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Bidirectional Computer Interface Specification for VITEK® Systems

bioMérieux®, Inc.
Box 15969
Durham, North Carolina 27704-0969 / USA
Tel. (1) 800-682-2666

bioMérieux sa
au capital de 11 879 045 €
673 620 399 RCS LYON
69280 Marcy l'Etoile / France
tél. 33 (0)4 78 87 20 00 / fax 33 (0)4 78 87 20 90
http://www.biomerieux.com

Argentina
bioMérieux Argentina s.a.
Av. Congreso 1745
(C1428BUE) Capital Federal
Buenos Aires
tel. (54) 11 5555-6800
fax (54) 11 5555-6888

Australia
bioMérieux Australia P/L
Unit 25, Parkview Business Center
1 Maitland Place
Baulkham Hills NSW 2153
tel. (61) 2 8852 4700
fax (61) 2 8852 4777

Austria
bioMérieux Austria GmbH
Eduard-Kittenberger-Gasse 97
Top 3
A-1230 Wien
tel. (43) 186 50 650
fax (43) 186 50 661

Belgium
bioMérieux Benelux s.a./n.v.
Media Square
18–19 Place des Carabiniers
Bruxelles 1030
tel. (32) 2 743 01 70
fax (32) 2 733 55 97

Brazil
bioMérieux Brasil SA
Estrada Do Mapuá
491 Jacarepaguá
CEP 22710 261 Rio de Janeiro RJ
tel. (55) 21 2444 1400
fax (55) 21 2455 6099

Canada
bioMérieux Canada, Inc.
4535, Dobrin
Saint Laurent (Québec) H4R 2L8
tel. (1) 514 336 7321
fax (1) 514 336 6450

Chile
bioMérieux Chile S.A.
Seminario 131
Providencia
Santiago
tel. (56) 2634 20 92
fax (56) 2634 20 93

China
bioMérieux China Limited
Unit 1701-2, 17/F, Nanyang Plaza
No. 57 Hung To Road, Kwun Tong
Kowloon - Hong Kong
tel. (852) 2356.7033
fax (852) 2330.2085

Colombia
bioMérieux Colombia Ltda
Diagonal 109 # 20A - 33
Bogotá
tel. (57) 1 619 64 70
fax (57) 1 619 69 10

Denmark
bioMérieux Danmark Aps
Smedeholm 13C
2730 Herlev
tel. (45) 70 10 84 00
fax (45) 70 10 84 01

Finland
bioMérieux Suomi Oy
Rajatorpantie 41 C
01640 Vantaa
tel. (358) 9 8545 6000
fax (358) 9 8545 6045

France
bioMérieux SA
69280 Marcy l'Etoile
tel. (33) 0(4) 78 87 20 00
fax (33) 0(4) 78 87 20 90
http://www.biomerieux.com

Germany
bioMérieux Deutschland GmbH
Weberstrasse 8
D 72622 Nürtingen
tel. (49) 7022 30070
fax (49) 7022 36110

Greece
bioMérieux Hellas S.A.
Papanikoli 70
15232 Halandri
Athens
tel. (30) 210 81 72 400
fax (30) 210 68 00 880

India
bioMérieux India Pvt. Ltd
D-45, Defense Colony
New Delhi 110 024
tel. (91) 11 2 464 88 40
fax (91) 11 2 464 88 30

Indonesia
bioMérieux Asean
Enseval Building
Kawasan Industri Pulo Gadung -
Jl. Pulo
Lentut No. 10
Djakarta Timur 13920
tel. (62) 21 461 51 11
fax (62) 21 460 41 07

Italy
bioMérieux Italia S.p.A.
Via Fiume Bianco, 56
00144 Roma
tel. (39) 06 52308.1
fax (39) 06 52308.240

Ivory Coast
bioMérieux Afrique Occidentale
08 BP 2634
Rue Joseph Blohom - Cocody
Abidjan 08
tel. (225) 22 40 93 93
fax (225) 22 40 93 94

Japan
bioMérieux Japon, Ltd.
Seizan Bldg.,
12-28 Kita-Aoyama 2-chome
Minato-ku, Tokyo 107-0061
tel. (81) 3 5411 86 91
fax (81) 3 5411 86 90

Korea
bioMérieux Korea Co., Ltd.
7th floor YooSung Building
830-67, Yoksam-dong,
Kangnam ku
Séoul
tel. (82) 2.547.6262
fax (82) 2.547.6263

Mexico
bioMérieux México SA de CV
Chihuahua 88, col. Progreso
México 01080, D.F.
tel. (52) 55 5481 9550
fax (52) 55 5616 2245

Netherlands (The)
bioMérieux Benelux BV
Boseind 15
P.O. Box 23
5280 AA Boxtel
tel. (31) 411 65 48 88
fax (31) 411 65 48 73

New Zealand
bioMérieux New Zealand Ltd.
22/10 Airbourne Road
North Harbour Auckland
tel. (64) 9 415 0601
fax (64) 9 415 0603

Norway
bioMérieux Norge AS
Økernveien 145
N-0513, Oslo
tel. (47) 23 37 55 50
fax (47) 23 37 55 51

Phillipines (The)
Representation Office
bioMérieux Phillipines
11th floor, Pearlbank Centre
146 Valero Street, Salcedo Village
1227 Makati City
tel. (632) 817 7741
fax (632) 812 0896

Poland
bioMérieux Polska Sp. Z. o.o.
ul. Zeromskiego 17
01-882 Warszawa
tel. (48) 22 569 85 00
fax (48) 22 569 85 54

Portugal
bioMérieux Portugal, Lda.
Rua Alto do Montijo, Lotes 1 e 2
Portela de Carnaxide
2794-070 Carnaxide
tel. (351) 21 424 59 80
fax (351) 21 418 32 67

Russia
o.o.o. bioMérieux
Petrovsko-Razoumovskii proyezd, 29
127287 Moscow
tel. (7) 095 212 10 26
(7) 095 424 79 38
fax (7) 095 214 95 41

Spain
bioMérieux España s.a.
Manual Tovar, 36
28034 Madrid
tel. (34) 91.358 11 42
fax (34) 91.358 06 29

Sweden
bioMérieux Sverige AB
Hantverksvägen 15
436 33 Askim
tel. (46) 31 68 84 90
fax (46) 31 68 48 48

Switzerland
bioMérieux Suisse s.a.
51, avenue Blanc
Case postale 2150
1211 Genève 2
tel. (41) 22.906 57 60
fax (41) 22.906 57 42

Taiwan
Representation Office
bioMérieux China Limited - Taiwan Branch
RM 608, No. 6-3 Ching Cheng Street
Taipei 105
tel. (886) 2 2545 2250
fax (886) 2 2545 0959

Thailand
bioMérieux Thailand Ltd
Regent House Bldg, 16th Floor
183 Rajdamri Road, Lumpini,
Pathumwan
Bangkok 10330
tel. (66) 2 651 98 00
fax (66) 2 651 98 01

Turkey
bioMérieux Diagnostik A.S.
Yenisahra Mah.
Caliskan Sok. No. 4
34746 Kadiköy / Istanbul
tel. (90) 216 472 81 30
fax (90) 216 472 81 35

United Kingdom
bioMérieux UK Ltd
Grafton Way, Basingstoke
Hampshire RG22 6HY
tel. (44) 1256.461881
fax (44) 1256.816863

USA
bioMérieux, Inc.
100 Rodolphe Street
Durham NC 27712
tel. (1) 919 620 20 00
fax (1) 919 620 22 11

Vietnam
Representation Office
bioMérieux Vietnam Rep. Office
Sai Gon Center Bldg. 11th Fl.
65 Le Loi District 1
Ho Chi Minh City
tel. (632) 817 7741
fax (632) 812 0896

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OVERVIEW OF BCI

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Introduction

bioMérieux® manufactures instruments for microbiological analysis and data collection. This document contains detailed information about the bidirectional software used to interface between the VITEK, VITEK 2, and VITEK 2 Compact systems and Laboratory Information System (LIS) host computers.

You should assume that the contents of this manual relate to all bioMérieux instruments (VITEK, VITEK 2, & VITEK 2 Compact). If the content does not relate to every instrument, the manual clarifies which instrument, in text.

IMPORTANT: ***For VITEK and VITEK 2, this specification covers BCI versions R06.01 and higher. For VITEK 2 Compact, BCI is integrated into the VITEK 2 Compact software.***

Instruments mentioned in this specification can be interfaced as stand-alone systems or in combination with several bioMérieux or other vendor instruments.

The shared bioMérieux computer can be any VITEK or VITEK 2 systems workstation running BCI. The workstations must interface with similar

instruments. For example, a single bioMérieux computer workstation can use BCI to communicate with multiple VITEK 2 systems. It can not use BCI to communicate with a network of various types of instruments (for example, VITEK 2 and VITEK 2 Compact).

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Product References and Terminology

This is a partial listing of product names and acronyms used throughout this specification.

Table 1-1: bioMérieux Acronyms

TERM	DEFINITION
BacT/ALERT®	bioMérieux blood culture diagnostic system. BCI interfaces between the BacT/ALERT system and bioLIAISON®.
BacT/VIEW®	A component of the BacT/ALERT blood culture system.
BCI	Bidirectional Computer Interface. bioMérieux computer interface software.
bioLIAISON (bioLIAISON)	bioMérieux database software (VITEK & VITEK 2 only)
bmx	bioMérieux
Download	Data transfer from the host computer to a VITEK computer.
TheraTrac® 2	bioMérieux pharmacy database and intervention system.
Upload	Data transfer from a VITEK computer or instrument to a host computer.
VITEK (VTK) VITEK	bioMérieux present system for bacteriological analysis. Consists of both instrument and software components.
VITEK 2 VITEK	bioMérieux system for microorganism identification and antimicrobial susceptibility testing (ID/AST). Consists of both instrument and software components.
VITEK 2 Compact VITEK 2 compact	bioMérieux new system for microorganism identification and antimicrobial susceptibility testing (ID/AST). Consists of both instrument and software components.
Workstation	IBM computer with an AIX operating system (VITEK and VITEK 2) or a personal computer with an XP operating system (VITEK 2 Compact).

System Design

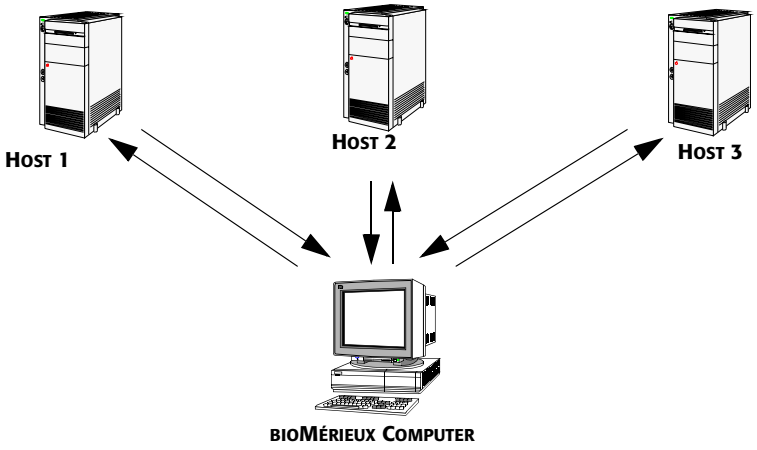

Figure 1-1: Overview of System Design

BCI is organized into two independent layers. The lowest is a communications layer which establishes sessions and ensures that raw data transmissions are free of errors.

Above that is an applications layer responsible for transmitted message content and for updating the database on the bioMérieux computer. Between these two layers is an interface that defines the interaction of the layers with each other.

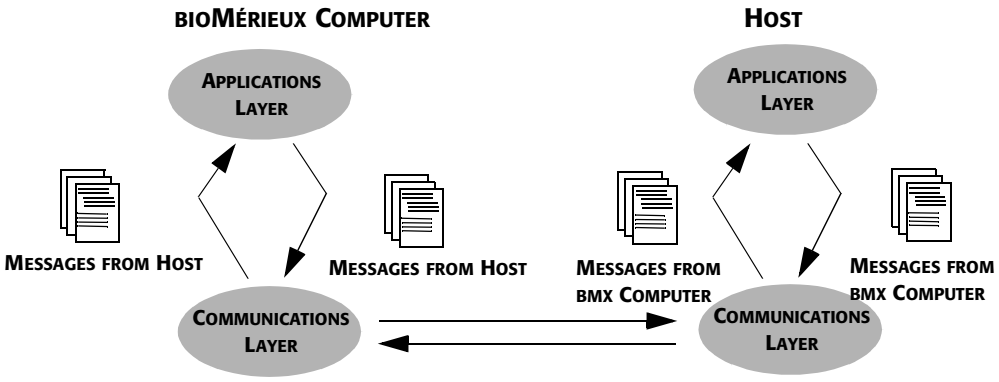

Figure 1-2: The Two Layers of the BCI Interface

Communications Layer

This layer controls the physical and logical communication with a host computer. It includes a set of rules (the protocol) for error free exchange of messages between the bioMérieux computer and the host. Checksums in the communications layer detect transmission errors.

Applications Layer

Virtual communication between the bioMérieux computer and host is established through the applications layer. Because this layer is only concerned with transmitted message content, the details of the communications protocol are transparent.

Software Components

Communications Layer Program

This program controls the actual data transfer process. All data is presented as eight-bit values within a range of 0 to 255. Values between 0 and 127 are defined by the ASCII standard. Values between 128 and 255 are defined by either ISO-8859-1 or IBM-850 (VITEK and VITEK 2 only).

VITEK

Note: *Kanji character sets in VITEK and VITEK 2 use the extended UNIX codes (EUC) although Japanese customers should still select ISO-8859-1.*

BCI users can modify configuration items such as baud rate, time outs, and field separators.

VITEK 2 compact

Note: *In VITEK 2 Compact, data is transferred in either ISO-8859-1, Shift-JIS, or UTF-8. Kanji character sets should typically choose Shift-JIS as the encoding.*

Demographics Download Program

The demographic download program controls the processing of data downloaded from a host. Patient, specimen, and exam information is stored in the bioMérieux computer database.

VITEK

Note: *In VITEK and VITEK 2, information can be routed to other systems.*

Note: *In VITEK and VITEK 2, ID, susceptibility, and smear tests and results that follow an exam can be downloaded and transferred to the bioLIAISON database.*

Downloaded data can be sent to the bioMérieux computer at any time. Updates to existing patient, specimen, exam demographics, tests, and results

are allowed, but specimen demographics must always have corresponding patient and exam identifiers.

Note: *It is assumed that all information from the host computer is correct.*

Result Upload Program

The results upload program controls transmission of results to the host computer(s). VITEK, VITEK 2, VITEK 2 Compact and BacT/ALERT results upload to the host with enough demographic information to link with the correct patient, specimen, exam, or test on the host computer(s). If necessary, results can be retransmitted.

Utilities Program

This program allows BCI users to configure a bioMérieux computer with the appropriate communications settings for compatibility with a host. It also allows them to transmit test patterns, display communications data on the screen, and access status and error logs.

Level-to-Level Message Definitions

The bioMérieux and host computers exchange messages between both the communications and applications layers.

Communications Level Messages

Table 1-2: BCI Supported Protocols

Communication Protocol	Applicable Instruments	Documentation
ASTM E1381	VITEK and VITEK 2	Documentation for the ASTM E1381 protocol is available in the ASTM Standards.
bioMérieux Literal and bioMérieux Alternate	VITEK, VITEK 2, and VITEK 2 Compact	For information about the bioMérieux communications protocol, see “bioMérieux Communications Protocol” on page 2-1.

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Applications Level Messages

Applications level messages can be sent from the host computer to the bioMérieux computer or from the bioMérieux computer to the host.

There are three types of applications messages from the host to a bioMérieux computer: patient information (**mpr**), out of service (**oos**), and back in service (**bis**).

Table 1-3: bioMérieux Computer to Host Messages

Message Type	Description
Patient Information (mtmpr)	This message indicates a download of patient, specimen, and exam demographics. In VITEK and VITEK 2, it can also include tests and results if programmed optionally by an LIS.
Out of Service (mtoos)	This message tells the bioMérieux computer that the host is going out of service and will not respond to any messages. The bioMérieux computer can continue to receive messages from the host, but it will not attempt to transmit. Application messages from the bioMérieux computer to the host queue up for later transmission.
Back in Service (mtbis)	This message tells the bioMérieux computer that the host is back in service. Upon receiving this message, the bioMérieux computer resumes transmission and sends any queued messages.

There are also three types of messages a bioMérieux computer can send to the host: results (**rsl**), out of service (**oos**), and back in service (**bis**).

Table 1-4: bioMérieux Computer to Host Messages

Message Type	Description
Results (mtrsl)	Results from instruments transmit in a literal format. Demographics can be sent with results.
Out of Service (mtoos)	This message tells the host that the bioMérieux computer is going out of service. During this time, the bioMérieux computer will not respond to downloads from the host, but it can continue sending messages to the host.
Back in Service (mtbis)	This message tells the host that the bioMérieux computer is ready to receive downloads.

VITEK

Note: *BCI R06.01 and higher has a routing feature. A downloaded mtmpr can be routed back to another port as an upload. VITEK 2 Compact does not support this feature.*

Hardware Requirements

For VITEK or VITEK 2, BCI runs on any bioMérieux workstation that has one or more available RS-232 serial TTY ports.

For VITEK 2 Compact, BCI runs on a bioMérieux PC that has one or more serial COM ports.

Note: *BCI can use one or more ports, with each capable of uploading and downloading.*

bioMérieux Communications Protocol

Chapter Contents

Introduction

VITEK 2 compact

Note: *VITEK 2 Compact does not support the ASTM protocol.*

BCI supports both the ASTM E1381 protocol and its own bioMérieux communications protocol. This specification only describes the bioMérieux communications protocol.

Note: *For information on the ASTM protocol, see ASTM E1381 documentation.*

The bioMérieux communications protocol works with BCI to ensure an accurate data flow between a bioMérieux computer and instruments and a host (LIS) computer. It is responsible for establishing sessions, data transfer, and error detection.

Basic Message Content

- Either computer can begin a session by transmitting the ASCII control character **<ENQ>**. If the computer receiving the inquiry is ready to receive data, it responds with the acknowledgment character **<ACK>**. If it is not ready, it sends a **<NAK>** character. Sessions end when one of the computers receives an **<EOT>** character.
- Data transfer between the host and bioMérieux computer takes place using communications messages (data packets). A communications message begins with the ASCII start character **<STX>**.
- Subsequent records begin with the ASCII record separator character **<RS>** or the group separator **<GS>**. The **<RS>** records contain the text of the message. A checksum must follow the **<GS>** separator.
- Communications messages end with the **<ETX>** character.
- There can be only one **<STX>** and **<ETX>** character per data packet. At least one **<RS>** record must be in the packet. There will always be one **<GS>** record per packet.
- Records can be terminated with the ASCII carriage return/line feed characters **<CR><LF>**. Each record type has a fixed format as shown in the following diagram.

