LogFile = C:\WST\commlog.txt** determines the path and name of the trace log file that the system will create. You can enter a different path or name if necessary.
4. Save the file and close notepad. The system will now generate a trace log file which will be useful for troubleshooting image transfer.
5. After troubleshooting, make sure to set **LogLevel** back to **0** to avoid unnecessary disk use.

} If, on occasion, you are missing the first image after initialization, your Bayer Filed Service Representative can change the following FSE Parameter setting in the Lis.ini file: **Host_Watchdog=40,000**.

} Whenever you have problems with Host communication, view the **Trame.par** file in the **Format** window using **Tools**. Make sure the **Trame.par** file matches what you expect in your Host data stream.

} Switching the system software to **Tools Modify** mode breaks the communication link between the system and the Host computer. Make sure your Host computer is set up to handle this condition.

} If host query (Q mode or F mode) is not working correctly, make sure the **Wst.ini** file contains the following settings:

Uiw_IdReader=Y
Uiw_PosMode=Y
Uiw_SidOnly=Y

} Using the host computer to delete pending workorders from the system:

In order for the host to delete a pending workorder, it must send an updated workorder (Y message with UPDT=A) for that SID with no tests requested.

} Using the host computer to delete complete sample records from the system:

In **Customer Parameters**, set **Replace sample in complete by a workorder = Y**.

The host must send an updated workorder (Y message with UPDT=A) for that SID with no tests requested to the system. The laboratory does not then need to do an SID reset or purge the database.

} Sending a system number to the host computer:

1. In Tools Modify, Format, modify the R message of the trame.par file to include the system number.
2. Modify the host program so it expects the system number in the position of the result stream.
   - Starting segment of the current R message:

     Trame_R=STX,MT,"R",1,(IDEE),1,(POSTTUBE),11,(ASPMONT),"/".....
   - Same segment with the system number (1001) entered:

     Trame_R=STX,MT,"R",1,(IDEE),1,(POSTTUBE),1,"1001" ,6,(ASPMONT),"/".....

} If you are setting up a Network LIS connection on a Standalone PC, and the system software gives 'Analyzer Not Connected' when the simulator is active:

1. Shut down the system software.
2. On the Windows **Start** menu, point to **Settings**, and then click **Control Panel**.
3. In the **Control Panel** window, click **Network**.
4. Click the **Protocols** tab.
5. Select the **TCP/IP Protocol** and click **Properties**.
6. Make sure the subnet address of the LIS Card is different from the Instrument Card. If it is not the same, change it, and then click **OK**.
7. Change the order of the network cards.
   a. Click the **Bindings** tab.
   b. From the **Show Bindings for** pull-down menu, choose **all protocols**.
   c. Double-click **TCP/IP Protocol**.
   d. Select one of the network cards under **TCP/IP Protocol,** and then change the order by clicking either the **Move Up** or **Move Down** button.
   e. Click **OK**.
8. Restart the computer.

} If you get open port errors:

If you are using Host Spec. 79 Serial, check the COM1 setting in Windows (Control Panel, Ports).

If you are using Host Spec 79 Network:

1. Verify the LIS address and name are correct in C:\winnt\system32\drivers\etc\hosts.
2. Verify that the last line is empty in C:\winnt\system32\drivers\etc\services.

Using the Spy File

To activate the spy file

1. Using **Customer Parameters** in **Tools Modify**, set **TRACE SPY ACTIVATION ON LIS COMMUNICATION =Y**. (Refer to the *Operator's Guide* for detailed instructions on how to change **Customer Parameter** settings.)
2. Leave **Tools Modify** and initiate Host communication. Make sure the **LIS** indicator on the **Sample Control Panel** is green.
3. When you finish troubleshooting, reset **TRACE SPY ACTIVATION ON LIS COMMUNICATION =N**.

Locating and viewing the spy file

In **Tools View,** use **Spy View** to view the **Host.Spy** file. (Refer to the *Operator's Guide* for detailed instructions on how to use Spy View.) The **Host.spy** file is located in the **C:\Wst** folder on the system PC. You can also view **Host.spy** in any text editor.

Understanding the spy file

Host.spy logs all messages that the system sends or recieves.

A message that the system receives is logged as follows:

1. IN (12/13/99 13:54:50)
2. → 1 S
3. e←

Line 1 of the message indicates that it is an incoming message with arrival date and time. Text between → and ← is the actual message received.

A message that the system sends is logged as follows:

1. OUT (12/13/99 13:55:07)
2. → :S
3. n ←

Line 1 of the message indicates that it is an outgoing message with the date and time it was sent. Text between → and ← is the actual message sent.

When there is no communication between the system and the host computer, a message ***&* TIME OUT** is logged in the file after each timeout period. The timeout period is specified in the system software.

