LABORATORY UNIVERSAL INTERFACE
Patch LA*5.2*17
Patch LR*5.2*65

Version 1.0

March 30, 1996

Preface

The Laboratory Universal Interface patches LA*5.2*17 and LR*5.2*65 are designed to make the process of interfacing automated instrument easier, faster, and more reliable.

This manual is intended to be used as an installation and setup guide for Information Resource Management (IRM). This manual will aid Laboratory Managers, Automated Data Processing Application Coordinator (ADPAC) and staff in implementing the Laboratory Universal Interface (UI) system for automated instruments.

References

- DHCP Health Level Seven (HL7) Version 1.6, October 1995, Albany Information Resource Management Field Office (IRMFO), Troy, New York

- Health Level Seven (HL7), Version 2.2®, 1994 Standard

- Documentation from Mary Lu Kotschi, VA Medical Center, Milwaukee, WI

Acknowledgments

- James Reed, John McCormack, Frank Stalling, Katie Thomas, Taca Foster, and test sites.

Table of Contents

Introduction

The Laboratory UI is designed to make the process of interfacing automated instrument easier, faster, and more reliable. Laboratory UI uses the standard messaging protocol Health Level Seven (HL7) to communicate with all instruments. HL7 is a standard developed by health care information systems professionals to simplify the communications between computer systems that must exchange information. HL7 was adopted by Decentralized Hospital Computer Program (DHCP) as the primary communications protocol for messaging between systems and even between applications on the same system. Information contained in the HL7 Standard protocol is not repeated here; therefore, anyone wishing to interface with the DHCP Laboratory package should become familiar with the HL7 protocol version 2.2. For an overview of the HL7 Standard and DHCP HL7 package see the HL7 Standard and DHCP HL7 Package section of this manual.

The laboratory technologist sees very little change between the Laboratory UI and the traditional interface system. After the Laboratory Information Manager (LIM) or ADPAC sets up the files and installs the new hardware, the technologist can accession, build Load/Worklists, download, and verify the results as usual. The benefit of using the Laboratory UI is that almost any instrument by any manufacturer can be interfaced quickly and dependably, in unidirectional or bidirectional mode. Interfacing is only subject to the limitations of the instrument.

The key component of the Laboratory UI is a new piece of equipment that performs the protocol conversion between the instrument and DHCP. Since all the instrument manufacturers have not conformed to HL7 Standard, a commercial product is used to convert all the different message types into HL7. The commercial protocol converter puts all the messages into HL7 format, enabling the work required on the DHCP system to be greatly simplified. All messages from any instrument now look the same, so only one interface routine set needs to be used.

With the Laboratory UI, laboratory managers have much more flexibility in choosing the instrumentation that meets requirements, without concern that it might not be interfaced to DHCP. The time required to get a new instrument working could be as little as two days, and generally no more than two months. The time will depend on how quickly the programmer for the commercial protocol converter can write a new protocol. The current method of interfacing instruments (DHCP programmers creating a separate interface for each instrument either through the LSI or direct connect) will continue to work alongside the Laboratory UI for those managers that want to phase-in the Laboratory UI system. However, an instrument may be connected to only one method of interfacing at a time. Switching from one methodology to another for testing purposes is possible.

Software functionality that has been incorporated into the Laboratory HL7 interface is the Universal Identification (UID) number for specimen identification. This functionality gives sites the ability to have a totally unique number attached to every specimen.

This version of the Laboratory UI software will not accept Microbiology subscript data.

Laboratory UI Description

The Laboratory UI system uses commercial hardware and software products to connect automated instruments to DHCP, very similar to the traditional Large Scale Integrator (LSI). Several vendors have a product available for this purpose. In this document, this product is referred to generically as the Generic Interface Manager (GIM). All the instruments connect to the GIM through an appropriate protocol used by the GIM. This protocol may be the same as the one used for the LSI previously used by the laboratory software, but it is not limited to a single protocol. The GIM then connects to DHCP using one connection configured as a standard device, again analogous to the LSI.

The next two pages show the System Instrument Setup and the Data Flow for Laboratory UI.

System Instrument Setup

Automated
Instruments

Vendor Specific
Protocols

Generic Interface Manager (GIM)
486 PC

Communication
Device/Protocol

Terminal Server

Bi-Directional
HL7
Messages

Ethernet Lan

Data Flow

Generic Interface Manager

```
^HLLP
Hybrid Lower
Level
Protocol
```

```
HL7
Package
```

Results

```
^LA7HL7
Called by
HL7
Package
```

```
Download
Load/Work List
```

Message Acceptable → No → Log Error

Yes

```
^LA7UID1
Build HL7
Messages
```

```
Store in
Queue
```

Download Msg

```
Hand Off Message
to  HL7
```

Ack Msg

```
Send
MSA  Msg
```

62.49

```
Store
in
Queue
```

62.49

```
LA7UIIN
Parse
Message
```

```
Store
Results in
LAH
Global
```

^LAH

Installation Notes

Pre-Installation Information

The Lab Universal Interface software requires two patches LA*5.2*17 and LR*5.2*65. Patch LA*5.2*17 must be installed and the Numeric Identifier field (#.091) of the ACCESSION file (#68) must be populated before installing patch LR*5.2*65. Patch LR*5.2*65 references Field # .091 to create the Universal ID.

Patch LR*5.2*65 can be obtained from the Patch Module. This document does not cover the installation of patch LR*5.2*65.

Required Packages

Before installing Laboratory UI patch LA*5.2*17, the following DHCP packages must be installed.

Package	Minimum Version Needed
Laboratory	5.2
DHCP Health Level Seven (HL7)	1.6
Kernel	8.0
VA FileMan	21
Tool Kit	7.3

This software also requires a vendor specific Generic Interface Manager (GIM). Refer to the Laboratory UI Description section of this manual for more information on the GIM.

NOTE: Refer to DHCP HL7 Version 1.6 Installation Guide, Technical and User Manuals for additional information on the HL7 options and communications setup.

Patch Namespace

LA7 is the namespace assigned to Laboratory UI.

Resource Requirements

The LA 7 MESSAGE PARAMETER file (#62.48) and LA7 MESSAGE LOG BULLETINS file (#62.485) take up minimal space. LA7 MESSAGE QUEUE file (#62.49) with 9455 entries will take up approximately 14,125 blocks. All of this data is stored in the ^LAHM global.

NOTE: Patch LA*5.2*17 must be installed before Patch LR*5.2*65.

Installation Procedures

Laboratory users must be off the system during installation of Laboratory UI. Sites are encouraged to backup the system before installation.

1. All systems:

*   Unless your site has installed DHCP Laboratory Universal Interface software, there are no routines to unmap.
*   Global Placement
    The new global ^LAHM must be placed in the appropriate translation and set to null.
*   The HL7 Initiate Background Task job must be stopped.
*   No journaling required.

2. a. Sign into the UCI where you plan to install the Laboratory UI patch LA*5.2*17.
    b. Install the LA7* routines and LA7 inits from the PackMan message.

Example: Installation

```
Subj: LA*5.2*17 LAB MESSAGING  [#8] 26 Feb 96 10:03  6224 Lines
From: THOMA,KAT  in 'IN' basket.   Page 1
-------------------------------------------------------------------------

Select MESSAGE Action: IGNORE (in IN basket)// X

Select PackMan function: INSTALL
     1    INSTALL SELECTED ROUTINE(S)
     2    INSTALL/CHECK MESSAGE
CHOOSE 1-2: 2

Warning:  Installing this message will cause a permanent update of globals
and routines.  Do you really want to do this? NO// Y

Shall I preserve what is on disk in a separate back-up message ?  YES// <RET>
Subject: Backup of LA*5.2*17 Lab Messaging


Send mail to: THOMA,KAT// <RET>
  Select basket to send to: IN// <RET>
And send to: <RET>.
PackMan backup message built with subject Backup of LA*5.2*17 Lab Messaging


Routine LA7ADL is not on the disk.
Routine LA7ADL1 is not on the disk.
Routine LA7HL7 is not on the disk.
Routine LA7HLP is not on the disk.
Routine LA7IN001 is not on the disk.
```

```
Routine LA7IN002 is not on the disk.
Routine LA7IN003 is not on the disk.
Routine LA7IN004 is not on the disk.
Routine LA7IN005 is not on the disk.
Routine LA7IN006 is not on the disk.
Routine LA7IN007 is not on the disk.
Routine LA7IN008 is not on the disk.
Routine LA7IN009 is not on the disk.
Routine LA7IN00A is not on the disk.
Routine LA7IN00B is not on the disk.
Routine LA7IN00C is not on the disk.
Routine LA7IN00D is not on the disk.
Routine LA7IN00E is not on the disk.
Routine LA7IN00F is not on the disk.
Routine LA7IN00G is not on the disk.
Routine LA7IN00H is not on the disk.
Routine LA7IN00I is not on the disk.
Routine LA7IN00J is not on the disk.
Routine LA7IN00K is not on the disk.
Routine LA7IN00L is not on the disk.
Routine LA7IN00M is not on the disk.
Routine LA7IN00N is not on the disk.
Routine LA7IN00O is not on the disk.
Routine LA7IN00P is not on the disk.
Routine LA7IN00Q is not on the disk.
Routine LA7IN00R is not on the disk.
Routine LA7IN00S is not on the disk.
Routine LA7IN00T is not on the disk.
Routine LA7IN00U is not on the disk.
Routine LA7IN00V is not on the disk.
Routine LA7IN00W is not on the disk.
Routine LA7IN00X is not on the disk.
Routine LA7IN00Y is not on the disk.
Routine LA7IN00Z is not on the disk.
Routine LA7IN010 is not on the disk.
Routine LA7IN011 is not on the disk.
Routine LA7INIS is not on the disk.
Routine LA7INIT is not on the disk.
Routine LA7INIT1 is not on the disk.
Routine LA7INIT2 is not on the disk.
Routine LA7INIT3 is not on the disk.
Routine LA7INIT4 is not on the disk.
Routine LA7INIT5 is not on the disk.
Routine LA7LOG is not on the disk.
Routine LA7NTEG is not on the disk.
Routine LA7POST is not on the disk.
Routine LA7UID is not on the disk.
Routine LA7UID1 is not on the disk.
Routine LA7UID2 is not on the disk.
Routine LA7UIIN is not on the disk.
Routine LA7UIIN1 is not on the disk.
Routine LA7UIIN2 is not on the disk.
Routine LA7UTIL is not on the disk.
Line 3     Message #6535     Unloading Routine   ROU LA7ADL
Line 77    Message #6535     Unloading Routine   ROU LA7ADL1
Line 114   Message #6535     Unloading Routine   ROU LA7HL7
Line 186   Message #6535     Unloading Routine   ROU LA7HLP
Line 318   Message #6535     Unloading Routine   ROU LA7IN001
Line 476   Message #6535     Unloading Routine   ROU LA7IN002
Line 572   Message #6535     Unloading Routine   ROU LA7IN003
```

```
Line 712   Message #6535       Unloading Routine   ROU LA7IN004
Line 850   Message #6535       Unloading Routine   ROU LA7IN005
Line 990   Message #6535       Unloading Routine   ROU LA7IN006
Line 1126  Message #6535       Unloading Routine   ROU LA7IN007
Line 1268  Message #6535       Unloading Routine   ROU LA7IN008
Line 1416  Message #6535       Unloading Routine   ROU LA7IN009
Line 1544  Message #6535       Unloading Routine   ROU LA7IN00A
Line 1694  Message #6535       Unloading Routine   ROU LA7IN00B
Line 1854  Message #6535       Unloading Routine   ROU LA7IN00C
Line 2004  Message #6535       Unloading Routine   ROU LA7IN00D
Line 2160  Message #6535       Unloading Routine   ROU LA7IN00E
Line 2172  Message #6535       Unloading Routine   ROU LA7IN00F
Line 2326  Message #6535       Unloading Routine   ROU LA7IN00G
Line 2420  Message #6535       Unloading Routine   ROU LA7IN00H
Line 2480  Message #6535       Unloading Routine   ROU LA7IN00I
Line 2584  Message #6535       Unloading Routine   ROU LA7IN00J
Line 2758  Message #6535       Unloading Routine   ROU LA7IN00K
Line 2818  Message #6535       Unloading Routine   ROU LA7IN00L
Line 3012  Message #6535       Unloading Routine   ROU LA7IN00M
Line 3116  Message #6535       Unloading Routine   ROU LA7IN00N
Line 3232  Message #6535       Unloading Routine   ROU LA7IN00O
Line 3354  Message #6535       Unloading Routine   ROU LA7IN00P
Line 3502  Message #6535       Unloading Routine   ROU LA7IN00Q
Line 3658  Message #6535       Unloading Routine   ROU LA7IN00R
Line 3816  Message #6535       Unloading Routine   ROU LA7IN00S
Line 3966  Message #6535       Unloading Routine   ROU LA7IN00T
Line 4132  Message #6535       Unloading Routine   ROU LA7IN00U
Line 4294  Message #6535       Unloading Routine   ROU LA7IN00V
Line 4434  Message #6535       Unloading Routine   ROU LA7IN00W
Line 4596  Message #6535       Unloading Routine   ROU LA7IN00X
Line 4752  Message #6535       Unloading Routine   ROU LA7IN00Y
Line 4896  Message #6535       Unloading Routine   ROU LA7IN00Z
Line 4916  Message #6535       Unloading Routine   ROU LA7IN010
Line 5090  Message #6535       Unloading Routine   ROU LA7IN011
Line 5124  Message #6535       Unloading Routine   ROU LA7INIS
Line 5171  Message #6535       Unloading Routine   ROU LA7INIT
Line 5221  Message #6535       Unloading Routine   ROU LA7INIT1
Line 5263  Message #6535       Unloading Routine   ROU LA7INIT2
Line 5294  Message #6535       Unloading Routine   ROU LA7INIT3
Line 5366  Message #6535       Unloading Routine   ROU LA7INIT4
Line 5391  Message #6535       Unloading Routine   ROU LA7INIT5
Line 5412  Message #6535       Unloading Routine   ROU LA7LOG
Line 5510  Message #6535       Unloading Routine   ROU LA7NTEG
Line 5582  Message #6535       Unloading Routine   ROU LA7POST
Line 5612  Message #6535       Unloading Routine   ROU LA7UID
Line 5652  Message #6535       Unloading Routine   ROU LA7UID1
Line 5716  Message #6535       Unloading Routine   ROU LA7UID2
Line 5844  Message #6535       Unloading Routine   ROU LA7UIIN
Line 5908  Message #6535       Unloading Routine   ROU LA7UIIN1
Line 6004  Message #6535       Unloading Routine   ROU LA7UIIN2
Line 6084  Message #6535       Unloading Routine   ROU LA7UTIL
Line 6197  Message #6535       Unloading Routine   ROU LADOWN
Line 6255  Message #6535       Unloading Routine   ROU LAGEN


Select PackMan function: <RET>


Select MESSAGE Action: IGNORE (in IN basket)// <RET>
 Ignored
```

3. Run Integrity Routines

> **NOTE:**
> - Please insure that the variables DUZ and DUZ(0) are defined before attempting initialization. The initialization will abort if DUZ is not set to a valid user number and DUZ(0) does not equal "@".
> - The variables DT, DTIME, and U must be defined.
> - Call your IRM Field Office if any routines fail the integrity routine.

```
>D ^LA7NTEG

Checksum routine created on 2960227.130055 by KERNEL V7.3

LA7ADL     ok                          LA7INIT2   ok
LA7ADL1    ok                          LA7INIT3   ok
LA7HL7     ok                          LA7INIT4   ok
LA7HLP     ok                          LA7INIT5   ok
LA7IN001   ok                          LA7LOG     ok
LA7IN002   ok                          LA7POST    ok
LA7IN003   ok                          LA7UID     ok
LA7IN004   ok                          LA7UID1    ok
LA7IN005   ok                          LA7UID2    ok
LA7IN006   ok                          LA7UIIN    ok
LA7IN007   ok                          LA7UIIN1   ok
LA7IN008   ok                          LA7UIIN2   ok
LA7IN009   ok                          LA7UTIL    ok
LA7IN00A   ok                          LADOWN1...ok
LA7IN00B   ok                          LAGEN.....ok
LA7IN00C   ok
LA7IN00D   ok
LA7IN00E   ok
LA7IN00F   ok
LA7IN00G   ok
LA7IN00H   ok
LA7IN00I   ok
LA7IN00J   ok
LA7IN00K   ok
LA7IN00L   ok
LA7IN00M   ok
LA7IN00N   ok
LA7IN00O   ok
LA7IN00P   ok
LA7IN00Q   ok
LA7IN00R   ok
LA7IN00S   ok
LA7IN00T   ok
LA7IN00U   ok
LA7IN00V   ok
LA7IN00W   ok
LA7IN00X   ok
LA7IN00Y   ok
LA7IN00Z   ok
LA7IN010   ok
LA7IN011   ok
```

```
LA7INIS    ok
LA7INIT    ok
LA7INIT1   ok
```

4. Run the LA7INIT routines to initialize Laboratory files

>D ^LA7INIT

```
This version (#5.21) of 'LA7INIT' was created on 21-FEB-1996
        (at DALLAS ISC - VERIFICATION ACCOUNT, by VA FileMan V.21.0)

I AM GOING TO SET UP THE FOLLOWING FILES:

   61         TOPOGRAPHY FIELD  (Partial Definition)
Note:  You already have the 'TOPOGRAPHY FIELD' File.
Shall I write over the existing Data Definition? YES//  <RET>

   62.05      URGENCY  (Partial Definition)
Note:  You already have the 'URGENCY' File.
Shall I write over the existing Data Definition? YES//  <RET>

   62.4       AUTO INSTRUMENT
Note:  You already have the 'AUTO INSTRUMENT' File.
Shall I write over the existing Data Definition? YES//  <RET>

   62.48      LA7 MESSAGE PARAMETER

   62.485     LA7 MESSAGE LOG BULLETINS  (including data)
I will OVERWRITE your data with mine.

   62.49      LA7 MESSAGE QUEUE

   68         ACCESSION
Note:  You already have the 'ACCESSION' File.
Shall I write over the existing Data Definition? YES//  <RET>


SHALL I WRITE OVER FILE SECURITY CODES? No//  <RET>   (No)
NOTE: This package also contains INPUT TEMPLATES
      SHALL I WRITE OVER EXISTING INPUT TEMPLATES OF THE SAME NAME? Yes//
<RET>  (Yes)
NOTE: This package also contains OPTIONS
      SHALL I WRITE OVER EXISTING OPTIONS OF THE SAME NAME? Yes//  <RET>   (Yes)


ARE YOU SURE EVERYTHING'S OK? No//  Y  (Yes)

...HMMM, LET ME THINK ABOUT THAT A
MOMENT.......................................
.........................................
'LA7 APPLICATION PARAMETER FILE' Option Filed
'LA7 MAIN MENU' Option Filed
'LA7 PRINT 0070 TABLE' Option Filed
'LA7 PRINT LAB UI ERROR LOG' Option Filed
'LA7 UPDATE MESSAGE PARAMETER' Option Filed.
NO SECURITY-CODE PROTECTION HAS BEEN MADE
>>>Adding HL7 DHCP APPLICATION file entry for LA AUTO INST...
```

Post-Installation Instructions

Once installation is completed perform the following steps:
1. Delete LA7* and LA7POST routines
2. **MSM systems:**
- Move LA7* routines to other servers.
- Sites running Kurzwiel will need to setup another NULL DEVICE with a different $I with parameters as follows.