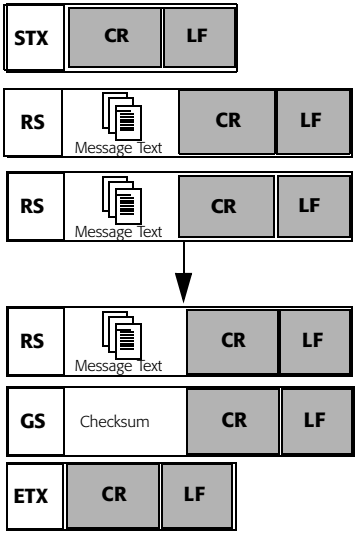

Figure 2-1: BCI Protocol

Records and Characters

Table 2-1: Record and Character Descriptions

Record/ Character	Description
STX (CR/LF)	Signals the start of a message packet. It is a single character record that expects no response from the target computer.
ETX (CR/LF)	Signals the end of a message packet. It is also a single character record that expects no response from the target computer.
RS (CR/LF)	This record contains specific message information of up to 80 printable ASCII characters per record. There can be any number of **<RS>** records in a data packet. It does not expect a response from the target computer.
GS (CR/LF)	This record contains a checksum that determines if the packet was received properly. Calculation of checksums begin with the first **<RS>** and end with the **<GS>** character. Checksums are calculated by adding the values of appropriate characters, truncating the most significant part of the result (leaving an 8-bit number), and converting this value to two ASCII characters representing the hexadecimal value of the number. An **<ACK>** or **<NAK>** is always expected in response to this record type. See the topic for a description of the checksum.
ENQ (CR/LF)	This is the line request character. It establishes a session between the sending and receiving computers.
EOT (CR/LF)	The sending computer sends this character to the receiver to signal the end of the session.
ACK	Upon receipt of a **<GS>** record, this character is sent to indicate successful transmission of the data packet. It is also used by the receiver to respond to receipt of an **<ENQ>**.
NAK	This signals a negative response when a session is not possible or when a transmission error was detected by a bad checksum or parity error.

Terminology

Table 2-2 lists basic and bioMérieux-specific terms and concepts used throughout this specification.

Table 2-2: Terms and Descriptions

Term	Description
Session	A session consists of a connection between the host and a bioMérieux computer. Data transfer in a single session can only go in one direction at a time. The initiator of the session is the sender and the other computer is the receiver. The ASCII line request character **<ENQ>** starts the session. **<EOT>** signals the end of the message and session.
Applications level message	The bioMérieux computer will never send more than one applications level message per session, but it can receive more than one per session. An applications level message contains patient, specimen, and exam demographics and results. It must always be complete so that the receiving applications layer can process the message correctly. The applications level message starts with **mt** and ends with either the next **mt** (if there are multiple applications level messages per session) or with an **<EOT>**, **zz** or **<GS>**.
Communications level message	The communications layer sends an applications level message through one or more communications level messages. The communications layer divides the applications message into 1,920 character blocks and sends each block consecutively. Adding the ASCII control characters **<STX>**, **<RS>**, **<GS>**, and **<ETX>** to each block of the applications level message creates the communications level messages. These characters describe the beginning and end of a communications level message and establish control of transmission errors. A communications level message always has an **<STX>** indicating the start of the message and one **<ETX>** indicating the end. Each block is further subdivided by the **<RS>** character into records from one to eighty characters long. The **<GS>** character marks the beginning of transmission error control information. In order to handle transmission errors effectively, there is always one **<GS>** character in a communications level message.
Record	A communications level message consists of one or more records. A record contains 1 to 80 ASCII characters. All records begin with one of the following ASCII control characters: **<STX>**, **<ETX>**, **<RS>**, or **<GS>**. Each record type can be terminated by the new line sequence **<CR><LF>**. The new line sequence is optional and not included in the size of the record.
Packet	All records associated with a **<GS>** record are called a packet. At the end of a packet, the sending computer waits for the receiver to send an acknowledgment that it received the packet.

Table 2-2: Terms and Descriptions (Continued)

Term	Description
Field	A field is a discrete unit of information such as a patient name, sex, or primary physician. Each field is preceded by a code that describes the type of field and also implies its length. All fields end with one to three user-defined terminating characters (chosen from a subset of ASCII characters). Each field has a maximum length in characters. BCI will accept data that is less than or equal to the maximum number of allowable characters. Most fields that are longer than the number of significant characters are truncated and the text left-justified. The only exception is the exam ID (**ci**), which is truncated and right-justified.

Communications Protocol

Communications Level Message Exchange Protocol

- The session-oriented protocol used for communication between the host and bioMérieux computer permits transmission in one direction at a time.
- A session is established in a given direction and must end before the initiation of another session. This creates a half-duplex communication.
- Either computer can initiate a session by sending the ASCII line request character **<ENQ>**. When the receiving computer gets the **<ENQ>**, it responds with the positive acknowledgment character **<ACK>** or the negative acknowledgment **<NAK>**.
- BCI uses a “last master delay” protocol where the BCI computer waits before transmission of another **<ENQ>**. This prevents BCI from continuously controlling the line. The time is in seconds and can be defined by the user.
- The bioMérieux computer expects the host to implement a last master delay time allowing the bioMérieux computer to request the line between each host downloaded message.
- All sessions end when the initiating computer sends the ASCII end of transmission character **<EOT>**.

Protocol Examples

In the following examples, **mtxxx** refers to the beginning of a generic applications level message. The X's which follow represent the rest of the application message.

Example 1: Successful Transmission by the Host Computer

In this example, the host computer initiates a session by sending an **<ENQ>** to and receiving an **<ACK>** from the bioMérieux computer. The host then begins transmitting data records **<RS>**. The bioMérieux computer sends an **<ACK>** for every checksum record received correctly. This example shows only a single applications level and communications level message transmitted in the session.

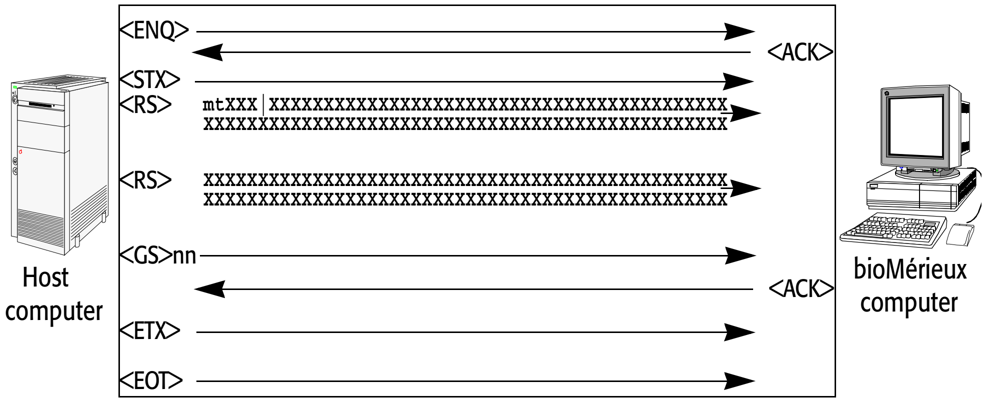

Figure 2-2: Successful Transmission by Host Computer

Example 2: Successful Transmission by the bioMérieux Computer

A successful transmission by the bioMérieux computer proceeds the same way as one initiated by the host. This also shows a single applications level and communications level message session.

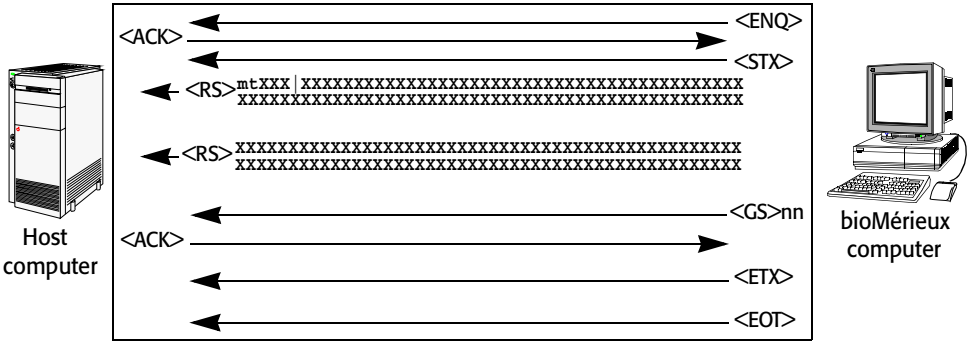

Figure 2-3: Successful Transmission by bioMérieux Computer

2

Example 3: Multiple Communications Level Messages in a Session

This example shows two communications level messages for one application packet. Communications level messages are limited to 1,920 characters from both the host and bioMérieux computers.

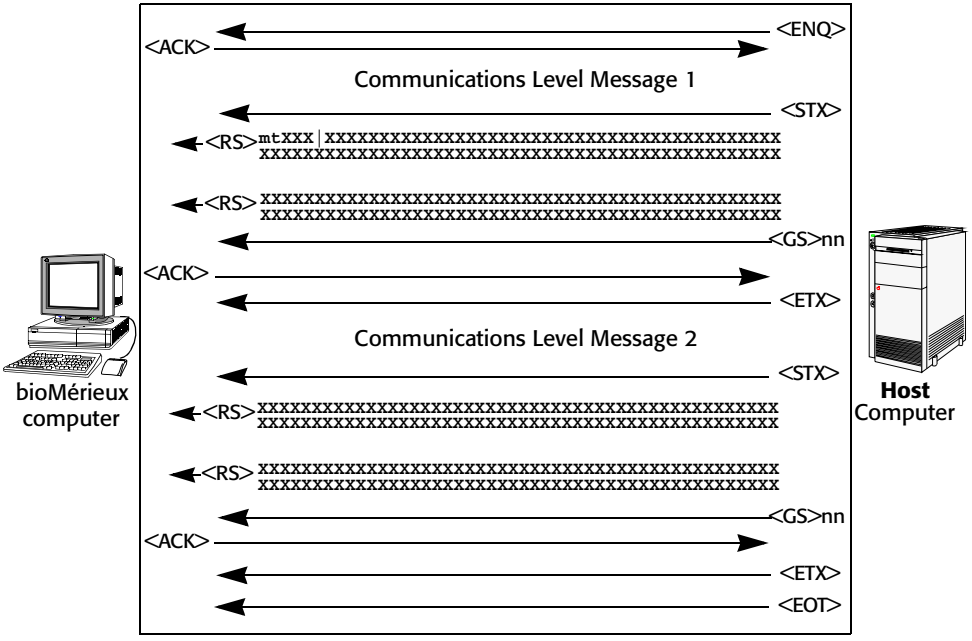

Figure 2-4: Multiple Communications Level Messages in a Session

2

Example 4: Multiple Application Messages in a Session

This example shows two applications level messages in one communications packet. Note that the bioMérieux computer does not send multiple applications level messages in the same communications level message.

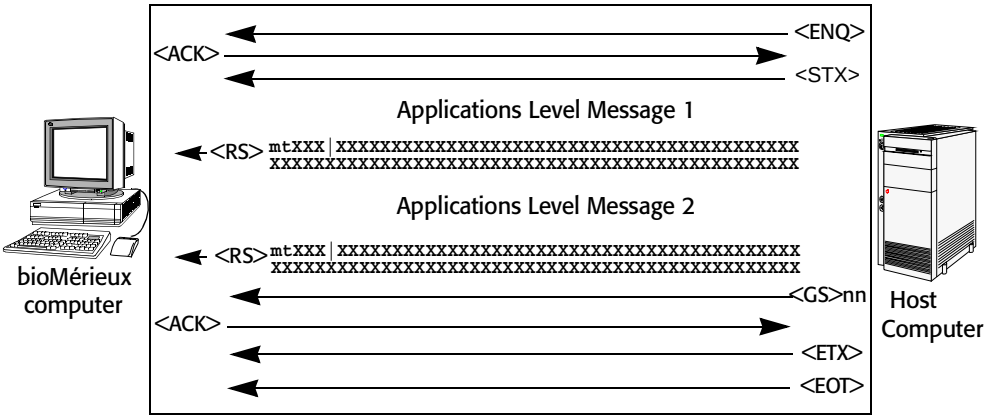

Figure 2-5: Multiple Application Messages in a Session

Example 5: Transmission Collision

A collision occurs when both computers try to establish a session simultaneously. When this happens, the bioMérieux computer drops its request and responds to the host with an **<ACK>**.

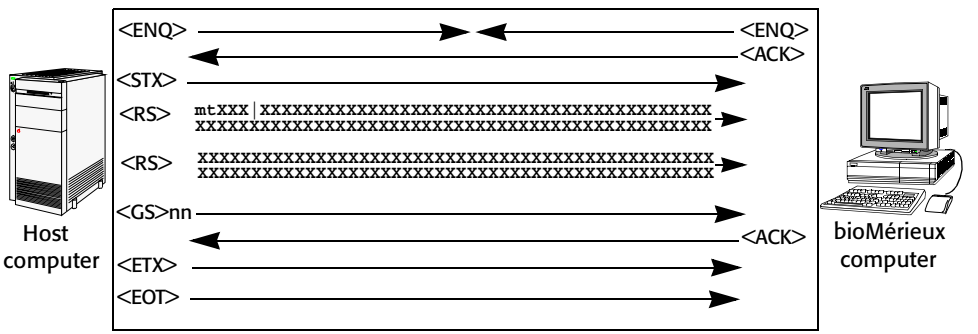

Figure 2-6: Transmission Collision

Example 6: Transmission Failure — Negative Acknowledgment to an Inquiry

If either computer receives a **<NAK>** to an **<ENQ>,** it should wait for a specified time and try again. The computer reports a failure after a user specified number of unsuccessful attempt.

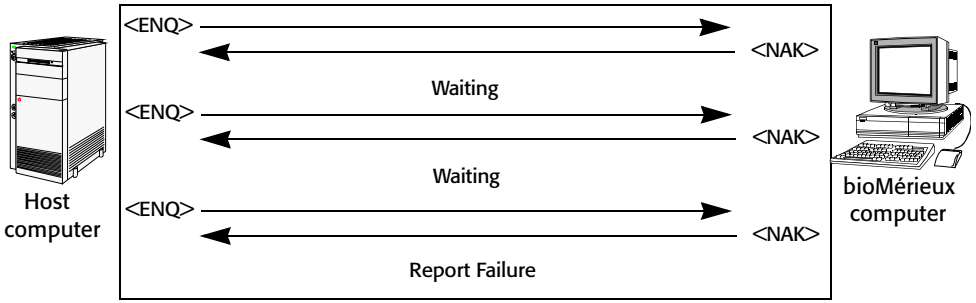

Figure 2-7: Negative Acknowledgement to an Inquiry

Example 7: Transmission Failure — No Response to an Inquiry

When neither computer receives an **<ACK>** or **<NAK>** to an **<ENQ>**, it should wait for a specified time and try again. After a user specified number of unsuccessful attempts, it should report a failure.

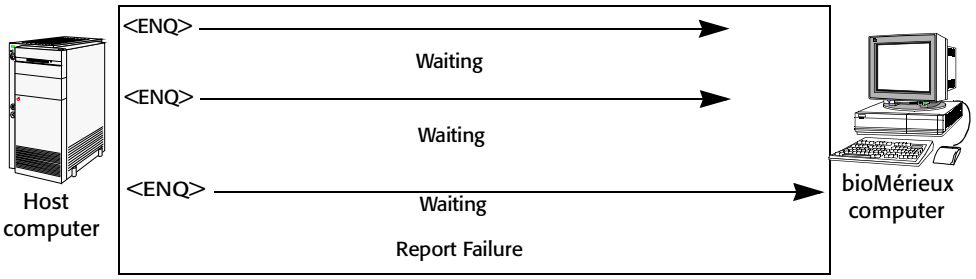

Figure 2-8: No Response to an Inquiry

Example 8: Transmission Failure – Faulty Checksum with Literal Protocol

When a checksum is incorrect, the receiving computer responds to the checksum record with a **<NAK>**. Upon receiving this, the sender retransmits the entire data packet. If the checksum fails again, the sender tries again. The sender abandons the transmission and logs an error after a set number of unsuccessful attempts.

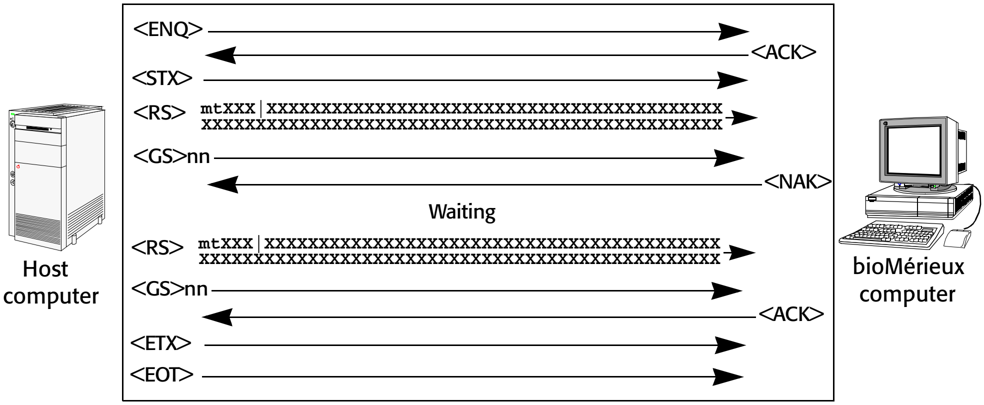

Figure 2-9: Faulty Checksum with Literal Protocol

Example 9: Faulty Checksum with Alternate Protocol

The bioMérieux computer will accept transmissions in this format from the host computer. It allows the host to repeat an alternate protocol **<STX>** when it receives a **<NAK>** to a **<GS>** record.

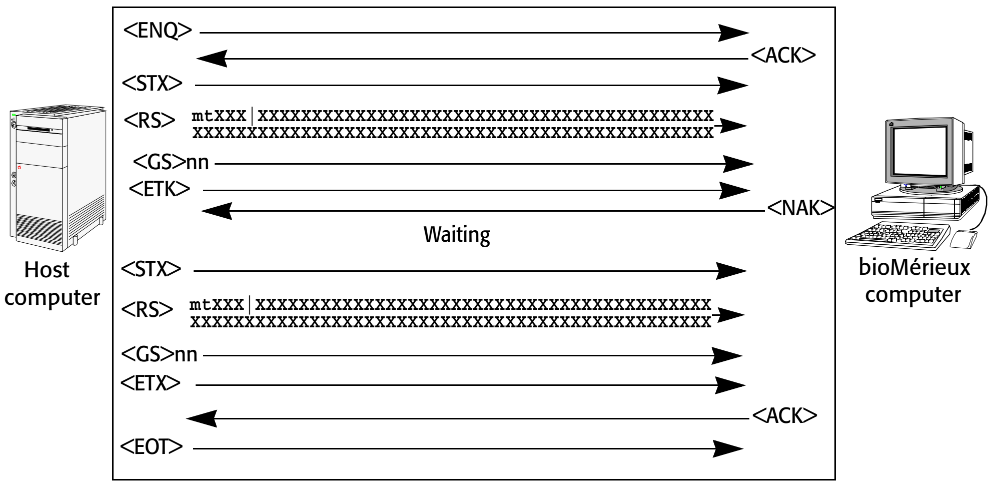

Figure 2-10: Faulty Checksum with Alternate Protocol

Example 10: End of Transmission by the bioMérieux Computer

When the bioMérieux computer encounters certain error conditions, it may respond with an **<EOT>**. This is a signal to the host that the bioMérieux computer is ending the current session.