Figure C-2: A condensed example of a spy file (with images transmitted)

```
IN (02/18/99 10:31:16)
-> 0I |002|/wst/|
g <-
…

OUT (02/18/99 10:34:46)
-> WQ 00000000040801
, <-
IN (02/18/99 10:34:47)
->W<-
IN (02/18/99 10:34:48)
-> XY     00000000040801                    PATIENT_ID31     PATIENT_NAME 31
01/01/1969 M 01/01/99 1259 LOCAT1 DOCTO1
00100200303605100403900904104003800600700503701101301201007707800807691592
29209139199129189249149219179239119 10
  <-
OUT (02/18/99 10:34:48)
->X<-
OUT (02/18/99 10:34:48)
-> YE        10
  <-
IN (02/18/99 10:34:49)
->Y<-
OUT (02/18/99 10:34:49)
-> ZS
  <-
IN (02/18/99 10:34:50)
->Z<-
IN (02/18/99 10:34:50)
-> 0S
d <-
…

OUT (02/18/99 10:37:23)
->;<-
OUT (02/18/99 10:37:26)
-> <R 00000000040801 006-03          02/18/99 10:35:05
  1 6.29 bay  2 5.03 bay|CC|  3 17.7 bay|CC|  4 62.9 bay|CC|  5125.3 bay|CC|  6 35.2 bay|CC|
7 28.1 bay|CC| 51 30.5 bay|CC|  8 14.2 bay|CC|  9 2.43 bay|CC| 10  266 bay 11 10.8 bay910
0.6 bay|FC|911 27.8 bay|FC|921134.1 bay|FC|914121.4 bay|FC|922 27.2 bay|FC|915 29.8
bay|FC|912 36.3 bay|FC|919 36.0 bay|FC| 38  +++ bay 40  +++ bay 12 49.2 bay 13 0.29
bay917 13.6 bay|FC|918 2.40 bay920 4.33 bay|FC|923 10.7 bay|FC|924 2.61 bay913 4.51
bay|FC|250    3 bay
  <-
IN (02/18/99 10:37:26)
->><-
IN (02/18/99 10:37:27)
-> =Z                0
P <-
OUT (02/18/99 10:37:27)
->=<-
OUT (02/18/99 10:37:27)
-> >S
j <-
IN (02/18/99 10:37:28)
->><-
IN (02/18/99 10:37:28)
-> ?S
k <-
```

Initialization message sent from the LIS

Some toggling back and forth has been removed here.

Data Manager workorder query

Workorder message from the LIS

Data Manager workorder confirmation

S message from the Data Manager

S message from the LIS

Some toggling back and forth has been removed here.

Results from the Data Manager
(The image file is test #250)

LIS result confirmation

S message from the Data Manager

S message from the LIS

Configuring a Network Connection

IMPORTANT

The ADVIA 120 and ADVIA 2120 systems use different operating system software. Make sure you use the appropriate procedure below.

Configuring the ADVIA 120 Network Connection

1. Plug in the network cable to the second network port on the PC, which is either a separate card or a port on the motherboard.
2. Log on using a field service name and password.
3. On the **ADVIA 120 Shell**, click **Close.**
4. Configure the network card:
   a. On the **Start** menu, click **Settings** and then select **Control Panel**.
   b. In the **Control Panel** window, double-click **Network Settings**.
   c. Click **Identification**.
   d. Click **Change.**
   e. Enter a unique name for the computer.
   f. Enter the name of the workgroup for this network. This name must be the same on all computers on the network.
   g. Click **OK**.
   h. If the system asks if you want to restart the computer, choose **No**.
   i. Click **Bindings**.
   j. Click S**how bindings for all adapters**.
   k. Open adapter #2 and activate all protocols. Disable **Netbui protocol**.
   l. Click **OK**.
   m. Restart the computer.
5. Log on using a field service name and password.
6. On the ADVIA Shell, click **Close.**
7. Set the IP address for the local network:
   a. Right-click **Network Neighborhood**, or use the **Control Panel** to navigate to **Network Settings**.
   b. Click **Protocols.**
   c. Select **TCP/IP** and then click **Properties**.
   d. Select adapter #2 and enter the unique IP address for this computer or click **dhcp** for automatic IP address selection.
      If selecting **dhcp** a dialog box appears. Click **Yes.**
      If selecting a unique ip address, make sure that the subnet mask for the second network card is different from the one used for the first card. **Do not** change the subnet mask on the first network card, which connects to the instrument!
   e. Click **Apply** and then **OK** and **OK**.
   f. Restart the computer.
8. Log on using a field service name and password and then start the ADVIA 120 system software.

Configuring the ADVIA 2120 Network Connection

1. Plug in the network cable to the second network port on the PC, which is either a separate card or a port on the motherboard.
2. Log on using a field service name and password.
3. On the **ADVIA 2120 Shell**, click **Close.**
4. Configure the network card:
   a. Right-click **My Computer** and then select **Properties**.
   b. In the **System Properties** window, click the **Network Identification** tab.
   c. Click **Properties**.
   d. Enter a unique name for the computer.
   e. Click the workgroup radio button and enter the name of the workgroup for this network. This name must be the same on all computers on the network.
   f. Click **OK** and **OK**.
   g. In the **Control Panel** window, double-click **Network and Dial-up Connections**.
   h. Right-click **Local Network** and then select **Properties.**
   i. Select **Internet Protocol (TCP/IP)** and then click **Properties**.
   j. To use automatic IP detection, select **Obtain an IP address automatically**.
   To enter a static Ip address, select **Use the following IP address** and then enter the IP address and subnet mask. Make sure that the subnet mask for the second network card is different from the one used for the first card. **Do not** change the subnet mask on the first network card, which connects to the instrument!
   k. Click **OK**, close all windows, and then restart the computer.
5. Log on using a field service name and password and then start the ADVIA 120 system software.