NOTE: Please respond with site specific information when applicable.

```
Select Port Number: 413

Port Types:

     1 - PC CONSOLE
     2 - Serial Communication Ports (COM)
     3 - Parallel Printers (LPT)
     4 - ARNET Multiport Card
     5 - Quadport-AT Card
     6 - AST 4 Port/XN Card
     7 - MCC Card
     8 - Console Window Devices
     9 - ARNET SmartPort card
    10 - Bios LPT device
    11 - LAT Port - connection to a specific port and server
    12 - DigiBoard multiport card

Select Option <LAT Port>: <RET> LAT Port - connection to a
specific port and server

Server Name <EQN17>: <RET>
Port Name <PORT_43>:<RET>
Tied Terminal Index <>: <RET>
Terminal Line Width <132>: <RET> 132
Translate name <>: <RET>

Select Echo Option:

    1 - ON
    2 - OFF

Select Option <ON>: <RET> ON

Escape Processing Mode:

    1 - OFF
    2 - ON

Select Option <OFF>: <RET> OFF
```

```
8-bit Mode:

    1 - OFF
    2 - ON
Select Option <OFF>: <RET> OFF

Pass All Mode:

    1 - OFF
    2 - ON

Select Option <OFF>: <RET> OFF

Line Feed Suppression:

    1 - OFF
    2 - ON

Select Option <OFF>: <RET> OFF

Upper-Case Setup:

    1 - OFF
    2 - ON

Select Option <OFF>: <RET> OFF

Select 'Output-Only' Mode:

    1 - OFF (Input/Output Device)
    2 - ON (Output-only device)

Select Option <OFF>: <RET> OFF (Input/Output Device)

Login Allowed:

    1 - YES
    2 - NO

Select Option <NO>: <RET> NO

CRT Mode:

    1 - ON
    2 - OFF

Select Option <ON>: <RET> ON

Set up the DEVICE file as follows:

Select DEVICE NAME: <RET> NULL

    1    NULL DEVICE          IRM         413        PSA
    2    NULL DEVICE          RAD/NULL        434        PSA
    3    NULL1         NT SYSTEM      46       GSA
CHOOSE 1-3: 1
NAME: NULL DEVICE//<RET>
LOCATION OF TERMINAL: IRM//<RET>
```

```
Select MNEMONIC: <RET>
LOCAL SYNONYM: <RET>
$I: 413//<RET>
VOLUME SET(CPU): PSA//<RET>
SIGN-ON/SYSTEM DEVICE: <RET>
TYPE: TERMINAL//<RET>
SUBTYPE: P-OTHER//<RET>
ASK DEVICE: YES//<RET>
ASK PARAMETERS: NO//<RET>
ASK HOST FILE: <RET>
ASK HFS I/O OPERATION: <RET>
QUEUING: <RET>
OUT-OF-SERVICE DATE: <RET>
NEAREST PHONE: <RET>
KEY OPERATOR: <RET>
*MARGIN WIDTH: 255//<RET>
*FORM FEED: #//<RET>
*PAGE LENGTH: 256//<RET>
SUPPRESS FORM FEED AT CLOSE: <RET>
*BACK SPACE: $C(8)// <RET>
SECURITY: <RET>
CLOSEST PRINTER: <RET>
FORM CURRENTLY MOUNTED: <RET>
OPEN PARAMETERS: <RET>
CLOSE PARAMETERS: <RET>
USE PARAMETERS: <RET>
PRE-OPEN EXECUTE:v
POST-CLOSE EXECUTE: <RET>
MICOM PRINTER CONTENTION PORT: <RET>
MODEM: <RET>
PRIORITY AT RUN TIME: <RET>
TASKMAN PRINT A HEADER PAGE: <RET>
PASSWORD: <RET>
SLAVED FROM DEVICE: <RET>
*HUNT GROUP: V02// <RET>
Select HUNT GROUP DEVICE: NULL DEVICE//<RET>
  HUNT GROUP DEVICE: NULL DEVICE//<RET>
Select HUNT GROUP DEVICE: <RET>
AUTO DESPOOL: <RET>
```

MSM sites: Set up HUNT GROUP DEVICES:

```
INPUT TO WHAT FILE: DEVICE
EDIT WHICH FIELD: ALL// HUNT GROUP DEVICE
         EDIT WHICH HUNT GROUP DEVICE SUB-FIELD:  //ALL
THEN EDIT FIELD: <RET>

Select DEVICE NAME: NULL
        1       NULL DEVICE        IRM        413          PSA
        2       NULL DEVICE        RAD/NULL       434       PSA
CHOOSE 1-2: 1
Select HUNT GROUP DEVICE:  NULL DEVICE
        1       NULL DEVICE        IRM        413          PSA
        2       NULL DEVICE        RAD/NULL       434        PSA
CHOOSE 1-2:  1
       HUNT GROUP DEVICE ORDER:  1//<RET>
Select HUNT GROUP DEVICE: NULL DEVICE    IRM      413       PSA
             .OK?   YES//   N  (NO)
     NULL DEVICE            RAD/NULL      434      PSA
   HUNT GROUP DEVICE ORDER:  2//<RET>
Select HUNT GROUP DEVICE: <RET>


Select DEVICE NAME: NULL
        1       NULL DEVICE        IRM        413          PSA
        2       NULL DEVICE        RAD/NULL       434       PSA
CHOOSE 1-2: 3
Select HUNT GROUP DEVICE:  NULL DEVICE
        1       NULL DEVICE        IRM        413          PSA
        2       NULL DEVICE        RAD/NULL       434        PSA
CHOOSE 1-2:  2
       HUNT GROUP DEVICE ORDER:  1//
Select HUNT GROUP DEVICE: NULL DEVICE    IRM     434      PSA
             .OK?   YES//   N  (NO)
     NULL DEVICE            IRM           413      PSA
   HUNT GROUP DEVICE ORDER:  2//<RET>
Select HUNT GROUP DEVICE: <RET>

The first NULL DEVICE points to the second.
The second NULL DEVICE points to the first.
```

All systems: Add the Laboratory Universal Interface Menu [LA7 Main Menu] for the appropriate staff.

3. The HL7 software must be installed and implemented prior to running Laboratory UI. If a previous version of DHCP HL7 V. 1.6 is installed and running on your system do the following:

- Active and pending HLLP jobs must be stopped and restarted using the DHCP HL7 V. 1.5 option Initiate Background Task.

4. Setup DHCP HL7 Files

From the DHCP HL7 V. 1.6 MAIN MENU access V. 1.5 options. Use the HL7 V. 1.5 options to setup HL7 files and initiate background task. Additional options exist allowing HL7 transmissions to be logged and purged.

> **NOTE:**
> - Where appropriate, use site specific entries for the following files.
> - In the examples, the XXX means that site specific data is displayed.

Non-DHCP Application Parameter Enter/Edit

Use the Non-DHCP Application Parameter Enter/Edit option to:

- Enter non-DHCP applications (applications that will be communicating with the DHCP system via the HL7 Protocol) in the HL7 NON-DHCP APPLICATION PARAMETER file (#770).
- Enter or edit parameters associated with non-DHCP applications.
- Delete an application from the HL7 NON-DHCP APPLICATION PARAMETER file (#770).

> **NOTE:**   The applications entered in this file are referred to as non-DHCP applications simply as a way of distinguishing them from the DHCP system with which they will be communicating. These non-DHCP applications could also be other DHCP applications (e.g., Laboratory UI).

Example: Non-DHCP Application Parameter Enter/Edit

```
Select OPTION NAME: HL7 Main Menu

    1        V1.5 OPTIONS ...
    2        V1.6 OPTIONS ...
    3        Activate/Inactivate Application
    4        Print/Display Menu ...
    5        Purge Message Text File Entries

Select HL7 Main Menu Option: 1  V1.5 OPTIONS

    1        Non-DHCP Application Parameter Enter/Edit
    2        Initiate Background Task
    3        Start/Stop Log of HL7 Transmissions

Select V1.5 OPTIONS Option: 1  Non-DHCP Application Parameter Enter/Edit

Select HL7 NON-DHCP APPLICATION PARAMETER NAME: ?
 Answer with HL7 NON-DHCP APPLICATION PARAMETER NAME
Choose from:
    EDR-MAS            RCP        EDR-MAS-DHCP
    IVM CENTER      XXX       XXX       IVM
    LAB INTERFACE       XXX        YOUR SITE         LA7 AUTO INST

    You may enter a new HL7 NON-DHCP APPLICATION PARAMETER, if you wish
    The name of the application from/to which HL7 messages may be
    transmitted by the DHCP system.  Answer must be 3-15 characters in length
    and must be unique.
Select HL7 NON-DHCP APPLICATION PARAMETER NAME: LAB INTERFACE        XXX
YOUR SITE        LA7 AUTO INST
NAME: LAB INTERFACE// <RET>
```

NON-DHCP FACILITY NAME: // *(Enter sites generic interface manager (GIM))*

DHCP STATION NUMBER: // *(Enter sites station number)*

MAXIMUM BLOCK SIZE: // *(Enter maximum block size)*

NUMBER OF RETRIES: // *(Enter number of times to attempt retransmission)*

HL7 DEVICE: *(Enter your HL7 device name)*

HL7 VERSION NUMBER: // *(Enter the version of HL7 your vendor GIM is using)*
```
DHCP APPLICATION: LA7 AUTO INST// <RET>
LOWER LEVEL PROTOCOL TIMEOUT: 5// <RET>
MAIL GROUP: <RET>
```

HL7 PROCESSING ID: // *(This field can be used to turn on debugging. Turn off after debugging is completed to stop producing large amount of data in the ^TMP.)*
```
PURPOSE: <RET>
  1> <RET>
```

Initiating Background Task

Use this option to create a background task to start up the lower level protocol routine for the Laboratory UI.

Example: Initiate Background Task

```
Select HL7 Main Menu Option: 1  V1.5 OPTIONS


   1        Non-DHCP Application Parameter Enter/Edit
   2        Initiate Background Task
   3        Start/Stop Log of HL7 Transmissions

Select V1.5 OPTIONS Option: 2  Initiate Background Task

Note:  You must select a Non-DHCP Application for which an HL7 Device has been
defined.
Select HL7 NON-DHCP APPLICATION PARAMETER NAME: ?
 Answer with HL7 NON-DHCP APPLICATION PARAMETER NAME
Choose from:
```

Start/Stop Log of HL7 Transmissions

The Start/Stop Log of HL7 Transmission option is a diagnostic tool. Use this option to:

- Test the HL7 interface when the HL7 Hybrid Lower Level Protocol is used as the communication protocol.
- Check that HL7 messages are being properly exchanges with a particular non-DHCP application.

Example: Start/Stop Log of HL7 Transmissions

```
Select HL7 Main Menu Option: 1  V1.5 OPTIONS


    1       Non-DHCP Application Parameter Enter/Edit
    2       Initiate Background Task
    3       Start/Stop Log of HL7 Transmissions

Select V1.5 OPTIONS Option: 3  Start/Stop Log of HL7 Transmissions

Select the Non-DHCP Application for which you wish to start/stop the
HL7 log of transmissions.

Select HL7 NON-DHCP APPLICATION PARAMETER NAME: ?
 Answer with HL7 NON-DHCP APPLICATION PARAMETER NAME
Choose from:
    EDR-MAS            RCP        EDR-MAS-DHCP
    IVM CENTER    XXX      XXX       IVM
    LAB INTERFACE      XXX      YOUR SITE     LA7 AUTO INST

Select HL7 NON-DHCP APPLICATION PARAMETER NAME: LAB INTERFACE
     XXX YOUR SITE       LA AUTO INST

You must define an HL7 Device for this Non-DHCP Application before you can
start the log.

HL7 DEVICE: (The name of the device (must exactly match a name in the
DHCP Device file)that will be used to send/receive HL7 messages to this non-
DHCP
application.  Answer must be 1-30 characters in length.)

Do you want to purge existing log entries? Yes// <RET>
```

Activate/Inactivate Application

Use this option to activate or inactivate a specific DHCP application that exists in the HL7 APPLICATION PARAMETER FILE (#771). Your entry in this option determines if a DHCP application is communicating with a non-DCHP application using the HL7 protocol. An application must be active to send and receive messages.

Example: Activate/Inactivate Application

```
Select OPTION NAME: HL7 Main Menu

    1       V1.5 OPTIONS ...
    2       V1.6 OPTIONS ...
    3       Activate/Inactivate Application
    4       Print/Display Menu ...
    5       Purge Message Text File Entries

Select HL7 Main Menu Option: 3  Activate/Inactivate Application

Select HL7 APPLICATION PARAMETER NAME: ?
 Answer with HL7 APPLICATION PARAMETER NAME
Choose from:
   EDR-MAS        ACTIVE
   EDR-MAS-DHCP        ACTIVE
   IVM        ACTIVE
   IVM CENTER        ACTIVE
   LA AUTO INST        INACTIVE
   RADIOLOGY        INACTIVE

Select HL7 APPLICATION PARAMETER NAME: LA AUTO INST          INACTIVE
ACTIVE/INACTIVE: ACTIVE// <RET>
```

5. Populate Laboratory Files with HL7 Codes

The following are examples of how to populate the Laboratory files with HL7 codes using the FileMan option Enter or Edit File Entries.

NOTE:
- Field .091 of the ACCESSION file (#68) must be populated after installing LA*5.2*17 and before installing LR*5.2*65.
- The TOPOGRAPHY FIELD and URGENCY files can be populated once users are back on the system.

Example: How to Populate ACCESSION file (#68)

```
>D P^DI


VA FileMan 21.0


Select OPTION: ENTER OR EDIT FILE ENTRIES



INPUT TO WHAT FILE: 68  ACCESSION
                      (22 entries)
EDIT WHICH FIELD: ALL// .091  NUMERIC IDENTIFIER
THEN EDIT FIELD: .092  TYPE OF ACCESSION NUMBER
THEN EDIT FIELD: <RET>


Select ACCESSION AREA:    CHEMISTRY
NUMERIC IDENTIFIER: // (Enter a one or two digit number for each accession area)
TYPE OF ACCESSION NUMBER: SHORT// ?
     Select the type of Accession Number that will be barcoded and passed in
     messages.  If nothing is entered, the default will be 'L'ong.
     Choose from:
       S       SHORT
       L       LONG
TYPE OF ACCESSION NUMBER: SHORT//<RET>
```

Example: How to Populate TOPOGRAPHY FIELD file (#61)

```
Select OPTION:    ENTER OR EDIT FILE ENTRIES


INPUT TO WHAT FILE: TOPOGRAPHY FIELD// <RET>
EDIT WHICH FIELD: ALL// .08  HL7 CODE
THEN EDIT FIELD: <RET>


Select TOPOGRAPHY FIELD NAME: ?
 Answer with TOPOGRAPHY FIELD NAME, or SNOMED CODE, or ABBREVIATION, or
     SYNONYM
 Do you want the entire 8575-Entry TOPOGRAPHY FIELD List? NO
     You may enter a new TOPOGRAPHY FIELD, if you wish
     ANSWER MUST BE 2-80 CHARACTERS IN LENGTH
Select TOPOGRAPHY FIELD NAME:    AMNIOTIC FLUID        8Y300
HL7 CODE: ?
     Answer must be 2-4 characters in length.


Enter the two to four character code from the left column:

ABS       ABCs
AMN       Amniotic fluid
ASP       Aspirate
BPH       Basophils
ABLD      Blood arterial
BBL       Blood bag
BON       Bone
BRTH      Breath
BRO       Bronchial
BRN       Burn
Enter RETURN to continue or '^' to exit: ^

HL7 CODE: AMN
```

Example: How to Populate URGENCY file (#62.05)

```
Select OPTION:    ENTER OR EDIT FILE ENTRIES


INPUT TO WHAT FILE: 62.05  URGENCY
                           (17 entries)
EDIT WHICH FIELD: ALL// ?
 Answer with FIELD NUMBER, or LABEL
Choose from:
   .01             URGENCY
   1               CAN LAB COLLECT?
   2               WORKLOAD ONLY
   3               HL7 CODE
   FOLLOW A FIELD NAME WITH ';"CAPTION"' TO HAVE THE FIELD ASKED AS 'CAPTION: '
        OR WITH ';T' TO USE THE FIELD 'TITLE' AS CAPTION
EDIT WHICH FIELD: ALL// 3  HL7 CODE
THEN EDIT FIELD: <RET>


Select URGENCY: ?
 Answer with URGENCY, or NUMBER
 Do you want the entire 17-Entry URGENCY List? Yes  (Yes)
Choose from:
   1               STAT
   2               ASAP
   3               PRE-OP
   4               CALL RESULT
   5               ADMIT
   6               OUTPATIENT
   7               PURPLE TRIANGLE
   9               ROUTINE
   50              WKL
   51              WKL - STAT
   52              WKL - ASAP
   53              WKL - PRE-OP
   54              WKL - CALL RESULT
   55              WKL - ADMIT
   56              WKL - OUTPATIENT
   57              WKL - PURPLE TRIANGLE
   59              WKL - ROUTINE

    You may enter a new URGENCY, if you wish
    Answer must be 3-30 characters in length.
Select URGENCY: 1  STAT
HL7 CODE: ?
    Enter the corresponding HL7 Table of Priority that most closely matches
    the DHCP Lab urgency.
    Choose from:
      S       Stat (do immediately)
      A       As soon as possible (a priority lower than stat)
      R       Routine
      P       Preoperative (to be done prior to surgery)
      T       Timing critical (do as near as possible to requested time)
HL7 CODE: S
```

Populated DHCP HL7 Files

The following are examples of populated DHCP HL7 files.