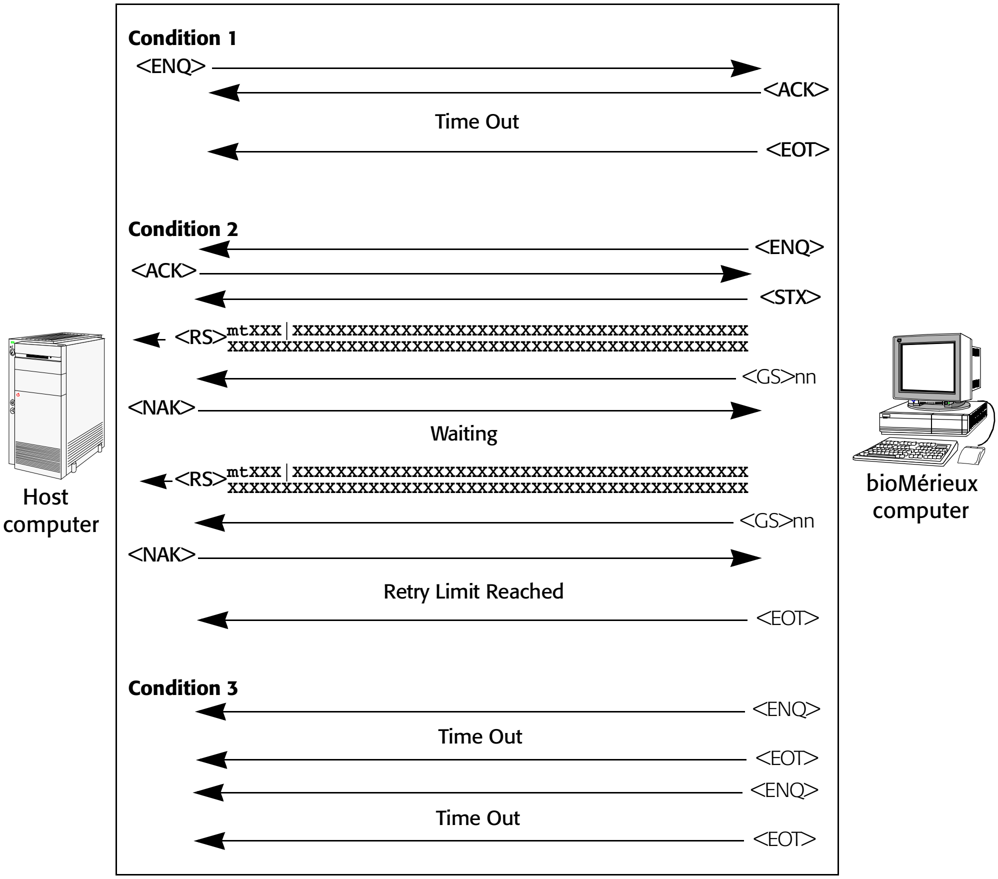

Figure 2-11: End of Transmission

Alternate Communications Protocol

To accommodate some LIS computers, BCI provides an alternate communications protocol and uses a different **<STX>** and **<ETX>** checksum sequence.

When a checksum is incorrect and one of the computers receives a **<NAK>** or no response, the retransmission begins with an **<STX>**.

The **<ETX>** is sent immediately after the checksum **<GS>** record instead of after receipt of an **<ACK>**.

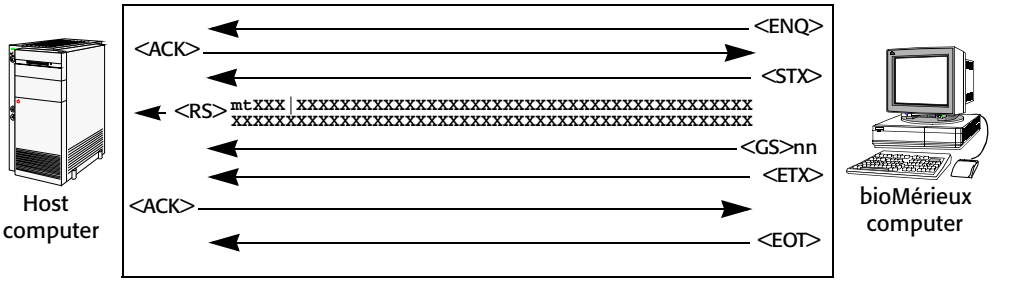

Figure 2-12: Alternate Protocol with Correct Checksum

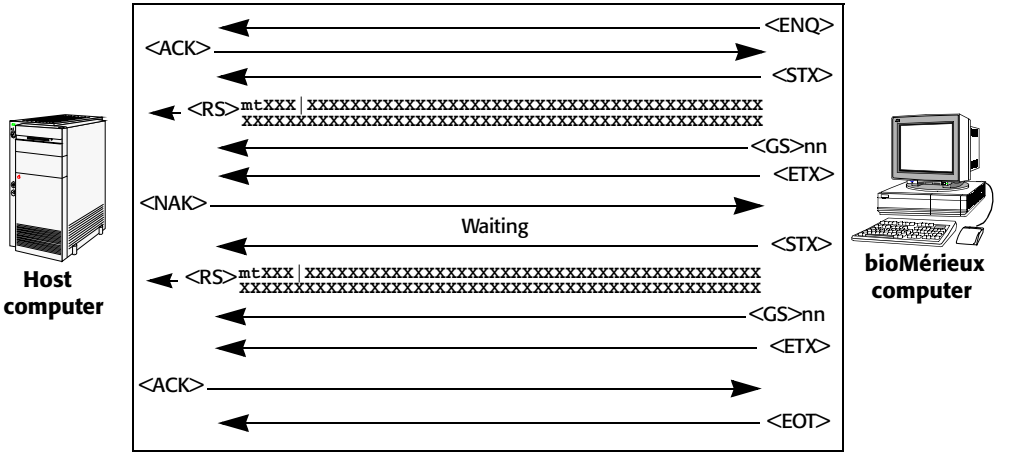

Figure 2-13: Alternate Protocol with Faulty Checksum

ASTM 1381 Protocol

Note: *This protocol is only available for VITEK and VITEK 2 systems.*

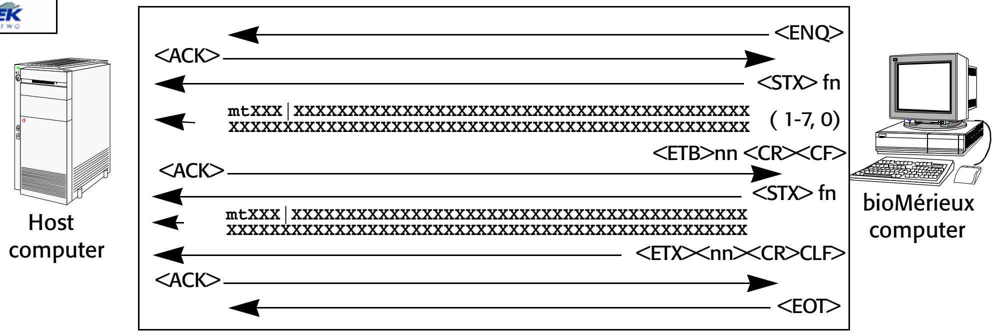

Figure 2-14: ASTM 1381 Protocol (VITEK and VITEK 2 only)

Note: *fn = frame number (1-9, then 0-9)*
nn = checksum

Checksum Field Format

The checksum consists of a two-digit ASCII representation of an eight-bit number. This number is calculated by adding the value of all characters beginning with the first **<RS>** record and ending with the **<GS>** character. The number is then truncated, leaving the least significant eight bits which convert to two ASCII hexadecimal characters.

This example applies to incoming and outgoing checksums. (It also shows the use of record terminators.)

Received data:

<STX> <CR> <LF>
<RS> <HELLO> <CR> <LF>
<GS> c6 <CR> <LF>

Characters in the checksum calculation:

<RS>< HELLO> <CR> <LF>
<GS>

Character	8 bit Binary Code
5	00011110
H	01001000
E	01000101
L	01001100
L	01001100
O	01001111
<CR>	00001101
<LF>	00001010
<GS>	00011101

Checksum Calculation:

<RS> + **H** =
0000000000011110 + 01001000 = 0000000001100110
0000000001100110 + **E** =
0000000001100110 + 01000101 = 0000000010101011
0000000010101011 + **L** =
0000000010101011 + 01001100 = 0000000011110111
0000000011110111 + **L** =
0000000011110111 + 01001100 = 0000000101000011
0000000101000011 + **O** =
0000000101000011 + 01001111 = 0000000110010010
0000000110010010 + **<CR>** =
0000000110010010 + 00001101 = 0000000110011111
0000000110011111 + **<LF>** =
0000000110011111 + 00001010 = 0000000110101001
0000000110101001 + **<GS>** =
0000000110101001 + 00011101 = 0000000111000110

Truncated 8 bit result = **11000110**
ASCII representation of checksum = **c6**

Figure 2-15: Checksum Field Format

Note: *The bioMérieux computer always sends checksum characters in lower case, but it can accept both upper and lower case.*

Examples of Message Exchanges

The following examples show the complete exchange that takes place during message transmission. Each example contains one applications level message and one communications level message per session. (These are bracketed by **<STX>** and **<ETX>.**)

In Example 3, the applications level message has more than eighty characters, so the communications layer must send multiple **<RS>** records. The applications layer associated with the **<RS>** record is shown to its left and follows the **<RS>** character in the data flow.

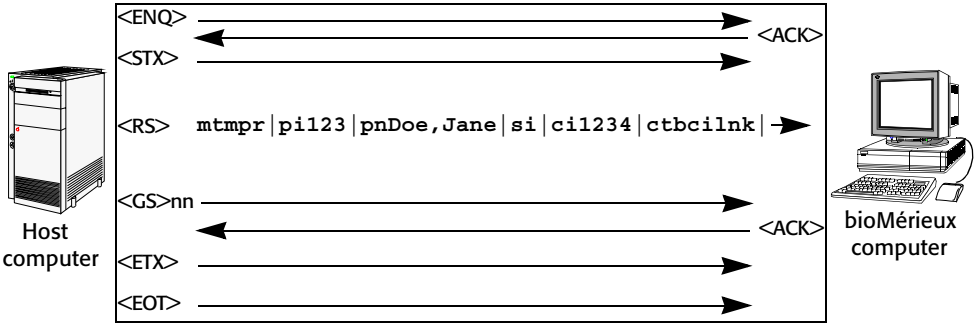

Figure 2-16: Patient Demographics Sent from Host to bioMérieux Computer for ID or Susceptibility Test

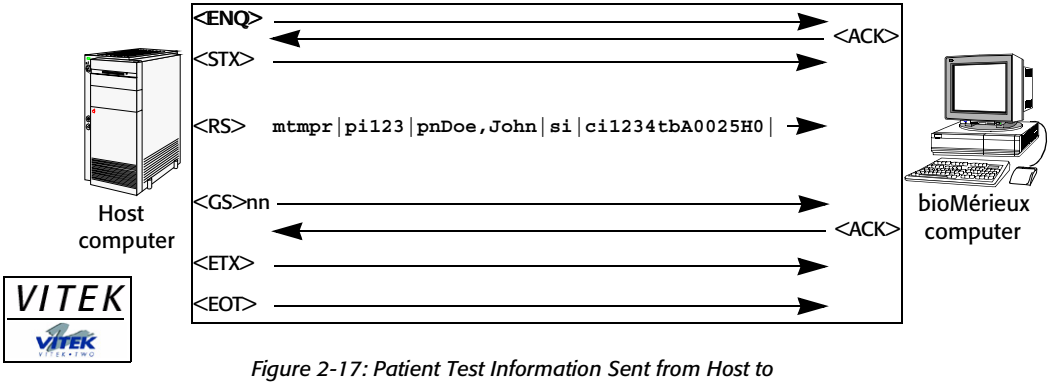

Figure 2-17: Patient Test Information Sent from Host to bioMérieux Computer for a Blood Culture (VITEK and VITEK 2 Only).

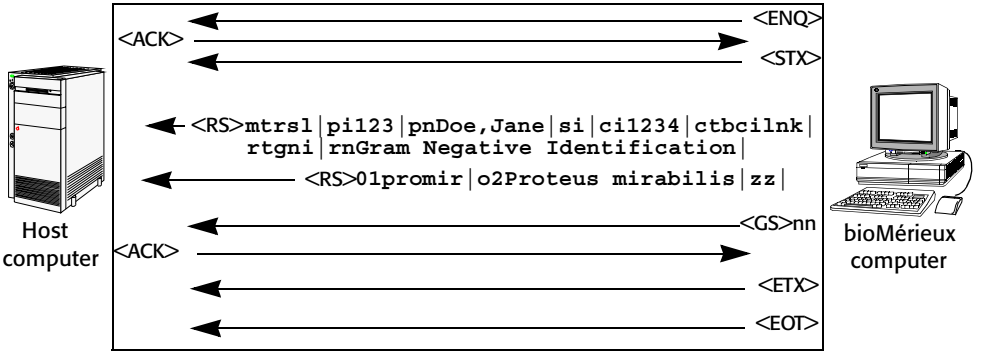

Figure 2-18: VITEK ID Test Results Sent to Host from bioMérieux Computer

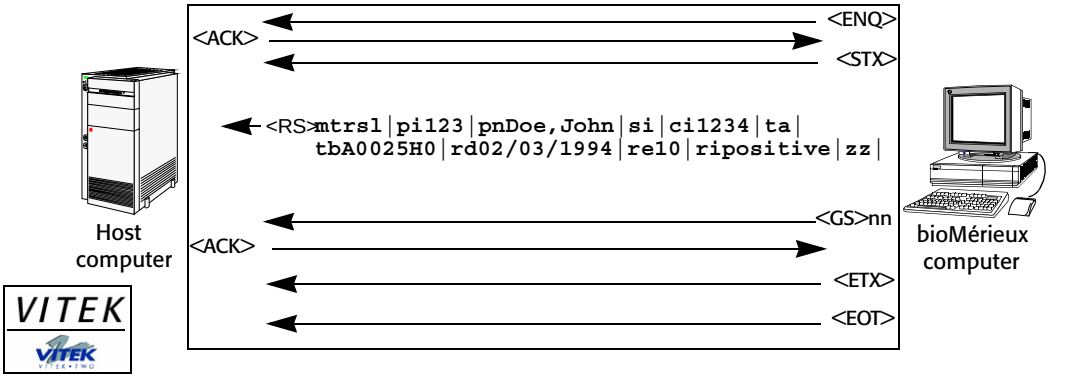

Figure 2-19: Blood Test Results Sent to Host from bioMérieux Computer (VITEK and VITEK 2 Only)

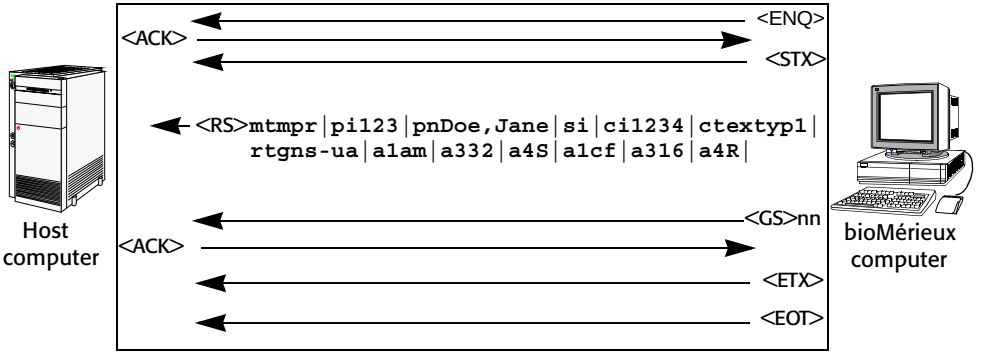

Figure 2-20: Susceptibility Test Results Sent to Host from bioMérieux Computer

Cable Specs for the BMX Computer Host Port

Data transmits on an asynchronous serial line that conforms to RS-232 voltage specifications. bioMérieux supplies the interface cabling, but LIS vendors may provide their own. The interface to the host computer determines cable configurations.

Table 2-3 shows designated uses for pins on the bioMérieux cable.

Table 2-3: bioMérieux Cable Pins

DB 25 - CC1 or higher	Code	Name	VITEK Use
2	TD	Transmit Data	VITEK transmitted data
3	RD	Receive Data	VITEK received data
4	RTS	Request to Send	Asserted by VITEK*
5	CTS	Clear to Send	
6	DSR	Data Set Ready	
7	SG	Signal Ground	Common ground with host
8	CD	Carrier Detect	
20	DTR	Data Term Ready	Asserted by VITEK*

**.Asserted (positive) means greater than +3 v with respect to Signal Ground.*

Note: *Pins 2 and 3 may need to be crossed to ensure that what is transmitted data for the bioMérieux computer is received data for the host. To do this, use a null modem.*

2

DOWNLOAD SPECIFICS

Chapter Contents

3

Introduction

When setting up systems to work with BCI, keep these points in mind:

- Download applications messages are divided into fields and must be logically complete. The first field is the message type, which dictates the number and types of remaining fields in a message.
- A complete message is made up of the message type and all its related fields.
- Data is separated into five groups: patient, specimen, culture (or exam), tests, and results. Each group contains a specific set of fields.
- Each field has a fixed size in the database. If the database receives a value larger than its fixed size, the field will be truncated to fit. All fields are left-justified and truncated except the exam id (`ci`) field. It is right-justified and truncated.
- Fields from one group cannot be used in another. The beginning of each group is marked by a specific field, a patient ID (`pi`) for patient demographics, a specimen separator (`si`) for specimen data, (`ci`) for culture/exam data, (`ta`) for tests (VITEK and VITEK 2 only), (`ra`) for results (VITEK and VITEK 2 only), and (`tb`) for blood culture tests (VITEK and VITEK 2 only).
- Field values shorter than defined do not need to be padded to the maximum size.

VITEK

- For VITEK and VITEK 2, a user-defined terminator ends each field. The terminator is one to three user-defined ASCII characters. The default character is the vertical bar (|).
- If a host sends a physician or source field with values that match a host code, BCI's host field translations changes the host code to match the bioMérieux code that goes to bioLIAISON. This is in addition to any existing antimicrobial or organism translations (VITEK and VITEK 2 only).