Example: HL7 APPLICATION PARAMETER file (#771)

This file will be populated during the post-initialization process.

```
NAME: LA AUTO INST                      ACTIVE/INACTIVE: ACTIVE
  HL7 ENCODING CHARACTERS: ^~\&        HL7 FIELD SEPARATOR: |
HL7 MESSAGE: ORU                        PROCESSING ROUTINE: ORU^LA7HL7
HL7 MESSAGE: ORM                        PROCESSING ROUTINE: NONE
HL7 SEGMENT: OBR
  FIELDS USED IN THIS SEGMENT: 4,7,8,9,14,22
HL7 SEGMENT: OBX
  FIELDS USED IN THIS SEGMENT: 2,3,4,5,6,7,8
HL7 SEGMENT: MSH
  FIELDS USED IN THIS SEGMENT: 1,2,3,4,5,6,7,8,9,10,11,12
HL7 SEGMENT: PID                        FIELDS USED IN THIS SEGMENT: 3,5,7,8,19
HL7 SEGMENT: ORC                        FIELDS USED IN THIS SEGMENT: 1,2,3
HL7 SEGMENT: NTE                        FIELDS USED IN THIS SEGMENT: 3
```

If the LA UTO INST does not look correct (-1), use FileMan to edit the file and remove the -1.

Example: HL7 Non-DHCP APPLICATION PARAMETER file (#770)

```
NAME: LAB INTERFACE                     DHCP STATION NUMBER: XXX
  NON-DHCP FACILITY NAME: Generic Interface Manager
  MAXIMUM BLOCK SIZE: 245               NUMBER OF RETRIES: 3
  HL7 DEVICE: INST MGR                  HL7 VERSION NUMBER: 2.1
  DHCP APPLICATION: LA AUTO INST        LOWER LEVEL PROTOCOL TIMEOUT: 3
  HL7 PROCESSING ID: PRODUCTION         START/STOP TRANSMISSION LOG: STOP LOG
```

Populated Laboratory Universal Interface Files

The following are examples of populated LA7 files. Use VA FileManager to edit or update File #62.48.

Example: LA7 MESSAGE PARAMETER file (#62.48)

```
CONFIGURATION: UNIVERSAL INTERFACE        PROTOCOL: HEALTH LEVEL SEVEN
  STATUS: ACTIVE                          MODE FOR LOG: NO LOGGING
  HL7 NON-DHCP APPLICATION: LAB INTERFACE
  PROCESS IN: D QUE^LA7UIIN               PROCESS DOWNLOAD: D EN^LA7UID1
REMOTE SYSTEM ID: LAB INTERFACEGeneric Interface ManagerLA AUTO INSTXXX
```

The .01 field of File #770

GIM or name of vendors' systems. Field #3 of File #770

DHCP Application, Field .01 in File #771 and Field #8 of File #770

Your station number

Example: LA7 MESSAGE QUEUE file (#62.49)
This file is populated by the Laboratory UI software.

```
MESSAGE NUMBER: 13346                    TYPE: INCOMING
  STATUS: QUEUED FOR ACTION              PRIORITY: 3
  DATE/TIME ENTERED: JUL 10, 1994@00:11:48
  INSTRUMENT NAME: SYSMX1                CONFIGURATION: UNIVERSAL INTERFACE
  MSH: MSH                               ENCODING CHARACTERS:  ~\&
  SENDING APPLICATION: LAB INTERFACE     SENDING FACILITY: Generic Interface
   Manager
  RECEIVING APPLICATION: LA AUTO INST    RECEIVING FACILITY: XXX
  DATE/TIME OF MESSAGE: JUL 10, 1994@00:14:03
  MESSAGE TYPE: ORU                      MESSAGE CONTROL ID: 11812
  PROCESSING ID: PRODUCTION              VERSION ID: 2.1
 HL7 TEXT:
 MSH|^~\&|LAB INTERFACE|Generic Interface Manager|LA AUTO INST|642
    |19940710001403|ORU|11812|P|2.1|
 OBR|1|ERR000000003||||||||SYSMX1^|0||19940707
 OBX|1|ST|85048^White Blood Count^AS4^||9.1|k/ul|||F|
 OBX|2|ST|85041^Red Blood Count^AS4^||3.4|ma/ul|L||F|
 OBX|3|ST|83020^Hemoglobin, electrophoresis^AS4^||10.3|g/dl|L||F|
 OBX|4|ST|85014^Blood count; other than spun hematocrit^AS4^||32.9|%|L||F|
 OBX|5|ST|85021.11^Hemogram, automated;MCV^AS4^||96.8|fl|||F|
 OBX|6|ST|85021.21^Hemogram, automated;MCH^AS4^||30.3|pg|||F|
 OBX|7|ST|85021.27^Hemogram, automated;MCHC^AS4^||31.3|g/dl|L||F|
 OBX|8|ST|85021.47^Hemogram, automated;Platelet count auto^AS4^||20.3|k/ul|||F|
 OBX|9|ST|85048.42^White Blood Count;Lymphocyte, %^AS4^||25.3|%|||F|
 OBX|10|ST|85048.52^White Blood Count;Monocyte, %^AS4^||4.8|%|||F|
 OBX|11|ST|85048.12^White Blood Count;Total neutrophil, %^AS4^||66.8|%|||F|
 OBX|12|ST|85048.64^White Blood Count;Eosinophil, %^AS4^||2.7|%|||F|
 OBX|13|ST|85048.60^White Blood Count;Basophil, %^AS4^||.4|%|||F|
 OBX|14|ST|85048.41^White Blood Count;Lymphocyte count^AS4^||2.3|k/ul|||F|
 OBX|15|ST|85048.51^White Blood Count;Monocyte count^AS4^||.44|k/ul|||F|
 OBX|16|ST|85048.11^White Blood Count;Total neutrophil count^AS4^|
    |6.07|k/ul|||F|
 OBX|17|ST|85048.63^White Blood Count;Eosinophil count^AS4^||.25|k/ul|||F|
 OBX|18|ST|85048.59^White Blood Count;Basophil count^AS4^||.04|k/ul|||F|
 OBX|19|ST|85021.91^^AS4^||17.8|%|H||F|
 OBX|20|ST|85021.92^^AS4^||63.3|fl|H||F|
 OBX|21|ST|85029.15^^AS4^||12|fl|||F|
 OBX|22|ST|85029.11^^AS4^||9.3|fl|||F|
```

All systems: Allow users back on the laboratory system.

Laboratory Universal Interface   March 30, 1996
Patches LA*5.2*17 and LR*5.2*65

Technical Notes

Planning Considerations

This section is a quick overview of some of the major issues to be considered in the planning and implementation of the Laboratory UI.

Location/Cabling

If you place the GIM PC in the same location as the LSI, then existing cabling can probably be used. If you change the location or decide to use ethernet instead of arnet board, then you may need to recable each instrument. If you are moving direct connect interfaces to the GIM, you may need to recable those instruments. Cables can be purchased from the GIM vendor or done yourself.

If the GIM is in the laboratory, it may be very difficult to route satellite laboratory instrumentation or instruments from other buildings to the GIM. Wherever the GIM is located determines who does the maintenance and support of the GIM.

Communications

You probably want to increase the speed to 9600 baud for all instruments which are capable of that speed to keep a good response time.

Driver Availability

Check with the GIM vendor to see if DHCP HL7 drivers are already written for your instrument models. If not, it will speed the process if you can supply the interface specifications to the GIM vendor. If the vendor request the specifications from the laboratory instrument manufacturer themselves, the possibility exist that vendor may be delayed or be given the wrong version or wrong model. Even if the driver is already written, it may need enhancements or modifications to work in your laboratory. Be very specific and complete when discussing the instrument specific interface software with the vendor. An instrument may have many different data streams for different methods. The existing driver may not include all of the methods.

Data Formats

For laboratory instruments that have more than one possible data stream format, the LSI tended to use the simplest format. The GIM drivers tend to use the more complex format which have the maximum amount of error checking in the data transmission. This is to insure that the data received is exactly what was sent. However, it may create more difficulty in establishing proper communications and may result in more rejected transmissions than previously seen with the LSI.

Implementation Considerations

Do not expect to get each interface going in five minutes. The same process used with the LSI will be repeated with the GIM. Wiring needs to be tested. Communication parameters need to be synchronized on both sides. Incoming data needs to be examined and tested with each instrument driver. The logic in decoding the data may be somewhat different than the old LSI routine so you may have to re-think some of your bench procedures. There are a number of configuration steps to do for each interface. A test mapping screen on the GIM has to be completed to make sure that the tests are defined compatibly between the instrument and DHCP. There are also many new fields in the AUTO INSTRUMENT file (#62.4), TOPOGRAPHY file (#61), URGENCY file (#62.05), and ACCESSION file (#68) to be filled in.

The HL7 package must to be installed and setup with the proper entries to establish the DHCP link with the Laboratory UI. (Refer to DHCP HL7 V. 1.6 documentation.)

If you are going to use bar coded labels, these must be functioning and tested.

You may need to change your downtime procedures somewhat to accommodate the new system. Plan to move the instruments over gradually so that you can thoroughly test and incorporate each change in an orderly way.

Bidirectional Considerations

The bidirectional interfaces require more effort to establish. The site needs to decide whether to use automatic download or manual download and whether site wants host query or direct download.

Support and Troubleshooting

The person supporting the Laboratory UI needs to get familiar with the structure of the HL7 messages. Personnel need training in how to check for and start the background job and how to reboot the PC and start the interfaces. Plans need to be made for a backup system and how to implement it. Errors can occur in numerous places and the support person(s) need to be familiar with the path of data back and forth to track problems. The Start/Stop Log of HL7 Transmissions can be used as a debugging tool between DHCP and the GIM system.

DHCP has its regular error log and also has a separate log for HL7 message errors which tracks data streams that did not meet the HL7 standard for a variety of reasons. The Laboratory UI has a Print Laboratory Universal Interface Log option to track message errors. For the bidirectional instruments the errors can occur at any of these levels and in both directions so it can be complicated to track a problem. (Refer to DHCP HL7 Versions 1.5 and 1.6 documentation.)

GIM Backup

Backups of the vendor's generic interface system must be considered, discussed, and planned with your vendor. Make sure that there is a hardware and software backup available through the vendor or contractor.

Checklist for Laboratory Universal Interface Implementation

This checklist provides the actions required before implementing the Laboratory UI.

I. PC - Vendor specific

    1. _____ Instrument specific software installed
    2. _____ Interface software installed
    3. _____ Configuration of PC
    A. _____ System
    B. _____ Instrument tests/parameters
                (repeat for each instrument
                that is interfaced)
    4. _____ Wiring/ports
    A. _____ Connected to DHCP
    _____ Wiring
    _____ Port configuration
    _____ Tested OK
    B. _____ Connected to instrument(s)
    _____ Wiring
    _____ Port configuration if needed (if
                PC is located in the laboratory, this step
                will not be needed)
    _____ Tested OK

II. DHCP

    1. _____ HL7 Package

    A. _____ Installed
    B. _____ Files configured
    _____ NON-DHCP APPLICATION PARAMETER file (#770)
    _____ HL7 APPLICATION PARAMETER file #771
    _____ Others
    C. _____ Debug log on for testing

NOTE: Turn off debug log after testing is completed. Disk full errors can occur if debug log is left on for an extended period (days).

    D. _____ Background job running

2. _____ Laboratory HL7 Software

   A. _____ Installed
   B. _____ Files configured
   _____ LA7 MESSAGE PARAMETER file(#62.48)
   _____ AUTO INSTRUMENT file (#62.4)
   _____ TOPOGRAPHY file (#61)
   _____ URGENCY file (#62.05)
   _____ ACCESSION file (#68)

III.   Barcode Labels

   A. _____ Printer installed
   B. _____ Label routine installed
   C. _____ Bar codes print OK
   D. _____ Bar codes read on instrument(s) OK

IV. Laboratory Instruments (repeat for each one that is interfaced)

   A. _____ Wiring
   _____ Connected
   _____ Communication parameters set on
              instrument
   _____ Tested OK

   B. _____ Verify compatible communication
              parameters on the PC *or* DHCP port
              depending on where the PC is located

V. Bidirectional Interfaces

   A. _____ Manual download tested OK
   B. _____ Auto download tested OK
   _____ if using, turn on Autodownload
              field in File #62.4
   C. _____ Host query tested OK
   _____ If using host query, turn on at
              the instrument

Interface Data Form

The next page shows a sample form for keeping records of how each interface is setup. This form can be helpful for troubleshooting purposes and for passing on to others who may have to work with problems when the original implementor is no longer available. We recommend that each instrument interface specification be filed with a form such as this one to document the settings on interface. It is also helpful to print out the data in the AUTO INSTRUMENT file that relates to this instrument and the load worklist entry and attach those to the file.

Interface Data

Date:_____

Instrument Name/Model:_____

Location of instrument:_____

DecServer/Port:_____

Hard Wire or Phone Data line:_____

Port Communication Parameters:

       Baud:_____
       Data:_____
       Stop:_____
       Parity:_____
       Protocol:_____

Instrument Communication Parameters:

       Baud:_____
       Data:_____
       Stop:_____
       Parity:_____
       Protocol:_____

Instrument Software version:_____

Type of interface:
       Unidirectional:_____
       Bidirectional Cluster:_____
          Manual download:_____
          Auto download:_____
       Bidiretional Direct Download:_____
          Manual download:_____
          Auto download:_____

       Other:_____

AUTO INSTRUMENT file (#62.4) entry:_____

LOAD/WORKLIST file (#68.2) entry:_____

Notes:

Routine Descriptions

There are 13 new routines, 3 modified routines, plus 1 NTEG, and 44 init routines associated with this patch.

New Routines

The following is a list of new routines for the Laboratory UI patch LA*5.2*17.

Routine Name	Description
LA7ADL	This routine runs in the background to automatically download test orders to each instrument flagged for automatic downloading. It monitors the LA("ADL" node to check for accessions that are to have test orders automatically downloaded to another computer system. All entries in the AUTO INSTRUMENT file (# 62.4) that are flagged for automatic downloading will be checked to see if they contain any tests on the accession. If tests are found, then the appropriate download message is constructed and sent.
LA7ADL1	This routine is called by LA7ADL.
LA7HL7	This routine is the main driver for incoming messages. This routine is called by the DHCP HL7 package V. 1.6 to process incoming HL7 messages. Expected variables are those documented in the DHCP HL7 package documentation. The line tag is called if it is entered into the Processing Routine field in the HL7 SEGMENT NAME file (#771.3). Each message type is processed at the line tag of the same name.
LA7HLP	This routine contains the HL7 Source of Specimen Table 0070 from the HL7 standard. This table contains the possible choices for filling in field .08 of the TOPOGRAPHY file (#61).
LA7LOG	This routine logs events and errors from Laboratory Messenger. Creates an entry in the log file to record events or errors while processing messages. The calling routine passes the ien for a bulletin in LA7 MESSAGE LOG BULLETIN file (#62.485). Requires the variables LA762485 (ien of bulletin in File #62.485) and LA76248 (IEN of config in LA MESSAGE PARAMETER file (#62.48) or null if none is defined. Also prints the error log which is stored in ^XTMP. Errors are logged only if the debug log field is turned on in File #62.48.
LA7UID	The EN line tag is called from ^LADOWN when downloading a load work list to File # 62.4. LADOWN1 should have already build ^TMP($J with all of the atomic and cosmic tests, ^TMP("LA7", $J holds all of the instrument defined tests from COLLECTION SAMPLE file (#62).

Routine Name	Description
LA7UID1	This routine converts the information for each test in the load list into HL7 messages and hands them off to the HL7 package for delivery.
LA7UID2	This routine processes download message for an entry in File #62.48. The various segments required by the HL7 format are constructed in this routine and then stored in the array expected by the HL7 package. Calls are made to the HL7 package to construct the MSH header and to send the completed HL7 message.
LA7UIIN	This routine is a background task job which processes incoming laboratory result UI messages that are received from the GIM. File #62.48 should have an entry in the PROCESS IN field. The PROCESS IN field must contain D QUE^LA7UIIN. The LA7UIIN routine runs in the background to check the incoming queue for messages.
LA7UIIN1	If a message is found in the incoming queue, LA7UIIN1 is called to process the message. LA7UIIN1 processes the MSH and OBR segments of the HL7 message.
LA7UIIN2	This routine is called from LA7UIIN1 and processes the Notes and Comments Segment (NTE) and OBX segments which contain results and comments. It also checks the PARAM 1 and the other fields (#12-17) in the AUTO INSTRUMENT file (#62.4) which control various characteristics of individual test results.
LA7UTIL	This routine has various utilities for the Laboratory HL7 interface.

Modified Routines for Laboratory UI Patch LA*5.2*17

Routine Name	Description
LADOWN	Utility for manual download options that have special codes for HL7 interface.
LADOWN1	Utility for manual download options that have special codes for HL7 interface.
LAGEN	This routine transfers results to ^LAH.

Modified Routines for Laboratory UI Patch LR*5.2*65

The following is a list of regular laboratory routines that have hooks or special code in them to handle the HL7 laboratory interface. These routines are in Laboratory patch LR*5.2*65, and must be installed before running the Laboratory UI.

Routine Name	Description
LROLOVER	UID stays the same but traditional accession number changes dates.
LRX	Entry point for Extrinsic function call to create unique accession ID number.
LRLABLD	Code for UID
LRLABLD0	Code to suppress UID on future labels.
LRCONJAM	Added code to create UID on controls and check if auto downloading is being used.
LRWLST, LRWLST1	Added code to check for auto downloading. Also added code to create UID.
LRTSTSET	Added code to check for auto downloading when tests added to an accession.

Init Routines

```
LA7IN001  LA7IN002  LA7IN003  LA7IN004  LA7IN005  LA7IN006  LA7IN007  LA7IN008
LA7IN009  LA7IN00A  LA7IN00B  LA7IN00C  LA7IN00D  LA7IN00E  LA7IN00F  LA7IN00G
LA7IN00H  LA7IN00I  LA7IN00J  LA7IN00K  LA7IN00L  LA7IN00M  LA7IN00N  LA7IN00O
LA7IN00P  LA7IN00Q  LA7IN00R  LA7IN00S  LA7IN00T  LA7IN00U  LA7IN00V  LA7IN00W
LA7IN00X  LA7IN00Y  LA7IN00Z  LA7IN010  LA7IN011  LA7INIS   LA7INIT   LA7INIT1
LA7INIT2  LA7INIT3  LA7INIT4  LA7INIT5
```

```
    44 routines
```

Files

New Files

File Number	File Name	Description
62.485	LA7 MESSAGE LOG BULLETINS	This file stores canned text for logging errors during message processing. This file is not meant to be edited locally, but if local entries are made, they must be entered at ien >999. There are about 20 error messages in the file. The most commonly seen errors are: • Message stored that had no message text • Message text did not begin with MSH, message rejected • Field or component separator is bad, message rejected • OBR segment was not found, message rejected • OBR contained bad instrument name • Instrument name in message is not in AUTO INSTRUMENT file (#62.4) • Unique ID not found in ACCESSION file (#68) • Accession not found in File #68 for area x, date x, entry x • Test=null • Test value=null • No download code for this test name in File #62.4
62.48	LA7 MESSAGE PARAMETER	This file requires site setup. This file stores parameters associated with laboratory messaging configuration. Only one entry is needed to run each Laboratory UI. Other entries can be made if other messaging systems are in use.
62.49	LA7 MESSAGE QUEUE	This file stores the HL7 messages sent and received by the Laboratory HL7 interface. It is populated by the routines. This file must not be edited by users.

Modified Files and Fields

The following is a list of files and fields from other Laboratory files.

AUTO INSTRUMENT File # 62.4		
Field #	**Field Name**	**Description**
62.4,.02	VENDOR CARD ADDRESS	The vendor card address should be stored in this field for Lab HL7 message downloads using Lab Universal Interface software.
62.4,.04	SHORT ACCESSION # LENGTH	This field should be used to pad accession numbers based on the fixed length entered for this instrument.
62.41,2	PARAM 1	This is an old field with a new use. Any M code written into this field will be executed on a given test result which is contained in the variable LA7VAL. Some examples of code which could be used in PARAM 1: 1. S LA7VAL=$S(LA7VAL>100:">100",1:LA7VAL) This code is used on PTT test to convert any numerical value over 100 to >100 result rather than the actual number send by the instrument. 2. S LA7VAL=LA7VAL*10 This code converts the random urine protein to a concentration unit different from that reported by the instrument. 3: S LA7VAL=$S(LA7VAL>99,"PRESUMP POS",1:"NEG") This code takes numerical drug screen results sent by the instrument and converts any result over 99 to the string PRESUMP POS and any other number to the string NEG.
62.41,6	UI Test Code	Another old field with a new use. This field is used to define the instrument "name" for a test. This "name" is used as an identifier for the test in all messages sent to and from the instrument. It is important that the Universal Interface PC has the name defined in this instrument's configuration exactly as it is here in the File #62.4, including upper and lower case.

AUTO INSTRUMENT File # 62.4 (continued)		
Field #	**Field Name**	**Description**
62.41,6 continued	UI Test Code	This field does *not* have to be the test name, but can be. The name of this field should not be taken literally, it is used for both uploading and downloading, for unidirectional as well as bi-directional. This is the primary identifier in all of the HL7 messages passed between DHCP and the Laboratory UI PC. It must be defined on the PC exactly as it is entered here. This field can be any alphanumeric string that passes the transform. There is an "AC" cross reference on this field that is used as a lookup when a message is received. If test results are not being downloaded or uploaded for this test, it might be because the Download Code does not match exactly with the identifier on the PC for this instrument configuration. On some GIM systems, the test name is not configured on the PC but just passes the name of the test as sent from the instrument. This can be determined by using the transmission log on the PC if available on that system or by using the LA7 error log option. Some instruments require a different download code from the upload code. In this case the test would be entered twice and using the fields Accept results for this test and Download to Instrument, the appropriate upload and download tests can be defined.
62.41,12	Number of Decimal Places	In this field, if nothing is entered, the decimal place of the result will not be modified. Rounding will take place if the number of decimal places is exceeded. This field is used to modify the result returned by the instrument. It is used to force the result to a certain number of decimal places. If the result has more decimal places than the number entered for this field, the result will be rounded to the number of decimal places specified. If M code exists in PARAM 1, it will be executed before any modification to the result. If the code in PARAM 1 changes the result such that it is no longer a canonic number, no modification to decimal places will take place.

AUTO INSTRUMENT File # 62.4 (continued)		
Field #	**Field Name**	**Description**
62.41,12 continued	Number of Decimal Places	To round off the result based on other factors, or in other words - "on the fly", you can set a variable in PARAM 1 as follows: PARAM 1: S:(CONDITION) LA7XFORM(1)=3 where CONDITION is some M value that equates to true or false, and 3 represents the number of decimal places. 3 is just an example, you can use any number including zero.
62.41,13	Convert Result to Remark	This field should be set to *YES* if you want the result to be converted to a comment or remark. If M code exists in PARAM 1, it will be executed before converting the result to a comment. Be aware that if field 17 REMOVE SPACES FROM RESULT is set to *YES*, the comment will have all spaces removed. To convert the result to a comment based on other factors, or in other words - "On the fly." You can set a variable in PARAM 1 as follows: S:(CONDITION) LA7XFORM(2)=1 where CONDITION is some M value that equates to true or false.
62.41,14	Accept Results for this Test	In this field if the null default is *YES*, it means that results should be moved to ^LAH for verification. If there is M code in PARAM 1, it will be executed regardless of how this field is set. To accept results for this test based on other factors, or in other words - "On the fly," you can set a variable in PARAM 1 as follows: S:(CONDITION) LA7XFORM(3)=1 where CONDITION is some M value that equates to true or false. This field can be used for screening out extraneous test results sent from the instrument or to screen out tests used for downloading only. As noted in the UI Test Code field (#62.41,6), an instrument can use a different code for downloading than uploading. A *NO* in this field would be appropriate for the download test with a *YES* in the Download to Instrument field (#62.41,15) and in cases where extra test results are being sent from the instrument, enter a *NO* in field (#62.41.6) and a *NO* in the Field (#62.41,15).

AUTO INSTRUMENT File # 62.4 (continued)		
Field #	**Field Name**	**Description**
62.41,15	Download to Instrument	This field is used to prevent downloading of calculated tests to CX7. Example: Anion Gap. Even though it may be an ordered test, it is not a "performed" test--just a calculation so the result gets uploaded, but the order is not downloaded. If null, default is *YES*. If there is M code in PARAM 1 it will be executed regardless of how this field is answered. This field is only used for processing results.
62.41,16	Ignore Results not Ordered	If null, the default will be *NO*. This field should be set to *YES* if you want to restrict results to only those tests that were ordered. For example, if an electrolytes panel was ordered consisting of Na, K, Cl, CO2 and the instrument also reported a BUN result, the BUN would not be reported if this field was set to *YES*. To ignore results not ordered based on other factors, "on the fly," you can set variable in PARAM 1 as follows: PARAM 1: S:(CONDITION) LA7XFORM(5)=1 where CONDITION is some M value that equates to true or false.
62.41,17	Remove Spaces from Result	Answer *YES* if you want to strip all space characters from the result before storing it. If answered *YES* the result from the instrument will be changed so that it contains no spaces, e.g., > 3.2 would be >3.2. If this test is setup to be converted to a comment (see field 13), the spaces will *not* be removed regardless of how you answer this filed. M code in PARAM 1 will always be executed before any other transformation of the result takes place, including the stripping of spaces. To strip spaces conditionally based on other factors, "on the fly" you can set a variable in PARAM 1 as follows: PARAM 1: S:(CONDITION) LA7XFORM(6)=1 where CONDITION is some M value that equates to true or false.
62.4,91	Download Entry	Enter the line tag of the routine used to down load data to the instrument. DO NOT USE '^' ON THIS LINE TAG. IT WILL BE HANDLED BY THE PROCESSING ROUTINE.

AUTO INSTRUMENT File # 62.4 (continued)		
Field #	**Field Name**	**Description**
62.4,92	Download Protocol	Enter the name of the routine used to down load data to the instrument.
62.41,98	Automatic Download	This field checks if the instrument is ready for automatic download. This field is needed for LA7ADL routine.

Topography File (#61)		
Field #	**Field Name**	**Description**
61,.08	HL7 Code	This field links DHCP specimen type with the HL7 Specimen Source Table (0070). By entering a code from Table 0070 for each entry in the HL7 Code file, a mapping is made to the HL7 standard codes. The HL7 CODE field should be edited for any specimen types that could possibly be downloaded to an instrument.

Urgency File (#62.05)		
Field #	**Field Name**	**Description**
62.05,.08	HL7 Code	This field is a set of codes to map to the HL7 urgencies. This field is used for downloading the urgency to an instrument. By entering a code from the HL7 Specimen Code Table (0070) for each entry in the HL7 Code field, a mapping is made to the HL7 standard codes. The HL7 CODE field should be edited for any specimen types that could possibly be downloaded to an instrument.

Accession File (# 68)		
Field #	**Field Name**	**Description**
68,.091	Numeric Identifier	This field is a one or two digit unique number used to create the UID.
68,.092	Type of Accession Number	This field is a long or short identifier.

Refer to the UID specifications section of this manual, for more information on Field (#.092).

Exported Options

Give the following options to the appropriate IRM and Laboratory staff.

Lab Universal Interface Menu (LA7 MAIN MENU)
|
|
1. Print Source of Specimen Table [LA7 PRINT 0070 TABLE]

This option is used to print errors and events logged using the Lab Universal Interface system.

2. Print Lab Universal Interface Log [LA7 PRINT LAB UI ERROR LOG]

This option is used to print the Source of Specimen Table (0070) from the HL7 standard. This table contains the possible choices for filling in field .08 of the TOPOGRAPHY file #61.

Cross-reference

LA 7 MESSAGE QUEUE file (#62.49)

```
XREF              DD        FLD NUM              FIELD NAME
   ---------------   --------   ----------   ------------------------------
 *  "AD"              62.49             4     DATE/TIME ENTERED
 *  "B"               62.49           .01     MESSAGE NUMBER
 *  "C"               62.49             5     INSTRUMENT NAME
 *  "Q"               62.49             2     STATUS
```

LA7 MESSAGE LOG BULLETIN file (#62.485)

```
XREF              DD        FLD NUM              FIELD NAME
   ---------------   --------   ----------   ------------------------------
 *  "B"               62.485          .01     CODE
```

LA7 MESSAGE PARAMETER FILE 62.48

```
XREF              DD        FLD NUM              FIELD NAME
   ---------------   --------   ----------   ------------------------------
 *  "B"               62.48           .01     CONFIGURATION
 *  "C"               62.483          .01     REMOTE SYSTEM ID
```

Archiving and Purging

Archiving

There is no archiving in the Laboratory UI.

Purging

Laboratory UI messages that are transmitted successfully will be given a purge status. These messages are purged every 24 hours. Error messages are kept seven days and then purged by Kernel. In addition to the message, an interpretation of the error is given. These error messages are displayed in time sequence with the most recent being first.

Refer to the DHCP HL7 V. 1.6 Technical Manual for purging options within DHCP HL7 application.

Callable Routines

There are no callable routines in the Laboratory UI.

External Relations

Integration Agreements exist allowing applications to populate and reference HL7 files. Refer to the External Relations section of DHCP HL7 V. 1.6 Technical Manual

Internal Relations

All options of the Laboratory UI are stand alone.

Package-wide Variables

There are no package-wide variables associated with the Laboratory UI software.

Laboratory Universal Interface March 30, 1996
Patches LA*5.2*17 and LR*5.2*65

Universal Identification Number (UID) Specifications

This section describes the specifications for DHCP UID.

- Automated instrument software needs to allow multiple accession areas to use the same instrument.
- The historical accession number does not lend itself to a pure numeric character bar coded.
- The UID will be a pure numeric bar code accession number.
- The UID will provide positive identification of the specimen for verification purposes, downloading and uploading to the universal interface.
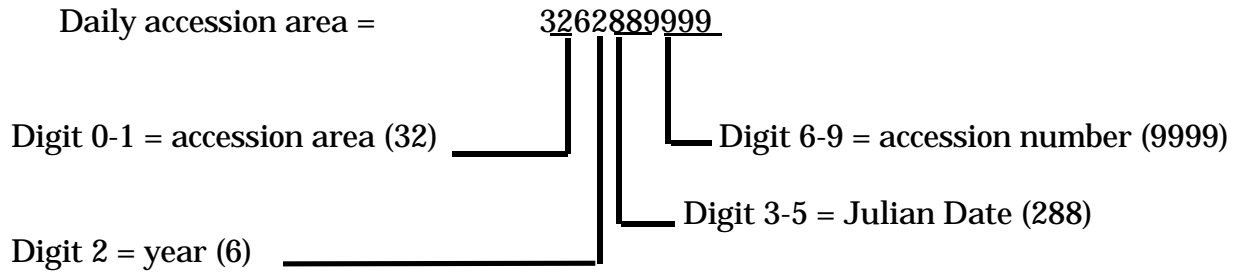
Parameters

1. The UID should be a 9 or 10 digit numeric string.
2. Position 1 and 2 will contain a unique number identifying the accession area.
3. The range of accession numbers for a daily transform accession should be 1-9999.
4. The range of accession numbers for a yearly transform should be 1-999999.
5. The range for quarterly monthly accession areas should be 1-99999.
6. By accession area select UID functionality to be used for bar coding and downloading messages.
7. If the accession area uses UID, the UID should appear on barcode labels, and is displayed when the specimen is accessioned.
8. The system should accept just the accession number portion of UID.
9. Create a user defined two digit field to contain a unique accession area number with a range of 01-99.
10. Auto instruments should allow multiple load/worklist for downloading test(s) to the interface.
11. Current auto instrument software should be supported for backward compatibility.

Examples of possible UID number by accession transforms. The accession area is user defined as 32. Accession numbers are represented by 9's.

Example 1: Daily Accession Area

    Digit Position = 0123456789

    Daily accession area =   3262889999

Digit 0-1 = accession area (32) _____| |____ Digit 6-9 = accession number (9999)

                                                    |____ Digit 3-5 = Julian Date (288)
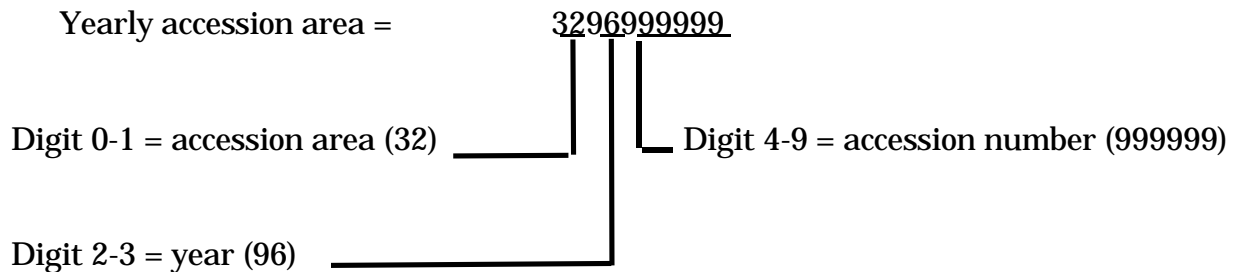
Digit 2 = year (6) _____|

The UID number is created during accessioning for all accession areas. The UID is displayed on the labels as shown in this example:

    UID: 3262889999

CHE 1015 9999   Stat   10/15/96
WAYNE,JOHN D
023-45-6789   Ward: 5CN
RED OR MARB
B CHEM.   Order: 120

Example 2: Yearly Accession Area

    Digit Position = 0123456789

    Yearly accession area =   3296999999

Digit 0-1 = accession area (32) _____| |____ Digit 4-9 = accession number (999999)

Digit 2-3 = year (96) _____|

Example 2: Quarterly and Monthly Accession area

Digit Position = 0123456789

Quarterly/Monthly accession area = 3260399999

Digit 0-1 = accession area (32)

Digit 5-9 = accession number (99999)

Digit 2 = Year (6)

Digit 3 = Quarter/month (03)
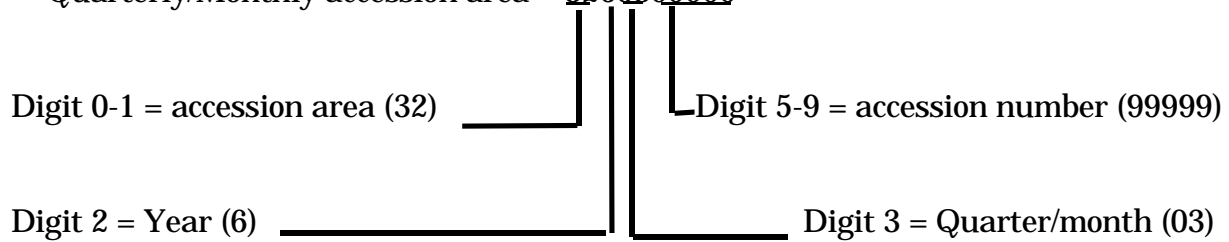
The UID is controlled in ACCESSION file (#68) where it is possible to turn off the long number display for a given accession area in the Type of Accession Number field (#.092). The number is still created, but not displayed or used if turned off. If the long number is used, the barcode will code the UID. If the UID is turned off, the barcode will only code the final digits of the traditional accession number.