Download Applications Layer Message Types

- An application layer message type is a three-letter code which identifies information contained in the message. Message types indicate the beginning of a new message and must precede any information related to the message.
- Messages must contain certain field types. Additional field types may be included.
- If a bioMérieux computer cannot handle or recognize a particular field type, it ignores the field and logs a message. It also blanks out any empty, non-required fields.

Table 3-1 lists required download field types.

Table 3-1: Download Messages and Required Field Types

Message Type	Description	Required Field Types
mpr	Patient Demographics	(For all test types) mt, pi, si, ci (For blood test orders) mt, pi, si, ci, and tb
	If test results are downloaded... (VITEK and VITEK 2 only)	(For id or blood test results) mt, pi, si, ci, tb,ta (For susc and smear results) mt, pi, si, ci, ta, ra
oos	Out of Service	mt
bis	Back in Service	mt

Patient Demographic Message Type (mpr)

This message type indicates that patient demographics (and, optionally, tests and results) follow. The minimum required fields for a download message are: message type (**mt**), patient ID (**pi**), specimen separator (**si**), and exam ID (**ci**).

The bottle bar code can also be downloaded for blood test orders. If this is the case, required fields are **mt,pi,si,ci,** and **tb**, (bottle bar code).

Out of Service (oos)

This message is an indication to the bioMérieux computer that the host is not ready to receive messages. The bioMérieux computer will then stop sending messages to the host and queue them for later transmission. The bioMérieux computer can continue to receive and process all messages from the host during this time. This message does not require any additional fields. An example of an out of service message is: **mtoos|**

Back in Service (bis)

When the host resumes normal operation after being out of service, it sends a bis message. When the bioMérieux computer receives this message, it transmits any queued messages. It does not require any additional fields. An example of a back in service message is: **mtbis|**

Download Applications Layer Field Types

This section lists all the field types that can be in downloaded messages. If the applications layer encounters an unknown field type, it ignores it and continues to process the message. Each field type has a maximum length that refers to the maximum size of the field within the database. If a message contains fields with information exceeding the maximum size, they are truncated to fit in the database.

Table Field Types

VITEK

Note: *This feature is only available in VITEK and VITEK 2.*

A predefined alphanumeric code is sent as a lookup value for a table entry. An example of this is a code representing a physician. The bioMérieux computer user has the responsibility of maintaining user tables in the bioLIAISON database with codes used by the host computer. User-defined fields are noted by US, UT, or BU in the source column of the following tables.

Use these data classification and source descriptions to determine field types and their contents.

Table 3-2: Download Data Classification Codes

Code	Data Classification
G	General fields
P	Patient demographics fields
S	Specimen demographics fields
C	Culture (exam) demographics fields
T	Test fields
R	Result fields
A	All

Table 3-3: Download Source Description Codes

Code	Source Description
UT	User-defined table (VITEK and VITEK 2 only)*
US	User-supplied data
BT	bioMérieux-defined table
BU	bioMérieux-defined, user-modifiable table
HO	Host-computer supplied data
UR	User-supplied data, BCI translation utility (VITEK and VITEK 2 only)*

VITEK 2 compact

*= The UT and UR code is treated as free text in VITEK 2 Compact. The code is not table driven.

Demographic Fields

Table 3-4 shows the fields which BCI and bioLIAISON recognize in a demographics (**mpr**) message type.

In VITEK and VITEK 2, if two maximum field sizes are shown, the first number is bioLIAISON's maximum size and the second is the size determined by the host in Host Field Translations.

Table 3-4: Download Demographic Fields

Field Code	Data Class	Max. Length	Source	VITEK and VITEK 2 Description	VITEK 2 Compact Description	Required (R)
mt	G	3	BT	Message Type	Message Type	R
id	G	3	HO	Instrument ID	NA	
pi	P	16	US	Patient ID	Patient ID	R
pv	P	16	US	NA	Patient Visit Number (Alternate Patient ID)	
pn	P	40	US	Patient Name	Patient Name	
pb	P	date	US	Patient Date of Birth	NA	
ps	P	10	US	Patient Sex	NA	
pl	P	6	UT	Patient Location Code	Patient Location Code	
px	P	6	UT	Patient Hospital Service Code	NA	
po	P	6	UT	Patient Admitting Diagnosis Code	NA	
pp	P	6/15+	UT/UR	Patient Primary Physician Code	Patient Primary Physician Code	
pa	P	date	UT	Patient Admitting Date	NA	
pd	P	6	BA	Patient Dosage Group Code	NA	
pc	P	6	UT	Patient Comment Code (repeatable)	Patient Comment Code (not repeatable)	
w1	P	40	US	Patient Wild Field 1 (Alternate Patient ID)	Patient Wild Field 1 (Alternate Patient ID)	
w2	P	40	US	Patient Wild Field 2	NA	
w3	P	40	US	Patient Wild Field 3	NA	
w4	P	40	US	Patient Wild Field 4	NA	
w5	P	40	US	Patient Wild Field 5	NA	
w6	P	40	US	Patient Wild Field 6	NA	
w7	P	40	US	Patient Wild Field 7	NA	

Table 3-4: Download Demographic Fields (Continued)

Field Code	Data Class	Max. Length	Source	VITEK and VITEK 2 Description	VITEK 2 Compact Description	Required (R)
w8	P	40	US	Patient Wild Field 8	NA	
ua	P	6	UT	Patient User Field 1 Code	NA	
uc	P	6	UT	Patient User Field 2 Code	NA	
ue	P	6	UT	Patient User Field 3 Code	NA	
u1	P	6	UT	Patient User Field 4 Code	NA	
u3	P	6	UT	Patient User Field 5 Code	NA	
si	S	0	–	Specimen Separator	Specimen Separator	R
ss	S	6/15+	UT/UR	Specimen Source Code	Specimen Source Code	
st	S	6	UT	Specimen Site Code	NA	
sl	S	6	UT	Specimen Location Code	NA	
sp	S	6/15+	UT/UR	Specimen Requesting Physician Code	NA	
sx	S	6	UT	Specimen Service Code	NA	
sy	S	2	BU	Specimen Status Code	NA	
s1	S	date	US	Specimen Collection Date	Specimen Collection Date	
s2	S	time	US	Specimen Collection Time *	Specimen Collection Date	
s3	S	date	US	Specimen Receipt Date	NA	
s4	S	time	US	Specimen Receipt Time *	NA	
sf	S	5	US	Patient Temperature	NA	
so	S	8	US	Collection Number	NA	
sc	S	6	US	Specimen Comment Code (repeatable)	Specimen Comment Code (not repeatable)	
ug	S	6	UT	Specimen User Field 1 Code	NA	
ui	S	6	UT	Specimen User Field 2 Code	NA	
uk	S	6	UT	Specimen User Field 3 Code	NA	
um	S	6	UT	Specimen User Field 4 Code	NA	
uo	S	6	UT	Specimen User Field 5 Code	NA	
uq	S	6	UT	Specimen User Field 6 Code	NA	
us	S	6	UT	Specimen User Field 7 Code	NA	
uu	S	6	UT	Specimen User Field 8 Code	NA	

Table 3-4: Download Demographic Fields (Continued)

Field Code	Data Class	Max. Length	Source	VITEK and VITEK 2 Description	VITEK 2 Compact Description	Required (R)
wa	S	40	US	Specimen Wild Field 1	NA	
wb	S	40	US	Specimen Wild Field 2	NA	
wc	S	40	US	Specimen Wild Field 3	NA	
wd	S	40	US	Specimen Wild Field 4	NA	
we	S	40	US	Specimen Wild Field 5	NA	
ci	C	20	–	Exam ID (Culture ID & Lab ID)	Exam ID (Culture ID & Lab ID)	R
ct	C	6	UT	Exam Type Code	Exam Type Code	
c1	C	date	US	Exam Completion Date	NA	
c2	C	time	US	Exam Completion Time*	NA	
x1	C	40	US	Exam Wild Field 1	NA	
x2	C	40	US	Exam Wild Field 2	NA	
na^	C	6	UT	Exam Comment Code (repeatable)	NA	
zz	G	0	NA	Message Terminator	Message Terminator	

* Time format is HH:MM using a 24 hour clock.
+ VITEK 2 Compact has a maximum length of 6. VITEK and VITEK 2 have a maximum length of 15 (if the translation table is used).
^ For VITEK and VITEK 2, the Blood Culture Order Field and/or Test Result Fields follow the na field.

Note: *Values downloaded in the Culture ID field must match the ID which the user assigned to the card in the VITEK, VITEK 2, or VITEK 2 Compact system. Do not download the VITEK card's isolate (dash) number in the culture ID field. For VITEK and VITEK 2, use the t1 field for the isolate number if you are downloading results.*

Blood Culture Order Field

VITEK

Note: *This section is only applicable to VITEK and VITEK 2 systems.*

For blood tests, the test type field (**rt**) is required. However, only the bottle bar code is required for downloaded test orders.

Table 3-5: Blood Culture Order Field

Field Code	Data Class	Max. Length	Source	VITEK and VITEK 2 Description	VITEK and VITEK 2 Required (R)
tb	T	10	BT	Bottle bar code	

Test Result Fields (All Test Types)

VITEK

Note: *This section is only applicable to VITEK and VITEK 2 systems.*

The fields shown in Table 3-6 are allowed in each test type.

In VITEK and VITEK 2, if two maximum field sizes are shown, the first number is bioLIAISON's maximum size and the second is the size determined by the host in Host Field Translations.

Table 3-6: Download Test Result Fields

Field Code	Data Class	Max. Length	Source	VITEK and VITEK 2 Description	VITEK and VITEK 2 Required (R)
ta	T	0	–	Test Separator	R
rt	T	8	BT	Test Type Code	R
t4	T	2	BT	Test Status Code	
m3	T	6	UT	Technologist Code	
nc	T	6	UT	Test Comment Code (repeatable)	
y1	T	40	UT	Test Wild Text	
y2	T	40	UT	Test Wild Text	
y3	T	40	UT	Test Wild Text	
y4*	T	40	UT	Test Wild Text	*

*. Test type specific result fields follow the y4 field

Test Result Fields for Specific Tests

Note: *This section is only applicable to VITEK and VITEK 2 systems.*

This table lists each test type and their allowable fields.

In VITEK and VITEK 2, if two maximum field sizes are shown, the first number is bioLIAISON's maximum size and the second is the size determined by the host in Host Field Translations.

Table 3-7: Download Test Result Fields for Specific Tests

Test Type / Field Type	Data Class	Max. Length	VITEK and VITEK 2 Description	VITEK and VITEK 2 Required (R)
ID Test				
t1	T	2	Isolate number	R
tb	T	10	Bottle bar code	
t6	T	6/15	Preliminary organism code	
t8	T	6	Preliminary modifier code	
o1	T	6/15	Final organism code	R
o3	T	16	Final bionumber	
o4	T	6	Final modifier code	
o9		8	Percent Probability	
Susc. Test				
t1	T	2	Isolate number	R
tb	T	10	Bottle bar code	
t6	T	6/15	Preliminary organism code	
t8	T	6	Preliminary modifier code	
o1	T	6/15	Final organism code	R
o4	T	6	Final modifier code	
ra	R	0	Result separator*	
ad	R	0	Deduced Drug Indicator*	
a1	R	8/15	Drug code*	
a3	R	8	Final MIC*	

Table 3-7: Download Test Result Fields for Specific Tests (Continued)

Test Type / Field Type	Data Class	Max. Length	VITEK and VITEK 2 Description	VITEK and VITEK 2 Required (R)
a4	R	2	Final Result*	
Smear Test				
tb	T	10	Bottle bar code	
ra	R	0	Result separator†	R
rs	R	6	Smear code†	
o4	R	6	Modifier code†	

*. Fields ra through a4 are repeatable as a group.
†. Fields ra through o4 are repeatable as a group.

Message Examples

Applications layer messages can be any of the types described in Table 3-1. They will have one or more field types associated with the

Patient, specimen, and exam data must be in this order:

1) Patient ID and optional patient demographics

2) Specimen separator and optional specimen data

3) Culture ID and optional exam data

4) Bottle bar code for a blood test order (VITEK and VITEK 2 only)

VITEK

Note: *If there are additional test or result fields, then the ta field must precede the tb field.*

5) Test information may be included in the download, followed by the repeating results of the test. Each result for the same test must be preceded by a result separator, and different tests must be preceded by a test separator. Multiple tests are allowed.

To download multiple specimens for a single patient, repeat items two through five in sequence. To download multiple exams for a single specimen (VITEK and VITEK 2 only), repeat items three through five. To download multiple tests, repeat item five.

VITEK

Note: *VITEK 2 Compact only supports one exam per specimen.*

Note: *There can be only one patient per mpr message.*

The following examples contain sample packets of test data. Line breaks are for example purposes only. There are no line breaks or carriage returns in a data packet unless **<CR><LF>** characters are entered.

```
mtmpr|pi193301|pnHo, Ida|p14|ppsu|pda|w1475|uaf|
si|ssu|slzer|spsor|s102/21/1994|s208:40|s302/21/94|
s411:04|
ci020517|ctr|zz|
```

Figure 3-1: Patient Demographics Only


```
mtmpr|pi193301|pnHo, Ida|p14|ppsu|pda|w1475|uaf|
si|ssu|slzer|spsor|s102/21/1994|s208:40|s302/21/94|
s411:04|
ci020517|ctr|na>|na5|nagnb|ta|rtgni|t4P|t11|o1promir|
o36003200001220|zz|
```

VITEK

Figure 3-2: Identification Test Results (VITEK and VITEK 2 Only)

```
mtmpr|pi193301|pnHo, Ida|p14|ppsu|pda|w1475|uaf|
si|ssu|slzer|spsor|s102/21/1994|s208:40|s302/21/94|
s411:04|
ci020517|ctr|na>|na5|nagnb|ta|rtgni|t4P|t11|tb123456|
o1promir|o36003200001220|zz|
```

VITEK

Figure 3-3: Identification Test Results from a Blood Culture (VITEK and VITEK 2 Only)

```
mtmpr|pi960297|pb09/27/1996|
si|s109/27/96|s214:55|s309/27/1996|s414:55|sf 99.8|
ci000064|ctauto|c109/27/96|c214:55|ta|rtgns-1s|t11|
t4p|o1provul|ra|a1cz|a3>=32|a4R|ra|a1tax|a3>=64|a4R|
ra|a1taz|a3>=32|a4R|ra|a1roxa|a38|a4I|ra|a1rox|a38|
a4S|ra|a1cip|a3<=0.5|a4S|ra|a1am|a3>=32|a4R|zz|
```

VITEK

Figure 3-4: Susceptibility Test Results (VITEK and VITEK 2 Only)


```
mtmpr|pi960297|pb09/27/1996|
si|s109/27/96|s214:55|s309/27/1996|s414:55|sf 99.8|
ci000064|ctauto|c109/27/1996|c214:55|ta|rtgns-
1s|t11|
tb654321|t4P|o1provul|ra|a1cz|a3>=32|a4R|ra|a1tax|
a3>=64|a4R|ra|a1taz|a3>=32|a4R|ra|a1roxa|a38|a4I|ra|
a1rox|a38|a4S|ra|a1cip|a3<=0.5|a4S|ra|a1am|a3>=32|
a4R|zz|
```

VITEK

Figure 3-5: Susceptibility Test Results from a Blood Culture (VITEK and VITEK 2 Only)

```
mtmpr|pi193301|pnBrown, James|p17|ppowe|pda|w177|uam|
si|ssw|s17|spowe|s111/15/96|s209:45|s311/15/1996|
s411:55|
ci110333|ctr|c111/18/96|x2Back mass|nang3d|ta|
rtvitest|t4P|ra|rssmear|o41|ra|rssmear|o42|zz|
```

VITEK

Figure 3-6: Smear Test Results (VITEK and VITEK 2 Only)

```
mtmpr|pi193301|pnBrown, James|p17|ppowe|pda|w177|uam|
si|ssw|s17|spowe|s111/15/1996|s209:45|s311/15/1996|
s411:55|
ci110333|ctr|c111/18/96|x2Back mass|nang3d|ta|
rtvitest|tb98765|t4P|ra|rssmear|o41|ra|rssmear|o42|zz|
```

VITEK

Figure 3-7: Smear Test Results from a Blood Culture (VITEK and VITEK 2 Only)

```
mtmpr|piA10001|pv123444|pnDoe,
John|plloc1|ppph1|pccom1|si|sssrc1|s101/21
2004|s201:01|sccom2|ci123111|ctet|zz
```

VITEK 2 compact

Figure 3-8: VITEK 2 Compact Sample Download (VITEK 2 Compact Only)

UPLOAD SPECIFICS

Chapter Contents

Introduction

When setting up systems to work with BCI, keep these points in mind:

- The BCI results upload program sends test results from the bioMérieux computer to the host LIS computer. All applications messages are complete, with each message divided into fields.
- The first field is the message type. It establishes the number and types of remaining fields within the message. A complete message contains a message type and all the fields that message type requires.
- Each field is assigned a unique two-character code. A field cannot be larger than its maximum size. Depending on the needs of the host LIS computer, each field may or may not be padded with spaces to fill out its maximum size.

VITEK

- For VITEK and VITEK 2, terminator characters ending each field are user-defined and use one to three ASCII characters. The default terminator character is a vertical bar (|).

VITEK 2 compact

- VITEK 2 Compact supports only the (|) terminator character.

Upload Applications Layer Message Types

Applications layer message types describe information contained in a message. Message types indicate the beginning of a new message and must precede any information related to that message. There are certain fields required in messages, although a message may contain other fields types as well.

If the host computer receives a field type it doesn't recognize or if the field is empty, it should ignore the field.

Note: *It may be useful to log and report these errors.*

Table 4-1: Applications Layer Messages, Descriptions, and Required Field Types

Message Type	Description	Required Field Types
rsl	Test Results	mt, pi, si, ci
oos	Out of Service	mt
bis	Back in Service	mt

Test Results Literal Format (rsl)

The bioMérieux computer uses this message type to report test results. Results include organism identifications, antimicrobial susceptibilities, smear and blood test results. Fields required for this message type are the patient id (**pi**), specimen separator (**si**), and culture id (**ci**).

Out of Service (oos)

The bioMérieux computer sends this message to the host computer indicating it is going to be out of service. No additional fields are required for this message type. The host should continue to receive and process any message from the bioMérieux computer. The message will not have any additional fields. An example of an out of service message is: **mtoos|**

Back in Service (bis)

When the bioMérieux computer resumes normal operation after being out of service, it sends a **bis** message. The host computer should then transmit any queued messages. The message will not have any additional fields. An example of a back in service message is: **mtbis|**

Upload Applications Layer Field Types

For VITEK and VITEK 2, a predefined alphanumeric code is sent as a lookup value for a table entry. An example of this is a code representing a physician. The bioMérieux computer user has the responsibility of maintaining user tables in the bioLIAISON database with codes used by the host computer. User-defined fields are noted by US, UT, or BU in the source column of the following tables.

Use the data classification and source descriptions to determine field types and their contents.