Example: Of a Barcode with the UID Turned Off and showing the final digits of the traditional accession number

UID: 9999

CHE 1015 9999   Stat   10/15/96
WAYNE,JOHN D
023-45-6789   Ward: 5CN
RED OR MARB
B CHEM.   Order: 120

If the barcode contains the UID, and for some reason you have to manually program the sample into your instrument, you need to type in the entire number so that it matches the barcode read by the instrument off the tube.

HL7 Standard and DHCP HL7 Package

Overview

The first step in understanding the Laboratory UI is a basic understanding of HL7 Standard and the DHCP HL7 Health Level Seven (HL7) package.

HL7

HL7 is a standard protocol which specifies the implementation of interfaces between two computer applications (sender and receiver) for electronic data exchange in health care environments. HL7 allows health care institutions to exchange key sets of data from different application systems. Specifically, it defines the following:

- The data to be exchanged
- The timing of the interchange
- The communication of errors to the sending/receiving application

The formats are generic in nature, and must be configured to meet the needs of the two applications involved. An HL7 interface specification should be written detailing what formats (events, messages, segments, and fields) will be used, and the lower level protocol that will be implemented in order for the two applications to interface with one another.

The HL7 Protocol defines the content and format of abstract messages and transactions for interface capabilities for the following areas:

- Admission, discharge, and transfer (ADT)
- Order entry
- Query
- Financial applications such as charge, payment adjustments, and insurance
- Ancillary data reporting for Laboratory, Radiology, Pharmacy, etc.

In HL7, information is exchanged using HL7 messages when an event occurs in an application. Each HL7 message consists of one or more HL7 segments. A segment can be thought of as a record in a file. Each segment consists of one or more fields separated by a special character called the *field separator.* The field separator character is defined in the Message Header (MSH) segment of an HL7 message. The MSH segment is always the first segment in every HL7 message. Each field *is* assigned an HL7 data type (e.g., numeric, text, etc.).

In addition to the field separator character, there are four other special characters called encoding characters. Encoding characters are also defined in the MSH segment. They operate on a single field in an HL7 segment. Each encoding character must be unique, and serves a specific purpose. None of the encoding characters can be the same as the field separator character.

- The first encoding character is the *component separator.* Some data fields can be divided into multiple components. The component separator is used to separate adjacent components within a data field.

- The second encoding character is the *repetition separator.* Some data fields can be repeated multiple times in a segment. The repetition separator character is used to separate multiple occurrences of a field.

- The third encoding character is the *escape character.* Data fields defined as text or formatted text can include escape sequences. The escape character is used to separate escape sequences from the actual text.

- The fourth encoding character is the *sub-component separator.* Some data fields can be divided into components, and each component can be further divided into sub-components. The sub-component separator is used to separate adjacent sub-components within a component of a field.

DHCP HL7 Package

The purpose of the DHCP HL7 package is to assist DHCP applications in exchanging health care information with other applications using the HL7 Protocol. The DHCP HL7 package consists of a set of utility routines and files that provide a generic interface to the HL7 Protocol for all DHCP applications. The DHCP HL7 package can be divided into two parts:

- Lower level protocol support between sending and receiving applications
- DHCP interface to the HL7 Protocol

Lower Level Protocols

The term lower level refers to a portion of the Open Systems Interconnect (OSI) model. The OSI model is divided into seven layers or levels. The lower levels (layers 1 through 4) support the actual movement of data between systems. This includes the actual physical connection between the systems and the communications protocol used.

DHCP HL7 V. 1.6 supports the following lower level interfaces:

- HL7 Hybrid Lower Layer Protocol over an RS-232 connection
- DHCP MailMan messages
- X3.28

Using these lower level interfaces, the DHCP HL7 package can support layers one through four of the OSI model and eliminate the need for DHCP applications to write lower level interfaces each time they want to exchange data with another application.

These lower level interfaces provide the following functions:

- Receive and send HL7 messages.
- Validate the HL7 Message Header (MSH) information.
- Invoke the appropriate DHCP application routine to process the data in the message.
- Send HL7 accept acknowledgment (ACK) messages back to the sending application.

DHCP Interface to the HL7 Protocol

With the release of V. l.6, DHCP HL7 supports several methods for interfacing to the HL7 protocol. The method established by V. 1.5 is still supported (for backwards compatibility), and a new method is introduced, as well as new routines, file structures, templates, menus, and options. There are some significant differences between the V. 1.5 and V. 1.6 interface methods, as shown in the following table.

V. 1.5 Interface Method	V. 1.6 Interface Method
One sender and one receiver per message.	One sender, one or more receivers.
Sender and receiver must be on different systems.	Sender and receiver can be on the same or different systems.
Messages must go through a communications protocol.	Messages sent to applications on the same system do not have to go through a communications protocol.
All messages are processed in the background.	Messages are processed in either the foreground or background, based on the priority assigned by sending/receiving applications.
No support for event points.	Event points are supported.

The DHCP HL7 package assists DHCP applications in interfacing to the HL7 Protocol. In addition to the lower levels mentioned previously, all applications must perform the following upper level functions in order to exchange data with another application:

- Event analysis
- Data extraction
- Data filing
- Data formatting
- Message administration

Currently, the functions of event analysis, data extraction, and data filing must be performed by each application package. The DHCP HL7 package provides the following utilities to assist the application package with data formatting:

- Creation of HL7 Message Header (MSH) segments
- Utility calls to convert HL7 data to VA FileMan formats and vice versa
- Validation of Message Header information for all HL7 messages received
- A set of pre-defined variables for use in building HL7 messages/segments

The DHCP HL7 package provides the following functions to assist the application package with message administration:

- Support for tracking transmissions and providing a status for each
- Generation of reports on pending transmissions and transmissions with errors
- A queue for incoming and outgoing transmissions
- A real-time monitor that monitors active transmission links and their status's

DHCP HL7 Routines

The following ten DHCP HL7 routines from V. 1.5 and V. 1.6 are used by Laboratory UI.

Routine Name	Description
HLCHK	Validate data in the HL7 Message Header (MSH) segments of all incoming messages, and creates and "AR" error type acknowledgment messages.
HLFNC and HLFNC1	Performs various functions such as: Format names, dates, and times in HL7 or VA FileMan format. Convert lower case letters to upper case, etc.
HLLP	Implements the HL7 Hybrid Lower Level Protocol receiver/sender.
HLNTEG	Integrity routine for the DHCP HL7 package. Provides checksum for the DHCP HL7 routines.
HLOPT	Main menu for HL7 module.
HLSERV	Server Routine for HL7 Messages received through MailMan
HLTASK	Called to create a background task to start the HL7 Lower Level Protocol routine for a non-DHCP application and purge HL7 transmissions.
HLTF	Process HL7 transmission file entries for HL7 Messages.
HLTRANS	Creates mail message and entry in the HL7 transmission file.

Background Job(s)

Routine Name	Description
HLLP	Serial connection driver for DHCP HL7 to GIM.

Related Manuals

For HL7 information, you might also want to refer to the following manual:

- Health Level Seven (HL7) Standard version 2.2

  Health Level Seven
  3300 Washtenaw Ave, Suite 227
  Ann Arbor, MI 48104-4250
  (313) 677-7777
  Email: hq@hl7.win.net

For applications using the V. 1.6 interface method, you might also want to refer to the following manuals:

- DHCP HL7 V. 1.6 Installation Guide
- DHCP HL7 V. 1.6 Package Security Guide
- DHCP HL7 V. 1.6 Release Notes
- DHCP HL7 V. 1.6 Technical Manual
- DHCP HL7 V. 1.6 User Manual

For applications using the V. 1.5 interface method, you might also want to refer to the following manuals:

- DHCP HL7 V. 1.5 Developer Manual
- DHCP HL7 V. 1.5 Installation Guide
- DHCP HL7 V. 1.5 Package Security Guide
- DHCP HL7 V. 1.5 Release Notes
- DHCP HL7 V. 1.5 Technical Manual
- DHCP HL7 V. 1.5 User Manual

Messages

When everything is working correctly, the HL7 messages will not be visible to the user so knowledge of the details of their structure, location and transmission may not seem important.

However, when problems occur, troubleshooting will often require tracking and reading the messages to determine the cause of the problem. Problems often occur when a new instrument is being interfaced, but sporadic problems can be encountered also. New versions of software on the instrument or on DHCP can trigger problems.

Laboratory UI HL7 messages can be located in two different FileMan files. HL7 MESSAGE TEXT file (#772), in the HL7 package stores messages only briefly, but retains parameters about the message for a longer time. Laboratory UI HL7 messages are also stored in the LA7 MESSAGE QUEUE file (#62.49), and its associated information. Messages which are transmitted successfully will be given a purge status. These are purged every 24 hours. Error messages are kept seven days and then purged by Kernel. In addition to the message, an interpretation of the error is given. These messages are displayed in time sequence with the most recent being first.

HL7 FIELD LIST file (#771.1) is currently used for documentation only.

Caution: If you use FileMan to print out messages, do not attempt to count the delimiter "|" characters to determine the field number of a particular piece of data. FileMan uses the vertical bar for some formatting purposes, and will remove some of the bars that are actually in the global causing your field number counts to be erroneous if the segment contained null fields.

Example 1: A Segment Printed Directly from the Global

MSH|^~\&|LAB INTERFACE|GenericInterfaceManager|LA AUTO INST
|142|19940710001403|**|ORU**|11812|P|2.1|

Example 2: Same Segment Printed by FileMan

MSH|^~\&|LAB INTERFACE|GenericInterfaceManager|LA AUTO
INST|642|19940710001403|**ORU**|11812|P|2.1|

Segments

The following HL7 segments are used to support the exchange of Laboratory data. Tables referenced in the segments can be found in the HL7 version 2.2 Standard document. For the standard HL7 segments, definitions of each elements are provided for those fields that are utilized in the Laboratory UI.

Segment: MSA -Message Acknowledgment

The MSA segment contains information sent while acknowledging another message.

Sequence #	Length	Field Element Name
1	2	Acknowledgment Code
2	20	Message Control ID
3	80	Text Message

MSA Field Definitions

Field 1:   Acknowledgment Code (ID)

This field can have the following values.

Value	Length	Description
AA	2	Application Accept
AE	2	Application Error
AR	2	Application Reject

Field 2:   Message Control ID (ST)

This field identifies the message sent by the sending system. It allows the sending system to associate this response with the message for which it is intended.

Field 3:   Text Message (ST)

This is an optional text field that further describes an error condition. the text may be printed in error logs or presented to an end user.

If the incoming message could not be processed, an MSA segment will be built containing AR in the first field, the message control ID in the second field, and a free text string in the third field that describes the reason for rejecting to be used for debugging purposes. If no reject reason found, AA will be imbedded in the first field, and the message ID in the second field. This is returned to the DHCP HL7 package. It is not seen in the laboratory message queue.

Segment: MSH - Message Header

The MSH segment defines the intent, source, destination and some specifics of the syntax of a message. It is present in both uploads and downloads. Fields 3-6 will be reversed depending on whether the message is an upload or a download.

Each message is required to start with a MSH segment. In the Laboratory UI messages, immediately after the MSH is the field separator character "|". Other encoding characters as described in the HL7 Standard section of this manual. Encoding characters operate on a single field in an HL7 segment. Each encoding character must be unique and none of the encoding characters may be the same as the field separator character. Each encoding character serves a specific purpose.

Sequence #	Length	Field Element Name
1	1	Field Separator
2	4	Encoding Characters
3	15	Sending Application
4	20	Sending Facility
5	30	Receiving Application
6	30	Receiving Facility
7	26	Date/Time of Message
9	7	Message Type
10	20	Message Control ID
11	1	Processing ID
12	8	Version ID

MSH Field Definitions:

Field 1:   Field Separator (ST)

This field serves as a separator and defines the character to be used as a separator for the rest of the message.

Field 2:   Encoding Character Sequence (ST)

This field is four characters in the following order: the component separator, repetition separator, escape character, and subcomponent.

Field 3:   Sending Application (ST)

This field is used for interface with lower level protocols.

Field 4:   Sending Facility (ST)

This field addresses one of several occurrences of the same application within the sending system. This field is entirely site-defined.

This field is the three digit number identifying the medical center division, as found in the DHCP INSTITUTION file (#4).

Field 5:   Receiving Application (ST)

This field is used for interface with lower level protocols.

Field 6:   Receiving Facility (ST)

This field identifies the receiving application among multiple identical instances of the application running on behalf of different organizations.

This field is the three digit number identifying the medical center division, as found in the DHCP INSTITUTION file (#4).

Field 7:   Date/time of Message (TS)

This field is the date/time that the sending system created the message. If the time zone is specified, it is used throughout the message as the default time zone. YYYYMMDDHHMMSS

Field 9:   Message Type ID (CM)

The receiving system uses this field to identify the data segments. This field is a coded value from the Message Type Table 0076.

- ORM=Order message
- ORU=Observation result/unsolicited

Field 10:   Message Control ID (ST)

The message control ID is a sequential number that uniquely identifies the message transmitted by the sending system.

Value	Description
P	Production
D	Debugging
T	Training

Field 12:   Version ID (ID)

This field is matched by the receiving system to its own version to be sure the message is interpreted correctly.

Field 8 and 13 through 17 are not used for laboratory messages.

Segment: OBR - Observation Request

The OBR is used to transmit information specific to an order for a diagnostic study or observation, physical exam or assessment. The observation request segment defines the attributes of a particular request for diagnostic services. For laboratory tests the information in the order segment usually applies to a single specimen. However, there is not a 1 to 1 relationship between specimen and tests ordered. Different test batteries will usually require their own order segments even when they can be performed on a single specimen. In this case the specimen information must be duplicated in each of the order segments that employ that specimen.

One or more OBR segments are present in all uploads and all download messages. The amount of information present in the OBR segment of the uploads will depend on whether it was preceded by a download. Some of the downloaded information is echoed back to DHCP in the corresponding upload. It also depends on whether the instrument is capable of receiving certain information and whether the driver on the GIM system is written to accept particular pieces of information.

Sequence #	Length	Element Name
1	4	Set ID - Observation Request
2	75	Order Number (short or long ID)
3	75	Filler Order Number
4	200	Test Code ^99001^^IEN LABORATORY TEST FILE 60xIEN LAB DATA NAME^TEST NAME^99002
7	26	Observation Date/Time #
8	26	Observation End Date/time #
9	20	Collection Volume
12	60	Danger Code (Infection Warning)
13	300	Relevant Clinical Information
14	26	Specimen Received Date/Time+
15	300	Specimen Source ^^ "Control"
18	60	Placer Field 1 (Analyzer)^Card Address
19	60	Placer Field 2 Tray^Cup^Accession Area^Accession Date^Accession Number^Accession^Universal ID^Sequence Number
22	26	Results Report/Status Change - Data/Time +

Sequence #	Length	Element Name
27	200	Quantity/Timing^Quanity^Interval^ Duration^Start Date/Time^End Date/Time^Priority^Condition^Text^ Conjunction^Order Sequence

OBR Field Definitions

Field 1:   Set ID - Observation Request (SI)

This field is a sequence number. For the first order transmitted, the sequence number is 1; for the second order, it is 2; and so on.

Field 2:   Order Number (CM)

In DHCP this field contains the accession number (short or long UID).

Field 3:   Filler Order Number (CM)

This field is the UID.

Field 4:   Test Code (CE)

This field is a permanent identifier for an order and its associated observations

    Subfields are:

    Identifier: CPT code or instrument code

    Test: Instrument code or null

    Name of coding system: "99001" This is a hard coded number used by DHCP to denote a user defined coding system. User defined coding systems start with the digit 9.

    Alternate identifier: ien (**file name**) file 60_X_ien (**file name**) file 63

    Alternate text: Test name in File #60

    Alternate coding system: "99002" This is a hard coded number used by **DHCP** to denote a user defined coding system. User defined coding systems start with the digit 9.

Field 7:   Observation Date/Time (TS)

This field contains the actual date and time of a specimen collection (YYYYMMDDHHMMSS).

Field 8:   Observation End Date/Time (TS)

This field contains the end date and time of a specimen collection.

Field 9:   Collection Volume (CQ)

This field is the volume of the collected specimen.

Field 12:   Danger Code (CE)

This field is used for the infection warning.

Field 13:   Relevant Clinical Information (ST)

This field is used to provide specimen comments.

Field 14:   Specimen Received Date/Time (TS)

This field is the actual log-in time of a specimen at the diagnostic service.

Field 15:   Specimen Source CM

The Specimen Source Table 0070, from the HL7 Standard is encoded in a DHCP routine. A field in the ETIOLOGY FIELD file (#61.2) must be filled in with a choice from the table. That choice will be inserted into the first subcomponent of this field. Other subcomponents defined by the standard are additives such as anticoagulants, method of collection, body site (example: leg) and site modifier (example: left or right).

Field 18:   Placers Field #1 (ST)

This field is used for the name of the instrument entry from the AUTO INSTRUMENT file.

Field 19:   Placers field #2

This field has eight subcomponents which may be used as needed by a particular instrument interface.

1. Tray
2. Cup
3. Accession area (ien)
4. FileMan accession date
5. Accession number (terminal digits only)
6. Accession--traditional (CH 0725 290)
7. Universal ID (1051050200)
8. Sequence # from the instrument

Field 22:   Results Report/Status Change-Date/Time

This field is used to indicate the date and time that the report is released.

Field 27:   Quantity/Timing

This field contains information about how many services to perform at one service time and how often the service times are repeated, and to fix duration of the request. This field has 10 subcomponents. Only subcomponent number six, Priority (Star or Routine) is presently used in the laboratory standard.

Fields 3, 5 and 6, 10 and 11, 16 and 17, 20 and 21, 23 through 26, and 28-36 are not used for laboratory messages.

Segment: NTE - Notes and Comments

The NTE segments follow the OBRs. The NTE segments contain comments from the instrument. Comments contained in the NTE pertain to the entire test battery, not test specific. There can be more than one NTE and each will be stored as a comment in ^LAH.

Sequence #	Element Name
3	Comments

NTE Field Definitions

Field 3:   Comments

This field contains the comment.

Fields 1 and 2 are not used for laboratory messages.

Segment: OBX - Observation Results

The OBX segment is present only in upload messages. The OBX segment is used to transmit a single observation or observation fragment. This segment represents the smallest indivisible unit of a report.

Sequence #	Element Name
1	Set ID - Observational Simple (Sequence**)
2	Value Type
3	Observation Identifier
4	Observation Sub-ID
5	Observation Value
6	Units
7	References Range
8	Abnormal Flags
11	Observe Result Status

OBX Field Definitions

Field 1:   Set ID - Observation Simple (SI)

Set ID - Observation Simple is a sequence number used to identify the segment repetitions.

Field 2:   Value Type (ID)

This field is the format of the observation value in OBX. Refer to the Value Type Table 0125 of the HL7 Standard.

Field 3:   Observation Identifier (CE)

This field is a unique identifier for the observation. There are six components: ID, text, name of coding system, alternate ID, alternate text, name of alternate coding system.

Field 4:   Observation Sub-ID (ST)

This field can be used to:

- distinguish between multiple OBX segments with the same observation ID organized under one OBR,
- group related components in reports such as surgical pathology,
- organize the reporting of some kinds of fluid intakes and outputs.

Field 5:   Observation Value (*)

This field is the value observed by the observation producer.

Field 6:   Units (CE)

This field is a coded element made up of identifier, text, and name of coding system. the default coding system for Units consists of the ISO abbreviations as defined in section 7.1.4 of the HL7 version 2.2 Standard.

Field 7:   Reference Range (ST)

This field is a numeric value, lower limit - upper limit, e.g., for potassium, 3.5 -4.5.

Field 8:   Abnormal Flags (ID)

This field is a table lookup indicating the normalcy status of a report. Refer to Abnormal Flags Table 0078 in the HL7 Standard.

Field 11:   Observe Result Status (ID)

This field reflects the current completion status of the results for one Observation Identifier.

Fields 9 - 10 and 12 through 16 are not used in the laboratory messages.

Segment: ORC - **Common Order**

The ORC segment is present only in downloads. The ORC segment is used to transmit data elements that are common to all orders (all types of services that are requested). The ORC segment is required in the ORM message.

Sequence #	Element Name
1	Order Control
3	Filler Order Number
5	Order Status
12	Ordering Provider

ORC Field Definitions

Field 1:   Order Control (ID)

This field determines the function of the order segment. This field may be considered the "trigger event" identifier for orders. The codes fall roughly into the following categories:

- Event request- codes like "NW" (new order) and "CA" (cancel order request) that are intended to initiate an event.
- Event acknowledgment- codes like "OK" (orders accepted) and "CR" (canceled as requested) that are intended to reply to an application that requested an event.
- Event notification - codes like "OC" (order canceled) and "OD" (order discontinued) that are intended to notify another application that an event has occurred.

In the Laboratory UI, NW = New order is hard coded into every ORC segment.

Field 3:   Filler Order Number (CM)

This field is the order number associated with the filling application. This field contains the DHCP order number on the download messages.

Field 5:   Order Status (ID)

The purpose of this field is to report the status of an order either upon request (solicited).

Messages

Field 12:   Ordering Provider (CN)

This field contains the identity of the person who is responsible for creating the request (i.e., ordering physician).

Fields 2, 4, 6 through 11, and 13 through 19 are not used in the laboratory messages.

Segment: PV1 - Patient Visit

The PV1 segment is present in downloads. PV1 segment will be echoed back in uploads if there was a previous download.

Sequence #	Element Name
1	Set ID - Patient Visit
3	Assigned Patient Location

PV1 Field Definitions

Field 1:   Set ID - Patient Visit (SI)

This field is a number that uniquely identifies this transaction for the purpose of adding, changing, or deleting the transaction. for those messages that permit segments to repeat, the set ID field is used to identify the repetitions. For example, the swap and query transactions allow for multiple PID segments would have Set ID values of 1, 2, then 3, etc. When defined, the sequence is always "1" in Laboratory UI messages.

Field 3:   Assigned Patient Location (CM)

This field is the assigned patient location.

Fields 2, and 4 through 25 are not used in the laboratory messages.

Segment: PID - **Patient ID**

The PID segment originates on downloads and echoes back on upload. If no downloads, not present on uploads.

Sequence #	Element Name
3	LRDFN^CHECKSUM^M11
5	Patient Name
7	Date of Birth
8	Sex
19	SSN Number - Patient

PID Field Definitions

Field 3:   Patient ID (Internal ID) (CM)

This field is a composite element made up of the following components: patient ID (LRDFN), check digit, and check digit scheme used to calculate the check digit.

Field 5:   Patient Name (PN)

The subcomponents are last name, first name, middle initial, and suffix such as Jr., prefix such as Dr., degree such as MD.

Field 7:   Date of Birth (DT)

This field is the patient's date of birth (YYYYMMDD)

Field 8:   Sex (ID)

This field is the patient's sex.

Field 19:   SSN Number (ST)

This field is the patient's social security number.

Fields 1 and 2, 4, 6, 9 through 18, and 20 through 27 are not used in the laboratory messages.

Message Types

Message types are defined by the HL7 Standard in the Message Type Table 0076. There are two types used by the Laboratory HL7 interface.

1. General Order Message (ORM)

The function of this message is to initiate the transmission of information about an order. This includes placing new orders, cancellation of existing orders, discontinuation, holding, etc.

Downloads are ORM message types.

2. Unsolicited Transmission of an Observation (ORU)

For each patient order (OBR segment) more results may be transmitted depending upon the number of observations generated by the order.
All uploads are ORU message types.

HL7 Messages

Following are some examples of HL7 messages used in the Laboratory Universal
Interface. These are examples of actual download requests and upload results
messages. This is not a complete interface specification, but might be useful to
begin work toward a DHCP compliant interface.

This first message is a simple results message. A field by field breakdown is
included to show the DHCPs particular requirements. A results message requires at
least one MSH, Observational Request Segment (OBR), and Result Segment (OBX).

Example: Simple Results Message

```
MSH|~^\&|LA AUTO INST|695|LAB INTERFACE|Generic Interface Manager
    |19960227084324||ORM|350988|P|2.2
PID|||33466~0~M11||SMITH~JOE~Z||19250929|M|||||||||||111-11-1111
PV1|||LPC
ORC|NW||38277|||||||||~DANN~CARO~J
OBR|1|1560580026||441~~99001~1244X695003~PROSTATE SPECIFIC ANTIGEN~99002|
    ||19960227084325|||||||||SER|||AXSYM|~~24~2960227~26~SC 022
    7 26~1560580026~|||||||||~~~~~R
```

```
MSH|^~\&|LAB INTERFACE|Generic Interface Manager|LA AUTO INST|695
    |19960227103316|    |ORU|53801|P|2.2
PID|1||33466||SMITH^JOE^Z|||||||||||||||
OBR|1|1560580026|||||||||||||||||AXSYM|^^24^2960227^26^SC 0227 26^1560580026
OBX|1|ST|441^^^1244X695003^PROSTATE SPECIFIC ANTIGEN^99002||1.15|ng/ml|0.00 TO
    4.00|||F
```

This messages represent a download test request message. The Patient
Identification Segment (PID) and Patient Visit Segment (PV1) fields in the
download are straight forward.

Example: Download Request Message

```
MSH|~^\&|LA AUTO INST|695|LAB INTERFACE|Generic Interface Manager
    |19950725133514||ORM|2950725.133514|P|2.1
PID|||56535~2~M11||DOE~JOHN~H||19190927|M|||||||||||111-11-1111
PV1|||LORTH
ORC|NW||130424|||||||||~NORR~DANNY~W
OBR|1|1052060288||82374~02A~99001~55X454~BICARBONATE---------O~99002|
    ||19950725133542|||||||SER|||CX7CL-IM|~~11~2950725~288~CHE 0725
    288~1052060288~|||||||||~~~~~R
OBR|2|1052060288||82251~11A~99001~186X695168~BILIRUBIN, TOTAL
    -----~99002|||19950725133542|||||||SER|||CX7CL-IM|~~11~2950725~288~
    CHE 0725 288~1052060288~|||||||||~~~~~R
OBR|3|1052060288||84075~35A~99001~188X17~ALKALINE PHOSPHATASE
    -~99002|||19950725133542|||||||SER|||CX7CL-IM|~~11~2950725~288~CHE 0725
    288~1052060288~|||||||||~~~~~R
OBR|4|1052060288||84460~31A~99001~191X20~SGPT-----------------~
    99002|||19950725133542|||||||SER|||CX7CL-IM|~~11~2950725~288~CHE 0725
    288~1052060288~|||||||||~~~~~R
OBR|5|1052060288||84132~01B~99001~1442X6~POTASSIUM-----------O~
    99002|||19950725133542|||||||SER|||CX7CL-IM|~~11~2950725~288~CHE 0725
    288~1052060288~|||||||||~~~~~R
OBR|6|1052060288||84295~01A~99001~1443X5~SODIUM-------------O~
    99002|||19950725133542|||||||SER|||CX7CL-IM|~~11~2950725~288~CHE 0725 288~
    1052060288~|||||||||~~~~~R
OBR|7|1052060288||82435~04A~99001~1444X7~CHLORIDE-----------O~
    99002|||19950725133542|||||||SER|||CX7CL-IM|~~11~2950725~288~CHE 0725
    288~1052060288~|||||||||~~~~~R
```

Example: Upload of Results Message

Some of the fields in the download are echoed back in the results message:

```
PID|1||111-11-1111||
    SSN echoed, PV1 not required

OBR|1|1052060285||||||||||||||SER|EBER_MARGE_J_MD||CX7A-IM|46^1^^^^^^42865|||
    echoed from download

OBR|1|1052060285||||||||||||||SER|EBER_MARGE_J_MD||CX7A-IM|46^1^^^^^^42865|||19
    950725135024|||||^^^^^
     46^1 represents the tray/cup
    as downloaded, but is also used
    on unidirectional when tray cup
    is the only method for identifying
    the specimen.  3rd component is the
    tray, 4th component is the cup.
    Components 1 and 2 would be empty
    in the case of a unidirectional
    upload by tray cup.


OBX|1|ST|82251^^^||0.9|mg/dl|||||F
 alternate test code echoed
```

Glossary

ACK/NAK

A type of software handshake method. Before sending data the sender must receive permission from the receiver. If the data is flawed, the receiver sends back the NAK character and the sender will re-send the data.

Arnet Board

PC circuit board to provide multiple serial connections for lab instruments to transmit data.

ASTM

American Society for Testing and Materials. This organization has two standards for communication between laboratory analyzers and information systems. E1381 defines protocol and E1394 defines format/content. These standards are totally separate from the HL7 standard. Some of the newer instruments are using these for their data stream, but the various implementations are still not totally similar with each other.

Automatic Download

Patient demographics and tests ordered are automatically formatted and transmitted either directly to a lab instrument or to a location where the instrument can query directly for the information. The automatic transmission usually occurs as soon as the accession number is created.

Baud Rate

The number of discrete signaling events that occur on a transmission line in a second. For binary digital transmission, a baud is a bit per second. Common rates are usually multiples or halves or quarters of 600. Baud rate divided by 10 is approximately equal to the number of characters/second that are transmitted at a given rate.

Bidirectional	Communication between two computers or devices which occurs in both directions. Old style interfaces were usually unidirectional. That is, the host computer "listened" continuously for incoming data. The instrument transmitted whenever there was data available and always assumed the data was received. Bidirectional communications are much more complicated since nothing is assumed and both sides are "listening" continuously. No communication takes place without permission and data received is checked and acknowledged. In newer instruments even unidirectional interfaces have a bidirectional component. That is, the instrument will not release data until it has received permission from the host to send it. This permission may only consist of a single invisible character, but without it there is no data flow. There may also be error checking communications between devices in unidirectional interfaces.
Breakout Box	A device used for testing electrical activity on each individual wire in a cable connecting two computers or devices. It is used for troubleshooting interface wiring problems and building communication cables. It allows you to experiment with connector signals by attaching jumper wires between pins that correspond to various RS 232 signals.
Checksum	A specific calculation is performed on the contents of a message or packet of data. This checksum is sent with the data. The same calculation is performed by the receiver of the data. If they do not match, the data is rejected and the sender is requested to re-send.
Cluster	A term used by a vendor to describe a configuration where similar instruments are functionally treated as a single entity. Test requests are sent to the cluster without specifying a single instrument. The specimen may be placed on any instrument in the cluster. Instruments using this configuration must be capable of host query or test request download.

Communication Parameters   Various electronic specifications that define the characteristics of the signals such as the timing and sequence for coding and decoding information being passed from one device to another. Examples of common parameters are baud rate, parity, # of data bits and # of stop bits.

Communication Protocol   Computer program which defines the rules for data transfer between two devices or computers. The same protocol must be defined at both ends of the transmission. Some common examples of protocols are XON/XOFF, ACK/NAK, Kermit, TCP/IP. Some protocols are designed for modems and some for networks and others intended for devices connected to a single computer. They may have different purposes and varying degrees of complexity.

Data Stream   The format, content, sequence and timing of the information transmitted and/or received by computer devices such as lab instruments. There is very little standardization among manufacturers. A given instrument may indeed have several different data streams simultaneously, and it is common for instrument software upgrades to significantly alter the data stream rendering the interface useless.

DB25 Male/Female   The RS232 standard specifies the use of a D connector with 25 pins (male) or holes (female) in two rows with 13 on top and 12 on the bottom. The "B: refers to the connector's shell size. Instruments may use either male or female connectors and may have varying numbers of the 25 wires actually connected.

DB9 Male/Female   Since most RS232 connections only use a few pins of the RS-232 specification, a 9 pin connector is often used to save space. The pin numbers do not necessarily correspond to the same pin numbers on the DB 25.

Decserver Port	Physical connection used to link peripheral devices to the DEC DHCP computers.
Direct Connect	A lab DHCP term denoting a lab instrument (which may be either unidirectional or bidirectional) that is connected directly to a dedicated port on the DHCP computer. Such an interface bypasses the LSI or other intermediate data receiver. Each direct connect interface requires a separate background job on DHCP to intercept its data.
Driver	Computer program which transports electronic information such as data or commands going between two computers or devices.
DSR	Display Response Message
EIA	Electronics Industry Association
Equinox Port	Physical connection to link peripheral devices to MSM DHCP computers.
Ethernet Card	Circuit board which allows network port connections.
EVN	Event Type Segment
FRAMING	The method used to delimit characters in asynchronous serial communications. Each character is preceded by a start bit (space) and followed by a stop bit (mark), with a continuous marking condition indicating no transmission.
HANDSHAKING	An electronic method of granting permission to transmit data between two computers or devices. This can be done via software using a pair of ASCII characters sent over the data send and receive lines such as ACK/NAK or can be done via separate wires specially dedicated to the purpose such as Clear to Send (CTS) and Ready to Send (RTS). Lab instrument interfaces may provide hardware communications, but the DHCP computer does not utilize these so if present, they are disables by directly connecting the corresponding pins in the instrument cable connection.

HL7 Standard | Set of written rules and specifications for computer programmers to use to format medical information in a uniform way so it can be transported from one computer system to another.

HL7 DHCP Package | Software to manage, store and route HL7 formatted messages between DHCP packages and other computer systems. It handles low level handshaking and physical delivery and receipt of messages between systems.

HL7 LAB Interface | Software to encode data into the HL7 format and to decode HL7 messages into lab global for use by standard DHCP lab options.

Host Query | A type of bidirectional interface where the instrument requests the ordering information and patient demographics directly from the main computer or some intermediate computer GIM PC when the instrument has a sample accession number read from a bar code off the specimen tube or the instrument has the accession number and location of the specimen by some other means. The Host system must reply to the query within a time frame (usually a few seconds) which is set by the lab instrument.

ISO | International Standards Organization. A voluntary international group of national standards organizations including ANSI, that issues standards in all areas including computers and information processing.

Kermit | A public domain file transfer protocol developed at Columbia University to transfer files from one computer to another. Some lab instruments use this protocol. Kermit transfers data by breaking it up into pieces and encapsulating the pieces within packets. It requires a special set of routines on both sender and receiver computers to pack and unpack the data being transferred.

LAT   Local Area Transport A proprietary network protocol
                             for communicating to multiple devices (computers or
                             terminal servers) via a single physical line.

Line Monitor   Device which can be inserted into the cable
                             connecting two computers or devices. The monitor will
                             detect electrical activity on selected wires in an
                             RS232 circuit.

LSI   Large Scale Integrator. A "black box" device used to
                             concentrate incoming data from as many as 8 lab
                             instruments and then pass that data to the DHCP
                             computer through a single port.

Manual Download   Lab orders and patient demographics are sent
                             directly to a specific lab instrument or to some
                             intermediate device such as the GIM PC. This is
                             initiated manually by a technologist who builds a
                             worklist and then uses a DHCP option to download
                             the information.

MSA   Message acknowledgment

MSH   Message header

Multiplexor   Physical device or circuit board which allows one
                             device to connect to multiple other devices. Specific
                             transport protocol software is needed to route data to
                             and from a multiplexor.

NTE   Notes and comments segment. These segments
                             contain comments from the instrument, comments
                             contained in the NTE refer to the entire test battery,
                             not test specific. NTE comments are not allowed
                             anywhere except after the OBR. There can be more
                             than one NTE. Each will be stored as a comment in
                             ^LAH.

Null Modem   A pair of connectors usually with cable between them
                             allowing 2 computers or devices to be directly
                             connected without intervening modems or
                             multiplexers, supplying the required RS-232 signals
                             by means of cross-connections and jumpers.