Table 4-2: Upload Data Classification Codes

Code	Data Classification
G	General Fields
P	Patient Demographics Fields
S	Specimen Demographics Fields
C	Culture (exam) Demographics Fields
T	Test Fields
R	Result Fields
A	All

Table 4-3: Upload Source Description Codes

Code	Source Description
UT*	User-Defined Table
US	User-Supplied Data
BT	bioMérieux-Defined Table
BU	bioMérieux-Defined, User-Modifiable Table
BR	bioMérieux-Defined Table, BCI Utilities Translation
UR	User-supplied data, BCI translation utility (VITEK and VITEK 2 only)*

* = The UT and UR code is treated as free text in VITEK 2 Compact. The code is not table driven.

Demographic Fields

Table 4-4 lists all the valid upload fields. Any of them can be transmitted to a host as part of results. The utility menu in BCI is where users select and enable reported fields.

In VITEK and VITEK 2, if two maximum field sizes are shown, the first number is bioLIAISON's maximum size and the second is the size determined by the host in Host Field Translations.

Table 4-4: Upload Demographic Fields

Field Code	Data Class	Max. Length	Source	VITEK and VITEK 2 Description	VITEK 2 Compact Description	Required (R)
mt	G	3	BT	Message type	Message Type	R
id	G	3	BT	Instrument ID	NA	
ii	G	2	BT	Instrument Code	Instrument code	
is	G	80	BT	NA	Instrument Serial Number	
it	G	2	BT	Test Group Code	Test group Code	
pi	P	16	US	Patient ID	Patient ID	R
pv	P	16	US	NA	Patient Alternate ID	
pn	P	40	US	Patient Name	Patient Name	
pb	P	date	US	Patient Date of Birth	NA	
ps	P	10	US	Patient Sex	NA	
pl	P	6	UT	Patient Location Code	Patient Location Code	
p2	P	32	UT	Patient Location Text	Patient Location Name	
px	P	6	UT	Patient Hospital Service Code	NA	
p3	P	20	UT	Patient Hospital Service Text	NA	
po	P	6	UT	Patient Admitting Diagnosis Code	NA	
p4	P	40	UT	Patient Admitting Diagnosis Text	NA	
pp	P	6/15+	UT/UR	Patient Primary Physician Code	Patient Physician Code	
p5	P	30	UT	Patient Primary Physician Text	Patient Physician Name	
pa	P	date	US	Patient Admission Date	NA	
pd	P	6	BU	Patient Dosage Group Code	NA	
p6	P	40	BU	Patient Dosage Group Text	NA	
pc	P	6	UT	Patient Comment Code (repeatable)	Patient Comment Code (not repeatable)	

Table 4-4: Upload Demographic Fields (Continued)

Field Code	Data Class	Max. Length	Source	VITEK and VITEK 2 Description	VITEK 2 Compact Description	Required (R)
pt	P	800	UT	Patient Comment Text (repeatable)	Patient Comment Text (not repeatable)	
w1	P	40	US	Patient Wild Field 1	Patient Wild 1 (Patient Alternate ID)	
w2	P	40	US	Patient Wild Field 2	NA	
w3	P	40	US	Patient Wild Field 3	NA	
w4	P	40	US	Patient Wild Field 4	NA	
w5	P	40	US	Patient Wild Field 5	NA	
w6	P	40	US	Patient Wild Field 6	NA	
w7	P	40	US	Patient Wild Field 7	NA	
w8	P	40	US	Patient Wild Field 8	NA	
ua	P	6	UT	Patient User Field 1 code	NA	
ub	P	40	UT	Patient User Field 1 text	NA	
uc	P	6	UT	Patient User Field 2 code	NA	
ud	P	40	UT	Patient User Field 2 text	NA	
ue	P	6	UT	Patient User Field 3 code	NA	
uf	P	40	UT	Patient User Field 3 text	NA	
u1	P	6	UT	Patient User Field 4 code	NA	
u2	P	40	UT	Patient User Field 4 text	NA	
u3	P	6	UT	Patient User Field 5 code	NA	
u4	P	40	UT	Patient User Field 5 text	NA	
p7	P	40	UT	Physician Address Line 1	NA	
p8	P	40	UT	Physician Address Line 2	NA	
p9	P	40	UT	Physician Address Line 3	NA	
p0	P	40	UT	Physician Address Line 4	NA	
si	S	0	—	Specimen Separator	Specimen Separator	R
s0	S	8	BT	Relative Specimen Number	Specimen System Code	
ss	S	6/15+	UT/UR	Specimen Source Code	Specimen Source Code	
s5	S	26	UT	Specimen Source Text	Specimen source name	
st	S	6	UT	Specimen Site Code	NA	

Table 4-4: Upload Demographic Fields (Continued)

Field Code	Data Class	Max. Length	Source	VITEK and VITEK 2 Description	VITEK 2 Compact Description	Required (R)
s6	S	26	UT	Specimen Site Text	NA	
sl	S	6	UT	Specimen Location Code	NA	
s7	S	32	UT	Specimen Location Text	NA	
sp	S	6/15	UT/UR	Specimen Requesting Physician Code	NA	
s8	S	30	UT	Specimen Requesting Physician Text	NA	
sx	S	6	UT	Specimen Service Code	NA	
s9	S	20	UT	Specimen Service Text	NA	
sy	S	2	BU	Specimen Status Code	NA	
sz	S	16	BU	Specimen Status Text	NA	
s1	S	date	US	Specimen Collection Date	Specimen Collection Date	
s2	S	time	US	Specimen Collection Time	Specimen Collection Time	
s3	S	date	US	Specimen Receipt Date	Specimen Receipt Date (same value as Specimen Collection Date)	
s4	S	time	US	Specimen Receipt Time	Specimen Receipt Time (same value as Specimen Collection Time)	
sf	S	5	US	Patient Temperature	NA	
so	S	8	US	Collection Number (Blood Test)	NA	
sc	S	6	UT	Specimen Comment Code (repeatable)	Specimen Comment Code (not repeatable)	
sn	S	800	UT	Specimen Comment Text (repeatable)	Specimen Comment Text (not repeatable)	
ug	S	6	UT	Specimen User Field 1 Code	NA	
uh	S	40	UT	Specimen User Field 1 Text	NA	
ui	S	6	UT	Specimen User Field 2 Code	NA	
uj	S	40	UT	Specimen User Field 2 Text	NA	
uk	S	6	UT	Specimen User Field 3 Code	NA	
ul	S	40	UT	Specimen User Field 3 Text	NA	
um	S	6	UT	Specimen User Field 4 Code	NA	
un	S	40	UT	Specimen User Field 4 Text	NA	
uo	S	6	UT	Specimen User Field 5 Code	NA	

Table 4-4: Upload Demographic Fields (Continued)

Field Code	Data Class	Max. Length	Source	VITEK and VITEK 2 Description	VITEK 2 Compact Description	Required (R)
up	S	40	UT	Specimen User Field 5 Text	NA	
uq	S	6	UT	Specimen User Field 6 Code	NA	
ur	S	40	UT	Specimen User Field 6 Text	NA	
us	S	6	UT	Specimen User Field 7 Code	NA	
ut	S	40	UT	Specimen User Field 7 Text	NA	
uu	S	6	UT	Specimen User Field 8 Code	NA	
uv	S	40	UT	Specimen User Field 8 Text	NA	
sa	S	40	UT	Physician Address Line 1	NA	
sb	S	40	UT	Physician Address Line 2	NA	
se	S	40	UT	Physician Address Line 3	NA	
sd	S	40	UT	Physician Address Line 4	NA	
wa	S	40	US	Specimen Wild Field 1	NA	
wb	S	40	US	Specimen Wild Field 2	NA	
wc	S	40	US	Specimen Wild Field 3	NA	
wd	S	40	US	Specimen Wild Field 4	NA	
we	S	40	US	Specimen Wild Field 5	NA	
ci	C	20	—	Culture ID (Examination ID)	Lab ID	R
c0	C	8	BT	Relative Culture/Exam Number	Lab ID System Code	
ct	C	6	UT	Culture Type Code	Culture Type Code	
cn	C	26	UT	Culture Type Text	Culture Type Name	
c1	C	date	US	Culture Completion date	NA	
c2	C	time	US	Culture Completion time	NA	
c3	C	2	BU	Culture Status Code	NA	
c4	C	16	BU	Culture Status Text	NA	
x1	C	40	US	Culture Wild Field 1	NA	
x2	C	40	US	Culture Wild Field 2	NA	
na	C	6	UT	Culture Comment Code (Repeatable)	NA	
nb	C	800	UT	Culture Comment Text (Repeatable)	NA	

[+] VITEK 2 Compact has a maximum length of 6. VITEK and VITEK 2 have a maximum length of 15 (if the translation table is used).

Test Result Fields

The fields listed in Table 4-5 are included in each test type, if they are enabled by users.

Table 4-5: Upload Test Result Field Types

Field Type	Data Class	Max. Length	Source	VITEK and VITEK 2 Description	VITEK 2 Compact Description	VITEK and VITEK 2 Required (R)
ta	T	0	–	Test Separator	Test Separator	
rt	T	8	BT	Test Type Code	Card type	
rn	T	40	BU	Test Type Name	NA	
rr	T	8	BT	Relative Test Number	Isolate System Code	
ti	T	2	BT	Instrument System Code	NA	
tj	T	16	BT	Instrument Name	NA	
tc	T	8	BT	Instrument Comment Code (Repeatable)	NA	
tn	T	800	BT	Instrument Comment Text (Repeatable)	NA	
t2	T	2	BT	Test Group Code	NA	
t3	T	16	BT	Test Group Name	NA	
t4	T	2	BT	Test Status Code	NA	
t5	T	16	BT	Test Status Name	NA	
m3	T	6	UT	Technologist Code	NA	
m4	T	30	UT	Technologist Name	NA	
nc	T	6	UT	Test Comment Code (Repeatable)	NA	
nd	T	800	UT	Test Comment Text (Repeatable)	NA	
y1	T	40	UT	Test Wild Text	NA	
y2	T	40	UT	Test Wild Text	NA	
y3	T	40	UT	Test Wild Text	NA	
y4*	T	40	UT	Test Wild Text	NA	
zz	G	0	-	Test Terminator	Result End	

*. Test type specific results follow the y4 field.

Test Result Fields for Specific Tests

Table 4-6 lists each test type and their allowable fields. Some of the fields within the table below are repeatable as a group. See the footnote at the bottom of this table for details.

In VITEK and VITEK 2, if two maximum field sizes are shown, the first number is bioLIAISON's maximum size and the second is the size determined by the host in Host Field Translations.

VITEK 2 Compact supports Host Field Translations for Organism Code and Drug Code.

Table 4-6: Upload Test Result Fields for Specific Tests

Test Type / Field Type	Data Class	Max. Length	VITEK and VITEK 2 Description	VITEK 2 Compact Description	Required (R)
ID Test					
t1	T	2	Isolate Number	Isolate Number	
tb	T	10	Bottle Bar Code	NA	
t6	T	6/15	Preliminary Organism Code	NA	
t7	T	60	Preliminary Organism Name	NA	
t8	T	6	Preliminary Modifier Code	NA	
t9	T	20	Preliminary Modifier Name	NA	
o1	T	6/15	Final Organism Code	Final Organism Code	
o2	T	60	Final Organism Name	Final Organism Name	
o3	T	16	Final Bionumber	Final Bionumber	
o4	T	6	Final Modifier Code	NA	
o5	T	20	Final Modifier Name	NA	
o6	T	6	Organism Group Code	NA	
o7	T	30	Organism Group Name	NA	
o9	T	8	Percent Probability	Percent Probability	
Susc. Test					
t1	T	2	Isolate Number	Isolate Number	
tb	T	10	Bottle Bar Code	NA	
tt	T	10,000	Test Free Text (VITEK 2 only) (AES Result Comment)	NA	
t6	T	6/15	Preliminary Organism Code	NA	

Table 4-6: Upload Test Result Fields for Specific Tests (Continued)

Test Type / Field Type	Data Class	Max. Length	VITEK and VITEK 2 Description	VITEK 2 Compact Description	Required (R)
t7	T	60	Preliminary Organism Name	NA	
t8	T	6	Preliminary Modifier Code	NA	
t9	T	20	Preliminary Modifier Name	NA	
o1	T	6/15	Final Organism Code	Final Organism Code	
o2	T	60	Final Organism Name	Final Organism Name	
o4	T	6	Final Modifier Code	NA	
o5	T	20	Final Modifier Name	NA	
o6	T	6	Organism Group Code	NA	
o7	T	30	Organism Group Name	NA	
af	T	40	NA	Antibiotic Family Name (Repeatable)	
ap	T	800	NA	Phenotype Names (Repeatable within an Antibiotic Family (af))	
ra*^	R	0	Result Separator	Result Separator	
ar*	R	0	CAR Suppression Indicator	NA	
ad*^	R	0	Deduced Drug (AES) (VITEK 2 only)	Deduced Antibiotic Flag	
a1*^	R	8/15	Drug Code	Antibiotic Code	
a2*^	R	60	Drug Name	Antibiotic Name	
a3*^	R	8	Final MIC	Result MIC	
a4*^	R	2	Final Result	Final Interpretation	
a5*	R	26	Dosage Column 1 (repeatable)	NA	
a6*	R	16	Dosage Column 2 (repeatable)	NA	
a7*	R	16	Dosage Column 3 (Repeatable)	NA	
an^	R	16	NA	Non-expertised Interpretation	
Smear Test					
tb	T	10	Bottle Bar Code	NA	
ra†	R	0	Result Separator	NA	
rs†	R	6	Smear Code	NA	
rm†	R	60	Smear Name	NA	

Table 4-6: Upload Test Result Fields for Specific Tests (Continued)

Test Type / Field Type	Data Class	Max. Length	VITEK and VITEK 2 Description	VITEK 2 Compact Description	Required (R)
o4†	R	6	Final Modifier Code	NA	
o5†	R	20	Final Modifier Name	NA	
Screen Test					
ra	R	0	Result Separator	NA	
o1	R	6/15	Final Organism Code	NA	
o2	R	60	Final Organism Name	NA	
o4	R	6	Final Modifier Code	NA	
o5	R	20	Final Modifier Name	NA	
o6	R	6	Organism Group Code	NA	
o7	R	30	Organism Group Name	NA	
o8	R	20	Total Count Text	NA	
o3	R	6	Total Count Code	NA	
rh	R	Time	Hours to Positive	NA	
Blood Test					
t1	T	2	Isolate Number (Repeatable)	NA	
o1	T	6/15	Final Organism Code (Repeatable)	NA	
tb	T	10	Bottle Bar Code	NA	
rd	T	Date	Result Date	NA	
ru	T	Time	Result Time	NA	
re	T	8	Elapsed Hours	NA	
rc	T	2	Instrument Result Code	NA	
ri	T	20	Instrument Result Name	NA	
rj	T	2	Blood Test Final Result Code	NA	
rk	T	20	Blood Test Final Result Name	NA	

*. The ra through a7 fields are repeatable as a group (VITEK and VITEK 2).
†. The ra through 05 fields are repeatable as a group (VITEK and VITEK 2).
^. The ra through an fields are repeatable as a group (VITEK 2 Compact).

Upload Applications Message Format

The first field in a message is a message type which describes the content and format. When an `rsl` message is indicated, the rest of the message follows this format:

1) First are patient demographics, followed by specimen, exam, tests, and results (if available).

2) Each level down through test will have a complete set of levels above it. Each level uses one field to mark its beginning.

3) Only one set of specimen demographics will follow patient demographics. Specimens will only have one set of culture demographics, and exams will only have one set of test demographics.

4) Result information may be sent, but is always treated as an update. For example, consider a culture with two isolates. The first gets tested on day one, while the other gets tested on day two. When the report for isolate two prints out, so does a repeat of isolate one.

5) When the a3 and a4 fields are both null (with no MIC or category call), they cause a suppression of the a1 through a7 fields in VITEK and VITEK 2 and the a1 through an fields in VITEK 2 Compact. When either field is null, it is sent without a value along with the other fields.

Descriptions of Fields in the Record Format

This table describes required components of fields in the basic record format.

Table 4-7: Component Requirements of the Record Format Fields

Record	Component Requirements
Patient demographic fields	Always begin with the patient identification (**pi**) field. Any of the other patient demographic fields can follow. The specimen demographics (**si**) field terminates this group.
Specimen demographic fields	This set of demographics always begins with the specimen separator (**si**) field. The **si** field is always null. Any of the other specimen demographics may follow. The culture field (**ci**) terminates this group.
Exam (culture) fields	This set of information will begin with the culture ID field (**ci**) and can be followed by any of the culture fields. The test separator (**ta**) field terminates this group if enabled.
Test fields	One set of tests can accompany a set of exam fields. Test groups begin with the **ta** field (if enabled), followed by the **rt** and **t1** fields which indicate the test type and isolate number. The result separator (**ra**) or message terminator (**zz**) terminates this group if enabled.

Table 4-7: Component Requirements of the Record Format Fields

Record	Component Requirements
Result fields	Organism fields transmit in numerical order beginning with **o1** and ending with **o9**. When enabled for transmission, the **ar** field precedes antimicrobial (**a1-a7**) fields. If appropriate. Antimicrobial fields also transmit in numerical order.

Note: *If users enable deduced drug information, the* `ad` *code will precede the antimicrobial field (*`a1`*).*

Note: *Users can configure the* `zz` *field to mark the end of the results. If they do not, the end of the packet indicates the end of the message.*

Test Result Examples

In the following upload packet examples, line breaks are for sample purposes only. There are no added line breaks in actual packets.

```
mtrsl|pi193301|pnHo, Ida|p14|p24 St. Vincent|ppsu|
p5Spuds, W.
Prettigrew|pda|p6Adult|w1475|uaf|ubFemale|
si|ssu|s5Urine|s1zer|s7EU|spsor|s8Sorrell, John|
s102/21/1996|s208:45|s302/21/1996|s411:10|
ci020517|ctr|cnRoutine C&S|c3F|c4Final|na>|na5|nangb|
nbColony count > 100,000col/ml|nb5%|nb Gram negative
bacilli|ta|rtgni|t11|rr2|rn Gram Negative
Identification|rr22|t11|t2ID|t3Identification|t4F|
t5Final|tb123456|o1promir|o2proteus mirabilis|
```

Figure 4-1: Identification Test

```
mtrs|pi193301|pnHo, Ida|p14|St. Vincent|ppsu|p5Spuds,W.
Prettigrew|pda|p6Adult|w1475|uaf|ubFemale|si|ssu|s5Uri
ne|slzer|s7EU|spor|s8Sorrell, John|s102/21/
1996|s208:45|s302/21/
1996|s411:10|ci020517|ctr|cnRoutine
C&S|c3F|c4Final|na>|na5|nangb|nbColony count >
100,000col/ml|nb5%|nb Gram Negative
bacilli|ta|rtgni|t11|rr22|rn Gram Negative
Identification|rr22|t11|t21D|t3Identification|t4F|t5Fi
nal|tb123456|o1promir|o2proteus
mirabilis|o3360320001220|zz|
```

Figure 4-2: Identification Test from a Blood Culture with ra and ta Fields Enabled

```
mtrsl|pi118962|pnGentley, Dirk|p12|p22nd J E|pprast|
p5Rastling, Fred|pda|p6Adult|w1277|
si|ssw|s5Nonsurgical Wound/Abscess|slicu|s7ICU|sprast|
s8Rastling, Fred|s106/06/1996|s222:45|
ci1759|ctr|cnRoutine C&S|c106/06/96|c3F|c4Final|x2Gall
bladder|nah|nbHeavy growth|rtkb|rnGram positive Kirby-
Bauer|rr1|ti1|tjVitek2-Wounds|tnInstrument Comments|
t2KB|t3Kirby-Bauer|t4F|t5Final|o1strvir|o2streptococcus
viridans group|o6nes|o7Non-enterococcal Strep|nckb|
ndSensitivity performed by disk testing|y12 morphologies
isolated.|a1cf|a2Cephalothin|a3|a4S|a1c|
a2Chloramphenicol|a3|a4S|a1cc|a2Clindamycin|a3|a4S|a1e|
a2Erythromycin|a3|a4S|a1peng|a2Penicillin-G|a3|a4S|
a1tet|a2Tetracycline|a3|a4S|a1va|a2Vancomycin|a3|a4S|zz
|
```

Figure 4-3: Susceptibility Test

```
mtrsl|pi118962|pnGentley, Dirk|p12|p22nd J E|pprast|
p5Rastling, Fred|pda|p6Adult|w1277|
si|ssw|s5Nonsurgical Wound/Abscess|slicu|s7ICU|sprast|
s8Rastling, Fred|s106/06/1996|s222:45|
ci1759|ctr|cnRoutine C&S|c106/06/96|c3F|c4Final|x2Gall
bladder|nah|nbHeavy growth|ta|rtkb|rnGram positive
Kirby-Bauer|rr1|ti1|tjVitek2-Wounds|tn|Instrument
Comments|t2KB|t3KirbyBauer|t4F|t5Final|o1strvir|o2str
eptococcusviridans group|o6nes|o7Non-enterococcal
Strep|nckb|ndSensitivity performed by disk testing|
y12morphologiesisolated.|ra|a1cf|a2Cephalothin|a3|a4S
|ra|a1c|a2Chloramphenicol|a3|a4S|ra|a1cc|a2Clindamyci
n|a3|a4S|ra|a1e|a2Erythromycin|a3|a4S|ra|a1peng|a2Pen
icillin-
G|a3|a4S|ra|a1tet|a2Tetracycline|a3|a4S|ra|a1va|
a2Vancomycin|a3|a4S|zz|
```

Figure 4-4: Susceptibility Test from a Blood Culture / ra and ta enabled

4

```
mtrsl|iiAM|itSC|pi299817|pnJones, Louise|p1zop|p2Out
Patient|ppsco|p5Scott, Graham|pda|p6Adult|w10P|uaf|
ubFemale|
si|s02|ssear|s5Ear|s102/02/1996|s218:48|
ci54698|c3P|c4Preliminary|
nasns|nbSensitivity not by standardized method.
Confirm-ation of sensitivities to follow.|rtuid-
3|rr2|rnUrine
Identification|tiAM|tjVITEK|t2SC|t3Screen|t4F|t5Final|
o1PC|o2Positive Control|o4cnt0|o1prospe|o2Proteus
species|o4cnt0|o8> 50,000 cfu/ml|o3cnt2|zz|
```

Figure 4-5: Screen Test

```
mtrsl|pi219513|pnBrown, James|p17|p27 St.
Luke's|ppowe|
p5Owens, C. Jesse|pda|p6Adult|w1774|uam|ubMale|
si|ssw|s5Nonsurgical Wound/Abscess|s17|s77 St. Luke's|
spowe|s8Owens, C. Jesse|sl11/15/1996|s211:55|
ci110333|ctr|cnRoutine C&S|c111/18/1996|c3F|c4Final|
x2Back mass|nang3d|nbNo growth in 3 days|ta|rtvitest|
rr1|rnVitekTest|t2SM|t3Smear|t4F|t5Final|tb444|ra|
rssmear|o41|o51+|ra|rssmear|o42|o52+|zz|
```

Figure 4-6: Smear Test from a Blood Culture / ra and ta enabled

```
mtrsl|pi193301|pnHo, Ida|p14|p24 St. Vincent|ppsu|
p5Spuds, W. Prettigrew|pda|p6Adult|w1475|uaf|ubFemale|
si|ssgf|s5Genital - Female|slzer|s7EU|spsor|s8Sorrel,
John|s102/21/1996|s210:20|s302/21/1996|s411:45|
ci020506|ctr|cnRoutine C&S|c102/23/1996|c3F|c4Final|
x2vagina|nah|na100|nanvf|nbHeavy growth|nb100%|
nbNormal vaginal flora|zz|
```

Figure 4-7: Demographics Only

```
mtrsl|idBMX|iiOT|itBC|pibcitest600|pnGallant, Hazel|
psf|p14|p24 St. Vincent|pprich|pda|p6Adult|w1471|uaf|
si|s07|ssu|slsicu|s7SICU|sprich|s110/07/1992|s214:00|
sf0.0|
ci100167|c01|ctser|c110/11/1992|c211:08|c3P|na>|ta|
rtaer|rr7|tiOT|t2BC|t3Blood Culture|t4I|m3rm|tb943628|
rd12/25/
1996|ru14:30|re40|rc+|riPositive|rj+|rkPositive|
zz|
```

Figure 4-8: Blood Culture Test

```
mtrsl|iiV2|is123456789012|itSU|pi49562999|pv123456|pnDoe,
John A.|plicu|p2icu|pp
JJ12|p5JJ12|pcPatien|ptPatient comment goes
here|w1123456|si|s066|ssarm|s5arm|s1
04/01/2004|s304/01/2004|scSpecim|snSpecimen comment goes
here|ci9910123|c066|ctw
ound|cnwound|ta|rtAST-GN04|rr70|t11|o1entclo|o2Enteroba
cter cloacae|afBETA-LACTAMS|apHIGH LEVEL
CEPHALOSPORINASE|apEXTENDED SPECTRUM BE
TA-
LACTAMASE|afAMINOGLYCOSIDES|apWILD|afQUINOLONES|apPARTIALLY
RESISTANT|apRESIS
TANT QUIN-
1|apWILD|afFURANES|apRESISTANT|apWILD|afTRIMETHOPRIM/
SULFONAMIDES|apWI
LD|ra|a1am|a2Ampicillin|a3>=32|a4R|anR|ra|a1ams|a2Ampicilli
n/Sulbactam|a3>=32|a4
R|anR|ra|a1tcc|a2Ticarcillin/Clavulanic
Acid|a3>=128|a4R|anR|ra|a1pip|a2Piperaci
llin|a332|a4I|anI|ra|a1tzp|a2Piperacillin/
Tazobactam|a316|a4S|anS|ra|a1cz|a2Cefa
zolin|a3>=64|a4R|anR|ra|a1rox|a2Cefuroxime|a3>=64|a4R|anR|r
a|a1roxa|a2Cefuroxime

Axetil|a3>=64|a4R|anR|ra|a1cte|a2Cefotetan|a3>=64|a4R|anR|r
a|a1taz|a2Ceftazidim
e|a3>=64|a4R|anR|ra|a1ctr|a2Ceftriaxone|a332|a4I|anR|ra|a1f
ep|a2Cefepime|a3<=1|a
4S|anS|ra|a1azm|a2Aztreonam|a316|a4I|anI|ra|a1imi|a2Imipene
m|a3<=0.5|a4S|anS|ra|
a1an|a2Amikacin|a3<=2|a4S|anS|ra|a1gm|a2Gentamicin|a3<=1|a4
S|anS|ra|a1tob|a2Tobr
amycin|a3<=1|a4S|anS|ra|a1cip|a2Ciprofloxacin|a3<=0.25|a4S|
anS|ra|a1lev|a2Levofl
oxacin|a3<=0.25|a4S|anS|ra|a1ftn|a2Nitrofurantoin|a364|a4I|
anR|ra|a1sxt|a2Trimet
hoprim/
Sulfamethoxazole|a3<=20|a4S|anS|ra|ad|a1amx|a2Amoxicillin|a
3|a4R|an|ra|ad
a1amc|a2Amoxicillin/Clavulanic
Acid|a3|a4R|an|ra|ad|a1mz|a2Mezlocillin|a3|a4I|a
n|ra|ad|a1cid|a2Cefonicid|a3|a4R|an|ra|ad|a1cm|a2Cefamandol
e|a3|a4R|an|ra|ad|a1t
ax|a2Cefotaxime|a3|a4I|an|ra|ad|a1zox|a2Ceftizoxime|a3|a4I|
an|ra|ad|a1mem|a2Mero
penem|a3|a4S|an|zz|
```

VITEK 2 compact

Figure 4-9: Sample AST (VITEK 2 Compact)

```
mtrsl|iiV2|is123456789012|itID|pi49562999|pv123456|pn
Doe, John A.|plicu|p2icu|pp
JJ12|p5JJ12|pcPatien|ptPatient comment goes
here|w1123456|si|s067|ssarm|s5arm|s1
04/01/2004|s304/01/
2004|ci99109|c067|ctwound|cnwound|ta|rtGP|rr12|t11|o1
gember|o
2Gemella bergeri|o3000022000401001|o996|zz|
```

VITEK 2 compact

Figure 4-10: Sample ID (VITEK 2 Compact)

BCI UTILITIES (VITEK & VITEK 2 ONLY)

Chapter Contents

Introduction

Note: *To learn about BCI utilities that relate to VITEK 2 Compact, see the VITEK 2 Compact Online Software User Manual.*

BCI utilities allow users to customize the interface. This provides the flexibility a bioMérieux computer needs to communicate simultaneously

with a variety of host computers. BCI recognizes and uses several protocols and port parameters depending on the needs of the host system.

BCI allows the configuration of one or more ports for various upload and download options. It also lets users view data transmissions, transaction logs, and status logs.

BCI Main Window

To access BCI utilities, open the BCI window by clicking **BCI** in the bioLIAISON Main Menu.

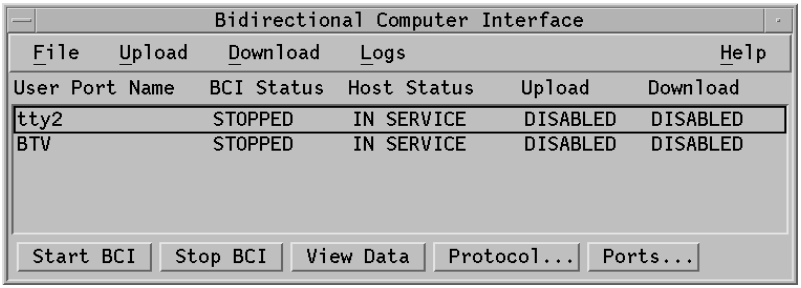

Figure 5-1: BCI Main Menu

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This example shows two ports assigned to use BCI. One is connected to an unnamed computer and the other to a BacT/VIEW system in the microbiology laboratory. The fields in the main window provide information about the status of each port and how they are being used.

Information in the main window lists by:

User Port Name — This is the user-assigned name that identifies the host computer the port serves.

BCI Status — This shows the status of communications on each port. Values are:

- **Started.** BCI allows communications to occur on the port.
- **Stopped**. communications do not occur on the port.

Host Status — This shows the status of the host computer connected to the port. Values are:

- **In Service**. The host is available for uploads.
- **Out of Service**. The host is not available for uploads.

- **No Response**. The bioMérieux computer tries to send data to the host but receives no confirmation.

Upload. Shows whether or not the port can receive uploads. Values are:

- **Enabled**. BCI will allow bioMérieux programs to upload to the host.
- **Disabled**. BCI will not accept data from bioMérieux programs but will allow uploads.

Download — Shows whether or not the port can process downloads. Values are:

- **Enabled**. BCI will process downloaded transactions.
- **Disabled.** BCI will not process downloaded transactions, but will allow downloads.

Port Configuration Options

The Port Configuration utility lets users set parameters for each BCI port. To access the utility, select a port in the BCI window and click on the **Ports** button.

Note: *You can get a printout of current configuration settings by selecting* **Print Configuration** *in the BCI window.*

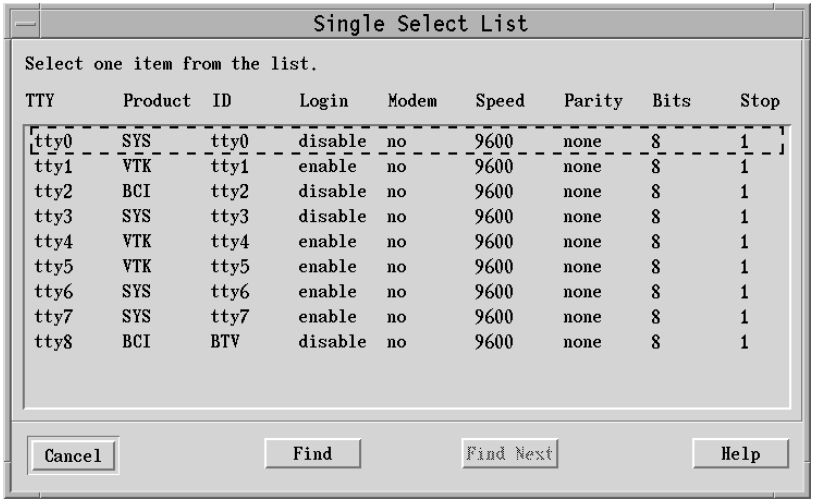

Figure 5-2: Port Configuration Options

The selection window lists each port and its configuration currently on the bioMérieux computer. To configure a BCI port, click on a port in the list.

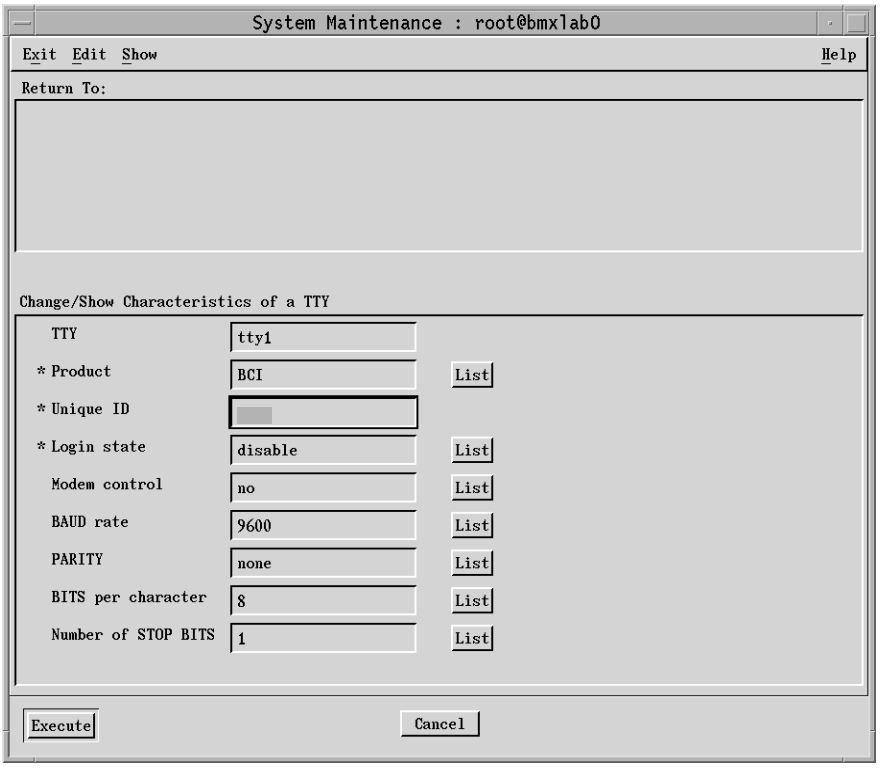

Figure 5-3: Configuring a BCI Port

5

Possible Port Configuration Settings

Table 5-1: Configuration and Setting Description

Configuration	Setting Description
Product	Set to **BCI**.
Unique ID	This is the user-defined name for the port.
Login State	Set to **Disable**.
BAUD rate	Set as required. Available settings are **300**, **1200**, **2400**, **9600**, and **19,200**. The default is **9600**.
Parity	Set as required. Available settings are **Even**, **Odd**, and **None**. The default is **None**.
Bits per character	Set as required. Available settings are **7** and **8.** The default is **8.**
Number of Stop bits	Set as required. Available settings are **1** and **2**. The default is **1.**

Clicking **Execute** saves the settings.

Protocol Configuration

The protocol configuration utility sets the communications protocol, data separators, and other protocol specific parameters for a port. To access the utility, select a user port name and click **Protocol** in the BCI main window.

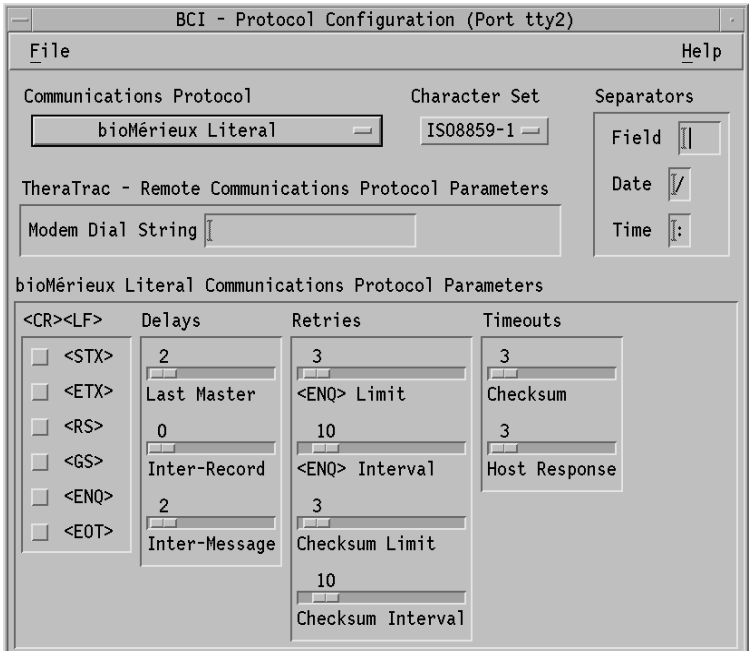

Figure 5-4: Protocol Configuration

Communications Protocols

BCI supports three communications protocols plus a manual mode for testing purposes. There are also two protocols for use with the bioMérieux TheraTrac pharmacy system.

- **bioMérieux Literal** — A proprietary protocol developed by bioMérieux. See "Appendix D: Antimicrobial MICs and Categories" on page D-1 for details.
- **bioMérieux Literal (Alternate)** — This is the same as the Literal protocol except all messages must be framed with an **<STX>** and **<ETX>**. It expects responses to the checksum **<GS>** record after the **<ETX>**. See the bioMérieux Communications Protocol section for details.
- **ASTM E1381** — A low level protocol that complies with ASTM E1381.