OBR	Observational Request segment
OBX	Result segment
ORC	Common order segment
OCF	Order Confirmation Message type
ORC	Observational Result/Record Response Message type
ORM	Order message type
ORR	Order response message
ORU	Observational results unsolicited message type
OSI	Open System Interconnection
OSQ	Order Status Query Message type
Parity	A method to detect errors in binary information. It requires 7 bits to represent a character, but 8 bits are sent. If you are using odd parity, the sender will count the number of 1's in the 7 bits of the character. If it is odd, the sender will put 0 in the 8th bit. If it is even, the sender will put 1 in the 8th bit. In other words odd parity means that the parity bit will be whatever is required to make the total number of 1's in the 8 bit character odd. For even parity, reverse the above procedure. When the receiver gets the character, it also calculates the parity. If it doesn't match with what was received, there is an error and there may be an unusual character displayed on the screen, but there is no provision to correct the error so it is of little help to use it. Mark and space parity always place either a mark or a space in the 8th bit of every character. No parity means the 8th bit is ignored.
PID	Patient identification segment
PV1	Patient Visit Segment
QRY	Query message type

Router   A computer or self-contained unit of a computer
                                which makes decisions about which path incoming
                                and outgoing data traffic will take to reach its
                                destination. A router can also filter traffic to restrict
                                or detect errors in data transmissions.

RS232   An EIA standard that gives the electrical and
                                functional specification for serial binary digital data
                                transmission, the most commonly used interface
                                between computers, terminals and other computer
                                devices and instruments.

Serial Port   Physical connection on a computer used for RS232
                                data transmission. All data is transferred over a
                                single wire in sequential fashion.

Stop Bits   In asynchronous serial transmission, the mark (1 bit)
                                that terminates a character. It lasts for at least one
                                bit time and thereafter until the next character starts
                                to arrive.

TCP/IP   A network protocol for communicating to multiple
                                systems via a single physical line.

UDM   Unsolicited Display Message type

UI   Universal Interface

UID   Unique identifier. 10 digit number which identifies a
                                specimen.

Unidirectional   A type of communication between two computers or
                                devices where data only flows in one direction. In
                                terms of lab interfacing, this is usually from a lab
                                instrument to the DHCP computer directly or to an
                                intermediate device such as the LSI or the Universal
                                Interface which in turn sends the information to the
                                DHCP computer. (See also bidirectional).

URD   Results/Update definition Segment

XON/XOFF   A data flow control method where the receiver sends
                                 an XOFF character when its input buffer is close to
                                 being full and an XON when it has room to receive
                                 more data. The XON and XOFF are sent over the
                                 same wire that the device uses to send data.

# Appendix A. Data Innovations Software Configuration

Option #1: Multi-Port Serial board (8 to 64 connections)
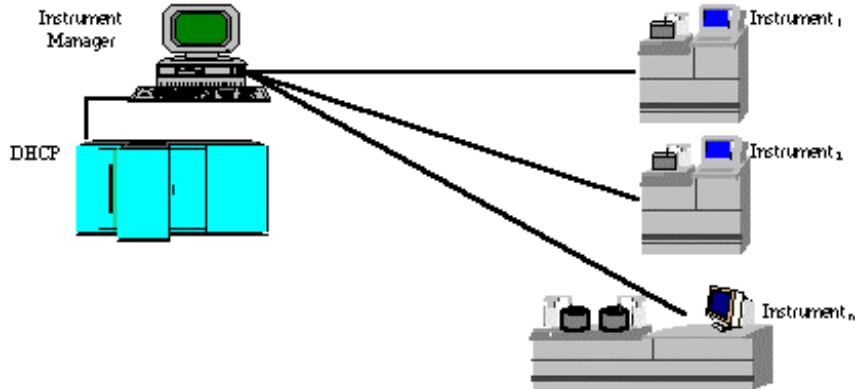
In this configuration, all devices are connected to the Instrument Manager using an Arnet multi-port serial board. A single connection to DHCP assumes the use of the DHCP Laboratory Universal Interface (HL7 protocol). If the Universal Interface is not available, the Instrument Manager can be interfaced to DHCP in Instrument Emulation Mode. The Instrument Manager can be setup to emulate one of the sites existing interfaces. Listed below is an example of instrument emulation:
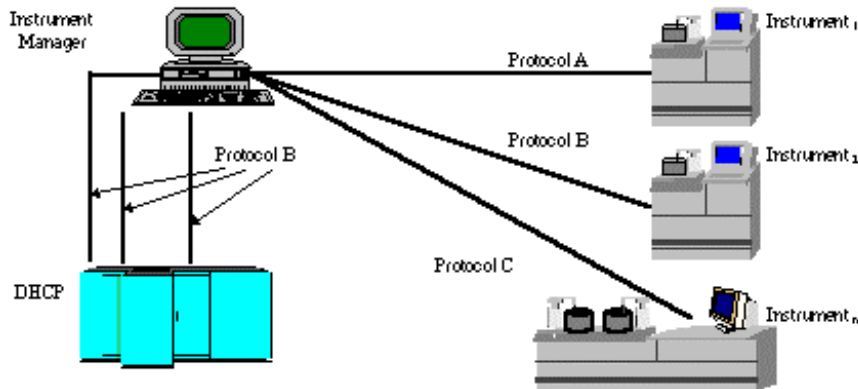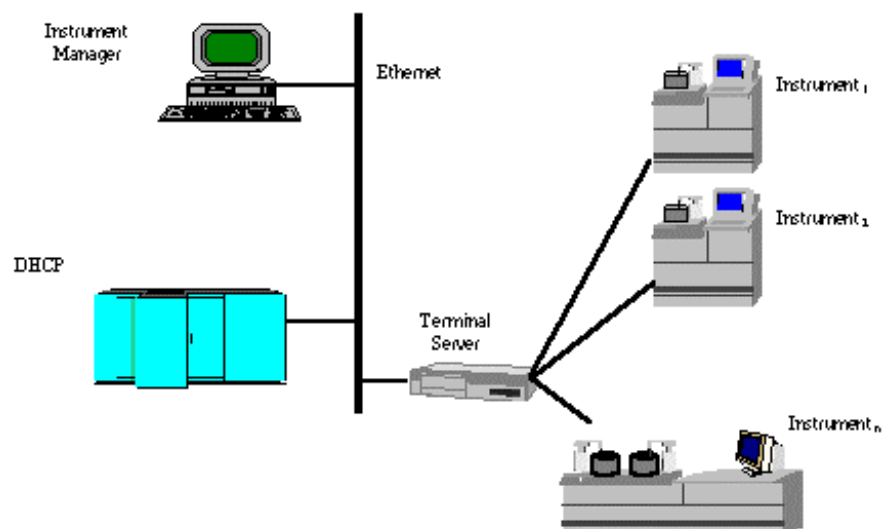
Option #2: Serial connection to DHCP, DEC LAT to instruments using Terminal Servers
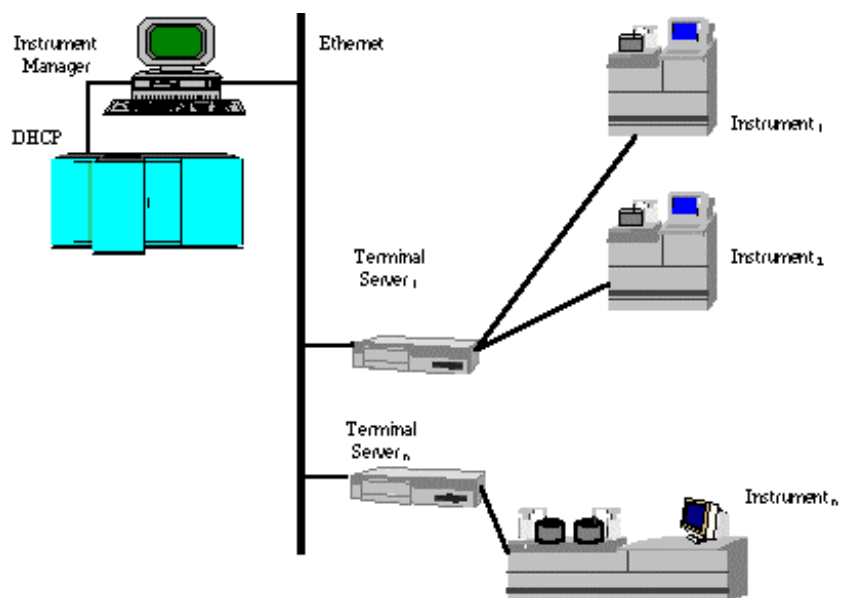

The above example makes use of the Instrument Managers ability to communicate using the DEC LAT network protocol. Instruments are connected to Terminal Servers throughout the institution. The Terminal Servers are attached to the Ethernet network. The Instrument Manager can connect to the individual Terminal Server ports using an Ethernet adapter and the LAT protocol. This allows the Instrument Manager to be placed anywhere in an institution (Lab, IRM, etc.).

Option #3: TCP/IP connections to DHCP, DEC LAT to instrument using Terminal Server
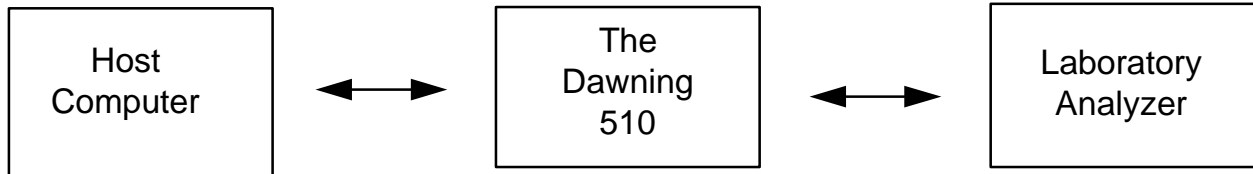

The above example demonstrates the Instrument Manager running two network protocols simultaneously. The DEC LAT protocol is used for communicating with instruments via Terminal Servers. The TCP/IP protocol is used to communicate with the DHCP system. Since TCP/IP can use the Ethernet network, communication speeds between DHCP and GIM are much faster than standard serial communications.

Option #4: TCP/IP connection to DHCP, DEC LAT to instruments, remote lab using T1
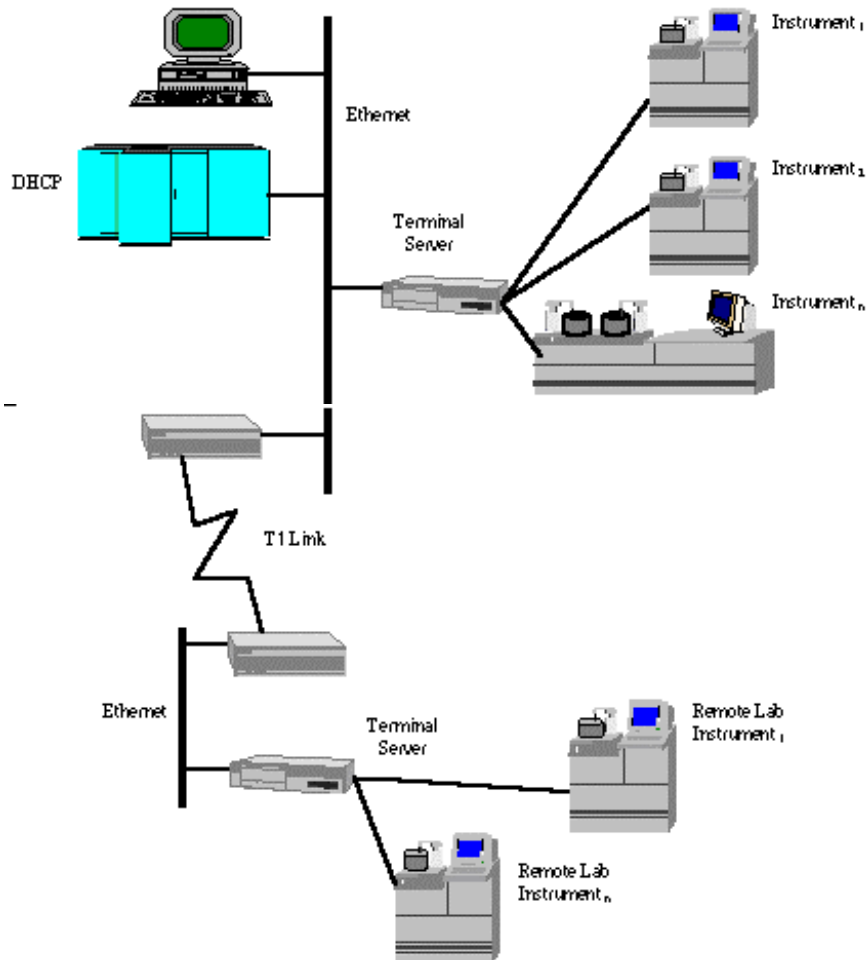
The GIM can access instruments in remote (off-site) labs if the remote sites are connected to the main network. The above example shows the use of a T1 link to create a wide area network (WAN).

Appendix B. Dawning Software Configuration

```
┌──────────────┐        ┌──────────────┐        ┌──────────────┐
│     Host     │  ◄───► │     The      │  ◄───► │  Laboratory  │
│   Computer   │        │   Dawning    │        │   Analyzer   │
│              │        │     510      │        │              │
└──────────────┘        └──────────────┘        └──────────────┘
```

ReseultNet Configuration

HL7 Host Format Definition

SEND   Application   :   Laboratory Interface
              Facility   :   Dawning

RECV   Application   :   LA Auto Instruments
              Facility   :   This field is site specific

DELIM   Field   :   7C
              Component   :   5E
              Repeat   :   7E
              Escape   :   5C
              Sub-Component   :   26

DWNLD   Details   :   Yes

HL7 Host Protocol

              Device   :   COM1

              Protocol   :   Hybrid

BLOCK   Start   :   OB
              End   :   1C

CKSUM   Enabled   :   Yes
PACK   Data   :   Yes

Operational

HOST	Enabled	:	Yes
	Transmit	:	Yes
	Protocol	:	Serial
	Format	:	HL7

AUX	Enabled	:	Yes
	Transmit	:	Yes
	Protocol	:	Block
	Format	:	CDF

HL7 Specification from VA

HEALTH LEVEL 7
INTERFACE SPECIFICATIONS
DALLAS INFORMATION RESOURCE MANAGEMENT FIELD OFFICE
DEPARTMENT OF VETERANS AFFAIRS

DECENTRALIZED HOSPITAL COMPUTER PROGRAM
EXCHANGE OF LABORATORY HEALTHCARE INFORMATION

JULY 1996

1. PURPOSE

This document specifies an interface to the DHCP Laboratory package based upon the HL7 protocol. It is intended that this interface form the basis for the exchange of healthcare information between the DHCP Laboratory package and all non-DHCP systems, especially those non-DHCP systems that generate laboratory results information.

2. OVERVIEW

2.1 Statement of Intent

The Dallas IRM Field Office (IRMFO) is developing and plans to implement a generic interface to the HL7 protocol for use by the DHCP Laboratory package in communicating with non-DHCP systems for the purpose of exchanging healthcare information. The interface will strictly adhere to the HL7 protocol and will avoid using "Z" type extensions to the protocol wherever possible. This interface specification is subject to modification/revision to incorporate changes, improvements and enhancements. Later versions may support additional functionality of the current HL7 protocol (currently V 2.2) and new functionality released in future versions of the HL7 protocol.

2.2 Scope

This document describes messages that are exchanged between the DHCP Laboratory package and a non-DHCP system for the purpose of exchanging information concerning laboratory results, specifically test order and reports.

3. GENERAL SPECIFICATIONS

3.1 Communication Protocol

The HL7 protocol defines only the seventh level of the Open System Inter-connect (OSI) protocol. This is the application level. Levels one through six involve primarily communication protocols. The HL7 protocol provides some guidance in this area. The communication protocols that will be used for interfacing with the DHCP Laboratory package will be based on the HL7 Hybrid Lower Level Protocol which is described in the HL7 Interface Standards document.

3.2 Application Processing Rules

The HL7 protocol itself describes the basic rules for application processing by the sending and receiving systems. Information contained in the protocol will not be repeated here, therefore anyone wishing to interface with the DHCP Laboratory package should become familiar with the HL7 protocol V. 2.2.

The following HL7 messages will be used to support the exchange of Laboratory data:

    ORM   Order
    ORU   Observational Results Unsolicited

3.4 Segments

The following HL7 segments will be used to support the exchange of Laboratory data:

    MSA   Message Acknowledgment
    MSH   Message Header
    OBR   Observational Request
    OBX   Result
    ORC   Common Order
    PID   Patient Identification
    NTE   Notes and Comments

4. TRANSACTION SPECIFICATIONS

4.1 General

The flow of transactions between the DHCP Laboratory package and the non-DHCP system can occur in the following way.

A. DHCP will notify the non-DHCP system that an lab test order has been created .

B. The non-DHCP system will then send the results of the tests ordered to the DHCP system once the report has been entered.

4.2 Specific Transactions

A. Complete Test Order Sent to Non-DHCP System

When an lab test is ordered on the DHCP system, an Order (ORM) message is sent to the non-DHCP system. The ORM message would consist of the following segments:

```
ORM     ORDER MESSAGE
-----------------------------------------
MSH     Message Header
PID     Patient Identification
ORC     Common Order
OBR     Observational Request
OBX     Result
```

B. Results of Test Order sent to DHCP System

When the test results corresponding to the order that was sent by the ORM message in paragraph A are ready, an Observational Results Unsolicited (ORU) message is sent to the DHCP system. The ORU would consist of the following segments:

```
ORU     OBSERVATIONAL RESULTS UNSOLICITED
-----------------------------------------------------------------
MSH     Message Header
PID     Patient Identification
OBR     Observational Request
OBX     Result
NTE        Notes and Comments
```

Segments

The following HL7 segments are used to support the exchange of Laboratory data. Tables referenced in the segments an be found in the HL7 version 2.2 Standard

document. For the standard HL7 segments, definitions of each elements are provided for those fields that are utilized in the Laboratory UI.

Segment: MSA -Message Acknowledgment

The MSA segment contains information sent while acknowledging another message.

Sequence #	Length	Field Element Name
1	2	Acknowledgment Code
2	20	Message Control ID
3	80	Text Message

MSA Field Definitions

Field 1:   Acknowledgment Code (ID)
This field can have the following values.

Value	Length	Description
AA	2	Application Accept
AE	2	Application Error
AR	2	Application Reject

Field 2:   Message Control ID (ST)
This field identifies the message sent by the sending system. It allows the sending system to associate this response with the message for which it is intended.

Field 3:   Text Message (ST)
This is an optional text field that further describes an error condition. the text may be printed in error logs or presented to an end user.

If the incoming message could not be processed, an MSA segment will be built containing AR in the first field, the message control ID in the second field, and a free text string in the third field that describes the reason for rejecting to be used for debugging purposes. If no reject reason found, AA will be imbedded in the first field, and the message ID in the second field.

Segment: MSH - Message Header

The MSH segment defines the intent, source, destination and some specifics of the syntax of a message. It is present in both uploads and downloads. Fields 3-6 will be reversed depending on whether the message is an upload or a download.

Each message is required to start with a MSH segment.

Sequence #	Length	Field Element Name
1	1	Field Separator
2	4	Encoding Characters
3	15	Sending Application
4	20	Sending Facility
5	30	Receiving Application
6	30	Receiving Facility
7	26	Date/Time of Message
9	7	Message Type
10	20	Message Control ID
11	1	Processing ID
12	8	Version ID

MSH Field Definitions:

Field 1: Field Separator (ST)
This field serves as a separator and defines the character to be used as a separator for the rest of the message.

Field 2: Encoding Character Sequence (ST)
This field is four characters in the following order: the component separator, repetition separator, escape character, and subcomponent.

Field 3: Sending Application (ST)
When DHCP is the sending application it will contain the name of the application within the Laboratory package which generated the message. For non-DHCP applications the field is entirely site-defined.

Field 4: Sending Facility (ST)
This field addresses one of several occurrences of the same application within the sending system.

When DHCP is the sending facility it will contain contain 3-7 characters, the three digit station number plus any modifiers, identifying the medical center division. For non-DHCP applications the field is entirely site-defined.

Field 5: Receiving Application (ST)

When DHCP is the recieving appkication it will contain the name of the DHCP Laboratory application which it is addressed to. For non-DHCP applications the field is entirely site-defined.

Field 6:   Receiving Facility (ST)
This field identifies the receiving application among multiple identical instances of the application running on behalf of different organizations.

When DHCP is the receiving facility it will contain 3-7 characters, the three digit station number plus any modifiers, identifying the medical center division. For non-DHCP applications the field is entirely site-defined.

Field 7:   Date/time of Message (TS)
This field is the date/time that the sending system created the message. If the time zone is specified, it is used throughout the message as the default time zone. YYYYMMDDHHMMSS

Field 9:   Message Type ID (CM)
The receiving system uses this field to identify the data segments. This field is a coded value from the Message Type Table 0076.

- ORM=Order message
- ORU=Observation result/unsolicited

Field 10:   Message Control ID (ST)
The message control ID is a sequential number that uniquely identifies the message transmitted by the sending system.

Value	Description
P	Production
D	Debugging
T	Training

Field 12:   Version ID (ID)
This field is matched by the receiving system to its own version to be sure the message is interpreted correctly.

Field 8 and 13 through 17 are not used for laboratory messages.

Segment: OBR - Observation Request

The OBR is used to transmit information specific to an order for a diagnostic study or observation, physical exam or assessment. The observation request segment defines the attributes of a particular request for diagnostic services. For laboratory tests the information in the order segment usually applies to a single specimen. However, there is not a 1 to 1 relationship between specimen and tests ordered. Different test batteries will usually require their own order segments even when

they can be performed on a single specimen. In this case the specimen information must be duplicated in each of the order segments that employ that specimen.

One or more OBR segments are present in all uploads and all download messages. The amount of information present in the OBR segment of the uploads will depend on whether it was preceded by a download. Some of the downloaded information is echoed back to DHCP in the corresponding upload. It also depends on whether the instrument is capable of receiving certain information and whether the driver on the GIM system is written to accept particular pieces of information.

Sequence #	Length	Element Name
1	4	Set ID - Observation Request
2	75	Order Number (short or long ID)
3	75	Filler Order Number
4	200	Test Code ^99001^^IEN LABORATORY TEST FILE 60xIEN LAB DATA NAME^TEST NAME^99002
7	26	Observation Date/Time #
8	26	Observation End Date/time #
9	20	Collection Volume
12	60	Danger Code (Infection Warning)
13	300	Relevant Clinical Information
14	26	Specimen Received Date/Time+
15	300	Specimen Source ^^ "Control"
18	60	Placer Field 1 (Analyzer)^Card Address
19	60	Placer Field 2 Tray^Cup^Accession Area^Accession Date^Accession Number^Accession^Universal ID^Sequence Number
22	26	Results Report/Status Change - Data/Time +
27	200	Quantity/Timing^Quanity^Interval^Duration^StartDate/Time^End Date/Time^Priority^Condition^Text^Conjunction^Order Sequence

OBR Field Definitions

Field 1:   Set ID - Observation Request (SI)
This field is a sequence number. For the first order transmitted, the sequence number is 1; for the second order, it is 2; and so on.

Field 2:   Order Number (CM)
In DHCP this field contains the accession number (short or long UID).

Field 3:   Filler Order Number (CM)
This field is the UID.

Field 4:   Test Code (CE)
This field is a permanent identifier for an order and its associated observations

   Subfields are:

   Identifier: CPT code or instrument code

   Test: Instrument code or null

   Name of coding system: "99001" This is a hard coded number used by DHCP to denote a user defined coding system. User defined coding systems start with the digit 9.

   Alternate identifier: ien (**file name**) file 60_X_ien (**file name**) file 63

   Alternate text: Test name in File #60

   Alternate coding system: "99002" This is a hard coded number used by **DHCP** to denote a user defined coding system. User defined coding systems start with the digit 9.

Field 7:   Observation Date/Time (TS)
This field contains the actual date and time of a specimen collection (YYYYMMDDHHMMSS).

Field 8:   Observation End Date/Time (TS)
This field contains the end date and time of a specimen collection.

Field 9:   Collection Volume (CQ)
This field is the volume of the collected specimen.

Field 12:   Danger Code (CE)
This field is used for the infection warning.

Field 13:   Relevant Clinical Information (ST)
This field is used to provide specimen comments.

Field 14:   Specimen Received Date/Time (TS)
This field is the actual log-in time of a specimen at the diagnostic service.

Field 15:   Specimen Source CM
The Specimen Source Table 0070, from the HL7 Standard will be inserted into the first subcomponent of this field.   If the speciment is a lab control , the third component will contain "Control".

Field 18:   Placers Field #1 (ST)
This field is used for the name of the instrument entry from the AUTO INSTRUMENT file.

Field 19:   Placers field #2
This field has eight subcomponents which may be used as needed by a particular instrument interface.

1. Tray
2. Cup
3. Accession area (ien)
4. FileMan accession date
5. Accession number (terminal digits only)
6. Accession--traditional (CH 0725 290)
7. Universal ID (1051050200)
8. Sequence # from the instrument

Field 22:   Results Report/Status Change-Date/Time
This field is used to indicate the date and time that the report is released.

Field 27:   Quantity/Timing
This field contains information about how many services to perform at one service time and how often the service times are repeated, and to fix duration of the request. This field has 10 subcomponents. Only subcomponent number six, Priority is presently used in the laboratory standard.

Fields 3, 5 and 6, 10 and 11, 16 and 17, 20 and 21, 23 through 26, and 28-36 are not used for laboratory messages.

Segment: NTE - Notes and Comments

The NTE segments follow the OBRs. The NTE segments contain comments from the instrument. Comments contained in the NTE pertain to the entire test battery, not test specific. There can be more than one NTE and each will be stored as a comment in ^LAH.

Sequence #	Element Name
3	Comments

NTE Field Definitions

Field 3:   Comments
This field contains the comment.

Fields 1 and 2 are not used for laboratory messages.

Segment: OBX - Observation Results

The OBX segment is present only in upload messages. The OBX segment is used to transmit a single observation or observation fragment. This segment represents the smallest indivisible unit of a report.

Sequence #	Element Name
1	Set ID - Observational Simple (Sequence**)
2	Value Type
3	Observation Identifier
4	Observation Sub-ID
5	Observation Value
6	Units
7	References Range
8	Abnormal Flags
11	Observe Result Status

OBX Field Definitions

Field 1:   Set ID - Observation Simple (SI)
Set ID - Observation Simple is a sequence number used to identify the segment repetitions.

Field 2:   Value Type (ID)
This field is the format of the observation value in OBX. Refer to the Value Type Table 0125 of the HL7 Standard.

Field 3:   Observation Identifier (CE)
This field is a unique identifier for the observation. There are six components: ID, text, name of coding system, alternate ID, alternate text, name of alternate coding system.

Field 4:   Observation Sub-ID (ST)
This field can be used to:

- distinguish between multiple OBX segments with the same observation ID organized under one OBR,
- group related components in reports such as surgical pathology,
- organize the reporting of some kinds of fluid intakes and outputs.

Field 5:   Observation Value (*)
This field is the value observed by the observation producer.

Field 6:   Units (CE)
This field is a coded element made up of identifier, text, and name of coding system. The default coding system for Units consists of the ISO abbreviations as defined in section 7.1.4 of the HL7 version 2.2 Standard.

Field 7:   Reference Range (ST)
This field is a numeric value, lower limit - upper limit, e.g., for potassium, 3.5 -4.5.

Field 8:   Abnormal Flags (ID)
This field is a table lookup indicating the normalcy status of a report. Refer to Abnormal Flags Table 0078 in the HL7 Standard.

Field 11:   Observe Result Status (ID)
This field reflects the current completion status of the results for one Observation Identifier.

Fields 9 - 10 and 12 through 16 are not used in the laboratory messages.

Segment: ORC - Common Order

The ORC segment is present only in downloads. The ORC segment is used to transmit data elements that are common to all orders (all types of services that are requested). The ORC segment is required in the ORM message.

Sequence #	Element Name
1	Order Control
3	Filler Order Number
5	Order Status
12	Ordering Provider

ORC Field Definitions

Field 1:   Order Control (ID)
This field determines the function of the order segment. This field may be considered the "trigger event" identifier for orders. The codes fall roughly into the following categories:

- Event request- codes like "NW" (new order) and "CA" (cancel order request) that are intended to initiate an event.
- Event acknowledgment- codes like "OK" (orders accepted) and "CR" (canceled as requested) that are intended to reply to an application that requested an event.
- Event notification - codes like "OC" (order canceled) and "OD" (order discontinued) that are intended to notify another application that an event has occurred.

In the Laboratory UI, NW = New order is hard coded into every ORC segment.

Field 3:   Filler Order Number (CM)
This field is the order number associated with the filling application. This field contains the DHCP order number on the download messages.

Field 5:   Order Status (ID)
The purpose of this field is to report the status of an order either upon request (solicited).

Field 12:   Ordering Provider (CN)
This field contains the identity of the person who is responsible for creating the request (i.e., ordering physician).

Fields 2, 4, 6 through 11, and 13 through 19 are not used in the laboratory messages.

Segment: PV1 - Patient Visit

The PV1 segment is present in downloads. PV1 segment will be echoed back in uploads if there was a previous download.

Sequence #	Element Name
1	Set ID - Patient Visit
3	Assigned Patient Location

PV1 Field Definitions

Field 1:   Set ID - Patient Visit (SI)
This field is a number that uniquely identifies this transaction for the
purpose of adding, changing, or deleting the transaction. for those messages that
permit segments to repeat, the set ID field is used to identify the repetitions. For
example, the swap and query transactions allow for multiple PID segments would
have Set ID values of 1, 2, then 3, etc. When defined, the sequence is always "1" in
Laboratory UI messages.

Field 3:   Assigned Patient Location (CM)
This field is the assigned patient location.

Fields 2, and 4 through 25 are not used in the laboratory messages.

Segment: PID - Patient ID

The PID segment originates on downloads and echoes back on upload. If no
downloads, not present on uploads.

Sequence #	Element Name
3	LRDFN^CHECKSUM^M11
5	Patient Name
7	Date of Birth
8	Sex
19	SSN Number - Patient

PID Field Definitions

Field 3:   Patient ID (Internal ID) (CM)
This field is a composite element made up of the following components: patient ID
(LRDFN), check digit, and check digit scheme used to calculate the check digit.

Field 5:   Patient Name (PN)
The subcomponents are last name, first name, middle initial, and suffix such as Jr.,
prefix such as Dr., degree such as MD.

Field 7:   Date of Birth (DT)
This field is the patient's date of birth (YYYYMMDD)

Field 8:   Sex (ID)
This field is the patient's sex.

Field 19:   SSN Number (ST)
This field is the patient's social security number.

Fields 1 and 2, 4, 6, 9 through 18, and 20 through 27 are not used in the laboratory messages.

Message Types

Message types are defined by the HL7 Standard in the Message Type Table 0076. There are two types used by the Laboratory HL7 interface.

1. General Order Message (ORM)

The function of this message is to initiate the transmission of information about an order. This includes placing new orders, cancellation of existing orders, discontinuation, holding, etc.

Downloads are ORM message types.

2. Unsolicited Transmission of an Observation (ORU)

For each patient order (OBR segment) more results may be transmitted depending upon the number of observations generated by the order. All uploads are ORU message types.

HL7 Messages

Following are some examples of HL7 messages used in the Laboratory Universal Interface. These are examples of actual download requests and upload results messages. This is not a complete interface specification, but might be useful to begin work toward a DHCP compliant interface.

This first message is a simple results message. A field by field breakdown is included to show the DHCPs particular requirements. A results message requires at least one MSH, Observational Request Segment (OBR), and Result Segment (OBX).

Example: Simple Results Message

```
MSH|~^\&|LA AUTO INST|695|LAB INTERFACE|Generic Interface Manager
    |19960227084324||ORM|350988|P|2.2
PID|||33466~0~M11||SMITH~JOE~Z||19250929|M||||||||||||111-11-1111
PV1|||LPC
ORC|NW||38277||||||||||~DANN~CARO~J
```

```
OBR|1|1560580026||441~~99001~1244X695003~PROSTATE SPECIFIC
ANTIGEN~99002|
    ||19960227084325|||||||SER|||AXSYM|~~24~2960227~26~SC 022
    7 26~1560580026~|||||||||~~~~~R
```

```
MSH|^~\&|LAB INTERFACE|Generic Interface Manager|LA AUTO INST|695
    |19960227103316|   |ORU|53801|P|2.2
PID|1||33466||SMITH^JOE^Z||||||||||||||||
OBR|1|1560580026||||||||||||||||AXSYM|^^24^2960227^26^SC 0227
26^1560580026
OBX|1|ST|441^^^1244X695003^PROSTATE SPECIFIC
ANTIGEN^99002||1.15|ng/ml|0.00 TO
    4.00|||F
```

These messages represent a download test request message. The Patient Identification Segment (PID) and Patient Visit Segment (PV1) fields in the download are straight forward.

Example: Download Request Message

```
MSH|~^\&|LA AUTO INST|695|LAB INTERFACE|Generic Interface Manager
    |19950725133514||ORM|2950725.133514|P|2.1
PID|||56535~2~M11||DOE~JOHN~H||19190927|M|||||||||||111-11-1111
PV1|||LORTH
ORC|NW||130424|||||||||~NORR~DANNY~W
OBR|1|1052060288||82374~02A~99001~55X454~BICARBONATE---------O~99002|
    ||19950725133542|||||||SER|||CX7CL-IM|~~11~2950725~288~CHE 0725
    288~1052060288~|||||||||~~~~~R
OBR|2|1052060288||82251~11A~99001~186X695168~BILIRUBIN, TOTAL
    ------~99002|||19950725133542|||||||SER|||CX7CL-IM|~~11~2950725~288~
    CHE 0725 288~1052060288~|||||||||~~~~~R
OBR|3|1052060288||84075~35A~99001~188X17~ALKALINE PHOSPHATASE
    -~99002|||19950725133542|||||||SER|||CX7CL-IM|~~11~2950725~288~CHE 0725
    288~1052060288~|||||||||~~~~~R
OBR|4|1052060288||84460~31A~99001~191X20~SGPT-----------------~
    99002|||19950725133542|||||||SER|||CX7CL-IM|~~11~2950725~288~CHE 0725
    288~1052060288~|||||||||~~~~~R
OBR|5|1052060288||84132~01B~99001~1442X6~POTASSIUM-----------O~
    99002|||19950725133542|||||||SER|||CX7CL-IM|~~11~2950725~288~CHE 0725
    288~1052060288~|||||||||~~~~~R
OBR|6|1052060288||84295~01A~99001~1443X5~SODIUM-------------O~
    99002|||19950725133542|||||||SER|||CX7CL-IM|~~11~2950725~288~CHE 0725 288~
    1052060288~|||||||||~~~~~R
OBR|7|1052060288||82435~04A~99001~1444X7~CHLORIDE-----------O~
    99002|||19950725133542|||||||SER|||CX7CL-IM|~~11~2950725~288~CHE 0725
    288~1052060288~|||||||||~~~~~R
```

Example: Upload of Results Message

Some of the fields in the download are echoed back in the results message:

```
PID|1||111-11-1111||
    SSN echoed, PV1 not required

OBR|1|1052060285|||||||||||||SER|EBER_MARGE_J_MD||CX7A-IM|46^1^^^^^^42865|||
    echoed from download

OBR|1|1052060285|||||||||||||SER|EBER_MARGE_J_MD||CX7A-IM|46^1^^^^^^42865|||19
    950725135024|||||^^^^^
     46^1 represents the tray/cup as downloaded, but is also used
    on unidirectional when tray cup  is the only method for identifying
    the specimen.  3rd component is the tray, 4th component is the cup.
    Components 1 and 2 would be empty in the case of a unidirectional
    upload by tray cup.


OBX|1|ST|82251^^^||0.9|mg/dl|||||F
 alternate test code echoed
```

Example: Upload of Results Message

```
MSH^~|\&^LAB INTERFACE^NON-DHCP^LA AUTO INST695^199104301001^^ACK^54322^P^2.2
MSA^AA^12345
```