- **Manual** — A tool that helps establish initial connections to a host.
- **TheraTrac (Local)** - This protocol is for use with bioMérieux TheraTrac pharmacy systems connected with RS232 cabling.
- **TheraTrac (Remote)** - This protocol is for use with bioMérieux TheraTrac pharmacy systems connected with a modem.

Note: *If you set the TheraTrac protocol, the remaining Literal protocol settings are not used.*

Record and Field Separators

This is a listing of the record and field separators available for data transmissions. See "BCI Upload Options" on page 5-8 and "BCI Download Options" on page 5-11 for descriptions of data sent with BCI.

Field terminator characters — These can be one to three characters. The default is a vertical bar (|). Valid characters include:

Table 5-2: Field Terminator Characters

!	@	#	$	%	^
&	*	(	)	-	+
|	=	<	>	/	?
[	]	{	}	\	.

Note: *Commas are not allowed and separators must be unique. It is recommended that you use only / : or - as the date separator.*

Date — These are single characters only which separate month, day, and year data. The default character is a slash (**/**).

Time — These are single characters that separate hour, minute, and second data. The default character is a colon (**:**).

bioMérieux Literal Protocol Parameters

These parameters apply only to the bioMérieux Literal and Literal (Alternate) protocols.

End of Record <CR> <LF>

This option appends a **<CR><LF>** sequence to each record in the packet. Each record type can also be toggled so they can apply on a per record basis. The default end of record does **not** append **<CR><LF>**.

Delays

There are three types of delays:

Last Master (seconds) - This lets users set the amount of time BCI will wait before starting another session. (It sends an **<ENQ>** when it was master of the last session.) Values can be from 0 to 99 seconds. The default is two seconds.

Note: *The host should have a similar delay to prevent it from controlling the line continuously.*

InterRecord (seconds) - If the host system requires additional time to clear its input buffers, users can adjust the delay time an instrument uses between record transmissions. Values can be from 0 to 99 seconds. The default is zero

InterMessage (seconds) - Users can also insert a delay time between communications messages using this option. Values can be from 0 to 99 seconds. The default is two seconds.

Retries

- **<ENQ> Limit** — This is the number of times BCI will try to contact the host to begin a session. When the retry limit is reached, BCI logs an error and begins queueing data for upload and notifies the user with a message. If the host responds, BCI sends any queued data and adds a note to the message log that the host responded.

  Values can be from 0 to 99 tries. Choosing zero means BCI will not log an error or send a message to the message beeper. In all cases BCI will continue trying to send. The default is three tries.

- **<ENQ> Interval** (seconds) — This is the amount of time BCI will wait before the next transmission of an **<ENQ>** following a no response or **<NAK>**. Values can be from 0 to 99 seconds. The default is ten seconds.

- **Checksum Limit** — The communications layer will retransmit an entire packet if it receives a **<NAK>** to a **<GS>** record or the checksum **<ACK>** time out expires. When this limit is reached, BCI logs an error and tosses the packet. Values can be from 0 to 99. The default is three tries.

- **Checksum Interval** (seconds) — This is the amount of time BCI will wait before retransmitting a packet after receiving a bad or no checksum. Values can be from 0 to 99 seconds. The default is ten seconds.

Timeouts

- **Checksum** (seconds) — This is the amount of time BCI will wait for an <**ACK**> to a **<GS>** record. If the time expires and BCI still has not received

either an <**ACK**> or a <**NAK**>, it will retransmit the entire packet. Values can be from 0 to 99. The default is three seconds.

- **Host Response** (seconds) - During a host initiated session, BCI waits for data from the host. If it does not receive any data during a specified time, it times out and sends an <**EOT**> to the host and terminates the session. It also logs an error and assumes the host has ended the session. Values can be from 0 to 99 seconds. The default is three seconds.

Character Set Options

BCI supports the ISO8859-1 and IBM-850 character sets.

Modem Dial String

Use this option to enter the modem number if there is a remote connection to a TheraTrac or other device via modem.

BCI Upload Options

To access upload options, select **Upload** > **Configuration** in the BCI Main Menu.

Upload Configurations

Field Length

When this option is set to **Fixed**, BCI pads fields with spaces if necessary to send their maximum size. When set to **Variable**, BCI does not pad with spaces. The default setting is **Variable**.

Case of Data

This option lets users select either all upper case or all lower case letters for alphabetic data. The **As Is** setting does not modify characters. If set to upper case, all characters except the checksum transmit in upper case. The default setting is **As Is**.

Miscellaneous Tests

There are several sensitivity results which have atypical susceptibility result formats. If enabled, the literal upload transmits these results as if they were antibiotics in the `a1–a7` fields. Suppressing a particular test means its results are not sent. See “Appendix D: Antimicrobial MICs and Categories” on page D-1.

CAR Rules (bioLIAISON)

When this option is set to **Applied**, bioLIAISON's Conditional Antimicrobial Rules are enforced during uploads. Only specified antimicrobials transmit to the host. If the option is set to **Not Applied**, all antimicrobial results transmit but some may be marked by the (`ar`) field to indicate to the host that the user has CAR rules and if set to **Applied**, the drug would not be sent. The default setting is **Not Applied**.

Deduced Drugs

The VITEK 2 has a method to deductively analyze susceptibility results that uses a special antimicrobial table. Even if a laboratory chooses to use this VITEK 2 feature, it may not want deduced results to upload to a host. This option tells BCI whether or not to allow the upload of deduced results. The default is **Allowed**.

Leading Zeros

Because some LIS systems require a certain number of digits in an exam ID, this option lets users designate the size in characters of exam IDs by inserting zeros in front of the first digit. Using the slider bar, they can force the exam ID to be up to twenty characters long. The default is zero indicating no added zeros.

Date Format Options

BCI contains six date format options. They include both two and four digit year formats.

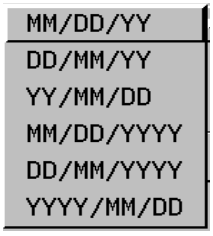

Figure 5-5: Date Format

Upload Fields to Transmit

This window lets users select the fields they want to upload. Clicking on buttons to the left of the field code toggles the field on and off. BCI uploads toggled fields.

BMX Data Configuration

This window lets users specify which bioLIAISON programs can upload information to the host for a specific port.

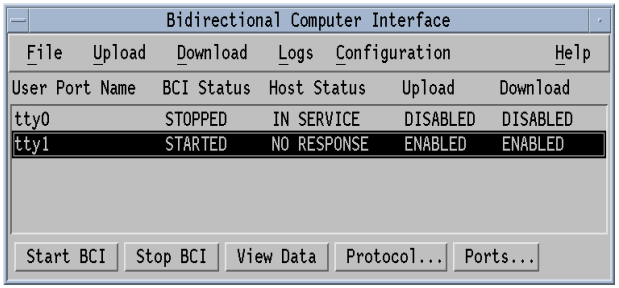

Figure 5-6: BMX Data Configuration

Enable Upload

This option enables uploads for the port selected in the main window. The current status for each port appears under the **UPLOAD** column.

Disable Upload

This option disables uploads for the port selected in the main window. The current status for each port appears under the **UPLOAD** column.

5

Host In Service

This option changes the host status to **In Service** making it unnecessary for the host to transmit a Back in Service **<BIS>** message.

Host Out Of service

This option changes the host status to **Out of Service** making it unnecessary for the host to transmit an out of service <**OOS**> message.

BCI Download Options

To select download options, click **Download** > **Configuration** in the BCI main window.

Download Configuration

This window provides several options for configuring data downloaded from the host to the bioMérieux computer.

Duplicate Demographics Update

This option lets users decide whether or not they want BCI to update records in the bioLIAISON database when downloads contain new information. If enabled, this option updates existing patient, specimen, and exam demographics if the download contains a matching exam and patient ID and the exam status is preliminary.

If the update changes the exam type, the update still occurs, but a notation about the change goes to the download error log. Successful updates depend on the following conditions:

1) The exam must have a preliminary status.

2) Final exams never update, even if the exam and patient ID's match the input packet.

3) Only one preliminary exam can have matching exam and patient ID's. If more than one preliminary exam matches, BCI rejects the update and issues an error message.

For either setting, if there is no match bioLIAISON creates a new specimen and exam record in the database, including tests and results if sent. Even if a final exam matches the input packet, bioLIAISON still creates the new records because final exams are not considered during the matching process.

When disabled, BCI does not update existing exam, patient, and specimen records. Instead, it issues a message.

Table 5-3: Duplicate Demographics Updating Options

Enabled	Disabled
if preliminary... the database updates demographics	**if preliminary**... the database gives a message
if final... the database inserts a new specimen and exam	**if final...** the database inserts a new specimen and exam

Initialize Specimen Data

When enabled, this option uses the location (`p1`), service (`px`), and physician (`pp`) fields in the patient block to update corresponding specimen fields in the database when the host does not download the specimen fields `s1`, `sx`, and `sp`.

When disabled, these specimen fields are left blank.

Date Formats

Figure 5-7: Date Format

Dates are configurable to comply with requirements for four-digit date formats. If the LIS is downloading two digit years, BCI will interpret them so they fall in the range between 90 years in the past to 10 years in the future. For example:

Table 5-4: Date Configurations

Today's date	LIS sends	BCI says	LIS sends	BCI says	LIS sends	BCI says
1998	98	1998	08	1908	07	2007
1999	98	1998	09	1909	08	2008
2000	98	1998	10	1910	09	2009

Download Fields to Process

This window gives users the ability to select the fields they want to process from the host computer. Clicking on the buttons to the left of the field code toggles the field on and off. BCI processes any fields with depressed shaded buttons. Grayed out fields can't be toggled off.

Running BCI

After users set configuration options for the port and select upload and download options, they can start communications. This section describes the operating functions accessed in the main window.

Start BCI

Clicking **Start BCI** begins communications for the selected port(s). The status for the port(s) changes to **Started** in the main window.

Stop BCI

Clicking **Stop BCI** stops communications for the selected port(s). The status for the port(s) changes to **Stopped** in the main window.

View Data

When communications are running, users can view transmissions online by clicking **View Data**.

Messages scroll across the window as data transmits between the two computers. Host data highlights in reverse video and bioMérieux data appears in black text. Functions available in this window include:

Table 5-5: View Data Window Buttons

Button	Function
CLEAR	Clears messages from the window (but not the data file)
BIS	Sends a back in service message to the host
OOS	Send an out of service message to the host
TEST	Sends a test pattern to the host

When a port is configured for manual mode, the View Data window displays automatically. The **BIS**, **OOS**, and **TEST** buttons grey out and the following functions become active.

Table 5-6: View Data Window Buttons in Manual Mode

Button	Function
ENQ	Sends line request signal to the host
ACK	Sends an acknowledgment signal to the host

Table 5-6: View Data Window Buttons in Manual Mode

Button	Function
NAK	Sends a negative acknowledgment signal to the host
Send Text	Sends a text string to the host

Logs

To access BCI logs, click **Logs** in the BCI main window.

Upload Transaction Log

The upload transaction log provides information on data transmitting from an instrument to the host computer.

The upload transaction log lists transmitted data by:

Date/Time — This is the date and time the data received its current status.

Port — This is the port to which the data uploaded.

Instrument — This is the type of instrument from which the data uploaded. See Appendix H for a listing of instruments and codes.

Patient/Exam ID — This is the patient and exam ID for the transmitted test data.

Iso — This is the isolate number for the test result.

Test Type — This is the type of test transmitted. See Appendix F for a listing of test types.

Status — This is the status of the upload determined by BCI. Possible statuses are:

- **To Be Processed.** This means BCI received data from the bmx program but has not yet processed it into the bioMérieux literal format.
- **To Be Sent.** This means BCI has processed the data for upload and is waiting to send it to the host.
- **Sent.** The host received and acknowledged the upload.
- **Failed.** The transaction was not transmitted to the host and the packet discarded.

The log also has search and filtering functions for finding and deleting transactions.

Note: *See the BCI Operator's Manual for more information.*

Download Transaction Log

The download transaction log provides information about data transmitting from the host to the bioMérieux computer.

This window functions similarly to the Upload Transaction log except that its status field has different meanings.

- **To Be Processed** — This means BCI received data downloaded from the host.
- **To Be Sent** — This means BCI processed the downloaded data from the host and is waiting to send it to the bioMérieux product database.
- **Sent** — This means BCI has transmitted downloaded data to the bioLIAISON database.

Note: *See the BCI Operator's Manual for more information.*

Status Log

The Status Log shows how BCI's programs are running.

Note: *See the Bidirectional Computer Interface Operator Manual for bioLIAISON for more information.*

Communications Data Log

This log shows data transmitted across a port.

Download Error Log

The download error log maintains a listing of error messages and problems BCI encountered while processing data in a download transaction. Date errors are logged in the Status Log.

Note: *Messages in the download log purge automatically as the log fills. Older data is an indication that there were relatively few errors.*

Configuration Options

Host Field Translations

This utility lets users select the bioLIAISON drug, organism, physician and source tables and specify either default bioLIAISON or special host codes for drug and organism fields. Users can also translate the physician and specimen source tables. BCI uses all four translation tables for downloads and uploads.

Drug Field Translations

bioMérieux provides a default drug table in bioLIAISON which contains drug names and codes. This window lets users set different codes for those drugs if required by the host system. When transmitting a drug code field (`a1`), the bioMérieux computer checks this table for user-defined codes. If there are none, it transmits the bioMérieux default code. Codes defined by the user in this window can be up to fifteen characters long.

Note: *The vertical pipe (|) may not be used in a host code.*

Organism Field Translations

Similar to the drug field table, bioMérieux provides a default organism table in bioLIAISON which contains organism names and codes. This window lets users set new codes for those organisms if required by the host system. When transmitting an organism code field, the bioMérieux computer checks this table for user-defined codes. If there are none, it transmits the bioMérieux default code. Codes defined by the user in this window can be up to fifteen characters long.

There are two other translation menus – one for physicians and one for specimen source. They work the same way as the drug and organism field menus.

Transaction Routing

The transaction routing program displays the routing paths of downloads from each port and allows users to change settings on a port by port basis. This option was designed specifically for users who want blood culture results to transfer from a blood culture instrument as soon as they become available.

There have to be at least two designated BCI ports in order to use transaction routing.

Appendix A: Field Type Definitions

These are descriptions of valid upload and download fields.

Table A-1: Field Type Definitions

Field Code	VITEK and VITEK 2 Type and Name Description	VITEK 2 Compact Description	Upload/ Download	Definition and Use
mt	Message Type	Message Type	U/D	A unique code identifying the type of message that is being sent.
id	Instrument ID	NA	U/D	A unique code assigned by an instrument system. BCI uses it to determine from where data was sent.
ii	Instrument System Code	Instrument Code	U	A unique code assigned to an instrument system, bioLIAISON uses it to determine where a test came from. This field is useful for hosts that need immediate identifications in a packet so it can route the packet to a desired destination. (This is the same data as the ti field. It is not applicable if there are no tests or results.)
is	NA	Instrument Serial Number	U	A unique code assigned to the VITEK 2 Compact instrument that processed the test.
it	Test Group System Code	Test Group Code	U	A unique code assigned to an instrument system which contains a unique set of codes for grouping tests. It is used to determine which test and result table should hold test data. Is also an optional field that follows the instrument code field.
pi	Patient.System Code	Patient ID	U/D	A unique code assigned by an instrument system to identify a patient.
pn	Patient.Name	Patient Name	U/D	Identifies the patient by name.
pb	Patient.Birthdate	NA	U/D	Specifies the patient date of birth.
ps	Patient.Sex	NA	U/D	Specifies the patient gender. Is a free text field.
p1-p2	Patient.Location User Code and Name	Patient Location Name	U/D	Usually indicates a patient location by ward, floor, unit, or room. BCI uploads and downloads the code but only uploads the name.

Table A-1: Field Type Definitions (Continued)

Field Code	VITEK and VITEK 2 Type and Name Description	VITEK 2 Compact Description	Upload/ Download	Definition and Use
px, p3	Patient.Service User Code and Name	NA	U/D	Usually indicates an institution's functional service area, for example surgery, icu, obstetrics, etc. BCI uploads and downloads the code but only uploads the name.
po, p4	Patient.Diagnosis User Code and Name	NA	U/D	Indicates a standard diagnosis. BCI uploads and downloads the code but only uploads the name.
pp, p5	Patient.Physician User Code and Name	Patient Physician Code and Patient Physician ID	U/D	Identifies the physician responsible for the patient or case. BCI uploads and downloads the code but only uploads the name. For VITEK and VITEK 2, these are translatable fields.
pa	Patient.AdmissionDate	NA	U/D	Indicates the date a patient was admitted to an institution.
pd, p6	Patient.Dosage Group User Code and Name	NA	U/D	Identifies the dosage group — usually adult or pediatric. Code selected from the dosage group table in bioLIAISON. BCI uploads and downloads the code but only uploads the name.
pc, pt	Patient.Comment User Code and Text	NA	U/D	These fields contain patient comments. In VITEK and VITEK 2, they can repeat multiple times in a single record. BCI uploads and downloads the code but only uploads the text.
pv	NA	Patient Alternate ID	U/D	Identifier for patient visits. Used by TheraTrac 2 to link test results with associated patient information.
w1 - w8	Patient.User Text	Patient Wild 1	U/D	These fields contain free text. Users can enter any data they want here. Note: VITEK 2 Compact maps w1 to pv.
ua-uf, u1-u4	Patient.Extra User Codes and Names	NA	U/D	These codes and fields contain user defined information about patients. BCI uploads and downloads the codes but only uploads the names
p7-p0	Patient.Address Lines 1 thru 4	NA	U	Contains address information for the primary physician.
si	Specimen Separator	Specimen Separator	U/D	This field separates patient demographics from specimen data. Is always sent as a null field.

Table A-1: Field Type Definitions (Continued)

Field Code	VITEK and VITEK 2 Type and Name Description	VITEK 2 Compact Description	Upload/ Download	Definition and Use
s0	Specimen.Specimen System Code	Specimen System Code	U	This field contains a relative specimen number.
ss, s5	Specimen.Source User Code and Name	Specimen Source Code and Specimen Source Name	U/D	Contains a basic specimen type, for example blood, urine, or stool. Fields are host translatable. BCI uploads and downloads the codes but only uploads the names.
st, s6	Specimen.Site User Code and Name	NA	U/D	Indicates the place on a patient's body where specimens are taken. BCI uploads and downloads the codes but only uploads the names.
sl, s7	Specimen.Location User Code and Name	Specimen Collection Date	U/D	Identifies the institution location where the specimen was taken. Is often the same as the patient location. BCI uploads and downloads the code but only uploads the name.
sp, s8	Specimen.Physician User Code and Name	NA	U/D	Identifies the physician requesting specimens taken for an exam. BCI uploads and downloads the codes but only uploads the name. Fields can be translated.
sx, s9	Specimen.Service User Code and Name	NA	U/D	Identifies functional areas within an institution as opposed to a specific location. For example, pediatrics, oncology, etc. BCI uploads and downloads the codes but only uploads the name.
sy - sz	Specimen.Status System Code and Name	NA	U/D	Indicates the status (preliminary, final, etc.) of a specimen. BCI uploads and downloads the codes but only uploads the name.
s1	Specimen.Collection Date	Specimen Collection Date	U/D	Indicates the date on which a specimen was collected.
s2	Specimen.Collection Time	Specimen Collection Time	U/D	Indicates the time a specimen was collected.
s3	Specimen.Receipt Date	Specimen Receipt Date	U/D	Indicates the date a specimen was received in the lab. Note: VITEK 2 Compact does not download this field. Instead, it copies the Collection Date into this field for uploads.

Table A-1: Field Type Definitions (Continued)

Field Code	VITEK and VITEK 2 Type and Name Description	VITEK 2 Compact Description	Upload/ Download	Definition and Use
s4	Specimen.Receipt Time	Specimen Receipt Time	U/D	Indicates the time a specimen was received in the lab. Note: VITEK 2 Compact does not download this field. Instead, it copies the Collection Time into this field for uploads.
sf	Specimen.Patient Temp	NA	U/D	Usually indicates a patient's body temperature at the time of specimen collection.
so	Specimen.Collection Number	NA	U/D	This field is used in place of the collection date and time fields to order and sort collected specimens.
sc - sn	Specimen.Comment User Code and Text	Specimen Comment Code and Specimen Comment Text	U/D	Contains user-entered comments about the specimen. In VITEK and VITEK 2, the sc and sn fields can repeat multiple times in a single record. BCI uploads and downloads the code but only uploads the text.
ug - uv	Specimen.Extra User Codes and Text	NA	U/D	These are additional coded fields for miscellaneous specimen information. BCI can upload and download the codes, but only uploads the text.
sa, sb, se, sd	Specimen.Address Lines 1- 4	NA	U	Contain address information for the specimen requesting physician.
wa - we	Specimen.User Text 1- 5	NA	U/D	These fields contain free text. Users can enter any data they want here.
ci	Exam.User Code	Lab ID	U/D	Also referred to as the exam ID or accession number. This is a unique number assigned by the instrument system to link test results with the correct patient record. In a results message, the culture ID precedes test results.
c0	Exam.Exam System Code	Lab ID System Code	U	This is an exam counter field.
ct, cn	Exam.Exam Type User Code and Name	Culture Type Code and Culture Type Name	U/D	Indicates the culture (exam) type. For example routine, AFB, or yeast. BCI upload and downloads the code but only uploads the text.
c1	Exam.Completion Date	NA	U/D	Indicates the date an exam was completed.
c2	Exam.Completion Time	NA	U/D	Indicates the time an exam was completed.

Table A-1: Field Type Definitions (Continued)

Field Code	VITEK and VITEK 2 Type and Name Description	VITEK 2 Compact Description	Upload/ Download	Definition and Use
c3, c4	Exam.Status System Code and Name	NA	U	Identifies the status of a culture as preliminary or final.
x1 - x2	Exam.User Text 1 - 2	NA	U/D	These fields contain free text. Users can enter any data they want here.
na - nb	Exam.Comment User Code and Text	NA	U/D	Contain comments about cultures. These fields can repeat multiple times in a single record. BCI uploads and downloads the code, but only uploads the text.
ta	Test Separator	Test Separator	U/D	Test separator field. Required for downloads
rt - rn	Test.Test Type Code and Name	Card Type	U/D	This is the first field in a test result. It indicates the type of results a host computer can expect. BCI uploads and downloads the code, but only uploads the name. VITEK 2 Compact does not upload the name.
rr	Test.Test System Code	Isolate System Code	U	This is a relative test number field. It allows for a unique identification of each test associated with a particular exam. If users modify and retransmit results, the relative test number allows the host to make changes to the correct result record.
ti - tj	Test.Instrument System Code and Name	NA	U	A unique code assigned by the instrument system to identify itself to a host. Also contains the name of a bioMérieux instrument system.
tc, tn	Test.Instrument Comment Code and Text	NA	U	Contains an instrument analysis generated code and comment. Users cannot modify the code or text.
t2 - t3	Test.Test Group System Code and Name	NA	U	Contains a unique set of codes for grouping tests. They determine which test and result tables should hold test data. (See the ti definition)
t4 - t5	Test.Status System Code and Name	NA	U/D	Indicates the status of individual tests. Users can modify or add to the bioLIAISON default statuses of final, preliminary, and duplicate. BCI uploads and downloads the code, but only uploads the name.

Table A-1: Field Type Definitions (Continued)

Field Code	VITEK and VITEK 2 Type and Name Description	VITEK 2 Compact Description	Upload/ Download	Definition and Use
m3 - m4	Test.Technician User Code and Name	NA	U/D	Contains the name of a laboratory technologist who ran a test. BCI uploads and downloads the code but only uploads the name.
nc - nd	Test.Comment User Code and Text	NA	U/D	Contains comments concerning tests. BCI uploads and downloads the code but only uploads the text.
y1 - 4	Test.User Text 1 - 4	NA	U/D	These fields contain free text. Users can enter any data they want here.
t1	Test.Isolate Number	Isolate Number	U/D	This field indicates the isolate results belong to. Is also called the dash number on VITEK cards.
tb	Test.Bottle Bar Code	NA	U/D	This is the bar code for a blood culture bottle.
tt	AES Free Text	NA	U	Contains therapeutic comments from the Advanced Expert System.
t6 - t7	Test.Preliminary Organism Code and Name	NA	U/D	Contains a user-defined preliminary organism identification. Can be translated using BCI's host field translation utility. BCI uploads and downloads the code but only uploads the name.
t8 - t9	Test.Preliminary Modifier User Code and Name	NA	U/D	Contains a user-defined preliminary organism modifier. BCI uploads and downloads the code but only uploads the name.
o1- o2	Test.Final Organism User Code and Name	Final Organism Code and Final Organism Name	U/D	Contains the code and name of the final organism identification. Can be translated using BCI's host field translation utility. BCI uploads and downloads the code but only uploads the name.
o3	Test.Final Bionumber	Final Bionumber	U/D	Contains a calculated bionumber from the VITEK computer. Interpretation is dependent on the VITEK test type. VITEK and VITEK 2 Compact use bionumbers in organism identifications. VITEK 2 does not. For VITEK urine identification cards, the o3 field acts as the total count code.

Table A-1: Field Type Definitions (Continued)

Field Code	VITEK and VITEK 2 Type and Name Description	VITEK 2 Compact Description	Upload/ Download	Definition and Use
o4 - o5	Test.Final Modifier User Code and Name	NA	U/D	Contains additional information from the lab about tests and organisms. For example Heavy Growth, or 100.000 col/ml. BCI uploads and downloads the code but only uploads the name.
o6 - o7	Test.Organism Group User Code and Name	NA	U	Contains user-defined entries from the bioLIAISON table that helps organize organisms by class.
o9	Test.Percent Probability	Percent Probability	U	This field supplies the percent probability calculation of an identification.
rd, ru	Test.Result Date and Time	NA	U/D	Indicates the date and time a blood culture instrument determined a test result.
re	Test.Elapsed Hours	NA	U/D	Indicates the number of hours a blood culture bottle was in the instrument before determining a result.
rc, ri	Test.Instrument Result System Code and Name	NA	U/D	This field contains the reaction determined by an instrument for a blood culture test. Users cannot modify the value. BCI uploads and downloads the code but only uploads the name.
rj - rk	Test.Final Result System Code and Final Bottle Result Name	NA	U/D	Contains the confirmed result for a blood culture as determined by the laboratory technician. BCI uploads and downloads the code but only uploads the name.
af	NA	Antibiotic Family	U	This field contains the higher level Drug Family name that the Antibiotic(s) belong to. This field may occur one to many times for each upload transaction.
ap	NA	Phenotype Name	U	This field contains the name of the resistance mechanism (for example, Phenotype) for the Drug(s) belonging to the Antibiotic Family. This field may occur one to many times for each Antibiotic Family.
ra	Result Separator	Result Separator	U/D	Result separator field. Required for downloads.
rs - rm	Result.Smear User Code and Name	NA	U/D	Contains user-defined codes and text describing a smear observation. BCI uploads and downloads the code but only uploads the name.

Table A-1: Field Type Definitions (Continued)

Field Code	VITEK and VITEK 2 Type and Name Description	VITEK 2 Compact Description	Upload/ Download	Definition and Use
o8	Result.Total Count	NA	U	Contains the total count text for a VITEK Urine Identification card.
rh	Result.Hours to Positive	NA	U	Indicates the number of hours a blood culture bottle processed before determining positive results.
ar	Result.Indicator Character	NA	U	This field suppresses reporting of antimicrobials. If the field precedes an antimicrobial code or name field (a1 or a2), it indicates to the host that the bioMérieux user does not want that drug's results on patient reports.
ad	Deduced Drug	Deduced Antibiotic Flag	U/D	This is the deduced drug indicator.
a1-a2	Result.Drug User Code and Name	Antibiotic Code and Antibiotic Name	U/D	These fields contain either the mnemonic or name of drugs reporting from the bioMérieux computer. Either field can upload to the host. Can be translated using BCI's host field translation utility. BCI uploads and downloads the code but only uploads the name.
a3	Result.Final MIC	Result MIC	U/D	This field contains an antimicrobial's MIC value. The value relates to the previous drug as defined by the a1 and a2 fields. Users can modify MICs and calls in bioLIAISON.
a4	Result.Final Result	Final Interpretation	U/D	This field contains the category call for the drug defined by the a1 and a2 fields. Users can modify categories using bioLIAISON's table maintenance.
a5 - a7	Result.Dosage Columns 1-3	NA	U	These fields contain additional user-defined drug information and follow the a1 and a2 fields.
an	NA	Non-expertized Results	U	This field contains the Instrument Interpretation result before AES expertization (the final Expertized Interpretation is sent in the a4 field). If enabled, the an field will be sent with each Antibiotic. In some cases it will contain a result, in other cases it will contain a null field.

Table A-1: Field Type Definitions (Continued)

Field Code	VITEK and VITEK 2 Type and Name Description	VITEK 2 Compact Description	Upload/ Download	Definition and Use
zz	Result.End	Result End	U/D	This is the separator that ends a data packet. BCI prefers to receive it, but it is not a required field.

Note: *When autolinking, test results from an instrument automatically go to a corresponding patient demographic record if the pi and ci fields are present. For VITEK and VITEK 2, a culture must also have preliminary status. Exams downloaded through BCI automatically receive a preliminary exam status.*

Appendix B: ASCII Characters and Other Values

Table B-1: ASCII Characters and Other Values

Hex value	Octal value	ASCII character
00	000	NUL
01	001	SOH
02	002	STX
03	003	ETX
04	004	EOT
05	005	ENQ
06	006	ACK
07	007	BEL
08	010	BS
09	011	HT
0A	012	LF
0B	013	VT
0C	014	FF
0D	015	CR
0E	016	SO
0F	017	SI
10	020	DLE
11	021	DC1
12	022	DC2
13	023	DC3
14	024	DC4
15	025	NAK
16	026	SYN
17	027	ETB
18	030	CAN
19	031	EM

Hex value	Octal value	ASCII Character
1A	032	SUB
1B	033	ESC
1C	034	FS
1D	035	GS
1E	036	RS
1F	037	US
20	040	SPACE
21	041	!
22	042	“
23	043	#
24	044	$
25	045	%
26	046	&
27	047	‘
28	050	(
29	051	)
2A	052	*
2B	053	+
2C	054	‘
2D	055	-
2E	056	.
2F	057	/
30	060	0
31	061	1
32	062	2
33	063	3

Table B-1: ASCII Characters and Other Values (Continued)

Hex value	Octal value	ASCII character
34	064	4
35	065	5
36	066	6
37	067	7
38	070	8
39	071	9
3A	072	:
3B	073	;
3C	074	<
3D	075	=
3E	076	>
3F	077	?
40	100	@
41	101	A
42	102	B
43	103	C
44	104	D
45	105	E
46	106	F
47	107	G
48	110	H
49	111	I
4A	112	J
4B	113	K
4C	114	L
4D	115	M
4E	116	N
4F	117	O

Hex value	Octal value	ASCII Character
50	120	P
51	121	Q
52	122	R
53	123	S
54	124	T
55	125	U
56	126	V
57	127	W
58	130	X
59	131	Y
5A	132	Z
5B	133	[
5C	134	\
5D	135	]
5E	136	^
5F	137	_
60	140	
61	141	a
62	142	b
63	143	c
64	144	d
65	145	e
66	146	f
67	147	g
68	150	h
69	151	i
6A	152	j
6B	153	k

Table B-1: ASCII Characters and Other Values (Continued)

Hex value	Octal value	ASCII character
6C	154	l
6D	155	m
6E	156	n
6F	157	o
70	160	p
71	161	q
72	162	r
73	163	s
74	164	t
75	165	u

Hex value	Octal value	ASCII Character
76	166	v
77	167	w
78	170	x
79	171	y
7A	172	z
7B	173	{
7C	174	|
7D	175	}
7E	176	~
7F	177	DEL

APPENDIX C: RECOMMENDED HOST FEATURES

For BCI to upload and download data efficiently, bioMérieux recommends that the host computer support the following features.

Table C-1: Recommended Download Features

Feature	Condition or Explanation
XON/XOFF	XON/XOFF is a required protocol. This pacing discipline controls data flow using the special control characters 0x11 (XON) and 0x13 (XOFF).
Test Types	The host should only send patient, specimen, and exam demographics for bioMérieux related tests. Since all demographics sent are stored in the bioLIAISON database, non-bioMérieux demographics will waste database space.
Automatic Transmission of Patient Demographics	To make full use of the BCI, the host should be able to transmit patient demographics automatically.
Manual Transmission of Patient Demographics	The host should support a method of manually transmitting patient demographics. This will allow the user to request the download of demographics for a specific patient or group of patients.
Demographics Updates	The host may update patient demographics by simply retransmitting the appropriate pieces of information. There is a user-configurable option that determines if updates are allowed. (See the BCI Utilities section.) If this option is enabled, the bioMérieux computer considers any retransmissions of a patient's demographics as an update.
Field Terminator Characters	Due to a conflict with the default time and date separator characters (**:** and **/**), bioMérieux recommends that the host not use these as field terminators.

Table C-2: Recommended Upload Features

Feature	Condition or Explanation
Upload of Patient Demographics	BCI's upload program is designed to only upload essential information to an LIS computer. It is the responsibility of the LIS/HIS vendors to determine which demographics are needed by the host.
Updates	bioMérieux recommends that retransmissions to a host be treated as updates.

Appendix D: Antimicrobial MICs and Categories

The following tables list MIC values and category calls a bioMérieux computer can report for the **a1–a4** fields. For example, if the bioMérieux computer were to report ampicillin with an MIC <=16 and a category of S, this part of the upload message would be:

|a1am|a2Ampicillin|a3<=16|a4S|

Table D-1: Sample MIC and Category Designations

Doubling Dilution	Category
<=16	S
32	I
64	R
128	R
256	R
>=512	R

There are ten exceptions to the previous list of antimicrobial susceptibility codes.

Table D-2: Possible Field Entries

a1	a2	Possible a3 field (MIC) entries	Possible a4 field (Category) entries
oxid	oxidase	Pos / Neg	+ / -
beta	beta-lactamase	Pos / Neg	+ / -
cata	catalase	Pos / Neg	+ / -
gm500	Gentamicin 500	SYN-S / SYN-R	blank
st2000	Streptomycin 2000	SYN-S / SYN-R	blank
esbl	ESBL	Pos / Neg	+ / -
hlg	Gentamicin High Level (synergy)	SYN-S / SYN-R	S or R
hls	Streptomycin High Level (synergy)	SYN-S / SYN-R	S or R

Table D-2: Possible Field Entries (Continued)

a1	a2	Possible a3 field (MIC) entries	Possible a4 field (Category) entries
hlk	Kanamycin High Level (synergy)	SYN-S / SYN-R	S or R
oxs	Oxacillin	blank	S or R
	Deduced drugs	blank	S, I, R

Note: *See also Miscellaneous Tests on page 5-8 of this specification.*

Appendix E: Bionumber Descriptions

VITEK and VITEK 2 Compact identification tests produce individual biochemical test results for each well in the card. These results can be either positive or negative. Biochemical results are then put into groups of three so the analysis programs can calculate a single octal number. This example shows how a bionumber (o3 field) is created for a GNI card.

Note: *This is only an example and not meant to be a biopattern for any particular organism. See the package insert or technical bulletin for biochemicals used with other VITEK or VITEK 2 Compact ID cards.*

Table E-1: Card Well and Biochemical Result Values

Well Position	Biochemical Code Name	Result
1	DP3	-
2	OFG	-
3	PC	-
4	ACE	-
5	ESC	-
6	PLI	+
7	URE	-
8	CIT	+
9	MAL	-
10	TDA	-
11	PXB	+
12	LAC	+
13	MLT	+
14	MAN	-
15	XYL	-
16	RAF	+

Well Position	Biochemical Code Name	Result
17	SOR	-
18	SUC	+
19	INO	+
20	ADO	+
21	COU	-
22	H2S	+
23	ONP	+
24	RHA	+
25	ARA	-
26	GLU	-
27	ARG	-
28	LYS	-
29	ORN	-
30	OXI	+
31	TLA	+

Table E-2: Result Patterns and Bionumber Calculation

Well Position	Results	Calculated Bionumber
1-3	- - - 000	0
4-6	- - + 004	4
7-9	- + - 020	2
10-12	- + + 024	6
13-15	+ - - 100	1
16-18	+ - + 104	5
19-21	+ + - 120	3
22-24	+ + + 124	7
25-27	- - - 000	0
28-30	- - + 004	4
31	+ 1	1

Resulting biopattern: 04261537041

Appendix F: Reference Tables

Test Group Table

Note: *This section is only applicable to VITEK and VITEK 2 systems.*

This table lists current test group codes (`t2` field) and their descriptions.

Table F-1: Test Group Codes and Descriptions

Test Group Code	Test Description
ID	Identification
SU	Susceptibility
KB	Kirby-Bauer
SC	Screen
SM	Smear
BC	Blood Culture
NA	No Test Group Available

Instrument Code Table

Table F-2: Instrument Codes and Descriptions

Instrument Code	Instrument Description
AM	VITEK
AT	ATB
NA	No instrument available
OT	BacT/Alert
UD	User defined
V2	VITEK 2 and VITEK 2 Compact

Blood Test Download Result Fields

Note: *This section is only applicable to VITEK and VITEK 2 systems.*

Table F-3: Blood Test Download Result Fields

Field Type	Data Class	Max. Length	Description
t1	T	2	Isolate number (repeatable only for blood tests)
o1	T	6/15	Final organism code (repeatable)
tb	T	10	Bottle barcode
rd	T	Date	Result date
ru	T	Time	Result time
re	T	8	Elapsed hours
rc	T	2	Instrument result code
rj	T	2	Blood test final result code